Proposal full title: ***Test Infrastructure and Accelerator Research Area***

Proposal acronym: ***TIARA***

Type of funding scheme: ***Combination of Collaborative Projects and Coordination and Support Actions for Construction of New Infrastructures – Preparatory Phases***

Work programme topics addressed: ***INFRA-2010-2.2.11***

Name of the coordinating person: ***Dr Roy Aleksan***

List of participants:

Participant no.	Participant organisation name	Country
1 (coordinator)	CEA – Commissariat à l'Energie Atomique	France
2	CERN – European Organization for Nuclear Research	International
3	CNRS – Centre National de la Recherche Scientifique	France
4	CIEMAT – Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas	Spain
5	DESY – Deutsches Elektronen-Synchrotron	Germany
6	GSI – Helmholtzzentrum für Schwerionenforschung GmbH	Germany
7	INFN – Istituto Nazionale di Fisica Nucleare	Italy
8	PSI – Paul Sherrer Institute	Switzerland
9	STFC – Science and Technology Facilities Council	UK
10	UU – Uppsala University	Sweden
11	IFJ PAN – Instytut Fisyki Jadrowej PAN	Poland

Website: **www.eu-tiara.eu**

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PART B

1. Objectives and Description of the Activities foreseen

The realization of current and planned state-of-the-art accelerator-based research infrastructures, such as LHC, XFEL, FAIR, SPIRAL2, ESS, IFMIF, serving the needs of a vast range of research communities, is only made possible by continuous progress in accelerator science and technology supported by strong and sustainable R&D activities. It is thus not surprising that strengthening Europe's capability in accelerator R&D has been identified as a very high priority issue within many of the communities using accelerator-based research infrastructures. This is, in particular, the case for Particle Physics, for which the CERN Council has ranked accelerator R&D as a top priority in its European Strategy document, and also applies to a large number of projects included in the ESFRI roadmap.

To carry out a viable and state-of-the-art accelerator R&D programme requires the use of a wide variety of R&D infrastructures, ranging in scale from high-tech equipment and large size accelerator component test stands up to state-of-the-art test accelerator infrastructures costing several tens of millions of Euros. For illustration, a list of some of the largest R&D infrastructures currently available in Europe is shown in the tables 1.1 and 1.2 below.

Table 1.1: Accelerator infrastructure which are dedicated or used part time for Accelerator R&D

Laboratory	Accelerator	Short Description
CEA	***IPHI***	Dedicated 3 MeV High Intensity Proton Injector for accelerator R&D
CNRS-Orsay	***PHIL***	Dedicated electron accelerator test infrastructure
CERN	***Linac3, Linac4, PS, SPS, LEIR, AD, RexIsolde***	Proton accelerator complex, also used as R&D infrastructures
	CTF3	Dedicated two-beams electron linear accelerator test facility
	RADMAT	Material radiation facility for accelerator material and component tests
DESY	***FLASH***	Electron superconducting linear accelerator test facility and free electron laser, also used as R&D infrastructures
GSI	***UNILAC. SIS, ESR***	Heavy ion accelerator complex, also used as R&D infrastructures
INFN	***DAPHNE***	Electron-Positron collider, also used as R&D infrastructures
	SPARC	Electron linear accelerator for R&D on FEL
PSI	***SINQ, SLS***	Accelerator complex for the electron, neutron and muon facility which are also used as R&D infrastructures
	SwissFEL Injector	250 MeV Linac for study of FEL injector and bunch compressor performance and development of high performance beam instrumentation
STFC	***ISIS at RAL***	Accelerator complex for neutron and muon source, also used as R&D infrastructures
	ALICE at Daresbury Laboratory	Electron energy-recovery linear accelerator test facility

Table 1.2: Examples of other type of large infrastructures, used for accelerator R&D

Laboratory	Facility	Description
CEA	***RF test stands***	Including 704 MHz RF test stand for pulsed SC cavity testing (1 MW) as well as 352 Mhz RF sources
	SC structure test stands and integration facilities	Horizontal Cryogenic cavity test stand (Cryholab) and several vertical cryostats very large clean room for cryomodule integration
	SC magnet test stands	Superconducting magnet test facility, including a set very large cryostats and facilities for thermal, mechanical and electrical characterization
CERN	***Proton beam test stand***	Multipurpose 3 MeV test stand (chopping tests, H-source studies…)
	RF stand	352 MHz RF test stand for cavity testing (120 kW)
	FRESCA	Superconducting wire and cable test facility
CNRS-Orsay	***Coupler test stand***	Production Test facility for couplers
	RF test stand	RF test stand at 352 MHz :10 kW CW RF test stand at 704 MHz : 80 kW CW
	SC structure test stands and integration facilities	Vertical cryostats for SC cavity testing Class 10 clean room for cavity preparation and cryomodule integration Chemistry facility for SC cavity surface treatment
DESY	***SC structure test stands and integration facilities***	Horizontal Cryogenic test stand (Chechia) and very large clean room for cryomodule integration
	Magnet test stands	Superconducting Magnet Test Facility
	PITZ	Photo-injector test facility
GSI	***Magnet test stands***	Superconducting Magnet Test Facility
INFN	***Magnet wire test stands***	Superconducting wire test facility High-Field Superconducting wire test facility
STFC	***Mechanical test stands***	Cryogenic facility for mechanical measurement

A first estimate of the scale of investment in these infrastructures, which will be refined and detailed in the course of the proposed preparatory phase project, is in the range of **one billion Euros**, with maintenance and operating yearly costs estimated to be about 10% of the total cost, on average. No single institute or laboratory, nor even a single country, has the expertise and the resources to develop and operate such a wide and diverse set of infrastructures.

The ESGARD[1] grouping has promoted and coordinated the establishment of a strong R&D programme using the R&D infrastructures above in a coordinated and optimized way taking advantage of the incentive of the FP6 and FP7 as seen in the table 1.3 below.

[1] The European Steering Group on Accelerator R&D was established in 2002 by several large research organizations in consultation with ECFA (European Committee for Future Accelerator) to optimize and enhance the outcome of the Research and Technical Development in the field of accelerator science in Europe. It includes a representative from CERN, CEA/IRFU, CIEMAT, DESY, INFN, CNRS/IN2P3, PSI and STFC/RAL.

Table 1.3: FP6 and FP7 projects on accelerator R&D promoted by ESGARD

<table>
<tr><th>Project Type</th><th>2003</th><th>2004</th><th>2005</th><th>2006</th><th>2007</th><th>2008</th><th>2009</th><th>2010</th><th>2011</th><th>2012</th><th>2013</th></tr>
<tr><td>I3/IA</td><td></td><td colspan="5">CARE (3 networks e, n, p)</td><td colspan="4">EuCARD</td><td></td></tr>
<tr><td>I3/IA</td><td></td><td colspan="5">CARE/SRF (LC)</td><td colspan="4">EuCARD/SRF</td><td></td></tr>
<tr><td>I3/IA</td><td></td><td colspan="5">CARE/PHIN (LC)</td><td colspan="4">EuCARD/SRF-ANAC</td><td></td></tr>
<tr><td>I3/IA</td><td></td><td colspan="5">CARE/HIPPI (p injection systems)</td><td colspan="4">EuCARD/SRF-ColMat</td><td></td></tr>
<tr><td>I3/IA</td><td></td><td colspan="5">CARE/NED (High-Field Magnets)</td><td colspan="4">EuCARD/HFM</td><td></td></tr>
<tr><td>Prep.-Phase</td><td></td><td></td><td></td><td></td><td></td><td colspan="3">SLHC (p Coll.)</td><td></td><td></td><td></td></tr>
<tr><td>Design Study</td><td></td><td></td><td colspan="4">EUROTEV (LC)</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Prep.-Phase</td><td></td><td></td><td></td><td></td><td></td><td colspan="4">ILC-HiGrade (ILC)</td><td></td><td></td></tr>
<tr><td>Design Study</td><td></td><td></td><td colspan="4">EURISOL, β-beams)</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Design Study</td><td></td><td></td><td></td><td></td><td></td><td colspan="5">EURO-Nu</td><td></td></tr>
<tr><td>NEST</td><td></td><td></td><td></td><td colspan="3">EUROLEAP (plas.)</td><td colspan="4">EuCARD/ANAC</td><td></td></tr>
<tr><td>I3/IA</td><td></td><td></td><td></td><td></td><td></td><td></td><td colspan="4">EuCARD/ANAC (SuperB)</td><td></td></tr>
</table>

A total of eight R&D projects have been developed covering the high priority technological aspects for future accelerators over a period of nine years and amounting to a total cost of about 191 M€, out of which 59.6 M€ is financed by the EC. While carrying out these projects, it has become increasingly clear that establishing an efficient, structured and sustainable coordination of activities in this area is crucial for the optimal use and development (upgrades and construction of new facilities) of this large variety of large scale test infrastructures.

Thus, the idea of integrating these infrastructures into ***a single European distributed accelerator R&D facility*** has progressively emerged, with the goal of creating in Europe the Test Infrastructure and Accelerator Research Area (TIARA).

1.1 Concept and objectives

The main objective of the TIARA Preparatory Phase is the integration of national and international accelerator R&D infrastructures into ***a single distributed European accelerator R&D facility***.

TIARA will enable full exploitation of the complementary features and expertise of the individual member infrastructures and will maximize the benefits for both the member infrastructures and the users. This includes the agreement and implementation of organisational structures and methods that will enable integration of existing individual infrastructures, their efficient operation and upgrades, and the construction of new infrastructures as part of the TIARA facility, thus ensuring the competitiveness and sustainability of accelerator R&D in Europe. Such a unique distributed facility will enable Europe to establish its leadership in accelerator science and technology through the development of an integrated R&D program embracing the needs of many different fields, as well as medical and industrial sectors both for technical and human resource aspects.

Besides the preparation and realization of critical technological improvements to ensure that the distributed TIARA facility will remain at the state-of-the-art and will be exploited with highest efficiency, taking advantage of the structure that will be established, TIARA will also aim to:

- develop a joint European accelerator R&D programme, in particular by defining the structure and mechanism allowing one to identify the user needs, to enable the formation of collaborative projects and to implement them as part of a coherent programme
- help the promotion of educating and training of accelerator scientists, through the establishment and implementation of a coherent European plan of action in this area
- offer economically efficient ways to develop collaboration on accelerator R&D with the industrial sector for the development of products for research facilities, as well as medical and industrial applications of accelerators.

As a whole, TIARA will thus constitute, in Europe, the groundwork and the driving force to enable Europe to reinforce its world-level leadership in accelerator science at large by integrating all the crucial ingredients:

- a European state-of-the-art distributed R&D facility
- the means for establishing and supporting
    - joint accelerator R&D programming
    - a joint education and training programme
    - strengthened collaboration with the industry, including the transfer of technology.

The TIARA Consortium is supported by a strong collaboration between the partners with the overall goal of enhancing user access to world-level research infrastructures, thanks to their complementarities. Upgrades or new constructions of large accelerator based infrastructures, such as particle physics accelerators, intense radioactive ion-beams for nuclear physics, new types of light sources and neutron sources for interdisciplinary research, and also medical and industrial accelerators will be facilitated and/or made possible. It will thus contribute directly to scientific European excellence in a competitive High-Technology and economically important domain, enhancing also the European health and industry sectors.

In summary, TIARA will offer a world-level service in response to the needs of users from a broad range of research communities, as well as medical and industrial applications through the establishment of a ***distributed pan-European Research Facility and a multi-field Joint Programming activity****.*

TIARA will thus aim to deliver a sustainable coordinated European framework for the benefit of

- the different fields of science, which need state-of-the-art and/or cost effective accelerators, to carry out joint accelerator R&D using large infrastructures
- the implementation of the accelerator-based infrastructures identified in the ESFRI roadmap
- the different partners (national laboratories, universities, industry) to develop joint projects and exchange expertise on state-of-the-art technologies
- European countries to invest and develop their own infrastructures and research centres as parts of TIARA, within an established Europe-wide coordination framework.
- Europe as a whole to ensure world leadership in the field of accelerators and to enable a coordinated and efficient means for its regionally balanced scientific and technological development.

1.2 Progress beyond the state-of-the-art

The proposal submitted in response to the call INTRA.2.2.11 addresses a topic identified by the CERN Council as its highest priority after the LHC. It is referred to in the ESFRI Roadmap in the section for Particle Physics and Space Physics where it is stated that “It is vital to strengthen the advanced accelerator R&D programme in Europe, providing a strong technological basis for future projects in particle physics" (page 72). The CERN Council, including the national representatives of 20 European member states, has thus decided to submit the TIARA proposal on its 8th European Strategy session (September 18th, 2009).

Although progress beyond the state-of-the-art has been assessed by the CERN Council, it is worthwhile briefly highlighting the added value of TIARA in this domain.

As mentioned in the introduction, during the work carried out by projects promoted by ESGARD, it became clear that, in order to fulfil the requirements of a broad European community of accelerator scientists and engineers with respect to the diversity and quantity of large scale test infrastructures needed, it would be of great advantage to integrate the national and international R&D infrastructures in a well coordinated distributed European facility. Such a facility will enable to develop, in an optimized, efficient and comprehensive way, accelerator technologies beyond the current state-of-the-art for the benefit of a broad community of scientific, medical and industrial users.

The R&D infrastructures that will be integrated within TIARA constitute the most advanced presently available tools to carry the research in accelerator science. They are part of the largest multidisciplinary high technology research organizations in Europe, which are partners of the TIARA consortium. It is thus a clear indicator of the potential strength of TIARA.

All large European accelerator facilities recently built or in construction have been initiated and led by one or more of these partners. It is important to note, that TIARA is therefore not simply a project for the particle physics domain: accelerator R&D underpins many of the high-priority infrastructures for interdisciplinary science included in the ESFRI roadmap, such as ESS, IFMIF, XFEL, SPIRAL2 and FAIR. Joining their R&D infrastructures to enable the development of a joint R&D programme will enhance further considerably the ability of Europe to remain at the forefront of the accelerator technologies in a sustainable way for the benefit of the society of knowledge and in turn will contribute to the building of an economy of knowledge.

Some specific performance criteria of the TIARA project are:

- scientific and technical quality of the distributed facility as a whole
- optimized balance of supply and demand of R&D infrastructures covering the full range of needs requested by the European user community
- enhanced collaboration between the member infrastructures including coordinated exchange of know-how and personnel and the creation of centres of excellence in Europe
- improved access of users to the facility
- improvements of the individual infrastructures and the construction of new infrastructures in a coordinated and collaborative manner
- savings through a coordinated approach to industrial suppliers

1.3 Work Plan for the Preparatory Phase

1.3.1 Overview

The goal of the preparatory phase project is to bring TIARA to a state of readiness for implementation at the end of the preparatory phase. The work carried out combines both a bottom-up and top-down approach, as it will consult widely the user communities to identify the detailed needs and wishes, and involve directly the relevant funding agencies and their respective Ministries for the elaboration of the Overall Memorandum of Agreement as one of the main deliverables of the preparatory phase.

The three year work plan of the TIARA-PP project is broken down into ten work packages, which include Management activities of the preparatory phase (WP1), Coordination and Support activities (WP2 to WP6) and RTD activities (WP7 to WP10). The work package structure reflects the critical questions that need to be addressed during the preparatory phase. The strategy chosen in term of organization is to set up :

- one work package (WP2) in charge of all structural issues, including legal, financial and administrative aspects enabling the setting-up, the implementation and the extension of the TIARA coordination framework.
- four work packages providing inputs to WP2 through a coordinated approach
  - on relevant scientific and technical issues (accelerator R&D infrastructures and programme - WP3 and WP4)
  - on relevant academic, human resource and industrial issues (education and training and collaboration with industry - WP5 and WP6)
- four technical work packages, the objectives of which is to bring, prior to the implementation of TIARA, critical R&D infrastructures to a level of performance allowing one to address the crucial R&D needs for the development of presently envisaged future large scale accelerators not yet benefiting of a dedicated preparatory phase. These targeted R&D infrastructures will be very important parts of the TIARA distributed facility. The practical experience gained in the collaborative development of these infrastructures will also provide valuable inputs to the construction of TIARA.

An Overall TIARA Memorandum of Agreement will be worked out and signed, defining the individual infrastructures which will be included in the distributed facility, the management structure of the consortium, and the user policies and procedures for an optimized access of users to the TIARA facility. It will also comprise means to facilitate exchange and development of human resources and take user needs into account in the improvement and the construction of new infrastructures integrated in the distributed facility. Web-based tools will be developed to enable efficient communication between the individual member facilities and TIARA-PP to make the distributed facility as a whole visible and easily accessible for the European research community. A further key objective is to identify critical technical issues that are of importance for the TIARA Consortium, and to organize long-term collaborations and the transfer of knowledge between the TIARA members as well as with industry. This will allow optimization of resources and production times and enable full scientific exploitation of the new R&D facilities from the start. Moreover, it will lead to high standards and continuous technical developments enabling the consortium to assume and maintain a leading role worldwide.

The structural development of the consortium is the subject addressed in Work Package WP2. A series of meetings is planned to negotiate and agree on the consortium and management structure as well as legal, financial and advisory aspects. It is planned to seek advice from legal experts in order to address these issues. The final outcome will be an Overall Memorandum of Agreement that includes all the relevant aspects enabling the legal implementation of TIARA. It will receive important inputs from other Work Packages.

WP3 will deal with the individual R&D infrastructures which will constitute the distributed TIARA facility. It will carry out a thorough survey of these accelerator R&D infrastructures in Europe and study, together with WP4, the user needs for the operation, upgrades and the construction of new R&D infrastructures. An overall access policy will be devised with the goal of optimizing the access of users to the distributed TIARA facility. WP3 will also work out methods for ensuring that the needs of a broad user community will be taken into account in the planning and decisions of the consortium. A strong benefit for the user community will come from the comprehensive and complementary set of technical infrastructures that the consortium will be able to provide.

Amongst the infrastructures which constitute TIARA, several specific unique and crucial infrastructures are dedicated and vitally needed to enable the development of R&D for very large projects, possibly leading to the construction of world class accelerator facilities in Europe. Four such potential facilities have been identified: a future electron-positron collider CLIC, an intense neutrino beam facility, the proposed Super B factory, and the nuclear physics facility EURISOL. The corresponding critical R&D infrastructures are already needed in the coming 3 years. It is thus natural to use the opportunity of the Preparatory Phase to accelerate their realization and upgrade in a complementary and collaborative way, anticipating partly the implementation of TIARA's objectives. This will be achieved in the work packages, WP7, WP8, WP9 and WP10. The corresponding WPs will be strongly connected to WP3 on R&D infrastructures, in which there is no technical work (as explained above). The user community will thus also benefit from the strong combined world-class expertise of the consortium and the timely forefront technical developments it can realize.

Work packages WP4 to WP6 will provide the basis for a strong consortium by making efficient use of the resources and distributed complementary expertise of the partners.

WP4 organizes long-term collaborations by establishing the means to develop an ambitious accelerator R&D programme and knowledge transfer between the members of the consortium. The main objective of this work package is to identify the critical technical issues in the field of accelerator science and technology that are of importance for the TIARA Consortium, help defining a joint R&D Programme and organize long-term collaborations between the TIARA partners and associates by developing the methodology and procedures for initiating, costing and implementing collaborative R&D projects in a sustainable way.

WP5 supports education and training in accelerator science. Human resources are the key elements in the conception, design, realization, operation and further development of each individual TIARA facility within the TIARA Consortium, and more generally for the construction of accelerators. The main objective of this work package is the development of structures and mechanisms that allow efficient education and training of human resources and facilitate their exchange among the partner facilities. WP5 will provide extensive information for the research community through web-based tools.

WP6 organizes efficient long-term collaborations with industry and a coordinated approach to industrial suppliers. The central objective of WP6 is to bring together research institutes and universities developing accelerator technologies and industrial companies interested both in commercializing products for scientific projects based on these technologies and in supplying accelerator systems (industrial accelerators, medical accelerators) to a wide user community. The aim is to create a framework intellectually and economically attractive to develop industrial products both for the research facilities and medical and industrial accelerators. The WP6 activity should enable to increase the speed of the R&D industrialization, to facilitate the technology and knowledge transfer, and cost optimization.

It is worthwhile mentioning the general strategy adopted for the Work Packages 2 to 6: Although some of the beneficiaries, via the WP leaders and deputies, will lead the coordination of the work, participants from all beneficiaries will contribute. In such an ambitious project as TIARA, it is felt that active participation and inputs from all participants are essential assets in order to reach the objectives of TIARA-PP.

The following table summarizes the participation of the participants in the different work packages.

Participant number	Participant number	WP 1	WP 2	WP 3	WP 4	WP 5	WP 6	WP 7	WP 8	WP 9	WP 10
1	**CEA**	X	X	X	X	X	X				
2	**CERN**		X	X	X	X	X	X	X		X
3	**CNRS**		X	X	X	X	X				X
4	**CIEMAT**		X	X	X	X	X				
5	**DESY**		X	X	X		X				
6	**GSI**		X	X	X	X	X				
7	**INFN**		X	X	X	X	X	X		X	
8	**PSI**		X	X	X	X	X	X		X	
9	**STFC**		X	X	X	X	X		X		
10	**UU**		X	X	X	X	X	X			X
11	**IFJ PAN**		X	X	X	X	X				

The detailed work plan is described in the following sections. Gantt charts, under B 1.3.2, show the schedule of the work packages, as well as the tasks and sub-tasks carried out. The detailed descriptions of the work packages to be supported under this project are listed in B 1.3.3.

1.3.2 Work Plan

The overall work plan of the TIARA-PP project is summarized in this section. It includes the list of Work Packages (table 1.3 a1 & a2) and the planned timing of the work packages (Gantt charts 1.3.a1 to 1.3.a10). The detailed description of the Work Packages is shown in section 1.3.4.

Table 1.3 a1: Work package list (foreseen under this proposal)

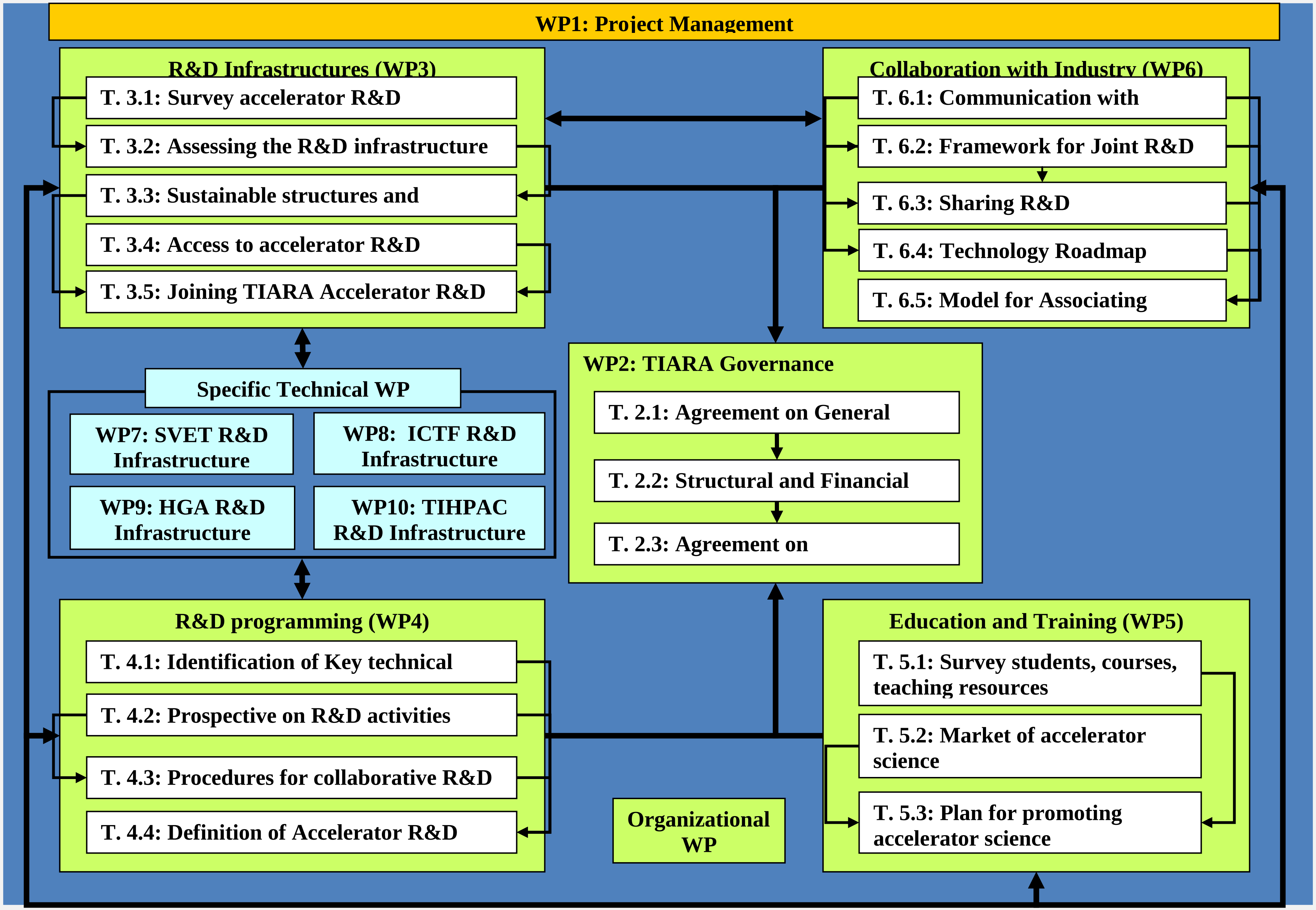
Work package No[2]	Work package title	Type of activity[3]	Lead participant No[4]	Lead participant short name	Person-months[5]	Start month[6]	End month[6]	Indicative Total costs	Indicative requested EC contribution
WP1	Management	MGT	1	CEA	90	1	36	1007840	607580
WP2	Governance	SUPP	1	CEA	116	1	36	1581750	953270
WP3	R&D Infrastructures	COORD	2	CERN	90	1	36	1309710	771640
WP4	Joint R&D Programming	COORD	7	INFN	90	1	36	1234950	753200
WP5	Education&training	SUPP	9	STFC	80	1	36	1148930	665950
WP6	Collaboration with industry	SUPP	5	DESY	85	1	36	1252370	730630
WP7	SVET R&D infrastructure	RTD	2	CERN	79	1	36	1336900	492870
WP8	ICTF R&D infrastructure	RTD	9	STFC	54	1	36	896250	271910
WP9	HGA R&D infrastructure	RTD	7	INFN	95	1	36	1343440	515890
WP10	TIHPAC R&D infrastructures	RTD	3	CNRS	60	1	36	690430	237030
				TOTAL	839			11802570	5999970

2 Work package number: WP 1 – WP n
3 MGT = Management of the consortium; COORD = Coordination activity; SUPP = Support activity; RTD = Research and technological development.
4 Number of the participant leading the work in this work package.
5 The total number of person-months allocated to each work package.
6 Measured in months from the project start date (month 1).

Table 1.3 a2: Additional Work package list (not supported by the EC under this proposal)

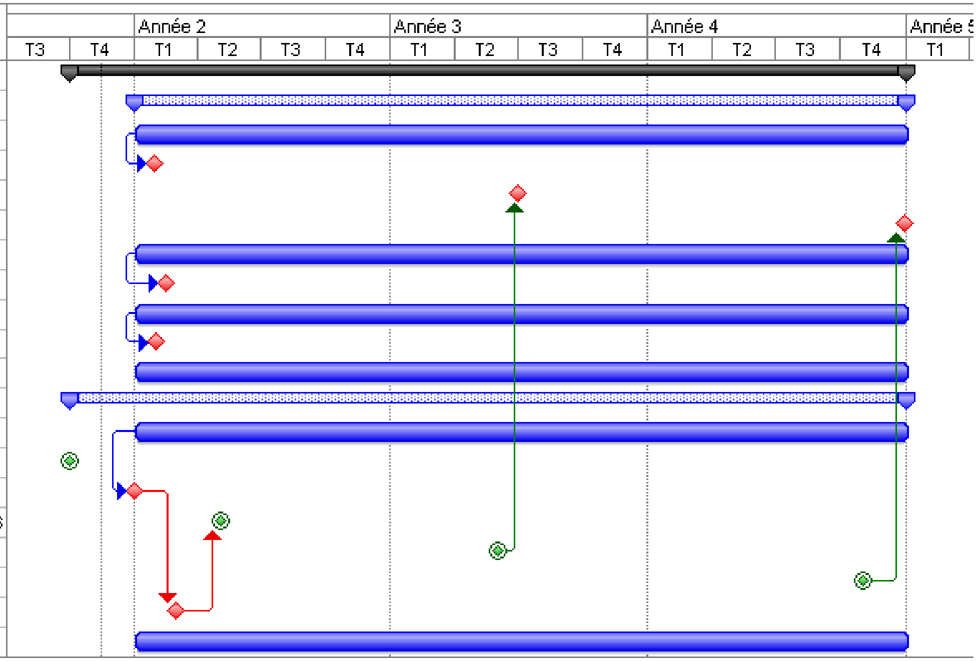
Work package No	Work package title	Type of activity[7]	Organisations involved	Indicative Person-months[8]	Start month[9]	End month[9]	Indicative budget
WP11	International Muon Ionisation Cooling Experiment	RTD	ICST Harbin, Sofia, Como, Milano, Napoli, Pavia, Roma III, Trieste, KEK, Kyoto, Osaka, NIKHEF, CERN, Geneva, Brunel, Cockcroft/Lancaster, DL, Glasgow, Imperial, Liverpool, Oxford, RAL, Sheffield, Warwick, ANL, BNL, FNAL, JLab, LBNL, IIT, Mississipi, Iowa, Muons Inc., New Hampshire, UC Riverside, UCLA	300	1	36	~40M€
		TOTAL		300			~40 M€

[7] MGT = Management of the consortium; COORD = Coordination activity; SUPP = Support activity; RTD = Research and technological development.
[8] The total number of person-months allocated to each work package
[9] Measured in months from the project start date (month 1).


WP1: Project Management
R&D Infrastructures (WP3)
T. 3.1: Survey accelerator R&D
T. 3.2: Assessing the R&D infrastructure
T. 3.3: Sustainable structures and
T. 3.4: Access to accelerator R&D
T. 3.5: Joining TIARA Accelerator R&D
Collaboration with Industry (WP6)
T. 6.1: Communication with
T. 6.2: Framework for Joint R&D
T. 6.3: Sharing R&D
T. 6.4: Technology Roadmap
T. 6.5: Model for Associating
Specific Technical WP
WP7: SVET R&D Infrastructure
WP8: ICTF R&D Infrastructure
WP9: HGA R&D Infrastructure
WP10: TIHPAC R&D Infrastructure
WP2: TIARA Governance
T. 2.1: Agreement on General
T. 2.2: Structural and Financial
T. 2.3: Agreement on
R&D programming (WP4)
T. 4.1: Identification of Key technical
T. 4.2: Prospective on R&D activities
T. 4.3: Procedures for collaborative R&D
T. 4.4: Definition of Accelerator R&D
Education and Training (WP5)
T. 5.1: Survey students, courses, teaching resources
T. 5.2: Market of accelerator science
T. 5.3: Plan for promoting accelerator science
Organizational WP

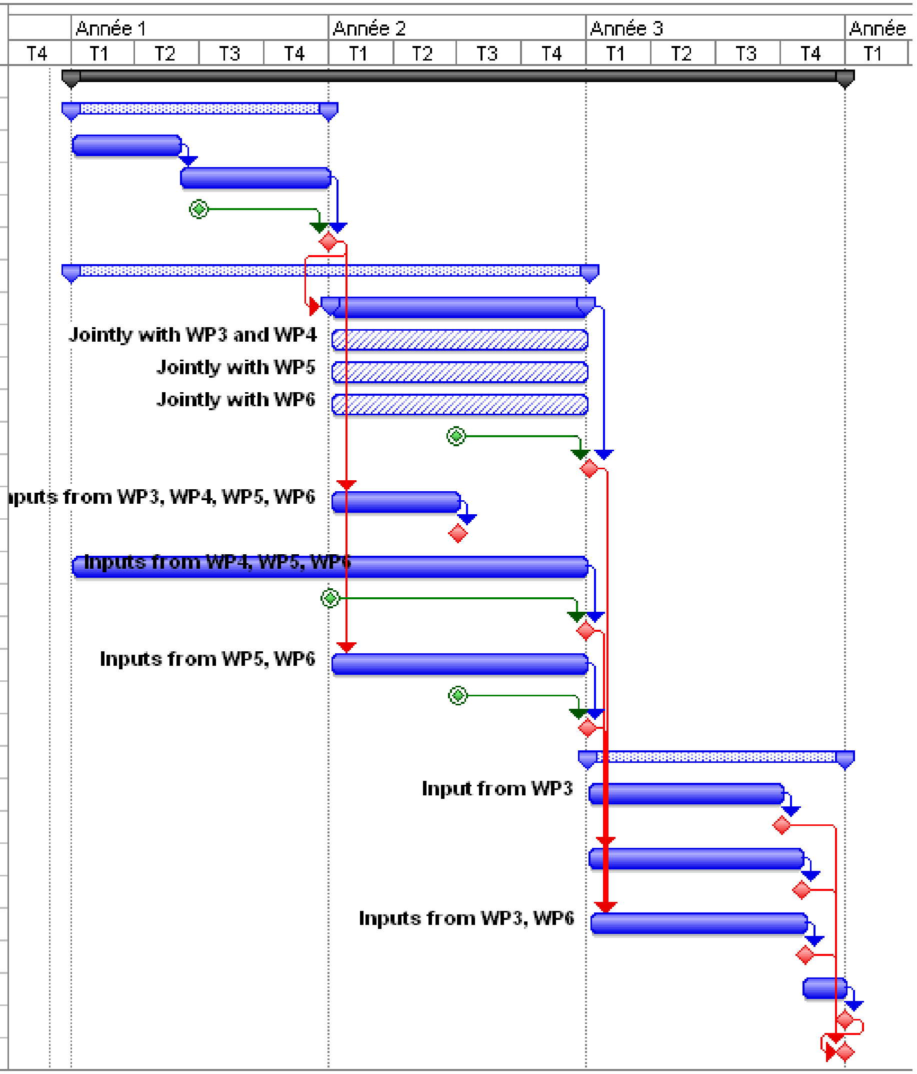
Gantt Chart 1.3.a1 for Work Package WP1

N°	WBS	Task Name
1	**1**	**WP1 Management of the TIARA consortium**
2	**1.1**	**1.1 CoC: Coordination of the Consortium**
3	1.1.1	1.1.1 REC: Reporting to the EC
4	**D1.3**	**D1.3 CCE: Contract of the Consortium with the EC signed**
5	**D1.6**	**D1.6 MTR: Mid term Report**
6	**D1.7**	**D1.7 FTR: Final Report**
7	1.1.2	1.1.2 RGB: Reporting to the Consortium Governing Bodies
8	**D1.2**	**D1.2 CAP: Consortium Agreement between participants ready**
9	1.1.3	1.1.3 CMP: Coordination and monitoring of the project
10	**D1.4**	**D1.4 OKM: Organization of Kick-off meeting**
11	1.1.4	1.1.4 MoB: Management of the budget
12	**1.2**	**1.2 CDO: Communication, Dissemination and Outreach**
13	1.2.1	1.2.1 CDC: Communication and Dissemination in the Consortium
14	M1.1	M1.1 POWS: Preliminary Overall Web Site Frame set up
15	**D1.1**	**D1.1 OWSF: Overall Web Site Frame ready**
16	M1.2	M1.2 MTR: Development of task performance monitoring tools and documentation repos
17	M1.3	M1.3 MGM: Organization of Mid-term General Meeting
18	M1.4	M1.4 FGM: Organization of the Final Meeting
19	**D1.5**	**D1.5 IWSF: Internal Web Stite Frame Ready**
20	1.2.2	1.2.2 DOC: Dissemination and Outreach toward the communities and Public at large



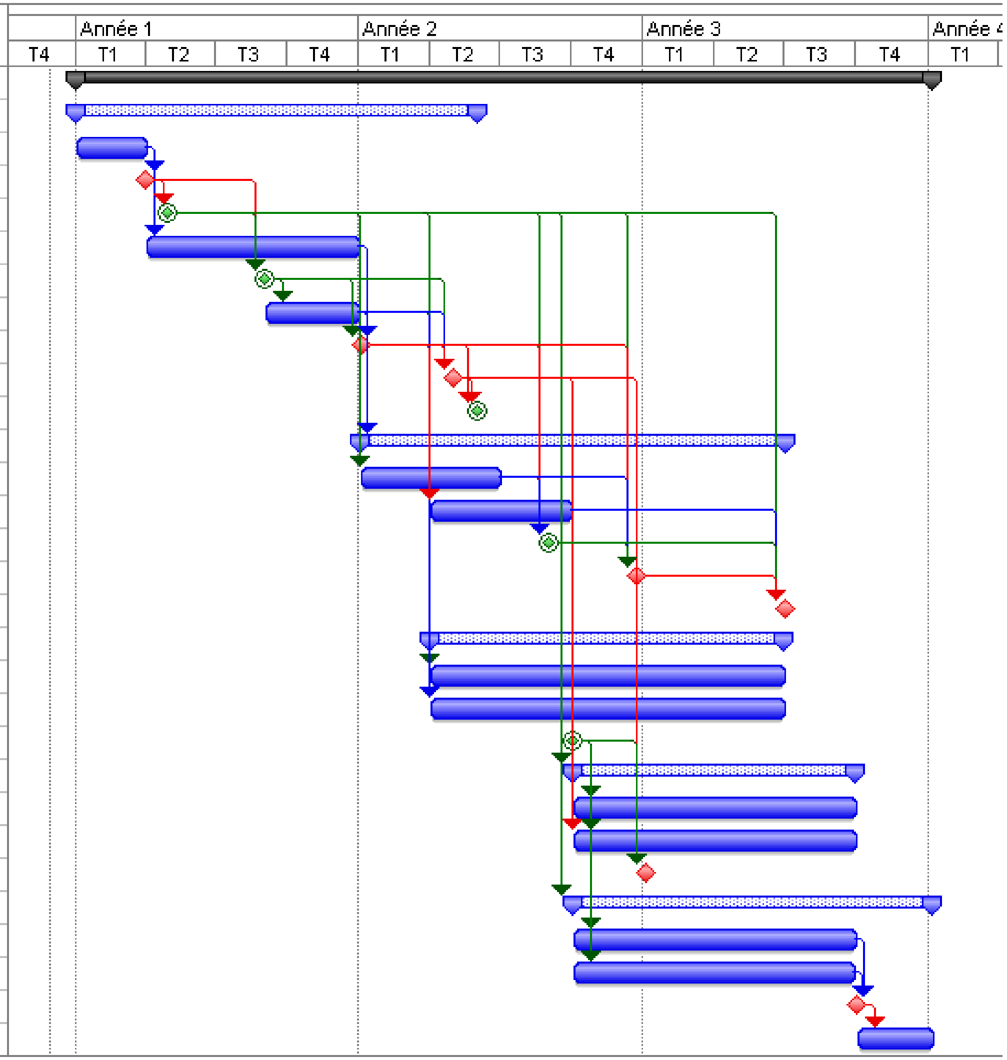
Gantt Chart 1.3.a2 for Work Package WP2

N°	WBS	Task Name
1	**2**	**WP2 Governace**
2	**2.1**	**2.1 TGI: Agreement on TIARA General Issues**
3	2.1.1	2.1.1 AMS: Agreement on the Mission and Scope
4	2.1.2	2.1.2 ACG: Agreement on Central Coordination Guideline
5	M2.1	M2.1 I-GI: Interim report on General Issues
6	**D2.1**	**D2.1 MoA-GI: Memorandum of Agreement on General Issues**
7	**2.2**	**2.2 SFN: Structural and Financial Needs**
8	2.2.1	2.2.1 AMO: Advising Mechanism and Organization
9	*2.2.1.1*	*2.2.1.1 STA: Scientific and Technical Advising Mechanism and Organization*
10	*2.2.1.2*	*2.2.1.2 ETA: Education and Training Advising Mechanism and Organization*
11	*2.2.1.3*	*2.2.1.3 IIA: Industrial Issue Advising Mechanism and Organization*
12	M2.2	M2.2 I-AMO: Interim Report on Advisory Mechanism and Organization
13	**D2.2**	**D2.2 AMO: Report on Advisory Mechanisms and Organization**
14	2.2.2	2.2.2 IBC: Identification of Bodies with which Collaboration is needed
15	**D2.3**	**D2.3 COB: Report on Collaboration with Other Bodies**
16	2.2.3	2.2.3 CDO: Communication, Dissemination and Outreach Structure
17	M2.3	M2.3 I-CDO: Interim Report on Communication, Dissemination and Outreach
18	**D2.4**	**D2.4 CDO: Report on Communication, Dissemination and Outreach Structure**
19	2.2.4	2.2.4 FMN: Financial Management Needs
20	M2.4	M2.4 I-FMN: Interim Report on Financial Management Needs
21	**D2.5**	**D2.5 FMN: Report on Financial Management Needs**
22	**2.3**	**2.3 TTI: Toward TIARA Implementation**
23	2.3.1	2.3.1 ITI: Agreement on Initial TIARA Infrastructures
24	**D2.6**	**D2.6 MoA-ITI: Memorandum of Agreement on Initial TIARA Infrastructures**
25	2.3.2	2.3.2 FME: Financial Management Model and Engineering
26	**D.2.7**	**D2.7 MoU-FIE: MoU on Financial Management Model and Engineering**
27	2.3.3	2.3.3 OLS: Overall Legal Structure
28	**D2.8**	**D2.8 MoU-LID: MoU on the overall TIARA Legal Structure**
29	2.3.4	2.3.4 TII: TIARA Impacts and related Indicators
30	**D2.9**	**D2.9 TIM: Report on TIARA Impact Measurement**
31	**D2.10**	**D2.10 F-MoA: Final overall Memorandum of Agreement**



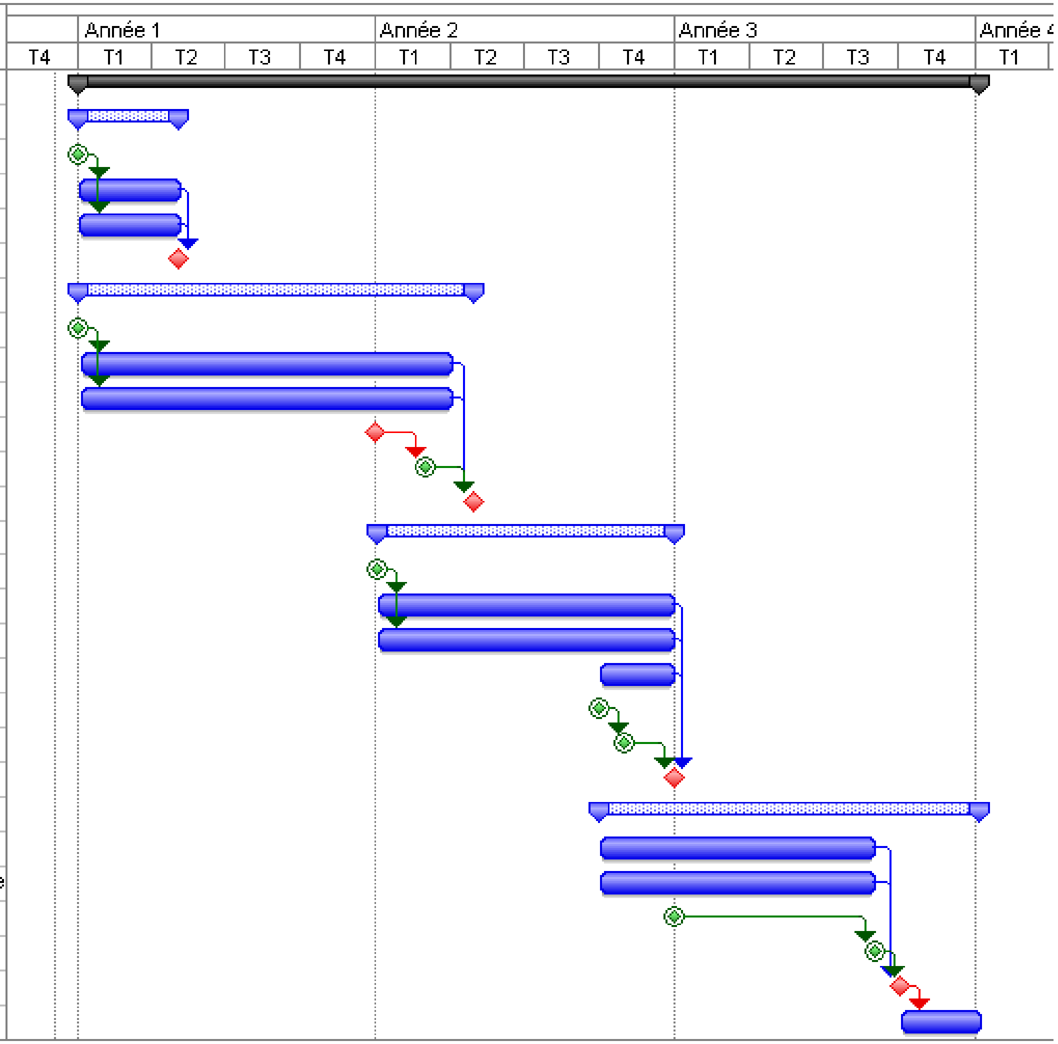
Gantt Chart 1.3.a3 for Work Package WP3

N°	WBS	Task Name
1	**WP3**	**WP3 Accelerator R&D Infrastructures**
2	**3.1**	**3.1 SCC: Survey of existing accelerator R&D infrastructures**
3	3.1.1	3.1.1 IKARA: Identification of key Accelerator Research Areas
4	**D3.1**	**D3.1 ARA: Report of key ARA**
5	M3.1	M3.1 NWPC: Nomination of WPC for each ARA
6	3.1.2	3.1.2 SIARA: Survey of existing infrastructures per ARA
7	M3.2	M3.2 ISR: Interim Infrastructure Survey Report
8	3.1.3	3.1.3 ECICM: Cost Estimation for existing infrastructures
9	**D3.2**	**D3.2 ISR: Infrastructure Survey Report**
10	**D3.3**	**D3.3 IWD: Web based Infrastructure Data Base**
11	M3.3	M3.3 IWD: Presentation of Web-based data base to TIARA collaborators
12	**3.2**	**3.2 ACA: Assesing infrastructure needs**
13	3.2.1	3.2.1 CMLIN: Assessing the accelerator R&D infrastructure needs
14	3.2.2	3.2.2 CAIN: Comparison of the R&D needs with existing infrastructures
15	M3.4	M3.4 IRC: Interim Report on Infrastructure versus Needs comparison
16	**D3.4**	**D3.4 INR: Report on Infrastructure versus Needs comparison**
17	**D3.6**	**D3.6 RUC: Report on potential infrastructure upgrades**
18	**3.3**	**3.3 SSC: Structures for Sustainability**
19	3.3.1	3.3.1 DSSPT: Proposal for structures to ensure sustainability
20	3.3.2	3.3.2 CMUCI: Proposal of a common costing method
21	M3.5	M3.5 JTI: Proposal of structures for sustainability to WP2
22	**3.4**	**3.4 ATI: Access to the TIARA Infrastructures**
23	3.4.1	3.4.1 PMAIT: Policy and modalities for accessing TIARA
24	3.4.2	3.4.2 CnEII: Coordination with infrastructures outside TIARA
25	**D3.5**	**D3.5 IAR: Infrastructure Access report**
26	**3.5**	**3.5 JTI: Joining TIARA Infrasctructures**
27	3.5.1	3.5.1 CEPET: Criteria and procedures for joining TIARA
28	3.5.2	3.5.2 ISLI: Link between different infrastructures
29	**D3.7**	**D3.7 JTI: Report on Joining TIARA and sustainable structures**
30	3.5.3	3.5.3 CFTR: Contribution to the Final TIARA_PP Report



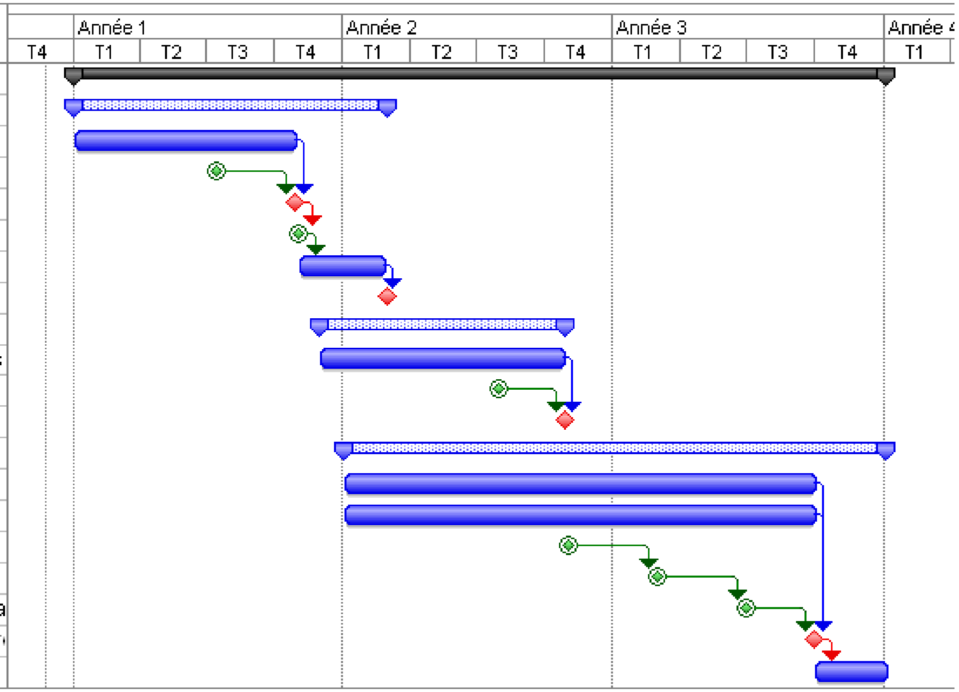
Gantt Chart 1.3.a4 for Work Package WP4

N°	WBS	Task Name
1	**4**	**WP4: Accelerator R&D Programme**
2	**4.1**	**4.1: ITK: Identification of Key technical issues**
3	M4.1	M4.1 FSG: Formation of sub-groups
4	4.1.1	4.1.1 FAF: Prospective on future accelerator based facilities
5	4.1.2	4.1.2 EIT: Prospective on emerging ideas and technologies
6	**D4.1**	**D4.1 KIR: General report on key issues**
7	**4.2**	**4.2 PAR: Prospective on present R&D activities**
8	M4.2	M4.2 SSG: Formation of survey sub-groups
9	4.2.1	4.2.1 SAS: Survey of present R&D activities
10	4.2.2	4.2.2 SCC: Identification of International Collaboration
11	**D4.2**	**D4.2 SRA: Delivery of the Survey Report**
12	M4.4	M4.4 PDB: Presentation of Web-based database
13	**D4.3**	**D4.3 PWD: Delivery of Database**
14	**4.3**	**4.3 PMP: Procedure and Methodology for evaluation**
15	M4.3	M4.3 FWG: Formation of Working Groups
16	4.3.1	4.3.1 PEL: Procedures for emergence and launching of R&D projects
17	4.3.2	4.3.2 MEC: Projects evaluation and estimation of their costs
18	4.3.3	4.3.3 CEA: Identification of appropriate communication tools
19	M4.5	M4.5 JTI: Integration meeting of survey studies (WP3 and WP4)
20	M4.6	M4.6 RPA: Presentation of Report on R&D projects access
21	**D4.4**	**D4.4 PAR: Delivery of Report on R&D projects access**
22	**4.4**	**4.4 DAP: An R&D Programme for TIARA**
23	4.4.1	4.4.1 IFP: Identification of infrascructures needed for R&D Program
24	4.4.2	4.4.2 CNE: Coordination of TIARA Program with non European R&D accele
25	M4.7	M4.7 JPR: Intermediate discussion on Joint R&D Programme
26	M4.8	M4.8 RDP: Presentation of Final Report on the Joint R&D Programme
27	**D4.5**	**D4.5 TTR: Delivery of Final Report on the Joint R&D Programme**
28	4.4.3	4.4.3 CFTR: Contribution to the Final TIARA_PP Report



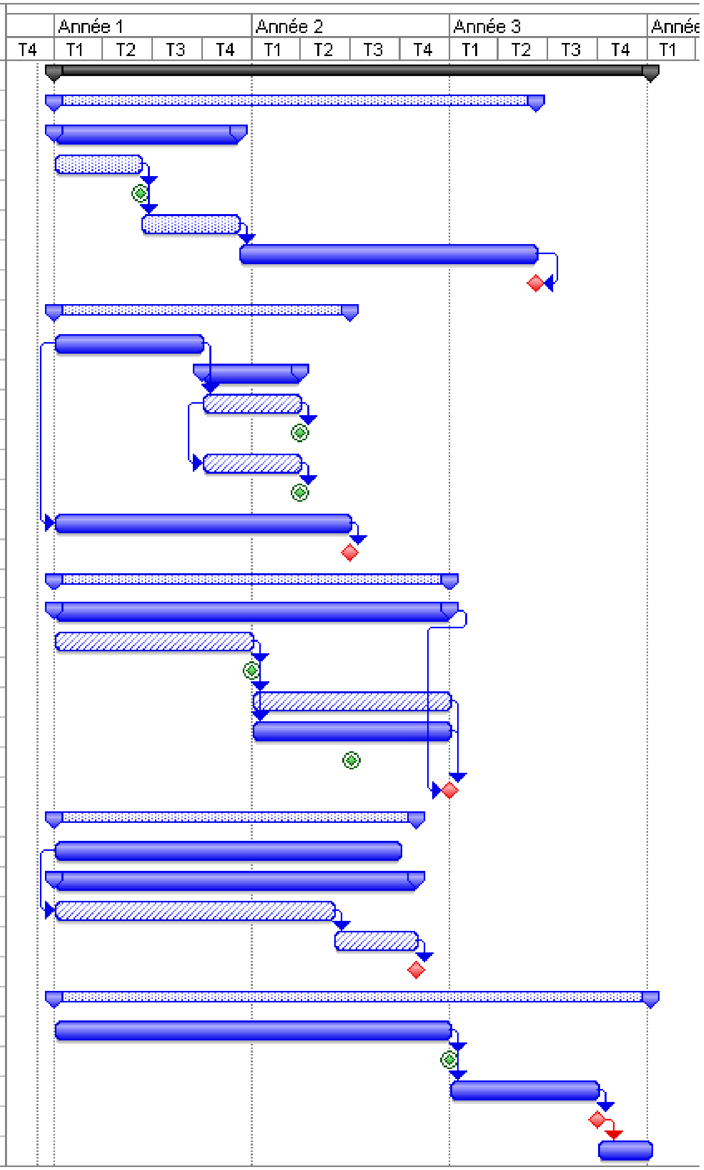
Gantt Chart 1.3.a5 for Work Package WP5

N°	WBS	Task Name
1	**5**	**WP5: Education and Training for Accelerator Sciences**
2	**5.1**	**5.1 SAS: Survey of Accelerator Science**
3	5.1.1	5.1.1 SASS: Survey of Students, Courses and Teaching Resources
4	M5.1	M5.1 METR: Meeting to Plan Education and Training Survey Report (ETR)
5	**D5.1**	**D5.1 ETR: Education and Training Survey Report**
6	M5.2	M1.2 METD: Meeting to Plan Education and Training resources Database
7	5.1.2	5.1.2 SASD: Development of Education and Training Resources Database
8	**D1.2**	**D5.2 ETD: Education and Training Resources Database**
9	**5.2**	**5.2 MAS: Market for Accelerator Science**
10	5.2.1	5.2.1: Evaluation and study of the Development of the Market for Accelerator Sciences
11	M5.3	M5.3 MASR: Meeting to plan for Accelerator Scientist Report
12	**D5.3**	**D5.3 ASR: Accelerator Scientist Report**
13	**5.3**	**5.3 PAS: Plan for Promoting Accelerator Sciences**
14	5.3.1	5.3.1 DAS: Development of the Academic Sector
15	5.3.2	5.3.2 TEK: Training and Exchange of Knowledge
16	M5.4	M5.4 MIRW: interim report for input to WP2.2.4
17	M5.5	M5.5 MMWP: Meeting with WP4 and WP6
18	M5.6	M5.6 MPAR: Meeting to plan the Report on Recommendations for Promoting Accelera
19	**D5.4**	**D5.4 PAR: Report on Recommendations for Promoting AcceleratorSciences in Eur**
20	5.3.3	5.3.3 CFTR: Contribution to the Final TIARA-PP Report



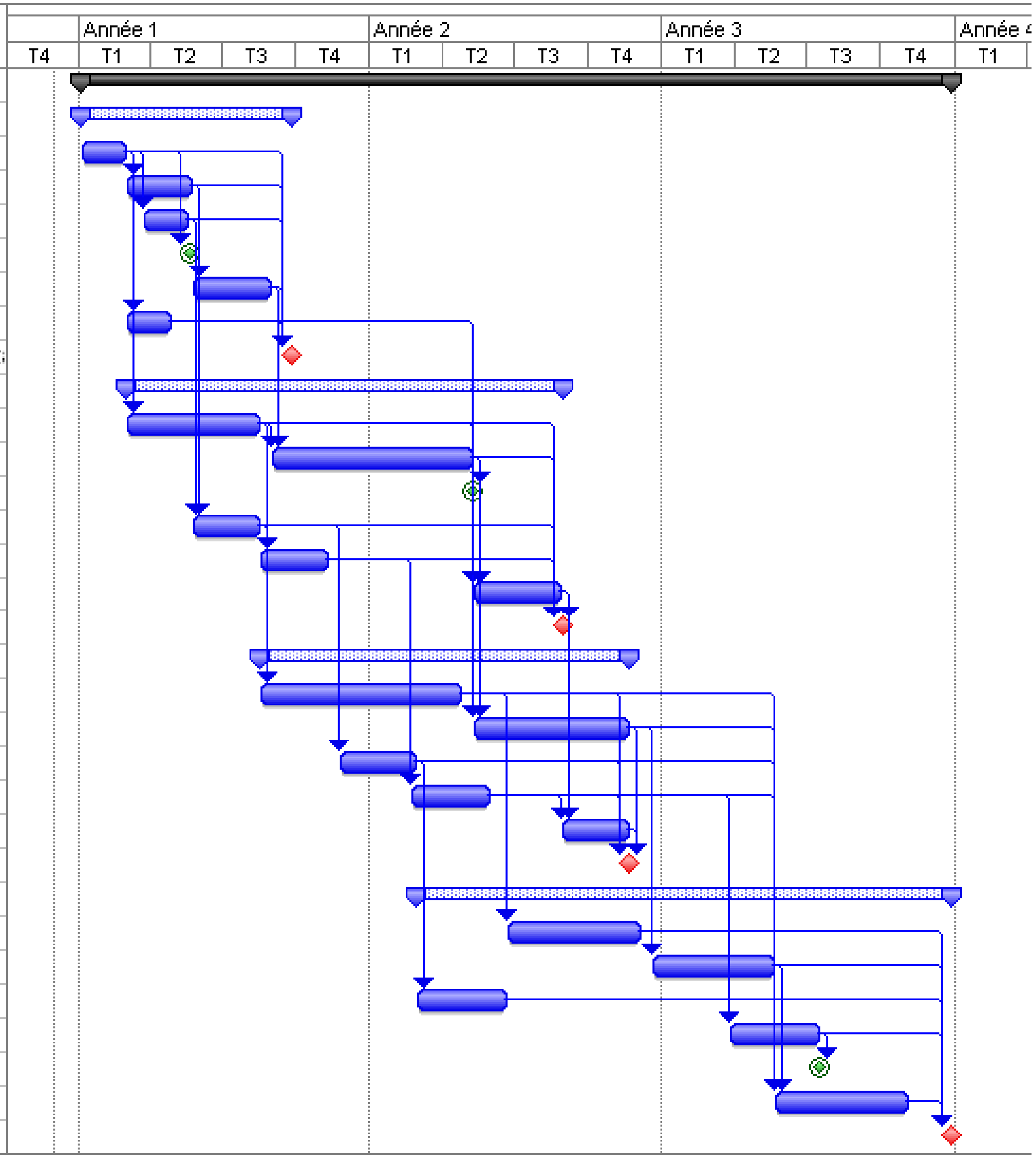
Gantt Chart 1.3.a6 for Work Package WP6

N°	WBS	Task Name
1	**6**	**WP6 TIARA-PP**
2	**6.1**	**6.1 ECI: Establishing Efficient Communication with Industry**
3	6.1.1	6.1.1 LTI: Establishing a Liaison between TIARA and Relevant Industry
4	*6.1.1.1*	*6.1.1.1: RIT Definition of Relevant Industry Sectors for TIARA*
5	M6.1	M6.1 RIT: Relevant Industry Sector for TIARA is Defined
6	*6.1.1.2*	*6.1.1.2 FLT: Establishing of a Formal Liaison with TIARA*
7	6.1.2	6.1.2 INA: Understanding the Industry Interest in Accelerators R&D Infrastructures and Programs
8	**D6.1**	**D6.1 IDB: Identification of Industry Interest and Ways of Communication. Industry data base**
9	**6.2**	**6.2 FPT: Establishing a Joint Framework for Developing Joint R&D Projects and Industrializing Recent Technologies**
10	6.2.1	6.2.1 JRD Identifying the Topics Appropriate for Joint R&D Concerning Accelerator Components and Test Systems
11	6.2.2	6.2.2 MIA: Identifying Recent Technologies that are or can be Used for the Development of Accelerators
12	*6.2.2.1*	*6.2.2.1 LII: Define a List of Existing or Planned Infrastructures of Interest for Industry*
13	M6.3	M6.3 LII: List of technologies, components surveyed by TIARA. List of Infrastructures of Interest for Industry
14	*6.2.2.2*	*6.2.2.2: ISB Identifying Industrial Sectors and Applications Benefiting the most from Joint R&D Collaboration*
15	M6.2	M6.2 FJP: Framework for Joint R&D Projects is established
16	6.2.3	6.2.3 IPR: Studying how to Enforce the IPR Within this Joint Framework
17	**D6.2**	**D6.2 IPR: Proposal on how to Handle IPR in the Framework Joint R&D Projects and Industrializing Technologies**
18	**6.3**	**6.3 SDI: Sharing R&D Infrastructures and Developing Joint R&D Infrastructures**
19	6.3.1	6.3.1 CRI: Determining the Criteria and Establishing the Rules for Sharing R&D Infrastructures
20	*6.3.1.1*	*6.3.1.1 AAI: Analysis of Access of Industry to Existing Infrastructure in Europe and other Regions*
21	M6.4	M6.4 AAI: Categorisation of Existing joint R&D Projects and Analysis of Industry Access to Infrastructure
22	*6.3.1.2*	*6.3.1.2 CRS: Determine Criteria and the Rules for Sharing R&D Infrastructures*
23	6.3.2	6.3.2 FMI: Investigating Financial Models for Developing Joint R&D Infrastructures
24	M6.5	M6.5 FMJI: Possible Financial Models for Developing Joint R&D infrastructure. Interim Report
25	**D6.3**	**D6.3 SDR: Sharing R&D Infrastructures and Developing Joint R&D Infrastructures Report**
26	**6.4**	**6.4 TRI: Definition of a Technology Roadmap for the Development of Future Accelerator Components in Industry**
27	6.4.1	6.4.1 ICR: Identify the Critical Requirements and their Targets
28	6.4.2	6.4.2 ITA: Identify the Technology Alternatives and Give Recommendation what Alternative should be Pursued
29	*6.4.2.1*	*6.4.2.1 TRM: Analysis of Technology RoadMap with Different Technology Alternatives*
30	*6.4.2.2*	*6.4.2.2 RAP: Work out the Recommendation what Alternative should be Pursued*
31	**D6.4**	**D6.4 TRM: Technology RoadMap with Different Technology Alternatives defined**
32	**6.5**	**6.5 AIT: Defining a Model for Associating Industry to TIARA and Propose the Structure to Implementation**
33	6.5.1	6.5.1 MAIL: Report on Existing Models of Associating Industry to Labs for Accelerator Researches.
34	M6.6	M6.6 MAIL: Report on Existing Models of Associating Industry to Labs for Accelerator Researches (Milestone).
35	6.5.2	6.5.2 MAIT: Proposal of a Model for Associating Industry to TIARA
36	**D6.5**	**D6.5 MAIT: Summary report on a Model for Associating Industry to TIARA**
37	6.5.3	6.5.3 CFTR: Contribution to the final TIARA-PP report



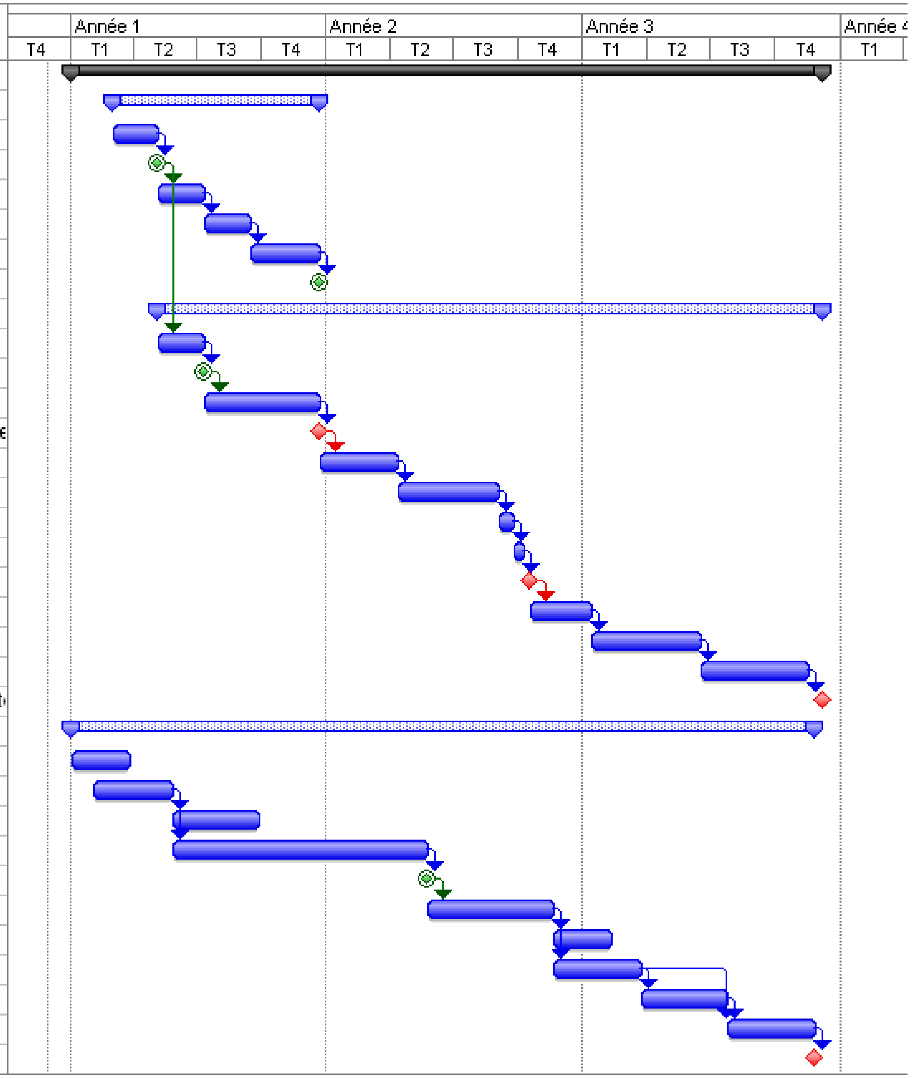
Gantt Chart 1.3.a7 for Work Package WP7

N°	WBS	Task Name
1	**7**	**WP7 Upgrade of SLS vertical emittance tuning system**
2	**7.1**	**7.1 SLS_NOW: Experimental tests at SLS with existing systems**
3	7.1.1	7.1.1 EPS_Limit: emittance limit
4	7.1.2	7.1.2 EPS_Sens: emittance sensitivity
5	7.1.3	7.1.3 MON-RES: profile monitor resolution
6	M7.1	M7.1 M_INSTR: Interim report on existing beam instrumentation
7	7.1.4	7.1.4 COUPLING: coupling theory
8	7.1.5	7.1.5 MAG_Scale: magnet scaling
9	**D7.1**	**D7.1 D_SLS_NOW: Report on existing hardware situation and limit**
10	**7.2**	**7.2 SPEC: Specification of necessary upgrades**
11	7.2.1	7.2.1 ORB_C_SPEC: Orbit Control Specifications
12	7.2.2	7.2.2 KNOB_SPEC: emittance knobs
13	M7.2	M7.2 M_KNOBS: Specification of emittance knobs ready
14	7.2.3	7.2.3 MON1_SPEC: 1st monitor specification
15	7.2.4	7.2.4 MON2_SPEC: 2nd monitor specification
16	7.2.5	7.2.5 MAG_SPEC: magnet trimming
17	**D7.2**	**D7.2 D_SPEC: Specifications ready**
18	**7.3**	**7.3 IMPL: Implementation of the specified upgrade**
19	7.3.1	7.3.1 ORB_C_IMPL: Orbit Control upgrade
20	7.3.2	7.3.2 COUPL_IMPL: Coupling automation
21	7.3.3	7.3.3 MON1_IMPL: 1st monitor installation
22	7.3.4	7.3.4 MON2_IMPL: 2nd monitor installation
23	7.3.5	7.3.5 MAG_IMPL: magnet coils installation
24	**D7.3**	**D7.3 D_IMPL: Hardware ready and installed**
25	**7.4**	**7.4: COMM**
26	7.4.1	7.4.1 ORB_C_COMM: Orbit Control Commissioning
27	7.4.2	7.4.2 COUPL_COMM: Coupling control
28	7.4.3	7.4.3 MON1_COMM: 1st monitor commissioning
29	7.4.4	7.4.4 MON2_COMM: 2nd monitor commissioning
30	M7.3	M7.3 HE_COMM: High energy commissioning finished
31	7.4.5	7.4.5 LOW_E_COMM: low energy operation
32	**D7.4**	**D7.4 FINAL_R: Commissioning report**



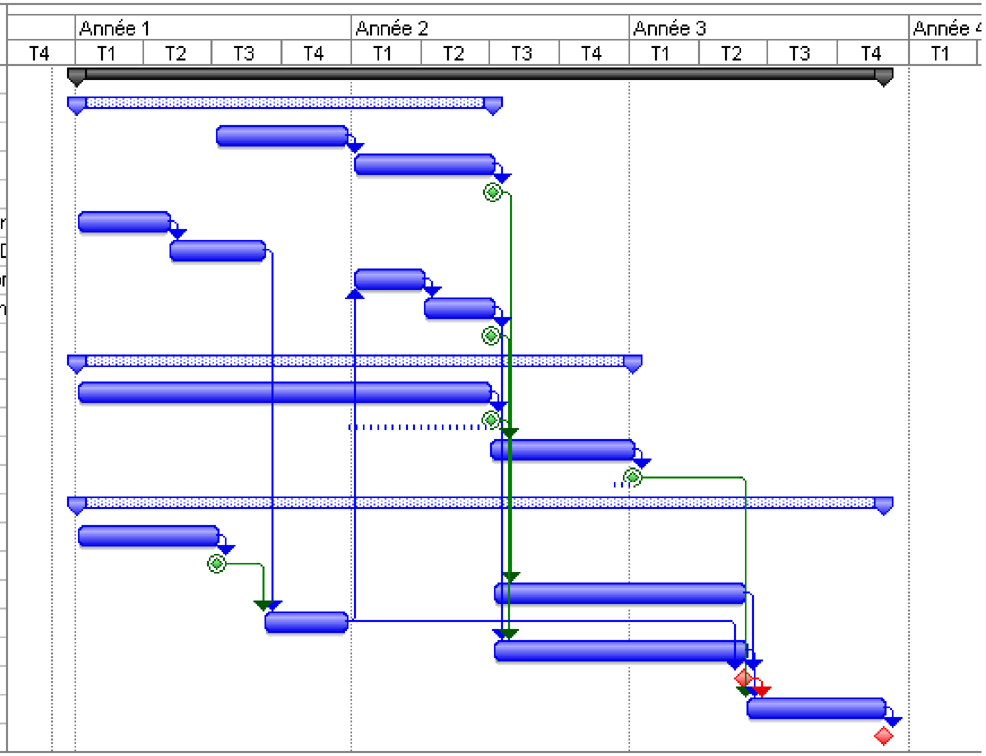
Gantt Chart 1.3.a8 for Work Package WP8

N°	WBS	Task Name
1	**8**	**WP8: Upgrade to Ionisation Cooling Test Facility**
2	**8.1**	**8.1: SSU: ICTF sub-station upgrade**
3	8.1.1	8.1.1: DSU: Design and specification of the upgrade
4	M8.1	M8.1 SSU-Spec: Report on sub-station upgrade specification
5	8.1.2	8.1.2: Proc: Procurement
6	8.1.3	8.1.3: Impl: Implementation
7	8.1.4	8.1.4: ComTst: Commissioning and testing
8	M8.2	M8.2 SSU-Inst: ICTF sub-station upgrade complete
9	**8.2**	**8.2: RFP: ICTF RF power infrastructure**
10	8.2.1	8.2.1: RevLO: Review of layout and requirements in ICTF Hall
11	M8.3	M8.3 RFSysReq: Report on RF system layout and requirements
12	8.2.2	8.2.2: DSStpV: Design and specification of the RF power distribution system for MICE Step V
13	**D8.1**	**D8.1 RFSysV-Spec: Report on the design and specification of ICTF RF power distribution syste**
14	8.2.3	8.2.3: Amp#2Ass: Assembly of RF High Power Amplifier #2
15	8.2.4	8.2.4: Amp#2Tst: Test of RF High Power Amplifier #2 (at DL)
16	8.2.5	8.2.5: Amp#1Pck: Dismantling & packing of RF System #1
17	8.2.6	8.2.6: Amp#1Shp: Transport of RF System #1 to RAL
18	**D8.2**	**D8.2 RFAmp1-Test: Report on commissioning of the first RF amplifier system in the ICTF Hall.**
19	8.2.7	8.2.7: Amp#1Inst: Installation of RF System #1 in ICTF Hall (with dummy load)
20	8.2.8	8.2.8: Amp#1Com: Commissioning of RF System #1 in ICTF Hall
21	8.2.9	8.2.9: DSStpVI: Design and specification of the RF power distribution system for MICE Step VI
22	**D8.3**	**D8.3 RFSysVI-Spec: Report on the design and specification of ICTF RF power distribution syst**
23	**8.3**	**8.3: NRFAmp: Novel pulsed RF power amplifier design**
24	8.3.1	8.3.1: ICTFRFNds: Specify ICTF RF system upgrade needs
25	8.3.2	8.3.2: RFSurv: Survey for relevant existing RF power systems
26	8.3.3	8.3.3: PSSpec: Specify power supply and protection circuitry
27	8.3.4	8.3.4: SimDiac: Computer simulation of Diacrode with input/output circuits
28	M8.4	M8.4: SymDiac: Simulation of Diacrode complete
29	8.3.5	8.3.5: IOMock: Build input and output circuit lab mock-ups
30	8.3.6	8.3.6: LPTst: Low power tests of the lab mock-ups
31	8.3.7	8.3.7: IntStud: Integration of power amplifier, power supply and diacrode study
32	8.3.8	8.3.8: SysAna: Overall system analysis and performance predictions
33	8.3.9	8.3.9: RedactRep: Redaction of design report
34	**D8.4**	**D8.4 RF_Ampl-DR: Design report of a 3 MW power amplifier**



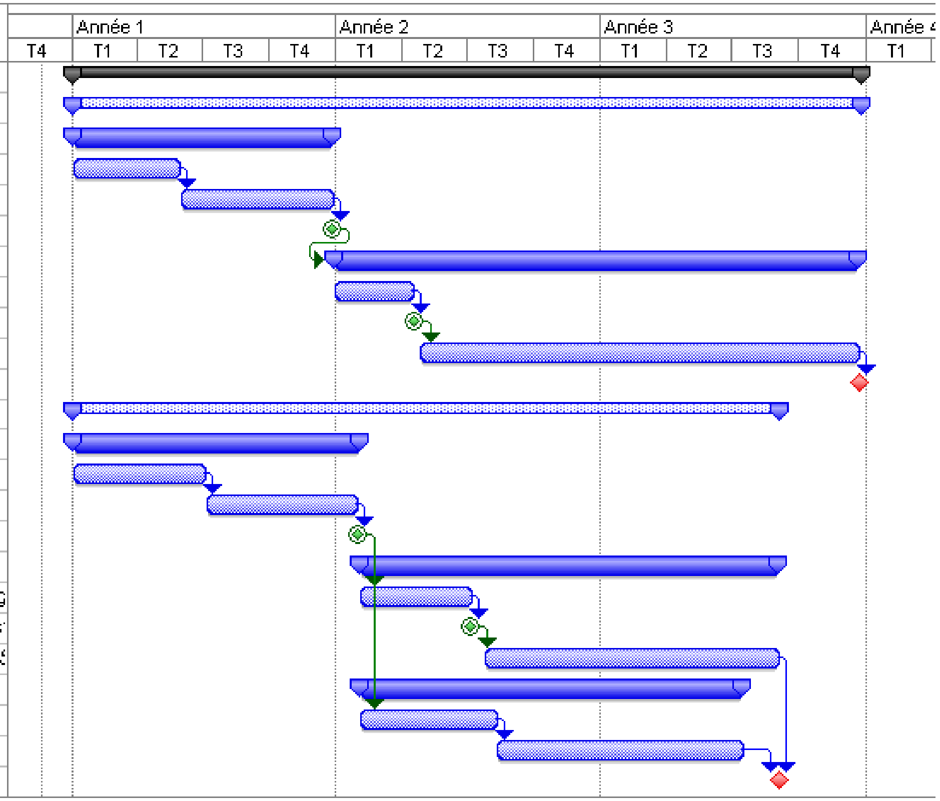
Gantt Chart 1.3.a9 for Work Package WP9

N°	WBS	Task Name
1	**9**	**WP9: High Gradient Acceleration (HGA) R&D Infrastructure**
2	**9.1**	**9.1 SPARC-UP: Study of SPARC upgrade in energy**
3	9.1.1	9.1.1 SLED-DES: Design of SLED: simulation and optimization of a C-band SLED cavity
4	9.1.2	9.1.2 SLED-CAD: Design of SLED: preparation of CAD mechanical drawings
5	M9.2	M9.2 SLED-D: SLED-D: SLED designed
6	9.1.3	9.1.3 ACCP-DES: Design of a C-band accelerating structure prototype: simulation and optir
7	9.1.4	9.1.4 ACCP-CAD: Design of a C-band accelerating structure prototype: preparation of CAD
8	9.1.5	9.1.5 ACC-DES: Design of a C-band final accelerating structure: simulation and optimizatior
9	9.1.6	9.1.6 ACC-CAD: Design of a C-band final accelerating structure: preparation of CAD mech
10	M9.3	M9.3 ACC-D: Accelerating structures designed
11	**9.2**	**9.2 RF-LLE: RF Low Level Electronic**
12	9.2.1	9.2.1 LLE-DES: Design of a digital RF-LLE electronics
13	M9.4	M9.4 RF-LLE-D: RF-LLE-D: Low Level Electronic RF designed
14	9.2.2	9.2.2 LLE-CON: Construction and test of a prototype at SPARC
15	M9.5	M9.5 RF-LLE-P: RF-LLE-P: First RF-LLE prototype
16	**9.3**	**9.3 SPARC_CON: Construction and test of SPARC C-band section**
17	9.3.1	9.3.1 HGA-HDW: Hardware and material acquisition
18	M9.1	M9.1 HARDW-A: Hardware and material acquisition
19	9.3.2	9.3.2 SLED-CON: Construction and test of SLED
20	9.3.3	9.3.3 ACC-PROT: Construction and test of an accelerating structure prototype
21	9.3.4	9.3.4 ACC-CON: Construction of two final accelerating structures
22	**D9.1**	**D9.1 SPARC-C: Construction of SLED and accelerating structures finished**
23	9.3.5	9.3.5 ACC-TEST: Test of SPARC C-band upgrade
24	**D9.2**	**D9.2 SPARC-T: Report on commissioning of SLED and accelerating structures**



Gantt Chart 1.3.a10 for Work Package WP10

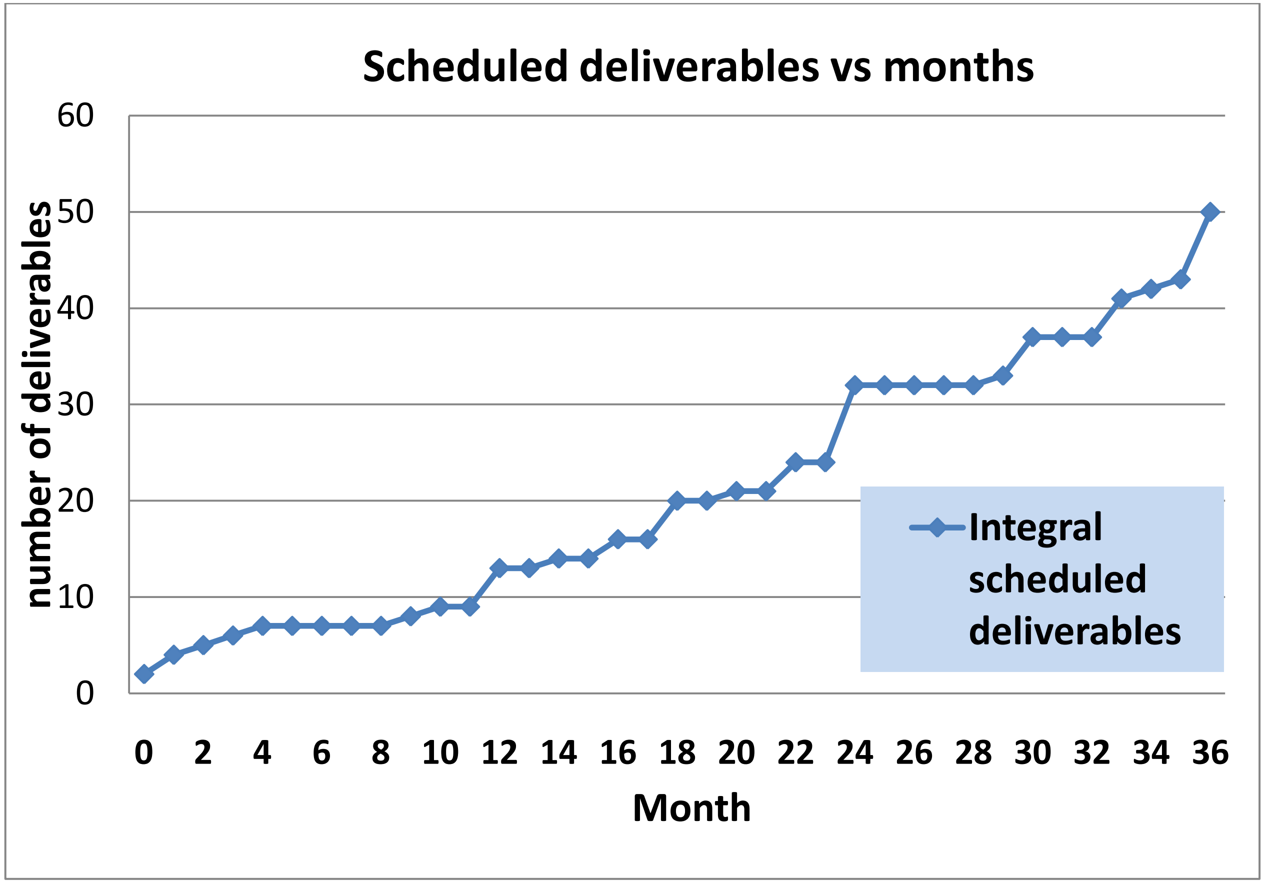
N°	WBS	Task Name
1	**10**	**WP10 : TIHPAC (Test Infrastructure for High Power Accelerator Components)**
2	**10.1**	**Task 10.1 M-MWIF: Multi MW Irradiation Facility for complex target testing**
3	10.1.1	10.1.1 DSITF: Definition and specifications of Irradiation Test Facility
4	*10.1.1.1*	*10.1.1.1 IIF: Identification of the required Irradiation Facility*
5	*10.1.1.2*	*10.1.1.2 SIF: Specifications of the irradiation test facility*
6	M10.1	M10.1 DSIF: Report on the Definition and Specifications of the Irradiation test Facilities
7	10.1.2	10.1.2 DSITF: Design Study of the high power Irradiation Test Facility
8	*10.1.2.1*	*10.1.2.1 PDITF: Preliminary Design study of high power Irradiation Test Facility*
9	M10.2	M10.2 PDIF: Preliminary Design report on the high power Irradiation test Facility
10	*2.1.2.2*	*10.1.2.2 TDITF: Technical Design report on the high power Irradiation Test Facility*
11	**D10.1**	**D10.1 TDIF: Technical Design report of the high power Irradiation test Facility**
12	**10.2**	**Task 10.2 DCTC: Design of a low beta Cavity Test Cryostat**
13	10.2.1	10.2.1 DSTC: Definition and Specification of the low beta SC Test Cryostat
14	*10.2.1.1*	*10.2.1.1 IUR: Identification of Users Requirements*
15	*10.2.1.2*	*10.2.1.2 STC: Specifications of the low beta SC Test Cryostat*
16	M10.3	M10.3 URCS: Report on the User Requirements and setting up of the test Cryostat
17	**10.2.2**	**10.2.2 Design of the test cryostat (vacuum tank, shielding, supporting systems)**
18	*10.2.2.1*	*10.2.2.1 PDTSCS: Preliminary Design study Tank, Shielding, and Cavity supporting*
19	M10.4	M10.4 PDCC: Report on the Preliminary Design study of the low beta SC Cavity tes
20	*10.2.2.2*	*10.2.2.2 ADTSCS: Advanced Design study Tank, Shielding, and Cavity supporting S*
21	10.2.3	10.2.3 Design study of the associated cryogenic cold box
22	*10.2.3.1*	*10.2.3.1 PDCCB: Preliminary Design study of the Crogenic Cold Box*
23	*10.2.3.2*	*10.2.3.2 ADCCB: Advanced Design study of the Cryogenic Cold Box*
24	**D10.2**	**D10.2 TDCC: Technical Design report of the low beta Cavity test Cryostat**



1.3.3 Deliverables and Milestones

The complete list of the Deliverables and the Milestones for the TIARA-PP project are summarized in the tables 1.3.b and 1.3 c.

- *1.3.3.1 Deliverables*



The above diagram shows the integrated number of deliverables as function of the month since the start of the project. A similar curve for the achieved deliverables will be superimposed in this diagram, providing a convenient performance indicator and allowing one to monitor the progress.

Table 1.3 b: Deliverables List

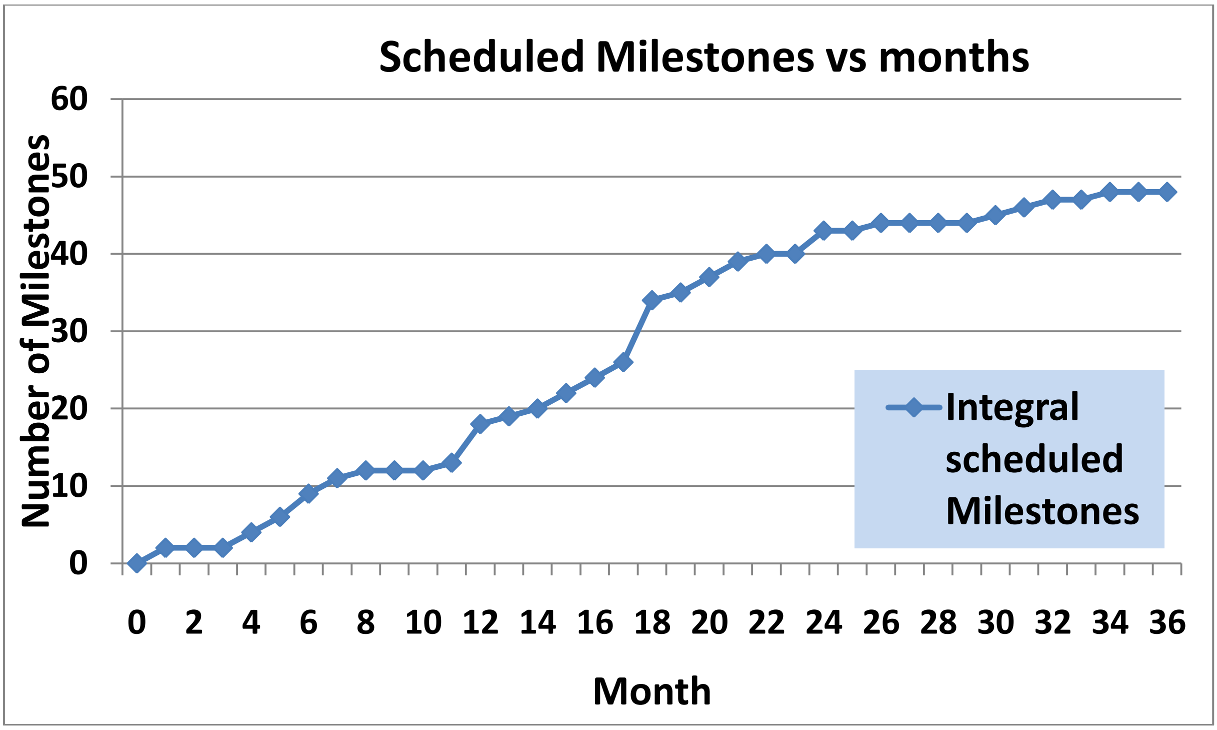
Del. no.[10]	Deliverable name	WP no.	Nature[11]	Dissemination level[12]	Delivery date[13]
D1.1	Overall Web Site Frame ready	1	O	PU	**0**
D1.2	Consortium Agreement between participants ready	1	O	CO	**0**
D1.3	Contract of the Consortium with the EC signed	1	O	CO	**1**
D1.4	Organization of the Kickoff meeting	1	O	CO	**1**
D1.5	Internal Web Site Frame Ready	1	O	CO	**2**
D3.1	Identification of key Accelerator Research Areas.	3	R	PU	**3**
D4.1	General Report on Key Issues	4	R	PU	**4**
D7.1	Report on existing hardware limitations and needed upgrades.	7	R	PU	**9**
D5.1	Education and Training Survey Report (*task 5.1*)	5	R	PU	**10**
D2.1	Memorandum of Agreement on General Issues	2	O	CO	**12**
D3.2	Infrastructure Survey Report (sub*task 3.1.1*).	3	R	PU	**12**
D4.2	Survey Report on the present R&D activities and of their current status, with identification of specific infrastructures used in these activities.	4	R	PU	**12**
D8.1	Report on the design and specification of ICTF RF power distribution system for MICE Step V	8	R	PU	**12**
D5.2	Education and Training resources Database (*task 5.1*)	5	O	PU	**14**
D3.3	Infrastructure Web-based Database.	3	O	PU	**16**

[10] Deliverable numbers in order of delivery dates. Please use the numbering convention <WP number>.<number of deliverable within that WP>.
[11] Nature of the deliverable: **R** = Report, **P** = Prototype, **D** = Demonstrator, **O** = Other
[12] Dissemination level: **PU** = Public **PP** = Restricted to other programme participants (including the Commission Services). **RE** = Restricted to a group specified by the consortium (including the Commission Services). **CO** = Confidential, only for members of the consortium (including the Commission Services).
[13] Measured in months from the project start date (month 1).

D4.3	Web-based database in current R&D activities	4	O	PU	**16**
D1.6	Midterm Report	1	R	CO	**18**
D2.2	Report on Advisory Mechanisms and Organization	2	R	CO	**18**
D2.3	Report on Collaboration with Other Bodies	2	R	CO	**18**
D6.2	Proposal on how to Handle IPR in the Framework for Developing joint R&D Projects and Industrializing Recent Technologies	6	R	PU	**18**
D7.2	Specifications ready	7	R	PU	**20**
D5.3	Needs for Accelerator Scientists Report (*task 5.2*)	5	R	PU	**22**
D6.4	Technology RoadMap with Different Technology Alternatives	6	R	PU	**22**
D8.2	Report on commissioning of the first RF amplifier system in the ICTF Hall.	8	R	PU	**22**
D2.4	Report on Communication, Dissemination and Outreach Structure	2	R	CO	**24**
D2.5	Report on Financial Management Needs	2	R	CO	**24**
D2.6	Memorandum of Agreement on Initial TIARA Infrastructures	2	O	CO	**24**
D3.4	Infrastructure Need and Resource comparison.	3	R	PU	**24**
D3.5	Infrastructure Access Report (*task 3.4*).	3	R	PU	**24**
D4.4	R&D Projects Access Report. Procedure for identifying, defining and launching of collaborative R&D projects, including common methodology for costing the projects.	4	R	PU	**24**
D6.3	Sharing R&D Infrastructures and Developing joint R&D Infrastructures Report	6	R	PU	**24**
D7.3	Hardware installed	7	O	PU	**24**
D9.1	Construction of SLED and accelerating structures	9	O	PU	**29**
D2.7	MoU on Financial Model and Engineering	2	R	CO	**30**
D2.8	MoU on Legal Issues and Documents	2	R	CO	**30**
D3.6	Report on potential Upgrades and/or Construction of New R&D Infrastructures in Europe.	3	R	PU	**30**
D6.1	Identification of Industry Interest and Ways of Communication. Industry Data Base	6	O	PU	**30**

D10.2	Technical Design Report on the SC Cavity test Cryostat	10	R	PU	**32**
D3.7	Joining the TIARA distributed accelerator R&D Infrastructure and defining structures for sustaining and maintaining the Infrastructure data base.	3	R	PU	**33**
D4.5	"Toward TIARA". Final plan of the collaborative R&D Program.	4	R	PU	**33**
D5.4	Recommendations for Promoting Accelerator Science and Technology in Europe Report	5	R	PU	**33**
D6.5	Summary report on Model for Associating Industry to TIARA	6	R	PU	**33**
D2.9	Report on TIARA Impact Measurement	2	R	CO	**34**
D9.2	Installation, commissioning and test report of the C-band Linac at SPARC	9	R	PU	**35**
D10.1	Technical Design Report of the Multi-MW test Irradiation Facility	10	R	PU	**36**
D7.4	WP7 Final report	7	R	PU	**36**
D8.3	Report on the design and specification of ICTF RF power distribution system for MICE Step VI (full ICTF implementation)	8	R	PU	**36**
D8.4	Design report of a 3 MW power amplifier	8	R	PU	**36**
D2.10	Final Memorandum of Agreement	2	O	CO	**36**
D1.7	Final Report of TIARA-PP	1	R	CO	**36**

- *1.3.3.2 Milestones*



The above diagram shows the integrated number of planned milestones as function of the month since the start of the project. A similar curve for the achieved milestones will be superimposed in this diagram, providing a convenient performance indicator and allowing one to monitor the progress.

Table 1.3 c: List of milestones

Milestone number	**Milestone name**	**Work package(s) involved**	**Expected date[14]**	**Means of verification[15]**
M1.1	WebPub	1	**-3**	Web site Frame operating; validated by users
M4.1	FSG	4	**1**	Working groups set up & operating; validated by Steering Committee
M4.2	SSG	4	**1**	Working groups set up & operating; validated by Steering Committee
M1.2	MonTool	1	**4**	Monitoring tool in place and validated by Steering Committee
M3.1	CPN	3	**4**	Nomination of contact persons validated by Steering Committee
M7.1	M_INSTR	7	**5**	Report document
M8.1	SSU-Spec	8	**5**	Report document
M2.1	Int-GI	2	**6**	Report document
M6.1	RIT	6	**6**	Presentation at Steering Com. Meet.
M9.1	HARDW-A	9	**6**	Purchased hardware component received
M5.1	METR	5	**7**	Written minutes of Meeting

[14] Measured in months from the project start date (month 1).
[15] Confirmation means that the milestone has been attained. For example: a laboratory prototype completed and running flawlessly; software released and validated by a user group; field survey complete and data quality validated.

M8.3	RFSys-Req	8	**7**	Report document
M3.2	ISR	3	**8**	Report document
M5.2	METD	5	**11**	Written Minutes of Meeting
M8.2	SSU-Inst	8	**11**	Upgrade completed and operational
M10.1	DSIF	10	**12**	Report document
M2.3	Int-CDO	2	**12**	Report document
M4.3	FWG	4	**12**	Working groups set up & operating; validated by Steering Committee
M6.4	AAI	6	**12**	Report document
M10.3	URCS	10	**13**	Report document
M4.4	PDB	4	**14**	Presentation of Database to TIARA partners
M6.2	FJP	6	**15**	Report document
M6.3	LII	6	**15**	Report document
M10.2	PDIF	10	**16**	Report document
M7.2	M_KNOBS	7	**16**	Report document
M1.3	MidMeet	1	**17**	General TIARA meeting took place
M3.3	IWD	3	**17**	Presentation of Database to TIARA partners
M10.4	PDCC	10	**18**	Report document
M2.2	Int-AMO	2	**18**	Report document
M2.4	Int-FMN	2	**18**	Report document
M6.5	FMJI	6	**18**	Report document
M8.4	SymDiac	8	**18**	Verification of Simulation result by experts
M9.2	SLED-D	9	**18**	Report document
M9.3	ACC-D	9	**18**	Report document
M9.4	RF-LLE-D	9	**18**	Report document
M5.3	MASR	5	**19**	Written Minutes of Meeting
M3.4	IRC	3	**20**	Report document
M5.4	MIRW	5	**20**	Report document
M3.5	JTI	3	**21**	Written Minutes of joint Meeting WP3&WP4
M4.5	JTI	4	**21**	Written Minutes of joint Meeting WP3&WP4
M4.6	RPA	4	**22**	Report document
M.4.7	JPR	4	**24**	Written Minutes of Meeting
M6.6	MAIL	6	**24**	Report document
M9.5	RF-LLE-P	9	**24**	Prototype completed and running
M5.5	MMWP	5	**26**	Written Minutes of Meeting
M5.6	MPAR	5	**30**	Written Minutes of Meeting
M7.3	HE_COMM	7	**31**	Report document
M4.8	RDP	4	**32**	Report document
M1.4	FinMeet	1	**34**	Final General TIARA meeting took place

1.3.4 Work Package description

1.3.4.1 Work package supported under this proposal

Table 1.3 d: Work package description

Work package number	**1**	Start date or starting event:	**1**
Work package title	**Management of the TIARA-PP consortium**		
Activity Type[16]	**MGT**		

Participant number	**1**
Participant short name	**CEA**
Person-months per participant:	**90**

Objectives: The overall objective of this Work Package is the management of the TIARA consortium during the Preparatory Phase project to ensure the achievement of the TIARA-PP objectives with the realization of the defined deliverables in a timely fashion. To this end, the detailed objectives include the coordination and the monitoring of the project progress and the timely reporting to the relevant bodies including the EC, the management of the decision making process and financial aspects and the establishment of appropriate communication inside and outside of the consortium.

Description of work

The work in this WP will be structured in 2 overall tasks, each divided in subtasks, as detailed below

WP1.1 Coordination of the Consortium
This task is devoted to the coordination of the TIARA-PP consortium carrying the work within the Preparatory Phase of TIARA. Several subtasks will be accomplished under the responsibility of the coordinator with the support of the TIARA Project Office.

WP1.1.1 Reporting to the EC
The coordinator will be the single point of contact to the EC. The coordinator will provide the annual reports on the activities of the consortium and take care of the financial statements.

WP1.1.2 Reporting to the Consortium Governing bodies
The coordinator will report to the Governing Council, the representation of the participants. The Coordinator will provide the Consortium Agreement and obtain the signatures of all participants before the beginning of the project.
The coordinator maintains direct contact with the national authorities and funding agencies whenever needed to ensure a proper communication and their awareness of the development of the work.
WP1.1.3 Coordination and monitoring of the project
The implementation and performance of the TIARA-PP will be coordinated and continuously monitored by the Coordinator, supported by the project office and the Work Package

[16] MGT = Management of the consortium; COORD = Networking activity; SUPP = Support activity; RTD = Research and Technological Development.

Leaders. The WP Leaders will ensure the coordination within the WP, as well as transversely for the activities where several WP contribute to a common objective. The Work Package Leaders will provide regular updates of the progress towards milestones and deliverables. The project progress will be monitored through direct interaction with the WP leaders, during the regular Steering Committee meetings (3 times per year) and half-yearly reports, as well as phone meetings as appropriate. Individual WP meetings are foreseen to support the streamlined performance of the activities.

WP1.1.4 Management of the budget

The coordinator will be responsible for the accountancy and budget control. He will be in charge of the money transfer to the participants, of collecting regularly their financial reports, of consolidating the budget and its day-to-day management.

WP1.2 Communication, Dissemination and Outreach

This task is dedicated to the communication and dissemination internal to the members of the TIARA consortium but also toward the scientific communities at large. It will also be in charge of the outreach toward the general public. It includes

WP1.2.1 Communication and Dissemination in the consortium

Three overall project meetings will be scheduled: a Kick-Off Meeting will takes place during the first month after the official project start and two overall TIARA Meetings will be organized. Attendees are representatives of the beneficiaries and potential beneficiaries and selected invited guests. Parallel sessions will be planned for individual work package meetings. The overall goal of the meetings is to generate strong interactions and exchanges between the different work packages, as well as stakeholders. The communication across the individual work packages will support the linkages between the activities and the overall understanding of the TIARA achievements.

The TIARA Governing Council will meet during the 3 overall project Meetings. These meetings will be chaired by the coordinator. The members of the Steering Committee will attend part of these meeting to report on the work progress and provide inputs for discussing strategic issues. Close sessions of the TIARA Governing Council will also be foreseen.

A public website will be set up as an efficient exchange platform for the beneficiaries. General information, meeting dates, publications etc. will be made available. A protected Website will also be set up for the exchange of project documents, meeting planning, related documents and minutes and internal exchange of information using discussion forums. A Web-based database will be set up to enable easy access to the deliverables, milestones related documentations. Dedicated activity follow up tools will be developed to monitor the ability of TIARA-PP to perform its tasks and deliver in a timely fashion.
Finally, a study of the usefulness of an intranet for the R&D infrastructure will be studied in connection with the Work Packages. If deemed useful, the concept of a TIARA intranet will be developed based on the requirements.

WP1.2.2 Dissemination and Outreach toward the communities and public at large

The coordinator together with the steering committee will be in charge of organizing town meetings, preferably linked to the TIARA overall meetings. They will also ensuring that the objectives, and their importance for the European and the Worldwide scientific communities, the status and achievements of TIARA are widely disseminated to the relevant communities, as well as the general public in the European Union, and their governments in as many languages of the EU as is practicable. The coordinators will establish link with others majors partners in the field of accelerator science in the other regions of the world. Members will seek to present the TIARA project at the occasion of major conferences, workshops or dedicated colloquia or seminars. The TIARA web site will included targeting the general public. A Web-based documentation repository will be setup to enable easy access for the

TIARA documentation and presentations.

Summary tasks and sub-task breakdown

Task Num	Short Name	Description
1.1	CoC	**Coordination of** the **Consortium**
1.1.1	REC	Reporting to the EC
1.1.2	RGB	Reporting to the Consortium Governing Bodies
1.1.3	CMP	Coordination and Monitoring of the Project
1.1.4	MoB	Management of the Budget
1.2	CDO	**Communication, Dissemination and Outreach**
1.2.1	CDC	Communication and Dissemination within the consortium
1.2.2	DOC	Dissemination and Outreach toward the Communities and people at large

Deliverables (brief description and month of delivery)

Num	Nat[17]	Short name	Description	month
D1.1	O	OWSF	Overall Web Site Frame ready	**0**
D1.2	O	CAP	Consortium Agreement between participants ready	**0**
D1.3	O	CCE	Contract of the Consortium with the EC signed	**1**
D1.4	O	OKM	Organization of the Kickoff meeting	**1**
D1.5	O	IWSF	Internal Web Site Frame Ready	**2**
D1.6	R	MTR	Midterm TIARA-PP Report	**18**
D1.7	R	FTR	Final TIARA-PP Report	**36**

Milestones

Num	Nat[17]	Short name	Description	month
M1.1	O	POWS	Preliminary Overall Web Site Frame set up	**-3**
M1.2	O	MTR	Development of task Monitoring Tool and documentation Repository	**4**
M1.3	O	MGM	Organization of Midterm General Meeting	**17**
M1.4	O	FGM	Organization of Final General Meeting	**34**

[17] R for Report, P for prototype, D = Demonstrator, O = Other

Work package number	2				Start date or starting event:					1
Work package title	**Governance**										
Activity Type[18]	**SUPP**										
Participant number	**1**	2	3	4	5	6	7	8	9	10	11
Participant short name	**CEA**	CERN	CNRS	CIEMAT	DESY	GSI	INFN	PSI	STFC	UU	IFJ
Person-months per participant:	**20**	12	8	8	12	8	12	8	12	8	8

Objectives: The overall objective of this Work Package is to develop the TIARA governance structure enabling the creation, the management, the operation and the evolution, in term of membership and infrastructures, of the proposed European distributed accelerator R&D facility, with particular attention towards the integration of the user needs for as many fields as possible, in a sustainable way.

The detailed objectives embrace the definition of the consortium structure, the constitution of the statutes, and the required means and methods for its management including the related administrative, legal and financial aspects. The aims are also to integrate the means and mechanisms enabling TIARA to promote the collaboration with other research infrastructures, to interact efficiently with the industrial sector and to develop the human knowledge and knowhow as well as its dissemination.

Description of work

The work within this WP will be structured in 3 main tasks, each divided into subtasks, as detailed below. The mode of operation will be the development of a series of Memoranda of Agreement, Memoranda of Understanding and reports, which will be combined into an Overall Memorandum of Agreement, ready to be enforced as a legal document. All TIARA participants will participate in the activities of this Work Package.

WP2.1: Agreement on General Issues
The aim of this task is to reach an overall agreement concerning the general issues of TIARA, which will guide the work in the subsequent tasks 2.2 and 2.3.
WP2.1 includes 2 sub-tasks below and will lead to 1 deliverable.

WP2.1.1: Agreement on the Mission and Scope
The overall objective of this subtask is to reach agreement on the definition of the mission and scope of TIARA. It includes the Terms of Reference (domain of competence, scientific and technical fields involved, type of R&D infrastructures, type of R&D programme...), nature of the TIARA actions, general membership criteria and associated participants, general rights and obligations, and withdrawal rules.

WP2.1.2: Agreement on Central Coordination Guidelines
The principal aim of this subtask is to reach agreement on the overall guidelines for defining

[18] MGT = Management of the consortium; COORD = Networking activity; SUPP = Support activity; RTD = Research and Technological Development.

the management structure (including its role, responsibilities and reporting lines) and corresponding staff (scope and expertise), with the objectives to optimize efficiency and minimize the manpower within the central coordination. Guidelines on the term, location, and the funding of the central coordination team will be drawn. Guiding principles relating to the financing of the R&D infrastructures, as well as the R&D and other programmes to be promoted by TIARA, will be established.

WP2.2: Understanding the Structural and Financial Needs to achieve TIARA objectives
The objective of this task is to have a common understanding of the needs in term of management, coordination and financial organization to operate TIARA efficiently. In particular, one needs to identify the aspects dealt with entirely by the central coordination, the ones requiring dedicated counselling and/or special liaison with other bodies, and the ones that can be managed by the partners themselves.
WP2.2 includes 4 sub-tasks below and will lead to 4 deliverables.

WP2.2.1: Advisory Mechanisms and Organization
The needs and mechanisms for advising the TIARA Consortium will be investigated in coordination with Work Packages 3 to 6, leading to recommendations on the appropriate committee(s) or liaison(s) to be established. The committees will not substitute those established by the individual infrastructure owners and partners, but will explore the mechanisms for connecting to existing committees, so as to avoiding duplication. The number, remit and scope of the committees will be defined, as will the number of people, their expertise and term of office. The TIARA Consortium will finance this advisory activity, which will cover three main areas. A dedicated subtask will be set up for each:

- WP2.2.1.1: Advisory mechanism and organization for scientific and technical matters (in liaison with WP3 and 4)
- WP2.2.1.2: Advisory mechanism and organization on education and training issues (in liaison with WP5)
- WP2.2.1.3: Advisory mechanism and organization on industrial issues (in liaison with WP6**)**

For each subtask, two members of WP2 will be liaison to the relevant Work packages.

WP2.2.2: Identification of the bodies with which Collaboration is needed
A number of international bodies (collaborations, consortia, strategy committees…) are carrying out activities, which are directly related to accelerator infrastructures. *Examples are US-LARP, EuroFEL, ECFA, NuPECC...* It is thus important to establish an appropriate liaison between these bodies and TIARA. The main task of WP2.2.2 is to identify these bodies, contact them and collect their views on which method would be best suited to establish such links with TIARA.

WP2.2.3: Enabling efficient communication, dissemination and outreach
Avery important issue for a successful long term operation of TIARA is the establishment of efficient means for Communication, Dissemination and Outreach (CD&O). Besides the TIARA website (external, internal and possibly the intranet) that will be developed and optimised in this preparatory phase, a more detailed study will be carried out in this WP, leading to a comprehensive CD&O plan. Example of items for such a plan are:

- Development of a Central Documentation database with embedded liaison to other databases set up by the individual Work Packages.
- Development of Common public relations materials.
- Sponsorship of international conferences and workshops related to accelerator R&D.
- Establishment of a yearly programme of public conferences.

This subtask, which will receive inputs fromWP3-6, will define the mechanisms and tools that would be implemented within TIARA, and will evaluate the needed resources.

WP2.2.4: Financial Management Needs (dedicated WG)
This subtask will define the needs in term of financial management. A first step will be the agreement on the type of actions that the TIARA consortium aims at partly or fully financing directly and the ones that can be carried out through other mechanisms. One will then investigate what types of financial operations are necessary in order to finance the TIARA coordination structure and the actions it will promote, initiate and support. This will be translated in administrative requirements. The outcome of this work will be an important ingredient in order to define the financial management model and the required administrative nature of the TIARA management structure.

WP2.3: Toward TIARA Implementation
This task will integrate all the work carried out in the previous tasks WP2.1 and WP2.2 to achieve the final deliverable (i.e. Final Memorandum of Agreement) integrating all the issues that will enable the establishment of TIARA and its sustainable operation. It includes 4 sub-tasks below and will lead to 5 deliverables.

WP2.3.1: Agreement on Initial TIARA Infrastructures
This subtask will use the input of WP3 and establish a Memorandum of Agreement for the initial list of R&D infrastructures constituting the ***TIARA distributed R&D Infrastructure***.
The access and new infrastructure acceptance rules will be included in this document.

WP2.3.2: Financial Management Model and Engineering for supporting TIARA activities
WP2.3.2 will establish an overall model for financing the TIARA Coordinating Structure and the actions that it will encompass in areas such as, but not only, R&D infrastructures, R&D projects, education and training. The funding sources and the mode for their management will be investigated amongst the partners and the European Commission. In particular, the part financed through the Coordinating Structure and those financed directly by the partners will be defined.
In addition, advice and procedures for TIARA Consortium members, for successful individual or joint requests for financing from the European Commission Framework Programme, regional development funds or other third party funding at all levels (from the European to the local perspective) will be developed, based on the experience and the techniques adopted by consortium members. The financing possibilities through the European Investment Bank will also be investigated. Advice from financial expert(s) will be sought and integrated into the TIARA Consortium Agreement to develop this service. Procedures for monitoring and optimizing stakeholder participation and guarantees will be explored and established.

WP2.3.3: Overall legal structure of the central coordination
This subtask will integrate the outcomes of the relevant tasks in WP2, WP3, WP4, WP5 and WP6 and define the legal set-up and statutes of the consortium structure, including reporting and the organization chart. This will include the means to fund the established consortium, the financial management of the structure, and its control through auditing. Aspects of inter-institutional and private sector Intellectual Property Rights and patenting will be incorporated (this will be linked to WP6). Obligations and withdrawals, liabilities and methods to resolve conflicts etc., will be established. Advice from legal experts will be sought. The interaction mechanisms with other organizations or bodies, as well as the development of a policy for exchanges and/or activities, will be established.

WP2.3.4: TIARA Impact and related indicators
Once TIARA has been established, it will be important to evaluate its impact on the development of European research infrastructures and more generally on the European research area, as well as at an international level. WP2.3.4 will evaluate this expected impact, try to assess its coordinating effect and develop appropriate indicators. The work of WP2.3.4 will be based on the results of work packages 3 to 6 and is therefore planned for the

last two months of the project.

Summary tasks and sub-task breakdown

Task Num	Short Name	Description
2.1	TGI	**Agreement on TIARA General Issues**
2.1.1	AMS	Agreement on the Mission and Scope
2.1.2	ACG	Agreement on Central Coordination Guidelines
2.2	SFN	**Structural and Financial Needs**
2.2.1	AMO	Advising Mechanisms and Organization
2.2.1.1	*STA*	*Scientific & Technical Advising mechanism and Organization*
2.2.1.2	*ETA*	*Education &Training Advising mechanism and Organization*
2.2.1.3	*IIA*	*Industrial Issue Advising mechanism and Organization*
2.2.2	IBC	Identification of the Bodies with which Collaboration is needed
2.2.3	CDO	Enabling efficient communication, dissemination and outreach
2.2.4	FMN	Financial Management Needs
2.3	TTI	**Toward the TIARA Implementation**
2.3.1	ITI	Agreement on Initial TIARA Infrastructures
2.3.2	FME	Financial Management Model and Engineering
2.3.3	OLS	Overall Legal Structure
2.3.4	TII	TIARA Impact and related Indicators

Deliverables (brief description and month of delivery)

Num	Nat[19]	Short name	Description	month
D2.1	O	MoA-GI	Memorandum of Agreement on General Issues	**12**
D2.2	R	AMO	Report on Advisory Mechanisms and Organization	**18**
D2.3	R	COB	Report on Collaboration with Other Bodies	**18**
D2.4	R	CDO	Report on Communication, Dissemination and Outreach Structure	**24**
D2.5	R	FMN	Report on Financial Management Needs	**24**
D2.6	O	MoA-ITI	Memorandum of Agreement on Initial TIARA Infrastructures	**24**
D2.7	R	MoU-FIE	MoU on Financial Model and Engineering	**30**
D2.8	R	MoU-LID	MoU on Legal Issues and Documents	**30**
D2.9	R	TIM	Report on TIARA Impact Measurement	**34**
D2.10	O	F-MoA	Final Memorandum of Agreement	**36**

Milestones

Num	Nat[19]	Short name	Description	month
M2.1	R	I-GI	Interim Report on General Issues	**6**
M2.2	R	I-AMO	Interim report on Advisory Mechanisms and Organization	**18**
M2.3	R	I-CDO	Interim Report on Communication, Dissemination and Outreach	**12**
M2.4	R	I-FMN	Interim Report on Financial Management Needs	**18**

[19] R for Report, P for prototype, D = Demonstrator, O = Other

Work package number	3	Start date or starting event:				1				
Work package title	**Accelerator R&D Infrastructures**									
Activity Type[20]	**COORD**									
Participant number	1	**2**	3	4	5	6	7	8	9	10	11
Participant short name	CEA	**CERN**	CNRS	CIEMAT	DESY	GSI	INFN	PSI	STFC	UU	IFJ
Person-months per participant:	6	**23**	6	6	6	6	6	13	6	6	6

Objectives: The overall goal of this Work Package is to integrate and optimize the European infrastructures for accelerator R&D.

The main objectives are to provide a survey of the existing accelerator R&D infrastructures and facilities, to identify synergies between existing infrastructures and to provide a costing model for their operation for comparison, to identify discrepancies between the existing infrastructures and future needs for accelerator R&D and to ensure that the needs of a broad user community of accelerator R&D infrastructures are adequately taken into account in the construction and operation of the TIARA distributed infrastructure.

Description of work:

WP3.1 will generate a web-based database of existing, currently developed and planned accelerator infrastructures with information on their capacities and exploitation levels. It will further propose a common costing method for the utilization of these infrastructures. Main points to be addressed in this work package include:

- Detailed survey of the infrastructures in the public and private sector and identification of their user communities. The European part of this survey will constitute the groundwork for establishing the TIARA distributed accelerator R&D infrastructure.
- Proposal for common methods for the valorization of the infrastructures and evaluating their capacities, exploitation levels and operation costs.
- Creation of a web based database of the existing accelerator R&D infrastructures.

WP3.1 will require input from WP6.

WP3.2 will evaluate the needs of the user community, in close interaction with WP4 and WP6. It will compare the outcome of WP3.1 with the current and future needs for Accelerator R&D and establish an assessment of the current situation highlighting which areas of Accelerator R&D are adequately covered, which have overcapacities and which need to be expanded and addressed in more detail in the future (identification of missing or excess infrastructures and resources). The analysis should start with the identification of key Accelerator Research Areas (ARA). Individual research areas can be defined in the context of (for example):

- RF accelerating system test and development (cryogenic and room temperature)
- Magnet testing and characterization (cryogenic and room temperature).
- Beam instrumentation.
- Beam physics.
- Advanced acceleration methods like plasma laser acceleration.
- High power targetry (infrastructure for treatment and handling of radioactive materials, test beam generation).

[20] MGT = Management of the consortium; COORD = Networking activity; SUPP = Support activity; RTD = Research and Technological Development

- Medical accelerator applications (gantry).
- Material surface studies (e.g. secondary electron emission yields for electron cloud and multipacting).
- Development, assessment and testing of radiation hard electronics and materials.
- Precision tooling and manufacturing (nano-technologies).
- Alignment and survey techniques for precision alignment.
- …

The creation of a complete list of key ARAs requires input from WP4 and WP6 and can therefore only be finalized during the TIARA execution phase. For the preparation of this document we consider a total number of ca. 15 ARAs and assume that a dedicated Work Package Contact Person (WPC) will carry out the analysis in WP3.2 for each ARA (e.g. a total of ca. 15 WPCs). For the resource table we assumed that the related resources are equally distributed over all TIARA contractors. This point needs to be revised once a complete list of ARAs becomes available.

For exploratory R&D, targeted R&D and industrialization R&D one should consider and study the needs, synergies and means for a European (single sited or distributed) R&D infrastructure for each ARA.

The second task of WP3.2 is to compare the identified future needs from WP4 with the existing infrastructures. The goal is to generate an assessment report that presents discrepancies between future needs for Accelerator R&D infrastructures and the currently available infrastructures. This later part requires input from WP4 and WP6 on the required and planned future accelerator R&D projects.

WP3.3 will propose appropriate structures that can ensure the sustainability of the process described in WP3.2 and propose a common costing method for the operation, upgrade and construction of individual large infrastructures (including costing of a full accelerator facility). It will provide direct input to WP2.2 of work package 2.

WP3.4 will address all issues related to access of the accelerator R&D infrastructures. It will define the general access policy and modalities for accessing R&D infrastructures of TIARA. It will further identify means for ensuring a continuous coordination with infrastructures outside TIARA (e.g. non-European accelerator R&D infrastructures) and, if appropriate, propose a coordinated structure for the possible review panels involved. This work needs to be done in collaboration with WP6 and will provide input to WP2.3.1 and WP2.2.4 of work package 2 of the TIARA proposal.

WP3.5 will investigate possible models for linking between them different levels of infrastructures and establish technical criteria and evaluation procedures for joining the TIARA distributed infrastructure and propose their implementation in TIARA. This work needs to be done in close connection with WP2 and will provide direct input to WP2.3 of work package 2.

The results of WP3.1 to WP3.3 will feed back into WP2.

Task and sub-task breakdown

Task Num	Short Name	Description	Input to[21]
3.1	**SCC**	**Survey** of existing accelerator R&D infrastructures and those that are already planned or under construction, Evaluation of their **Capacities** and estimation of	

[21] If some work or partial work carried out within a task also contributes to another work package, the task number is indicated.

		their utilization **Costs**.	
3.1.1	IKARA	Identification of Key Accelerator Research Areas (in close collaboration with WP4 and WP6).	4.1 4.4.1
3.1.2	SIARA	Detailed Survey of existing Infrastructures and their current user communities for each ARA.	4.4 6.2.2.1
3.1.3	ECICM	Estimation of the operation Cost of the existing R&D Infrastructures, Comparison of their costing Models.	
3.2	**ACA**	**Assessing** the current, medium- and long-term accelerator R&D infrastructure needs (will require input from WP4 and WP6), **Compare** these needs with the existing infrastructure and **Analyze** discrepancies between the two.	
3.2.1	CMLIN	Assessing the Current, Medium- and Long-term accelerator R&D Infrastructure Needs. This task is directly linked to deliverables of WP4 and WP6.	
3.2.2	CAIN	Comparison of the Accelerator R&D Infrastructure Needs with the existing infrastructures.	2.3.1 4.4 4.4.1
3.3	**SSC**	Definition of the appropriate **Structure** for ensuring the **Sustainability** of the evaluation and recommendations procedures within TIARA and determination of common **Costing** methods for the upgrade and construction of individual large infrastructures (including costing of full accelerator facility).	
3.3.1	DSSPT	Definition of the appropriate Structure for ensuring the Sustainability of the evaluation and recommendation procedures within TIARA.	2.2.1 2.2.2 4.3.1
3.3.2	CMUCI	Proposal of a common Costing Method for the Upgrade and Construction of individual large Infrastructures (including costing of full accelerator facility).	2.3.3
3.4	**ATI**	Ensuring **Access** to the **TIARA** accelerator R&D **Infrastructures**.	
3.4.1	PMAIT	Policy and Modalities to Access the R&D Infrastructures of TIARA.	2.3.1
3.4.2	CnEII	Ensuring the Coordination with non-European accelerator R&D Infrastructures and Industrial and publically funded infrastructures.	2.2.2 2.3.3
3.5	**JTI**	**Joining** the **TIARA** distributed accelerator R&D **Infrastructure**.	2.3.3
3.5.1	CEPET	Technical Criteria and Evaluation Procedure for Eligibility to join TIARA.	2.3.3
3.5.2	ISLI	Investigation of different Scenarios for the Link between different Infrastructures (within and outside TIARA).	
3.5.3	CFTR	Contribution to the Final Tiara-PP Report	

Deliverables				
Num	Nat[22]	Short name	Description	Month
D3.1	R	ARA	Identification of key Accelerator Research Areas.	**3**
D3.2	R	ISR	Infrastructure Survey Report.	**12**
D3.3	O	IWD	Infrastructure Web-based Database.	**16**
D3.4	R	INR	Infrastructure Need and Resource comparison.	**24**
D3.5	R	IAR	Infrastructure Access Report.	**24**
D3.6	R	RUC	Report on potential Upgrades and/or Construction of New R&D Infrastructures in Europe.	**30**
D3.7	R	JTI	Joining the TIARA distributed accelerator R&D Infrastructure and defining structures for sustaining and maintaining the Infrastructure data base.	**33**

[22] R for Report, P for prototype, D = Demonstrator, O = Other

Milestones				
Num	Nat[23]	Short name	Description	Month
M3.1	O	NWPC	Nomination of WPC for each ARA.	**4**
M3.2	R	ISR	Interim Infrastructure Survey Report	**8**
M3.3	O	IWD	Presentation of the Infrastructure Web-based database to representatives of the TIARA collaborators.	**17**
M3.4	R	IRC	Interim Infrastructure Need and Resource comparison	**20**
M3.5	O	JTI	Presentation of structure proposals for Joining the TIARA distributed accelerator R&D Infrastructure and sustaining and maintaining the Infrastructure database to representatives of the TIARA collaborators.	**21**

[23] R for Report, P for prototype, D = Demonstrator, O = Other

Work package number	4				Start date or starting event:				1		
Work package title	**Joint R&D Programming**										
Activity Type[24]	**COORD**										
Participant number	1	2	3	4	5	6	**7**	8	9	10	11
Participant short name	CEA	CERN	CNRS	CIEMAT	DESY	GSI	**INFN**	PSI	STFC	UU	IFJ
Person-months per participant:	6	12	6	6	6	12	**18**	6	6	6	6

Objectives: The main objective of this Work Package is to develop a common methodology and procedure for initiating, costing and implementing collaborative R&D projects in a sustainable way. Using these procedures, WP4 will aim at proposing a coherent and comprehensive Joint R&D Programme in the field of accelerator science. This Programme will identify the activities in accelerator science to be carried out by a broad community within the distributed TIARA infrastructure.

Description of work:

The purpose of the TIARA Consortium is to create a single European distributed accelerator R&D infrastructure, allowing the relevant communities to develop a strong and sustainable accelerator program.
To substantiate this purpose, this Work Package is devoted to identify the critical technical issues in the field of accelerator science and to promote and help defining a joint R&D Programme to be carried out with the European distributed accelerator R&D infrastructure, proposed by TIARA.
For many accelerators in construction or being planned, as well as for novel accelerator concepts, there is currently significant overlap in the technical requirements and designs or required components. Therefore the coordination of activities will lead to higher efficiency and optimal use of resources and reduction of production times; furthermore shorter commissioning times and more robust operation of the facilities will be enabled.

WP4.1 will identify the key technical issues and synergies for R&D activities in accelerator science. The work will be carried out in close interaction with WP3 and WP6. The objective of WP4 will be achieved thanks to an analysis of both the needs for the accelerators currently being developed and those that are being planned. More specifically prospective will be promoted on key R&D issues related to future or foreseeable new large accelerator based infrastructures (SLHC, ESS, IFMIF, ILC/CLIC, Neutrino and flavor factories, EURISOL, 4th generation light sources…).
Furthermore dedicated studies will be carried out on emerging ideas and technologies, so to identify key issues and common component developments.

WP4.2 will survey present R&D activities in the public and private sectors and will collect information on their current status. Whatever infrastructure being in use by these R&D activities will be identified. The European part of this survey will constitute the groundwork to define the TIARA R&D program. Another dedicated survey will be devoted to identify International Collaborations with ongoing R&D projects. Both surveys will result in a web based database, where the existing accelerator R&D programs will be reported.

[24] MGT = Management of the consortium; COORD = Networking activity; SUPP = Support activity; RTD = Research and Technological Development

WP4.3 will develop a common methodology and procedure for initiating, costing and implementing collaborative R&D projects in a sustainable way. Methodology and procedure for evaluation of scientific and technical projects and for their costing will be turned to enable the emergence and the launching of collaborative R&D activities.
In addition, appropriate communication tools for effective knowledge exchange (in connection with WP5) and for assistance in legal questions (through WP2) will be identified and implemented.

WP4.4 will propose a coherent collaborative R&D programme to be carried on in the TIARA framework. In connection will WP3 and WP6, this programme will identify the infrastructures needed to validate new technologies and to tests prototypes. The R&D Programme will also ensure appropriate coordination with non European accelerator R&D programs to be established.

Summary of Task and Subtask breakdown

Task Num	Short Name	Description	Input to[25]
4.1	ITK	Identification of Key technical Issues for a coherent joint R&D programme.	3.1.1
4.1.1	FAF	Prospective on Future or foreseeable new large Accelerator based Facilities (SLHC, ESS, IFMIF, ILC/CLIC, Neutrino and flavor factories, EURISOL, 4th generation light sources…) and identification of key R&D issues and synergies	3.2.2
4.1.2	EIT	Prospective on Emerging Ideas and Technologies and identification of key issues and common component developments.	3.2.2
4.2	PAR	Prospective on present R&D activities.	
4.2.1	SAS	Survey of the present R&D activities and of their current status. Identification of specific infrastructures used in these activities.	6.2
4.2.2	SCC	Identification of the International Collaborations having ongoing R&D projects in Accelerator Science. Input on their needs will be collected and emerging new ideas will be considered.	2.2.2
4.3	PMP	Procedure for initiating and methodology for costing and implementing collaborative R&D Projects	2.2.1.1
4.3.1	PEL	Procedure for enabling the Emergence and the Launching of collaborative R&D projects in a sustainable way	3.3.1
4.3.2	MEC	Common Methodology for project's scientific and technical Evaluation and for their Costing.	
4.3.3	CEA	Identification and implementation of appropriate Communication tools for effective knowledge Exchange (in connection with WP5) and Assistance in legal questions (in connection with WP2).	2.2.3
4.4	DAP	Definition of the coherent collaborative Accelerator R&D Program (this is an input to WP3) and identification of the necessary infrastructures.	3.2
4.4.1	IFP	Identification of the infrastructures needed to validate new technologies and to tests prototypes (input to WP3 and WP6 will be requested) according to the R&D Program.	3.2
4.4.2	CNE	Proposal of an appropriate coordination of the TIARA Programme with non European accelerator R&D programs.	
4.4.3	CFTR	Contribution to the Final TIARA_PP Report	

[25] If some work or partial work carried out within a task also contributes to another work package, the task number is indicated.

Deliverables				
Num	Nat[26]	Short name	Description	month
D4.1	R	KIR	General Report on Key Issues	**4**
D4.2	R	SRA	Survey Report on the present R&D activities and of their current status, with identification of specific infrastructures used in these activities.	**12**
D4.3	O	PWD	Web-based database in current R&D activities	**16**
D4.4	R	PAR	R&D Projects Access Report. Procedure for identifying, defining and launching of collaborative R&D projects, including common methodology for costing the projects.	**24**
D4.5	R	TTR	"Toward TIARA". Final plan of the collaborative R&D Program.	**33**

Milestones				
Num	Nat[26]	**Short name**	Description	month
M4.1	O	FSG	Formation of 2 subgroups SG1: for task 4.1.1 SG2: for task 4.1.2	**1**
M4.2	O	SSG	Formation of 2 survey subgroups SSG1: for task 4.2.1 SSG2: for task 4.2.2	**1**
M4.3	O	FWG	Formation of as many Working Groups (WP) as the number of issues identified in Milestone M4.2. The mandate of each WG is to address the issue of deliverable D4.3 "what Procedure should be put in place for identifying, defining and launching of collaborative R&D projects in TIARA".	**12**
M4.4	M	PDB	Presentation of the Web-based database on the present R&D activities and specific infrastructures used in these activities to the representatives of the TIARA collaborators.	**14**
M4.5	M	JTI	Joint meeting of WP3 and WP4: Presentation of proposals for joining the TIARA distributed R&D Infrastructure.	**21**
M4.6	R	RPA	Report on R&D Projects Access, describing procedures for identifying, defining and launching of collaborative R&D projects, including common methodology and	**22**
M.4.7	O	JPR	Intermediate discussion on the guidelines for a coherent Joint R&D Programme	**24**
M4.8	R	RDP	Presentation of final, implemented plan of the collaborative R&D Program.	**32**

[26] R for Report, P for prototype, D = Demonstrator, O = Other

Work package number	**5**			Start date or starting event:				**1**	
Work package title	**Education and Training for Accelerator Sciences**								
Activity Type[27]	**SUPP**								
Participant number	1	2	3	4	6	7	8	**9**	10	11
Participant short name	CEA	CERN	CNRS	CIEMAT	GSI	INFN	PSI	**STFC**	UU	IFJ
Person-months per participant	5	10	10	10	5	5	5	**20**	5	5

Objectives: The main objective of this work package is the development of structures and mechanisms that allow efficient education and training of human resources and facilitate their exchange among the partner facilities. The main tasks are to survey the human resources, training resources, and the market for Accelerator Scientists in Europe, and establish a plan of action for promoting Accelerator Science via enhanced coordination of training and exchange of knowledge and staff between institutions.

Description of work

Human resources are the key elements in the conception, design, realization, operation and further development of each individual TIARA facility within the TIARA Consortium, and more generally for the construction of accelerators. They are also key elements in the R&D programme carried out on TIARA infrastructures. However it is clear that there is a lack of young accelerator scientists in Europe (and worldwide) and that recruitment is becoming increasingly difficult, in research centres as well as in industry. Because the issues addressed are common to all the partners in Europe, most of the TIARA-PP participants will contribute. The work within WP5 is structured over three main tasks.

WP5.1 will carry out a survey of the number of Accelerator Science students and trainees and its evolution in Europe. It will also survey the available courses and teaching resources (including text books, lecture courses, and www-based materials) in European universities, laboratories and research organizations. This will provide an input to WP2.2.1.2 and WP2.2.2 A database of accessible training resources will be set up and updated regularly. This will provide an input to WP2.2.3.

WP5.2 will evaluate and develop the “market” for trained Accelerator Scientists, including physicists, engineers and technicians, for research, healthcare, industry and public service. One possibility to be explored is the creation of a centralized database of career opportunities for Accelerator Scientists within Europe. This study will be widely publicized and regularly updated to reflect (often rapid) developments in the field. This will provide an input to WP2.2.3.

WP5.3 will establish a plan of action for promoting Accelerator Science and Technology at multiple levels: i) within schools, in order to help attract bright young people into science and engineering disciplines; ii) within universities, in order to enhance the pool of graduate-level trained individuals; iii) within universities and research organizations that provide

[27] MGT = Management of the consortium; COORD = Networking activity; SUPP = Support activity; RTD = Research and Technological Development

postgraduate qualifications (Masters and PhDs), in order to ensure the flow of highly-skilled individuals; iv) within industry, so as to capitalize on Accelerator Science technologies and applications; v) within society at large, in order to assist understanding of the many societal benefits that are built upon Accelerator Science and Technology. This will provide an input to WP2.2.4. The plan will be developed with input from WPs 4 and 6.

The appropriate structure to coordinate these efforts will be investigated and concrete actions will be proposed (**WP5.3.1**). Likely candidates for enhanced academic training coordination include:

- Creation of a European masters (consistent with the Bologna process) in Accelerator Science.
- Grants for European masters/PhD studies in Accelerator Science.
- Internships for masters/PhD students.
- Joint organization/coordination of courses and training schools.
- Integration of Accelerator Science training infrastructures within accelerator R&D laboratories.

Knowledge and abilities are being built up at a number of locations but human resources are limited within Europe and a collaborative effort in key areas would greatly improve the quality of the activities. By building a mechanism to allow for easy exchange of these resources, significant strengthening of the expertise, and its more effective usage, should be possible. Such a mechanism should include a common framework for handling exchanges between partners (**WP5.3.2**), as well as with industry and other sectors. Key issues to be investigated, and in which actions will be proposed, include:

- Training and transfer of knowledge among universities and research centres, including healthcare and industry:
- Exchange of staff between centres.
- Joint training programmes.
- Accelerator operations training.

The required resources for the proposed actions will be evaluated and the required structure for implementing the developed plan will be proposed.

Summary task and subtasks breakdown

Task Num	Short Name	Description	Input to[28]
5.1	**SAS**	Performing a **Survey** of the numbers of students, courses, and teaching resources in Europe in the field of **Accelerator Science** and establishing a common resources database	
5.1.1	SASS	Survey of Students, courses, and teaching resources.	2.2.1.2 2.2.2
5.1.2	SASD	Development of education and training resources Database.	2.2.3
5.2	**MAS**	Evaluating and developing the **“market”** for trained **Accelerator Scientists** (physicists, engineers and technicians) for research, healthcare, industry and public service.	
5.2.1	MASS	Evaluation and Study of the development of the market for Accelerator Sciences.	2.2.3
5.3	**PAS**	Determining a **plan of action** for **promoting Accelerator Science and Technology** within schools, universities and research organizations, industry and society, and estimation of required resources for the proposed actions	2.2.4

[28] If some work or partial work carried out within a task also contributes to another work package, the task number is indicated.

5.3.1	DAS	Developing the European academic sector for accelerator sciences.	2.2.4
5.3.2	TEK	Training and exchange of knowledge among universities and research centres.	2.2.4
5.3.3	CFTR	Contribution to the final TIARA-PP report	

Deliverables				
Num	Nat[29]	Short name	Description	Month
D5.1	R	ETR	Education and Training Survey Report	**10**
D5.2	O	ETD	Education and Training Resources Database	**14**
D5.3	R	ASR	Needs for Accelerator Scientists Report	**22**
D5.4	R	PAR	Recommendations for Promoting Accelerator Science and Technology in Europe Report	**33**

Milestones				
Num	Nat[29]	Short name	Description	Month
M5.1	O	METR	Meeting to plan ETR report	**7**
M5.2	O	METD	Meeting to plan ETD database	**11**
M5.3	O	MASR	Meeting to plan ASR report	**19**
M5.4	R	MIRW	Interim report for input to WP2.2.4	**20**
M5.5	O	MMWP	Meeting with WPs 4 and 6 to take input for PAR report	**26**
M5.6	O	MPAR	Meeting to plan PAR report	**30**

[29] R for Report, P for prototype, D = Demonstrator, O = Other

Work package number	6			Start date or starting event:				1		
Work package Title	**Industry Involvement in TIARA**									
Activity Type[30]	**SUPP**									
Participant number	1	2	3	4	**5**	6	7	8	9	10	11
Participant short name	CEA	CERN	CNRS	CIEMAT	**DESY**	GSI	INFN	PSI	STFC	UU	IFJ
Person-months per participant	4	17	17	4	**18**	4	5	4	4	4	4

Objectives

The central objective of this Work Package is to create a framework intellectually and economically attractive to develop industrial products both for the research facilities and medical and industrial accelerators. The aim is to increase the impact of R&D collaboration and the speed of the industrialization of breakthrough technologies by facilitating the technology and knowledge transfer and optimizing the costs.

The main task of this work package is therefore to identify the partners within the relevant industrial sectors, organize the dialog with the TIARA Consortium, lay the groundwork and implement the means enabling a closer and sustainable association for the development of R&D programmes and infrastructures in Europe on the basis of long term mutual interest.

Description of work:

The aim of WP6 is to bring together research institutes and universities working in the field of accelerator technology and industrial companies interested both in supplying products to scientific projects based on this technology and in supplying an accelerators user community (industrial accelerators, medical accelerators). The work will be organised within five overall tasks:

WP6.1 will establish efficient communication with the relevant industry sectors in order to understand their interest in term of accelerator R&D infrastructures and programs.

In WP6.1.1 the relevant industry sectors will be identified, in connection with WP3 and WP4, and a formal liaison with TIARA will be establishing. This will enable to establish a continuous dialog.

In WP6.1.2 the partners will seek to understand and identify the industry interest in accelerator R&D infrastructures and programmes. Accordingly, a web-based data base collecting the information about industrial technology and industrial application in the accelerating area will be created and used as an important tool.
An open and recognized way of communication will also enable industry to give valuable inputs for defining the most useful R&D direction for industrial-medical applications when establishing the accelerator R&D programme in WP4.

WP6.2 will establish a joint framework for developing joint R&D projects and industrializing recent technologies. This will be done for the construction of accelerator components and test systems with a focus on the development of medical and industrial

[30] MGT = Management of the consortium; COORD = Networking activity; SUPP = Support activity; RTD = Research and Technological Development

accelerators.

In WP6.2.1 the topics that are most appropriate for joint R&D concerning accelerator components and test systems will be identified

In WP6.2.2 the recent technologies that can be used for the development of medical and industrial accelerators will be identified and a list of existing or planned infrastructures of interest for industry will be established, for example but not only main patents licensed in these domains.

WP6.2.3 will investigate how to enforce the IPR (intellectual property rights) within this joint framework. Protecting of IPR in technology transfer plays a very important role for industry. In particular, this task will explore how to reconcile IPR with respect to the typical open-access practice carried out within the research institutes funded by public money. The main issues of intellectual property policy will be: analysis of patent lifecycle, exchange of knowledge and confidentiality, in other words who owns knowledge, who owns inventions, under what condition a license can be granted in TIARA, etc…

WP6.3 will analyse the different possible options for sharing R&D infrastructures and developing joint R&D Infrastructures with the industry

In WP6.3.1 the analysis of access of industry to existing infrastructures in Europe and other regions will be done, the criteria for sharing R&D infrastructures will be determined and the rules for sharing R&D infrastructures will be established. This will be done in close collaboration with WP3.

In WP6.3.2 a financial model for developing joint R&D infrastructures will be investigated. The existing financial examples of the infrastructure sharing will be analyzed (for example the access today granted in existing synchrotron radiation facilities, neutron and irradiation facilities), the alternatives will be taken into consideration and on this base the general financial model and ROI (return on investment) for both academic and industry partners will be developed.

WP6.4 will define a technology roadmap for the development of future accelerator components in industry

In WP6.4.1 the critical requirements and the main targets, which are aimed at, (costs, reliability etc.) will be identified

In WP6.4.2 the technology alternatives will be identified and recommendation what alternative should be pursued will be given

The technology alternatives that can satisfy the targets will be analysed and the cost evaluated. The timeline from each alternative will be taken into consideration. The best information has to be consolidated and consensus from many experts both from industries and laboratories-universities will be developed.

To ensure the sustainability and timely relevance of the roadmap, the experience gained in this process will be used to propose the structure required to update and eventually extend the scope of this roadmap periodically.

WP6.5 will investigate a viable and efficient model for associating industry to TIARA and propose the appropriate structure, which is required for its implementation.

The models (in which industry are associated to accelerator R&D infrastructures) already used in other regions, like USA (DOE-SBIR and others) and Japan, will be examined and evaluated. Finally a possible model for Europe will be developed, taking into account the specific present context in which some of the strong national institutes or agencies have already developed their own mechanisms for technology transfer and close cooperation with industry.

Summary of task and subtask breakdown

Task Num	Short Name	Description	Input to[31]
6.1	**ECI**	**Establishing** Efficient **Communication** with **Industry**	
6.1.1	LTI	Establishing a Liaison between TIARA and Relevant Industry	3.3
6.1.1.1	*RIT*	*Definition of Relevant Industry Sectors for TIARA*	2.2.3 3.1.1
6.1.1.2	*FLT*	*Establishing of a Formal Liaison with TIARA*	2.2.1.3 2.2.2
6.1.2	INA	Understanding the Industry Interest in Accelerator R&D Infrastructures and Programs	3.5.1
6.2	**FPT**	Establishing a Joint **Framework** for Developing Joint R&D **Projects** and Industrializing Recent **Technologies**	
6.2.1	JRD	*Identifying the Topics that are Most Appropriate for Joint R&D Concerning Accelerator Components and Test Systems*	
6.2.2	MIA	*Identifying Recent Technologies that are or can be Used for the Development of Medical and Industrial Accelerators*	
6.2.2.1	*LII*	*Define a List of Existing or Planned Infrastructures of Interest for Industry*	
6.2.2.2	*ISB*	*Identifying industrial sectors and applications benefiting the most from joint R&D collaboration*	
6.2.3	IPR	*Studying how to Enforce the IPR within this Joint Framework*	
6.3	**SDI**	**Sharing** R&D Infrastructures and **Developing** Joint R&D **Infrastructures**	3.5.2
6.3.1	CRI	Determining the Criteria and Establishing the Rules for Sharing R&D Infrastructures	
6.3.1.1	*AAI*	*Analysis of Access of Industry to Existing Infrastructure in Europe and other Regions*	
6.3.1.2	*CRS*	*Determine Criteria and the Rules for Sharing R&D Infrastructures*	
6.3.2	FMI	*Investigating Financial Models for Developing Joint R&D Infrastructures*	2.2.4
6.4	**TRI**	Definition of a **Technology Roadmap** for the Development of Future Accelerator Components in **Industry**	
6.4.1	ICR	Identify the Critical Requirements and their Targets	
6.4.2	ITA	Identify the Technology Alternatives and give Recommendation what Alternative Should be Pursued	
6.4.2.1	*TRM*	*Technology RoadMap with Different Technology Alternatives*	
6.4.2.2	*RAP*	*Work out the Recommendation what Alternative should be Pursued*	
6.5	**AIT**	Model for **Associating Industry** to **TIARA** and Definition of the Appropriate Structure	
6.5.1	MAIL	Report on existing Models of Associating Industry to Laboratories for Accelerator Researches	2.3.3
6.5.2	MAIT	Model for Associating Industry to TIARA	2.3.3
6.5.3	CFTR	Contribution to the Final TIARA-PP Report	

[31] If some work or partial work carried out within a task also contributes to another work package, the task number is indicated.

Deliverables				
Num	Nat[32]	Short name	Description	month
D6.1	O	IDB	Identification of Industry Interest and Ways of Communication. Industry Data Base	**30**
D6.2	R	IPR	Proposal on how to Handle IPR in the Framework for Developing joint R&D Projects and Industrializing Recent Technologies	**18**
D6.3	R	SDR	Sharing R&D Infrastructures and Developing joint R&D Infrastructures Report	**24**
D6.4	R	TRM	Technology RoadMap with Different Technology Alternatives	**22**
D6.5	R	MAIT	Summary Report on Model for Associating Industry to TIARA	**33**

Milestones				
Num	Nat[32]	Short name	Description	month
M6.1	O	RIT	Definition of Relevant Industry Sectors for TIARA	6
M6.2	R	FJP	Framework for Joint R&D Projects is Established	15
M6.3	R	LII	List of Technologies, Components that will be Surveyed by TIARA. List and Details on Access and Special Interest of Existing or Planned Infrastructures of Interest for Industry	15
M6.4	R	AAI	Categorisation of Existing Joint R&D Projects and Access of Industry to Existing Infrastructure in Europe and other Regions	12
M6.5	R	FMJI	Possible Financial Models for Developing Joint R&D infrastructure (Interim Report)	18
M6.6	R	MAIL	Report on Models of Associating Industry to Labs for Accelerator Researches	24

[32] R for Report, P for prototype, D = Demonstrator, O = Other

Work Package number	7	Start date or starting event:	1
Work package Title	**SLS vertical emittance tuning system (SVET)**		
Activity Type[33]	**RTD**		

Participant number	**2**	7	8	10
Participant short name	**CERN**	INFN	PSI	UU
Person-months per participant:	**17**	12	36	14

Objectives:

The main objective of SVET is to upgrade the Swiss Light Source (SLS) at PSI to enable R&D on ultra-low emittances.

The CLIC damping ring aims at delivering an e+/e− beam with ultra-low vertical normalized emittance of 5 nm for achieving the required collider luminosity. This corresponds to a geometrical emittance of less than 1 pm at 2.86 GeV, which has never been reached in any lepton storage ring, especially for bunch currents equivalent to the ones of the CLIC DR, i.e. in a regime where collective effects and especially intra-beam scattering (IBS) are predominant. The SuperB e+e− factory aims at comparable vertical emittances of down to 4 pm at 7 GeV at bunch currents in the order of 2 A, i.e. again in IBS dominated regime. These ultra-low emittances are also extremely important for present and future light sources such as the Swiss Light Source storage ring (SLS) at PSI and MAX-IV at Maxlab in Sweden.

In order to obtain and control these ultra-low emittances, not only low magnetic error tolerances and extremely good control of the geometric alignment of the magnets are required, but also a combination of diagnostics for precise beam size, position and emittance measurement as well as on-line correction techniques. The suppression of betatron coupling and controlled excitation of vertical dispersion in order to adjust the vertical emittance to an optimum value with respect to brightness and lifetime are necessary. All these issues will have to be addressed in a dedicated R&D program, which will comprise three fields of activity: a) Suppression of betatron coupling and vertical dispersion by utilizing skew quadrupoles, b) measurement of small vertical beam size and emittance by means of high resolution beam profile monitors and c) measurements of IBS contributions to emittance and of the particle distribution in the IBS-halo.

SLS has achieved a vertical geometric emittance of around 3 pm at 2.4 GeV, one of the smallest vertical emittances ever obtained and only a factor 5 larger than the ultimate vertical emittance limit given by the quantum nature of synchrotron radiation. In this respect, SLS represents the ideal test-bed for deploying diagnostics and testing experimental approaches with a goal of reaching sub-pm vertical emittance beams. Recognizing this unique opportunity, PSI has agreed to allocate machine time to this important R&D program, making the SLS – a user facility by nature – an important R&D infrastructure.

In order to enable the SLS to perform the above mentioned dedicated R&D program, an upgrade of some of its key elements is however crucial. To identify these key elements and to implement this necessary upgrade of SLS is the objective of work package 7 (SVET). If successful, SLS will – after this upgrade – be an R&D infrastructure suitable to investigate ultra-low vertical emittance tuning and control, in particular also in the regime of strong IBS. This is relevant for damping rings of future linear colliders and for next generation light sources.

[33] MGT = Management of the consortium; COORD = Networking activity; SUPP = Support activity; RTD = Research and Technological Development

Description of work:

The Work package is subdivided in four main tasks described below.

Task 7.1 : Experimental tests at SLS with existing systems

Experimental tests at SLS with existing system to understand potential and limitations. Emittance coupling will be measured and reduced as much as possible with the existing skew quadrupoles, by re-alignment of girders and beam position monitors (BPM's). The results will be the smallest vertical emittance obtainable in the present configuration, its sensitivity on machine parameters, the resolution of critical beam instrumentation and finally an identification of those elements that require an upgrade. It will equally be determined which field errors occur at reduced beam energy and how they could be compensated.

Task 7.2 : Specification of necessary upgrades

Depending on the outcome of the above, the necessary upgrades for BPM's, beam profile monitors, emittance monitors, emittance knobs, coils, magnet trimming and power supplies will be specified.

Task 7.3 : Implementation of the specified upgrade

The implementation of the specified upgrades will require some hardware work and some purchasing, followed by the installation in SLS. These upgrades will concern the control system, beam instrumentation for position and emittance measurements and magnet trimming.

Task 7.4 : Commissioning to verify the implementation

Commissioning of the implemented upgrade will is planned in two stages: first at the nominal energy of 2.4 GeV, later at a reduced energy of 1.5 GeV, where the emittance limit will become IBS dominated. After this commissioning, SLS will be prepared for dedicated MD's, which are not part of this proposal.

Detailed task and subtask breakdown

Task Num	Short Name	Description
7.1	**SLS_NOW**	**Experimental tests at SLS with existing systems**
7.1.1	EPS_LIMIT	Suppression of emittance coupling to lowest possible values based on measurements of response matrix and vertical dispersion in order to determine which minimum coupling can be achieved with the existing set of skew quadrupoles, beam position monitors and girder realignment capabilities. Includes BBA ("beam based alignment", i.e. beam based BPM calibration), BBGA (beam based girder alignment), measurement of sextupole misalignments, measurement of BPM roll errors and design of a minimum coupling orbit (dispersion free steering).
7.1.2	EPS_SENS	Study the sensitivity of an optimum setting thus obtained to small variations of machine parameters like orbit bumps, insertion device gap changes and current changes (causing phase shifts due to resistive wall impedance).
7.1.3	MON_RES	Characterize the resolution and sensitivity of the existing beam profile monitors (visible polarized light monitor, X-ray pinhole array) with respect to the resulting uncertainty of an emittance

		measurement and the capability to analyse the beam halo distribution.
7.1.4	COUPLING	Establish a sound theoretical framework and machine model to understand how the observables (beam size, response matrix) are related to emittance coupling, to distinguish local and global aspects of coupling and to figure out how many beam profile monitors at different locations are required to obtain a complete description of the coupled beam.
7.1.5	MAG_SCALE	Explore the capability of SLS to operate at reduced beam energy, in particular limitations due to diverging magnet hysteresis curves.
7.2	**SPEC**	**Specification of necessary upgrades.**
7.2.1	ORB_C_SPEC	Depending on the outcome of 1.1, specification of improvements to the BPM or alignment systems required to reach a vertical emittance close to the natural limit.
7.2.2	KNOB_SPEC	Specification of correction knobs and feedback algorithms for an automated correction of coupling, and algorithms for BBGA.
7.2.3	MON1_SPEC	Specification of an improved beam profile monitor for higher resolution and/or for larger halo sensitivity. This could be a polarized UV light monitor or a long baseline X-ray pinhole array or another type of monitor not yet existing at SLS, e.g. laser wire, zone plate, residual gas monitor etc.
7.2.4	MON2_SPEC	Specification of the number of additional beam profile monitors required to obtain sufficient information on local and global coupling.
7.2.5	MAG_SPEC	Specification of additional coils and power supplies to compensate for deviations in magnet hysteresis curves when operating at reduced beam energy.
7.3	**IMPL**	**Implementation of the specified upgrade**
7.3.1	ORB_C_IMPL	Depending on the outcome of 1.1 and 2.1, improvements or extensions of present BPM and alignments systems may become necessary.
7.3.2	COUPL_IMPL	Implementation of a procedure for automated coupling control.
7.3.3	MON1_IMPL	Implementation of an improved beam profile monitor, most probably an interferometric UV monitor with long focal length and large/variable central absorber for blocking the core beam radiation.
7.3.4	MON2_IMPL	Depending on the outcome of 2.4, implementation of an additional beam profile monitor of same type
7.3.5	MAG_IMPL	Depending on the results of Implementation of additional coils and power supplies to balance SLS magnets for low energy operation.
7.4	**COMM**	**Commissioning to verify the implementation**
7.4.1	ORB_C_COMM	Commissioning of the system from 3.1.
7.4.2	COUPL_COMM	Verification of automated coupling control.
7.4.3	MON1_COMM	Commissioning of new beam profile monitor.
7.4.4	MON2_COMM	Commissioning of an additional beam profile monitor.
7.4.5	LOW_E_COMM	repeat 4.2-4.4 at reduced beam energy

Deliverables

Num	Nat[34]	Short name	Description	month
D7.1	R	D_SLS_NOW	Report on existing hardware limitations and needed upgrades.	**9**
D7.2	R	D_SPEC	Specifications ready	**20**
D7.3	P	D_IMPL	Hardware installed	**24**
D7.4	R	FINAL_R	Final report	**36**

Milestones				
Num	Nat[34]	Short name	Description	month
M7.1	R	M_INSTR	Interim report on existing beam instrumentation	**5**
M7.2	R	M_KNOBS	Specification of emittance knobs ready	**16**
M7.3	R	HE_COMM	High energy commissioning finished	**31**

[34] R for Report, P for prototype, D = Demonstrator, O = Other

Work package number	**8**	Start date or starting event:	**1**
Work package title	**Ionisation Cooling Test Facility**		
Activity Type[35]	**RTD**		

Participant number	2	**9**
Participant short name	CERN	**STFC**
Person-months per participant:	16	**38**

Objectives:

The principal objective of this work package is to deliver detailed design reports of the RF power infrastructure upgrades that the Ionisation Cooling Test Facility at the Rutherford Appleton Laboratory requires for it to become the world's laboratory for ionization cooling R&D.

Muon storage rings have been proposed for use as sources of intense high-energy neutrino beams at the Neutrino Factory and as the basis for multi-TeV lepton-antilepton collisions at the Muon Collider. To optimize the performance of such facilities requires the phase-space compression (cooling) of the muon beam prior to acceleration and storage. The short muon-lifetime makes it impossible to employ traditional techniques to cool the beam while maintaining the muon-beam intensity. Ionization cooling, a process in which the muon beam is passed through a series of liquid-hydrogen absorbers followed by accelerating RF-cavities, is the technique proposed to cool the muon beam. A globally unique Ionisation Cooling Test Facility (ICTF) is under construction at the Rutherford Appleton Laboratory to provide the infrastructure required to allow the first steps in an ionization-cooling R&D programme to be carried out.

The ICTF presently serves the international Muon Ionisation Cooling Experiment (MICE) collaboration by providing a muon beam and the necessary infrastructure to carry out the first steps of the MICE programme. MICE is a collaboration of roughly 150 physicists and engineers from Europe, Japan, and the USA. The international MICE collaboration will provide the equipment that makes up the MICE cooling channel and the muon spectrometer systems. The value of these contributions has been estimated to be ~€40M. The goal of the MICE collaboration is to construct a single lattice cell of the Neutrino Factory cooling channel and to measure its performance in a variety of beam conditions and lattice configurations. The collaboration seeks to carry out the experiment in time for the results to inform the decision point (roughly 2012) on the future direction of the neutrino programme in Europe as identified in the European Strategy for Particle Physics. The importance of the MICE experiment and the ICTF to the European accelerator R&D programme is widely recognized and resources to allow Transnational Access to the facility have been approved by the Commission through the EuCARD Integrating Activity.

It is planned that the MICE experiment will be built up in six 'Steps'. Step I, which is being carried out at the moment, will perform a detailed characterization of the ICTF muon beam to establish that it can deliver the range of emittance and momentum required by the experiment. It is anticipated that Step I will be complete in the first quarter of 2010. The muon spectrometer system will be implemented in Step II (second quarter 2010) and Step III (fourth quarter 2010) and the first liquid-hydrogen absorber and focus-coil (AFC) system will be implemented in Step IV (2011). Step V will add a first section of linac and a second AFC module and is expected to be complete in the second quarter of 2012. The upgrades to the ICTF that will be carried out within TIARA-PP will therefore enable Step V of MICE to be implemented and the first demonstration of ionization cooling to be made. The final

[35] MGT = Management of the consortium; COORD = Networking activity; SUPP = Support activity; RTD = Research and Technological Development.

configuration of the experiment will be reached at Step VI (2013) with the inclusion of the second section of linac and the third AFC module.

The design of the infrastructure that is required for the ICTF to serve MICE up to Step IV is in hand, supported by the STFC. The work within TIARA-PP described below is required to allow the detailed design and specification of the RF power distribution system by which the ICTF can support Step V of MICE. In addition, by carrying out the design work required to further upgrade the RF power infrastructure, the ICTF will be able to support Step VI of MICE as part of the TIARA distributed network of European infrastructures for accelerator R&D.

A future Muon Collider would require an even more aggressive ionization cooling system that would reduce the size of the beam in all six phase-space dimensions. Various schemes have been proposed to achieve this. The US Muon Collider Task Force (MCTF) and Neutrino Factory and Muon Collider Collaboration (NFMCC) have taken the lead in the development of conceptual and engineering designs for 6D cooling lattices. One particular proposal, MANX, which is based on a helical transport channel filled with high-pressure hydrogen gas, has already been proposed as a possible user of the ICTF once the MICE experiment has been completed. The MANX collaboration has initiated discussion of the implementation of the experiment at the ICTF using the MICE spectrometer systems with the MICE collaboration and resources have been made available in the US for design work on the 6D cooling experiment to continue.

While no decision has yet been reached on use of the ICTF by MANX, their interest demonstrates the broad applicability and generic value of the Ionisation Cooling Test Facility at the Rutherford Appleton Laboratory as an accelerator R&D infrastructure to be included in TIARA. It is the only facility in the world capable of providing the necessary infrastructure to develop the technologies required for muon cooling for the Neutrino Factory and Muon Collider communities. MICE is expected to be completed by 2014 after which the six-dimensional (6D) ionization cooling R&D programme will be initiated. It is likely that the 6D cooling programme will take 10 years to complete. Therefore it is crucial that the ICTF infrastructure be sustainable until at least 2024. It is therefore essential that preparations are made to replace the triode-based amplifiers in a future upgrade. For this reason, it is proposed to carry out a design study of a novel Diacrode-based high-power amplifier that will form the basis of a future upgrade to the ICTF RF power system.

The work that will be carried out in this work package will allow the ICTF to realize its full potential as the world's ionization-cooling R&D infrastructure. The upgraded ICTF will become part of the internationally-open TIARA network of infrastructures for accelerator R&D in Europe, allowing Europe to contribute a unique facility to the international accelerator R&D effort and ensuring continued European leadership in this area.

Description of work

The work within this WP will be carried out in three top-level tasks through which the electrical power to the ICTF Hall will be upgraded, design reports for the RF power upgrades required to serve MICE Steps V and VI will be produced, and a design study of a Diacrode-based amplifier to ensure the long-term sustainability of the ICTF will be carried out.

Critical to the success of this programme is the close collaboration of specialist electrical and RF engineers at CERN and at the STFC Daresbury and Rutherford Appleton Laboratories (DL and RAL respectively). RF amplifiers for the Ionisation Cooling Test Facility (ICTF) have been refurbished at CERN and at DL. The design of the RF-power distribution system must take into account the safety requirements arising from the use of liquid and gaseous hydrogen as well as the constraints imposed by personnel safety and the restricted space in the ICTF Hall. The CERN RF group has an established track record and a substantial depth of experience in the area of high-power RF systems. RF systems of similar specification to those required for the ICTF are used on the ISIS injector linac and for CERN's planned SPS upgrade. Both CERN and STFC RF specialists therefore have extensive experience in the design, implementation, commissioning, and maintenance of these systems. By pooling their expertise the TIARA WP8 team will be able to create the robust and flexible system required for the long-term viability of the ICTF. In addition, the close collaboration that will be forged through the work proposed here will be invaluable in the future development of the ICTF to serve the more demanding, six-dimensional cooling programme in the TIARA era.

Upgrade to ICTF power infrastructure

The work within this task will be to coordinate the work at CERN, DL, and RAL on the specification, procurement, and implementation of the sub-station upgrade and on the specification, detailed design, and installation and test of the first power-amplifier system.

Task 8.1: ICTF sub-station upgrade

Power to the current ICTF Hall is supplied via an aging 1.25 MVA sub-station. In order for the facility to accommodate the full equipment foreseen for the ICTF an upgrade to the capacity of the substation is required. The work to be carried out in this sub-task will be to specify the upgrade, to procure the components, and then to oversee the implementation of the upgrade in the ICTF Hall at RAL.

Task 8.2: ICTF RF power infrastructure

The principal aim of this subtask is to deliver the complete design of the RF power distribution system. The work will proceed by reviewing the layout and RF power requirements of the ICTF in order to produce a specification document for the RF power distribution system. This will be done in two steps – the first half system will be sufficient for Step V of the MICE experiment, while the full system will be required for Step VI of MICE and for the full ICTF implementation.

The second ICTF high power RF amplifier will be assembled at Daresbury Laboratory and tested with the existing ICTF RF System #1 there. Subsequently the complete RF System #1 will be dismantled, packed and shipped to RAL where it will be installed and commissioned in the ICTF Hall, thus providing a source of RF power for the MICE experiment. The installation of the equipment in the ICTF Hall will be carried out by the ICTF installation team, under the supervision and with the support of the personnel supported by TIARA WP8. Commissioning of the system will be the responsibility of the TIARA WP8 personnel.

Once the installation and commissioning of the first RF Amplifier system is complete, the focus of the work will move to the design of the RF power distribution system required for the full scope of the ICTF.

Task 8.3: Novel pulsed RF power amplifier design

The existing ICTF power amplifiers are based on relatively old technology, using high power triodes with glass envelopes. While sufficient tubes are being procured to allow the ICTF to serve the MICE experiment, the production of these tubes will be discontinued. For this reason, future multi-megawatt RF power systems will use more modern high power tubes, for example Diacrodes®. For the ICTF to serve the ionization cooling R&D programme of the future, for example 6D cooling experiments such as MANX, it is essential to develop an alternative 201 MHz power source. Therefore, it is planned to perform a design study of a 201 MHz, 2—3 MW, pulsed power amplifier in the framework of TIARA-PP. This design study will fully exploit synergy, since similar RF systems will be required at many other high-power facilities in the future, including, for example, the proposed upgrade to CERN's SPS and the possible upgrade of the ISIS facility at RAL to a multi-MW, pulsed neutron spallation

source.		
Summary tasks and sub-task breakdown		
Task Num	Short Name	Description
8.1	**SSU**	**ICTF sub-station upgrade**
8.1.1	DSU	Design and specification of the upgrade
8.1.2	Proc	Procurement
8.1.3	Impl	Implementation
8.1.4	ComTst	Commissioning and testing
8.2	**RFP**	**ICTF RF Power infrastructure**
8.2.1	RevLO	Review of layout and requirements in ICTF Hall
8.2.2	DSStpV	Design and specification of the RF power distribution system for MICE Step V
8.2.3	Amp#2Ass	Assembly of RF High Power Amplifier #2
8.2.4	Amp#2Tst	Test of RF High Power Amplifier #2 (at DL)
8.2.5	Amp#1Pck	Dismantling & packing of RF System #1
8.2.6	Amp#1Shp	Transport of RF System #1 to RAL
8.2.7	Amp#1Inst	Installation of RF System #1 in ICTF Hall (with dummy load)
8.2.8	Amp#1Com	Commissioning of RF System #1 in ICTF Hall
8.2.9	DSStpVI	Design and specification of the RF power distribution system for MICE Step VI
8.3	**NRFAmp**	**Novel pulsed RF power amplifier design**
8.3.1	ICTFRFNds	Specify ICTF RF system upgrade needs
8.3.2	RFSurv	Survey for relevant existing RF power systems
8.3.3	PSSpec	Specify power supply and protection circuitry
8.3.4	SimDiac	Computer simulation of Diacrode with input/output circuits
8.3.5	IOMock	Build input and output circuit lab mock-ups
8.3.6	LPTst	low power tests of the lab mock-ups
8.3.7	IntStud	"Integration of power amplifier, power supply and diacrode study"
8.3.8	SysAna	overall system analysis and performance predictions
8.3.9	RedactRep	Redaction of design report

Deliverables (brief description and month of delivery)				
Num	Nat[36]	Short name	Description	month
D8.1	R	RFSysV-Spec	Report on the design and specification of ICTF RF power distribution system for MICE Step V	**12**
D8.2	R	RFAmp1-Test	Report on commissioning of the first RF amplifier system in the ICTF Hall.	**22**
D8.3	R	RFSysVI-Spec	Report on the design and specification of ICTF RF power distribution system for MICE Step VI (full ICTF implementation)	**36**
D8.4	R	RF_Ampl-DR	Design report of a 3 MW power amplifier	**32**

Milestones				
Num	Nat[36]	Short name	Description	month
M8.1	R	SSU-Spec	Report on sub-station upgrade specification	**5**
M8.2	O	SSU-Inst	ICTF sub-station upgrade complete	**12**
M8.3	R	RFSysReq	Report on RF system layout and requirements	**7**
M8.4	R	SymDiac	M8.4 Simulation of Diacrode complete	**18**

[36] R for Report, P for prototype, D = Demonstrator, O = Other

Work package number	**9**		Start date or starting event:		**1**
Work package title	**HGA (High Gradient Acceleration)**				
Activity Type[37]	**RTD**				
Participant number	**7**	8			
Participant short name	**INFN**	PSI			
Person-months per participant:	**67**	28			

Objectives:

An upgrade of the existing S-band Linac of the SPARC Test Facility at LNF-Frascati with high gradient C-band accelerating structures is proposed, in order to reach 250 MeV at the end of the structure. The upgrade will be done with state-of-the art technology, setting up a facility unique in Europe made of S-band and C-band Linacs (a new “hybrid” configuration, never implemented up to now). This work will be carried out by the INFN in collaboration with the PSI-Zurich.

The SPARC test facility at LNF is an advanced photo-injector producing at present a 150 MeV electron beam to generate high brilliance FEL radiation in the visible region at the fundamental wavelength and at VUV wavelengths with the harmonics.

The upgrade design proposed here is based on a S-Band photo-injector operating in a RF compression mode followed by a C-band Linac. This scheme seems very promising from the beam dynamics point of view in terms of preservation of the low emittance of the electron beam and reachable photon beam brilliance. It is also much more compact with respect to a full S-band Linac, since with relatively short (1.5 m) C-band accelerating sections it will be possible to reach an accelerating gradient of the order of 35 MV/m. Finally, this compact design will allow for performing the design and realization of the accelerating structures at LNF with the present facilities.

After the upgrade SPARC will facilitate R&D on low emittance beams, photo-emission processes with novel cathodes, generation of polarized electrons, acceleration and synchronization of a bi-frequency Linac, efficiency and reliability of the system. In particular, a velocity bunching R&D test, providing both a substantial pulse compression with a reduction of the compressed beam energy spread, due to the higher SPARC beam energy, will allow for opening a number of possible future FEL experiments.

The SPARC upgrade will be crucial for at least two future FEL projects in Europe (SwissFEL and SPARX), for which the use of C-band accelerators for the main Linac is being considered, since they can greatly profit from the high accelerating gradients and the compactness of the system.

Finally, the SuperB collider, - a very high luminosity asymmetric (4 and 7 GeV) e^+e^- collider at the B meson cm energy, - will also profit from the SPARC upgrade. In fact a critical SuperB subsystem is the injector, which needs to deliver very intense bunches of positrons and polarized electrons at very high rates, due to the low beam lifetimes in the ring caused by the SuperB large luminosity. For these reasons an important topic which will need significant R&D for SuperB is the study of a high performance C-band Linac which could deliver the beams with the required properties in a very cost effective manner. It is clear then that the implementation of this technology at SPARC will be crucial for the SuperB design.

[37] MGT = Management of the consortium; COORD = Networking activity; SUPP = Support activity; RTD = Research and technological development.

Besides the implementation of the C-band technology at SPARC, the PSI is also interested in C-band high gradient acceleration studies towards a European standard and to design a modern digital Low Level RF (LLRF) both for SPARC upgrade and for SwissFEL (future development, not included in this WP).

Description of work

The work will focus on the design and construction of a Pulse Compressor and two C-band Accelerating Sections for the energy upgrade of the SPARC Test Facility at LNF.
The RF system will employ a high peak power C-band station, made of a 50 MW peak klystron supplied by a pulsed modulator, a waveguide system and two C-band 1.5 m accelerating sections. The waveguide system, operating in vacuum, includes a Pulse Compressor (usually known as SLED) to increase the klystron output peak power of about a factor 3, at expense of a reduction of the pulse duration from 2.5 to 0.5 µsec.

WP9.1: Study of SPARC upgrade in energy

The aim of this task is to design the SLED and the accelerating sections for the upgrade of the SPARC test facility in order to achieve a final energy of 200 MeV.

WP9.1.1: Design of SLED: simulation and optimization

The SLED consists of two very low RF losses cylindrical cavities, coupled with a 90° hybrid junction. The cavities require careful electromagnetic design, prototyping and a high quality manufacturing to ensure the fulfilment of the stringent RF and vacuum parameters. For optimal acceleration efficiency and cost optimization the specifications for the RF Pulse Compressor and the accelerating cavities must be matched.

Since strong expertise on SLED design is available outside of INFN, it is planned to issue a subcontract for this subtask. The sub-contractor will make a survey of RF compressor techniques, analysis and comparison of technical solutions, choice of C-Band SLED configuration and parameters for SPARC, a preliminary design, and an analysis of low power RF measurements and characterization techniques applied to C-band RF compressors. A report will be issued to INFN to proceed with the mechanical design and construction.

WP9.1.2: Design of SLED: CAD mechanical design

The CAD mechanical drawings for the SLED will be carried out.

WP9.1.3: Design of C-band Accelerating Section: simulation and optimization of a prototype

The Accelerating Sections must be carefully designed and a preliminary high power test on a smaller prototype has to be performed before the manufacturing of the final models. This sub-task will deal with the simulation and optimization of a C-band traveling wave structure operating at $2\pi/3$ mode with 2D and 3D codes as SuperFish and HFSS.

WP9.1.4: Design of C-band Accelerating Section: prototype CAD mechanical design

The CAD mechanical drawings for two Accelerating Sections will be prepared.

WP9.1.5: Design of C-band Accelerating Section: final accelerating structures design

Following the results of the prototype tests, modifications on the final design can be necessary, and this sub-task will deal with such adjustments.

WP9.1.6: Design of C-band Accelerating Section: final accelerating structures CAD design

Following the possible design modifications this sub-task will deal with the new CAD design.

WP9.2: RF Low Level Electronics for SPARC

A stable and flexible LLRF is indispensable to monitor the shot to shot jitter of the beam parameters and to provide corrections to compensate drifts of the system (feedback). Based on a stable RF distribution system the low level RF must deliver very stable RF signals to the klystron amplifier with fast phase modulation during the RF pulse as required for the operation of the RF compressor. Within this proposal we suggest to develop and test at PSI a flexible and powerful digital low level RF electronics concept based on a non IQ sampling techniques and fast FPGA controllers.

WP9.2.1: Design of a digital RF-LLE

The design of the digital LLRF electronics will be carried out at PSI.

WP9.2.2: Construction and test of a prototype at SPARC

The construction and test of prototype LLRF electronics for SPARC upgrade will be performed. Installation and integration at SPARC will be done.

WP9.3: Construction and test of SPARC C-band section

This task will deal with the construction and test at SPARC of the C-band sections and SLED. Material for the SLED and sections will be purchased, and procurement of a 500 W klystron driver for the power tests will be done.

WP9.3.1: Hardware and material acquisition

The acquisition of the necessary hardware and material will be carried out.

WP9.3.2 Construction and test of SLED.

The construction and test of the SLED will be performed.

WP9.3.3: Construction and test of an accelerating structure prototype

The construction and test of an accelerating structure prototype with a reduced number of cells to be tested at high power will be performed.

WP9.3.4: Construction of 2 final accelerating sections.

The construction of the two final accelerating structures will be carried out after the tests on the prototype and possible design modifications.

WP9.3.5: Test of SPARC C-band upgrade.

The test of the SPARC C-band upgrade will be carried out.

Summary task and sub-task breakdown

Task	Short Name	Description
9.1	**SPARC-UP**	**Study of SPARC upgrade in energy**
9.1.1	SLED-DES	Design of SLED: simulation and optimization of a C-band SLED cavity with HFSS (High Frequency Structure Simulator)
9.1.2	SLED-CAD	Design of SLED: preparation of CAD mechanical drawings
9.1.3	ACCP-DES	Design of a C-band accelerating structure prototype: simulation and optimization
9.1.4	ACCP-CAD	Design of a C-band accelerating structure prototype: preparation of CAD mechanical drawings
9.1.5	ACC-DES	Modifications of the accelerating structures design if needed after prototype test
9.1.6	ACC-CAD	Modifications of CAD mechanical drawings if needed after prototype test
9.2	**RF-LLE**	**RF Low Level Electronics**
9.2.1	LLE-DES	Design of a digital LLRF electronics
9.2.2	LLE-CON	Construction and test of a prototype at SPARC

9.3	**SPARC_CON**	**Construction and test of SPARC C-band section**
9.3.1	HGA-HDW	Acquisition of necessary hardware and material
9.3.2	SLED-CON	Construction, installation and test of SLED
9.3.3	ACC-PROT	Construction and test of an accelerating structure prototype with a reduced number of cells to be tested at high power
9.3.4	ACC-CON	Construction, installation on SPARC of the final accelerating structures
9.3.5	ACC-TEST	Test of C-band upgrade at SPARC

Deliverables				
Num	Nat[38]	Short name	Description	month
D9.1	P	**SPARC-C**	Construction of SLED and accelerating structures	**29**
D9.2	R	**SPARC-T**	Installation, commissioning and test report of the C-band Linac at SPARC	**35**

Milestones				
Num	Nat[38]	Short name	Description	month
M9.1	O	**HARDW-A**	Purchase of crucial hardware components	**6**
M9.2	R	**SLED-D**	Design of SLED	**18**
M9.3	R	**ACC-D**	Design of accelerating structures (prototype and final)	**18**
M9.4	R	**RF-LLE-D**	Design LLRF	**18**
M9.5	P	**RF-LLE-P**	First LLRF electronics prototype	**24**

[38] R for Report, P for prototype, D = Demonstrator, O = Other

Work Package number	**10**		Start date or starting event:	**1**
Work package Title	**TIHPAC (Test Infrastructure for High Power Accelerator Components)**			
Activity Type[39]	**RTD**			

Participant number	2	**3**	10
Participant short name	CERN	**CNRS**	UU
Person-months per participant:	18	**34**	8

Objectives

Before launching the construction of EURISOL, the next-generation facility for the production of very intense radioactive ion beams (RIB), two major technical issues need to be addressed; the development of high power target and low beta superconducting accelerating structures. The objective of this Work Package is to coordinate the design of the corresponding test infrastructures: an irradiation test facility for the high power target developments and a test cryostat for testing fully-equipped low beta superconducting cavities (SC).

These installations are key infrastructures, not only for the accomplishment of the R&D programme that is required to enable the construction of EURISOL, but also for other projects, such as the European Spallation Source (ESS) or the development of Accelerator Driven Systems (ADS), in particular with the MYRRHA project, as part of the EUROTRANS programme.

The EURISOL facility is aiming at the production of very intense radioactive ion beams (RIB) using the ISOL (Isotope Separation On Line) technique. It would provide unique world-class research opportunities in nuclear physics, nuclear astrophysics and material science, and supply new radiopharmaceutical radioisotopes.

The facility is based on a 5 MW driver accelerator, capable of accelerating protons up to 1 GeV, and also some other species, such as deuterons and He3 (2+) to 250 MeV and 2 GeV respectively at a reduced current. The beam is then directed to one multi-MW target and several low power target stations for the neutron conversion and the RIB production. The produced RIBs produced are then prepared and sent to the post-accelerator, which can accelerate up to 150 MeV/u, depending on the physics case requirements.

Achieving the required performance on the EURISOL facility necessitates an important R&D on several key components to assess the technological choices. Several components are today at the technological limit, and the difficulties will be overcome only with an intense R&D effort which includes an important test and qualification programme. The opportunity to test these components in conditions as close as possible to the final operation of the machine is mandatory to achieve a reliable design, which can meet the specifications.

Description of work

This work package is divided into two main tasks; the first one corresponding to the design of a high power target test facility and the second one to the design of the test cryostat for the low beta SC cavities.

[39] MGT = Management of the consortium; COORD = Networking activity; SUPP = Support activity; RTD = Research and technological development

Task 10.1: **Defining and designing the necessary test infrastructures for multi MW target complex tests.**

The target complex is one of the key elements of the EURISOL facility, which has been the subject of intense design work and preliminary prototyping phase in the EURISOL Design-Study. The 4 MW mercury converter-uranium target is based on a circulating metal loop exposed to direct proton beam irradiation. First prototypes have been developed and tested offline, from which important information was obtained. At the present stage, several issues are yet to be addressed, such as the impact of beam irradiation parameters on the liquid metal loop operation. Similarly, the target development will necessitate further research in the field of heat exchange with liquid metal, irradiation and fatigue testing of materials.

Achieving the design of the full scale target for EURISOL will require several partial tests: sub-components, irradiation at lower power, instrumentation tests… For example, some target concepts could be tested with laser heating to assess the thermal behaviour, before testing them with a real irradiation. The objective of this task is at first to identify the necessary test facilities that are required to address several technological issues of the final multi-MW target, and secondly to perform a design study of the final target complex irradiation facility at high power. These issues will be addressed in the two following subtasks:

Task 10.1.1 : Identification of the necessary test facilities
Task 10.1.2 : Design study of the high power irradiation test facility, as defined in the previous task

Task 10.2: **Designing a test cryostat for fully equipped SC low beta SC cavity tests**

The EURISOL accelerators (driver and post-accelerator) are based on the superconducting technology. Several types of superconducting cavities are foreseen, covering a wide range of particle velocities. While the classical elliptical cavities are used in the driver for the high-energy end, the low and intermediate energy of the driver, as well as all the post-accelerator structures are composed of low beta SC cavities of different shapes. Other accelerators, such as ESS, HIE-ISOLDE and ADS, are also based on low beta SC cavities. Contrary to elliptical cavities, operating experience on these accelerating structures is today much more limited, even non-existing for some of them, for example, the promising single or multi-gap spoke cavities. It is therefore essential to test them in an accelerator-like configuration to validate definitively the final design for beam acceleration. To perform these tests, a specific test cryostat is required, capable of hosting these cavities, fully equipped with their ancillary systems (power coupler, cold tuning system). This equipment will be complementary to the few others that are available in Europe and dedicated for the test of elliptical cavities. Three subtasks are foreseen to realise the design of such test infrastructure.

Task 10.2.1: Identification of the user requirements for the cavities and all their ancillary systems: geometric constraints, mode of operation.
Task 10.2.2: Design of the vacuum vessel including a magnetic shielding and the thermal shields, design of the cavity supporting system.
Task 10.2.3: Design of the cryogenic cold box to supply the vacuum vessel with the different cryogenic fluids.

Summary of task and sub-task breakdown

Task	Short Name	Description
10.1	**M-MWIF**	**Multi MW Irradiation Facility** for complex target testing
10.1.1	DSIF	Definition and Specification of the Irradiation test Facility
10.1.1.1	*IIF*	*Identification of the Irradiation test Facility*
10.1.1.2	*SIF*	*Specifications of the Irradiation test Facility*

10.1.2	DSIF	Design Study of the high power Irradiation test Facility
10.1.2.1	*PDIF*	*Preliminary Design study of the high power Irradiation test Facility*
10.1.2.2	*TDIF*	*Technical Design report on the high power Irradiation test Facility*
10.2	**DCTC**	**Design** of a fully equipped low beta **Cavities Test Cryostat**
10.2.1	DSTC	Definition and Specification of the low beta SC Test Cryostat
10.2.1.1	*IUR*	*Identification of the User Requirements*
10.2.1.2	*STC*	*Specifications of the low beta Test Cryostat*
10.2.2	DTSCS	Design of the vacuum Tank, Shielding, and Cavity supporting System
10.2.2.1	*PDTSCS*	*Preliminary Design study Tank, Shielding, and Cavity supporting System*
10.2.2.2	*ADTSCS*	*Advanced Design study Tank, Shielding, and Cavity supporting System*
10.2.3	DCCB	Design of the associated Cryogenic Cold Box
10.2.3.1	*PDCCB*	*Preliminary Design study of the Cryogenic Cold Box*
10.2.3.2	*ADCCB*	*Advanced Design study of the Cryogenic Cold Box*

Deliverables				
Num	Nat[40]	Short name	Description	month
D10.1	R	TDIF	Technical Design Report of the Multi-MW test Irradiation Facility	**36**
D10.2	R	TDCC	Technical Design Report on the SC Cavity test Cryostat	**36**

Milestones				
Num	Nat[40]	Short name	Description	Month
M10.1	R	DSIF	Report on the Definition and Specifications of the Irradiation test Facilities	**12**
M10.2	R	PDIF	Preliminary Design report of the high power Irradiation test Facility	**16**
M10.3	R	URCS	Report on the User Requirements and setting up of the test Cryostat Specifications	**13**
M10.4	R	PDCC	Report on the Preliminary Design study of the low beta SC Cavity test Cryostat	**18**

[40] R for Report, P for prototype, D = Demonstrator, O = Other

1.3.4.2 Work package not supported by the EC under this proposal

WP11: International Muon Ionisation Cooling Experiment

The international Muon Ionisation Cooling Experiment (MICE) collaboration of roughly 140 physicists and engineers from Europe, Japan, and the US has been formed to design, build, commission, and operate a single lattice cell of the Neutrino Factory ionisation cooling channel. The performance of the MICE cooling channel will be measured in a series of operating modes and over a range of initial muon-beam emittances and momenta. The results will be used to validate the simulation of the cooling channel as part of the optimisation of the performance of the Neutrino Factory facility in preparation of the Reference Design Report for the facility.

MICE is a single particle experiment in which the phase-space parameters of each muon are measured in a spectrometer upstream of the cooling channel and again in a second spectrometer downstream of the cooling channel. MICE will be built up in a series of 'Steps' (see figure 1). Step I, which is being carried out at the moment, will perform a detailed characterization of the ICTF muon beam to establish that it can deliver the range of emittance and momentum required by the experiment. Step I includes a time-of-flight system, two Cherenkov detectors, and a lead-scintillator pre-shower calorimeter. The muon spectrometer system will be implemented in Steps II and III and the first liquid-hydrogen absorber and focus-coil (AFC) system will be implemented in Step IV. Step V will add a first section of linac and a second AFC module. The final configuration of the experiment will be reached at Step VI with the inclusion of the second section of linac and the third AFC module.

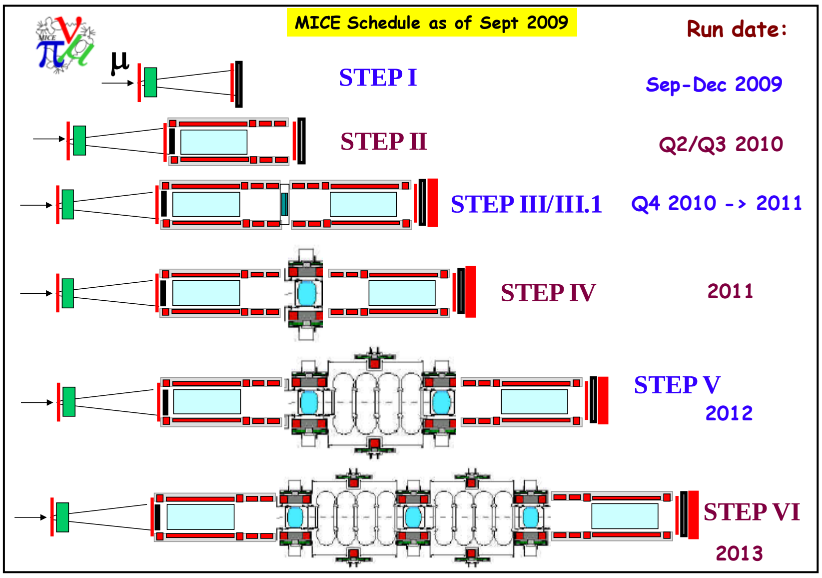


Figure 1: Stepwise build up of the MICE experiment. The schedule on which the various 'Steps' described in the text will be carried out is summarised in the figure.

By the time the proposed TIARA-PP comes to a conclusion, it is expected that the MICE experiment will be implemented as far as Step V. It will be possible to demonstrate the ionisation cooling of the muon beam with the Step V configuration. For the ionisation cooling technique to be applied in the multi-cell cooling channel of the Neutrino Factory, it is essential to introduce a field flip at the mid-point of the lattice cell. For this reason, the MICE collaboration has proposed and has approval to implement the full lattice cell at Step VI.

Step VI of MICE will therefore be the first ionisation-cooling experiment to be carried out in the Ionisation Cooling Test Facility that will be a unique part of the TIARA distributed infrastructure for accelerator R&D in Europe.

The distribution of responsibility within the MICE collaboration for the provision of the various components of the experiment is summarised in table WP11.1. While the variety of different accounting paradigms in use across the collaboration makes it somewhat difficult to evaluate the total value of the experiment, fully-loading the capital costs yields an estimate of the value of the experiment of ~€40M. Funding for all of the components of the experiment is either in place, or is in the plans of the national funding agencies that support the collaboration. The implementation of the components of the spectrometer systems or the cooling channel does not depend on the resources requested by TIARA-PP for WP8.

Table WP11.1: Summary of the distribution of responsibilities within the MICE collaboration.

Component	**Responsibility**
MICE instrumentation	
Particle identification system	
Time-of-flight system	Italy
Cherenkovs a and b	US
Lead-scintillator ('KLOE-light') pre-shower detector	Italy
Electron/muon ranger	Italy, Switzerland, US
DAQ and controls	Switzerland, UK, US
Muon spectrometers	
Spectrometer solenoids	US
Scintillating-fibre tracker	Japan, Netherlands, UK, US
MICE cooling channel	
Absorber/focus-coil modules	
Focus-coil modules	UK
Liquid-hydrogen absorbers	Japan, US
Linac sections (RFCC modules)	
201 MHz cavity systems	US
Coupling coils	US

1.3.5 Staff Effort

Table 1.3 e: Summary of staff effort

Participant no./short name	WP1	WP2	WP3	WP4	WP5	WP6	WP7	WP8	WP9	WP10	Total person-month
1/CEA	90	20	6	6	5	4	0	0	0	0	**131**
2/CERN	0	12	23	12	10	17	17	16	0	18	**125**
3/CNRS	0	8	6	6	10	17	0	0	0	34	**81**
4/CIEMAT	0	8	6	6	10	4	0	0	0	0	**34**
5/DESY	0	12	6	6	0	18	0	0	0	0	**42**
6/GSI	0	8	6	12	5	4	0	0	0	0	**35**
7/INFN	0	12	6	18	5	5	12	0	67	0	**125**
8/PSI	0	8	13	6	5	4	36	0	28	0	**100**
9/STFC	0	12	6	6	20	4	0	38	0	0	**86**
10/UU	0	8	6	6	5	4	14	0	0	8	**51**
11/IFJ	0	8	6	6	5	4	0	0	0	0	**29**
Total	**90**	**116**	**90**	**90**	**80**	**85**	**79**	**54**	**95**	**60**	**839**

2. Implementation

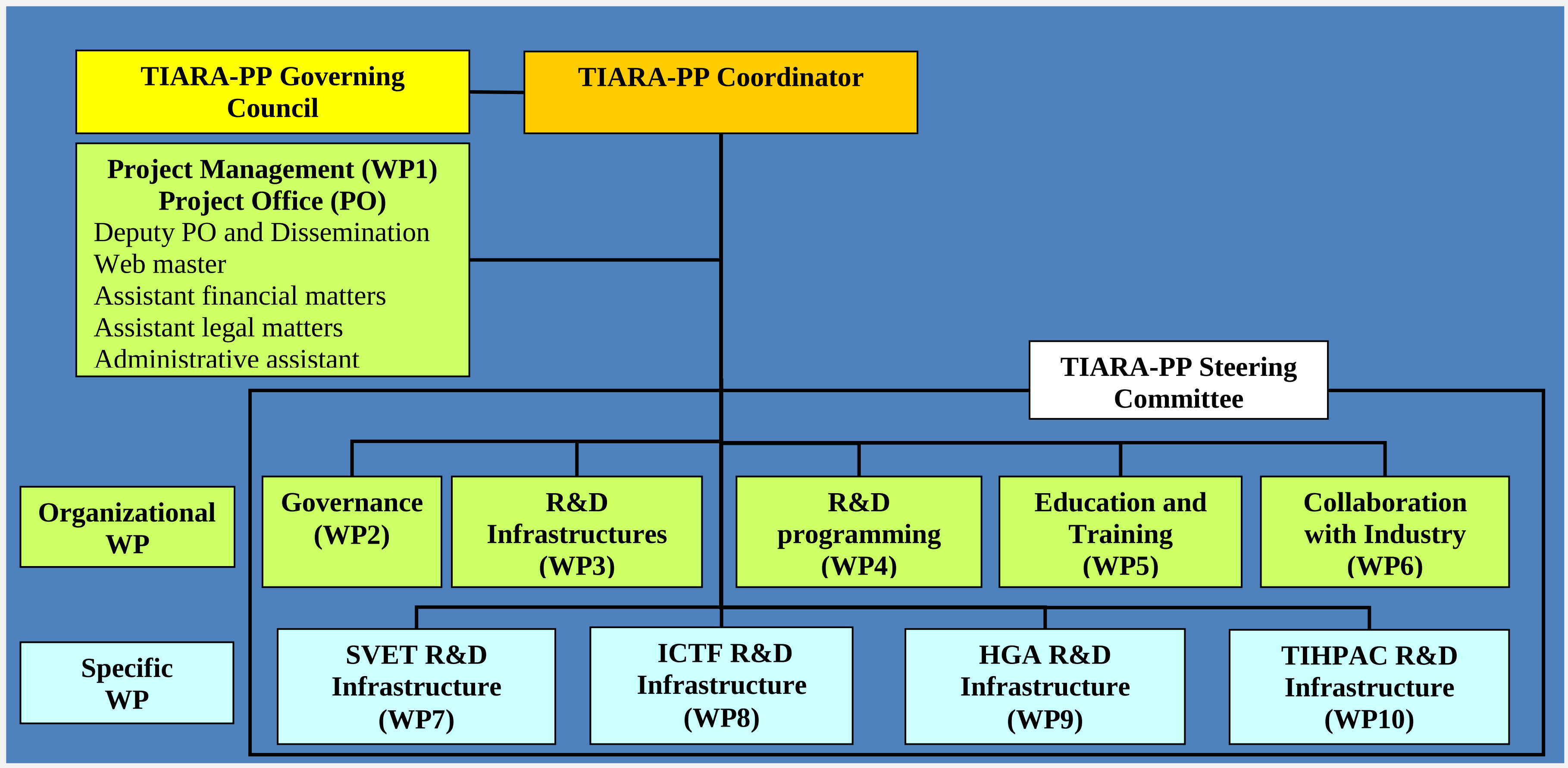
2.1 Management structure and procedures

The preparatory phase of the TIARA Consortium is carried out by the beneficiaries of the TIARA-PP project and involves the funding agencies responsible for the national member infrastructures. The TIARA-PP project is coordinated by CEA.

2.1.1 The Management of TIARA-PP

The TIARA consortium is composed of 11 legal entities (public research entities operating research infrastructures and universities) representing several thousand scientific staff. The management structure of the consortium will, at the same time, ensure a wide participation and consultation with this large scientific community, as well as an efficient decision-making process.

The management organizational structure is summarized in the attached diagram.


TIARA-PP Governing Council
TIARA-PP Coordinator
Project Management (WP1)
Project Office (PO)
Deputy PO and Dissemination
Web master
Assistant financial matters
Assistant legal matters
Administrative assistant
TIARA-PP Steering Committee
Organizational WP
Governance (WP2)
R&D Infrastructures (WP3)
R&D programming (WP4)
Education and Training (WP5)
Collaboration with Industry (WP6)
Specific WP
SVET R&D Infrastructure (WP7)
ICTF R&D Infrastructure (WP8)
HGA R&D Infrastructure (WP9)
TIHPAC R&D Infrastructure (WP10)

Its key bodies include the ***Governing Council***, the coordinator assisted by the management team, constituting the ***Project Office***, and the ***Steering Committee***. They are detailed below.

- The **TIARA-PP Governing Council (TGC)** is the arbitration and strategic decision-making body. Its membership is composed of one representative per Participant (i.e. 11 members), which are in general funding agency representatives. The chair of TGC will be elected from amongst its members. For Participants that are not funding agencies, the respective funding agency representatives will be invited as will the representative of the European Commission. Meetings will take place on the occasion of the general consortium meetings and specifically, as needed. The Governing Council is competent to take decisions: upon Steering Committee proposals, political and strategic orientation of the Project, significant modification of the work to be done (i.e. decision to add or abandon an activity), approval of the Consortium budget and of the financial allocation of the European funds, rescheduling of an activity, and exclusion of a defaulting participant.
- The **TIARA-PP Coordinator (TC)** is Dr Roy Aleksan from the Commissariat à l'Energie Atomique (CEA) working in the DSM/IRFU Institute. He will be responsible for the overall management of the TIARA-PP Project and for its day-to-day operation, both for scientific aspects and for administrative, financial and legal management. He will also be the intermediary between the Consortium and the European Commission and will ensure fulfilments of its duties in accordance with the EC Contract. The Coordinator chairs the Steering Committee.
- The **TIARA-PP Project Office (TPO),** also identified as Work Package 1 (WP1), will assist the TIARA-PP Coordinator. It includes:
  - A project office deputy, also responsible for Dissemination and Outreach
  - Administrative assistant
  - Assistant for legal matters from the CEA Legal Department
  - Assistant for financial matters, from the accounting office of CEA/IRFU
  - A web master, expert in web engineering
- The **TIARA-PP Steering Committee (TSC)** is composed of 11 members: the Coordinator, who will chair the meetings, the TPO deputy Coordinator, and the WP leaders. The Steering Committee is the central coordination body of the Consortium responsible for monitoring and directing the progress of the work packages against the overall goals of TIARA-PP. It is, in particular, in charge of ensuring the coordination of transverse activities for the whole Project. It meets at least three times a year. It oversees and reviews the work progress and decides on overall organizational and technical matters, submits proposals to the Governing Council, prepares the Consortium budget and the allocation of funding to be submitted to the Governing Council, consolidates the reports received from the Work Packages and prepares the reports and deliverables to be submitted to the Governing Council for approval, and then makes them available to the European Commission. The Steering Committee has also an arbitration role in case of a deadlock situation within a single, or between, Work Package(s).
- **The Work Packages and their Management**

The TIARA-PP Project includes **10 Work Packages (WP)**
  - The Project Office WP1
  - 5 general Work Packages
  - 4 specific Work Packages

A Work Package Leader who is assisted by one or several deputy(ies) leads each Work Package. The Work Package Leader manages and coordinates the work within the WP on a day-to-day basis. Each Work Package is structured by tasks, subdivided, if appropriate, into well defined subtasks under the supervision of a task leader.

- **WP Steering Committee (WPSC)**
  Following the same model as the TIARA Steering Committee (see above), each WP will create its own **WP Steering Committee** composed of the WP Coordinator, his/her deputy and the task leaders. Each WP Steering Committee will meet at least three times a year to review and manage the activities conducted within the WP. In case of a deadlock situation, it will refer to the TIARA-PP Steering Committee for arbitration.

- **TIARA General Meetings (TGM)**
  These meetings are essential events for the management of the TIARA-PP project and will serve to:
  - Review all TIARA-PP matters
  - Enhance the exchange of information
  - Disseminate the achievements of TIARA amongst the participants and also to the international community at large by organizing associated Town Meetings.

  The TIARA General Meetings will be organized in the large infrastructure laboratories and at least 2 such meetings are scheduled, one at the mid-term and one for concluding TIARA-PP activities. In addition, the participants plan to hold a **kick-off meeting**, during the first 2 months of the project.
  Furthermore, Town Meetings will be organized to inform and consult the scientific communities at large about issues related to the work within TIARA-PP. These meetings, as appropriate, will be linked to the TIARA general meetings.

2.1.2 Communication and Dissemination

Particular attention will be devoted to communication within the TIARA-PP Consortium and to the dissemination of the project results and knowledge acquired in the TIARA-PP activities. During the preparatory phase it will be handled by the TIARA-PP Project Office (TPO) as task WP1.2. It is worthwhile noting that, as part of the overall strategy, the results of most of the project tasks are deliverables, i.e. they are delivered to the project management as written reports or in another suitable form. This ensures that most project results can be managed centrally and made available to the TIARA-PP Consortium through the project websites or relevant databases.

Overall, the plan for communication and dissemination, which will be implemented, is articulated around 5 main axes

1. <u>Written TIARA documentations</u>
2. <u>Web sites</u>
3. <u>Creation and maintenance of specific databases</u>
4. <u>Promotion of the TIARA-PP results at conferences/workshops through talks and/or contributed papers</u>
5. <u>Identification of Spin-offs and development of Outreach Activities</u>

Although one of the first tasks of the TPO will be to define the detail of the implementation plan for communication and dissemination, it is expected that it will include the following goals and means:

1. Ensure <u>the quality and distribution</u> of the TIARA-PP documentation, including publications in scientific reviews, TIARA-notes and reports as well as oral and written contributions to conferences, workshops, TIARA-PP general meetings … To this end, the TPO will be in charge of:
   - Drafting the <u>publication policy</u> which will be discussed in the TIARA–PP Steering Committee and submitted for approval to the Governing Council

- Providing overall material for presenting the TIARA project to the scientific communities and policy makers, as well as to the public at large

2. Develop Web based tools: A central public-access Web Site has already been created (http://www.eu-tiara.eu) and has been used intensively in preparing the TIARA-PP proposal. It already includes a lot of information relating to the TIARA-PP activities. An internal centralized archiving Web-based mailing system will be set up, allowing one to subscribe to the different TIARA-PP activities and thus be up to date on all developments in TIARA-PP. Besides facilitating an archived dialogue between TIARA-PP members, this site will also include overall information and specific indicators, such as
   - Internal information relating to the day-to-day progress of the project
   - Indicators of the impact of the TIARA-PP activities, such as the number of publications/preprints/reports and their citations in other publications, presentations at conferences, numbers of accesses to the TIARA web site… as well as the status of the achievement of deliverables and milestones
3. Provide centralized repositories, directories and databases accessible through the internet such as
   - Database of electronic addresses of the TIARA members
   - Repository of TIARA-PP publications, notes, conference papers and reports as well as the overall TIARA material for public or scientific presentations.
   - Specific scientific and technical databases
4. Promote actively talks and contributions at conferences and workshops, including the presentation of TIARA-PP activities at a higher level (ECFA, ICFA, EPS, NuPECC…). Exchange of knowledge within the Consortium will also be supported by work package 5 via preparation of the groundwork for exchange of staff and joint training activities
5. Identify possible spin-offs from the intellectual and technical developments and set up a team for developing outreach activities. Work package 6 is specifically in charge of developing the collaboration with, and knowledge transfer to, industry.

2.2 Individual participants

The TIARA-PP consortium includes 11 beneficiaries, the description of which is given below. Letters of support from these organisations or their funding agencies or Ministry are shown in appendix 1. In addition, numbers of other laboratories, universities and industrial companies are interested in TIARA. An initial list of these is shown in appendix 2. This list is called to grow until the contract with the EC is signed.

Beneficiary 1: CEA – Commissariat à l'Energie Atomique

Organization Description: The CEA is one of the Europe's largest multidisciplinary organizations, covering a wide range of fundamental and applied research activities. Created in 1945, it supports more than 15000 researchers, engineers, technicians and administrative staff as well as about 340 postdocs and 1200 PhD students, dispatched over its 9 research centres. At the CEA, many scientific sectors develop or use particle accelerators. Without being exhaustive, it includes in particular particle and nuclear physics, condensed matter, biology, nuclear fusion and energy production. The CEA is renowned for designing, constructing and operating large accelerator systems and R&D infrastructures. The accelerator R&D is carried out within the CEA-IRFU (Institut de Recherche sur les lois Fondamentales de l'Univers).

Field of excellence: Research in High Energy and Nuclear Physics; Design, Development, Construction and operation of Particle Accelerator (Beam dynamics, intense proton beam Acceleration, Superconducting RF Technologies, High Magnetic Field technologies), Computing, remote operation systems…

Specific Responsibilities: ***General Coordinator, Work Package Leader for WP1 and WP2***
Other specific participations in: **WP3, WP4, WP5, WP6**

Beneficiary 2: CERN – European Organization for Nuclear Research

Organization Description**:** CERN was founded in 1954 as one of Europe's first joint ventures, bringing specialists from 12 Member States together to pursue a common dream. Established on the Franco-Swiss border near Geneva, it has become a shining example of successful international scientific collaboration. Today, CERN has 20 Member States from Europe, and additional nations from around the globe also contribute to and participate in its research programme. CERN is now a European laboratory for the world.

CERN's business is fundamental physics, finding out what the Universe is made of and how it works. The instruments used at CERN are particle accelerators and detectors. Accelerators boost beams of particles to high energies before they are made to collide with each other or with stationary targets. Detectors observe and record the results of these collisions. By studying what happens when particles collide, physicists learn about the laws underlying the evolution of the Universe.

CERN's flagship is the Large Hadron Collider (LHC), the particle accelerator that will provide the highest particle energies ever achieved in the laboratory. The energy density generated in its 14 TeV proton-proton collisions will be similar to that existing a few instants after the Big Bang. Recreating such conditions is a tremendous way to look back to the birth of the Universe; it provides the only way to do experiments to find answers to very fundamental questions concerning, for example, the origin of mass, the nature of dark matter, and the balance of matter and antimatter in the Universe.

Field of excellence: Research in High Energy and Nuclear Physics; Development, Construction and operation of large scale Particle Accelerator producing electron, proton, ion, muon, neutrino beams; all technologies for particle beam production and acceleration, such as Beam dynamics, ECR ions sources, intense proton beam Acceleration, high power and/or radioactive targets, warm and Superconducting RF Technologies, High Magnetic Field technologies, Computing, remote operation systems…

Specific Responsibilities: ***Work Package Leader of WP3 and WP7***
Other specific participations in: **WP2, WP4, WP5, WP6, WP7, WP8, WP10**

Beneficiary 3: CNRS – Centre National de la Recherche Scientifique

Organization Description: The Centre National de la Recherche Scientifique (National Centre for Scientific Research) is a government-funded research organisation, under the administrative authority of France's Ministry of Research. CNRS's annual budget represents a quarter of French public spending on civilian research. As the largest fundamental research organization in Europe, CNRS carried out research in all fields of knowledge, through its seven research institutes: Mathematics (INSMI), Physics (INP), Chemistry (INC), Life Sciences (INSB), Humanities and Social Sciences (INSHS), Environmental Sciences and Sustainable Development (INEE), Information and Engineering Sciences and Technologies (INST2I) and its two national institutes: the National Institute of Earth Sciences and Astronomy (INSU) and the National Institute of Nuclear and Particle Physics (IN2P3).

Its own laboratories as well as those it maintains jointly with universities, other research organizations, or industry are located throughout France, but also overseas with international joint laboratories located in several countries. Measured by the amount of human and material resources it commits to scientific research or by the great range of disciplines in which its scientists carry on their work, the CNRS is clearly the hub of research activity in France. It is also an important breeding ground for scientific and technological innovation.

The IN2P3 is the National Institute of Nuclear Physics and Particle Physics of the CNRS. IN2P3 devotes itself to research in the physics of the infinitely small, from the atomic nucleus down to the elementary particles, and of the physics of the infinitely large, to study the composition and evolution of the Universe. The objectives are to determine matter's most elementary constituents and understand their interactions, and to understand the structure and properties of nuclei. It participates to the four big experiments, which are going to take place at the LHC of the CERN (Atlas, CMS, Alice and LHCb). In the field of data processing, IN2P3 is one of the leaders of the French Grid effort and is deeply involved in the European Computation grid projects aimed at optimum use of powerful, distributed computing facilities. IN2P3 leads a programme of application of nuclear methods in medical imaging and environmental sciences. On behalf of CNRS, it pilots the interdisciplinary programme PACEN on future fission nuclear energy and its backend.

The IN2P3 has been very active in R&D on accelerators, and disposes of several important installations with superconducting cavities (mainly at IPNO and LAL).

Field of excellence: High Energy and Nuclear Physics Accelerators and Experiments, Design, Construction and operation of Particle Accelerators and electron/positron sources and injectors, Superconducting accelerator technologies (cavities, couplers), neutrino horns, computing. Lasers and Plasmas for new techniques of acceleration…

Specific Responsibilities: ***Work Package Leader of WP10***
Other specific participations in: ***WP2, WP3, WP4, WP5, WP6***

Beneficiary 4: CIEMAT – Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas

Organization Description: CIEMAT is a Spanish Public Research Institution dependent on the Ministry of Science and Innovation. From its creation in 1951 it has developed and led R&D projects in the fields of Energy, Environment and Technology, placing the institution in the international vanguard of science and technology and having a close relation with other research groups with similar objectives. As a technological research centre, it is the link between basic research, mainly performed in the academic world, and the national industry. The main activities are related to: basic strategic research aimed at generating knowledge; strategic technological research aimed at generating new technologies; technological development aimed at developing and transferring technology; testing, mainly of a commercial type; and training aimed at improving the professional qualification of the research teams. Concerning accelerators research, CIEMAT has a scientific group of 30 people with a long experience in the field of superconductivity and other technologies, which is collaborating in various European projects like XFEL, FAIR, CLIC, IFMIF, etc. The scientific and technical team at CIEMAT is composed of approximately 1,650 people, of whom 47 % have a University degree.

Field of excellence: High Energy and Nuclear Physics , Fusion and Plasma Physics, superconducting technologies, High Magnetic Field Technologies, High Power Radio-Frequency Systems, Computing

Specific participations in: ***WP2, WP3, WP4, WP5, WP6***

Beneficiary 5: DESY – Deutsches Elektronen-Synchrotron

Organization Description: Founded in 1959, DESY is one of the worldwide leading accelerator centres for research in the area of structure of matter. DESY develops, builds and operates accelerators and detectors for the research with photons and for particle physics. DESY includes a total number of ~1,900 staff personnel, of which 34% are scientific, 29% technicians/engineers and 37% other. DESY is financed by public funds and is a member of the Helmholtz Association.

The present portfolio of accelerators in operation at DESY comprises the SR storage rings DORIS-III and PETRA-III and the soft X-ray free electron laser facility FLASH. DESY is also strongly involved in the European XFEL facility which is under construction at and near the DESY site. Both FLASH and the XFEL utilise the superconducting RF technology which was developed by the international TESLA collaboration, coordinated by DESY. DESY participates in the global design effort towards a linear collider based on this superconducting technology. The accelerator R&D programme at DESY is focused mainly on: further development of superconducting RF technology, high-brilliance electron beam sources, beam dynamics and diagnostics for ultra-short electron bunches in femtosecond regime. DESY operates numbers of R&D infrastructures such as clean rooms and surface treatment facilities for superconducting cavities, assembly of superconducting accelerator modules, test stands for cavities and modules, an RF gun injector test stand and the FLASH linac, which is used a fraction of its beam time for R&D.

Field of excellence: Development, construction and operation of Particle Accelerators (linear accelerators, synchrotrons and storage rings for electrons, positrons and protons) for High Energy Physics and Synchrotron radiation sources, Superconducting Cavities, Superconducting Magnets, R&D on Linear Colliders and Free Electron Lasers, Accelerator Controls, Computing, Networking and Video Communication Tools for remote accelerator operations

Specific Responsibilities: ***Work package Leader of WP6***
Other specific participations in: ***WP2, WP3, WP4***

Beneficiary 6: GSI – Helmholtzzentrum für Schwerionenforschung GmbH

<u>Organization Description</u>: The GSI Helmholtz Centre for Heavy-Ion Research (GSI GmbH), founded in 1969 and located at Darmstadt, Germany, operates a large, in many aspects worldwide unique accelerator facility for heavy-ion beams up to energies of 2 GeV per nucleon. GSI has about 1000 employees and about 1000 researchers per year from around the world use the facility for experiments that help point the way to new and fascinating discoveries in basic research. In addition, the scientists use their findings to continually develop new and impressive applications. The research program at GSI covers a broad range of activities extending from nuclear and atomic physics to plasma and materials research to biophysics and cancer therapy. Probably the best-known results are the discovery of six new chemical elements and the development of a new type of tumour therapy using heavy ion beams.

GSI operates a unique heavy-ion accelerator system consisting of the universal linear accelerator UNILAC, the heavy ion synchrotron SIS, and the experimental storage ring ESR. At this accelerator facility, it is possible not only to prepare ion beams of all the elements, up to and including uranium, in any state of electric charge, but also to accelerate these beams to nearly the speed of light. GSI especially provides ion beams with high intensity, and excellent beam quality beams using beam cooling techniques. A further special topic is the time-sharing operation mode of the facility that simultaneously provides different ion beams with different energies to typically 3-4 experiments. Concerning accelerator R&D projects GSI is, among other things and together with competent partners, active in the following fields: development of fast-ramped superconducting magnets, high-current beam diagnostic devices, RF synchronisation, linac developments, beam cooling, minimisation of beam losses, etc. The necessary infrastructure is partly located at GSI, and partly at external partners (mainly universities and other research institutions, but also companies). It consists of mechanical workshops, test facilities and laboratories, including the necessary capacities for engineering and design.

<u>Field of excellence</u>: Nuclear, atomic, plasma, and applied physics experiments with heavy ion beams, dynamics of high current beam transport and acceleration, development, design, construction and operation of heavy ion sources, linear and circular accelerators, storage rings, stochastic and electron cooling of stored beams, remote accelerator controls, computing.

<u>Specific participations in:</u> **WP2, WP3, WP4, WP5, WP6**

Beneficiary 7: INFN – Istituto Nazionale di Fisica Nucleare

<u>Organization Description</u>: INFN (Istituto Nazionale di Fisica Nucleare) is an Italian Public Research Institution dependent on the Ministry of University, Education and Research. Since its creation in 1951 INFN acts as a large multidisciplinary Organization, with main focus on fundamental research on Nuclear, Particle and Astroparticle Physics but also with interests in Applied Research activities. INFN coordinates the Italian contribution to CERN activities and in other HEP laboratories around the world and operates four large National Laboratories: an Underground Research Centre (LNGS under the Gran Sasso mountain) and three laboratories (LNF in Frascati, LNL in Legnaro and LNS in Catania) where well-established accelerator R&D on cutting-edge activities are carried out, like: beam dynamics, SCRF technologies, high magnetic field technologies, intense beam acceleration and beam monitoring. INFN activities are carried out by an internal staff of about 2000 people plus about 3000 University staff associated to INFN researches.

<u>Field of excellence</u>: High Energy and Nuclear Physics Accelerators and Experiments, Construction and operation of Particle Accelerators and Colliders including all related technologies, Accelerator Controls, Computing, Synchrotron Radiation Sources and Experiments.

<u>*Specific Responsibilities*</u>*:* ***Work Package Leader of WP4 and WP9***
<u>*Other Specific participations in*</u>*:* ***WP2, WP3, WP5, WP6, WP7***

Beneficiary 8: PSI – Paul Scherrer Institute

<u>Organization Description</u>: The Paul Scherrer Institute (PSI) is a multi-disciplinary research centre for the natural sciences and technology. PSI collaborates with academic institutions, other research institutions and industry in the areas of condensed matter research, materials sciences, particle physics, life sciences, energy research and environmental research.
PSI concentrates on basic and applied research, particularly in those fields that are at the leading edge of scientific knowledge, but also contributes to the training of the next generation and paves the way to sustainable development of society and the economy. The Institute is actively involved in the transfer of new discoveries to industry, and offers, as an international centre of competence, its services to external organisations.

PSI employs 1300 staff members, making it the largest of the Swiss national research institutions – and the only one of its kind within Switzerland. It develops, builds and operates complex large-scale particle accelerator based research facilities. These provide beams of photons, protons, neutrons and muons. Research and development of advanced accelerator based medical applications include routine proton radiation therapy of deep-seated tumours.

An X-Ray Free Electron Laser “SwissFEL”, which will produce fully coherent, intense, ultra-short X-ray pulses with wavelengths in the Angstrom range, will extend the park of PSI’s research facilities in the future.

PSI is one of the world’s leading user laboratories for the national and international scientific community.

<u>Field of excellence:</u> Design, development, construction and operation of high energy, high intensity electron and proton accelerators; production and transport of intense proton beams; high power targets for muons and spallation neutrons; generation and preservation of ultra-low emittance electron beams for synchrotron light sources and free electron lasers; simulation of space-charge dominated beam transport; charged particle optics; magnet design and measurement; diagnostics for charged particle beams; high power radio-frequency systems; fast digital electronic feed-back and control; large scale control systems for accelerator and photon beam-line operation; ultra-high vacuum techniques; precision alignment and measurement; state of the art laser systems.

<u>*Specific participations in*</u>*:* ***WP2, WP3, WP4, WP5, WP6, WP7, WP9, WP10***

Beneficiary 9: STFC – Science and Technology Facilities Council

<u>Organization Description</u>: The Science and Technology Facilities Council is one of Europe's largest multidisciplinary research organisations, supporting scientists and engineers world-wide. It operates world-class, large-scale research facilities, provides strategic advice to the government on their development, and manages international research projects in support of a broad cross-section of the UK research community. The council operates the Rutherford Appleton Laboratory and the Daresbury Laboratory in the UK, supports university researchers through grants, and is responsible for our subscriptions to CERN, ESO, ESA, ILL and ESRF. The Council has responsibility to ensure that the UK scientific community has access to the large facilities that will enable it to perform high quality, world leading research in the future. This includes carrying out R&D in support of future particle and nuclear physics accelerators, neutron sources and light sources.

<u>Field of excellence</u>: Long term expertise in the design, development, construction and operation of high energy, high intensity electron and proton accelerators; production and transport of intense proton beams; expertise with high power targets for muons and spallation neutrons; production of electron beams for synchrotron light sources and free electron lasers; experience with neutrino and muon physics and experiments; experience with education and training of students in accelerator science and technology in collaboration with university institutes.

Specific Responsibilities: ***Work Package Leader of WP5 and WP8***
Other Specific participations in: ***WP2, WP3, WP4, WP6***

Beneficiary 10: UU – Uppsala University

Organization Description: Uppsala University was founded in 1477 and is one of the largest universities in Scandinavia with about 6,000 employees and 40,000 students. Its Faculty for Science and Technology comprises departments for Physics, Chemistry, Biology, Geoscience, Mathematics and Technology. A 180 MeV synchro-cyclotron was designed and built at the University in the 1950s and upgraded in the 1980s with the 1.4 GeV proton storage ring CELSIUS. The High Energy Physics department has been using the CERN accelerators in Geneva for particle physics experiments continuously since the 1960s, the Nuclear Physics department, which previously used the local accelerators, is presently using the COSY accelerator in Jülich and the Material Physics department is using several synchrotron light sources in the world, including MAXLAB in Lund. Accelerator development has been pursued at Uppsala University since the 1950's. Recently the Faculty has created a Centre for Accelerator and Instrumentation Development (CAI) to further stimulate and support this activity. Currently, the University is participating in the technical development programs for CLIC at CERN and XFEL at DESY and is preparing plans for participation in the technical development of the superconducting linear proton accelerator for ESS in Sweden. The University of Uppsala will coordinate the active participation of several partners from the Nordic countries (Denmark, Finland, Norway and Sweden).

Field of excellence: Experimental and theoretical research in nuclear and particle physics, including grid-computing and accelerator physics, related to the construction, operation and diagnostic of charged particle beams for high-energy and synchrotron radiation research. In particular, the University has built the Two-beam test-stand for CTF3 to test the two-beam acceleration scheme and radio-frequency components foreseen for CLIC as well as an optical replica synthesizer, a device to diagnose ultra-short electron bunches in FLASH at DESY.

Specific participations in: ***WP2, WP3, WP4, WP5, WP6, WP7, WP10***

Beneficiary 11: IFJ PAN – Instytut Fisyki Jadrowej Polskiej Akademii Nauk

Organization Description: Established in 1955, the Henryk Niewodniczanski Institute of Nuclear Physics Polish Academy of Sciences (http://www.ifj.edu.pl/?lang=en) at Krakow employs about 300 researchers, mainly working on high energy and elementary particle physics, physics of the structure of the nucleus and of nuclear reaction mechanisms, studies of the structure, interactions and properties of condensed matter, as well as on applications of nuclear methods in geophysics, radio-chemistry, medicine, biology, environmental physics and material engineering. About 250 to 300 scientific papers are published annually in world-class scientific journals. Each year the Institute organizes international schools and conferences. The Institute closely cooperates with other scientific institutions in Poland and abroad.

The Institute is an active member of many international HEP collaborations, including the experiments ALICE, ATLAS and LHCb experiments at LHC, BELLE at KEK, neutrino and dark matter experiments ICARUS, T2K and WARP and the cosmic ray Pierre Auger project. Similarly, IFJ PAN nuclear physics groups have substantial contribution to running or prepared large experiments using stable and radioactive ion beams (AGATA, RISING,HECTOR-PARIDE, PARIS). An on-site proton cyclotron, designed and built at the IFJ PAN, has recently been upgraded to 60 MeV. Funds for a new, about 200 MeV cyclotron have been granted and installation is expected by 2011. Long term activity of experimental physics groups attracted teams of high quality specialists: particularly in electronics, mechanics and cooling; they are welcome members of collaborations designing or upgrading their installations.

IFJ-PAN will coordinate the active participation of several other partners from Poland.

Field of excellence: Over fifty years of expertise in nuclear and high energy particle physics and experiments; design, construction and operation of components related to accelerator technologies (LHC, SuperB machines in KEK and INFN, XFEL)

Specific participations in: **WP2, WP3, WP4, WP5, WP6**

2.3 Consortium as a whole

The TIARA-PP Consortium consists of eleven beneficiaries, CEA (FR), CERN (INT), CNRS (FR), CIEMAT (SP), DESY (DE), GSI (DE), INFN (IT), PSI (CH), STFC (UK), Uppsala University (SE) and IFJ-PAN (PL). The consortium integrates renowned partners in accelerator science, not only due to their specific technological approaches and research environment, but also due to their experience in managing large accelerator based centres and large national and international consortia.

More specifically,

- All beneficiaries are either large national or international research centres or funding agencies and universities operating large research centres with long standing experience in constructing and operating accelerators and/or large accelerator R&D infrastructures with a total of more than ten thousand users per year.
- The overall domain of competence of the TIARA-PP consortium as a whole includes all fields of science requiring accelerator R&D.
- A vast majority of the large European accelerator R&D infrastructures are presently owned and operated by the beneficiaries of this proposal.
- All beneficiaries have contributed relevant Research and Development to accelerator science over the years.
- All beneficiaries participate extensively in international collaborative projects such as the FP6 and FP7 projects mentioned in table 1.3 in section 1.
- The beneficiaries also have long standing contacts with industry, including knowledge exchange in a large variety of relevant areas for the development of accelerators and auxiliary systems.
- All beneficiaries are participating actively in education and training in the field of accelerator science

In addition to the beneficiaries, many associated partners will participate or be consulted during this preparatory phase (see appendix 2).

Finally, after having unanimously supported the TIARA project and the submission of this proposal, the twenty European member states of the CERN Council will follow the work progress of TIARA-PP and will provide guidance, if needed. One can also note that the eight CERN Council observer states, including the European Commission and UNESCO will also be informed of progress.

In summary, the combined expertise and the resources of the consortium as a whole, as well as the management and reporting structures, which will be set up, are a safe and very strong basis for achieving the objectives of the TIARA-PP project, and establishing the appropriate structures, planning, constructing and operating the new distributed TIARA facility.

2.4 Resources to be committed

The table 2.4.1 below summarizes the person-months and the direct costs for the different types of TIARA-PP activities.

Table 2.4.1: Direct costs of the different types of activities.

Resources in p-m or €	MGT	COORD	SUPP	RTD	Total
Person-month	90	180	281	288	839
Personnel costs	489600	1252020	1916300	1953340	5611260
subcontract	0	0	0	30000	30000
Consumable/equipment	100000	42000	66000	788400	996400

Travel	**100000**	**363200**	**575200**	**134400**	**1172800**
Direct costs (€)	**689600**	**1657220**	**2557500**	**2906140**	**7810460**

The resources necessary for the Management, Coordination, Support and Research and Technical Development activities are detailed in the following:

The budget for the Project Management (WP1) includes all activities related to the coordination of the consortium and communication, dissemination and outreach (DC&O). In the current indicative budget breakdown, the costs include the personnel (36 person-months (p-m) for the coordinator (from CEA) and his deputy, and 54 p-m for administration, including webmaster, legal and financial assistance and secretariat). An estimated budget (200 k€) covers the costs for consumables and travel for the management team. It includes organization of the three general meetings, as well as Governing Council and Steering Committee meetings, consultant or external experts to be invited to the project meetings, publications and printing of documents and other needs for DC&O. Concerning the latter, it has been decided to include a strong plan, detailed in section 3, in WP1 for higher efficiency instead of creating a separate work package. About 40% of the budget of WP1 will be foreseen for DC&O. Audit certificates are covered in the indirect costs of the partners.

The non-technical work packages include Coordination and Support Activities (CSA). For ensuring the success of the integration of all accelerator R&D infrastructures and related activities distributed amongst all the beneficiaries of TIARA-PP, it is essential to involve all TIARA-PP participants in the corresponding Work Packages (WP2 to WP6). It should be noted that to enforce further the strong involvement of the participants, each work package leader is assisted, on average, by two deputies from different participating organizations.

The Coordination Activities are carried out within two Work Packages (WP3: Accelerator R&D infrastructures and WP4: Joint R&D programming). The resources for the sum of these two Work Packages include a total of 180 p-m, out of which 78 p-m are aimed at the coordination (i.e. WP leaders from CERN and INFN, respectively, and their deputies). The total estimated budget for travel is 363 k€, out of which 164 k€ are devoted to the WP leaders and deputies. The budget of the WP leaders also includes an estimated budget for inviting external experts or consultants (58 k€) and a budget for consumables mainly for the organization of WP meetings (42 k€). A cost summary for each coordination work package is given in a table in the next page.

The Support Activities are carried out within three Work Packages (WP2: Governance, WP5: Education and Training, and WP6: Industry Involvement in TIARA). The resources for the sum of these three Work Packages include a total of 281 p-m, out of which 170 p-m are shared amongst the leading participants (i.e. WP leaders from CEA, STFC and DESY, respectively, and their deputies). It should be noted that the budget for WP2 (Governance) is the largest of the three, with a direct cost of 1,030 k€. It is estimated that a third of this budget will be needed for legal and financial experts. The total estimated budget for travel for the three Support work packages is 575 k€, out of which 325 k€ are devoted to the WP leaders and deputies. The budget of the WP leaders also includes an estimated budget for inviting external experts or consultant (84 k€) and a budget for consumables mainly for the organization of WP meetings or consulting expenses (66 k€). A cost summary for each support work package is given in a table in the next page.

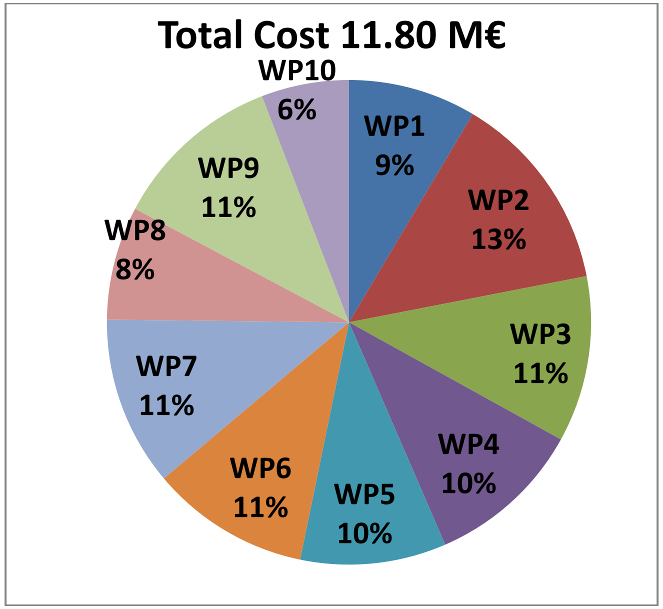
The RTD Activities are carried out within four Work Packages (WP7 to W10) led by CERN, STFC, INFN and CNRS respectively. Their aims is to improve and prepare some critically needed infrastructures that will enable specific R&D for future very large scale projects, such as CLIC, intense neutrino beam facilities, SuperB, EURISOL, ESS, ADS light sources... The preparatory work will maximize their impact and allow their optimal integration within TIARA. The total budget of these four technical work packages is dominated by the cost of personnel (about 70%), which includes 288 p-m. The travel costs are about 134 k€. In addition 788 k€ are necessary for consumables and equipment. The latter is a small part, which amounts to about 100 k€, essentially for the purchase of a power sub-station. In addition, a subcontract of about 30 k€ might be issued in WP9. A cost summary for each RTD work package is given in the table 2.4.2.

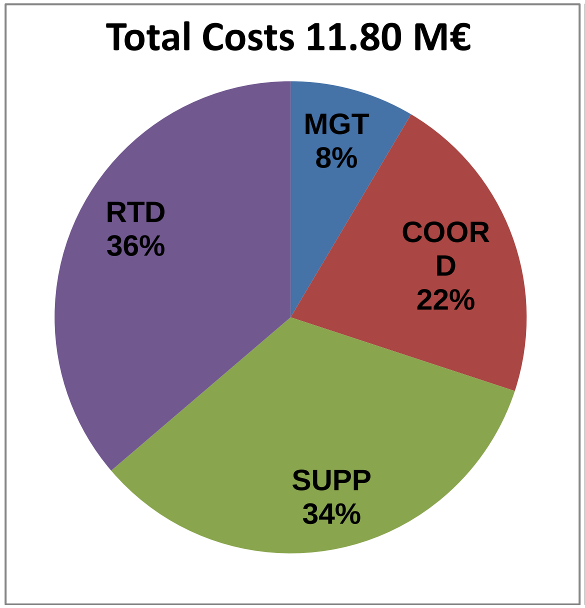
The submission of the TIARA Preparatory Phase proposal has been approved by the CERN Council, which includes the funding agencies of the TIARA-PP beneficiaries. The overall required resources for the TIARA Preparatory Phase is about 11,802 k€ and includes 839 person-months. A contribution of 6,000 k€ is requested from the EC while the matching funds of about 5,800 k€ will be secured from the annual research budgets of the beneficiaries. The funding of the work package 11, not directly supported by the EC in this proposal, is already agreed amongst the collaborators listed in Table 1.3 a2. The work in the different work packages does not require subcontracting, with the exception of WP9. A rather small subcontract of about 30 k€ might be issued by INFN since optimal specific expertise on RF compressor techniques, concerning the design of a SLED system consisting in two very low RF losses cylindrical cavities, coupled with a 90° hybrid junction, is available outside of the TIARA-PP consortium.

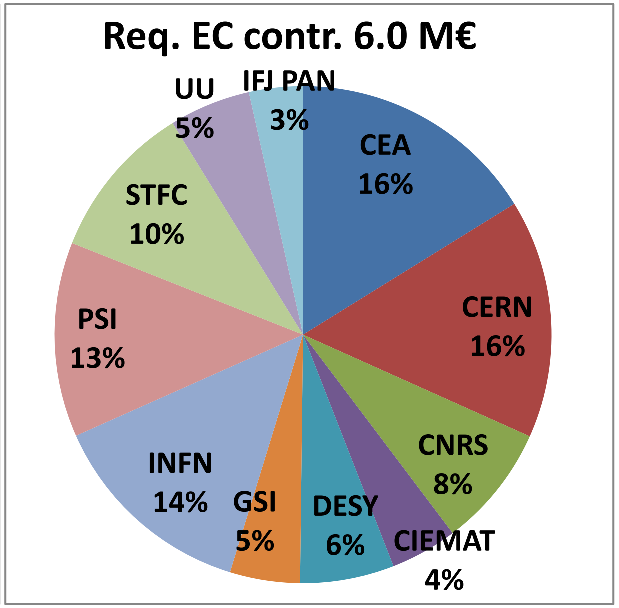
The TIARA distributed accelerator R&D facility is expected to operate with a long-term sustainability. This will require subsequent upgrades of the member infrastructures and the construction of new ones. The maintenance and operation costs of these infrastructures will be primarily covered by the annual research budgets of the beneficiaries. However active contribution to the whole accelerator R&D programme, which will be promoted by TIARA, is expected also from many other European partners from, and outside of, the EU, such as Russia. Further contributions from other countries such as USA, Canada, Japan, China, India and Israel are also expected.

The table 2.4.2 below summarizes the costs of the TIARA-PP work packages.

Work Packages	WP1	WP2	WP3	WP4	WP5	WP6	WP7	WP8	WP9	WP10	Totals
Activity type	MGT	SUPP	COORD	COORD	SUPP	SUPP	RTD	RTD	RTD	RTD	
Person-month	90	116	90	90	80	85	79	54	95	60	**839**
Subcontract (€)	489600	778160	652860	599160	540100	598040	596760	396260	569600	390720	**5611260**
Personnel costs (€)	0	0	0	0	0	0	0	0	30000	0	**30000**
Consumable (€)	100000	26000	12000	30000	10000	30000	370000	108400	310000	0	**996400**
Travel costs (€)	100000	225600	189600	173600	174400	175200	33600	36000	24000	40800	**1172800**
Indirect costs (€)	318240	551990	455250	432190	424430	449130	336540	355590	409840	258910	**3992110**
Total cost (€)	**1007840**	**1581750**	**1309710**	**1234950**	**1148930**	**1252370**	**1336900**	**896250**	**1343440**	**690430**	**11802570**
Requ. EC Contr.	**607580**	**953270**	**771640**	**753200**	**665950**	**730630**	**492870**	**271910**	**515890**	**237030**	**5999970**







3. Impact

3.1 Expected impacts

It is useful to recall here the expected impact related to the call topic INTRA-2010-2.2.11 proposed by the CERN Council, i.e. "It is vital to strengthen the advanced accelerator R&D programme in Europe, providing a strong technological basis for future projects in particle physics." The 20 member states of the CERN Council have unanimously supported the submission of the project TIARA-PP aiming at establishing a sustainable structure enabling the implementation and the development of a long-term accelerator R&D strategy and programme in Europe through the ***creation of a single distributed accelerator R&D facility,*** which will integrate the crucial large-scale national and international R&D infrastructures.

TIARA is a very ambitious and complex project, as it will

- Involve a large number of collaborators and parties (national and international laboratories, universities, industrial partners)
  - from many different scientific fields
  - from many different countries
- Involve numerous large infrastructures distributed all over Europe
- Involve significant human and financial resources
  - for the operation and upgrades of the existing infrastructures and the construction of new ones, (in addition to the large value of the existing infrastructures, which will be part of TIARA)
  - for the long term joint R&D programme
  - for the promotion of education and training

For such a large-scale project, the implementation phase needs a number of critical organizational, financial, coordination, technical, and legal issues to be resolved beforehand, all contributing towards the expected impacts. *The TIARA-PP project tackles all these critical issues directly and will thus directly contribute towards the expected impacts.*

3.1.2 Organizational, financial and legal issues

The agreement and implementation of the structures and methods covered by the non-technical work packages, together with the identification and implementation of the key R&D infrastructures and programme, will be the foundation of a functioning TIARA Consortium. By addressing the issues above, the TIARA-PP consortium will make sure that the distributed TIARA facility can be efficiently constructed and operated, and that all member infrastructures will be exploited with highest efficiency. It will also foresee how the required upgrades of the infrastructures or the construction of new ones will be dealt with by the consortium, both for ensuring that they fulfil the user needs and that they are well integrated in TIARA. It exploits the complementary features and expertise of the individual member infrastructures in order to maximize the benefits for both the member facilities and the users. The establishment of appropriate Memoranda of Agreement or Understanding, allowing the consortium to solve the issues step-by-step and, at the same time, monitor the progress toward the expected impacts will mark the phases needed to achieve the final objective.

3.1.2 Coordination issues

In order to construct a sustainable organization several important issues need to be addressed. They are 4-fold and include Joint Strategic programming, joint R&D programming, promotion of education and training and strengthening the collaboration with the industry sector.

- *Joint Strategic programming and joint R&D programming*

  The development of a European distributed R&D facility will be an essential tool for enabling a consistent accelerator R&D programme. An important impact of TIARA-PP will be the development of appropriate and recognized structures allowing the communities and policy makers to reach consensus on the strategic areas and the related joint R&D programme. The planning and organization of the work carried out in WP3 and WP4 will be important inputs to these expected impacts. WP2 will integrate these inputs and include these important aspects in the TIARA governance.

- *promotion of education and training*

  In order to establish a sustainable R&D facility and the structure for carrying out accelerator R&D, one needs to address the issues for education and training of accelerator scientists and engineers. Indeed, the lack of qualified human resources is identified as a critical issue, not only for the research sector but also for industry. A Work Package (WP5) will be dedicated to establishing the appropriate plan of action to remedy this situation, after setting up a large Europe-wide dynamic survey of the relevant education and training programmes available in parallel with a “market” study.

- *strengthening the collaboration with the industrial sector*

  The industrial sector is both the main provider of accelerator components and users of particle beams for industrial applications. It is important to note that the latter point contributes also to technological development capacity in the European Research Area and to European competitiveness in the global market. The consortium will define and implement the means to establish the appropriate liaison to the industrial sector and involve industrial partners in the accelerator R&D programme, as well as the development and sharing of the distributed TIARA facility. Setting up the appropriate mechanisms will result from a large consultation with the medical and industrial sector and will strengthen the global competitiveness of Europe.

The issues above are all directly addressed in the Work Packages 2 to 6.

3.1.3 Technical issues

One of the reasons for creating the distributed TIARA facility is to enable the European scientific community to develop world-leading accelerator facilities. Four such future facilities are envisaged: CLIC, the Neutrino Factory, SuperB and EURISOL. The preparation of the corresponding critical technologies necessitates specific R&D projects that already require dedicated R&D infrastructures. It is thus natural to use the opportunity of the Preparatory Phase to accelerate their realization or upgrade in a collaborative way, anticipating partly the implementation of TIARA’s objectives. This will be achieved in the technical work packages, WP7, WP8, WP9 and WP10. These WPs will be strongly connected to WP3 on R&D infrastructures, in which there is no technical work as already explained. A first immediate achievement of the expected impacts of TIARA will thus be visible during the 3 years of the Preparatory Phase. It is expected that some of the mentioned world-leading accelerator-facility projects mentioned will then be in a position to apply for a dedicated Preparatory Phase project. Indirectly, the user communities will also benefit from a strong consortium combining world-class technical expertise and the timely forefront technical developments it can realize. Finally, the experience gained in developing jointly R&D infrastructures will be extremely useful to identify and solve specific practical issues for establishing the structure of TIARA.

3.1.4 Attractiveness of the ERA, balanced regional development and EC added value

The individual infrastructures that will be part of TIARA are mostly embedded in large research centres, operating a variety of infrastructures, such as particle accelerators, for the benefit of large user communities. They are also located in the vicinity of universities, other research institutions and high tech SME's that can take immediate advantage of the spinoffs from the scientific and technological programmes. The TIARA infrastructures that are presently envisaged are widely spread in Europe, supported by, and conveniently accessible to, a large and diverse European research community, which exploits their complementarities. They are very often part of larger clusters of excellence which usually have a strong international component. Indeed, a mobile European and international user community, including also many groups from the convergence regions has developed world-leading research and technological collaborations. TIARA will contribute to reinforce these existing clusters of excellence by offering further capacity for new technological developments and unique new research possibilities.

Furthermore, it is important to stress that TIARA will not be a static structure and will call for expansion via the inclusion of new infrastructures, in a way similar to the European Union construction. These new infrastructures, in turn, will enable the creation of new technology and research centres of excellence in the entire European territories. Therefore, TIARA represents a unique opportunity to develop accelerator science all over Europe, in particular in the less developed countries, which will benefit from the expertise and the support of the more experienced centres. TIARA will thus offer a coordinated and efficient means for the regionally balanced scientific and technological development of Europe. In summary, the distributed TIARA Facility will contribute substantially to the European Research Area (ERA) and the scientific excellence of Europe as a whole.

The European Community support for TIARA-PP will be a clear and strong asset, and a natural continuation of the past achievements. The construction of a European consortium, integrating all the national and international accelerator R&D infrastructures, has been largely triggered by the coherent strategic approach that ESGARD has set up for developing and submitting collaborative projects to FP6 and FP7. In parallel the ESFRI process and the CERN Council, acting as the Strategy Council for Particle Physics, have established a European Roadmap. Several potential accelerator facilities identified by the CERN Council require a number of large accelerator R&D infrastructures. This also applies to several projects included in the ESFRI roadmap.

Therefore, it has been deemed that the current EC support for Preparatory Phase work would be of great advantage for integrating all the national and international accelerator R&D infrastructures in a well coordinated distributed European facility. Because of the Europe-wide distributed character of the TIARA facility and the large diversity of the interested fields, this framework offers a natural catalytic and leveraging effect, which will be difficult to realize with the existing mechanisms at the national level. The formation and operation of the consortium requires significant additional efforts and commitments, which would be difficult to gather without a well identified framework and EC support. The preparatory phase will cover not only the preparatory work that directly benefits the users, but also the work that motivates and strengthens the consortium.

3.2 Dissemination and/or exploitation of project results, and management of intellectual property

The communication and dissemination plan, internal to the TIARA-PP consortium, was discussed in section 2.1.2. In this section, we concentrate on measures, which will increase the impact of the project. The identified targeted audience is 4-fold.

- Research communities
- Medical and Industrial sectors
- Policy makers and government officials
- Public at large

Appropriate measures ensuring optimum dissemination and use of major results from the project have been foreseen in the project structure. For example, knowledge exchange within the consortium will be addressed by work package WP5 by preparing the groundwork for exchange of staff and joint training activities. Work package WP6 is specifically concerned with collaborations with and knowledge transfer to industry. More generally, the following table summarizes the envisaged measures and the audience that will be targeted primarily.

	Primary targeted Audiences			
Dissemination and Outreach supports	Research communities	Medical and industrial sectors	Policy makers and Government officials	Public at large
Publication, Reports…	X	X		
Survey results	X	X	X	
MoU, MaA	X	X	X	
General TIARA meeting	X	X	X	
Town-meetings	X	X		
Conferences/workshops	X	X	X	
Industry days		X		
Internal Website	X	X		
External Website	X	X	X	X
Web-based Publication Repository	X	X		
Web-based Databases	X	X	X	
Flyers/leaflets and other advertising means		X	X	X
Video presentations			X	X
Press releases			X	X
Press conferences			X	X

As can be seen, four categories of dissemination and outreach means will be used to address these various audiences:

- ***Scientific and management documentation***

  The scientific and technical results of the projects will be disseminated through publications in journals, TIARA-PP reports, notes and conference papers. The main management documentation will be based on Memoranda of Understanding and Agreement. Several surveys will be used as groundwork to develop consensus and disseminate findings. Other than the formal reporting vis-à-vis the European Commission, specified in the contract, summary reports on the TIARA-PP project will be submitted to the ministries and government agencies of the CERN Member and Observer states, including the EC, through the normal status reports to the European Strategy Sessions of the CERN Council. The reports to the CERN Council will be prepared under the responsibility of the Project Coordinator. The reports to the TIARA-PP Governing Council will also represent an efficient mean of communication with the ministries and government agencies.

- ***Meetings***

  The scientific results will also be disseminated via attendance at various international and topical conferences and workshops in the field of accelerator science, which account for several thousand engineers and physicists world-wide. A major dissemination event will be the general TIARA-PP Meetings, which will be open to external participants by organizing linked town-meetings. Active discussions concerning the TIARA Implementation Phase will also take place during these Meetings, within the accelerator communities. To achieve further its objectives, the TIARA-PP Project Office may organize, as appropriate, specific events such as Industry Days (in coordination with WP6), Press Conferences, etc.

- ***Web-based tools***

  A dedicated web-site, hosted on a CEA server and managed by the management team, will be the main showcase and permanent dissemination tool of the TIARA-PP project. It will serve to inform the scientific community at large, as well as any other interested parties, of the activities and results of the PP project. The TIARA website will be the access point to various databases as deliverables of Work Packages 3, 4 5 and 6, as well as the repository for TIARA publications, documentation, and overall supporting material. In particular, a database of the existing R&D infrastructures with their specification and availability will be generated and should increase the impact of the project. The TIARA Website will also provide impact indicators such as the number of publications/preprints/reports and their citations in other publications, presentations at conferences, numbers of accesses to the TIARA web site… as well as the status of the achievement of deliverables and milestones.

- ***Advertising means***

  Advertising the achievements and results of TIARA-PP is a crucial aspect of dissemination and outreach. The members of TIARA-PP will present the objectives and outcomes of TIARA-PP in wide audience presentations during symposia, general audience conferences or policy maker meetings, such as ECRI conferences. To support further dissemination and outreach, specific communication tools, as for example video presentations, flyers/leaflets, and demonstration equipments will be developed. For significant highlights the TIARA Project office will issue press release or organize press conferences, as appropriate.

Contribution to policy development

Finally, it is worthwhile repeating that the TIARA-PP project has resulted from the long-standing development of a coordinated set of accelerator R&D projects by ESGARD. Depending on the degree of integration achieved, the benefit of a single distributed R&D facility as compared to an independent set of national infrastructures will be assessed. The experience gained from TIARA-PP may have a significant impact on *policy development at a European level* to help develop practical models for integrated distributed facilities.

4. Ethical Issues

The TIARA-PP project does not involve any ethical issues that relate to:

- Informed consent
- Data protection issues
- Use of animals
- Human embryonic stem cells
- Dual use

ETHICAL ISSUES TABLE

(Note: Research involving activities marked with an asterisk * in the left column in the table below will be referred automatically to Ethical Review)

	Research on Human Embryo/ Foetus	***YES***	***Page***
*	Does the proposed research involve human Embryos?		
*	Does the proposed research involve human Foetal Tissues/ Cells?		
*	Does the proposed research involve human Embryonic Stem Cells (hESCs)?		
*	Does the proposed research on human Embryonic Stem Cells involve cells in culture?		
*	Does the proposed research on Human Embryonic Stem Cells involve the derivation of cells from Embryos?		
	I CONFIRM THAT NONE OF THE ABOVE ISSUES APPLY TO MY PROPOSAL	YES	

	Research on Humans	**YES**	**Page**
*	Does the proposed research involve children?		
*	Does the proposed research involve patients?		
*	Does the proposed research involve persons not able to give consent?		
*	Does the proposed research involve adult healthy volunteers?		
	Does the proposed research involve Human genetic material?		
	Does the proposed research involve Human biological samples?		
	Does the proposed research involve Human data collection?		
	I CONFIRM THAT NONE OF THE ABOVE ISSUES APPLY TO MY PROPOSAL	YES	

	Privacy	**YES**	**Page**
	Does the proposed research involve processing of genetic information or personal data (e.g. health, sexual lifestyle, ethnicity, political opinion, religious or philosophical conviction)?		
	Does the proposed research involve tracking the location or observation of people?		
	I CONFIRM THAT NONE OF THE ABOVE ISSUES APPLY TO MY PROPOSAL	YES	

	Research on Animals	**YES**	**Page**
	Does the proposed research involve research on animals?		
	Are those animals transgenic small laboratory animals?		
	Are those animals transgenic farm animals?		
*	Are those animals non-human primates?		
	Are those animals cloned farm animals?		

	I CONFIRM THAT NONE OF THE ABOVE ISSUES APPLY TO MY PROPOSAL	YES	

	Research Involving Developing Countries	YES	Page
	Does the proposed research involve the use of local resources (genetic, animal, plant, etc)?		
	Is the proposed research of benefit to local communities (e.g. capacity building, access to healthcare, education, etc)?		
	I CONFIRM THAT NONE OF THE ABOVE ISSUES APPLY TO MY PROPOSAL	YES	

	Dual Use	YES	Page
	Research having direct military use		
	Research having the potential for terrorist abuse		
	I CONFIRM THAT NONE OF THE ABOVE ISSUES APPLY TO MY PROPOSAL	YES	

5. Consideration of gender aspects

Recent surveys of the European research and education system have shown that female students and scientists are underrepresented in many engineering and scientific fields. Therefore, all institutes and laboratories involved in the TIARA-PP project have introduced equal opportunities programs over the past years. These programs promote and monitor gender balance at the recruitment and career level and promote the awareness of gender issues at the work place. Work-life balance and childcare issues also get proper attention. Launched generally a decade ago, these programs are progressively showing their impact with increased female representation in professional research. However, due to the lack of female influx in engineering and science fields at the educational level, progress is slow.

Within the TIARA-PP project the promotion of gender balance will primarily rely on the equal opportunities programs set by the participant partners. In addition it will be addressed through the several lines of actions, such as:

- Although most of the human resources in TIARA-PP will involve available staff in the institutes and laboratories involved, the applications from female individuals at all levels for scientific and management positions available within the consortium will be encouraged.
- Inviting renowned female experts in particle accelerators to deliver talks at the TIARA-PP meetings, organized by the consortium.
- Remaining informed of the work of the European Parliament’s Committee on Women’s Rights and Equal Opportunities and promoting adherence to selective actions proposed.

Appendix 1 : Letters of Support from participants

A.1 France

A.1.1 Ministry of Higher Education and Research

Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE

ministère
éducation
nationale
enseignement
supérieur
recherche

Direction générale pour la recherche et de l'innovation

Département-organismes transversaux et grandes infrastructures de recherche

Responsable de la Cellule des Très Grandes Infrastructures

DGRI/SPFCO/ B3

Affaire suivie par
Dany Vandromme

Téléphone
01 55 55 89 06
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Dany.Vandromme@recherche.gouv.fr

1 rue Descartes
75231 Paris Cedex 05

Paris, le 13 novembre 2009

<u>OBJET</u> : Lettre de support pour le projet « TIARA »

Monsieur Roy Aleksan,

Au nom du service en charge du suivi des très grandes infrastructures du Ministère de l'enseignement supérieur et de la recherche (DGRI/SPFCO/B3) en France, je confirme l'intérêt et le support pour le projet :

"TIARA"

et pour la proposition préparée en réponse à la publication de la Commission européenne: *[Call n°6, Call-Identifier: FP7-INFRASTRUCTURES-2010-1– Topic: INFRA-2010-2.2.11,]*.

Par ailleurs, je vous confirme que vous-même, en tant que coordinateur français, représenterez la France pour la préparation de cette proposition.

Sincèrement vôtre,

Dany VANDROMME
Responsable du suivi
des Très Grandes Infrastructures

Roy Aleksan,
CEA Saclay
DSM/IRFU
Bat. 141
91191 Gif sur Yvette Cedex,
France

A.1.2 CEA (Participant #1)

Direction des sciences de la matière et Direction du Centre de Saclay
Le Directeur

Robert Jan SMITS
European Commission
Directorate General
Research, Directorate B
B -1049 Brussels

Saclay, 17th November 2009

O/Ref : Irfu/Dir n° 09-175
Concern : TIARA – Preparatory Phase project

Dear Professor Smits,

Recently the CERN council has recommended the submission of the proposal

TIARA (Test Infrastructure and Accelerator Research Area)

as a preparatory phase project in response to the call "FP7-INFRASTRUCTURES-2010-1" for the topic "INFRA-2010-2.2.11: One project in the European strategy for particle physics (CERN Council)".

The primary aim of TIARA is to create in Europe a distributed accelerator R&D facility. Beyond Particle Physics, such a distributed facility is essential for ensuring the sustainable development of the accelerator technologies useful for many fields of science as well as medical and industrial applications.

I would like to inform you that the Commissariat à l'Energie Atomique (CEA) supports strongly the TIARA proposal and is committed in its coordination.

Best regards,

Yves Caristan

Copy : R. Aleksan

Commissariat à l'Energie Atomique
CEA/Saclay, DSM/DIR, Bât. 523, 91191 Gif sur Yvette cedex
Tél. : 33 (0)1 69 08 75 15 (secrétariat 33 (0)1 69 08 74 85) – Fax : 33(0)1 69 08 40 04

Etablissement public à caractère industriel et commercial
R.C.S. PARIS B 775 685 019

A.1.3 CNRS (Participant #3)

Our ref : MS/AM/CB/09.0556

CNRS IN2P3
Institut national de physique nucléaire
et de physique des particules
www.in2p3.fr

3 rue Michel-Ange
75794 Paris Cedex 16

T. 01 44 96 40 00
F.01 44 96 53 40

Robert Jan SMITS
European Commission
Directorate General
Research, Directorate B
B-1049 Brussels,
BELGIUM

November, 16th 2009

Subject : letter of support for the TIARA Preparatory Phase

As Director of IN2P3, I would like to support strongly the following preparatory phase:

TIARA - « *Test infrastructure and Accelerator Research Area* »,

to be submitted in response to the FP7 call for proposals « *INFRA-2010-2.2.11: One project in the European strategy for particle physics (CERN Council)* ».

This Project will contribute to a further structuring of the Accelerator R&D in Europe, which is essential for many fields of science.

Michel SPIRO

Director of IN2P3

Cc : Dr Roy Aleksan, coordinator of TIARA

A.2 CERN (Participant #2)

A.2.1 CERN Council

ORGANISATION EUROPÉENNE POUR LA RECHERCHE NUCLÉAIRE
EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

Adresse postale / Mailing address:

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President of Council
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Mr Robert-Jan Smits
European Commission
Research Directorate-General –
Directorate B
Office: SDME 01/124
200, Rue de la Loi
B – 1049 Bruxelles

Ref: CERN/CS/10045

Geneva, 26 November 2009

The FP7-INFRASTRUCTURES-2010-1 call and the CERN Council

Dear Mr Smits,

Accelerator R&D is in the core of the European Strategy for Particle Physics. The need for sustainability and increased European effort in this field is well recognized. Other fields than Particle Physics also depend on the development of accelerator science and technology, and an open approach to those are needed.

In the FP7-INFRASTRUCTURES-2010-1 call one of the projects is specified as: *One project in the European Strategy for Particle Physics (CERN Council).*

The CERN Council discussed in September 2009 the submission of the TIARA project for this call. TIARA is a Preparatory Phase project for development of a sustainable, distributed and coordinated European framework for accelerator R&D.

The CERN Council took note of the information presented about the proposal, and decided, by unanimous vote of the delegations present, to endorse the submission of the TIARA proposal.

The CERN Council is looking forward to future reports on the progress on the TIARA project.

Best regards,

Torsten Åkesson
President of the CERN Council

Cc: Prof. S. Stapnes, Scientific Secretary
Prof. R-D. Heuer, CERN Director-General
Prof. R. Aleksan

A.3 Germany

A.3.1 Ministry of Education and Research

€.

Bundesministerium
für Bildung
und Forschung

Freiheit
Einheit
Demokratie

Dr. Beatrix Vierkorn-Rudolph
Leiterin der Unterabteilung 71 „Großgeräte, Energie, Grundlagenforschung"
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HOMEPAGE www.bmbf.de
DATUM Bonn, 20. November 2009

POSTANSCHRIFT Bundesministerium für Bildung und Forschung, 53170 Bonn

Herrn
Robert-Jan Smits
Europäische Kommission
Generaldirektion Forschung
Direktorat B
B-1049 Brüssel
Belgien

ab 20. Nov. 2009

BETREFF **ESFRI – Europäische Roadmap für Forschungsinfrastrukturen**
hier: Unterstützung des Antrags auf Förderung der Vorbereitungsphase durch das Projekt TIARA

Sehr geehrter Herr Smits,

deutsche Forschungseinrichtungen haben dem Bundesministerium für Bildung und Forschung gegenüber ihr Interesse bekundet, sich an dem Projekt TIARA zu beteiligen. Das BMBF begrüßt und unterstützt die Initiative zur Beantragung einer Förderung der Vorbereitungsphase dieses Projekts durch die Europäische Kommission im Rahmen des 7. Forschungsrahmenprogramms.

Von Seiten des BMBF ist für die Betreuung des Projekts zuständig:

Dr. Stefan Kern
Leiter des Referats 711: Naturwissenschaftliche Grundlagenforschung
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53170 Bonn
Tel.: +49-22899-57-3279
Fax: +49-22899-578-3279
Email: Stefan.Kern@bmbf.bund.de

Darüber hinaus ist das BMBF bereit, einen Vertreter in den Lenkungsausschuss des Projekts zu entsenden. Ich möchte jedoch betonen, dass die Unterstützung der Vorbereitungsphase des Projektes keine Entscheidung über eine finanzielle Beteiligung am Bau und Betrieb der Einrichtung impliziert. Diese muss zu einem späteren Zeitpunkt getroffen werden.

Mit freundlichen Grüßen
Im Auftrag
20/11
Dr. Beatrix Vierkorn-Rudolph

<u>Kopie:</u>
Prof. Brinkmann, DESY Hamburg, für das TIARA-Konsortium

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A.3.2 DESY (Participant #5)

Accelerators | Photon Science | Particle Physics

Deutsches Elektronen-Synchrotron
A Research Centre of the Helmholtz Association

DESY, GD, 22603 Hamburg, Germany

Dr. Roy Aleksan
CEA/Saclay
DAM/IRFU
Bat. 141
91191 Gif-sur-Yvette cedex
France

Prof. Dr. Helmut Dosch

Chairman of the Board of Directors

Tel. +4940 8998 3000
Fax +4940 8998 4304
DESY-Director@desy.de

November 16, 2009

TIARA FP7 proposal

Dear Dr. Aleksan,

This is to confirm that DESY fully supports the TIARA (Test Infrastructure and Accelerator Research Area) FP7 proposal.

With best regards

Prof. Dr. Helmut Dosch

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Fax +49 40 8998-3282

Postal address
22603 Hamburg
Germany

Locations of DESY
Hamburg
Zeuthen/Brandenburg

A.3.3 GSI (Participant #6)

GSI

GSI Helmholtzzentrum für Schwerionenforschung GmbH
Planckstraße 1
64291 Darmstadt
www.gsi.de

GSI · Planckstraße 1 · 64291 Darmstadt · Deutschland

Dr. Roy Aleksan
Coordinator TIARA

CEO and Scientific Director

Prof. Dr. phil. nat. Dr. hc
Horst Stoecker

Fon: +49 6159 71-2648
Fax: +49 6159 71-2991

stoecker@gsi.de

Ref. TIARA project

November 27, 2009

Dear Dr. Aleksan, dear Roy,

Dr. H. Eickhoff informed about your desire concerning a statement of the GSI management to the TIARA project.

To my opinion this project is very essential as it will bring the possibility to coordinate the various aspects of accelerator development in Europe. The definition of the workpackages is appropriate to cover all essential aspects starting from R&D definitions, their requested infrastructure, the connection to industry and also the education aspects for accelerator physicists. GSI is present in five of the workpackages with contact persons.

I am convinced that the TIARA project is really a step forward and to GSI of great importance also with respect to our new FAIR project.

With best regards, Yours,

Horst

Horst Stöcker

Sitz: Darmstadt · Amtsgericht Darmstadt HRB 1528
Geschäftsführung: Professor Dr. Dr. h.c. Horst Stöcker, Christiane Neumann
Vorsitzende des Aufsichtsrates: Dr. Beatrix Vierkorn-Rudolph
Stellvertreter: Ministerialdingent Dr. Rolf Bernhardt

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Hessische Landeszentralbank Frankfurt
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HELMHOLTZ | GEMEINSCHAFT

A.4 Italy

A.4.1 Ministry of Education, University and Research

Ministero dell'Istruzione, dell'Università e della Ricerca

Direzione Generale per l'Internazionalizzazione della Ricerca

Prot. 1016

Prof. Roberto Petronzio
Presidente INFN

Dr. Umberto Dosselli
Vice-Presidente INFN

Piazza dei Caprettari 70
I-00186 Roma

Reference: Letter of support to the Preparatory Phase proposal "**One project** in the European strategy for particle physics (CERN Council)"

With reference to the publication of the European Commission FP7 call INFRA-2010-2.2.11, the MIUR (Ministero dell'Istruzione, Università e Ricerca) hereby wishes to express its support to the project "2.2.11: **One project** in the European strategy for particle physics expressed by the CERN Council".

The CERN Council has specified the One project in the European strategy for particle physics to be "**TIARA - Test Infrastructure and Accelerator Research Area**" project. TIARA aims at stimulating and strengthening leading developments of new accelerator technologies by integrating the European technical test-infrastructures required for this purpose and by enhancing education and training in accelerator technology.

The MIUR confirms that Dr. Umberto Dosselli (INFN) will represent Italy in this preparatory phase proposal.

This letter does not entail any commitments of funding by MIUR at this stage in the construction phase of the TIARA infrastructure.

Roma, 27 Novembre 2009

IL DIRETTORE GENERALE
Dott. Mario ALI
Mario Ali

MM

A.4.2 INFN (Participant #7)

INFN
Istituto Nazionale di Fisica Nucleare

IL PRESIDENTE

Roma, 27 NOV. 2009

Prot. n° 6851/9.2 P

TO WHOM IT MAY CONCERN

In my quality of INFN President, I strongly support the submission of the TIARA Project to the preparatory phase in the framework of FP7-INFRASTRUCTURES-2010.

Prof. Roberto Petronzio
INFN President

Infn - Piazza dei Caprettari, 70 - Roma Tel. +39 066840031 - Fax +39 0668307924 - e-mail: presidenza@presid.infn.it - www.infn.it

A.5 Poland

A.5.1 Ministry of Science and Higher Education

MINISTRY
OF SCIENCE AND HIGHER EDUCATION
UNDERSECRETARY OF STATE
Prof. Jerzy Szwed

MNiSW-DSM-WP-1870-941-17/MBA/09

Warsaw, 27 November 2009

TIARA Coordinator

Dear Coordinator,

concerning the interest of the Polish institutions forming the Polish consortium of the TIARA (Test Infrastructure and Accelerator Research Area), to become an active partner in the preparatory phase of the project, I am pleased to transmit, on behalf of the Polish Ministry of Science and Higher Education (MSHE) my support to the participation of the above mentioned consortium in the TIARA collaboration, and express my conviction that their competence and activity in the field will significantly contribute to the success of this challenging European project.

The Polish consortium, grouping the University of Science and Technology, the Andrzej Soltan Institute of Nuclear Studies, the Cracow University of Technology, the Institute of Nuclear Physics Polish Academy of Sciences, the Technical University of Łódź, the Warsaw University of Technology and the Wrocław University of Technology, is being represented by the Institute of Nuclear Physics Polish Academy of Sciences and receives hereby the support of MSHE for participating in the preparatory phase of the TIARA project, in the understanding that this support does not mean in any aspect a decision on the financial contribution from the MSHE to the project.

Sincerely yours,

CC.: Prof. Marek Jeżabek, Director of the Institute of Nuclear Physics Polish Academy of Sciences in Cracow

A.5.2 IFJ PAN (Participant #11)

The Henryk Niewodniczański
INSTITUTE OF NUCLEAR PHYSICS
POLISH ACADEMY OF SCIENCES

ND/388/2009

Kraków, 30.11.2009

Prof. Roy Aleksan
CEA/Saclay
DSM/IRFU
Bat. 141
91191 Gif sur Yvette cedex,
France

Dear Professsor Aleksan,

As Director of the IFJ PAN I would like to confirm that our Institute strongly supports the application: ***Test Infrastructure and Accelerator Research Area – TIARA,*** the response to the EC FP7 call for proposals FP7-INFRASTRUCTURES-2010-1, the topic: INFRA-2010-2.2.11.
This preparatory phase project will significantly contribute to the actions pertaining to the construction of new European accelerator R&D infrastructure.

Yours sincerely,

Prof. dr hab. Marek Jeżabek
General Director of IFJ PAN

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VAT No.: PL 6750000444

A.6 Spain

A.6.1 Ministry of Science and Innovation

MINISTERIO DE CIENCIA E INNOVACION

SECRETARIO DE ESTADO DE INVESTIGACION

Carlos Martínez Alonso

Madrid, 17 november, 2009

Mr. Roy Aleksan
CEA/Saclay
DSM/IRFU
Bat. 141
91191 Gif sur Yvette cedex, (France)

Dear Prof. Roy Aleksan,

I would like to thank you for keeping us informed about the development of the TIARA-PP proposal under preparation by your team and to be submitted as a CNI Preparatory Phase in response to the call FP7-INFRASTRUCTURES-2010-1 for the topic "INFRA-2010-2.2.11: One project in the European strategy for particle physics (CERN Council)".

In our meetings last June in Madrid I could hear about this interesting idea of integrating the national and international accelerator R&D infrastructures into a single distributed European accelerator R&D facility. Beyond Particle Physics, such a distributed facility is essential for ensuring the sustainable development in Europe of the accelerator technologies useful for many fields of science as well as medical and industrial applications.

On behalf of the Spanish Ministry of Science and Innovation, I am therefore most interested in the evolution of this project, which I strongly support and encourage through the active participation of our national research accelerator centers.

With my best wishes of success,

C/ ALBACETE, 5
28071-MADRID
Teléfono: 91/6037163
Fax: 6037005

Correo electrónico: se.investigacion@micinn.es

A.6.2 CIEMAT (Participant #4)

MINISTERIO
DE CIENCIA
E INNOVACIÓN

Ciemat Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas
Juan Antonio Rubio
DIRECTOR GENERAL

Madrid, 23 november, 2009

Prof. Roy Aleksan
CEA/Saclay
DSM/IRFU
Bat. 141
91191 Gif sur Yvette cedex,
France

Dear Prof. Aleksan,

I have followed the evolution of the Tiara project through my collaborators at Ciemat, and I am very pleased to know that there is a significant progress in the preparation of a Proposal with the contribution of most relevant European accelerator research centers.

As you already know CIEMAT has been particularly active in promoting accelerator research, launching a special programme to create an accelerator group and boost research on accelerator technologies in collaboration with other research centers in Spain. In my opinion, the possibility to participate in a cooperative European framework, as Tiara will be, will bring our incipient accelerator community the chance to face a constructive challenge.

I would like to take this opportunity to express the strong support of CIEMAT to the Tiara project, as an initiative to coordinate the resources and infrastructures in the European accelerator research field.

CORREO ELECTRÓNICO:
juanantonio.rubio@ciemat.es

AVENIDA COMPLUTENSE, 22
28040 MADRID
TLF.: 91 346 64 11
FAX: 91 346 08 37

A.7 Sweden

A.7.1 University of Uppsala (Participant #10)

UFV 2009/1903

UPPSALA
UNIVERSITET

Vice-Chancellor

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Uppsala, November 23, 2009

Robert-Jan Smits
European Commission
Directorate General Research,
Directorate B
B-1049 Brussels
BELGIUM

Ref. Letter of Support for TIARA

Uppsala University is taking part in the preparation of the proposal for the Preparatory Phase project TIARA (Test Infrastructure and Accelerator Research Area) to be submitted in response to the FP7 call for proposals INFRA-2010-2.2.11: One project in the European strategy for particle physics (CERN Council).

The TIARA project aims at creating a program of joint European particle-accelerator research and development and the integration of the European infrastructures required for that. Uppsala University, together with collaborating universities in the Nordic countries, foresees to take part in the technical development of several world-leading accelerator projects, among those CLIC and ESS. The purpose of TIARA, if realised, would considerably facilitate the development work required for these important projects. We therefore give our strong support to the TIARA project.

Yours sincerely,

Anders Hallberg
Vice-Chancellor of Uppsala University

Copy to Dr Roy Aleksan, Coordinator of TIARA

A.8 Switzerland

A.8.1 PSI (Participant #8)

PAUL SCHERRER INSTITUT

Prof. Dr. Joël Mesot
Director PSI
Prof. Phys. ETH Zurich & EPF Lausanne
5232 Villigen PSI
Switzerland

Telephone direct +41 (0)56 310 40 29
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Dr. Roy Aleksan
CEA Saclay
DSM/IRFU
Bat. 141
91191 Gif sur Yvette Cedex
France

November 19, 2009

TIARA FP7 Proposal

Dear Dr. Aleksan,

This is to confirm, that the Paul Scherrer Institut fully supports the Test Infrastructure and Accelerator Research Area (TIARA) FP7 Proposal.

This initiative is particularly important in view of our various developments at the 1 MW proton accelerators, Swiss Light Source and SwissFEL project.

With best regards
PAUL SCHERRER INSTITUT

Prof. Dr. Joël Mesot
Director PSI

A.9 United Kingdom

A.9.1 STFC (Participant #9)

Science & Technology Facilities Council

Science and Technology Facilities Council
Director, Science Programmes
Polaris House, Swindon, SN2 1SZ
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+44 (0)1793 442622 (Swindon)
+44 (0)1235 445782 (RAL)
www.stfc.ac.uk

17 November 2009

To whom it may concern

Dear Sir/Madam,

I am writing to confirm that the United Kingdom supports the application:

Test Infrastructure and Accelerator Research Area – TIARA
Call identifier FP7-INFRASTRUCTURES-2010-1
Topic INFRA-2010-2.2.11: One project in the European strategy for particle physics (CERN Council)

Accelerator research and development is a high priority within the Science and Technology Facility Council's programme. We believe that accelerators are a vital technology for the research infrastructures that will allow the European Research Area to make progress. They underpin the future light sources and neutron sources identified on the ESFRI roadmap, which will enable the atomic and molecular structures of novel materials to be explored with applications in healthcare, energy, security and the environment. They are also essential to maintaining European leadership in particle and nuclear physics.

STFC supports significant accelerator research infrastructures at the Rutherford and Daresbury laboratories, which we would like to see as part of a coordinated and sustainable distributed European infrastructure, which is the goal of this preparatory phase project.

Yours sincerely

John Womersley

Director, Science Programmes
UK delegate to ESFRI

Appendix 2: Associated partners

An initial list of the partners associated to the TIARA-PP projects is shown below. These partners are affiliated to a TIARA-PP beneficiary and will be associated to the elaboration of TIARA, through this channel.

- The associated partners will be informed as appropriate on the status of the on-going activities of the WP by the beneficiary to which they are affiliated. Thus they can give their inputs and contribute to the elaboration of TIARA through this channel.
- The associated partners can participate directly, if appropriate, to the activities of the WP as a contact person on behalf of the beneficiary to which they are affiliated.
- The associated partners can participate to the TIARA general meetings. The travel expenses will then be covered by the beneficiary to which they are affiliated.

TIARA generates a large interest from many other potential partners. For example, several large laboratories from Russia are very interested in the development of TIARA. Similarly, several industrial companies have declared their strong interest for contributing to the TIARA-PP project. Therefore this list will be updated before the elaboration of the TIARA-PP Consortium agreement.

Number	Associate Name	Short description and topics of interest	Affiliated to
1. **NTUA**	**National Technical University of Athens, Athens, Greece**	***Short Description:*** The National Technical University of Athens is mainly involved in the R&D programme on two beam acceleration system (CLIC/CTF3). NTU-Athens is also active in education with a Master2 programne on accelerators and detectors in High Energy Physics. NTUA will also act as the coordinator for a Greek consortium including the National 1 Capodistrian University of Athens (NCUA) and the "NCRS" Demokritos of Athens. *Topics of interest in:* ***WP5***	**CEA**
2. **SOLEIL**	**Synchrotron SOLEIL,** **Gif sur Yvette France**	***Short Description:*** Both a research laboratory and a very high-level scientific resource serving thousands of users, SOLEIL also has a double vocation: to make the highest-performing experimental facilities in the world available to its users, and to develop cutting-edge internal scientific research activity around the synchrotron beam. In particular, SOLEIL is involved in accelerator R&D toward next generation of light sources. *Topics of interest in:* ***WP4***	**CNRS**

3. **ESS-BIL**	**ESS Bilbao,** **Spain**	***Short Description:*** The ESS Bilbao is a Centre of recent creation, devoted to R&D in accelerators technologies, mainly related with the ESS to be constructed in Sweden. This Centre will have an H/D accelerator build in three phases: proton injector following the performance expected for ESS, accelerating structures (RFQ+DTL) able to reach 40-50 Mev test bench for SRF structures (cavities+cryomodules). This Bilbao's Centre, which complement the main ESS Headquarters, will be operative by 2011 and will employ 80 people. The investment in the Bilbao Sub Headquarters is forecast to amount to 180 million Euros. *Topics of interest in:* ***WP3, WP4, WP5, WP6***	**CIEMAT**
4. **CELLS-ALBA**	**CELLS – ALBA** **Cerdanyola, Spain**	***Short Description:*** CELLS-ALBA is the Consortium for the Exploitation of the Synchrotron Light Laboratory ALBA, situated in Cerdanyola, near Barcelona. This laboratory is a new generation of synchrotron, that uses arrays of magnets, called insertion devices to generate bright beams of synchrotron light. Around the machine there are a collection of experimental research laboratories, called beam-lines. At each beam-line, scientists independently use the light generated by the machine for a wide variety of experiments. The ALBA team currently consists of 60 dedicated engineers, scientists, support staff and technicians. *Topics of interest in: :* ***WP3, WP4 and WP5***	**CIEMAT**
5. **CNA**	**Centro Nacional de Aceleradores (CNA),** **Sevilla, Spain**	***Short Description:*** Accelerator centre dedicated to multidisciplinary research with particle accelerators. CNA has a 3MV Tandem, which is used in several Ion beam analysis techniques, and for low energy nuclear physics and detector development. It also has a Cyclotron, dedicated to production of PET radio-pharmaceuticals, which has also an external beam for irradiation. Finally, it has a 1 MV Tandetron, used for Accelerator Mass spectrometry and 14C dating. *Topics of interest in: :* ***WP3, WP5 and WP6***	**CIEMAT**
6. **CI**	**Cockcroft Institute, Daresbury, UK**	***Short Description:*** The Cockcroft Institute is a partnership between the Universities of Liverpool, Manchester and Lancaster, the Science and Technologies Facilities Council (STFC), Daresbury Laboratory and the North West Development Agency (NWDA). It is an international centre of accelerator R&D in UK, with the mission of advancing forefront accelerator R&D serving particle, nuclear, photon and neutron sciences, providing national stewardship of international accelerator project deliverables from UK, operating state-of-the-art local R&D facilities, educating and training the next generation of accelerator scientists and applying the knowledge so generated to societal ambitions in energy, environment, health and security. It operates from a purpose-built building in Daresbury, with laboratory infrastructure and associated staff also in satellite centres at the three universities. Total effort is about 130 FTEs per year and investment of £100M+ to date since 2006, with major long-term collaboration established with CERN, Imperial College, Fermilab (USA) and SLAC (USA). *Topics of interest in:* ***WP3, WP4 and WP5***	**STFC**

7. **ICL**	**Imperial College,** **London, UK**	***Short Description:*** Recognising the potential of muon beams for particle physics, the High Energy Physics Group of the Physics Department at Imperial College London has established an accelerator R&D activity aimed at establishing the key technologies and systems required for the Neutrino Factory. The work of the accelerator R&D group now encompasses the development of high-power, pulsed, proton sources, the development of ionization cooling systems through a leading participation in the MICE experiment, a leading role in the conceptual design of the Neutrino Factory, R&D into the application of accelerator technology to the treatment of cancer, and, more recently, the use of muon beams for the search for charged lepton flavour violation. *Topics of interest in:* ***WP8***	**STFC**
8. **JAI**	**John Adams Institute,** **Oxford, UK**	***Short Description:*** The John Adams Institute was established to act as a focus and stimulus for the regeneration of accelerator science as an academic discipline in the UK. The JAI provides undergraduate and graduate training in accelerator science and technology, producing around 5-6 Ph.D. graduates per year. The JAI research programme includes beam dynamics, design, and instrumentation R&D for electron-positron colliders and advanced light sources, the neutrino factory, high-gradient laser-plasma accelerators, and accelerators for hadron therapy. *Topics of interest in:* ***WP5 and WP6***	**STFC**
9. **KEK**	**KEK, High Energy Accelerator Research Organization** **Tsukuba, Japan**	***Short Description:*** Expertise in Sc magnets for Accelerators and detectors and SC accelerator integration. Development of design and constructing techniques for super conducting magnets, development of special conductors. Experience in the operation of storage rings with electron cloud effects and development of electron cloud simulation tools, design studies on linear colliders, development of klystrons, modulators and normal conducting RF cavities. Cryogenics design and development of liquid hydrogen target/absorber system *Topics of interest in:* ***WP8***	**STFC**
10. **ANL**	**Argonne National Laboratory** **Argonne, U.S.A.**	***Short Description:*** 10 years experience in the measurement and simulation of the limiting RF gradient in both superconducting and normal cavities. This work is published in a large number of papers. Presently developing the techniques (both theoretical and experimental) required for a fundamental understanding at the atomic scale of the processes that cause breakdown in cavities. *Topics of interest in:* ***WP8***	**STFC**

11. **BNL**	**Brookhaven National Laboratory** **Upton, U.S.A.**	***Short Description:*** Expertise in SC hadron collider integration and operation, Accelerator Magnets design and construction, cable design, and test; recent development for cycling SC magnets and HTS special designed magnets. Simulation of ionization cooling and theory of vacuum RF breakdown in magnetic fields. *Topics of interest in:* ***WP8***	**STFC**
12. **FNAL**	**Fermi National Accelerator Laboratory** **Batavia, U.S.A**	***Short Description:*** Expertise in SC hadron collider integration and operation. Design and construction of accelerator magnets, test of magnets. Specific experience in high field A15 accelerator magnets R&D, design of innovative solution of VLHC (like the handling of synchrotron radiation). Radiation shielding calculations. Design work on linear colliders of SC and NC technology. Muon capture and cooling design, Accelerator systems, RF Test and diagmositcs, Beam line instrumentation design and construction, Detector systems design and construction, magnet test/mapping and cryogenics support *Topics of interest in:* ***WP8***	**STFC**
13. **JLAB**	**Jefferson Lab** **Newport News, U.S.A.**	***Short Description:*** SRF technology, recirculating linacs, beam physics, RF structures and associated technologies. *Topics of interest in:* ***WP8***	**STFC**
14. **LBNL**	**Lawrence Berkeley National Laboratory,** **Berkeley, U.S.A.**	***Short Description:*** Expertise in SC magnets for accelerators and wide experience in very high field design and construction technique. Test of SC magnets. Reference centre for cabling of Rutherford cable and of A15 and HTS development and test for accelerators. Accelerator design and operation; RF systems; beam instrumentation; beam dynamics. *Topics of interest in:* ***WP8***	**STFC**

15. **AU**	**University of Aarhus,** **Aarhus, Denmark**	***Short Description:*** The University of Aarhus operates the synchrotron radiation (SR) storage ring ASTRID together with the associated injector system. Several other low-energy ion accelerators and storage devices are used in atomic, molecular and bio physics. Seven SR beamlines on ASTRID cover a photon energy range from the visible to the soft X-Ray region supporting a diverse SR research program. A new state-of-the art synchrotron light source ASTRID2 for research within medicine, molecular and cell biology, nanotechnology and atomic and molecular physics is presently being constructed. Being a university, teaching and training of students are integrated with the accelerator facilities. *Topics of interest in:* ***WP5***	**UU**
16. **UH**	**University of Helsinki,** **Helsinki, Finland**	***Short Description:***. The Helsinki Institute of Physics (HIP), a research institute at the University of Helsinki (UH), carries out physics research and technology development at international accelerator laboratories and is responsible for the Finnish research collaboration with CERN. HIP participates in the CLIC Test facility 3 project at CERN in high precision mechanics and assembly and atomistic modeling of RF breakdown. HIP is assisted by a network of Finnish academia and industry with a wide expertise in technologies used in accelerators. The Helsinki CTF3 group is member of the NorduCLIC consortium. HIP carries out research in the ALICE, CMS and TOTEM experiments at the CERN Large Hadron Collider. *Topics of interest in:* ***WP6***	**UU**
17. **JYU**	**University of Jyväskylä,** **Jyväskylä, Finland**	***Short Description:*** The Accelerator Laboratory of the Department of Physics (JYFL) of the University of Jyväskylä (JYU) has a cyclotron (AVF, K=130) with two External Electron Cyclotron Resonance ion sources (ECR) for highly charged heavy ions and light ion source (LIISA) for intense light-ion beams. The laboratory is also equipped with 1.7 MV Pelletron Accelerator mainly for accelerator-based material physics. A new high-intensity MCC30/15 proton and deuteron cyclotron was installed in August 2009 to serve both basic science and applied research. The Field of research is the study of atomic nuclei under extreme conditions of spin, isospin and excitation energy and the main research topics include exotic nuclei and decay modes, heavy elements and heavy ion reactions, rotating and hot nuclei, dynamics of heavy ion reactions and accelerator physics and technology. An applied science program includes medical research, environmental studies and research into the effects of radiation on materials and devices. Topics of interest in: **WG10**	**UU**

18. **UIO**	**University of Oslo,** **Oslo, Norway**	***Short Description:*** The Physics Department of University of Oslo participates in the CLIC Test Facility 3 at CERN where it is involved in the design of the Power Extraction and Transfer Structure (PETS) and the investigation of the stability of the power-generating drive-beam. The Oslo group is member of the NorduCLIC consortium. The Physics Department of the University of Oslo carries out research in the ATLAS and ALICE experiments at the CERN Large Hadron Collider. *Topics of interest in:* ***WP5 and WP6***	**UU**
19. **LU**	**Lund University,** **Lund, Sweden**	***Short Description:*** The MAX-lab at Lund University operates three electron storage rings (MAX I, MAX II and MAX III) and one electron pre-accelerator (MAX injector). All three storage rings produce synchrotron light used for experiments and measurements in a wide range of disciplines and technologies. The MAX I ring is also used as an electrons source for experiments in nuclear physics. MAX IV is planned as the next generation Swedish synchrotron radiation facility. The main source at MAX IV will be a 3-GeV ring with state-of-the-art low emittance for the production of soft and hard x-rays. The linac injector will provide short pulses to a short pulse facility. The MAX IV design also includes an option for a Free Electron Laser as a second development stage of the facility. The University is also currently hosting the upcoming European Spallation Source which will be sited outside Lund and for which the designs and tests of 4 MW super conducting proton linac and a high power target are currently being initiated. The Physics Department of Lund University carries out research in the ATLAS and ALICE experiments at the CERN Large Hadron Collider and is a member of the Swedish LHC Consortium (LHCK). *Topics of interest in:* ***WA7 and WA10***	**UU**
20. **SU**	**Stockholm University,** **Stockholm, Sweden**	***Short Description:*** The Manne Siegbahn Laboratory at Stockholm University operates the CRYRING accelerator facility. CRYRING has been running for experiments in, mainly, atomic and molecular physics since 1992. According to present plans, it will be moved to Germany in 2010, where it will be used for deceleration of antiprotons and heavy ions at the FLAIR facility at FAIR. The laboratory is currently building a small, double electrostatic storage ring DESIREE designed for experiments with merged beams of positive and negative ions, such as studies of mutual neutralization between two singly charged ions. It can also be used for single-beam experiments like measurements of atomic lifetimes or investigations of the physical properties of biomolecules. The Physics Department of Stockholm University carries out research in the ATLAS experiment at the CERN Large Hadron Collider and is a member of the Swedish LHC Consortium (LHCK). *Topics of interest in:* ***WA10***	**UU**

21. **AGH**	**AGH University of Science and Technology,** **Krakow, Poland**	***Short Description:*** The AGH - 90 years old University of Science and Technology is the largest technical university in Cracow. The Faculty of Physics and Applied Computer Science and The Faculty of Electrical Engineering, Automatics, Computer Science and Electronics are pioneers in the Polish engagement in the experimental cosmic ray and the high energy accelerator particle physics. For years the AGH teams were and are active in DESY and CERN projects (recently: XFEL, ATLAS, LHCb and LHC upgrade) as well as in the design of the new INFN SuperB machine. Concerning the" Education and Training for Accelerator Science" the AGH topics of interest are: the survey of human resources for Accelerator Science in East European countries: the number of Accelerator Science students and trainees, the available courses and teaching resources (including text books, lecture courses, and www-based material, laboratories) and research organizations. Especially we will evaluate and develop the "market" for trained Accelerator Scientists, including physicists, engineers and technicians, for research, healthcare, industry and public service. *Topics of interest in:* ***WP5***	**IFJ PAN**
22. **CUT**	**Cracow University of Technology,** **Krakow, Poland**	***Short Description:*** The Cracow University of Technology is the second largest University of technical profile in Cracow. The University comprises 8 faculties, 2 of which are heavily involved in the low and high energy physics projects. The Faculty of Physics, Mathematics and Applied Informatics and the Faculty of Mechanical Engineering contribute to such projects like LHC or CLIC at CERN as well as FAIR at GSI. Some 20 scientists from CUT were involved at different stages in the design and optimization of LHC (both the accelerator and the detectors) practically since 1990. At present, apart from large international events like FAIR, the University participates in the international projects financed by the FP7 like: EuroNu, "A High Intensity Neutrino Oscillation Facility in Europe". The domain of competence at the CUT covers both the theoretical and applied physics as well as the engineering science and technologies related to beam dynamics, cryogenics, superconductivity, ultra-high vacuum and modern materials. *Topics of interest in:* ***WP4***	**IFJ PAN**
23. **TUL**	**Technical University of Lodz,** **Lodz, Poland**	***Short Description:*** Technical University of Lodz (TUL) specializes in development of Low Level Radio Frequency (LLRF) control systems for high energy accelerators for years. TUL have a dedicated laboratory for R&D and development of LLRF systems based on the modern infrastructures like ATCA and AMC. TUL collaborates with DESY on the design of the control systems for FLASH, XFEL and ILC accelerators. *Topics of interest in:* ***WP3, WP4, WP5, WP6***	**IFJ PAN**

24. **IPJ**	**Andrzej Soltan Institute,** **Swierk, Poland**	***Short Description:*** The Andrzej Soltan Institute for Nuclear Studies Is one of the largest R&D institutes in Poland. The main site is in Swierk (close to Warsaw), some departments reside in the centre of Warsaw. IPJ takes part in major high energy particle physics and nuclear physics experiments and is the member of corresponding large international collaborations. It also works on accelerator techniques for years, e.g. on the design and development of new medical and industrial accelerators, as well as on depositing thin Nb layers upon internal surfaces of RF cavities of particle accelerators and depositing thin Pb films to form Pb cathodes within RF electron guns. All these with the close collaborations with DESY, CERN, INFN … An existing accelerator R&D infrastructure is mainly in Swierk. It covers e.g. various stands for the plasma coatings, RF installation for warm cavities searches etc. *Topics of interest in:* ***WP2 and WP3***	**IFJ PAN**
25. **WUT**	**Warsaw University of Technology,** **Warsaw, Poland**	***Short Description:*** The Warsaw University of Technology with roots in the Institute of Technology established in 1826 is, with its 23 000 of students, over 800 PhD students, 471 professors (including 155 titular professors), 1892 PhD ... one of the largest technical universities in Poland. Teams of the WUT are – since a long time – engaged in several experimental high energy accelerator physics activities at DESY and CERN (recently e.g. in DESY's XFEL or in ALICE and LHCb experiments at LHC). Also, important contributions of WUT teams concerns such accelerator physics subjects as studies on cavity structures for HE accelerators, RF low level electronics, studies on medical accelerators, Master Oscillators for large accelerators etc. Profiting from the university environment, some of these research subjects transform into university courses. *Topics of interest in:* ***WP2, WP3, WP4, WP5***	***IFJ PAN***
26. **PWR**	**Wroclaw University of Technology,** **Wroclaw, Poland**	***Short Description:*** The Wroclaw's UT was established in 1945. It has over 30 000 students, 830 doctoral students,4100 eployees. The Faculty of Mechanical and Power Enineering specializes in cryogenics for years. An existing infrastructure at the Wroclaw UT Cryogenics Lab allows e.g. for the significant contribution to the XFEL, POLFEL, SUNLAB, FAIR and other projects. Recently, the project of creating the large "European Cryo Test Facility" with the partnership of private companies (explorers of helium in Odolanow) entered a preparatory phase. *Topics of interest in:* ***WP6***	**IFJ PAN**