



# **TIARA**

Kick-off meeting 23-24 February  
2011

**Work package 4**

# WP4 Objectives



- **WP4.1** will identify the key technical issues and synergies, in close interaction with WP3 and WP6
- **WP4.2** will survey present R&D activities in the public and private sectors and will collect information on their current status.
- **WP4.3** will develop methodologies and procedures for initiating and costing, so to implement collaborative R&D projects in a sustainable way.
- **WP4.4** will promote the definition of the baselines to support and strengthen a coherent collaborative R&D programme to be carried on in the TIARA framework

# WP 3 vs. WP 4



Some of the objectives in WP 3 and WP 4 are very similar, e.g.:

- a) WP 4.1 “will identify the key Accelerator research Areas and the key technical R&D issues. The work will be carried out in close interaction with WP3; the responsibility of the work will be shared with WP3.”
- b) WP 3.5 “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”  
WP 4.2 “will develop a common methodology and procedure for initiating, costing and implementing collaborative R&D projects in a sustainable way.
- c) WP 3.6 “will further identify means for ensuring a continuous coordination with infrastructures outside TIARA”  
WP 4.3 “The R&D Programme will also ensure appropriate coordination with non European accelerator R&D programs to be established.”

Conclusion: Very close collaboration is necessary between WP 3 and WP 4.

## Summary of Task and Subtask breakdown

Task Num	Short Name	Description	
<b>4.1</b>	ITK	Identification of Key technical Issues for a coherent joint R&D programme.	3.1.1
<b>4.1.1</b>	FAF	Prospective on Future or foreseeable new large Accelerator based Facilities (SLHC, ESS, IFMIF, ILC/CLIC, Neutrino and flavor factories, EURISOL, 4 <sup>th</sup> generation light sources...) and identification of key R&D issues and synergies	3.2.2
<b>4.1.2</b>	EIT	Prospective on Emerging Ideas and Technologies and identification of key issues and common component developments.	3.2.2
<b>4.2</b>	PAR	Prospective on present R&D activities.	
<b>4.2.1</b>	SAS	Survey of the present R&D activities and of their current status. Identification of specific infrastructures used in these activities.	6.2
<b>4.2.2</b>	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
<b>4.3</b>	PMP	Procedure for initiating and methodology for costing and implementing collaborative R&D Projects	2.2.1.1
<b>4.3.1</b>	PEL	Procedure for enabling the Emergence and the Launching of collaborative R&D projects in a sustainable way	3.3.1
<b>4.3.2</b>	MEC	Common Methodology for project's scientific and technical Evaluation and for their Costing.	
<b>4.3.3</b>	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
<b>4.4</b>	DAP	Definition of the coherent collaborative Accelerator R&D Program (this is an input to WP3) and identification of the necessary infrastructures.	3.2
<b>4.4.1</b>	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
<b>4.4.2</b>	CNE	Proposal of an appropriate coordination of the TIARA Programme with non European accelerator R&D programs.	
<b>4.4.3</b>	CFTR	Contribution to the Final TIARA_PP Report	

# Milestones



Milestones				
Num	Nat	Short name	Description	
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

# Deliverables

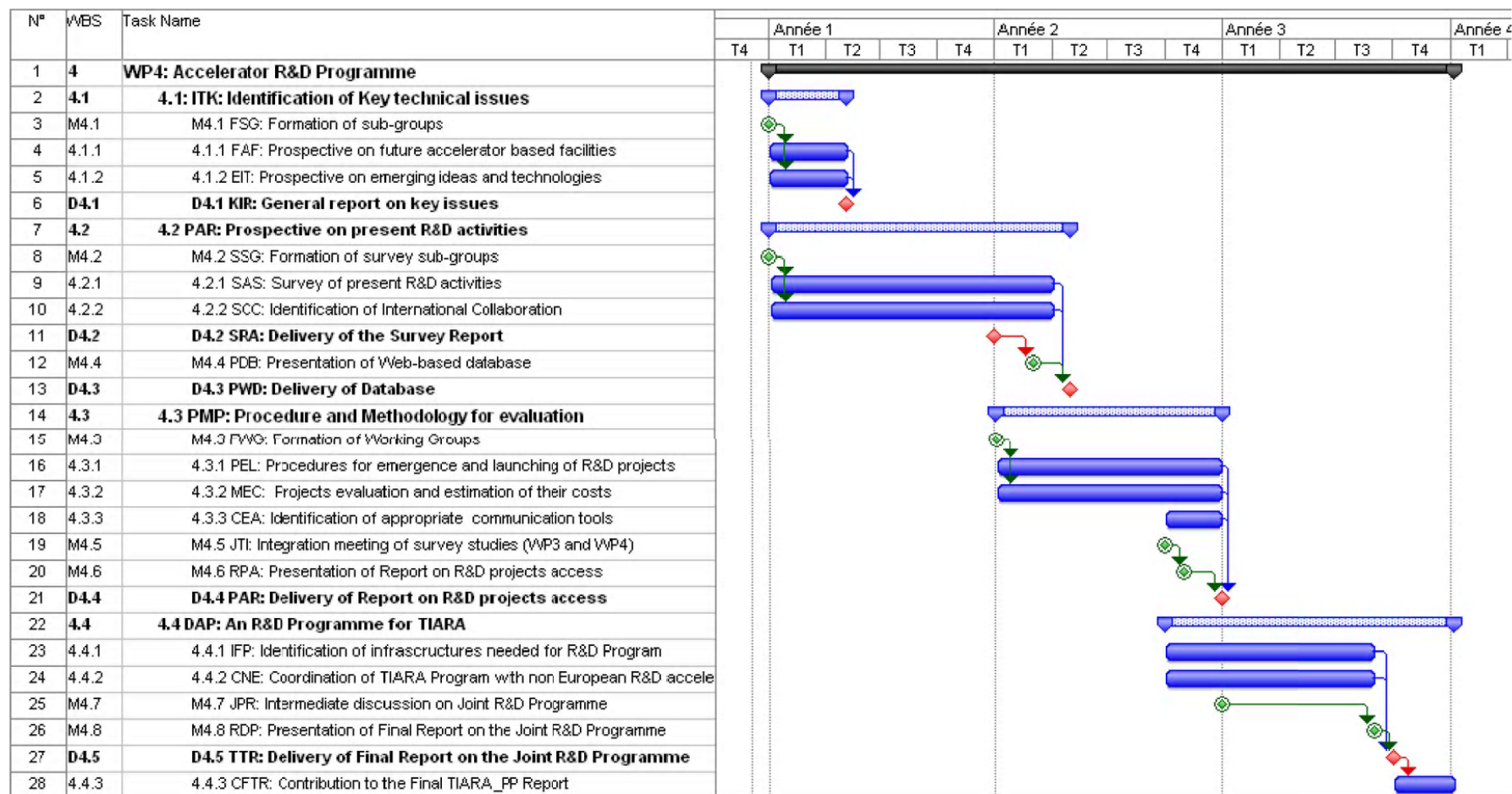


<b>Deliverables</b>				
Num	Nat <sup>26</sup>	Short name	Description	month
D4.1	R	KIR	General Report on Key Issues	<b>4</b>
D4.2	R	SRA	Survey Report on the present R&D activities and of their current status, with identification of specific infrastructures used in these activities.	<b>12</b>
D4.3	O	PWD	Web-based database in current R&D activities	<b>16</b>
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.	<b>24</b>
D4.5	R	TTR	"Toward TIARA". Final plan of the collaborative R&D Program.	<b>33</b>

# WP4 General Planning



Gantt Chart 1.3.a4 for Work Package WP4







Issues	Short term priority	Medium term priority	Long term priority	Specifications*
New sources and Injectors				
Targetry				
RF power supply				
RF cavity materials				
SC RF				
Fast Cycling SC Magnets				
High gradient quadrupoles				
Normal and SC high field dipoles				
Low beta quadupoles				
Modulators and wigglers				



Final focus systems				
Crab crossing				
Cryogenic handling				
Electron cloud control				
Radiation hard material				
Dynamic vacuum				
Diagnostics				
Damping rings				
Beam polarization				
Cooling				
New techniques for high gradient acceleration (laser-plasma etc.)				



Priority score: 1 (low), 2 (medium), 3 (high)

\*Note: "Specifications" columns may be used to specify some particular sub-items



# Partner institutes



CEA:	Olivier Napoly
CERN:	Jean-Pierre Koutchouk
CNRS:	Jean-Marc Filhol
CIEMAT:	Luis Garcia
DESY:	Lutz Lilje
GSI:	Peter Spiller
INFN:	Franco Cervelli
PSI:	Terence Garvey
STFC:	Susan Smith
Uppsala Univ.:	Volker Ziemann
IFJ PAN:	Blazeg Skoczen



# Identification of key technical issue: Primary Challenges in Accelerator R&D

**Beam power** , i.e average luminosity or brightness

**Beam brightness and control**, i.e peak luminosity and  
radiation source brightness

**Beam energy**, i.e energy reach or radiation wavelength

# Short Term Planning



## Actions:

- a) Institutes are requested to indicate their interest taking charge of a particular sub-package.
- b) Considering the necessary collaboration with WP 4, combined WP3/WP4 meetings will be regularly.

# Miscellanea



- ☐ Participants from each participating Institutions
- ☐ Who is going to do what
- ☐ Financial Resources: Requests for Supports
- ☐ Next meetings

# Accelerator R & D



- Timescales for accelerator development are long
  - Test facilities and infrastructure are critical to enable R&D
  - Specific infrastructure are required for both fundamental and directed (project) R&D
  - Need to maintain pipeline of new ideas
  - Many systems-level demonstrations are often required
  - Important to understand timescales and costs both for the R&D as well as the demonstrations





## WP4 Meetings

- 1) Meetings for preparation of bi-annual reports (June and December)
- 2) Steering Committee meetings will be held 3 times per year
- 3) Before Easter a meeting will be held to review progress in view of D4.1 issue (end May)

Forthcoming decisions

Formation of Working groups

# Key issues



- Identification of key issues for accelerator R&D must be based on:
  - ☐ present and future programs in National (in Europe) and International Laboratories
  - ☐ emerging new promising ideas
  - ☐ present and forthcoming National (in Europe) and International infrastructures

# Suggestions



Issues	Specifications*
New sources and Injectors	<b>High intensity proton injectors:</b> 1) develop new ECR proton sources with better RF coupling and plasma diagnostics 2) improve high space charge bunch transport simulation methods
RF cavity materials	<b>Pushing the Copper limits:</b> 1) New fabrication and preparation techniques for CLIC 12 GHz high gradient structures 2) Qualification of accelerating structures on CTF3 and klystron teststand
SC RF	<b>Overtake the Niobium limits:</b> 1) research on multi-layer RF surface for high gradient superconducting cavities 2) research on new HTc material surface for low cryoless superconducting cavities  <b>Low beta cavities:</b> Push the high power limit of superconducting cavities for proton linacs : gradient, duty cycle, couplers
High field SC magnets gradient quadrupoles	<b>New means to improve the L-He cooling of high field superconducting magnets under extreme heat conditions:</b> 1) cryogenic studies of heat transfer with LHe through new micro-porous or ceramic insulation for SC cables 2) cryogenic studies of heat transfer in reduced gravity induced by large magnetic fields  <b>Nb3Sn dipole:</b> 1) design study for a 20 T dipole 2) construct a technology demonstrator model dipole magnet in the 15 T - 18 T range. 3) conductor development for the 20 T field range.
Cryogenic handling	<b>Cut cryogenic consumption:</b> 1) new techniques to improve large cryoplant efficiency (modelisation, energy recovery, centrifugal compressors) 2) new methods to improve the cryostat insulation and He distribution
Diagnostics	<b>Proton beams:</b> Develop non-interceptive bunch diagnostics for high intensity proton linacs



# R&D Key Issues

- SCRF
- normal and SC structures
- new sources and injectors
- targetry
- RF power sources
- radiation hard materials
- electron cloud control
- fast cycling SC magnets (for injectors)
- cryogenic handling
- .....
- .....













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New techniques for high gradient acceleration (laser-plasma etc.)				

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	<b>SG1 for task 4.1.1</b>	<b>SG2 for task 4.1.2</b>	<b>SSG1 for task 4.2.1</b>	<b>SSG2 for task 4.2.2</b>	
<b>xGx lead</b>					
<b>Contacts</b>					
<b>CEA</b>					
<b>CERN</b>					
<b>CNRS</b>					
<b>CIEMAT</b>					
<b>DESY</b>					
<b>GSI</b>					
<b>INFN</b>					
<b>PSI</b>					
<b>STFC</b>					
<b>Uppsala</b>					
<b>IFJ</b>					

# Objectives



# Planning



## Milestones/deliverables within the first 12 months

Milestone/ deliverable	Description	Time from start (months)
		1
		8
		12
		<i>1</i>
		<i>5</i>

\* Action item from WP 4, work in close interaction with WP 3