

TIARA: Structuring further Accelerator R&D in Europe

**PIGES Meeting
R. Aleksan
May 18th, 2011**

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- The background of the slide is a large, waving European Union flag, featuring a blue field with twelve golden stars arranged in a circle.
- 1. Introduction**
 - 2. General Context**
 - 3. Building TIARA**
 - 4. Conclusion**

The use of Accelerators

The development of state of the art accelerators is essential for many many fields of science (fundamental, applied or industrial)

Research accelerators

- Particle Physics, Nuclear Physics, Research fields using light source, Research fields using spallation neutron sources, Study of material for fusion, Study of transmutation...

In past 50 years, about 1/3 of Physics Nobel Prizes are rewarding work based on or carried out with accelerators

This « market » represents ~15 000 M€ for the next 15 years, i.e. **~1 000M€/year**

Clinical accelerators

- radiotherapy, electron therapy, hadron (proton/ion)therapy...

Industrial accelerators

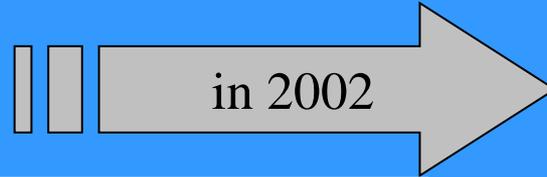
- ion implanters, electron beam and X-ray irradiators, radioisotope production...

This market represents **~3 000M€/year** and is increasing at a rate of **~10% /year**

Accelerator R&D in Europe (History and today's Organization)

1) ECFA 2001 Report “The Future of Accelerator-based Particle Physics in Europe”

“an improved educational programme in the field of accelerator physics and increased support for accelerator R&D activity in European universities, national facilities and CERN”



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R. Edgecock (CCLRC), E. Elsen (DESY),
S. Guiducci (LNF), J.-P. Koutchouk (CERN),
F. Richard (IN2P3/Orsay), L. Rivkin (PSI)



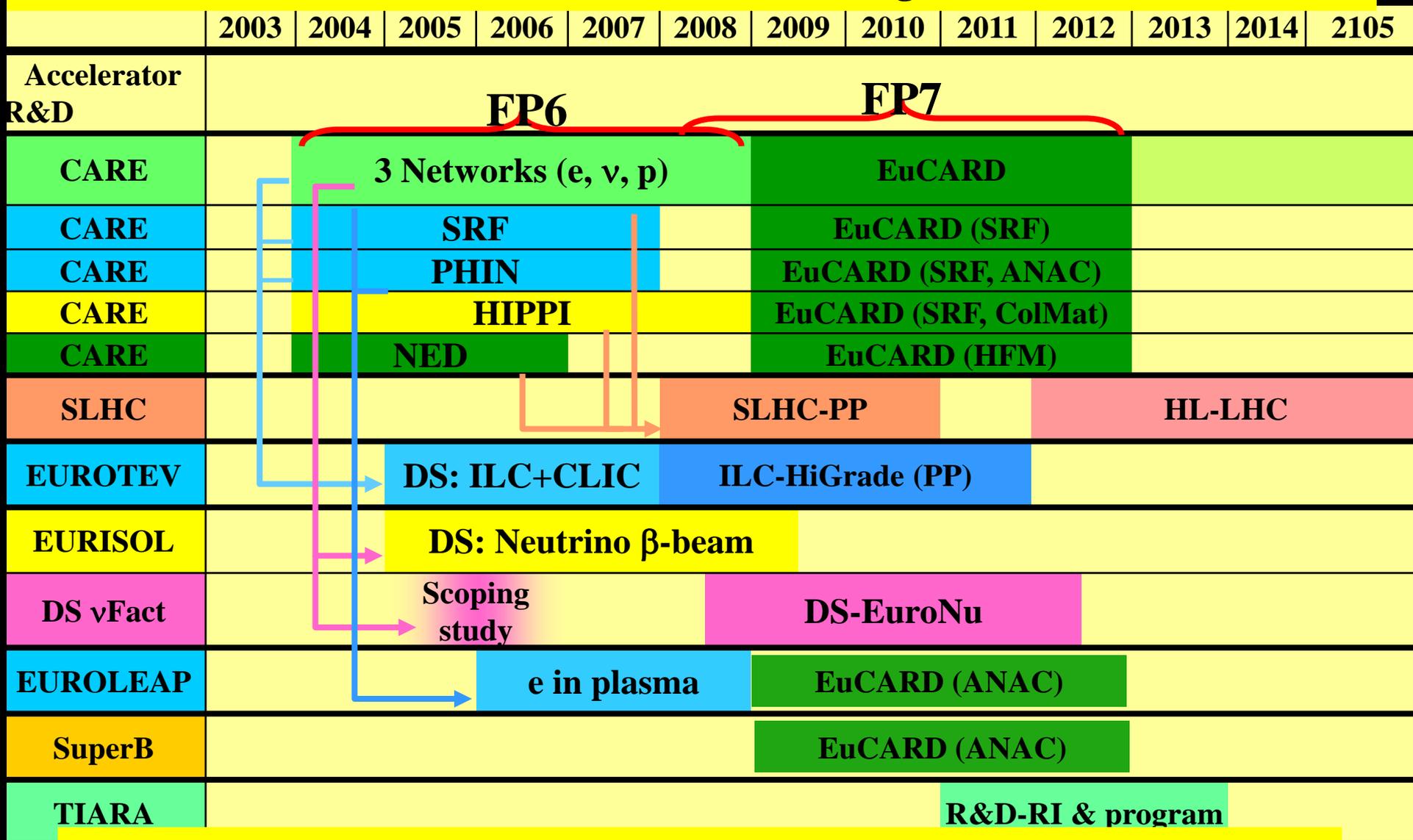
<http://esgard.lal.in2p3.fr>

ESGARD mandate develop and implement a Strategy to optimize and enhance the outcome of the Research and Technical Development in the field of accelerator physics in Europe

2) Absence of HEP in the FP of the EU

This strategy led to the preparation and implementation of a coherent set of collaborative projects using the incentive funding of the 6th and 7th Framework Programme.

ESGARD developed and implemented a strategy to promote Accelerator R&D with the incentive of the EC Framework Programme within ERA



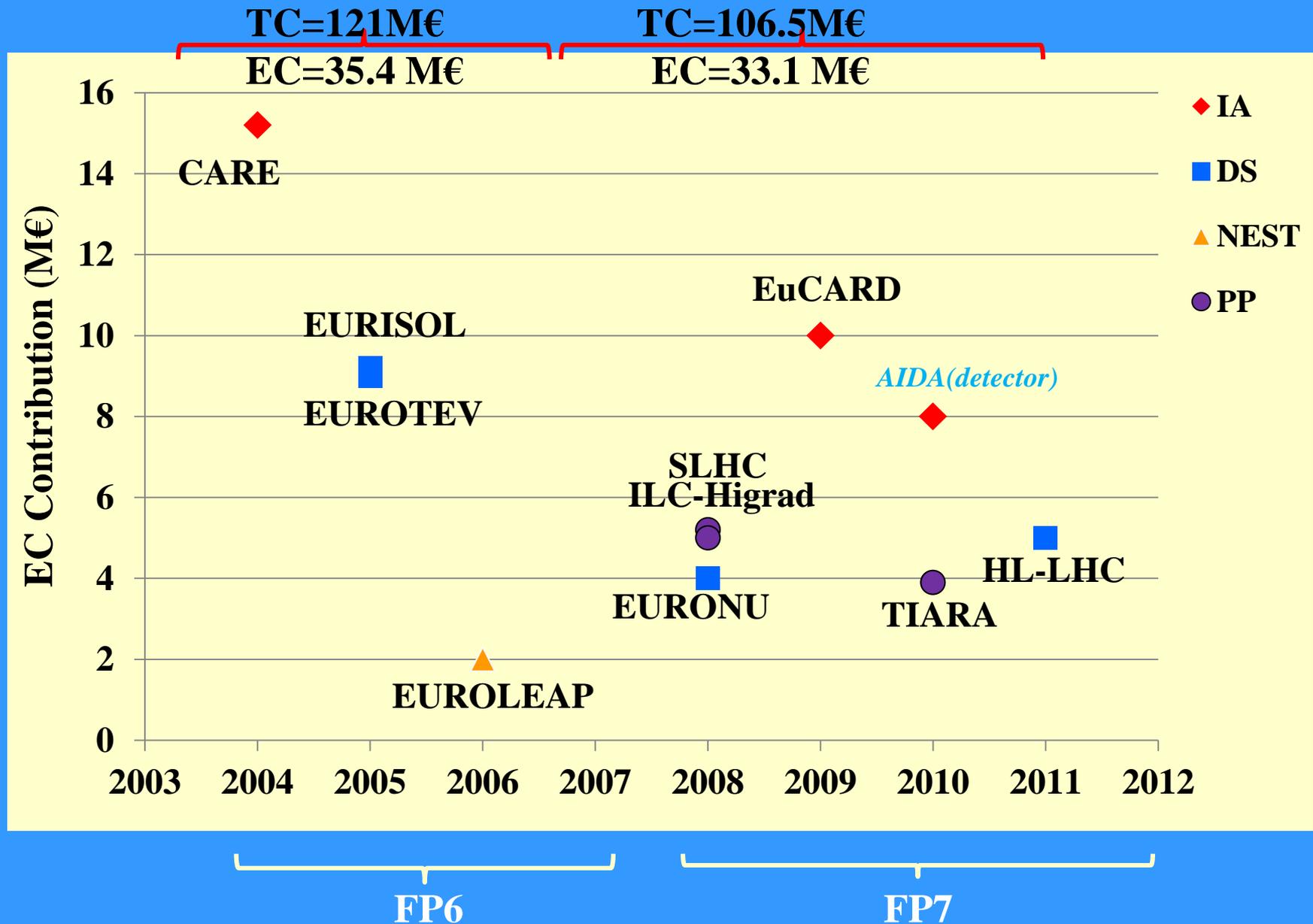
Altogether EC has partially financed projects in FP6 and FP7 with a total budget of ~197 M€ (60 M€ from EC)



FP7-Planning of calls and indicative budget

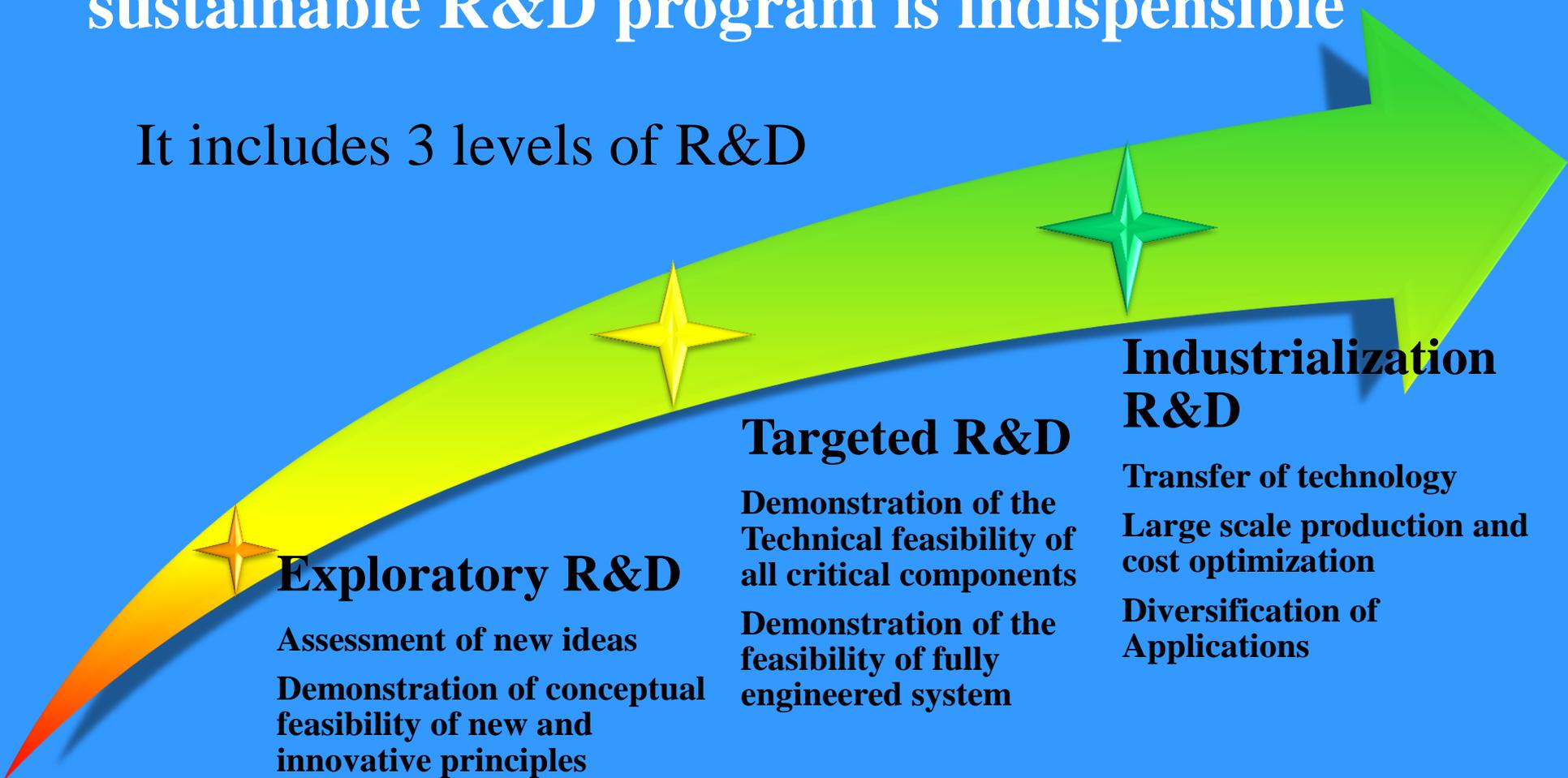
Total operational budget 1665 M€	Call 1 2007	Call 2 2007	Call 3 2008	Call 4 2008	Call 5 2009	Call 6 2010	Call 7 2011
Integrating activities			277		162	104	<100
e-Infrastructures	42	50	EuCARD	113	AIDA _x (detector)	IA-accel. R&D	
Design studies	31					20	
Construction – Support to the Preparatory Phase	147				45	HL-LHC	
Construction – Support to the Implementation Phase					TIARA		
			RSFF (200 M€) + 130 M€			30	
Policy Development and Programme Implementation	8	14	5		9.94	9.5	x
						CRISP	
Total per call (M€)	228	64	282	113	216.9	163.5	CAPACITIES

But many indications that EC funding will diminish steadily
Trend for FP8 is to finance programme instead of projects



To be able to build future accelerators, a strong sustainable R&D program is indispensable

It includes 3 levels of R&D



It requires large and costly infrastructures



We have to think at the European level, at least

We have to think beyond

ESGARD is already carrying out a coordination leading to development of well organized European wide integrated R&D project for Particle Physics (see the high success rate of FP proposals).

Building on this experience, we can and need to go further

A structure and mechanism that ensures **the sustainability of accelerator R&D useful for many fields**, which includes

⇒ **The integration of R&D infrastructures and offered services within a general framework (including industry)**

⇒ **The development of a joint R&D program and the launching of a set of consistent integrated accelerator R&D projects**

⇒ **The promotion of the education and training for accelerator sciences**

⇒ **A model for financing all of the above**

TIARA website: <http://www.eu-tiara.eu>



Test Infrastructure and Accelerator Research Area

A multi-field, coordinated pan-European distributed infrastructure

*Joint particle accelerator R&D programming in Europe
and the integration of the required infrastructures*

The Virtuous Triangle

**Innovations for
Cultural, Medical,
Industrial...
applications**

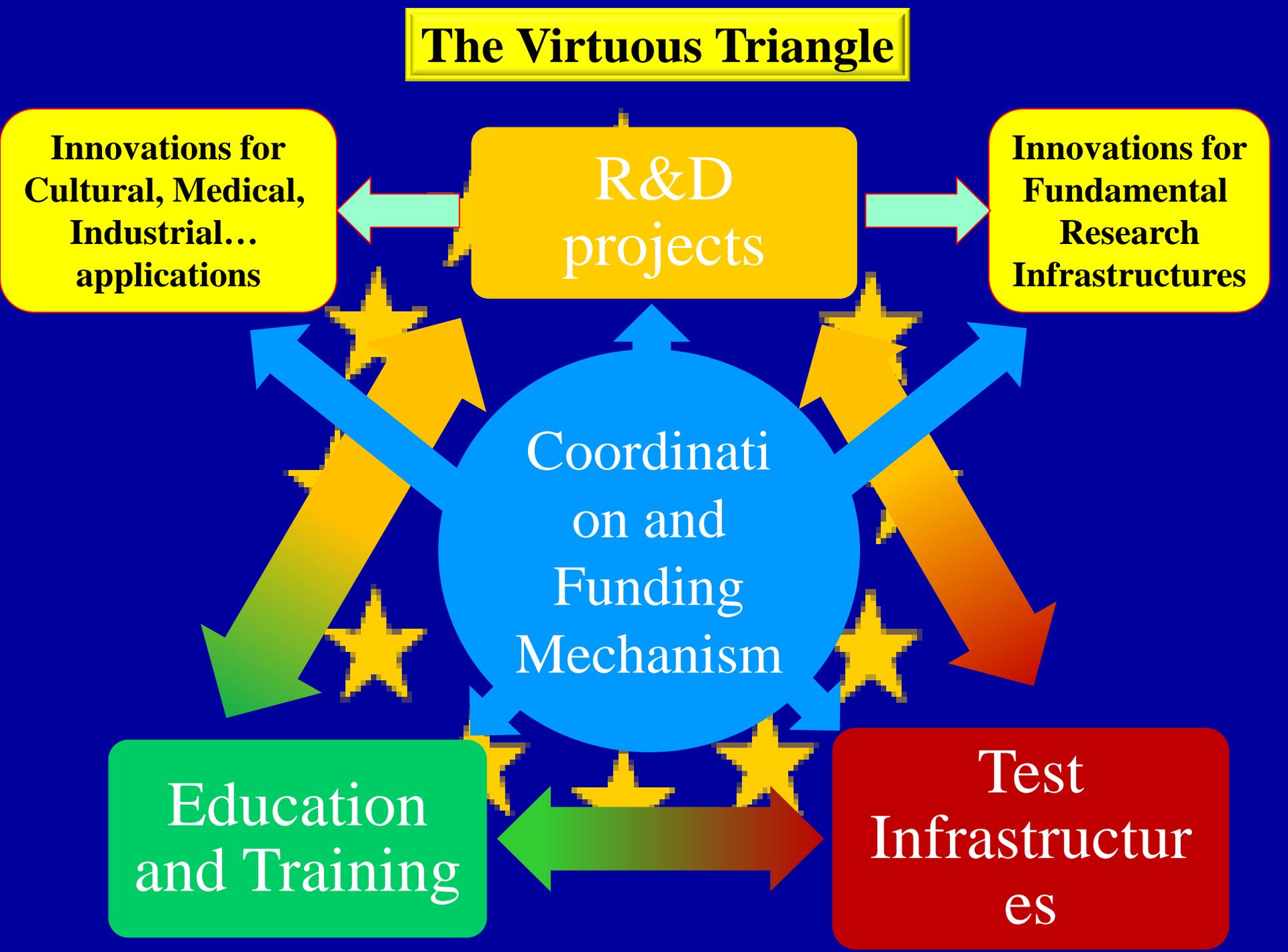
**R&D
projects**

**Innovations for
Fundamental
Research
Infrastructures**

**Coordinati
on and
Funding
Mechanism**

**Education
and Training**

**Test
Infrastructur
es**





*Test Infrastructure
and
Accelerator Research Area*



Creation of a coordinated panEuropean multi-purpose distributed Test Infrastructure



Joint Strategic Analysis of the accelerator needs and perspective for the development of R&D RI



Joint R&D programming and launching of a set of consistent integrated accelerator R&D projects



Promotion of the education and training for accelerator science



Strengthening the collaboration with the industry

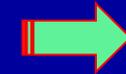


Test Infrastructure and Accelerator Research Area

Needed Infrastructures

★ Test accelerators
for carrying accelerator R&D

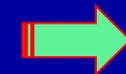
10-100M€



TIER1

★ Specific large scale equipments

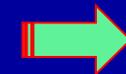
1-10M€



TIER2

★ Laboratory equipments

0.1-1M€



TIER3

A rough estimate of all these infrastructure is **500-1000 M€**

**These infrastructures need to be upgraded and/or
new infrastructures are necessary**



Creation of a coordinated panEuropean multi-purpose distributed Test Infrastructure



Monitoring and coordinating the use and the development of the European test infrastructures for accelerator R&D



Monitoring accesses, including industry involvement



Identifying weaknesses and needed upgrades/investments and assessing their costs



Making recommendations and contributing to upgrade and/or construction of new R&D Infrastructures as well as their corresponding R&D programs





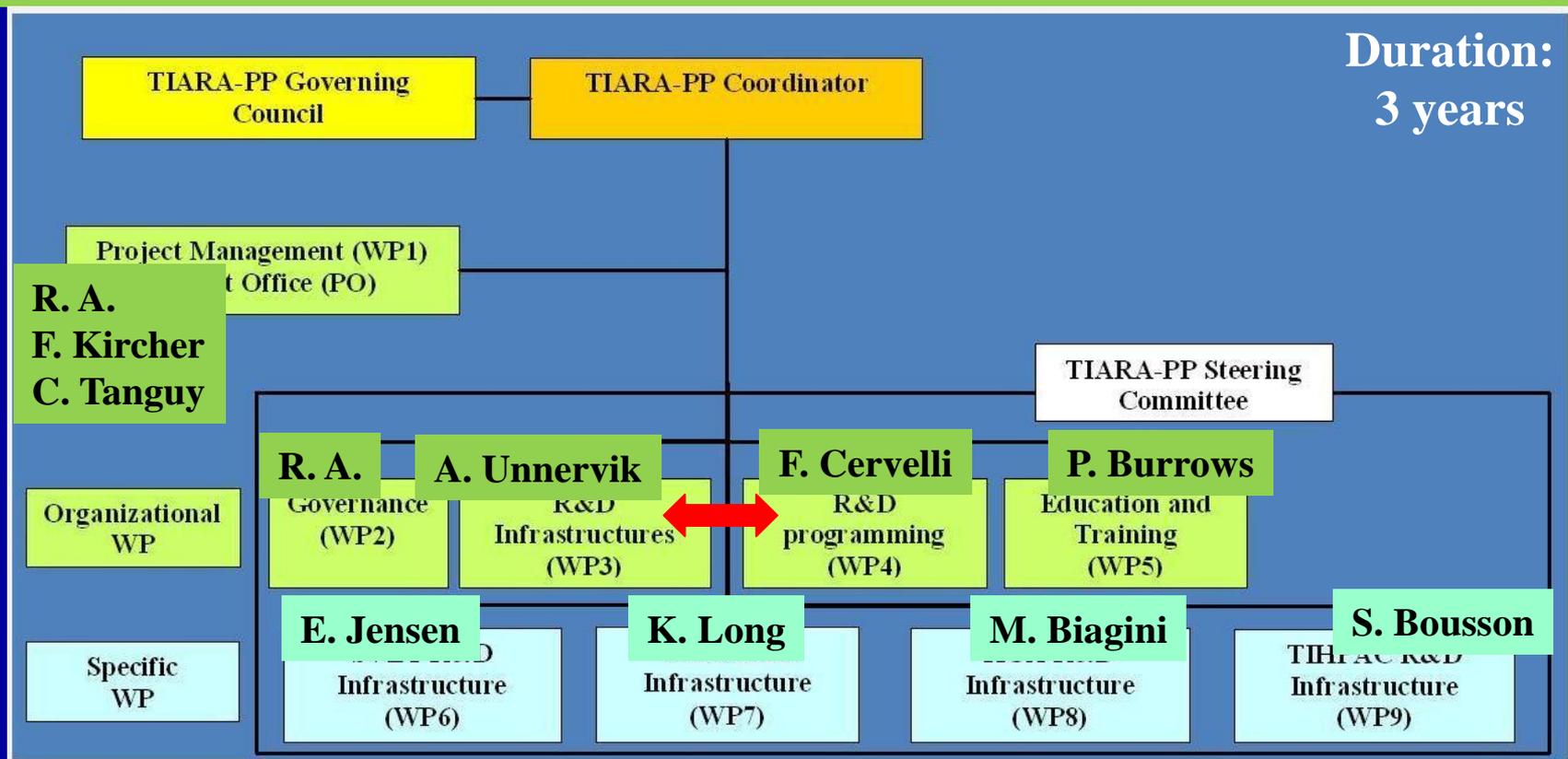
Test Infrastructure and Accelerator Research Area

11 participants (8 countries + 1 int. organisation)

Number	Organization Name	Country
1 (coordinator)	CEA	France
2	CERN	International
3	CNRS	France
4	CIEMAT	Spain
5	DESY	Germany
6	GSI	Germany
7	INFN	Italy
8	PSI	Switzerland
9	STFC	UK
10	Uppsala University (rep. Nordic Consortium)	Sweden
11	IPJ-PAN	Poland

September 18th: TIARA has been presented and approved by the CERN Council at the European session of the Council

TIARA proposed to the PP call in Dec. 2009 and accepted in 2010



Total Cost: € 9 139 196

EC contribution: € 3 900 000



Status



- *Official start 1/1/2011*
- *February 23-24, 2011: TIARA-PP Kickoff meeting at CERN*



Deliverables



Num	Nat[1]	Short name	Description	month		
D1.1	O	✓	OWSF	Overall Web Site Frame ready	1	PU
D1.2	O	✓	CAP	Consortium Agreement between participants ready	1	CO
D1.3	O	✓	CCE	Contract of the Consortium with the EC signed	1	CO
D1.4	O	✓	OKM	Organization of the Kickoff meeting	1	CO
D1.5	O	✓	IWSF	Internal Web Site Frame Ready	2	CO
D4.1	R	✓	KIR	General Report on Key Accelerator Research Areas and Key R&D Issues	5	PU
D6.1	R		D_SLS_NOW	Report on existing hardware limitations and needed upgrades.	9	PU
D5.1	R		ETR	Education and Training Survey Report	10	PU
D2.1	O		MoA-GI	Memorandum of Agreement on General Issues	12	CO
D3.1	R		ISR	Infrastructure Survey Report.	12	PU
D5.2	O		ETD	Education and Training resources Database	14	PU
D7.1	R		RFSysV-Spec	Report on the design and specification of ICTF RF power distribution system for MICE Step V	15	PU
D3.2	O		IWD	Infrastructure Web-based Database.	16	PU
D1.6	R		TTR	Midterm Report	18	CO
D2.3	R		COB	Report on Collaboration with Other Bodies	18	CO
D6.2	R		D_SPEC	Specifications ready	18	PU

➤ *June, 2012: TIARA-PP Mid-Term meeting in Madrid*



Deliverables (cont'd)



Num	<u>Nat</u> <u>[1]</u>	Short name	Description	month	
D5.3	R	ASR	Needs for Accelerator Scientists Report	22	PU
D2.2	R	AMO	Report on Advisory Mechanisms and Organization	24	CO
D2.4	R	CDO	Report on Communication, Dissemination and Outreach Structure	24	CO
D2.5	R	FMN	Report on Financial Management Needs	24	CO
D3.3	R	INR	Infrastructure Need and Resource comparison.	24	PU
D3.4	R	IAR	Infrastructure Access Report (task 3.4).	24	PU
D4.2	R	PAR	R&D Projects Access Report.	24	PU
D6.3	O	D_IMPL	Hardware installed	24	PU
D8.1	O	SPARC-C	Construction of accelerating structures	29	PU
D3.5	R	RUC	Report on potential Upgrades and/or Construction of New R&D Infrastructures in Europe.	30	PU
D6.4	R	FINAL_R	Final report	30	PU
D2.6	O	MoA-ITI	Memorandum of Agreement on Initial TIARA Infrastructures	33	CO
D3.6	R	JTI	Joining the TIARA distributed accelerator R&D Infrastructure and defining structures for sustaining and maintaining the Infrastructure data base.	33	PU
D4.3	R	TTR	“Toward TIARA”. Final plan of the collaborative R&D Program.	33	PU
D5.4	R	PAR	Recommendations for Promoting Accelerator Science and Technology in Europe Report	33	PU
D7.2	R	RFamp1	Report on commissioning of the first RF amplifier system in the ICTF Hall.	33	PU
D9.2	R	TDCC	Technical Design Report on the SC Cavity test Cryostat	33	PU
D2.7	R	MoU-FIE	MoU on Financial Model and Engineering	34	CO
D2.8	R	MoU-LID	MoU on Legal Issues and Documents	34	CO
D8.2	R	SPARC-T	Installation, commissioning and test report of the C-band Linac at SPARC	35	PU



Deliverables (cont'd)



Num	<u>Nat</u> <u>[1]</u>	Short name	Description	month	
D1.7	R	FTR	Final Report	36	CO
D2.9	O	F-MoA	Final Memorandum of Agreement	36	CO
D7.3	R	RFSysVI -Spec	Report on the design and specification of ICTF RF power distribution system for MICE Step VI (full ICTF implementation)	36	PU
D7.4	R	RF_Amp I-DR	Design report of a 3 MW power amplifier	36	PU
D9.1	R	TDIF	Technical Design Report of the Multi-MW test Irradiation Facility	36	PU



Industry



One of the goals of TIARA is to strengthen relations with industry.

Several aspects of TIARA concern industry

WP2:

- *Should and how associate the industrial sector in TIARA Governance*

WP3:

- *Study options for sharing R&D infrastructures and developing joint R&D Infrastructures with the industry*
- *Define technology roadmap for the development of future accelerator components in industry.*

WP4:

- *Develop an accelerator R&D programme in Europe*

WP5:

- *Survey of the numbers of students, courses, and teaching resources*
- *Evaluation and Study of the development of the market for Accelerator Sciences*
- *Establish a plan of action for promoting Accelerator Science and Technology*

Conclusions

After having established an accelerator R&D strategy, implemented through several projects in FP6 and FP7, ESGARD is proposing to go one step further with the TIARA Concept, submitted to the EC as a Preparatory Phase project

The EC has approved TIARA with an EC funding of 3.9 M€. The project is on track for signing the contract in the fall.

TIARA will hopefully establish the groundbase for supporting sustainably Accelerator R&D and infrastructures in Europe through “program funding” in FP8

Accelerator science is a powerful mean
toward scientific, technical
and industrial breakthroughs...

TIARA will strengthen significantly this potential

