# TIARA: Structuring further Accelerator R&D in Europe

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# 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"**

in 2002

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

ESGARD

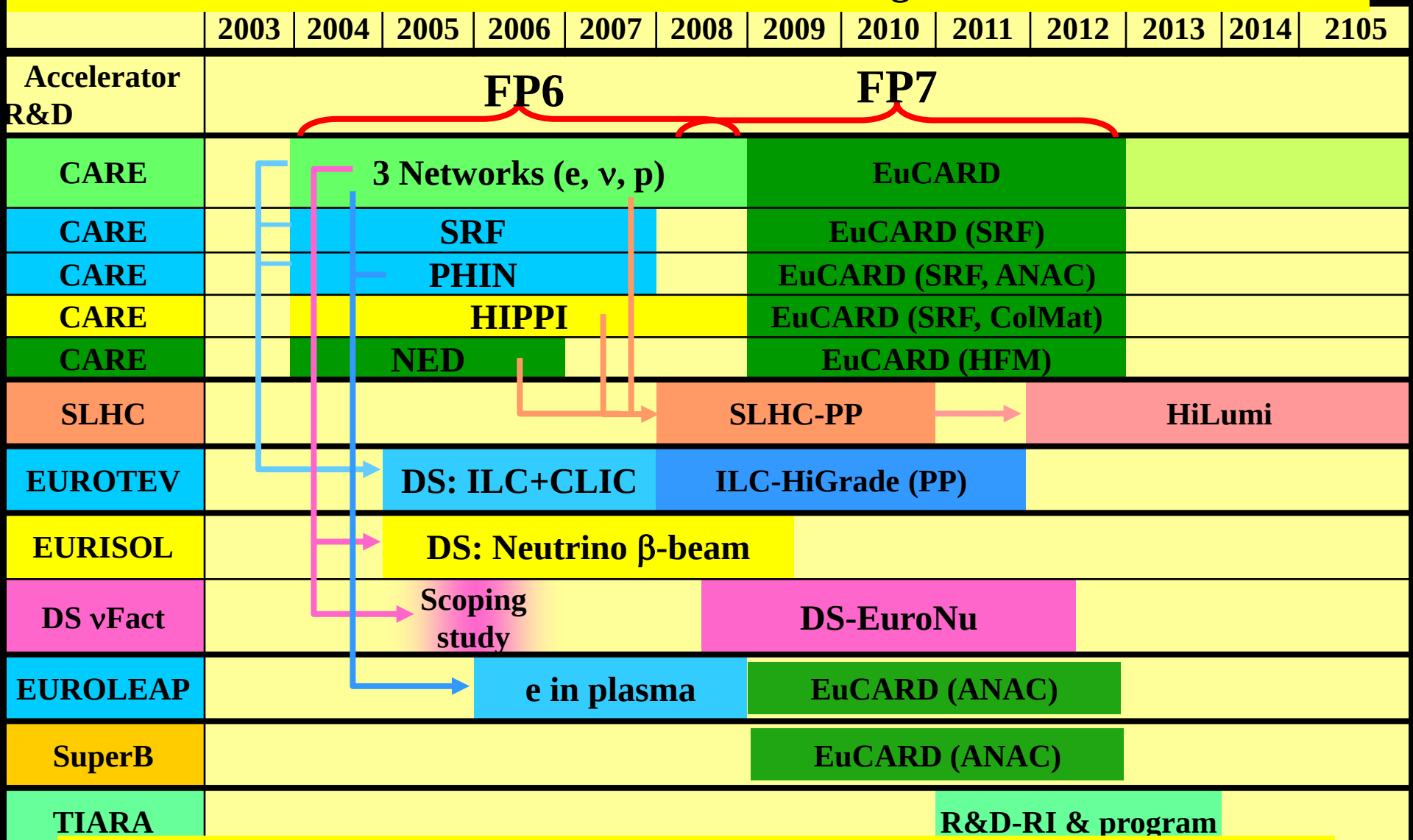
**http://www.esgard.org**

**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**

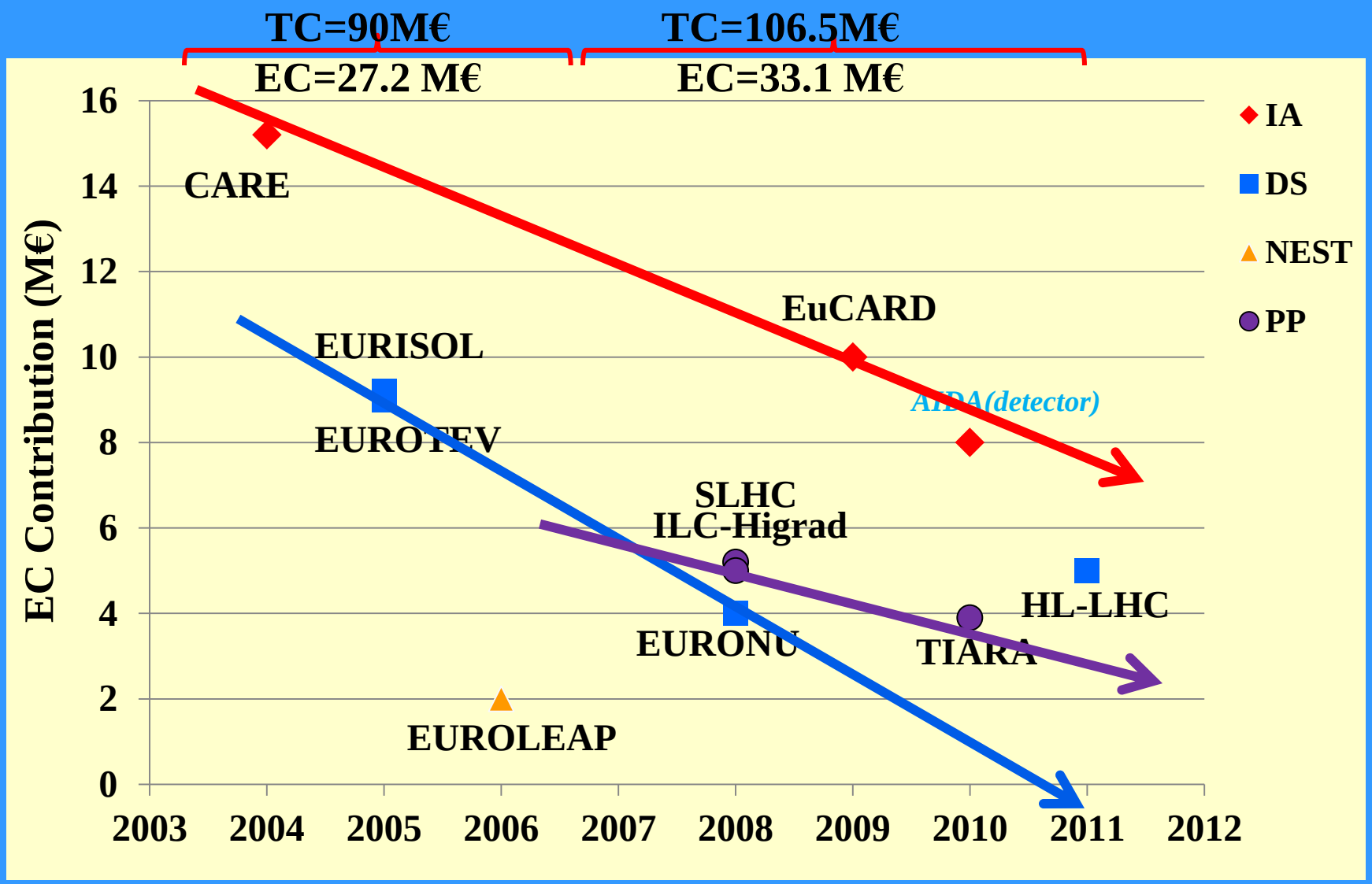
**This strategy led to the preparation and implementation of a coherent set of collaborative projects using the incentive funding of the 6th and 7th Framework Programme.**

**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)**

**But the trend seems that the EC funding is diminishing steadily**
**For FP8, the EC wishes to support of the implemetation and operation of RI**




FP6 FP7

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

It includes 3 levels of R&D

## Exploratory R&D

**Assessment of new ideas**

**Demonstration of conceptual feasibility of new and innovative principles**

## Targeted R&D

**Demonstration of the Technical feasibility of all critical components**

**Demonstration of the feasibility of fully engineered system**

## Industrialization R&D

**Transfer of technology**

**Large scale production and cost optimization**

**Diversification of Applications**

**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 <u>many fields</u>**, 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 science and technology**
- **A model for financing all of the above**

# Test Infrastructure and Accelerator Research Area

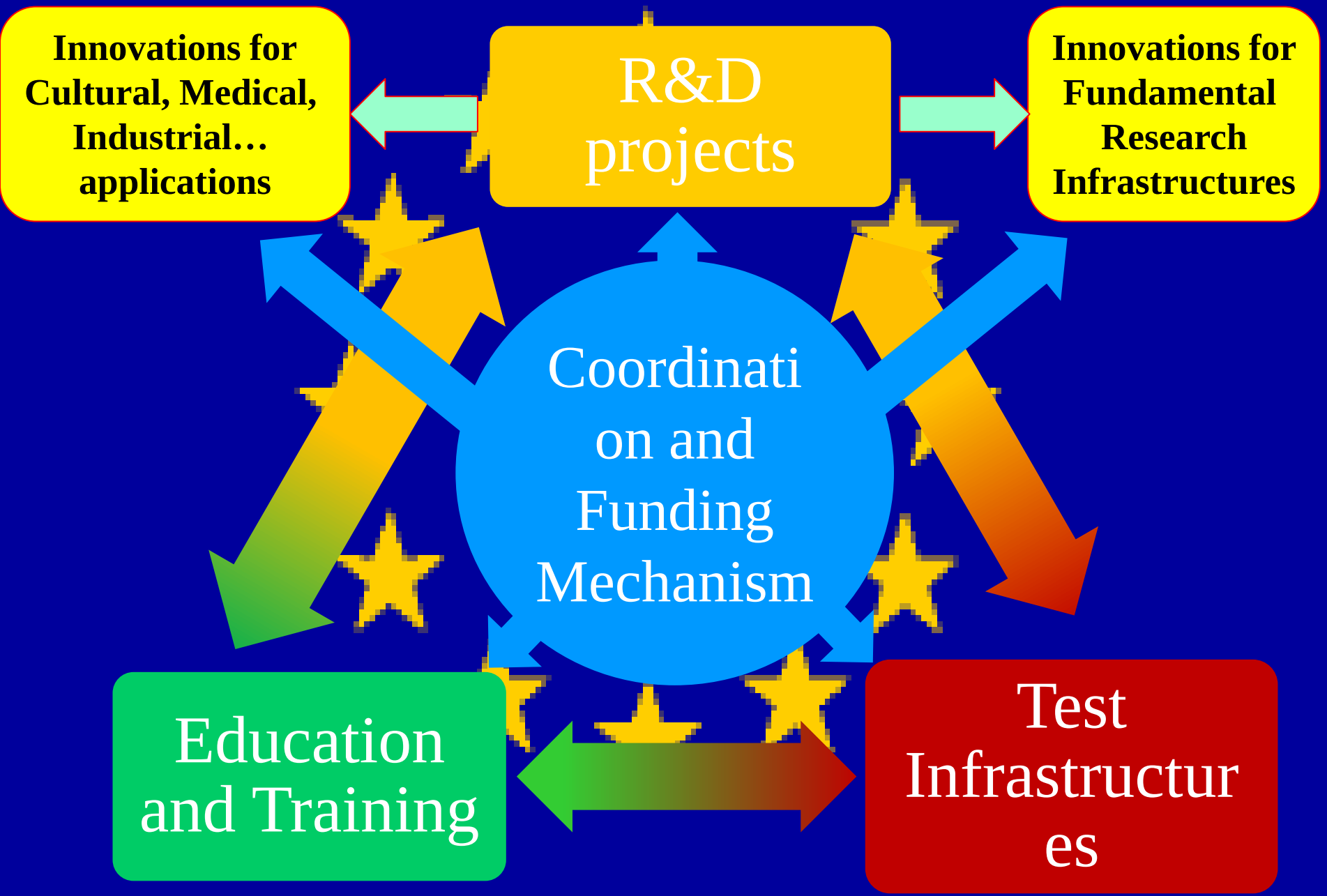
**TIARA website: http://www.eu-tiara.eu**

**Accelerating Knowledge and Innovation**

**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



Tiara

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**

# 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
- Facilitating accesses to R&D RIs, 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

# 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 |

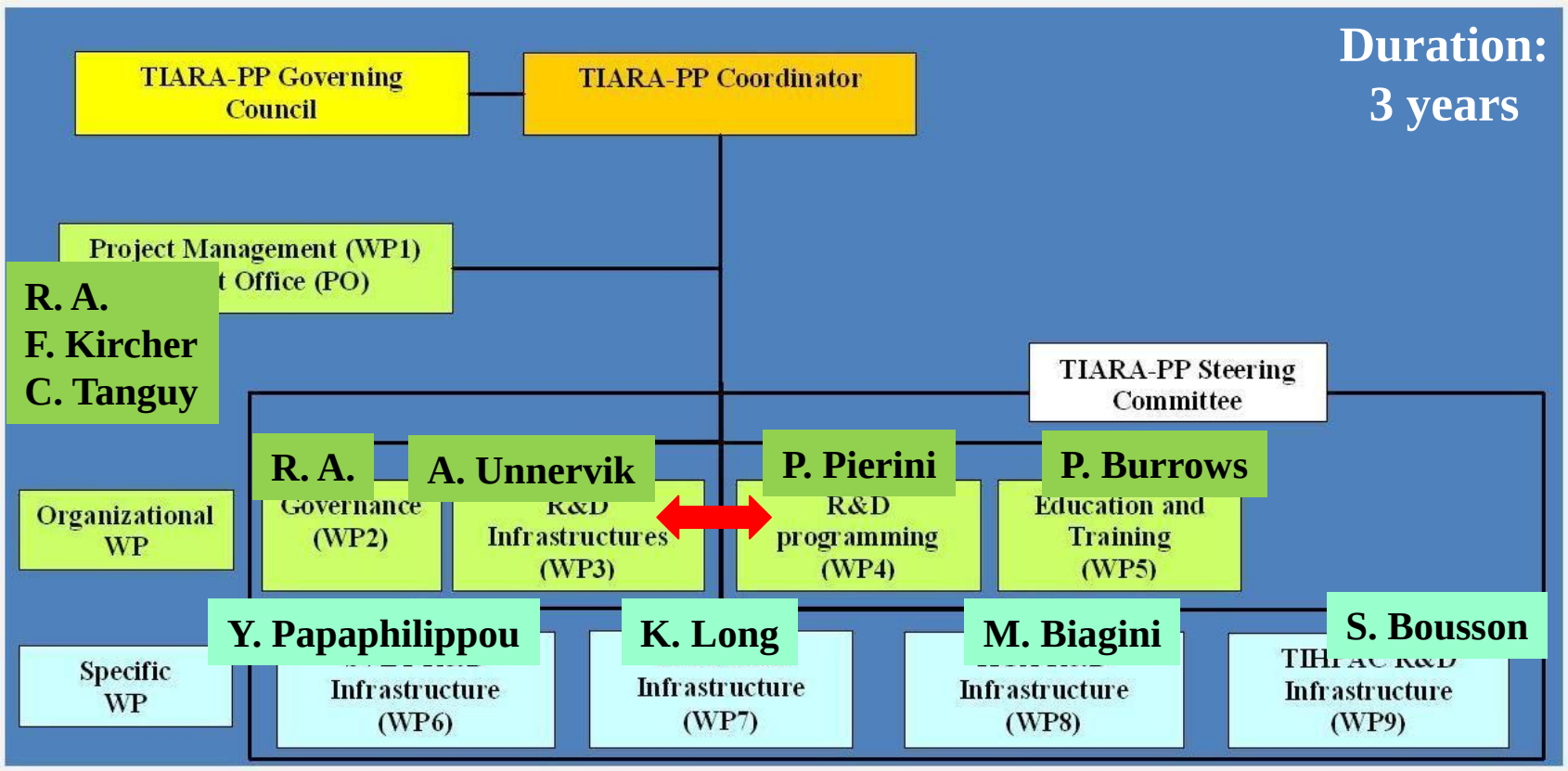
Tiara

http://www.eu-tiara.eu

Test Infrastructure and Accelerator Research Area

***2009, Sept. 18th*** **: TIARA has been presented and approved by the CERN Council at the European session of the Council**

**FP7-PP call in Dec. 2009, accepted in 2010 and started in 2011**




***Total Cost: € 9 139 196 EC contribution: € 3 900 000***

# Organization (cont'd)

## 1. Management of TIARA-PP

- ***WP1:*** ***Management of the consortium*** ***(MGT)***
  Objective: Organization of the Preparatory Phase work, Dissemination and outreach

## 2. General Coordination and Support Work Packages

- ***WP2: Governance of TIARA (SUPP)***
  Objective: Developing governance allowing one to involve as many fields as possible
- ***WP3: Accelerator R&D Infrastructures in Europe (COORD)***
  Objective: Integrating and optimizing European Infrastructures for accelerator R&D
- ***WP4: Joint R&D programming (COORD)***
  Objective: Defining a Joint R&D Programme in the field of accelerator science
- ***WP5: Education and Training for accelerator sciences (SUPP)***
  Objective: Promoting education and training for accelerator research in Europe

# Organization (cont'd)

## 3. Specific RTD Work Packages

- ***WP6: SLS Emittance Tuning System Infrastructure (SVET)***

Objective: Upgrade of SLS at PSI for very low emittance studies
Main interested projects: CLIC, Light Sources, SuperB

- ***WP7: Ionisation Cooling Test Facility (ICTF)***

Objective: Upgrade of Test Infrastructure at RAL for ionisation cooling studies
Main interested projects: Neutrino Factory

- ***WP8: High Gradiant Acceleration Infrastrcuture (HGA)***

Objective: Construction at LNF of SC C-Band High Gradiant Test Infrastructure
Main interested projects: SuperB, FEL

- ***WP9: Test Infrastructure for High Power Accelerator Components (TIHPAC)***

Objective: Design of infrastructures for multi MW target complex tests and of test cryostat for SC low beta SC cavity tests
Main interested projects: EURISOL, ESS, MYRRHA

# Status

- ***Official start 1/1/2011***
- ***February 23-24, 2011*:**
  **TIARA-PP *Kickoff at CERN***
- ***November 8-9, 2011:***
  ***Governing Council in Uppsala***

**Next large event**

# Conclusions

After having established an accelerator R&D strategy, implemented through several projects in FP6 & FP7, ESGARD proposed to go one step further with the TIARA Concept.

The EC has approved TIARA as a Preparatory Phase project with an EC funding of 3.9 M€.
The project has started on 1/1/2011 and is on track.

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 and innovations…

TIARA will strengthen significantly this potential