February 4th 2008

Introduction to the DevDet project

DevDet

Combination of Collaborative Project and Coordination and Support Action for Integrating Activities

Capacities – Research Infrastructures

FP7-INFRASTRUCTURES-2008-1

Full proposal name: **Development of Detectors for Particle Physics Experiments**

Coordinator: CERN
Planned duration: 4 years
Planned starting date: January 1st 2009

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DevDet stands for: "Development of Detectors"

DevDet addresses infrastructures required for the development of detectors for future particle physics experiments.

It is the first project coordinated by the RECFA[1] Coordination Group for Detector R&D in FP7 programs and responds to the FP7-INFRASTRUCTURES-2008-1 call from the European Commission.

In line with the European strategy for particle physics[2] DevDet targets the communities preparing experiments at a number of key future accelerators: SLHC (luminosity-upgraded LHC), future Linear Colliders (ILC and CLIC), future accelerator-driven neutrino facilities and B-physics facilities (e.g. Super-B). This covers almost all detector R&D for particle physics in Europe.

The infrastructures covered by the DevDet project are key facilities required for an efficient development of the future experiments, such as: test beam infrastructures (at CERN and DESY), specialised equipment irradiation facilities (in several European countries), common software tools, common microelectronics tools and engineering coordination offices.

The DevDet proposal is currently under preparation.

[1] Restricted sub-group of the European Commiittee for Future Accelerators, http://committees2.web.cern.ch/Committees2/ECFA/Welcome.html

[2] http://council-strategygroup.web.cern.ch/council-strategygroup/Strategy_Statement.pdf

Background and origin of DevDet

The European Strategy for particle physics.

The CERN council, in its official role of defining the future strategy and direction for European particle physics research, unanimously adopted a document describing "the European strategy for particle physics" in July 2006. The strategy document covers both scientific issues and organisational issues that can be summarized in short in the following way:

- **Scientific activities**: R&D for accelerators and detectors crucial for European Particle Physics in the next 5-year period (in parallel with LHC startup and operation). In order of priority, the following future facilities are listed:
  - SLHC, the luminosity-upgraded Large Hadron Collider
  - Linear colliders (CLIC and LHC)
  - Future neutrino facilities
  - Flavour physics facilities
- **Organizational issues** emphasized:
  - Process of defining and updating the European strategy (through the CERN council and its bodies)
  - Coordination of work on a large scale
  - Strengthening of the relationship between the European Research Area and the organisation and structures in European particle physics

RECFA Coordination Group for Detector R&D in FP7 programs:

European coordination group for Detector R&D, following the successful model of ESGARD, covering accelerator R&D
For particle detector R&D the activities are much more widely distributed than for accelerator R&D. The major stakeholders are the main experiments being planned for: SLHC, Linear Collider (e.g. EUDET collaboration), Neutrino and Flavour physics. Therefore RECFA created in 2007 a Coordination Group with representatives for these planned experiments, as well as representatives from the CERN and DESY laboratories. The current composition of the group is:

- Joachim Mnich, EUDET (Linear Collider Detectors)
- Nigel Hessey, upgrade coordinator of the ATLAS experiment at LHC
- Jordan Nash, upgrade coordinator of the CMS experiment at LHC
- Alain Blondel, representing neutrino detectors
- Francesco Forti, representing flavour physics detectors
- Lucie Linssen, representing CERN
- Rolf Heuer, representing DESY
- Gilbert Guignard, ESGARD contact person

The group is lead by Norman McCubbin and Steinar Stapnes.

Most of the European detector R&D is focused and organised as part of the above collaborations or proto-collaborations.

The National Contact Group

The national contact group is a reference group with national representatives. Given that detector R&D is a very widely distributed activity with many potential project partners, it is important to have discussion partners in each European country that can:

- Help to identify the major detector R&D activities in each country.
- Help to identify one (or a few) potential contract partners for EU proposals in the area of detector R&D (this could typically be national labs taking on coordination roles within one country, or a leading institute).
- Provide guidance to the Coordination Group during the proposal planning phase.

The nominations of the RECFA coordination group for Detector R&D and the National Contact group are important elements in the implementation of the European strategy for particle physics. Both bodies are currently focusing their work on the DevDet proposal.

DevDet addresses the two main objectives of the European Strategy for Detector R&D - at a European Scale

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Snapshot status overview of European priority projects and their relation to Detector R&D

European priority projects (focus on detectors)	Timescales	Current Phase	Key R&D issues
SLHC = Upgrade of LHC detectors for increased luminosity in 2016	Technical Design Reports (TDR) 2011	Wide R&D focusing on key technology developments; irradiation and testbeam measurements starting	Electronics, Simulations/software, Irradiation and testbeam measurements
Linear Collider Detectors for next large international accelerator project	Letter of Intend 2008-9, then towards TDR	System studies in testbeam next, individual tests ongoing (EUDET)	Simulations/software, Integration, System tests in beams
Neutrino Detector Studies	Design studies to be concluded in 2012	Design studies, testbeam studies next step	Simulation/Software, Integration, Testbeam measurement low energy
Flavour Physics at SuperB	Conceptual Design Report in 2007, Technical Design Report next	Design studies, testbeam measurements next step	Simulaton/Software, Testbeams with low energy and high intensity

DevDet project

Devdet covers 11 work packages:

- 4 work packages (networks) that will enable detector R&D and detector design (software/simulation, electronics, integration support)
- 3 transnational access work packages that cover access to all European facilities that are deemed essential for detector R&D in the next phase (access for all)
- 3 work packages that make these facilities accessible, build the necessary infrastructure to put detector elements into them, and provide support improvement and for operation of these infrastructures
- 1 work package for the overall management of the project and for the outreach activities

FP7 IA project: DevDet

WP#	Type	Task	Description
1	**MGT**		**Management of the consortium**
		1.1	Managerial, finances, admin
		1.2	Outreach, web pages
2	**COORD**		**Simulation and reconstruction tools for particle physics**
		2.1	General purpose detector geometry description package
		2.2	Reconstruction software
		2.3	Detailed Simulation Software Development
		2.4	Parallelization of Software Frameworks to exploit Muti-core processors
3	**COORD**		**Microelectronics and interconnect technologies for particle physics experiments**
		3.1	Microelectronics Technologies and enabling Tools
		3.2	Shareable IP blocks for HEP
		3.3	3D Interconnect
4	**COORD**		**Project office for Linear Collider detectors**
		4.1	Project office tools and standards
		4.2	Coordination of the EUVIF infrastructure
		4.3	Cooridnation of detector integration at LC forward region
5	**COORD**		**Coordination office for long baseline neutrino experiments**
		5.1	Coordination and information exchange
		5.2	Definition and planning of test beam activities
		5.3	Coherent evaluation of CDR options
6	**SUPP**		**Transnational access CERN**
		6.1	Test beams and irradiation facilities
7	**SUPP**		**Transnational access DESY**
		7.1	Test beams
8	**SUPP**		**Transnational access European irradiation facilities**
		8.1	Access to UCL facilities, Louvain, Belgium
		8.2	Access to Prague facilities, Czech republic
		8.3	Access to Forschungscentrum Karlsruhe facilities, Germany
		8.4	Access to Ljubljana university facilities, Slovenia
		8.5	Access to Uppsala TSL facilities, Sweden
		8.6	Access to Bunel university facilities, United Kingdom
9	**RTD**		**Construction of irradiation facilities**
		9.1	GIF++ photon irradiation facility
		9.2	Proton and mixed field irradiation facility
		9.3	Qualification of materials and common database
10	**RTD**		**Test beam infrastructures for fully integrated detector tests**
		10.1	Beam line(s) set-up and generic infrastructure (e.g. expt. magnets)
		10.2	Common DAQ and detector controls for integrated detector tests
		10.3	Tracking infrastructure
		10.3.a	Vertex
		10.3.b	Intermediate tracker
		10.3.c	Improvement of gageous infrastructure
		10.4	Calorimeter prototype infrastructure
		10.4.a	Electromagnetic calorimeter
		10.4.b	Hadron calorimeter
		10.4.c	Very Forward Calorimeter
		10.5	Particle flow reconstruction and grid infrastructure, software for integrated testbeams
		10.6	Qualification of silicon sensors using standardised tests structures and procedures
11	**RTD**		**Test beam infrastructures for stand-alone detector tests**
		11.1	Basic infrastructures in the testbeams
		11.2	Moveable equipment: DAQ, DCS, trigger, telescopes, trigger
		11.3	Related infrastructures for preparation and post measurements

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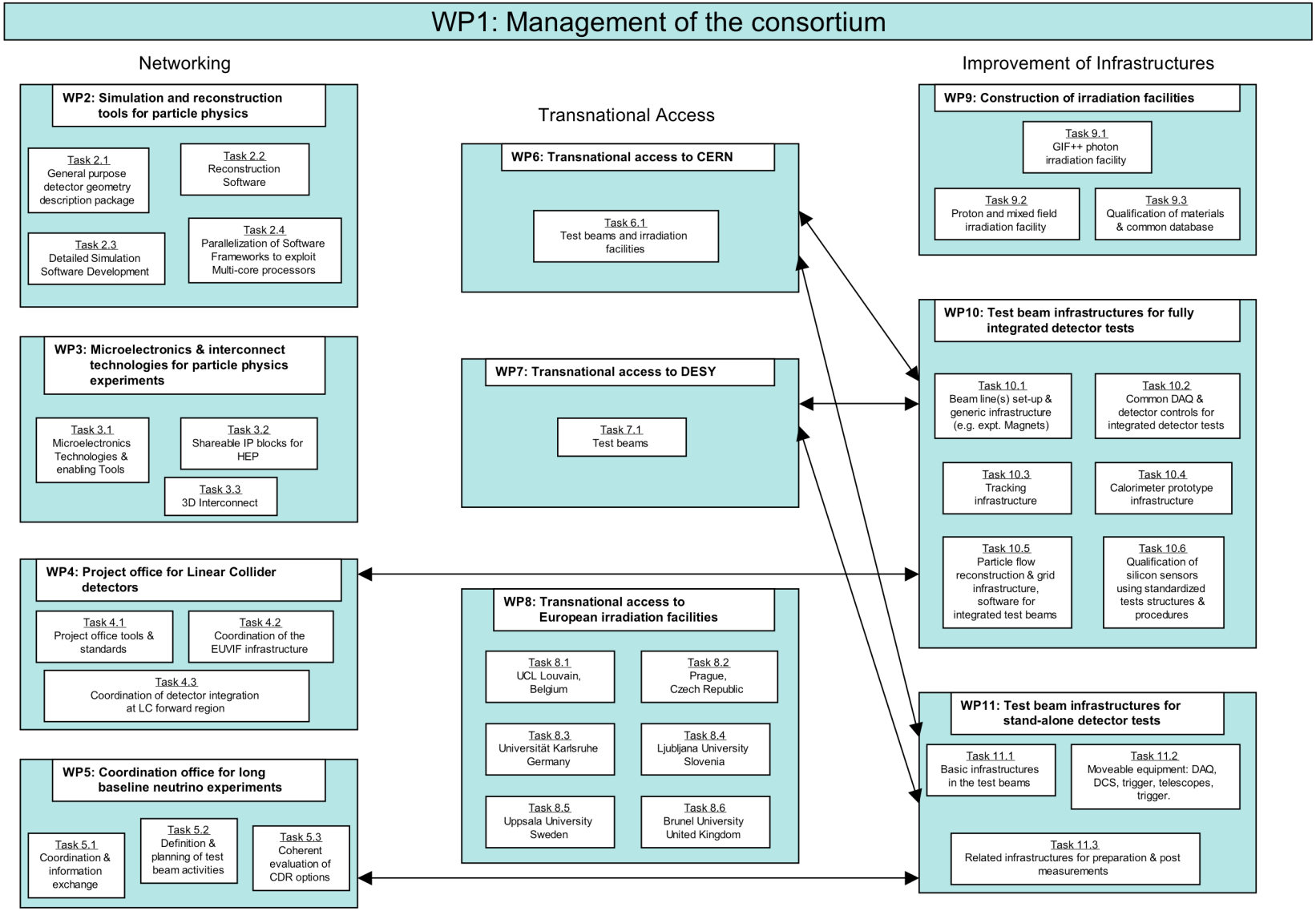
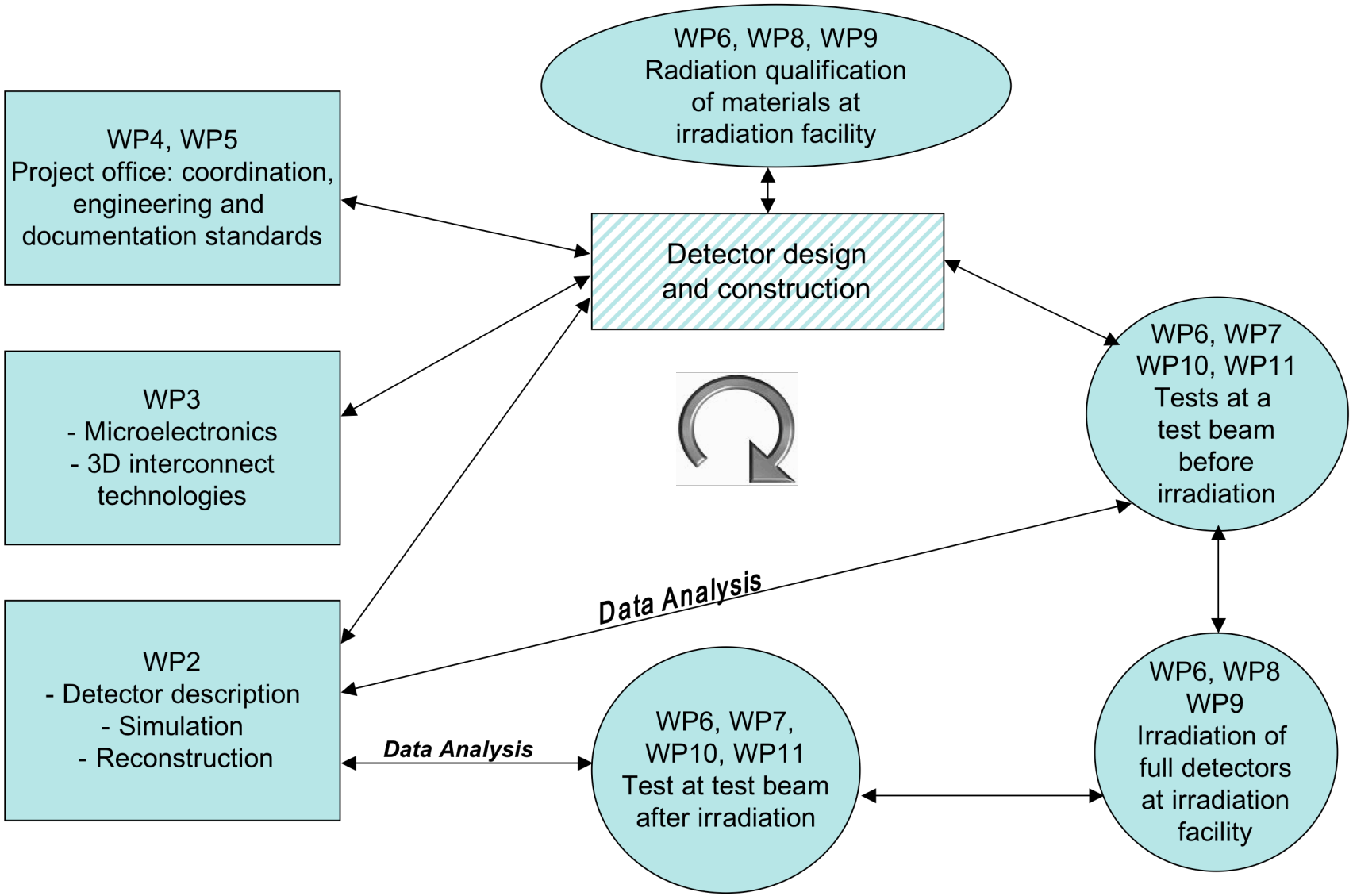
Diagram of DevDet work packages





Process of detector construction and its relation to DevDet work packages

WP#	Type	Description	Indicative EU budget request (Meuro)
1	MGT	Management of the consortium	1.00
2	COORD	Simulation and reconstruction tools for particle physics	1.20
3	COORD	Microelectronics and interconnect technologies for particle physics experiments	1.20
4	COORD	Project office for Linear Collider detectors	0.40
5	COORD	Coordination office for long baseline neutrino experiments	0.25
6	SUPP	Transnational access to CERN	0.20
7	SUPP	Transnational access to DESY	0.10
8	SUPP	Transnational access to European irradiation facilites	0.70
9	RTD	Construction of irradiation facilities	1.00
10	RTD	Test beam infrastructures for fully integrated detector tests	3.20
11	RTD	Test beam infrastructures for stand-alone detector tests	1.75
			11.00

Total cost of the project: ~35 MEuro (incl. indirect cost)
Total requested EU funding ~11 Meuro (incl. indirect cost)

EUDET follow-up

WP10 and WP7 are a continuation of the EUDET FP6 project.
EUDET has been instrumental in coordinating detector development for ILC detectors in Europe. It is a big success in the technical domain, and even more as a community-building project, clustering the work of many smaller institutes and a few larger laboratories. The FP6 EU funding for EUDET has been instrumental to start a coordinated Linear Collider detector development effort. Within EUDET the work concentrates on integrating activities for initial detector R&D. Within DevDet, this work is carried to the next phase of R&D on integrated detector systems.

DevDet project time span

Work package	Planned start date	Duration
W1, WP2, WP3, WP4, WP5, WP6, WP8, WP9, WP11	January 1st 2009	4 years
WP7, WP10	January 1st 2010	3 years

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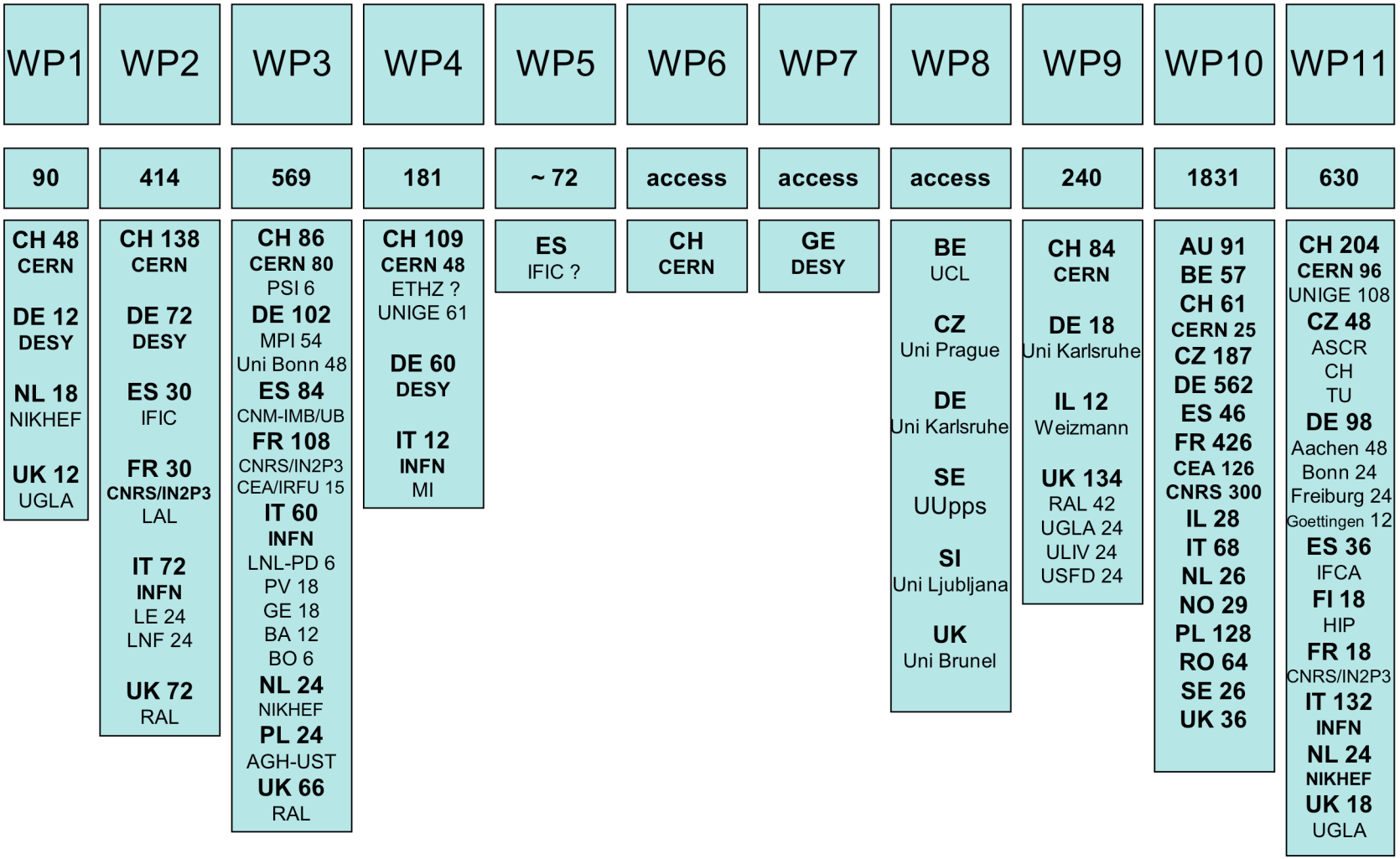
Overview of Consortiums / Partners



WP10

1831

AU 91
HEPHY
BE 57
IIHE
CH 61
CERN 25
UNIGE 36
CZ 187
CU Prague 45
IPASCR 142
FR 426
CEA/-IRFU 126
Saclay 26
IRFU 54
Omega 36
CNRS/IN2P3 300
LAL 113
LLR 36
IRES 69
LPNHE 46
LPC 36
DE 562
DESY 139
Uni Bonn 83
MPI 86
Dresden 25
Freiburg 26
Heidelberg 66
Karlsruhe 82
Mainz 26
WuppertaL 29
ES 46
IFCA
IL 28
TAU
IT 68
INFN
MI 39
ROMA 29
NL 26
FOM-NIKHEF
NO 29
Bergen
PL 128
AGH-UST 64
INPPAS 64
RO 64
WUT
SE 26
LUND
UK 36
Manchester

Partners and consortia

Participation from ~75 institutions from ~20 European countries

Many countries are grouping their efforts into scientific consortia, joining the proposal as a single legal entity

- Germany, 14 institutes, 1 legal entity
- France, ~10 institutes, 2 legal entities
- Italy, ~13 institutes, 1 legal entity
- The Netherlands, 1 national laboratory
- Switzerland, ~5 institutions, 1 legal entity
- United Kingdom, ~5 institutes, 1 legal entity

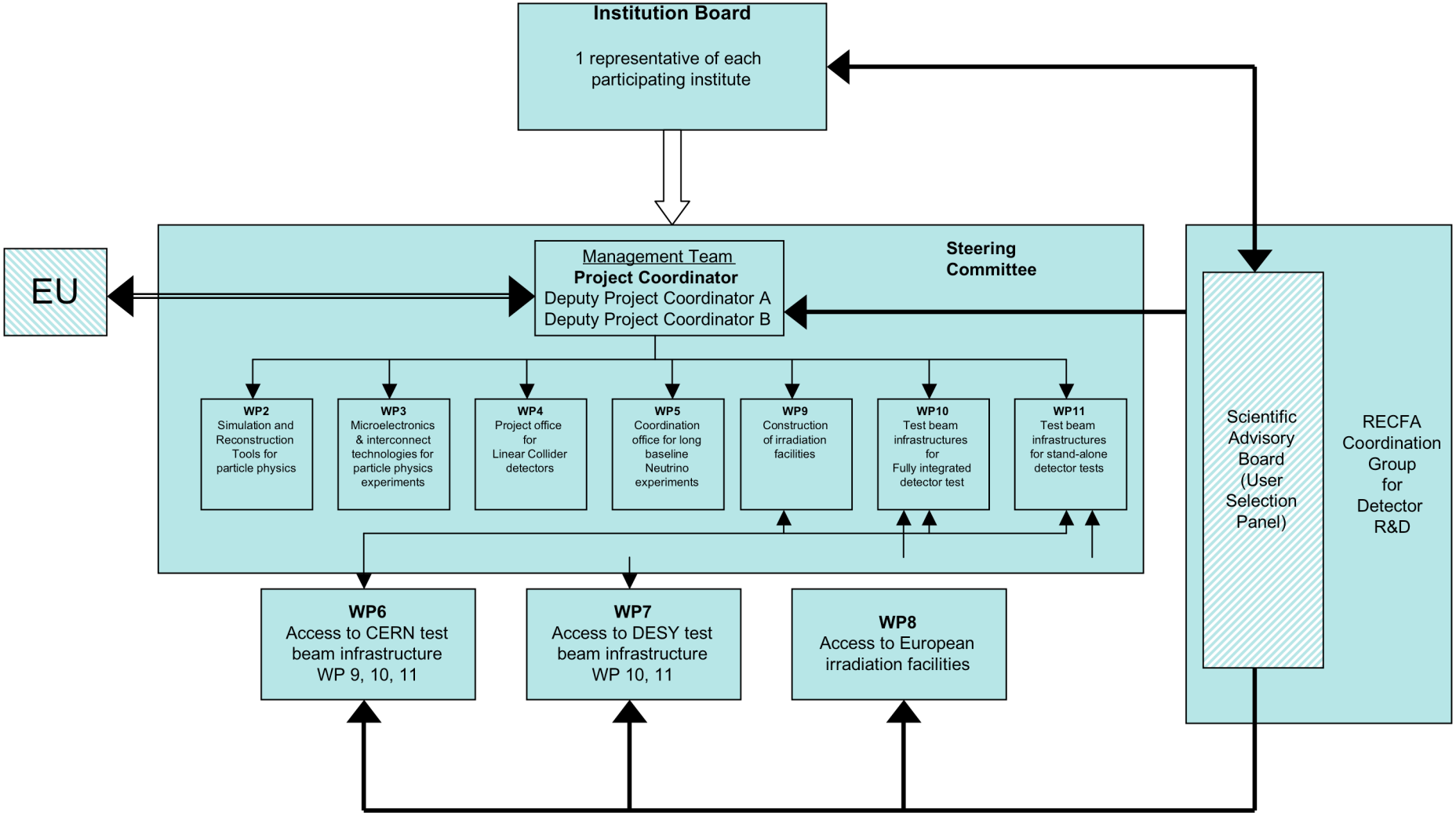
Other countries are still in the process to define a clustering of their efforts.

In total we expect ~30 legal entities to sign the proposal

Management structure

The management structure is based on the EUDET example, which has proven to function effectively. The composition of the management team represents a fair combination of the main future experiments.

The principal decision body is the Institution Board (IB) with representatives from each participating institute. The link with the RECFA coordination group is ensured via the Scientific Advisory Board (SAB). The RECFA coordination group nominates the SAB. It reviews the progress of the project and reports its findings to the IB. The SAB will also form the selection panel for transnational access to the facilities listed in WP6, WP7 and WP8.



DevDet Project Management Structure