EuCARD-2

Enhanced European Coordinated Accelerator Research & Development

A new FP7 Integrating Activity for 2013/2017

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Background

- EuCARD (and CARE before it) had an enormous impact in ***structuring and promoting*** the European R&D on particle accelerators; but the work needs to continue while EuCARD will be ***completed in March 2013***.

- The accelerator community, under the coordination of ESGARD (European Steering Group on Accelerator R&D), has underlined the importance of continuing a ***joint R&D effort*** and has acknowledged the ***added value*** from European projects.

- However, the boundary conditions have changed: we need to adapt to ***new guidelines*** coming from the EU and to ***new priorities*** coming from our field and to ***coordinate*** with other accelerator projects.

- A ***new Integrating Activity project*** covering the period ***2013/2017*** has been defined and its proposal submitted to EU in November 2011.

EuCARD-2 facts

- Preparation of the new project has been initiated by ESGARD in 2011, coming to a first definition of the new project in spring 2011.
- Last "details" defined at end of summer 2011: final structure, name of the project, name of the coordinator (…).
- Proposal finalized in autumn and submitted to the EU on 24 November 2011: 41 participants for a total budget of 28.3 M€ with a requested EU contribution of 10 M€.
- Evaluation by the EU reviewers communicated on 8 March 2012: score of 14/15 (which is very good!).
- Project "favourably evaluated" by the EU Commission services on 30 March, but placed in stand-by, waiting for the approval of the 2013 EU budget expected to take place around June (with increased allocations for RI).
- As soon as the EU budget is approved, EuCARD-2 is expected to be invited to negotiations with the EU, with a likely reduction in the EU contribution of the order of 20% (i.e. from 10 to 8 M€).
- If all goes well, the goal is to start of the project in 2013, ideally at the end of EuCARD or with a minimum overlap.

Guidelines from EU

- Large push to increase the share of Networking Activities within the IA → reduction of the JRA funding, compensated by an increased focus.
- Accent on innovation and outreach to industry → introduction of new Networks (on innovative technologies, applications and technology transfer).
- Transnational Accesses remain an essential ingredient of IA's (like in EuCARD).
- Some preference for high-risk, high pay-off activities.
- Coordination with other accelerator projects, in particular TIARA-PP.

Priorities from accelerator community

- In the **JRA**'s, continuation of the main and critical EuCARD studies (magnets, acceleration, collimation), but opening to new programmes (very-high field magnets, new acceleration concepts, thin films, etc.).
- In the **NA**'s, continuation of the successful Network on extreme beams and integrate the new activity on low emittance rings.
- Support at a more significant level of novel technologies: Plasma Wakefield Acceleration, ultrafast events processing.
- Support of new themes in the field of innovation and outreach to industry: energy efficiency and accelerator applications.
- Neutrino activities have now their own project.
- Similar number of partners, with identical core and new members.
- Funding of CERN only for management and coordination; CERN waives back funding for JRA activities.

Structuring the project

- General coordination entrusted by ESGARD to **CERN**: structures, experience, etc.

- J.P. Koutchouk retires in 2013: selection of a new coordinator, with a specific background in accelerator applications, contacts with industry and project management → **M. Vretenar** (expert in linear accelerators, coordinator of the linac JRA in CARE, project leader for Linac4 at CERN).

- New programme but need to underline the continuity with EuCARD and to acknowledge the effort done by EuCARD in communication and in structuring the community: **EuCARD-2.**

Priorities and motivations

- Accelerators based activities are rapidly growing, in full transition from basic science to applied science, medicine and industry.
- In the period **2013/17**: **a)** existing accelerators pushed to extreme performance (eg. LHC); **b)** new accelerators enter final design and/or construction phase (XFEL, FAIR, ESS, SuperB, MYRRHA, etc.); **c)** strategic decisions will be taken for the future (CLIC, ILC, HE-LHC, LHeC, Neutrinos).
- Individual projects have their own support structure (internal, international or EU-based) but general accelerator R&D tends to be second priority for large laboratories and is often left to small institutes and laboratories that do not have the critical mass for breakthrough achievements.
- EuCARD2 (and EuCARD) aim at joining the experience and infrastructure of the major labs with the intellectual potential and creativity of smaller universities and institutions on few research topics of excellence.
- The objective is to propose and develop ideas and technologies a) for the evolution of the present accelerator infrastructure; b) to support the final design and construction of the coming generation of facilities; and c) to impact on the choices to be made on the future generation of accelerators.

The partners

41 partners from 15 European countries, including Russia.

Types of institutes:

	#	Short names	Country
Accelerator laboratories	10	CERN, CEA, CNRS, SOLEIL, DESY, GSI, INFN, ESS, PSI, STFC	Europe, France, Germany, Italy, Sweden, Switzerland, UK
Technology Institutes and University departments in Applied Research	24	KUG, DTI, TUT, INPG, KIT, POLITO, WUT, EPFL, HHUD, JGU, UROS, UM, UT, CSIC/VALENCIA, UU, UNIGE, HUD, RHUL, SOTON, STRATH, UCL, ULANC, UNIMAN, UOXF	Austria, Denmark, Finland, France, Germany, Italy, Malta, Netherland, Poland, Spain, Sweden, Switzerland, UK
Scientific Research Institutes	5	HZB, HZDR, NCBJ, NRC KI, LUND	Germany, Poland, Russia, Sweden
Industry	2	RHP, BHTS	Austria, Germany

EuCARD²

The proposal – 6 Networks

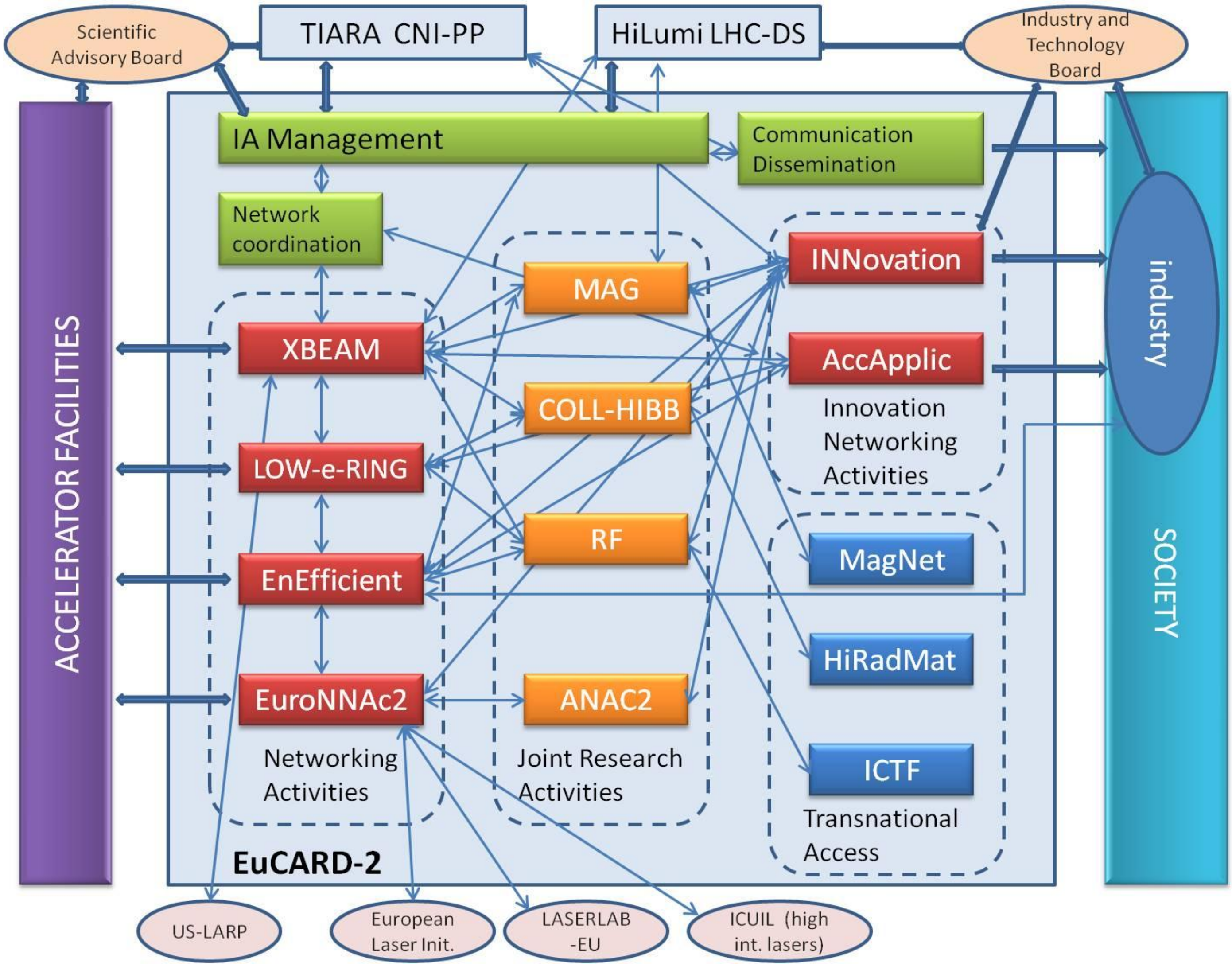
	Name	Acronym	Type	Tasks	EU Contribution (MEUR)	WP Coordinator	Task Coordinator
WP1	Management and communication	MANCOM	Management	Management	0.85	M. Vretenar (CERN)	M. Vretenar (CERN)
				Communication, dissemination, outreach			K. Kahle (CERN)
				Scientific publications and monographs			R. Romanyuk (WUT)
				Coordination of Accelerator Networks			F. Zimmermann (CERN)
WP2	Catalysing Innovation	INN	Network	Coordination and Communication	0.1	G. Anelli (CERN)	G.Anelli (CERN)
				Technology Transfer			G.Anelli (CERN)
WP3	Energy Efficiency	EnEfficient	Network	Coordination and Communication	0.4	M. Seidel (PSI)	M.Seidel (PSI)
				Energy recovery from cooling circuits			T. Parker (ESS)
				Higher electronic efficiency RF power gener			E. Jensen (CERN)
				Short term energy storage systems			M. Sander (KIT)
				Virtual power plant			J.Stadlmann (GSI)
				Beam transfer channels with low powe			P.Spiller (GSI)
WP4	Accelerator Applications	AccApplic	Network	Coordination and Communication	0.4	R. Edgecock (HUD)	R.Edgecock (HUD)
				Low energy accelerators			M. Cavenago (INFN Legnaro)
				Intermediate energy proton and ion acceler			M. Schippers (PSI)
				High beam power proton and ion accelerato			A. Lombardi (CERN)
				High beam power targets			H. Owen (UNIMAN)
WP5	Extreme Beams	XBEAM	Network	Coordination and communication	0.4	F. Zimmermann (CERN)	F. Zimmermann (CERN)
				Extreme colliders			F.Zimmermann+M.Zobov
				Extreme performance rings			A. Franchetti (GSI)
				Extreme SC linacs			S. Peggs (ESS)
				Extreme polarization			K.Aulenbacher (MAINZ)
WP6	Low Emittance Rings	LowERings	Network	Coordination and Communication	0.4	Y. Papaphilippou (CERN) + S. Guiducci (INFN) + R. Bartolini (UOXF-DL)	S.Guiducci,Y.Papaphilippou
				Low emittance ring design			M. Boege (PSI)
				Beam instabilities, impedances, vacuum			R. Nagaoka (SOLEIL)
				Low emittance ring technology			H. Schmikler (CERN)
WP7	Novel Accelerators	EuroNNAc2	Network	Coordination and communication	0.4	R. Assmann (CERN)	R. Assman (CERN)
				Scientific goals and programme			R. Assman (CERN)
				Organisation, strategy and funding			H. Videau (CNRS)
				Communication, training and tech. transf.			J. Osterhoff (DESY)

The proposal – 2 TAs and 4 JRAs

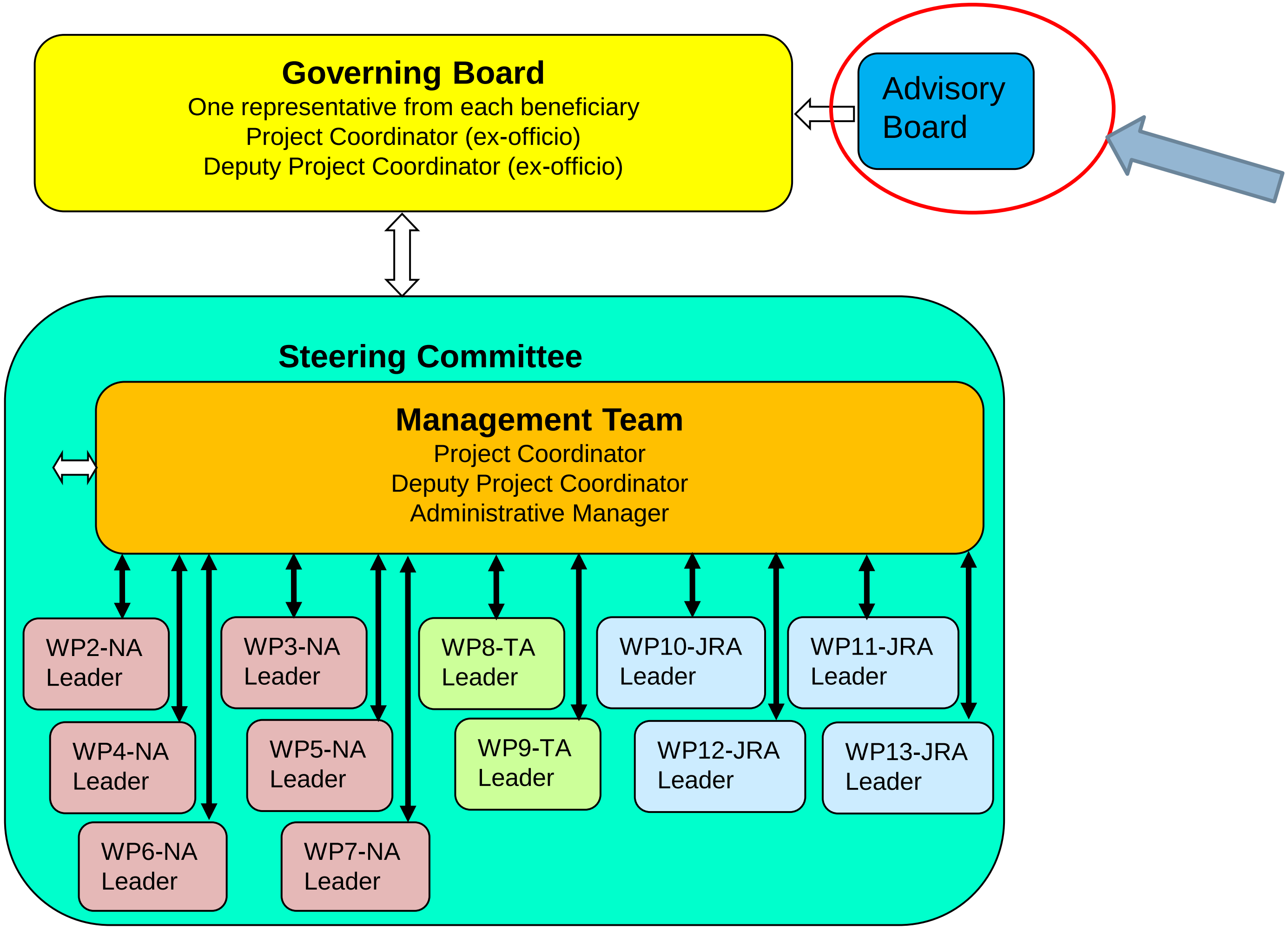
	Name	Acronym	Type	Tasks	EU Contribution (MEUR)	WP Coordinator	Task Coordinator
WP8	ICTF@STFC		TN Access		0.33	N. Mccubbin (STFC)	N. Mccubbin (STFC)
WP9	HiRadMat and MagNet@CERN		TN Access		0.6	I. Eftymiopoulos + M. Bajko (CERN)	I. Eftymiopoulos + M. Bajko (CERN)
WP10	Future Magnets	MAG	JRA	Coordination and Communication	1.7	L. Rossi (CERN) + JM Rey (CEA)	L. Rossi (CERN)
				10kA-20T class superconductor devel.			L. Bottura (CERN)
				5 T HTS Dipole Magnet Design and Construct			J.-M. Rey (CEA)
				HTS Magnet Stand Alone Test			G. Volpini (INFN -Milano)
				HTS Magnet Very High Field Test			G. de Rijk (CERN)
WP11	Collimation for High Brightness Beams	COLL-HIBB	JRA	Coordination and Communication	0.8	J. Stadlman (GSI) + A. Rossi (CERN)	. Stadlman (GSI) + A. Rossi (CERN
				Spec., halo b. dynamics, safe operation			?
				Advanced collimator modeling			?
				Collimator testing for high brightness			?
WP12	RF Technology Preparation	RF	JRA	Coordination and Communication	2.5	P. Macintosh (STFC)	P. Macintosh (STFC)
				Thin films			C. Antoine (CEA)
				Normal conducting high gradient cavities			W. Wuensch (CERN)
				SRF HOM beam diagnostics			R. Jones (UNIMAN)
				SRF photocathodes			R. Nietubjc (IPJ)
WP13	Novel Acceleration Concepts	ANAC2	JRA	Coordination and Communication	1.15	?	?
				Laser driven plasma acceleration			V. Malka (CNRS)
				Ultra-fast accelerator science			B. Militsyn (STFC)
				Generation & modulation of long plasmas			M. Wing (UCL)

Theme coordinators: 9 CERN, 8 non-CERN (STFC 2, PSI HUD INFN UOXF CEA GSI 1)
Females: 3/17 (=18%)

Internal and external links



Management structure



Two "scientific" Networks

- Extreme Beams (XBEAM): colliders and accelerator frontiers, for high-intensity high-luminosity, including FFAGs and superconducting hadron and electron linacs – interest for HL-LHC, ESS, FAIR, SuperB, HE-LHC, LHeC, etc.).

- Low emittance rings (LOWeRINGS): New synergy between synchrotron light sources, storage rings, damping rings and lepton colliders facilities. Kick off workshops took place under ICFA.

Three "technological" Networks

- Energy Efficiency: Interest from several laboratories on optimized energy management for a sustainable accelerator science. This NA wants to be very hands-on and focus on fundamental and precise themes: energy recovery from cooling, efficient klystrons, energy storage, virtual power plant, low-power transport channels.

- Accelerator Applications: Aims at reviewing and analysing present applications, propose how to adapt existing accelerator technology to industry, health care, energy, security.

- Catalysing Innovation, technology transfer Network based on the existing CERN and STFC structures. Proactive approach, scouting for technologies ready for industry engagement and collaboration. Organise "EuCARD-2 meets industry" events.

One "future" network

- Novel Accelerators (EuroNNAC2): federating the European effort in plasma-based accelerators to prepare a roadmap for an efficient use in full-scale accelerators (from acceleration to accelerators...).

Three Transnational Access

- Ion Cooling Test Facility (ICTF) of STFC in the UK, tests with high-quality low-energy beams (Phase I in EuCARD)
- HiRadMat facility at CERN, performance of materials bombarded with intense proton beams (already in EuCARD, but the real start will be in EuCARD-2)
- MagNet test stand at CERN, superconducting cable and magnet test station at CERN freed after the completion of the LHC.

Four JRAs

- Future Magnets: development of an HTS magnet that can become the full-bore high-field insert to allow a dipole magnet reaching 20T for the needs of a HE-LHC at 2x16.5 TeV. Preliminary step production of the first HTS 10 kA cable for accelerator magnets (high-quality low-loss).
- Collimators for high-brightness beams: steady increase in LHC luminosity leads to accelerate the next phase of collimators (beyond EuCARD), validating the new materials of EuCARD and developing the design for the next generation of collimators.
- Radio Frequency Technologies: includes a) thin film deposition technologies for superconducting cavities, b) wakefield extraction and monitoring and cavity testing for high-gradient CLIC structures, c) HOM analysis for XFEL-type cavities, d) new RF photocathodes, based on Pb and on and on Diamond Amplifier cathode.
- Novel Acceleration Techniques: laser plasma acceleration, ultra-fast accelerator science and long plasmas. Develop laser-driven and proton-driven plasma-wakefield acceleration, including femtosecond arrival time control.

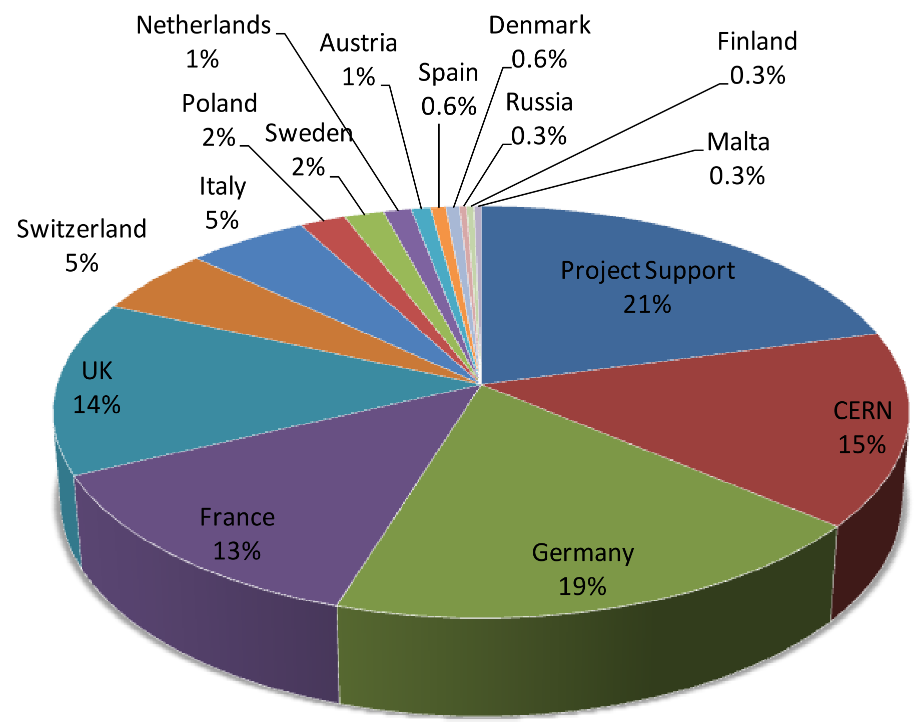
The budget

Work package	Type	PM	Personnel cost (Euro)	Subcontracting (Euro)	Consumables and prototypes (Euro)	Travel (Euro)	Indirect costs (Euro)	Access costs (Euro)	Total budget (Euro)	Requested EC contribution (Euro)
WP1	MGT	106.0	1,188,613	0	220,000	100,000	905,168	0	2,413,780	834,432
WP2	COORD	12.0	137,604	0	0	100,000	136,684	0	374,288	140,000
WP3	COORD	24.0	146,400	0	0	379,778	174,342	0	700,520	400,000
WP4	COORD	24.0	169,056	0	0	229,608	216,918	0	615,582	400,000
WP5	COORD	22.0	138,200	0	0	318,366	248,741	0	705,307	400,000
WP6	COORD	18.0	119,678	0	0	376,356	233,040	0	729,074	400,000
WP7	COORD	12.0	78,000	0	0	305,645	230,187	0	613,832	400,000
WP8	SUPP	11.0	43,205	0	0	243,074	45,365	830,638	1,162,282	327,394
WP9	SUPP	7.2	71,200	0	113,438	324,300	305,363	3,179,626	3,993,926	548,220
WP10	RTD	376.0	2,490,485	0	1,492,000	167,000	2,446,345	0	6,595,830	1,700,092
WP11	RTD	248.3	1,230,939	0	172,000	230,970	858,826	0	2,492,735	800,000
WP12	RTD	387.4	2,348,773	0	1,109,254	201,130	1,853,486	0	5,512,642	2,599,834
WP13	RTD	250.5	1,130,360	0	234,965	85,000	914,763	0	2,365,088	1,050,028
Total		**1498.4**	**9,292,513**	**0**	**3,341,657**	**3,061,227**	**8,569,227**	**4,010,264**	**28,274,888**	**10,000,000**

EU contribution = 35.4% of project cost
Matching funds = 64.6% of project cost

Scaling: 35.4% EU contribution , 37.5% indirect costs not claimed, 27.1% direct contribution from the labs

Distribution of EU contribution



Requested EU funding (10M€ in total)

Project support includes TA's , common pots for NA's, common purchase of equipment

Project evaluation - 1

1. Scientific and/or technological excellence (relevant to the topics addressed by the call)

The concepts and the workpackages are clearly and convincingly presented. In many of the proposal's work packages related to JRAs a "high risk-high payoff" approach is being taken, leveraging the expertise of the associated networks and using the existing infrastructure. All WPs are well described and explain the effectiveness of the methodology applied as well as how to achieve the objectives. The scientific goals are at the frontier of accelerator physics. Many of the topics in the workpackages, if successfully delivered will lead to a large social and/or economic impact (described later). Some of these work packages are continuations of the current EUCARD project while some others are new and reach out into new areas.
The infrastructure that is being used under this proposal is very diverse, going from surface science and technology to providing irradiation or muon beam facilities that are unique to the accelerator community as well as to industry.

* high risk-high pay off in JRAs
* socioeconomical impact
* diversity

Overall score (Threshold: 3.00/5.00, Weight: 1.00) **5.00**

2. Quality and efficiency of the implementation and the management

The leading European Institutions and their experts are engaged in the proposal. The management structure is proven to work well through the previous EUCARD proposal.

The quality and management experience of the individual WP leaders as well as the overall management is high. CERN takes a leading role in the coordination of the WPs which is a strength, since there is a well integrated and acknowledged leadership team. CERN is very much used to a culture of exchange and managing external contribution and is therefore a good and natural choice. At the same time EUCARD and the FP7 program could provide more of an opportunity to build up new leadership potential in other laboratories and institutions, decreasing the dominance of a single laboratory in the proposal. Developing them into leaders is an opportunity that could be used more prominently in managing the packages and maximixing the impact in their home institutions.

In the majority of the packages, significant additional manpower is leveraged in the institutions and laboratories. EUCARD II is a large consortium of 41 legal entities. The consortium is large and geographically widely distributed.Overall the resources in the packages arer well described, thought through and sufficient. The risk management and contingency plan is professionally formulated.

Overall score (Threshold: 3.00/5.00

- efficient management proven by EuCARD
- leading role of CERN a strength but more opportunities to be given to build leadership potential in other labs

Project evaluation - 2

3. Potential impact through the development, dissemination and use of project results

The dissemination of the results is well planned through already existing conferences and workshops as well as through additional specific meetings. Presentation of the consortium, the workplans and the dissemination of results through the WWW is very good.

With the experience of CERN as well as several other large national laboratories in managing large collaborations, EUCARD will be able to achieve significant advances in structuring the field and bringing in smaller contributors.

Accelerators affect many fields of the society beyond discovery science. Medical Applications, food processing, intense radiation sources, non-destructive testing and inspection are some of the majr areas of application. It represents a multibillion Euro market that is driven by the innovation from accelerator science looking for more efficient, more compact and more powerful accelerators. Good technology transfer management and representation is crucial to grow this field. This proposal is well positioned to have a great impact on the development of this marketplace for European companies. Applying a "lessons learned" strategy by utilizing the Tech Transfer office experience from major European laboratories would further strenghten this approach.

Overall score (Threshold: 3.00/5.00, Weight: 1.00) **4.50**

TOTAL

Total score (Threshold: 10.00/15.00, Weight: 1.00) **14.00**

- Positive dissemination
- Structuring the field and bringing in small contributors
- Development of the accelerator marketplace for EU companies
- Learn from previous experience (…) of Tech Transf offices

Recommendations

The negotiations should allow to take a closer look in particular to WP 4 and WP 8 of the proposal.

WP 4 Accelerator Applications, while it is a very important topic, it is not well motivated here and the implementation plan would benefit from a more detailed description as well as leveraging already existing infrastructures in other Universities and National Laboratories.

WP 8 ICTF @STFC is a Transnational Access activity. It should be clarified which scientists beyond those directly involved MICE collaboration would benefit from access and in what way. It should be further clarified which specific community is targeted or how a new community would be attracted. From the description of the work package the references show only MICE collaboration reports.

The support for networking of the communities and their activities should be given the highest priority within the proposal. The portion of money in this proposal associated with Research activities is relatively high. To balance the budget between the different types of activities, a closer look should be given to the JRA work packages WP 10 - WP 13.

Budget reductions could possibly be identified within WP 10 and WP 11, since both of them are institutionally focused and the future of CERN and GSI and are therefore less general. WP 10 and WP 11 are crucial to these institutions and are largely funded through other sources.

WP 12 and WP 13 are high risk – high pay off projects that do assemble a large and diverse community. Budget cuts on workpackage 13 should be avoided as much as possible.

If reductions to the budget of the different WP's need to be made, the management should shrink proportionally which would reduce WP 1.

1. Acc. applications needs more focusing and more integration with existing programmes
2. ICTF at STCF should enlarge its scope and programme beyond the MICE community
3. More support to NA's at the expense of JRA's,
4. Reduction s to WP10 and WP11, centered at CERN
5. Support of WP12 (RF) and in particular WP13 (PWFA)
6. Reduce management (WP1) in proportion with overall EU budget

CERN officially reacted to this statement (letter 29.3): WP10 and 11 are well ahead of the targeted institutional R&D of both CERN and GSI, involve many participants and CERN has waived all direct funding.

What's next ?

- ➢ wait for the approval of the EU budget and the formal invitation to negociations with the EU (expected in June/July);
- ➢ redefine the project with a reduced EU contribution and accordingly to the guidelines of the reviewers and of the commission;
- ➢ get the final approval of Annex 1.
- ➢ if all goes well, start the project in 2013, immediately after EuCARD or with a minimum overlap.

See you in EuCARD-2