



Introducing EuCARD-2

M. Vretenar, CERN



 **European Union**
50 Years of Peace, Prosperity, and Partnership



EuCARD-2 is co-funded by the partners and the European Commission under Capacities 7th Framework Programme, Grant Agreement 312453



Good bye EuCARD, welcome EuCARD-2 !

The adventure continues...
but themes and priorities change.

- The approval of the EuCARD-2 project shows that R&D for particle accelerators remains a global priority for improving the European Research Infrastructure.
- The transition from EuCARD to EuCARD-2 allows to redefine our strategy, in accordance with the guidelines from the particle accelerator community and from the European Commission.

And we warmly welcome the new EuCARD-2 participants !



Capacity – research infrastructures

Integrating Activities

Design Studies,
Preparatory Phases

FP6

CARE
Coordinated Accelerator Research in Europe for Particle Physics
01/2004 – 12/2008 (5 years) 15.2 M€ EU contribution

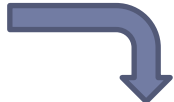


FP7

EuCARD
European Coordination for Accelerator Research and Development
04/2009 – 03/2013 (4 years) 10.0 M€ EU contribution



EuCARD-2
Enhanced Eur. Coordination for Accelerator Research and Development
05/2013 – 04/2017 (4 years) 8.0 M€ EU contribution



EuroNu DS, 2008/12, 4M€

SLHC-PP, 2008/11, 5.2M€

ILC-HiGrade, 2008/12, 5M€

TIARA-PP, 2011/13, 3.9M€

HiLumi LHC, 2011/15, 4.9M€

Long series of projects co-funded by the European Commission since 2004:
68 M€ from the EU for the accelerator community in 2004/2017,
with a peak of ~7 M€/year in 2011 (~5 M€/year in 2013).



EuCARD²

The EuCARD-2 Timeline

- 👉 January/September 2011 Project definition (on priorities set by ESGARD)
- 👉 September/November 2011 Nomination of coordinator, Project finalization
- 👉 24.11.2011 Proposal submitted (10 M€ requested EU contribution)
- 👉 08.03.2012 Evaluation Summary Report received: 14/15
- 👉 30.03.2012 Favourable evaluation for funding, in stand-by for 2013 EC budget
- 👉 16.07.2012 Invitation to negotiations received (8 M€ contribution)
- 👉 27.08.2012 **Negotiation meeting** with EU officer
- 👉 07.09.2012 Draft Annex1(reference document) **submitted**
- 👉 19.10.2012 New version of Annex1 incorporating EC comments **submitted**
- 👉 24.10.2012 Final Annex1 **accepted** by EC – end of negotiation phase
- 👉 14.12.2012 All signed documents (Grant Preparation Forms) sent to Brussels
- 👉 01.03.2013 Grant Agreement received from EU (after clearing technical details)
- 👉 12.03.2013 Signed Grant Agreement sent to EU
- 👉 22.04.2013 Signed Grant Agreement **received from EU** + autorisation **1st payment**
- 👉 **01.05.2013** **Start of the project**

48 months duration (01.05.2013 - 30.04.2017)

13 Workpackages (6 Networks, 2 Transnational Access, 4 JRAs)

40 beneficiaries (3 with 0 EU contribution)

14 countries (+ CERN)

23.5 M€ total cost (13.4 M€ direct costs, 10.1 M€ indirect+access cost)

8 M€ EC contribution (34% of total cost, 59.7% of direct cost)

1288 persons.month (average 8 pm/participant.year)

62 deliverables

86 milestones

Scientific objectives:

1. Contributions to few **R&D topics of excellence** (high risk, high pay-off) on accelerators for **research** (HEP, nuclear physics, synchrotron lights, etc.).
2. Include new dimension of innovation, **applications**, relations with **industry** (healthcare, energy, environment, etc.).



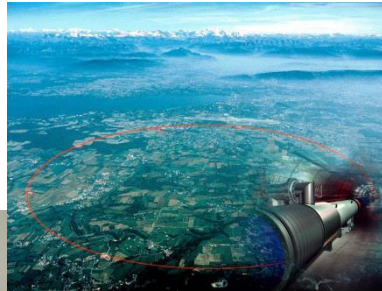
Political objectives:

- For **EU**: strenghten **collaboration** and foster synergies, create a network of complementary scientific infrastructures, enhance EU **competitiveness**.
- For **large laboratories**: attract **partners** into (long-term) projects, connect with high-level R&D, create a network of competences around the large laboratories.
- For **small Institutes**: get access to big labs and to **large scientific programmes**, get the recognition (and the internal matching **funds**) related to EU projects.

EuCARD-2 as a global actor for accelerators' future

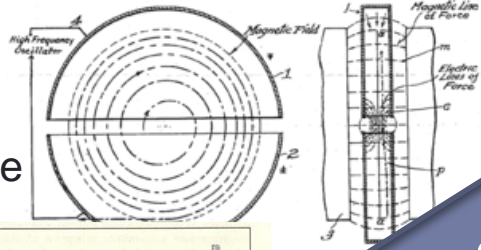
89 years of progress... what's next?

2013 ...

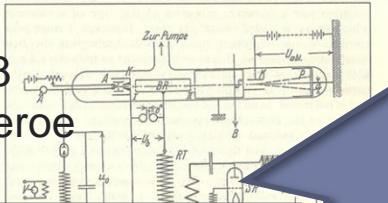


1970's
Superconductivity

1931
Lawrence



1928
Wideroe



ARKIV FÖR MATEMATIK, ASTRONOMI OCH FYSIK.
BAND 18. N:o 30.

Prinzip einer Methode zur Herstellung von
Kanalstrahlen hoher Voltzahl.

Von
GUSTAF ISING.

Mit 2 Figuren im Text.

Mitgeteilt am 12. März 1924 durch C. W. OERSTED und M. REINHARDT.

1924
Ising

Break the wall:
Push B, E
reduce P

2

EuCARD²



Climb the wall:
optimize the frontier
accelerators

1

EuCARD²

Go round the wall:
beyond cyclic RF
acceleration,
lasers and
plasmas

3

89 years of cyclic RF particle accelerators

4

Enhance the transfer process

EuCARD²

Industry

Medicine

Applied science

The four EuCARD-2 themes for the future of particle accelerators

We are at a **turning point** for particle accelerators:

1. Accelerator technology is rapidly moving from basic science to applied science, medicine, industry.
2. Size and complexity of large machines start raising questions of sustainability and societal acceptance.

The ambition of EuCARD-2 is to play a role in this process, fostering a **global and cooperative approach** to address the main open issues, acting at 4 levels:

1. Explore limitations and frontier performance of present machines (WP5).
2. Address the technological limits: bending field (WP10), RF and accelerating gradient (WP11), power consumption (WP3), collimation (WP11).
3. Strengthen and focus the research on alternative approaches (WP6) and support their R&D effort (WP13)
4. Support the transfer of technology from research to industrial accelerators (WP2, WP4).



EuCARD-2: the context

- In this critical moment, **accelerator R&D** tends to be second priority for large laboratories that are focused on their short-term programmes and is often left to small institutes and universities that do not have the critical mass for breakthrough achievements.
- EuCARD-2 follows in the line of EuCARD and aims 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 to prepare the **future evolution** of the European particle accelerator infrastructure.

The logo for EuCARD² features a stylized blue and red swoosh on the left, a yellow star above the 'A', and the text 'EuCARD²' in blue. To the right of the logo is the main title 'EuCARD-2: new dimensions' in a large, blue, sans-serif font.

EuCARD² EuCARD-2: new dimensions

With respect to the previous programmes, EuCARD-2:

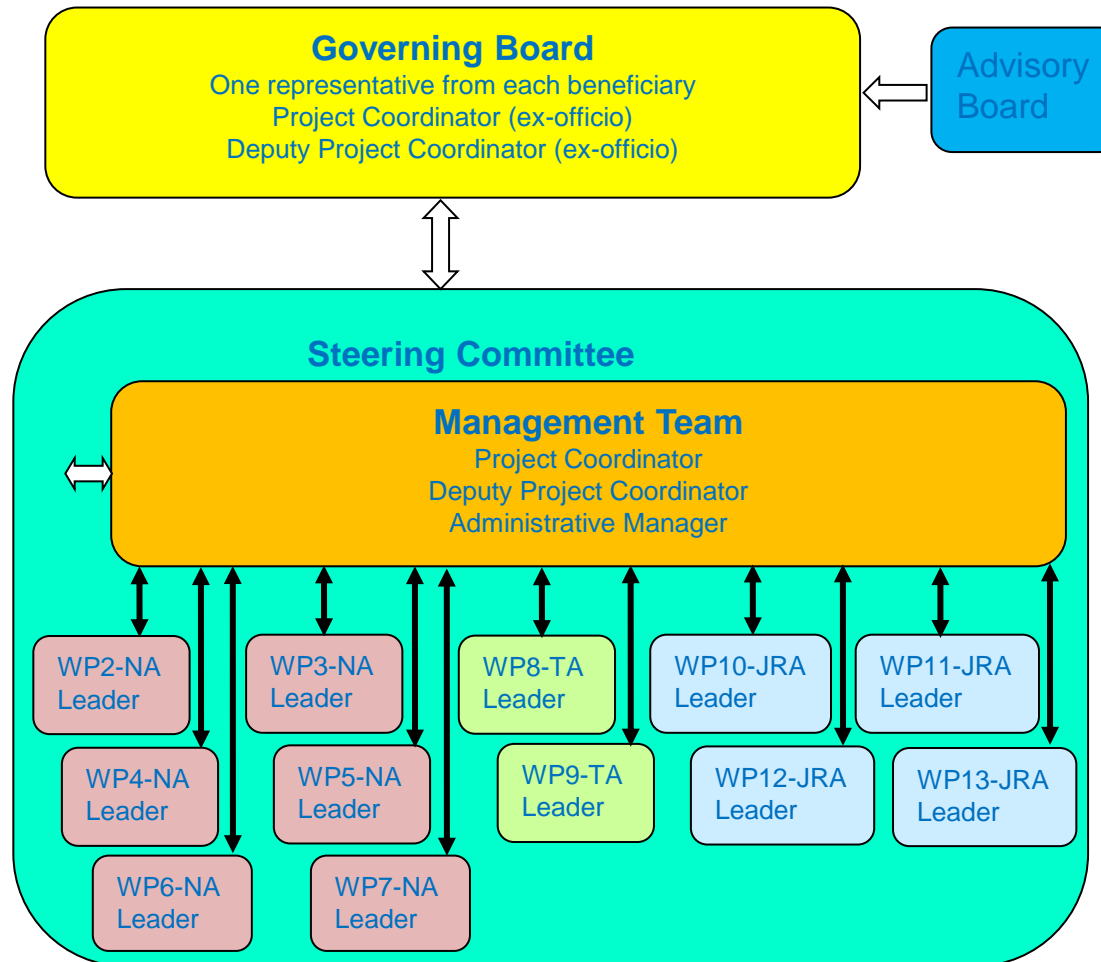
- Increases the share of **Networking Activities**;
- Puts priority to **innovation and outreach to industry** → new Networks (innovative technologies, applications and technology transfer).
- Improved **Transnational Access** to our Test Facilities.
- Improved **coordination** with other EU accelerator projects.
- Give preference to **high-risk, high pay-off** activities.

	Name	Acronym	Type	Tasks	WP Coordinator	Task Coordinator
WP1	Management and communication	MANCOM	Management	Management	M. Vretenar (CERN) deputy: R. Assmann (DESY)	M. Vretenar (CERN)
				Communication, dissemination and outreach		A. Szeberenvi (CERN)
				Scientific publications and monographs		R. Romanuk (WUT)
				Coordination of accelerator networks		F. Zimmermann (CERN)
WP2	Catalysing Innovation	INNovation	Network	Coordination and communication	G. Anelli (CERN) + P. Woodman (STFC)	G. Anelli, P. Woodman
				Transferring innovation to society (in particular, industry)		E. Chesta (CERN)
WP3	Energy Efficiency	EnEfficient	Network	Coordination and communication	M. Seidel (PSI)	M. Seidel (PSI)
				Energy recovery from cooling circuits		T. Parker (ESS)
				Higher electronic efficiency RF power generation		E. Jensen (CERN)
				Short term energy storage systems		M. Sander (KIT)
				Virtual power plant		J. Stadlmann (GSI)
				Beam transfer channels with low power consumption		P. Spiller (GSI)
WP4	Accelerator Applications	AccApplic	Network	Coordination and communication	R. Edgecock (HUD)	R. Edgecock (HUD)
				Low energy accelerators		M. Cavenago (INFN Legnaro)
				Intermediate energy proton and ion accelerators		M. Schippers (PSI)
				High beam power proton and ion accelerators		A. Lombardi (CERN)
				High beam power targets		H. Owen (UNIMAN)
WP5	Extreme Beams	XBEAM	Network	Coordination and communication	F. Zimmermann (CERN)	F. Zimmermann (CERN)
				Extreme colliders		F. Zimmermann+M. Zobov (INFN)
				Extreme performance rings		G. Franchetti (GSI)
				Extreme SCLINACS		M. Eshraqui (ESS)
				Extreme polarization		K. Aulenbacher (MAINZ)
WP6	Low Emittance Rings	LOW-e-RING	Network	Coordination and communication	Y. Papaphilippou (CERN) + S. Guiducci (INFN) + R. Bartolini (UOXF-DI)	S. Guiducci, Y. Papaphilippou
				Low emittance ring design		M. Boege (PSI)
				Instabilities, impedances and collective effects		R. Nagaoka (SOLEIL)
				Low emittance rings technology		H. Schmickler (CERN)
WP7	Novel Accelerators	EuroNNAc2	Network	Coordination and communication	R. Assmann (DESY)	R. Assmann (DESY)
				Scientific goals and programme		R. Assmann (DESY)
				Organisation, strategy and funding		A. Specka (CNRS)
				Communication, training and technology transfer		J. Osterhoff (DESY)
WP8	ICTF@STFC		TN Access		R. Preece (STFC)	R. Preece (STFC)
WP9	HiRadMat and MagNet@CERN		TN Access	HiRadMat@CERN MagNet@CERN	A. Fabich + M. Bajko (CERN)	A. Fabich (CERN) M. Bajko (CERN)
WP10	Future Magnets	MAG	JRA	Coordination and communication	L. Rossi (CERN) + J.M. Rey (CEA)	L. Rossi (CERN)
				10kA-20T class superconductor development		L. Bottura (CERN)
				5 T HTS dipole magnet design and construction		J-M. Rey (CEA)
				HTS magnet stand alone test		G. Volpini (INFN-Milano)
WP11	Collimator Materials for fast High Density Energy Dep.	COMA-HDED	JRA	Coordination and communication	J. Stadlmann (GSI) + A. Rossi (CERN)	J. Stadlmann (GSI) + A. Rossi (CERN)
				Material testing for fast energy density deposition and high		A. Rossi (CERN)
				Material mechanical modelling		A. Bertarelli (CERN)
WP12	Innovative Radio Frequency Technologies	RF	JRA	Material specification	P. McIntosh (STFC)	J. Stadlmann (GSI)
				Coordination and communication		P. McIntosh (STFC)
				Thin films		C. Antoine (CEA)
				Normal conducting high gradient cavities		W. Wuensch (CERN)
WP13	Novel Acceleration Concepts	ANAC2	JRA	SRF HOM beam diagnostics	V. Malka (CNRS)	R. Jones (UNIMAN)
				SRF photocathodes		R. Nietubic (IPJ)
				Coordination and communication		V. Malka (CNRS)
				Achievement of high brightness electron beam with laser		O. Lundh (LLC)
				Ultra-fast accelerator science		H. Schlarb (DESY)
				Modulation of long plasmas		M. Wing (UCL)

40 partners from 15 European countries, including Russia

	#	Short names	Country	% of EC
Accelerator laboratories	10	CERN, CEA, CNRS, SOLEIL, DESY, GSI, INFN, ESS, PSI, STFC	Europe, France, Germany, Italy, Sweden, Switzerland, UK	63%
Technology Institutes and University departments in Applied Research	23	KUG, DTI, TUT, Grenoble INP, KIT, POLITO, WUT, UDUS, 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	27%
Scientific Research Institutes	5	HZB, HZDR, NCBJ, NRC KI, LUND	Germany, Poland, Russia, Sweden	7%
Industry	2	RHP, BHTS	Austria, Germany	3%

Management structure



Extreme Beams (XBEAM) – coord.: F. Zimmermann (CERN) – 330 k€ EU contribution
Frontier performance of colliders and other accelerators (including SC linacs, polarisation,...).
Interest for HL-LHC, ESS, FAIR, HE-LHC, LHeC, VHE-LHC, etc.).

Low emittance rings – coord.: Y.Papaphilippou (CERN), S.Guiducci (INFN), R.Bartolini (UOXF) – 330k€
New synergy between synchrotron light sources, storage rings, damping rings and lepton colliders facilities (activity started under ICFA, now integrated into EuCARD-2).

Novel Accelerators (EuroNNAC) – coord.: R. Assmann (DESY) – 330k€
Federating the European effort in plasma-based accelerators, prepare a roadmap for an efficient use in full-scale accelerators (from acceleration to accelerators...).

Energy Efficiency – coord.: M. Seidel (PSI) – 350 k€
Optimized energy management for a sustainable accelerator science. Energy recovery from cooling, efficient klystrons, energy storage, virtual power plant, low-power transport channels.

Accelerator Applications – coord.: R. Edgecock (HUD) – 350k€
Reviewing and analyzing present applications, propose how to adapt existing accelerator technology to industry, health care, energy, security.

Catalysing Innovation – coord.: G. Anelli (CERN), P. Woodman (STFC) – 126k€
Technology transfer Network based on the existing CERN and STFC structures.

2 Transnational Access

Ion Cooling Test Facility (ICTF) at STFC – coord.: R. Preece (STFC) – 200 k€
Tests with high-quality low-energy beams (MICE and others)

HighRadMat and MagNet at CERN – coord.: A. Fabich and M. Bajko (CERN) – 500 k€
Measure performance of materials bombarded with intense proton beams;
Open SM18 (superconducting cable and magnet test station) at CERN to external users.



4 Joint Research Activities

Future Magnets – coord.: L. Rossi (CERN) – 1.31 M€ - CERN, CEA, INFN, INP, BHTS & others

R&D towards a 20 T dipole magnet for the HE-LHC (2 x 16.5 TeV) based on High-Temperature Superconductors (10 kA). Magnet design, choice of HTS material, manufacturing and characterization at low field of an HTS coil as full-bore high-field insert of a 20 T dipole.

Collimator Materials for fast high dens. en. dep. – coord.: A. Rossi (CERN), J. Stadlmann (GSI) – 0.4 M€

Material studies and collimator tests. Building of samples made of new (and old) materials and test them under high energy beam impact. Material mechanical modelling; specification of materials using collimation simulation codes. CERN, GSI, KUG, POLITO, UM & others

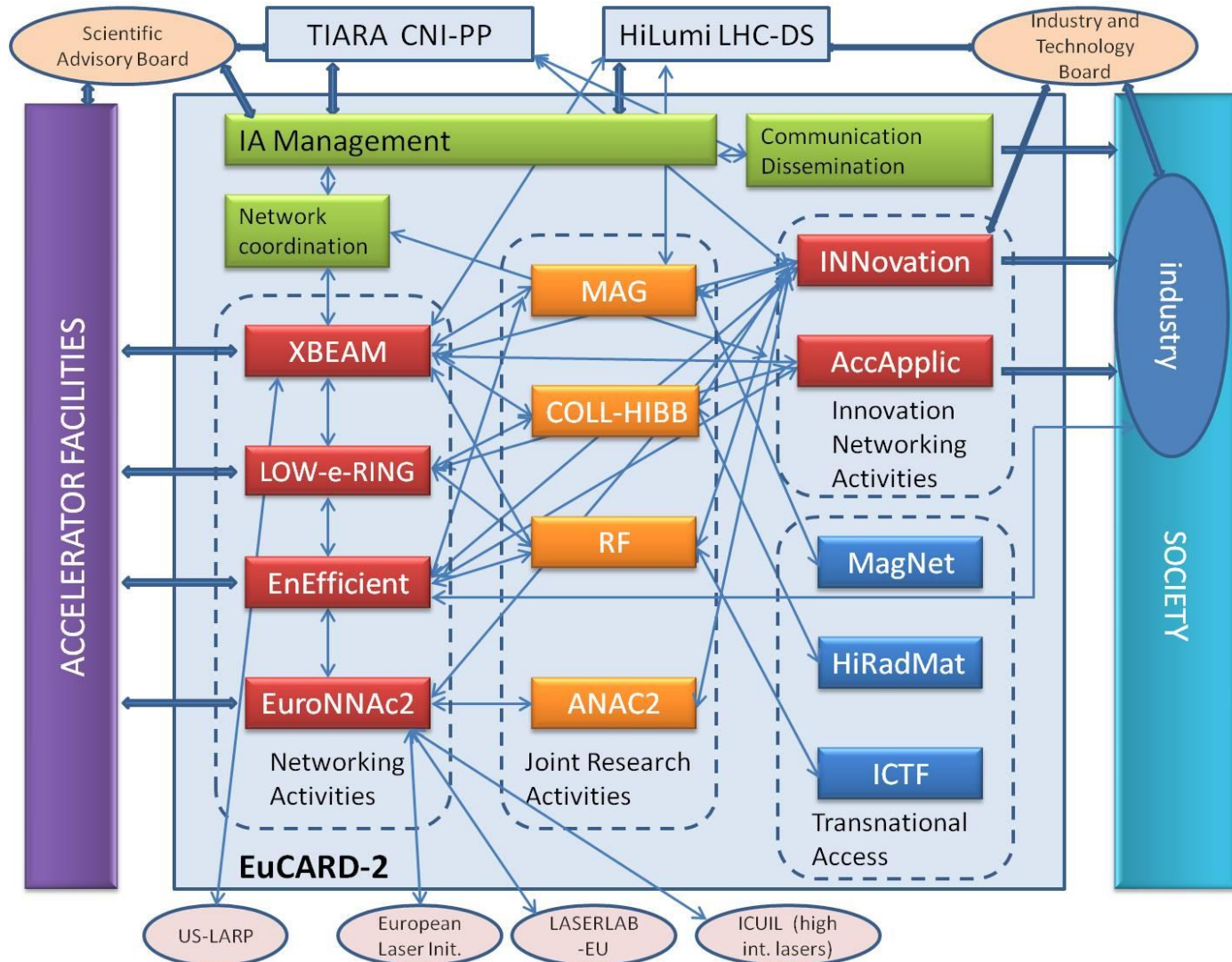
Innovative RF Technologies – coord.: P. Macintosh (STFC) – 2.18 M€ - CEA, UNIMAN, ULANC, PSI, etc.

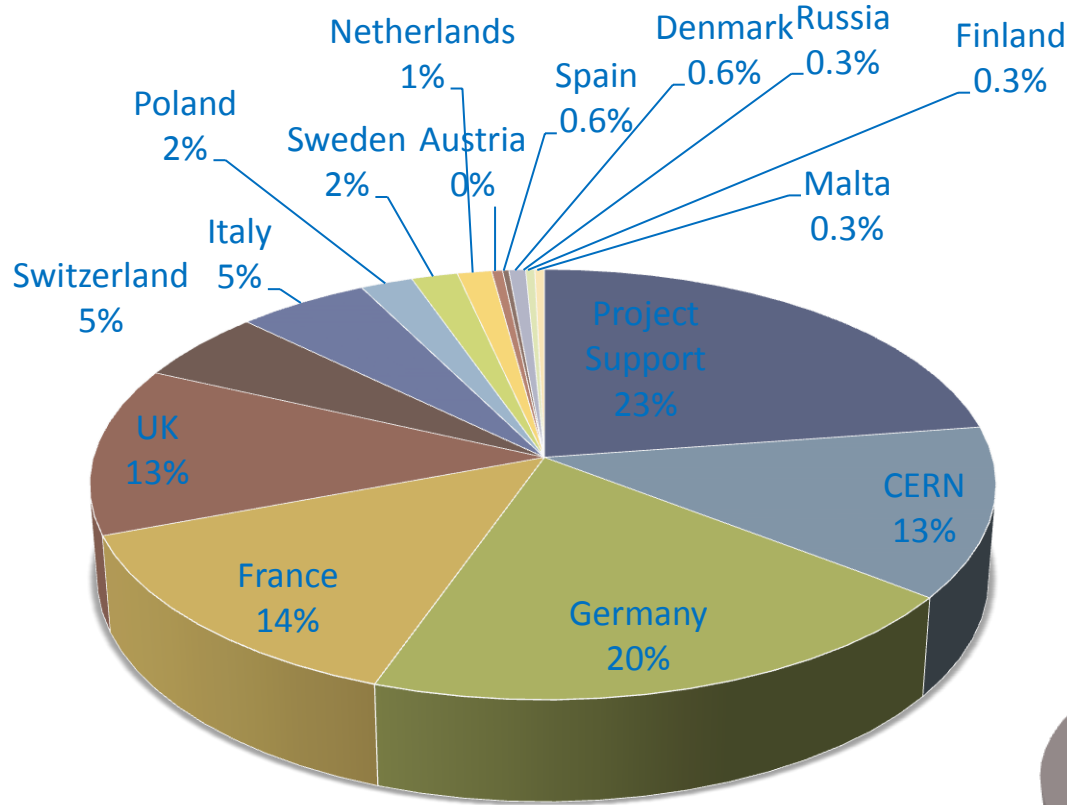
Multi-disciplinary (NC and SC) grouping a number of promising RF R&D activities: 1) **thin film** deposition technologies for SC cavities (CEA et al.); 2) advances in **X-band technology**: high-gradient, low-wakefield structures, novel power sources (CERN et al.); 3) **HOM-based** analysis for XFEL-type cavities (DESY et al.); 4) new **RF photocathodes** (NCBJ et al.).

Novel Acceleration Techniques – coord.: V. Malka (CNRS) – 0.927 M€

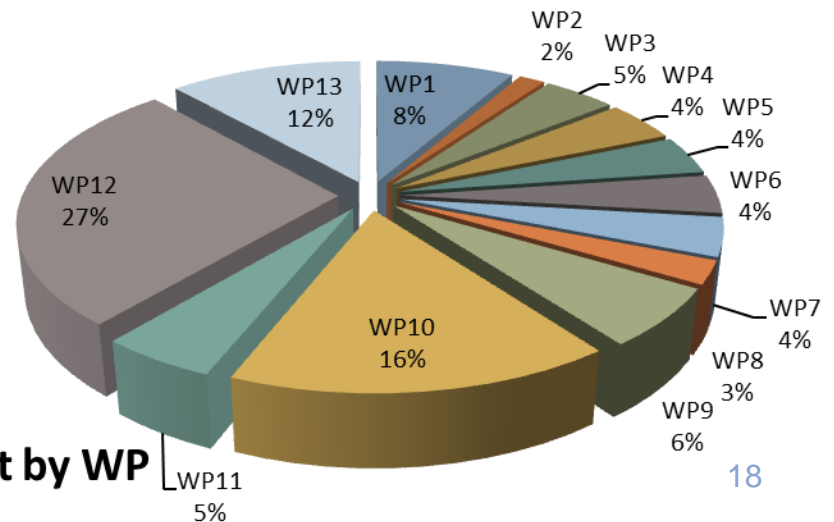
Selected R&D topics on **laser plasma** acceleration, **ultra-fast** accelerator science and long plasmas. Develop laser-driven and proton-driven plasma-wakefield acceleration, including femtosecond arrival time control. CNRS, INFN, UDUS, UCL, DESY, etc.

EuCARD² Internal and external links





Requested EU funding (8M€ in total)

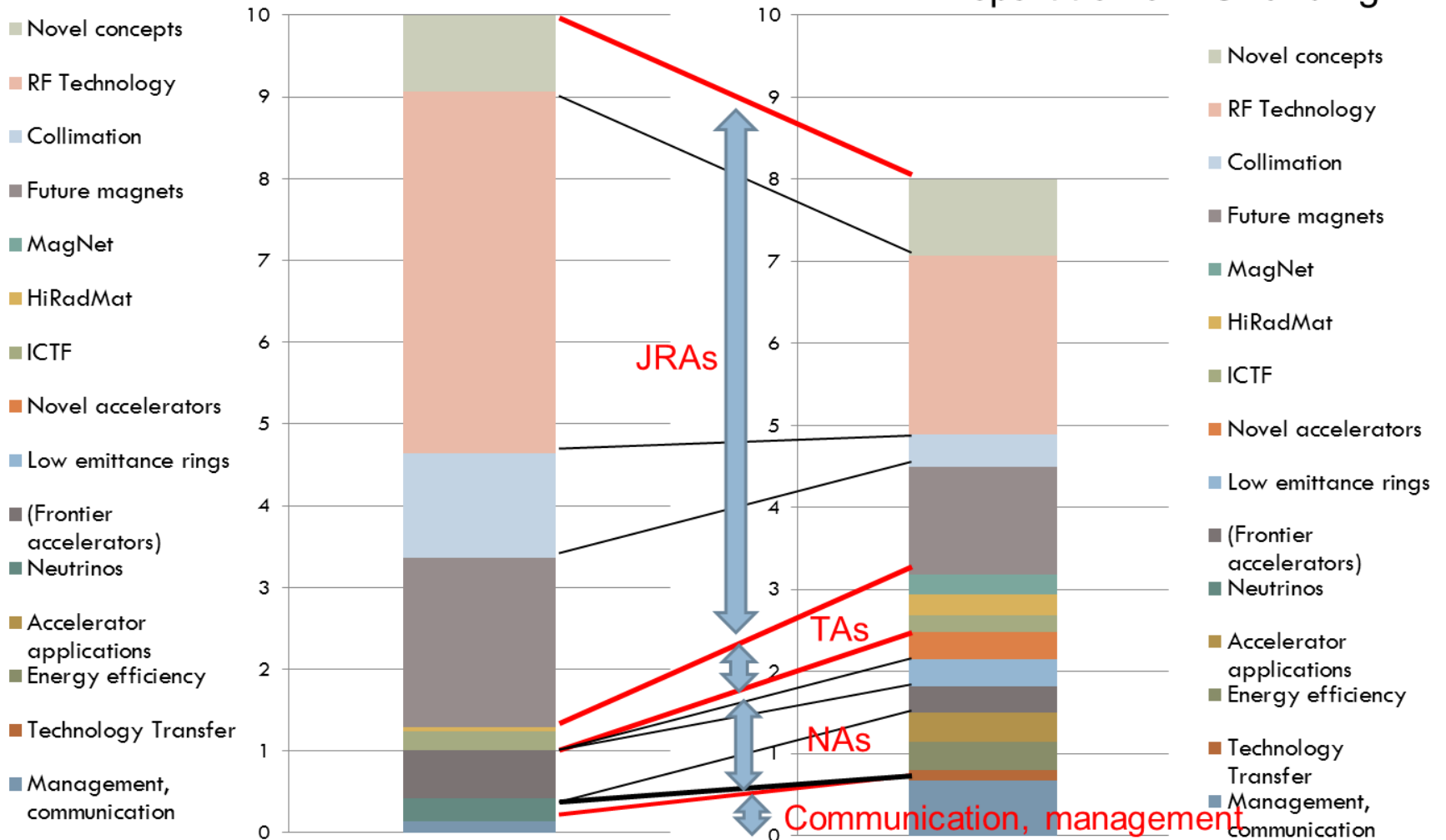


EC request by WP



EuCARD² From EuCARD to EuCARD-2

Repartition of EU funding





EuCARD² EuCARD-2 reporting strategy

Goal: simplification, respect the engagements with the EC while minimising the administrative overheads.

One report/year, with arrangements to match the EC reporting periodicity (IAR becomes P1R).

n.	Type	From Month	To Month	End of reporting period	Notes
1	Internal Activity Report	1	12	30.04.2014	
	<i>Period 1 Activity Report</i>	<i>1</i>	<i>18</i>	<i>30.10.2014</i>	updated IAR
2	Mid Term Activity Report	19	24	30.04.2015	
3	Period 2 Activity Report	19	36	30.04.2016	
4	Period 3 Activity Report	37	48	30.04.2017	

Deadlines (for each report):

Input from Task Leaders to WP Coordinators	Y+10	10 May
Input from WP Coordinators to Project Coord.	Y+20	20 May
Draft submitted to Steering Committee	Y+30	30 May
Draft approved by GB at Annual Meeting		~10 June
Report submitted to EC (when required)	Y+60	30 June

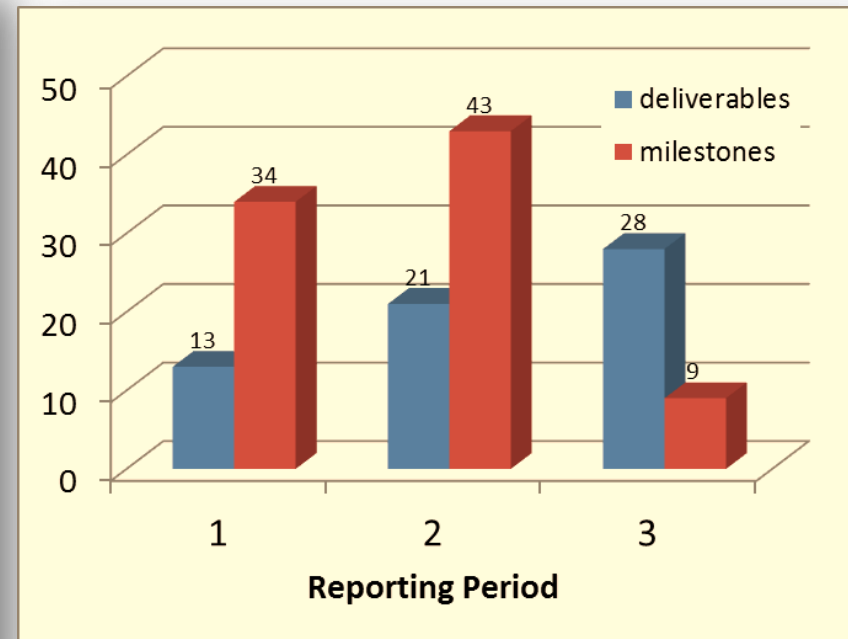
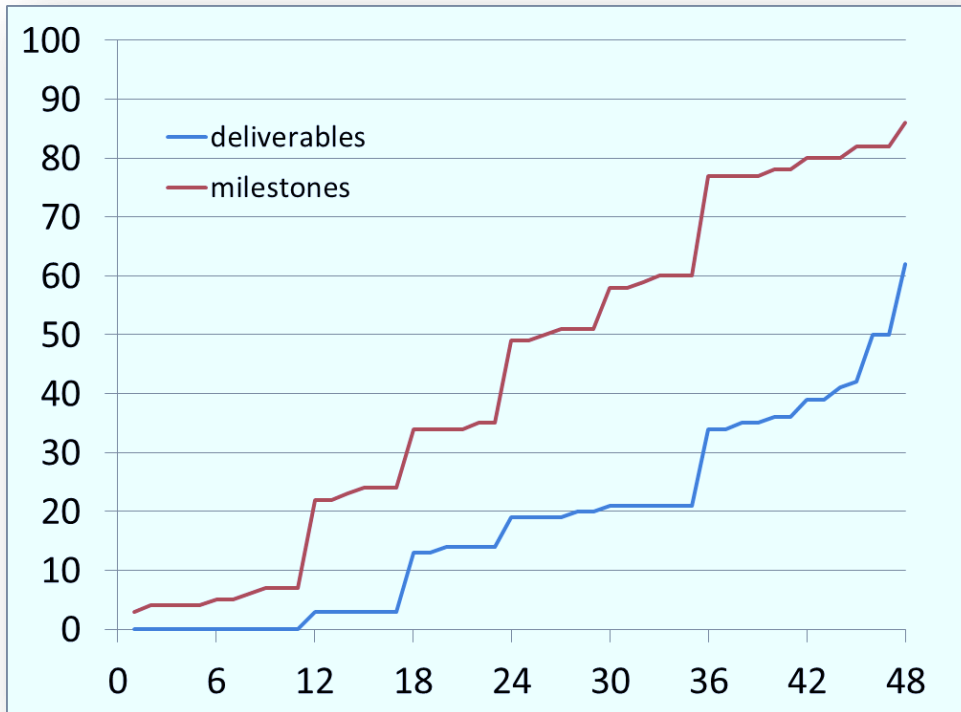
Size:

Inputs from Task Leaders: maximum 2 pages, including 1 or 2 pictures, graphs, tables.

Inputs from WP coordinators: input from Tasks (between 8 and 12 pages) plus an executive summary.²⁰

EuCARD² The EuCARD-2 deliverables

Our first objective is to produce (in time) all our 62 deliverables.



The deliverable reports can be short – its main goal is to demonstrate that the result has been achieved, and it can make reference to more detailed reports and papers.

A 1st Workshop in the frame of EuCARD-2



1st European Advanced Accelerator Concepts Workshop
 Supported by EU via EuCARD-2, GA 312453
 June 2 - 7, 2013 La Biodola, Isola d'Elba (Italy)



1st European Advanced Accelerator Concepts Workshop
 Supported by EU via EuCARD-2, GA 312453
 2-7 June 2013, La Biodola, Isola d'Elba, Italy

Novel schemes using advanced technologies (table-top FEL, plasma linear collider)
 High gradient and multibunch acceleration in metallic structures
 (C-X-band and beyond) with innovative power generation schemes
 Advanced beam diagnostics for beams and plasma
 Dielectric structures and other novel technologies
 Plasma accelerators driven by electron beams
 Plasma accelerators driven by modern lasers
 Plasma accelerators driven by proton beams
 Computations for Accelerator Physics

The European Advanced Accelerator Concepts workshop has the mission to discuss and foster methods of beam acceleration with gradients beyond state of the art in operational facilities. The most cost effective and compact methods for generating high energy particle beams shall be reviewed and assessed. This includes diagnostics methods, timing technology, special need for injectors, beam matching, beam dynamics with advanced accelerators and development of adequate simulations. This workshop is organized within the 7th European Programme by the European Network for Novel Accelerators (EuroNNAc), representing 52 European Research Institutes. The EAAC will be followed by a 1-day network meeting by invitation only.

On Friday 7th: EuroNNAc 2013 yearly meeting

Workshop Organizing Committee
 Massimo Ferrario (INFN), Ulf Lohm (DESY), Ralph Assmann (DESY), Alex Dementiev (CEC), Andri Speckli (Ecole Polytechnique)

www.inf.infn.it/conference/EAAC2013/

Programme Co-ordinator
 Andrea Lodi (Ecole Polytechnique)

International Advisory Committee
 (see the website for the full list of members)

European Network for Novel Accelerators (EuroNNAc)
 website: euCARD-2.org

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On Friday 7th: EuroNNAc 2013 yearly meeting

Workshop information



1st European Advanced Accelerator Workshop
 June 2-7, 2013

Co-organized by the EuroNNAc Network (WP7) of EuCARD-2.

Idea to foster European research on innovative acceleration techniques (plasmas, dielectrics, high-gradient) launching a series of European workshops in alternance with the US series (running since several years...).

Large participation (150) and interest, lot of young people, impressive amount of presentations.

See R. Assmann's presentation for details.

Topics

- Dielectric structures and other novel technologies
- High gradient and multibunch acceleration in metallic structures (C-X-band and beyond) with innovative power generation schemes
- Novel schemes using advanced technologies (table-top FEL, plasma linear collider)
- Advanced beam diagnostics for beams and plasma
- Plasma accelerators driven by electron beams
- Plasma accelerators driven by proton beams
- Plasma accelerators driven by modern lasers
- Computations for Accelerator Physics



The Website is up and running !

The screenshot shows the EuCARD² website homepage. At the top left is the EuCARD² logo. To its right is the text "Enhanced European Coordination for Accelerator Research & Development". Below this is a navigation menu with "HOME", "ABOUT US", "SCIENCE", and "CONTACT". The main content area is divided into several sections: a paragraph about the project's global view, a "PROJECT STRUCTURE" section with a sub-section for "Management and Communication" listing WP1, and "Networking Activities" listing WPs 2 through 7. Below that are "Transnational Access" (listing WPs 8 and 9) and "Joint Research Activities" (listing WPs 10 through 13). On the right side of the page, there are three vertical panels: "LATEST NEWS" with dates from May 1 to June 7, 2013; "EVENTS" with dates from June 10-14 and June 11-12, 2013; and "ADDITIONAL LINKS" with links to "Accelerating Newsletter", "Publication database (CDS)", and "Document repository (EDMS)". At the bottom right is an "INTRANET" section with "Access Intranet" and "How to access Intranet". The footer contains the European Union flag, a funding statement, and the CERN logo.

Thanks to Agnes Szeberenyi, our Communication Manager, the web site is open since March:

<http://eucard2.web.cern.ch>

Two WP websites are already available and accessible from the main site:

WP3 (Energy efficiency)
WP13 (Novel Acc. Techniques)



EuCARD-2 next steps

All Forms A (Grant Accession Forms) have been signed and received by the EC on May 30th.

Prefinancing received by CERN on May 2nd, being now distributed to all partners (proportionally to their share of the overall budget).

Consortium agreement: all comments to the 2nd draft have been received, the CERN legal service has finalised the document. One week more for additional comments, will be then distributed for signature.

Setting up the governance: first meeting of the Governing Board today at 17:00; approval of the Steering Committee (WP Coordinators and Deputies).

A great thank to the administrative services and to the technical contacts of all partners for their kind and fruitful collaboration and to the CERN EU office (the great trio!) for successfully going through all the administrative procedures.

...and now we have no excuses not to do the work!



Today, June 13th: EuCARD-2 kick-off

Welcome from EuCARD-2 coordinator <i>Council Chamber, CERN</i>	<i>Dr. Maurizio VRETENAR</i> 13:30 - 13:35
Introduction by the EC Project Officer <i>Council Chamber, CERN</i>	<i>Dr. Mariano MENNA</i> 13:35 - 13:45
The EuCARD-2 programme	<i>Dr. Maurizio VRETENAR</i> 13:45 - 14:10
EuCARD-2 communication strategy <i>Council Chamber, CERN</i>	<i>Dr. Agnes SZEBERENYI</i> 14:10 - 14:20
XBEAMS: exploring the accelerator frontiers <i>Council Chamber, CERN</i>	<i>Dr. Frank ZIMMERMANN</i> 14:20 - 14:35
LowErings: common challenges and common solutions <i>Council Chamber, CERN</i>	<i>Dr. Yannis PAPAPHILIPPOU</i> 14:35 - 14:50
EuRONNAC2: from plasma acceleration to plasma accelerators <i>Council Chamber, CERN</i>	<i>Dr. Ralph ASSMANN</i> 14:50 - 15:05
EnEff: towards sustainable accelerators <i>Council Chamber, CERN</i>	<i>Dr. Mike SEIDEL</i> 📄 15:05 - 15:20
AccApp: Reviewing and promoting applications of accelerators <i>Council Chamber, CERN</i>	<i>Dr. Rob EDGECOCK</i> 15:20 - 15:35
Tea break <i>Pas Perdu</i>	15:35 - 15:55
ICTF at RAL, a versatile test facility for the muon community and beyond <i>Council Chamber, CERN</i>	<i>Dr. Roy PREECE</i> 16:05 - 16:15
HiRadMat at CERN, a new powerful material test facility <i>Council Chamber, CERN</i>	<i>Dr. Adrian FABICH</i> 16:15 - 16:25
The CERN Magnet test facility as a resource for European accelerator research <i>Council Chamber, CERN</i>	<i>Dr. Marta BAJKO</i> 16:25 - 16:35
New Collimator Materials in EuCARD-2 <i>Council Chamber, CERN</i>	<i>Dr. Adriana ROSSI</i> 16:35 - 16:55

Presenting all WPs that were not already introduced during the common workshop of Tue/Wed

17:00-19:00
Joint Governing Board and Steering Committee Meeting

19:30
EuCARD-2 Cocktail (Glass Box)



And now it's time to set sail for a new adventure !

Thank you for your attention