



## **WP2: Catalysing Innovation (INNovation)**

**WP2: Overview of technology scouting and plans  
for the next workshop with industry**

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- **To maximize the likelihood that the innovation generated within the various accelerator related R&D work packages (WPs) of the EuCARD-2 project is transferred to industry.**
- WP Leader: Giovanni Anelli (CERN), Penny Woodman (STFC)
- Participants: CERN and STFC, 5.5 person-months each
- DELIVERABLE REPORT - RESPONSIBLE PARTNER (STFC)
  - **EUCARD-2 : KEY TECHNOLOGY AREAS**
  - AUTHORS: VLAD SKARDA (STFC) AND TIM TSARFATI (CERN)
  - DELIVERABLE: D2.1 – DUE DATE: 31 MAY 2014
  - JUST PUBLISHED

The logo for EuCARD² features a stylized blue and red swoosh with a yellow star above the 'A'.

# EuCARD<sup>2</sup> Methodology/Questionnaire

- Active technology scouting within the EuCARD-2 consortium was carried out via interviews with all work package leaders with a view of identifying:
  - *the key technological areas that are potentially of interest to industry*
  - *possible exploitation/industry engagement mechanism for knowledge and technology transfer (KTT) and*
  - *the likely process for the development of the technology bearing in mind a variety of enablers and barriers - (in house R&D, collaborative academic or industrial R&D, subcontract)*

1. What are the most important innovative technologies being developed in your WP?
2. Why are they innovative? What are the needs/advantages or specific requirements over existing technologies that drive the development?
3. What are, in your opinion, other potential applications for the technology outside high energy physics area?
4. What is the likely process for the development of the technology (in house R&D, collaborative academic or industrial R&D, subcontract)

5. Who are industrial partners you are either already collaborating with (if any) or would potentially envisage to collaborate with in the future?
  - What is/would be their role (supplier, R&D collaborator or a subcontractor)
6. What are the potential enablers, barriers and bottlenecks to KTT
7. How could certain developments be made more attractive to industry
8. AOB (any other business e.g. workshops)

- Considering the location and the proximity of WP leaders, it was agreed that:
  - Dr Vlad Skarda, [vlad.skarda@stfc.ac.uk](mailto:vlad.skarda@stfc.ac.uk), STFC, would interview
    - **WPs: 4, 6, 8, 12 &13 and write a final deliverable report and**
  - Dr Tim Tsarfati, [Tim.Tsarfati@cern.ch](mailto:Tim.Tsarfati@cern.ch), CERN, would interview
    - **WPs: 3, 7, 9, 10 &11.**
- The analysis of the results of interviews was carried out in terms of
  - time to market for the technology,
  - potential for KTT and
  - whether the WP was ready to engage with industry.

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# EuCARD<sup>2</sup> WPs Overview and Analysis

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- The analysis highlighted, that 7 work packages (WPs) may potentially be proposed for the three planned WP2 industry workshops, with the following initial ranking:
  - WPs 3 and 11 were given the highest priority (1),
  - WPs 6, 9 and 10 were all ranked at (2) and
  - WPs 4 and 12 were given initially the same ranking (3).

WP	WP Type	Market/Scope outside HEP	Time to market	Potential for KTT	Workshop wanted - ready for industry engagement	Ranking (timing)
3	R&D on energy efficiency	Energy	Near term*	High	Yes	1
4	Network (large), focus is on complete accelerators	Energy, medical, security	Near to medium term	Medium	Yes	3
5	HEP Network, focus is on extreme accelerators	None at present, focus is on HEP area	Long term	Low	No	-
6	Network, focus is on ultra-low emittance accelerator rings	Light sources, medical and industrial applications	Near to medium term	High	Yes, bringing together system users and industry	2
7	Network to design fully operational accelerator facility	Photon science, medical sector, semiconductor industry	Medium term*	Not at present	No	-
8	Support access to ICTF	None at present	Long term*	Not at present	No	-
9	Development and testing of instrumentation under extreme environments	Medical and cryogenic industry, condition monitoring	Near to medium term	High	Yes	2
10	R&D on HTS magnets	Medical sector and applied superconductivity	Medium term	High	Potentially in additive manufacturing / 3D printing	2
11	R&D on novel materials for LHC collimators	Thermal management applications e.g. power electronics, aerospace and gas turbines	Near to Medium	High	Yes	1
12	R&D on high gradient cavities, SRF thin films	Medical, security, environment and industrial processing sectors	Medium term	High	Yes	3
13	R&D on laser plasma accelerators	Medical, security, testing of materials	Medium term	High	Potentially in the future	-

\*Note - Time to market: Near term (3-5 years), Medium (5-10 years) and Long term (10+ years).





# EuCARD<sup>2</sup> WPs Overview and Analysis

- **WP3 - ENERGY EFFICIENCY (1)** is dealing with
  - heat recycling from accelerators, which is also applicable to all buildings, including data centres and industry.
  - **These methods are of general interest to industry as well as public sector and are not specifically connected to high energy applications**
  - **2 ‘Energy for Sustainable Science’ Workshops already - 2011& 2013**
- **WP4 - ACCELERATOR APPLICATIONS (3)**
  - is a large network (52 partners) looking at the improvements that accelerators developed for research could bring to the existing or new applications of accelerators e.g. for medical, energy and security sectors
  - document (Q4) describing the current uses of accelerators in Europe, improvements that are required and possible future applications.



# EuCARD<sup>2</sup> WPs Overview and Analysis

- **WP6 - LOW EMITTANCE RINGS (2)**
  - networking work package developing ultra-low emittance accelerator rings for light sources, colliders and damping rings with potential benefit to all other areas where accelerators are applied (medicine, industrial application, but also in pure research in new accelerating techniques), e.g. by reducing size, cost and improving the overall performance.
  - bringing together system users and industry (already working with TESLA, other companies interested)
- **WP9 - HIRADMAT@SPS AND MAGNET@CERN (2)**
  - focusses on development and testing of instrumentation under extreme environments.
  - novel optical sensors and fibres were developed with the aim of sensing temperature, strain and acoustic emission below 50K in the presence of high field superconducting magnets or power transmission lines.
  - **already working with a number of companies**
  - **potential applications are in the medical sector, aeronautics and other fields of condition monitoring system.**



# EuCARD<sup>2</sup> WPs Overview and Analysis

- **WP10 – FUTURE MAGNETS (2)**
  - addresses the development of the first High Temperature Superconductor (HTS) Magnet with potential applications in the medical sector for MRI as well as for high field NMR used in the solid-state physics or protein research in the pharmaceutical industry.
- **WP11 – COLLIMATOR MATERIALS FOR FAST HIGH DENSITY ENERGY DEPOSITION (1)**
  - focuses on development of Ceramic/Graphite Composites, exhibiting resistance to thermal shocks up to very high temperatures, high thermal conductivity, good electrical conductivity, low density and high radiation damage hardness.
  - **these new materials have applications in power electronics, avionics and aerospace, advanced braking systems for automotive and aerospace and hot components for gas turbines**
  - Already working with industry, looking for expansion of this work.

## **WP12 – INNOVATIVE RADIO FREQUENCY (RF) TECHNOLOGIES (3)**

- **Compact low energy accelerators**
- reducing physical size and overall cost will have significant commercial benefits
- used extensively in medical, security, environment and industrial processing sectors
- already working with a number of industrial companies.



# Enablers/Barriers for KTT

**The enablers/barriers for industry are fundamentally dependant on business opportunities envisaged and commercial return on investment (P McIntosh).**

- **Enablers**
  - collaborative R&D between academic/laboratory side and industrial partner
  - new technology would open a series of new applications
  - **EuCARD-2 initiative is extremely important because it helps in structuring the research activity at the highest level**
- **Barriers for collaboration with industry**
  - Fear of losing the IP
  - **Obtaining the funding to develop the accelerators for the applications**
  - quality HTS material - materials availability and cost (thin films and cables)
  - **industry looking at near to medium term return on investment (cannot afford to get involved in long term development).**

- The decision on the exact sequence and priorities for the next three WP2 industry workshops in months 18, 30 and 42 will be taken:
  - over the next few months depending on the detailed discussion with the WPs involved and also
  - **taking into account recent workshops, which were already held for some of the technologies.**

**Knowledge transfer activities help to form the links between researchers and their institutes with industrial companies, through which the technical and scientific expertise is exchanged and ultimately transferred to industry.**

- This deliverable gives a good overview of technologies being worked on **specifically in the EuCARD - 2** and highlights particularly those ones which are closer to the market and where there is a need and interest in collaboration with WP2.
- Continued interaction with all the participants of EuCARD-2 is necessary in order to profit from the developments and organise jointly with the selected WP leaders the **next three WP2 industry workshops in months 18, 30 and 42.**



# Future work – Cont.

**Existing knowledge transfer networks will be used to disseminate some of the results of this deliverable as well as information regarding the next workshop with industry.**

- **CERN is involved in a number of international knowledge exchange networks, some of which are listed below:**
  - **EEN - The Enterprise Europe Network, helping small business to make the most of the European marketplace**
  - **ENET - CERN's network of TTOs in the Member States**
  - **HEPTech - Leading HEP technologies for industry Technology Transfer opportunities**
- **The aim is to collaborate with these networks rather than duplicate the effort in dissemination of the results specifically from the EuCARD-2 consortium.**
- **In addition to this, there are complimentary national knowledge exchange activities (e.g. STFC Innovations Club), which through knowledge exchange workshops, not only bring the researchers together with the industry, but also inform the participants about the funding opportunities for innovation, technology transfer and commercialisation.**





**Thank you**

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