

To: M. Vretenar
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Report from the EuCARD-2 Scientific Advisory Committee

The second meeting of the EuCARD-2 Science Advisory Committee (SAC) took place from April 21 to April 23, 2015, during the EuCARD-2 Annual Meeting held in Barcelona. Present for the SAC were Caterina Biscari (ALBA-CELLS) and Stephen Peggs (BNL). The SAC mandate is in Appendix A.

Additional objectives for the 2015 meeting were

- a. Assess the progress of EuCARD-2 and the quality of the results, in preparation for the Mid-Term Review of May.
- b. Contribute to the discussion on the contents of the next Integrating Activity project. ["EuCARD-3"]

1 EXECUTIVE SUMMARY

We congratulate and thank all the participants of the annual meeting for their hard work, careful thought, excellent presentations, and hospitality. The presentations made by EuCARD-2 collaborators were of consistently high quality.

SAC is impressed with the activities of the first half of the EuCARD-2 period, and with the reports that were presented. Enormous progress has been made since the 2014 Annual Meeting. Nonetheless, it is impossible for SAC to systematically review technical and scientific results and developments, within the limited resources and time available.

Ties to industry have been strengthened and exploited in several Work Packages, but more progress is possible. Work Packages 2 and 4 ("Catalysing innovation" and "Applications of accelerators") have an especially important role to play in strengthening ties to industry.

SAC recommends that EuCARD-2 anticipate the delivery of final (year 4) report statistics by making them available on an annual basis to the SAC, for example at the annual meetings. Networking Activities, in particular, need to provide quantitative indicators.

SAC strongly supports encouraging young scientists to be active, especially in Networking Activities, for the long-term future of advanced accelerator science and technology.

2 OVERVIEW AND GENERAL COMMENTS

EuCARD-2 activities are well coordinated into categories of “Management”, “Networking Activities”, “Transnational Access (to Research Infrastructure)”, and “Joint Research Activities” (sometimes also called “Research & Technology Development”).

WP1 Management and communications

On the annual meeting agenda, we recommend enhancing the visibility of the smaller institutes and universities, at the expense of presentation slots assigned to the larger laboratories. Similarly, younger researchers should be given more visibility, expanding the 2015 examples. The presentation of “special topics” at the second annual meeting was successful and stimulating.

Wherever possible, meetings and workshops should take place at the smaller institutes, laboratories and universities, in order to make EuCARD-2 activities more visible to communities that are likely to be very receptive.

Work Package leaders, or their representatives, could be asked to highlight what they consider their breakthrough results at the Annual Meeting, together with weaknesses and opportunities. This would be useful in preparation for EuCARD-3 proposal submissions. Perhaps it would be possible to provide the leaders with some kind of template, with indicators, not only at the annual meetings but also for final EuCARD-2 reports.

3 NETWORKING ACTIVITIES (NA) – Work Packages 2 to 7

WP2	Catalysing innovation
WP3	Energy efficiency
WP4	Accelerator applications
WP5	Extreme beams
WP6	Low emittance rings
WP7	Novel accelerators

In general, Networking Activities appear to have been very successful. The need to provide quantitative indicators – and the challenge to provide them – is especially strong in NA’s. Insofar as metrics were presented, it was not with a unique format, nor easily readable. It may be possible to measure:

- a. Interactivity: ratio of participants to speakers for each workshop.
- b. Added value: a brief written workshop summary describing the added value outcomes – new ideas generated, or eliminated, publically available on the project web site
- c. Student participation: prizes, et cetera
- d. Statistics: how many presentations, posters, industrial presence, et cetera
- e. Non-European participation: strong in some cases, but not evident in others.

WP2 Catalysing innovation

The report showed Knowledge Transfer activities that are mainly being organised by the large laboratories, such as CERN and STFC. We suggest paying attention to the need to address diverse industrial communities, especially in those European countries that are technologically less competitive. We also suggest developing statistics on meeting attendance, and highlight those successful initiatives that materialise into real projects.

WP3 Energy efficiency

This important new initiative is well structured and advancing well. Its networking and sharing is of the utmost relevance to small and large accelerator infrastructures. It is well connected to other global and regional accelerator initiatives towards the same objectives, and is essential for the future generations of accelerators, large and small.

WP4 Accelerator applications

SAC fully supports the “Applications of Particle Accelerators in Europe” project, which will provide a document readily accessible and useful for policy-makers and funding agencies. The APAE document will be useful during EuCARD-3 preparations, and in future presentations to the European Commission. We recommend the early identification and involvement of a geographically broad (but numerically small) sample of policy-makers, and other members of the goal audience, who can provide occasional feedback on the scope and depth of the document, throughout its production process. We recommend including in the document a survey – even if approximate – of accelerators: their uses, locations, types, sizes et cetera.

WP5 Extreme beams

This Work Package is especially active in one of the 5 tasks, Extreme Colliders, so far exclusively meaning FCC. The successful acceptance of the EuroCirCol design study in H2020 is an offshoot from this activity. We recommend giving more visibility to several partners from multiple European laboratories, especially junior participants. Collaboration with colleagues working on the CEPC and SppC projects is encouraged, where possible, with the support of management and policy-makers. Two parallel projects of such dimensions should not ignore each other.

WP6 Low emittance rings

This is a well-structured and balanced effort, with encouraging results from all of the tasks. When the activity was initiated in 2012 there were only 3 accelerator facilities aiming at low emittance. Today, almost all synchrotron light sources are pursuing low emittance efforts. MAX-IV (near to commissioning) and ESRF (constructing an upgrade) will be real tests of low emittance advances. We recommend that WP6 members consider participating in these commissioning efforts.

WP7 Novel accelerators

The EuPRAXIA proposal to H2020 – for a 5 GeV, 250 m facility with FEL and HEP users – was unsuccessful, even though it was highly evaluated. The participation of many small labs

and universities was a positive aspect to the proposal. The group has acted in a positive way to this temporary setback. We encourage further similar proposals, to EuCARD-3.

The special topic presentation on tomographic micro-CT imaging using X-rays from betatron oscillations in a plasma-wakefield accelerator was especially impressive.

4 TRANSNATIONAL ACCESS (TA) – Work Packages 8 and 9

WP8 Ionisation Cooling Test Facility – ICTF at STFC

WP9 High radiation & magnet tests – HiRadMat & MagNet at CERN

For EuCARD-3 TNA's are foreseen to be enhanced. The EuCARD-2 community could learn from experience gained in these 2 Work Packages, especially in terms of the organization, in planning for EuCARD-3 activities.

WP8 Ionisation Cooling Test Facility – ICTF at STFC

Currently the ICTF beamline at RAL serves the Muon Ionisation Cooling Experiment (MICE) collaboration and community. MICE is now taking preliminary muon-by-muon data for detector calibration runs, in the Step IV configuration. Around-the-clock Step IV data-taking will extend from June 2015 until June 2016, when re-configuration with RF modules begins, in preparation for the Cooling Demonstration configuration. CD construction will be complete in March 2017, with muon-by-muon data-taking extending from May 2017 until the end of 2018.

MICE offers the opportunity for accelerator physicists to engage in the operations, data-taking and analysis of a unique experiment that is a *sine qua non* on the road to neutrino factories and/or muon colliders.

WP9 High radiation & magnet tests – HiRadMat & MagNet at CERN

Both the HiRadMat and MagNet test facilities at CERN are being successful in attracting significant numbers of outside users, although not without interruptions due to equipment upgrades, et cetera. The statistics that were presented were very useful in gauging the depth of interest and involvement.

5 JOINT RESEARCH ACTIVITIES – Work Packages 10 to 13

WP10	Future magnets
WP11	Collimator materials
WP12	Innovative RF technologies
WP13	Novel acceleration techniques

SAC is impressed by the large number of ongoing JRA activities, and by mid-term results. EuCARD-2 serves as a complement to what individual labs are already developing, and provides them with an efficient mechanism for collaboration.

WP10 Future magnets

WP10 is a continuation of previous programs under CARE and EuCARD-1. It is a well-structured Work Package headed by CEA and CERN, with a clear hardware deliverable of an HTS dipole magnet prototype. It includes a specific industrial partner, and also collaborates with U.S. and Japanese institutions through a tripartite agreement, including workshops in the three global regions.

Impressive results seem likely, with significant implications for future HTS magnets, if one or more magnet prototypes can be delivered before the end of EuCARD-2. One task aims towards delivering an accelerator quality 5 T dipole using coils made from Roebel cable in an “aligned block” design.

WP11 Collimator materials

This effort includes many active collaborating institutions, but is focused solely on the CERN projects and proposals HL-LHC and FCC. Significant progress has been made since the last Annual Meeting, and many activities are under way. Two promising materials have been identified for future collimators: copper-diamond and molybdenum carbide-graphite. Plans include testing a full scale prototype of an HL-LHC collimator in the HiRadMat facility.

WP12 Innovative RF technologies

This diverse Work Package is making remarkable progress on many fronts, including Nb₃Sn deposition on cavity surfaces at CERN, wakefield monitor tests at PSI, HOM simulation development at the University of Rostock, and crab cavity development at the University of Lancaster. Co-ordinated efforts between the tasks in this Work Package make a strong foundation for the future, for example in the preparation of EuCARD-3 proposals.

WP13 Novel acceleration techniques

We were presented with an impressive list of activities, results and simulations. However, it was not immediately clear to SAC what were the “highlights, the breakthrough results, the weaknesses, and/or the opportunities”.

APPENDIX A – SAC MANDATE

Mandate of EuCARD-2 Scientific Advisory Committee

The EuCARD-2 Scientific Advisory Committee (SAC) is an external advisory body composed of members with an international reputation endorsed by the Governing Board upon proposition of the EuCARD-2 Steering Committee.

This committee will receive the EuCARD-2 Yearly Activity Reports and is expected to meet at least once per year during the EuCARD-2 Annual Meeting.

The role of the committee consists in:

- Monitoring the scientific and technical activities and advising the EuCARD-2 management in case of possible failure/delays in the EuCARD-2 deliverables/milestones.
- Giving recommendation to the EuCARD-2 management about scientific/technical choices to be made throughout the project or actions to be taken with the partners and or within the Work Packages.
- On request of the EuCARD-2 management, participating to an EuCARD-2 internal review.
- Providing a short document after each SAC meeting, and reporting at the EuCARD-2 plenary or EuCARD-2 governing board meeting

Finally the scientific advisory committee is expected to participate to the strategy reflections about the continuation of EuCARD-2 within the European framework but also with non European partners.