WP12 Increased Collaborative Interactions

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8 - 9th April 2015
WP12 2nd Annual Review Meeting, DESY

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

WP12
Innovative RF Technologies

- This JRA focuses on the development of a range of technical solutions that has the potential to achieve **significant performance increases** in **gradient**, **efficiency** and **beam quality** of RF-based accelerator systems.

- Several novel techniques in the field of normal and superconducting RF technology have been selected, presenting the **highest impact potential** and with the additional benefit of profiting from exchanges and communication between these two distinct communities.

- Main R&D areas encompass:
  - **SRF Thin Films** – C Antoine (CEA Saclay);
  - **High Gradient NC Cavities** – W Wuensch (CERN)
  - **SRF HOM Beam Diagnostics** – R Jones (Manchester University)
  - **RF Photocathodes** – R Nietubyc (NCBJ)

High Risk ⇒ High Win!

Reducing the footprint, machine energy consumption and overall cost of linear accelerators are of primary importance for all accelerators being developed today.

Fundamental Objectives

12.2 Thin Films

Exploitation of new superconducting materials, such as Nb_3Sn and the development of new nano and multi-layer thin films, each anticipated to break new ground in the performance of SC accelerator cavities, with the potential of achieving gradients well beyond present Nb technology.

12.3 High Gradient NC Cavities

Development of an efficient NC structure capable of high gradient operation (Eacc > 100 MV/m) but free from dangerous wakefield contributions.

12.4 SRF HOM Beam Diagnostics

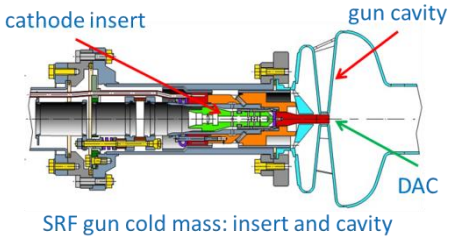
Development of electronics for utilising Higher Order Mode (HOM) signals from accelerating cavities for precision beam position diagnostics in high-energy electron linear accelerators, with the goal of reducing accelerator cost and length.

12.5 RF Photocathodes

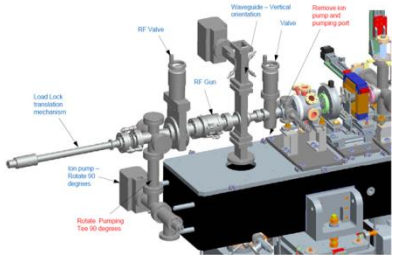
Development of next generation advanced RF photocathodes, exploring revolutionary production techniques as lead deposition, diamond amplifier cathode and metallic photocathodes, enhancing the ability to reach fs response time, for more effective electron beam generation, capture and transport with high brightness and low intrinsic emittance.

WP12
Pushing the Envelope

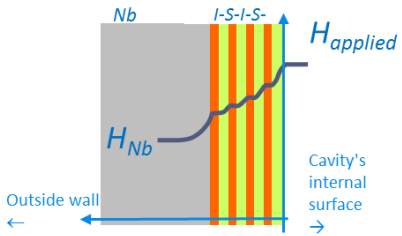
- **Beam Generation:**
  - New photocathodes providing demonstration of highest beam intensities and smallest beam emittances.

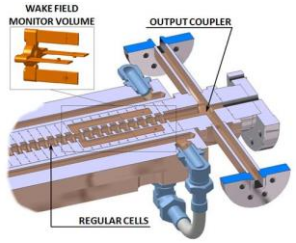


SRF gun cold mass: insert and cavity

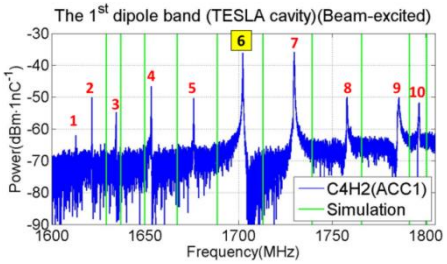


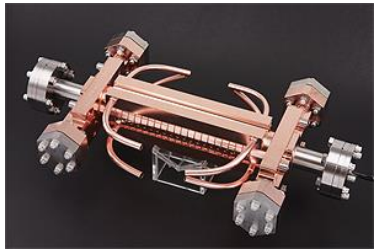
- **Acceleration:**
  - Demonstration of the highest level of acceleration performance.





- **Beam Diagnostics/Control:**
  - Demonstration of high performance and low cost beam position diagnostic.





Integrated and balanced programme encompassing high performance capabilities across both SC and NC technologies.

Intra-Task Collaborations?

- Simulation
  - High Gradient (cavity and klystron) and SRF HOM
  - SRF Thin Films, RF photo-cathodes
- Material Preparation & Analysis
  - SRF Thin Films and RF Photo-cathodes
    - Sample deposition and analysis exchange
      - Plug configuration differences, possibly provide online database for systems used including drawings.
- RF Breakdown
  - High Gradient (cavity), RF photo-cathodes and SRF Thin Films
    - Analysis and sample exchange
- HOM Management
  - High Gradient (cavity) and SRF HOM
- Experimental Evaluation
  - High Gradient (WFM) and SRF HOM

- Collaborative efforts may enhance the efficiency or outcome of some planned activities. However it is clear that it is not always feasible, due to the limited man power and existing commitments.
- Even when not feasible at this time, collaborative efforts could facilitate the foundation for future, longer term benefits, beyond EuCARD-2.

EuCARD²


감사합니다
Natick
Grazie
Danke
Ευχαριστίες
Dalu
Obrigado
Thank You
Köszönöm
Tack
Спасибо
Dank
Gracias
谢谢
Merci
Seé
ありがとう