Mid-Term Review
10 December 2018, Brussels

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ESR8, WP2

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ESR8, WP2 - Background

- Background: SRF technologie, Accelerator physics, Beam dynamics
- Contract start date: 01.03.2018
- Host institute: Helmholtz-Zentrum Berlin
- EASITrain Supervisor(s): Oliver Kugeler
- PhD Title: Radiofrequency properties of superconducting Nb3Sn and NbN thin films
- PhD University: University Siegen
- Secondments:
  - 1. "Research Instruments" GmbH, production of samples for material research, 05-18.11.18, 2 weeks
  - 2. To Be Decided.

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Role in the Project & Objectives

- Operation of the equipment exclusively built for SRF[1] research in HZB
- Determination of the radiofrequency properties (RF surface resistance, etc.) of novel SRF materials.
- Analyzation of the production recipes (in coop with ESR14 USIEGEN, CERN, INFN, and others) and manufacturing methods of novel SRF materials. Examine impacts of those methods on the materials properties.
- Identify the coating parameters impacting the RF performance most and establish a dependency model.
- Identify the most suitable material and production method of post-Niobium SRF cavities.

[1]SRF – Superconducting Radiofrequency

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Research, Methodology, Results & Next Steps

- Methodology:
  - SRF measurements with The QPR - Quadrupole Resonator
- Results achieved so far:
  - Education in system operation
  - Design improvement investigations
  - Multilayer SRF material characterisations
  - Production of the SRF samples for other ESRs and stakeholders (with the help of the ARIES* project)
- Next Steps :
  - Measurements of SRF thin films produced in SIEGEN and other labs.
  - Design improvements

The QPR – Quadrupole Resonator – HZB facility for fundamental R&D

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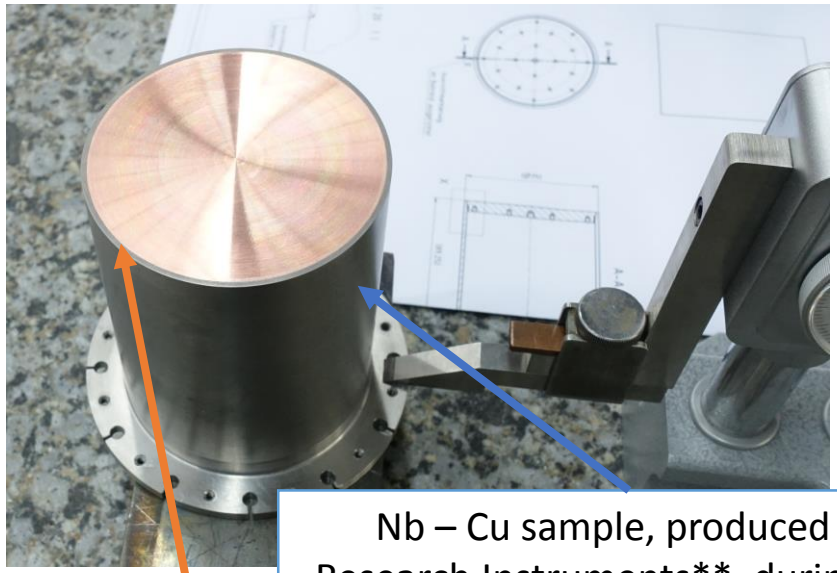
Research, Methodology, Results & Next Steps

- Production of the samples for SRF thin film deposition:
  - During 1st EASITrain secondment in Research Instruments 10 samples fabrication is completed
  - Different surface treatments are remaining to be performed
  - The work is done with the support of the ARIES* project which is aimed to the systematic study of different surface preparation techniques for thin film depositions on copper.



Nb – Cu sample, produced by Research Instruments**, during first secondment

Nb – Cu welding technique is pioneered by Research Instruments**, during EASITRain collaboration

Thin films. For particle accelerators SRF cavities play essential role. Niobium cavities are now approaching fundamental limits of field levels they can create to accelerate particles. SRF thin films – next generation approach to creating High field cavities. To do that novel superconducting materials are sputtered on Nb or Cu. Improved parameters of those materials will allow to push limits of SRF cavities.

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Research, Methodology, Results & Next Steps

- Next Steps :
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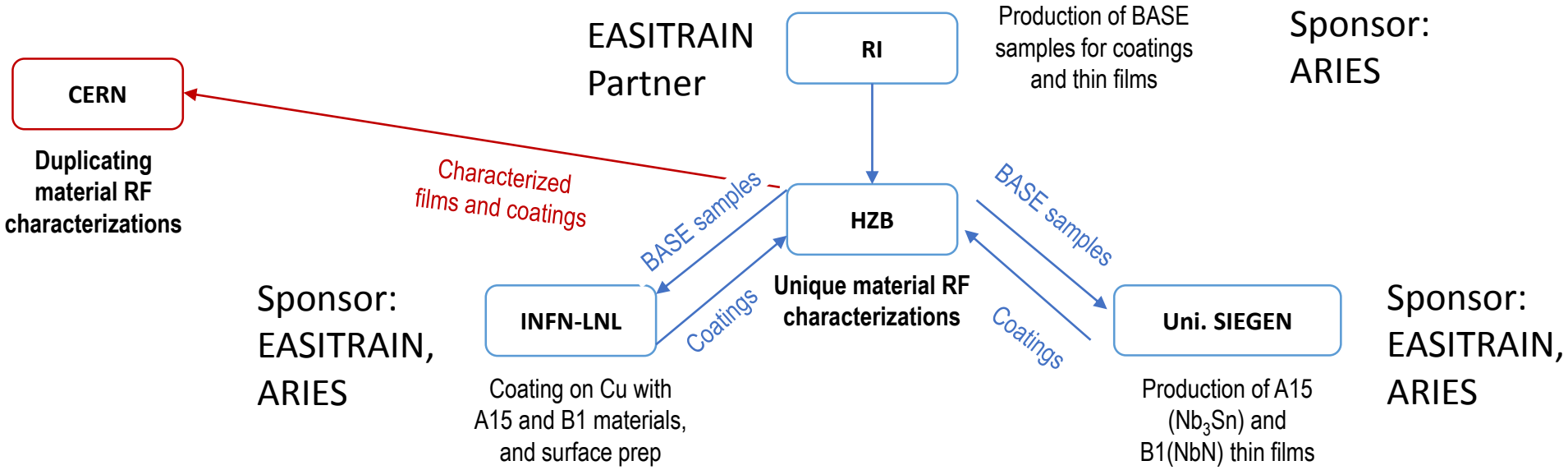
  - Design improvements



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Training, Conferences & Workshops

- Training
  - ✓EASITRAIN LECTURES SPRING, 2018, 05.03.18 - 23.03.18, CERN, Geneva, Switzerland
  - ✓EASISchool 1, 01.09.18 - 14.09.18, Technical University of Vienna (TUW), Vienna, Austria.
- Conferences & Workshops
  - ✓FCC week, Amsterdam, Netherlands, 09.04.18 - 13.04.18
  - ✓4th Matter and Technology Meeting, Berlin, Germany, 12.06.18 - 14.06.18
  - ✓8th International Workshop on Thin Films and New Ideas for Pushing the Limits of RF Superconductivity, Padova, Italy, 08.10.18 - 10.11.18
- Attended EASITRain events
  - ✓EASITRAIN LECTURES SPRING, 2018, 05.03.18 - 23.03.18, CERN, Geneva, Switzerland
  - ✓EASISchool 1, 01.09.18 - 14.09.18, Technical University of Vienna (TUW), Vienna, Austria

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Outreach, Dissemination & Networking

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- **Outreach activities**
  - ✓ Researcher Night at HZB 08.06.18 – attended
- **Dissemination activities**
  - ✓ Presentation: FCC week, Amsterdam, Netherlands, 09.04.18 - 13.04.18
  - ✓ Presentation: 8th International Workshop on Thin Films and New Ideas for Pushing the Limits of RF Superconductivity, Padova, Italy, 08.10.18 - 10.11.18
  - ✓ Poster: 4th Matter and Technology Meeting, Berlin, Germany, 12.06.18 - 14.06.18
- **Networking**
  - ✓ Establishing connections during all attended conferences, EASITrain events and activities

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Impact

- New State-of-Art materials for Future accelerators, FCC, and other applications
- Personal Impact.
  - Learning new languages, communication, networking, acquiring experience from visiting research centers and secondments.
  - Getting strong experimental and theoretical background and experience for working in frontier research areas and institutes

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Thank you!

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