Contribution ID: **477** Type: **Presentation**

RF performances of superconducting coatings on copper for the FCC study

Tuesday 25 June 2019 10:48 (18 minutes)

The conceptual design report for the future circular collider (FCC) study indicated niobium on copper (Nb/Cu) as the technology of choice for the realization of superconducting radio frequency (SRF) accelerating cavities for the 400 MHz RF systems. This technology is well established at CERN and provides a significant reduction of the costs involved as compared to bulk Nb. Nevertheless, a well-focused R&D is still required to further improve the overall RF performances of the Nb coatings. In particular, the aim is to mitigate the so-called "Q-slope"issue and thus reduce the RF losses at a relatively high accelerating gradient. Moreover, such an R&D effort could possibly lead to the demonstration of the advantage of the Nb/Cu technology over bulk Nb even at the operation frequency of 800 MHz.
Energetic condensation techniques, like the high power impulse magnetron sputtering (HiPIMS) and the electron cyclotron resonance (ECR), provide niobium films with improved microstructure and enhanced RF performances. Our results, in fact, show the feasibility of coatings characterized by a surface resistance Rs 2-3 times lower than the values obtained in the state-of-the-art Nb/Cu LHC cavities.
A significant boost towards a further reduction of the cryogenic power consumption associated to Rs could come from the use of alternative superconductors beyond Nb characterized by larger critical temperature and field. In this respect, materials of the A15 family, such as the Nb3Sn alloy, are among the most promising. The coating of high quality Nb3Sn on copper has been optimized at CERN and the first RF characterizations are very promising.
In this talk, we shall present the main results of the RF performances of both Nb and Nb3Sn films coated on copper substrates. The investigation was carried out employing the CERN quadrupole resonator (QPR). The QPR is a very versatile tool and it allows for the measurement of the Rs of flat samples at different temperatures, frequencies and RF field values. The results will be compared with those of a bulk Nb sample, measured with the same technique.

Author: Dr ARZEO, Marco (CERN)

Co-authors: Dr ROSAZ, Guillaume Jonathan (CERN); Dr FERNANDEZ-PEÑA, Stephanie (CERN); Dr ILYINA BRUNNER, Katsiaryna; Dr VALENTE, Anne-Marie (Jefferson lab); Mr VENTURINI-DELSOLARO, Walter (CERN); Prof. SENATORE, Carmine (Geneva university); Dr BONURA, Marco (Geneva university)

Presenter: Dr ARZEO, Marco (CERN)

Session Classification: SRF

Track Classification: Superconducting RF & associated technologies