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Flux trapping investigation in superconducting samples via the quadrupole resonator

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Magnetic flux trapping has been demonstrated to be very detrimental for the performances of superconducting radio frequency (SRF) cavities for accelerators. How exactly the flux, trapped in pinning centers in the form of vortices, results in dissipation of the RF power is an interesting open question. Theoretical models have been proposed to explain the experimental observations. A possible discriminant between the different models is the dependence of the trapping sensitivity as a function of the RF frequency.
The quadrupole resonator (QPR) at CERN is a tool that allows for the measurement of the surface resistance of flat samples at different temperatures, peak magnetic fields at the sample surface and RF frequencies. This makes the QPR very appealing for fundamental studies on flux trapping. Indeed, frequency dependencies can be investigated on a single superconducting sample, with no need to change the object under test.
In this work, we present results of the surface resistance measured for both a bulk niobium and superconducting films on a copper sample in the presence of external magnetic field to enhance the trapping effect. The results are presented in comparison to the proposed models, with particular focusing on the frequency dependence.

Presenter: ARZEO, Marco (CERN)

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