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High-Tc superconductors as accelerators wall coatings in FCC-hh: Impedance and compatibility with collective effects issues.

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One of the ambitious goals of current studies on accelerators is the possibility to work at the highest energy frontier even after the LHC era. To this aim, CERN is preparing a conceptual design report for Future Circular Colliders (FCC) with emphasis on proton-proton (hh) high-energy frontier machines. For FCC-hh one of the foreseen effort is the reduction of the machine impedance to allow to operate at high beam currents. One of the potential solution is the use of high-Tc superconductors as accelerator wall coating. This will require theoretical and experimental validation to see whether the impedance can be brought to the desired values in all frequency range.

Low impedance is not the only characteristic required by a wall coating. Positively charged beams may suffer from unconventional interaction with vacuum components. Beam instabilities are predicted, and, in some cases, observed, as caused by the mere presence of low energy electrons in the beam pipe. Such electrons are known to be produced by photo and/or electron interactions with the accelerator walls. The detailed characterization and the precise control of surface properties like surface chemistry, Secondary Electron Yield (SEY), Photoemission, Photoelectron Yield (PY), photon Reflectivity (R) for high-Tc superconductor surfaces is then required to qualify such materials as a potential solution to the foreseen impedance issues. Here, we present a tentative master plan for future activities at INFN.

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