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Beam coupling impedance wireless measurements of accelerator components: beam vacuum chambers and HL-LHC collimators

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A novel wireless method for beam coupling impedance measurements is currently under development, with preliminary measurements on beam pipes serving as proof of concept for its validity. This innovative approach overcomes the limitations of existing methods by not only evaluating impedance with high accuracy but also enabling the characterization of an unknown Device Under Test (DUT) as it will be installed in the accelerator. This capability is crucial for constructing accurate impedance models of accelerators and may help resolve or reduce discrepancies between modelled and measured impedance contributions. While analytical computations or simulations can provide accurate predictions of the beam coupling impedance for simple beam pipes with well-defined material properties, they often fail to account for real-world imperfections, such as surface roughness. Potential applications of this method are the characterization of High-Luminosity LHC collimators and other beam vacuum components planned for future installation. By providing detailed insights into their impedance contribution, this method could play a pivotal role in achieving a highly accurate HL-LHC impedance model.

Footnotes

Paper preparation format

Region represented

Europe

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