
Contribution ID: **739** Contribution code: **WEPM085** Type: **Poster Presentation**

# Metamaterial absorbers for beam-coupling impedance mitigation

*Wednesday 4 June 2025 16:00 (2 hours)*

Charged particle bunches traversing cavity-like discontinuities in the beam pipe at relativistic velocities excite electromagnetic resonant modes that can detrimentally affect the dynamics of trailing bunches. This beam-cavity interaction, characterized in the frequency domain through the concept of beam-coupling impedance, poses significant challenges for beam stability and performance in high-energy particle accelerators. While conventional mitigation strategies encompass higher-order mode (HOM) couplers and lossy ferrite insertions, novel approaches leveraging metamaterial properties offer promising alternatives for selective mode damping. This investigation explores advanced metamaterial-based structures designed to specifically target and attenuate higher-order modes, thereby selectively reducing the beam-coupling impedance resonances.

## Footnotes

## Paper preparation format

LaTeX

## Region represented

Europe

## Funding Agency

CERN

**Author:** SITO, Leonardo (University of Napoli Federico II)

**Co-authors:** SALVANT, Benoit (European Organization for Nuclear Research); ZANNINI, Carlo (European Organization for Nuclear Research); FIENGA, Francesco (European Organization for Nuclear Research); BREGLIO, Giovanni (University of Napoli Federico II)

**Presenter:** SITO, Leonardo (University of Napoli Federico II)

**Session Classification:** Wednesday Poster Session

**Track Classification:** MC5: Beam Dynamics and EM Fields: MC5.D04 Beam Coupling Impedance Theory, Simulations, Measurements, Code Development