SRF2025 TOKYO

22ND INTERNATIONAL CONFERENCE ON RF SUPERCONDUCTIVITY

September 21-26, 2025

Contribution ID: **70** Contribution code: **WEA03** Type: **Invited Oral Presentation**

Towards high power tests of an FE-FRT for transient detuning

Wednesday 24 September 2025 09:10 (20 minutes)

The design, fabrication, and validation progress towards a ferroelectric fast reactive tuner (FE-FRT) as a demonstrator of a high-power tuner for beam loading compensation at LHC injection settings is presented. Such compensation is referred to as transient detuning compensation and involves discrete frequency switching of an LHC cavity configuration on sub-microsecond time scales. The FE-FRT is operated in a two-state mode with a 7 kV bias applied across a BaTiO3/SrTiO3-Mg ferroelectric material in the tuner stub to provide the required cavity frequency shift. To achieve this, the device has been designed to operate as a coupled resonant tuner that provides an ˜8 kHz cavity tuning range. As an FE-FRT design, the tuner must tolerate a reactive power load of ±226 kW and ˜3 kW of dissipated power. The key design decisions taken are presented, along with the specific optimisation of the tuner in terms of the expected performance. Finally, measurements and first results for the tuner demonstrator validation process are discussed.

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Yes

Footnotes

Funding Agency

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Session Classification: Wednesday Oral Session: A

Track Classification: MC4: SRF Technologies