SRF2025 TOKYO

22ND INTERNATIONAL CONFERENCE ON RF SUPERCONDUCTIVITY

September 21-26, 2025

Contribution ID: **87** Contribution code: **FRB02**   Type: **Invited Oral Presentation**

Development of a traveling-wave (TW) structure for high gradients

Friday 26 September 2025 11:20 (20 minutes)

High-gradient superconducting RF structures are of keen interest to next-generation linear colliders because they offer substantial savings in terms of reduced construction cost by shortening the machine, and reduced operating costs. The gradient of bulk niobium superconducting RF structures is fundamentally limited by the maximum surface magnetic field these structures can sustain before quenching. While a history of sophisticated and complex niobium surface processing techniques has aimed to increase the niobium critical surface field, it is also possible to increase the accelerating gradient by altering the cavity geometry and accelerating mode in order to improve the ratio of the accelerating gradient to peak surface magnetic field. Traveling wave structures do just this by using geometric means to operate in the traveling-wave mode to increase the structure's transit time factor. With increased transit-time factor, higher gradients such as ~70 MV/m can be achieved under the same peak surface fields that otherwise limit 1.3 GHz cavities to below ~50 MV/m. These structures use proven Nb fabrication and processing techniques. Prototype development activities for a 3-cell structure, and a proof-of-principle waveguide loop are under development at FNAL. This talk shall provide an update of activities at FNAL, and worldwide collaboration on traveling wave structure development.

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Yes

Footnotes

Funding Agency

Author: MCGEE, Kellen (Fermi National Accelerator Laboratory)

Co-authors: NETEPENKO, Alex (Fermi National Accelerator Laboratory); CONTRERAS-MARTINEZ, Crispin (Fermi National Accelerator Laboratory); FURUTA, Fumio (Fermi National Accelerator Laboratory); UMEMORI, Kensei (High Energy Accelerator Research Organization); SOLYAK, Nikolay (Fermi National Accelerator Laboratory); AVRAKHOV, Pavel (Euclid Techlabs (United States)); KOSTIN, Roman (Euclid Techlabs (United States)); KAZAKOV, Sergey (Fermi National Accelerator Laboratory); KHABIBOULLINE, Timergali (Fermi National Accelerator Laboratory); YAKOVLEV, Vyacheslav (Fermi National Accelerator Laboratory)

Presenter: MCGEE, Kellen (Fermi National Accelerator Laboratory)

Session Classification: Friday Oral Session: B

Track Classification: MC3: Cavities