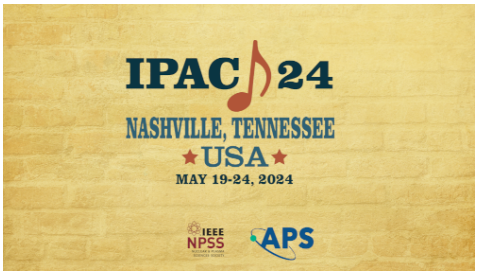

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Development of superconducting RF cavity in traveling-wave regime at Fermilab

Wednesday, 22 May 2024 16:00 (2 hours)

Niobium Superconducting RF (SRF) cavities have a theoretical peak magnetic field which limits the accelerating field to 50-60 MV/m. Presently, all SRF cavities operate in a Standing Wave (SW) resonance field in which particles experience an accelerating force alternating from zero to peak. In contrast, a resonance field in Traveling Wave (TW) mode propagates along with a structure, so particles in such field can experience a constant acceleration force and could have higher energy gain than that of SW mode. This phenomenon is defined by the cavity's transit time factor, T. A TW structure proposed in an early study achieves T ˜0.9, suggesting an increase in acceleration per structure by more than 20% compared to a SW structure (T ˜0.7). The early stages of developments had been funded by several SBIR grants to Euclid Techlabs and completed in collaboration with Fermilab through a 1-cell prototype and a proof-of-principle 3-cell TW cavity. It demonstrated the TW resonance excitation at room temperature in the "as-fabricated"3-cell structure. Here we report recent progresses and the first cryogenic testing of the 3-cell TW cavity in 2 K liquid helium at Fermilab.

Footnotes

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