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Development of a half-meter scale Traveling-Wave (TW) SRF cavity

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While a demonstration of TW resonance excitation in the 3-cell structure in 2K liquid helium had been prepared and carried out at Fermilab in collaboration with Euclid Techlabs, the RF design process of 0.5~1 meter scale TW cavity was begun at Fermilab as the next step of TW development towards an accelerator-scale one. Considering the physical dimensions of existing SRF facilities (for fabrication, processing, and cryogenic testing), Fermilab has proposed a half-meter scale TW RF design consisting of a 7-cell structure and a power feedback waveguide (WG) loop. The WG loop design includes the new RF configurations for TW resonance control during a high-power operation. 1-year US-Japan collaboration program focused on EBW optimization for the TW shape iris joint within the narrow gap was awarded and the efforts had been made by KEK, Jlab, and Fermilab. 1-year LDRD program of Fermilab is awarded recently to fabricate a low-cost mockup of the WG loop with new RF configurations and validate them. Here we will present a preliminary 7-cell TW RF design and report the progress and challenges through the awarded programs.

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