

## High Pressure Gas-Filled RF Cavities for Use in a Muon Accelerator Cooling Channel

A high pressure hydrogen gas-filled RF (HPRF) cavity can operate in the multi-Tesla magnetic fields required for a muon accelerator cooling channel. A beam test was performed at the Fermilab MuCool Test Area by sending a 400 MeV proton beam through an 805 MHz cavity and quantifying the effects of the resulting plasma within the cavity. The resulting energy loss per electron-ion pair produced has been measured at  $10\text{E-}18$  to  $10\text{E-}16$  J every RF cycle. Doping the hydrogen gas with oxygen greatly decreases the lifetime of an electron, thereby improving the performance of the HPRF cavity. Electron lifetimes as short as 1 ns have been measured. The recombination rate of positive and negative ions in the cavity has been measured on the order of  $10\text{E-}8$  cm<sup>3</sup>/s. Extrapolation in both gas pressure and beam intensity are required to obtain Muon Collider parameters, however the results indicate HPRF cavities can be used in a muon accelerator cooling channel.

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