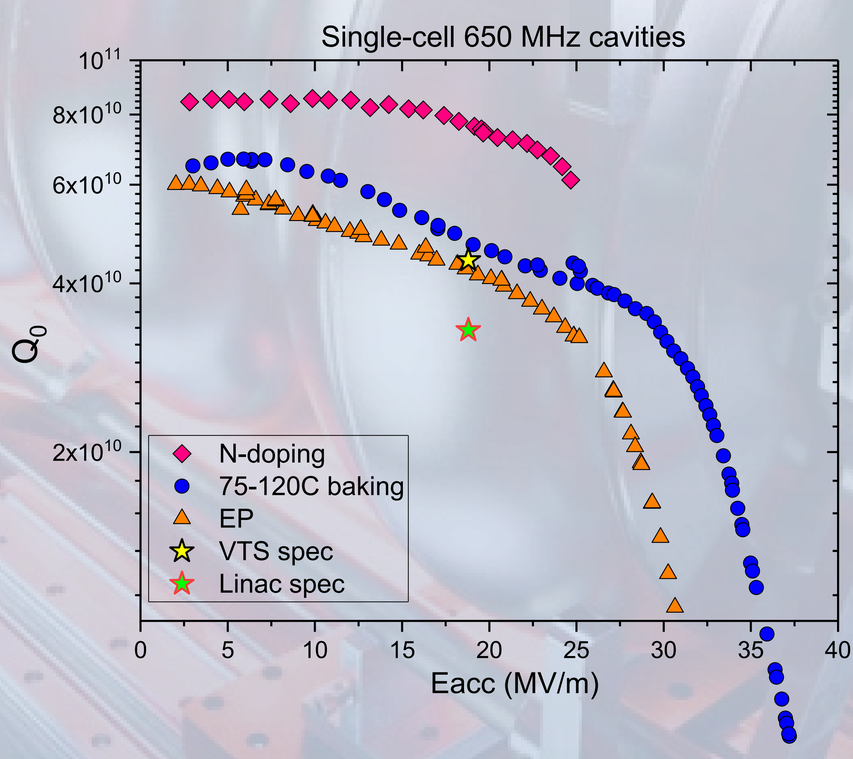
β = 0.61 & 0.92 SYSTEMS FOR PIP-II

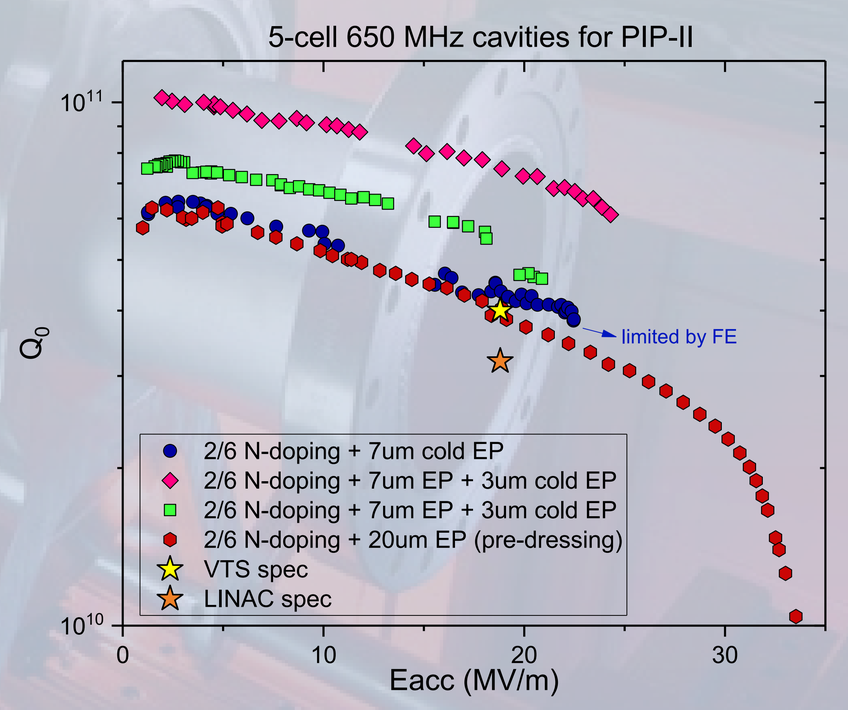
FERMILAB-POSTER-20-017-TD

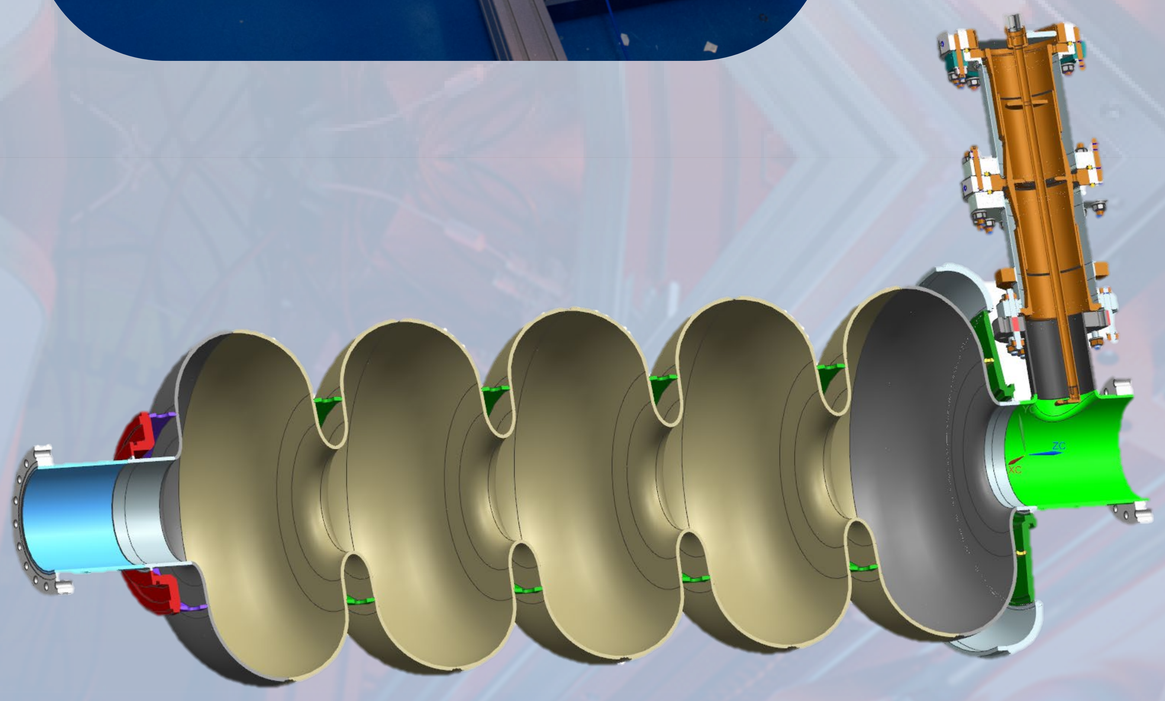
State-of-the-art surface treatments for SRF cavities (EP/BCP, 120C baking, 75-120C baking, N-doping) applied to 650 MHz cavities

Example of performance for SRF state-of-the-art treatments, in single-cell cavities:



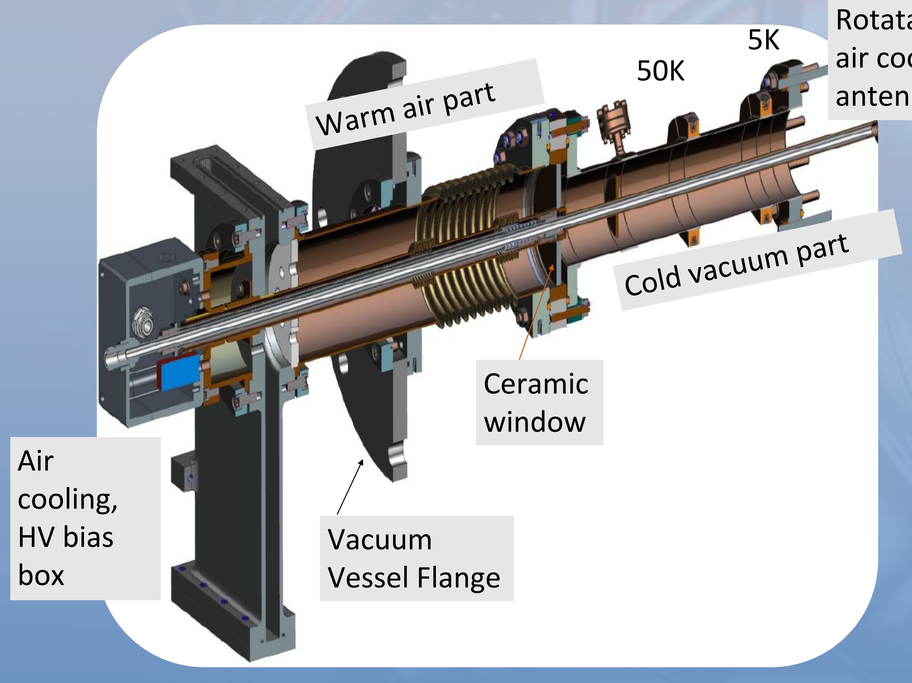
N-doping treatment optimization in 5-cell cavities:



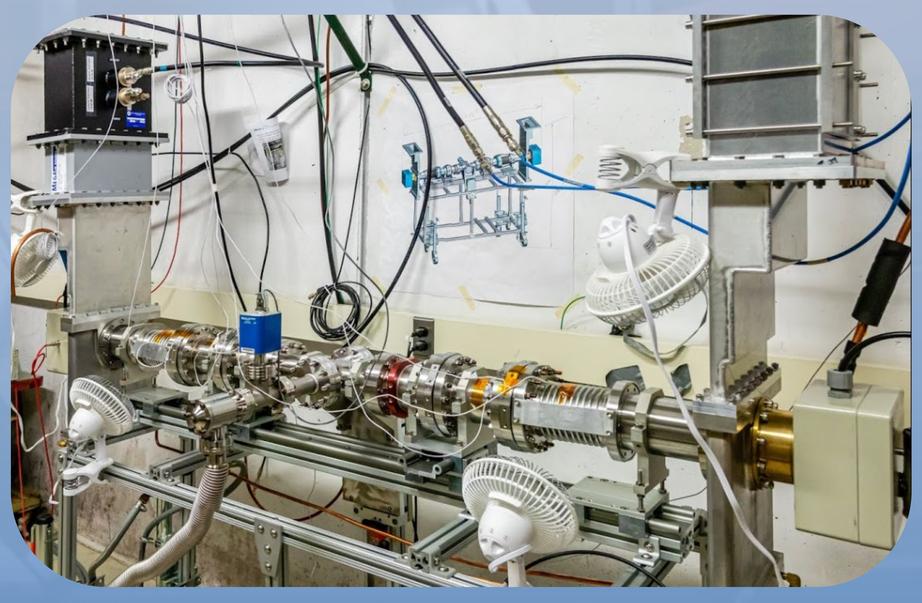


- ✓ The PIP-II 800 MeV CW linac employs 650 MHz elliptical 5-cell cavities to accelerate up to 2 mA of average beam current of H- in the energy range 185 – 800 MeV.
- ✓ The 650 MHz 5-cell elliptical cavities with geometric velocity factors β_G = 0.61 and β_G = 0.92 have been selected to optimize acceleration efficiency.
- ✓ The cavity geometry was optimized to minimize surface electric and magnetic fields and to comply with the PIP-II specifications.
- ✓ The cavities are required to operate in superfluid helium at a temperature 2.0K with very high unloaded quality factors.
- ✓ The cavity beam line aperture was optimized within the constraints on field stability, surface fields and RF load.
- ✓ The RF coupler design supports a future upgrade path with average currents as high as 5 mA.

650 MHz Fundamental Power coupler (prototype)



- ✓ 650MHz coupler designed for 100kW travelling wave or 50kW standing wave
- ✓ Air cooled antenna, window and warm part
- ✓ Used for LB650 and HB650 cavities.
- ✓ Two different cold-end designs built and tested at 50kW CW with full reflection.
- ✓ Integrated test with cavity at STC is ongoing



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