Fermilab has recently completed an upgrade to its spoke resonator test cryostat to enable testing of cavities in superfluid helium. Two single-spoke resonators with differing helium vessel designs have been tested in this new configuration. Gradient and $Q_0$ performance was studied along with microphonics control and sensitivity of the resonant frequency to pressure variations. A description of the testing and the results obtained are presented.

COMMISSIONING OF 2K UPGRADE

Spoke Test Cryostat with new 2 K feedcan

$Q_0$ vs. $E_{acc}$ curves for commissioning cavity. Data taken at 4.5 K agree well with the cavity’s STC data from before the upgrade

Circulator reflections influence $Q_L$ and can be seen by varying the phase between circulator and cavity. A matching network of phase shifters can reduce this effect.

TEST OF CAVITY S1H-NR-107

New helium vessel was designed to minimize $df/dP$. Measurements agree well with simulation.

Observed Lorentz force detuning

CONCLUSION

- STC successfully upgraded and commissioned for 2 K operations
- Cavity S1H-NR-107 meets performance requirements
- New helium vessel design shows expected improved $df/dP$
- Microphonics compensation studies qualification of additional cavities in the coming year