

TESLA Type 9-Cell Cavities Continuous Wave Tests

cavity in LHe tank – without LHe end-groups cooling

Abstract

TESLA 9-cell cavity was designed a decade ago for pulse operation at duty factor of a few percents. Recently, numerous coherent and synchrotron light sources projects base their driving superconducting linacs on this design assuming operation in a continuous wave (CW) mode at rather high gradients. We have performed CW tests of a standard 9-cell TESLA cavities installed in helium vessel and fully equipped with the standard **TESLA-TTF** auxiliaries, main coupler and both Higher Order Mode (HOM) couplers in the horizontal test cryostat to find out a limit in the CW operation.



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- feedthrough temperature decreases from 100 to 70K for 10W HOM coupler long time operation at $6/9\pi$ mode

Summary

• CW tests of a standard 9-cell TESLA cavity installed in helium vessel and fully equipped with TESLA-TTF auxiliaries, main coupler and both Higher Order Mode (HOM) couplers, but sapphire isolator feedthroughs (JLAB design), in the horizontal test cryostat shows certain performance degradation compared to the test in vertical cryostat (cavity cooled completely with liquid helium). Two cavities, AC128 (presented) and S33 were tested, both with the same trend. • Main cavity performance limit is LHe cooling, limited at about 35W dissipated power per cavity in tank (full CW mode – 17 MV/m). Better HOM coupler feedthroughs cooling improves the cavity performance.



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HOM1,2

- HOM2,1

14 h 10.2.09

5.5-

4.5+

17.

16.

13.

12.

11.-

14 h 10.2.09

14. tromo

14 h 10.2.09

