

Development Efforts on Helium Vessel for 5 cell – 650 MHz SRF Cavity at RRCAT

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Abstract

The work focuses on the development of helium vessel which houses a 5 cell – 650 MHz SRF niobium cavity and serves as a helium bath to maintain the cavity at 2 K. The vessel has provision for changing the axial length of the cavity for tuning purpose by using a tuning mechanism and a large bellow. Titanium has been chosen as a material of construction of the vessel due to its coefficient of thermal expansion being close to that of niobium. Efforts have been initiated to understand the functional requirements, design requirements, acceptance criteria for design and analysis, non-destructive examination requirements, inspection and testing requirements, manufacturing technology of the titanium vessel and its integration with the SRF cavity. The welding assumes a special significance as titanium is highly reactive and ductility of the weld joint is lost in the presence of air and other impurities. A trial vessel has been conceptualised having typical sizes and geometries. The manufacturing features of vessel are based on ASME B & PV Code, Section VIII Division-1 and manufacturing of this vessel has been started at an Indian industry. Quality assurance plan for this work is developed. The paper describes the work done at RRCAT on the functional and integration requirements, overall design requirements, design methodology to achieve code conformance, manufacturing technology and QAP being used in the development of helium vessel.