



Contribution ID: 29

Type: **Invited**

Design of the Seamless HIE-ISOLDE Quarter Wave Resonator

Thursday, 8 December 2016 14:35 (20 minutes)

A new design of the Quarter Wave Resonator (QWR) for Cryomodule (CM) 4 will be presented. Since the performance of the recent QWRs produced seems limited by the welding at the highest radio-frequency (RF) magnetic field, intensive efforts have been made to design a seamless QWR without welding process. A beam port was removed for machining the whole shape of the cavity from a one single bulk copper material. This also benefited transit time factor of higher velocity inside CM4 than other CMs. A conicity was introduced on the outer wall in order to prevent RF leakage and recover the shunt impedance over quality factor. The beam dynamics in the new design was also calculated and turned out to be reasonable for CM4. A summary of mechanical design and current production status will be also shown.

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Session Classification: Technical Session 2: HIE-ISOLDE