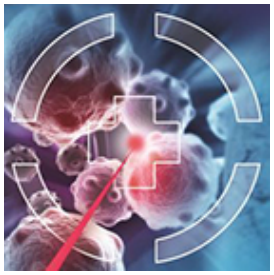

Contribution ID: **43** Type: **not specified**

Beamline characterization of a Dielectric-filled Reentrant Cavity Resonator as a Beam Current Monitor for medical cyclotron beamline at PSI, Switzerland: Its advantanges and limits

Wednesday, 4 September 2019 15:20 (20 minutes)

At PSI (Paul Scherrer Institute) Villigen, Switzerland, a superconductive cyclotron called "COMET"delivers pulsed proton beam of 250MeV at 72.85MHz for proton radiation therapy. Measuring proton beam current (0.1-40 nA) is of crucial importance and is traditionally measured with invasive monitors such as ionization chambers. A new non-invasive beam current monitor working on the principle of resonance is envisaged to replace ionization chambers (due to associated scattering) and to preserve the beam quality delivered. The resonator working on its fundamental mode is tuned to the second harmonic of the pulse rate at 145.7MHz, thus providing signals proportional to beam current. The cavity resonator installed in the PROSCAN beamline of the COMET is used to measure beam current at different energies: 141, 171, 201 and 231 MeV with multiple current sweeps. This paper focuses on the signal processing chain, its noise figure evaluation and helps to identify the relationship of the resonator calibration factor as a function of beam energy. We summarize the paper with measured resonator sensitivity, its potential advantages compared to invasive beam diagnostic such as an ionization chamber and its limitation due to noise

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