

Determination of Hardness Factors for Proton Beams of Various Energies.

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Abstract

Upon analysis of the I–V and C–V characteristics of BPW34F photodiodes, the Hardness Factors for three proton beams of differing energy have been measured. By computing the change in leakage current of the photodiodes before and after irradiation as a function of proton fluence, the hardness factor of the MC40 cyclotron was found to be 2.20 ± 0.08 for an energy of 25 MeV. For a beam energy of 24 MeV, and adopting a similar methodology, a value of 2.20 ± 0.28 was determined for the cyclotron at the Karlsruhe Institute of Technology. Through further collaborations, the hardness factor of the IRRAD proton facility at CERN was measured to be 0.62 ± 0.02 for a beam energy of 24 GeV. The value for the MC40 cyclotron is in agreement with theory, and the values for the IRRAD facility and the Karlsruhe Institute of technology agree with other Independent studies.