Design of picosecond pulsed positron beam for defect characterization

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We present preliminary results of the timing performance of pulsed positron beamline at RCD, BARC as measured using a DC electron gun. The complete beamline consists of – source assembly, ExB filter section, chopper-buncher assembly and the sample chamber [1]. A uniform magnetic field of ~ 80 G is maintained using a series of Helmholtz coils. The picoseconds pulsing of the electron beam is achieved in two steps- (a) chopping and (b) bunching. The chopper consists of three parallel highly transparent tungsten grids, separated from each other by 3 mm. The surface normal of the grids is parallel to the beam direction. The first and third grid are grounded while the middle one is fed a 5W sinusoidal potential of frequency 37.5 MHz[2]. The RF applied to the chopper rides on a DC level adjusted for the beam energy in such a way so as to produce ~ 1 ns pulses. The next stage of picoseconds pulsing is achieved using a 150 MHz quarter wave resonator. It is constructed using two concentric OFHC copper cylinders with their axis parallel to the incident beam. The Q value of the cavity is 750. Operating the buncher cavity at ~ 8 W, we have obtained 280 ps pulses as measured using a fast micro channel plate. Details regarding the RF circuitry, design of various DC and RF components will be presented along with future plans regarding various systems that we intend to study.

References

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