Positron Source based on Coherent Bremsstrahlung of 10-50 MeV Electrons

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Conventional positron sources are based on the conversion of bremsstrahlung from relativistic electrons into electron-positron pairs.

Reasonably effective approach for a positron source known as a "hybrid" solution [1, 2] is using a multi-GeV electron beam for production of channeling radiation (CR) in a crystalline target (radiator) with its subsequent conversion into electron-positron pairs in amorphous target (convertor).The total yields and energy spectra of positrons produced in both thin [3] and thick [4] amorphous W converters by conversion bremsstrahlung and axial channeling radiation of electrons in a thin W crystalline radiator were calculated using approach proposed in [5], revealing the advantages in the use of channeling phenomenon for getting higher positron fluxes.

On the contrary to channeling radiation from relativistic particles, coherent bremsstrahlung is characterized by higher radiation frequencies at lower energies of charged particles crossing the crystal, the radiation intensity of which exceed those for bremsstrahlung. This feature can be applied for obtaining an effective positron source at much lower electron energies. In this report we consider the radiator-converter approach for calculating total yield and energy spectra of positrons produced by bremsstrahlung and coherent bremsstrahlung (CB) using the formulae of Ref. [6] from 10-50 MeV electrons in Si and Ge crystalline radiators and W amorphous converter. Computer simulations are carried out taking into account positron stopping in a thick convert

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