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Space and energy distributions of the charged particles at the maximum of electromagnetic showers initiated by 5-1000 GeV electrons in Fe, W and Pb

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Detectors consisting of a high Z converter and a hodoscope type particle detector behind it are often used in HEP experiments for e,γ/hadron and γ/π0 separations and for e,γ coordinate and energy measurements. The most popular converter materials are Pb and W, while Fe or Cu are used less frequently. The converter thickness is often close to tmax that corresponds to the maximum flux of charge particles (mainly electrons and positrons) in the EM shower. Thus the characteristics of EM showers at tmax are of particular interest. In our article/1/ fluctuations of charge particles flux at tmax were considered. In this report the results of calculations of the charged particles space and energy distributions at tmax for the Fe, W and Pb converters irradiated by 5 to 1000 GeV electrons are discussed in details. The calculations are based on GEANT4. In particular it is shown that a converter of tmax placed in a high energy electron beam can be used as a source of the intense bunches of ultarelativistic positrons and electrons with subpicosecond time spread and of ˜2 mm in diameter. Obtained results are compared with experimental data.

1.S.P.Denisov, V.N.Goryachev. Preprint IHEP 2018-10, Protvino, 2018.

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