Laboratori Nazionali di Frascati

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Production of Coherent Bremsstrahlung in the GeV-Region

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DESY

We present some preliminary measurements on a polarised γ-ray beam from an oriented diamond radiator target. Fig. 1 shows a spectrum as measured by the pair spectrometer.

The electron beam of 3.8 GeV strikes the diamond target in the machine at an angle of 5.1 mrad with respect to the [110]-axis of the crystal lattice, the electron momentum being in the plane [110], [001]. The resulting coherent γ-ray beam displays a strongly peaked spectrum with a large enhancement of intensity over the incoherent background, which is still present due to thermal vibrations of the lattice. The solid curve is the theoretical spectrum calculated with an exponentially screened Coulomb potential [1]; the dashed curve is ob-

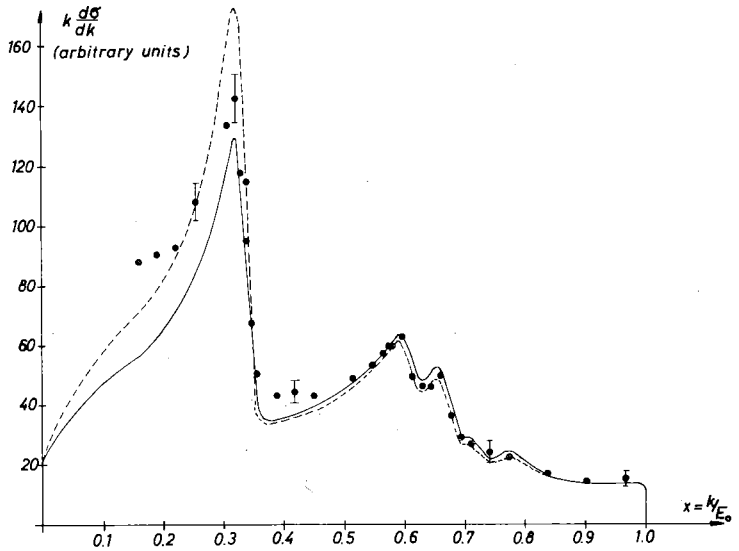

Fig. 1. Photon spectrum from a diamond target oriented at 5.1 mrad to the electron beam of 3.8 GeV

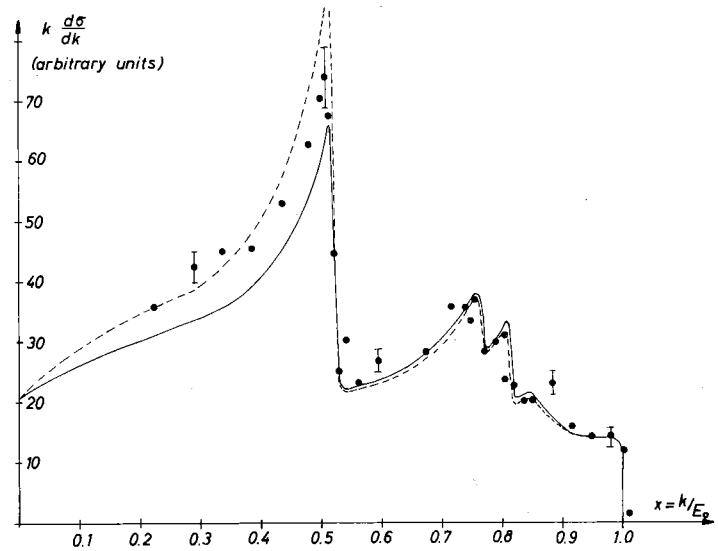

Fig. 2. The same as Fig. 1, but with the target oriented at 10.7 mrad

tained with a Hartree-type potential model [2]. Both spectra take into account the actual experimental conditions, namely the divergence in the primary electron beam, the multiple scattering in the diamond target of 0,08 radiation lengths, the collimation angle of 0,2 mrad total, and the 2% energy resolution of the pair spectrometer. The experimental points favour the Hartree-type potential model. The first peak at $x = k/E_0 = 0.34$ with a photon energy of 1.3 GeV should have a polarisation of 42%.

Fig. 2 shows a spectrum obtained by changing the angle of orientation from 5.1 to 10.7 mrad. The first peak moves to 2.0 GeV and is reduced in intensity, polarisation being 33%.

This work is a continuation of the research made by the group of the Frascati electron synchrotron [3], who were first to obtain a polarised photon beam from a diamond radiator target in the region below 1 GeV.

References

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