

# Simulation of Synchrotron Radiation from the TESLA Energy Spectrometer

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Measuring synchrotron radiation from the TESLA energy spectrometer could be a complementary method to cross check the stability of the beam energy.

For a better understanding and possible optimization of the use of synchrotron light a simulation was performed based on GEANT 3. This draft summarizes some very first results. Since not the last values of magnet parameters were used and also detector parameters are rather unclear, this simulations have to be continued for a conclusive study.

The following parameters were used in the simulation:

- all magnet lengths = 3m
- magnet positions 10, 23, 36 m (begin)
- fields  $B = 1.5/3.0$ kG for ancillary/spectrometer magnet
- beam energies 250, 245, 255 GeV for  $10^6$  electrons
- lower limit of photon energy energy 1 keV

Some observations from the plots ...

Figs.1/2:

About 3/6 photons with an average energy of 2/4 MeV are observed from the ancillary/spectrometer magnets.

Fig.3:

The synchrotron radiation fans are about 1 cm wide at a sensitive plane at 31 m.

Fig.4:

The synchrotron radiation fans from the ancillary and spectrometer magnet overlap, and have a common upper edge.

Fig.5:

The energy dependence of the upper synchrotron radiation edge is a measure of the energy drift. For a change of 10 GeV the edge position changes 420 Micron. Assuming a position measurement of the edge with an accuracy of 10 Micron allows to follow the energy drift with a relative precision of  $10^{-3}$ . For a relative precision of  $10^{-4}$  a spatial resolution in the order of 1 Micron is needed.

**Fig.1: Ancillary Magnet, 250 GeV**

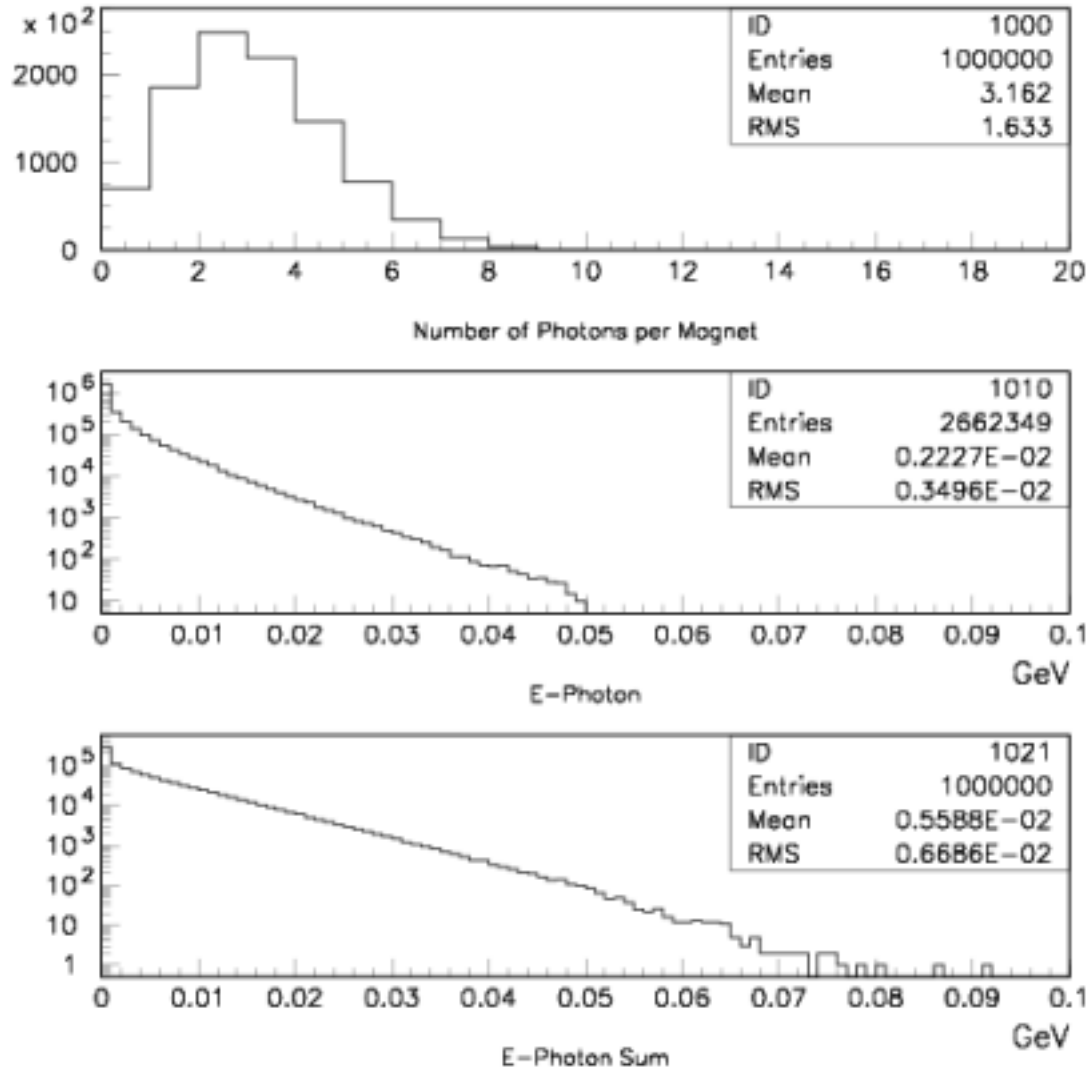


Figure 1: Photons from the ancillary magnet.

**Fig.2: Spectrometer Magnet, 250 GeV**

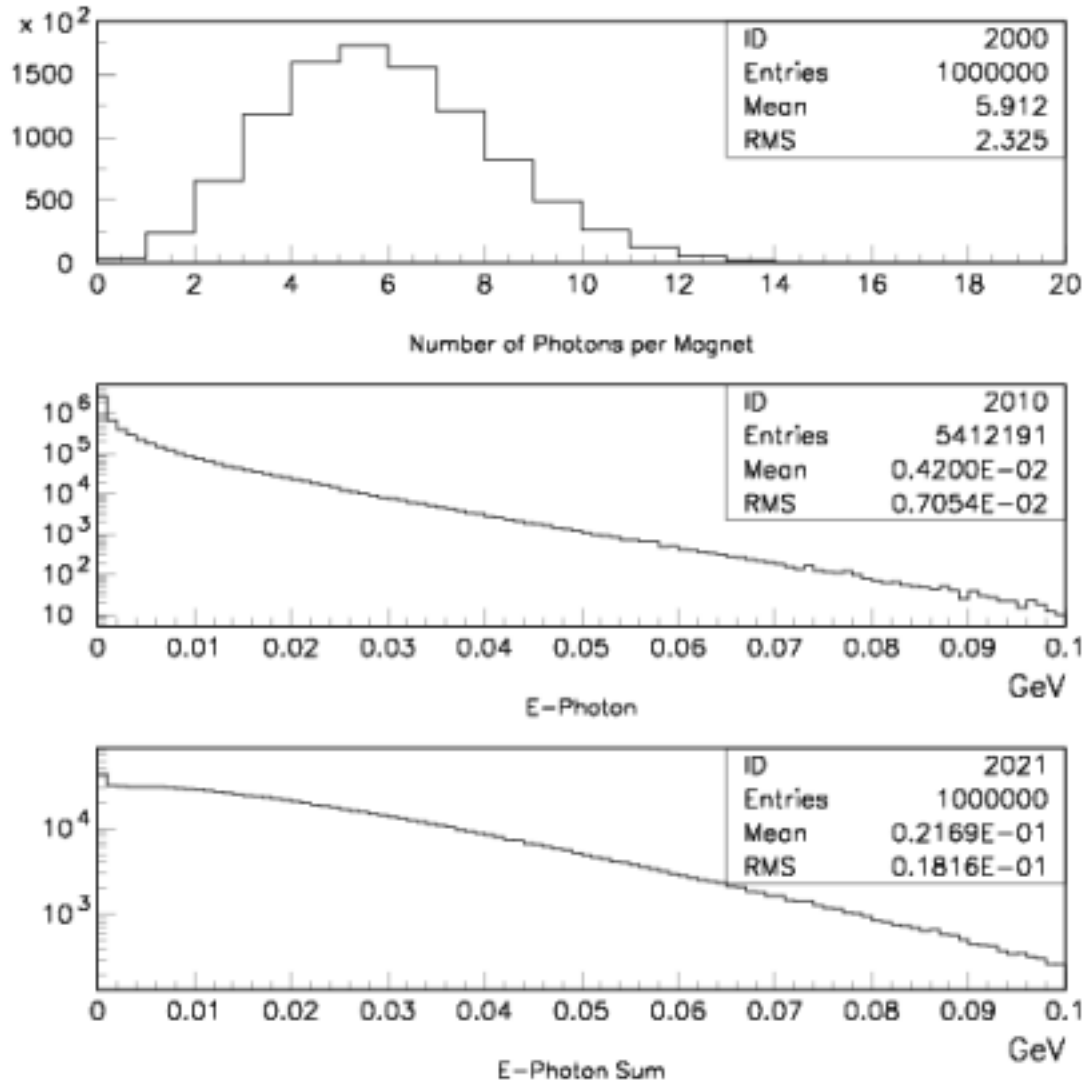


Figure 2: Photons from the spectrometer magnet.

**Fig.3: Synchrotron Rad. Fans at 31 m, 250 GeV**

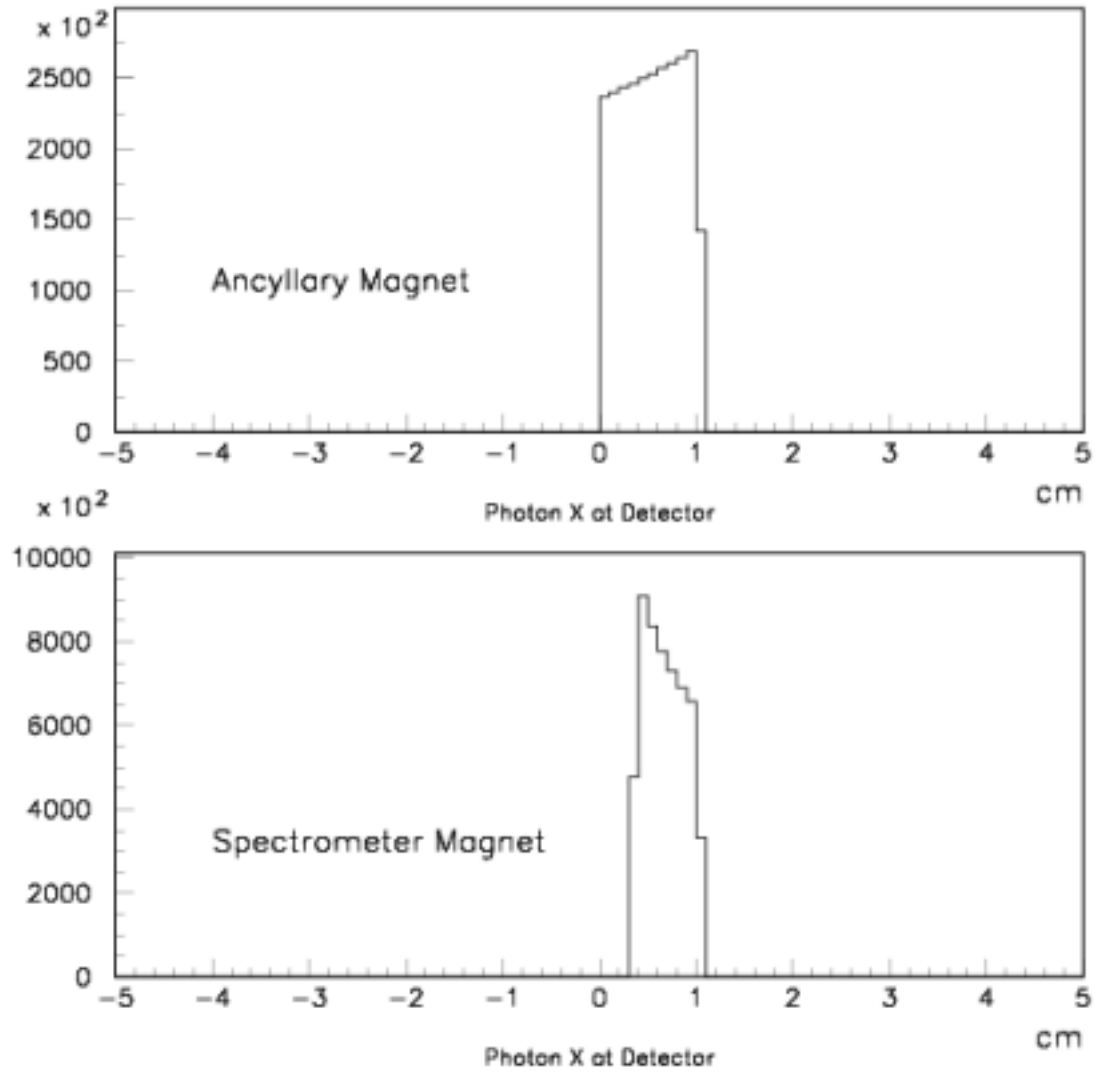


Figure 3: Synchrotron radiation fan measured by sensitive plane at 31 m.

**Fig.4: Edge of 2 Synchrotron Fans, 250 GeV**

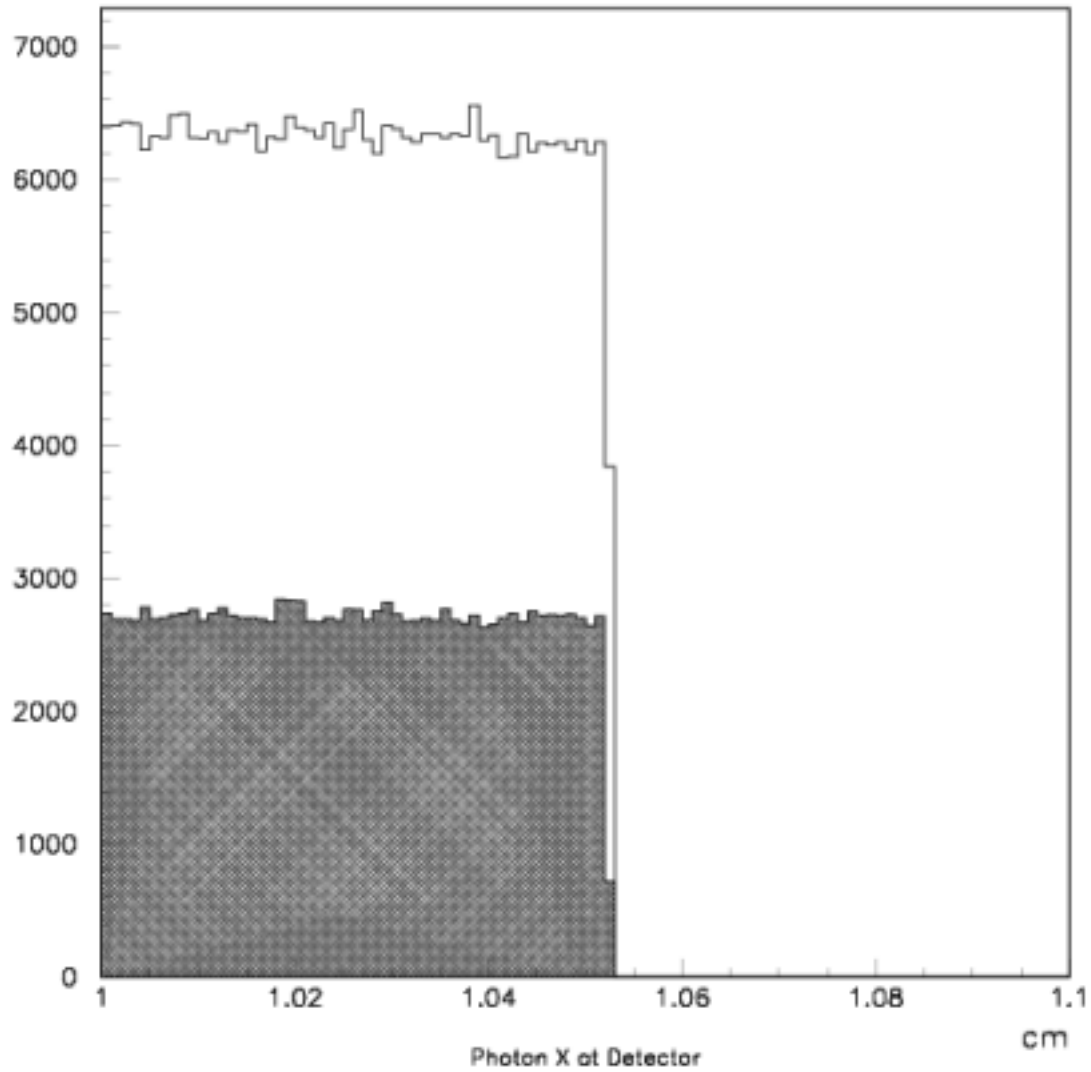


Figure 4: Overlap region of the upper edge of radiation fans from the ancillary and spectrometer magnet.

**Fig.5: E-dependence of Synch.Rad.Edge**

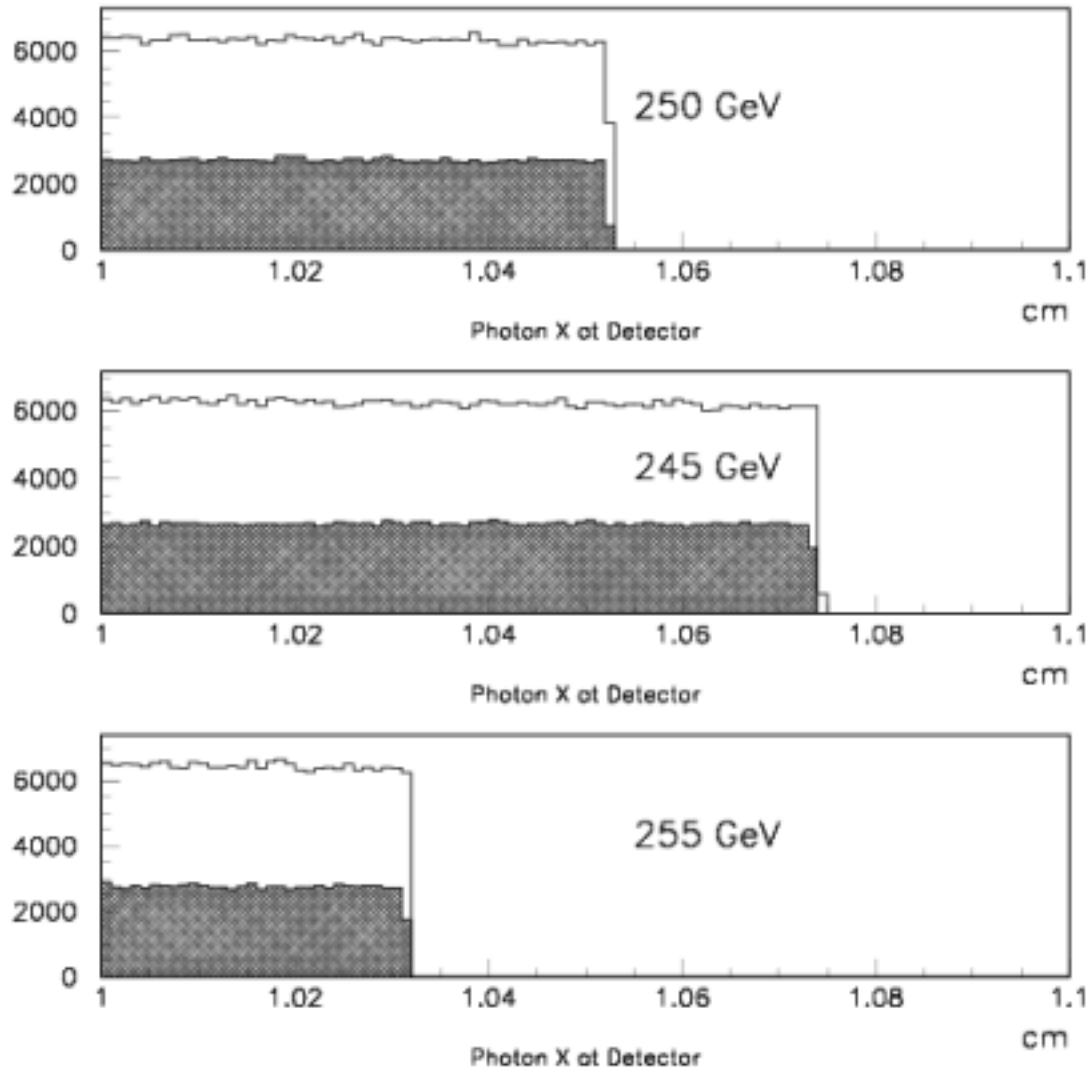


Figure 5: The energy dependence of the upper synchrotron radiation edge.