

7. Radiation Transport Examples Using EGS4

Several examples will be given to demonstrate how EGS4 can accurately solve electron-photon radiation transport problems at all energies. The examples will include "pictures" showing particle trajectories in a variety of geometries. For example, Fig. 2 shows the radiation induced by a single 1-GeV photon as it enters a liquid hydrogen bubble chamber and strikes a lead plate located at the center.

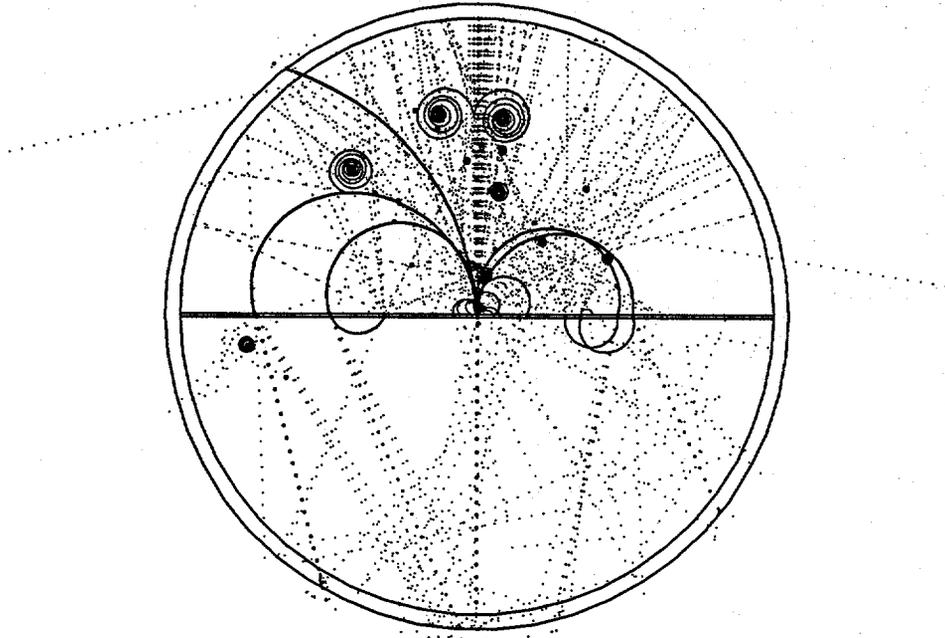


Figure 2. Hydrogen bubble chamber: A single 1-GeV photon strikes a $0.5X_0$ Pb slab from the bottom at 90° . All charged particles (solid) and photons (dots) are shown.

Photons are depicted as dotted lines in this shower picture. The charged particles (solid lines) curl up as a result of a 20-kGauss magnetic field being applied along the axis of the cylinder (*i.e.*, out of the paper). The capability of visualizing the electron-photon transport that takes place with EGS4 is made available through an add-on graphics package called SHOWGRAF².

In this picture, pair production, Compton, bremsstrahlung, and other events can clearly be seen. This is an example taken from high-energy physics involving charged-particle transport under the influence of an external magnetic field in a cylinder-slab geometry. This is also a nice example to show students, since the charged particles are produced by photons—which are not visible in a real bubble chamber.

We will use SHOWGRAF in many of the following examples in order to illustrate the variety of problems, both high- and low-energy, that can be solved using the EGS4 Code System.