1. Introduction

The EGS* system of computer codes is a general purpose package for the Monte Carlo simulation of the coupled transport of electrons and photons in an arbitrary geometry for particles with energies above a few keV up to several TeV. The current version by Nelson, Hirayama and Rogers[1] is more commonly referred to as EGS4. In addition to tracing the history of EGS, this paper will describe the physical processes that are considered and will demonstrate various problem-solving capabilities of the code by means of a variety of practical examples. We will also take advantage of a new add-on package, called SHOWGRAF[2], to display particle trajectories in complicated geometries using both laser-printed 2-D graphics and a 3-D high-resolution color graphics monitor (presented as photographic slides during the talk).

2. The History of EGS

The original version called EGS3 was developed during 1972-1978 by R. L. Ford and W. R. Nelson[3]. The sole purpose of the collaboration was to completely revamp the work started by Nagel[4] but to do it in such a way that further enhancements could easily be made as time progressed—in today's words, to create a program that was *versatile*, *upward-compatible*, and very *user-friendly*.

When it was formally introduced, EGS3 was designed to simulate electromagnetic cascade showers in arbitrary geometries and at energies up to a few thousand GeV and down to cutoff kinetic energies of 0.1 MeV (photons) and 1 MeV (electrons/positrons). Using an auxiliary code called PEGS (Preprocessor for EGS), radiation transport was achievable in any of 100 elements, or any compound or mixture of these elements. In addition to providing more efficient sampling schemes, EGS3 also included some processes that were not part of the original Nagel program.

To lend credibility to our efforts, a fairly extensive set of benchmark comparisons, representing a wide range of applications, were included in the EGS3 manual. The most important benchmarks today, however, are those that have been performed by the multitude of users of the code itself, examples of which will be presented in this paper.

Upon reflection, probably the single most important event that made EGS an everyday word in high-energy physics was the discovery of the J/ψ particle in the Fall of 1974. EGS3 was originally intended to be a tool for high-energy health physicists and accelerator designers, but the "November Revolution", as it is now referred to in the particle physics world, led to a dramatic increase in the use of storage rings and the need for sophisticated high-energy calorimetry. It is safe to say that EGS3 has played a role in the design of many, if not most, of the electromagnetic shower detectors since then.

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* Electron-Gamma Shower