Figure 11 shows a system consisting of five iron rods (10 cm long, 1 cm diameter) suspended in a cylindrical vacuum tank. Three 100-MeV electrons strike the center rod and produce a cascade shower. This example is included here to demonstrate that one can use Combinatorial Geometry as well as CGSHOWGF with EGS4.

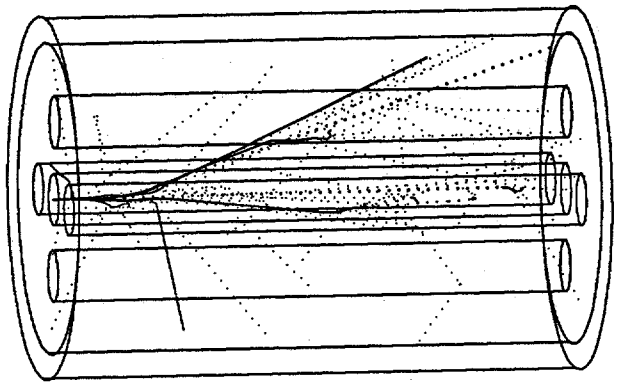

Figure 11. EGS4/Combinatorial Geometry example. Three 100-MeV electrons strike the center rod.

7.4 Photoproduction and Induced Radioactivity

EGS4 can be used to simulate photonucleon production and the resultant induced radioactivity. This is most easily done by scoring within subroutine AUSGAB of the User Code. In particular, whenever a photon with energy k is transported a distance ℓ in the medium, an estimate can be made of a specific reaction (*e.g.*, ^{182}W(γ, n)^{181}W) using ℓ/λ, where λ is the mean-free-path for the reaction at that energy.

A calculation of this type was recently performed by Donahue and Nelson[9] for electron beams showering in *natural* tungsten. Figure 12 shows the distribution of induced radioactivity within a 9-cm long (10-cm diameter) cylinder of tungsten struck by 100-MeV electrons.

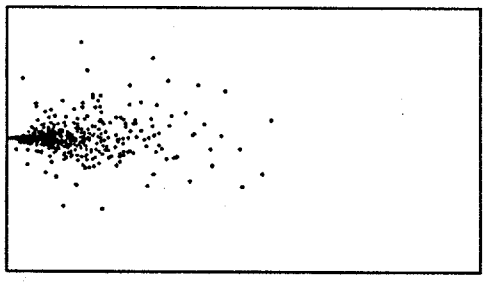

Figure 12. Activity produced in natural tungsten by 1000 incident electrons at 100 MeV/e$^-$.

The activity is not uniformly distributed, but tends to follow the higher-energy photons—*i.e.*, the shower profile. Whereas with relatively low-energy incident electrons the activity is produced near the front surface, the more energetic the primary beam the deeper into the target the maximum activity concentration is found.