

## New Photon Transport Physics in EGS5

High Energy Accelerator Research Organization (KEK)

Y. Namito, H. Hirayama

Improvement of photon transport in egs4 code has been described in 1st and 2nd international EGS workshop. The items were;

1. Linearly polarized photon scattering: Electric vector of photon is maintained while photon transport calculation. Azimuth angle dependence of photon intensity in Compton and Rayleigh scattering is considered.
2. Doppler broadening and binding in Compton scattering: Doppler broadening of Compton scattered photon energy due to pre-collision motion of electron is treated.
3. L-X rays: Energy dependence of L1-L2-L3 subshell photoelectric effect cross section is treated. The energy dependent branching ratio of each sub-shell was introduced by fitting from the data provided for limited materials, Ag, Pb and U. Salem's L X-ray emission rate is used.
4. Auger electron: K shell and L shell Auger electron is considered.
5. X ray and Auger electron from compound/mixture: Ratio of photoelectric effect cross sections of each element in compound or mixture is introduced to treat X ray and Auger electron from compound or mixture.
6. K shell electron impact ionization (EII): Five kind of K shell EII cross section is included.
7. Use of PHOTX data base: The principal change is to photoelectric cross section.

After 2nd international EGS workshop, one improvement is introduced;

8. General treatment of photoelectric cross sections: K-, L1-, L2-, L3 and other sub-shell photoelectric cross sections taken from the PHOTX data base are fitted to a quadratic function in a log-log plot and prepared in the form of the BLOCK DATA of EGS4. It becomes possible to calculate the branching ratio of each element inside EGS4 by this improvement and becomes not necessary to use piece-wise linear-fitted data calculated by PEGS4. This means that the general treatment for compounds or mixtures can be applied to the material data calculated defaults PEGS4.

New photon transport physics in EGS5 also consists of these items. Mechanism of these items will be reviewed. Comparisons of measurements and EGS5 calculation are included. Also, calculation using improved EGS4 code are mentioned.