

Examination of the Program to Avoid Round-off Error

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In order to set up geometry easily, the EGS4 have been providing *MACRO* program which can express a simple shape. EGS4 user is able to configure various areas (be called region) and geometry by combination of this *MACRO*. These shapes which are expressed by each *MACRO* are *CYLINDER*, *CONE*, *SPHERE* and *PLANE*. Each *MACRO* is a program which calculates the distance to the border of the region in front of the advance direction of particle.

Using these *MACRO* programs, we tried to set up the geometry of gantry head which is the radiation aperture of X-ray generator. In order to set up this gantry head, it needs a plane that unparallels to X, Y and Z-axis. For example, the plane with an angle is shown in figure 1 (a). This plane may cause the expansion of round-off error in calculation process. Even if the region is simple, round-off error will occur, but usually this error is of no significant. The simple region is shown in figure 1 (b).

In fact, *CYLINDR*, *CONE* and *SPHERE MACRO* include a program which can avoid a round-off error because these *MACROS* with complicated calculation result in this error. These programs mainly operate near the border of the region.

So we added similar program to *PLANE MACRO*, and we named this *MACRO* "DELPLANE" programs. In this study, we check on the DELPLANE program with the following method.

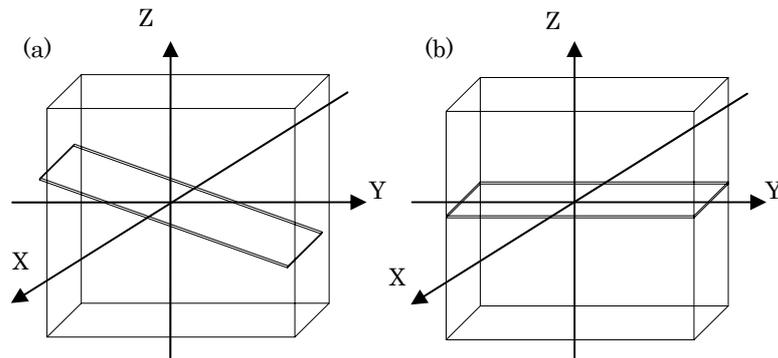


Figure 1

(a): The center PLANE is unparallel to Z-axis and Y-axis.

(b): All planes are horizontal and vertical respect as all axes.

The geometry was simple two regions, such as figure 1 (a), and its material is water. The plane placed center of geometry shown in figure 1 (a) was decided unparallels to Z and Y-axis, and parallels to X-axis. The planes angle is every 5 degrees (0, 5, 10...40, 45). The planes angle is shown in figure 2 (a).

Incident particle selected 5MeV of photon at parallel beam, and its position was center of geometry. The particles direction was decided unparallels to Z and Y-axis, and parallels to X-axis. The incident angle of particle directs every 5 degrees (0, 5, 10...85, 90) toward the plane as shown in figure 2 (b).

The distance between plane and source was decided 1mm.

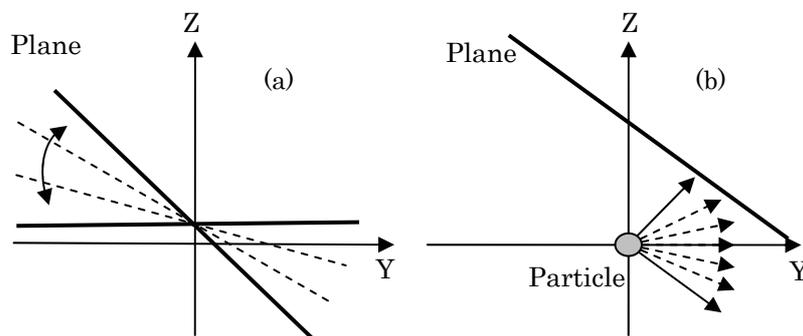


Figure 2 : Change of the angle of plane(a) and particle(b).