

2.7 Calibration

2.7.1 Calibration for each detector

We had two α sources that emitted 4.780, 5.480 and 5.795 MeV α particles and 3.148, 5.762 and 5.771 MeV α particles. The first layer detector was too thin for α particles which had an energy over 4.4 MeV to stop inside. If the particles do not stop inside the detectors, the particles do not lose their all energy. Hence we do not know how large the particles lose energy, and do not have the correspondence between MeV and channel.

In order to degrade these particles, we used 12 μm Al foil. We set the 12 μm Al foil in front of the source which emitted 4.780, 5.480 and 5.795 MeV α particles so that the α particles passed through the foil and lost their energies sufficient to stop inside the thin detector. Table 2.3 shows calculated energies of the α particles. These α particles lost their energies sufficiently. Therefore they should stop inside the thin detectors.

Original α particles (MeV)	After 12 μm Al foil from calculation (MeV)
4.780	1.872
5.480	2.988
5.795	3.397

Table 2.3: Energies of α particles which pass through a 12 μm Al foil in calculation

The second-layer detectors were thick enough for the α particles from another source which emits 3.1462, 5.462 and 5.771 MeV particles to stop inside. Hence we obtained the calibration for those. We were able to calibrate the thick detectors in the method of setting the α source in front of the thick detector. In order to calibrate thin detectors, we firstly calibrated the thick detectors, measured the energies of the α particles which passed through the 12 μm Al foil with the thick detector, and used those energies for the thin detectors.

2.7.2 Result of calibration for each detector

The thick detectors were calibrated with the α from the source (shown in Figure 2.12). The energies of the α particles which passed through the 12 μm Al foil measured by the PSD1b are shown in Table 2.4 and by the PSD2b are shown in Table 2.5. The energies from the PSD2b were smaller than the energies from the PSD1b, since the PSD2a and PSD2b were angled against the Al foil, and the PSD1a and the PSD1b were installed in parallel against the foil. The thickness for the particle which hit the PSD2a and the PSD2b was longer than the thickness