

Nuclear resonant scattering by the nuclei with high transition energy

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The nuclear cascade decay excited by the synchrotron radiation was observed for the first time using ¹⁶¹Dy by the authors. The cascade decay of ⁷³Ge whose excited energy is 69 keV as shown in Fig. 1 has been observed.

The sample was ⁷³Ge and before the sample the Al absorber was arranged to eliminate the first harmonics from the Si 111 monochromator and multi-array APD detector was used as shown in Fig. 2. The peak profile of the time delayed photon after the prompt pulse was shown in Fig. 3 when the X-ray energy through the monochromator coincides with the transition energy of ⁷³Ge.

It showed the good S/N ratio using the Si APD detector. The count rate of 10 cps in the case of ⁷³Ge shows the possibilities of the excitation of the nuclei with high transition energy by SR and its applications as follows.

- PAC excited by SR
- The possibility of the X-ray source with extremely narrow bandwidth in this energy region using Bragg reflection (Cascade or not).
- Nuclear inelastic scattering using high resolution monochromator with good S/N ratio.

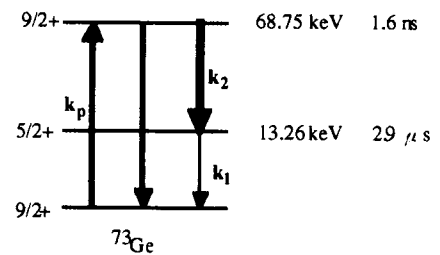


Fig. 1. The energy state of ¹⁶¹Dy.

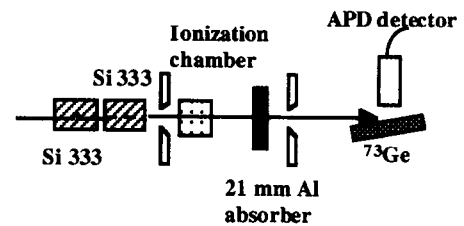


Fig. 2. The experimental setup of cascade decay of ⁷³Ge excited by SR.

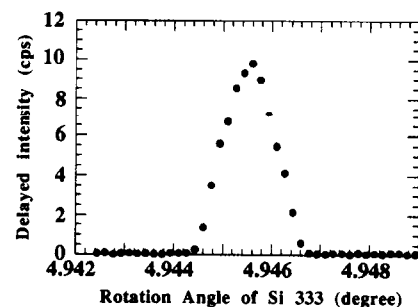


Fig. 3. Delayed intensity v.s. Incident energy. ~10 cps delayed intensity was observed at the resonant energy.