JOURNAL OF THE PHYSICAL SOCIETY OF JAPAN VOL. 34, SUPPLEMENT, 1973
PROCEEDINGS OF THE INTERNATIONAL CONFERENCE ON NUCLEAR MOMENTS AND NUCLEAR STRUCTURE, 1972

II–10 Time-Differential Perturbed Angular Distribution Following a Fast-Neutron-Induced Nuclear Reaction

W. LEITZ, H. -E. MAHNKE, W. SEMMLER, R. SIELEMANN and TH. WICHERT

Hahn-Meitner-Institut für Kernforschung, Berlin-West, Germany

In-beam PAD experiments have been done thus far only through the use of charged-particle bombardment to excite the isomeric states. Here we report on a time-differential PAD experiment, in which fast neutrons were used as bombarding particles. We observed the magnetic interaction of the 197-keV ^{19}F state in polycristalline CaF_2 with an external applied field. For comparison we did an equivalent experiment, except for using protons to induce the nuclear reaction.

The extensively studied ^{19}F state was chosen as a favourable case for a (n, n′) reaction. The reaction cross section and the anisotropy of the 197 keV γ-rays is known for several neutron energies.

A thick lithium target was bombarded with 4.3 MeV protons from the 7 MV Van de Graaff at the Hahn-Meitner-Institut Berlin. The pulsed beam repetition time was 1 μs, the pulse width 10 ns. A CaF_2 target with 60 ccm volume was about 8 cm away from the neutron source inside an electromagnet which provided the magnetic field of about 5 kG. The delayed γ-rays were observed with two Ge(Li) detectors. No shielding against prompt neutrons was used.

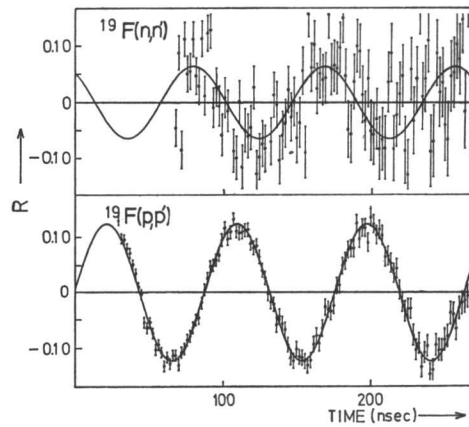

Fig. 1. Modulation spectra $R(t)$ vs delay time for the 197 keV-^{19}F-state excited by (n, n′) and (p, p′) reactions at the same magnetic field.

Figure 1 shows the modulation spectra for the (n, n′) reaction and the (p, p′) reaction at the same magnetic field. The (n, n′) data were accumulated within 5 h, compared to 1/2 h for the (p, p′) data.