The study of the Perturbed Nuclear Resonant Scattering

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In the system that the hyperfine field oscillates on the plane perpendicular to the light axis , NFS shows the temporal change of the polarization state. By using this phenomenon, we investigated the magnetically excited state of the $^{57}FeBO_3$ antiferromagnetic single crystal. The experiment was performed at the BL09 undulator beamline of SPing-8. The storage ring was operated in 21-bunch mode at 20mA. A pulse emitted only in 228ns with typically 100ps width. The $^{57}FeBO_3$ crystal was excited magnetically by the external pulse magnetic field. The magnetic field was phase locked by the SR pulse signal. (Magnetic field parameters: strength 28Oe, pulse width 80ns, and fall off time 7ns, frequency ~400kHz) The Mössbauer time spectra were measured with and without the Si(840) polarization analyzer crystal. (This crystal reflect only the σ -polarization.) In this measurement system, at the same time, we could get 11 time spectra in the time range of 2.5 μ s after the fall off. The parameter of the specific time region P(t) (depolarization factor) were determined by the obtained time spectra. {The value of P(t) relates the rotation of hyper-fine field in the magnetic easy plane (111) during that time region [2].} As a result, $P(t)_{10\sim20ns}$ shows the speedy reduction, on the other hand, $P(t)_{20\sim60ns}$ keeps about fixed value. (See Fig.1.) It indicates that the rotation speed of the local hyper-fine field in the $^{57}FeBO_3$ crystal is decreases by the magnetic relaxation.

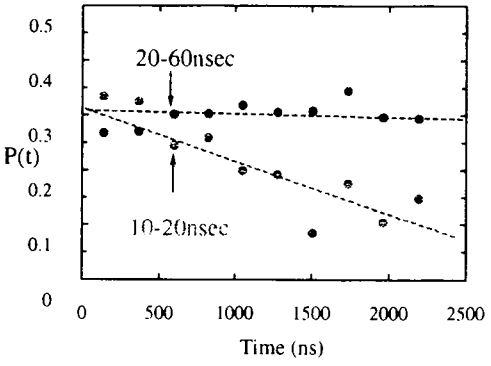

Fig.1. The time dependent depolarization factor

References

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Hyper fine Interact., in press

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Hyper fine Interact 90(1994)335.