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Nuclear Barnett effect and Nuclear Einstein-de Haas effect

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Spin mechanical coupling played a crucial role in developing the quantum mechanics. The coupling between the spin of an electron and mechanical rotation provided the first experimental proof that an electron has an angular momentum i.e., spin by Barnett, and Einstein and de・Haas in 1915 [1, 2]. By using these studies, they were experimentally determined the value of the g factor of an electron to be ~2 prior to the establishment of the modern quantum physics. The Barnett effect is the phenomenon, in which a mechanically rotating magnet is magnetized. The reverse of the Barnett effect is referred to as the Einstein- de・Haas (EdH) effect, in which magnetization generates mechanical rotation of a magnet. These effects have been studied in the electron spin system. We have expanded these effect to the nuclear spin system. We observed the Barnett field, which is the origin of the Barnett effect, by using coil-rotation NMR and NQR method[3, 4]. Now, we are trying to observe the nuclear EdH effect by exploiting the dynamic nuclear polarization.

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