

Cantilever-detected high-frequency ESR measurement using a backward wave travelling oscillator

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Our cantilever-detected electron spin resonance (ESR) technique ¹ is motivated for terahertz ESR spectroscopy of a tiny single crystal at low temperature. In this technique, ESR signal is obtained as a cantilever deflection, which is sensitively detected by a commercial pieoresistive microcantilever ². So far, ESR detection at 315 GHz was succeeded using a Gunn oscillator ³. In this study, we combine our ESR technique with a backward wave travelling oscillator (BWO), which covers a wide frequency range 200-1200 GHz, to achieve better spectral resolution. Experiments were carried out at 4.2 K for a single crystal of Co Tutton salt with a newly constructed optical system. We successfully observed two ESR absorption lines in BWO frequencies up to 370 GHz. From multi-frequency measurements, the observed ESR lines shifted linearly with BWO frequency, being consistent with paramagnetic resonance. The estimated g values are $g_1 = 3.00$ and $g_2 = 3.21$. The spin sensitivity was estimated to $\sim 10^{12}$ spins/gauss at 370 GHz.

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