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Terahertz study of magnetic excitations in a chiral iron-langasite

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For the first time, down to low temperature (from 300 K to 5 K), successful terahertz measurements (from 8 to 60 cm-1) have been performed on the AILES synchrotron line at SOLEIL. Those measurements were realized on the iron-langasite single crystals Ba3(Ta,Nb)Fe3Si2O14. These compounds are unique examples of complete chirality (structural chirality and double magnetic chirality [1,2]). They also present magneto-electric effects, which suggest that they are good candidate for multiferroicity and occurrence of electromagnons.On a structural point of view, the studied iron-langasite single crystals are single domain: they are growth with one structural chirality, opposite for the Ta and Nb compound. On a magnetic point of view, the Fe3+ network consists of layers with triangles arranged on a triangular lattice. The helicoidal magnetic structure, observed below TN=27 K, has a periodicity of about 7 times the crystal structure in the stacked direction while the magnetic moments are arranged at 120° in the triangles [1]. Our terahertz measurements revealed two distinct energy ranges for the magnetic excitations with very different and unexpected temperature dependence. The low energy spectra below 15 cm-1 in Ba3TaFe3Si2O14 disappears above TN, while the high energy part remains up to 150K. We have studied these excitations as a function of the sample structural chirality and electromagnetic field polarization.

REFERENCES
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