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Radio-frequency magnetic susceptibility of spin ice crystals $Dy_2Ti_2O_7$ using tunnel diode resonator SERAFIM TEKNOWIJOYO, KYUIL CHO, MAKARIY A. TANATAR, RUSLAN PROZOROV, Ames Laboratory and Iowa State University, ROBERT J. CAVA, JASON W. KRIZAN, Princeton University, AMES LABORATORY AND IOWA STATE UNIVERSITY TEAM, PRINCETON UNIVERSITY COLLABORATION — Spin ice compound, $Dy_2Ti_2O_7$, has shown complex frequency - dependent magnetic behavior at low temperatures. While the DC measurements show conventional paramagnetic behavior, finite frequency susceptibility shows two regimes, - complex kagomé ice behavior at around 2 K and spin collective behavior above 10 K, depending on the frequency. Conventional AC susceptometry is limited to frequencies in a kHz range, but to get an insight into the possible Arrhenius activated behavior and characteristic relaxation times, higher frequencies are desired. We used self-oscillating tunnel-diode resonator (TDR) to probe magnetic susceptibility at 14.6 MHz, in the presence of a DC magnetic field and down to 50 mK. We found an unusual non-monotonic field dependence of the lower transition temperature, most likely associated with different spin configurations in a kagomé ice and an activated behavior of the upper transition, which has now shifted to 50 K range. This work was supported by the U.S. DOE BES MSED and was performed at the Ames Laboratory, Iowa State University under contract DE-AC02-07CH11358. The work at Princeton university was supported by DOE BES grant number DE-FG02-08ER46544.

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