

Abstract Submitted
for the SES21 Meeting of
The American Physical Society

Massive 116 GHz crystal-field clock transition in a tetragonal molecular Ho(III) complex ROBERT STEWART, Department of Physics, Florida State university, Tallahassee, FL32306, USA, ANNA CELMINA, EMMA REGINCS, MARK MURRIE, WestCHEM, School of Chemistry, University of Glasgow, Glasgow, G12 8QQ, UK, STEPHEN HILL, Department of Physics, Florida State university, Tallahassee, FL32306, USA — Molecular lanthanide complexes are promising candidates for development of next-generation quantum technologies [1]. High-symmetry structures can give rise to well-isolated crystal-field quasi-doublet ground states, i.e., quantum two-level systems that may serve as a basis for spin qubits. Recent work has shown that the coordination environment around the lanthanide can be tailored to produce an avoided crossing, or clock transition within the ground doublet, leading to significantly enhanced coherence times [2]. Here, we employ single-crystal high-frequency electron paramagnetic resonance (EPR) spectroscopy to interrogate a new molecular Ho(III) complex. An axial coordination environment with four-fold symmetry gives rise to a ground state $m_J = 8$ crystal-field quasi-doublet with a massive 116 GHz clock transition, where m_J denotes the projection of the $J = 8$ spin-orbital moment associated with the Ho(III) ion. These states are further split into eight $(2I + 1)$ sub-levels due to the hyperfine interaction with the $I = 7/2$ nuclear spin. [1] Nat. Chem. 11, 301 – 309 (2019); <https://doi.org/10.1038/s41557-019-0232-y> [2] Nature 531, 348 – 351 (2016); <https://doi.org/10.1038/nature16984>

Robert Stewart
Department of Physics, Florida State university, Tallahassee, FL32306, USA

Date submitted: 19 Oct 2021

Electronic form version 1.4