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Evolution of magnetic interactions in a pressure-induced Jahn-Teller driven magnetic dimensionality switch JOHANNES MOELLER, SAMAN GHANNADZADEH, PAUL GODDARD, University of Oxford, TOM LANCASTER, FAN XIAO, Durham University, STEPHEN BLUNDELL, University of Oxford, ALEXANDER MAISURADZE, RUSTEM KHASANOV, Paul Scherrer Institut, JAMIE MANSON, Eastern Washington University, STAN TOZER, DAVID GRAF, National High Magnetic Field Laboratory, JOHN SCHLUETER, Argonne National Laboratory — Much of the research in molecular magnetism focusses on low-dimensional magnetic systems. Here we discuss the interesting possibility of controlling the magnetic dimensionality in a molecular magnet by driving the system through a quantum critical point using applied pressure. We present the results of muon-spin relaxation measurements and high-field magnetisation experiments on the coordination polymer $CuF_2(H_2O)_2$(pyrazine) in pressures up to 22.5 kbar that demonstrate a transition from a quasi-two-dimensional to a quasi-one-dimensional antiferromagnetic phase driven by a rotation of the Jahn-Teller axis at 9.1 kbar. Antiferromagnetic ordering is observed in both regimes. The dimensionality switch is accompanied by a halving of the primary magnetic exchange energy J and a fivefold decrease in the ordering temperature T_N. Density-functional theory calculations of the spin density and muon sites are used to complement the experimental data. Part of this work is published in S. Ghannadzadeh et al., Phys. Rev. B 87, 241102 (R).

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