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Magnetism in Single Xtals of Magnetite (Fe_3O_4): A MaxEnt-uSR Study

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Magnetite has a fully spin-polarized band and is therefore considered an important spintronic oxide material. The internal fields in single crystals of magnetite (Fe_3O_4) have been previously studied through muon-spin rotation (mSR). [1] By Maximum-Entropy (ME) [2] we have analyzed single crystal Fe_3O_4mSR datain zero field and with external field B parallel to the <111>, <110> or <100> axis. Several mSR time series indicate a beat pattern. By curve fitting [1] and confirmed *with improved precision* by MEmSR, secondary frequency signals are observed in the temperature range above the Verwey transition (T_V). Assuming one demagnization field and one muon-probe-site set, we find for roomtemperature (RT) <111> Fe_3O_4 fields larger than the maximum allowable. [1] We compare our RT B// <110>dependent results with those observed for 205 K <110>Fe_3O_4 [3] to better understand a transition observed at twice T_V.The existence of these secondary signals may be related to phonon-assisted 3d-electron hopping. [3, 4] Another possibility could be magnetically different muon-probe sites.

Our MEmSR B-dependent studies provide insight into the local magnetism and conduction mechanism of this Mott-Wigner glass. [1, 4]

Biography:

Dr. Carolus Boekema Professor Emeritus of Physics at San Jose State University (SJSU). His field of Research includes Magnetism in Cuprate Superconductors; Rare O[-1] ions in MgO (earthquake-like precursors); Modeling Frustration in Condensed Matter. He is Nominee, American Physical Society, Faculty Undergraduate Research 2017 Award**,** SJSU Faculty Mentor Awards 2017, 2013 & 2005**;** APS Far West Section **(*co-Founder*)** Grant support PIPD & coPI: ~1.7 M$; 111 *refereed* student-coauthored publications, including two Phys Rev *Lett*, two Phys Rev **B** Rapid *Comm*, and eight invited papers.