Magnetism and Geometric Frustration

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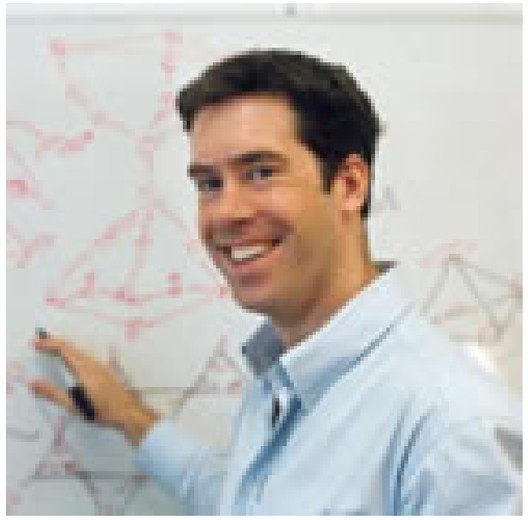
Group

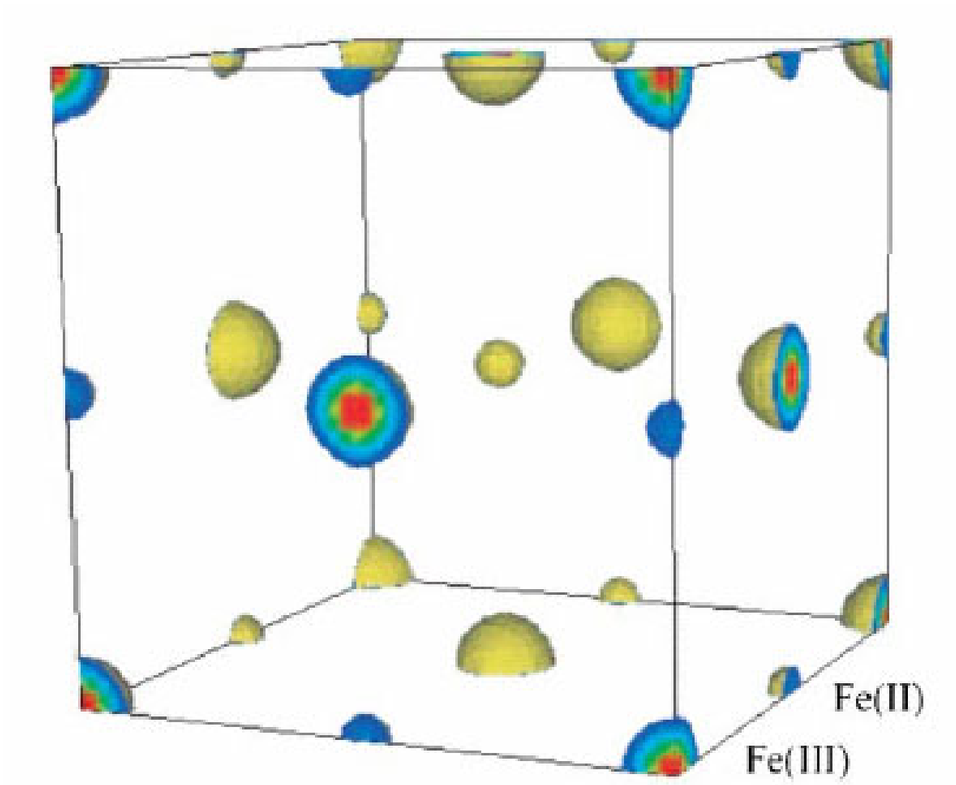


Andrew Wills

Eddy Lelievre Berna

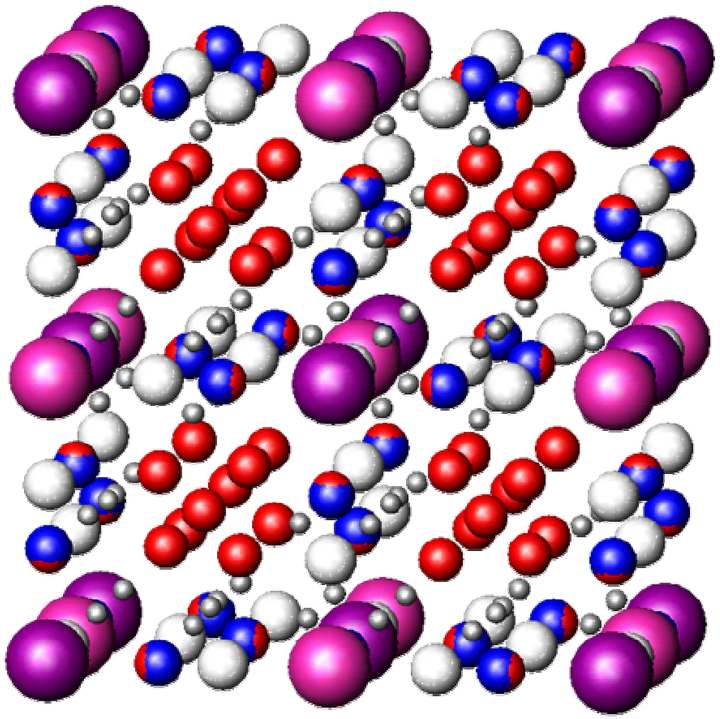
Will Bisson

Magnetisation Distribution Maps of Powders



- **Molecular Magnets**
- **Colossal magnetoresistance**
- **Superconductors**

Prussian Blue $Fe^{III}_4[Fe^{II}(CN)_6]_3.14H_2O$



Fm-3m

Fe^{III} - NC - Fe^{II} - CN - Fe^{III}

~10.2Å

- Origin of colour is CT from Fe II (low spin) to Fe III (high spin)
- Proposed mechanism via spin transfer to the nominally non-magnetic Fe^{II}

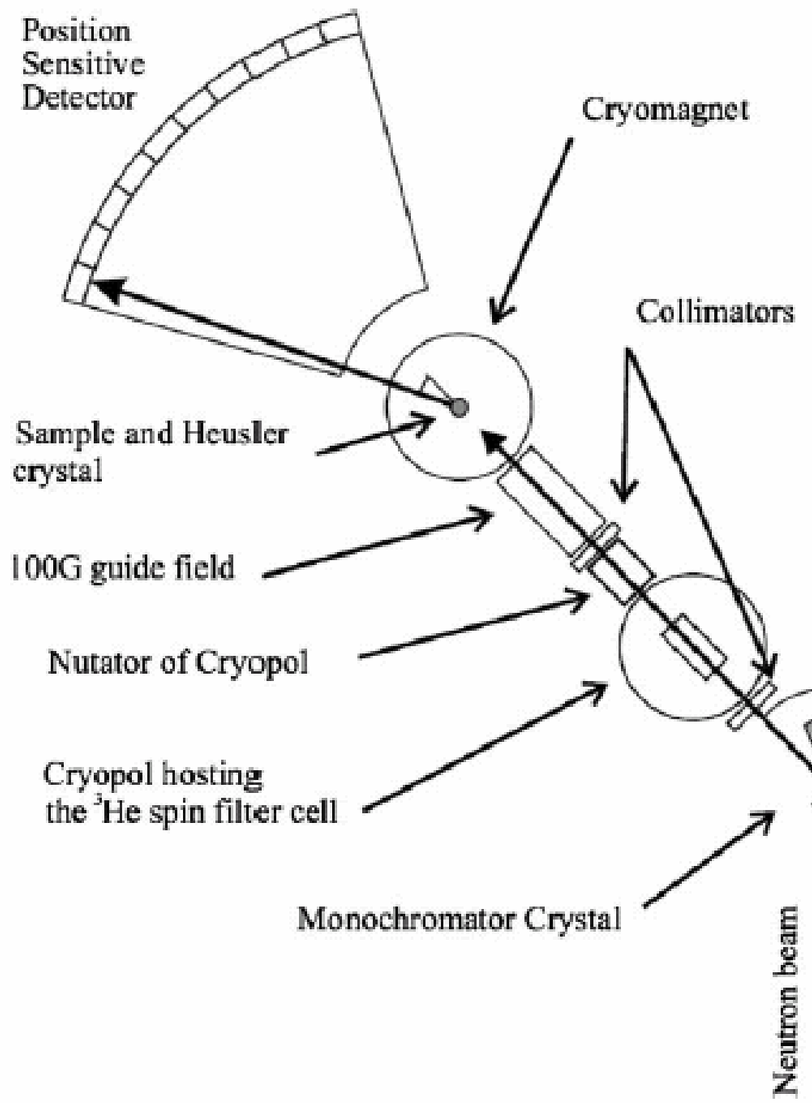
Test Experiment on D1b

Reconstruction

- Replace any magnetic components
- Polarisation of monochromatic beam using ^{3}He Spin Filter
- Guide tube with nutator fitted

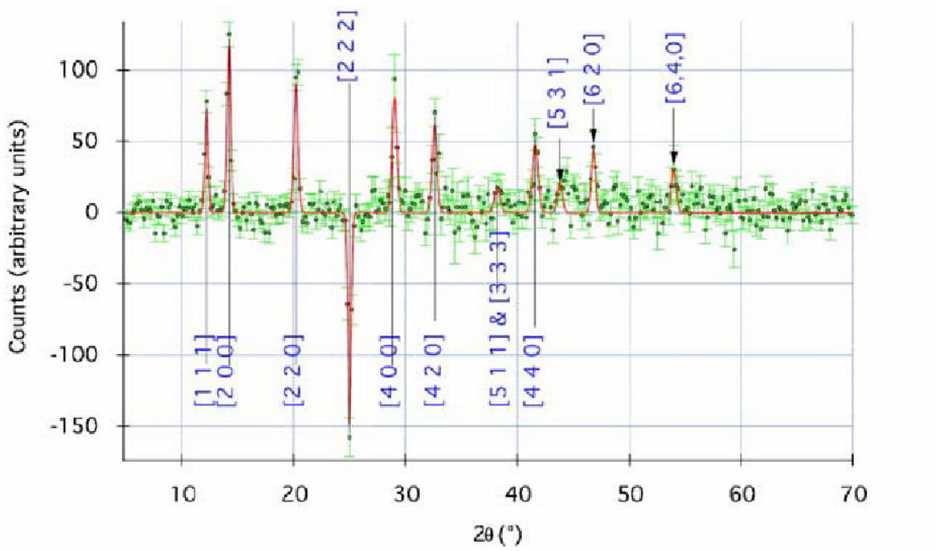
Systems

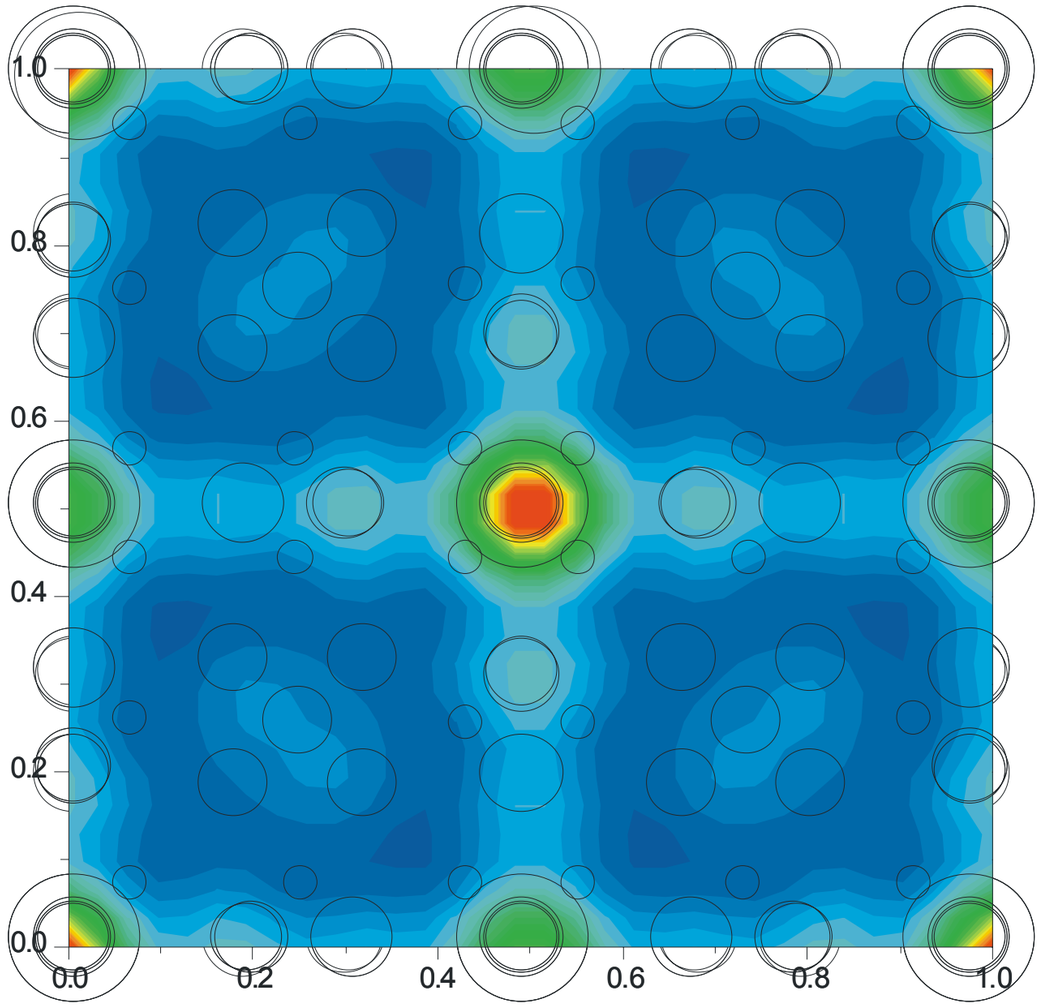
- Prussian Blue
- YNi_3



Analysis

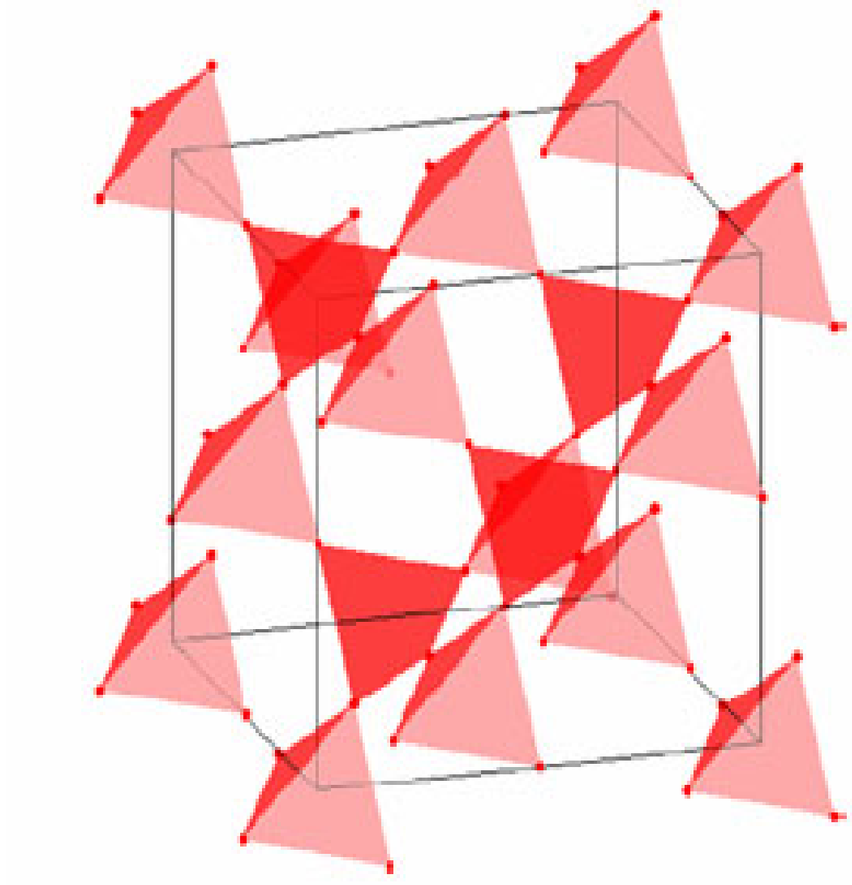
- Multipolar refinements
- Spin Patterson Density Distribution Maps
- Maximum Entropy MEMSYS and PRIMA





Erbium Titanate $Er_2Ti_2O_7$

The model <111> XY Antiferromagnet?



- The Hamiltonian has a macroscopically degenerate set of ground states at $T = 0$ but MC simulations indicate that thermal fluctuations induce an AF groundstate

ψ2

Tetrahedral basis with ***k*** *= 000, selected by OBD*

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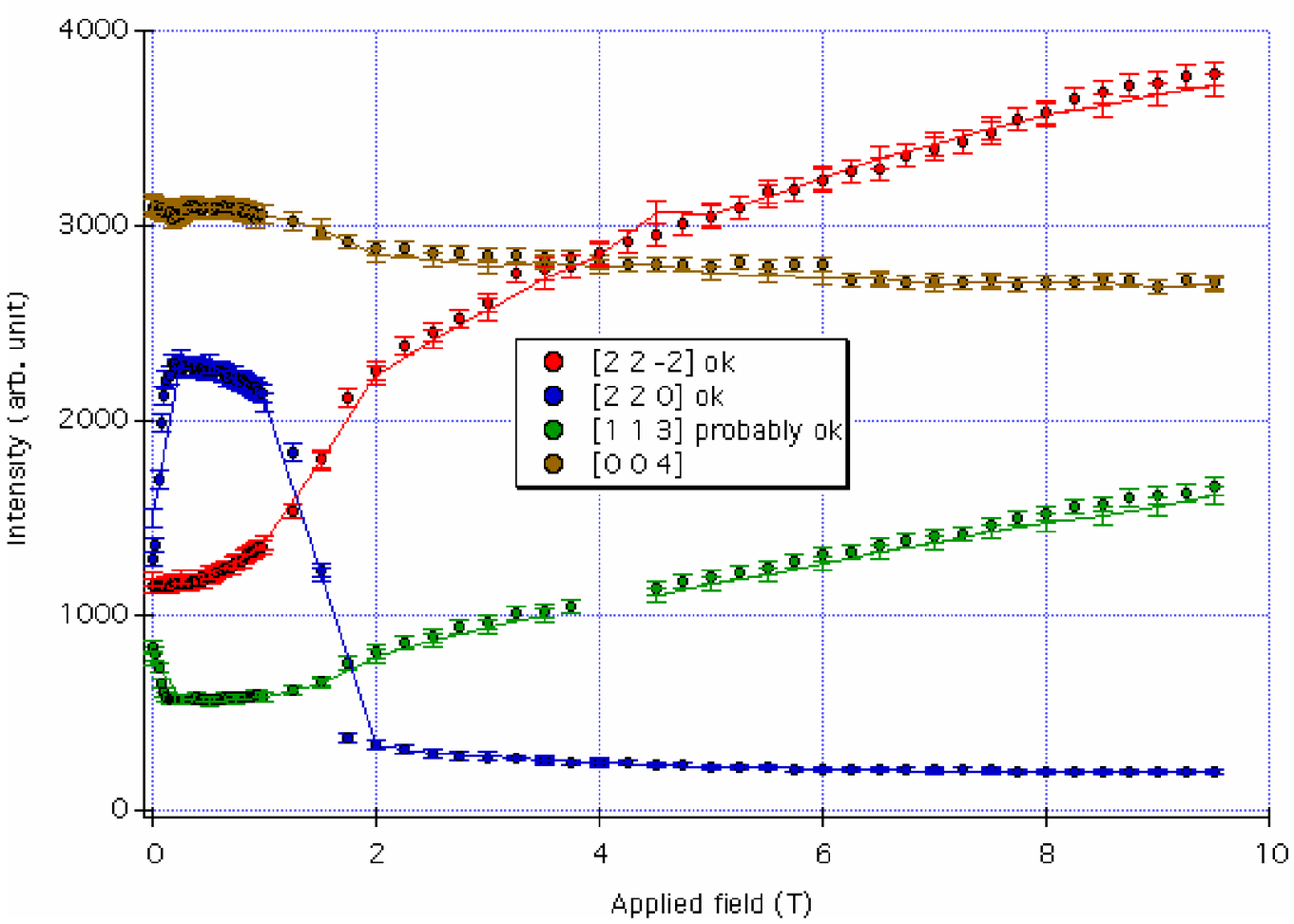

Field dependency from 0 to 9.5 Tesla at 55 mK collected on D3

Future Work

- Magnetisation density studies of ferromagnetic superconductors that cannot be synthesised as single crystals – D20

- Intermediate and high field magnetic phases of $Er_2Ti_2O_7$ – D10

- Determination of AF form factors and AF phase? – CRYOPAD on D3

- Construct Magnetic Phase Diagram for the frustrated itinerant ferromagnetic Iron stannate compound, which displays AH – D20