

Neutron Scattering on Magnetic Spinel Compounds

Michael Mücksch

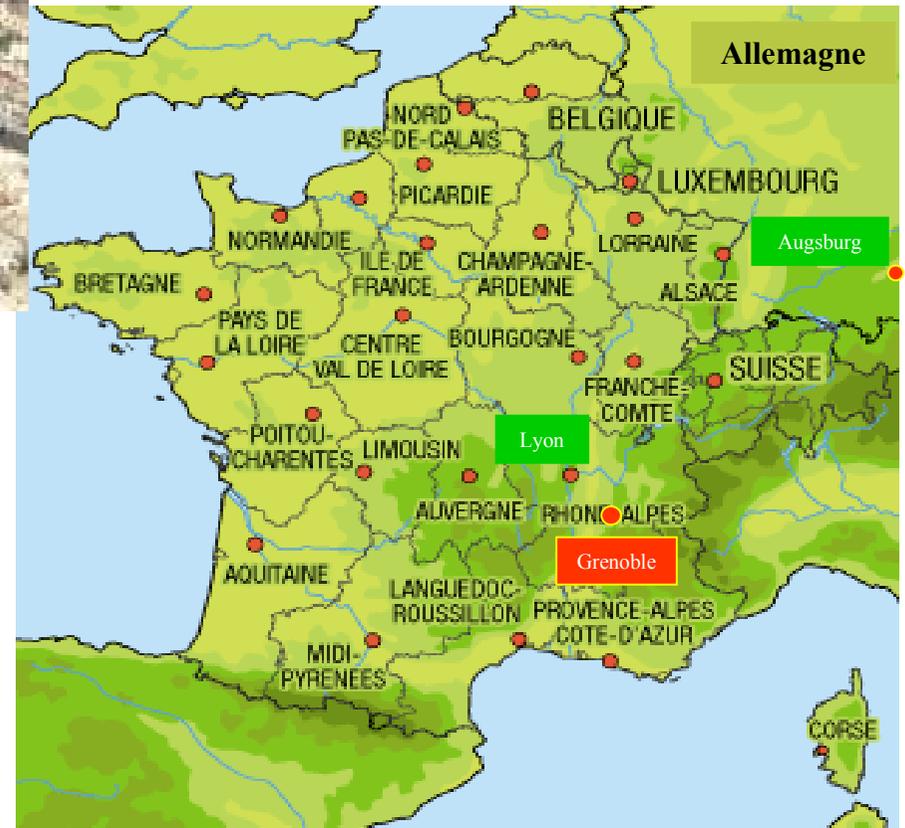
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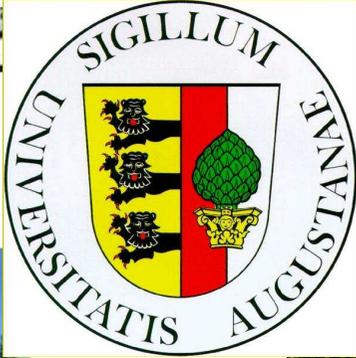
West Central Europe



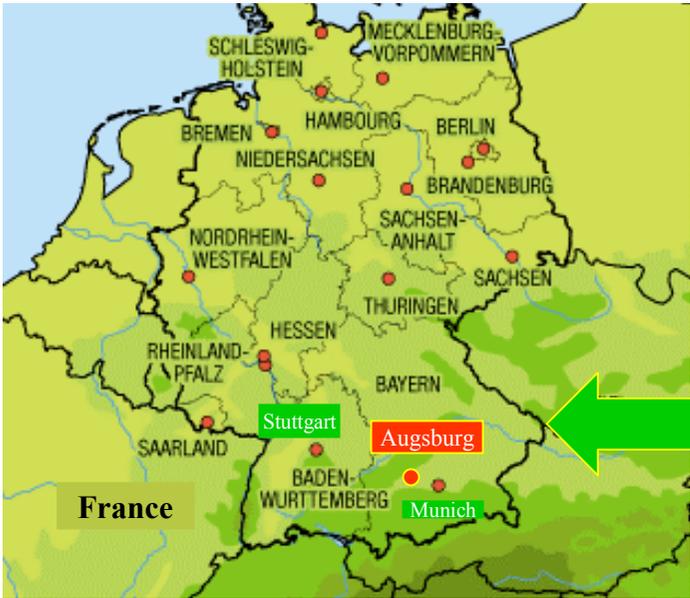
University of Augsburg



**Institute of Physics
&
Material Sciences**



Augsburgs "Old" City Center



Neuschwanstein Castle



Map of Central Europe



Sample Preparation

University of Augsburg & Institute of Applied Physics Chisinau

Experimental Methods

Magnetisation, Specific Heat, XRD
Neutron Diffraction – D20, D2B, D1A (ILL), HRPT (PSI)
Time of Flight - Inelastic Neutron Scattering
FOCUS (PSI), IN4 & IN6 (ILL)

Systems under Investigation

FeSc_2S_4 and MnSc_2S_4
 LiV_2O_4
 CuV_2S_4 and CuTi_2S_4
 CoCo_2S_4 and CuCo_2S_4

Thesis Subject

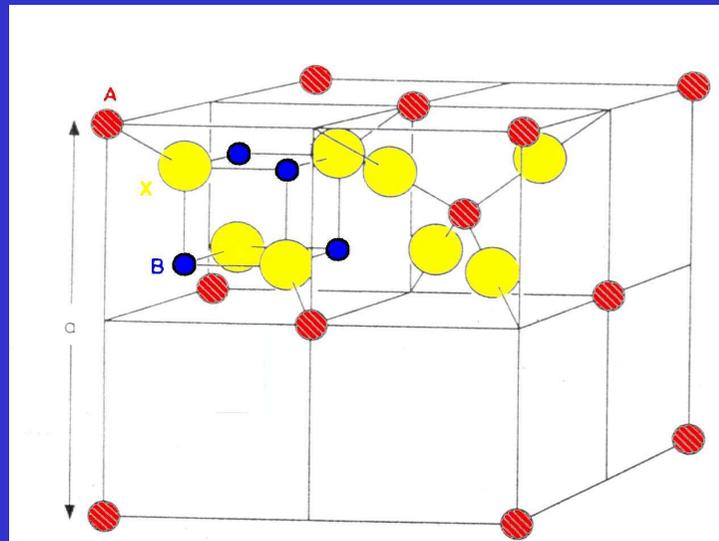
Spinel Compounds - general formula AB_2X_4

Interest

Orbital and Spin Degrees of Freedom

Electronic Correlations

- A and B sublattice tetrahedral local coordination
- Geometric Frustration inherent to Spinel structure on A & B-sites
- AFM Exchange → Magnetic frustrated ions on A-places (here Mn, Fe)

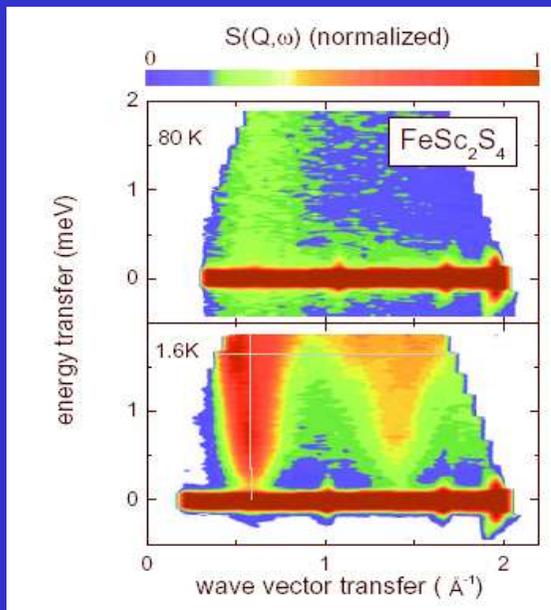


Spinel Unit Cell

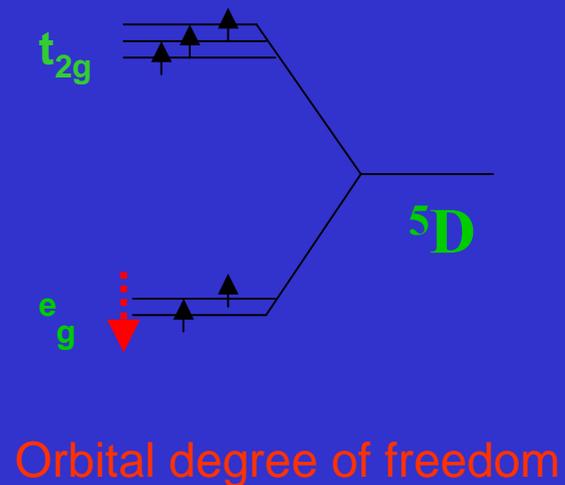
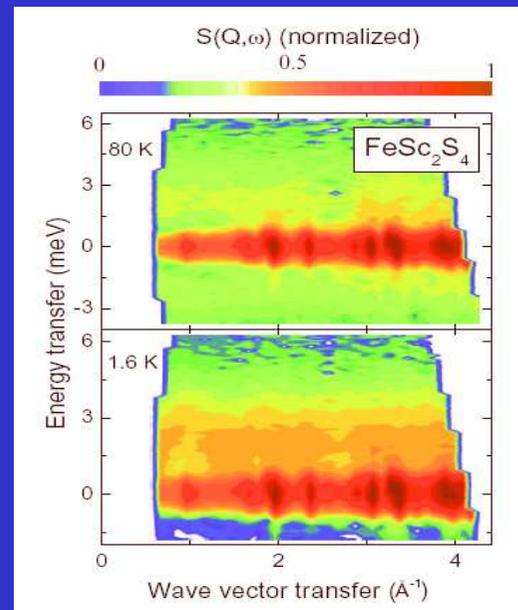
Dynamic measurements - Time of flight on FeSc_2S_4

- Jahn-Teller active Fe^{2+} ($3d^6$) with $\Delta E_{\text{JT}} \sim 2\text{meV}$
- magnetic fluctuations for all temperatures measured
- indications for possible short range order at $T=1.5\text{K}$
- indication for a (pseudo)-spin-gap $\Delta E \sim 0.2\text{meV}$

In 6 - ILL



In 4 - ILL



- Dynamic Jahn-Teller-Effect superposed with collective magnetic excitations
- Spin & Orbital liquid state in FeSc_2S_4

Outlook

- Detailed study of the magnetic ground state properties of FeSc_2S_4 & MnSc_2S_4
- Determination of magnetic fluctuations in CuB_2S_4 compounds is difficult
- Influence of electron- phonon coupling in CuB_2S_4 compounds
- Simulation of phonon densities in CuB_2S_4 - compounds

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Thanks for your attention!