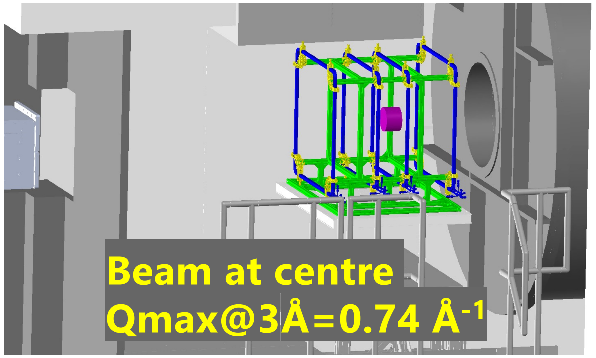
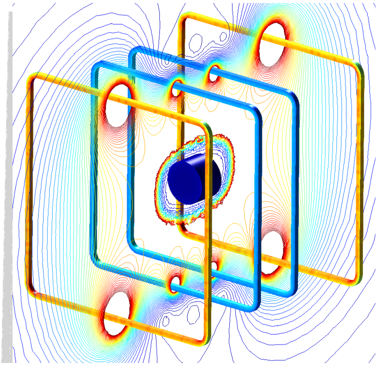
Designing & prototyping analysers

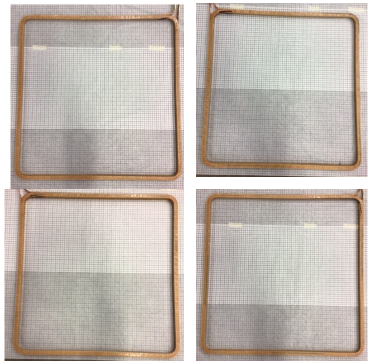
Uniform field coils – first use: lab-based test facility



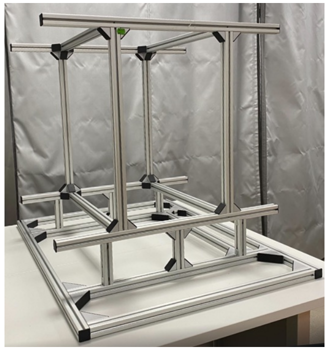
Coil-based analyser on SKADI



Large high-uniformity volume

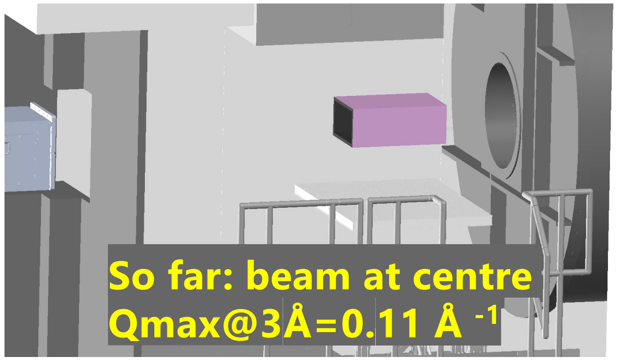


Test coils passed evaluation. Adding cooling water & electrical connections

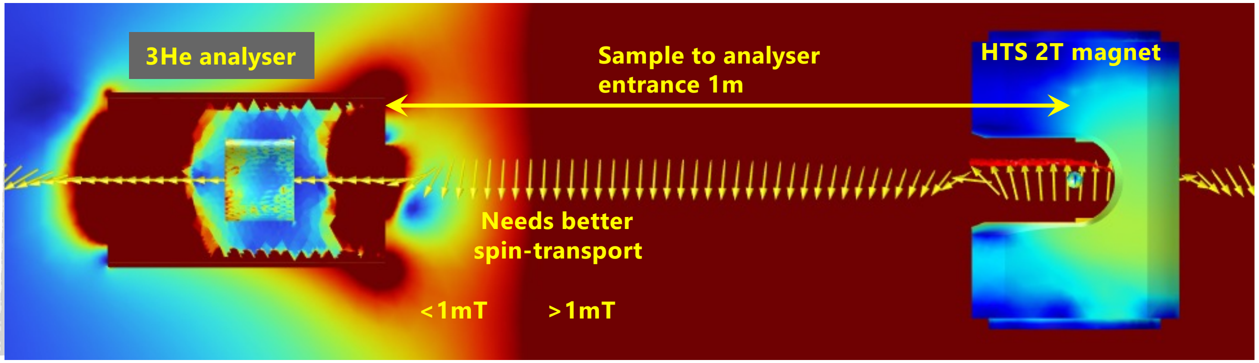


Coils holder being built

Magnetostatic cavity to use with magnets



Magnetostatic cavity-based analyser on SKADI



First-cut: field is uniform at 3He cell. Optimisation: (1) bring analyser closer to sample, (2) larger beam angle acceptance, (3) improve spin-transport / adiabaticity near analyser entrance.

Additional design underway: *in-situ* polarisation to keep the analysing efficiency stable through the experiment.

Analyser equipment development summary:

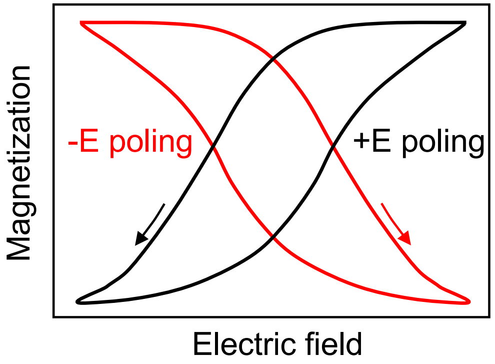
- Building prototype coil based analyser. First use as lab based test facility.

- Designing magnetostatic cavity based analyser.
- Evaluated use together with HTS 2T magnet.
- To improve: increase Qmax, improve spin-transport at analyser entrance.

- Developing *in-situ* polarisation setup – no more ^{3}He polarisation decay.

- Designer dedicated to polarisation development starts today!

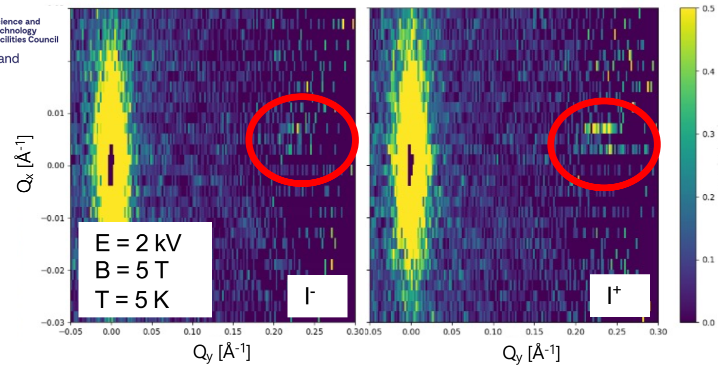
Topic 1: Magnetoelectrics



Technique: half-polarized TOF-SANS

ISIS Neutron and Muon Source

ZOOM



Results & interpretation:

Results:

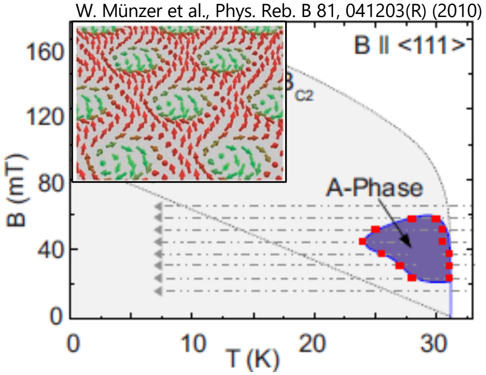
- Spin-asymmetry in magnetic phases
- E-field dependence

Interpretation:

- ME-effect originated in change of spin helicity

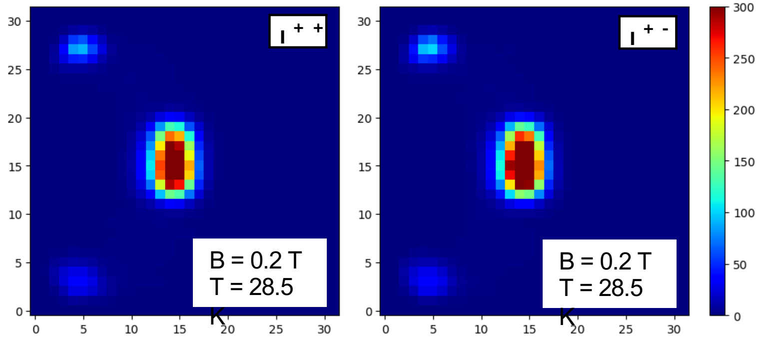
Topic 2: Skyrmions

W. Münzer et al., Phys. Reb. B 81, 041203(R) (2010)



Technique: full-polarized SANS

IN15



Results & interpretation:

Results:

- Spin asymmetry FeCoSi
- At the detection threshold!
- Bg: polarization dependent

Interpretation:

- Elliptically shaped skyrmions

Necessary data reduction:

$$\begin{pmatrix} I^{++} \\ I^{+-} \\ I^{-+} \\ I^{--} \end{pmatrix} = I_0 \begin{pmatrix} A^{+} & A^{-} & 0 & 0 \\ A^{-} & A^{+} & 0 & 0 \\ 0 & 0 & A^{+} & A^{-} \\ 0 & 0 & A^{-} & A^{+} \end{pmatrix} \begin{pmatrix} 1 & 0 & 0 & 0 \\ 1-F_2 & F_2 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 1-F_2 & F_2 \end{pmatrix} \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 1-F_1 & 0 & F_1 & 0 \\ 0 & 1-F_1 & 0 & F_1 \end{pmatrix} \begin{pmatrix} P^{+} & 0 & P^{-} & 0 \\ 0 & P^{+} & 0 & P^{-} \\ P^{-} & 0 & P^{+} & 0 \\ 0 & P^{-} & 0 & P^{+} \end{pmatrix} \begin{pmatrix} S^{++} \\ S^{+-} \\ S^{-+} \\ S^{--} \end{pmatrix}$$

$P(t, \lambda)$ = Polarizer transmission

$A(t, \lambda)$ = Analyzer transmission

$F_1(\lambda)$ = Incoming flipper1 efficiency

$F_2(\lambda)$ = Outgoing flipper1 efficiency