



# LoKI (and ESS SANS)

DMSC–CIS contribution

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2026-04-22



# LoKI

## Abridged background



ToF multi-detector wide- $\lambda$  SANS instrument

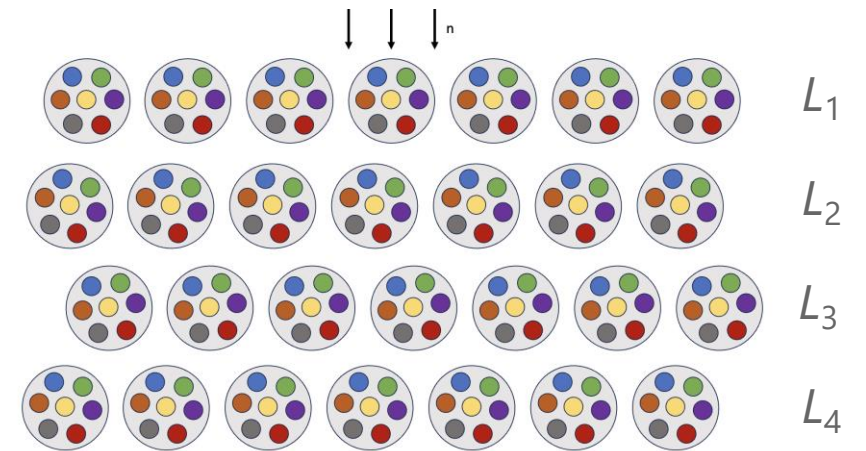
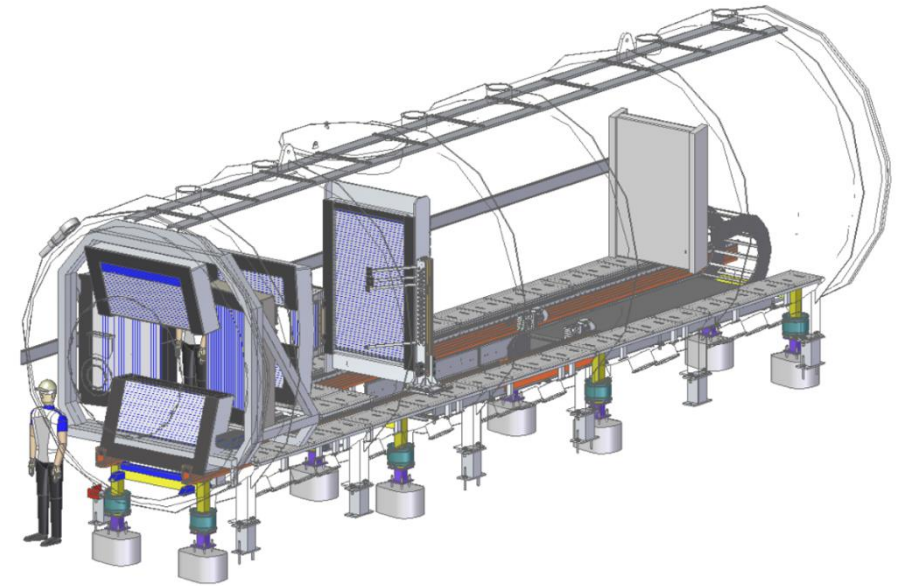
- Wide-angle 'windows' and 5 m – 10 m rear bank
- Broad Q-coverage

•ESS tranche 1

•Multiplexed  $^{10}\text{B}_4\text{C}$  straw-tube detector banks

•ESS: Judith Houston, Andrew Jackson, Hannah Burrall

•ESS-DMSC: Simon Heybrock & Neil Vaytet

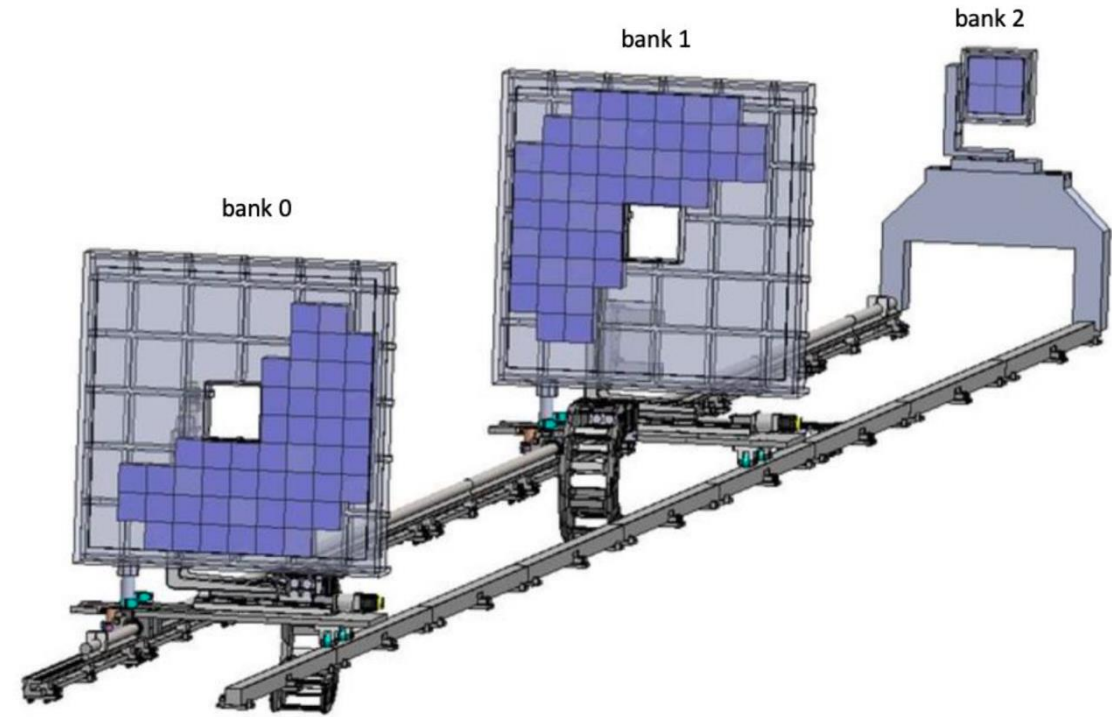


# SKADI

## Abridged background

ToF multi-detector high-resolution SANS instrument

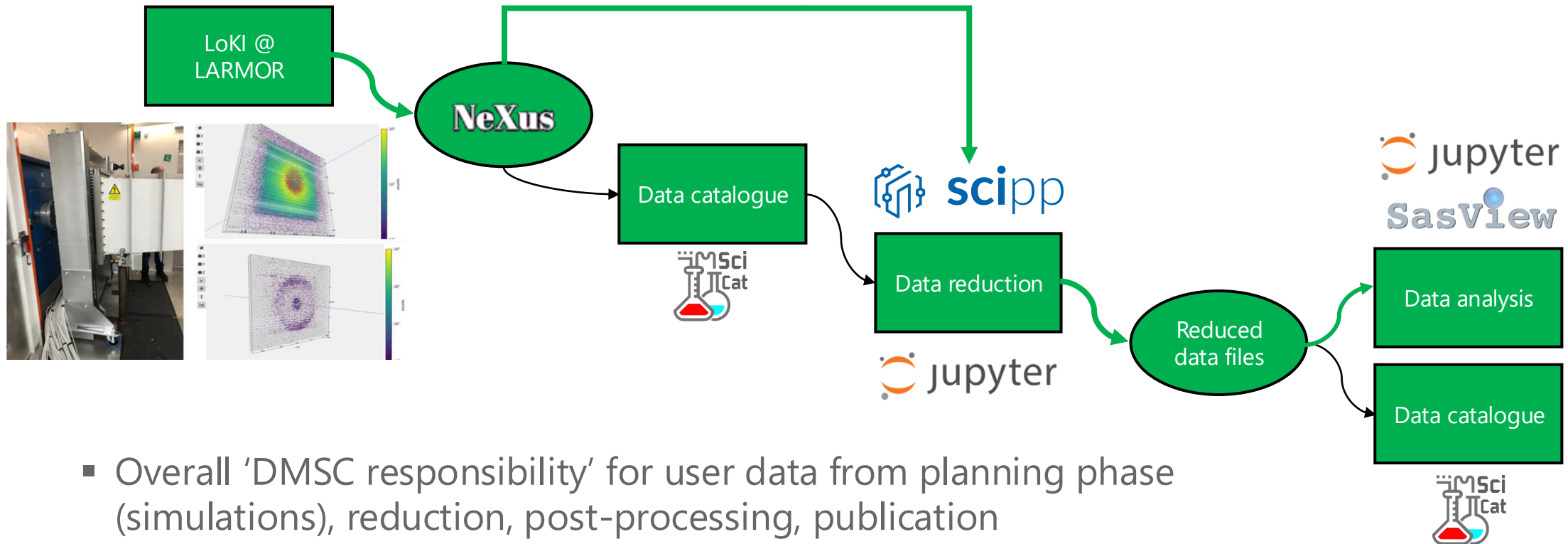
- 3 banks of new 'SoNDe' detector technology from IDEAS
  - $^6\text{Li}$ -doped glass scintillator
  - Multi-anode photomultiplier tubes
    - High theoretical resolution and efficiency (76% thermal neutrons)
- ESS tranche 2
  - Large tank installed and under vacuum
- ESS: Sebastian Jaksch
- **Importance of common workflows**



# Overview



## General data pipeline



- Overall 'DMSC responsibility' for user data from planning phase (simulations), reduction, post-processing, publication
- **Cold commissioning has been ongoing**

Proposal

Data access & analysis

Experiment

# Recap of established workflows

## Scipp works

1. VISA
  - Now used sitewide, day-to-day
2. Beamfinding
3. Direct beam function
4. Reduction to I(Q)
  - Separate by wavelength bands, by straw/tube



**Data Analysis, in the cloud**

VISA (Virtual Infrastructure for Scientific Analysis) makes it simple to create compute instances on the data analysis infrastructure to analyse your experimental data using just your web browser

[Sign in with your user account](#)

**Analyse your data**

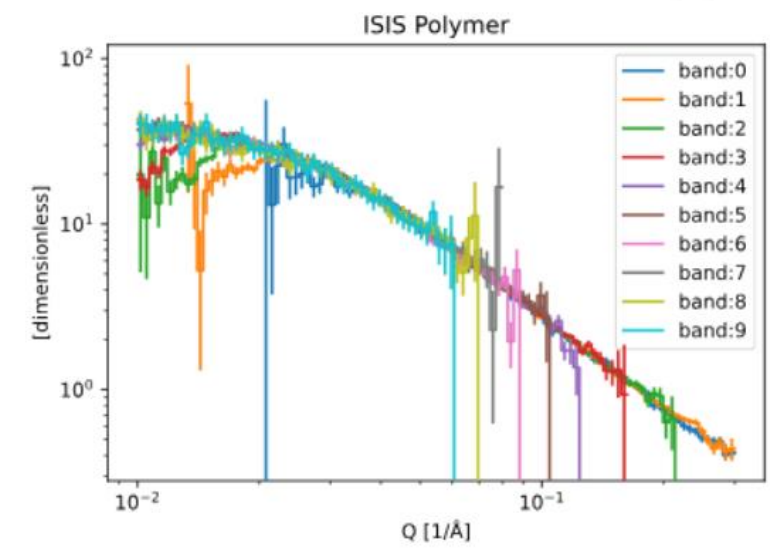
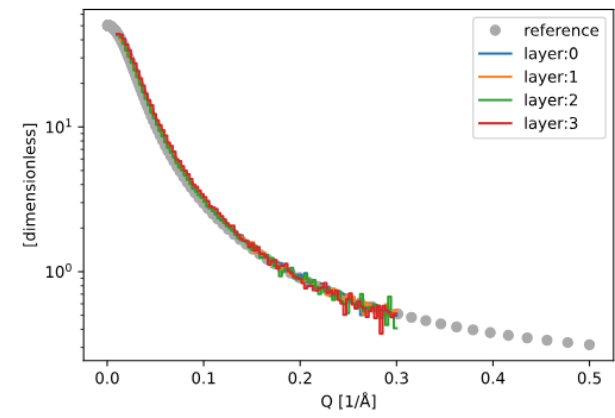
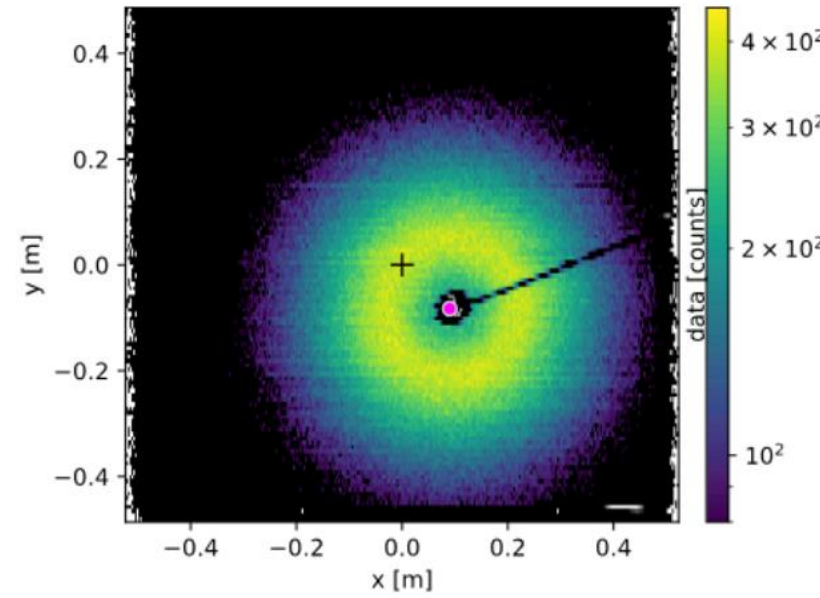
Create a new compute instance and use your web browser to access a Remote Desktop or JupyterLab to start analysing your experimental data

**Collaborate with your team**

Share your compute instance with other members of your team to collaborate together in real time

**No need to install software**

The compute instances come with pre-installed data analysis software so you can start analysing your experimental data immediately





# Cold commissioning progress

## Summer '25

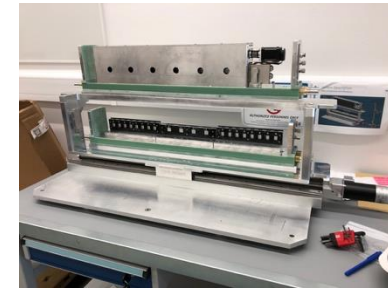
- Early involvement with instrument team, ECDC, etc, in defining cold commissioning test plan documentation (ESS document numbers)
  - Sample area systems (ESS-5758591)
  - Detector motion system (ESS-5601102)
  - Collimation system (ESS-5601101)
  - Detector & Beam monitor system (ESS-5758315)
- Physically present at all tests
- Responsible for data-orientated test cases and review for:
  - Chopper system (ESS-5759105)
  - Sample area systems (ESS-5769853)
  - Detector motion system (ESS-5767051)
  - Collimation system (ESS-5769855)
  - Detector & Beam monitor system (ESS-5818477)

# Cold commissioning

## Notes and highlights



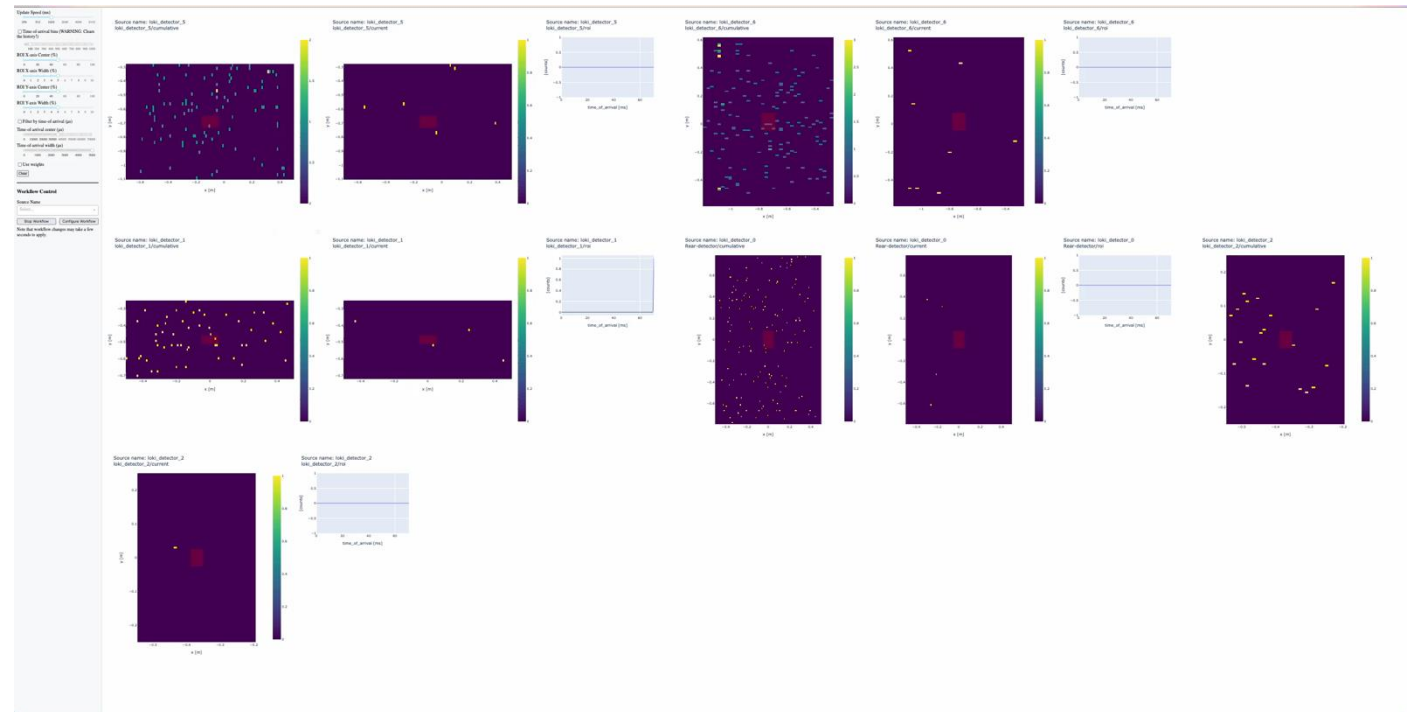
- **A representative workflow was used :**
  - **VISA instances** (provided by DST @ DMSC)
  - **LoKI proposal 051657** dedicated to commissioning activities
- Choppers controlled by NICOS and recorded to nxs file
- Detector carriage motion
- Found some intermittent filewriter issues: was quickly patched by ECDC
- Sample changer motion now working as desired
  - Position ie. 'AT' now recorded to file, and can be set without pure motor positions



# Detectors and beam monitors

## Live Display of Neutron Data

- Excluding beam monitors
  - all but one multi-pixel monitor now installed; defective monitor returned to STFC for modifications
- Detector upgrade: 'missing' panels to be installed in the coming weeks
- Live display works with DMSC implementation (Scipp Live dashboard)
  - Now in place in LoKI cabin!

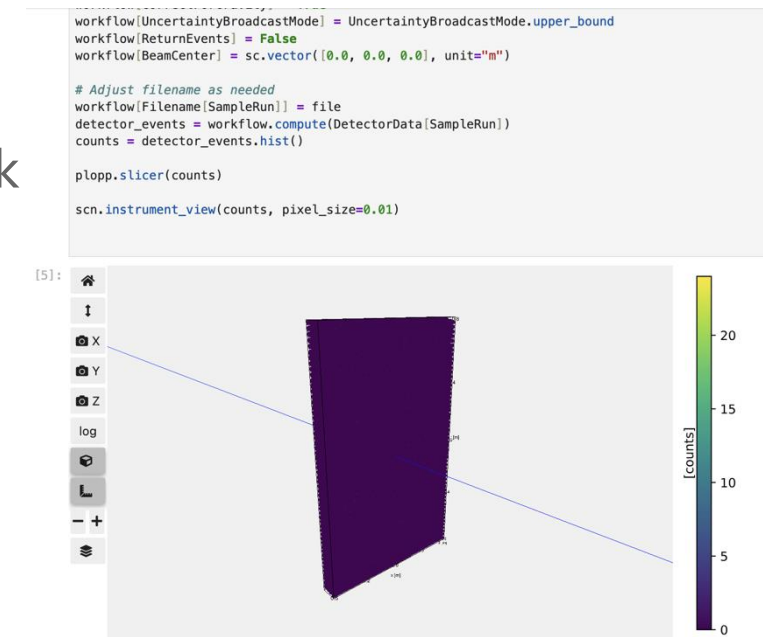
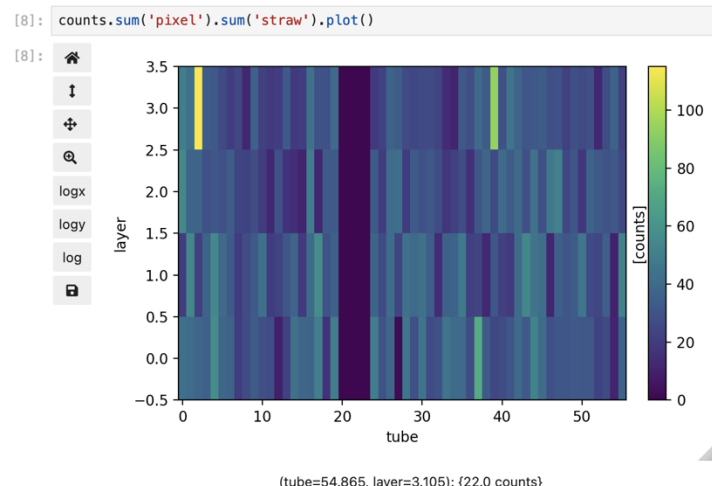


# Detector and beam monitor systems



## From ESS-5818477, test case 3: Storage of Neutron Events

- Cosmic testing
- Compared EFU readout directly from Grafana (approx. ~6 cps)...
- To those written to file 051657\_00000083.hdf between 07:19:08.624 – 07:38:18.733 (6697 events; 5.87 cps)
- Data file listed in SciCat: "Immediate" = 11 seconds.
- Stored data file can be loaded in VISA Jupyter notebook: Check
- Detector data plotted in VISA Jupyter notebook: Check





# Reduction and analysis

## LARMOR test data

- Already demonstrated functioning reduction workflows and Jupyter widgets which can be used as GUI for user interaction
- Analysis: for SANS, community standard software

Reduction (Manual) | Reduction (Smart) | **Reduction (Auto)**

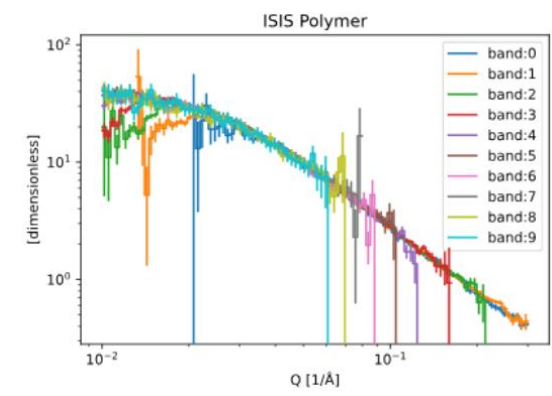
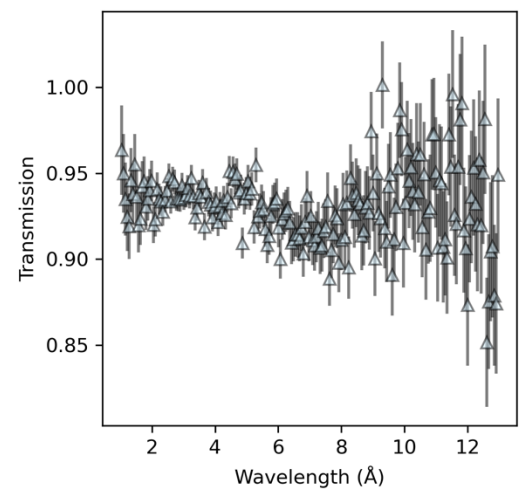
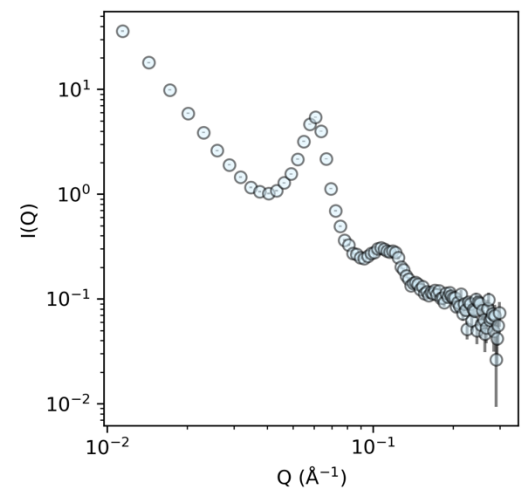
Select Input Folder: /scratch/oliverhammond/LARMOR/nxs/in-auto/

Select Output Folder: /scratch/oliverhammond/LARMOR/nxs/in-auto/out/

key	SAMPLE	SANS	TRANS
0	isis_polymer	60339	60394

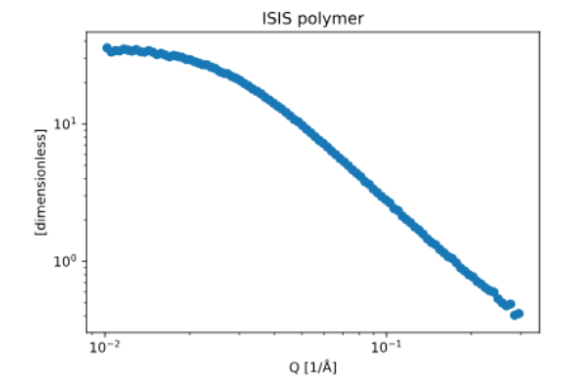
Scanned 4 files. Found 1 reduction entries.  
 Using mask file: /scratch/oliverhammond/LARMOR/nxs/in-auto/mask\_new\_july2022.xml for sample isis\_polymer  
 Reducing sample isis\_polymer...  
 Using mask: /scratch/oliverhammond/LARMOR/nxs/in-auto/mask\_new\_july2022.xml for sample isis\_polymer  
 Reducing sample isis\_polymer...  
 Saved reduced data to /scratch/oliverhammond/LARMOR/nxs/in-auto/out/60339-2022-02-28\_2215\_mod.xy  
 Saved reduction plot for sample isis\_polymer.  
 Uploaded dataset for run 60339 using files:  
 - /scratch/oliverhammond/LARMOR/nxs/in-auto/out/60339-2022-02-28\_2215\_mod.xy  
 - /scratch/oliverhammond/LARMOR/nxs/in-auto/out/60339-2022-02-28\_2215\_mod\_reduced.png  
 Scanned 4 files. Found 1 reduction entries.

SiO2 colloidal ludox - 60385-2022-02-28\_2215.nxs



```
#log bins
workflow[Qbins] = sc.geospace('Q', 0.01, 0.3, 101, unit='1/angstrom')
da = workflow.compute(BackgroundSubtractedIofQ)
da.plot(norm="log", title="ISIS polymer", scale={'Q': 'log'})

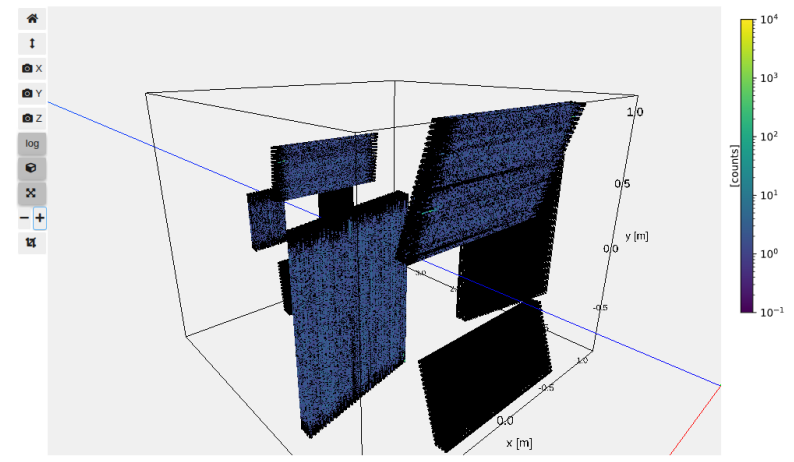
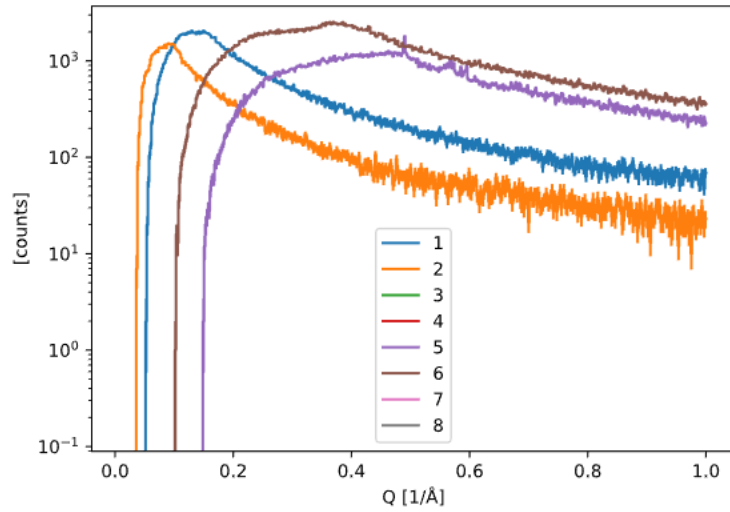
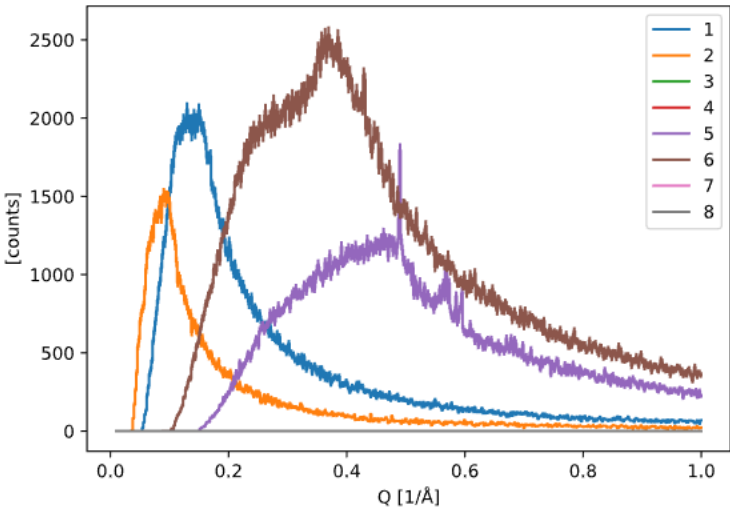
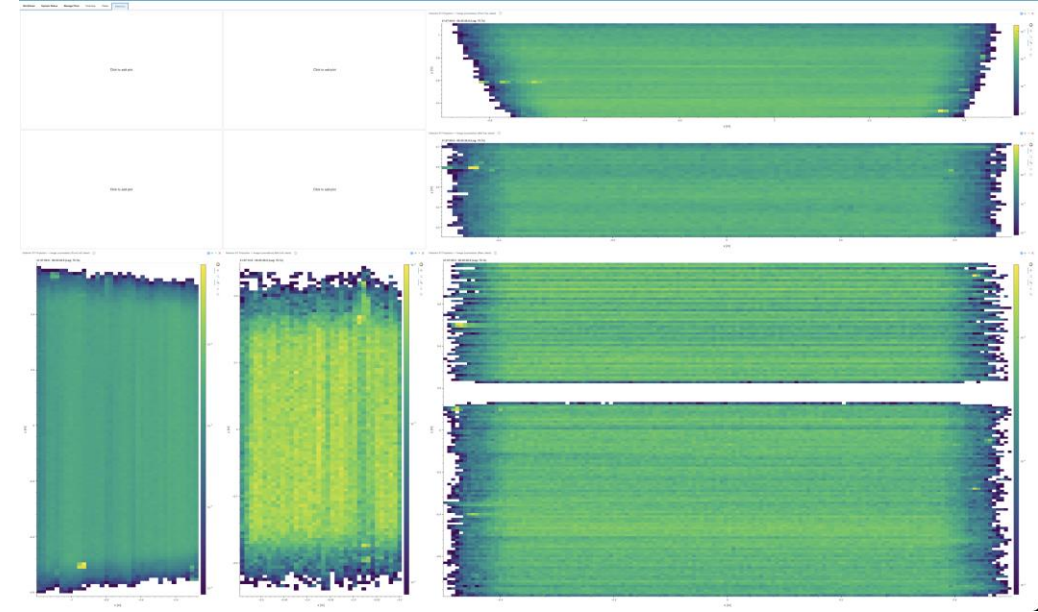
#save output
da.coords['Q'] = sc.midpoints(da.coords['Q'])
sx.ye.save_xye(fname='ISIS-polymer-1.xye', da=da)
da.plot(norm="log", title="ISIS polymer", scale={'Q': 'log'})
```



# Reduction and analysis

## Cosmic data at ESS

- Using ESSLiveData we can watch data accumulating in real time
- We have the ability to “reduce” cosmic background measurements using documented LoKI Scipp workflows:  
<https://scipp.github.io/essans/user-guide/loki/loki-reduction-ess.html>
- Bank-by-bank reduction & 3D view





# Outstanding issues

## Focus of current work

- Detector positioning to be written to file using physical measured values (source of truth)
  - Modification ongoing ([NIT-209](#)) to redefine bank\_0 in NeXuS file as a transformation chain with:
    1. Motor position dependency
    2. A 'positive' linear offset from a fixed point to the detector carriage motor zero
    3. A 'negative' linear offset from a fixed point to the sample position, as highlighted previously
  
- SKADI work ongoing with view towards commonality of workflows
  
- Proton pulse and general target PVs to be written to file
  - Needed by some instruments for run control (ie. integrated proton charge)
  - Functioning, next step to validate PVs with ICS during beam-on-dump testing (parasitic)



**Thank you for your attention!**

2026-04-22