**ISIS SANS SUITE**

(as of Jan 2013)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **2013** | **2014** | | | **2015** | | **2016** | **2017** | **2018** | | **2019** | | **2020** |
| **TS1** |  | | | Long  Shutdown | |  | | | | Tgt &Mod  Upgrade? | |  | | |
|  |  | | |  | |  | | | |  | |  | | |
| **LOQ** |  |  |  |  | |  | | | |  | | ? | | |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **TS2** |  | | | Long  Shutdown |  | | | | | | | | Long  Shutdown |  |
|  |  |  |  |  |  | | | | | | | |  |  |
| **SANS2D** |  | A |  |  |  | | | | | | | |  |  |
|  |  |  | | |  |  | |  | | | | |  |  |
| **LARMOR** | Build | Commission (B) | | |  | | C |  | | D |  | E |  |  |
|  |  | | | | |  | | |  | | | |  |  |
| **ZOOM** | Build | | | | | Commission (F) | | |  | | | |  |  |

*Key:*

A=Installation & commissioning of replacement linear gas tube array detectors

B=Commissioning of basic instrument (slit-SANS)

C=*Expected* installation & commissioning of RF & polarisation systems for SESANS

D=*Planned*  commissioning of Larmor Diffraction, NRSE, MIEZE & TOFLAR modes of operation

E=*Potential* installation & commissioning of WANS & USANS capability

F=Commissioning of basic instrument (slit-SANS) but including polarisation system.

|  |  |
| --- | --- |
|  | **SANS2D** |
| E:\Instrumentation\Larmor\Larmor_High_Detail_Render_smaller.png | **LARMOR** |
| http://www.isis.stfc.ac.uk/instruments/zoom/zoom-image10290.jpg | **ZOOM** |

**SAS DATA REDUCTION**

(after Pauw, 2013)

Some of this will apply to *all* neutron/X-ray measurements, not just SAS!

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **#** | **Correction Step** | **Applied By** | **ISIS SANS** | **ORNL SANS** |
| 1 | ‘Dezingering’  *(for removal of spikes from cosmic rays, etc)* | Spatial & time masking | Y | Not seen this prob! |
| 2 | DAQ deadtime  *(delay from readout and ADC conversion)* |  |  |  |
| 3 | Detector deadtime  *(delay from intrinsic ion pair/photon production)* |  |  |  |
| 4 | Detector flat-field  *(to give uniform response from all pixels)* | Flood file | Y | Y |
| 5 | Detector flux response  *(in case count rate is not linear with incident flux)* |  |  |  |
| 6 | Detector dark current  *(source on detector background)* | Shutter closed run | Assumed negligible | Y |
| 7 | Natural background  *(source off detector background)* |  | Assumed negligible |  |
| 8 | Incident flux & measurement time  *(for per neutron per second normalisation)* | Incident beam monitor | Y | Y |
| 9 | Detector efficiency  *(or just ratio to monitor efficiency)* | Direct beam file | Y | (Y) |
| 10 | Detector coordinate distortion  *(to compensate for electronics)* | Coordinate shifts from ‘holey mask’ data | Y | Y |
| 11 | Detector spherical dilation (parallax)  *(for larger solid area of pixels at wider angles)* |  | ? |  |
| 12 | Detector detection depth (‘gondola effect’)  *(for greater path length at wider angles)* |  | Only affects LOQ (2014-) | Not an issue with tubes |
| 13 | Probe polarisation (SAXS only?)  *(scattering is dependent on polarisation)* |  |  |  |
| 14 | Inelasticity (SANS only!)  *(to compensate for thermalisation in sample)* |  |  | Assume sam bkg does it |
| 15 | Sample transmission  *(to compensate for absorbtion by sample)* | Transmission monitor data | Y | Y |
| 16 | Sample self-absorbtion  *(for greater path length at wider angles)* | Calculation using transmission data | Y | Y |
| 17 | Sample thickness  *(for per cm normalisation)* | Physical measurement (or assumption!) | Y | Y |
| 18 | ‘Pixel health’/’Detector shadowing’  *(to exclude pixels from data reduction)* | Spatial masking | Y | Y |
| 19 | Absolute intensity scaling  *(if you are going to do things properly…)* | Use of ‘known standard scatterer’ | Y | Y |
| 20 | Sample background subtraction  *(to get the actual sample scattering)* | ‘Can’ measurement and data | Y | Y |
| 21 | Radial/azimuthal averaging  *(to convert 2D data into 1D data; I(Q) vs Q)* | ‘Reduce 1D’ | Y | Y |
| The following corrections *could* be applied during data reduction, but the consensus view is that they are best handled as part of data analysis | | | | |
| 22 | Multiple scattering |  |  |  |
| 23 | Instrumental smearing due to:   1. Polychromaticity 2. Beam divergence 3. Beam profile 4. Sample thickness variations 5. Detector positioning variations |  |  |  |

**FUTURE NEEDS OF ISIS SANS**

(in rough order of priority)

* Implementation of outstanding reduction corrections (see table)
* Generalisation of the top end of the SAS reduction process to facilitate the accommodation of new beamlines (eg, LARMOR and ZOOM)
  + NB: this would also benefit D33 (at ILL) and Bilby (at ANSTO) which use TOF
* Implementation of different time bins (& thereby time regimes) for monitors and detectors
* ~~Implementation of rectangular workspaces so that patterns from different 2D detectors can be combined into one pattern (eg, SANS2D & ZOOM)~~ Said to be already present in the framework…
* Implementation of ‘beam stop out’ transmission measurements
  + NB: this would also benefit D33 and Bilby
* Implementation of a GRASP-compatible reduced data output format
* Implementation of polarisation analysis (for NR & SANS)
* Implementation of Q errors
* Implementation of reactor TOF reduction procedures
  + It is vitally important that reactor facilities employing TOF techniques (eg, D33 and Bilby) learn from the experience that Mantid has with TOF data reduction and that their Users get the same answers from the same samples that ISIS or SNS do.
* Move to ‘cradle-to-grave’ automation of parametric experiments (ie, where *one* script sets sample changer positions, temperatures, etc, BEGINs & ENDs runs, loads the appropriate ‘sample’ and ‘can’ data into Mantid, reduces the data, writes the reduced data out, and also sends it to an appropriate analysis program)

The above are for the most part *in addition* to existing tickets.