

Introduction

The NCNR is a user facility. People, who want to utilize the various instruments at the NCNR, must submit a proposal. After the proposal is accepted, the person can use the instrument for his/her research. One of these instruments is the **Small-Angle Neutron Scattering (SANS)** instrument.

Small-Angle Neutron Scattering (SANS) probes structure in materials on the nanometer (10^{-9} m) to micrometer (10^{-6} m) scale. SANS has been applied to investigations of biological processes in cells, storage of information on magnetic disks, and hardness of steels and super alloy.

The process of correcting this data is called **data reduction**. SANS users must reduce their data for the many problems and discrepancies of the raw data.

For a typical SANS experiment, seven different types of files are gathered (sample, empty cell, empty beam, blocked, transmission of sample, and transmission of empty cell, sensitivity). As aforementioned, the data must be corrected. Using these different files, different corrections are performed throughout the reduction.

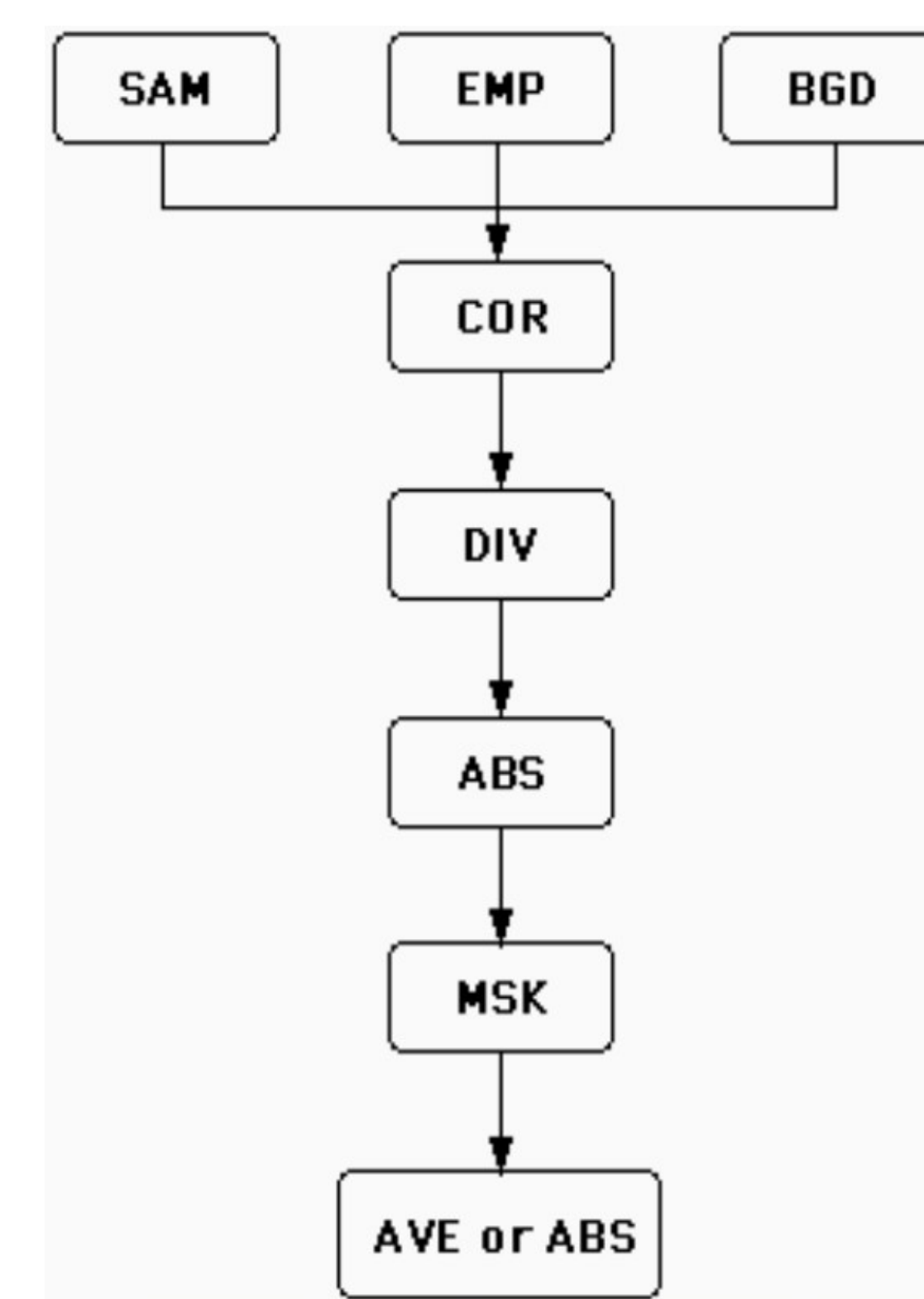
Currently, users utilize a program called IGOR to perform the data reduction for them. IGOR must be downloaded by the user. IGOR also takes a relatively long time to learn and to master. **To make data reduction more user-friendly, flexible, and accessible, a web-based system was developed.** Using web-based data reduction, a user can access his/her data files and perform reductions wherever there is **Internet connection**. The web-based system also gives the user the ability to manipulate the reductions, adding or deleting the steps they want. All this provides SANS users with an easier way to reduce their data.

Data Reduction Steps

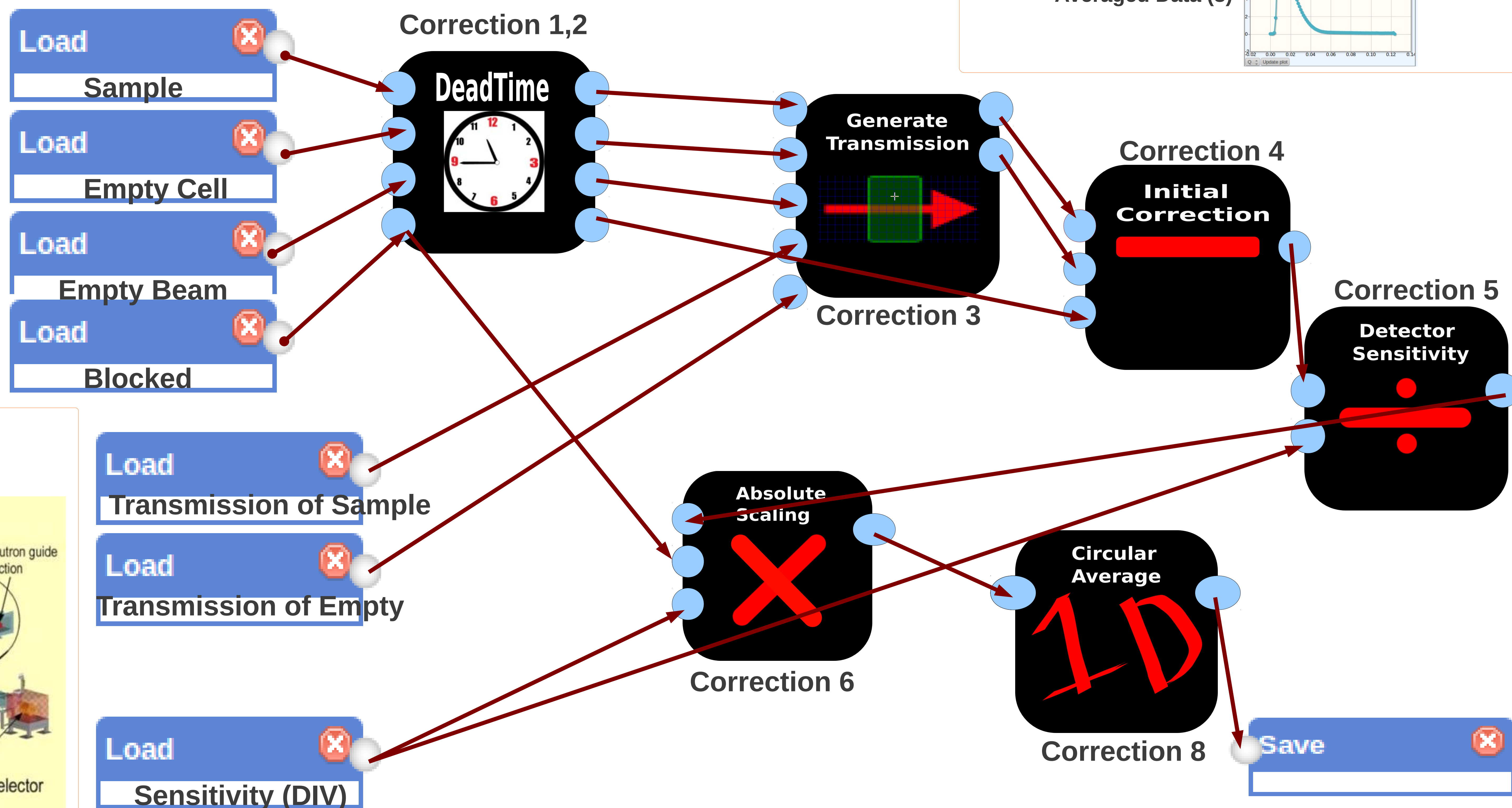
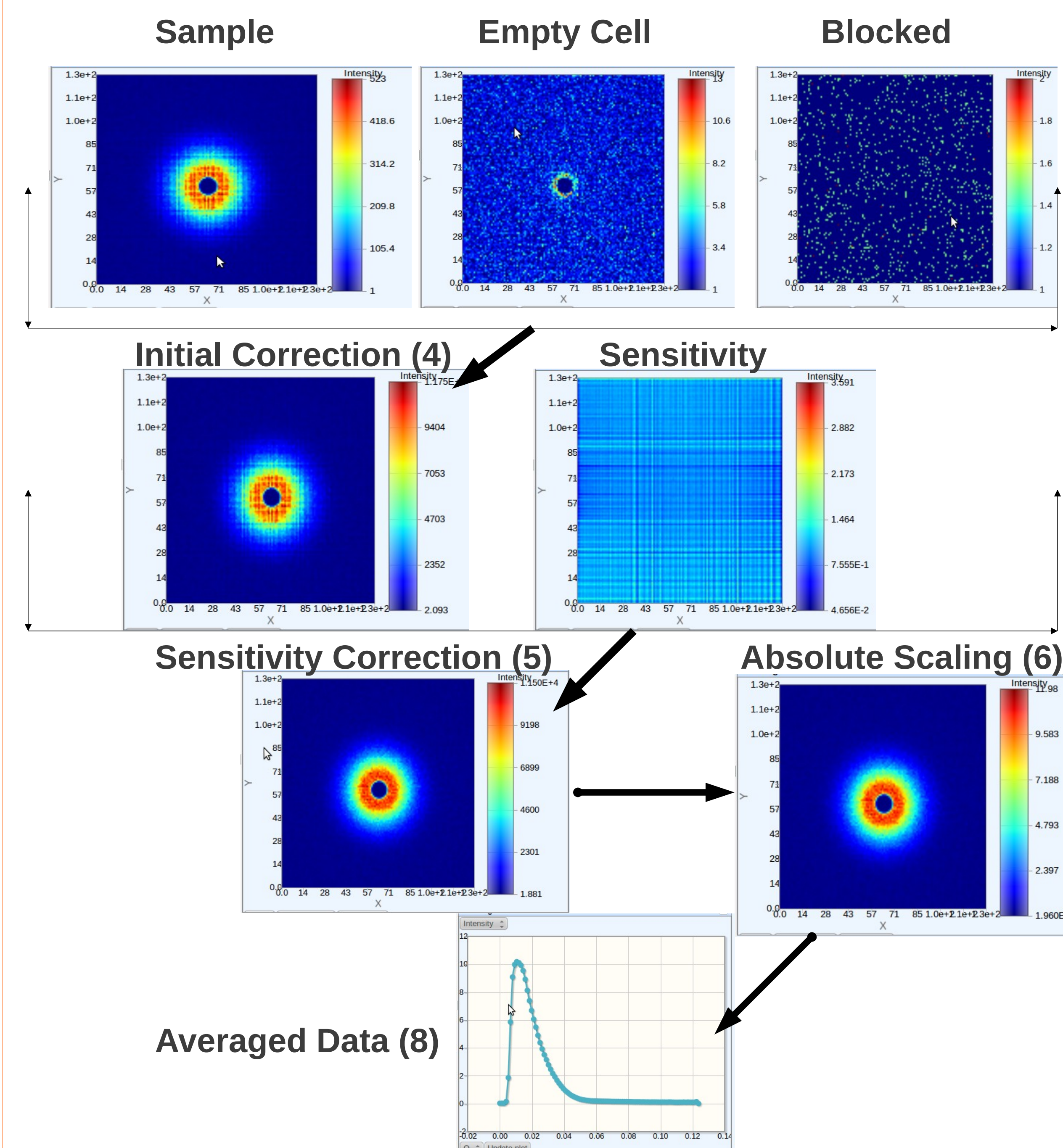
Main Corrections:

- (1) **Solid Angle Correction** – Scattering geometry is described by an Ewald sphere, but the detector is flat,
- (2) **Dead time correction** – corrects for the measured count time (since the instrument is not able to count when processing signals)
- (3) **Generate Transmission** – normalizes data and calculates the transmission of the sample and of the empty cell. Needs coordinates to be able to sum intensities in transmission and empty beam data. **Formula:**
$$\text{Intensity_in_beam (transmission)/ Intensity_empty_beam}$$
- (4) **Initial Correction, COR = (SAM - BGD) - [Tsam/Temp] (EMP - BGD)**
- (5) **Detector Sensitivity Correction, DIV = COR/sensitivity**
- (6) **Absolute Scaling**, takes parameters for instrument name and coordinates, scalar value is calculated through an algorithm $\text{ABS} = (\text{Scalar}) * (\text{DIV})$
- (7) **MASK (Not implemented yet), Delete Unwanted Areas (Usually border)**
- (8) **Average Data by circular integration (Q vs. I)**, where I is the intensity, **Convert to 1D**

Original SANS Reduction Flow Chart



Example Data



SANS NG7 Instrument

