

# Monochromatic GISANS reduction

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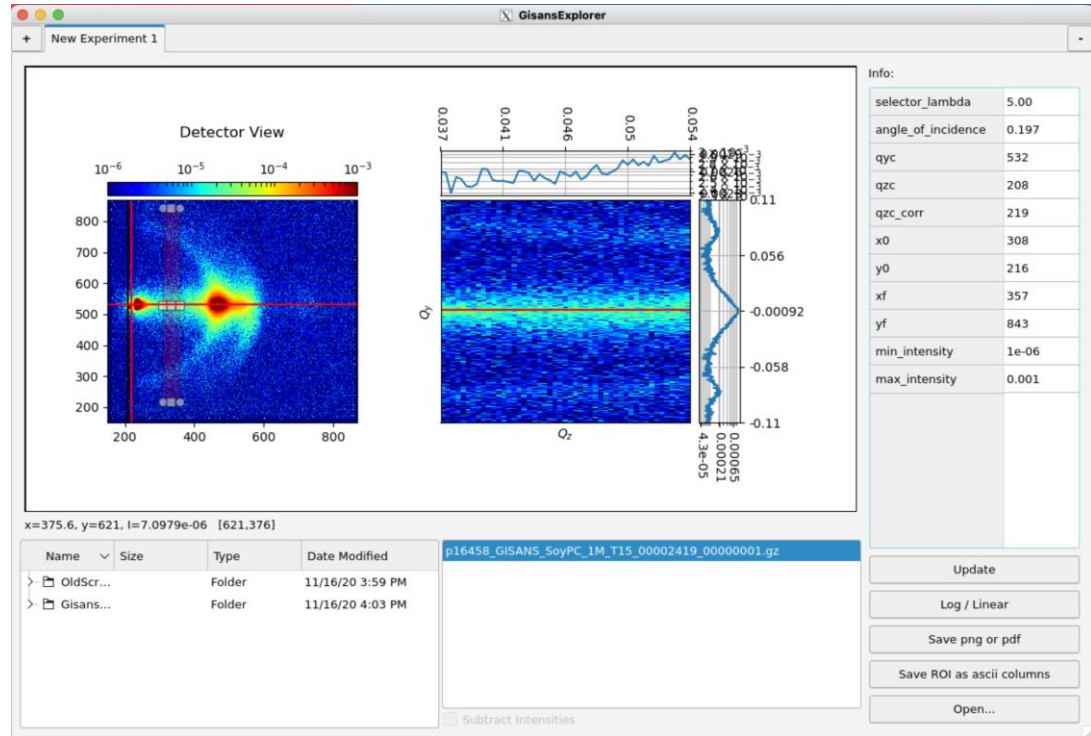
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# Our past practice at MARIA

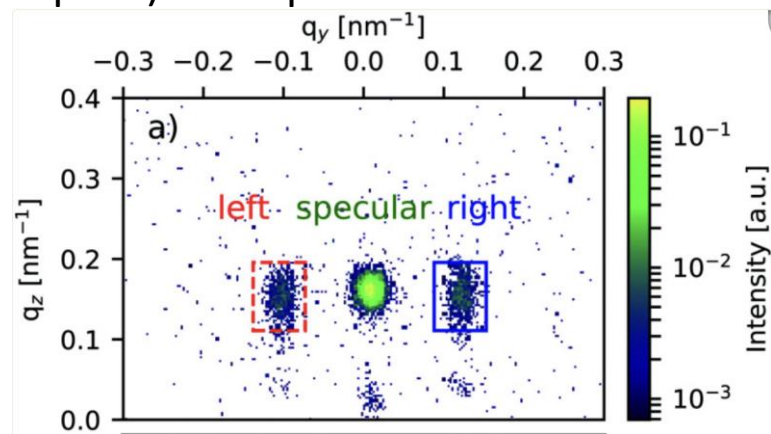
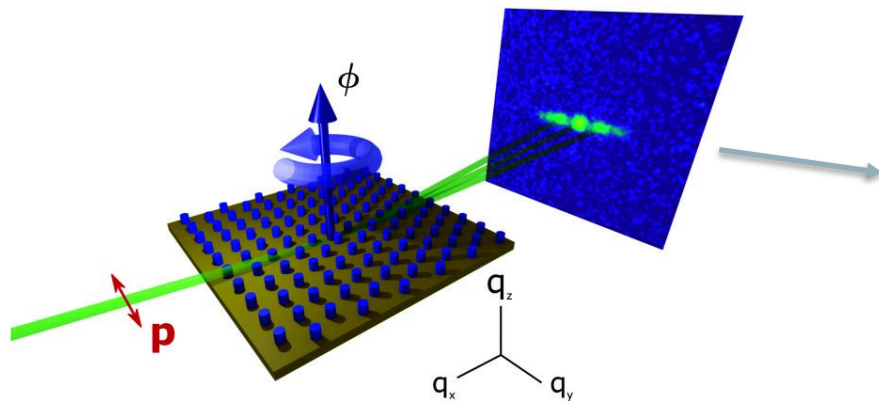
A very basic python GUI giving the ability to:

- Transform detector images to  $Q_y$  vs  $Q_z$  maps
- Primary beam monitor normalization
- Apply detector sensitivity corrections
- Subtract spin up/down images
- Perform and display line cuts
- Save data to an “easily” readable format



# Our past practice at MARIA

- No absolute intensity normalization (probably only attenuated direct beam measurement)
- Very basic handling of background corrections
- Resolution information etc. ( $\Delta\lambda/\lambda$ , slit settings, footprint) in output file



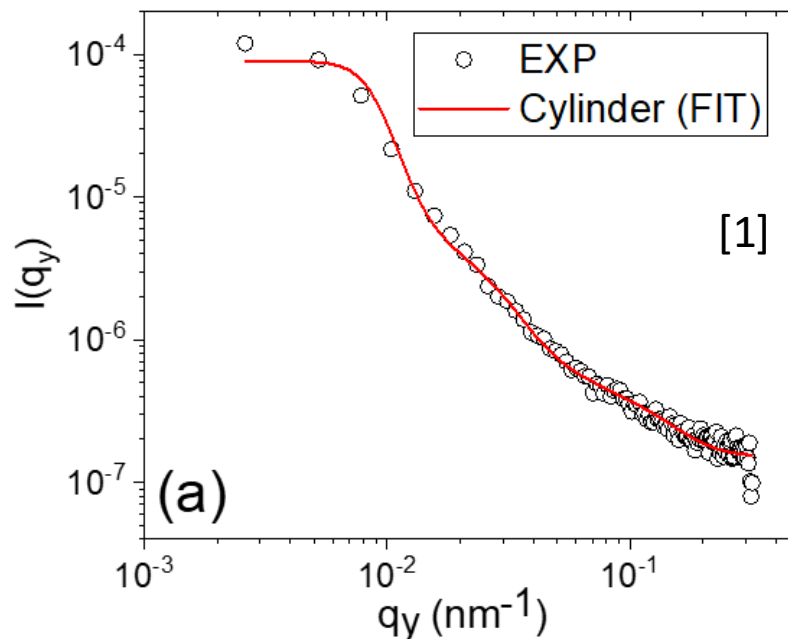
Pip, Glavic et al. *Nanoscale Horiz.* **2021** 6(6):474–481.

# Absolute intensity in GISANS - it matters?

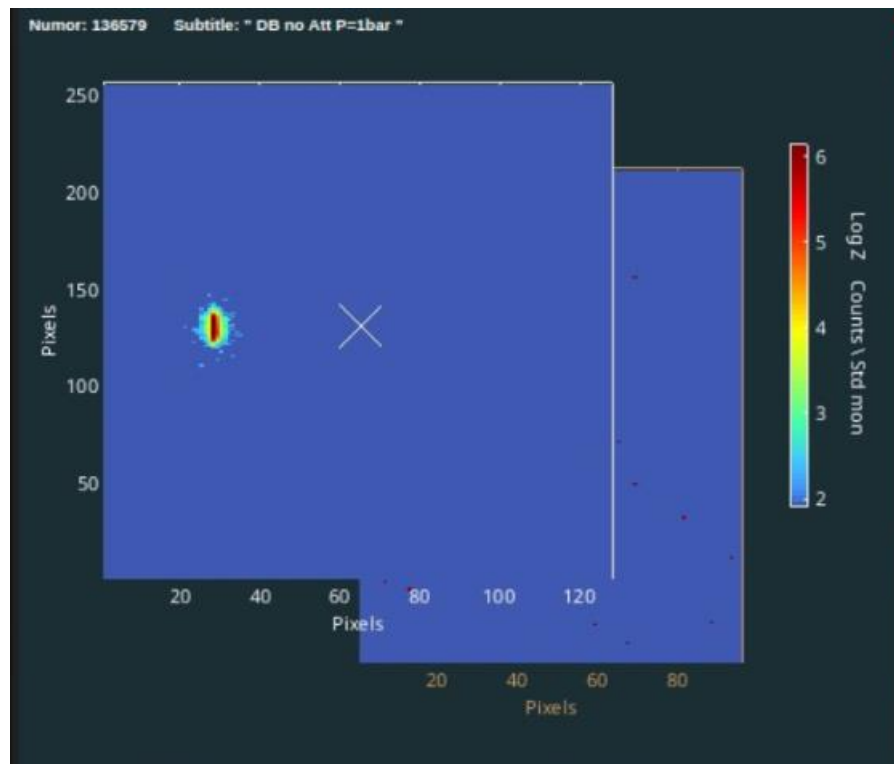
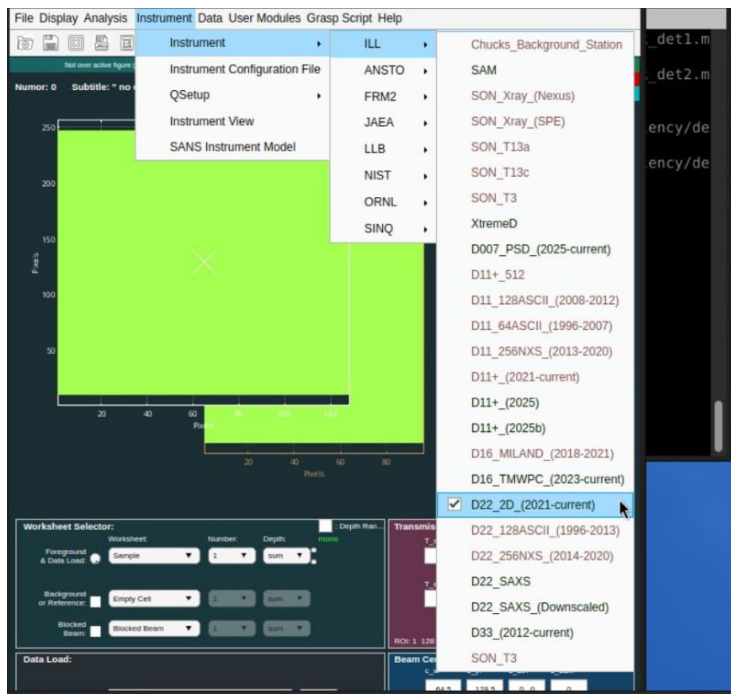
Often, horizontal GISANS linecuts are displayed in arbitrary units (“a.u.”) – Is it the end of the story?

→ There is the possibility to bypass the arbitrary units, by **normalizing to the monitor corrected direct beam intensity**

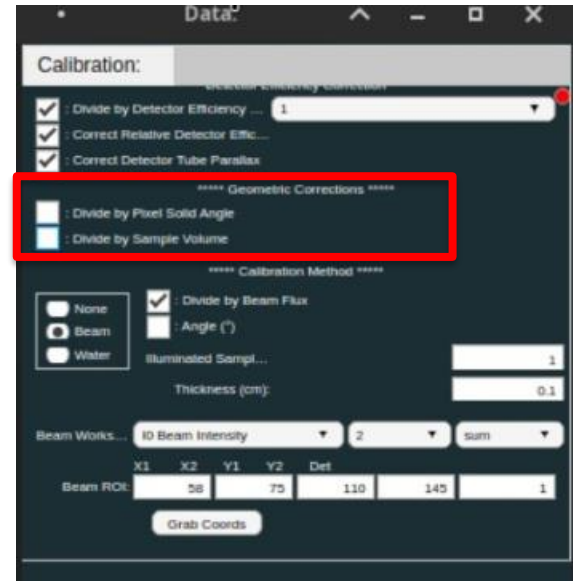
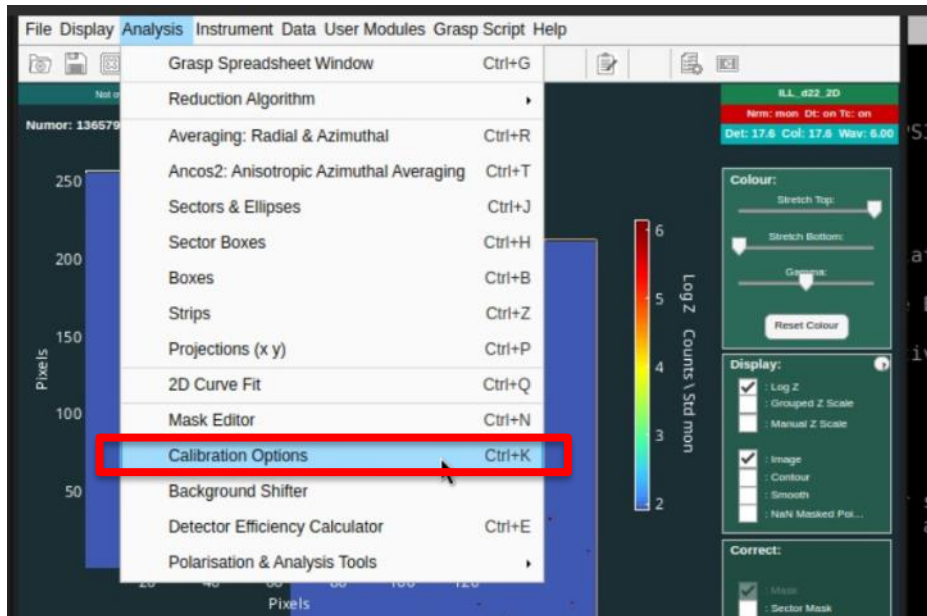
→ **An approach using GRASP software is shown next**



# We browse to the instrument / file path of the proposal



# Identify the count rates from the Direct Beam (Detector and monitor)



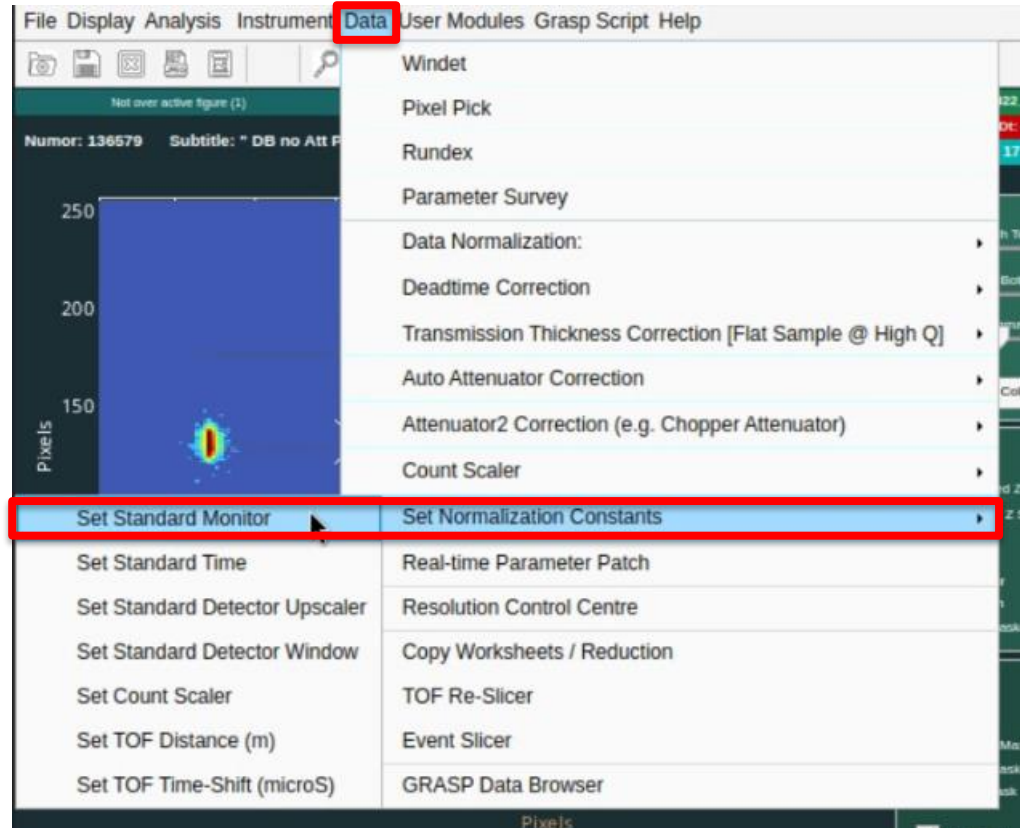
# Direct Beam: Identify the count rates (Detector and monitor)

```
Sample Environment:
  T_set = 322.15; T_reg = 322.15; T_sample = 298.15
  Magnetic Field = 0
  Power Supplies : PS1 0 [A] 0.038 [V] : PS2 0 [A] 0.038 [V] : PS3 0 [A]
] 0.001 [V]

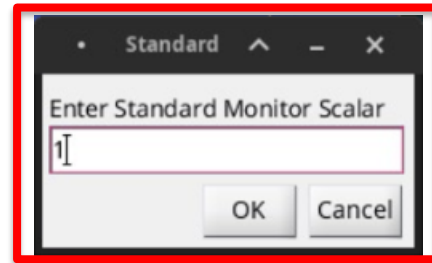
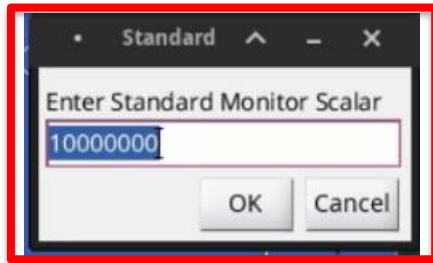
Acquisition:
  Acquisition Time = 60 [s] Exposure Time = 60 [s]
  Total Det Counts [Det:1] 193665 Over 60secs (~3227.8 cps) : Relative Efficiency = 1
  Total Det Counts [Det:2] 979 Over 60secs (~16.3 cps) : Relative Efficiency = 1
  Total ALL Det Counts: 194644 Over 60secs (~3244.1 cps) : Relative Efficiency = 1
  Total Monitor1 Counts 125633 Over 60secs (~2093.9 cps)
  Reactor Power = 44.02 MW

**** Resolution Components: ****
Wavelength resolution d_lambda / lambda: 10 [%] FWHM of triangular shape
Effective source is Rectangular of dimensions: 40 (mm) x 55 (mm) at a distance of: 17.6 (m)
Sample aperture: assuming Circular 10 [mm] diameter
Detector 1 pixelation: x: 8 y: 4 [mm]
Detector 2 pixelation: x: 8 y: 4 [mm]
```

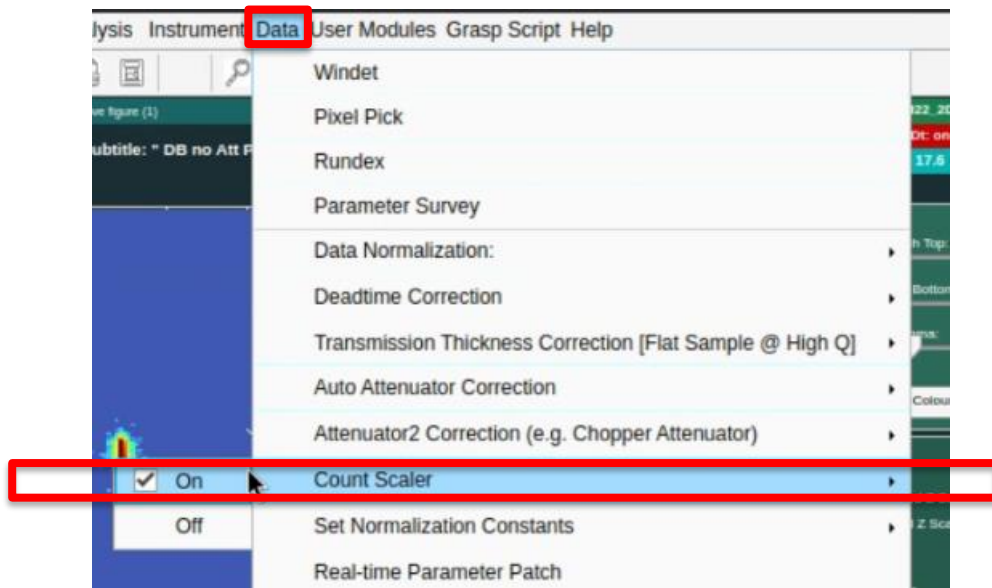
# Select "Set Standard Monitor"



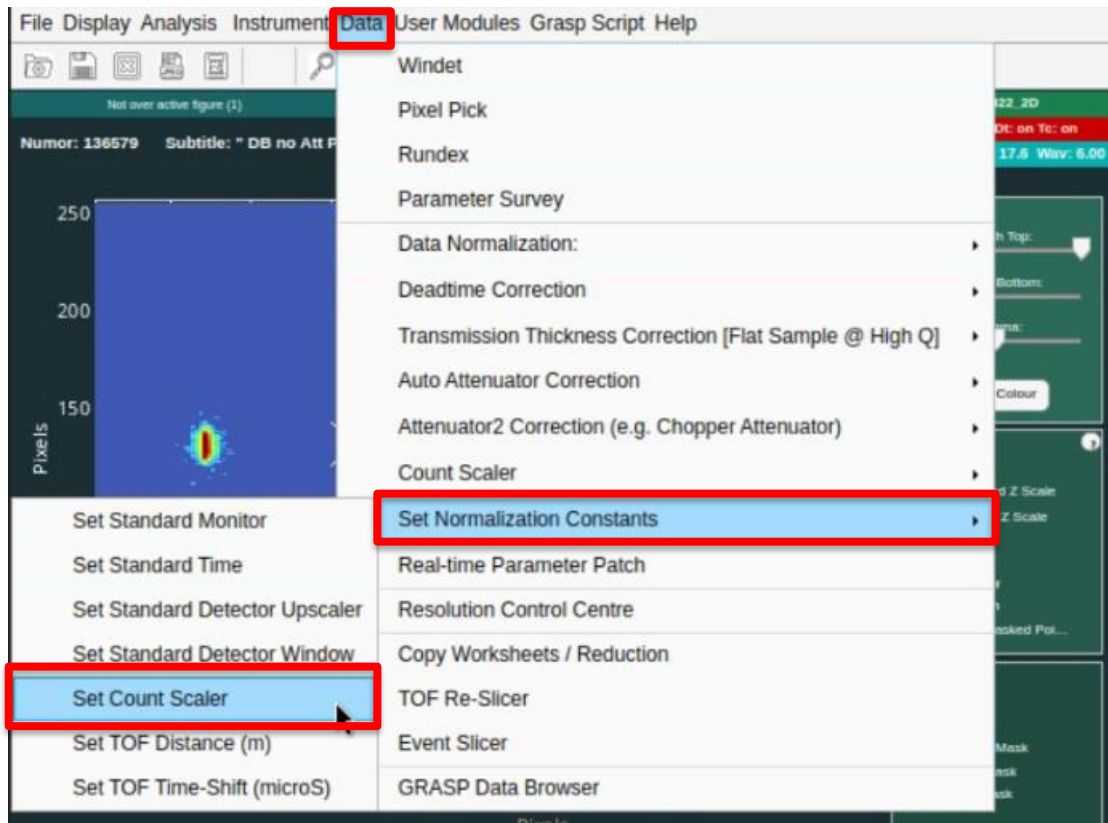
# Set the “Standard Monitor” constant



# Set the "Count Scaler" ON



# Set the count scaler (slide 1)



$$\text{Count scaler} = \frac{\text{Monitor rate}}{\text{Detector rate}}$$

# Set the count scaler (slide 2)

```
Sample Environment:
  T_set = 322.15; T_reg = 322.15; T_sample = 298.15
  Magnetic Field = 0
  Power Supplies : PS1 0 [A] 0.038 [V] : PS2 0 [A] 0.038 [V] : PS3 0 [A]
] 0.001 [V]

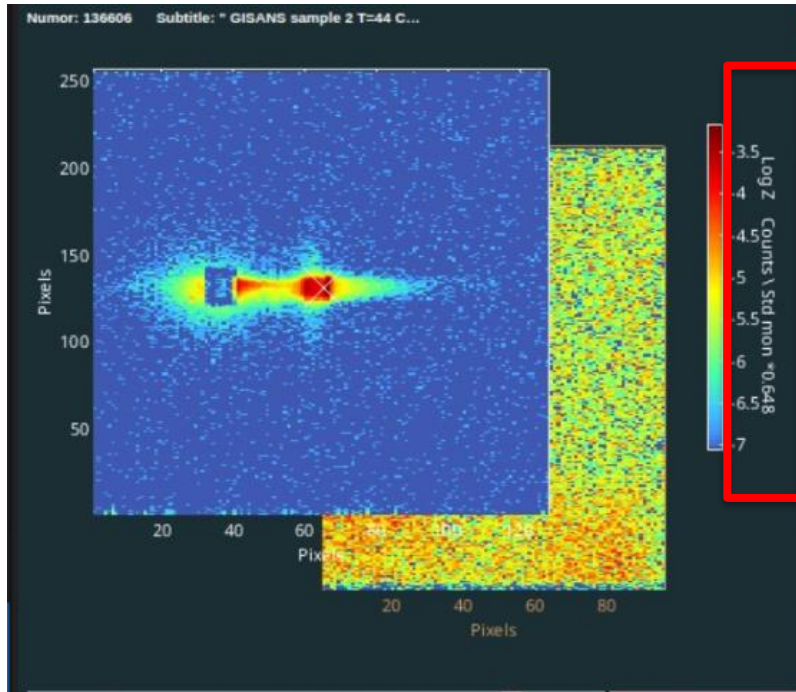
Acquisition::
  Acquisition Time = 60 [s] Exposure Time = 60 [s]
  Total Det Counts [Det:1] 193665 Over 60secs (~3227.8 cps) : Relative Efficiency = 1
  Total Det Counts [Det:2] 979 Over 60secs (~16.3 cps) : Relative Efficiency = 1
  Total ALL Det Counts: 194644 Over 60secs (~3244.1 cps) : Relative Efficiency = 1
  Total Monitor1 Counts 125633 Over 60secs (~2093.9 cps)
  Reactor Power = 44.62 MW

**** Resolution Components: ****
Wavelength resolution d lambda / lambda: 10 [%] FWHM of triangular shape
Effective source is Rectangular of dimensions: 40 (mm) x 55 (mm) at a distance of: 17.6 (m)
Sample aperture: assuming Circular 10 [mm] diameter
Detector 1 pixelation: x: 8 y: 4 [mm]
Detector 2 pixelation: x: 8 y: 4 [mm]
```

The screenshot shows a software window titled "0.39a - EASY\_1091\_v2\_for\_GISANS". The main area displays a blue plot with a white curve. A dialog box titled "Enter Count Scaler" is overlaid on the plot, with the value "0.648" entered in the input field. The dialog has "OK" and "Cancel" buttons.

The screenshot shows a Windows Calculator window in Scientific mode. The display shows the calculation  $2094 \div 3227 = 0.64889990703439727300898667493028$ . The calculator interface includes various scientific function buttons like DEG, F-E, MC, MR, M+, M-, MS, Mv, Trigonometry, Function, 2<sup>nd</sup>,  $\pi$ , e, CE,  $\times$ ,  $x^2$ ,  $1/x$ ,  $|x|$ , exp, mod,  $\sqrt{x}$ , (, ), n!,  $\div$ ,  $x^y$ , 7, 8, 9, and  $\times$ .

# 2D GISANS data displayed in absolute intensity



# Open questions (for breakout groups)

- **Software capabilities:** Necessary manipulations related to normalization (absolute?), background, polarization etc..
- **Metadata?:** Minimal info to be exported in the final metadata (beam geometry, resolution etc...)
- **Software for reduction:** can GRASP and other softwares all provide all necessary features needed for proper GISANS data reduction?