# 1 Data with Debye-Waller factor correction for direct comparisson with QMC

Our QMC collaborators compute $S(\boldsymbol{Q})$, which is related to our measurement as

$$I(t) = I_{\mathrm{TOF}=\infty}(1 + DW_t(S(\boldsymbol{Q}) - 1)) \tag{1}$$

where $DW_t$ is the TOF dependent Debye-Waller factor. Previously we presented our collaborators the data which did not have a Debye-Waller factor correction. Here we make a correction, also noting that we only made measurements in situ and at $t = 6\mu$s . With these two measurements one can solve for the spin structure factor

$$I_t \equiv \frac{I(t=0)}{I(t)} = \frac{1 + DW_0(S(\boldsymbol{Q}) - 1)}{1 + DW_t(S(\boldsymbol{Q}) - 1)} \tag{2}$$

$$\Rightarrow S(\boldsymbol{Q}) = \frac{I_t(1 - DW_t) - (1 - DW_0)}{DW_0 - I_t DW_t} \tag{3}$$

In the long time limit ($DW_t = 0$), and for negligible wavefunction size in the lattice ($DW_0 = 1$) this reduces to $S(\boldsymbol{Q}) = I_t$.

The data including this Debye-Waller factor correction is shown in Fig. 1 and also attached to the email.

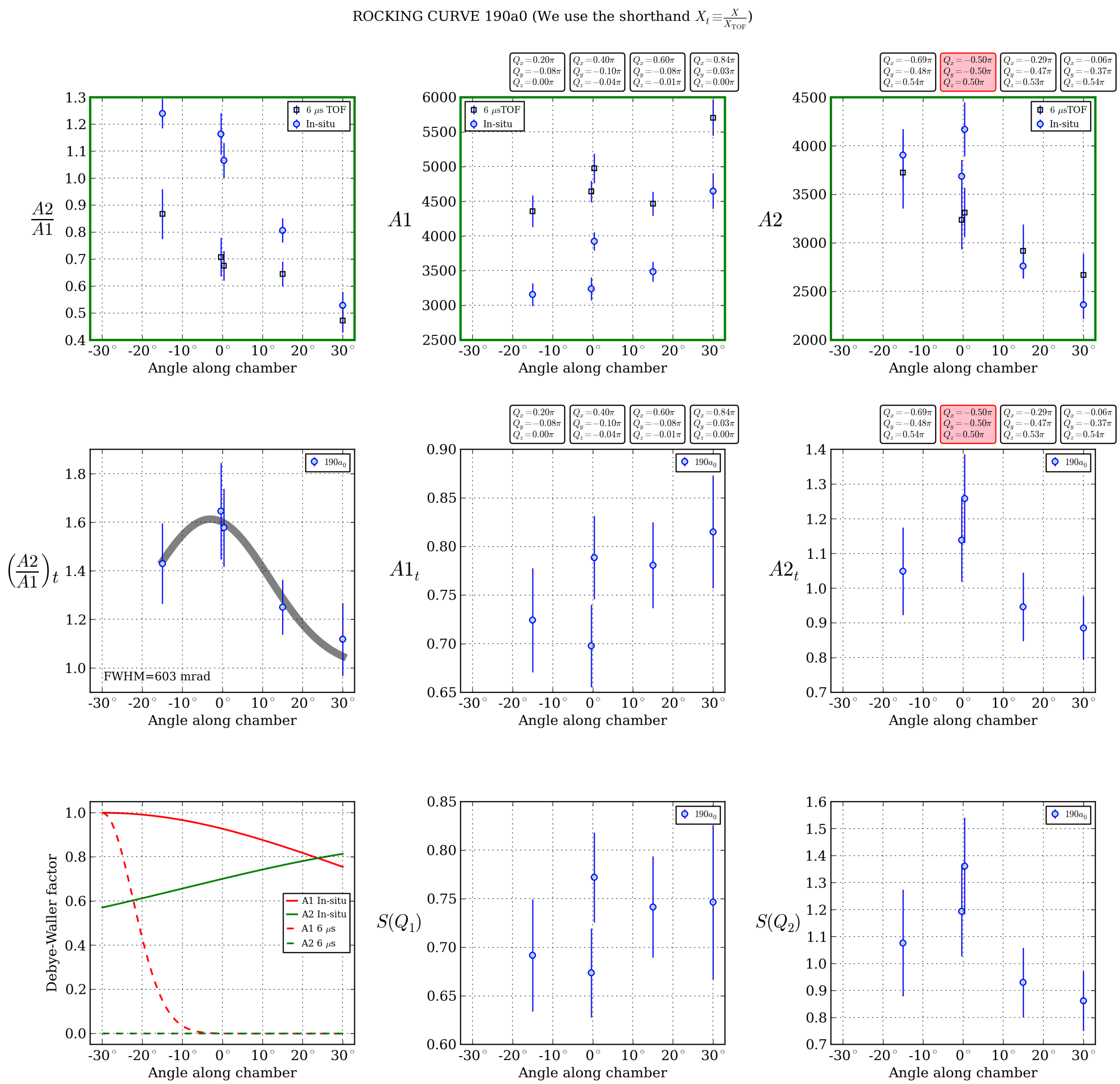


Figure 1: Top row shows our raw data, which corresponds to ratio of CCD counts $A2/A1$, and CCD counts for $A1$, $A2$ respectively. Middle row shows the ratio of in-situ and TOF data for each of the three quantities. Bottom row, left panel shows the Debye-Waller factor for the in-situ picture and the 6 $\mu$s TOF picture as a function of angle along chamber. The $A1$ Debye-Waller factor goes to 1 for both in-situ and TOF at 30°, which corresponds to zero momentum transfer. Bottom row, right panels show the spin structure factor determined from our data and the Debye-Waller factor corrections.