Error analysis of TMA data:

I have an array (32 x 185 x 388 pixels) of summed images, I_{tot}

The intensity in photons:

$$I = \frac{T_{tot}}{27.3}$$

Q-binning and shot averaging:

$$\bar{I}(q) = \frac{1}{N_{shots}} \times \frac{\sum_{pixels \in q} I}{\sum_{pixels \in q} 1}$$

Error for $\bar{I}(q)$ is the square root of the total number of photons in each q-bin, averaged by the number of pixels in the q-bin, and the number of shots in the time-bin:

$$\Delta\bar{I}(q) = \frac{1}{N_{shots}} \times \frac{\sqrt{\sum_{pixels \in q} I}}{\sum_{pixels \in q} 1}$$

Percent difference: $S = \frac{\bar{I}_{on}(q,t) - \bar{I}_{off}(q)}{\bar{I}_{off}(q)} \times 100 = 100 \times \left(\frac{\bar{I}_{on}(q,t)}{\bar{I}_{off}(q)} - 1\right)$

$$(\Delta S)^2 = \left(\frac{\partial S}{\partial \bar{I}_{on}(q,t)}\right)^2 (\Delta \bar{I}on(q,t))^2 + \left(\frac{\partial S}{\partial \bar{I}_{off}(q)}\right)^2 (\Delta \bar{I}off(q))^2$$

$$\frac{\partial S}{\partial \bar{I}_{on}(q,t)} = \frac{100}{\bar{I}_{off}(q)} \ , \ \frac{\partial S}{\partial \bar{I}_{off}(q)} = -100 \times \frac{\bar{I}_{on}(q,t)}{\bar{I}^2_{off}(q)}$$

$$(\Delta S)^2 = \left(\frac{100}{\bar{I}_{off}(q)}\right)^2 \times \left[(\Delta \bar{I}on(q,t))^2 + \left(\frac{\bar{I}_{on}(q,t)}{\bar{I}_{off}(q)}\right)^2 (\Delta \bar{I}off(q))^2\right]$$