Results and Gains from the testing phase of SNR based QSO at CFHT

Daniel Devost, devost@cfht.hawaii.edu
Claire Moutou, moutou@cfht.hawaii.edu
Billy Mahoney, mahoney@cfht.hawaii.edu

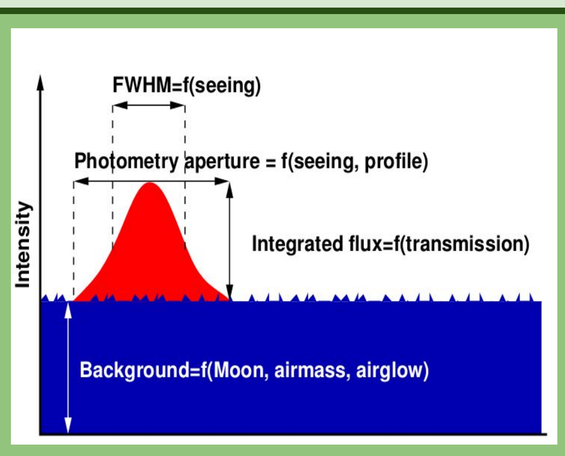
SNR based observing

Over the last few years, the capability of doing SNR based observations was implementedn and tested into the QSO system at CFHT. The principle is simple, we observe programs until a predetermined SNR based on the scientific requirements of the proposal. This observing technique capitalizes on the exquisite seeing on Maunakea. The testing phase will end with semester 2016B and QSO-SNR will become the default mode for MegaCam and ESPaDOnS starting in 2017A. I present here some of the results obtained during implementation and testing.

Models are needed to determine the depth (SNR, Magnitude) needed **per exposure** for the science program. Depending on the instrument used, a different model is needed.

For Megacam, we are using the IQ and background measured on the image to estimate the SNR.

On ESPaDOnS, we are using an exposure meter.



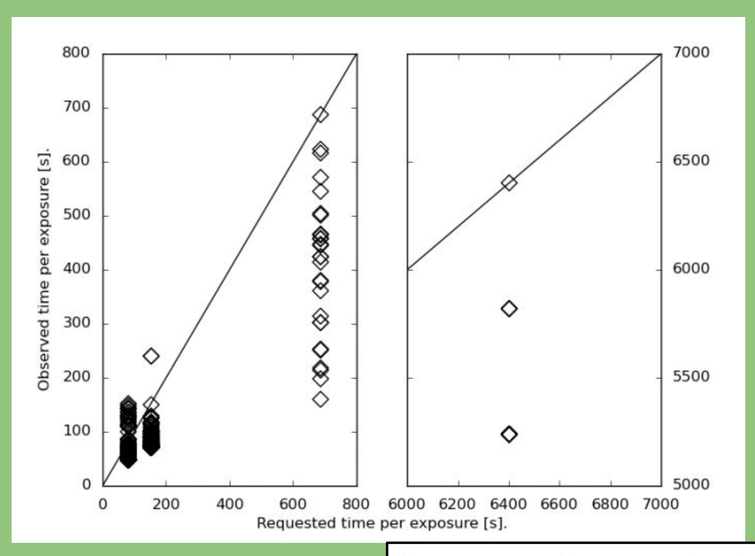
Model for MegaCam: A model based on PSF photometry is used by PIs to estimate depth and SNR before their observations take place.

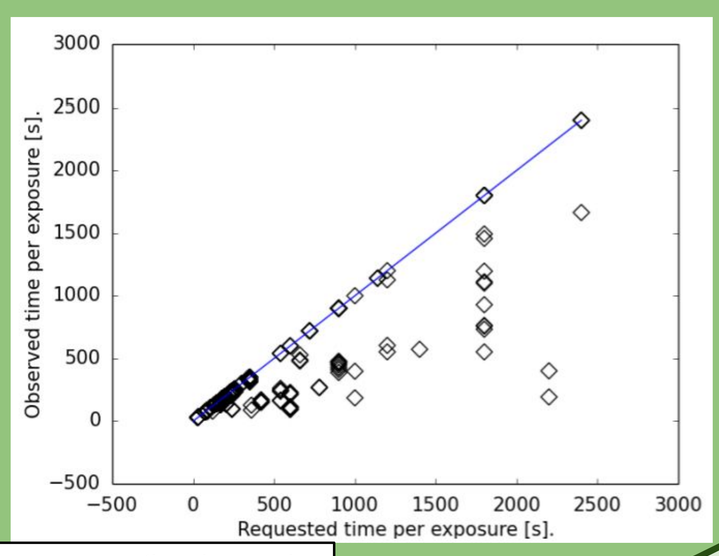
During observing, these values will be compared with the values obtained on each image and the exposure time of the subsequent exposure adjusted.

Results

- MegaCam: Overall, targetted SNRs were reached **27% faster**
- ESPaDOnS: On average, the target SNR was reached **20% faster**. On good nights, **some observations were done in less than half the time**.

The testing phase showed that significant gains can be made using SNR based observations allowing the observation of several hours of additional programs during one night without compromising the scientific value of the data.





Comparison of the requested time per exposure vs the observed exposure time for MegaCam programs (left) and ESPaDOnS programs (right). The straight line on both graphs is a unit slope line. Significant savings in exposure times be seen.

Model for ESPaDOnS: The spectrograph is equipped with an exposure meter that counts part of the photons recieved by the source. This is represented by the red curve.
The counts from the exposure meter are calibrated to the SNR of the exposure. as more counts come in, the SNR raises. This is represented by the blue curve.
The green line is the targetted SNR.