FAQ

Ask a question, get an answer! This will eventually be a repository for posting outstanding IGRINS issues and questions, and getting answers.

Send all questions to kfkaplan@astro.as.utexas.edu

Q: How do I observe stars or point source objects?

A: IGRINS is optimized for observing stars, and they are the simplest types of objects to observe. Stars are placed in either position A or position B along the slit, and dithered between these two positions between exposures. Typically we take exposures in a sequence called a "quad" where you start at position A, take one exposure, move to position B, take two exposures, and then back to position A for one final exposure, resulting in an ABBA quad. The B positions are subtracted from the A positions such that B acts as the sky, bias, and dark subtraction for A and vice-versa. This way all exposures get signal from your science target. The data reduction pipeline then fits the combined of A-B frames to optimally extract the signal for your science target.

Q: How do I observe extended source objects?

A: Similar to point sources (see question above), but you must dither your object ON and OFF the slit. A quad would look like ON-OFF-OFF-ON, similar to an ABBA quad but with ~1/2 times the S/B since you are not getting signal during OFF exposures. The pipeline will subtract the OFF frames from the ON frames to subtract the sky, dark, and bias.

Q: I have a star or object of magnitude X and want to get a S/N of XX. How do I calculate my exposure times?

A: You can look at this chart and equation here for A0 type stars. It is also a good first order estimate for stars of any typical spectral type. You can also calculate your own S/N estimates with the Exposure Time Calculator (ETC) which can be downloaded here. Note that Park et al. (2014; SPIE Proceedings) found that the S/N estimates from the ETC should be multiplied from the ETC by 0.83. For ABBA quads, set your number of exposures to 4. For ON-OFF-OFF-ON quads, set the number of exposures to 2.

Q: What S/N and exposure times should I get for an A0 star telluric standard?

The simple answer is you want your telluric standard to have a higher S/N than your science target. Why? When you divide your science target spectrum by the telluric standard, the object with the lowest S/N will dominate the final S/N after applying your telluric correction. The telluric corrected S/N $(S/N)_{corr}$ can be calculated from the following equation (see this website for detailed derivation):

$$(S/N)_{corr} = [(S/N)_{sci}^{-2} + (S/N)_{std}^{-2}]^{-1/2}$$

where $(S/N)_{sci}$ is the S/N for your science target and $(S/N)_{std}$ is the S/N for your A0 telluric standard. It is clear that the smallest S/N will dominate the sum of $(S/N)_{sci}^{-2} + (S/N)_{std}^{-2}$, thus would dominate $(S/N)_{corr}$. Go to this page to estimate A0 star S/N or use the ETC.

Q: What is the overhead time while observing?

Based on experience, allow the following amount of time for each science target:

- ~5-10 minutes to acquire a new target with telescope, make sure your pointing is good, and begin properly guiding. It is usually a good idea to have a finder chart ready ahead of time to speed this process up, especially for dimmer targets (see Kyle's IGRINS Observability program).
- ~1 minute between each exposure for readout, and dithering between AB or ON-OFF positions. Allow an extra 1-2 minutes when dithering between ON-OFF to reacquire guiding (~5 minutes per quad).
- ~20 minutes for an A0 telluric standard (depending on the star's magnitude, see this page for estimating S/N for telluric stds.)

Your typical observing time for each science target will be (Exp. Time)*(# of exp.) + 30 minutes.

You can sometimes cut down on overhead by sharing the same A0 telluric standard star between multiple science targets if they are near each other in the sky. Brighter targets are easier to find and guide on, so usually wll require lower overhead than dim targets.