NIRSPEC

NIRSPEC Electronics Design Note 7.00 Motor Noise

The object of the experiment was to determine if having a motor running while reading out the CCD would introduce noise and if so how much. This was done by reading out the long wavelength channel CCD while moving the short wavelength filter wheel. The results did not appear to depend on integration time. Motor speed used was that typical for Gemini, several thousand steps per second, to avoid problems with resonances.

The noise was measured by taking sets of two frames, subtracting them, and noting the standard deviation of counts. The noise measurements taken with a moving motor could then be compared to that without. Thirteen sets were taken with an integration time of five seconds each. In addition a non-moving frame was subtracted from moving frame to see if there was any structure to the noise introduced. None could be detected.

Not moving:	N = 4.33 DN = 108.25 e SD = 0.13 DN = 3.25 e	(for 25 e/DN)		
Moving:	N = 4.47 DN = 111.75 e SD = 0.18 DN = 4.5 e			
% increase = 3.2%				

The tests were repeated after installation of the isolator chip. In addition, frames were taken while the motor was powered but not moving. Motor speed was 1000 steps/sec. Integration time was five seconds and five sets of exposures were taken in each case.

Not moving	: N = 3.73 DN = 93.25 e SD = 0.06 DN = 1.5 e	(for 25 e/DN)
Moving:	N = 3.97 DN = 99.25 e SD = 0.08 DN = 2.0 e	
Powered:	N = 3.83 DN = 95.75 e SD = 0.03 DN = 0.79 e	

% increase when moving = 6.4%

% increase when powered = 2.7%

It*s clear that both moving a motor and applying power to a motor introduces noise. However moving the motor adds more noise.