Pixels, slits and facets for a MEMS-type spectrograph for NGST

Appendix: Extension to different PSF and detector properties

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Appendix: Update for different PSF and detector properties

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Part of the analysis presented in ISR 2002-01 has been repeated considering different detector and PSF properties. In particular:

❏ Instead of a detector characterized by 0.02 e⁻/pix/s, we now consider 0.1 e⁻/pix/s. This corresponds to a detector having a behavior required for long exposures (i.e. dark current 0.05 e⁻/pix/sec, readout noise 7 e⁻/pix (rms), individual frames of 1000 sec).

❏ Instead of a PSF defined by a surface having low frequency errors of 0.144 μm (mid-frequencies as Hubble), a value of 0.073 μm was used (see Bely et al, 2001). This PSF meets the two requirements established by Bely et al. for the OTA optical quality.

The figure represents the results already presented in Figures 1 and 2 (red lines - upper), together with the results for the new values (blue lines - lower). It is seen that the effects are relatively minor. For R = 100 the optimum pixel scale is about 0.1 arcsec/pix, while for R = 1000 it is somewhat larger. Therefore, the main conclusions of the analysis remain unchanged.

Reference

Bely, P. et al. 2001, NGST-Monograph No. 7
   http://www.ngst.nasa.gov/public/unconfigured/doc_0791/rev_04/ monograph7_v10.pdf

6.5m, λ= 2 μ
Single object observations
Slit width = 2 x pixels

Detector: 0.02 e/s
PSF (rms ~ 0.144 μ)
Detector: 0.10 e/s
PSF (rms ~ 0.073 μ)