Dick Gattinger September 11, 1996

The GOZINTA Star Class

$m_V = 4 \approx 15$ photons / cm^2 · sec · Å

Assume a 3" aperture system (7 cm × 7 cm ≈ 49 cm^2)

Differential spectrum input rate ≈ 15 × 50 = 750 ph / sec · Å

(Exposure time cannot be much longer than 1 sec due to star setting rate)

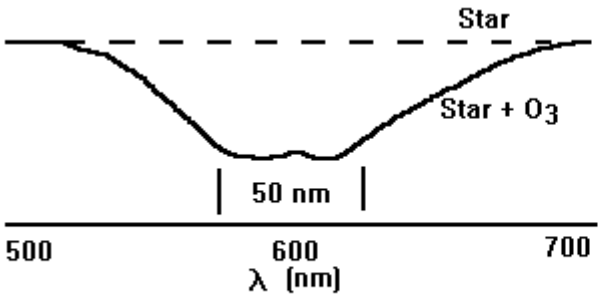

Figure 1: Chappuis bands

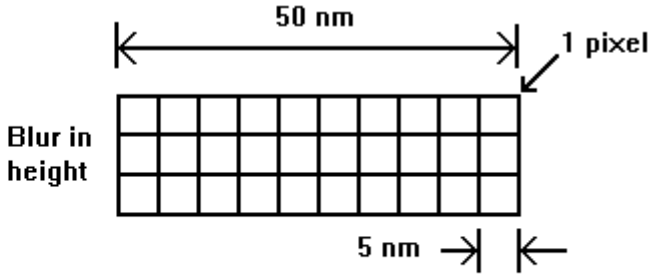

Figure 2: CCD Image

Figure 1 - estimates ≈ 50 nm region to do Chappuis measurement

Figure 2 - Assume 5 nm per pixel in spectral direction to get enough spectral shape info to get Chappuis shape

Assume QE = 50%, grating 50%, optics 80%, so total transmission ≈ 0.2 = τ

So detected electrons is

750 ph / sec · Å × (τ = 0.2) × 50 Å / pixel

= 7500 ph / sec · pixel

Assume readout noise ≈ 30 electrons rms (rms over 3 rows to cover star image blur)

So signal / noise = $7500 / \sqrt{(7500 + 30^2)} \approx 80$

Fitting over ≈10 pixels improves S/N by ≈$\sqrt{10}$,

so 80×3.3 (sic) ≈ 260 = S/N for $m_v = 4$

Estimate S/N for star brightness decrease of factor of 100 ($\Delta m_v = 5$, i.e. $m_v = 9$)

S/N = $75 / \sqrt{(75 + 30^2)} \approx 2.5$ (sic)

Fitting over 10 pixels give $\times \sqrt{10}$

S/N ≈ 8 for $m_v = 9$