Radial Velocity Precision of CHORUS with Different Pupil Slicing Designs (in prep.)

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Download my poster **here**.

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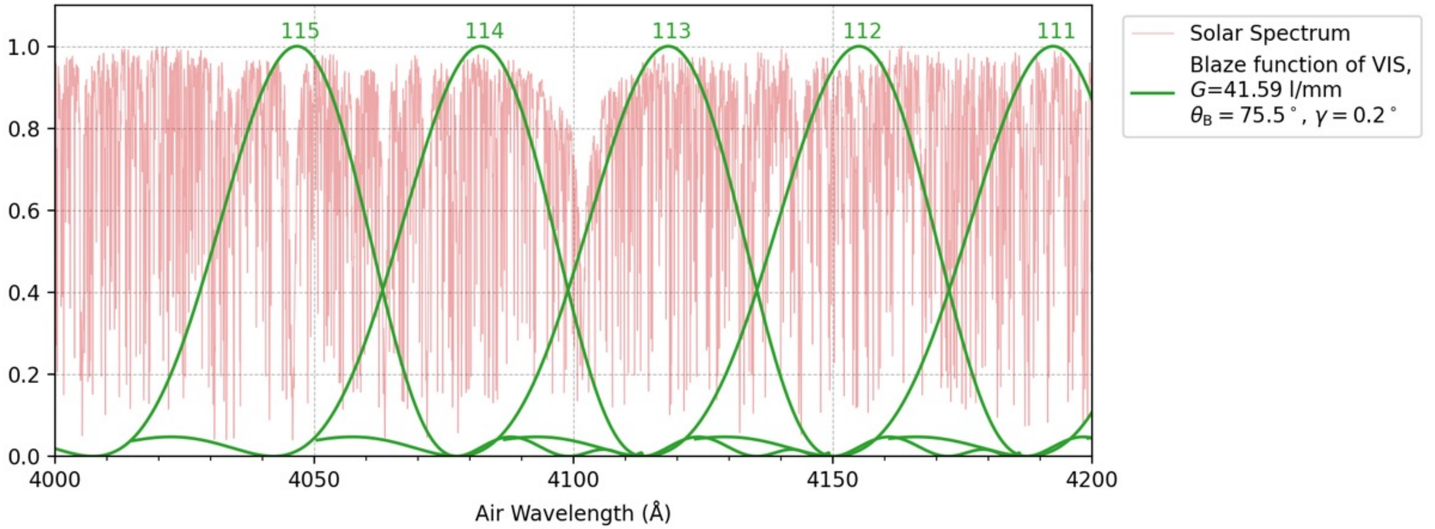
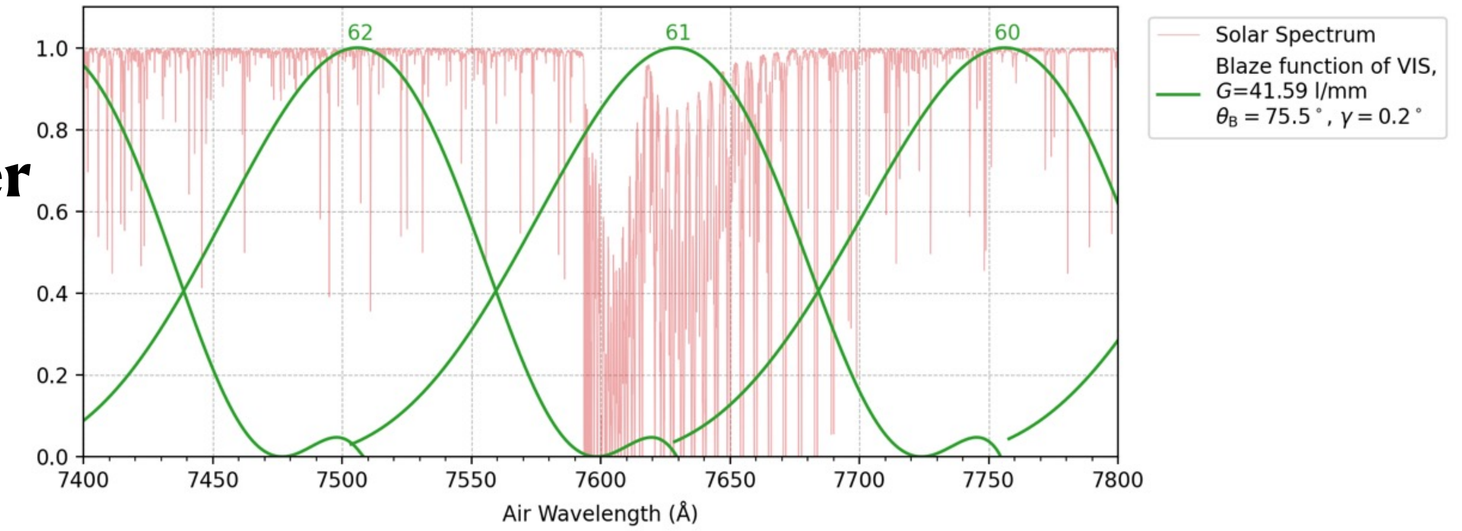
Blaze function of spectrograph

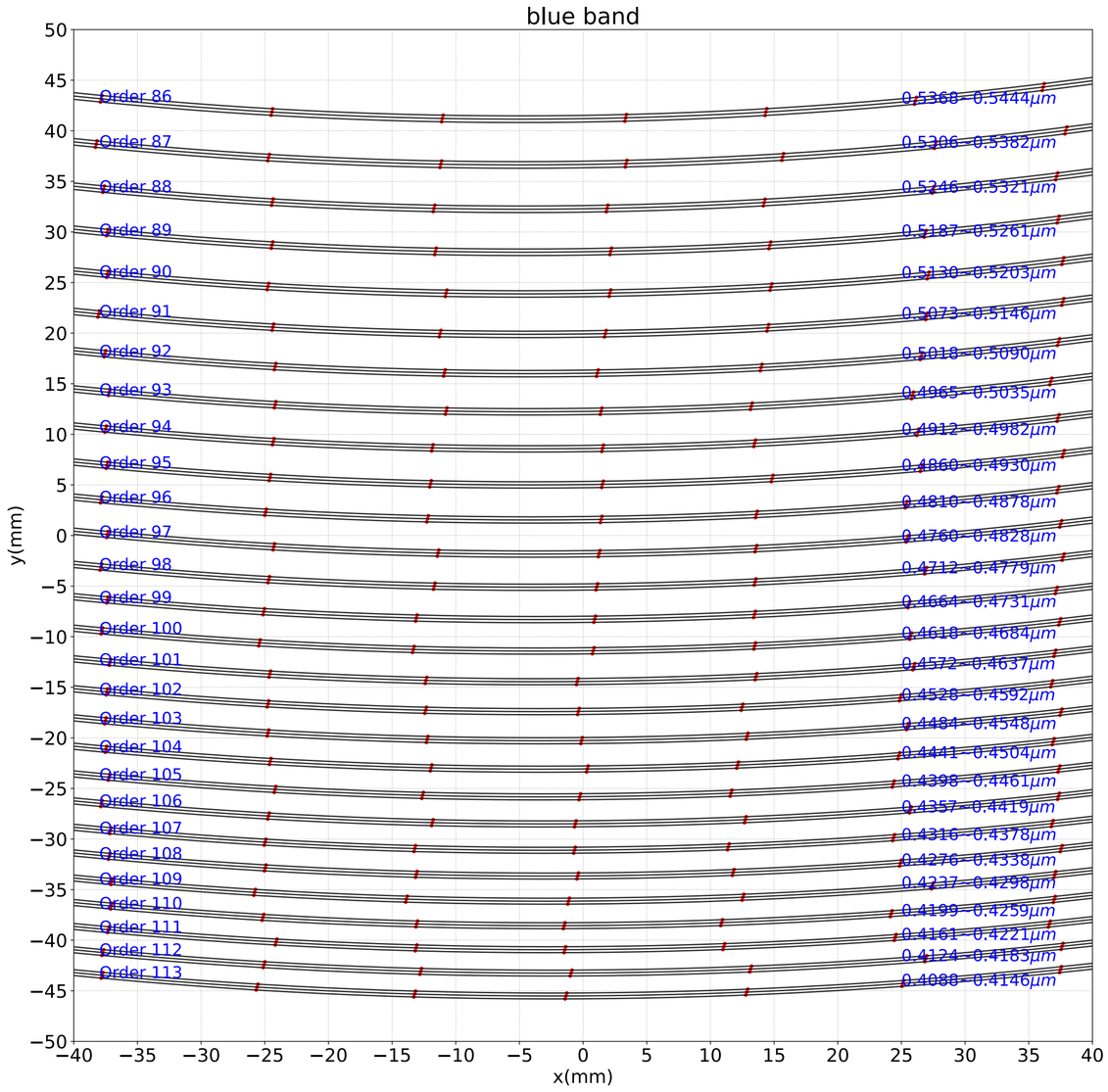


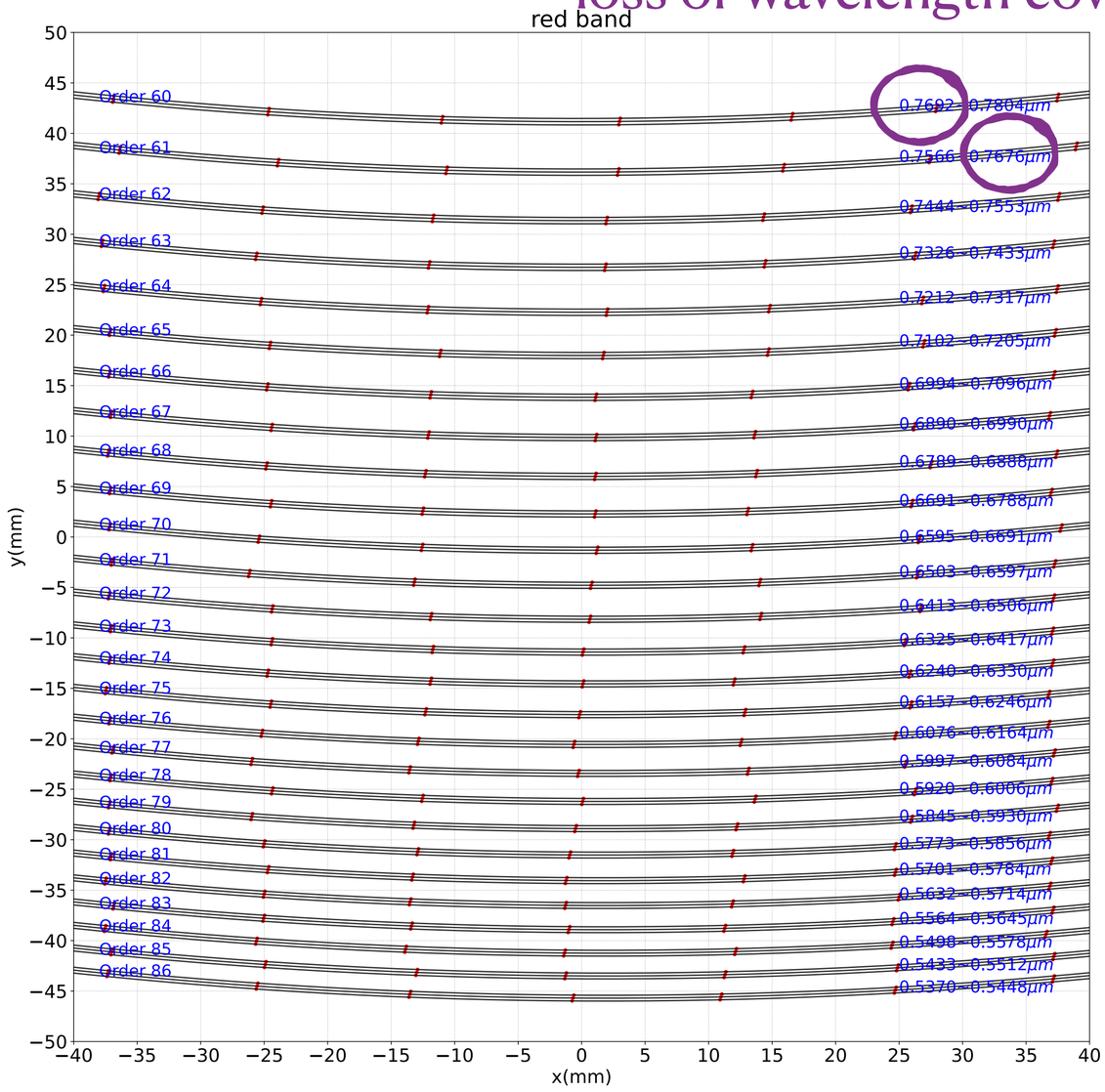


- **Wavelength coverage of each order** in the red band is larger.
- **Order** in the red band is lower.

CCD at 3-slice setting

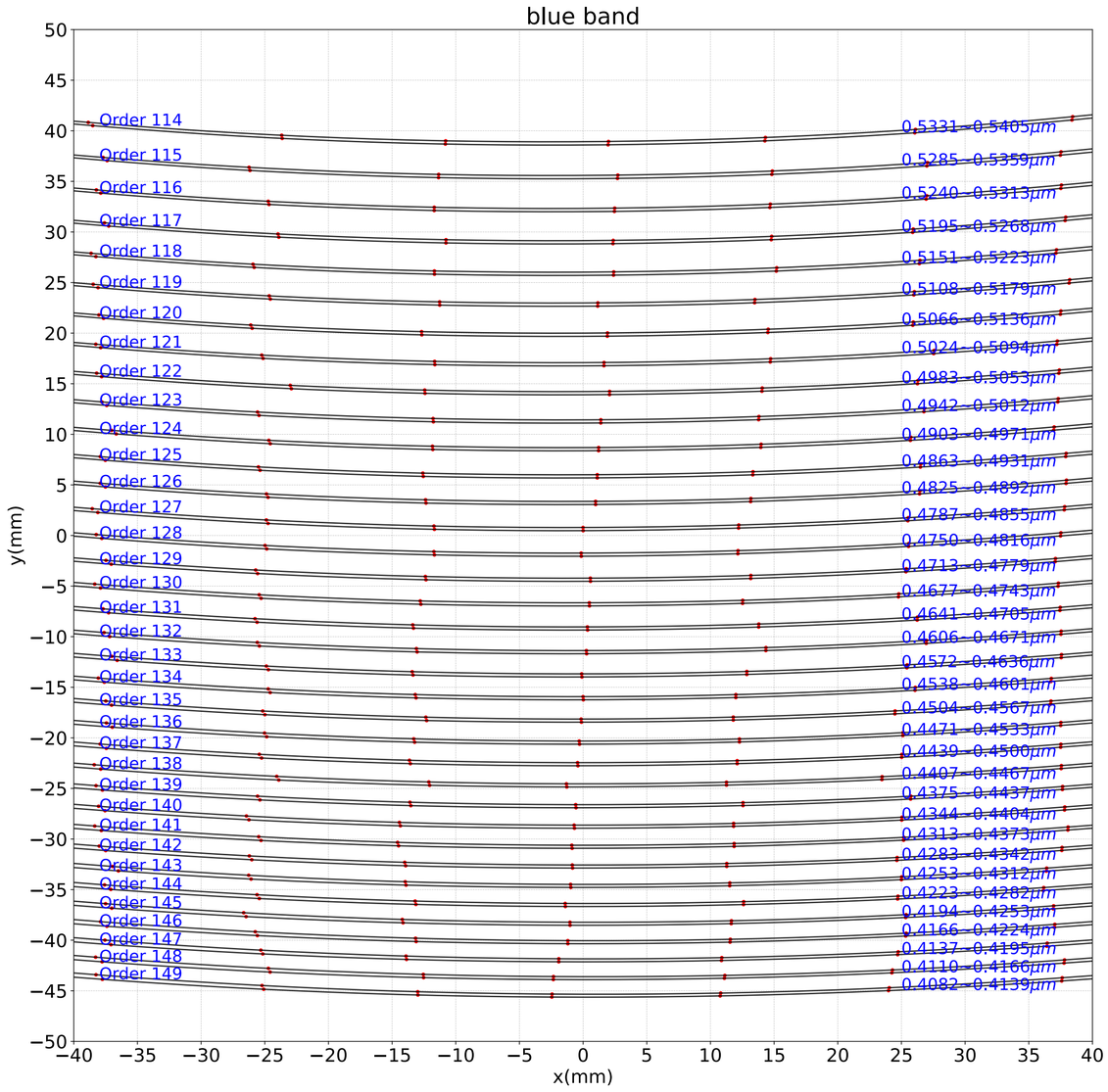
loss of wavelength coverage

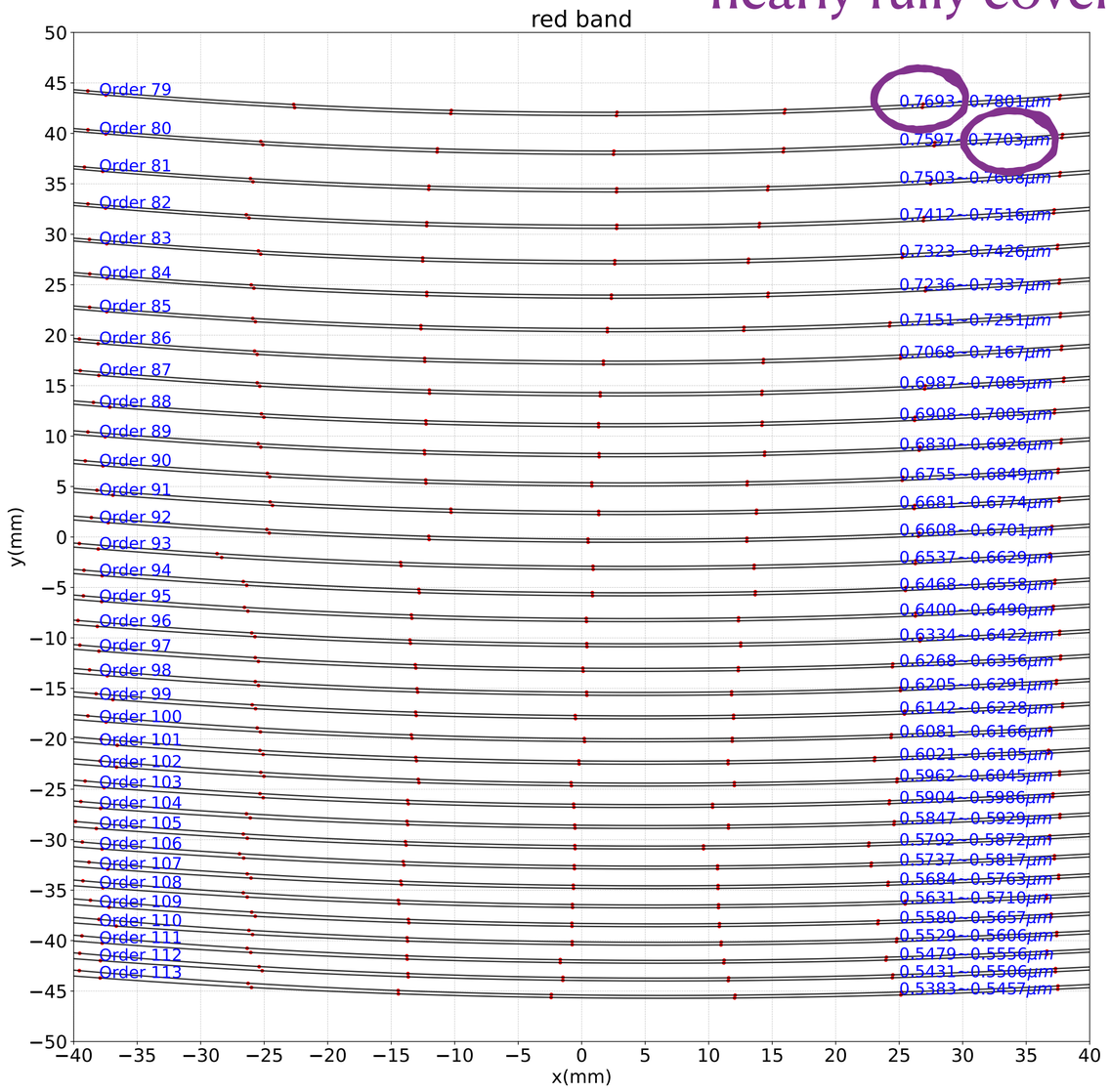




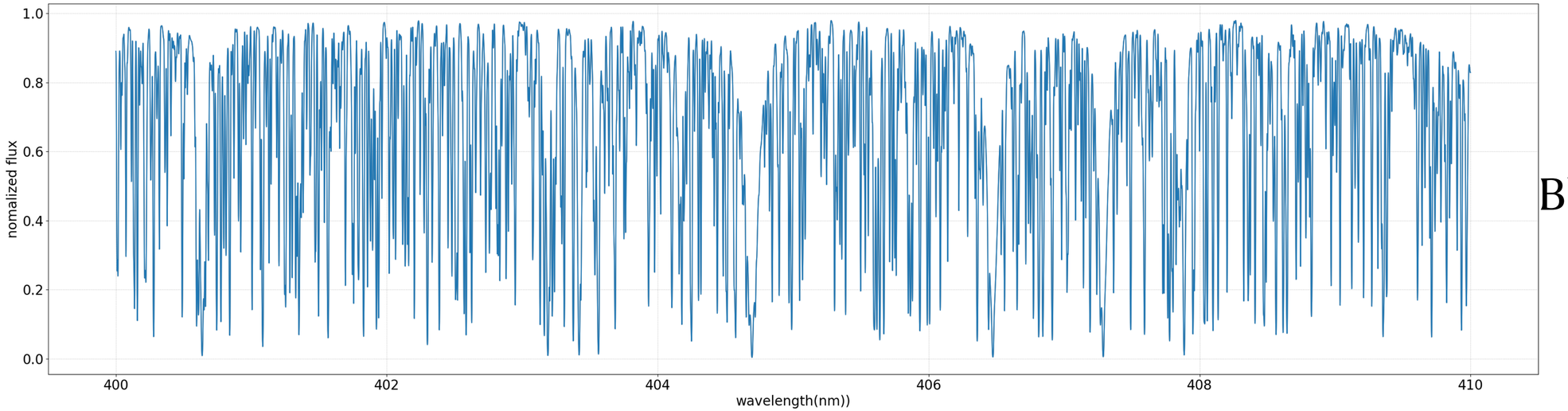
CCD at 2-slice setting

nearly fully covered

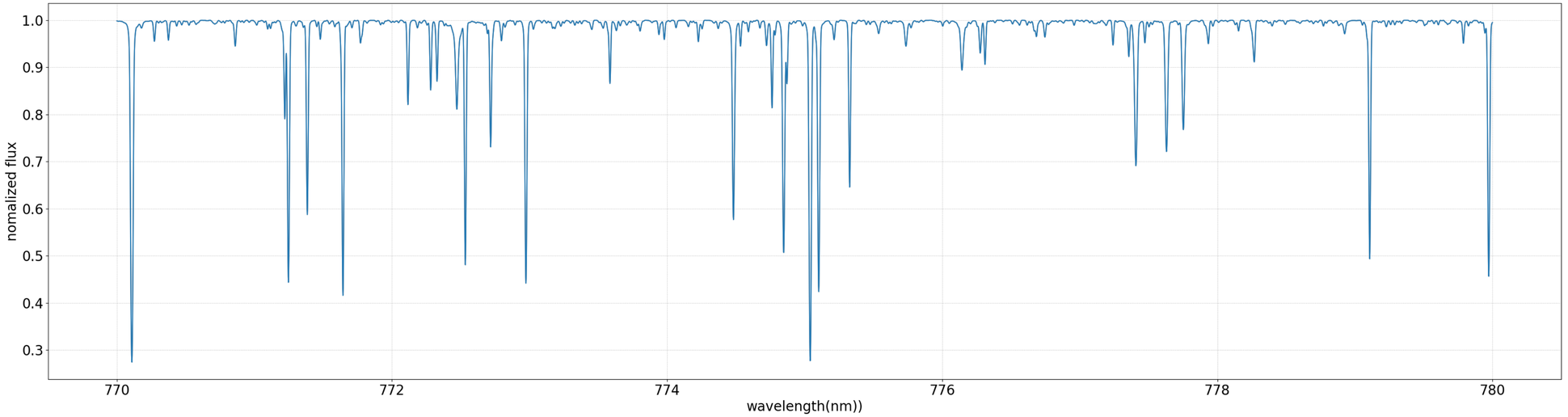




Kurucz's solar template

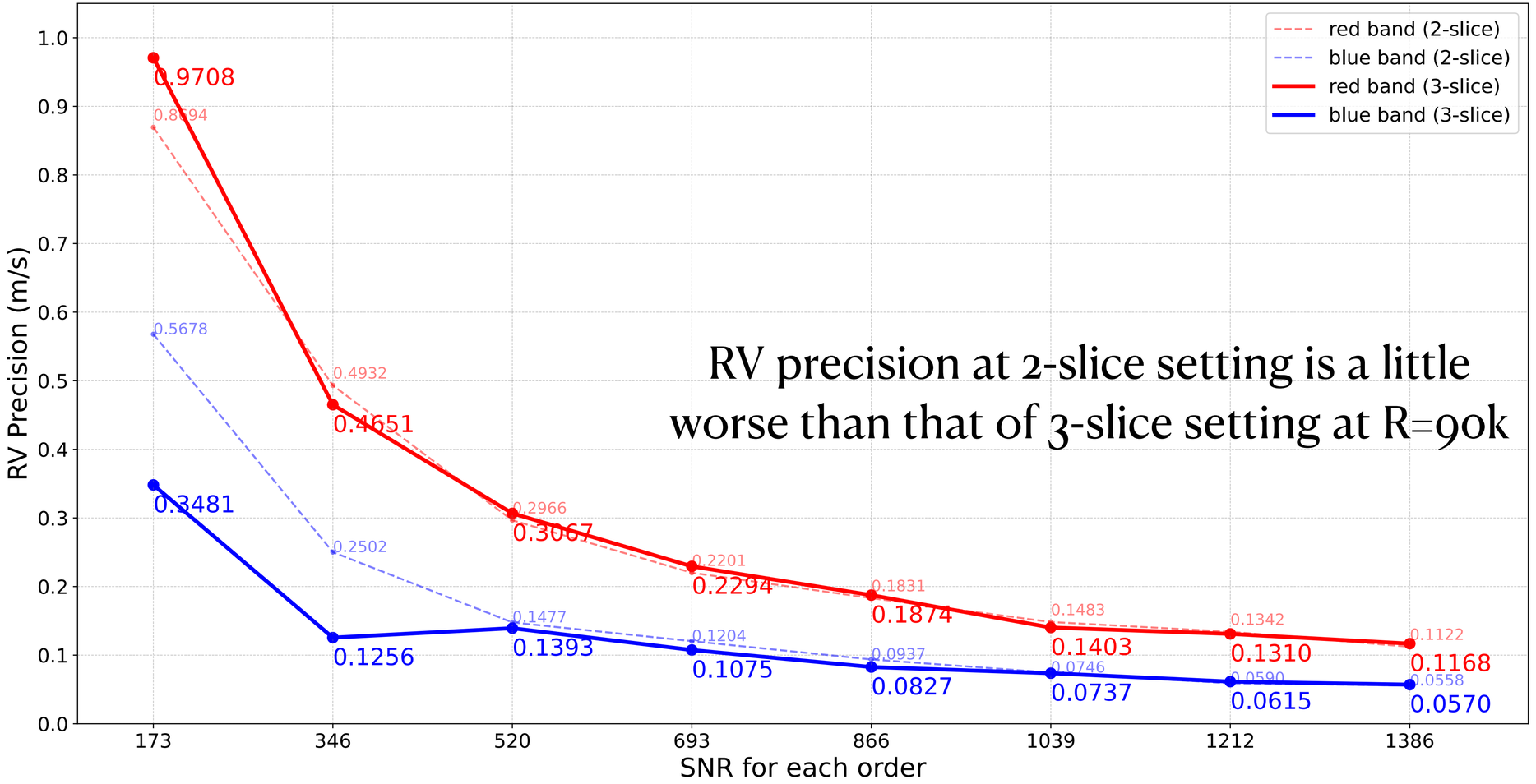


Blue band, more lines

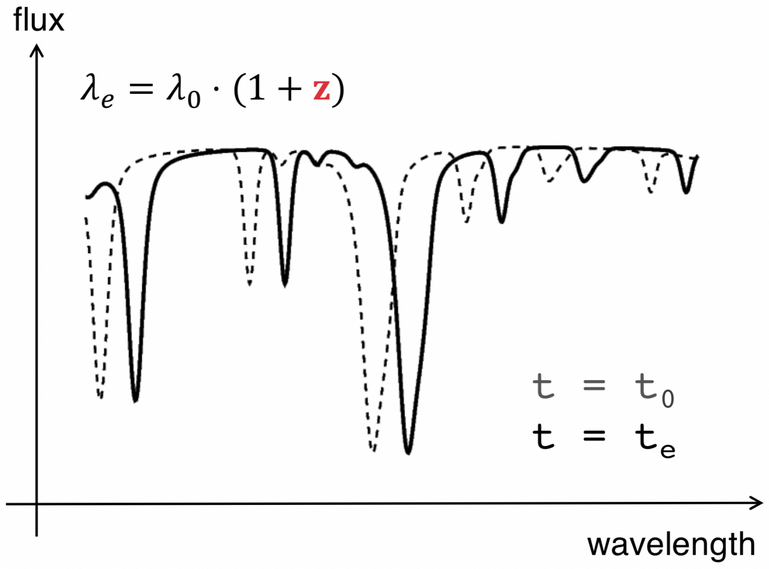


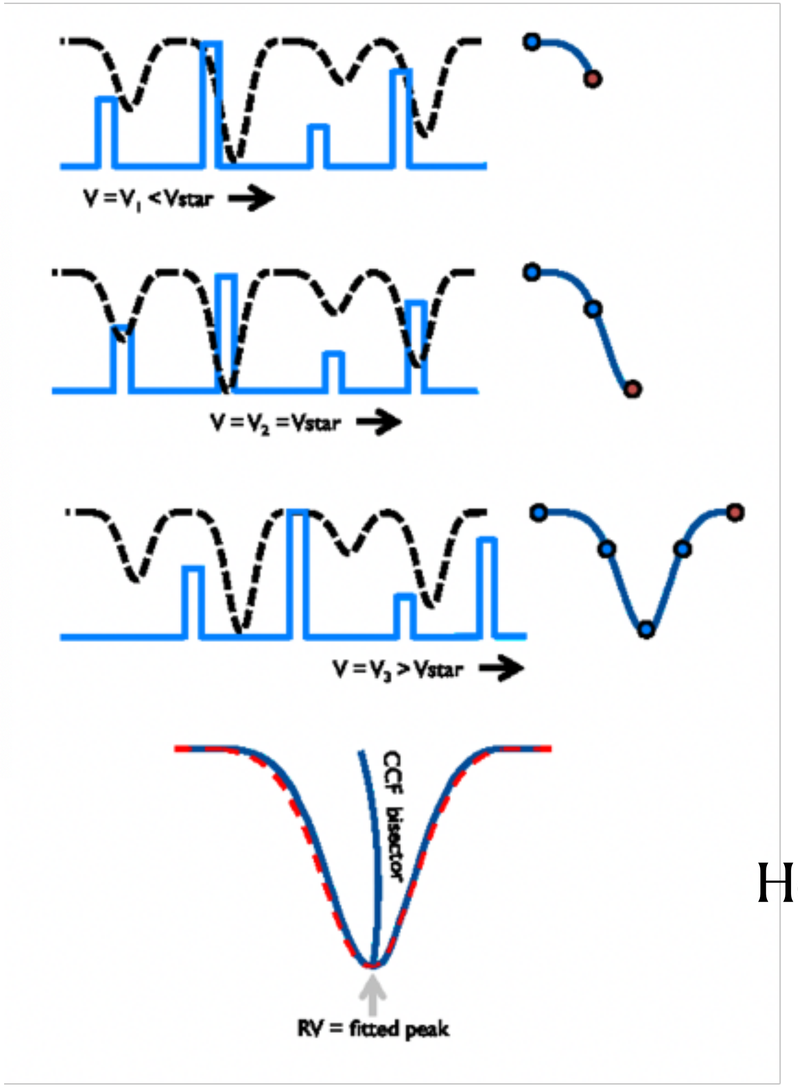
Red band

Comparison between 2- and 3-slice setting



Cross-correlation function





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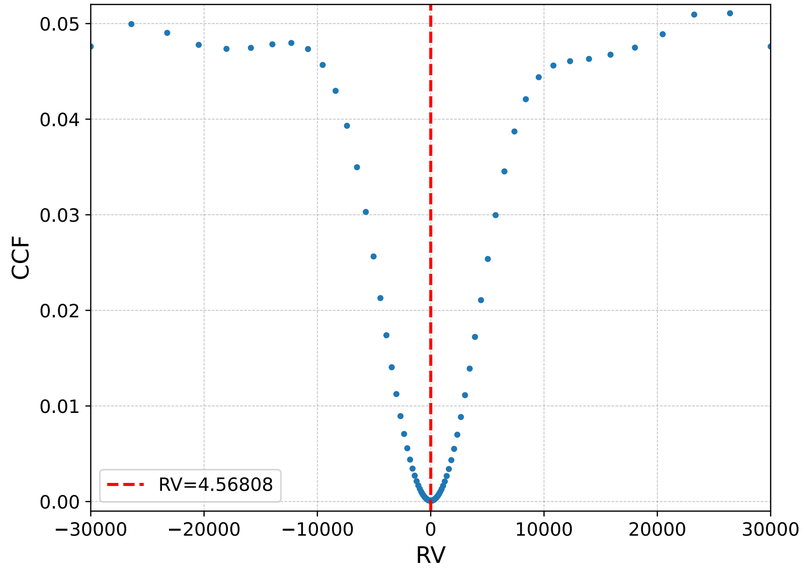
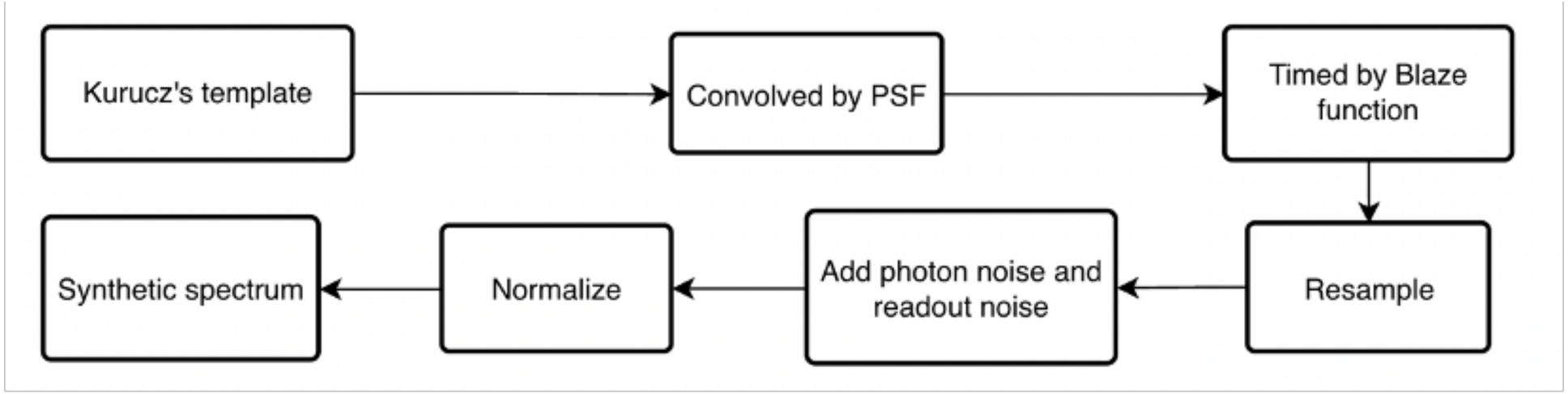
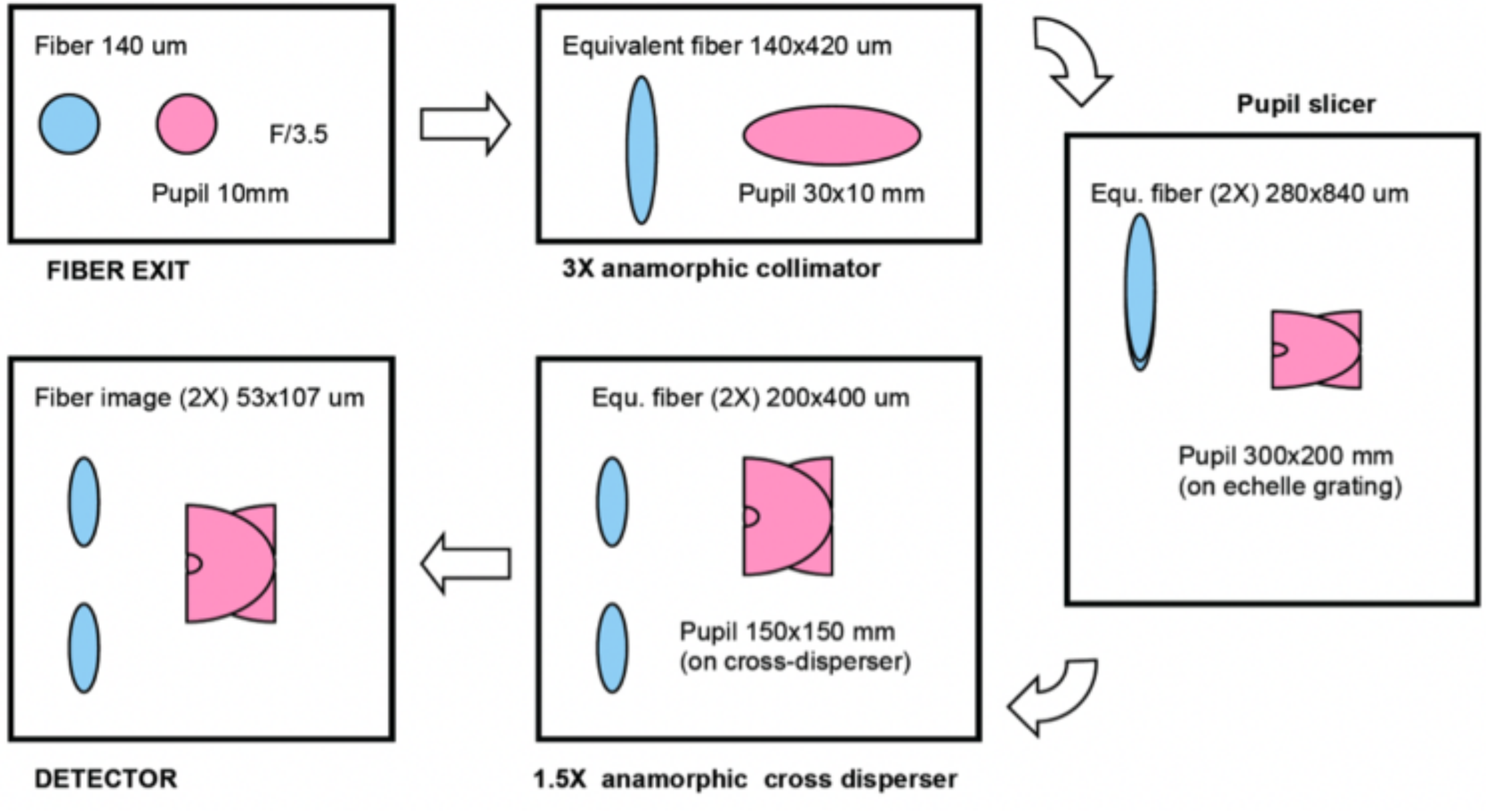


Here, RV at minimum CCF is ***4.56m/s***.

Generate spectrum



Split of optical pupil



Definitions

- Resolution: $R = \frac{\lambda}{\Delta\lambda}$
- SNR: $SNR = \frac{signal}{noise} = \frac{N}{\sigma} = \frac{N}{\sqrt{(N)}} = \sqrt{(N)}$, for Poisson distribution
- Convolution: $F(x) \times G(x) \rightarrow k(\sigma) = \int f(\sigma_1) \times g(\sigma - \sigma_1) d\sigma_1 \equiv f(\sigma) * g(\sigma)$
- PSF: $LSF = \int e^{-\frac{1}{2}(\frac{x}{\sigma})^2} dx = \int e^{-\frac{1}{2}(\frac{x}{\frac{\lambda}{\Delta\lambda R}})^2} dx$
- Poisson distribution (used when adding photon noise): $P(N) = \frac{e^{-\lambda}\lambda^N}{N!}$
- Gaussian distribution (used when adding readout noise): $f(x) = \frac{1}{\sigma\sqrt{(2\pi)}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$