

Analysis of an Iodine absorption cell for the new TIGRE adapter

TIGRE WS 2016
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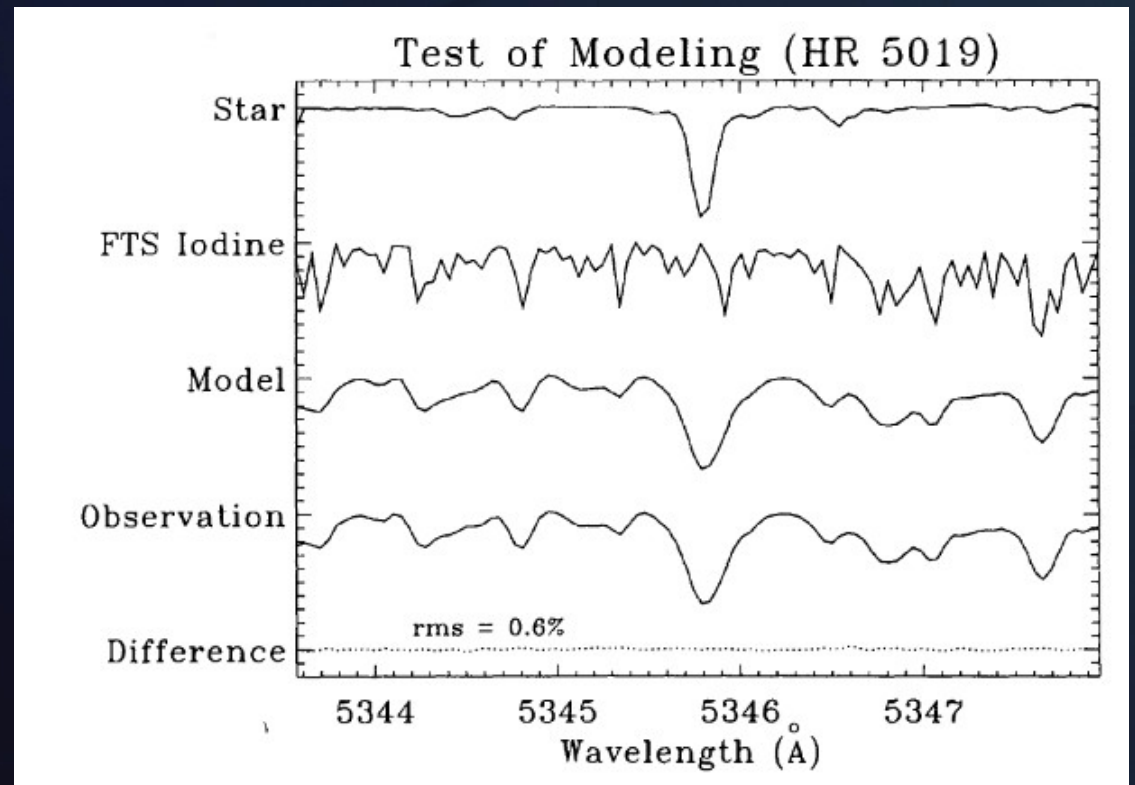
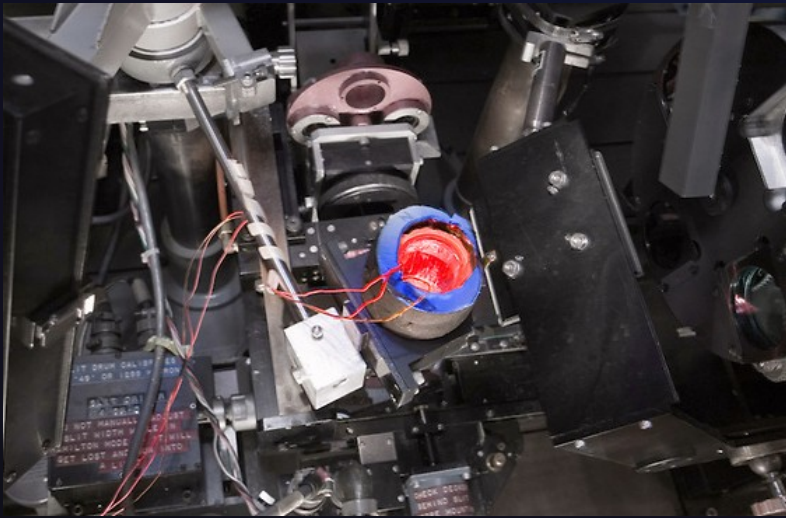


Outline

- Why use an Iodine cell?
- High-res analysis of the cell
- Determining the parameters
- Schedule for the adapter

Iodine cells for wavelength calibration

- Pioneered by Marcy&Butler (1992)



Marcy&Butler (1992)

Iodine cells for wavelength calibration

We model the spectrum (taken through the absorption cell), $I_{\text{obs}}(\lambda)$, as

$$I_{\text{obs}}(\lambda) = k[I_s(\lambda + \Delta\lambda_s)T_{\text{I}_2}(\lambda + \Delta\lambda_{\text{I}_2})] \otimes \text{PSF}. \quad (1)$$

Here, $\Delta\lambda_s$ and $\Delta\lambda_{\text{I}_2}$ are the shifts of the star spectrum and iodine transmission function, respectively, and the symbol \otimes represents convolution. The constant k is proportional to the exposure level of the observation. In operation, $\Delta\lambda_s$, $\Delta\lambda_{\text{I}_2}$, and k are determined by least-squares fitting to the observed, composite spectrum, I_{obs} .

The final, corrected Doppler shift, $\Delta\lambda$, is simply given by

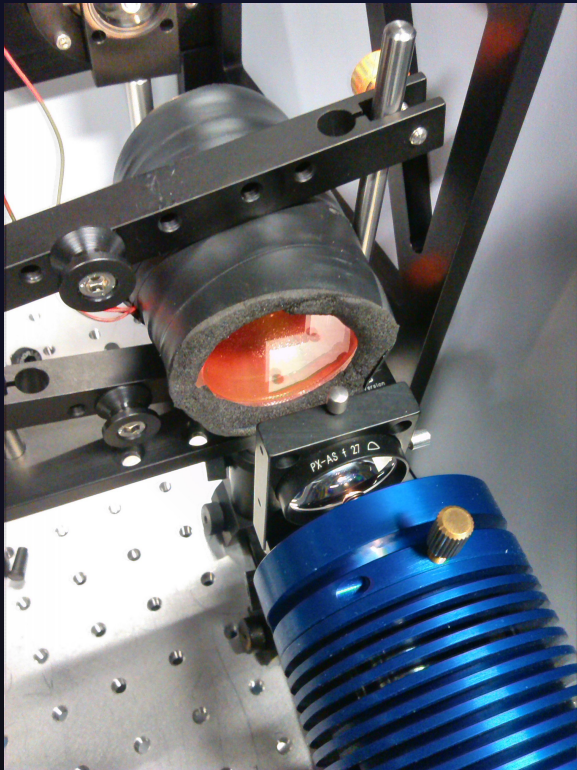
$$\Delta\lambda = \Delta\lambda_s - \Delta\lambda_{\text{I}_2}, \quad (2)$$

which is converted to a velocity by the Doppler formula:

$$\lambda = \lambda_0 \frac{(1 + \beta \cos \theta)(1 + \rho_g)}{n(1 - \beta^2)^{1/2}}. \quad (3)$$

Marcy&Butler (1992)

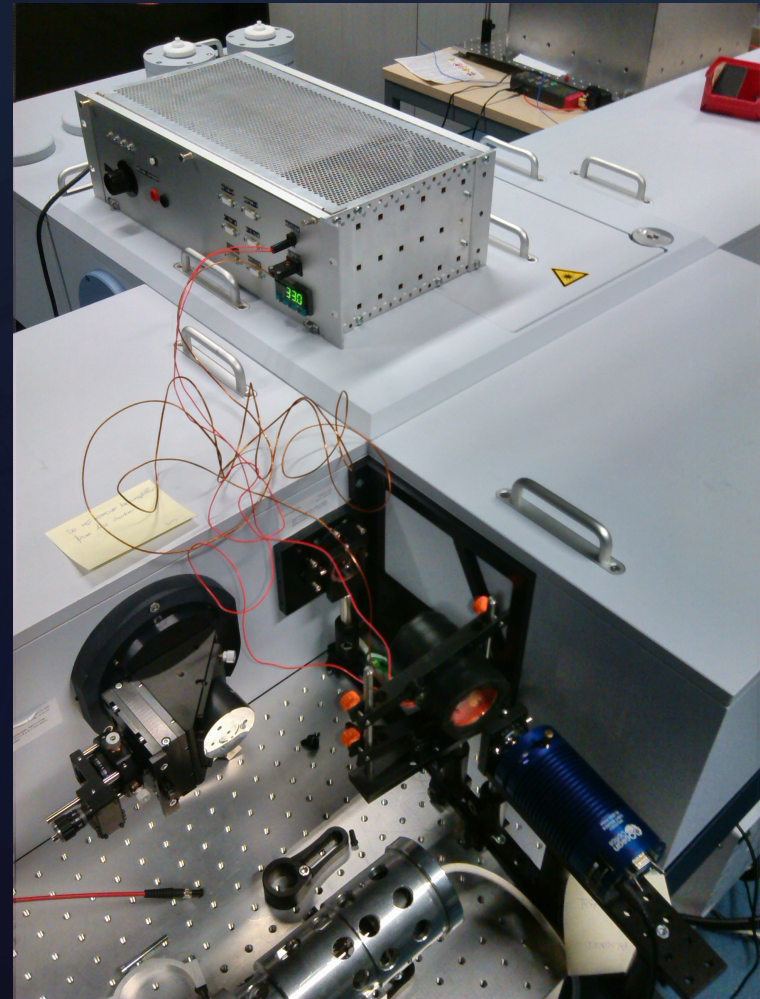
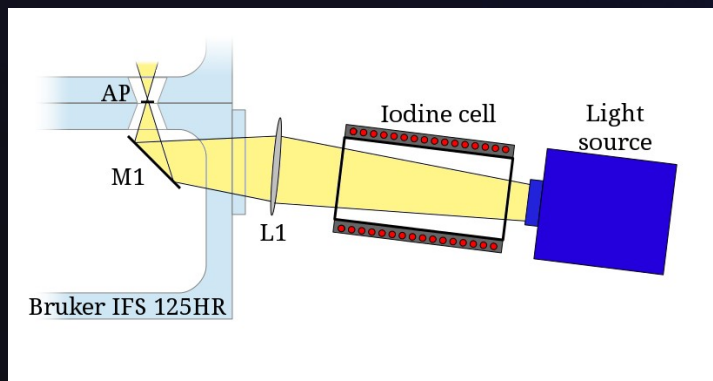
Our Iodine cell



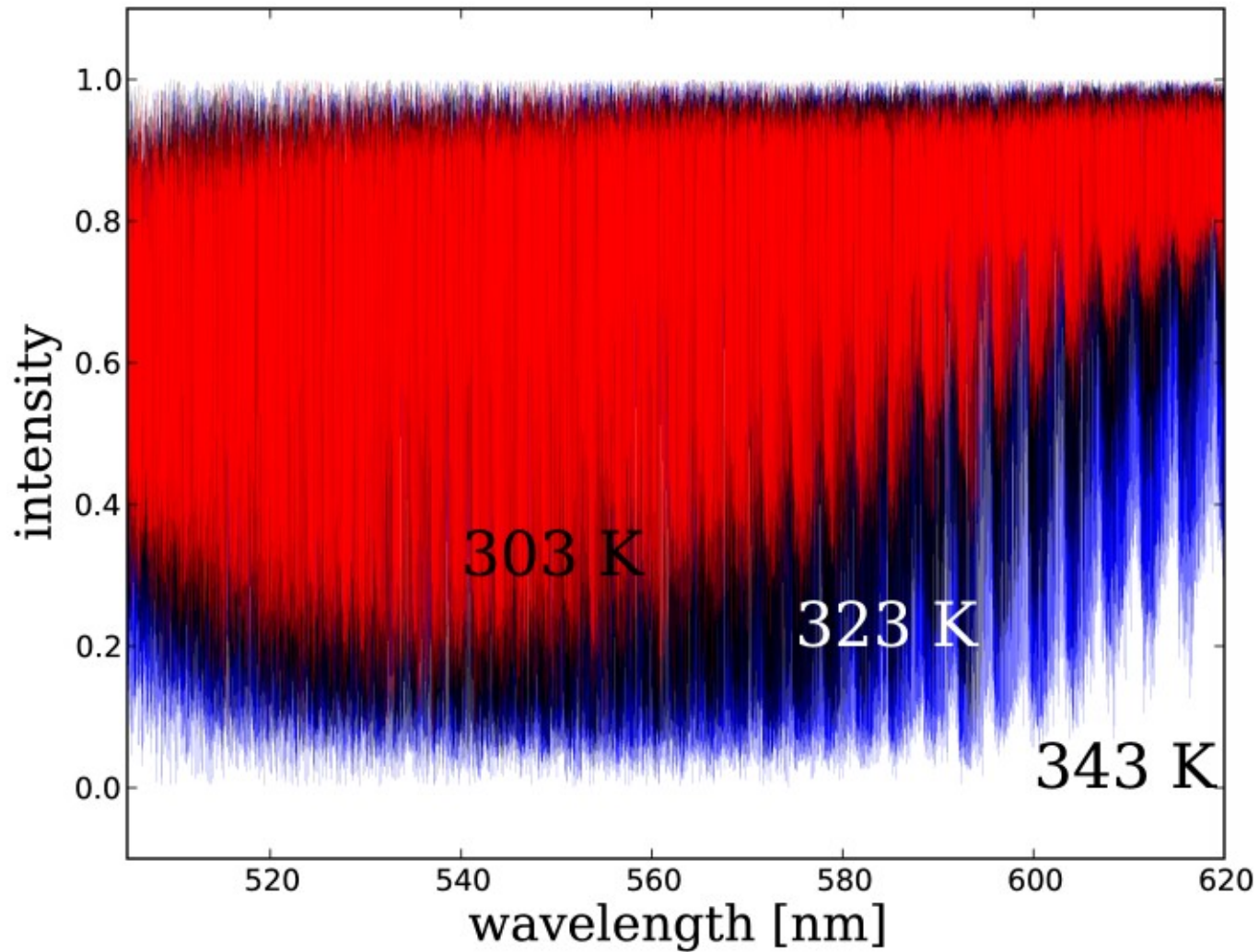
- Manufactured by A. Hartzes (Tautenburg)
- 6cm diameter
- Heating foil
- Rel. large iodine content

High-resolution measurements

- Collaboration with A. Reiners' group (Göttingen)
- Bruker IFS 125HR
- Fourier Transform spectrometer
- Up to $R=2000000$



The spectra



Adapter: Schedule

- 2/17: final design
- 2-4/17: manufacturing of parts
- Assembly and programming until 6/17
- Transport and assembly in GTO: Autumn 17