Alpy 600 + RC14 Test

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Abstract

First light testing of the Shelyak Alpy 600 since attaching it to the main telescope (RC14) via an optical manifold using 3 bright target stars.

1 Target details

Three random targets were chosen high in the eastern sky:

Target	Spectral type	Magnitude (V)	Exposure	Max ADU
HD207971	B8IV-V	3.01	10 x 2s	25,000
HD214952	M4.5III	2.11	20 x 0.8s	20,000
HD216956	A4V	1.16	20 x 0.8s	>65,000

HD215956 exhibited saturation after calibration despite the sub-1s exposure. The other targets exhibited excellent SNR and are unsaturated using 1 second exposures.

2 Processing

Targets were processed using ISIS, with a pre-determined spectral dispersion based on the Alpy's calibration unit. Instrument response curves were generated using the Miles standards from the database contained in ISIS:

- HD172958 (Type B8V)
- HD123657 (Type M4.5III)
- HD189849 (Type A4III)

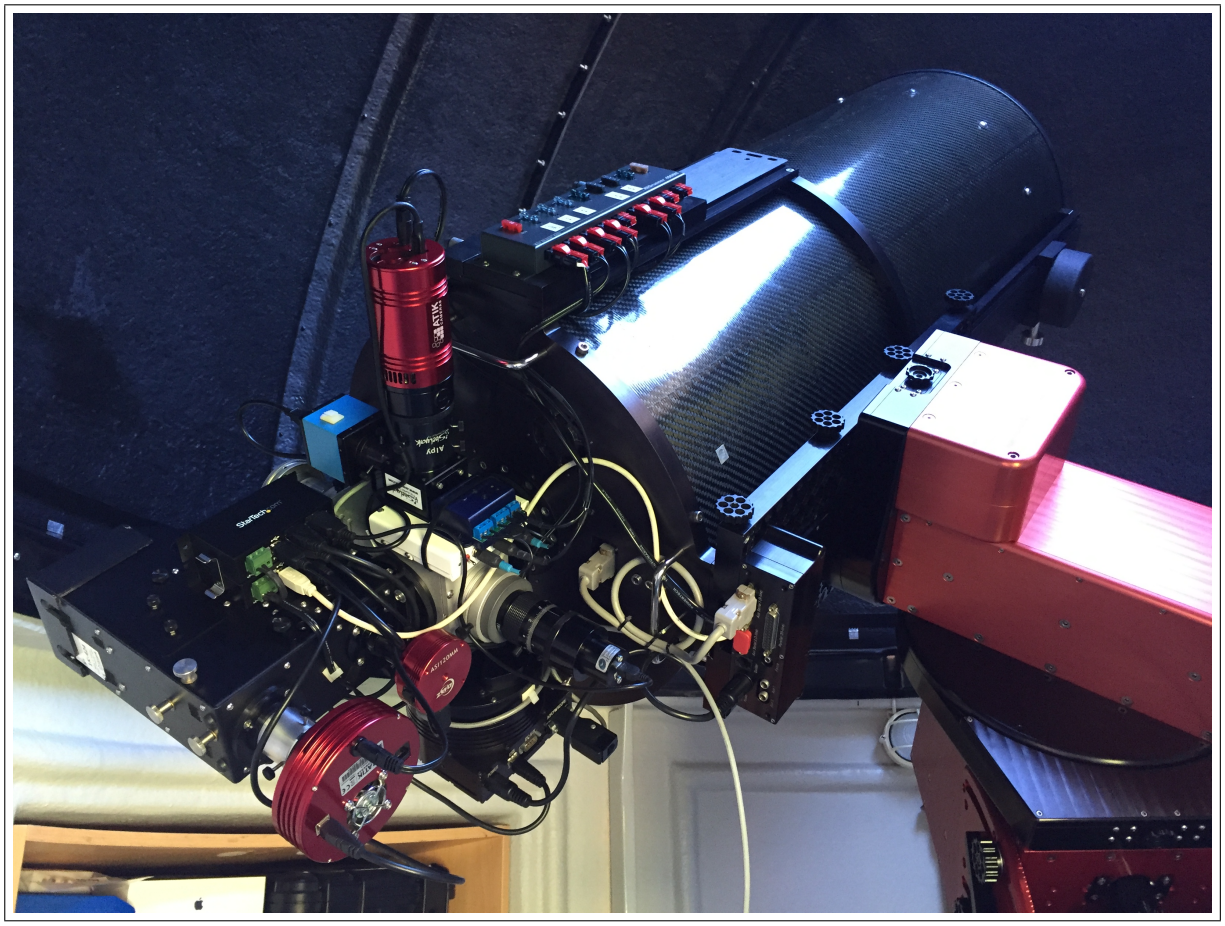

Figure 1: The RC14C telescope's optical manifold which allows manual selection of instruments. The Alpy 600 is located at the 3 o'clock position and includes a calibration unit and a video feed for target positioning on the slit. The image train also includes a Lhires III spectrograph (rear most instrument) and a photometric CCD camera (barely visible at the 9 o'clock position).

3 Results

3.1 HD207971

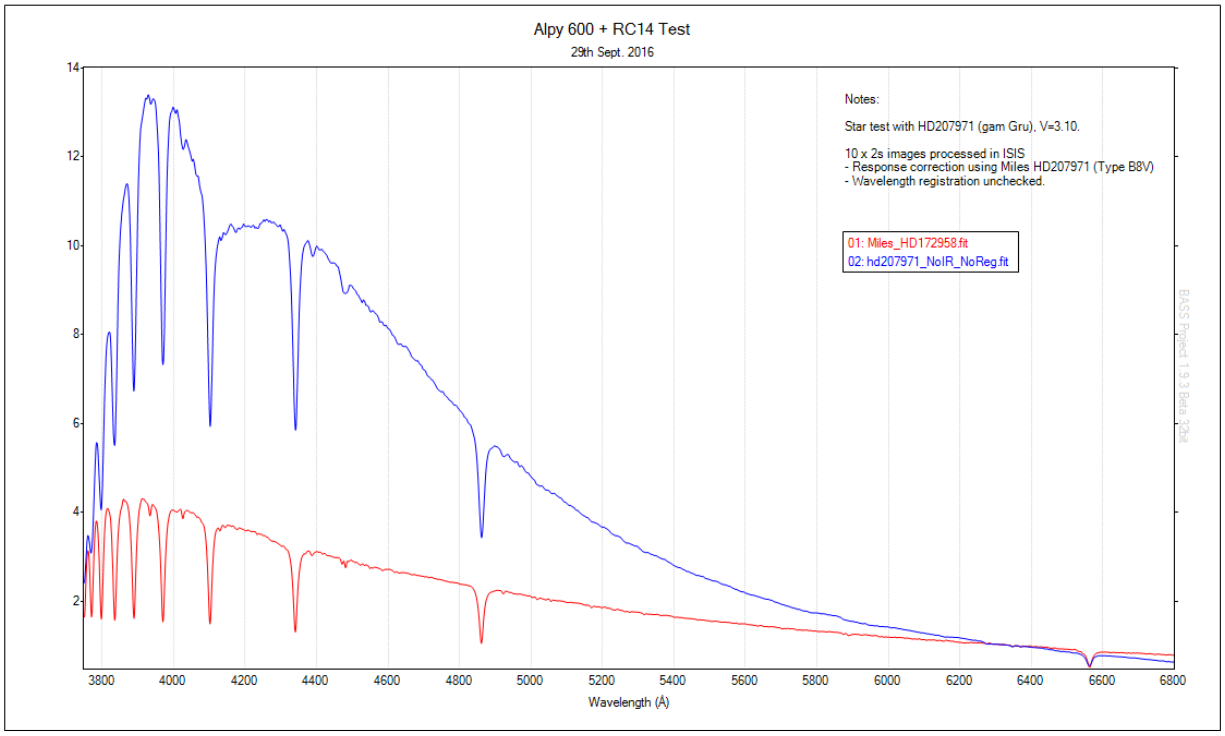

Figure 2: The wavelength calibrated spectrum of HD207971 **without** instrument response correction applied compared to a Miles B8V standard (both spectra have been scaled to unity at 6355Å).

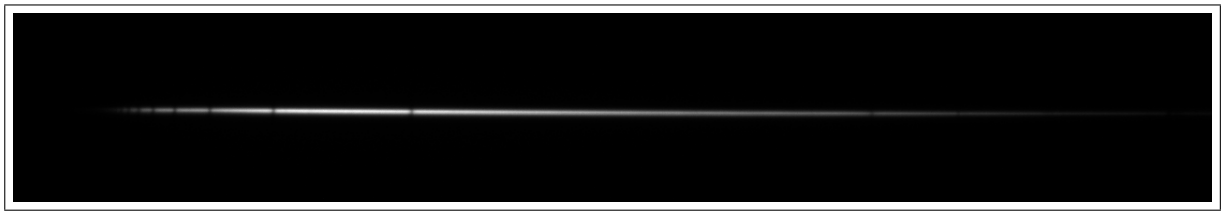

Figure 3: A single uncalibrated 2 second exposure of HD207971.

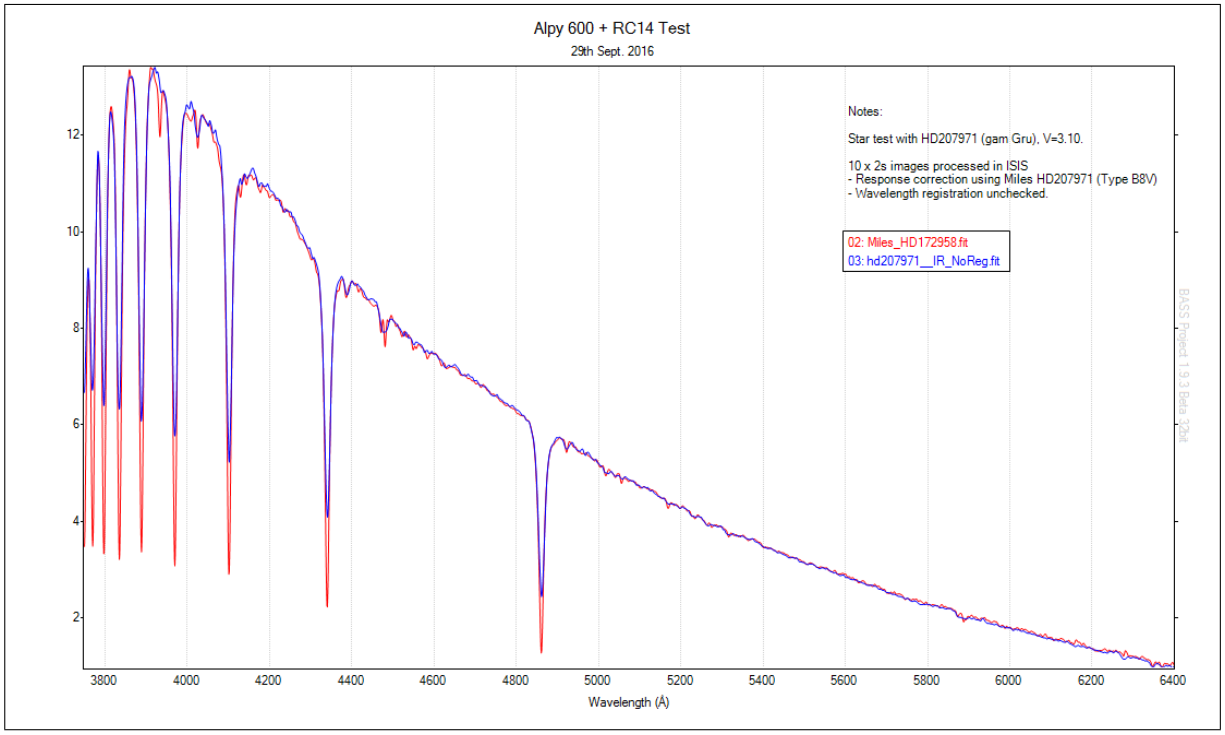

Figure 4: The calibrated and instrument response corrected spectrum. The acquired spectrum (blue) compared to a Miles B8V standard (Red) shows excellent alignment to wavelength and temperature profile.

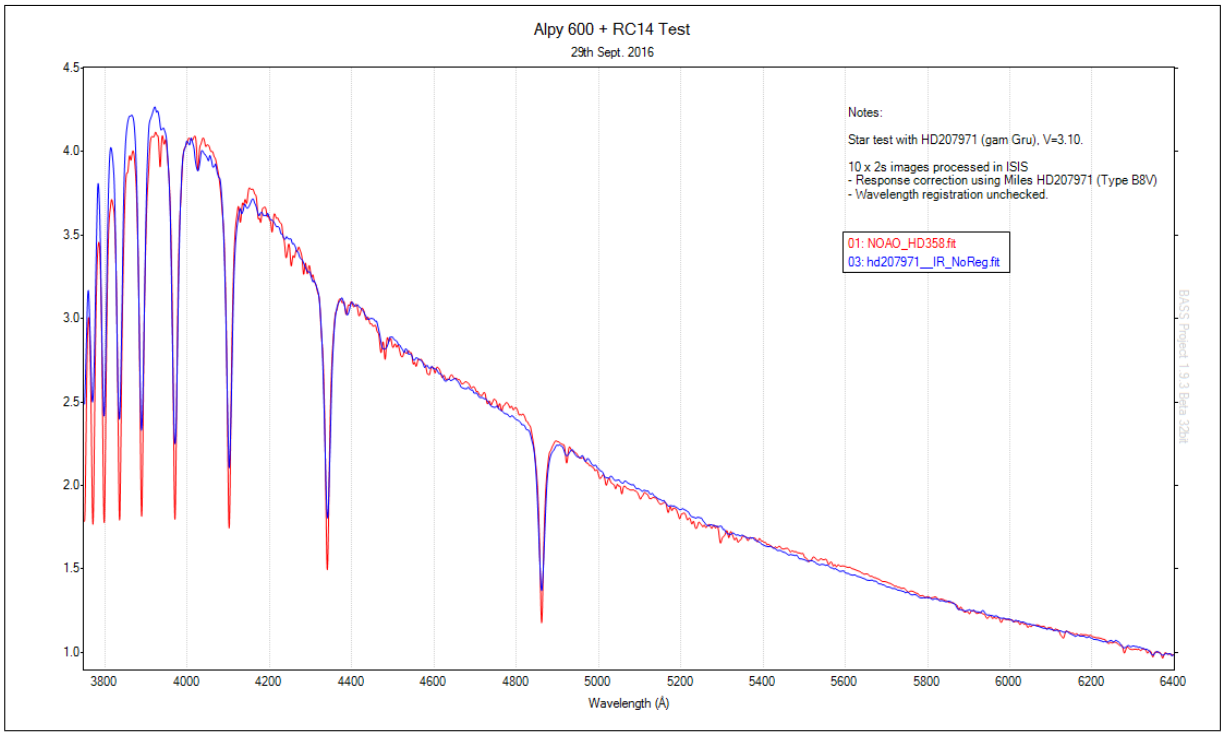

Figure 5: Comparison with the NOAO standard HD358 shows similarly good results.

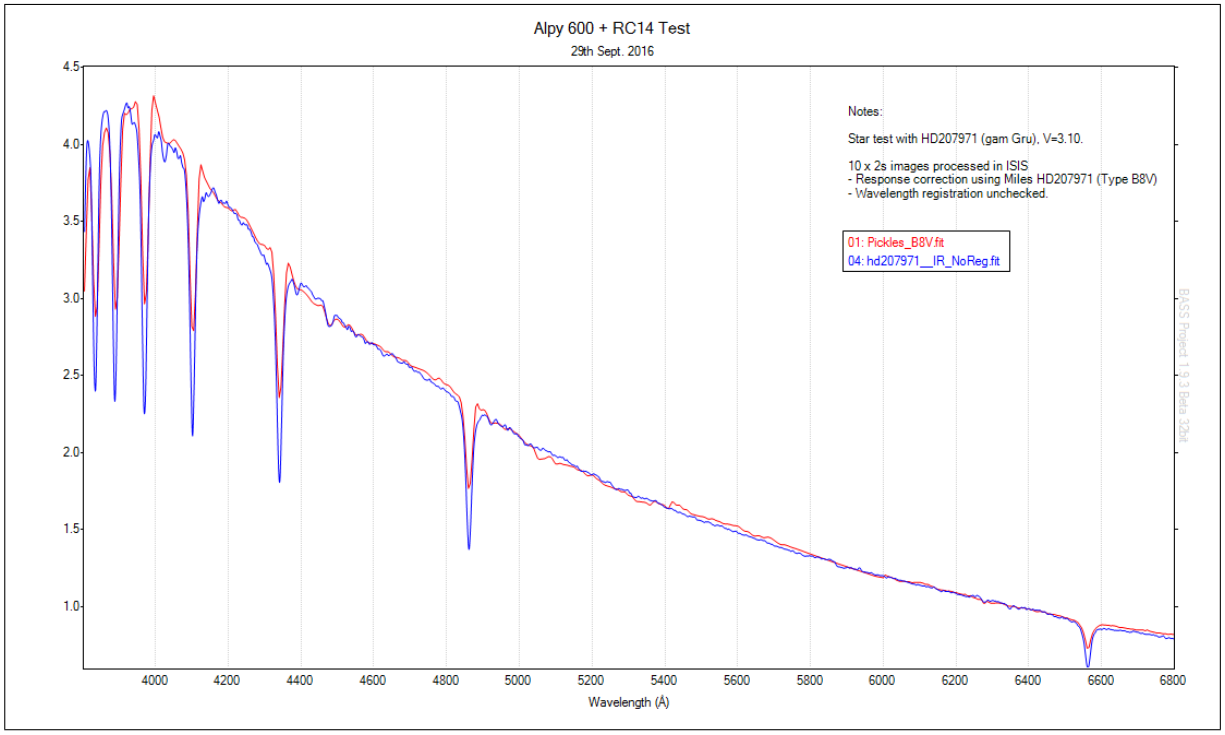

Figure 6: Comparison with a Pickles B8V standard.

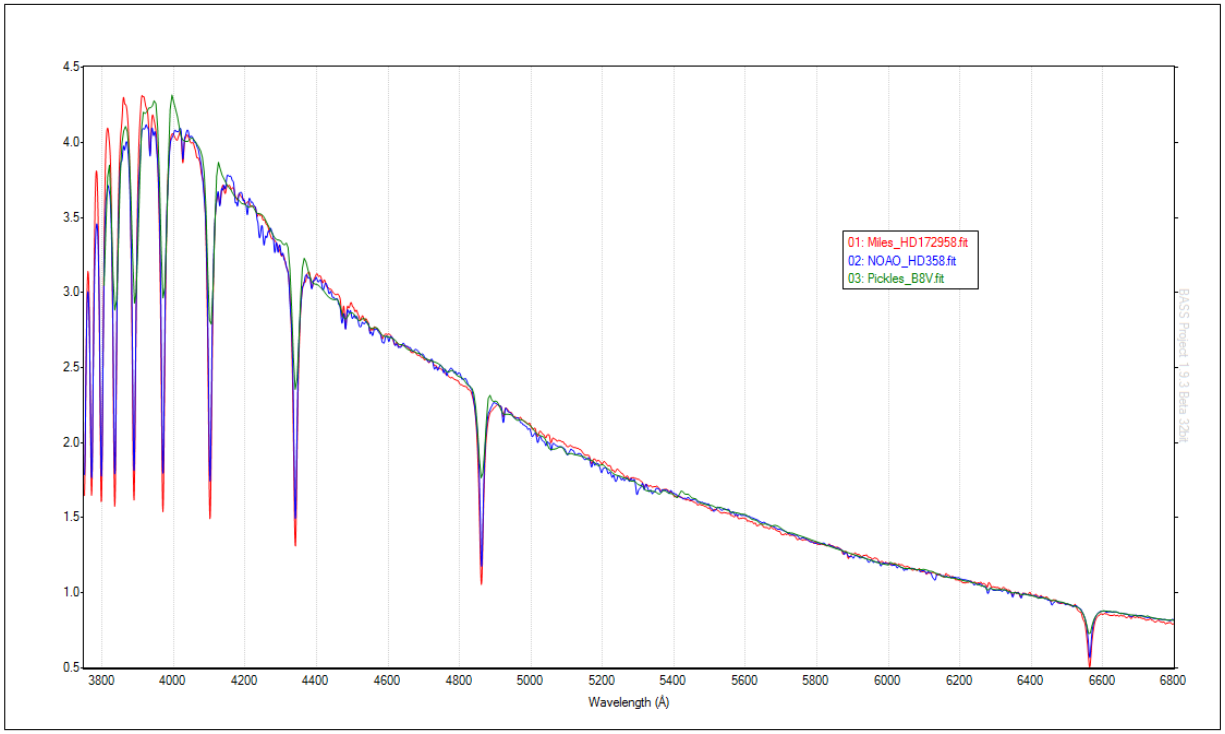

Figure 7: Miles, NOAO and Pickles B8V standards extracted from ISIS.

3.2 HD214952

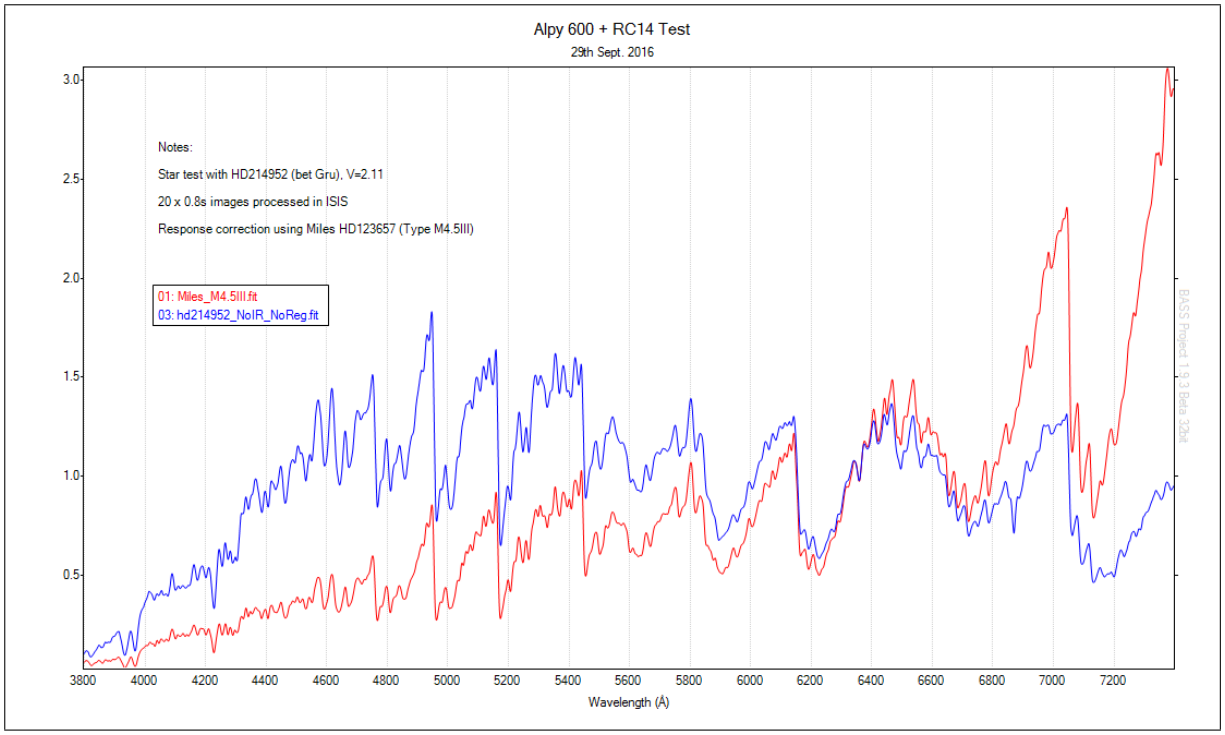

Figure 8: The wavelength calibrated spectrum of HD214952 **without** instrument response correction applied compared to a Miles M4.5III standard (both spectra have been scaled to unity at 6355Å).

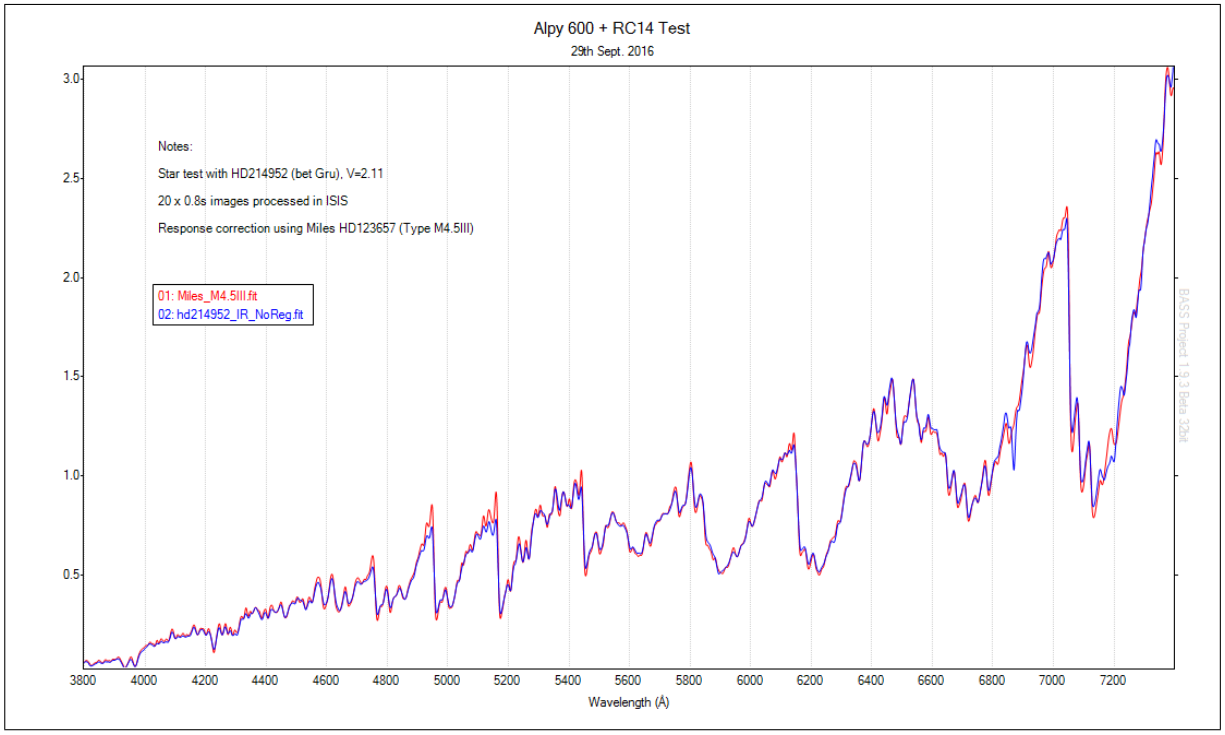

Figure 9: The calibrated and instrument response corrected spectrum. The acquired spectrum (blue) compared to a Miles M4.5III standard (Red) shows excellent alignment to wavelength and temperature profile.

3.3 HD216956

This star exhibited saturation after calibration, however the ISIS processed spectrum, together with the comparison plots below show excellent correlation with a Miles standard.

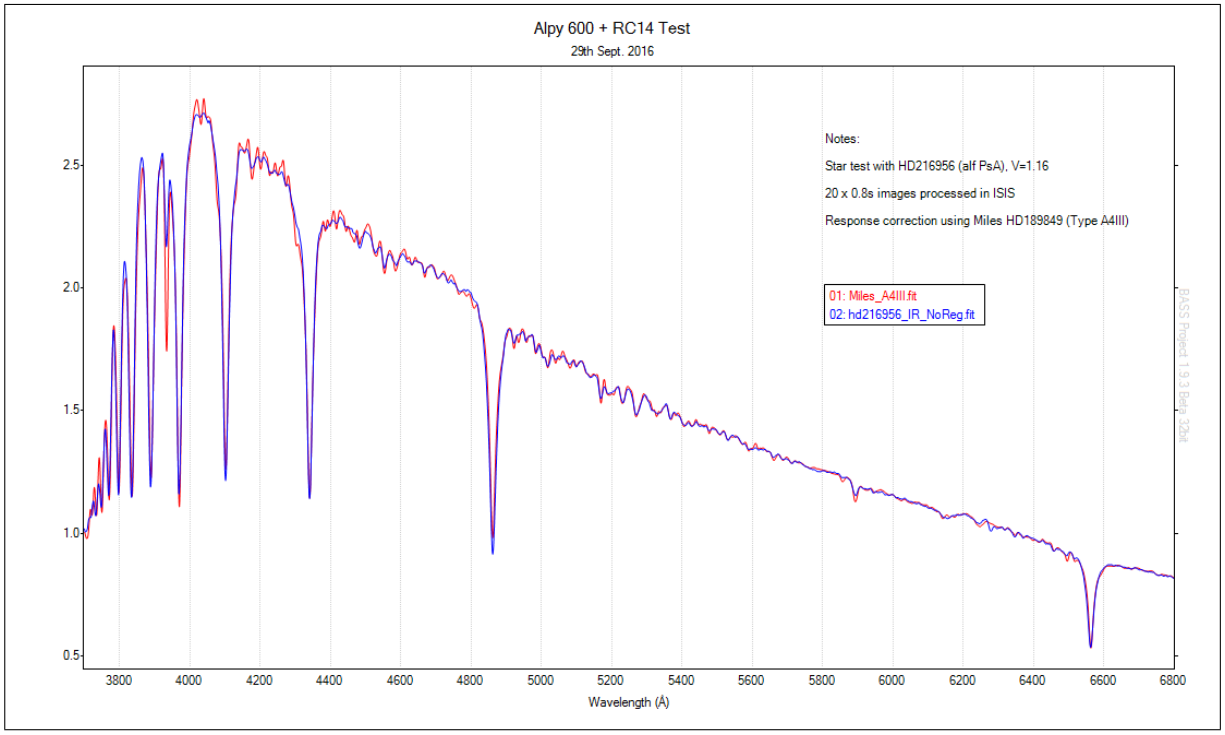

Figure 10: The calibrated and instrument response corrected spectrum of HD216956. The acquired spectrum (blue) compared to a Miles A4III standard (Red) shows excellent alignment to wavelength and temperature profile.

4 Fainter stars

Additional tests performed under hazy skies on October 5th:

Target	Spectral type	Magnitude (V)	Exposure	Max ADU
HD215950	A1V	8.05	6 x 180s	35,000
V777 Sgr	K51b+A	8.63	6 x 300s	15,000
HD206651	F5V	9.89	1 x 600s	15,000

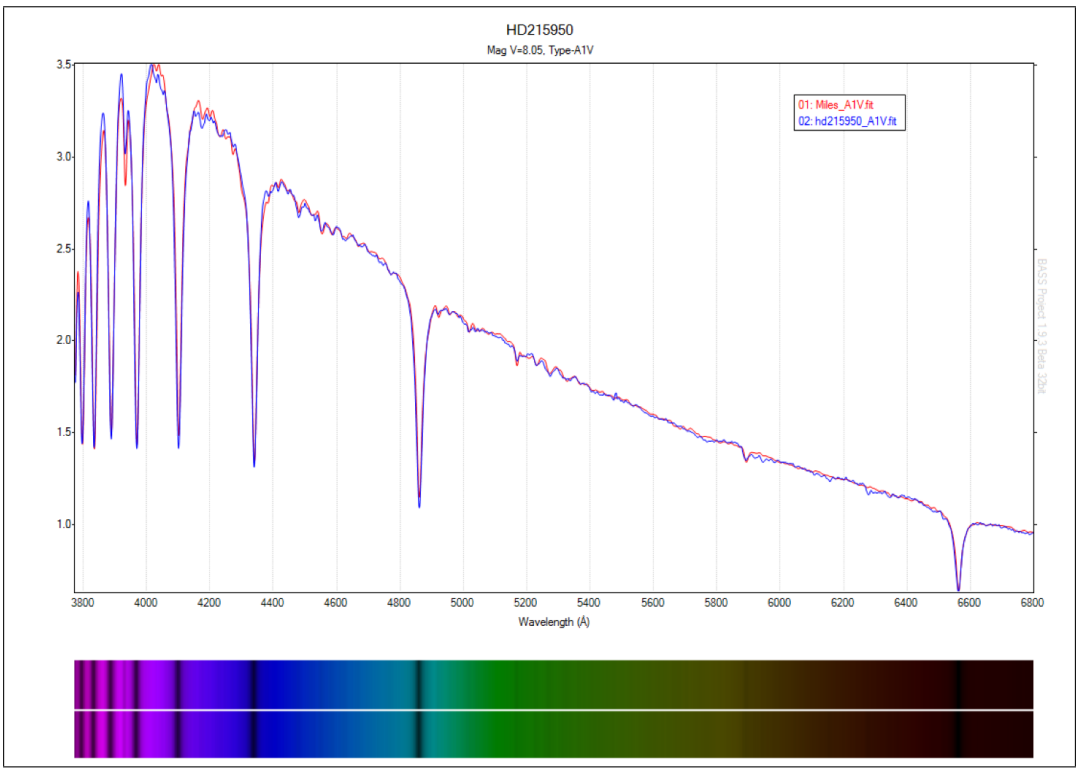

Figure 11: HD215950. A magnitude 8, type-A1V star comparison with Miles.

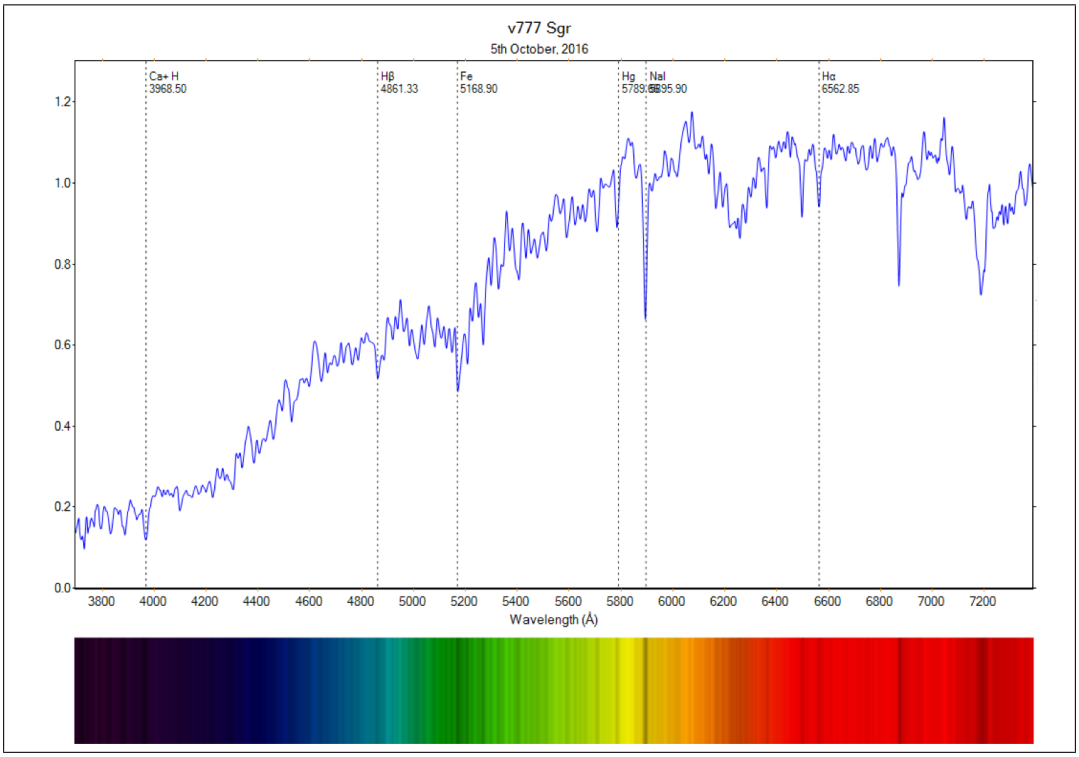

Figure 12: V777 Sgr. An eclipsing binary, type-K51b+A, mag V=8.64.

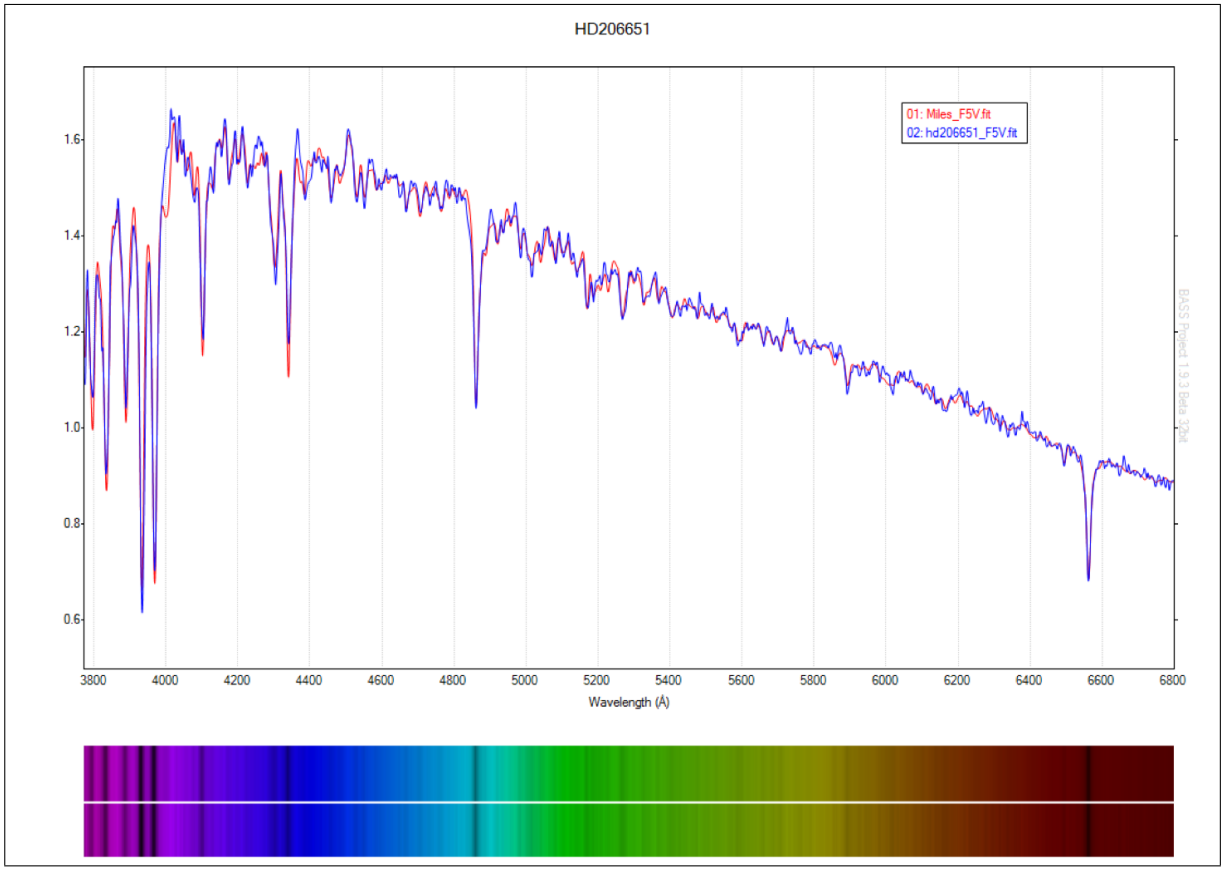

Figure 13: HD206651, type-F5V, mag V=9.89 with a Miles F5V comparison.

5 Summary

The test shows great promise for the Alpy 600 attached to the RC14C. Subtleties in the spectral profiles are easily detected at R=520. For example, the increased strength of the hydrogen Balmer lines of the Type-A star compared to the Type-B star is evident in Figure 14. Early faint star tests appear to show that good S/N can be achieved with a single 600s exposure on stars down to magnitude 10.

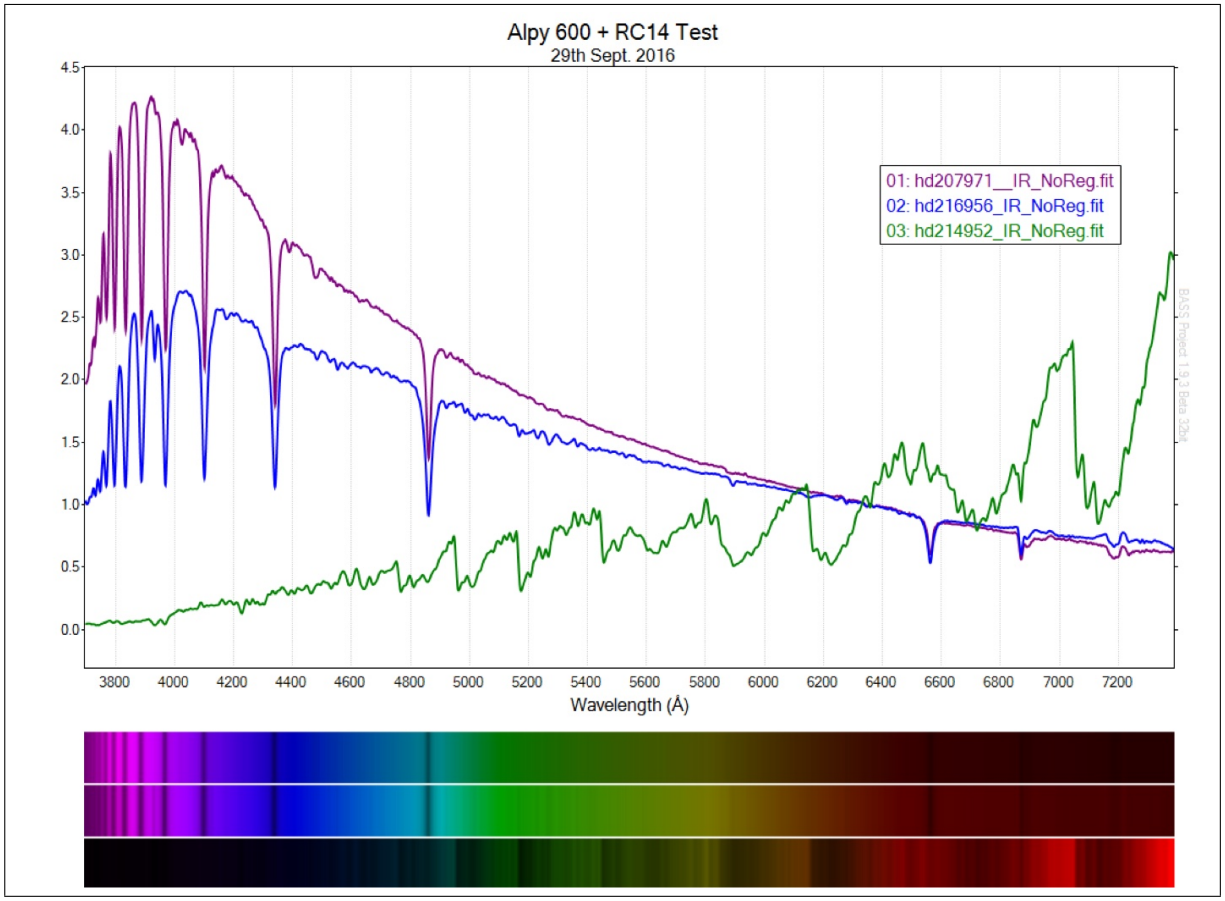

Figure 14: Three bright star test profiles and their synthentically generated spectral strips.

5.1 ISIS wavelength registration issues

A curious issue was noted in the way ISIS creates ALPY 600 spectral profiles with wavelength registration enabled. Enabling wavelength registration appears to shift the spectral profile by approximately 5Å. As a consequence, ALPY spectra should be processed with wavelength registration disabled.

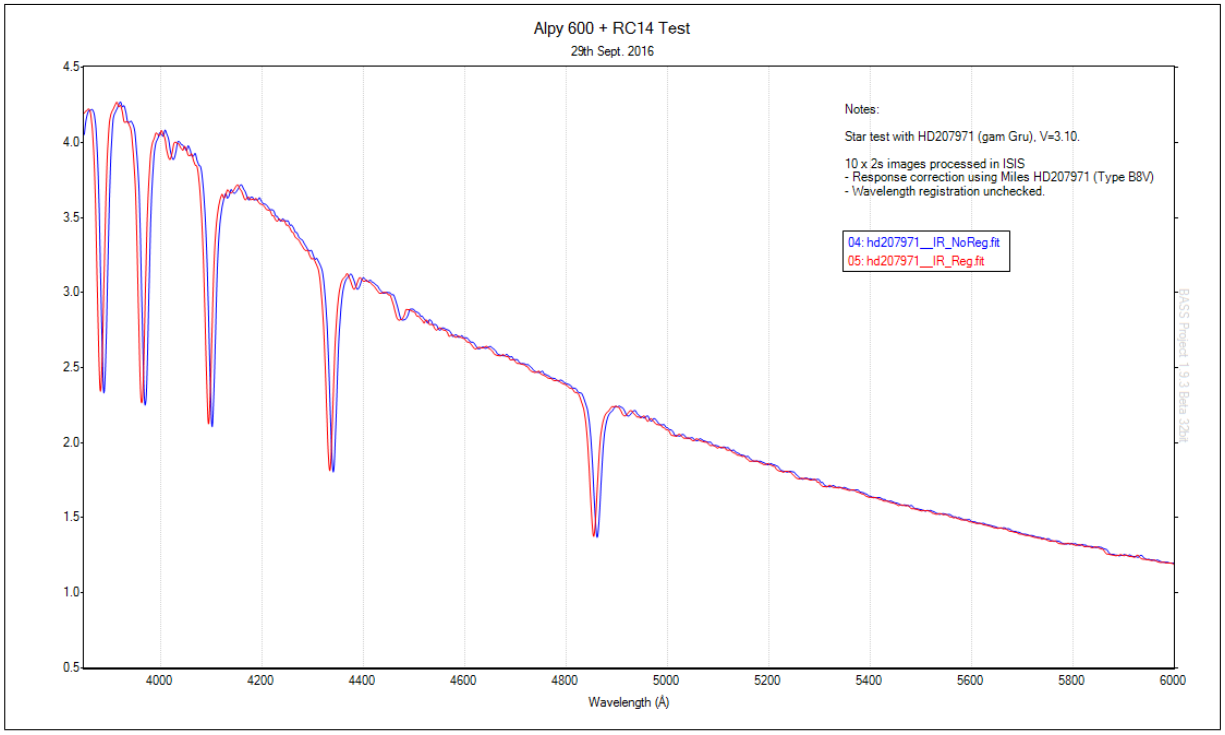

Figure 15: A comparison of spectra with wavelength registration disabled (blue) and enabled (red). The red profile exhibits an unexplained shift of approximately 5Å.

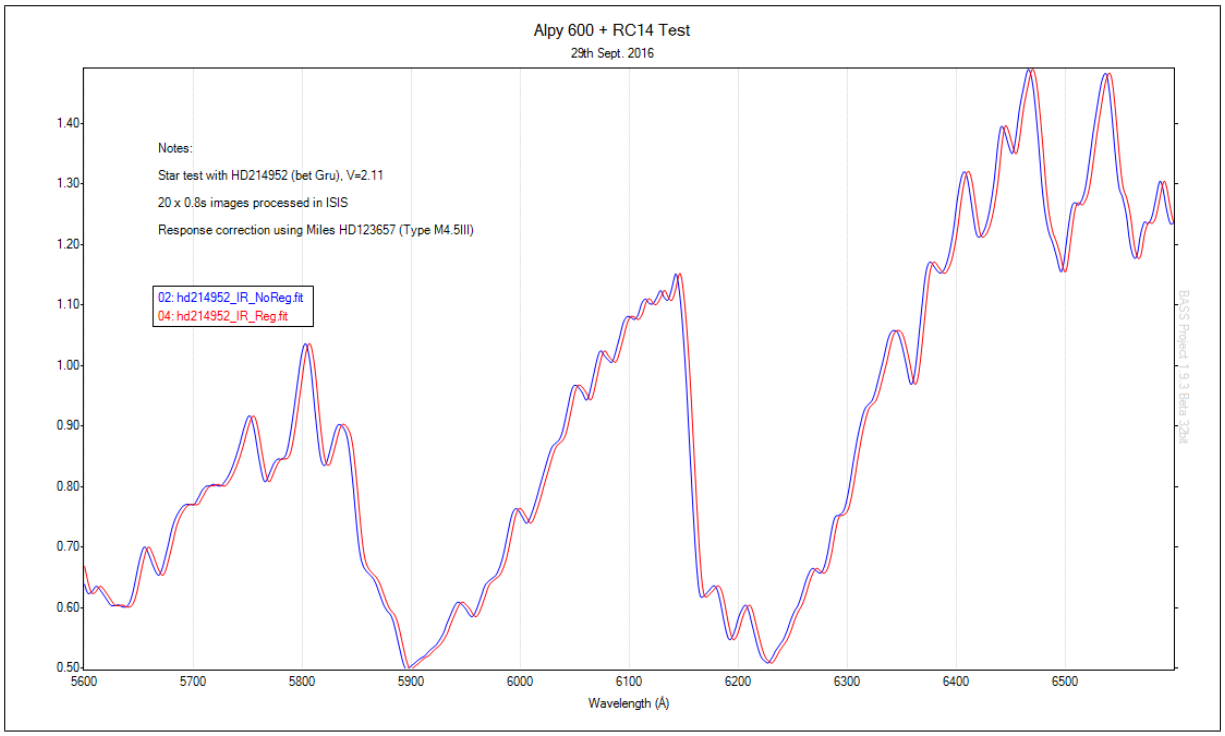

Figure 16: A comparison of spectra with wavelength registration disabled (blue) and enabled (red) of the Type-M star HD214952. The red profile shows an unexplained shift of approximatly 2.5Å.