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Performance Comparison Study FieldSpec 4 Hi-Res (8nm SWIR) - FieldSpec 4 Hi-Res NG (6nm SWIR)

The FieldSpec® 4 Hi-Res NG provides enhanced spectral resolution to meet the rigorous demands of the next generation hyperspectral imaging systems such as AVRIS-NG and HySpex ODIN-1024. Under favorable illumination conditions the 6 nm FieldSpec 4 Hi-Res NG delivers superior spectral performance that is capable of detecting many small absorption features not visible in the 8 nm data of the FieldSpec Hi-Res.

Higher resolution hyperspectral sensors yield greater precision for remote sensing applications, producing more information from every pixel generated in an image than ever before. In order to take advantage of the full potential of these next generation sensors, supporting measurements from ground based instrumentation must meet or exceed the sensor's spectral resolution. In the absence of this resolution parity, vital spectral features present in the image may be interpolated, smoothed and lost during post processing.

In addition to superior spectral resolution, the FieldSpec 4 Hi-Res NG, like all ASD spectroradiometers, provides the smallest available spectral sampling interval in a field portable device. The standard 1.1 nm average sampling rate ensures detection of even the most subtle spectral features. This is in contrast to all array-based designs that sample the spectrum at relatively coarse intervals.

This combination of high spectral resolution and small spectral sampling interval provides superior performance when accuracy really matters and for results you can trust.

It is important to understand that in any spectroradiometer available "signal' is reduced as spectral resolution is increased. This response is particularly noticeable in the higher wavelengths of the SWIR 2 region. Note that optimal performance of the FieldSpec 4 Hi-Res NG requires favorable solar illumination conditions.

Figure 1 shows the spectral resolution comparison of several argon emission lines in the SWIR 2 region from a FieldSpec 4 Hi-Res 8 nm and the FieldSpec Hi-Res NG.

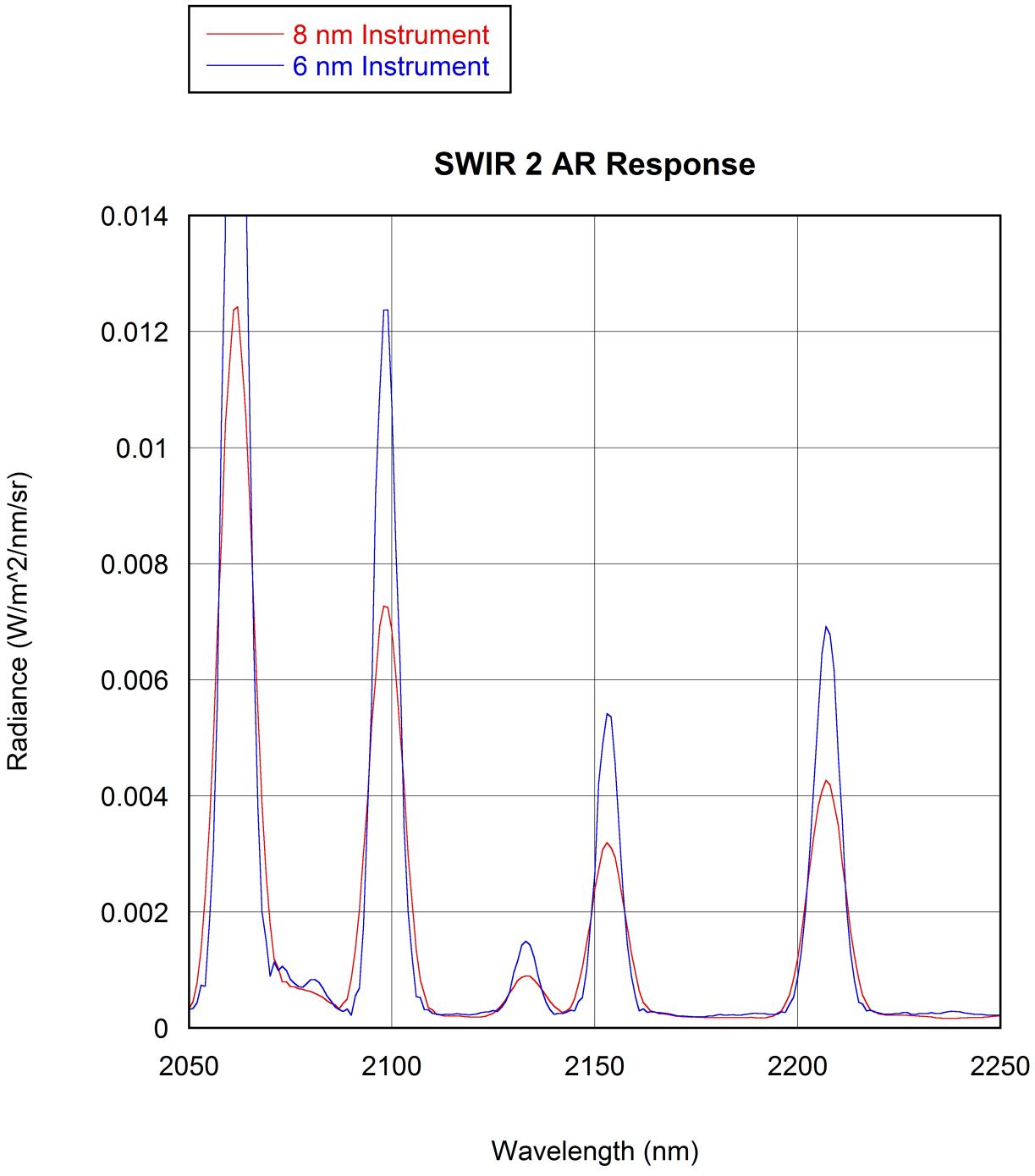


Figure 1. Argon emission lines in SWIR 2

Figures 2, 3 and 4 show the solar illuminated radiance data for SWIR 1 and SWIR 2 ranges. The 6 nm spectra clearly show deeper, narrower absorption features than the 8 nm data. Many small absorption features are visible in the 6 nm data but not visible in the 8 nm data that are legitimate features due to their persistence in all the collected spectra. Note the small features that lie on top of the normal solar curve continuum, only visible in the 6 nm data in Figures 3 and 4.

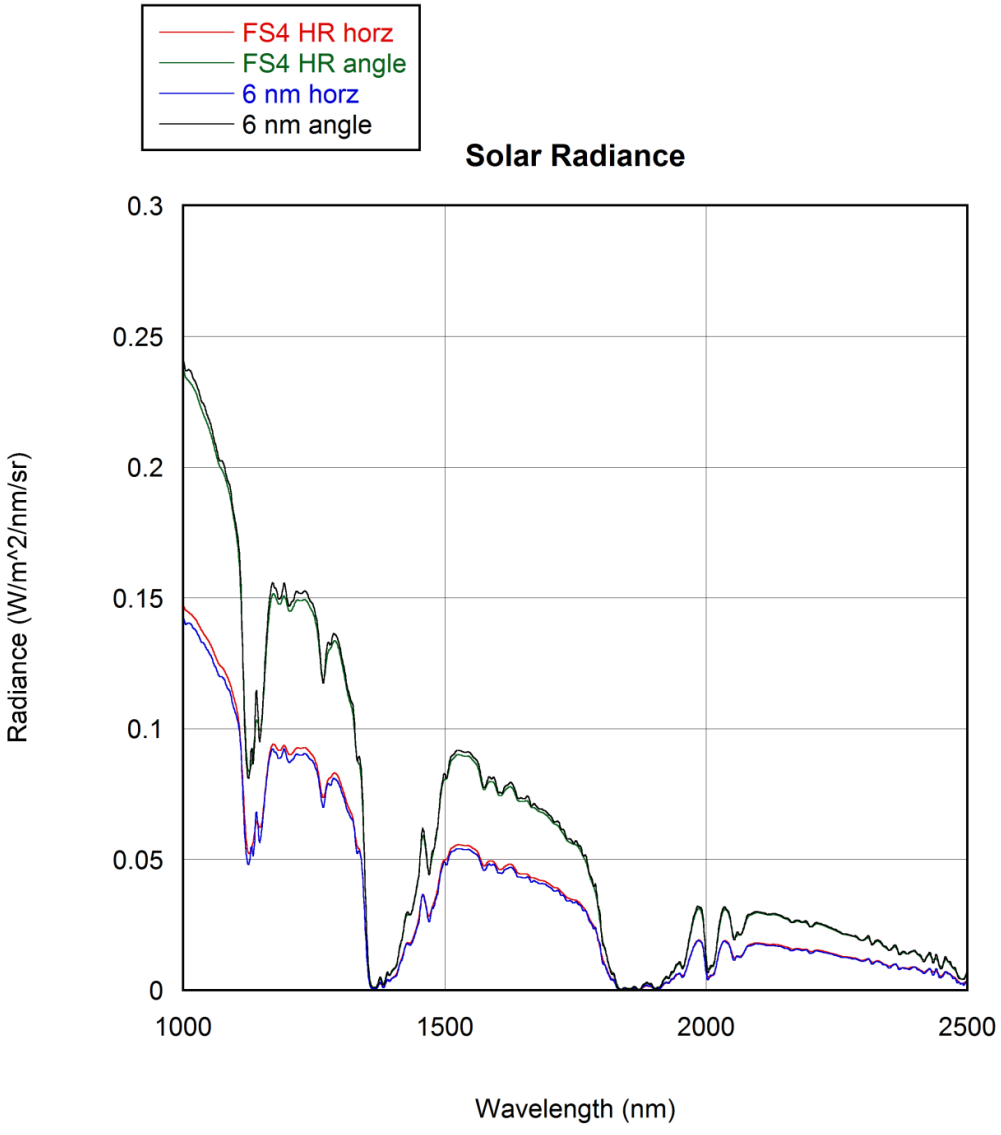


Figure 2. Full SWIR region radiometric spectra with both panel orientations

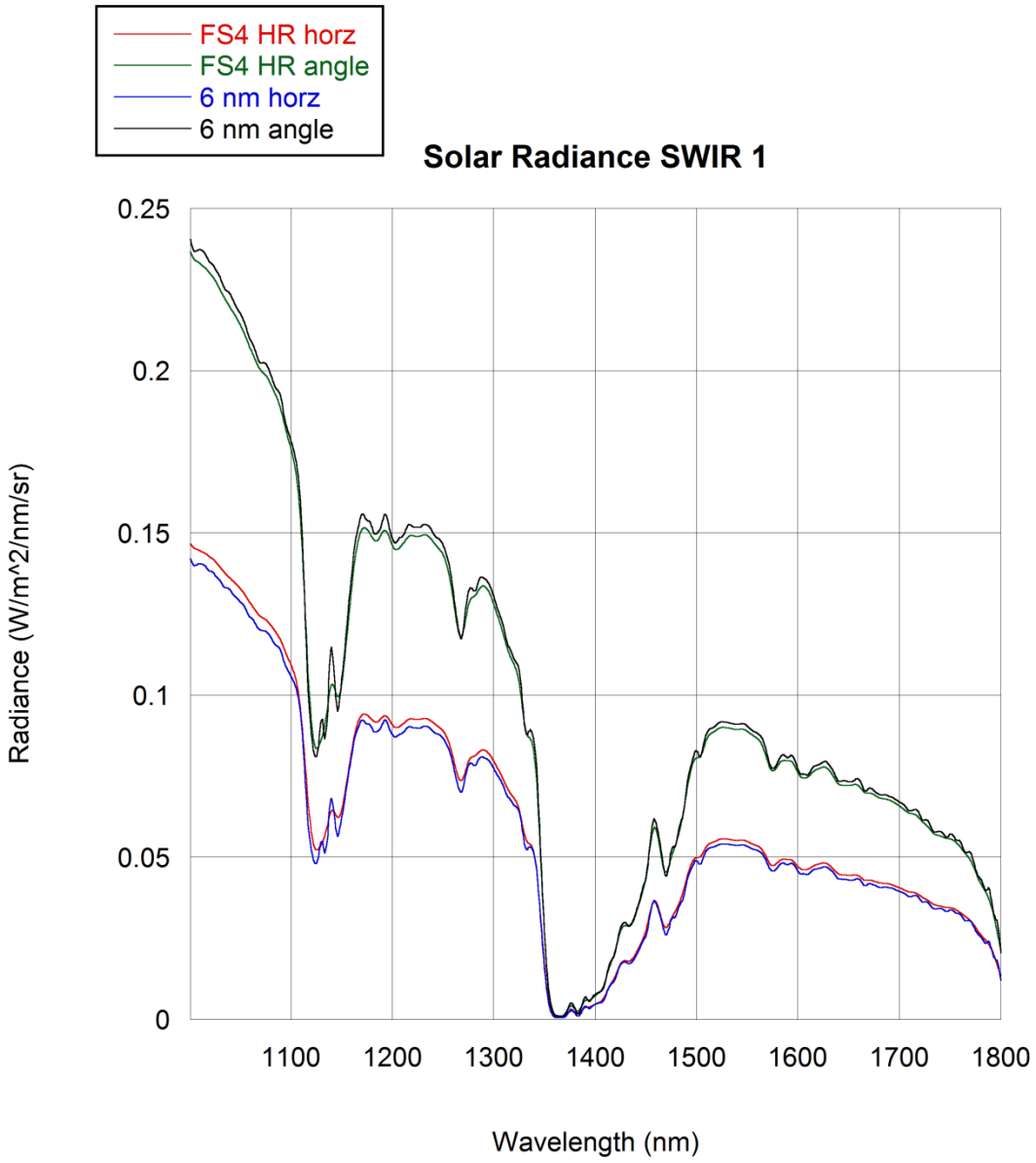


Figure 3. SWIR 1 radiometric data

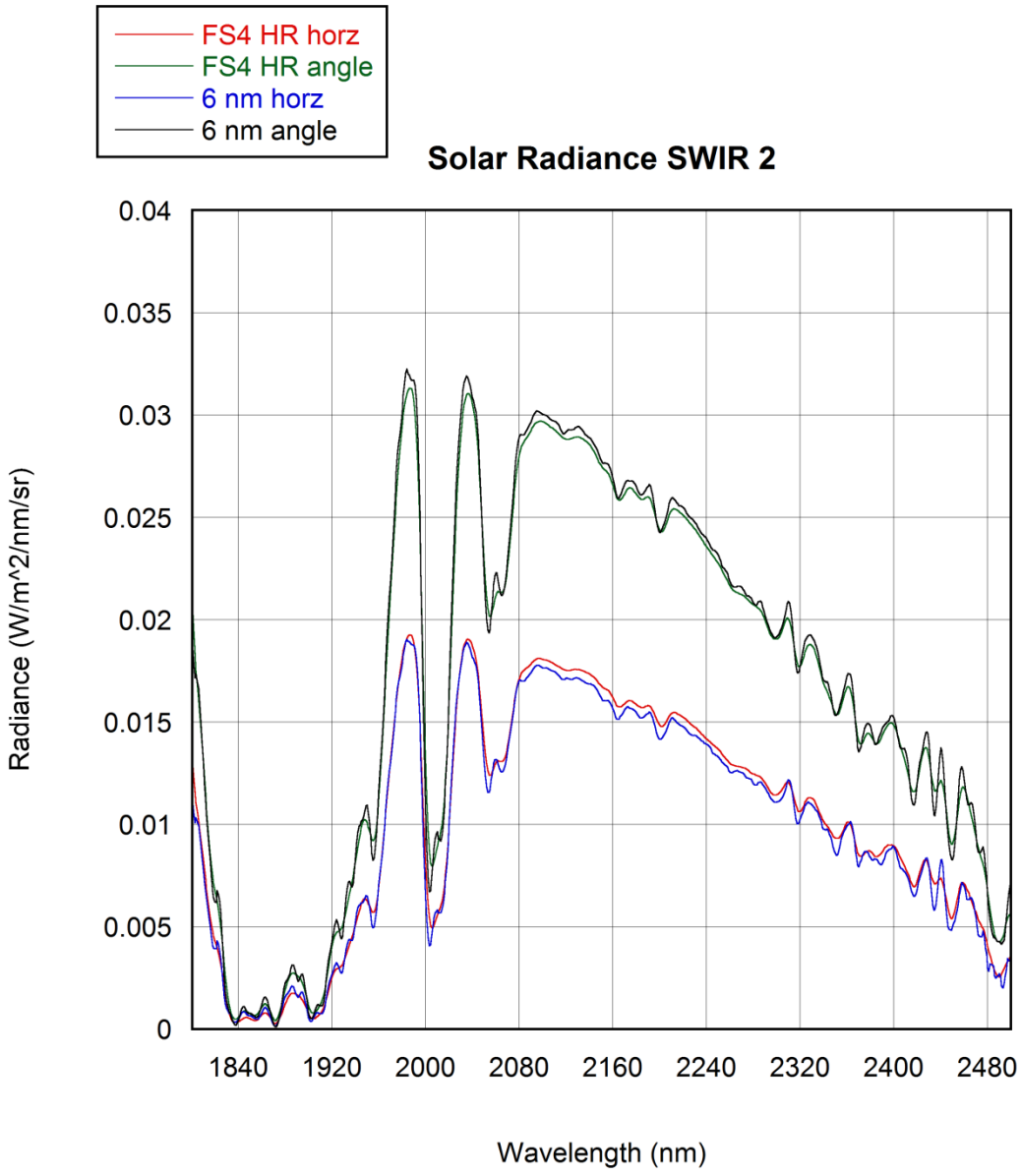


Figure 4. SWIR 2 radiometric data.

Figures 5, 6, and 7 show reflectance spectra of the ASD Rare Earth calibration puck collected with a spectrum average of 50. The FieldSpec 4 Hi-Res NG consistently identified deeper and narrower features. Figure 6 illustrates the inherent signal loss above 2400 nm with a 6 nm optical configuration. Figure 7 shows the ability to detected subtle absorption on the shoulders of the larger features.

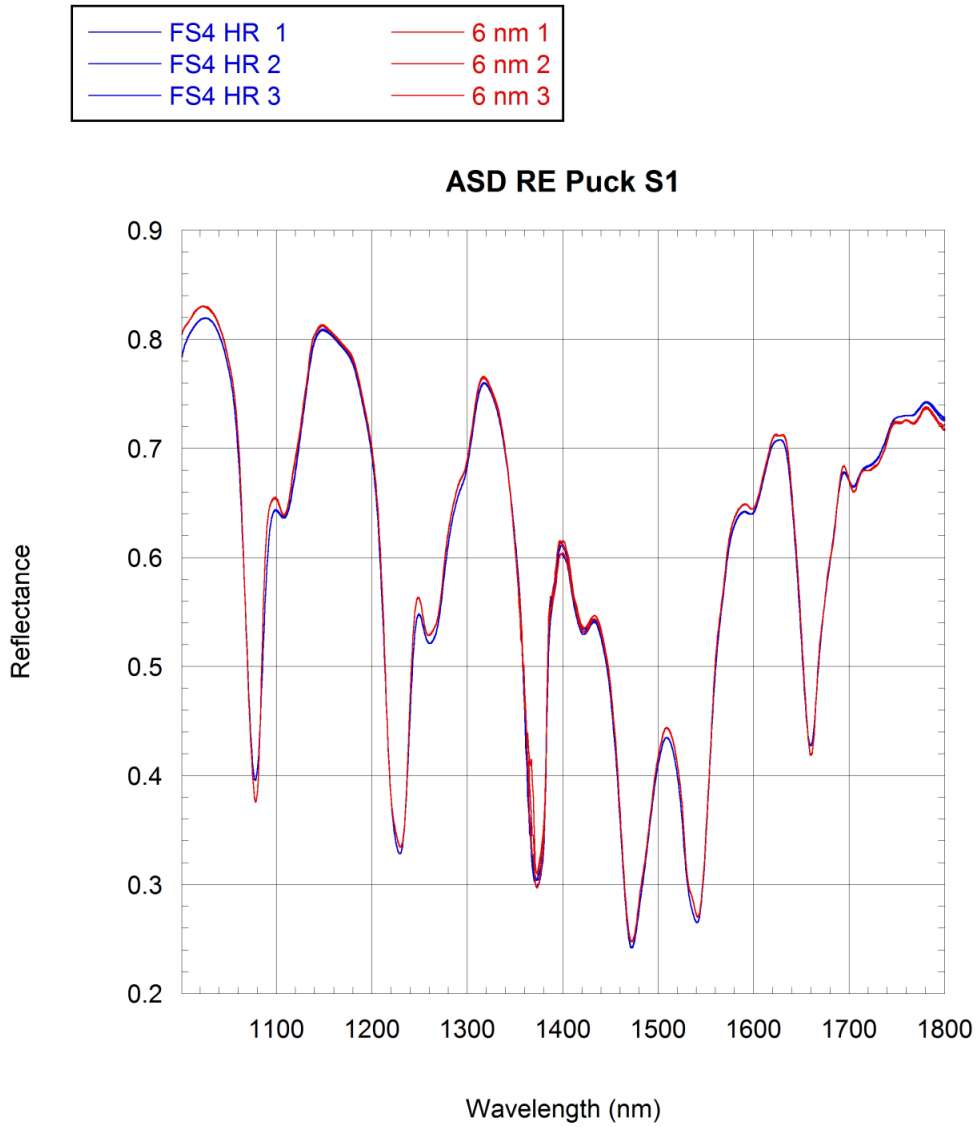


Figure 5. SWIR 1 region showing reflectance spectra from the ASD Rare Earth calibration puck collected with a perpendicular orientation to the sun.

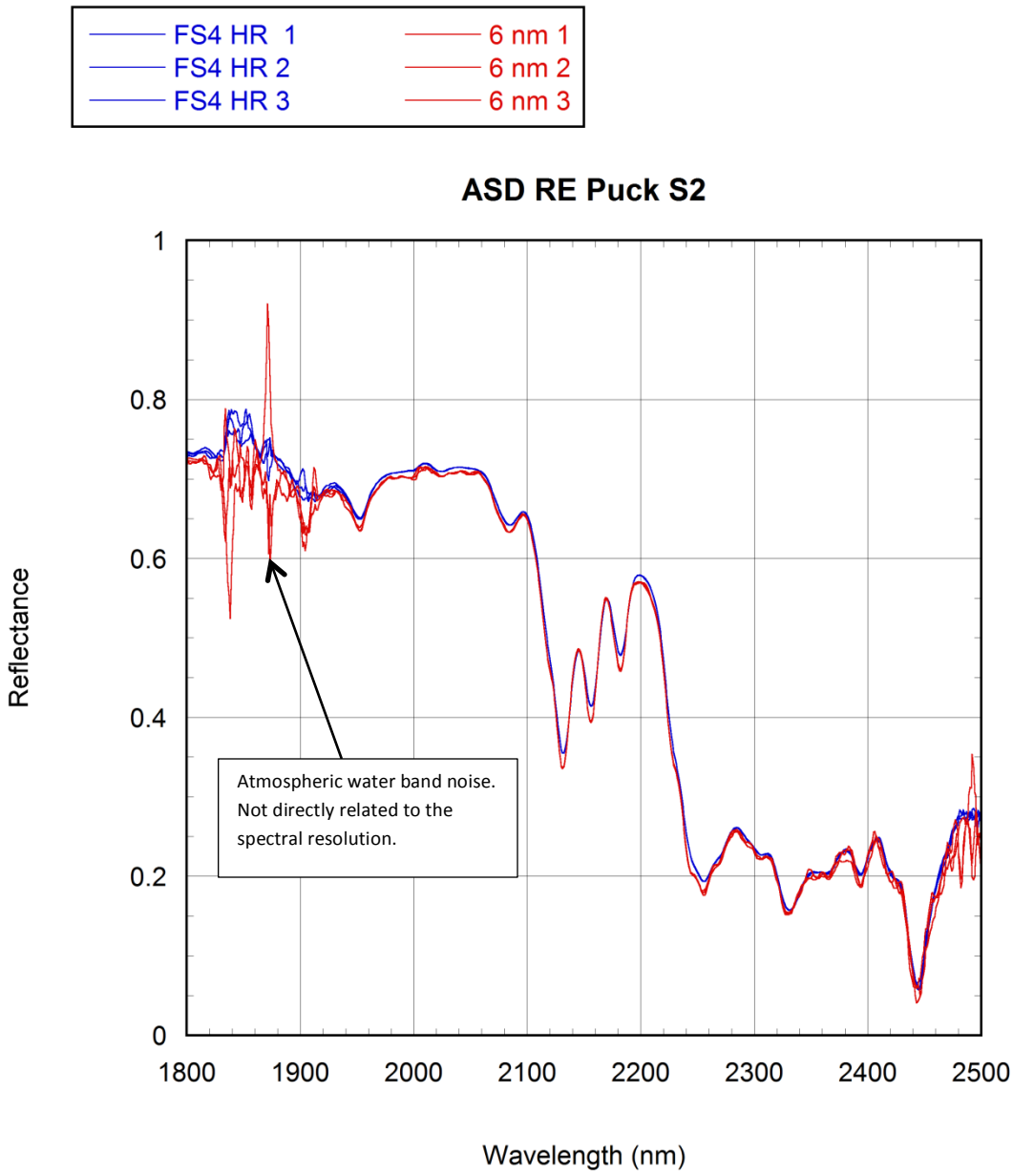


Figure 6. SWIR 2 region showing reflectance spectra from the ASD Rare Earth calibration puck collected with a perpendicular orientation to the sun.

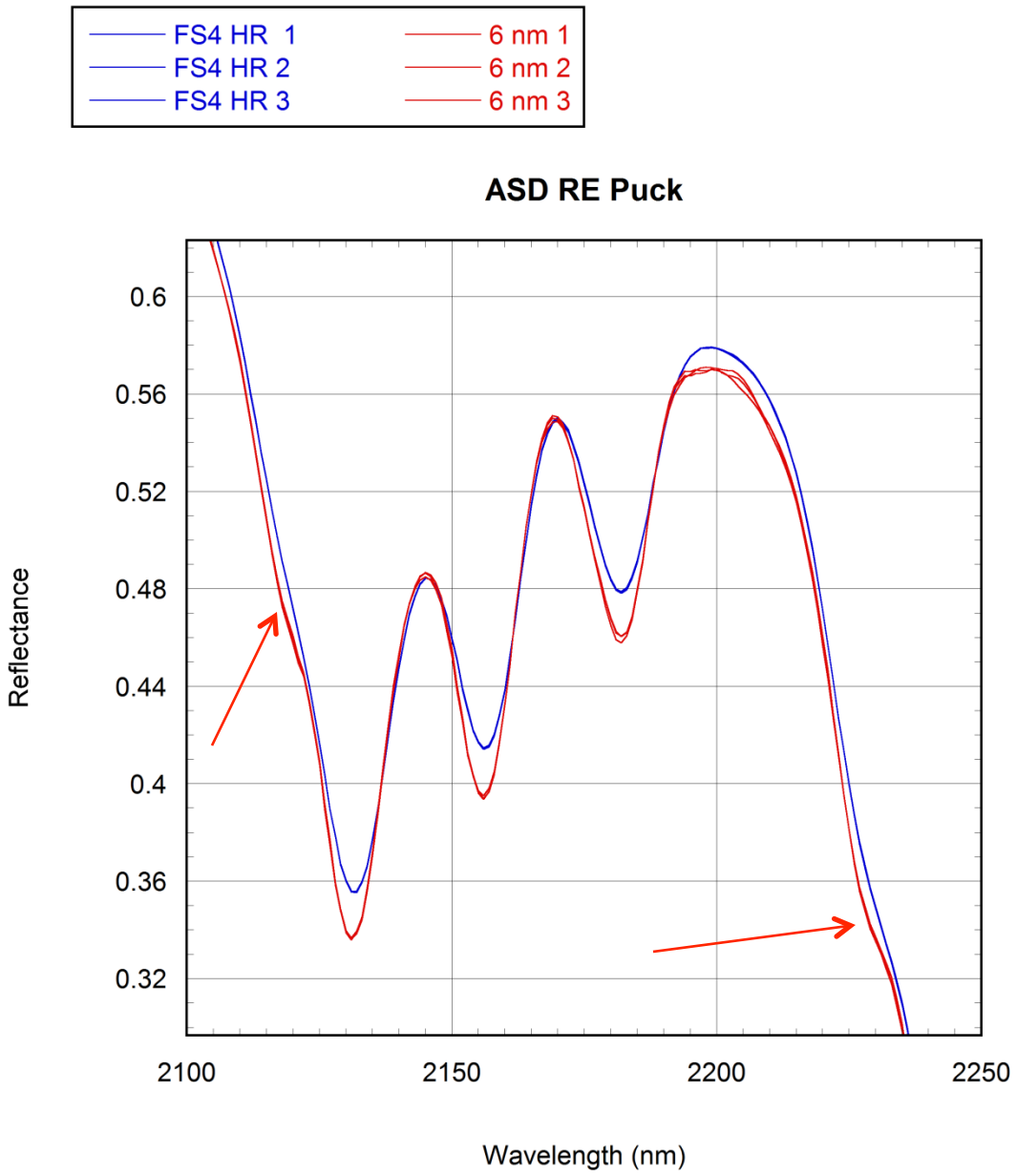


Figure 7. Detail of the Rare Earth triplet region in SWIR 2. Red arrows indicate features seen only by the FieldSpec 4 Hi-Res NG.

Figure 8 highlights the NEdL differences between the 8 nm FieldSpec 4 Hi-res and 6 nm FieldSpec 4 Hi-Res NG.

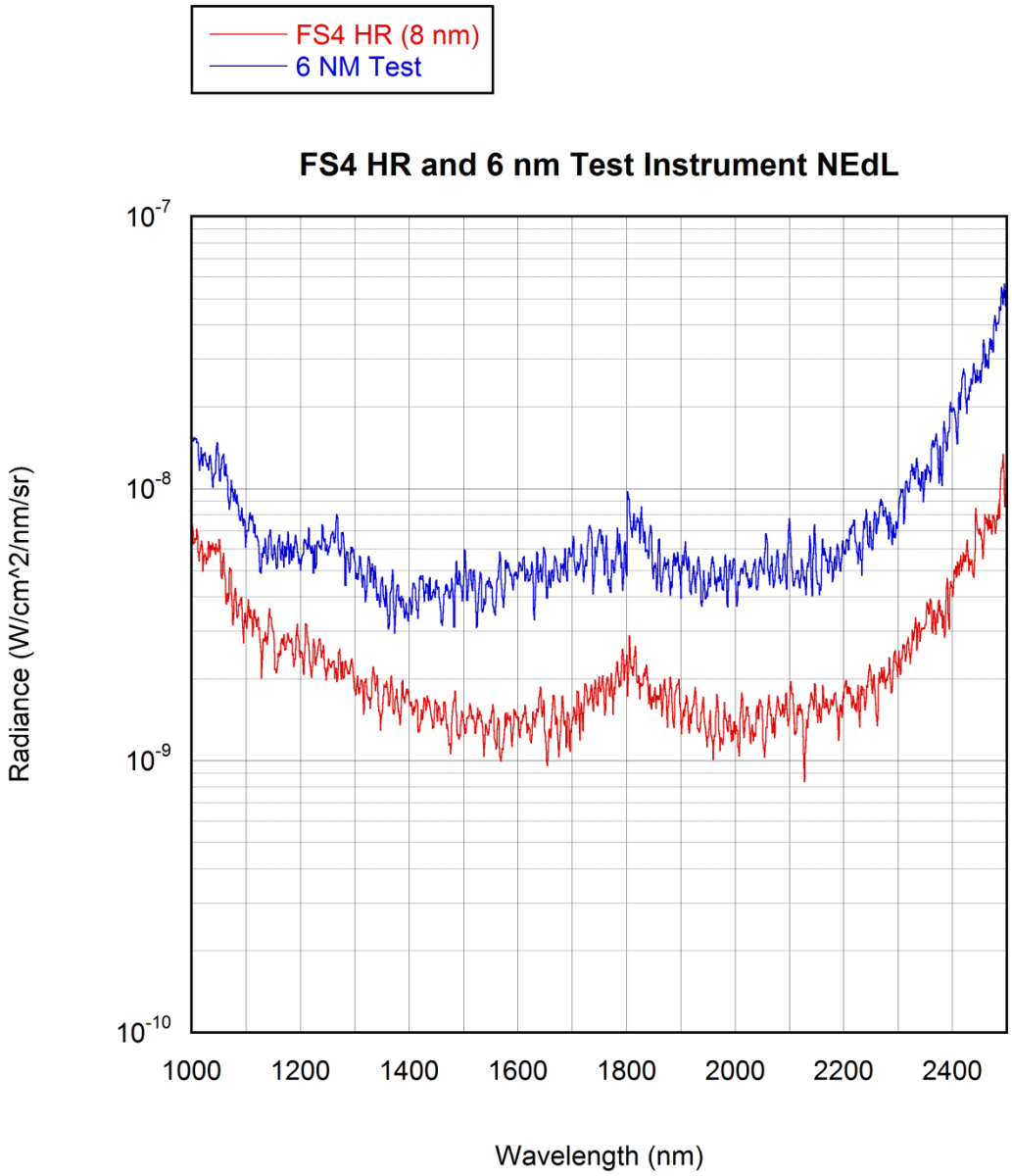


Figure 8. NEdL comparison between the 8nm FieldSpec 4 Hi-res and 6nm Hi-Res NG.

Figure 9 compares signal to noise of both instruments with two panel orientations.

- High – Perpendicular to the sun
- Low – Horizontal/Nadir

The NEdL was used as the noise component.

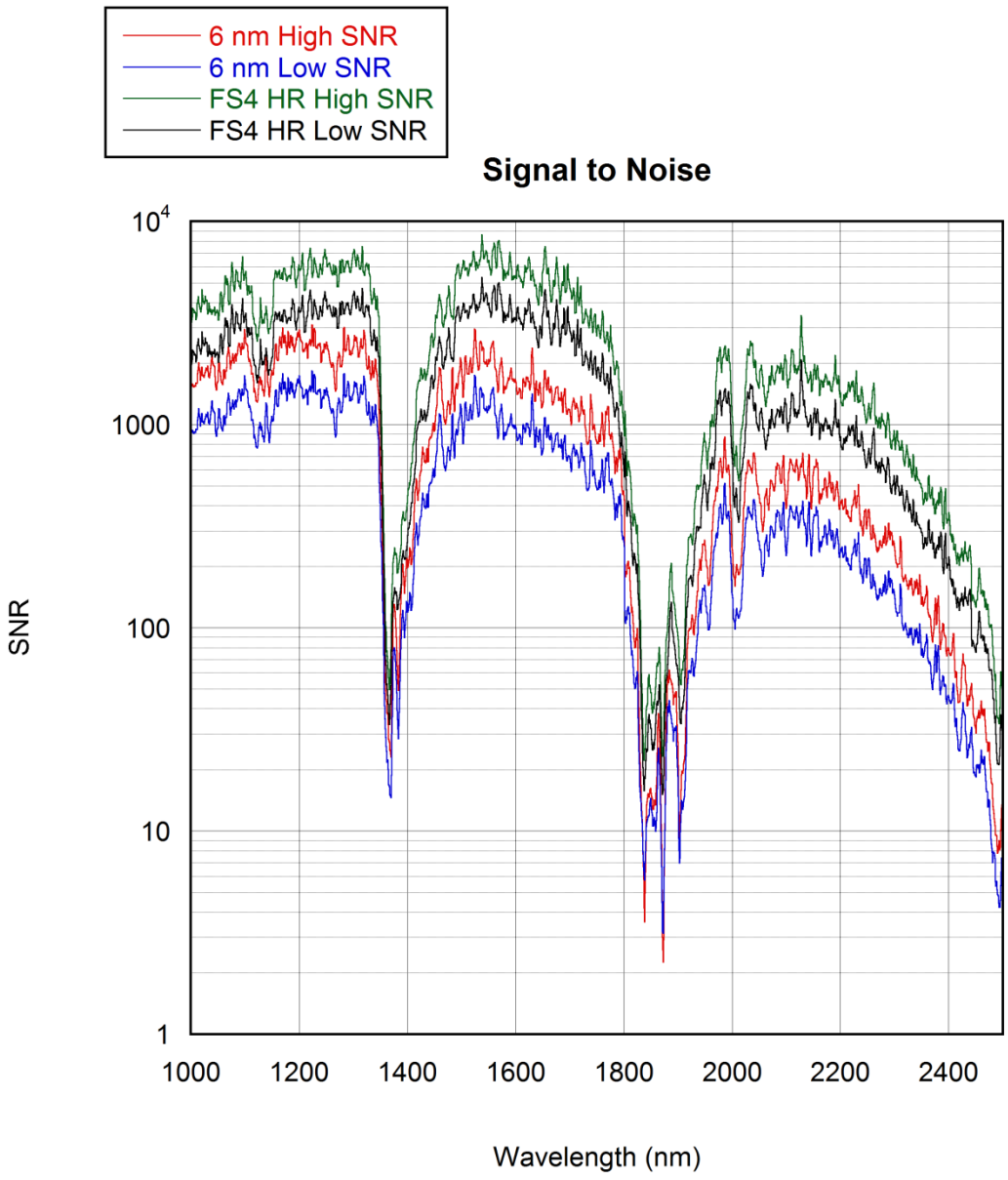


Figure 9. Signal to noise comparison based on solar illumination.