



PFM3 Test Results

SPIRE SDAG Meeting

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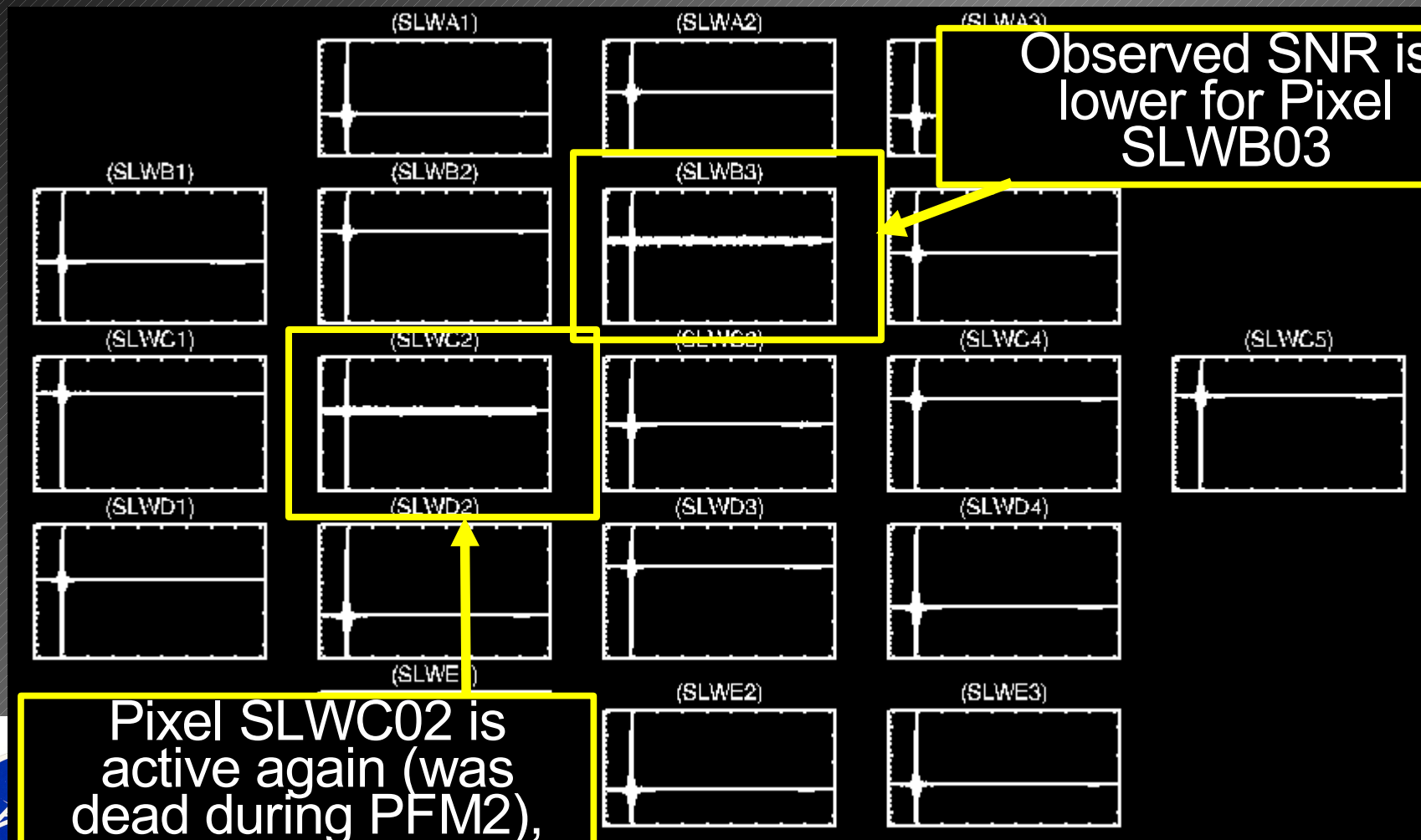


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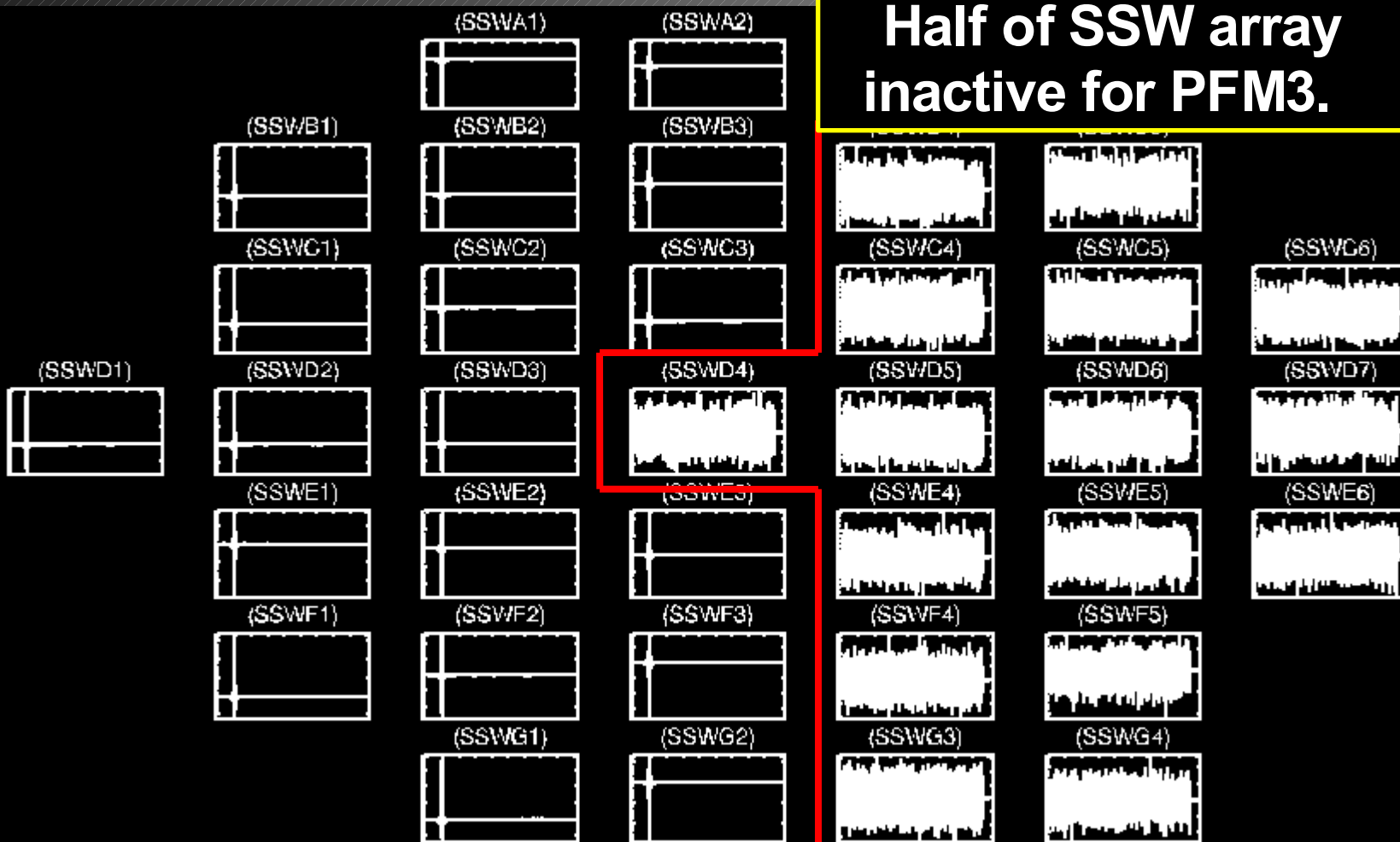


Active Pixels, SLW



Active Pixels, SSW

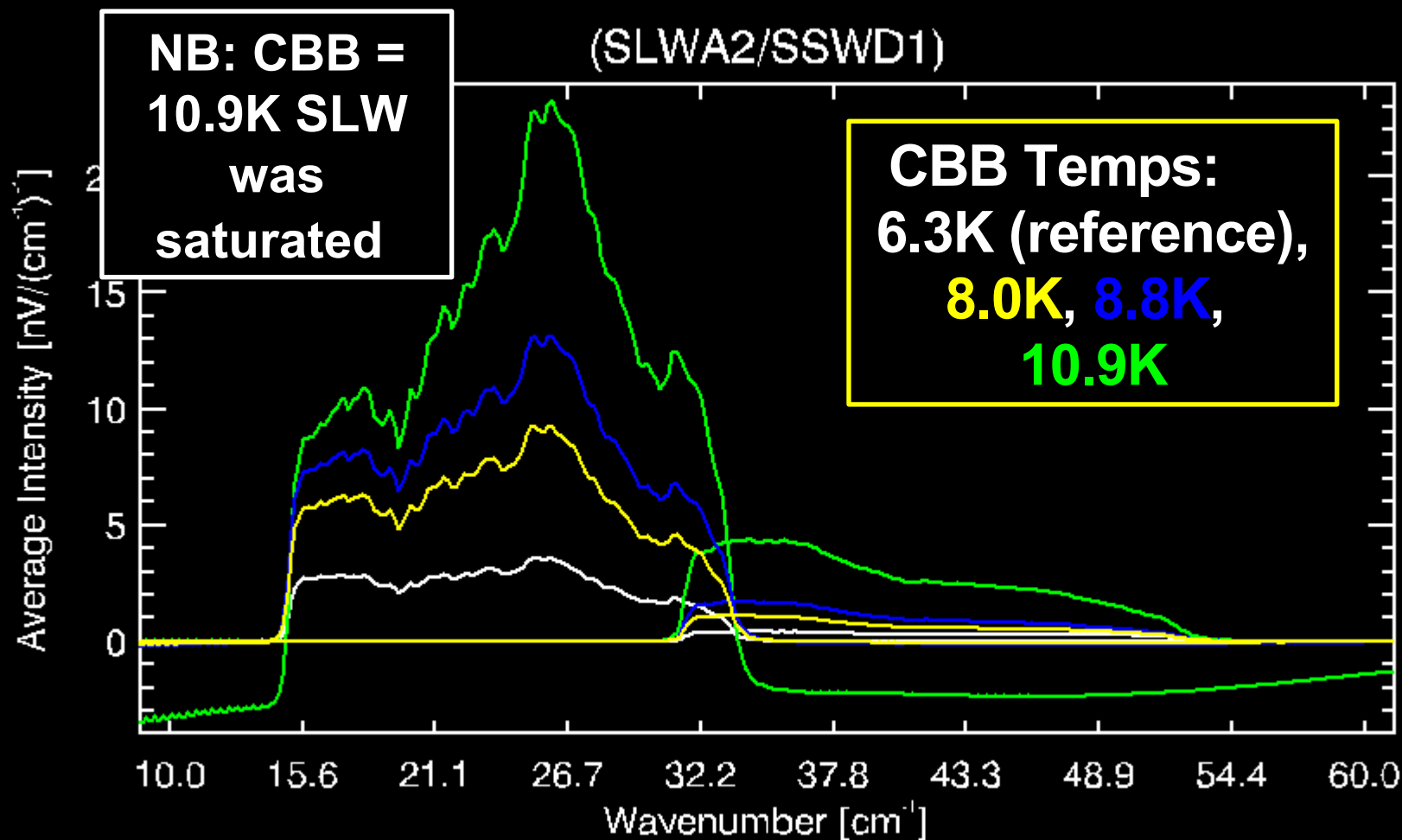
Half of SSW array inactive for PFM3.



Transmission

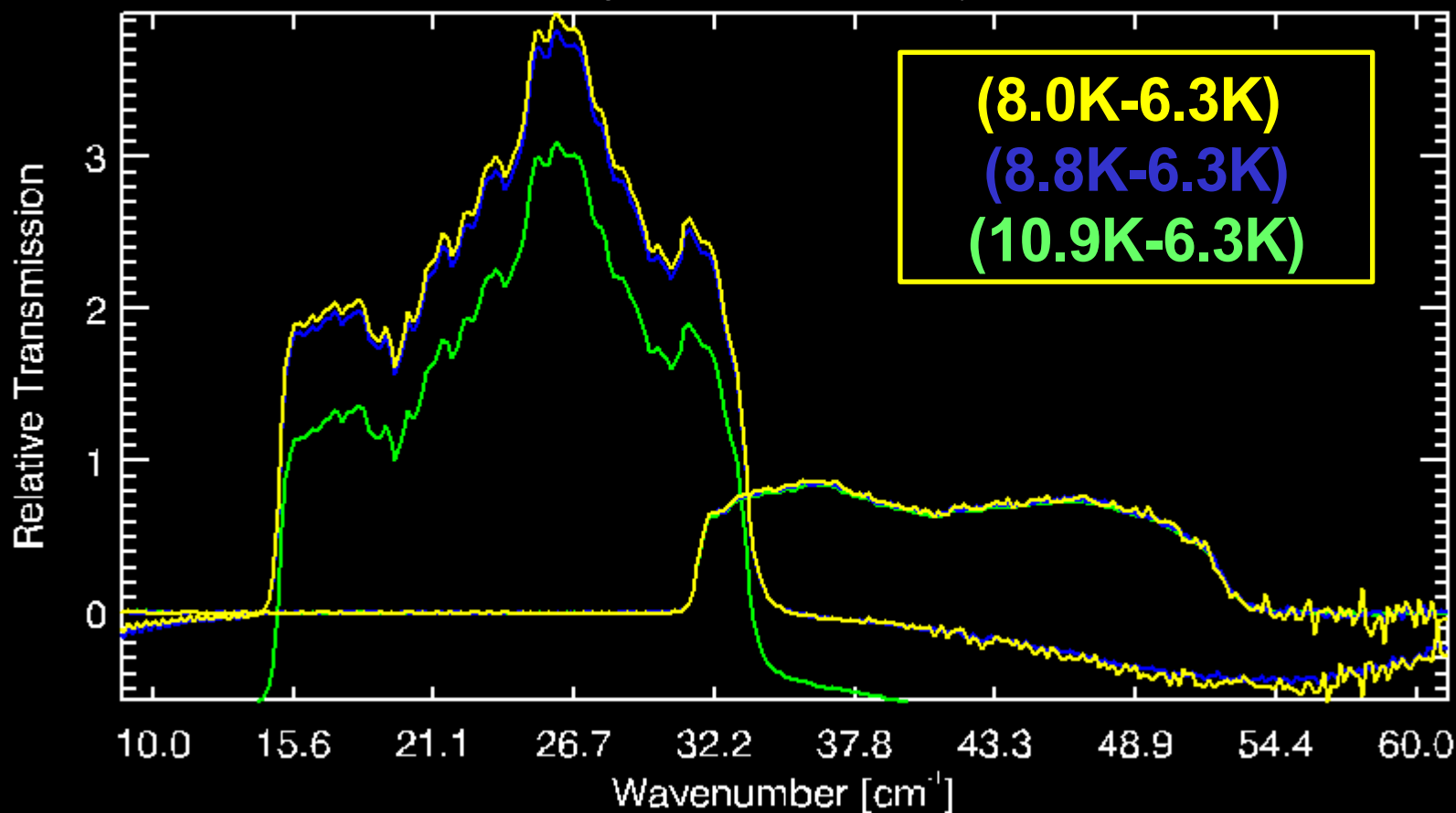
- Following Jean-Paul's analysis, the transmission for each input port (telescope and SCAL) was examined.
- For each input port, the measured difference between a "hot" and a reference observation is computed.
- The ratio of this measured difference and the modeled difference is then determined.
- For the CBB port, the reference observation was CBB=6.3K and the "hot" observations were CBB=8.0K, 8.8K, and 10.9K. In each case, SCAL~4.5K.

Transmission



Transmission

(SLWA2/SSWD1)

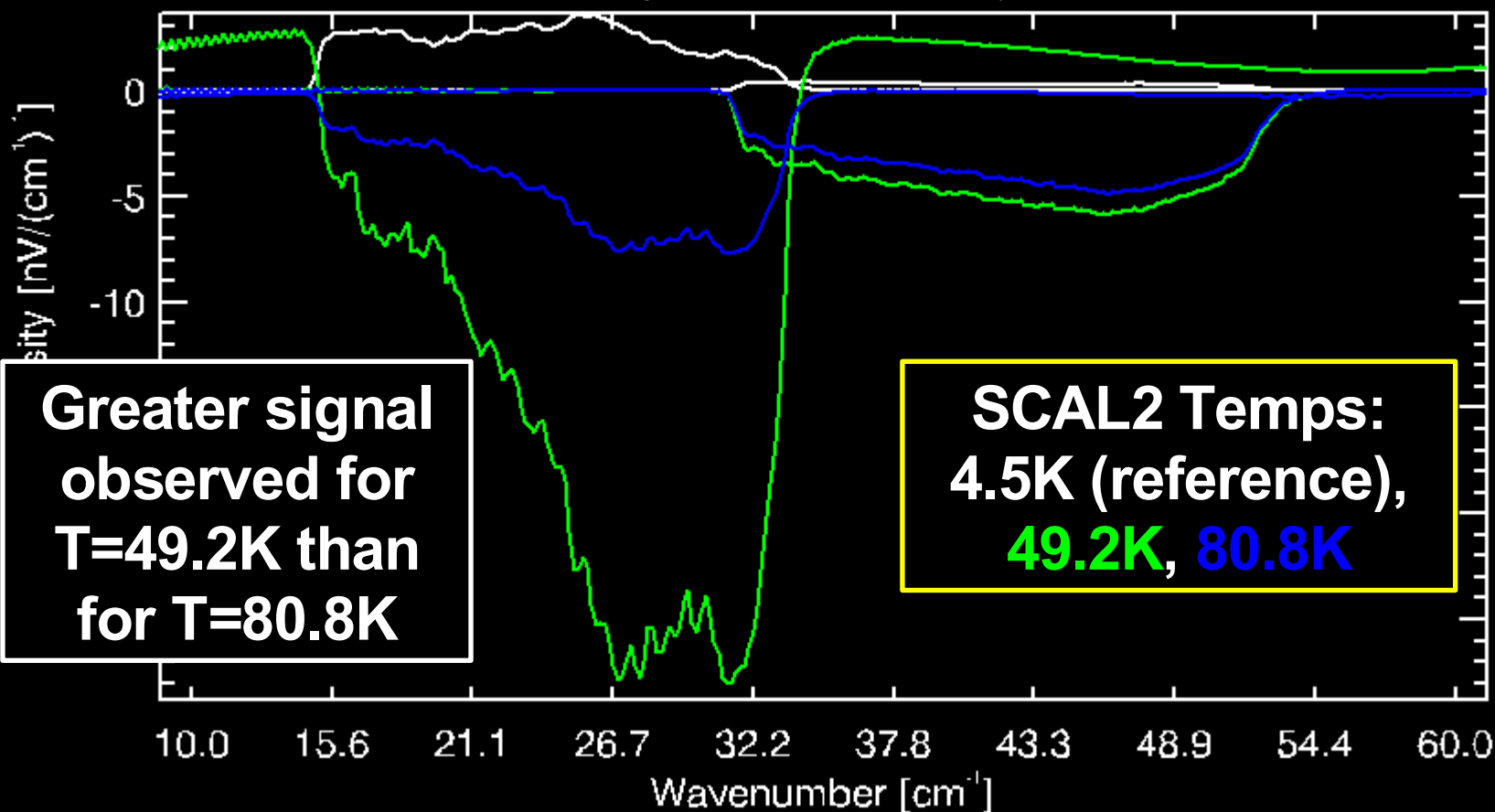


Transmission

- For the CBB port, the various ratios agree with one another (except for $T=10.9\text{K}$ SLW due to saturation).
- A similar analysis was undertaken for the SCAL port. The reference observation was $\text{SCAL2}=4.5\text{K}$ and the “hot” observations were $\text{SCAL2}=49.2\text{K}$ and 80.8K . In each case, $\text{CBB}\sim 6.3\text{K}$.

Transmission

(SLWA2/SSWD1)



Transmission

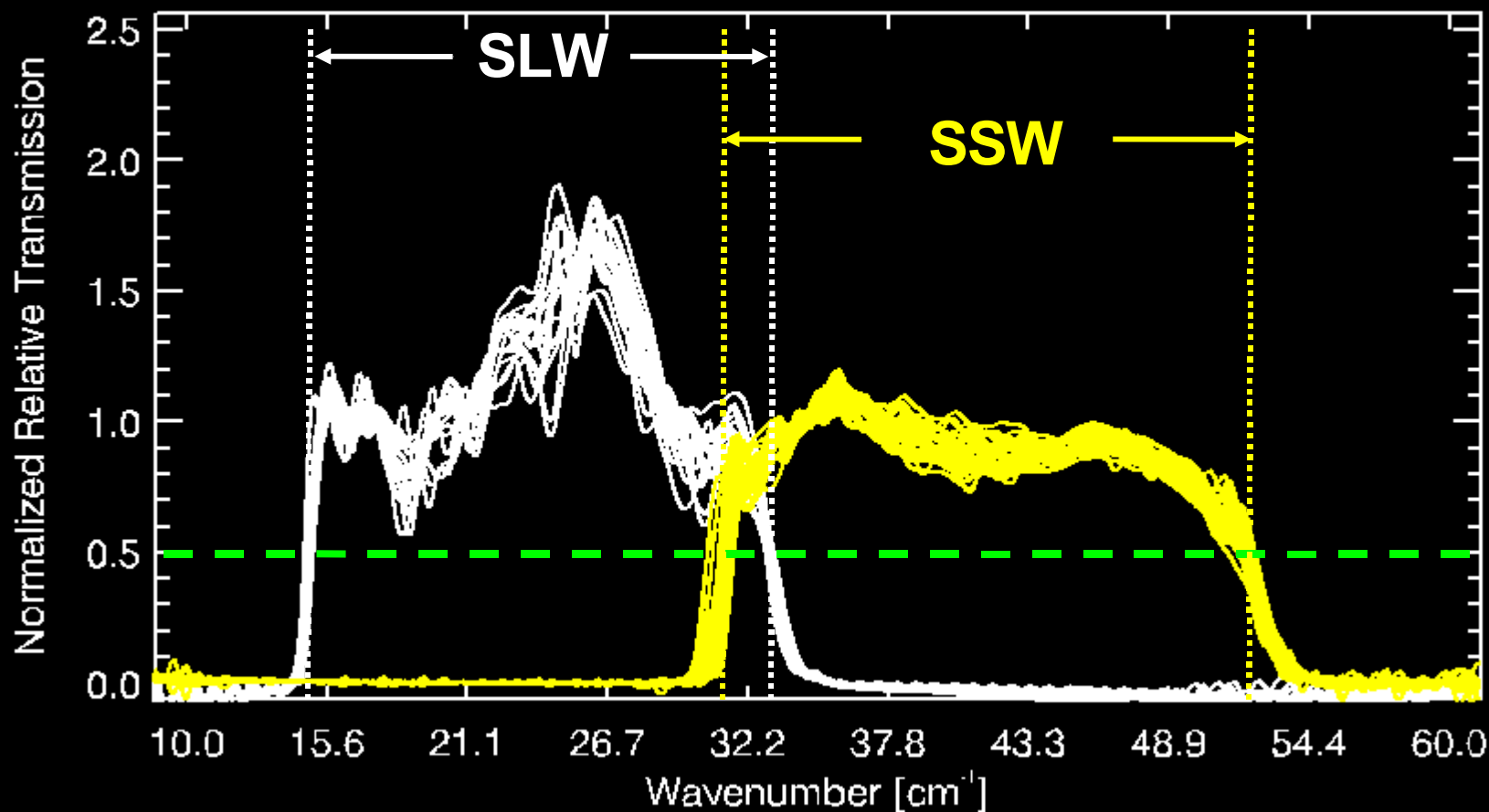
- The observed signal was greater for the lower SCAL2 temperature.
- Need to resolve this detector signal conversion error before PFM3 transmission analysis can be completed for the SCAL port.

Spectrometer Bands

- Techniques similar to those in the transmission analysis were used to remove the input source from the data, leaving only the relative detector response.
- The relative detector response of each was then normalized to one in the single mode region:
 - SLW at 17cm^{-1}
 - SSW at 34.5cm^{-1}
- From these normalized response curves, the band-edges were defined as the points where the spectral response was equal to 0.5 (50%).

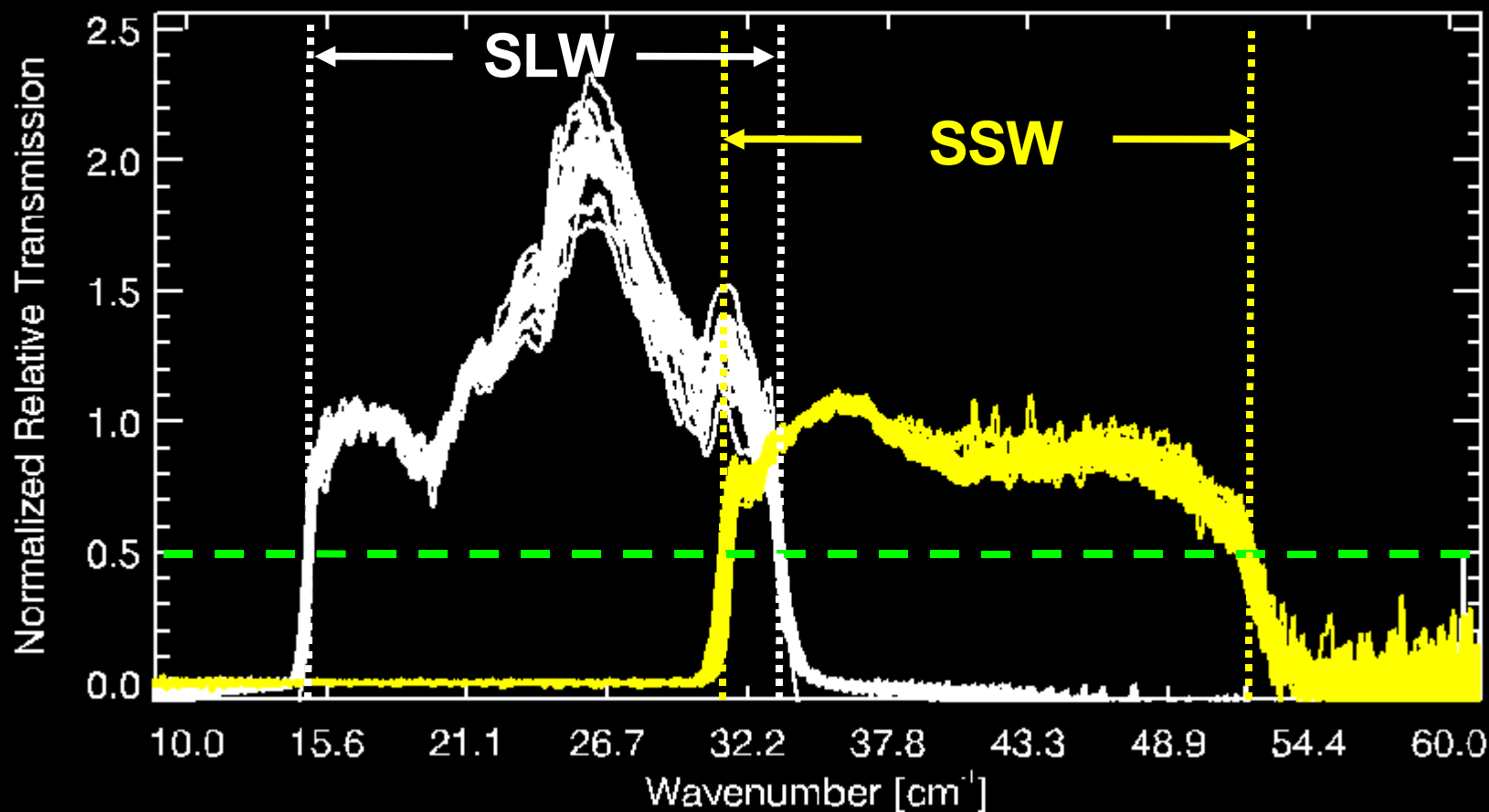
Spectrometer Bands

PFM1



Spectrometer Bands

PFM3



Spectrometer Bands

	SLW		SSW	
	Cut on [cm ⁻¹]	Cut off [cm ⁻¹]	Cut on [cm ⁻¹]	Cut off [cm ⁻¹]
Specs	14.64 – 15.02	33.00 – 33.67	30.40 – 31.15	52.08 – 53.19
PFM1	14.905 ± .099	33.068 ± .096	31.32 ± .28	51.99 ± .24
PFM3	14.899 ± .091	33.525 ± .096	31.37 ± .17	51.98 ± .20

Band edge changed from PFM1 to PFM3

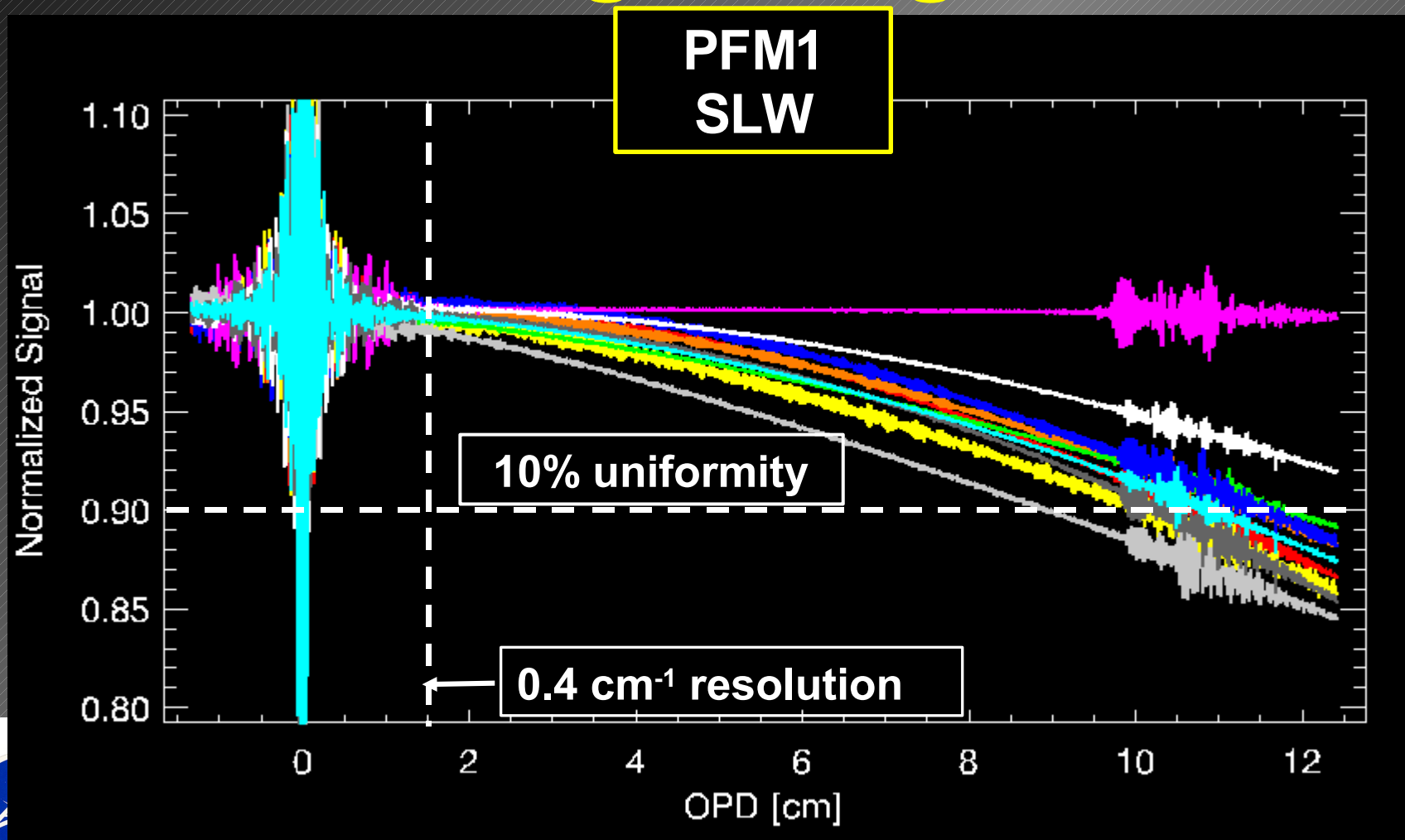
Spectrometer Bands

- The only change observed between PFM1 and PFM3 spectral band edges was the cut-off edge for SLW (PFM3 edge @ 33.5cm^{-1} , PFM1 edge @ 33.0cm^{-1}).
- Analysis shows that spectral band edges meet specs for all but SSW cut-on edge.
- Nevertheless, a $\sim 2\text{cm}^{-1}$ overlap between the bands was observed.

Vignetting

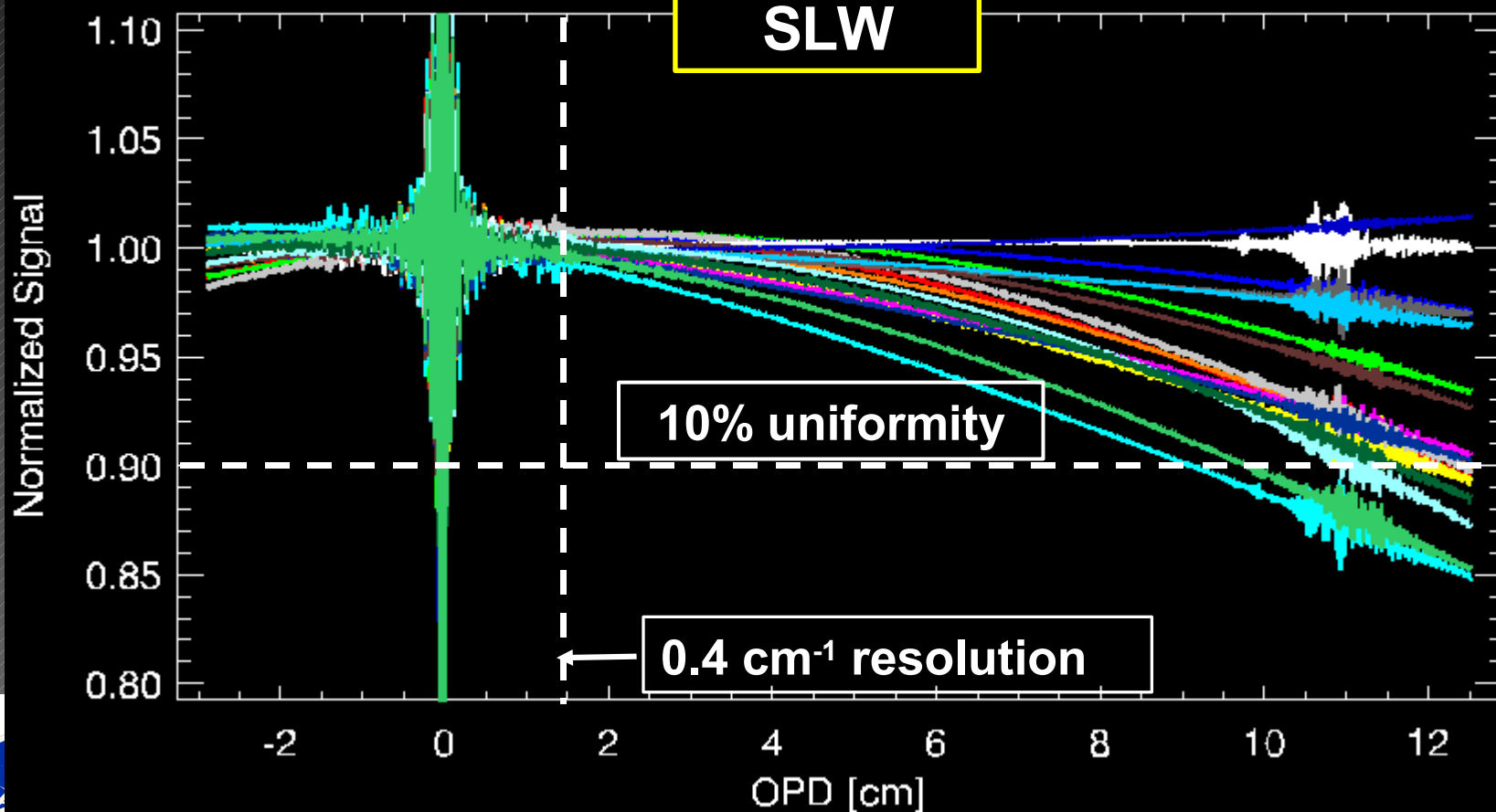
- Vignetting is the loss of incident power as a function of optical path difference.
- Observed as a deviation in the baseline of the interferogram as OPD increases.
- Requirement:
 - $<10\%$ uniformity for $R = 0.4\text{cm}^{-1}$.
- The following slides show the vignetting for most pixels* of SLW and SSW for PFM1 and PFM3.
(*Some of the pixels are not shown for clarity)

Vignetting

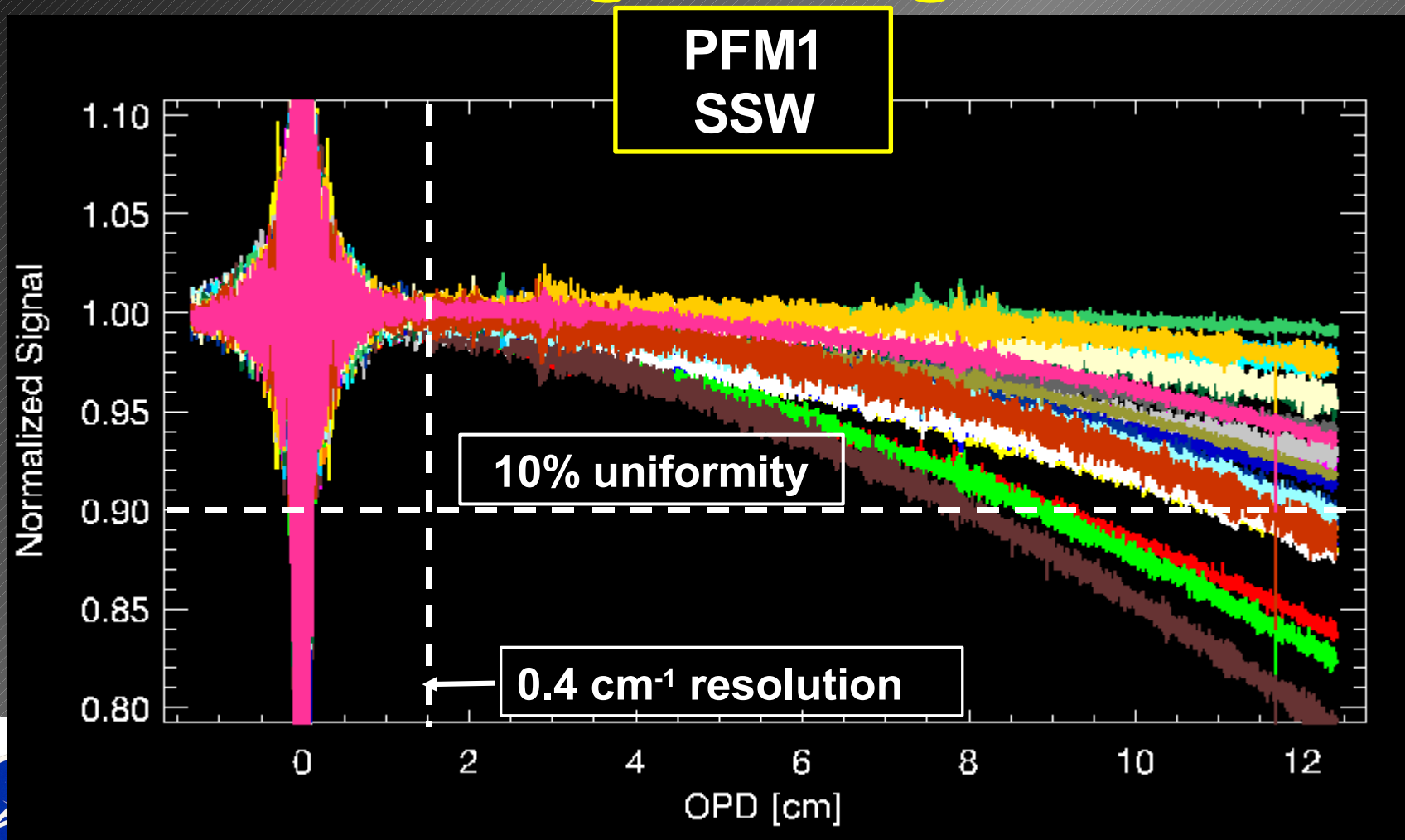


Vignetting

PFM3
SLW

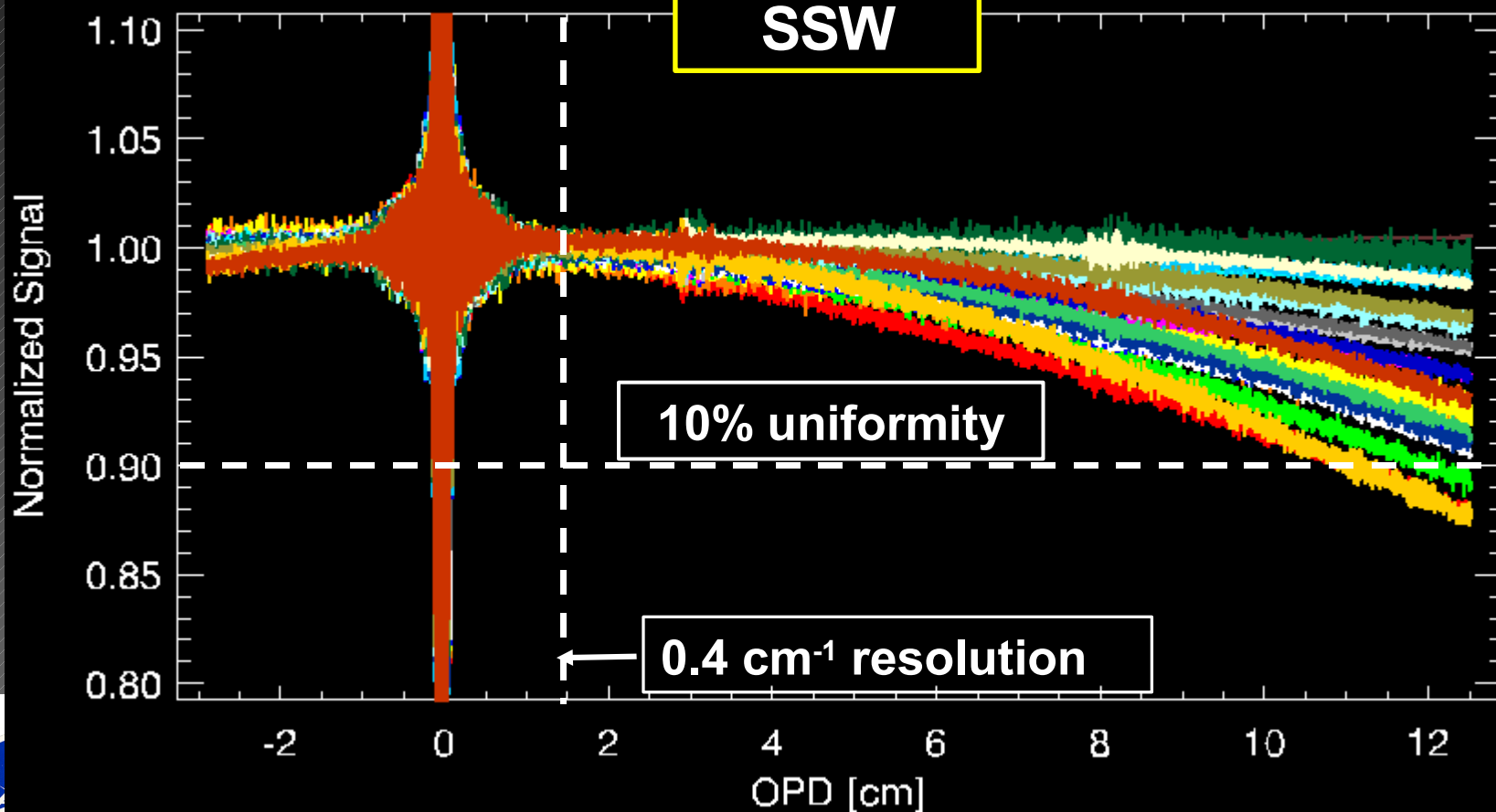


Vignetting



Vignetting

PFM3
SSW



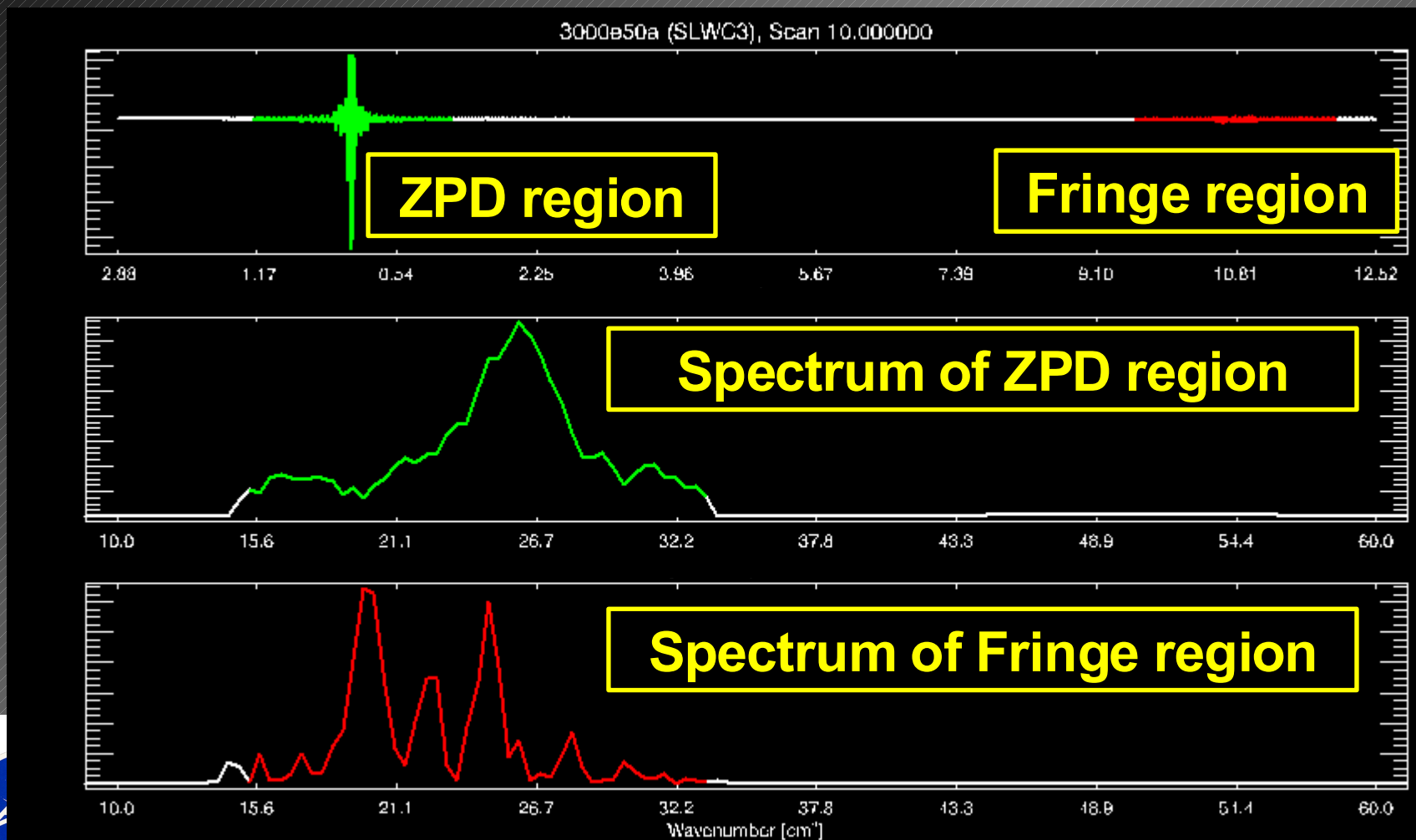
Vignetting

- Similar results for PFM3 to those observed for PFM1.
- Observed vignetting is well within the requirements at a spectral resolution of 0.4cm^{-1} .
- The uniformity requirements are nearly met even at the maximum spectral resolution ($R = 0.04\text{cm}^{-1}$) even for the outermost pixels.

Channel Fringes

- The integrated in-band spectral power was determined for spectra derived from both the ZPD region and the fringe region.
 - Fringe region:**
 - **SLW: 10.2 cm OPD**
 - **SSW: 7.8 cm OPD**
- The ratio of the integrated fringe power to the integrated ZPD power was used as a metric for the channel fringes and allowed a comparison to be drawn between PFM1 and PFM3.

Channel Fringes



Channel Fringes

PFM1

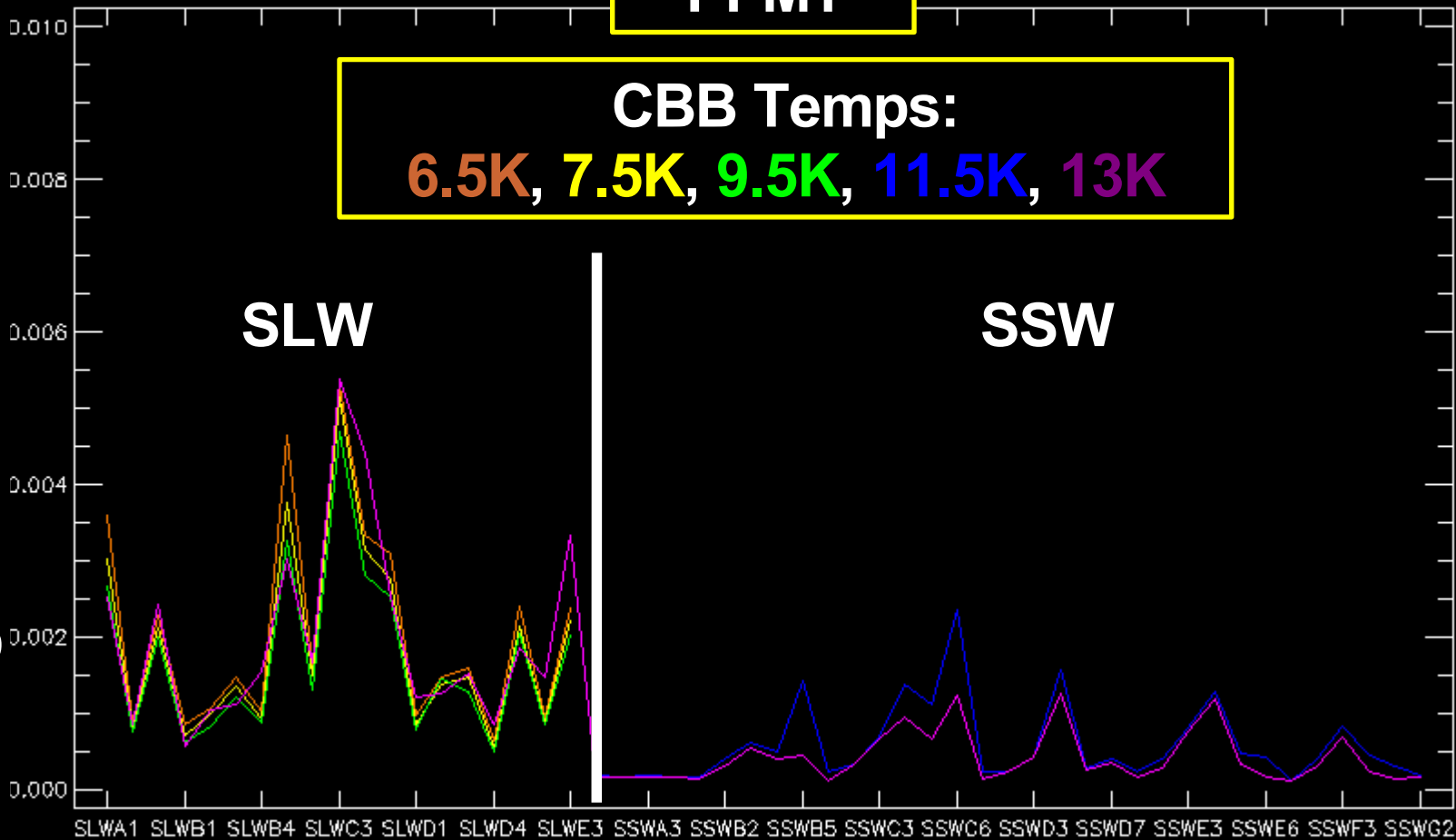
CBB Temps:

6.5K, 7.5K, 9.5K, 11.5K, 13K

Fringe Power/ZPD Power

SLW

SSW



Channel Fringes

PFM3

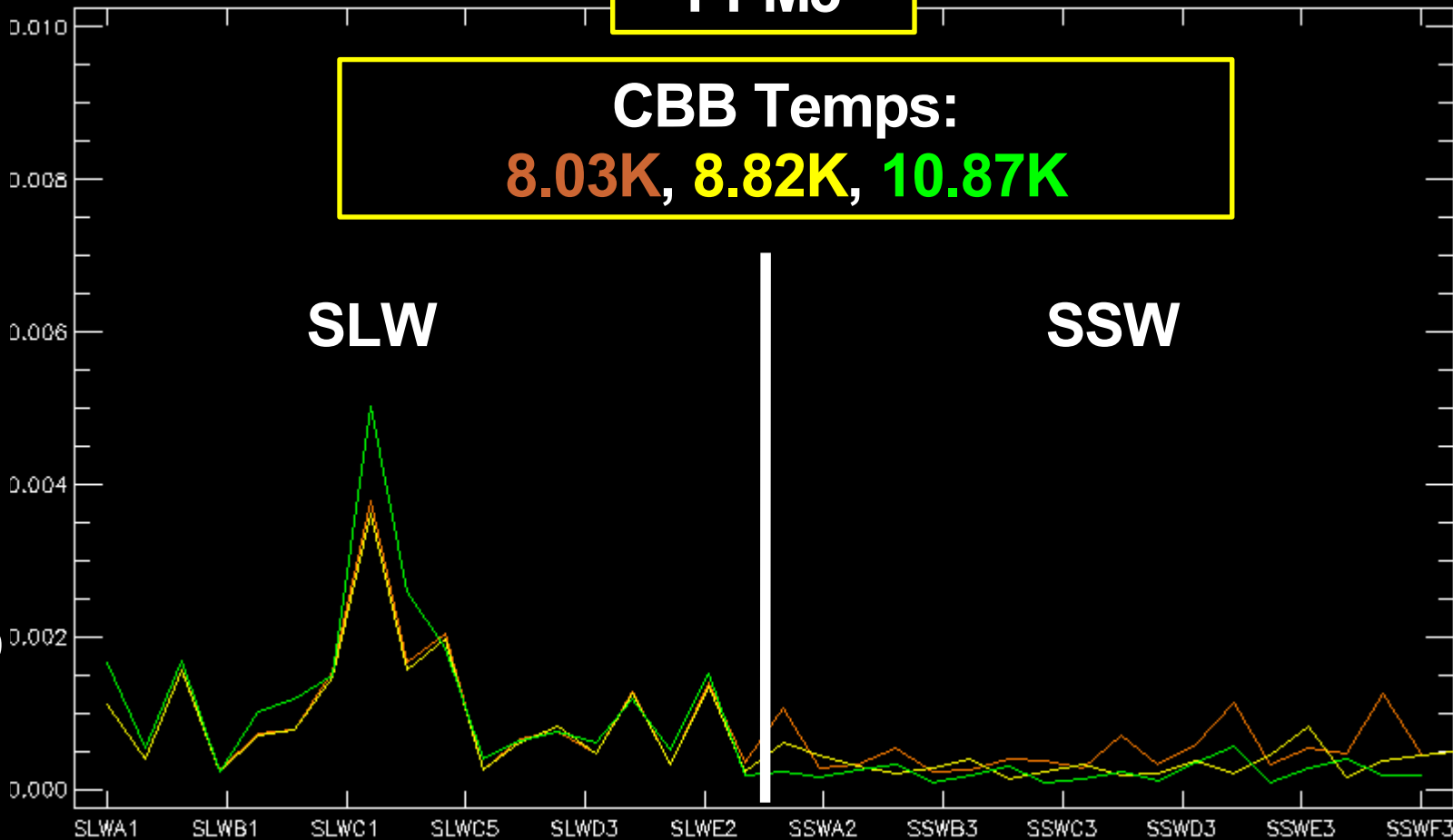
CBB Temps:

8.03K, 8.82K, 10.87K

Fringe Power/ZPD Power

SLW

SSW



Pixel Name

Channel Fringes

- The overlapping curves in the preceding plots show that fringe amplitude is related to input signal.
- PFM3 shows a slight decrease in fringe power for SSW pixels, as well as for SLW pixels with the exception of the central pixel (SLWC3).
- Were the lenses changed for both BDAs?

Future Work

- Complete transmission analysis and compare PFM3 with PFM1.
- Spectral resolution.
- Modulation efficiency using mixer data.