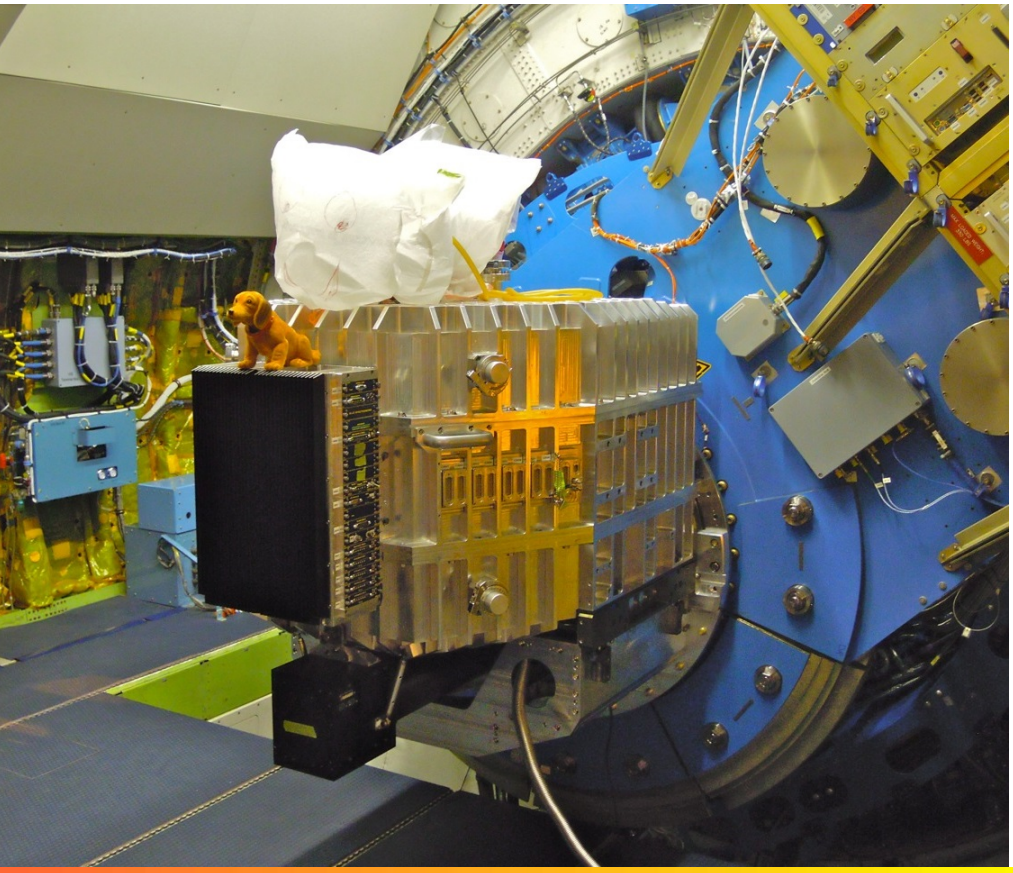

FIFI-LS

Improvement Options

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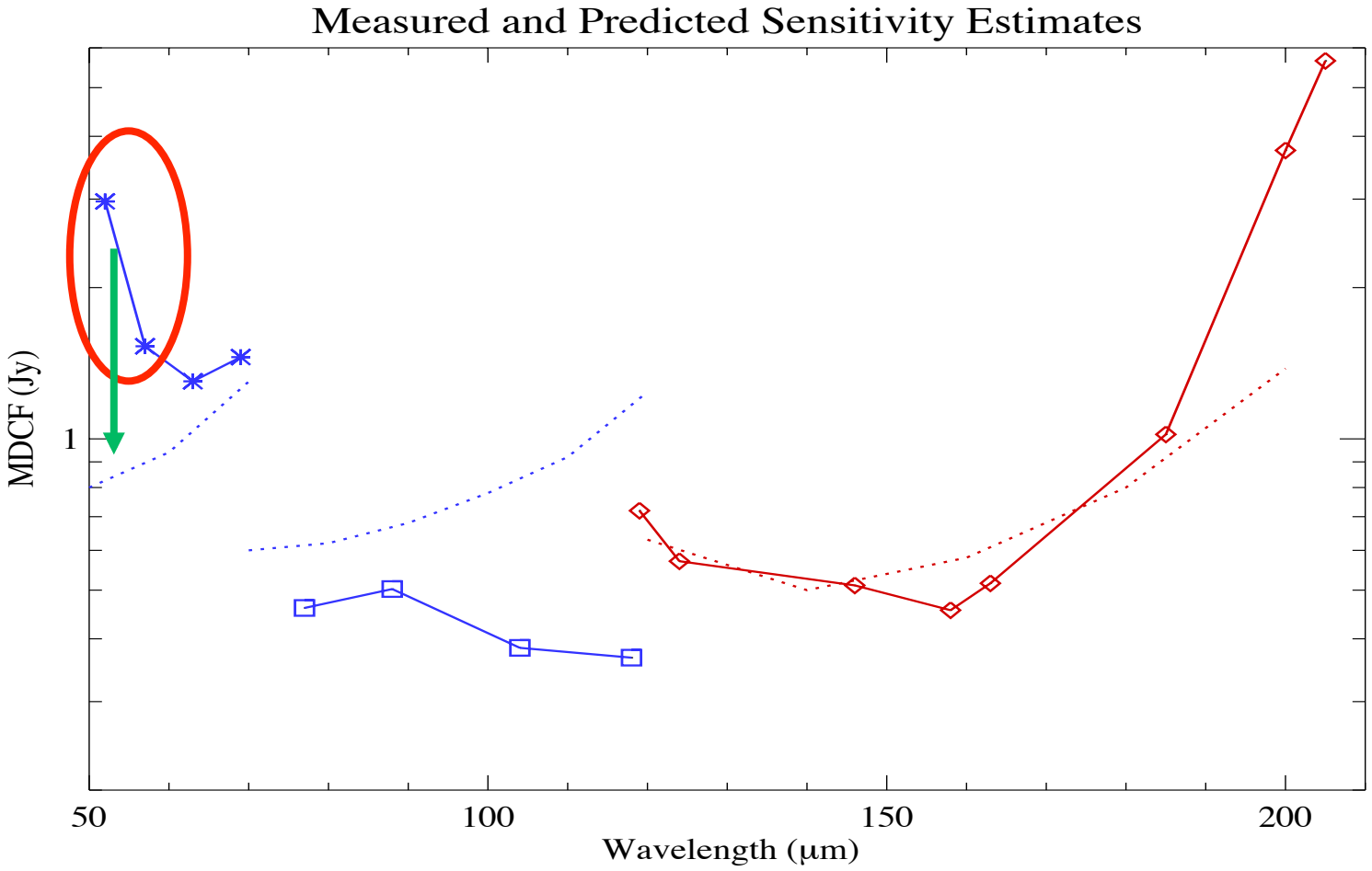
Agenda

- Where are we?
- Where do we want to be?
- How can we get there?
- Conclusions

Where are we:

- FIFI-LS has successfully completed 40 flights
- The instrument runs stable: >95% reliability, value increasing
- Sensitivity → at or better than original estimates for almost all wavelengths
- Spectral Resolution compared to original estimates →
  - 65%-100% in the red channel (~115 μm to ~203 μm)
  - 65%-85% in the blue channel 1st Order (~71μm to ~115μm)
  - 55%-70% in the blue channel 2nd Order (~50μm to ~71 μm)

Where do we want to be: Sensitivity



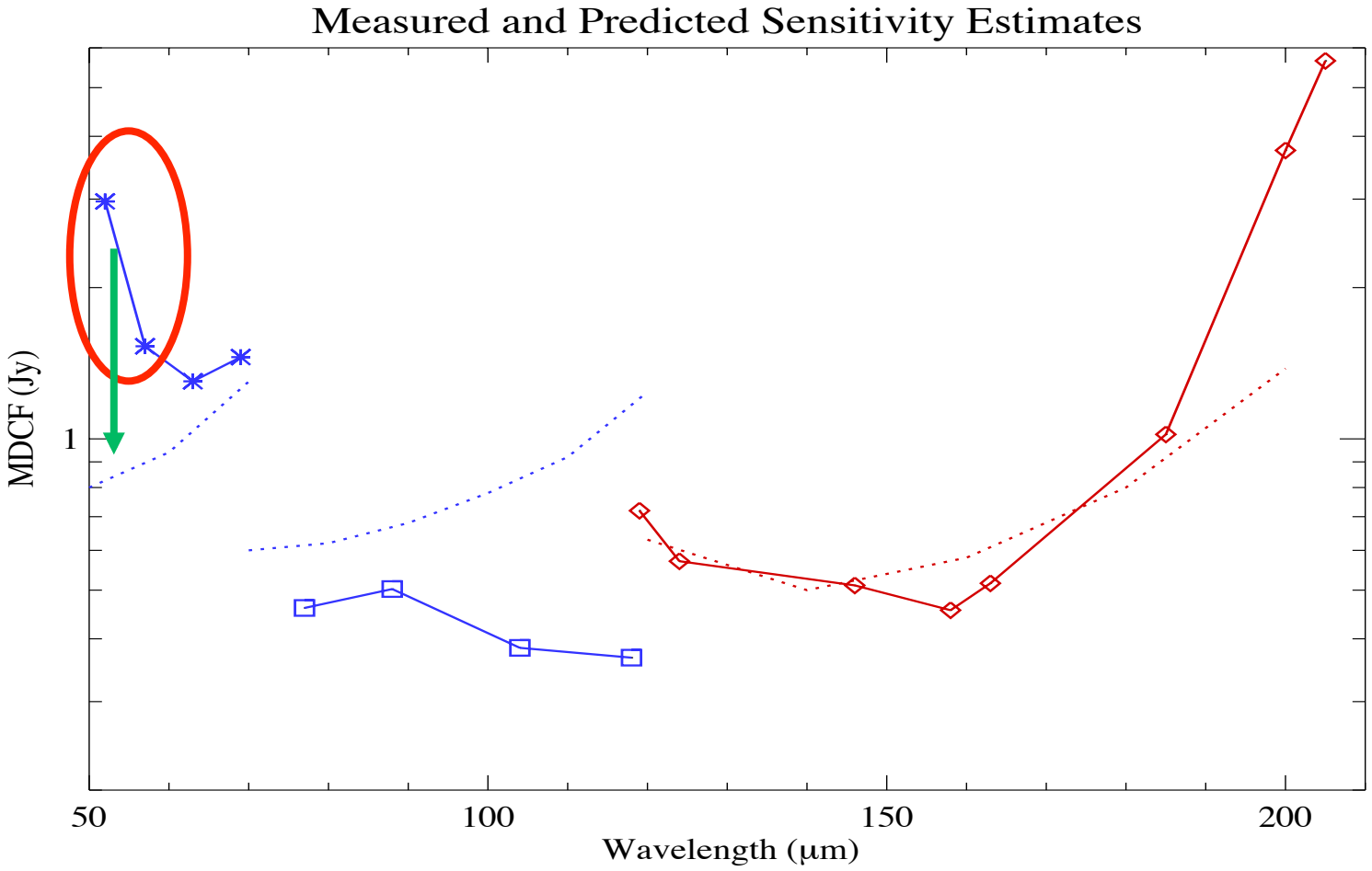
Klein R. , Fischer C.

Scaled to 4σ in 900s. That is a factor of 4/√(900*4) = 0.067. @158μm -> 0.47Jy

Where do we want to be: Spectral Resolution

Colditz S. in prep.

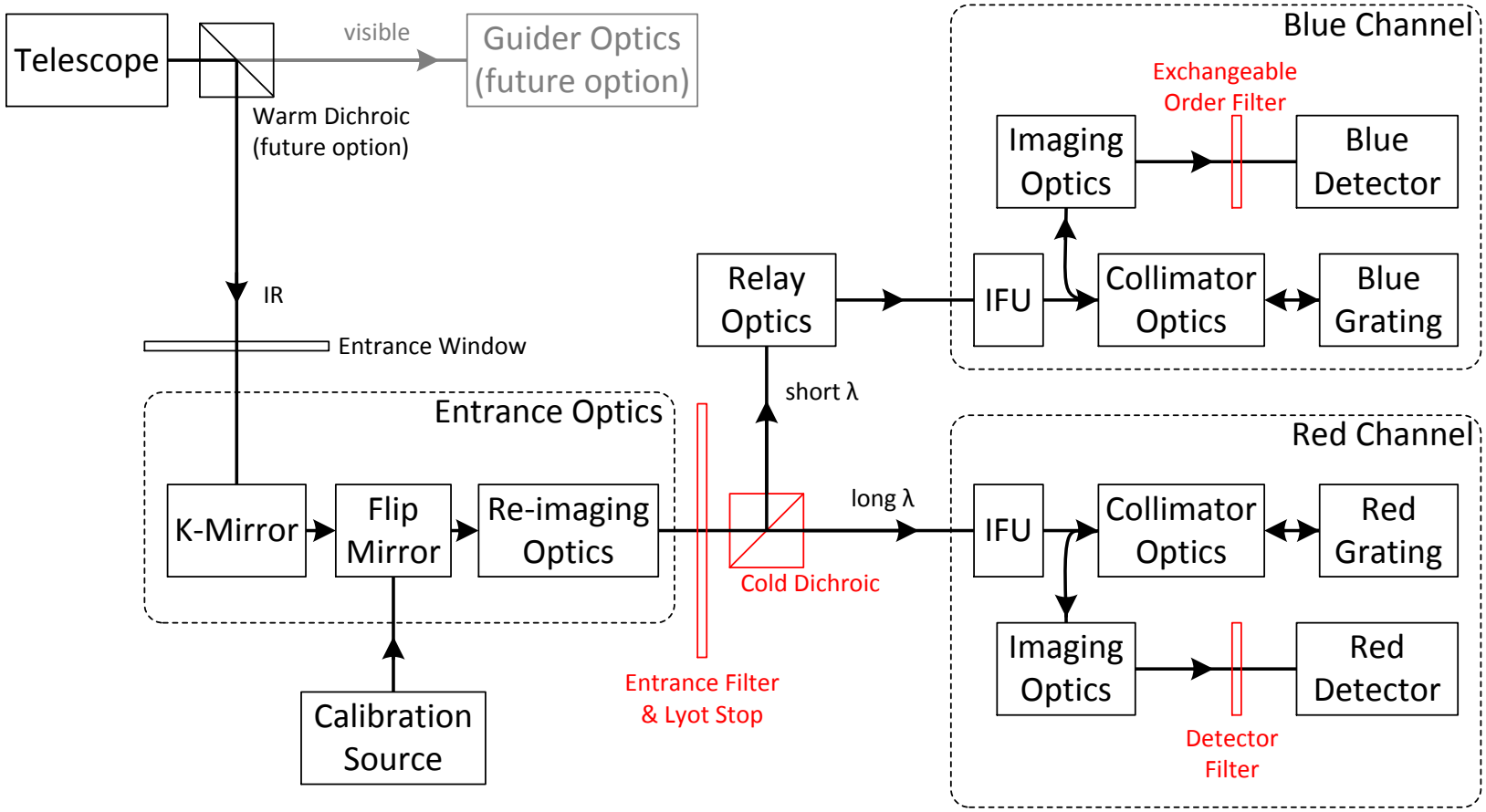
How can we get there: Sensitivity



Klein R. , Fischer C.

How can we get there: Sensitivity

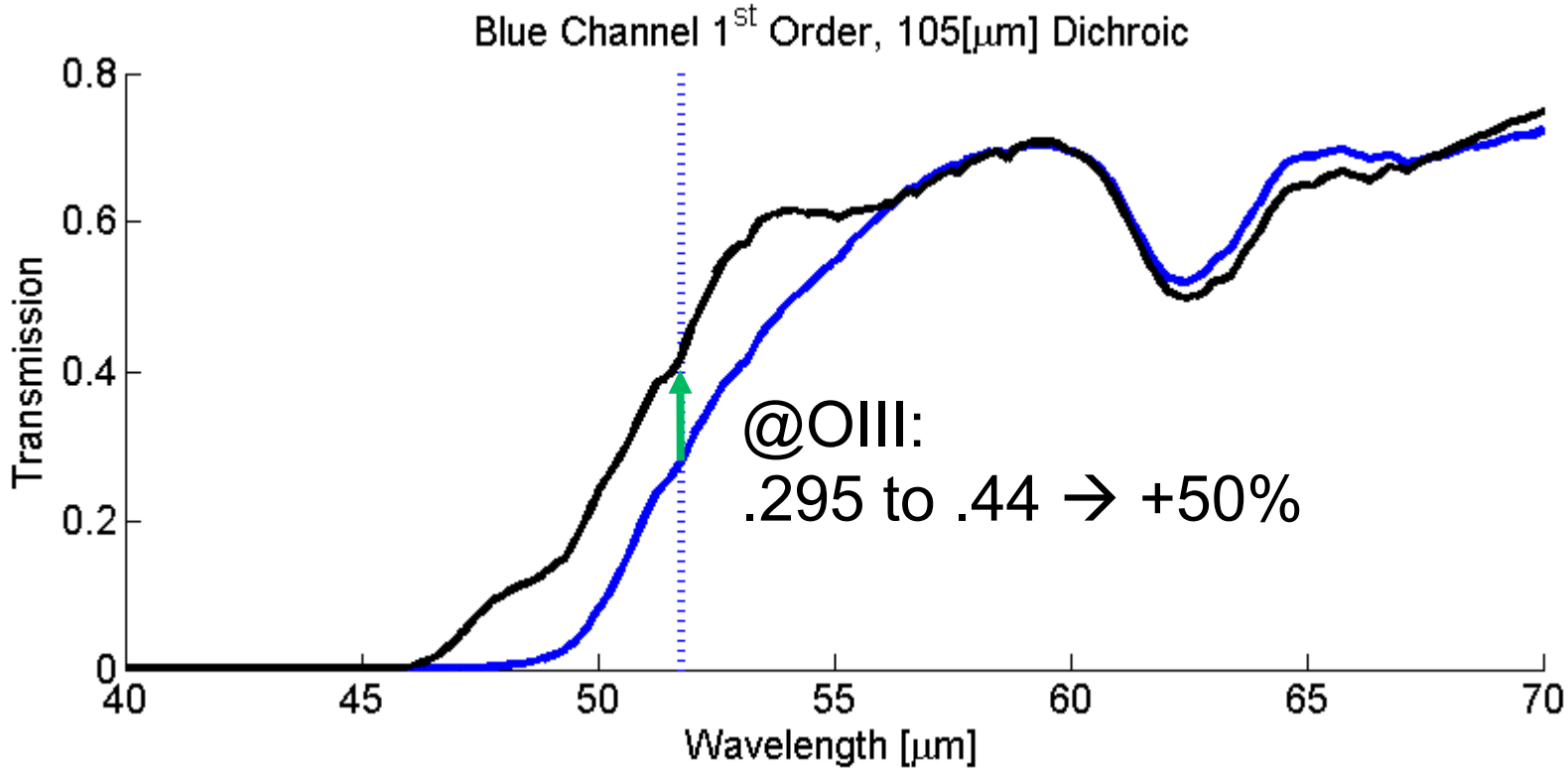
- PACS entrance filter installed in FIFI-LS → cutoff @ ~51.5µm



- Should be replaced → But how?

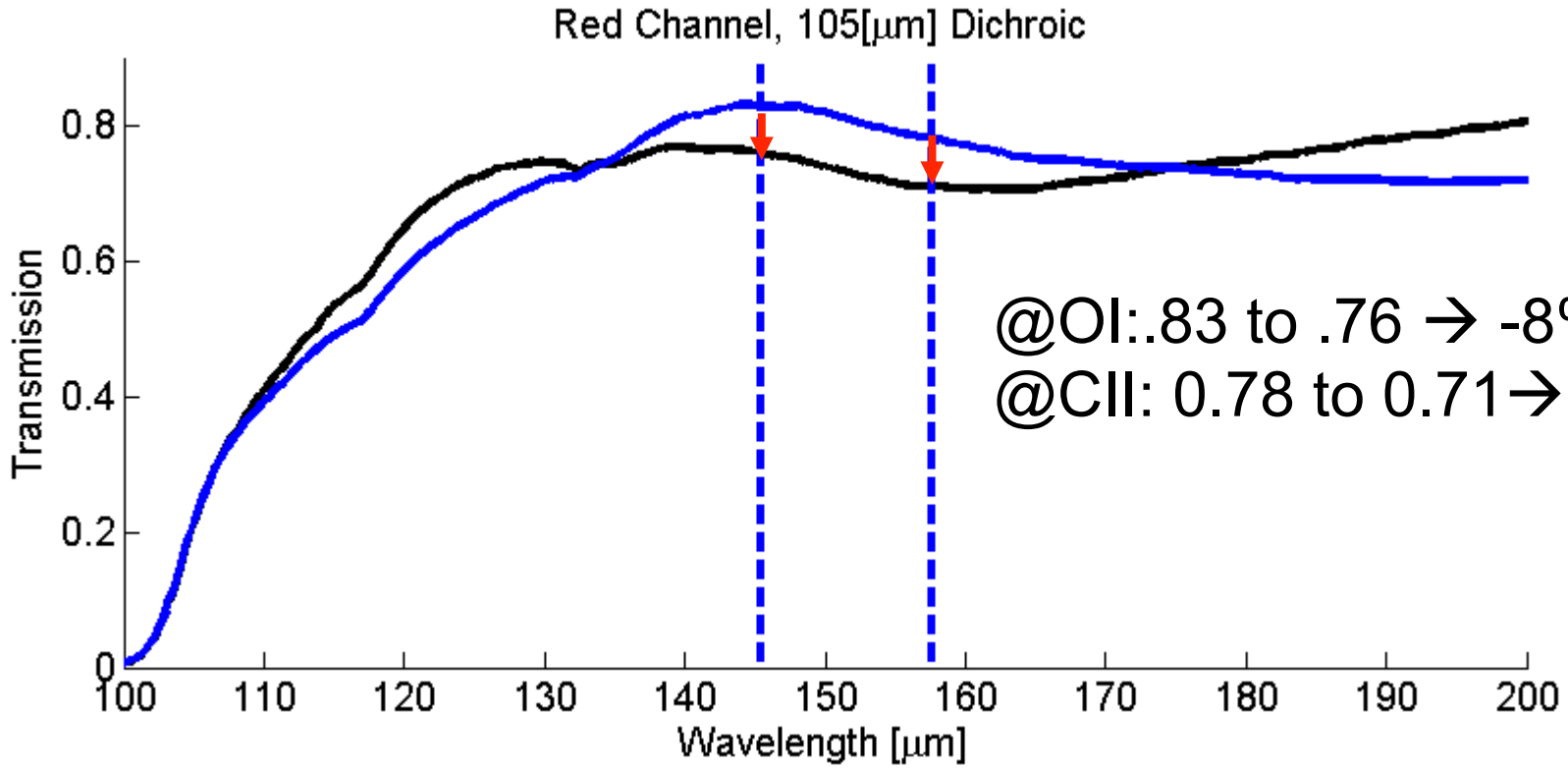
Filter Options 1: Small Solution

- Replace entrance filter with a filter like the blue 2nd order filter (47.5µm)



Filter Options 1: Small Solution

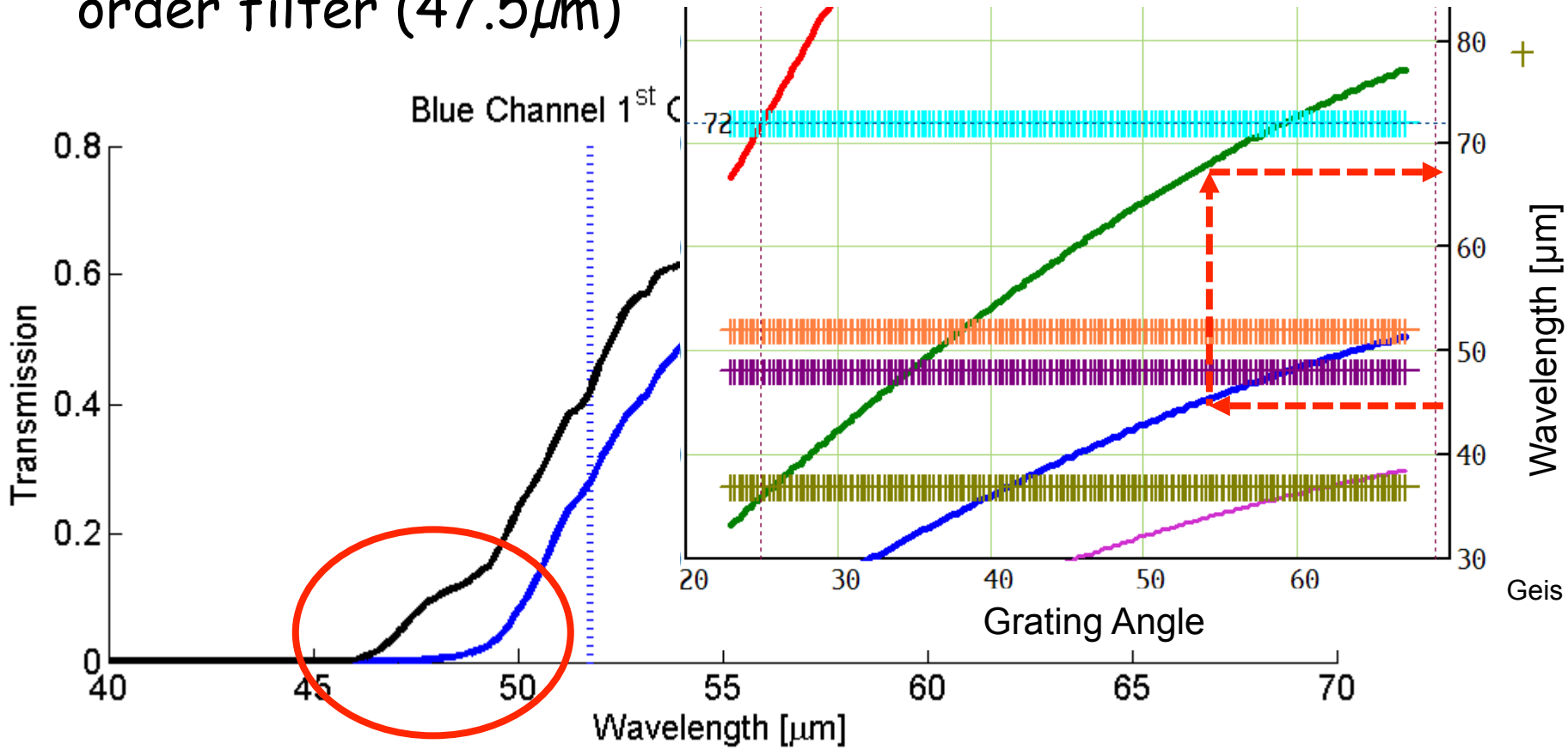
- Replace entrance filter with a filter like the blue 2nd order filter (47.5µm)



@OI:.83 to .76 → -8%
@CII: 0.78 to 0.71→ -9%

Filter Options 1: Small Solution

- Replace entrance filter with a filter like the blue 2nd order filter (47.5µm)



Geis N.

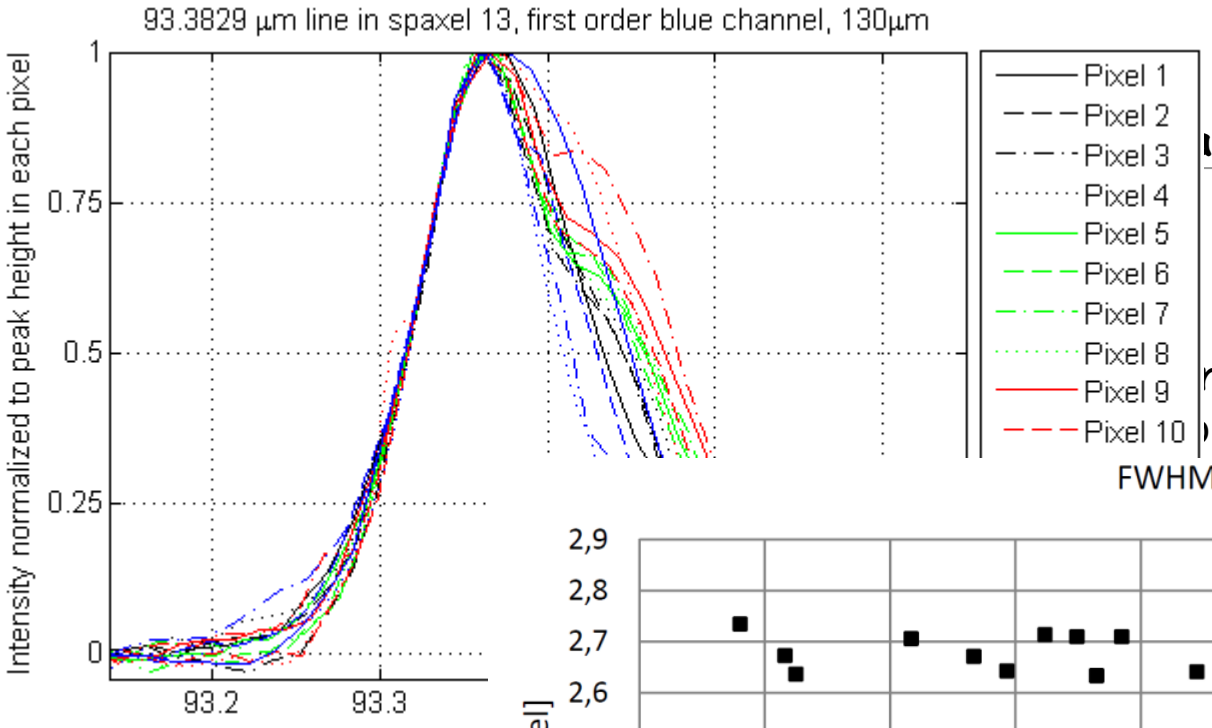
Filter Options 1: Small Solution

- Replace Entrance Filter with a Filter like the 2nd Blue Order Filter (47.5µm)
- 50% Increased Transmission @ OIII 52µm
- 10% Decreased Transmission @ CII 158µm
- 10% Decreased Transmission @ OI 145µm
- Third order Spill @ 68µm to 71µm

Filter Options 2: Big Solution

- Replace Entrance Filter with a new Filter with cutoff @ ~40µm
- 75% Increased Transmission @ OIII 52µm
- ~0% change @ CII 158µm
- 11% Decreased Transmission @ OI 145µm
- Third order Spill @ 65µm to 71µm
- Possibility to add a 3rd Order in the blue channel from ~45-50µm with resolutions of R ~1500 to ~3000

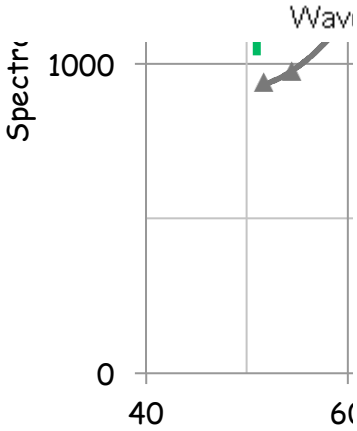
How can we get there: Spectral Resolution

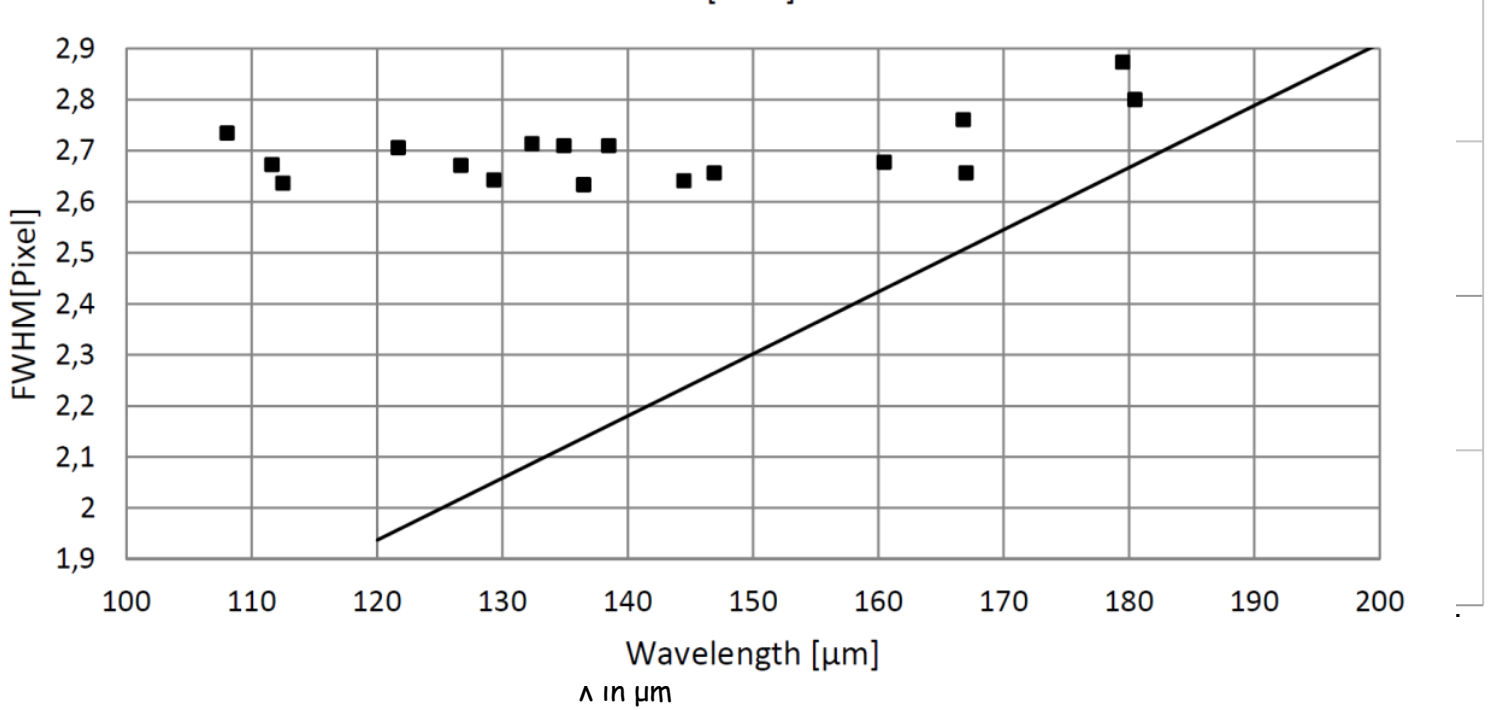


ıtion vs. Lab Results

nal Estimate

Data





How can we get there: Spectral Resolution

- Blue channel line spread function warped
- Red channel LSF is constant in pixel space

→ Need to look for reasons in the optical setup

- Zemax simulations will be performed
- Optics will be aligned or redesigned according to findings

Conclusion

- FIFI-LS works nicely and has already taken numerous nice measurements
- There is always potential for improvement
- The sensitivity of the instrument @ the important OIII line will be improved significantly in the near future using new filters
- There is potential to increase the spectral resolution and ways to achieve these increases are currently investigated