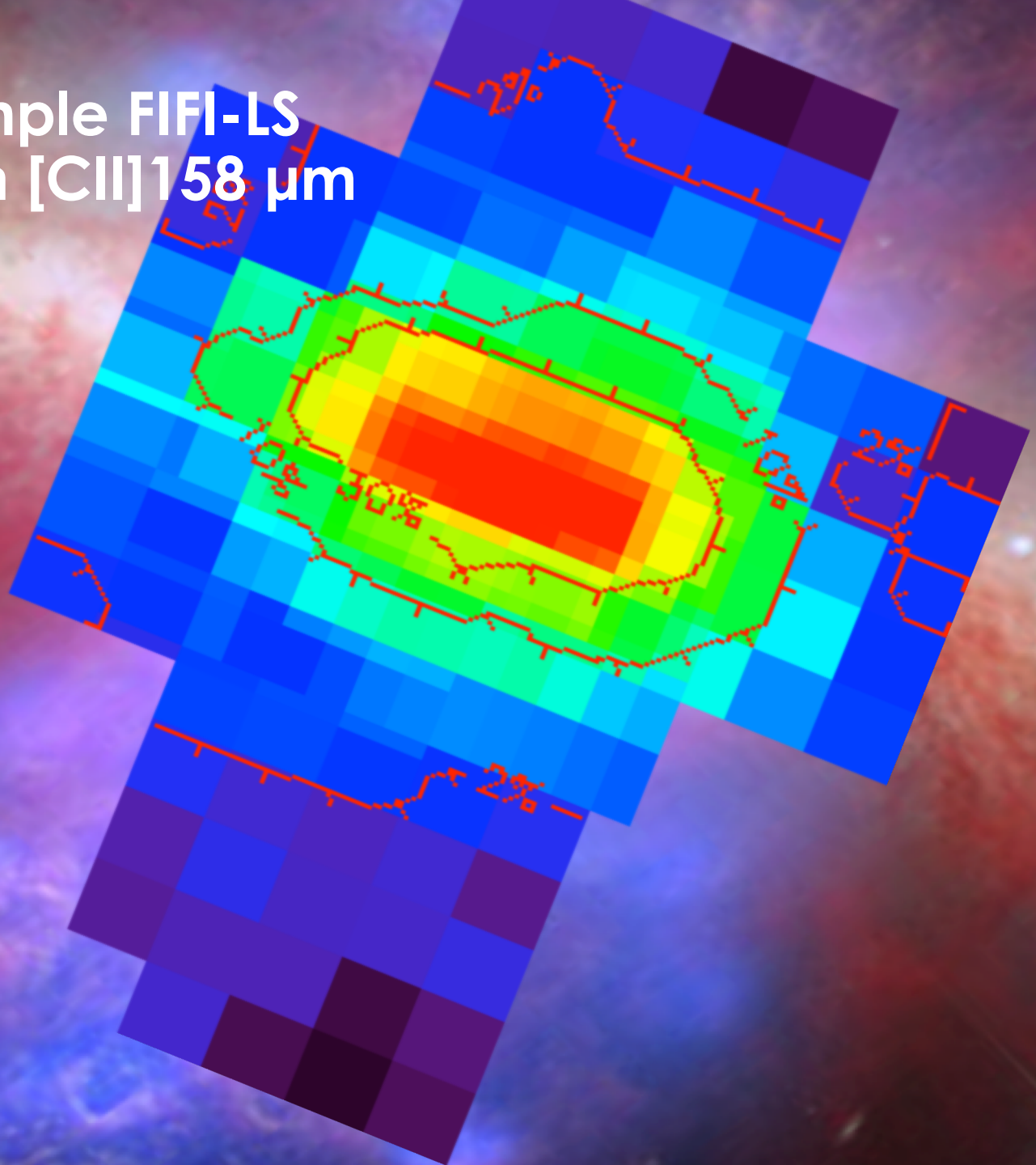


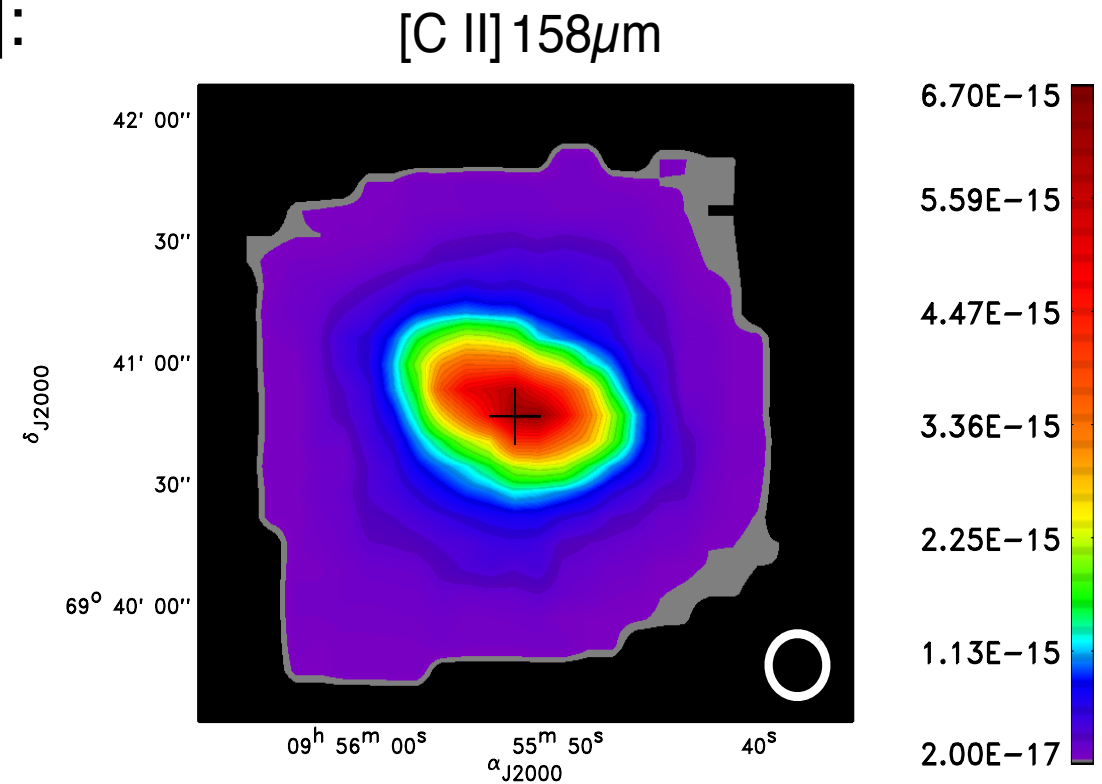
Observing Example FIFI-LS  
Mapping M82 in [CII]158  $\mu\text{m}$



Randolf Klein  
August 2019

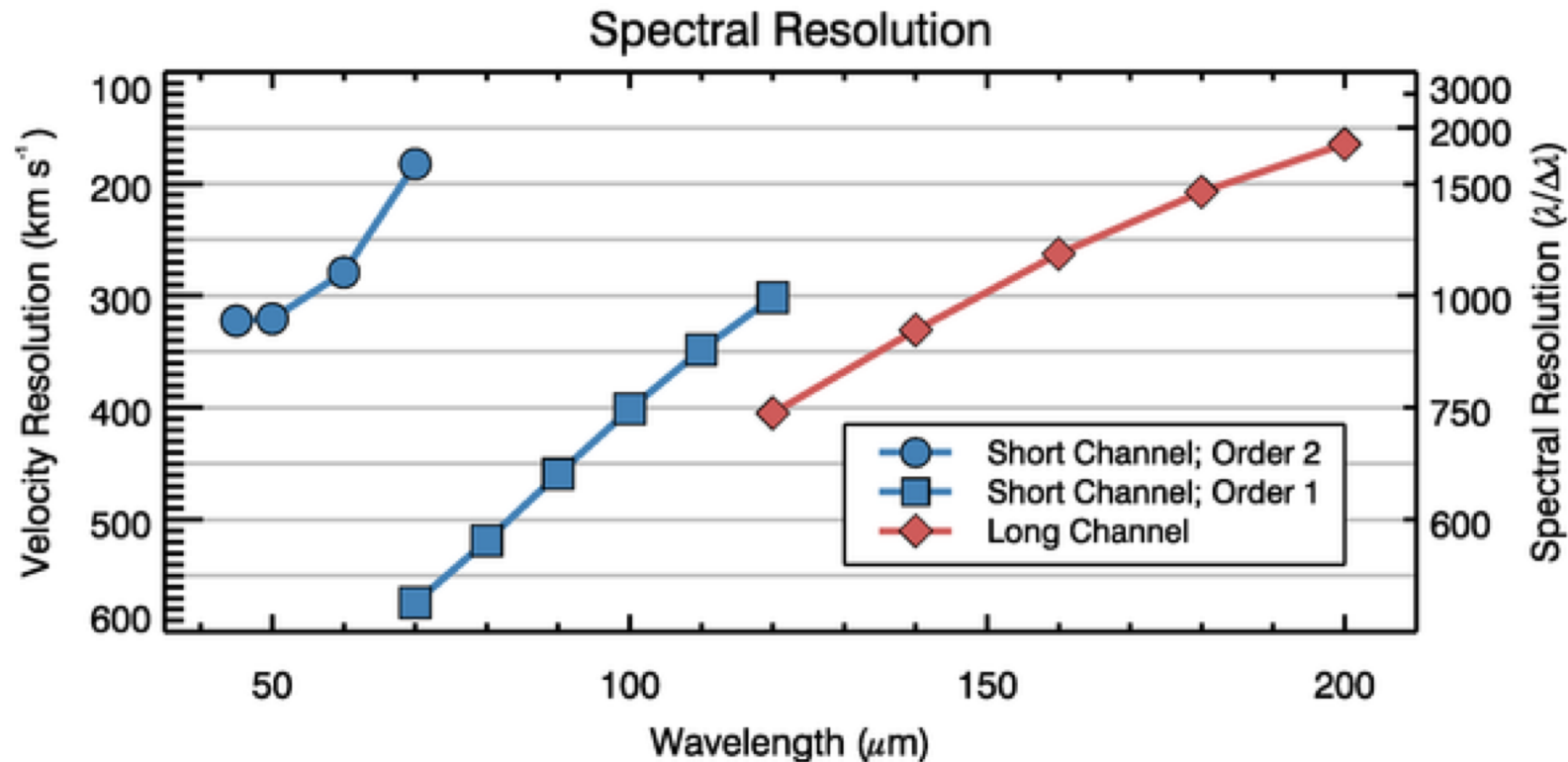
# Flux Estimates

- Expected flux e.g. from KAO, ISO, or Herschel observations
- From Herschel PACS-S: Central 2'x2' with PACS-S  
[Contursi et al. A&A 549, A118 \(2013\)](#)
- Expected integrated line flux for [CII]:  
 $\sim 2 \times 10^{-17}$  W/m<sup>2</sup> per PACS-S spaxel in outer regions
- PACS-S spaxel is 9.7"x9.7"
- FIFI-LS red spaxel:  
12"x12" -> 1.5 times larger
- Expected flux per FIFI-LS spaxel:  $3 \times 10^{-17}$  W/m<sup>2</sup>
- Linewidth: up to 400km/s
- Centroid shift up to 250km/s



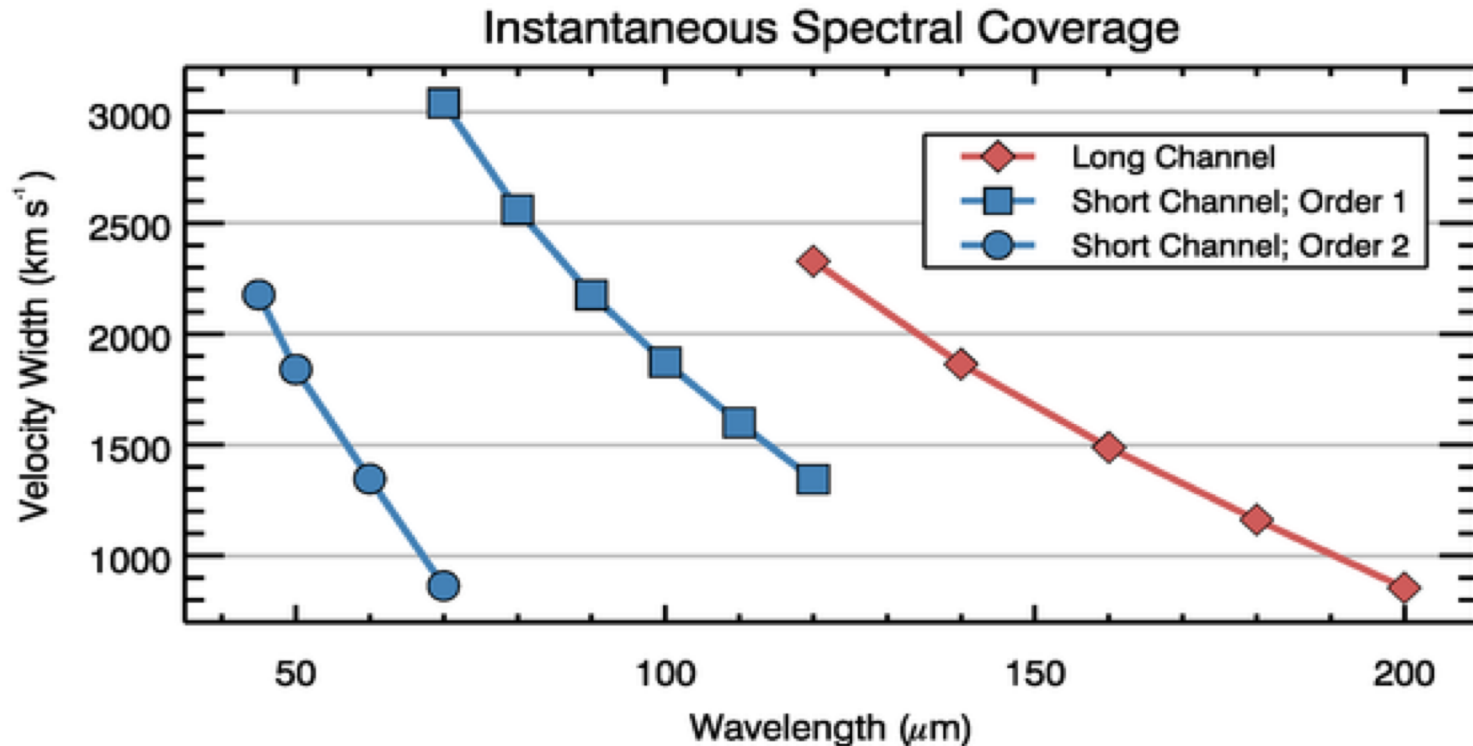
# Width of Line and Spectrum

- FIFI-LS [SITE](#): input for Bandwidth = width of spectrum required
- Compare expected line width to [spectral resolution](#)
- 400km/s vs 260km/s spectral resolution for [CII]



# Time estimates

- If the bandwidth is set to 0 you'll get the minimum bandwidth – [instantaneous spectral coverage](#) For [CII]: 1560km/s
- Width + shifts + baseline =  $(400 + 250 + 2 \times 400) \text{ km/s} = 1450$



# Time Estimate

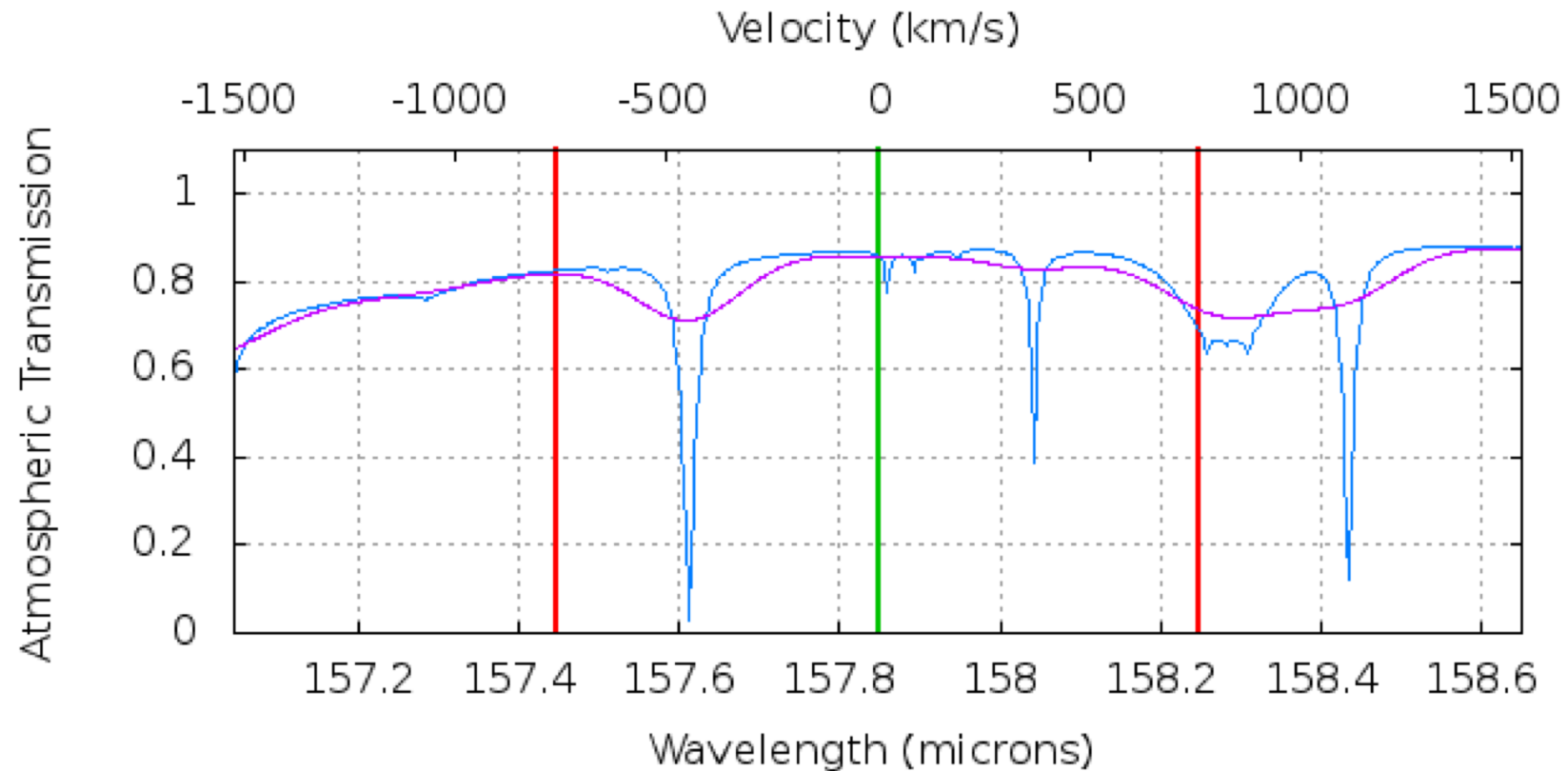
Use [SITE](#) to estimate on-source exposure time

- Wavelength: 157.741 (Sources for wavelength e.g. [Splatalogue](#))
- Bandwidth: 0km/s (instantaneous coverage was sufficient here)
- Observer Velocity can be ignored typically
- SNR: 5
- Source Flux:  $3e-17$  W/m<sup>2</sup>
- Source Velocity: 203km/s (e.g. NED)
- Use default Observing Conditions

Calculate

# Time Estimate

- Result 16min on-source integration time per position!
- 20min if bandwidth is increased to 2000km/s



# Create Phase I AORs in USPOT

Only entries with stars are required!

- Consider overlap of different sized FOVs:  
30"x30" grid leads to a 4x overlap for the red array.  
→  $16/4\text{min} = 4\text{min}$  per raster point for [CII] on-source
- 30sec on-source per cycle times 8 cycle → 4min per raster point
- Total time with overhead: Observation Est... 5772 sec = 1.6h
- 3x3, 30"x30" grid:
  - 1'x1' full coverage – 16min,
  - 4 fields 1'x30" – 8min
  - 4 fields 30"x30" – 4min
- The larger the map the smaller the edge effects
- Detailed mapping strategies including dither → Phase II

# What about the second line?

In the blue channel: 4min per point at [OIII]52 $\mu$ m

Use SITE: sensitivity of  $3 \times 10^{-17}$ W/m<sup>2</sup> per FIFI-LS spaxel

