Specsim
An IFU Spectrometer Simulator

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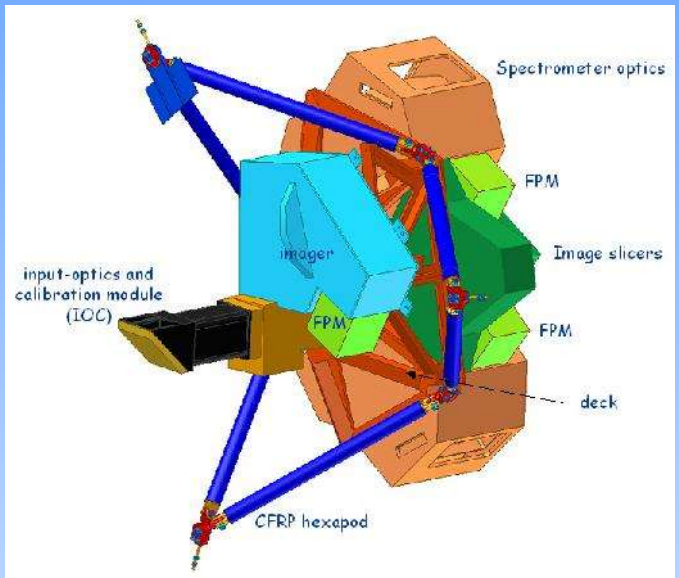
JWST-MIRI MRS

- Launch in 2013
- Positioned at L2
- 4 instruments on board

JWST-MIRI MRS



- Collaborative project between
  - Consortium of 21 institutes under ESA
  - NASA
- Imager, coronograph, lopw-resolution spectrometer, IFU medium resolution spectrometer

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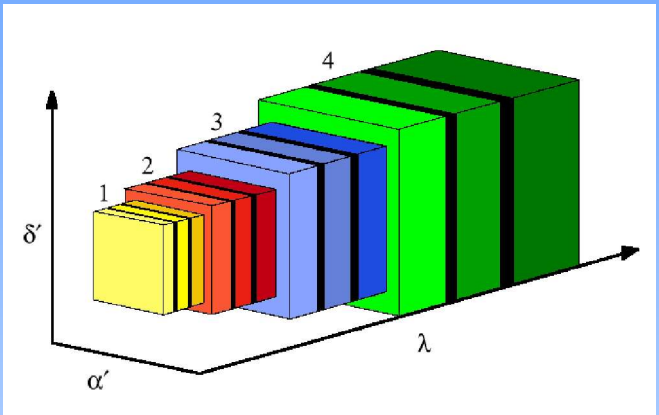
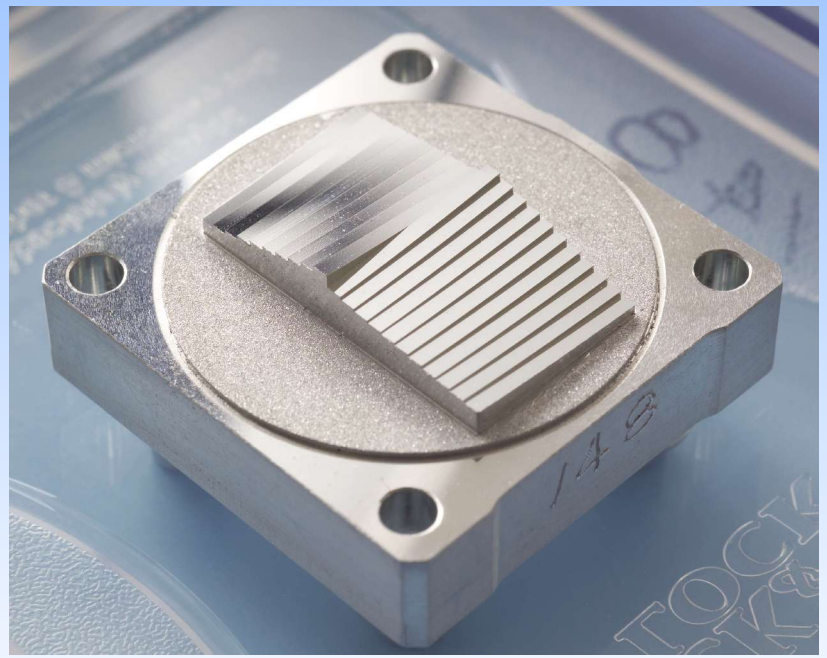
JWST-MIRI MRS



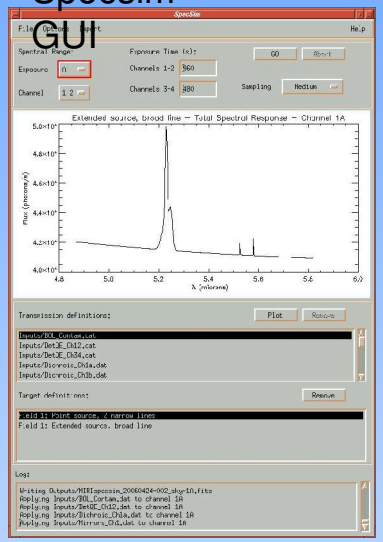
- 4 spectral channels (5 – 28 microns)
- FoV 3.70x3.70arcsec – 7.74x7.93 arcsec
- Spectral resolution ~3000

- One IFU slicer per channel
- All channels are observed simmultaneously
- Dichroic filters divide each IFU channel into 3 sub-bands
- Data from pairs of channels are captured on two 1024x1024 pixel detectors
- Expected sensitivity 1.21e-20 Wm^-2, 6.4microns, 5.610e-20 W^m-2 at 22.5 microns



Specsim: Modelling the Field of View

Specsim GUI



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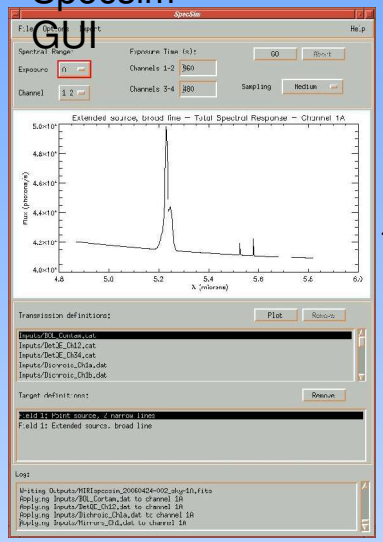
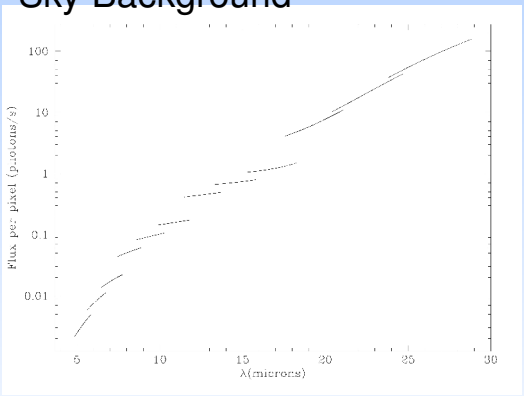


Sky Background



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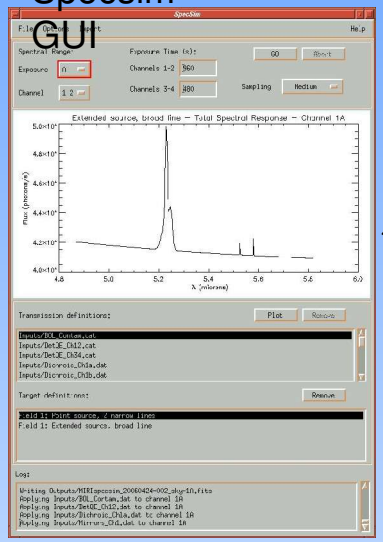
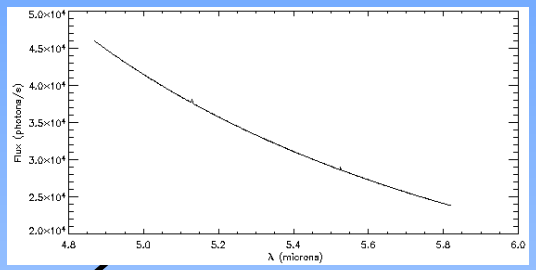
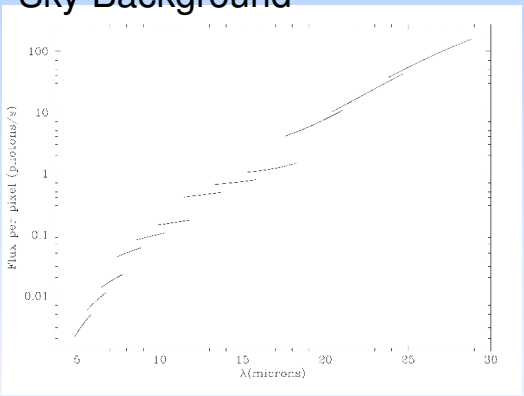




Targets

Sky Background



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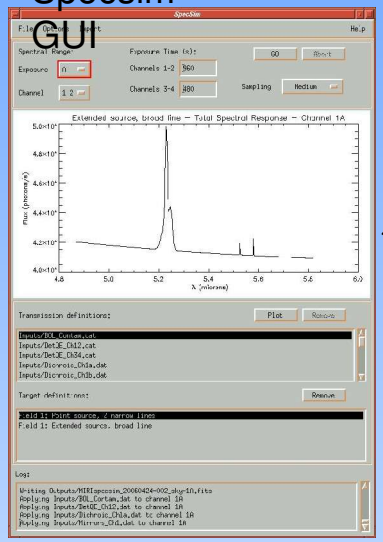

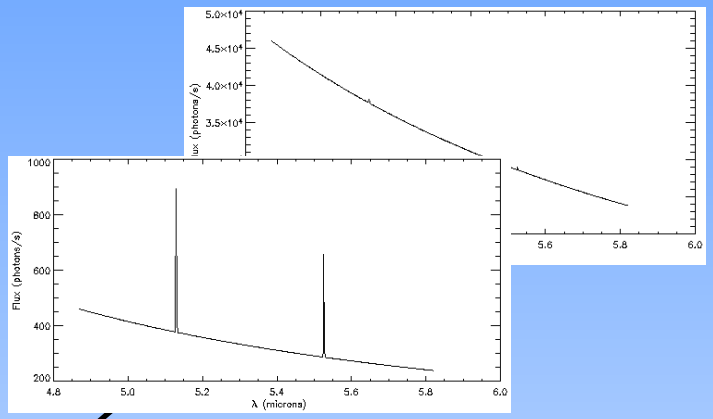

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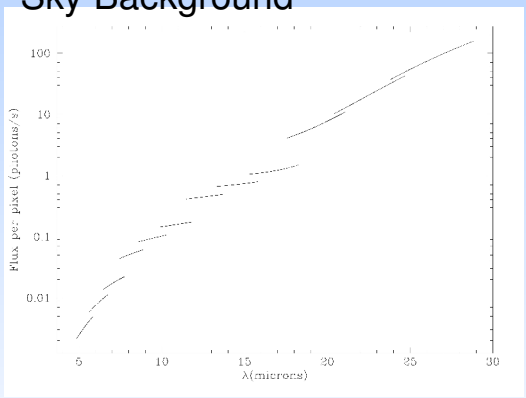
Sky Background



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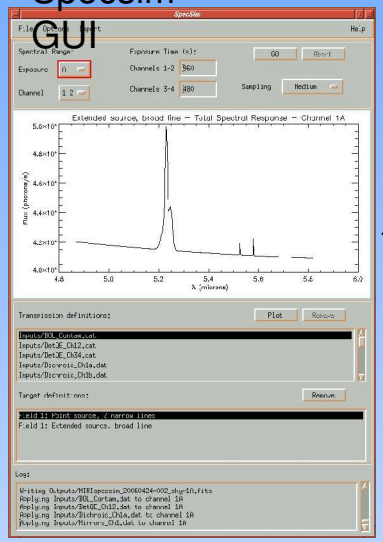

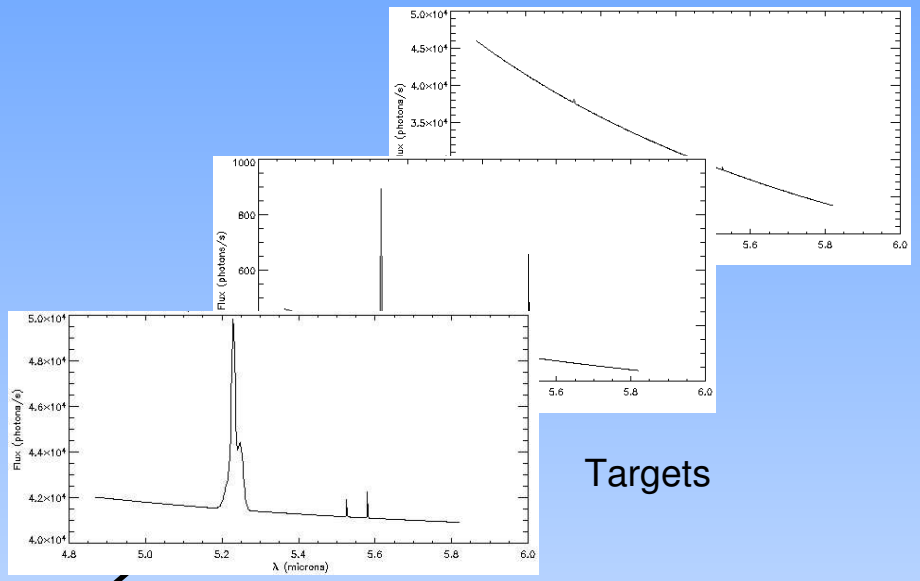

Targets

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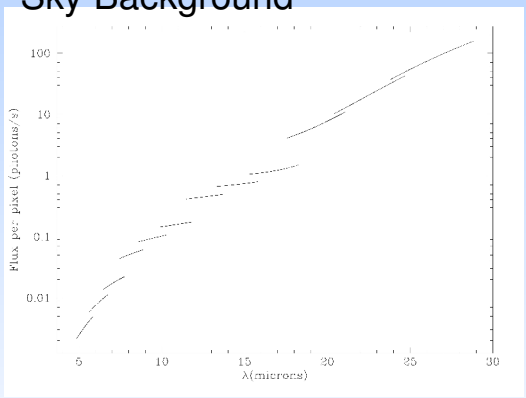

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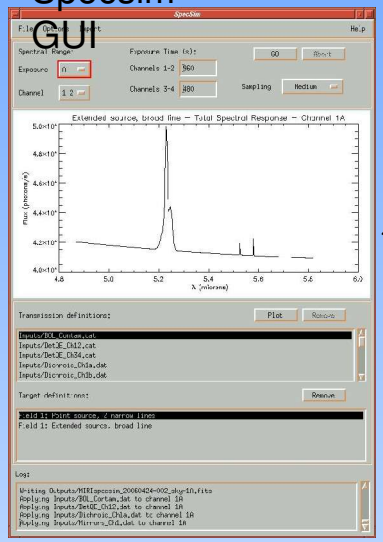

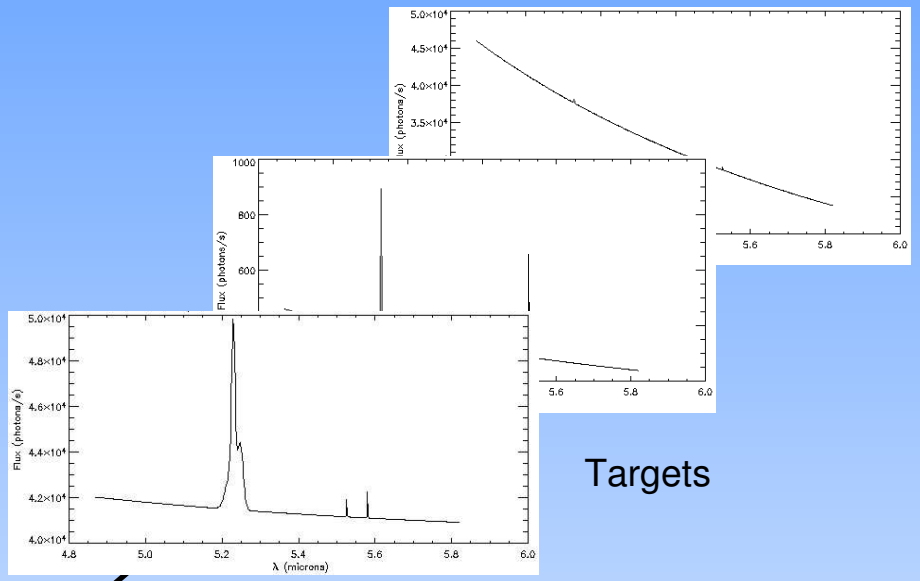

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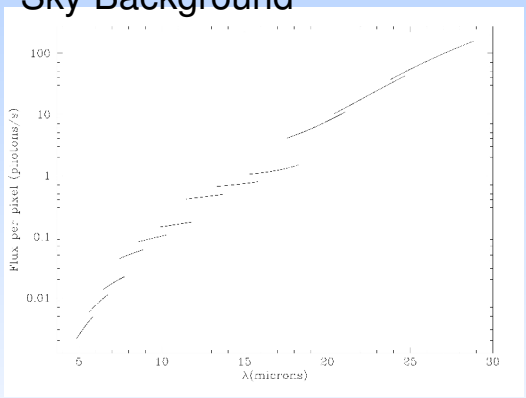
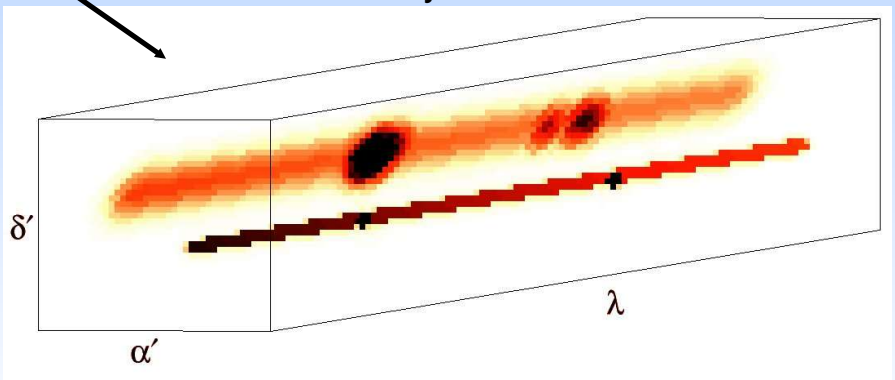
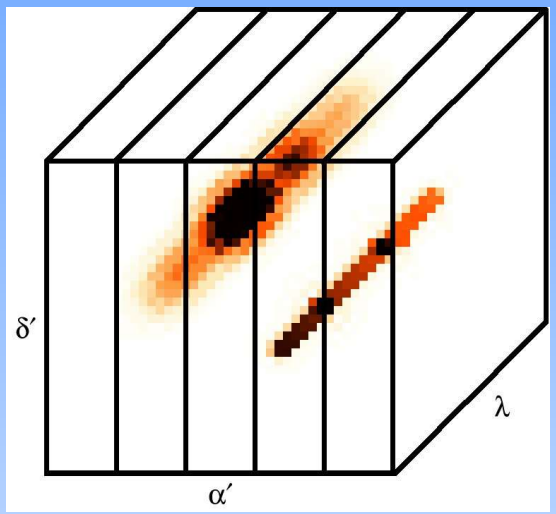


Sky Model



Specsim: Modelling the IFU Spectrometer



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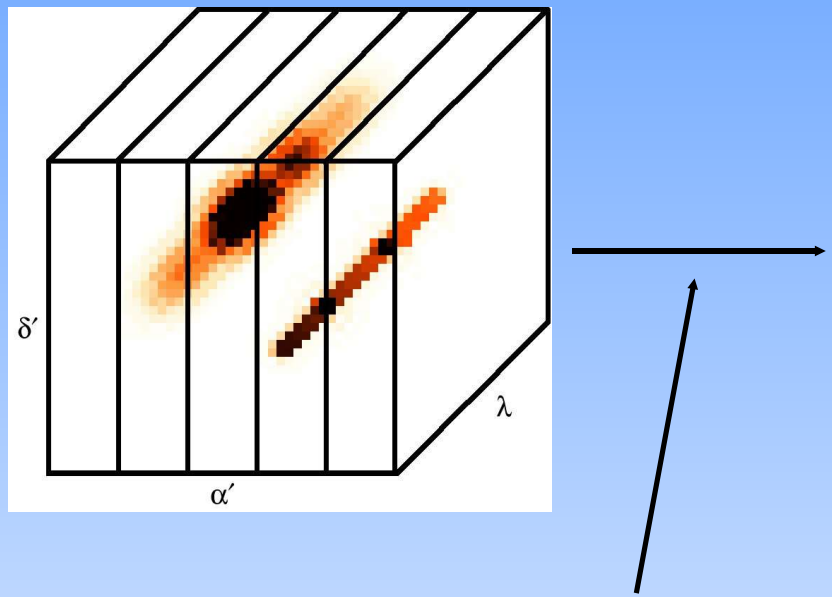
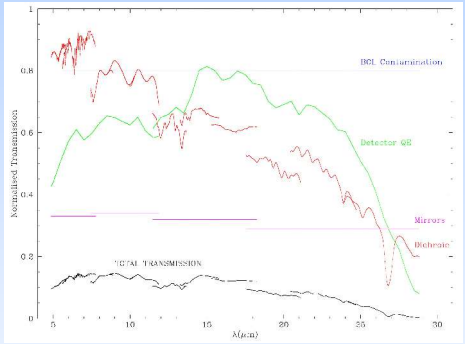
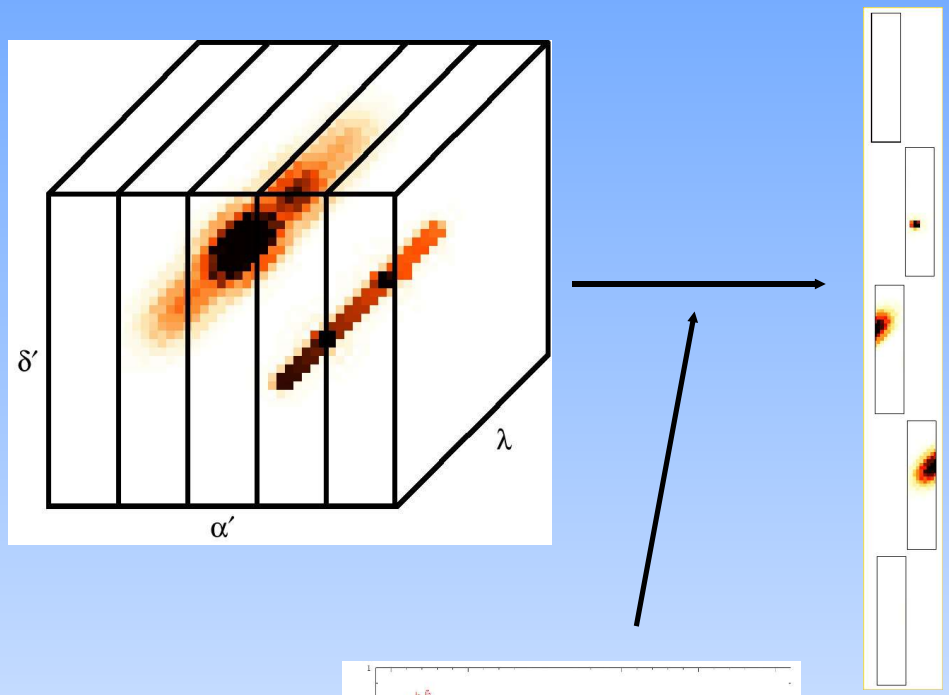
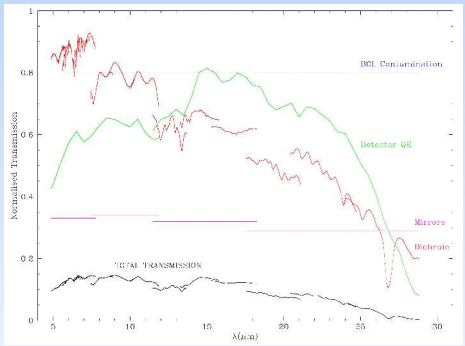




Transmission Function Definitions

Specsim: Modelling the IFU Spectrometer





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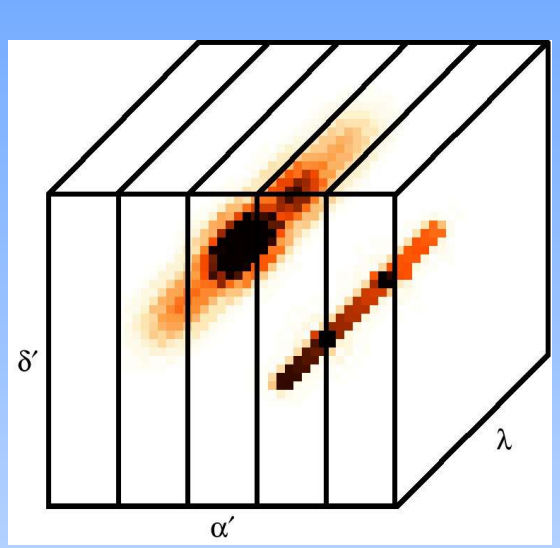
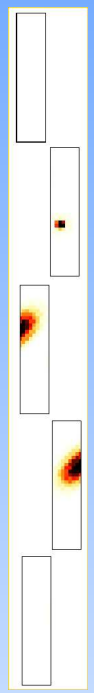
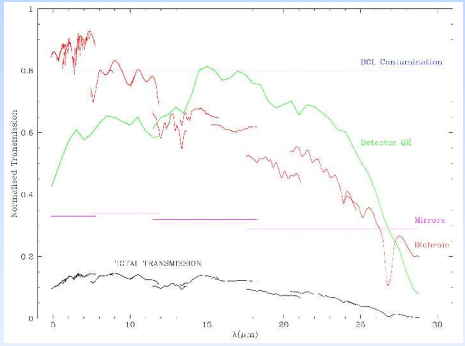


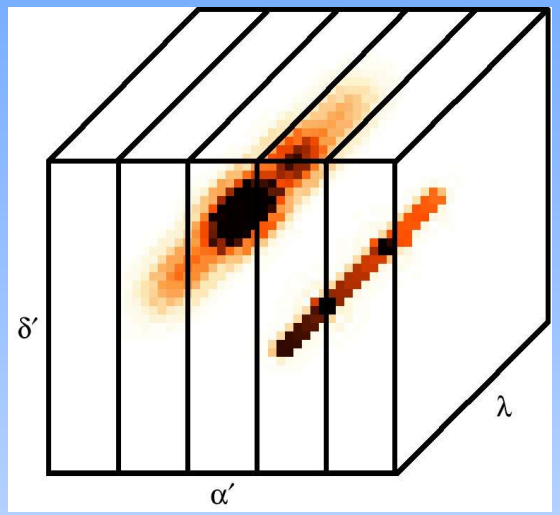


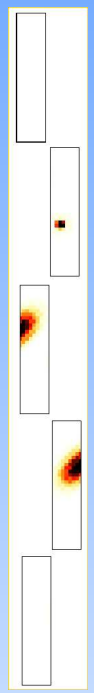


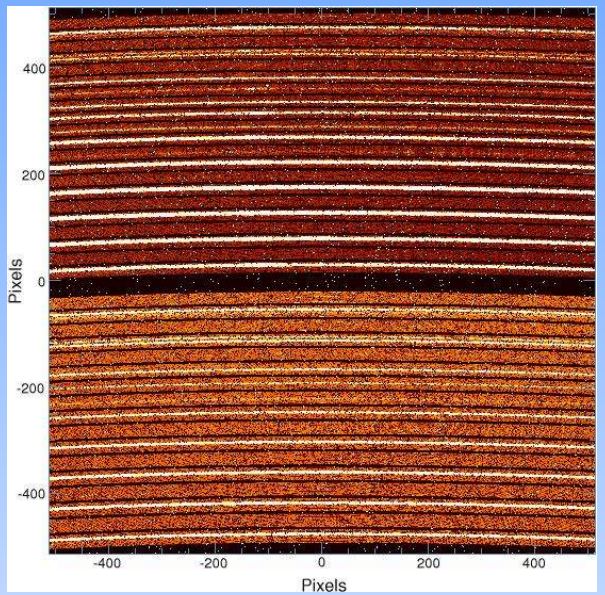
Transmission Function Definitions

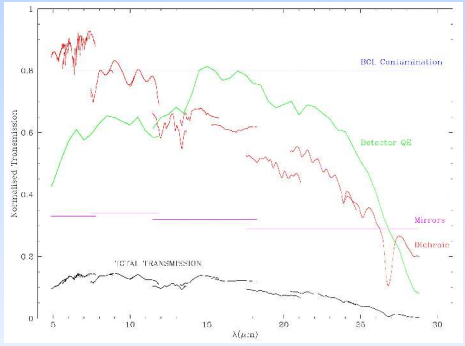
Cosmic Rays
Noise
Exposure Length

Specsim: Modelling the IFU Spectrometer







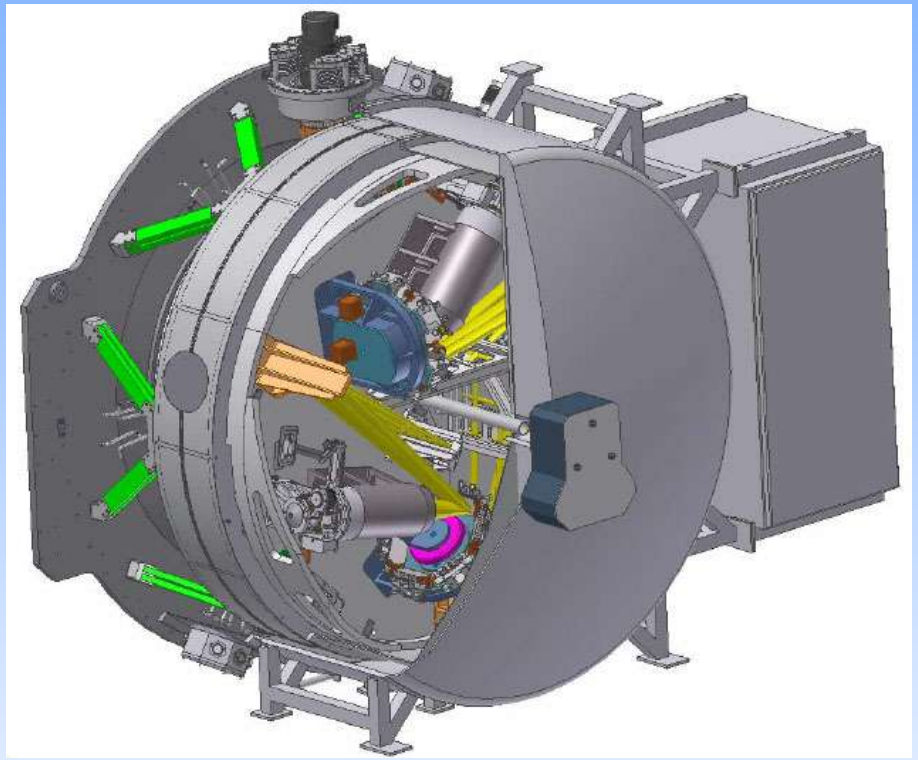


Transmission Function Definitions

Cosmic Rays
Noise
Exposure Length

VLT - KMOS

- NIR multi-object IFU spectrometer
- 3 identical channels
- 8 IFUs per channel
- 14 slices of 14 pixels per IFU
- 3 spectrographs
- 2048 x 2048 pixel detector images

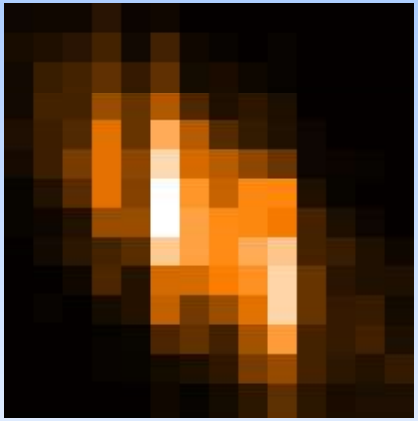


VLT - KMOS

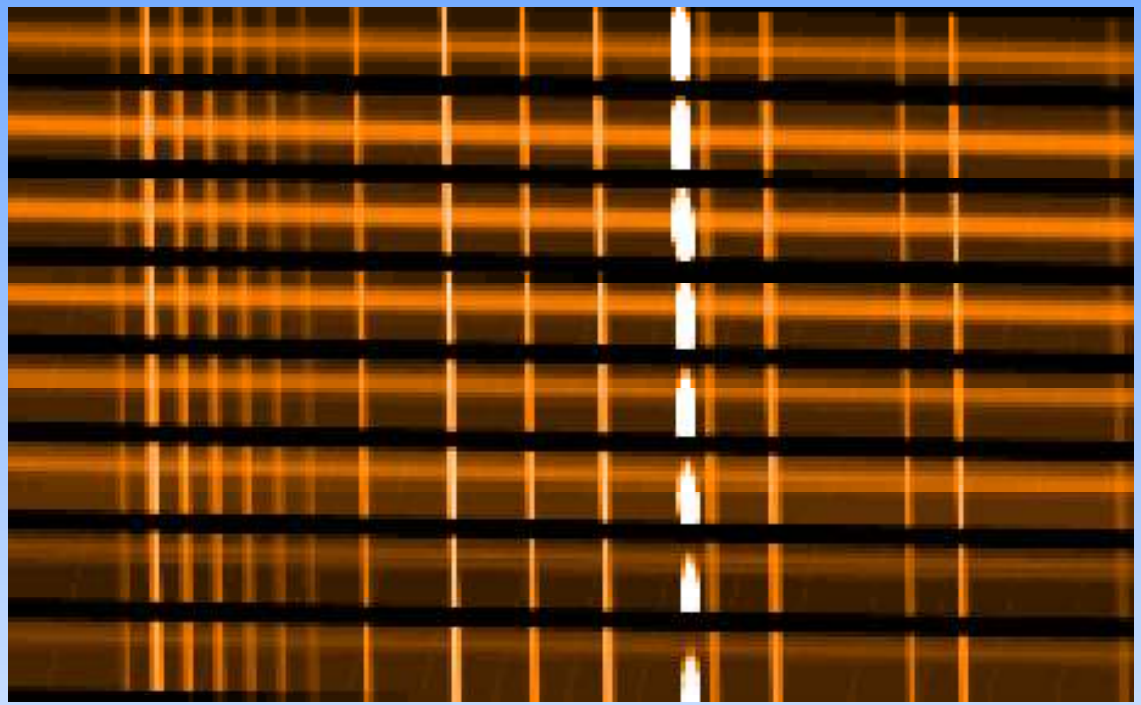
```
"Emission line galaxy with 3 lines"
N_TARGETS                    1
{
"Galaxy continuum"
5      0.0  0.0  2.0  0.6  50
N_CONT                       1
0      0.000003  2500.0
N_BROAD                      0
N_NARROW 0
}
"Emission line – different extent"
12    0.0  0.0  2.0  1.0  140.0
N_CONT                       0
N_BROAD                      0
N_NARROW 3
1.1   90.0      "Line1"
1.7   60.0      "Line2"
2.2   100.0     "Line3"
}
```

VLT - KMOS

• White-light image of a galaxy



• Image of the galaxy at the wavelength of the emission line

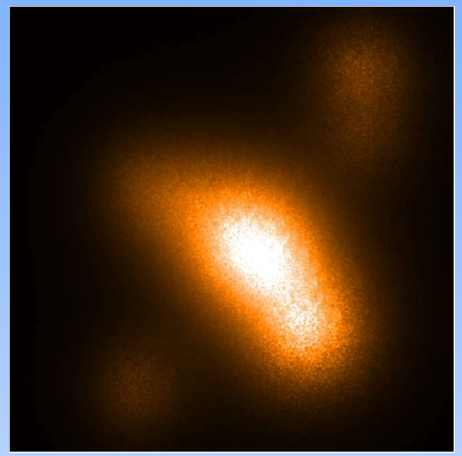


• Portion of the detector image

• Note the spectral line and the galaxy continuum

E-ELT

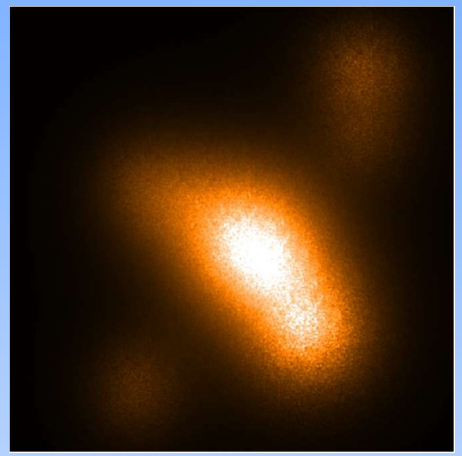
- Specsim for E-ELT: Investigating the effect of adaptive optics on image quality



- Seeing-limited field

E-ELT

- Specsim for E-ELT: Investigating the effect of adaptive optics on image quality



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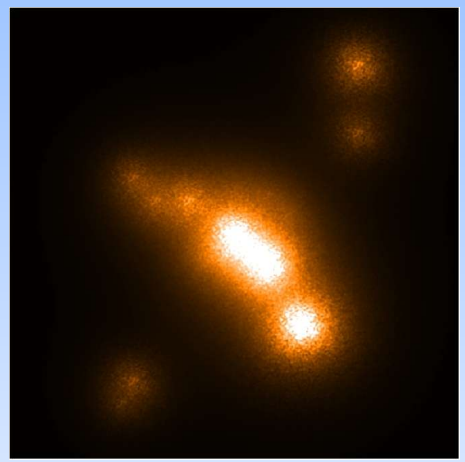
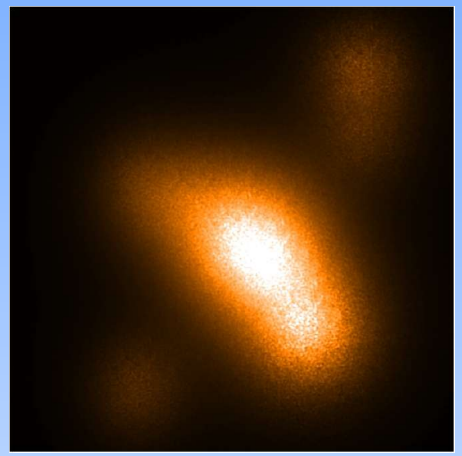


- Ground layer correction only

E-ELT

- Specsim for E-ELT: Investigating the effect of adaptive optics on image quality



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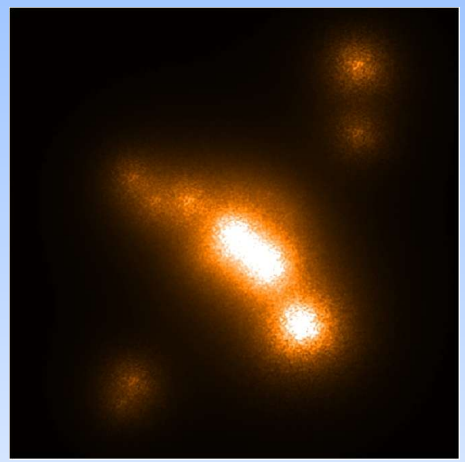
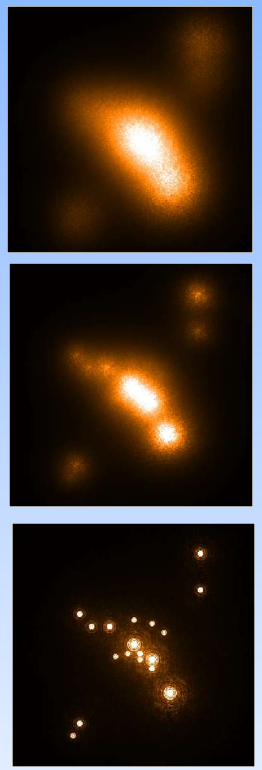


- Ground layer correction only

- Laser-tomography

UK
Astronomy Technology Centre

With a critical dependence on AO correction in the ELT project, Specsim has obvious applications both in refining the science case and in the integrated modelling of the instrumentation. Specsim is being used, in the MOMSI design study, to investigate the effects of various levels of adaptive optics on the quality of the images obtained. The images on the right show a field of view with three different levels of correction (using PSFs from ESO's 42m ELT study). Top – the seeing-limited field, with no adaptive optics applied. Centre – the same field, ground layer correction only. Bottom – the field observed with the aid of laser-tomography.



(See Evans et al., Thu 16:15)

E-ELT MOMSI