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, low-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 simultaneously
- 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: Modelling the Field of View

Specsim GUI

Sky Background
Specsim: Modelling the Field of View
Specsim: Modelling the Field of View

Specsim GUI

Sky Background

Targets
Specsim: Modelling the Field of View

Specsim GUI

Sky Background

Targets
Specsim: Modelling the Field of View

Specsim

GUI

Sky Background

Skys Model

Targets
Specsim: Modelling the IFU Spectrometer
Specsim: Modelling the IFU Spectrometer

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
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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
- Portion of the detector image
- Image of the galaxy at the wavelength of the emission line
- 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

• Seeing-limited field

• Ground layer correction only
E-ELT

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

• Seeing-limited field

• Ground layer correction only

• Laser-tomography
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)