Simulation of the observation of an individual object in IFU mode

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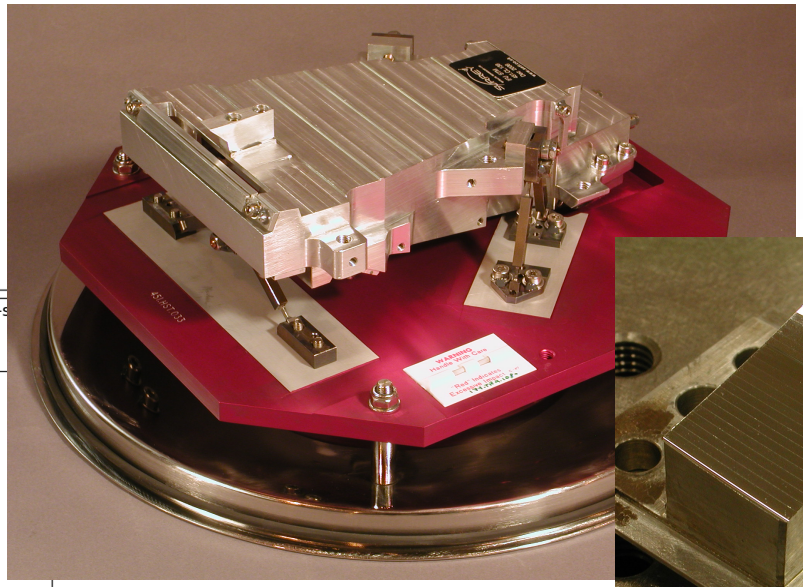
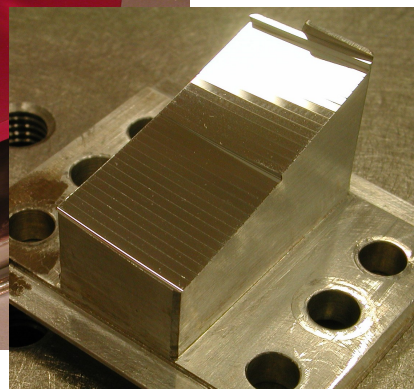
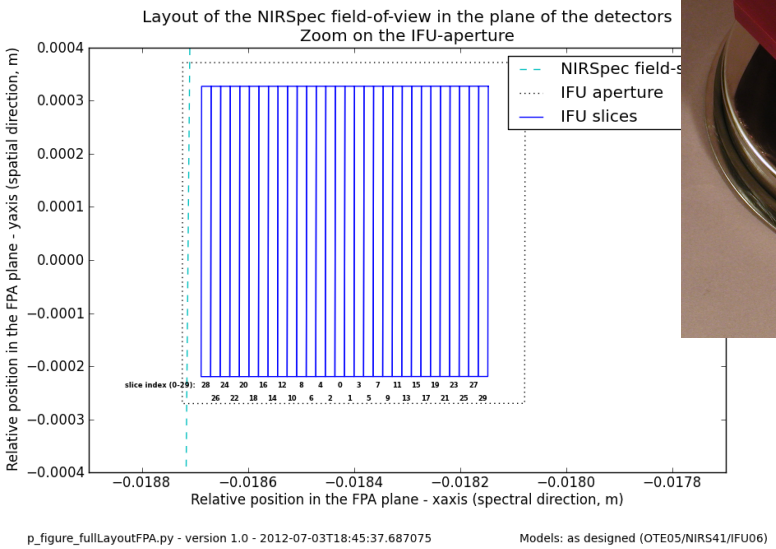
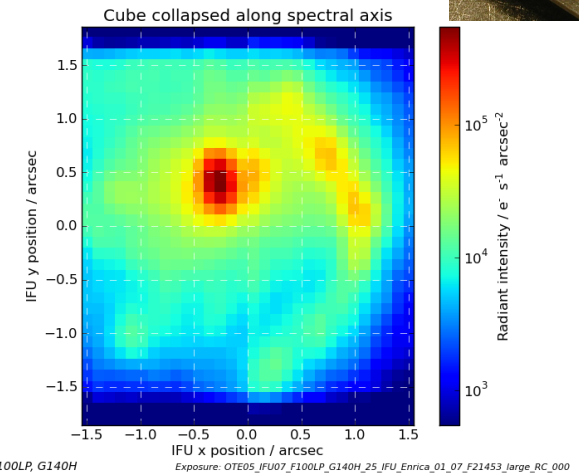






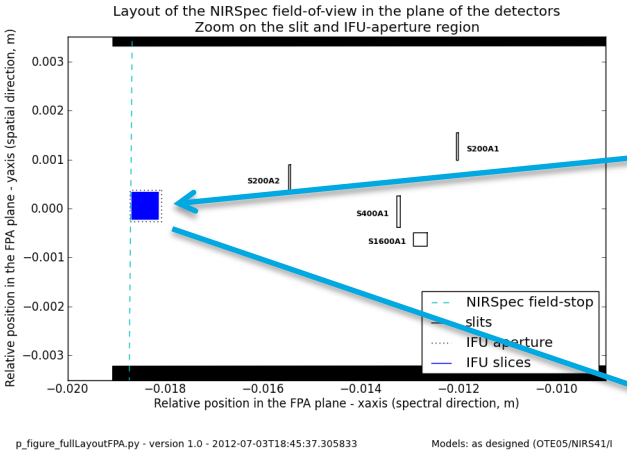


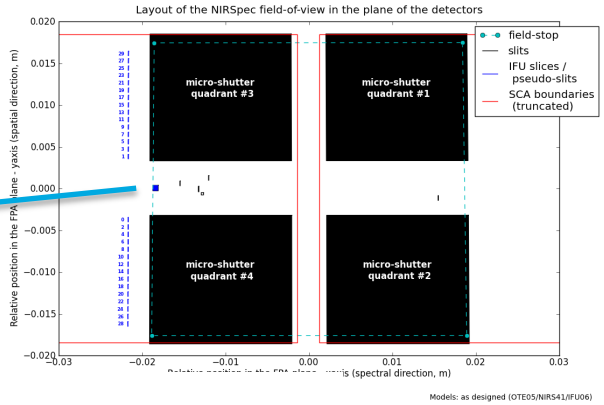
IFU cube, F100LP, G140H

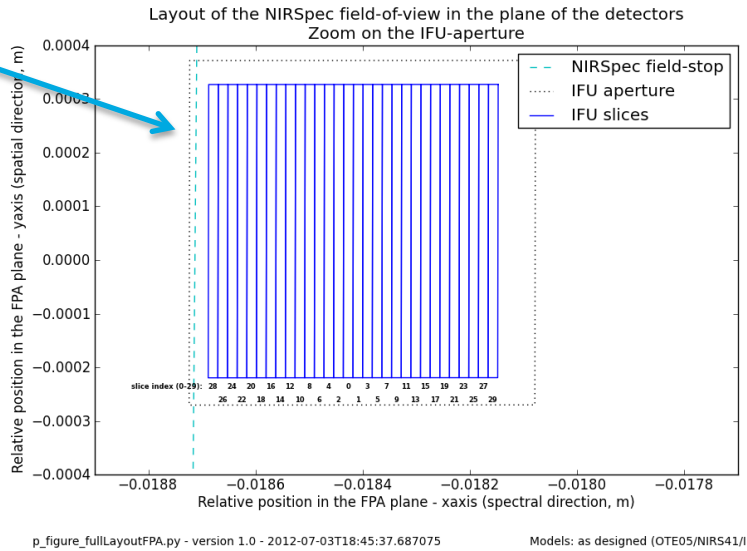
Exposure: OTE05_IFU07_F100LP_G140H_25_IFU_Enrica_01_07_F21453_large_RC_000

Quick reminder about the NIRSpec IFU mode

- Field of view of 3”x3” sampled by 30x30 spaxels (sampling of 0.1”x0.1”).

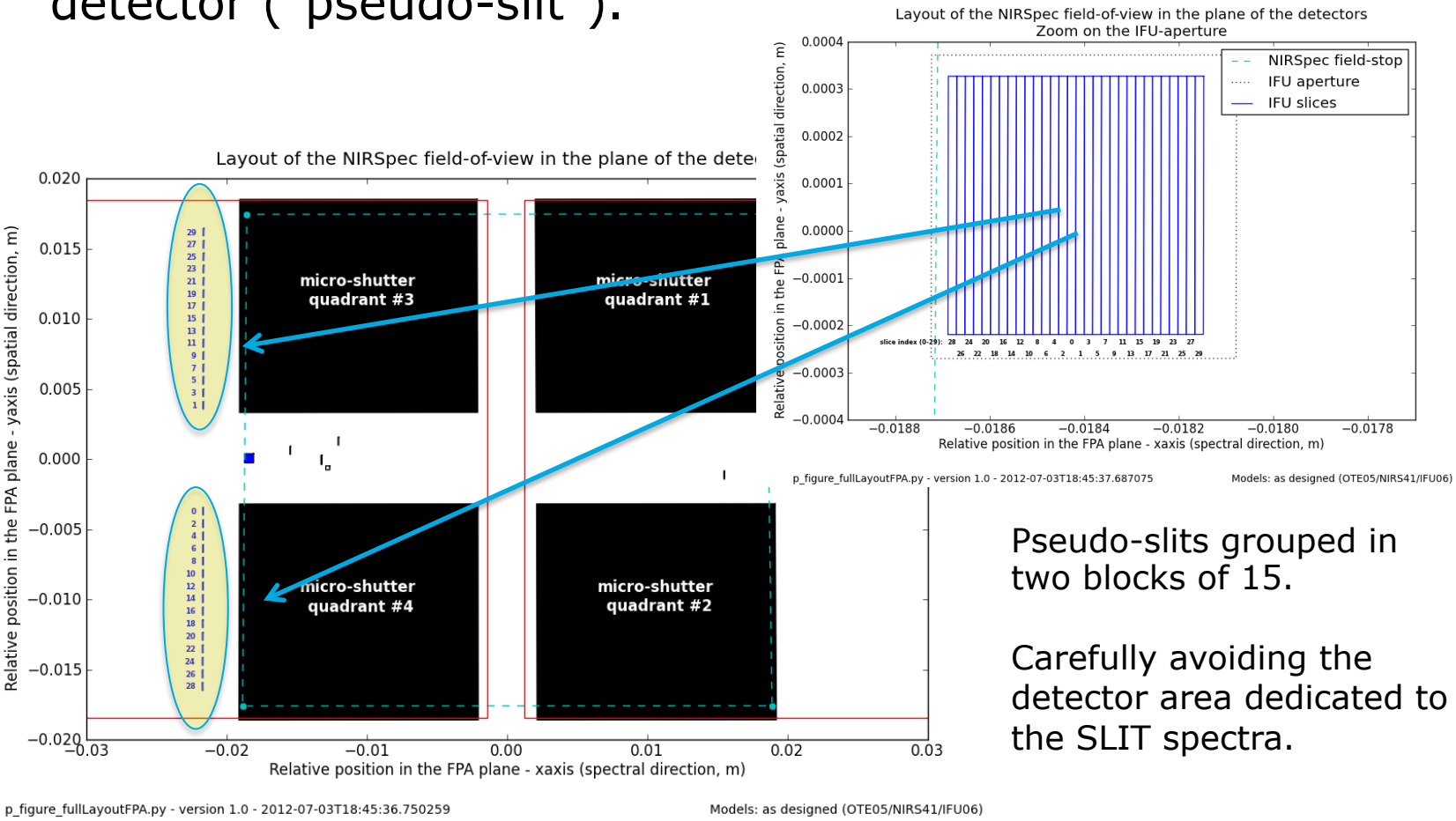






Quick reminder about the NIRSpec IFU mode

- Each 0.1”x3” slice is then projected on 2x30 pixels on the detector (“pseudo-slit”).

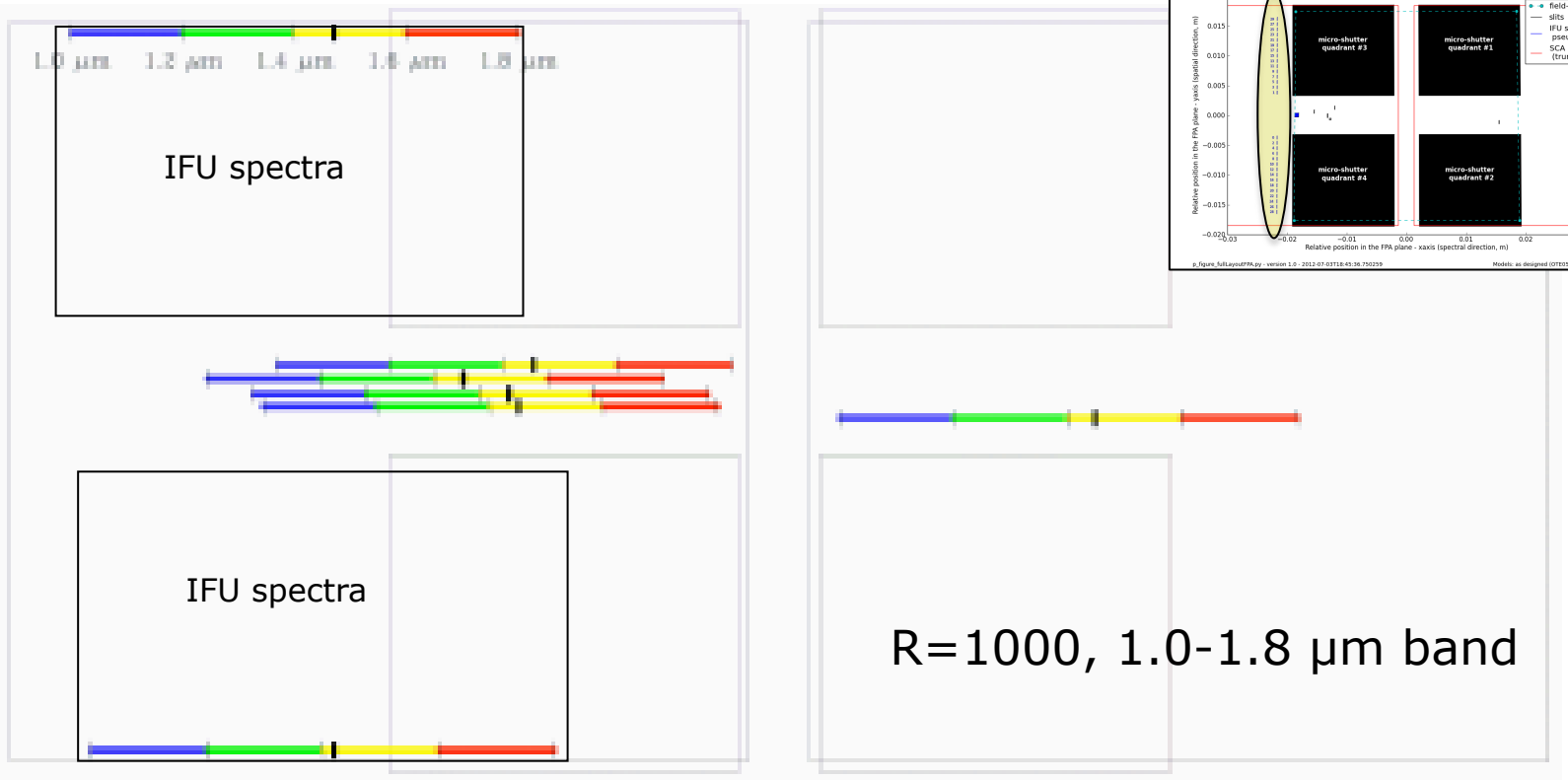


Pseudo-slits grouped in two blocks of 15.

Carefully avoiding the detector area dedicated to the SLIT spectra.

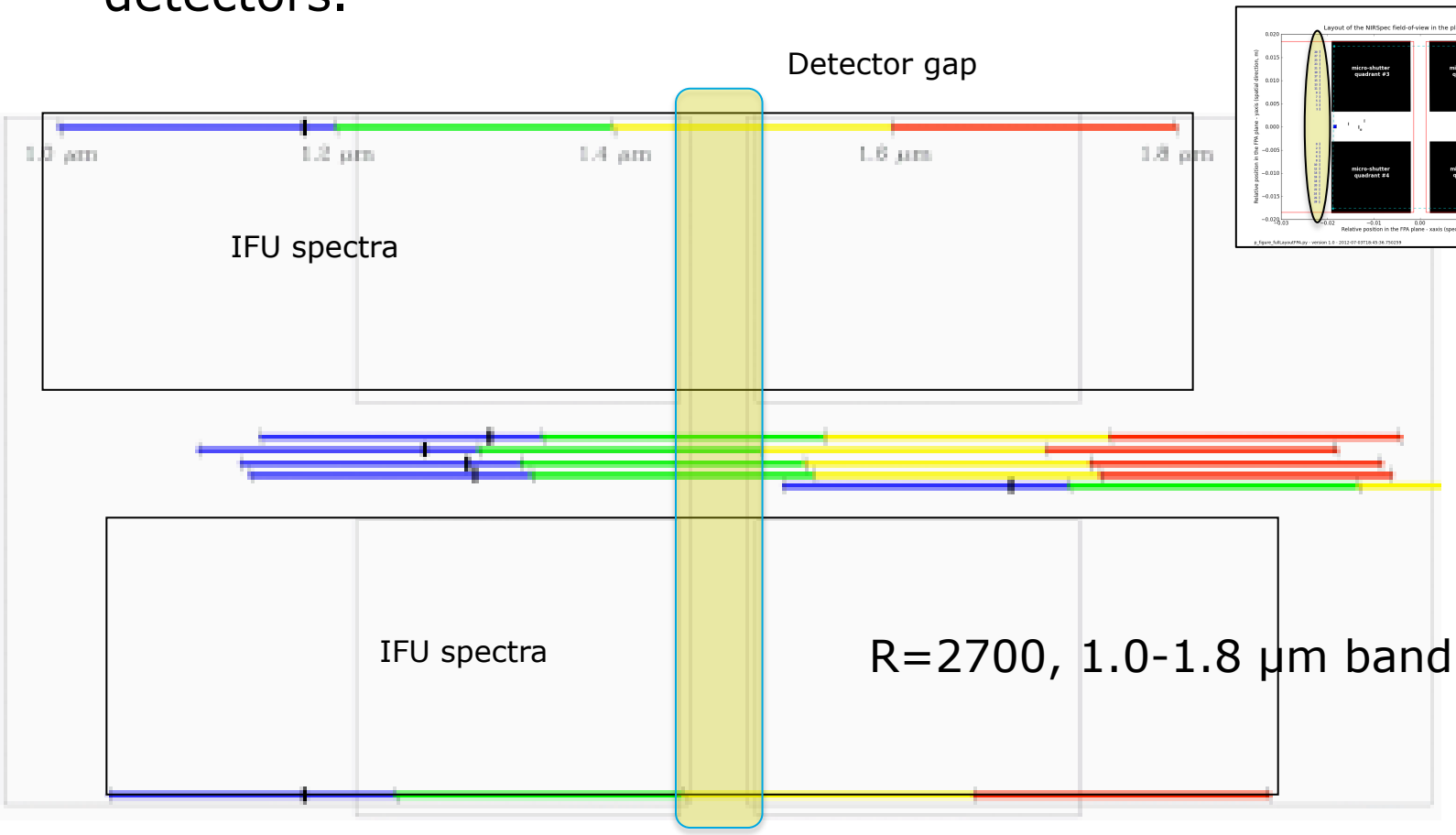
Quick reminder about the NIRSpec IFU mode

- Examples of the position of the IFU spectra on the detectors.

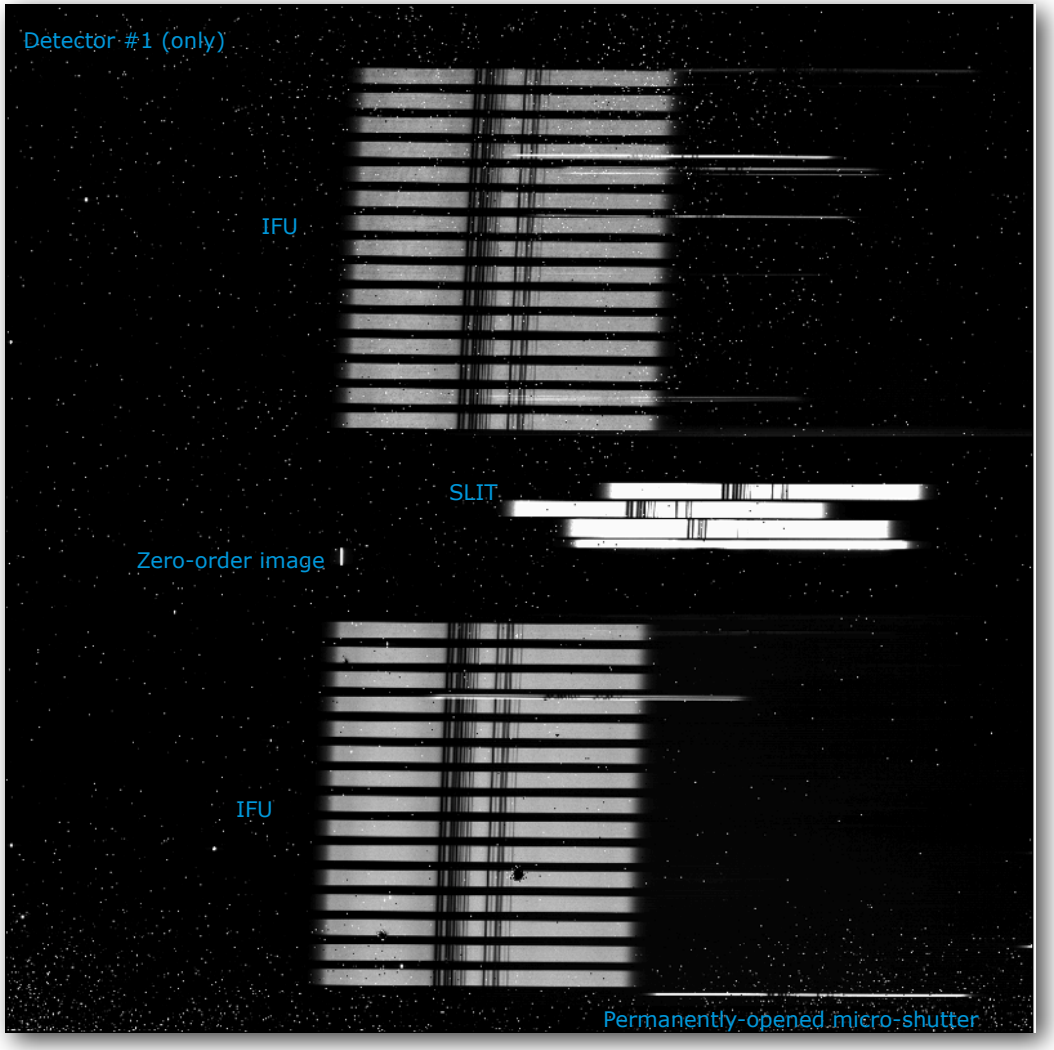


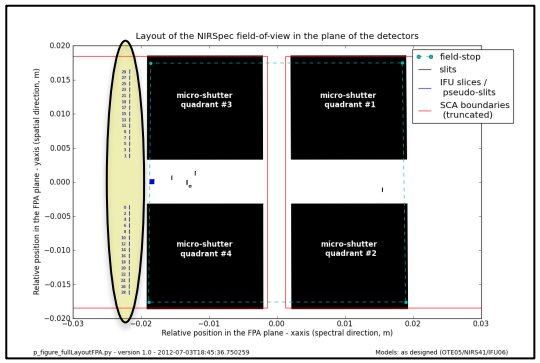
Quick reminder about the NIRSpec IFU mode

- Examples of the position of the IFU spectra on the detectors.



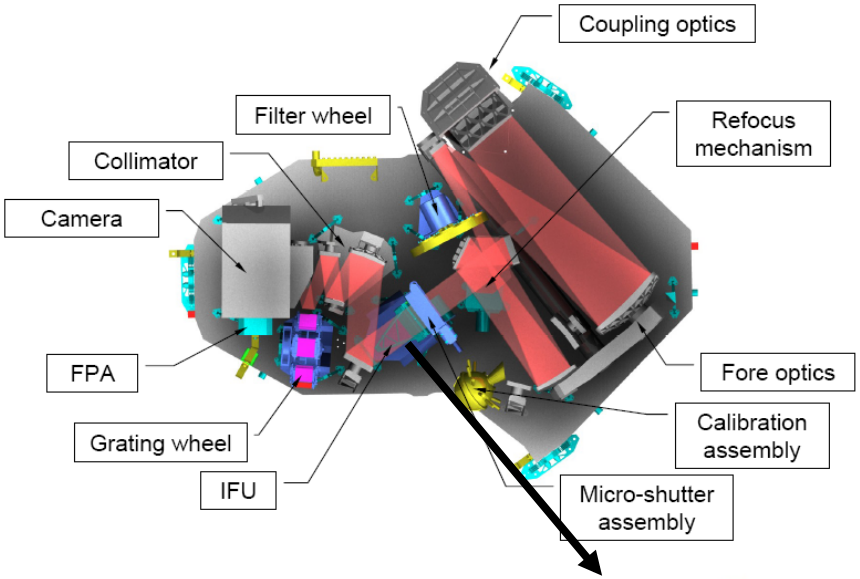
Quick reminder about the NIRSpec IFU mode



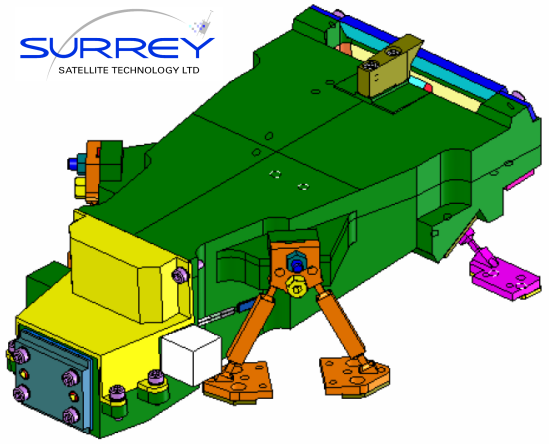


Medium resolution (R=700-1300) spectra of a continuum source with absorption features obtained with the IFU during cryogenic testing in 2011.

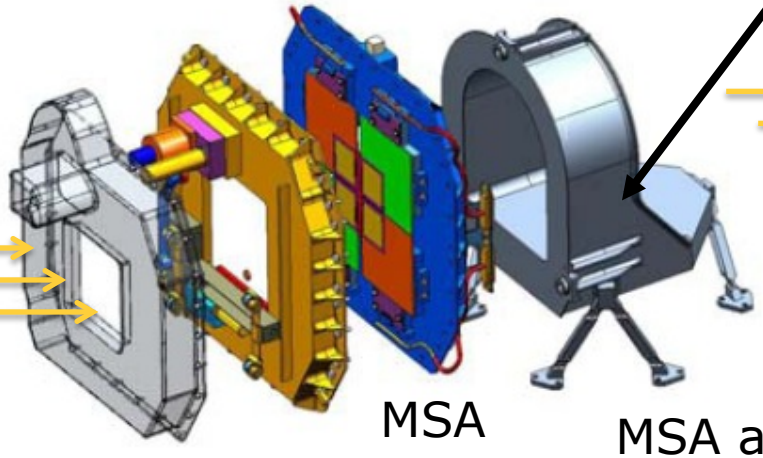
Nuts and bolts… (the hardware)



IFU



Light coming from the JWST telescope

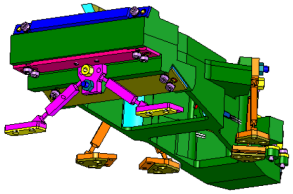


Toward NIRSpec's spectrograph

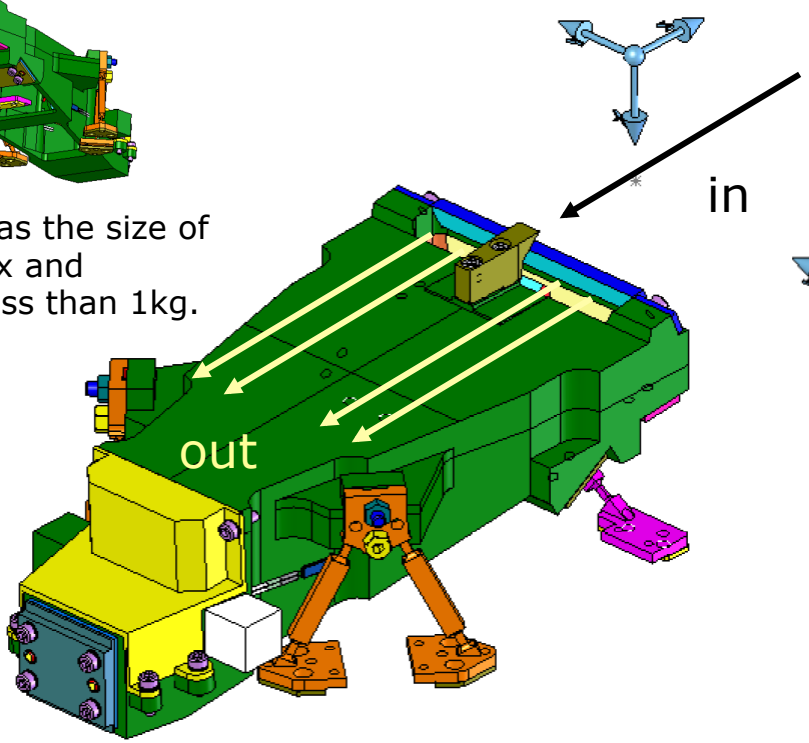
MSA

MSA and IFU bracket

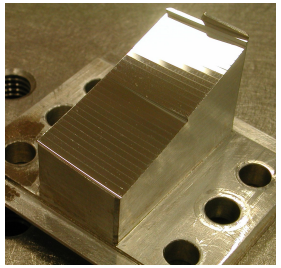
Nuts and bolts… (the hardware)

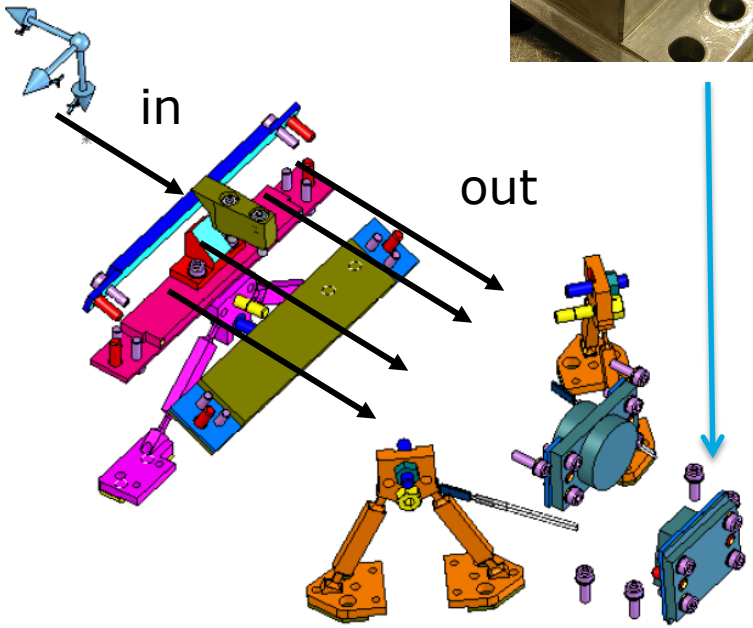


The IFU has the size of a shoe box and weights less than 1kg.



diamond-machined slicer
1 slice = 0.8mmx12mm





The IFU steals light in the MSA plane, « reorganize » it and send it back in NIRSpec spectrograph.

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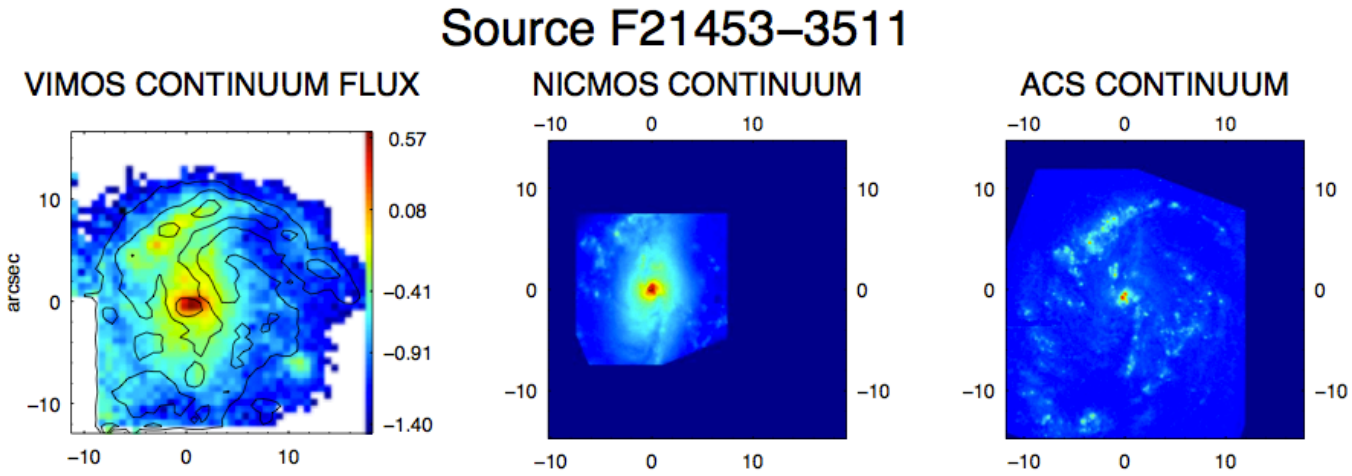
Ah, yes and the simulations?

- Example of observation of a single object.
- Using [NII]+Ha data on a luminous infrared galaxy (LIRG) as a starting point for the simulations.
- Paper by Enrica Bellocchi et al.:
  - "Studying the kinematic asymmetries of disks and post-coalescence mergers using a new 'kinemetry' criterion"
  - 2012, A&A, 542, 54
- Preparation of the input data by Enrica & Bernhard.
- Preparation of the input datacubes and of the simulations by Bernhard.

Input data – Bellocchi et al. 2012

- Observations of a small sample of nearby LIRGs in the [NII] +Ha range with the VLT/VIMOS IFU.

ID1 IRAS (1)	ID2 Other (2)	α (J2000) (3)	δ (J2000) (4)	z (5)	D (Mpc) (6)	scale (pc/arcsec) (7)	log L_{IR} ($L_\odot$) (8)	Class (9)	References (10)
F11255-4120	ESO 319-G022	11:27:54.1	-41:36:52	0.016351	70.9	333	11.04	0	1
F10567-4310	ESO 264-G057	10:59:01.8	-43:26:26	0.017199	74.6	350	11.07	0	1
~~F04315-0840~~	~~NGC 1614~~	~~04:33:59.8~~	~~-08:34:44~~	~~0.015983~~	~~69.1~~	~~325~~	~~11.69~~	~~2~~	~~1, 2~~
F21453-3511	NGC 7130	21:48:19.5	-34:57:05	0.016151	70.0	329	11.41	2	1, 2

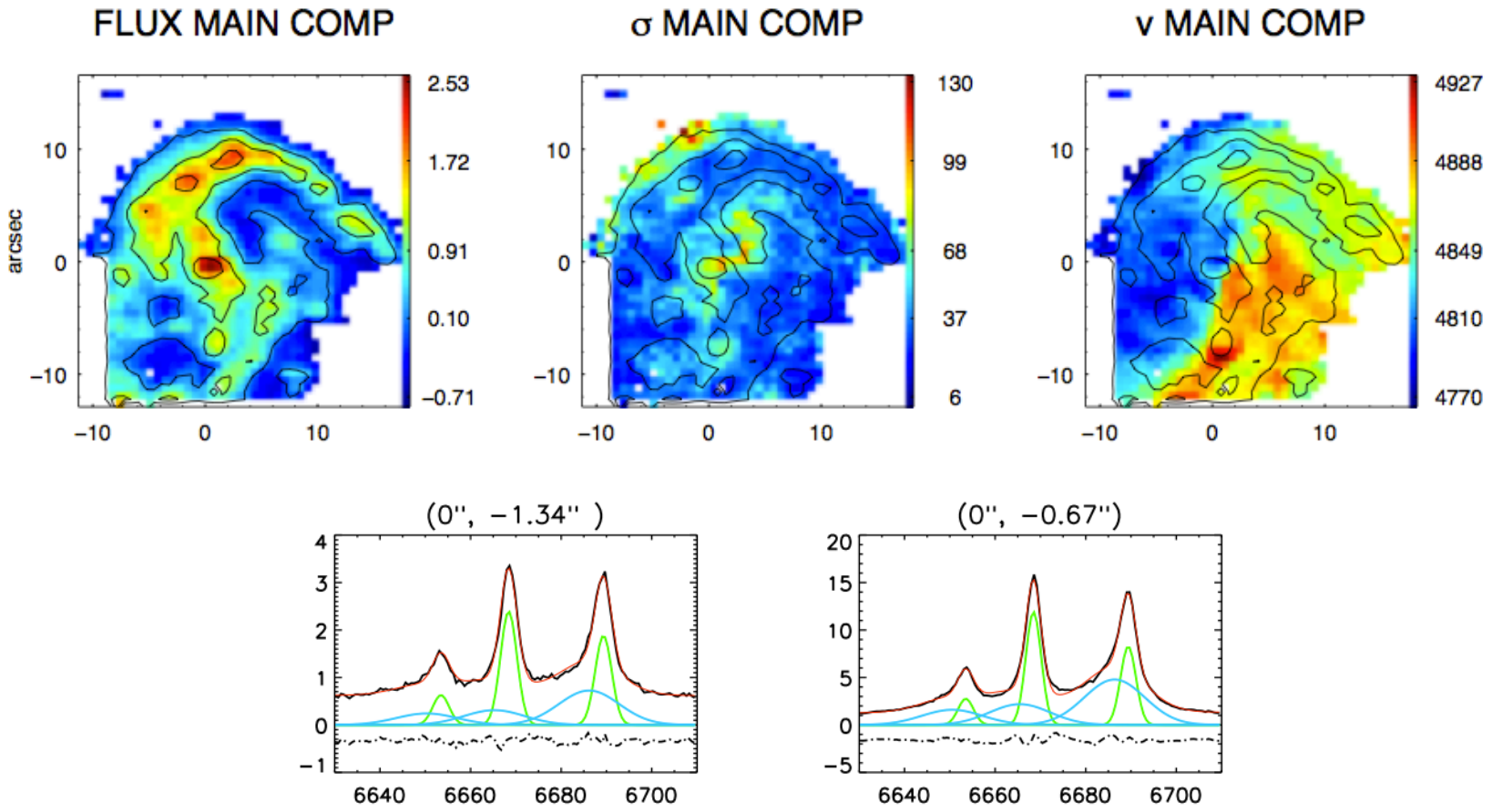


From figure 4 – Bellocchi et al. 2012

Input data – Bellocchi et al. 2012

- Some velocity structure.

From figure 4 – Bellocchi et al. 2012



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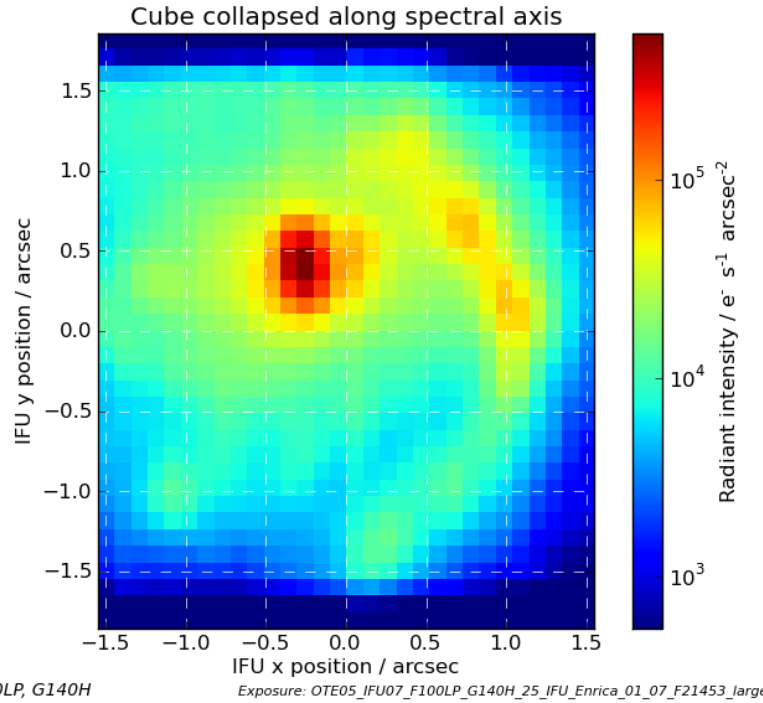
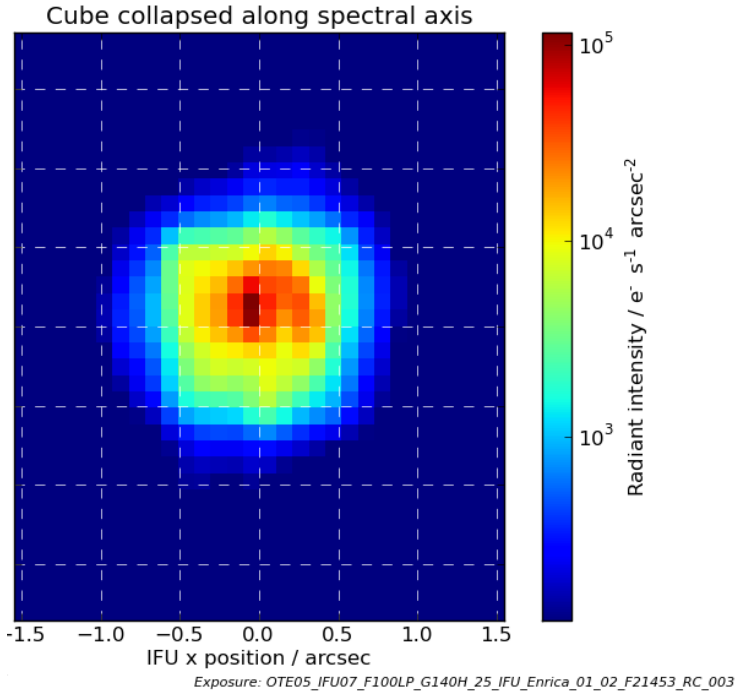
Input data cube – XL and compact versions

- "XL version" - The object was scaled to fit in the 3"x3" NIRSpec IFU field of view (arbitrary scaling).
  - Just for the sake of having a nice example of a spatially resolved object observed in IFU mode.
- "compact version" – Object size of roughly 1"x1"
  - Arbitrary scaling once more. More similar to the z=3 case example present in the paper.
- The [NII]+Ha spectra were "redshifted" to z=1, putting the Ha line around 1.3 microns.
  - Mimicking an observation in the 1.0-1.8 micron band of NIRSpec (with a medium resolution grating).
  - Only considering the [NII]+Ha line region (this is just an example…).

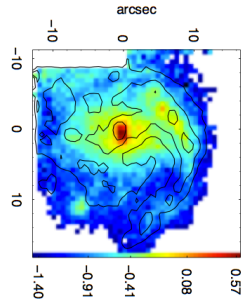
Input data cube – XL and compact versions



XL version

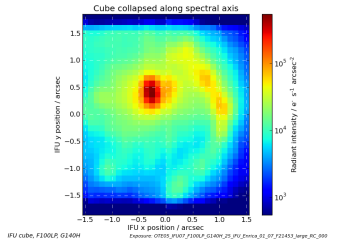


compact version

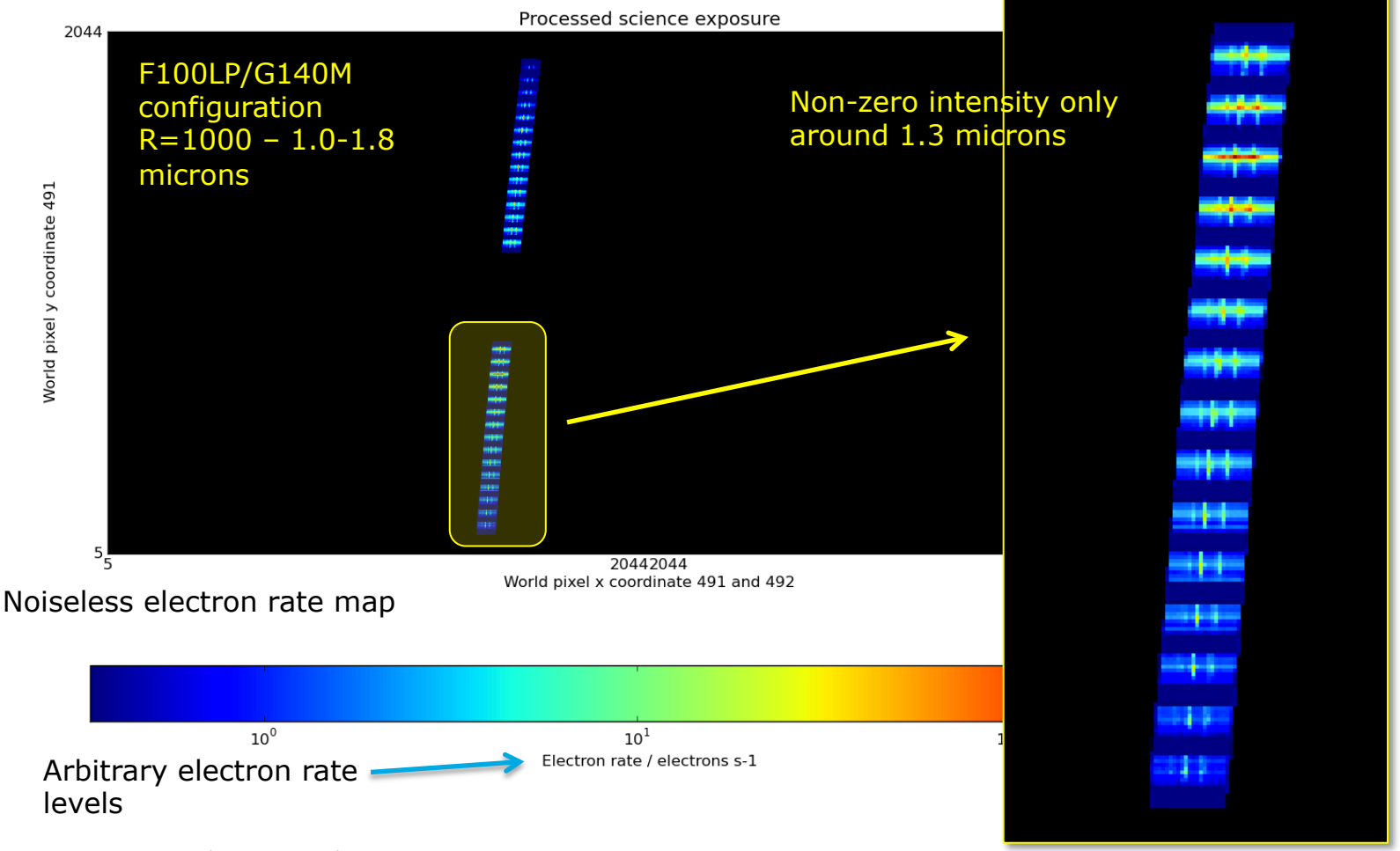


Reconstructed datacubes (i.e. at NIRSpec IFU spatial resolution).

Simulated data – XL version



IFU only, small spectral range around [NII]+Ha



OTE05_IFU07_F100LP_G140H_25_IFU_Enrica_01_07_F21453_large_RC_000, F100LP, G140H

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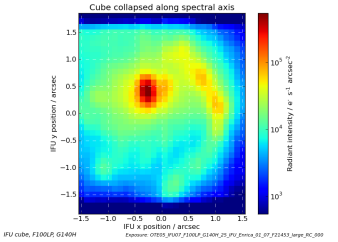
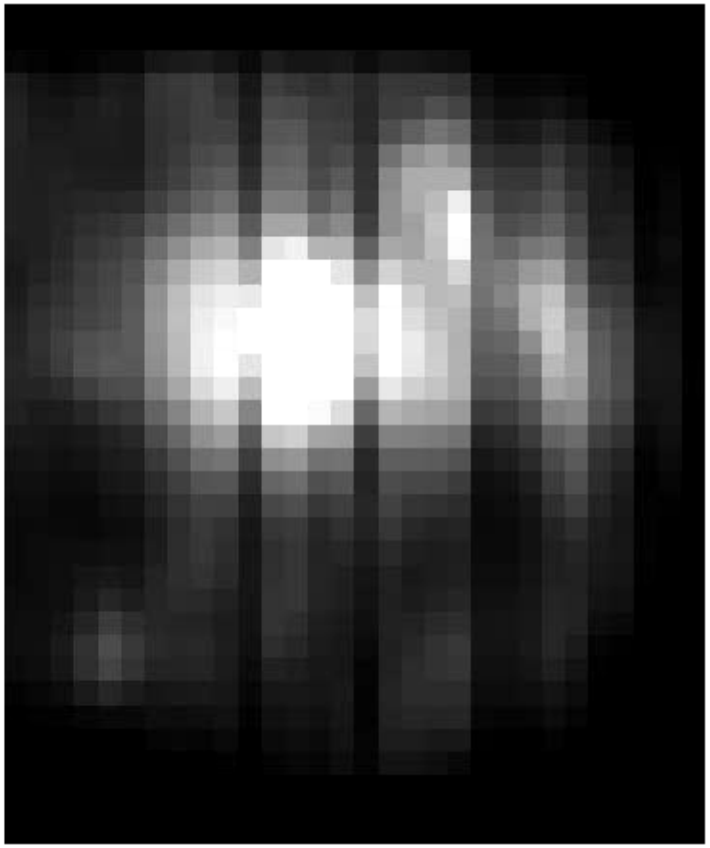
Simulated data – XL version



Going through the cube planes. [ignore first frame in the movie]



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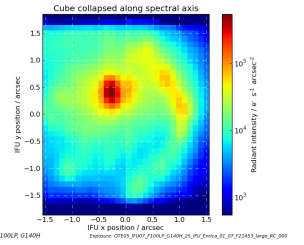
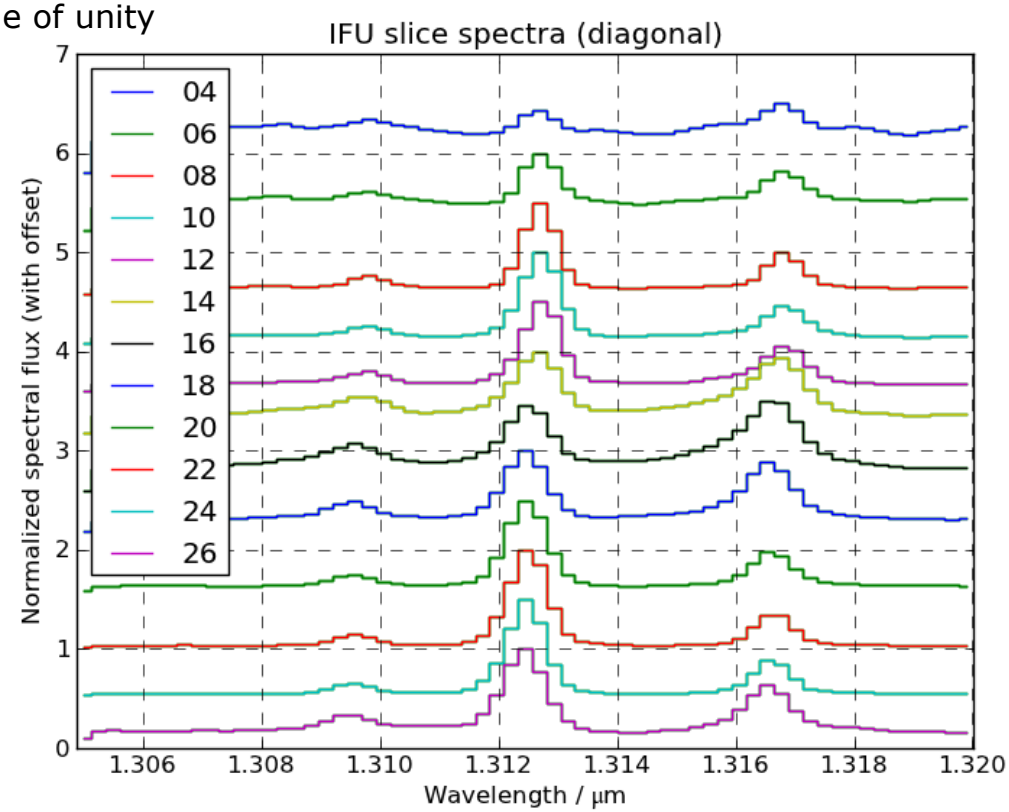
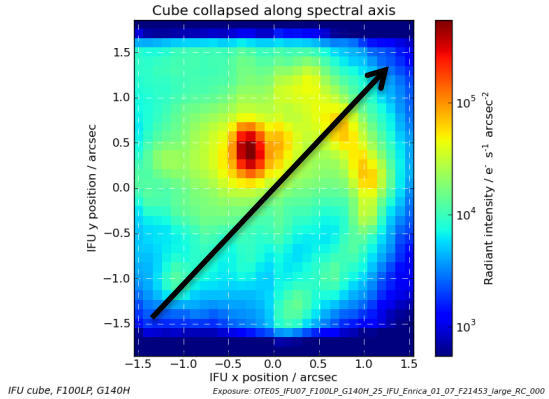
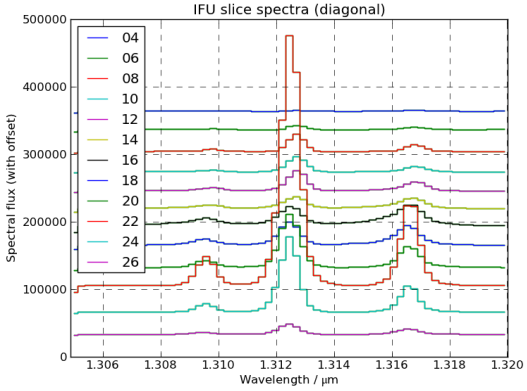
Simulated data – XL version



Normalized to a peak value of unity

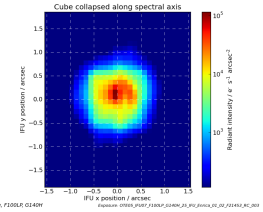




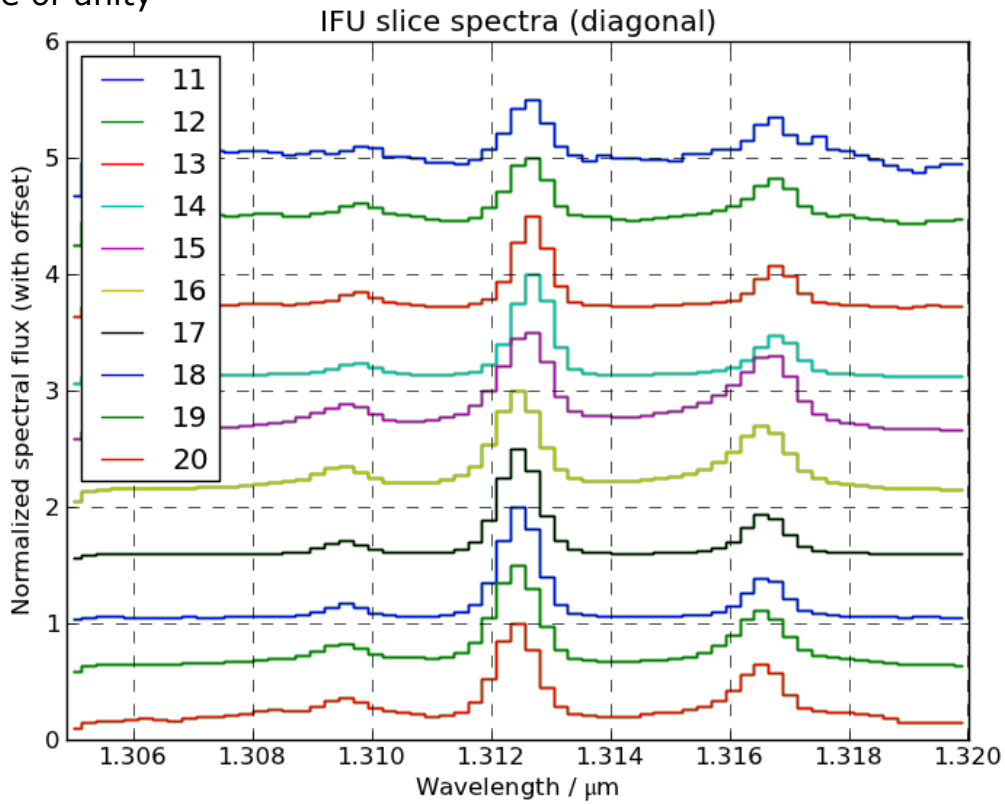


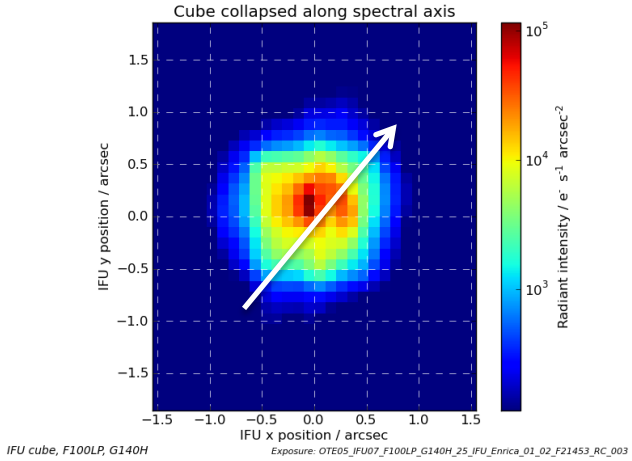
Velocity structure clearly visible as we progress diagonally through the cube.

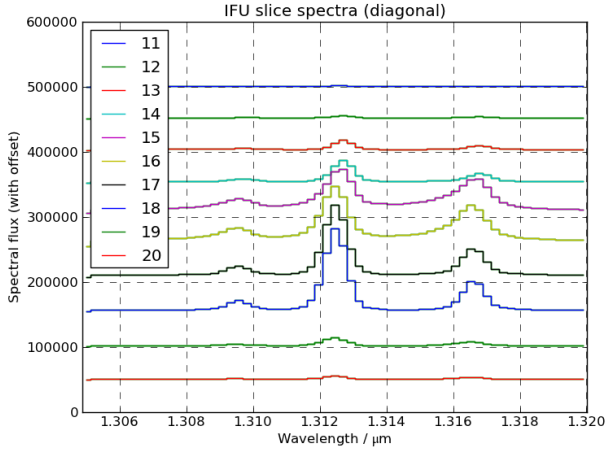
Simulated data – compact version



Normalized to a peak value of unity

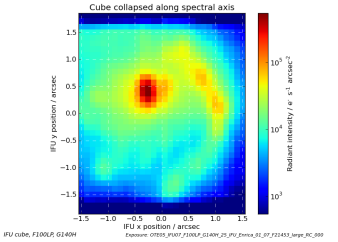




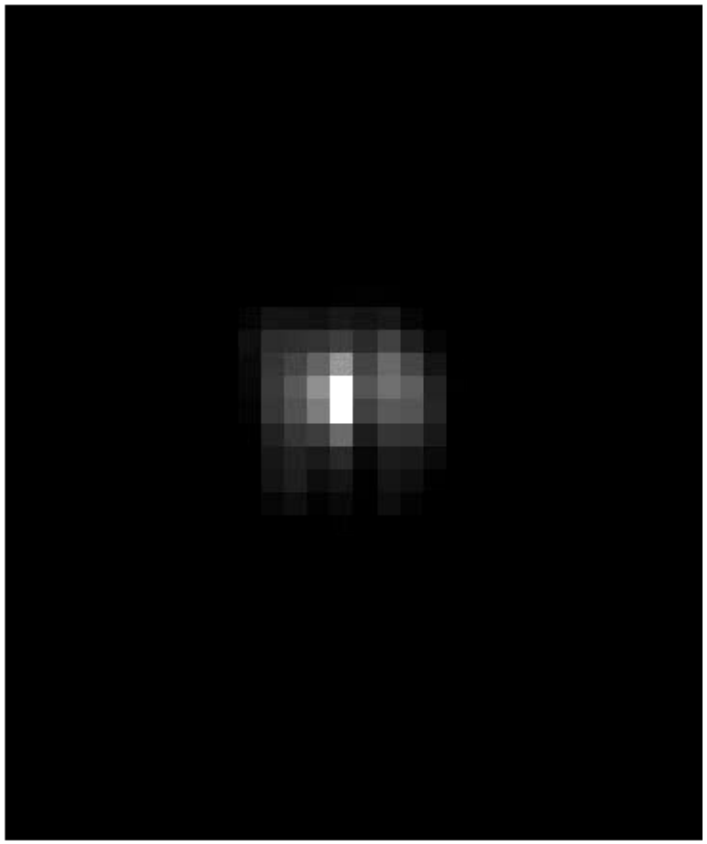


Velocity structure is still clearly visible as we progress diagonally through the cube.

Simulated data – XL version



Going through the cube planes. [ignore first frame in the movie]



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Conclusions

- First (noiseless) taste of what observations with the NIRSpec IFU will be.
- Next steps:
  - Run the full simulation flow to generate "noisy" data (need to scale correctly the intensities).
  - More simulations…