

JWST NIRSpec in depth



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Current state of our plans for Cycle 1 (if time)

Integrating with JWST + readout patterns

Frame

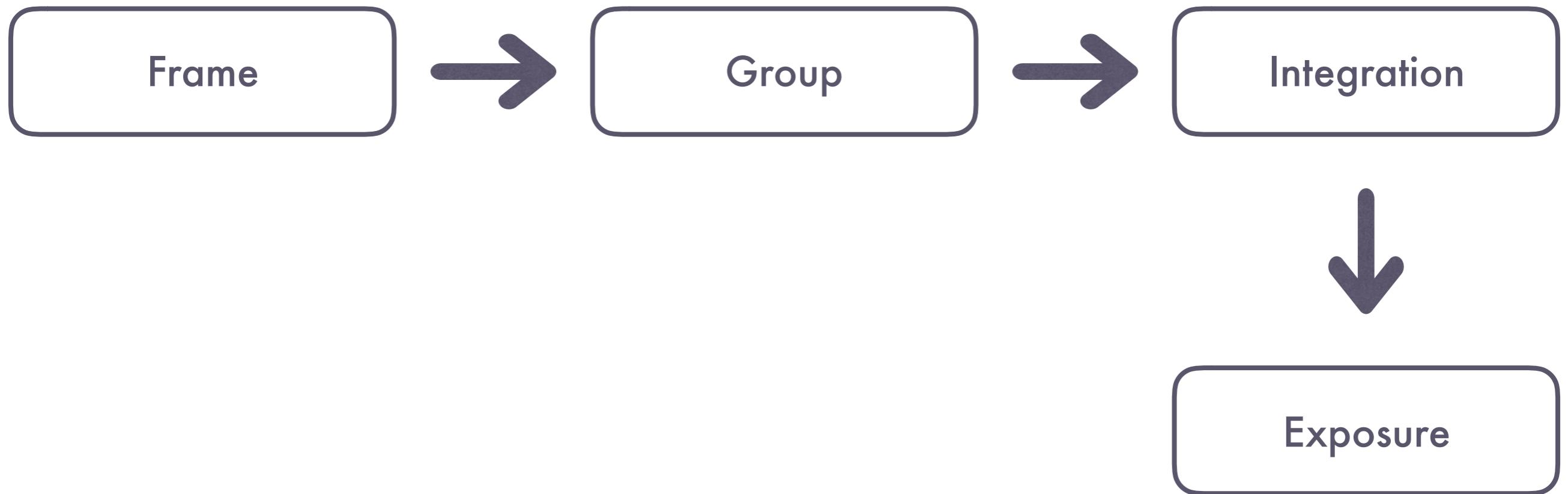
Integrating with JWST + readout patterns



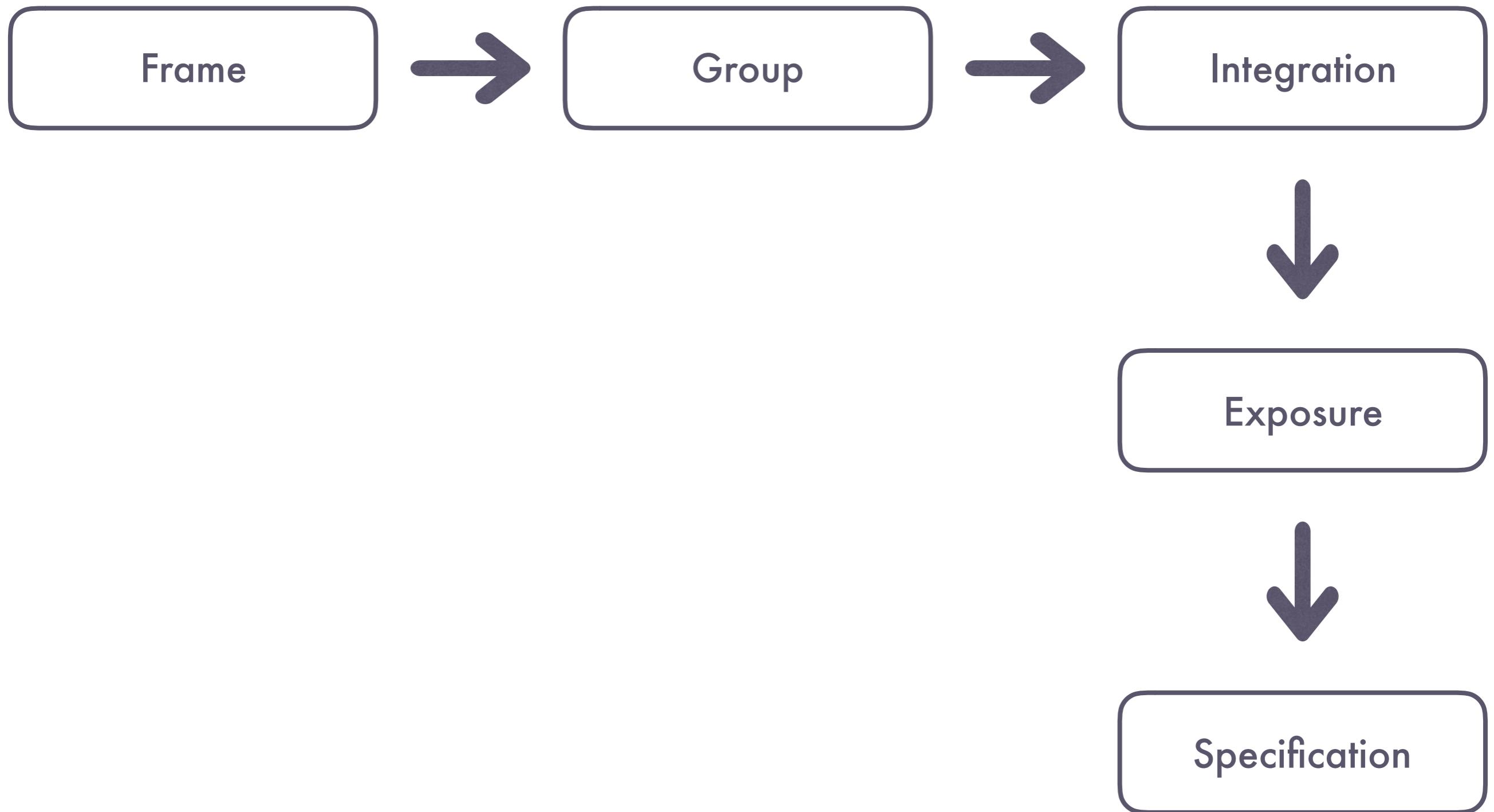
Integrating with JWST + readout patterns



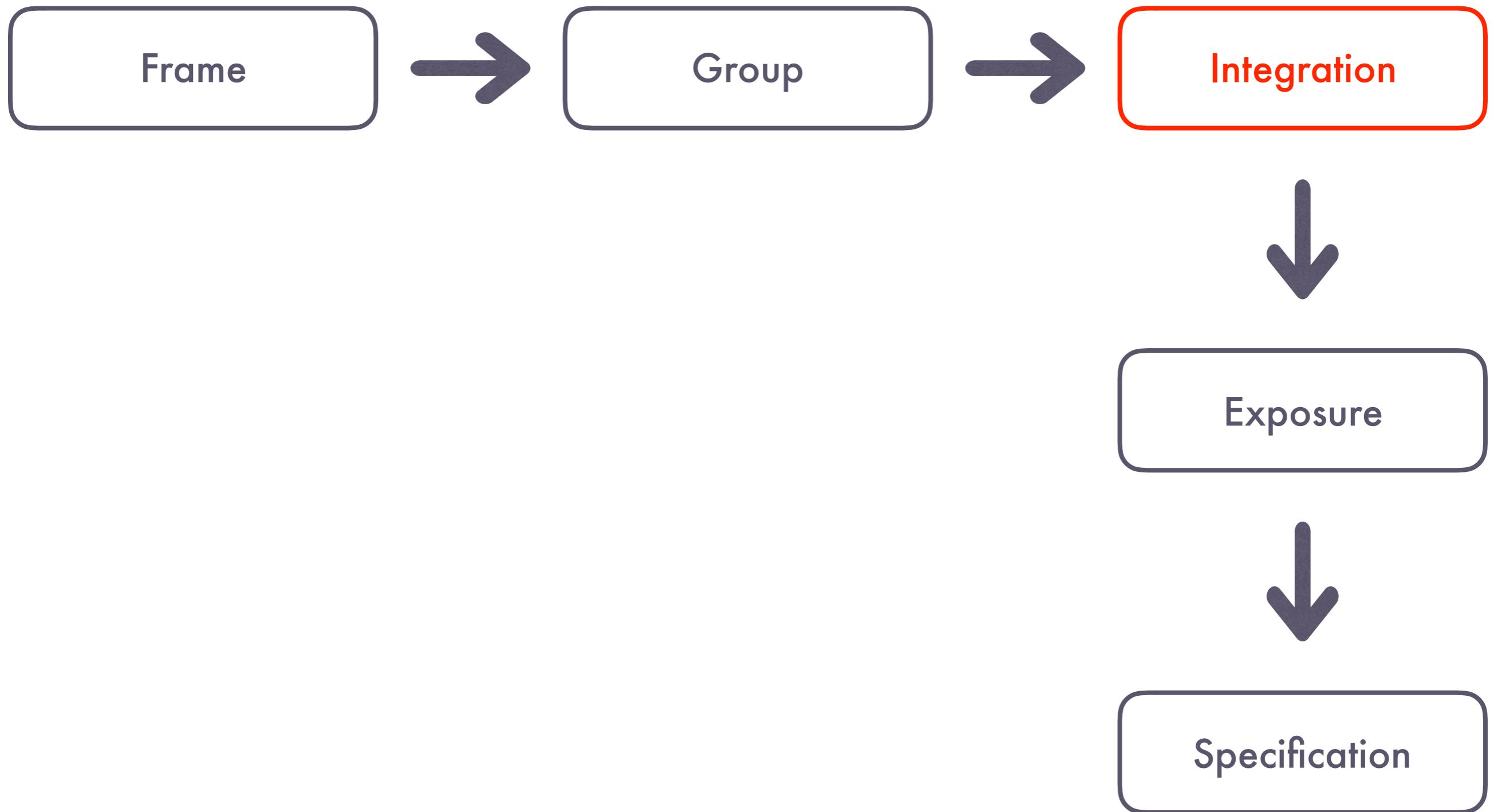
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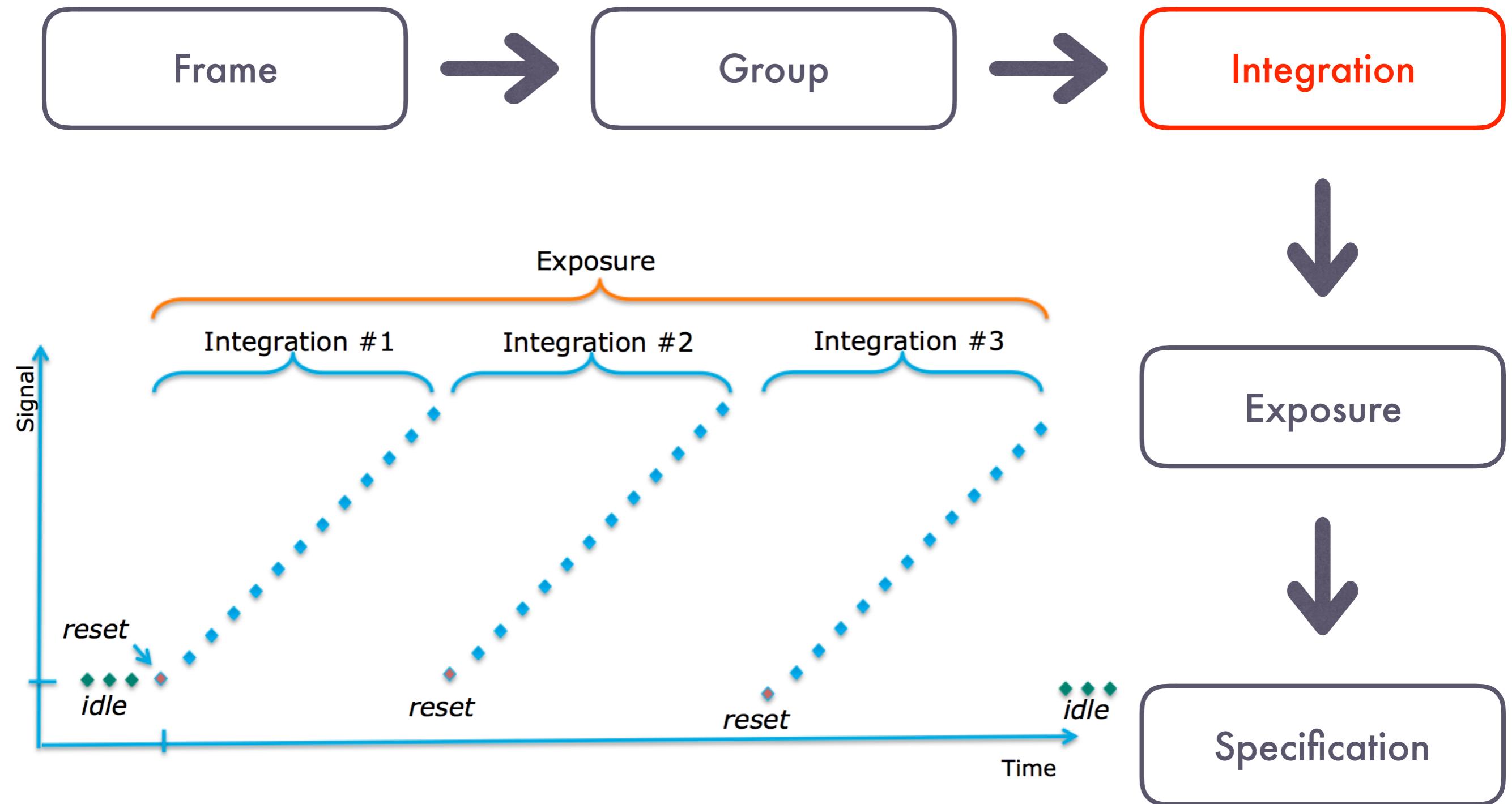
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RAPID have 1 frame/group, others have 5 and 4 respectively

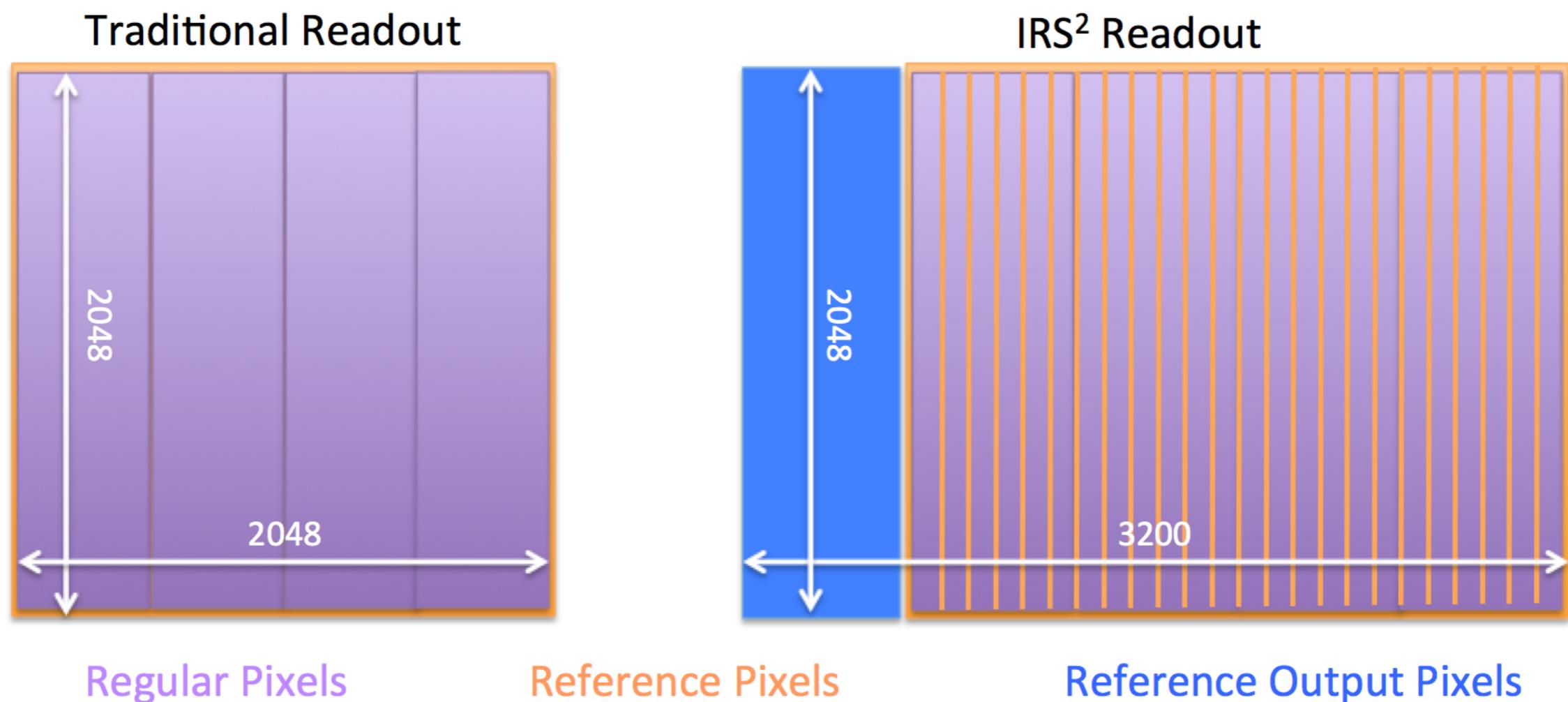
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One exposure with multiple integrations most efficient, but other considerations e.g. dithering/nodding will take precedence

NIRSpec dispersion options

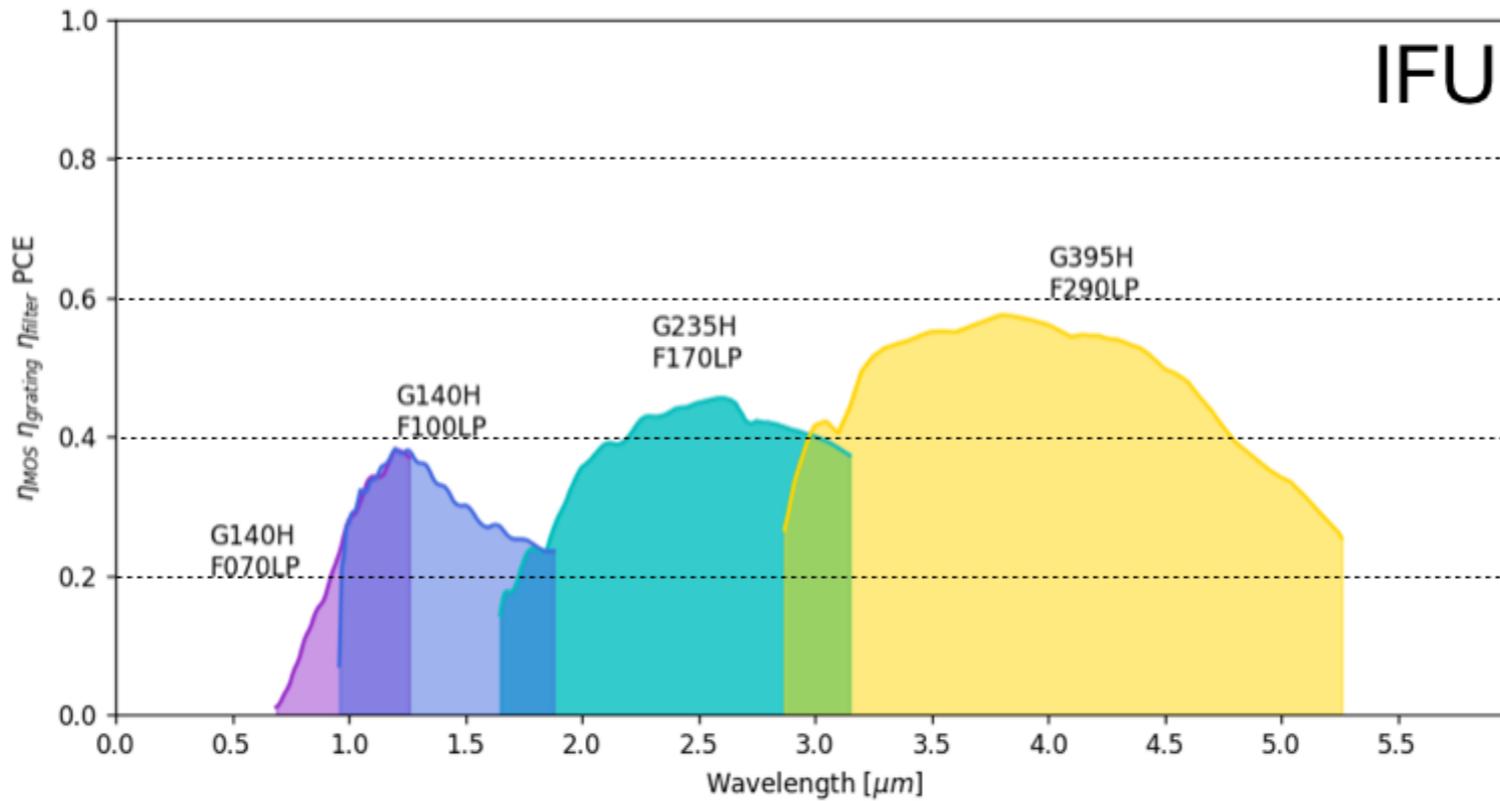
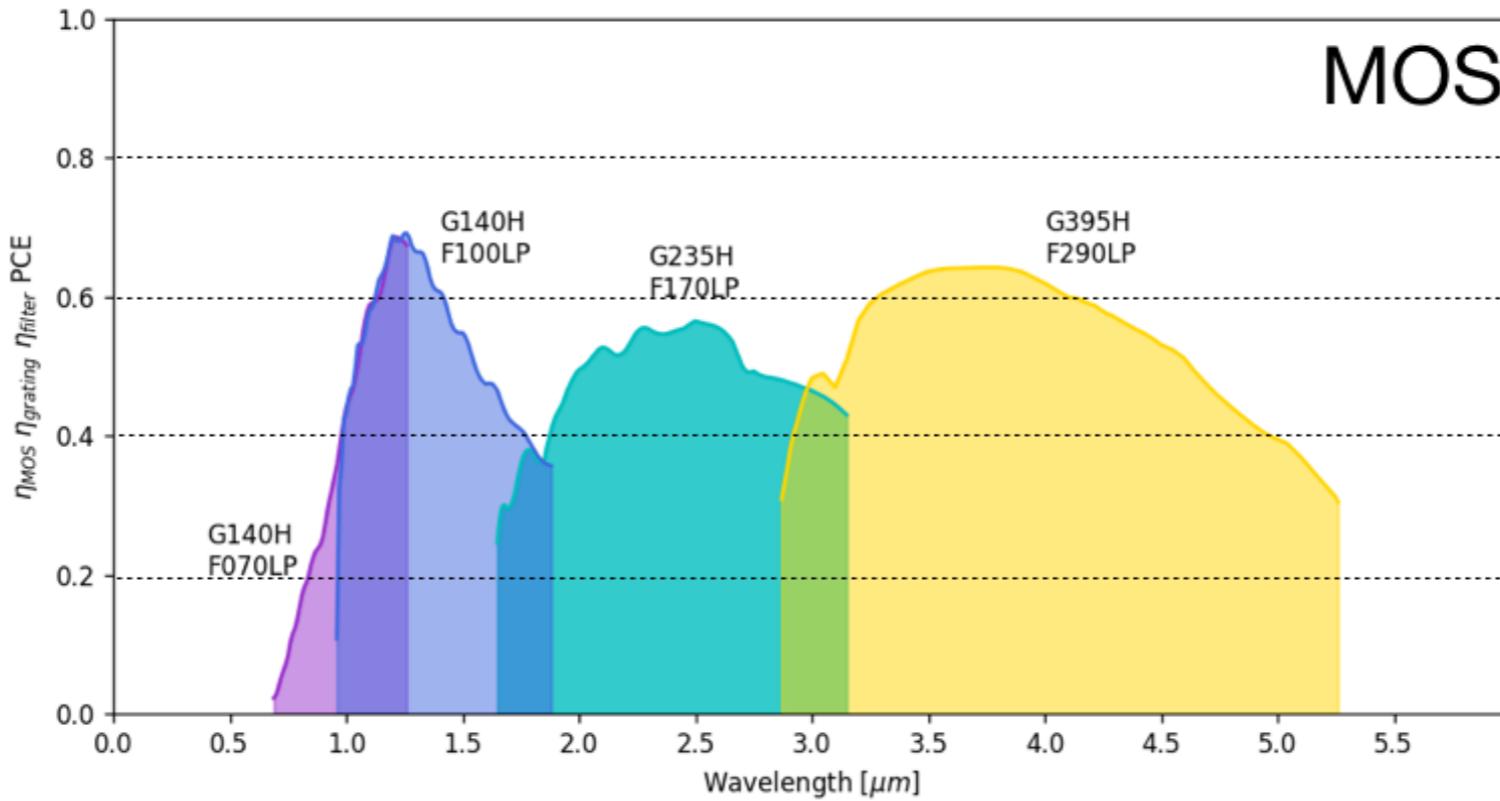
Wavelength range of 0.6 - 5.3 microns

3x2 grisms covering 3 wavelength ranges at 2 different resolutions

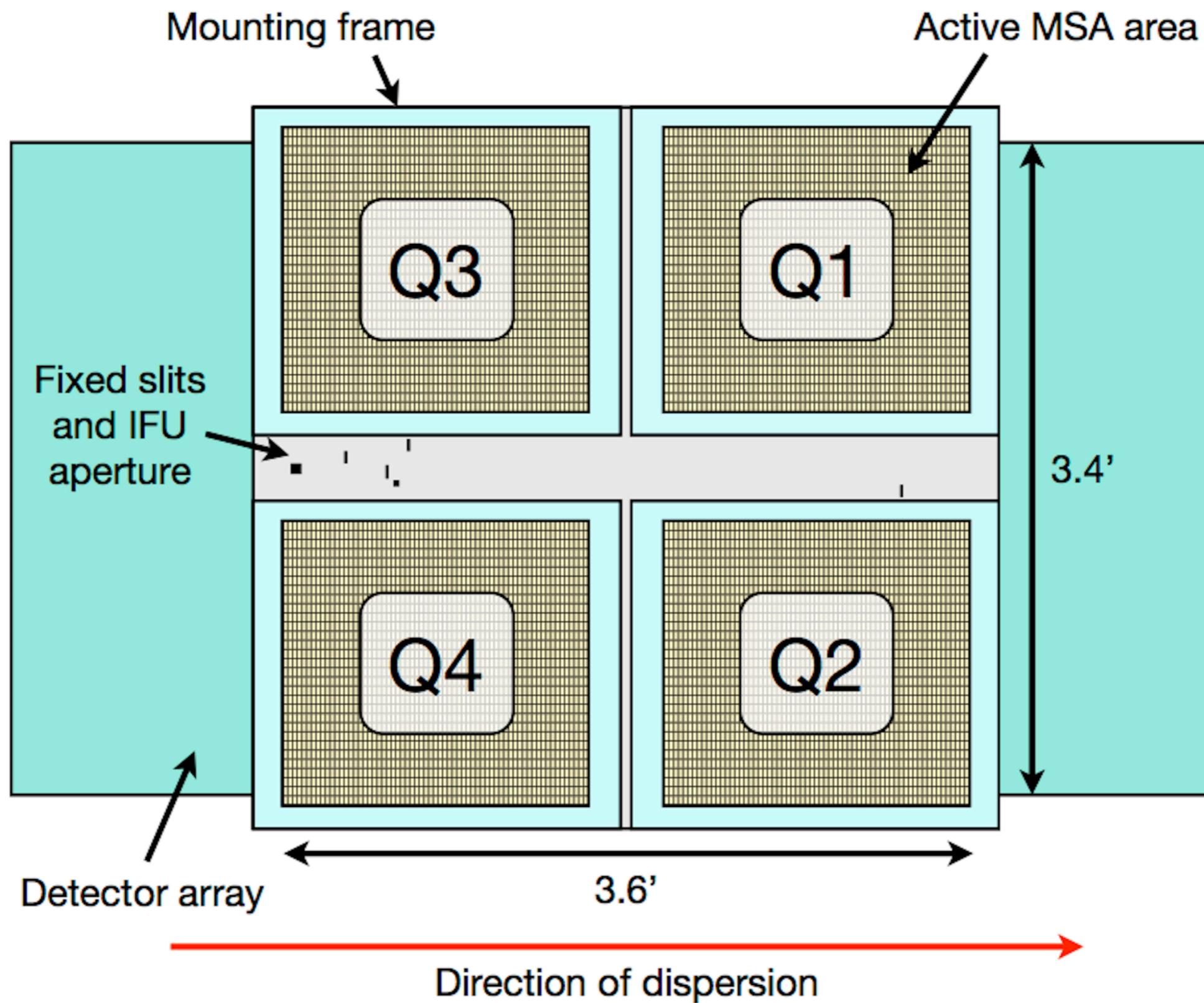
Also low resolution prism option covering whole wavelength range

| Disperser/filter combination | Nominal resolving power | Wavelength range (μm) |
|------------------------------|-------------------------|------------------------------------|
| G140M/F070LP | ~1000 | 0.70-1.27 |
| G140M/F100LP | | 0.97-1.84 |
| G235M/F170LP | | 1.66-3.07 |
| G395M/F290LP | | 2.87-5.10 |
| G140H/F070LP | ~2700 | 0.81-1.27 |
| G140H/F100LP | | 0.97-1.82 |
| G235H/F170LP | | 1.66-3.05 |
| G395H/F290LP | | 2.87-5.14 |
| PRISM/CLEAR | ~100 | 0.60-5.30 |

NIRSpec dispersion options



NIRSpec observing modes



NIRSpec observing modes - MSA

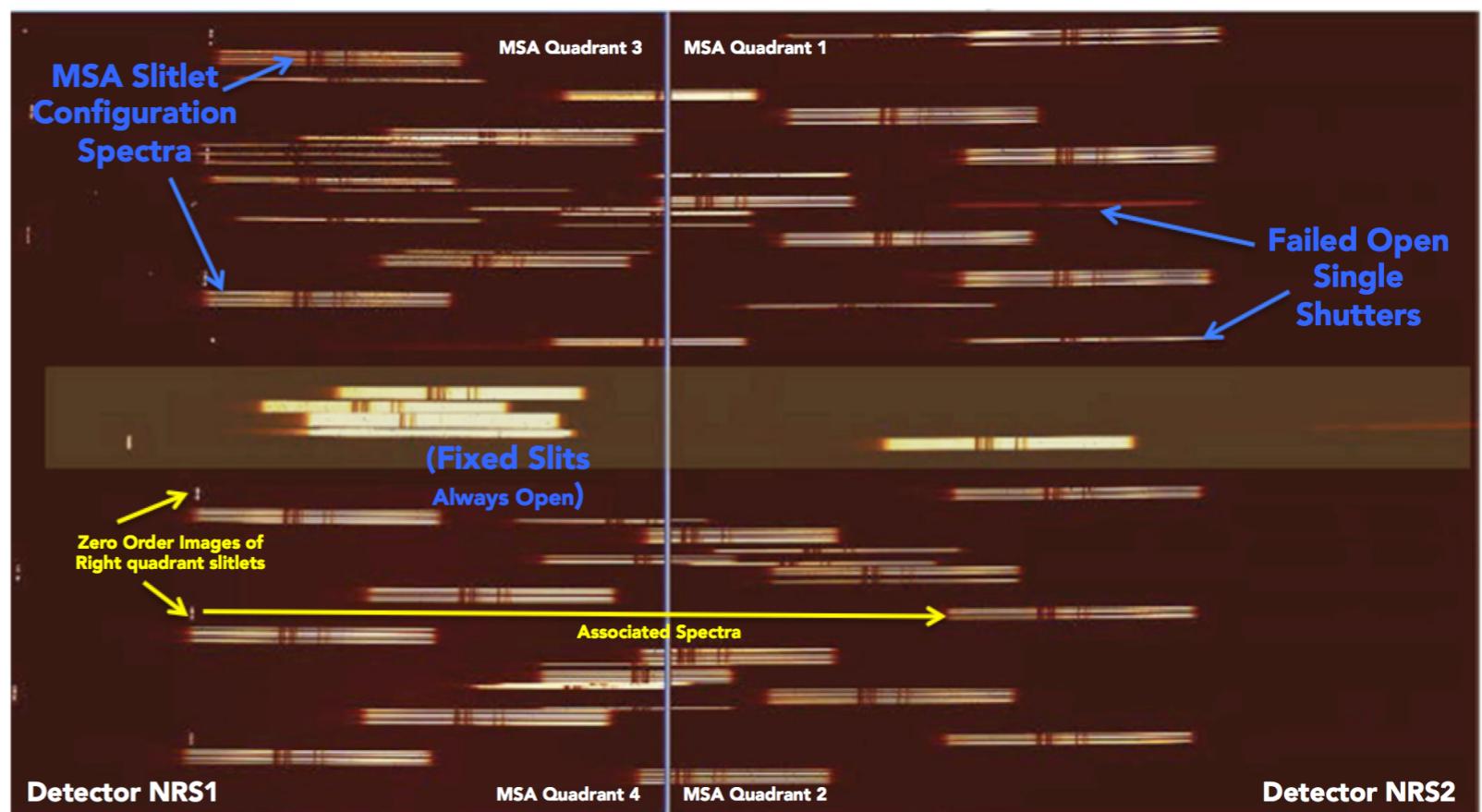
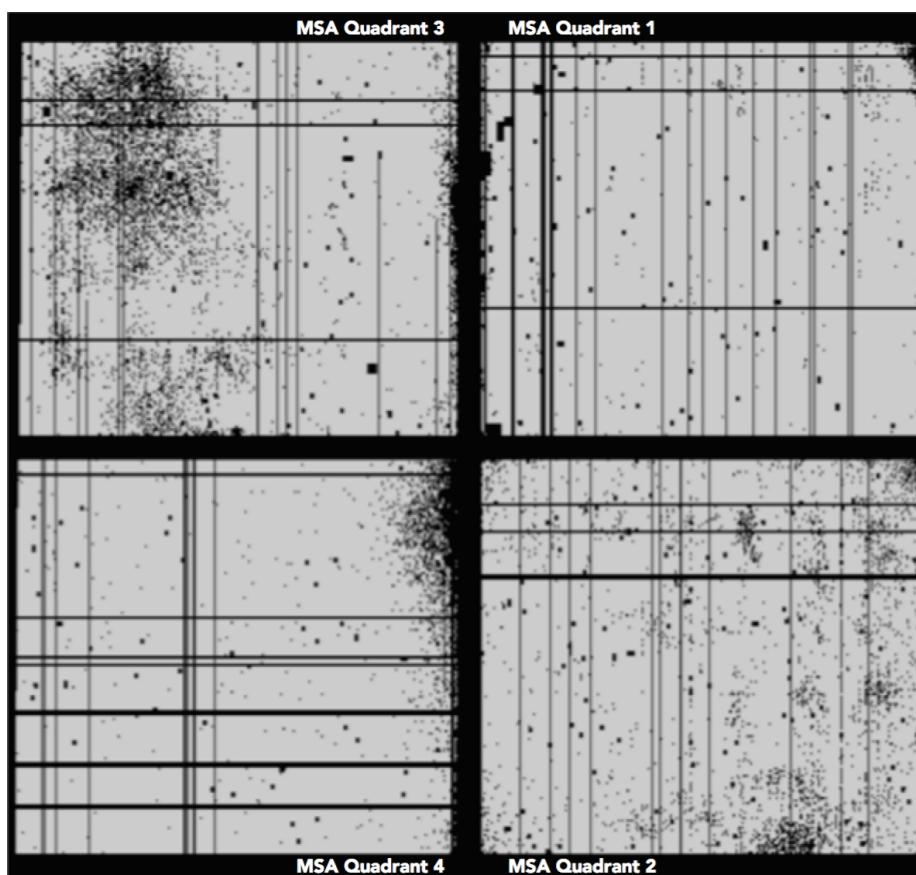
Micro-shutter assembly designed for multi-object spectroscopy

4x365x171 shutters each of size 0.2" x 0.46"

Some shutters are fixed closed ~14% and fixed open (> 12)

Allows tens to hundreds of simultaneous observations

Main difficulties are with target selection and acquisition

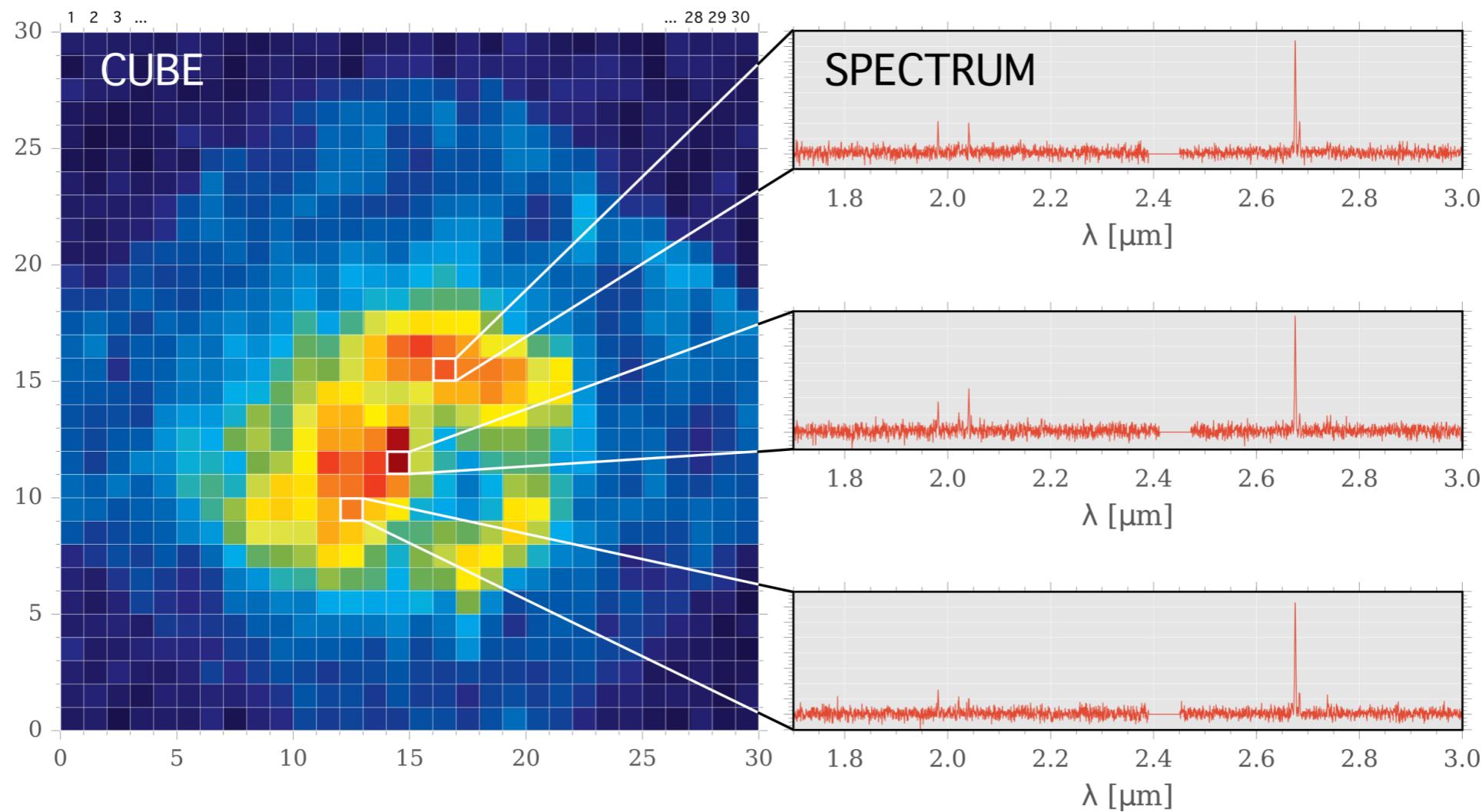


NIRSpec observing modes - IFU

3" x 3" array of 0.1" x 0.1" pixels, each of which is dispersed

PSF size is ~0.03" at 0.6 microns up to ~0.2" at 5.3 microns

Image slicing technique disperses light onto same CCD as MSA



NIRSpec observing modes - IFU

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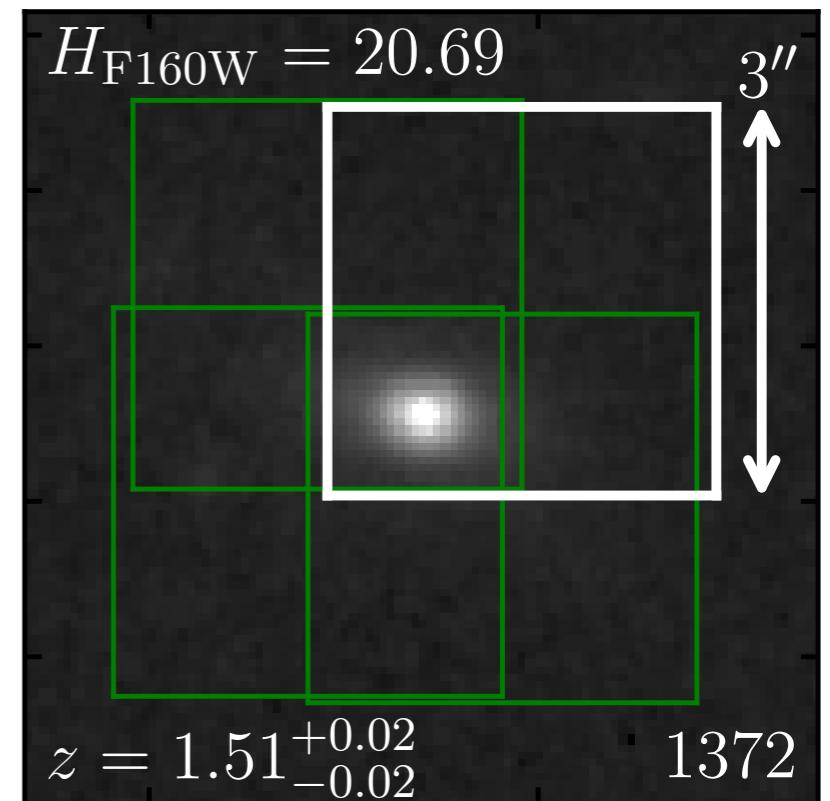
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NIRSpec observing modes - FS/BOTS

Fixed slits for observing the brightest and faintest objects

Good for faintest as they project onto an area of CCD not contaminated by finite opacity of the MSA shutters

Good for brightest objects which would saturate in MSA/IFU

S1600A1 1.6" x 1.6" square aperture also used in acquisition

Probably not that useful for what we want to do

| FS aperture name | Width (arcsec) | Height (arcsec) |
|------------------|----------------|-----------------|
| S200A1 | 0.2 | 3.2 |
| S200A2 | 0.2 | 3.2 |
| S400A1 | 0.4 | 3.65 |
| S1600A1 | 1.6 | 1.6 |
| S200B1* | 0.2 | 3.2 |

NIRSpec target acquisition

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3. VERIFY_ONLY/NONE - risk it, optionally take a verification image so you'll know how badly wrong the pointing was later on