Difficulty & more FOV

- Baseline 6x3
  - Judgment is that 4 or more rows of active H4RGs does not fit unvignettable field
  - Note that colors are for imaging mode
    - Focal prisms may not work in portions yellow region
      - Preliminary look says 2 grisms, each covering half of 1.3-2.4um bandpass, is an alternative
    - Focal prisms much more difficult with curved layout

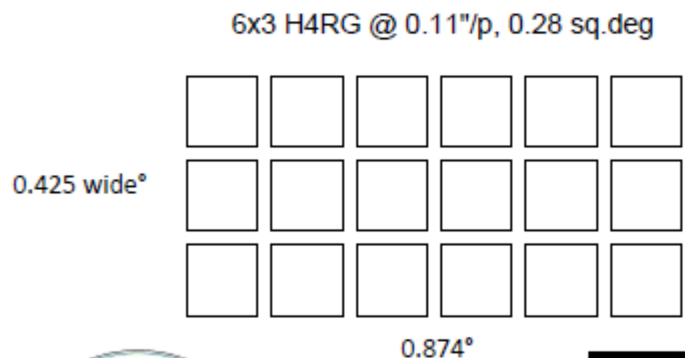
"/p | layout	6x3	8x3	10x3
0.09	0.188	0.251	0.313
0.1	0.232	0.309	0.387
0.11	**0.281**	0.374	0.468
0.12	0.334	0.446	0.557
0.13	0.392	0.523	0.654
0.14	0.455	0.607	0.758

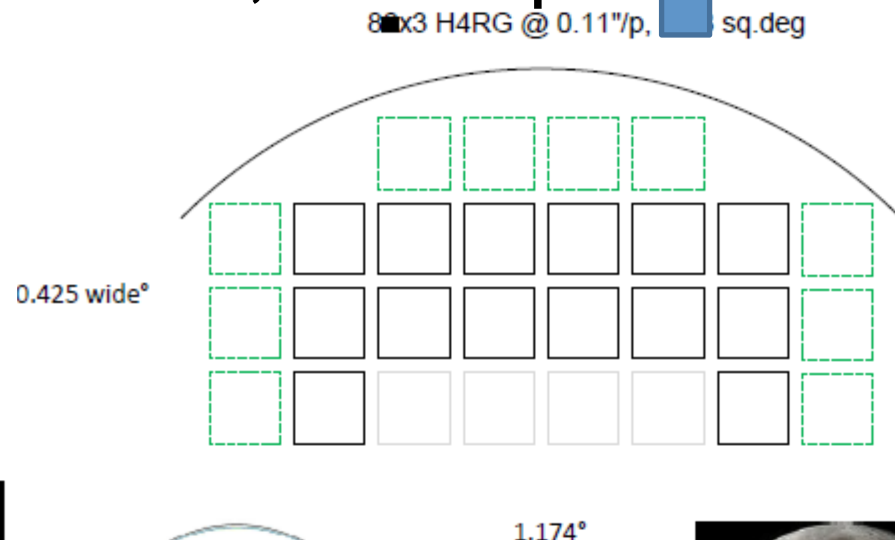
Layout table:
X – layout (H4RG (10um))
Y – pixel scale, arcsec
Data: FOV area, sq. deg.
Colors are **qualitative guess**, as to doable, hard, very hard, unworkable; for green/yellow/red/black respectively
Baseline is 0.11 6x3

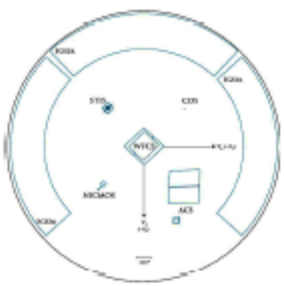
Baseline and larger FOV widefield layouts

6x3, 0.11"/p

8x3, 0.11 "/p 0.374°

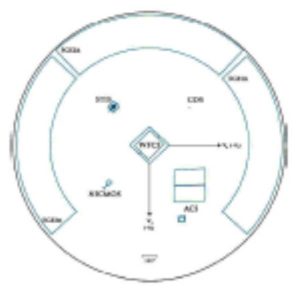





HST [all instruments]


JWST [all instruments]

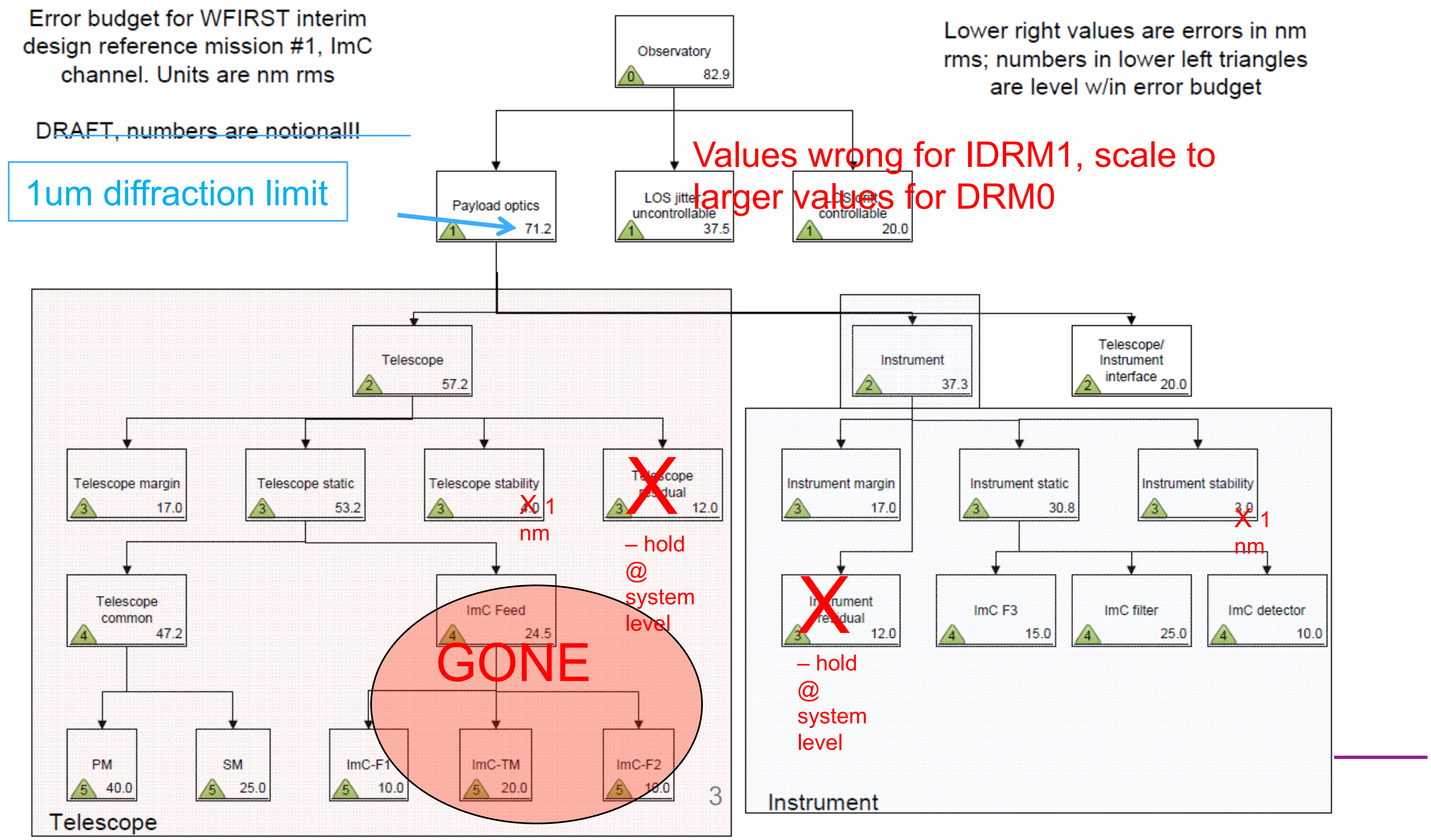

Moon (average size seen from Earth)


HST [all instruments]


JWST [all instruments]


Moon (average size seen from Earth)

WFIRST – recasting IDRM Imaging channel (ImC) error budget for AFTA widefield instrument



Pointing equivalent wavefront error

- Jitter can be treated as equivalent to wavefront error
- Portion of derivation at right
- Table lists derived wavefront errors for IDRM, current DRM0, and HST(in visible)
- Increases w/ D, so even 11masec (tighter than by naïve pixel scale scaling) is a large wfe (44nm rms)
- Needs more discussion with SDT

Combining (1) and (2), one can find expressions for "jitter-equivalent wavefront error".

$$\sigma_{wfe} = \frac{\lambda}{2\pi}\sqrt{\ln\left[1+\frac{1}{2}\left(\frac{\pi\sigma_{los}D}{\lambda}\right)^2\right]} \quad (3)$$

$$\sigma_{los} = \frac{\lambda\sqrt{2}}{\pi D}\sqrt{e^{\left(\frac{2\pi\sigma_{wfe}}{\lambda}\right)^2}-1} \quad (4)$$

For λ = 1 microns and D = 1.5 meters, equation (3) yields a scale factor of 1 mas jitter ≈ 2.5 nm wavefront error. Hence, the upper bound on pointing stability is 30 mas rms, assuming that GN&C gets the entire 75 nm rms wavefront error budget!

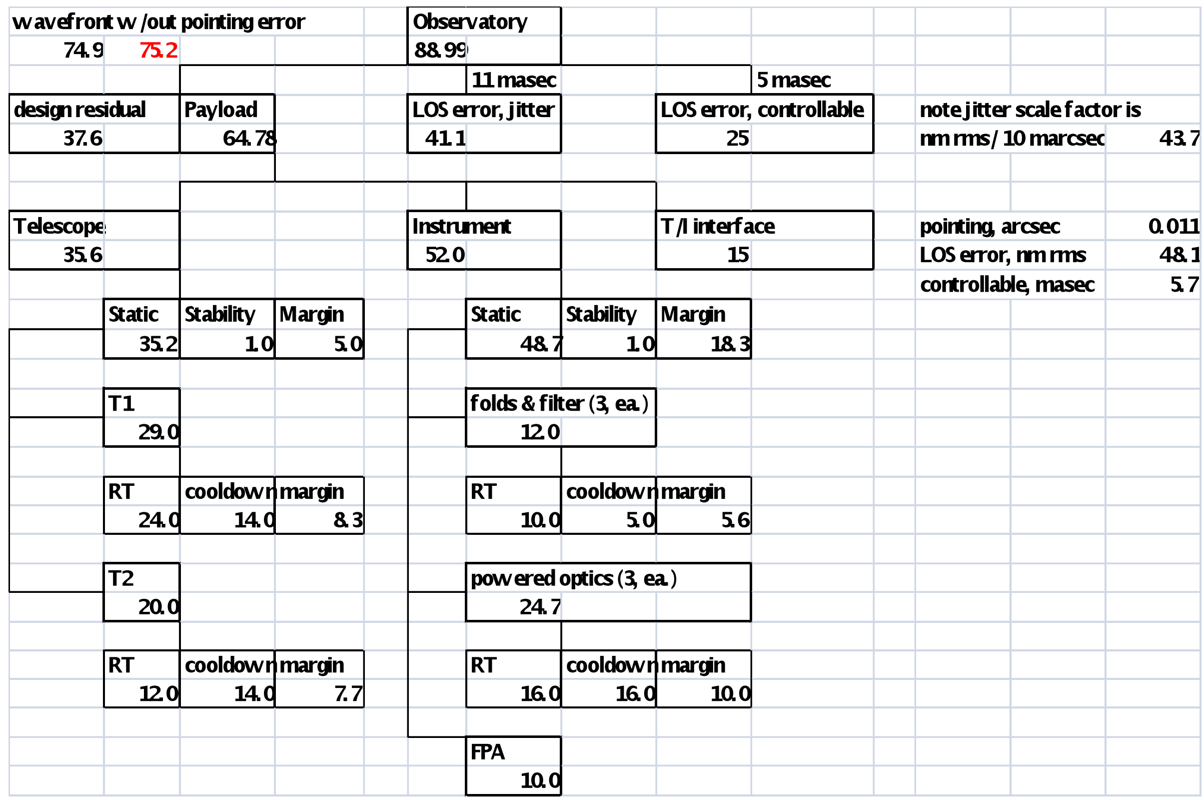
Image Quality approach to Pointing Stability.pdf

Gary Mosier

		IDRM	DRM0	HST		example
lambda	um	1	1	0.5		1
D	m	1.3	2.36	2.4		1.5
p	arcsec	0.18	0.11	0.04		
pointing	pixel	0.139	0.1	0.1		
s_LOS	arcsec	0.0250	0.0110	0.0040		0.001
s_LOS	urad	0.121	0.053	0.019		0.005
s_wfe	nm	54.0	43.7	16.3		2.57

{revised} 1st cut – imaging mode, wide field instrument

- Based on same requirements as IDRM/DRM1&2: 1um diffraction limit plus pointing errors at ~1/7th pixel rms per axis
- T1/T2 room temp (RT) errors from ITT data
- T1 Cooldown is based on the one analysis done so far [may be overly tight, or not, tbd]
  - T2 cooldown set equal to T1
- This is VERY tight:
  - Near state of art polishing
  - Minimal allocation for thermal cooldown distortion
  - Small margins
- Tightened pointing allocations
  - jitter from 15 to 11 masec
  - ACS from to 5.7 masec



DRAFT/notional