

Comparison of Space-Based Near-IR Capabilities

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Comparison of Space-Based Near-IR Survey Speeds

- Assume deep exposures - background limited.
- Orbital efficiency, $E \sim 35\%$ for HST & 70% for non-LEO orbits.
- Field of view determines how much sky can be surveyed in a given time.
- $S/N \sim (A_{\text{Telescope}})^{1/2} \sim D$
- $S/N \sim (A_{\text{image}})^{-1/2} \sim 1/\text{Resolution}$
- Define a Survey Figure of Merit, $\text{FOM} = (K D E \text{FOV})/\text{Resolution}$
- Constant, K , chosen to normalize to IR channel of HST-WFC3.
- SFOM breaks down if Object Size $>$ Resolution
- The JWST FOV refers to the sum of the two identical short wavelength channels of NIRCAM

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Version	Diam.	Red Limit	Resolution at 1.5μ	Detectors	Pixels (10 ⁶)	Pixel Size	FOV (Sq. Deg.)	SFOM HST=1
AFTA	2.4 m	2.0? μ	0.22"	H4RG	302	0.11"	0.28	410
DRM1	1.3 m	2.4 μ	0.36"	H2RG	151	0.18"	0.38	138
DRM2	1.1 m	2.4 μ	0.36"	H4RG	235	0.18"	0.59	180
HST	2.4 m	1.7 μ	0.26"	H2RG	1	0.13"	1.37x10 ⁻³	1
JWST	6.6 m	2.3 μ	0.064"	H2RG	34	0.032"	2.6x10 ⁻³	30

- The two most important parameters for WFIRST science are resolution and survey speed. These two parameters are far superior for AFTA compared to other telescopes.