

IRMS: Infrared Multi-Slit Spectrograph Technical Requirement Study

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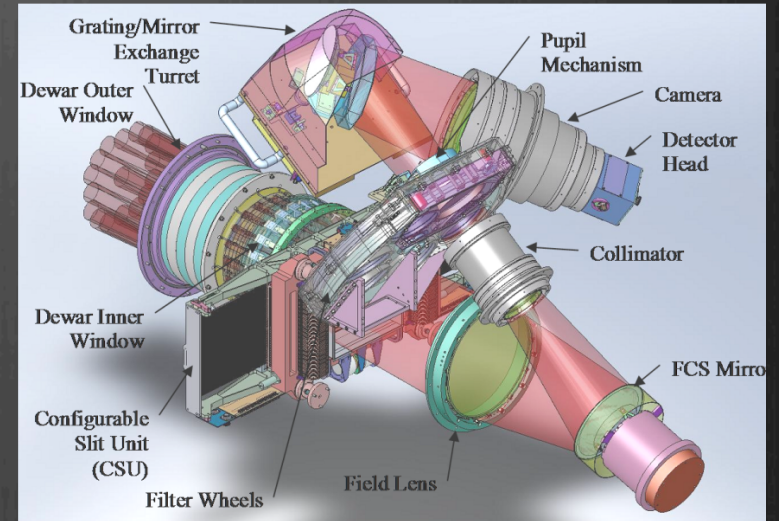
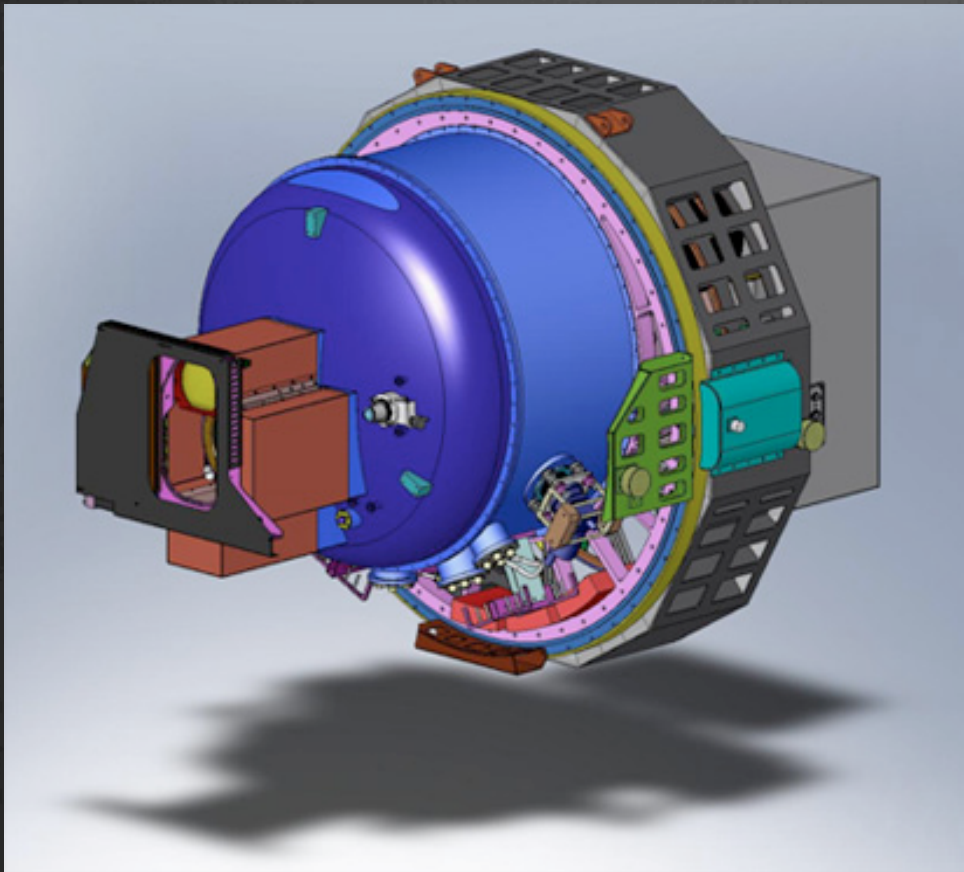
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Brief Description of MOSFIRE

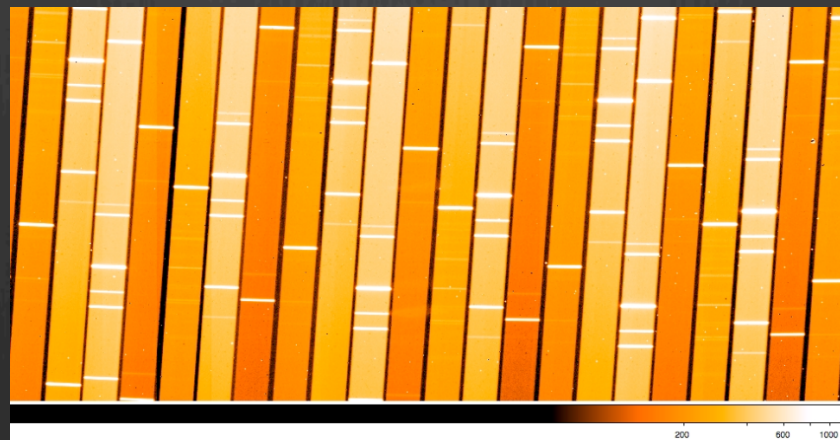
Wavelength	0.9 - 2.5 μm
Spectral Resolution	R=3270 w/0.7" slit (R=4770 w/0.48" slit)
AO	None
Sampling	0.18" in imaging mode
Field Size	6.14' x 6.14'
MOS	Cryogenic Configurable Slit Unit (CSU) ~45 remotely configurable slits. Length 7.3"
Throughput	0.45 ~ 0.35 (Imaging) 0.33 ~ 0.27 (Spectrograph) (not including telescope)
Detector	One H2RG and ASIC (2k x 2k pixels)
First Light	Summer 2011

MOSFIRE on Keck

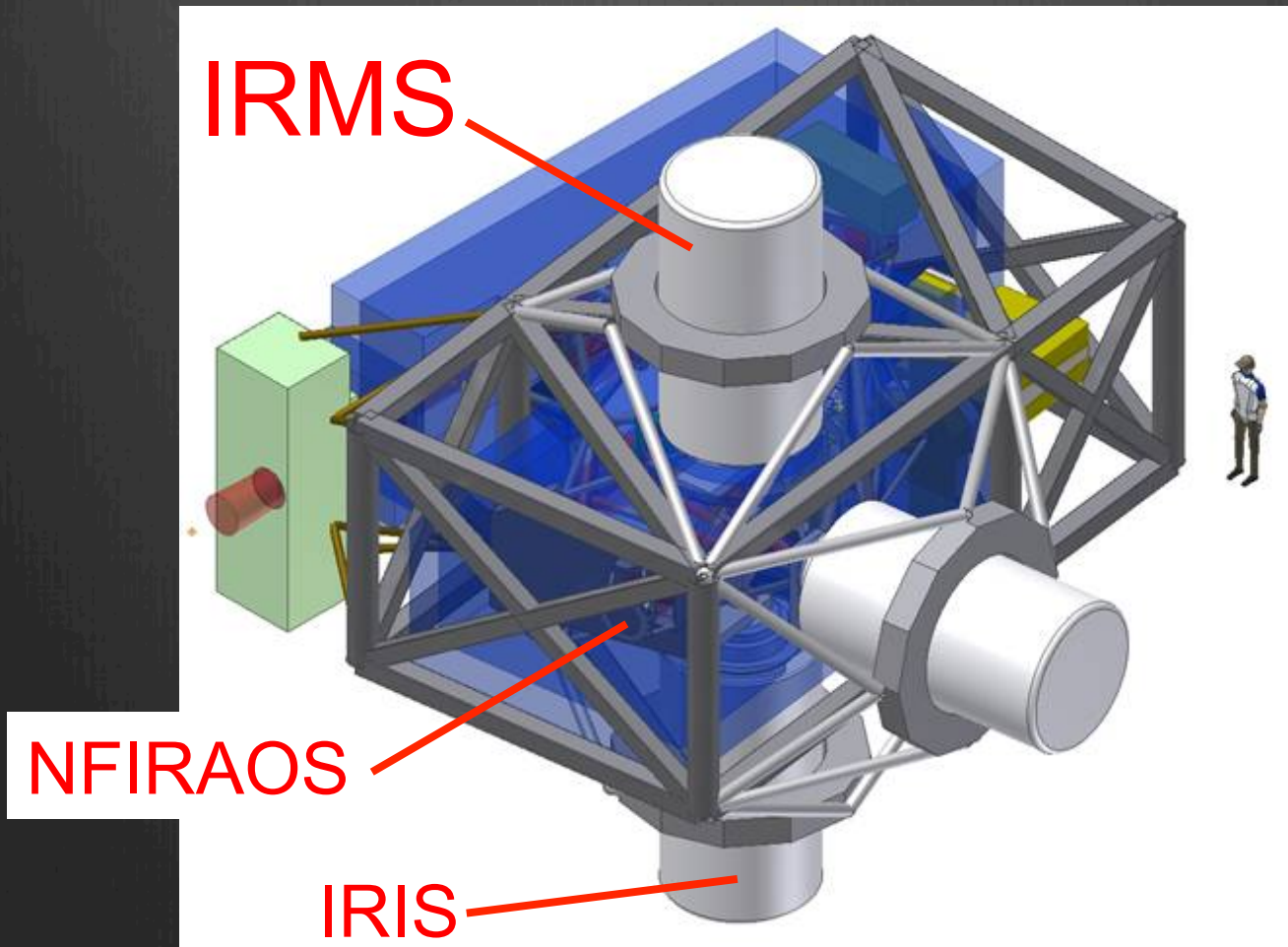


Current Status of MOSFIRE

- Lab first light in July 2010 with an excellent optical performance.
- Cryogenic test with all the components in December 2010.
- Will be shipped to Hawaii in 2011.



IRMS on TMT



TMT Nasmyth image by NRC-HIA

MOSFIRE to IRMS

	MOSFIRE	IRMS
Telescope Aperture	10m Keck, Cassegrain	30m TMT, Nasmyth
Telescope F-ratio	f/14.5	f/15
FOV	6.8 x 6.8 arcmin	2 x 2 arcmin
Sampling	0.18"	0.06" (60 mas)
Plate Scale of Telescope	1.38 arcsec/mm 300 mm for 6.8 arcmin 507 um for 0.7" slit	0.45 arcsec/mm 267 mm for 2 arcmin 355 um for 160 mas slit
AO	N/A	NFIRAOS
OIWFS	N/A	Required
Atmospheric Dispersion Corrector (ADC)	None (On-Telescope Tip-tilt)	Required (On-Instrument)
Instrument Rotator	N/A	Required

IRMS on TMT

IRMS ($2 \times 2 \text{ arcmin}^2$)

H2RG
(2k x 2k
pixels)

IRIS ($17 \times 17 \text{ arcsec}^2$)

H4RG
(4k x 4k
pixels)



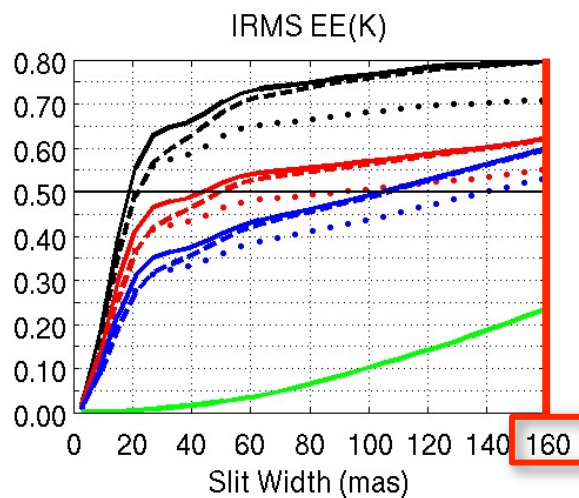
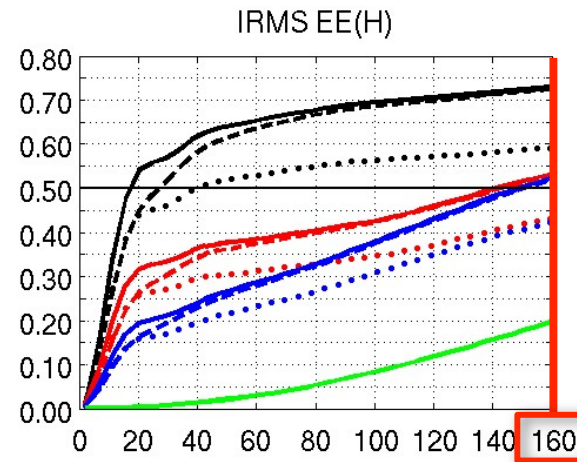
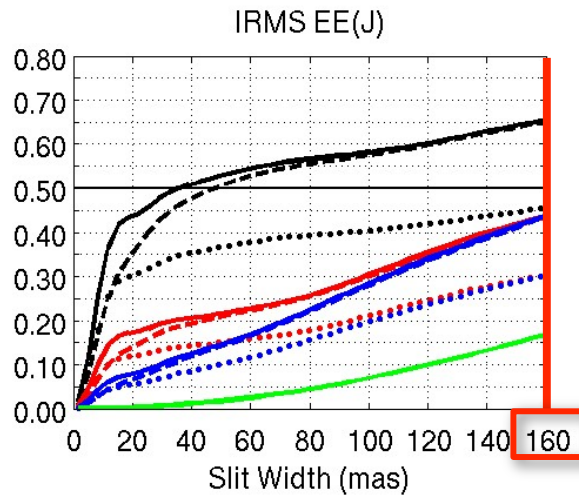
Sky image by HST/WFC3/IR/HUDF $2.2 \times 2.2 \text{ arcmin}^2$

IRMS Sensitivity

- MOSFIRE optical throughput and detector QE.
- Including updated NFIRAOS wide-field mode simulations.
- TMT telescope efficiency.
- Mauna Kea sky brightness.

IRMS Sensitivity

NFIRAOS Wide-field Mode (~2') EE



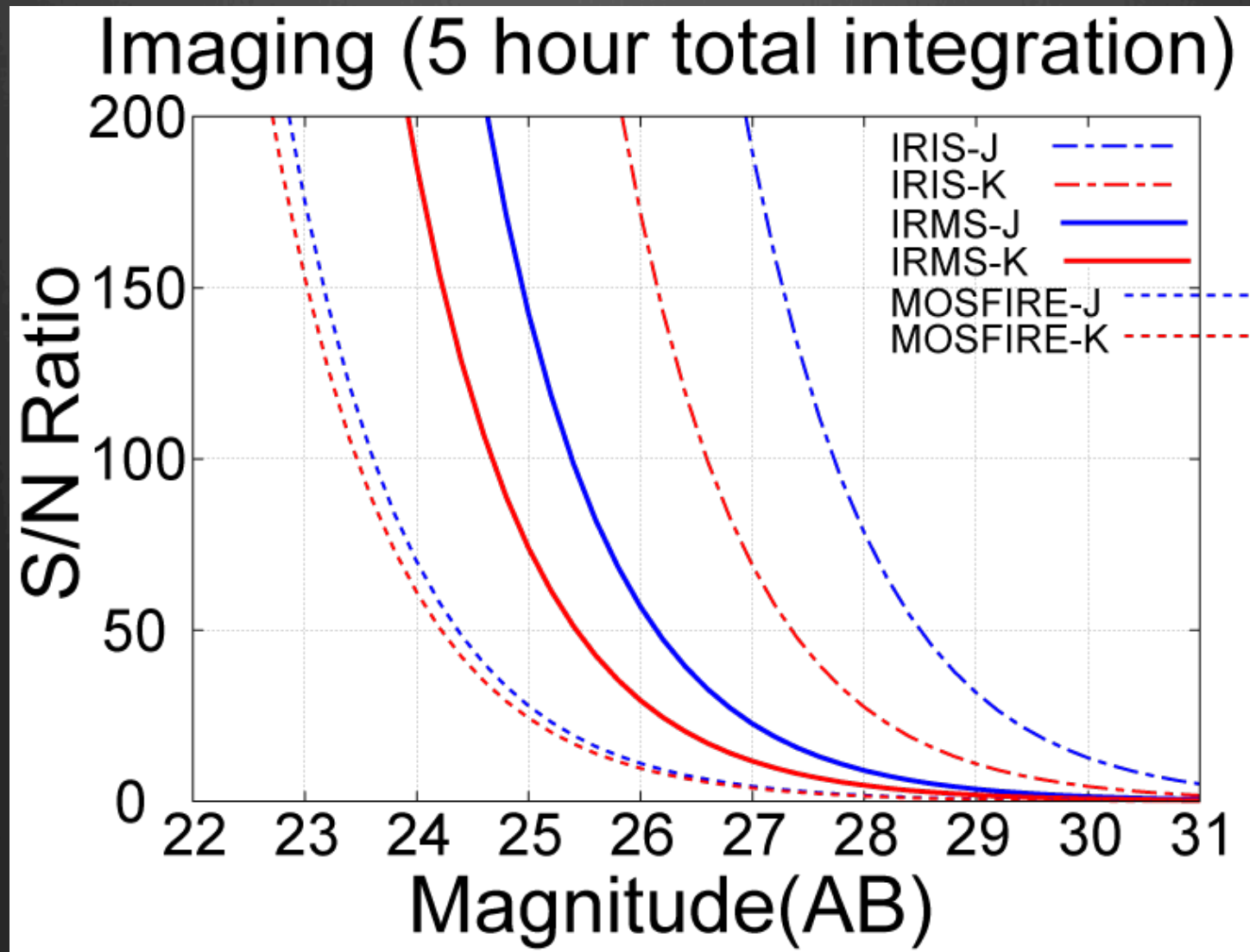
Slit Width 160mas

- D=0', Excl. Impl. On-axis
- - - D=0', Incl. Impl. (OTF)
- D=0', Incl. Impl. (Marechal) Edge of 1'
- D=1', Excl. Impl.
- - - D=1', Incl. Impl. (OTF)
- D=1', Incl. Impl. (Marechal) Edge of 2'
- D=2', Excl. Impl.
- - - D=2', Incl. Impl. (OTF)
- D=2', Incl. Impl. (Marechal)
- Seeing Limited

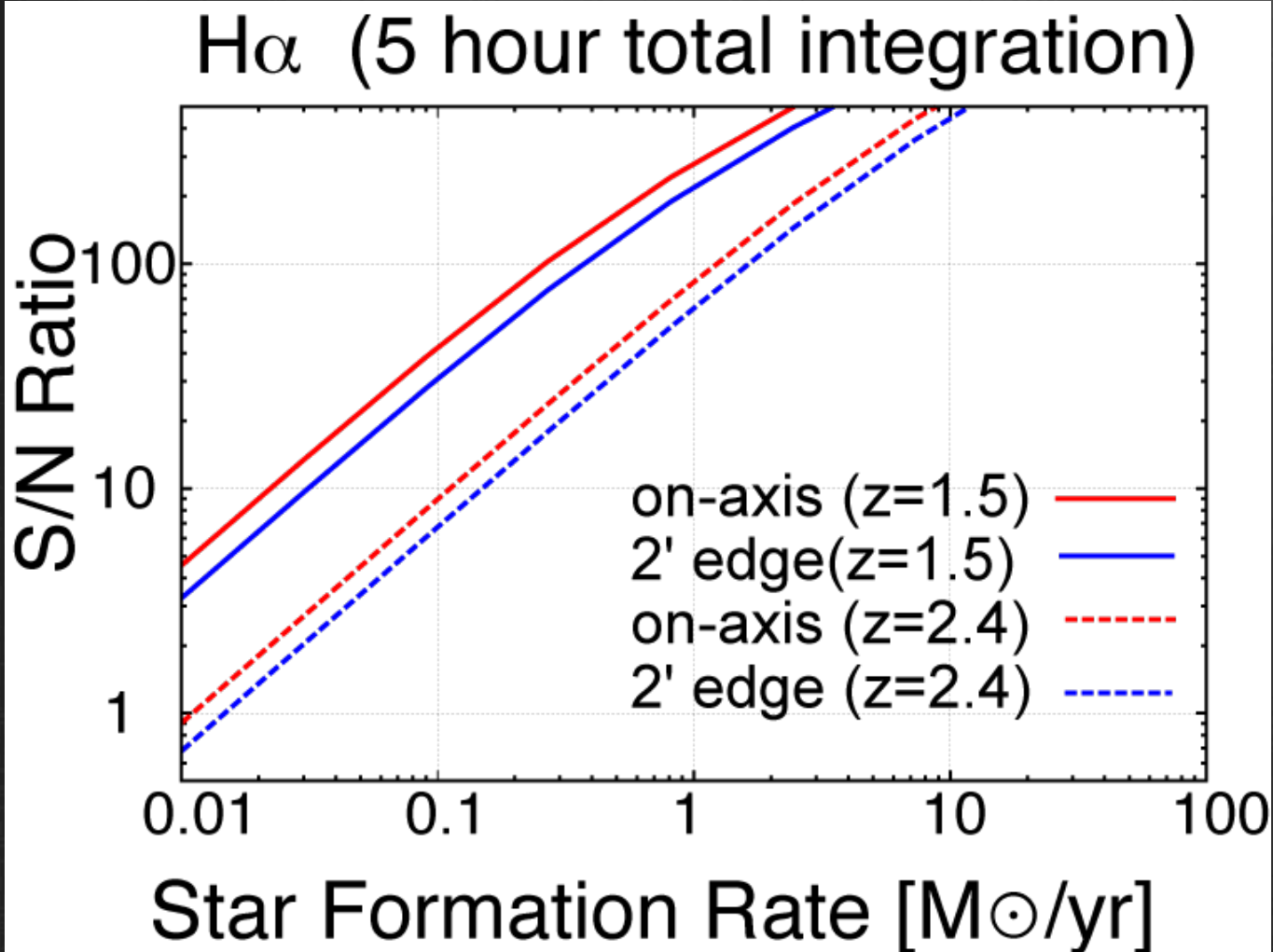
Seeing limited

Simulation by Luc Gilles

Imaging Sensitivity Comparison with IRIS and MOSFIRE



MOS Sensitivity H α emission line



H α @z=1.5 (H-band)
H α @z=2.4 (K-band)

Dispersion 80 km/s
5 hour exposure

160mas
1.37kpc@z=1.5
1.32kpc@z=2.4

Future Works

- Detailed data simulations for the science case.
- Identify and define scientific requirements for IRMS.

Summary

- IRMS is a clone of MOSFIRE.
- MOSFIRE is about to be shipped to the Keck.
- IRMS sensitivities, including the updated NFIRAOS wide-field simulations.