SALT RSS-NIR
MID-TERM REVIEW
MAY 20 & 21, 2009

COMMISSIONING PLAN

ANDREW SHEINIS
UNIVERSITY OF WISCONSIN

Schedule

date	task	mode	On sky
I+1 mo	**Group I comissioning tasks (not requiring all mirrors)**		
5 d	Integrate + test instrument control software w/telescope	...	N
1 d	Develop focus procedure, check focus with field position	Img	Y
1 d	Test acquisition & guide accuracy w/offset guiders	Img	Y
1 d	Check focus + image position vs. telescope + tracker position	Img	Y
1 d	Develop focus procedures for tilted longslits	Spec	Y
1 d	Plot grating wavelength solutions w/ scope/tracker position	Spec	N
1 d	Plot spatial distortion along slit for each config.	Spec	Y
1 d	Plot focus as function of wavelength, field position and tracker	Spec	Y
5 d	Develop slitmask fabrication procedures	MSpec	N
1 d	Test slitmask insertion + alignment	MSpec	Y
1 d	Plot focus as function of wavelength, field position and tracker	MSpec	Y
1 d	Calibrate FP wavelength & stability w/telescope position	FP	N
1 d		ImPol	N
1 d	Calibrate FP instr. polarization w/telescope + tracker position	FPPol	Y

Schedule

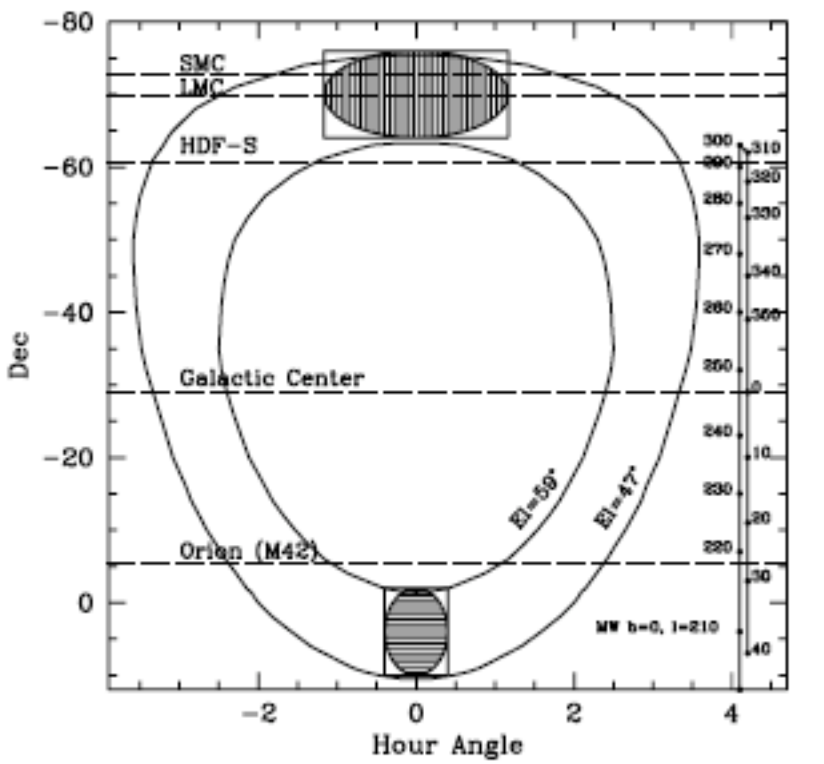
date	task	mode	On sky
I+3 mo	**Group II comissioning tasks (those requiring all mirrors)**		
8 h	Perform direct imaging science program *	Img *	Y
1 d	Test overall throughput for each grating vs. tilt, field position	Spec	Y
1 d	Test target acquisition + tracking procedure for single slits	Spec	Y
8 h	Perform Single slit spectroscopy science program *	Spec *	Y
1 d	Obtain on-sky imaging to calibrate mask-making plate solution	MSpec	Y
1 d	Test automated milti-slit acquisition & peak-up procedure	MSpec	Y
1 d	Test sensitivity & wavelength stability over multi-slit field	MSpec	Y
8 h	Perform Multi-slit spectroscopy science program *	MSpec *	Y
1 d	FP ...	FP	Y
1 d	Perform Fabry-Perot science program *	FP *	Y
1 d	Calibrate instrumental polarization vs. field position	ImPol	Y
1 d	Calibrate instrumental polarization vs. pupil illumination	ImPol	Y
8 h	Perform Imaging Polarimetry science program *	ImPol *	Y
8 h	Perform Spectro-Polarimetric science program *	SpecPol *	Y
8 h	Perform Fabry-Perot Polarimetric science program *	FPPol *	Y

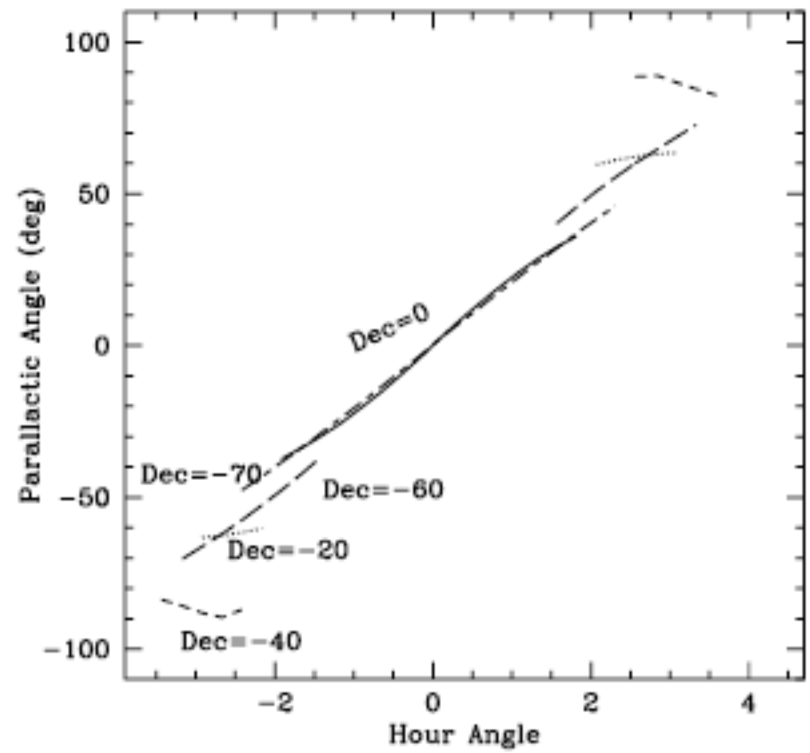
Slits

		Length	Use
1	$0.45''$	$7.5'$	Tilted longslit reflective plate
2	$0.6''$	$7.5'$	Tilted longslit reflective plate
3	$0.9''$	$7.5'$	Tilted longslit reflective plate
4	$1.1''$	$7.5'$	Tilted longslit reflective plate
5	$1.3''$	$7.5'$	Tilted longslit reflective plate
6	$3.0''$	$7.5'$	Tilted longslit reflective plate
7	$1.1''$	central $4'$	Tilted longslit reflective plate for polarimetry
8	$1.1''$	central $4'$	Tilted plate for coronographic work and polarimetry

- Longslits available to RSS

Target visibility

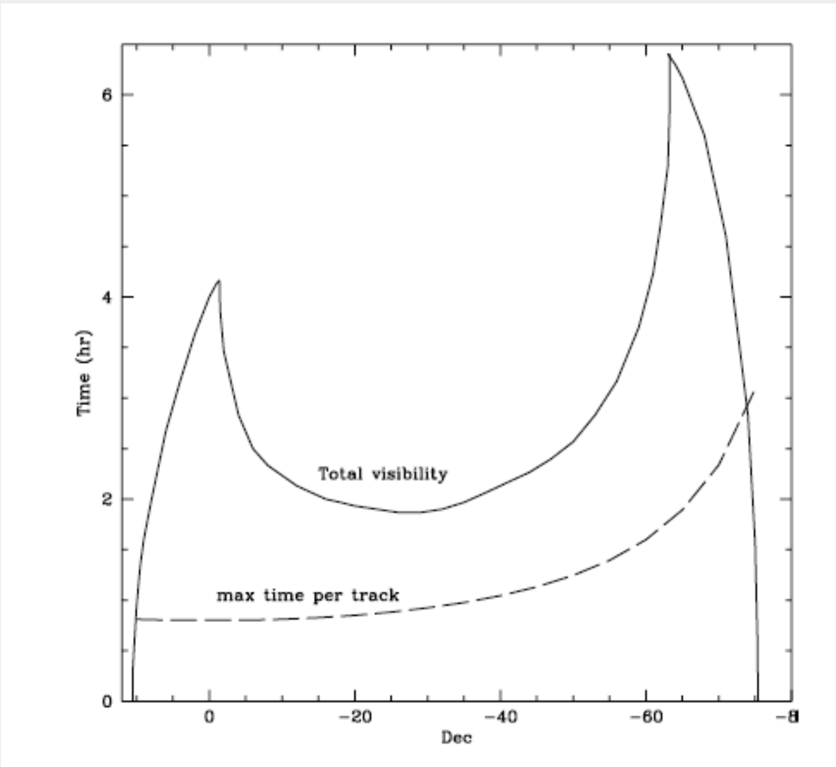




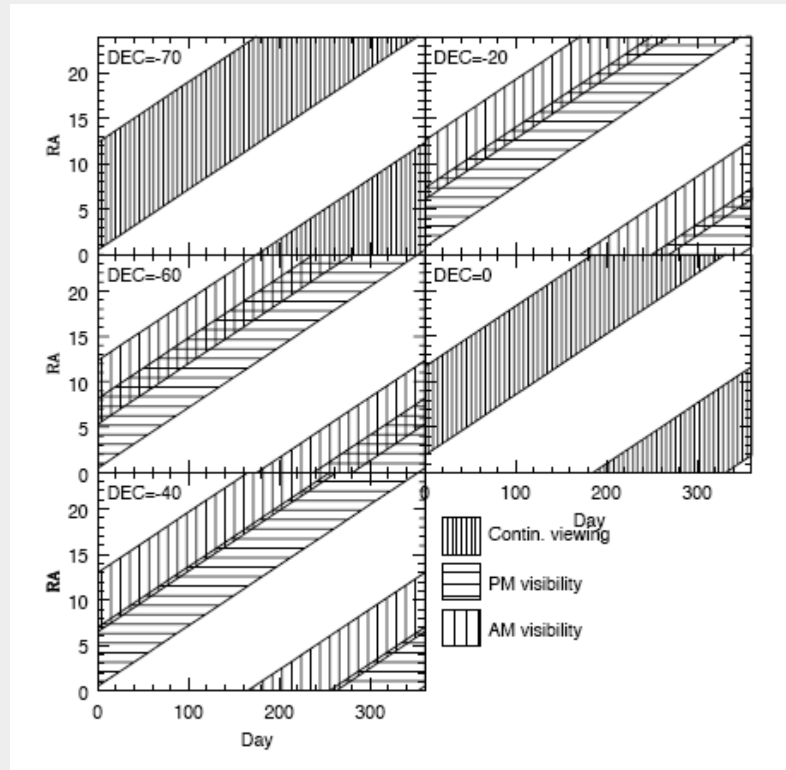
The annulus of visibility for SALT as a function of Declination and hour angle

The parallactic angle for different declinations as a function of hour angle

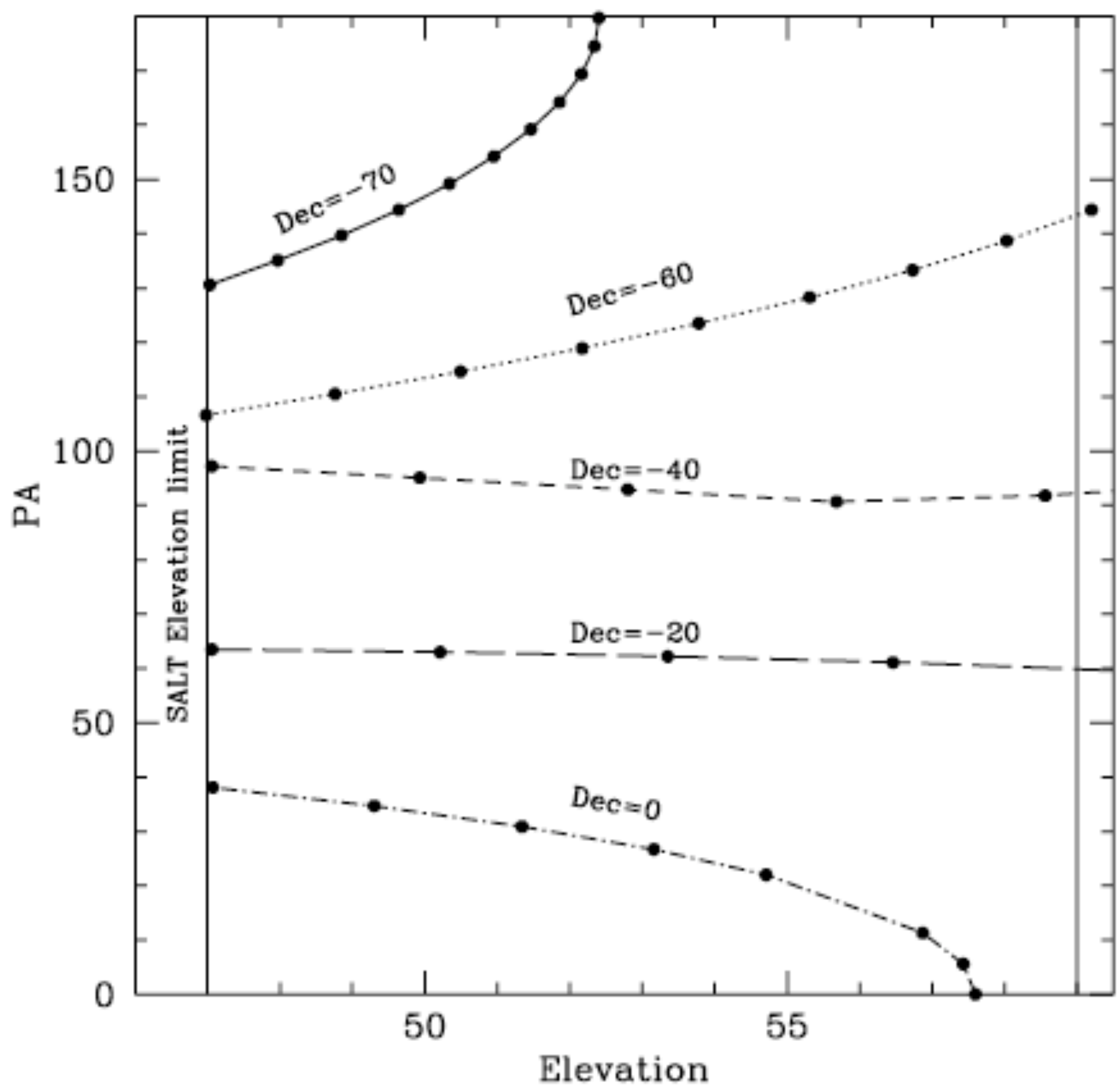
Total target visibility



Total visibility as a function of declination and 6 degree tracker limit

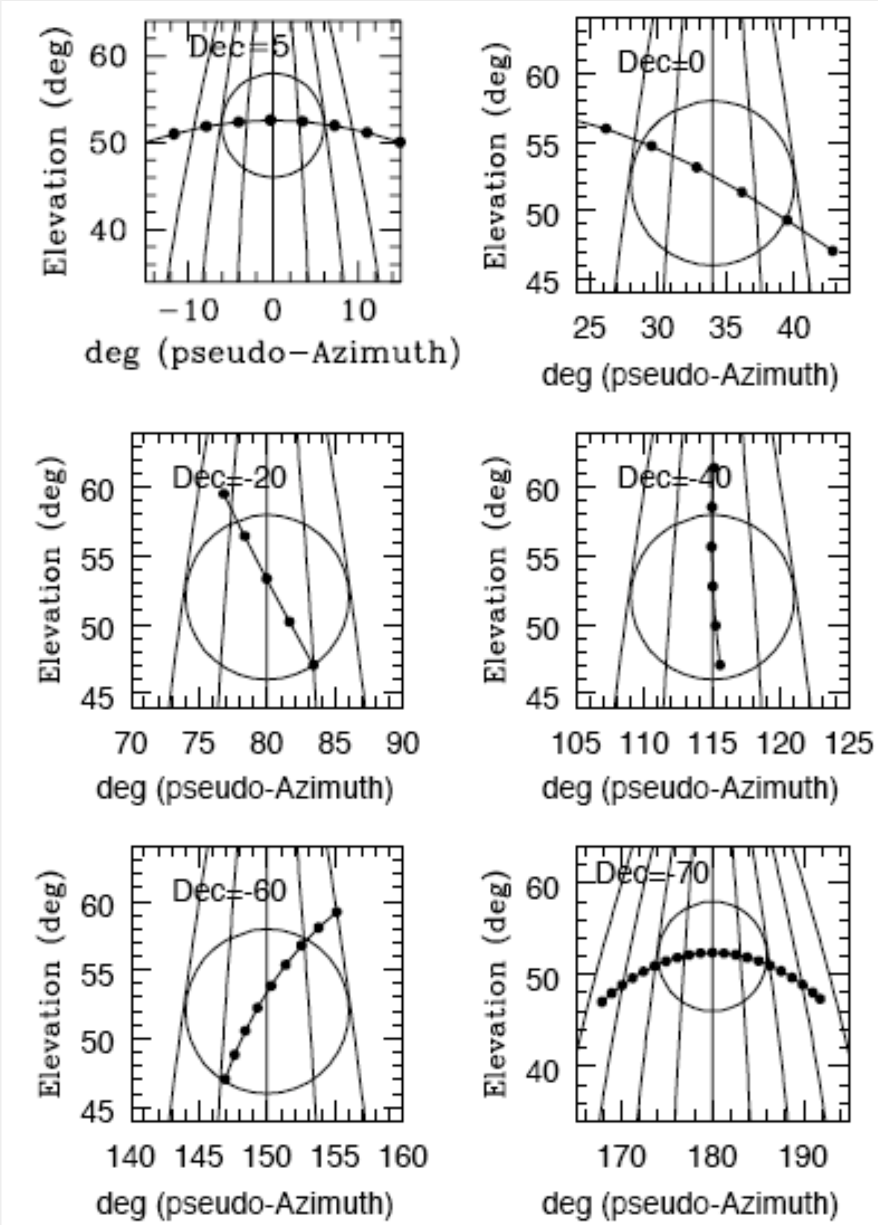


The range of Right Ascension where an object is visible to SALT for at least hour



Curves showing the change in parallactic angle with elevation for a sampling of different Declinations.

Schematic diagrams showing how sources at various declinations track across the field of SALT



Goals-Imaging

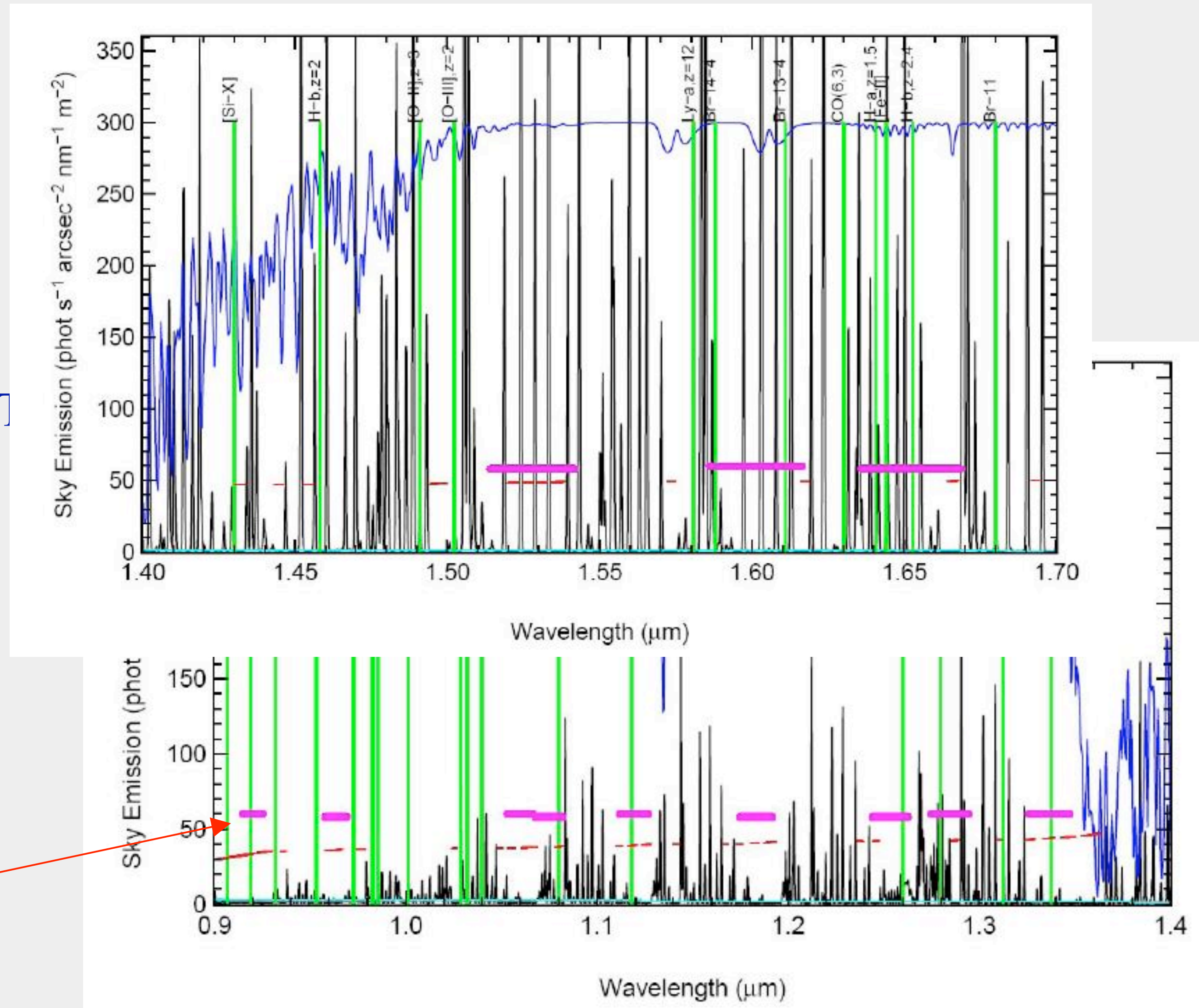
1) Plots of PSF as a function of focus position for each filter
2) Plots of PSF as a function of field location focus position for each filter
3) Plots of PSF as a function of ambient temperature
4) Quantify offsets and relative distortions between acquisition CCD, guide probes and NIR detector.
5) Test image quality over the field by observing a stellar eld with known astrometry and stellar sources
    1) Vector plots of astrometric distortion across the detector
    2) Vector plots of astrometric distortion as a function of rotator angle
    3) Vector plots of astrometric distortion as a function of tracker position including repeatability

Goals-Imaging-continued

1. Calibrate filter set with standard stars
2. Plots of sensitivity (erg/DN) in each filter
3. Plots of total system throughput for each filter as a function of field position and illumination
4. Test telescope pointing tracking: produce plots of seeing and image motion as a function of exposure time, hour angle, tracker position, and rotator motion

FP BLOCKING FILTERS

- Location chosen to minimize terrestrial foreground
- optimize FIRST LIGHT detection in discovery mode
- and hit key z=0 diagnostics

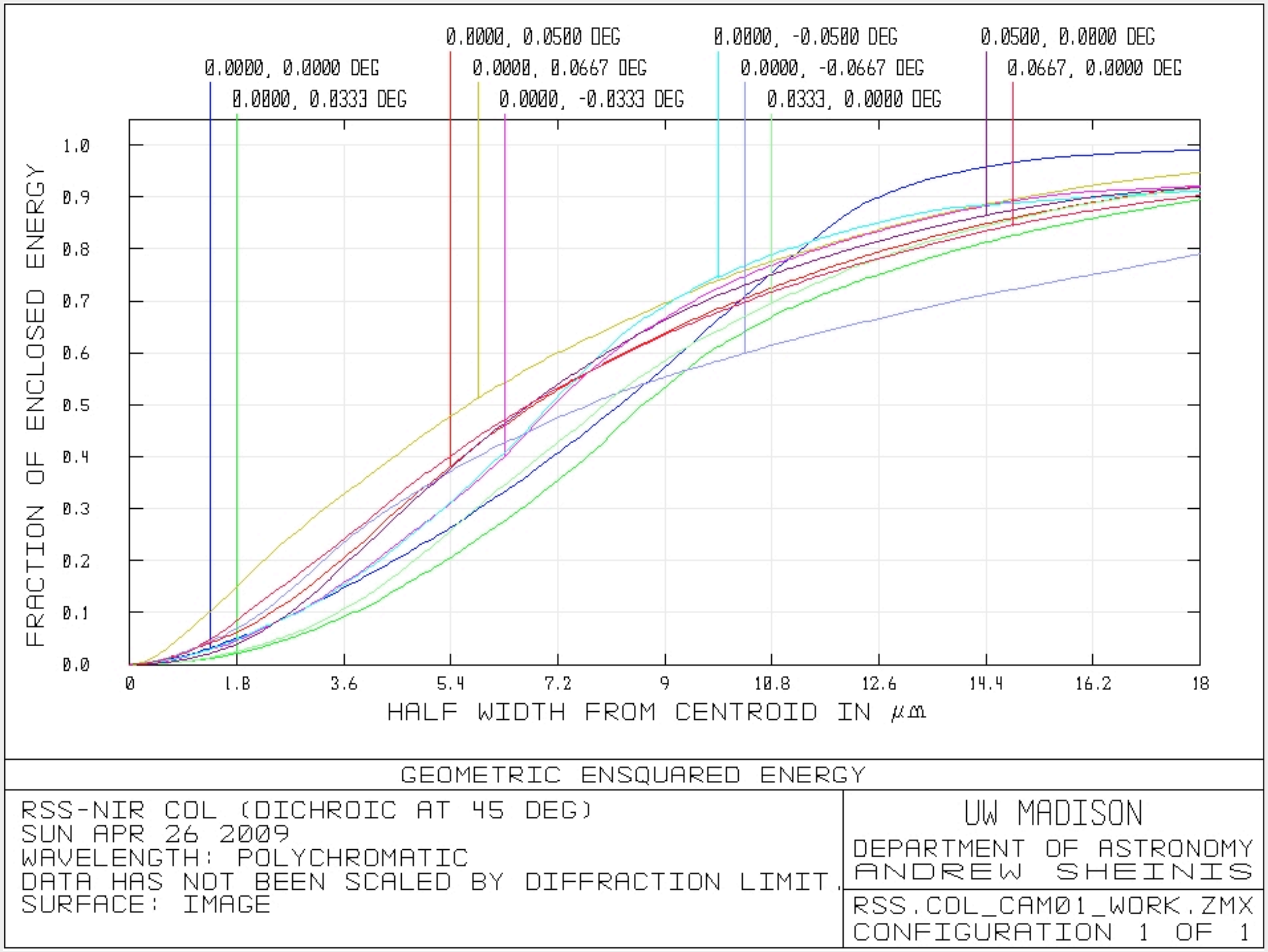


Filters

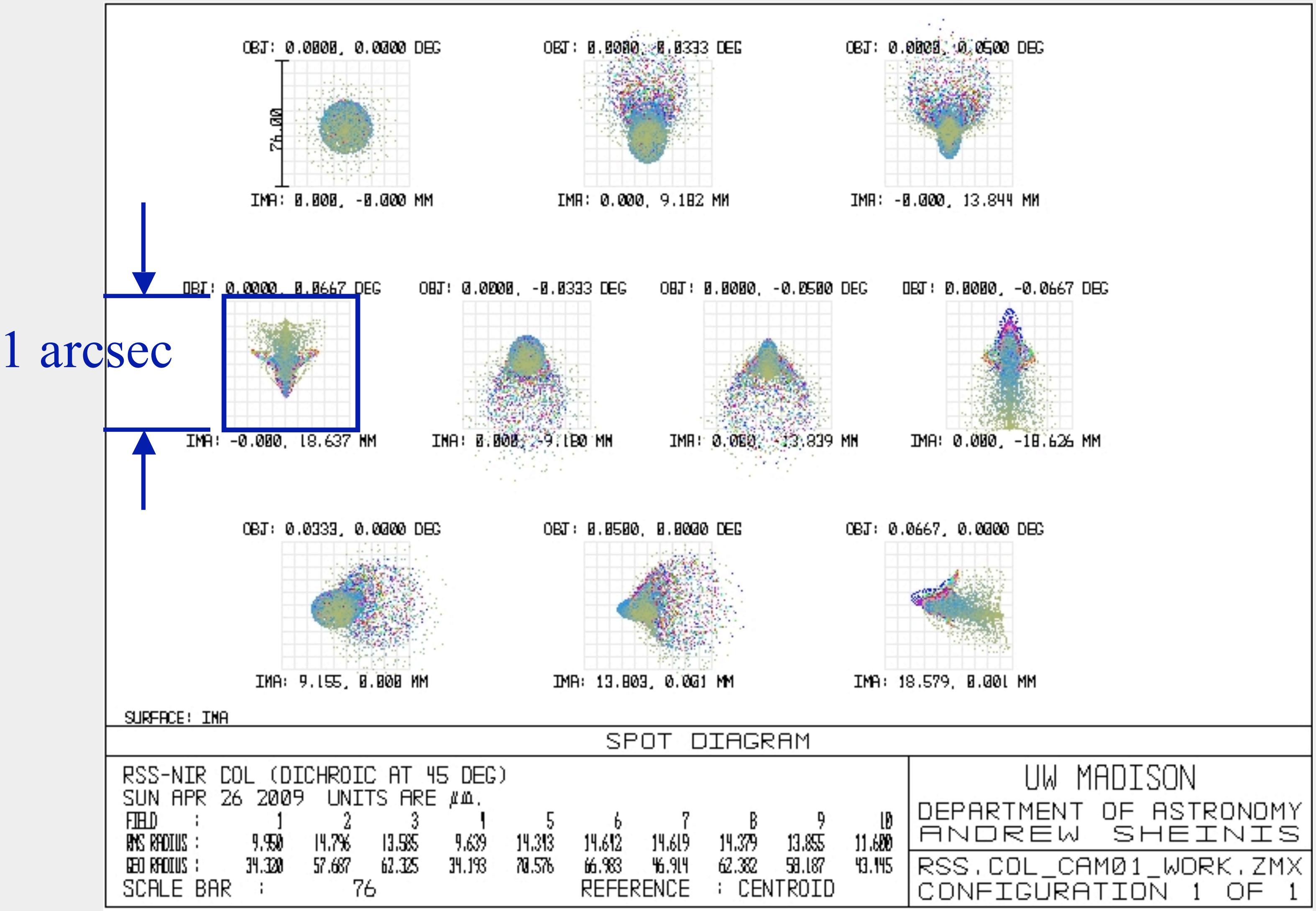
Goals-Imaging: sample target list

Field	RA (2000)	DEC (2000)	notes
47 Tuc	00 24 05.2	-72 04 49	Globular Cluster (Cudworth astrometry!)
Ω Cen	3 26 45.8	-47 28 36	Globular Cluster
LMC	05 11 00	-70 00 00	LMC bar/disk Smecker-Hane HST program
NGC 3603	11 15 09.1	-61 16 17	Young open cluster
M5	15 18 33.7	+02 04 58	Globular Cluster (Cudworth astrometry!)
M4	16 23 35.4	-26 31 32	Globular Cluster (Cudworth astrometry!)
NGC 6397	17 40 41.3	-53 40 25	Globular Cluster (Cudworth astrometry!)
M22	18 36 24.4	-23 54 12	Globular Cluster (Cudworth astrometry!)

System ensquared energy

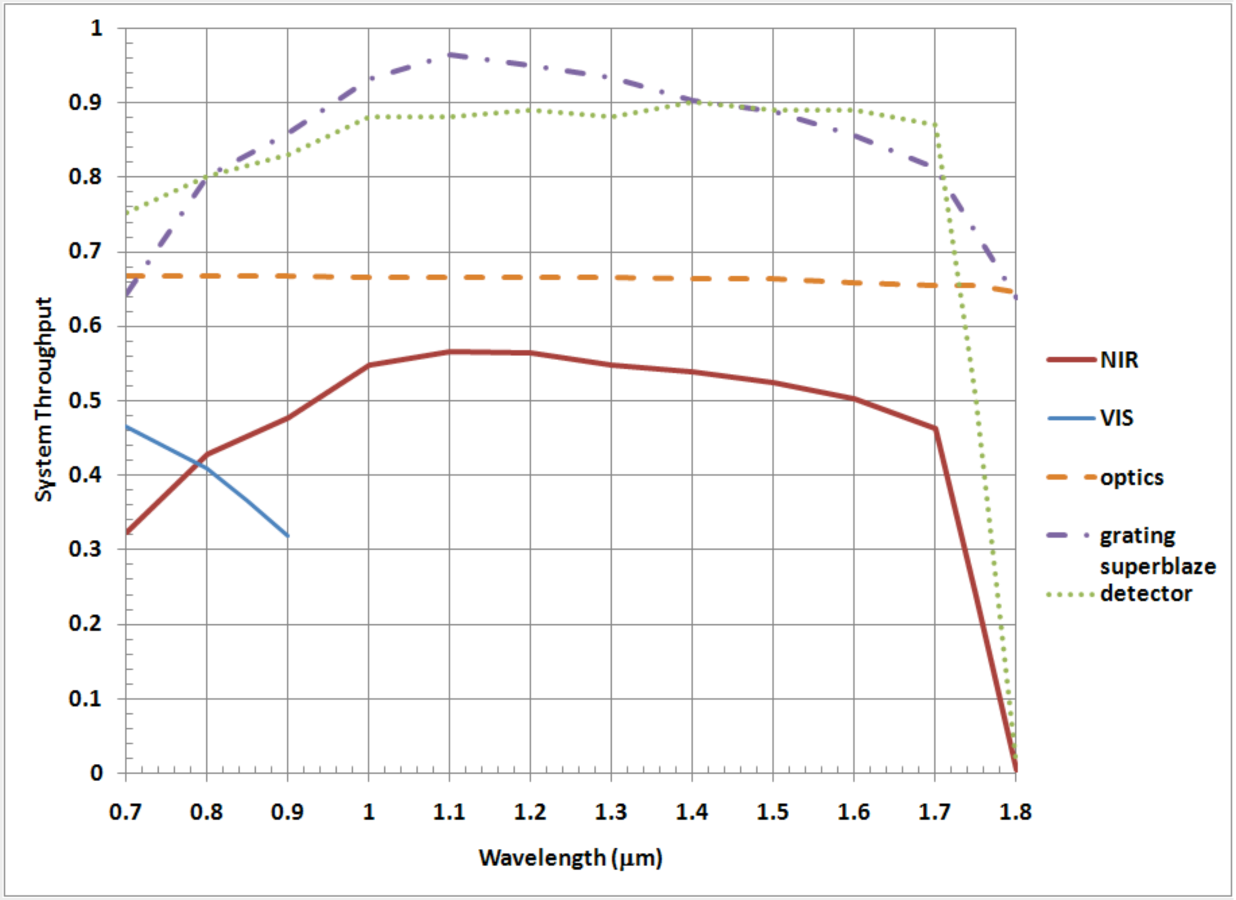


Nominal System spot diagrams

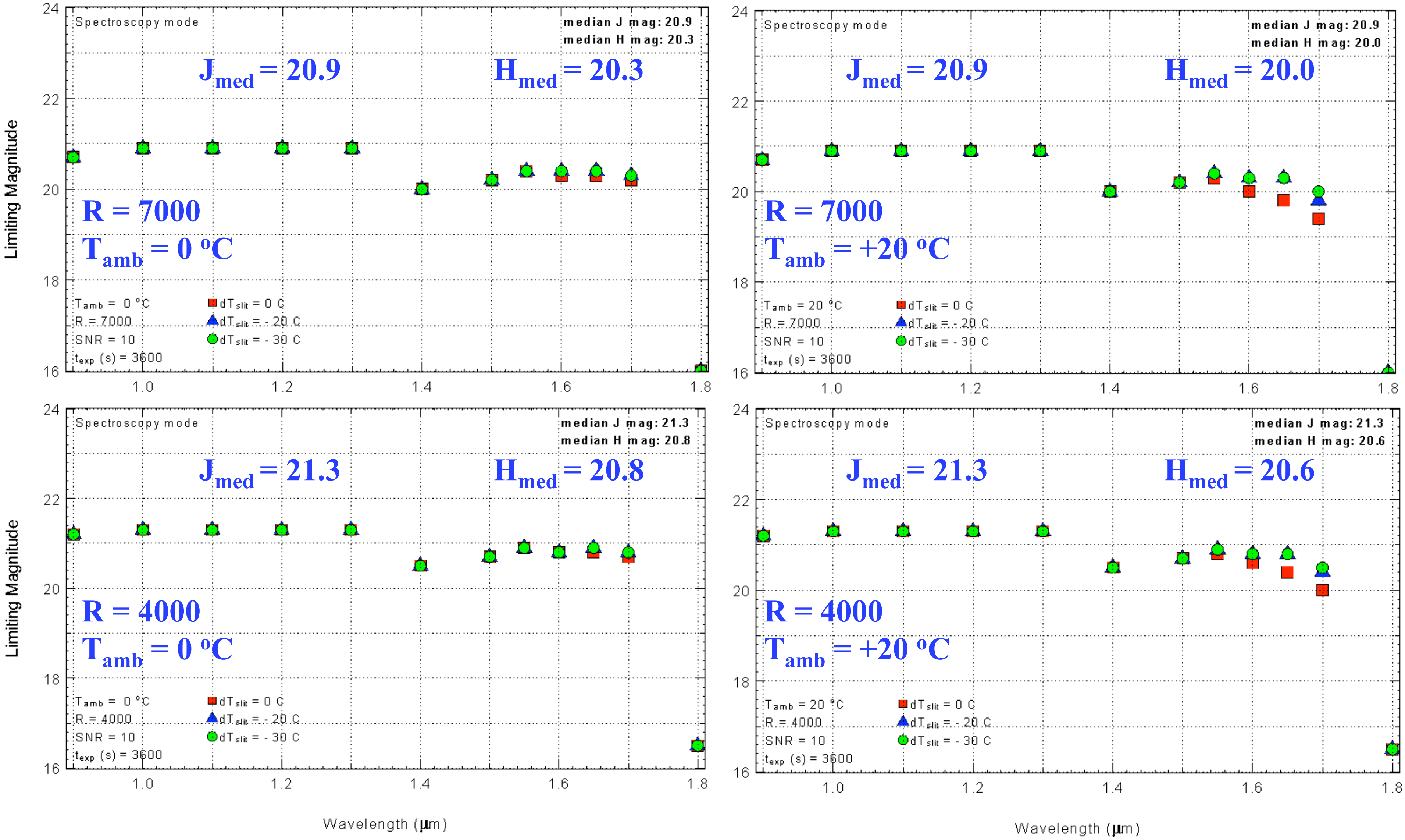


INSTRUMENT THROUGHPUT

- T of all optical materials
- 1% R coatings
- Grating superblaze predicted by Kolgelnik approximation
- Hawaii-2RG-1.7μm measured QE
  - Beletic et al. 2008 SPIE



LIMITING VEGA MAGNITUDES



Spectroscopy-Longslit

1. Test use of standard single slits and target acquisition operations
2. Produce plots of spectrophotometric sensitivities with each grating
3. Produce plots of slit illumination function and image quality at several different pupil illumination positions
4. Produce plots of distortion along spatial direction of slit
5. Produce plots of wavelength solution for each grating and how it varies with time tracker position etc
6. check for timing errors
7. Test data acquisition   storage under heavy throughput

Spectroscopy-MOS

1. Test slitmask fabrication/ gold coating
2. Plots of edge smoothness and slit uniformity
3. Plots of time required to fabricate masks based on number of slits
4. Test slitmask insertion position repeatability
5. Test astrometric solutions required to make masks
6. Check for slitmask flexure with position temperature
7. Test multi slit acquisition strategy
8. Test multi slit flat fields, spectral calibration
9. Plots of spectral sensitivity vs position in field for each grating
10. Plots of slit illumination function

Observational procedure

1. Pre observation: Obtain coordinates for targets from literature
2. Run Pre-observation-software program, choose targets take into account camera distortions and write AUTOCAD format file to be used for mask fabrication
3. Pre observation: Cut mask on laser cutter
4. Pre observation: verify tolerances size position of slits and mask
5. Pre observation: verify correct insertion into mask holder and mask magazine and focal plane
6. Afternoon Obtain at fields
7. Afternoon Take direct image through mask s with at field lamp to locate positions of alignment boxes on science CCD
8. Obtain Afternoon flat fields
9.

Observational procedure

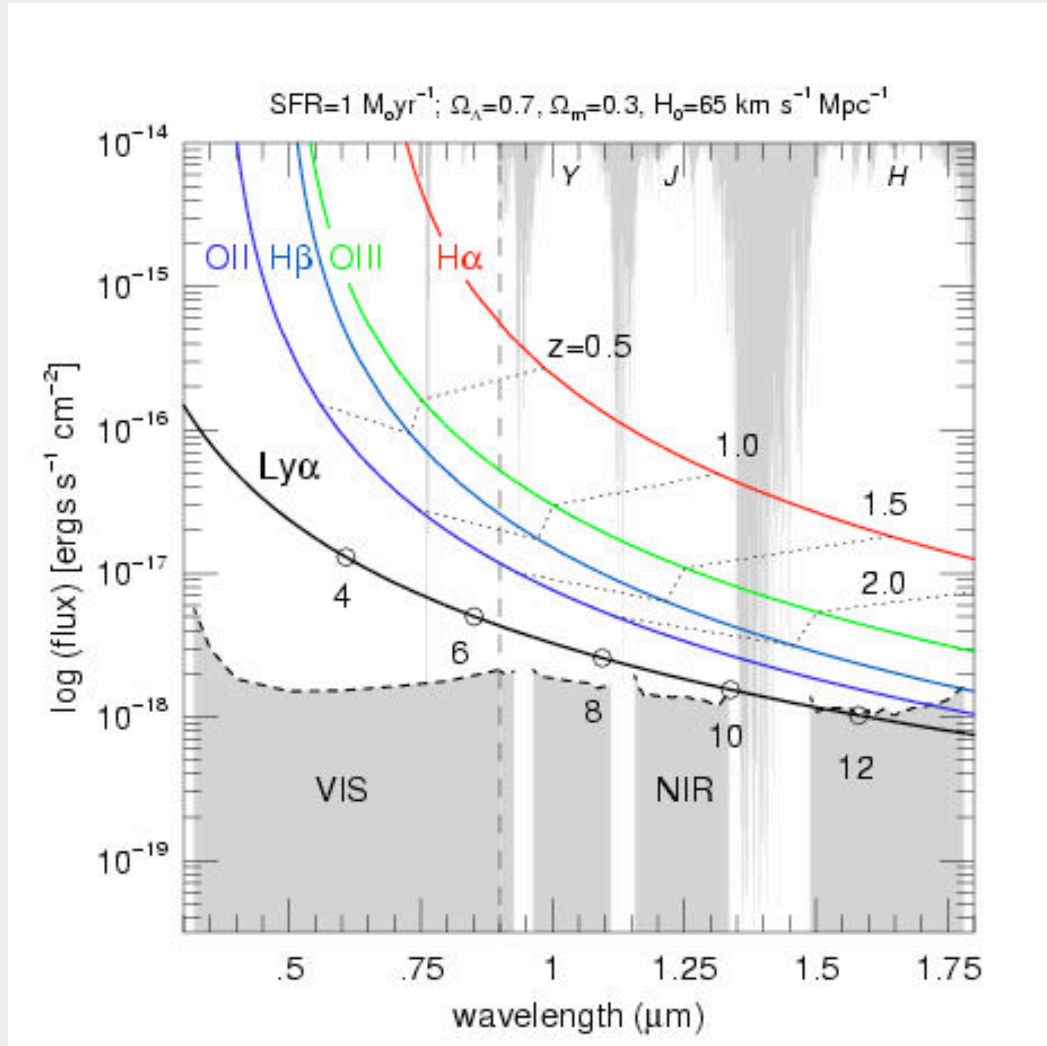
1. Move to target field
2. Obtain arc lamp exposures
3. Initiate acquisition camera exposure to locate field
4. Pattern matching software moves telescope so that alignment stars in field will fall on slitmask alignment boxes
5. Peak up software steps telescope and reads out sub regions of the science CCD near alignment boxes to find the position of maximal throughput Software positions telescope at ideal position
6. Guide star is acquired by moving guider stage and tracking begins
7. Science exposures started
8. Obtain arc lamp exposure(s)

SCIENCE THEMES

1. Discovering First Light
2. Star-Formation in the "Desert"
3. Baryon Processing in a Mature Universe

3. Massive Star-formation at z = 0

We envision surveys generating consortium-wide collaboration



RSS Flux Limits

Sample galactic targets

Cluster ID	z	RA (2000)	DEC (2000)
MS 0011.7+0837	0.163	00h14m21.0s	+08d54m11s
MS 0011.7+0837	0.163	00h14m21.0s	+08d54m11s
ABELL 0041	0.277	00h28m46.8s	+07d50m35s
ABELL 0293	0.1631	02h01m59.9s	+03d46m26s
ABELL 0732	0.203	08h57m54.5s	+03d10m22s
ABELL 1437	0.1339	12h00m27.8s	+03d20m18s
ABELL 1835	0.253	14h01m02.0s	+02d51m32s
MS 1426.4+0158	0.32	14h28m58.7s	+01d45m12s
MS 1532.5+0130	0.320	15h35m02.7s	+01d20m58s
GHO 2146+0406	0.5155	21h48m39.1s	+04d20m53
ABELL 2397	0.224	21h56m09.0s	+01d20m17s
GHO 2201+0258	0.640	22h04m05.0s	+03d12m46s
ABELL 2631	0.273	23h37m39.7s	+00d17m37s
ABELL 2819 NED05	0.16	00h45m49.4s	-63d35m36s
F1557.19TC	0.51	04h12m54.7s	-65d50m58s
ABELL S0910	0.311	20h57m22.0s	-64d39m26s
AM 2250-633	0.2112	22h54m00.5s	-63d14m31s
ABELL 3995	0.186	23h21m35.3s	-69d41m33s

End of Commissioning