10855 - The Near-IR Spectra and Thermal Emission of Hot Jupiters

Cycle: 15, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
Dr. Mark Raboin Swain (PI)	**Jet Propulsion Laboratory**	**Mark.Swain@jpl.nasa.gov**
Dr. Drake Deming (CoI)	NASA Goddard Space Flight Center	drake.deming@gsfc.nasa.gov

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) 189733 NONE	NIC3	5	21-May-2007 19:21:59.0	yes
02	(1) 189733 NONE	NIC3	5	21-May-2007 19:36:11.0	yes

10 Total Orbits Used

ABSTRACT

We propose to observe the brightest transiting exoplanet systems, HD 209458b and HD 189733b, during both primary eclipse (transit) and secondary eclipse (when the planet is behind the star). A successful measurement would result in the spectral characterization of both dayside and nightside thermal emission. This, in turn, would result in several important determinations, including (1) the temperature of the dayside, (2) the temperature of the nightside, (3) the probable detection of water, (4) strong constraints on the presence or absence of clouds, and (5) constraints on models of atmospheric transport between the day and night sides. Our selected wavelength region of 1.4 to 2.4 microns includes the two most prominent predicted features (water) in models for hot Jupiter emission. For these observations, we propose to use the NICMOS 3 grism and selected narrow

band filters in a carefully designed, differential observation intended to achieve a dynamic range of 10,000:1. Our proposed observations are uniquely enabled by HST, which alone has the combination of stability, sensitivity, wavelength coverage, and dynamic range to make these high-impact observations possible.

OBSERVING DESCRIPTION

Visits: 3 each consisting of either 3 or 4 consecutive HST orbits. In each visit, either the second or or third orbit observing observing interval is phased to start at approximately the onset of the secondary eclipse or transit events. The visits each end with observations using a narrow band filter for wavelength calibration. All remaining time in the orbtis consistes of repeated 2s exopsures using one of the NICMOS 206 and 141 grisms. All observations need to be conducted at the same role angle. Additionally, there should be no role angle moves during a given visit.

ADDITIONAL COMMENTS

IMPLEMENTATION NOTES:

1) Manual deletion of some NICMOS HOME alignment is necessary
2) Must force the creation of a final HOME
3) May need to extend the Phase Critical window this schedules in

This proposal uses standard NICMOS ALIGN exposures to cause a defocus for the observations. The desire is to defocus, perform all science exposures and then return (HOME) to normal focus at the end. For the defocus the mechanisms are to be placed, in absolute terms, in the same positions as the first ALIGN exposure in the NIC3 visits of the NICMOS Focus Monitor. The Focus Monitor uses special commanding and ALIGN exposures to manage the NIC mechanisms while this proposal uses only ALIGN exposures, no special commanding.

It is necessary to translate the ALIGN parameters in the Focus Monitor into a usable set for this proposal because the two proposals reference different zero points for determining the mechanism motions. The ALIGN optional parameter values in the Focus monitor are relative to mechanical zero where as this proposal must use values based on the nominal NIC3 zero points. Mechanical Zero for the Focus and X & Y tilts is (0, 4, 9) respectively and, at the time of this proposal, the nominal NIC3 zero points are (-8636, -10, -5).

The "Focus Monitor (-455, -1, -1) from the Mech Zero points" yields an absolute position of (-455, 3, 8) which can be achieved by using "(+8181, +13, +13) from the Nominal NIC3 Zero points" for this proposal.

Due to the usage of the PHASE and NEW OBSET special requirements in this proposal, TRANS will create a HOME which occurs immediately after the ALIGN and would cause the observation to execute at nominal focus, not at the desired defocus. Additionally, TRANS will not create a final HOME because it thinks it already HOMEd the mechanisms. These issues are resolved by using an ALIGN exposure at the very end to force TRANS to create a final HOME and then manually deleting any HOME(s) that occurs between the first ALIGN exposure and this forcebly created final HOME. This allows the mechanisms to stay at the defocus position during all science exposures and then returns them to their nominal focus positions at the very end. See the exposure level comments in the last ALIGN exposure of each visit.

Visit

Proposal 10855, Visit 01, implementation Mon May 21 18:38:22 GMT 2007

Diagnostic Status: Error

Scientific Instruments: NIC3

Special Requirements: Period 2.218573 D AND ZERO-PHASE JD2453629.3942

Comments: start 189733 day g206 spectra
- visit is 5 orbits long with secondary eclipse observed in orbit 3
- constraint: role angle held constant

Diagnostics

(Align (01.001)) Error: ALIGN is not a valid selection

(Align (01.001)) Error: This attribute is not allowed to have this value: Calibration_Target = NONE
It is a Restricted option and can only be used in an engineering proposal.

(Align (01.001)) Error: XTILT is not a valid selection

(Align (01.001)) Error: FOCUS is not a valid selection

(Align (01.001)) Error: YTILT is not a valid selection

(Align (01.001)) Error: Target NONE is no longer a valid selection

(Align (01.001)) Error: This attribute is not allowed to have this value: Mode = ALIGN
It is a Restricted option and can only be used in an engineering proposal.

(Align (01.007)) Error: ALIGN is not a valid selection

(Align (01.007)) Error: This attribute is not allowed to have this value: Calibration_Target = NONE
It is a Restricted option and can only be used in an engineering proposal.

(Align (01.007)) Error: Target NONE is no longer a valid selection

(Align (01.007)) Error: This attribute is not allowed to have this value: Mode = ALIGN
It is a Restricted option and can only be used in an engineering proposal.

(Align (01.007)) Error: FOCUS is not a valid selection

(Visit 01) Warning: VERY SHORT PHASE WINDOW

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	189733	RA: 20 00 43.7133 (300.1821388d) Dec: +22 42 39.07 (22.71085d) Equinox: J2000		V=7.67	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	Align	NONE	NIC3, ALIGN		FOCUS=8181; XTILT=13; YTILT=13			0.0 Secs *[==>]*	***[1]***
Comments: The FOCUS and XTILT, YTILT parameters defines the PAM focus setting for camera NIC3 at -0.5mm relative to mechanical zero. The use of these parameters assume that the PAM is at the nominal NIC3 position of -9.5mm, with FOCUS=-8636, XTILT=-10, YTILT=-5. The tilt moves as 1.4 steps/mm and the focus as 909.05 steps/mm.									
2	Imaging 1	(1) 189733	NIC3, MULTIACCUM, NIC3-FIX	F190N	NSAMP=2; SAMP-SEQ=SCAMRR	POS TARG 2.6,20.93; PHASE 0.430197 TO 0.433328; GS ACQ SCENARIO BASE1TNS		*[==>]*	***[1]***

Exposures (continued)

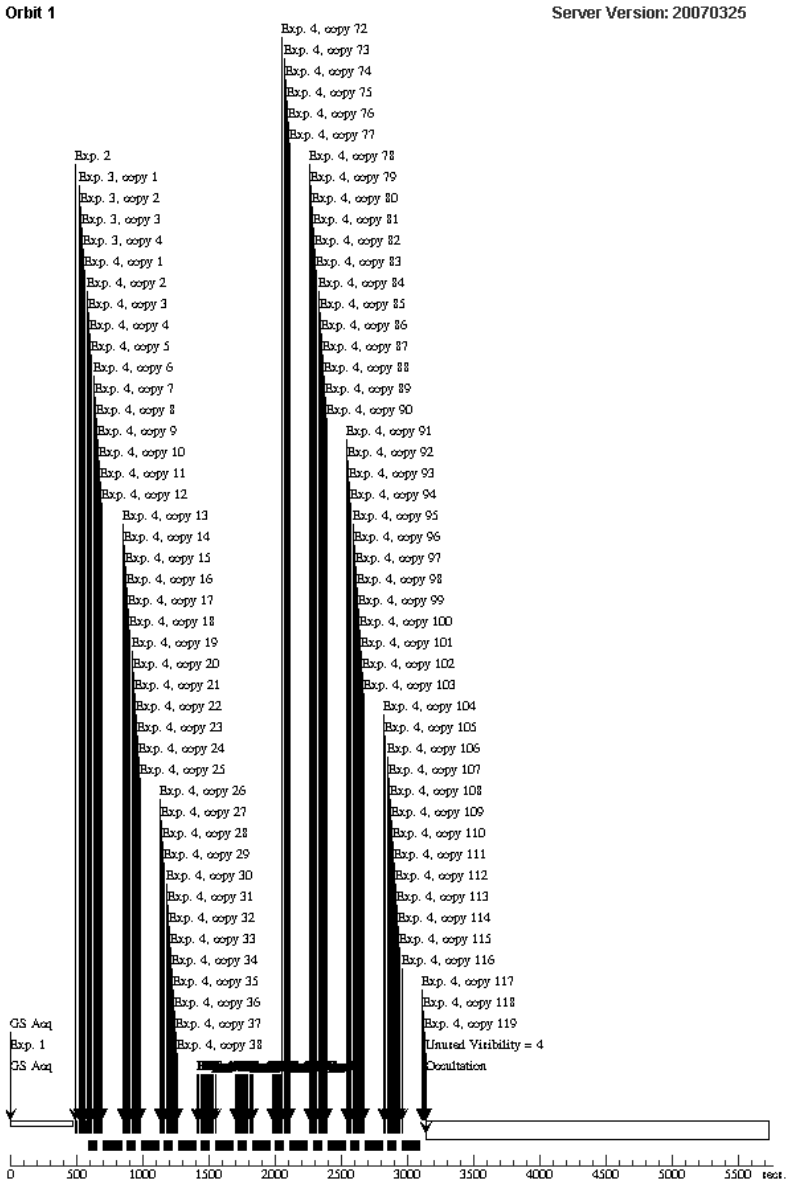
#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
3	Imaging 2	(1) 189733	NIC3, MULTIACCUM, NIC3-FIX	F190N	NSAMP=2; SAMP-SEQ=SCAMRR	POS TARG 2.6,20.93		*[==>(Copy 1)]* *[==>(Copy 2)]* *[==>(Copy 3)]* *[==>(Copy 4)]*	***[1]***

Exposures (continued)

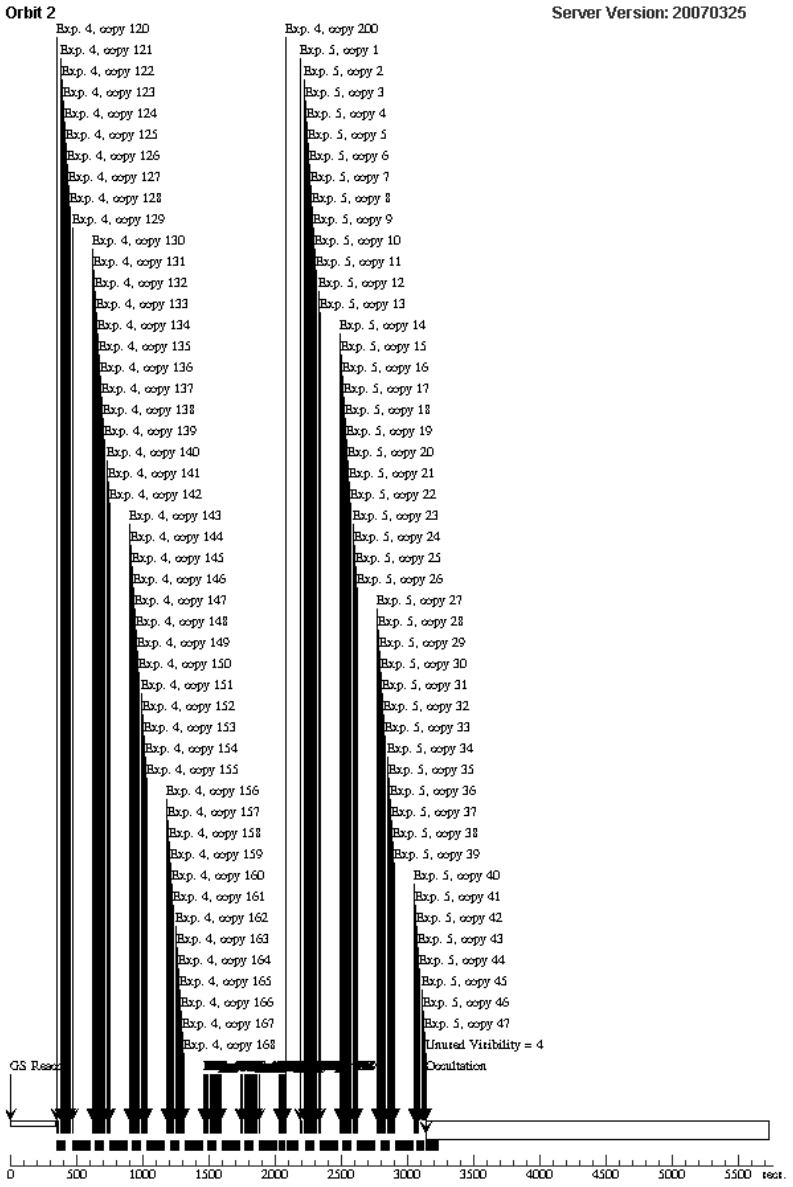
#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
7	Align	NONE	NIC3, ALIGN		FOCUS=-1			0.0 Secs	
								[==>]	***[5]***

Comments: See special implementation notes in proposal level Additional Comments. This exposure is used to fake the system. It forces the creation of a final HOME alignment. Any HOME that occurs between the first ALIGN exposure and this created final HOME must be manually deleted. The focus value is purposely small to keep the duration of this exposure as short as possible and to let the HOME perform the job of returning the mechanisms to their nominal positions. NOTE: That while this exposure says to move the focus -1 step from the nominal zero point (-8636 - 1), the actual execution will, due to deleting the HOME(s), be -1 step from the current position (-455 - 1). Meaning the absolute position after this move will be far different than the absolute position this exposure seems to request. You must verify that this move will not violate limits and/or damage the mechanisms.

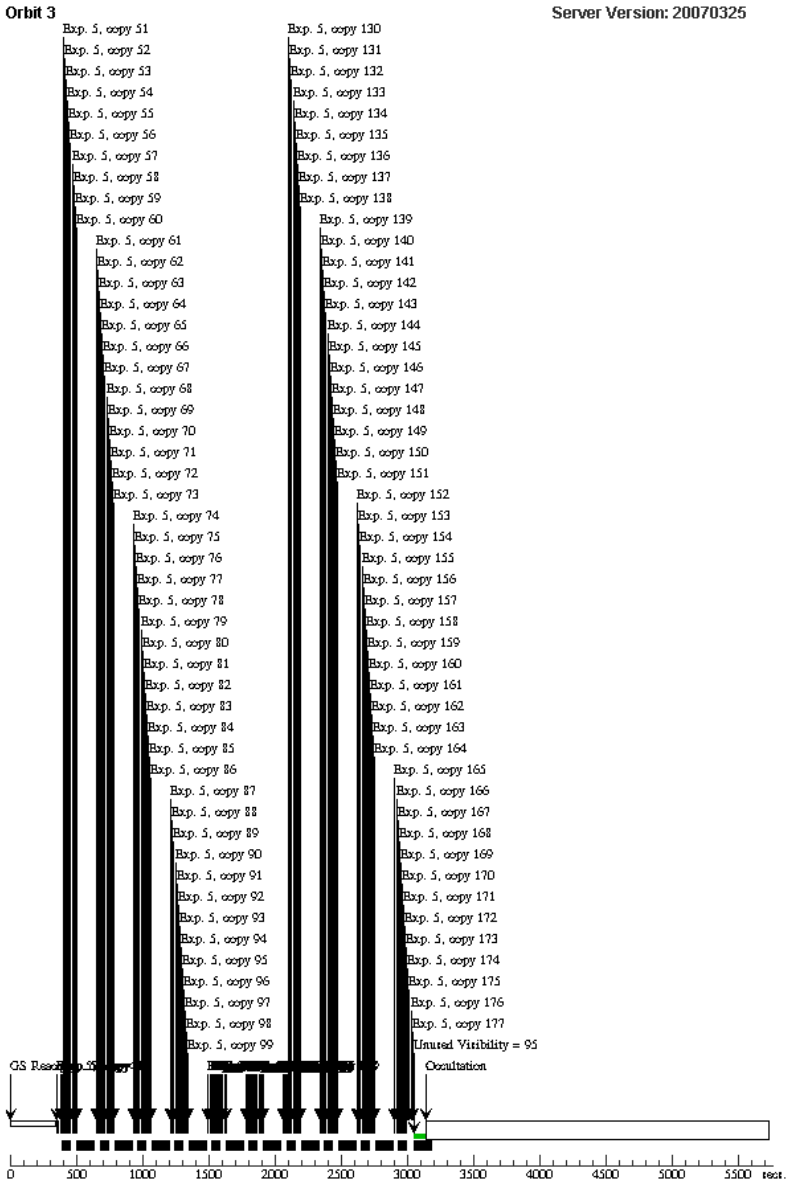
Orbit Structure



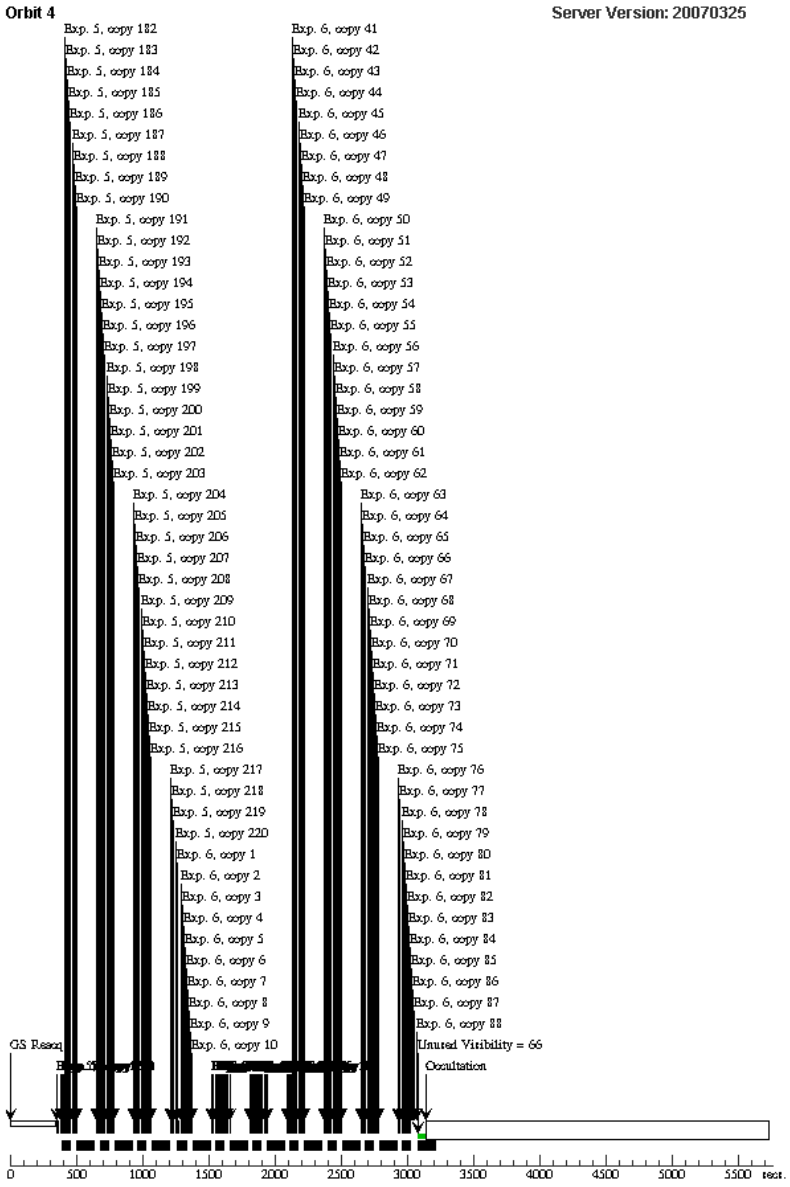
Orbit Structure (continued)



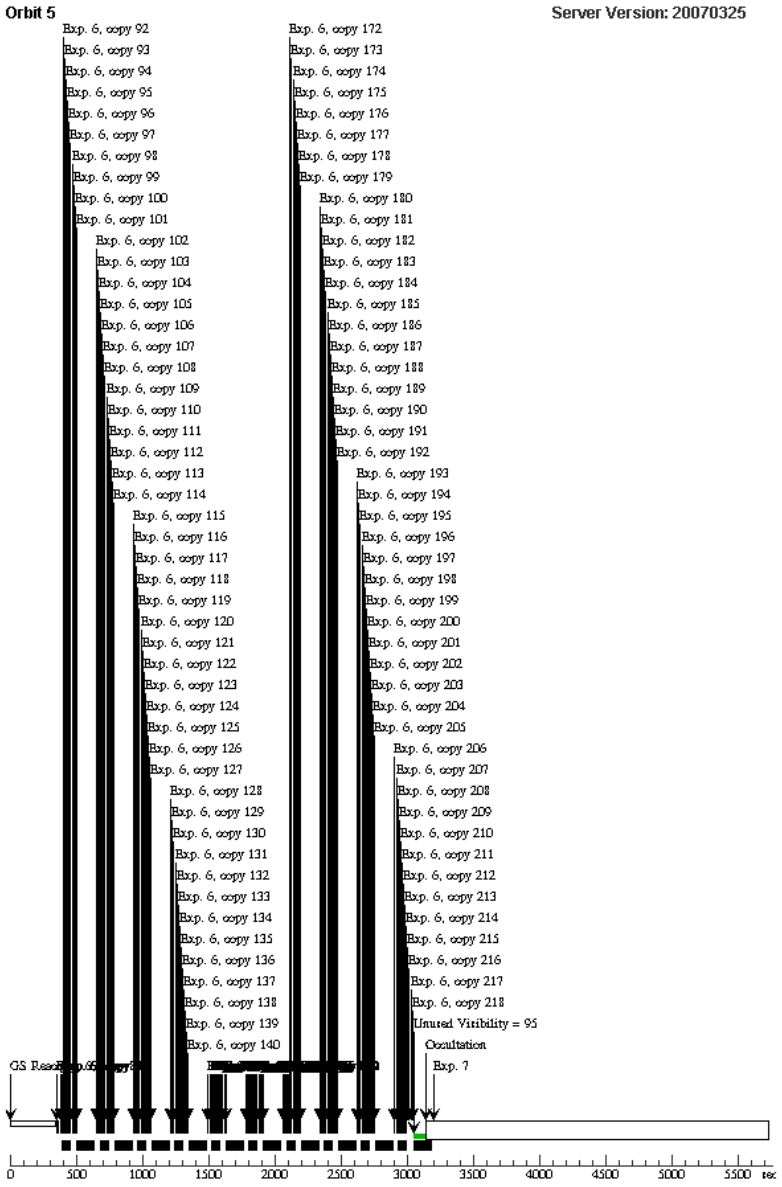
Orbit Structure (continued)



Orbit Structure (continued)



Orbit Structure (continued)



Visit

Proposal 10855, Visit 02 Mon May 21 18:38:30 GMT 2007

Diagnostic Status: Error

Scientific Instruments: NIC3

Special Requirements: SAME ORIENT AS 01; Period 2.218573 D AND ZERO-PHASE JD2453629.3942

Comments: start 189733 night g206 spectra
- visit is 5 orbits long with secondary transit observed in orbit 3
- constraint: role angle held constant

Diagnostics

(Align (02.001)) Error: YTILT is not a valid selection

(Align (02.001)) Error: FOCUS is not a valid selection

(Align (02.001)) Error: ALIGN is not a valid selection

(Align (02.001)) Error: Target NONE is no longer a valid selection

(Align (02.001)) Error: This attribute is not allowed to have this value: Mode = ALIGN
It is a Restricted option and can only be used in an engineering proposal.

(Align (02.001)) Error: XTILT is not a valid selection

(Align (02.001)) Error: This attribute is not allowed to have this value: Calibration_Target = NONE
It is a Restricted option and can only be used in an engineering proposal.

(Align (02.007)) Error: This attribute is not allowed to have this value: Mode = ALIGN
It is a Restricted option and can only be used in an engineering proposal.

(Align (02.007)) Error: Target NONE is no longer a valid selection

(Align (02.007)) Error: FOCUS is not a valid selection

(Align (02.007)) Error: This attribute is not allowed to have this value: Calibration_Target = NONE
It is a Restricted option and can only be used in an engineering proposal.

(Align (02.007)) Error: ALIGN is not a valid selection

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	189733	RA: 20 00 43.7133 (300.1821388d) Dec: +22 42 39.07 (22.71085d) Equinox: J2000		V=7.67	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	Align	NONE	NIC3, ALIGN		FOCUS=8181; XTILT=13; YTILT=13			0.0 Secs *[==>]*	***[1]***
Comments: The FOCUS and XTILT, YTILT parameters defines the PAM focus setting for camera NIC3 at -0.5mm relative to mechanical zero. The use of these parameters assume that the PAM is at the nominal NIC3 position of -9.5mm, with FOCUS=-8636, XTILT=-10, YTILT=-5. The tilt moves as 1.4 steps/mm and the focus as 909.05 steps/mm.									
2	Imaging 1	(1) 189733	NIC3, MULTIACCUM, NIC3-FIX	F190N	NSAMP=2; SAMP-SEQ=SCAMRR	POS TARG 2.6,20.93; PHASE 0.930197 TO 0.931762; GS ACQ SCENARIO BASE1TNS		*[==>]*	***[1]***

Exposures (continued)

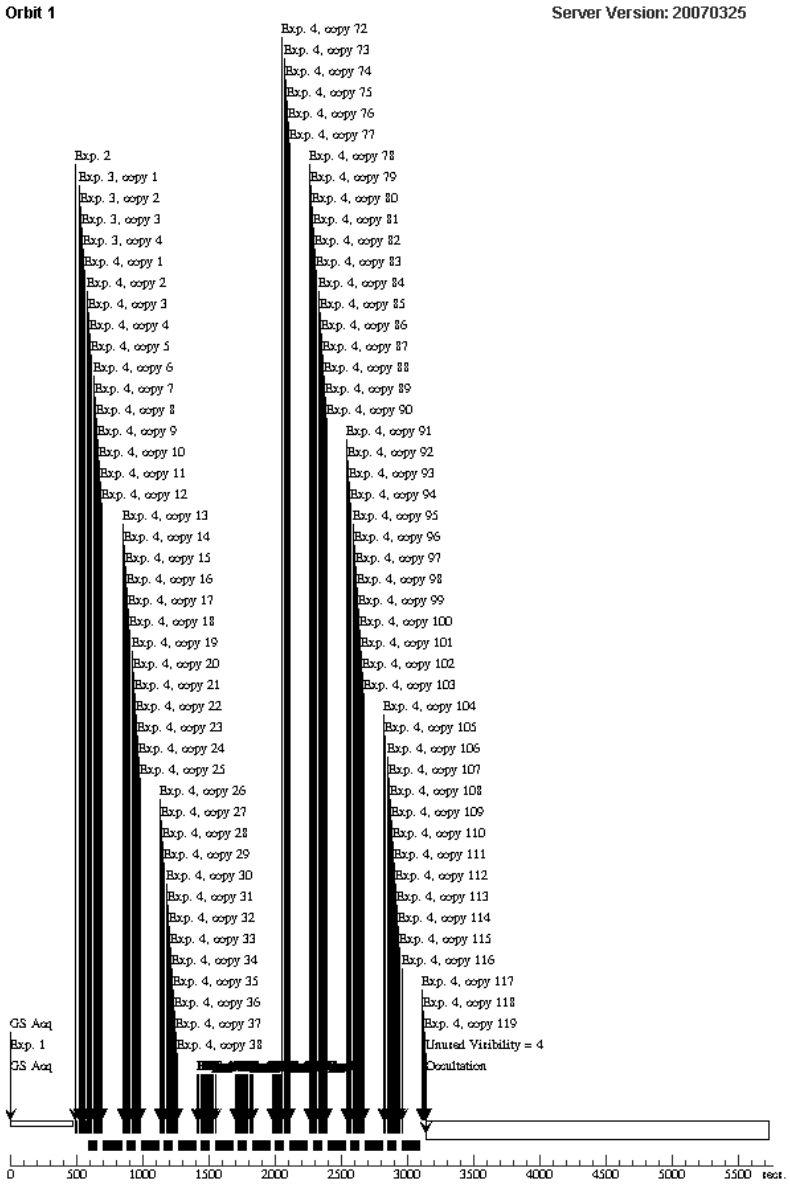
#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
3	Imaging 2	(1) 189733	NIC3, MULTIACCUM, NIC3-FIX	F190N	NSAMP=2; SAMP-SEQ=SCAMRR	POS TARG 2.6,20.93		*[==>(Copy 1)]* *[==>(Copy 2)]* *[==>(Copy 3)]* *[==>(Copy 4)]*	***[1]***

Exposures (continued)

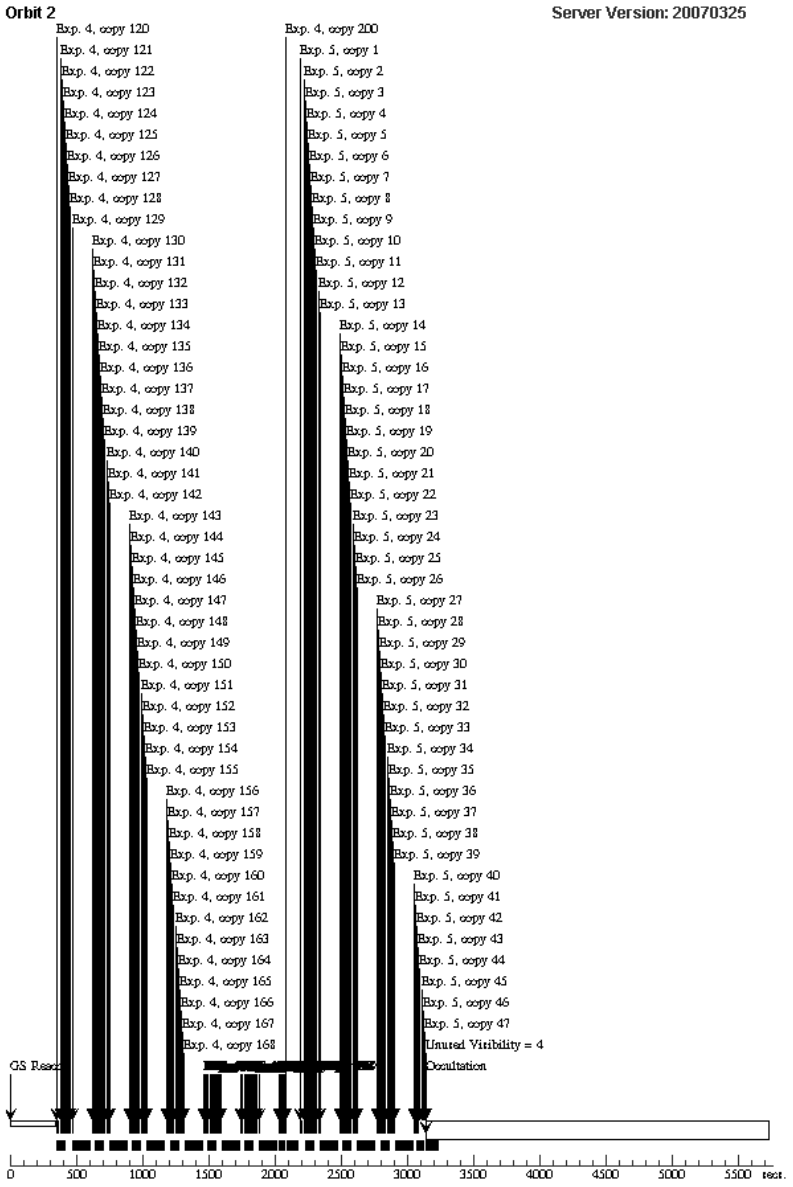
#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
7	Align	NONE	NIC3, ALIGN		FOCUS=-1			0.0 Secs	
								[==>]	***[5]***

Comments: See special implementation notes in proposal level Additional Comments.
This exposure is used to fake the system. It forces the creation of a final HOME alignment. Any HOME that occurs between the first ALIGN exposure and this created final HOME must be manually deleted. The focus value is purposely small to keep the duration of this exposure as short as possible and to let the HOME perform the job of returning the mechanisms to their nominal positions. NOTE: That while this exposure says to move the focus -1 step from the nominal zero point (-8636 - 1), the actual execution will, due to deleting the HOME(s), be -1 step from the current position (-455 - 1). Meaning the absolute position after this move will be far different than the absolute position this exposure seems to request. You must verify that this move will not violate limits and/or damage the mechanisms.

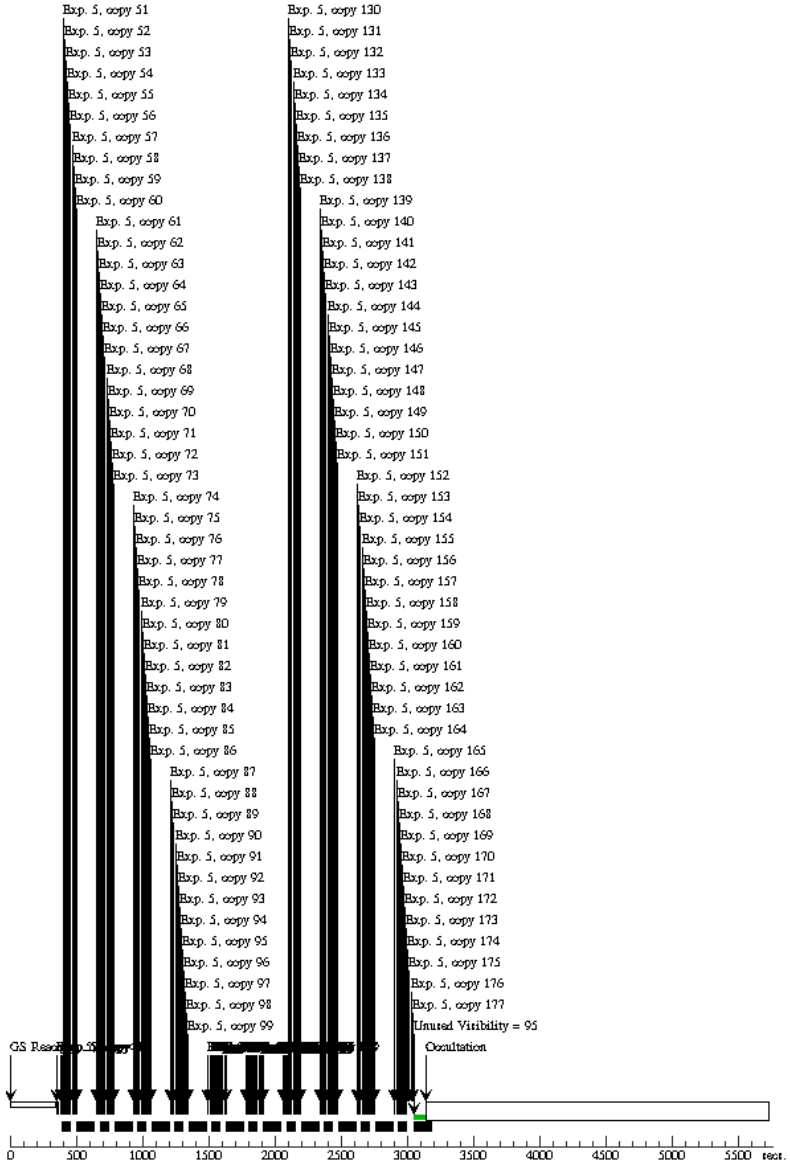
Orbit Structure



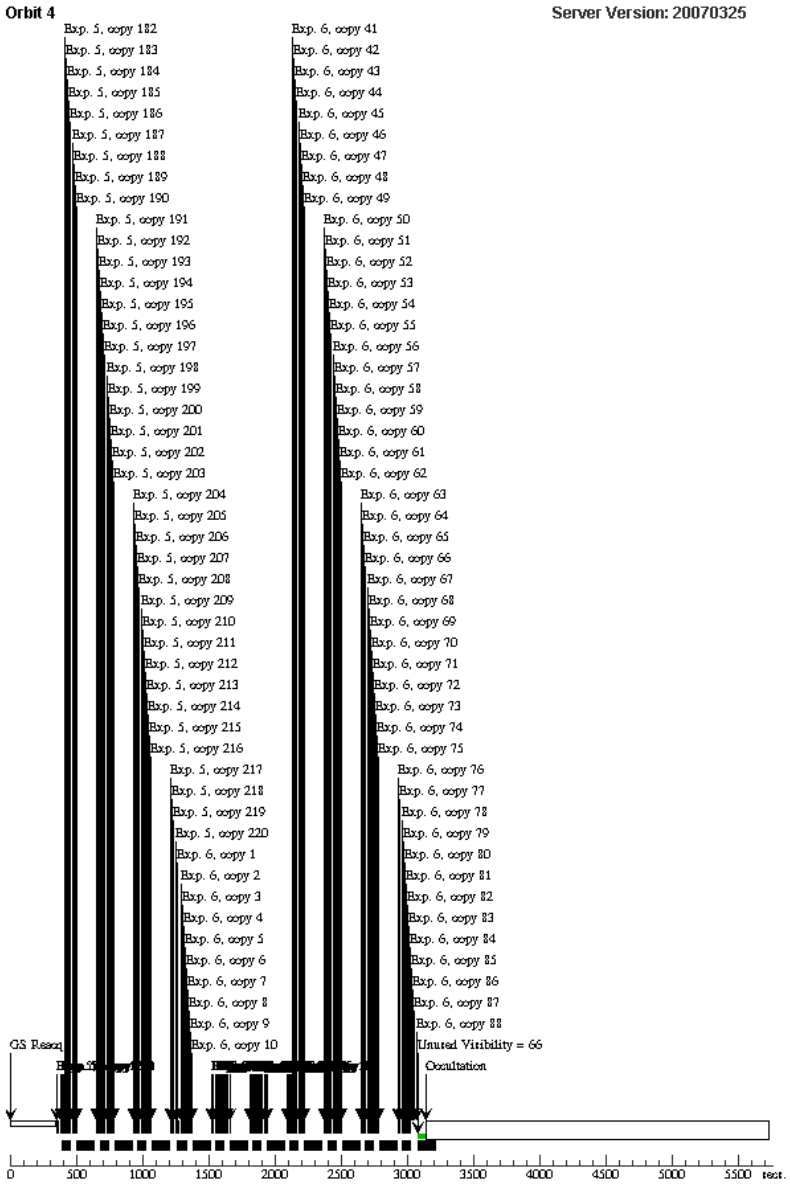
Orbit Structure (continued)



Orbit Structure (continued)



Orbit Structure (continued)



Orbit Structure (continued)