13321 - COS Spectroscopy of the Stephan's Quintet Giant Shock

Cycle: 21, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

INVESTIGATORS

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VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
02	(1) HCG92-1 (8) ACQ-STAR1	COS/FUV COS/NUV	4	25-Sep-2013 21:09:16.0	yes

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
03	(2) HCG92-2 (8) ACQ-STAR1	COS/FUV COS/NUV	4	25-Sep-2013 21:09:42.0	yes
04	(3) HCG92-3 (9) ACQ-STAR2	COS/FUV COS/NUV	4	25-Sep-2013 21:10:06.0	yes
05	(5) HCG92-5 (8) ACQ-STAR1	COS/FUV COS/NUV	4	25-Sep-2013 21:10:32.0	yes
06	(7) HCG92-7 (9) ACQ-STAR2	COS/FUV COS/NUV	2	25-Sep-2013 21:10:54.0	yes

18 Total Orbits Used

ABSTRACT

Stephan's Quintet, the most studied compact group, is an ideal laboratory to study how kinetic energy is dissipated, how gas cools, and how star formation is triggered in galaxy interactions. It hosts a dramatic 30 kpc X-ray emitting shocked region, triggered by a 1000 km/s galaxy collision. Our Spitzer and Herschel spectroscopy has revealed that H2, C+ and OI are important coolants in the shock, with luminosities exceeding that of X-rays. However, nothing is known about UV line cooling. Our models of the collision show that the kinetic energy is dissipated through a turbulent cascade, with a large range of shock velocities (from 600 down to 10 km/s in the H2 gas), with shock-excited UV emission lines possibly dominating the energy budget at intermediate velocities. Thus, we propose to observe the brightest ones (Lya, CIV, OVI) with COS by targeting different environments in the shock. Our key science goals are to (1) quantify the contribution of the UV lines to the total gas cooling, (2) understand why, despite large H2 masses, the star formation efficiency in the shock is very low, and (3) determine the origin of the diffuse UV emission detected with GALEX in the shock (is it continuum or line emission?). These observations are crucial to determine the dissipation rate and physical state of the gas and to understand the star formation efficiency. This problem is relevant to many other active phases of galaxy evolution, ranging from shocks in infrared luminous galaxies and AGN feedback, to gas cooling and formation of the first galaxies at high z.

OBSERVING DESCRIPTION

The project aims to explore the importance of key UV emission lines in the cooling side of the energy budget of the giant intergalactic shock structure in the Stephan's Quintet group. Previous observations with Spitzer and Herschel have shown that this huge intergroup structure shows powerful line cooling through pure rotational molecular lines in the mid-IR and almost as much cooling from the [CII] and [OI] far-IR fine-structure

lines. Preliminary modeling suggests that energy from a galaxy collision is being dissipated through various cooling pathways, however nothing is known about the UV cooling. The COS spectroscopy is targeted at specific regions in the giant filament where we might expect powerful UV cooling from Lyman-alpha, CIV, OVI and other lines. The observations will allow us to 1) determine how important UV line cooling is as energy is progressively funneled by turbulence to smaller and smaller scales, 2) use the spectra to help understand the kinematics of warmer gas and its connection to the turbulent molecular gas already detected and specifically to look for mechanisms that might suppress star formation (negative feedback), and finally 3) to determine how much of the UV emission detected by GALEX across the shock-structure is attributed to line emission rather than diffuse continuum emission from faint massive stars. We request observations at moderate resolution using the G130M and G160M settings for the seven positions in the shock structure. In order to achieve continuous spectral coverage and minimize fixed pattern noise, observations in each grating will be made at two central wavelengths for G130M and G160M. We will use central wavelengths settings at 1096A and 1222A for G130M, and the 1611A and 1623A for G160M.

Visit

Proposal 13321, Target 1 (02), implementation Thu Sep 26 01:11:05 GMT 2013

Diagnostic Status: Warning

Scientific Instruments: COS/NUV, COS/FUV

Special Requirements: (none)

Diagnostics

(Target 1 (02)) Warning (Orbit Planner): NO PLATE ID SPECIFIED FOR FIXED TARGET

(Target 1 (02)) Warning (Orbit Planner): NO PLATE ID SPECIFIED FOR FIXED TARGET

(Target 1 (02)) Warning (Orbit Planner): NO PLATE ID SPECIFIED FOR FIXED TARGET

(Target 1 (02)) Warning (Orbit Planner): NO PLATE ID SPECIFIED FOR FIXED TARGET

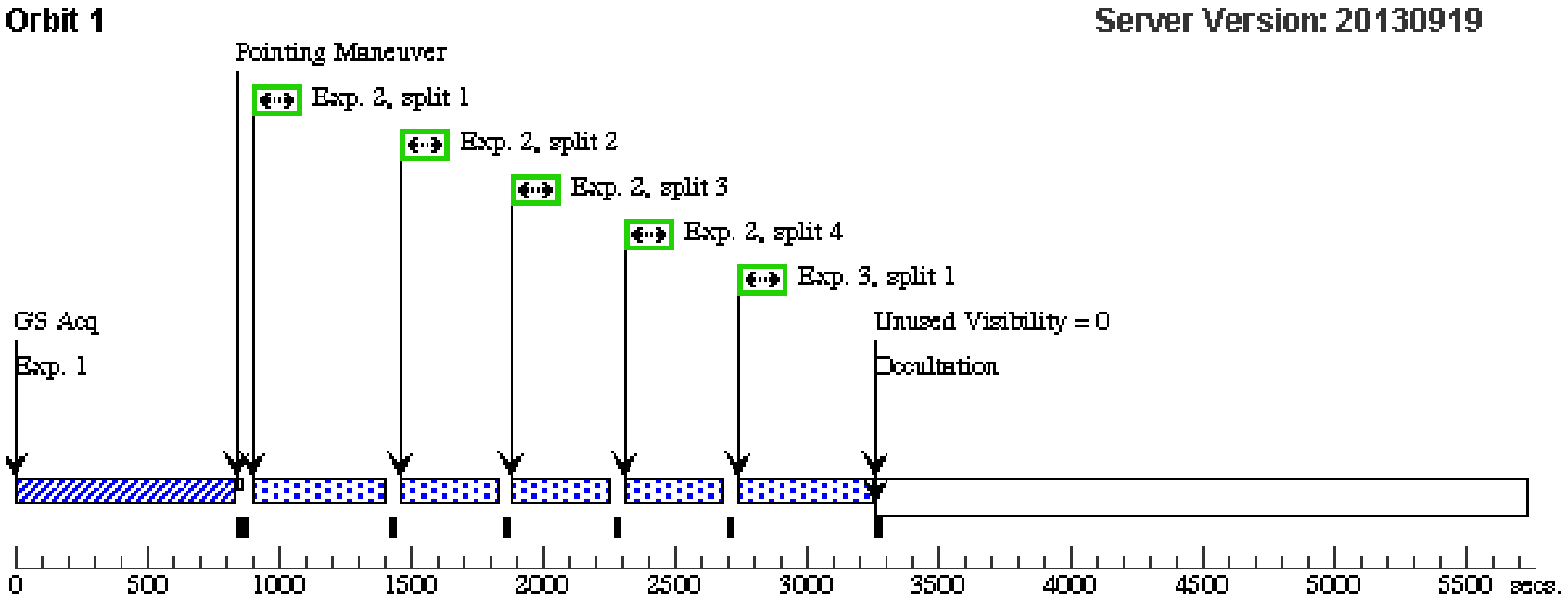
Fixed Targets

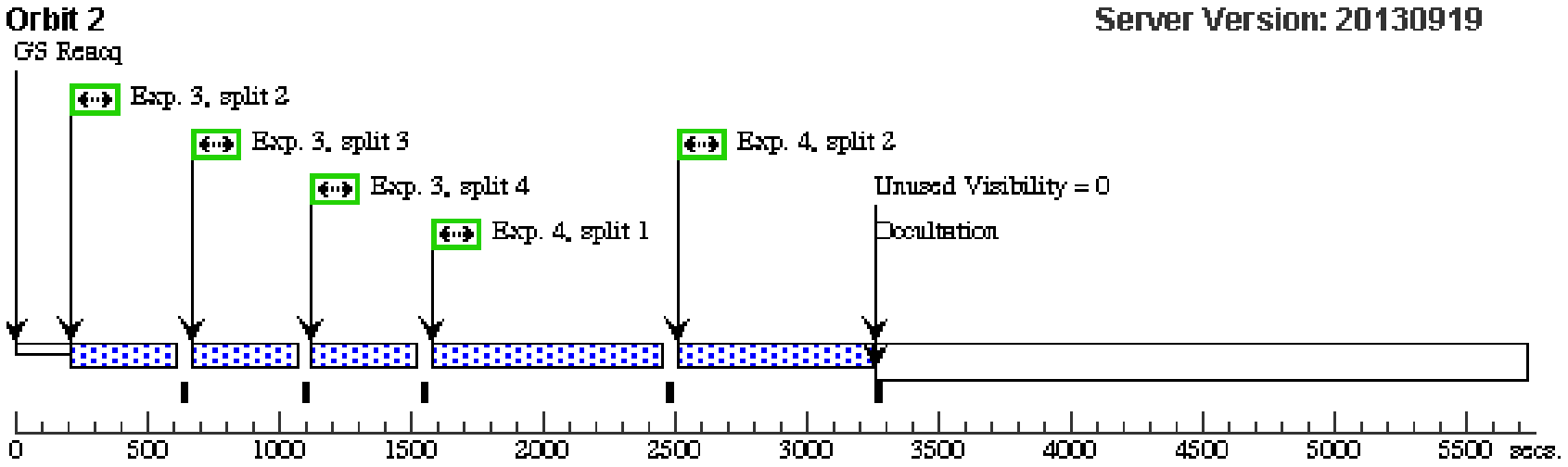
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	HCG92-1	Offset from ACQ-STAR1 RA Offset: -1.08 Secs Dec Offset: -0.56 Arcsec		V=20.7+/-0.2	Offset Position (HCG92-1)
(8)	ACQ-STAR1 Alt Name1: 22360085+3358219	RA: 22 36 0.8450 (339.0035208d) Dec: +33 58 21.89 (33.97275d) Equinox: J2000		V=17.42+/-0.1	Reference Frame: ICRS

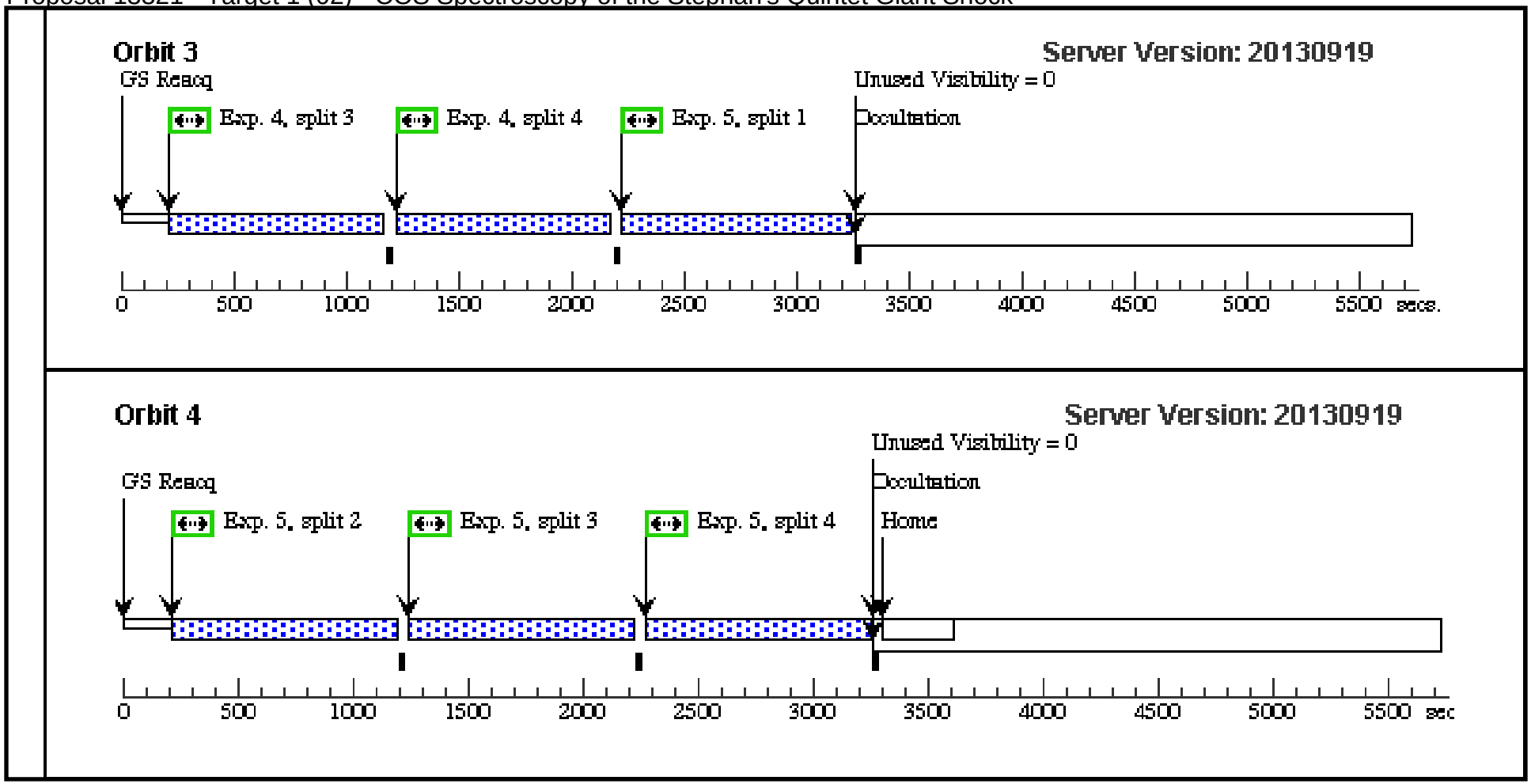
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	T1 Acquisition (534404)	(8) ACQ-STAR1	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				216 Secs (216 Secs) *[==>]*	*[1]*
2	T1-G130M-1096 (513432)	(1) HCG92-1	COS/FUV, TIME-TAG, PSA	G130M 1096 A	FP-POS=ALL; BUFFER-TIME=8475			350 Secs (1288 Secs) *[==>322.0 Secs (Split 1)]* *[==>322.0 Secs (Split 2)]* *[==>322.0 Secs (Split 3)]* *[==>322.0 Secs (Split 4)]*	*[1]*
3	T1-G130M-1222 (513463)	(1) HCG92-1	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=ALL; BUFFER-TIME=13207			350 Secs (1438 Secs) *[==>388.0 Secs (Split 1)]* *[==>(Split 2)]* *[==>(Split 3)]* *[==>(Split 4)]*	*[1]* *[2]*
4	T1-G160M-1611 (513465)	(1) HCG92-1	COS/FUV, TIME-TAG, PSA	G160M 1611 A	BUFFER-TIME=2240; FP-POS=ALL			900 Secs (3180 Secs) *[==>690.0 Secs (Split 1)]* *[==>690.0 Secs (Split 2)]* *[==>(Split 3)]* *[==>(Split 4)]*	*[2]* *[3]*
5	T1-G160M-1623 (513468)	(1) HCG92-1	COS/FUV, TIME-TAG, PSA	G160M 1623 A	FP-POS=ALL; BUFFER-TIME=22303			900 Secs (3673 Secs) *[==>902.0 Secs (Split 1)]* *[==>923.0 Secs (Split 2)]* *[==>923.0 Secs (Split 3)]* *[==>925.0 Secs (Split 4)]*	*[3]* *[4]*

Orbit Structure



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Exp. 4, split 4
Exp. 5, split 1
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4500
5000
5500
secs.
Orbit 4
Server Version: 20130919
Unused Visibility = 0
GS Reacq
Occultation
Exp. 5, split 2
Exp. 5, split 3
Exp. 5, split 4
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4500
5000
5500
sec

Visit

Proposal 13321, Target 2 (03), implementation Thu Sep 26 01:11:08 GMT 2013

Diagnostic Status: Warning

Scientific Instruments: COS/NUV, COS/FUV

Special Requirements: (none)

Diagnostics

(Target 2 (03)) Warning (Orbit Planner): NO PLATE ID SPECIFIED FOR FIXED TARGET

(Target 2 (03)) Warning (Orbit Planner): NO PLATE ID SPECIFIED FOR FIXED TARGET

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(Target 2 (03)) Warning (Orbit Planner): NO PLATE ID SPECIFIED FOR FIXED TARGET

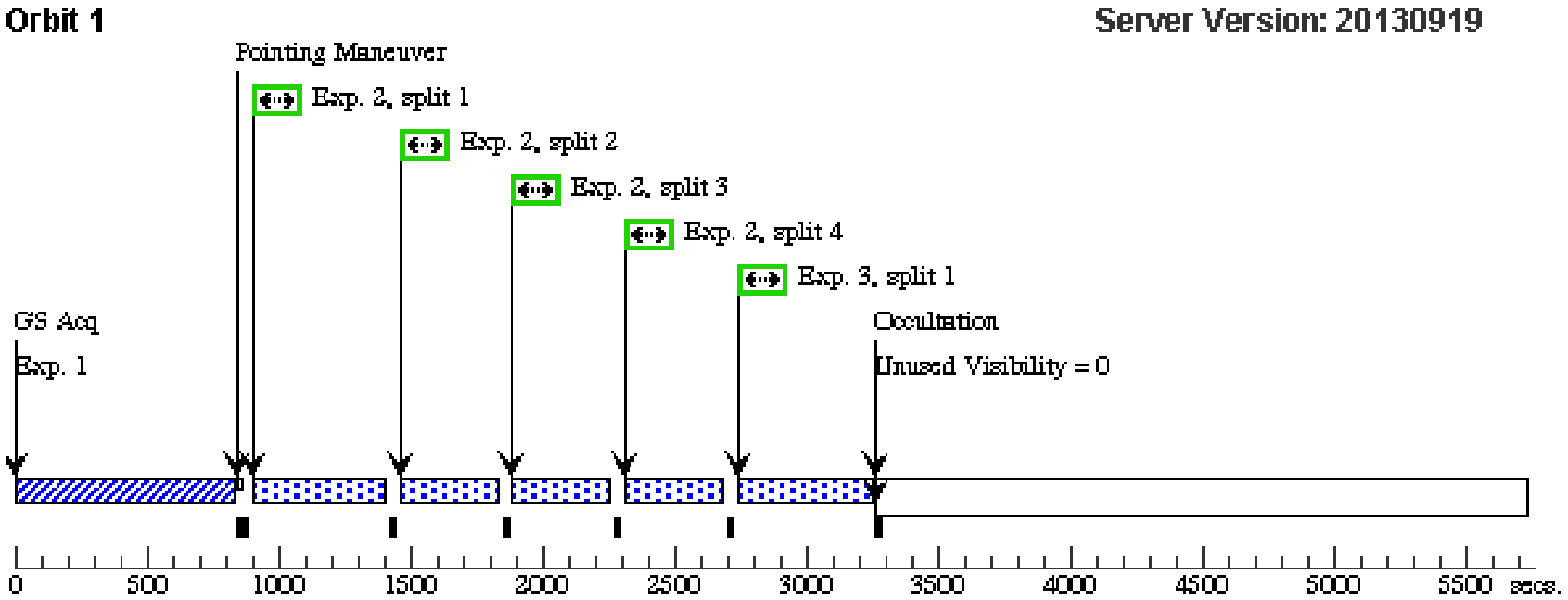
Fixed Targets

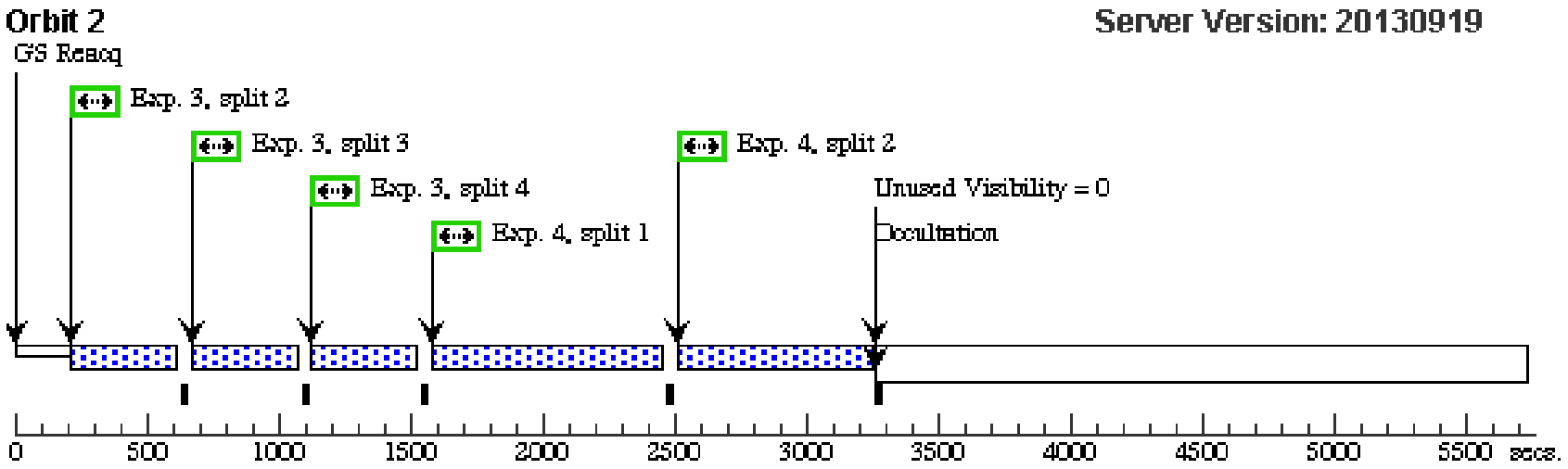
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	HCG92-2	Offset from ACQ-STAR1 RA Offset: -0.813 Secs Dec Offset: -15.14 Arcsec		V=20.2+/-0.2	Offset Position (HCG92-2)
(8)	ACQ-STAR1 Alt Name1: 22360085+3358219	RA: 22 36 0.8450 (339.0035208d) Dec: +33 58 21.89 (33.97275d) Equinox: J2000		V=17.42+/-0.1	Reference Frame: ICRS

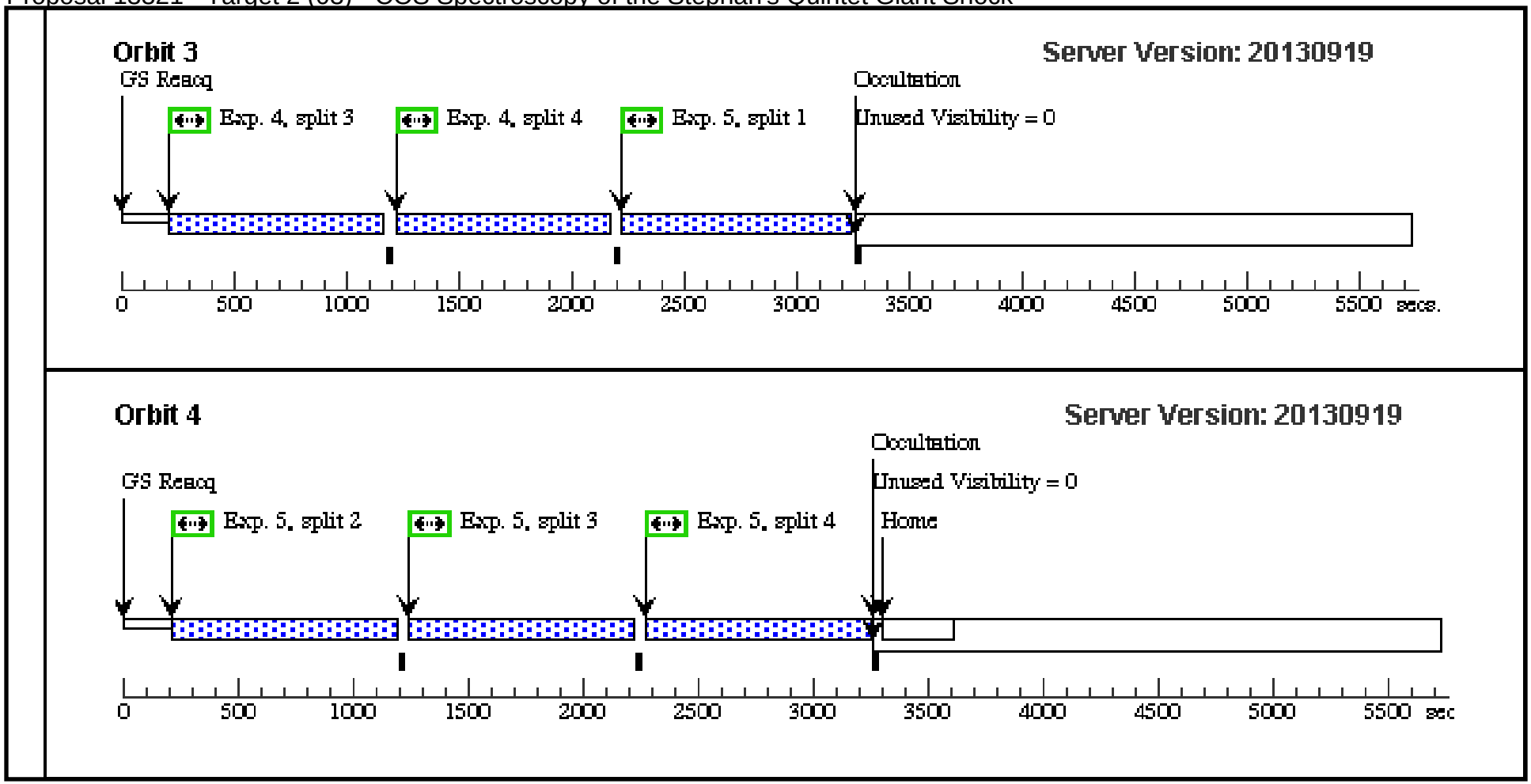
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	T2 Acquisition (534404)	(8) ACQ-STAR1	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				216 Secs (216 Secs) *[==>]*	*[1]*
2	T2-G130M-1096 (513432)	(2) HCG92-2	COS/FUV, TIME-TAG, PSA	G130M 1096 A	FP-POS=ALL; BUFFER-TIME=8475			350 Secs (1288 Secs) *[==>322.0 Secs (Split 1)]* *[==>322.0 Secs (Split 2)]* *[==>322.0 Secs (Split 3)]* *[==>322.0 Secs (Split 4)]*	*[1]*
3	T2-G130M-1222 (513463)	(2) HCG92-2	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=ALL; BUFFER-TIME=13210			350 Secs (1438 Secs) *[==>388.0 Secs (Split 1)]* *[==>(Split 2)]* *[==>(Split 3)]* *[==>(Split 4)]*	*[1]* *[2]*
4	T2-G160M-1611 (513465)	(2) HCG92-2	COS/FUV, TIME-TAG, PSA	G160M 1611 A	BUFFER-TIME=22260; FP-POS=ALL			900 Secs (3180 Secs) *[==>690.0 Secs (Split 1)]* *[==>690.0 Secs (Split 2)]* *[==>(Split 3)]* *[==>(Split 4)]*	*[2]* *[3]*
5	T2-G160M-1623 (513468)	(2) HCG92-2	COS/FUV, TIME-TAG, PSA	G160M 1623 A	FP-POS=ALL; BUFFER-TIME=22303			900 Secs (3673 Secs) *[==>902 Secs (Split 1)]* *[==>923.0 Secs (Split 2)]* *[==>923.0 Secs (Split 3)]* *[==>925.0 Secs (Split 4)]*	*[3]* *[4]*

Orbit Structure



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4500
5000
5500
secs.
Orbit 4
Server Version: 20130919
GS Reacq
Exp. 5, split 2
Exp. 5, split 3
Exp. 5, split 4
Occultation
Unused Visibility = 0
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4000
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5000
5500
sec

Visit

Proposal 13321, Target 3 (04), implementation Thu Sep 26 01:11:10 GMT 2013

Diagnostic Status: Warning

Scientific Instruments: COS/NUV, COS/FUV

Special Requirements: (none)

Diagnostics

(Target 3 (04)) Warning (Orbit Planner): NO PLATE ID SPECIFIED FOR FIXED TARGET

(Target 3 (04)) Warning (Orbit Planner): NO PLATE ID SPECIFIED FOR FIXED TARGET

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(Target 3 (04)) Warning (Orbit Planner): NO PLATE ID SPECIFIED FOR FIXED TARGET

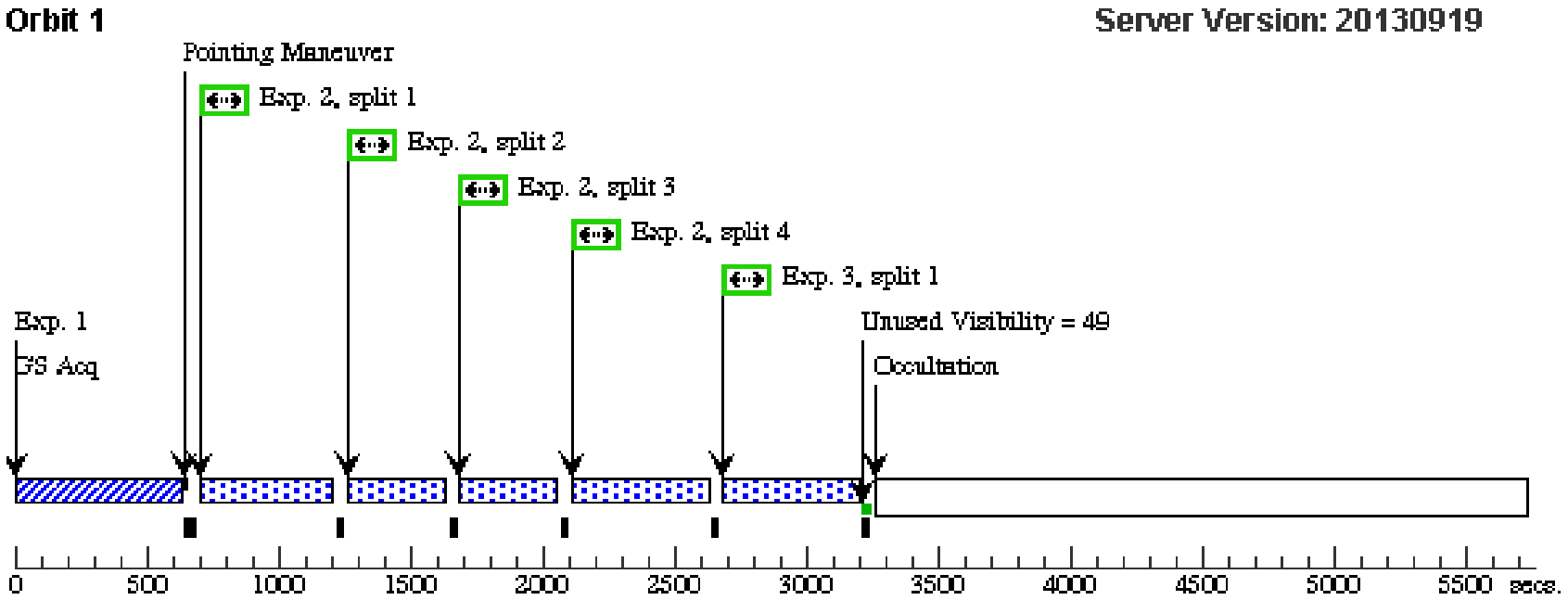
Fixed Targets

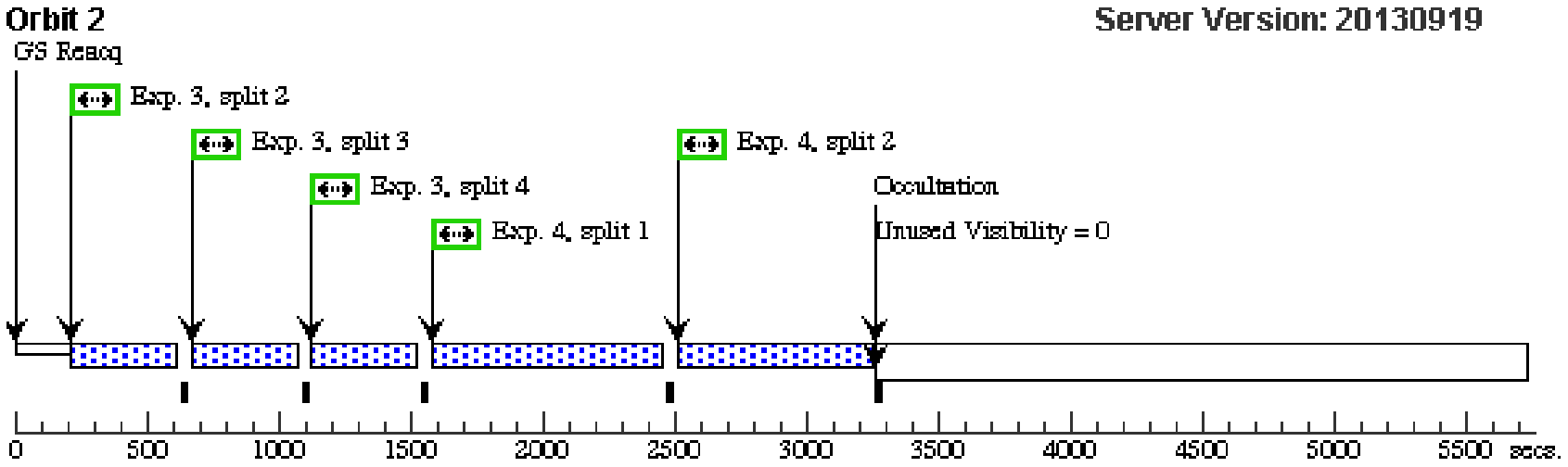
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	HCG92-3	Offset from ACQ-STAR2 RA Offset: 0.114 Secs Dec Offset: -1.96 Arcsec		V=22.0+/-0.2	Offset Position (HCG92-3)
(9)	ACQ-STAR2 Alt Name1: 2MASSJ22355933+3358367	RA: 22 35 59.3250 (338.9971875d) Dec: +33 58 36.76 (33.97688d) Equinox: J2000		V=18.5+/-0.5	Reference Frame: ICRS

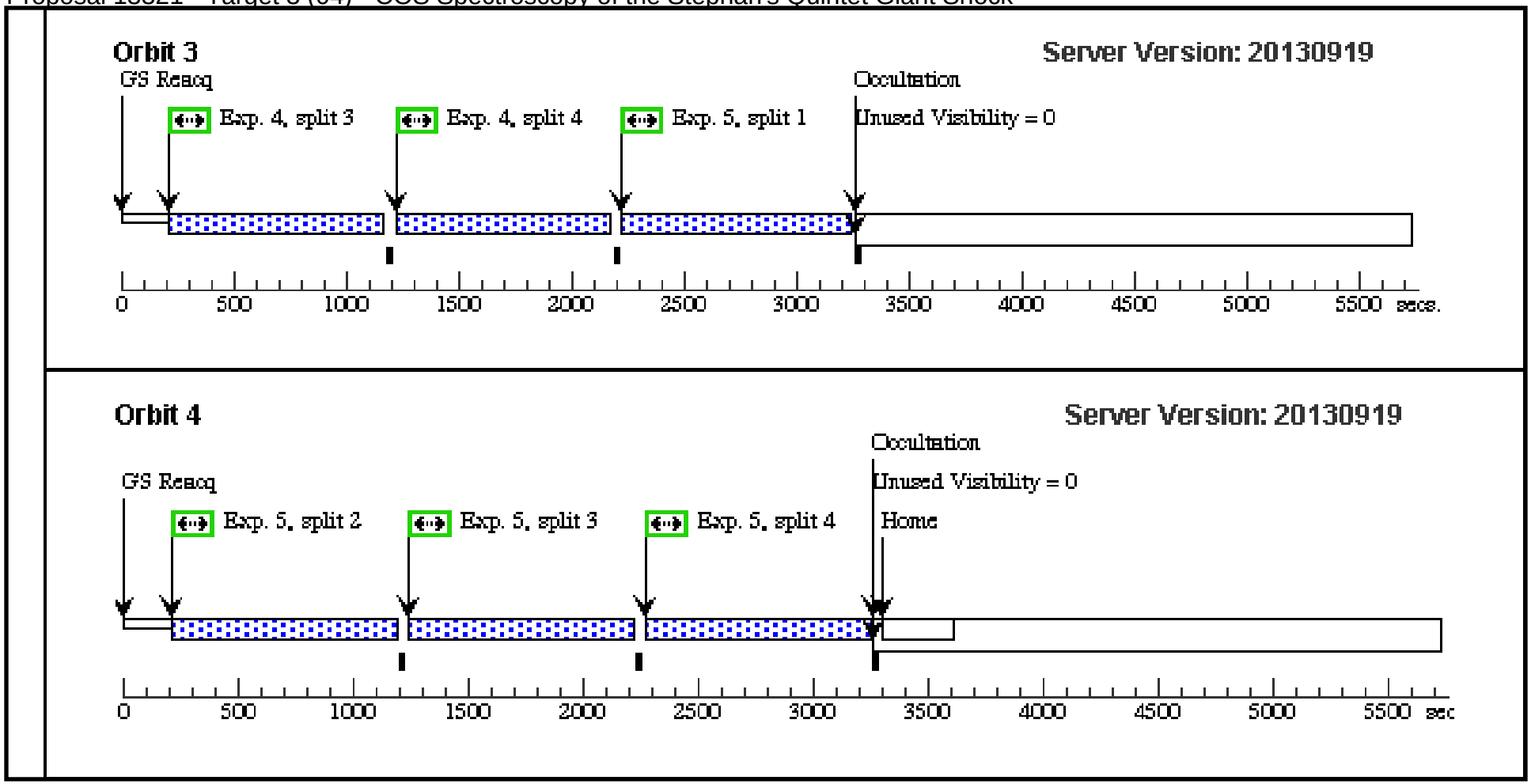
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	T3 Acquisition (534407)	(9) ACQ-STAR2	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				116 Secs (116 Secs) *[==>]*	*[1]*
2	T3-G130M-1096 (513432)	(3) HCG92-3	COS/FUV, TIME-TAG, PSA	G130M 1096 A	FP-POS=ALL; BUFFER-TIME=8475			350 Secs (1429 Secs) *[==>322.0 Secs (Split 1)]* *[==>322.0 Secs (Split 2)]* *[==>322.0 Secs (Split 3)]* *[==>463.0 Secs (Split 4)]*	*[1]*
3	T3-G130M-1222 (513463)	(3) HCG92-3	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=ALL; BUFFER-TIME=13210			350 Secs (1448 Secs) *[==>398.0 Secs (Split 1)]* *[==>(Split 2)]* *[==>(Split 3)]* *[==>(Split 4)]*	*[1]* *[2]*
4	T3-G160M-1611 (513465)	(3) HCG92-3	COS/FUV, TIME-TAG, PSA	G160M 1611 A	BUFFER-TIME=22260; FP-POS=ALL			900 Secs (3180 Secs) *[==>690.0 Secs (Split 1)]* *[==>690.0 Secs (Split 2)]* *[==>(Split 3)]* *[==>(Split 4)]*	*[2]* *[3]*
5	T3-G160M-1623 (513468)	(3) HCG92-3	COS/FUV, TIME-TAG, PSA	G160M 1623 A	FP-POS=ALL; BUFFER-TIME=22303			900 Secs (3673 Secs) *[==>902.0 Secs (Split 1)]* *[==>923.0 Secs (Split 2)]* *[==>923.0 Secs (Split 3)]* *[==>925.0 Secs (Split 4)]*	*[3]* *[4]*

Orbit Structure



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Exp. 5, split 1
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5000
5500
secs.
Orbit 4
Server Version: 20130919
GS Reacq
Exp. 5, split 2
Exp. 5, split 3
Exp. 5, split 4
Occultation
Unused Visibility = 0
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4000
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5000
5500
sec

Visit

Proposal 13321, Target 5 (05), implementation Thu Sep 26 01:11:12 GMT 2013

Diagnostic Status: Warning

Scientific Instruments: COS/NUV, COS/FUV

Special Requirements: (none)

Diagnostics

(Target 5 (05)) Warning (Orbit Planner): NO PLATE ID SPECIFIED FOR FIXED TARGET

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(Target 5 (05)) Warning (Orbit Planner): NO PLATE ID SPECIFIED FOR FIXED TARGET

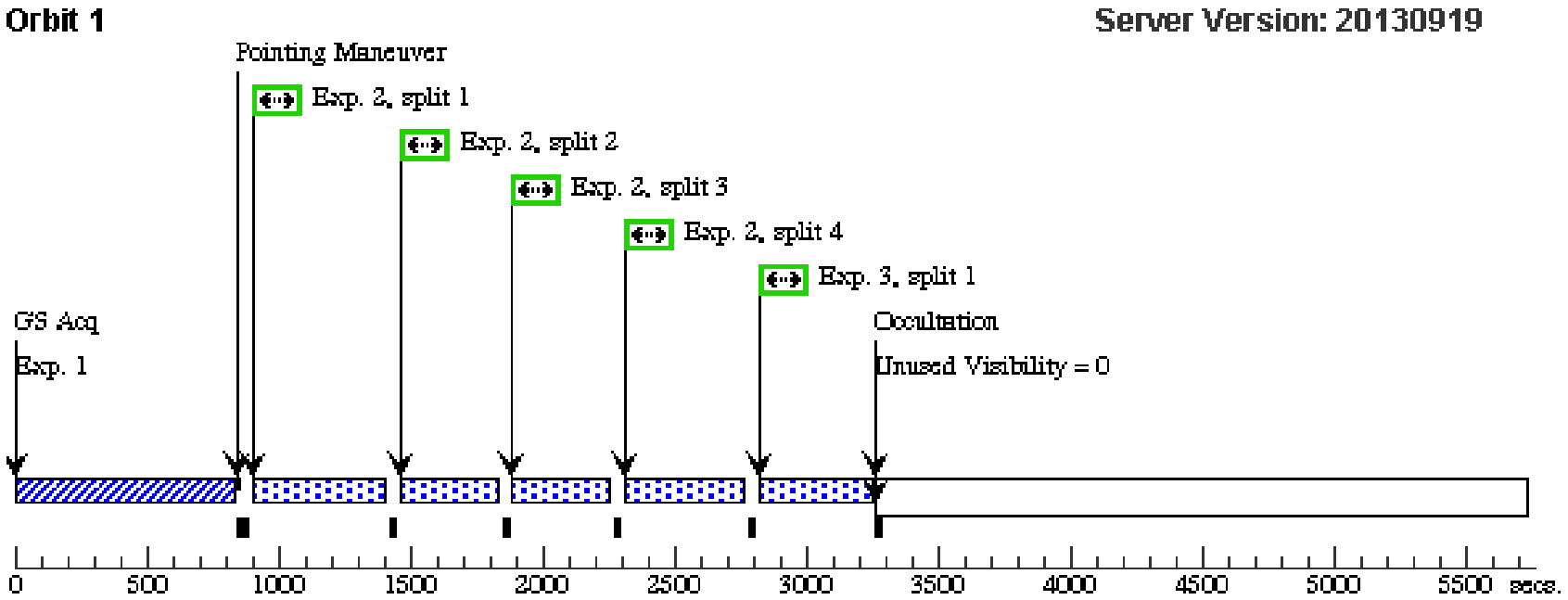
Fixed Targets

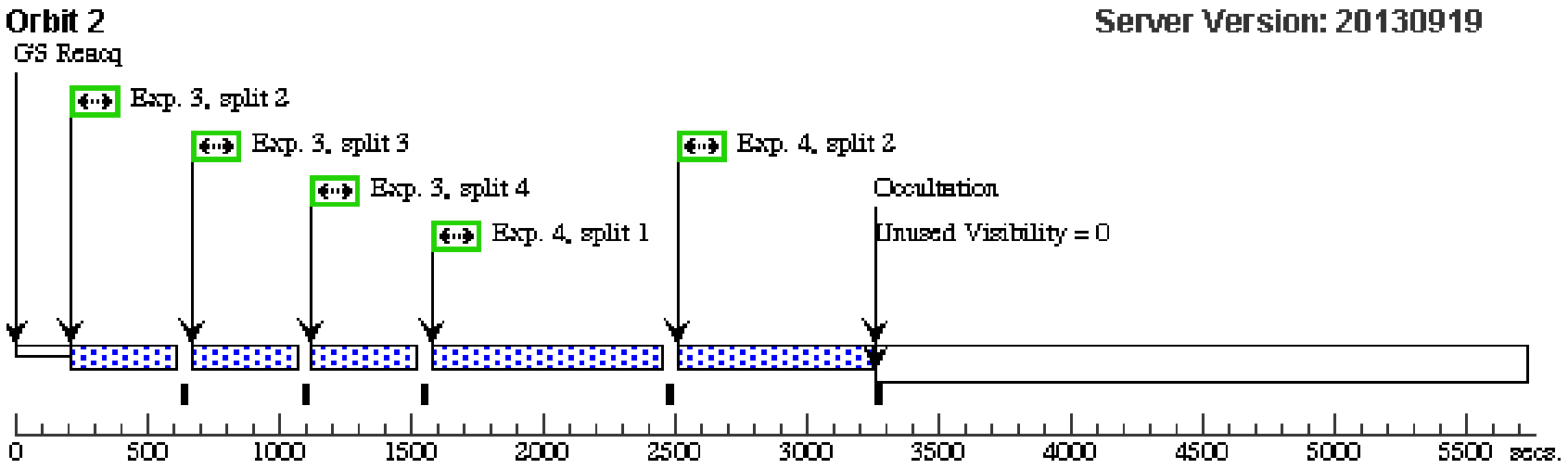
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(5)	HCG92-5	Offset from ACQ-STAR1 RA Offset: 0.377 Secs Dec Offset: 0.85 Arcsec		V=19.4+/-0.2	Offset Position (HCG92-5)
(8)	ACQ-STAR1 Alt Name1: 22360085+3358219	RA: 22 36 0.8450 (339.0035208d) Dec: +33 58 21.89 (33.97275d) Equinox: J2000		V=17.42+/-0.1	Reference Frame: ICRS

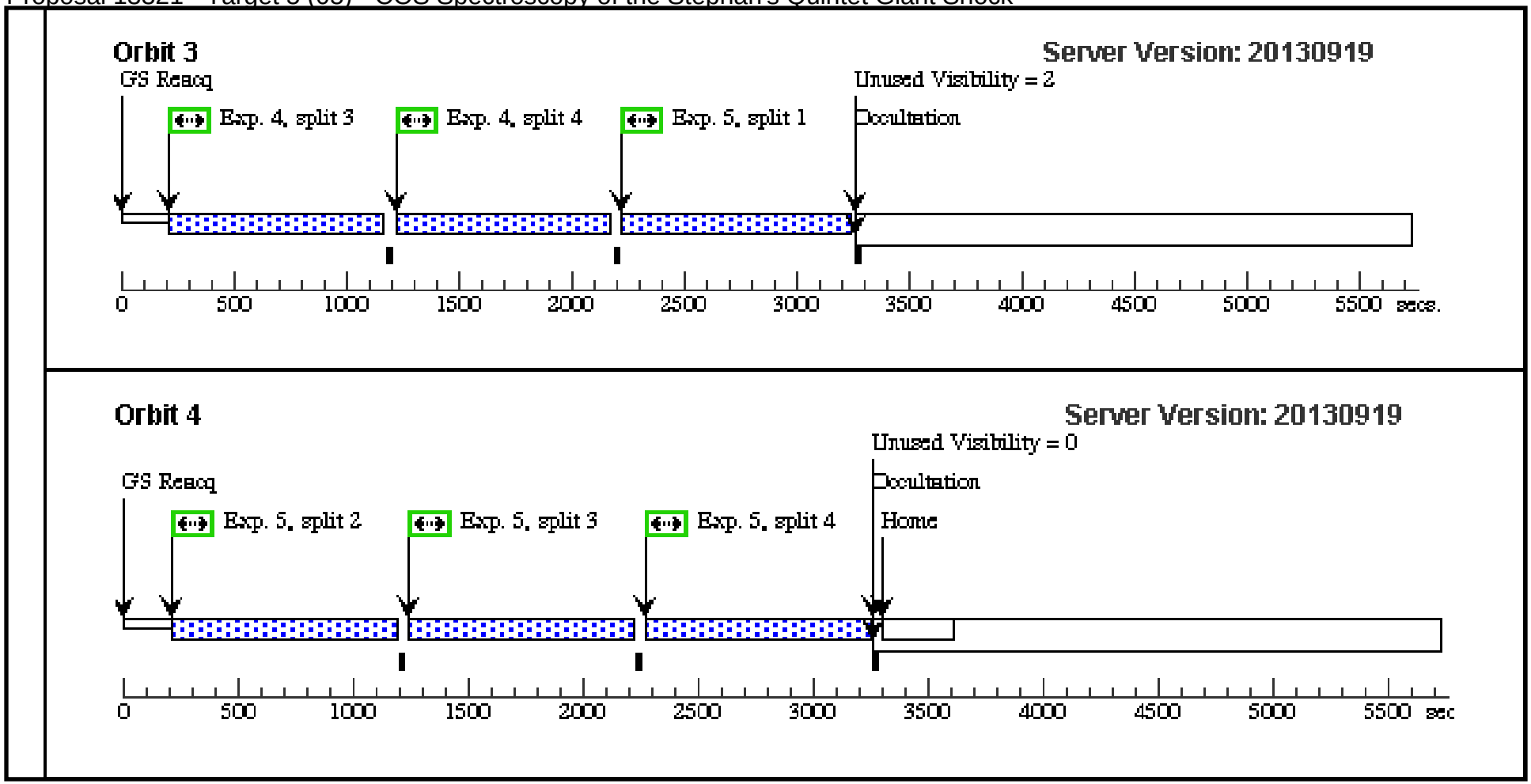
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	T5 Acquisition (534404)	(8) ACQ-STAR1	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				216 Secs (216 Secs) *[==>]*	*[1]*
2	T5-G130M-1096 (513432)	(5) HCG92-5	COS/FUV, TIME-TAG, PSA	G130M 1096 A	FP-POS=ALL; BUFFER-TIME=8475			350 Secs (1366 Secs) *[==>322.0 Secs (Split 1)]* *[==>322.0 Secs (Split 2)]* *[==>322.0 Secs (Split 3)]* *[==>400.0 Secs (Split 4)]*	*[1]*
3	T5-G130M-1222 (513463)	(5) HCG92-5	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=ALL; BUFFER-TIME=13210			350 Secs (1360 Secs) *[==>310.0 Secs (Split 1)]* *[==>(Split 2)]* *[==>(Split 3)]* *[==>(Split 4)]*	*[1]* *[2]*
4	T5-G160M-1611 (513465)	(5) HCG92-5	COS/FUV, TIME-TAG, PSA	G160M 1611 A	BUFFER-TIME=22260; FP-POS=ALL			900 Secs (3180 Secs) *[==>690.0 Secs (Split 1)]* *[==>690.0 Secs (Split 2)]* *[==>(Split 3)]* *[==>(Split 4)]*	*[2]* *[3]*
5	T5-G160M-1623 (513468)	(5) HCG92-5	COS/FUV, TIME-TAG, PSA	G160M 1623 A	FP-POS=ALL; BUFFER-TIME=22303			900 Secs (3671 Secs) *[==>(Split 1)]* *[==>923.0 Secs (Split 2)]* *[==>923.0 Secs (Split 3)]* *[==>925.0 Secs (Split 4)]*	*[3]* *[4]*

Orbit Structure



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GS Reacq
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Exp. 5, split 1
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Occultation
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1000
1500
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2500
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3500
4000
4500
5000
5500
secs.
Orbit 4
Server Version: 20130919
Unused Visibility = 0
GS Reacq
Occultation
Exp. 5, split 2
Exp. 5, split 3
Exp. 5, split 4
Home
0
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3500
4000
4500
5000
5500
sec

Visit

Proposal 13321, Target 7 (06), implementation Thu Sep 26 01:11:14 GMT 2013

Diagnostic Status: Warning

Scientific Instruments: COS/NUV, COS/FUV

Special Requirements: (none)

Diagnostics

(Target 7 (06)) Warning (Orbit Planner): NO PLATE ID SPECIFIED FOR FIXED TARGET

(Target 7 (06)) Warning (Orbit Planner): NO PLATE ID SPECIFIED FOR FIXED TARGET

(Target 7 (06)) Warning (Orbit Planner): NO PLATE ID SPECIFIED FOR FIXED TARGET

(Target 7 (06)) Warning (Orbit Planner): NO PLATE ID SPECIFIED FOR FIXED TARGET

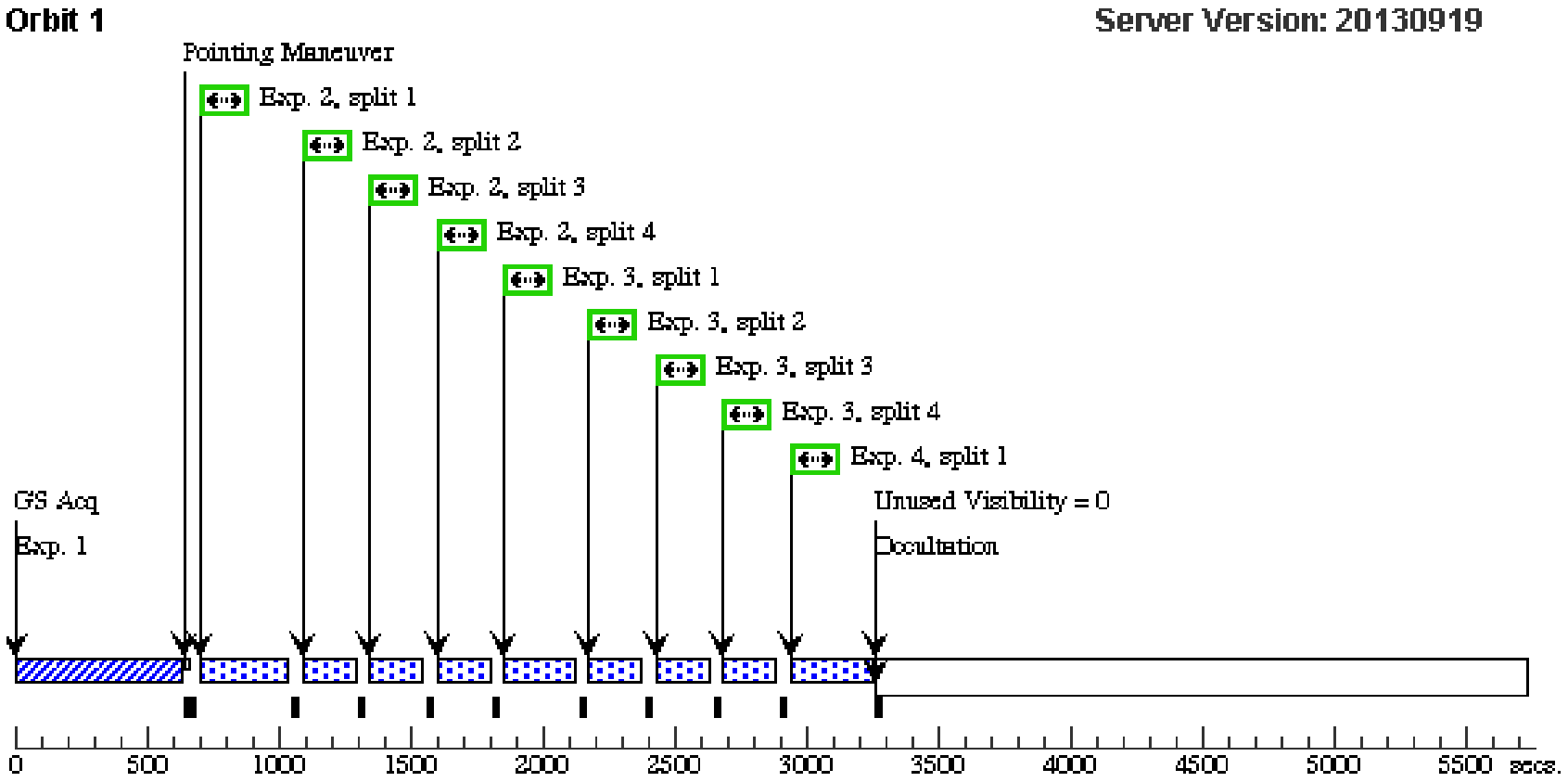
Fixed Targets

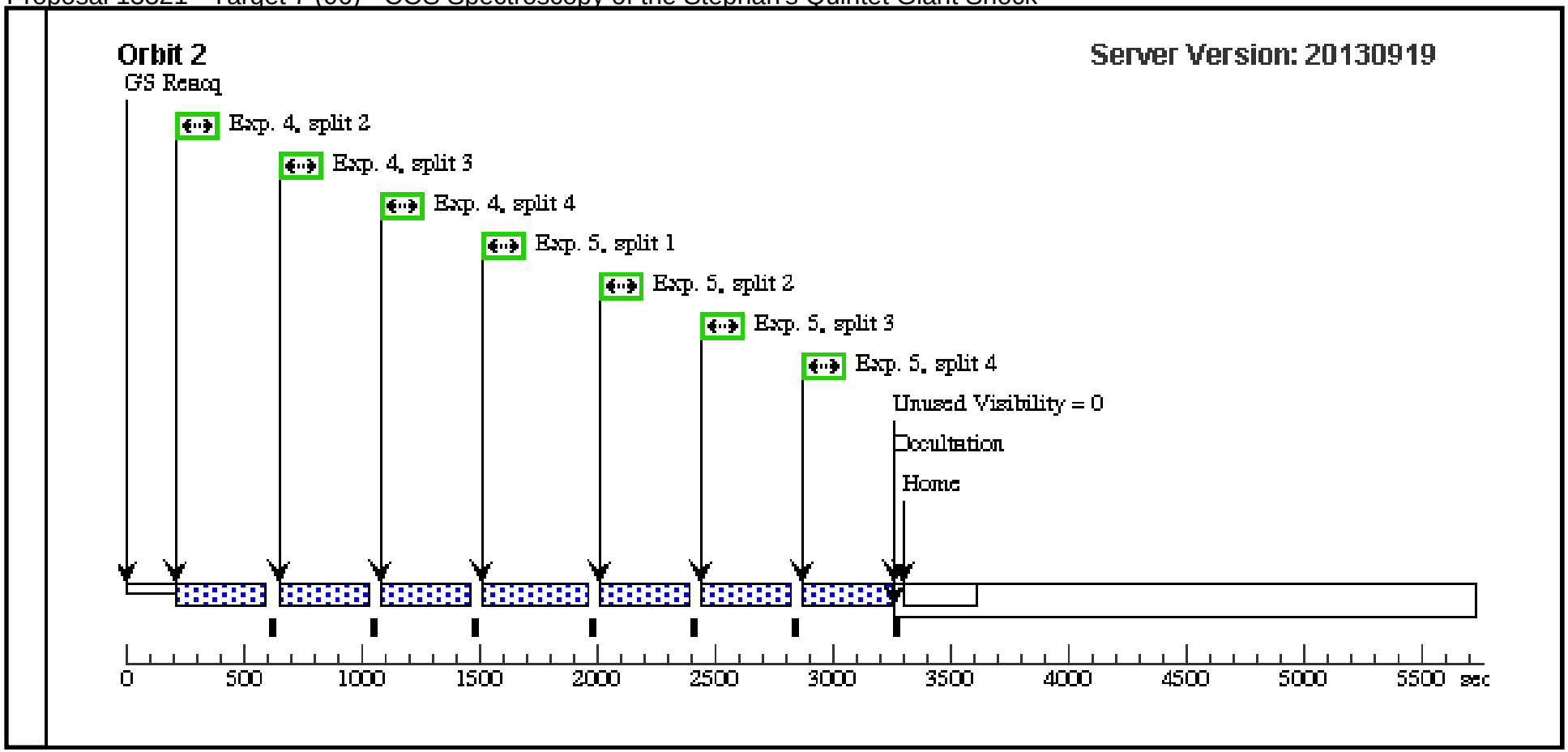
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(7)	HCG92-7	Offset from ACQ-STAR2 RA Offset: -0.372 Secs Dec Offset: 13.2 Arcsec		V=13.1+/-0.2	Offset Position (HCG92-7)
(9)	ACQ-STAR2 Alt Name1: 2MASSJ22355933+3358367	RA: 22 35 59.3250 (338.9971875d) Dec: +33 58 36.76 (33.97688d) Equinox: J2000		V=18.5+/-0.5	Reference Frame: ICRS

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	T7 Acquisition (534407)	(9) ACQ-STAR2	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				116 Secs (116 Secs) *[==>]*	*[1]*
2	T7-G130M-1096 (512167)	(7) HCG92-7	COS/FUV, TIME-TAG, PSA	G130M 1096 A	FP-POS=ALL; BUFFER-TIME=8475			150 Secs (600 Secs) *[==>(Split 1)]* *[==>(Split 2)]* *[==>(Split 3)]* *[==>(Split 4)]*	*[1]*
3	T7-G130M-1222 (512167)	(7) HCG92-7	COS/FUV, TIME-TAG, PSA	G130M 1222 A	FP-POS=ALL; BUFFER-TIME=13210			150 Secs (600 Secs) *[==>(Split 1)]* *[==>(Split 2)]* *[==>(Split 3)]* *[==>(Split 4)]*	*[1]*
4	T7-G160M-1611 (512190)	(7) HCG92-7	COS/FUV, TIME-TAG, PSA	G160M 1611 A	BUFFER-TIME=22260; FP-POS=ALL			350 Secs (1103 Secs) *[==>125.0 Secs (Split 1)]* *[==>326.0 Secs (Split 2)]* *[==>326.0 Secs (Split 3)]* *[==>326.0 Secs (Split 4)]*	*[1]* *[2]*
5	T7-G160M-1623 (512191)	(7) HCG92-7	COS/FUV, TIME-TAG, PSA	G160M 1623 A	FP-POS=ALL; BUFFER-TIME=22303			350 Secs (1304 Secs) *[==>326.0 Secs (Split 1)]* *[==>326.0 Secs (Split 2)]* *[==>326.0 Secs (Split 3)]* *[==>326.0 Secs (Split 4)]*	*[2]*

Orbit Structure




Orbit 2
Server Version: 20130919
GS Reacq
Exp. 4, split 2
Exp. 4, split 3
Exp. 4, split 4
Exp. 5, split 1
Exp. 5, split 2
Exp. 5, split 3
Exp. 5, split 4
Unused Visibility = 0
Occultation
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec