



14601 - The Energetically Complete Picture of a Starburst Superwind

Cycle: 24, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

INVESTIGATORS

<i>Name</i>	<i>Institution</i>	<i>E-Mail</i>
Prof. Matthew James Hayes (PI) (ESA Member) (Contact)	Stockholm University	matthew@astro.su.se
Prof. Goeran Oestlin (CoI) (ESA Member)	Stockholm University	ostlin@astro.su.se
Dr. Jens Melinder (CoI) (ESA Member)	Stockholm University	jens@astro.su.se
Prof. Claudia Scarlata (CoI) (AdminUSPI)	University of Minnesota - Twin Cities	scarlata@astro.umn.edu
Dr. Matthew D. Lehnert (CoI) (ESA Member)	CNRS, Institut d'Astrophysique de Paris	lehnert@iap.fr

VISITS

<i>Visit</i>	<i>Targets used in Visit</i>	<i>Configurations used in Visit</i>	<i>Orbits Used</i>	<i>Last Orbit Planner Run</i>	<i>OP Current with Visit?</i>
01	(1) SDSSJ1156+5008--CLUSTER (2) SDSSJ1156+5008--HALO	COS/FUV COS/NUV	4	29-Jul-2016 13:50:54.0	yes

4 Total Orbits Used

ABSTRACT

Recent Cycle 22 observations, with both ACS and COS, have revealed a halo of OVI emission surrounding a low-redshift, compact star-forming galaxy. This is the first time that the coronal gas phase, with the illusive temperature of $T \sim 300,000$ K, has been mapped in emission for an individual galaxy. The implications of this are profound, in that this gas may represent the hitherto unobservable temperature regime through which galaxy superwinds can radiate energy. These unique observations enable us measure a large number of properties of the warm outflow, but the global properties of the wind in all other gas phases remain illusive because few suitable metal lines are available in the existing COS/G130M spectrum.

We propose to obtain COS spectroscopy in the redder G160M setting to measure the absorption features of 10 more interstellar lines. From this we will build a picture of the velocity structure of the outflow in the colder atomic phases that are likely to contain the bulk of the mass. This will provide the complete energetic picture of the outflow, including warm/coronal and colder/atomic phases for the first time. A further G130M spectrum positioned in the halo will determine the properties (flux and kinematics) of a peculiar 'blob' of enhanced OVI emission. This region is as bright in OVI as the central pointing, but is located 10 optical scale lengths from the center, with no obvious cospatial source of excitation. Kinematics derived from this observation will determine its physical origin.

OBSERVING DESCRIPTION

This programme will obtain spectra with COS of a single galaxy that hosts an extreme starburst. The object has a very luminous compact central object, with a diffuse gaseous halo.

We will obtain:

- A. COS/G160M spectroscopy on the central pointing (2 orbits)
- B. G130M spectroscopy in the halo, offset by {ra,dec} = {-1.86,2.13} arcsec (2 orbits)

The four orbit allocation will be executed in one visit.

We will use the PSA, ACQ/IMAGE, and MIRROR A.

The acquisition is a copy of that used in GO 13656, which obtained COS spectroscopy (G130M) on the central pointing. After this initial acquisition we will obtain the G160M spectrum of the central pointing (part A. above)

We will then perform an offset to a pointing in the halo, re-image the galaxy in the NUV, change grating to G130M, and execute part B.

Acquisition time is 13 seconds for SNR=40 assuming a point-source.

In part A we use G160M, CENWAVE=1600, TIME-TAG, and all FP positions

In part B we use G130M, CENWAVE=1318, TIME-TAG, and all FP positions

Each individual spectrum is roughly half an orbit.

Proposal 14601 - Visit 01 - The Energetically Complete Picture of a Starburst Superwind

Fri Jul 29 17:50:55 GMT 2016

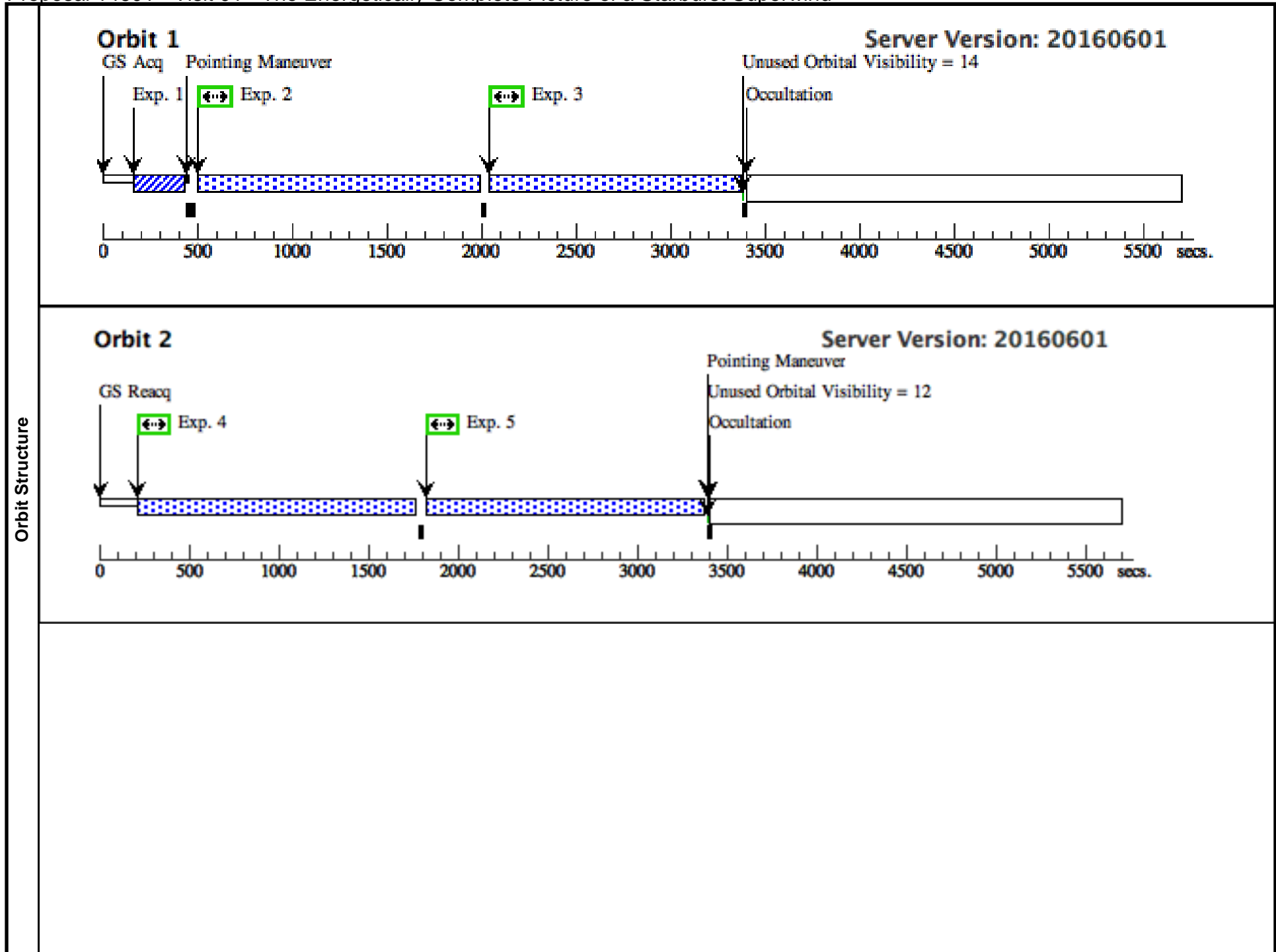
Visit	<p>Proposal 14601, Visit 01</p> <p>Diagnostic Status: Warning</p> <p>Scientific Instruments: COS/FUV, COS/NUV</p> <p>Special Requirements: (none)</p> <p><i>Comments: Photometry that guides target acquisition and integration times is done with HST data from visits 1 and 30 from GO 13656. Flux was measured on the brightest UV source in 0.2 arcsec (acquisition) and 1.25 arcsec (spectroscopic observation) apertures, using the F140LP and F390W filters. Then we interpolated (power-law) between the two, to lambda=2300 AA. Fluxes are quoted in the Comments section of the Acquisition.</i></p> <p><i>HST datasets used for the photometry:</i> <i>F140LP : JCME01010</i> <i>F390W : JCME30010</i></p>																																																																						
	<p>(Visit 01) Warning (Form): If the target coordinates are not known to 0.4" (or better), an ACQ/SEARCH should precede the ACQ/IMAGE.</p> <p>(G130M off axis 1 (01.007)) Warning (Form): COS FUV PSA science exposures with extended targets have special calibration limitations. See "Errors and Warnings" for more details.</p> <p>(G130M off axis 2 (01.008)) Warning (Form): COS FUV PSA science exposures with extended targets have special calibration limitations. See "Errors and Warnings" for more details.</p> <p>(G130M off axis 3 (01.009)) Warning (Form): COS FUV PSA science exposures with extended targets have special calibration limitations. See "Errors and Warnings" for more details.</p> <p>(G130M off axis 4 (01.010)) Warning (Form): COS FUV PSA science exposures with extended targets have special calibration limitations. See "Errors and Warnings" for more details.</p>																																																																						
Diagnosics	<table border="1"> <thead> <tr> <th>#</th> <th>Name</th> <th>Target Coordinates</th> <th>Targ. Coord. Corrections</th> <th>Fluxes</th> <th>Miscellaneous</th> </tr> </thead> <tbody> <tr> <td>(1)</td> <td>SDSSJ1156+5008-- CLUSTER</td> <td>RA: 11 56 30.6305 (179.1276271d) Dec: +50 08 22.18 (50.13949d) Equinox: J2000</td> <td></td> <td>V=18.6+/-0.1 FUV magnitude 18.8 AB</td> <td>Reference Frame: ICRS</td> </tr> <tr> <td colspan="6"><i>Comments: These target data are copied from GO 13656, which successfully observed the galaxy with COS. Extended=NO</i></td> </tr> <tr> <td>(2)</td> <td>SDSSJ1156+5008-- HALO</td> <td>RA: 11 56 30.4373 (179.1268221d) Dec: +50 08 24.31 (50.14009d) Equinox: J2000</td> <td></td> <td>V=18.6+/-0.1 FUV magnitude 18.8 AB</td> <td>Reference Frame: ICRS</td> </tr> <tr> <td colspan="6"><i>Comments: These target data are offset by {ra,dec} = {-1.86,2.13} arcsec, as measured in HST images.</i></td> </tr> <tr> <td colspan="6"><i>offset in RA = 1.8573139999999967 arcseconds</i> <i>= 1.8573139999999967 / 3600 / cos(50.139494444 / 180 * pi)</i> <i>= 0.00080496788894599393</i></td> </tr> <tr> <td colspan="6"><i>offset in DEC = 2.1318730000000016 arcsec</i> <i>= 2.1318730000000016 / 3600</i> <i>= 0.0005921869444444448 degrees.</i></td> </tr> <tr> <td colspan="6"><i>RA halo = 179.12762708333332 - 0.00080496788894599393</i> <i>= 179.12682211544438 degrees</i></td> </tr> <tr> <td colspan="6"><i>DEC halo = 50.13949444444445 + 0.0005921869444444448</i> <i>= 50.140086631388</i></td> </tr> <tr> <td colspan="6"><i>This is 11:56:30.4373, 50:08:24.31, as entered.</i></td> </tr> <tr> <td colspan="6"><i>Extended=YES</i></td> </tr> </tbody> </table>					#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous	(1)	SDSSJ1156+5008-- CLUSTER	RA: 11 56 30.6305 (179.1276271d) Dec: +50 08 22.18 (50.13949d) Equinox: J2000		V=18.6+/-0.1 FUV magnitude 18.8 AB	Reference Frame: ICRS	<i>Comments: These target data are copied from GO 13656, which successfully observed the galaxy with COS. Extended=NO</i>						(2)	SDSSJ1156+5008-- HALO	RA: 11 56 30.4373 (179.1268221d) Dec: +50 08 24.31 (50.14009d) Equinox: J2000		V=18.6+/-0.1 FUV magnitude 18.8 AB	Reference Frame: ICRS	<i>Comments: These target data are offset by {ra,dec} = {-1.86,2.13} arcsec, as measured in HST images.</i>						<i>offset in RA = 1.8573139999999967 arcseconds</i> <i>= 1.8573139999999967 / 3600 / cos(50.139494444 / 180 * pi)</i> <i>= 0.00080496788894599393</i>						<i>offset in DEC = 2.1318730000000016 arcsec</i> <i>= 2.1318730000000016 / 3600</i> <i>= 0.0005921869444444448 degrees.</i>						<i>RA halo = 179.12762708333332 - 0.00080496788894599393</i> <i>= 179.12682211544438 degrees</i>						<i>DEC halo = 50.13949444444445 + 0.0005921869444444448</i> <i>= 50.140086631388</i>						<i>This is 11:56:30.4373, 50:08:24.31, as entered.</i>						<i>Extended=YES</i>					
	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous																																																																	
(1)	SDSSJ1156+5008-- CLUSTER	RA: 11 56 30.6305 (179.1276271d) Dec: +50 08 22.18 (50.13949d) Equinox: J2000		V=18.6+/-0.1 FUV magnitude 18.8 AB	Reference Frame: ICRS																																																																		
<i>Comments: These target data are copied from GO 13656, which successfully observed the galaxy with COS. Extended=NO</i>																																																																							
(2)	SDSSJ1156+5008-- HALO	RA: 11 56 30.4373 (179.1268221d) Dec: +50 08 24.31 (50.14009d) Equinox: J2000		V=18.6+/-0.1 FUV magnitude 18.8 AB	Reference Frame: ICRS																																																																		
<i>Comments: These target data are offset by {ra,dec} = {-1.86,2.13} arcsec, as measured in HST images.</i>																																																																							
<i>offset in RA = 1.8573139999999967 arcseconds</i> <i>= 1.8573139999999967 / 3600 / cos(50.139494444 / 180 * pi)</i> <i>= 0.00080496788894599393</i>																																																																							
<i>offset in DEC = 2.1318730000000016 arcsec</i> <i>= 2.1318730000000016 / 3600</i> <i>= 0.0005921869444444448 degrees.</i>																																																																							
<i>RA halo = 179.12762708333332 - 0.00080496788894599393</i> <i>= 179.12682211544438 degrees</i>																																																																							
<i>DEC halo = 50.13949444444445 + 0.0005921869444444448</i> <i>= 50.140086631388</i>																																																																							
<i>This is 11:56:30.4373, 50:08:24.31, as entered.</i>																																																																							
<i>Extended=YES</i>																																																																							
Fixed Targets																																																																							

Proposal 14601 - Visit 01 - The Energetically Complete Picture of a Starburst Superwind

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit	
Exposures	1	Acquisition (COS.ta.708 853)	(1) SDSSJ1156+500 8--CLUSTER	COS/NUV, ACQ/IMAGE, PSA	MIRRORA			20 Secs (20 Secs) [==>]	[1]	
	<p><i>Comments: F140LP full = 45.660 adu/sec = 1.2387e-15 cgs/AA</i> <i>F140LP ACQ = 27.489 adu/sec = 7.4575e-16 cgs/AA</i></p> <p><i>F390W full = 335.631 adu/sec = 1.7145e-16 cgs/AA</i> <i>F390W ACQ = 227.063 adu/sec = 1.1599e-16 cgs/AA</i></p> <p><i>COS/NUV full = 6.5052e-16 cgs/AA</i> <i>COS/NUV ACQ = 4.068e-16 cgs/AA</i></p> <p><i>These numbers (and the beta slope) were entered into the acquisition and spectroscopic ETCs.</i></p>									
	2	G160M on a xis 1 (COS.sp.824 837)	(1) SDSSJ1156+500 8--CLUSTER	COS/FUV, TIME-TAG, PSA	G160M 1600 A	FP-POS=1; FLASH=YES; BUFFER-TIME=13 869			1280 Secs (1280 Secs) [==>]	[1]
	<p><i>Comments: There are four observations take, one on each of the FP-POS positions.</i></p> <p><i>To estimate the performance we use the COS-aperture flux measured in the F140LP frame. (central wavelength ~1500 AA)</i> <i>F140LP full = 45.660 adu/sec = 1.2387e-15 cgs/AA</i></p> <p><i>The exposure time is taken to be 1500 seconds for all integrations.</i></p>									
	3	G160M on a xis 2 (COS.sp.824 837)	(1) SDSSJ1156+500 8--CLUSTER	COS/FUV, TIME-TAG, PSA	G160M 1600 A	FP-POS=2; FLASH=YES; BUFFER-TIME=13 869			1280 Secs (1280 Secs) [==>]	[1]
	4	G160M on a xis 3 (COS.sp.824 837)	(1) SDSSJ1156+500 8--CLUSTER	COS/FUV, TIME-TAG, PSA	G160M 1600 A	FP-POS=3; FLASH=YES; BUFFER-TIME=13 869			1500 Secs (1500 Secs) [==>]	[2]
5	G160M on a xis 4 (COS.sp.824 837)	(1) SDSSJ1156+500 8--CLUSTER	COS/FUV, TIME-TAG, PSA	G160M 1600 A	FP-POS=4; FLASH=YES; BUFFER-TIME=13 869			1500 Secs (1500 Secs) [==>]	[2]	
6	Offset to hal o and NUV i mage (COS.im.82 4472)	(2) SDSSJ1156+500 8--HALO	COS/NUV, TIME-TAG, PSA	MIRRORA	BUFFER-TIME=17 92; FLASH=YES			120 Secs (120 Secs) [==>]	[2]	
<p><i>Comments: A POS-TARG is executed first.</i></p> <p><i>This observation is to obtain a short NUV image to confirm the pointing of the telescope after the POS-TARG.</i> <i>The aim is to detect the NUV continuum at SNR=20.</i> <i>We adopt the following calculation:</i></p> <p><i>In ACS/SBC/F140LP flux = 2.5708e-17 cgs/AA</i> <i>In WFC3/UVIS/F390W flux = 1.518e-18 cgs/AA</i> <i>==> Beta = -0.7998</i> <i>==> COS/NUV flux at 2200 AA = 2.0109e-17 cgs/AA</i></p>										

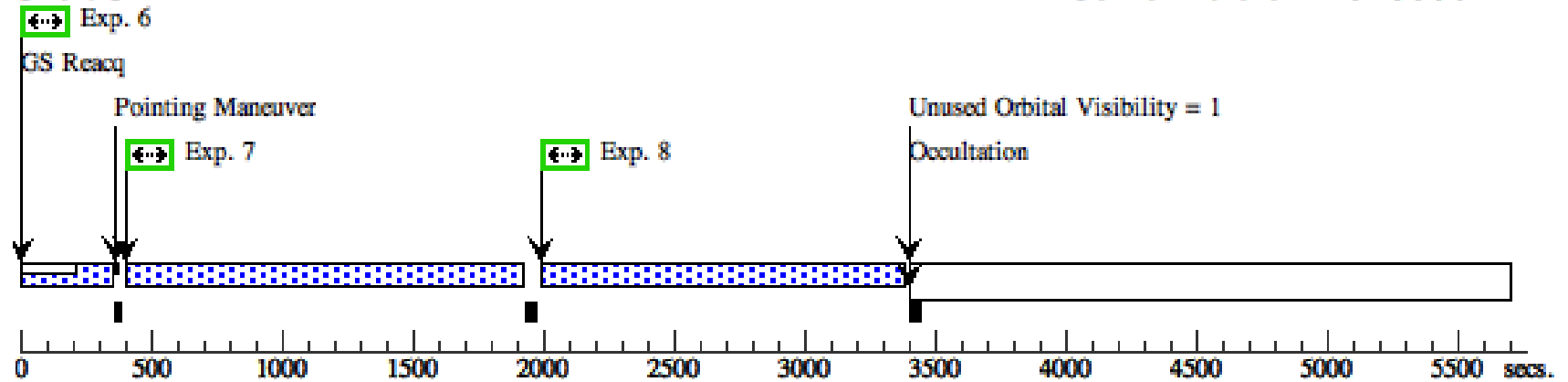
Proposal 14601 - Visit 01 - The Energetically Complete Picture of a Starburst Superwind

7	G130M off axis 1 (COS.sp.824 476)	(2) SDSSJ1156+500 8--HALO	COS/FUV, TIME-TAG, PSA	G130M 1318 A	FP-POS=1; FLASH=YES; BUFFER-TIME=49 20	1340 Secs (1340 Secs) [==>]	[3]
<p><i>Comments: For this we aim to detect a single emission line, the flux of which is estimated from the continuum-subtracted OVI image.</i></p> <p><i>Line at Center 1283.0 FWHM 0.54 Flux 4.1e-16</i></p> <p><i>The continuum, as estimated in the calculation for Exposure 6, is extremely weak and likely to be undetected in spectroscopic mode.</i></p> <p><i>We adopt 1500 seconds as the exposure time, giving SNR=2.97 per exposure. This will then total SNR~6 PER RESEL in the combined spectrum.</i></p>							
8	G130M off axis 2 (COS.sp.824 476)	(2) SDSSJ1156+500 8--HALO	COS/FUV, TIME-TAG, PSA	G130M 1318 A	FP-POS=2; FLASH=YES; BUFFER-TIME=49 20	1340 Secs (1340 Secs) [==>]	[3]
<p><i>Comments: For this we aim to detect a single emission line, the flux of which is estimated from the continuum-subtracted OVI image.</i></p> <p><i>Line at Center 1283.0 FWHM 0.54 Flux 4.1e-16</i></p> <p><i>The continuum, as estimated in the calculation for Exposure 6, is extremely weak and likely to be undetected in spectroscopic mode.</i></p> <p><i>We adopt 1500 seconds as the exposure time, giving SNR=2.97 per exposure. This will then total SNR~6 PER RESEL in the combined spectrum.</i></p>							
9	G130M off axis 3 (COS.sp.824 476)	(2) SDSSJ1156+500 8--HALO	COS/FUV, TIME-TAG, PSA	G130M 1318 A	FP-POS=3; FLASH=YES; BUFFER-TIME=49 20	1490 Secs (1490 Secs) [==>]	[4]
<p><i>Comments: For this we aim to detect a single emission line, the flux of which is estimated from the continuum-subtracted OVI image.</i></p> <p><i>Line at Center 1283.0 FWHM 0.54 Flux 4.1e-16</i></p> <p><i>The continuum, as estimated in the calculation for Exposure 6, is extremely weak and likely to be undetected in spectroscopic mode.</i></p> <p><i>We adopt 1500 seconds as the exposure time, giving SNR=2.97 per exposure. This will then total SNR~6 PER RESEL in the combined spectrum.</i></p>							
10	G130M off axis 4 (COS.sp.824 476)	(2) SDSSJ1156+500 8--HALO	COS/FUV, TIME-TAG, PSA	G130M 1318 A	FP-POS=4; FLASH=YES; BUFFER-TIME=49 20	1490 Secs (1490 Secs) [==>]	[4]
<p><i>Comments: For this we aim to detect a single emission line, the flux of which is estimated from the continuum-subtracted OVI image.</i></p> <p><i>Line at Center 1283.0 FWHM 0.54 Flux 4.1e-16</i></p> <p><i>The continuum, as estimated in the calculation for Exposure 6, is extremely weak and likely to be undetected in spectroscopic mode.</i></p> <p><i>We adopt 1500 seconds as the exposure time, giving SNR=2.97 per exposure. This will then total SNR~6 PER RESEL in the combined spectrum.</i></p>							



Orbit 3

Server Version: 20160601



Orbit 4

Server Version: 20160601

