14211 - Diagnosing the super-Eddington accretion/outflow regime using the microquasar MQ1 in M83

Cycle: 23, Proposal Category: GO

(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?*
01	(1) MQ1-OFFSET (2) MQ1	STIS/CCD	4	22-Jul-2015 22:12:44.0	yes

4 Total Orbits Used

ABSTRACT

We are addressing an important, unsolved astrophysical problem: determining the radiative and mechanical power of black holes at extreme rates of mass accretion, at or above their Eddington limit. In our recent multiband imaging study of the spiral galaxy M83 with HST/WFC3, Chandra and ATCA, we discovered a stellar-mass black hole with strong radio, X-ray and optical line emission. WFC3 optical imaging resolves the source into a core and two lobes or hot spots (separated by 0".6), the result of powerful jets interacting with the surrounding interstellar medium.

We now propose to use STIS to do spatially-resolved spectroscopy of this microquasar, with the following objectives:

a) determine whether the optical line emission of the core is mostly from photo-ionized gas and the lobe emission from shock-ionized gas;
b) use the optical line luminosities as proxies for the integrated radiative and mechanical power of the black hole;
c) measure or constrain the expansion velocity of the gas in the core and in the lobes, which will help us determine the duration and integrated energy of this powerful accretion/ejection phase.

OBSERVING DESCRIPTION

The is a proposal to observe a new microquasar, MQ1, in M83, using the STIS longslit CCD (G750M and G450L). The object is an emission line source, but it is seen projected against a moderately bright but unresolved stellar continuum, about 5" NE of the M83 nucleus. The source has a compact core and two bright surrounding knots of emission, and we need to align the STIS slit along the direction of the knots.

The source emits in [O III] but because of the complex background, we will acquire using a blind offset from a nearby offset star, chosen from existing WFC3 imagery. (Because of the M83 galaxy surrounding, no GSC stars are available nearby.) We have calculated accurate offset coordinates for MQ1 from the offset star.

We desire a nominal aperture position angle of 77 degrees to align the slit on the structure, but provide a +/-5 degree flexibility on the alignment. Also, we allow modulo 180 degrees, so STIS ORIENT ranges of 117 - 127 and 297 - 307 degrees are allowed.

To mitigate CTE, we choose aperture 52x0.2E1.

Visit

Proposal 14211, Visit 01 Thu Jul 23 02:12:46 GMT 2015

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: ORIENT 117D TO 127 D; ORIENT 297D TO 307 D

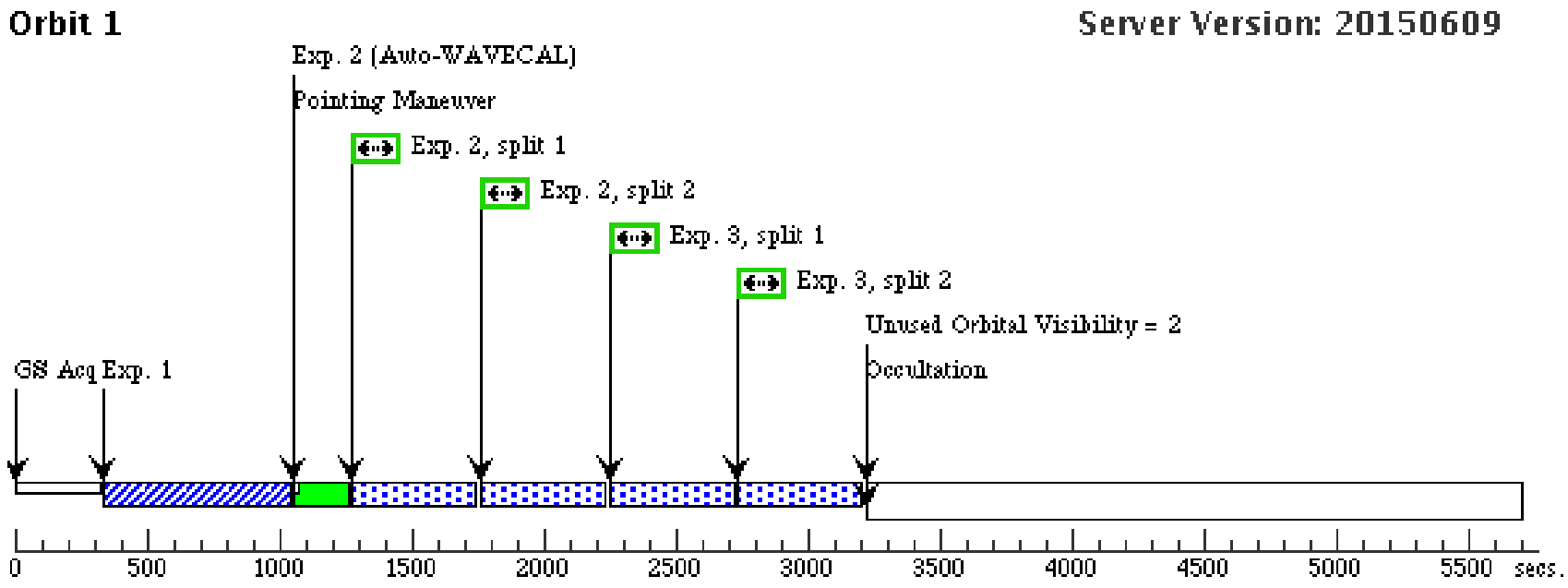
Fixed Targets

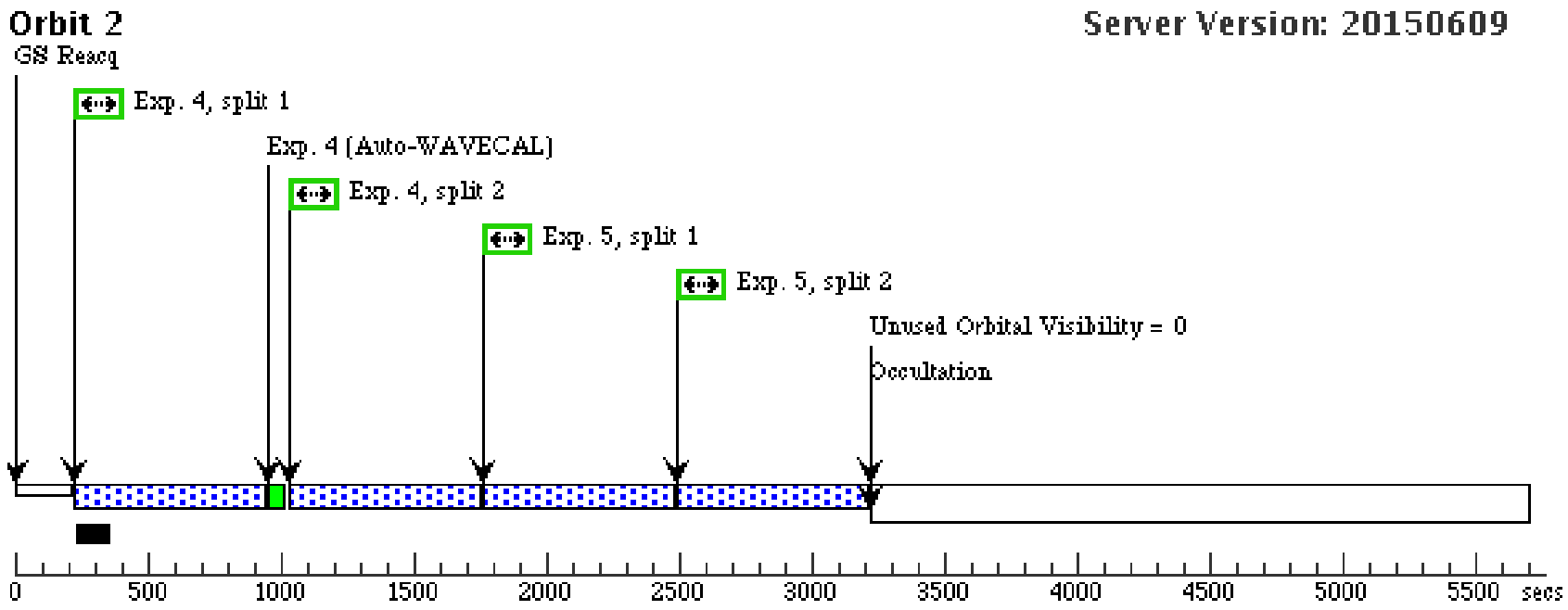
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	MQ1-OFFSET	RA: 13 37 0.7740 (204.2532250d) Dec: -29 51 47.28 (-29.86313d) Equinox: J2000		V=21.8	Reference Frame: ICRS
Comments: Extended=NO					
(2)	MQ1	Offset from MQ1-OFFSET RA Offset: 0.345 Secs Dec Offset: -4.75 Arcsec		V=24 Various line emission at ~a few E-16 erg/cm2/s	Offset Position (MQ1)
Comments: MQ1 is a pure emission line source, but it is projected against unresolved and variable stellar continuum. Extended=YES					

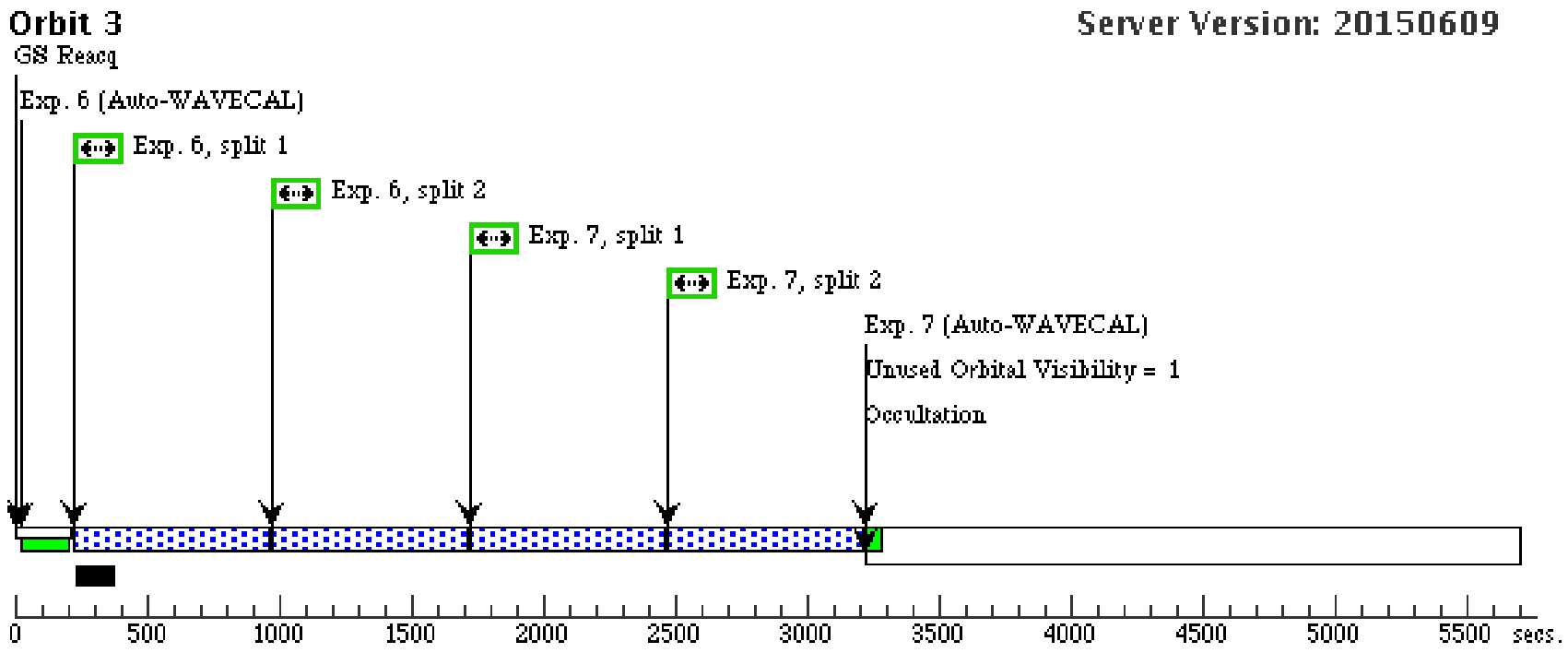
Exposures

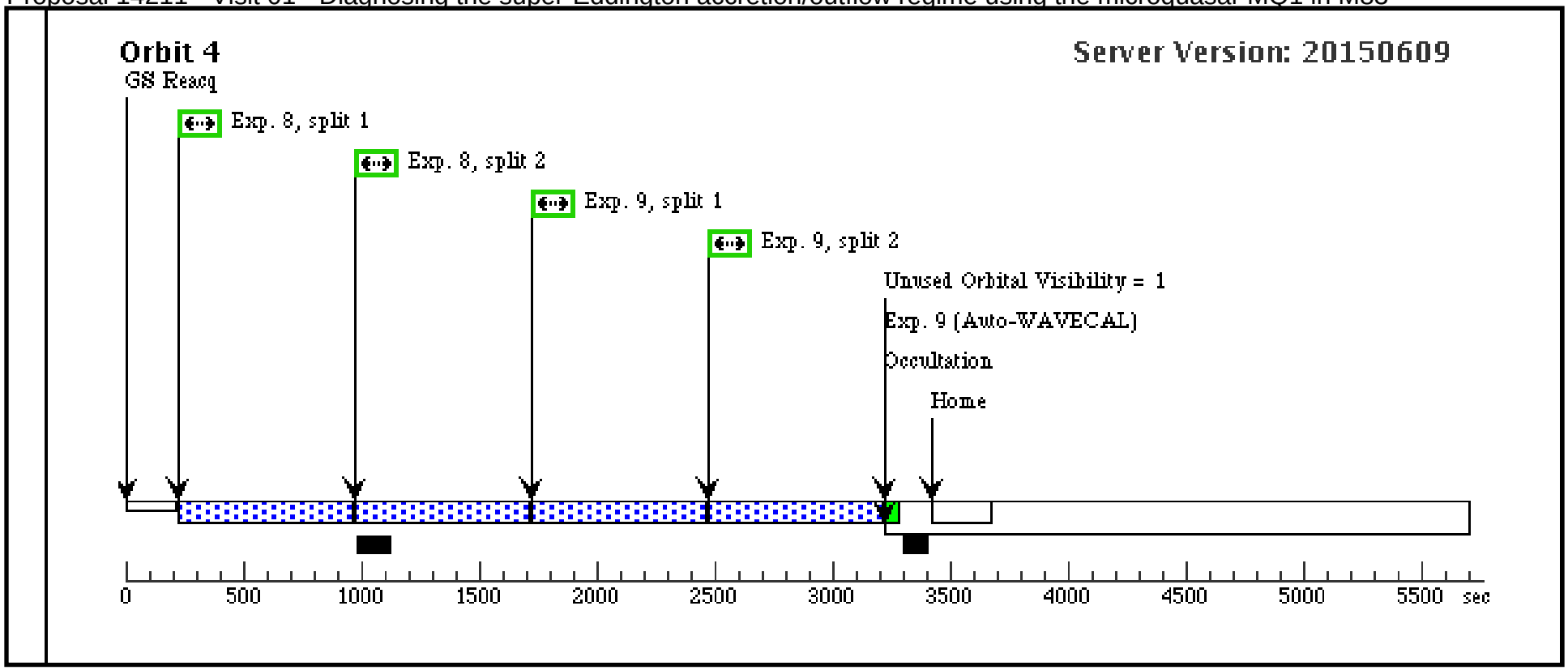
#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) MQ1-OFFSET	STIS/CCD, ACQ, F28X50LP	MIRROR				120 Secs (120 Secs)	
								[==>]	***[1]***
2		(2) MQ1	STIS/CCD, ACCUM, 52X0.2E1	G750M 6581 A				884 Secs (884 Secs)	
								[==>(Split 1)] *[==>(Split 2)]*	***[1]***
3		(2) MQ1	STIS/CCD, ACCUM, 52X0.2E1	G750M 6581 A				884 Secs (884 Secs)	
								[==>(Split 1)] *[==>(Split 2)]*	***[1]***
4		(2) MQ1	STIS/CCD, ACCUM, 52X0.2E1	G750M 6581 A				1372 Secs (1372 Secs)	
								[==>(Split 1)] *[==>(Split 2)]*	***[2]***
5		(2) MQ1	STIS/CCD, ACCUM, 52X0.2E1	G750M 6581 A				1372 Secs (1372 Secs)	
								[==>(Split 1)] *[==>(Split 2)]*	***[2]***
6		(2) MQ1	STIS/CCD, ACCUM, 52X0.2E1	G430L 4300 A				1412 Secs (1412 Secs)	
								[==>(Split 1)] *[==>(Split 2)]*	***[3]***
7		(2) MQ1	STIS/CCD, ACCUM, 52X0.2E1	G430L 4300 A				1412 Secs (1412 Secs)	
								[==>(Split 1)] *[==>(Split 2)]*	***[3]***
8		(2) MQ1	STIS/CCD, ACCUM, 52X0.2E1	G430L 4300 A				1412 Secs (1412 Secs)	
								[==>(Split 1)] *[==>(Split 2)]*	***[4]***
9		(2) MQ1	STIS/CCD, ACCUM, 52X0.2E1	G430L 4300 A				1412 Secs (1412 Secs)	
								[==>(Split 1)] *[==>(Split 2)]*	***[4]***

Orbit Structure




Orbit 2
Server Version: 20150609
GS Reacq
Exp. 4, split 1
Exp. 4 [Auto-WAVECAL]
Exp. 4, split 2
Exp. 5, split 1
Exp. 5, split 2
Unused Orbital Visibility = 0
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
secs.


Orbit 3
Server Version: 20150609
GS Reacq
Exp. 6 (Auto-WAVECAL)
Exp. 6, split 1
Exp. 6, split 2
Exp. 7, split 1
Exp. 7, split 2
Exp. 7 (Auto-WAVECAL)
Unused Orbital Visibility = 1
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
secs.


Orbit 4
Server Version: 20150609
GS Reacq
Exp. 8, split 1
Exp. 8, split 2
Exp. 9, split 1
Exp. 9, split 2
Unused Orbital Visibility = 1
Exp. 9 (Auto-WAVECAL)
Occultation
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec