



15480 - A cosmic dance at high redshift - Resolving the host galaxies of a 20kpc separation dual AGN system at $z=3.3$ with WFC3/IR

Cycle: 25, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

<i>Name</i>	<i>Institution</i>	<i>E-Mail</i>
Dr. Bernd Husemann (PI) (ESA Member) (Contact)	Max-Planck-Institut fur Astronomie, Heidelberg	husemann@mpia.de
Dr. Gabor Worseck (CoI) (ESA Member)	Universitat Potsdam	gworseck@uni-potsdam.de
Dr. Fabrizio Arrigoni Battaia (CoI) (ESA Member)	European Southern Observatory - Germany	farrigon@eso.org
Dr. Knud Jahnke (CoI) (ESA Member)	Max-Planck-Institut fur Astronomie, Heidelberg	jahnke@mpia-hd.mpg.de
Prof. Tom Shanks (CoI) (ESA Member)	Durham Univ.	tom.shanks@durham.ac.uk
Dr. Rich Bielby (CoI) (ESA Member)	Durham Univ.	richard.bielby@durham.ac.uk

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) LBQS-0302-0019	WFC3/IR	4	15-Aug-2018 11:00:53.0	yes

4 Total Orbits Used

ABSTRACT

We recently discovered that the unobscured QSO LBQS0302-0019 at $z=3.286$ is actually a dual AGN with an obscured component (dubbed Jil) at 20kpc projected distance. This is the tightest unobscured/obscured dual AGN known at $z>3$. Subsequently, we detected a galaxy at the location of Jil in a deep K-band image taken during science verification of the adaptive optics system for VLT/HAWK-I in January 2018. The image reveals that both AGN live in massive galaxies as expected for bright AGN at $z=3.3$. As a natural next step we propose for WFC3/IR F125W observations with

HST to 1) resolve the morphology of the two AGN host galaxies at a resolution of 0.1" (4x times better than from ground), 2) detect potential tidal features given the depth provided by HST, and 3) obtain the F125W-K (U-V rest-frame) color which is a proxy for the age and mass-to-light ratio supporting accurate stellar mass measurements. This information is crucial to characterize this extraordinary cosmic dance of these two high-redshift galaxies, particularly, its current interaction stage and stellar mass. The big questions here are: 1) Is the host galaxy of J11 a single distorted galaxy or a merger of two? 2) Did the two galaxies form the majority of their young stars before or after their close encounter? 3) What is the mass ratio and total stellar mass of the system? 4) Is this system hosted by one of the most massive halos at this redshift? With the proposed HST observations this newly discovered dual AGN system will turn into a unique laboratory to understand how massive galaxies and their super-massive black holes formed through merging at high redshift and what role AGN play for their evolution.

OBSERVING DESCRIPTION

The observations are aiming to obtain a single high S/N WFC3/IR F125W image of the dual AGN system LBQS 0302-0019. Given a limiting surface brightness of 22mag/arcsec² (Vega) we compute a minimum exposure time of 8000sec for WFC3/IR F125W if split into 72 individual exposures. The large number of frames are necessary to achieve 1) a good sampling of the PSF and 2) a high contrast imaging for a bright QSO with $m_K=15.4$ mag (Vega).

The brightness of the QSO is reaching the saturation level already at 50s long exposures and the sampling of the PSF demands several dithered exposures. The current observing strategy therefore takes a sequence of short exposures first, followed by a sequence of long exposures which both properly sample the PSF. The short images can replace the saturated pixels of the QSO in the long exposures before combination. In practice we will apply the WFC-IR-DITHER-BLOB dither pattern (2 points separated by 3.2arcsec with the WFC-IF-DITHER-BOX-MIN pattern (4 points for optimal PSF sampling), which leads to 8 dither positions for each of the short and long exposure. For both exposures we will use the IRSUB256 aperture which provides a 25arcsec large FoV which is well sufficient to capture the system for all dither positions. We will employ the SPARS10 read-out sequence with 7 sampling points (i.e. 44sec exposure time) and the SPARS25 read-out sequence with 11 sampling points (i.e. 223sec exposure time) for the short and long exposures, respectively. At each dither position we will obtain 5 and 4 individual exposures for the short and long exposure sequences, respectively. This observing sequence will accumulate in total 1760s of short exposures, aimed at the bright QSO nucleus, and 7136s of long exposures, aimed at the extended diffuse emission of the QSO host galaxy and companion J11.

Proposal 15480 - Visit 01 - A cosmic dance at high redshift - Resolving the host galaxies of a 20kpc separation dual AGN system at z=...

Wed Aug 15 15:00:56 GMT 2018

Visit	Proposal 15480, Visit 01 Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/IR Special Requirements: SCHED 30%					
	Patterns	#	Primary Pattern	Secondary Pattern	Exposures	
	(2)	Pattern Type=WFC3-IR-DITHER-BLOB Purpose=DITHER Number Of Points=2 Point Spacing=6.183 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=41.859 Angle Between Sides= Center Pattern=true	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=0.572 Line Spacing=0.365	(1-5), (6-9)	
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(1)	LBQS-0302-0019	RA: 03 04 49.8576 (46.2077400d) Dec: -00 08 13.49 (-.13708d) Equinox: J2000		V=18.0	Reference Frame: NED
	Comments: This object was generated by the targetselector and retrieved from the NED database. Category=GALAXY Description=[HIGH REDSHIFT GALAXY, INTERACTING GALAXY, QSO] Extended=YES					

Proposal 15480 - Visit 01 - A cosmic dance at high redshift - Resolving the host galaxies of a 20kpc separation dual AGN system at z=...

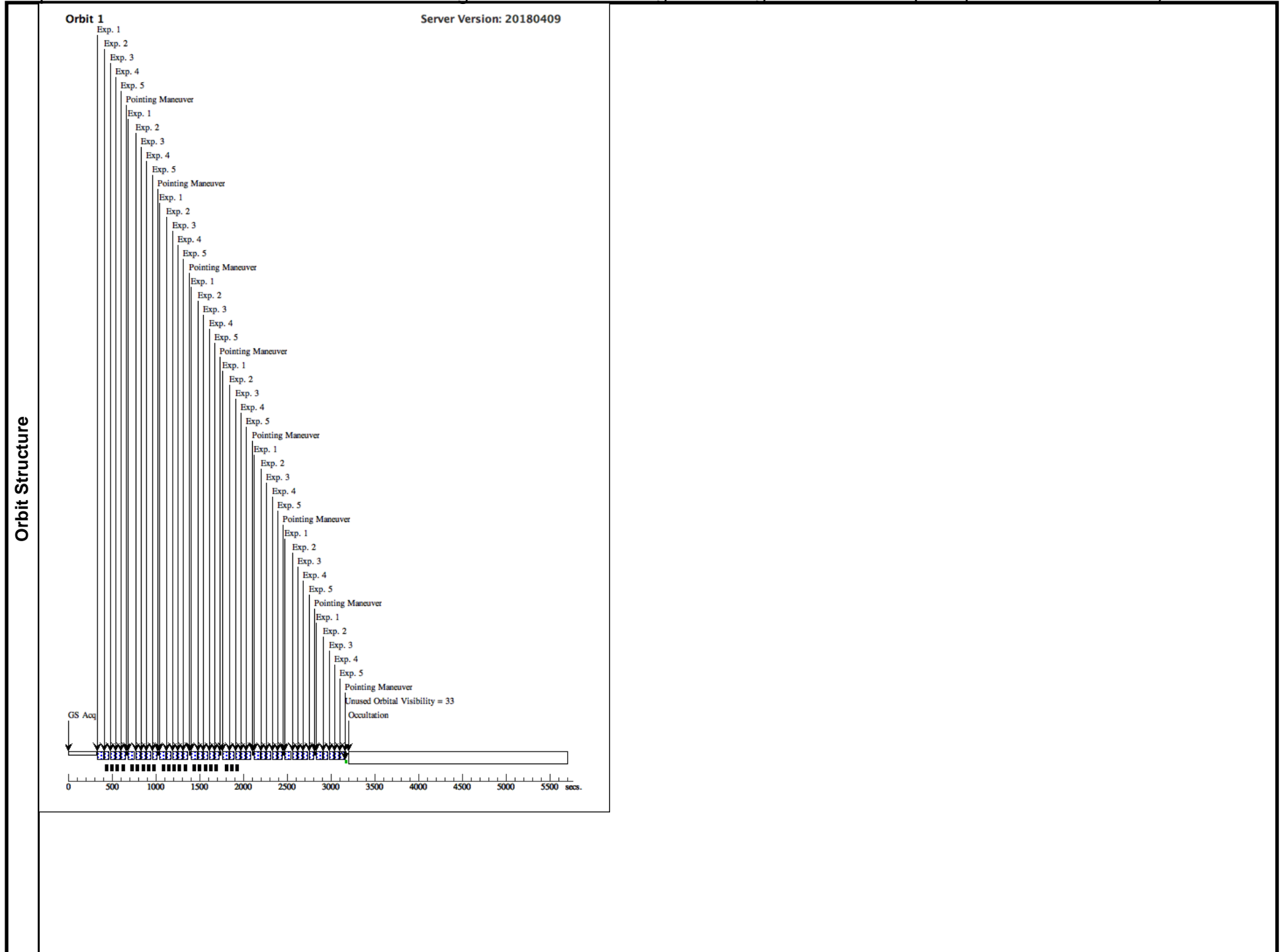
#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
Exposures	1	(1) LBQS-0302-001 9	WFC3/IR, MULTIACCUM, IRSUB256	F125W	SAMP-SEQ=SPARS 10; NSAMP=7		Pattern 2, Exps 1-5 i n Visit 01 (2)	44.356737 Secs (354.854 Secs) [=>(Pattern 1,1)] [=>(Pattern 1,2)] [=>(Pattern 1,3)] [=>(Pattern 1,4)] [=>(Pattern 2,1)] [=>(Pattern 2,2)] [=>(Pattern 2,3)] [=>(Pattern 2,4)]	[1]
	2	(1) LBQS-0302-001 9	WFC3/IR, MULTIACCUM, IRSUB256	F125W	SAMP-SEQ=SPARS 10; NSAMP=7		Pattern 2, Exps 1-5 i n Visit 01 (2)	44.356737 Secs (354.854 Secs) [=>(Pattern 1,1)] [=>(Pattern 1,2)] [=>(Pattern 1,3)] [=>(Pattern 1,4)] [=>(Pattern 2,1)] [=>(Pattern 2,2)] [=>(Pattern 2,3)] [=>(Pattern 2,4)]	[1]
	3	(1) LBQS-0302-001 9	WFC3/IR, MULTIACCUM, IRSUB256	F125W	SAMP-SEQ=SPARS 10; NSAMP=7		Pattern 2, Exps 1-5 i n Visit 01 (2)	44.356737 Secs (354.854 Secs) [=>(Pattern 1,1)] [=>(Pattern 1,2)] [=>(Pattern 1,3)] [=>(Pattern 1,4)] [=>(Pattern 2,1)] [=>(Pattern 2,2)] [=>(Pattern 2,3)] [=>(Pattern 2,4)]	[1]
	4	(1) LBQS-0302-001 9	WFC3/IR, MULTIACCUM, IRSUB256	F125W	SAMP-SEQ=SPARS 10; NSAMP=7		Pattern 2, Exps 1-5 i n Visit 01 (2)	44.356737 Secs (354.854 Secs) [=>(Pattern 1,1)] [=>(Pattern 1,2)] [=>(Pattern 1,3)] [=>(Pattern 1,4)] [=>(Pattern 2,1)] [=>(Pattern 2,2)] [=>(Pattern 2,3)] [=>(Pattern 2,4)]	[1]

Proposal 15480 - Visit 01 - A cosmic dance at high redshift - Resolving the host galaxies of a 20kpc separation dual AGN system at z=...

5	(1) LBQS-0302-001 9	WFC3/IR, MULTIACCUM, IRSUB256	F125W	SAMP-SEQ=SPARS 10; NSAMP=7	Pattern 2, Exps 1-5 i n Visit 01 (2)	44.356737 Secs (354.854 Secs)	[1]
6	(1) LBQS-0302-001 9	WFC3/IR, MULTIACCUM, IRSUB256	F125W	SAMP-SEQ=SPARS 25; NSAMP=11	Pattern 2, Exps 6-9 i n Visit 01 (2)	223.738205 Secs (1789.906 Secs)	[2]
							[3]
							[4]
							[4]
7	(1) LBQS-0302-001 9	WFC3/IR, MULTIACCUM, IRSUB256	F125W	SAMP-SEQ=SPARS 25; NSAMP=11	Pattern 2, Exps 6-9 i n Visit 01 (2)	223.738205 Secs (1789.906 Secs)	[2]
							[3]
							[4]
							[4]
8	(1) LBQS-0302-001 9	WFC3/IR, MULTIACCUM, IRSUB256	F125W	SAMP-SEQ=SPARS 25; NSAMP=11	Pattern 2, Exps 6-9 i n Visit 01 (2)	223.738205 Secs (1789.906 Secs)	[2]
							[3]
							[4]
							[4]
9	(1) LBQS-0302-001 9	WFC3/IR, MULTIACCUM, IRSUB256	F125W	SAMP-SEQ=SPARS 25; NSAMP=11	Pattern 2, Exps 6-9 i n Visit 01 (2)	223.738205 Secs (1789.906 Secs)	[2]
							[3]
							[4]
							[4]

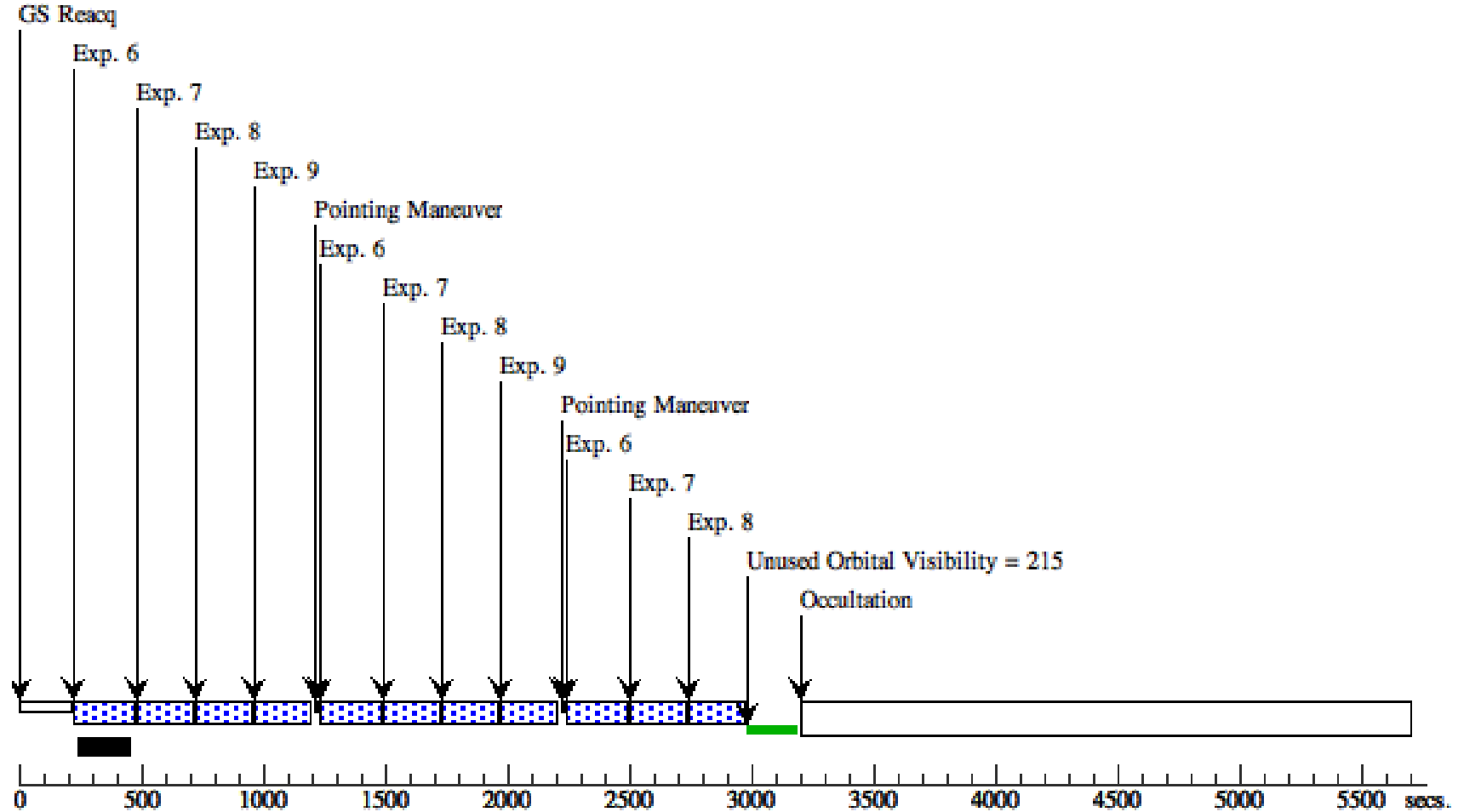
Proposal 15480 - Visit 01 - A cosmic dance at high redshift - Resolving the host galaxies of a 20kpc separation dual AGN system at z=...

10	(1) LBQS-0302-001 9	WFC3/IR, MULTIACCUM, IRSUB256	F125W	SAMP-SEQ=SPARS 25; NSAMP=11	223.738205 Secs (223.738 Secs) [==>]	[4]
----	------------------------	----------------------------------	-------	-----------------------------------	---	-----



Orbit 2

Server Version: 20180409



Orbit 3

Server Version: 20180409

