



15911 - Orbits of Isolated Dwarfs: Local Group Mass and Environmental Quenching

Cycle: 27, Proposal Category: GO
(Availability Mode: SUPPORTED)

INVESTIGATORS

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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) CETUS-DSPH	ACS/WFC	4	17-Sep-2020 12:00:46.0	yes
02	(2) LEOA-DIRR	ACS/WFC	4	17-Sep-2020 12:00:47.0	yes
03	(3) TUCANA-DSPH	ACS/WFC	4	17-Sep-2020 12:00:49.0	yes

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04	(4) SAG-DIRR	ACS/WFC	4	17-Sep-2020 12:00:51.0	yes
06	(4) SAG-DIRR	ACS/WFC	1	17-Sep-2020 12:00:51.0	yes
05	(4) SAG-DIRR	ACS/WFC	4	17-Sep-2020 12:00:52.0	yes

21 Total Orbits Used

ABSTRACT

Dwarf galaxies are excellent test particles for studying dynamical properties of the Local Group (LG) and the role of environment in quenching of star formation in low-mass galaxies. In this context, galaxies at the edge of the LG are of particular interest. They enable an estimate of the mass of the LG through the radius of the turn-around surface. However, how dwarfs can be located at such large distances from the barycenter of the LG is still an open question. It may be that these galaxies are on their first infall into the LG potential well. Alternatively, they may have been close to their first orbital apocenter when the LG decoupled from the Hubble flow, the so-called splashback radius. Depending on this issue, the environment the dwarfs have moved through can be quite different. This environment also affects their star formation history through e.g. quenching. Here we propose to measure proper motions (PM) 4 dwarfs located at the edge of the LG: 2 dwarf irregulars (LeoA and Sag dIrr) and 2 dwarf spheroidals (Cetus and Tucana). These are the only dwarfs at the edge of the Local Group with first epoch archival data for PM measurements and star formation history determination. We will construct full three-dimensional velocity vectors, trace back their orbits, calculate the LG Mass, and determine whether past interactions with the MW or M31 can explain their different morphologies and star-formation histories.

OBSERVING DESCRIPTION

The main goal of this program is to measure absolute proper motions of the four target galaxies CETUS-DSPH, LEOA-DIRR, TUCANA-DSPH, and SAG-DIRR dwarf galaxies. For this, we will use compact background galaxies in the field view as stationary reference sources. The target galaxies have already been observed in two separate epochs: the first epoch in 2003-2006, and the second epoch in 2011. The imaging data from this program will add another epoch thereby extending the time baseline from 5-8 to 14-17 years. For the proper motion measurements, we will measure the average motion of stars in each dwarf galaxy with respect to compact background galaxies using the multi-epoch data. Our analysis techniques and expected accuracies are described in the Phase I proposal.

The first epoch ACS/WFC data were obtained in at least two filters to make deep color magnitude diagrams for the target galaxies. The available broad-band colors and depth are sufficient for separating stars, foreground stars, and background galaxies to first order. For the current program, we

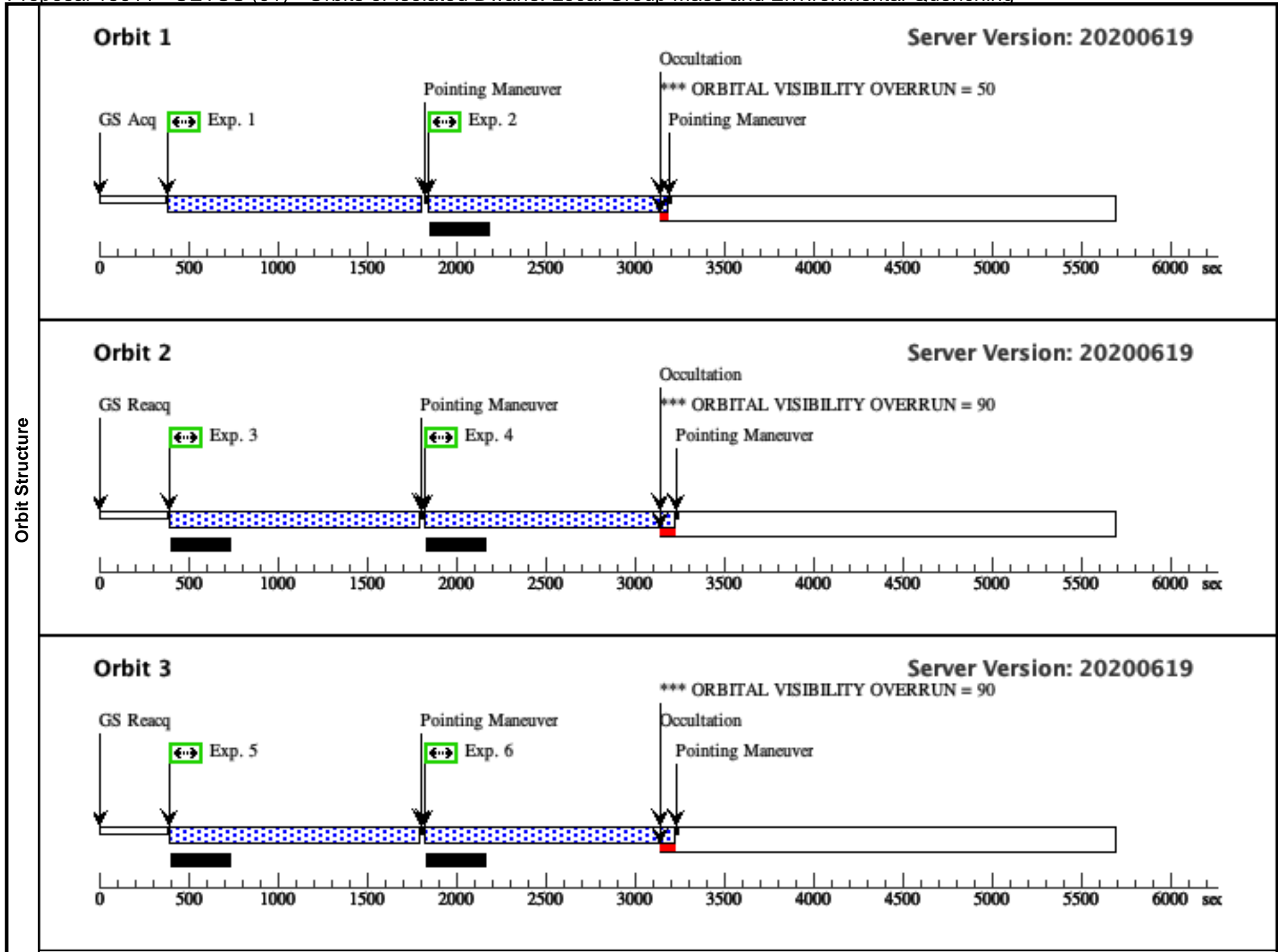
Proposal 15911 (STScI Edit Number: 2, Created: Thursday, September 17, 2020 at 11:00:53 AM Eastern Standard Time) - Overview

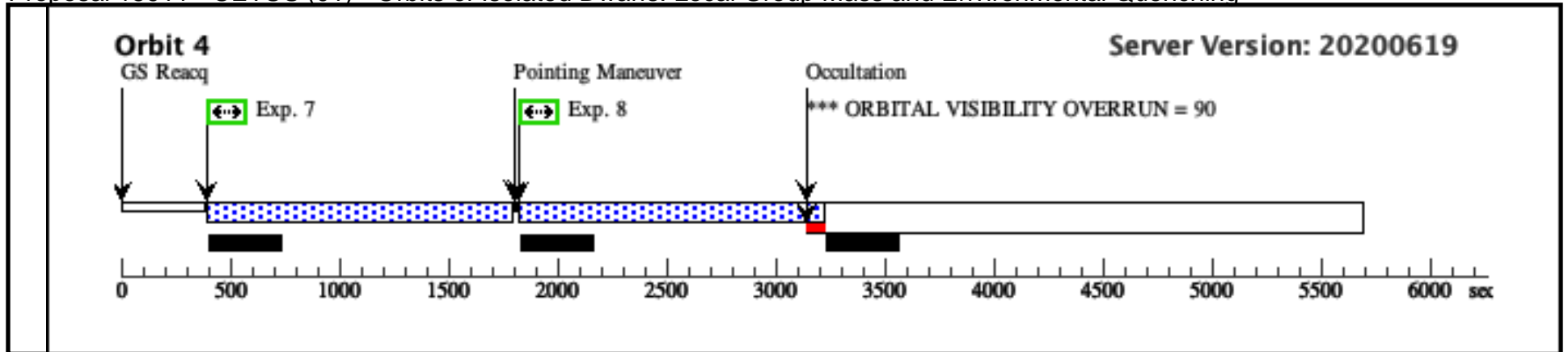
will observe each target galaxy with the F814W filter using the same pointing and orientation used for the first-epoch data. We therefore added Visit Orient Requirements to all visits. Individual exposures will be sub-pixel dithered and will last half an orbit. We will use customized dither patterns designed to maximize the pixel phase coverage via the POSTARG requirements. We request CETUS-DSPH, LEOA-DIRR, and TUCANA-DSPH to be each observed in a single visit with 4 orbits. For SAG-DIRR, we request two visits (each lasting 4 orbits) with Tminig Requirements "GROUP WITHIN 30D" so that they can be treated as single epoch data for astrometric analyses.

Proposal 15911 - CETUS (01) - Orbits of Isolated Dwarfs: Local Group Mass and Environmental Quenching

Thu Sep 17 16:00:53 GMT 2020

Visit	<p>Proposal 15911, CETUS (01), completed</p> <p>Diagnostic Status: Warning</p> <p>Scientific Instruments: ACS/WFC</p> <p>Special Requirements: ORIENT 266.015D TO 266.015 D</p> <p><i>Comments: This is the visit for imaging the Cetus dwarf spheroidal galaxy. Four orbits are required to complete this visit. Since our goal is to measure proper motions of stars in the target galaxy, our orientation is set to exactly match the previous observations of programs GO-10505 and 12273. We adopt a customized dither pattern designed to optimally cover the pixel phase using the POS-TARG special requirements. We will do a set of 8-point dithering.</i></p>									
	<p>(CETUS (01)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN</p> <p>(CETUS (01)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN</p> <p>(CETUS (01)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN</p> <p>(CETUS (01)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN</p>									
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(1)	CETUS-DSPH	RA: 00 26 9.6193 (6.5400804d) Dec: -11 04 33.95 (-11.07610d) Equinox: J2000		V=13.2	Reference Frame: NED				
<p><i>Comments: This object was generated by the targetselector and retrieved from the NED database.</i></p> <p><i>Category=GALAXY</i></p> <p><i>Description=[DWARF SPHEROIDAL]</i></p>										
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(1) CETUS-DSPH	(1) CETUS-DSPH	ACS/WFC, ACCUM, WFCENTER	F814W		POS TARG 0.0000,0 .0000	Sequence 1-2 Non-Int in CETUS (01)	1219 Secs (1219 Secs) [==>]	[1]
	2	(1) CETUS-DSPH	(1) CETUS-DSPH	ACS/WFC, ACCUM, WFCENTER	F814W		POS TARG 0.1740,0 .2350	Sequence 1-2 Non-Int in CETUS (01)	1219 Secs (1219 Secs) [==>]	[1]
	3	(1) CETUS-DSPH	(1) CETUS-DSPH	ACS/WFC, ACCUM, WFCENTER	F814W		POS TARG 0.3232,0 .1235	Sequence 3-4 Non-Int in CETUS (01)	1275 Secs (1275 Secs) [==>]	[2]
	4	(1) CETUS-DSPH	(1) CETUS-DSPH	ACS/WFC, ACCUM, WFCENTER	F814W		POS TARG 0.1005,0 .3305	Sequence 3-4 Non-Int in CETUS (01)	1276 Secs (1276 Secs) [==>]	[2]
	5	(1) CETUS-DSPH	(1) CETUS-DSPH	ACS/WFC, ACCUM, WFCENTER	F814W		POS TARG 0.5075,0 .0505	Sequence 5-6 Non-Int in CETUS (01)	1275 Secs (1275 Secs) [==>]	[3]
	6	(1) CETUS-DSPH	(1) CETUS-DSPH	ACS/WFC, ACCUM, WFCENTER	F814W		POS TARG 0.6815,0 .2855	Sequence 5-6 Non-Int in CETUS (01)	1276 Secs (1276 Secs) [==>]	[3]
	7	(1) CETUS-DSPH	(1) CETUS-DSPH	ACS/WFC, ACCUM, WFCENTER	F814W		POS TARG 0.8300,0 .1735	Sequence 7-8 Non-Int in CETUS (01)	1275 Secs (1275 Secs) [==>]	[4]
	8	(1) CETUS-DSPH	(1) CETUS-DSPH	ACS/WFC, ACCUM, WFCENTER	F814W		POS TARG 0.6080,0 .3810	Sequence 7-8 Non-Int in CETUS (01)	1276 Secs (1276 Secs) [==>]	[4]

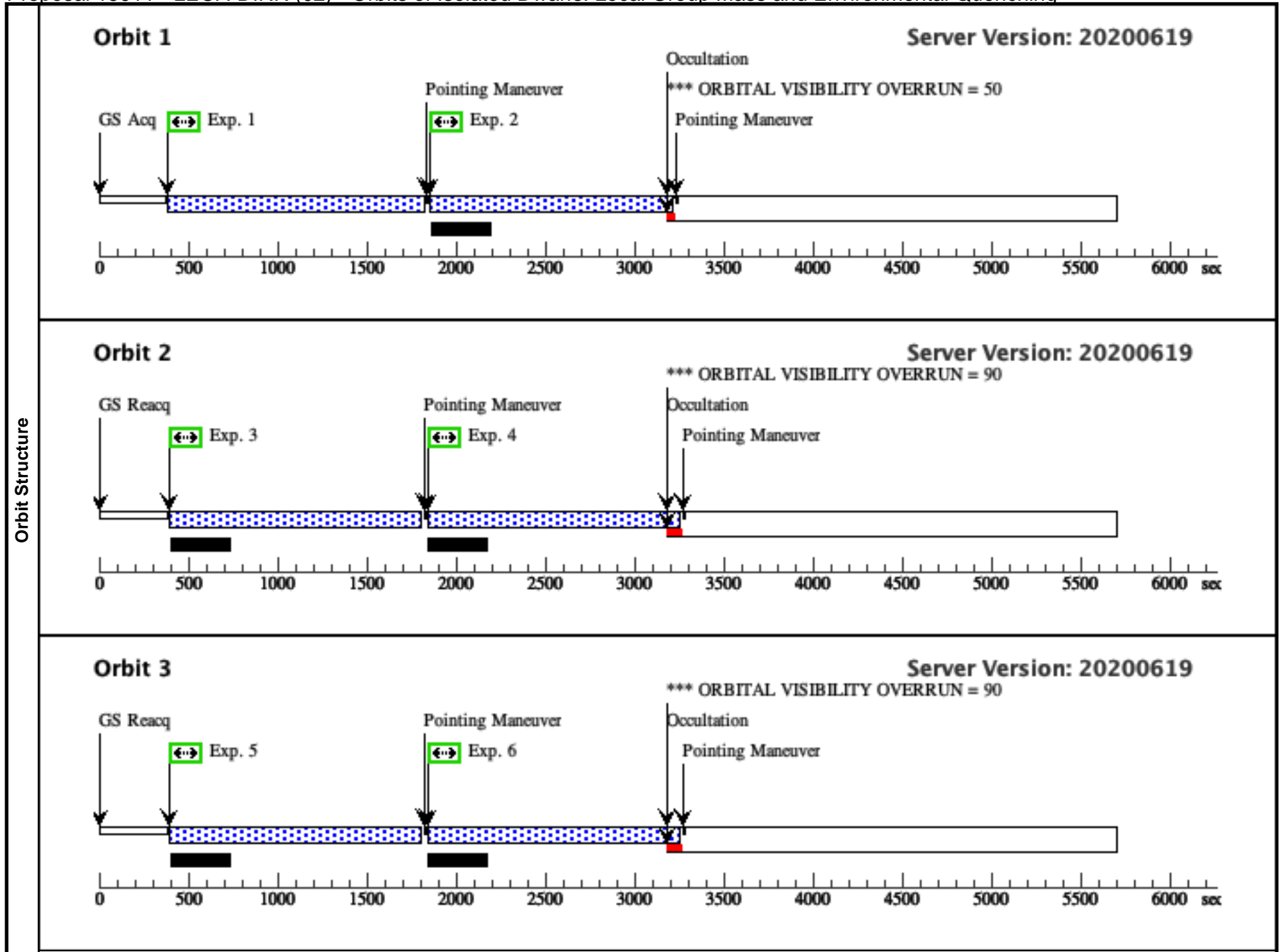




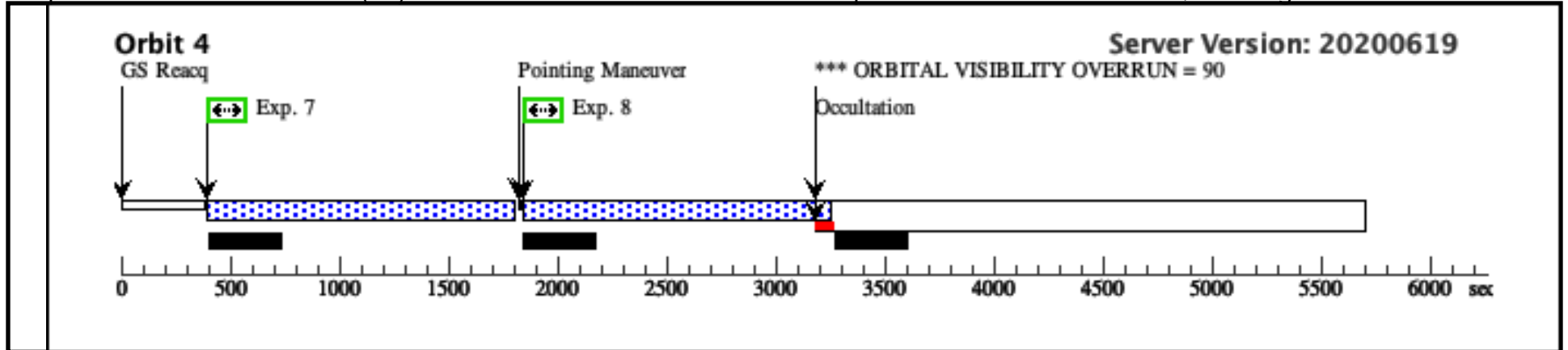
Proposal 15911 - LEOA-DIRR (02) - Orbits of Isolated Dwarfs: Local Group Mass and Environmental Quenching

Thu Sep 17 16:00:53 GMT 2020

Visit	Proposal 15911, LEOA-DIRR (02), scheduling Diagnostic Status: Warning Scientific Instruments: ACS/WFC Special Requirements: ORIENT 283.239D TO 283.239 D <i>Comments: This is the visit for imaging the Leo A dwarf irregular galaxy. Four orbits are required to complete this visit. Since our goal is to measure proper motions of stars in the target galaxy, our orientation is set to exactly match the previous observations of PID 10505 and 12273. We adopt a customized dither pattern designed to optimally cover the pixel phase using the POS-TARG special requirements. We will do a set of 8-point dithering.</i>																																																																																													
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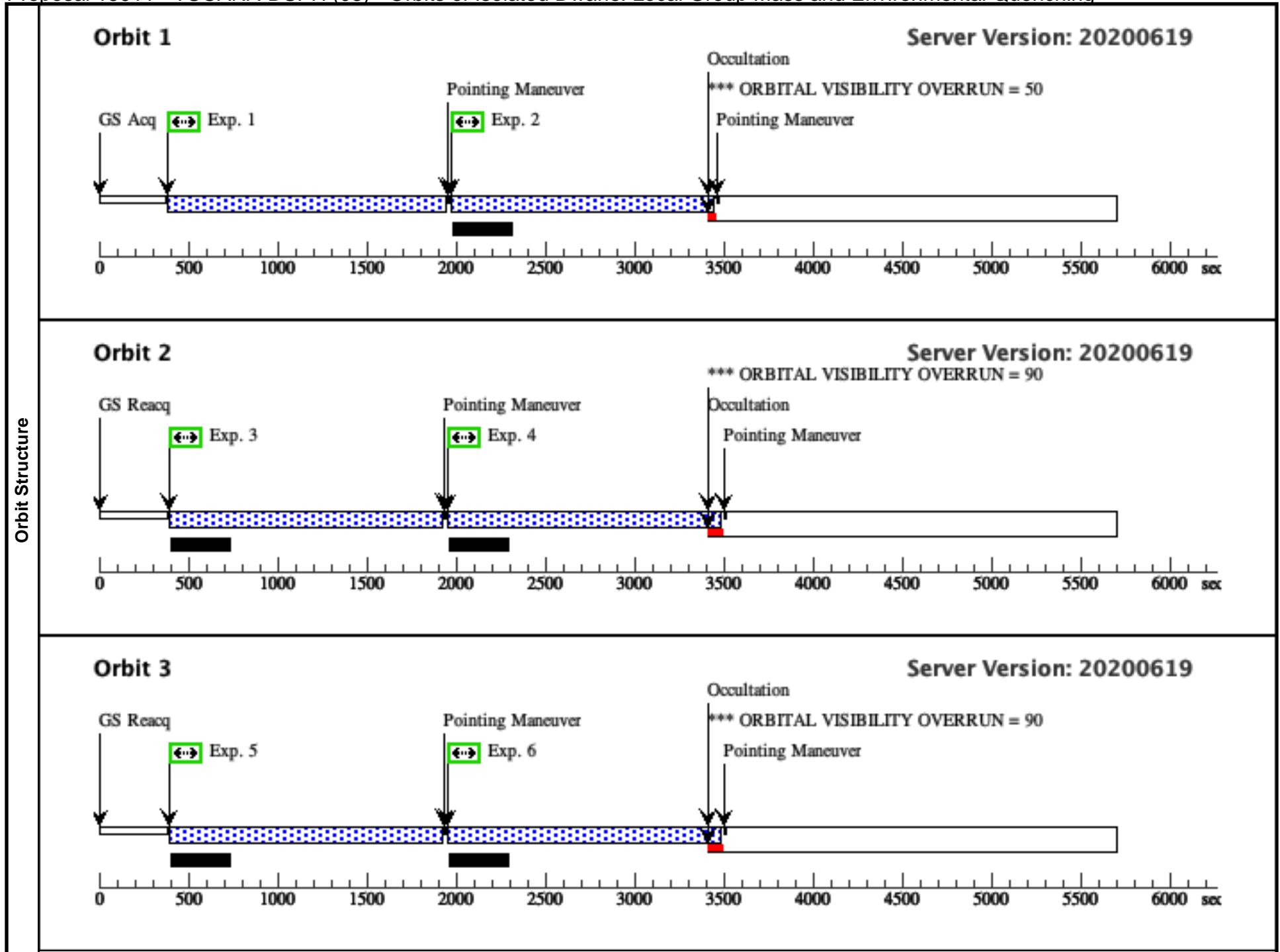
Orbit Structure



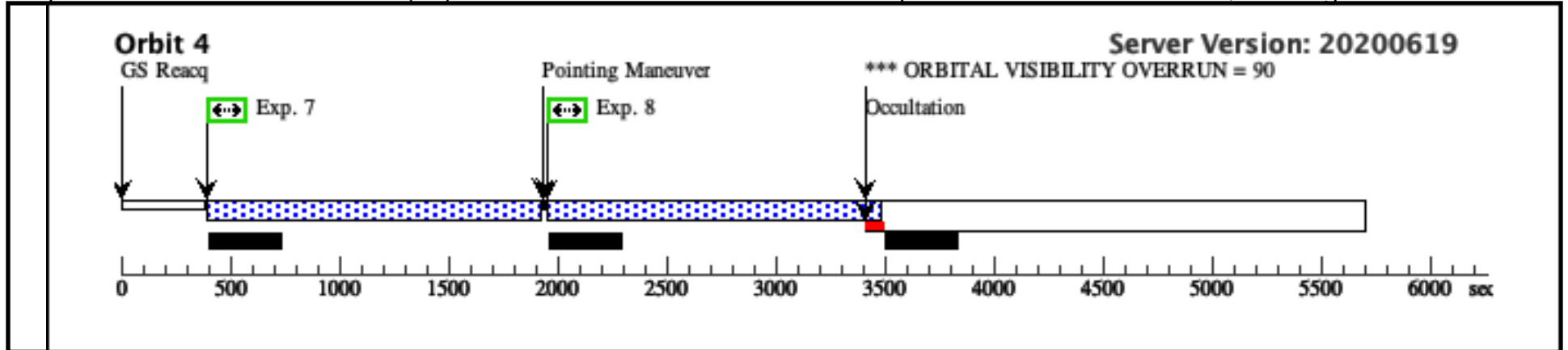
Proposal 15911 - TUCANA-DSPH (03) - Orbits of Isolated Dwarfs: Local Group Mass and Environmental Quenching

Thu Sep 17 16:00:54 GMT 2020

Visit	<p>Proposal 15911, TUCANA-DSPH (03), completed</p> <p>Diagnostic Status: Warning</p> <p>Scientific Instruments: ACS/WFC</p> <p>Special Requirements: ORIENT 231.554D TO 231.554 D</p> <p><i>Comments: This is the visit for imaging the Tucana dwarf spheroidal galaxy. Four orbits are required to complete this visit. Since our goal is to measure proper motions of stars in the target galaxy, our orientation is set to exactly match the previous observations of PID 10505 and 12273. We adopt a customized dither pattern designed to optimally cover the pixel phase using the POS-TARG special requirements. We will do a set of 8-point dithering.</i></p>																																																																																														
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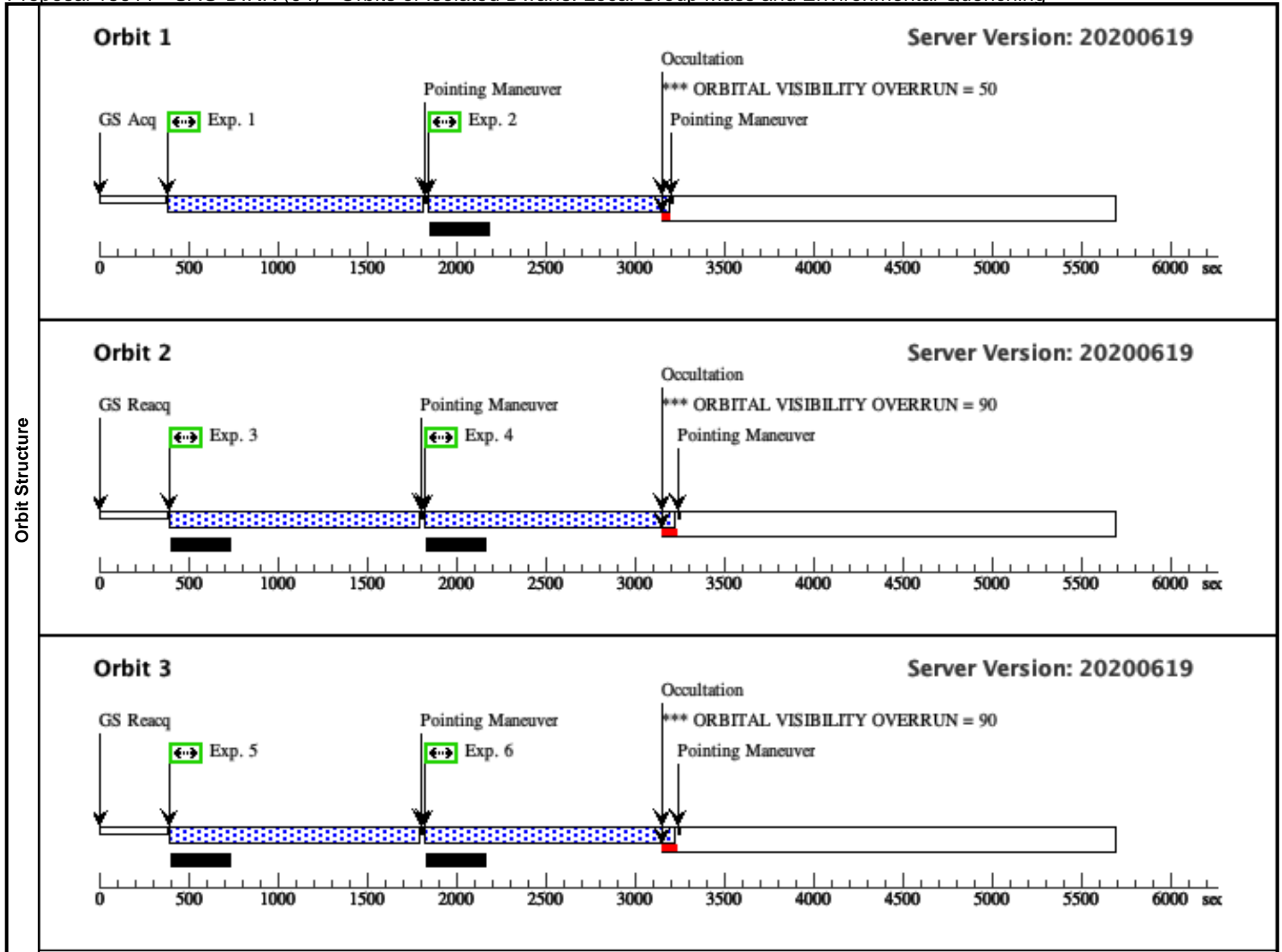
Orbit Structure



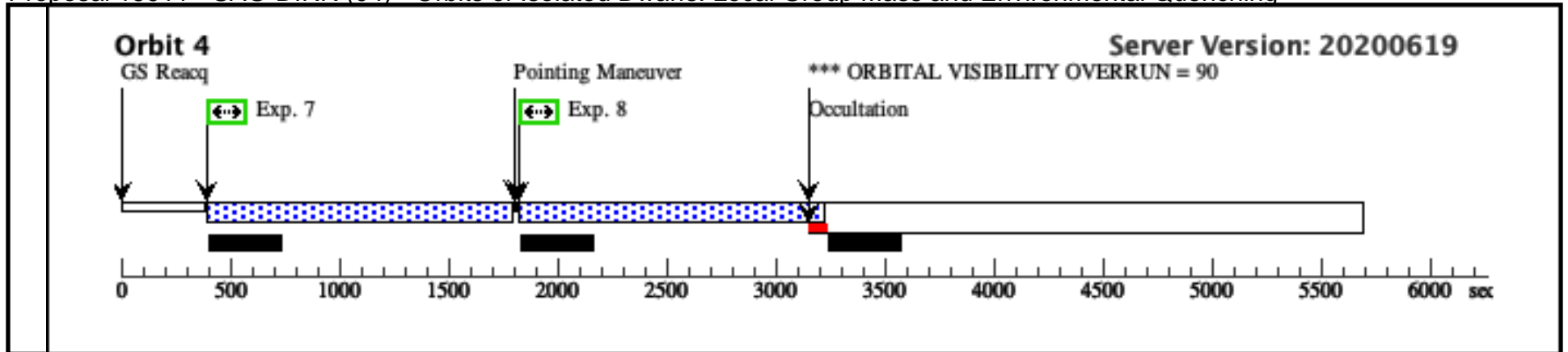
Proposal 15911 - SAG-DIRR (04) - Orbits of Isolated Dwarfs: Local Group Mass and Environmental Quenching

Thu Sep 17 16:00:54 GMT 2020

Visit	Proposal 15911, SAG-DIRR (04), completed Diagnostic Status: Warning Scientific Instruments: ACS/WFC Special Requirements: ORIENT 87.261D TO 87.261 D; GROUP 04,05 WITHIN 30D <i>Comments: This is the first visit for imaging the Sagittarius dwarf irregular galaxy. Four orbits are required to complete this visit. Since our goal is to measure proper motions of stars in the target galaxy, our orientation is set to exactly match the previous observations of PID 9820 and I2273. We adopt a customized dither pattern designed to optimally cover the pixel phase using the POST-ARG special requirements. For each visit we will do a set of 8-point dithering. We added the Timing Requirement of "GROUP 04, 05 WITHIN 30D" so that they can be treated as single epoch data for astrometric analysis.</i>																																																																																														
	Diagnosics (SAG-DIRR (04)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN (SAG-DIRR (04)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN (SAG-DIRR (04)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN (SAG-DIRR (04)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN																																																																																														
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Orbit Structure



Proposal 15911 - SAG-DIRR (06) - Orbits of Isolated Dwarfs: Local Group Mass and Environmental Quenching

Thu Sep 17 16:00:54 GMT 2020

Visit
Proposal 15911, SAG-DIRR (06)
Diagnostic Status: No Diagnostics
 Scientific Instruments: ACS/WFC
 Special Requirements: ORIENT 87.261D TO 87.261 D
Comments: This is one-orbit visit for the TTRB-approved partial reobservation of visit 04 for imaging the Sagittarius dwarf irregular galaxy. One orbit is required to complete this visit. Since our goal is to measure proper motions of stars in the target galaxy, our orientation is set to exactly match the previous observations of PID 9820 and 12273. We adopt a customized dither pattern designed to optimally cover the pixel phase using the POST-ARG special requirements. For this visit we will do 2-point dithering.

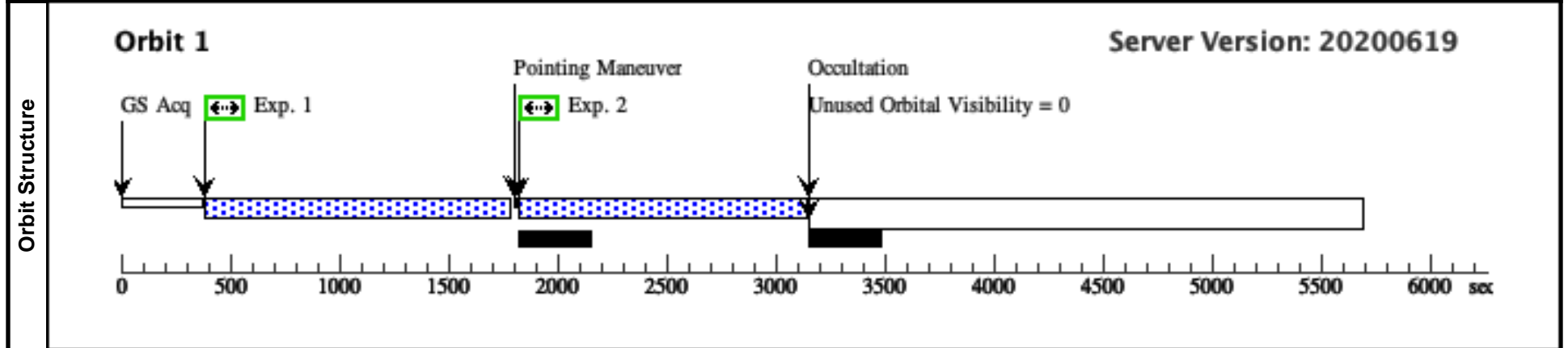
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(4)	SAG-DIRR	RA: 19 29 59.2059 (292.4966913d) Dec: -17 40 46.83 (-17.67967d) Equinox: J2000	Epoch of Position: 2015.5	V=13.6	Reference Frame: SIMBAD

*Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
 Category=GALAXY
 Description=[DWARF SPHEROIDAL]*

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(4) SAG-DIRR	ACS/WFC, ACCUM, WFCENTER	F814W		POS TARG 0.0000,0 .0000	Sequence 1-2 Non-Int in SAG-DIRR (06)	1198 Secs (1198 Secs) [==>]	[1]
2		(4) SAG-DIRR	ACS/WFC, ACCUM, WFCENTER	F814W		POS TARG 0.2228,0 .1158	Sequence 1-2 Non-Int in SAG-DIRR (06)	1197 Secs (1197 Secs) [==>]	[1]



Proposal 15911 - SAG-DIRR (05) - Orbits of Isolated Dwarfs: Local Group Mass and Environmental Quenching

Thu Sep 17 16:00:54 GMT 2020

Visit	Proposal 15911, SAG-DIRR (05), completed Diagnostic Status: Warning Scientific Instruments: ACS/WFC Special Requirements: ORIENT 87.261D TO 87.261 D; GROUP 05,04 WITHIN 30D <i>Comments: This is the second visit for imaging the Sagittarius dwarf irregular galaxy. Four orbits are required to complete this visit. Since our goal is to measure proper motions of stars in the target galaxy, our orientation is set to exactly match the previous observations of PID 9820 and I2273. We adopt a customized dither pattern designed to optimally cover the pixel phase using the POST-ARG special requirements. For each visit we will do a set of 8-point dithering. We added the Timing Requirement of "GROUP 05, 04 WITHIN 30D" so that they can be treated as single epoch data for astrometric analysis.</i>																																																																																														
	Diagnosics (SAG-DIRR (05)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN (SAG-DIRR (05)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN (SAG-DIRR (05)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN (SAG-DIRR (05)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN																																																																																														
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