15695 - An accurate distance to the controversial low-dark matter galaxy NGC1052-DF4

Cycle: 26, 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) NGC1052-DF4	ACS/WFC	2	27-Mar-2019 07:00:19.0	yes
02	(1) NGC1052-DF4	ACS/WFC	2	27-Mar-2019 07:00:20.0	yes
03	(1) NGC1052-DF4	ACS/WFC	2	27-Mar-2019 07:00:22.0	yes
04	(1) NGC1052-DF4	ACS/WFC	2	27-Mar-2019 07:00:23.0	yes
05	(1) NGC1052-DF4	ACS/WFC	2	27-Mar-2019 07:00:24.0	yes

10 Total Orbits Used

ABSTRACT

The "galaxy without dark matter" NGC1052-DF2 has been the topic of intense debate since it was published in March 2018, with >30 papers having been written on it in nine months. A new galaxy in the same class, NGC1052-DF4, was just announced. Both galaxies appear to have an unprecedented population of luminous globular clusters and an unprecedented low dark matter fraction. This interpretation is critically dependent on the distance to these objects. The currently available single-orbit F814W data have yielded two very different distance estimates: van Dokkum and collaborators find a distance of D=19-20 Mpc for both objects from surface brightness fluctuations, whereas Trujillo et al. use the same data to measure a distance of D~13 Mpc for NGC1052-DF2. Almost all the extreme properties of these galaxies are distance-dependent, and for D~13 Mpc they are not particularly unusual. This proposal requests 10 orbits of HST imaging to unambiguously measure the distance to NGC1052-DF4 from the tip of the red giant branch (TRGB). With 7+3 orbits of F814W+F606W imaging (8+4 after adding the existing data) the TRGB can be reliably detected out to D~20 Mpc, providing a distance with an uncertainty of ~5%. This measurement has implications for alternatives to the dark matter paradigm, for galaxy formation, and for globular cluster formation.

OBSERVING DESCRIPTION

The ten orbits are divided into 5 visits of 2 orbits each, and will obtain a total of 3 orbits F606W and 7 orbits F814W imaging of NGC1052-DF4. Three of the five visits are 1 orbit F606W + 1 orbit F814W, and two of the five are 1 orbit F814W + 1 orbit F814W.

Each orbit is divided into 4 dithered exposures, using a combination of a 2-point line dither to cover the chip gap plus a 2-point small dither for removing hot pixels.

The pointing is slightly away from NGC1052-DF4 so it is exposed near the middle of one of the ACS chips for many roll angles. The visits have +-4" offsets to move the slit gap around and limit its effects.

ORIENTS of 290-360 are excluded as then the chip gap crosses the galaxy. This barely affects scheduling: only 10 days in October are excluded because of this constraint. The visits do not have to be scheduled at the same time or at the same roll angle (although this would be nice).

The exposure time was *not* auto-adjusted as this slightly decreases the observing windows. With the chosen exposure times the scheduling windows are maximized.

Scheduling this program from June - Aug/Sept would be ideal as this would enable follow-up observations in the Fall ground-based observing season

for this field.

No post-flash is requested as the per pixel counts should be in the "safe" regime.

Visit

Proposal 15695, NGC1052-DF4 (01) Wed Mar 27 11:00:25 GMT 2019

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: ORIENT 0D TO 100 D; ORIENT 225D TO 290 D

Patterns

#	Primary Pattern		Secondary Pattern		Exposures
(1)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=3.034 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.29 Angle Between Sides= Center Pattern=false	Pattern Type=LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.145 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=47.23 Angle Between Sides= Center Pattern=false	(1), (2)

Fixed Targets

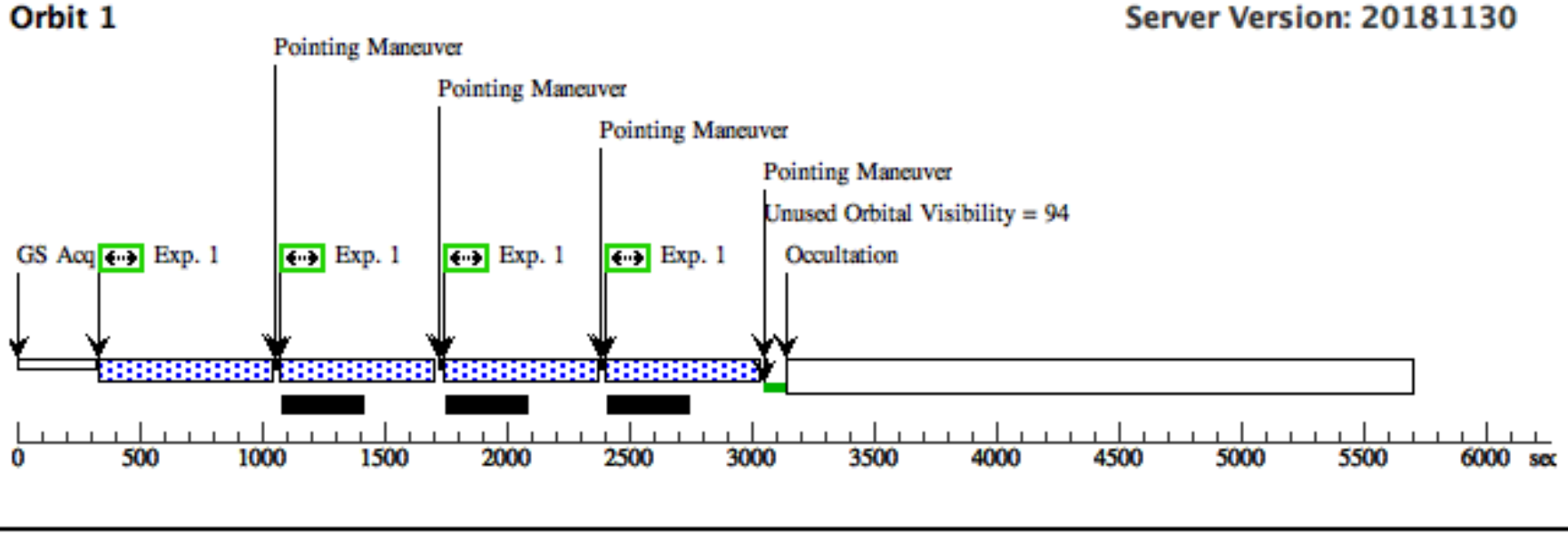
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	NGC1052-DF4	RA: 02 39 12.5100 (39.8021250d) Dec: -08 07 18.00 (-8.12167d) Equinox: J2000		V=25	Reference Frame: ICRS

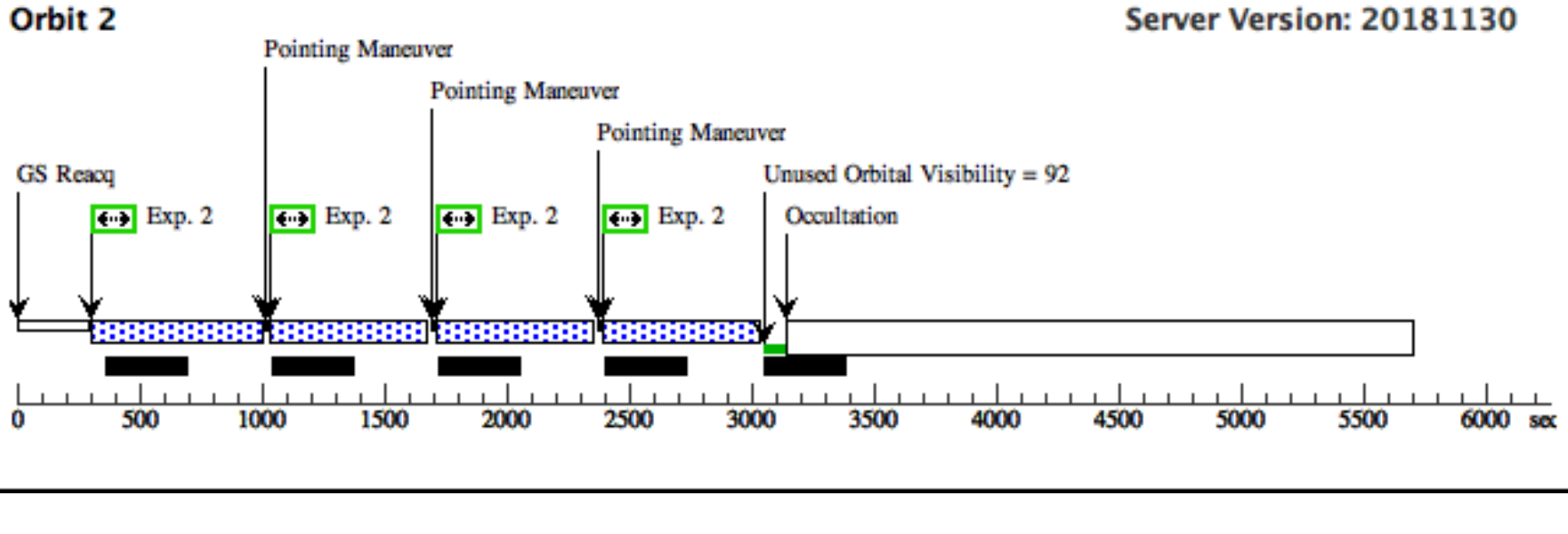
Comments:
Category=GALAXY
Description=[DWARF SPHEROIDAL]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) NGC1052-DF4	ACS/WFC, ACCUM, WFCENTER	F606W		POS TARG 0,0	Pattern 1, Exps 1-1 in NGC1052-DF4 (01) (1)	505 Secs (2020 Secs) *[==>(Pattern 1,1)]* *[==>(Pattern 1,2)]* *[==>(Pattern 2,1)]* *[==>(Pattern 2,2)]*	***[1]***
2		(1) NGC1052-DF4	ACS/WFC, ACCUM, WFCENTER	F814W		POS TARG 0,0	Pattern 1, Exps 2-2 in NGC1052-DF4 (01) (1)	520 Secs (2080 Secs) *[==>(Pattern 1,1)]* *[==>(Pattern 1,2)]* *[==>(Pattern 2,1)]* *[==>(Pattern 2,2)]*	***[2]***

Orbit Structure





Visit

Proposal 15695, NGC1052-DF4 (02) Wed Mar 27 11:00:25 GMT 2019

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: ORIENT 0D TO 100 D; ORIENT 225D TO 290 D

Patterns

#	Primary Pattern		Secondary Pattern		Exposures
(1)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=3.034 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.29 Angle Between Sides= Center Pattern=false	Pattern Type=LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.145 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=47.23 Angle Between Sides= Center Pattern=false	(1), (2)

Fixed Targets

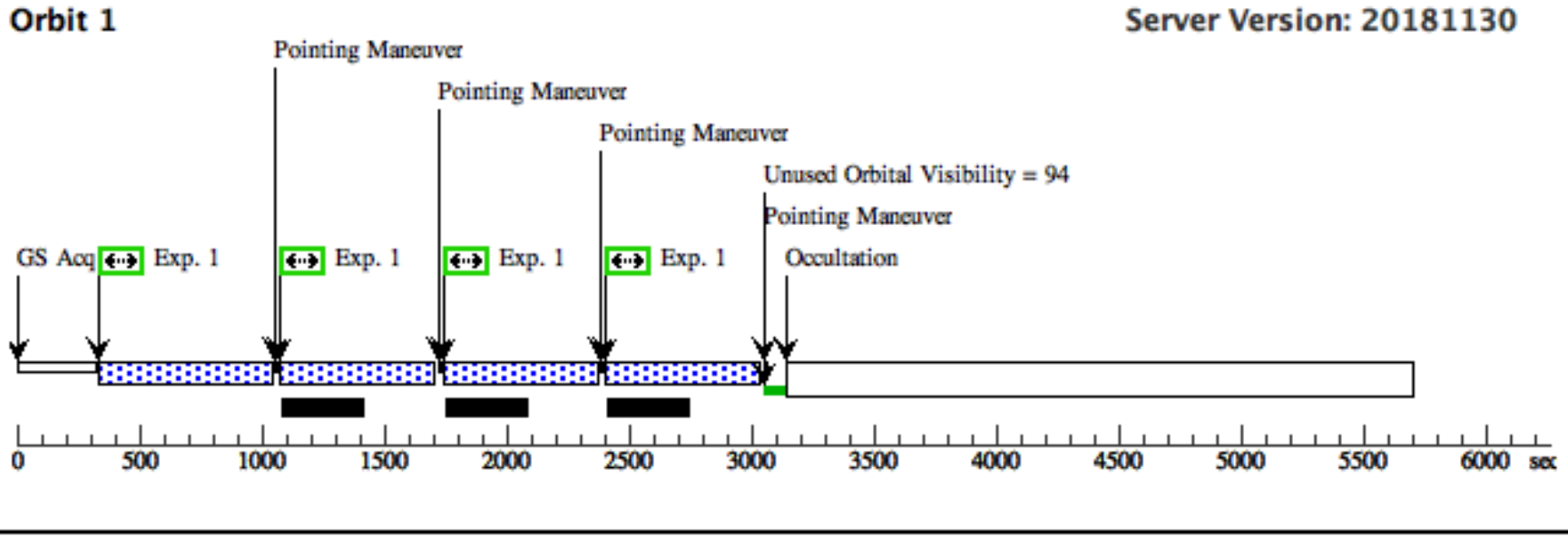
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	NGC1052-DF4	RA: 02 39 12.5100 (39.8021250d) Dec: -08 07 18.00 (-8.12167d) Equinox: J2000		V=25	Reference Frame: ICRS

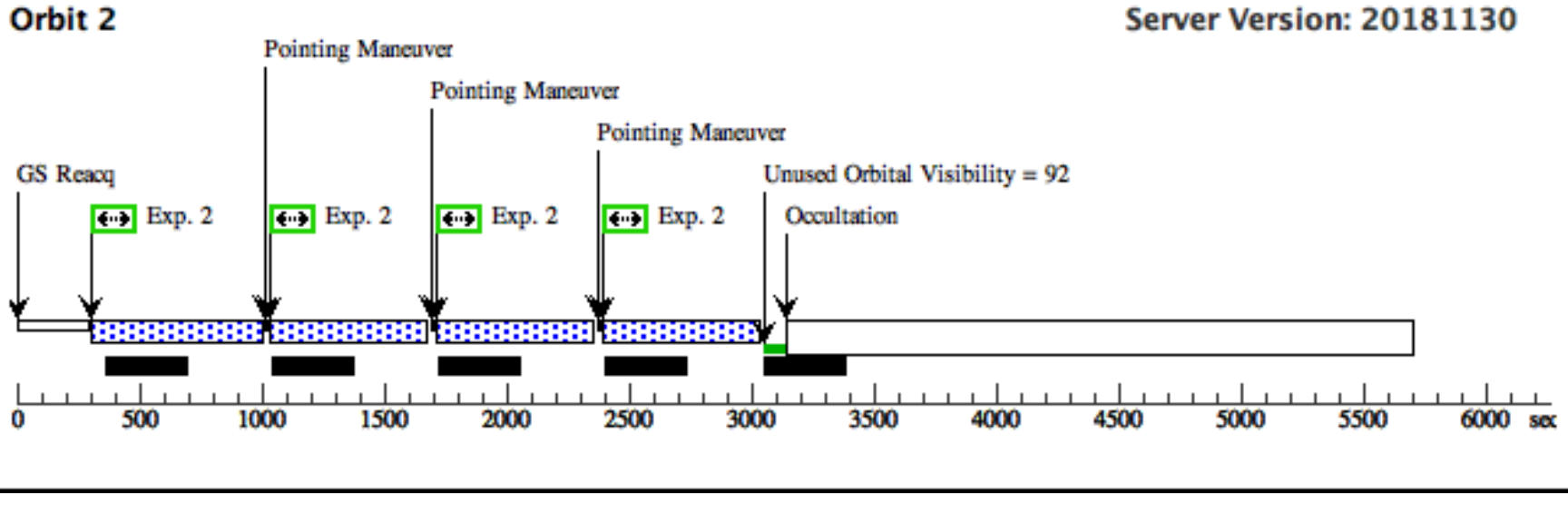
Comments:
Category=GALAXY
Description=[DWARF SPHEROIDAL]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) NGC1052-DF4	ACS/WFC, ACCUM, WFCENTER	F606W		POS TARG 0,4.0	Pattern 1, Exps 1-1 in NGC1052-DF4 (02) (1)	505 Secs (2020 Secs) *[==>(Pattern 1,1)]* *[==>(Pattern 1,2)]* *[==>(Pattern 2,1)]* *[==>(Pattern 2,2)]*	***[1]***
2		(1) NGC1052-DF4	ACS/WFC, ACCUM, WFCENTER	F814W		POS TARG 0,4.0	Pattern 1, Exps 2-2 in NGC1052-DF4 (02) (1)	520 Secs (2080 Secs) *[==>(Pattern 1,1)]* *[==>(Pattern 1,2)]* *[==>(Pattern 2,1)]* *[==>(Pattern 2,2)]*	***[2]***

Orbit Structure





Visit

Proposal 15695, NGC1052-DF4 (03) Wed Mar 27 11:00:25 GMT 2019

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: ORIENT 0D TO 100 D; ORIENT 225D TO 290 D

Patterns

#	Primary Pattern		Secondary Pattern		Exposures
(1)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=3.034 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.29 Angle Between Sides= Center Pattern=false	Pattern Type=LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.145 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=47.23 Angle Between Sides= Center Pattern=false	(1), (2)

Fixed Targets

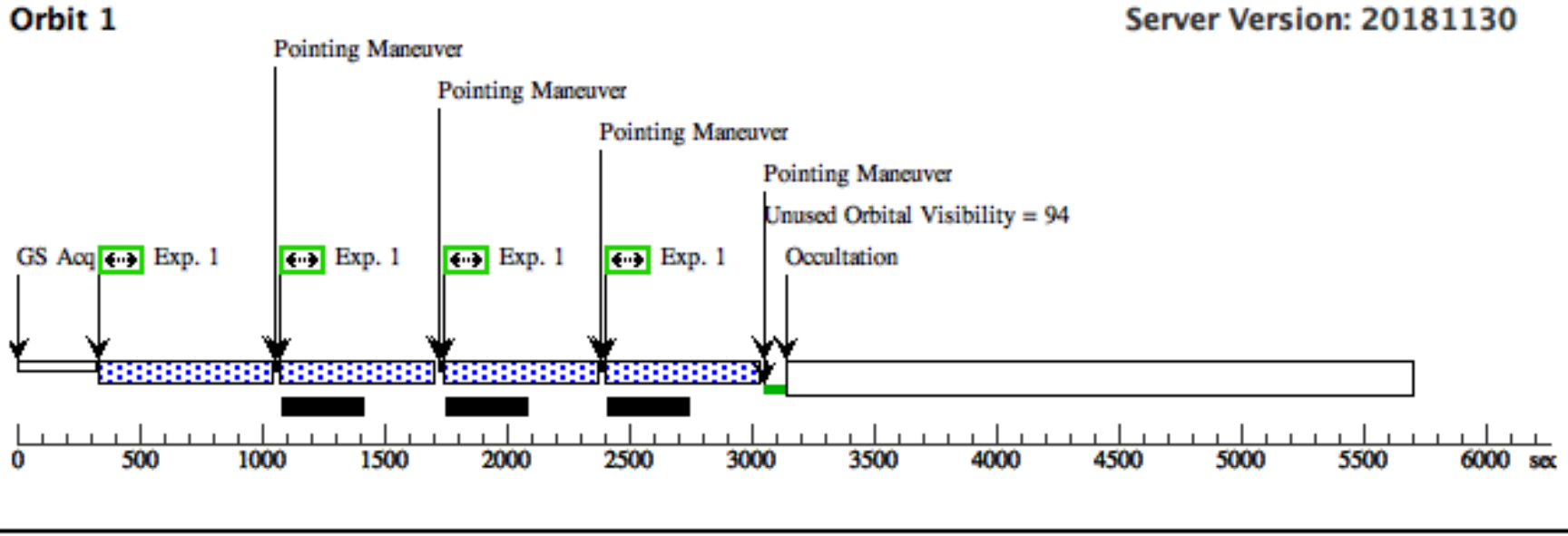
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	NGC1052-DF4	RA: 02 39 12.5100 (39.8021250d) Dec: -08 07 18.00 (-8.12167d) Equinox: J2000		V=25	Reference Frame: ICRS

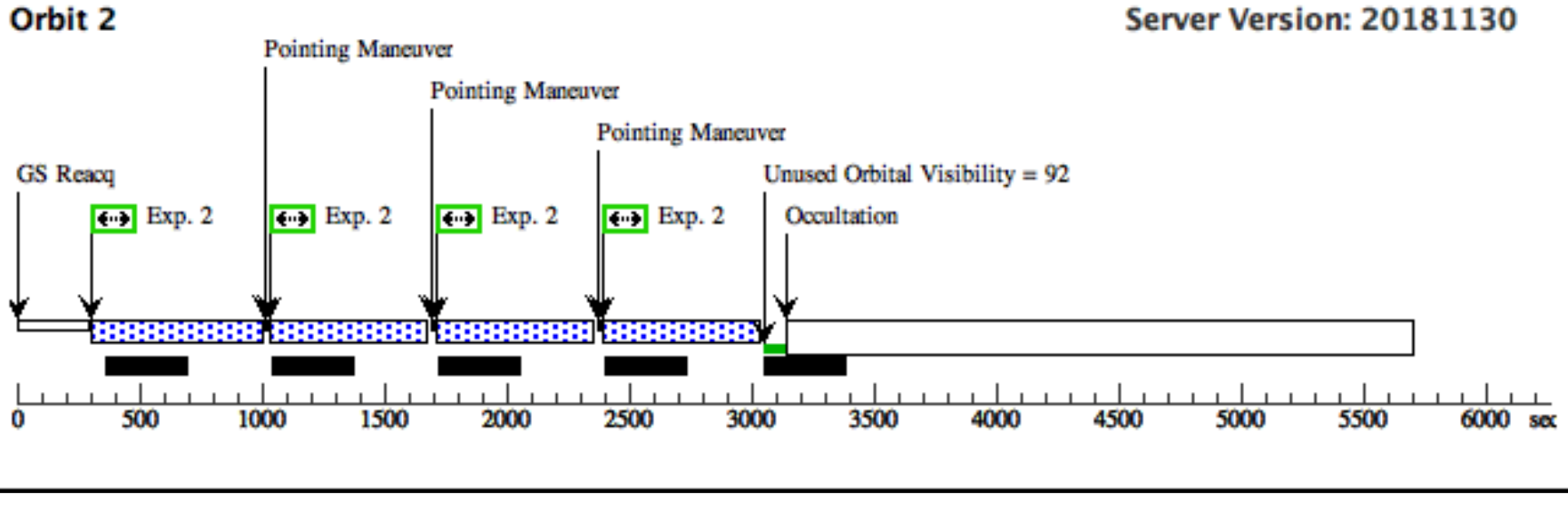
Comments:
Category=GALAXY
Description=[DWARF SPHEROIDAL]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) NGC1052-DF4	ACS/WFC, ACCUM, WFCENTER	F606W		POS TARG 0,-4.0	Pattern 1, Exps 1-1 in NGC1052-DF4 (03) (1)	505 Secs (2020 Secs) *[==>(Pattern 1,1)]* *[==>(Pattern 1,2)]* *[==>(Pattern 2,1)]* *[==>(Pattern 2,2)]*	***[1]***
2		(1) NGC1052-DF4	ACS/WFC, ACCUM, WFCENTER	F814W		POS TARG 0,-4.0	Pattern 1, Exps 2-2 in NGC1052-DF4 (03) (1)	520 Secs (2080 Secs) *[==>(Pattern 1,1)]* *[==>(Pattern 1,2)]* *[==>(Pattern 2,1)]* *[==>(Pattern 2,2)]*	***[2]***

Orbit Structure





Visit

Proposal 15695, NGC1052-DF4 (04) Wed Mar 27 11:00:25 GMT 2019

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: ORIENT 0D TO 100 D; ORIENT 225D TO 290 D

Patterns

#	Primary Pattern		Secondary Pattern		Exposures
(1)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=3.034 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.29 Angle Between Sides= Center Pattern=false	Pattern Type=LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.145 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=47.23 Angle Between Sides= Center Pattern=false	(1), (2)

Fixed Targets

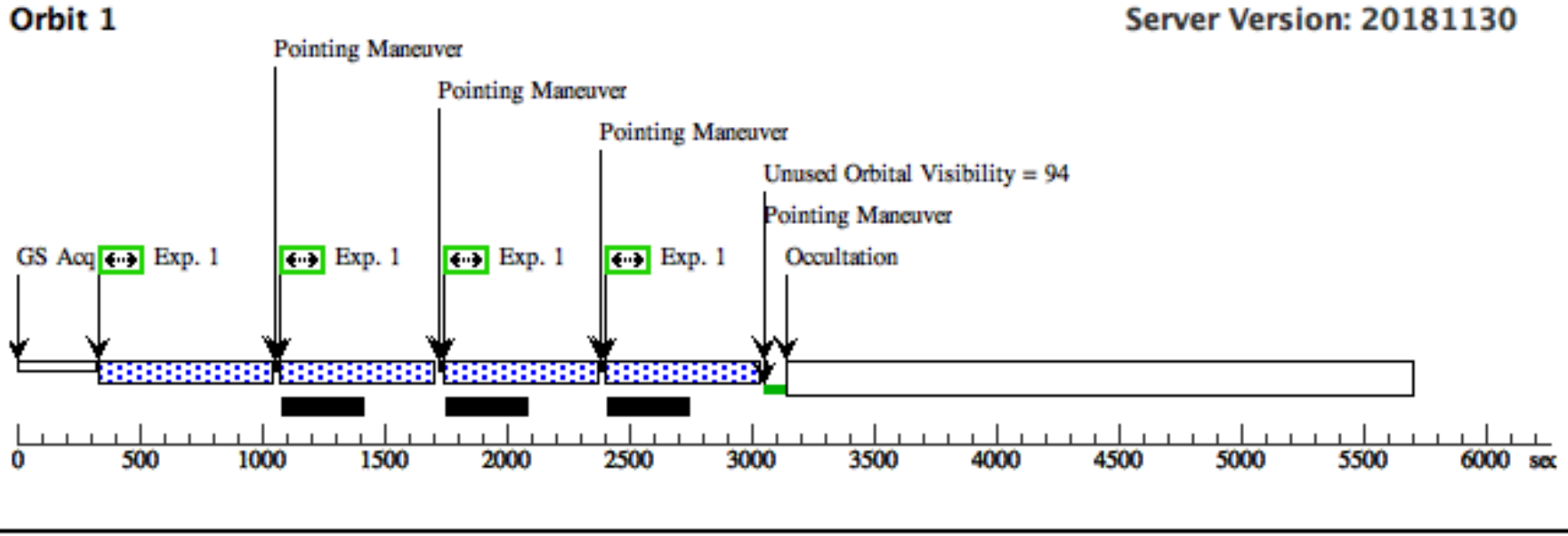
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	NGC1052-DF4	RA: 02 39 12.5100 (39.8021250d) Dec: -08 07 18.00 (-8.12167d) Equinox: J2000		V=25	Reference Frame: ICRS

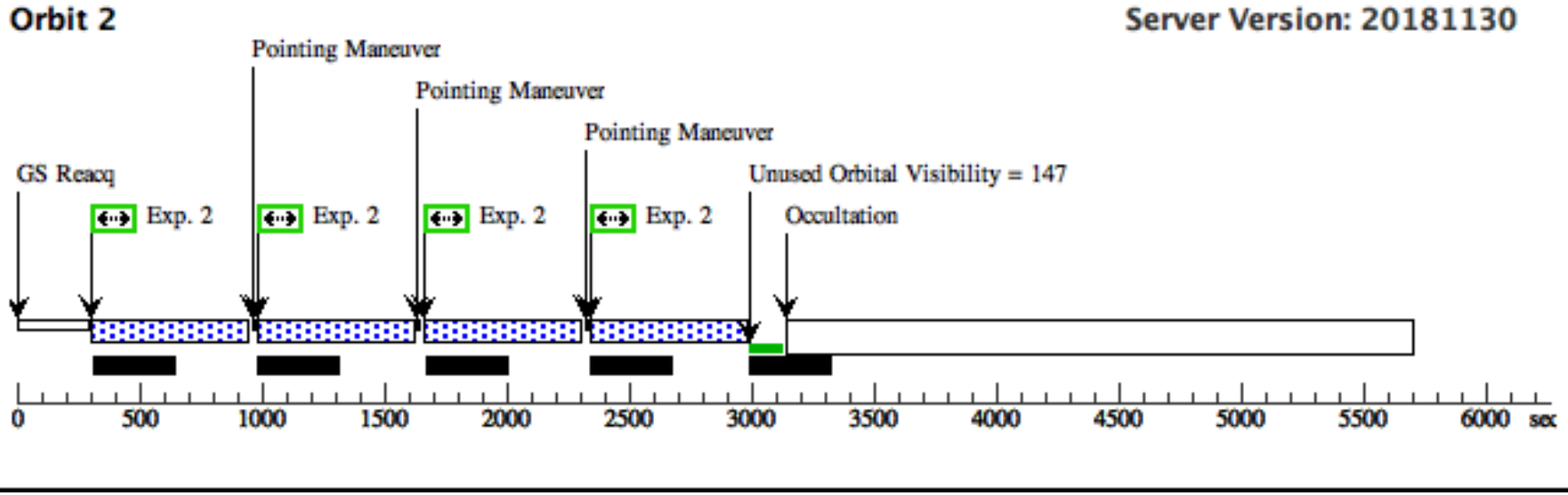
Comments:
Category=GALAXY
Description=[DWARF SPHEROIDAL]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) NGC1052-DF4	ACS/WFC, ACCUM, WFCENTER	F814W		POS TARG 0,0	Pattern 1, Exps 1-1 in NGC1052-DF4 (04) (1)	505 Secs (2020 Secs) *[==>(Pattern 1,1)]* *[==>(Pattern 1,2)]* *[==>(Pattern 2,1)]* *[==>(Pattern 2,2)]*	***[1]***
2		(1) NGC1052-DF4	ACS/WFC, ACCUM, WFCENTER	F814W		POS TARG 0,0	Pattern 1, Exps 2-2 in NGC1052-DF4 (04) (1)	520 Secs (2080 Secs) *[==>(Pattern 1,1)]* *[==>(Pattern 1,2)]* *[==>(Pattern 2,1)]* *[==>(Pattern 2,2)]*	***[2]***

Orbit Structure





Visit

Proposal 15695, NGC1052-DF4 (05) Wed Mar 27 11:00:25 GMT 2019

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: ORIENT 0D TO 100 D; ORIENT 225D TO 290 D

Patterns

#	Primary Pattern		Secondary Pattern		Exposures
(1)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=3.034 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.29 Angle Between Sides= Center Pattern=false	Pattern Type=LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.145 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=47.23 Angle Between Sides= Center Pattern=false	(1), (2)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	NGC1052-DF4	RA: 02 39 12.5100 (39.8021250d) Dec: -08 07 18.00 (-8.12167d) Equinox: J2000		V=25	Reference Frame: ICRS

Comments:
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		(1) NGC1052-DF4	ACS/WFC, ACCUM, WFCENTER	F814W		POS TARG 0,4.0	Pattern 1, Exps 1-1 in NGC1052-DF4 (05) (1)	505 Secs (2020 Secs) *[==>(Pattern 1,1)]* *[==>(Pattern 1,2)]* *[==>(Pattern 2,1)]* *[==>(Pattern 2,2)]*	***[1]***
2		(1) NGC1052-DF4	ACS/WFC, ACCUM, WFCENTER	F814W		POS TARG 0,4.0	Pattern 1, Exps 2-2 in NGC1052-DF4 (05) (1)	520 Secs (2080 Secs) *[==>(Pattern 1,1)]* *[==>(Pattern 1,2)]* *[==>(Pattern 2,1)]* *[==>(Pattern 2,2)]*	***[2]***

Orbit Structure