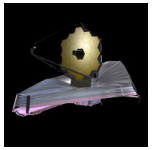

1685 - Uncrowding the Cepheids for an Improved Determination of the Hubble Constant

Cycle: 1, Proposal Category: GO

INVESTIGATORS

Name	*Institution*
Dr. Adam Riess (PI)	**The Johns Hopkins University**
Dr. Stefano Casertano (CoI)	Space Telescope Science Institute
Dr. Lucas M. Macri (CoI)	NOIRLab - (AZ)
Dr. Daniel Scolnic (CoI)	Duke University
Dr. Louise Breuval (CoI)	The Johns Hopkins University
Dr. Richard I Anderson (CoI) (ESA Member)	Ecole Polytechnique Federale de Lausanne
Dr. Wenlong Yuan (CoI)	The Johns Hopkins University

OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
N1559				
	1	N1559_1	NIRCam Imaging	(1) N1559
	2	N1559_2	NIRCam Imaging	(1) N1559
N1448				
	13	N1448_1	NIRCam Imaging	(8) NGC-1448
	14	N1448_2	NIRCam Imaging	(8) NGC-1448
N4258				
	5	N4258_1	NIRCam Imaging	(3) N4258
	6	N4258_2	NIRCam Imaging	(3) N4258
N5468				
	7	N5468_1	NIRCam Imaging	(4) N5468

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
	8	N5468_2	NIRCam Imaging	(4) N5468
N5584				
	9	N5584_1	NIRCam Imaging	(5) N5584
	10	N5584_2	NIRCam Imaging	(5) N5584
N5643				
	11	N5643_1	NIRCam Imaging	(6) N5643
	12	N5643_2	NIRCam Imaging	(6) N5643

ABSTRACT

We propose to scrutinize the puzzling tension in measurements of the Hubble constant (H0) by un-crowding observations of extragalactic Cepheids used to calibrate Type Ia supernovae (SNe Ia). The current 4-6 sigma tension between predictions of H0 based on the Early Universe (e.g., CMB+LCDM) and direct measurements from the Late Universe is one of the outstanding problems in cosmology, and Cepheid-based methods provide the strongest evidence of the tension. The unparalleled IR resolution of JWST will largely resolve the stellar backgrounds of Cepheids, whose fluctuations dominate the scatter of Period-Luminosity relations, and reduce the associated noise by nearly an order of magnitude. We propose observations of over 1500 known Cepheids in three filters and two epochs in five galaxies hosting 7 SNe Ia and in NGC 4258. The latter has a maser-based 1.5% geometric distance that will anchor a 2% measurement of H0 independent of HST and without significant background noise. These same observations will further develop two other independent distance indicators useful to calibrate SNe Ia and measure H0: the infrared TRGB and Oxygen-rich Miras. This will provide a multi-pronged approach to unravel differences between methods connecting both ends of the distance ladder and determine if the H0 tension is a robust feature of the Universe. The proposed observations are crucial to un-crowd Cepheid observations and address the only remaining systematic difference between the observations of these variables in SN Ia hosts and in the Milky Way, yielding a test of the tension beyond reproach and clearing the path for a direct 1% measurement of H0.

OBSERVING DESCRIPTION

We propose observations of over 1500 known Cepheids in three filters and two epochs in five galaxies hosting 7 SNe Ia and in NGC 4258. The latter has a maser-based 1.5% geometric distance that will anchor a 2% measurement of H0 independent of HST and without significant background noise.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	N1559	RA: 04 17 35.7700 (64.3990417d) Dec: -62 47 1.20 (-62.78367d) Equinox: J2000	Proper Motion RA: 0 Proper Motion Dec: 0 Parallax: 0" Epoch of Position: 2000	
Comments: *Category=Galaxy* *Description=[Galaxy disks, Spiral galaxies]* *Extended=YES*				
(2)	N3254	RA: 10 29 21.9929 (157.3416371d) Dec: +29 30 12.70 (29.50353d) Equinox: J2000	Epoch of Position: 2015.5	
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. *Category=Galaxy* *Description=[Spiral galaxies]*				
(3)	N4258	RA: 12 18 54.0326 (184.7251358d) Dec: +47 21 25.74 (47.35715d) Equinox: J2000		
Comments: *Category=Galaxy* *Description=[Spiral galaxies]*				
(4)	N5468	RA: 14 06 34.8906 (211.6453775d) Dec: -05 27 10.72 (-5.45298d) Equinox: J2000	Epoch of Position: 2015.5	
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. *Category=Galaxy* *Description=[Spiral galaxies]*				
(5)	N5584	RA: 14 22 23.8110 (215.5992125d) Dec: -00 23 14.82 (-.38745d) Equinox: J2000	Epoch of Position: 2015.5	
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. *Category=Galaxy* *Description=[Spiral arms]*				
(6)	N5643	RA: 14 32 40.5590 (218.1689958d) Dec: -44 10 25.56 (-44.17377d) Equinox: J2000	Epoch of Position: 2015.5	
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. *Category=Galaxy* *Description=[Spiral galaxies]*				
(8)	NGC-1448	RA: 03 44 39.3000 (56.1637500d) Dec: -44 36 57.00 (-44.61583d) Equinox: J2000	Epoch of Position: 2015.5	
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. *Category=Galaxy* *Description=[Field galaxies]*				

Observation

Proposal 1685, Observation 1: N1559_1 Wed Jul 26 19:00:30 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRCam Imaging

Diagnostics

(Visit 1:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(N1559_1 (Obs 1)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	N1559	RA: 04 17 35.7700 (64.3990417d) Dec: -62 47 1.20 (-62.78367d) Equinox: J2000	Proper Motion RA: 0 Proper Motion Dec: 0 Parallax: 0" Epoch of Position: 2000	

Comments:
Category=Galaxy
Description=[Galaxy disks, Spiral galaxies]
Extended=YES

Template

Module	Subarray	Target Placement
ALL	FULL	Module Gap

Dithers

#	Primary Dither Type	Primary Dithers	Subpixel Dither Type	Dither Size	Subpixel Positions
1	NONE		SMALL-GRID-DITHER		4

Spectral Elements

#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	F090W	F277W	SHALLOW4	8	1	4	4	1674.936	
2	F150W	F277W	SHALLOW4	10	1	4	4	2104.407	

Special Requirements

Offset 86.0 arcsec, 0.0 arcsec

2 After 1 by 15 Days to 30 Days
Aperture PA Offset 2 from 1 by -5 to +5 Degrees (Same offsets in V3)

Observation

Proposal 1685, Observation 2: N1559_2

Wed Jul 26 19:00:30 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRCam Imaging

Diagnostics

(Visit 2:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(N1559_2 (Obs 2)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	N1559	RA: 04 17 35.7700 (64.3990417d) Dec: -62 47 1.20 (-62.78367d) Equinox: J2000	Proper Motion RA: 0 Proper Motion Dec: 0 Parallax: 0" Epoch of Position: 2000	

Comments:
Category=Galaxy
Description=[Galaxy disks, Spiral galaxies]
Extended=YES

Template

Module	Subarray	Target Placement
ALL	FULL	Module Gap

Dithers

#	Primary Dither Type	Primary Dithers	Subpixel Dither Type	Dither Size	Subpixel Positions
1	NONE		SMALL-GRID-DITHER		4

Spectral Elements

#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	F090W	F277W	SHALLOW4	8	1	4	4	1674.936	
2	F150W	F277W	SHALLOW4	10	1	4	4	2104.407	

Special Requirements

Offset 86.0 arcsec, 0.0 arcsec

2 After 1 by 15 Days to 30 Days
Aperture PA Offset 2 from 1 by -5 to +5 Degrees (Same offsets in V3)

Observation

Proposal 1685, Observation 13: N1448_1

Wed Jul 26 19:00:30 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRCam Imaging

Diagnostics

(Visit 13:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(N1448_1 (Obs 13)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(8)	NGC-1448	RA: 03 44 39.3000 (56.1637500d) Dec: -44 36 57.00 (-44.61583d) Equinox: J2000	Epoch of Position: 2015.5	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Galaxy
Description=[Field galaxies]

Template

Module	Subarray	Target Placement
ALL	FULL	Module Gap

Dithers

#	Primary Dither Type	Primary Dithers	Subpixel Dither Type	Dither Size	Subpixel Positions
1	NONE		SMALL-GRID-DITHER		4

Spectral Elements

#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	F090W	F277W	SHALLOW4	8	1	4	4	1674.936	
2	F150W	F277W	SHALLOW4	10	1	4	4	2104.407	

Special Requirements

Offset 86.0 arcsec, 3.0 arcsec

14 After 13 by 15 Days to 30 Days
Aperture PA Offset 14 from 13 by -5 to +5 Degrees (Same offsets in V3)

Observation

Proposal 1685, Observation 14: N1448_2

Wed Jul 26 19:00:30 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRCam Imaging

Diagnostics

(Visit 14:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(N1448_2 (Obs 14)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(8)	NGC-1448	RA: 03 44 39.3000 (56.1637500d) Dec: -44 36 57.00 (-44.61583d) Equinox: J2000	Epoch of Position: 2015.5	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Galaxy
Description=[Field galaxies]

Template

Module	Subarray	Target Placement
ALL	FULL	Module Gap

Dithers

#	Primary Dither Type	Primary Dithers	Subpixel Dither Type	Dither Size	Subpixel Positions
1	NONE		SMALL-GRID-DITHER		4

Spectral Elements

#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	F090W	F277W	SHALLOW4	8	1	4	4	1674.936	
2	F150W	F277W	SHALLOW4	10	1	4	4	2104.407	

Special Requirements

Offset -86.0 arcsec, -10.0 arcsec

14 After 13 by 15 Days to 30 Days
Aperture PA Offset 14 from 13 by -5 to +5 Degrees (Same offsets in V3)

Observation

Proposal 1685, Observation 5: N4258_1

Wed Jul 26 19:00:30 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRCam Imaging

Diagnostics

(Visit 5:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(N4258_1 (Obs 5)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(3)	N4258	RA: 12 18 54.0326 (184.7251358d) Dec: +47 21 25.74 (47.35715d) Equinox: J2000		

Comments:
Category=Galaxy
Description=[Spiral galaxies]

Template

Module	Subarray	Target Placement
ALL	FULL	Module Gap

Dithers

#	Primary Dither Type	Primary Dithers	Subpixel Dither Type	Dither Size	Subpixel Positions
1	NONE		SMALL-GRID-DITHER		4

Spectral Elements

#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	F090W	F277W	SHALLOW4	5	1	4	4	1030.73	
2	F150W	F277W	SHALLOW4	7	1	4	4	1460.201	

Special Requirements

Aperture PA Range 140 to 140 Degrees (V3 140.0713531 to 140.0713531)

6 After 5 by 15 Days to 30 Days
Aperture PA Offset 6 from 5 by -5 to -3 Degrees (Same offsets in V3)

Observation

Proposal 1685, Observation 6: N4258_2

Wed Jul 26 19:00:30 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRCam Imaging

Diagnostics

(Visit 6:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(N4258_2 (Obs 6)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(3)	N4258	RA: 12 18 54.0326 (184.7251358d) Dec: +47 21 25.74 (47.35715d) Equinox: J2000		

Comments:
Category=Galaxy
Description=[Spiral galaxies]

Template

Module	Subarray	Target Placement
ALL	FULL	Module Gap

Dithers

#	Primary Dither Type	Primary Dithers	Subpixel Dither Type	Dither Size	Subpixel Positions
1	NONE		SMALL-GRID-DITHER		4

Spectral Elements

#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	F090W	F277W	SHALLOW4	5	1	4	4	1030.73	
2	F150W	F277W	SHALLOW4	7	1	4	4	1460.201	

Special Requirements

Offset 173.0 arcsec, -8.0 arcsec

6 After 5 by 15 Days to 30 Days
Aperture PA Offset 6 from 5 by -5 to -3 Degrees (Same offsets in V3)

Observation

Proposal 1685, Observation 7: N5468_1 Wed Jul 26 19:00:30 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRCam Imaging

Diagnostics

(Visit 7:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(N5468_1 (Obs 7)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(4)	N5468	RA: 14 06 34.8906 (211.6453775d) Dec: -05 27 10.72 (-5.45298d) Equinox: J2000	Epoch of Position: 2015.5	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Galaxy
Description=[Spiral galaxies]

Template

Module	Subarray	Target Placement
ALL	FULL	Module Gap

Dithers

#	Primary Dither Type	Primary Dithers	Subpixel Dither Type	Dither Size	Subpixel Positions
1	NONE		SMALL-GRID-DITHER		6

Spectral Elements

#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	F090W	F277W	SHALLOW4	4	1	6	6	1223.992	
2	F150W	F277W	SHALLOW4	9	1	6	6	2834.507	

Special Requirements

Offset -86.0 arcsec, -3.0 arcsec

8 After 7 by 15 Days to 30 Days
Aperture PA Offset 8 from 7 by -5 to +5 Degrees (Same offsets in V3)

Observation

Proposal 1685, Observation 8: N5468_2

Wed Jul 26 19:00:30 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRCam Imaging

Diagnostics

(Visit 8:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(N5468_2 (Obs 8)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(4)	N5468	RA: 14 06 34.8906 (211.6453775d) Dec: -05 27 10.72 (-5.45298d) Equinox: J2000	Epoch of Position: 2015.5	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Galaxy
Description=[Spiral galaxies]

Template

Module	Subarray	Target Placement
ALL	FULL	Module Gap

Dithers

#	Primary Dither Type	Primary Dithers	Subpixel Dither Type	Dither Size	Subpixel Positions
1	NONE		SMALL-GRID-DITHER		5

Spectral Elements

#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	F090W	F277W	SHALLOW4	6	1	5	5	1556.832	
2	F150W	F277W	SHALLOW4	10	1	5	5	2630.509	

Special Requirements

Offset -86.0 arcsec, -3.0 arcsec

8 After 7 by 15 Days to 30 Days
Aperture PA Offset 8 from 7 by -5 to +5 Degrees (Same offsets in V3)

Observation

Proposal 1685, Observation 9: N5584_1

Wed Jul 26 19:00:30 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRCam Imaging

Diagnostics

(Visit 9:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(N5584_1 (Obs 9)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(5)	N5584	RA: 14 22 23.8110 (215.5992125d) Dec: -00 23 14.82 (-.38745d) Equinox: J2000	Epoch of Position: 2015.5	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Galaxy
Description=[Spiral arms]

Template

Module	Subarray	Target Placement
ALL	FULL	Module Gap

Dithers

#	Primary Dither Type	Primary Dithers	Subpixel Dither Type	Dither Size	Subpixel Positions
1	NONE		SMALL-GRID-DITHER		4

Spectral Elements

#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	F090W	F277W	SHALLOW4	8	1	4	4	1674.936	
2	F150W	F277W	SHALLOW4	10	1	4	4	2104.407	

Special Requirements

Offset 86.0 arcsec, 3.0 arcsec

10 After 9 by 15 Days to 30 Days
Aperture PA Offset 10 from 9 by -5 to +5 Degrees (Same offsets in V3)

Observation

Proposal 1685, Observation 10: N5584_2

Wed Jul 26 19:00:30 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRCam Imaging

Diagnostics

(Visit 10:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(N5584_2 (Obs 10)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(5)	N5584	RA: 14 22 23.8110 (215.5992125d) Dec: -00 23 14.82 (-.38745d) Equinox: J2000	Epoch of Position: 2015.5	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Galaxy
Description=[Spiral arms]

Template

Module	Subarray	Target Placement
ALL	FULL	Module Gap

Dithers

#	Primary Dither Type	Primary Dithers	Subpixel Dither Type	Dither Size	Subpixel Positions
1	NONE		SMALL-GRID-DITHER		4

Spectral Elements

#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	F090W	F277W	SHALLOW4	8	1	4	4	1674.936	
2	F150W	F277W	SHALLOW4	10	1	4	4	2104.407	

Special Requirements

Offset 86.0 arcsec, 3.0 arcsec

10 After 9 by 15 Days to 30 Days
Aperture PA Offset 10 from 9 by -5 to +5 Degrees (Same offsets in V3)

Observation

Proposal 1685, Observation 11: N5643_1

Wed Jul 26 19:00:30 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRCam Imaging

Diagnostics

(Visit 11:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(N5643_1 (Obs 11)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(6)	N5643	RA: 14 32 40.5590 (218.1689958d) Dec: -44 10 25.56 (-44.17377d) Equinox: J2000	Epoch of Position: 2015.5	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Galaxy
Description=[Spiral galaxies]

Template

Module	Subarray	Target Placement
ALL	FULL	Module Gap

Dithers

#	Primary Dither Type	Primary Dithers	Subpixel Dither Type	Dither Size	Subpixel Positions
1	NONE		SMALL-GRID-DITHER		4

Spectral Elements

#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	F090W	F277W	SHALLOW4	6	1	4	4	1245.465	
2	F150W	F277W	SHALLOW4	8	1	4	4	1674.936	

Special Requirements

Offset 86.0 arcsec, 3.0 arcsec

12 After 11 by 15 Days to 30 Days
Aperture PA Offset 12 from 11 by -5 to +5 Degrees (Same offsets in V3)

Observation

Proposal 1685, Observation 12: N5643_2

Wed Jul 26 19:00:30 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRCam Imaging

Diagnostics

(Visit 12:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(N5643_2 (Obs 12)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(6)	N5643	RA: 14 32 40.5590 (218.1689958d) Dec: -44 10 25.56 (-44.17377d) Equinox: J2000	Epoch of Position: 2015.5	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Galaxy
Description=[Spiral galaxies]

Template

Module	Subarray	Target Placement
ALL	FULL	Module Gap

Dithers

#	Primary Dither Type	Primary Dithers	Subpixel Dither Type	Dither Size	Subpixel Positions
1	NONE		SMALL-GRID-DITHER		4

Spectral Elements

#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	F090W	F277W	SHALLOW4	6	1	4	4	1245.465	
2	F150W	F277W	SHALLOW4	8	1	4	4	1674.936	

Special Requirements

Offset -86.0 arcsec, -9.0 arcsec

12 After 11 by 15 Days to 30 Days
Aperture PA Offset 12 from 11 by -5 to +5 Degrees (Same offsets in V3)