14957 - ACS SBC Recovery from Anomalous Shutdown

Cycle: 25, Proposal Category: CAL/ACS

(Availability Mode: RESTRICTED)

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	DARK	S/C	1	21-Jun-2017 21:02:15.0	yes
02	DARK	ACS/SBC S/C	1	21-Jun-2017 21:02:16.0	yes
03	DARK	ACS/SBC S/C	1	21-Jun-2017 21:02:17.0	yes
04	DARK DEUTERIUM	ACS/SBC S/C	1	21-Jun-2017 21:02:18.0	yes

4 Total Orbits Used

ABSTRACT

This proposal is designed to permit a safe and orderly recovery of the SBC (FUV MAMA) detector after an anomalous shutdown. This is accomplished by using slower-than-normal MCP high-voltage ramp-ups and diagnostics. Anomalous shutdowns can occur because of bright object violations, which trigger the Global Hardware Monitor or the Global Software Monitor. Anomalous shutdowns can also occur because of MAMA hardware anomalies or failures. The cause of the shutdown should be thoroughly investigated and understood prior to recovery. Twenty-four hour wait intervals are required after each test for MCP gas desorption and data analysis. Event flag 2 is used to prevent inadvertent MAMA usage.

The recovery procedure consists of four separate tests (i.e. visits) to check the MAMA's health after an anomalous shutdown: 1) signal processing electronics check, 2) slow, high-voltage ramp-up to an intermediate voltage, 3) a slow high-voltage ramp-up to the nominal operating HV, and 4) fold analysis test. Each must be completed successfully before proceeding onto the next. During the two high-voltage ramp-ups, dark ACCUM exposures are taken. At high voltage, dark ACCUM exposures and diagnostics are taken. This proposal is based on Proposal 14515 from Cycle 24. For additional MAMA recovery information, see STIS ISR 98-02R.

OBSERVING DESCRIPTION

The SBC (FUV MAMA) Recovery from Anomalous Shutdown consists of four tests (i.e. visits) where each must be successfully completed before the next. The visits are enabled for execution by the clearing of flag 2. The visits are:

(1) Signal processing electronics check. This reduces amplifier thresholds to 0.28V and monitors the ORCOUNT rates. (MAMA HV is off during this procedure.)

(2) Intermediate high-voltage ramp-up. The MAMA is ramped to an MCP voltage 300V below the nominal operating value. A dark ACCUM is taken during this partial ramp-up. Then a dark ACCUM is taken while W, X, Y, Z, OR, EV and VE counters are cycled and sampled.

(3) Full high-voltage ramp-up. The MAMA is ramped to the nominal MCP voltage. A dark ACCUM is taken during this full ramp-up. Then a dark ACCUM is taken during which events counter is cycled through W, X, Y, Z, OR, EV, and VE counters are sampled.

(4) Fold analysis test. The fold analysis provides a measurement of the distribution of charge cloud sizes incident upon the anode giving some measure of changes in the pulse height distribution of the MCP and, therefore, MCP gain. This is accomplished by disabling/enabling different combinations of decoder rows and columns.

For the Anomalous Shutdown tests to be executed, the following conditions have to have been met:

For visit 01: There was an anomalous MAMA HV shut down and the reason for the shutdown is understood. For this and visits 02 and 03, the ACS M3 fold mirror must be in the HRC position and the Cal Door must be in the Deployed position.

For visit 02: A minimum of 24 hours must have elapsed since the initial shutdown prior to beginning the intermediate HV ramp-up. For visits 02, 03, 24 hours are required for telemetry and data analysis.

--------- Additional Comments ----------

This is not a requirement but it is desirable to have real-time engineering telemetry (MA return) during the execution of the first three visits.

Visit

Proposal 14957, LV Signal Processing Test (01) Thu Jun 22 01:02:18 GMT 2017

Diagnostic Status: No Diagnostics

Scientific Instruments: S/C

Special Requirements: ON HOLD ; PARALLEL

Comments: Signal processing electronics checkout procedure. Goal: verify electronics. Must clear event flag 2 for the commanding to execute. Since no high voltage is involved, this visit may be scheduled within the 24 hour period following an anomalous HV shutdown. There are no images taken in this visit, only telemetry is required.

On Hold Comments: To be used only after an anomalous shutdown of the SBC high voltage.

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	LV On and Signal Processing Check	DARK	S/C, DATA, NONE			SAA CONTOUR 28; SPEC COM INSTR EJOPTLV_0; QASISTATES ACSSI WFHROPER WFHROPER	Same Alignment in LV Signal Processing Test (01)	1080.0 Secs (1080 Secs) *[==>]*	*[1]*

Comments: Switch on LV power supply and clean up after a possible MCE reset. Enable Software global monitor to values of Threshold = 77000 and Integration Period = 0.1 secs. Set amplifier threshold to default (0.48V). Collect a minimum of 30 telemetry points (OR counts). Set amplifier threshold to 0.28V. Collect a minimum of 30 telemetry points (OR Counts). Counts (W, X, Y, etc) are sampled by telemetry every 15 seconds for ACS.

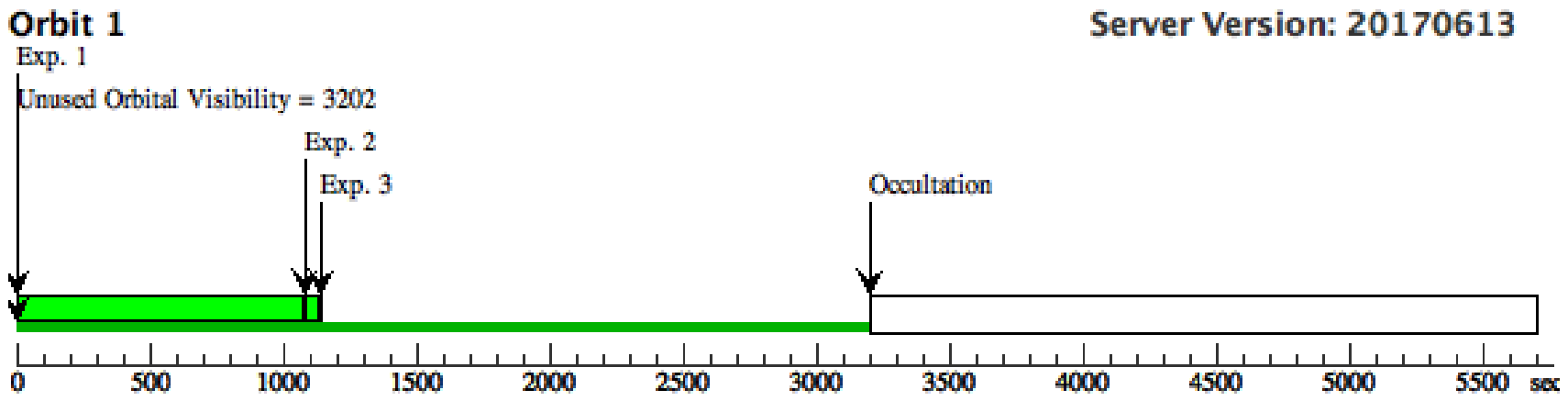
2	LV Off	DARK	S/C, DATA, NONE			SAA CONTOUR 28; SPEC COM INSTR RJLVTOP	Same Alignment in LV Signal Processing Test (01)	60.0 Secs (60 Secs) *[==>]*	*[1]*

Comments: Transition from MAMA Low Voltage to WFHROPER.

3	Set Flag 2	DARK	S/C, DATA, NONE			SAA CONTOUR 28; SPEC COM INSTR EJFLAG2	Same Alignment in LV Signal Processing Test (01)	10.0 Secs (10 Secs) *[==>]*	*[1]*

Comments: Set event flag 2. Prevents execution of the next scheduled visit without ground approval.

Orbit Structure



Visit

Proposal 14957, Ramp to Intermediate HV (02) Thu Jun 22 01:02:19 GMT 2017

Diagnostic Status: Warning

Scientific Instruments: S/C, ACS/SBC

Special Requirements: AFTER 01 BY 1.0 D TO 30.0 D; ON HOLD ; PARALLEL

Comments: Minimum wait of 24 hours following the anomalous shutdown. MAMA intermediate voltage checkout procedure. Goal: 1) Ramp MAMA to intermediate MCP voltage 2) Obtain dark image and dark count telemetry. Must clear event flag 2 for the commanding to execute.

On Hold Comments: To be used only after an anomalous shutdown of the SBC high voltage.

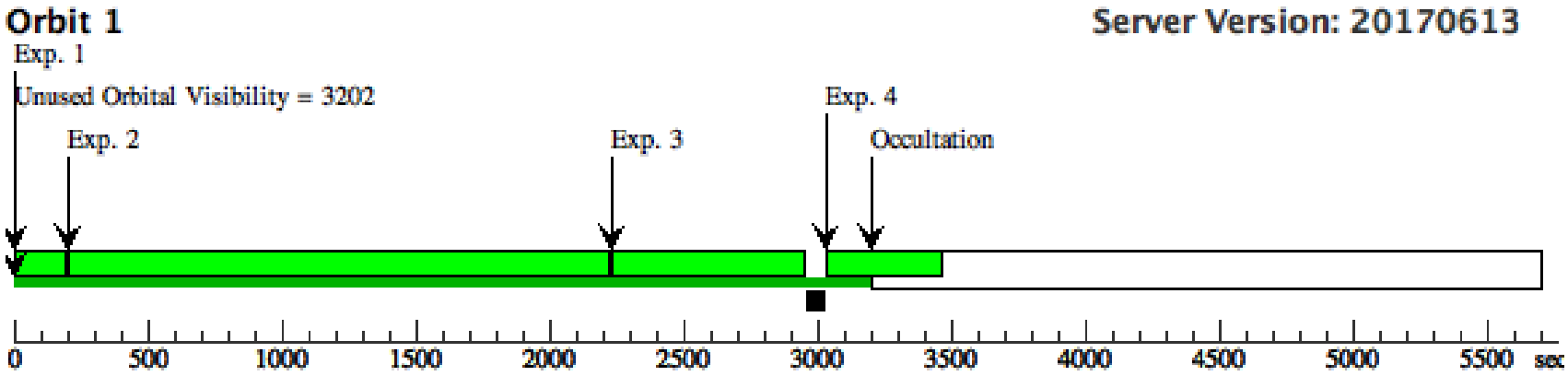
Diagnostics

(Ramp to Intermediate HV (02)) Warning (Orbit Planner): MAXIMUM DURATION EXCEEDED FOR INTERNAL OR EARTH CALIB SU

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	LV On	DARK	S/C, DATA, NONE			SAA CONTOUR 28; SPEC COM INSTR EJOPTLV_1; QASISTATES ACSSI WFHROPER WFMALVON	Sequence 1-4 Non-Int in Ramp to Intermediate HV (02)	200 Secs (200 Secs) *[==>]*	***[1]***
Comments: Switch on LV power supply and clean up after a possible MCE reset. Enable Software global monitor to values of Threshold = 100 and Integration Period = 0.1 secs. Enable SDF. Set amplifier threshold to default (0.48V). Event flag 2 must be cleared for this commanding to execute.									
2	Ramp HV to -2000/-100	DARK	ACS/SBC, ACCUM, SBC	DEF		SPEC COM INSTR EJLVTHV_1; NEW ALIGNMENT ; QASISTATES ACSSI WFMALVON WFMAHVON	Sequence 1-4 Non-Int in Ramp to Intermediate HV (02)	1980.0 Secs (1980 Secs) *[==>]*	***[1]***
Comments: The MCP and Field Voltage partial Ramp-ups will be performed in stages. The ramp-up within a stage is by increments of 50V. The final MCP voltage will be -2000V, 300V shy of the nominal value of -2300V. The final Field Voltage will be -100V, rather than the nominal -1000V setting. Use the nominal yellow and red limits for ramping. At the end of each stage, reset the SGM to a Threshold = 100 and an Integration Period = 0.1 sec, and collect telemetry samples of Z Counts for 4 minutes. The ACS rate is 1 TLM sample/15 secs; 15 or 16 samples will be obtained. Stage 1 - MCP ramp-up (0 - 500V). Stage 2 - MCP ramp-up (500V - 1000V). Stage 3 - MCP ramp-up (1000V - 1500V). Stage 4 - MCP ramp-up (1500V - 2000V). Stage 5 - Field Voltage ramp-up (+28 - -100V) .									
3	Dark and Cycle SGM	DARK	ACS/SBC, ACCUM, SBC	DEF		SPEC COM INSTR EJHVDARK; NEW ALIGNMENT	Sequence 1-4 Non-Int in Ramp to Intermediate HV (02)	720.0 Secs (720 Secs) *[==>]*	***[1]***
Comments: Obtain a MAMA DARK while at 2000V. During the exposure, set Software Global Monitor to an SGM Threshold = 200 and an Integration Period = 0.1 secs. Collect a minimum of 5 samples of W, X, Y, Z, OR, EV, and VE events.									
4	HV and LV Off - Set Flag 2	DARK	S/C, DATA, NONE			SAA CONTOUR 28; SPEC COM INSTR EJHVTOP_1; NEW ALIGNMENT ; QASISTATES ACSSI WFMAHVON WFHROPER	Sequence 1-4 Non-Int in Ramp to Intermediate HV (02)	440.0 Secs (440 Secs) *[==>]*	***[1]***
Comments: Ramp the Field and MCP High Voltage down from its intermediate value. Turn off the high voltage, then low voltage power. Set Event Flag 2									

Orbit Structure



Visit

Proposal 14957, Ramp to Full HV (03) Thu Jun 22 01:02:19 GMT 2017

Diagnostic Status: Warning

Scientific Instruments: S/C, ACS/SBC

Special Requirements: AFTER 02 BY 1.0 D TO 30.0 D; ON HOLD ; PARALLEL

Comments: Full HV ramp-up and checkout procedure. Goal: 1) Ramp MAMA to full MCP operating voltage. 2) Obtain a dark image and dark count telemetry. Must clear event flag 2 for the commanding to execute. Note this visit is normally followed immediately by the MAMA Fold Test, visit 4. The MAMA HV is left on and flag 2 is NOT set at the end of this visit.

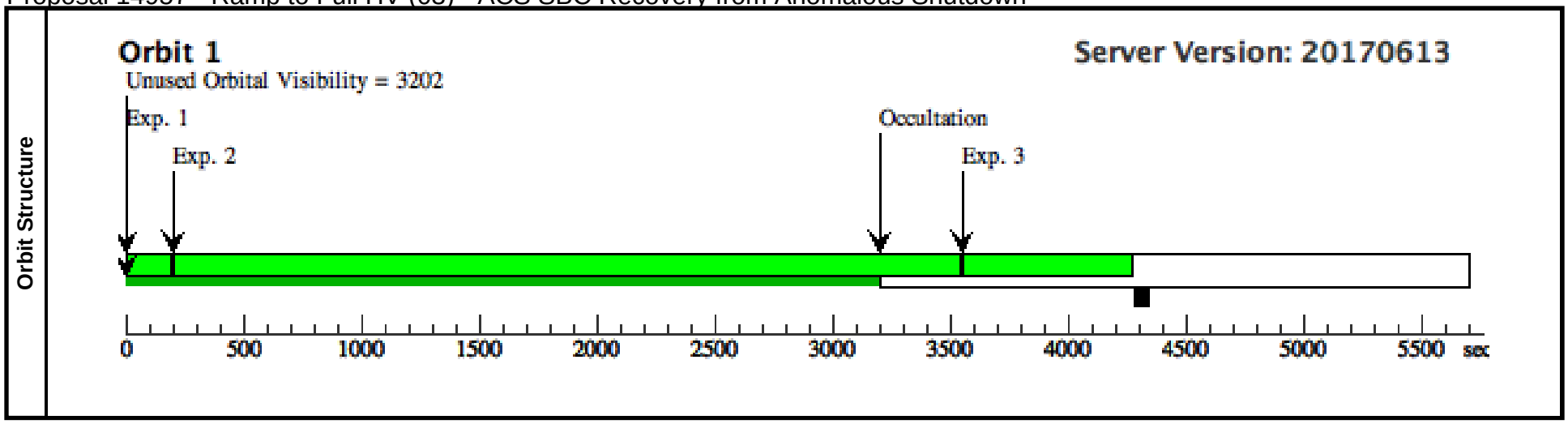
On Hold Comments: To be used only after an anomalous shutdown of the SBC high voltage.

Diagnostics

(Ramp to Full HV (03)) Warning (Orbit Planner): MAXIMUM DURATION EXCEEDED FOR INTERNAL OR EARTH CALIB SU

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	LV On	DARK	S/C, DATA, NONE			SAA CONTOUR 28; SPEC COM INSTR EJOPTLV_2; QASISTATES ACS SI WFHROPER WF MALVON	Sequence 1-3 Non-Int in Ramp to Full HV (03)	200 Secs (200 Secs) *[==>]*	***[1]***
	Comments: Switch on LV power supply and clean up after a possible MCE reset. Enable Software global monitor to values of Threshold = 100 and Integration Period = 0.1 secs. Enable SDF. Set amplifier threshold to default (0.48V). Event flag 2 must be cleared for this commanding to execute.								
2	Ramp HV to -2300/-1000	DARK	ACS/SBC, ACCUM, SBC	DEF		SPEC COM INSTR EJLVTHV_2; NEW ALIGNMENT ; QASISTATES ACS SI WFMALVON W FMAHVON	Sequence 1-3 Non-Int in Ramp to Full HV (03)	3300.0 Secs (3300 Secs) *[==>]*	***[1]***
	Comments: The MCP and Field Voltage Ramp-ups will be performed in stages. The ramp-up within a stage is by increments of 50V. Use the nominal yellow and red limits for ramping. At the end of each stage, reset the SGM to a Threshold = 100 and an Integration Period = 0.1 sec, and collect telemetry samples of Z Counts for 4 minutes. The ACS rate is 1 TLM sample/15 secs; 15 or 16 samples will be obtained. Stage 1 - MCP ramp-up (0 - 500V) Stage 2 - MCP ramp-up (500V - 1000V) Stage 3 - MCP ramp-up (1000V - 1500V) Stage 4 - MCP ramp-up (1500V - 2000V) Stage 5 - Field Voltage ramp-up (+28 - -100V) Stage 6 - MCP ramp-up (2000V - 2100V) Stage 7 - MCP ramp-up (2100V - 2200V) Stage 8 - Final MCP ramp-up (2200V - 2300V) Stage 9 - Field Voltage ramp-up (100V-1000V)								
3	Dark and Cycle SGM	DARK	ACS/SBC, ACCUM, SBC	DEF		SPEC COM INSTR EJHVDARK; NEW ALIGNMENT	Sequence 1-3 Non-Int in Ramp to Full HV (03)	720.0 Secs (720 Secs) *[==>]*	***[1]***
	Comments: Obtain a MAMA DARK while ramped up. During the exposure, set Software Global Monitor to an SGM Threshold = 200 and an Integration Period = 0.1 secs. Collect a minimum of 5 samples of W, X, Y, Z, OR, EV, and VE events.								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Exp. 2
Occultation
Exp. 3
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500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Proposal 14957 - Fold Test (04) - ACS SBC Recovery from Anomalous Shutdown

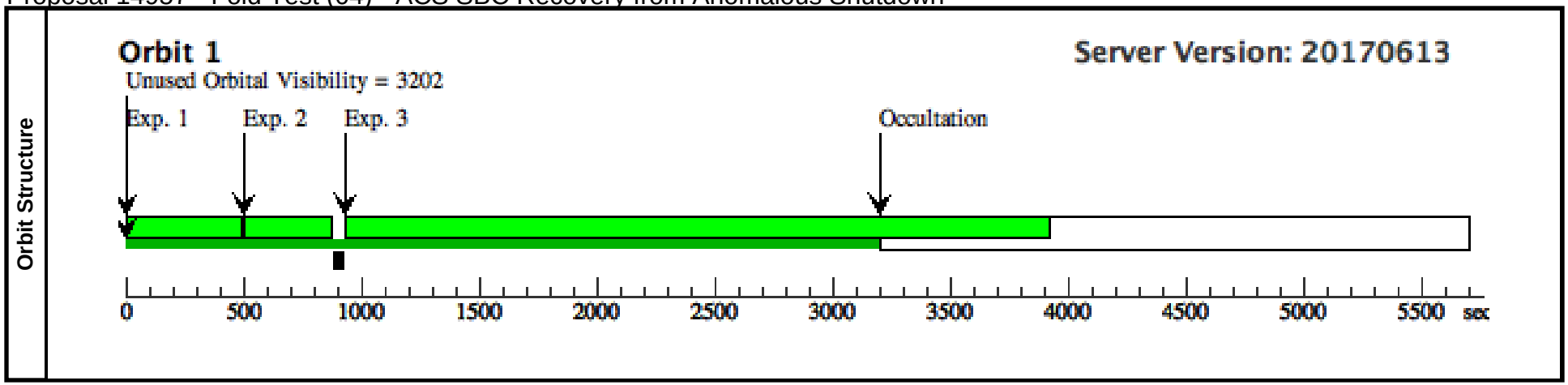
Visit	**Proposal 14957, Fold Test (04)** Thu Jun 22 01:02:19 GMT 2017 **Diagnostic Status: Warning** Scientific Instruments: S/C, ACS/SBC Special Requirements: AFTER 03 BY 0.0 D TO 30.0 D; ON HOLD ; PARALLEL *Comments: ACS MAMA fold analysis. Goal: verify performance of MCP. Since the Deterium lamp is turned on during exposure 1, the MAMA filter wheel should be initially set to blocking filter number 3 which is adjacent to F165LP used in exposure 2.* *On Hold Comments: To be used only after an anomalous shutdown of the SBC high voltage.*
Diagnostics	(Fold Test (04)) Warning (Orbit Planner): MAXIMUM DURATION EXCEEDED FOR INTERNAL OR EARTH CALIB SU

Proposal 14957 - Fold Test (04) - ACS SBC Recovery from Anomalous Shutdown

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	Turn On D2 Lamp	DARK	S/C, DATA, NONE			SAA CONTOUR 28; SPEC COM INSTR EJFOLDSET	Sequence 1-3 Non-Int in Fold Test (04)	500.0 Secs (500 Secs) *[==>]*	 ***[1]***
	Comments: Patch soft safe table. Set Software Global monitor (SGM) SGM Threshold =15000 SGM Integration period = 0.1 secs. Move SBC FW to BLOCK3. Disable TDF response. Turn on DEUTERIUM lamp.								
2	D2 Expo	DEUTERIUM	ACS/SBC, ACCUM, SBC	F165LP		QASISTATES ACS LAMP HOLD HOLD	Sequence 1-3 Non-Int in Fold Test (04)	300.0 Secs (300 Secs) *[==>]*	 ***[1]***
	Comments: This is a DEUTERIUM lamp exposure. The lamp setup is performed by line 1.								
3	Fold Test	DARK	S/C, DATA, NONE			SAA CONTOUR 28; SPEC COM INSTR EJFOLDTST	Sequence 1-3 Non-Int in Fold Test (04)	3000.0 Secs (3000 Secs) *[==>]*	 ***[1]***

Comments: Move the fold mech to SBC. Set Software Global monitor (SGM Threshold = 130000 SGM Integration period = 1.0 secs. The TLM sample rate for ACS is one sample / 15 seconds.
(a) Collect counter samples during flat field illumination
Collect 5 samples X events
Collect 5 samples Y events
Collect 5 samples Z events
Collect 5 samples W events
Collect 5 samples VE events
Collect 5 samples EV events
Collect 5 samples OR events
(b) Disable MAMA Folds: C2, C3, C4, C5, C6, R2, R3, R4, R5, R6
(c) Conduct fold analysis Collect 5 samples VE for following 19 combinations of MAMA folds:
(1) Enabled: C2, R2; Disabled: C3, C4, C5, C6, R3, R4, R5, R6
(2) Enabled: C2, R3; Disabled: C3, C4, C5, C6, R2, R4, R5, R6
(3) Enabled: C3, R2; Disabled: C2, C4, C5, C6, R3, R4, R5, R6
(4) Enabled: C2, R4; Disabled: C3, C4, C5, C6, R2, R3, R5, R6
(5) Enabled: C3, R3; Disabled: C2, C4, C5, C6, R2, R4, R5, R6
(6) Enabled: C4, R2; Disabled: C2, C3, C5, C6, R3, R4, R5, R6
(7) Enabled: C3, R4; Disabled: C2, C4, C5, C6, R2, R3, R5, R6
(8) Enabled: C4, R3; Disabled: C2, C3, C5, C6, R2, R4, R5, R6
(9) Enabled: C3, R5; Disabled: C2, C4, C5, C6, R2, R3, R4, R6
(10)Enabled: C4, R4; Disabled: C2, C3, C5, C6, R2, R3, R5, R6
(11)Enabled: C5, R3; Disabled: C2, C3, C4, C6, R2, R4, R5, R6
(12)Enabled: C4, R5; Disabled: C2, C3, C5, C6, R2, R3, R4, R6
(13)Enabled: C5, R4; Disabled: C2, C3, C4, C6, R2, R3, R5, R6
(14)Enabled: C4, R6; Disabled: C2, C3, C5, C6, R2, R3, R4, R5
(15)Enabled: C5, R5; Disabled: C2, C3, C4, C6, R2, R3, R4, R6
(16)Enabled: C6, R4; Disabled: C2, C3, C4, C5, R2, R3, R5, R6
(17)Enabled: C5, R6; Disabled: C2, C3, C4, C6, R2, R3, R4, R5
(18)Enabled: C6, R5; Disabled: C2, C3, C4, C5, R2, R3, R4, R6
(19)Enabled: C6, R6; Disabled: C2, C3, C4, C5, R2, R3, R4, R5
(d) Enable MAMA folds C2, C3, C4, C5, C6, R2, R3, R4, R5, R6 at completion of exposure
(e) Check lamp stability by checking EV and VE Collect 5 samples events (EV). Collect 5 samples Valid Events (VE)
(f) Turn off DEUTERIUM lamp
(g) Collect event counter data for detector dark count rate
Collect 5 samples X dark events
Collect 5 samples Y dark events
Collect 5 samples Z dark events
Collect 5 samples W dark events
Collect 5 samples VE dark events
Collect 5 samples EV dark events
Collect 5 samples OR dark events
(h) At completion of procedure reset SGM to nominal operating level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Unused Orbital Visibility = 3202
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Exp. 2
Exp. 3
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