17935 - Cycle 33 COS NUV MAMA Fold Distribution

Cycle: 33, Proposal Category: CAL/COS

(Availability Mode: RESTRICTED)

INVESTIGATORS

Name	*Institution*
Dr. David J. Sahnow (PI) (Contact)	**Space Telescope Science Institute**
Dr. Alan D. Welty (CoI) (Contact)	Space Telescope Science Institute
Nick Indriolo (CoI) (Contact)	Space Telescope Science Institute
Jacqueline Hernandez (CoI) (Contact)	Space Telescope Science Institute
Dr. Leonardo Dos Santos (CoI) (Contact)	Space Telescope Science Institute
Dr. Marc Rafelski (CoI) (Contact)	Space Telescope Science Institute
Dr. Svea S Hernandez (CoI) (ESA Member) (Contact)	Space Telescope Science Institute - ESA - JWST

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	DARK DEUTERIUM	COS/NUV S/C	1	06-Jun-2025 10:00:12.0	yes

1 Total Orbits Used

ABSTRACT

The performance of the MAMA microchannel plate can be monitored using a MAMA fold analysis procedure. 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 proposal executes the same steps as Cycle 32, Proposal 17617.

OBSERVING DESCRIPTION

While globally illuminating the detector with a flat field the valid event (VE) rate counter is monitored while various combinations of row and column folds are selected. The procedure is implemented using special commanding. The procedure is described below and in COS TIR 2010-01.

The proposal nomenclature for the various anode fold configurations is: C2 = Column 2, R2 = Row 2, C3 = Column 3, R3 = Row 3, C4 = Column 4, R4 = Row 4, C5 = Column 5, R5 = Row 5, C6 = Column 6, and R6 = Row 6. The fold analysis is initiated by selecting the grating/lamp combination appropriate for the test. The following steps are then executed:

Select the count rate monitor and collect 60 seconds of data;
Repeat this for each of the count rate monitors W, X, Y, Z, OR, EV, VE;
Disable all of the selectable folds (C2, C3, C4, C5, C6, R2, R3, R4, R5, R6);
Collect 60 seconds of VE with folds C2, R2 enabled, other folds disabled;
Collect 60 seconds of VE with folds C2, R3 enabled, other folds disabled;
Collect 60 seconds of VE with folds C3, R2 enabled, other folds disabled;
Collect 60 seconds of VE with folds C2, R4 enabled, other folds disabled;
Collect 60 seconds of VE with folds C3, R3 enabled, other folds disabled;
Collect 60 seconds of VE with folds C4, R2 enabled, other folds disabled;
Collect 60 seconds of VE with folds C3, R4 enabled, other folds disabled;
Collect 60 seconds of VE with folds C4, R3 enabled, other folds disabled;
Collect 60 seconds of VE with folds C3, R5 enabled, other folds disabled;
Collect 60 seconds of VE with folds C4, R4 enabled, other folds disabled;
Collect 60 seconds of VE with folds C5, R3 enabled, other folds disabled;
Collect 60 seconds of VE with folds C4, R5 enabled, other folds disabled;
Collect 60 seconds of VE with folds C5, R4 enabled, other folds disabled;
Collect 60 seconds of VE with folds C4, R6 enabled, other folds disabled;
Collect 60 seconds of VE with folds C5, R5 enabled, other folds disabled;
Collect 60 seconds of VE with folds C6, R4 enabled, other folds disabled;
Collect 60 seconds of VE with folds C5, R6 enabled, other folds disabled;
Collect 60 seconds of VE with folds C6, R5 enabled, other folds disabled;
Collect 60 seconds of VE with folds C6, R6 enabled, other folds disabled;

Enable all selectable folds (C2, C3, C4, C5, C6, R2, R3, R4, R5, R6);
Collect 60 seconds of EV and 5 samples of VE counts to measure any lamp drift;
Turn off the lamp;
Select the W count rate monitor and collect 60 seconds of data for the dark rate;
Repeat this for each of the other count rate monitors (X, Y, Z, OR, EV, and EV);
Restore the global monitor to its normal value.

Analysis of the data is performed by creating a histogram binned by the sums
of the fold numbers for columns and rows:
C2R2 = 4 folds
C2R3 + C3R2 = 5 folds
C2R4 + C3R3 + C4R2 = 6 folds
C3R4 + C4R3 = 7 folds
C3R5 + C4R4 + C5R3 = 8 folds
C4R5 + C5R4 = 9 folds
C4R6 + C5R5 + C6R4 = 10 folds
C5R6 + C6R5 = 11 folds
C6R6 = 12 folds
The sum of the 4 to 12 folds is equal to VE. The total number of events >= 4 folds is EV. The number of events greater than 12 folds is EV-VE.
Generate a plot of 4 fold/EV, 5 fold/EV through 12 fold/EV, with (EV-VE)/EV on the abscissa and with the ordinate labeled 4 fold, 5 fold... 12 fold.

Results are sent to the COS Science Team and Steve Franka of Ball Aerospace <sfranka@ball.com>.

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

Bright Object Protection Considerations. During the execution of the fold analysis some anode folds are disabled. Consequently, the OR counter does not provide a true representation of the OR count and so the Software Global Monitor (SGM) does not trigger until the enabled folds provide enough counts to the OR counter to trigger the SGM's threshold. To compensate, while the fold analysis is running the SGM threshold is reduced to 100,000 counts in a 1.0 second interval, from its nominal value of 20,000 counts in a 0.1 second interval.

This test should only be run with the COS extenal shutter closed.

Special Commanding is used in this proposal.

Visit

Proposal 17935, NUV Fold Test (01) Fri Jun 06 14:00:13 GMT 2025

Diagnostic Status: Warning

Scientific Instruments: S/C, COS/NUV

Special Requirements: BETWEEN 01-MAY-2026:00:00:00 AND 01-JUN-2026:00:00:00; PARALLEL

Comments: Schedule one NUV MAMA fold analysis visit per year

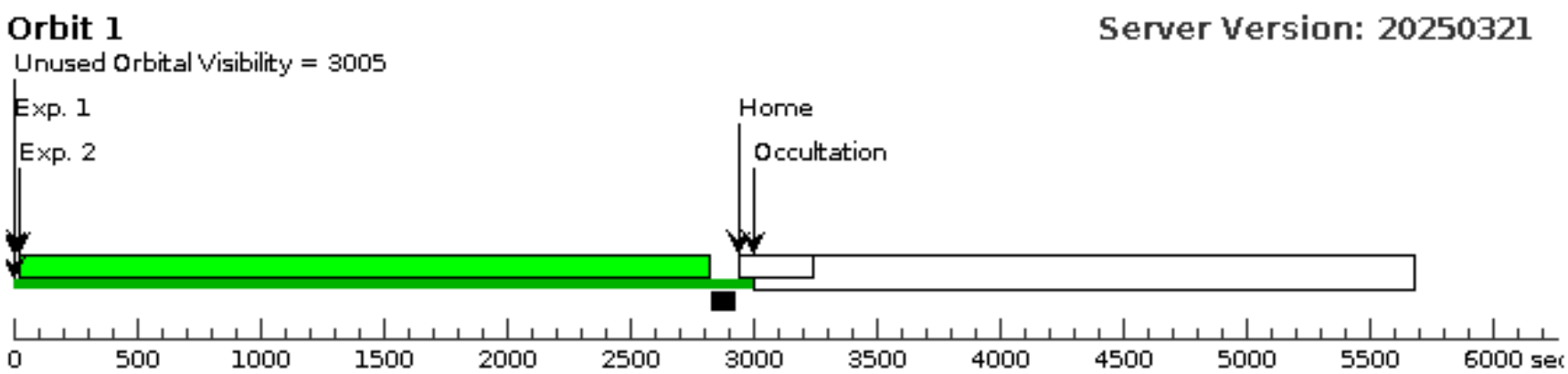
Diagnostics

(NUV Fold Test (01)) Warning (Orbit Planner): MAXIMUM DURATION EXCEEDED FOR INTERNAL OR EARTH CALIB VISIT

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	Fold Test Setup	DARK	S/C, DATA, NONE			SAA CONTOUR 32; SPEC COM INSTR ELFOLDSET	Same Alignment in NUV Fold Test (01)	20.0 Secs (20 Secs) [==>]	[1]
	Comments: Special setup for NUV Fold Analysis Test. Set the Software Global Monitor to 15,000 ORCOUNTS per sec (sufficient to allow for spike at lamp turn-on).								
2	Fold Test	DEUTERIUM	COS/NUV, TIME-TAG, FCA	G185M 1850 A	CURRENT=MEDIUM; BUFFER-TIME=2700	SPEC COM INSTR ELFOLDTST; QESIPARM TARG TYPE FOLD	Same Alignment in NUV Fold Test (01)	2315.0 Secs (2315 Secs) [==>]	[1]

Comments: The NUV Fold Analysis will be conducted during a deuterium lamp time-tag exposure. The exposure specification will ensure that the FCA aperture will be used, that the OSMs will be positioned at NCM1 FLAT and G185M/1850, and that the lamp current is set to MEDIUM. Qesiparm TARGTYPE must be specified as FOLD so that the instructions will command the proper lamp. Note that the commanding will turn the lamp off during the exposure, and the exposure commanding will issue a redundant lamp off command after the exposure.

Set Software Global monitor (SGM Threshold = 10,000, SGM Integration period = 1 sec.)
(1) Collect event data during flat field illumination. Collect 60 sec. of data for the following event types: W, X, Y, Z, OR, EV, and VE.
(2) Disable MAMA Folds: C2, C3, C4, C5, C6, R2, R3, R4, R5, R6
(3) Conduct fold analysis. Collect one minute of VE data for following 19 combinations of MAMA folds:
(a) Enabled: C2, R2; Disabled: C3, C4, C5, C6, R3, R4, R5, R6
(b) Enabled: C2, R3; Disabled: C3, C4, C5, C6, R2, R4, R5, R6
(c) Enabled: C3, R2; Disabled: C2, C4, C5, C6, R3, R4, R5, R6
(d) Enabled: C2, R4; Disabled: C3, C4, C5, C6, R2, R3, R5, R6
(e) Enabled: C3, R3; Disabled: C2, C4, C5, C6, R2, R4, R5, R6
(f) Enabled: C4, R2; Disabled: C2, C3, C5, C6, R3, R4, R5, R6
(g) Enabled: C3, R4; Disabled: C2, C4, C5, C6, R2, R3, R5, R6
(h) Enabled: C4, R3; Disabled: C2, C3, C5, C6, R2, R4, R5, R6
(i) Enabled: C3, R5; Disabled: C2, C4, C5, C6, R2, R3, R4, R6
(j) Enabled: C4, R4; Disabled: C2, C3, C5, C6, R2, R3, R5, R6
(k) Enabled: C5, R3; Disabled: C2, C3, C4, C6, R2, R4, R5, R6
(l) Enabled: C4, R5; Disabled: C2, C3, C5, C6, R2, R3, R4, R6
(m) Enabled: C5, R4; Disabled: C2, C3, C4, C6, R2, R3, R5, R6
(n) Enabled: C4, R6; Disabled: C2, C3, C5, C6, R2, R3, R4, R5
(o) Enabled: C5, R5; Disabled: C2, C3, C4, C6, R2, R3, R4, R6
(p) Enabled: C6, R4; Disabled: C2, C3, C4, C5, R2, R3, R5, R6
(q) Enabled: C5, R6; Disabled: C2, C3, C4, C6, R2, R3, R4, R5
(r) Enabled: C6, R5; Disabled: C2, C3, C4, C5, R2, R3, R4, R6
(s) Enabled: C6, R6; Disabled: C2, C3, C4, C5, R2, R3, R4, R5
(4) Enable MAMA folds C2, C3, C4, C5, C6, R2, R3, R4, R5, R6
(5) Check lamp stability by checking EV and VE: Collect 60 sec. of data for EV and VE event types.
(6) Turn off the deuterium lamp.
(7) Collect event data for detector dark count rate. Collect 60 sec. of data for the following event types: W, X, Y, Z, OR, EV, and VE.
(8) At completion of the test, reset SGM to nominal operating level.

Orbit Structure