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# Introduction

The primary objective of this document is to describe the in-flight commissioning plan of the SWA flight instrument. The proposed tests will demonstrate that the performance of the instrument meets the operational requirements. The aim is to define activities with an emphasis on performing tests that require real time contact with the spacecraft.

# Reference Documents

The documents listed below form a part of this document, to the extent specified and described herein.

|  |  |  |
| --- | --- | --- |
| Ref. | No | Title |
| NR1 | SOL-EST-IF-0050 | Solar Orbiter Experiment Interface Document Part A |
| NR2 | SOL-EST-RS-1937 | Solar Orbiter Product Assurance Requirements for Instruments |
| NR3 | SO-SWA-MSSL-SP-006 | SWA Instrument Scientific Requirements Report |
| NR4 | SO-SWA-MSSL-PL-006 | SWA Product Assurance Plan |
| NR5 | MSSL-SO-SWA-EID-B | SWA EID-B |
| NR6 | SO-SWA-LPP-LP-039\_MCP Acceptance Test | LPP MCP Acceptance and characterisation Plan |
| NR7 | SO-SWA-LPP-RP-078\_1\_1-MCP\_test\_report\_PartI | MCP detector characterisation test report |
| NR8 | SO-SWA-LPP-RP-092 EAS Det FM1 Test Report rev 1-4.pdf | LPP detector sub-system test report FM1 |
| NR9 | SO-SWA-LPP-RP-093 EAS Det FM2 Test Report rev 1-2.pdf | LPP detector sub-system test report FM2 |
| NR10 | SO-SWA-MSSL-SP-012\_EAS-DPU\_Interface\_Specification\_Issue\_2.pdf | EAS-DPU Interface Specification |
| NR11 | SO-SWA-MSSL-PL-013 | SWA EAS Calibration Plan |
| NR12 | SO-SWA-MSSL-UM-002 | SWA Instrument User manual |

# Acronym and Abbreviation List

|  |  |
| --- | --- |
| Abbreviation | Meaning |
| AD | Applicable Document |
| EAS | Electron Analyser System |
| EID | Experiment Interface Document |
| FMECA | Failure Modes, Effects and Criticality Analysis |
| ESA | European Space Agency |
| MSSL | Mullard Space Science Laboratory |
| N/A | Not Applicable |
| PA | Product Assurance |
| SWA | Solar Wind Analyser |
| TBC | To Be Confirmed |
| TBD | To Be Defined |

# General requirements

## Spacecraft Location and Plasma Environment

To be included

## Required Configuration of the Spacecraft

## Spacecraft Pointing

To be included

## Spacecraft-generated Gases

SWA commissioning, particularly involving high voltages, should not begin until sufficient time has elapsed for spacecraft outgassing to be essentially complete. It has been estimated that at least 20 days are required after launch, following assessment of data from TQCM.

No thruster firing should occur during SWA commissioning, and a sufficient time should be allowed between any thruster firing and the start of commissioning.

## Telemetry

A telemetry requirement of xxx will be required for SWA commissioning

## Required Configuration of other Instruments

It is requested that ALL other instruments are in ‘Standby’ or are not powered during SWA commissioning periods.

## Inter-Experiment Links - Service 20

The IEL inputs to SWA are from

* MAG
* RPW

Until completion of commissioning of each sensor, IEL inputs will be disabled at the DPU.

## Verification process during commissioning

### Performance Verification

Following each command in the commissioning sequence the experimenter will either confirm that the command was executed as expected or recommend that a contingency plan is executed.

### Spacecraft EGSE Real-time Housekeeping Parameters

Checking of the housekeeping parameters will be performed using the spacecraft EGSE. Visual checking of the real time housekeeping by a SWA team member viewing the ESOC video display.  **Unless otherwise stated, each command in the commissioning sequences given should be followed by inspection of the housekeeping by an SWA team member before the next command in the sequence is sent.**

### Real-time SWA Housekeeping Parameters

Visual checking of the near-real time housekeeping data by an SWA team member viewing the SWA EGSE display. Data will be acquired via tbd mechanism. The EGSE provides a range of graphical displays for the interpretation of the housekeeping and science data and will have limit checking similar to that used for ground testing. Specific parameters which will be checked in this way are listed in the detailed procedures in this document.

### Spacecraft OBDH Checking of Housekeeping Parameters

None (tbc)

### Real-time SWA Science Data

Real-time assessment of science data from the SWA sensors will be required during commissioning. Interpretation and visualisation of the data will use a dedicated EGSE, both for engineering and science assessments.

## Order of commissioning of the DPU and SWA sensors

The order of commissioning of the different SWA units is as follows (tbc):

* DPU
* HIS
* PAS
* EAS
* All SWA

# SWA Commissioning flow

The overall commissioning flow for the SWA instrument is as follows:

* In the first instance, the DPU will be commissioned to the extent that the unit is powered, service 20 response is verified and relevant tests required prior to sensor turn-on are carried out
* The next step will be to turn on the individual sensors and commission them, one at a time. This will include performing sensor functional tests, commissioning of high voltages, performing engineering mode tests as required and carrying out optimisation of instrument performance, with the emphasis on tests requiring real time contact with the spacecraft
* Following completion of commissioning of each of the three sensors, the DPU will be commissioned for operation of all three sensors and step through the suite level commissioning process. This process will
  + Demonstrate Normal Mode operation
  + Demonstrate Burst and Triggered mode operation. MAG and RPW will require to be commissioned and operational for this step
  + Perform suite level performance optimisation, particularly carrying out tests where real time contact is required
* Following demonstration of suite level operation, the instrument suite will be operated for a period of time, possibly in parallel with other instruments being commissioned.
* Finally, the Suite will participate in inter-instrument operations and interference campaigns

The rest of the section details the commissioning plan for the DPU and each individual sensor.

# SWA Redundant FSW Upload

# SWA FSW Table Patch

Patch for EAS Moments

# SWA-DPU Power On Procedure

|  |  |  |  |
| --- | --- | --- | --- |
| **Step N°** | **Commanding Flow** | **MOC Procedure** | **Checks and PASS/FAIL Criteria** |
|  | ; Switch on SWA with HPC  **TC, ZCSD11D2, PCSB0036\_:SPV** := “UNIT\_B” ; Redundant  Or  **TC, ZCSD11D2,** **PCSB0036\_:SPV** := “UNIT\_A” ; Nominal | IA-FCP-012 | ; Parameter to be checked in TM(5,1) SID= 43796 SWA\_E\_BOOT\_EVENT  **TM, YIA58452, NIA01633, EQUAL, BootEvent** |
|  | ; Wait 00:00:20 (20 seconds) | IA-FCP-0112 |  |
|  | ; Send a Service 9 synchronization packet | IA-FCP-012 |  |
|  | ; Wait 00:00:36 (36 seconds) | IA-FCP-012 |  |
|  | ; Send command to leave Boot Mode  **TC, ZIA58735** | IA-FCP-012 |  |
|  | ; Wait 00:00:08 (8 seconds) from last TC. | IA-FCP-012 |  |
|  | ; Enable S20 with a frequency of 8Hz (125 msec) | IA-FCP-012 |  |
|  | ; Wait 00:00:01 (1 second) | IA-FCP-012 |  |
|  | ; Send a Service 9 synchronization packet | IA-FCP-012 | ; Reception of:  **TM, YIA58452** ;TM(5,1) SID=43796 SWA\_E\_BOOT\_EVENT  ; Parameter to be checked  **TM, YIA58452, NIA01633, EQUAL, BootEvent** |
|  | ; Wait 00:01:00 (60 seconds) | IA-FCP-012 |  |
|  | ; Perform the SpW connection test  **TC, ZIA58001** | IA-FCP-012 | ; Reception of:  **TM,YIA58061 ;** TM(17,2) SID=0 SWA\_TM\_CT\_REP |
|  | ; Check telemetry after Time Synch | IA-FCP-012 | ; Reception of:  **TM, YIA58200**  Coarse Time = 0 |
|  | ; Check sensor currents | IA-FCP-030 | ; Parameter to be checked  **TM, YIA58200,NIA00837, LIMIT, 100,200** ; Eng DCDC current  **TM,,NIA00833, LIMIT, 0,10**; Eng EAS1 current  **TM,,NIA00832, LIMIT, 0,10**; Eng EAS2 current  **TM,,NIA00835, LIMIT, 0,10**; Eng PAS current  **TM,,NIA00834, LIMIT, 0,10**; Eng HIS current  ; Time packet is now synchronised with onboard time |
|  | ; Switch DPU into OPS mode  **TC, ZIA58703** | IA-FCP-030 | ; Parameter to be checked  **TM, YIA58445, NIA01633, EQUAL, DpuOpsState** |
|  | ; Wait 00:00:40 (40 seconds) | IA-FCP-030 |  |
|  | ; Check Flight Software | IA-FCP-030 | ; Parameter to be noted  **TM, YIA58902,NIA01529** ; FSW\_NOMINAL\_VERSION  **TM, YIA58902,NIA01530** ; FSW\_NOMINAL\_SUBVERSION  **TM, YIA58902,NIA01531** ; FSW\_NOMINAL\_CRC |
|  | ; Adjust the HK rate  **TC, ZIA58052, PIA58050, EQUAL, DPU\_HK**  **TC, ZIA58052, PIA58052, EQUAL, 10.0** (10 seconds) |  | ; Wait 40 seconds |

# DPU Commissioning Procedure

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Step N°** | | **FFT Commanding Flow** | **MOC Procedure** | **Checks and PASS/FAIL Criteria** |
| **; DPU HK Packets Tests** | | | | |
|  | ; Switch DPU TC count HK on  **TC, ZIA58050, PIA58050, EQUAL, DPU\_TC\_CNT\_HK** | |  | ; Reception of at least one:  **TM,YIA58204 ;** TM(3,26) SID=4 SWA\_TM\_DPU\_RECEIVED\_TC\_CNT\_HK |
|  | ; Switch DPU TC count HK off  **TC, ZIA58051, PIA58050, EQUAL, DPU\_TC\_CNT\_HK** | |  |  |
|  | ; Switch DPU validity parameters HK on  **TC, ZIA58050, PIA58050, EQUAL, DPU\_VALID\_PAR\_HK** | |  | ; Reception of at least one:  **TM,YIA58205 ;** TM(3,26) SID=5 SWA\_TM\_DPU\_VALIDITY\_PARAM\_HK |
|  | ; Switch DPU validity parameters HK off  **TC, ZIA58051, PIA58050, EQUAL, DPU\_VALID\_PAR\_HK** | |  |  |
|  | ; Switch DPU diagnostic parameters HK on  **TC, ZIA58050, PIA58050, EQUAL, DPU\_HW\_DIAG\_HK** | |  | ; Reception of at least one:  **TM,YIA58206 ;** TM(3,26) SID=6 SWA\_TM\_DPU\_HW\_DIAGN\_PARAM\_HK |
|  | ; Switch DPU diagnostic parameters HK off  **TC, ZIA58051, PIA58050, EQUAL, DPU\_HW\_DIAG\_HK** | |  |  |
|  | ; Switch DPU maximum duration HK on  **TC, ZIA58050, PIA58050, EQUAL, DPU\_MAX\_DUR\_HK** | |  | ; Reception of at least one:  **TM,YIA58207 ;** TM(3,26) SID=7 SWA\_TM\_MAX\_DURATION\_SSID\_HK |
|  | ; Switch DPU maximum manager duration HK off  **TC, ZIA58051, PIA58050, EQUAL, DPU\_MAX\_DUR\_HK** | |  |  |
|  | ; Switch DPU FDIR parameters HK on  **TC, ZIA58050, PIA58050, EQUAL, DPU\_FDIR\_ST\_HK** | |  | ; Reception of at least one:  **TM,YIA58208 ;** TM(3,26) SID=8 SWA\_TM\_FDIR\_STATUS\_PARAMS\_HK |
|  | ; Switch DPU FDIR parameters HK off  **TC, ZIA58051, PIA58050, EQUAL, DPU\_FDIR\_ST\_HK** | |  |  |
|  | ; Switch DPU derived HK on  **TC, ZIA58050, PIA58050, EQUAL, DPU\_FDIR\_MON\_HK** | |  | ; Reception of at least one:  **TM,YIA58209 ;** TM(3,26) SID=9 SWA\_TM\_DPU\_FDIR\_MONITOR\_PARAMS\_HK |
|  | ; Switch DPU derived HK off  **TC, ZIA58051, PIA58050, EQUAL, DPU\_FDIR\_MON\_HK** | |  |  |
|  | ; Switch DPU derived HK on  **TC, ZIA58050, PIA58050, EQUAL, DPU\_MON\_DER\_HK** | |  | ; Reception of at least one:  **TM,YIA58210 ;** TM(3,26) SID=10 SWA\_TM\_DPU\_DERIVED\_PARAMS\_HK |
|  | ; Switch DPU derived HK off  **TC, ZIA58051, PIA58050, EQUAL, DPU\_MON\_DER\_HK** | |  |  |
|  | ; Switch DPU TM counters HK on  **TC, ZIA58050, PIA58050, EQUAL, DPU\_TM\_CNT** | |  | ; Reception of at least one:  **TM,YIA58214 ;** TM(3,26) SID=12 SWA\_DPU\_TM\_CNT\_HK |
|  | ; Switch DPU TM Counters HK off  **TC, ZIA58050, PIA58050, EQUAL, DPU\_TM\_CNT** | |  |  |
|  | ; Switch DPU error counters HK on  **TC, ZIA58050, PIA58050, EQUAL, DPU\_ERR\_CNT** | |  | ; Reception of at least one:  **TM,YIA58215 ;** TM(3,26) SID=13 SWA\_DPU\_ERR\_CNT\_HK |
|  | ; Switch DPU error counters HK off  **TC, ZIA58051, PIA58050, EQUAL, DPU\_ERR\_CNT** | |  |  |
| **; DPU Memory Tests** | | | | |
|  | | ; Dump RAM  **TC, ZIA58054, PIA58056, EQUAL, DPU\_RAM**  **TC, ZIA58054, PIA60330, EQUAL, 0x40 00 00 00**  **TC, ZIA58054, PIA60329, EQUAL, 10** |  | ; Parameters to be checked  **TM, YIA58164, NIA01547#1, EQUAL, DPU\_RAM** |
|  | | ; Dump MRAM  **TC, ZIA58054, PIA58056, EQUAL, DPU\_MRAM1**  **TC, ZIA58054, PIA60330, EQUAL, 0x10 00 00 00**  **TC, ZIA58054, PIA60329, EQUAL, 10** |  | ; Parameters to be checked  **TM, YIA58173 NIA01547#1, EQUAL, DPU\_MRAM1** |
|  | | ; Dump PROM  **TC, ZIA58054, PIA58056, EQUAL, DPU\_PROM**  **TC, ZIA58054, PIA60330, EQUAL, 0x00 00 00 00**  **TC, ZIA58054, PIA60329, EQUAL, 10** |  | ; Parameters to be checked  **TM, YIA58174 NIA01547#1, EQUAL, DPU\_PROM** |
|  | | ; Dump MRAM2  **TC, ZIA58054, PIA58056, EQUAL, DPU\_MRAM2**  **TC, ZIA58054, PIA60330, EQUAL, 0x10 00 00 00**  **TC, ZIA58054, PIA60329, EQUAL, 10** |  | ; Parameters to be checked  **TM, YIA58179 NIA01547#1, EQUAL, DPU\_MRAM2** |
|  | | ; Write to RAM  **TC, ZIA58053, PIA58056, EQUAL, DPU\_RAM**  **TC, ZIA58053, PIA60330, EQUAL, 0x40 70 00 00**  **TC, ZIA58053, PIA60329, EQUAL, 4**  **TC, ZIA58053, PIA60432, EQUAL, 0xAB**  **TC, ZIA58053, PIA60432, EQUAL, 0xCD**  **TC, ZIA58053, PIA60432, EQUAL, 0xEF**  **TC, ZIA58053, PIA60432, EQUAL, 0x01** |  |  |
|  | | ; Check RAM  **TC, ZIA58055, PIA58056, EQUAL, DPU\_RAM**  **TC, ZIA58055, PIA60330, EQUAL, 0x40 70 00 00**  **TC, ZIA58055, PIA60329, EQUAL, 4** |  | ; Parameters to be checked  **TM, YIA58165, NIA01547#1, EQUAL, DPU\_RAM**  **TM, YIA58165, NIA01550, EQUAL, 1186** |
|  | | ; Check MRAM1  **TC, ZIA58055, PIA58056, EQUAL, DPU\_MRAM1**  **TC, ZIA58055, PIA60330, EQUAL, 0x10 1E 10 00**  **TC, ZIA58055, PIA60329, EQUAL, 52** |  | ; Parameters to be checked  **TM, YIA58165, NIA01547#1, EQUAL, DPU\_MRAM1**  **TM, YIA58165, NIA01550, EQUAL, 16815 (Dependant on SW version)** |
|  | | ; Check PROM  **TC, ZIA58055, PIA58056, EQUAL, DPU\_PROM**  **TC, ZIA58055, PIA60330, EQUAL, 0x00 00 00 00**  **TC, ZIA58055, PIA60329, EQUAL, 100** |  | ; Parameters to be checked  **TM, YIA58165, NIA01547#1, EQUAL, DPU\_PROM**  **TM, YIA58165, NIA01550, EQUAL, 22271** |
|  | | ; Check MRAM2  **TC, ZIA58055, PIA58056, EQUAL, DPU\_MRAM2**  **TC, ZIA58055, PIA60330, EQUAL, 0x10 1E 10 00**  **TC, ZIA58055, PIA60329, EQUAL, 52** |  | ; Check the contents of the  **TM, YIA58165, NIA01547#1, EQUAL, DPU\_MRAM2**  **TM, YIA58165, NIA01550, EQUAL, 16815 (Dependant on SW version)** |
|  | | ; Check not valid address  **TC, ZIA58055, PIA58056, EQUAL, DPU\_RAM**  **TC, ZIA58055, PIA60330, EQUAL, 0x00 00 00 00**  **TC, ZIA58055, PIA60329, EQUAL, 16000** |  | ; Reception of:  **TM,YIA58152 ;** TM(1,8) SWA\_CMD\_INVALID\_START\_ADDR |
|  | | ; Check not valid length  **TC, ZIA58055, PIA58056, EQUAL, DPU\_RAM**  **TC, ZIA58055, PIA60330, EQUAL, 0x40 00 00 00**  **TC, ZIA58055, PIA60329, EQUAL, 0x80 00 00** |  | ; Reception of:  **TM,YIA58153 ;** TM(1,8) SWA\_CMD\_INVALID\_LENGTH |
|  | | ; Check dump abort while not dumping  **TC, ZIA58056** |  | ; Reception of:  **TM,YIA58155 ;** TM(1,8) SWA\_CMD\_NO\_DUMP\_ONGOING |

# HIS Commissioning Procedure

# PAS Commissioning Procedure

|  |  |  |  |
| --- | --- | --- | --- |
| **Step No.** | **Commanding Flow** | **MOC Procedure** | **Checks and PASS/FAIL Criteria** |
|  | ; PAS ON, wait 1min |  |  |
|  |  |  | ; Check PAS consumption by DPU HKs. |
|  | ; Load Sequencer and start it |  |  |
|  |  |  | ; Get the first HK on the ground, analyse the HK contents. |
|  | ; Perform a ramp up the Main HV in 5 steps waiting each time the HV stabilization in HKs. |  |  |
|  |  |  |  |
|  | Start Sequencer “Static Scheme” with lows energy fast mode (up to 3keV energy) with N – 12000 (NO CEM ON/OFF). DPU will filter each 4th sampling |  |  |
|  |  |  |  |
|  | Perform a ramp up CEMs HV with 200 and 100V steps waiting each time the HKs and HV stabilization. Take a decision to move on every step. Get and analyse the science data run-time. Stop when Solar Wind data are observed. |  |  |
|  |  |  |  |
|  |  |  |  |
|  | ; Take a decision about the the PAS health and the CEMs working point. |  |  |
|  | ; OFF PAS. Set PAS working point to DPU |  |  |
|  | ; Perform a standard procedure PAS ON and go to a normal mode for one hour. |  |  |
|  |  |  |  |

# EAS Commissioning Procedure

## EAS1 Power Up

|  |  |  |  |
| --- | --- | --- | --- |
| **Step No.** | **Commanding Flow** | **MOC Procedure** | **Checks and PASS/FAIL Criteria** |
|  | ; Log spacecraft pressure readings |  | Is pressure better than **XX**?  (Yes) Proceed  (No) Consult commissioning team lead |
|  | ; Log EAS 1 temperature |  | Is EAS 1 temperature less than **XX**?  (Yes) Proceed  (No) Consult commissioning team lead |
|  | ; Lower the EAS1 MCP voltage to zero before powering on  **TC,ZIA58706, PIA60133,EQUAL,1**  **TC,ZIA58706, PIA60136,EQUAL,0x1003**  **TC,ZIA58706, PIA60135,EQUAL,6**  **TC,ZIA58706, PIA60134,EQUAL,0x00**  **TC,ZIA58706, PIA60134,EQUAL,0x7F**  **TC,ZIA58706, PIA60134,EQUAL,0xFF**  **TC,ZIA58706, PIA60134,EQUAL,0x00**  **TC,ZIA58706, PIA60134,EQUAL,0x00**  **TC,ZIA58706, PIA60134,EQUAL,0x00** |  |  |
|  | ; Accept the new values  **TC, ZIA58708** |  |  |
|  | ; Lower the EAS1 HEM voltage to zero before powering on  **TC,ZIA58706, PIA60133,EQUAL,1**  **TC,ZIA58706, PIA60136,EQUAL,0x1003**  **TC,ZIA58706, PIA60135,EQUAL,6**  **TC,ZIA58706, PIA60134,EQUAL,0xDE**  **TC,ZIA58706, PIA60134,EQUAL,0xB8**  **TC,ZIA58706, PIA60134,EQUAL,0x51**  **TC,ZIA58706, PIA60134,EQUAL,0x00**  **TC,ZIA58706, PIA60134,EQUAL,0x00**  **TC,ZIA58706, PIA60134,EQUAL,0x00** |  |  |
|  | ; Accept the new values  **TC, ZIA58708** |  |  |
|  | ; Power on EAS1 on  **TC, ZIA58760** | IA-FCP-014 | ; Check EAS1 current in DPU HK  **TM,YIA58200, NIA00833, LIMIT, 60,150** |
|  | ; Enable EAS1 HK  **TC, ZIA58050, PIA58050, EQUAL, EAS1\_SENS\_HK** | IA-FCP-040 |  |
|  | ; Run the EAS1 post transition macro  **TC, ZIA58934,PIA60739,EQUAL,POST** | IA-FCP-040 |  |
|  | ; Run the EAS1 idle transition macro  **TC, ZIA58753** | IA-FCP-040 |  |
|  | ; Request EAS1 HK packet  **TC, ZIA58782** | IA-FCP-040 | ; Check EAS1 HK parameters before continuing  **TM,YIA58201,NIA00903, LIMIT,2.5, 4.0** ; EAS1\_E33VD  **TM,,NIA00905, LIMIT,1.0, 2.0** ; EAS1\_E15VD  **TM,,NIA00907, LIMIT,280, 310** ; EAS1\_EOPTEMP  **TM,,NIA00909, LIMIT,1500, 2500** ; EAS1\_EHVOUTV  **TM,,NIA00910, LIMIT,0, 1** ; EAS1\_EMCPV  **TM,,NIA00911, LIMIT,0, 1** ; EAS1\_EGRIDV  **TM,,NIA00912, LIMIT,2, 10** ; EAS1\_E10VAPOSV  **TM,,NIA00914, LIMIT,25, 30** ; EAS1\_E28POSV  **TM,,NIA00915, LIMIT,280, 310** ; EAS1\_EHVGENTHER  **TM,,NIA00916, LIMIT,280, 310** ; EAS1\_EHVMODTHER |
| **CONSULT SWA OPERATIVE FOR GO AHEAD** | | | |
|  | ; Check the EAS1 HEM is zero  **TC, ZIA58785, PIA58061,EQUAL, CmdReadNewMcpHv** | IA-FCP-040 | ; Check the HEM HV is zero  **TM, YIA58904, NIA01503#1, EQUAL, 0x0** ; EAS1 HV Max  **TM, YIA58904, NIA01503#2, EQUAL, 0x0** ; EAS1 HV Max |
|  | ; Run the EAS1 run transition macro  **TC, ZIA58758** | IA-FCP-040 |  |
|  | ; Wait 00:00:20 (20 seconds) | IA-FCP-040 | ; Check EAS1 MCP and Grid voltage in EAS1 HK  **TM, YIA58201,NIA00910, LIMIT,0, 1** ; EAS1\_EMCPV  **TM, YIA58201,NIA00911, LIMIT,-10, 0** ; EAS1\_EGRIDV |

## EAS2 Power Up

|  |  |  |  |
| --- | --- | --- | --- |
|  | ; Log EAS 2 temperature |  | Is EAS 2 temperature less than **XX**?  (Yes) Proceed  (No) Consult commissioning team lead |
|  | ; Lower the EAS2 MCP voltage to zero before powering on  **TC,ZIA58706, PIA60133,EQUAL,1**  **TC,ZIA58706, PIA60136,EQUAL,0x2003**  **TC,ZIA58706, PIA60135,EQUAL,6**  **TC,ZIA58706, PIA60134,EQUAL,0x00**  **TC,ZIA58706, PIA60134,EQUAL,0x7F**  **TC,ZIA58706, PIA60134,EQUAL,0xFF**  **TC,ZIA58706, PIA60134,EQUAL,0x00**  **TC,ZIA58706, PIA60134,EQUAL,0x00**  **TC,ZIA58706, PIA60134,EQUAL,0x00** |  |  |
|  | ; Accept the new values  **TC, ZIA58708** |  |  |
|  | ; Lower the EAS2 HEM voltage to zero before powering on  **TC,ZIA58706, PIA60133,EQUAL,1**  **TC,ZIA58706, PIA60136,EQUAL,0x2003**  **TC,ZIA58706, PIA60135,EQUAL,6**  **TC,ZIA58706, PIA60134,EQUAL,0xDE**  **TC,ZIA58706, PIA60134,EQUAL,0xB8**  **TC,ZIA58706, PIA60134,EQUAL,0x51**  **TC,ZIA58706, PIA60134,EQUAL,0x00**  **TC,ZIA58706, PIA60134,EQUAL,0x00**  **TC,ZIA58706, PIA60134,EQUAL,0x00** |  |  |
|  | ; Accept the new values  **TC, ZIA58708** |  |  |
|  | ; Switch EAS2 on  **TC, ZIA58808** | IA-FCP-015 | ; Check EAS2 current in DPU HK  **TM,YIA58200, NIA00832, LIMIT, 60,150** |
|  | ; Enable EAS2 HK  **TC, ZIA58050, PIA58050, EQUAL, EAS2\_SENS\_HK** | IA-FCP-050 |  |
|  | ; Run the EAS2 post transition macro  **TC, ZIA58936,PIA60740,EQUAL,POST** | IA-FCP-050 |  |
|  | ; Run the EAS2 idle transition macro  **TC, ZIA58801** | IA-FCP-050 |  |
|  | ; Wait 00:00:30 (30 seconds) to allow HK to refresh | IA-FCP-050 |  |
|  | ; Request EAS2 HK packet  **TC, ZIA58830** | IA-FCP-050 | ; Check EAS2 HK parameters before continuing  **TM,YIA58202,NIA10903, LIMIT,2.5, 4.0** ; EAS2\_E33VD  **TM,,NIA10905, LIMIT,1.0, 2.0** ; EAS2\_E15VD  **TM,,NIA10907, LIMIT,280, 310** ; EAS2\_EOPTEMP  **TM,,NIA10909, LIMIT,1500, 2500** ; EAS2\_EHVOUTV  **TM,,NIA10910, LIMIT,0, 1** ; EAS2\_EMCPV  **TM,,NIA10911, LIMIT,0, 1** ; EAS2\_EGRIDV  **TM,,NIA10912, LIMIT,2, 10** ; EAS2\_E10VAPOSV  **TM,,NIA10914, LIMIT,25, 30** ; EAS2\_E28POSV  **TM,,NIA10915, LIMIT,280, 310** ; EAS2\_EHVGENTHER  **TM,,NIA10916, LIMIT,280, 310** ; EAS2\_EHVMODTHER |
| **CONSULT SWA OPERATIVE FOR GO AHEAD** | | | |
|  | ; Check the HV Max is low  **TC, ZIA58833, PIA58061,EQUAL, CmdReadHemHigVol** | IA-FCP-050 | ; Check the HV Max is low  **TM, YIA58905, NIA01503#1, EQUAL, 0x0** ; EAS2 HV Max  **TM, YIA58905, NIA01503#2, EQUAL, 0x0** ; EAS2 HV Max |
|  | ; Run the EAS2 run transition macro  **TC, ZIA58806** | IA-FCP-050 |  |
|  | ; Wait 00:00:20 (20 seconds) | IA-FCP-050 | ; Check MCP and Grid voltages in EAS2 HK  **TM, YIA58202,NIA10910, LIMIT,0, 1** ; EAS2\_EMCPV  **TM, YIA58202,NIA10911, LIMIT,0, 1** ; EAS2\_EGRIDV |

## EAS Heaters

CAN WE DO THESE TOGETHER?

CAN WE DO THIS AFTER RUN MACRO?

|  |  |  |  |
| --- | --- | --- | --- |
|  | ; Set the master control register for manual heater on EAS1  **TC, ZIA58776, PIA60423, EQUAL, 0x00**  **TC,, PIA60424, EQUAL, 0x40**  **TC,, PIA60425, EQUAL, 0x60** |  |  |
|  | ; Set the master control register for manual heater on EAS2  **TC, ZIA58824, PIA60423, EQUAL, 0x00**  **TC,, PIA60424, EQUAL, 0x40**  **TC,, PIA60425, EQUAL, 0x60** |  |  |
|  | ; Turn the manual heater on for EAS1 FM  **TC, ZIA58757, PIA60773, EQUAL, 0x00**  **TC,, PIA60774, EQUAL, 0x01**  **TC,, PIA60775, EQUAL, 0x60** |  |  |
|  | ; Turn the manual heater on for EAS2  **TC, ZIA58805, PIA60773, EQUAL, 0x00**  **TC,, PIA60774, EQUAL, 0x01**  **TC,, PIA60775, EQUAL, 0x60** |  |  |
|  | ; Wait 00:00:60 (60 seconds) |  | ; After 60 seconds record the EAS1&2 current in the DPU HK and the EAS1&2 temperatures in the HK  **TM, YIA58200, NIA00833, LIMIT, NO, NO;** PCDM\_HK\_IMON\_EAS1  **TM,YIA58201, NIA10907, LIMIT, NO, NO ;** EAS1\_EOPTEMP  **TM, YIA58200, NIA00832, LIMIT, NO, NO ;** PCDM\_HK\_IMON\_EAS2  **TM,YIA58202, NIA10907, LIMIT, NO, NO ;** EAS2\_EOPTEMP |
|  | TURN MANUAL HEATERS OFF ??????? |  |  |

## EAS1 Electronics Commission

**The HEM and MCP is ramped to zero at this point. Do we need to ramp them up?**

| **Step No.** | **Commanding Flow** | **MOC Procedure** | **Checks and PASS/FAIL Criteria** |
| --- | --- | --- | --- |
|  | ; Perform Eng mode 9 on EAS1 (FPGA SELF TEST)  **TC, ZIA58795, PIA60165, EQUAL, 5** ; Acq time |  | ; Receive:  **1 x TM, YIA589460** ; TM(21,3) SSID=17 SWA\_TM\_SCI\_EAS1\_ENG\_2-5-6-8-9\_RAW\_START  **5 x TM, YIA58942** ; TM(21,3) SSID=18 SWA\_TM\_SCI\_EAS1\_ENG\_2-5-6-8-9\_RAW\_FIRST  **85 x TM, YIA58944** ; TM(21,6) SSID=19 SWA\_TM\_SCI\_EAS1\_ENG\_2-5-6-8-9\_RAW\_DATA  **ASSESS DATA TO CONTINUE** |
|  | ; Run post-eng mode macro on EAS1  **TC, ZIA58934,PIA60739,EQUAL,POST\_ENG** |  |  |
|  | ; Perform Eng mode 7 on EAS1 (Modulator sweep test)  **TC, ZIA58793, PIA60165** |  | ; Receive:  **300 x TM, YIA58917** ; TM(21,3) SSID=13 SWA\_TM\_SCI\_EAS1\_ENG\_7  **ASSESS DATA TO CONTINUE** |
|  | ; Run post-eng mode macro on EAS1  **TC, ZIA58934,PIA60739,EQUAL,POST\_ENG** |  |  |
|  | ; Switch to Eng mode 5 on EAS1 (Threshold Sweep)  **TC, ZIA58791, PIA60454, EQUAL, 0xFF** ; PA1 stim  **TC, ZIA58791, PIA60455, EQUAL, 0xFF** ; PA2 stim  **TC, ZIA58791, PIA60040, EQUAL, 0x724** ; Start Thresh  **TC, ZIA58791, PIA60039, EQUAL, 0x477** ; End Thresh  **TC, ZIA58791, PIA60041, EQUAL, 0x76** ; Thresh step  **TC, ZIA58791, PIA60106, EQUAL, 0x0** ; MCP value  **TC, ZIA58791, PIA60171, EQUAL, 0xA** ; MCP wait  **TC, ZIA58791, PIA60165, EQUAL, 2** ; Acq time |  | ; Receive:  **1 x TM, YIA58940** ; TM(21,3) SSID=17 SWA\_TM\_SCI\_EAS1\_ENG\_2-5-6-8-9\_RAW\_START  **TM, YIA58942** ; TM(21,3) SSID=18 SWA\_TM\_SCI\_EAS1\_ENG\_2-5-6-8-9\_RAW\_FIRST  **TM, YIA58944** ; TM(21,6) SSID=19 SWA\_TM\_SCI\_EAS1\_ENG\_2-5-6-8-9\_RAW\_DATA  **ASSESS DATA TO CONTINUE** |
|  | ; Run post-eng mode macro on EAS1  **TC, ZIA58934,PIA60739,EQUAL,POST\_ENG** |  |  |
|  | ; Switch to Eng mode 6 on EAS1 (Stim Test)  **TC, ZIA58792, PIA60457, EQUAL, 0xFF** ; Stim high  **TC, ZIA58792, PIA60458, EQUAL, 0x32** ; Stim low  **TC, ZIA58792, PIA60459, EQUAL, 0x29** ; Stim step  **TC, ZIA58792, PIA60106, EQUAL, 0x0** ; MCP value  **TC, ZIA58792, PIA60171, EQUAL, 0xA** ; MCP wait  **TC, ZIA58792, PIA60165, EQUAL, 2** ; Acq time |  | ; Receive:  **1 x TM, YIA58940** ; TM(21,3) SSID=17 SWA\_TM\_SCI\_EAS1\_ENG\_2-5-6-8-9\_RAW\_START  **TM, YIA58942** ; TM(21,3) SSID=18 SWA\_TM\_SCI\_EAS1\_ENG\_2-5-6-8-9\_RAW\_FIRST  **TM, YIA58944** ; TM(21,6) SSID=19 SWA\_TM\_SCI\_EAS1\_ENG\_2-5-6-8-9\_RAW\_DATA  **ASSESS DATA TO CONTINUE** |
|  | ; Run post-eng mode macro on EAS1  **TC, ZIA58934,PIA60739,EQUAL,POST\_ENG** |  |  |

## EAS1 Electronics Commission

**The HEM and MCP is ramped to zero at this point. Do we need to ramp them up?**

| **Step No.** | **Commanding Flow** | **MOC Procedure** | **Checks and PASS/FAIL Criteria** |
| --- | --- | --- | --- |
|  | ; Perform Eng mode 9 on EAS1 (FPGA SELF TEST)  **TC, ZIA58795, PIA60165, EQUAL, 5** ; Acq time |  | ; Receive:  **1 x TM, YIA589460** ; TM(21,3) SSID=17 SWA\_TM\_SCI\_EAS1\_ENG\_2-5-6-8-9\_RAW\_START  **5 x TM, YIA58942** ; TM(21,3) SSID=18 SWA\_TM\_SCI\_EAS1\_ENG\_2-5-6-8-9\_RAW\_FIRST  **85 x TM, YIA58944** ; TM(21,6) SSID=19 SWA\_TM\_SCI\_EAS1\_ENG\_2-5-6-8-9\_RAW\_DATA  **ASSESS DATA TO CONTINUE** |
|  | ; Run post-eng mode macro on EAS1  **TC, ZIA58934,PIA60739,EQUAL,POST\_ENG** |  |  |
|  | ; Perform Eng mode 7 on EAS1 (Modulator sweep test)  **TC, ZIA58793, PIA60165** |  | ; Receive:  **300 x TM, YIA58917** ; TM(21,3) SSID=13 SWA\_TM\_SCI\_EAS1\_ENG\_7  **ASSESS DATA TO CONTINUE** |
|  | ; Run post-eng mode macro on EAS1  **TC, ZIA58934,PIA60739,EQUAL,POST\_ENG** |  |  |
|  | ; Switch to Eng mode 5 on EAS1 (Threshold Sweep)  **TC, ZIA58791, PIA60454, EQUAL, 0xFF** ; PA1 stim  **TC, ZIA58791, PIA60455, EQUAL, 0xFF** ; PA2 stim  **TC, ZIA58791, PIA60040, EQUAL, 0x724** ; Start Thresh  **TC, ZIA58791, PIA60039, EQUAL, 0x477** ; End Thresh  **TC, ZIA58791, PIA60041, EQUAL, 0x76** ; Thresh step  **TC, ZIA58791, PIA60106, EQUAL, 0x0** ; MCP value  **TC, ZIA58791, PIA60171, EQUAL, 0xA** ; MCP wait  **TC, ZIA58791, PIA60165, EQUAL, 2** ; Acq time |  | ; Receive:  **1 x TM, YIA58940** ; TM(21,3) SSID=17 SWA\_TM\_SCI\_EAS1\_ENG\_2-5-6-8-9\_RAW\_START  **TM, YIA58942** ; TM(21,3) SSID=18 SWA\_TM\_SCI\_EAS1\_ENG\_2-5-6-8-9\_RAW\_FIRST  **TM, YIA58944** ; TM(21,6) SSID=19 SWA\_TM\_SCI\_EAS1\_ENG\_2-5-6-8-9\_RAW\_DATA  **ASSESS DATA TO CONTINUE** |
|  | ; Run post-eng mode macro on EAS1  **TC, ZIA58934,PIA60739,EQUAL,POST\_ENG** |  |  |
|  | ; Switch to Eng mode 6 on EAS1 (Stim Test)  **TC, ZIA58792, PIA60457, EQUAL, 0xFF** ; Stim high  **TC, ZIA58792, PIA60458, EQUAL, 0x32** ; Stim low  **TC, ZIA58792, PIA60459, EQUAL, 0x29** ; Stim step  **TC, ZIA58792, PIA60106, EQUAL, 0x0** ; MCP value  **TC, ZIA58792, PIA60171, EQUAL, 0xA** ; MCP wait  **TC, ZIA58792, PIA60165, EQUAL, 2** ; Acq time |  | ; Receive:  **1 x TM, YIA58940** ; TM(21,3) SSID=17 SWA\_TM\_SCI\_EAS1\_ENG\_2-5-6-8-9\_RAW\_START  **TM, YIA58942** ; TM(21,3) SSID=18 SWA\_TM\_SCI\_EAS1\_ENG\_2-5-6-8-9\_RAW\_FIRST  **TM, YIA58944** ; TM(21,6) SSID=19 SWA\_TM\_SCI\_EAS1\_ENG\_2-5-6-8-9\_RAW\_DATA  **ASSESS DATA TO CONTINUE** |
|  | ; Run post-eng mode macro on EAS1  **TC, ZIA58934,PIA60739,EQUAL,POST\_ENG** |  |  |

## EAS1 MCP Commission

| **Step No.** | **Commanding Flow** | **MOC Procedure** | **Checks and PASS/FAIL Criteria** |
| --- | --- | --- | --- |
|  | ; Set EAS1 hemisphere voltage max to 800V  **TC, ZIA58767, PIA60441, EQUAL, 0x02**  **TC, ZIA58767, PIA60442, EQUAL, 0x9C**  **TC, ZIA58767, PIA60443, EQUAL, 0x80** |  |  |
|  | ; Set EAS1 hemisphere voltage ratio to 1  **TC, ZIA58766, PIA60469, EQUAL, 0x00**  **TC, ZIA58766, PIA60470, EQUAL, 0x00**  **TC, ZIA58766, PIA60471, EQUAL, 0x01** |  |  |
|  | ; Set EAS1 deflector ratios to zero  **TC, ZIA58765, PIA60474, EQUAL, 0x00**  **TC,, PIA60475, EQUAL, 0x00**  **TC,, PIA60578, EQUAL, 0x00**  **TC,, PIA60589, EQUAL, 0x00**  **TC,, PIA60600, EQUAL, 0x00**  **TC,, PIA60611, EQUAL, 0x00**  **TC,, PIA60622, EQUAL, 0x00**  **TC,, PIA60633, EQUAL, 0x00**  **TC,, PIA60644, EQUAL, 0x00**  **TC,, PIA60655, EQUAL, 0x00**  **TC,, PIA60476, EQUAL, 0x00**  **TC,, PIA60487, EQUAL, 0x00**  **TC,, PIA60498, EQUAL, 0x00**  **TC,, PIA60509, EQUAL, 0x00**  **TC,, PIA60520, EQUAL, 0x00**  **TC,, PIA60531, EQUAL, 0x00**  **TC,, PIA60542, EQUAL, 0x00**  **TC,, PIA60553, EQUAL, 0x00**  **TC,, PIA60564, EQUAL, 0x00**  **TC,, PIA60575, EQUAL, 0x00**  **TC,, PIA60579, EQUAL, 0x00**  **TC,, PIA60580, EQUAL, 0x00**  **TC,, PIA60581, EQUAL, 0x00**  **TC,, PIA60582, EQUAL, 0x00**  **TC,, PIA60583, EQUAL, 0x00**  **TC,, PIA60584, EQUAL, 0x00**  **TC,, PIA60585, EQUAL, 0x00**  **TC,, PIA60586, EQUAL, 0x00**  **TC,, PIA60587, EQUAL, 0x00**  **TC,, PIA60588, EQUAL, 0x00**  **TC,, PIA60590, EQUAL, 0x00**  **TC,, PIA60591, EQUAL, 0x00**  **TC,, PIA60592, EQUAL, 0x00**  **TC,, PIA60593, EQUAL, 0x00**  **TC,, PIA60594, EQUAL, 0x00**  **TC,, PIA60595, EQUAL, 0x00**  **TC,, PIA60596, EQUAL, 0x00**  **TC,, PIA60597, EQUAL, 0x00**  **TC,, PIA60598, EQUAL, 0x00**  **TC,, PIA60599, EQUAL, 0x00**  **TC,, PIA60601, EQUAL, 0x00**  **TC,, PIA60602, EQUAL, 0x00**  **TC,, PIA60603, EQUAL, 0x00**  **TC,, PIA60604, EQUAL, 0x00**  **TC,, PIA60605, EQUAL, 0x00**  **TC,, PIA60606, EQUAL, 0x00**  **TC,, PIA60607, EQUAL, 0x00**  **TC,, PIA60608, EQUAL, 0x00**  **TC,, PIA60609, EQUAL, 0x00**  **TC,, PIA60610, EQUAL, 0x00**  **TC,, PIA60612, EQUAL, 0x00**  **TC,, PIA60613, EQUAL, 0x00**  **TC,, PIA60614, EQUAL, 0x00**  **TC,, PIA60615, EQUAL, 0x00**  **TC,, PIA60616, EQUAL, 0x00**  **TC,, PIA60617, EQUAL, 0x00**  **TC,, PIA60618, EQUAL, 0x00**  **TC,, PIA60619, EQUAL, 0x00**  **TC,, PIA60620, EQUAL, 0x00**  **TC,, PIA60621, EQUAL, 0x00**  **TC,, PIA60623, EQUAL, 0x00**  **TC,, PIA60624, EQUAL, 0x00**  **TC,, PIA60625, EQUAL, 0x00**  **TC,, PIA60626, EQUAL, 0x00**  **TC,, PIA60627, EQUAL, 0x00**  **TC,, PIA60628, EQUAL, 0x00**  **TC,, PIA60629, EQUAL, 0x00**  **TC,, PIA60630, EQUAL, 0x00**  **TC,, PIA60631, EQUAL, 0x00**  **TC,, PIA60632, EQUAL, 0x00**  **TC,, PIA60634, EQUAL, 0x00**  **TC,, PIA60635, EQUAL, 0x00**  **TC,, PIA60636, EQUAL, 0x00**  **TC,, PIA60637, EQUAL, 0x00**  **TC,, PIA60638, EQUAL, 0x00**  **TC,, PIA60639, EQUAL, 0x00**  **TC,, PIA60640, EQUAL, 0x00**  **TC,, PIA60641, EQUAL, 0x00**  **TC,, PIA60642, EQUAL, 0x00**  **TC,, PIA60643, EQUAL, 0x00**  **TC,, PIA60645, EQUAL, 0x00**  **TC,, PIA60646, EQUAL, 0x00**  **TC,, PIA60647, EQUAL, 0x00**  **TC,, PIA60648, EQUAL, 0x00**  **TC,, PIA60649, EQUAL, 0x00**  **TC,, PIA60650, EQUAL, 0x00**  **TC,, PIA60651, EQUAL, 0x00**  **TC,, PIA60652, EQUAL, 0x00**  **TC,, PIA60653, EQUAL, 0x00**  **TC,, PIA60654, EQUAL, 0x00**  **TC,, PIA60656, EQUAL, 0x00**  **TC,, PIA60657, EQUAL, 0x00**  **TC,, PIA60658, EQUAL, 0x00**  **TC,, PIA60659, EQUAL, 0x00**  **TC,, PIA60660, EQUAL, 0x00**  **TC,, PIA60661, EQUAL, 0x00** |  |  |
|  | ; Load the EAS1 threshold values  **TC, ZIA58797, PIA60174, EQUAL, 0x5F40**  **TC,, PIA60185, EQUAL, 0x5F41**  **TC,, PIA60196, EQUAL, 0x5F42**  **TC,, PIA60200, EQUAL, 0x5F43**  **TC,, PIA60201, EQUAL, 0x5F44**  **TC,, PIA60202, EQUAL, 0x5F45**  **TC,, PIA60203, EQUAL, 0x6586**  **TC,, PIA60204, EQUAL, 0x6587**  **TC,, PIA60205, EQUAL, 0x66C8**  **TC,, PIA60175, EQUAL, 0x5F49**  **TC,, PIA60176, EQUAL, 0x5F4A**  **TC,, PIA60177, EQUAL, 0x5F4B**  **TC,, PIA60178, EQUAL, 0x5F4C**  **TC,, PIA60179, EQUAL, 0x5F4D**  **TC,, PIA60180, EQUAL, 0x5F4E**  **TC,, PIA60181, EQUAL, 0x5F4F**  **TC,, PIA60182, EQUAL, 0x5F40**  **TC,, PIA60183, EQUAL, 0x5F41**  **TC,, PIA60184, EQUAL, 0x5F42**  **TC,, PIA60186, EQUAL, 0x5F43**  **TC,, PIA60187, EQUAL, 0x5F44**  **TC,, PIA60188, EQUAL, 0x5F45**  **TC,, PIA60189, EQUAL, 0x5F46**  **TC,, PIA60190, EQUAL, 0x5F47**  **TC,, PIA60191, EQUAL, 0x5F48**  **TC,, PIA60192, EQUAL, 0x5F49**  **TC,, PIA60193, EQUAL, 0x5F4A**  **TC,, PIA60194, EQUAL, 0x5CCB**  **TC,, PIA60195, EQUAL, 0x5F4C**  **TC,, PIA60197, EQUAL, 0x5F4D**  **TC,, PIA60198, EQUAL, 0x5F4E**  **TC,, PIA60199, EQUAL, 0x5F4F** |  |  |
|  | ; Switch to Eng mode 2 on EAS1  **TC, ZIA58788, PIA60165, EQUAL, 60** ; 1 minute |  |  |
|  | ; Wait 00:00:10 (10 seconds) |  |  |
|  | ; Load the EAS1 MCP ramp voltage to 100V  [Conversion = 1.022 ]  **TC, ZIA58784, PIA60218, EQUAL, 0x66** |  |  |
|  | ; Wait 00:00:05 (5 seconds) |  |  |
|  | ; Load the EAS1 MCP ramp voltage to 0V  **TC, ZIA58784, PIA60218, EQUAL, 0x0** |  |  |
|  |  |  | ; Process Electron Count in  **TM, YIA58944** ; TM(21,6) SSID=19 SWA\_TM\_SCI\_EAS1\_ENG\_2-5-6-8-9\_RAW\_DATA  **ASSESS DATA TO CONTINUE**  **ENSURE THERE ARE NO COUNTS PRESENT** |
|  | ; After SWA permission increase MCP level by half  **TC, ZIA58784, PIA60218, EQUAL, 0x33** |  |  |
|  | ; Repeat steps 1.1.44 to 1.1.50 in steps of 100V until MCP equals 2200V |  |  |
|  | ; Switch to no science mode on EAS1  **TC, ZIA58771, PIA60031, EQUAL, MBOX1**  **TC, ZIA58771, PIA60446, EQUAL, 0**  **TC, ZIA58771, PIA60447, EQUAL, 0**  **TC, ZIA58771, PIA60448, EQUAL, 0** |  |  |
|  | ; Set EAS1 hemisphere voltage max to 800V  **TC, ZIA58767, PIA60441, EQUAL, 0x02**  **TC, ZIA58767, PIA60442, EQUAL, 0x9C**  **TC, ZIA58767, PIA60443, EQUAL, 0x80** |  |  |
|  | ; Set EAS1 hemisphere voltage ratio to 1  **TC, ZIA58766, PIA60469, EQUAL, 0x00**  **TC, ZIA58766, PIA60470, EQUAL, 0x00**  **TC, ZIA58766, PIA60471, EQUAL, 0x01** |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  | Prepare Run macro with appropriate values for transmitting plasma particles.  Have this double checked by an instrument scientist. |  | Hem max: 800V  Hem Ratio: 0.83  Upper def: 0  Lower def: 0  VGF: 0  Threshold: tbc |
|  | Run in-flight equivalent of EAS\_to\_Normal\_Mode\_Command  .txt  Science packets should start being returned.  (YES-PASS / NO-FAIL) |  |  |
|  | Verify data. No counts expected. If counts appear, consult commissioning lead |  |  |
|  | MCP ramp macro. Step up 50V, wait 5 seconds, step down 25V (tbd). |  |  |
|  | Verify data. Record counts. Consult commissioning lead to continue |  |  |
|  | Repeat steps 22 and 23 to 2500 (tbd) voltage |  |  |
|  | Run in-flight version of EAS\_to\_no\_science.txt |  |  |
|  | Prepare Run macro with appropriate values for stopping transmission of plasma particles.  Have this double checked by an instrument scientist. |  | Hem max: 800V  Hem Ratio: 1  Upper def: 0  Lower def: 0  VGF: 0  Threshold: tbc |
|  | Run in-flight equivalent of EAS\_to\_Normal\_Mode\_Command  .txt  Science packets should start being returned.  (YES-PASS / NO-FAIL) |  |  |
|  | Verify data. Record counts. Consult commissioning lead to continue |  |  |
|  | MCP ramp macro. Step up 30V, wait 5 seconds, step down 15V (tbd). |  |  |
|  | Verify data. Record counts. Consult commissioning lead to continue |  |  |
|  | Repeat steps 22 and 23 to 2710 (tbd) voltage |  |  |
|  | Acquire data for 15 minutes at 2695V (tbd) |  |  |
|  | Run in-flight version of EAS\_to\_no\_science.txt |  |  |
|  | Prepare Run macro with appropriate values for stopping transmission of plasma particles.  Have this double checked by an instrument scientist. |  | Hem max: 800V  Hem Ratio: 0.83  Upper def: 0  Lower def: 0  VGF: 0  Threshold: tbc |
|  | Run in-flight equivalent of EAS\_to\_Normal\_Mode\_Command  .txt  Science packets should start being returned.  (YES-PASS / NO-FAIL) |  |  |
|  | Verify data. Record counts. Consult commissioning lead to continue |  |  |
|  | Acquire data for 15 minutes at 2695V (tbd) |  |  |
|  | Record peak MCP voltage that was tested. |  | MCP:\_\_\_\_\_\_\_\_\_\_\_\_\_V |
|  | Run rest of EMs |  |  |
|  | EAS in-flight parameter optimisation |  |  |
|  | Copy data for analysis |  | File path: |

# Near Earth Suite commissioning – realtime contact

## Normal mode operation demonstration

## Burst, triggered. MAG and RPW (can be faked) on

## Normal mode operation

Possible in parallel with other instruments being commissioned

# Inter-instrument campaign

# Interference campaign