# Bepi Colmbo MMO

# MEA FS functional test in vacuum with MDP at ISAS

Fedorov, 12/14/17

The configuration of the MEA FS functional test in vacuum is shown in the diagram below:



### What we would need:

- 1. Setup the MEA FS in the vacuum chamber in some steady-state mechanical support. DONE.
- 2. Radiate the MEA aperture by a UL lamp. **PREPARED.**
- 3. Connect the instrument to the space-cube, See The Test Plan
- 4. Then connect the Instrument to MDP via an SW Sniffer. See the Test Plan

The list of necessary items is in the table below:

Item	Origin	State	Comment
MEA mechanical support	ISAS	TBD	Or use any available
UV lamp	ISAS	Available	
MEA-FS	ISAS	Available	
SW sniffer	IRAP	Available	IRAP will bring it
MDP	ISAS	Available	
SpaceCube	IRAP	Available	IRAP will bring it
2 Sub-D 9 vacuum feedthroughs	ISAS	Available	Sockets inside, Pins outside
Cable "interrn" SW	IRAP	Available	
Cable "intern" Power	IRAP	Available	I
Cable "Extern" SW Space Cube	IRAP	Available	
Cable "Extern" Power to MDP	ISAS	Done	
Cable from Cniffer to MDP	ISAS	Done	
Laboratory power source	ISAS	Done	

Corresponding Photos:



### The plan of the test:

- 1. Connect the SpaceCube and perform:
  - (a) Set MCP HV to the working point according to the standard procedure ( keep the MCP under 1000V during at least 1 hour for heating and degasing, etc)
  - (b) Load the MINIMAL energy table (300 eV, 32 steps)
  - (c) Set 16 enery sweeps per spin
  - (d) Set GF = 1
  - (e) For the Spin periods : 3800 ms (TBD to get the same in MDP), 4000 ms, 4200 ms (TBD to get the samie in MDP) perform:
    - i. accumulate 10 min of data. Switch ON UV at 1st min and switch OFF UV the minute 7.
    - ii. make plots of the energy spectra (for each from 16 rotations sectors if possible) intergrated over the anodes
    - iii. make plots of the angular (over anodes) (for each from 16 rotations sectors if possible) intergrated over anodes
  - (f) Set Gf = 3
  - (g) Repeat (e)

- 2. Connect MDP with no switching OFF the instrument and perform:
  - (a) For the Spin periods : 3800 ms (TBD to get the saminin MDP), 4000 ms, 4200 ms (TBD to get the saminin MDP) perform:
    - i. For two Satellite potentials 0V and +2V perform: ii iv
    - ii. Define energies 28, 29, 30, 31, width 1 range for Pitch-angle distribution. Set some arbitrar vector of the magnetic field
    - iii. accumulate 10 min (TBD) of data. Switch ON UV at 1st min and switch OFF UV during the minute 7.
    - iv. Switch mode "Stop Sweep" with stop at step 30
    - v. Later analyse date with Alain's processing and CL. To see the Data Poducts:
      - A. L
      - B. M
      - C. Pitch-angle
      - D. 3D distribution
      - E. Moments
- 3. Connect again the Space Cube and load the Maximal Enery Table (25 keV, 32 steps)
  - (a) Reapeat (1c) (1d) (1e) (1f) (1g) and (2)
- 4. The options:
  - (a) Test 32 sweeps per spin with "H" MDP mode
  - (b) Repeat (1) if Yokota-san can modify MDP software (according to IRAP proposal)

#### 15 Dec 2017. Execution of the test:

- 1. The vacuum = 2.8e-5 Pa = 2.0e-7 Tor, Turbo + Criogen
- 2. 09:20 start to mount the MCP HV.
- 3. There is a problem with SpaceCube communication. We have replaced the MEA spacecube to MIA spacecube.
- 4. We are going to 1500V and stop there for one hour
- 5. Stop at 09:51 up to 11:00
- 6. 11:00 : going to 2300 V, Vacuum 3.3 -5 Pas
- 7. Set the working conditions:

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Vacuum	3.5e-5 Pas	
Energy table	2	3 keV
Spin period	4000 ms	
MCP HV	2500 V	
GF	1.0	
Start Data	13:21	
UV ON	13:24	
UV OFF	13:30	
Energy Spec		
Anodes Spec		
Raw data		

Vacuum	3.5e-5 Pas	
Energy table	2	3 keV
Spin period	4000 ms	
MCP HV	2500 V	
GF	0.37	
Start Data	13:32	
UV ON	13:34	
UV OFF	go to next GF	
Energy Spec		
Anodes Spec		
Raw data		

	Vacuum	3.5e-5 Pas	
	Energy table	2	3 keV
	Spin period	4000 ms	
	MCP HV	2500 V	
10.	GF	0.8	
	Start Data	13:39	
	UV ON		
	UV OFF		
	Energy Spec		
	Anodes Spec		
	Raw data		
	Vacuum	3 50 5 Pac	
		0.JE-J T as	21.1/
	Energy table	2	3 KeV
	Spin period	4000 ms	
		2500 V	
11	GF Start Data	0.53	
11.	Start Data	13:43	
	Anodos Spec		
	Row data		
	Vacuum	3.5e-5 Pas	
	Energy table	2	3 keV
	Spin period	4000 ms	
	MCP HV	2500 V	
	GF	0.28	
12	Start Data	13:46	
	Stop Data	13:52	
	UV ON		
	UV OFF	13:49	
	Energy Spec		
	Anodes Spec		

Raw data

Connect the MDP - Sniffer - MEA The connection is shown in the following figure:



Vacuum	3.3e-5 Pas	
Energy table	2	3 keV
Spin period	4000 ms	
MCP HV	2500 V	Step 200 to 2200
GF	1.0	
Start Data	15:15	
UV ON	15:21	S/C potential = 0
UV OFF	16:01	
Set Pitch angle Energy set	15:36	
S/C Potential set	15:47	
Start Sweep 30 step	15:51	15:55
Science Data		
HK Data		

	Vacuum	3.7e-5 Pas	
	Energy table	2	3 keV
	Spin period	4000 ms	
	MCP HV	2500 V	
	GF	0.8	16:13
	GF	0.53	16:17
	GF	0.37	16:21
	GF	0.28	16:25
2.	Energy table 300 eV	16:07	GF = 1
	Start Data	16:07	
	UV ON	16:09	
	UV OFF	16:30	
	S/C potential	0	
	Pitch angle set	the same as before	
	Sience Data		
	HK Data		
	Log data		

1.

To recognise the H mode in the file we have to find: 00 03 DE E6 to 00 03 (generation time) at 18 counting from 0  $\,$ 

I he last data after the Sofware correction is:		
Vacuum	3.6e-5 Pas	
Energy table	2	3 keV
Spin period	4000 ms	
MCP HV	2500 V	
GF	0.8	17:45
H mode start	17:46	
GF	0.53	17:48
GF	0.37	17:52
GF	0.28	17:55
Energy table 300 eV		
Start Data	17:38	GF = 1
UV ON	17:41	
UV OFF	17:58	
S/C potential	0	
Pitch angle set	the same as before	
Sience Data		
HK Data		
Log data		