MPPE LHEP Data Meeting Memo

**30 May 2017 1800(after SWT)-2130**

**@** Hotel Mercure

rue Saint-Jerome

Toulouse

**1) Confirm agreements @ previous LHEP Meetings**

**(1) Definition of Level0-3 data**

Level 0 Data

almost raw data (equivalent to “data dump” using QL: SDTP packet is decoded and header is removed) all the information are included

“without internet access, all the higher level data can be made with this data”

not necessary to be registered to MMO working archive

to be registered to “MMO-MPPE internal data storage”

Level 1 Data : to be released within TBD days after receiving data

made from LVL0 data

de-compressed & decoded data

remove error data -> ex. Checksum error/ automatic correction

multiple files

not efficiency corrected, not background corrected

**CDF format data -> to be registered to MMO working archive**

can be used for initial data analysis but not for publication

Level-1 CDF and Level-2 CDF files can have different format.

ex. Level1: integer Level2: floating point

Level1: FOV direction Level2: channel sector remapped data

but preferably be as close as possible…

Level 2 Data

made from LVL1 data

calibrated data (it takes some time to provide)

count data (further processed from Level1 Data) + 　separate efficiency table

back-ground corrected data (UV contamination / background noise etc.)

“efficiency corrected velocity moment” or “efficiency not corrected velocity moment + separate efficiency table”

velocity moment calculated from 3D data

CDF format data -> to be registered to MMO working archive

to be used for data analysis and publication

differential number flux, differential energy flux, phase space density are added (T.B.C.) is approved depending on the version of Level 2 data)

Pitch angle distribution data (at least MEA)

MEA : only select data in the plane including B (on board)

* MEA needs magnetic field data on the ground
* Offset and sensitivity of magnetic field vector can be changed both MGF side and MDP-MEA side.

AI-20170530-1

Decide offset and sensitivity of magnetic field vector is changed in MGF side or MDP-MEA side.

Level 3 Data

higher level data ex. Ion Species – Location Map etc.

cross-calibrated data (ex, HEP+ MEA MIA MSA , MIA <-> MSA )

(2) MEA/MIA/MSA/HEP　will have data storage for internal use (starting from MEA1, MEA2, MIA, MSA, HEP to be added ENA).

ISAS, IRAP, LPP, and MPS will have the same MEA1, MEA2, MIA, MSA data. The generated data files are copied every T.B.D. days.

ISAS is responsible for making MIA data files, registering CDF files to MMO working archive. Possibly MGF data will be provided from ISAS??

IRAP is responsible for making MEA1, MEA2 data files, registering CDF files to MMO working archive .

LPP/MPS are responsible for making MSA data files, registering CDF files to MMO working archive.

ISAS/Takashima-san is responsible for making HEP data files, registering CDF file to MMO working archive.

Note:

1. MMO working archive: managed by MMO project / archive will be somewhere in ISAS
2. MMO-MPPE internal data storage @ each participating institute

**(2) CDF　Data Format of L1 Data**

CDF file name?

Ex. Bepi\_mmo\_level\_mppe\_instrument\_productname\_YYMMDD

(may be automatically generated from Global Attribute information)

MPPE-LEP preference : 1 file/ 1 Earth day (easy to compare MMO-MPO)

separate file for each data products/rate (possible grouping is considered)

<HK data>

1. User HK 128bytes + MDP Software HK (MEA ~50bytes MSA~0 MIA~30)

AI-20161111-1

MPPE will request User HK every 10/20minutes

(In case of emergency or special events higher rate is necessary.) -> close 11 Nov. 2016

2) 20bytes HK: system HK to be provided every 4s/8s etc.

3) mission data HK: each group is responsible for these HKs

AI-20170530-2

ISAS will inform how to monitor system HK using SDTP to MEA and MSA

AI-20170530-3

ISAS will revise MDP software document for MEA including system HK information

separate file: all bits will be decoded for self-explanatory ???

It is allowed to make Level-2 HK data (analogue HK data are converted to physical value) without creating Level-1 HK data.

in data cdf files: limited information is included

~~Ex. mode etc.~~

~~Mode information -> Global Attribute~~

SunPulse: Obs. Start time

TI 4bytes+2bytes or converted total msec/day

AI-20170530-4

MEA and MSA teams will check what time information is included in mission data.

Sweep Start timing (first spin sector)?

IF we can decide the definition of EPOCH

EPOCH is the same time as sun pulse (converted to real time)

EPOCH: TT2000

CDF\_file variables from the beginning:

1)EPOCH TT2000

2) Unix\_time : CDF\_CHAR 1dim 128/256

3) Sunpulse : TI 4bytes+2bytes or ex. converted total\_msec

4) some additional information

quality flag: definition will be made in the future

5) data

count data

COUNT[instrument CH][spin\_sector][energy]

COUNT[view direction/pich angle][energy]

COUNT[energy][TOF]

event data (MSA)

EVENT M-mode

A(without event) or E(with event) can be selected

Velocity moment:

Converted to physical value: RELA4

Density (mass included for MSA)

nV (mass included for MSA)

P (mass included for MSA)

(not calculate fluid moments for LEVEL1)

**2) What we discussed @ previous LHEP Meetings**

**a) CDF file format proposal from LPP (Bruno-san)**

MSA

32 cdf files -> it may be necessary to consider further grouping

L-mode data -> to be divided into multiple CDF files

Variable Attributes: to be added in the near future

Grouping without 2 EPOCH in one cdf is preferable

The number of CDF files will be reduced from 32.

**b) CDF file format proposal from IRAP**

**2HSK + 5 L-mode +5 M-mode +2 H-mode +2 moments = 16 CDF files**

**(2HSK data sets : MEA1 and MEA2)**

**moments: Both M-mode and L-mode data are included.**

**Fixed FOV direction information:**

**Energy Step information**

**G-factor information**

**Preferably Common to MEA, MIA, MSA, and HEP**

**Necessary Variable Attributes(from MEA team’s experience):**

1. DEPEND\_i (in case of C order=raw majority)

(DEPEND\_0 EPOCH

DEPEND\_1 Channel (Anode)

DEPEND\_2 Sector

DEPEND\_3 Energy)

1. DELTA\_PLUS/MINUS
2. REFERENCE\_FRAME
3. UNITS
4. SI\_CONVERSION : conversion factor from SI-unit

NOTE: these variable attributes are necessary in addition to ISTP mandatory variable attributes

**Count Data**

Array (example)

Dims 3

Dim Sizes [8(channel) 16(sector) 32(energy)]

**In case of angle mapping mode, this definition cannot be used.**

AI-20161111-2

LPP will send MSA’s Count Mapping explanation to IRAP. IRAP will propose how to define Variable Attribute for angle mapping mode data.

(One of the solutions may be to re-construct (channel)-(sector)-(energy) data from mapped angle data. Another solution may be Dims 2 Dim Sizes [36(fov) 32(energy)]

* CLOSE 20170530

Angle theta will have angle phi dependence

Array: MPPE’s BASELINE: Raw Majority C order

<C-order = Raw Majority>

Count [anode] [sector] [enegy]

DEPEND-1 DEPEND-2 DEPEND-3

<Fortran-order = Column Majority>

**c) HEP data (Hirahara-san)**

Explanation of the HEP data products.

SSD mode: 3 dims

2 angular directions 1 energy

TOF mode: 3dims

2 angular directions 1 TOF

**d) Others**

**Time TAG**

1. EPOCH: TT2000 mandatory

TT2000: leap second is taken into account 64bits singned integer

1. Sun-pulse: TI 4bytes+2bytes CDF UINT4

May not be necessary for L2 data

To be included in L1 data

1. Time Stamp(UNIX) CDF 64bits FLOAT

AI-20161111-3

ISAS will ask Markus-san the definition of “CDF CHARACTER Unix Time” and if it is usueful / necessary.

* Close 20170530

Unix Time is useful from the view point of “leap second” processing

AI-20170530-5

MSA MEA MIA and HEP will consider what time stamp information should be included in CDF file.

One idea is to put TT2000+Unix time to CDF.

AI-20161111-4

ISAS will ask Bijorn-san what is the output timing of MSA’s “TI4bytes+2bytes(time elapsed since last sun pulse)” in mission packet.

AI-20161111-5

ISAS will CHECK the definition of TI +2bytes described on the design document and send the documents to all the team. -> close 12 Dec. 2016

**Quality Flag**Quality flag: necessary zVariable 1byte

The detailed usage will be considered in the future.

Ex. intermediate data between mode change->can be automatically set

Scientific evaluation -> difficult to be automatically set

**3) Older Action Item Status**

AI-20160519-1

Bruno-san will make draft Level1 CDF skelton file and send it to MIA, and MEA teams. Due: E. August

-> CLOSE

<MPPE MODE>

AI-20150415-13

Consider how to use MSA Table E for M-mode data. If additional macro command is necessary, one of the MSA macro commands may be converted to MPPE mode change macro command. -> CLOSE

MSA will use 2 macro commands:

1. Initiate MSA & threshold setup
2. MCP check

Table E: ration of event stream increases

Event stream: used for magnetospheric science

Changing to table-E mode requires 2 commnads. They will be put into one of the MPPE macro commands (one of the 5 MPPE macro-commands) or use two discrete commands.

AI-20150911-1

MSA team will send ISAS the information about 2 MSA macro-commands and commands to change to / recover from table-E mode. -> CLOSE (not necessary: current Mactro Command is OK. For this only two commands are necessary.)

AI-20150415-1

ISAS will send “MPPE DATA MODE ver 2.00 20150413 (After 2nd Integration Test@ISAS)” to MEA/MIA/MSA teams. -> CLOSE

AI-20150415-2

MEA/MSA/MIA teams will check the contents of “MPPE DATA MODE ver 2.00 20150413 (After 2nd Integration Test@ISAS)” and send comments to ISAS by 15 May. -> CLOSE

AI-20150911-2

Y. Saito will start talking with SERENA team in order to mutually understand the operation / data mode. -> CLOSE(MPPE has started talking SERENA at HEWG meeting @ Rovaniemi (submitted data/operation information with other instruments on MMO))

<Data Management>

AI-20150415-3

MSA will test download data from ISAS data server using SDTP.

IRAP will help. -> CLOSE

AI-20150415-4

Level0 data format will be decided by negotiation between ISAS and IRAP.I RAP will transfer the information to LPP.

-> CHANGED to new AI (AI-20161111-6)

AI-20161111-6

Level0 data format will be decided by negotiation between ISAS/IRAP/LPP.

ISAS made a header file to make MIA Level0 data The detail of the data format (including the necessity of the common information) will be determined through the comparison of CDF skeleton file between the teams.

AI-20150415-5

ISAS will check the requirement on CDF data format (relating with the future conversion to PDS 4.0). -> CLOSE

<status>

Conversion from CDF to PDS4 will be automatically made by a conversion

software, that imposes some limitations on the CDF format. Therefore CDF

should not be made freely.

The structure of CDF should be simple.

Simple time series 2D or 3D data are preferable.

(In this sense, there will be no problem with magnetic field, velocity

moments.

There will be some problem with energy spectra of ions/electrons, when

(for example) energy step number, FOV resolution, observation timing etc.

will change depending on the observation(data) modes.

One possibility is to prepare all the data format into one CDF and put

invalid data to the data for unused data mode or prepare multiple CDF

files (one CDF for each observation(data) mode).

The detail of the CDF->PDS conversion limitation will be informed in the

near future.

AI-20150415-6

IRAP will make proposal about the CDF data format. Based on the information and negotiation between IRAP/ISAS/LPP, the detailed CDF data format will be decided. (MEA, MIA, MSA CDF file format should be similar.) -> CLOSE (Change to a new AI)

Based on the information (two files concerning the requirements to be compatible with PDS4.0; MMS CDF format specification) and the requirements to be compatible with “auto-plot”/SPEDAS, MEA, MIA, MSA teams will make CDF skeleton file for Level1 data and compare / modify the skeleton file. Comparison will star from MSA<-> MIA (CDF file for ion data should have much similarity), then MSA/MIA <-> MEA.

AI-20150911-3

MEA team will circulate MMS CDF format specification document to MSA(LPP), MIA(ISAS). -> CLOSE (each team has the document)

AI-20150911-4

Based on the information (two files concerning the requirements to be compatible with PDS4.0; MMS CDF format specification) and the requirements to be compatible with “auto-plot”/SPEDAS, MEA, MIA, MSA teams will make CDF skeleton file for Level1 data and compare / modify the skeleton file. Comparison will start from MSA<-> MIA (CDF file for ion data should have much similarity: within ~4 months), then MSA/MIA <-> MEA (by next LEP meeting in April 2016).

-> OPEN (20161111: started comparison between MEA<->MSA <-> MIA)

AI-20150415-7

ISAS will talk with MGF team about inclusion of MGF data in the “data storage for internal use”. Low time resolution / direction only data will also be OK if the full resolution data is difficult.

-> OPEN

(not started talking with MGF PI) : Y.Saito talked with A. Matsuoka (Co-PI of MGF) There will be no problem but official request should be sent to the MGF PI in the future. (20161111: the request has not been sent yet)

AI-20150415-8

TI <-> real time conversion is better to be common to MEA/MIA/MSA.

Need further discussion at MMO SWG.

-> OPEN (20161111: Y. Saito mentioned this point @ MMO SWG in September 2016.)

<ESTEC TEST>

AI-20150415-9

ISAS will send the participants information to MMO project by 17 April. -> CLOSE

<Initial Check>

AI-20150415-10

MSA team will send HV & LV initial check plan to ISAS by 22 April. -> CLOSE

AI-20150415-11

MEA team will send LV initial check plan to ISAS by 22 April. -> CLOSE

The HV initial check procedure should take into account the data block loss (due to the clock timing difference between MPO and MMO). If data block loss is found, it is necessary to wait for about 30minuts.

MEA will revise HV initial check procedure in order to reduce the risk of high voltage discharge.

In order to reduce the risk of high voltage discharge during the initial high voltage check, high voltage should be powered on with low voltage (in order to heat up and outgass) for some time before start raising high voltage.

AI-20150911-5

MEA will revise HV initial check procedure in order to reduce the risk of high voltage discharge. MEA team will send ISAS revised HV initial check procedure by around 20 Sep 2015. -> OPEN

AI-20150911-6

Each team will check the agreed definition of the Level0-3 data. The definition can be modifies/improved in the future. -> CLOSE

<Others>

AI-20150415-12

MEA MIA and MSA teams will have next data management meeting at SWT meeting in September 2015. -> CLOSE

AI-20160519-2

MPPE’s Science Target Document@proposal will be revised. ISAS will initiate the revision process. Revision should be finished by next MPPE tutorial @ SWT Italy,

* OPEN

(20161111: The output of the young scientists’ activity will be included as a part of this document. Nishino-san is participating to this activity from MPPE.

20170520: Talked with Nishino-san in Nagoya University who will greatly contribute to the revision.

Schedule

5E 2017 itemize the new MPPE science targets.

5/29-6/1 2017 talk with Dominique-san and Nicolas-san @ LHEP meeting

15 June make contact with persons to ask to prepare manuscript

7E 2017 Intermediate progress check

8E 2017 Due date of 1st draft

9B- 9/20 2017　 Edit the Document

10? 2017 MPPE tutorial talks 2 @ SWT

AI-20161111-7

ISAS will ask SWT tutorial coordinator not to consider MPPE as a single instrument team but as a large instrument consortium. At least ~ One Hour is necessary.

* Closed 20170323

AI-20161111-8

ISAS will inform MMO project that MEA will upload revised sensitivity table to MDP at the similar time when MSA CPU program and MIA velocity moment calculation table are uploaded. MEA will also upload HV table to MEA’s RAM at the time of testing unsent commands. -> CLOSED 20161129

AI-20160519-3

MPPE data -> CDPP@IRAP will be considered @SWG meeting in fall 2016

* CLOSE (20161111 Y. Saito raised this point @ SWG in September 2016.)

1. **What we want to discuss today’s LHEP Meetings**
2. HK

Included in every file or separate file?

Level1 decoded but not necessarily converted to physical value

Level2 decoded and converted to physical value

MIA’s current example: 28bytes integer ie. Mission HK not decoded

* To be changed to float? Yes.

L1 not converted to physical value

L2 will be converted to physical value -> no level

Bi-level status?

0, 1 -> LABEL

(not ascii convert)

System & User HK will be a separate file :

MSA:

System & User HK and Mission HK will be used to create HK CDF file.

If they have the same time, User HK has priority because it include MDP software HK.

To be converted to physical value

no level for HK CDF

MEA: HKs are included in every file

Are they system HKs / User HKs? Maybe user HKs.

L1 converted to physical value -> only one level

1. CDF format based on our discussion so far we made

COUNTS/Velocity Mometns

1) EPOCH TT2000

2) Unix\_time : CDF\_FLOAT 64

3) Sunpulse : TI 4bytes+2bytes or ex. converted total\_msec

start timing of energy sweep?

4) HKs

5) Quality flag

6) data

count data

velocity moments etc.

User HKs / System HKs

1) EPOCH TT2000

2) Unix\_time : CDF\_FLOAT 64

3) Sunpulse : TI 4bytes+2bytes or ex. converted total\_msec

What timing?

4) HKs

all float common to L1 and L2?

bi-level data : 0, 1 Label

analogue data: float

L1: not necessarily converted to physical value

L2: converted to physical value

1. current status of CDF format L1 & L2 (Bruno-san, Alain-san)

Bruno-san

November 2016 32 data sets +HK

* between 15 and 21 data sets+HK

Time stamp should be “center” of accumulation in order to be compliant with ISTP standard. Epoch refer to center of acquisition.

1 EPOCH / 1 CDF

Epoch refer to center of acquisition

Time Stamp: (MAVEN example)

EPOCH (old)

TT2000

MET(mission elapsed time)

Ephemreris Time (SPICE kernel) UT time corrected

Unix time

Level 2:

TT2000

Unix Time

Level 1:

TT2000

Unix Time

+ TI (in this case, the format between Level1 and Level2 is different)

AI-20170530-6

How to calculate center time is considered. Spin rate is necessary.

Calculate spin rate using multiple data / just add fixed time?

MSA 方向モード

Grouping

Phi

Theta:phiに依存

MEA方向モード

マトリックスに変換

24 data products

MEA1 12 + MEA2 12

1. How shall we proceed?

What is the next step?

AI-20170530-7

By next meeting each team will decide CDF format and send the CDF format information to other teams.

Generate example CDF file taking into all the discussions so far we had?

1. **HV initial check procedure**

Propagation time : ~2min.

ISAS/JAXA commanding/monitoring equipment @ ESOC: 1.5min delay

Monitoring @ ISAS/JAXA: +0.5min.

Total 4min. delay

Due date for determining Time Slot: Summer 2017

Due date for command list : Fall 2017

(final commanding test will be performed in Fall 2017)

1. **Next LHEP meeting ?**

Twice / year : baseline

At the time of next SWT?

Matera, Italy in the week from 23-27 October 2017.

Or After SWT meeting @ Paris

MPPE MSA Meeting Agenda

**30 May 2017**

**@** Hotel Mercure

rue Saint-Jerome

Toulouse

1. Venus Fly-by

Shall we power on MSA?

What will the high voltage level be?

AI-20170530-8

Request MMO project to turn on MSA during Venus Fly-By.

1. MSA test @ ISAS in June

June 19 - 23

2 remaining items : spoiler trigger, M3-M5 noise

AI-20170530-9

ISAS will send HVPS initial test documents (schedule etc.) to MSA and MEA teams.