



Mio vSWG meeting

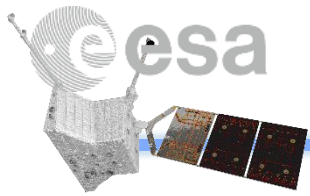
07 March 2024

Go Murakami

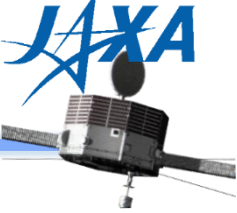
BepiColombo project

Japan Aerospace Exploration Agency (JAXA)





Action items (07 March 2024)

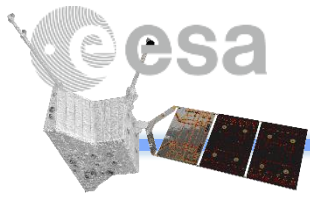


- **Operations**

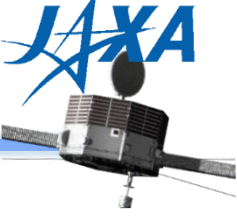
- **[JAXA Mio system team]** proposes a draft strategy/plan for the initial C/O at Mercury by **<30 April 2024>**
 - -> **[All PIs]** provide detailed information (Activity, brief procedure, and duration) by **<13 June 2024>**

- **Data handling**

- **[All PIs]** check the draft Rules of the Road (p.58) for cruise observation data and give any feedbacks **<31 March 2024>**
- **[All PIs]** provide instrument context product following to the PWI example (attached and p.63-64) **<31 March 2024>**
- **[JAXA & Mio Science Center]** provide sample/template document of EAICD (Experiment to Archive Interface Control Document) by **<13 June 2024>**
 - **[All PIs]** provide the first draft of EAICD by **<31 Oct 2024>**

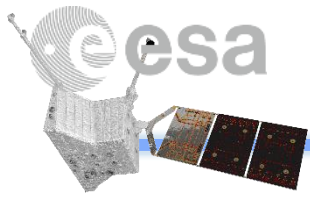


Mio Science Working Group meeting

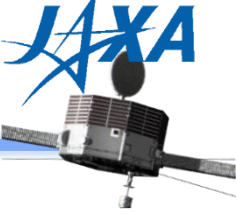


07 March 2024 18:00JST/10:00CET

- **1. Updated status of Mio**
- **2. Upcoming operations plan**
 - 2024/H1
 - Preparations for Mercury arrival: separation and deployments
 - Mercury flyby #4, #5, and #6
- **3. Updates on baseline observation plans**
 - Current status of the activity (thermal analysis)
- **4. Data handling and archiving**
 - Status of Mio Science Center (Yoshi Miyoshi)
 - Request to each PI team
- **5. Others**



Mio Science Working Group meeting



07 March 2024 18:00JST/10:00CET

- **1. Updated status of Mio**
- **2. Upcoming operations plan**
 - 2024/H1
 - Preparations for Mercury arrival: separation and deployments
 - Mercury flyby #4, #5, and #6
- **3. Updates on baseline observation plans**
 - Current status of the activity (thermal analysis)
- **4. Data handling and archiving**
 - Status of Mio Science Center (Yoshi Miyoshi)
 - Request to each PI team
- **5. Others**



Operations



MIO Operation schedule **up to Mercury orbit insertion**

2024.3.7

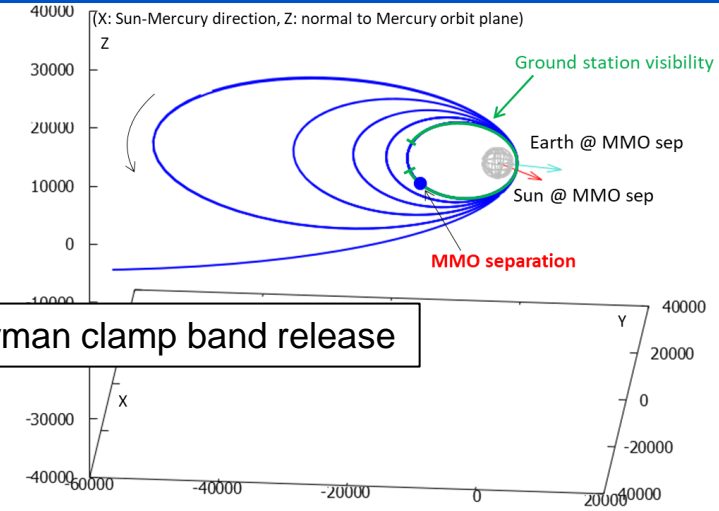
Checkout/maintenance			
	2024/4/9	Cruise C/O#11	10 hrs Routine checkout sequence + Battery cell UVC status check, MWE check (short interval commanding)
	2024/2H	Cruise C/O#12	
		Cruise checkout in 2025 to be confirmed	
	Before 2025/11	MC/AT/RQ/ST table upload	Will be requested to ESOC but may not be possible in this timeframe.
Science observation			
	2024/9/5	MSB4	200km
	2024/12/2	MSB5	40,000km
	2025/1/9	MSB6	393km



MIO – MPO separation



Epoch (UTC)	Events	Post-burn orbit	Orbital period
2025/1/9	MSB6		
2025/11/1	MTM separation		
2025/11/7	L1		
2025/12/4	MOI 1 (OCM burn 1)	700 x 48,700 km	52h
2025/12/9	MOI 2 (OCM burn 2)	680 x 29,300 km	27h
2025/12/13	MOI 3 (OCM burn 3)	680 x 21,200 km	18h
2025/12/16	MOI 4 (OCM burn 4)	660 x 15,100 km	12h
2025/12/19	MOI 5 (OCM burn 5)	650 x 11,600 km	9.3h
2025/12/22	MMO separation at 2025/12/22 22:42		



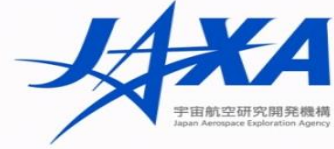
MIO Marman clamp band release

- MIO commissioning
- Battery charging
 - Pre-separation checkout
 - MC upload (if necessary)
 - deploy HGA
 - Configure for separation

Based on
bc_mpo_fcp_00161_20181020_20260328_v01



Schedule



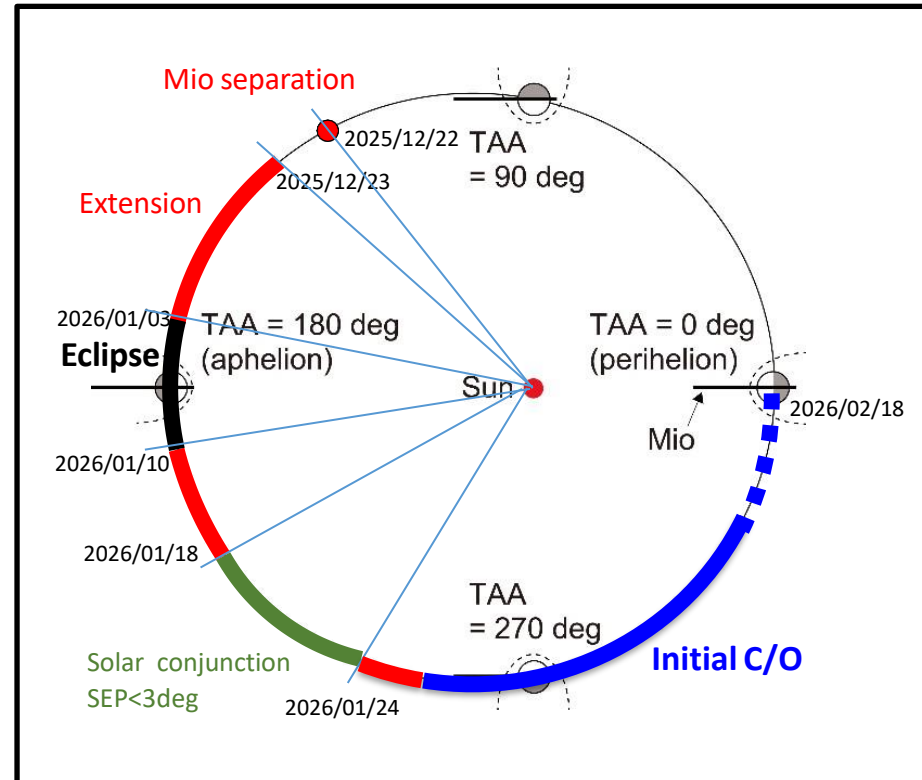
Date UTC	Events	
2023/12/22	MIO separation	
2025/12/23 – 26	Separation ops	HGA
12/26-27	EXT1	
12/27-28	EXT2	
12/28-29	EXT3	
12/29-30	EXT4	
12/30-31	EXT5	
12/31-2026/1/1	EXT6	
1/1-2	EXT7	MEF/WPT 10m
1/3–10 (eclipse season)	ACS checkout	HGA
1/9-10	EXT8	
1/10-11	EXT9	MEF/WPT 15m
1/11-13	EXT10	HGA
1/13-14	EXT11	MAST 5m
1/14-15	EXT12	HGA
1/15-16	EXT13	

1/16, 17 is saved for pre-conjunction ops

Note:

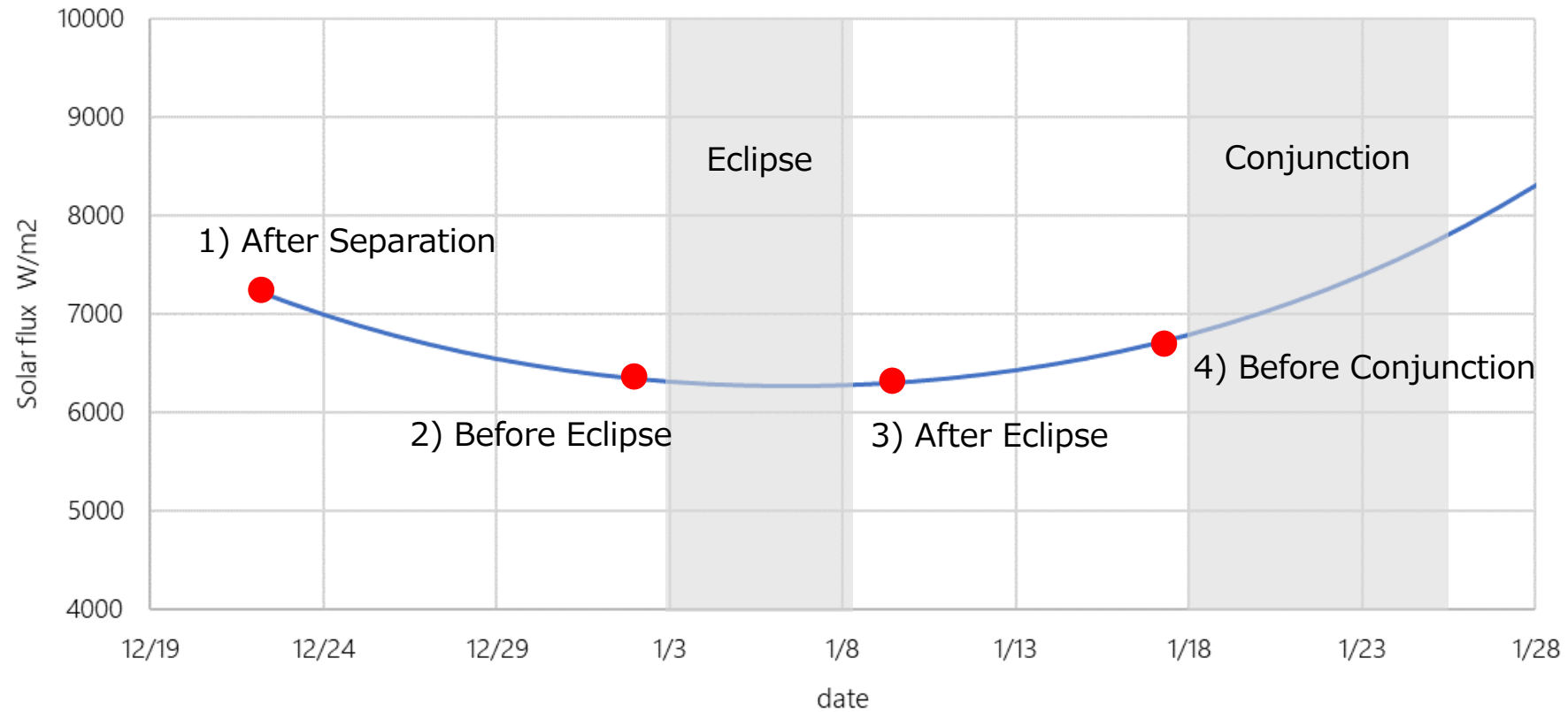
- This case assumes 2 ground station passes per day
- full downlink + 4hrs uplink support at MLG
- full downlink/uplink at MISASA

An alternative station support plan was presented from ESOC which could possibly provide more margin.

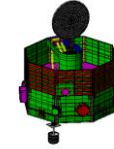


Temperature profile analysis

Analysis dates

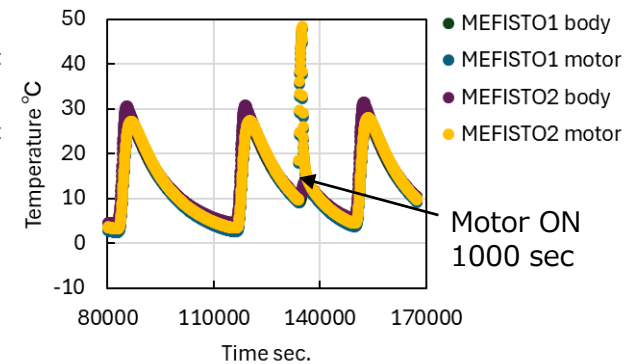
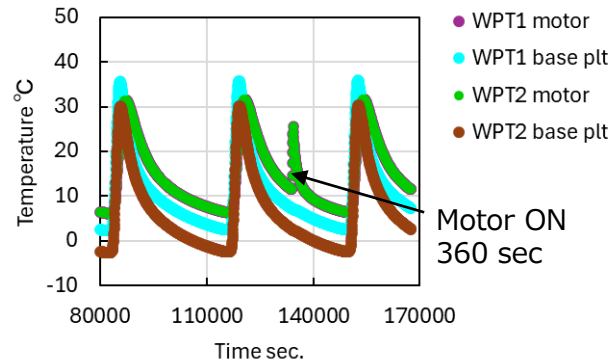
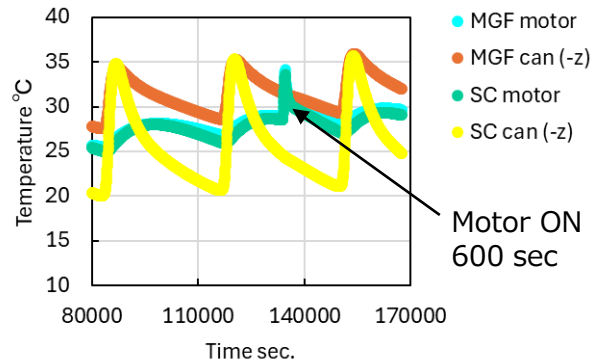


Stored configuration

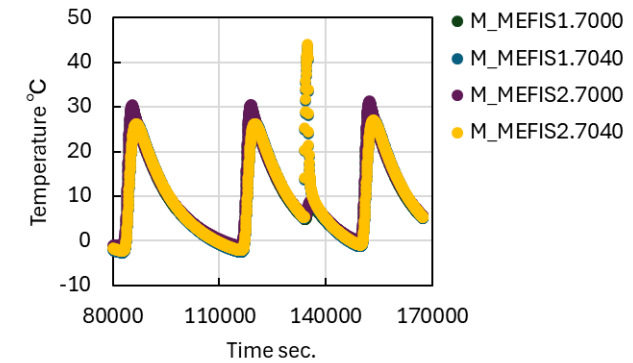
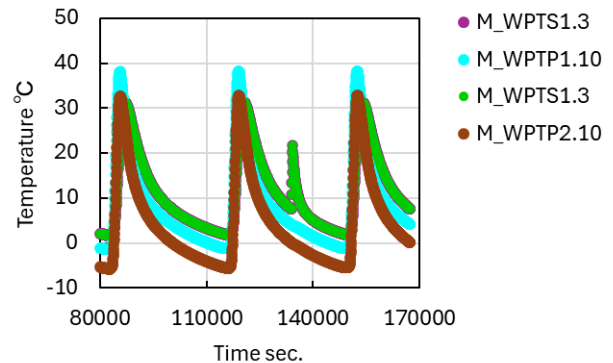
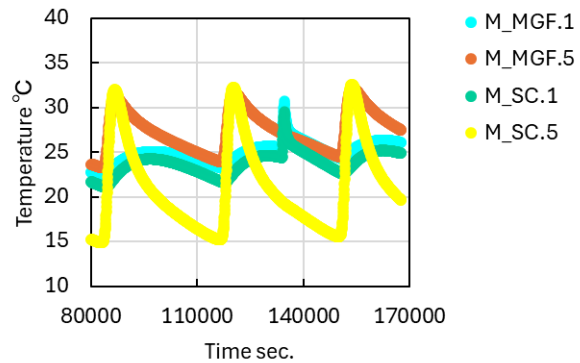


*Probe and PreAmp of MEFISTO are not defined in the stored model

1) After separation 2025/12/22

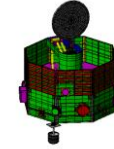


2) Before eclipse 2026/01/02



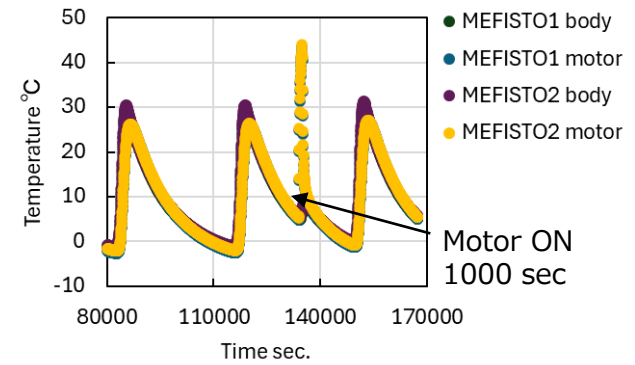
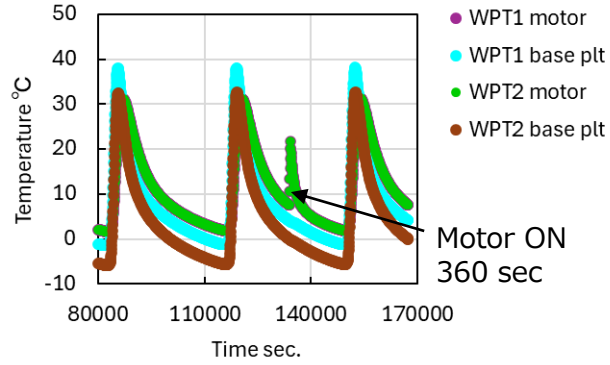
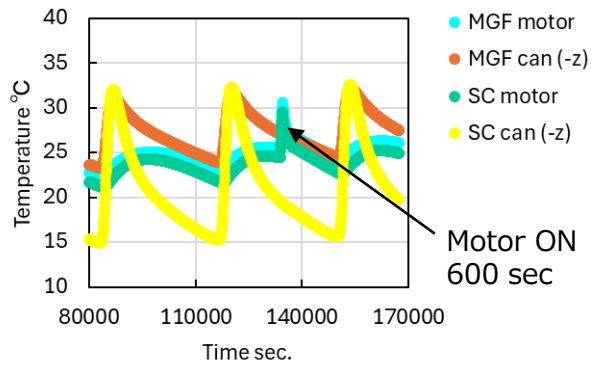
Temperature range for motor activation
 MAST motor: 0 to +80 deg
 WPT motor: -30 to +65 deg
 MEF: -20 to 80 deg (operational <100deg)

Stored configuration

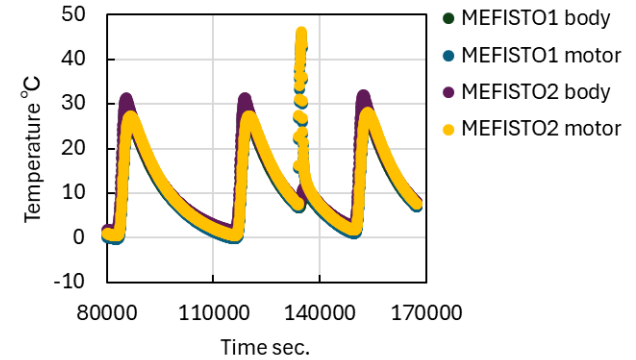
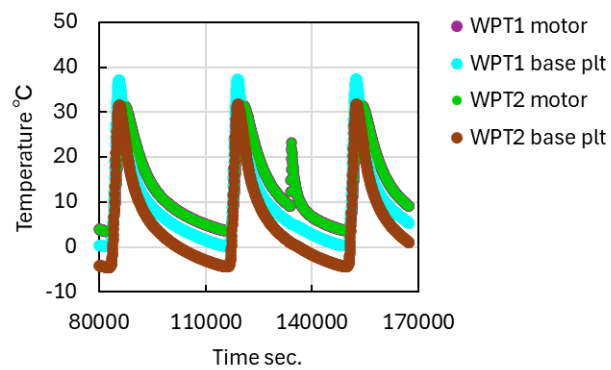
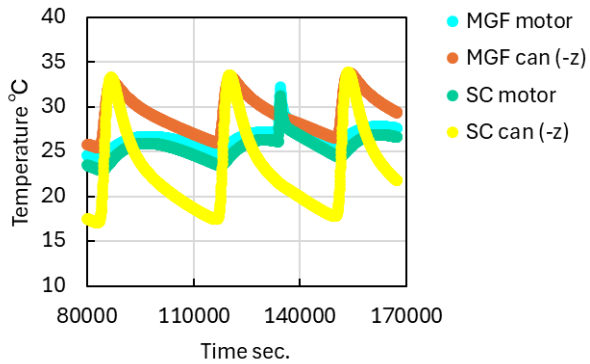


*Probe and PreAmp of MEFISTO are not defined in the stored model

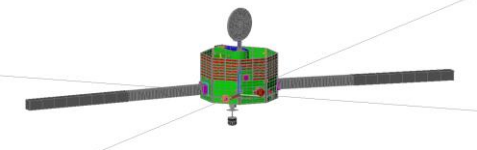
3) After Eclipse 2026/01/11



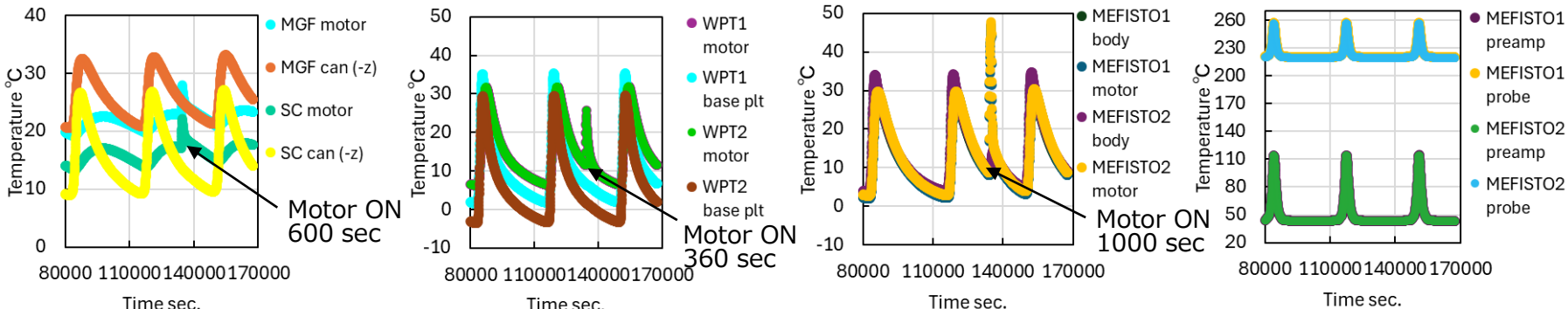
4) Before conjunction 2026/01/17



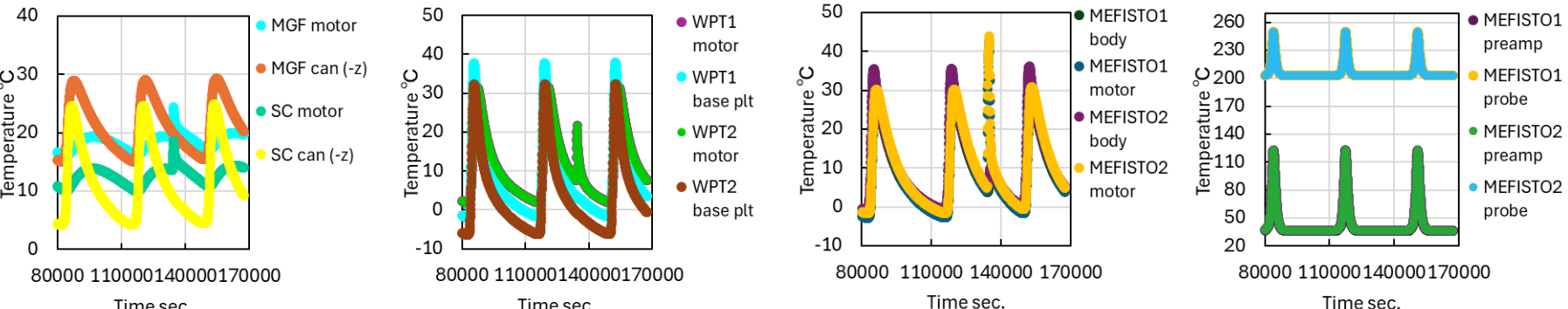
Deployed configuration



1) After separation 2025/12/22

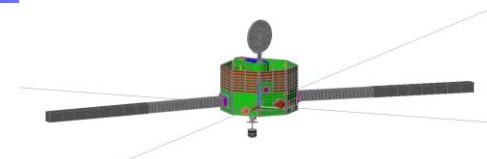


2) Before eclipse 2026/01/02

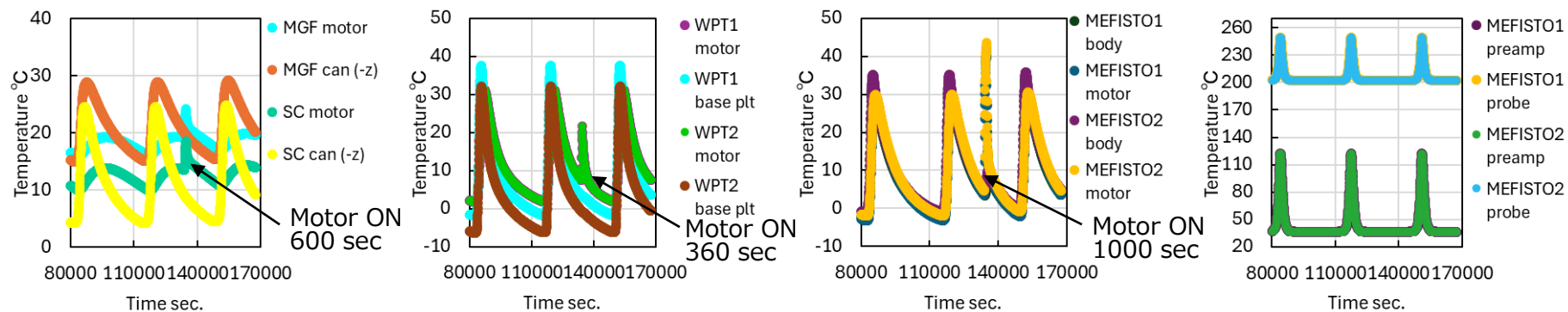


MEF preamp slightly over 125deg

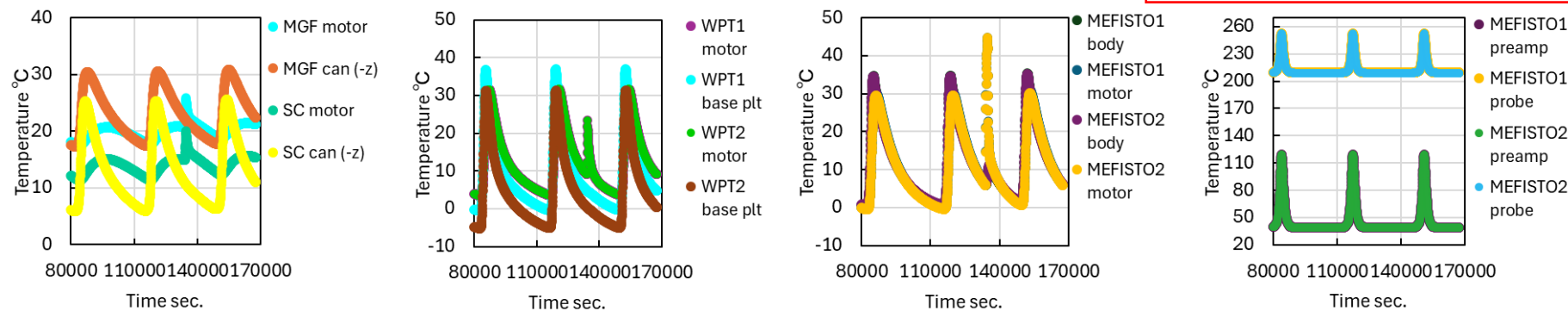
Deployed configuration



3) After Eclipse 2026/01/11

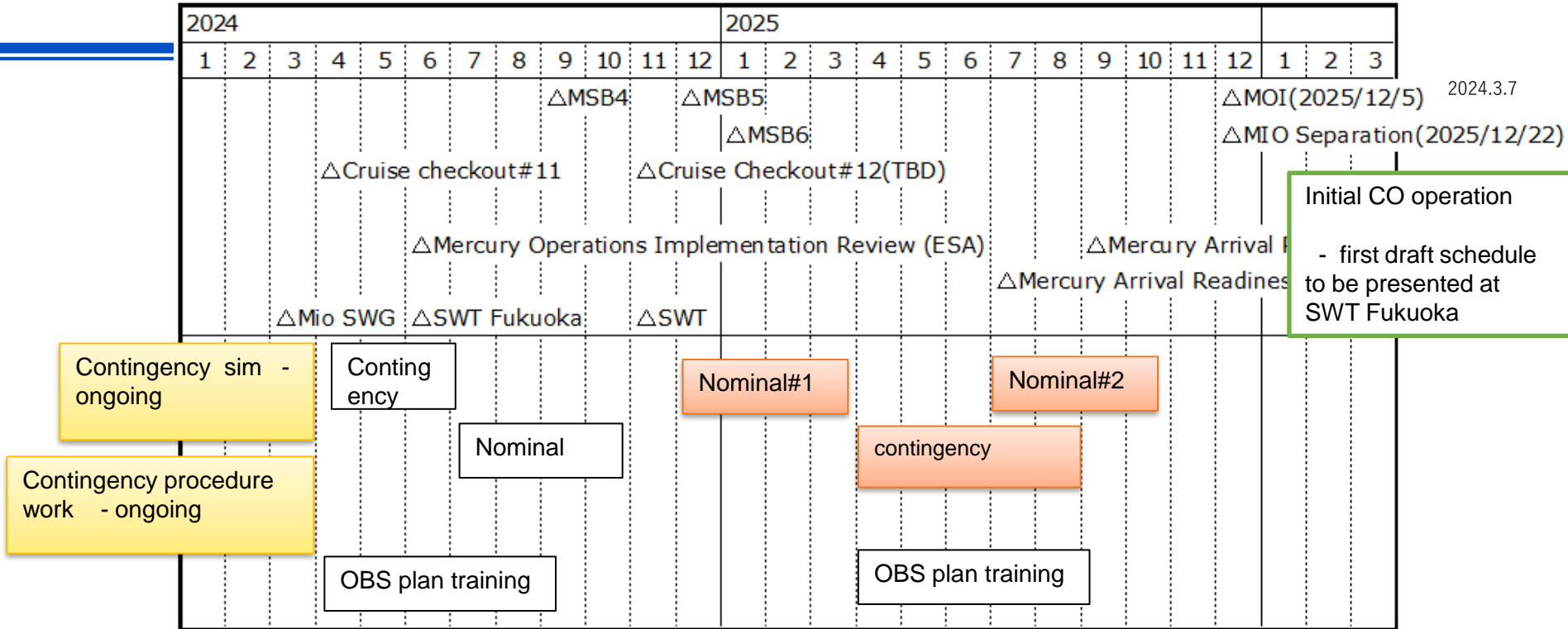


4) Before conjunction 2026/01/17





Preparing for Mercury Arrival



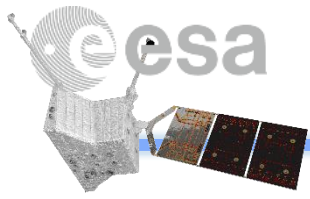
- 2024 2Q contingency (SEP/EXT unfinished cases)
- 2024 3Q Nominal (SEP/EXT) ... for project core
- 2024 2-3Q OBS plan training
- Larger-scale campaigns from 2024 4Q with ground stations, support team, etc. -----
- 2024 4Q-2025 1Q Nominal#1 (SEP/EXT)
- 2025 2-3Q contingency
- 2025 3-4Q Nominal#2 ...



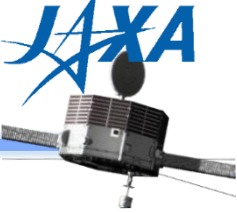
MC upload timing



- 1) Before 2025/11 TBC, may not be possible due to conflicts
- 2) Pre-separation activity last chance before separation
- 3) Initial checkout add macro commands for observation/updates to in-flight parameters
- 4) Before science observation update observation parameters after checkout/test observations
- 5) During observation phase update foreseen, timing is irregular



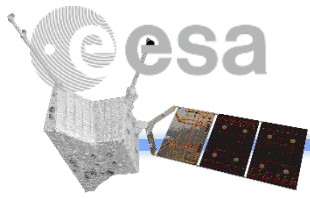
Table/macro update plan



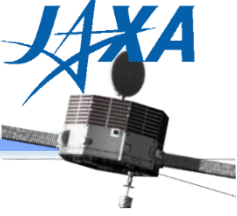
- We have original plans provided in January 2018
 - MEA, MIA, ENA, MSASI, MGF are available
 - **Any updates?**
 - **Other instruments?**
 - **-> ENA requested additional long macro commands**

Instrument	Timing		Table type	Macro number or area		Size	Purpose	Change point	Comments
	After	Before							
MEA	Preparation for nominal science observation	Nominal science observation	MEA MDP	0x1FCF AC50	MDP MEA Table Area	1440B	Change Calibration Table	Calibration Table	
MEA	Nominal science observation	Nominal science observation	MEA MDP	0x1FCF AC50	MDP MEA Table Area	1440B	Change Calibration Table	Calibration Table	

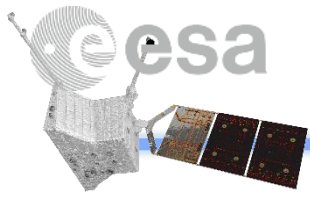
Instrument	Timing		Table type	Macro number or area		Size	Purpose	Change point	Comments
	After	Before							
MGF	MAST deployment	Nominal science observation	MC-S	0x0E7	// MGF_PARAM_SET	-	Finalize the parameters to roughly calibrate the data provided to other instruments	Change the whole parameters	



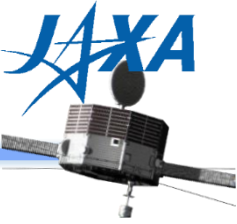
Operations: C/O at Mercury



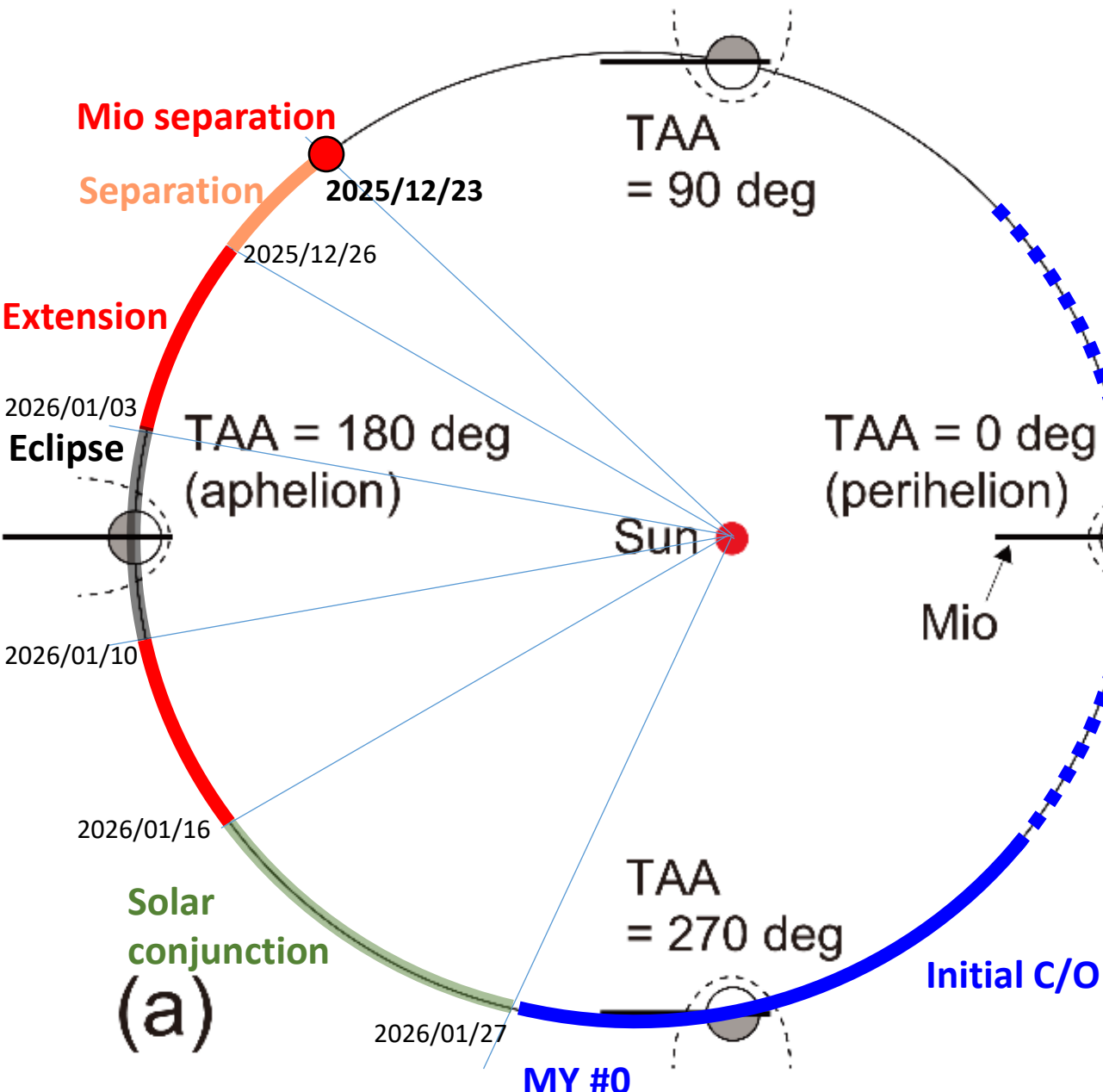
- Main purpose: health check and function check after 7-years cruise and MMO separation
- Baseline plan: ~~same procedures as NECP C/O (but with different setup: telemetry rate, DR available, MMO timeline available, etc...)~~
- **-> Strong constraints due to thermal issue (interactive operations are difficult)**
- New baseline (draft):
 - Timeline operations (including out of communication pass)
 - Skip cruise observation procedures (already checked)
 - Only critical operations (e.g., HV) will be performed during the communication pass (with timeline)
- **JAXA Mio system team will propose a draft strategy/plan for the initial C/O at Mercury by 30 April 2024**
- **-> PI teams will provide detailed information by the next SWT meeting in Japan**
 - **Activity, brief procedure, and duration**



Operations: instrument optimizations for nominal science observations

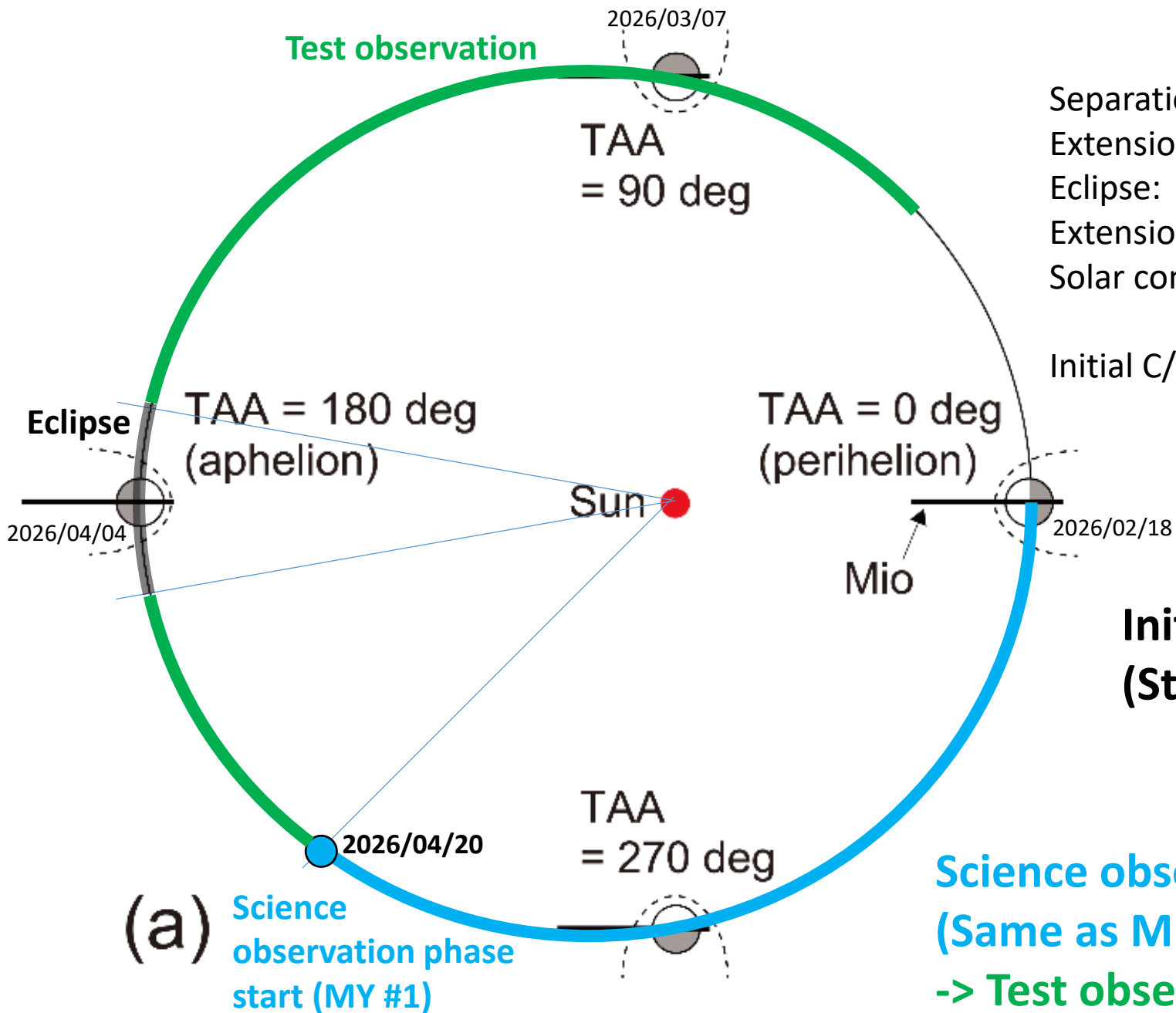


- Main purpose: optimizations of instrument observation modes, parameters (e.g., HV), timings, and so on
- No information/plan now
- -> We need brief information list: activity, duration, observation mode, data mode, requested geometry
- **【To be asked to each PI team】**



Separation:	2025/12/22-2026/12/26 (TAA: 137-150)
Extension:	2025/12/26-2026/01/03 (TAA: 150-170)
Eclipse:	2026/01/03-2026/01/10 (TAA: 170-190)
Extension:	2026/01/11-2026/01/16 (TAA: 190-210)
Solar conjunction:	2026/01/16-2026/01/27 (TAA: 210-245)
Initial C/O:	2026/01/29-2026/02/18 (TAA: 249-360)

**Initial C/O phase: 2-3 weeks
 (Strong constraints near perihelion)**



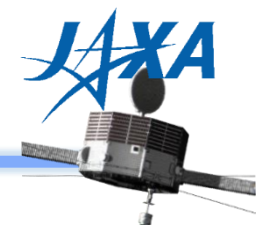
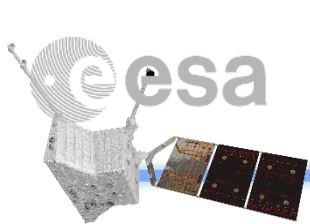
Separation: 2025/12/22-2026/12/26 (TAA: 137-150)
 Extension: 2025/12/26-2026/01/03 (TAA: 150-170)
 Eclipse: 2026/01/03-2026/01/10 (TAA: 170-190)
 Extension: 2026/01/11-2026/01/16 (TAA: 190-210)
 Solar conjunction: 2026/01/16-2026/01/27 (TAA: 210-245)

Initial C/O: 2026/01/29-2026/02/18 (TAA: 249-360)

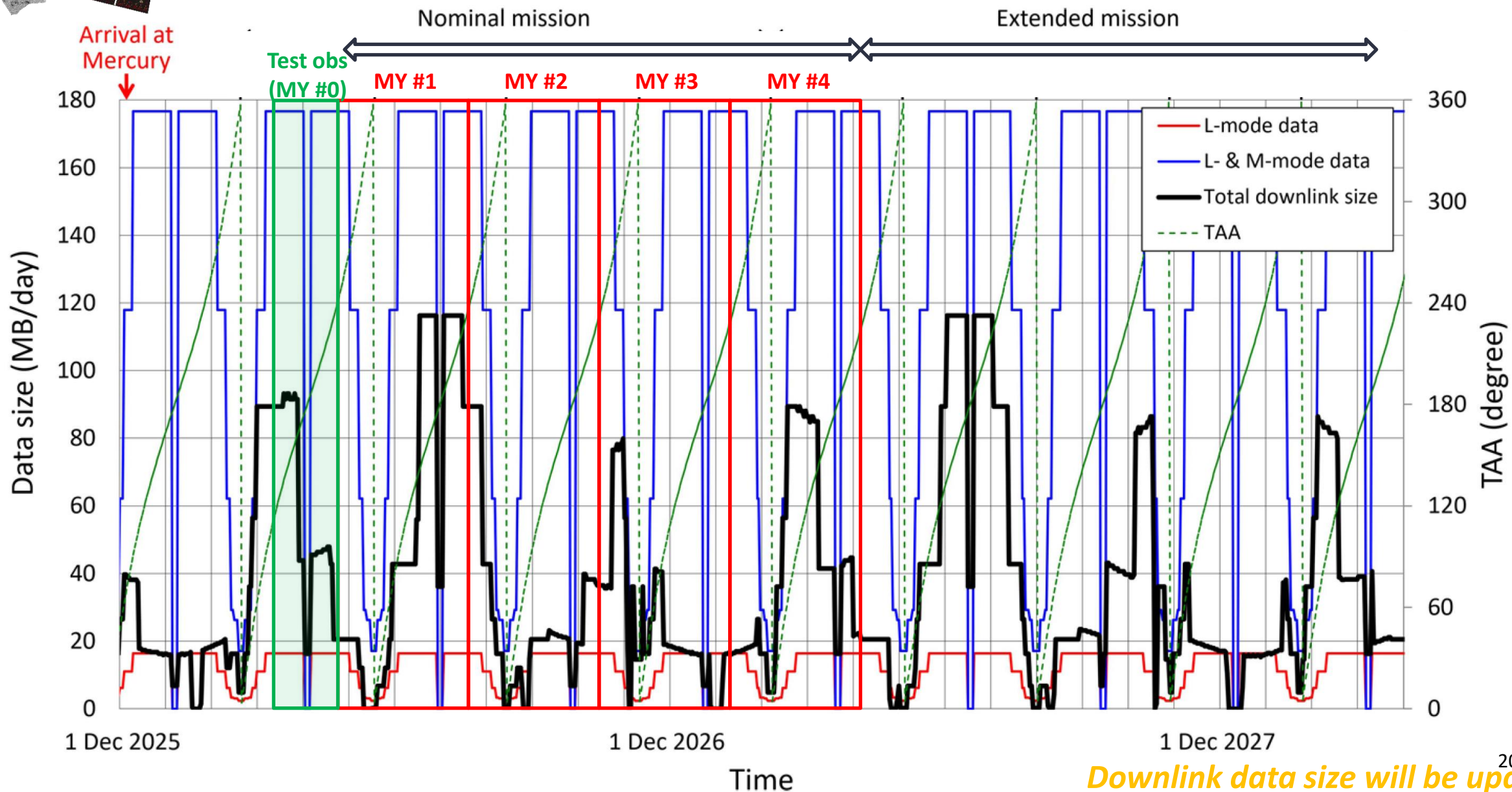
**Initial C/O phase: 2-3 weeks
 (Strong constraints near perihelion)**

**Science observation phase: 2026/04/20 (TAA 225)-
 (Same as MPO)**

-> Test observation: ~5-6 weeks

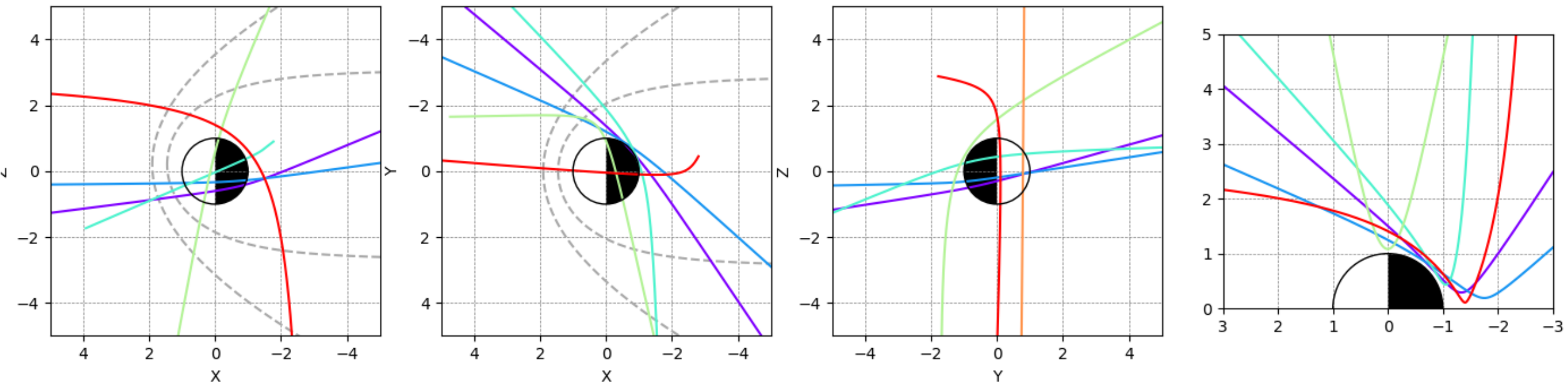


Baseline downlink plan



Mercury flyby #4, #5, and #6

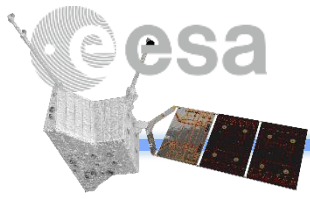
— Flyby#1
 — Flyby#2
 — Flyby#3
 — Flyby#4
 — Flyby#5
 — Flyby#6



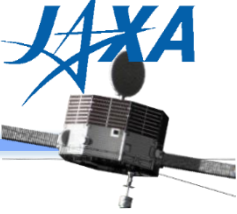
Instrument	Flyby operation foreseen? (Yes/No)	Relative priority of this swingby wrt other two	Description of the flyby operation	Operation start relative to CAHE	Operation end relative to CAHE	Pointing requirements	S/C platform requests (e.g., no WOL, no appendage movement, etc)	Special TM requests (eg, payload hk rate increase, AOCSS HK TM increase, etc)
MIO	Yes	NORMAL	Same as MSB3 (, MSB1, and MSB2)	About -24h (depending on result of thermal analysis)	About +24h (depending on result of thermal analysis)	<Soft request> direct open FoV to Mercury during closest approach if possible <same as MSB3>	No WOL from CA-3.0h to CA+1.0h if possible (HV start 10 min after WOL, taking 1.7h for HV ramp) <Same as MSB3>	Before the observation sequence, MSA requires interactive operations to check science data generation. MGF requests early power on (just after MSA) for drift investigation. <Same as MSB3>
MIO	Yes	LOW	Same as MSB3 (, MSB1, and MSB2)	About -24h (depending on result of thermal analysis)	About +24h (depending on result of thermal analysis)	<Soft request> direct open FoV to Mercury during closest approach if possible <same as MSB3>	No WOL from CA-3.0h to CA+1.0h if possible (HV start 10 min after WOL, taking 1.7h for HV ramp) <Same as MSB3>	Before the observation sequence, MSA requires interactive operations to check science data generation. MGF requests early power on (just after MSA) for drift investigation. <Same as MSB3>
MIO	Yes	HIGH	Same as MSB3 (, MSB1, and MSB2)	About -24h (depending on result of thermal analysis)	About +24h (depending on result of thermal analysis)	<Soft request> direct open FoV to Mercury during closest approach if possible <same as MSB3>	No WOL from CA-3.0h to CA+1.0h if possible (HV start 10 min after WOL, taking 1.7h for HV ramp) <Same as MSB3>	Before the observation sequence, MSA requires interactive operations to check science data generation. MGF requests early power on (just after MSA) for drift investigation. <Same as MSB3>

Mio request: same as MSB #3 as a baseline

Priority: #6 >= #4 >> #5

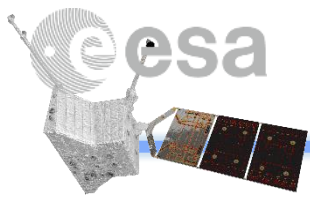


Mio Science Working Group meeting

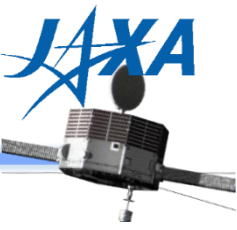


07 March 2024 18:00JST/10:00CET

- 1. Updated status of Mio
- 2. Upcoming operations plan
 - 2024/H1
 - Preparations for Mercury arrival: separation and deployments
 - Mercury flyby #4, #5, and #6
- **3. Updates on baseline observation plans**
 - Current status of the activity (thermal analysis)
- 4. Data handling and archiving
 - Status of Mio Science Center (Yoshi Miyoshi)
 - Request to each PI team
- 5. Others



Baseline plan: updates needed

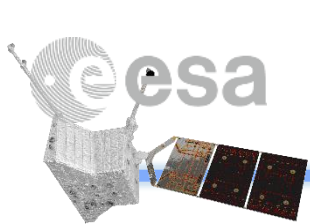


Mio observation/downlink planning and verification tool

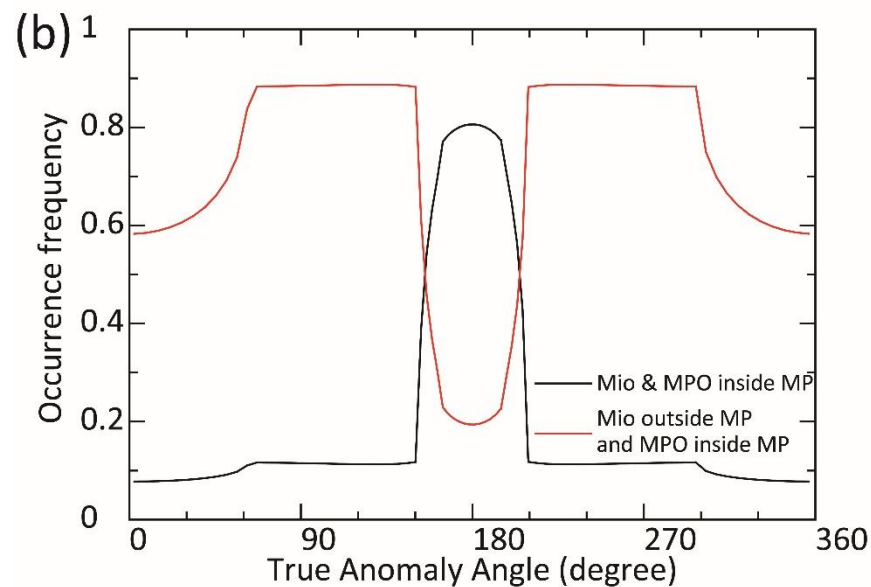
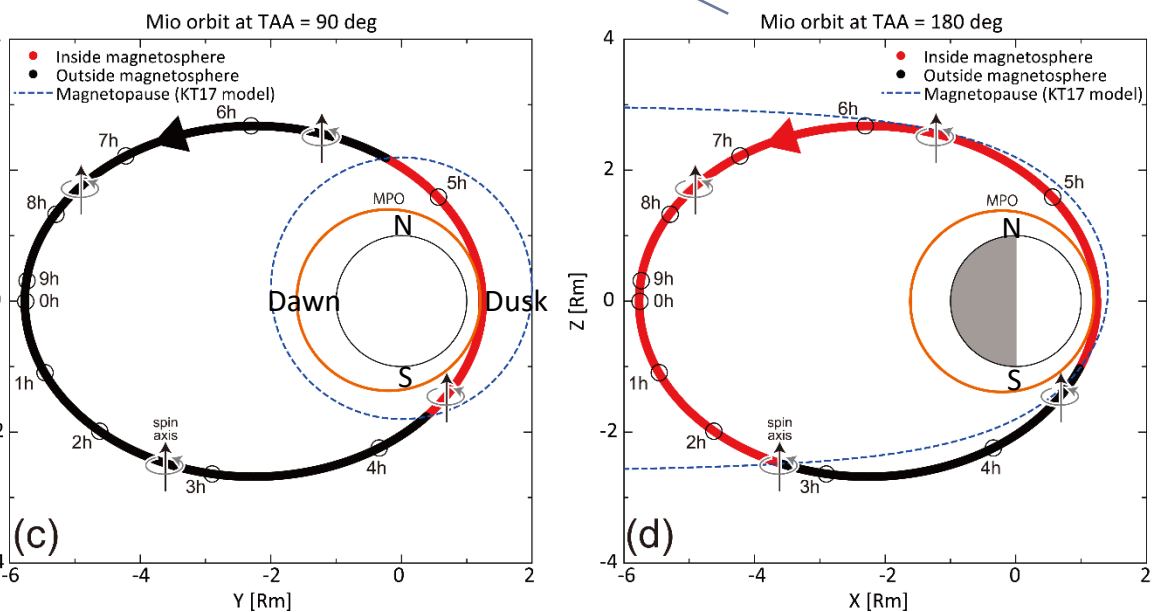
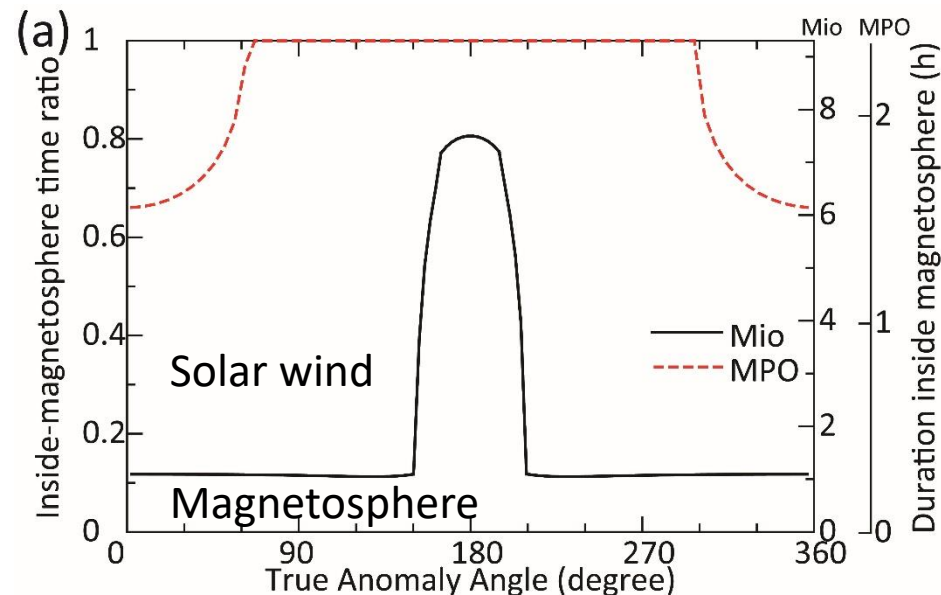
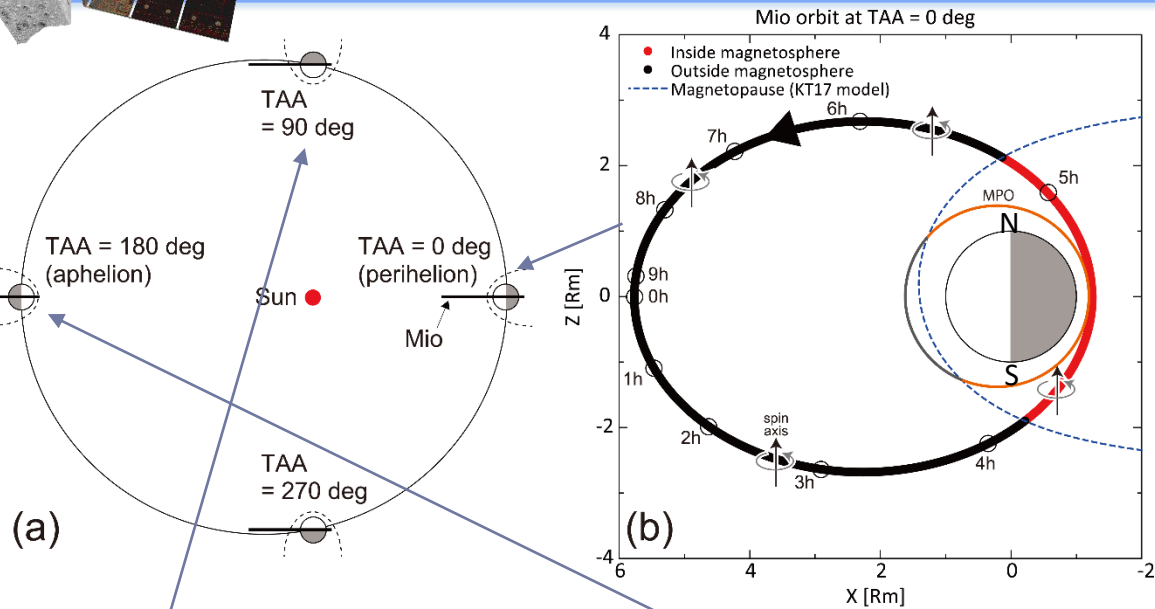
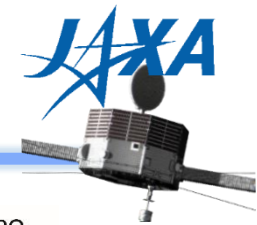
-Purpose: generate and verify science observation and downlink plans

Current status

- Software updating, verification and I/F tests: **Done**
- Thermal simulator updates: **Done and analysis is on-going**
- Power consumption simulator: **implementing**
- > **Updating the baseline plans for observation and downlink**



Baseline observation plan (old)

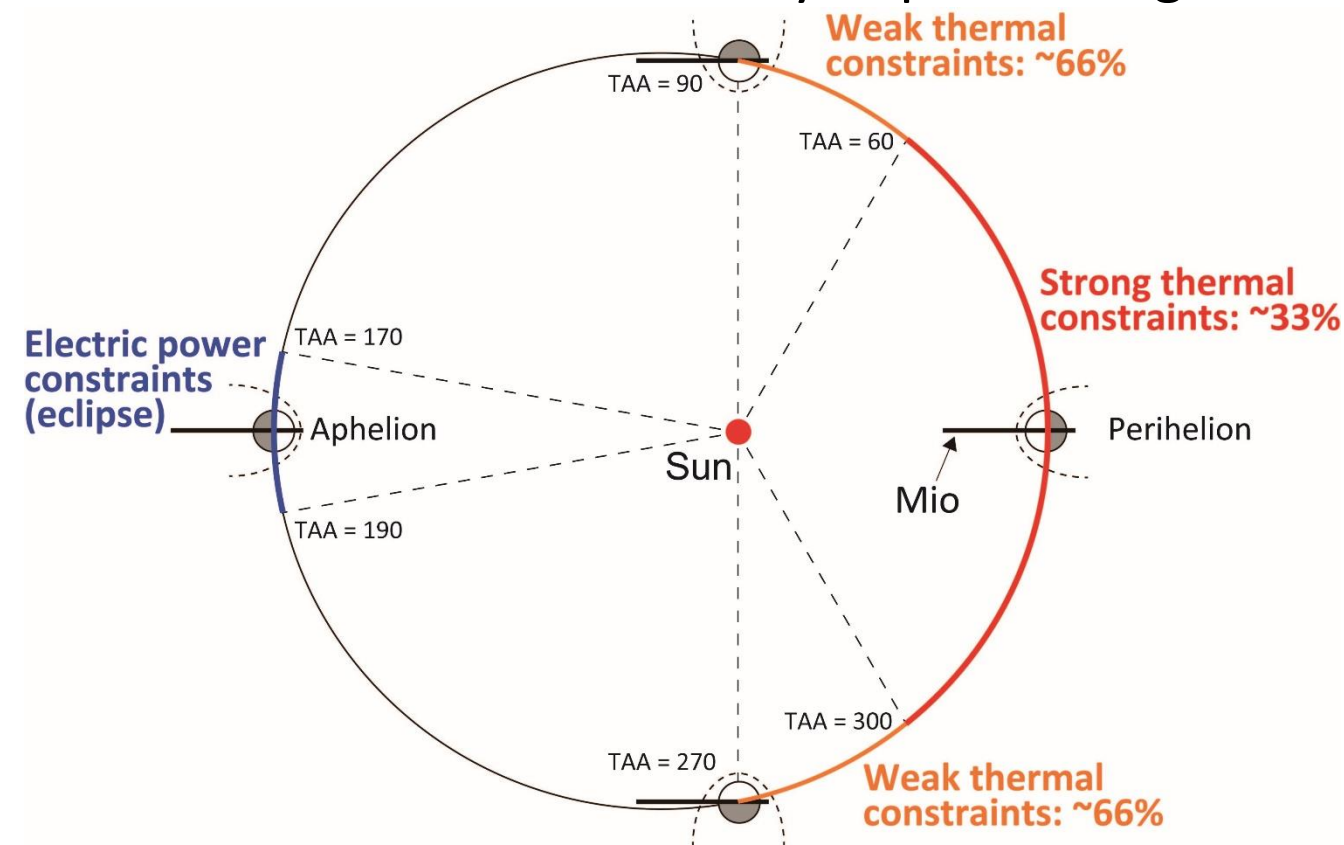


Baseline observation plan (old)

Summary of science observations

- Basically always ON (except for MSASI)
- Constraints: **thermal** (TAA = 0 ± 90 deg), **electrical power** (5 days around TAA = 180), and **number of commands** (512 commands / 1 TL)
- Observations mode: basically depends on geometry

To be updated!!

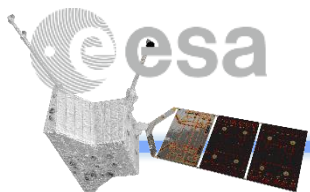


Thermal constraints

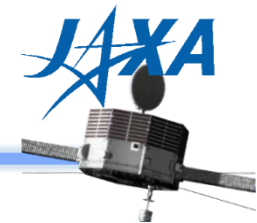
- SI ON: 1 orbit / 3 orbits (TA ± 60 deg)
2 orbits / 3 orbits ($60 < TA < 90$ deg)
- Limited downlink duration near perihelion
- Thermal analysis soon to be updated**

Electric power constraints

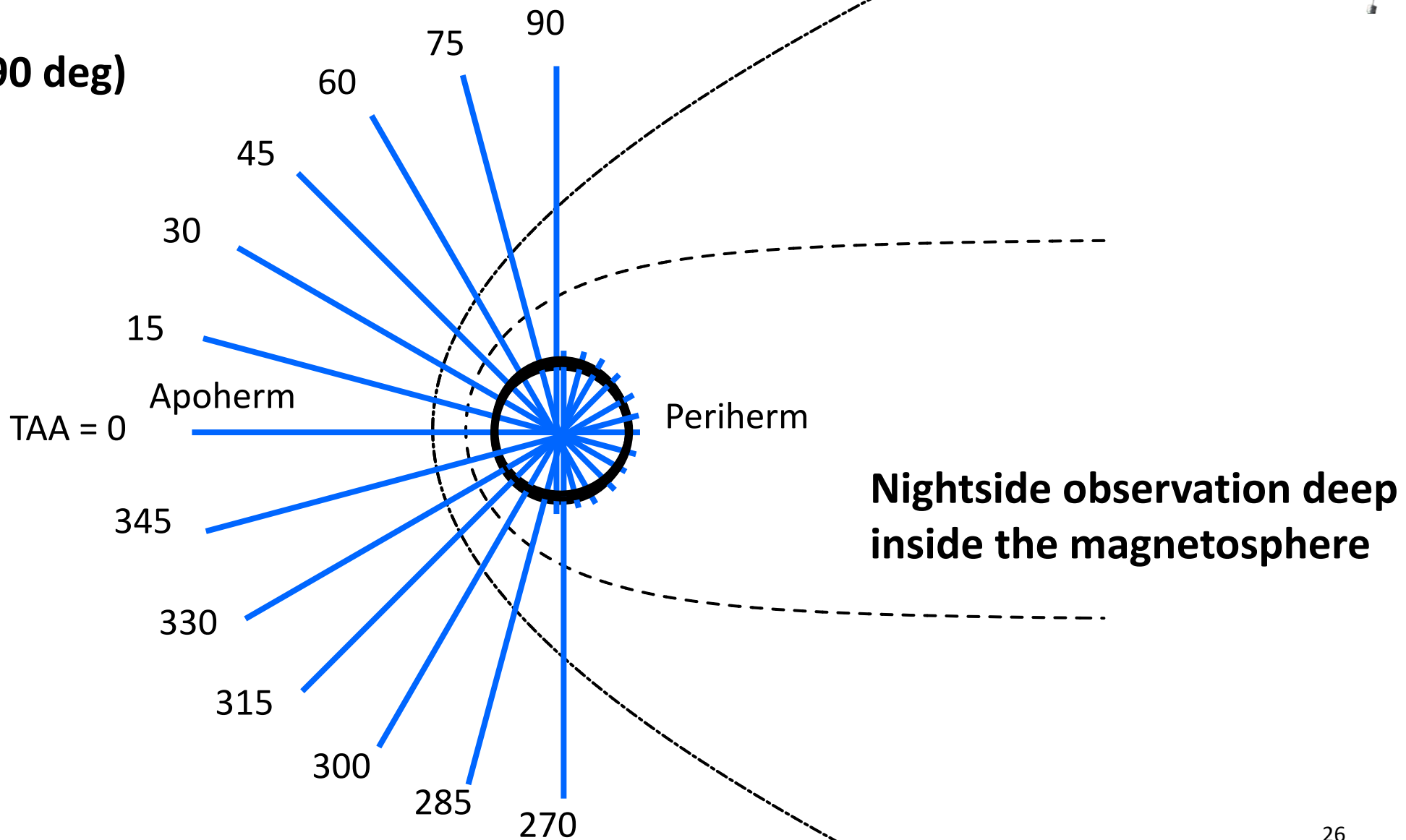
- Due to the eclipse (1-2 hours/orbit), almost no observations will be possible for ~5 days around TA = 180 deg.
- The battery charge needs 3 times as long as the eclipse duration
- Updated analysis is under implementation**



Baseline observation plan



Mio orbit (TAA \pm 90 deg)



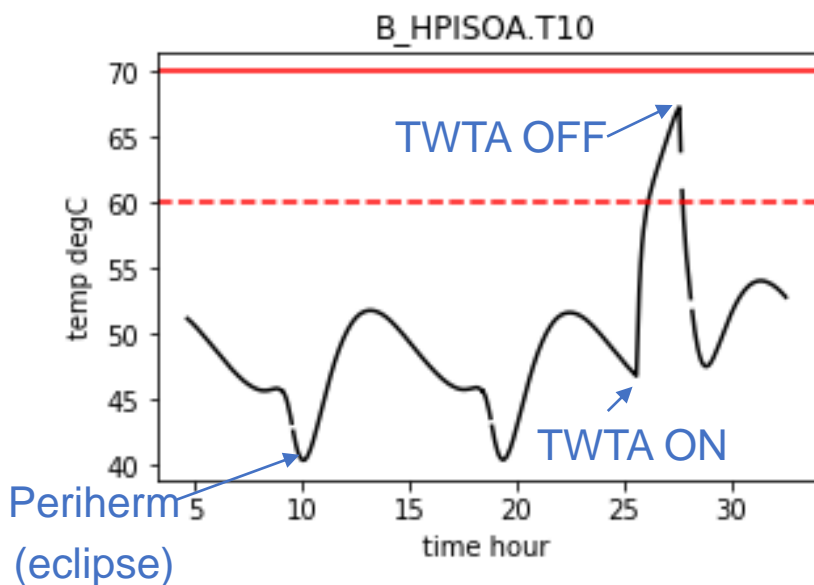
Current status of MMO operational plans

Hiroto Tanaka

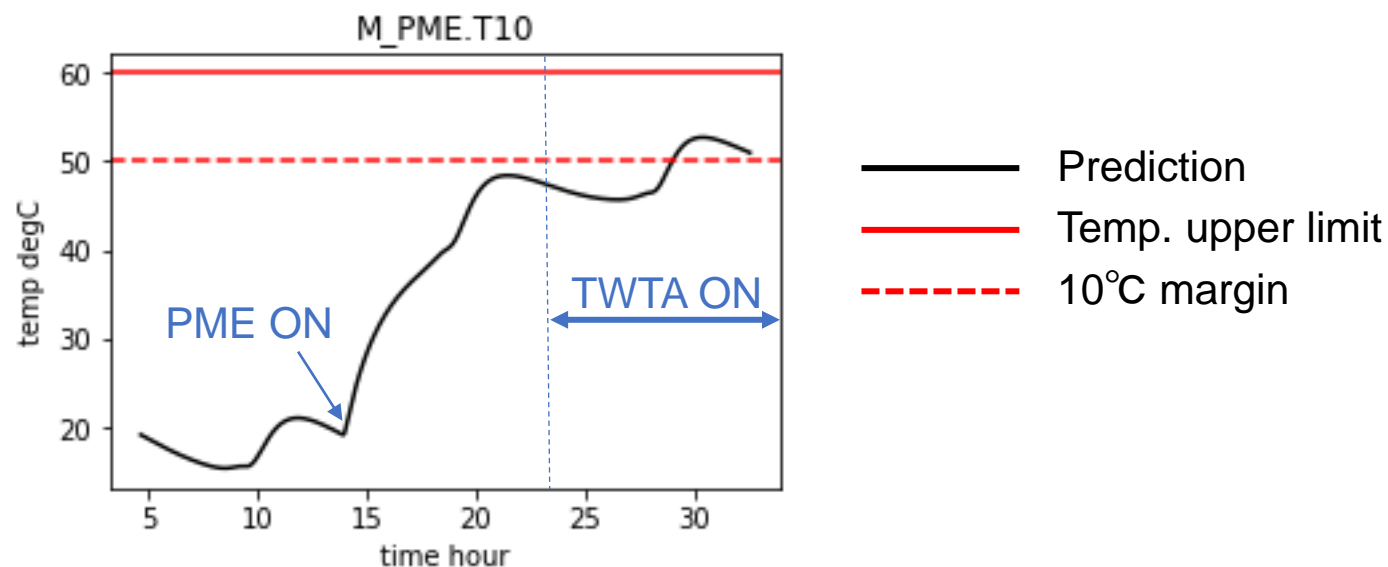
Thermal issues of operational plans

- Thermal mathematical model was updated reflecting on-orbit operation data.
- Predicted temperature **increases of 5 to 10 °C** compared to pre-launch analysis.
- **Thermal constraints becomes more severe** than assumed before launch.

e.g.) TAA = 0°



e.g.) TAA = 90°



Plan updates

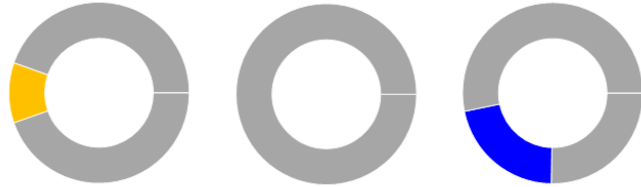
- Update the operational plans while satisfying thermal constraints *
- Maximize communication and observation durations as close as possible to those of CDR plans
- Consider communication visibility time for six phases in TAA = 0, 30, 60, 90, 135, 180 deg (2026/5-7)
- Compare the operation duration between CDR plan and current plan

* We will temporarily exclude bellow concerns in plan updates

- Equipment that cannot keep sufficient margin even in standby mode.
- ENA temperature : too tight temperature margins

Operational Plan / CDR

Mode A
TAA: 0-8



Mode B
TAA: 8-15



Mode C
TAA: 15-30



Mode D
TAA: 30-45



Mode E
TAA: 45-60



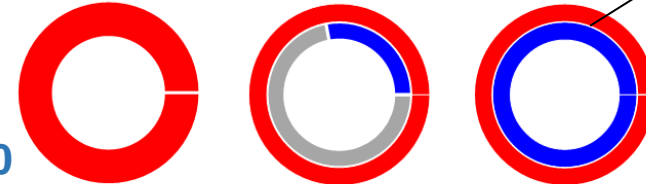
Mode F
TAA: 60-90



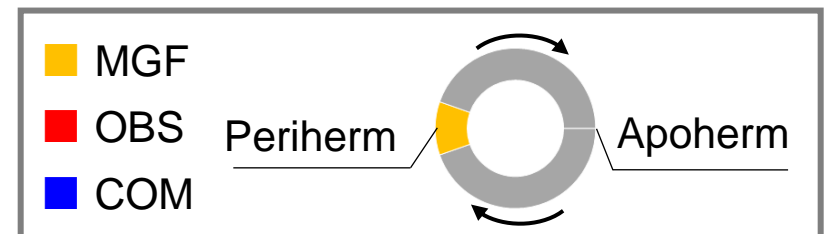
Mode G
TAA: 90-135



Mode H
TAA: 135-180

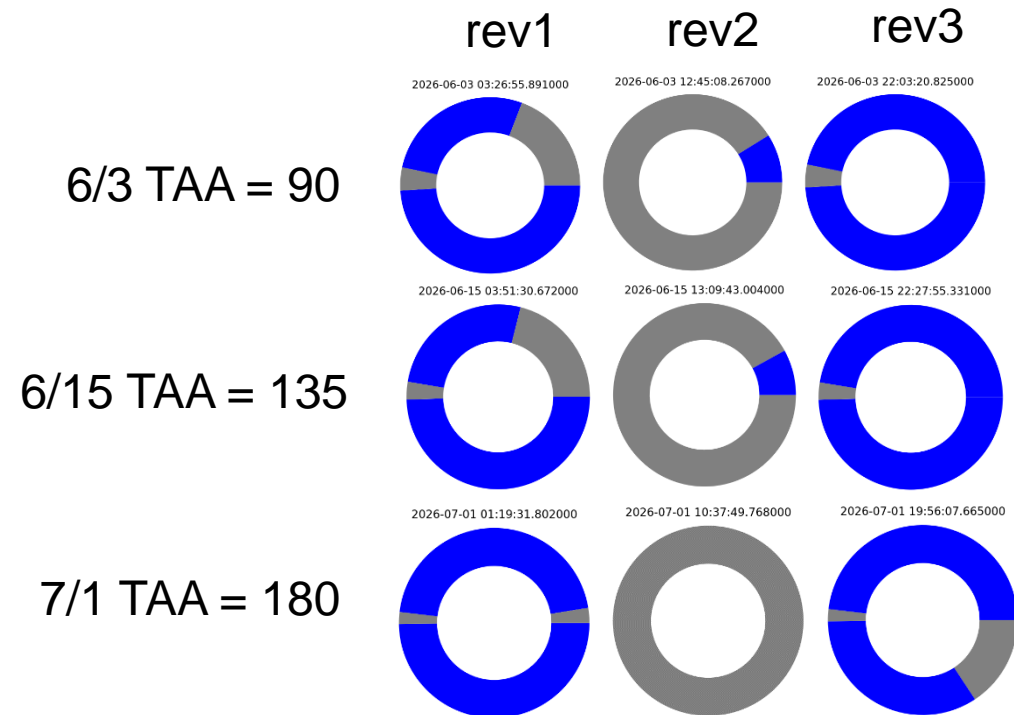
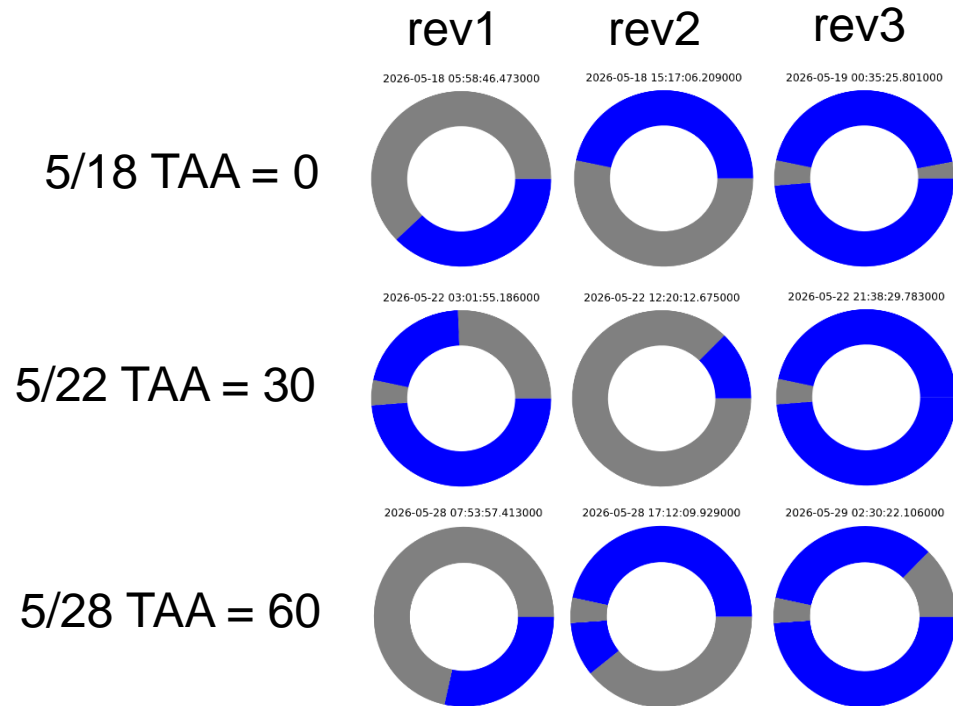
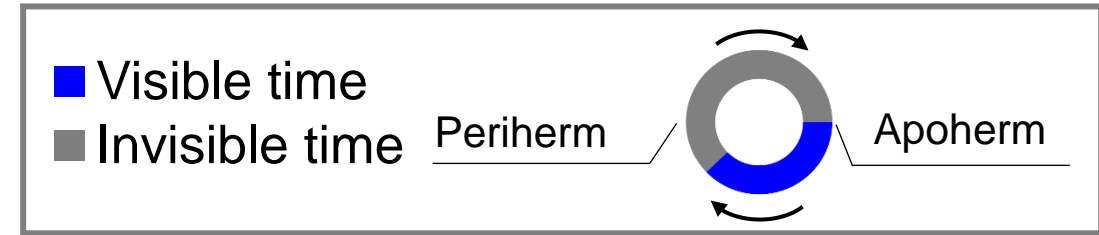


OBS/COM



Actual visible time cases: 2026 / May - July

- 6 specific dates for planning
- Visible time estimated in the latest orbital plan
- Update the plans with COM duration constrains

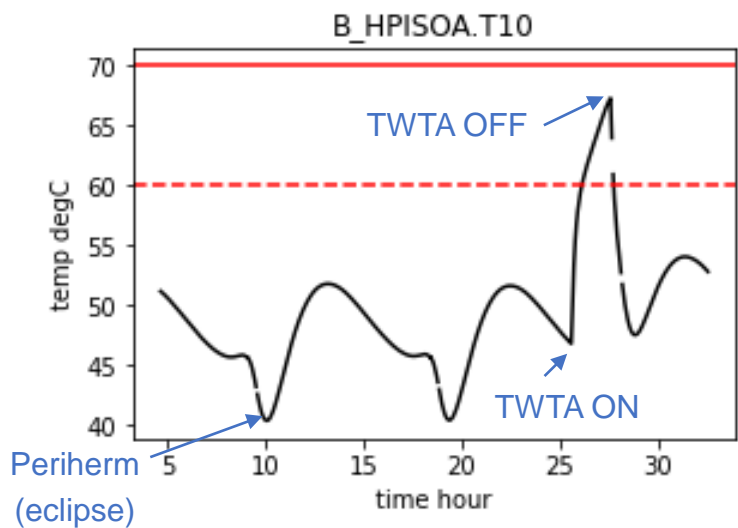


Plan update procedure

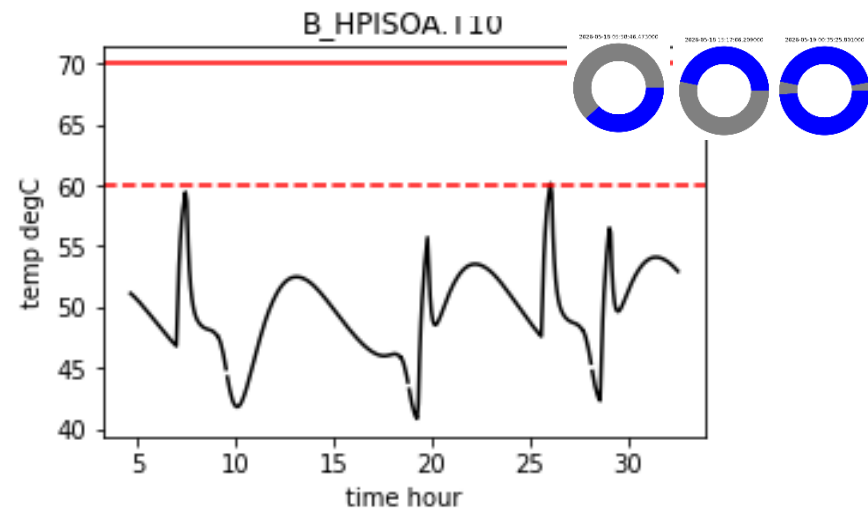
■ CDR plan



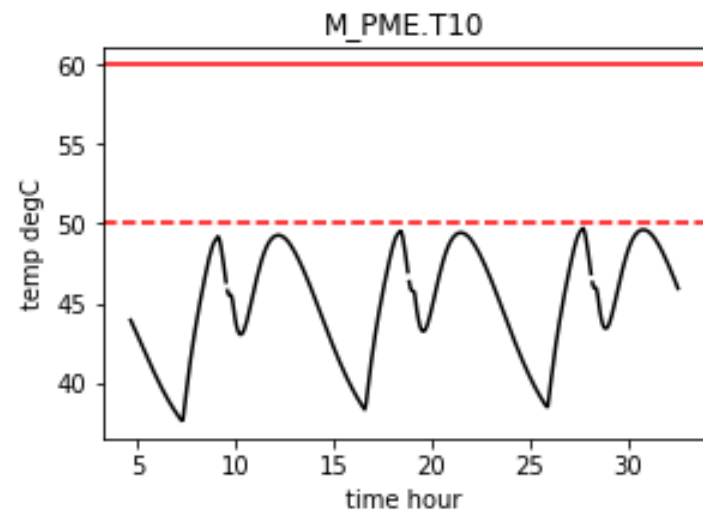
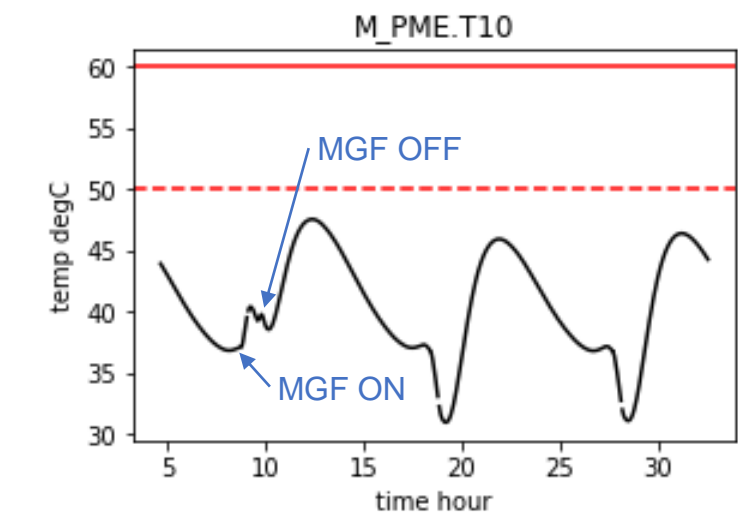
■ Updated plan



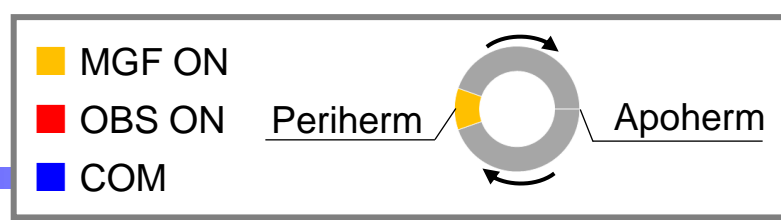
STEP1: Adjust the COM time



STEP2: Maximize OBS time



Current operational plans: TAA = 0 deg



	CDR Plan	Current Plan
Operational Mode	Mode A TAA: 0-8 	 Updated Mode 2026/5/18 Visible time . . .
COM	2.00 h	2.00 h
OBS ON	-	-
MGF ON	1.00 h	7.50 h

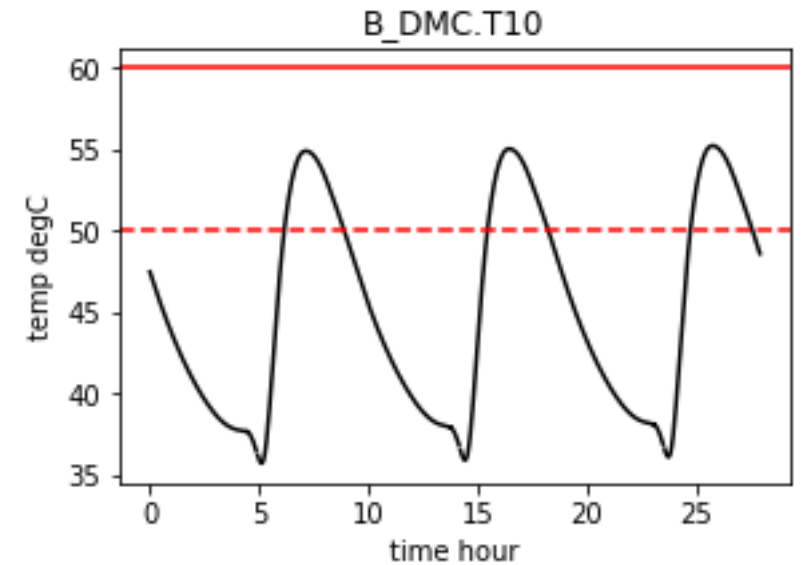
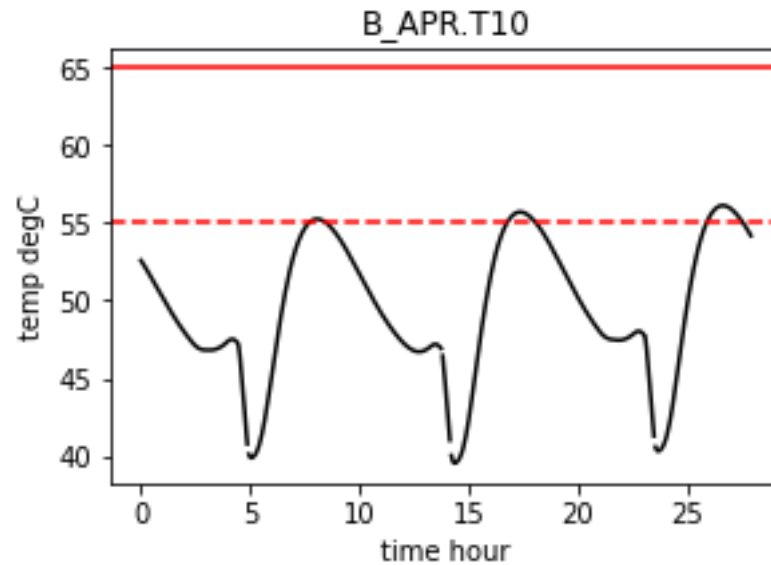
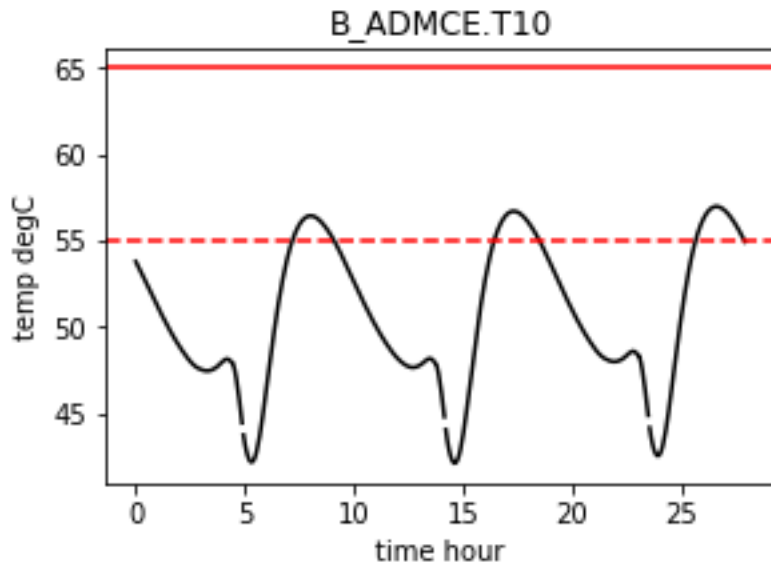
* Concerns : 12 equipment

Concerns

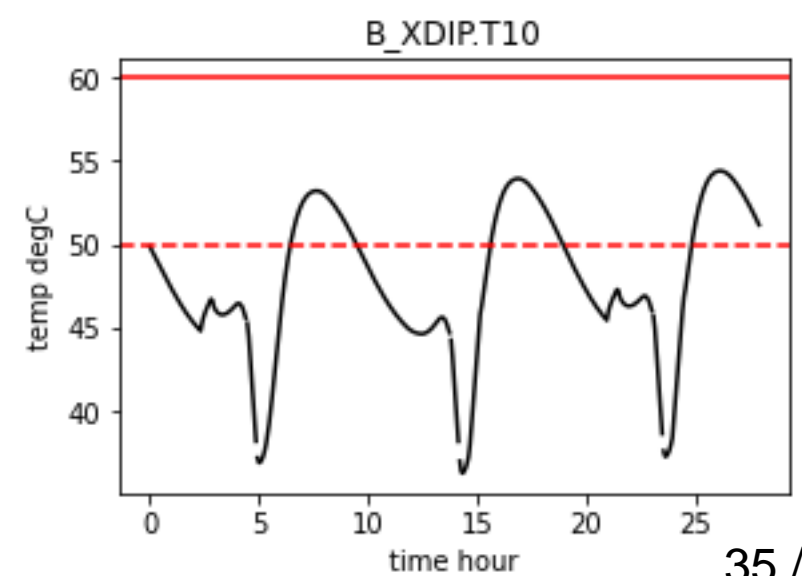
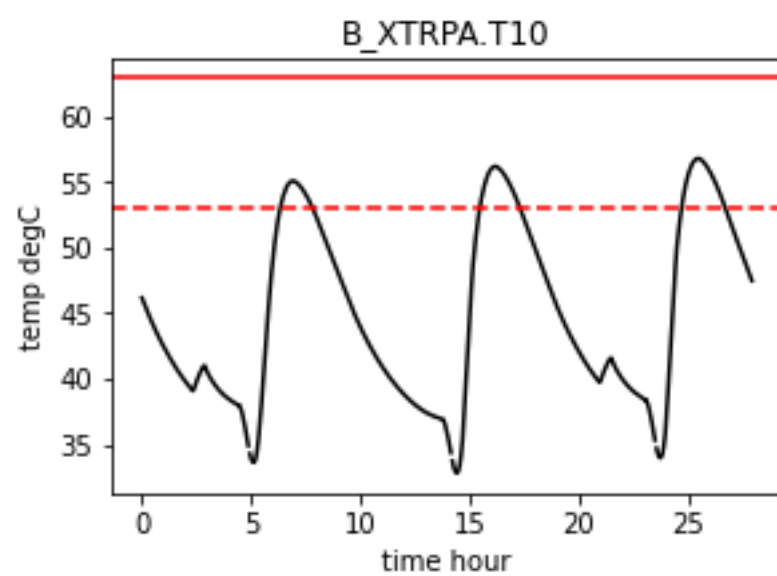
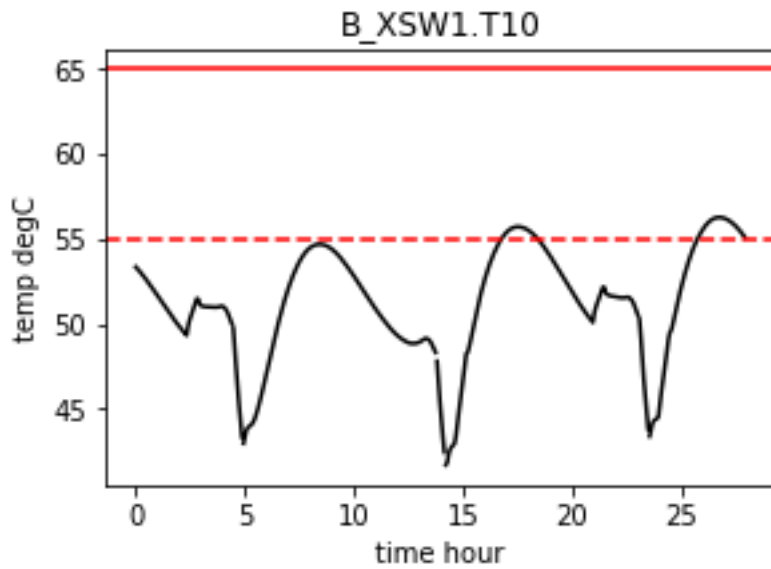
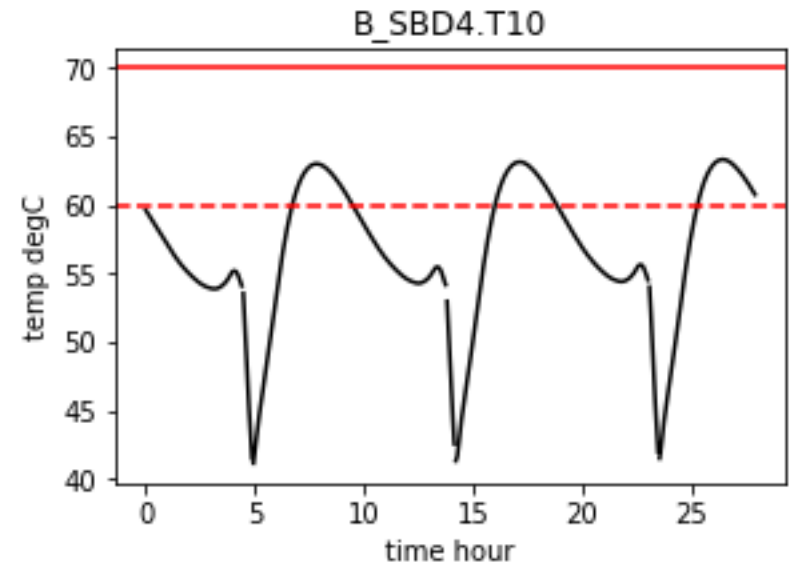
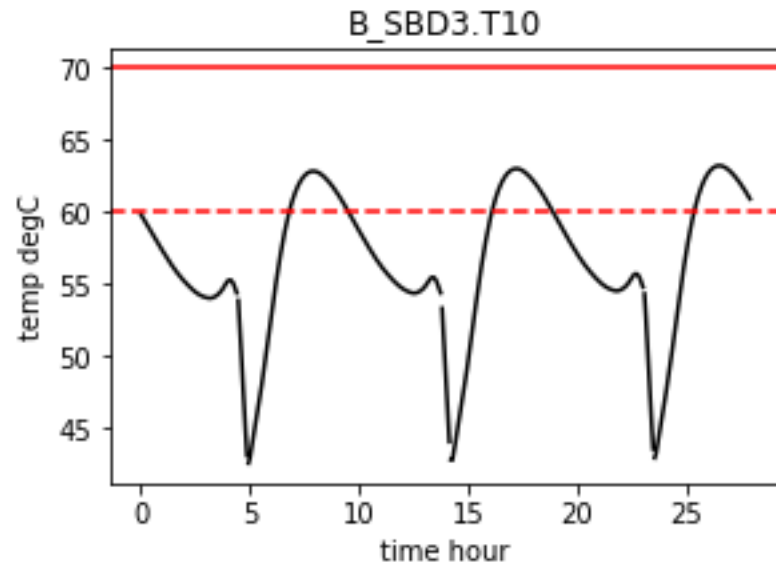
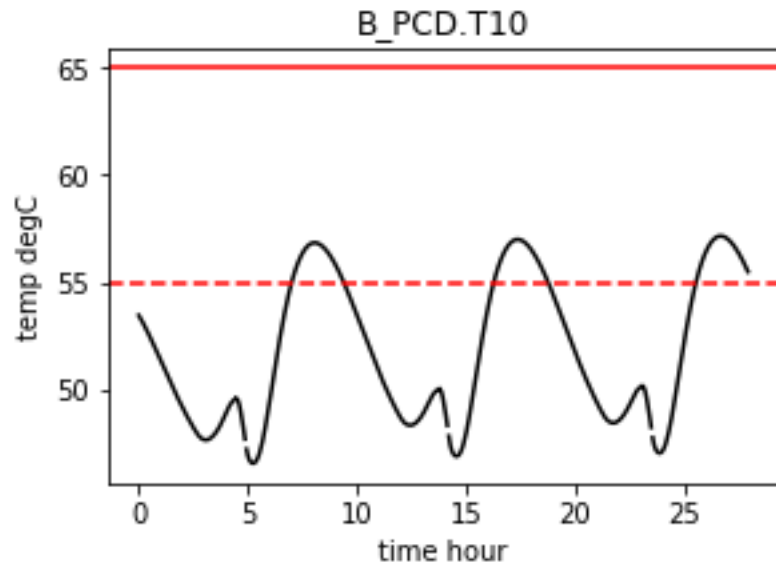
- Equipment bellow cannot satisfy 10°C margin **even in standby mode**

■ BUS : ADMCE, APR, DMC, PCD, SBD, XSW, XTRPA, XDIP, TXBPF, XTRPB

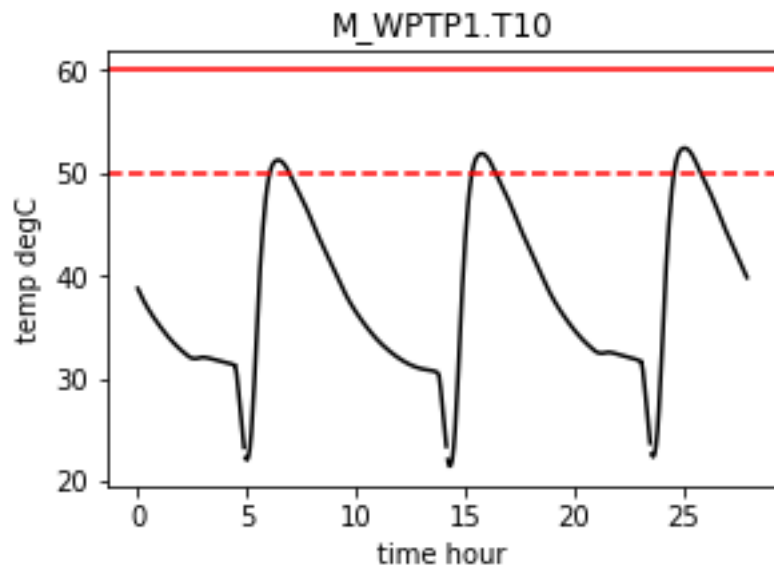
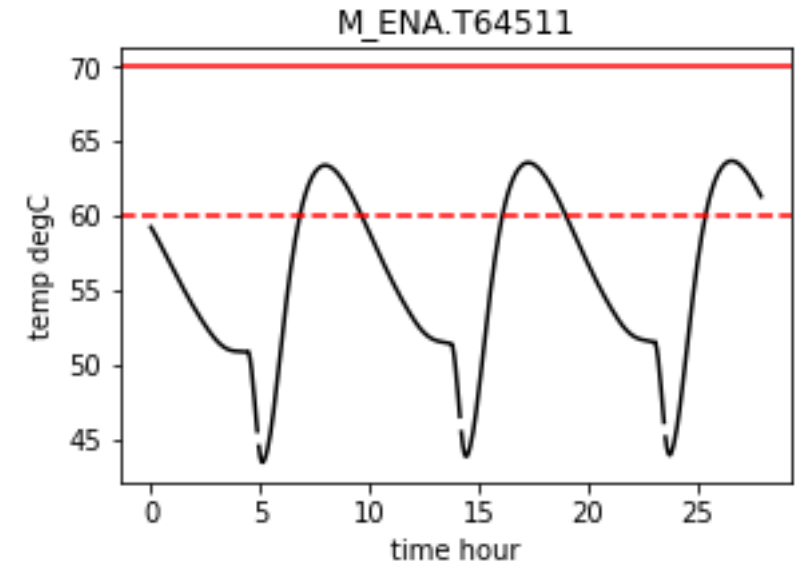
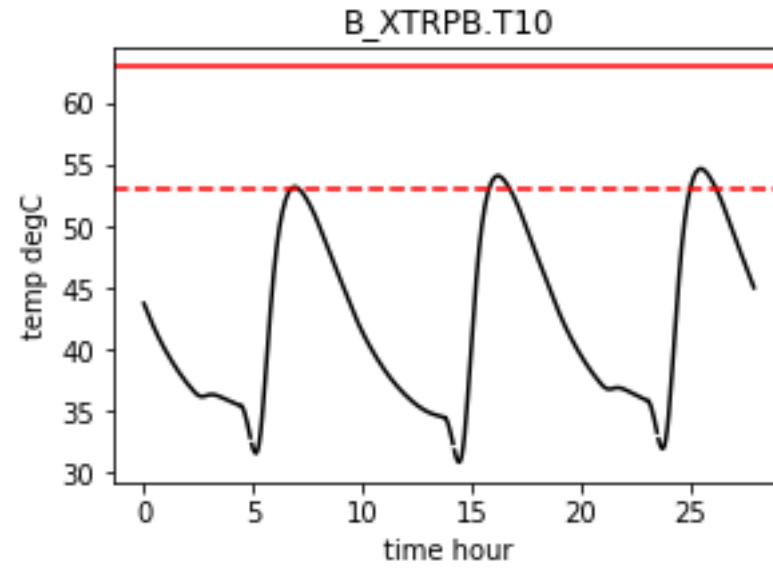
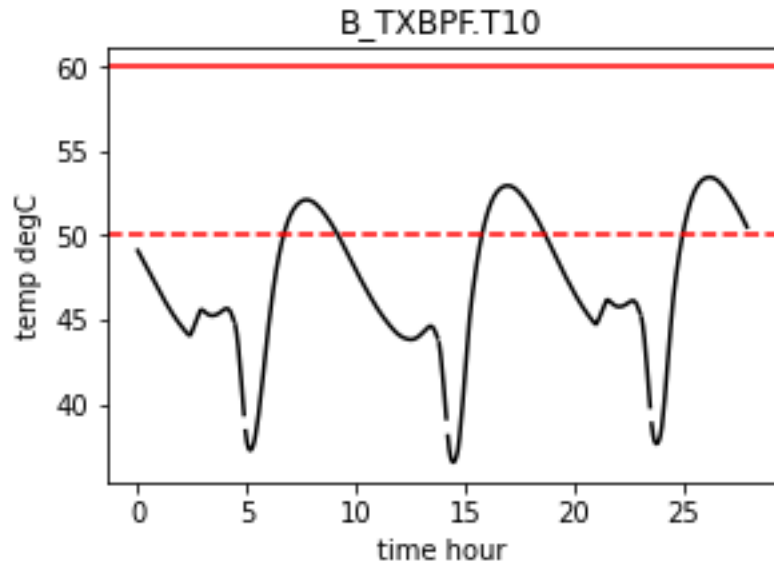
■ MISSION : ENA, WPT



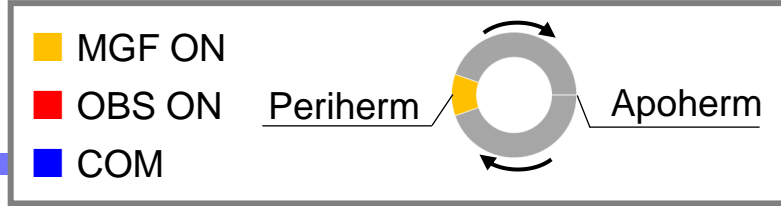
Concerns







Concerns



Current operational plans: TAA = 30 deg

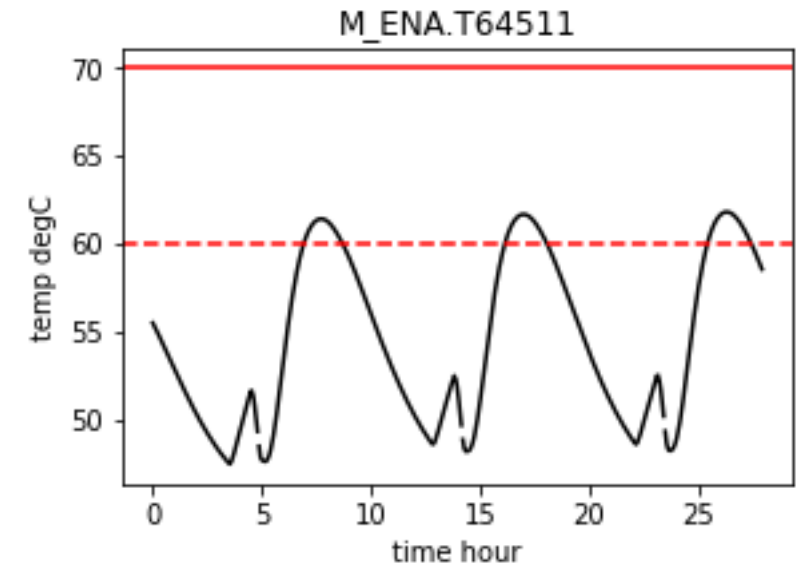
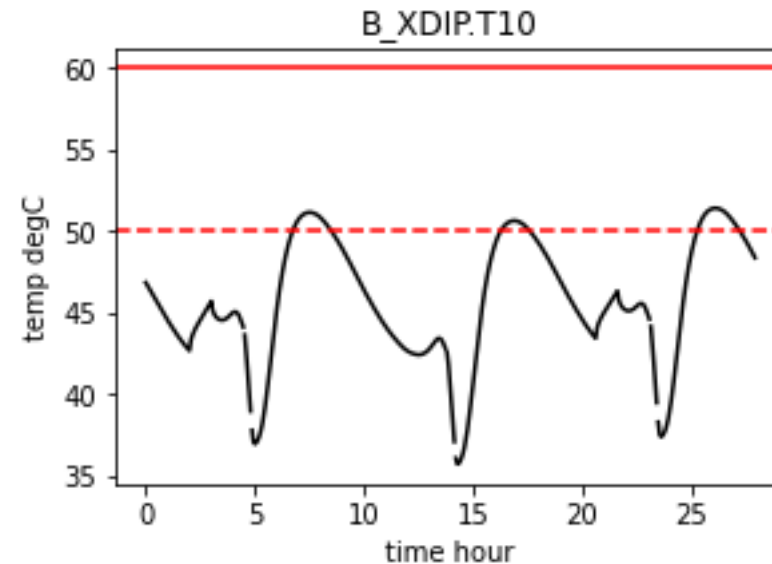
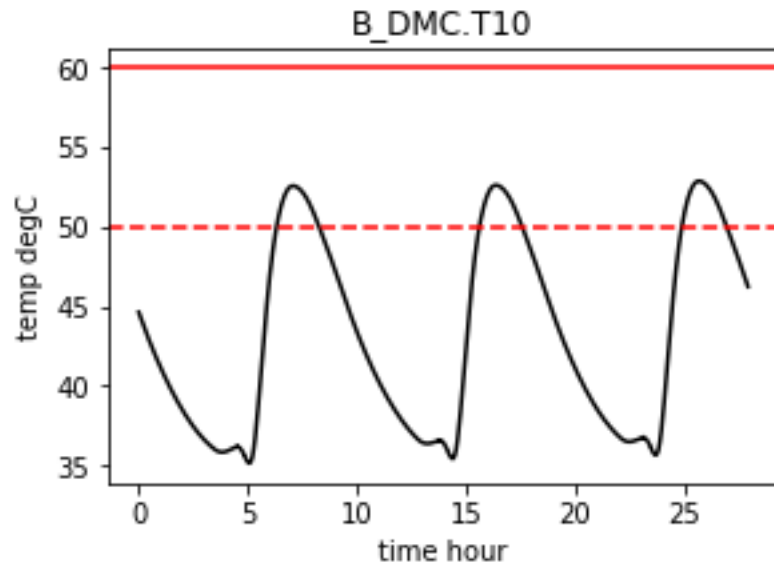


	CDR Plan	Current Plan
Operational Mode	<p>Mode C TAA: 15-30</p>  <p>Mode D TAA: 30-45</p> 	 <p>Updated Mode</p> <p>2026/5/22 Visible time . . .</p> 
COM	4.00 h	2.00 h
OBS ON	2.00 h – 4.65 h	4.50 h
MGF ON	1.00 h – 1.50 h	-

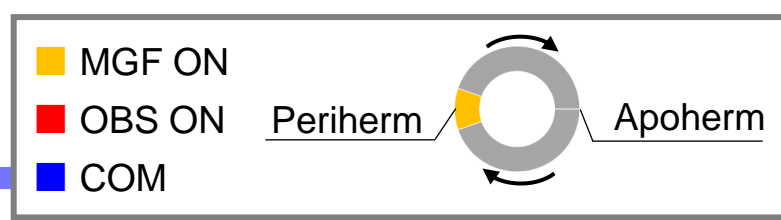
* Concerns : DMC, DIP, ENA

Concerns

- DMC and XDIP cannot satisfy a 10°C margin **even in standby mode**
 - ENA cannot satisfy a 10°C margin
- ⇒ need to reduce turn-on time



Current operational plans: TAA = 60 deg



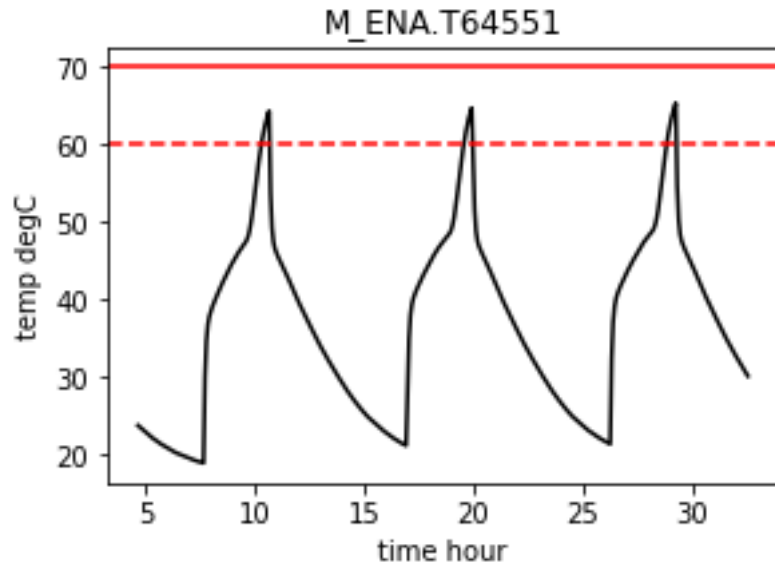
	CDR Plan	Current Plan
Operational Mode	<p>Mode E TAA: 45-60</p> <p>Mode F TAA: 60-90</p>	<p>Updated Mode</p> <p>2026/5/28 Visible time . . .</p>
COM	6.00 h – 9.30 h	7.00 h
OBS ON	9.30 h – 18.60 h	12.00 h
MGF ON	1.00 h	-

* Concern : ENA

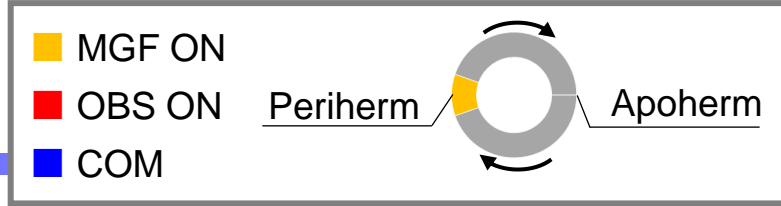
Concerns



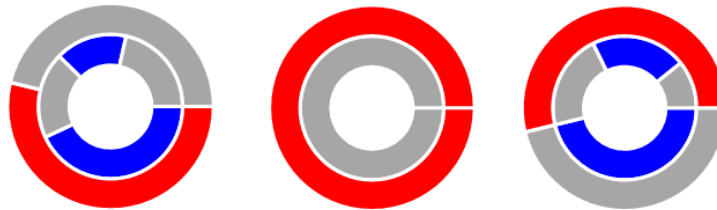

- ENA cannot satisfy a 10°C margin

⇒ need to turn off during periods of high temperature

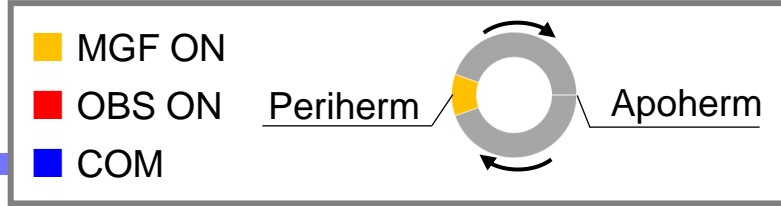


Current operational plans: TAA = 90 deg



	CDR Plan	Current Plan
Operational Mode	Mode F TAA: 60-90  Mode G TAA: 90-135 	 Updated Mode 2026/6/3 Visible time . . . 
COM	9.30 h	11.80 h
OBS ON	18.60 h – 27.90 h	19.30 h
MGF ON	-	-

Current operational plans: TAA = 135 deg



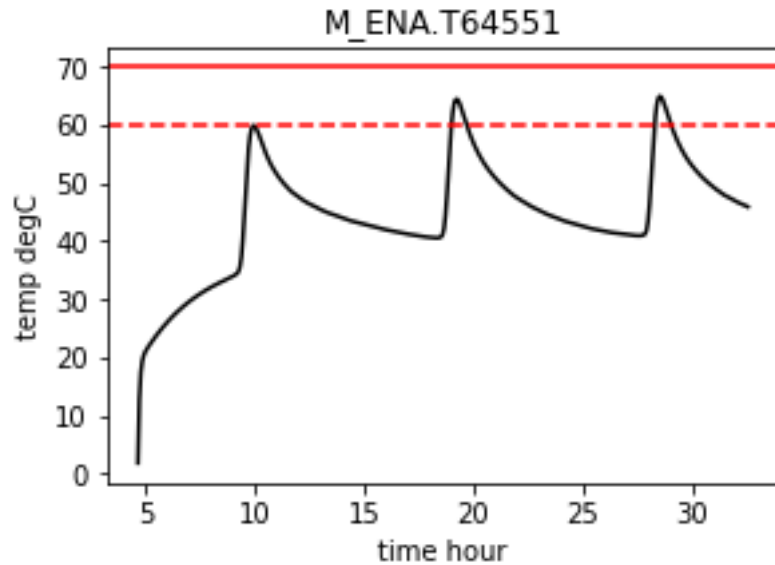
	CDR Plan	Current Plan
Operational Mode	<p>Mode G TAA: 90-135</p> <p>Mode H TAA: 135-180</p>	<p>Updated Mode</p> <p>2026/6/15 Visible time . . .</p>
COM	9.30 h – 11.9 h	11.80 h
OBS ON	27.90 h	27.90 h
MGF ON	-	-

* Concern : ENA cannot guarantee a 10°C margin

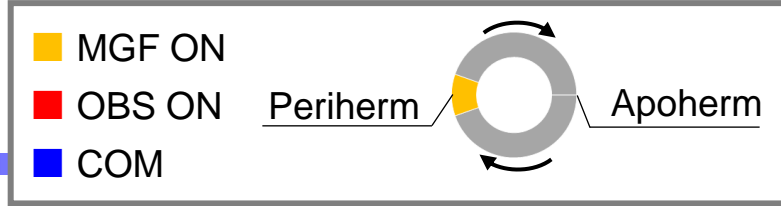
Concerns

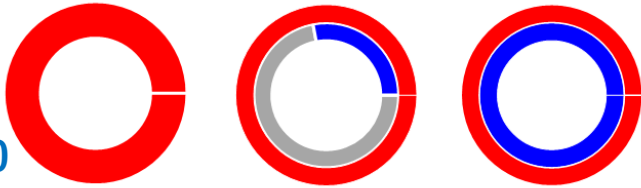
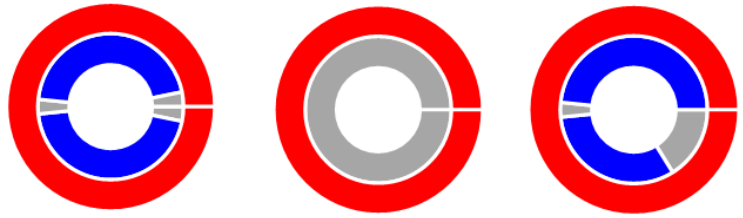

- ENA cannot satisfy a 10°C margin

⇒ need to turn off during periods of high temperature



Current operational plans: TAA = 180 deg

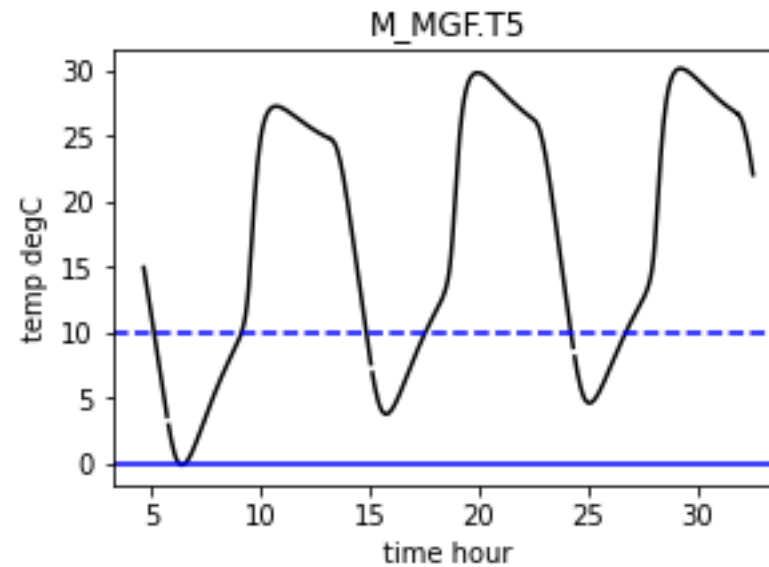
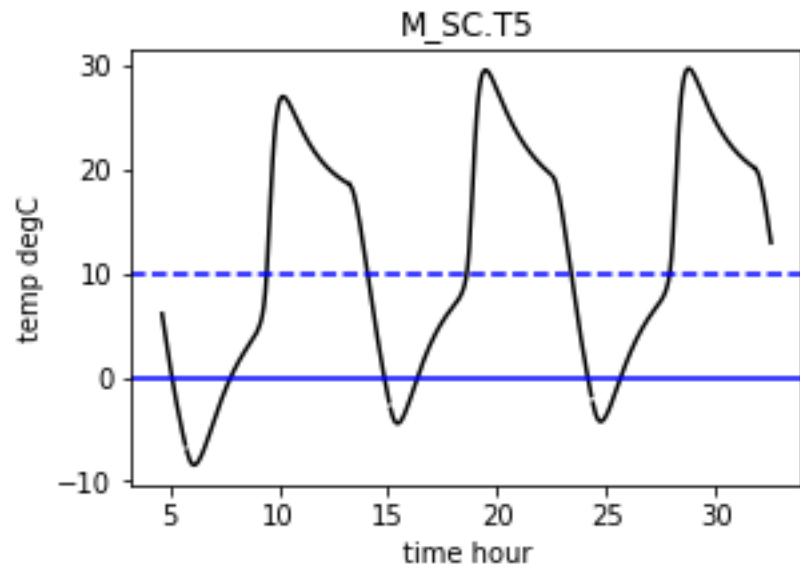


	CDR Plan	Current Plan
Operational Mode	Mode H TAA: 135-180 	 Updated Mode 2026/7/1 Visible time . . . 
COM	11.90 h	15.90 h
OBS ON	27.90 h	27.90 h
MGF ON	-	-

* Concern : SC, MGF

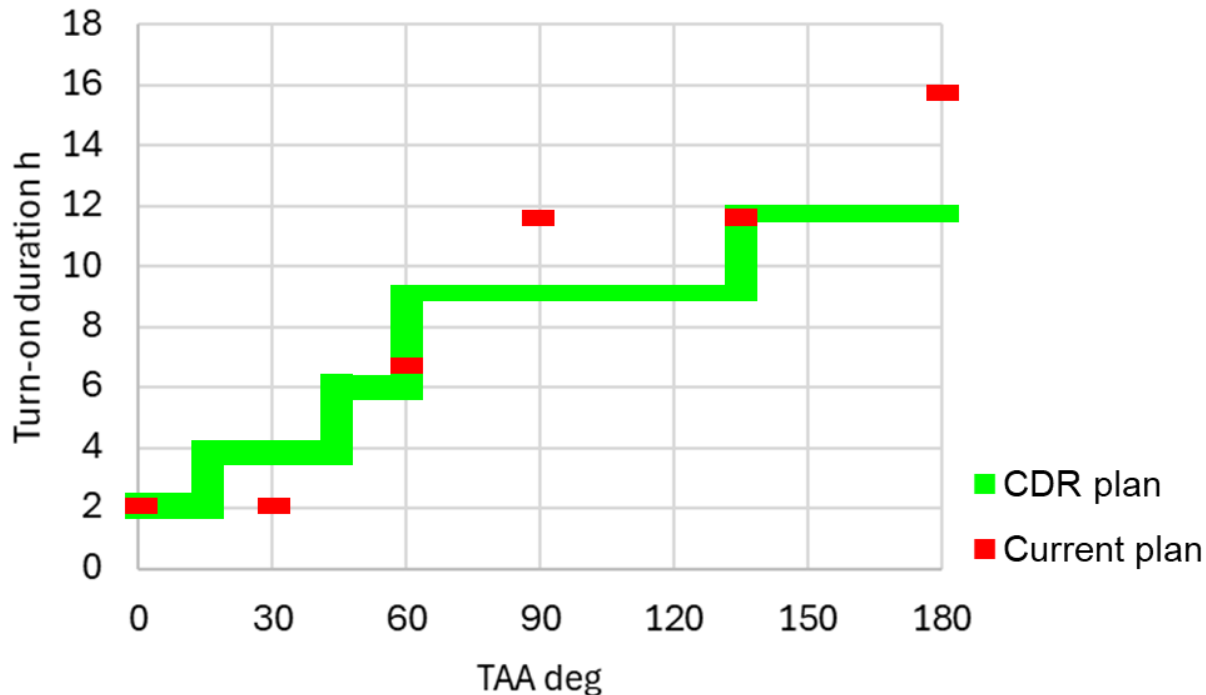
Concerns

- SC and MGF exceed their allowable temperature
 - ⇒ need to turn off during periods of low temperature
 - * turn-on limit = 0 °C
 - turn-off limit = -30°C

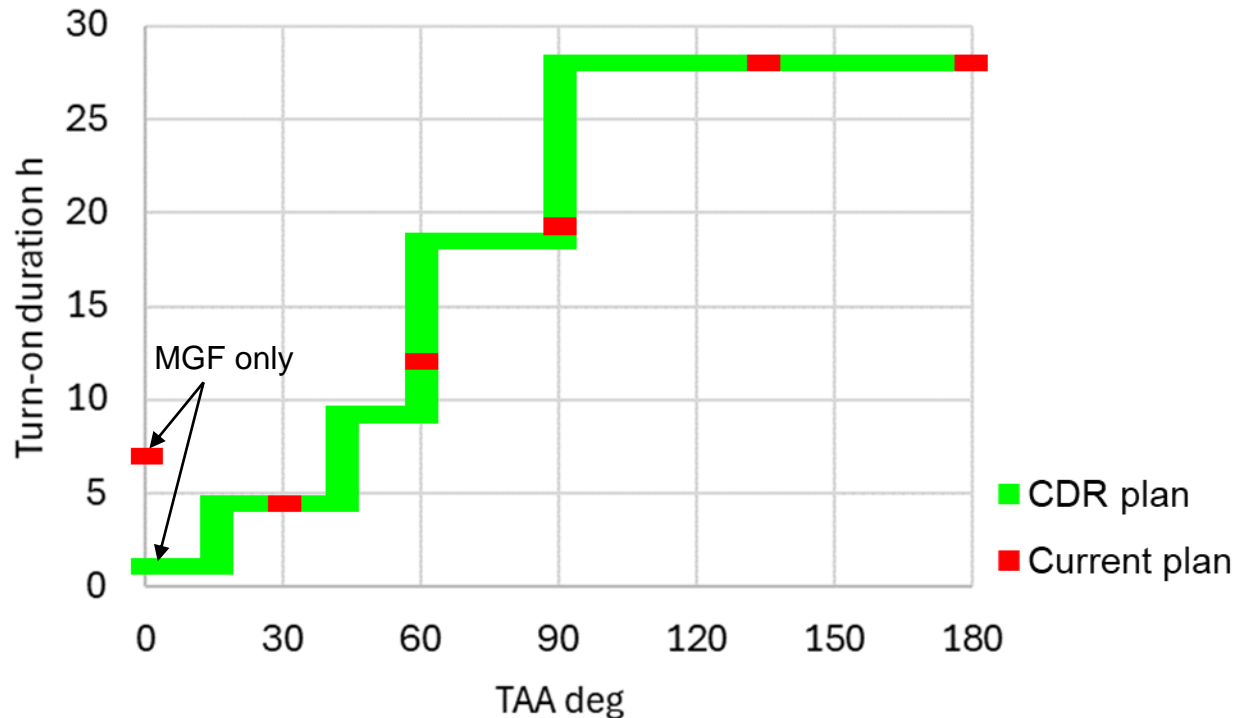


Summery

- We are trying to keep COM & OBS durations as close as possible to those of CDR plans.
- Several equipment cannot satisfy 10°C margin even in standby mode in $TAA \leq 30^\circ$.
- ENA should shorten OBS time or revise the allowable temperature.



Communication



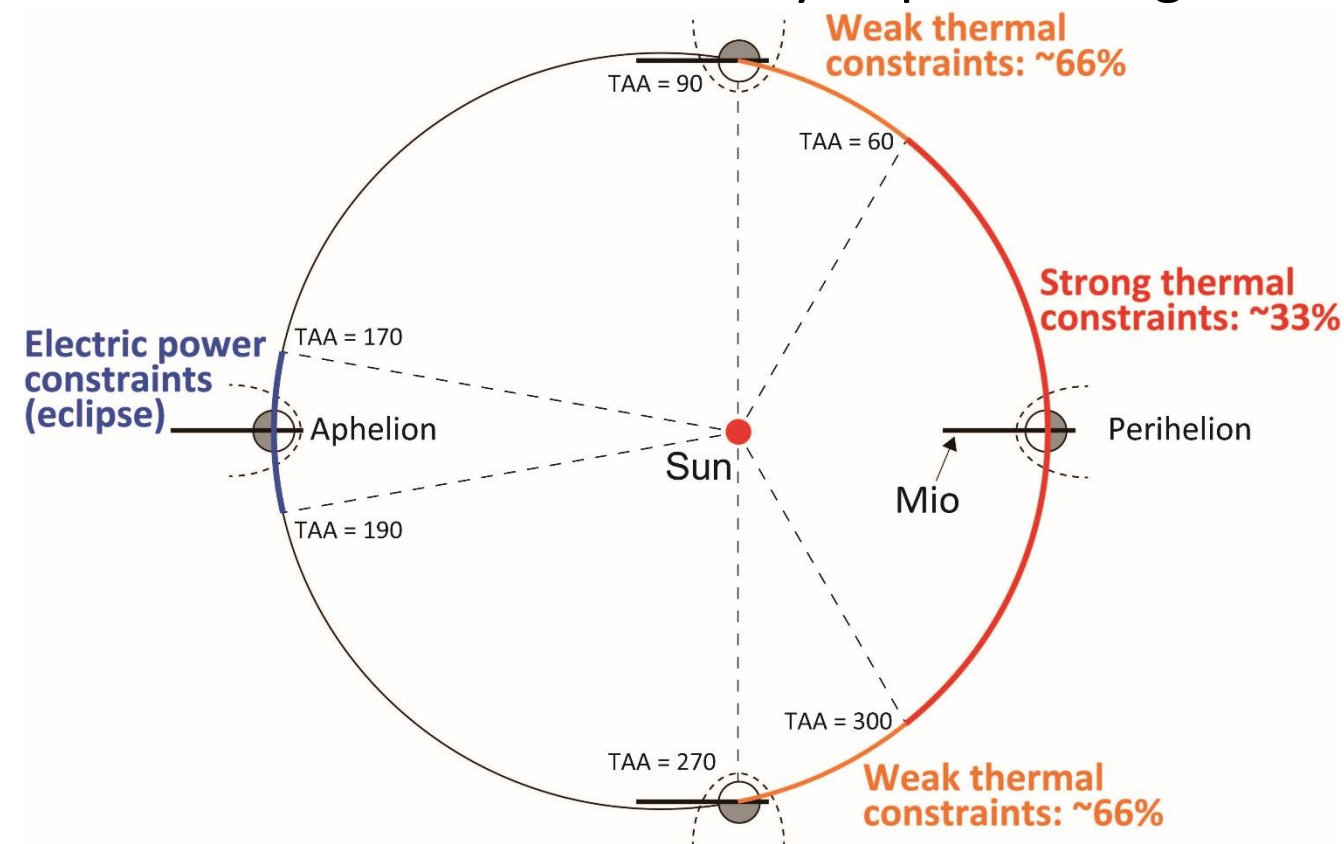
Observation

Baseline observation plan (old)

Summary of science observations

- Basically always ON (except for MSASI)
- Constraints: **thermal** (TAA = 0 ± 90 deg), **electrical power** (5 days around TAA = 180), and **number of commands** (512 commands / 1 TL)
- Observations mode: basically depends on geometry

To be updated!!

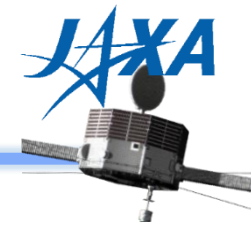
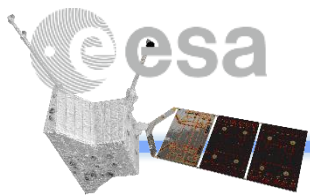


Thermal constraints

- SI ON: 1 orbit / 3 orbits (TA ± 60 deg)
2 orbits / 3 orbits ($60 < TA < 90$ deg)
- Limited downlink duration near perihelion
- Thermal analysis soon to be updated**

Electric power constraints

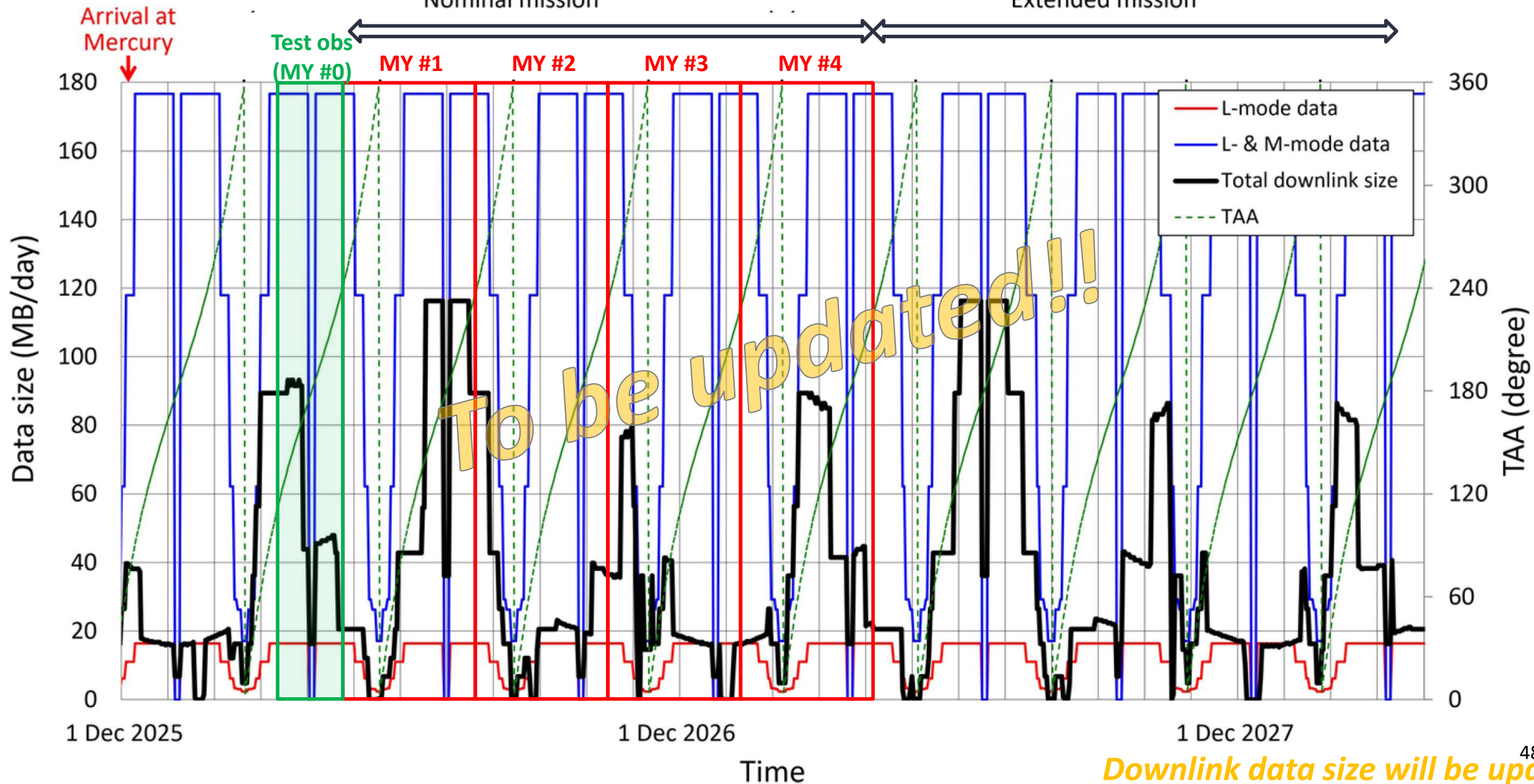
- Due to the eclipse (1-2 hours/orbit), almost no observations will be possible for ~5 days around TA = 180 deg.
- The battery charge needs 3 times as long as the eclipse duration
- Updated analysis is under implementation**



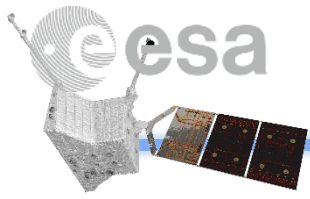
Baseline downlink plan

Nominal mission

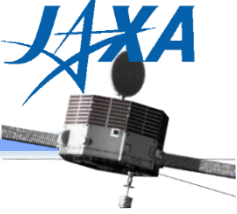
Extended mission



Downlink data size will be updated



Mio Science Working Group meeting



07 March 2024 18:00JST/10:00CET

- **1. Updated status of Mio**
- **2. Upcoming operations plan**
 - 2024/H1
 - Preparations for Mercury arrival: separation and deployments
 - Mercury flyby #4, #5, and #6
- **3. Updates on baseline observation plans**
 - Current status of the activity (thermal analysis)
- **4. Data handling and archiving**
 - Status of Mio Science Center (Yoshi Miyoshi)
 - Request to each PI team
- **5. Others**



Report from BepiColombo/Mio Science Center

ISEE/Nagoya University

Y. Miyoshi, T. Hori, C.-W. Jun, A. Shinbori, T. Sori, N. Kitamura,
K. Yamamoto, T. Segawa

ISAS/JAXA

G. Murakami, I. Shinohara, K. Asamura, S. Murakami

Kanazawa Univ.

S. Matsuda

CNRS

S. Aizawa

Kyoto University

Y. Harada

UCB

T. Hara

<https://miosc.isee.nagoya-u.ac.jp/>

Status Report

- 1: Point of contact of each instrument data
- 2: Release of L2pre CDF files of SPM
- 3: Draft of RoR for L2pre (cruise phase) data files

Before Mercury orbit insertion (MOI):

Science Data: **Lv.2pre data** files

- Mainly archived as CDF or FITS files.
- **The data files are released from the web data repository of the science center to the project team.**
 - Also delivered to and archived in ESA's PSA.

After MOI:

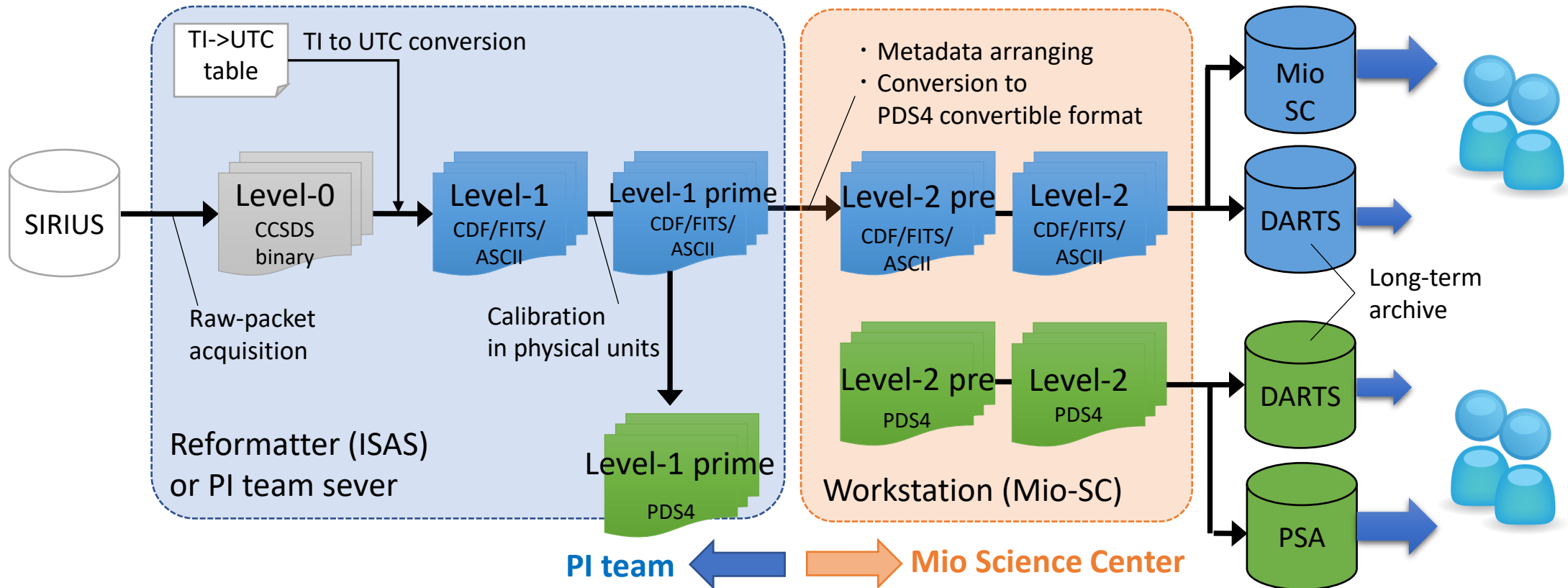
Science Data: **Lv.2 data** files

- Mainly archived as CDF or FITS files.
- Data production target: **Partially and fully calibrated datasets of all instruments**
- The data files are released from the web data repository of the science center.
 - Also delivered to and archived in ESA's PSA.

Data Analysis Environment: (common to before and after MOI)

- The science center develops and releases the Mio plug-in for SPEDAS/PySPEDAS to the science community.

Data Pipeline



Level	Contents	Scope	File format
Level-0 (L0)	Raw-telemetry	Internal	CCSDS-Binary
Level-1 (L1)	Uncalibrated data converted from Level-0 raw-telemetry	Internal	CDF, FITS, ASCII
Level-1 prime (L1p)	Calibrated data in physical units	Internal	CDF, FITS, ASCII
Level-2 pre (L2pre)	Cruise-phase data calibrated in physical units with metadata	Internal	CDF, FITS, ASCII
Level-2 (L2)	Calibrated data in physical units with full metadata	Public	CDF, FITS, ASCII
Level-3 (L3)	Processed data by combining data from multiple instruments	Public	CDF, FITS, ASCII

Status-1: contact points of each instrument data

The following mailing lists have been set up for communication between instrument teams and the Mio-SC (unless other dedicated MLs are already prepared by PIs), and later will be used as a point of contact from the data users.

MEA: mio_mea_info @ isee.nagoya-u.ac.jp

MIA: mio_mia_info @ isee.nagoya-u.ac.jp

MSA: mio_msa_info @ isee.nagoya-u.ac.jp

HEP: mio_hep_info @ isee.nagoya-u.ac.jp

ENA: mio_ena_info @ isee.nagoya-u.ac.jp

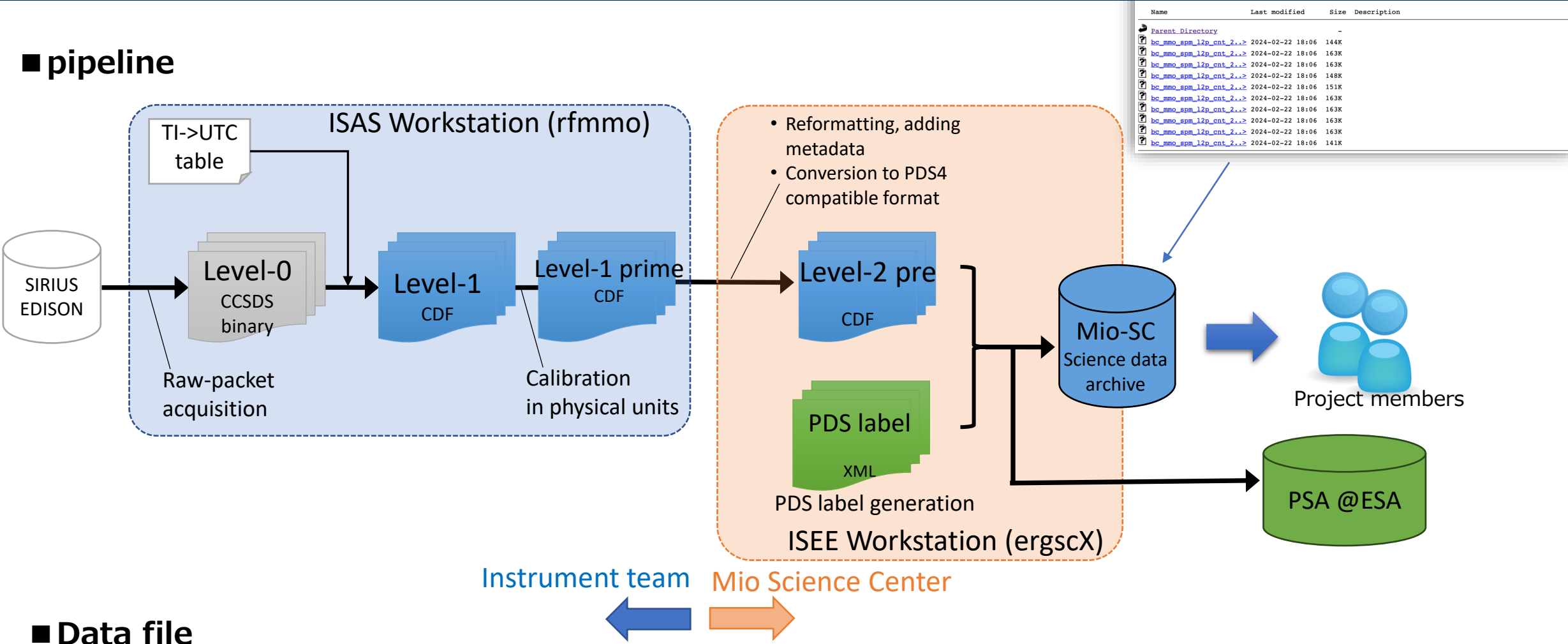
PWI: mio_pwi_info @ isee.nagoya-u.ac.jp

MGF: mio_mgf_info @ isee.nagoya-u.ac.jp

SPM: mio_spm_info @ isee.nagoya-u.ac.jp

Status-2: Release Plan: L2pre CDF files of SPM

■ pipeline

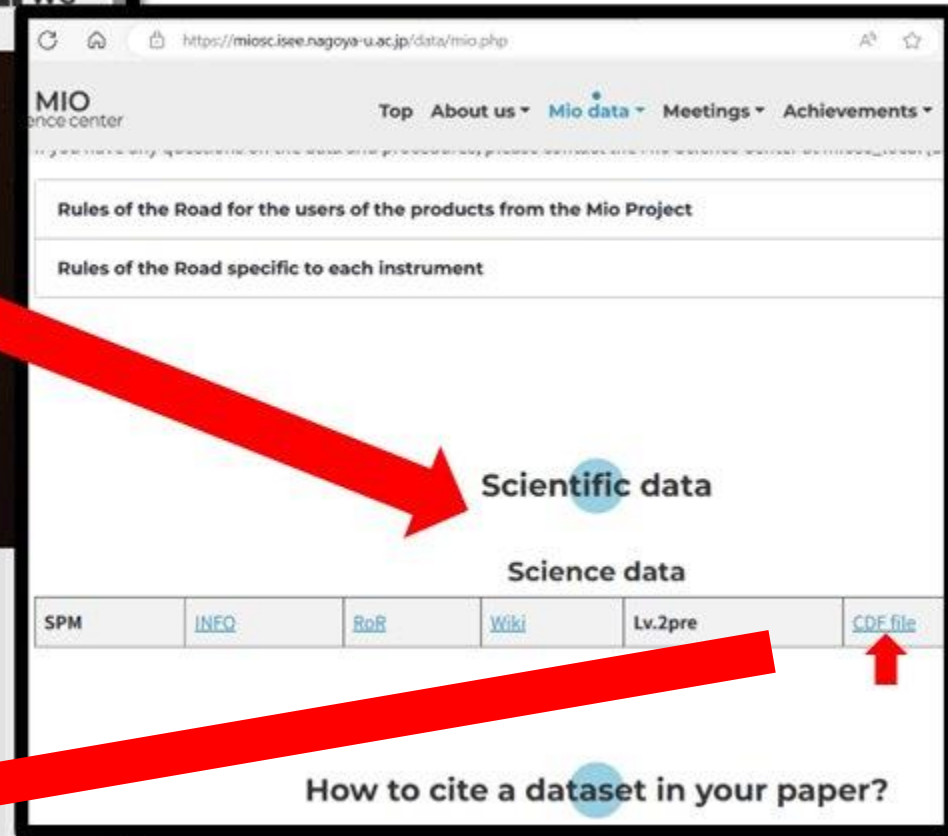
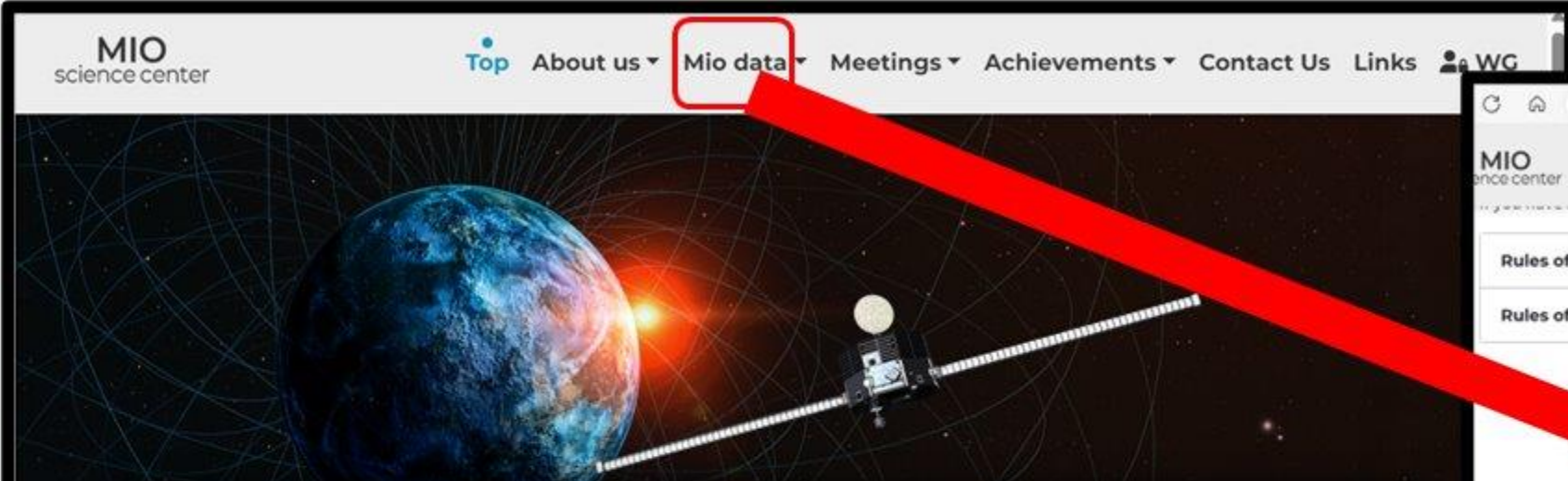


Instrument team ← Mio Science Center →

■ Data file

- SPM raw count (and possibly tentative flux values?) data as Lv.2pre dataset
 - Period: s/c launch through the latest date (~6 yrs)

Release Plan: L2pre CDF files of SPM from the S/C webpage



Index of /data/chs/satellite/mmo/cdf/spm/l2pre/cnt/2021/08

Name	Last modified	Size	Description
Parent Directory	-	-	-
bc_mmo_spm_l2p_cnt_2..>	2024-02-22 18:06	144K	
bc_mmo_spm_l2p_cnt_2..>	2024-02-22 18:06	163K	
bc_mmo_spm_l2p_cnt_2..>	2024-02-22 18:06	163K	
bc_mmo_spm_l2p_cnt_2..>	2024-02-22 18:06	148K	
bc_mmo_spm_l2p_cnt_2..>	2024-02-22 18:06	151K	
bc_mmo_spm_l2p_cnt_2..>	2024-02-22 18:06	163K	
bc_mmo_spm_l2p_cnt_2..>	2024-02-22 18:06	163K	
bc_mmo_spm_l2p_cnt_2..>	2024-02-22 18:06	163K	
bc_mmo_spm_l2p_cnt_2..>	2024-02-22 18:06	163K	
bc_mmo_spm_l2p_cnt_2..>	2024-02-22 18:06	163K	
bc_mmo_spm_l2p_cnt_2..>	2024-02-22 18:06	141K	

https access with password control

L2pre CDF files of SPM data / IDL SPEDAS plug-in will be opened to the Mio project team soon.

March 7, 2024

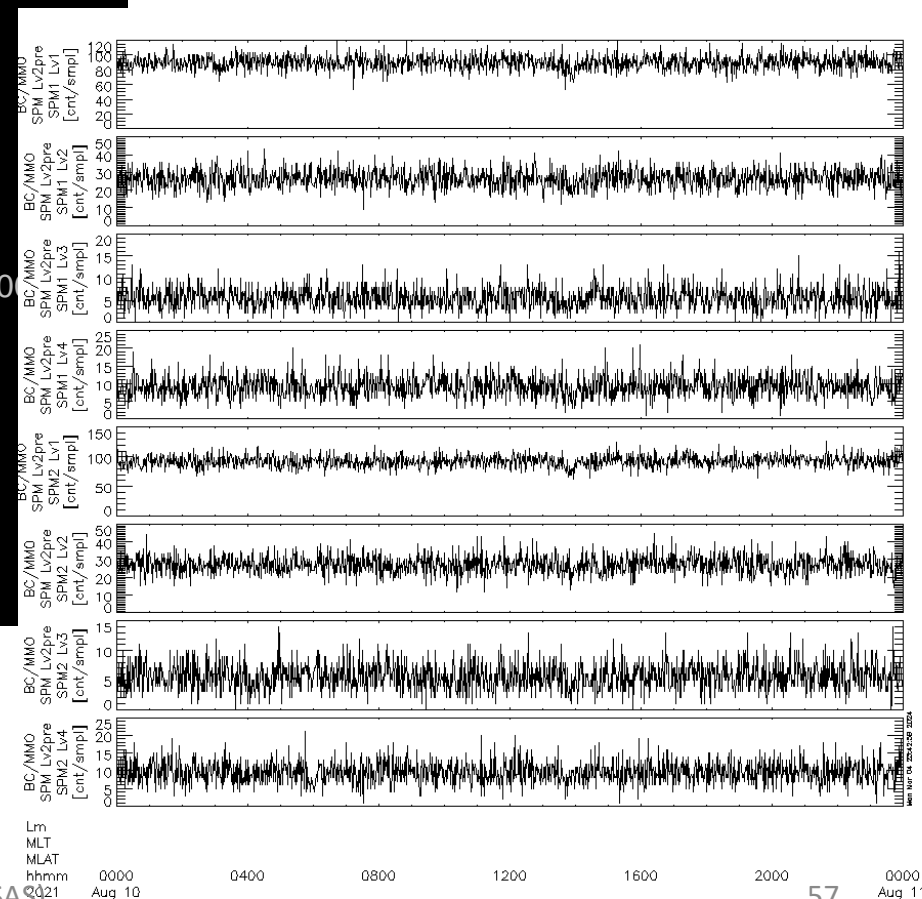
Mio Science Center / Mio Meeting (JBE/19)

Release Plan: IDL/SPEDAS plugin for Mio/SPM

```
MMO> timespan,'2021-08-10' & mmo_load_spm
TIMESPAN(53): Time range set from 2021-08-10/00:00:00 to 2021-08-11/00:00:00
ROOT_DATA_DIR(76): Warning: No Root Data Directory has been defined!
Using default: "c:/data/" (Which might change in the future!)
ROOT_DATA_DIR(79): To define the Root Data Directory, see
documentation in C:\Program
Files\Harris\spedas_3_20\idl\general\misc\root_data_dir.pro
SPD_DOWNLOAD_FILE(221): Downloading:
https://chs.isee.nagoya-u.ac.jp/data/chs/satellite/mmo/cdf/spm/l2pre/cnt/2021/08/
SPD_DOWNLOAD_FILE(244): Download failed. Trying a second time.
SPD_DOWNLOAD_FILE(308): Unauthorized to access:
https://chs.isee.nagoya-u.ac.jp/data/chs/satellite/mmo/cdf/spm/l2pre/cnt/2021/08/
SPD_DOWNLOAD(238): No matching remote files found. Searching for local files.
SPD_MMS_CDF_LOAD_VARS(223): Loading file:
"C:\data\chs\satellite\mmo\cdf\spm\l2pre\cnt\2021\08\bc_mmo_spm_l2p_cnt_20210810_r00-v00-0
STORE_DATA(261): Altering tplot variable: 21 mmo_spm_l2p_spm1_lv1_cnt
STORE_DATA(261): Altering tplot variable: 22 mmo_spm_l2p_spm1_lv2_cnt
STORE_DATA(261): Altering tplot variable: 23 mmo_spm_l2p_spm1_lv3_cnt
STORE_DATA(261): Altering tplot variable: 24 mmo_spm_l2p_spm1_lv4_cnt
STORE_DATA(261): Altering tplot variable: 25 mmo_spm_l2p_spm2_lv1_cnt
STORE_DATA(261): Altering tplot variable: 26 mmo_spm_l2p_spm2_lv2_cnt
STORE_DATA(261): Altering tplot variable: 27 mmo_spm_l2p_spm2_lv3_cnt
MMO> tplot, 'mmo_spm_l2p_spm?_lv?_cnt'
```

Downloading CDF files from
the science center repository

Plot



Status-3: Draft: Rules of the Road for the cruise phase data (L2pre)

1. [Scope of use for this data]

All level-2pre datasets from the cruise phase observations are available for limited scientific uses only to the BepiColombo project members and outside collaborators that the project and instrument teams approved. The data user may use them only for specific studies of which the project and instrument teams have approved in advance.

2. [Early-contact with the PI as a mandatory requirement]

The BepiColombo project strongly requests the data user to establish early contact with the project and the instrument team(s) whose data are involved in his/her/their planned study, to allow sufficient time to be available for those responsible for the data to check their quality, intended usage, scientific interpretation in the user's study. Please be aware that the data are often subject to limitations which are not immediately evident to end users.

3. [Always use the latest version]

The data user should always use the latest version of data files provided from the Mio science center for their data analyses, presentations, and publications.

4. [Redistribution strictly prohibited]

Redistribution of the data files is strictly prohibited.

5. [Paper Citation, Co-authorship]

Any publications in which MMO satellite data are used must cite the papers listed below.

In addition, the project and/or instrument teams may suggest potential coauthor(s) to be involved as well as some necessary articles to be cited in the publications.

Feedback is greatly welcomed. Please give your feedback to the project scientist/Mio Science Center.

Summary & Plans for this year

Summary:

- We have developed Level-2pre data files for SPM and will make them available in near future.
- We have prepared the draft of RoR for the cruise phase data.

Plans:

- Prototypes of Lv.2pre data files have also been made and under review by several instrument teams. These files will be opened to the project team from the data repository of the science center.
- We have also developed a plug-in of the integrated data analysis software (SPEDAS/PySPEDAS) , and these plug-in tool will be opened to the project team.

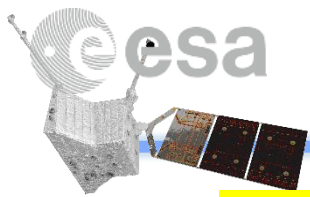
- PDS4 instrument bundle information: **updated**

Instrument ID	Bundle and context LIDS	Sub-Instruments	Instrument Type
msasi	urn:jaxa:darts:bc_mmo_msasi urn:jaxa:darts:context:instrument:mmo.msasi		Spectrometer Imager
pwi	urn:jaxa:darts:bc_mmo_pwi urn:jaxa:darts:context:instrument:mmo.pwi	efd	Electric Field Instrument Magnetometer
		wfc	Electric Field Instrument Magnetometer
		ofa	Electric Field Instrument Magnetometer
		sorbet	Electric Field Instrument Magnetometer
mgf	urn:jaxa:darts:bc_mmo_mgf urn:jaxa:darts:context:instrument:mmo.mgf		Magnetometer

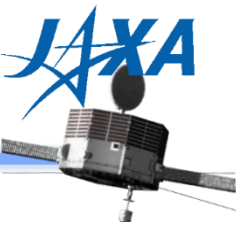
ESA-JAXA discussion status

- PDS4 instrument bundle information: **updated**

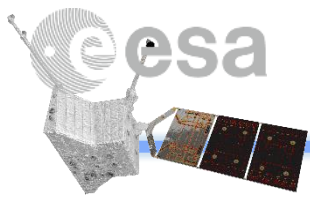
Instrument ID	Bundle and context LIDS	Sub-Instruments	Instrument Type
mppe	urn:jaxa:darts:bc_mmo_mppe urn:jaxa:darts:context:instrument:mmo.mppe	mia	Particle analyzer Charged Particle Detector
		mea	Particle analyzer Charged Particle Detector
		msa	Mass Spectrometer Charged Particle Detector
		hep	Particle analyzer Charged Particle Detector
		ena	Neutral Particle Detector Particle analyzer
mdm	urn:jaxa:darts:bc_mmo_mdm urn:jaxa:darts:context:instrument:mmo.mdm		Dust Analyzer
spm	urn:jaxa:darts:bc_mmo_spm urn:jaxa:darts:context:instrument:mmo.spm		Charged Particle Detector



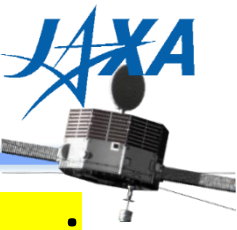
Request to each PI team



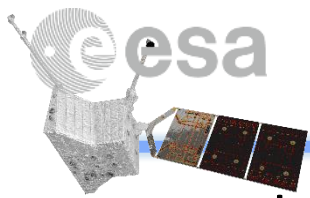
- **Instrument context product [urgent]**
 - Example of PWI is available
 - Contents:
 - PDS4 bundle info: LID, version, ...
 - Reference paper
 - Instrument description
- EAICD (Experiment to Archive Interface Control Document): kind of user manual and/or data definition document, to be provided by PI **[31 Oct 2024]**
 - Sample/template document will be distributed **by the next SWT**
- Dedicated data handling meeting with each team: on-going



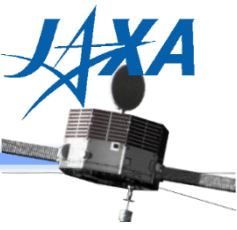
(Reference: PWI context product)



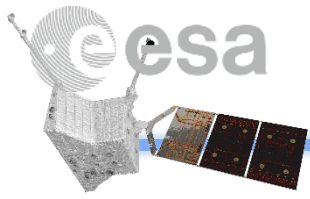
- <logical_identifier>urn:jaxa:darts:context:instrument:mmo.pwi
- <title>Plasma Wave Investigation
- <reference_text>
 - Kasaba, Y., Kojima, H., Moncuquet, M., Wahlund J.-E, Yagitani, S., Sahraoui, F., Henri, P., Karlsson, T., Kasahara, Y., Kumamoto, A., Ishisaka, K., Issautier, K., Wattieaux, G., Imachi, T., Matsuda, S., Lichtenberger, J., and Usui H., Plasma Wave Investigation (PWI) Aboard BepiColombo Mio on the Trip to the First Measurement of Electric Fields, Electromagnetic Waves, and Radio Waves Around Mercury. Space Sci Rev 216, 65 (2020)
- <name>PWI
- <type>Plasma Wave Spectrometer



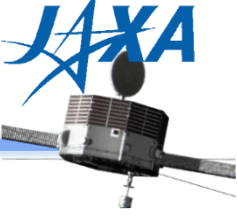
(Reference: PWI context product)



- <description>
 - The Plasma Wave Investigation (PWI) aboard the BepiColombo Mio (Mercury Magnetospheric Orbiter, MMO) will enable the first observations of electric fields, plasma waves, and radio waves in and around the Hermean magnetosphere and exosphere. The PWI has two sets of receivers (EWO with AM2P, SORBET) connected to two electric field sensors (MEFISTO and WPT) and two magnetic field sensors (SCM: LF-SC and DB-SC).
 - The PWI measures electric field from DC to 10 MHz using two dipole antennae with a 32-m tip-to-tip length in the spin plane and the magnetic field from 0.3 Hz to 20 kHz using a three-axis sensor and from 2.5 kHz to 640 kHz using a single-axis sensor at the tip of a 4.5-m solid boom extended from the spacecraft's side panel. Those receivers and sensors will provide (1) in-situ measurements of electron density and temperature that can be used to determine the structure and dynamics of the Hermean plasma environment; (2) in-situ measurements of the electron and ion scale waves that characterize the energetic processes governed by wave–particle interactions and non-MHD interactions; (3) information on radio waves, which can be used to remotely probe solar activity in the heliocentric sector facing Mercury, to study electromagnetic-energy transport to and from Mercury, and to obtain crustal information from reflected electromagnetic waves; and (4) information concerning dust impacts on the spacecraft body detected via potential disturbances.



Mio Science Working Group meeting



07 March 2024 18:00JST/10:00CET

- **1. Updated status of Mio**
- **2. Upcoming operations plan**
 - 2024/H1
 - Preparations for Mercury arrival: separation and deployments
 - Mercury flyby #4, #5, and #6
- **3. Updates on baseline observation plans**
 - Current status of the activity (thermal analysis)
- **4. Data handling and archiving**
 - Status of Mio Science Center (Yoshi Miyoshi)
 - Request to each PI team
- **5. Others**



REGISTRATION FOR SWT#23 IN FUKUOKA IS NOW OPEN - 1ST ANNOUNCEMENT OF MERCURY2024

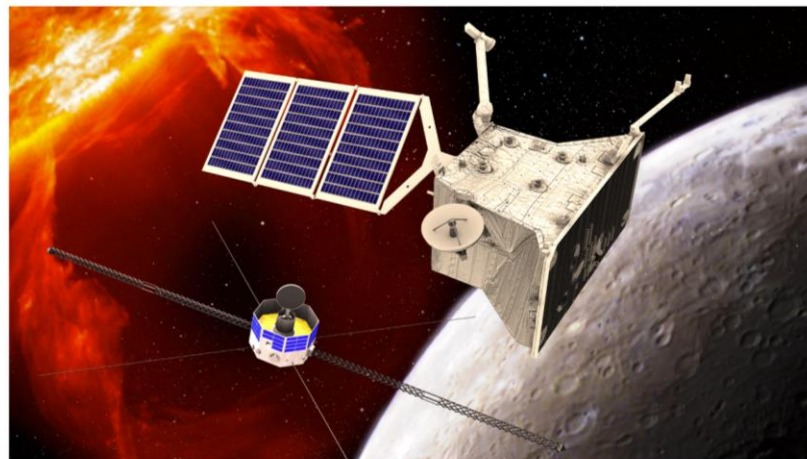
NEXT SWT MEETING:

UPCOMING:

VIRTUAL SCIENCE WORKING TEAM MEETING #25

APRIL 2024, TBC

REMOTE



[BEPICOLOMBO MEETING CALENDAR \(TEAM MEMBERS ONLY\):](#)

MERCURY 2024

4-7 June 2024, Uji Obaku Plaza Kihada Hall, Hybrid Space, Restaurant Kihada, Kashiwada-67-1 Gokasho, Uji, **Kyoto** 611-0011, Japan

[SOME IMPORTANT INFORMATION ON TRAVELING TO THE MEETING PLACE, INFORMATION, ACCOMODATION, AND SOCIAL DINNER.](#)

Registration/abstract submission will start by the end of March 2024

Registration fee: 15,000 JPY (~93 €)



HOW TO REACH OUR MEETING PLACE?

The meeting will take place at the Obaku Plaza, Kyoto University and can be easily reached by train ([link to google maps](#))

MEETING VENUE



BepiColombo SWT » BepiColombo SWT#23

BEPICOLOMBO SWT#23
10-13 June 2024, Fukuoka

[SOME IMPORTANT INFORMATION ON TRAVELING TO THE MEETING PLACE, INFORMATION ACCOMODATION, AND SOCIAL DINNER](#)



GENERAL INFORMATION/REGISTRATION
to register for the meeting please [click here](#)

Thank you!



Stay safe!

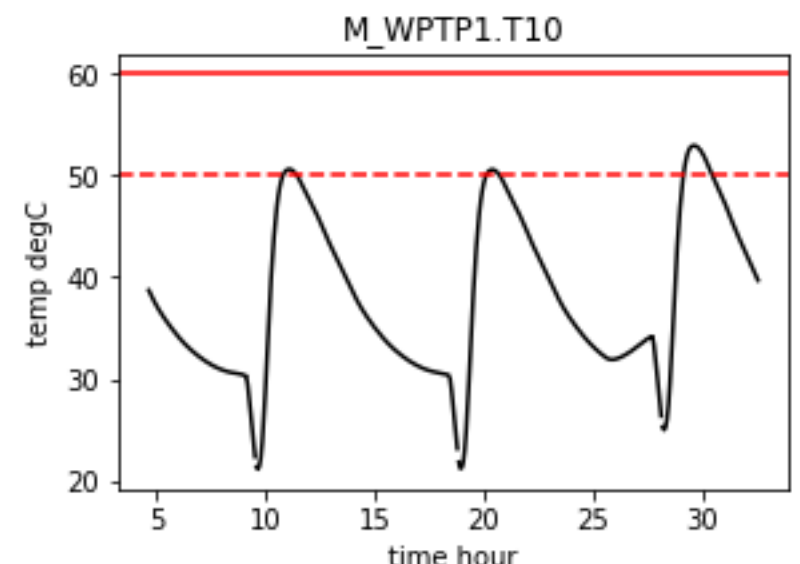
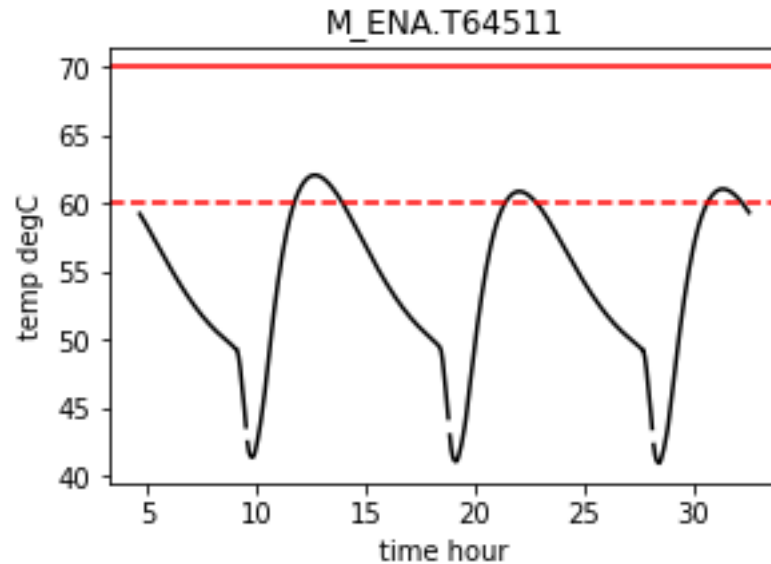
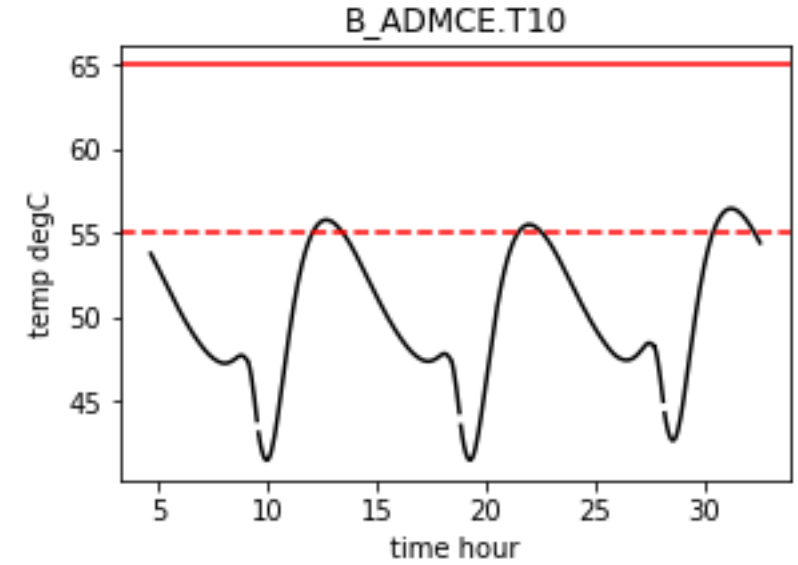
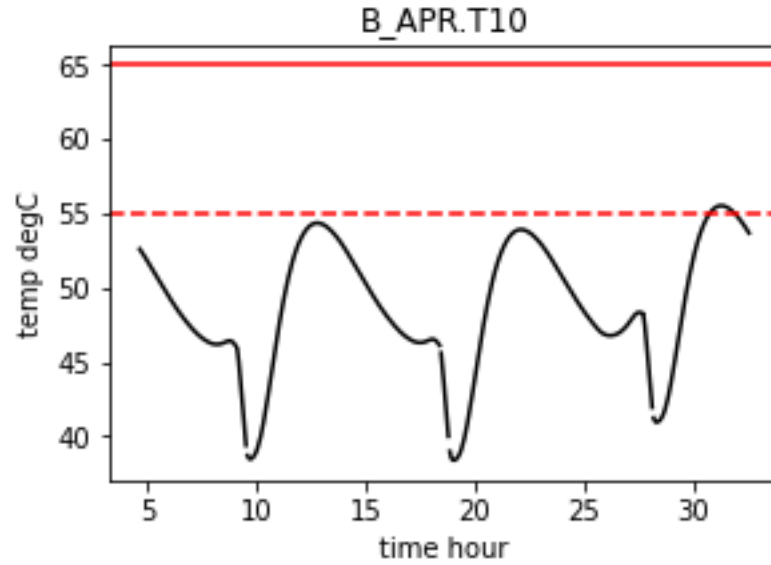
Illustration by Masayuki Ishikawa

Appendix

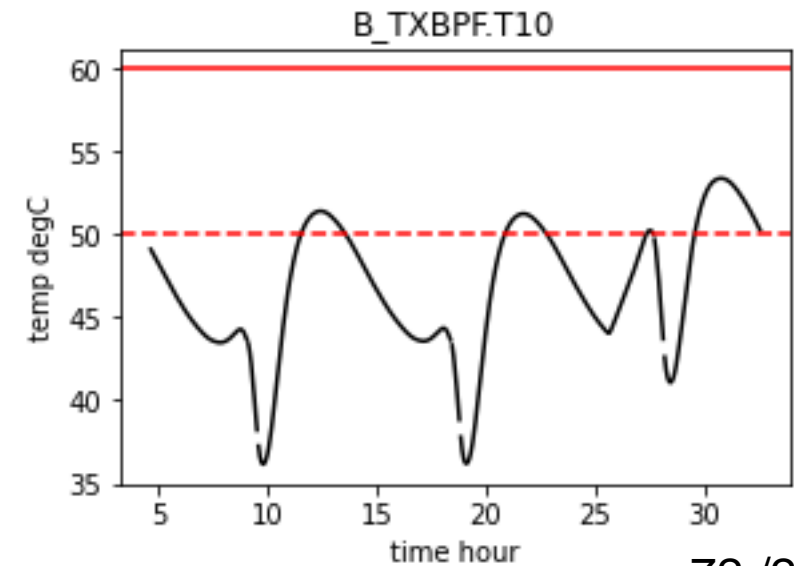
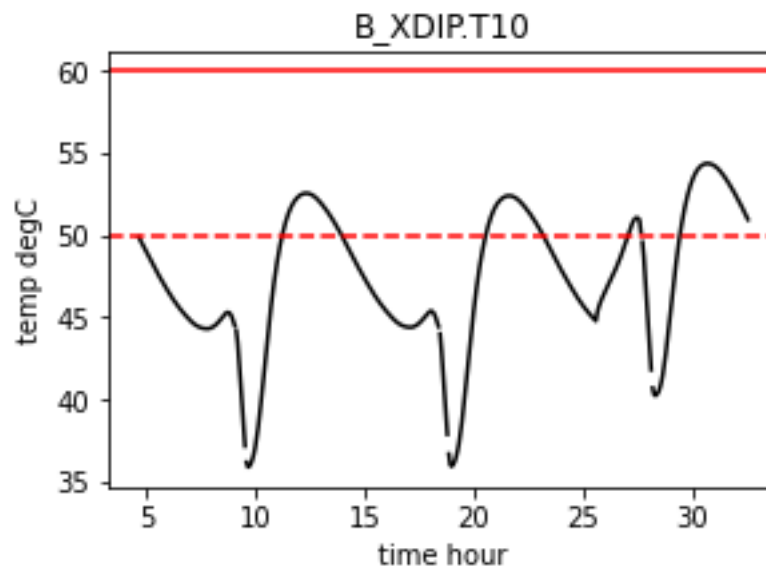
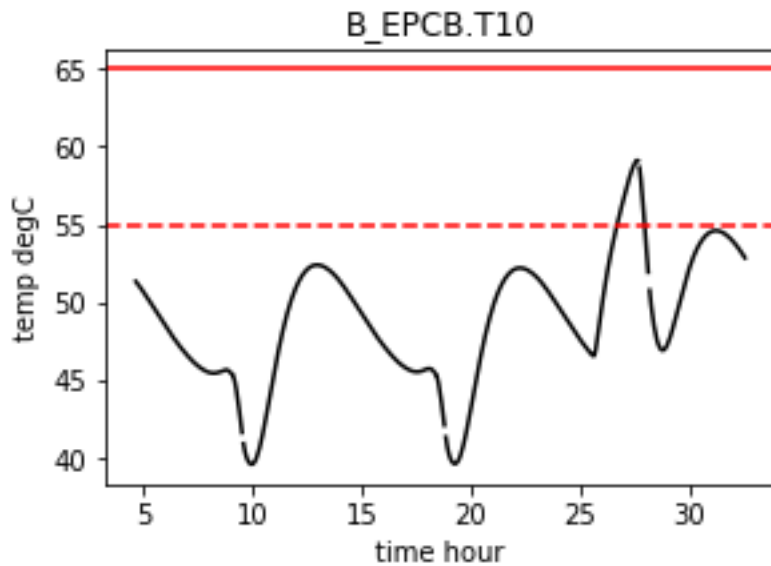
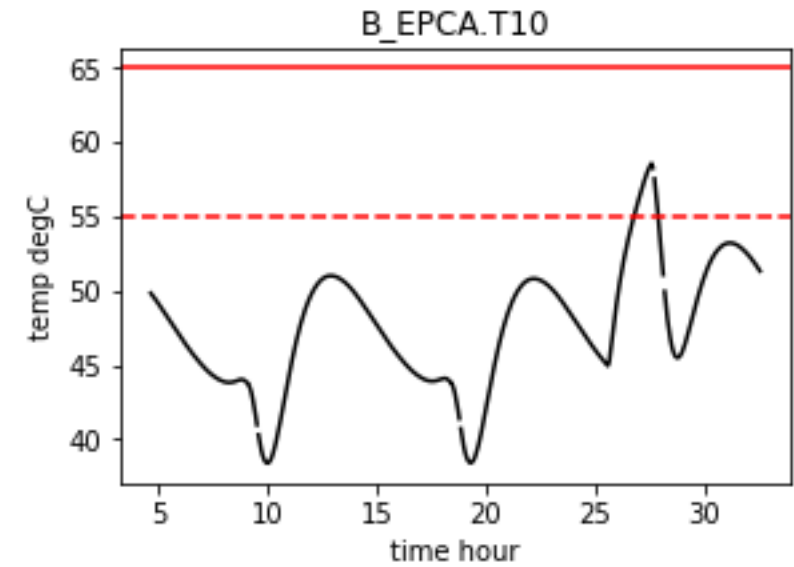
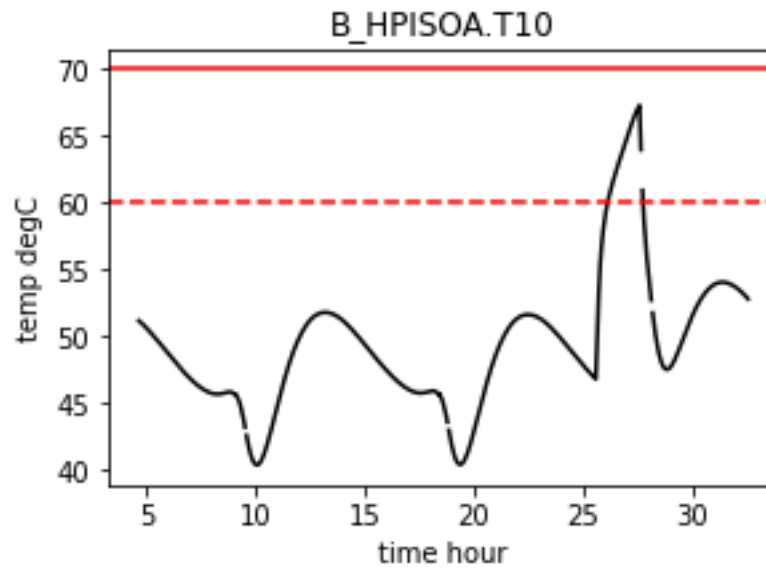
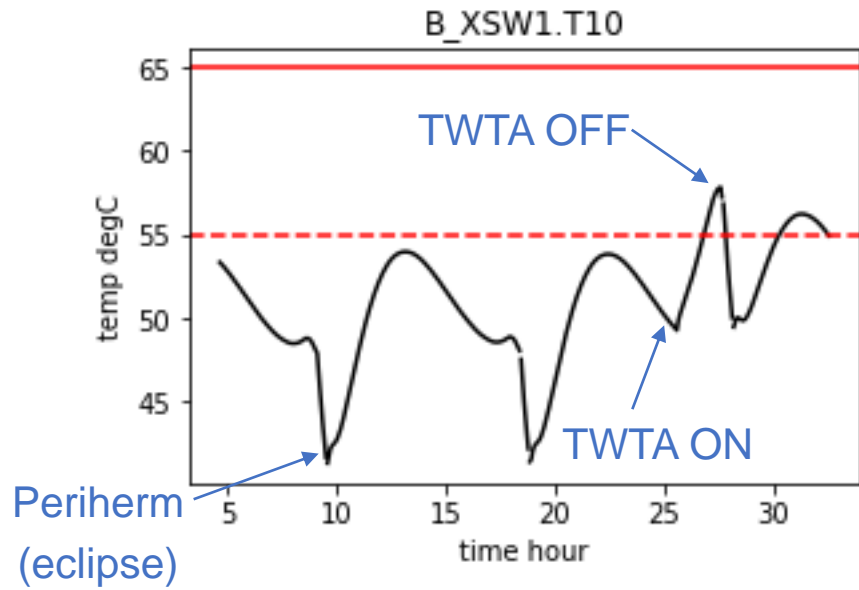
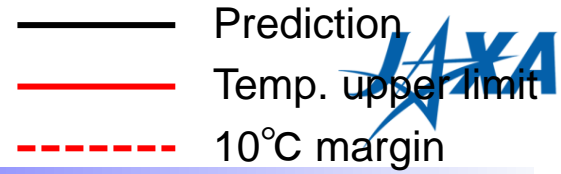
Operational mode A : 2/19 (TAA = 0 deg)

— Prediction
— Temp. upper limit
- - - 10°C margin

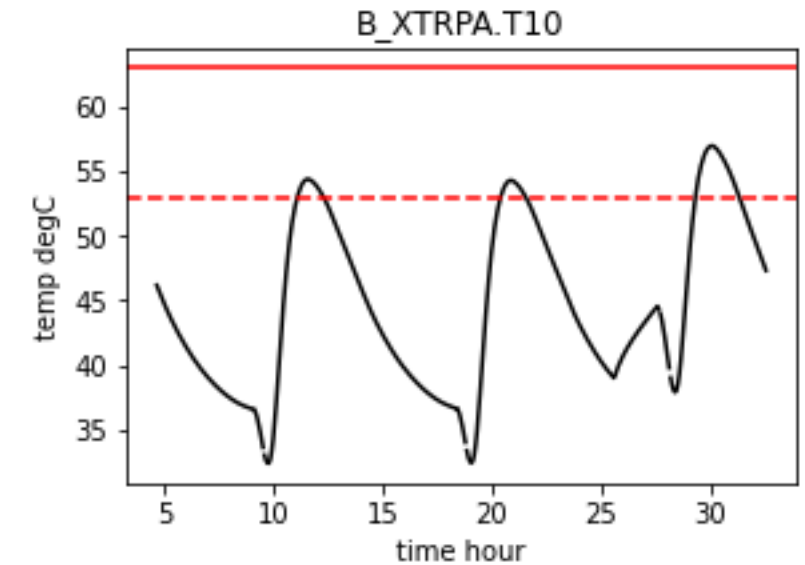
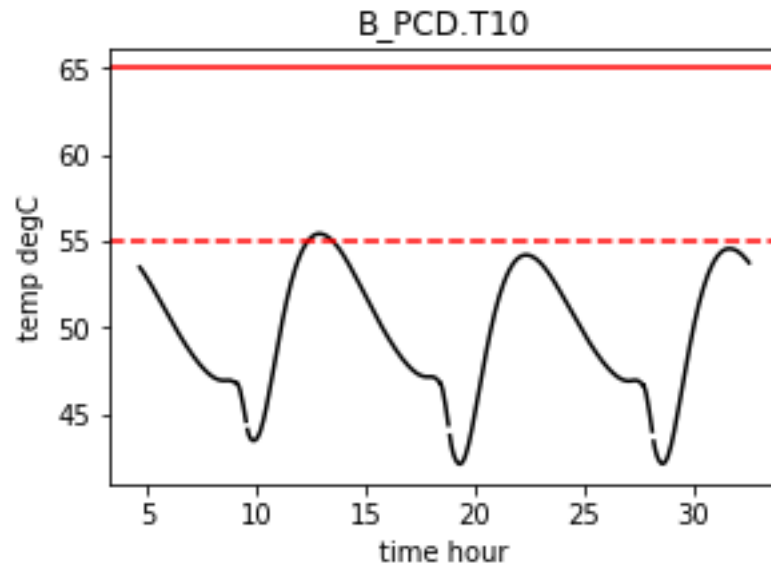
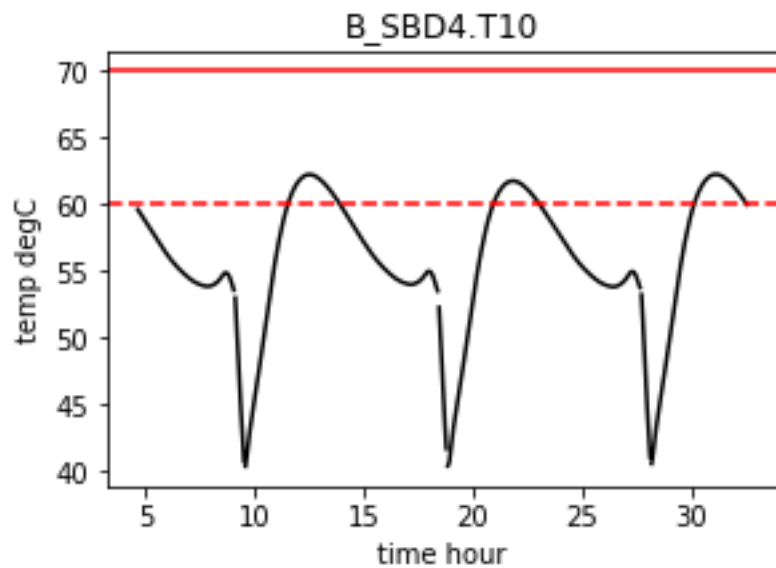
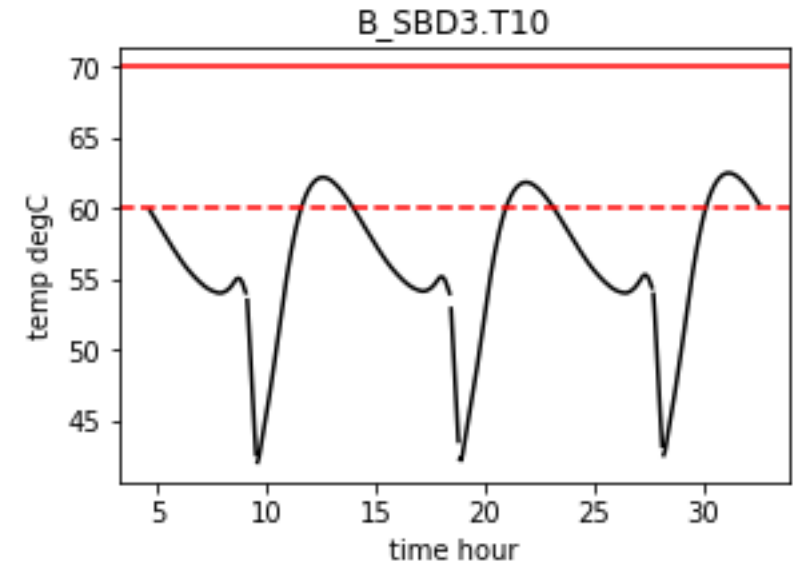
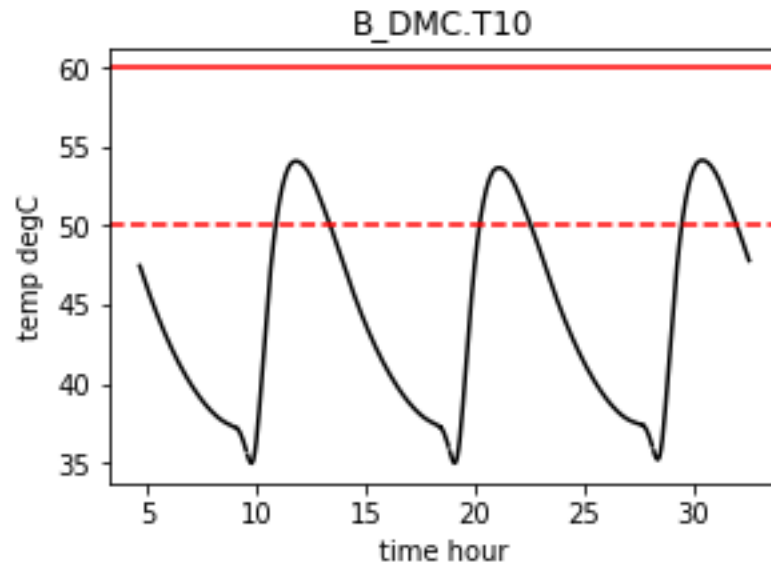
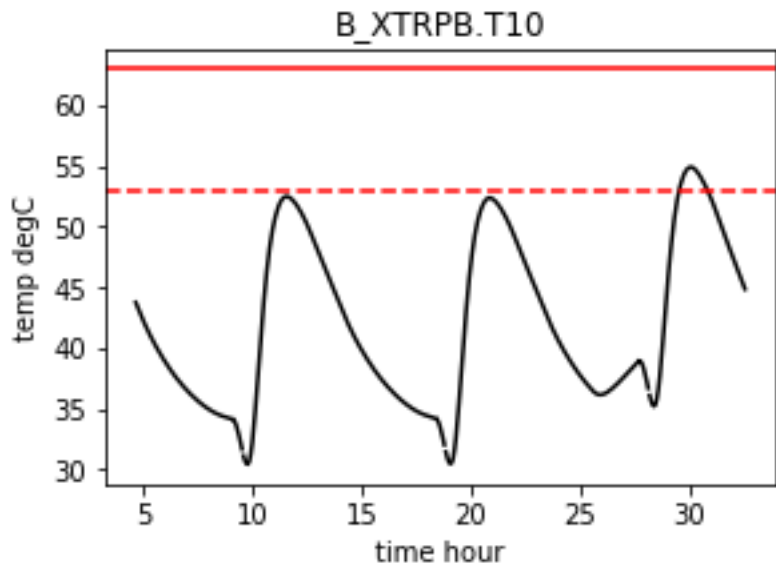
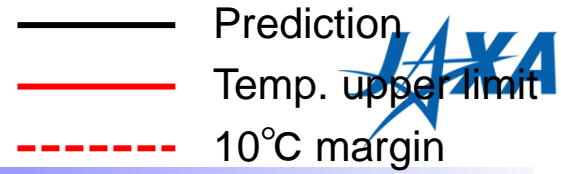
margin	
B_ADMCE.T10	8.55°C
B_APR.T10	9.49°C
B_DMC.T10	5.87°C
B_EPCA.T10	6.45°C
B_EPCB.T10	5.90°C
B_HPISOA.T10	2.75°C
B_PCD.T10	9.59°C
B_SBD3.T10	7.54°C
B_SBD4.T10	7.77°C
B_TXBPF.T10	6.62°C
B_XDIP.T10	5.65°C
B_XSW1.T10	7.16°C
B_XTRPA.T10	6.06°C
B_XTRPB.T10 </td <td>8.13°C</td>	8.13°C
M_ENA.T64511	7.95°C
M_WPTP1.T10	7.09°C



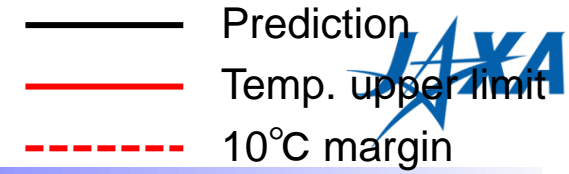
Operational mode A : 2/19 (TAA = 0 deg)



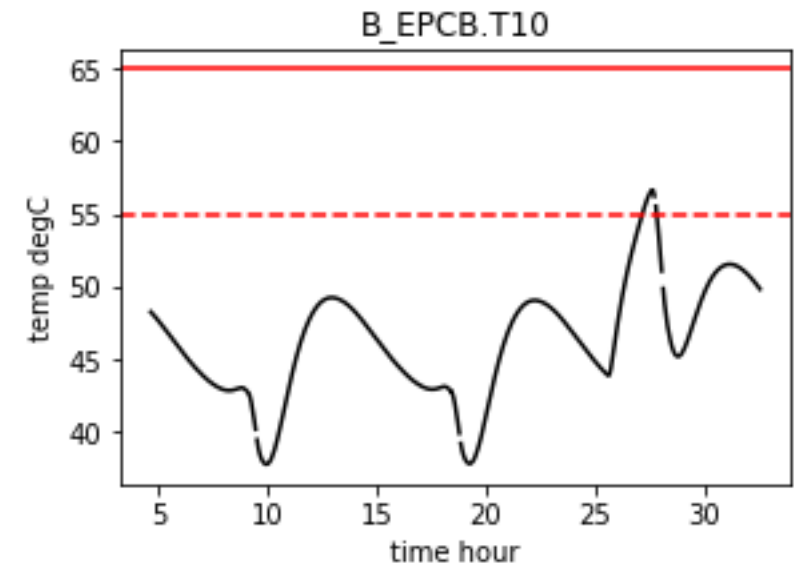
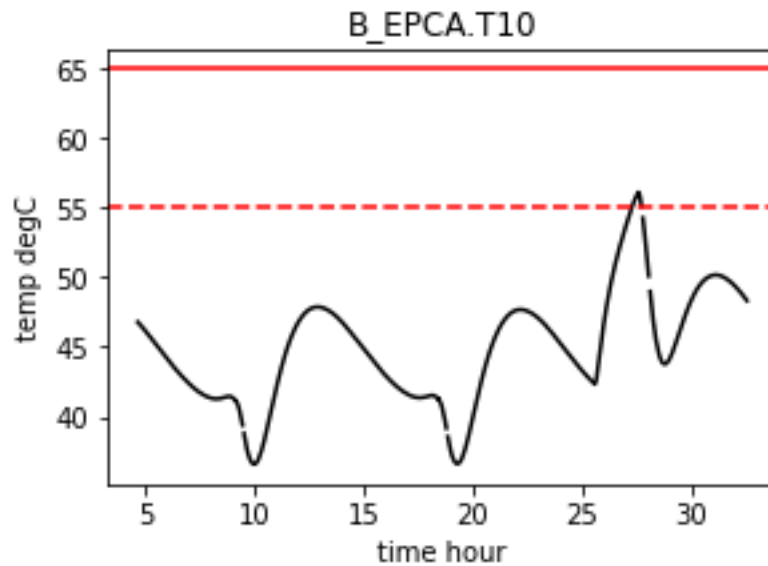
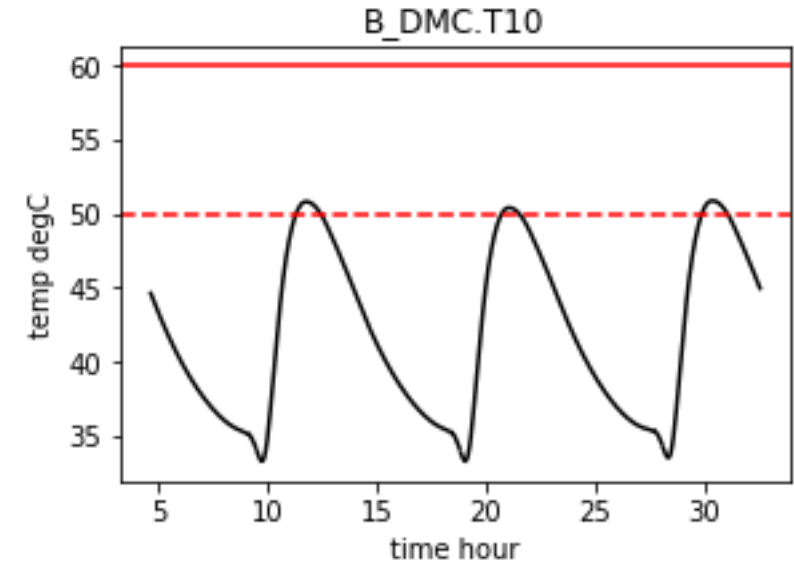
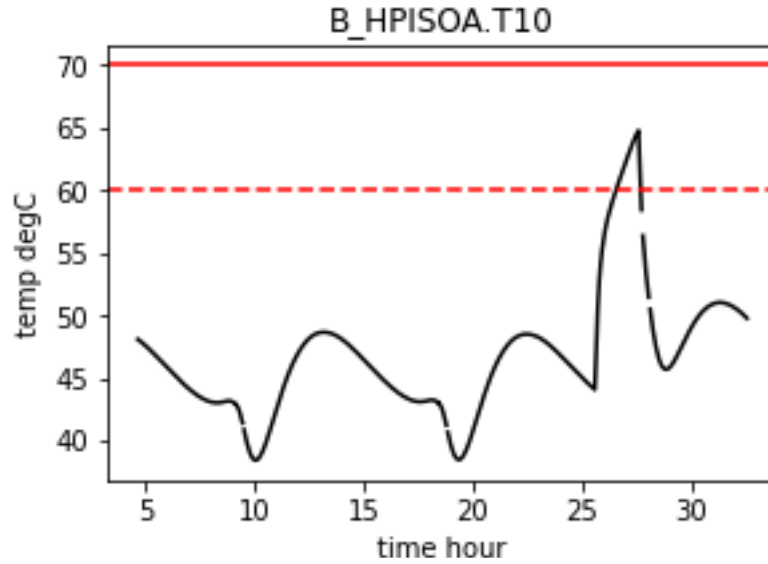
Operational mode A : 2/19 (TAA = 0 deg)



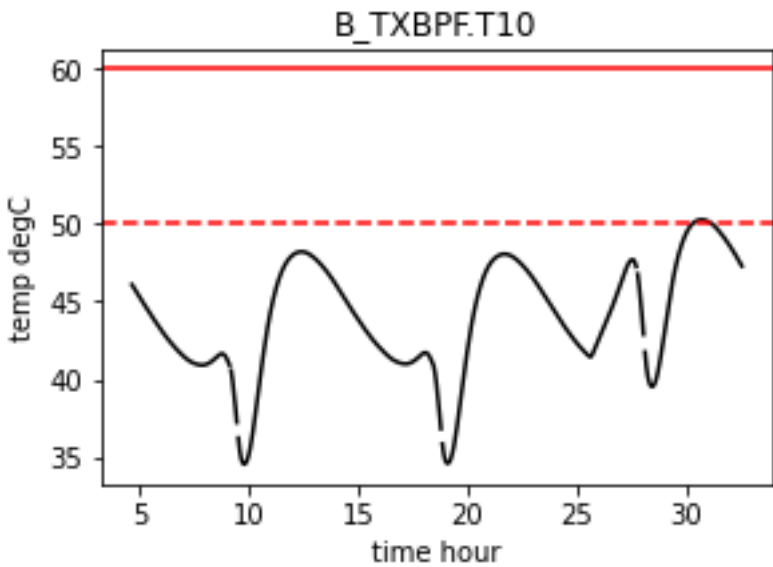
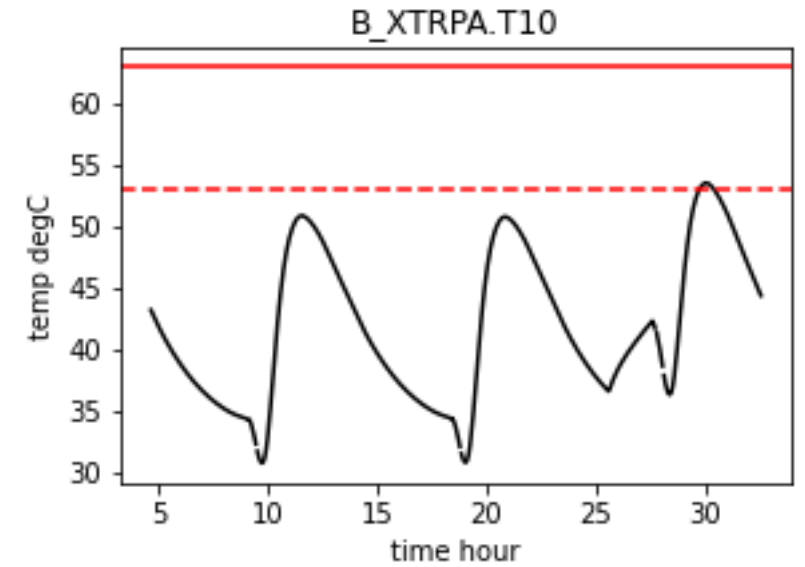
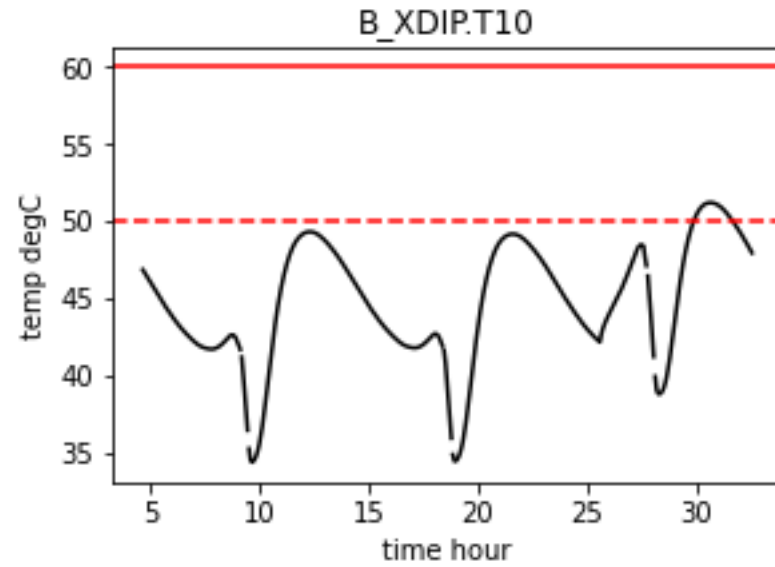
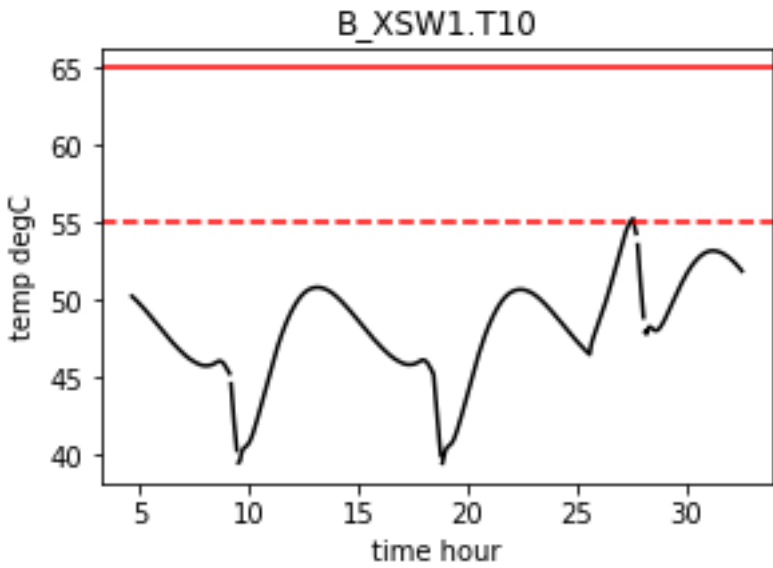
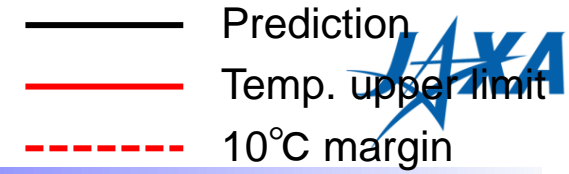
Operational mode A : 2/23 (TAA = 25 deg)



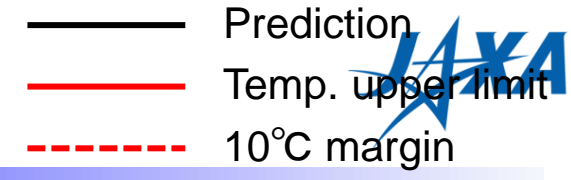
margin	
B_DMC.T10	8.53°C
B_EPCA.T10	8.64°C
B_EPCB.T10	8.12°C
B_HPISOA.T10	5.02°C
B_TXBPF.T10	9.61°C
B_XDIP.T10	8.70°C
B_XSW1.T10	9.50°C
B_XTRPA.T10	9.34°C



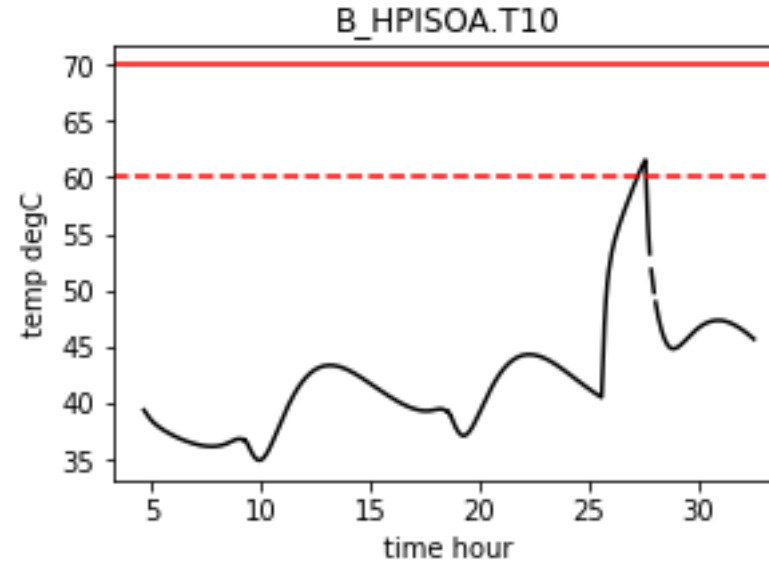
Operational mode A : 2/23 (TAA = 25 deg)



Operational mode A : 2/27 (TAA = 50 deg)



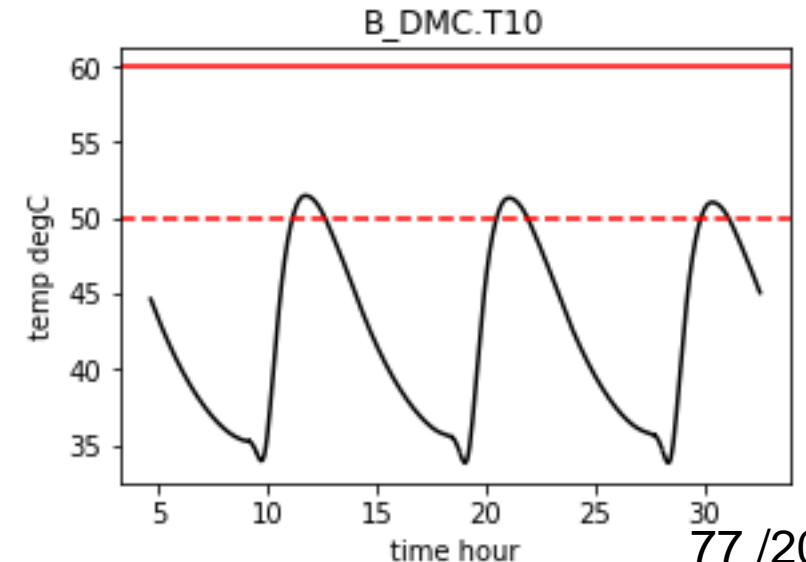
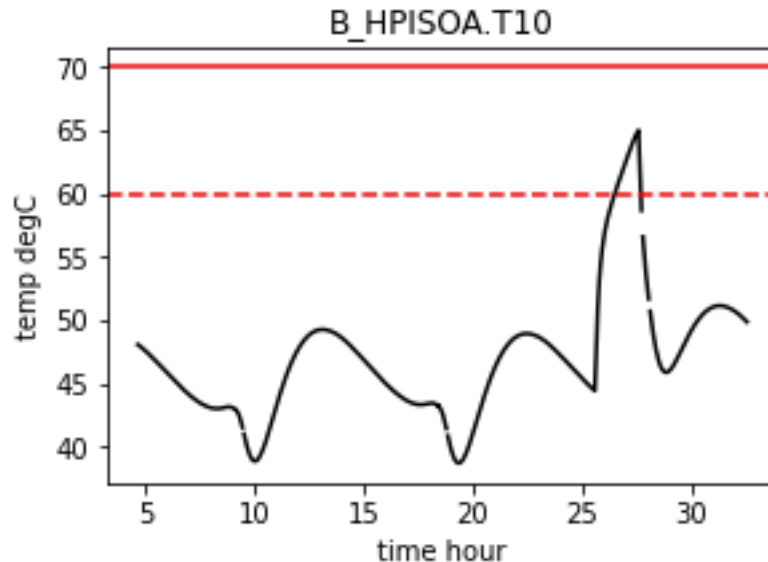
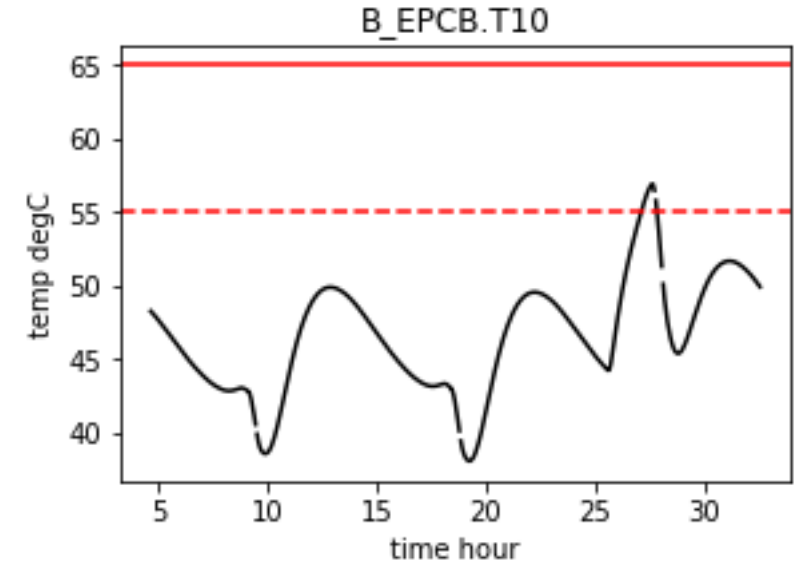
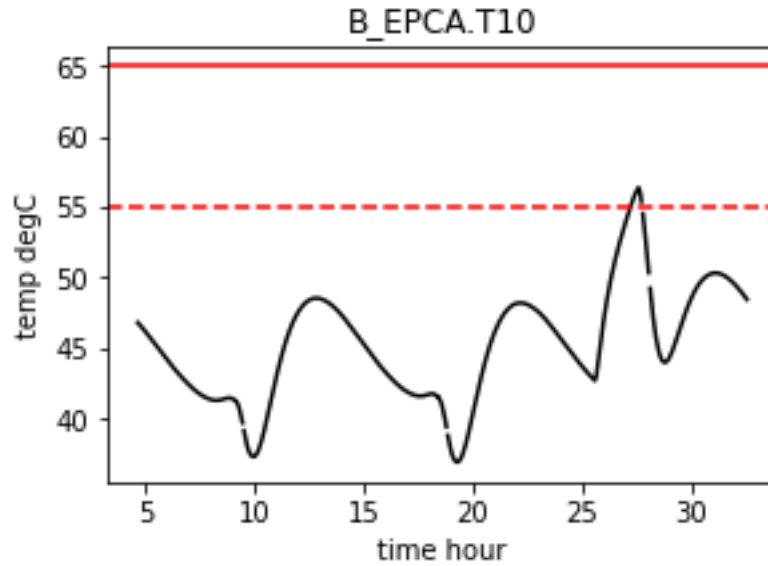
margin	
B_HPISOA.T10	8.47°C



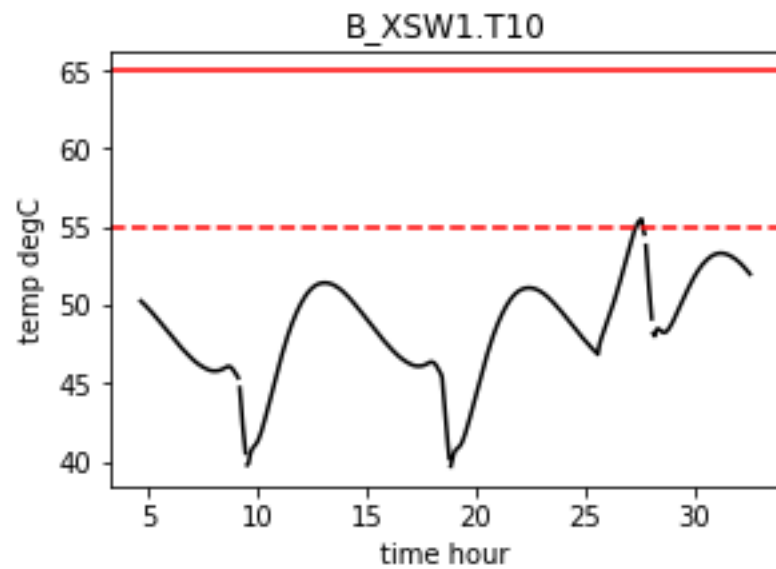
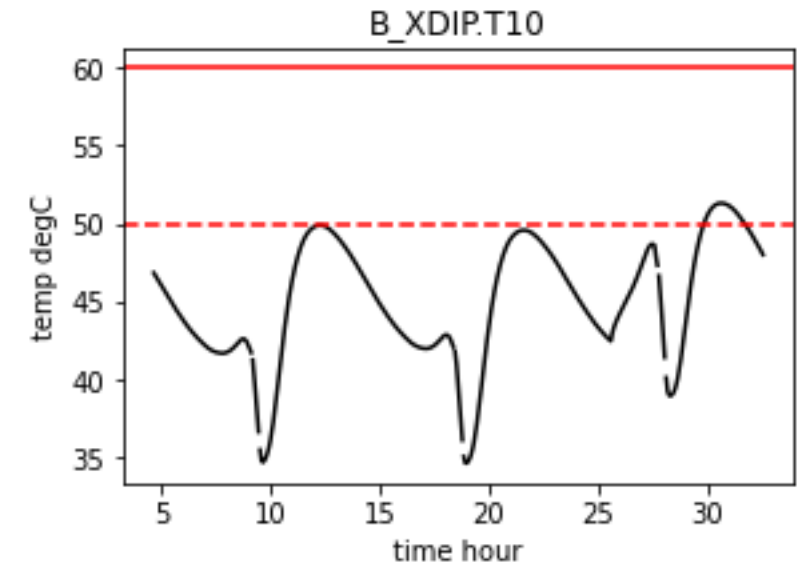
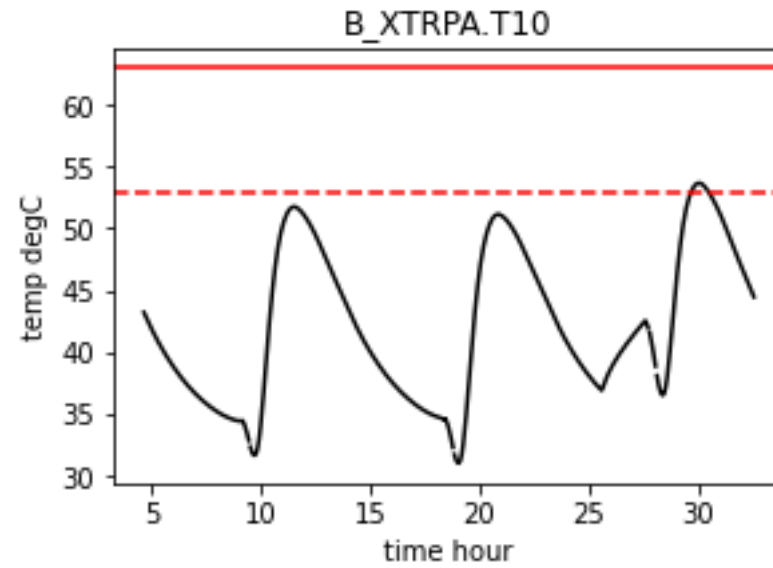
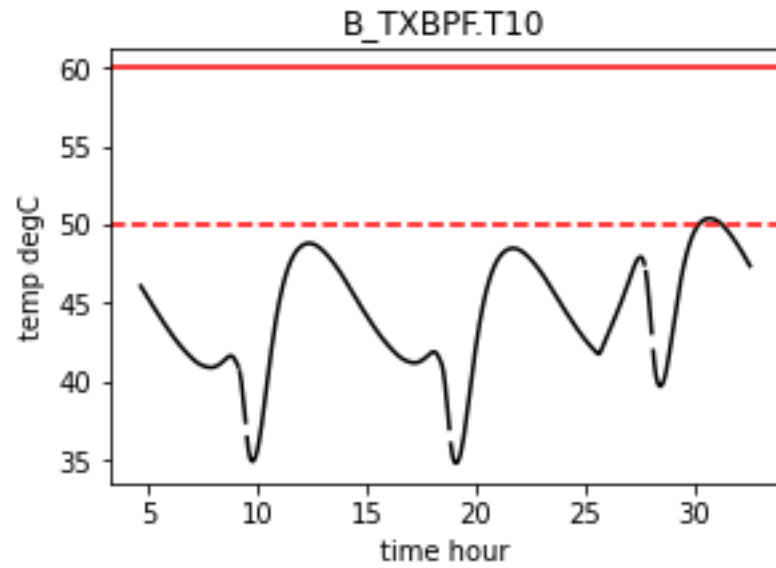
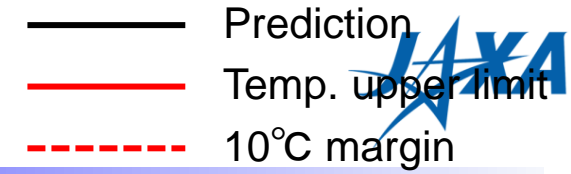
Operational mode B : 2/23 (TAA = 25 deg)

— Prediction
— Temp. upper limit
- - - 10°C margin

margin	
B_DMC.T10	8.53°C
B_EPCA.T10	8.64°C
B_EPCB.T10	8.12°C
B_HPISOA.T10	5.02°C
B_TXBPF.T10	9.61°C
B_XDIP.T10	8.70°C
B_XSW1.T10	9.50°C
B_XTRPA.T10	9.34°C



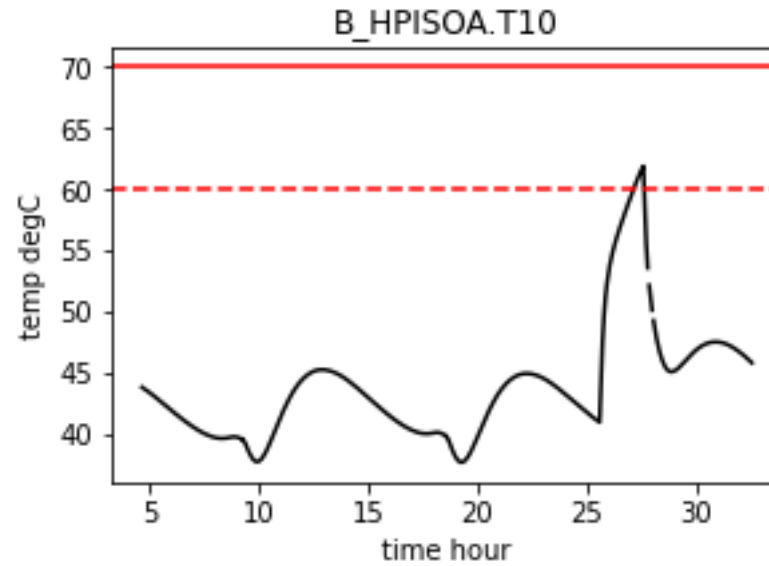
Operational mode B : 2/23 (TAA = 25 deg)



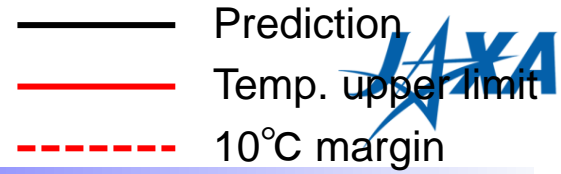
Operational mode B : 2/27 (TAA = 50 deg)

— Prediction
— Temp. upper limit
- - - 10°C margin

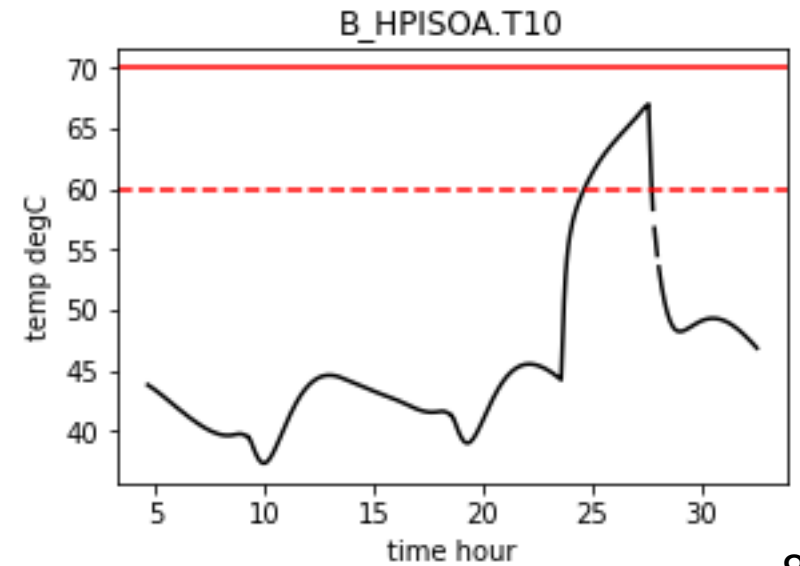
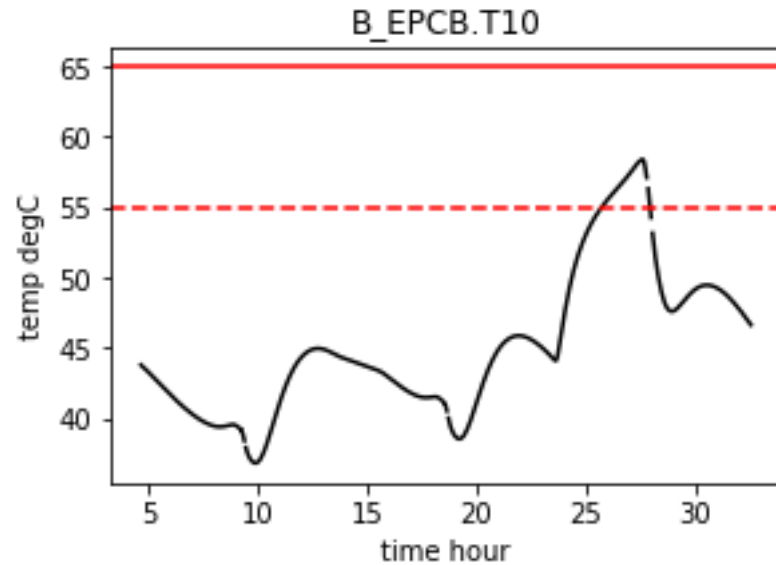
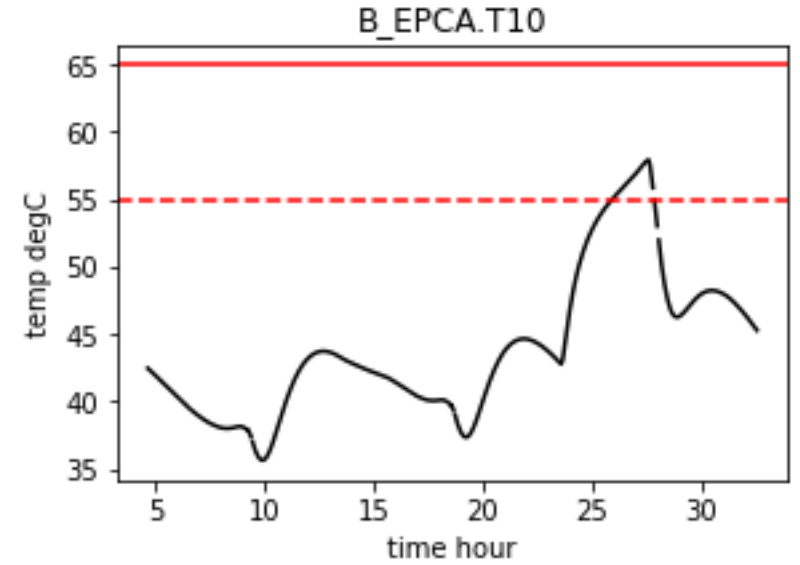
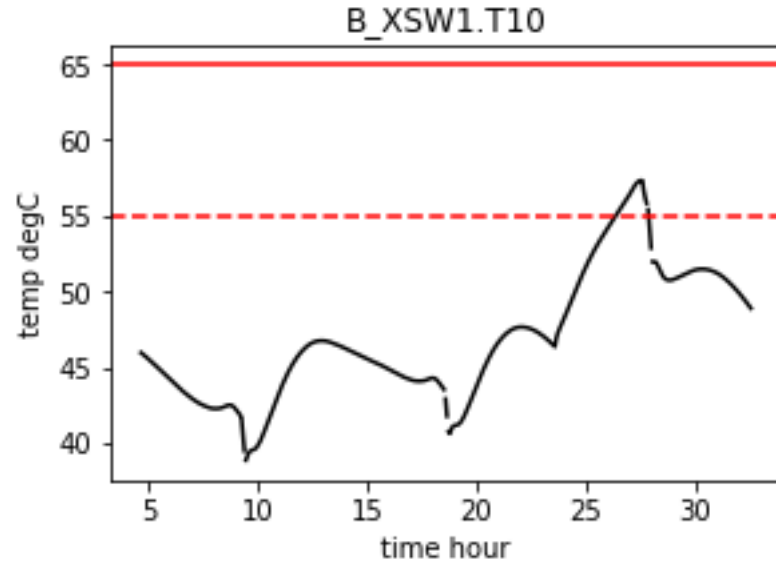
margin	
B_HPISOA.T10	8.14°C



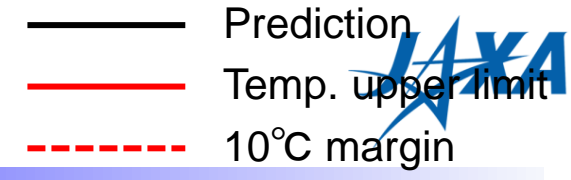
Operational mode C : 2/27 (TAA = 50 deg)



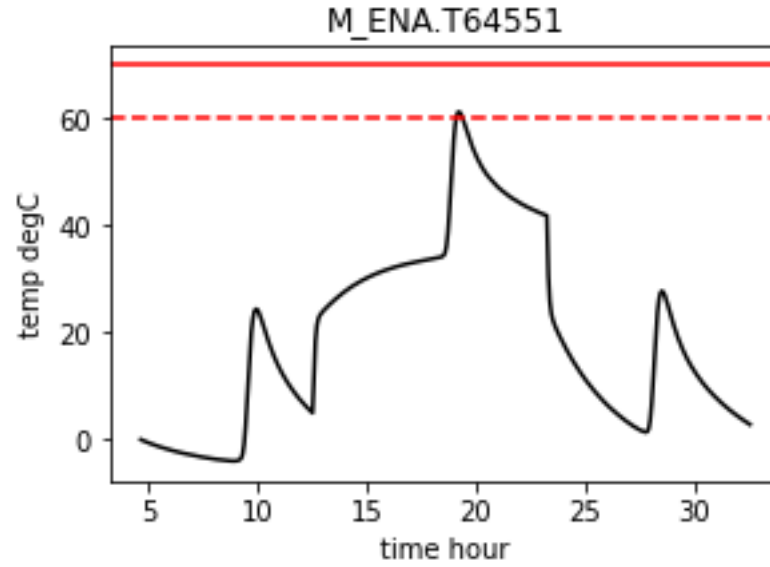
margin shortfall		
B_EPCA.T10	上限	7.07°C
B_EPCB.T10	上限	6.58°C
B_HPISOA.T10	上限	3.03°C
B_XSW1.T10	上限	7.66°C
M_MEFIS1.T7000	上限	1.47°C
M_MEFIS2.T7000	上限	1.09°C



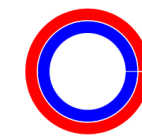
Operational mode F : 3/15 (TAA = 120 deg)



margin	
M_ENA.T64551	8.86°C



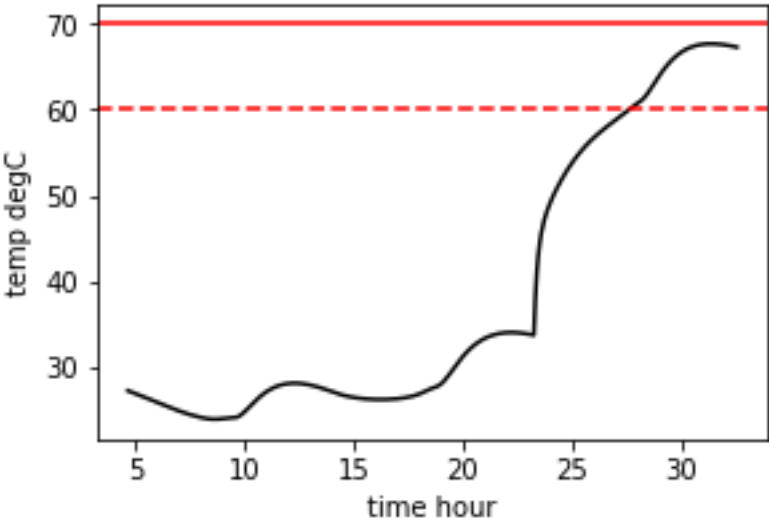
Operational mode F''' : 3/7 (TAA = 90 deg)



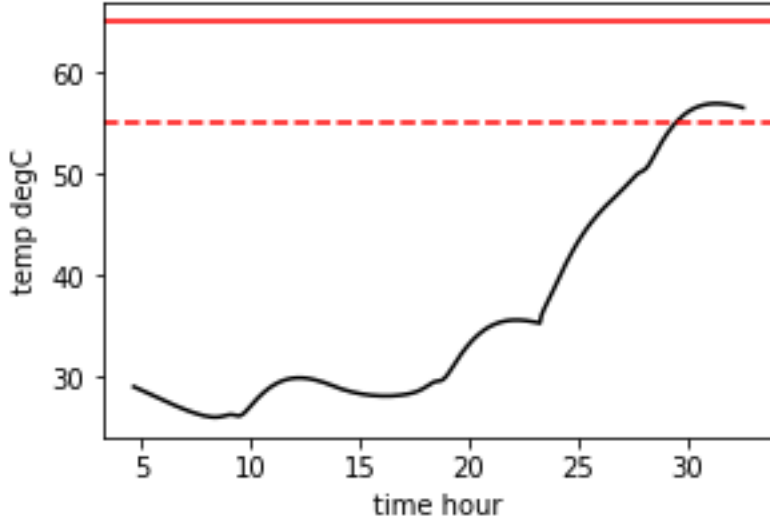
- Prediction
- Temp. upper limit
- 10°C margin



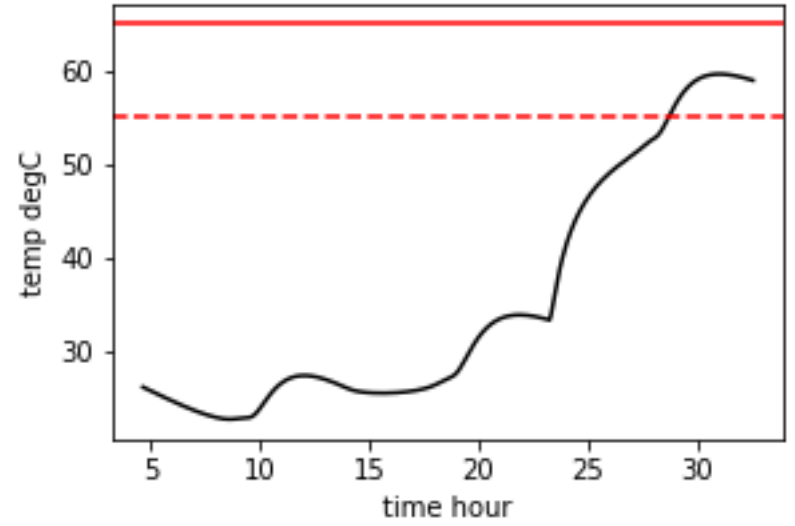
B_HPISOA.T10



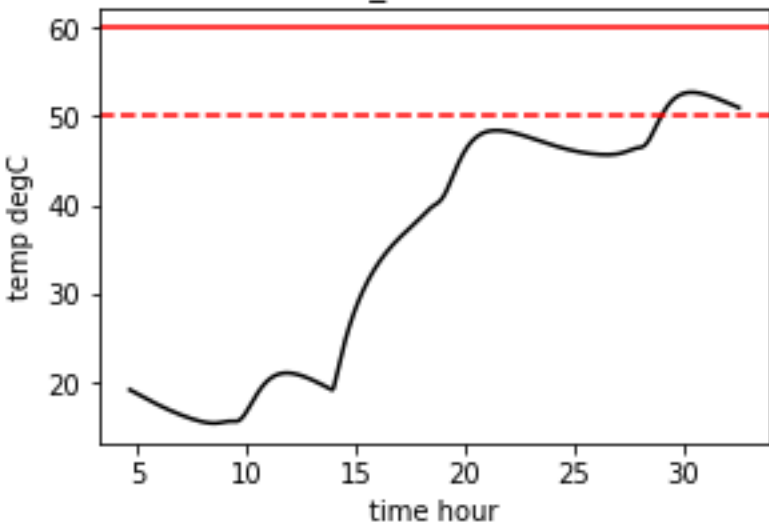
B_XSW1.T10



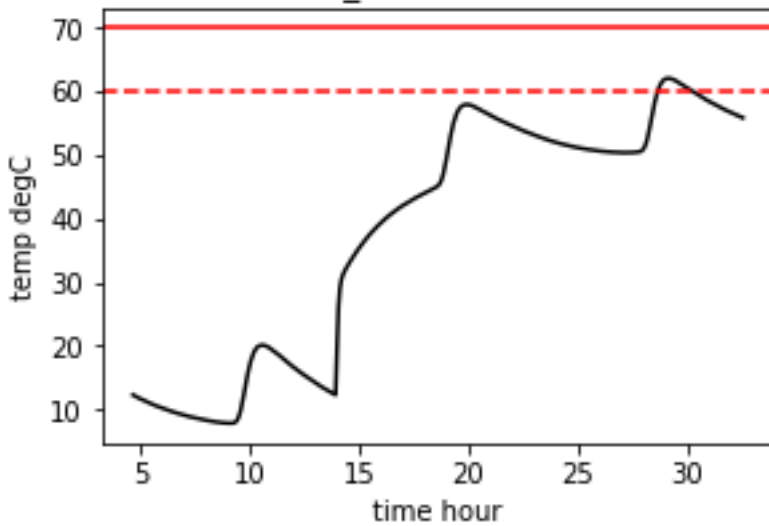
B_EPCA.T10



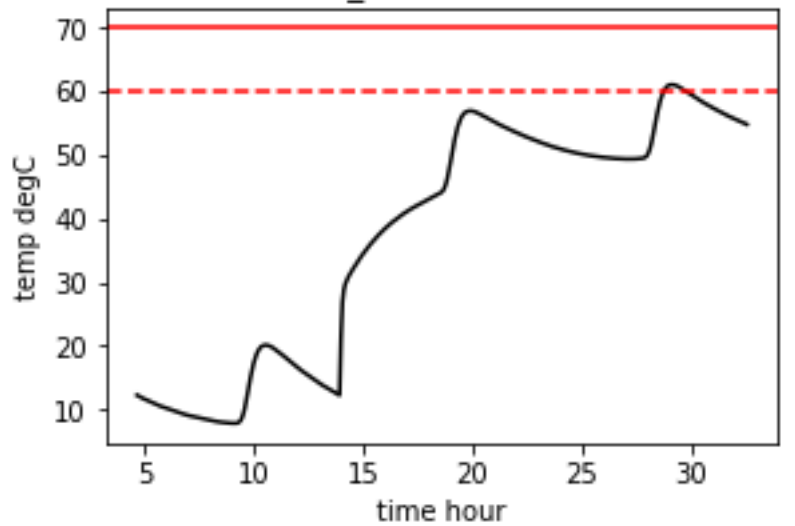
M_PME.T10



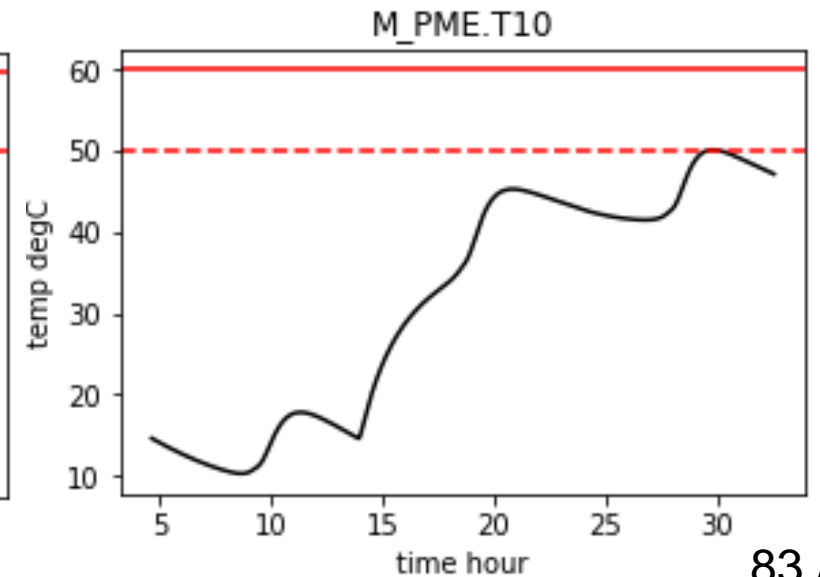
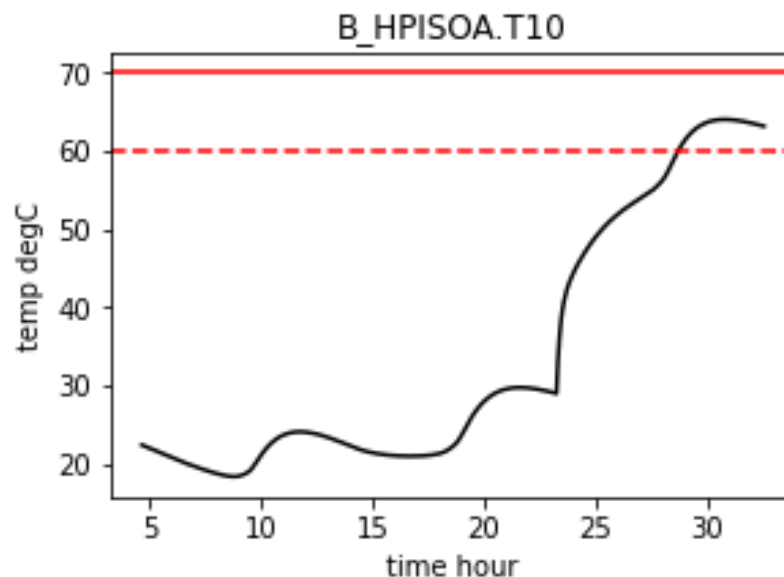
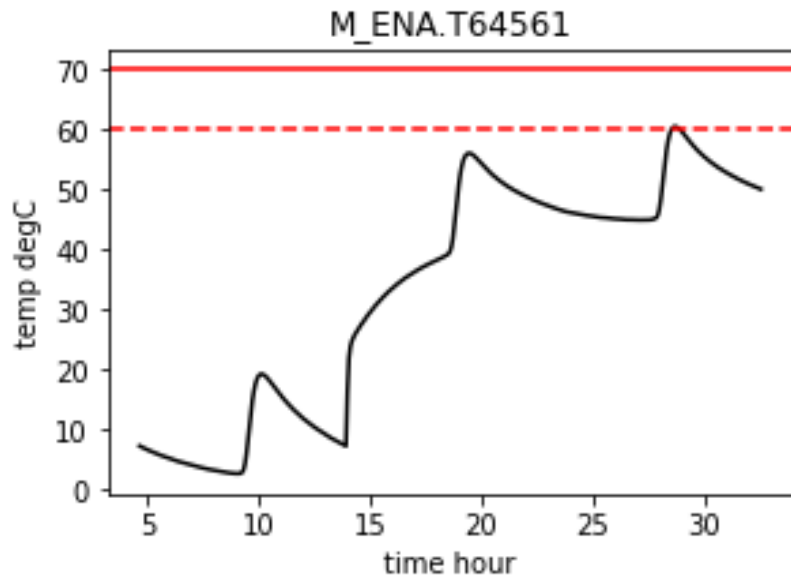
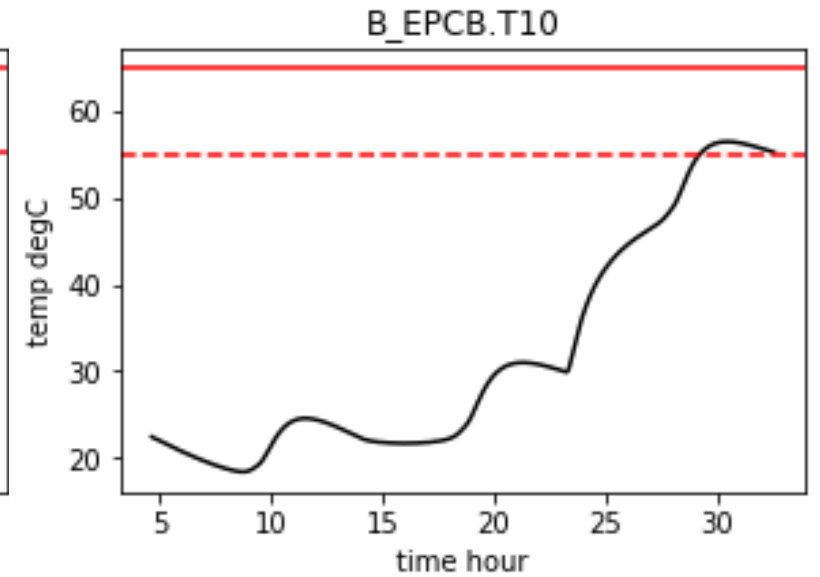
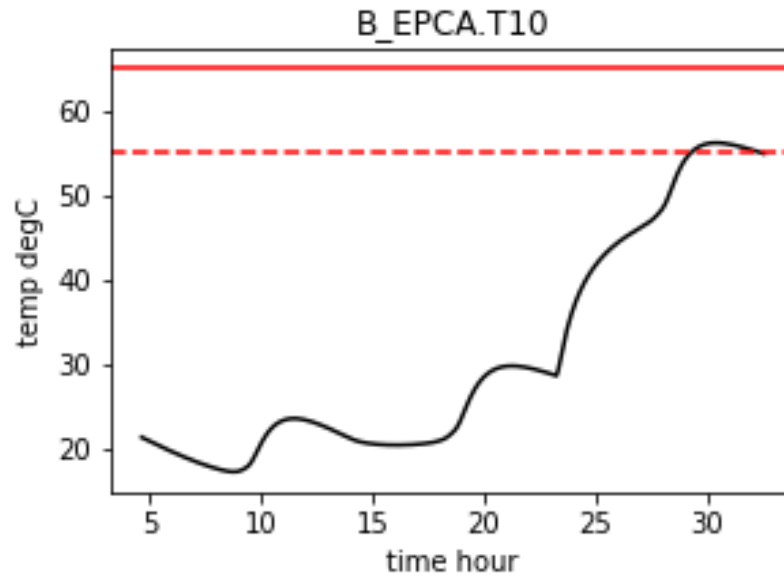
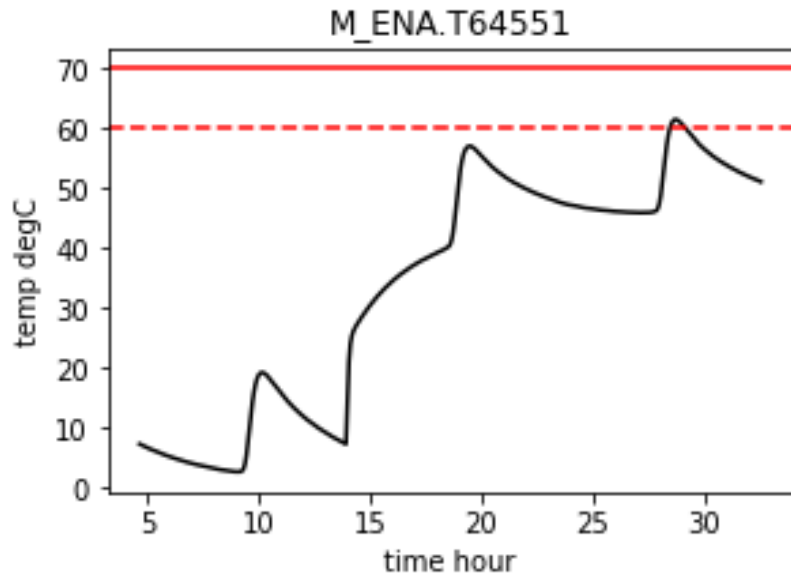
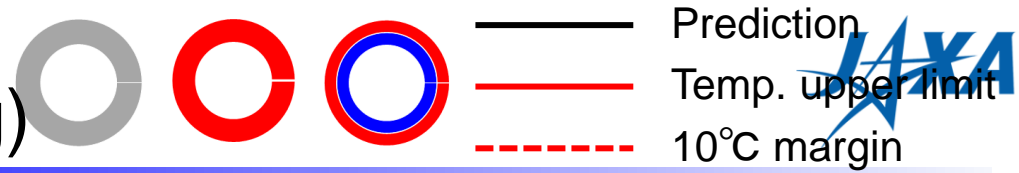
M_ENA.T64551



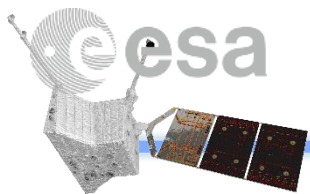
M_ENA.T64561



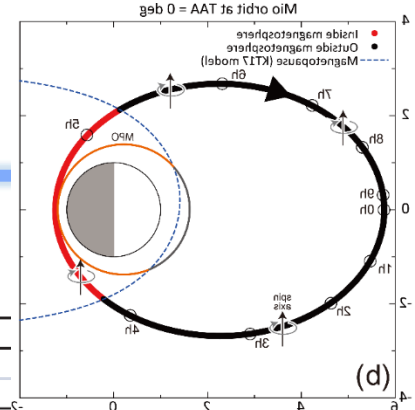
Operational mode F''' : 3/11 (TAA = 120 deg)



Appendix 2



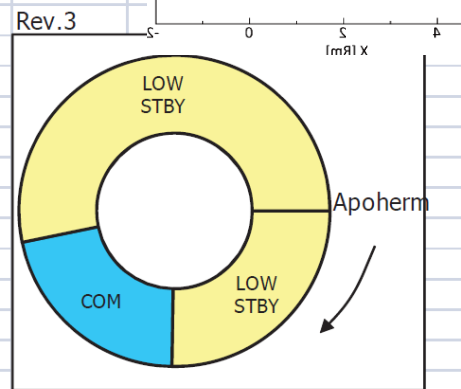
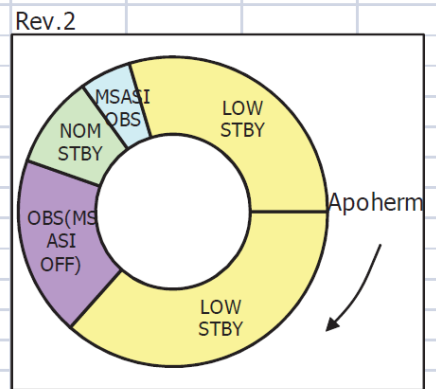
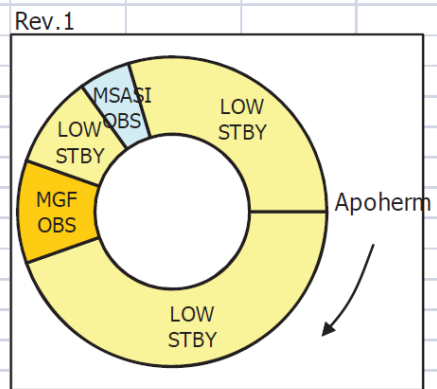
Thermal constraints (at CDR)



TAA: 0-15 deg

Table 7.2.7-1 (1/6) MMO Operation plan of OBS/COM Duty on Mercury Orbit after Separation

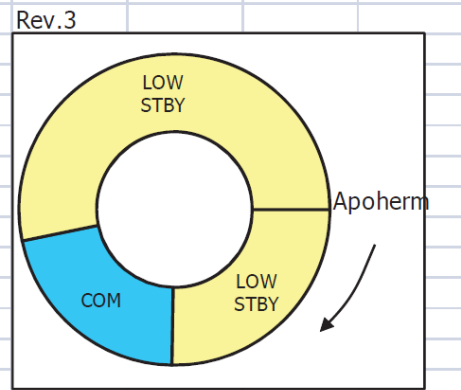
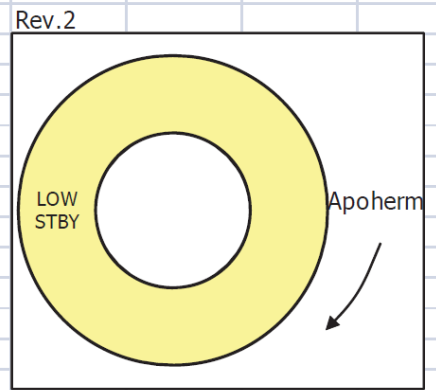
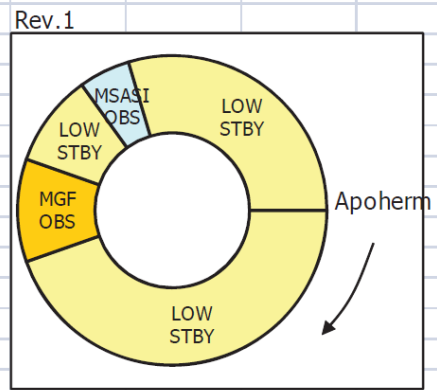
ID	TA	MMO Operation Profiles				
B1	0	Apoherm=0				
		Rev.1	Mode	Start[h]	End[h]	Interval[h]
			LOW STBY	0.00	4.15	4.15
			MGF OBS	4.15	5.15	1.00
			LOW STBY	5.15	6.05	0.90
			MSASI OBS	6.05	6.55	0.50
		Rev.2	LOW STBY	6.55	9.30	2.75
			LOW STBY	0.00	3.40	3.40
			OBS(MSASI OFF)	3.40	5.15	1.75
			NOM STBY	5.15	6.05	0.90
			MSASI OBS	6.05	6.55	0.50
		Rev.3	LOW STBY	6.55	9.30	2.75
			LOW STBY	0.00	2.35	2.35
			COM	2.35	4.35	2.00
			LOW STBY	4.35	9.30	4.95



Full obs: 1.75 h

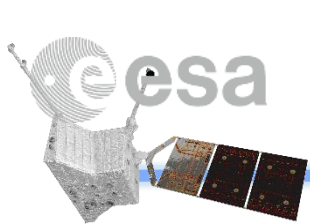
COM: 2 hours

ID	TA	MMO Operation Profiles				
B1b	0	Apoherm=0				
		Rev.1	Mode	Start[h]	End[h]	Interval[h]
			LOW STBY	0.00	4.15	4.15
			MGF OBS	4.15	5.15	1.00
			LOW STBY	5.15	6.05	0.90
			MSASI OBS	6.05	6.55	0.50
		Rev.2	LOW STBY	6.55	9.30	2.75
			LOW STBY	0.00	9.30	9.30
		Rev.3	LOW STBY	0.00	2.35	2.35
			COM	2.35	4.35	2.00
			LOW STBY	4.35	9.30	4.95

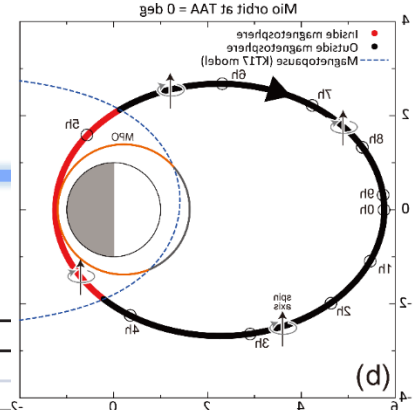


Full obs: N/A

COM: 2 hours



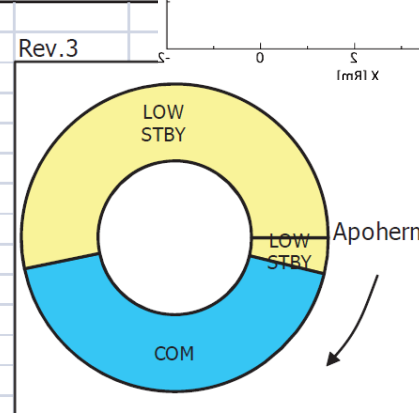
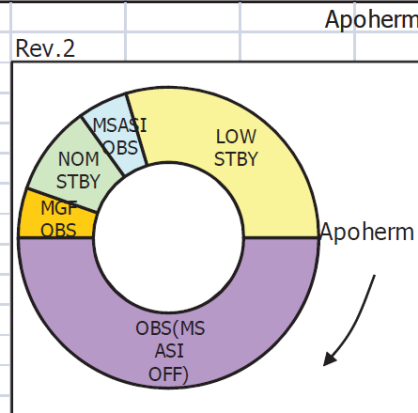
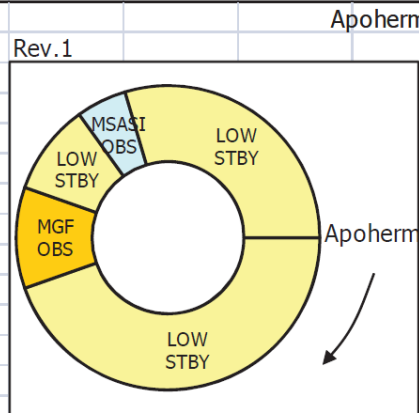
Thermal constraints (at CDR)



TAA: 15-30 deg

Table 7.2.7-1 (2/6) MMO Operation plan of OBS/COM Duty on Mercury Orbit after Separation

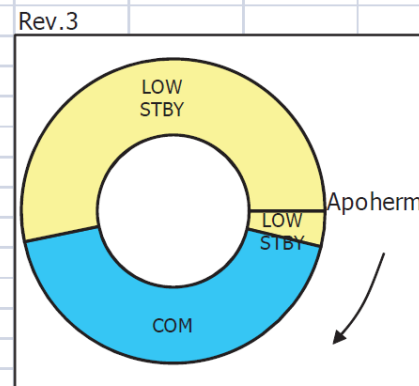
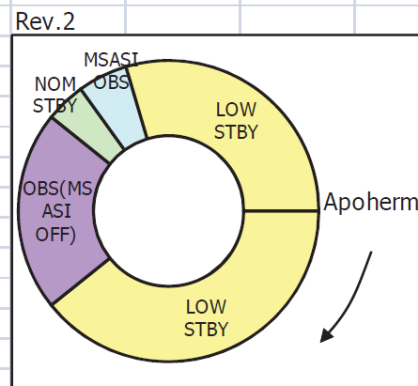
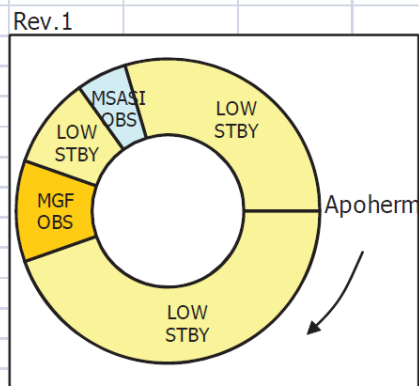
ID	TA	MMO Operation Profiles				
B2a	15 30	Apoherm=0				
			Mode	Start[h]	End[h]	Interval[h]
		Rev.1	LOW STBY	0.00	4.15	4.15
			MGF OBS	4.15	5.15	1.00
			LOW STBY	5.15	6.05	0.90
			MSASI OBS	6.05	6.55	0.50
			LOW STBY	6.55	9.30	2.75
		Rev.2	OBS(MSASI OFF)	0.00	4.65	4.65
			MGF OBS	4.65	5.15	0.50
			NOM STBY	5.15	6.05	0.90
			MSASI OBS	6.05	6.55	0.50
			LOW STBY	6.55	9.30	2.75
		Rev.3	LOW STBY	0.00	0.35	0.35
COM	0.35		4.35	4.00		
LOW STBY	4.35		9.30	4.95		



Full obs: 4.65 h

COM: 4 hours

ID	TA	MMO Operation Profiles				
B2b	15	Apoherm=0				
			Mode	Start[h]	End[h]	Interval[h]
		Rev.1	LOW STBY	0.00	4.15	4.15
			MGF OBS	4.15	5.15	1.00
			LOW STBY	5.15	6.05	0.90
			MSASI OBS	6.05	6.55	0.50
			LOW STBY	6.55	9.30	2.75
		Rev.2	LOW STBY	0.00	3.65	3.65
			OBS(MSASI OFF)	3.65	5.65	2.00
			NOM STBY	5.65	6.05	0.40
			MSASI OBS	6.05	6.55	0.50
			LOW STBY	6.55	9.30	2.75
		Rev.3	LOW STBY	0.00	0.35	0.35
COM	0.35		4.35	4.00		
LOW STBY	4.35		9.30	4.95		



Full obs: 2 h

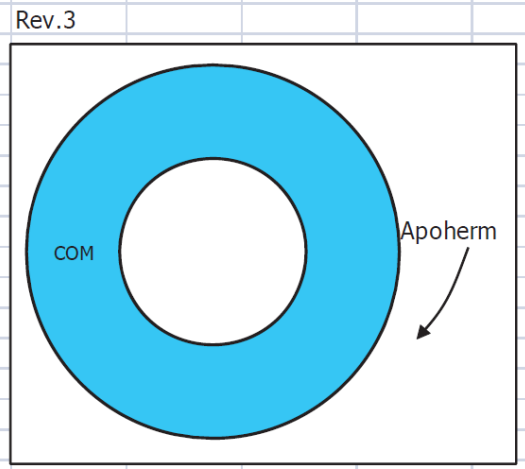
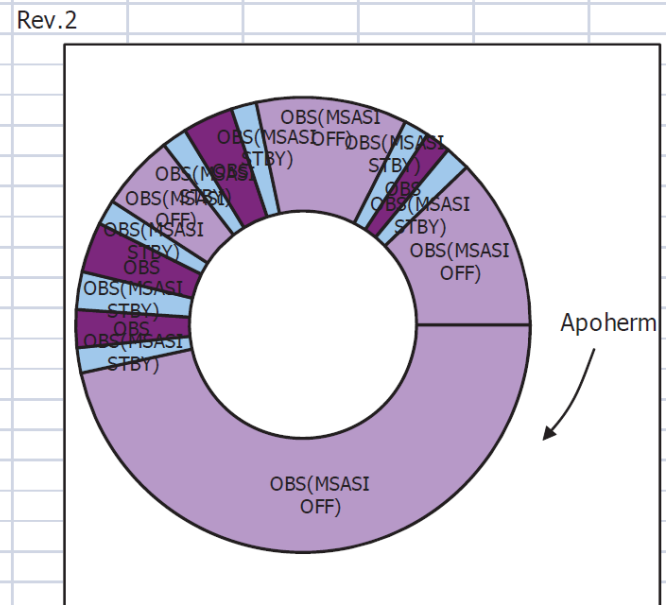
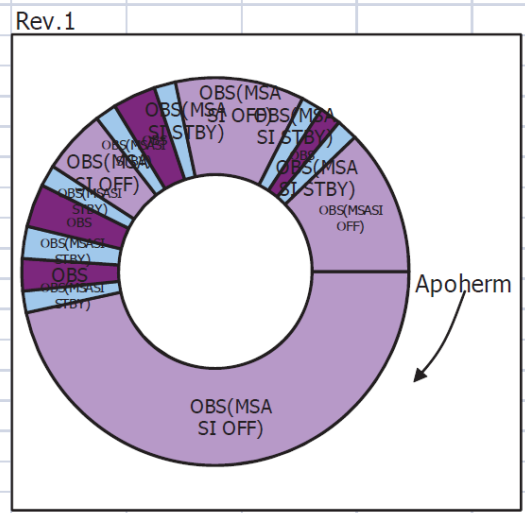
COM: 4 hours

Thermal constraints (at CDR)

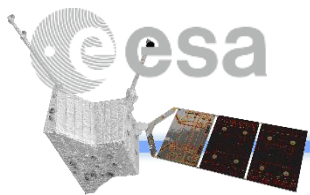
TAA: 60-90 deg

Table 7.2.7-1 (4/6) MMO Operation plan of OBS/COM Duty on Mercury Orbit after Separation

ID	TA	MMO Operation Profiles	Apoherm=0				
		Mode	Start[h]	End[h]	Interval[h]		
B4	60	Rev.1	OBS(MSASI OFF)	0.00	4.33	4.33	
			OBS(MSASI STBY)	4.33	4.50	0.17	
			OBS	4.50	4.75	0.25	
			OBS(MSASI STBY)	4.75	5.00	0.25	
			OBS	5.00	5.33	0.33	
			OBS(MSASI STBY)	5.33	5.50	0.17	
			OBS(MSASI OFF)	5.50	6.00	0.50	
			OBS(MSASI STBY)	6.00	6.17	0.17	
			OBS	6.17	6.50	0.33	
			OBS(MSASI STBY)	6.50	6.67	0.17	
			OBS(MSASI OFF)	6.67	7.67	1.00	
			OBS(MSASI STBY)	7.67	7.83	0.17	
			OBS	7.83	8.00	0.17	
			OBS(MSASI STBY)	8.00	8.17	0.17	
			OBS(MSASI OFF)	8.17	9.30	1.13	
			Rev.2	OBS(MSASI OFF)	0.00	4.33	4.33
				OBS(MSASI STBY)	4.33	4.50	0.17
				OBS	4.50	4.75	0.25
		OBS(MSASI STBY)		4.75	5.00	0.25	
		OBS		5.00	5.33	0.33	
		OBS(MSASI STBY)		5.33	5.50	0.17	
		OBS(MSASI OFF)		5.50	6.00	0.50	
		OBS(MSASI STBY)		6.00	6.17	0.17	
		OBS		6.17	6.50	0.33	
		OBS(MSASI STBY)		6.50	6.67	0.17	
		OBS(MSASI OFF)		6.67	7.67	1.00	
		OBS(MSASI STBY)		7.67	7.83	0.17	
		Rev.3	OBS	7.83	8.00	0.17	
			OBS(MSASI STBY)	8.00	8.17	0.17	
			OBS(MSASI OFF)	8.17	9.30	1.13	
			COM	0.00	9.30	9.30	



COM: 9.3 hours



Thermal constraints (at CDR)

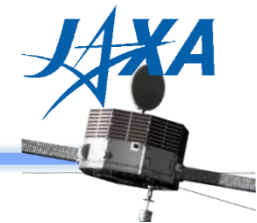
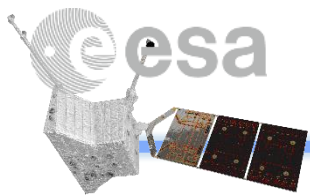


Table 7.2.7-1 (5/6) MMO Operation plan of OBS/COM Duty on Mercury Orbit after Separation

TAA: 90-135 deg

TA	MMO Operation Profiles	Apoherm=0			Rev.1	Rev.2	Rev.3		
		Start[h]	End[h]	Interval[h]					
B5-1	90	Rev.1	Mode						
			OBS(MSASI OFF)	0.00	4.33	4.33			
			OBS(MSASI STBY)	4.33	4.50	0.17			
			OBS	4.50	4.75	0.25			
			OBS(MSASI STBY)	4.75	5.00	0.25			
			OBS	5.00	5.33	0.33			
			OBS(MSASI STBY)	5.33	5.50	0.17			
			OBS(MSASI OFF)	5.50	6.00	0.50			
			OBS(MSASI STBY)	6.00	6.17	0.17			
			OBS	6.17	6.50	0.33			
			OBS(MSASI STBY)	6.50	6.67	0.17			
			OBS(MSASI OFF)	6.67	7.67	1.00			
		OBS(MSASI STBY)	7.67	7.83	0.17				
		OBS	7.83	8.00	0.17				
		OBS(MSASI STBY)	8.00	8.17	0.17				
		OBS(MSASI OFF)	8.17	9.30	1.13				
		Rev.2	OBS(MSASI OFF)	0.00	4.33	4.33			
			OBS(MSASI STBY)	4.33	4.50	0.17			
			OBS	4.50	4.75	0.25			
			OBS(MSASI STBY)	4.75	5.00	0.25			
			OBS	5.00	5.33	0.33			
			OBS(MSASI STBY)	5.33	5.50	0.17			
			OBS(MSASI OFF)	5.50	6.00	0.50			
			OBS(MSASI STBY)	6.00	6.17	0.17			
			OBS	6.17	6.50	0.33			
			OBS(MSASI STBY)	6.50	6.67	0.17			
			OBS(MSASI OFF)	6.67	7.67	1.00			
			OBS(MSASI STBY)	7.67	7.83	0.17			
		OBS	7.83	8.00	0.17				
		OBS(MSASI STBY)	8.00	8.17	0.17				
		OBS(MSASI OFF)	8.17	9.30	1.13				
		Rev.3	OBS/COM(MSASI OFF)	0.00	4.33	4.33			
			OBS/COM(MSASI STBY)	4.33	4.50	0.17			
			OBS/COM	4.50	4.75	0.25			
			OBS/COM(MSASI STBY)	4.75	5.00	0.25			
			OBS/COM	5.00	5.33	0.33			
OBS/COM(MSASI STBY)	5.33		5.50	0.17					
OBS/COM(MSASI OFF)	5.50		6.00	0.50					
OBS/COM(MSASI STBY)	6.00		6.17	0.17					
OBS/COM	6.17		6.50	0.33					
OBS/COM(MSASI STBY)	6.50		6.67	0.17					
OBS/COM(MSASI OFF)	6.67		7.67	1.00					
OBS/COM(MSASI STBY)	7.67		7.83	0.17					
OBS/COM	7.83	8.00	0.17						
OBS/COM(MSASI STBY)	8.00	8.17	0.17						
OBS/COM(MSASI OFF)	8.17	9.30	1.13						

COM: 9.3 hours



Thermal constraints (at CDR)

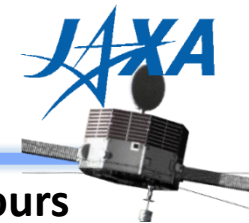


Table 7.2.7-1 (6/6) MMO Operation plan of OBS/COM Duty on Mercury Orbit after Separation

COM: 12 hours

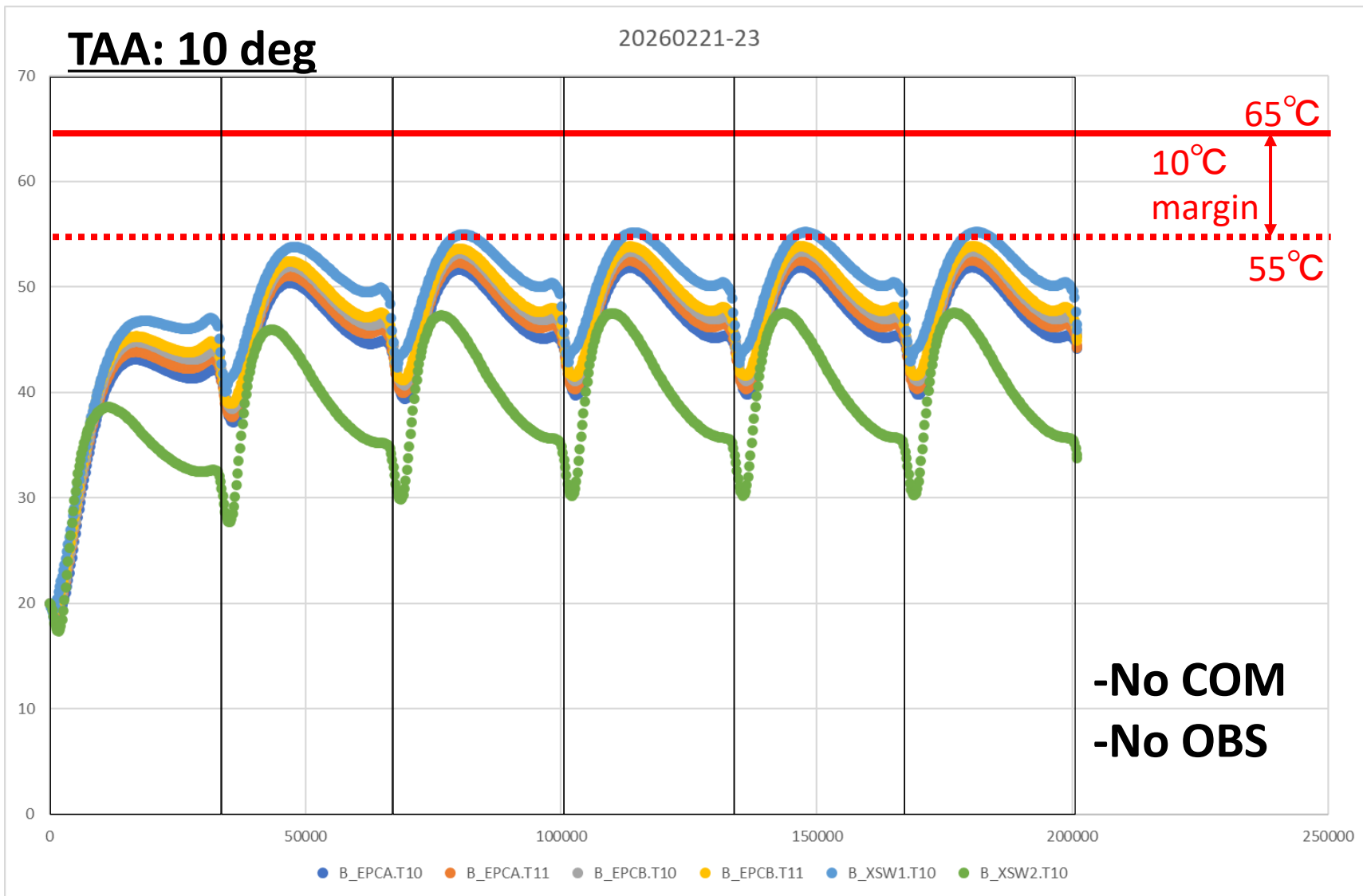
TAA: 135-180 deg

B5-2	TA	MMO Operation Profiles				Apoherm=0		Apoherm		Apoherm		Apoherm												
		Mode	Start[h]	End[h]	Interval[h]	Rev.1	Rev.2	Rev.3	Rev.1	Rev.2	Rev.3	Rev.1	Rev.2											
135 150 165 175	Rev.1	OBS(MSASI OFF)	0.00	4.33	4.33																			
		OBS(MSASI STBY)	4.33	4.50	0.17																			
		OBS	4.50	4.75	0.25																			
		OBS(MSASI STBY)	4.75	5.00	0.25																			
		OBS	5.00	5.33	0.33																			
		OBS(MSASI STBY)	5.33	5.50	0.17																			
		OBS(MSASI OFF)	5.50	6.00	0.50																			
		OBS(MSASI STBY)	6.00	6.17	0.17																			
		OBS	6.17	6.50	0.33																			
		OBS(MSASI STBY)	6.50	6.67	0.17																			
		OBS(MSASI OFF)	6.67	7.67	1.00																			
		OBS(MSASI STBY)	7.67	7.83	0.17																			
		OBS	7.83	8.00	0.17																			
		OBS(MSASI STBY)	8.00	8.17	0.17																			
		OBS(MSASI OFF)	8.17	9.30	1.13																			
	Rev.2	OBS(MSASI OFF)	0.00	4.33	4.33																			
		OBS(MSASI STBY)	4.33	4.50	0.17																			
		OBS	4.50	4.75	0.25																			
		OBS(MSASI STBY)	4.75	5.00	0.25																			
		OBS	5.00	5.33	0.33																			
		OBS(MSASI STBY)	5.33	5.50	0.17																			
		OBS(MSASI OFF)	5.50	6.00	0.50																			
		OBS(MSASI STBY)	6.00	6.17	0.17																			
		OBS	6.17	6.50	0.33																			
		OBS(MSASI STBY)	6.50	6.67	0.17																			
		OBS(MSASI OFF)	6.67	7.67	1.00																			
		OBS(MSASI STBY)	7.67	7.83	0.17																			
		OBS	7.83	8.00	0.17																			
		OBS(MSASI STBY)	8.00	8.17	0.17																			
		OBS(MSASI OFF)	8.17	9.30	1.13																			
		Rev.3	OBS(MSASI OFF)	0.00	4.33										4.33									
			OBS(MSASI STBY)	4.33	4.50										0.17									
			OBS	4.50	4.75										0.25									
OBS(MSASI STBY)	4.75		5.00	0.25																				
OBS	5.00		5.33	0.33																				
OBS(MSASI STBY)	5.33		5.50	0.17																				
OBS(MSASI OFF)	5.50		6.00	0.50																				
OBS(MSASI STBY)	6.00		6.17	0.17																				
OBS	6.17		6.50	0.33																				
OBS(MSASI STBY)	6.50		6.67	0.17																				
OBS(MSASI OFF)	6.67		7.67	1.00																				
OBS(MSASI STBY)	7.67		7.83	0.17																				
OBS	7.83		8.00	0.17																				
OBS(MSASI STBY)	8.00		8.17	0.17																				
OBS(MSASI OFF)	8.17		9.30	1.13																				

B6 180 (LOW STBY)

Baseline observation plan

Updated thermal analysis (on-going)



-Thermal simulator tool is almost ready

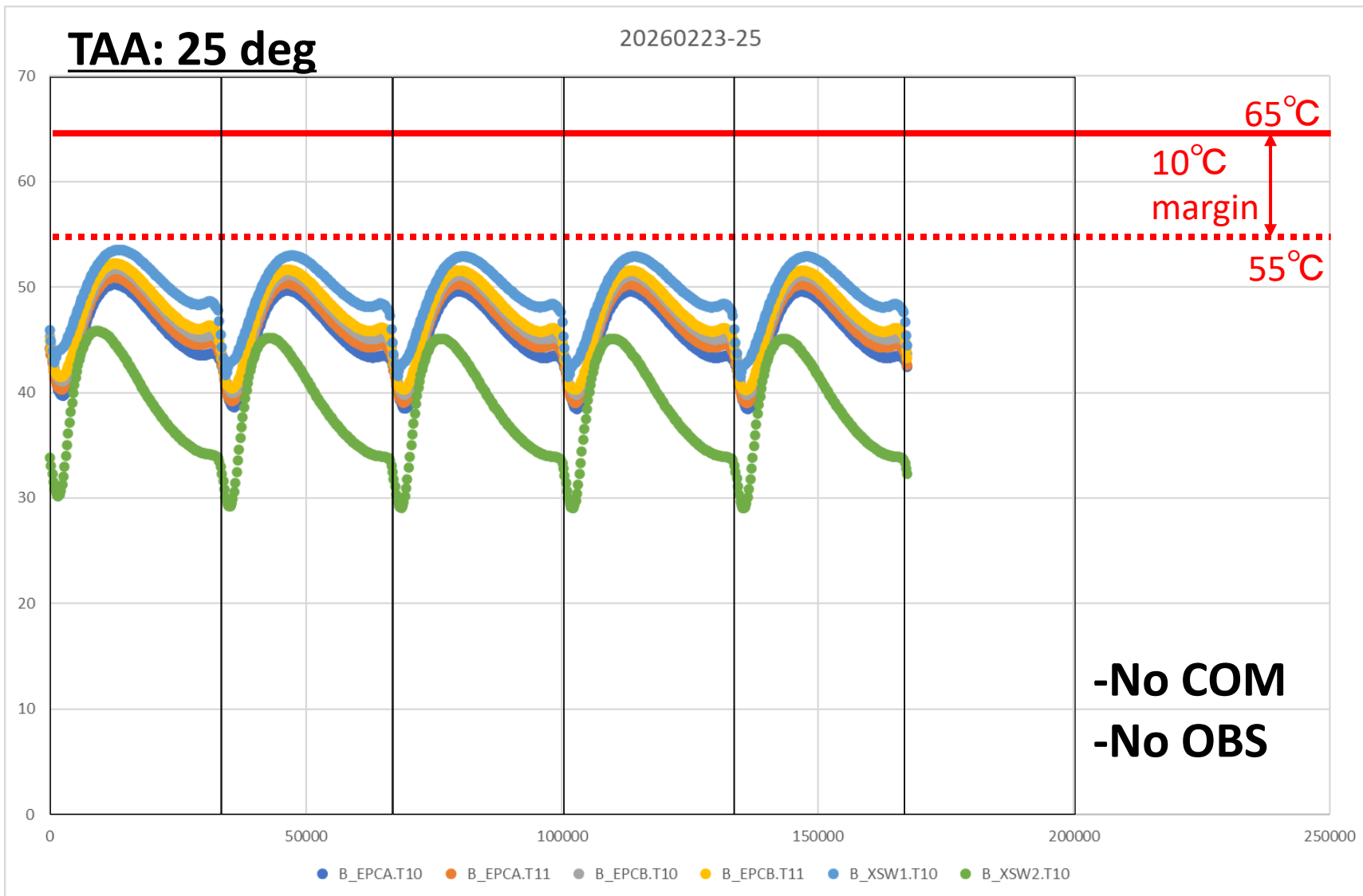
-Using a new thermal model updated using cruise phase data

-Thermal analysis is on-going

-Perihelion season is most critical

Baseline observation plan

Updated thermal analysis (on-going)

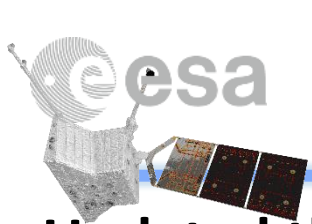


-Thermal simulator tool is almost ready

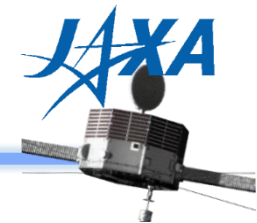
-Using a new thermal model updated using cruise phase data

-Thermal analysis is on-going

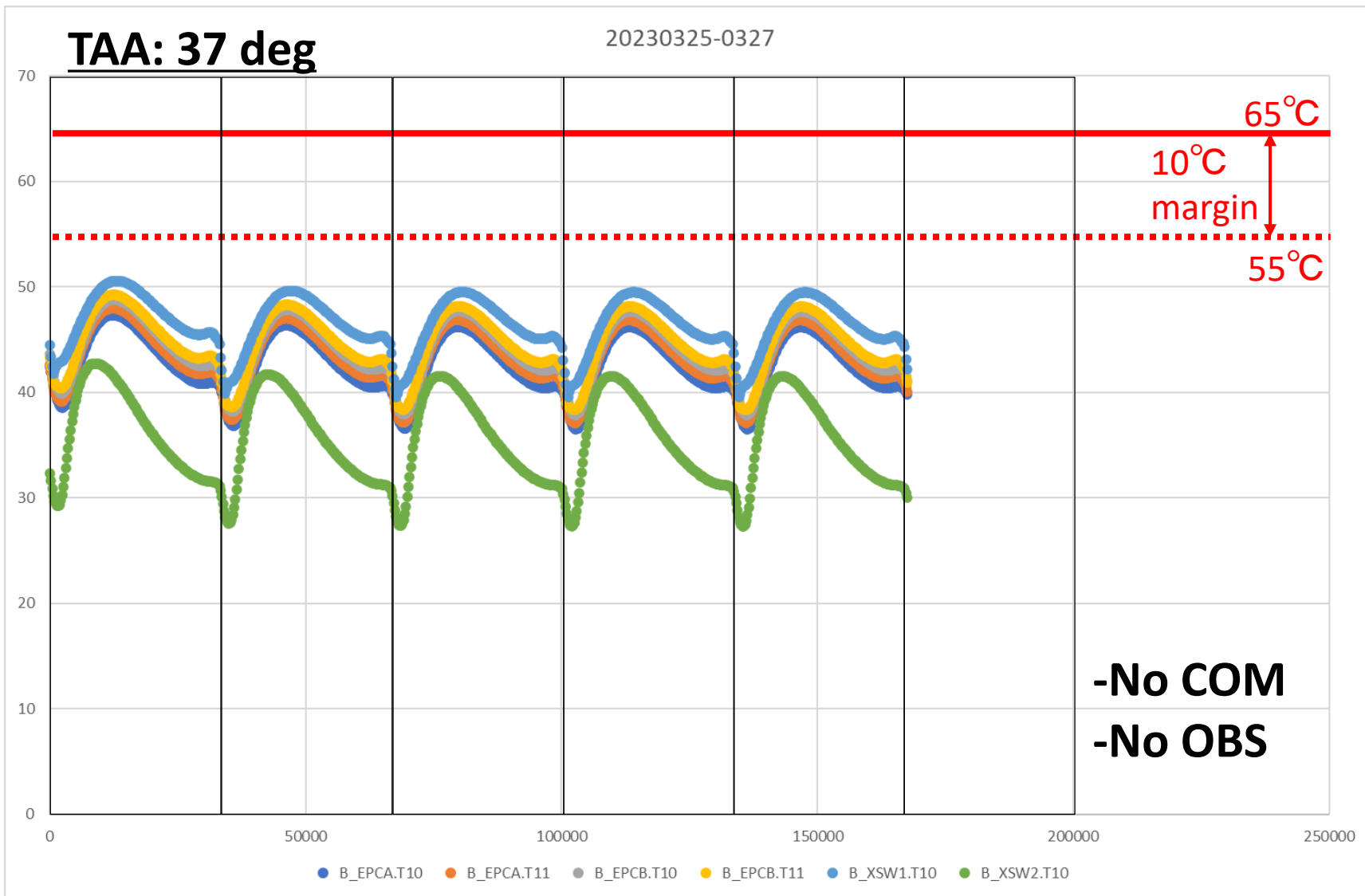
-Perihelion season is most critical



Baseline observation plan



Updated thermal analysis (on-going)



-Thermal simulator tool is almost ready

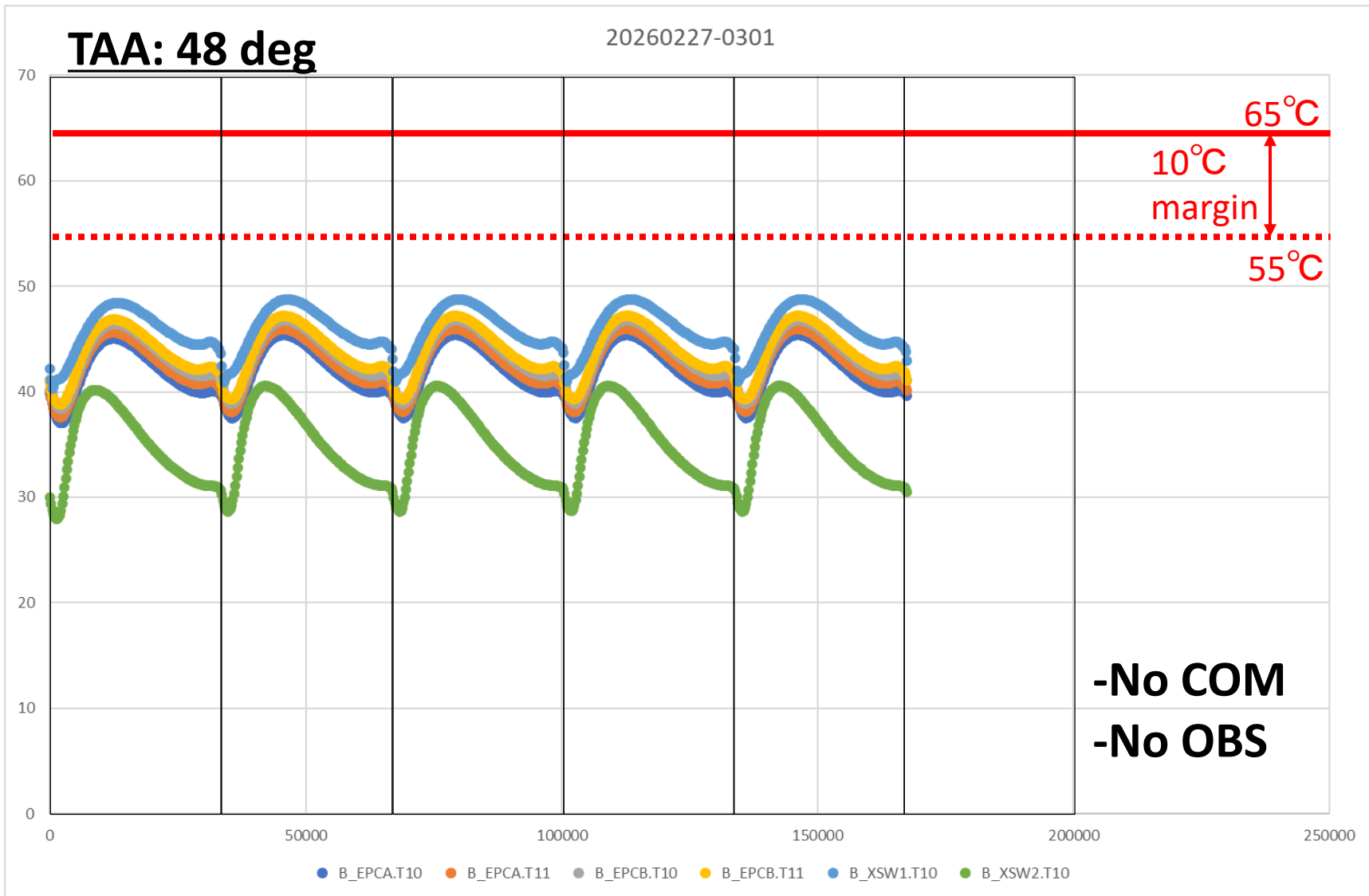
-Using a new thermal model updated using cruise phase data

-Thermal analysis is on-going

-Perihelion season is most critical

Baseline observation plan

Updated thermal analysis (on-going)



-Thermal simulator tool is almost ready

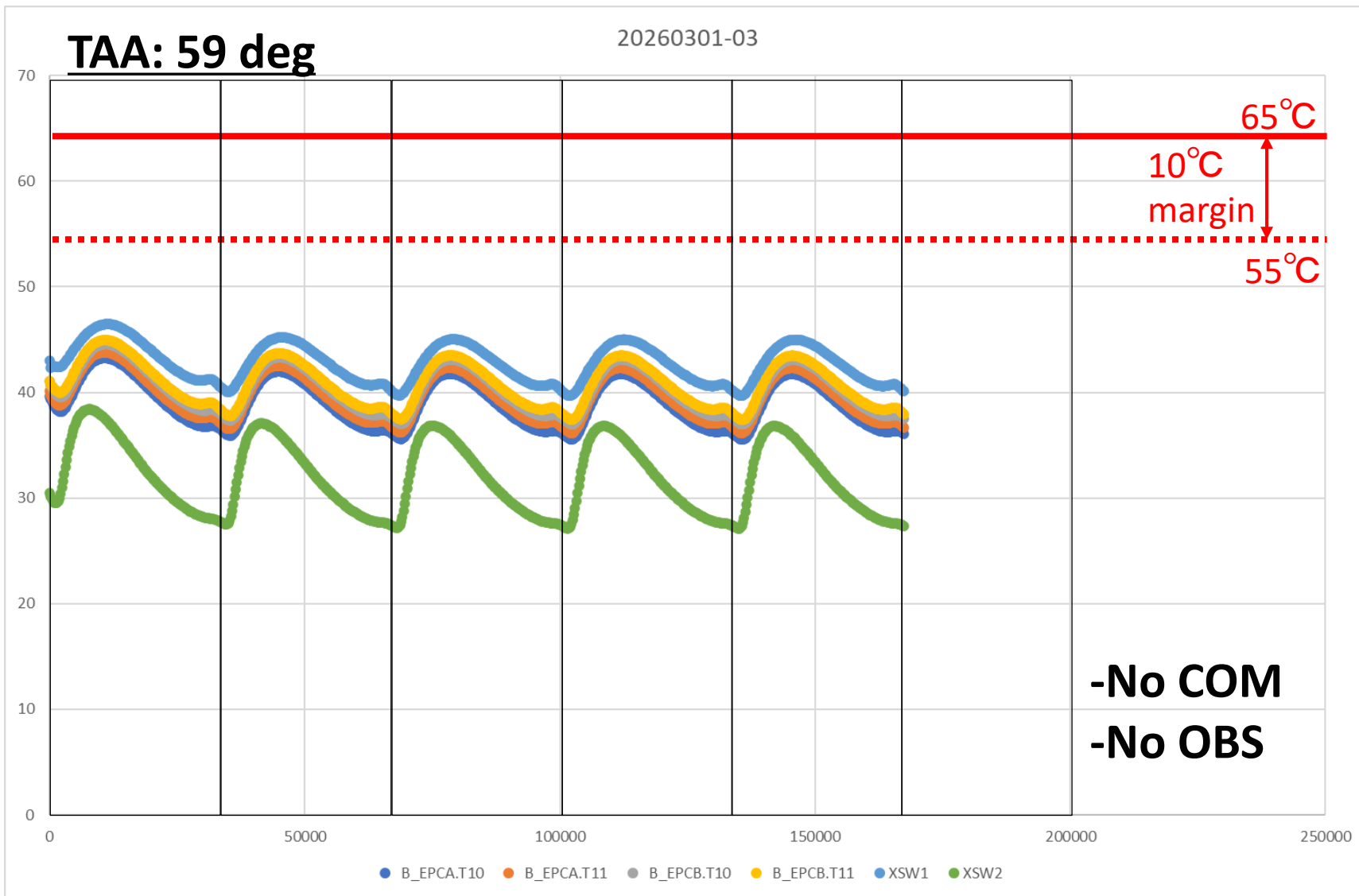
-Using a new thermal model updated using cruise phase data

-Thermal analysis is on-going

-Perihelion season is most critical

Baseline observation plan

Updated thermal analysis (on-going)



-Thermal simulator tool is almost ready

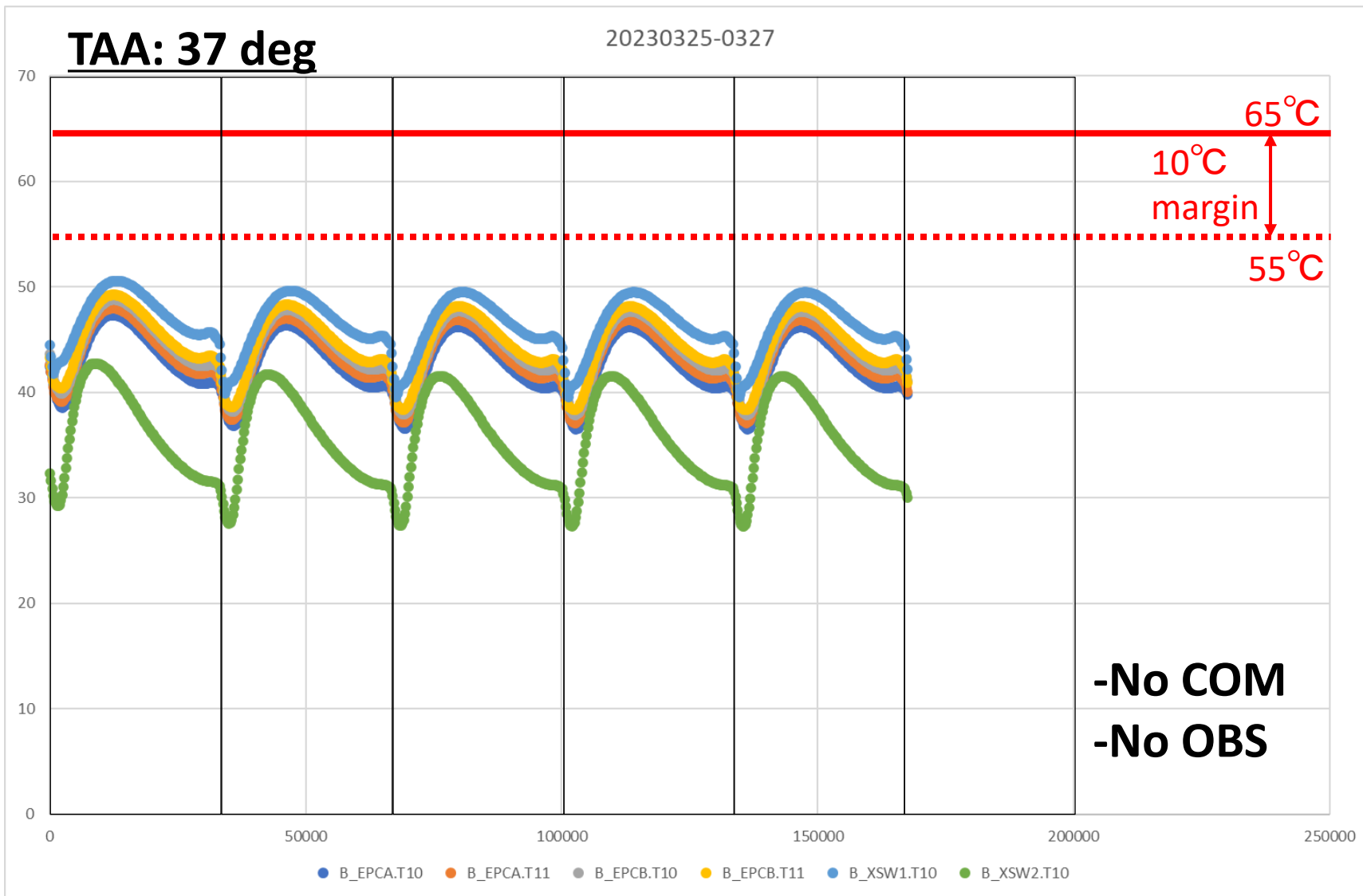
-Using a new thermal model updated using cruise phase data

-Thermal analysis is on-going

-Perihelion season is most critical

Baseline observation plan

Updated thermal analysis (on-going)

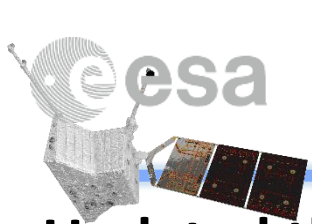


-Thermal simulator tool is almost ready

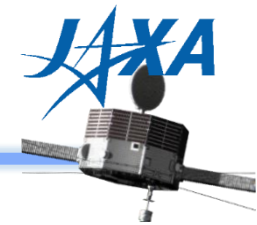
-Using a new thermal model updated using cruise phase data

-Thermal analysis is on-going

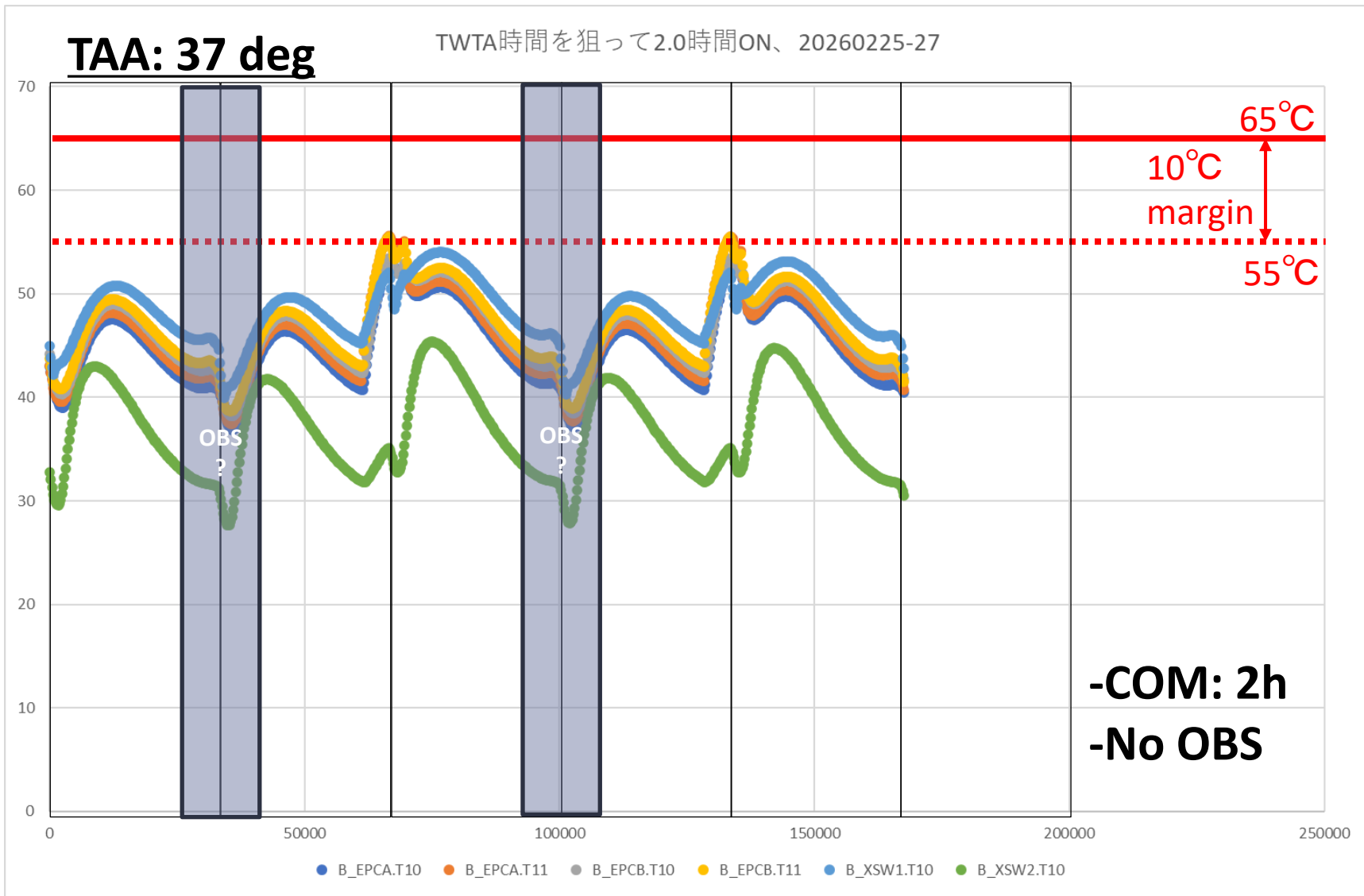
-Perihelion season is most critical



Baseline observation plan



Updated thermal analysis (on-going)



-Thermal simulator tool is almost ready

-Using a new thermal model updated using cruise phase data

-Thermal analysis is on-going

-Perihelion season is most critical