

Proposal for new mode transitions in HIFI

DT – 02-11-2009

27-10-2009: V1.0, first draft

02-11-2009: V2.0: updated sequences for manual commanding

Procedures to cover new OBSW autonomous function (SCR-3064)

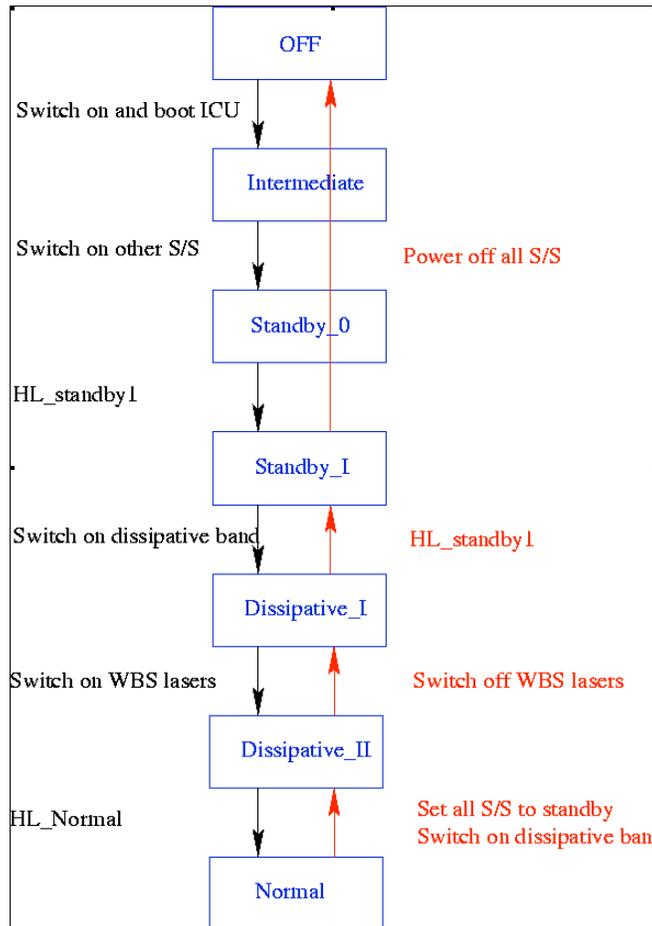
Introduction

This note proposes a new scheme for the HIFI mode transition based on the software and operation changes described by TK and PO in MPFifr/HIFI/TN/2009-544, “HIFI LO Software Modifications”.

The proposal contains new names, and gives a detailed description of what commands would be involved at uplink level. Wherever applicable, it indicates where brand new commands are assumed, and what their expected action is.

Mode transition scheme

The diagram below shows the proposed new scheme.



In effect, the standby2 is removed. It is replaced by two flavours of the dissipative mode, which stand for the former standby1 and standby2 (without and with WBS lasers ON). The new standby1 is only valid for LCU memory updates. The arrows indicate the standard way of transiting up and down the mode ladder. However, they do not represent the only ways to move from one mode to the other (it is e.g. possible to directly go from standby_1 to normal and vice-versa – see below).

Proposed CUS engineering modes for mode transitions

Following the diagram above, the following engineering modes would be introduced:

1. HifiIntoStandby_I

This mode would simply issue the TC “HL_Standby1”, which is a new TC expected to replace the current “HL_Standby”. This TC will NOT switch the standby relay, but only switch to sub-band 0 (TBC). The TCs I anticipate are:

- Set HK rate to TBD value
- HL_Standby1 (or other name TBD by e.g. Luc)
- LOU heater set to **6V**

After the above sequence, the HL_mode HK shall display “*standby1*”.

The same engineering mode can be used regardless of whether one comes from the standby_0 state (after boot) or from the Dissipative_I state. In both cases, it is only meant to be used when a new table + path upload is needed.

It is important to note that for the other S/S, the standby_I state is similar to that obtained after a standard instrument switch-on, except that the chopper would be in closed loop.

- FPU is in band 0, CSA fully powered, chopper loop closed
- HRS tuned to default wide-band settings, attenuators to maximum
- WBS with all lasers off, attenuators to maximum, ZERO switched on, COMB switched off
- H/K rate is of 1 per 4 sec (**this can be changed if a finer sampling is preferred**)

NOTE: it is my recommendation to NOT implement such an engineering mode at MTL level. I would propose that the “lowest” one can get via scheduled observations is to Dissipative_I. If the HIFI experts need to go to standby_I, this shall be done as the first procedure in the DTCP used to perform the upload. Before this a procedure should likely be used to also deactivate the OBS autonomous function that performs the checksum verification on regular basis in standby.

2. HifiFromStandby_I to Dissipative_I

This mode switches on one of the bands designated to support the dissipative state. It is my understand that, contrary to what was used so far in “dissipative” mode, the “HL_Normal” shall **NOT** be issued prior to the tuning macro setting the appropriate band/frequency index combination. Note that, because the “SetObsid” block will be issued, a checksum recomputation will be performed.

The TCs I anticipate are:

- Set HK rate to TBD value
- Tuning macro for dissipative band and frequency of interest
- TM page dump
- 7AH page dump
- Flag clearance
- LOU heater set to 4V

After the above sequence, the HL_mode HK shall display “*dissipative*”.

In this mode, the other S/S are in the same states as in the Standby_I state.

3. [HifiFromDissipative_I_to_Dissipative_II](#)

This mode does nothing else than switching on the WBS lasers. There is no change in any of the other S/S. Note that, because the “SetObsid” block will be issued, a checksum recomputation will be performed.

After the above sequence, the HL_mode HK shall display “*dissipative*”.

4. [HifiIntoNormal](#)

This mode does nothing else than sending the “HL_normal” command, that allows to transit from dissipative to normal state, and unlocks normal usage of the LOU. Note that, because the “SetObsid” block will be issued, a checksum recomputation will be performed.

It is also proposed somewhere else that this engineering mode would deactivate the OBS autonomous function that performs the checksum verification on regular basis (see SCR **HIFI-3046** for details).

After the above sequence, the HL_mode HK shall display “*normal*”.

5. [HifiFromNormal_to_Dissipative_II](#)

This modes sets the instrument in a standby state involving the WBS lasers still on, and the LOU switching to one of the bands designated to support the dissipative state. Note that, because the “SetObsid” block will be issued, a checksum recomputation will be performed.

The TCs I anticipate are:

- Set HK rate to TBD value
- Tuning macro for dissipative band and frequency of interest
- TM page dump
- 7AH page dump
- Flag clearance
- Set WBS to standby (max. attenuation, zero ON, comb OFF) with laser ON
- Set HRS to standby (max. attenuation, default wide-band settings)
- Set FPU to band 0, CSA fully powered, chopper loop closed

After the above sequence, the HL_mode HK shall display “*dissipative*”.

This procedure should also activate the OBS autonomous function that performs the checksum verification on regular basis.

NOTE: one could avoid the complication of having two different modes to end up in Dissipative_II (depending on where one comes from) if one accepts the overhead of superfluous TCs to set all S/S to their standby stage even if one comes from the Standby_I state. One should note that this will imply one more call to the tuning macro setting the dissipative band of interest.

This common engineering mode would be called “HifiIntoDissipative_II”.

6. HifiFromDissipative_II_to_Dissipative_I

This modes does nothing else that switching off the WBS lasers. It is needed only in case HIFI will not be prime instrument for more than 2 consecutive days. Note that, because the “SetObsid” block will be issued, a checksum recomputation will be performed.

After the above sequence, the HL_mode HK shall display “*dissipative*”.

NOTE: similarly to the transition to Dissipative_II, one could create a “HifiIntoDissipative_I” which would contain all the commands from “HifiFromStandby_I_to_Dissipative_I”, as well as the switch off of the WBS laser, and would be used regardless of where we come from, at the expense of some superfluous TCs.

Proposed MOC procedures for mode transitions

The current MOC procedures cover the following transitions:

1. Off to Intermediate
2. Intermediate to standby_I
3. Standby_I to Standby_II
4. Standby_II to Normal
5. Normal to Standby_II

6. Standby_II to Standby_I
7. Standby_I to Off (via intermediate)

While procedures 1, 4 and 7 are probably fine as they are (some HK checks will have to be revised though), the new transition scheme would represent a major rework of the other transitions.

I propose the following trade-off:

- The procedure to go from Intermediate to standby_I has probably as only change the swap of the current HL_standby with the anticipated HL_standby1. HK check instructions should be changed accordingly
- At that stage, the manual commanding procedures are ready to support table and patch upload. At the end of an upload, the LCU has to be put back to Dissipative_I. I propose to introduce a dedicated procedure to switch on the LCU with the dissipative band of interest (the band will be passed as a TPF, so we'll have full flexibility on this). This procedure should likely be followed by the activation of the OBS autonomous checksum verification. I am assuming here that the switch of the WBS laser will be done later on the MTL, one day prior to HIFI becoming prime.
- The exception to the above is when we start up again and have to support the S/S SFTs, in particular the LOU SFT. There, the current CoP procedures assume a start from the Normal mode. In fact, it does not matter here 1) to have the WBS laser off or not, 2) to have been in a dissipative mode previously.
 - **Would that be considered acceptable to directly go from the standby_I state into the normal state (using MOC procedure 4 of the above list) ?** Depending on the decision, this procedure may also have to be followed by the disabling of the OBS autonomous checksum verification, if they are running, e.g. after the ICU boot.
 - **Similarly, at the end of the LOU SFT, would that be acceptable to directly go from normal to standby_I ? For this a dedicated procedure would have to be created**
- The same procedure (normal-to-standby_I) can be used when HIFI has been prime on the MTL, then set to Dissipative_I (via Dissipative_II) also on the MTL, and needs to get to standby_I in order to perform a table upload in DTCP.

In summary, the following procedures would be considered:

1. H_FCP_HIF_RION: already exists, minor changes
2. H_FCP_HIF_RSON: already exists, new TC to switch to standby1
3. H_FCP_HIF_RSD1: from standby1 to dissipative_I. To be created from scratch.
4. H_FCP_HIF_CS1P: from standby1 to normal. Already exists as H_FCP_HIF_CS2P (standby2 to normal), minor changes
5. H_FCP_HIF_RPS1: from nominal to standby_I. To be created from scratch.

On top of that, some useful procedures need to be added:

6. H_CRP_HIF_CORE: resets the OBS lock on the LCU operations whenever a checksum verification has been negative. This procedure will use a new TC still to be implemented (**HIFI-3045**)
7. H_FCP_HIF_CCEN: enables OBS autonomous checksum verification – prepared for contingency in case this needs to be enable on-the-fly. To be created from scratch (**HIFI-3046**)
8. H_FCP_HIF_CCDI: disables OBS autonomous checksum verification – prepared for contingency in case this needs to be disable on-the-fly. To be created from scratch (**HIFI-3046**)
9. H_FCP_HIF_LTEN: enables and updates OBS autonomous LOU temperature FDIR – prepared for contingency in case this needs to be enable on-the-fly. To be created from scratch
10. H_FCP_HIF_LTDI: disables OBS autonomous LOU temperature FDIR – prepared for contingency in case this needs to be disable on-the-fly. To be created from scratch
11. H_FCP_HIF_S0DI: disables the OBS autonomous function supposed to check for the LCU being in standby0 (**HIFI-3064**)
12. H_FCP_HIF_S0EN: enables the OBS autonomous function supposed to check for the LCU being in standby0 (**HIFI-3064**)

In agreement with the above list, the following sequences would be considered:

- ***HIFI redundant switch-on:***
 - i. H_FCP_HIF_RION
 - ii. OBSW upload (not covered in this note – unchanged)
 - iii. H_FCP_HIF_S0DI
 - iv. H_FCP_HIF_RSON
 - v. H_FCP_HIF_CCDI (if needed – default should be: not needed)
 - vi. LCU patch upload (covered later in this note – changes likely needed)
 - vii. LCU table upload (covered later in this note – unchanged)
 - viii. LCU memory dump
 - ix. Checksum verification
 - x. FPU, HRS and WBS SFT
 - xi. H_FCP_HIF_CS1P
 - xii. H_FCP_HIF_S0EN
 - xiii. LOU DC-only SFT
 - xiv. H_FCP_HIF_RPS1
 - xv. H_FCP_HIF_CCEN
 - xvi. (next day) H_FCP_HIF_CCDI
 - xvii. LCU patch upload (covered later in this note – changes likely needed)
 - xviii. LCU table upload (covered later in this note – unchanged)
 - xix. LCU memory dump
 - xx. Checksum verification
 - xxi. H_FCP_HIF_CS1P

- xxii. LOU SFT
- xxiii. H_FCP_HIF_RPS1
- xxiv. H_FCP_HIF_RSD1
- xxv. H_FCP_HIF_CCEN

At that stage, the instrument is in Dissipative_I and can transit to Dissipative_II and Normal via the MTL for the start of CoP-II.

- ***HIFI table upload during routine:***
 - i. On the MTL, the instrument is set from Normal to Dissipative_I via Dissipative_II
 - ii. H_FCP_HIF_RPS1
 - iii. H_FCP_HIF_CCDI
 - iv. LCU patch upload (covered later in this note – changes likely needed)
 - v. LCU table upload (covered later in this note – unchanged)
 - vi. LCU memory dump
 - vii. Checksum verification
 - viii. H_FCP_HIF_RSD1
 - ix. H_FCP_HIF_CCEN

At that stage, the instrument is in Dissipative_I and can transit to Dissipative_II and Normal via the MTL to support forthcoming prime periods.