

Instrument State Model (ISM)

This page gathers information related to the RPW instrument state model (ISM).

Context & Philosophy

During the mission, the RPW instrument state model (ISM) is used by Solar Orbiter MOC in order to control:

- The transition between two instrument modes. Especially, it shall be capable of checking that the right commands sequences are used/allowed to perform the modes transitions.
- The resource budget allocated to each instrument in terms of power consumption and TM bit rate sent to the spacecraft OBC. It requires that MOC has the power consumption and instrument OBC TM bit rate resource budget for each of the instrument mode.

Another hand, the Solar Orbiter SOC will also need its own version of the RPW ISM, in order to verify the instrument TM bit rate sent to the SSMM. Especially, this SOC RPW state model will have to be consistent with the MOC RPW ISM and compliant with the specification of the state model application tool used at both the SOC site.

The RPW ISM is based on three concepts:

- Instrument modes (applicable at the MOC level)
- Instrument states (applicable at the SOC level)
- Instrument configurations

Which are defined in the next section.

Definitions

The table below gives a list of the definition of the main terms encountered in the RPW ISM framework.

| Term | Definition | Comment |
|-----------------------------------|--|---|
| Instrument DPU software (sub)mode | Software modes and submodes of the instrument DPU (e.g, SAFE, STANDBY, SERVICE, SCIENCE, SURVEY_NORMAL, SURVEY_BURST, SBM_DETECTION, etc.) | Note that the RPW TDS/LFR/THR software modes are not the same than the DPU modes (see RPW DPU SSS for more details) |
| Instrument mode | An operating instrument mode with a fixed power consumption. | |
| Instrument configuration | A given setting of the instrument sub-system (i.e., with a given set of fixed parameters values). A same configuration can be used in different instrument modes. Especially, it results that the power consumption and the TM bit rate are not fixed for a given configuration. | |
| Instrument state | The union of a given instrument mode and a given instrument configuration. Especially, the power consumption and TM bit rate of an instrument state are fixed. | Nevertheless, the data compression can be activated/deactivated for a given state, changing the bit rate. |
| Transition | Transition between two instrument states (in SOC RPW ISM) or modes (in MOC RPW ISM) | |

ISM Constraints

MOC-related RPW ISM constraints

At MOC level, the RPW ISM shall fulfill the following constraints:

- The RPW ISM shall only take account of the instrument power consumption and OBC TM bit rate resources.
- The RPW OBC TM bit rate shall not exceed 50 bps
- Intermediate transition (e.g., A-->B-->C) is not allowed to go for a given instrument mode to another. In another word, only direct transitions are allowed (e.g., A-->C)

SOC-related RPW ISM constraints

At SOC level, the RPW ISM shall fulfill the following constraints:

- The SOC RPW ISM shall be consistent with the MOC RPW ISM
- The RPW ISM shall take account of the TM bit rate sent to the SSMM

- Intermediate transition is allowed to go for a given instrument state to another, if there is one step only. e.g., "A-->B-->C" 3 states transition is allowed, but not "A-->B-->C..." 4 or more states transition. In the case of RPW, the 3 states transition must be typically used to first tune the instrument configuration in RPW_SERVICE mode, then enter in one of the SCIENCE modes.

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