

# RPW Data Quality Verification

About the verification of the RPW data quality.

## RPW QUALITY\_BITMASK CDF VARIABLE

### Definition

The formal definition of the QUALITY\_BITMASK CDF zVariable is provided in the "Metadata Definition for Solar Orbiter Science Data" document ([SOL-SGS-TN-0009](#)). There is one value per CDF record.

### For RPW L1 CDF

#### WARNING: QUALITY\_BITMASK SETTING IS NOT FULLY IMPLEMENTED IN L1 CDF

The QUALITY\_BITMASK CDF\_UINT2 zVariable in the RPW L1 CDFs is set by the RPW operations and data pipeline (RODP) hosted at LESIA.

Table below gives the list of possible values for L1 CDFs. It assumes that these values are common to all RPW L1 CDF products.

NOTE: E-FECS events are defined in <https://s2e2.cosmos.esa.int/confluence/display/SOSP/Solar+Orbiter+Enhanced+Flight+Events+Communications+Skeleton+%28FECS%29+ICD>

Bit	Decimal value	Meaning	Justification	Computation	Comment
0	1	BIAS1_SWEEP - ongoing sweep	Ongoing sweep on ANT1 probe	Should be set from 100 ms before the sweep to 1 s after the sweep on a particular probe.	First bit (LSB)
1	2	BIAS2_SWEEP - ongoing sweep	Ongoing sweep on ANT2 probe		
2	4	BIAS3_SWEEP - ongoing sweep	Ongoing sweep on ANT3 probe		
3	8	EMC QUIET window	Solo payload is in EMC QUIET mode	Known from EMC_MAND_QUIET E-FECS event	
4	16	EMC NOISY window	Solo payload is in EMC NOISY mode	Known from EMC_PREF_NOISY E-FECS event	
5	32	Spacecraft roll manoeuvre	Indicate when the spacecraft perform rolls or slews	Known from *_ROLL and SLEW E-FECS event	
6	64	Thruster firings	Indicate when the platform thruster firings happen	Known from TMC+WOL E-FECS event	
		RPW +Z ANT PA in the line of sight of the HGA during TX ON.	The HGA TX may have an impact on the RPW science measurement quality when the ANT PA in the HGA light of sight	To be determined by ROC from SPICE computation	Not implemented
		SPICE Heat Shield Door is open	SPICE HSD may have an impact on the RPW +Z ANT bending effect	Known from HSD_SPICE_OPEN E-FECS event	Not implemented
		LFR setting has changed before the end of the current data samples acquisition	According to LFR data acquisition mechanism and CDF structure, it can be impossible for some dataset (i.e., SWF) to take of a LFR setting change - performed via a command execution on-board - in a CDF record time window. Users need nevertheless to be warned when such LFR setting change occurred during a data sample acquisition.	Known from the reception of the TM_LFR_TC_EXE_SUCCESS {YIW00139} S1 TM that confirms the LFR setting change	Not implemented

		Possible SWA-PAS high voltage contamination	SWA-PAS unit may provoke noise on RPW measurements	Inclusion of this event into the bitmask is TBC (quantification of the impact is TBD)	Not implemented
		BIAS1_CURRENT_NONCONSTANT	Changes in biasing current may (1) not be instantaneous, and (2) may have uncertain timestamps.	Should be set from 100 ms before to 1 s after any change in bias current on a particular probe (including sweeps).	Not implemented
		BIAS2_CURRENT_NONCONSTANT			
		BIAS3_CURRENT_NONCONSTANT			

## For RPW L2 CDF

The zVariable **QUALITY\_BITMASK** is set in the L1 CDF by the RPW data pipeline at LESIA and must not be changed by the RPW Calibration Software (RCS) when producing the L2 CDF. **QUALITY\_BITMASK** bits allocated in L1 CDF must be saved "as is" in L2 CDF. To store information specific to L2 data, please use the dedicated **L2\_QUALITY\_BITMASK\_CDF\_UINT2** zVariable instead.

The optional CDF\_UINT2 zVariable **L2\_QUALITY\_BITMASK** can be used instead in the RPW L2 CDF, in order to provide information related to the equipment. The name of this zVariable must be the same in all the L2 CDF, but the bit meaning can different.

Table below gives the list of values to be set in L2 CDF by RCS.

**INSTRUCTION:** Table to be filled with extra information to be passed by RCS in the L2 CDF **QUALITY\_BITMASK** zVar using free bits. "Bit" and "Decimal value" columns should be let free for the moment. "Comment" column can be used to specify the L2 CDF product(s) for which the **QUALITY\_BITMASK** zVar must be set (if it is not specified, it is assumed that all L2 CDF products requires this information).

Bit	Decimal value	Meaning	Justification	Computation	Comment
0		SCM outworking or unknown temperature	Indicate when the SCM temperature are out of working range	known from HK_LFR_TEMP_SCM T< -55°C or T> +85°C	Values defined by SCMCAL in the L2 magnetical data (-B) CDFs only
1		SCM heater on/off transition	indicate EMC transient: - SCM heater on/off	- Known from HK_PDU_HEATER_CURRENT	Values defined by SCMCAL in the L2 magnetical data (-B) CDFs only
2		LFR onboard calibration signal	Indicate when the LFR send calibration signal to SCM	known from HK_LFR_CALIB_ENABLED	Values defined by SCMCAL in the L2 magnetical data (-B) CDFs only

## RPW QUALITY\_FLAG CDF VARIABLE

### Definition

The formal definition of the **QUALITY\_FLAG** CDF zVariable is provided in the "Metadata Definition for Solar Orbiter Science Data" document ([SOL-SGS-TN-0009](#)). There is one value per CDF record.

The possible values of the **QUALITY\_FLAG** CDF zVariable are reported in the following table for convenience.

Quality	Meaning
0	Bad data
1	Known problems, use at your own risk
2	Survey data, possibly not publication-quality
3	Good for publication, subject to PI approval
4	Excellent data which has received special treatment

### Implementation plan

The QUALITY\_FLAG values of the RPW L1 CDF are all set to "3" by default.

From this initial status, the RCS must then decide in an autonomous way to change or not the value of QUALITY\_FLAG records, when transferring the quality information to the output RPW CDF. The RCS decision must rely on relevant data (i.e, QUALITY\_BITMASK, other data, parent data, etc.) as explained in the next section.

## Computation

The detailed computation of the QUALITY\_FLAG for each RPW L1R/L2 data product must be given in the RCS Software Requirements Specification (SRS) documents (see [RPW Calibration Software Documentation](#)).

## RESOURCES

- The RPW science Data Validation and Verification Plan (DVVP) is available in [https://confluence-lesia.obspm.fr/download/attachments/3113240/ROC-GEN-SCI-PLN-00077-LES\\_Iss01\\_Rev00%28RPW\\_DVVP%29.draft-2019011.pdf?version=1&modificationDate=1549625875889&api=v2](https://confluence-lesia.obspm.fr/download/attachments/3113240/ROC-GEN-SCI-PLN-00077-LES_Iss01_Rev00%28RPW_DVVP%29.draft-2019011.pdf?version=1&modificationDate=1549625875889&api=v2)
- Feedback from Clusted by Yury Khotyaintsev (IRFU): [bitmask\\_quality.pdf](#)