GRAS Level 1 Product Format Specification

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Document Change Record

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2.0	25/5/99		First Issue
2 Draft B	23/07/99		Addressed RIDs
3 Draft A	26/06/00	EUM.EPS.SYS.DCN.030	• Incorporate change in EPS Generic Product Specification, Issue 3
4 Draft A	15/11/00		• Add GTS Product section • Simplified document layout
4 Draft B	29/06/01		• Removed GTS section – to be covered by PGS • Removed information redundant with GPFS [AD-1]
5.0	01/06/01		CGS PDR Issue • Major reworking of Level 1b product format definitions in line with PGS updates
5.1	13/06/01		Revised issue for CGS PDR • Updated signature table
6.0			• Added details of Level 1a Product Format • Updated document template
6.1	26/04/02		• Major update of text and Annex
6.2	31/05/02	EUM.EPS.SYS.DCR.02.121	• Update of text to include detailed definition of the enumerated, bit string, and boolean type record fields • Update of the Record occurrence tables • For updates of the Annex, see the Change Record on the first page of the Annex
6.3	10/02/03	EUM.EPS.SYS.DCR.02.172	• Description of the SPH added to Section 3.1. • METOP_ID description removed from all tables. • GRAS ID added to SPHR description in Section 3.1 and removed from all other places. • An explanation of START_VALIDITY and

Issue / Revision	*Date*	*DCN. No*	*Changed Pages / Paragraphs*
			END_VALIDITY field contents is added into Table 7 • A description of the difference between START_EPOCH and END_EPOCH times and GRH time stamps is added into Table 7. • MISSION_STATUS field has been removed from Table 23 and Table 35. • All references to the PROCESSING_MODE field have been removed. • The description of the EARTH_MODEL_ID field has been moved to Section 3.1. • The description of the METOP_MANOEUVRE_FLAG field has been added to Section 3.1. • The METOP_MANOEUVRE_FLAG in Table 23 and in Table 35 has been replaced by METOP_MANOEUVRE. This flag indicates that the MDR is affected by the last Metop manoeuvre. • The number of level 1a MDR subclasses in Section 3.4.1 has been corrected to read 11. • A clarification on the default values for the WO_CHARACTERISATION field has been added to Table 33. • A clarification on the default values for the ATM_MULTIPATH field has been added to Table 34. • SMOOTH_CHARACTERISATION (Table 34 in PFS version 6.2) has been removed from Section and fields for smoothed level 1b products have been removed from the MDR-1B. • A clarification on the default values for the MDR-1A-GRAS-MONITORING has been added into Table 24 in Section 3.4.2. • Clarifications for the input sources for the MDR-1A-OCCULTATION DATA fields have been added into Table 24 in Section 3.4.2. • Clarifications for the input sources for the MDR-1B fields have been added into Table 36 in Section 4.4.2.

Issue / Revision	*Date*	*DCN. No*	*Changed Pages / Paragraphs*
			• Clarification of the GRAS_ID field has been added into Table 1 in Section 3.1. • Clarification of the POS_METOP_OBN, and VEL_METOP_OBN fields has been added into Table 24 in Section 3.4.2. • A description of the ID_FAILED flag that has been added into MDR-1A-OCCULTATION DATA, and MDR-1B, has been added into Table 23 in Section 3.4.2 and into Table 35 in Section 4.4.2. • A PGE field has been added into the MDR-1B as a place holder for future functionality and the description of the default values has been added into Table 36 Section 4.4.2. • The note about 30 occultations in a product in Section 5.2 has been modified to make it clear that this means archived products and not NRT disseminated products. • A record format version control table has been added into Section 6. • The RECORD SUBCLASS numbering in Section 4.3.1 for the Level 1B VIADRs has been changed to start numbering at 21 onwards. This provides record subclass numbers unique for L1a. • A table with the MDR-1B subclass values has been added into Section 4.4.1. • For updates of the Annex, see the Change Record on the first page of the Annex
6.4	12/03/04	EUM.EPS.SYS.DCR.04.021	• Clarification that GRAS products do not contain GEADRs or VEADRs has been added to Section 3.2 • Clarification of the ZDIG, VDIG, and AVDIG fields has been added to Section 3.4.2. • Description of the RS_DATA_MISSING field has been added to Table 23 and Table 35. • Tables 33 and 34 have been updated. • Table 35 has been updated to include new Boolean fields in level 1b products. • GRAS time field descriptions in Table 7 have

Issue / Revision	*Date*	*DCN. No*	*Changed Pages / Paragraphs*
			been updated. • Field names MDR-1B-GPS POD, MDR-1B-EOP, MDR-1B-GPS CLOCK, MDR-1B-TZD, MDR-1B-STATION CLOCK have been corrected in Table 37 to VIADR-1B-GPS POD, VIADR-1B-EOP, VIADR-1B-GPS CLOCK, VIADR-1B-TZD, VIADR-1B-STATION CLOCK. • A clarification for the values in the fields in MDR-1A-EPHEMERIS has been added into Section 3.4.2. • A clarification about the digital gain setting values in Table 13 has been added into Section 3.4.2. • A default value for the error covariance matrix reference has been added into Table 36. • TZD not available/TZD error too large case has been appended to the SSD_AVAILABILITY bit string description. • A reference to RD-1 for the NDF_BITS field has been added to Section 3.4.2. • Missing GPS_TYPE field definition added to Table 23. • MANŒUVRE has been corrected to MANOEUVRE throughout the document.
6.5	09/06/05	EUM.EPS.SYS.DCR.05.0234	• Correction to change table for version 6.4: The GPS_TYPE field has been added to Table 23 (and not to Table 35). • Erroneous reference to the MDR-1A-GRAS-MONITORING record has been removed from Table 36 • The correct occurrence information for GEADRs and VEADRs has been added into Sections 5.1 and 5.2
6.6	30/06/05	EUM.EPS.SYS.DCR.05.0238	• VIADR-1A-EOP and VIADR-1B-EOP: format version number has been updated to 5 • Changes to VIADR-1A-EOP and VIADR-1B-EOP in Annex.
v7A	15/07/08		Migrated into Hummingbird. Body contents copied into standard template. Editorial updates –

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			formatting etc. Signature table updated.
v7B	26/08/08		• Appendix A added to provide link to Annex file in Hummingbird. • Structure description in Section 1.2 updated. • Typos: Table 22 last row – bit value changed from 16 to 20. Tables 24 & 36 – GPS_MAOEUVRE_FLAG --> GPS_MANOEUVRE_FLAG. • Other editorial updates: typos, spelling standardisation, formatting, use of bookmark links for document and section references.

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List of Tables

1 INTRODUCTION

1.1 Purpose and Scope

This document is the GPS Receiver for Atmospheric Sounding (GRAS) Level 1 Product Format Specification.

The generic product format specification used by this document is defined in the EPS Generic Product Format Specification [AD 1]. The conventions used by this document are defined in the EPS Product Conventions Document [AD 3].

The structure and content of the products will be developed in the course of further EPS system design and nothing in this document (including the Annex) shall be taken as restricting this development of the product structures, the product or field sizes, or the time during processing at which content will be inserted into the structure of the product.

1.2 Structure of the Document

The document is organised in the following sections, including the introduction:

Section	*Contents*
1	describes the scope of the document
2	details the product formats for Level 1 products
3-4	describe the instrument and level specific records for Level 1a and 1b products
5	details the occurrence rates of the various records within Level 1 products
6	provides a history of version numbers for the records defined within the document
Appendix A	links to detailed tables describing the record formats

1.3 Applicable Documents

Ref	*Title*	*File name*
AD 1	EPS Generic Product Format Specification	EPS.GGS.SPE.96167
AD 2	EPS Ground Segment GRAS Level 1 Product Generation Specification	EPS/SYS/SPE/990010
AD 3	EPS Product Convention Document	EPS/SYS/TEN/990007
AD 4	EPS Core Ground Segment to GRAS Ground Support Network Interface Requirement Document	EPS/CGS/IRD/980692

1.4 Reference Document

Ref	*Title*	*File name*
RD 1	Measurement Data Interface Control Document	P-GRM-ICD-0008-SE

2 STRUCTURE OF GRAS LEVEL 1 PRODUCTS FORMAT

2.1 Overview

The product format for both GRAS Level 1a and 1b products is based on the generic product format as described in [AD 1]. This document details the instrument- and level-specific additions required for GRAS Level 1 products.

2.2 Generic Record Header Fields

All generic record header fields of the instrument/level specific records defined in this document shall have an INSTRUMENT_GROUP value of GRAS [AD 1].

3 LEVEL 1A

3.1 Secondary Product Header Record

There is one subclass of SPHR. The detailed contents of the SPHR are provided in the Annex (Appendix A) to this document.

Detailed descriptions of the contents of the enumerated and Boolean type fields in the level SPHR are provided in Table 1 - Table 3.

Value	*Meaning*	*Comment*
0	Not used	
1	GRAS 1	GRAS_ID is derived from the SPACECRAFT_ID in the MPHR and information of which GRAS instrument is onboard which spacecraft.
2	GRAS 2	
3	GRAS 3	

Table 1: GRAS_ID

Value	*Meaning*
0	Not used
1	WGS84 ellipsoid model
2 -	Spare

Table 2: EARTH_MODEL_ID

Boolean field	*Value*	*Comment*
METOP_MANOEUVRE_FLAG	0	Metop manoeuvres do not affect any of the MDRs in the product
	1	One or more MDRs affected by a manoeuvre

Table 3: METOP_MANOEUVRE_FLAG

3.2 Global and Variable External Auxiliary Data Records

There are no GEADRs or VEADRs in the GRAS products.

3.3 Variable Internal Auxiliary Data Record

There are 12 subclasses of VIADR for the Level 1a Product. These are detailed in the Annex to this document.

3.3.1 Record Subclasses

Subclass	*Description*	*Subclass ID*
VIADR-1A-GPS POD	Occulting GPS NRT orbit arc	1
VIADR-1A-EOP	Earth orientation parameters	2
VIADR-1A-TZD	Tropospheric delay product	3
VIADR-1A-GPS CLOCK	Ground station clock bias estimates	4
VIADR-1A-STATION CLOCK	Ground station clock offset estimates	5
VIADR-1A-SSD	Sounding support measurements	6

Subclass	*Description*	*Subclass ID*
VIADR-1A-GPS TRACKING	GPS Tracking Data	7
VIADR-1A-OCCULTATION TABLE	Occultation table	8
VIADR-1A-GSN QUALITY REPORT	GSN Quality Report	9
VIADR-1A-METOP POD	Metop NRT orbit arc	10
VIADR-1A-METOP ATTITUDE	Metop attitude data	11
VIADR-1A-METOP CLOCK	Metop clock offset estimates	12

Table 4: VIADR Subclasses

The detailed contents of the VIADR subclasses are provided in the Annex in Microsoft Excel format .

3.3.2 Level 1a VIADR descriptions

Detailed descriptions of the contents of the enumerated and bit string type fields in the Level 1a VIADRs are provided in Table 5 and Table 6.

Table 7 contains descriptions of the time information fields in VIADR and MDR records.

Value	*Meaning*	*Comment*
0	Not used	
1	NRT POD product	
2	Enhanced POD product	
3 -	Spare	

Table 5: PRODUCT_TYPE

Value	*Meaning*	*Comment*
0	Raising occultation	
1	Setting occultation	
2	Navigation measurement	
3 -	Spare	

Table 6: MEASUREMENT_TYPE.

Field	*Description*
START_VALIDITY, END_VALIDITY	START_VALIDITY and END_VALIDITY fields define the time window in the reference time frame when the content of the record is valid for use in the data processing. E.g. for POD solutions the validity time may be a 12 hour window in the middle of a 24 hour solution arc. In these fields the time is represented as seconds from 00:00, 1 Jan 2000.
START_EPOCH, END_EPOCH	These two fields show the time stamp of the first and last data sample in the record in the reference time frame with the full resolution. The resolution of the GRH time stamps is limited by the data type. In these fields the time is represented as seconds from 00:00, 1 Jan 2000.
TIME_IMT	These fields show the GRAS IMT time converted to seconds from the last start time of the IMT counter. This time is not synchronised with any other time.
TIME_UTC_GRAS	These fields show a time that has been synchronised with the UTC_GRAS time or is directly the UTC_GRAS time from the onboard navigation solution. In these fields the time is represented as seconds from 00:00, 1 Jan 2000.
TIME_OBT	These fields show a time that has been synchronised with the OBT time or is directly the OBT time included in the GRAS Extended Navigation Data Packet.
EPOCH_TIME, TIME_REF	These fields show a time that has been synchronised with the GSN reference time. In these fields the time is represented as seconds from 00:00, 1 Jan 2000.
TIME_UTC, TIME_UTC_WO	These fields show a time that has been synchronised with the UTC time. In these fields the time is represented as seconds from 00:00, 1 Jan 2000.

Table 7: Time information field descriptions

3.4 Measurement Data Record

The MDR contains information on a per GRAS measurement basis.

There are eleven subclasses of MDR for the Level 1a Product. The MDR is detailed in the Annex to this document.

3.4.1 Record Subclasses

Subclass	*Description*	*Subclass ID*
MDR-1A-ONBOARD NAVIGATION	Extended Navigation Data packets	1
MDR-1A-GAIN	Gain Setting Packets	2
MDR-1A-TEMPERATURE	Temperature Data Packets	3
MDR-1A-TRACKING STATE	Tracking State Packets	4
MDR-1A-EPHEMERIS	Ephemeris Data Packets	5
MDR-1A-OCC NOISE	Noise Data Packets (occultation channels)	6
MDR-1A-ZENITH NOISE	Noise Data Packets (navigation channels)	7
MDR-1A-OCCULTATION DATA	Occultation measurement data	8
MDR-1A-NAVIGATION DATA	Navigation measurement data	9
MDR-1A-NAV FRAME	Navigation Data Frame Dump bit strings	10
MDR-1A-GRAS MONITORING	Engineering parameters for GRAS in-flight monitoring	11

Table 8: MDR Subclasses

Detailed contents of the MDR subclasses are provided in Appendix A of this document.

3.4.2 Level 1a MDR descriptions

Detailed descriptions of the contents of the enumerated and bit string type fields in the Level 1a MDRs are provided in Table 9 - Table 22.

Descriptions of the START_EPOCH and END_EPOCH fields in Level 1a MDRs are provided in Table 7.

All Boolean flags in the Level 1a MDRs are defined in Table 23.

The description of the MDR-1A-EPHEMERIS record fields is provided in [RD 1]. Please note the two's exponent scaling factors in the "*Comment*" column in the description of the Ephemeris Data Packet in [RD 1]. Same scaling factors have to be applied to the values in the MDR-1A-EPHEMERIS record.

The description of the CCT_X fields in Table 13 is provided in [RD 1].

The description of the NDF_BITS in the MDR-1A-NAV FRAME is provided in [RD 1]**.**

Value	*Meaning*	*Comment*
000_B	Not navigation solution	
001_B	Propagated initial settings	
010_B	First-fix	
100_B	Calculated with least square	
101_B	Calculated with Kalman filter	
111_B	Invalid navigation solution	An invalid navigation solution will be indicated if least square is used and less than 4 satellites are in the field-of-view of the zenith antenna. The reported navigation solution will be the propagated one.

Table 9: ONBOARD_NAV_SOLUTION

Value	*Meaning*	*Comment*
00_B	Inside window	
01_B	Above windows	
10_B	Below window	
11_B	Automatic gain control disabled	

Table 10: ZALS, VALS, AVALS

Value	*Quantisation level*	*Comment*
0	+3	16 LSB of the Power Level Accumulator values obtained from the DISC
1	+2	
2	+1	
3	0	
4	–1	
5	–2	
6	–3	

Table 11: ZHIST, VHIST, AVHIST

Value	*Nominal gain [dB]*	*Comment*
0101_B	0	Analogue Gain Setting values obtained from the AGGA
1001_B	–5	
0110_B	–10	
1010_B	–15	

Table 12: ZANA, VANA, AVANA

Word	Bit number 0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	CCT_0								CCT_1							
1	CCT_2								CCT_3							
2	CCT_4								CCT_5							

Table 13: ZDIG, VDIG, AVDIG

Bit	*Meaning*	*Value*	*Comment*
0	Not used	0	
1			
2	LO Frequency Generator PLL LOCK status	0	Off
		1	On
3	SC Frequency Generator PLL LOCK status	0	Off
		1	On
4	USO Oven Relay Status	0	Off
		1	On
5	RFCU Anti-velocity chain RFCU status	0	Off
		1	On
6	RFCU Zenith chain RFCU status	0	Off
		1	On
7	RFCU Velocity chain RFCU status	0	Off
		1	On

Table 14: GEU_STS

Value	*Meaning*	*Comment*
0	Codeless tracking	
1	Coded tracking	Coded tracking is only reported for the three highest tracking states, i.e., tracking states 13, 14, and 15.

Table 15: CODE_STATUS

Value	Meaning	Comment
0	Acquisition and tracking ended	
1	C/A code acquisition	
2	C/A code lock check	
3	L1 carrier lock check	
8	Single carrier frequency tracking at 1 ms	
9	Single carrier frequency tracking at 10 ms	
13	P code acquisition	
14	P code tracking	
15	P code and L2 carrier tracking, highest tracking state	

Table 16: TRACKING_STATE (channels CH0 – CH11)

Value	Meaning	Comment
0	Raising occultation	
1	Setting occultation	
2	Navigation measurement	
3 -	Spare	

Table 17: MEASUREMENT_TYPE

Value	Meaning	Comment
0	Not Packet	This indicates that there was no secondary packet generated
1	Double frequency (DF)	
2	Single frequency (SF)	
3	Raw sampling (RS)	
4 -	Spare	

Table 18: MEASUREMENT_PACKET_TYPE, SECONDARY_PACKET_TYPE

Value	Meaning	Comment
0	Zenith chain 0	
1	Zenith chain 1	
2	Zenith chain 2	
3	Zenith chain 3	
4	Zenith chain 4	
5	Zenith chain 5	
6	Zenith chain 6	
7	Zenith chain 7	
8	Velocity chain 8	
9	Velocity chain 9	
10	Anti-velocity chain 10	
11	Anti-velocity chain 11	

Table 19: GRAS_CHANNEL_ID

Value	Meaning	Comment
0	Rate Reduction Mode	
1	Coarse Acquisition Mode	
2	Fine Acquisition Mode 1	
3	Fine Acquisition Mode 2	
4	Fine Acquisition Mode 3	
5	Operational Mode	
6	Fine Pointing Mode	
7	Yaw Steering Mode	
8	Orbit Control Mode	
9	Fine Control Mode	
10	Safe Mode	

Table 20: METOP_STEERING_MODE

Bit	Meaning	Value	Comment
0	Metop solar panel in the FOV	0	Outside FOV
		1	Inside FOV
1	ASCAT ANT RA in the FOV	0	Outside FOV
		1	Inside FOV
2	ASCAT ANT RF in the FOV	0	Outside FOV
		1	Inside FOV
3 -	Spare		

Table 21: LOCAL_MULTIPATH_SOURCE

Bit	*Meaning*	*Value*	*Comment*
1	ENDP Position X	0	Within range
		1	Outside range
1	ENDP Position Y	0	Within range
		1	Outside range
2	ENDP Position Z	0	Within range
		1	Outside range
3	ENDP Velocity X	0	Within range
		1	Outside range
4	ENDP Velocity Y	0	Within range
		1	Outside range
5	ENDP Velocity Z	0	Within range
		1	Outside range
6	Zenith antenna thermistor	0	Within range
		1	Outside range
7	Velocity antenna thermistor	0	Within range
		1	Outside range
8	Anti-velocity antenna thermistor	0	Within range
		1	Outside range
9	Zenith RFCU thermistor	0	Within range
		1	Outside range
10	Velocity RFCU thermistor	0	Within range
		1	Outside range
11	Anti-velocity RFCU thermistor	0	Within range
		1	Outside range
12	GEU thermistor	0	Within range
		1	Outside range
13	ISAC thermistor	0	Within range
		1	Outside range
14	USO internal thermistor	0	Within range
		1	Outside range
15	USO external thermistor	0	Within range
		1	Outside range
16	DBU power voltage	0	Within range
		1	Outside range
17	Thermistor supply voltage	0	Within range
		1	Outside range
18	FG thermistor	0	Within range
		1	Outside range
19	USO ground	0	Within range
		1	Outside range
20	Digital 5 V	0	Within range
		1	Outside range

Table 22: TELEMETRY_IN_RANGE

Boolean field	*Value*	*Comment*
GRAS_MODE	0	Occultation
	1	Navigation
Q_ANA	0	Analogue AGC has been active during the measurement
	1	No analogue AGC activity during the measurement
INSTRUMENT_STABLE	0	Instrument has been stabilised
	1	Instrument has not reached stable operating conditions after turning on
METOP_MANOEUVRE	0	MDR not affected by a manoeuvre
	1	MDR affected by a Manoeuvre
L1_CA_NOISE_FLAG	0	Within threshold
	1	Outside threshold
L1_P1_NOISE_FLAG	0	Within threshold
	1	Outside threshold
L2_P2_NOISE_FLAG	0	Within threshold
	1	Outside threshold
L1_CA_PSEUDORANGE_FLAG	0	Within threshold
	1	Outside threshold
L1_P1_PSEUDORANGE_FLAG	0	Within threshold
	1	Outside threshold
L2_P2_PSEUDORANGE_FLAG	0	Within threshold
	1	Outside threshold
L2_NOT_TRACKED	0	Dual carrier frequency tracking has been achieved
	1	No dual carrier frequency tracking during measurement
MEASUREMENT_INCOMPLETE	0	Measurement time sequence complete
	1	Part of the measurement data missing
ATTITUDE_MISSING	0	Metop mispointing angles data OK
	1	Metop mispointing angle not available
LOCAL_MULTIPATH	0	Low probability of local multipath
	1	High probability of local multipath
SA_FLAG	0	SA not active
	1	SA active
GPS_MANOEUVRE_FLAG	0	No manoeuvre
	1	Measurement during manoeuvre
GPS_ECLIPTING	0	No eclipse
	1	Measurement during eclipse
ID_FAILED	0	Measurement identification successful
	1	Measurement identification failed
GPS_TYPE	0	Occulting satellite
	1	Pivot satellite
RS_DATA_MISSING	0	RS data available for the measurement
	1	RS data is missing from this measurement
EOP_STATUS	0	Final products
	1	Predicted EOP

Table 23: Level 1a boolean type data record fields

Record	*Field name*	*Default value*	*Description*
MDR-1A-GRAS-MONITORING	ENGINEERING_PARAMETER_n	0	GRAS in-flight monitoring information. Currently all engineering parameter fields (n = 1 – 10) will be defaulted to 0.
MDR-1A-OCCULTATION DATA	GPS_HW_DELAY INSTRUMENT_STABLE TELEMETRY_IN_RANGE	NA	The derivation of the contents of these fields is defined in the GRAS PGS with explicit links to the field names.
	GPS_MANOEUVRE_FLAG GPS_MANOEUVRE_TIME GPS_ECLIPTING SA_FLAG	NA	The data in these fields are extracted from the GRAS GSN products.
MDR-1A-OCCULTATION DATA MDR-1A-NAVIGATION DATA	POS_METOP_OBN_X POS_METOP_OBN_Y POS_METOP_OBN_Z VEL_METOP_OBN_X VEL_METOP_OBN_Y VEL_METOP_OBN_Z	NA	These data are interpolated from the onboard navigation solution in the GRAS Extended Navigation Data Packets.

Table 24: Default values and input clarifications for Level 1a MDR fields

4 LEVEL 1B

4.1 Secondary Product Header Record

There is one subclass of SPHR for Level 1b products which is identical to Level 1a. The detailed contents of the SPHR are provided in Appendix A of this document.

Detailed descriptions of the contents of the enumerated and Boolean type fields in the level SPHR are provided in Table 1 - Table 3.

4.2 Global and Variable External Auxiliary Data Records

GEADRs and VEADRs are used as defined in [AD 1].

4.3 Variable Internal Auxiliary Data Record

There are six subclasses of VIADR for the Level 1b Product. These are detailed in the Annex to this document.

4.3.1 Record Subclasses

Subclass	*Description*	*Subclass ID*
VIADR-1B-GPS POD	GPS orbit arcs	21
VIADR-1B-GPS CLOCK	Occulting GPS clock bias estimates	22
VIADR-1B-TZD	Troposphere delay products for fiducial stations	23
VIADR-1B-STATION CLOCK	Clock offset estimates for fiducial stations	24
VIADR-1B-METOP POD	Metop NRT orbit arc	25
VIADR-1B-METOP CLOCK	Metop clock bias estimates	26
VIADR-1B-EOP	Earth orientation parameters	27
VIADR-1B-METOP ATTITUDE	Metop attitude information	28

Table 25: VIADR Subclasses

The detailed contents of the VIADR subclasses are provided in the Annex (Appendix A) in Microsoft Excel format.

4.4 Measurement Data Record

The MDR contains information on a per occultation basis.

The MDR is detailed in the Annex to this document.

4.4.1 Record Subclasses

Subclass	*Description*	*Subclass ID*
MDR-1B	GRAS Level 1b products	20

Table 26: MDR Subclasses

The detailed content of the MDR-1B subclass is provided in the Annex to this document.

4.4.2 Level 1b MDR descriptions

Detailed descriptions of the contents of the enumerated and bit string type fields in the Level 1b MDR are provided in Table 28 - Table 34.

Table 27 lists all field types that are common both for Level 1a and Level 1b. These types are described in Section 3.4.2.

A description of the START_VALIDITY and END_VALIDITY fields in Level 1b VIADR and MDR records is provided in Table 7.

All Boolean type fields in the Level 1b MDR are defined in Table 35.

Field name
PRODUCT_TYPE
MEASUREMENT_TYPE
GRAS_CHANNEL_ID
METOP_STEERING_MODE
LOCAL_MULTIPATH_SOURCE
TELEMETRY_IN_RANGE
ONBOARD_NAV_SOLUTION
GPS_SH (same as SH field in the MDR-1A-EPHEMERIS record)
RECEIVER_ANALOG_GAIN (same as ZANA, VANA and AVANA)
RECEIVER_DIGITAL_GAIN (same as ZDIG, VDIG, AVDIG)
TRACKING_STATE

Table 27: List of enumerated and bit string fields that are the same at level 1a and level 1b

Value	*Meaning*	*Comment*
0	No differencing (ND)	
1	Single differencing 1 (SD1)	
2	Single differencing 2 (SD2)	
3	Double differencing 1 (DD1)	
4	Double differencing 2 (DD2)	

Table 28: SELECTED_CLOCK_CORRECTION_METHOD

Bit	Meaning	Value	Comment
0	Fallback mode	0	Not activated
		1	Activated
1	DD2 => DD1	0	No
		1	Mode change performed
2	DD1 => SD2	0	No
		1	Mode change performed
3	SD2 => SD1	0	No
		1	Mode change performed
4	SD1 => ND	0	No
		1	Mode change performed
5	ND failed => no clock correction	0	No
		1	Yes (Note: this indicates that the products are useless)

Table 29: CLOCK_CORRECTION_FALLBACK_MODE

Value	Meaning	Comment
0	MSISE90	Baseline
1	NRLMSISE00	Updated model from MSISE90
2 -	Spare	

Table 30: BE_MODEL

Bit	Meaning	Value	Comment
0	SSD fiducial station 1	0	Available
		1	Not available
1	SSD fiducial station 2	0	Available
		1	Not available
2	Station characterisation data for station 1	0	Available
		1	Not available
3	Station characterisation data for station 2	0	Available
		1	Not available
4 -	Station 1 TZD estimate	0	Available
		1	Not available or error too large
5 -	Station 2 TZD estimate	0	Available
		1	Not available or error too large
6 -	Spare	0	
		1	

Table 31: SSD_AVAILABILITY

Value	Meaning	Comment
0	TEC at Level 1a	
1	TEC at Level 1b	
2 -	Spare	

Table 32: TEC_METHOD

Bit	Meaning	Value	Comment
0	Back Propagation (BP)	0	BP method has not been applied
		1	BP method has been applied
1	Canonical Transform (CT)	0	CT method has not been applied
		1	CT method has been applied
2	Canonical Transform 2 (CT2)	0	CT2 method has not been applied
		1	CT2 method has been applied
3	Full Spectrum Inversion (FSI)	0	FSI method has not been applied
		1	FSI method has been applied
4	Phase Matching (GOPM)	0	GOPM method has not been applied
		1	GOPM method has been applied
5 -	Spare	0	Bits will be defaulted to "unset" or zero.
		1	

Table 33: WO_CHARACTERISATION

Bit	Meaning	Value	Comment
0	Atmospheric multipath in stratosphere	0	Atmospheric multipath has not been detected
		1	Atmospheric multipath detected
1 -	Atmospheric multipath in troposphere	0	Atmospheric multipath has not been detected
		1	Atmospheric multipath detected
2 -		0	Bits will be defaulted to unset or zero.
		1	

Table 34: ATM_MULTIPATH

Boolean field	Value	Comment
GRAS_MODE	0	Occultation
	1	Navigation
Q_ANA	0	Analogue AGC has been active during the measurement
	1	No analogue AGC activity during the measurement
INSTRUMENT_STABLE	0	Instrument has been stabilised
	1	Instrument has not reached stable operating conditions after turning on
METOP_MANOEUVRE	0	MDR not impacted by a manoeuvre
	1	MDR impacted by a manoeuvre

Boolean field	*Value*	*Comment*
L1_CA_NOISE_FLAG	0	Within threshold
	1	Outside threshold
L1_P1_NOISE_FLAG	0	Within threshold
	1	Outside threshold
L2_P2_NOISE_FLAG	0	Within threshold
	1	Outside threshold
L1_CA_PSEUDORANGE_FLAG	0	Within threshold
	1	Outside threshold
L1_P1_PSEUDORANGE_FLAG	0	Within threshold
	1	Outside threshold
L2_P2_PSEUDORANGE_FLAG	0	Within threshold
	1	Outside threshold
L2_NOT_TRACKED	0	Dual carrier frequency tracking has been achieved
	1	No dual carrier frequency tracking during measurement
MEASUREMENT_INCOMPLETE	0	Measurement time sequence complete
	1	Part of the measurement data missing
ATTITUDE_MISSING	0	Metop mispointing angles data OK
	1	Metop mispointing angle not available
LOCAL_MULTIPATH	0	Low probability of local multipath
	1	High probability of local multipath
SA_FLAG	0	SA not active
	1	SA active
A_FLAG	0	Nominal
	1	Unauthorised use at own risk
AS_FLAG	0	Anti-spoofing off
	1	Anti-spoofing on
PHASE_L1	0	Within threshold
	1	Outside threshold
PHASE_L2	0	Within threshold
	1	Outside threshold
DOPPLER_L1	0	Within threshold
	1	Outside threshold
DOPPLER_L2	0	Within threshold
	1	Outside threshold
DOPPLER_RATE_L1	0	Within threshold
	1	Outside threshold
DOPPLER_RATE_L2	0	Within threshold
	1	Outside threshold
DOPPLER_ACC_L1	0	Within threshold
	1	Outside threshold

Boolean field	*Value*	*Comment*
DOPPLER_ACC_L2	0	Within threshold
	1	Outside threshold
TEC	0	Within threshold
	1	Outside threshold
TEC_DRIFT	0	Within threshold
	1	Outside threshold
TEC_ACC	0	Within threshold
	1	Outside threshold
BENDING_L1	0	Within threshold
	1	Outside threshold
BENDING_L2	0	Within threshold
	1	Outside threshold
NEUTRAL_BENDING	0	Within threshold
	1	Outside threshold
IMPACT_L1	0	Within threshold
	1	Outside threshold
IMPACT_L2	0	Within threshold
	1	Outside threshold
L1_CA_STRAT	0	Within threshold
	1	Outside threshold
L1_P1_STRAT	0	Within threshold
	1	Outside threshold
L2_P2_STRAT	0	Within threshold
	1	Outside threshold
L1_CA_TROP	0	Within threshold
	1	Outside threshold
L1_P1_TROP	0	Within threshold
	1	Outside threshold
L2_P2_TROP	0	Within threshold
	1	Outside threshold
BE_FLAG	0	BE on
	1	BE off
BE_TYPE	0	BBE
	1	FBE
OCCULTING_GPS_MANOEUVRE	0	No manoeuvre during measurement
	1	Manoeuvre
GPS_ECLIPTING	0	No eclipse
	1	Measurement during eclipse
GPS_NAV_HEALTH	0	All navigation data OK
	1	Some or all navigation data are bad

Boolean field	*Value*	*Comment*
ID_FAILED	0	Measurement identification successful
	1	Measurement identification failed
RS_DATA_MISSING	0	RS data available for the measurement
	1	RS data is missing from this measurement
LOW_PIV_GZA_SD1	0	Pivot satellite above threshold elevation
	1	Pivot satellite elevation from GZA is below threshold in SD1 processing
LOW_OCC_FID_SD2	0	Occulting satellite above threshold elevation
	1	Occulting GPS satellite elevation from fiducial station is below threshold in SD2 processing
LOW_PIV_GZA_DD1	0	Pivot satellite above threshold elevation
	1	Pivot satellite elevation from GZA is below threshold in DD1 processing
LOW_PIV_FID_DD1	0	Pivot satellite above threshold elevation
	1	Pivot satellite elevation from fiducial station is below threshold in DD1 processing
LOW_OCC_FID_DD1	0	Occulting satellite above threshold elevation
	1	Occulting GPS satellite elevation from fiducial station is below threshold in DD1 processing
LOW_PIV_GZA_DD2	0	Pivot satellite above threshold elevation
	1	Pivot satellite elevation from GZA is below threshold in DD2 processing
LOW_PIV_FID_DD2	0	Pivot satellite above threshold elevation
	1	Pivot satellite elevation from fiducial station is below threshold in DD2 processing
LOW_OCC_FID_DD2	0	Occulting satellite above threshold elevation
	1	Occulting GPS satellite elevation from fiducial station is below threshold in DD2 processing
USO_TEMP_NOMINAL	0	USO temperature within thresholds
	1	USO temperature outside thresholds
USO_TEMP_DRIFT_NOMINAL	0	USO temperature drift within thresholds
	1	USO temperature drift outside thresholds
EOP_STATUS	0	Final products
	1	Predicted EOP

Table 35: Level 1b boolean type data record fields

Record	*Field name*	*Default value*	*Description*
MDR-1B	PGE	0	Probability of Gross Error. This field is a place holder for a measurement quality estimate from a future NRT validation of the Level 1b products. Currently it will be defaulted to 0.
MDR-1B	OCC_GPS_HW_DELAY PIV_GPS_HW_DELAY INSTRUMENT_STABLE TELEMETRY_IN_RANGE BE_FLAG BE_TYPE BE_MODEL BE_HEIGHT BE_WINDOW BE_BIAS_ESTIMATE	NA	The derivation of the contents of these fields is defined in the GRAS PGS with explicit links to the field names.
	GPS_MANOEUVRE_FLAG GPS_MANOEUVRE_TIME GPS_ECLIPTING SA_FLAG	NA	The data in these fields are extracted from the GRAS GSN products.
	ERROR_COVARIANCE_ID	0	Reference to an error covariance matrix ID. Error covariance matrix is not used in Level 1 processing, but it is needed for NWP applications.

Table 36: Default values and input clarifications for Level 1b MDR fields

5 OCCURRENCE INFORMATION

5.1 Level 1a

Record	*Occurrence*
MPHR	Once per product
SPHR-1A	Once per product
GEADR/VEADR	Never
VIADR-1A-GPS POD	See update frequency of the product *NRT GPS POD* in Section 3.9.1 in [AD 4].
VIADR-1A-EOP	See update frequency of the product *Earth orientation parameters* in Section 3.9.1 in [AD 4].
VIADR-1A-TZD	See update frequency of the product *Tropospheric delay* in Section 3.9.1 in [AD 4].
VIADR-1A-GPS CLOCK	See update frequency of the product *GPS clock bias estimate* in Section 3.9.1 in [AD 4].
VIADR-1A-STATION CLOCK	See update frequency of the product *Station clock bias estimate* in Section 3.9.1 in [AD 4].
VIADR-1A-SSD	See update frequency of the product *SSD* in Section 3.9.1 in [AD 4].
VIADR-1A-GPS TRACKING	See update frequency of the product *Tracking data* in Section 3.9.1 in [AD 4].
VIADR-1A-OCCULTATION TABLE	See update frequency of the product *Occultation tables* in Section 3.9.1 in [AD 4].
VIADR-1A-GSN QUALITY REPORT	See update frequency of the product *Quality reports* in Section 3.9.1 in [AD 4].
VIADR-1A-METOP POD	Every 1 to 12 minutes (depends on the implementation of the Metop/GRAS NRT POD)
VIADR-1A-METOP ATTITUDE	The occurrence is N·1 s, where N is the number of epochs in the MDR.
VIADR-1A-METOP CLOCK	Every 1 – 12 minutes (depends on the implementation of the Metop/GRAS NRT POD)
MDR-1A-GRAS MONITORING	The occurrence is $N \cdot \tau_{eng}$, where τ_{eng} is the generation interval of the engineering N is the number of epochs in one MDR. Lower limit on τ_{eng} is 1 s.
MDR-1A-ONBOARD NAVIGATION	The occurrence is N·1 s, where N is the number of samples in the MDR.
MDR-1A-GAIN	The occurrence is N·1 s, where N is the number of samples in the MDR.
MDR-1A-TEMPERATURE	The occurrence is N·1 s, where N is the number of samples in the MDR.
MDR-1A-TRACKING STATE	The occurrence is N·1 s, where N is the number of samples in the MDR.
MDR-1A-EPHEMERIS	The occurrence is M·N·2 s, where M is the number of GPS satellites and N is the number of samples in the MDR.
MDR-1A-OCC NOISE	The occurrence is $M \cdot \tau_{noise}$ s, where τ_{noise} is the sampling interval of the noise data, and M is the number of measurement packets in the MDR.

Record	*Occurrence*
MDR-1A-ZENITH NOISE	The occurrence is $M \cdot \tau_{noise}$ s, where τ_{noise} is the sampling interval of the noise data, and M is the number of measurement packets in the MDR.
MDR-1A-OCCULTATION DATA	Once per GRAS occultation measurement
MDR-1A-NAVIGATION DATA	Once per GRAS navigation measurement
MDR-1A-NAV FRAME	The occurrence is N 1 s, where N is the number of packets in the MDR.

Note: The values of M and N shall depend on the implementation of the data processing system.

5.2 Level 1b

An archived Level 1b product will contain all complete occultation measurements from one Metop orbit, normally about 30 occultations.

Record	*Occurrence*
MPHR	Once per product
SPHR-1B	Once per product
GEADR/VEADR	Never
VIADR-1B-GPS POD	Once per product
VIADR-1B-EOP	Once per product
VIADR-1B-GPS CLOCK	Every 15 minutes
VIADR-1B-TZD	Every 15 minutes
VIADR-1B-STATION CLOCK	Every 15 minutes
VIADR-1B-METOP POD	Every 1 – 12 minutes[1)]
VIADR-1B-METOP CLOCK	Every 1 - 12 minutes[1)]
VIADR-1B-METOP ATTITUDE	Once per occultation
MDR-1B	Once per occultation

[1)] The occurrence depends on the implementation of the Metop/GRAS NRT POD.

6 RECORD FORMAT VERSION CONTROL

This section provides version numbers for the records defined within this document.

Record Subclass	*Format Version Number*	*Issue Defined*
SPHR-1A	**3**	**6.5**
	2	**6.3**
	1	6.2 (CDR)
VIADR-1A-GPS POD	**3**	**6.4**
	2	**6.3**
	1	6.2 (CDR)
VIADR-1A-EOP	**5**	**6.6**
	4	**6.5**
	3	**6.4**
	2	**6.3**
	1	6.2 (CDR)
VIADR-1A-GPS CLOCK	**3**	**6.4**
	2	**6.3**
	1	6.2 (CDR)
VIADR-1A-TZD	**3**	**6.4**
	2	**6.3**
	1	6.2 (CDR)
VIADR-1A-STATION CLOCK	**3**	**6.4**
	2	**6.3**
	1	6.2 (CDR)
VIADR-1A-SSD	**3**	**6.4**
	2	**6.3**
	1	6.2 (CDR)
VIADR-1A-GPS TRACKING	**3**	**6.4**
	2	**6.3**
	1	6.2 (CDR)
VIADR-1A-OCCULTATION TABLE	**3**	**6.4**
	2	**6.3**
	1	6.2 (CDR)
VIADR-1A-GSN QUALITY REPORT	**3**	**6.5**
	2	**6.4**
	1	**6.2 (CDR)**
VIADR-1A-METOP POD	**3**	**6.4**
	2	**6.3**
	1	6.2 (CDR)
VIADR-1A-METOP CLOCK	**3**	**6.4**
	2	**6.3**
	1	6.2 (CDR)
VIADR-1A-METOP ATTITUDE	**3**	**6.4**
	2	**6.3**
	1	6.2 (CDR)

Record Subclass	*Format Version Number*	*Issue Defined*
MDR-1A-GRAS MONITORING	**4**	**6.5**
	3	**6.4**
	2	**6.3**
	1	6.2 (CDR)
MDR-1A-ONBOARD NAVIGATION	**3**	**6.4**
	2	**6.3**
	1	6.2 (CDR)
MDR-1A-GAIN	**3**	**6.4**
	2	**6.3**
	1	6.2 (CDR)
MDR-1A-TEMPERATURE	**3**	**6.4**
	2	**6.3**
	1	6.2 (CDR)
MDR-1A-TRACKING STATE	**3**	**6.4**
	2	**6.3**
	1	6.2 (CDR)
MDR-1A-EPHEMERIS	**3**	**6.4**
	2	**6.3**
	1	6.2 (CDR)
MDR-1A-OCC NOISE	**3**	**6.4**
	2	**6.3**
	1	6.2 (CDR)
MDR-1A-ZENITH NOISE	**3**	**6.4**
	2	**6.3**
	1	6.2 (CDR)
MDR-1A-OCCULTATION DATA	**4**	**6.5**
	3	**6.4**
	2	**6.3**
	1	6.2 (CDR)
MDR-1A-NAVIGATION DATA	**4**	**6.5**
	3	**6.4**
	2	**6.3**
	1	6.2 (CDR)
MDR-1A-NAV FRAME	**3**	**6.4**
	2	**6.3**
	1	6.2 (CDR)
VIADR-1B-GPS POD	**3**	**6.4**
	2	**6.3**
	1	6.2 (CDR)
VIADR-1B-EOP	**5**	**6.6**
	4	**6.5**
	3	**6.4**
	2	**6.3**
	1	6.2 (CDR)
VIADR-1B-GPS CLOCK	**3**	**6.4**
	2	**6.3**
	1	6.2 (CDR)
VIADR-1B-TZD	**3**	**6.4**
	2	**6.3**
	1	6.2 (CDR)

Record Subclass	*Format Version Number*	*Issue Defined*
VIADR-1B-STATION CLOCK	**3**	**6.4**
	2	**6.3**
	1	6.2 (CDR)
VIADR-1B-METOP POD	**3**	**6.4**
	2	**6.3**
	1	6.2 (CDR)
VIADR-1B-METOP CLOCK	**3**	**6.4**
	2	**6.3**
	1	6.2 (CDR)
VIADR-1A-METOP ATTITUDE	**3**	**6.4**
	2	**6.3**
	1	6.2 (CDR)
MDR-1B	**4**	**6.5**
	3	**6.4**
	2	**6.3**
	1	6.2 (CDR)

Table 37: Record Format Version Numbers

APPENDIX A DETAILED SPECIFICATION OF GRAS LEVEL 1 DATA RECORDS

In the following Annex, detailed format specifications for all the Variable Internal and Measurement Data Records in GRAS Level 1a and 1b products are included, as listed in Section 6: Record Format Version Control.

The Annex is accessible under Document Reference: EPS.MIS.SPE.97234.ANX .

Doc Ref: EPS.MIS.SPE.97234.ANX
GRAS_Level_1_Product_Format_Specification_-_Annex[1].xls
Worksheet: VERSION

This Document	
Title	GRAS LEVEL 1 PRODUCT FORMAT SPECIFICATION TABLES
Reference Number	EPS/MIS/SPE/97234

Change Record	
Issue 4 Draft A	Removed Detailed Navigation section from SPHR-1A

Change Record	
Issue 5 Rev 0	Issue for CGS PDR
issue 5 Rev 1	Major updates of Level 1b records to agree with changes in the revised PFS document
	Removal of Level 1a records with a TBD status on the Level 1 product format

Change Record	
Issue 6 Rev 0	Major Update. Draft Level 1a product format description added
Issue 6 Rev 1	Major Revision of records
Issue 6 Rev 2	Split of MDR-1A to 11 smaller MDRs to ensure compatibility with the different output rates of the ancillary and the measurement data from GRAS
	Updates of Level 1a and Level 1b VIADRs to match the updated GRAS PGS and to remove type discrepancies
	Update of the MDR-1B to match the updated GRAS PGS
Issue 6 Rev 3	Description of the has been SPH added.
	METOP_ID removed from all records except MPHR.
	GRAS_ID field has been added to SPHR and removed from all other records.
	The START_SOLUTION/END_SOLUTION field names are changed to START_VALIDITY and END_VALIDITY in level 1a and level 1b VIADRs (except in VIADR-1A SSD and in VIADR-1A GPS TRACKING).
	The PRODUCT_EPOCH field has been removed from all records under the assumption that it is redundant with the PPF reporting information.
	The MISSION_STATUS field has been removed from all MDRs.
	The PROCESSING_MODE field has been removed from all MDRs.
	The EARTH_MODEL_ID field has been moved to SPHR and removed from all MDRs.
	METOP_MANŒUVRE_FLAG, METOP_MANŒUVRE_START, METOP_MANŒUVRE_END, MANŒUVRE_IMP_END fields have been added to the SPHR.

	The METOP_MANOEUVRE_FLAG and METOP_MANOEUVRE_TIME fields have been replaced in the MDRs with a single METOP_MANOEUVRE flag. This flag indicates that the MDR is affected by the last Metop manoeuvre.
	Onboard S/W (GOBS) major/minor version field has been added to SPHR.
	All fields for smoothed level 1b products have been removed from the MDR-1B.
	The LAGRANGE_COEF fields in MDR-1A-OCCULTATION DATA, and MDR-1A-NAVIGATION DATA have been replaced by separate fields for interpolation coefficients for x,y,z,vx,vy,vz.
	The M_O, E, SQRT_A, I_O, and OMEGA field types in MDR-1A-EPHEMERIS have been changed to integer4.
	The T_OT, and WN_T field types in MDR-1A-EPHEMERIS have been changed to u-byte.
	The LAGRANGE_ORDER field scale factor in MDR-1A-OCCULTATION DATA, and MDR-1A-NAVIGATION DATA has been changed to 0.
	The fild type and size specifications have been added to SLTA field in MDR-1B.
	The scale factors in EPOCH fields (except for predicted epochs) in MDR-1A-OCCULTATION DATA, MDR-1A-NAVIGATION DATA, MDR-1A-NAV FRAME, MDR-1B, AND COMPOUNDS have been changed to 9.
	The MJD units have been replaced by seconds in all records.
	"WO" in the description of CO_APPROXIMATE_L1_RAY_HEIGHT in MDR-1B has been corrected to "GO".
	A boolean flag ID_FAILED has been added into MDR-1A-OCCULTATION DATA, and MDR-1B to show identification failure in the occultation identification function.
	A PGE field has been added into the MDR-1B as a place holder for future functionality.
	PRED_START_LAT, PRED_START_LONG, PRED_END_LAT, PRED_END_LONG fields have been added to MDR-1B. For consistency, PROFILE_LATITUDE, and PROFILE_LONGITUDE fields have been replaced in the VIADR-1A-OCCULTATION TABLE by PRED_START_LAT, PRED_START_LONG, PRED_END_LAT, PRED_END_LONG fields.
	Typo in the TELEMETRY_IN_RANGE field description in MDR-1B has been corrected.
Issue 6 Rev 4	START_VALIDITY and END_VALIDITY fields in all relevant records in level 1a and level 1b have been modified so that the SF is 9 and unit is seconds [s]. In these fields the time is represented as seconds from 00:00, 1st Jan 2000.
	START_EPOCH and END_EPOCH fields in all relevant records in level 1a and level 1b have been modified so that the SF for all fields is 9 and unit is [s]. In these fields time is represented as seconds from 00:00, 1st Jan 2000.
	The type for NUMBER_OF_SAMPLES has been changed to u-integer4 in MDR-1B.
	The type for NUMBER_OF_SAMPLES_RS has been changed to u-integer4 in MDR-1B.

	The type for USO_TEMPERATURE_START, USO_TEMPERATURE_END and USO_TEMPERATURE_CHANGE has been changed to integer4 in MDR-1B.
	The type of SH has been changed to enumerated in MDR-1A-EPHEMERIS.
	The type for L1_CA_PHASE,L1_P1_PHASE,L2_P2_PHASE,L1_NOISE,L2_NOISE has been changed to integer8 in MDR-1B.
	Type of the NUMBER_SATELLITE field in VIADR-1B GPS POD has been changed to u-byte.
	Type of the GPS_NUMBER field in VIADR-1B GPS CLOCK has been changed to u-byte.
	The formats of the FID_ID_DD1 and FID_ID_DD2 fields have been changed to char(4) in MDR-1B.
	The type for USOG has been changed to integer8 in MDR-1A-TEMPERATURE.
	The Type for DT in MDR-1A-OCC NOISE and MDR-1A- ZENITH NOISE has been changed to u-integer4. The UNITS for DT in MDR-1A-OCC NOISE and MDR-1A- ZENITH NOISE have been changed to s.
	Irregular dynamically-sized structures (IDSS) indexing in all relevant has been changed to follow the agreement in Level 1a Algorithm Panel meeting on 11-12 Dec 2003.
	The DIM2 for ZHIST, VHIST and AVHIST has been changed to 7 in MDR-1A-GAIN.
	Low pivot and occulting satellite warning flags have been added to the MDR-1B for SD1, SD2, DD1, DD2 cases.
	The types for ZAT, VAT, AVAT, RZT, RVT, RAVT, GEUT, ISACT, USOIT, USOET, FGT, USOG have been changed to integer8 in MDR-1A-TEMPERATURE.
	ID_FAILED field has been added in the MDR-1A-NAVIGATION-DATA.
	In VIADR-1B-GPS CLOCK the name of the record " Ground Station Clock bias estimates" has been corrected to "GPS clock bias estimates".
	In MDR-1B all raw sampling mode data fields have been renamed as TIME_IMT_RS, TIME_UTC_GRAS_RS, TIME_OBT_RS, TIME_REF_RS, P_1_RS, F1_1_RS, TINT1_RS, F2_1_RS, TINT2_RS, IQ_CA_EXP_RS, I_CA_RS, Q_CA_RS, L1_PHASE_RS, L1_AMPLITUDE_RS, L1_CODE_PHASE_RS, L1_NOISE_RS.
	In MDR-1A_OCCULTATION_DATA all raw sampling mode data fields have been renamed as TIME_IMT_RS, P_1_RS, F1_1_RS, TINT1_RS, F2_1_RS, TINT2_RS, IQ_CA_EXP_RS, I_CA_RS, Q_CA_RS, L1_PHASE_RS, L1_AMPLITUDE_RS, L1_CODE_PHASE_RS, L1_NOISE_RS to avoid duplicated names in a record.
	The types for L1_CA_AMPLITUDE, L1_P1_AMPLITUDE, L2_P2_AMPLITUDE, L1_CA_CODE_PHASE, L1_P1_CODE_PHASE, L2_P2_CODE_PHASE, L1_CA_PSEUDORANGE, L1_P1_PSEUDORANGE, L2_P2_PSEUDORANGE, L1_AMPLITUDE_RS, and L1_CODE_PHASE_RS have been changed to u-integer8 in MDR-1A-OCCULTATION DATA

	The types for L1_CA_AMPLITUDE, L1_P1_AMPLITUDE, L2_P2_AMPLITUDE, L1_CA_CODE_PHASE, L1_P1_CODE_PHASE, L2_P2_CODE_PHASE, L1_CA_PSEUDORANGE, L1_P1_PSEUDORANGE, and L2_P2_PSEUDORANGE have been changed to u-integer8 in MDR-1A- NAVIGATION DATA
	The types for L1_AMPLITUDE_RS, L1_CODE_PHASE_RS have been changed to u-integer8 in MDR-1B.
	The units for L1_CA_AMPLITUDE_MDID, L1_P1_AMPLITUDE_MDID, L2_P2_AMPLITUDE_MDID, L1_CA_AMPLITUDE, L1_P1_AMPLITUDE, L2_P2_AMPLITUDE, and L1_AMPLITUDE_RS have been changed to dBV in MDR-1A-OCCULTATION DATA
	The units for L1_CA_AMPLITUDE_MDID, L1_P1_AMPLITUDE_MDID, L2_P2_AMPLITUDE_MDID, L1_CA_AMPLITUDE, L1_P1_AMPLITUDE, and L2_P2_AMPLITUDE have been changed to dBV in MDR-1A NAVIGATION DATA
	The units for WO_L1_CA_AMPLITUDE, WO_L1_P1_AMPLITUDE, WO_L2_P2_AMPLITUDE, L1_CA_AMPLITUDE, L1_P1_AMPLITUDE, L2_P2_AMPLITUDE, and L1_AMPLITUDE_RS have been changed to dBV in MDR-1B
	The units of the fields ANTENNA_AMPLITUDE_CORRECTION_L1_CA, ANTENNA_AMPLITUDE_CORRECTION_L1_P1, ANTENNA_AMPLITUDE_CORRECTION_L2_P2, RFCU_AMPLITUDE_CORRECTION_L1_CA, RFCU_AMPLITUDE_CORRECTION_L1_P1, RFCU_AMPLITUDE_CORRECTION_L2_P2, GEU_AMPLITUDE_CORRECTION_L1_CA, GEU_AMPLITUDE_CORRECTION_L1_P1, and GEU_AMPLITUDE_CORRECTION_L2_P2 in MDR-1A-OCCULTATION DATA and MDR-1A-NAVIGATION DATA have been removed.
	The scaling factors for L1_CA_Phase, L1_P1_Phase, and L2_P2_Phase in MDR-1B have been changed to 6 and the units have been changed to meters [m].
	In MDR-1A-OCCULTATION DATA, MDR-1A-NAVIGATION DATA and in MDR-1B the scaling factors for the fields L1_CA_Phase, L1_P1_Phase, and L2_P2_Phase has been changed to 6.
	The unit of IMT times has been changed to seconds [s] with SF = 9 in all relevant records.
	In VIADR-1A-STATION CLOCK and in VIADR-1B-STATION CLOCK the type of the NUM_EPOCHS field has been changed from u-byte to u-integer2.
	The types and scaling factors of all UTC time fields have been harmonised.
	A CLOCK_QUALITY fields have been added into VIADR-1B-GPS CLOCK and VIADR-1B-STATION CLOCK records.
	In MDR-1B field TEC for TEC quality has been renamed as TEC_QUALITY
	In VIADR_1A_OCCULTATION_TABLE field GPS_ID has been renamed GPS_ID_STATE.
	The type for TIME_OBT has been changed to long cds time in MDR-1A-TEMPERATURE, and in MDR-1A-EPHEMERIS.

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GRAS_Level_1_Product_Format_Specification_-_Annex[1].xls
Worksheet: VIADR-1A-STATION CLOCK

FIELD	DESCRIPTION	SF	UNITS	DIM1	DIM2	DIM3	TYPE	TYPE SIZE	FIELD SIZE	OFFSET
RECORD_HEADER	Generic Record Header	0		1	1	1	REC_HEAD	20	20	0
Ground station clock offset estimates										
START_VALIDITY	Start time of the record validity	9	s	1	1	1	u-integer8	8	8	20
END_VALIDITY	End time of the record validity	9	s	1	1	1	u-integer8	8	8	28
ESTIMATE_INTERVAL	Estimation interval for clock bias	0	s	1	1	1	u-integer2	2	2	36
STATION_NUMBER	Number of stations in solution	0		1	1	1	u-byte	1	1	38
PRODUCT_TYPE	NRT or enhanced POD product	0		1	1	1	enumerated	1	1	39
NUMBER_OF_STATIONS	Number of fiducial stations M			1	1	1	u-byte	1	1	40
STATION_ID	Ground station identification	0		M	1	1	char(4)	4	variable	41
CLOCK_QUALITY	Quality indicator for each station	0		M	1	1	u-integer8	8	variable	variable
NUM_EPOCHS	Number of epochs E			M	1	1	u-integer2	2	variable	variable
STATION_CLOCK_OFFSETS	Station clock offset estimates from GSN			E	M	1	STATION_CLOCKS	136	variable	variable
SIZE OF THE RECORD										variable

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GRAS_Level_1_Product_Format_Specification_-_Annex[1].xls
Worksheet: VIADR-1A-SSD

FIELD	DESCRIPTION	SF	UNITS	DIM1	DIM2	DIM3	DIM4	TYPE	TYPE SIZE	FIELD SIZE	OFFSET
RECORD_HEADER	Generic Record Header	0		1	1	1	1	REC_HEAD	20	20	0
Sounding support measurements											
MEASUREMENT_START	Start time of measurement arc	6	s	1	1	1	1	u-integer8	8	8	20
MEASUREMENT_END	End time of measurement arc	6	s	1	1	1	1	u-integer8	8	8	28
MEASUREMENT_SAMPLE_INTERVAL	Sampling interval used in tracking	0	s	1	1	1	1	u-byte	1	1	36
NUMBER_OF_OCCULTATIONS	Number of occultations J	0		1	1	1	1	u-byte	1	1	37
OCCULTATION_ID	Occultation identification			J	1	1	1	char(32)	32	variable	38
NUMBER_OF_STATIONS	Number of stations capable of supporting this occultation K	0		J	1	1	1	u-byte	1	variable	variable
STATION_ID	Ground station identification	0		K	J	1	1	char(4)	4	variable	variable
NUM_GPS	Number of GPS satellites measured by the station P	0		K	J	1	1	u-byte	1	variable	variable
GPS_ID	GPS PRN number	0		P	K	J	1	u-byte	1	variable	variable
GPS_TYPE	Occulting or pivot satellite	0		P	K	J	1	boolean	1	variable	variable
PIVOT_REC	Pivot satellite recommendation 1st, 2nd,…	0		P	K	J	1	u-byte	1	variable	variable
NUM_EPOCHS	Number of SSD epochs S	0		P	K	J	1	u-byte	1	variable	variable
GPS_SSD_DATA	GPS SSD data from GSN			S	P	K	J	SSD_SAMPLE	72	variable	variable
SIZE OF THE RECORD											variable

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GRAS_Level_1_Product_Format_Specification_-_Annex[1].xls
Worksheet: VIADR-1A-OCCULTATION TABLE

FIELD	DESCRIPTION	SF	UNITS	DIM1	DIM2	DIM3	TYPE	TYPE SIZE	FIELD SIZE	OFFSET
RECORD_HEADER	Generic Record Header	0		1	1	1	REC_HEAD	20	20	0
Occultation table										
START_VALIDITY	Start time of the record validity	9	s	1	1	1	u-integer8	8	8	20
END_VALIDITY	End time of the record validity	9	s	1	1	1	u-integer8	8	8	28
TABLE_ID	Table id number			1	1	1	u-integer4	4	4	36
Measurement characterisation (for each predicted measurement)										
NUMBER_OF_MEASUREMENTS	Number of predicted measurements N	0		1	1	1	u-integer2	2	2	40
MEASUREMENT_ID	Id number of the predicted measurement	0		N	1	1	char(32)	32	variable	42
MEASUREMENT_START	Measurement start time	6	s	N	1	1	u-integer8	8	variable	variable
MEASUREMENT_END	Measurement end time	6	s	N	1	1	u-integer8	8	variable	variable
MEASUREMENT_DURATION	Length of the measurement	0	s	N	1	1	u-integer2	2	variable	variable
GPS_ID	Measured GPS PRN number	0		N	1	1	u-byte	1	variable	variable
MEASUREMENT_TYPE	Raisin/setting/navigation	0		N	1	1	enumerated	1	variable	variable
INCIDENCE_AZIMUTH	Azimuth angle of the incoming ray	3	deg	N	1	1	integer4	4	variable	variable
INCIDENCE_ELEVATION	Elevation angle of the incoming ray	3	deg	N	1	1	integer4	4	variable	variable
GEOLOCATION_SLTH_START	SLTH start value used for geolocation	3	m	N	1	1	integer4	4	variable	variable
GEOLOCATION_SLTH_END	SLTH end value used for geolocation	3	m	N	1	1	integer4	4	variable	variable
PRED_START_LAT	Predicted start latitude of the measurement	3	degree	N	1	1	integer4	4	variable	variable
PRED_START_LONG	Predicted start longitude of the measurement	3	degree	N	1	1	integer4	4	variable	variable
PRED_END_LAT	Predicted end latitude of the measurement	3	degree	N	1	1	integer4	4	variable	variable
PRED_END_LONG	Predicted end longitude of the measurement	3	degree	N	1	1	integer4	4	variable	variable
Metop state vector (once per occultation table)										
METOP_SAMPLE_INTERVAL	Time sample interval of the state vectors	0	s	1	1	1	u-integer2	2	2	variable
NUMBER_OF_METOP_EPOCHS	Number of state vector epochs M	0		1	1	1	u-integer2	2	2	variable
EPOCH_TIME	Time stamp in reference time	6	s	M	1	1	integer8	8	variable	variable
SATELLITE_POSITION_X	Satellite position x at epoch time	6	m	M	1	1	integer8	8	variable	variable
SATELLITE_POSITION_Y	Satellite position y at epoch time	6	m	M	1	1	integer8	8	variable	variable
SATELLITE_POSITION_Z	Satellite position z at epoch time	6	m	M	1	1	integer8	8	variable	variable
SATELLITE_VELOCITY_X	Satellite velocity x at epoch time	6	m/s	M	1	1	integer8	8	variable	variable

SATELLITE_VELOCITY_Y	Satellite velocity y at epoch time	6	m/s	M	1	1	integer8	8	variable	variable
SATELLITE_VELOCITY_Z	Satellite velocity z at epoch time	6	m/s	M	1	1	integer8	8	variable	variable
GPS state vector (once per occultation table)										
GPS_SAMPLE_INTERVAL	Time sample interval of the state vectors	0	s	1	1	1	u-integer2	2	2	variable
NUMBER_OF_GPS	Number of GPS satellites G	0		1	1	1	u-byte	1	1	variable
GPS_ID_STATE	GPS PRN number	0		G	1	1	u-byte	1	variable	variable
NUMBER_OF_GPS_EPOCHS	Number of state vector epochs E	0		G	1	1	u-integer2	2	variable	variable
STATE_VECTOR	GPS position and velocity vector			E	G	1	GPS_STATE_SHORT	56	variable	variable
SIZE OF THE RECORD										variable

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GRAS_Level_1_Product_Format_Specification_-_Annex[1].xls
Worksheet: VIADR-1A-OCCULTATION TABLE

FIELD	DESCRIPTION	SF	UNITS	DIM1	DIM2	DIM3	TYPE	TYPE SIZE	FIELD SIZE	OFFSET
RECORD_HEADER	Generic Record Header	0		1	1	1	REC_HEAD	20	20	0
Occultation table										
START_VALIDITY	Start time of the record validity	9	s	1	1	1	u-integer8	8	8	20
END_VALIDITY	End time of the record validity	9	s	1	1	1	u-integer8	8	8	28
TABLE_ID	Table id number			1	1	1	u-integer4	4	4	36
Measurement characterisation (for each predicted measurement)										
NUMBER_OF_MEASUREMENTS	Number of predicted measurements N	0		1	1	1	u-integer2	2	2	40
MEASUREMENT_ID	Id number of the predicted measurement	0		N	1	1	char(32)	32	variable	42
MEASUREMENT_START	Measurement start time	6	s	N	1	1	u-integer8	8	variable	variable
MEASUREMENT_END	Measurement end time	6	s	N	1	1	u-integer8	8	variable	variable
MEASUREMENT_DURATION	Length of the measurement	0	s	N	1	1	u-integer2	2	variable	variable
GPS_ID	Measured GPS PRN number	0		N	1	1	u-byte	1	variable	variable
MEASUREMENT_TYPE	Raisin/setting/navigation	0		N	1	1	enumerated	1	variable	variable
INCIDENCE_AZIMUTH	Azimuth angle of the incoming ray	3	deg	N	1	1	integer4	4	variable	variable
INCIDENCE_ELEVATION	Elevation angle of the incoming ray	3	deg	N	1	1	integer4	4	variable	variable
GEOLOCATION_SLTH_START	SLTH start value used for geolocation	3	m	N	1	1	integer4	4	variable	variable
GEOLOCATION_SLTH_END	SLTH end value used for geolocation	3	m	N	1	1	integer4	4	variable	variable
PRED_START_LAT	Predicted start latitude of the measurement	3	degree	N	1	1	integer4	4	variable	variable
PRED_START_LONG	Predicted start longitude of the measurement	3	degree	N	1	1	integer4	4	variable	variable
PRED_END_LAT	Predicted end latitude of the measurement	3	degree	N	1	1	integer4	4	variable	variable
PRED_END_LONG	Predicted end longitude of the measurement	3	degree	N	1	1	integer4	4	variable	variable
Metop state vector (once per occultation table)										
METOP_SAMPLE_INTERVAL	Time sample interval of the state vectors	0	s	1	1	1	u-integer2	2	2	variable
NUMBER_OF_METOP_EPOCHS	Number of state vector epochs M	0		1	1	1	u-integer2	2	2	variable
EPOCH_TIME	Time stamp in reference time	6	s	M	1	1	integer8	8	variable	variable
SATELLITE_POSITION_X	Satellite position x at epoch time	6	m	M	1	1	integer8	8	variable	variable
SATELLITE_POSITION_Y	Satellite position y at epoch time	6	m	M	1	1	integer8	8	variable	variable
SATELLITE_POSITION_Z	Satellite position z at epoch time	6	m	M	1	1	integer8	8	variable	variable
SATELLITE_VELOCITY_X	Satellite velocity x at epoch time	6	m/s	M	1	1	integer8	8	variable	variable

SATELLITE_VELOCITY_Y	Satellite velocity y at epoch time	6	m/s	M	1	1	integer8	8	variable	variable
SATELLITE_VELOCITY_Z	Satellite velocity z at epoch time	6	m/s	M	1	1	integer8	8	variable	variable
GPS state vector (once per occultation table)										
GPS_SAMPLE_INTERVAL	Time sample interval of the state vectors	0	s	1	1	1	u-integer2	2	2	variable
NUMBER_OF_GPS	Number of GPS satellites G	0		1	1	1	u-byte	1	1	variable
GPS_ID_STATE	GPS PRN number	0		G	1	1	u-byte	1	variable	variable
NUMBER_OF_GPS_EPOCHS	Number of state vector epochs E	0		G	1	1	u-integer2	2	variable	variable
STATE_VECTOR	GPS position and velocity vector			E	G	1	GPS_STATE_SHORT	56	variable	variable
SIZE OF THE RECORD										variable

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GRAS_Level_1_Product_Format_Specification_-_Annex[1].xls
Worksheet: VIADR-1A-GSN QUALITY REPORT

FIELD	DESCRIPTION	SF	UNITS	DIM1	DIM2	DIM3	TYPE	TYPE SIZE	FIELD SIZE	OFFSET
RECORD_HEADER	Generic Record Header	0		1	1	1	REC_HEAD	20	20	0
GSN Quality report										
START_VALIDITY	Start time of the record validity	9	s	1	1	1	u-integer8	8	8	20
END_VALIDITY	End time of the record validity	9	s	1	1	1	u-integer8	8	8	28
GENERATION_TIME	File generation time	9	s	1	1	1	u-integer8	8	8	36
PAST_TIME_START	Start time of the past data	9	s	1	1	1	u-integer8	8	8	44
PAST_TIME_END	End time of the past data	9	s	1	1	1	u-integer8	8	8	52
GLOBAL_SA	Global SA setting of the GPS system			1	1	1	boolean	1	1	60
SA_CHANGE_EPOCH	Epoch of the global SA status change	9	s	1	1	1	u-integer8	8	8	61
STAT_NUM_GPS	Number of GPS satellites that status information is provided for A			1	1	1	u-byte	1	1	69
STAT_GPS_ID	GPS PRN number			A	1	1	u-byte	1	variable	70
GPS_MANOEUVRE_EPOCHS	Number of manoeuvre epochs for the GPS satellite B			A	1	1	u-integer2	2	variable	variable
GPS_MANOEUVRE_START	Start time of the GPS manoeuvre	9	s	B	A	1	u-integer8	8	variable	variable
GPS_MANOEUVRE_END	End time of the GPS manoeuvre	9	s	B	A	1	u-integer8	8	variable	variable
GPS_ECLIPSE_EPOCHS	Number of eclipse epochs for the GPS satellite L			A	1	1	u-integer2	2	variable	variable
GPS_ECLIPSE_START	Start time of the GPS eclipse	9	s	L	A	1	u-integer8	8	variable	variable
GPS_ECLIPSE_END	End time of the GPS eclipse	9	s	L	A	1	u-integer8	8	variable	variable
GPS_SA_EPOCHS	Number of Selective Availability (SA) epochs for the GPS satellite M			A	1	1	u-integer2	2	variable	variable
GPS_SA_STATUS	SA status of the GPS satellite			M	A	1	boolean	1	variable	variable
GPS_SA_EPOCH	Epoch of the SA status change	9	s	M	A	1	u-integer8	8	variable	variable
STAT_NUM_STATIONS	Number of fiducial stations that status information is provided for C			1	1	1	u-byte	1	variable	variable
STAT_STATION_ID	Station ID			C	1	1	char(4)	4	variable	variable
STAT_OUTAGE_EPOCHS	Number of station outage epochs D			C	1	1	u-integer2	2	variable	variable
OUTAGE_PAST_START	Start time of the past outage of the station	9	s	D	C	1	u-integer8	8	variable	variable
OUTAGE_PAST_END	End time of the past outage of the station	9	s	D	C	1	u-integer8	8	variable	variable
STAT_PLANNED_OUTAGE_EPOCHS	Number of station planned outage epochs N			C	1	1	u-integer2	2	variable	variable
OUTAGE_PLANNED_START	Start time of the planned outage of the station	9	s	N	C	1	u-integer8	8	variable	variable

OUTAGE_PLANNED_END	End time of the planned outage of the station	9	s	N	C	1	u-integer8	8	variable	variable
NUM_PERIOD_ORB_QUALITY	Number of periods that the orbit quality is provided E			1	1	1	u-integer2	2	variable	variable
ORB_COMPARISON_START	Start time of the orbit comparison	9	s	E	1	1	u-integer8	8	variable	variable
ORB_COMPARISON_END	End time of the orbit comparison	9	s	E	1	1	u-integer8	8	variable	variable
ORB_REF_FILE_NAME	Name of the reference file			E	1	1	char(88)	88	variable	variable
ORB_OVERALL_RMS	Overall RMS difference	6	m	E	1		integer4	4	variable	variable
ORB_OVERALL_WRMS	Weighted overall RMS difference	6	m	E	1	1	integer4	4	variable	variable
NUM_GPS_ORB_QUALITY	Number of GPS satellites that the orbit quality information is provided for F			E	1	1	u-byte	1	variable	variable
ORB_GPS_ID	GPS PRN number			F	E		u-byte	1	variable	variable
ORB_ALONG_RMS	RMS difference along track	6	m	F	E		integer4	4	variable	variable
ORB_CROSS_RMS	RMS difference cross track	6	m	F	E		integer4	4	variable	variable
ORB_RADIAL_RMS	RMS difference radial	6	m	F	E		integer4	4	variable	variable
NUM_PERIOD_CLOCK_QUALITY	Number of periods that the clock quality is provided G			1	1	1	u-integer2	2	variable	variable
CLOCK_COMPARISON_START	Start time of the clock comparison	9	s	G	1	1	u-integer8	8	variable	variable
CLOCK_ORB_COMPARISON_END	End time of the clock comparison	9	s	G	1	1	u-integer8	8	variable	variable
CLOCK_REF_FILE_NAME	Name of the reference file			G	1	1	char(88)	88	variable	variable
CLOCK_AVERAGE_RMS	Average RMS	15	s	G	1	1	integer8	8	variable	variable
CLOCK_AVERAGE_STDEV	Average standard deviation	15	s	G	1	1	integer8	8	variable	variable
NUM_GPS_CLOCK_QUALITY	Number of GPS satellites that the clock quality is provided for H			G	1	1	u-byte	1	variable	variable
CLOCK_GPS_ID	GPS PRN number			H	G	1	u-byte	1	variable	variable
CLOCK_GPS_RMS	RMS clock difference	15	s	H	G	1	integer8	8	variable	variable
CLOCK_GPS_STDEV	Standard deviation of the clock difference	15	s	H	G	1	integer8	8	variable	variable
NUM_STATION_CLOCK_QUALITY	Number of fiducial stations that the clock quality is provided for K			G	1	1	u-byte	1	variable	variable
CLOCK_FID_GPS_ID	Fiducial station ID			K	G	1	char(4)	4	variable	variable
CLOCK_FID_RMS	RMS clock difference	15	s	K	G	1	integer8	8	variable	variable
CLOCK_FID_STDEV	Standard deviation of the clock difference	15	s	K	G	1	integer8	8	variable	variable
SIZE OF THE RECORD										variable

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GRAS_Level_1_Product_Format_Specification_-_Annex[1].xls
Worksheet: VIADR-1A-METOP POD

FIELD	DESCRIPTION	SF	UNITS	DIM1	DIM2	DIM3	TYPE	TYPE SIZE	FIELD SIZE	OFFSET
RECORD_HEADER	Generic Record Header	0		1	1	1	REC_HEAD	20	20	0
Metop NRT orbit arc										
START_VALIDITY	Start time of the record validity	9	s	1	1	1	u-integer8	8	8	20
END_VALIDITY	End time of the record validity	9	s	1	1	1	u-integer8	8	8	28
SAMPLE_INTERVAL	Time sample interval used in solution	0	s	1	1	1	u-integer2	2	2	36
NUMBER_SATELLITE	Number of GPS satellites in solution	0		1	1	1	u-byte	1	1	38
PRODUCT_TYPE	NRT or enhanced POD product	0		1	1	1	enumerated	1	1	39
POSITION_UNCERTAINTY_X	Satellite position x uncertainty	6	m	1	1	1	integer8	8	8	40
POSITION_UNCERTAINTY_Y	Satellite position y uncertainty	6	m	1	1	1	integer8	8	8	48
POSITION_UNCERTAINTY_Z	Satellite position z uncertainty	6	m	1	1	1	integer8	8	8	56
VELOCITY_UNCERTAINTY_X	Satellite velocity x uncertainty	6	m/s	1	1	1	integer8	8	8	64
VELOCITY_UNCERTAINTY_Y	Satellite velocity y uncertainty	6	m/s	1	1	1	integer8	8	8	72
VELOCITY_UNCERTAINTY_Z	Satellite velocity z uncertainty	6	m/s	1	1	1	integer8	8	8	80
NUMBER_OF_EPOCHS	Number of solution epochs N			1	1	1	u-integer4	4	4	88
EPOCH_TIME	Time stamp in reference time	9	s	N	1	1	u-integer8	8	variable	92
SATELLITE_POSITION_X	Satellite position x at epoch time	6	m	N	1	1	integer8	8	variable	variable
SATELLITE_POSITION_Y	Satellite position y at epoch time	6	m	N	1	1	integer8	8	variable	variable
SATELLITE_POSITION_Z	Satellite position z at epoch time	6	m	N	1	1	integer8	8	variable	variable
SATELLITE_VELOCITY_X	Satellite velocity x at epoch time	6	m/s	N	1	1	integer8	8	variable	variable
SATELLITE_VELOCITY_Y	Satellite velocity y at epoch time	6	m/s	N	1	1	integer8	8	variable	variable
SATELLITE_VELOCITY_Z	Satellite velocity z at epoch time	6	m/s	N	1	1	integer8	8	variable	variable
SIZE OF THE RECORD										variable

Doc Ref: EPS.MIS.SPE.97234.ANX
GRAS_Level_1_Product_Format_Specification_-_Annex[1].xls
Worksheet: VIADR-1A-METOP CLOCK

FIELD	DESCRIPTION	SF	UNITS	DIM1	DIM2	DIM3	TYPE	TYPE SIZE	FIELD SIZE	OFFSET
RECORD_HEADER	Generic Record Header	0		1	1	1	REC_HEAD	20	20	0
Metop NRT orbit arc										
START_VALIDITY	Start time of the record validity	9	s	1	1	1	u-integer8	8	8	20
END_VALIDITY	End time of the record validity	9	s	1	1	1	u-integer8	8	8	28
SAMPLE_INTERVAL	Time sample interval used in solution	0	s	1	1	1	u-integer2	2	2	36
NUMBER_SATELLITE	Number of GPS satellites in solution	0		1	1	1	u-byte	1	1	38
PRODUCT_TYPE	NRT or enhanced POD product	0		1	1	1	enumerated	1	1	39
CLOCK_OFFSET_UNCERTAINTY	Satellite transmitter clock offset uncertainty	9	s	1	1	1	integer8	8	8	40
CLOCK_DRIFT_UNCERTAINTY	Satellite transmitter clock rate of change uncertainty	9	s/s	1	1	1	integer8	8	8	48
NUMBER_OF_EPOCHS	Number of solution epochs N			1	1	1	u-integer4	4	4	56
EPOCH_TIME	Time stamp in reference time	9	s	N	1	1	u-integer8	8	variable	60
CLOCK_OFFSET	Clock offset estimate	20	s	N	1	1	integer8	8	variable	variable
CLOCK_DRIFT	Satellite transmitter clock rate of change	20	s/s	N	1	1	integer8	8	variable	variable
SIZE OF THE RECORD										variable