

ANNEX E
ERS SAR.GEC
CCT and EXABYTE

Document:	ER-IS-EPO-GS-5902.5
Issue:	2.1
Date:	October 2, 1995
Prepared by:	Ola Gråbak _____
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1. INTRODUCTION

Sar Ellipsoid Geocoded Image

Acronym: **SAR.GEC**

The product SAR.GEC is a digital image generated from raw SAR data takes using up-to-date auxiliary parameters, with the best available instrumental corrections applied, precisely located and rectified onto a map projection.

The ESA SAR.GEC format is based on the general definition of the SAR CEOS format (ref. ER-IS-EPO-GS-5902).

1.1 General Structure

The product spans over two CCTs or one exabyte cassette.

In the case of a CCT, the first tape (CCT1) contains the following three files:

Volume Directory File Leader File Data Set File

1.2 Files Description

1.2.1 Volume Directory File

Volume Descriptor Record	360 bytes
Leader File Pointer Record	360 bytes
Data Set File Pointer Record	360 bytes
Text Record	360 bytes

1.2.2 Leader File

File Descriptor Record	720 bytes
Data Set Summary Record	2432 bytes
Map Projection Record	1620 bytes
Platform Position Data Record	 bytes
Facility Related Data Record General Type	12288 bytes

Facility Related Data Record Geocode Type	840 bytes
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1.2.3 Data Set File

Sar Data File Descriptor Record	 bytes
Processed Data Records	 bytes

CCT2 contains the following three files:

1.2.4 Volume Directory File (update of CCT1)

Volume Descriptor Record	360 bytes
Leader File Pointer Record	360 bytes
Data Set File Pointer Record	360 bytes
Text Record	360 bytes

1.2.5 Data Set File

Processed Data Records	 bytes
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1.2.6 Null Volume File

Volume Descriptor Record	360 bytes
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1.2.7 Notation conventions

- \$ - the use of the "\$" (dollar sign) in the documentation denotes a requirement for the blank character (ie. the ASCII pt EBCDIC space character).
- (n) - this expression is used to denote the contents of an integer binary field which will vary depending on the product type or data origin and will have to be supplied by the facility generating the tape.
- <.....> - this expression is used to denote the contents of an alphanumeric field, which will vary depending on the product type or data origin and will have to be supplied by the facility generating the tape.

<\$...\$> - this expression is used to denote a blank field.

1.2.8 File Class

	Class Code	Data Type
"8\$BIT\$ASCII\$ONLY\$\$\$\$\$\$\$\$\$\$\$\$"	"ASCO"	ASCII only data
"EBCDIC\$ONLY\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$"	"EBCO"	EBCDIC only
"BCD\$ONLY\$"	"BCDO"	BCD only
"BINARY\$ONLY\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$"	"BINO"	binary only data
"MIXED\$BINARY\$AND\$ASCII\$\$\$\$"	"MBAA"	binary & ASCII
"MIXED\$BINARY\$AND\$EBCDIC\$\$\$\$"	"MBAE"	binary & EBCDIC
"MIXED\$BINARY\$AND\$BCD\$\$\$\$\$\$\$\$"	"MBAB"	binary & BCD
"UNDEFINED,\$ETC.\$\$\$\$\$\$\$\$\$\$\$\$\$"	"UNDF"	undefined
"COMPLEX\$"	"COMP"	complex
"REAL\$"	"REAL"	floating point

1.2.9 Data Interpretation

	Format	Length
"INTEGER*1\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$"	"I*1\$"	1 byte wide
"INTEGER*2\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$"	"I*2\$"	2 byte wide
"INTEGER*4\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$"	"I*4\$"	4 byte wide

- one, two and four byte two's complement integer representation

"SIGNED\$INTEGER*1\$\$\$\$\$\$\$\$\$\$\$\$"	"IS1\$"	1 byte wide
"SIGNED\$INTEGER*2\$\$\$\$\$\$\$\$\$\$\$\$"	"IS2\$"	2 byte wide
"SIGNED\$INTEGER*4\$\$\$\$\$\$\$\$\$\$\$\$"	"IS4\$"	4 byte wide

- one, two and four byte signed integer with the most significant bit used to denote sign

"UNSIGNED\$INTEGER*1\$\$\$\$\$\$\$\$\$\$\$\$"	"IU1\$"	1 byte wide
"UNSIGNED\$INTEGER*2\$\$\$\$\$\$\$\$\$\$\$\$"	"IU2\$"	2 byte wide
"UNSIGNED\$INTEGER*4\$\$\$\$\$\$\$\$\$\$\$\$"	"IU4\$"	4 byte wide

- one, two and four byte unsigned integer with the most significant bit used as part of the pixel value, the pixel is always positive

"REAL*2\$"	"R*2\$"	2 byte wide
"REAL*4\$"	"R*4\$"	4 byte wide

"REAL*8\$"	"R*8\$"	8 byte wide
--	---------	-------------

- two, four and eight byte two's complement floating point representation with the exponent denoted in two's complement binary. (note that the REAL*8 representation is the same as double precision.)

"REAL*2\$HEXADECIMAL\$\$\$\$\$\$\$\$"	"R*2H"	2 byte wide
"REAL*4\$HEXADECIMAL\$\$\$\$\$\$\$\$"	"R*4H"	4 byte wide
"REAL*8\$HEXADECIMAL\$\$\$\$\$\$\$\$"	"R*8H"	8 byte wide

- two, four eight byte hexadecimal floating point representation with the exponent denoted as a hexadecimal exponent. (note that the REAL*8 representation is the same as double precision.)

"COMPLEX*4\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$"	"C*4\$"	4 byte wide
"COMPLEX*8\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$"	"C*8\$"	8 byte wide

- four byte field with the first half (two bytes) containing the two's complement floating point representation value of the real component and the second half containing the imaginary component. Similarly for the eight byte type, with each half of the field containing the real and imaginary pairs.

"COMPLEX\$INTEGER*2\$\$\$\$\$\$\$\$"	"CI*2"	2 byte wide
"COMPLEX\$INTEGER*4\$\$\$\$\$\$\$\$"	"CI*4"	4 byte wide
"COMPLEX\$INTEGER*8\$\$\$\$\$\$\$\$"	"CI*8"	8 byte wide

- similar to the complex floating point representation above except that each component is stored as a two's complement integer.

"COMPLEX\$SIGNED\$INTEGER*2\$\$\$\$"	"CIS2"	2 byte wide
"COMPLEX\$SIGNED\$INTEGER*4\$\$\$\$"	"CIS4"	4 byte wide
"COMPLEX\$SIGNED\$INTEGER*8\$\$\$\$"	"CIS8"	8 byte wide

- similar to the complex floating point representation above except that each component is stored as a signed integer.

"COMPLEX*4\$HEXADECIMAL\$\$\$\$\$\$"	"C*4H"	4 byte wide
"COMPLEX*8\$HEXADECIMAL\$\$\$\$\$\$"	"C*8H"	8 byte wide

- same as the floating point complex notation above except that the representation follows the hexadecimal conventions.

1.2.10 Records in products

Volume Directory File

	CEOS Codes
VOLUME DESCRIPTOR RECORD	192,192,18,18
FILE POINTER RECORD	219,192,18,18

TEXT RECORD	18,63,18,18
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Leader File

FILE DESCRIPTOR RECORD	63,192,18,18
DATA SET SUMMARY RECORD	10,10,31,20
MAP PROJECTION DATA RECORD	10,20,31,20
PLATFORM POSITION DATA RECORD	10,30,31,20
FACILITY RELATED DATA RECORD GENERAL TYPE	10,200,31,50
FACILITY RELATED DATA RECORD GEOCODED TYPE	10,200,31,50

SAR Data File

FILE DESCRIPTOR RECORD	63,192,18,18
PROCESSED DATA RECORD	50,11,31,20

Null Volume

NULL VOLUME DESCRIPTOR RECORD	(192,192,63,18)
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1.3 Note:

Fields not provided are treated as follows:(for a case of a field 8 bytes long)

Field type	Format	Filler
alphanumeric	A8	8 blanks
numeric integer	Iw	-9999999
numeric floating point	F8.2	-9999.99
numeric exponential	E8.2	-9999.99E-99

WARNING: Please be aware that the field “Example with GEC product” in the following tables, contains only an **EXAMPLE** of what can be found in a product.

2. VOLUME DIRECTORY FILE FORMAT DEFINITION

Table 1

VOLUME DESCRIPTOR RECORD

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE with GEC product	UNITS
1	1-4	B4	Record sequence number	1	
2	5-5	B1	1st record sub-type code	192	
3	6-6	B1	Record type code	192	
4	7-7	B1	2-nd record sub-type code	18	
5	8-8	B1	3-rd record sub-type code	18	
6	9-12	B4	Length of this record	360	
7	13-14	A2	ASCII/EBCDIC Flag	A	
8	15-16	A2	Blanks		
9	17-28	A12	Format control document	CCB-CCT-0002	
10	29-30	A2	Superstructure format control document	E	
11	31-32	A2	Superstructure record format revision	A	
12	33-44	A12	Logical volume generating facility software release and revision level	GEOS-2.0.0/D	
13	45-60	A16	ID of physical volume containing this volume descriptor		
14	61-76	A16	Logical volume identifier	ERS1.SAR.GEC	
15	77-92	A16	Volume set identifier	151221	
16	93-94	I2	Total number of physical volumes in the logical volume	1	
17	95-96	I2	Physical volume sequence number of the first tape within the logical volume	1	
18	97-98	I2	Physical volume sequence number of the last tape within the logical volume	1	
19	99-100	I2	Physical volume sequence number of current tape within the logical volume	1	
20	101-104	I4	First referenced file number in this physical volume within the logical volume	1	
21	105-108	I4	Logical volume number within volume set	1	
22	109-112	I4	Logical volume number within physical volume	1	
23	113-120	A8	Logical volume creation date (YYYYMMDD)	19950620	
24	121-128	A8	Logical volume creation time (HHMMSSDD, DD=deci-seconds)	12452300	
25	129-140	A12	Logical volume generation country	GERMANY	
26	141-148	A8	Logical volume generating agency	ESA	
27	149-160	A12	Logical volume generating facility	D-PAF	
28	161-164	I4	Number of pointer records in volume directory	2	
29	165-168	I4	Number of records in volume directory	4	
30	169-172	I4	Total number of logical volumes in the set	1	
31	173-260	A88	Volume descriptor spare segment (always blanks filled)		
32	261-360	A100	Local use segment		

Table 2

LEADER FILE POINTER RECORD

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE with GEC product	UNITS
1	1-4	B4	Record sequence number	2	
2	5-5	B1	1st record sub-type code	219	
3	6-6	B1	Record type code	192	
4	7-7	B1	2nd record sub-type code	18	
5	8-8	B1	3rd record sub-type code	18	
6	9-12	B4	Length of this record	360	
7	13-14	A2	ASCII/EBCDIC Flag	A	
8	15-16	A2	Blanks		
9	17-20	I4	Referenced file number	1	
10	21-36	A16	Referenced file name	ERS1.SAR.GECLEAD	
11	37-64	A28	Referenced file class	SARLEADER FILE	
12	65-68	A4	Referenced file class code	SARL	
13	69-96	A28	Referenced file data type	MIXED BINARY AND ASCII	
14	97-100	A4	Referenced file data type code	MBAA	
15	101-108	I8	Number of records in referenced file	6	
16	109-116	I8	Referenced file - descriptor record length	720	
17	117-124	I8	Referenced file maximum record length	12288	
18	125-136	A12	Referenced file record length type	VARIABLE LEN	
19	137-140	A4	Referenced file record length type code	VARE	
20	141-142	I2	Referenced file physical volume start number	1	
21	143-144	I2	Referenced file physical volume end number	1	
22	145-152	I8	Referenced file portion start, 1st record number for this physical volume	1	
23	153-160	I8	Referenced file portion end, last record number for this physical volume	6	
24	161-260	A100	File pointer spare segment		
25	261-360	A100	Local use segment		

Date		Time		Place		Remarks	
1911	10/1	10:00	10:30	St. Louis	Mo.	Left St. Louis for St. Paul	
1911	10/2	10:00	10:30	St. Paul	Mn.	Arrived St. Paul	
1911	10/3	10:00	10:30	St. Paul	Mn.	Left St. Paul for Minneapolis	
1911	10/4	10:00	10:30	Minneapolis	Mn.	Arrived Minneapolis	
1911	10/5	10:00	10:30	Minneapolis	Mn.	Left Minneapolis for Chicago	
1911	10/6	10:00	10:30	Chicago	Ill.	Arrived Chicago	
1911	10/7	10:00	10:30	Chicago	Ill.	Left Chicago for New York	
1911	10/8	10:00	10:30	New York	N.Y.	Arrived New York	
1911	10/9	10:00	10:30	New York	N.Y.	Left New York for Boston	
1911	10/10	10:00	10:30	Boston	Mass.	Arrived Boston	
1911	10/11	10:00	10:30	Boston	Mass.	Left Boston for Philadelphia	
1911	10/12	10:00	10:30	Philadelphia	Penn.	Arrived Philadelphia	
1911	10/13	10:00	10:30	Philadelphia	Penn.	Left Philadelphia for Washington	
1911	10/14	10:00	10:30	Washington	D.C.	Arrived Washington	
1911	10/15	10:00	10:30	Washington	D.C.	Left Washington for Richmond	
1911	10/16	10:00	10:30	Richmond	Virginia	Arrived Richmond	
1911	10/17	10:00	10:30	Richmond	Virginia	Left Richmond for Norfolk	
1911	10/18	10:00	10:30	Norfolk	Virginia	Arrived Norfolk	
1911	10/19	10:00	10:30	Norfolk	Virginia	Left Norfolk for New Orleans	
1911	10/20	10:00	10:30	New Orleans	La.	Arrived New Orleans	
1911	10/21	10:00	10:30	New Orleans	La.	Left New Orleans for Houston	
1911	10/22	10:00	10:30	Houston	Texas	Arrived Houston	
1911	10/23	10:00	10:30	Houston	Texas	Left Houston for Dallas	
1911	10/24	10:00	10:30	Dallas	Texas	Arrived Dallas	
1911	10/25	10:00	10:30	Dallas	Texas	Left Dallas for Fort Worth	
1911	10/26	10:00	10:30	Fort Worth	Texas	Arrived Fort Worth	
1911	10/27	10:00	10:30	Fort Worth	Texas	Left Fort Worth for El Paso	
1911	10/28	10:00	10:30	El Paso	Texas	Arrived El Paso	
1911	10/29	10:00	10:30	El Paso	Texas	Left El Paso for San Antonio	
1911	10/30	10:00	10:30	San Antonio	Texas	Arrived San Antonio	
1911	10/31	10:00	10:30	San Antonio	Texas	Left San Antonio for Austin	

Table 3

DATA FILE POINTER RECORD

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE with GEC product	UNITS
1	1-4	B4	Record number	3	
2	5	B1	1-st record subtype code	219	
3	6	B1	Record type code	192	
4	7	B1	2-nd subtype code	18	
5	8	B1	3-rd subtype code	18	
6	9-12	B4	Length of this record	360	
7	13-14	A2	ASCII/EBCDIC flag for referenced file	A	
8	15-16	A2	Blank		
9	17-20	I4	Referenced file number	2	
10	21-36	A16	Referenced file name	ERS1.SAR.GECIMGY	
11	37-64	A28	Referenced file class	IMAGERY OPTIONS FILE	
12	65-68	A4	Referenced file class code	IMOP	
13	69-96	A28	Referenced file data type	MIXED BINARY AND ASCII	
14	97-100	A4	Referenced file data type code	MBAA	
15	101-108	I8	Number of records in referenced file	8204	bytes
16	109-116	I8	Referenced file 1-st record length	16012	bytes
17	117-124	I8	Referenced file maximum record length	16012	
18	125-136	A12	Referenced file record length type	FIXED LENGTH	
19	137-140	A4	Referenced file record length type code	FIXD	
20	141-142	I2	Referenced file physical volume start number	1	
21	143-144	I2	Referenced file physical volume end number	2	
22	145-152	I8	Referenced file portion start, 1-st record number for this physical volume	1	
23	153-160	I8	Referenced file portion end, last record number for this physical volume	8204	
24	161-260	A100	File pointer spare segment		
25	261-360	A100	Local use segment		

Table 4

TEXT RECORD

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE with GEC product	UNITS
1	1-4	B4	Record sequence number	4	
2	5-5	B1	1st record sub-type code	18	
3	6-6	B1	Record type code	63	
4	7-7	B1	2nd record sub-type code	18	
5	8-8	B1	3rd record sub-type code	18	
6	9-12	B4	Length of this record	360	
7	13-14	A2	ASCII/EBCDIC Flag	A	
8	15-16	A2	Continuation flag (*)		
9	17-56	A40	Product type specifier	PRODUCT:ERS 1.SAR.GEC	
10	57-116	A60	Location and date/time of product creation	PRODUCED AT DLR/GERMANY/D-PAF ON 20-JUN-1995 12:45:23.000	
11	117-156	A40	Physical volume identification	EXA	
12	157-196	A40	Scene identification	HAWICK ESKDALE	
13	197-236	A40	Scene location	FRAME CENTER: 55.1194654 -3.2939875	
14	237-256	A20	<i>Spares</i>		
15	257-360	A104	<i>Spares</i>		

(*) this field is set to "C\$" if information is continued on the next text record (if any).

3. LEADER FILE FORMAT DEFINITION

Table 5

SAR - LEADER FILE, FILE DESCRIPTOR RECORD

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE with GEC product	UNITS
1	1-4	B4	Record Sequence Number	1	
2	5	B1	1st record sub-type code	63	
3	6	B1	Record type code	192	
4	7	B1	2nd record sub-type code	18	
5	8	B1	3rd record sub-type code	18	
6	9-12	B4	Length of this record	720	
7	13-14	A2	ASCII/EBCDIC Flag	A	
8	15-16	A2	Blanks		
9	17-28	A12	Format control document ID for this data file format	CEOS-SAR-CCT	
10	29-30	A2	Format control document revision level	B	
11	31-32	A2	File design descriptor revision letter	B	
12	33-44	A12	Generating software release and revision level	GEOS-2.0.0/D	
13	45-48	I4	File number	1	
14	49-64	A16	File name	ERS1.SAR.GECLEAD	
15	65-68	A4	Record sequence and location type flag	FSEQ	
16	69-76	I8	Sequence number location	1	
17	77-80	I4	Sequence number field length	4	
18	81-84	A4	Record Code and location type flag	FTYP	
19	85-92	I8	Record code location	5	
20	93-96	I4	Record code field length	4	
21	97-100	A4	Record length and location type flag	FLGT	
22	101-108	I8	Record length location	9	
23	109-112	I4	Record length field length	4	
24	113-113	A1	Reserved		
25	114-114	A1	Reserved		
26	115-115	A1	Reserved		
27	116-116	A1	Reserved		
28	117-180	A64	Reserved segment		
29	181-186	I6	Number of data set summary records	1	
30	187-192	I6	Data set summary record length	2432	
31	193-198	I6	Number of map projection data records	1	

32	199-204	I6	Map projection record length	1620	
33	205-210	I6	Number of platform pos. data records	1	
34	211-216	I6	Platform position record length	1442	
35	217-222	I6	Number of attitude data records	0	
36	223-228	I6	Attitude data record length	0	
37	229-234	I6	Number of radiometric data records	0	
38	235-240	I6	Radiometric record length	0	
39	241-246	I6	Number of rad. compensation records	0	
40	247-252	I6	Radiometric compensation rec. length	0	
41	253-258	I6	Number of data quality summary records	0	
42	259-264	I6	Data quality summary record length	0	
43	265-270	I6	Number of data histograms records	0	
44	271-276	I6	Data histogram record length	0	
45	277-282	I6	Number of range spectra records	0	
46	283-288	I6	Range spectra record length	0	
47	289-294	I6	Number of DEM descriptor records	0	
48	295-300	I6	DEM descriptor record length	0	
49	301-306	I6	Number of radar par. update records	0	
50	307-312	I6	Radar par. update record length	0	
51	313-318	I6	Number of annotation data records	0	
52	319-324	I6	Annotation data record length	0	
53	325-330	I6	Number of Det.processing records	0	
54	331-336	I6	Det.processing record length	0	
55	337-342	I6	Number of calibration records	0	
56	343-348	I6	Calibration record length	0	
57	349-354	I6	Number of GCP records	0	
58	355-360	I6	GCP record length	0	
59	361-366	I6	<i>Spare</i>		
60	367-372	I6	<i>Spare</i>		
61	373-378	I6	<i>Spare</i>		
62	379-384	I6	<i>Spare</i>		
63	385-390	I6	<i>Spare</i>		
64	391-396	I6	<i>Spare</i>		
65	397-402	I6	<i>Spare</i>		
66	403-408	I6	<i>Spare</i>		
67	409-414	I6	<i>Spare</i>		
68	415-420	I6	<i>Spare</i>		
69	421-426	I6	Number of facility data records	2	
70	427-432	I6	Facility data record maximum length	12288	
71	433-720	A288	Blanks		

Table 6

GEC DATA SET SUMMARY RECORD

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE with GEC product	UNITS
1	1 - 4	B4	Record sequence number	2	
2	5	B1	1-st record sub-type code	10	
3	6	B1	Record-type code	10	
4	7	B1	2 nd record sub-type code	31	
5	8	B1	3 rd record sub-type code	20	
6	9-12	B4	Length of this record	2432	
7	13-16	I4	Data Set Summary Record sequence number (starts at 1)	1	

SCENE PARAMETERS

8	17-20	I4	SAR channel indicator	1	
9	21-36	A16	Scene identifier	HAWICK ESKDALE	
10	37-68	A32	Scene reference number (e.g. orbit - frame number)	ORBIT= 19005- FRAME=2493-A-SITE=KS	
11	69-100	A32	Scene centre time (UTC) <YYYYMMDDhhmmsssttt\$...\$> [left justified] where: YYYY = year; MM = month; DD = day; hh = hours; mm = minutes; ss = seconds; ttt = milliseconds	19950304111334829	
12	101-116	A16	<i>Spare</i>		
13	117-132	F16.7	Processed scene centre geodetic latitude (positive for North latitude, negative for South latitude)	55.1194654	degrees
14	133-148	F16.7	Processed scene centre longitude (negative for West longitude)	-3.2939875	degrees
15	149-164	F16.7	Processed scene centre true heading as calculated relative to North		degrees
16	165-180	A16	Ellipsoid designator	WORLD GEODETIC S	
17	181-196	F16.7	Ellipsoid semimajor axis	6378.144	km
18	197-212	F16.7	Ellipsoid semiminor axis	6356.759	km
19	213-228	F16.7	Earth mass times gravitational constant (M . G)	3.9860044	kg.m/s ²
20	229-244	A16	<i>Spare</i>		
21	245-260	F16.7	Ellipsoid J2 parameter (contains information related to GEM6, not valid for WGS84)	1082.28	
22	261-276	F16.7	Ellipsoid J3 parameter (contains information related to GEM6, not valid for WGS84)	-2.30	
23	277-292	F16.7	Ellipsoid J4 parameter (contains information related to GEM6, not valid for WGS84)	-0.20	
24	293-308	A16	<i>Spare</i>		
25	309-324	F16.7	Average terrain height above ellipsoid at scene centre	207.922	meter

26	325-332	I8	Scene centre line number (the line number at the scene centre including zero fill)	5050	
27	333-340	I8	Scene centre pixel number (the pixel number at the scene centre including zero fill)	5000	
28	341-356	F16.7	Processed scene length including zero fill	126.25	km
29	357-372	F16.7	Processed scene width including zero fill	125.00	km
30	373-388	A16	<i>Spare</i>		

GENERAL MISSION / SENSOR PARAMETERS

31	389-392	I4	Number of SAR channels	1	
32	393-396	A4	<i>Spare</i>		
33	397-412	A16	Sensor platform mission identifier	ERS1	
34	413-444	A32	Sensor ID and mode of operation for this channel <AAAAAA-BB-CC-DD-EF> where : AAAAAA = sensor identifier; BB = SAR band; CC = resolution mode code; DD = imaging mode code; E = transmit polarisation; F = receiver polarisation	SAR- C-HR-IM-VV	
35	445-452	A8	Orbit number	19005	
36	453-460	F8.3	Sensor platform geodetic latitude at nadir corresponding to scene centre (positive for North latitude)		degrees
37	461-468	F8.3	Sensor platform longitude at nadir corresponding to scene centre (negative for West longitude)		degrees
38	469-476	F8.3	Sensor platform heading at nadir corresponding to scene centre (clockwise positive from North)		degrees
39	477-484	F8.3	Sensor clock angle as measured relative to sensor platform flight direction	90	degrees
40	485-492	F8.3	Incidence angle at scene centre as derived from sensor platform orientation	23.119	degrees
41	493-500	F8.3	Radar frequency	5.3	GHz
42	501-516	F16.7	Radar wavelength	0.0566	meters
43	517-518	A2	Motion compensation indicator "00" = no compensation, "01" = on board compensation, "10" = in processor compensation, "11" = both on board and in processor	00	
44	519-534	A16	Range pulse code specifier	Linear FM chirp	
45	535-550	E16.7	Nominal range pulse (chirp) amplitude coefficient, Constant term	1.0E+00	
46	551-566	E16.7	Nominal range pulse (chirp) amplitude coefficient, Linear term	0.0E+00	sec ⁻¹
47	567-582	E16.7	Nominal range pulse (chirp) amplitude coefficient, Quadratic term	0.0E+00	sec ⁻²
48	583-598	E16.7	Nominal range pulse (chirp) amplitude coefficient, Cubic term	0.0E+00	sec ⁻³
49	599-614	E16.7	Nominal range pulse (chirp) amplitude coefficient, Quartic term	0.0E+00	sec ⁻⁴
50	615-630	E16.7	Nominal range pulse (chirp) phase coefficient, Constant term	0.0E+00	cycles
51	631-646	E16.7	Nominal range pulse (chirp) phase coefficient, Linear term	0.0E+00	Hz

52	647-662	E16.7	Nominal range pulse (chirp) phase coefficient, Quadratic term	2.0889E+11	Hz/sec
53	663-678	E16.7	Nominal range pulse (chirp) phase coefficient, Cubic term	0.0E+00	Hz/sec ²
54	679-694	E16.7	Nominal range pulse (chirp) phase coefficient, Quartic term	0.0E+00	Hz/sec ³
55	695-702	I8	Down linked chirp extraction index	29	samples
56	703-710	A8	<i>Spare</i>		
57	711-726	F16.7	Range sampling rate	18.96	MHz
58	727-742	F16.7	Range gate delay at early edge (in time) at the start of the image		microsec
59	743-758	F16.7	Range pulse length	37.12	microsec
60	759-762	A4	<i>Reserved</i>		
61	763-766	A4	Range compressed flag (YES = range compressed data)	YES	
62-63	767-798	2 F16.7	<i>Reserved</i>		
64	799-806	I8	Quantization per channel I & Q (5I 5Q/6I 6Q for OGRC/OBRC)	5	bits
65	807-818	A12	Quantizer descriptor	Uniform I Q	
66	819-834	F16.7	DC Bias for I-component (actual value)	-0.151	
67	835-850	F16.7	DC Bias for Q-component (actual value)	-0.117	
68	851-866	F16.7	Gain imbalance for I & Q (actual value)	1.005	
69	867-882	F16.7	<i>Spare</i>		
70	883-898	F16.7	<i>Spare</i>		
71	899-914	F16.7	<i>Reserved</i>		
72	915-930	F16.7	Antenna mechanical boresight angle relative to platform vertical axis at the start of the image, positive to the right negative to the left	20.355	degrees
73	931-934	A4	<i>Reserved</i>		
74	935-950	F16.7	Pulse Repetition Frequency (PRF) (actual value)	1678.712	Hz
75	951-966	F16.7	<i>Reserved</i>		
76	967-982	F16.7	<i>Reserved</i>		

SENSOR SPECIFIC PARAMETERS

77	983-998	I16	Satellite encoded binary time code	1971655215	
78	999-1030	A32	Satellite clock time (UTC) <YYYYMMDDhhmmsssttt\$....\$> [left justified]		
79	1031-1038	I8	Satellite clock step length	3906249	nanosec
80	1039-1046	A8	<i>Spare</i>		

GENERAL PROCESSING PARAMETERS

81	1047-1062	A16	Processing facility identifier	D-PAF/DLR	
82	1063-1070	A8	Processing system identifier	GEOS	
83	1071-1078	A8	Processing version identifier	2.0.0	
84	1079-1094	A16	<i>Reserved</i>		

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85	1095-1110	A16	<i>Reserved</i>		
86	1111-1142	A32	Product type specifier	GEC	
87	1143-1174	A32	Processing algorithm identifier	Ellipsoid Reference	
88	1175-1190	F16.7	Nominal number of looks processed in azimuth	3	looks
89	1191-1206	F16.7	Nominal number of looks processed in range	1	looks
90	1207-1222	F16.7	Bandwidth per look in azimuth (null-to-null)	320	Hz
91	1223-1238	F16.7	Bandwidth per look in range	15.55	MHz
92	1239-1254	F16.7	Total processor bandwidth in azimuth	960	Hz
93	1255-1270	F16.7	Total processor bandwidth in range	15.55	MHz
94	1271-1302	A32	Weighting function designator in azimuth	Hamming	
95	1303-1334	A32	Weighting function designator in range	Hamming	
96	1335-1350	A16	Data input source	HDDT	
97	1351-1366	F16.7	Nominal resolution in range (3-dB width)	25	m
98	1367-1382	F16.7	Nominal resolution in azimuth (3-dB width)	22	m
99	1383-1398	F16.7	<i>Reserved</i>		
100	1399-1414	F16.7	<i>Reserved</i>		
101	1415-1430	F16.7	Along track Doppler frequency centroid at early edge of image, Constant term		Hz
102	1431-1446	F16.7	Along track Doppler frequency centroid at early edge of image, Linear term		Hz/sec
103	1447-1462	F16.7	Along track Doppler frequency centroid at early edge of image, Quadratic term		Hz/sec/sec
104	1463-1478	A16	<i>Spare</i>		
105	1479-1494	F16.7	Cross track Doppler frequency centroid at early edge of image, Constant term (Doppler Centroid)	-2146.780	Hz
106	1495-1510	F16.7	Cross track Doppler frequency centroid at early edge of image, Linear term (Slope of Doppler Centroid)	384744.529	Hz/sec
107	1511-1526	F16.7	Cross track Doppler frequency centroid at early edge of image, Quadratic term		Hz/sec/sec
108	1527-1534	A8	Time direction indicator along pixel direction	Increase	
109	1535-1542	A8	Time direction indicator along line direction	Decrease	
110	1543-1558	F16.7	Along track Doppler frequency rate at early edge of image, Constant term		Hz/sec
111	1559-1574	F16.7	Along track Doppler frequency rate at early edge of image, Linear term		Hz/sec/sec
112	1575-1590	F16.7	Along track Doppler frequency rate at early edge of image, Quadratic term		Hz/sec/sec/sec
113	1591-1606	A16	<i>Spare</i>		
114	1607-1622	F16.7	Cross track Doppler frequency rate at early edge of image, Constant term (Azimuth FM rate)	-2146.780	Hz/sec
115	1623-1638	F16.7	Cross track Doppler frequency rate at early edge of image, Linear term (Slope of Azimuth FM rate)	384744.529	Hz/sec/sec
116	1639-1654	F16.7	Cross track Doppler frequency rate at early edge of image, Quadratic term		Hz/sec/sec/sec
117	1655-1670	A16	<i>Spare</i>		
118	1671-1678	A8	Line content indicator	Easting	
119	1679-1682	A4	Clutterlock applied flag	No	
120	1683-1686	A4	Autofocussing applied flag	No	

121	1687-1702	F16.7	Line spacing	12.5	m
122	1703-1718	F16.7	Pixel spacing (in range)	12.5	m
123	1719-1734	A16	Processor range compression designator	Extracted chirp	
124	1735-1750	A16	<i>Spare</i>		
125	1751-1766	A16	<i>Spare</i>		

SENSOR SPECIFIC LOCAL USE SEGMENT

126/1	1767-1782	F16.7	Zero-doppler range time (two-way) of first range pixel	5.5236850	millisec
126/2	1783-1798	F16.7	Zero-doppler range time (two-way) of centre range pixel	5.6450970	millisec
126/3	1799-1814	F16.7	Zero-doppler range time (two-way) of last range pixel	5.7855920	millisec
126/4	1815-1838	A24	Zero-doppler azimuth time of first azimuth pixel (UTC) <dd-MMM-yyyy\$hh:mm:ss.ttt>	04-MAR-1995 11:13:27.215	
126/5	1839-1862	A24	Zero-doppler azimuth time of centre azimuth pixel (UTC) <dd-MMM-yyyy\$hh:mm:ss.ttt>	04-MAR-1995 11:13:34.829	
126/6	1863-1886	A24	Zero-doppler azimuth time of last azimuth pixel (UTC) <dd-MMM-yyyy\$hh:mm:ss.ttt>	04-MAR-1995 11:13:42.444	

PROCESSOR SPECIFIC LOCAL USE SEGMENT

127	1887-2006	A120	<i>Spare</i>		
128	2007-2014	I8	Number of annotation points (up to 64)		
129	2015-2022	A8	<i>Spare</i>		
130	2023-2030	I8	Line no of 1st annotation start		
131	2031-2038	I8	Pixel no of 1st annotation start		
132	2039-2054	A16	1st annotation text		
133	2055-2062	I8	Line no of 2nd annotation start		
134	2063-2070	I8	Pixel no of 2nd annotation start		
135	2071-2086	A16	2nd annotation text		
.....					
.....					
163	2375-2382	I8	Line no of 12th annotation start		
164	2383-2390	I8	Pixel no of 12th annotation start		
165	2391-2406	A16	12th annotation text		
166	2407-2432	A26	<i>Spare</i>		

The frame annotation points are max 3 points for each of the four edges of the image. The annotation text is "NnnnnnnnEeeeeee"; where nnnnnnn denotes the northing in integer meters and eeeeeee denotes the easting in integer meters of this point. The locations are selected in a way that the upper and lower frame marks are positioned to full 50000 m eastings (i.e. 3450000 next will be 3500000). The locations at the right and left image border are selected that the frame marks are positioned to full 50000 m northings. If more than two marks for one of the three borders will not fit within the image frame, the annotation line, column and text of the remaining mark is set to zero.

Table 7

MAP PROJECTION DATA RECORD

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE with GEC product	UNITS
1	1 - 4	B4	Record sequence number	3	
2	5	B1	1-st record sub-type code	10	
3	6	B1	Record-type code	20	
4	7	B1	2 nd record sub-type code	31	
5	8	B1	3 rd record sub-type code	20	
6	9-12	B4	Length of this record	1620	
7	13-28	A16	<i>Spare</i>		

MAP PROJECTION GENERAL INFORMATION

8	29-60	A32	Map projection descriptor	UTM	
9	61-76	I16	Number of pixels per line of image	9700	pixels
10	77-92	I16	Number of lines	9800	lines
11	93-108	F16.7	Nominal inter-pixel distance in output scene	12.5	m
12	109-124	F16.7	Nominal inter-line distance in output scene	12.5	m
13	125-140	F16.7	Orientation at output scene centre [for geocoded products this is simply the convergence of the meridians, ie: the angle between geographic north and map grid north (Angle of projection axis from true North)]	0.2654575	degrees
14	141-156	F16.7	Actual platform orbital inclination	98.516	degrees
15	157-172	F16.7	Actual ascending node (longitude at Equator)	2.48	degrees
16	173-188	F16.7	Geocentre to platform distance at input scene centre	7150570.67	m
17	189-204	F16.7	Platform geodetic altitude over the ellipsoid	785677.44	m
18	205-220	F16.7	Ground speed at nadir at input scene centre time		
19	221-236	F16.7	Platform heading at nadir corresponding to scene centre: effective subplatform track direction	192.508	degrees
20	237-268	A32	Name of reference ellipsoid	WGS84	
21	269-284	F16.7	Semimajor axis of ref.ellipsoid	6378.144	km
22	285-300	F16.7	Seminor axis of ref.ellipsoid	6356.759	km
23	301-316	F16.7	Datum shift parameter ref. to Greenwich : dx	0.0	m
24	317-332	F16.7	Datum shift parameter perp. to Greenwich : dy	0.0	m
25	333-348	F16.7	Datum shift parameter direct of rotation axis : dz	0.0	m
26	349-364	F16.7	Additional datum shift parameter first rotation angle	0.0	degrees
27	365-380	F16.7	Additional datum shift parameter second rotation angle	0.0	degrees
28	381-396	F16.7	Additional datum shift parameter third rotation angle	0.0	degrees

29	397-412	F16.7	Scale factor of reference ellipsoid	0.0	
30	413-444	A32	Alphanumeric description of map projection	UNIVERSAL TRANSVERSE MERCATOR	

UTM PROJECTION
(first default projection)

31	445-476	A32	UTM descriptor	UNIVERSAL TRANSVERSE MERCATOR	
32	477-480	A4	Signature of the UTM zone	UT30	
33	481-496	F16.7	Map origin (false easting)	500000.00	m
34	497-512	F16.7	Map origin (false northing)	0.0	m
35	513-528	F16.7	Longitude of centre of projection	-3.0	deg
36	529-544	F16.7	Latitude of centre of projection	0.0	deg
37	545-560	F16.7	First standard parallel	0.0	deg
38	561-576	F16.7	Second standard parallel	0.0	deg
39	577-592	F16.7	Scale factor	0.9996	

UPS PROJECTION
(second default projection)

40	593-624	A32	UPS descriptor		
41	626-640	A4	Longitude of centre of projection		deg
42	641-656	F16.7	Latitude of centre of projection		deg
43	657-672	F16.7	Scale factor		

NATIONAL SYSTEMS
(any other projection)

44	673-704	A32	Projection descriptor		
45	705-720	F16.7	Map origin (false easting)		m
46	721-736	F16.7	Map origin (false northing)		m
47	737-752	F16.7	Longitude of centre of projection		deg
48	753-768	F16.7	Latitude of centre of projection		deg
49	769-784	F16.7	Standard parallels		deg
50	785-800	F16.7	Standard parallels		deg
51	801-816	F16.7	Standard parallels		deg
52	817-832	F16.7	Standard parallels		deg

53	833-848	F16.7	Central meridian		deg
54	849-864	F16.7	Central meridian		deg
55	865-880	F16.7	Central meridian		deg
56	881-944	A64	Spare		

COORDINATES OF FOUR CORNER POINTS

57	945-960	F16.7	1st line 1st pixel (North West) northing	6171250.00	m
58	961-976	F16.7	1st line 1st pixel (North West) easting	418750.00	m
59	977-992	F16.7	1st line last pixel (North East) northing	6171250.00	m
60	993-1008	F16.7	1st line last pixel (North East) easting	543750.00	m
61	1009-1024	F16.7	Last line last pixel (South East) northing	6045000.00	m
62	1025-1040	F16.7	Last line last pixel (South East) easting	543750.00	m
63	1041-1056	F16.7	Last line 1st pixel (South West) northing	6045000.00	m
64	1057-1072	F16.7	Last line 1st pixel (South West) easting	418750.00	m
65	1073-1088	F16.7	1st line 1st pixel (North West) geodetic latitude (positive for North latitude)	55.6802505	degrees
66	1089-1104	F16.7	1st line 1st pixel (North West) longitude (negative for West longitude)	-4.2921475	degrees
67	1105-1120	F16.7	1st line last pixel (North East) geodetic latitude	55.6850785	degrees
68	1121-1136	F16.7	1st line last pixel (North East) longitude	-2.3041578	degrees
69	1137-1152	F16.7	Last line last pixel (South East) geodetic latitude	54.5506460	degrees
70	1153-1168	F16.7	Last line last pixel (South East) longitude	-2.3236029	degrees
71	1169-1184	F16.7	Last line 1st pixel (South West) geodetic latitude	54.5460165	degrees
72	1185-1200	F16.7	Last line 1st pixel (South West) longitude	-4.2560471	degrees
73	1201-1216	F16.7	North West corner terrain height relative to ellipsoid	281.00	m
74	1217-1232	F16.7	North East corner terrain height relative to ellipsoid	361.00	m
75	1233-1248	F16.7	South East corner terrain height relative to ellipsoid	260.00	m
76	1249-1264	F16.7	South West corner terrain height relative to ellipsoid	0.00	m

COEFFICIENTS FOR IMAGE TO MAP TO IMAGE CONVERSION

77	1265-1284	E20.10	Coefficient A11 to convert a line (L) and pixel (P) position to the map projection frame (E,N)	+4187.50E+02	
78	1285-1304	E20.10	Coefficient A12 to convert a line (L) and pixel (P) position to the map projection frame (E,N)	0.0	
79	1305-1324	E20.10	Coefficient A13 to convert a line (L) and pixel (P) position to the map projection frame (E,N)	+1250.00E-02	
80	1325-1344	E20.10	Coefficient A14 to convert a line (L) and pixel (P) position to the map projection frame (E,N)	0.0	
81	1345-1364	E20.10	Coefficient A21 to convert a line (L) and pixel(P) position to the map projection frame (E,N)	+6171.25E+03	

82	1365-1384	E20.10	Coefficient A22 to convert a line (L) and pixel(P) position to the map projection frame (E,N)	-1250.00E-02	
83	1385-1404	E20.10	Coefficient A23 to convert a line (L) and pixel(P) position to the map projection frame (E,N)	0.0	
84	1405-1424	E20.10	Coefficient A24 to convert a line (L) and pixel(P) position to the map projection frame (E,N)	0.0	
85	1425-1444	E20.10	Coefficient B11 to convert a map projection frame(E,N) to line and pixel position in the image (L,P)	+4937.00E+02	
86	1445-1464	E20.10	Coefficient B12 to convert a map projection frame(E,N) to line and pixel position in the image (L,P)	0.0	
87	1465-1484	E20.10	Coefficient B13 to convert a map projection frame(E,N) to line and pixel position in the image (L,P)	-8000.00E-05	
88	1485-1504	E20.10	Coefficient B14 to convert a map projection frame(E,N) to line and pixel position in the image (L,P)	0.0	
89	1505-1524	E20.10	Coefficient B21 to convert a map projection frame(E,N) to line and pixel position in the image (L,P)	3350.00E+01	
90	1525-1544	E20.10	Coefficient B22 to convert a map projection frame(E,N) to line and pixel position in the image (L,P)	8000.00E-05	
91	1545-1564	E20.10	Coefficient B23 to convert a map projection frame(E,N) to line and pixel position in the image (L,P)	0.0	
92	1565-1584	E20.10	Coefficient B24 to convert a map projection frame(E,N) to line and pixel position in the image (L,P)	0.0	
93	1585-1620	A36	Spares		

**** comment to field no 78 -93: The coefficients are derived from the following formulas:

Easting = A11 + A12 * line + A13 * column + A14 * line * column

Northing = A21 + A22 * line + A23 * column + A24 * line * column

The inverse is computed by:

Line = B11 + B12 * East + B13 * North + B14 * North * East

Column = B21 + B22 * East + B23 * North + B24 * North * East

Table 8

GEC PLATFORM POSITION DATA RECORD

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE with GEC product	UNITS
1	1 - 4	B4	Record sequence number	4	
2	5	B1	1-st record sub-type code	10	
3	6	B1	Record-type code	30	
4	7	B1	2 nd record sub-type code	31	
5	8	B1	3 rd record sub-type code	20	
6	9-12	B4	Length of this record (not fixed length)	1046	
7	13-44	A32	Orbital elements designator		
8	45-60	F16.7	1-st orbital element		
9	61-76	F16.7	2-nd orbital element		
10	77-92	F16.7	3-rd orbital element		
11	93-108	F16.7	4-th orbital element		
12	109-124	F16.7	5-th orbital element		
13	125-140	F16.7	6-th orbital element		

POSITIONAL DATA POINTS
(These are the state vectors for the geocoding)

14	141-144	I4	Number of data points (up to 64)	6	
15	145-148	I4	Year of data point <YYYY>	1994	
16	149-152	I4	Month of data point <\$\$MM>	12	
17	153-156	I4	Day of data point <\$\$DD>	4	
18	157-160	I4	Day in the year <GMT> (1st January = Day 1)		
19	161-182	E22.15	Seconds of day of data	7.805732E+04	sec
20	183-204	E22.15	Time interval between data points	4.018E+00	sec
21	205-268	A64	Reference coordinate system	Earth Centred Rotating	
22	269-290	E22.15	Greenwich mean hour angle		degrees
23	291-306	F16.7	Along track position error		meters
24	307-322	F16.7	Across track position error		meters
25	323-338	F16.7	Radial position error		meters
26	339-354	F16.7	Along track velocity error		m/sec
27	355-370	F16.7	Across track velocity error		m/sec
28	371-386	F16.7	Radial velocity error		deg/sec

FIRST POSITIONAL DATA POINT

29	387-408	E22.15	1st data point - Position vector X	4.4599626E+06	m
	409-430	E22.15	1st data point - Position vector Y	1.093685E+05	m
	431-452	E22.15	1st data point - Position vector Z	5.59626963E+06	m
30	453-474	E22.15	1st data point - Velocity vector X'	-5.61894961E+03	m/s
	475-496	E22.15	1st data point - Velocity vector Y'	-2.2451222E+03	m/s
	497-518	E22.15	1st data point - Velocity vector Z'	4.5109856E+03	m/s

SECOND POSITIONAL DATA POINT

31	519-540	E22.15	2nd data point - Position vector X	4.43734455E+06	m
	541-562	E22.15	2nd data point - Position vector Y	1.0035342E+05	m
	563-584	E22.15	2nd data point - Position vector Z	5.61434529E+06	m
32	585-606	E22.15	2nd data point - Velocity vector X'	-5.639553E+03	m/s
	607-628	E22.15	2nd data point - Velocity vector Y'	-2.24227818E+03	m/s
	629-650	E22.15	2nd data point - Velocity vector Z'	4.48649896E+03	m/s

33					
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Repetition of fields 29-30 as specified by the number of points in field 14 (usually 5 or 6 data points)

Table 9

GEC FACILITY RELATED DATA RECORD [GENERAL TYPE]

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE with GEC product	UNITS
1	1 - 4	B4	Record sequence number	5	
2	5	B1	1-st record sub-type code	10	
3	6	B1	Record-type code	200	
4	7	B1	2 nd record sub-type code	31	
5	8	B1	3 rd record sub-type code	50	
6	9-12	B4	Length of this record	12288	
7	13-76	A64	Name of this facility related data record	FACILITY RELATED DATA RECORD [ESA GENERAL TYPE]	

SIGNAL DATA QUALITY

8	77-82	A6	Date of last release of QC software <YYMMDD>		
9	83-84	A2	<i>Spare</i>		
10	85-90	A6	Date of the last calibration update <YYMMDD>	920905	
11	91-94	I4	Overall QA summary flag (Sum of the next 9 following flags)	0	
12	95-98	I4	PRF code change flag (0 = PRF constant in scene)	0	
13	99-102	I4	Sampling window start time change flag (0 = SWST constant)	0	
14	103-106	I4	Cal. system & receiver gain change flag (0 = Cal/Rx gain constant)	0	
15	107-110	I4	Chirp replica quality flag (0 = Replica XCF in limits)	0	
16	111-114	I4	Input data statistics flag (0 = Raw data mean & sd in limits)	0	
17	115-118	I4	Doppler centroid confidence measure flag (0 = in limits)	0	
18	119-122	I4	Doppler centroid value (0 = Dopp-centroid less than PRF/2)	0	
19	123-126	I4	Doppler ambiguity confidence measure flag (0 = in limits)	0	
20	127-130	I4	Output data mean flag (0 = Image mean or sd in limits)	0	
21	131-134	I4	On ground / on board range compressed flag (0 = OGRC)	0	
22	135-138	I4	Number of PRF code changes	0	
23	139-142	I4	Number of sampling window time changes	0	
24	143-146	I4	Number of calibration subsystems gain changes	0	
25	147-150	I4	Number of missing lines (i.e. raw data input lines)	172	
26	151-154	I4	Number of receiver gain changes	0	
27	155-170	F16.7	3-dB pulse width of (first) Chirp Replica Cross Correlation Function (CCF)	1.109	samples
28	171-186	F16.7	First side lobe level of chirp CCF	-10.413	dB
29	187-202	F16.7	ISLR of chirp CCF function	-7.154	dB

30	203-218	F16.7	Doppler centroid confidence measure (value normalized such that it takes a value of zero for the best case and a value of one for the worst case)	0.019	
31	219-234	F16.7	Doppler ambiguity confidence measure (value normalized such that it takes a value of one for the best case and a value of zero for the worst case)	0.954	
32	235-250	F16.7	Estimated mean of I input data (once the nominal bias of 15.5 has been applied)	-0.151	
33	251-266	F16.7	Estimated mean of Q input data (once the nominal bias of 15.5 has been applied)	-0.117	
34	267-282	F16.7	Estimated standard deviation of I input data	6.506	
35	283-298	F16.7	Estimated standard deviation of Q input data	6.473	
36	299-314	F16.7	Calibration system gain of first processed line (telemetry value)	11	
37	315-330	F16.7	Receiver gain of first processed line (telemetry value)	15	
38	331-346	F16.7	Doppler ambiguity number	0	
39	347-362	A16	<i>Spare</i>		

CALIBRATION INFORMATION

40	363-378	F16.7	Bias correction applied to I channel (to be added to the nominal bias)	-0.151	
41	379-394	F16.7	Bias correction applied to Q channel (to be added to the nominal bias)	-0.117	
42	395-410	F16.7	I/Q gain imbalance correction (applied to I channel)	1	
43	411-426	F16.7	I/Q gain imbalance correction (applied to Q channel)	1.005	
44	427-442	F16.7	I/Q non-orthogonality correction (applied to Q channel)	-0.0163841	
45	443-458	A16	<i>Spare</i>		
46	459-474	F16.7	Noise power per sample		
47	475-490	I16	Internal cal data time tag (UTC)		nanosec
48	491-494	I4	Number of valid calibration pulses	4	pulses
49	495-498	I4	Number of valid noise pulses	6	pulses
50	499-502	I4	Number of valid replica pulses	10	pulses
51	503-518	F16.7	First sample in replica (Chirp extraction index)	29	samples
52	519-534	F16.7	Mean calibration pulse power	11469.5	
53	535-550	F16.7	Mean noise pulse power	-1.0	
54	551-566	F16.7	Range compression normalisation factor	200987.28125	
55	567-582	F16.7	Replica pulse power	204671.0	
56	583-598	F16.7	Incidence angle at first range pixel (at mid-azimuth)	19.505	degrees
57	599-614	F16.7	Incidence angle at centre range pixel (at mid-azimuth)	23.119	degrees
58	615-630	F16.7	Incidence angle at last range pixel (at mid-azimuth)	26.618	degrees
59	631-646	F16.7	Slant range reference (for range spreading loss compensation)	847.0	km
60	647-658	A12	<i>Spare</i>		
61	659-662	I4	Antenna pattern correction flag (0 = no correction)	1	
62	663-678	F16.7	Absolute calibration constant K (scalar)	666610	

63	679-694	F16.7	Upper bound calibration constant K (+ 0.75 dB)	791673	
64	695-710	F16.7	Lower bound calibration constant K (- 0.75 dB)	560461	
65	711-726	F16.7	Estimated noise equivalent s^0	19.776	dB
66	727-732	A6	Date on which K was generated as YYMMDD	920905	
67	733-736	A4	K version number as XXYY, where XX refers to a K update implemented across the ground segment and YY refers to an upgrade only at the source facility (as may arise in case of local software updates)	0100	

VARIOUS PARAMETERS
(from SPH fields)

68	737-740	I4	Number of duplicated input lines	0	
69	741-756	F16.7	Estimated bit error rate		
70	757-768	A12	<i>Spare</i>		
71	769-784	F16.7	Output image mean	305.568	
72	785-800	F16.7	Output image standard deviation	155.078	
73	801-816	F16.7	Output image maximum value	30846.0	
74	817-840	A24	Time of raw data first input range line (UTC) <dd-MMM-yyyy\$hh:mm:ss.ttt>		
75	841-864	A24	Time of ascending node state vector (UTC)		
76 to 81	865-996	6E22.15	Ascending node state vectors (X,Y,Z,X',Y',Z')		m & m/s
82	997-1000	I4	Output pixel bit length	16	bits
83	1001-1016	F16.7	Processor gain #1	1.175	
84	1017-1032	F16.7	Processor gain #2	0.020	
85	1033-1048	F16.7	Processor gain #3	32.0	
86	1049-1052	I4	Peak location of Cross Correlation Function (CCF) between first extracted chirp and nominal chirp [for Bangkok processor, CCF between best extracted chirp and nominal chirp]	30	samples
87	1053-1068	F16.7	3-dB width of Cross Correlation Function (CCF) between last extracted chirp and nominal chirp	1.109	samples
88	1069-1084	F16.7	First side lobe level of chirp CCF between last extracted chirp and nominal chirp	-10.323	dB
89	1085-1100	F16.7	ISLR of chirp CCF between last extracted chirp and nominal chirp	-7.118	dB
90	1101-1104	I4	Peak location of Cross Correlation Function (CCF) between last extracted chirp and nominal chirp	30	samples
91	1105-1108	I4	Roll tilt mode flag (0 = not in roll tilt mode)	0	
92	1109-1112	I4	Raw data correction flag (0 = correction with defaults parameters)	1	
93	1113-1116	I4	Look detection flag (1 = power detected and summed)	1	
94	1117-1120	I4	Doppler ambiguity estimation flag (0 = no estimation done)	1	
95	1121-1124	I4	Azimuth baseband conversion flag (0 = no conversion done)	1	
96	1125-1128	I4	Samples per line used for the raw data analysis	1200	samples

97	1129-1132	I4	Range lines skip factor for raw data analysis	10	lines
98	1133-1156	A24	Time of input state vector (UTC) used to processed the image <dd-MMM-yyyy\$hh:mm:ss.ttt>		
99	1157-1178	E22.15	Reserved		m
100	1179-1200	E22.15	Reserved		m
101	1201-1222	E22.15	Reserved		m
102	1223-1244	E22.15	Reserved		m/s
103	1245-1266	E22.15	Reserved		m/s
104	1267-1288	E22.15	Reserved		m/s
105	1289-1292	I4	Reserved		
106	1293-1308	F16.7	Window coefficient for range-matched filter	0.75	
107	1309-1324	F16.7	Window coefficient for azimuth-matched filter	0.75	
108	1325-1328	I4	Update period of range-matched filter	2000	chirps
109	1329-1456	8 F16.7	Look scalar gains (up to 8 looks)	1,1,1,0,0,0,0,0	
110	1457-1460	I4	Sampling window start time bias	6265	nanosec
111	1461-1482	E22.15	Doppler centroid cubic coefficient	-5.0 E+12	Hz/sec ³
112	1483-1486	I4	PRF code of first range line (telemetry value)	2822	
113	1487-1490	I4	PRF code of last range line (telemetry value)	2822	
114	1491-1494	I4	Sampl. wind. start time code of first range line (telemetry value)	799	
115	1495-1498	I4	Sampl. wind. start time code of last range line (telemetry value)	799	
116	1499-1502	I4	Calibration system gain of last processed line (telemetry value)	11	
117	1503-1506	I4	Receiver gain of last processed line (telemetry value)	15	
118	1507-1510	I4	First processed range sample	1	
119	1511-1514	I4	Azimuth FFT/IFFT ratio	4	
120	1515-1518	I4	Number of azimuth blocks processed	15	
121	1519-1526	I8	Number of input raw data lines	26632	lines
122	1527-1530	I4	Initial Doppler ambiguity number	0	
123	1531-1706	11 F16.7	Thresholds for flags (fields 12 to 20)		
124	1707-1722	I16	Satellite binary time of first range line (telemetry value)		
125	1723-1726	I4	Number of valid pixels per range line (the remaining pixels are zero padded)	7662	pixels
126	1727-1730	I4	Number of range samples discarded during processing interpolations	9	samples
127	1731-1746	F16.7	I/Q gain imbalance - Lower bound	0.997	
128	1747-1762	F16.7	I/Q gain imbalance - Upper bound	1.002	
129	1763-1778	F16.7	I/Q quadrature departure - Lower bound	0.972	degrees
130	1779-1794	F16.7	I/Q quadrature departure - Upper bound	0.972	degrees
131	1795-1810	F16.7	3-dB look bandwidth	177.5	Hz
132	1811-1826	F16.7	3-dB processed Doppler bandwidth	817.5	Hz
133	1827-1830	I4	Range spreading loss compensation flag (0 = no compensation)	1	
134	1831-1831	I1	Datation flag (1 = azimuth timing improved based on timing information of range line specified in field 136)	1	

135	1832-1838	I7	Maximum error of range line timing	332082	nanosec
136	1839-1842	I4	Format number of range line used to synchronize the azimuth timing	342264	
137	1843-1846	I4	Automatic look scalar gain flag (1= automatically calculated)	0	
138	1847-1850	I4	Maximum value of look scalar gain before the look scalar gains are normalised		
139	1851-1854	I4	Replica normalisation method flag (0 = normalised by replica power, i.e. $Z' = Z \cdot c/A_r$ where A_r is the replica power and c is specified in field 54, 1 = normalised by the square root of replica power, i.e. $Z' = Z / A_r$)	1	
140	1855-1934	4 E20.10	4 coefficients of the ground range to slant range conversion polynomial . - For the <u>VMP</u>, the coefficients can be used to calculate the range time of the output range sample as follows : $T_n = (C_0 + C_1.G_n + C_2.G_n^2 + C_3.G_n^3) / Fr + T_0$ where : G_n is ground range of sample n from first range sample in metres Fr is the range sampling rate in Hz (field DSS 57) T_0 is the range time of the first output range sample (field DSS 126/1) - For the <u>Bangkok processor</u>, the coefficients can be used to calculate the slant range sample corresponding to the output range sample as follows : $S_n = C_0 + C_1.G_n + C_2.G_n^2 + C_3.G_n^3$ where : G_n is ground range sample number n S_n is the corresponding slant range sample n		
141	1935-2034	5 E20.10	5 coefficients of the antenna elevation pattern polynomial. - For the <u>VMP</u>, the coefficients can be used to calculate the antenna elevation pattern as a function of range time as follows : $A_t = C_0 + C_1.T + C_2.T^2 + C_3.T^3 + C_4.T^4$ where : A_t is expressed in dB T is the range time relative to the polynomial origin in seconds (field 142) - For the <u>Bangkok processor</u>, the coefficients can be used to calculate the antenna elevation pattern as a function of range pixel look angle as follows : $A_t = C_0 + C_1.T + C_2.T^2 + C_3.T^3 + C_4.T^4$ where : A_t is expressed in natural value (not in dB) from 1 to 0 T is the range pixel look angle in degrees	-7.1206316E+02 1.4109934E+02 -1.0455099E+01 3.4380848E-01 -4.2333874E-03	

142	2035-2050	E16.7	Range time of origin of antenna pattern polynomial		sec
143	2051-12288	A10238	<i>Spare</i>		

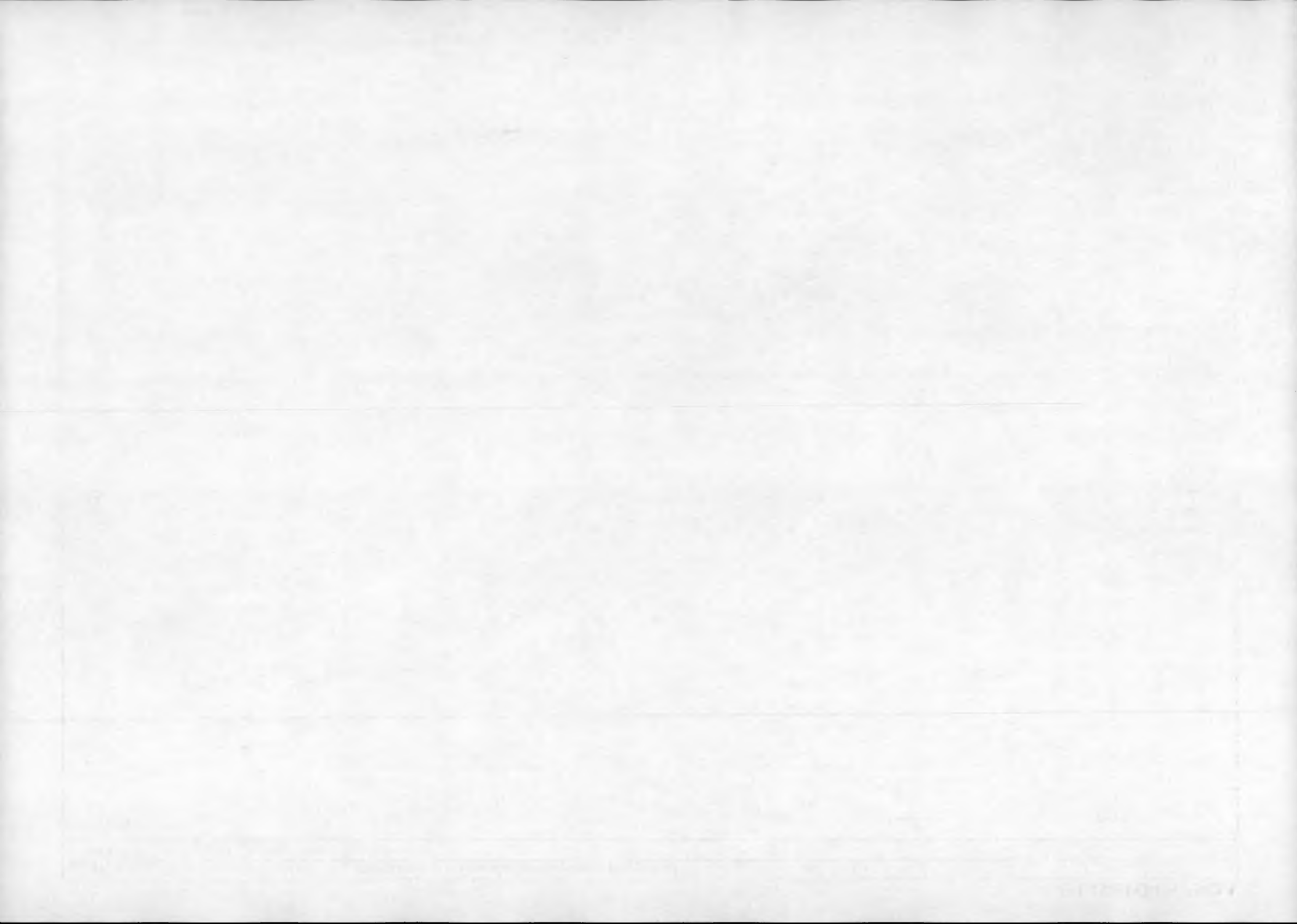


Table 10

GEC FACILITY RELATED DATA RECORD [GEOCODING AND QUALITY INFORMATION]

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE with GEC product	UNITS
1	1-4	B1	Record sequence number	6	
2	5	B1	1st record sub-type code	10	
3	6	B1	Record -type code	200	
4	7	B1	2nd record sub-type code	31	
5	8	B1	3rd record sub-type code	50	
6	9-12	B1	Length of this record	840	
7	13-16	B1	Facility related data record sequence number	1	
8	17-20	A4	Blank		
9	21-84	A64	Name of this facility related data record	GEOCODING AND QUALITY INFORMATION	
10	85-88	I4	Key-value pairs	16	
11	89-92	I4	Length of key field in bytes	16	
12	93-96	I4	Length of value field in bytes	20	
13	97-104	A8	<i>Spare</i>		

PARAMETER KEYS AND PARAMETER VALUES

14	105-120	A16	Key field first key-value pair	Q PRO_ID	
15	121-140	A20	Value field first key-value pair	1	
....					
44	645-660	A16	Key field key-value pair number 14	Q ALOC_RMSP	
45	661-680	A20	Value field key-value pair number 14		
46	681-696	F16.7	Easting of early azimuth near range position in geocoded image	9522.7498186	
47	697-712	F16.7	Northing of early azimuth near range position in geocoded image	1722.8951244	
48	713-728	F16.7	Easting of late azimuth near range position in geocoded image	7934.0655074	
49	729-744	F16.7	Northing of late azimuth near range position in geocoded image	9727.5484014	
50	745-760	F16.7	Easting of early azimuth far range position in geocoded image	1659.3709757	
51	761-776	F16.7	Northing of early azimuth far range position in geocoded image	219.2044952	
52	777-792	F16.7	Easting of late azimuth far range position in geocoded image	88.4457020	
53	793-808	F16.7	Northing of late azimuth far range position in geocoded image	8203.7407317	
54	809-824	F16.7	Number of columns in processed input product	8000.00	
55	825-840	F16.7	Number of lines in processed input product	8000.00	

4. DATA SET FILE FORMAT DEFINITION

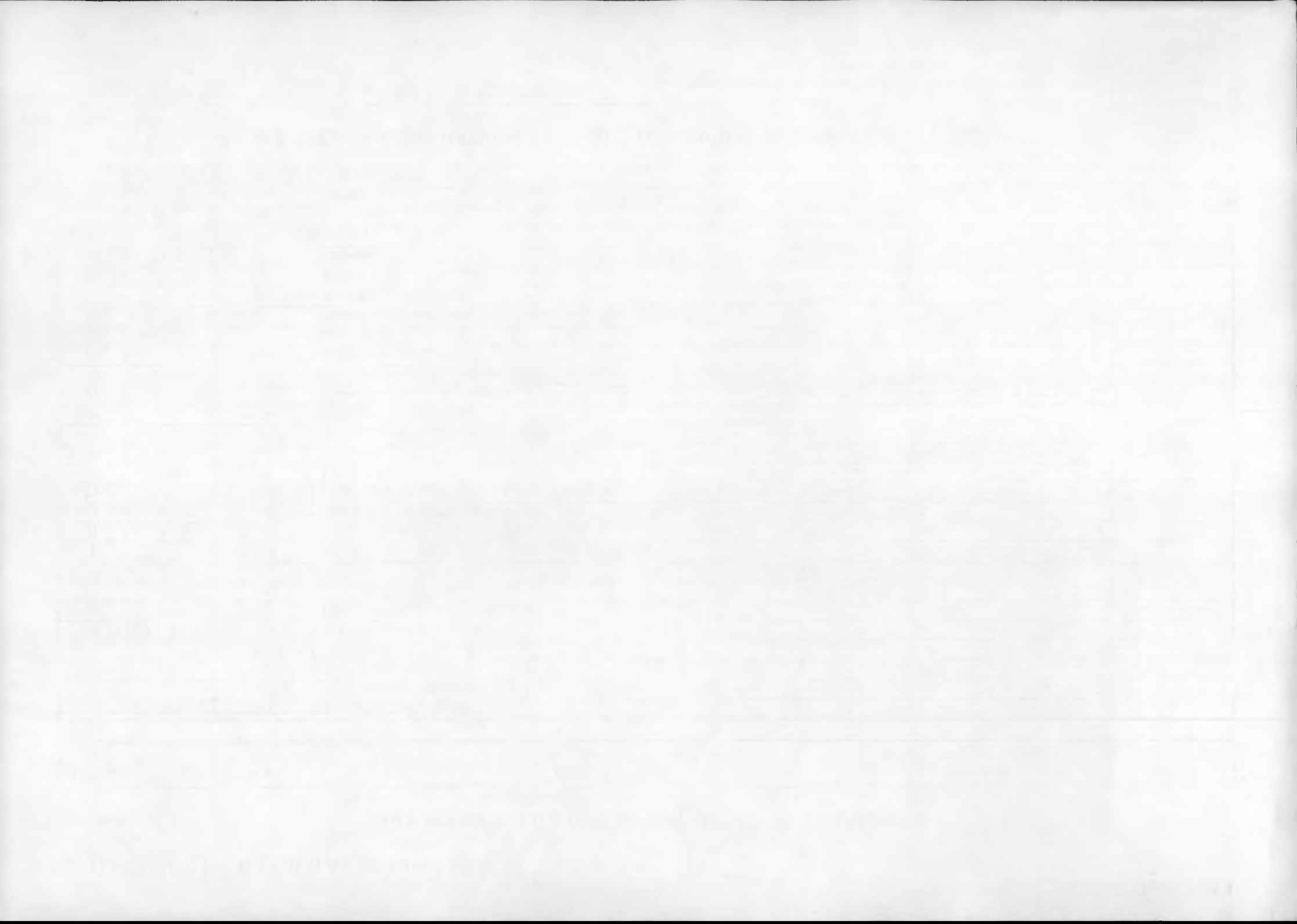
Table 11

SAR DATA FILE , FILE DESCRIPTOR RECORD (FIXED SEGMENT)

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE with GEC product	UNITS
1	1-4	B4	Record sequence number	1	
2	5	B1	1st record sub-type code	63	
3	6	B1	Record sub-type code	192	
4	7	B1	2nd record sub-type code	18	
5	8	B1	3rd record sub-type code	18	
6	9-12	B4	Length of this record (nominally)	19592	
7	13-14	A2	ASCII/EBCDIC flag	A	
8	15-16	A2	Blanks		
9	17-28	A12	Format control document ID for this data file format	CEOS-SAR-CCT	
10	29-30	A2	Format control document revision level	B	
11	31-32	A2	File design descriptor revision letter	B	
12	33-44	A12	Generating software release and revision level	GEOS-2.0.0/D	
13	45-48	I4	File number	2	
14	49-64	A16	File name	ERS1.SAR.GECIMGY	
15	65-68	A4	Record sequence and location type flag	FSEQ	
16	69-76	I8	Sequence number location	1	
17	77-80	I4	Sequence number field length	4	
18	81-84	A4	Record code and location type flag	FTYP	
19	85-92	I8	Record code location	5	
20	93-96	I4	Record code field length	4	
21	97-100	A4	Record length and location type flag	FLGT	
22	101-108	I8	Record length location	9	
23	109-112	I4	Record length field length	4	
24	113	A1	<i>Reserved</i>		
25	114	A1	<i>Reserved</i>		
26	115	A1	<i>Reserved</i>		
27	116	A1	<i>Reserved</i>		
28	117-180	A64	Reserved segment		

SAR DATA IMAGERY OPTIONS FILE, FILE DESCRIPTOR RECORD (VARIABLE SEGMENT)

29	181-186	I6	Number of SAR DATA records (nominal)	9800	
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30	187-192	I6	SAR DATA record length	19592	bytes
31	193-216	A24	<i>Reserved</i>		

SAMPLE GROUP DATA

32	217-220	I4	Number of bits per sample	16	
33	221-224	I4	Number of samples per data group (or pixels)	1	
34	225-228	I4	Number of bytes per data group (or pixels)	2	
35	229-232	A4	Justification and order of samples within data group		

SAR RELATED DATA IN THE RECORD

36	233-236	I4	Number of SAR channels in this file	1	
37	237-244	I8	Number of lines per data set (nominal)	9800	
38	245-248	I4	Number of left border pixels per line	0	
39	249-256	I8	Total number of data groups per line per SAR channel	9700	
40	257-260	I4	Number of right border pixels per line	0	
41	261-264	I4	Number of topborder lines	0	
42	265-268	I4	Number of bottom border lines	0	
43	269-272	A4	Interleaving indicator	BSQ	

RECORD DATA IN THE FILE

44	273-274	I2	Number of physical records per line	1	
45	275-276	I2	Number of physical records per multi-channel line	1	
46	277-280	I4	Number of bytes of prefix data per record	180	
47	281-288	I8	Number of bytes of SAR data(or pixel data) per record(nominal)	19400	
48	289-292	I4	Number of bytes of suffix data per record	0	
49-55	293-340	A48	<i>Reserved</i>		
56	341-368	A28	Blanks		
57-60	369-400	A32	<i>Reserved</i>		
61	401-428	A28	SAR Data format type identifier	UNSIGNED INTEGER	
62	429-432	A4	SAR Data format type code	U12	
63	433-436	I4	Number of left fill bits within pixel	0	
64	437-440	I4	Number of right fill bits within pixel	0	
65	441-448	I8	Maximum data range of pixel	65535	
66	449-EOR	A15564	<i>Spare</i>		

Table 12

IMAGERY OPTIONS FILE, PROCESSED DATA RECORD

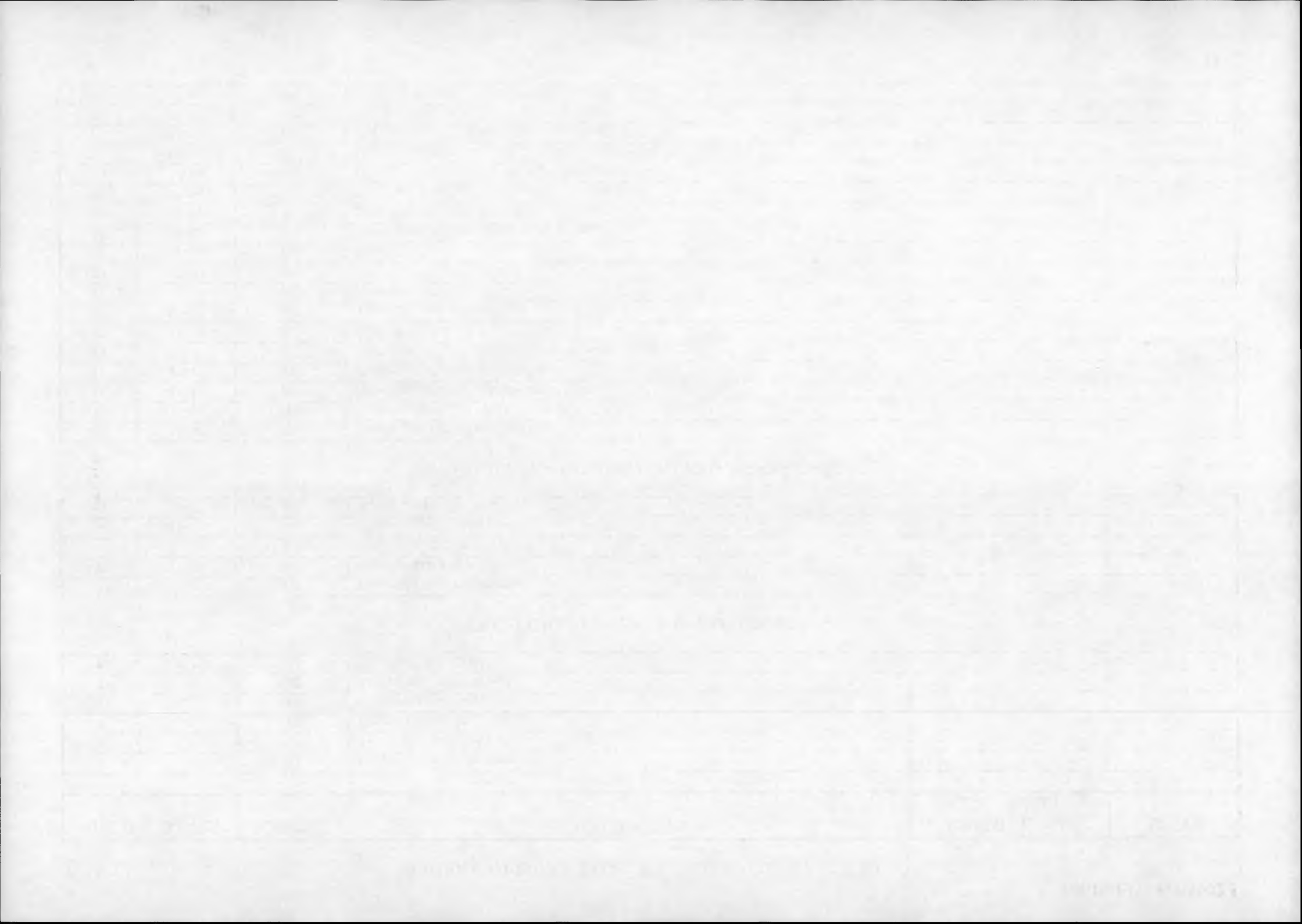
FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE with GEC product	UNITS
1	1-4	B4	Record sequence number		
2	5	B1	1-st record sub-type code		
3	6	B1	Record type code		
4	7	B1	2-nd record sub-type code		
5	8	B1	3-rd record sub-type code		
6	9-12	B4	Length of this record		

PREFIX DATA - GENERAL INFORMATION,

7	13-16	B4	Processed data line number		
8	17-20	B4	Processed data record index		
9	21-24	B4	Actual count of left-fill pixels		
10	25-28	B4	Actual count of data pixels		
11	29-32	B4	Actual count of right-fill pixels		

PREFIX DATA - SENSOR/PROCESSING PARAMETERS,

12	33-36	B4	Sensor parameters update flag		
13	37-40	B4	Sensor acquisition year		
14	41-44	B4	Sensor acquisition day of year		
15	45-48	B4	Sensor acquisition msec of day		
16	49-50	B2	SAR channel indicator (sequence number in multichannel SAR data)		
17	51-52	B2	SAR channel code		
18	53-54	B2	Transmitted polarization		
19	55-56	B2	Received polarization		
20	57-60	B4	PRF		
21	61-64	B4	<i>Spare</i>		
22	65-68	B4	Slant/range to first data sample in meters		
23	69-72	B4	Slant/range to mid data sample in meters		
24	73-76	B4	Slant/range to last data sample in meters		
25	77-80	B4	Doppler centroid value at first data sample in Hz		
26	81-84	B4	Doppler centroid value at mid data sample in Hz		
27	85-88	B4	Doppler centroid value at last data sample in Hz		
28	89-92	B4	Azimuth FM rate of the first data sample		
29	93-96	B4	Azimuth FM rate of the mid data sample		



30	97-100	B4	Azimuth FM rate of the last data sample		
31	101-104	B4	Radar look angle of nadir		(10 ⁻⁶ deg)
32	105-108	B4	Radar azimuth/squint angle		(10 ⁻⁶ deg)
33	109-112	B4	<i>Spare</i>		
34	113-116	B4	<i>Spare</i>		
35	117-120	B4	<i>Spare</i>		
36	121-124	B4	<i>Spare</i>		
37	125-128	B4	<i>Spare</i>		

PREFIX DATA - GEOGRAPHIC REFERENCE INFO.

38	129-136	B4	Geographic ref. parameter update flag		
39	133-136	B4	Latitude of first pixel		(10 ⁻⁶ deg)
40	137-140	B4	Latitude of mid-pixel		(10 ⁻⁶ deg)
41	141-144	B4	Latitude of last pixel		(10 ⁻⁶ deg)
42	145-148	B4	Longitude of first pixel		(10 ⁻⁶ deg)
43	149-152	B4	Longitude of mid-pixel		(10 ⁻⁶ deg)
44	153-156	B4	Longitude of last pixel		(10 ⁻⁶ deg)
45	157-160	B4	Northing of 1-st pixel		(m)
46	161-164	B4	<i>Spare</i>		
47	165-168	B4	Northing of last pixel		(m)
48	169-172	B4	Easting of 1-st pixel		(m)
49	173-176	B4	<i>Spare</i>		
50	177-180	B4	Easting of last pixel		(m)
51	181-184	B4	Orientation of image line		(10 ⁻⁶ deg)
52	185-188	B4	<i>Spare</i>		
53	189-192	B4	<i>Spare</i>		

SAR PROCESSED DATA

54	193-196	B2	First sample of first image line		
..		..			
(n)	.. EOR	B2	Last sample of last image line		

RECEIVED

5. NULL VOLUME FORMAT DEFINITION

Table 13

NULL VOLUME DESCRIPTOR RECORD

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE with GEC product	UNITS
1	1-4	B4	Record sequence number	1	
2	5	B1	1st record sub-type code	192	
3	6	B1	Record sub-type code	192	
4	7	B1	2nd record sub-type code	63	
5	8	B1	3rd record sub-type code	18	
6	9-12	B4	Length of this record	360	
7	13-14	A2	ASCII/EBCDIC flag	A	
8	15-16	A2	Blanks		
9	17-28	A12	Format control document	CCB-CCT-0002	
10	29-30	A2	Superstructure document	E	
11	31-32	A2	Superstructure record format revision	A	
12	33-44	A12	Logical volume generating facility software release and revision level	E1SAR-GEC-01	
13	45-60	A16	ID of physical volume containing this volume descriptor		
14	61-76	A16	Logical volume identifier	0005070800004864	
15	77-92	A16	Volume set identifier	1993112310351384	
16	93-94	I2	Total number of physical volumes in the logical volume	1	
17	95-96	I2	Physical volume sequence number of the first tape within the logical volume	1	
18	97-98	I2	Physical volume sequence number of the last tape in the logical volume	1	
19	99-100	I2	Physical volume sequence number of the current tape within the logical volume	1	
20	101-104	I4	First referenced file number in this physical volume within the logical volume	1	
21	105-108	I4	Logical volume within a volume set	2	
22	109-112	I4	Logical volume number within physical volume	2	
23	113-120	A8	Logical volume creation date (YYYYMMDD)	19950620	
24	121-128	A8	Logical volume creation time (hhmmssdd, dd-deci-seconds)	12452300	
25	129-140	A12	Logical volume generation country	GERMANY	
26	141-148	A8	Logical volume agency	ESA	
27	149-160	A12	Logical volume generating facility	D-PAF	
28	161-164	I4	Number of file pointer records in volume directory	0	
29	165-168	I4	Number of records in volume directory	1	
30	169-260	A92	Volume descriptor spare segment(always blank filled)		
31	261-360	A100	Local use segment		

