
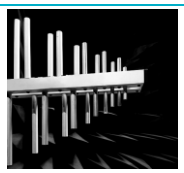
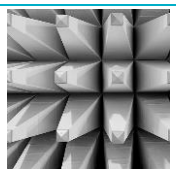

CTC advanced
member of RWTÜV group

Bundesnetzagentur

BNetzA-CAB-02/21-102

TEST REPORT

Test report no.: 1-5302/17-01-10

DAkkS Deutsche Akkreditierungsstelle D-PL-12076-01-03

Testing laboratory

CTC advanced GmbH
Untertuerkheimer Strasse 6 – 10
66117 Saarbruecken / Germany
Phone: + 49 681 5 98 - 0
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Internet: http://www.ctcadvanced.com
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Accredited Testing Laboratory:
The testing laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025 (2005) by the Deutsche Akkreditierungsstelle GmbH (DAkkS)
The accreditation is valid for the scope of testing procedures as stated in the accreditation certificate with the registration number: D-PL-12076-01-03

Applicant

Thrane & Thrane A/S
Lundtoftegaardsvej 93D
2800 Kgs. Lyngby / DENMARK
Phone: +45 39 55 88 00
Fax: +45 3955 8888
Contact: Morten Becker Saul
e-mail: morten.saul@cobham.com
Phone: +45 3955 8209

Manufacturer

Thrane & Thrane A/S
Lundtoftegaardsvej 93D
2800 Kgs. Lyngby / DENMARK

Test standard/s

CFR 47 Part 25	Satellite Communications
RSS-170	Mobile Earth Stations and Ancillary Terrestrial Component Equipment Operating in the Mobile-Satellite Service Bands

For further applied test standards please refer to section 3 of this test report.

Test Item

Kind of test item:	**Iridium NEXT Satellite Terminal consisting of a BDU and an ADU SAILOR 4300 L-Band System**
Model name:	**ADU 404352A** **BDU 404338A**
FCC ID:	**ROJ4330A**
IC:	**6200B-404330A**
Frequency:	Tx: 1610 – 1626.5 MHz Rx: 1610 – 1626.5 MHz
Antenna:	Maritime antenna
Power supply:	12V/24V DC from power supply
Temperature range:	-30°C to +55°C

This test report is electronically signed and valid without handwritten signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

Test report authorized:

Geraldy Karsten
cn=Karsten Geraldy, o=CTC advanced GmbH, ou=GER-2017-03-14, email=Karsten.Geraldy@ctcadvanced.com, c=DE
2018.04.06 14:01:37 +02'00'

Karsten Geraldy
Lab Manager
Radio Communications & EMC

Test performed:

M. Walla
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2018.04.03 22:05:01 +02'00'

Meheza Walla
Lab Manager
Radio Communications & EMC

1 Table of contents

2 General information

2.1 Notes and disclaimer

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This test report is electronically signed and valid without handwritten signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

2.2 Application details

Date of receipt of order:	2018-01-03
Date of receipt of test item:	2018-01-29
Start of test:	2018-01-29
End of test:	2018-02-09
Person(s) present during the test:	Mr. Maaloe Bjarre, Mr. Sorensen Yassin Thomas, Mr. Gronbaek Johansen Morten

2.3 Test laboratories sub-contracted

None

3 Test standard/s

Test standard	Date	Description
CFR 47 Part 25	2013-10	Satellite Communications
RSS-170	2011-03	Mobile Earth Stations and Ancillary Terrestrial Component Equipment Operating in the Mobile-Satellite Service Bands

Guidance	Version	Description
ANSI C63.4-2014	-/-	American national standard for methods of measurement of radio-noise emissions from low-voltage electrical and electronic equipment in the range of 9 kHz to 40 GHz
ANSI C63.10-2013	-/-	American national standard of procedures for compliance testing of unlicensed wireless devices

4 Test environment

Temperature	:	T_{nom} T_{max} T_{min}	+22 °C during room temperature tests +55 °C during high temperature tests -30 °C during low temperature tests
Relative humidity content	:		55 %
Barometric pressure	:		not relevant for this kind of testing
Power supply	:	V_{nom}	12V/24V DC from power supply

5 Test item

5.1 General description

Kind of test item	**:**	**Iridium NEXT Satellite Terminal consisting of a BDU and an ADU**
Type identification	**:**	**SAILOR 4300 L-Band System** **ADU 404352A** **BDU 404338A**
HMN:		-/-
PMN:		TT-4338A
HVIN:		TT-4338A
FVIN:		-/-
S/N serial number	:	ADU 404352A 0000000002 BDU 404338A 0000000001
HW hardware status	:	Version B
SW software status	:	-/-
Frequency band	:	Tx: 1610 – 1626.5 MHz Rx: 1610 – 1626.5 MHz
Type of modulation	:	APSK, QPSK
TX output power cond.:		37.60 dBm (measured value)
TX output power rad. (EIRP):		46.30 dBm (calculated value)
Number of channels		30 subbands + 0.5 MHz paging
Channel spacing	:	333.333 kHz
Antenna	:	Maritime antenna
Power supply	:	12V/24V V DC from power supply
Temperature range	:	-30 °C to +55 °C

5.2 Additional information

The content of the following annexes is defined in the QA. It may be that not all of the listed annexes are necessary for this report, thus some values in between may be missing.

EUT external photos are included in test report: 1-5302/17-01-01_AnnexA

EUT internal photos are included in test report: 1-5302/17-01-01_AnnexB

Test setup photos are included in test report: 1-5302/17-01-01_AnnexD

5.3 Operating conditions

The measurements were performed on 3 frequencies:

fl: 1616 MHz
fm: 1621 MHz
fh: 1626 MHz

Modulation Name	Modulation Type	Symbole rate (ksps)	Bit rate (kbps)	Allocated Bandwidth	Measured OBW
B1	DE-QPSK	25	50	41.666 kHz	33 kHz
B7	DE-QPSK x7	175	350	333.333 kHz	279 kHz
B8	DE-QPSK x8	175	350	333.333 kHz	321 kHz
B14	DE-QPSK x14	350	700	666.666 kHz	610 kHz
C1-QPSK	QPSK	30	60	41.666 kHz	36 kHz
C2-QPSK	QPSK	60	120	83.333 kHz	68 kHz
C8-QPSK	QPSK	240	480	333.333 kHz	267 kHz
C8-16APSK	16APSK	240	960	333.333 kHz	267 kHz
TX off	-/-	-/-	-/-	-/-	-/-

6 Sequence of testing

6.1 Sequence of testing radiated spurious 9 kHz to 30 MHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, a 2-axis positioner with 1.5 m height is used.*
- If the EUT is a floor standing device, it is placed directly on the turn table.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

Note: According to ANSI C63.4 a test site with no reference ground plane shall take precedence to show the compliance with the standard. In contrast to a semi-anechoic chamber with conductive ground, the EUT distance to the ground in a fully anechoic chamber is irrelevant because it is a reflection-reduced environment at any distance to the ground structure, so in this case a height of 1.5 m was used.

Premeasurement

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna height is 1.5 m.
- At each turntable position the analyzer sweeps with positive-peak detector to find the maximum of all emissions.

Final measurement

- Identified emissions during the premeasurement are maximized by the software by rotating the turntable from 0° to 360°. In case of the 2-axis positioner is used the elevation axis is also rotated from 0° to 360°.
- The final measurement is done in the position (turntable and elevation) causing the highest emissions with quasi-peak (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. A plot with the graph of the premeasurement and the limit is stored.

6.2 Sequence of testing radiated spurious 30 MHz to 1 GHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 10 m or 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

Premeasurement

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height changes from 1 m to 3 m.
- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement

- The final measurement is performed for at least six highest peaks according to the requirements of the ANSI C63.4.
- Based on antenna and turntable positions at which the peak values are measured the software maximize the peaks by changing turntable position ± 45° and antenna height between 1 and 4 m.
- The final measurement is done with quasi-peak detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement with marked maximum final results and the limit is stored.

6.3 Sequence of testing radiated spurious 1 GHz to 18 GHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, a 2-axis positioner with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed directly on the turn table.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

Premeasurement

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height is 1.5 m.
- At each turntable position and antenna polarization the analyzer sweeps with positive peak detector to find the maximum of all emissions.

Final measurement

- The final measurement is performed for at least six highest peaks according to the requirements of the ANSI C63.4.
- Based on antenna and turntable positions at which the peak values are measured the software maximizes the peaks by rotating the turntable from 0° to 360°. This measurement is repeated for different EUT-table positions (0° to 150° in 30°-steps) and for both antenna polarizations.
- The final measurement is done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and RMS detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement with marked maximum final results and the limit is stored.

6.4 Sequence of testing radiated spurious above 18 GHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet.
- The measurement distance is as appropriate (e.g. 0.5 m).
- The EUT is set into operation.

Premeasurement

- The test antenna is handheld and moved carefully over the EUT to cover the EUT's whole sphere and different polarizations of the antenna.

Final measurement

- The final measurement is performed at the position and antenna orientation causing the highest emissions with Peak and RMS detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement and the limit is stored.

7 Description of the test setup

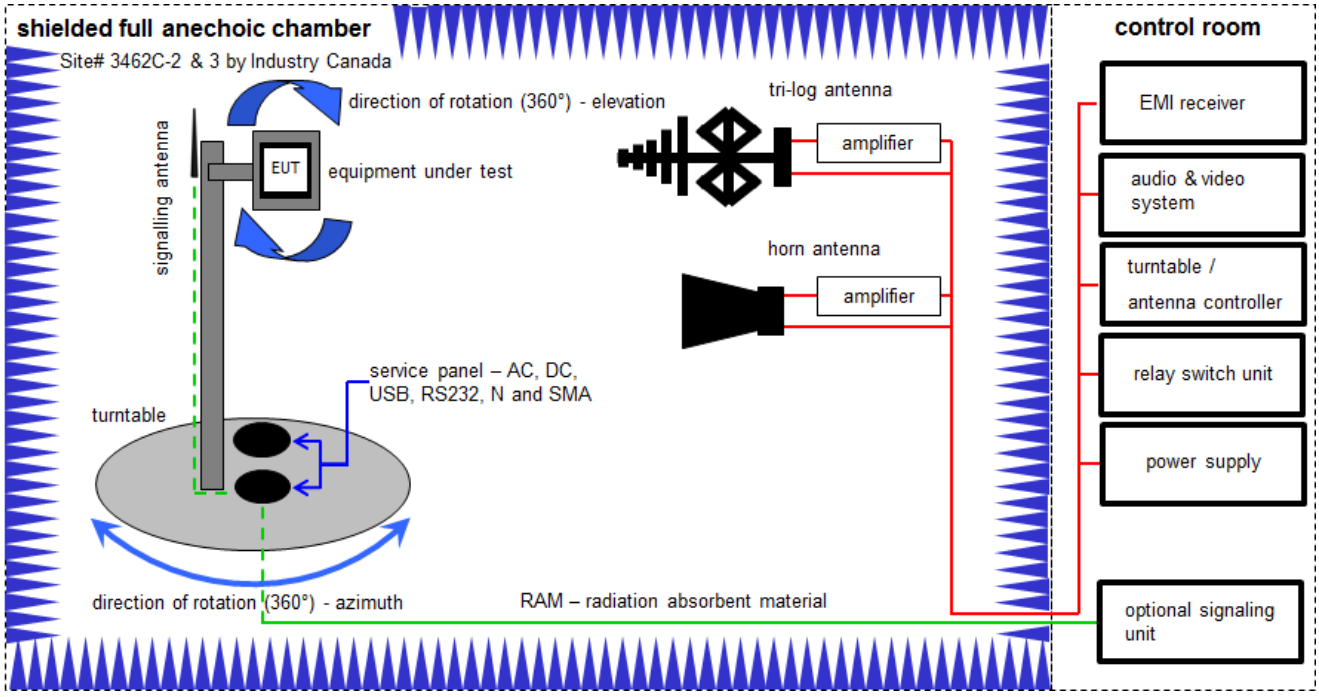
Typically, the calibrations of the test apparatus are commissioned to and performed by an accredited calibration laboratory. The calibration intervals are determined in accordance with the DIN EN ISO/IEC 17025. In addition to the external calibrations, the laboratory executes comparison measurements with other calibrated test systems or effective verifications. Weekly chamber inspections and range calibrations are performed. Where possible, RF generating and signaling equipment as well as measuring receivers and analyzers are connected to an external high-precision 10 MHz reference (GPS-based or rubidium frequency standard).

In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

Agenda: Kind of Calibration

k	calibration / calibrated	EK	limited calibration
ne	not required (k, ev, izw, zw not required)	zw	cyclical maintenance (external cyclical maintenance)
ev	periodic self verification	izw	internal cyclical maintenance
Ve	long-term stability recognized	g	blocked for accredited testing
vlkl!	Attention: extended calibration interval		
NK!	Attention: not calibrated	*)	next calibration ordered / currently in progress

7.1 Shielded fully anechoic chamber



Measurement distance: tri-log antenna and horn antenna 3 meter

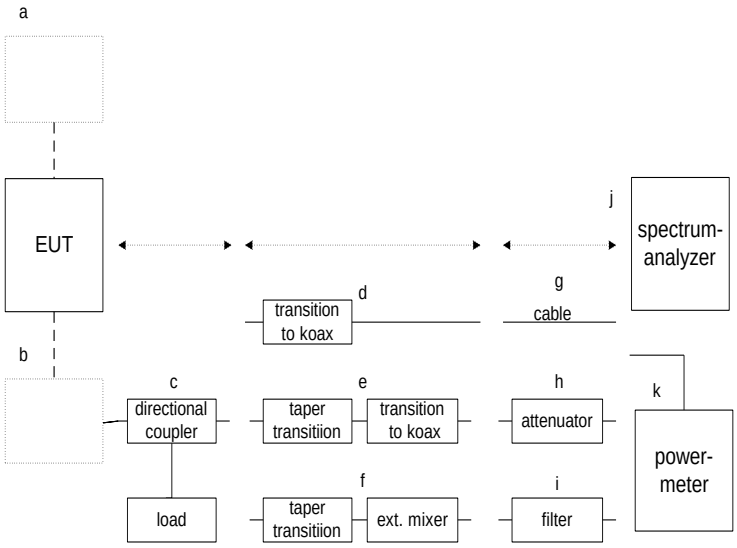
OP = AV + D - G + CA
(OP-radiated output power; AV-analyzer value; D-free field attenuation of measurement distance; G-antenna gain+amplifier gain; CA-loss signal path)

Example calculation:
OP [dBm] = -65.0 [dBm] + 50 [dB] - 20 [dBi] + 5 [dB] = -30 [dBm] (1 µW)

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	n. a.	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996	ev	-/-	-/-
2	n. a.	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	9107-3697	300001605	vIKI!	14.02.2017	13.02.2019
3	n. a.	Switch / Control Unit	3488A	HP	*	300000199	ne	-/-	-/-
4	n. a.	Variable isolating transformer	MPL IEC625 Bus Variable isolating transformer	Erfi	91350	300001155	ne	-/-	-/-
5	n. a.	Highpass Filter	WHKX2.9/18G-12SS	Wainwright	1	300003492	ev	-/-	-/-
6	n. a.	EMI Test Receiver 20Hz- 26,5GHz	ESU26	R&S	100037	300003555	k	20.12.2017	19.12.2018
7	n. a.	Highpass Filter	WHK1.1/15G-10SS	Wainwright	3	300003255	ev	-/-	-/-
8	n. a.	Highpass Filter	WHKX7.0/18G-8SS	Wainwright	19	300003790	ne	-/-	-/-
9	n. a.	MXG Microwave Analog Signal Generator	N5183A	Agilent Technologies	MY47420220	300003813	k	27.01.2017	26.01.2020
10	n. a.	High Pass Filter	VHF-3500+	Mini Circuits	-/-	400000193	ne	-/-	-/-
11	n. a.	4U RF Switch Platform	L4491A	Agilent Technologies	MY50000037	300004509	ne	-/-	-/-
12	n. a.	NEXIO EMV-Software	BAT EMC V3.16.0.49	EMCO		300004682	ne	-/-	-/-
13	n. a.	PC	ExOne	F+W		300004703	ne	-/-	-/-
14	n. a.	RF-Amplifier	AMF-6F06001800-30-10P-R	NARDA-MITEQ Inc	2011572	300005241	ev	-/-	-/-
15	n. a.	TRILOG Broadband Test-Antenna	VULB9163	Schwarzbeck Mess Elektronik	01029	300005379	k	07.04.2017	06.04.2020

7.2 Conducted measurements (RF-Laboratory)



Setup 1.2 x...x

RF-Laboratory Equipment:

No.	Lab / Item	Equipment	Type	Manufact.	Serial No.	INV. No	Kind of Calibration	Last Calibration	Next Calibration
1	n. a.	HF-Cable	SUCOFLEX 101	Huber&Suhner	3054/1		ev	-/-	-/-
2	n. a.	High Power Attenuator 30 dB	9498A	HP	2702A04550	300002403	ev	-/-	-/-
4	n. a.	Spectrum Analyzer 20 Hz - 50 GHz	FSU50	R&S	200012	300003443	k	28.10.2016	27.10.2018
5	n. a.	Temperature and Climatic Test Chamber	VUK04/500	Heraeus Voetsch	32678	300000297	nk	30.09.2015	-/-
6	n. a.	30 dB High Power Attenuator 150W	769-30	Narda	07662	property of Thrane & Thrane	-/-	-/-	-/-
7	n. a.	3 dB Bi-direct. Attenuator 50W	46-3-34	Weinschel Corp	BM0455	property of Thrane & Thrane	-/-	-/-	-/-
8	n. a.	6 dB Bi-direct. Attenuator 50W	46-6-34	Weinschel Corp	BM6859	property of Thrane & Thrane	-/-	-/-	-/-
9	n. a.	High Pass Filter	HPM50110	MICRO-TRONICS	083	property of Thrane & Thrane	-/-	-/-	-/-
10	n. a.	Diplexer Low Noise Amplifier	XN 3796	BSC FILTERS	836501	property of Thrane & Thrane	-/-	-/-	-/-

8 Measurement results

8.1 Summary

☒	**No deviations from the technical specifications were ascertained**
☐	There were deviations from the technical specifications ascertained
☐	This test report is only a partial test report. The content and verdict of the performed test cases are listed below.

TC identifier	Description	verdict	date	Remark
RF-Testing	CFR 47 Part 25 / RSS-170	see below	2018-04-03	-/-

Test Specification Clause	Test Case	Pass	Fail	NA	NP	Results
§2.1046 / §25.204/ RSS-170, 5.3.2	Measurements required: RF power output / Power limits	X				complies
§2.1051/ §25.202/ RSS-170, 5.4.3.1	Measurements required: Spurious emissions at antenna terminals / Emission limitations (conducted emissions)	X				complies
§2.1053/ §25.202/ RSS-170, 5.4.3.1	Measurements required: Field strength of spurious radiation / Emission limitations (radiated emissions)	X				complies
§25.202/ RSS-Gen Issue 4 §6.11	Transmitter frequency stability	X				complies

Note:
NA = Not applicable; NP = Not performed

8.2 Overview

I. RF power output / Power limits

Description / Limit:

§25.204 Power limits
(b) In bands shared coequally with terrestrial radiocommunication services, the equivalent isotropically radiated power transmitted in any direction towards the horizon by an earth station operating in frequency bands between 1 and 15 GHz shall not exceed the following limits except as provided for in paragraph (c) of this section:
+40 dBW in any 4 kHz band for $\theta \leq 0°$
+40 + 3 * θ dBW in any 4 kHz band for $0° < \theta \leq 5°$
θ = elevation angle above horizon

(c) For angles of elevation of the horizon greater than 5° there shall be no restriction as to the equivalent isotropically radiated power transmitted by an earth station towards the horizon.

Test setup(s):
See section 7.2: 1.2hgj

Measurement results:

Modulation Name	Transmitter conducted output power [dBm/dBW]			Transmitter radiated output power / EIRP [dBm/dBW]		
	f_{low}	f_{mid}	f_{high}	f_{low}	f_{mid}	f_{high}
B1	31.32 dBm 1.32 dBW	31.16 dBm 1.16 dBW	31.03 dBm 1.03 dBW	40.02 dBm 10.02 dBW	39.86 dBm 9.86 dBW	39.73 dBm 9.73 dBW
B7	34.31 dBm 4.31 dBW	34.29 dBm 4.29 dBW	34.07 dBm 4.07 dBW	43.01 dBm 13.01 dBW	42.99 dBm 12.99 dBW	42.77 dBm 12.77 dBW
B8	34.31 dBm 4.31 dBW	34.33 dBm 4.33 dBW	34.20 dBm 4.20 dBW	43.01 dBm 13.01 dBW	43.03 dBm 13.03 dBW	42.90 dBm 12.90 dBW
B14	34.45 dBm 4.45 dBW	34.09 dBm 4.09 dBW	33.96 dBm 3.96 dBW	43.15 dBm 13.15 dBW	42.79 dBm 12.79 dBW	42.66 dBm 12.66 dBW
C1-QPSK	31.35 dBm 1.35 dBW	31.12 dBm 1.12 dBW	30.92 dBm 0.92 dBW	40.05 dBm 10.05 dBW	39.82 dBm 9.82 dBW	39.62 dBm 9.62 dBW
C2-QPSK	31.46 dBm 1.46 dBW	31.36 dBm 1.36 dBW	31.17 dBm 1.17 dBW	40.16 dBm 10.46 dBW	40.06 dBm 10.06 dBW	39.87 dBm 9.87 dBW
C8-QPSK	31.40 dBm 1.40 dBW	31.22 dBm 1.22 dBW	31.08 dBm 1.08 dBW	40.10 dBm 10.10 dBW	39.92 dBm 9.92 dBW	39.78 dBm 9.78 dBW
C8-16APSK	**37.60 dBm** **7.60 dBW**	37.52 dBm 7.52 dBW	37.21 dBm 7.21 dBW	**46.30 dBm** **16.30 dBW**	46.22 dBm 16.22 dBW	45.91 dBm 15.91 dBW

Note: The manufacturer declared an antenna gain of 8.7 dBi.

Operating conditions of DUT:
Carrier-on radio state (for more details see table above)

Verdict: **Passed**

II. Emissions limitations (conducted emissions)

Description / Limit:

§25.202 Frequencies, frequency tolerance and emission limitations
(f) Emission limitations. Except for SDARS terrestrial repeaters, the mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the schedule set forth in paragraphs (f)(1) through (f)(4) of this section.
(1) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: 25 dB;
(2) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: 35 dB;
(3) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 250 percent of the authorized bandwidth:
An amount equal to 43 dB plus 10 times the logarithm (to the base 10) of the transmitter power in watts;
(4) In any event, when an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in paragraphs (f) (1), (2) and (3) of this section.

Test setup:
See section 7.2: 1.2hgj

Measurement results:

Conducted Spurious Emissions [dBm]								
f_{low}			f_{mid}			f_{high}		
F [MHz]	Detector	Level [dBm]	F [MHz]	Detector	Level [dBm]	F [MHz]	Detector	Level [dBm]
no critical peaks found								
Measurement uncertainty			± 1.5 dB					

n.f. = nothing found

Plots:
see section 9.1, plot 6 - 13

Verdict: **Passed**

III. Emissions limits (radiated emissions)

Description / Limit:

§25.202 Frequencies, frequency tolerance and emission limitations
(f) Emission limitations. Except for SDARS terrestrial repeaters, the mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the schedule set forth in paragraphs (f)(1) through (f)(4) of this section.
(1) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: 25 dB;
(2) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: 35 dB;
(3) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 250 percent of the authorized bandwidth:
An amount equal to 43 dB plus 10 times the logarithm (to the base 10) of the transmitter power in watts;
(4) In any event, when an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in paragraphs (f) (1), (2) and (3) of this section.

Test setup:
See section 7.1

Measurement results:

Radiated Spurious Emissions [dBm]								
f_{low}			f_{mid}			f_{high}		
F [MHz]	Detector	Level [dBm]	F [MHz]	Detector	Level [dBm]	F [MHz]	Detector	Level [dBm]
no critical peaks found								
Measurement uncertainty			± 3 dB					

n.f. = nothing found
v / h = vertical / horizontal

Plots:
see section 9.2, plots 1 - 4

Verdict: **Passed**

IV. Emissions limitations (conducted emissions)

Description / Limit:

§25.216 Limits on emissions from mobile earth stations for protection of aeronautical radionavigation-satellite service.
(h) Mobile earth stations manufactured more than six months after FEDERAL REGISTER publication of the rule changes adopted in FCC 03–283 with assigned uplink frequencies in the 1626.5–1660.5 MHz band shall suppress the power density of emissions in the 1605–1610 MHz band-segment to an extent determined by linear interpolation from -70 dBW/MHz at 1605 MHz to -46 dBW/MHz at 1610 MHz, averaged over any 2 millisecond active transmission interval. The e.i.r.p of discrete emissions of less than 700 Hz bandwidth from such stations shall not exceed a level determined by linear interpolation from -80 dBW at 1605 MHz to -56 dBW at 1610 MHz, averaged over any 2 millisecond active transmission interval.

(i) The e.i.r.p density of carrier-off state emissions from mobile earth stations manufactured more than six months after FEDERAL REGISTER publication of the rule changes adopted in FCC 03–283 with assigned uplink frequencies between 1 and 3 GHz shall not exceed -80 dBW/MHz in the 1559–1610 MHz band averaged over any two millisecond interval.

Test setup:
See section 7.2: 1.2hgj

Measurement results:

Conducted Spurious Emissions [dBm]								
f_{low}			f_{mid}			f_{high}		
F [MHz]	Detector	Level [dBm]	F [MHz]	Detector	Level [dBm]	F [MHz]	Detector	Level [dBm]
no critical peaks found								
Measurement uncertainty			± 1.5 dB					

n.f. = nothing found

Plots:
see section 9.1, plot 14 - 21

Verdict: **Passed**

V. Transmitter frequency stability

Description / Limit:

§25.202 Frequencies, frequency tolerance and emission limitations
(4)(i) The following frequencies are available for use by the 1.6 GHz Mobile-Satellite Service:
1610-1626.5 MHz: User-to-Satellite Link
1613.8-1626.5 MHz: Satellite-to-User Link (secondary)

(iii)(A) The following frequencies are available for use by the 1.6 GHz Mobile-Satellite Service:
1626.5-1660.5 MHz: Earth-to-space

RSS-Gen Issue 4 §6.11
In circumstances when the transmitter frequency stability is not stated in the applicable RSS or reference measurement method, the following applies:

Frequency stability is a measure of frequency drift due to temperature and supply voltage variations, with reference to the frequency measured at an appropriate reference temperature and the rated supply voltage. Unless specified otherwise in an RSS applicable to the device, the reference temperature for radio transmitters is +20°C (+68°F).

Test setup:
See section 7.2: 1.2hgj

Measurement results:

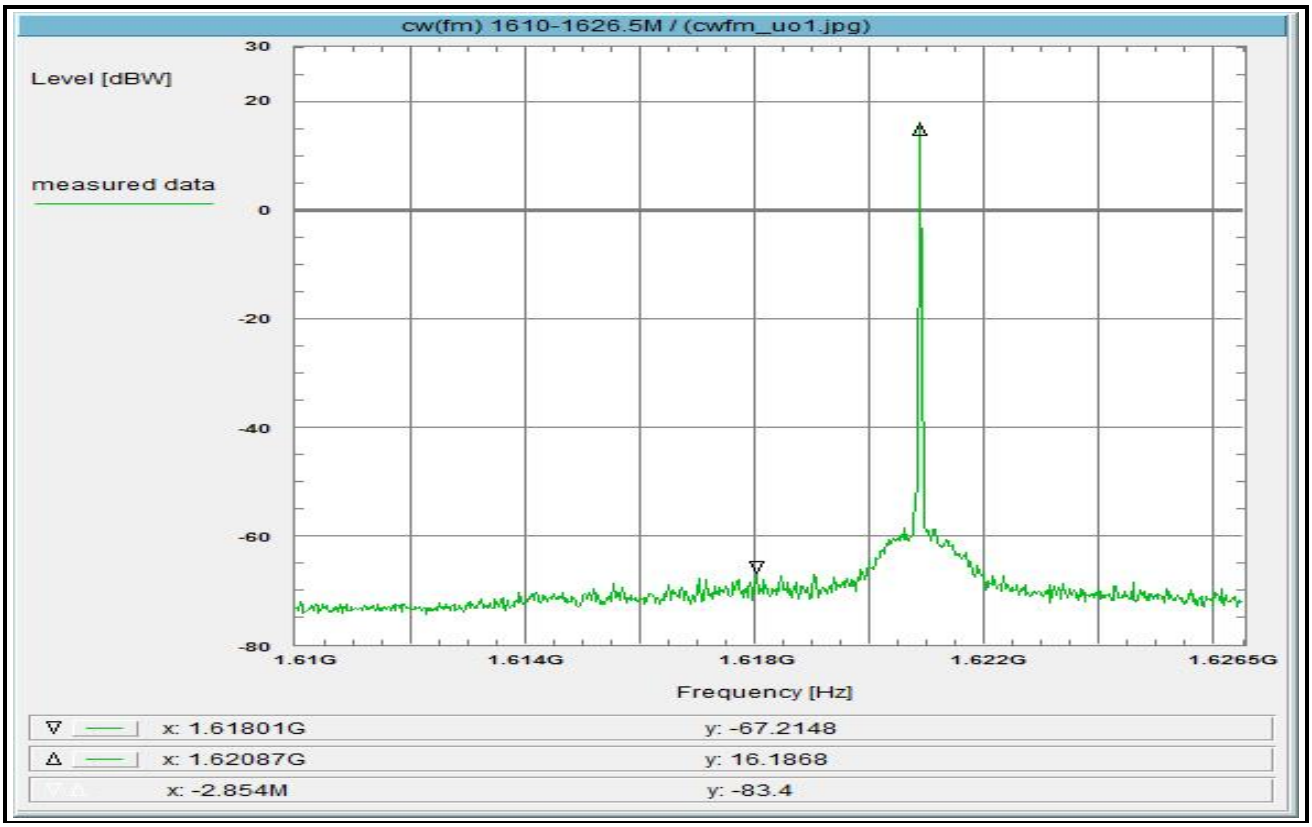
Temperature [°C]	Voltage [V DC]	Reference Frequency [MHz]	Measured Frequency [MHz]	Deviation [ppm]
-30	V_{nom}	fm: 1620. 854 255 (deviation based on 20 °C)	1620. 854 880	0.38
-20	V_{nom}		1620. 854 850	0.36
-10	V_{nom}		1620. 854 840	0.36
0	V_{nom}		1620. 854 815	0.35
+10	V_{nom}		1620. 854 780	0.32
+20	V_{min} - V_{max}		1620. 854 255	0.00
+30	V_{nom}		1620. 854 580	0.20
+40	V_{nom}		1620. 854 550	0.18
+50	V_{nom}		1620. 854 360	0.06
+55	V_{nom}		1620. 854 325	0.04

9 Plots

9.1 FCC Part 25

This annex consists of 22 pages including this page.

Plot No. 1 (21)



Subclause: -/- Function test
CW-rf-carrier in the middle of the band (fm)
Measurement within the band

Limit:
no limits defined

This test serves to verify the general function of the EUT and for orientation regarding to the spurious emissions which are expected within the band, furthermore for comparison of the actual power with the rated value at cw-carrier adjusted in the middle of the band (EIRP).

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see subclause 1.5.2
CW, fm

Test setup:
see section 7.2: 1.2hgj

Test equipment:
see annex 2: C218, R001, U005

Remark:

Test result: **Measurement for orientation**

Environment condition:

Date & Time:	Fri 02/Feb/2018 10:46:29	
Location:	CTC advanced GmbH, Laboratory RSC-Sat	
Temperature:	22	°C
Humidity:	45	%
Voltage:	24	V DC

Setup of measurement equipment:

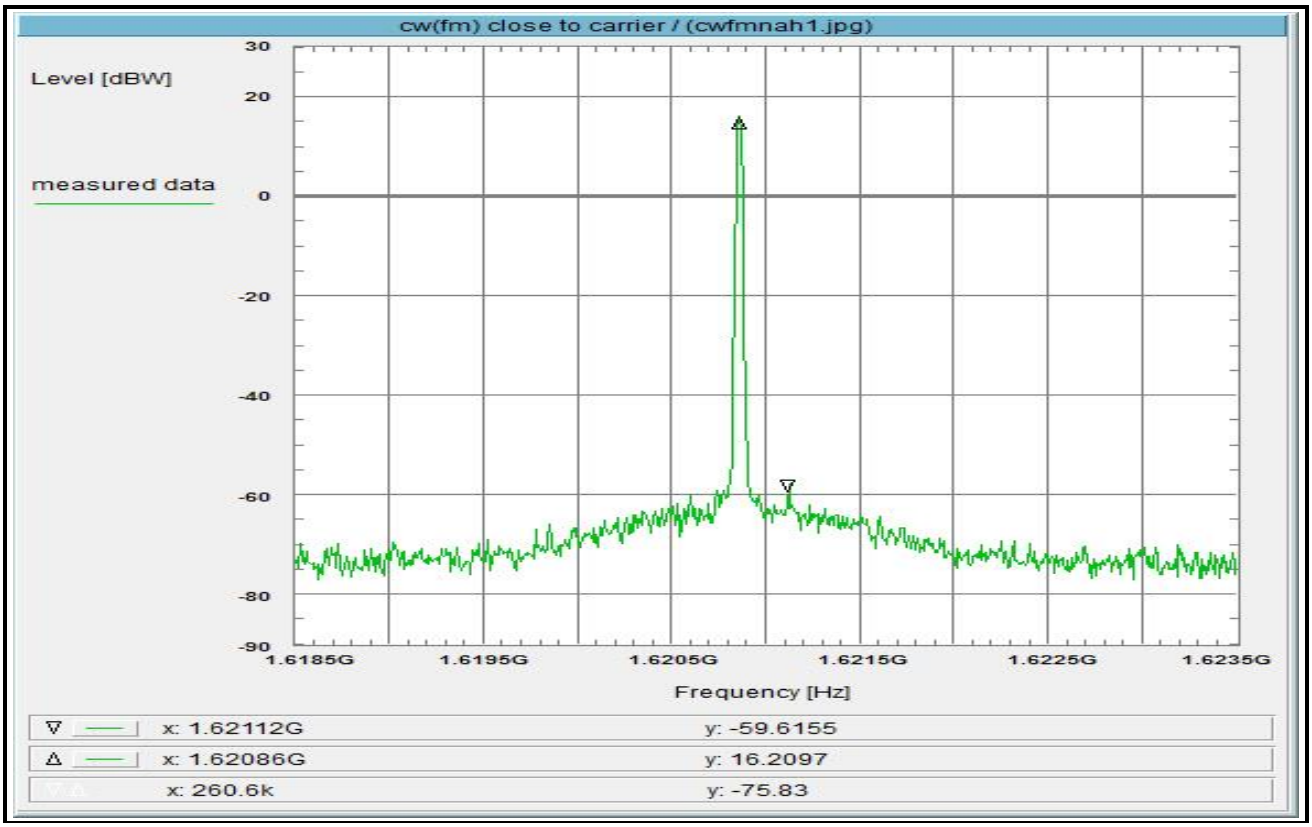
Start frequency:	1.61	GHz
Stop frequency:	1.6265	GHz
Center frequency:	1.61825	GHz
Frequency span:	16.5	MHz
Resolution-BW:	10	kHz
Video-BW:	1	kHz
Input attenuation:	5	dB
Trace-Mode:	Max-Hold	
Detector-Mode:	Pos Peak	

Correction:

Directional coupler	+	0.0	dB
Coaxial cable (C218)	+	0.8	dB
DUT-Antenna (on-axis)	+	8.7	dBi
Test antenna	+	0.0	dB
BW correction factor	+	0.0	dB
Atten. between HPA and feedhorn	+	0.0	dB
Attenuation (U005)	+	29.8	dB
TOTAL CORRECTION:	+	39.3	dB

Remarks:
Test of general function of the EUT and measurement for orientation.

Plot No. 2 (21)



Subclause: -/- Function test
CW-rf-carrier in the middle of the band (fm)
Measurement close to the wanted rf-signal

Limit:
no limits defined

This test serves to verify the general function of the EUT and for orientation regarding to the spurious emissions which are expected within the expected ´nominated bandwitdh´ and for comparison of the actual rf-power with the rated value at cw-carrier adjusted in the middle of the band (EIRP!)

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see subclause 1.5.2
CW, fm

Test setup:
see section 7.2: 1.2hgj

Test equipment:
see annex 2: C218, R001, U005

Remark:

Test result: **Measurement for orientation**

Environment condition:

Date & Time:	Fri 02/Feb/2018 10:47:08	
Location:	CTC advanced GmbH, Laboratory RSC-Sat	
Temperature:	22	°C
Humidity:	45	%
Voltage:	24	V DC

Setup of measurement equipment:

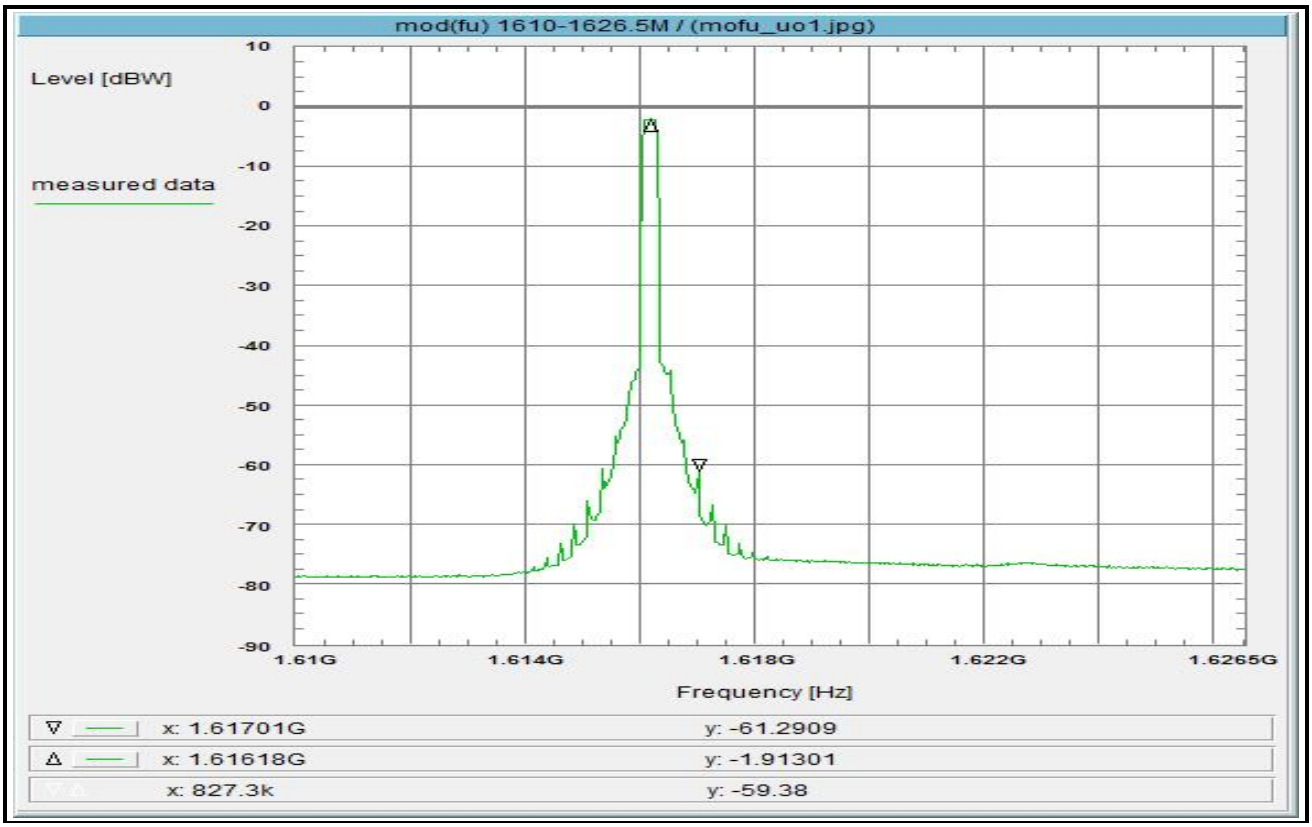
Start frequency:	1.6185	GHz
Stop frequency:	1.6235	GHz
Center frequency:	1.621	GHz
Frequency span:	5	MHz
Resolution-BW:	10	kHz
Video-BW:	1	kHz
Input attenuation:	5	dB
Trace-Mode:	Clear Write	
Detector-Mode:	Pos Peak	

Correction:

Directional coupler	+	0.0	dB
Coaxial cable (C218)	+	0.8	dB
DUT-Antenna (on-axis)	+	8.7	dBi
Test antenna	+	0.0	dB
BW correction factor	+	0.0	dB
Atten. between HPA and feedhorn	+	0.0	dB
Attenuation (U005)	+	29.8	dB
TOTAL CORRECTION:	+	39.3	dB

Remarks:
Test of general function of the EUT and measurement for orientation.

Plot No. 3 (21)



Subclause: -/- Function test
Modulated rf-carrier at the lower edge of the band (fl)
Measurement within the band

Limit:
no limits defined

This test serves to verify the general function of the EUT and for orientation regarding to the spurious emissions which are expected within the band, furthermore for comparison of the actual power with the rated value at modulated carrier adjusted as close to the lower edge of the operating frequency band.

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see subclause 1.5.2
Modulation C8-16APSK, fl

Test setup:
see section 7.2: 1.2hgj

Test equipment:
see annex 2: C218, R001, U005

Remark:

Test result: **Measurement for orientation**

Environment condition:

Date & Time:	Fri 02/Feb/2018 10:59:51	
Location:	CTC advanced GmbH, Laboratory RSC-Sat	
Temperature:	22	°C
Humidity:	45	%
Voltage:	24	V DC

Setup of measurement equipment:

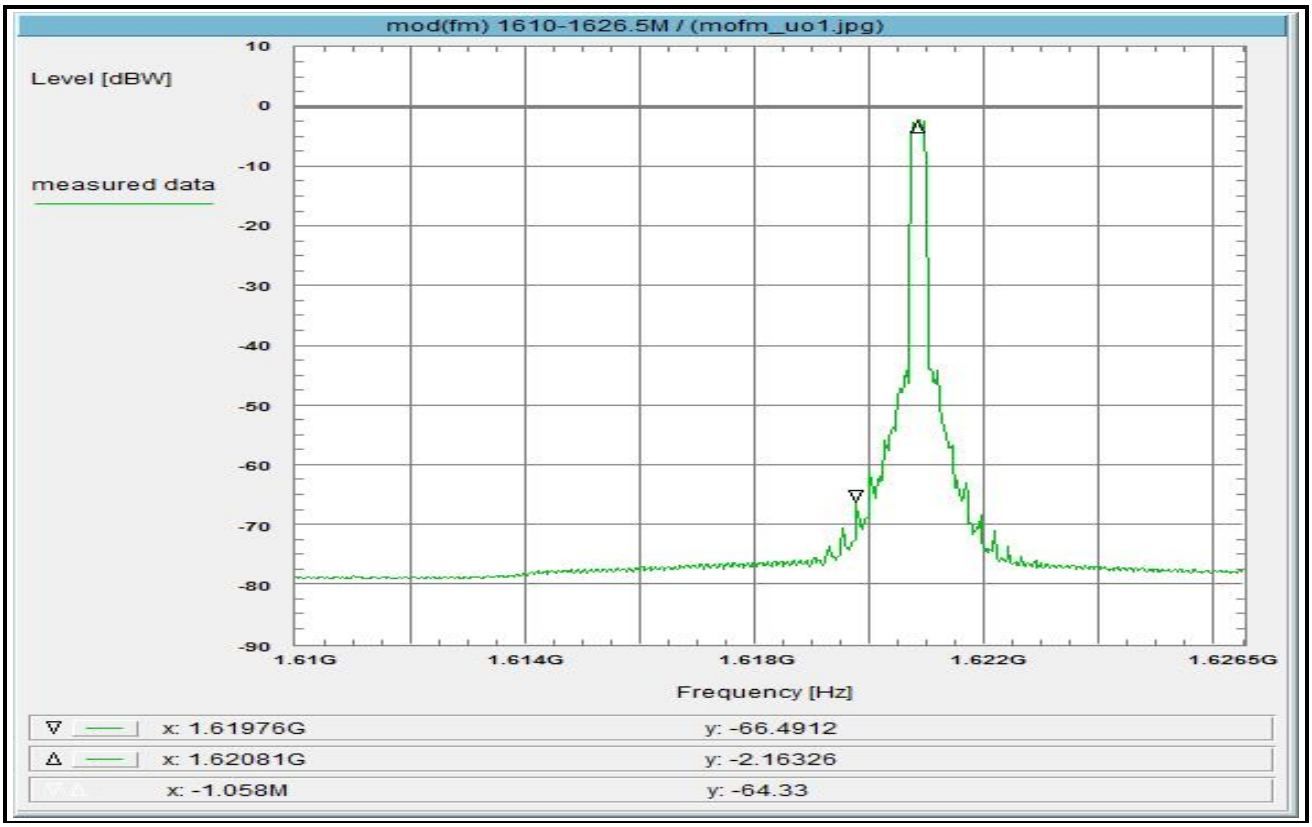
Start frequency:	1.61	GHz
Stop frequency:	1.6265	GHz
Center frequency:	1.61825	GHz
Frequency span:	16.5	MHz
Resolution-BW:	10	kHz
Video-BW:	1	kHz
Input attenuation:	5	dB
Trace-Mode:	Max-Hold	
Detector-Mode:	RMS	

Correction:

Directional coupler	+	0.0	dB
Coaxial cable (C218)	+	0.8	dB
DUT-Antenna (on-axis)	+	8.7	dBi
Test antenna	+	0.0	dB
BW correction factor	+	0.0	dB
Atten. between HPA and feedhorn	+	0.0	dB
Attenuation (U005)	+	29.8	dB
TOTAL CORRECTION:	+	39.3	dB

Remarks:
Test of general function of the EUT and measurement for orientation.

Plot No. 4 (21)



Subclause: -/- Function test
Modulated rf-carrier in the middle of the band (fm)
Measurement within the band

Limit:
no limits defined

This test serves to verify the general function of the EUT and for orientation regarding to the spurious emissions which are expected within the band, furthermore for comparison of the actual power with the rated value at modulated carrier adjusted in the middle of the band (EIRP).

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see subclause 1.5.2
Modulation C8-16APSK, fm

Test setup:
see section 7.2: 1.2hgj

Test equipment:
see annex 2: C218, R001, U005

Remark:

Test result: **Measurement for orientation**

Environment condition:

Date & Time:	Fri 02/Feb/2018 11:17:57	
Location:	CTC advanced GmbH, Laboratory RSC-Sat	
Temperature:	22	°C
Humidity:	45	%
Voltage:	24	V DC

Setup of measurement equipment:

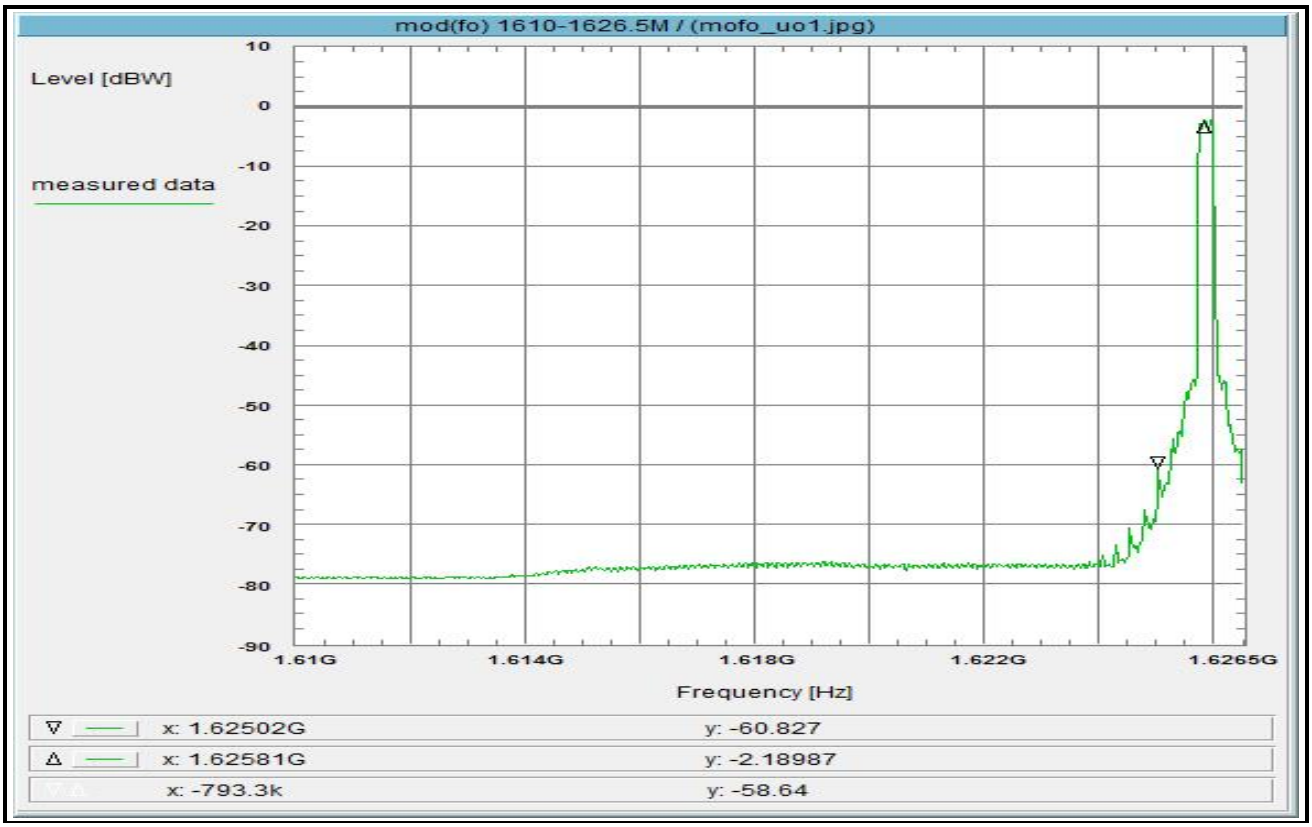
Start frequency:	1.61	GHz
Stop frequency:	1.6265	GHz
Center frequency:	1.61825	GHz
Frequency span:	16.5	MHz
Resolution-BW:	10	kHz
Video-BW:	1	kHz
Input attenuation:	5	dB
Trace-Mode:	Max-Hold	
Detector-Mode:	RMS	

Correction:

Directional coupler	+	0.0	dB
Coaxial cable (C218)	+	0.8	dB
DUT-Antenna (on-axis)	+	8.7	dBi
Test antenna	+	0.0	dB
BW correction factor	+	0.0	dB
Atten. between HPA and feedhorn	+	0.0	dB
Attenuation (U005)	+	29.8	dB
TOTAL CORRECTION:	+	39.3	dB

Remarks:
Test of general function of the EUT and measurement for orientation.

Plot No. 5 (21)



Subclause: -/- Function test
Modulated rf-carrier at the upper edge of the band (fo)
Measurement within the band

Limit:
no limits defined

This test serves to verify the general function of the EUT and for orientation regarding to the spurious emissions which are expected within the band, furthermore for comparison of the actual power with the rated value at modulated carrier adjusted as close to the upper edge of the operating frequency band.

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see subclause 1.5.2
Modulation C8-16APSK, fo

Test setup:
see section 7.2: 1.2hgj

Test equipment:
see annex 2: C218, R001, U005

Remark:

Test result: **Measurement for orientation**

Environment condition:

Date & Time:	Fri 02/Feb/2018 11:21:27	
Location:	CTC advanced GmbH, Laboratory RSC-Sat	
Temperature:	22	°C
Humidity:	45	%
Voltage:	24	V DC

Setup of measurement equipment:

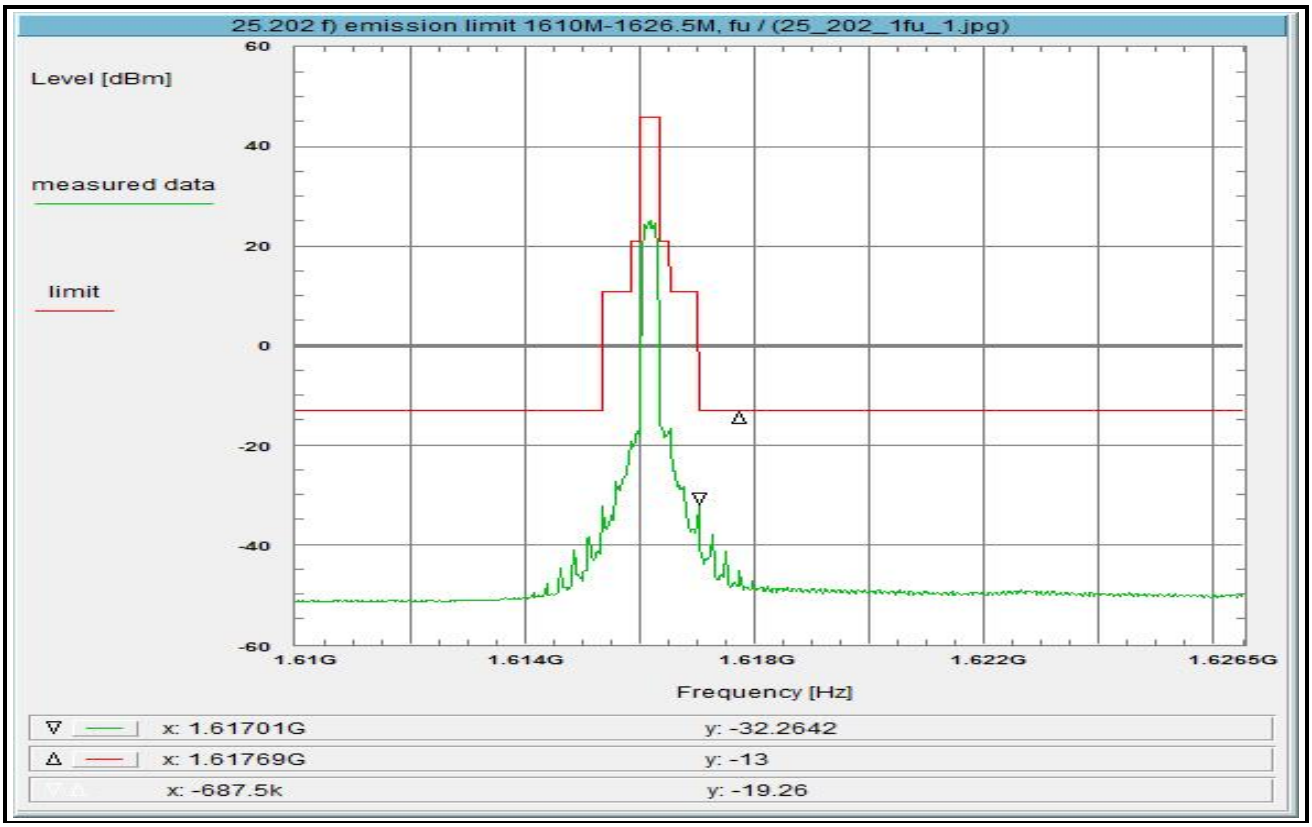
Start frequency:	1.61	GHz
Stop frequency:	1.6265	GHz
Center frequency:	1.61825	GHz
Frequency span:	16.5	MHz
Resolution-BW:	10	kHz
Video-BW:	1	kHz
Input attenuation:	5	dB
Trace-Mode:	Max-Hold	
Detector-Mode:	RMS	

Correction:

Directional coupler	+	0.0	dB
Coaxial cable (C218)	+	0.8	dB
DUT-Antenna (on-axis)	+	8.7	dBi
Test antenna	+	0.0	dB
BW correction factor	+	0.0	dB
Atten. between HPA and feedhorn	+	0.0	dB
Attenuation (U005)	+	29.8	dB
TOTAL CORRECTION:	+	39.3	dB

Remarks:
Test of general function of the EUT and measurement for orientation.

Plot No. 6 (21)



Subclause: 25.202 f) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier at the lower edge of the band (fl)

Limit:
Limit according to 25.202 f):
50-100% of assigned bw: -25dBc/4kHz
100-250% of assigned bw: -35dBc/4kHz
> 250% of assigned bw: -43+10log(Pmax)dBc/4kHz = -43 dBW
The mean power of emissions shall be attenuated
below the mean output power of the transmitter
in accordance with the above schedule.

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see subclause 1.5.2
Modulation C8-16APSK, fl

Test setup:
see section 7.2: 1.2hgj

Test equipment:
see annex 2: C218, R001, U005

Remark:

Test result: **Test passed**

Environment condition:

Date & Time:	Fri 02/Feb/2018 11:25:16
Location:	CTC advanced GmbH, Laboratory RSC-Sat
Temperature:	22 °C
Humidity:	45 %
Voltage:	24 V DC

Setup of measurement equipment:

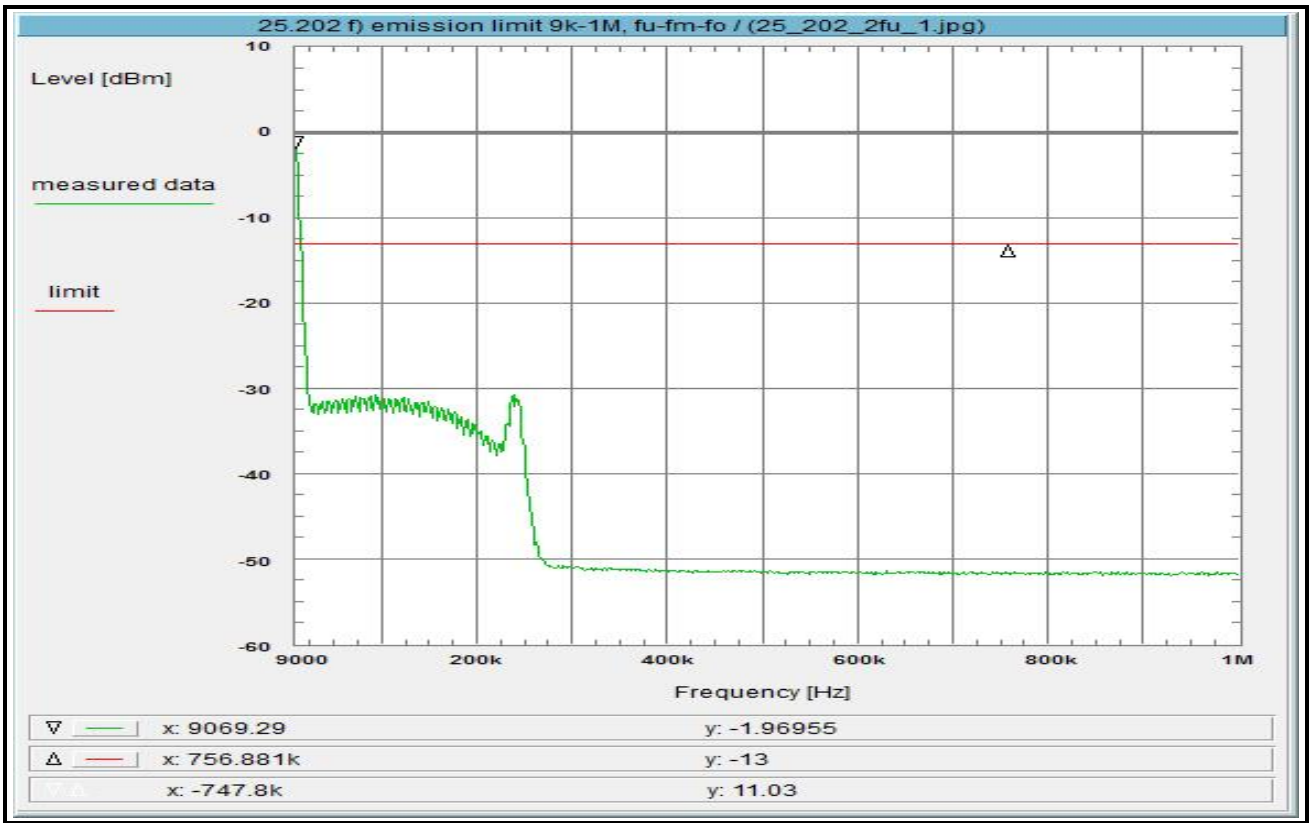
Start frequency:	1.61	GHz
Stop frequency:	1.6265	GHz
Center frequency:	1.61825	GHz
Frequency span:	16.5	MHz
Resolution-BW:	10	kHz
Video-BW:	100	kHz
Input attenuation:	5	dB
Trace-Mode:	Max-Hold	
Detector-Mode:	RMS	

Correction:

Directional coupler	+	0.0	dB
Coaxial cable (C218)	+	0.8	dB
DUT-Antenna (on-axis)	+	8.7	dBi
Test antenna	+	0.0	dB
BW correction factor (10k -> 4k)	-	4.0	dB
Atten. between HPA and feedhorn	+	0.0	dB
Attenuation (U005)	+	29.8	dB
TOTAL CORRECTION:	+	35.3	dB

Remarks:
Carrier-on state / Carrier at the lower edge of the band (fl)

Plot No. 7 (21)



Subclause: 25.202 f) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier at (fl-fm-fh) of the band

Limit:
Limit according to 25.202 f):
50-100% of assigned bw: -25dBc/4kHz
100-250% of assigned bw: -35dBc/4kHz
> 250% of assigned bw: -43+10log(Pmax)dBc/4kHz = -43 dBW
The mean power of emissions shall be attenuated
below the mean output power of the transmitter
in accordance with the above schedule.

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see subclause 1.5.2
Valid for all modulations and all channels

Test setup:
see section 7.2: 1.2hgj

Test equipment:
see annex 2: C218, R001, U005

Remark:

Test result: **Test passed**

Environment condition:

Date & Time:	Fri 02/Feb/2018 11:46:06	
Location:	CTC advanced GmbH, Laboratory RSC-Sat	
Temperature:	22	°C
Humidity:	55	%
Voltage:	230	Vac

Setup of measurement equipment:

Start frequency:	9	kHz
Stop frequency:	1	MHz
Center frequency:	504.5	kHz
Frequency span:	991	kHz
Resolution-BW:	10	kHz
Video-BW:	100	kHz
Input attenuation:	5	dB
Trace-Mode:	Max-Hold	
Detector-Mode:	RMS	

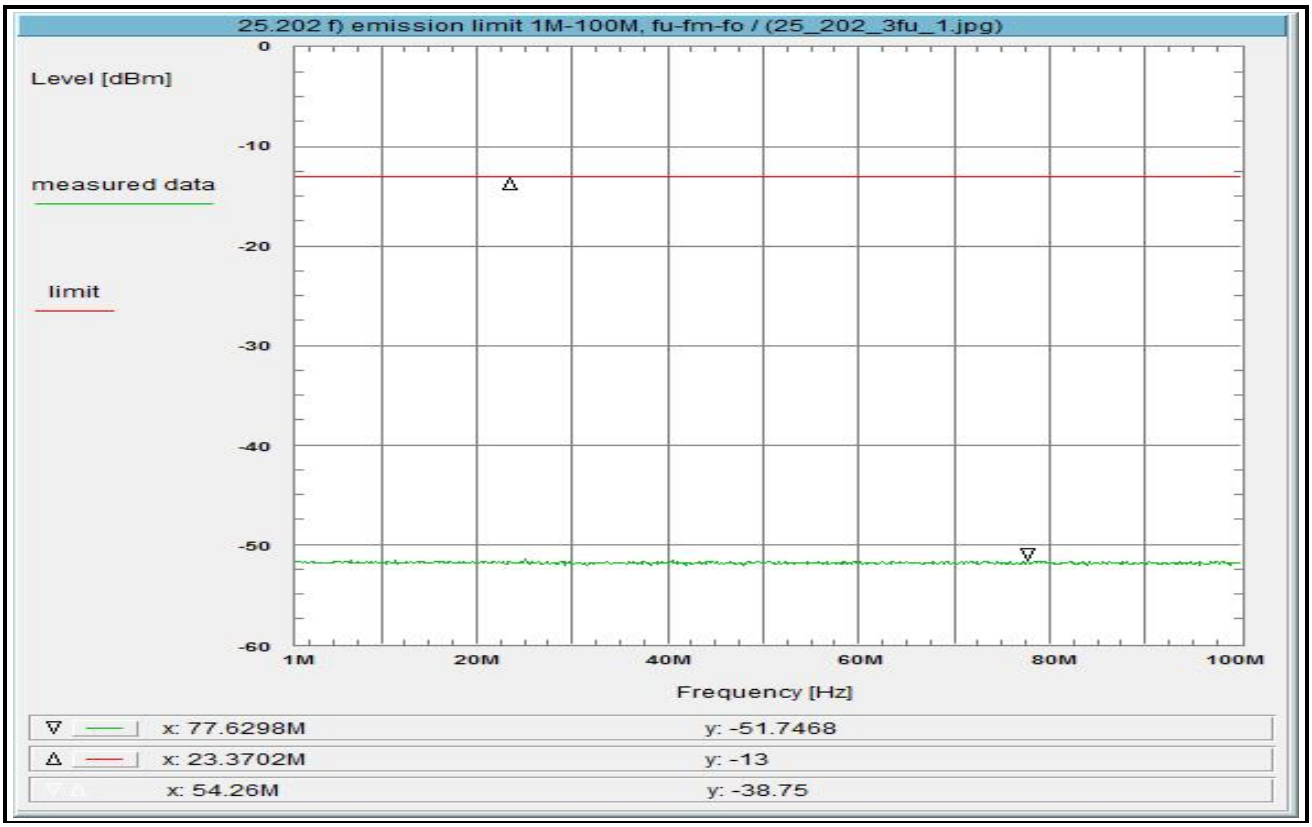
Correction:

Directional coupler	+	0.0	dB
Coaxial cable (C218)	+	0.5	dB
DUT-Antenna (on-axis)	+	8.7	dBi
Test antenna	+	0.0	dB
BW correction factor (10k -> 4k)	-	4.0	dB
Atten. between HPA and feedhorn	+	0.0	dB
Attenuation (U005)	+	29.8	dB
TOTAL CORRECTION:	+	35.0	dB

Remarks:
Carrier-on state

Rather left show the zero line of the FSU

Plot No. 8 (21)



Subclause: 25.202 f) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier at (fl-fm-fh) of the band

Limit:
Limit according to 25.202 f):
50-100% of assigned bw: -25dBc/4kHz
100-250% of assigned bw: -35dBc/4kHz
> 250% of assigned bw: -43+10log(Pmax)dBc/4kHz = -43 dBW
The mean power of emissions shall be attenuated
below the mean output power of the transmitter
in accordance with the above schedule.

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see subclause 1.5.2
Valid for all modulations and all channels

Test setup:
see section 7.2: 1.2hgj

Test equipment:
see annex 2: C218, R001, U005

Remark:

Test result: **Test passed**

Environment condition:

Date & Time:	Fri 02/Feb/2018 11:50:04	
Location:	CTC advanced GmbH, Laboratory RSC-Sat	
Temperature:	22	°C
Humidity:	55	%
Voltage:	230	Vac

Setup of measurement equipment:

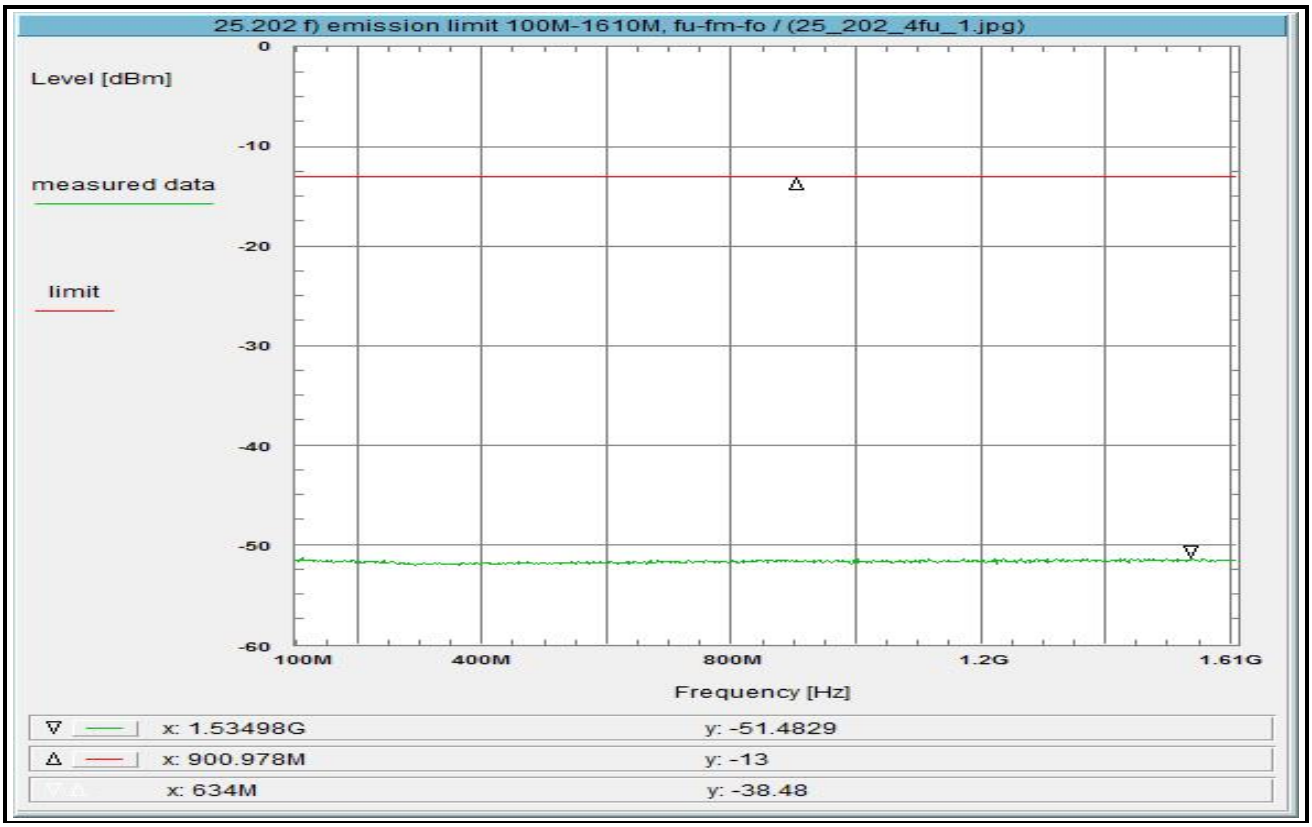
Start frequency:	1	MHz
Stop frequency:	100	MHz
Center frequency:	50.5	MHz
Frequency span:	99	MHz
Resolution-BW:	10	kHz
Video-BW:	100	kHz
Input attenuation:	5	dB
Trace-Mode:	Max-Hold	
Detector-Mode:	RMS	

Correction:

Directional coupler	+	0.0	dB
Coaxial cable (C218)	+	0.5	dB
DUT-Antenna (on-axis)	+	8.7	dBi
Test antenna	+	0.0	dB
BW correction factor (10k -> 4k)	-	4.0	dB
Atten. between HPA and feedhorn	+	0.0	dB
Attenuation (U005)	+	29.8	dB
TOTAL CORRECTION:	+	35.0	dB

Remarks:
Carrier-on state

Plot No. 9 (21)



Subclause: 25.202 f) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier at (fl-fm-fh) of the band

Limit:
Limit according to 25.202 f):
50-100% of assigned bw: -25dBc/4kHz
100-250% of assigned bw: -35dBc/4kHz
> 250% of assigned bw: -43+10log(Pmax)dBc/4kHz = -43 dBW
The mean power of emissions shall be attenuated
below the mean output power of the transmitter
in accordance with the above schedule.

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see subclause 1.5.2
Valid for all modulations and all channels

Test setup:
see section 7.2: 1.2hgj

Test equipment:
see annex 2: C218, R001, U005

Remark:

Test result: **Test passed**

Environment condition:

Date & Time:	Fri 02/Feb/2018 11:53:51	
Location:	CTC advanced GmbH, Laboratory RSC-Sat	
Temperature:	22	°C
Humidity:	55	%
Voltage:	230	Vac

Setup of measurement equipment:

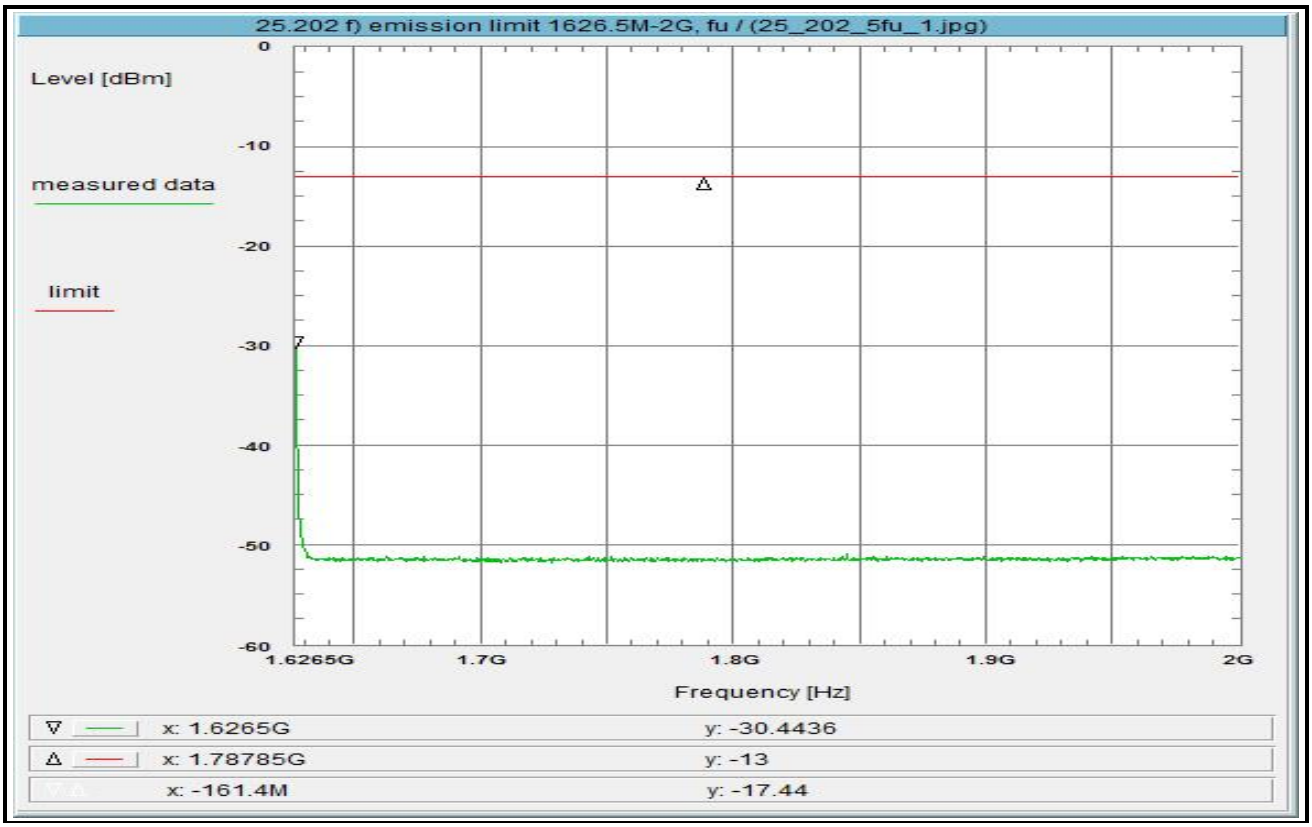
Start frequency:	100	MHz
Stop frequency:	1.61	GHz
Center frequency:	855	MHz
Frequency span:	1.51	GHz
Resolution-BW:	10	kHz
Video-BW:	100	kHz
Input attenuation:	5	dB
Trace-Mode:	Max-Hold	
Detector-Mode:	RMS	

Correction:

Directional coupler	+	0.0	dB
Coaxial cable (C218)	+	0.6	dB
DUT-Antenna (on-axis)	+	8.7	dBi
Test antenna	+	0.0	dB
BW correction factor (10k -> 4k)	-	4.0	dB
Atten. between HPA and feedhorn	+	0.0	dB
Attenuation (U005)	+	29.8	dB
TOTAL CORRECTION:	+	35.1	dB

Remarks:
Carrier-on state / Carrier at the lower edge of the band (fl)

Plot No. 10 (21)



Subclause: 25.202 f) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier at (fl-fm-fh) of the band

Limit:
Limit according to 25.202 f):
50-100% of assigned bw: -25dBc/4kHz
100-250% of assigned bw: -35dBc/4kHz
> 250% of assigned bw: -43+10log(Pmax)dBc/4kHz = -43 dBW
The mean power of emissions shall be attenuated
below the mean output power of the transmitter
in accordance with the above schedule.

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see subclause 1.5.2
Valid for all modulations and all channels

Test setup:
see section 7.2: 1.2hgj

Test equipment:
see annex 2: C218, R001, U005

Remark:

Test result: **Test passed**

Environment condition:

Date & Time:	Fri 02/Feb/2018 12:59:55	
Location:	CTC advanced GmbH, Laboratory RSC-Sat	
Temperature:	22	°C
Humidity:	55	%
Voltage:	230	Vac

Setup of measurement equipment:

Start frequency:	1.6265	GHz
Stop frequency:	2	GHz
Center frequency:	1.81325	GHz
Frequency span:	373.5	MHz
Resolution-BW:	10	kHz
Video-BW:	100	kHz
Input attenuation:	5	dB
Trace-Mode:	Max-Hold	
Detector-Mode:	RMS	

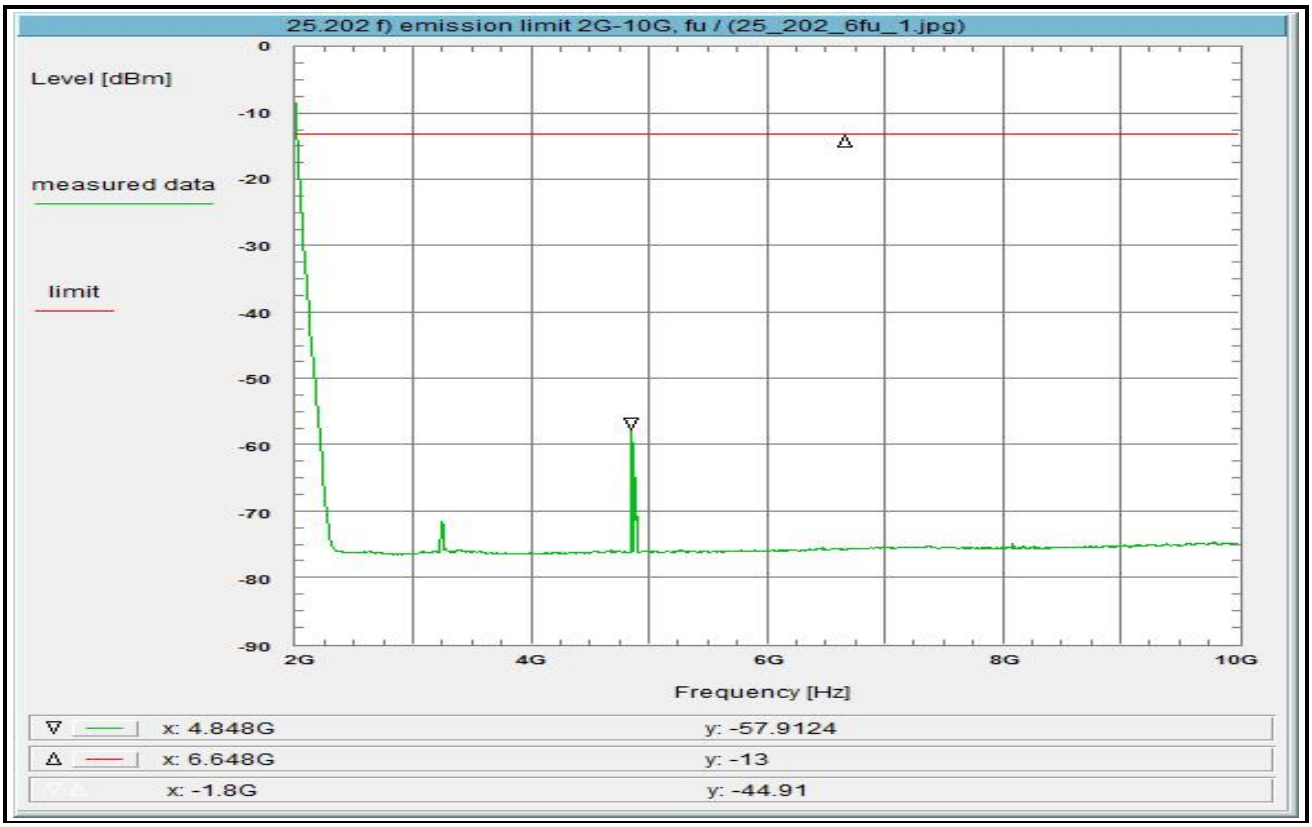
Correction:

Directional coupler	+	0.0	dB
Coaxial cable (C218)	+	0.9	dB
DUT-Antenna (on-axis)	+	8.7	dBi
Test antenna	+	0.0	dB
BW correction factor (10k -> 4k)	-	4.0	dB
Atten. between HPA and feedhorn	+	0.0	dB
Attenuation (U005)	+	29.8	dB
TOTAL CORRECTION:	+	35.4	dB

Remarks:
Carrier-on state

Marker show the wanted signal

Plot No. 11 (21)



Subclause: 25.202 f) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier at the lower edge of the band (fl)

Limit:
Limit according to 25.202 f):
50-100% of assigned bw: -25dBc/4kHz
100-250% of assigned bw: -35dBc/4kHz
> 250% of assigned bw: -43+10log(Pmax)dBc/4kHz = -43 dBW
The mean power of emissions shall be attenuated
below the mean output power of the transmitter
in accordance with the above schedule.

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see subclause 1.5.2
Valid for all modulations and all channels

Test setup:
see section 7.2: 1.2hgj

Test equipment:
see annex 2: C218, FHPF, R001, U311

Remark:

Test result: **Test passed**

Environment condition:

Date & Time:	Fri 02/Feb/2018 15:38:49	
Location:	CTC advanced GmbH, Laboratory RSC-Sat	
Temperature:	22	°C
Humidity:	55	%
Voltage:	230	Vac

Setup of measurement equipment:

Start frequency:	2	GHz
Stop frequency:	10	GHz
Center frequency:	6	GHz
Frequency span:	8	GHz
Resolution-BW:	100	kHz
Video-BW:	1	MHz
Input attenuation:	0	dB
Trace-Mode:	Max-Hold	
Detector-Mode:	RMS	

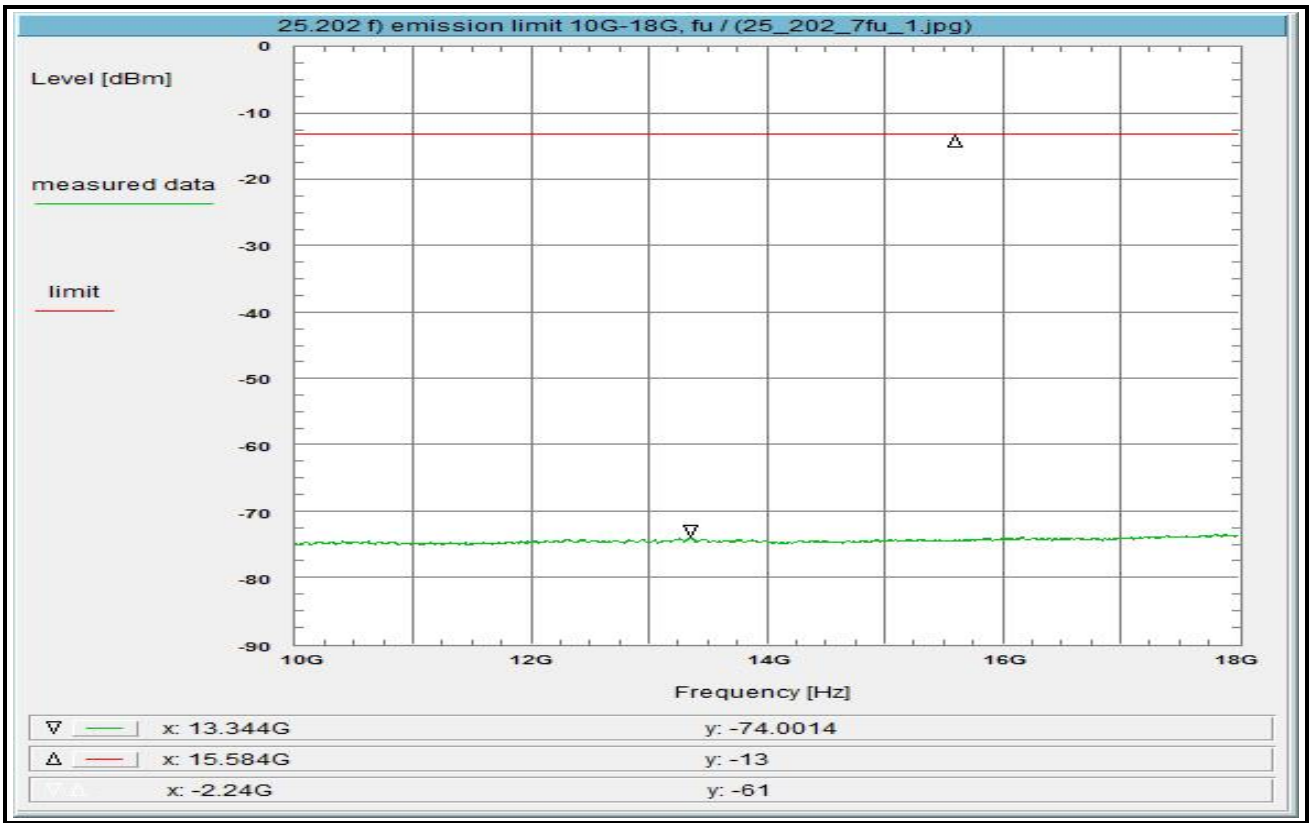
Correction:

Attenuation (U311)	+	9.9	dB
Coaxial cable (C218)	+	1.5	dB
DUT-Antenna (on-axis)	+	8.7	dBi
Test antenna	+	0.0	dB
BW correction factor (100k -> 4k)	-	14.0	dB
Atten. between HPA and feedhorn	-	0.0	dB
(FHPF)	+	1.8	dB
TOTAL CORRECTION:	+	7.9	dB

Remarks:
Carrier-on state / Carrier at (fu, fm, fo)

Marker show the 3rd Harmonic
Rather left the plot show the behaviour of the HPF

Plot No. 12 (21)



Subclause: 25.202 f) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier at the lower edge of the band (fl)

Limit:
Limit according to 25.202 f):
50-100% of assigned bw: -25dBc/4kHz
100-250% of assigned bw: -35dBc/4kHz
> 250% of assigned bw: -43+10log(Pmax)dBc/4kHz = -43 dBW
The mean power of emissions shall be attenuated
below the mean output power of the transmitter
in accordance with the above schedule.

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see subclause 1.5.2
Valid for all modulations and all channels

Test setup:
see section 7.2: 1.2hgj

Test equipment:
see annex 2: C218, FHPF, R001, U311

Remark:

Test result: **Test passed**

Environment condition:

Date & Time:	Fri 02/Feb/2018 15:44:41	
Location:	CTC advanced GmbH, Laboratory RSC-Sat	
Temperature:	22	°C
Humidity:	55	%
Voltage:	230	Vac

Setup of measurement equipment:

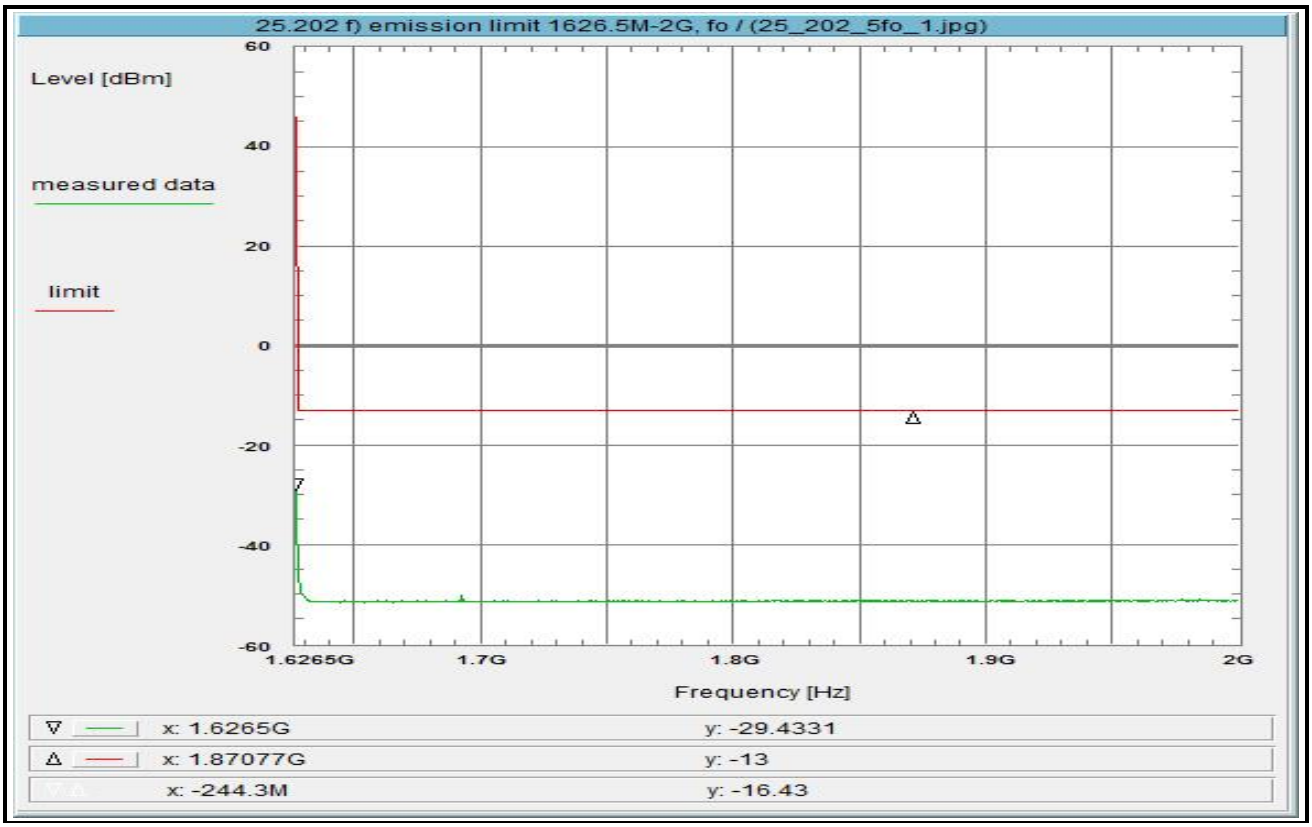
Start frequency:	10	GHz
Stop frequency:	18	GHz
Center frequency:	14	GHz
Frequency span:	8	GHz
Resolution-BW:	100	kHz
Video-BW:	1	MHz
Input attenuation:	0	dB
Trace-Mode:	Max-Hold	
Detector-Mode:	RMS	

Correction:

Attenuation (U311)	+	10.2	dB
Coaxial cable (C218)	+	2.4	dB
DUT-Antenna (on-axis)	+	8.7	dBi
Test antenna	+	0.0	dB
BW correction factor (100k -> 4k)	-	14.0	dB
Atten. between HPA and feedhorn	-	0.0	dB
(FHPF)	+	0.8	dB
TOTAL CORRECTION:	+	8.1	dB

Remarks:
Carrier-on state

Plot No. 13 (21)



Subclause: 25.202 f) Frequencies, frequency tolerance and emission limitations
Emission limitations
Modulated rf-carrier at (fl-fm-fh) of the band

Limit:
Limit according to 25.202 f):
50-100% of assigned bw: -25dBc/4kHz
100-250% of assigned bw: -35dBc/4kHz
> 250% of assigned bw: -43+10log(Pmax)dBc/4kHz = -43 dBW
The mean power of emissions shall be attenuated
below the mean output power of the transmitter
in accordance with the above schedule.

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see subclause 1.5.2
Valid for all modulations and all channels

Test setup:
see section 7.2: 1.2hgj

Test equipment:
see annex 2: C218, R001, U005

Remark:

Test result: **Test passed**

Environment condition:

Date & Time:	Fri 02/Feb/2018 13:27:21	
Location:	CTC advanced GmbH, Laboratory RSC-Sat	
Temperature:	22	°C
Humidity:	55	%
Voltage:	230	Vac

Setup of measurement equipment:

Start frequency:	1.6265	GHz
Stop frequency:	2	GHz
Center frequency:	1.81325	GHz
Frequency span:	373.5	MHz
Resolution-BW:	10	kHz
Video-BW:	100	kHz
Input attenuation:	5	dB
Trace-Mode:	Max-Hold	
Detector-Mode:	RMS	

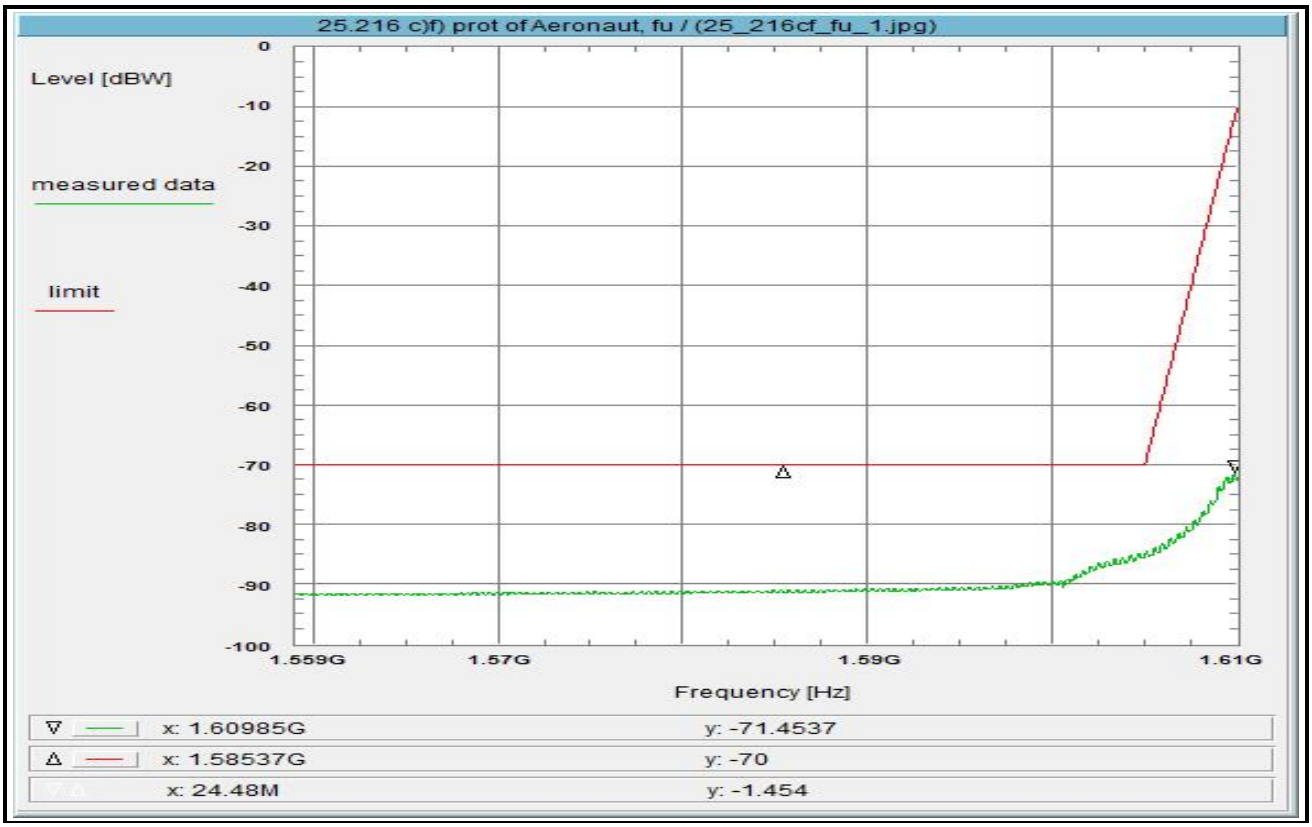
Correction:

Directional coupler	+	0.0	dB
Coaxial cable (C218)	+	0.9	dB
DUT-Antenna (on-axis)	+	8.7	dBi
Test antenna	+	0.0	dB
BW correction factor (10k -> 4k)	-	4.0	dB
Atten. between HPA and feedhorn	+	0.0	dB
Attenuation (U005)	+	29.8	dB
TOTAL CORRECTION:	+	35.4	dB

Remarks:
Carrier-on state / Carrier at the upper edge of the band (fo)

Marker show the wanted signal

Plot No. 14 (21)



Subclause: 25.216 c)f) Limits on emissions from mobile earth stations for protection of aeronautical radionavigation-satellite service
Carrier-on state, modulated carrier at the lower edge of the band (fl)
Conducted measurement at the antenna-connector

Limit:
Limit according to 25.216 c) and f):
1559.0 - 1605.0MHz: -70dBW/1MHz
1605.0 - 1610MHz: -70 to -10dBW/1MHz)linear interpolated)
The EIRP, averaged over any two-millisecond active transmission interval from the MESs in the carrier-on state shall not exceed the limits above.

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see subclause 1.5.2
Valid for all modulations

Test setup:
see section 7.2: 1.2hgj

Test equipment:
see annex 2: C218, FT&T, R001, U311

Remark:

Test result: **Test passed**

Environment condition:

Date & Time:	Fri 02/Feb/2018 15:58:00	
Location:	CTC advanced GmbH, Laboratory RSC-Sat	
Temperature:	22	°C
Humidity:	55	%
Voltage:	230	Vac

Setup of measurement equipment:

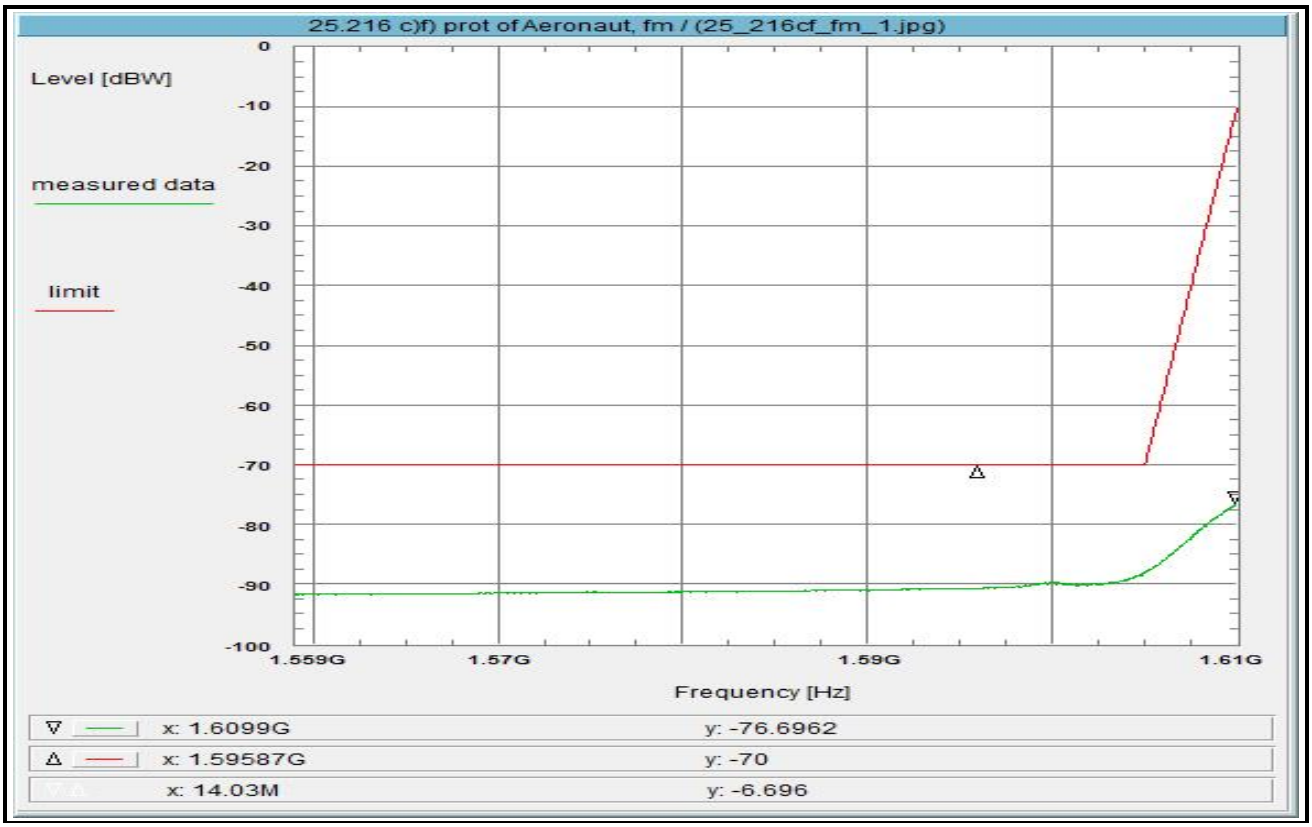
Start frequency:	1.559	GHz
Stop frequency:	1.61	GHz
Center frequency:	1.5845	GHz
Frequency span:	51	MHz
Resolution-BW:	1	MHz
Video-BW:	10	MHz
Input attenuation:	0	dB
Trace-Mode:	Max-Hold	
Detector-Mode:	RMS	

Correction:

Attenuation (U311)	+	9.7	dB
Coaxial cable (C218)	+	0.8	dB
DUT-Antenna (on-axis)	+	8.7	dBi
Test antenna	+	0.0	dB
BW correction factor	+	0.0	dB
Atten. between HPA and feedhorn	-	0.0	dB
(FT&T)	+	0.3	dB
TOTAL CORRECTION:	+	19.5	dB

Remarks:
Carrier-on state / Carrier at the lower edge of the band (fl)
Measurement with 1 MHz resolution/video filter and RMS Detector.
For EIRP calculation:
´worst-case´ = maximum antenna gain

Plot No. 15 (21)



Subclause: 25.216 c)f) Limits on emissions from mobile earth stations for protection of aeronautical radionavigation-satellite service
Carrier-on state, modulated carrier in the middle of the band (fm)
Conducted measurement at the antenna-connector

Limit:
Limit according to 25.216 c) and f):
1559.0 - 1605.0MHz: -70dBW/1MHz
1605.0 - 1610MHz: -70 to -10dBW/1MHz)linear interpolated)
The EIRP, averaged over any two-millisecond active transmission interval from the MESs in the carrier-on state shall not exceed the limits above.

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see subclause 1.5.2
Valid for all modulations, fm

Test setup:
see section 7.2: 1.2hgj

Test equipment:
see annex 2: C218, FT&T, R001, U311

Remark:

Test result: **Test passed**

Environment condition:

Date & Time:	Fri 02/Feb/2018 16:10:49	
Location:	CTC advanced GmbH, Laboratory RSC-Sat	
Temperature:	22	°C
Humidity:	55	%
Voltage:	230	Vac

Setup of measurement equipment:

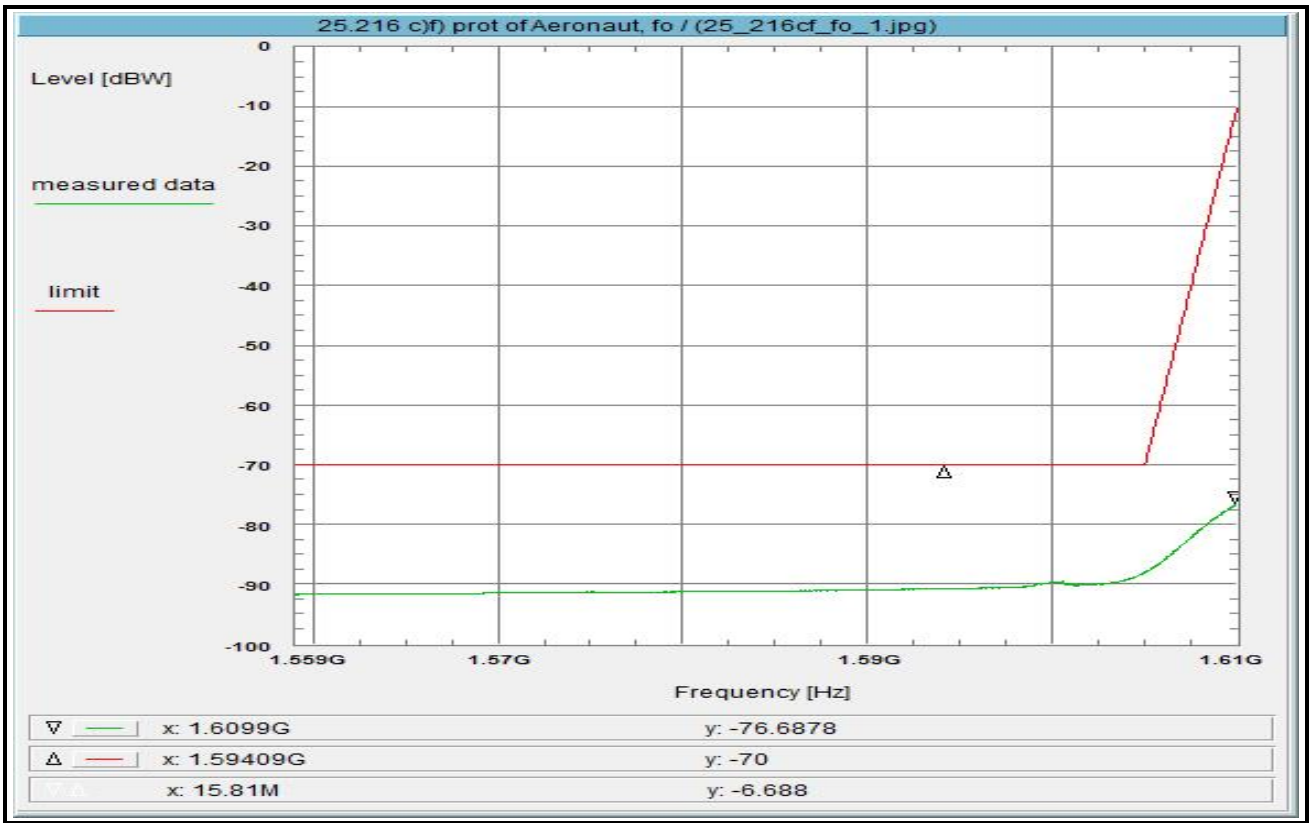
Start frequency:	1.559	GHz
Stop frequency:	1.61	GHz
Center frequency:	1.5845	GHz
Frequency span:	51	MHz
Resolution-BW:	1	MHz
Video-BW:	10	MHz
Input attenuation:	0	dB
Trace-Mode:	Max-Hold	
Detector-Mode:	RMS	

Correction:

Attenuation (U311)	+	9.7	dB
Coaxial cable (C218)	+	0.8	dB
DUT-Antenna (on-axis)	+	8.7	dBi
Test antenna	+	0.0	dB
BW correction factor	+	0.0	dB
Atten. between HPA and feedhorn	-	0.0	dB
(FT&T)	+	0.3	dB
TOTAL CORRECTION:	+	19.5	dB

Remarks:
Carrier-on state / Carrier in the middle of the band (fm)
Measurement with 1 MHz resolution/video filter and RMS Detector.
For EIRP calculation:
´worst-case´ = maximum antenna gain

Plot No. 16 (21)



Subclause: 25.216 c)f) Limits on emissions from mobile earth stations for protection of aeronautical radionavigation-satellite service
Carrier-on state, modulated carrier at the upper edge of the band (fo)
Conducted measurement at the antenna-connector

Limit:
Limit according to 25.216 c) and f):
1559.0 - 1605.0MHz: -70dBW/1MHz
1605.0 - 1610MHz: -70 to -10dBW/1MHz)linear interpolated)
The EIRP, averaged over any two-millisecond active transmission interval from the MESs in the carrier-on state shall not exceed the limits above.

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see subclause 1.5.2
Valid for all modulations, fo

Test setup:
see section 7.2: 1.2hgj

Test equipment:
see annex 2: C218, FT&T, R001, U311

Remark:

Test result: **Test passed**

Environment condition:

Date & Time:	Fri 02/Feb/2018 16:32:13	
Location:	CTC advanced GmbH, Laboratory RSC-Sat	
Temperature:	22	°C
Humidity:	55	%
Voltage:	230	Vac

Setup of measurement equipment:

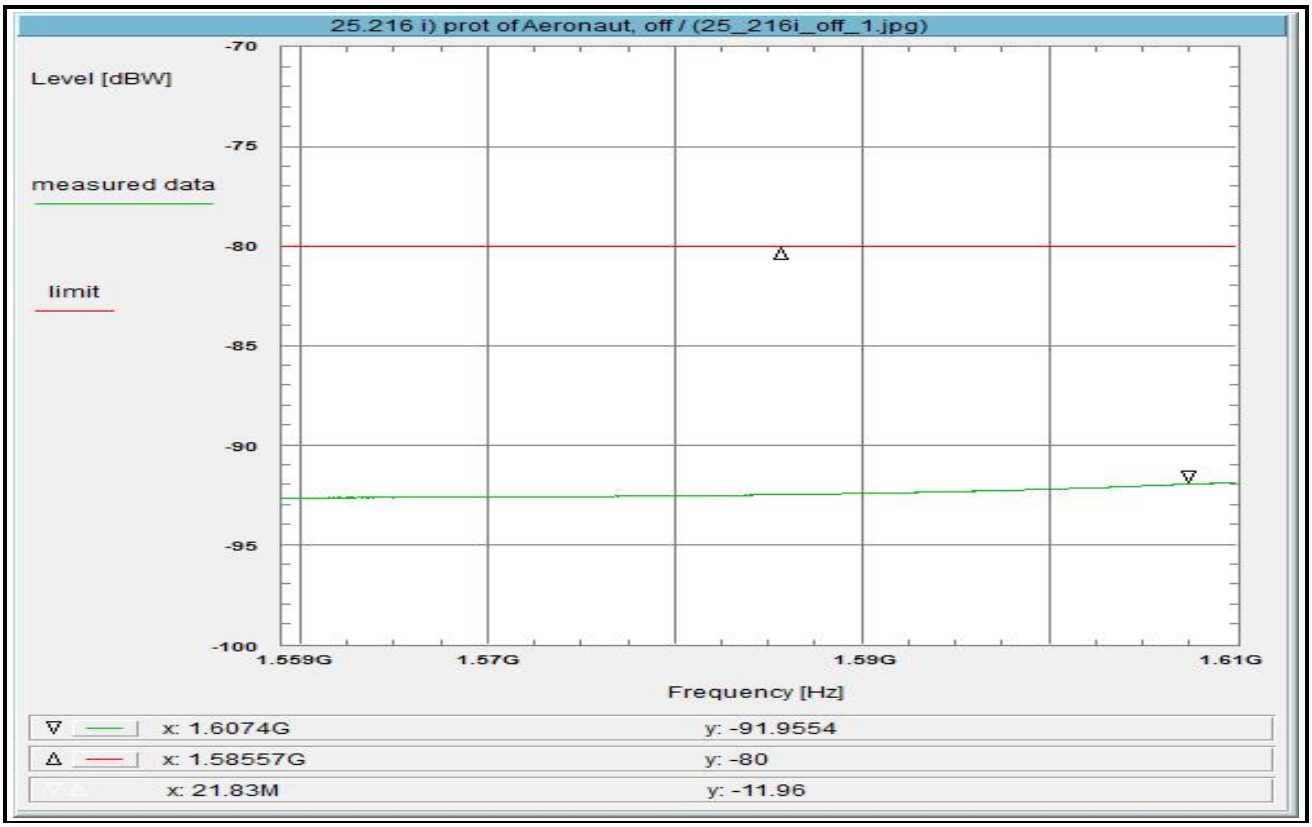
Start frequency:	1.559	GHz
Stop frequency:	1.61	GHz
Center frequency:	1.5845	GHz
Frequency span:	51	MHz
Resolution-BW:	1	MHz
Video-BW:	10	MHz
Input attenuation:	0	dB
Trace-Mode:	Max-Hold	
Detector-Mode:	RMS	

Correction:

Attenuation (U311)	+	9.7	dB
Coaxial cable (C218)	+	0.8	dB
DUT-Antenna (on-axis)	+	8.7	dBi
Test antenna	+	0.0	dB
BW correction factor	+	0.0	dB
Atten. between HPA and feedhorn	-	0.0	dB
(FT&T)	+	0.3	dB
TOTAL CORRECTION:	+	19.5	dB

Remarks:
Carrier-on state / Carrier at the upper edge of the band (fo)
Measurement with 1 MHz resolution/video filter and RMS Detector.
For EIRP calculation:
´worst-case´ = maximum antenna gain

Plot No. 17 (21)



Subclause: 25.216 i) Limits on emissions from mobile earth stations for protection of aeronautical radionavigation-satellite service
Carrier-off state, conducted measurement at the antenna-connector

Limit:
Limit according to 25.216 i): -80dBW/1MHz

The EIRP, averaged over any two-millisecond active transmission interval from the MESs in the carrier-off state shall not exceed the limit above.

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 2, see subclause 1.5.2
TX off

Test setup:
see section 7.2: 1.2hgj

Test equipment:
see annex 2: C218, FT&T, R001, U311

Remark:

Test result: **Test passed**

Environment condition:

Date & Time:	Fri 02/Feb/2018 16:38:20	
Location:	CTC advanced GmbH, Laboratory RSC-Sat	
Temperature:	22	°C
Humidity:	55	%
Voltage:	230	Vac

Setup of measurement equipment:

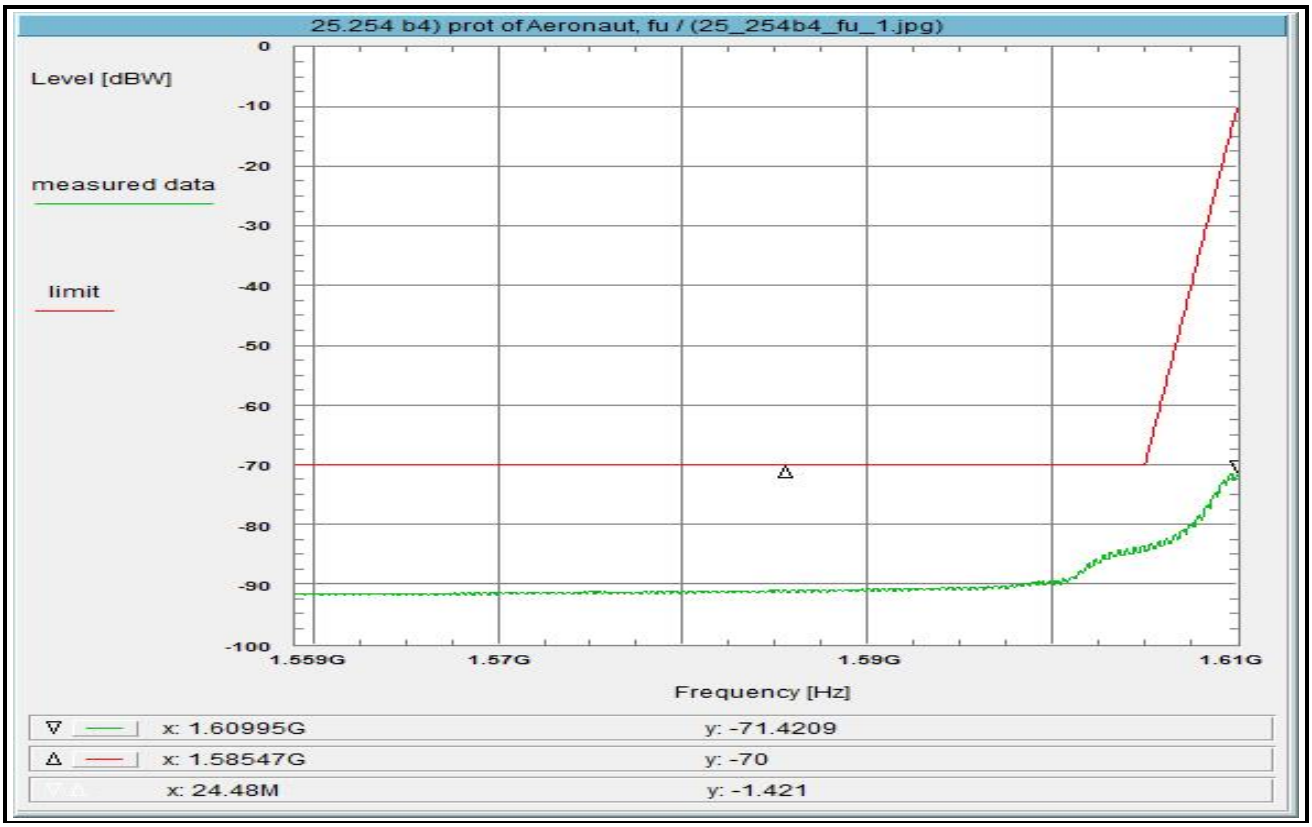
Start frequency:	1.559	GHz
Stop frequency:	1.61	GHz
Center frequency:	1.5845	GHz
Frequency span:	51	MHz
Resolution-BW:	1	MHz
Video-BW:	10	MHz
Input attenuation:	0	dB
Trace-Mode:	Max-Hold	
Detector-Mode:	RMS	

Correction:

Attenuation (U311)	+	9.7	dB
Coaxial cable (C218)	+	0.8	dB
DUT-Antenna (on-axis)	+	8.7	dBi
Test antenna	+	0.0	dB
BW correction factor	+	0.0	dB
Atten. between HPA and feedhorn	-	0.0	dB
(FT&T)	+	0.3	dB
TOTAL CORRECTION:	+	19.5	dB

Remarks:
Carrier-off state.
Measurement with 1 MHz resolution filter and RMS Detector.
For EIRP calculation:
´worst-case´ = maximum antenna gain

Plot No. 18 (21)



Subclause: 25.254 b)4) Special requirements for ancillary terrestrial components operating in the 1610-1626.5 MHz / 1525-1559 MHz bands
Carrier-on state, modulated carrier at the lower edge of the band (fl)
Conducted measurement at the antenna-connector

Limit:
Limit according to 25.254 b)4):
1559.0 - 1605.0MHz: -70dBW/1MHz
1605.0 - 1610MHz: -70 to -10dBW/1MHz)linear interpolated)
The EIRP, averaged over any two-millisecond active transmission interval from the MESs in the carrier-on state shall not exceed the limits above.

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 2, see subclause 1.5.2
Valid for all modulations, fu

Test setup:
see section 7.2: 1.2hgj

Test equipment:
see annex 2: C218, FT&T, R001, U311

Remark:

Test result: **Test passed**

Environment condition:

Date & Time:	Fri 02/Feb/2018 16:44:46
Location:	CTC advanced GmbH, Laboratory RSC-Sat
Temperature:	22 °C
Humidity:	55 %
Voltage:	230 Vac

Setup of measurement equipment:

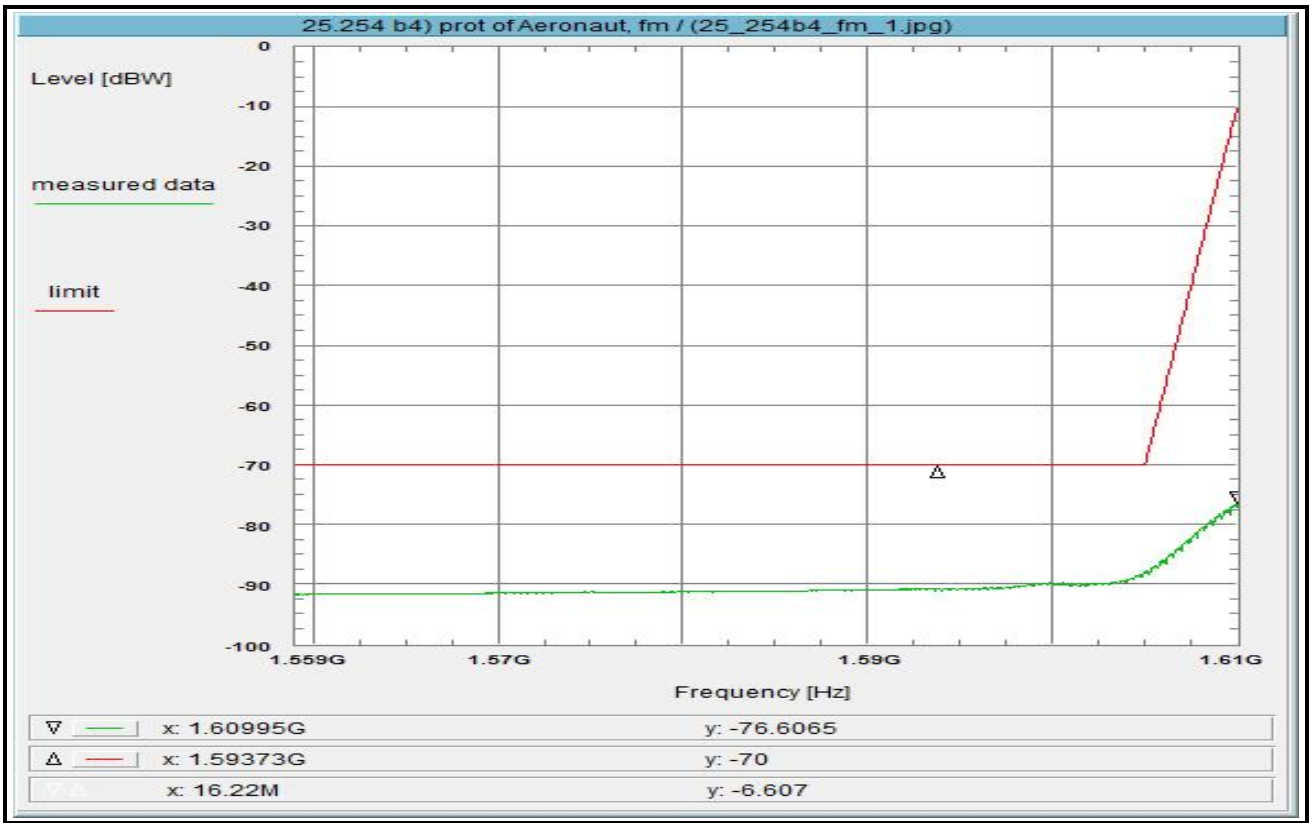
Start frequency:	1.559	GHz
Stop frequency:	1.61	GHz
Center frequency:	1.5845	GHz
Frequency span:	51	MHz
Resolution-BW:	1	MHz
Video-BW:	10	MHz
Input attenuation:	0	dB
Trace-Mode:	Max-Hold	
Detector-Mode:	RMS	

Correction:

Attenuation (U311)	+	9.7	dB
Coaxial cable (C218)	+	0.8	dB
DUT-Antenna (on-axis)	+	8.7	dBi
Test antenna	+	0.0	dB
BW correction factor	+	0.0	dB
Atten. between HPA and feedhorn	-	0.0	dB
(FT&T)	+	0.3	dB
TOTAL CORRECTION:	+	19.5	dB

Remarks:
Carrier-on state / Carrier at the lower edge of the band (fl)
Measurement with 1 MHz resolution/video filter and RMS Detector.
For EIRP calculation:
´worst-case´ = maximum antenna gain

Plot No. 19 (21)



Subclause: 25.254 b)4) Special requirements for ancillary terrestrial components operating in the 1610-1626.5 MHz / 1525-1559 MHz bands
Carrier-on state, modulated carrier in the middle of the band (fm)
Conducted measurement at the antenna-connector

Limit:
Limit according to 25.254 b)4):
1559.0 - 1605.0MHz: -70dBW/1MHz
1605.0 - 1610MHz: -70 to -10dBW/1MHz)linear interpolated)
The EIRP, averaged over any two-millisecond active transmission interval from the MESs in the carrier-on state shall not exceed the limits above.

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 2, see subclause 1.5.2
Valid for all modulations, fm

Test setup:
see section 7.2: 1.2hgj

Test equipment:
see annex 2: C218, FT&T, R001, U311

Remark:

Test result: **Test passed**

Environment condition:

Date & Time:	Fri 02/Feb/2018 16:53:34	
Location:	CTC advanced GmbH, Laboratory RSC-Sat	
Temperature:	22	°C
Humidity:	55	%
Voltage:	230	Vac

Setup of measurement equipment:

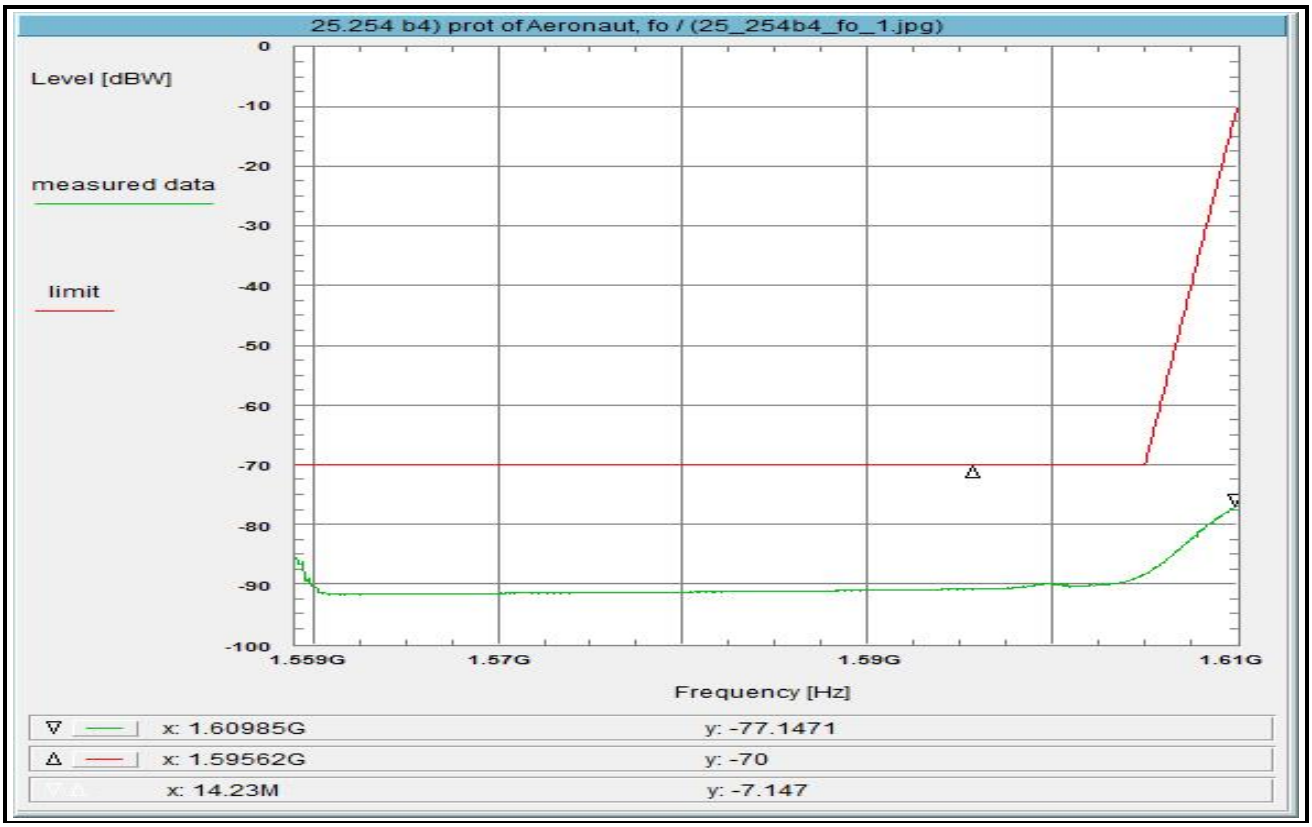
Start frequency:	1.559	GHz
Stop frequency:	1.61	GHz
Center frequency:	1.5845	GHz
Frequency span:	51	MHz
Resolution-BW:	1	MHz
Video-BW:	10	MHz
Input attenuation:	0	dB
Trace-Mode:	Max-Hold	
Detector-Mode:	RMS	

Correction:

Attenuation (U311)	+	9.7	dB
Coaxial cable (C218)	+	0.8	dB
DUT-Antenna (on-axis)	+	8.7	dBi
Test antenna	+	0.0	dB
BW correction factor	+	0.0	dB
Atten. between HPA and feedhorn	-	0.0	dB
(FT&T)	+	0.3	dB
TOTAL CORRECTION:	+	19.5	dB

Remarks:
Carrier-on state / Carrier in the middle of the band (fm)
Measurement with 1 MHz resolution/video filter and RMS Detector.
For EIRP calculation:
´worst-case´ = maximum antenna gain

Plot No. 20 (21)



Subclause: 25.254 b)4) Special requirements for ancillary terrestrial components operating in the 1610-1626.5 MHz / 1525-1559 MHz bands
Carrier-on state, modulated carrier at the upper edge of the band (fo)
Conducted measurement at the antenna-connector

Limit:
Limit according to 25.254 b)4):
1559.0 - 1605.0MHz: -70dBW/1MHz
1605.0 - 1610MHz: -70 to -10dBW/1MHz)linear interpolated)
The EIRP, averaged over any two-millisecond active transmission interval from the MESs in the carrier-on state shall not exceed the limits above.

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 2, see subclause 1.5.2
Valid for all modulations, fo

Test setup:
see section 7.2: 1.2hgj

Test equipment:
see annex 2: C218, FT&T, R001, U311

Remark:

Test result: **Test passed**

Environment condition:

Date & Time:	Fri 02/Feb/2018 17:04:11	
Location:	CTC advanced GmbH, Laboratory RSC-Sat	
Temperature:	22	°C
Humidity:	55	%
Voltage:	230	Vac

Setup of measurement equipment:

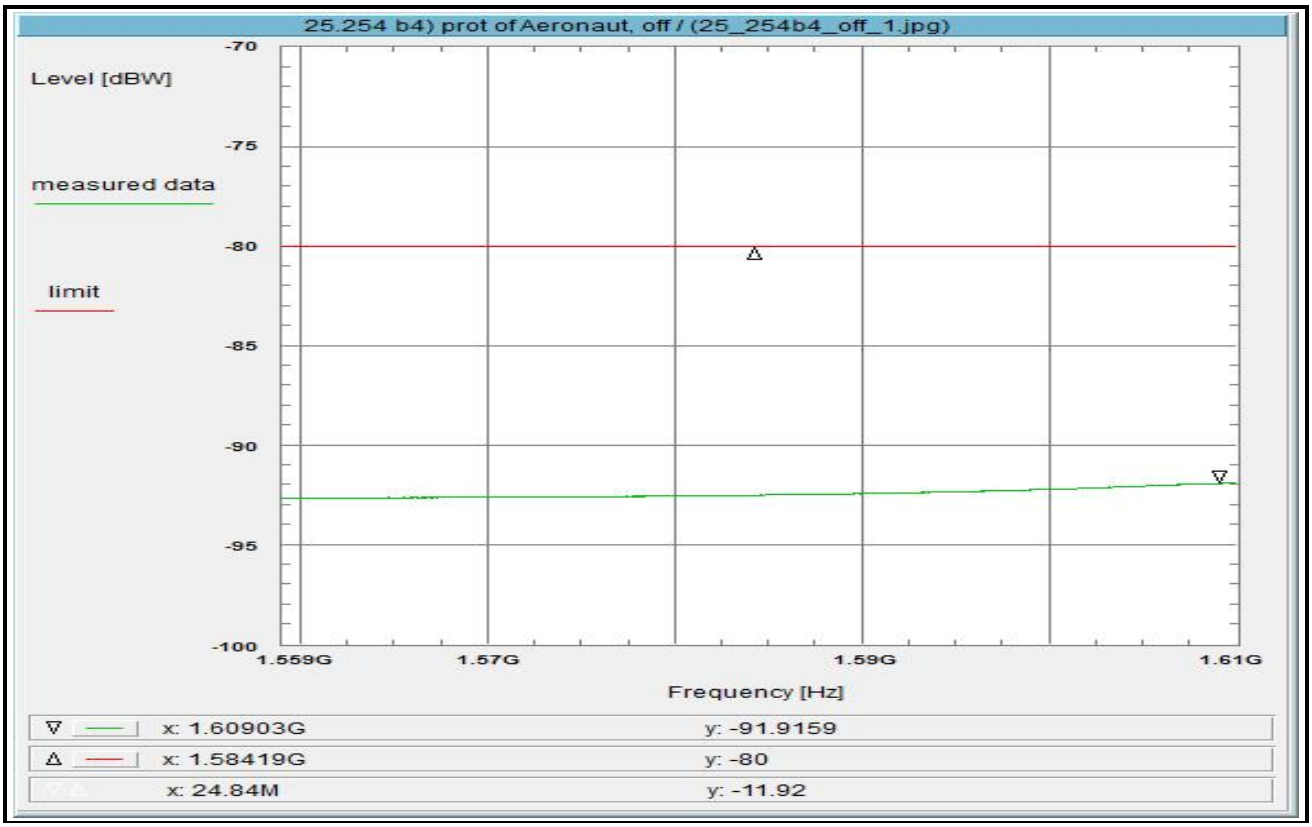
Start frequency:	1.559	GHz
Stop frequency:	1.61	GHz
Center frequency:	1.5845	GHz
Frequency span:	51	MHz
Resolution-BW:	1	MHz
Video-BW:	10	MHz
Input attenuation:	0	dB
Trace-Mode:	Max-Hold	
Detector-Mode:	RMS	

Correction:

Attenuation (U311)	+	9.7	dB
Coaxial cable (C218)	+	0.8	dB
DUT-Antenna (on-axis)	+	8.7	dBi
Test antenna	+	0.0	dB
BW correction factor	+	0.0	dB
Atten. between HPA and feedhorn	-	0.0	dB
(FT&T)	+	0.3	dB
TOTAL CORRECTION:	+	19.5	dB

Remarks:
Carrier-on state / Carrier at the upper edge of the band (fo)
Measurement with 1 MHz resolution/video filter and RMS Detector.
For EIRP calculation:
´worst-case´ = maximum antenna gain

Plot No. 21 (21)



Subclause: 25.254 b)4) Special requirements for ancillary terrestrial components operating in the 1610-1626.5 MHz / 1525-1559 MHz bands
Carrier-off state, conducted measurement at the antenna-connector

Limit:
Limit according to 25.254 b)4): -80dBW/1MHz

The EIRP, averaged over any two-millisecond active transmission interval from the MESs in the carrier-off state shall not exceed the limit above.

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 2, see subclause 1.5.2
TX-off

Test setup:
see section 7.2: 1.2hgj

Test equipment:
see annex 2: C218, FT&T, R001, U311

Remark:

Test result: **Test passed**

Environment condition:

Date & Time:	Fri 02/Feb/2018 17:06:46	
Location:	CTC advanced GmbH, Laboratory RSC-Sat	
Temperature:	22	°C
Humidity:	55	%
Voltage:	230	Vac

Setup of measurement equipment:

Start frequency:	1.559	GHz
Stop frequency:	1.61	GHz
Center frequency:	1.5845	GHz
Frequency span:	51	MHz
Resolution-BW:	1	MHz
Video-BW:	10	MHz
Input attenuation:	0	dB
Trace-Mode:	Max-Hold	
Detector-Mode:	RMS	

Correction:

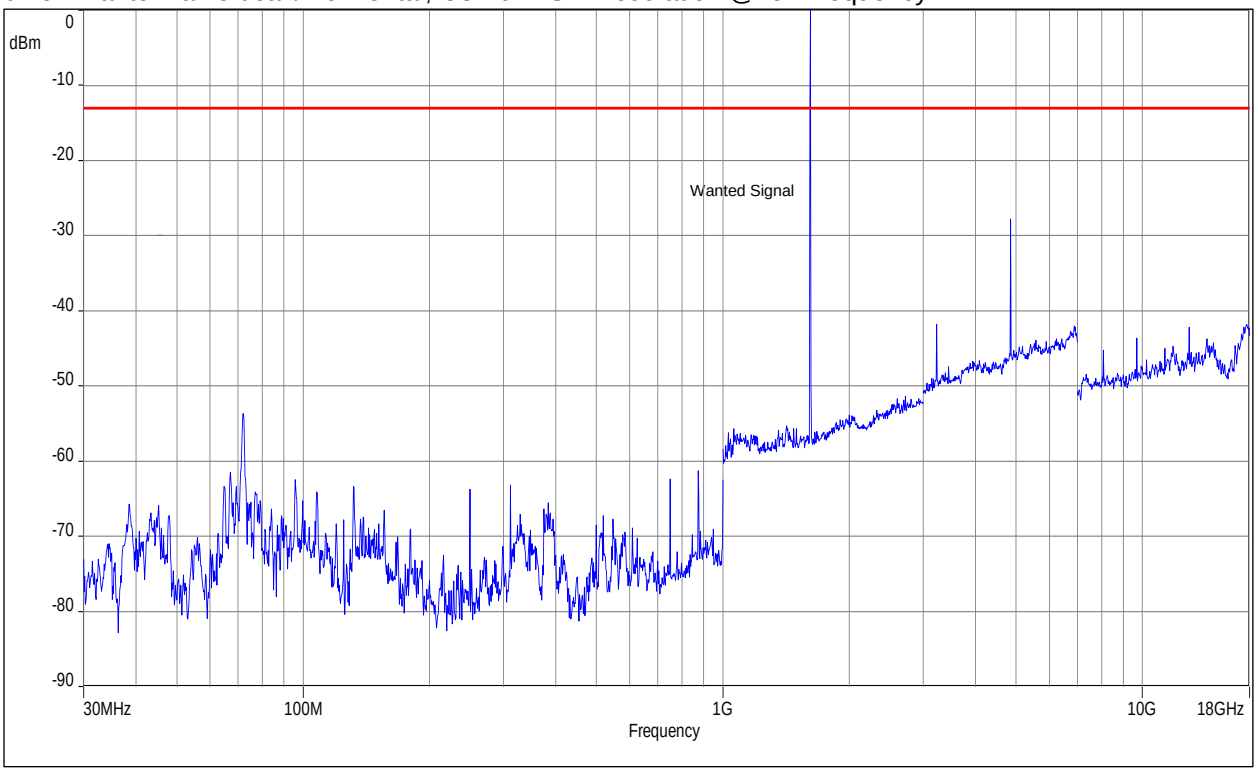
Attenuation (U311)	+	9.7	dB
Coaxial cable (C218)	+	0.8	dB
DUT-Antenna (on-axis)	+	8.7	dBi
Test antenna	+	0.0	dB
BW correction factor	+	0.0	dB
Atten. between HPA and feedhorn	-	0.0	dB
(FT&T)	+	0.3	dB
TOTAL CORRECTION:	+	19.5	dB

Remarks:
Carrier-off state.
Measurement with 1 MHz resolution filter and RMS Detector.
For EIRP calculation:
´worst-case´ = maximum antenna gain

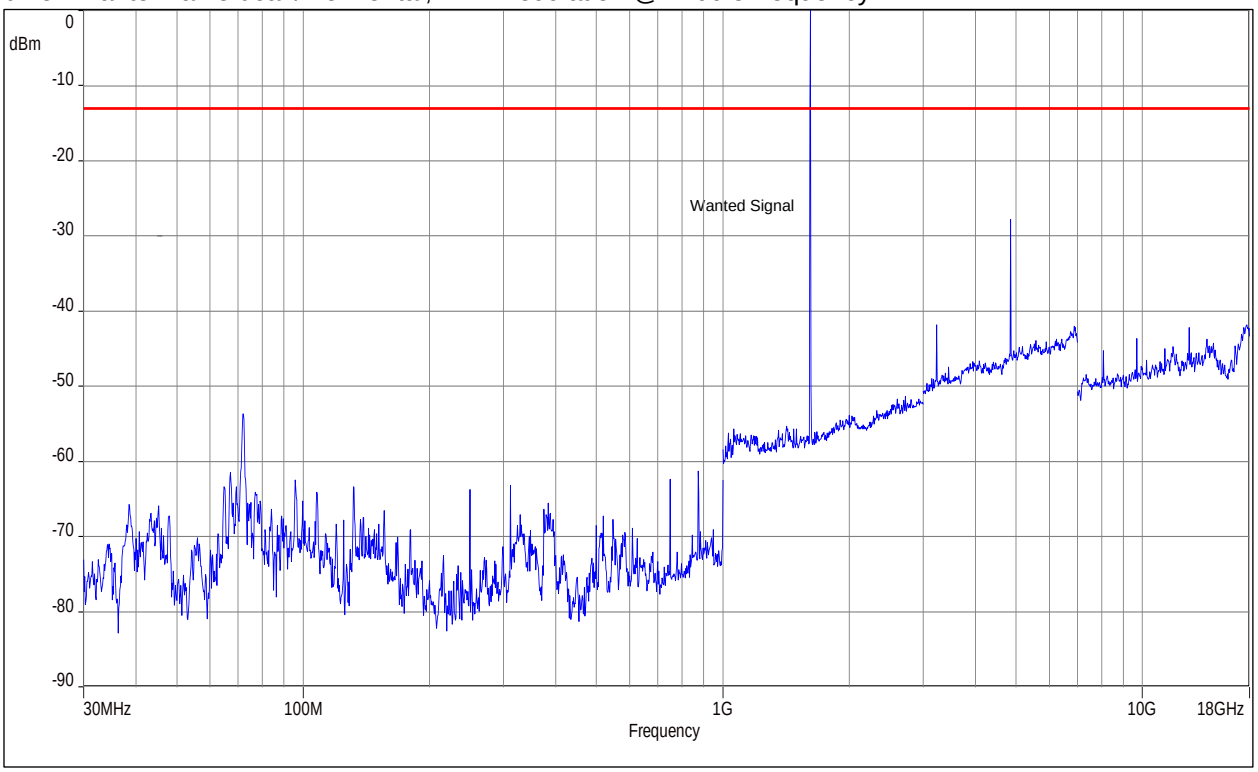
9.2 Radiated spurious emissions 30 MHz – 18 GHz

This part consists of 3 pages including this page.

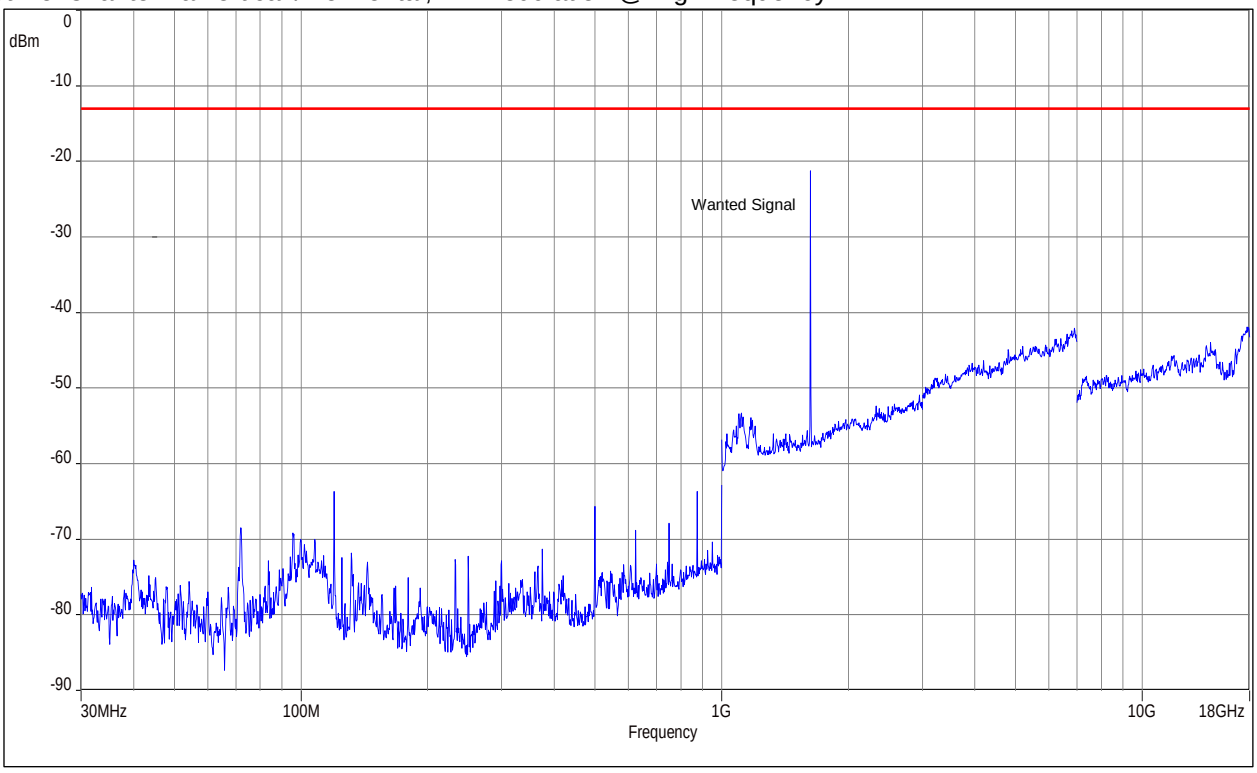
Plot No. 1: antenna vertical / horizontal, C8-16APSK modulation @ low frequency



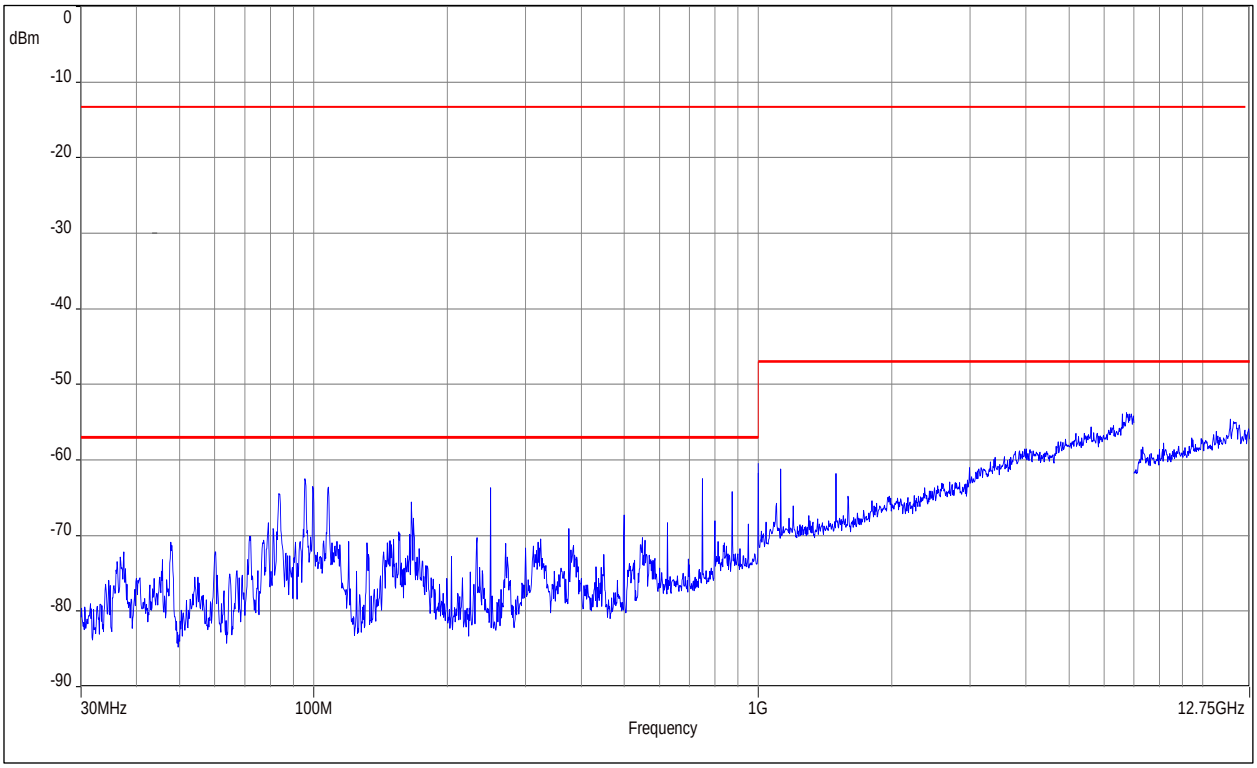
Plot No. 2: antenna vertical / horizontal, B14 modulation @ middle frequency



Plot No. 3: antenna vertical / horizontal, B1 modulation @ high frequency



Plot No. 4: antenna vertical / horizontal, RX-mode



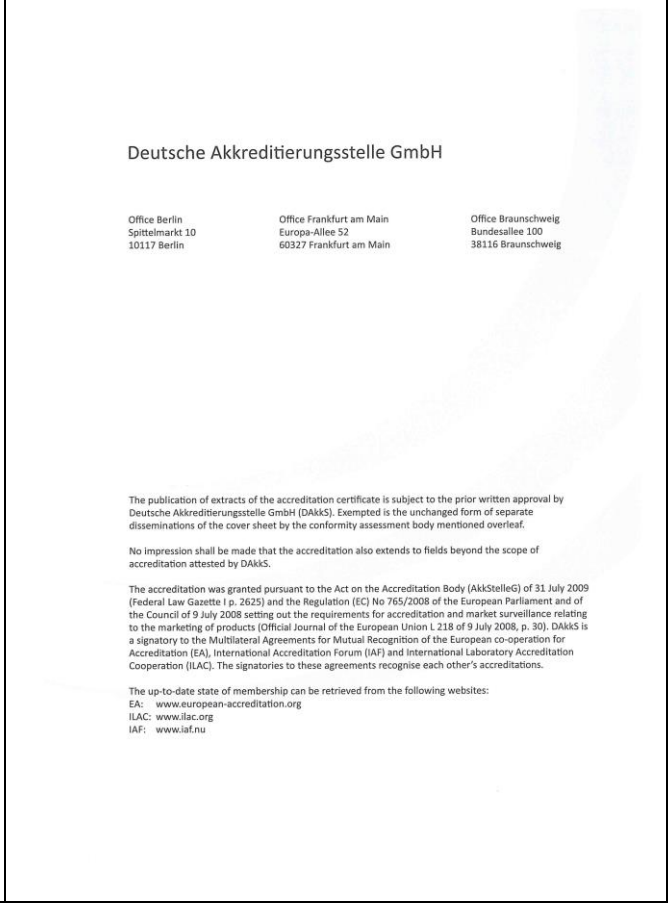
10 Glossary

EUT	Equipment under test
DUT	Device under test
UUT	Unit under test
GUE	GNSS User Equipment
ETSI	European Telecommunications Standards Institute
EN	European Standard
FCC	Federal Communications Commission
FCC ID	Company Identifier at FCC
IC	Industry Canada
PMN	Product marketing name
HMN	Host marketing name
HVIN	Hardware version identification number
FVIN	Firmware version identification number
EMC	Electromagnetic Compatibility
HW	Hardware
SW	Software
Inv. No.	Inventory number
S/N or SN	Serial number
C	Compliant
NC	Not compliant
NA	Not applicable
NP	Not performed
PP	Positive peak
QP	Quasi peak
AVG	Average
OC	Operating channel
OCW	Operating channel bandwidth
OBW	Occupied bandwidth
OOB	Out of band
DFS	Dynamic frequency selection
CAC	Channel availability check
OP	Occupancy period
NOP	Non occupancy period
DC	Duty cycle
PER	Packet error rate
CW	Clean wave
MC	Modulated carrier
WLAN	Wireless local area network
RLAN	Radio local area network
DSSS	Dynamic sequence spread spectrum
OFDM	Orthogonal frequency division multiplexing
FHSS	Frequency hopping spread spectrum
GNSS	Global Navigation Satellite System
C/N_0	Carrier to noise-density ratio, expressed in dB-Hz

11 Document history

Version	Applied changes	Date of release
-/-	DRAFT Initial release	2018-03-27
-/-	Minor editorial changes	2018-04-03

12 Accreditation Certificate

first page	last page
	

Note: The current certificate annex is published on the website (link see below) of the Accreditation Body DAkkS or may be received by CTC advanced GmbH on request

http://www.dakks.de/as/ast/d/D-PL-12076-01-03.pdf