

Test Site:
FCC Test Site No.: 96997



BUREAU
VERITAS

ECL-EMC Test Report No.: 16-089

Equipment under test: **AF 1937**
FCC ID: **BCR-AF1937**

Type of test: **FCC 47 CFR Part 24 Subpart E: 2016**
Broadband PCS

Measurement Procedures: 47 CFR Parts 2: 2016(*Frequency Allocations and Radio Treaty Matters; General Rules and Regulations*),
24 (Broadband PCS),
ANSI/TIA-603-C (2004), *Land Mobile FM or PM Communications Equipment Measurement and Performance Standards*

Test result: **Passed**

Date of issue:	28.04.16		Signature:
Issue-No.:	01	Author:	
Date of delivery:	18.04.16	Checked:	
Test dates:	05.04.16 – 19.04.16		
Pages:	51		



Manufacturer: ANDREW Wireless Systems GmbH
Industriering 10

D-86675 Buchdorf

Tel.: +49 (0)9099 69 0

Fax: +49 (0)9099 69 140

Test Location: Bureau Veritas Consumer Products Services
Germany GmbH
European Compliance Laboratory (ECL)
Thurn-und-Taxis-Straße 18

D-90411 Nürnberg

Tel.: +49 40 74041 0

Fax: +49 40 74041-2755

General:

The purpose of this report is to show compliance to the FCC regulations for unlicensed devices operating under part 24 of the Code of Federal Regulations title 47.

This report informs about the results of the EMC tests, it only refers to the equipment under test. No part of this report may be reproduced in any form, without written permission.



Table of contents

1	TEST RESULTS SUMMARY	5
2	EQUIPMENT UNDER TEST (E.U.T.)	6
2.1	DESCRIPTION	6
2.1.1	DOWNLINK	6
2.1.2	UPLINK	6
2.1.3	DESCRIPTION OF EUT	6
2.1.4	BLOCK DIAGRAM OF MEASUREMENT REFERENCE POINTS	7
3	TEST SITE (ANDREW BUCHDORF)	8
3.1	TEST ENVIRONMENT	8
3.2	TEST EQUIPMENT	8
3.3	INPUT AND OUTPUT LOSSES	9
3.4	MEASUREMENT UNCERTAINTY	9
4	TEST SITE (BUREAU VERITAS CONSUMER PRODUCTS SERVICES)	9
5	RF POWER OUT: §24.232, §2.1046	10
5.1	LIMIT	10
5.2	TEST METHOD	10
5.3	TEST RESULTS	11
5.3.1	DOWNLINK	11
5.3.2	UPLINK	11
5.3.2.1	LTE Downlink	12
5.3.2.2	LTE Uplink	13
5.4	SUMMARY TEST RESULT	13
6	OCCUPIED BANDWIDTH: §2.1049	14
6.1	LIMIT	14
6.2	TEST METHOD	14
6.3	TEST RESULTS	15
6.3.1	DOWNLINK	15
6.3.2	UPLINK	15
6.3.2.1	Downlink LTE	16
6.3.2.2	Uplink LTE	17
6.3.3	26dB BANDWIDTH	18
6.3.3.1	Downlink LTE	18
6.3.3.2	Uplink LTE	19
6.3.4	SUMMARY TEST RESULT	20
7	SPURIOUS EMISSIONS AT ANTENNA TERMINALS: §24.238, §2.1051	21
7.1	LIMIT	21
7.2	TEST METHOD	21
7.3	TEST RESULTS	22
7.3.1	DOWNLINK	22
7.3.2	UPLINK	22



7.3.2.1	Downlink LTE.....	23
7.3.2.2	Uplink LTE	24
7.4	SUMMARY TEST RESULT	24
8	INTERMODULATION: §24.238, §2.1051	25
8.1	LIMIT.....	25
8.2	TEST METHOD	25
8.3	TEST RESULTS	26
8.3.1	DOWNLINK	26
8.3.2	UPLINK	26
8.3.2.1	Downlink LTE.....	27
8.3.2.2	Uplink LTE	28
8.4	SUMMARY TEST RESULT	29
9	OUT OF BAND REJECTION	30
9.1	LIMIT.....	30
9.2	TEST METHOD	30
9.3	TEST RESULTS	30
9.3.1	DOWNLINK	31
9.3.2	UPLINK	32
9.4	SUMMARY TEST RESULT	32
10	FIELD STRENGTH OF SPURIOUS EMISSIONS: §24.238, §2.1053.....	33
10.1	METHOD OF MEASUREMENT	37
10.2	LIMIT	38
10.3	CLIMATIC VALUES IN THE LAB	38
10.4	TEST RESULTS.....	39
10.4.1	30 MHZ TO 1 GHZ UPLINK (BOTTOM – MIDDLE – TOP)	39
10.4.2	30 MHZ TO 1 GHZ DOWNLINK (BOTTOM – MIDDLE – TOP)	40
10.4.3	30 MHZ TO 1 GHZ UPLINK (MIDDLE OF BOTH PATHS).....	41
10.4.4	30 MHZ TO 1 GHZ DOWNLINK (MIDDLE OF BOTH PATHS)	42
10.4.5	1 TO 18 GHZ UPLINK (BOTTOM – MIDDLE – TOP)	43
10.4.6	1 TO 18 GHZ DOWNLINK (BOTTOM – MIDDLE – TOP)	44
10.4.7	1 TO 18 GHZ UPLINK (MIDDLE OF BOTH PATHS).....	45
10.4.8	1 TO 18 GHZ DOWNLINK (MIDDLE OF BOTH PATHS).....	46
10.4.9	18 TO 26.5 GHZ UPLINK (BOTTOM – MIDDLE – TOP)	47
10.4.10	18 TO 26.5 GHZ DOWNLINK (BOTTOM – MIDDLE – TOP).....	48
10.4.11	18 TO 26.5 GHZ UPLINK (MIDDLE OF BOTH PATHS)	49
10.4.12	18 TO 26.5 GHZ DOWNLINK (MIDDLE OF BOTH PATHS).....	50
11	HISTORY	51



1 Test Results Summary

Name of Test	FCC Para. No.	FCC Method	FCC Spec.	Result
RF Power Output	24.232(a)	2.1046(a)	500 Watts	Complies
Occupied Bandwidth	KDB 935210 D02 v03r02	2.1049(h)	Input/Output	Complies
Spurious Emissions at Antenna Terminals	24.238(a)	2.1051	-13dBm	Complies
Field Strength of Spurious Emissions	24.238(a)	2.1053	-13dBm E.I.R.P	Complies
Intermodulation	KDB 935210 D02 v03r02	KDB 935210 D02 v03r02	KDB 935210 D02 v03r02	Complies
*Frequency Stability	n.a.	2.1055(a)(d)	Must stay in band	NA
Out of Band Rejection	KDB 935210 D02 v03r02	KDB 935210 D03 v04	KDB 935210 D03 v04	Complies

*Footnotes (Frequency Stability):

(1) Modulation characteristics were not tested since the E.U.T processes but does not produce a modulated waveform.

(2) The equipment under test uses a common oscillator to down-convert the RF input to an intermediate frequency and to up-convert the IF to RF output. The RF input and output frequency are the same.



2 Equipment under test (E.U.T.)

2.1 Description

Kind of equipment	AF 1937
Andrew Ident. Number	7577554-01
Serial no.(SN)	NEO642
Revision	00
Software version and ID	Noda AM Software V1.7.6, 7613506-07
Type of modulation and Designator	CDMA (F9W) ☐ W-CDMA (F9W) ☐ LTE (G7D) ☒
Frequency Translation	F1-F1 ☒ F1-F2 ☐ N/A ☐
Band Selection	Software ☒ Duplexer ☒ Full band ☐

2.1.1 Downlink

Pass band	1930 MHz – 1995 MHz
Max. composite output power based on one carrier per path (rated)	37 dBm = 5 W
Gain max.	94 dB

2.1.2 Uplink

Pass band	1850 MHz – 1915 MHz
Maximum rated output power	30 dBm = 1 W
Gain max.	94 dB

2.1.3 Description of EUT

The Node A is an RF enhancer which is capable of filtering and amplifying a multitude of distinct sub-bands up to 120 MHz in total anywhere within multiple frequency bands. It is designed to be part of the primary infrastructure.



2.1.4 Block diagram of measurement reference points

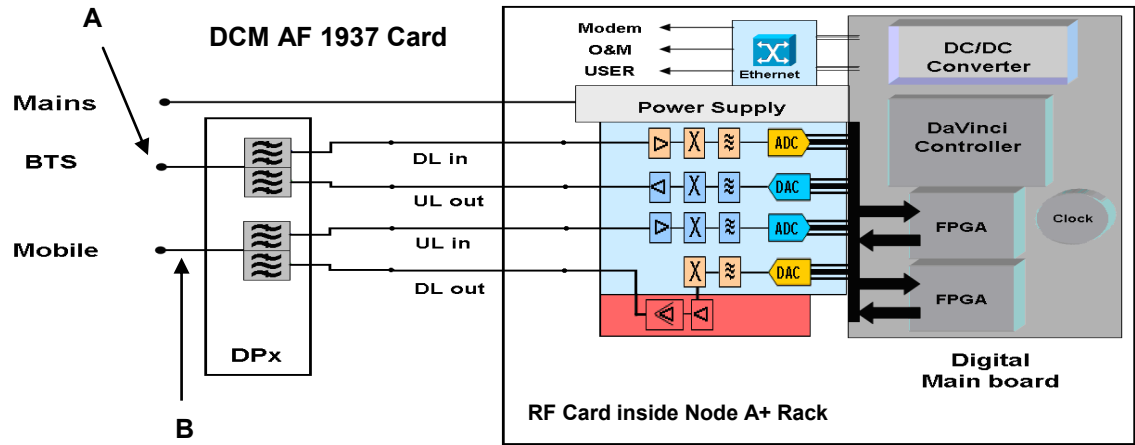


figure 2.1.4-#1 Block diagram of measurement reference points

DCM AF 1937 is the EUT

Reference point A	UL output,	DL input
Reference point B	DL output,	UL input



3 Test site (Andrew Buchdorf)

3.1 Test environment

All tests were performed under the following environmental conditions:

Condition	Minimum value	Maximum value
Barometric pressure	86 kPa	106 kPa
Temperature	15°C	30°C
Relative Humidity	20 %	75 %
Power supply range	±5% of rated voltages	

3.2 Test equipment

ANDREW Inv. No.	Test equipment	Type	Manufacturer	Serial No.	Calibration
9266	Network Analyzer	ZNB 20	R&S	101490	9/2015
9126	Spectrum Analyzer	FSV 30	R&S	101237	11/2015
9069	Generator	SMBV100A	R&S	256275	08/2015
9046	Generator	SMBV100A	R&S	255090	07/2015
8542	Power Meter	E4418A	Agilent	GB38273230	01/2016
8544	Power Sensor	E8481H	Agilent	3318A19208	01/2016
7583	RF-Cable	Testpro 4.2	Radiall	---	CIU
7584	RF-Cable	Testpro 4.2	Radiall	---	CIU
7585	RF-Cable	Testpro 4.2	Radiall	---	CIU
7586	RF-Cable	Testpro 4.2	Radiall	---	CIU
7537	RF-Cable	Testpro 4.2 + Projack	Radiall	---	CIU
7542	RF-Cable	Testpro 4.2 + Projack	Radiall	---	CIU
7475	Notch Filter	WRCT1850/1910	Wainwright	1	CIU
7459	Notch Filter	WRCT1930/1990	Wainwright	1	CIU
7406	Matrix		COMMSCOPE	---	weekly

CIU = Calibrate in use



3.3 Input and output losses

All recorded power levels should be referenced to the input and output connectors of the repeater, unless explicitly stated otherwise.

The test equipment used in this test has to be calibrated, so that the functionality is also checked.

All cables, attenuators, splitter, isolator, circulator and combiner etc. must be measured before testing and used for compensation during testing.

3.4 Measurement uncertainty

The extended measurement uncertainty corresponds to the measurement results from the standard measurement uncertainty multiplied by the coverage factor $k=2$. The true value is located in the corresponding interval with a probability of 95 %.

4 Test site (Bureau Veritas Consumer Products Services)

FCC Test site: 96997

See relevant dates under section 10 of this test report.

5 RF Power Out: §24.232, §2.1046

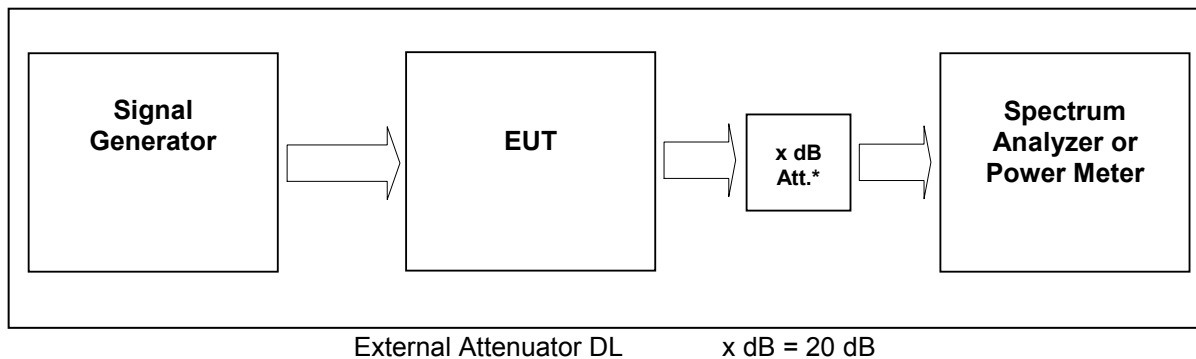


figure 5-#1 Test setup: RF Power Out: §24.232, §2.1046

Measurement uncertainty	± 0,38 dB
Test equipment used	9046, 9126, 9784, 7537, 7584, 7542, 8542, 8544, 7370

5.1 Limit

Minimum standard:

Para. No.24.232

(a)(1) Base stations with an emission bandwidth of 1 MHz or less are limited to 1640 watts equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT, except as described in paragraph (b) below.

(2) Base stations with an emission bandwidth greater than 1 MHz are limited to 1640 watts/MHz equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT, except as described in paragraph (b) below.

Table 1—Reduced Power for Base Station Antenna Heights Over 300 Meters

HAAT in meters	Maximum EIRP watts
≤ 300	1640
≤ 500	1070
≤ 1000	490
≤ 1500	270
≤ 2000	160

5.2 Test method

§ 2.1046 Measurements required: RF power output.

(a) For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in § 2.1033(c)(8). The electrical characteristics of the radio frequency load attached to the output terminals when this test is made shall be stated.



(c) For measurements conducted pursuant to paragraphs (a) and (b) of this section, all calculations and methods used by the applicant for determining carrier power or peak envelope power, as appropriate, on the basis of measured power in the radio frequency load attached to the transmitter output terminals shall be shown. Under the test conditions specified, no components of the emission spectrum shall exceed the limits specified in the applicable rule parts as necessary for meeting occupied bandwidth or emission limitations

5.3 Test results

Detector RMS.

Test signal LTE:

Signal waveform according to Test Model 1.1, E-TM1.1, clause 6.1.1.1-1, table 6.1.1.1-1 of standard specification 3GPP TS 36.141 V9.3.0 (2010-03).

5.3.1 Downlink

Modulation	Measured at	Path	RBW VBW Span	RF Power (dBm)	RF Power (W)	Plot -
LTE	Middle	1962.5 MHz	3MHz 10MHz 15MHz	37	5	5.3.2.1 #1
Maximum output power = 37 dBm = 5 W						
Limit Maximum output power (erp) = 1000 W						

table 5.3.1-#1 RF Power Out: §24.232, §2.1046 Test results Downlink

The max RF Power out is 37 dBm, so the maximum antenna gain (x) can be calculated as follow:

Limit = 1000W (erp) = 60 dBm

Info: 1000W (erp) = 1640W (eirp)

$60 \text{ dBm} > 37 \text{ dBm} + x \rightarrow x = 60 \text{ dBm} - 37 \text{ dBm} = 23 \text{ dBd}$

$x \text{ dBi} = 23 \text{ dBd} + 2.15 = 25.15 \text{ dBi}$

=> The antenna that will be used for the complete system have to have a gain lower than 25.15 dBi, relative to a dipol.

5.3.2 Uplink

Modulation	Measured at	Path	RBW VBW Span	RF Power (dBm)	RF Power (W)	Plot -
LTE	Middle	1882.5 MHz	3MHz 10MHz 15MHz	30	1	5.3.2.2 #1
Maximum output power = 30 dBm = 1 W						
Limit Maximum output power (erp) = 1000 W						

table 5.3.2-#2 RF Power Out: §24.232, §2.1046 Test results Uplink

The max RF Power out is 30 dBm, so the maximum antenna gain (x) can be calculated as follow:

Limit = 1000W (erp) = 60 dBm

Info: 1000W (erp) = 1640W (eirp)

$60 \text{ dBm} > 30 \text{ dBm} + x \rightarrow x = 60 \text{ dBm} - 30 \text{ dBm} = 30 \text{ dBd}$

$x \text{ dBi} = 30 \text{ dBd} + 2.15 = 32.15 \text{ dBi}$

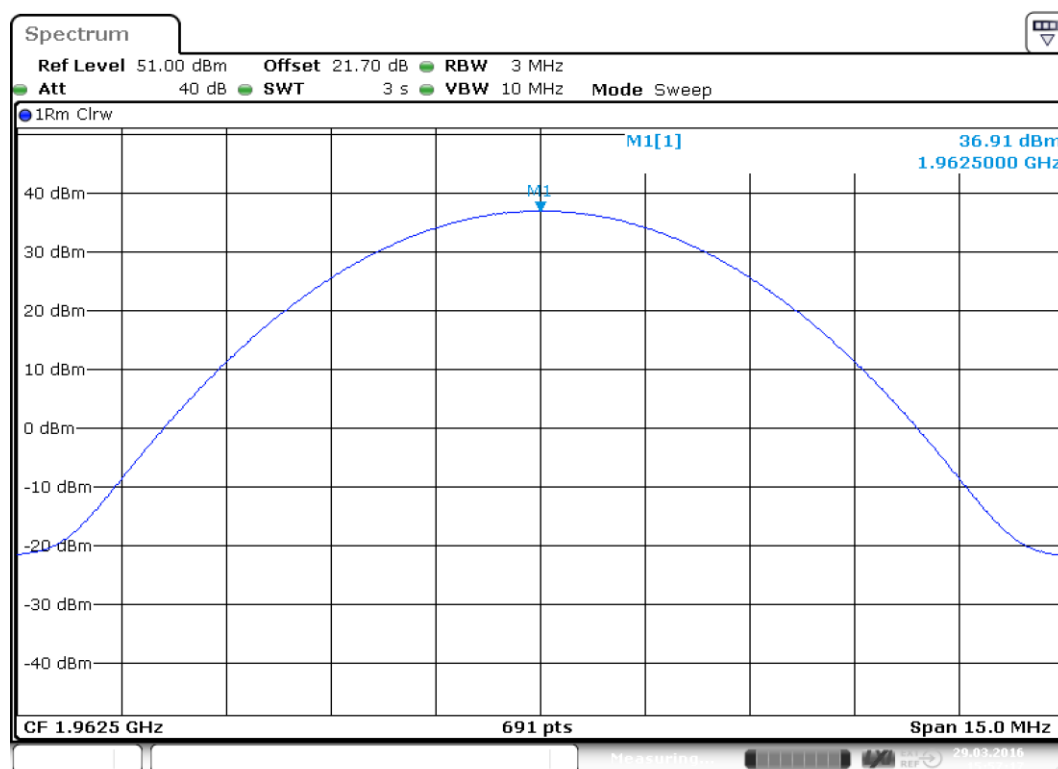
=> The antenna that will be used for the complete system have to have a gain lower than 32.15 dBi, relative to a dipol.

5.3.2.1 LTE Downlink

Modulation	Pin / dBm* (Ref. point A)
LTE	-27

*measured with 64dB gain

table 5.3.2-#3 RF Power Out: §24.232, §2.1046 Test results Uplink Input power



plot 5.3.2.1-#1 RF Power Out: §24.232, §2.1046; Test results; Uplink; LTE Downlink Middle

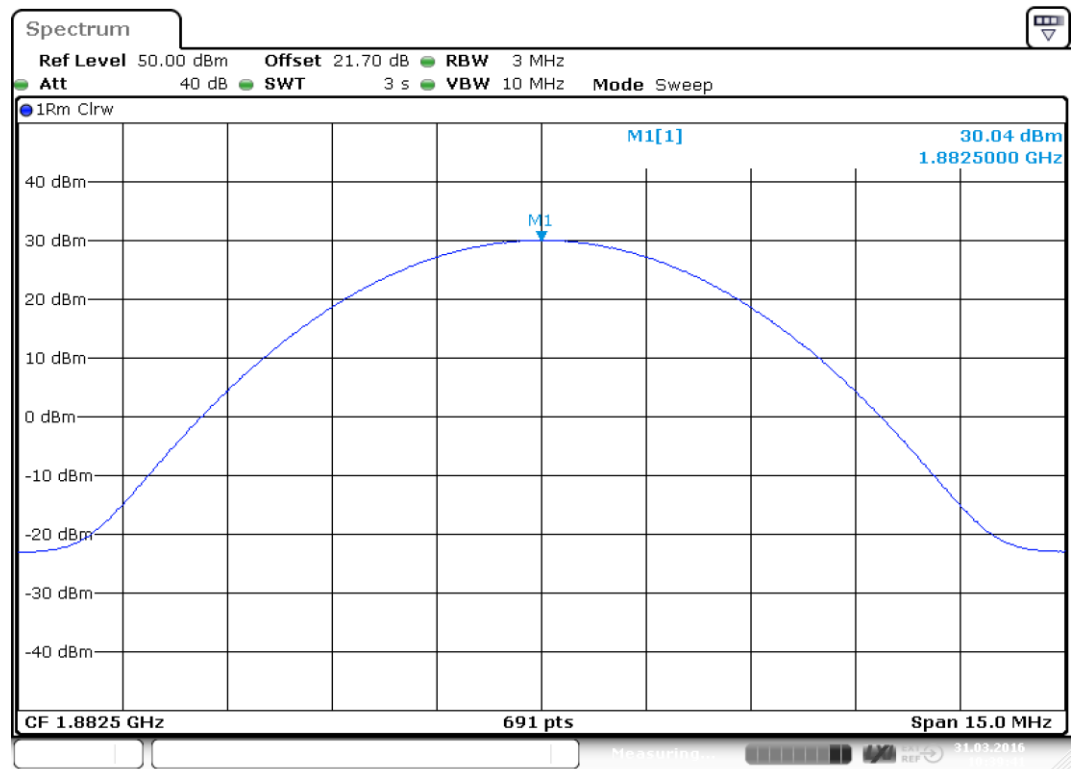


5.3.2.2 LTE Uplink

Modulation	Pin / dBm* (Ref. point B)
LTE	-34

*measured with 64dB gain

table 5.3.2-#4 RF Power Out: §24.232, §2.1046 Test results Uplink Input power



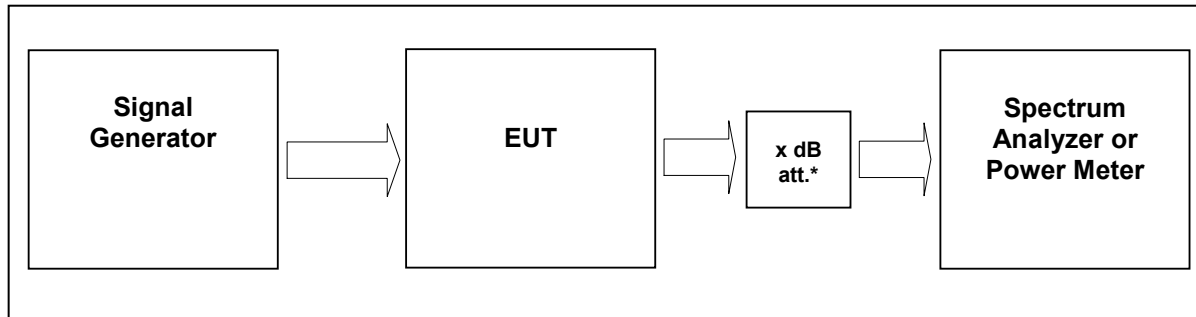
Date: 31.MAR.2016 10:39:41

plot 5.3.2.2-#1 RF Power Out: §24.232, §2.1046; Test results; Uplink; LTE Uplink Middle

5.4 Summary test result

Test result	complies, according the plots above
Tested by:	F. Bengesser
Date:	29.03.2016

6 Occupied Bandwidth: §2.1049



External Attenuator DL x dB = 20 dB
figure 6-#1 Test setup: Occupied Bandwidth: §2.1049

Measurement uncertainty	± 0,38 dB
Test equipment used	9046, 9126, 9784, 7537, 7584, 7542, 8542, 8544, 7370

6.1 Limit

The spectral shape of the output should look similar to input for all modulations.

6.2 Test method

Para. No.2.1049

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the following conditions as applicable:



6.3 Test results

6.3.1 Downlink

Detector PK.

Modulation	Measured at	F center / MHz	RBW VBW Span	Occupied Bandwidth / MHz	Plot #
LTE	Middle	1962.5	30 kHz 300 kHz 5 MHz	1.1	6.3.2.1 #1,#2

Modulation	Measured at	F center / MHz	RBW VBW Span	26dB Bandwidth / MHz	Plot #
LTE	Middle	1962.5	30 kHz 300 kHz 5 MHz	1.3	6.3.3.1 #1,#2

table 6.3-#1 Occupied Bandwidth: §2.1049 Test results Downlink

6.3.2 Uplink

Detector PK.

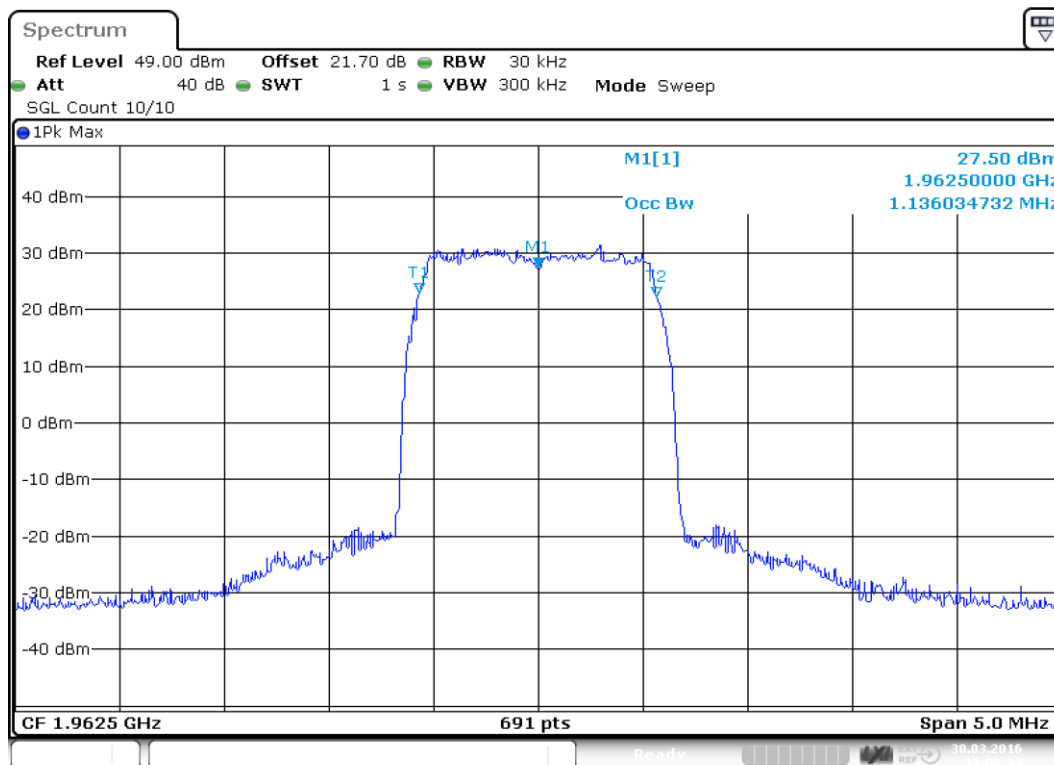
Modulation	Measured at	F center / MHz	RBW VBW Span	Occupied Bandwidth / MHz	Plot #
LTE	Middle	1882.5	30 kHz 300 kHz 5 MHz	1.1	6.3.2.2 #1,#2

Modulation	Measured at	F center / MHz	RBW VBW Span	26dB Bandwidth / MHz	Plot #
LTE	Middle	1882.5	30 kHz 300 kHz 5 MHz	1.4	6.3.3.2 #1,#2

table 6.3-#2 Occupied Bandwidth: §2.1049 Test results Uplink

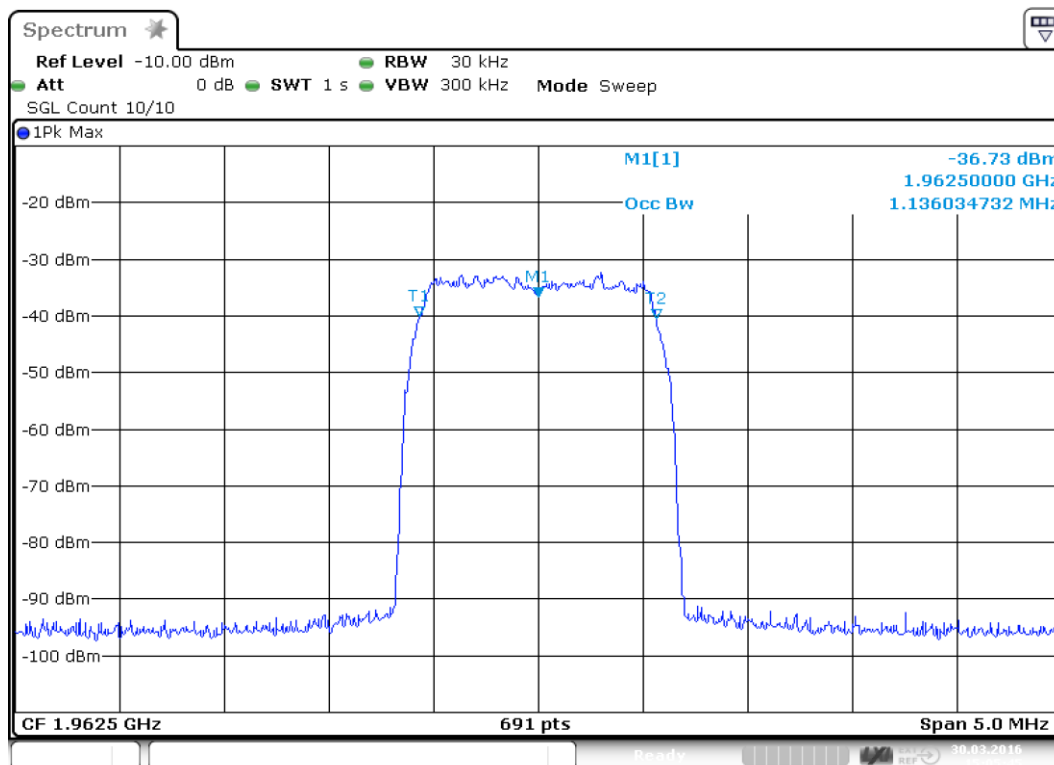


6.3.2.1 Downlink LTE



Date: 30.MAR.2016 15:08:54

plot 6.3.2.1-#1 Occupied Bandwidth: \$2.1049; Test results; Uplink; Downlink LTE Output

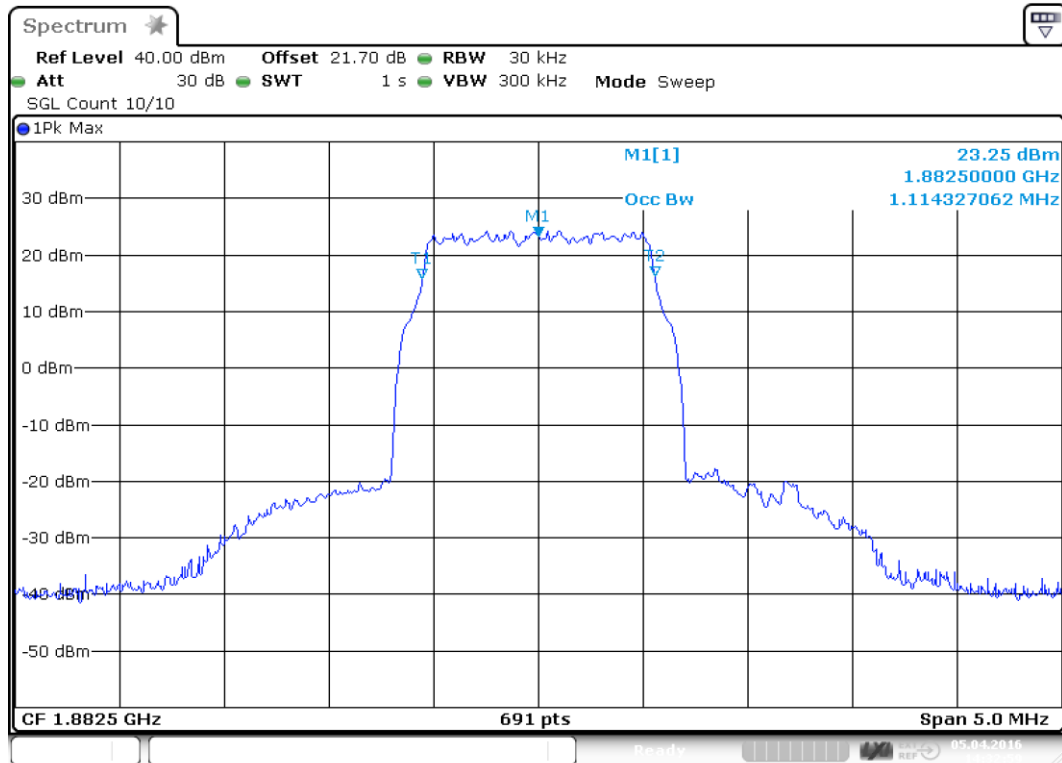


Date: 30.MAR.2016 15:05:46

plot 6.3.2.1-#2 Occupied Bandwidth: \$2.1049; Test results; Uplink; Downlink LTE Input

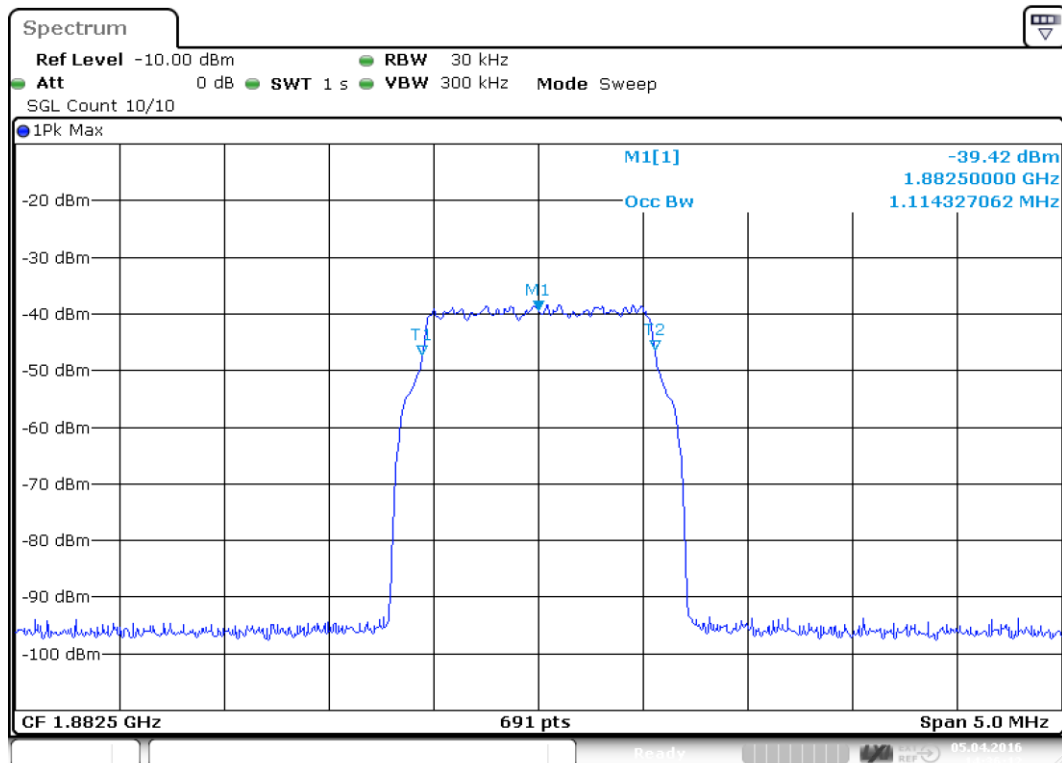


6.3.2.2 Uplink LTE



Date: 5.APR.2016 14:32:59

plot 6.3.2.2-#1 Occupied Bandwidth: \$2.1049; Test results; Uplink; Uplink LTE Output



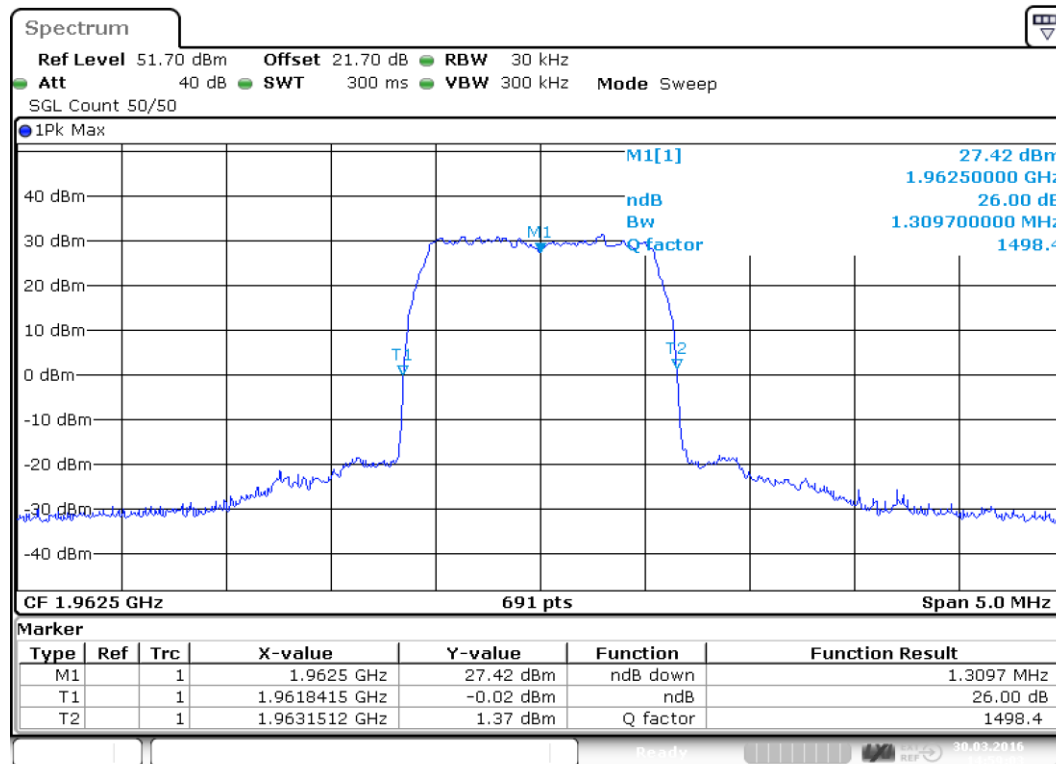
Date: 5.APR.2016 14:36:12

plot 6.3.2.2-#2 Occupied Bandwidth: \$2.1049; Test results; Uplink; Uplink LTE Input



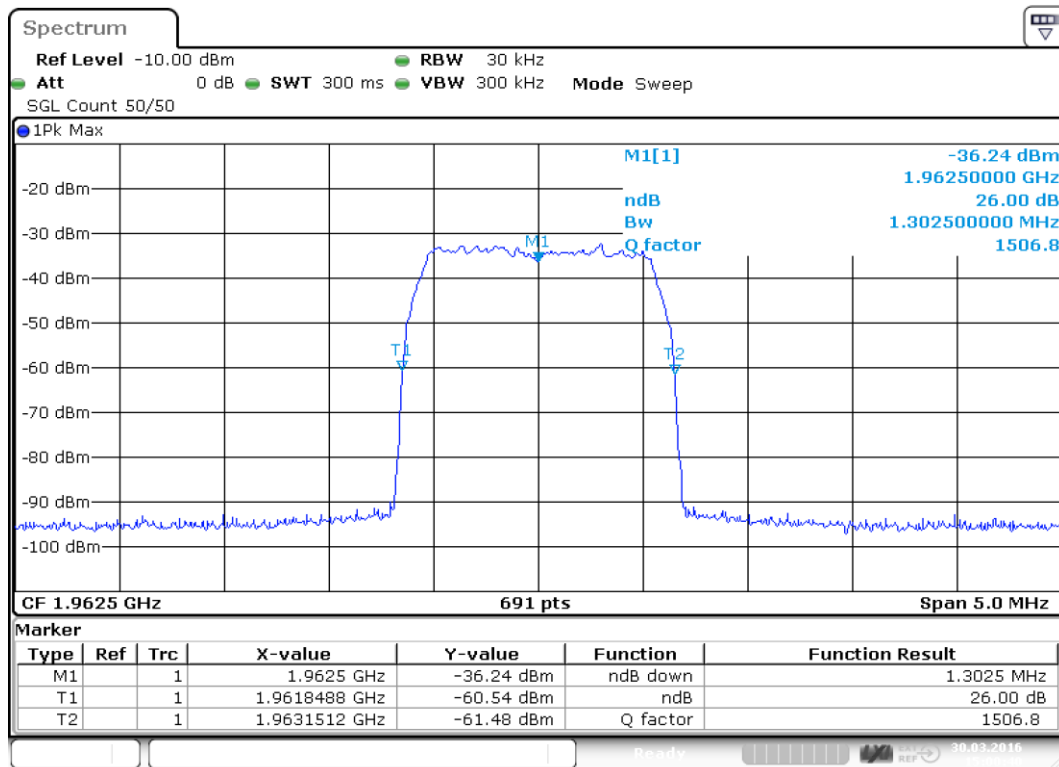
6.3.3 26dB Bandwidth

6.3.3.1 Downlink LTE



Date: 30.MAR.2016 14:59:04

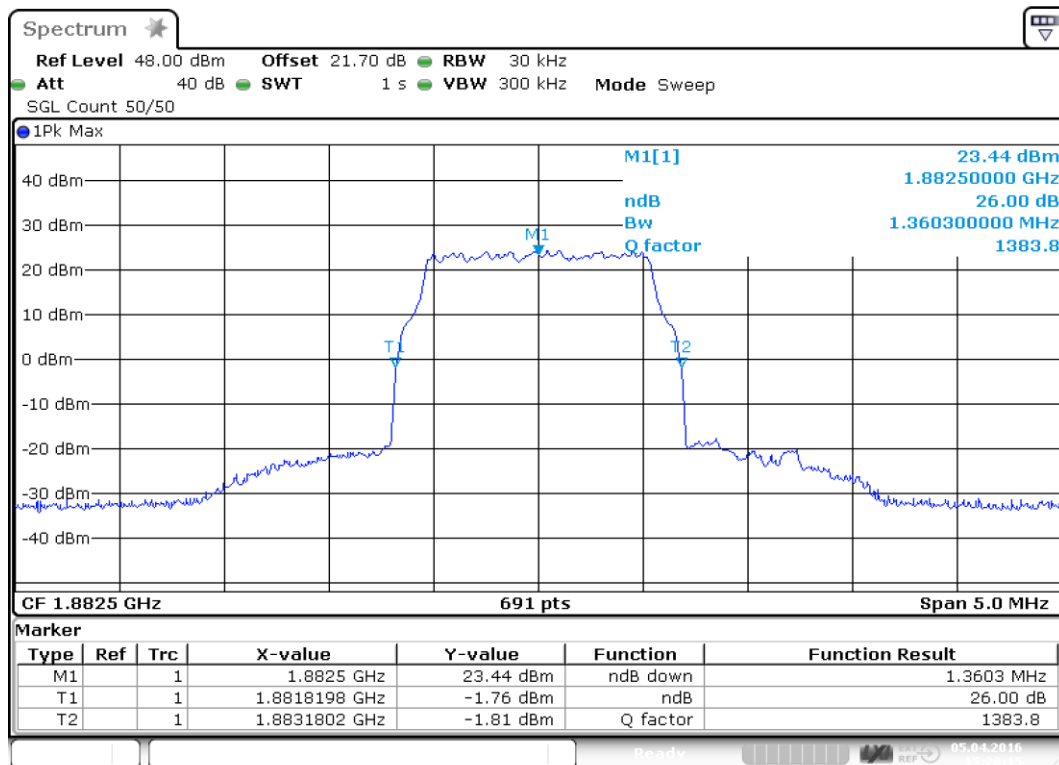
plot 6.3.3.1-#1 Occupied Bandwidth: \$2.1049; Test results; 26dB Bandwidth; Downlink LTE Output

BUREAU
VERITAS

Date: 30.MAR.2016 15:00:41

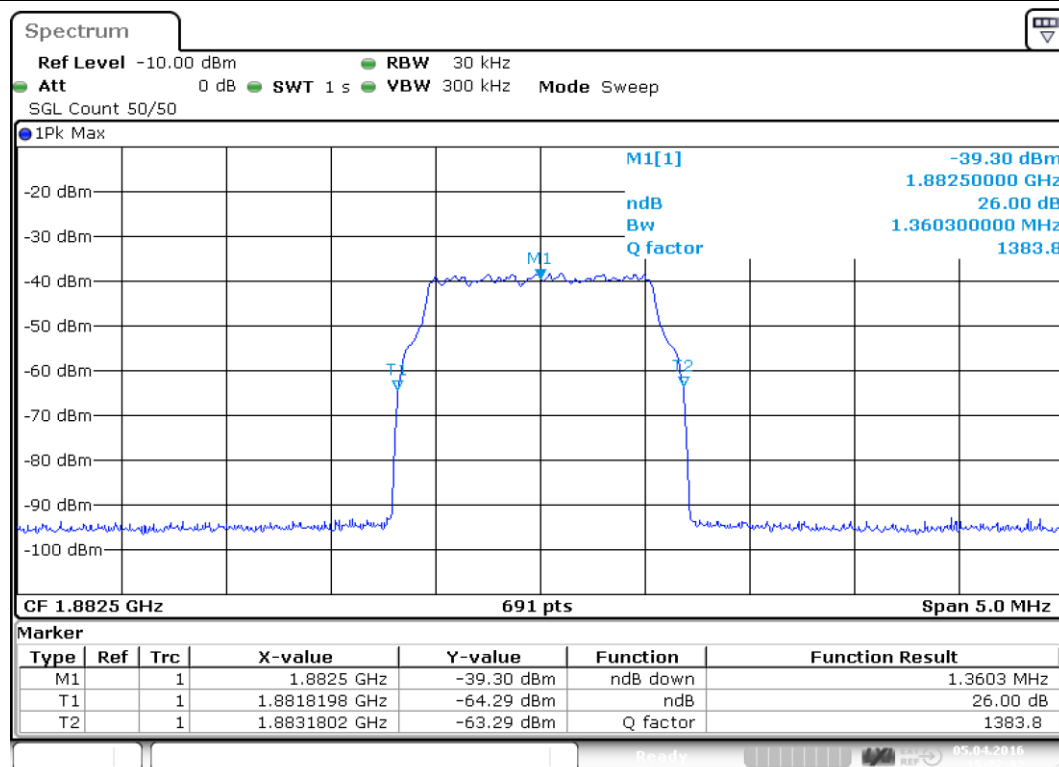
plot 6.3.3.1-#2 Occupied Bandwidth: \$2.1049; Test results; 26dB Bandwidth; Downlink LTE Input

6.3.3.2 Uplink LTE



Date: 5.APR.2016 15:20:15

plot 6.3.3.2-#1 Occupied Bandwidth: \$2.1049; Test results; 26dB Bandwidth; Uplink LTE Output

BUREAU
VERITAS

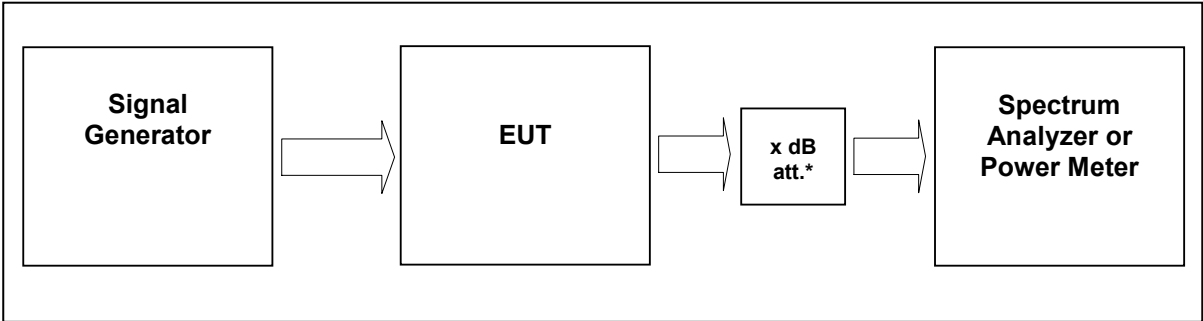
plot 6.3.3.2-#2 Occupied Bandwidth: \$2.1049; Test results; 26dB Bandwidth; Uplink LTE Input

6.3.4 Summary test result

Test result	complies, according the plots above
Tested by:	F. Bengesser
Date:	30.03.2016



7 **Spurious Emissions at Antenna Terminals: §24.238, §2.1051**



External Attenuator DL x dB = 20 dB

figure 7-#1 Test setup: Spurious Emissions at Antenna Terminals: §24.238, §2.1051

Measurement uncertainty	± 0,54 dB ± 1,2 dB ± 1,5 dB	9 kHz to 3 GHz 3 GHz to 7 GHz 7 GHz to 26 GHz
Test equipment used	9046, 9126, 9784, 7537, 7584, 7542, 7475, 7459, 8542, 8544, 7370	

7.1 Limit

Minimum standard:

Para. No.24.238(a)

The rules in this section govern the spectral characteristics of emissions in the Broadband Personal Communications Service.

(a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

7.2 Test method

Para. No 2.1051 Measurements required: Spurious emissions at antenna terminals.

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in § 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

[39 FR 5919, Feb. 15, 1974. Redesignated and amended at 63 FR 36599, July 7, 1998]



7.3 Test results

7.3.1 Downlink

Detector: RMS.

Modulation	Carrier	RBW VBW Span	Max. level (dBm)	Plot -
LTE	1962.5 MHz	1MHz 3MHz 30MHz – 23GHz	-36.6	7.3.2.1 #1

table 7.3-#1 Spurious Emissions at Antenna Terminals: §24.238, §2.1051 Test results

7.3.2 Uplink

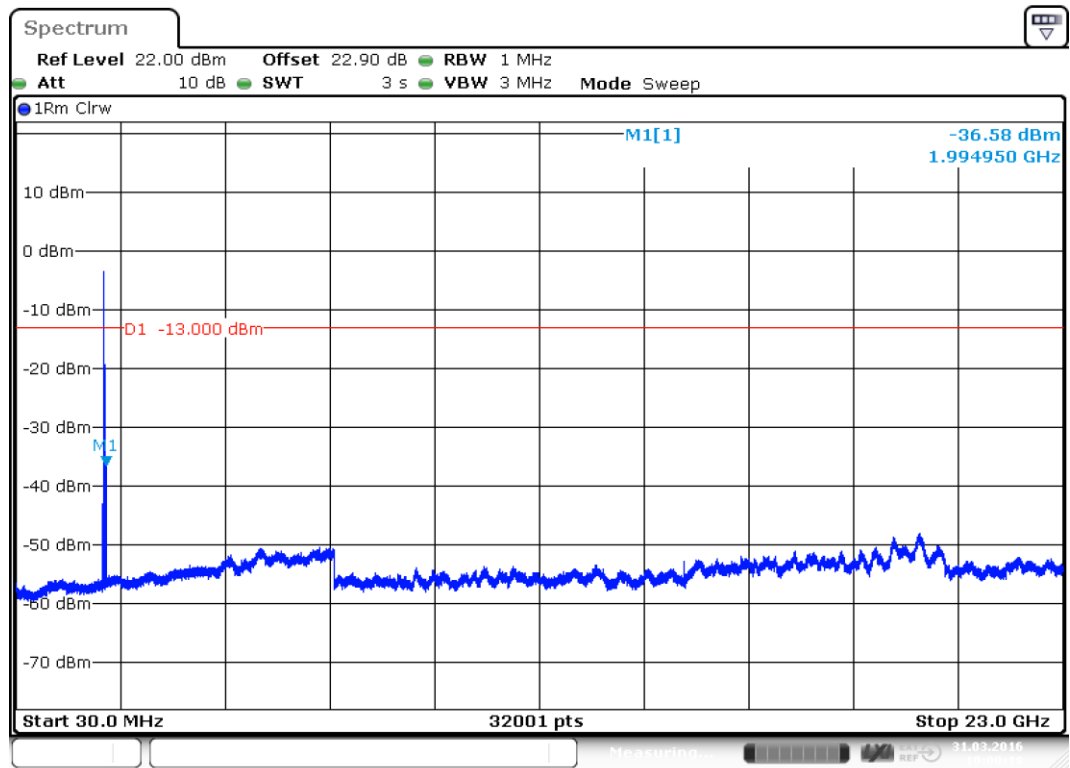
Detector: RMS.

Modulation	Carrier	RBW VBW Span	Max. level (dBm)	Plot -
LTE	1882.5 MHz	1MHz 3MHz 30MHz – 23GHz	-40.1	7.3.2.2 #1

table 7.3-#2 Spurious Emissions at Antenna Terminals: §24.238, §2.1051 Test results



7.3.2.1 Downlink LTE

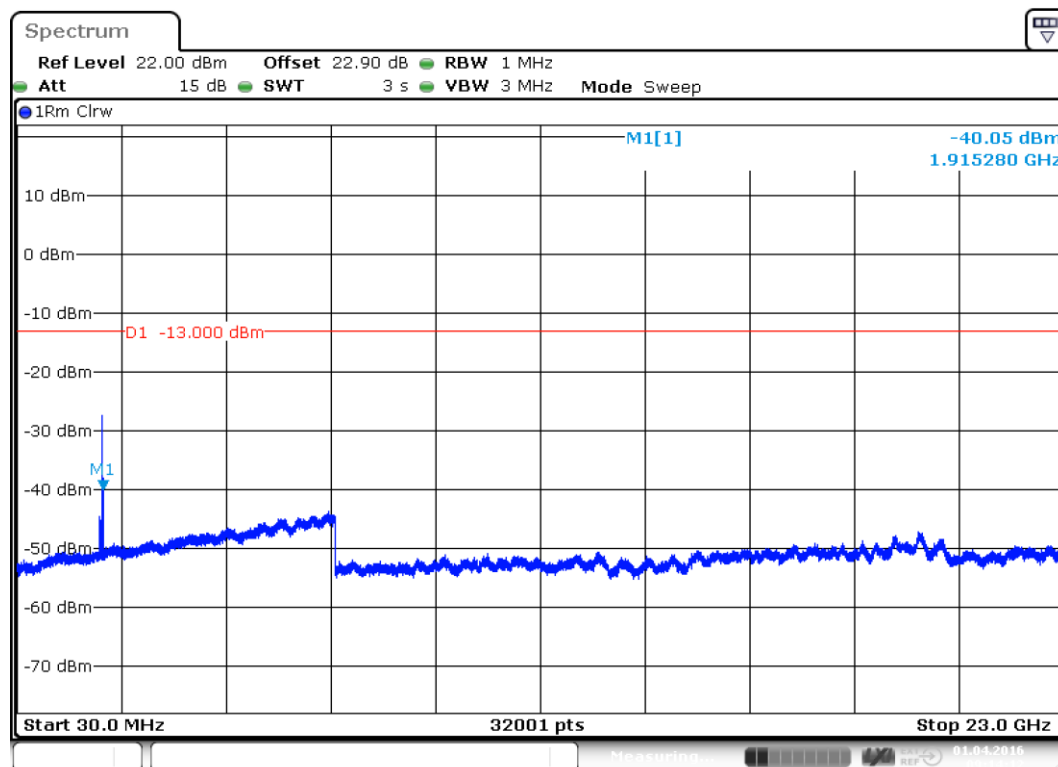


Date: 31.MAR.2016 10:00:18

plot 7.3.2.1-#1 Spurious Emissions at Antenna Terminals: §24.238, §2.1051; Test results; Uplink; Downlink LTE; carrier (1962.5MHz) notched



7.3.2.2 Uplink LTE



Date: 1.APR.2016 09:14:12

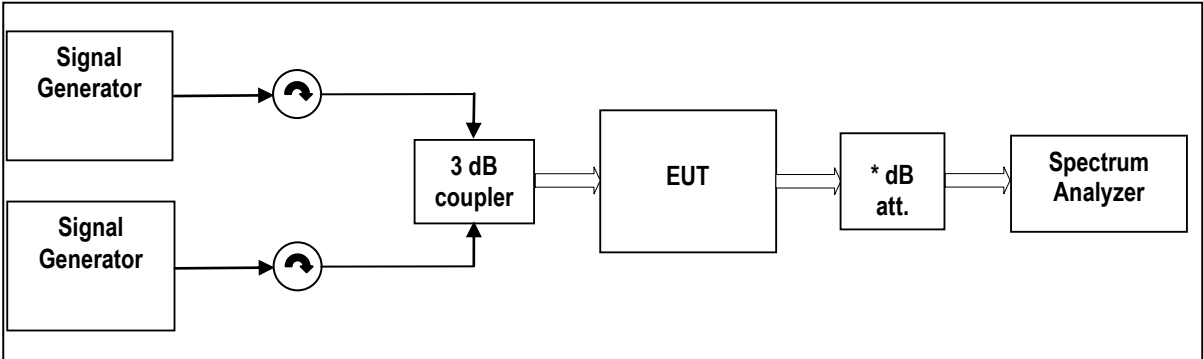
plot 7.3.2.2-#1 Spurious Emissions at Antenna Terminals: §24.238, §2.1051; Test results; Uplink; Uplink LTE; carrier (1882.5MHz) notched

7.4 Summary test result

Test result	complies, according the plots above
Tested by:	F. Bengesser
Date:	31.03.2016



8 Intermodulation: §24.238, §2.1051



External Attenuator DL x dB = 20 dB
figure 8-#1 Test setup: Intermodulation: §24.238, §2.1051

Measurement uncertainty	$\pm 0,54$ dB $\pm 1,2$ dB $\pm 1,5$ dB	9 kHz to 3 GHz 3 GHz to 7 GHz 7 GHz to 26 GHz
Test equipment used	9046, 9069, 9126, 9784, 7583, 7584, 7537, 7542, 8542, 8544, 7370	

8.1 Limit

Minimum standard:

Para. No.24.238(a)

The rules in this section govern the spectral characteristics of emissions in the Broadband Personal Communications Service.

(a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

8.2 Test method

Para. No 2.1051 Measurements required: Spurious emissions at antenna terminals.

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in § 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

[39 FR 5919, Feb. 15, 1974. Redesignated and amended at 63 FR 36599, July 7, 1998]



8.3 Test results

8.3.1 Downlink

Detector: RMS.

Modulation	Measured at Band Edge	Carriers	RBW VBW Span	Max. level (dBm)	Plot -
LTE	Lower Edge	1930.7 MHz 1932.1 MHz	30kHz 300kHz 6MHz	-36.0	8.3.2.1 #1
	Upper Edge	1992.9 MHz 1994.3 MHz			#2

table 8.3-#1 Intermodulation: §24.238, §2.1051 Test results

8.3.2 Uplink

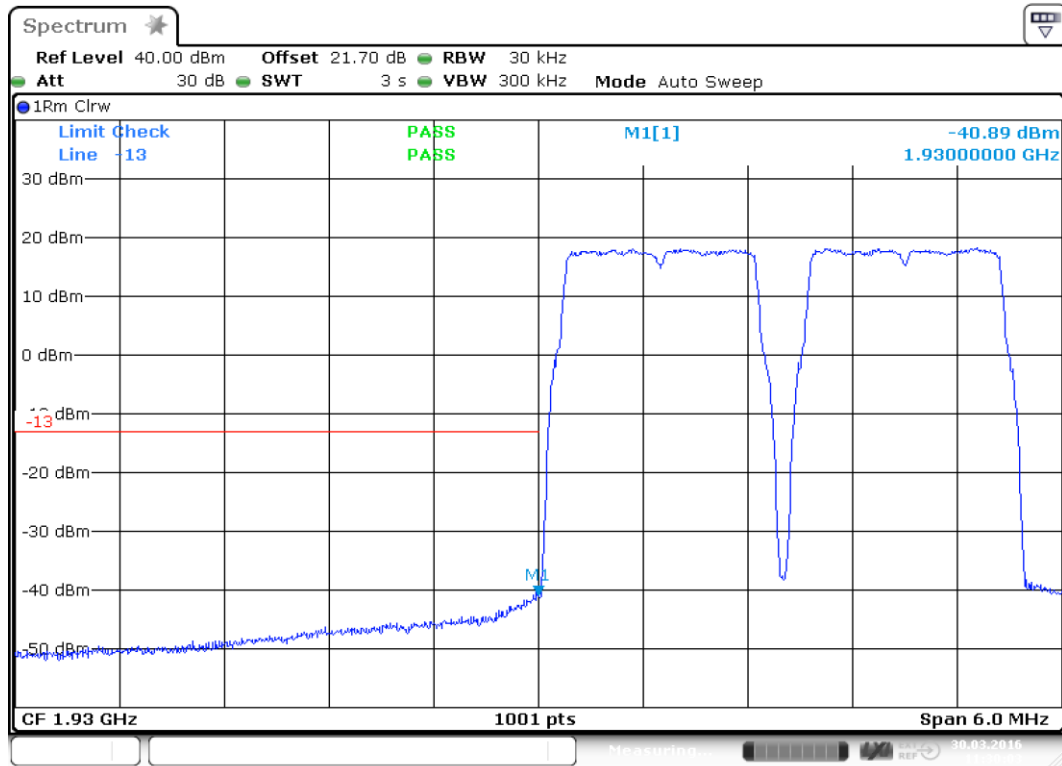
Detector: RMS.

Modulation	Measured at Band Edge	Carriers	RBW VBW Span	Max. level (dBm)	Plot -
LTE	Lower Edge	1850.7 MHz 1852.1 MHz	30kHz 300kHz 6MHz	-24.0	8.3.2.2 #1
	Upper Edge	1912.9 MHz 1914.3 MHz			#2

table 8.3-#2 Intermodulation: §24.238, §2.1051 Test results

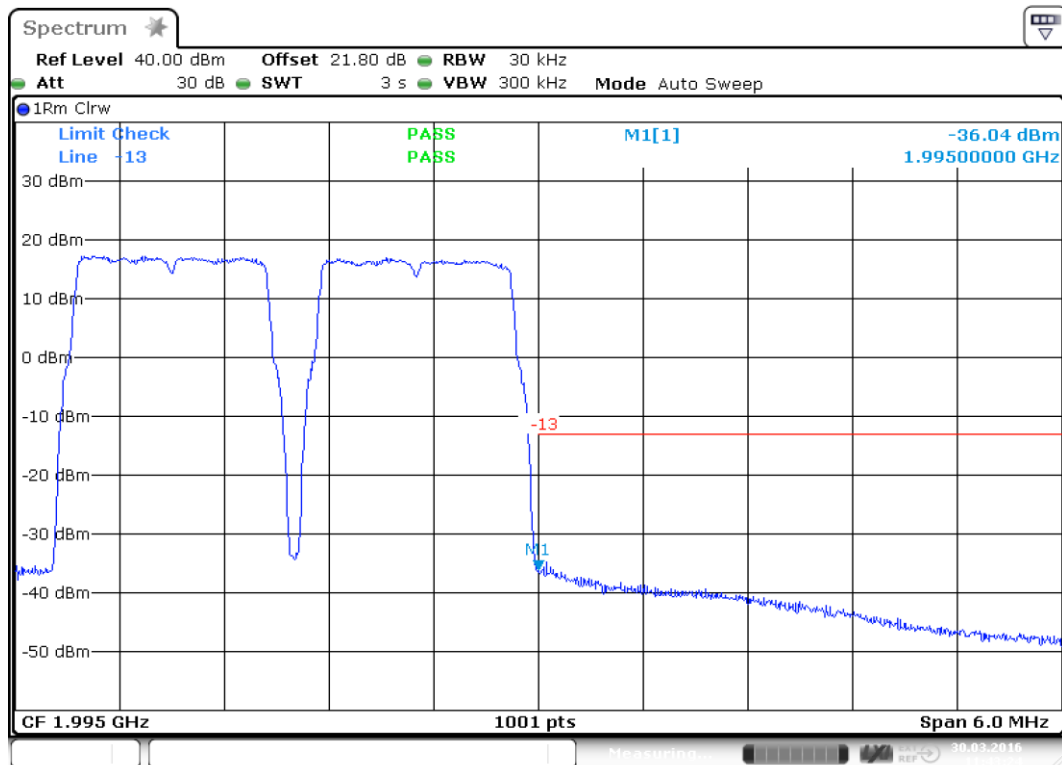


8.3.2.1 Downlink LTE



Date: 30.MAR.2016 11:30:04

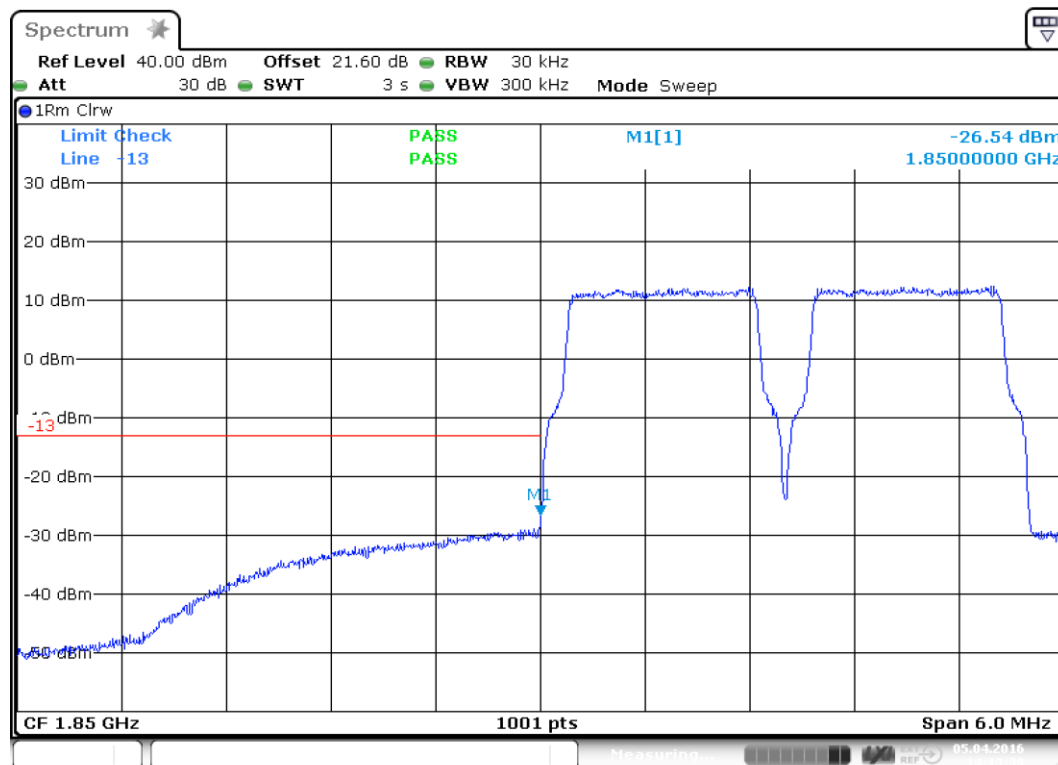
plot 8.3.2.1-#1 Intermodulation: §24.238, §2.1051; Test results; Uplink; Downlink LTE Lower Band Edge



Date: 30.MAR.2016 11:43:25

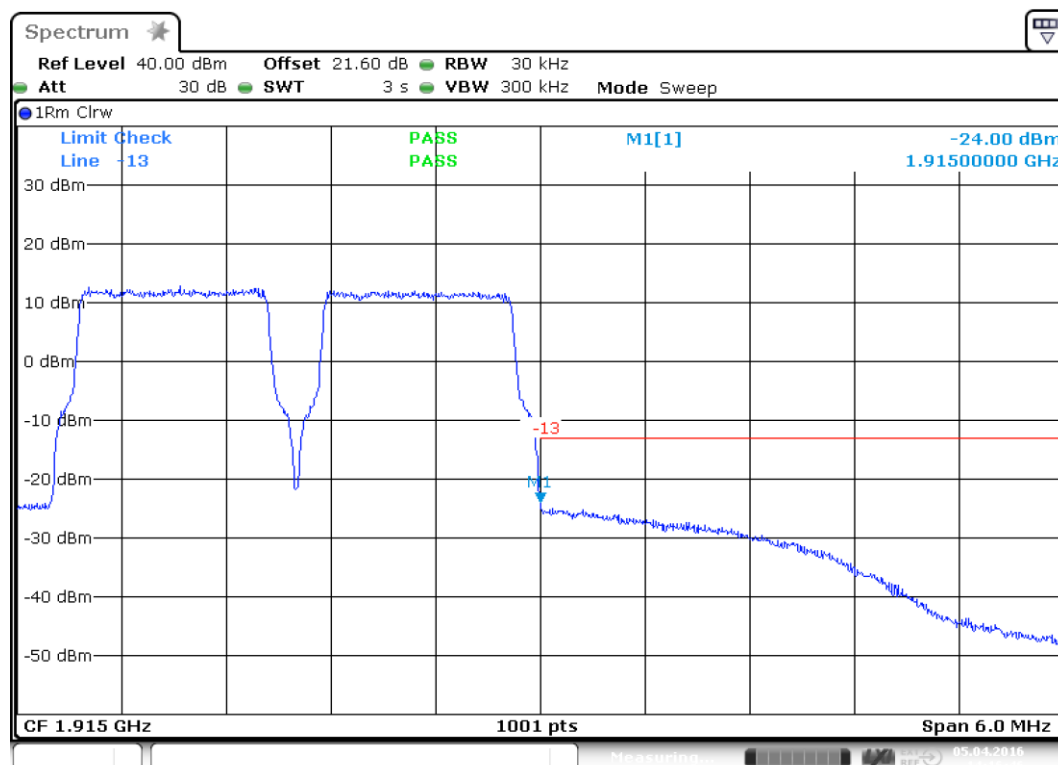
plot 8.3.2.1-#2 Intermodulation: §24.238, §2.1051; Test results; Uplink; Downlink LTE Upper Band Edge

8.3.2.2 Uplink LTE



Date: 5.APR.2016 14:13:39

plot 8.3.2.2-#1 Intermodulation: §24.238, §2.1051; Test results; Uplink; Uplink LTE Lower Band Edge



Date: 5.APR.2016 14:16:46

plot 8.3.2.2-#2 Intermodulation: §24.238, §2.1051; Test results; Uplink; Uplink LTE Upper Band Edge

Test Report No.: 16-089

FCC ID: BCR-AF1937

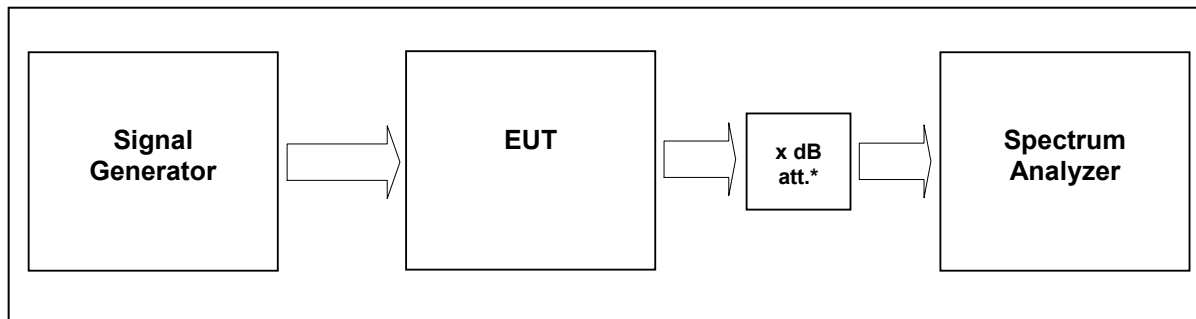


BUREAU
VERITAS

8.4 Summary test result

Test result	complies, according the plots above
Tested by:	F. Bengesser
Date:	30.03.2016

9 Out of Band Rejection



External Attenuator DL x dB = 20 dB
figure 9-#1 Test setup: Out of Band Rejection

Measurement uncertainty	± 0,38 dB
Test equipment used	9046, 9126, 9784, 7537, 7584, 7542, 8542, 8544, 7370

9.1 Limit

KDB 935210 D02 v03

Test for rejection of out of band signals. Filter frequency response plots are acceptable.

9.2 Test method

935210 D03 v03

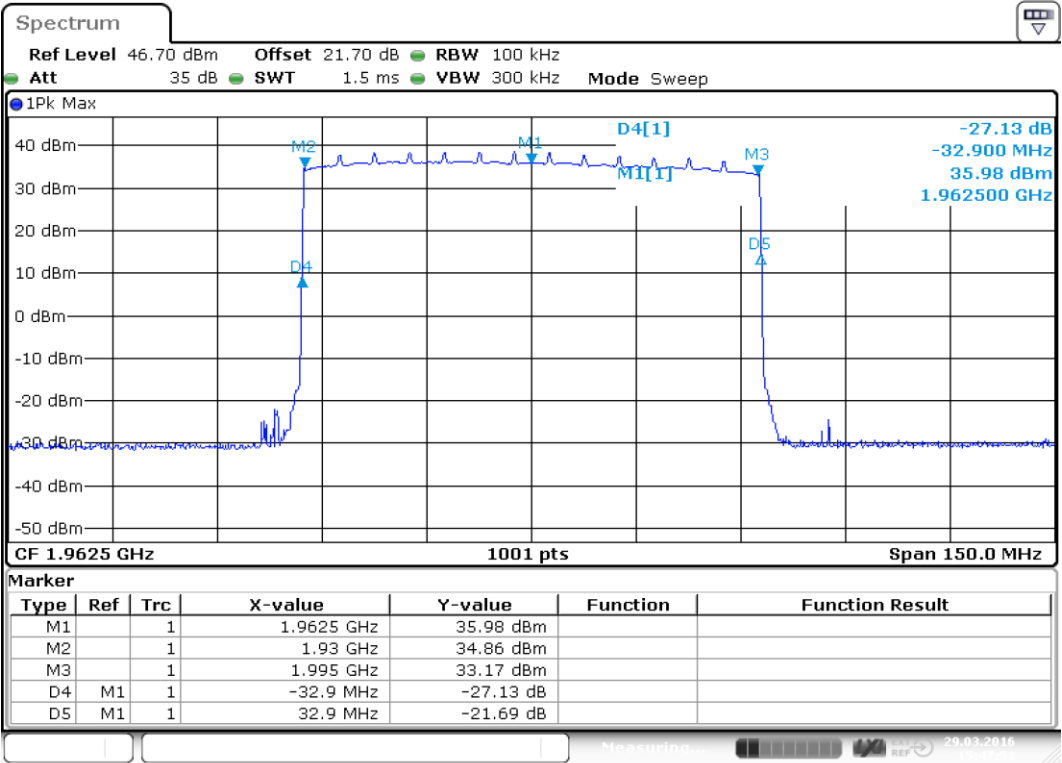
7.1 Authorized frequency band verification test

9.3 Test results

Detector Peak max hold



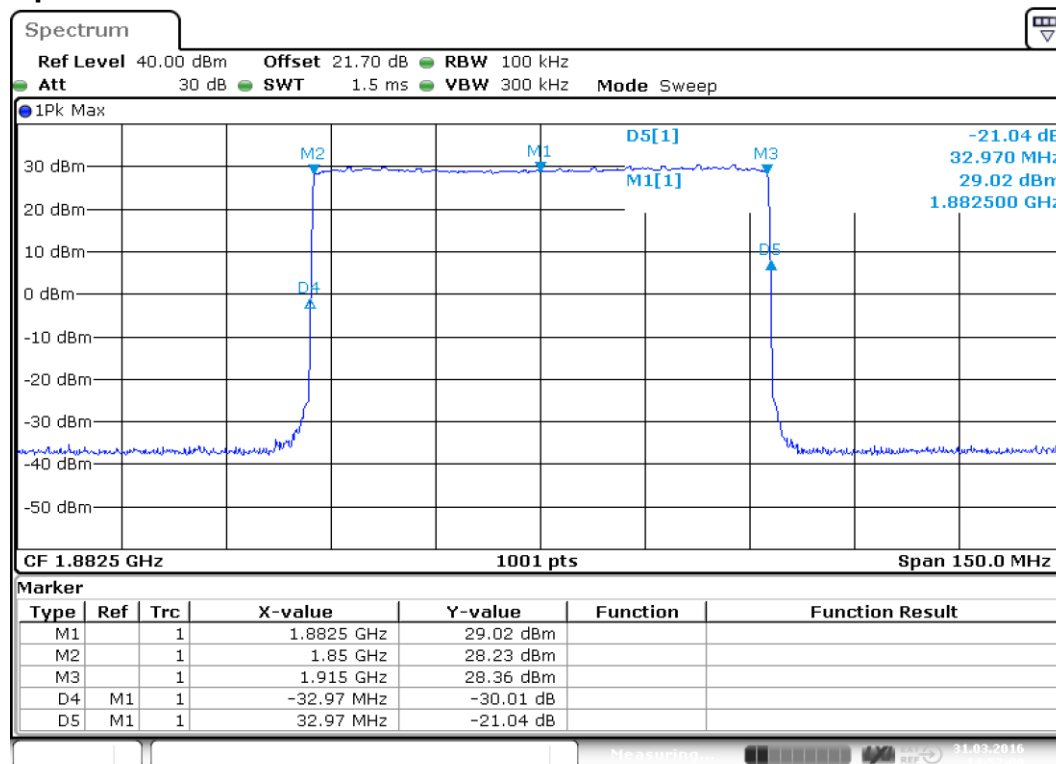
9.3.1 Downlink



Date: 29.MAR.2016 15:47:51

plot 9.3.1-#1 Out of Band Rejection; Test results; Downlink;

9.3.2 Uplink



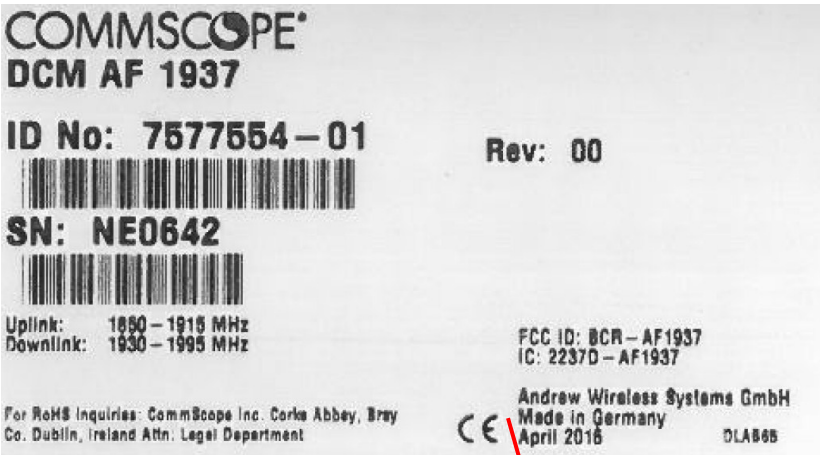
Date: 31.MAR.2016 14:52:00

plot 9.3.2-#1 Out of Band Rejection; Test results; Uplink;

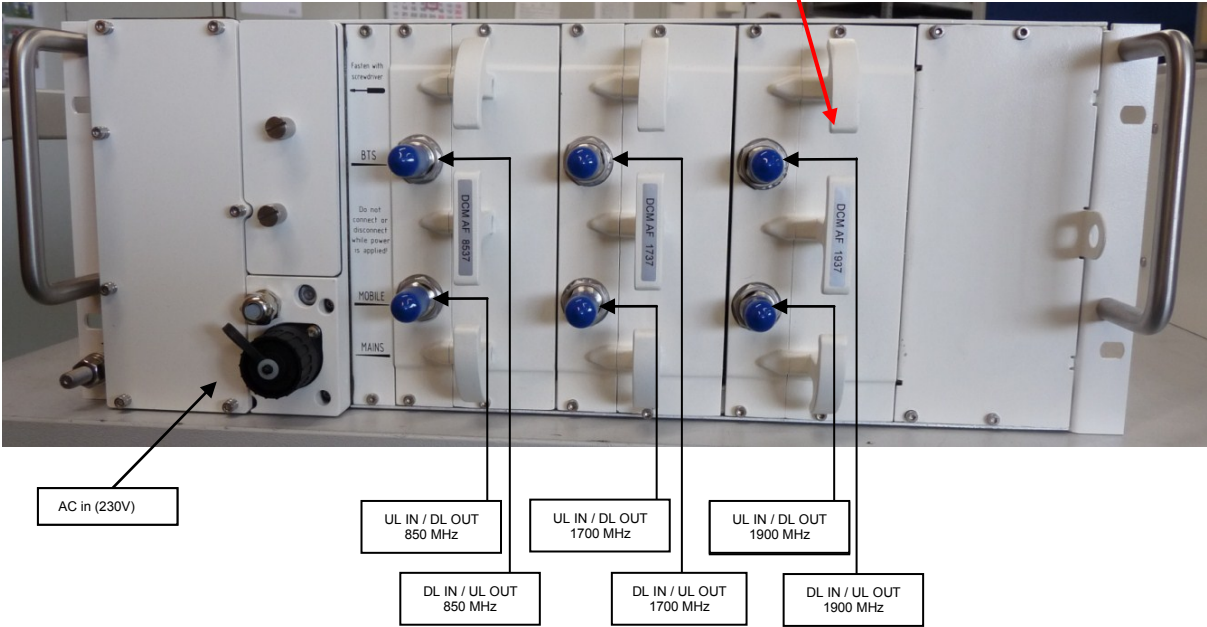
9.4 Summary test result

Test result	complies, according the plots above
Tested by:	F. Bengesser
Date:	29.03.2016

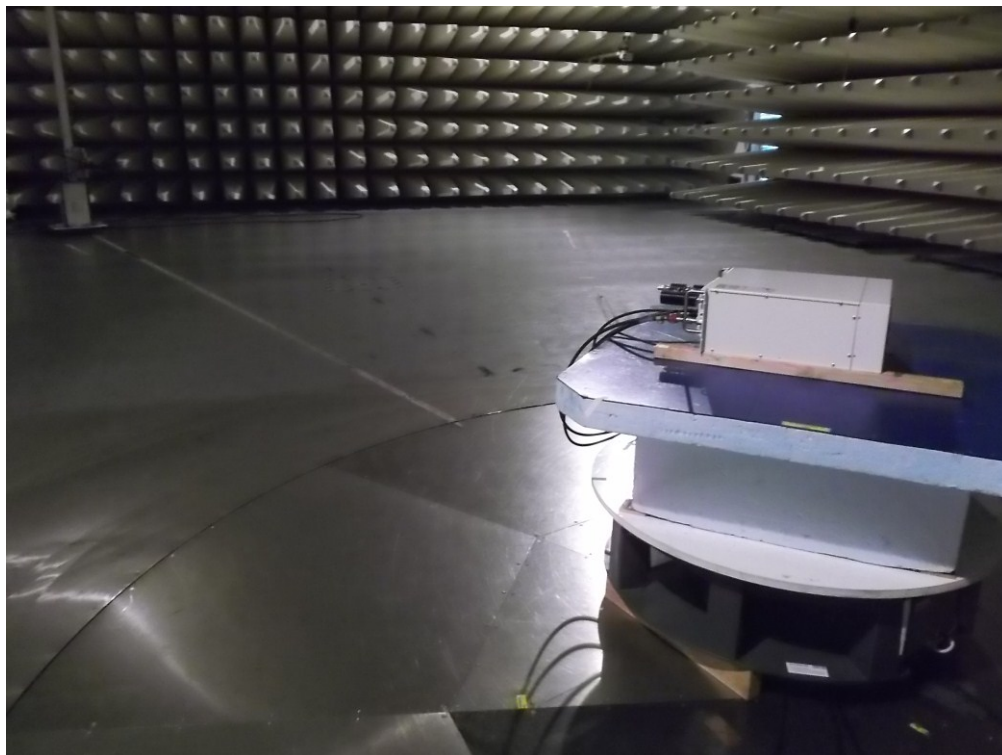
10 Field Strength of Spurious Emissions: §24.238, §2.1053



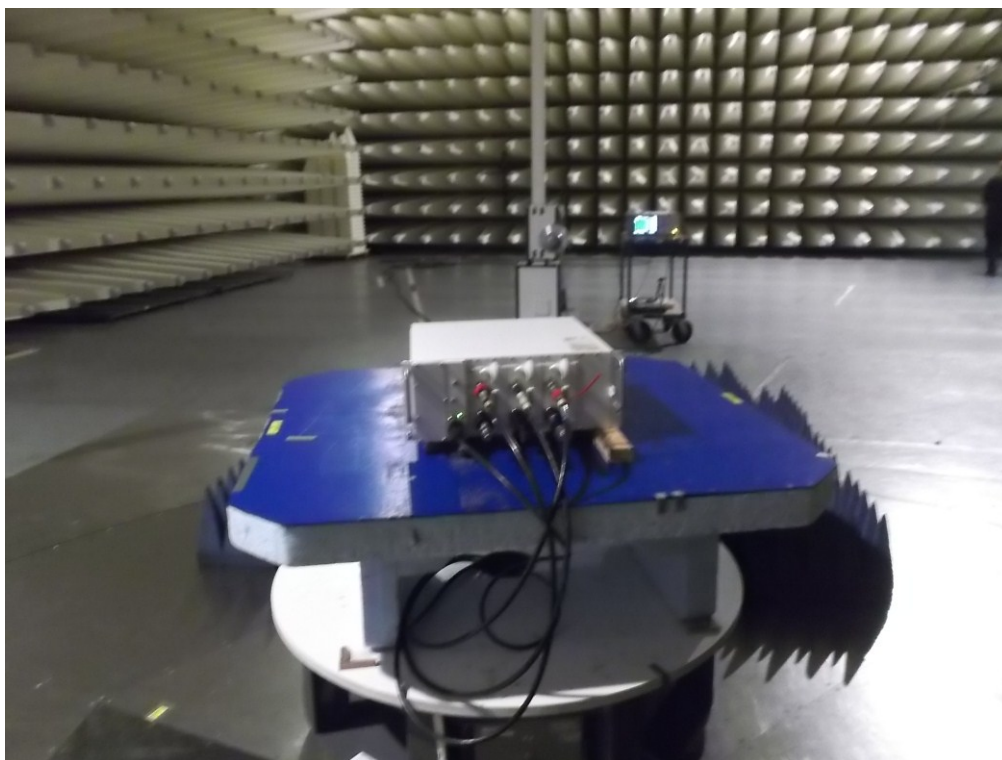
picture 8.1: label



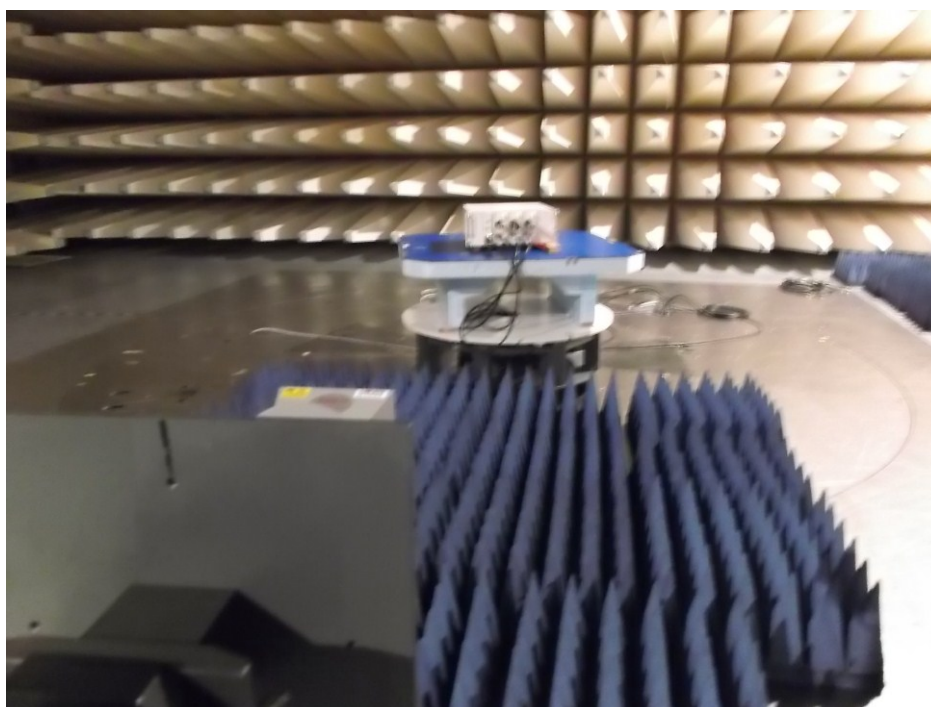
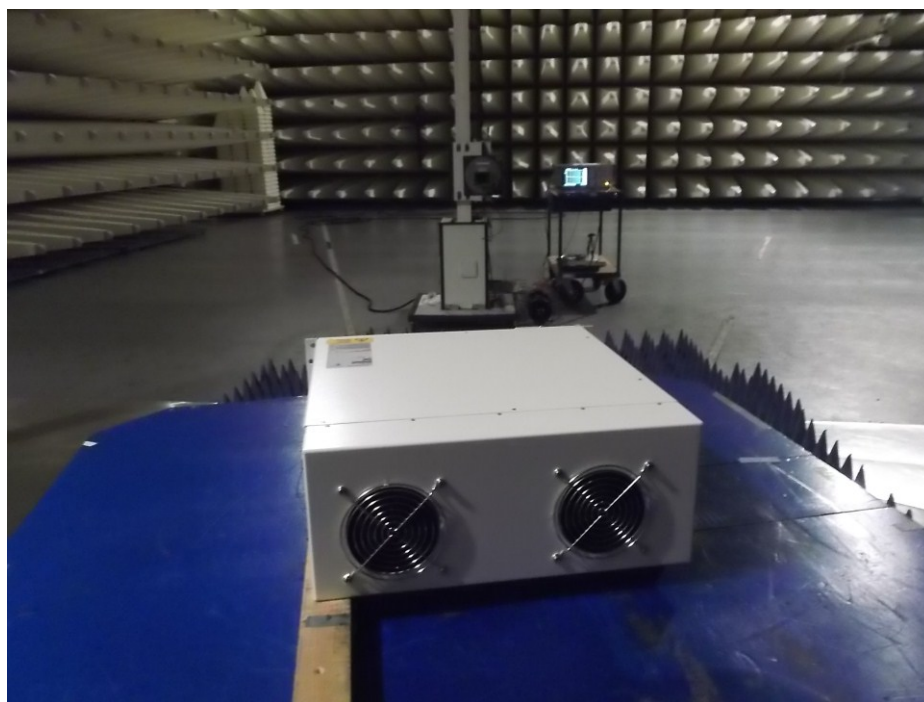
picture 8.2: (EUT)



picture 8.3: Test setup: Field Strength Emission <1 GHz @10m in the SAC



picture 8.4: Test setup: Field Strength Emission 1 - 18 GHz @3m in the SAC



picture 8.5: Test setup: Field Strength Emission 18 – 26.5 GHz @3m in the SAC

This clause specifies requirements for the measurement of radiated emission.

Frequency range	Distance: EUT <-> antenna / location	Limit	Test method
30 MHz – 1 GHz	10 metres / SAC	FCC 47 CFR Part 27.53	TIA/EIA-603-C:2004
1 GHz – 18 GHz	3 metres / SAC		
18 GHz – 26.5 GHz	3 metres / SAC		

Test equipment used:

Designation	Type	Manufacturer	Invent.-no.	Cal.-date	due Cal.- date	used
EMI test receiver	ESU40	Rohde & Schwarz	E2025	25.02.2016	25.02.2017	X
Antenna	CBL 6111	Chase	K1026	12.02.2016	12.02.2017	X
RF Cable	RG214	Frankonia	K1121	16.04.2015	16.04.2017	X
Antenna	HL 025	R&S	K1114	09.02.2016	09.02.2017	X
Preamplifier	AFS4-00102000	Miteq	K838	17.06.2015	17.06.2016	X
RF Cable	Sucoflex 100	Suhner	K1760	04.08.2015	04.08.2016	X
Antenna	JXTXLB-42-25- C-KF	A-Info	K1175	09.03.2015	09.03.2017	X

The REMI version 2.135 has been used to maximize radiated emission from the EUT with regards to ANSI C63.4:2009.

Test set-up:

Test location: SAC
Both, the Fully Anechoic Chamber (FAC) and the Semi Anechoic Chamber (SAC) fulfil the requirements of ANSI C63.4 and CISPR 16-1-4 with regards to NSA and SVSWR.

Test Voltage: 110V / 60 Hz

Type of EUT: Wall mounted

Measurement uncertainty:

Measurement uncertainty expanded (95% or K=2)	± 4,7 dB for ANSI C63.4 measurement ± 0,5 dB for TIA-603 measurement
--	---

10.1 Method of Measurement

Measurement procedure. TIA-603-C

The antenna substitution method is used to determine the equivalent radiated power at spurious frequencies. The spurious emissions are measured at a distance of 3 meters. The EUT is then replaced with a reference substitution antenna with a known gain referenced to a dipole. This antenna is fed with a signal at the spurious frequency. The level of the signal is adjusted to repeat the previously measured level. The resulting eirp is the signal level fed to the reference antenna corrected for gain referenced to an isotropic dipole (see Figure 7.2).

From KDB (AMPLIFIER, BOOSTER, AND REPEATER REMINDER SHEET):

Radiated spurs (enclosure) – Use of CW signal (low, mid. and high freq.) is acceptable rather than all modulations.

The maximum RFI field strength was determined during the measurement by rotating the turntable (± 180 degrees) and varying the height of the receive antenna ($h = 1 \dots 4$ m) as like defined in ANSI C63.4. A measurement receiver has been used with a RBW 120 kHz up to 1 GHz and 1 MHz above 1 GHz. Steps with during pre measurement was half the RBW.

Both, the Fully Anechoic Chamber (FAC) and the Semi Anechoic Chamber (SAC) fulfil the requirements of ANSI C63.4 and CISPR 16-1-4 with regards to NSA and SVSWR.

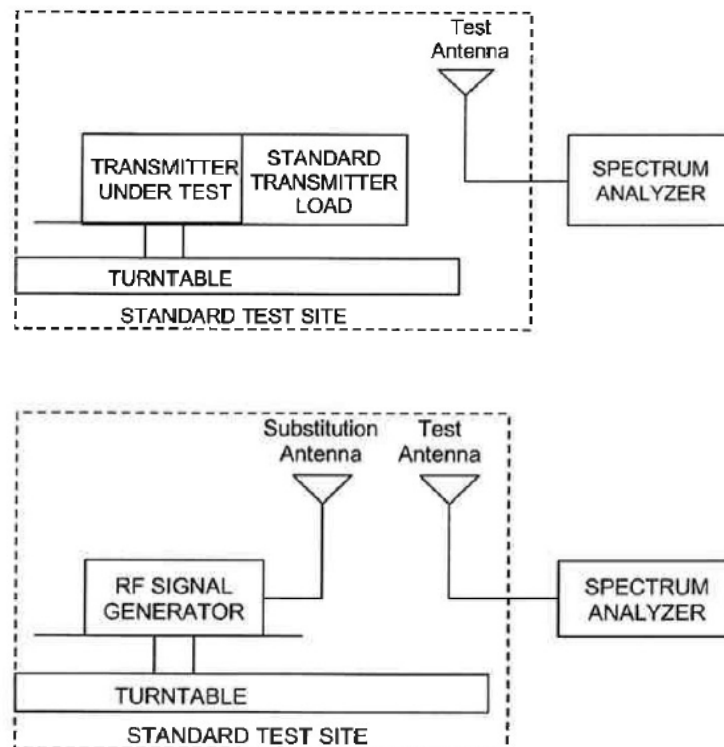


Figure #7.2 Substitution methods TIA/EIA-603-C



10.2 Limit

Minimum standard:

Para. No.24.238(a)

The rules in this section govern the spectral characteristics of emissions in the Broadband Personal Communications Service.

(a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

The Emission limit is -13dBm.

10.3 Climatic values in the lab

Temperature:	21°
Relative Humidity:	45%
Air-pressure:	1004 hPa

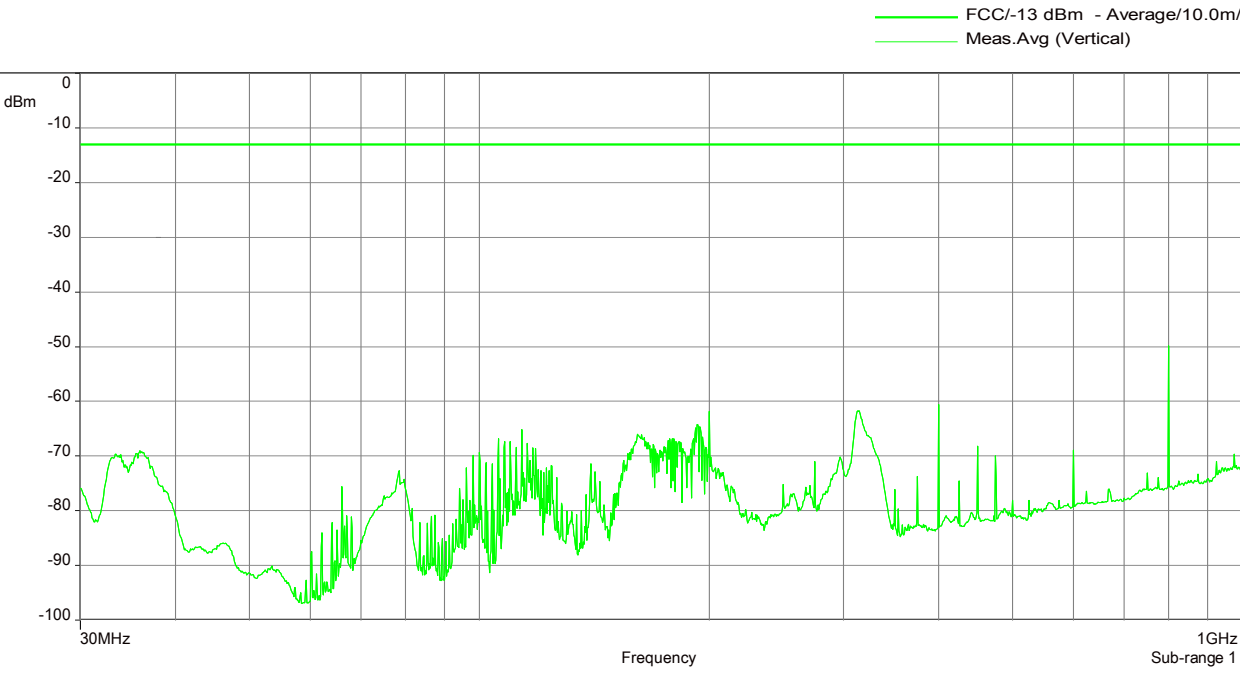


10.4 Test results

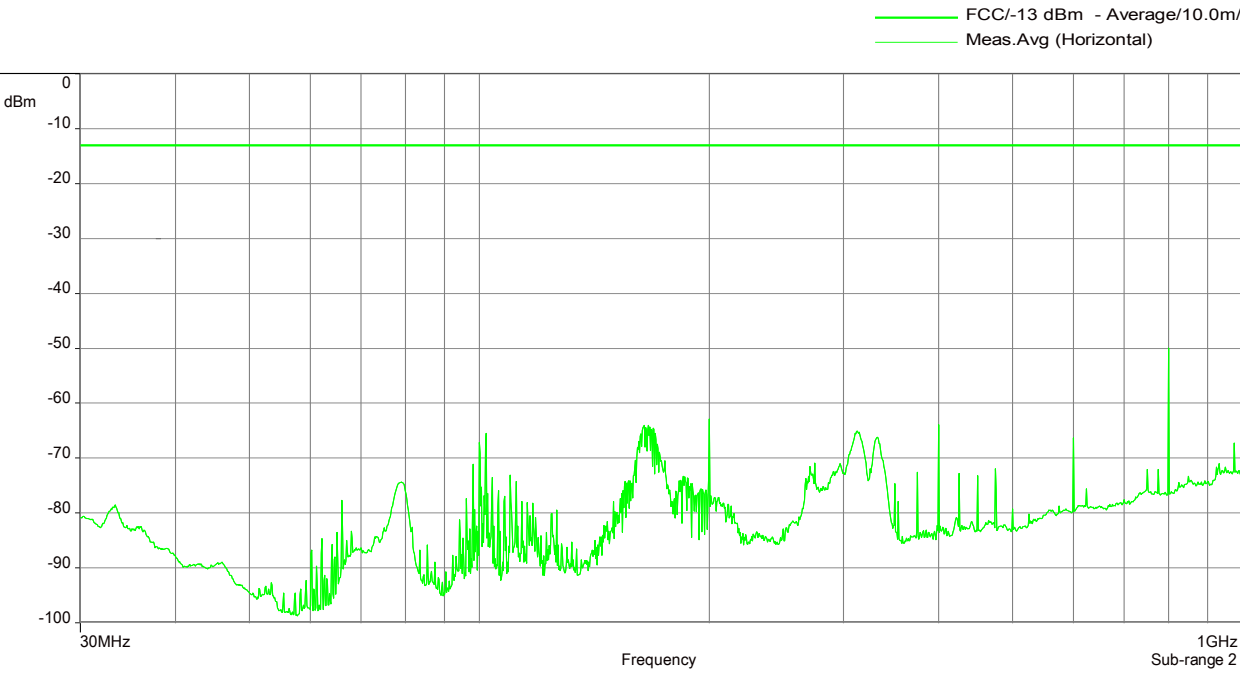
10.4.1 30 MHz to 1 GHz Uplink (Bottom – Middle – Top)

B/M/T: 1850 MHz / 1882.5 MHz / 1915 MHz (Operation with maximum composite power)

Vertikal



Horizontal

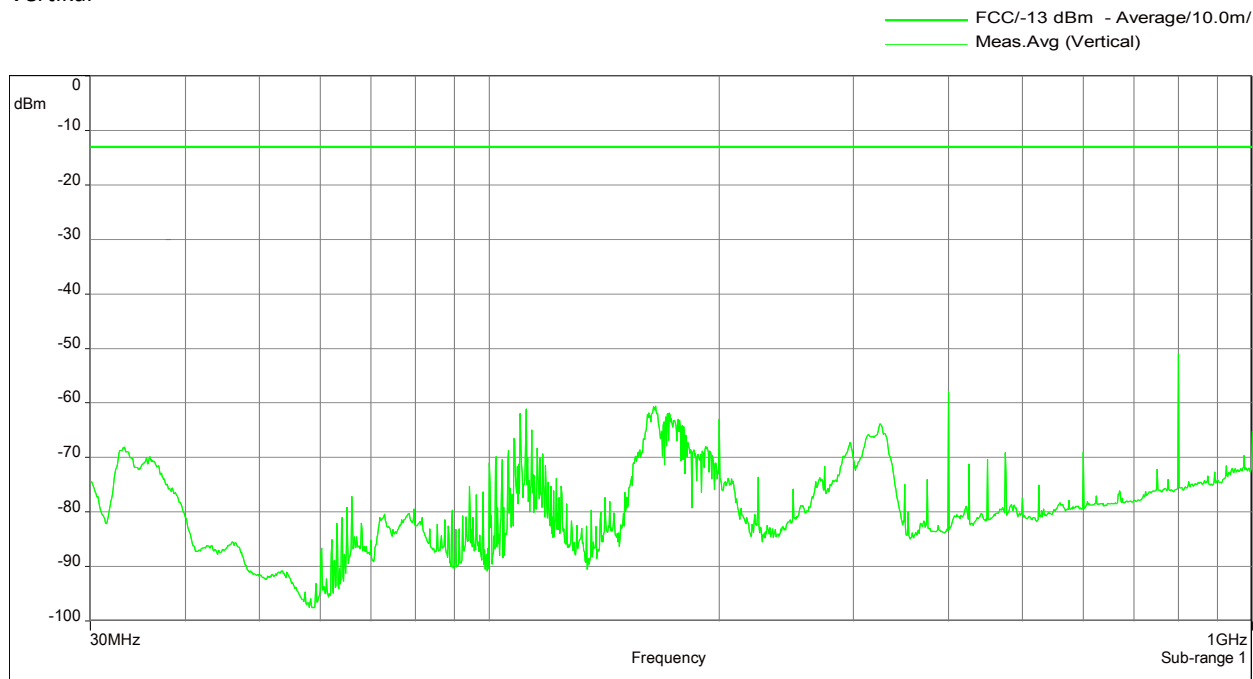


The RF output power is terminated.

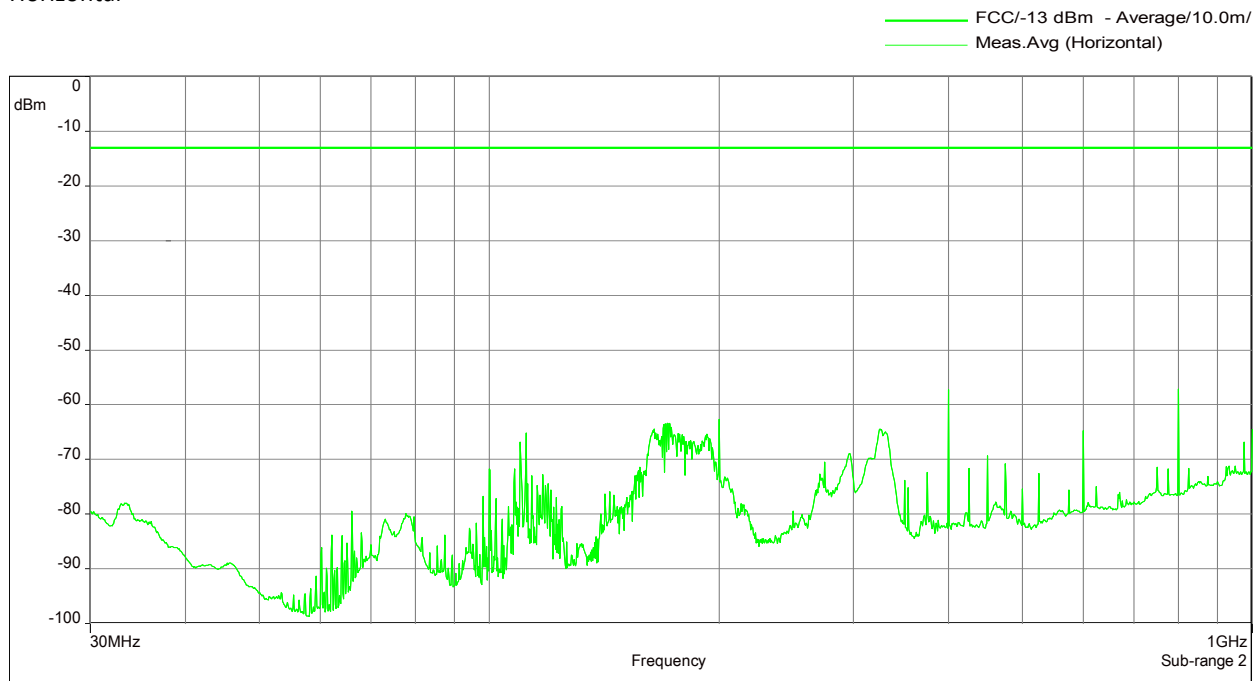
10.4.2 30 MHz to 1 GHz Downlink (Bottom – Middle – Top)

B/M/T: 1930 MHz / 1962,5 MHz / 1995 MHz (Operation with maximum composite power)

Vertikal



Horizontal



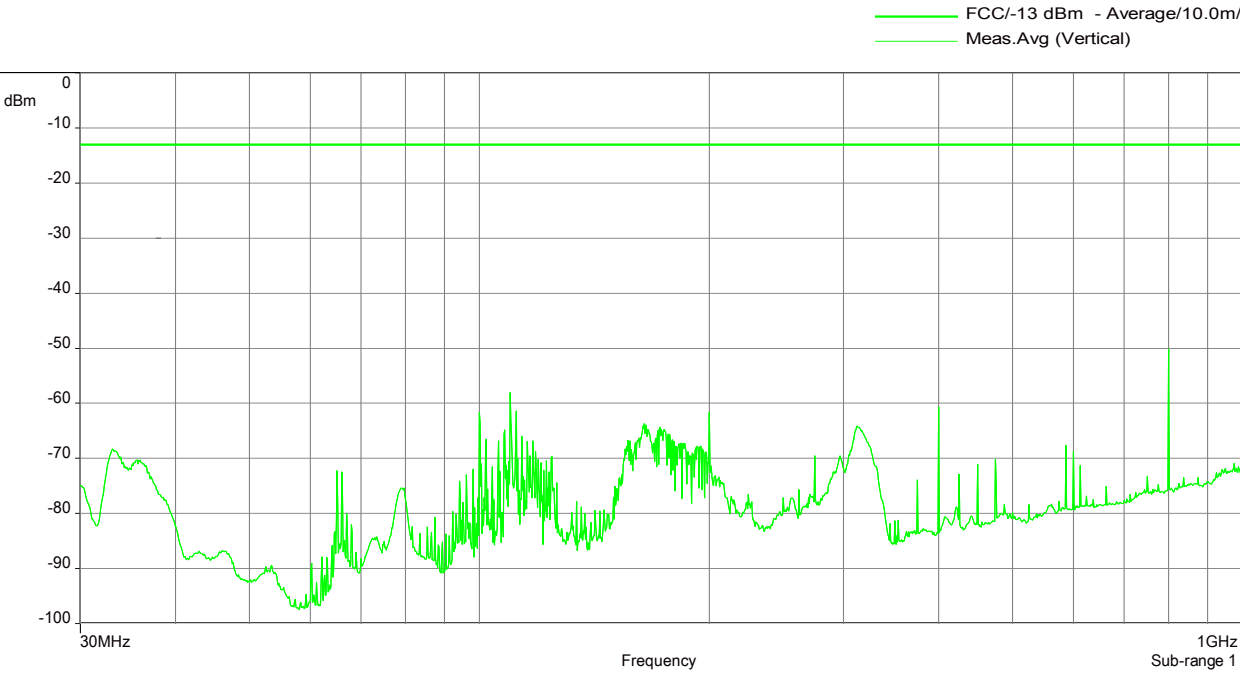
The RF output power is terminated.



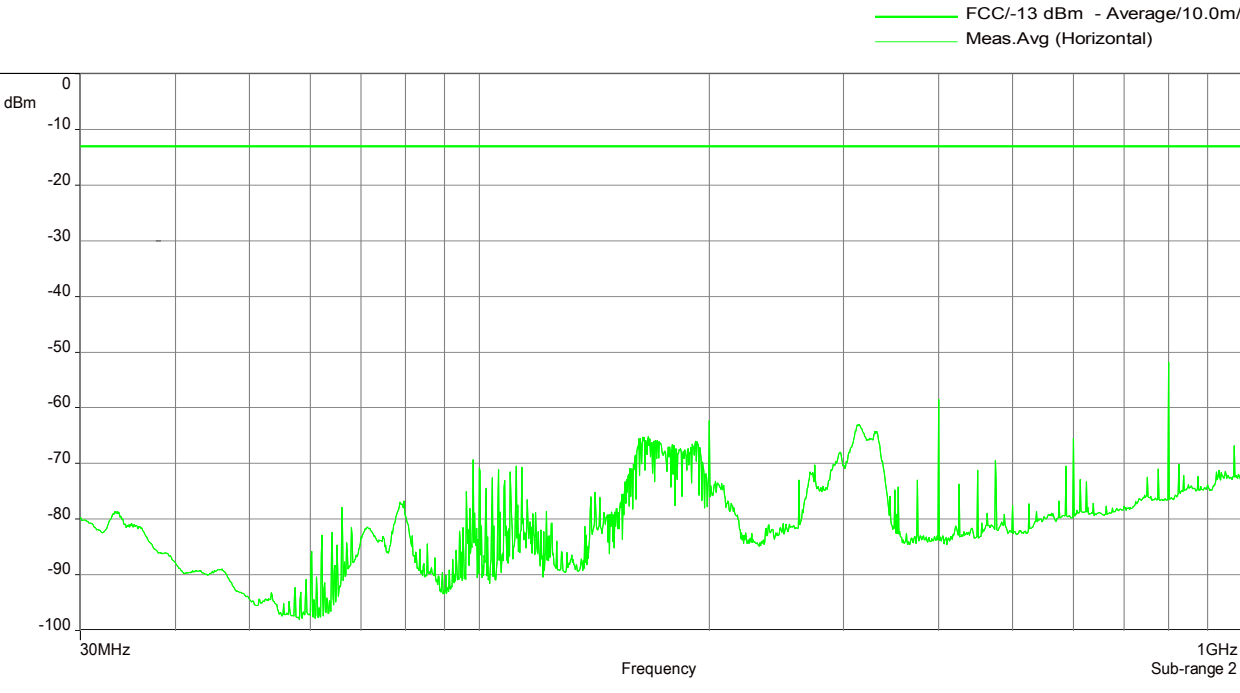
10.4.3 30 MHz to 1 GHz Uplink (Middle of both paths)

F1: 836,5 MHz; F2: 1732,5 MHz; F3: 1882,5 MHz

Vertikal



Horizontal



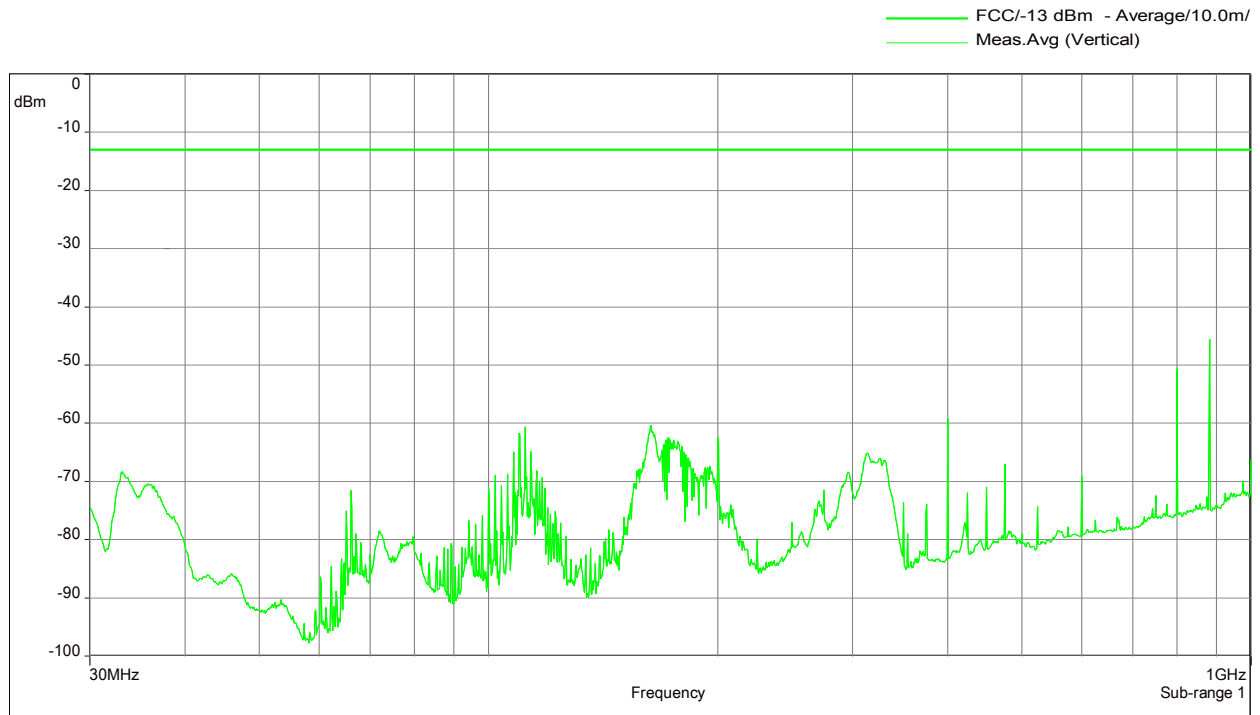
The RF output power is terminated.



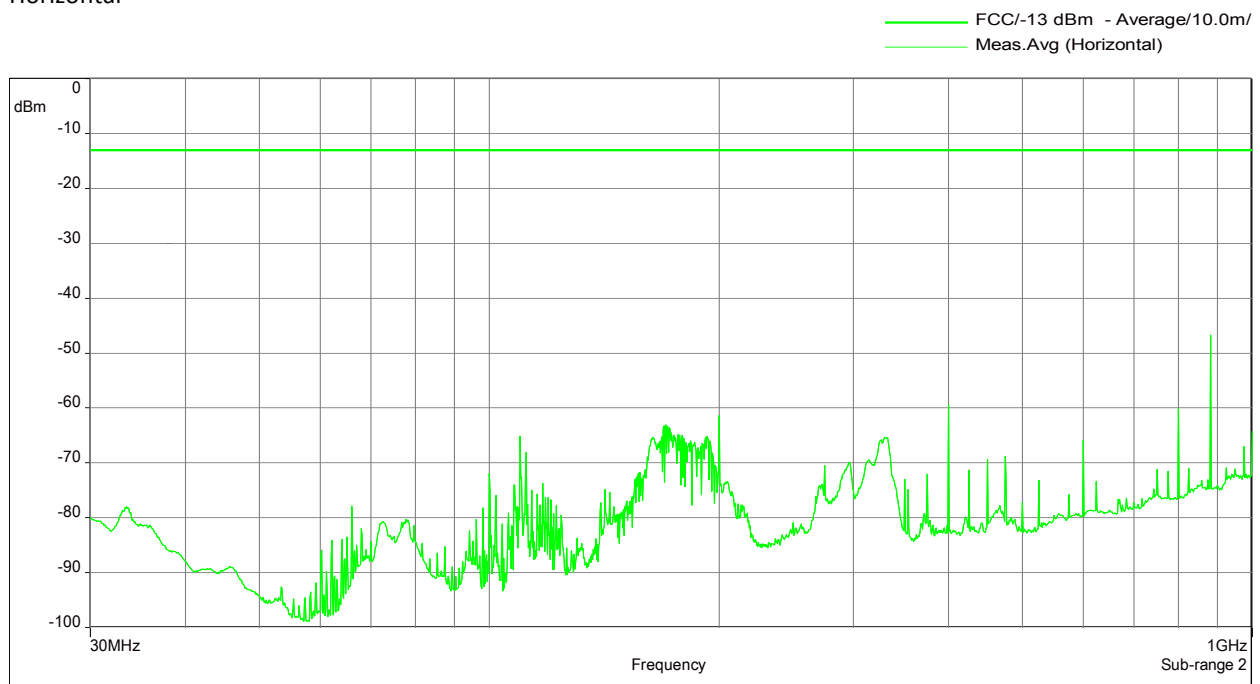
10.4.4 30 MHz to 1 GHz Downlink (Middle of both paths)

F1: 881.5 MHz; F2: 2132.5 MHz; F3: 1962.5 MHz

Vertical



Horizontal



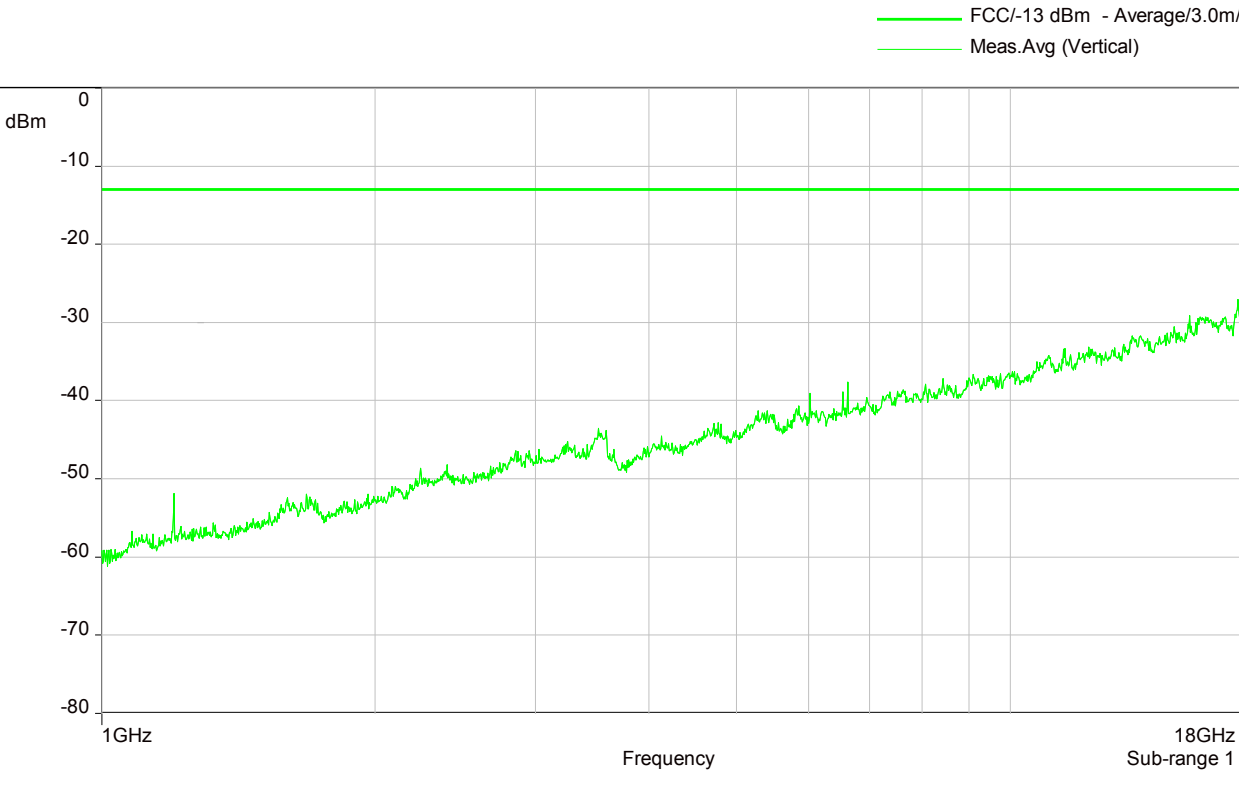
The RF output power is terminated.



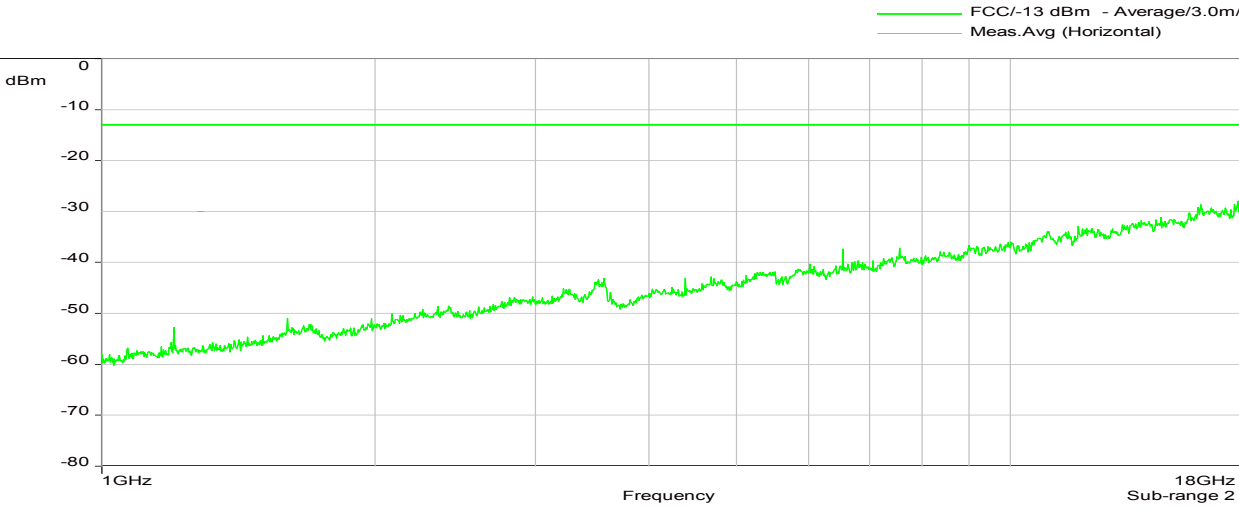
10.4.5 1 to 18 GHz Uplink (Bottom – Middle – Top)

B/M/T: 1850 MHz / 1882.5 MHz / 1915 MHz (Operation with maximum composite power)

Vertikal



Horizontal



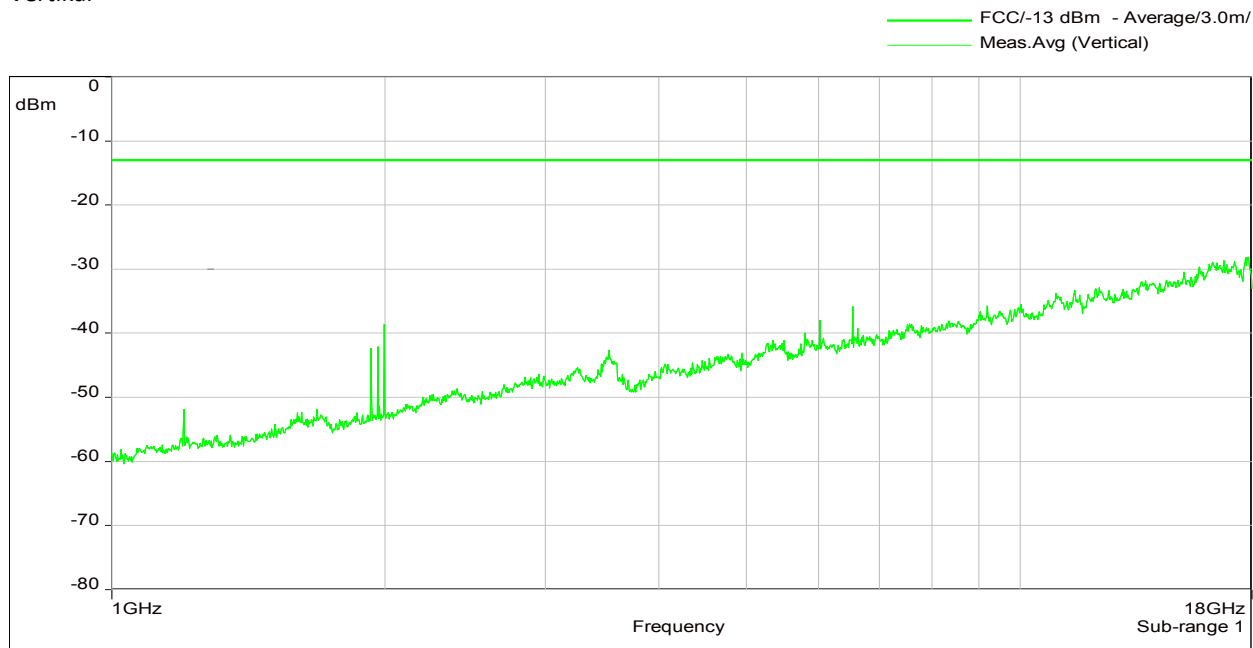
The RF output power is terminated.



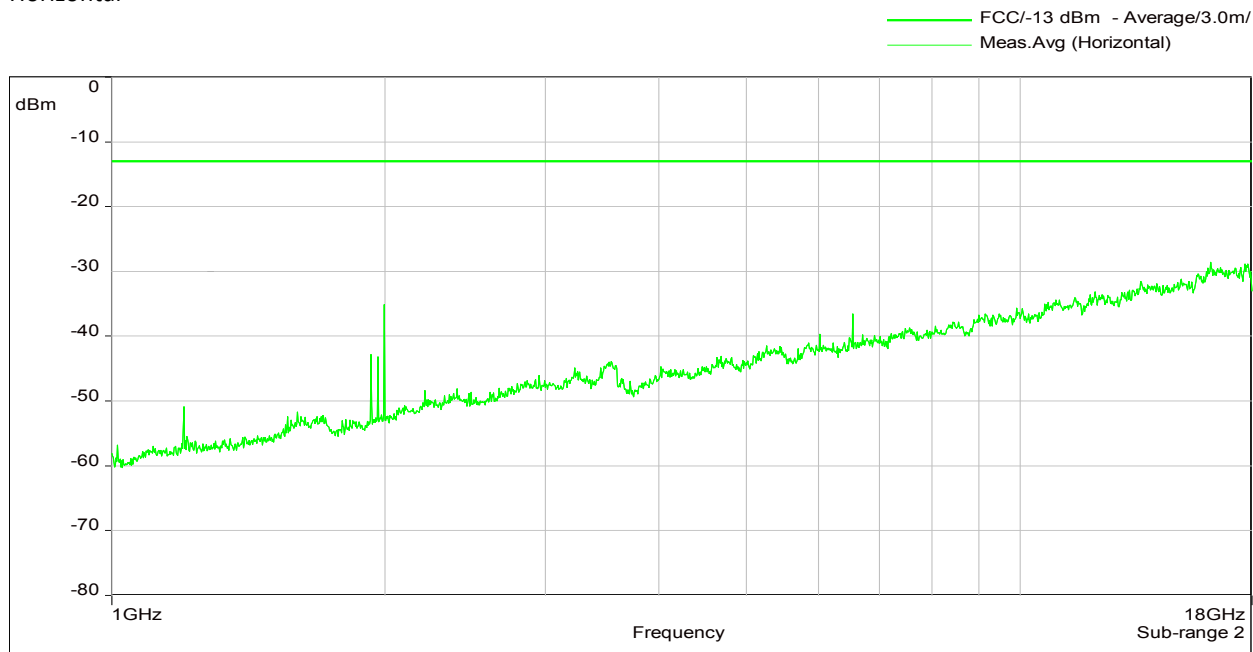
10.4.6 1 to 18 GHz Downlink (Bottom – Middle – Top)

B/M/T: 1930 MHz / 1962,5 MHz / 1995 MHz (Operation with maximum composite power)

Vertikal



Horizontal



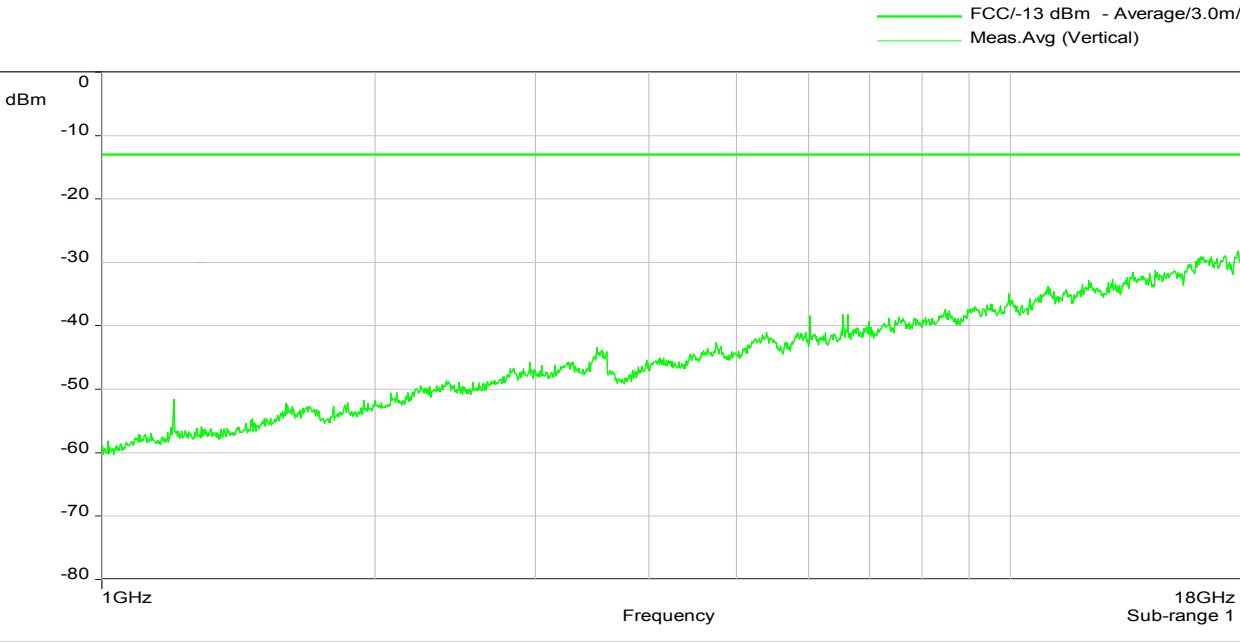
The RF output power is terminated.



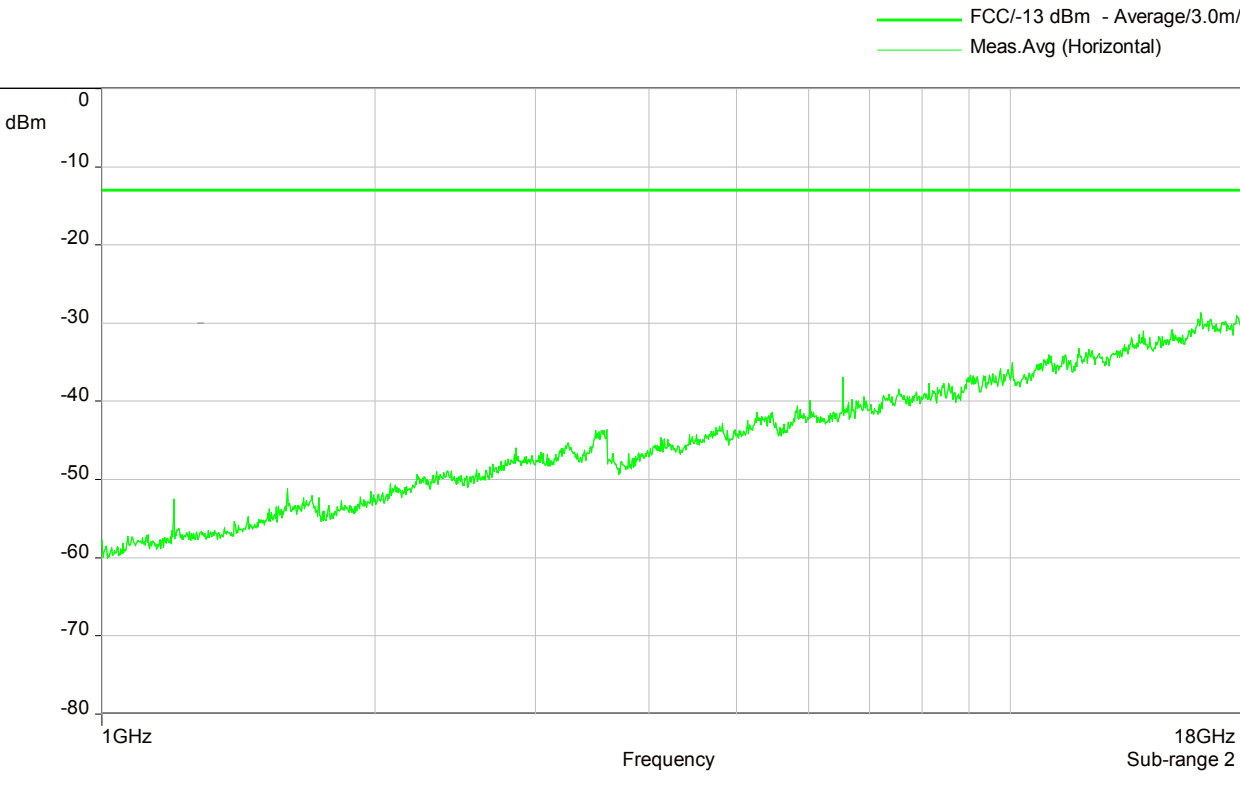
10.4.7 1 to 18 GHz Uplink (Middle of both paths)

F1: 836,5 MHz; F2: 1732,5 MHz; F3: 1882,5 MHz

Vertikal



Horizontal



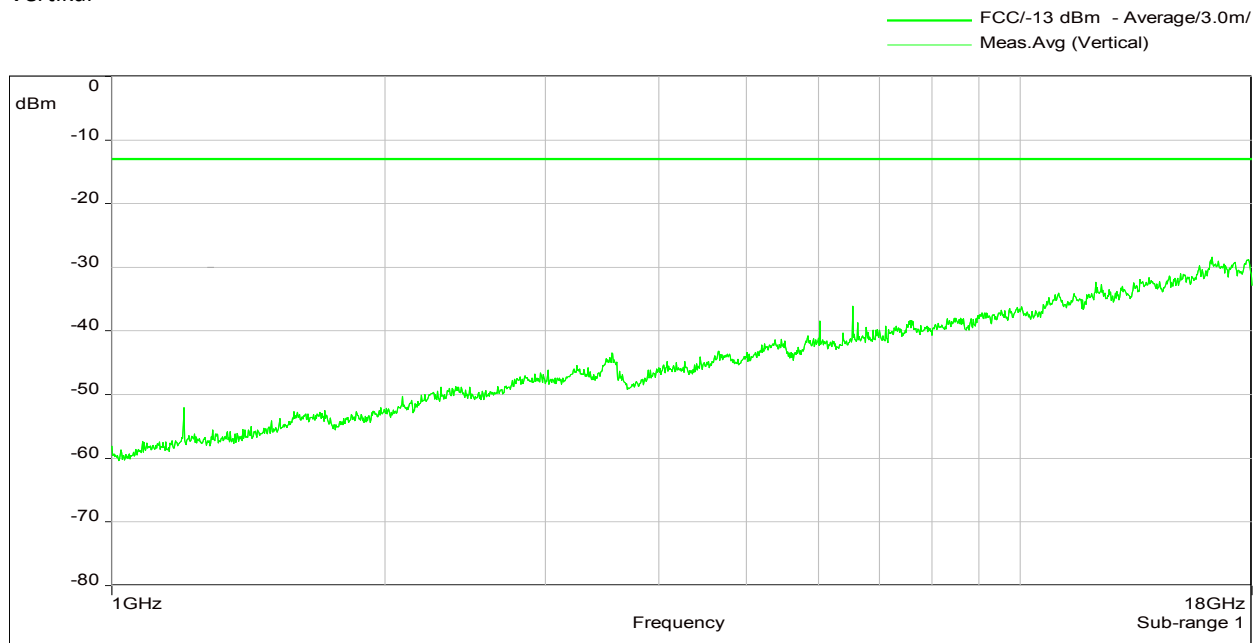
The RF output power is terminated.



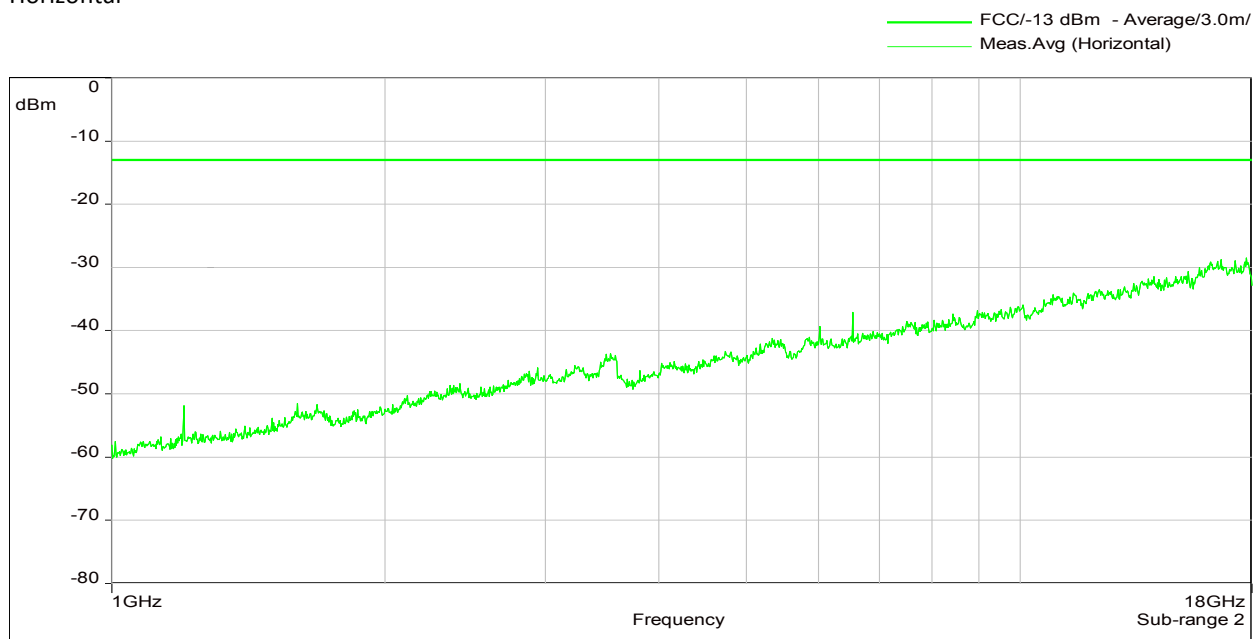
10.4.8 1 to 18 GHz Downlink (Middle of both paths)

F1: 881.5 MHz; F2: 2132.5 MHz; F3: 1962.5 MHz

Vertikal



Horizontal



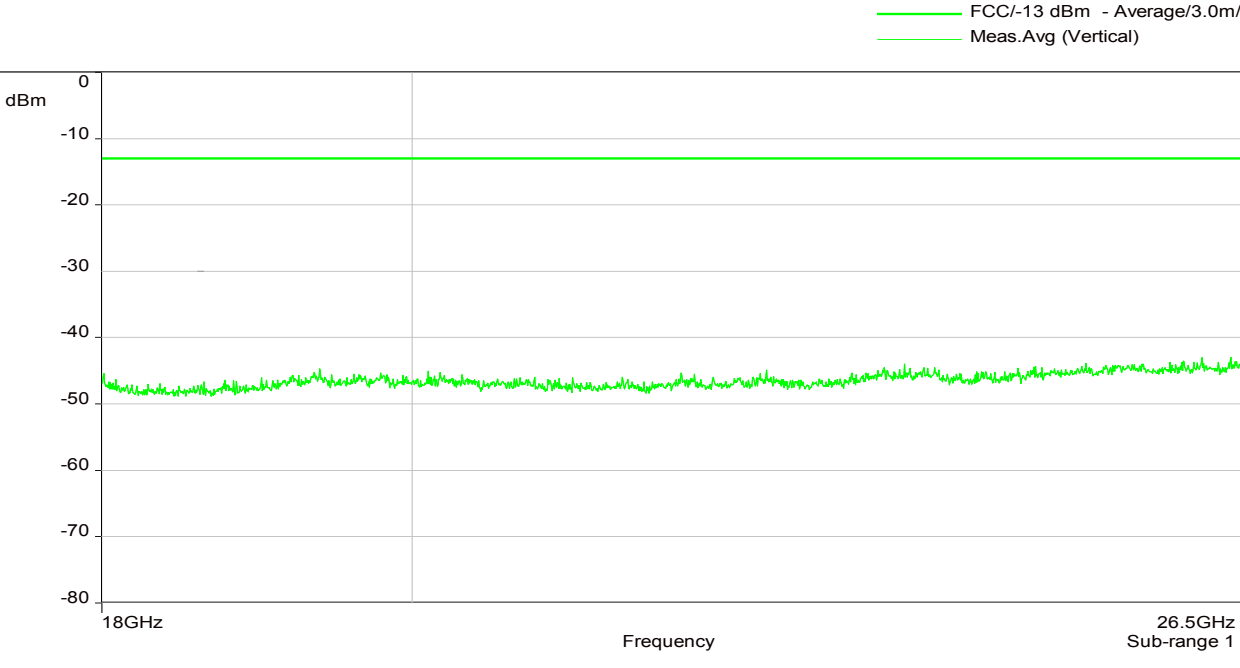
The RF output power is terminated.



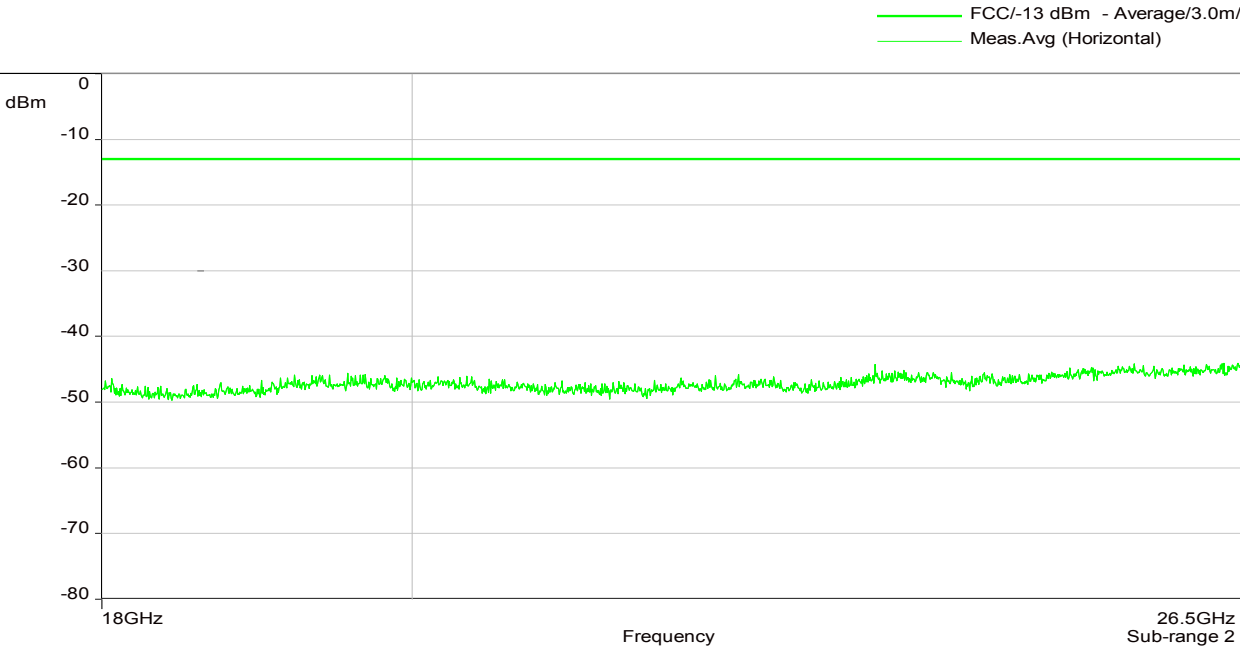
10.4.9 18 to 26.5 GHz Uplink (Bottom – Middle – Top)

B/M/T: 1850 MHz / 1882.5 MHz / 1915 MHz (Operation with maximum composite power)

Vertikal



Horizontal



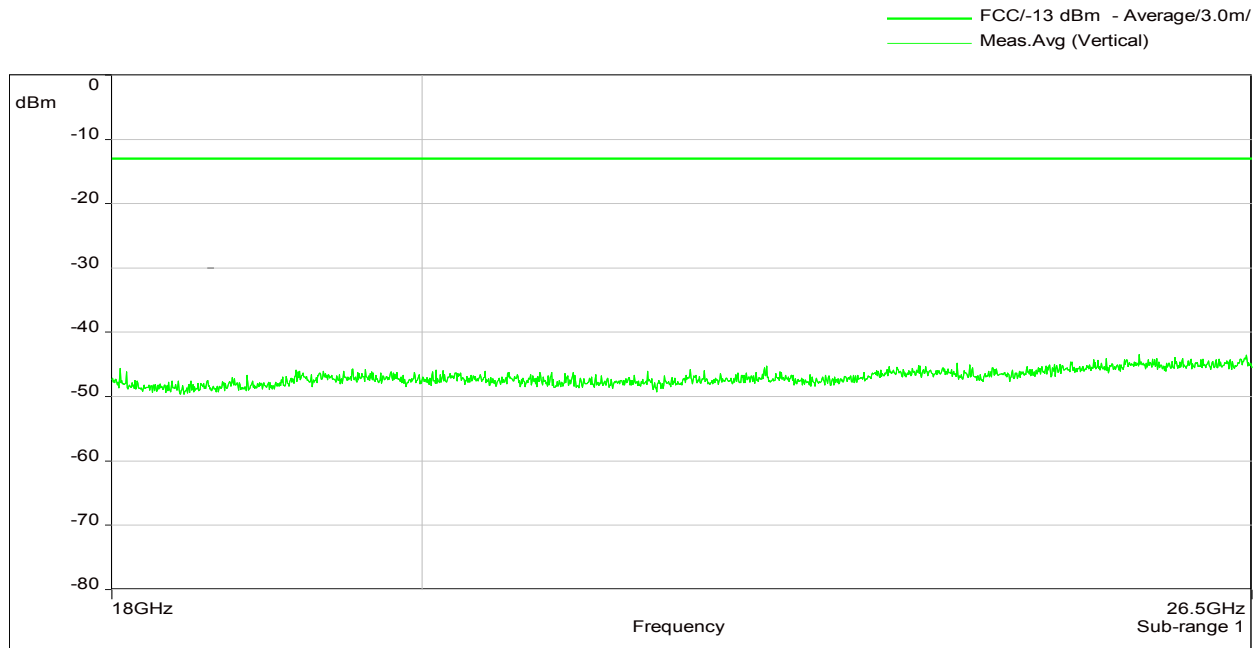
The RF output power is terminated.



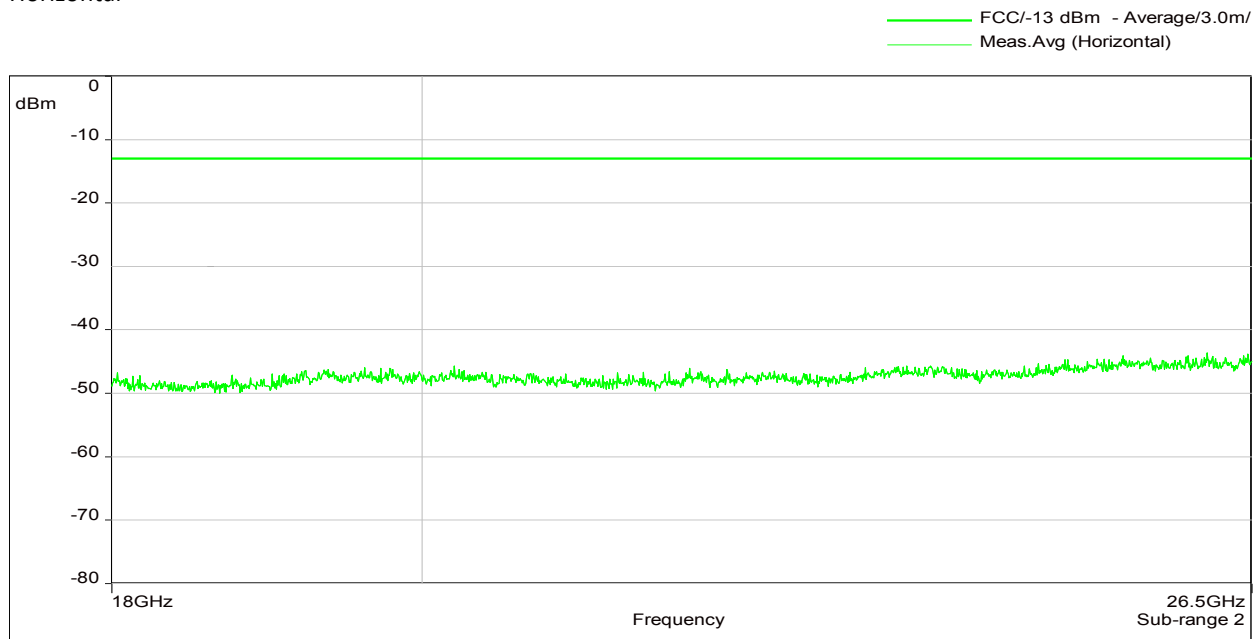
10.4.10 18 to 26.5 GHz Downlink (Bottom – Middle – Top)

B/M/T: 1930 MHz / 1962.5 MHz / 1995 MHz (Operation with maximum composite power)

Vertikal



Horizontal



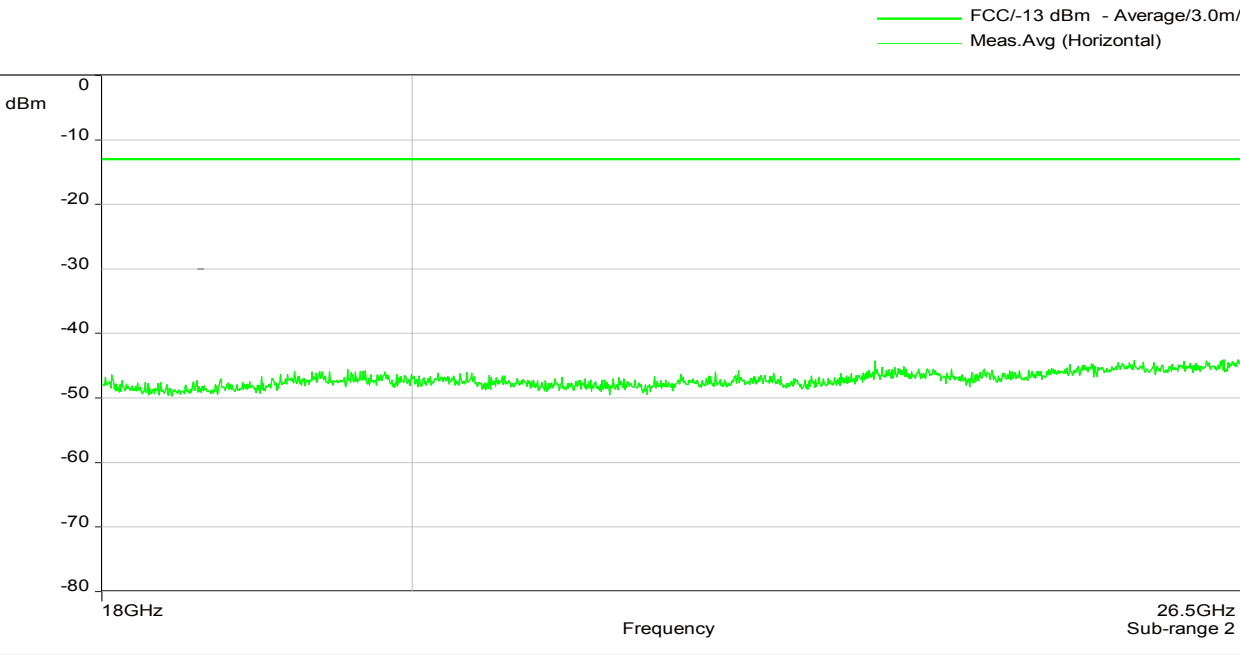
The RF output power is terminated.



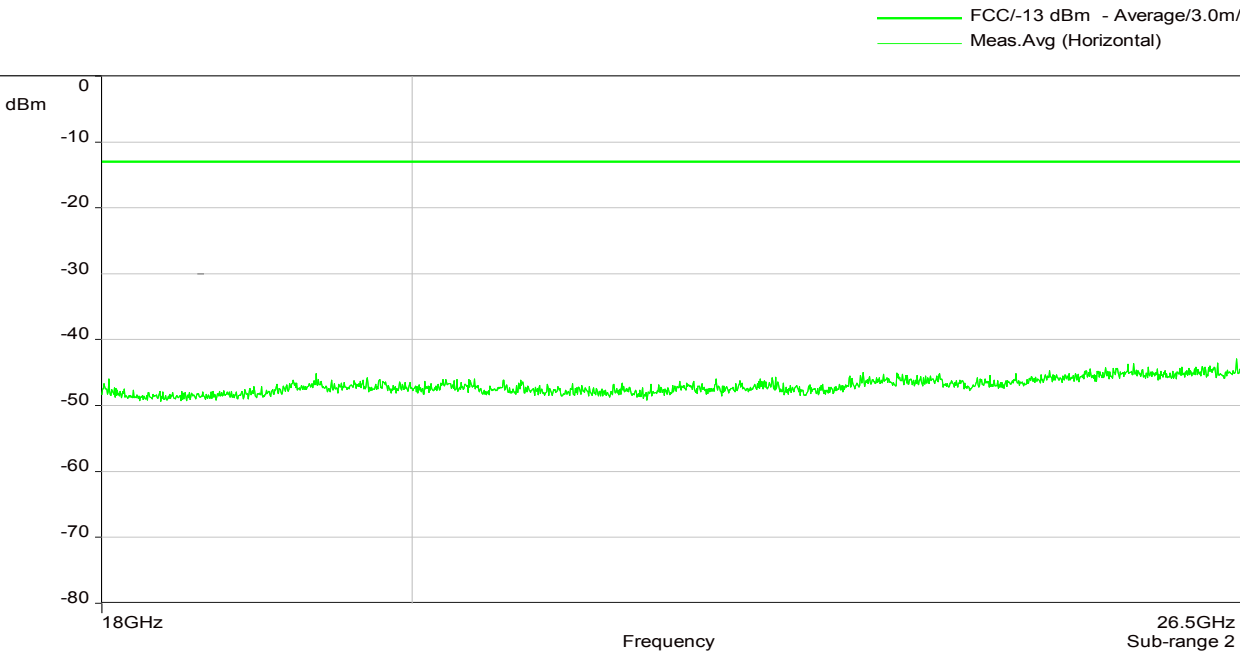
10.4.11 18 to 26.5 GHz Uplink (Middle of both paths)

F1: 836,5 MHz; F2: 1732,5 MHz; F3: 1882,5 MHz

Vertikal



Horizontal



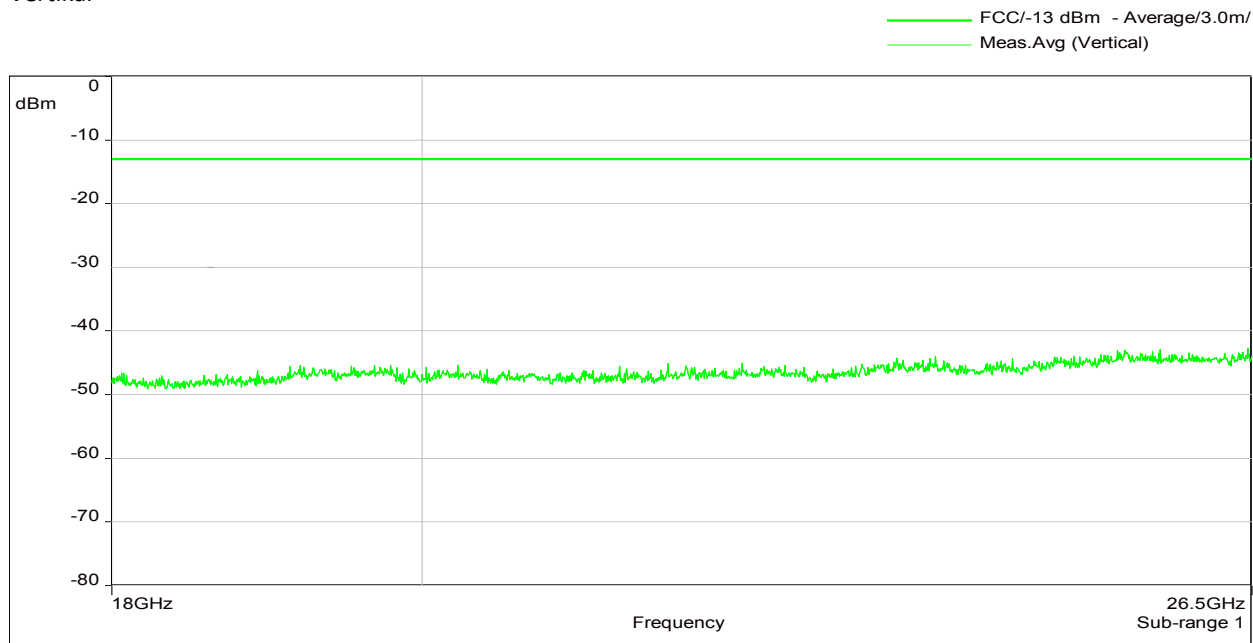
The RF output power is terminated.



10.4.12 18 to 26.5 GHz Downlink (Middle of both paths)

F1: 881.5 MHz; F2: 2132.5 MHz; F3: 1962.5 MHz

Vertikal



Horizontal



The RF output power is terminated.

Za/Ws / 15.04.2016

The radiated spurious emission measurements have been passed!



11 History

Revision	Modification	Date	Name
01.00	Initial Test report	28.04.2016	Tom Zahlmann

***** End of test report *****