ECL-EMC Test Report No.: 16-049

Equipment under test: **Prism 20 Watt 2.5 GHz TDD SISO High Band HDM**

FCC ID: **F8I-PSM25TDH**

Type of test: **FCC 47 CFR Part 27 Subpart C: 2016**
Miscellaneous Wireless Communication Services

Measurement Procedures: 47 CFR Parts 2 (*Frequency Allocations and Radio Treaty Matters; General Rules and Regulations*),
Part 27:2016 (Miscellaneous Wireless Communication Services),
ANSI/TIA-603-C (2004), *Land Mobile FM or PM Communications Equipment Measurement and Performance Standards*

Test result: **Passed**

Date of issue:	15.04.16			Signature:
Issue-No.:	01	Author:	Tom Zahlmann Test engineer	Digitally signed by Tom Zahlmann DN: cn=Tom Zahlmann, o=Bureau Veritas CPS, ou=ECL, email=tom.zahlmann@de.bureauveritas.com, c=DE Date: 2016.04.15 15:46:01 +02'00'
Date of delivery:	27.01.15	Checked:	Werner Haas Test engineer	Digital unterschrieben von Werner Haas DN: cn=Werner Haas, o=Bureau Veritas CPS, ou=ECL, email=werner.haas@de.bureauveritas.com, c=DE Datum: 2016.04.15 15:47:51 +02'00'
Test dates:	08.03.16 – 15.03.16			
Pages:	68			

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 devices operating under Part 27 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

Name of Test	FCC Para. No.	FCC Method	FCC Spec.	Result
RF Power Output	27.50(d)	2.1046	1640 Watts/MHz	Complies
Occupied Bandwidth	KDB 935210 D02 v03r02	2.1049	Input/Output	Complies
Spurious Emissions at Antenna Terminals	27.53(h)	2.1051	-13dBm	Complies
Field Strength of Spurious Emissions	27.53(m)	2.1053 TIA/EA-603	-13dBm E.I.R.P	Complies
Intermodulation	KDB 935210 D02 v03r02	KDB 935210 D02 v03r02	KDB 935210 D02 v03r02	Complies
Frequency Stability	27.54	2.1055	Must stay in band	Complies
Out of Band Rejection	KDB 935210 D02 v03r02	KDB 935210 D03 v04	KDB 935210 D03 v04	Complies

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

2.1 Description

Kind of equipment	Prism 20 Watt 2.5 GHz TDD SISO High Band HDM
Andrew Ident. Number	FWP-T4ST000MOD-H
Serial no.(SN)	320000117462-11
Revision	0
Software version and ID	8.1.0.23
Type of modulation and Designator	LTE (G7D) ☒
Frequency Translation	F1-F1 ☒ F1-F2 ☐ N/A ☐
Band Selection	Software ☐ Duplexer ☒ Full band ☐

2.1.1 Downlink

Pass band	2615 MHz – 2690 MHz
Max. composite output power based on one carrier per path (rated)	43.5 dBm = 22.4 W
System Gain*	10.5 dB @ Pout BTS of 33 dBm

*see 2.1.5

2.1.2 Uplink

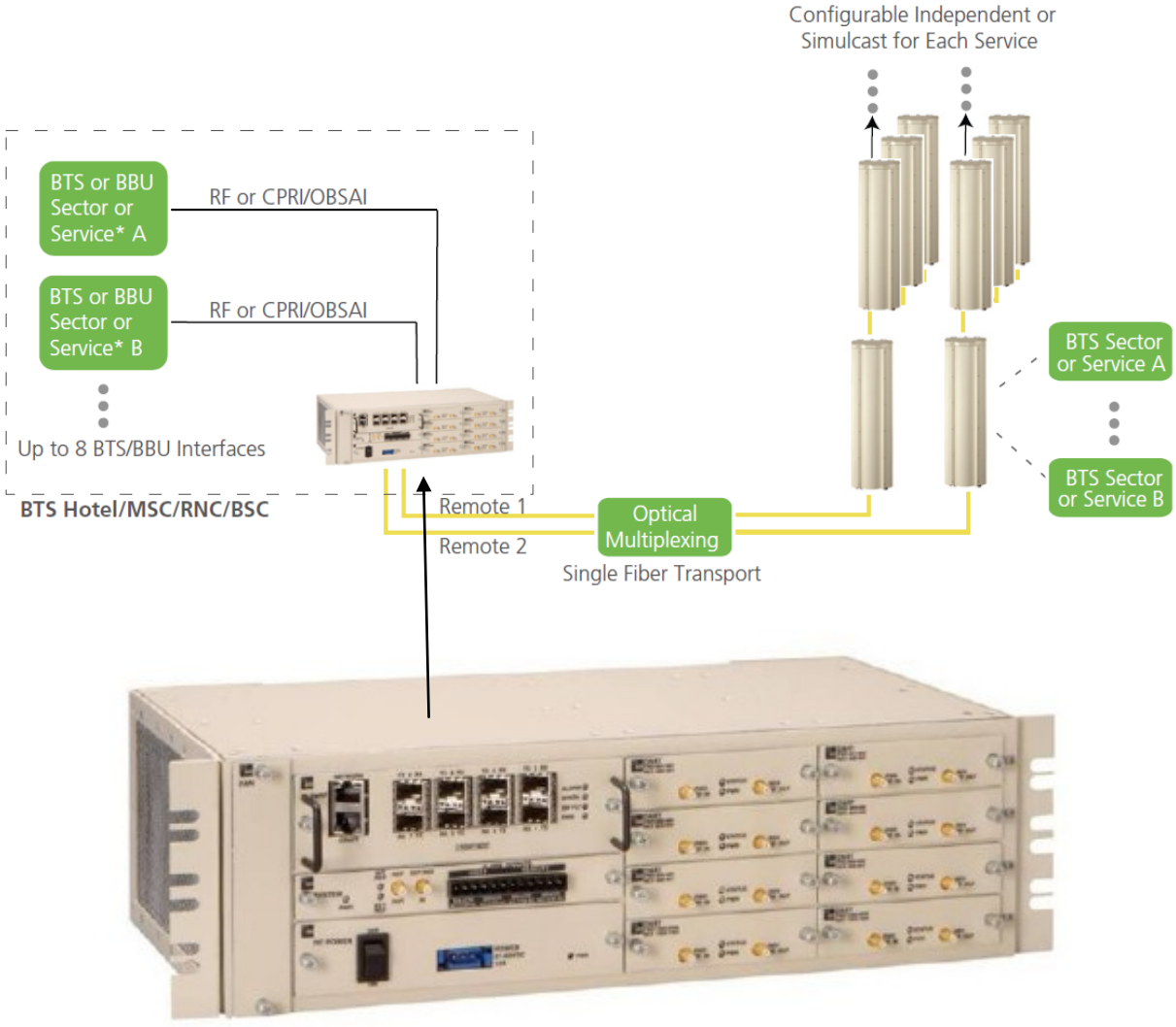
Pass band	2615 MHz – 2690 MHz
Maximum rated output power	n. a.
System Gain*	n.a.

*see 2.1.5

Note: The EUT does not transmit over the air in the uplink direction.

2.1.3 Description of EUT

CommScope's FlexWave Prism is a flexible solution for Distributed Antenna System applications. The FlexWave Prism uses patented digital-over-fiber technology to distribute RF to desired locations. The Prism digitizes the entire designated RF band and/or multiplexes direct digital CPRI or OBSAI feeds over dark fiber or millimeter wave links and reconstructs the signal at full bandwidth, regardless of modulation technology or BTS vendor, at the remote location. CommScope's digital RF transport allows RF signals to be replicated at full dynamic range, independent of the link length, for improved data throughput. As service providers migrate to 3G and 4G networks, high-data rate broadband services, networks utilizing a Prism backbone will be ready.



This test report describes only the approval of the 2615 – 2690 MHz Path.
The antenna(s) used with device must be fixed-mounted on permanent structures.

2.1.4 Block diagram of measurement reference points

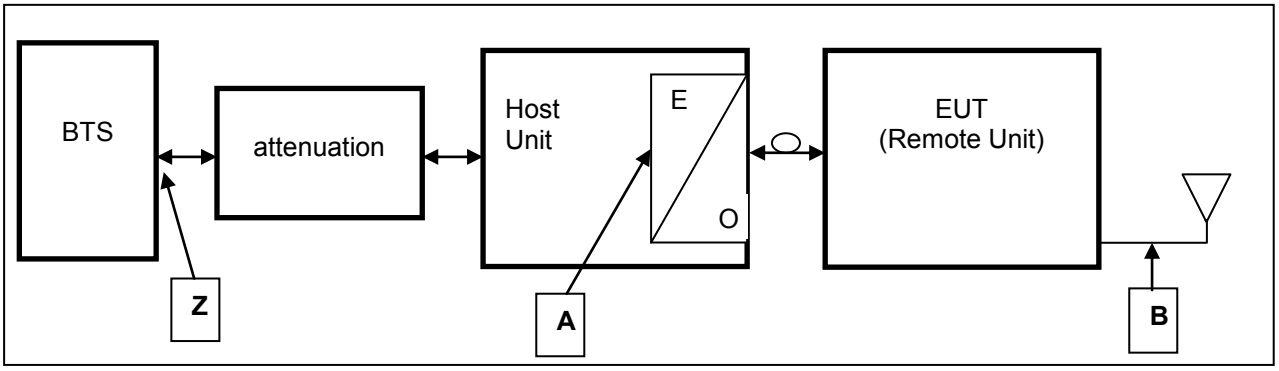


figure 2.1.4-#1 Block diagram of measurement reference points

Remote Unit (RU) is the EUT

O/E	Opitcal/Electrical converter		
Reference point A	Host Unit	UL output,	DL input
Reference point B	Remote Unit	DL output,	UL input
Reference point Z	BTS	DL output,	UL input

Since a signal generator does not supply a good output signal with +33 or +43dBm, for the downlink measurement the MU Attenuation is not used.
That means for downlink measurements the signal generator is connected to measurement point A at the Host Unit optical / electrical converter and the analyzer to the measurement point B at the RU.

2.1.5 Downlink System Gain and Output Power

System optimized for BTS power *(fixed value)* **Z**	Attenuation *(manual leveling)*	Maximum rated input power at the Host Unit *(fixed value)* **A**	RU Gain *(fixed value)* **A to B**	Maximum rated output power at RU Antenna port *(fixed value)* **B**
+33 dBm	**58**	**-25**	**68**	**43** *@ 1 carrier*
System Gain Z to B	**10**			
+43 dBm	**68**	**-25**	**68**	**43** *@ 1 carrier*
System Gain Z to B	**0**			

table 2.1.5-#1 Equipment under test (E.U.T.) Description Downlink System Gain and Output Power

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	

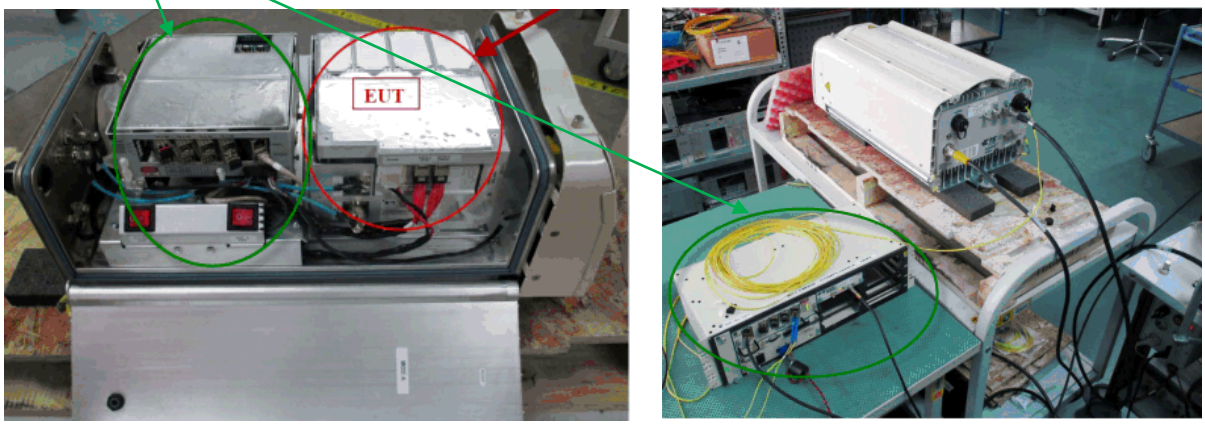
3.2 Test equipment

ANDREW Inv. No.	Test equipment	Type	Manufacturer	Serial No.	Calibration
9295	Network Analyzer	ZNB20	R&S	101540	11/16
9291	Spectrum Analyzer	FSV30	R&S	103090	06/16
9233	Signal Generator	SMBV100A	R&S	257777	06/16
9132	Signal Generator	SMBV100A	R&S	257693	04/16
8671	Power Meter	E4418B	Agilent	GB39513094	06/16
8672	Power Sensor	E9300H	Agilent	US41090179	06/16
7321	Circulator	E10-1FFF	AEROTEK	25350	CIU
7326	Circulator	E10-1FFF	AEROTEK	25360	CIU
7408	RF-Cable	2,0m; N-N	Andrew	---	CIU
7409	RF-Cable	2,0m; N-N	Andrew	---	CIU
7410	RF-Cable	1,0m; N-N	Andrew	---	CIU
7411	RF-Cable	2,0m; N-N	Andrew	---	CIU
7373	RF-Cable	Multiflex141	Andrew	---	CIU
7374	RF-Cable	Multiflex141	Andrew	---	CIU
7437	RF-Cable	Multiflex141	Andrew	---	CIU
7438	RF-Cable	Multiflex141	Andrew	---	CIU
7439	RF-Cable	Multiflex141	Andrew	---	CIU
7443	RF-Cable	Multiflex141	Andrew	---	CIU
7444	RF-Cable	Multiflex141	Andrew	---	CIU
7445	RF-Cable	Multiflex141	Andrew	---	CIU
7446	RF-Cable	Multiflex141	Andrew	---	CIU
7447	RF-Cable	Multiflex141	Andrew	---	CIU
7448	RF-Cable	Multiflex141	Andrew	---	CIU
7449	RF-Cable	Multiflex141	Andrew	---	CIU
7450	RF-Cable	Multiflex141	Andrew	---	CIU
7440	RF-Cable	RG-223 0.8m	Andrew	---	CIU
7441	RF-Cable	RG-223 0.8m	Andrew	---	CIU
7453	RF-Cable	RG223 2m SMA.	Andrew	---	CIU
7454	RF-Cable	RG223 2m SMA.	Andrew	---	CIU
7455	RF-Cable	RG223 2m SMA.	Andrew	---	CIU
7144	Attenuator	2N-20dB	Inmet 64671	---	CIU
7341	Power Attenuator	768-20	Narda	---	CIU
7368	Matrix		COMMSCOPE	---	weekly

CIU = Calibrate in use

3.3 Auxiliary Equipment

Test equipment	Type	Manufacturer	Serial No.
SERF Modul	FWP-000SERVMOD	ADC	GR22104R
Host II Chassis	8517620050	ADC	SVT-GU-1011



3.4 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.

3.5 Measurement uncertainty

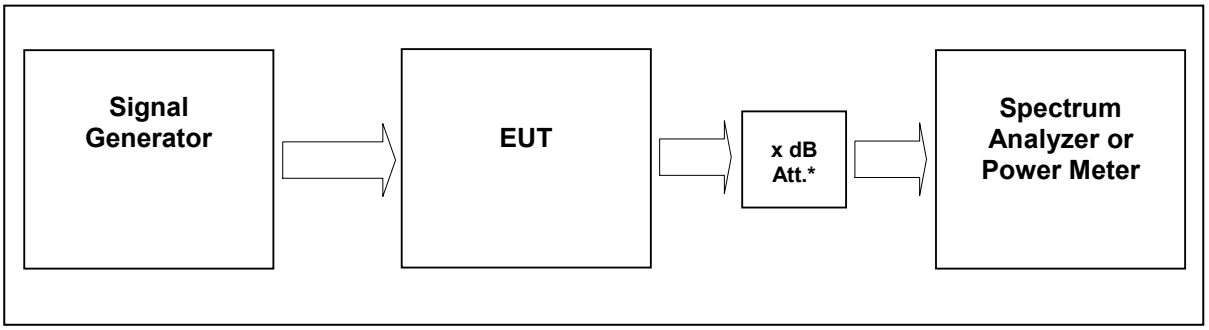
The extended measurement uncertainty corresponds to the measurement results from the standard measurement uncertainty multiplied by the coverage factor k=2. The true value is located in the corresponding interval with a probability of 95 %.

4 Test site (Bureau Veritas Consumer Products Services)

FCC Test site: **96997**

See relevant dates under section 11 of this test report.

5 RF Power Out: §27.50, §2.1046



External Attenuator DL x dB = 20 dB

figure 5-#1 Test setup: RF Power Out: §27.50, §2.1046

Measurement uncertainty	± 0,38 dB
Test equipment used	9291, 9233, 7444; 7321; 7144; 7454; 7453; 7341; 7449; 7368

5.1 Limit

(1) *Main, booster and base stations.* (i) The maximum EIRP of a main, booster or base station shall not exceed 33 dBW + 10log(X/Y) dBW, where X is the actual channel width in MHz and Y is either 6 MHz if prior to transition or the station is in the MBS following transition or 5.5 MHz if the station is in the LBS and UBS following transition, except as provided in paragraph (h)(1)(ii) of this section.

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 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		RBW VBW Span	RF Power (dBm)	RF Power (W)	Plot -
LTE	Bottom	2625 MHz	28MHz 28MHz 0MHz	43.5	22.4	5.3.1.1 #1
LTE	Middle	2652.5 MHz	28MHz 28MHz 0MHz	43.3	21.4	5.3.1.2 #1
LTE	Top	2680 MHz	28MHz 28MHz 0MHz	43.1	20.4	5.3.1.3 #1
Maximum output power = 43.5 dBm = 22.4 W						
Limit Maximum output power (erp) = 68.2 dBm						

table 5.3.1-#1 RF Power Out: §27.50, §2.1046 Test results Downlink

The max RF Power out is 43.5 dBm, so the maximum antenna gain (x) can be calculated as follow:

Limit = 68.2 dBm

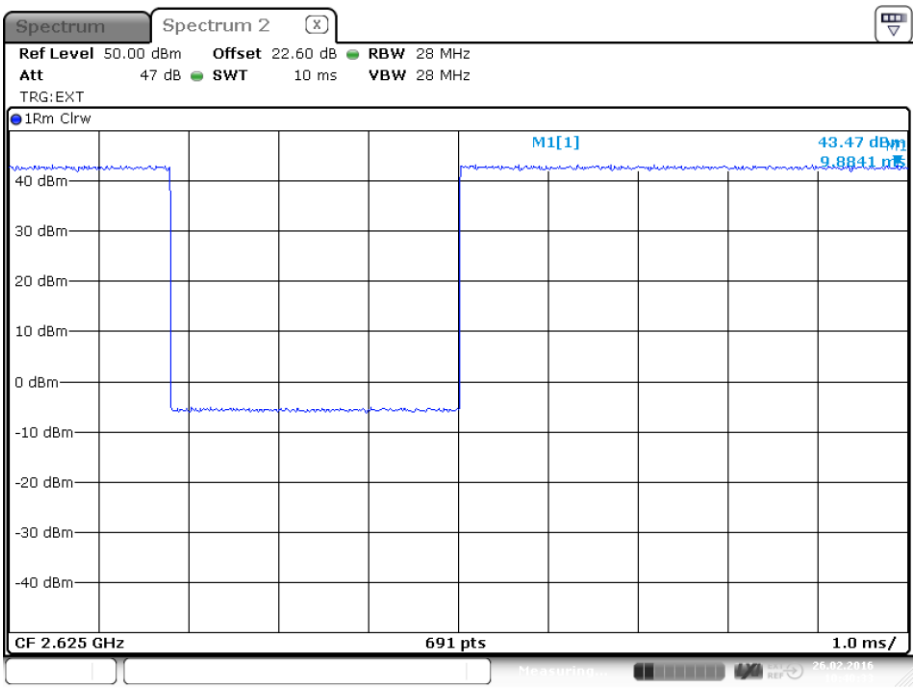
68.2 dBm **>** 43.5 dBm + x ------> x = 68.2 dBm – 43.5 dBm = 24.7 dBd
x dBi = 24.7 dBd + 2.15 = 26.85 dBi

=> The antenna that will be used for the complete system have to have a gain lower than 26.85 dBi, relative to a dipol.

Modulation	Pin / dBm (Ref. point B)
LTE bottom	-23.3
LTE middle	-24.7
LTE top	-23.5

table 5.3.1-#2 RF Power Out: §27.50, §2.1046 Test results Downlink Input power

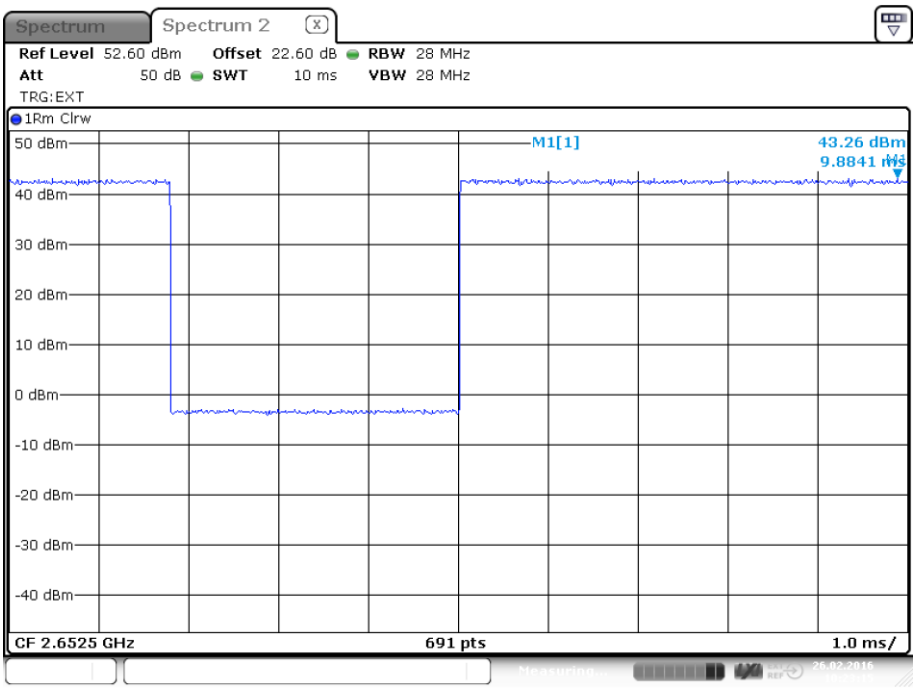
5.3.1.1 LTE, bottom



Date: 26.FEB.2016 10:40:33

plot 5.3.1.1-#1 RF Power Out: §27.50, §2.1046; Test results; Downlink; LTE, bottom

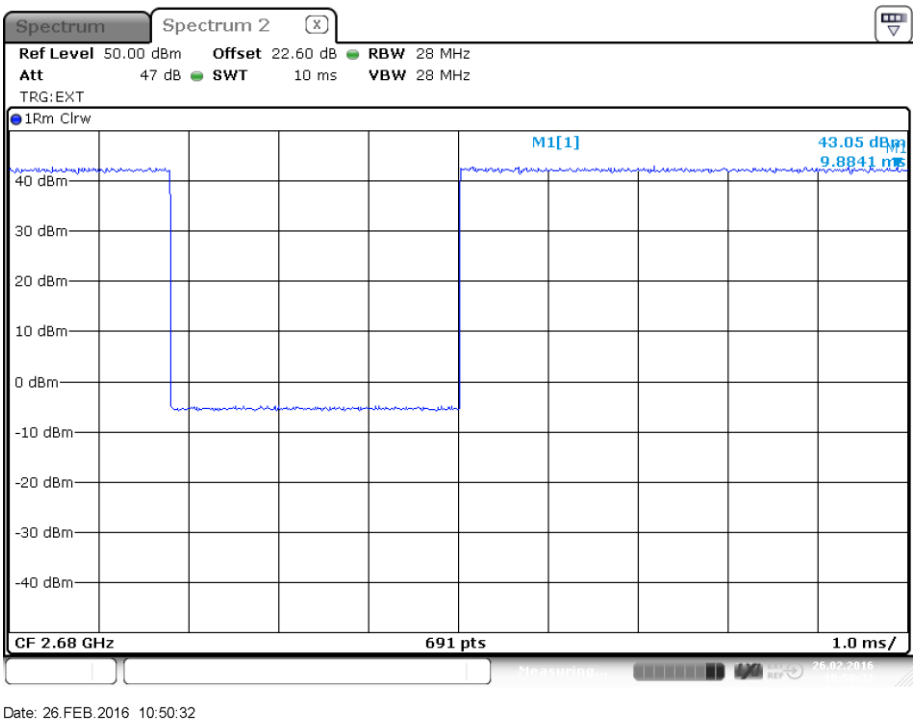
5.3.1.2 LTE, middle



Date: 26.FEB.2016 10:23:15

plot 5.3.1.2-#1 RF Power Out: §27.50, §2.1046; Test results; Downlink; LTE, middle

5.3.1.3 LTE, top



plot 5.3.1.3-#1 RF Power Out: §27.50, §2.1046; Test results; Downlink; LTE, top

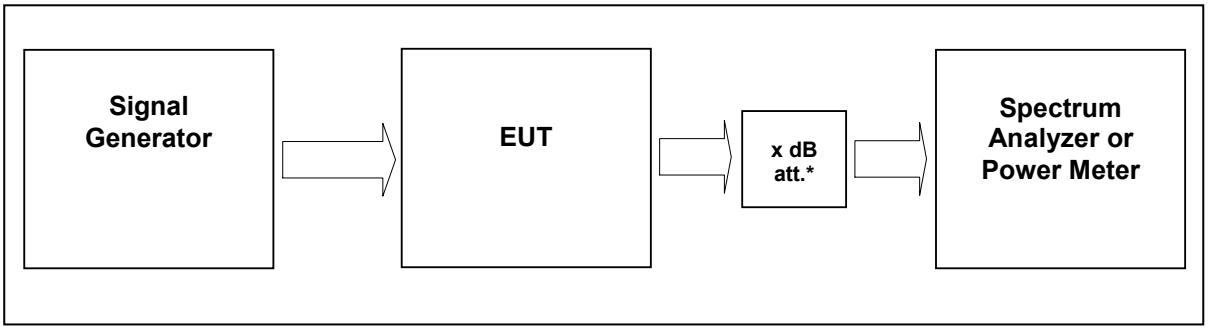
5.3.2 Uplink

n.a.
Note: The EUT does not transmit over the air in the uplink direction.

5.4 Summary test result

Test result	complies, according the plots above
Tested by:	Michael Leinfelder
Date:	04.03.2016

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	9291, 9233, 7444; 7321; 7144; 7454; 7453; 7341; 7449; 7368

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:

(h) Transmitters employing digital modulation techniques—when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated. The signal shall be applied through any filter networks, pseudo-random generators or other devices required in normal service. Additionally, the occupied bandwidth shall be shown for operation with any devices used for modifying the spectrum when such devices are optional at the discretion of the user.

6.3 Test results

6.3.1 Downlink

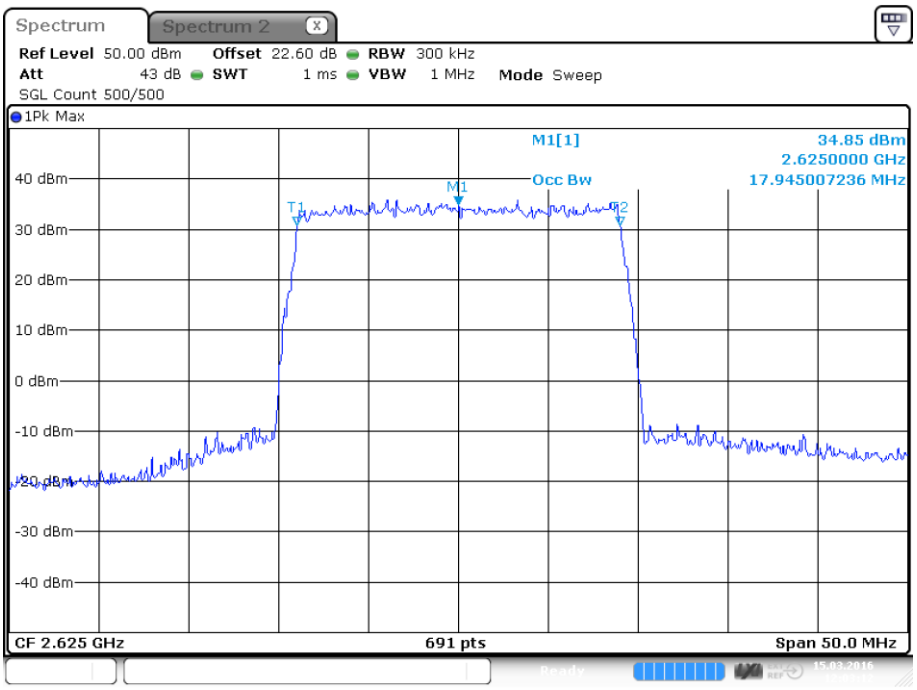
Detector PK.

Modulation	Measured at	Fcenter / MHz	RBW VBW Span	Occupied Bandwidth / MHz	Plot #
LTE	Bottom	2625	300kHz 1MHz 50MHz	17.9	6.3.1.1 #1, #2
LTE	Middle	2652.5	300kHz 1MHz 50MHz	17.9	6.3.1.2 #1, #2
LTE	Top	2680	300kHz 1MHz 50MHz	17.9	6.3.1.3 #1,#2

Modulation	Measured at	Fcenter / MHz	RBW VBW Span	26dB Bandwidth / MHz	Plot #
LTE	Bottom	2625	300kHz 1MHz 50MHz	19.6	6.3.2.1 #1, #2
LTE	Middle	2652.5	300kHz 1MHz 50MHz	19.5	6.3.2.2 #1, #2
LTE	Top	2680	300kHz 1MHz 50MHz	19.8	6.3.2.3 #1,#2

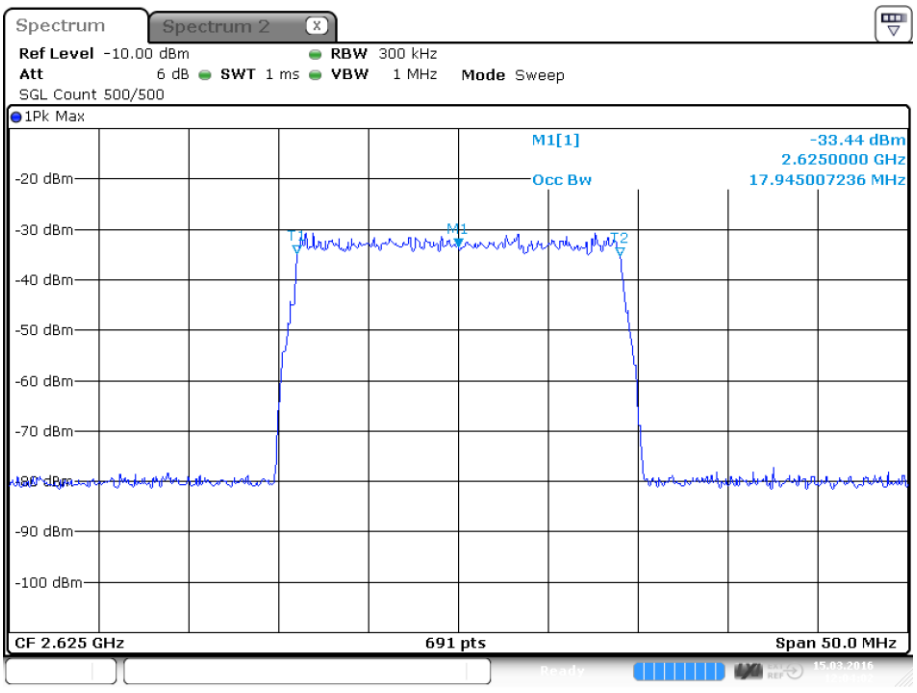
table 6.3-#1 Occupied Bandwidth: §2.1049 Test results Downlink

6.3.1.1 LTE bottom



Date: 15.MAR.2016 12:03:12

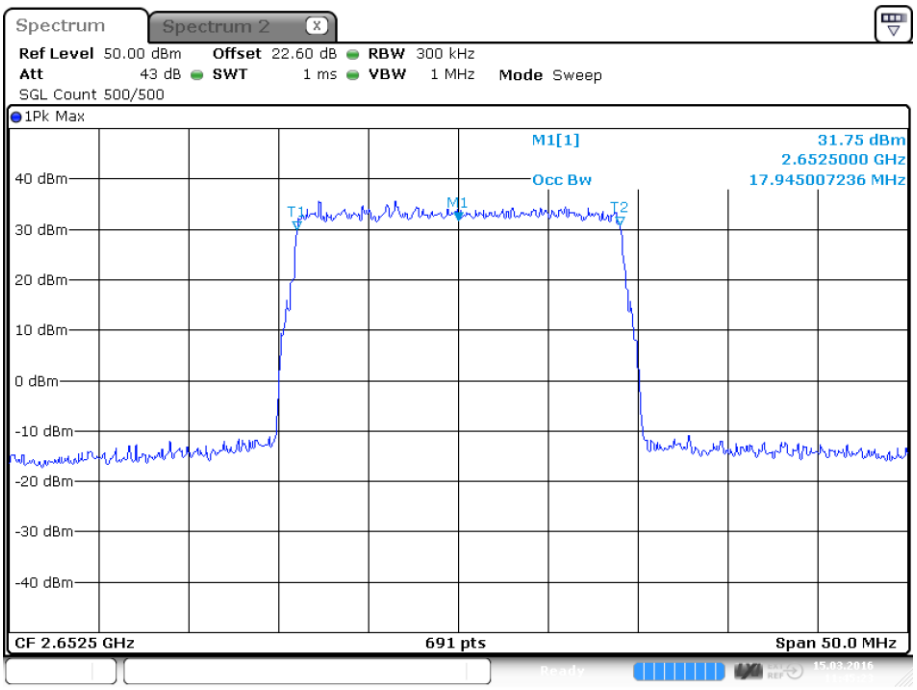
plot 6.3.1.1-#1 Occupied Bandwidth: §2.1049; Test results; Downlink; LTE bottom Output



Date: 15.MAR.2016 12:04:02

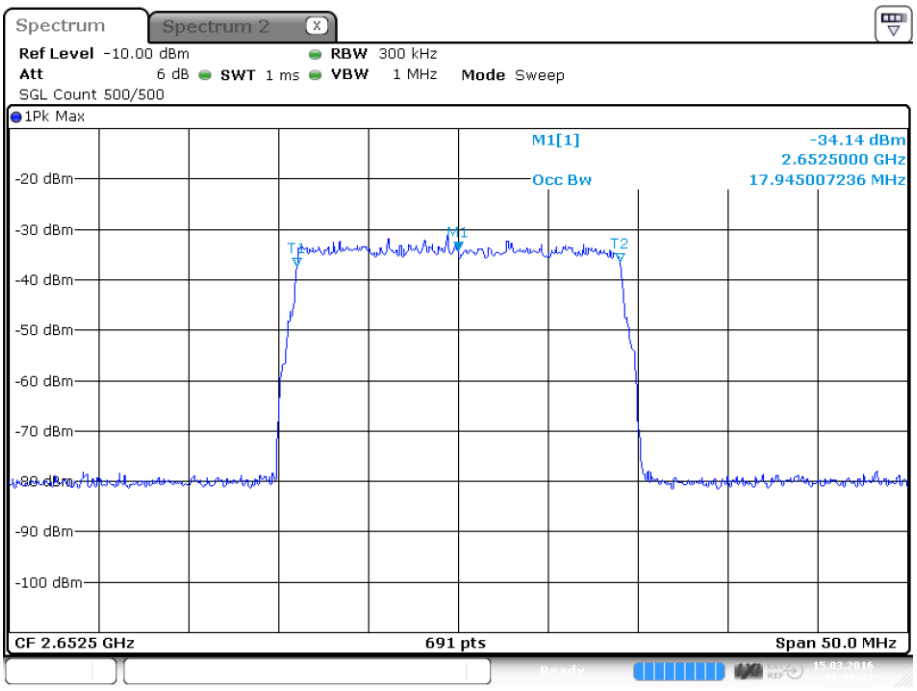
plot 6.3.1.1-#2 Occupied Bandwidth: §2.1049; Test results; Downlink; LTE bottom Input

6.3.1.2 LTE middle



Date: 15.MAR.2016 11:45:24

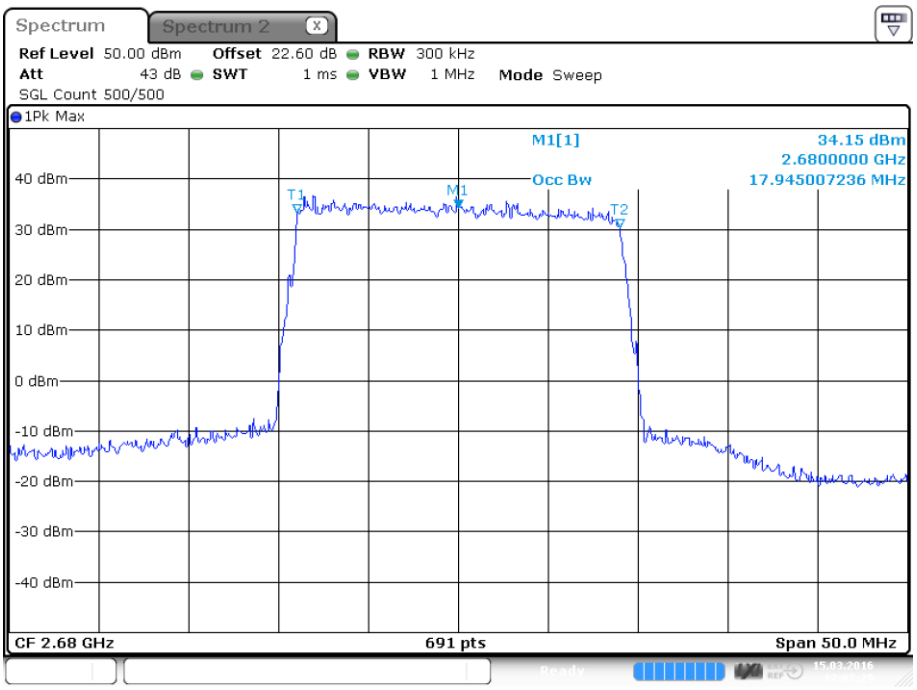
plot 6.3.1.2-#1 Occupied Bandwidth: §2.1049; Test results; Downlink; LTE middle Output



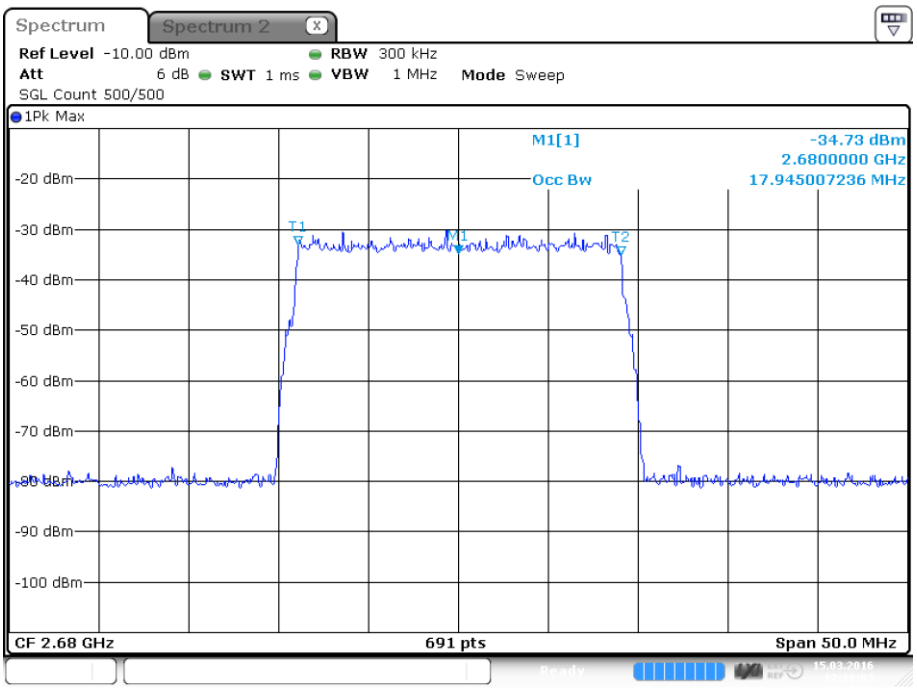
Date: 15.MAR.2016 11:48:47

plot 6.3.1.2-#2 Occupied Bandwidth: §2.1049; Test results; Downlink; LTE middle Input

6.3.1.3 LTE top



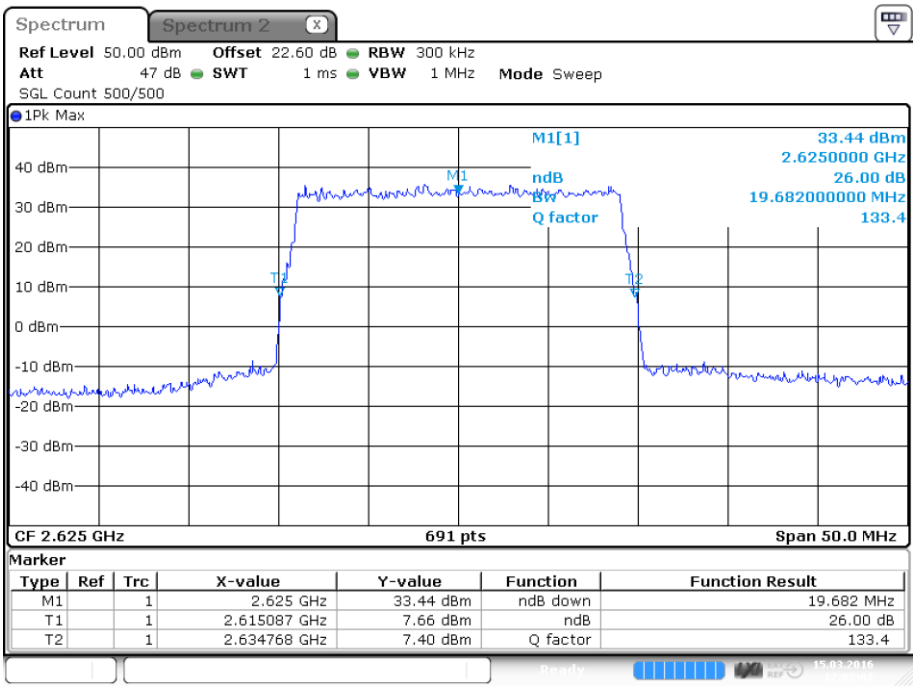
plot 6.3.1.3-#1 Occupied Bandwidth: §2.1049; Test results; Downlink; LTE top Output



plot 6.3.1.3-#2 Occupied Bandwidth: §2.1049; Test results; Downlink; LTE top Input

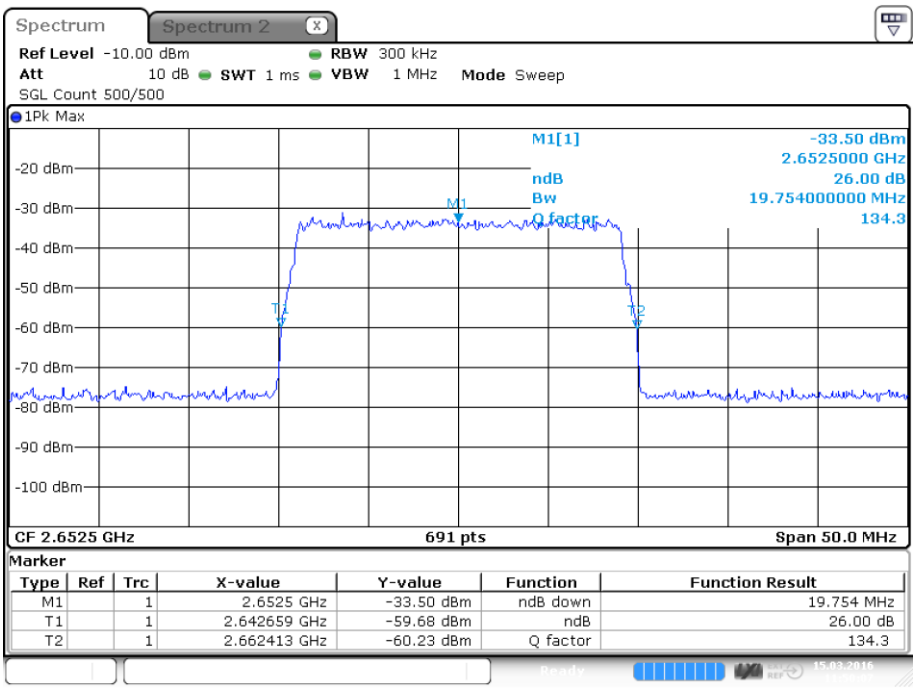
6.3.2 26dB Bandwidth

6.3.2.1 LTE bottom



Date: 15.MAR.2016 12:02:02

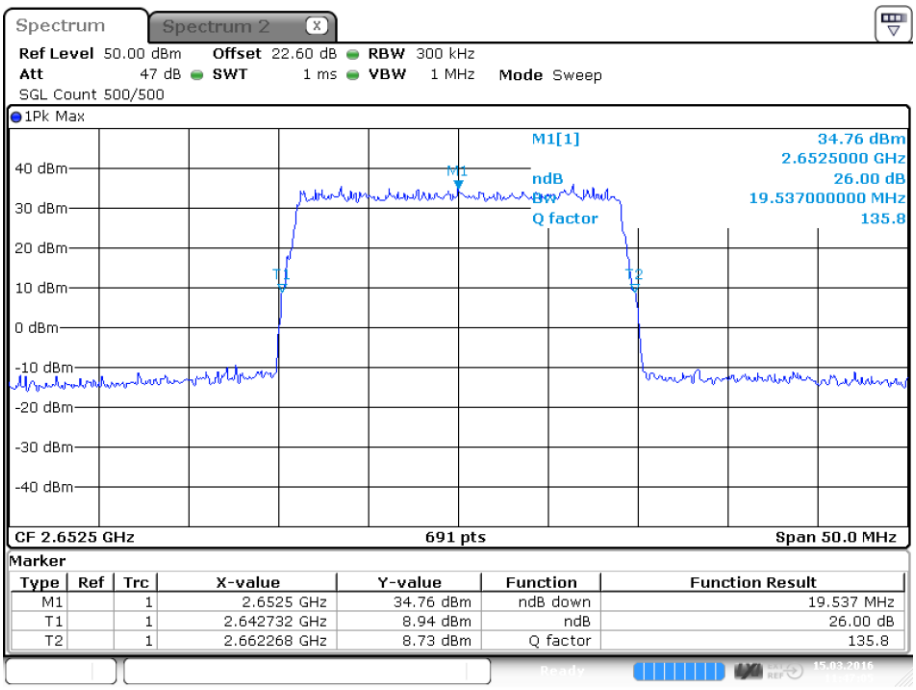
plot 6.3.2.1-#1 Occupied Bandwidth: §2.1049; Test results; 26dB Bandwidth; LTE bottom Output



Date: 15.MAR.2016 11:50:08

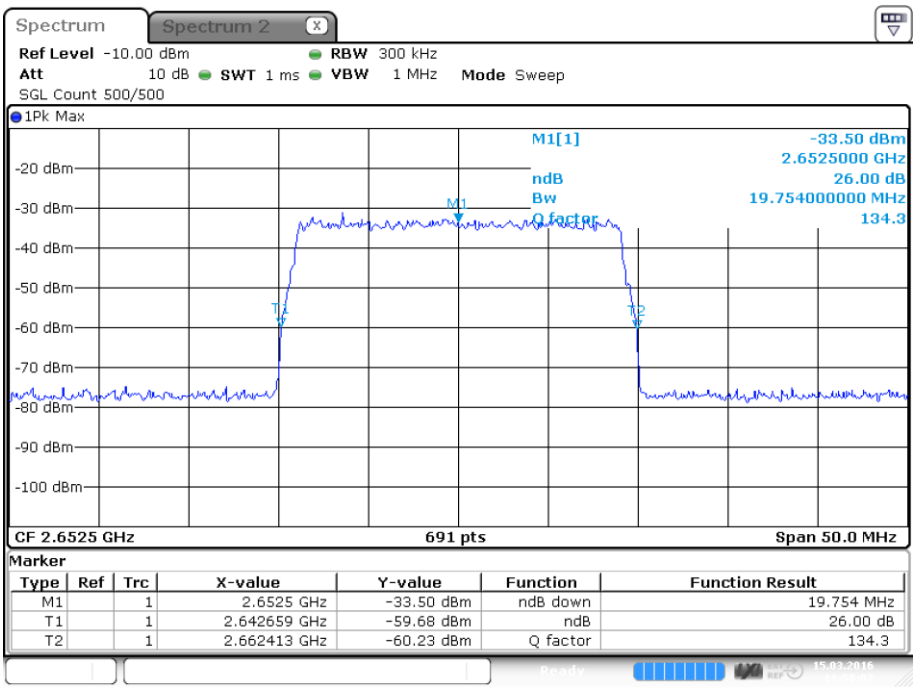
plot 6.3.2.1-#2 Occupied Bandwidth: §2.1049; Test results; 26dB Bandwidth; LTE bottom Input

6.3.2.2 LTE middle



Date: 15.MAR.2016 11:47:05

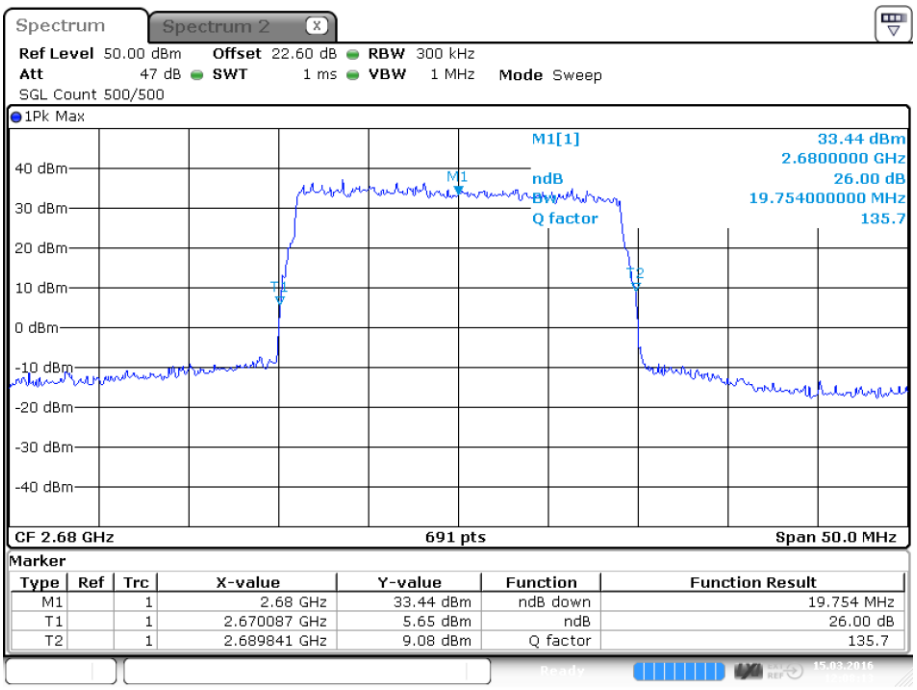
plot 6.3.2.2-#1 Occupied Bandwidth: §2.1049; Test results; 26dB Bandwidth; LTE middle Output



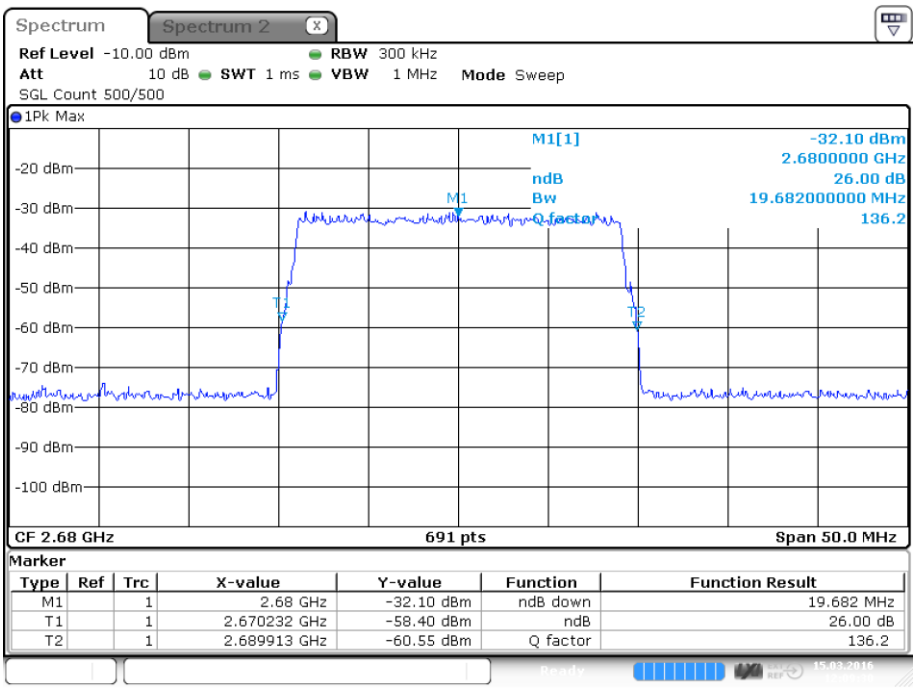
Date: 15.MAR.2016 11:50:08

plot 6.3.2.2-#2 Occupied Bandwidth: §2.1049; Test results; 26dB Bandwidth; LTE middle Input

6.3.2.3 LTE top



plot 6.3.2.3-#1 Occupied Bandwidth: §2.1049; Test results; 26dB Bandwidth; LTE top Output



plot 6.3.2.3-#2 Occupied Bandwidth: §2.1049; Test results; 26dB Bandwidth; LTE top Input

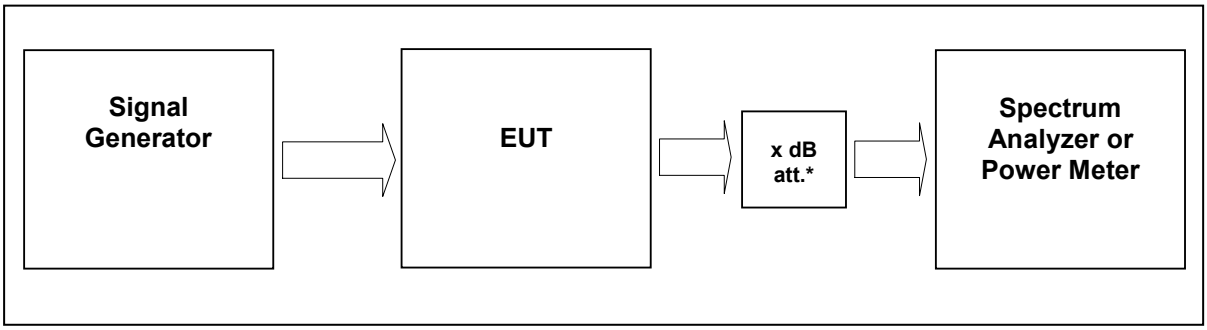
6.3.3 Uplink

n.a.
Note: The EUT does not transmit over the air in the uplink direction.

6.4 Summary test result

Test result	complies, according the plots above
Tested by:	Michael Leinfelder
Date:	15.03.2016

7 Spurious Emissions at Antenna Terminals: §27.53, §2.1051



External Attenuator DL x dB = 20 dB

figure 7-#1 Test setup: Spurious Emissions at Antenna Terminals: §27.53, §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	9291, 9233, 7444; 7321; 7144; 7454; 7453; 7341; 7449; 7368	

7.1 Limit

Minimum standard:
Para. No.27.53(h)

The Emission limit is -13dBm.

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 andamended at 63 FR 36599, July 7, 1998]

7.3 Test results

7.3.1 Downlink

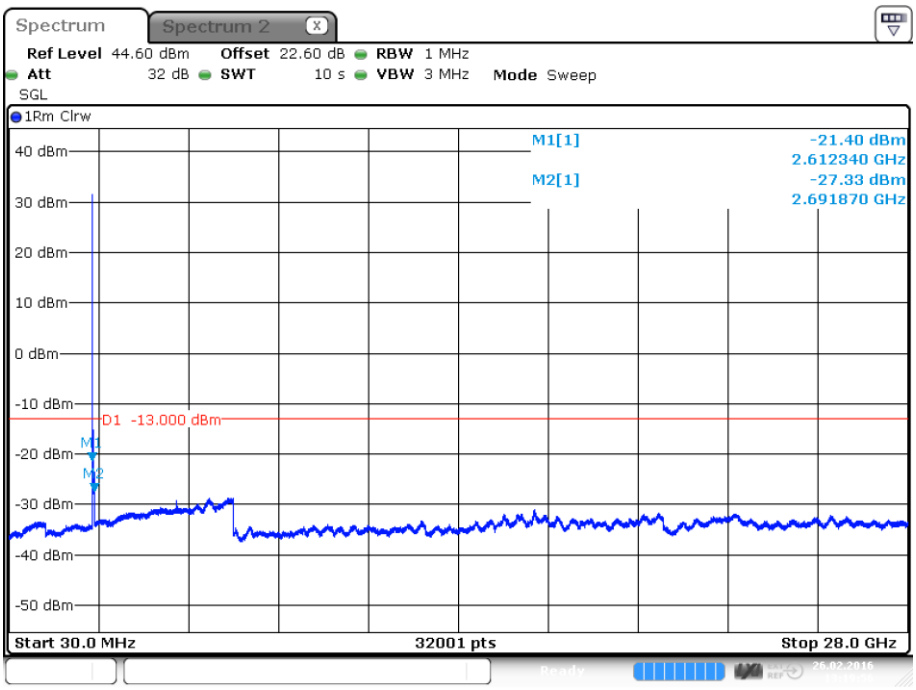
Detector: RMS.

Modulation	Carrier	RBW VBW Span	Max. level (dBm)	Plot -
LTE	2625 MHz	1MHz 3MHz 30MHz – 28GHz	-21.4	7.3.1.1 #1
LTE	2652.5 MHz	1MHz 3MHz 30MHz – 28GHz	-25.6	7.3.1.2 #1
LTE	2680 MHz	1MHz 3MHz 30MHz – 28GHz	-24.1	7.3.1.3 #1

table 7.3-#1 Spurious Emissions at Antenna Terminals: §27.53, §2.1051 Test results

If the DUT used in MIMO configuration according to KDB 662911, the summed emission (MIMO Max. Level) is calculated (Max. Level) of the output port plus 10 log (N_{ANT}). With (N_{ANT} =2) the MIMO Max. Level (dBm) equals Max. Level (dBm) plus 3dB.

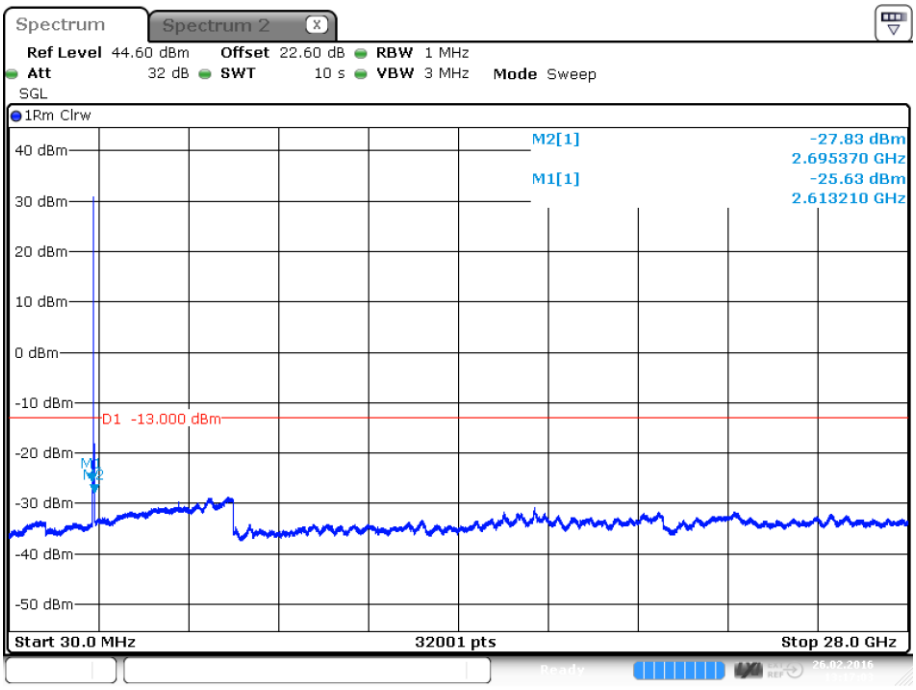
7.3.1.1 LTE bottom



Date: 26.FEB.2016 13:19:56

plot 7.3.1.1-#1 Spurious Emissions at Antenna Terminals: §27.53, §2.1051; Test results; Downlink; LTE bottom; carrier (2145MHz) notched

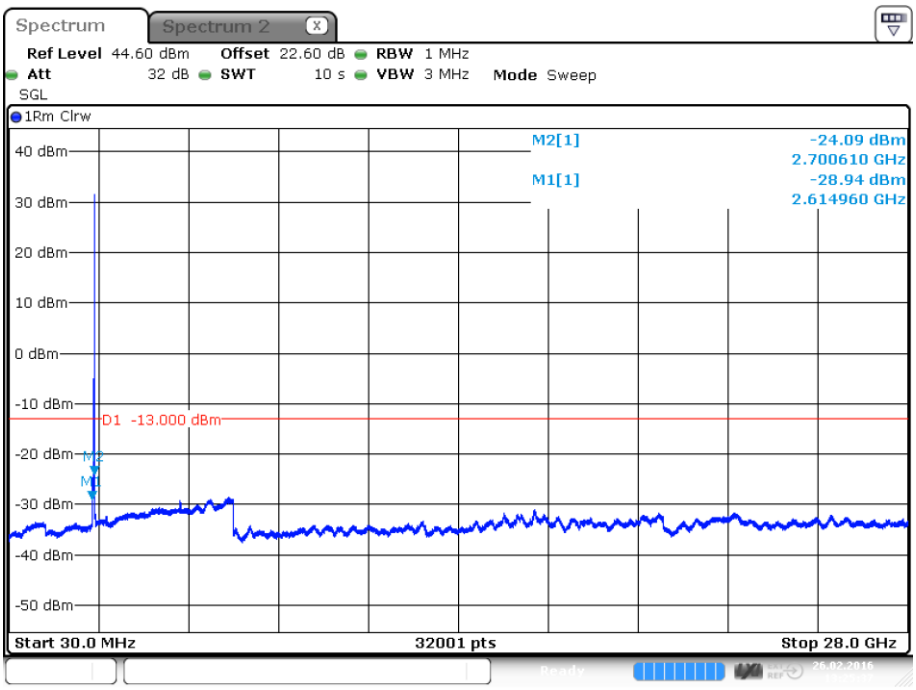
7.3.1.2 LTE middle



Date: 26.FEB.2016 13:17:03

plot 7.3.1.2-#1 Spurious Emissions at Antenna Terminals: §27.53, §2.1051; Test results; Downlink; LTE middle; carrier (2145MHz) notched

7.3.1.3 LTE top



plot 7.3.1.3-#1 Spurious Emissions at Antenna Terminals: §27.53, §2.1051; Test results; Downlink; LTE top; carrier (2145MHz) notched

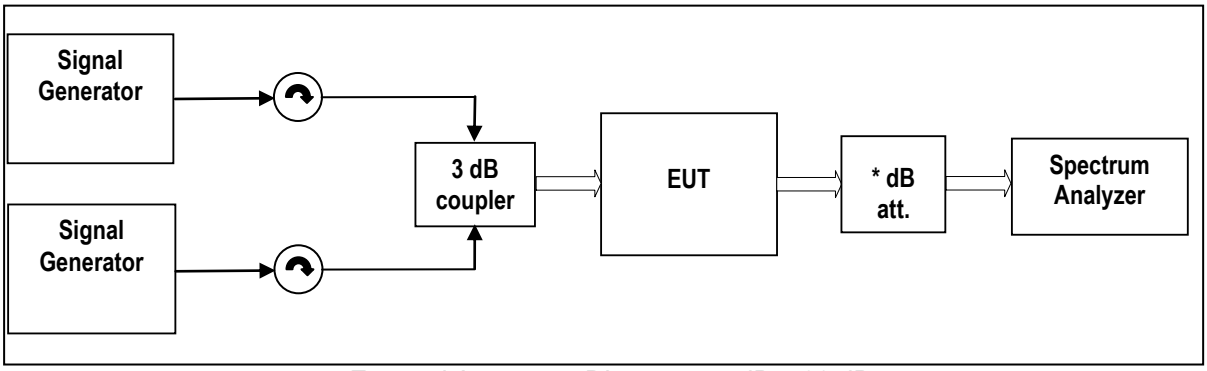
7.3.2 Uplink

n.a.
Note: The EUT does not transmit over the air in the uplink direction.

7.4 Summary test result

Test result	complies, according the plots above
Tested by:	Michael Leinfelder
Date:	04.03.2016

8 Intermodulation: §27.53, §2.1051



External Attenuator DL x dB = 20 dB

figure 8-#1 Test setup: Intermodulation: §27.53, §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	9291, 9132; 9233, 7444; 7321; 7326; 7144; 7454; 7453; 7341; 7449; 7368	

8.1 Limit

Minimum standard:
Para. No.27.53(h)

The Emission limit is -13dBm.

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 andamended 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	2625 MHz 2645 MHz	100kHz 1MHz 30MHz	-26.8	8.3.1.1 #1
	Upper Edge	2660 MHz 2680 MHz			#2

table 8.3-#1 Intermodulation: §27.53, §2.1051 Test results

8.3.1.1 LTE

Date: 26.FEB.2016 12:40:40

plot 8.3.1.1-#1 Intermodulation: §27.53, §2.1051; Test results; Downlink; LTE Lower Band Edge

Date: 26.FEB.2016 12:44:28

plot 8.3.1.1-#2 Intermodulation: §27.53, §2.1051; Test results; Downlink; LTE Upper Band Edge

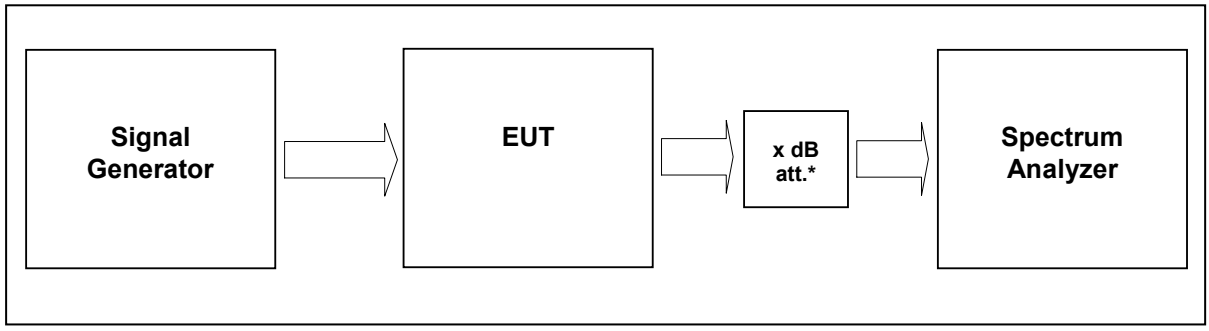
8.3.2 Uplink

n.a.
Note: The EUT does not transmit over the air in the uplink direction.

8.4 Summary test result

Test result	complies, according the plots above
Tested by:	Michael Leinfelder
Date:	04.03.2016

9 Frequency Stability



External Attenuator DL x dB = 20 dB

figure 9-#1 Test setup: Frequency Stability

Measurement uncertainty	± 0,38 dB
Test equipment used	9291, 9233, 7444; 7321; 7144; 7454; 7453; 7341; 7449; 7368

9.1 Limit

The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

9.2 Test method

KDB 935210 D05 v01r01
3.7 Frequency stability measurements

Frequency stability measurements are required by § 2.1055 of the FCC rules.

9.3 Test results

9.3.1 Downlink

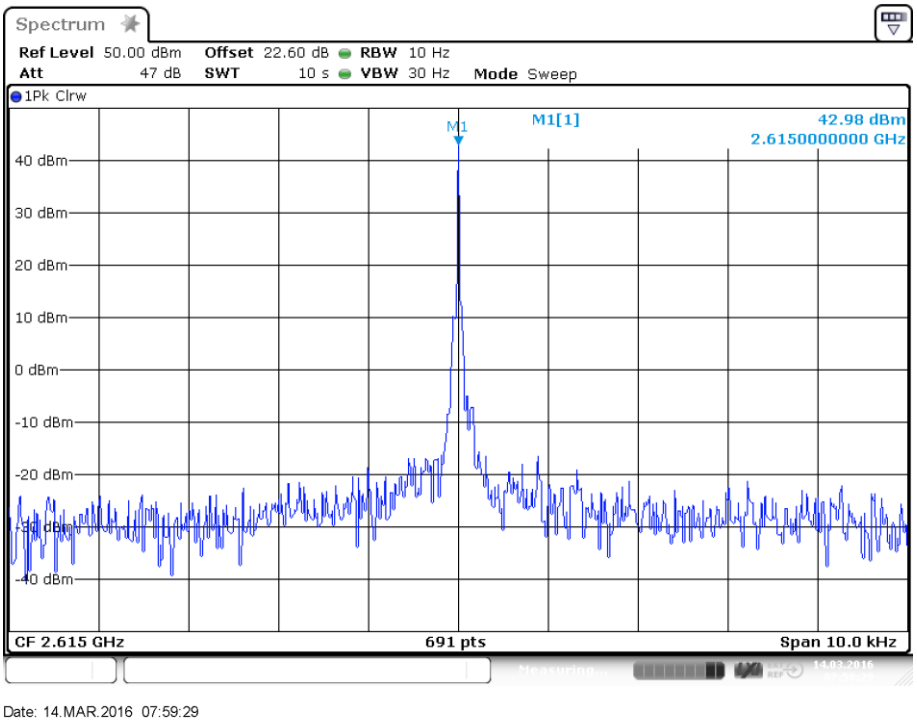
Detector Peak

	Assigned Value (MHz)	Measured Value (Hz)	Error (ppm)	Limit (ppm)	Results	Plot -
Voltage: 100%	2615	2615000000.0	0	100	Pass	9.3.1.1 #1
Voltage: 85%	2615	2615000000.0	0	100	Pass	9.3.1.1 #2
Voltage: 115%	2615	2615000000.0	0	100	Pass	9.3.1.1 #3
Voltage: 100%	2652.5	2652500000.0	0	100	Pass	9.3.1.1 #4
Voltage: 85%	2652.5	2652500000.0	0	100	Pass	9.3.1.1 #5
Voltage: 115%	2652.5	2652500000.0	0	100	Pass	9.3.1.1 #6
Voltage: 100%	2690	2690000000.0	0	100	Pass	9.3.1.1 #7
Voltage: 85%	2690	2690000000.0	0	100	Pass	9.3.1.1 #8
Voltage: 115%	2690	2690000000.0	0	100	Pass	9.3.1.1 #9
Temperature: +50°C	2615	2615000000.0	0	100	Pass	9.3.1.2 #1
	2652.5	2652500000.0	0	100	Pass	9.3.1.2 #2
	2690	2690000000.0	0	100	Pass	9.3.1.2 #3
Temperature: +40°C	2615	2615000000.0	0	100	Pass	9.3.1.3 #1
	2652.5	2652500000.0	0	100	Pass	9.3.1.3 #2
	2690	2690000000.0	0	100	Pass	9.3.1.3 #3
Temperature: +30°C	2615	2615000000.0	0	100	Pass	9.3.1.4 #1
	2652.5	2652500000.0	0	100	Pass	9.3.1.4 #2
	2690	2690000000.0	0	100	Pass	9.3.1.4 #3
Temperature: +20°C	2615	2615000000.0	0	100	Pass	9.3.1.5 #1
	2652.5	2652500000.0	0	100	Pass	9.3.1.5 #2
	2690	2690000000.0	0	100	Pass	9.3.1.5 #3
Temperature: +10°C	2615	2615000000.0	0	100	Pass	9.3.1.6 #1
	2652.5	2652500000.0	0	100	Pass	9.3.1.6 #2
	2690	2690000000.0	0	100	Pass	9.3.1.6 #3
Temperature: 0°C	2615	2615000000.0	0	100	Pass	9.3.1.7 #1
	2652.5	2652500000.0	0	100	Pass	9.3.1.7 #2
	2690	2690000000.0	0	100	Pass	9.3.1.7 #3
Temperature: -10°C	2615	2615000000.0	0	100	Pass	9.3.1.8 #1
	2652.5	2652500000.0	0	100	Pass	9.3.1.8 #2
	2690	2690000000.0	0	100	Pass	9.3.1.8 #3

table 9.3-#1 Frequency Stability Test results

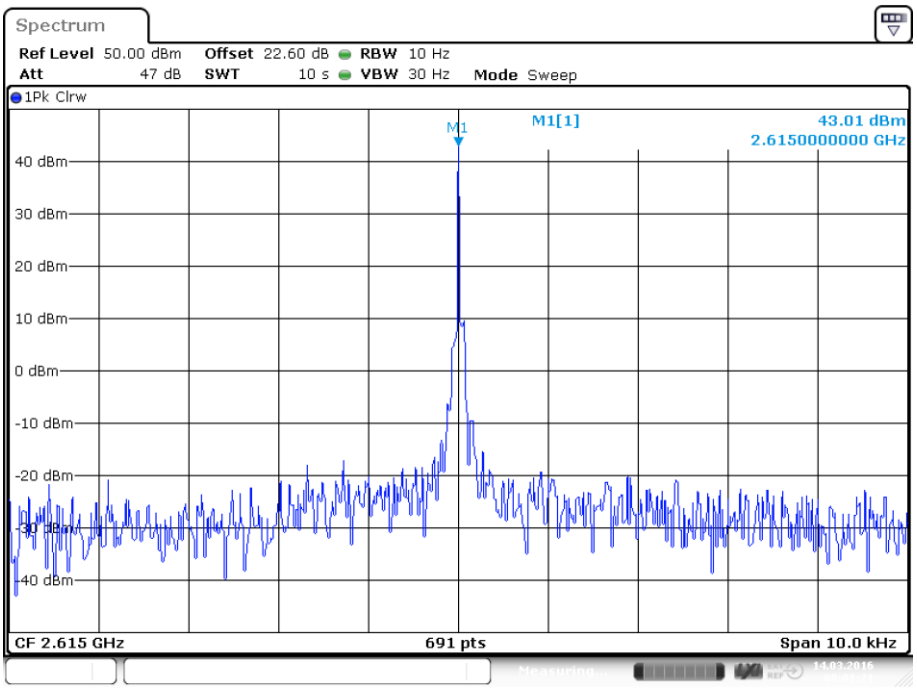
	Assigned Value (MHz)	Measured Value (MHz)	Error (ppm)	Limit (ppm)	Results	Plot -
Temperature: -20°C	2615	2615000000.0	0	100	Pass	9.3.1.9 #1
	2652.5	2652500000.0	0	100	Pass	9.3.1.9 #2
	2690	2690000000.0	0	100	Pass	9.3.1.9 #2
Temperature: -30°C	2615	2615000000.0	0	100	Pass	9.3.1.10 #1
	2652.5	2652500000.0	0	100	Pass	9.3.1.10 #2
	2690	2690000000.0	0	100	Pass	9.3.1.10 #3

9.3.1.1 @ 23 °C

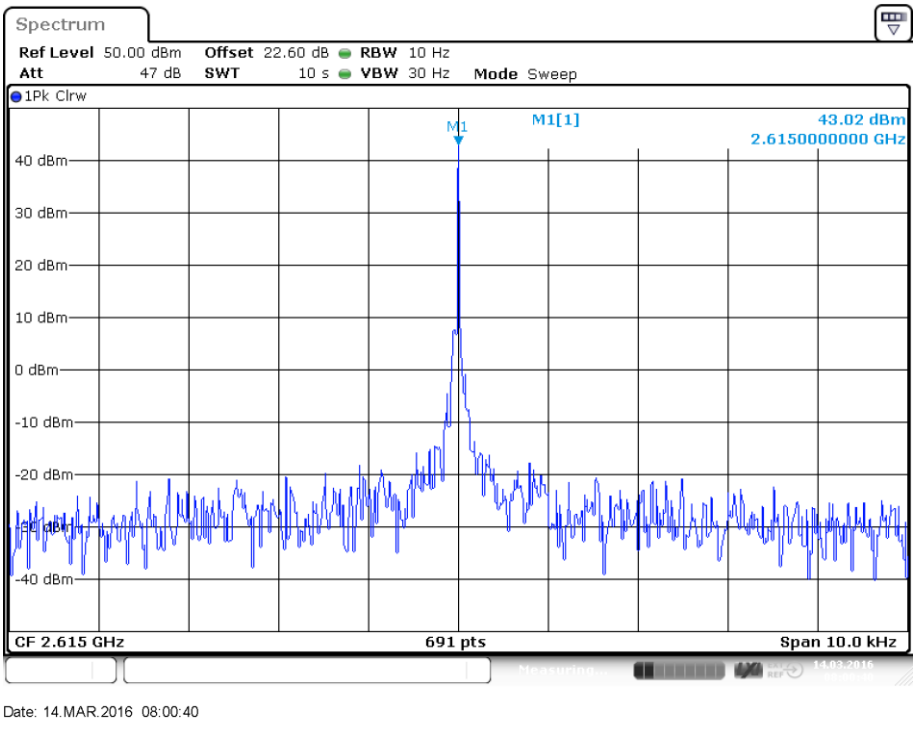


Date: 14.MAR.2016 07:59:29

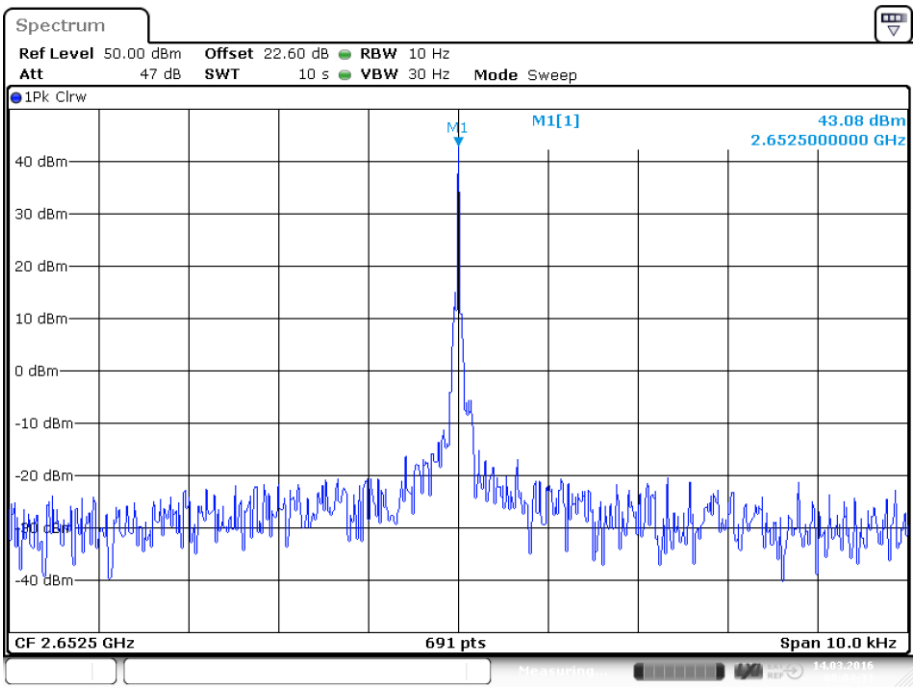
plot 9.3.1.1-#1 Frequency Stability; Test results; Downlink; @ 23 C; bottom; voltage 100%



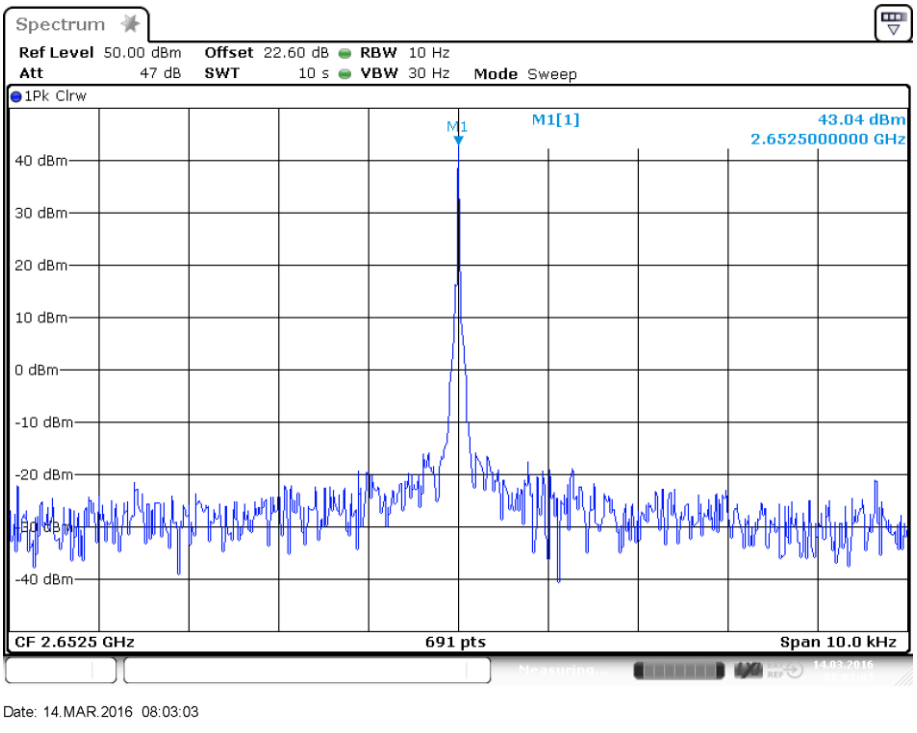
plot 9.3.1.1-#2 Frequency Stability; Test results; Downlink; @ 23 C; bottom; voltage 85%



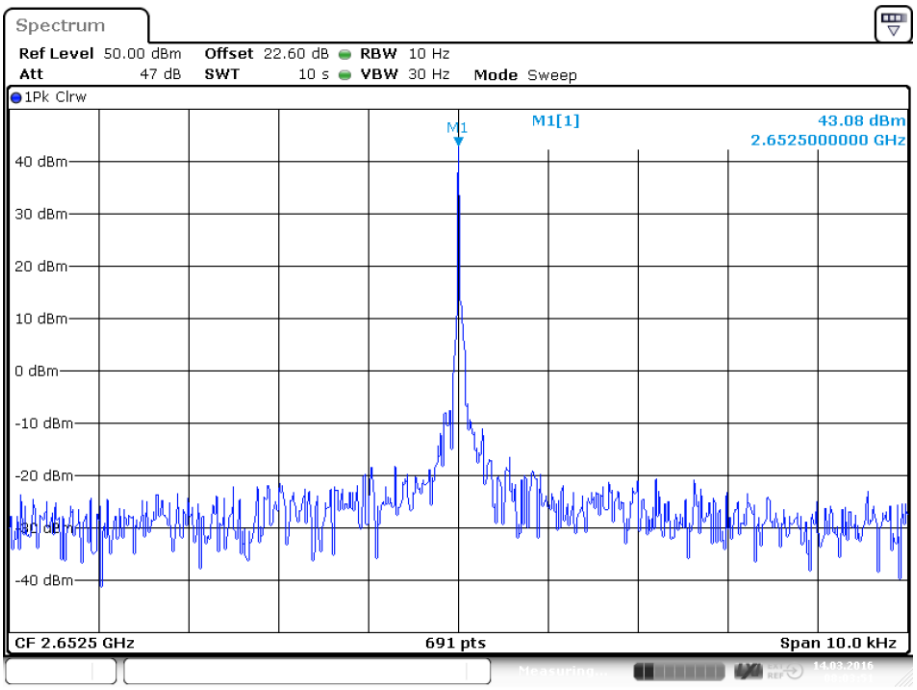
plot 9.3.1.1-#3 Frequency Stability; Test results; Downlink; @ 23 C; bottom; voltage 115%



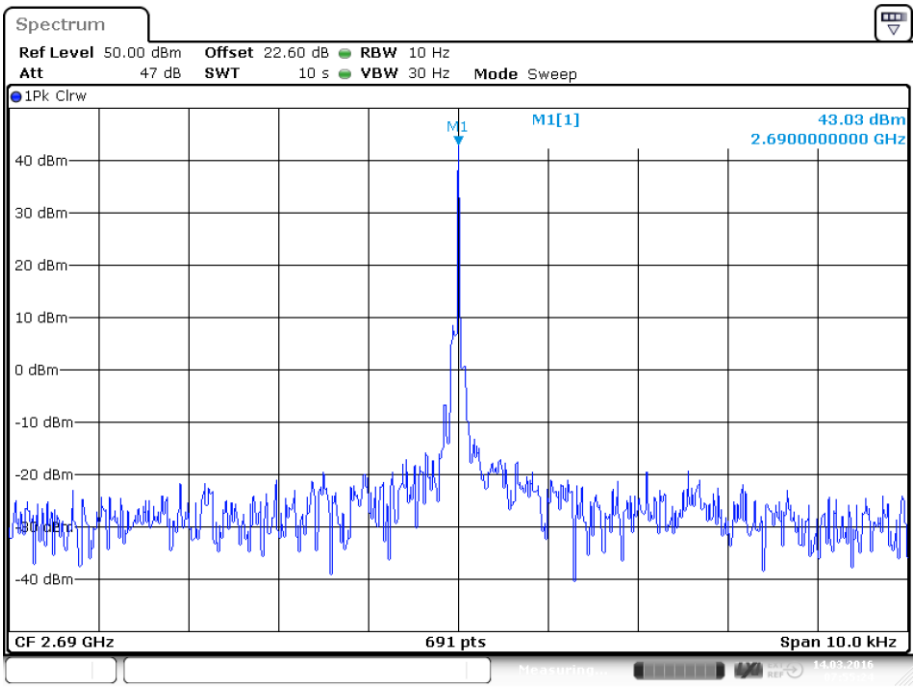
plot 9.3.1.1-#4 Frequency Stability; Test results; Downlink; @ 23 C; middle; voltage 100%



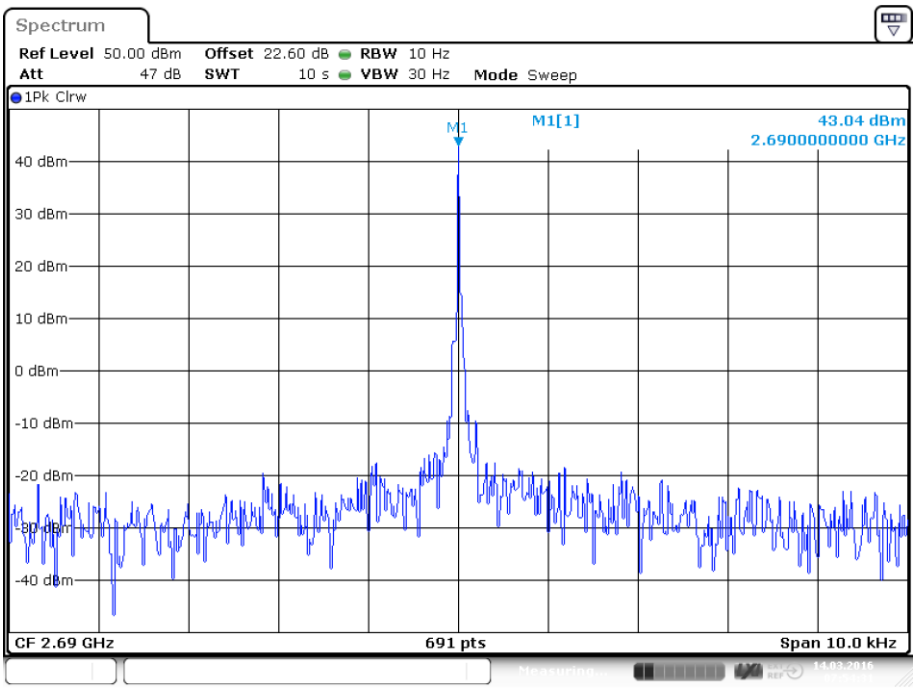
plot 9.3.1.1-#5 Frequency Stability; Test results; Downlink; @ 23 C; middle; voltage 85%



plot 9.3.1.1-#6 Frequency Stability; Test results; Downlink; @ 23 C; middle; voltage 115%

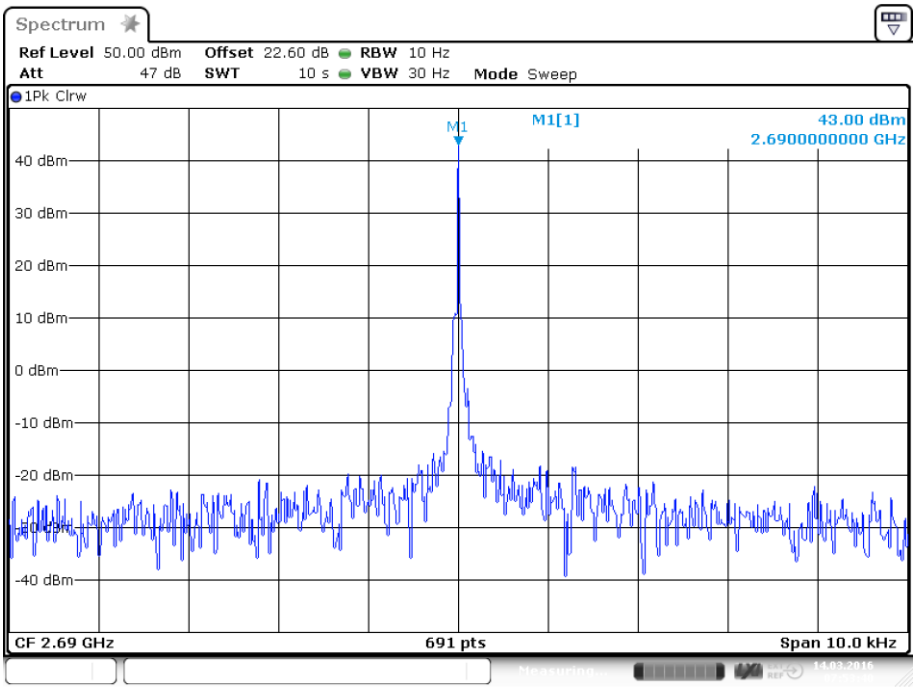


plot 9.3.1.1-#7 Frequency Stability; Test results; Downlink; @ 23 C; top; voltage 100%



Date: 14.MAR.2016 07:54:31

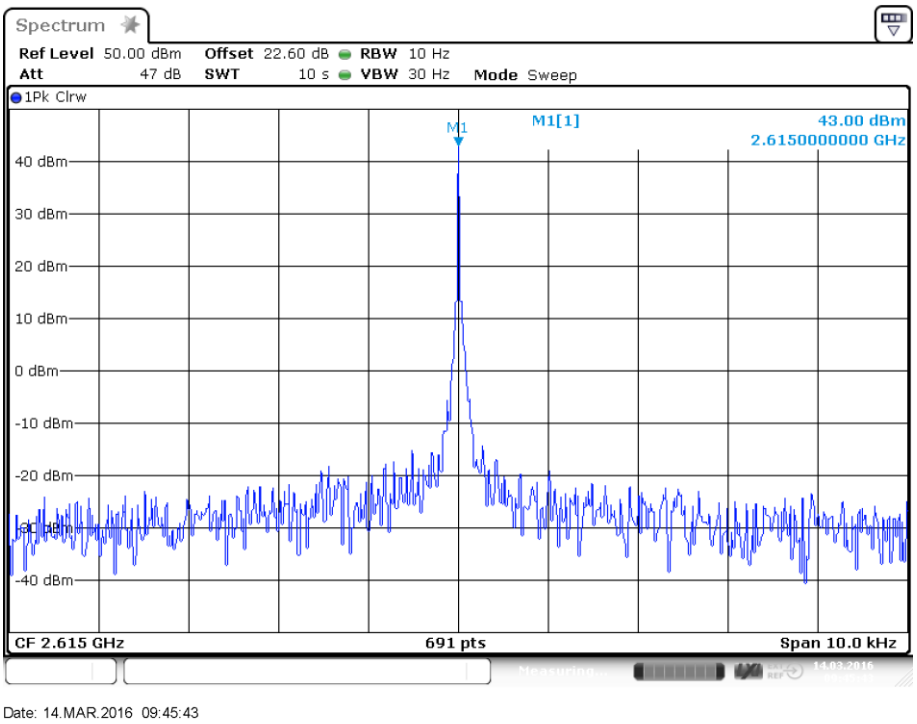
plot 9.3.1.1-#8 Frequency Stability; Test results; Downlink; @ 23 C; top; voltage 85%



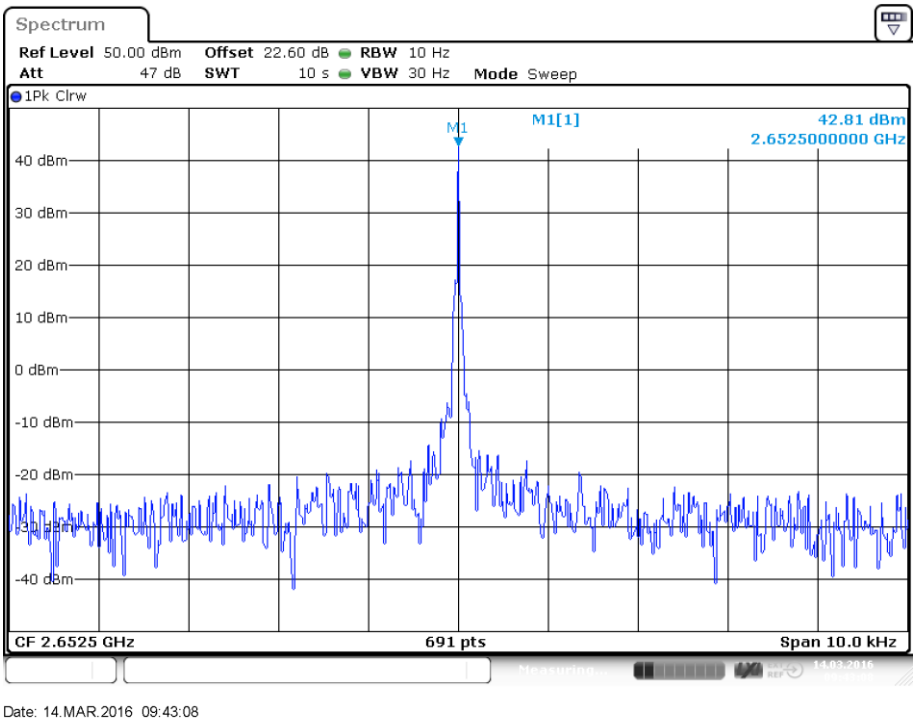
Date: 14.MAR.2016 07:53:40

plot 9.3.1.1-#9 Frequency Stability; Test results; Downlink; @ 23 C; top; voltage 115%

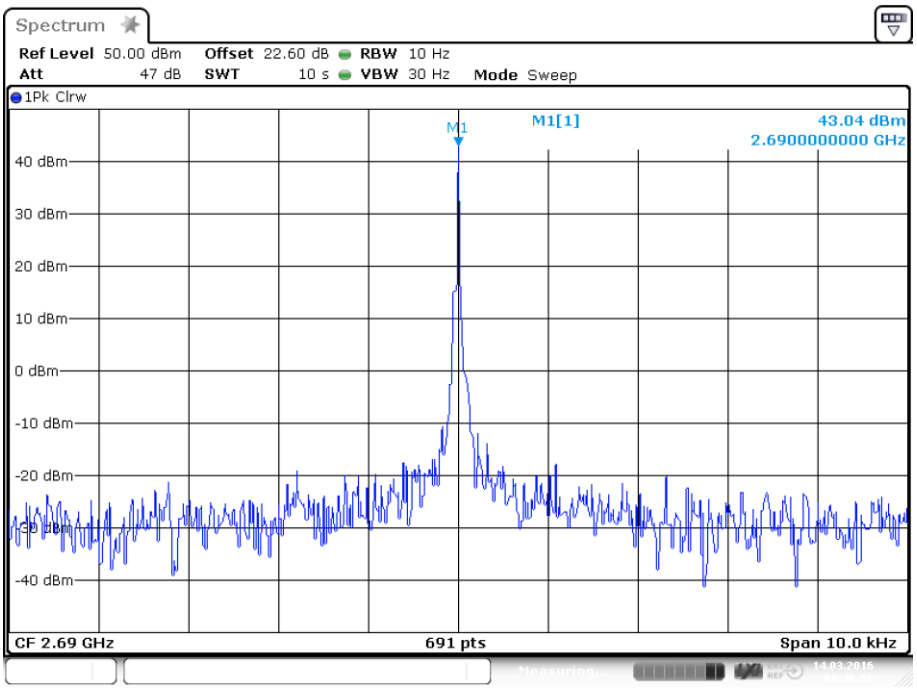
9.3.1.2 @ 50 °C



plot 9.3.1.2-#1 Frequency Stability; Test results; Downlink; @ 50 C; bottom; voltage 100%

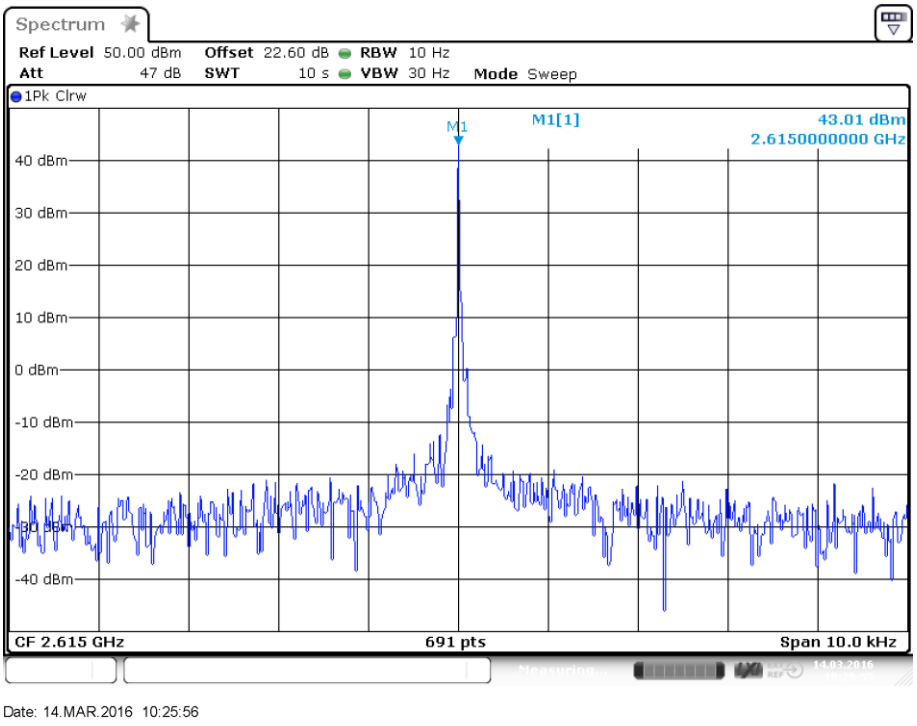


plot 9.3.1.2-#2 Frequency Stability; Test results; Downlink; @ 50 C; middle; voltage 100%

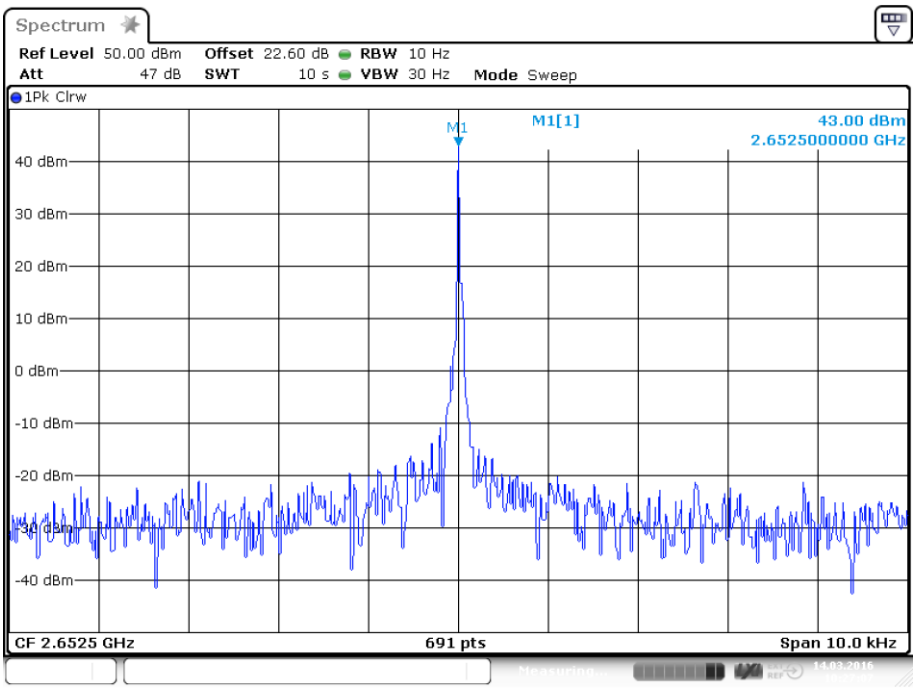


plot 9.3.1.2-#3 Frequency Stability; Test results; Downlink; @ 50 C; top; voltage 100%

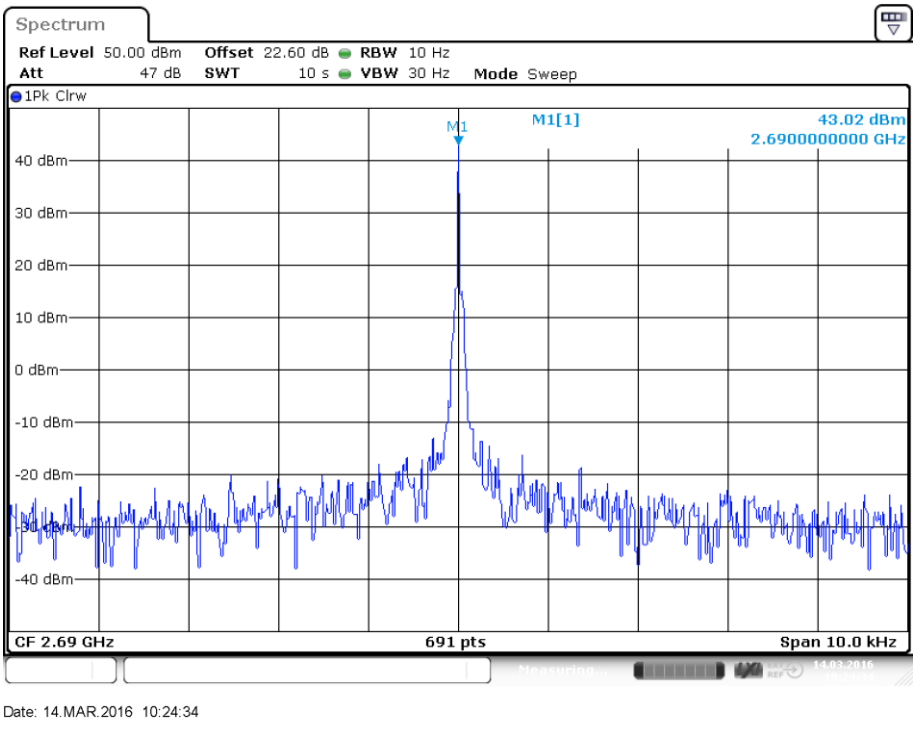
9.3.1.3 @ 40 °C



plot 9.3.1.3-#1 Frequency Stability; Test results; Downlink; @ 40 C; bottom; voltage 100%

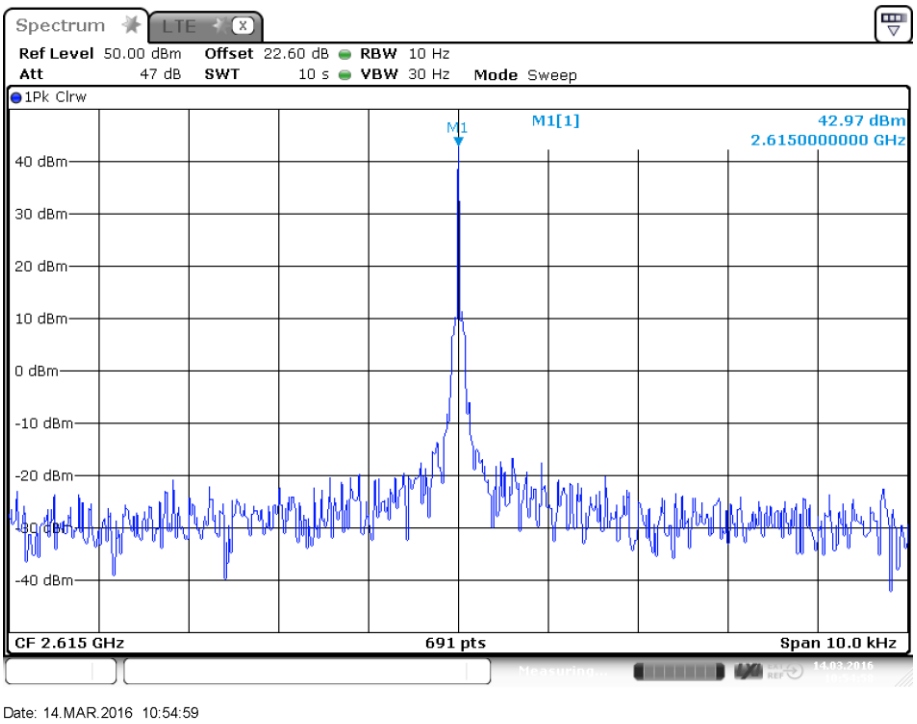


plot 9.3.1.3-#2 Frequency Stability; Test results; Downlink; @ 40 C; middle; voltage 100%

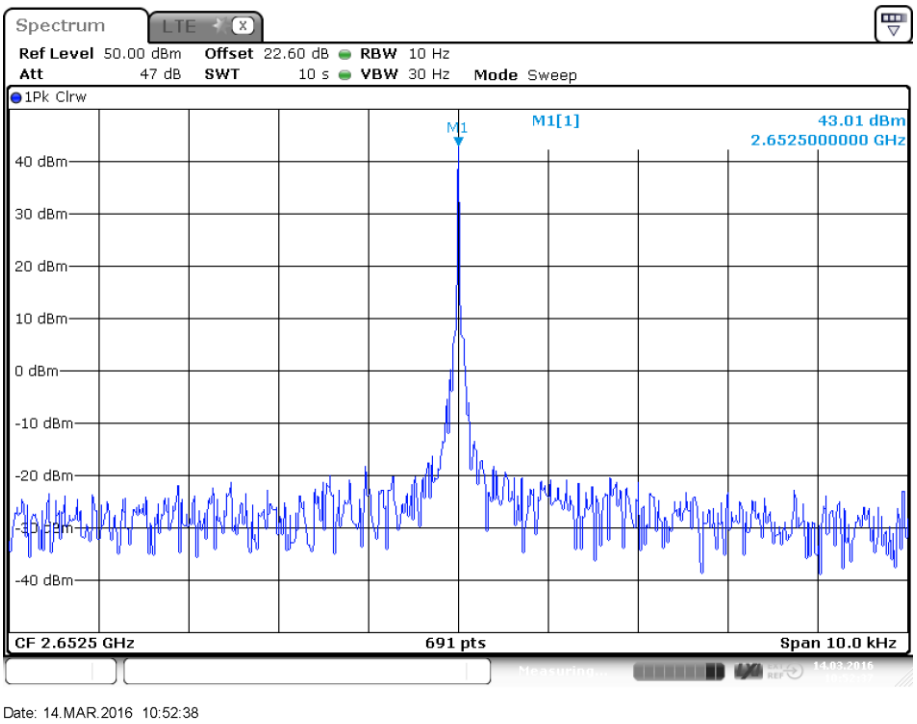


plot 9.3.1.3-#3 Frequency Stability; Test results; Downlink; @ 40 C; top; voltage 100%

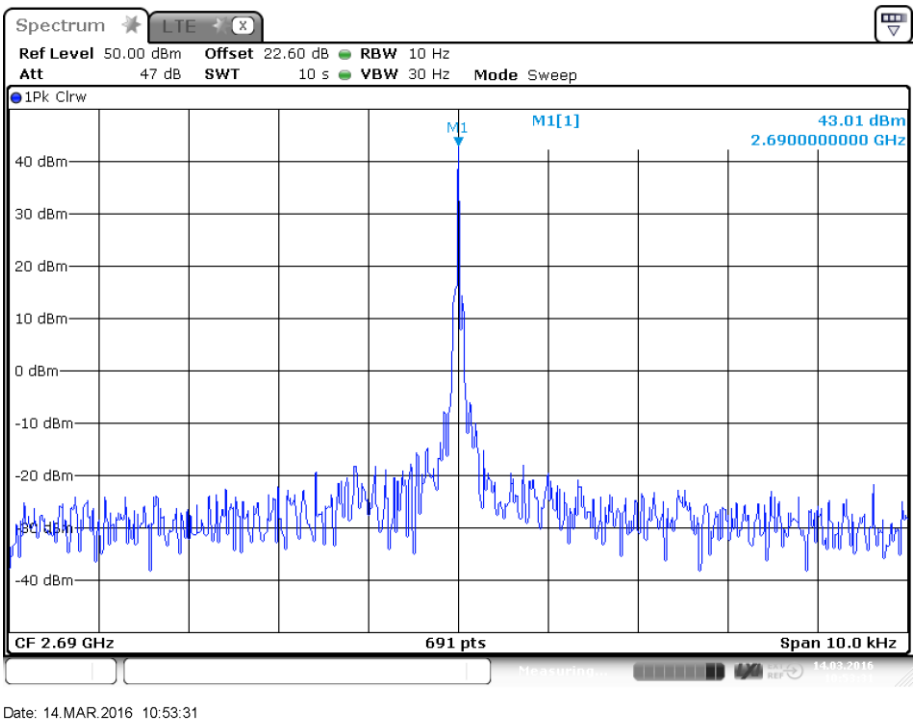
9.3.1.4 @ 30 °C



plot 9.3.1.4-#1 Frequency Stability; Test results; Downlink; @ 30 C; bottom; voltage 100%

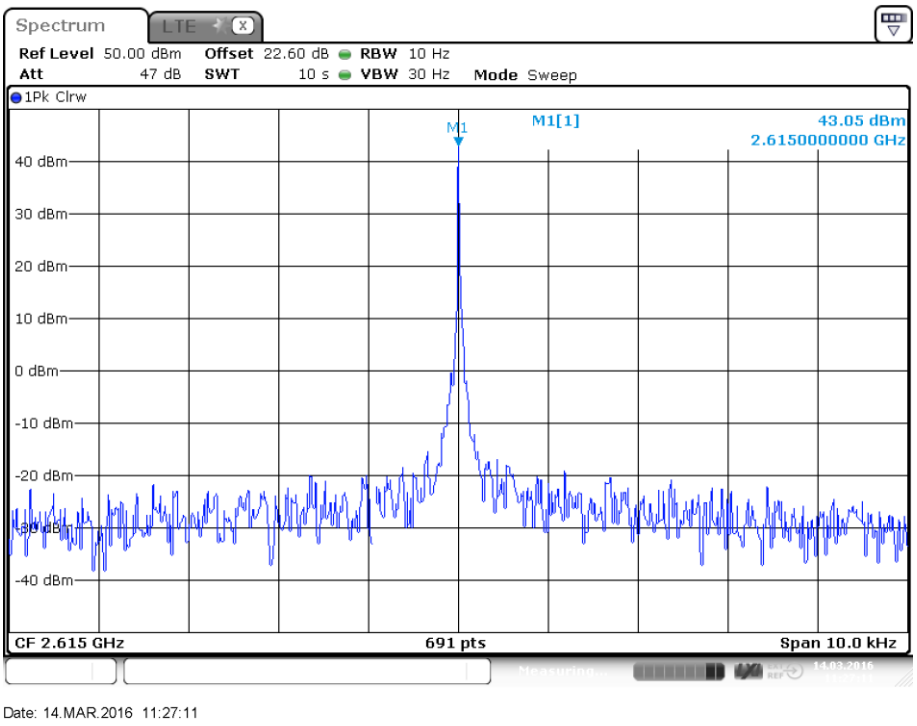


plot 9.3.1.4-#2 Frequency Stability; Test results; Downlink; @ 30 C; middle; voltage 100%

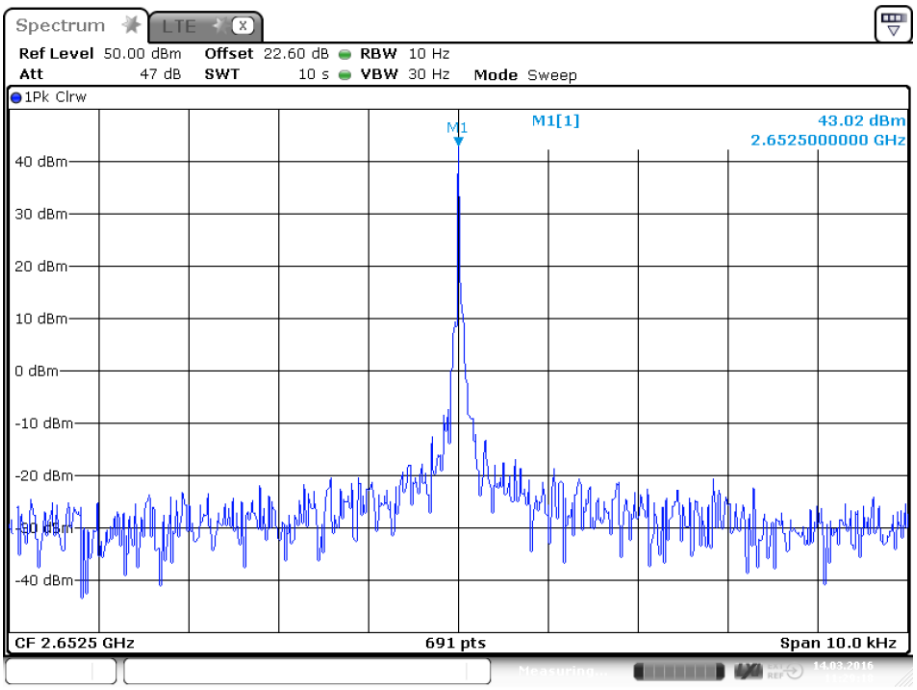


plot 9.3.1.4-#3 Frequency Stability; Test results; Downlink; @ 30 C; top; voltage 100%

9.3.1.5 @ 20 °C

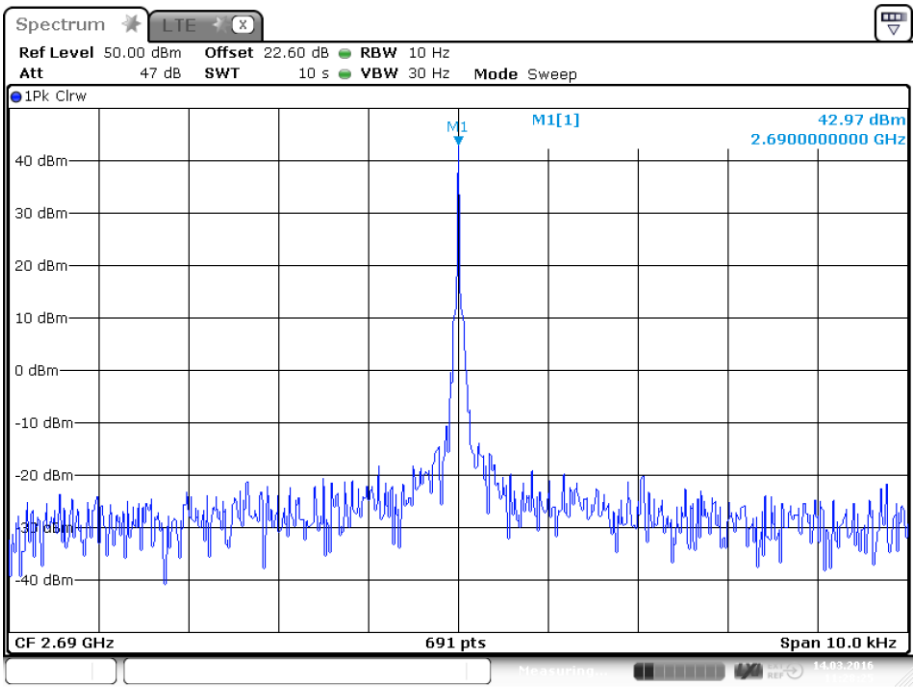


plot 9.3.1.5-#1 Frequency Stability; Test results; Downlink; @ 20 C; bottom; voltage 100%



Date: 14.MAR.2016 11:29:18

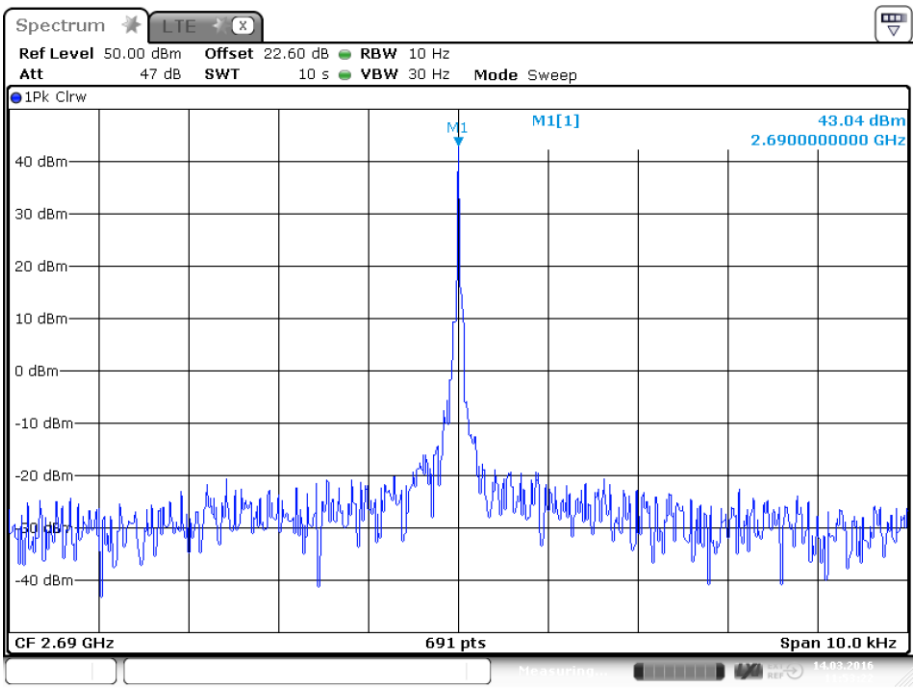
plot 9.3.1.5-#2 Frequency Stability; Test results; Downlink; @ 20 C; middle; voltage 100%



Date: 14.MAR.2016 11:28:26

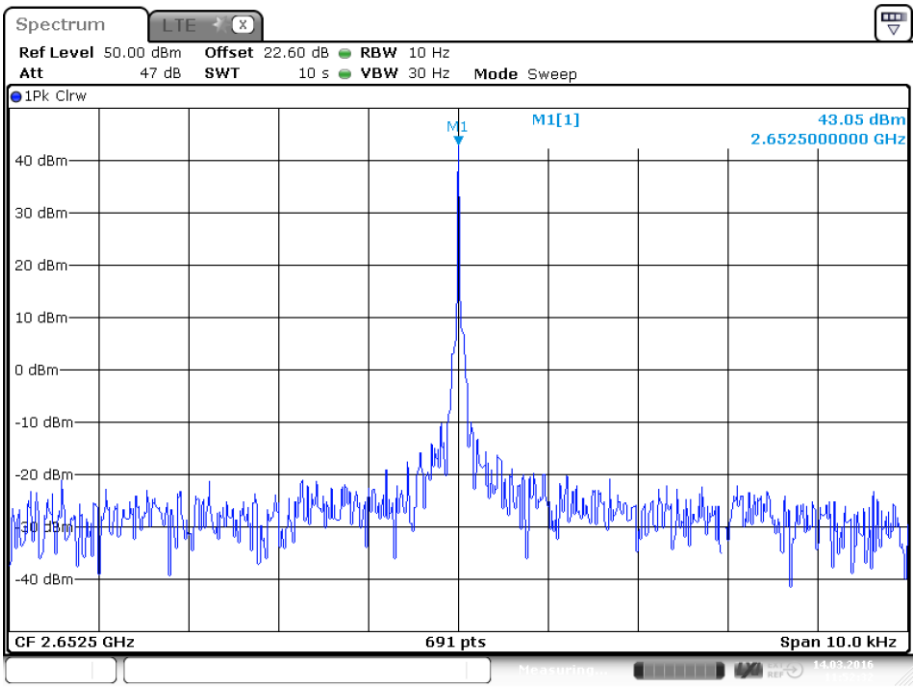
plot 9.3.1.5-#3 Frequency Stability; Test results; Downlink; @ 20 C; top; voltage 100%

9.3.1.6 @ 10 °C



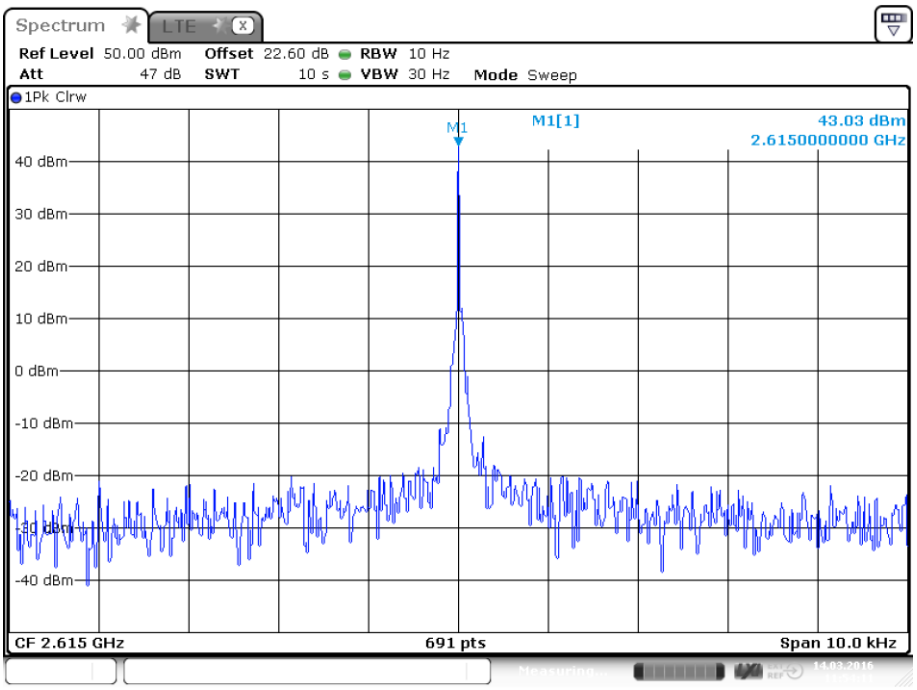
Date: 14.MAR.2016 11:53:22

plot 9.3.1.6-#1 Frequency Stability; Test results; Downlink; @ 10 C; bottom; voltage 100%



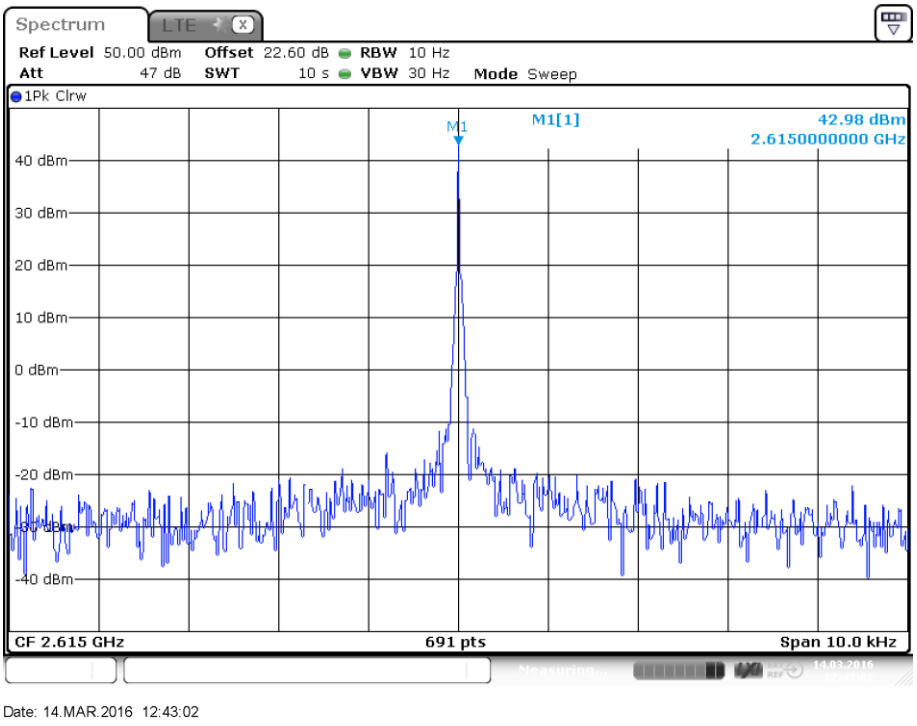
Date: 14.MAR.2016 11:52:32

plot 9.3.1.6-#2 Frequency Stability; Test results; Downlink; @ 10 C; middle; voltage 100%

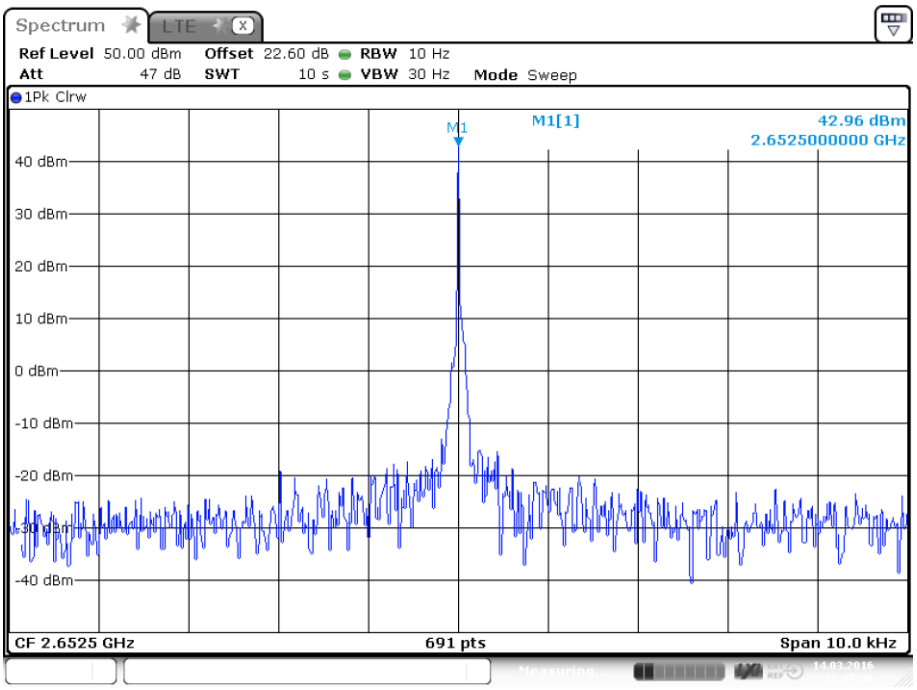


plot 9.3.1.6-#3 Frequency Stability; Test results; Downlink; @ 10 C; top; voltage 100%

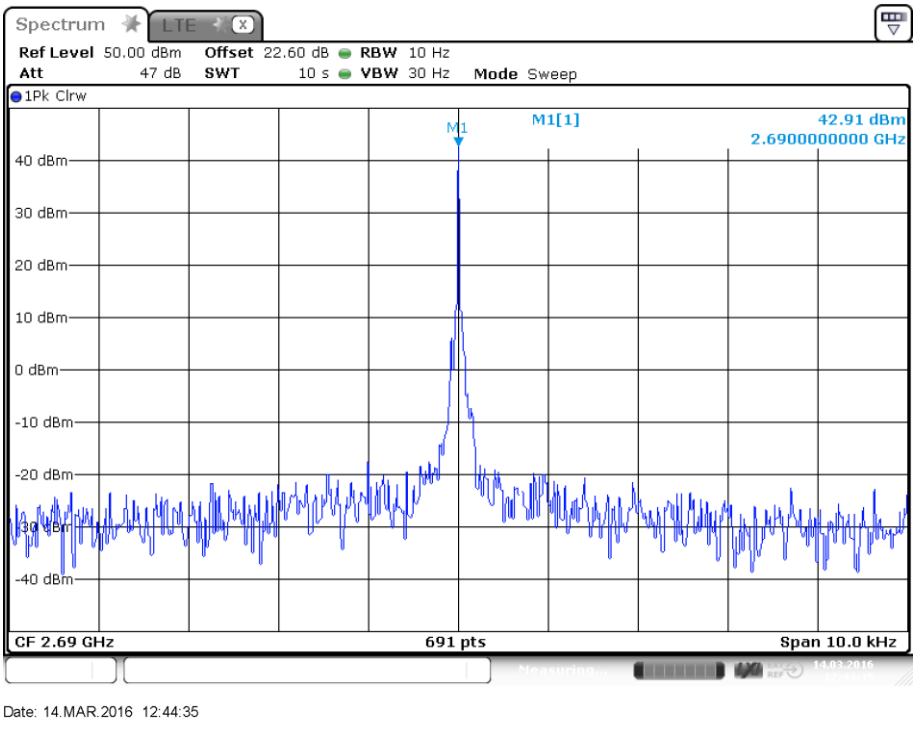
9.3.1.7 @ 0 °C



plot 9.3.1.7-#1 Frequency Stability; Test results; Downlink; @ 0 C; bottom; voltage 100%

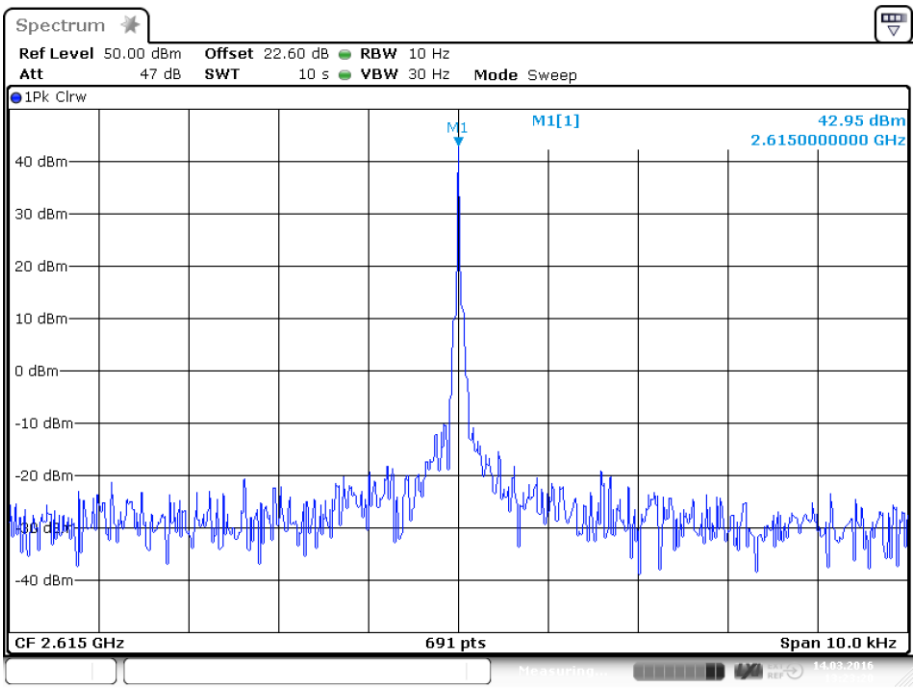


plot 9.3.1.7-#2 Frequency Stability; Test results; Downlink; @ 0 C; middle; voltage 100%

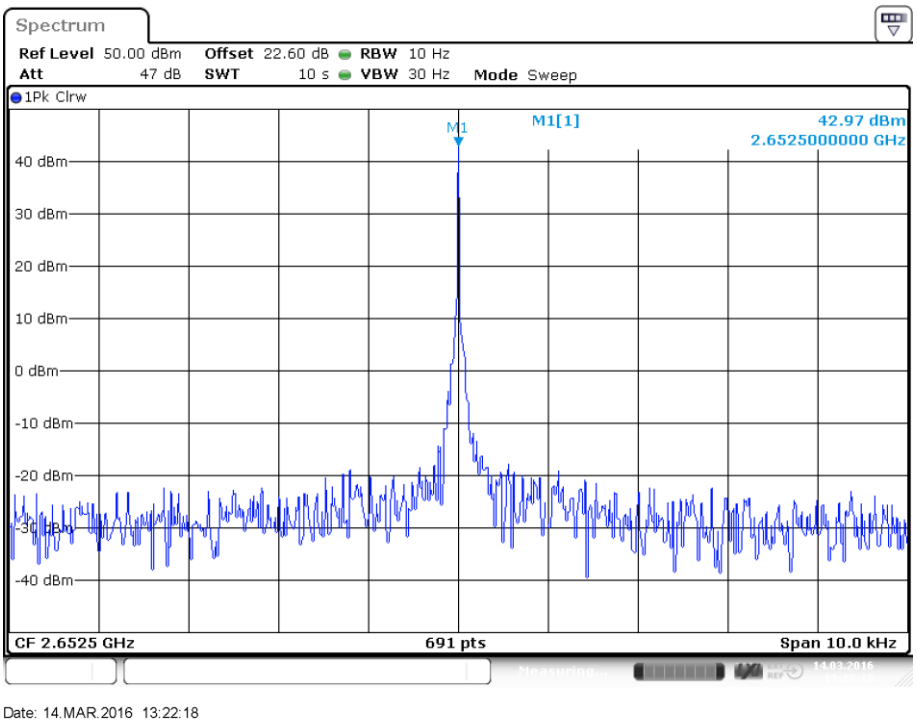


plot 9.3.1.7-#3 Frequency Stability; Test results; Downlink; @ 0 C; top; voltage 100%

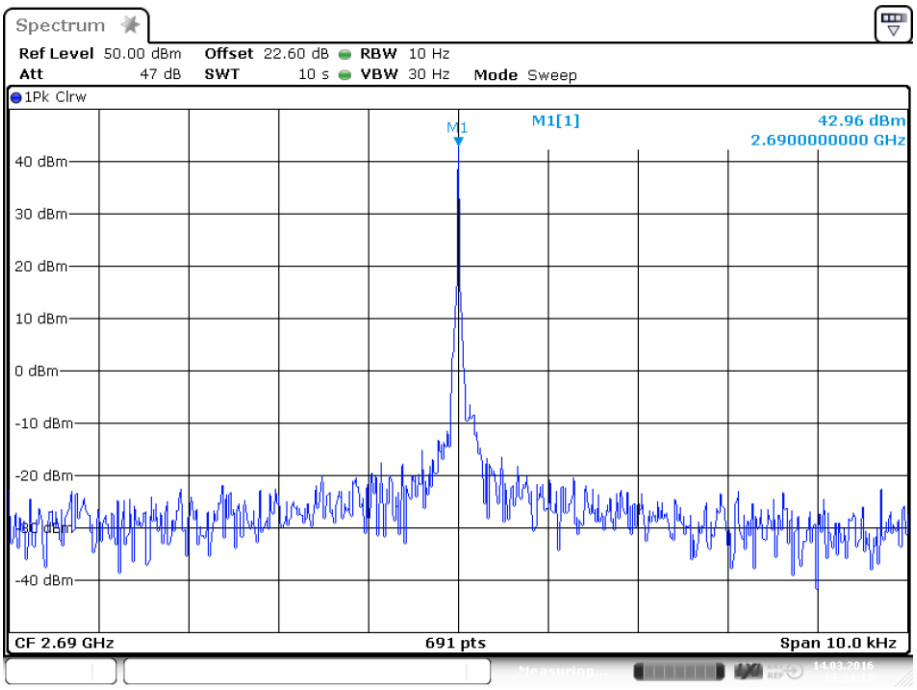
9.3.1.8 @ -10 °C



plot 9.3.1.8-#1 Frequency Stability; Test results; Downlink; @ -10 C; bottom; voltage 100%

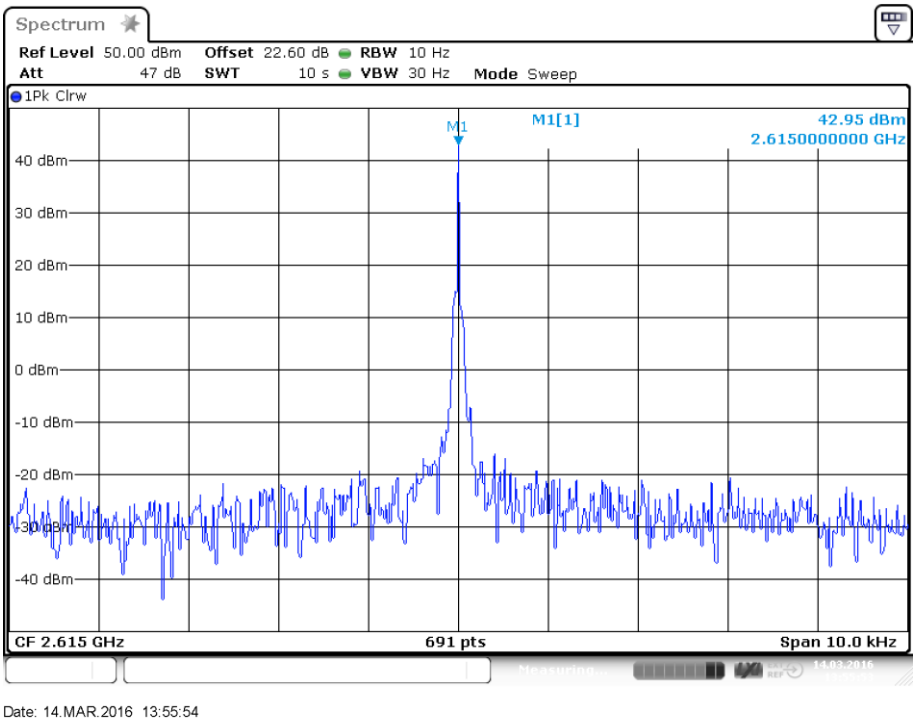


plot 9.3.1.8-#2 Frequency Stability; Test results; Downlink; @ -10 C; middle; voltage 100%

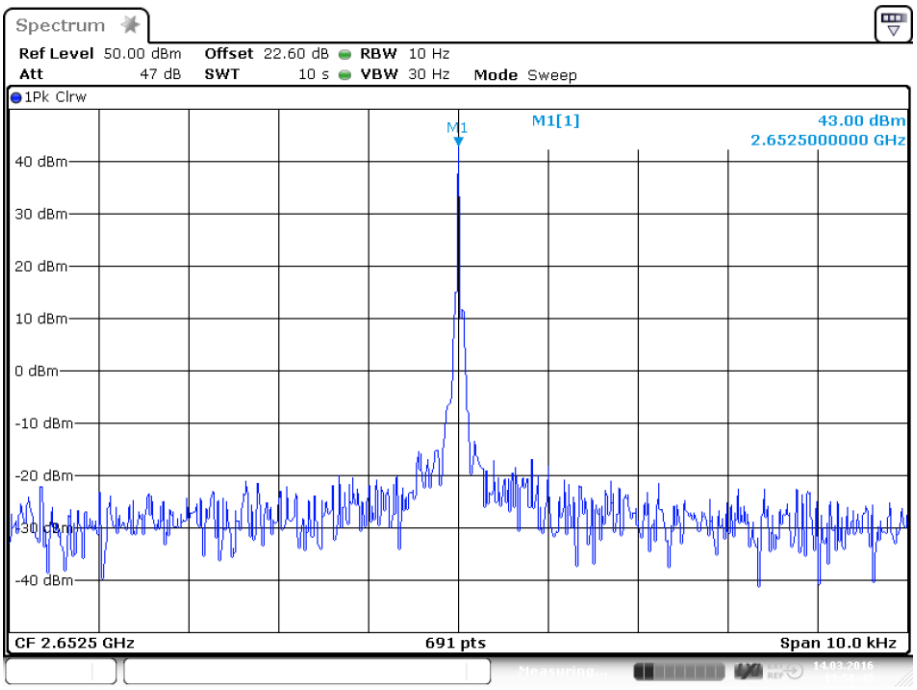


plot 9.3.1.8-#3 Frequency Stability; Test results; Downlink; @ -10 C; top; voltage 100%

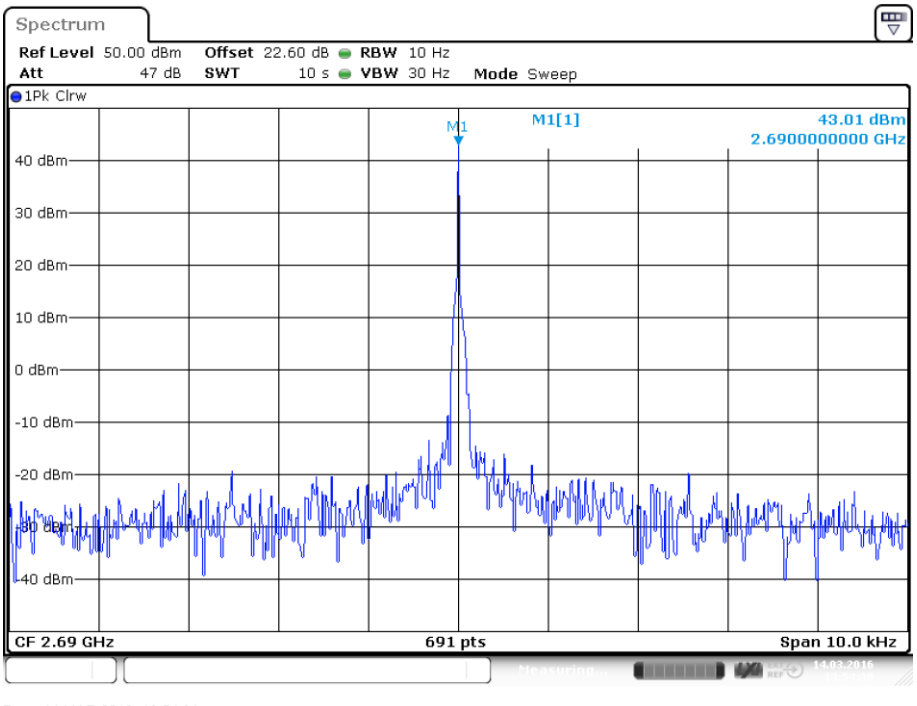
9.3.1.9 @ -20 °C



plot 9.3.1.9-#1 Frequency Stability; Test results; Downlink; @ -20 C; bottom; voltage 100%

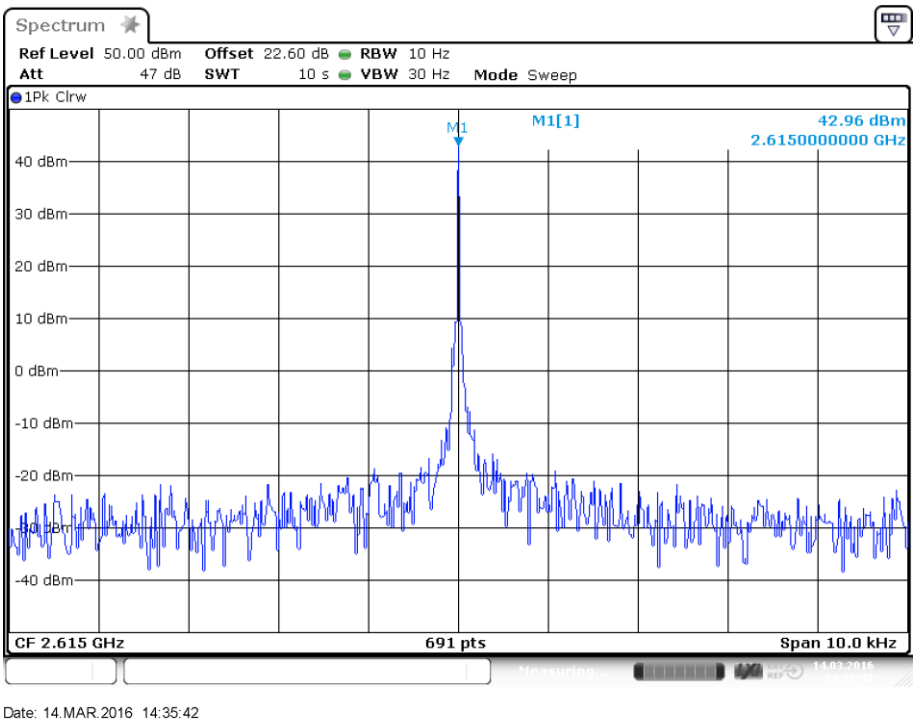


plot 9.3.1.9-#2 Frequency Stability; Test results; Downlink; @ -20 C; middle; voltage 100%

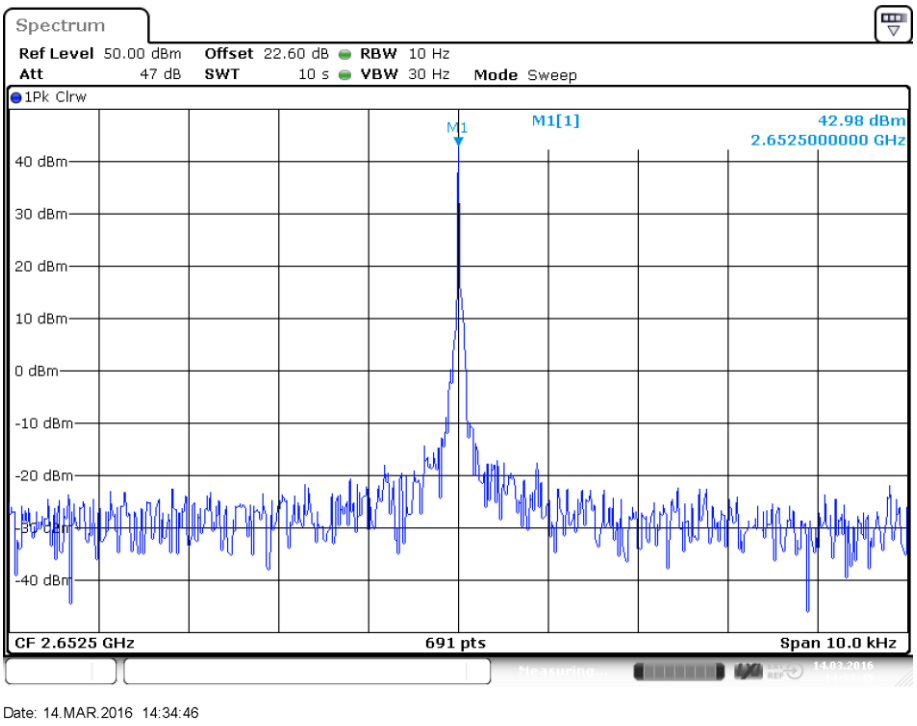


plot 9.3.1.9-#3 Frequency Stability; Test results; Downlink; @ -20 C; top; voltage 100%

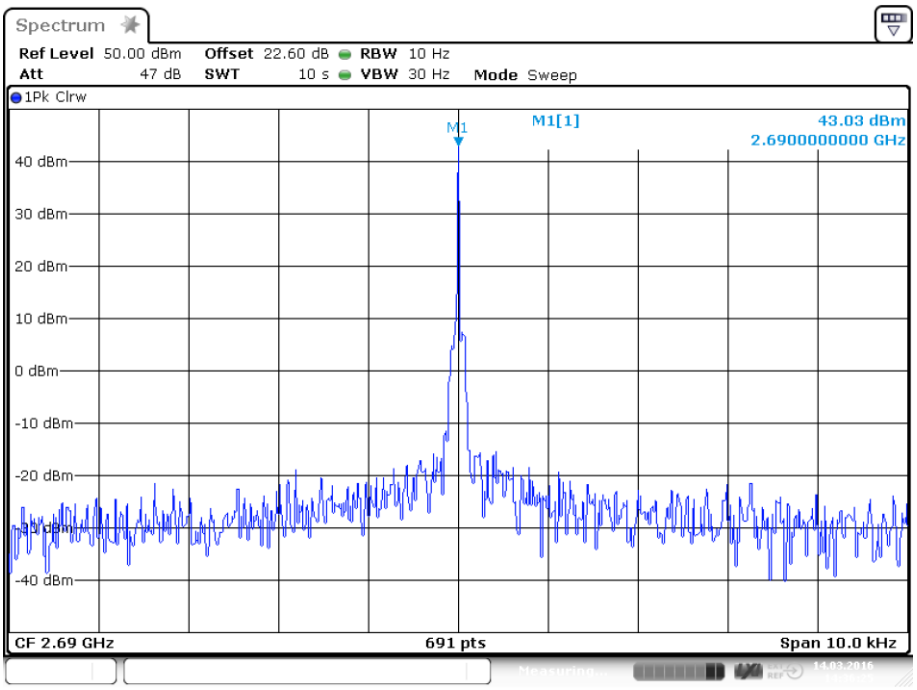
9.3.1.10 @ -30 °C



plot 9.3.1.10-#1 Frequency Stability; Test results; Downlink; @ -30 C; bottom; voltage 100%



plot 9.3.1.10-#2 Frequency Stability; Test results; Downlink; @ -30 C; middle; voltage 100%



plot 9.3.1.10-#3 Frequency Stability; Test results; Downlink; @ -30 C; top; voltage 100%

9.3.2 Uplink

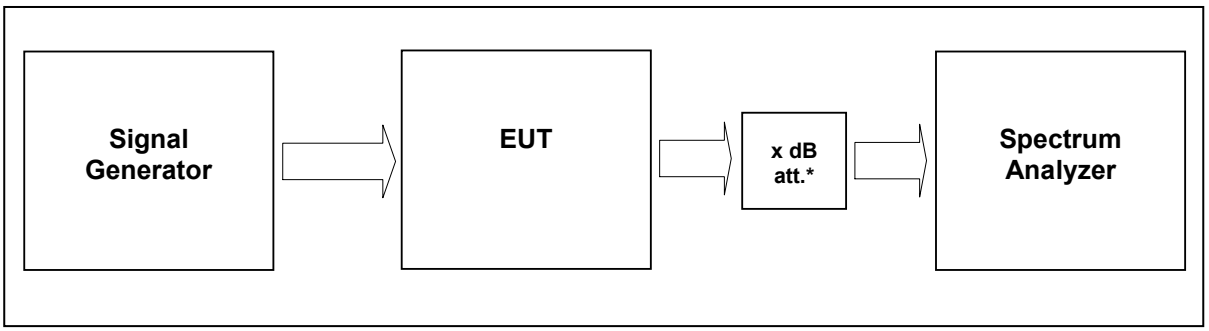
n.a.

Note: The EUT does not transmit over the air in the uplink direction.

9.4 Summary test result

Test result	complies, according the plots above
Tested by:	Michael Leinfelder
Date:	14.03.2016

10 Out of Band Rejection



External Attenuator DL x dB = 20 dB
figure 10-#1 Test setup: Out of Band Rejection

Measurement uncertainty	± 0,38 dB
Test equipment used	9291, 9233, 7444; 7321; 7144; 7454; 7453; 7341; 7449; 7368

10.1 Limit

KDB 935210 D02 v03r02
Test for rejection of out of band signals. Filter frequency response plots are acceptable.

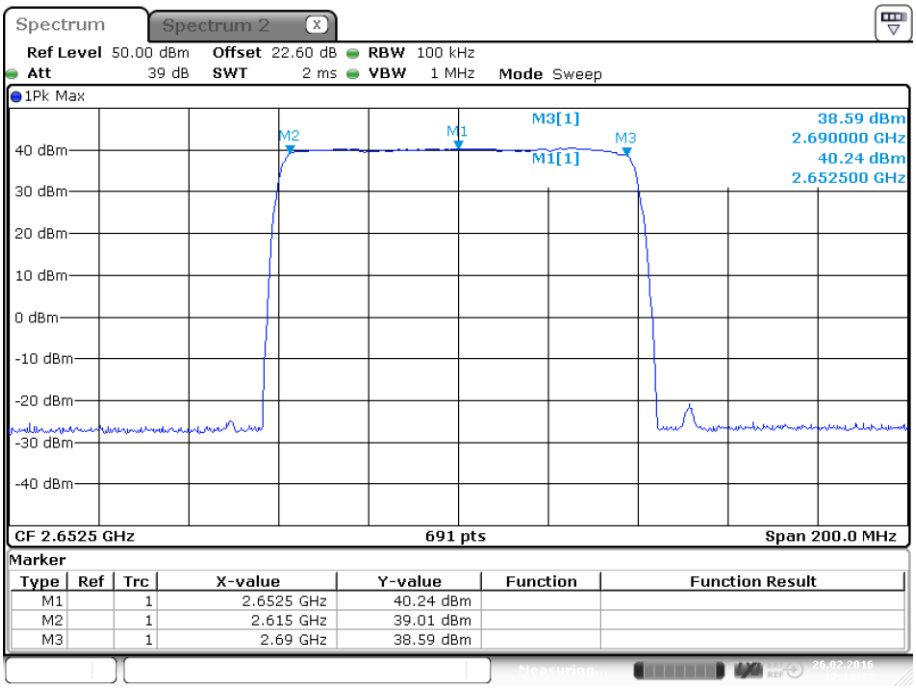
10.2 Test method

KDB 935210 D03 v04
7.1 Authorized frequency band verification test

10.3 Test results

Detector Peak max hold

10.3.1 Downlink



plot 10.3.1-#1 Out of Band Rejection; Test results; Downlink;

10.3.2 Uplink

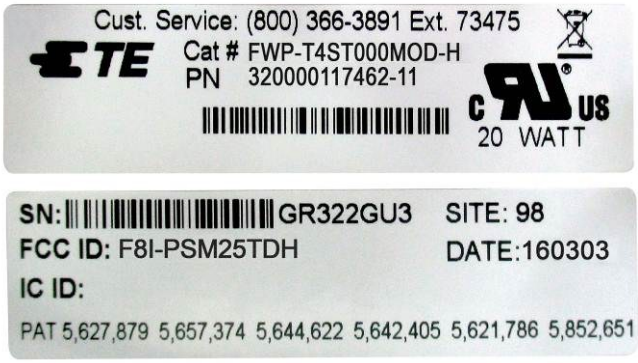
n.a.

Note: The EUT does not transmit over the air in the uplink direction.

10.4 Summary test result

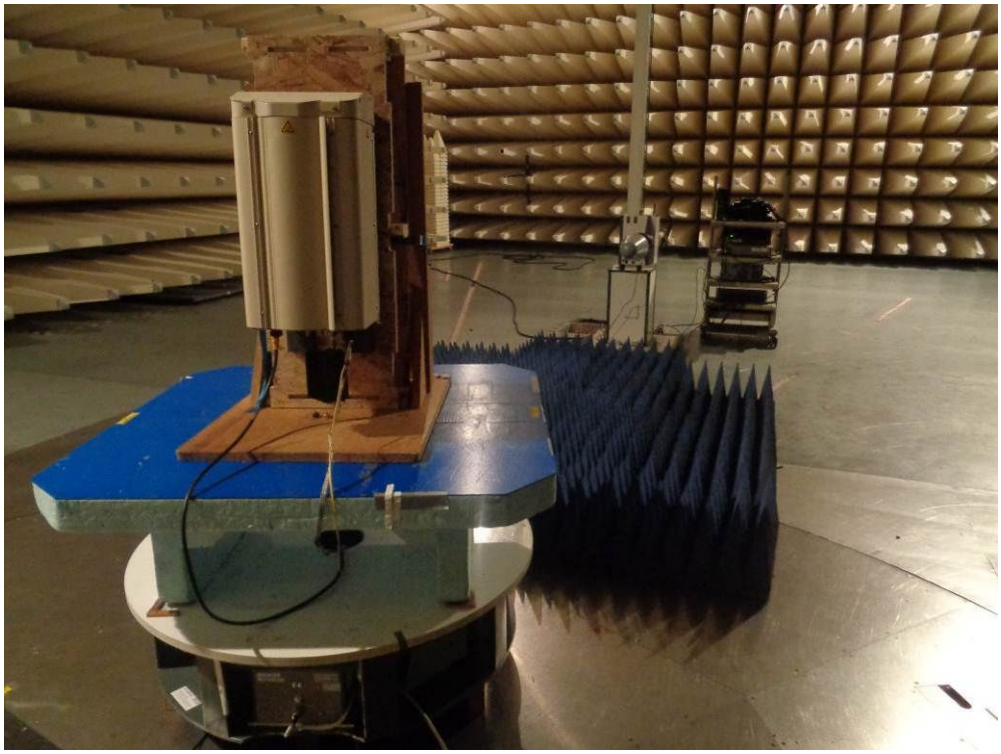
Test result	complies, according the plots above
Tested by:	Michael Leinfelder
Date:	04.03.2016

11 Field Strength of Spurious Emissions: §27.53, §15.109, §2.1053

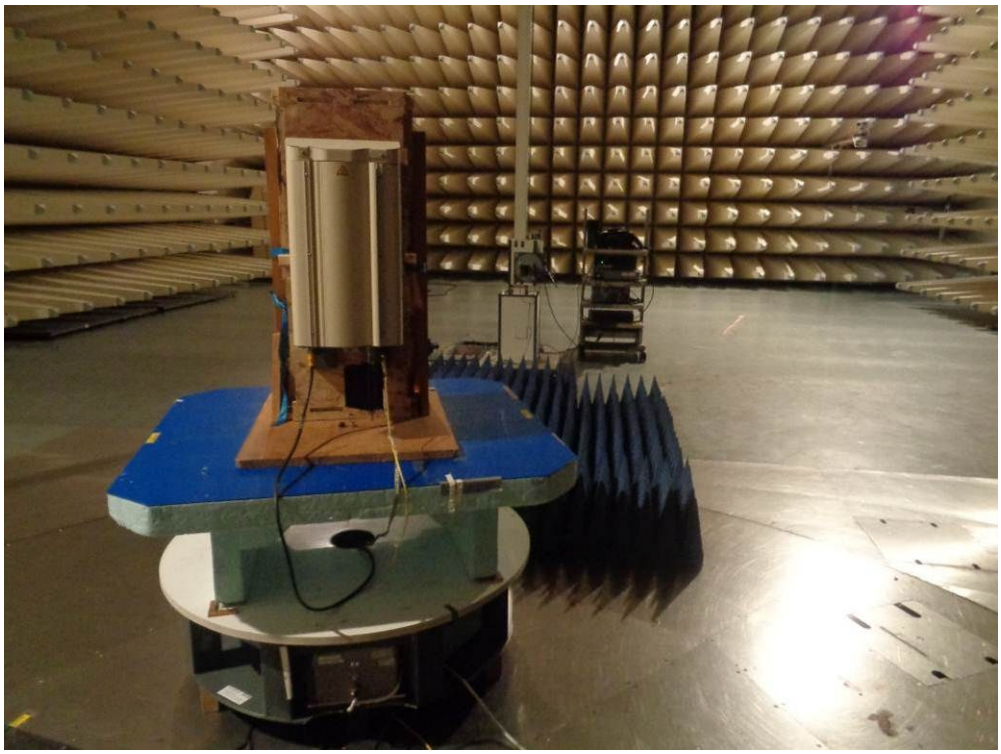


picture 8.1: label (EUT)

picture 8.2: Test setup: Field Strength Emission <1 GHz @10m in the SAC



picture 8.3: Test setup: Field Strength Emission 1 - 18 GHz @3m in the SAC



picture 8.4: 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 IC RSS-131 sec. 4.4	TIA/EIA-603-C:2004
1 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

11.1 Method of Measurement §27.53

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 10 and 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 ... 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.

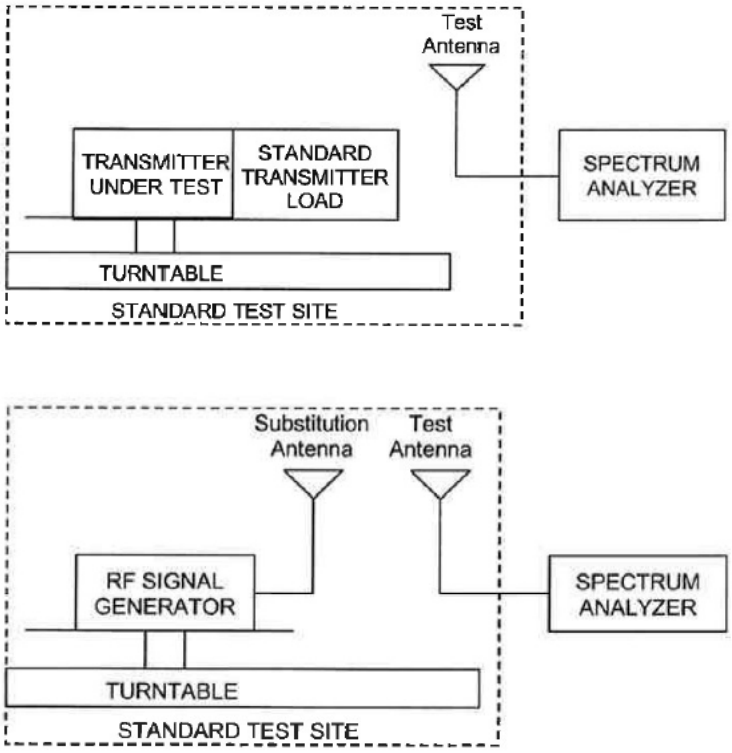


Figure #7.2 Substitution methods TIA/EIA-603-C

11.2 Method of Measurement §15.109

The measurements were made in the operating mode, with the EUT producing the maximum emission, consistent with normal applications. The EUT load was adjusted within the range specified by manufacturer in order to maximize the emission.

For this test, the EUT was placed on the turntable at a distance of 10 m from the receive antenna. The EUT was positioned on a 10 cm high wooden pallet or on a wooden table. The connecting lines to the EUT were fed in from above (as in the installation). The system ground was connected to the ground plane. The turntable was connected directly to the ground system of the test chamber.

While EUT power is on, an operator manually scans the selected frequency range using an EMI test receiver to identify signals being generated by the EUT. At this time the operator determines which signals generated by EUT are significant enough to assign to the final data list in the computer. The signals on the final list are automatically characterized while the antenna is in both horizontal and vertical polarity. The tower and turntable are controlled by the operator. The maximized signal indication on the receiver is then combined with the calibration factors, cable insertion loss and the proper antenna factors to provide the emission level in dB µV/m which is compared directly with the requirement stored in the program libraries. 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 ... 4 m).

Field Strength Calculations

FS = SA + AF + CL

Where as;

FS = Total Field Strength
SA = EMC test receiver Reading
AF = Antenna Factor
CL = Cable Loss

11.3 Limit §27.53

Minimum standard:
Para. No.27.53(h)

The Emission limit is -13dBm.

11.4 Climatic values in the lab

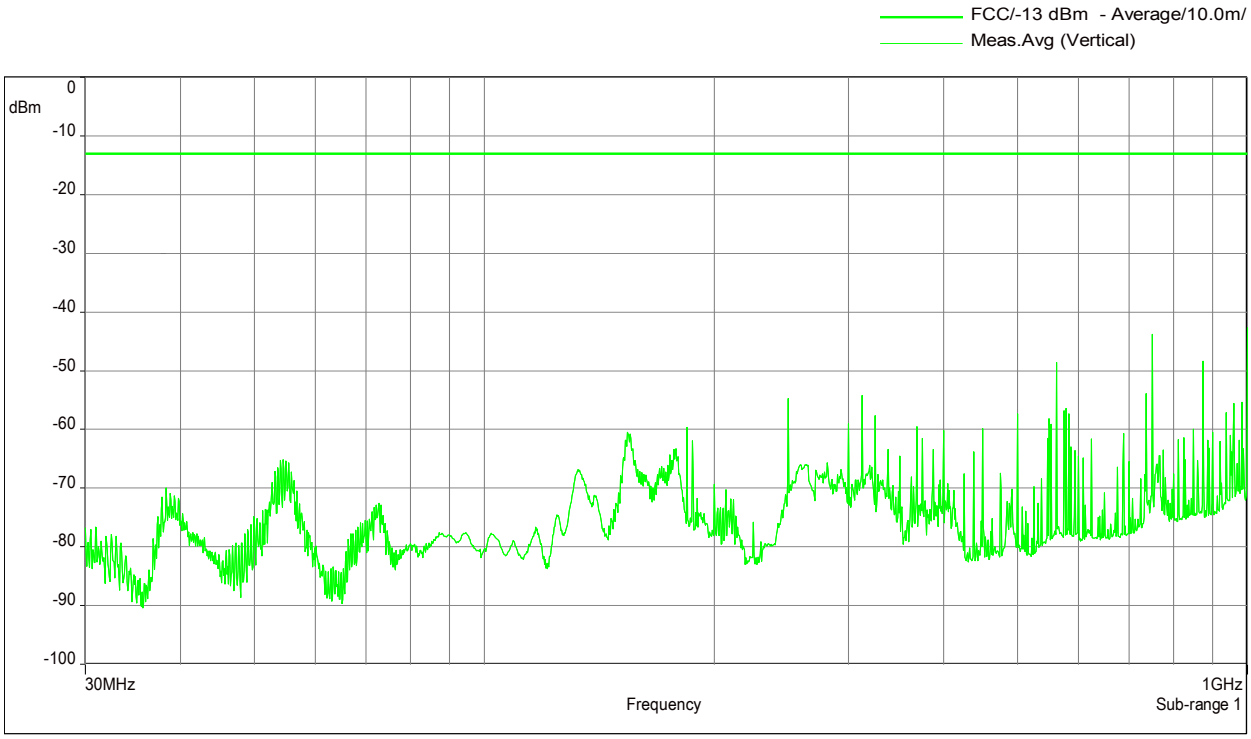
Temperature: 21°
Relative Humidity: 45%
Air-pressure: 1004 hPa

11.5 Test results

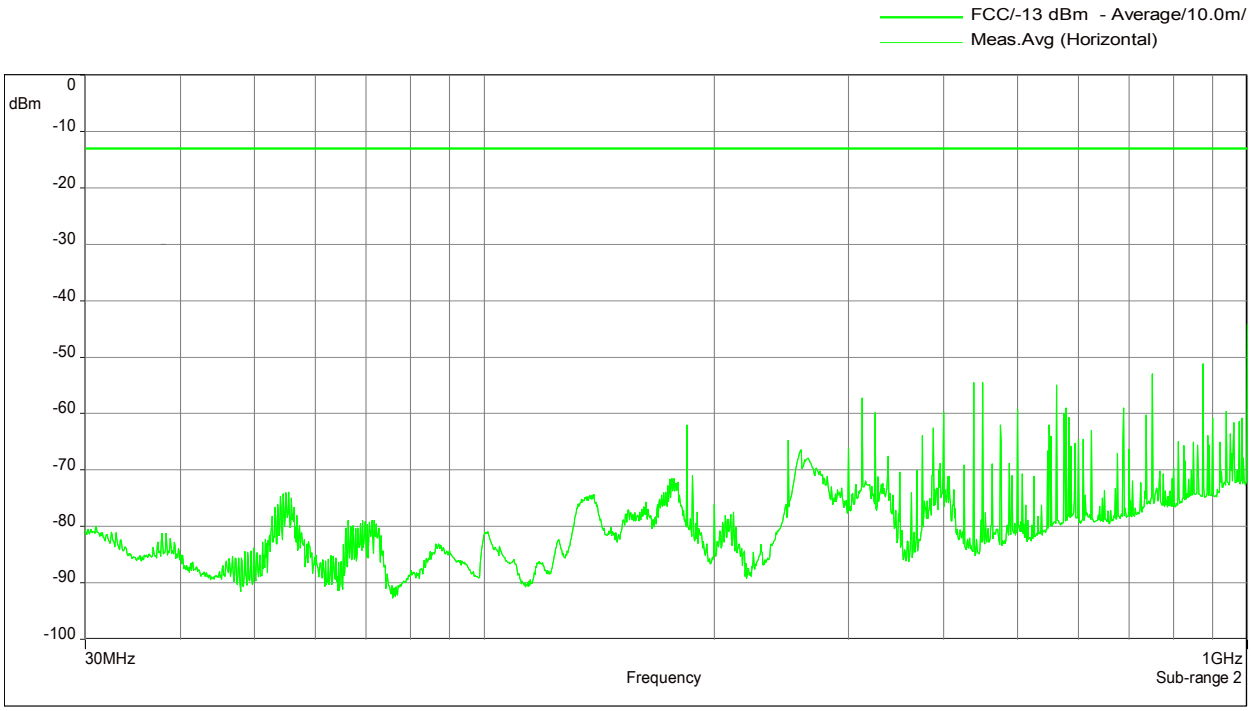
11.5.1 30 MHz to 1 GHz Downlink (Bottom – Middle – Top) §27.53

B/M/T: 2615 MHz / 2652.5 MHz / 2690 MHz (Operation with maximum composite power)

Vertikal



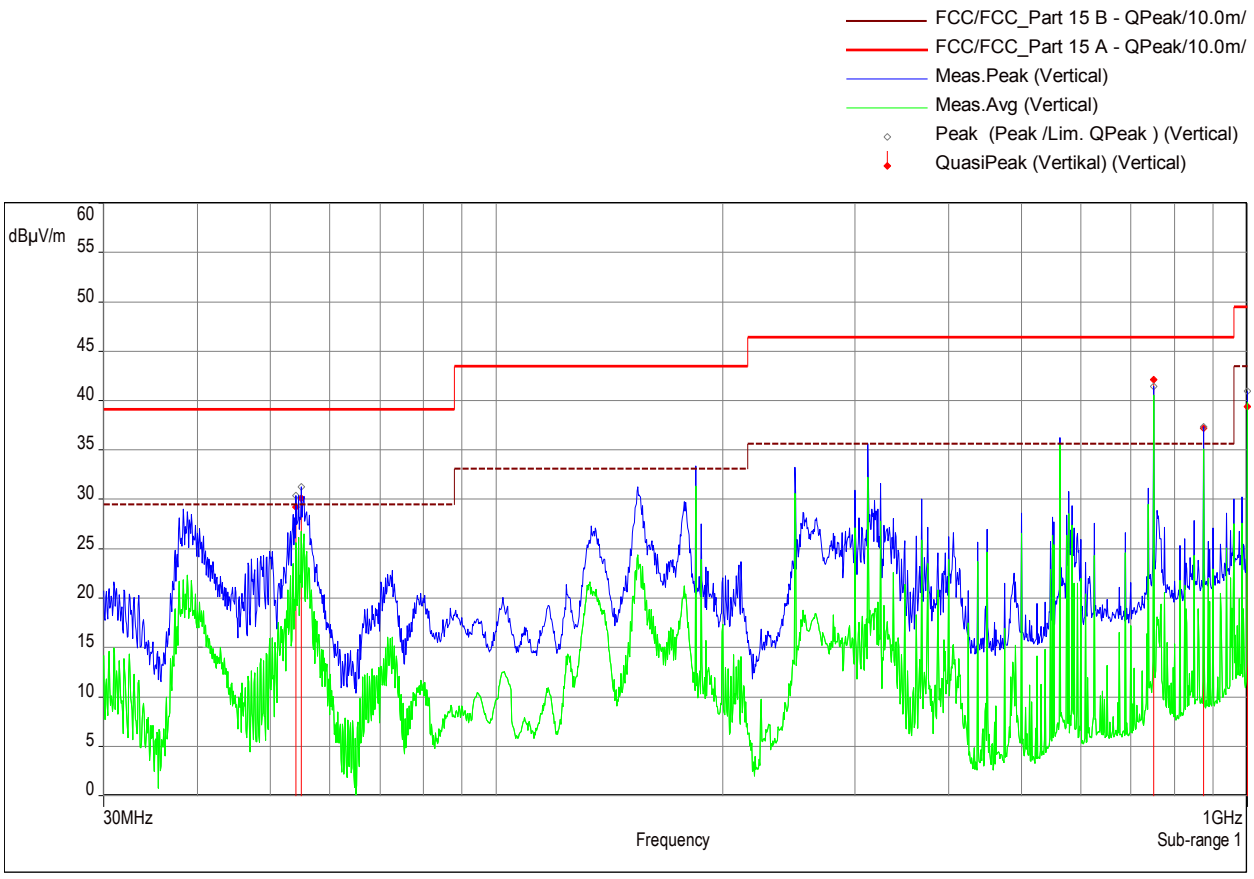
Horizontal



11.5.2 30 MHz to 1 GHz Downlink (Bottom – Middle – Top) §15.109

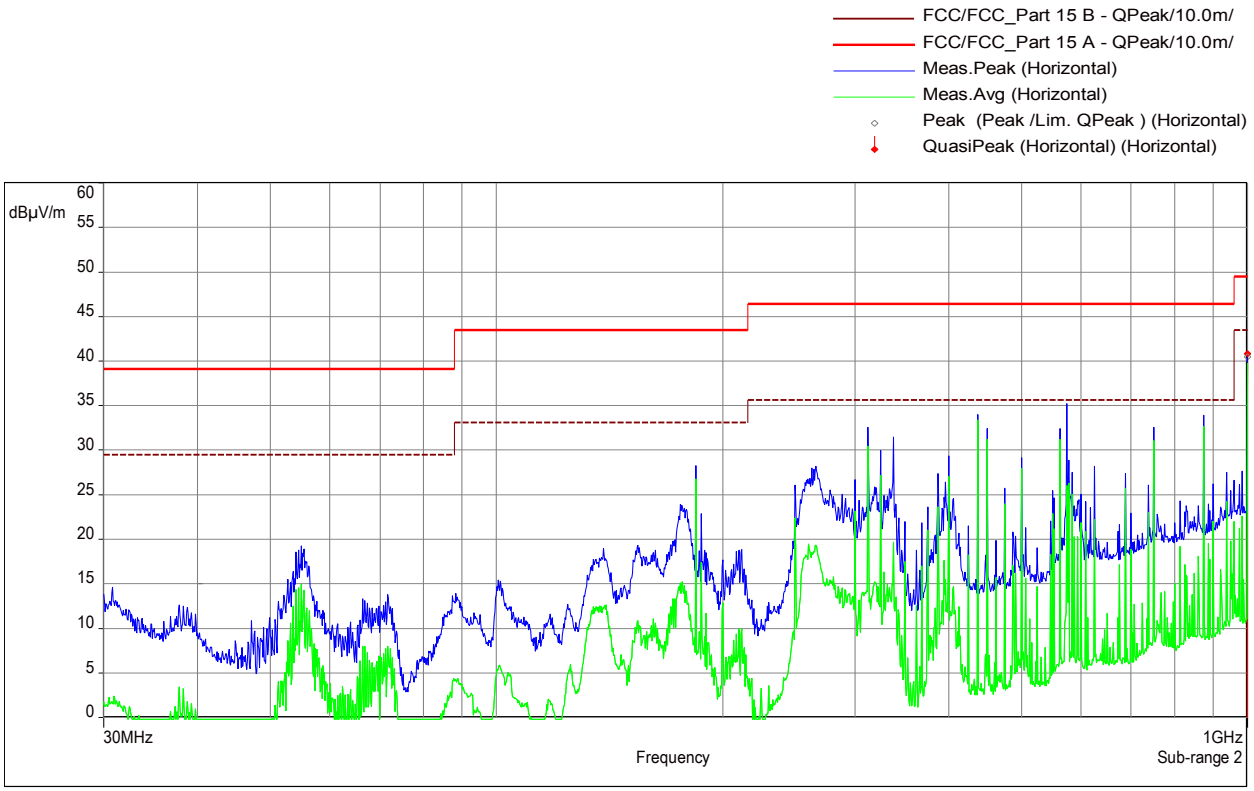
B/M/T: 2615 MHz / 2652.5 MHz / 2690 MHz (Operation with maximum composite power)

Vertikal



Frequency (MHz)	SR	QuasiPeak (dBµV/m)	Abstand	Average	Winkel	Höhe	Polarisation	Correction (dB)
54.09	1	29.21	9.89	19.83	-175.90	2.28	Vertical	-29.90
54.96	1	30.09	9.01	21.48	-173.80	1.55	Vertical	-30.14
750	1	42.10	4.30	41.63	150.10	2.55	Vertical	-11.77
875.01	1	37.20	9.20	36.08	75.60	1.22	Vertical	-11.24
1000	1	39.40	10.10	38.94	-150.50	2.98	Vertical	-9.10

horizontal

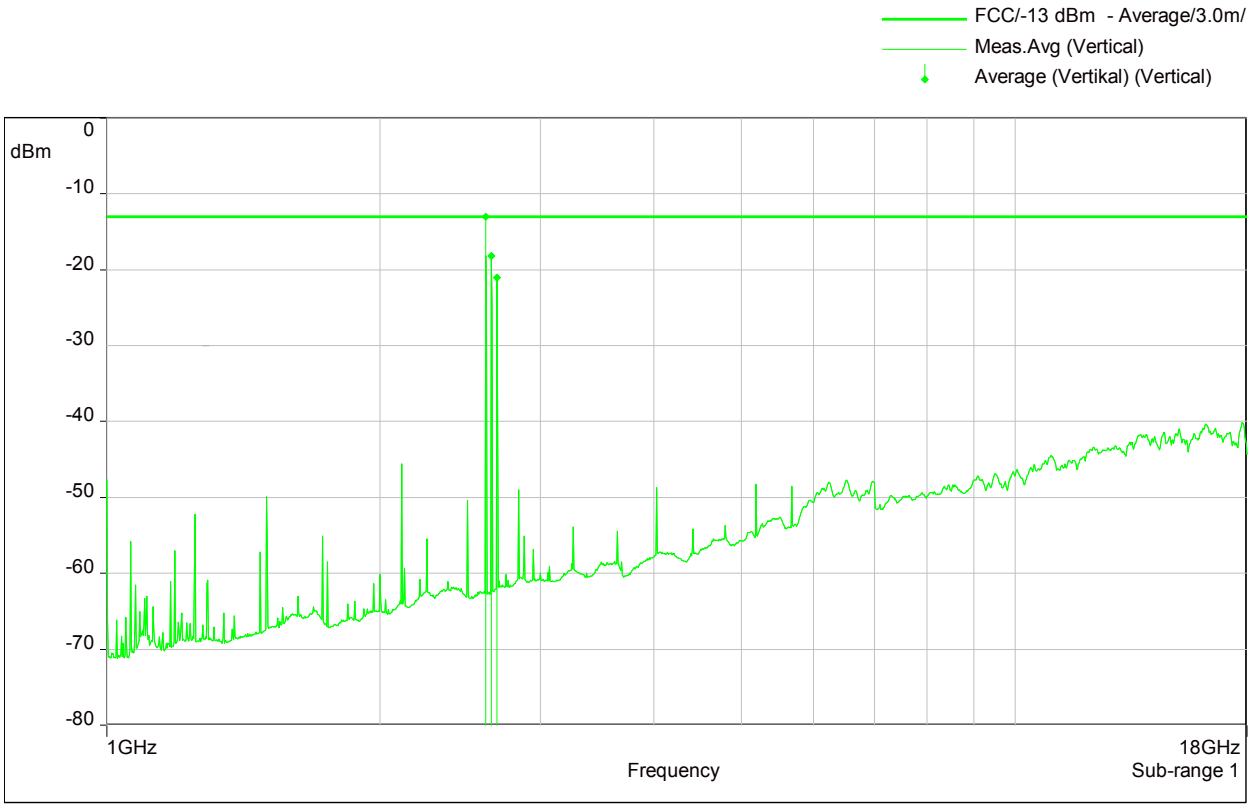


The RF output power is terminated.

11.5.3 1 GHz – 18 GHz Downlink (Bottom – Middle – Top) §27.53

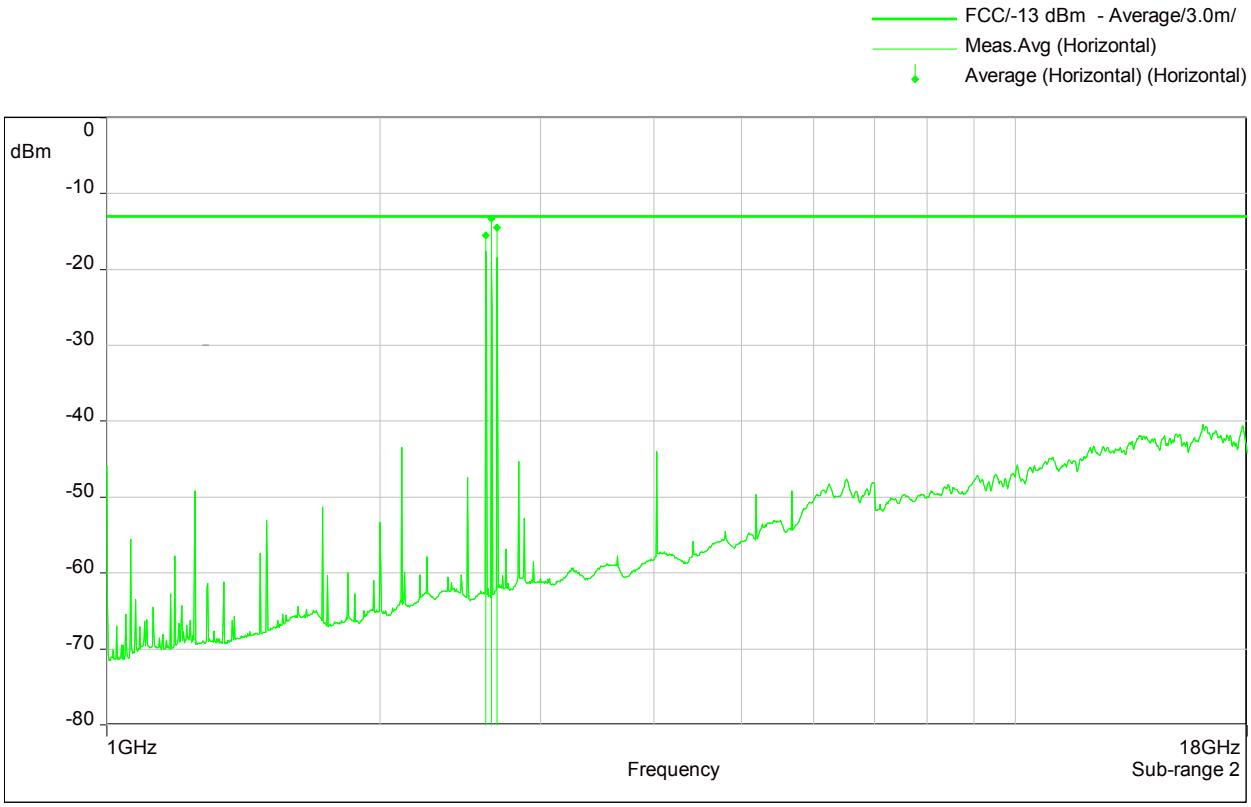
B/M/T: 2615 MHz / 2652.5 MHz / 2690 MHz (Operation with maximum composite power)

Vertikal



Frequency (MHz)	SR	Average (dBm)	Limit AV	Abstand AV (dBm)	Höhe	Winkel	Correction (dB)
2615	1	-12.98	-13.00	-0.02	1.00	-70.80	26.74
2652.5	1	-18.19	-13.00	5.19	1.33	-175.80	27.08
2690	1	-21.07	-13.00	8.07	1.83	-66.80	27.55

Horizontal

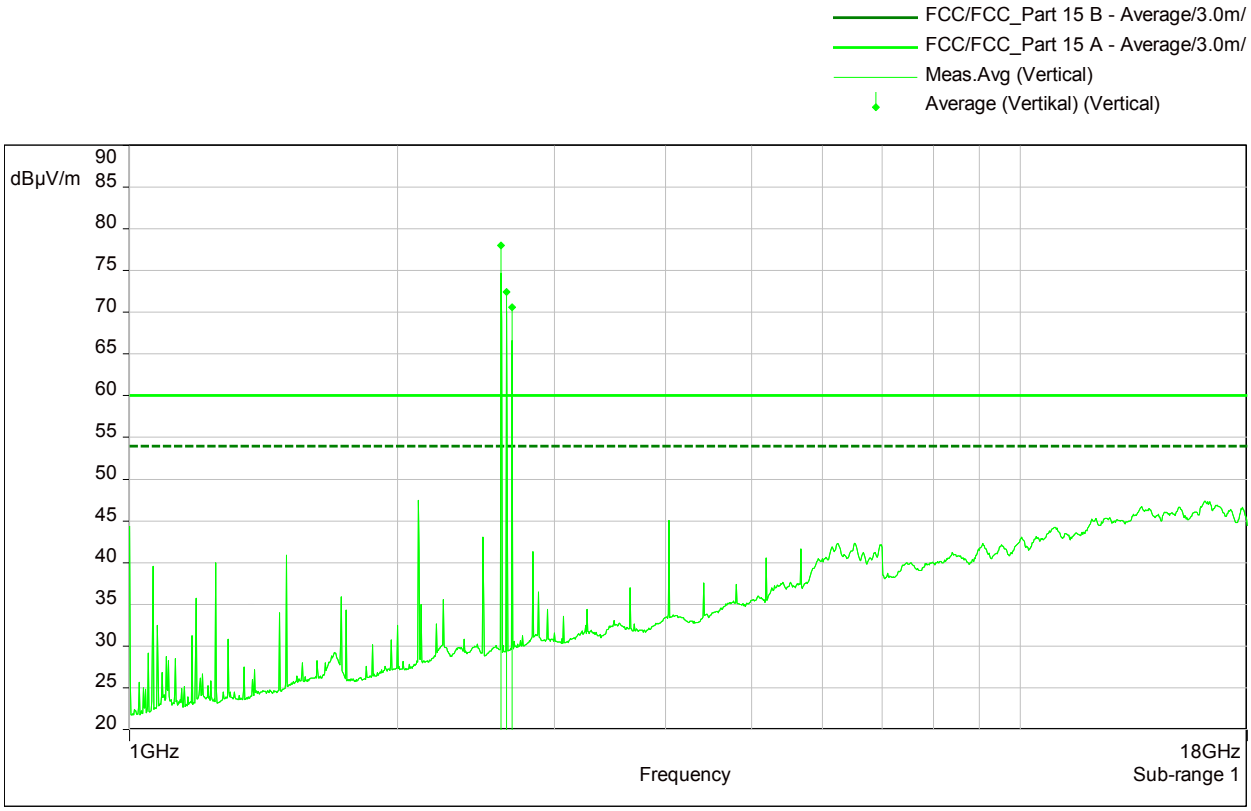


Frequency (MHz)	SR	Average (dBm)	Limit AV	Abstand AV (dBm)	Höhe	Winkel	Correction (dB)
2615	2	-15.49	-13.00	2.49	1.99	-25.50	26.85
2652.5	2	-13.24	-13.00	0.24	1.73	-127.10	26.99
2690	2	-14.47	-13.00	1.47	1.00	-121.60	27.62

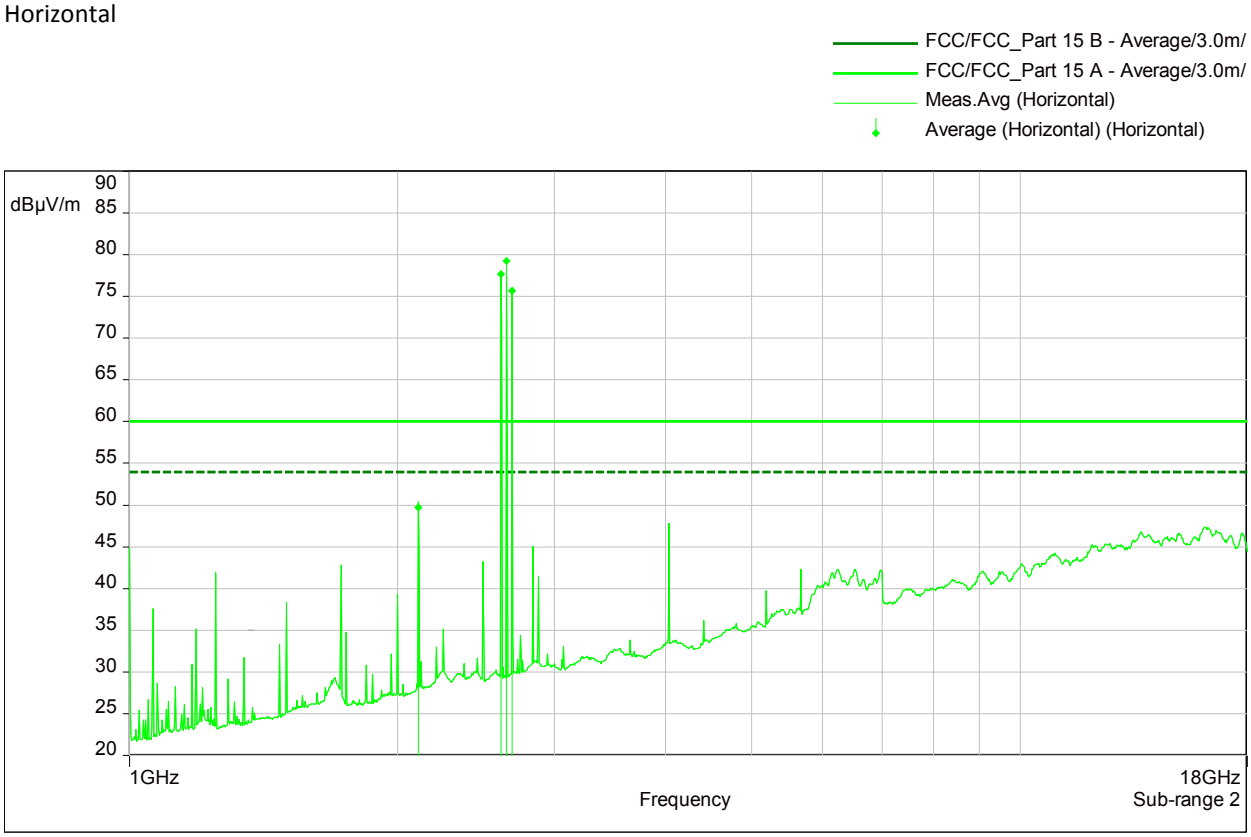
11.5.4 1 GHz – 18 GHz Downlink (Bottom – Middle – Top) §15.109

B/M/T: 2615 MHz / 2652.5 MHz / 2690 MHz (Operation with maximum composite power)

Vertikal



Horizontal

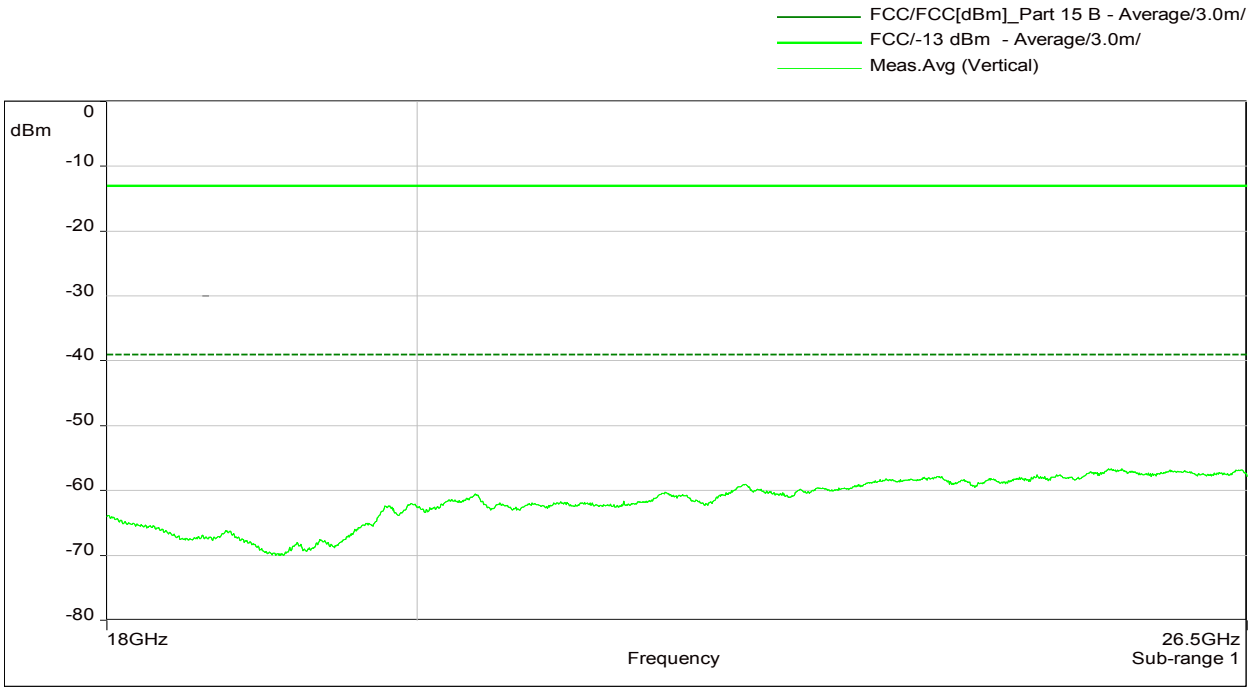


The RF output power is terminated.

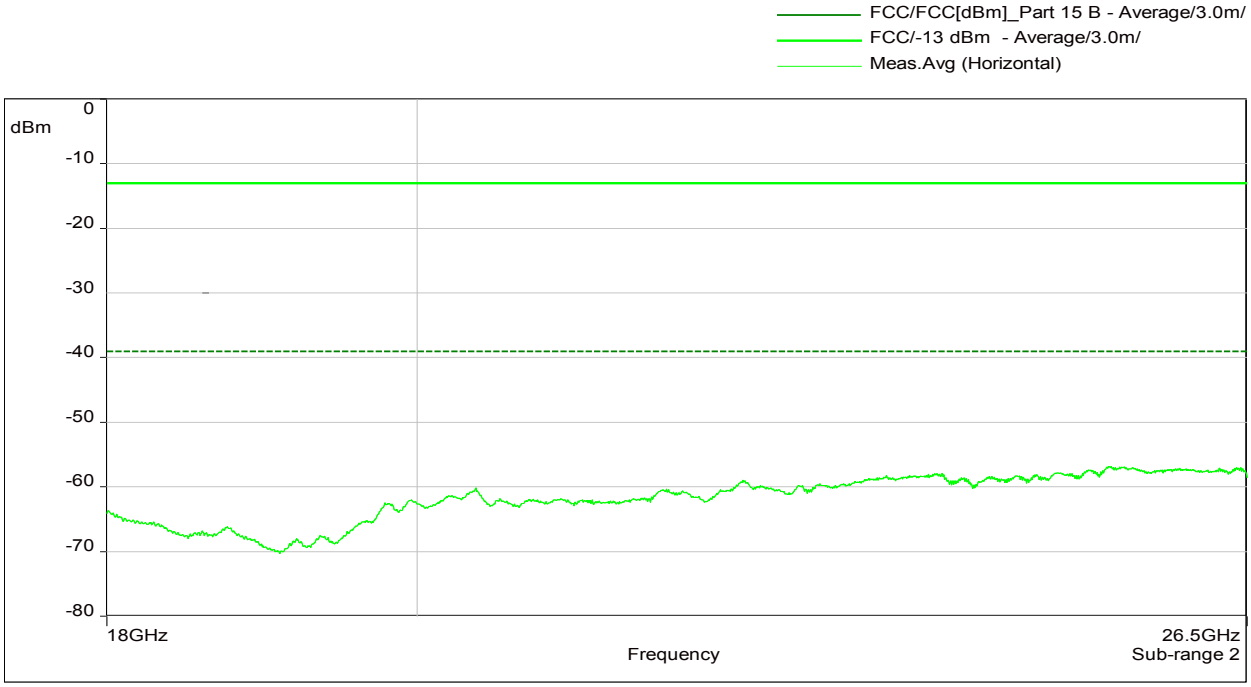
11.5.5 18 GHz – 26.5 GHz Downlink (Bottom – Middle – Top) §27.53

B/M/T: 2615 MHz / 2652.5 MHz / 2690 MHz (Operation with maximum composite power)

Vertikal



Horizontal



The RF output power is terminated.

Za / 08.03.2016

The radiated spurious emission measurements have been passed!

12 History

Revision	Modification	Date	Name
01.00	Initial Test report	12.04.2016	Tom Zahlmann

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