Test Report for FCC 47 CFR part §15.247

Test Report no.:	20153885301-Ver 2.00	**Date of Report:**	Sept 30th. 2015
Number of pages:	Page 1 of 37	**Contact person:**	Amir Amininejad

Testing laboratory:	Telefication Edisonstraat 12a 6902 PK Zevenaar The Netherlands Tel. +31 316583180 Fax. +31 316583189	**Client:**	TechNed Benelux Veersteeg 15 4212 LR Spijk The Netherlands Tel. +31 183631295 Fax.+31 1836 31778 Contact Person: M. Geluk

Tested device(s):	IP-68 mobile phone TechNed EX-SM14 Build number: EX0150_20141106_M312_SP BB ver.: MOLY.WR8.W1248.MD.WG.MP.V28.P1 (Detailed information for each device is listed in section 1).
Testing has been carried out in accordance with:	CFR 47, FCC rules Parts 15, KDB pub. 558074 meas. Guidance v03r02. Deviations, modifications or clarifications (if any) to above mentioned documents are written in each section under “Test method and limit”
Documentation:	The test report must always be reproduced in full; reproduction of an excerpt only is subject to written approval of the testing laboratory. The documentation of the testing performed on the tested devices is archived for 10 years at Telefication Netherland.
Test Results:	The results of the inspection are described on the following pages, where "conformity" in the Summary List means that test specification test purposes were verified and the tested device conforms to the applied standards. All performed tests are validated and the dates of testing are always available within internal documentation at Telefication. In cases where "declaration" is printed the required documents are available in the customer's documentation. This test result relates only to those tested devices mentioned in this document.
Accreditation:	Telefication is designated by the FCC as an Accredited Test Firm for compliance testing of equipment subject to Certification under Parts 15 & 18. The Designation number is: NL0001
Date of Signature:	**30-09-2015**

RF Test Laboratory Manager
Amir Amininejad

1 Revision record sheet

Version	Date	Remark(s)	BY
2.00	25-09-2015	On page 7: nominal powers of BT and WLAN added; actual operating frequency ranges of BT and WLAN added	P.A. Suringa
1.00	2015 09 22	Full revision	R,van Barneveld
1.00	2015 09 10	Version for first issue	A. Amininejad
0.50	2015 08 17	Draft release for peer review	A. Amininejad

Table of contents

Summary of test results

	Applied Standard(s): FCC Part 15 (15.247), Subpart C Canada RSS-210, RSS-GEN Issue 4				
	Standard(s) Section				
FCC	**IC**	**Conducted / Radiated**	**Name of the test item**	**Verdict**	**Ref.**
15.207	RSS-GEN 7.2.2	Conducted	AC Power Conducted Emission	Pass	5.5
15.247(d)	RSS-210 Annex 8 (A8.5)	Radiated	Radiated Spurious Emission	Pass	5.4
§2.1049(h)	4.6.1 RSS-GEN	Conducted	Emission Bandwidth	Pass	5.1
15.247(a) (2)	RSS-210 Annex 8 (A8.2(a))	Conducted	6 dB Bandwidth	Pass	5.1
15.247(b)	RSS-210 Annex 8 (A8.4(4))	Conducted	RF Output Power	Pass	5.2
15.247(e)	RSS-210 Annex 8 (A8.2(b))	Conducted	Peak Power Spectral Density	Pass	5.3
15.203	----	Conducted	Antenna Requirement	Pass	5.6
15.209; 15205	RSS-210 Annex 8 (A8.5)	Radiated	Transmitter Radiated Emission	Pass	5.4
15.247(d)	RSS-210 Annex 8 (A8.5)	Radiated	Radiated Band Edges	Pass	5.4

2 General Description

2.1 Applicant

TechNed Benelux, Veersteeg 15, 4212 LR Spijk, The Netherlands

2.2 Manufacturer

TechNed Benelux, Veersteeg 15, 4212 LR Spijk, The Netherlands

2.3 Tested Equipment under Test (EUT)

Device type:	Mobile Phone
Brand Name	Rough Pro
Model Name	EX0150_20141106_M312_SP EX-SM14
FCC ID	2AD2CEX-SM14
EUT support Radio applications	GSM850, PCS1900,GPRS,WCDMA Band II and Band V, WLAN 2.4GHz IEEE802.11b,g,n HT20, Bluetooth3.0, Bluetooth LE V. 4.0
DUT no.:	DUT#0005
Device type:	Mobile Phone IP-68 EX-SM14
	BC_EX_SM14_USB_Cable-1
	USB Travel Charger
SN/ IMEI number:	860636000507855 and 860636000607853
Hardware version/ Build number:	EX0150_20141106_M312_SP EX0150_20141106_M312_SP
Software version:	Android 4.2.2
Test software / firmware	EX0150_20141106_M312_SP
Date of receipt:	June 3rd. 2015
Date of tests started:	May 22nd. 2015
Date of tests ended:	Aug 18th. 2015

2.4 Product Specification subjective to this standard

Tx Frequencies	GSM850: 824.2 MHz ˜ 848.8 MHz GSM1900: 1850.2 MHz ˜ 1909.8 MHz WCDMA Band II: 1712.4 MHz ˜ 1752.6 MHz WCDMA Band V: 826.4 MHz ˜ 1907.6 MHz Bluetooth : 2402 MHz ˜ 2480 MHz Bluetooth LE: 2402 MHz ˜ 2480 MHz WLAN: 2412 MHz ˜ 2462 MHz
Rx Frequency	GSM850: 869.2 MHz ˜ 893.8 MHz GSM1900: 1930.2 MHz ˜ 1989.8 MHz WCDMA Band II: 1932.4 MHz ˜ 1987.6 MHz WCDMA Band V: 871.4 MHz ˜ 891.6 MHz Bluetooth : 2402 MHz ˜ 2480 MHz Bluetooth LE: 2402 MHz ˜ 2480 MHz WLAN: 2412 MHz ˜ 2462 MHz
Maximum Output power to Antenna	GSM/GPRS: 31 dBm GSM1900: 28 dBm WCDMA Band II: 23.5 dBm WCDMA Band V: 23.5 dBm Bluetooth: 8 dBm IEEE 802.11b: < 18.5 dBm IEEE 802.11g: 15.5 dBm IEEE 802.11n (HT20): 15.5 dBm
Antenna Type	Integrated antenna: Monopole FPC; Antenna Gain: GSM -2,4 dBi; WCDMA -2.5 dBi Bluetooth: 2.5 dBi WLAN: 2.5 dBi
Type of Modulation	GSM/GPRS: GMSK EDGE: GMSK/8PSK WCDMA: QPSK (UL) HSUPA: QPSK (UL) Bluetooth: Basic Rate (1Mbps) GFSK WLAN: DSSS/OFDM

2.5 Modification of the EUT

In order to be able to do the conducted tests, EUT is being modified by:

a) Soldering a 50 Ohm impedance matched coaxial cable to the antenna pads of the device, disconnecting the integrated antenna terminals. A SMA female connector is added to the other end of the RF coaxial cable (pigtail).

b) Battery terminal taken out from the EUT for variations of Supply voltage.

The modification is done following Device manufacturing instructions. The task of modification is performed using external company Techniveau:

Techniveau
Bijsterhuizen 2414
6604 LL Wijchen
Tel. +31 (0)6 21 551 223
www.techniveau.nl
info@techniveau.nl

2.6 Testing Location

Test Site	Telefication BV
Test Site location	Edisonstraat 12a 6902 PK Zevenaar The Netherlands Tel. +31 316583180 Fax. +31 316583189
Test Site FCC Designation No.	NL0001

2.7 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15 Subpart C §15.247 and Part 15 Subpart C, §15.207.
- FCC KDB Publication No. 558074 D01DTS Meas. Guidance V03r02
- ANSI C63.10:2013

Observations and remarks:

All tested items were verified and recorded according to the standards and no deviations were identified during the test.

2.8 Conclusions

The sample of the product showed **NO NON-COMPLIANCES** to the specifications stated in paragraph 2.7of this report.

The results of the tests as stated in this report, are exclusively applicable to the product item as identified in this report. Telefication accepts no responsibility for any stated properties of product items in this test report, which are not supported by the tests as specified in paragraph 2.7 "*Applicable standards".*

All conducted tests are performed by:

Name : A. Amininejad

Review of test methods and report by:

Name : ing. P.A. Suringa

The above conclusions have been verified by the following signatory:

Date : 30 September 2015

Name : A. Amininejad

Function : Operational Manager Radio Laboratory

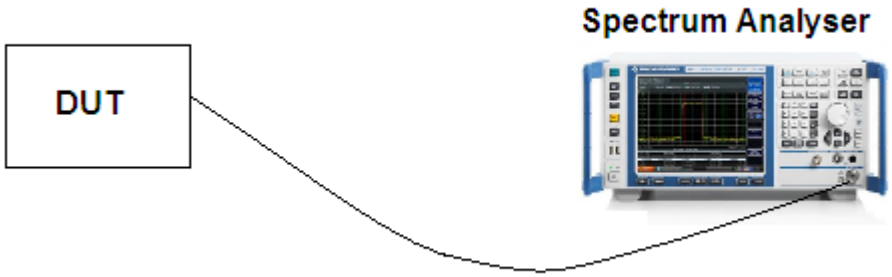
Signature :

3 Test Configuration of the EUT (Equipment under Test)

3.1 Test mode

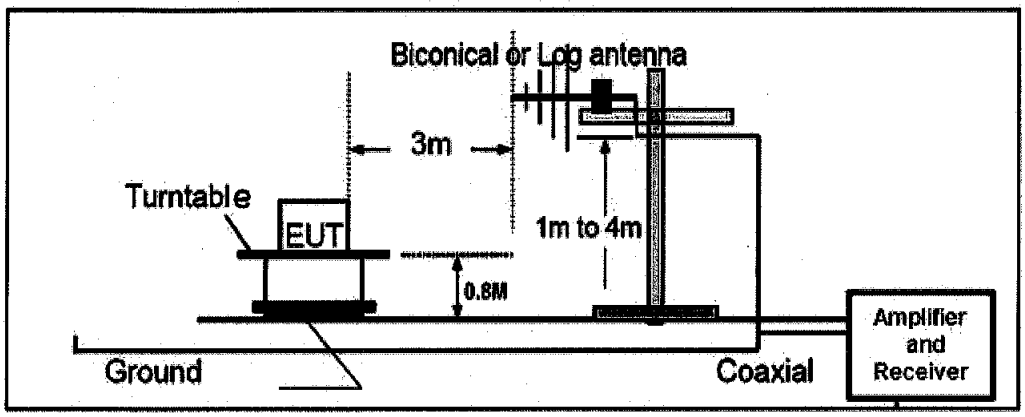
Antenna port conducted and radiated test cases were performed with the EUT configured to transmit at its maximum power. In the frequency range from 30 MHz up to 10th harmonic, the fundamental frequencies at low, mid and high channel were examined.

3.2 Conducted Test setup diagram

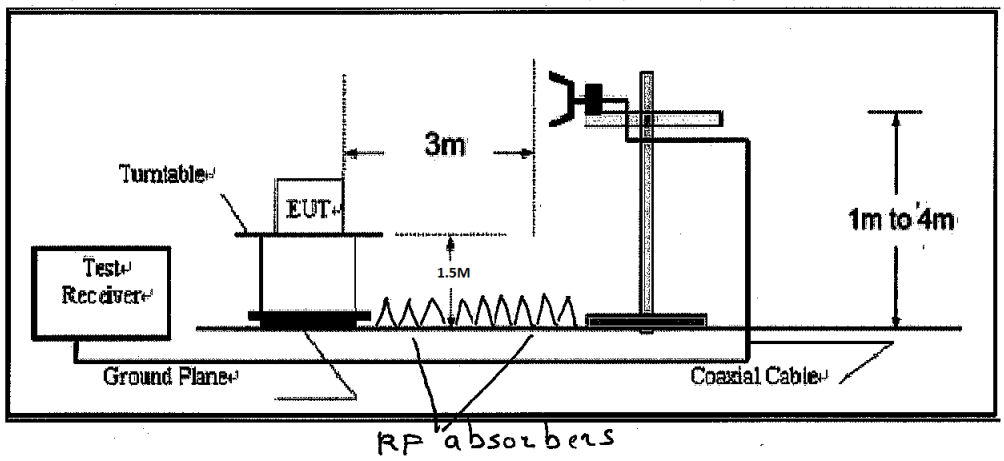


3.3 Radiated Test setup within a SAC Chamber

RADIATED EMISSION TEST SETUP 30MHz-1000MHz



RADIATED EMISSION TEST SETUP ABOVE 1000MHz



3.4 Equipment used in test setup

No 1:	HMP2020 Programmable Power Supply
Manufacturer:	Rohde & Schwarz
TE number	TE01270
No 2:	Hewlett Packard 83650B Signal Generator 10 MHz – 50 GHz
Manufacturer:	Hewlett Packard
TE number	TE00487
No 3:	FSV Signal Analyzer 10Hz- 40 GHz
Manufacturer:	Rohde & Schwarz
TE number	TE01269
No 4:	VT4002 EMC Climate Chmber
Manufacturer	Vötsch Industrietechnik GmbH
Serial number	56600930
TE number	TE01288
No 5:	Low insertion loss and VSWR DC – 40 GHz Directional Coupler
Manufacturer:	Marki CA-40 1443
Serial number	TE01278
TE number	
No 6:	FS735/1 10 MHz distribution Amplifier
Manufacturer:	Stanford Research Systems
TE number	TE01281
No 7:	USB to RS232 converter
Manufacturer:	Targus
Serial number	PA088
No 8:	USB to GPIB interface adopter
Manufacturer:	National Instruments
TE number	TE01283
No 9:	FSP- Signal Analyzer 9KHz- 40 GHz
Manufacturer:	Rohde & Schwarz
TE number	TE11125
No 10:	BiconiLog Antenna 30MHz-2GHz
Manufacturer:	Case
TE number	TE00967
No 11:	Horn Antenna 1GHz -18 GHz Model no. 3115
Manufacturer:	EMCO The Electro –Mechanics Co.
TE number	TE 00531

No 12:	SAC Chamber
Manufacturer:	Comtest Engineering BV
TE number	TE00861
No. 13:	ESCI EMI Test Receiver 9KHz - 3 GHz
Manufacturer:	Rohde & Schwarz
TE number	TE11128
No. 14:	ESH3 Z2 Mains CDN
Manufacturer:	Rohde & Schwarz
TE number	TE 000208
No. 15:	ESH3 Z2 Pulse limiter
Manufacturer:	Rohde & Schwarz
TE number	TE 00756

3.5 Explanation of the Measurement results for all conducted test Items:

The Path loss between the EUT and the Spectrum Analyser at the frequency range of 30 MHz up to 40 GHz is measured and is stored in a transducer table.
This transducer table is used for a level offset of the spectrum analyser.
With this level offset, the spectrum analyser's reading will exactly be the RF output.

4 Tested Channels

4.1 Bluetooth Low Energy Channels

Bluetooth LE Channels		**F_{Low}**	**F_{Mid}**	**F_{High}**
BT LE	**Ch.**	**0**	**20**	**39**
	F [MHz]	2402	2442	2480

5 BT LE Test results

5.1 6 dB Bandwidth Measurement

5.1.1 Limit

The Minimum 6 dB bandwidth shall be at least 500 kHz.

5.1.2 Measuring instruments

The measuring instruments are listed in chapter 3.4 of this report.

5.1.3 Test setup

As shown in chapter 3.2 of this report.

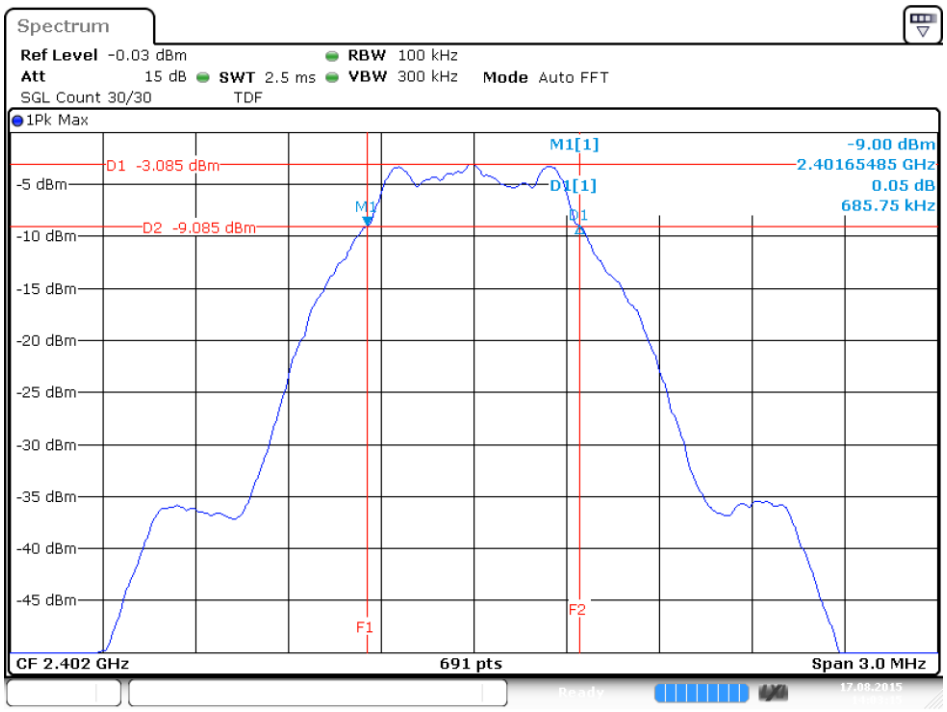
5.1.4 Test procedure

1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r02.
2. The RF output of EUT was connected to the spectrum analyser by RF cable and attenuator.
3. The path loss was compensated to the results for each measurement. This path loss is stored within the transducer table of the Spectrum analyser.
4. Measurement is made with Spectrum analyser with the following settings: RBW=100 kHz, VBW=3xRBW=300 kHz.
5. The criterion is that 6 dB bandwidth must be greater than 500 kHz.
6. Measurement results are recorded in the test report.

5.1.5 Test results

Channel	Frequency [MHz]	6dB bandwidth [kHz]	Limit [kHz]	Verdict
0	2402	685,75	500	Pass
20	2442	690,52	500	Pass
39	2480	690,52	500	Pass
Uncertainty	±88.2 kHz			

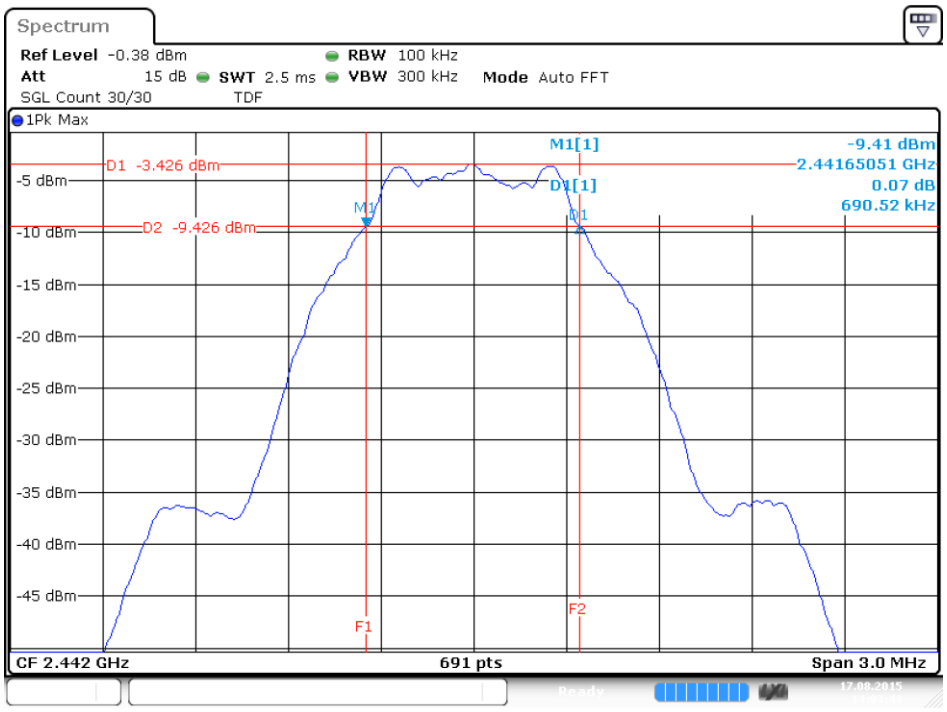
6 dB bandwidth channel 00.



Ble, channel: 0 : 6 dB BW Measurement

Date: 17.AUG.2015 14:03:15

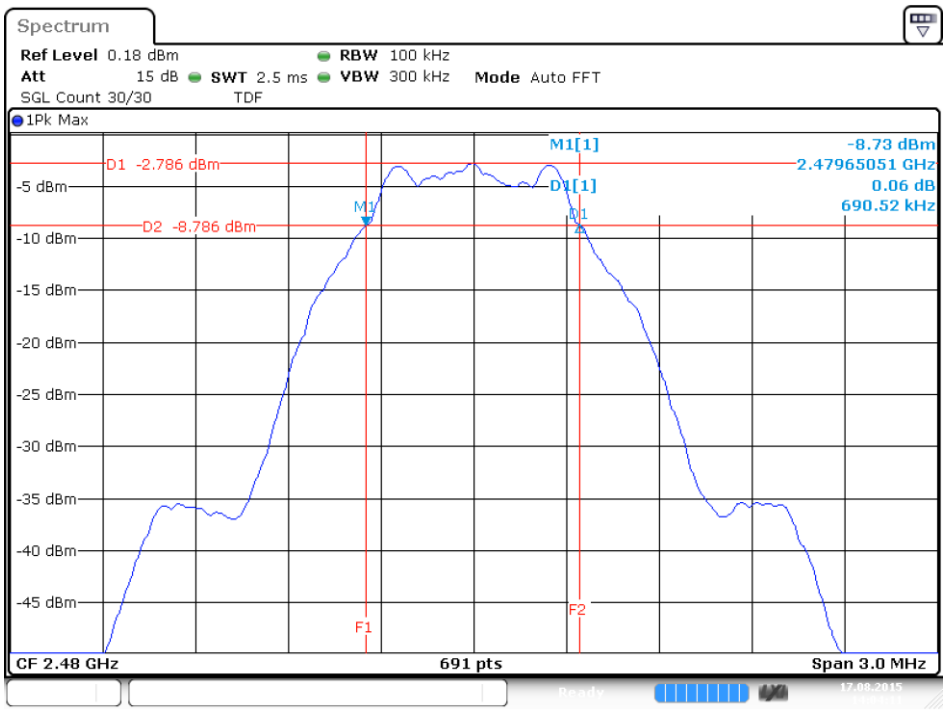
6 dB bandwidth channel 20.



Ble, channel: 20 : 6 dB BW Measurement

Date: 17.AUG.2015 14:03:44

6 dB bandwidth channel 39.



Ble, channel: 39 : 6 dB BW Measurement

Date: 17.AUG.2015 14:04:11

5.2 Peak Output Power Measurement

5.2.1 Limit

For systems using digital modulation in the 2400-2483.5 MHz, the limit for the peak output power is 30 dBm. If transmitting antenna of directional gain greater than 6 dBi is used, the peak output power from the intentional radiator shall be reduced bellow the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point to point operation, the limit has to be reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

5.2.2 Measuring instruments

The measuring instruments are listed in chapter 3.4 of this report.

5.2.3 Test setup

As shown in chapter 3.2 of this report.

5.2.4 Test procedure

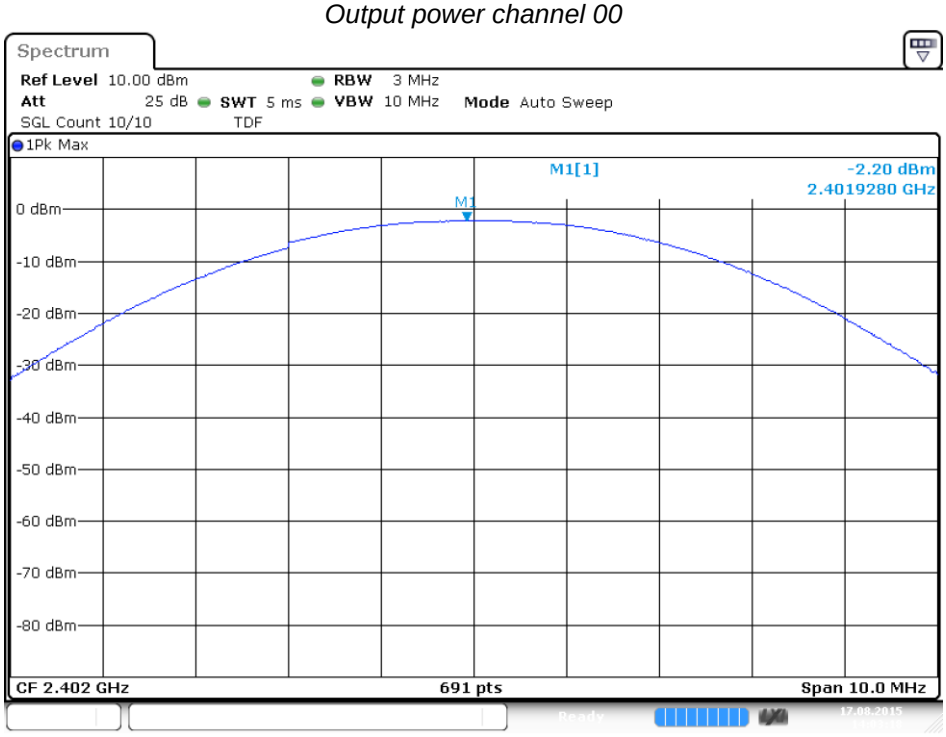
1. The testing follows the measurement Procedure of FCC KDB No. 558074 DTS D01 Meas. Guidance V03r02.
2. The RF output of EUT was connected to the spectrum analyser by RF Cable trough the directional coupler. The path loss was compensated for each measurement.
3. Set to the EUT to maximum power and enable continuous transmission.
4. Measure the conducted output power and record the results in the test report.

5.2.5 Test results

Channel	Frequency [MHz]	RF Power [dBm]	Limit [dBm]	Verdict
0	2402	0,3	30	Pass
20	2442	0,04	30	Pass
39	2480	0,55	30	Pass
Uncertainty	±0.71 dB			

Note: The values reported within the table above, includes 2.5 dBi Integrated Antenna gain. The information is provided by the device manufacturer.

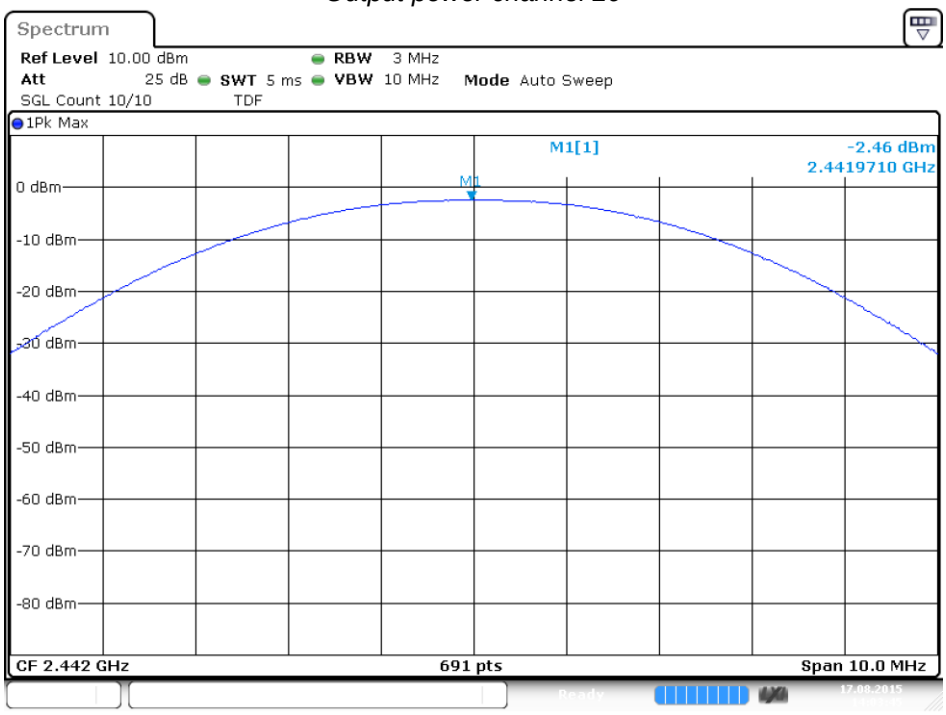
Output power channel 00



Ble Channel: 0 : Measure DUT output power

Date: 17.AUG.2015 14:03:17

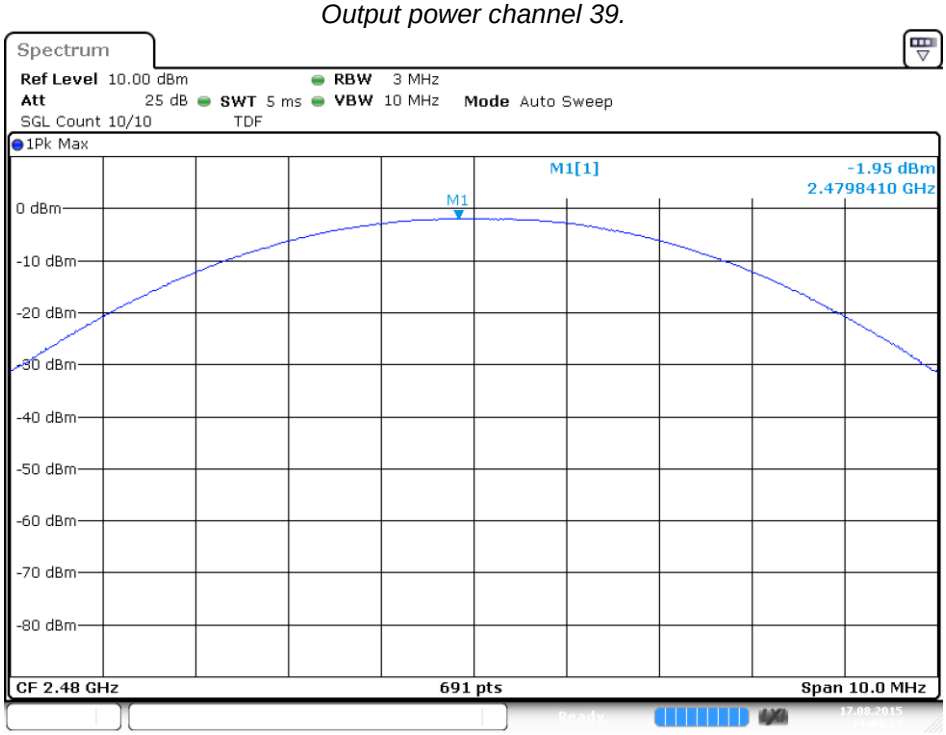
Output power channel 20



Ble Channel: 20 : Measure DUT output power

Date: 17.AUG.2015 14:03:45

Output power channel 39.



Ble Channel: 39 : Measure DUT output power

Date: 17.AUG.2015 14:04:13

5.3 Power Spectral Density measurement

5.3.1 Limit

The peak power spectral density shall not be greater than 8 dBm in any 3 kHz band at any time interval of continuous transmission.

5.3.2 Measuring instruments

The measuring instruments are listed in chapter 3.4 of this report.

5.3.3 Test setup

As shown in chapter 3.2 of this report.

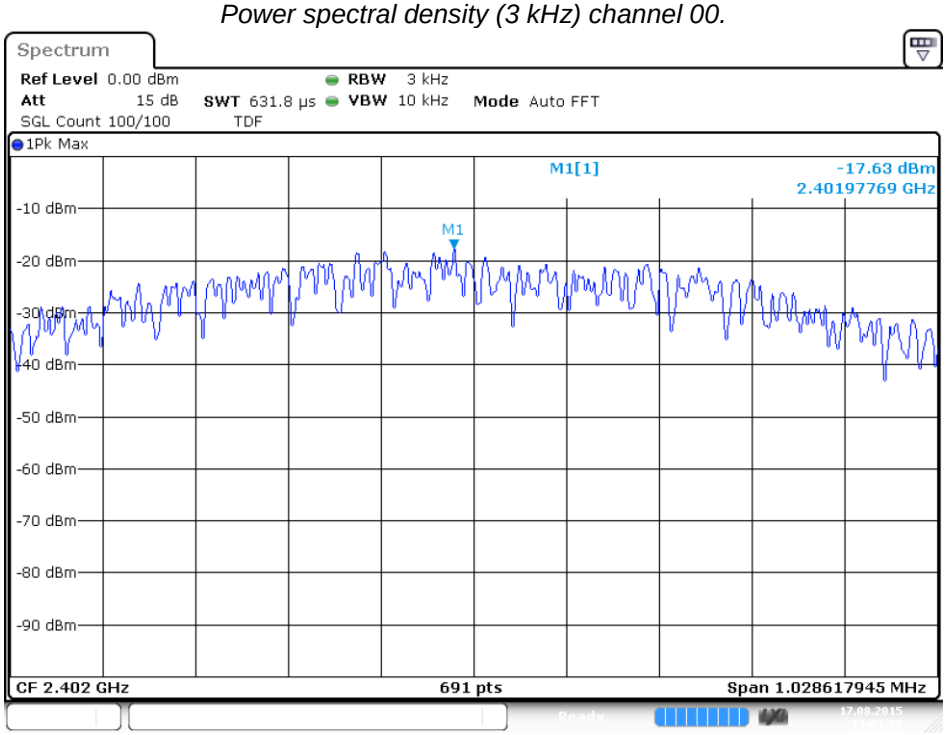
5.3.4 Test procedure

1. The testing follows the Measurement Procedure 10.2 Method PKPSD of FCC KDB Publication No. 558074 D01 DTS Meas. Guidance V03r02
2. The RF Output of EUT was connected to the spectrum analyser by RF cable. The path loss was compensated for each measurement. This is done by utilizing the path compensation of the cable within the TDF table of the FSV40 Spectrum analyser.
3. EUT is configured by utilizing the build in SW application provided by Device manufacturer. The EUT is set to transmit with its maximum power level and is enabled to transmit continuously.
4. Measurement is done by spectrum analyser. Which is configured as following:
   RBW = 100 kHz, Video BW = 300 kHz which is larger than 3x RBW.
   Detector = Peak, Sweep time = Auto couple, Trace mode = Max hold, Allowing trace to fully be stabilized. Maximum power level is detected by peak marker function of the spectrum analyser.
5. Test results are recorded into a log file.

5.3.5 Test results

Channel	Frequency [MHz]	PSD/100 kHz [dBm]	PSD/3 kHz [dBm]	Max limits [dBm/3 kHz]	Verdict
0	2402	-3,19	-17,63	8	Pass
20	2442	-3,56	-17,95	8	Pass
39	2480	-3,18	-17,27	8	Pass
Uncertainty	+2.8 / -3.0 dB				

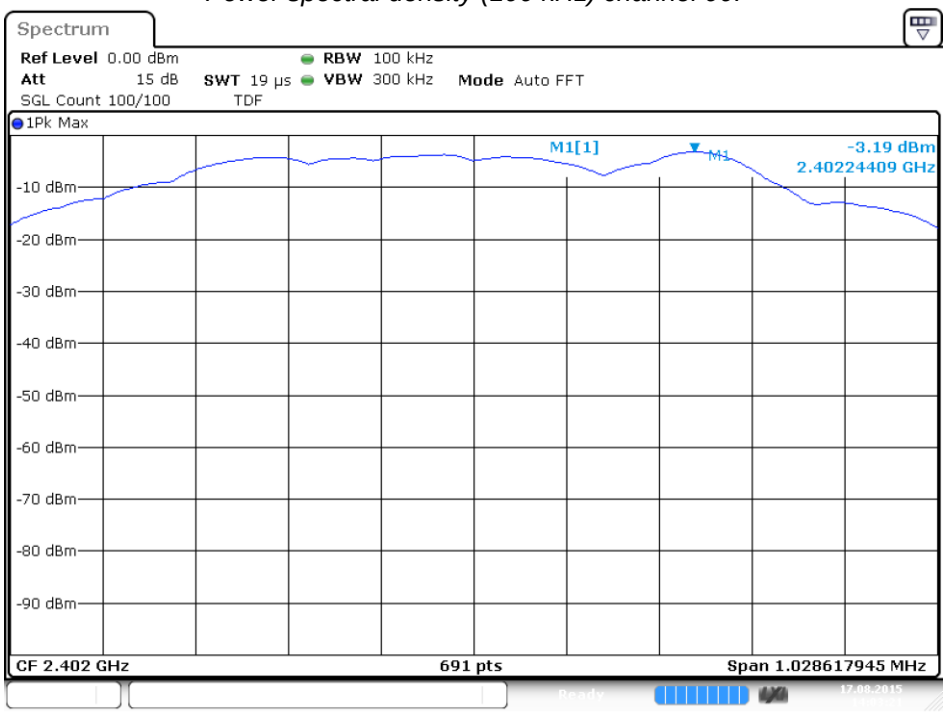
Power spectral density (3 kHz) channel 00.



Ble,0 : BLE Power spectral density (3KHz)

Date: 17.AUG.2015 14:03:20

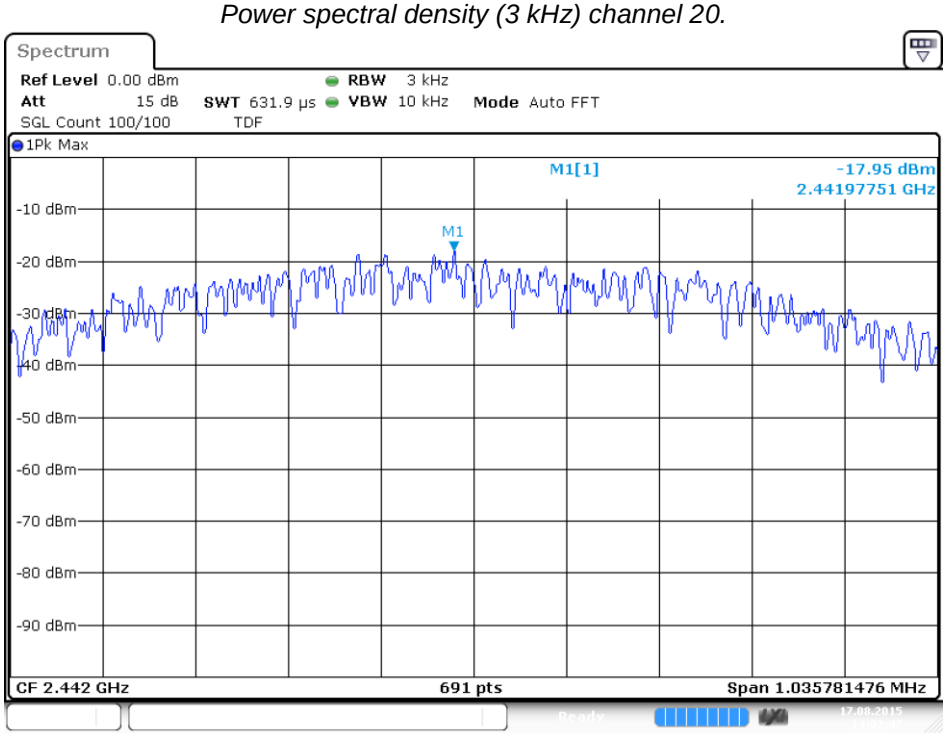
Power spectral density (100 kHz) channel 00.



Ble,0 : BLE Power spectral density (100KHz)

Date: 17.AUG.2015 14:03:21

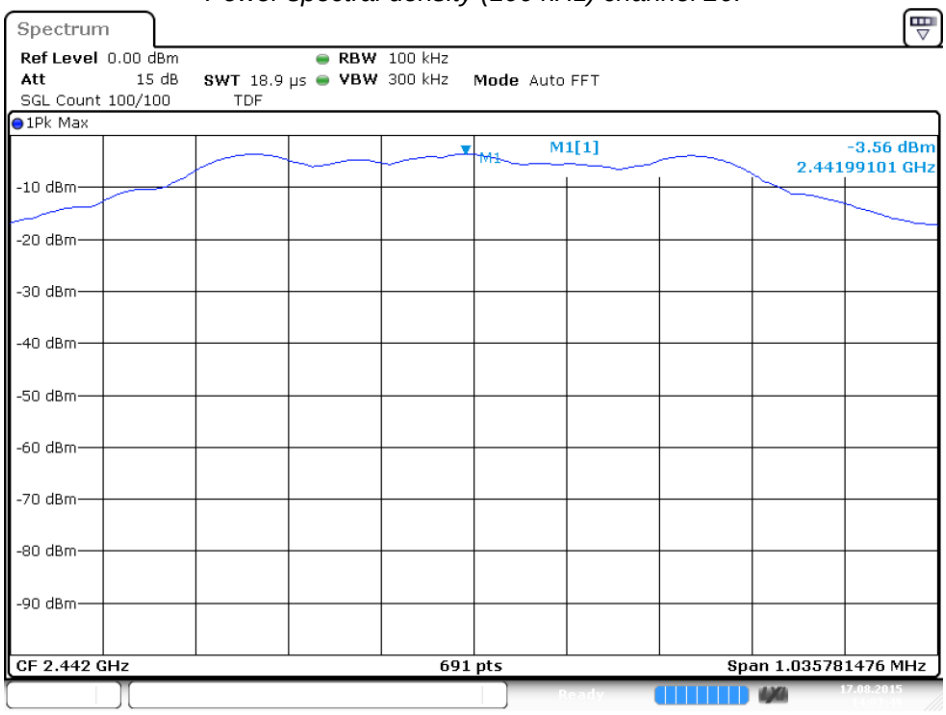
Power spectral density (3 kHz) channel 20.



Ble,20 : BLE Power spectral density (3KHz)

Date: 17.AUG.2015 14:03:48

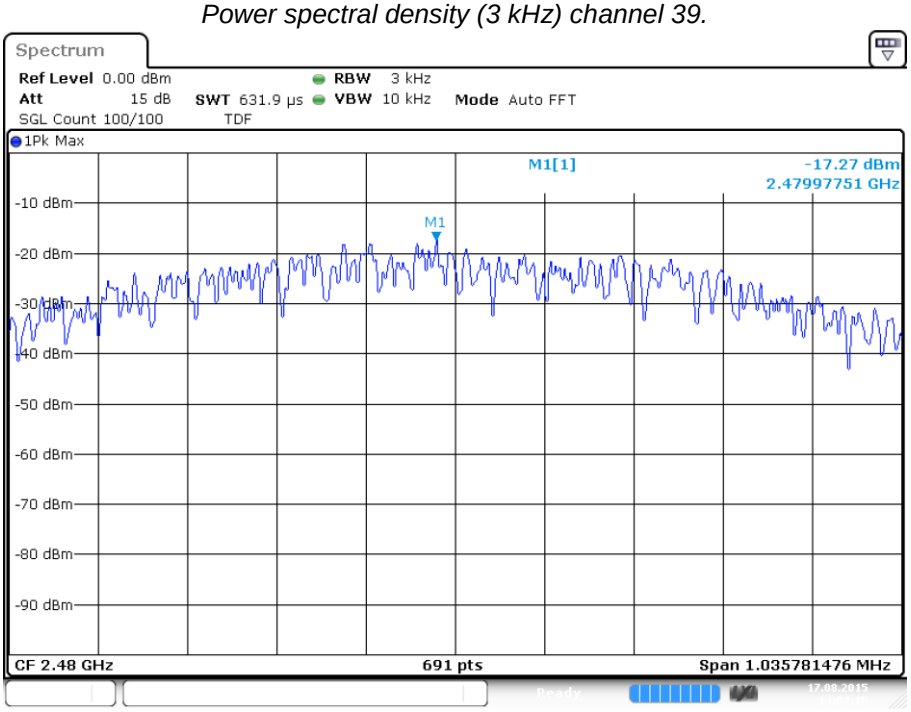
Power spectral density (100 kHz) channel 20.



Ble,20 : BLE Power spectral density (100KHz)

Date: 17.AUG.2015 14:03:49

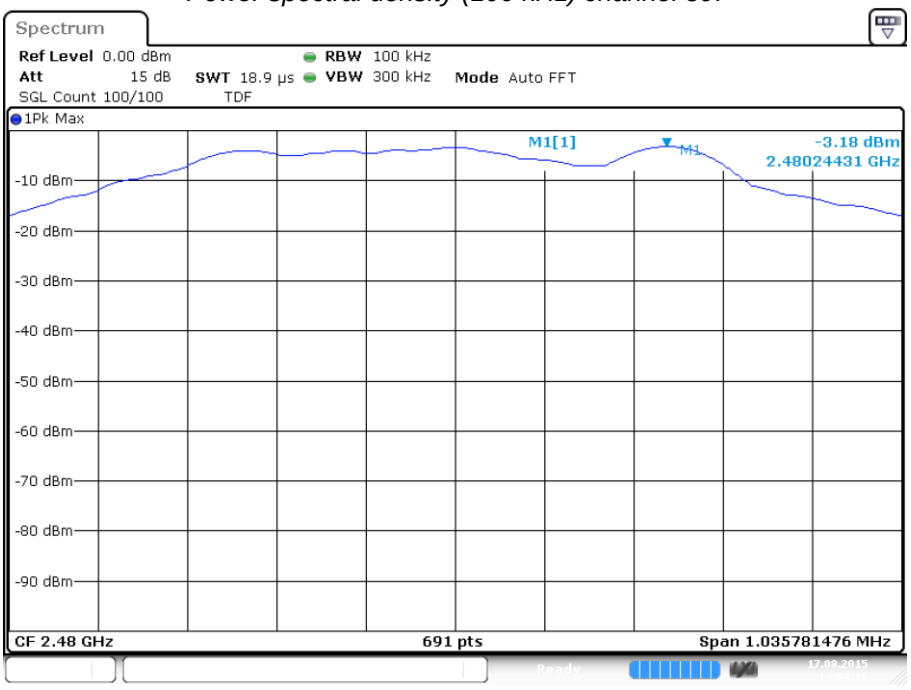
Power spectral density (3 kHz) channel 39.



Ble,39 : BLE Power spectral density (3KHz)

Date: 17.AUG.2015 14:04:15

Power spectral density (100 kHz) channel 39.



Ble,39 : BLE Power spectral density (100KHz)

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Note: The power density [dBm]/100 [kHz] is the reference level which might be used as 20 dBc down for conducted Band edges and Conducted Spurious Emissions limit line. However, in this report we have measured the Spurious emissions, covering the Band edges within a SAC chamber as radiated measurement.

5.4 Radiated spurious emission and band edges

5.4.1 Limits

In any 100 kHz bandwidth outside the operating frequency band, the RF power shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either a RF conducted or a radiated measurement.

A pre-scan has been conducted to determine the worst-case mode from all possible combinations of available modulations and antenna ports. Following channel(s) were selected for final test as listed below:

EUT configure Mode	Available Channels	Tested Channels	Modulation Type	Data Rate (Mbps)
Powered by adapter	0 to 39	0,20,39	GFSK	1.0

5.4.2 Measuring instruments

The measuring instruments are listed in chapter 3.4 of this report.

5.4.3 Test setup

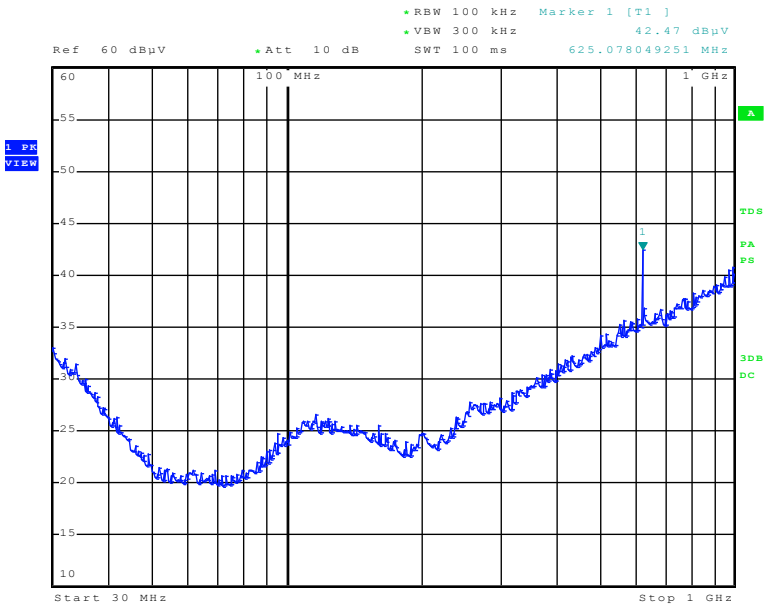
As shown in chapter 3.3 of this report.

5.4.4 Test procedure

According to section 11-3 of KDB publication 558074 V03r02.

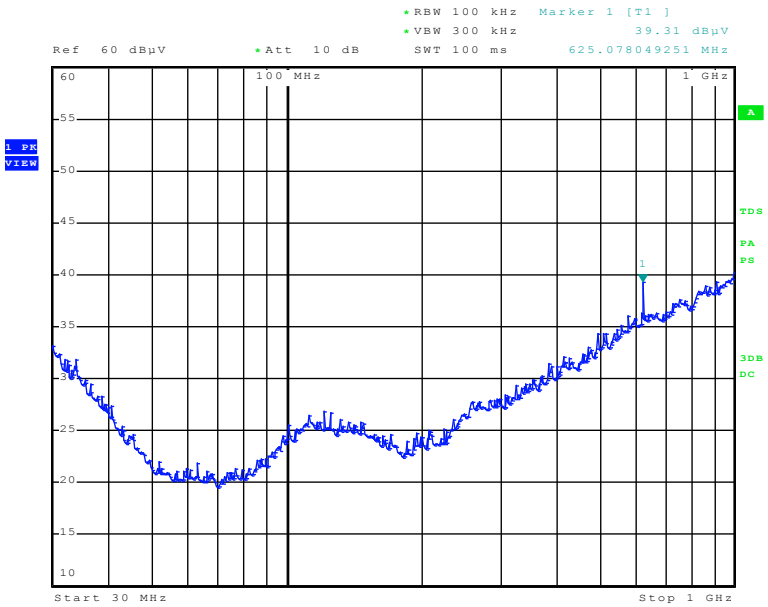
5.4.5 Test results

1) Ch Low, Vertical polarization for 0.03 < F < 1 GHz



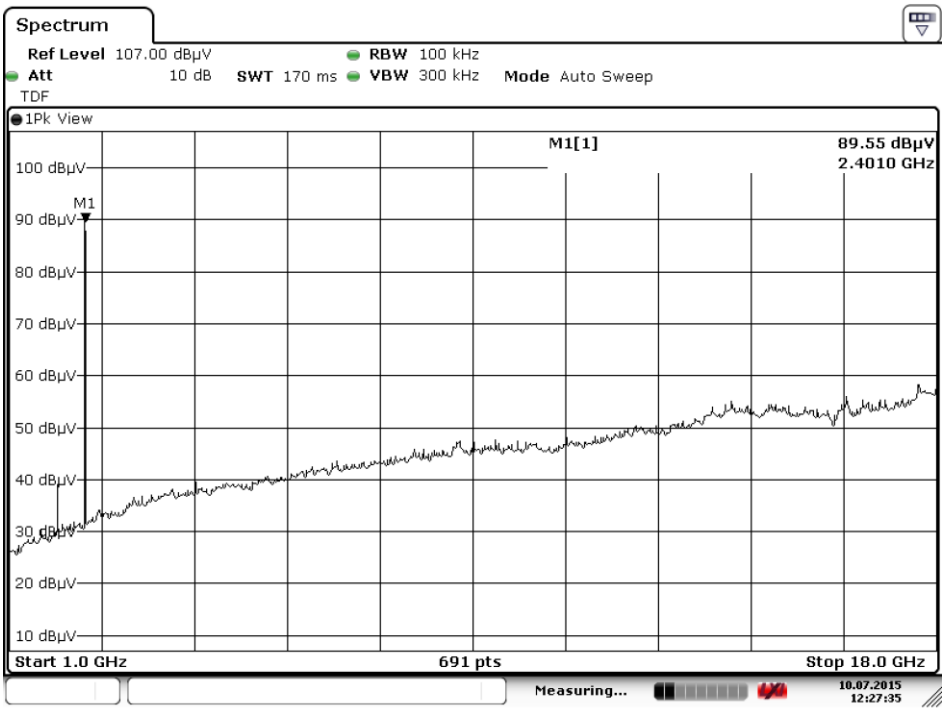
Date: 17.JUL.2015 09:18:58

2) Ch. Low, Horizontal polarization for 0.03 < F < 1 GHz



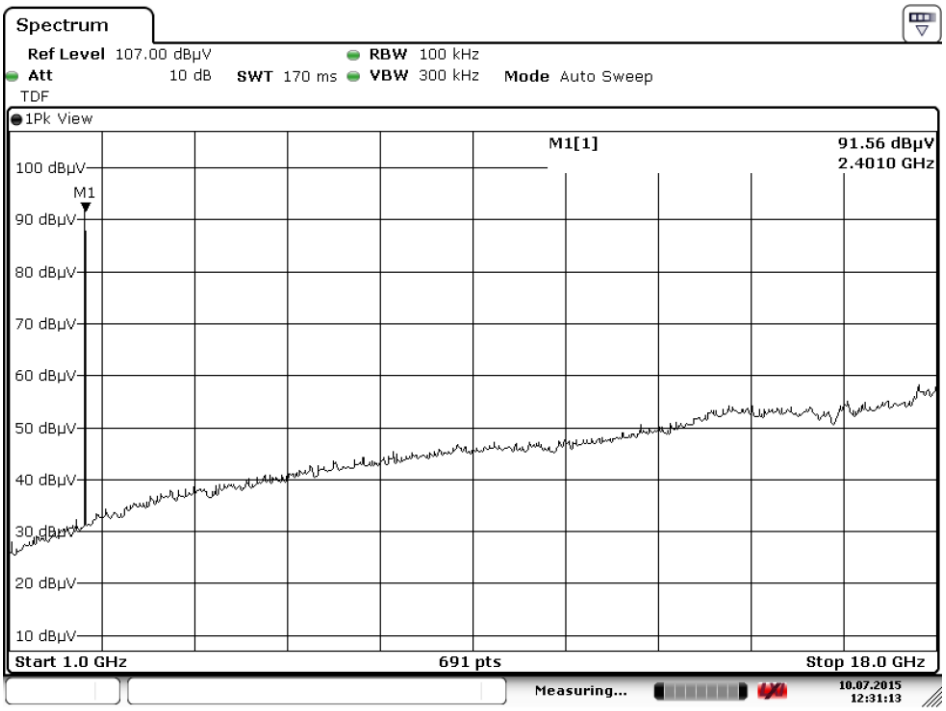
Date: 17.JUL.2015 09:29:46

3) Ch. Low , Vertical polarization for 1 GHz ≤ F < 18 GHz



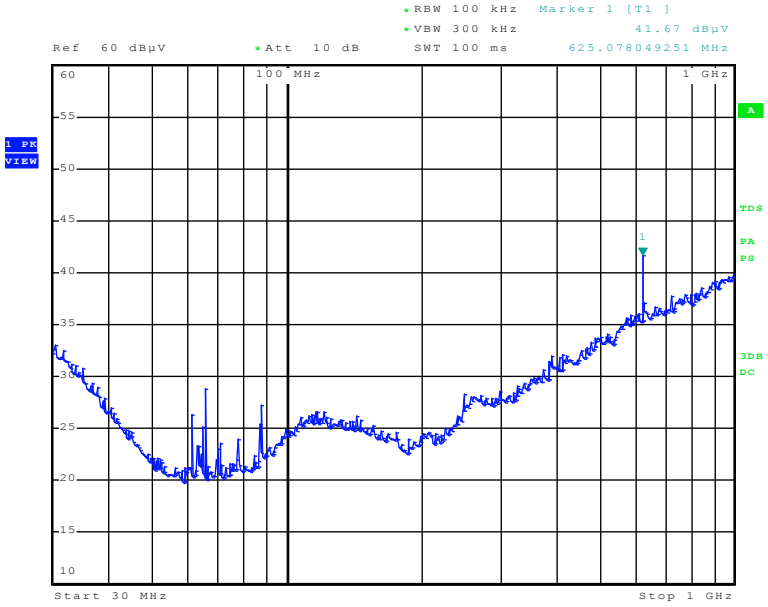
Date: 10.JUL.2015 12:27:35

4) Ch. Low , Horizontal polarization for 1 GHz ≤ F < 18 GHz



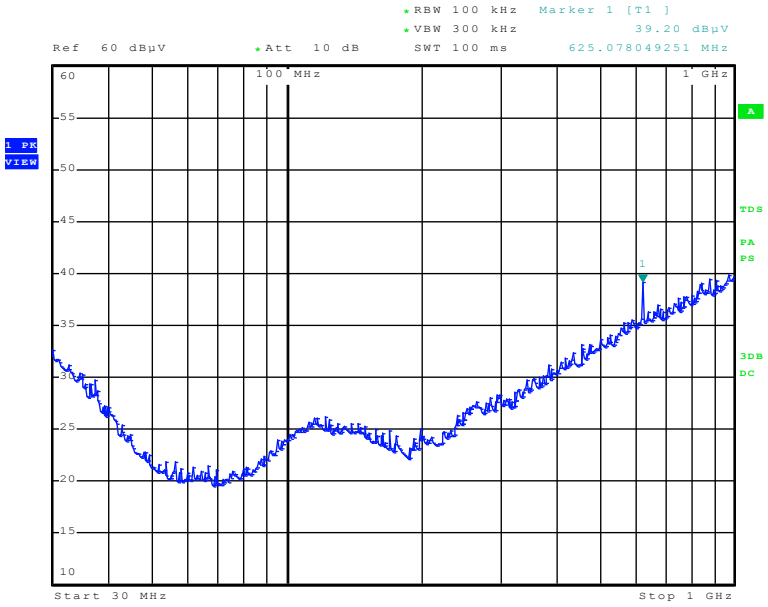
Date: 10.JUL.2015 12:31:12

5) Ch Mid, Vertical polarization for 0.03 < F < 1 GHz



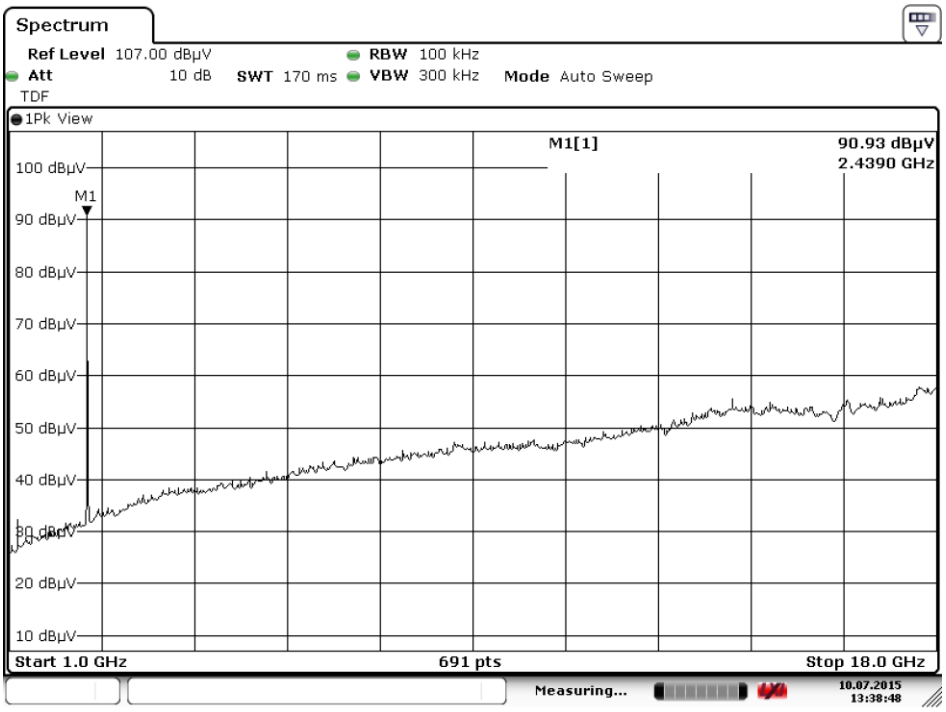
Date: 17.JUL.2015 10:10:49

6) Ch. Mid, Horizontal polarization for 0.03 < F < 1 GHz



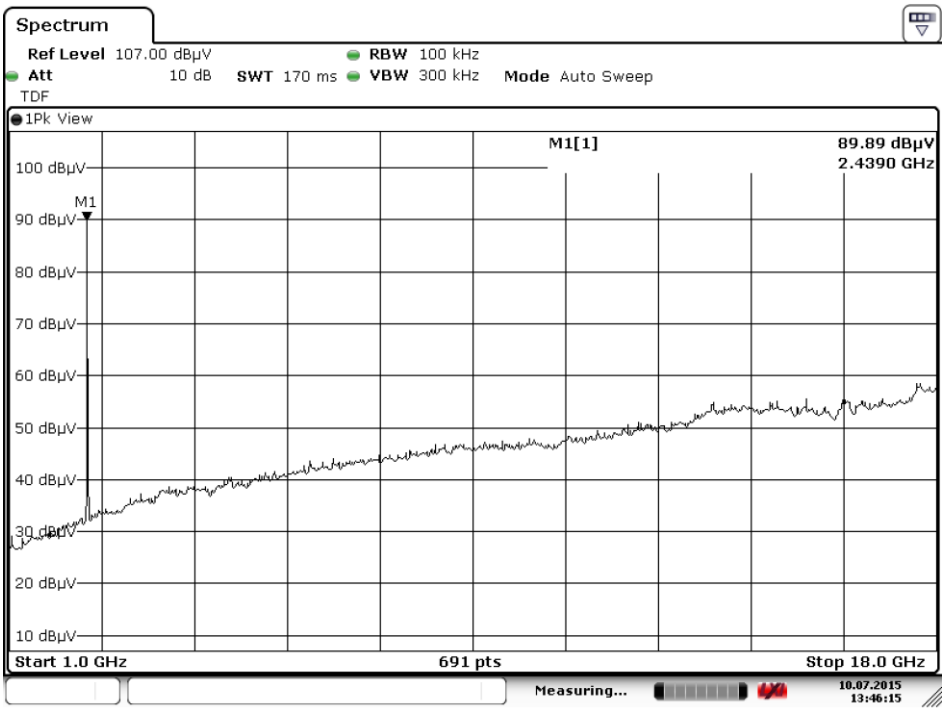
Date: 17.JUL.2015 09:52:26

7) Ch. Mid , Vertical polarization for 1 GHz ≤ F < 18 GHz



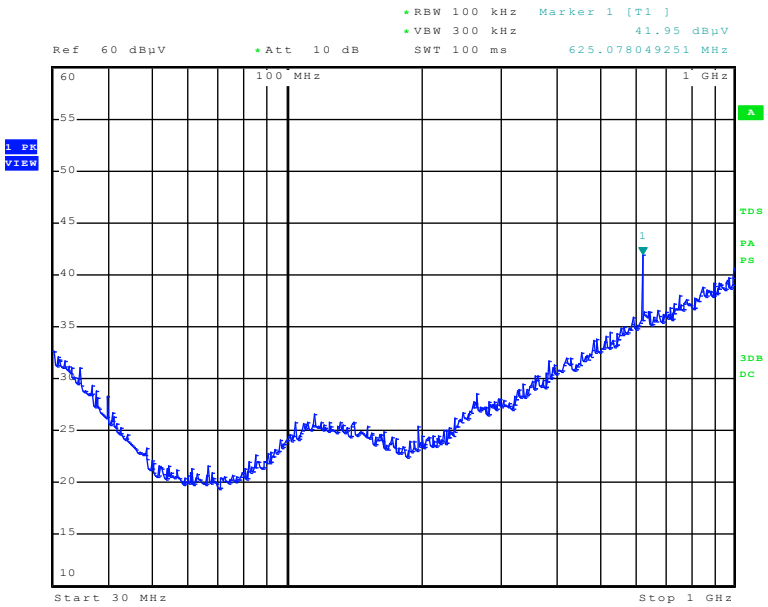
Date: 10.JUL.2015 13:38:47

8) Ch. Mid, Horizontal polarization for 1 GHz ≤ F < 18 GHz



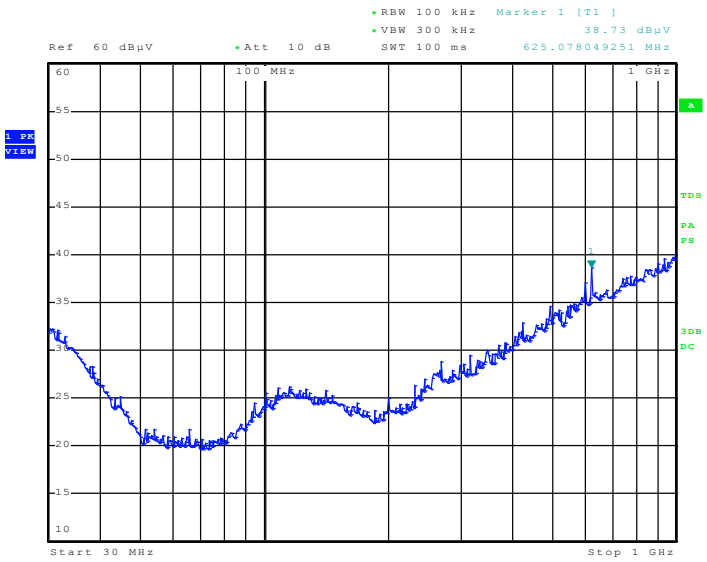
Date: 10.JUL.2015 13:46:15

9) Ch. High, Vertical polarization for 0.03 < F < 1 GHz



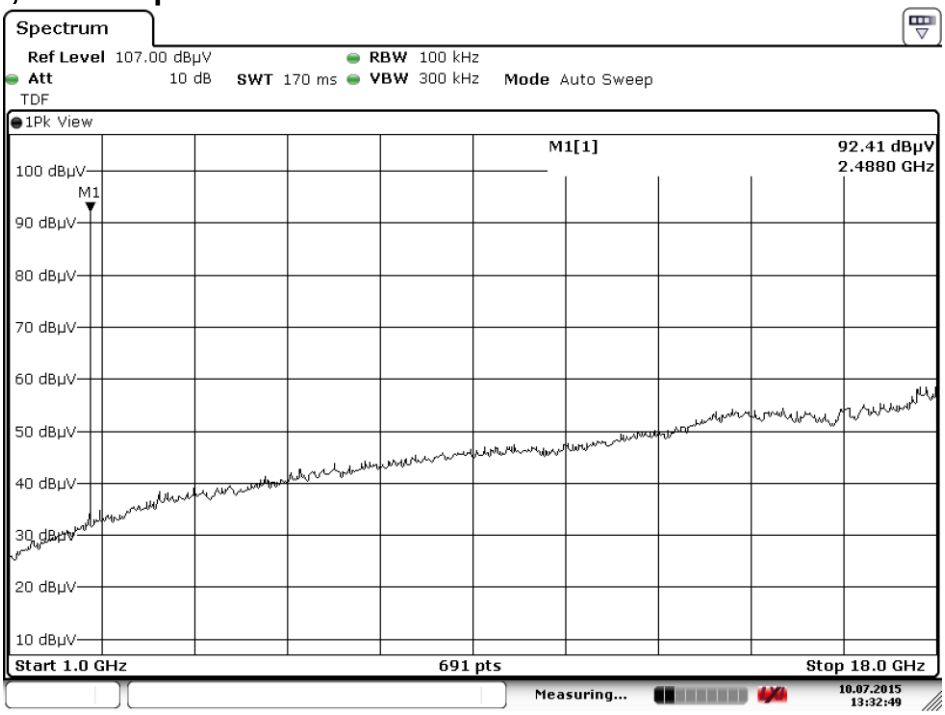
Date: 17.JUL.2015 10:21:35

10)Ch. High, Horizontal polarization for 0.03 < F < 1 GHz



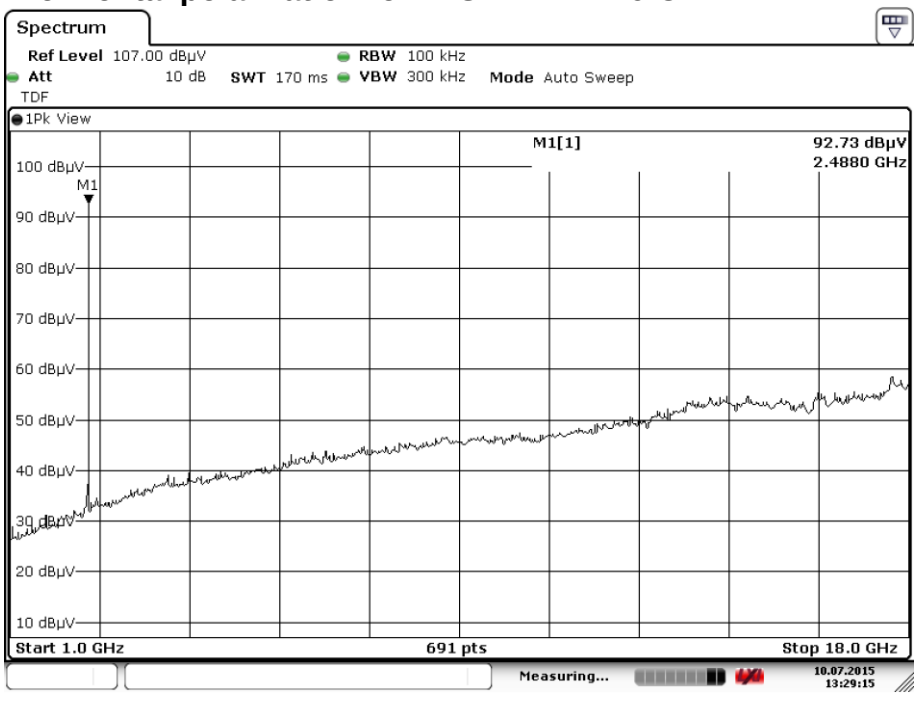
Date: 17.JUL.2015 10:30:48

11)Ch. High, Vertical polarization for 1 GHz ≤ F < 18 GHz



Date: 10.JUL.2015 13:32:49

12)Ch. High Horizontal polarization for 1 GHz ≤ F < 18 GHz

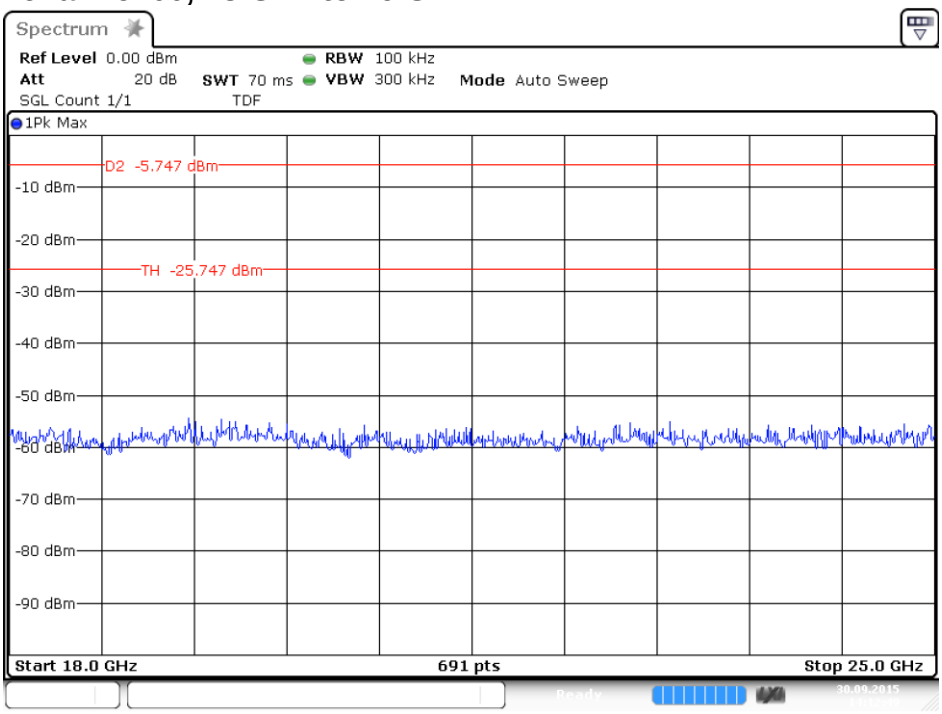


Date: 10.JUL.2015 13:29:15

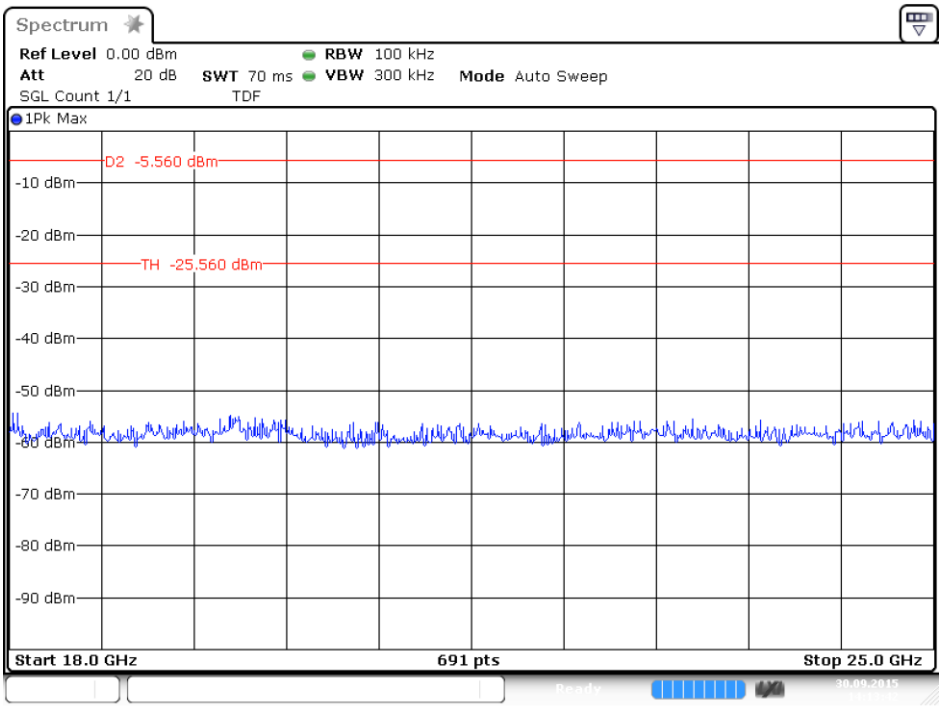
13)All channels, horizontal and vertical polarizations (18 ≤ F < 26 GHz)

Since no emissions higher than on the third harmonic frequency are found, as shown in the preceding graphs, measurements in the frequency range 18 to 26 GHz were considered not necessary. To confirm this a conducted pre-scan has been done, which can be seen in the plot on the next page.

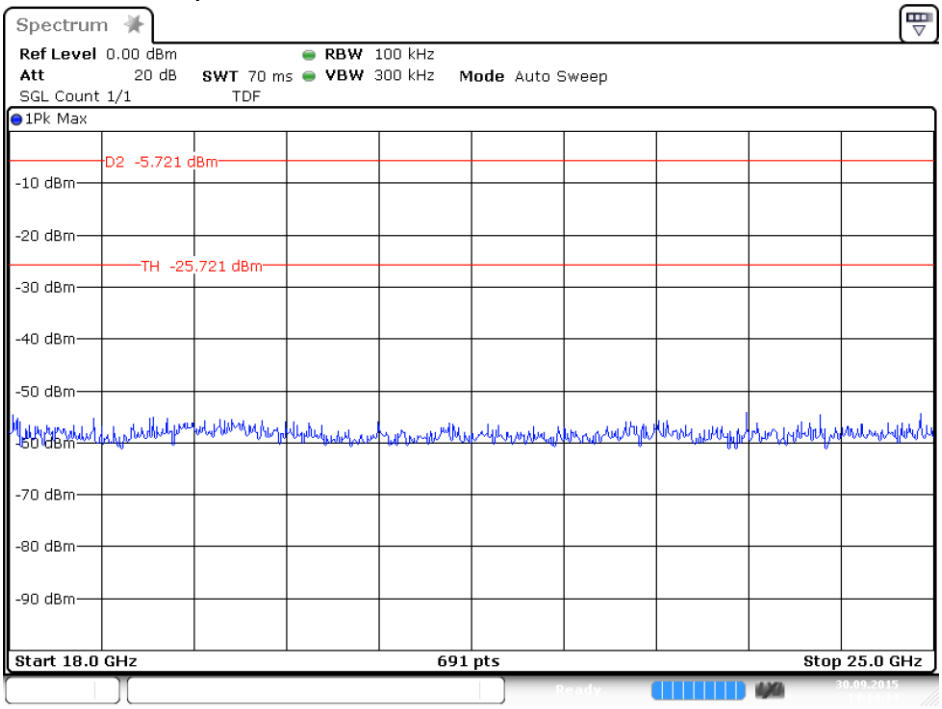
14)Pre-scan channel 00, 18 GHz to 26 GHz



15)Pre-scan channel 20, 18 GHz to 26 GHz

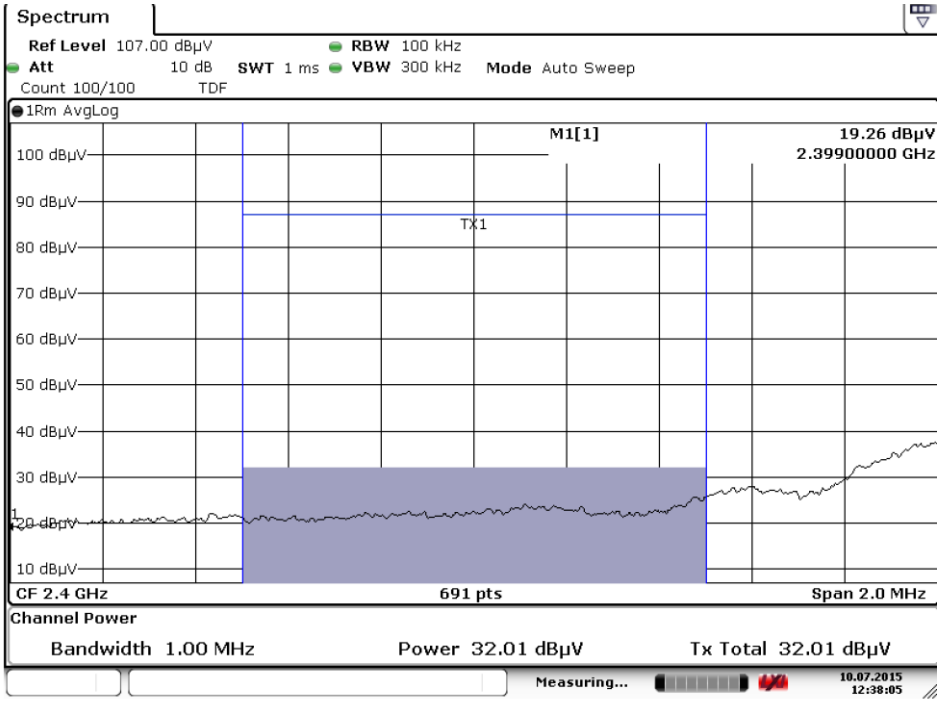


16)Pre-scan channel 39, 18 GHz to 26 GHz



17) Horizontal polarization for Lower Band edge measurement

(TX is transmitting at the low channel.)



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Measument uncertainty:

Horizontal Polarization	
30 – 200 MHz	4.5 dB
200 – 1000 MHz	3.6 dB
1000 – 18000 MHz	5.7 dB
Vertical Polarization	
30 – 200 MHz	5.4 dB
200 – 1000 MHz	4.6 dB
1000 – 18000 MHz	5.7 dB

5.5 AC conducted emissions measurement

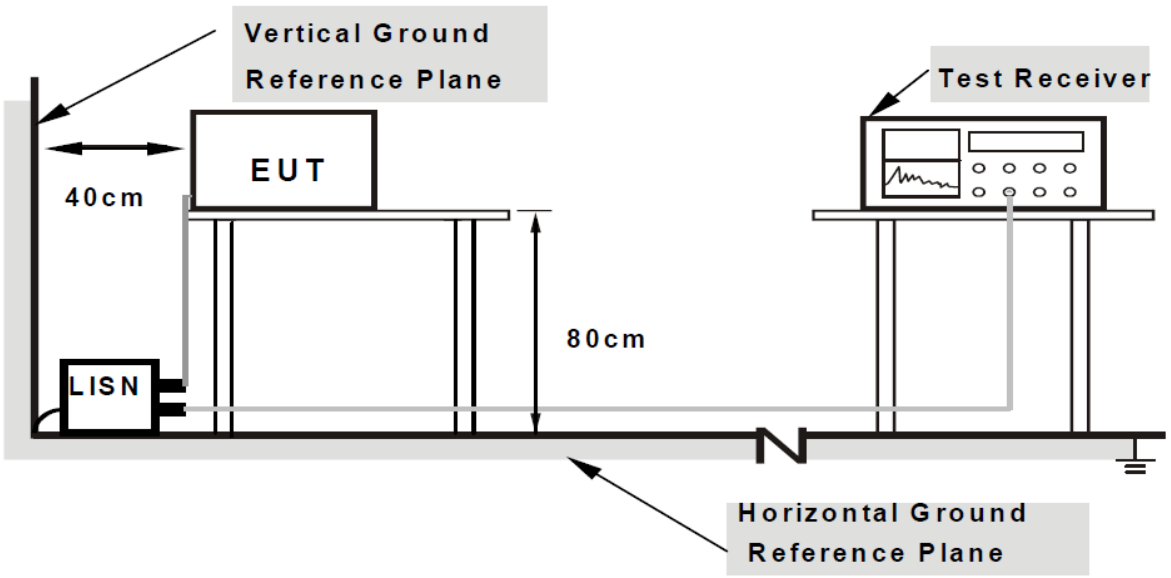
5.5.1 Limit

According to the FCC part 15C, §15.207(a)

5.5.2 Measuring instruments

The measuring instruments are listed in section 3.4 of this report.

5.5.3 Test setup

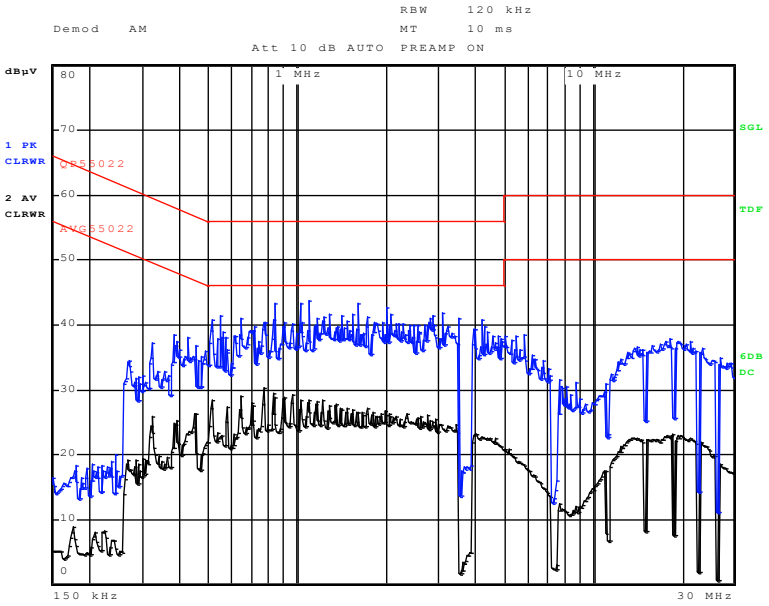


5.5.4 Test procedure

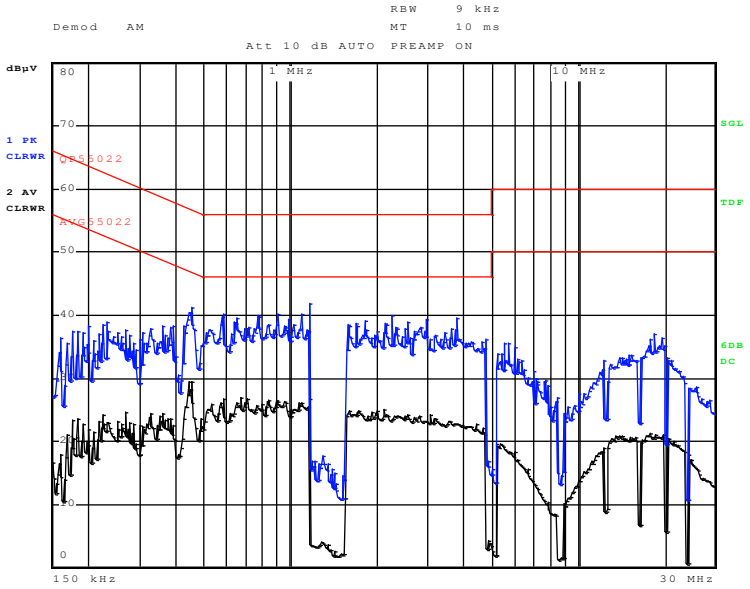
1. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/50 µH of coupling impedance for the measuring instrument.
2. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
3. The Frequency range from 150 kHz to 30 MHz was searched. Emission levels under (Limit -20 dB) were not recorded.
4. All modes of operation were investigated and worst-case emissions are reported.

5.5.5 Test results for the USB Travel Charger

Neutral:

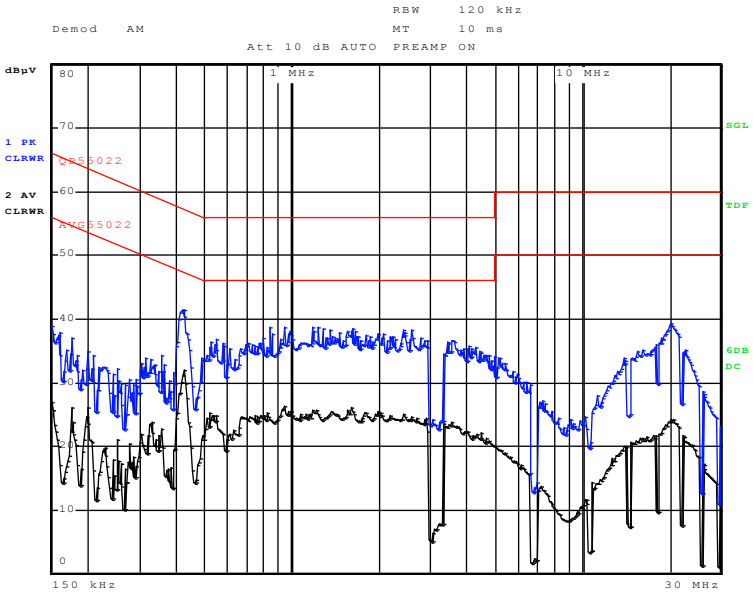


Phase:

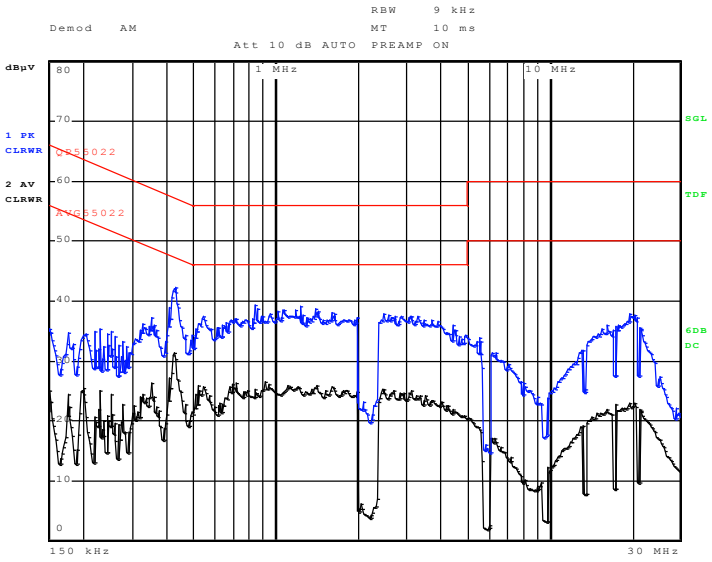


5.5.6 Test results for BC_EX_SM14_USB_Cable-1

Neutral:



Phase:



Uncertainty: + 3.1 / -3.1 dB

5.6 Antenna Requirement

According to FCC 15.03, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of sections 15.211, 15.213, 15.217, 15.219 or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

5.6.1 Test results

This product has permanent antenna, fulfilling the requirement of this section.

This is the last page of this test report.