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## **6.4 Test Software**

A continuous transmit or receive mode could be initiated by using test software as supplied by Intel Corporation. The test software was used to define various different operational modes of the EUT for the purpose of compliance testing. The version of the test software, as supplied by Intel Corporation and used during all tests is:

Test software : DRTU 1.6.0-0510  
Driver : 16.0.0.17

This software was running on a laptop computer (AUX1). It was used to enable the test operation modes listed in section 4.2 as appropriate.

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## 6.5 Special Accessories and Auxiliary Equipment

The product has been tested together with the following additional accessories:

4. AUX1

Product: Laptop Computer  
Brand: Lenovo  
Model: 9456-HTG  
Serial Number: L3-BF847 07/02  
Remark: property applicant, host for testsoftware and AUX2

5. AUX2

Product: Test Jig  
Brand: Intel  
Model: NGFF Extension Rev. 01  
Rated Voltage: 3.3 Vdc  
Antenna: Internal, integrated on the PCB  
Remarks: used for Antenna-port conducted tests

6. AUX3

Product: Reference antennas  
Manufacturer: SkyCross Electronics (Shenzhen) Co.,Ltd  
Brand: SkyCross Electronics (Shenzhen) Co.,Ltd  
Gain at 5G: 5.0 dBi (declared by applicant)  
Remarks: used for radiated tests

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## **7. Test Results**

### **7.1 Technical Requirements**

#### **7.1.1 Voltage Requirements**

##### **RESULT: Pass**

Requirements:

FCC 15.31(e)

For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

Verdict:

The EUT has an internal voltage regulator to supply the RF circuit. Hence it complies with the power supply requirements.

#### **7.1.2 Antenna Requirements**

##### **RESULT: Pass**

Requirements:

FCC 15.203 and IC RSS-Gen section 7.1.2

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.

Verdict:

The EUT has two non standard PIFA antenna connectors which complies with the requirements.

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### **7.1.3 Restricted Bands of Operation**

#### **RESULT: Pass**

Requirements:

FCC 15.205 and IC RSS-Gen section 7.2.2

Only spurious emissions are permitted in any of the restricted frequency bands, unless otherwise specified.

Verdict:

The EUT operation frequency range is 5745 MHz to 5825 MHz range. Therefore only spurious emissions may be found in the restricted bands of operation and the EUT complies with the restricted frequency band requirement.

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## 7.2 Conducted Measurements at Antenna Port

### 7.2.1 Conducted Output Power

#### RESULT: Pass

Date of testing: 2013-01-14 / 2013-03-15

Requirements:

FCC 15.247(b)(3)

For systems using digital modulation in the 5745 MHz to 5825 MHz band, the maximum peak output power is 1W (+30dBm).

RSS Gen : The e.i.r.p. shall not exceed 4 W (36 dBm).

Test procedure:

ANSI C63.10: 2009 and ANSI C63.10:2009

KDB Publication No. 558074 D01: Measurement of Digital Transmission Systems Operating under Section 15.247.

The Peak Conducted Output Power was measured using the channel integration method according to option 2 in KDB 558074 D01.

The maximum peak output power (conducted) was measured at the antenna connector with a spectrum analyzer. The final measurement takes into account the loss generated by all the involved cables.

In the measure-and-sum approach for MIMO mode, the conducted emission level (e.g., transmit power or power in specified bandwidth) is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically to determine the total emission level from the EUT. Summing is performed in linear power units (mW—not dBm).

The EIRP power (dBm) is calculated by adding the declared maximum antenna gain to the measured conducted power. For MIMO mode, the Guidance on directional Gain calculations according to the *Guidance for Emission Testing of Transmitters with Multiple Outputs in the Same Band 662911 D01 Multiple Transmitter Output v01r02 dated 9/26/2012* was used.

The number of transmit antennas (NANT) are 2 and the number of spatial streams (Nss) are 2 and therefore the Array Gain is 0 dB.

Notes:  $\text{mW} = 10^{(\text{dBm}/10)}$   
 $\text{dBm} = 10 \times \log(\text{mW})$

**plots : Peak power plots,**

Figures 1a, 1b and 1c, through 10a,10b,10c showing plots of the Peak Power outputs, correction factors included in the reading.

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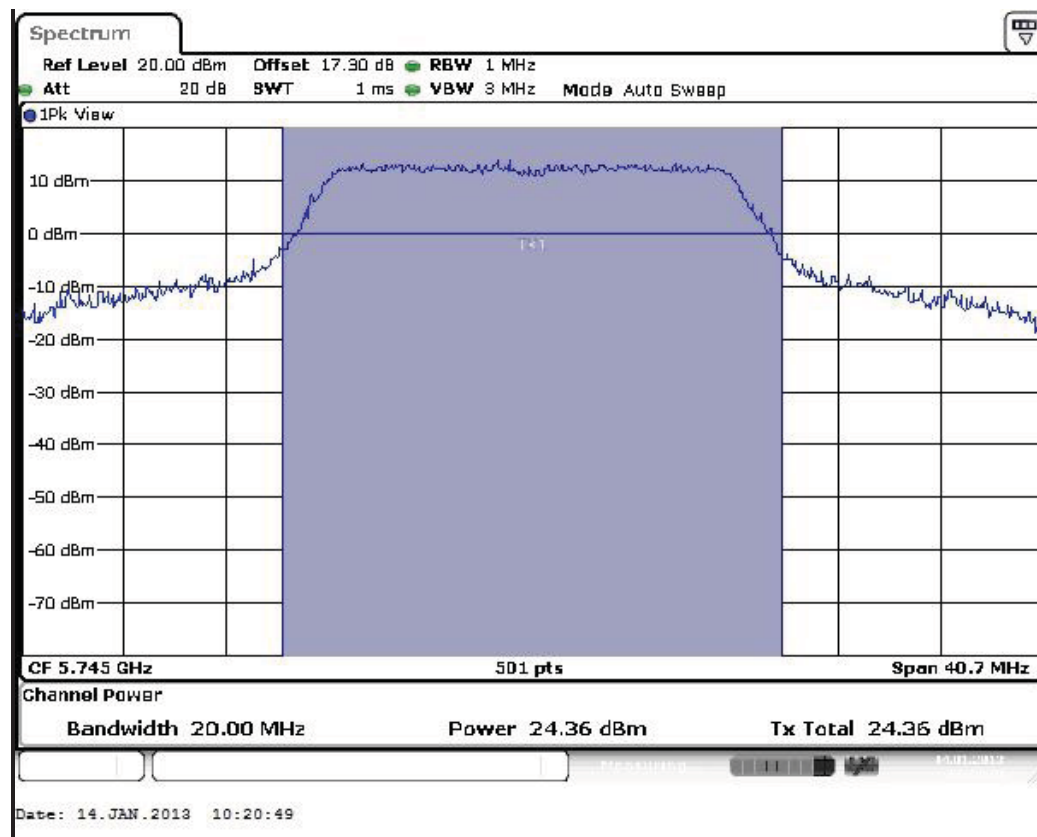
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**Table 4: Conducted Output Power**

Operation mode: 6Mb OFDM, Antenna 2

Freq- uency [MHz]	Gain control setting (dB)	Output Power [dBm]	Output Power [mW]	Limit [dBm]	Limit [mW]	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	Plot nr.
5745	31.0	24.36	272.9	+30	1000	5.0	29.36	863.0	A
5785	32.5	24.15	260.0	+30	1000	5.0	29.15	822.2	B
5825	31.5	23.74	236.6	+30	1000	5.0	28.74	748.2	C

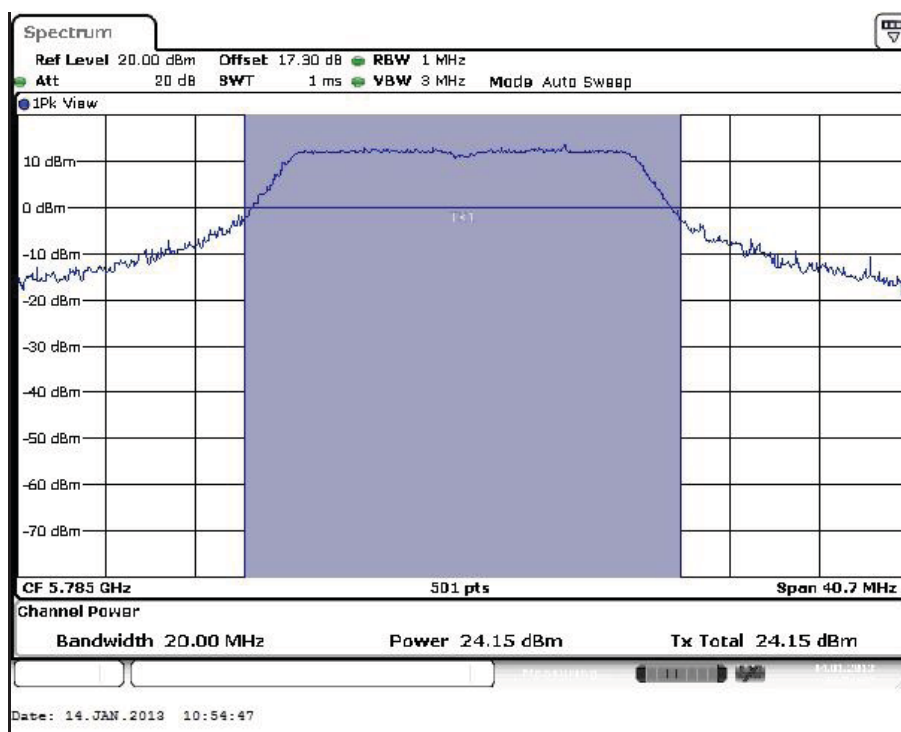


Plot A

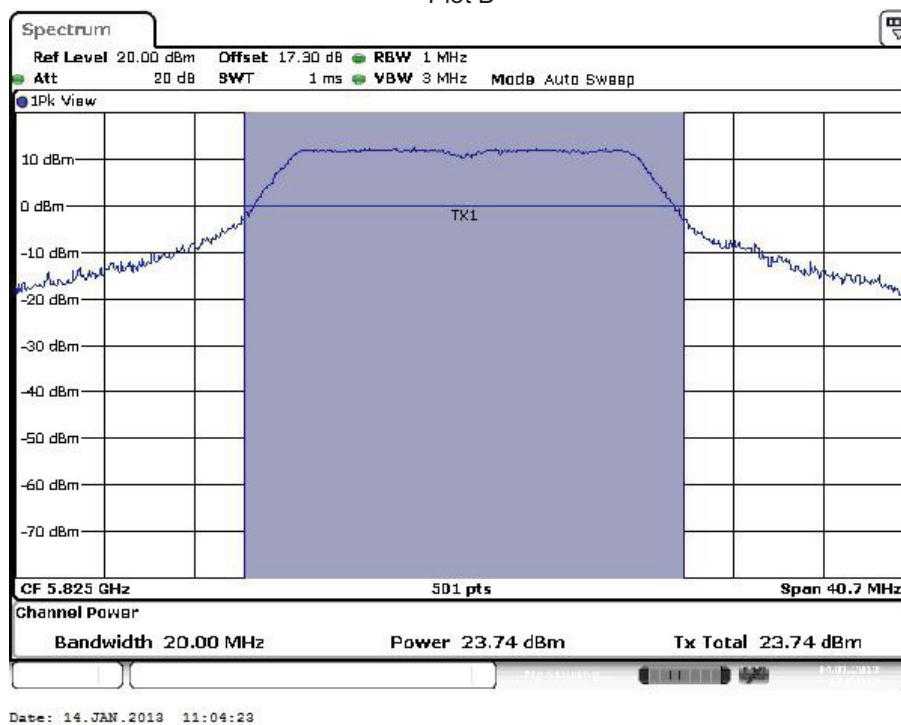
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Plot B



Plot C

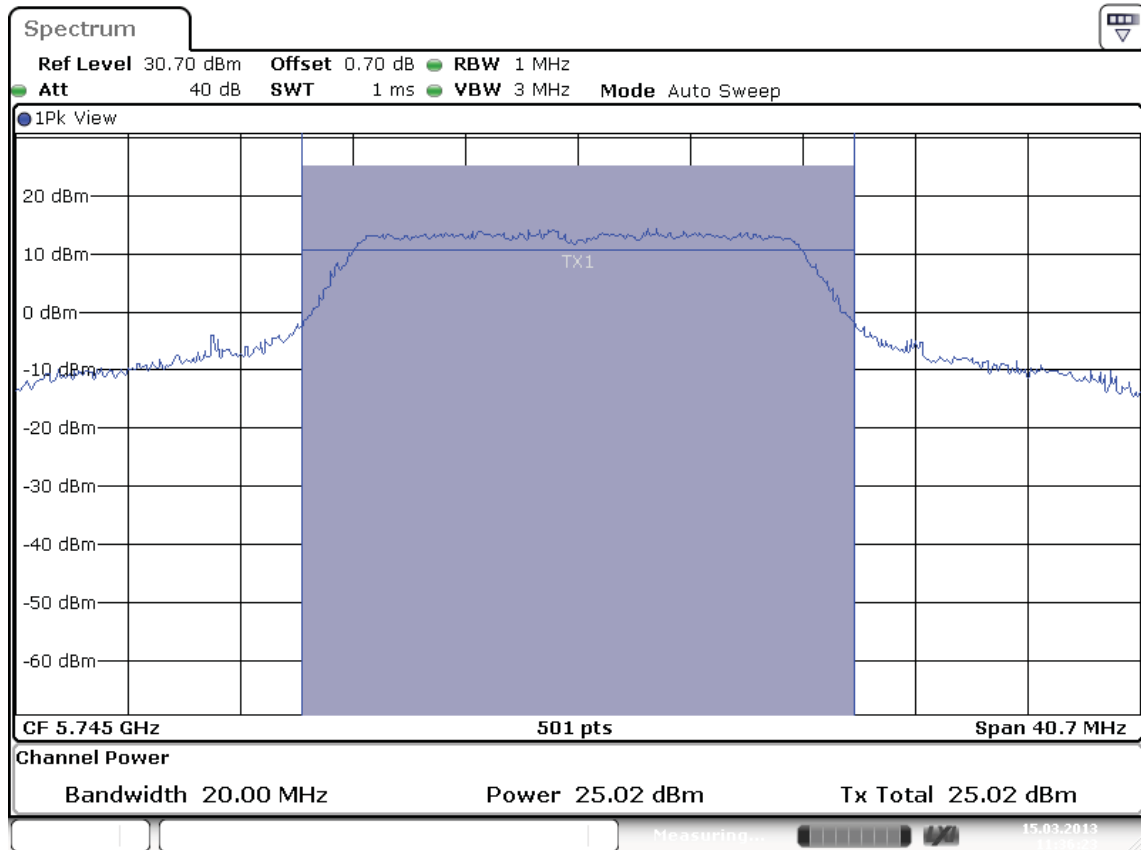
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Operation mode: 6Mb OFDM, Antenna 1

Frequency [MHz]	Power setting [dBm]	Output Power [dBm]	Output Power [mW]	Limit [dBm]	Limit [mW]	Antenna Gain [dBi]	EIRP [dBm]	EIRP [mW]	Plot number
5745	18.0	25.0	316.2	+30	1000	5.0	30.0	1000.0	A
5785	17.5	25.4	346.7	+30	1000	5.0	30.4	1096.5	B
5825	18.0	25.5	354.8	+30	1000	5.0	30.5	1122.0	C



Date: 15.MAR.2013 11:36:23

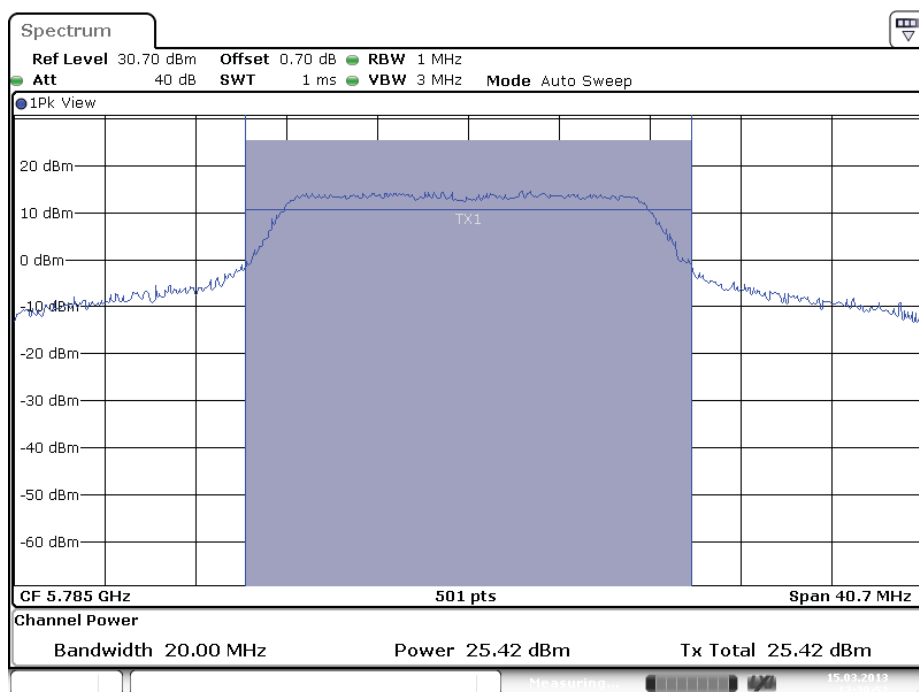
Plot A



Test Report No.:

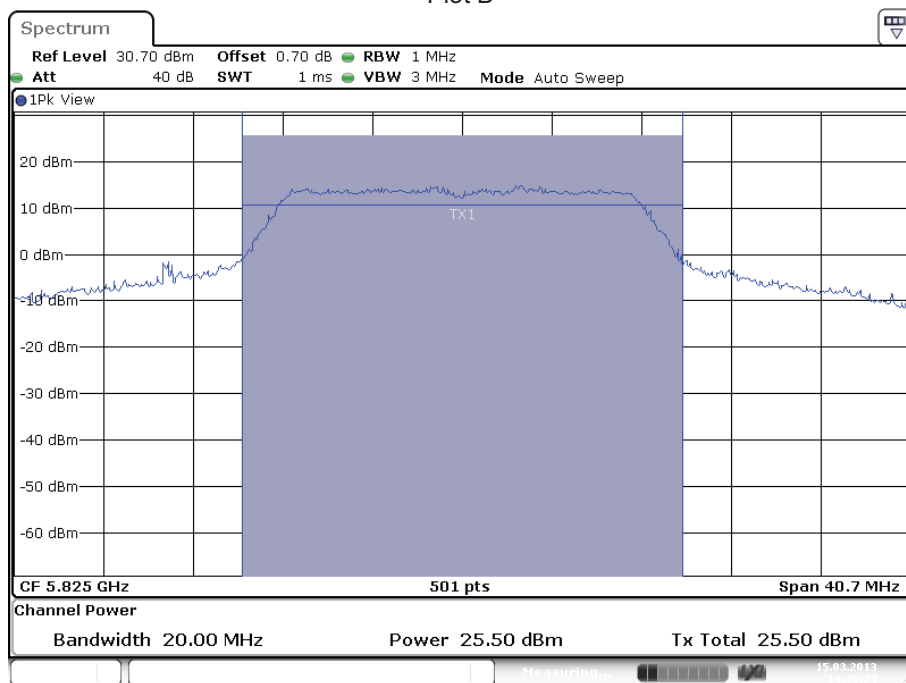
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Date: 15.MAR.2013 12:39:52

Plot B



Date: 15.MAR.2013 14:35:25

Plot C

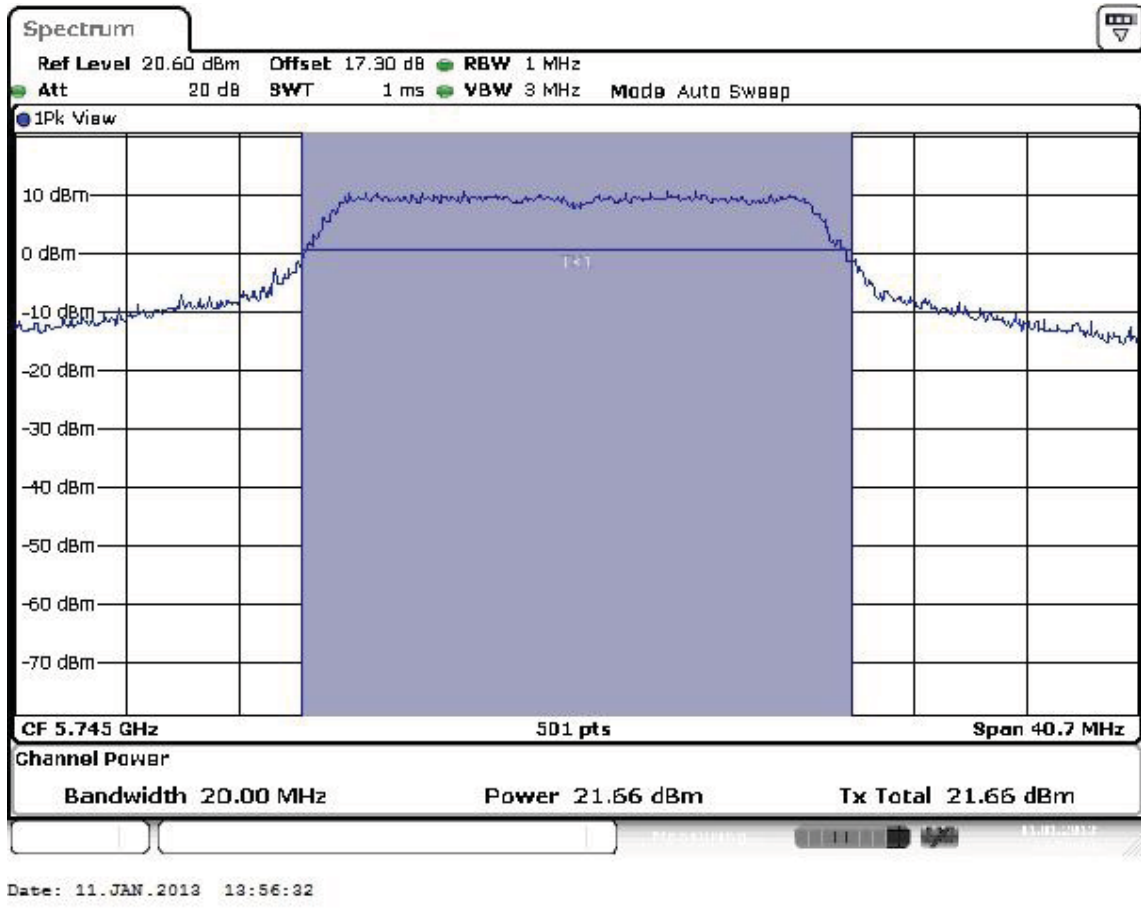
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Operation mode: HT4-20MHz, Antenna 1

Frequency [MHz]	Gain Control setting (dB)	Output Power [dBm]	Output Power [mW]	Limit [dBm]	Limit [mW]	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	Plot number
5745	32.5	21.66	146.6	+30	1000	5.0	26.66	463.4	A
5785	34.0	24.17	261.2	+30	1000	5.0	29.17	826.0	B
5825	32.0	24.01	251.8	+30	1000	5.0	29.01	796.2	C

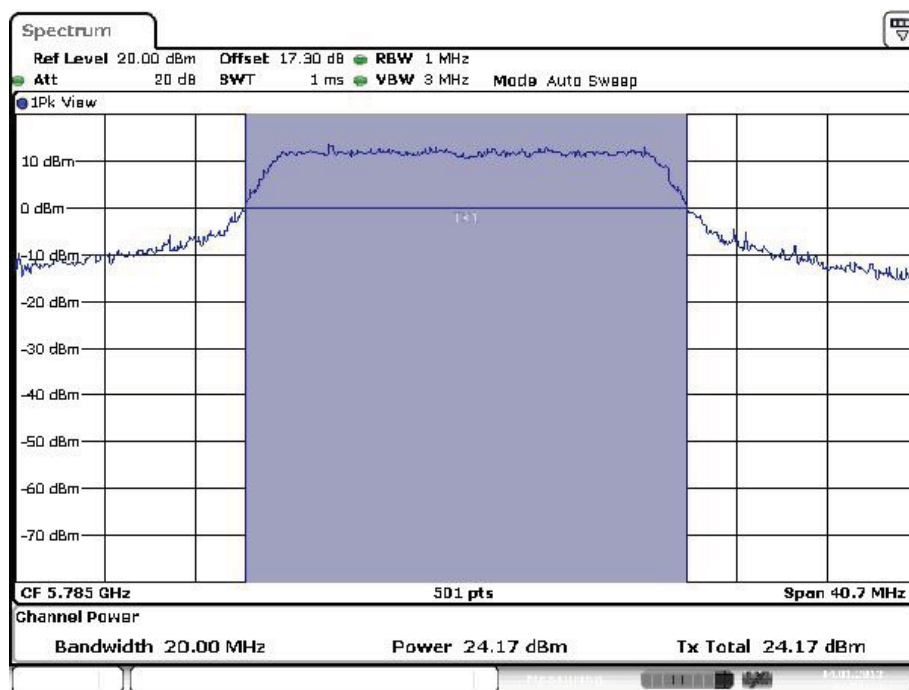


Plot A

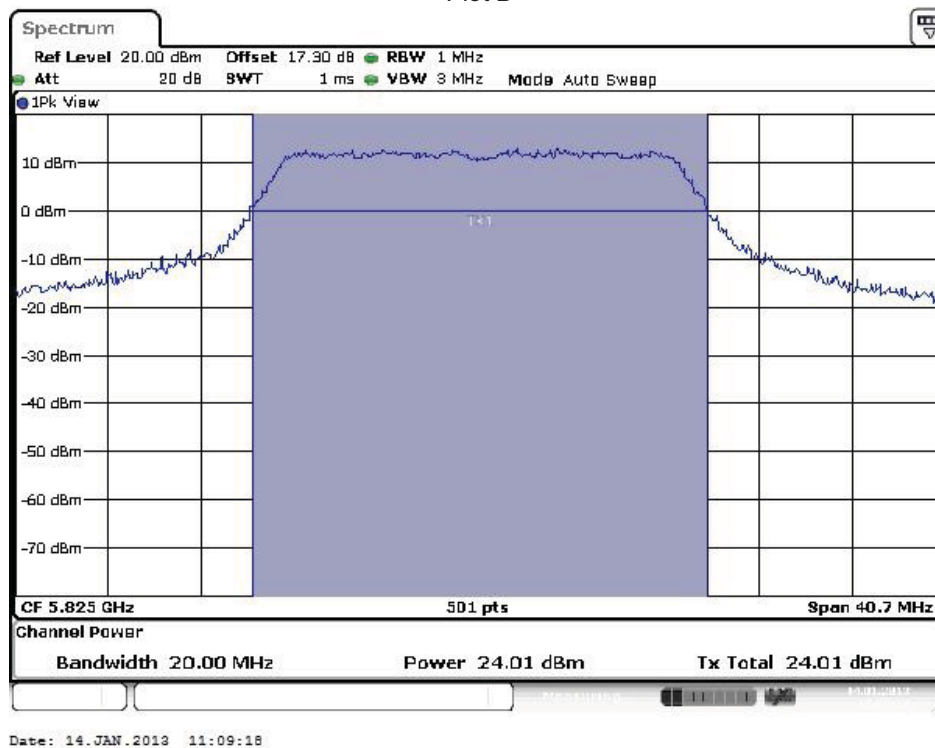
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Plot B



Plot C

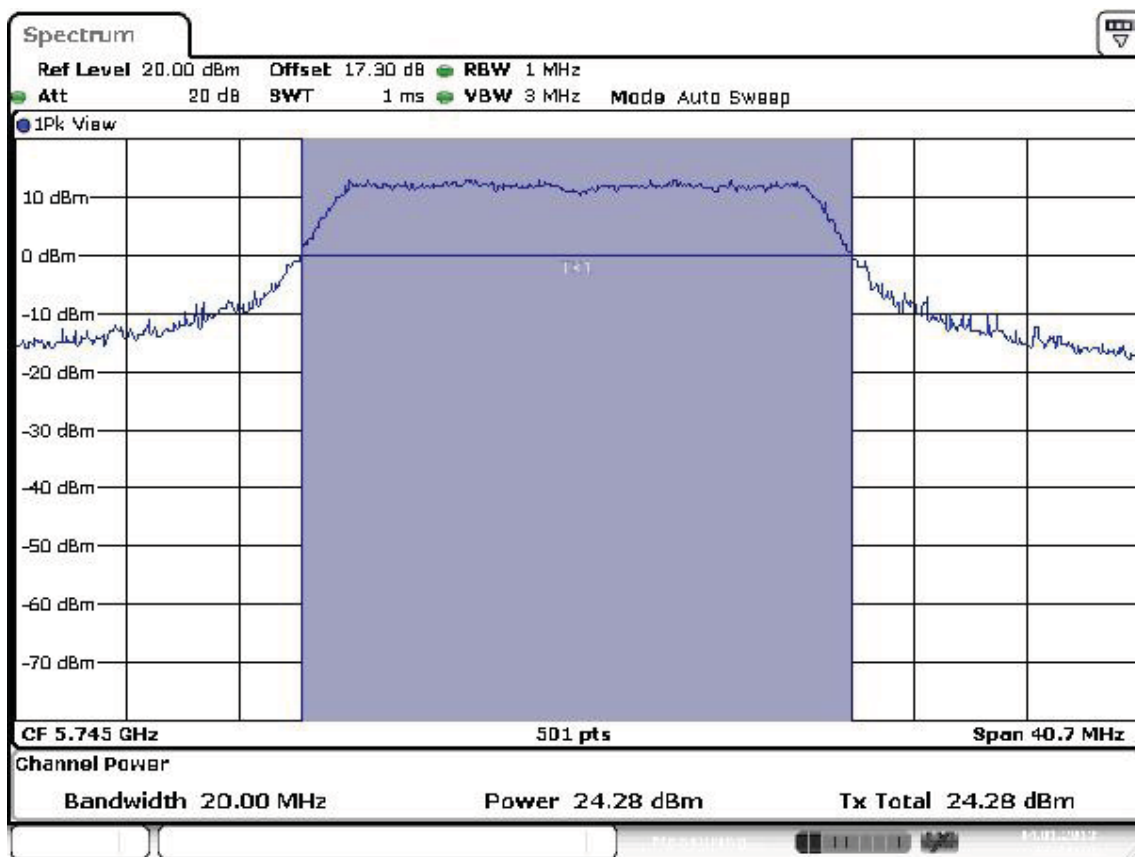
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Operation mode: HT4-20MHz, Antenna 2

Frequency [MHz]	Gain Control setting (dB)	Output Power [dBm]	Output Power [mW]	Limit [dBm]	Limit [mW]	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	Plot number
5745	32.0	24.28	267.9	+30	1000	5.0	29.28	847.2	A
5785	32.5	24.45	278.6	+30	1000	5.0	29.45	881.0	B
5825	32.0	24.19	262.4	+30	1000	5.0	29.19	829.9	C



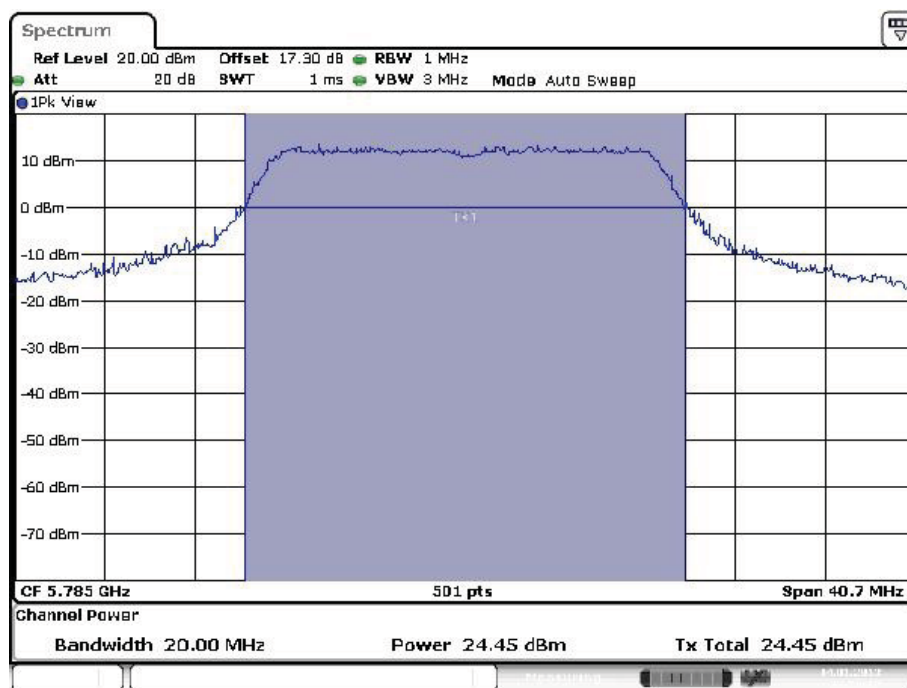
Date: 14.JAN.2013 10:22:21

Plot A

Test Report No.:

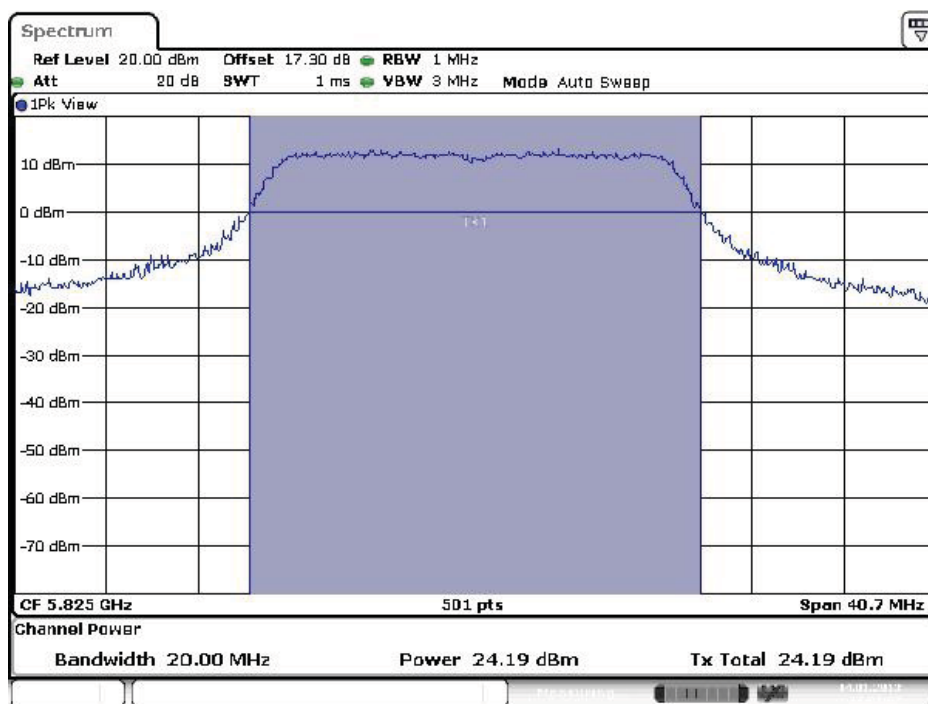
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Date: 14.JAN.2013 10:56:07

Plot B



Date: 14.JAN.2013 11:07:02

Plot C

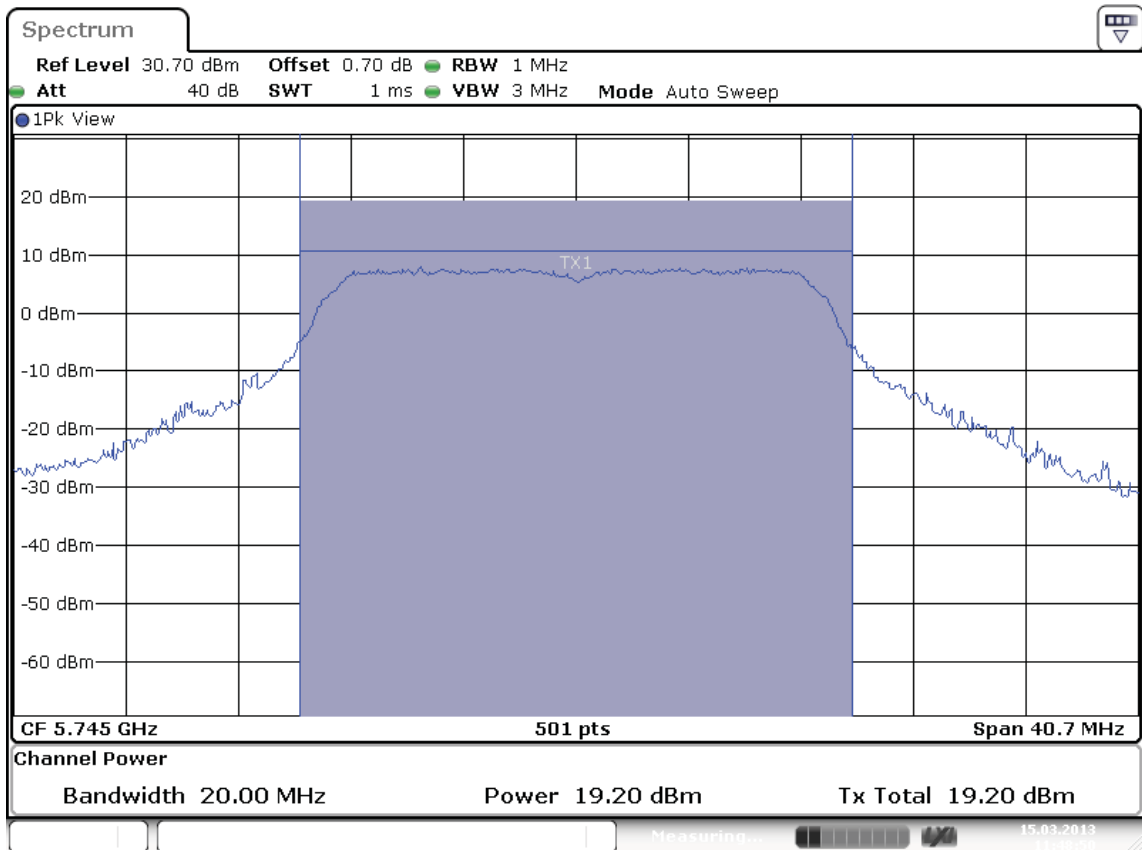
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Operation mode: HT8-20 MHz, Antenna 1+2

Frequency [MHz]	Gain control setting (dB)	Output Power Antenna 1 [dBm]	Output Power Antenna 2 [dBm]	Output 1+2 [mW]	Limit [dBm]	Limit [mW]	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	Plot number
5745	27.0/27.0	19.20	19.20	166.0	+30	1000	5.0	27.20	524.8	A
5785	27.5/27.5	19.22	19.11	165.2	+30	1000	5.0	27.18	522.4	B
5825	27.5/27.5	18.93	18.60	150.6	+30	1000	5.0	26.77	475.3	C



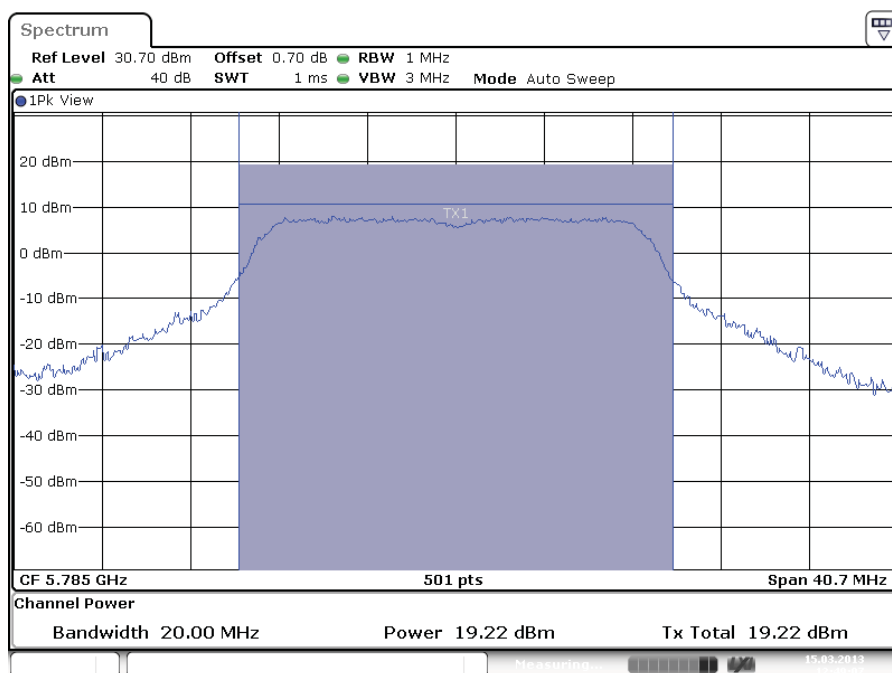
Date: 15.MAR.2013 11:48:50

Plot A Antenna 1

Test Report No.:

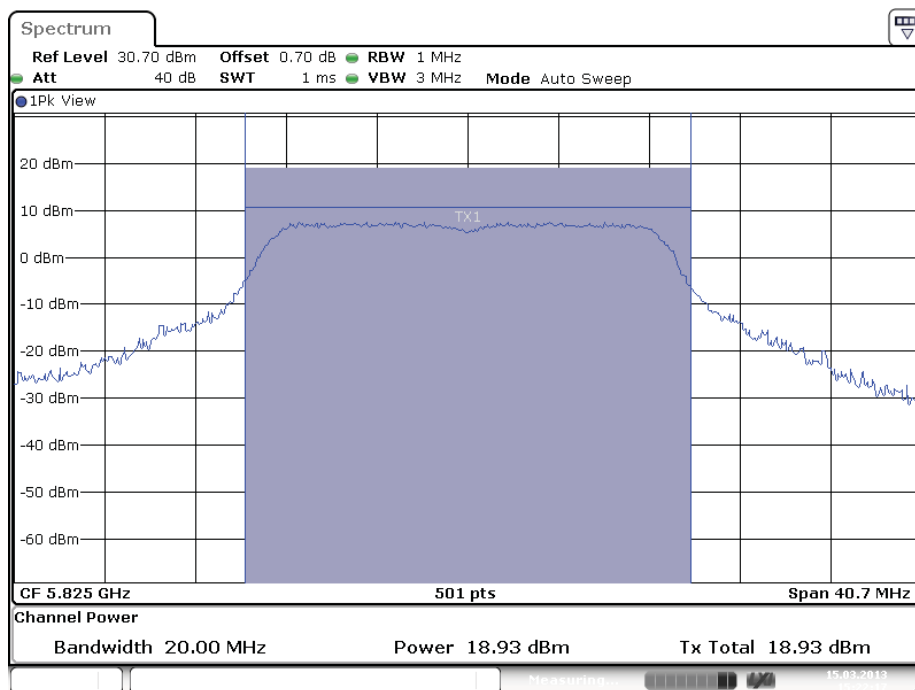
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Date: 15.MAR.2013 12:49:08

Plot B Antenna 1



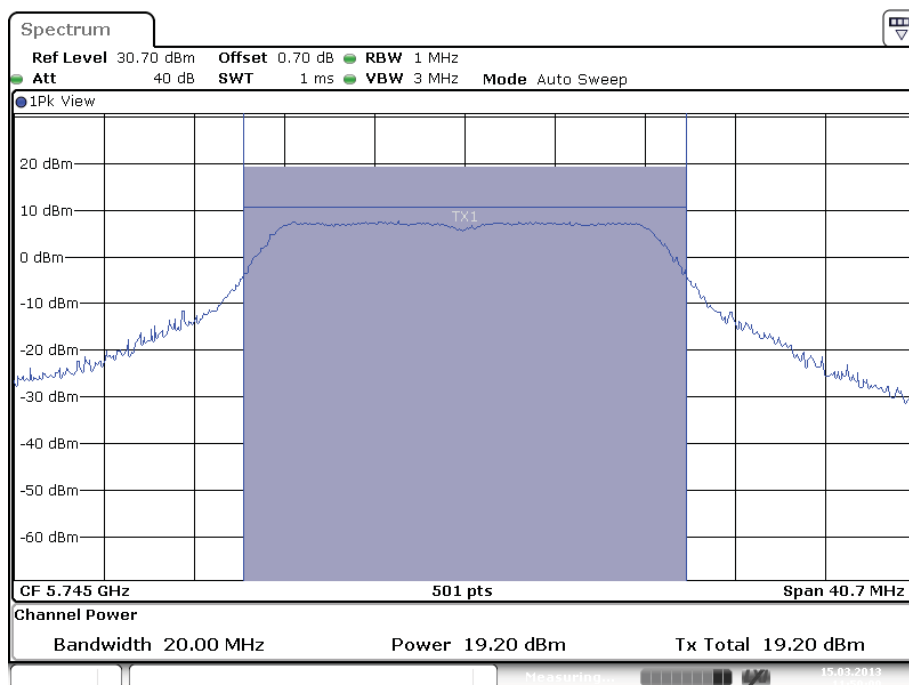
Date: 15.MAR.2013 15:22:17

Plot C Antenna 1

Test Report No.:

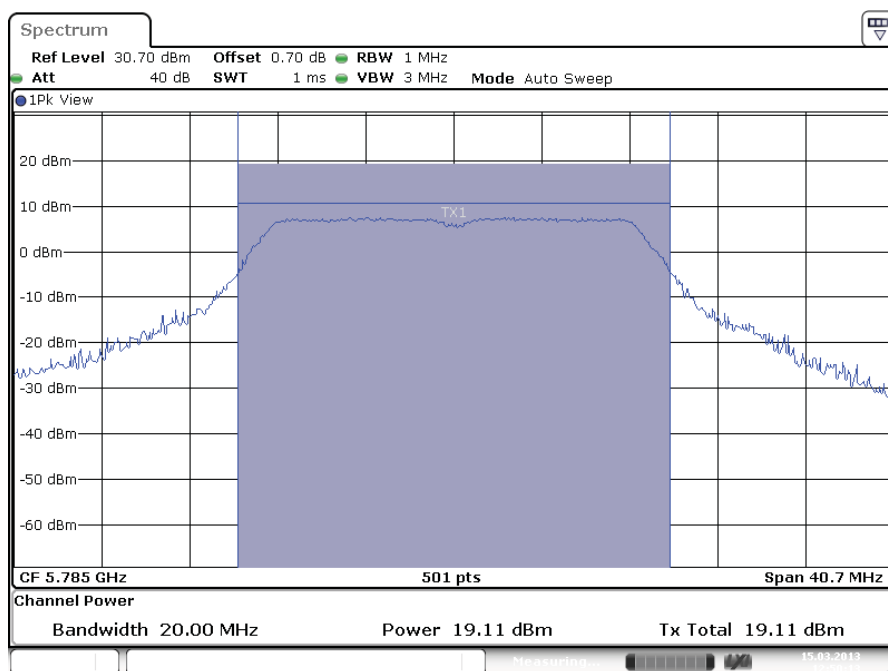
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Date: 15.MAR.2013 11:50:09

Plot A2 Antenna 2



Date: 15.MAR.2013 12:50:13

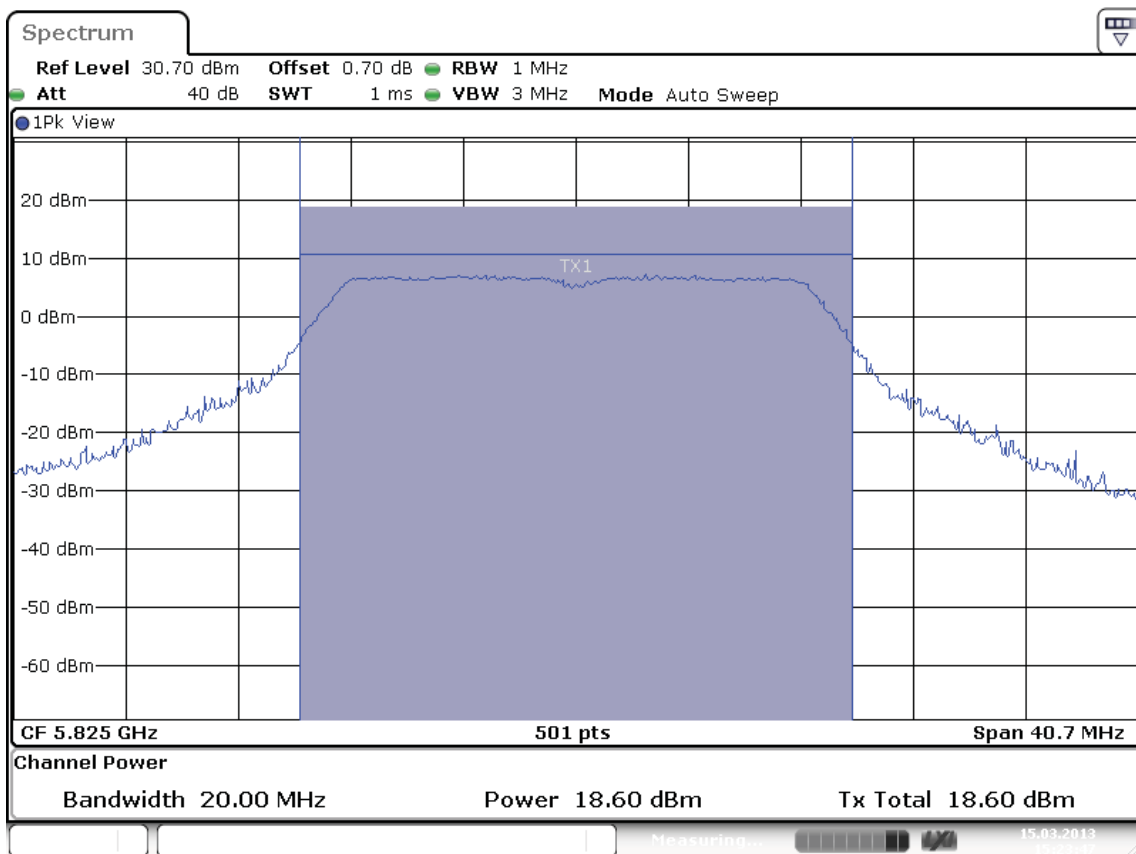
Plot B2 Antenna 2



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Date: 15.MAR.2013 15:23:47

Plot C2 Antenna 2

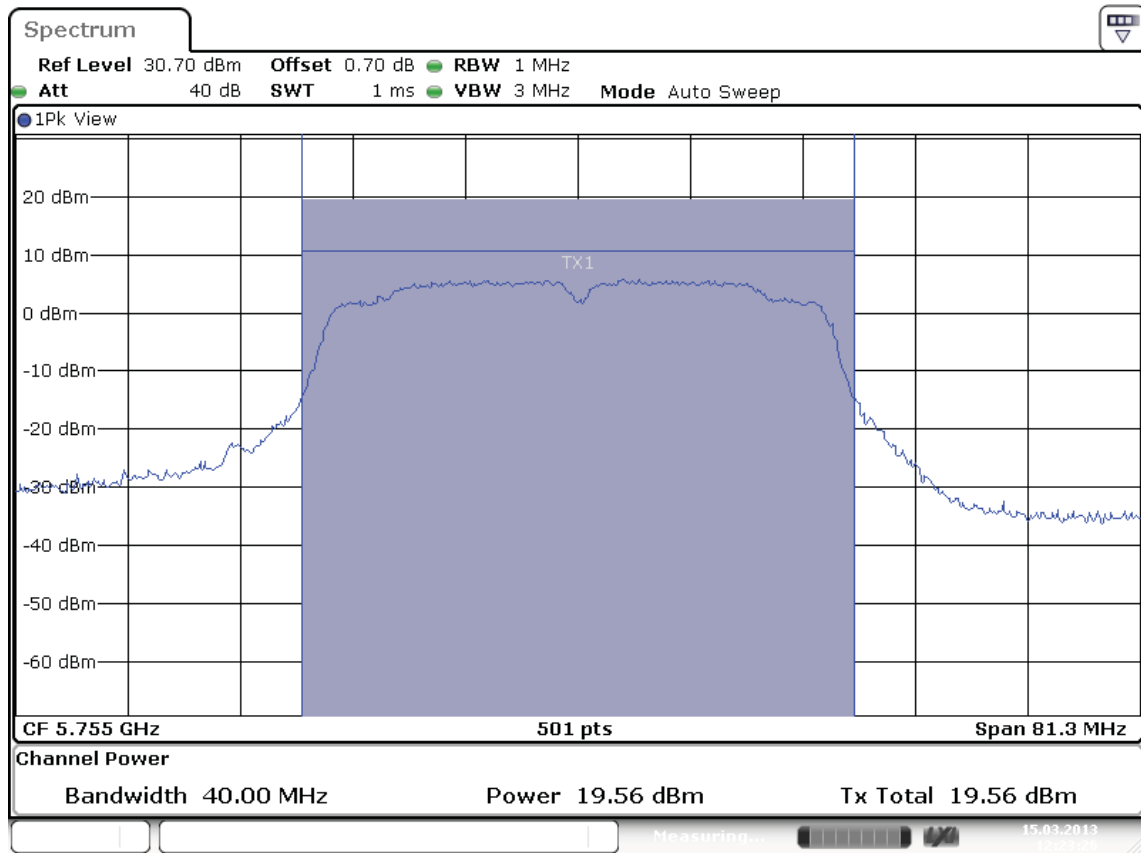
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Operation mode: HT4-40 MHz wide, Antenna 1

Frequency [MHz]	Power setting [dBm]	Output Power [dBm]	Output Power [mW]	Limit [dBm]	Limit [mW]	Antenna Gain [dBi]	EIRP [dBm]	EIRP [mW]	Plot number
5755	11.5	19.6	91.2	+30	1000	5.0	24.6	288.4	A
5795	11.0	19.2	83.2	+30	1000	5.0	24.2	263.0	B



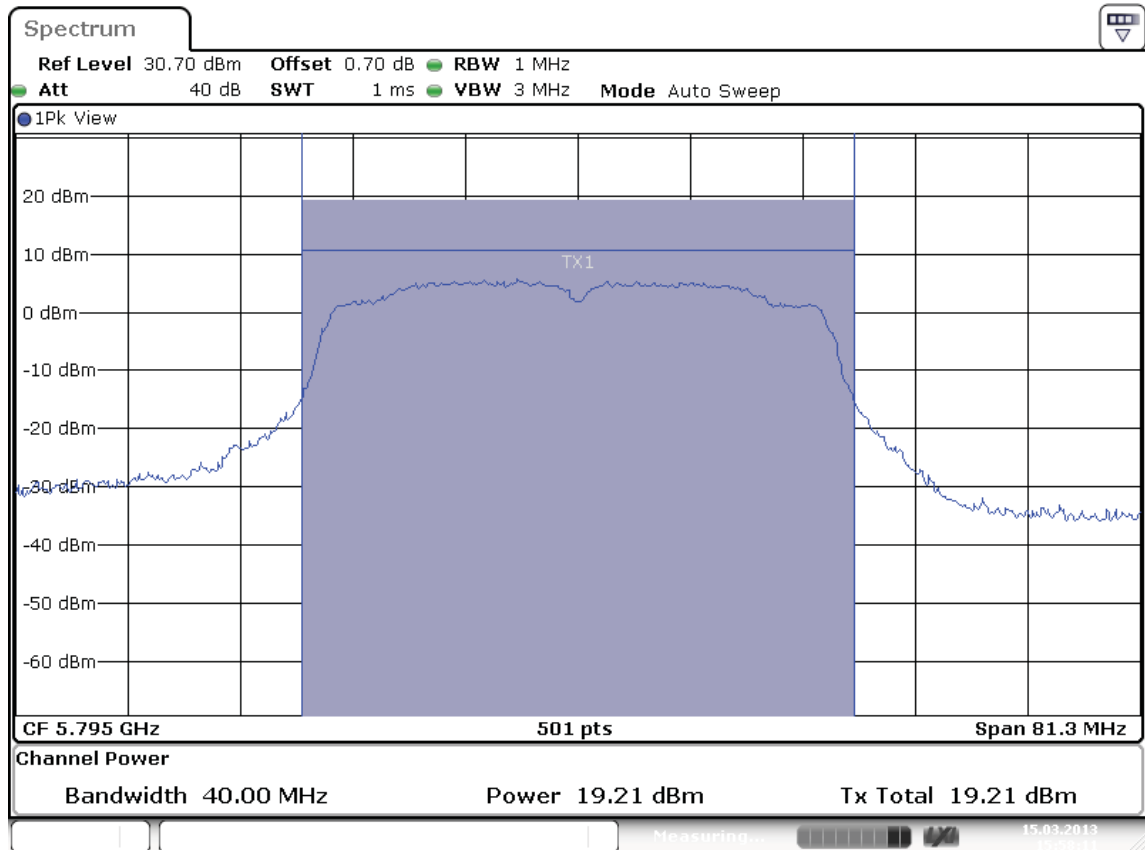
Date: 15.MAR.2013 12:23:27

Plot A

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Date: 15.MAR.2013 15:58:11

Plot B

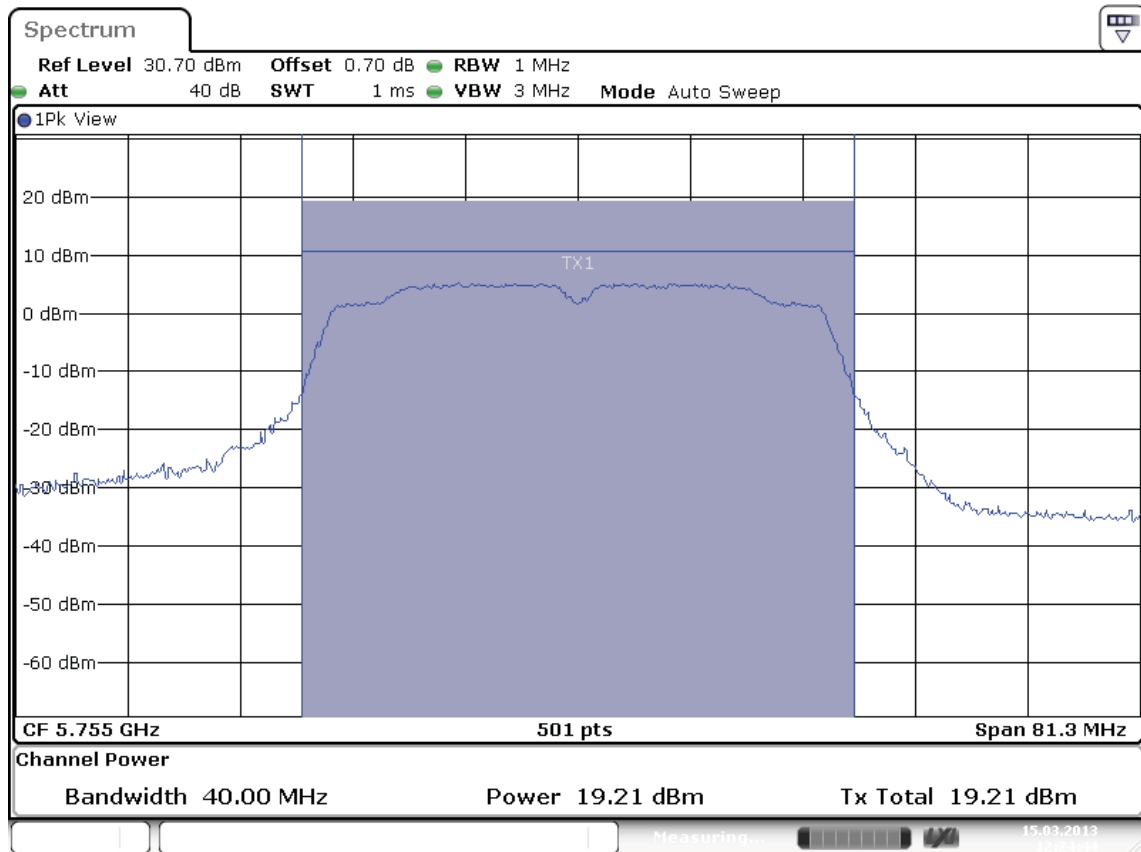
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Operation mode: HT4-40 MHz wide, Antenna 2

Frequency [MHz]	Power setting [dBm]	Output Power [dBm]	Output Power [mW]	Limit [dBm]	Limit [mW]	Antenna Gain [dBi]	EIRP [dBm]	EIRP [mW]	Plot number
5755	11.5	19.2	83.2	+30	1000	5.0	24.2	263.0	A
5795	10.5	19.2	83.2	+30	1000	5.0	24.2	263.0	B



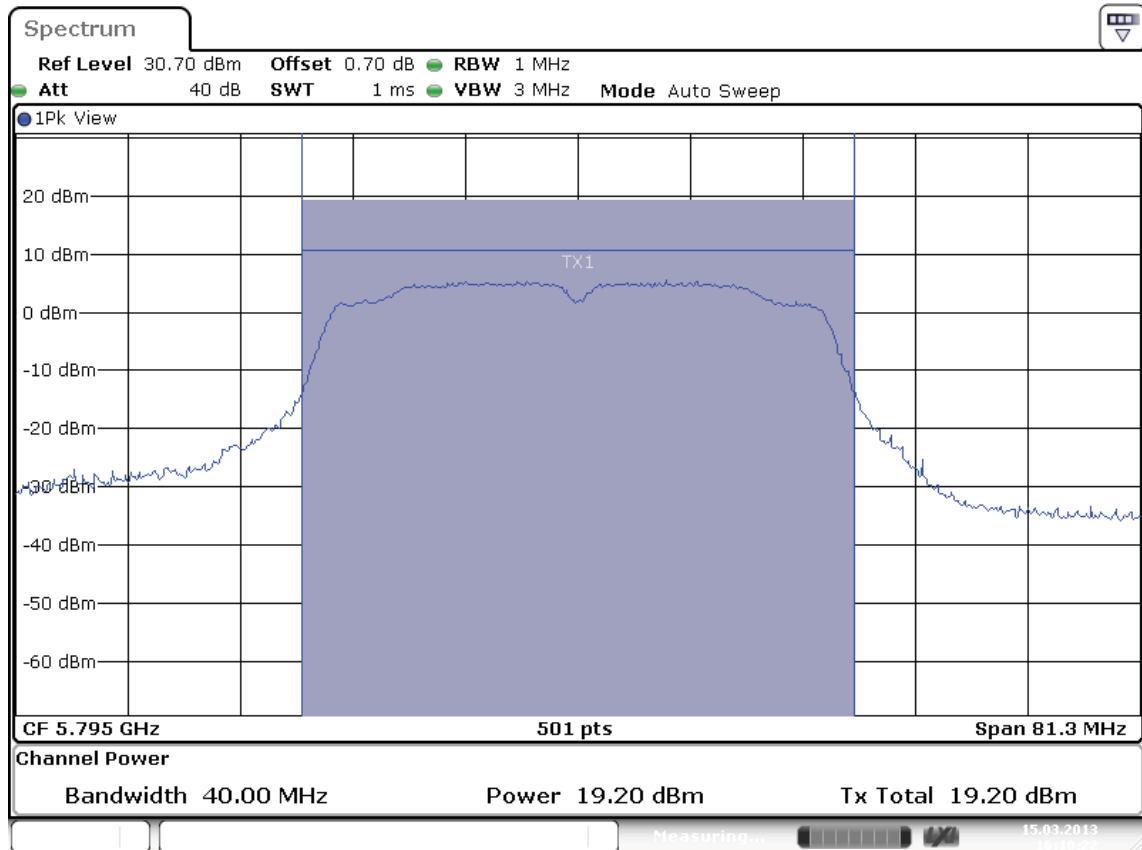
Date: 15.MAR.2013 12:24:44

Plot A

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Date: 15.MAR.2013 16:10:22

Plot B

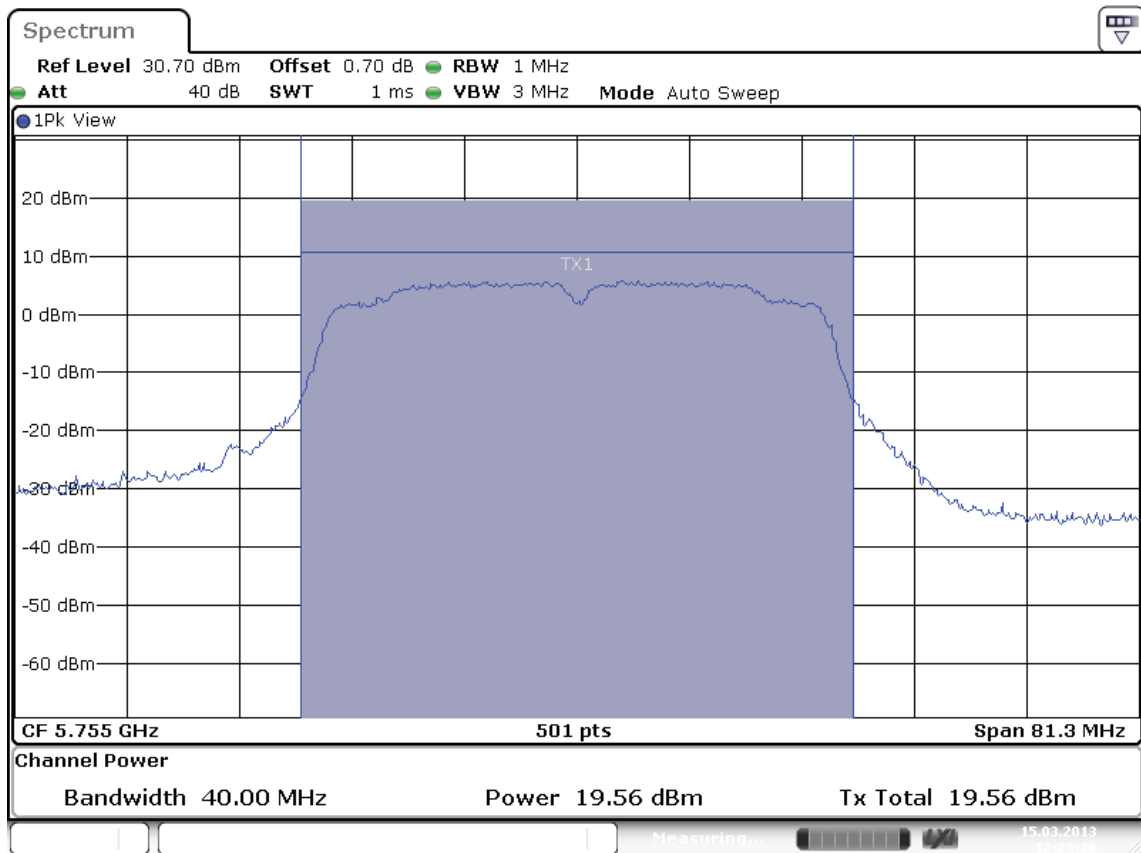
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Operation mode: HT8-40 MHz, Antenna 1+2

Frequency [MHz]	Power setting (dBm)	Output Power Ant1/Ant2 [dBm]	Output Power Ant1/Ant2 [mW]	Limit [dBm]	Limit [mW]	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	Plot number
5755	11.5/11.5	19.6/19.2	91.2/83.2	+30	1000	5.0	27.4	551.4	A
5795	11.0/11.0	19.2/19.2	83.2/83.2	+30	1000	5.0	27.2	526.1	B



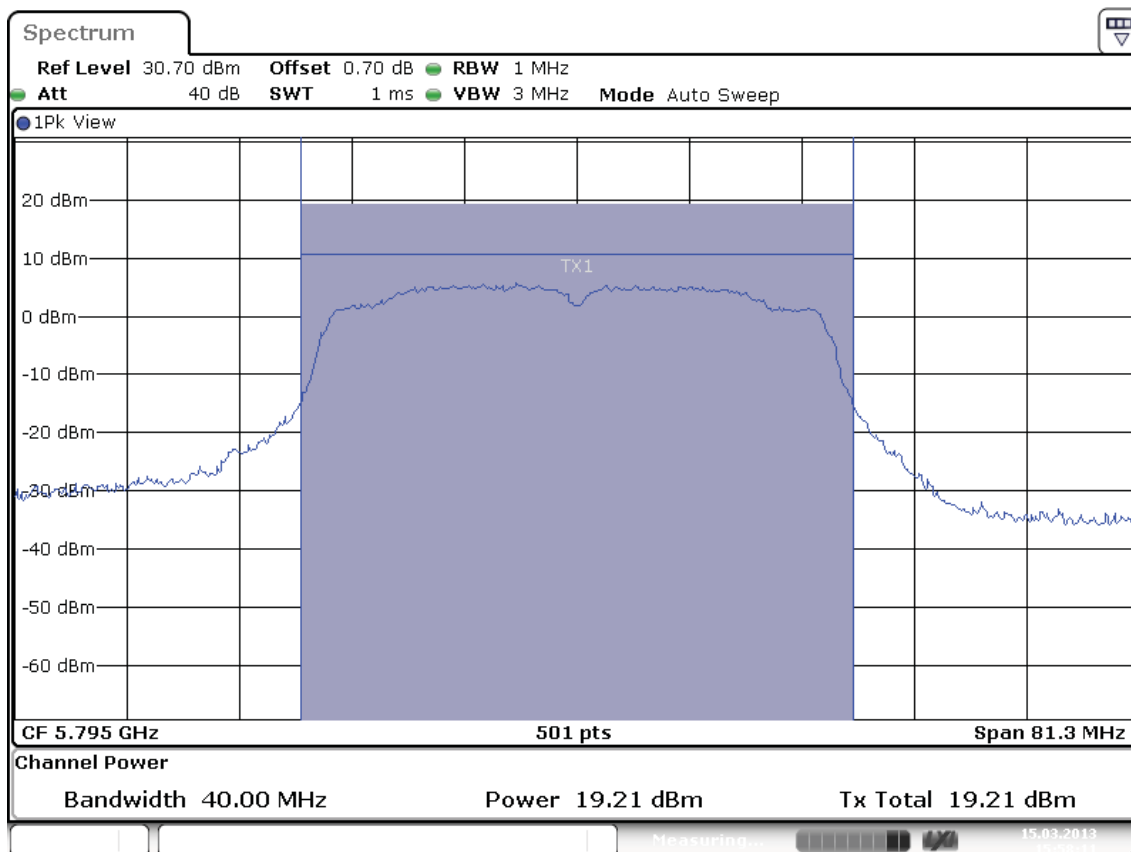
Date: 15.MAR.2013 12:23:27

Plot A1 Antenna1

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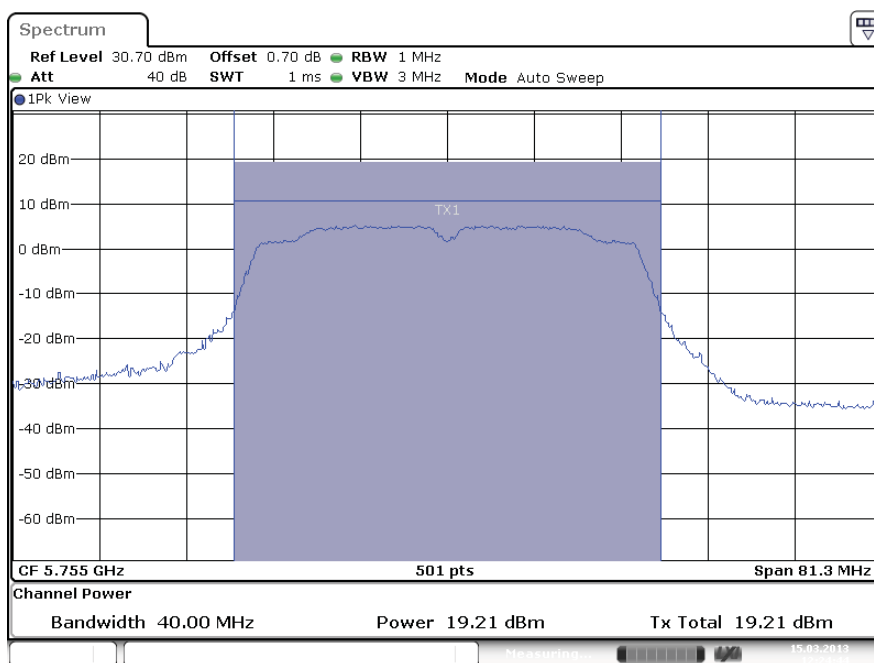
Date: 15.MAR.2013 15:58:11

Plot B1 Antenna1

Test Report No.:

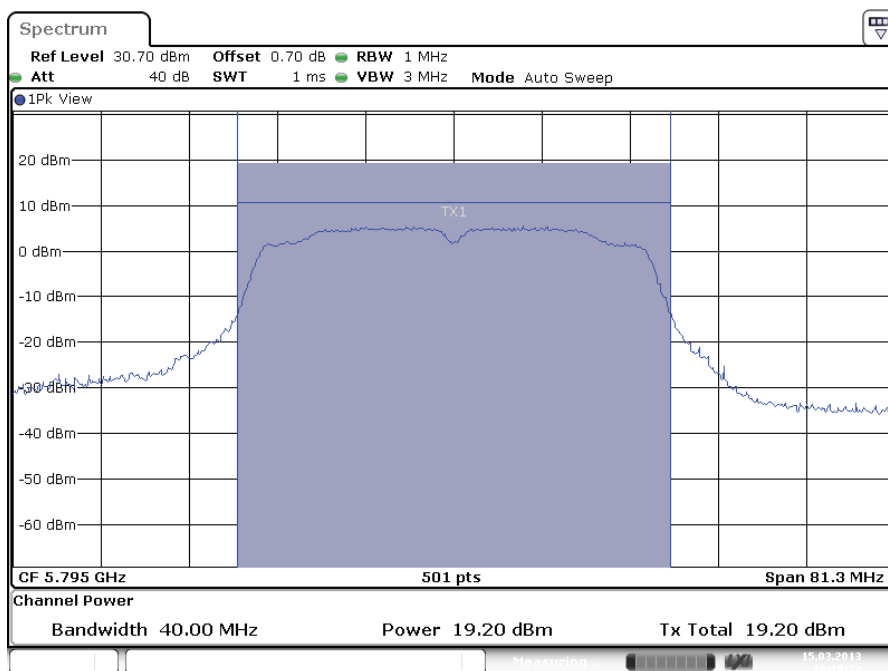
**12121201.fcc01**

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Date: 15.MAR.2013 12:24:44

Plot A2 Antenna2



Date: 15.MAR.2013 16:10:22

Plot B2 Antenna2



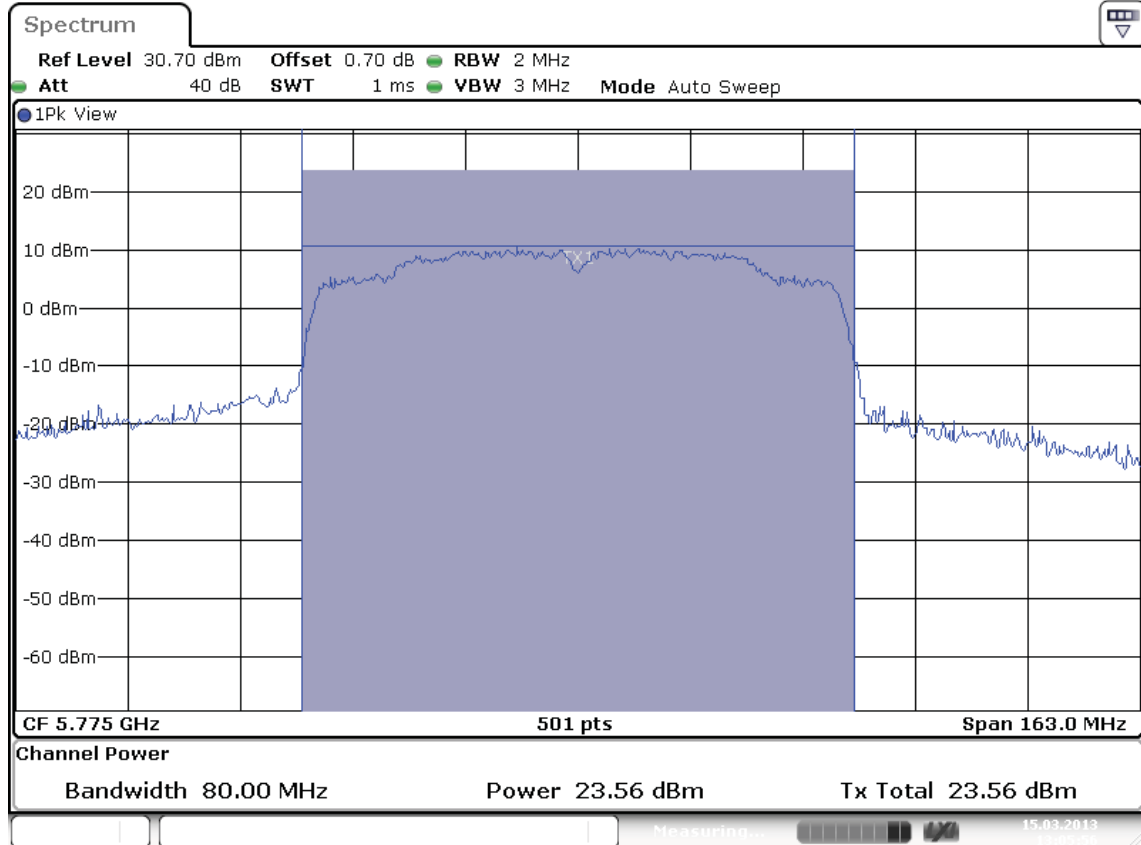
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Operation mode: VHT0-80 MHz wide, Antenna 1

Frequency [MHz]	Power setting [dBm]	Output Power [dBm]	Output Power [mW]	Limit [dBm]	Limit [mW]	Antenna Gain [dBi]	EIRP [dBm]	EIRP [mW]	Plot number
5775	14.0	23.56	227.0	+30	1000	5.0	28.56	717.8	A



Date: 15.MAR.2013 13:05:55

Plot A

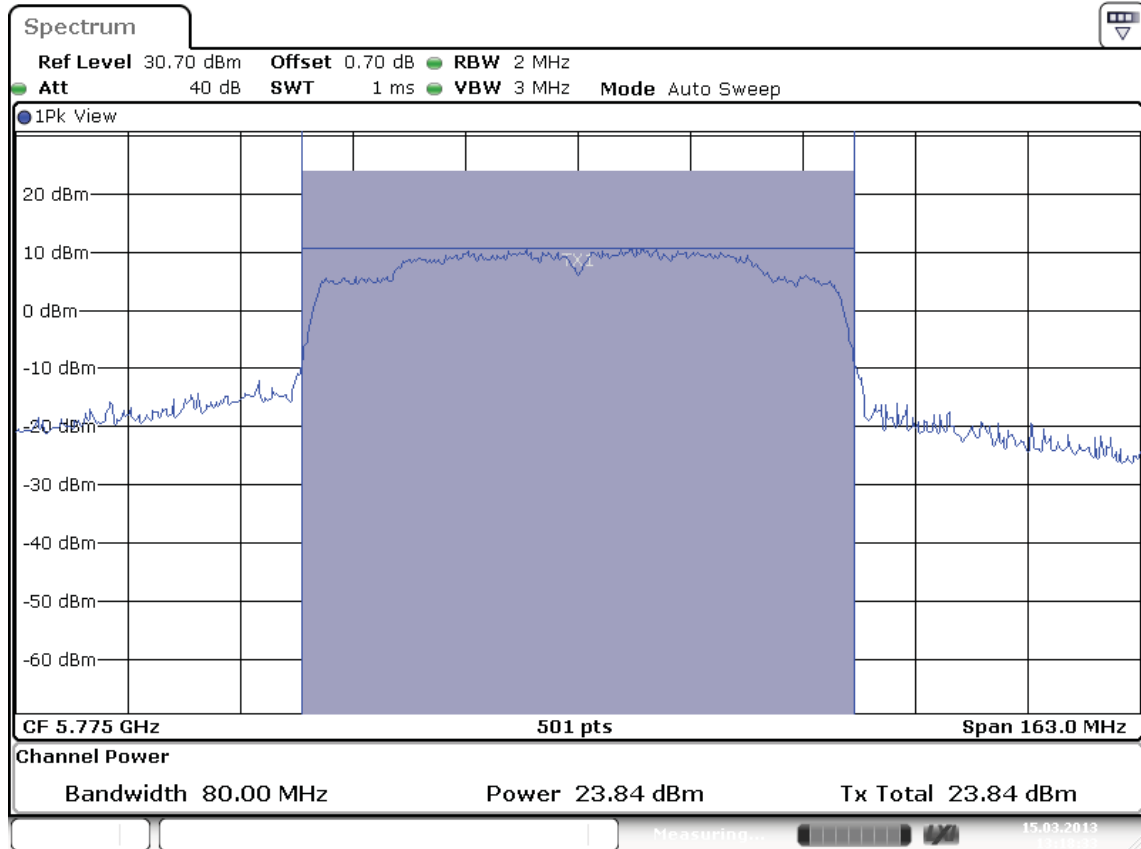
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Operation mode: VHT0-80 MHz wide, Antenna 2

Frequency [MHz]	Power setting [dBm]	Output Power [dBm]	Output Power [mW]	Limit [dBm]	Limit [mW]	Antenna Gain [dBi]	EIRP [dBm]	EIRP [mW]	Plot number
5775	14.0	23.84	242.1	+30	1000	5.0	28.84	765.6	A



Date: 15.MAR.2013 13:18:34

Plot A

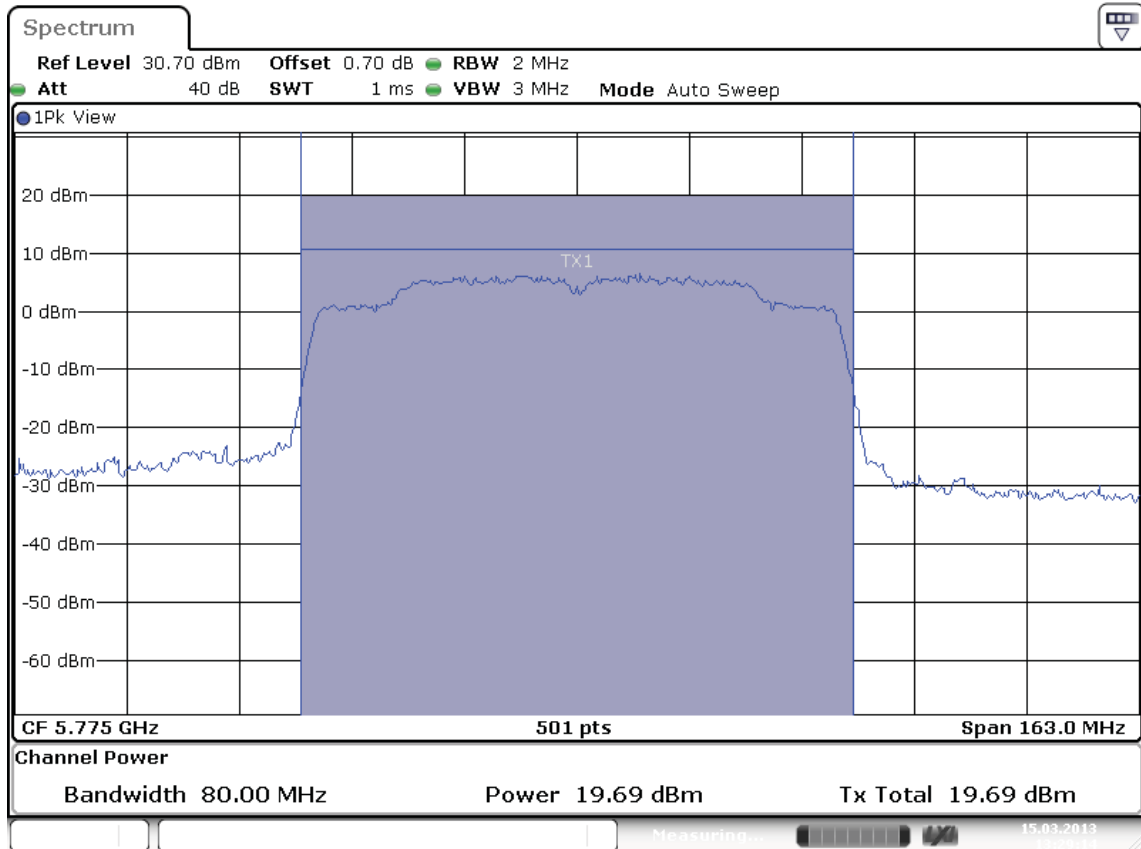
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Operation mode: VHT0-80 MHz wide, Antenna 1+2

Freq- uency [MHz]	Gain control setting (dB)	Output Power Antenna1 [dBm]	Output Power Antenna2 [dBm]	Total Power Ant1+Ant2 [dBm]	Limit [dBm]	Limit [mW]	Ant- enna Gain (dBi)	EIRP (dBm)	EIRP (mW)	Plot number
5775	27.0/27.0	19.69	19.92	22.82	+30	1000	5.0	27.82	605.3	A



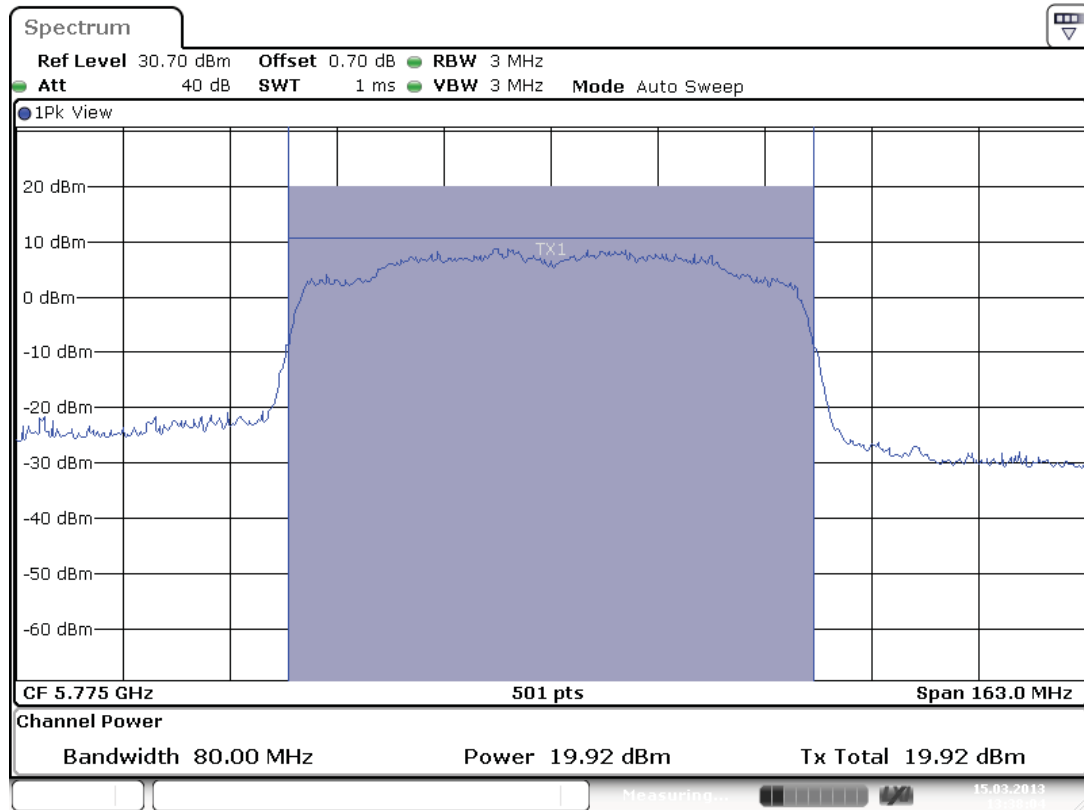
Date: 15.MAR.2013 13:29:14

Plot A

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Date: 15.MAR.2013 13:38:05

Plot B

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### **7.2.2 6dB and 99% Bandwidth**

**RESULT: Pass**

Date of testing:

2013-01-11 / 2013-03-15

Requirements:

FCC 15.247(a)(2) and RSS-210 Section A8.2(a)

For systems using digital modulation in the 5745 MHz to 5825 MHz band, the 6dB bandwidth shall be at least 500kHz.

For 99% Bandwidth: RSS-Gen Section 4.6.1: No requirement is given.

Test procedure 6dB bandwidth:

ANSI C63.10: 2009 and ANSI C63.10:2009

KDB Publication No. 558074 D01: Measurement of Digital Transmission Systems Operating under Section 15.247.

A spectrum analyzer was connected to the antenna port of the EUT. The spectrum analyzer resolution bandwidth was set to 100kHz, video bandwidth to 300kHz and the span wide enough to capture the modulated carrier.

For 99% Bandwidth:

ANSI C63.10: 2009 and RSS-Gen.

The transmitter shall be operated at its maximum carrier power measured under normal test conditions. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used given that a peak or peak hold may produce a wider bandwidth than actual.

A spectrum analyzer was connected to the antenna port of the EUT. The spectrum analyzer resolution bandwidth was set to 1% of the selected span, Video bandwidth was set to 3 times the resolution bandwidth. The span was set to capture the whole modulation process. The Spectrum analyzers automated function for 99% BW was used.

Test Report No.:

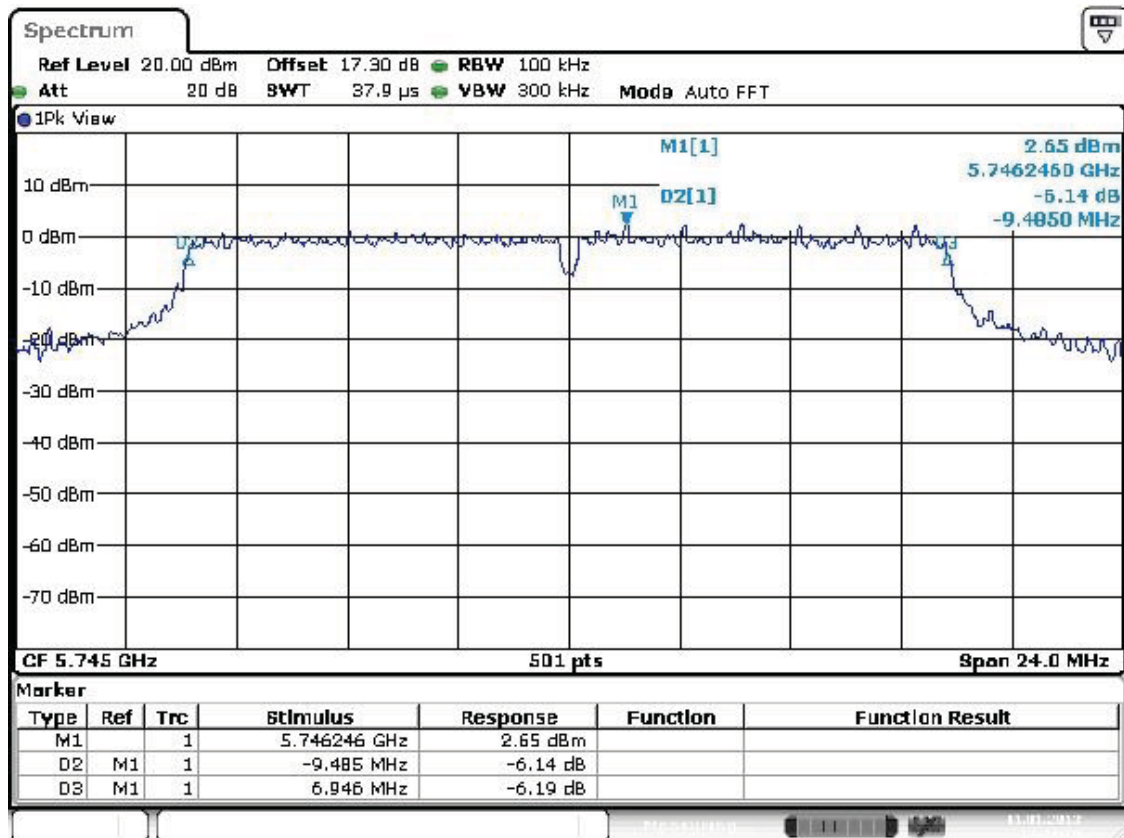
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**Table 5: 6dB and 99% Bandwidth**

Operation mode: 6Mb OFDM, Antenna 2

Operating Frequency [MHz]	99% Bandwidth [kHz]	6dB Bandwidth [kHz]	Limit [kHz]	Plot number
5745	18683	16431	500	A
5785	18962	16447	500	B
5825	18044	16407	500	C



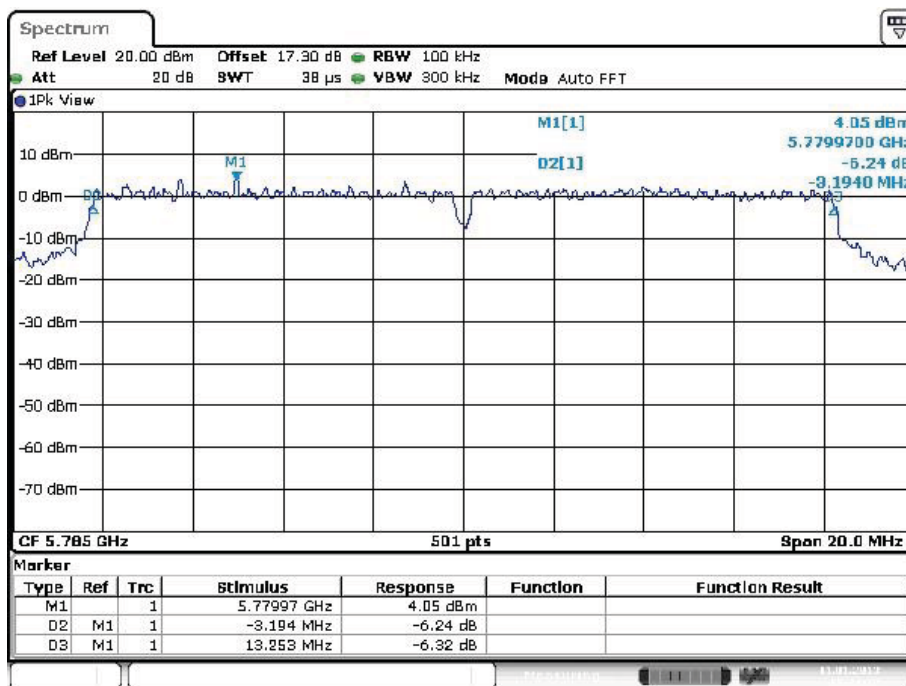
Date: 11. JAN. 2013 14:41:36

Plot A

Test Report No.:

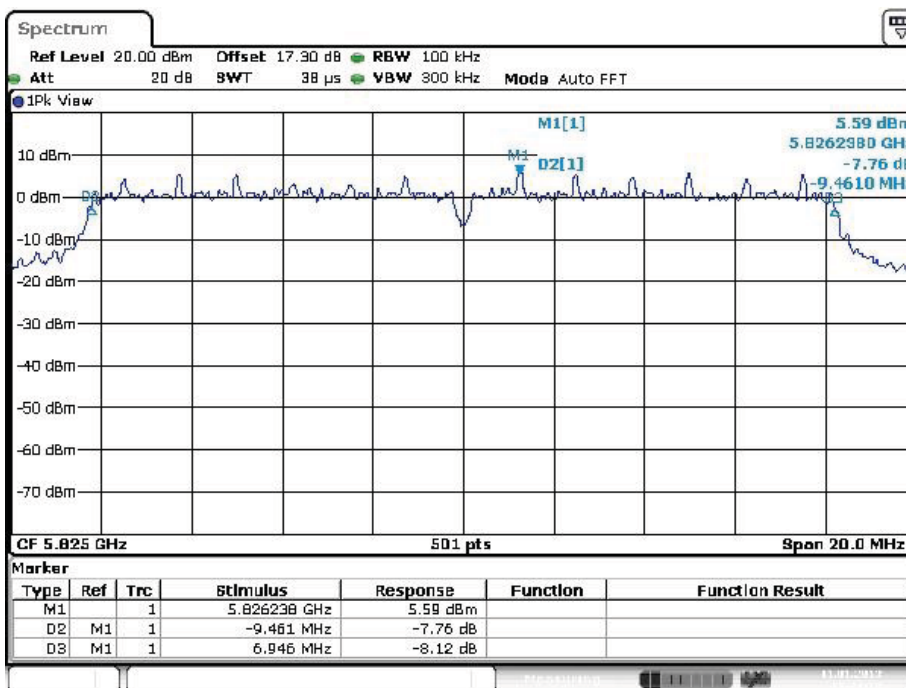
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Date: 11.JAN.2013 15:23:22

Plot B



Date: 11.JAN.2013 15:33:14

Plot C

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Operation mode: 6Mb OFDM, Antenna 1

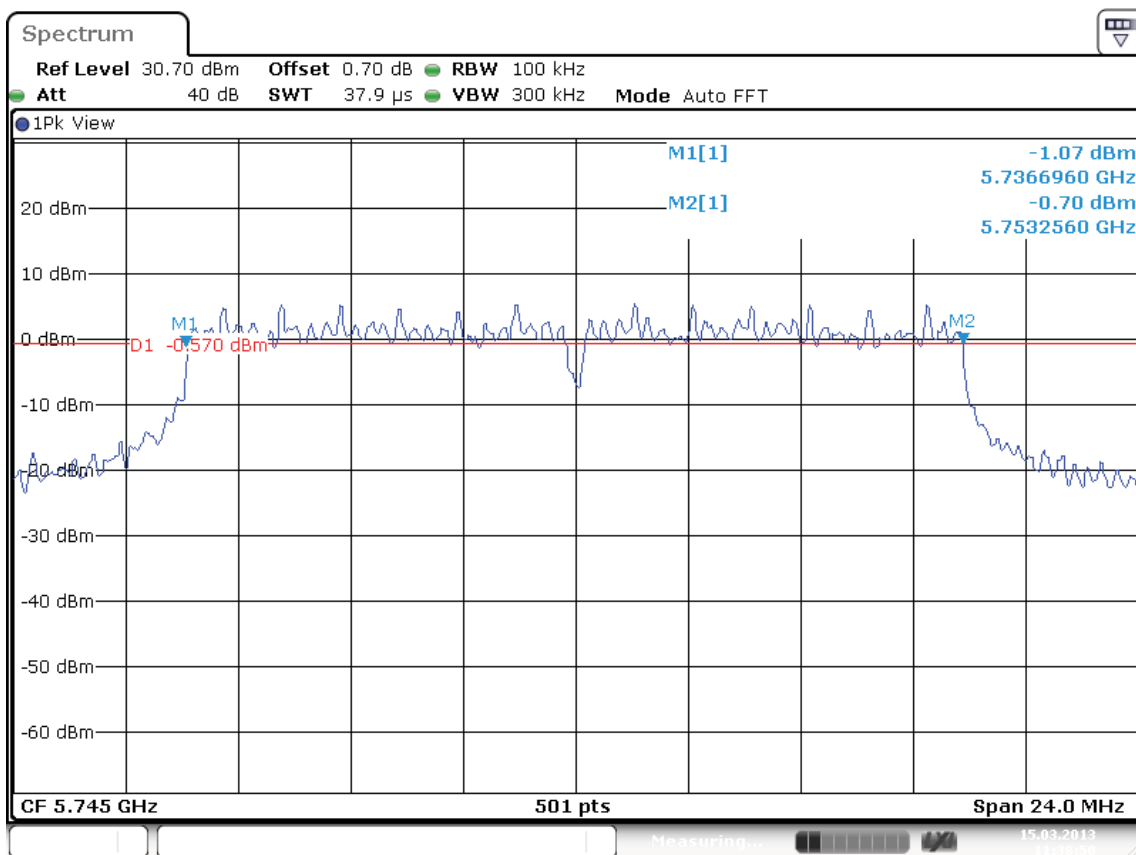
Operating Frequency [MHz]	99% Bandwidth [kHz]	6dB Bandwidth [kHz]	Limit [kHz]	Plot number
5745	16526	16560	500	A
5785	16479	16560	500	B
5825	16575	16560	500	C



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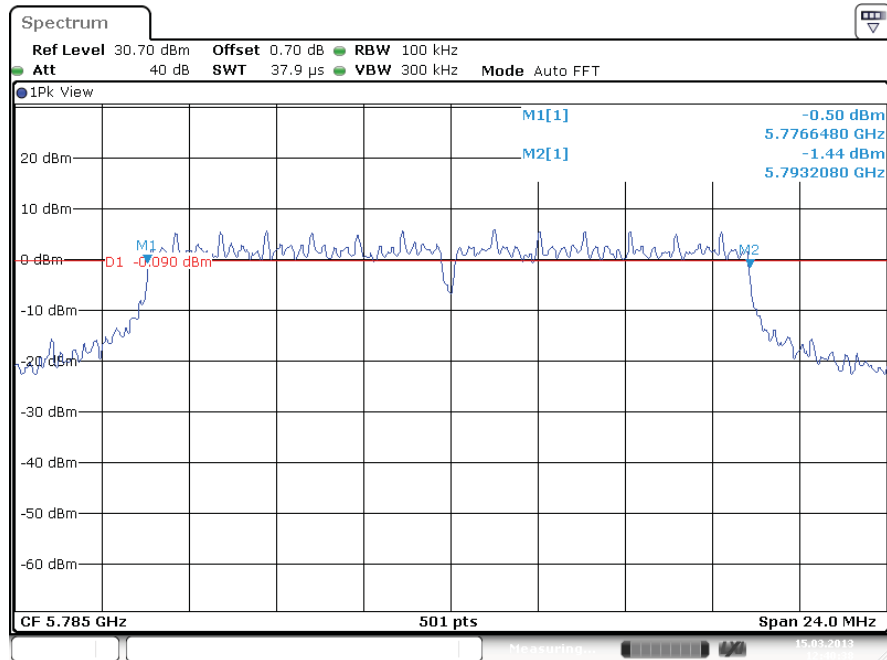
Date: 15.MAR.2013 11:38:50

Plot A

Test Report No.:

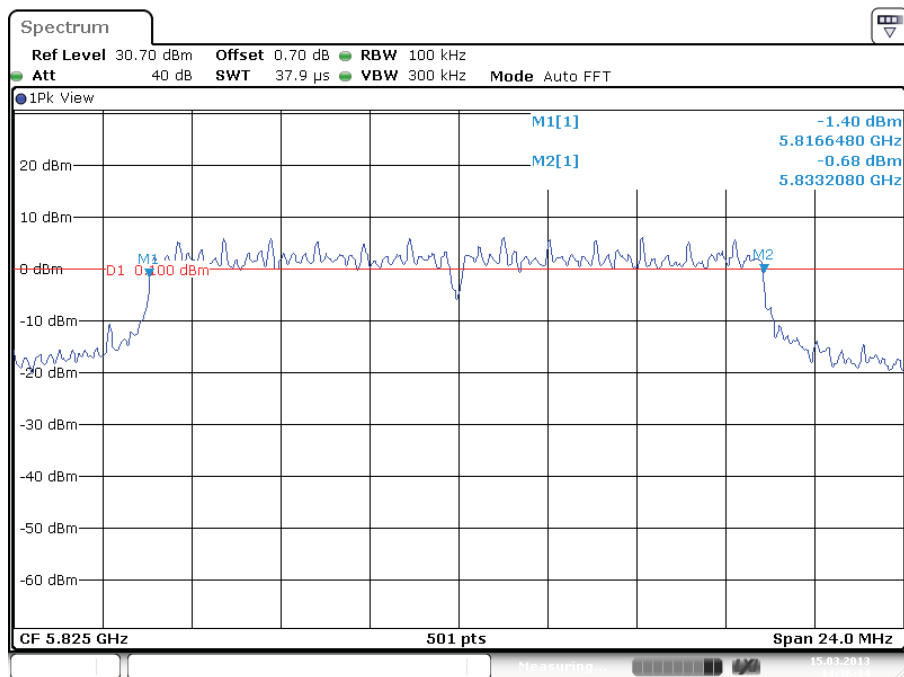
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Date: 15.MAR.2013 12:40:38

Plot B



Date: 15.MAR.2013 14:36:34

Plot C

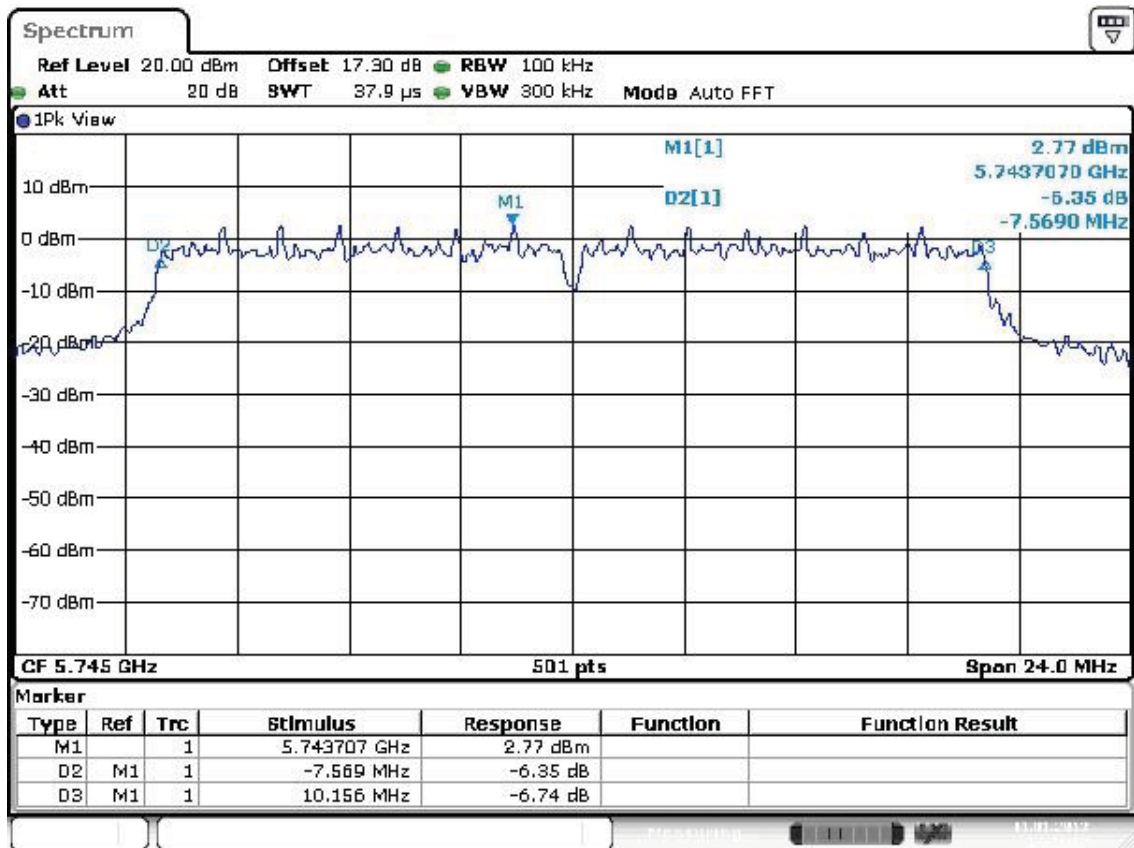
Test Report No.:

**12121201.fcc01**

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Operation mode: HT4 – 20MHz, Antenna 1

Operating Frequency [MHz]	99% Bandwidth [kHz]	6dB Bandwidth [kHz]	Limit [kHz]	Plot number
5745	18762	17725	500	A
5785	20159	17765	500	B
5825	19082	17725	500	C



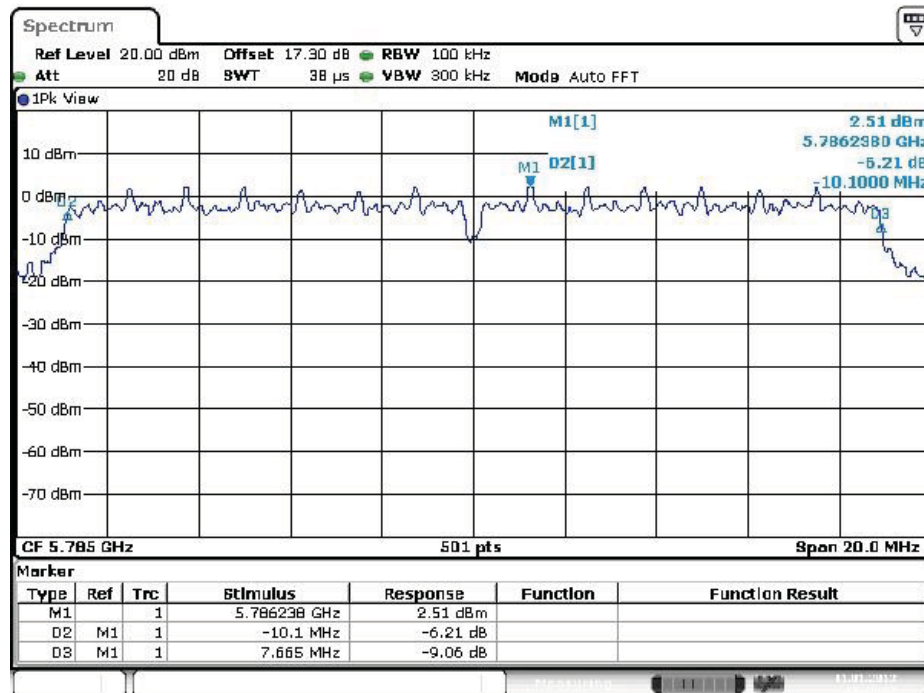
Date: 11.JAN.2013 14:47:07

Plot A

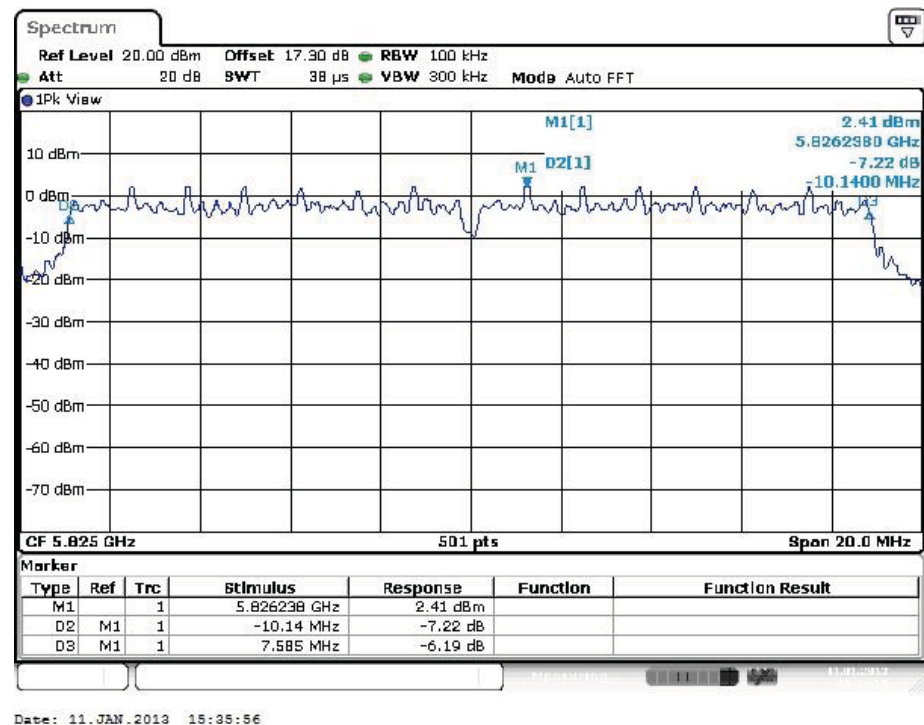
Test Report No.:

**12121201.fcc01**

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Plot B



Plot C

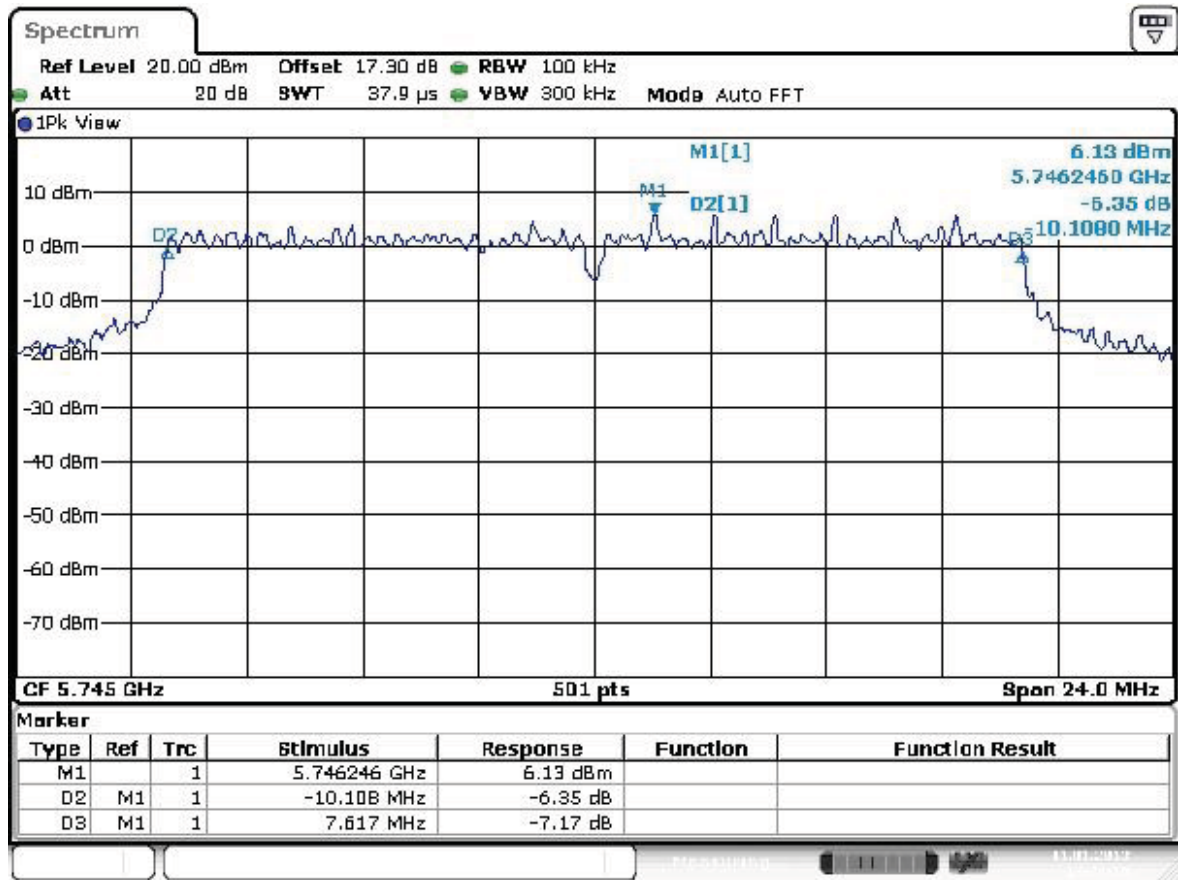
Test Report No.:

**12121201.fcc01**

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Operation mode: HT4 – 20MHz, Antenna 2

Operating Frequency [MHz]	99% Bandwidth [kHz]	6dB Bandwidth [kHz]	Limit [kHz]	Plot number
5745	19162	17725	500	A
5785	19062	17685	500	B
5825	19162	17724	500	C



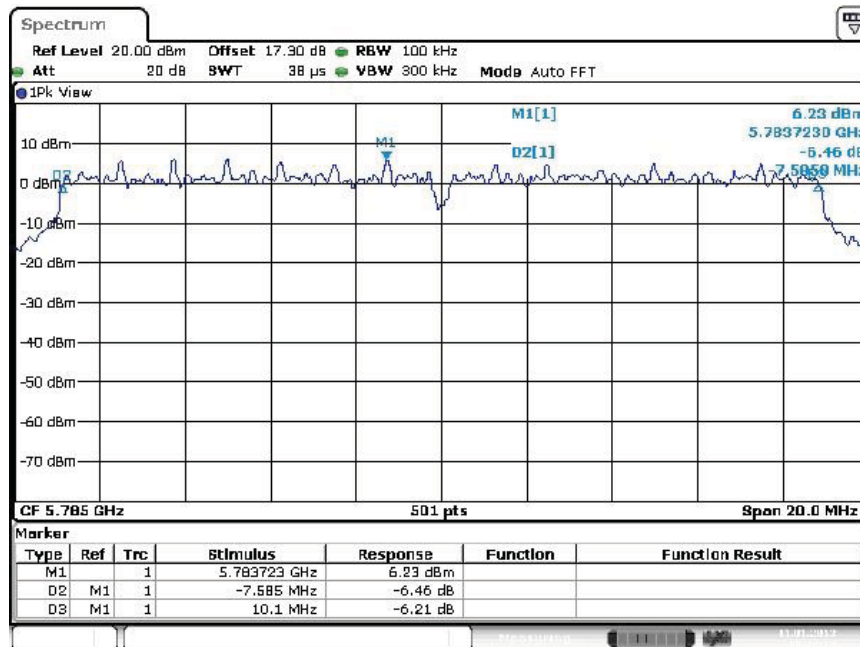
Date: 11. JAN. 2013 14:48:55

Plot A

Test Report No.:

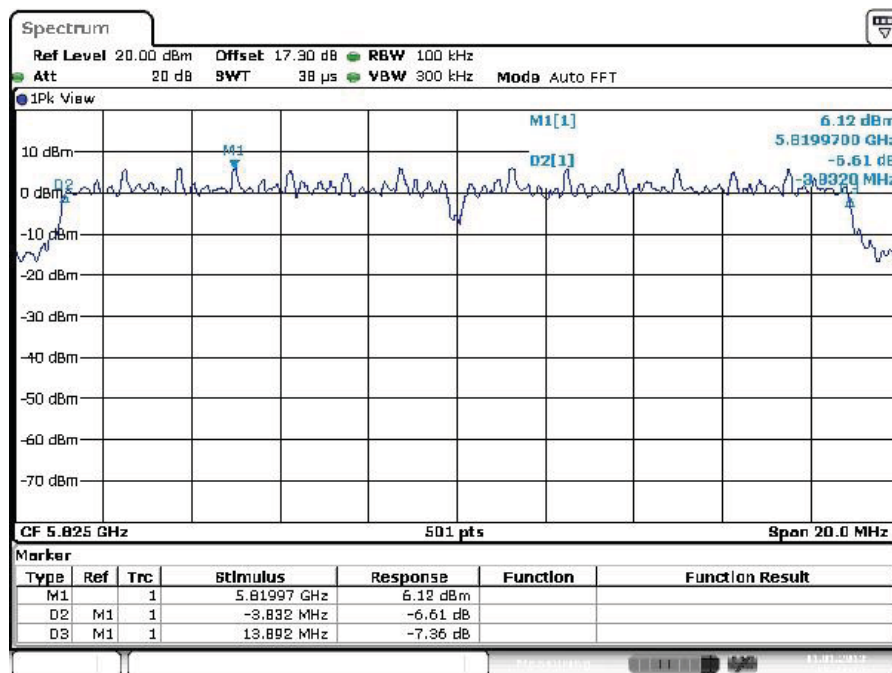
**12121201.fcc01**

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Date: 11.JAN.2013 15:28:29

Plot B



Date: 11.JAN.2013 15:37:32

Plot C

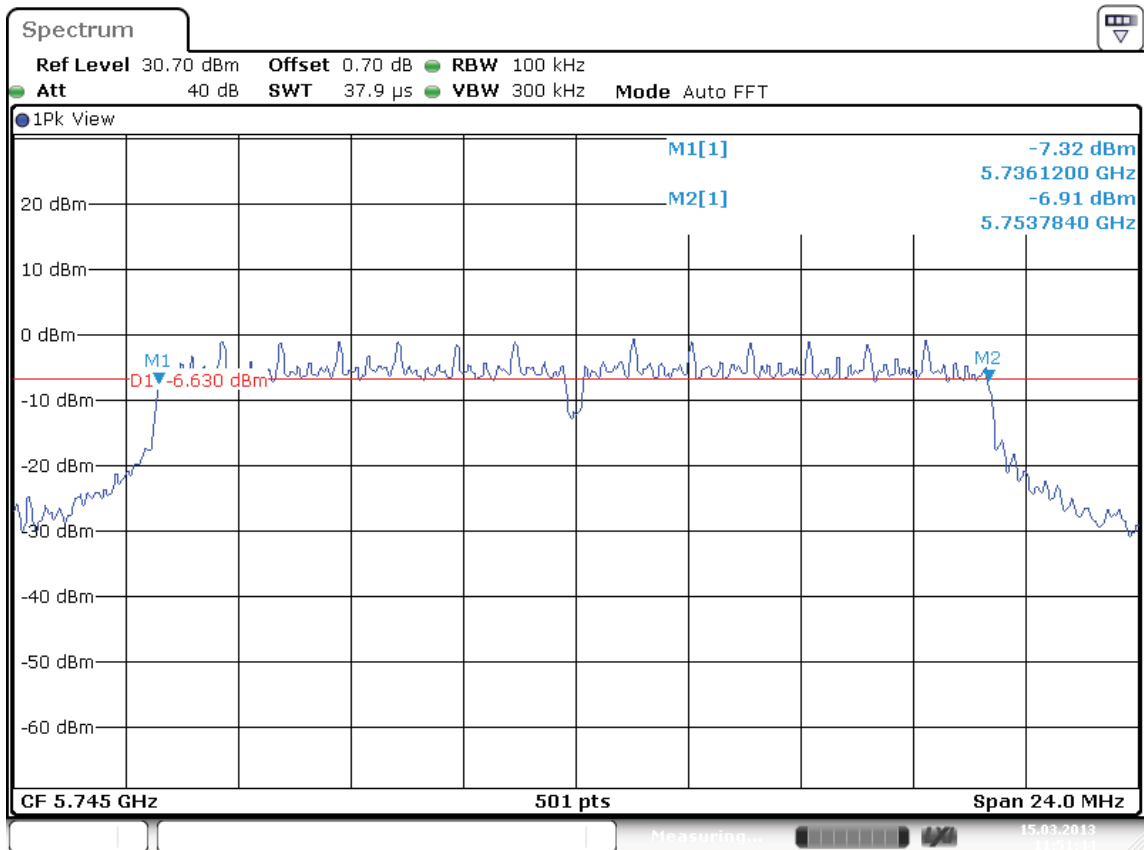
Test Report No.:

**12121201.fcc01**

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Operation mode: HT8-20 MHz, Antenna 1+2

Operating Frequency [MHz]	99% Bandwidth Antenna1/Antenna2 [kHz]	6dB Bandwidth Antenna1/Antenna2 [kHz]	Limit [kHz]	Plot number
5745	17676 / 17725	17664 / 17664	500	A
5785	17724 / 17724	17664 / 17664	500	B
5825	17724 / 17726	17664 / 17664	500	C



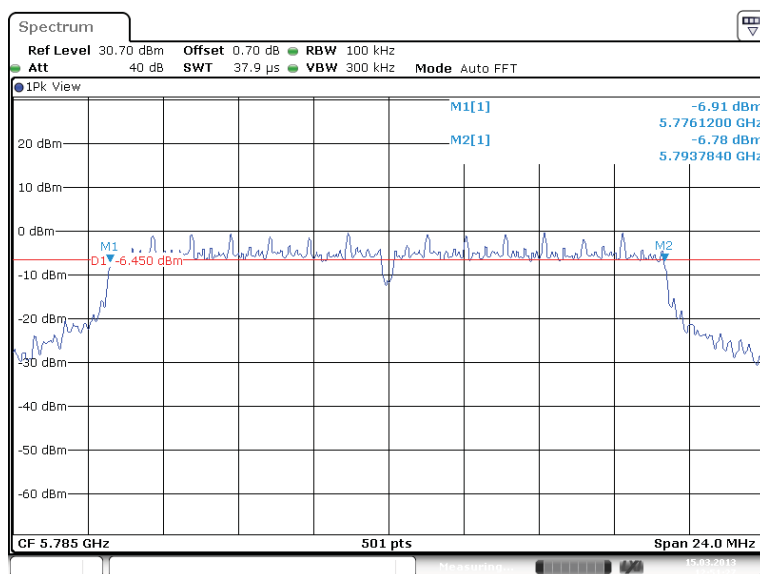
Date: 15.MAR.2013 11:51:44

Plot A Antenna 1

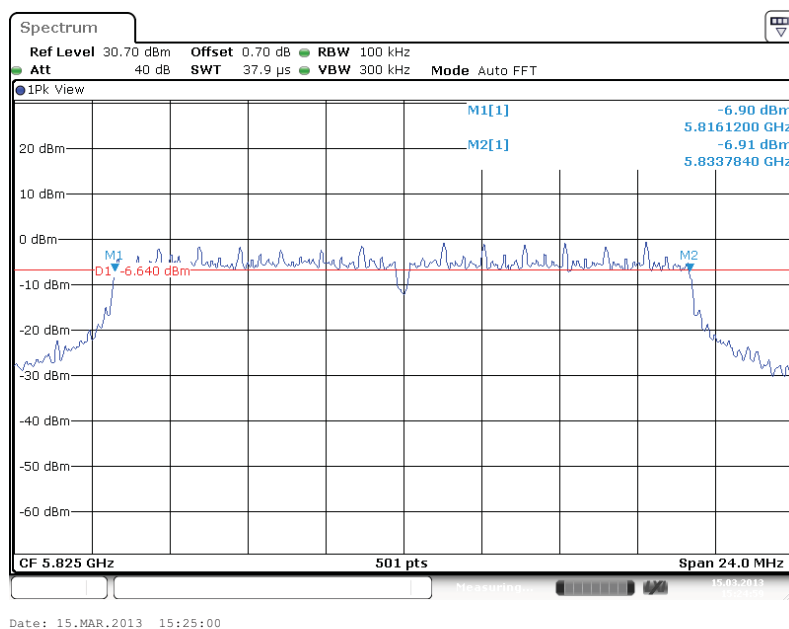
Test Report No.:

**12121201.fcc01**

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Plot B Antenna 1



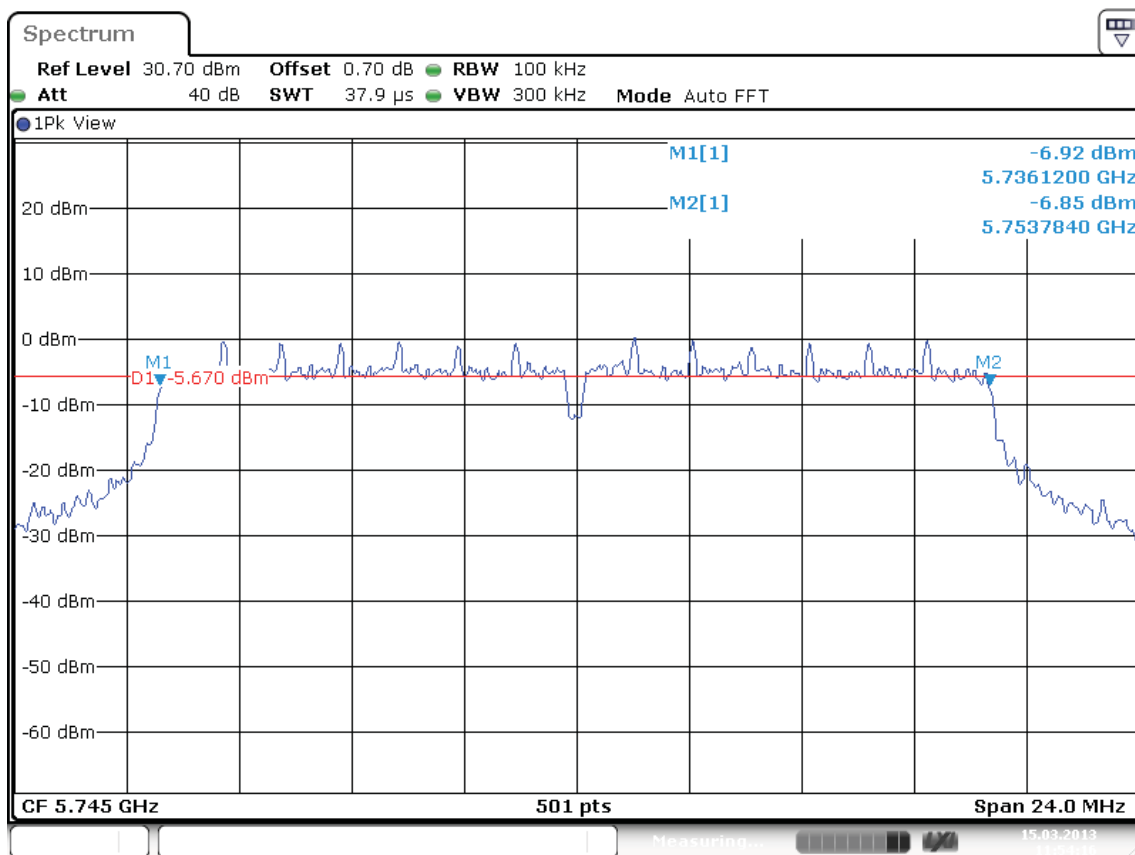
Plot C Antenna 1



Test Report No.:

**12121201.fcc01**

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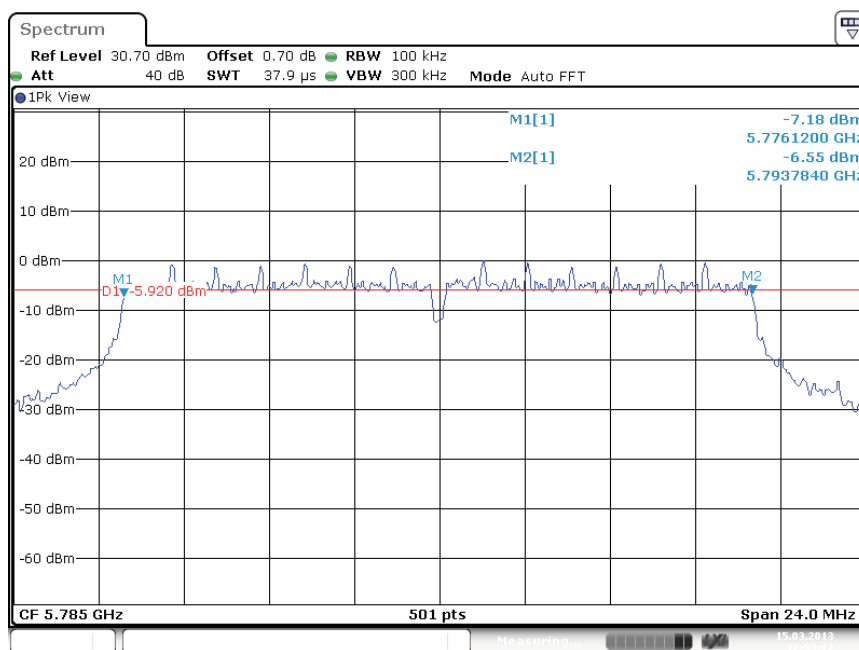
Date: 15.MAR.2013 11:54:17

Plot A Antenna 2

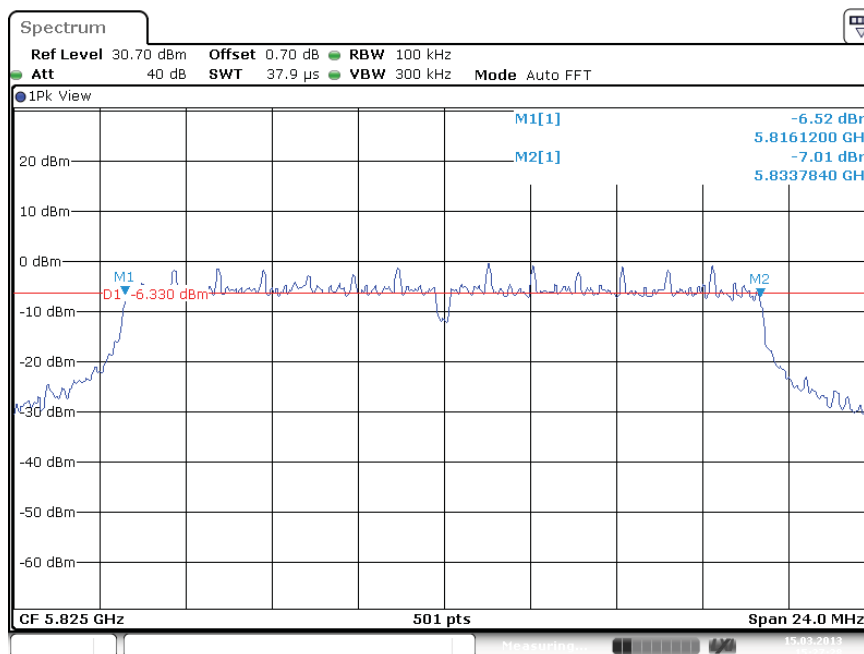
Test Report No.:

**12121201.fcc01**

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Plot B Antenna 2



Plot C Antenna 2

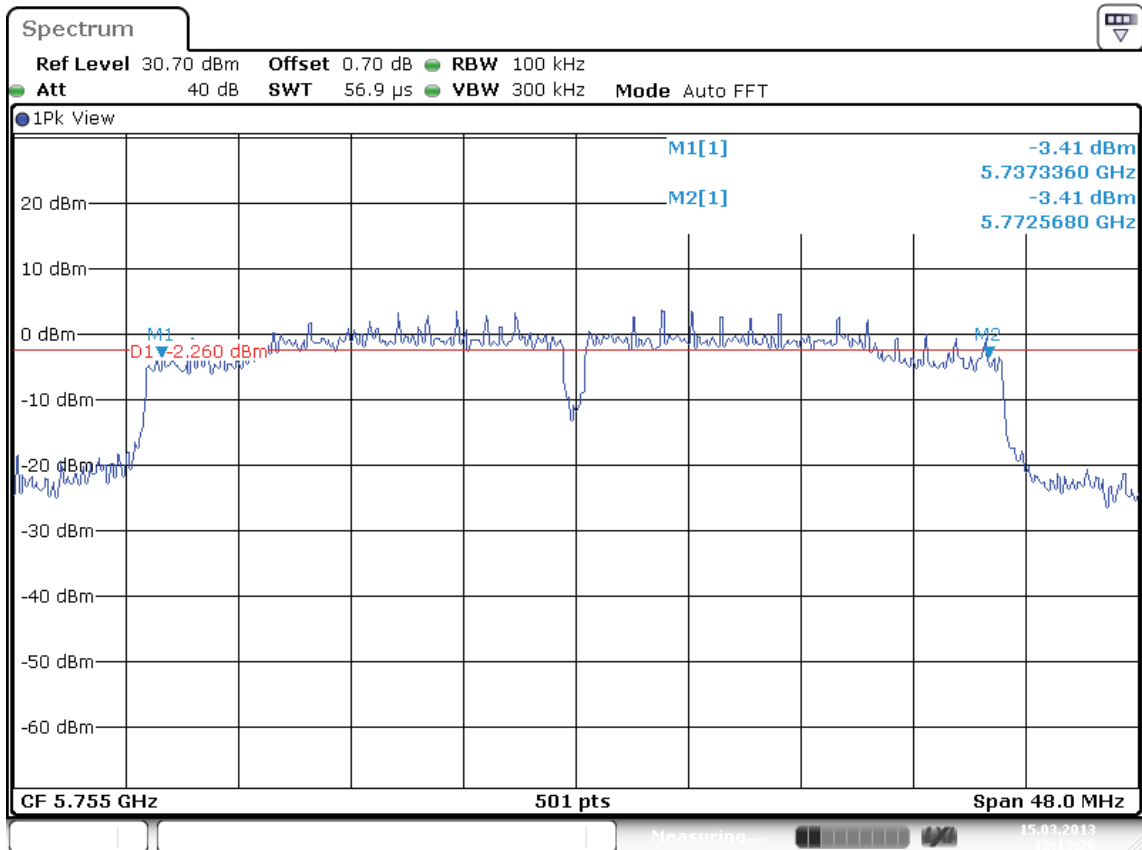
Test Report No.:

**12121201.fcc01**

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Operation mode: HT4-40 MHz wide , Antenna 2

Operating Frequency [MHz]	99% Bandwidth [kHz]	6dB Bandwidth [kHz]	Limit [kHz]	Plot number
5775	36119	35232	500	A
5795	36024	35328	500	B



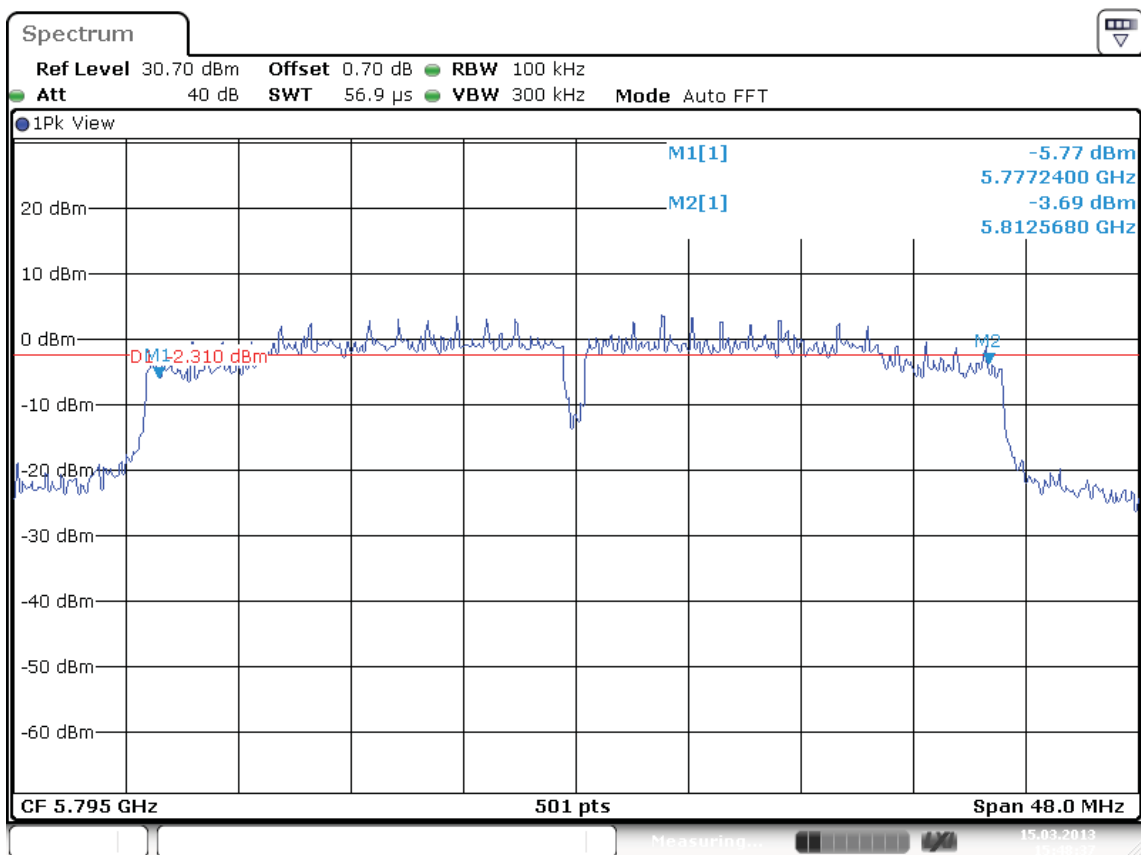
Date: 15.MAR.2013 12:13:26

Plot A

Test Report No.:

**12121201.fcc01**

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Date: 15.MAR.2013 15:48:38

Plot B

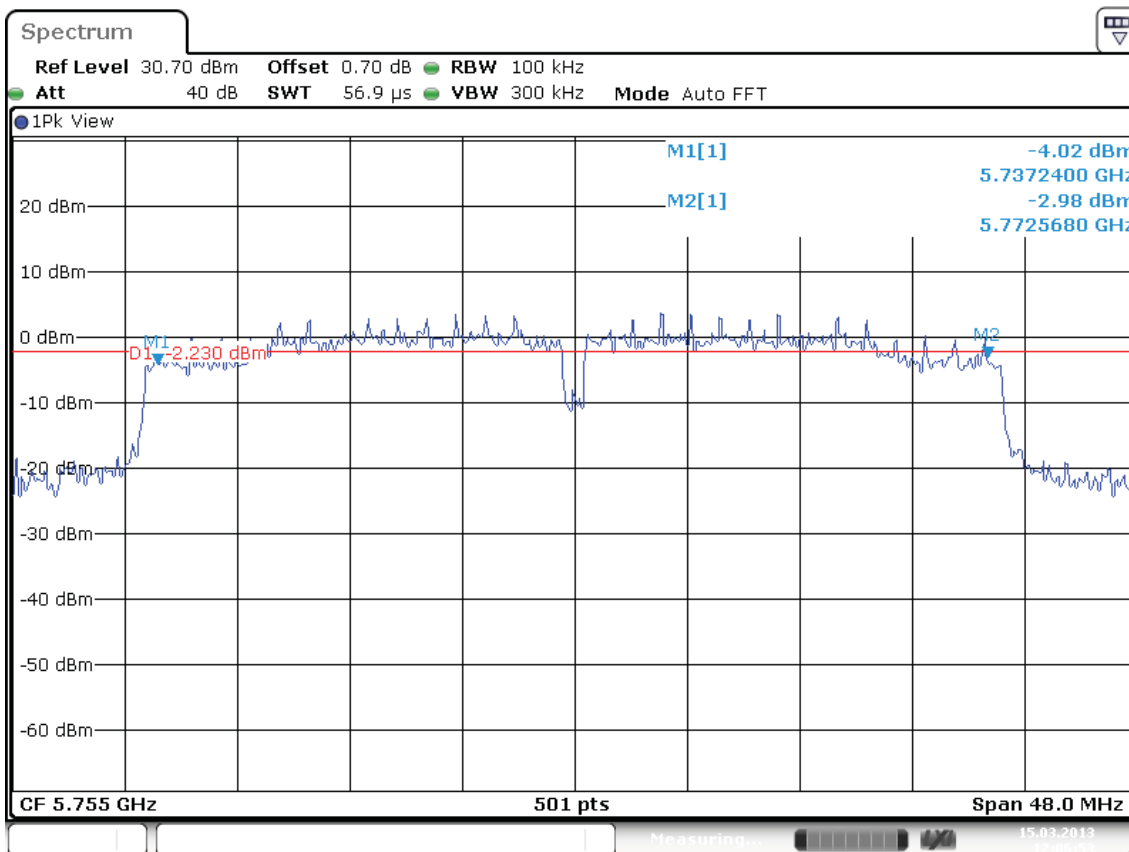
Test Report No.:

**12121201.fcc01**

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Operation mode: HT4-40 MHz, Antenna 1

Operating Frequency [MHz]	99% Bandwidth [kHz]	6dB Bandwidth [kHz]	Limit [kHz]	Plot number
5775	36024	35328	500	A
5795	36024	35328	500	B



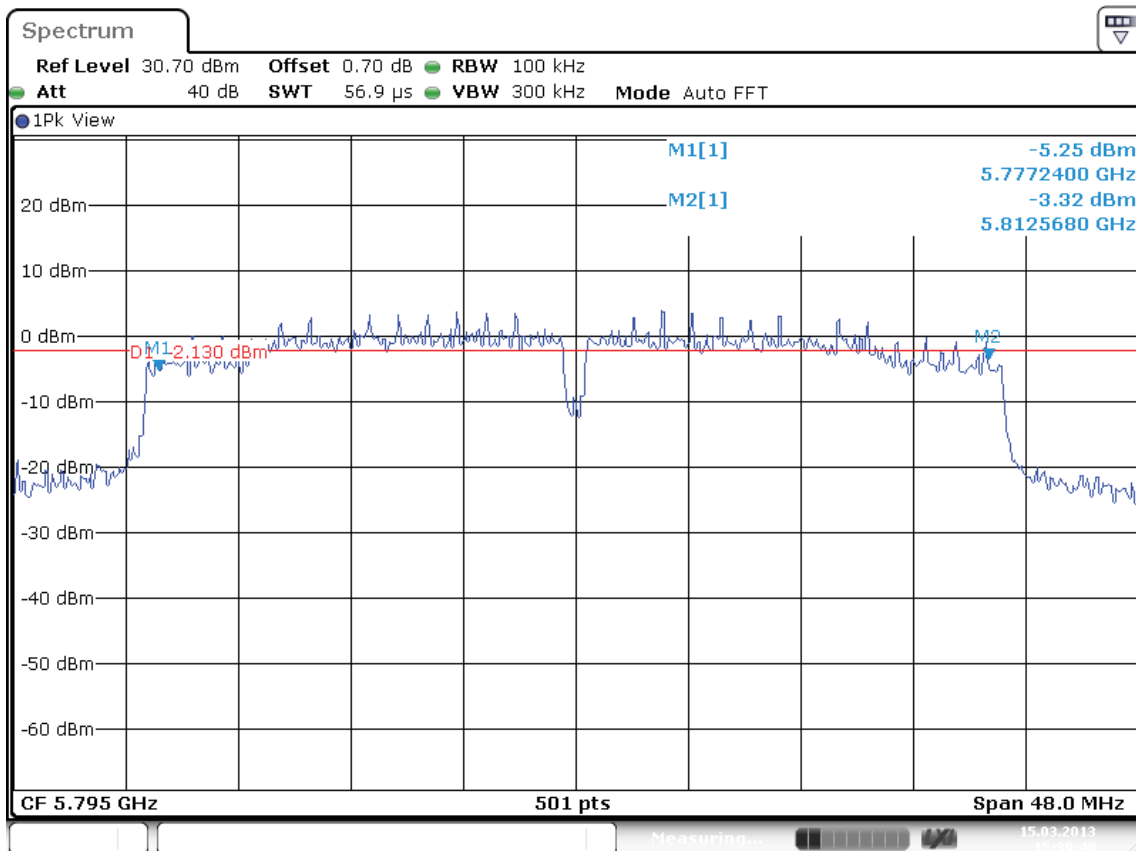
Date: 15.MAR.2013 12:06:54

Plot A

Test Report No.:

**12121201.fcc01**

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Date: 15.MAR.2013 15:39:40

Plot B

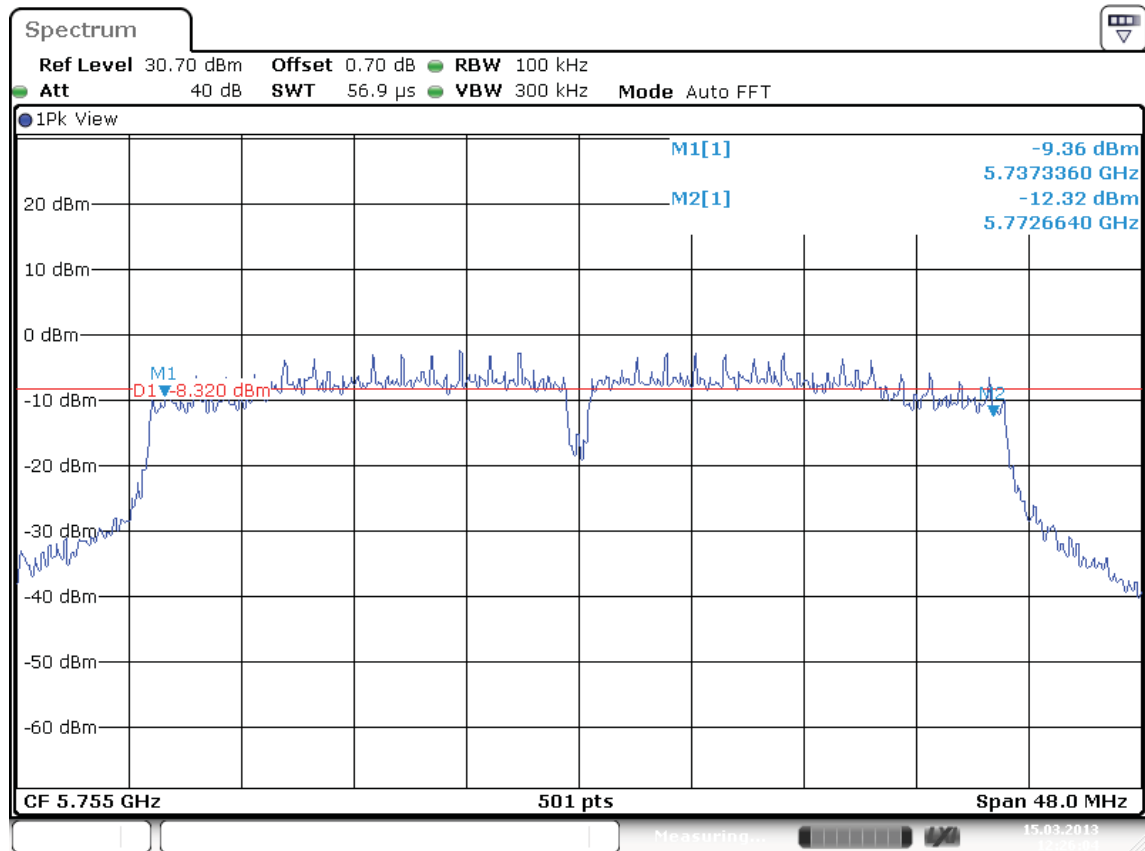
Test Report No.:

**12121201.fcc01**

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Operation mode: HT8-40 MHz wide, Antenna 1+2

Operating Frequency [MHz]	99% Bandwidth Antenna1/Antenna2 [kHz]	6dB Bandwidth Antenna1/Antenna2 [kHz]	Limit [kHz]	Plot number
5775	35928 / 35928	35832 / 35832	500	A
5795	35832 / 35832	35832 / 35832	500	B



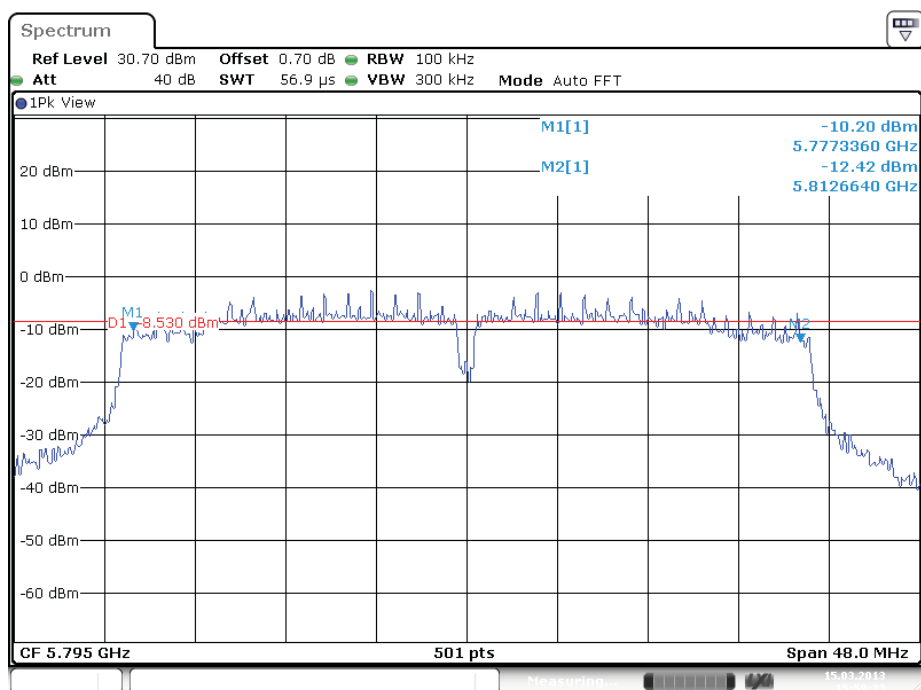
Date: 15.MAR.2013 12:26:04

Plot A Antenna 1

Test Report No.:

**12121201.fcc01**

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Date: 15.MAR.2013 15:59:33

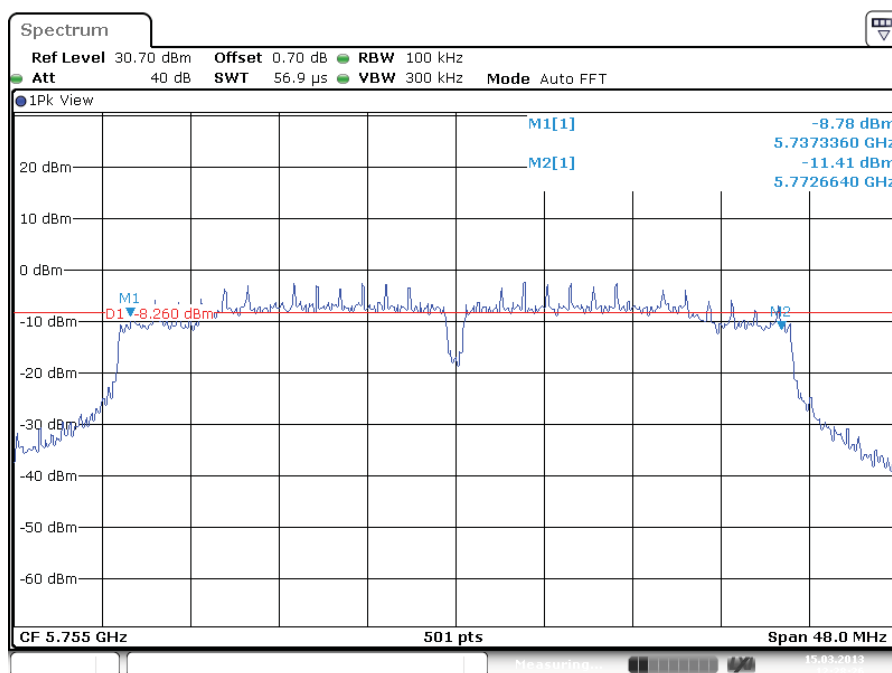
Plot B Antenna 1



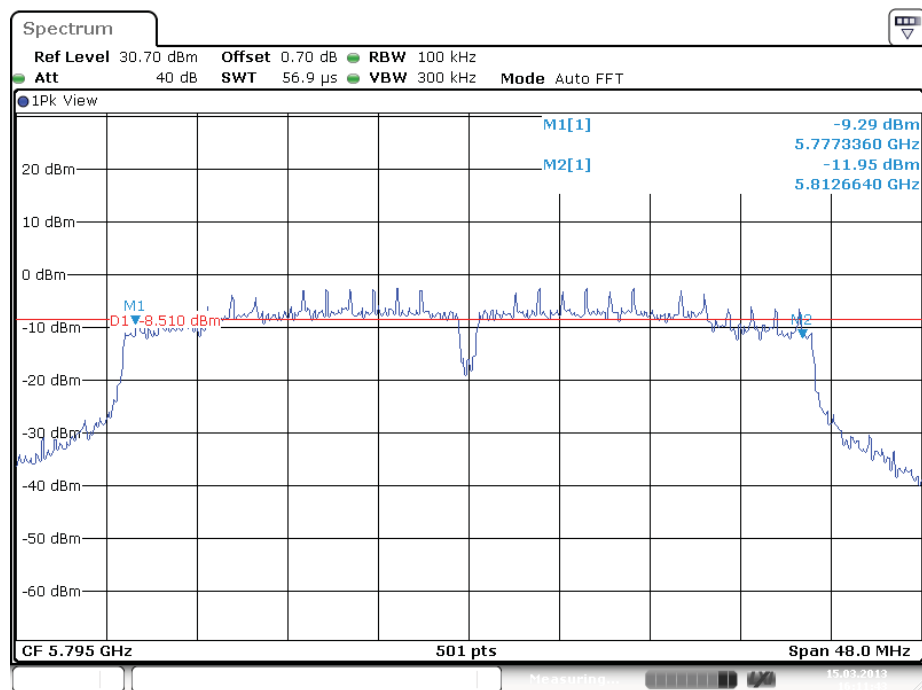
Test Report No.:

**12121201.fcc01**

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Plot A Antenna 2



Plot B Antenna 2

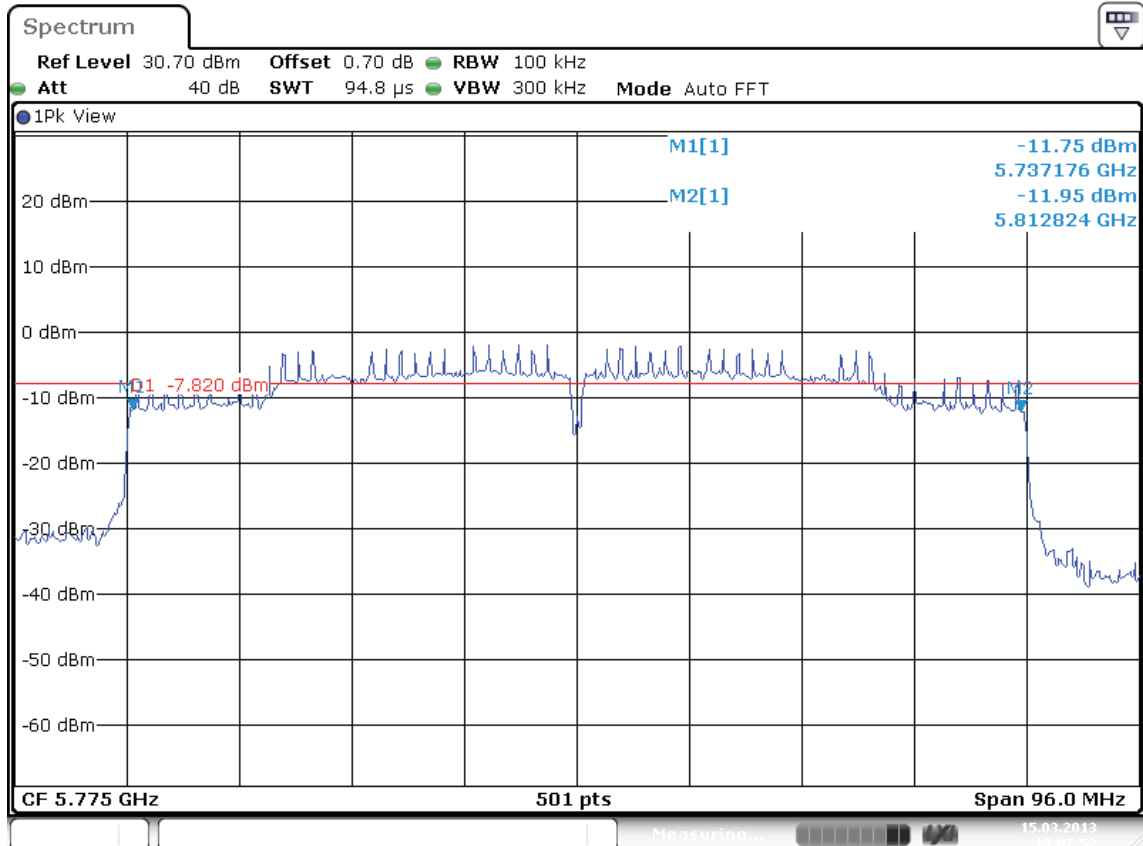
Test Report No.:

**12121201.fcc01**

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Operation mode:VHT6-80 MHz wide, Antenna 1

Operating Frequency [MHz]	99% Bandwidth Antenna1/Antenna2 [kHz]	6dB Bandwidth Antenna1/Antenna2 [kHz]	Limit [kHz]	Plot number
5775	75113	75648	500	A



Date: 15.MAR.2013 13:07:52

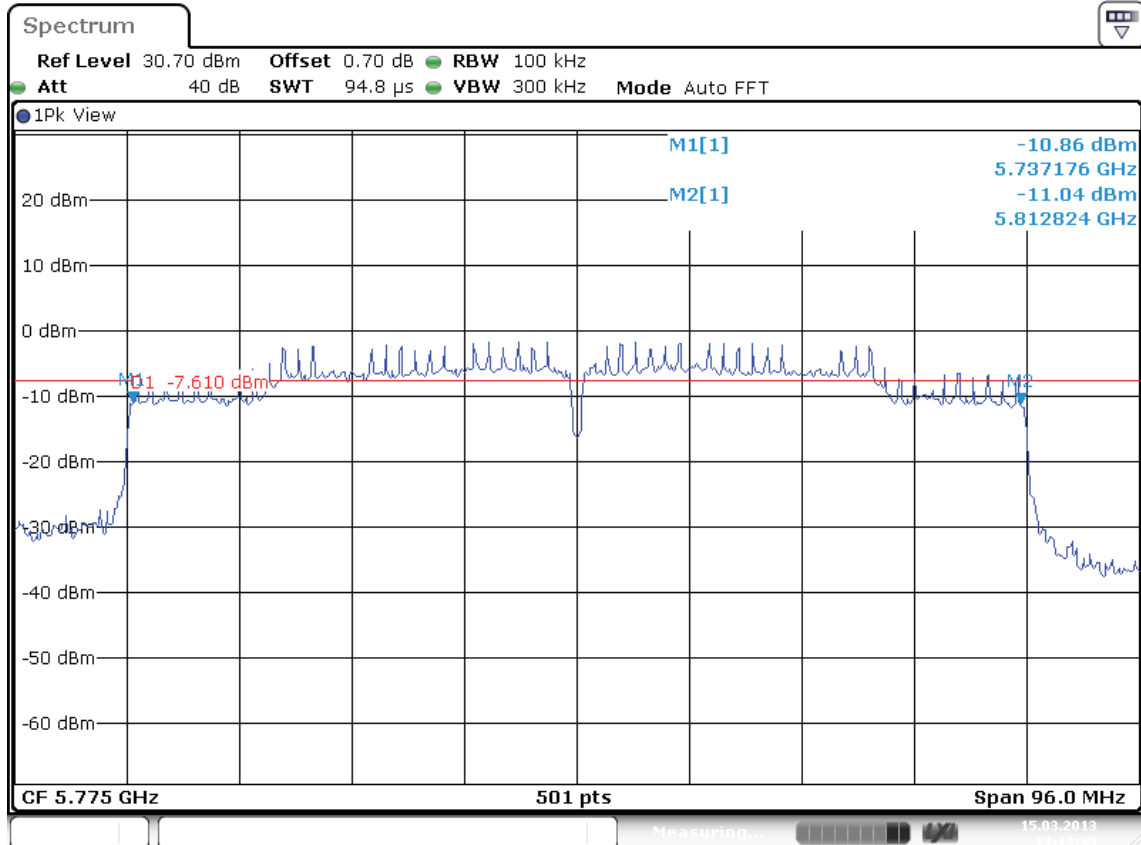
Test Report No.:

**12121201.fcc01**

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Operation mode:VHT6-80 MHz wide, Antenna 2

Operating Frequency [MHz]	99% Bandwidth Antenna1/Antenna2 [kHz]	6dB Bandwidth Antenna1/Antenna2 [kHz]	Limit [kHz]	Plot number
5775	74922	75648	500	A



Date: 15.MAR.2013 13:19:35

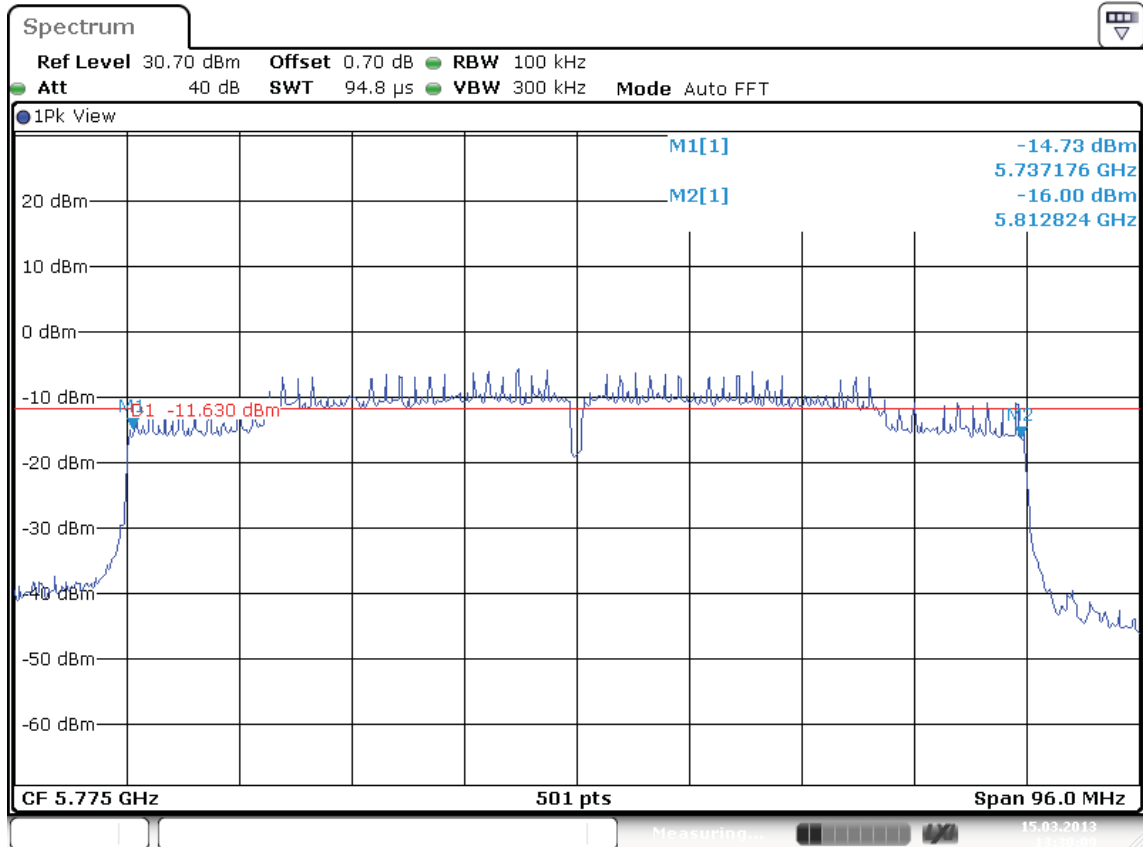
Test Report No.:

**12121201.fcc01**

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Operation mode:VHT6-80 MHz wide, Antenna 1+2

Operating Frequency [MHz]	99% Bandwidth Antenna1/Antenna2 [kHz]	6dB Bandwidth Antenna1/Antenna2 [kHz]	Limit [kHz]	Plot number
5775	75113	75648	500	A



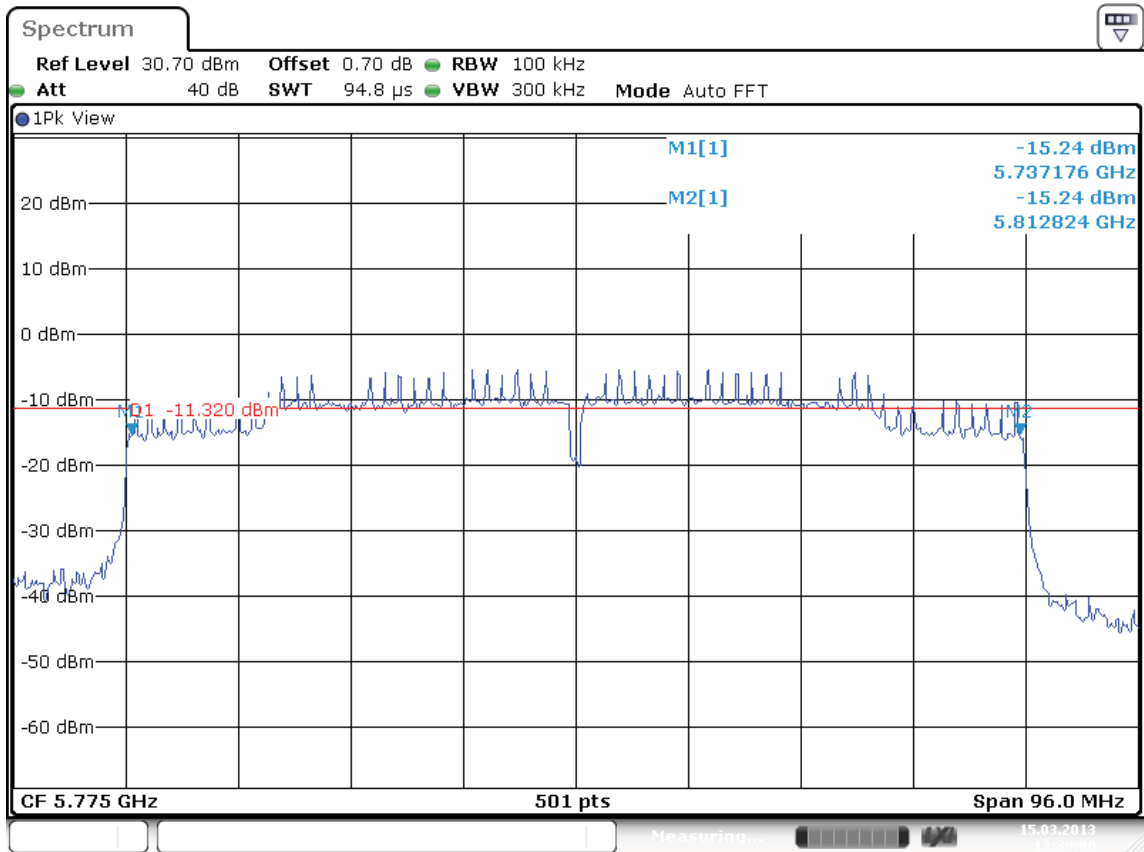
Date: 15.MAR.2013 13:30:09

Plot A-1: Antenna 1

Test Report No.:

**12121201.fcc01**

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Date: 15.MAR.2013 13:39:01

Plot A-2: Antenna 2

Test Report No.:

**12121201.fcc01**

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### 7.2.3 Peak Power Spectral Density

#### RESULT: PASS

Date of testing: 2013-01-14

#### Requirements:

FCC 15.247(e) and RSS-210 section A8.2(b)

For digitally modulated systems, the power spectral density (PSD) conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.

#### Test procedure:

ANSI C63.10: 2009 and ANSI C63.10:2009

KDB Publication No. 558074 D01: Measurement of Digital Transmission Systems Operating under Section 15.247.

The Peak PSD Option 1 procedure was used. A spectrum analyzer was connected to the antenna port of the EUT. The analyzer resolution bandwidth was set to 3kHz and the video bandwidth was set to 10kHz. The sweep time was set to auto couple and the trace was allowed to stabilize before making the final measurement. By using the Peak marker function the maximum amplitude was determined. The final measurement takes into account the loss generated by all the involved cables.

For MIMO mode, the *Measure and add  $10 \log(NANT)$  dB*, (where *NANT* is the number of outputs) technique was used according to the *Guidance for Emission Testing of Transmitters with Multiple Outputs in the Same Band 662911 D01 Multiple Transmitter Output v01r02 dated 9/26/2012*. With this technique, spectrum measurements are performed at each output of the EUT, and the quantity  *$10 \log(NANT)$  dB* is added to each spectrum value before comparing to the emission limit. Number of outputs = 2. In these MIMO cases 3 dB has to be added to the number shown in the plots. Figures in the tables for MIMO mode are already corrected with this 3 dB value.

Test Report No.:

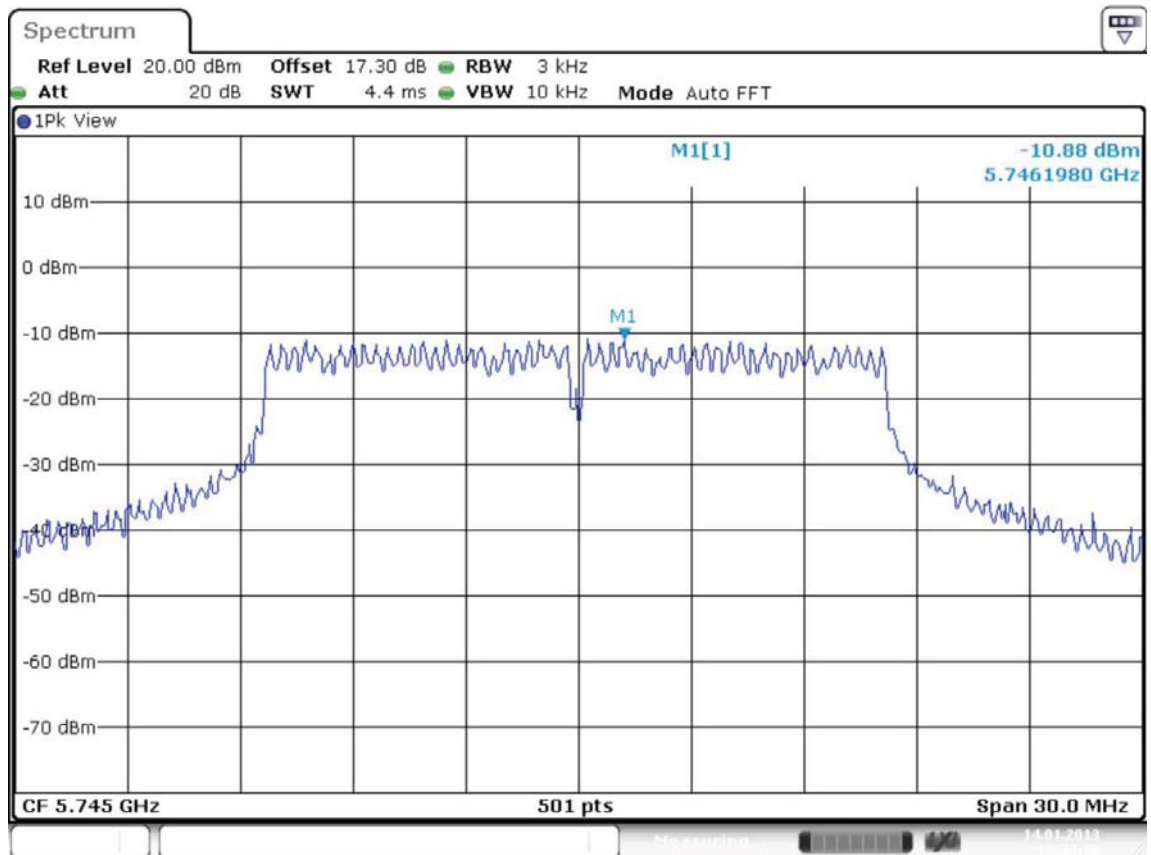
**12121201.fcc01**

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### Peak Power Spectral Density

Operation mode: 6Mb OFDM, Antenna 2

Operating Frequency [MHz]	Max PSD [dBm]	Limit [dBm]	Result [Pass/Fail]	Plot
5745	-10.88	8	Pass	A
5785	-8.56	8	Pass	B
5825	-9.19	8	Pass	C



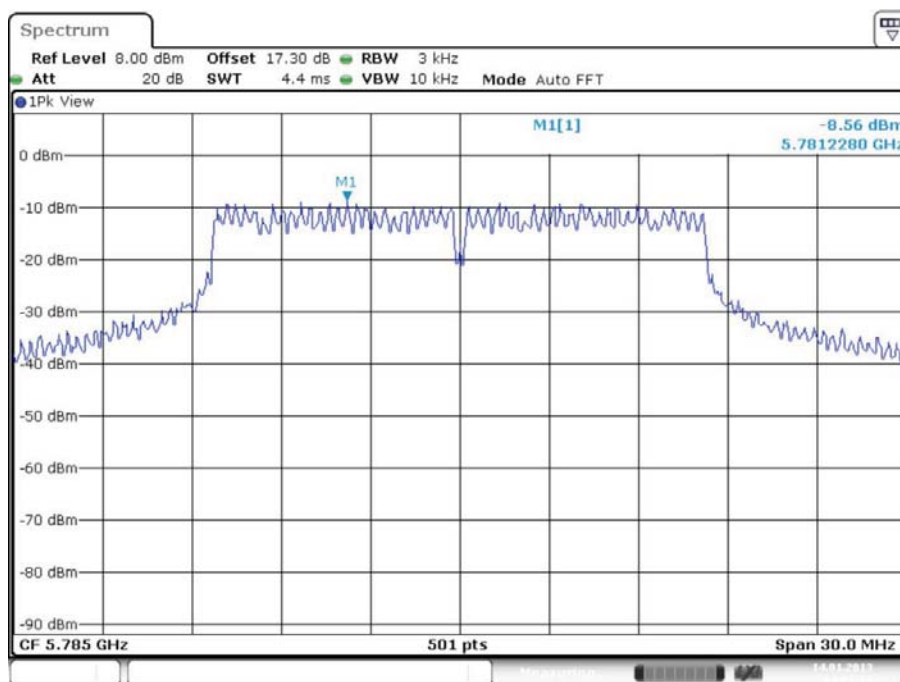
Date: 14.JAN.2013 13:44:20

Plot A

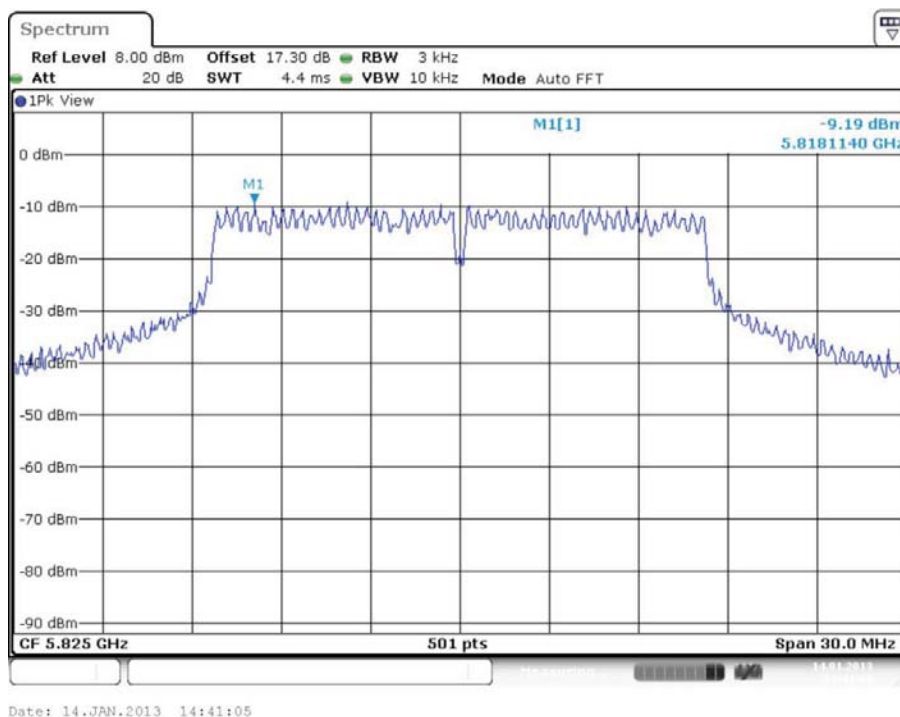
Test Report No.:

**12121201.fcc01**

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Plot B



Plot C



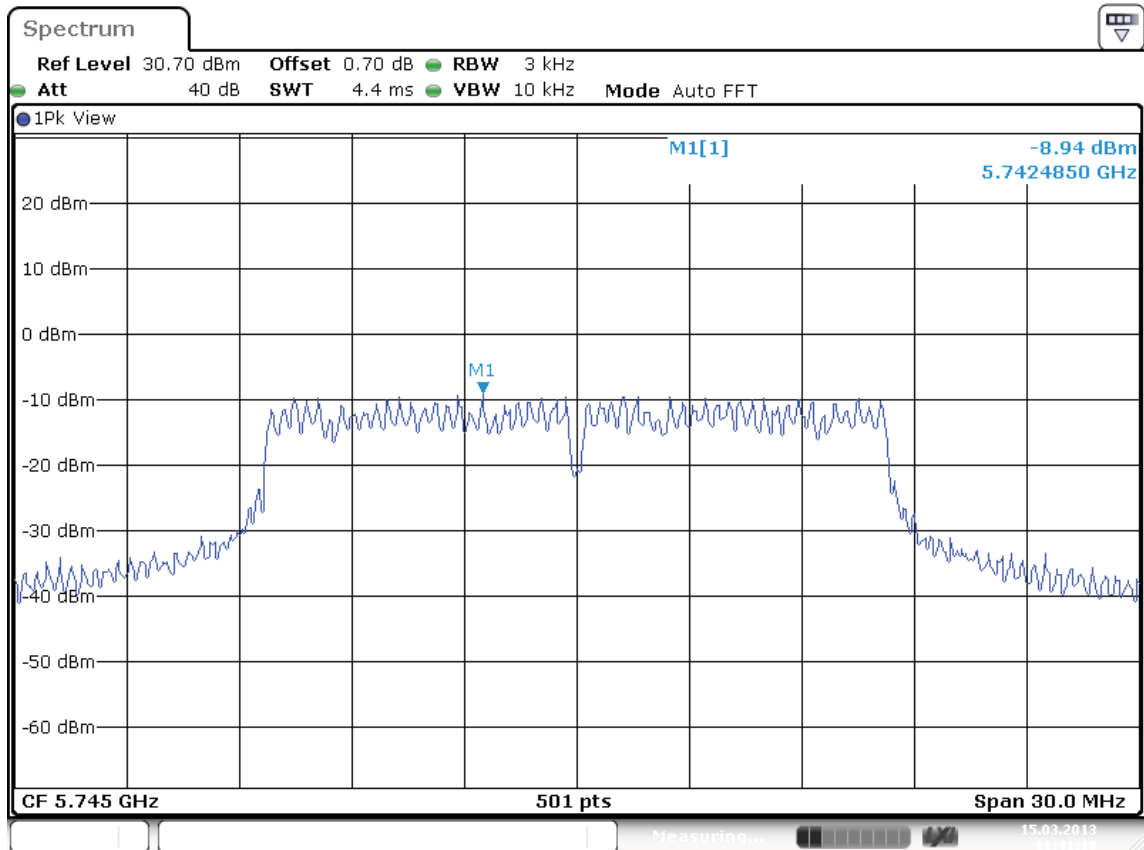
Test Report No.:

**12121201.fcc01**

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Operation mode: 6Mb OFDM, Antenna 1

Operating Frequency [MHz]	Max PSD [dBm]	Limit [dBm]	Result [Pass/Fail]	Plot
5745	-8.94	8	Pass	A
5785	-8.26	8	Pass	B
5825	-7.99	8	Pass	C



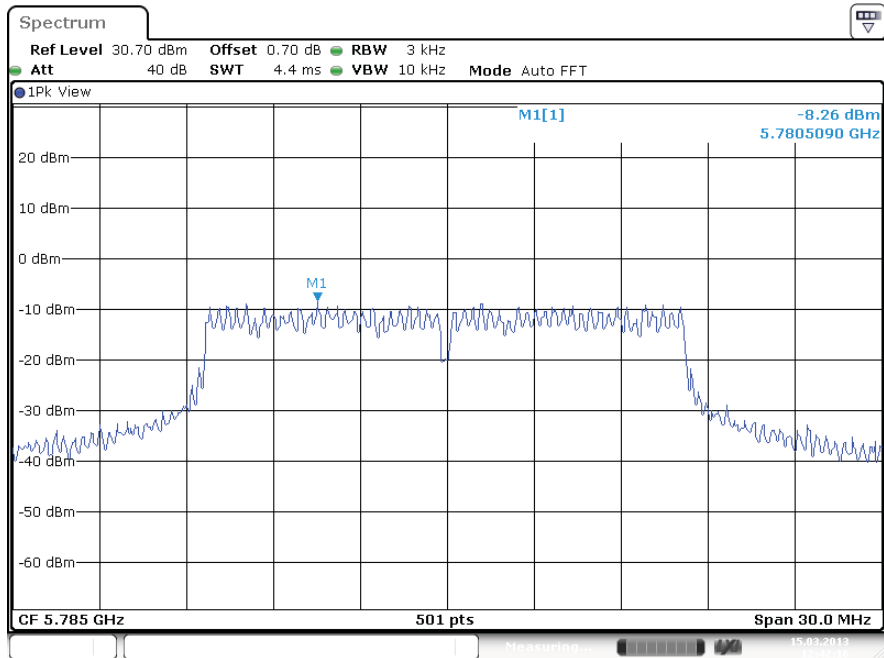
Date: 15.MAR.2013 11:41:18

Plot A

Test Report No.:

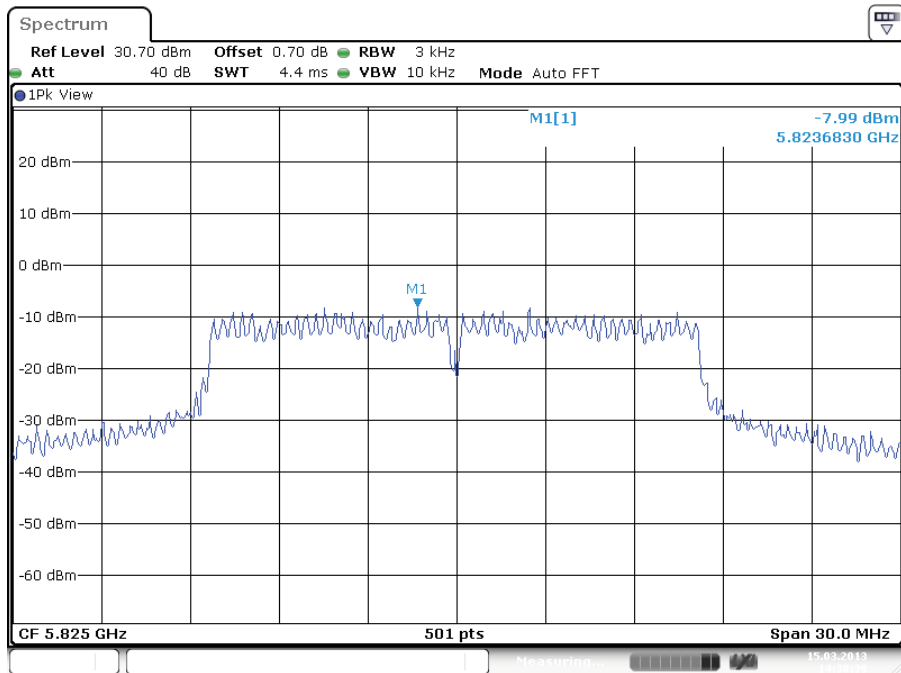
**12121201.fcc01**

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Date: 15.MAR.2013 12:42:16

Plot B



Date: 15.MAR.2013 14:38:39

Plot C

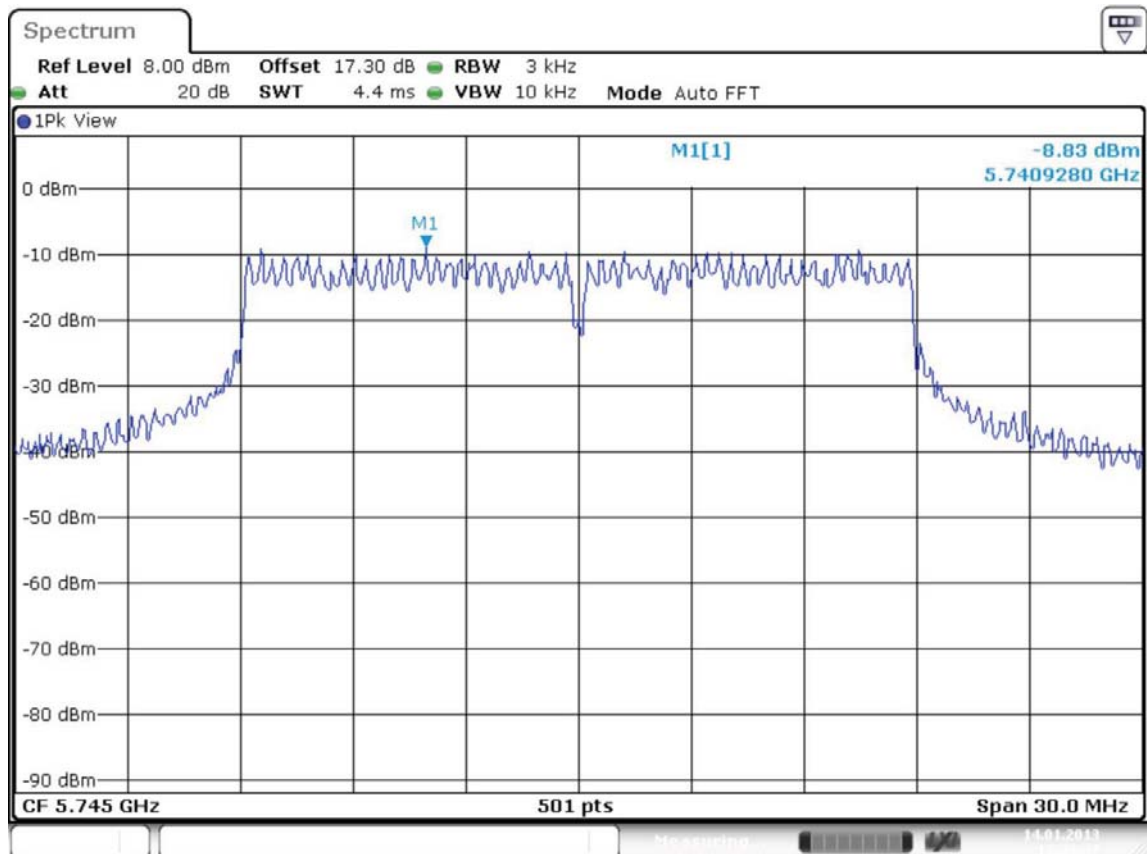
Test Report No.:

**12121201.fcc01**

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Operation mode: HT4-20MHz, Antenna 1

Operating Frequency [MHz]	Max PSD [dBm]	Limit [dBm]	Result [Pass/Fail]	Plot
5745	-8.83	8	Pass	A
5785	-7.96	8	Pass	B
5825	-8.70	8	Pass	C



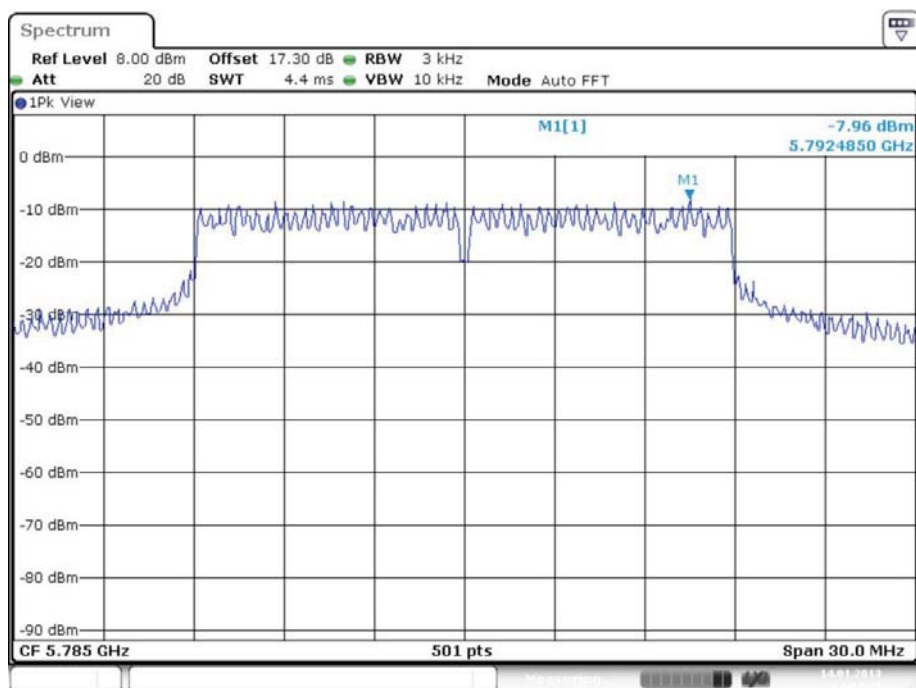
Date: 14.JAN.2013 13:49:47

Plot A

Test Report No.:

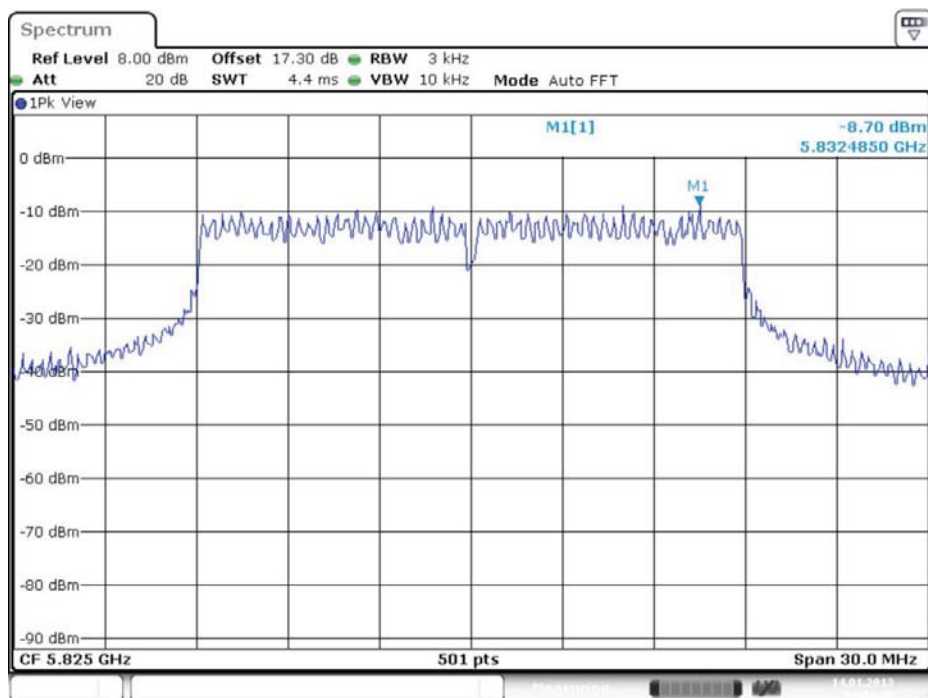
**12121201.fcc01**

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Date: 14.JAN.2013 14:04:24

Plot B



Date: 14.JAN.2013 14:44:09

Plot C

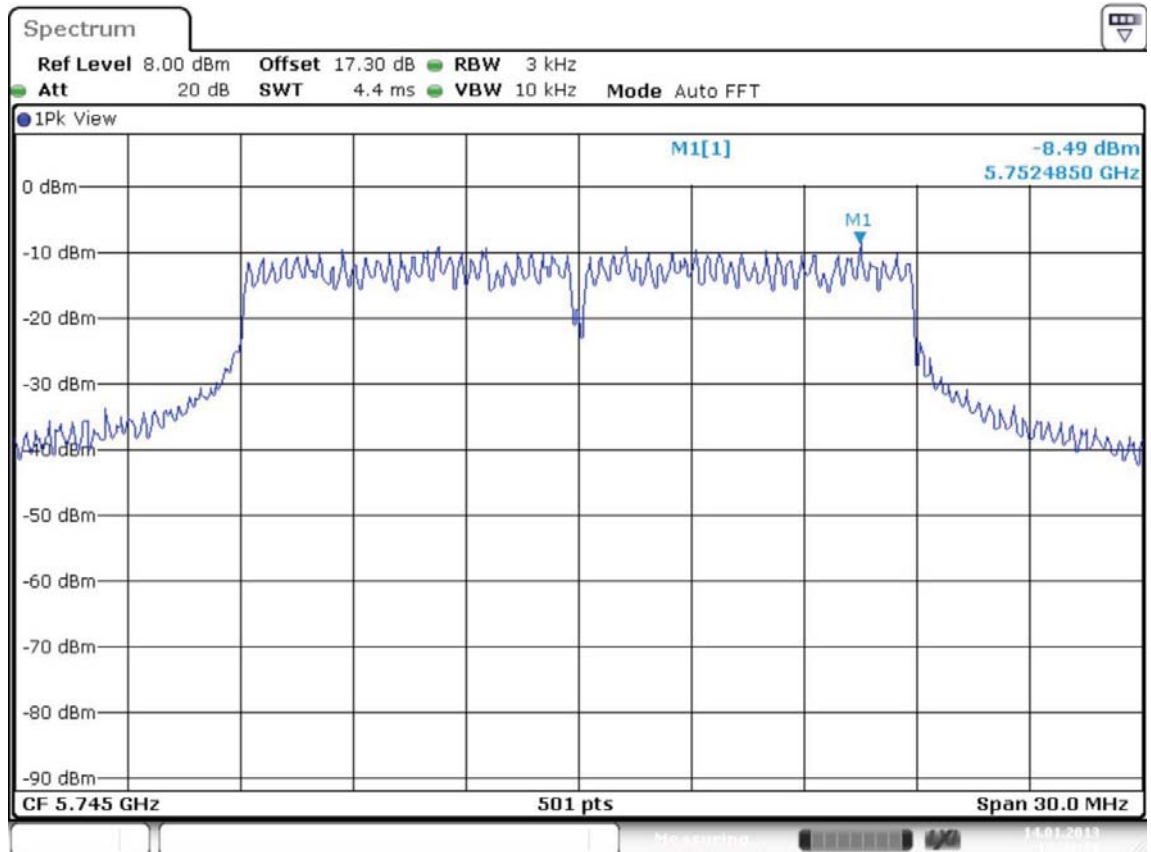
Test Report No.:

**12121201.fcc01**

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Operation mode: HT4-20MHz, Antenna 2

Operating Frequency [MHz]	Max PSD [dBm]	Limit [dBm]	Result [Pass/Fail]	Plot
5745	-8.49	8	Pass	A
5785	-8.36	8	Pass	B
5825	-9.04	8	Pass	C



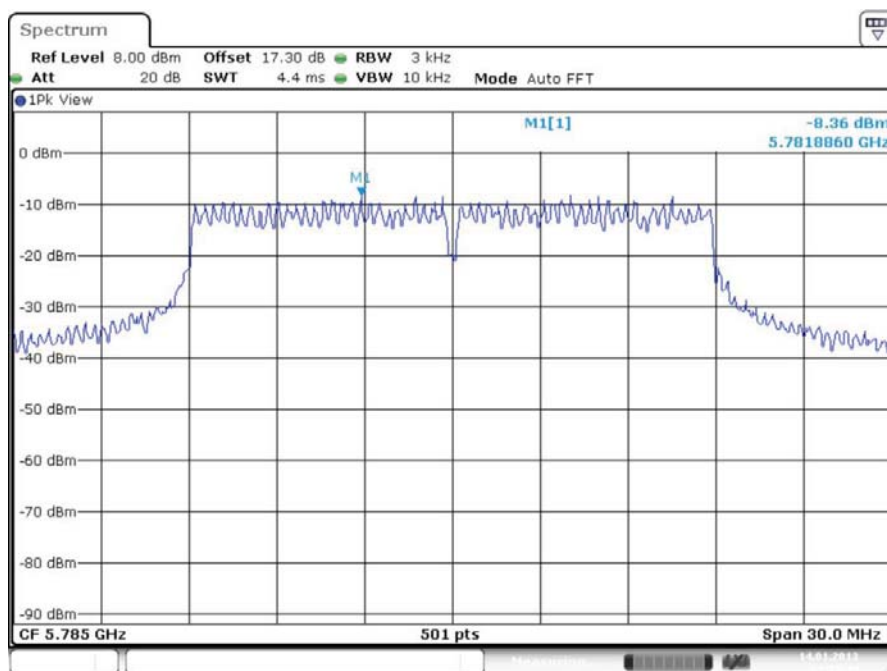
Date: 14.JAN.2013 13:48:10

Plot A

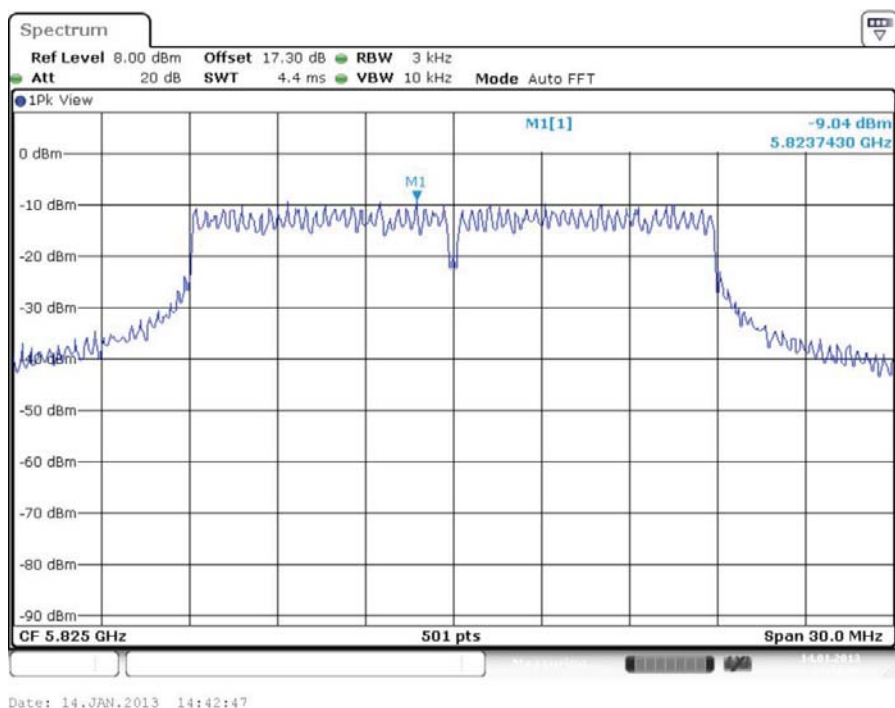
Test Report No.:

**12121201.fcc01**

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Plot B



Plot C

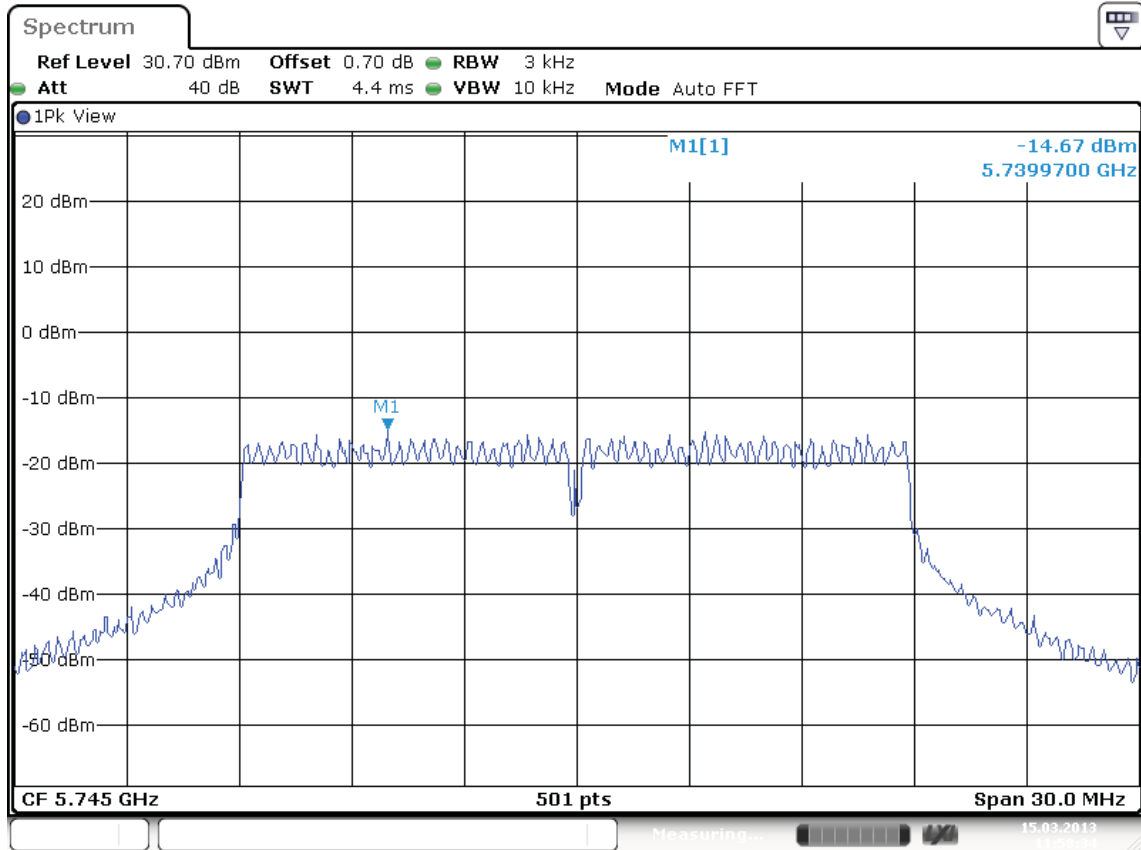
Test Report No.:

**12121201.fcc01**

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Operation mode: HT8-20 MHz, Antenna 1+2

Operating Frequency [MHz]	Max PSD Antenna 1 [dBm]	Max PSD Antenna 2 [dBm]	Limit [dBm]	Result [Pass/Fail]	Plot
5745	-11.67	-11.97	8	Pass	A
5785	-11.36	-11.25	8	Pass	B
5825	-11.85	-12.37	8	Pass	C



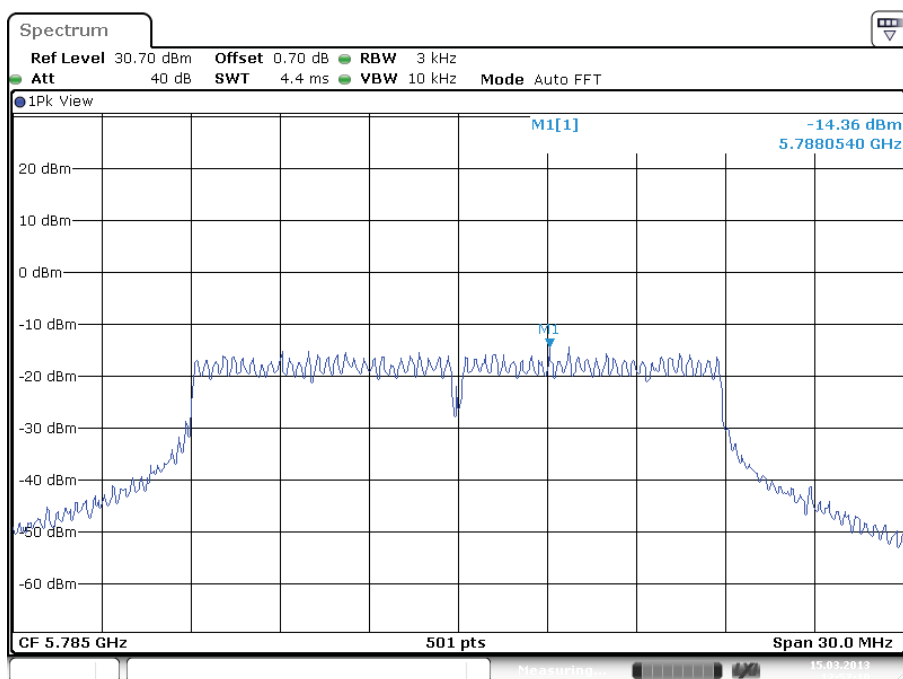
Date: 15.MAR.2013 11:58:34

Plot A Antenna 1

Test Report No.:

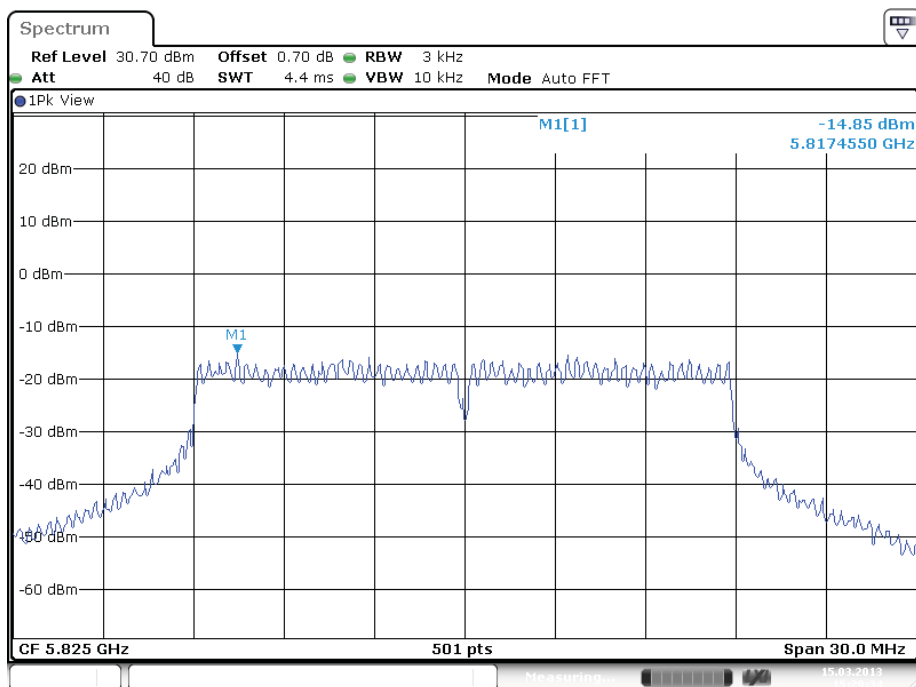
**12121201.fcc01**

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Date: 15.MAR.2013 12:57:10

Plot B Antenna 1



Date: 15.MAR.2013 15:29:34

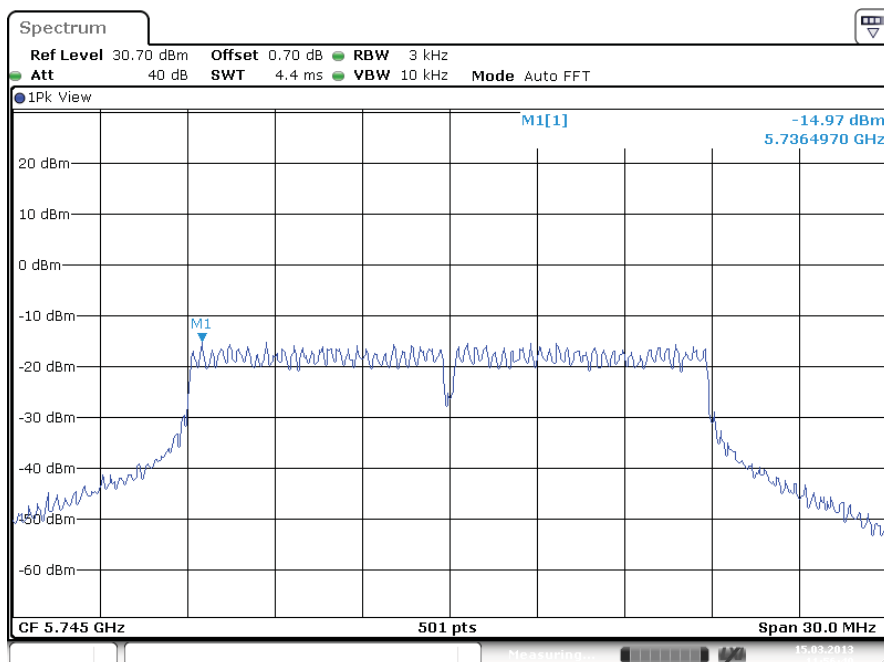
Plot C Antenna 1



Test Report No.:

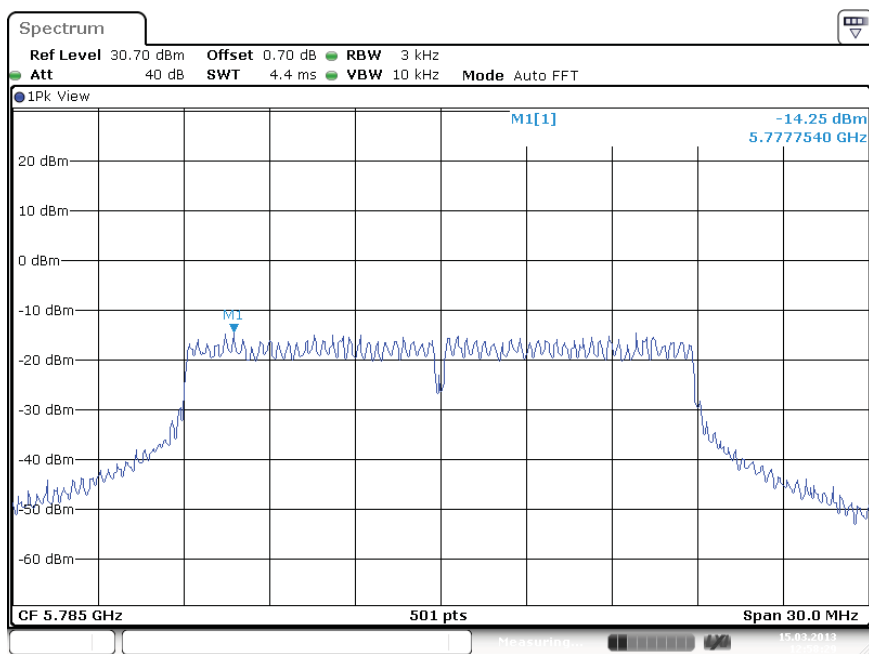
**12121201.fcc01**

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Date: 15.MAR.2013 11:56:49

Plot A Antenna 2



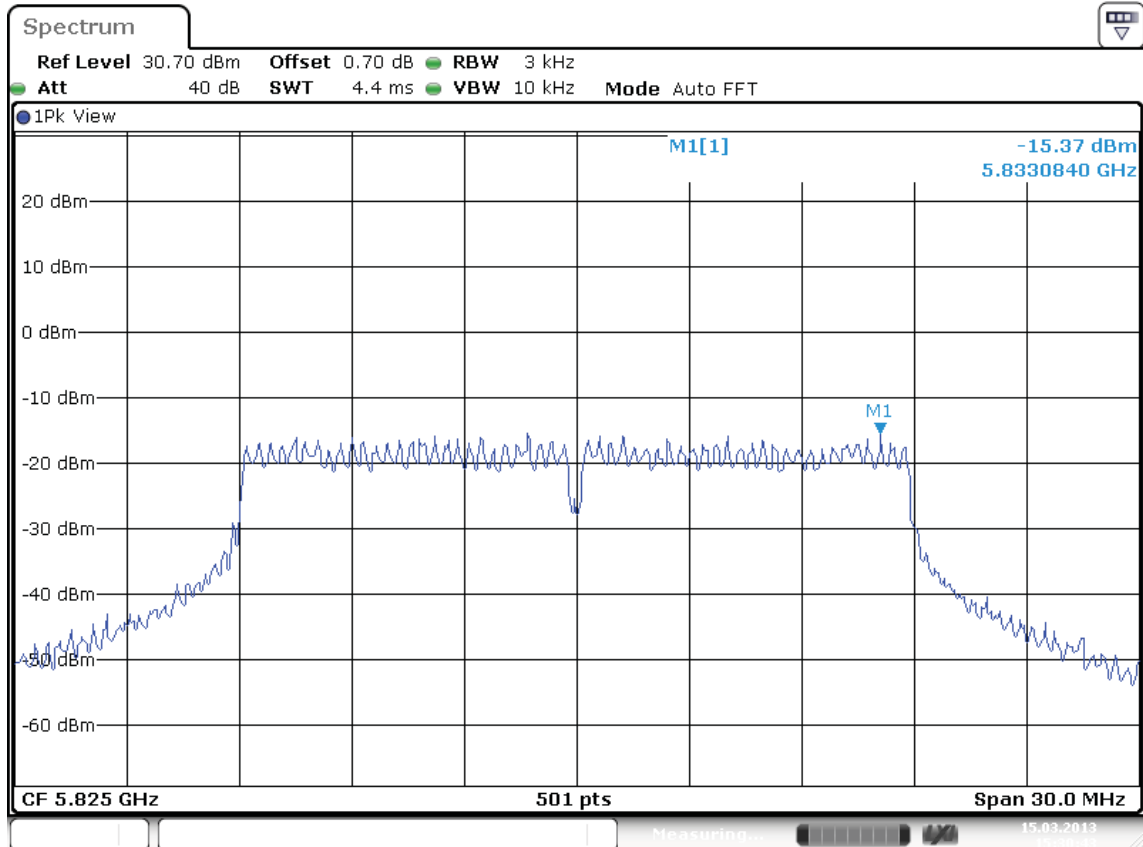
Date: 15.MAR.2013 12:58:29

Plot B Antenna 2

Test Report No.:

**12121201.fcc01**

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Date: 15.MAR.2013 15:30:43

Plot C Antenna 2

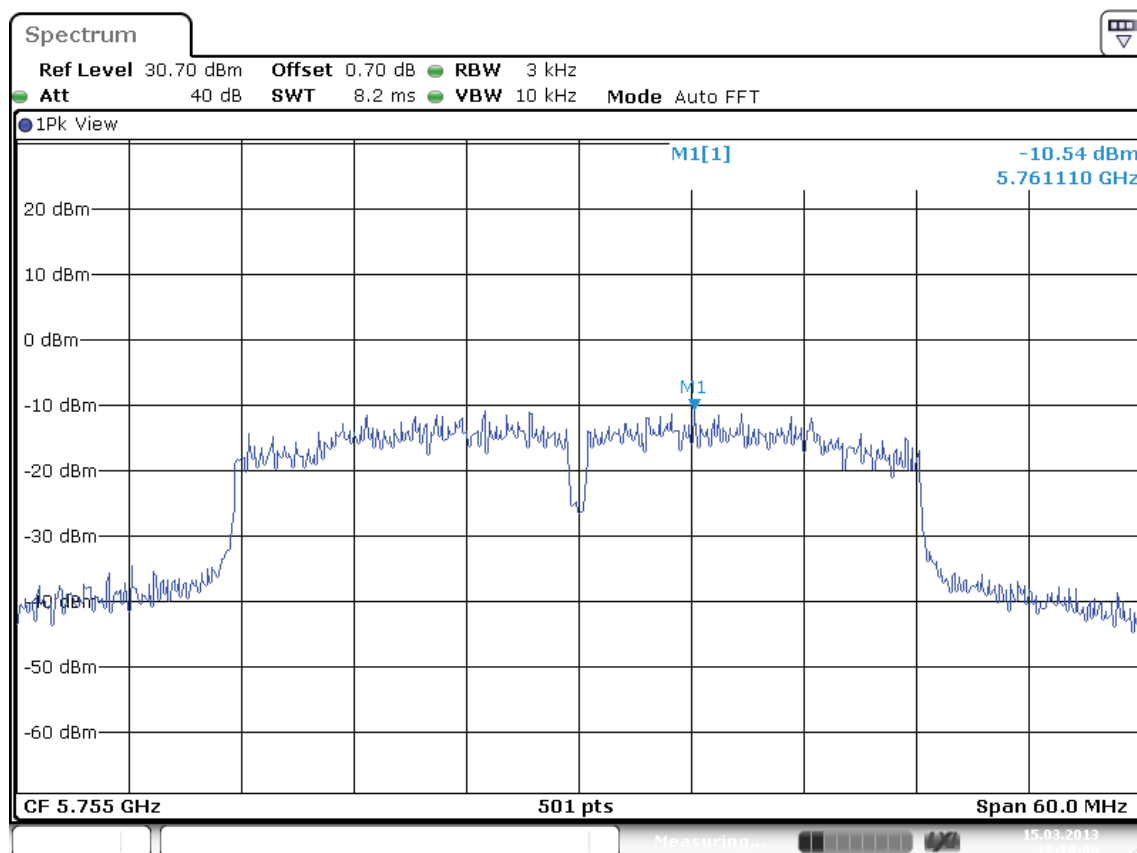
Test Report No.:

**12121201.fcc01**

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Operation mode: HT4-40 MHz, Antenna 1

Operating Frequency [MHz]	Max PSD [dBm]	Limit [dBm]	Result [Pass/Fail]
5775	-10.54	8	Pass
5795	-9.75	8	Pass



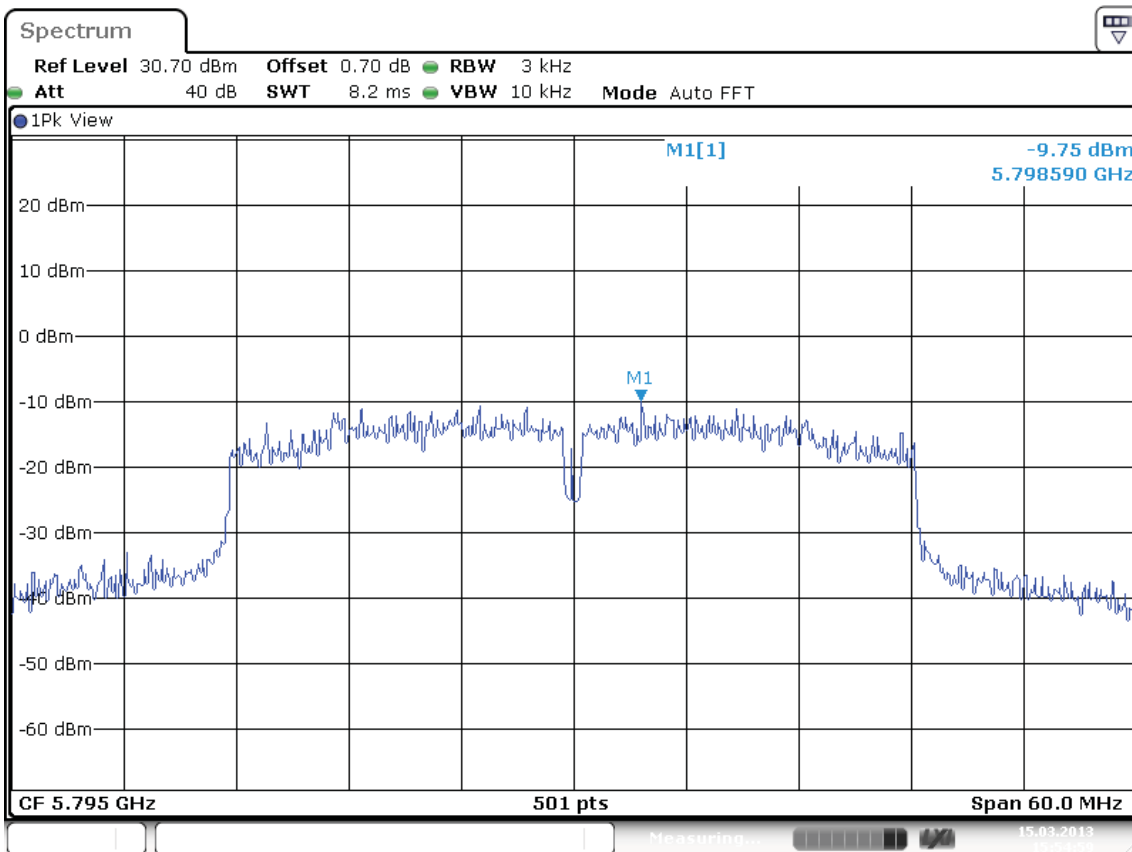
Date: 15.MAR.2013 12:19:00

Plot A

Test Report No.:

**12121201.fcc01**

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Date: 15.MAR.2013 15:54:59

Plot B

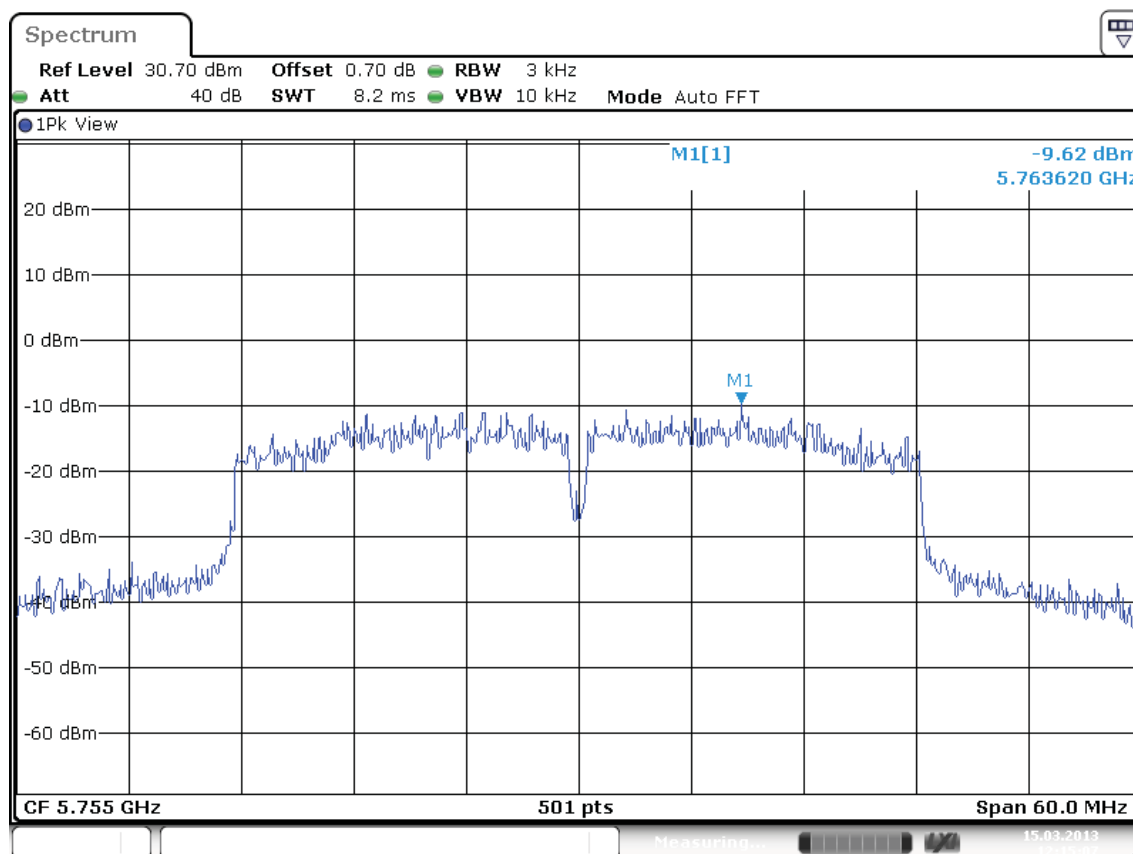
Test Report No.:

**12121201.fcc01**

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Operation mode: HT4-40 MHz, Antenna 2

Operating Frequency [MHz]	Max PSD [dBm]	Limit [dBm]	Result [Pass/Fail]
5775	-9.62	8	Pass
5795	-9.82	8	Pass



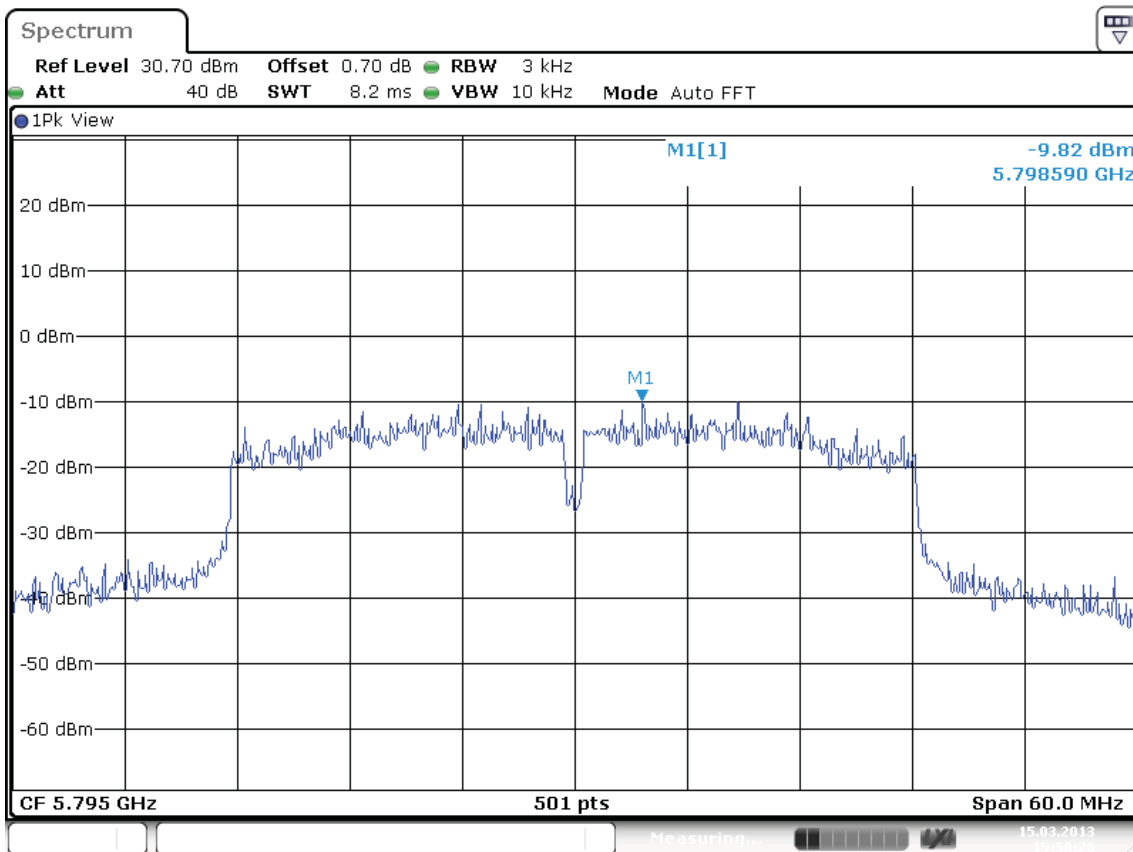
Date: 15.MAR.2013 12:15:07

Plot A

Test Report No.:

**12121201.fcc01**

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Date: 15.MAR.2013 15:50:20

Plot B

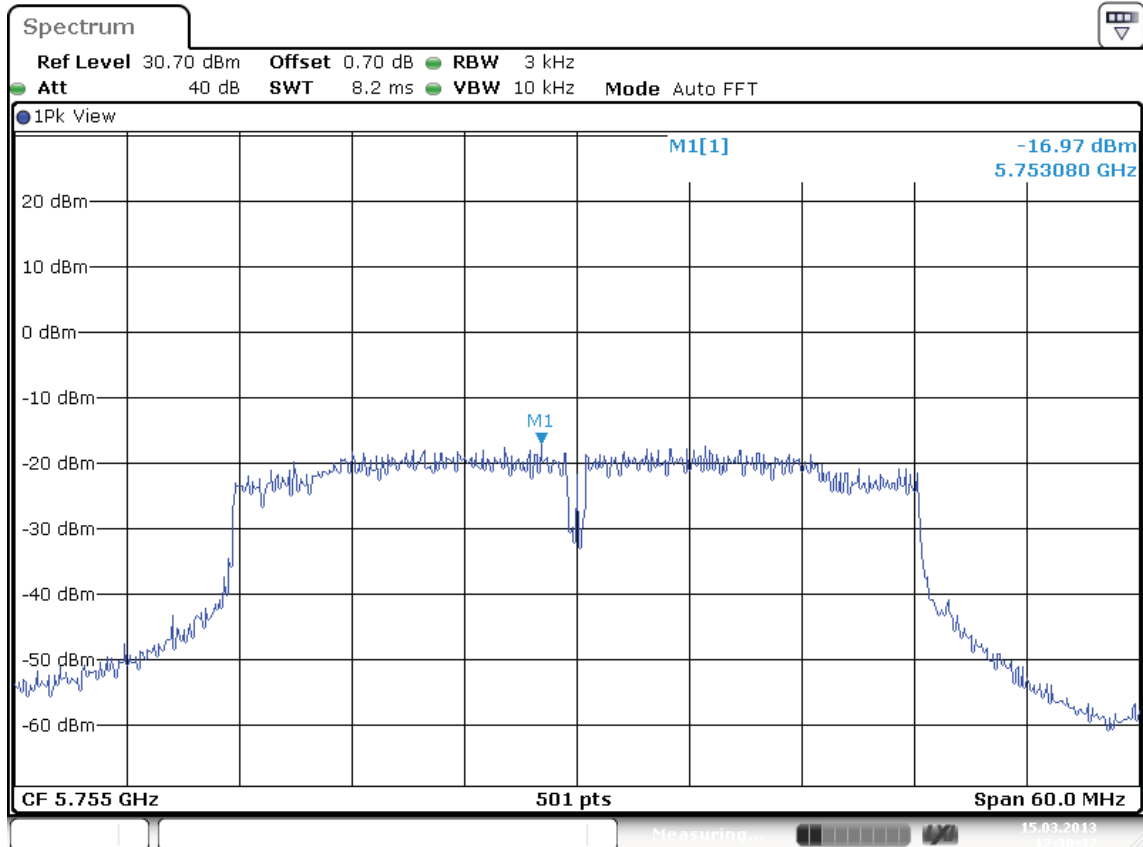
Test Report No.:

**12121201.fcc01**

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Operation mode: HT8-40 MHz, Antenna 1+2

Operating Frequency [MHz]	Max PSD Antenna 1 [dBm]	Max PSD Antenna 2 [dBm]	Limit [dBm]	Result [Pass/Fail]
5775	-13.97	-14.70	8	Pass
5795	-14.24	-14.22	8	Pass



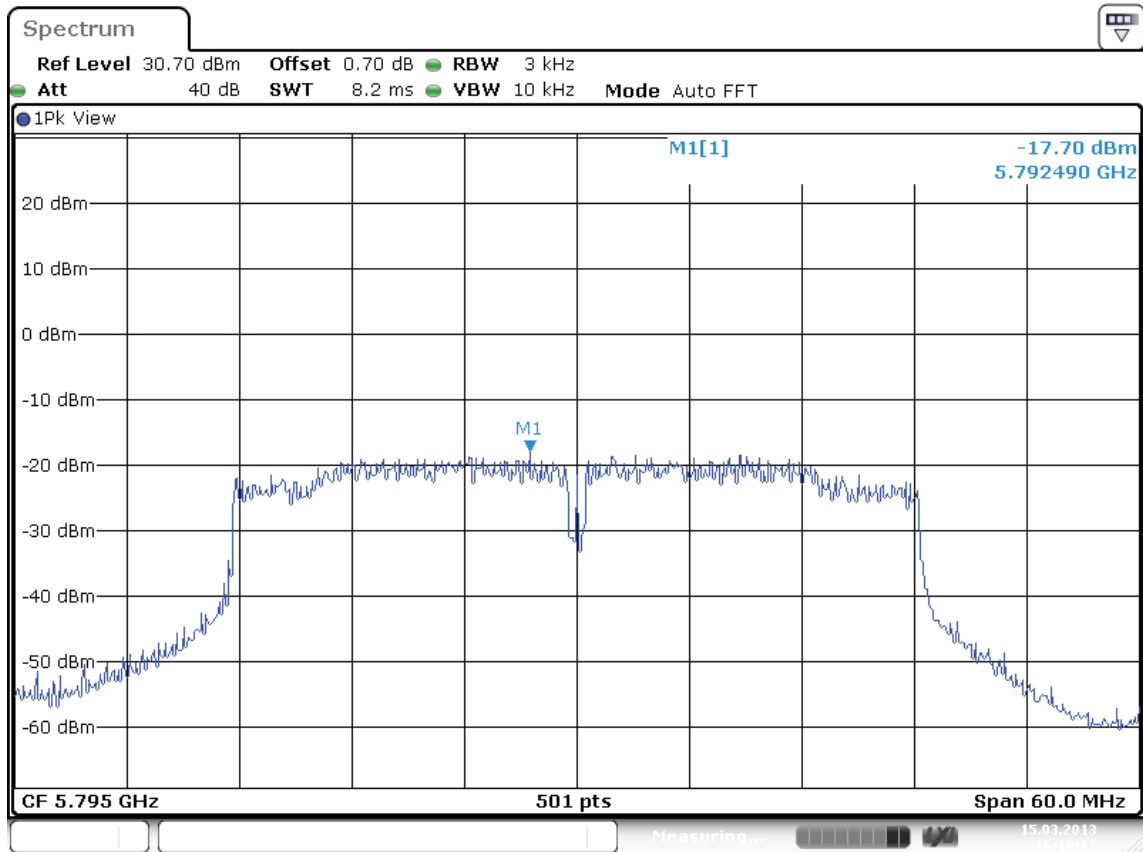
Date: 15.MAR.2013 12:30:37

Plot A Antenna 1

Test Report No.:

**12121201.fcc01**

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Date: 15.MAR.2013 16:18:16

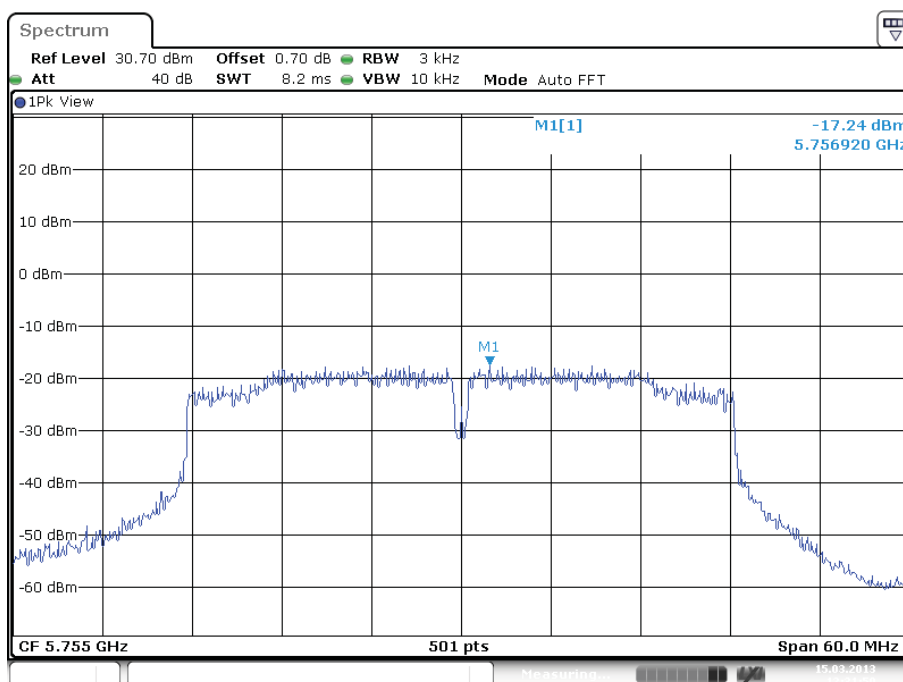
Plot B Antenna 1



Test Report No.:

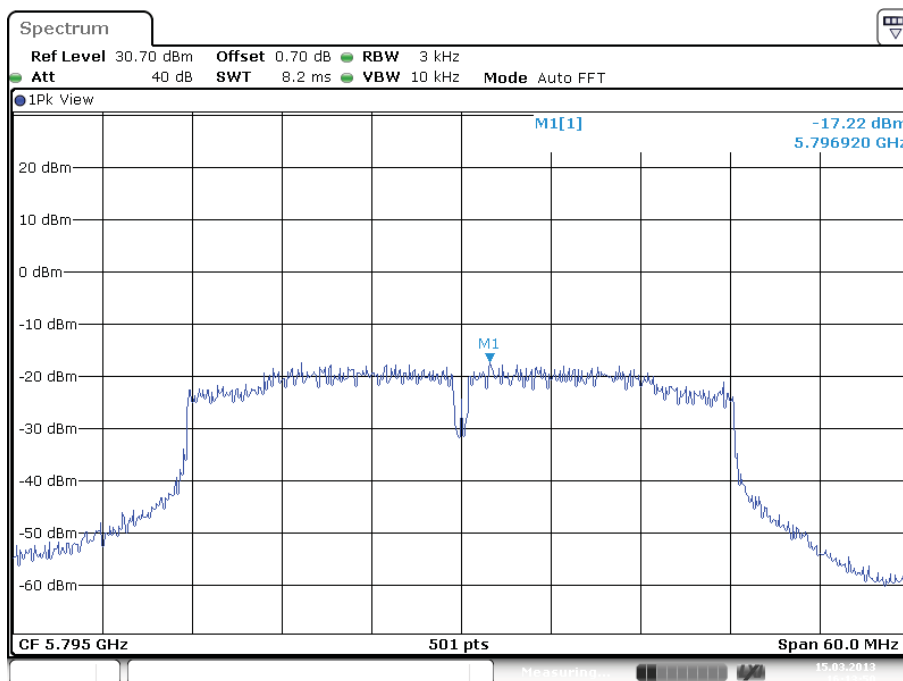
**12121201.fcc01**

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Date: 15.MAR.2013 12:31:51

Plot A Antenna 2



Date: 15.MAR.2013 16:13:50

Plot B Antenna 2

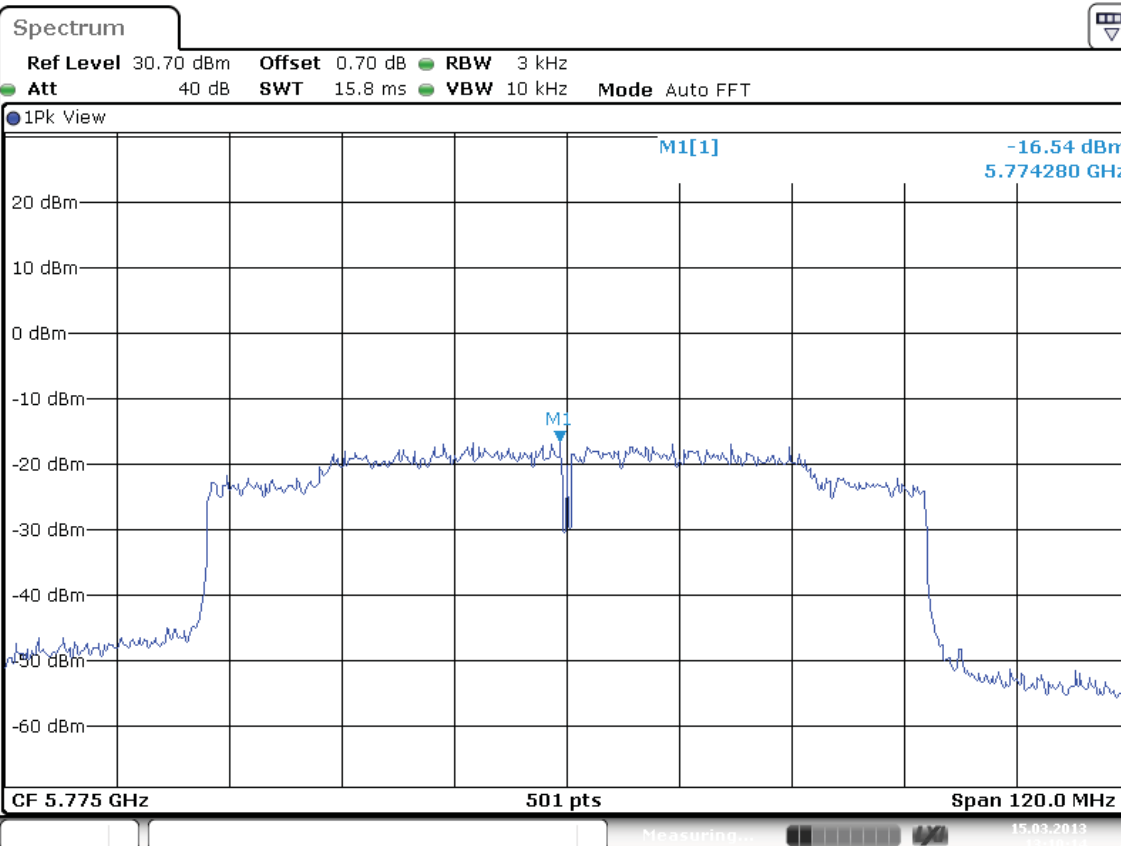
Test Report No.:

**12121201.fcc01**

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Operation mode: VHT6 -80 MHz, Antenna 1

Operating Frequency [MHz]	Max PSD [dBm]	Limit [dBm]	Result [Pass/Fail]
5775	-16.54	8	Pass



Date: 15.MAR.2013 13:10:14

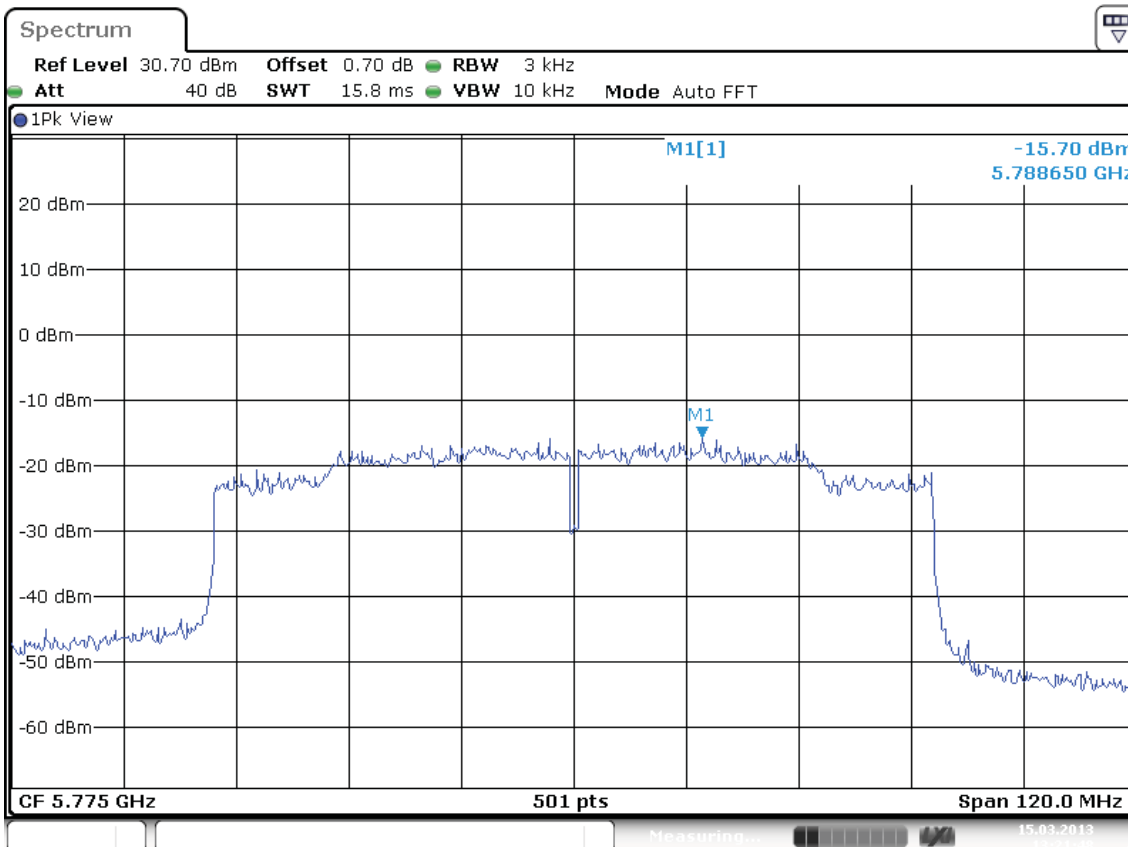
Test Report No.:

**12121201.fcc01**

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Operation mode: VHT6 -80 MHz, Antenna 2

Operating Frequency [MHz]	Max PSD [dBm]	Limit [dBm]	Result [Pass/Fail]
5775	-15.70	8	Pass



Date: 15.MAR.2013 13:21:48

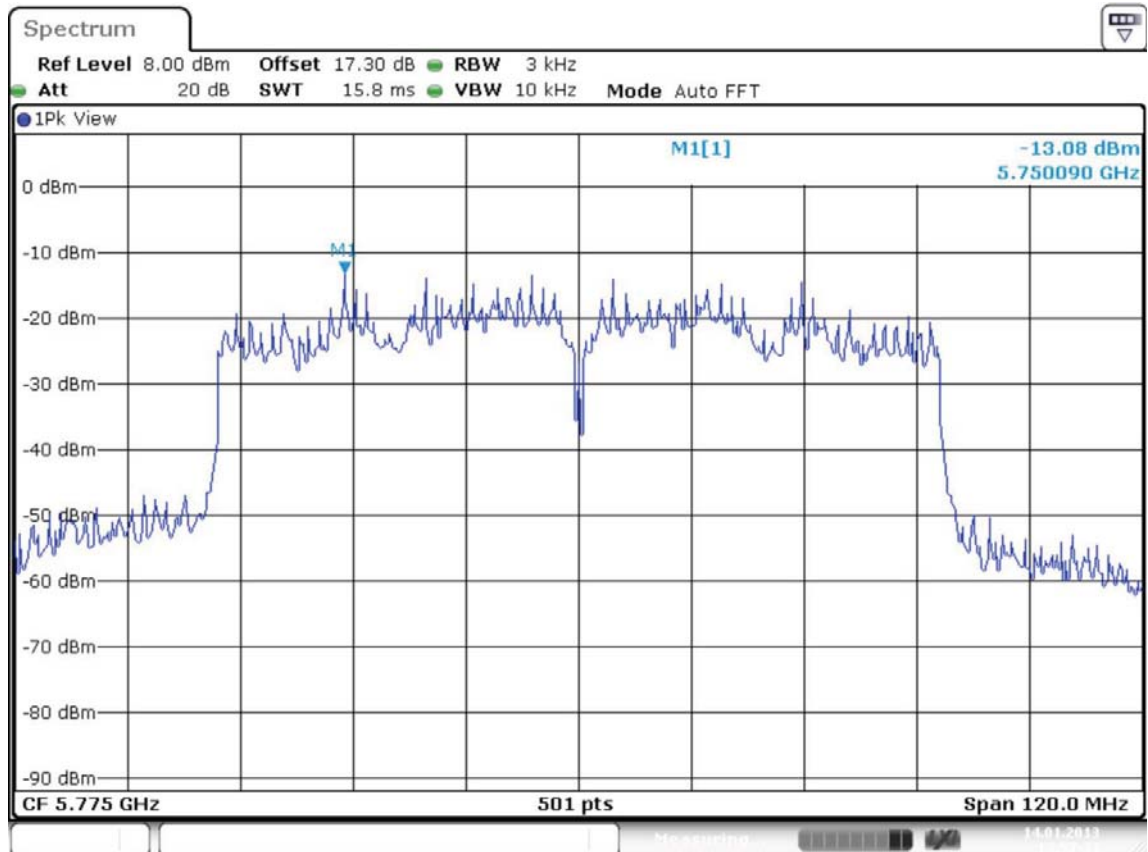
Test Report No.:

**12121201.fcc01**

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Operation mode:VHT6-80 MHz wide, Antenna 1+2

Operating Frequency [MHz]	Max PSD [dBm]	Limit [dBm]	Result [Pass/Fail]
5775	-13.08	8	Pass



Date: 14.JAN.2013 13:57:32

Test Report No.:

**12121201.fcc01**

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## 7.2.4 Band Edge Conducted Emissions

**RESULT: Pass**

Date of testing:

2013-01-16 / 2013-03-15

Requirements:

FCC 15.205, FCC 15.209, FCC 15.247(d) and RSS-210 section A8.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator 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 an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

Test procedure:

ANSI C63.10: 2009 and ANSI C63.10:2009

KDB Publication No. 558074 D01: Measurement of Digital Transmission Systems Operating under Section 15.247.

Measurements were performed using a spectrum analyzer with a suitable span to encompass the peak of the fundamental and using the following settings:

RBW = 100kHz, VBW = 300kHz.

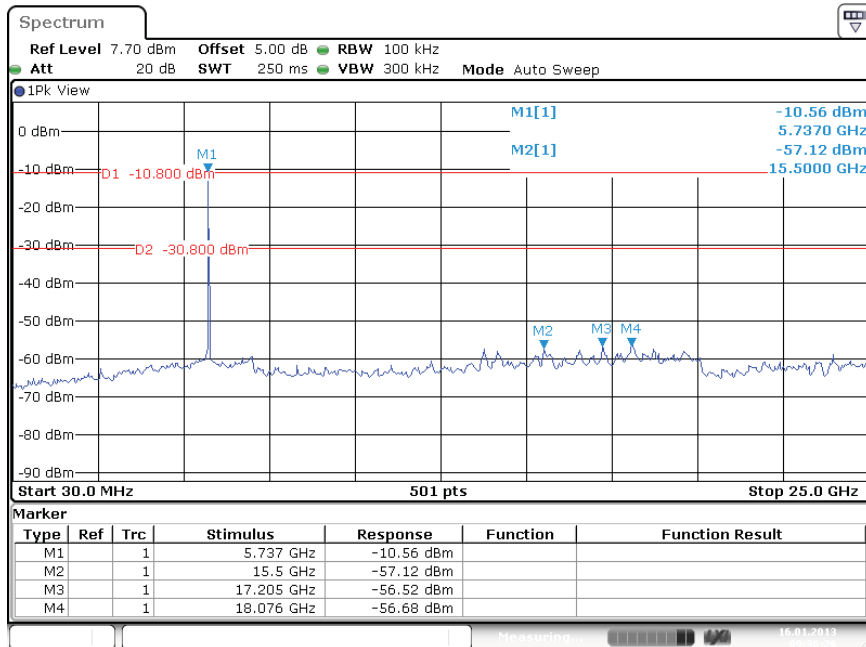
The highest emission amplitudes relative to the appropriate limit were measured and recorded in this report.

Results: All out of band spurious emissions are more than 20 dB below the fundamental.  
See the figures on the following pages.

Test Report No.:

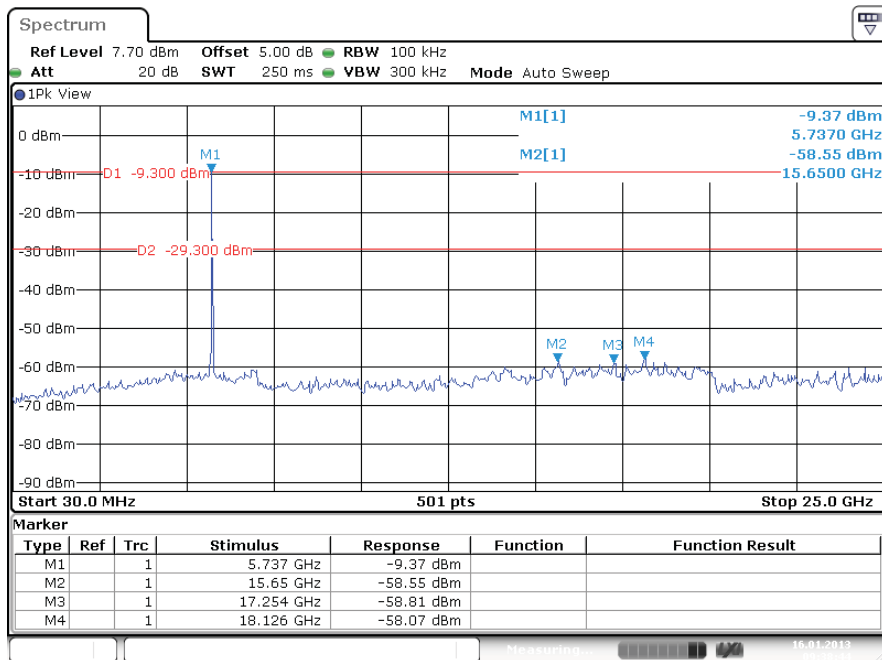
**12121201.fcc01**

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Date: 16.JAN.2013 09:36:26

Band Edge Conducted Emission, Spectral Diagram, 5745 MHz- 6Mb OFDM- Antenna 2



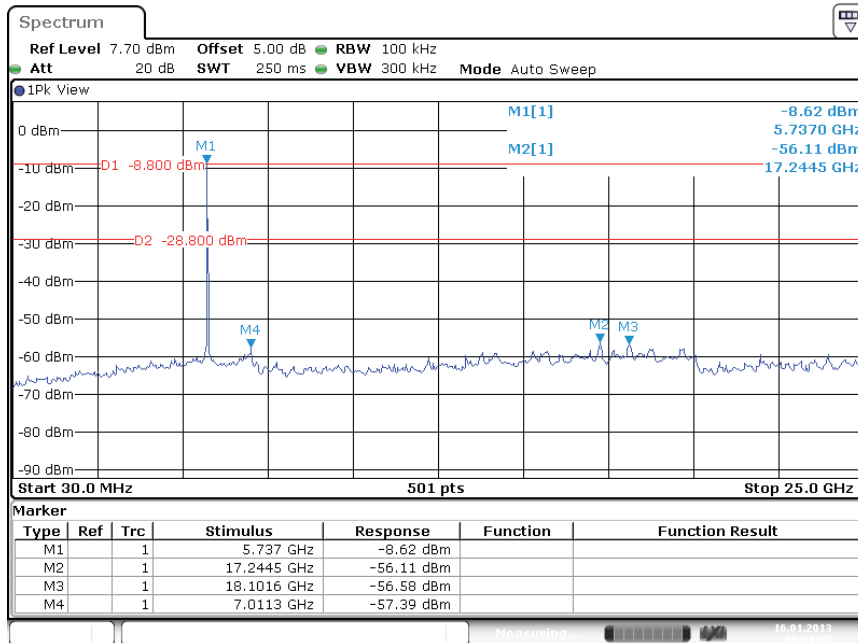
Date: 16.JAN.2013 09:38:44

Band Edge Conducted Emission, Spectral Diagram, 5745 MHz- 6Mb OFDM- Antenna 1

Test Report No.:

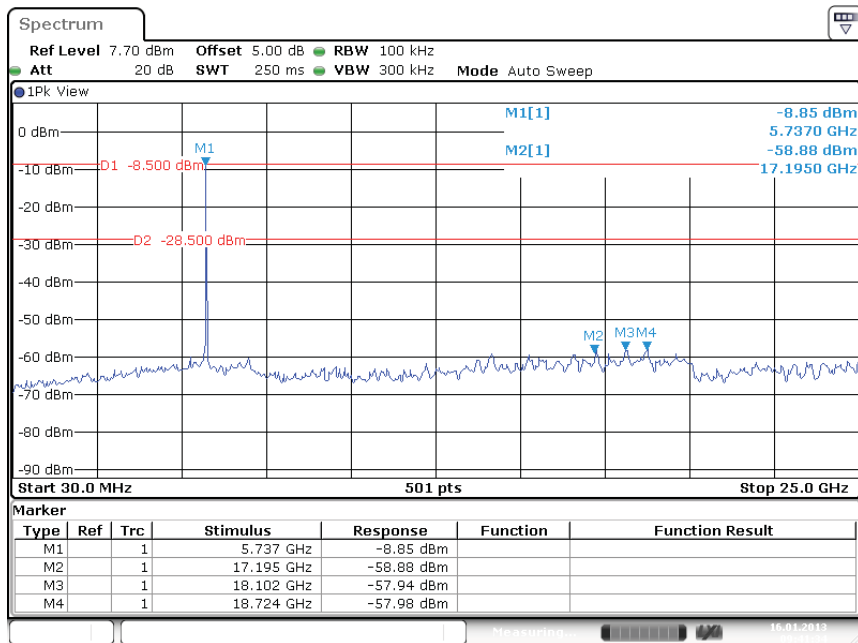
**12121201.fcc01**

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Date: 16.JAN.2013 09:31:27

Band Edge Conducted Emission, Spectral Diagram, 5745 MHz- HT4-20MHz- Antenna 1



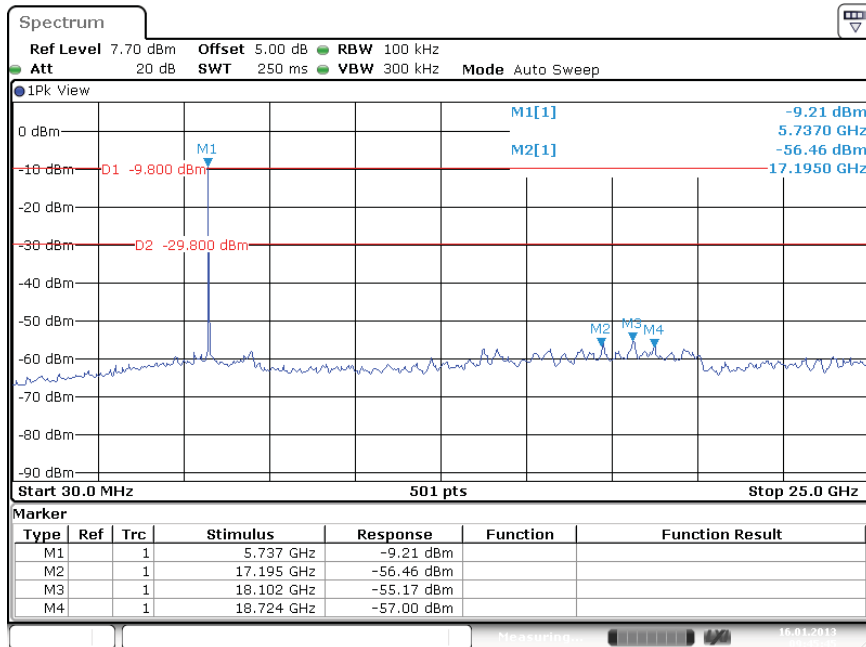
Date: 16.JAN.2013 09:41:35

Band Edge Conducted Emission, Spectral Diagram, 5745 MHz- HT4-20MHz- Antenna 2

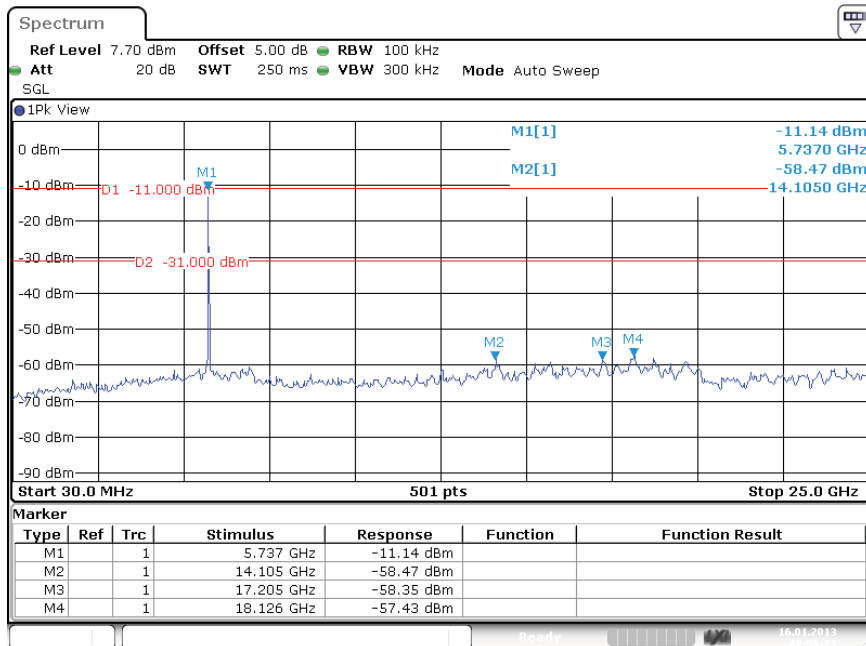
Test Report No.:

**12121201.fcc01**

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Band Edge Conducted Emission, Spectral Diagram, 5745 MHz HT8-20MHz- Antenna 1+2



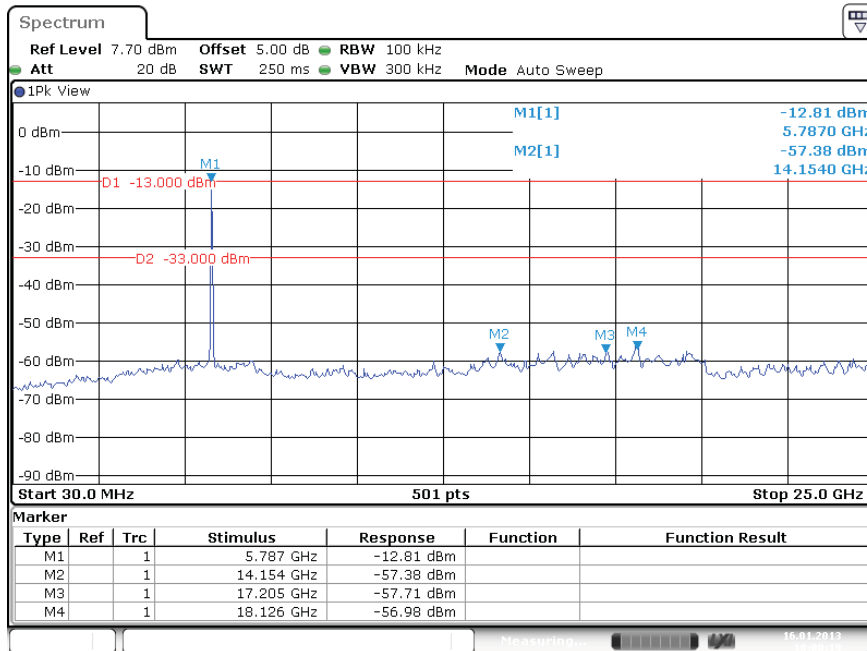
Band Edge Conducted Emission, Spectral Diagram, 5745 MHz- HT4-40MHz- Antenna 2



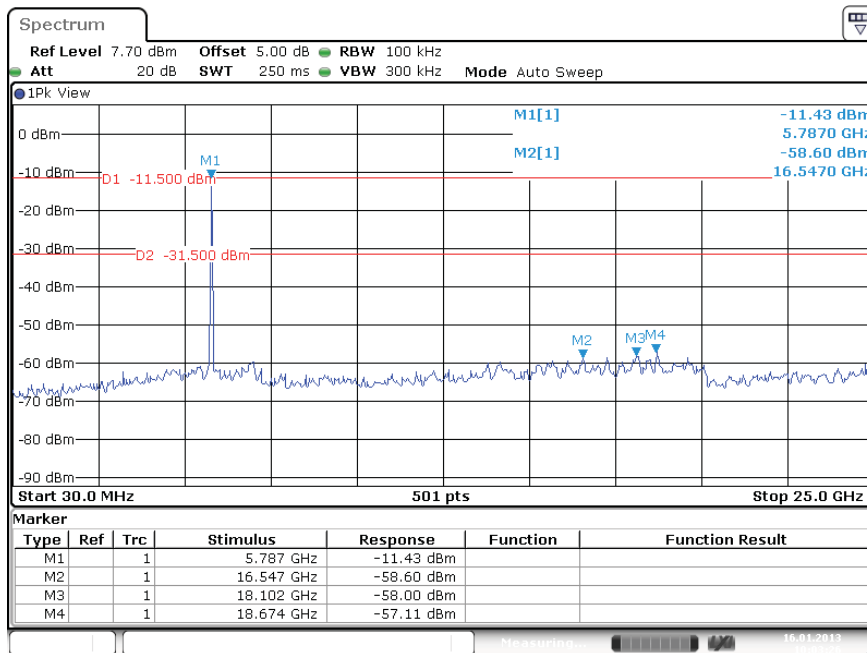
Test Report No.:

**12121201.fcc01**

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Band Edge Conducted Emission, Spectral Diagram, 5755 MHz- HT4-40MHz- Antenna 1

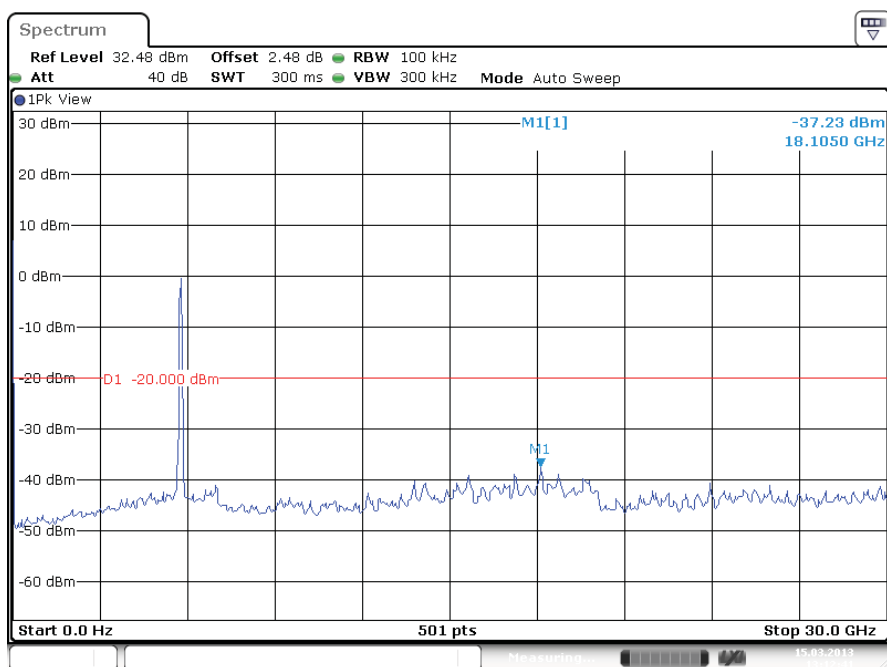


Band Edge Conducted Emission, Spectral Diagram, 5755 MHz- HT8-40MHz- Antenna 1+2

Test Report No.:

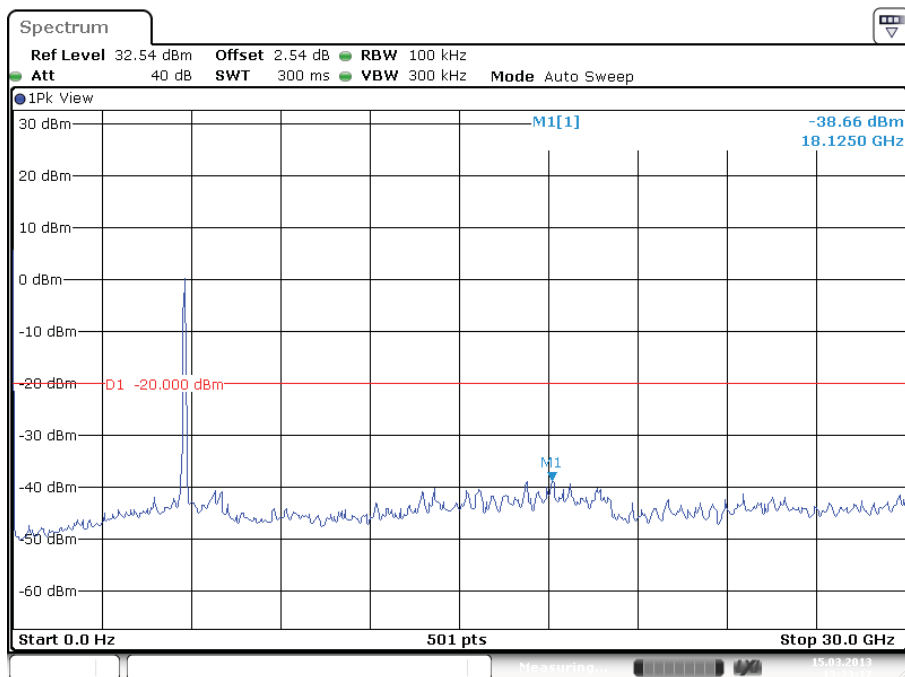
**12121201.fcc01**

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Date: 15.MAR.2013 13:12:41

Band Edge Conducted Emission, Spectral Diagram, 5775 MHz VHT6-80MHz, Antenna 1



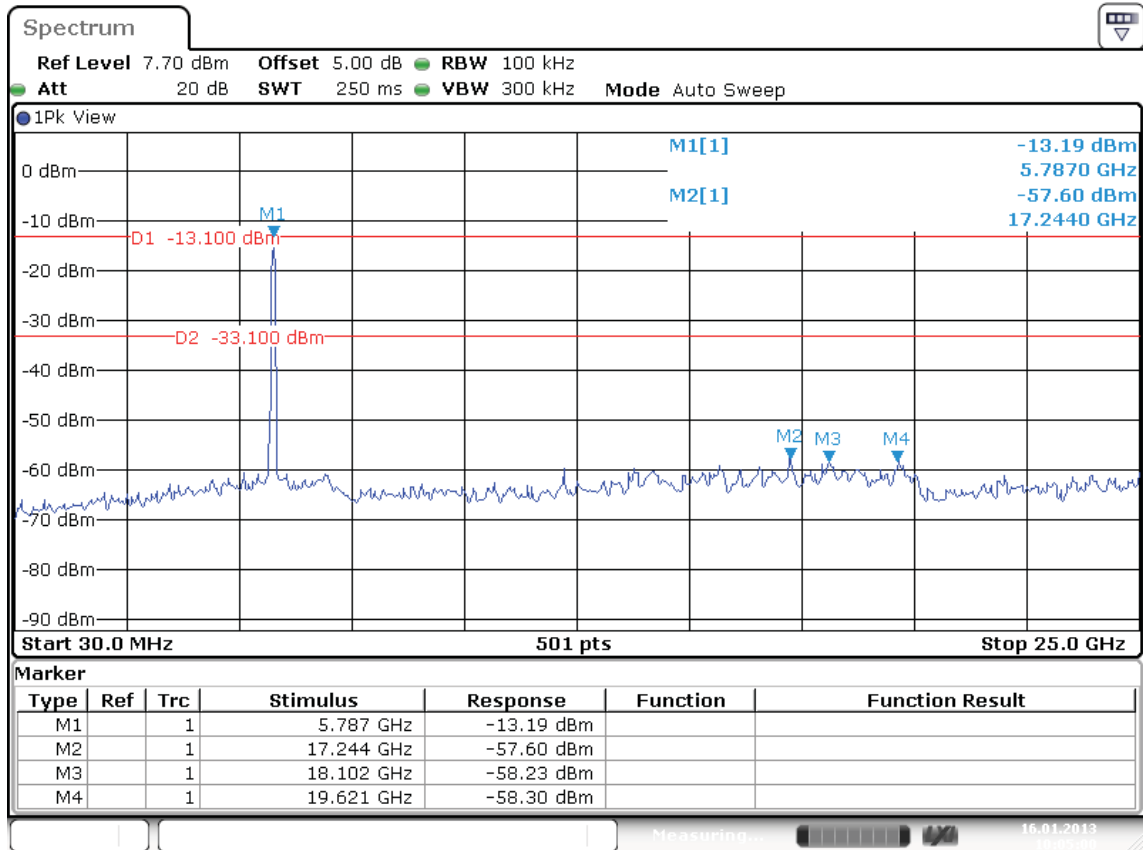
Date: 15.MAR.2013 13:23:17

Band Edge Conducted Emission, Spectral Diagram, 5775 MHz VHT6-80MHz, Antenna 2

Test Report No.:

**12121201.fcc01**

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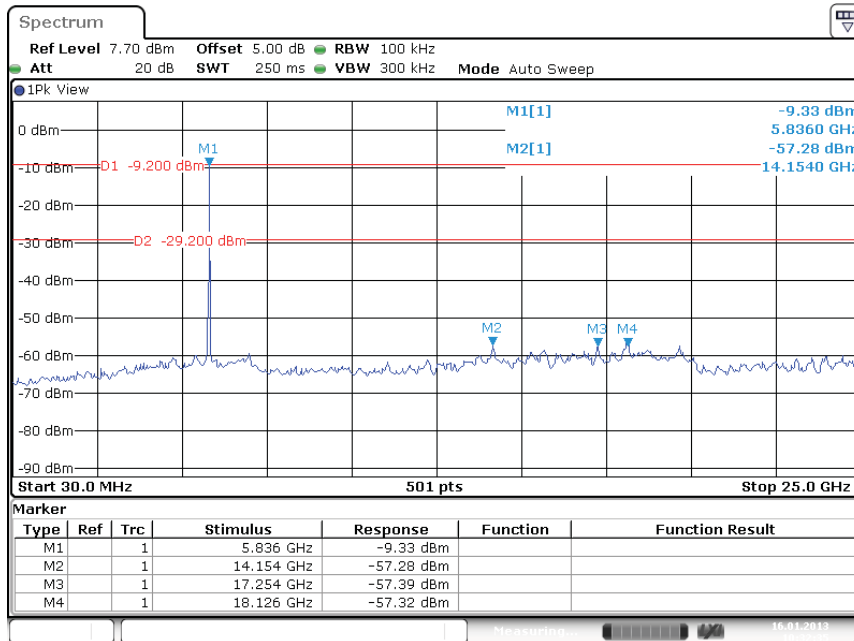
Date: 16.JAN.2013 10:05:00

Band Edge Conducted Emission, Spectral Diagram, 5775 MHz VHT6-80MHz, Antenna 1+2

Test Report No.:

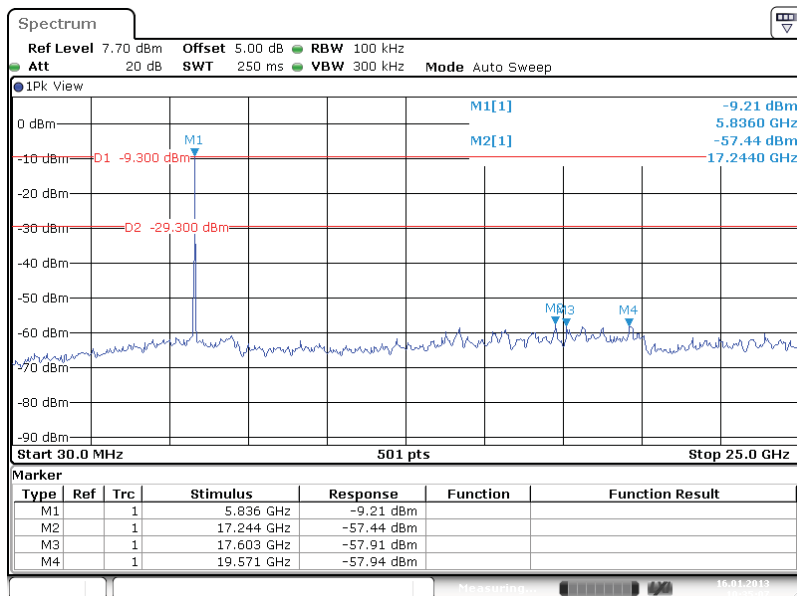
**12121201.fcc01**

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Date: 16.JAN.2013 10:32:35

Band Edge Conducted Emission, Spectral Diagram, 5825 MHz- 6Mb OFDM- Antenna 2



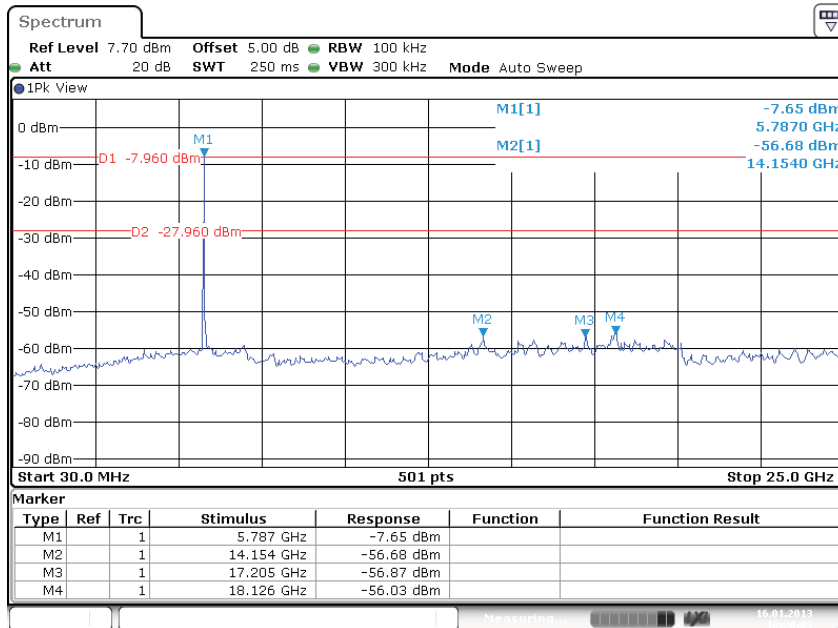
Date: 16.JAN.2013 10:35:08

Band Edge Conducted Emission, Spectral Diagram, 5825 MHz- 6Mb DSSS- Antenna 1

Test Report No.:

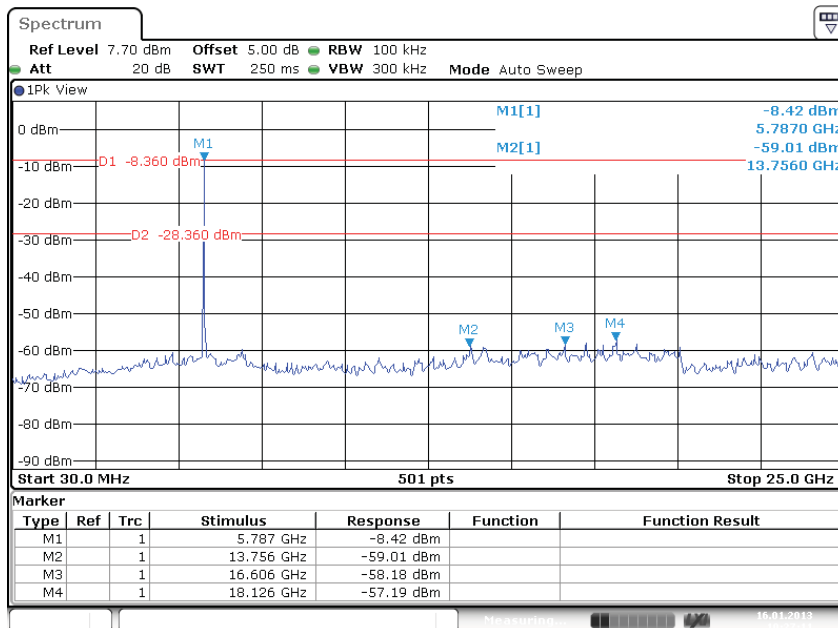
**12121201.fcc01**

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Date: 16.JAN.2013 10:20:02

Band Edge Conducted Emission, Spectral Diagram, 5825 MHz- HT4-20MHz- Antenna 1



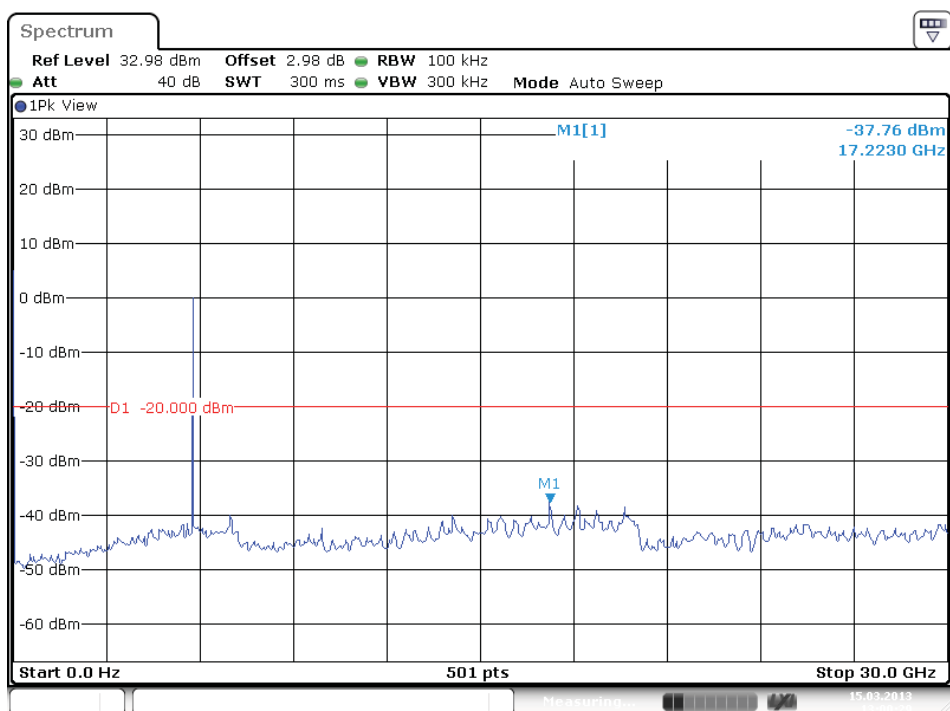
Date: 16.JAN.2013 10:27:11

Band Edge Conducted Emission, Spectral Diagram, 5825 MHz- HT4-20MHz- Antenna 2

Test Report No.:

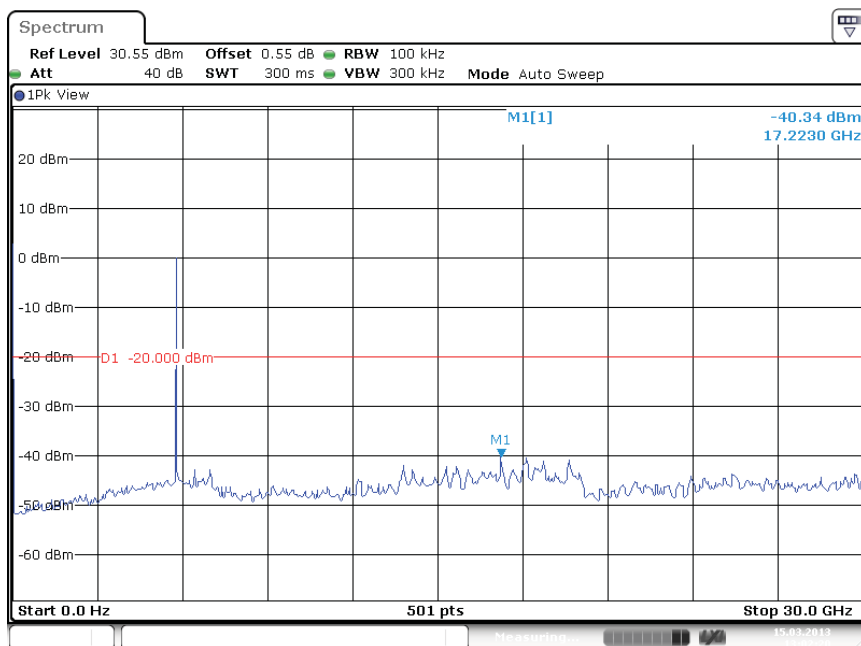
**12121201.fcc01**

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Date: 15.MAR.2013 13:00:29

Band Edge Conducted Emission, Spectral Diagram, 5825 MHz- MIMO HT8-20MHz- Antenna 1



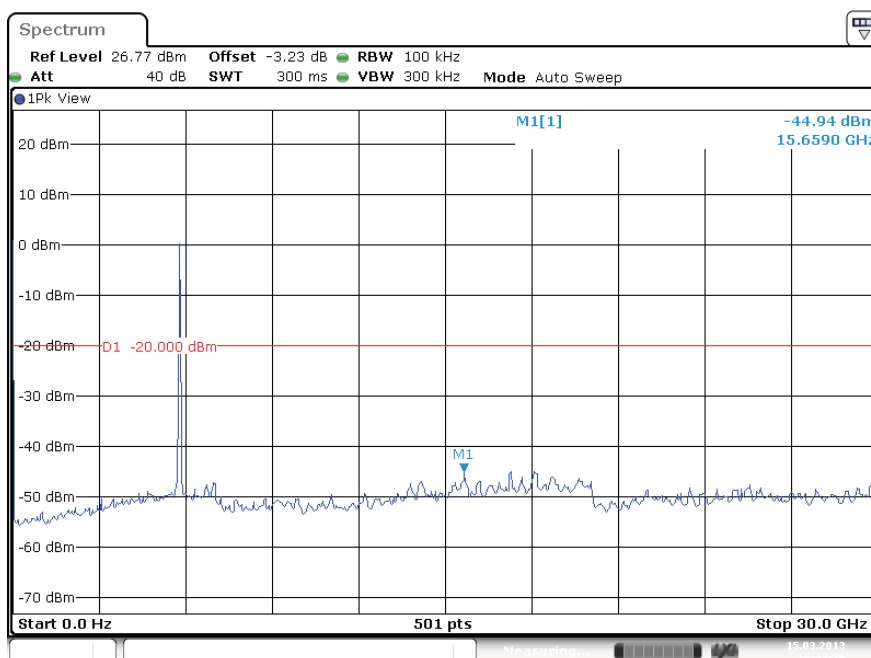
Date: 15.MAR.2013 13:02:20

Band Edge Conducted Emission, Spectral Diagram, 5825 MHz- MIMO HT8-20MHz- Antenna 2

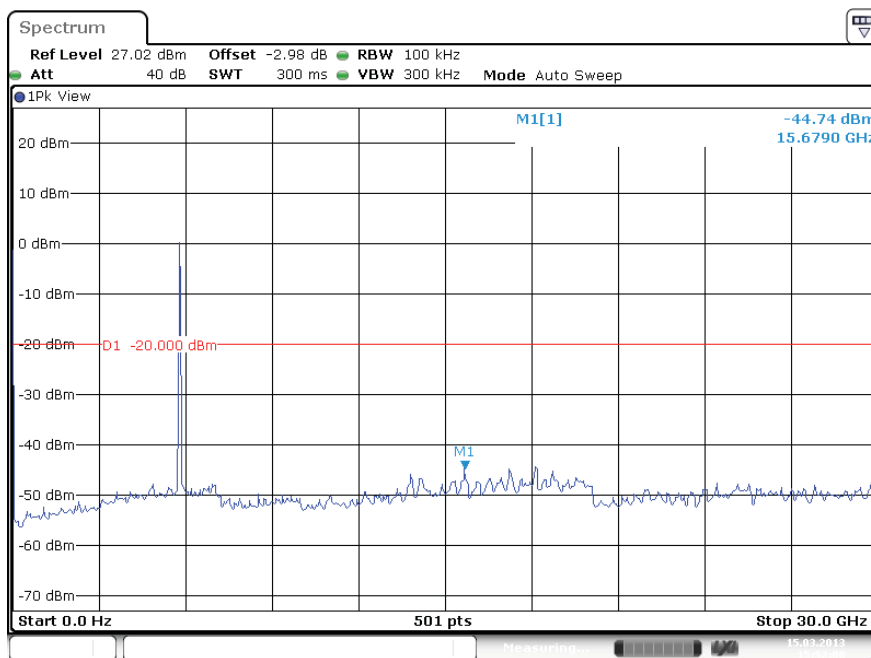
Test Report No.:

**12121201.fcc01**

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Band Edge Conducted Emission, Spectral Diagram, 5795 MHz- HT4-40MHz- Antenna 1

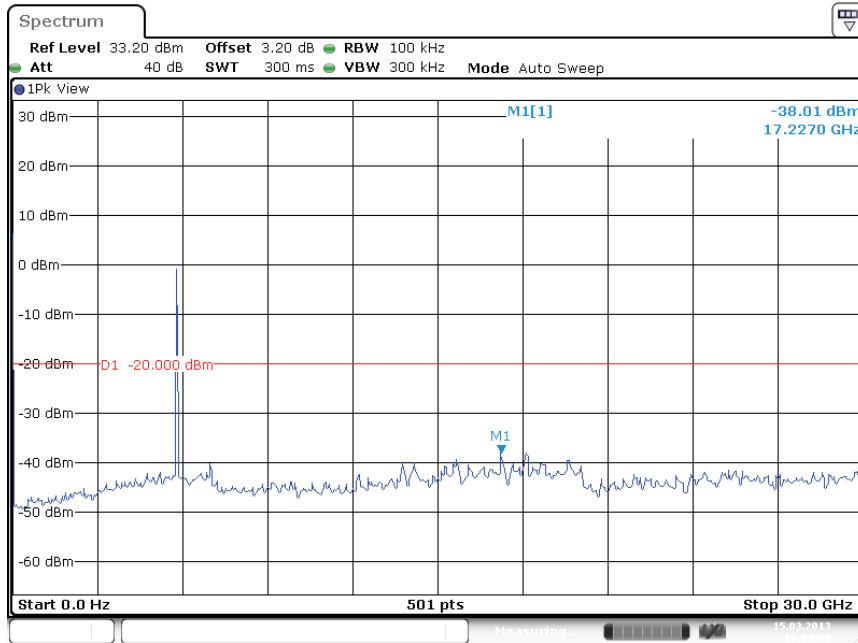


Band Edge Conducted Emission, Spectral Diagram, 5795 MHz- HT4-40MHz- Antenna 2

Test Report No.:

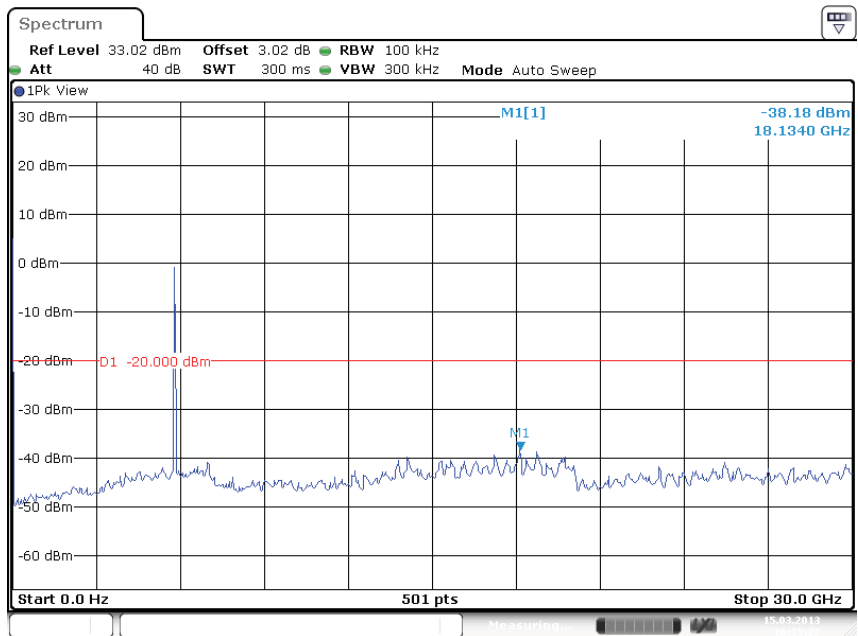
**12121201.fcc01**

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Date: 15.MAR.2013 16:03:07

Band Edge Conducted Emission, Spectral Diagram, 5795 MHz- MIMO HT8-40MHz- Antenna 1



Date: 15.MAR.2013 16:15:28

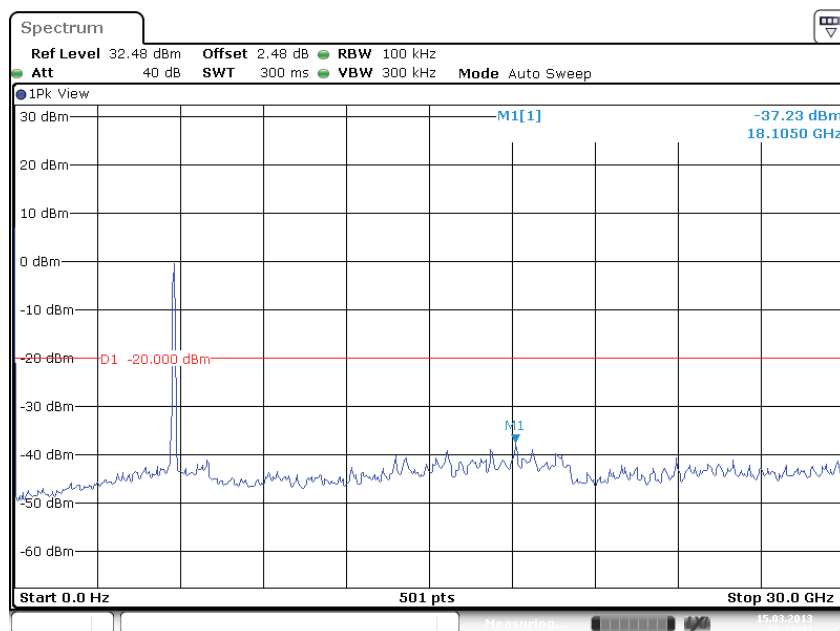
Band Edge Conducted Emission, Spectral Diagram, 5795 MHz- MIMO HT8-40MHz- Antenna 2



Test Report No.:

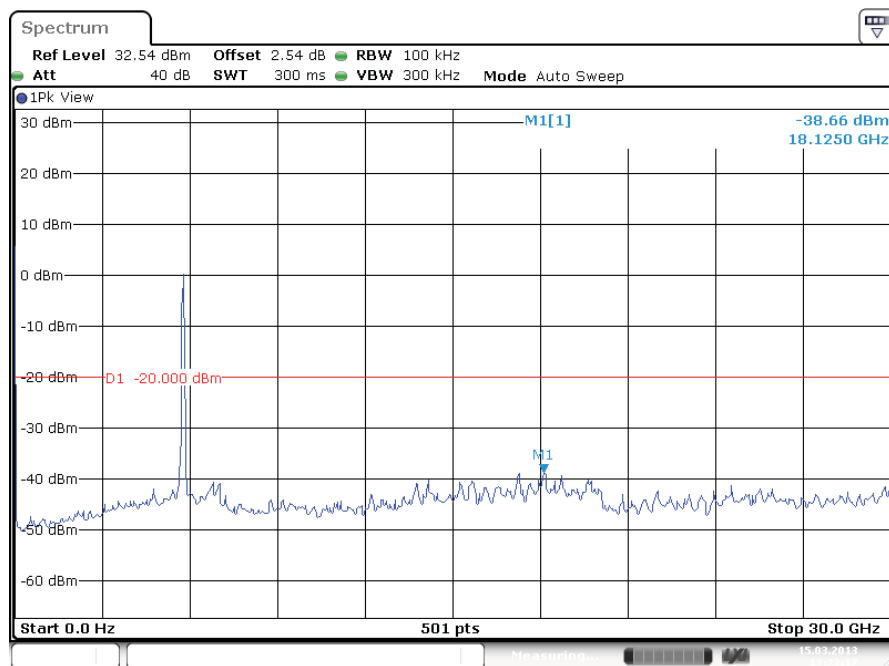
**12121201.fcc01**

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Date: 15.MAR.2013 13:12:41

Band Edge Conducted Emission, Spectral Diagram, 5775 MHz- VHT6-80MHz- Antenna 1



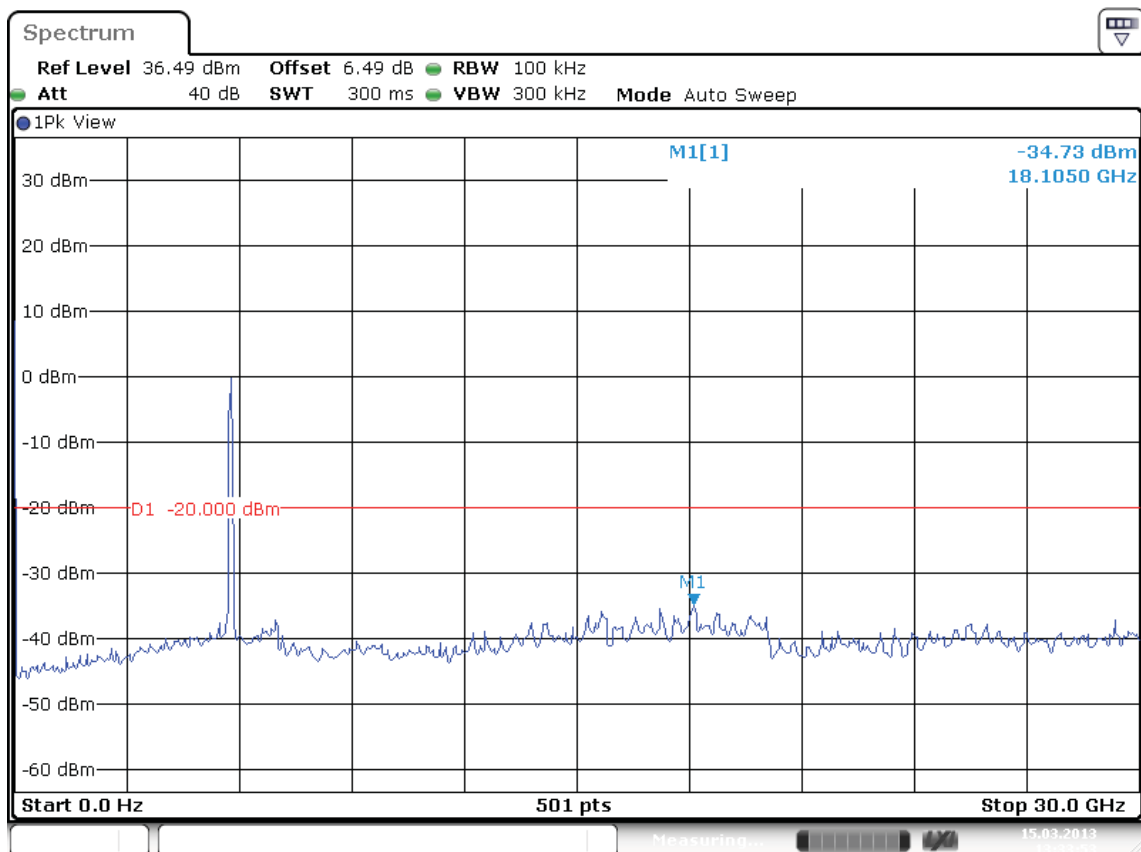
Date: 15.MAR.2013 13:23:17

Band Edge Conducted Emission, Spectral Diagram, 5775 MHz- VHT6-80MHz- Antenna 2

Test Report No.:

**12121201.fcc01**

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Date: 15.MAR.2013 13:33:53

Band Edge Conducted Emission, Spectral Diagram, 5775 MHz- VHT6-80MHz- Antenna 1+2

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## 7.2.5 Radiated Spurious Emissions of Transmitter

### RESULT: Pass

Date of testing: 2012-01-10

Frequency range: 30MHz - 40GHz

#### Requirements:

FCC 15.205, FCC 15.209 and FCC 15.247(d) and RSS-Gen

Radiated emissions which fall in the restricted bands, as defined in FCC 15.205(a), must comply with the radiated emission limits specified in FCC 15.209(a).

Radiated emissions which fall outside the operation frequency band and outside restricted bands shall either meet the limit specified in FCC 15.209(a) or be attenuated at least 20dB below the power level in the 100kHz bandwidth within the band that contains the highest level of the desired power (the less severe limit applies).

#### Test procedure:

ANSI C63.10-2009 and ANSI C63.10:2009

KDB Publication No. 558074 D01: Measurement of Digital Transmission Systems Operating under Section 15.247.

The EUT was placed on a nonconductive turntable 0.8m above the ground plane. Before final measurements of radiated emissions were performed, the EUT was scanned to determine its emission spectrum profile. The physical arrangement of the test system, the associated cabling and the EUT orientation (X, Y, Z) were varied in order to ensure that maximum emission amplitudes were attained.

The spectrum was examined from 30MHz to the 10th harmonic of the highest fundamental transmitter frequency with a maximum frequency of 40GHz. Final radiated emission measurements were made at 3m distance.

At each frequency where a spurious emission was found, the EUT was rotated 360° and the antenna was raised and lowered from 1 to 4m in order to determine the emission's maximum level. Measurements were taken using both horizontal and vertical antenna polarizations.

The highest emission amplitudes relative to the appropriate limit were recorded in this report. Field strength values of radiated emissions at frequencies not listed in the tables are more than 20 dB below the applicable limit.

Correction factors are incorporated in the spectrum analyzers as an automated function.

Refer to section 4.2 for the power settings and modes.

Correction factors includes: antenna factor, cable loss and pre-amplifier gain.

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**Radiated Emission, Quasi Peak Data, 30MHz - 1GHz, Horizontal and Vertical Antenna Orientations**

Freq. [MHz]	Antenna Orientation	Reading QP [dBµV]	Factor [dB(1/m)]	Level QP [dBµV/m]	Limit [dBµV/m]	Result
66.86	Vertical	15.1	5.4	20.5	40.0	Pass
111.48	Vertical	13.6	11.4	25.0	43.5	Pass
253.10	Vertical	13.7	14.2	27.9	46.0	Pass
774.96	Vertical	14.7	24.8	39.5	46.0	Pass
844.80	Vertical	15.3	26.1	41.4	46.0	Pass
922.40	Vertical	15.4	27.6	43.0	46.0	Pass

Note:

- Level QP = Reading QP + Factor
- Tested in modes as described in section 4.2, highest values noted.

Preliminary measurements indicated that the radiated emissions from EUT were not affected by the EUT's operating frequency or mode (transmit versus receive mode).

- Quasi Peak detector used with a bandwidth of 120 kHz

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**Radiated Emission, 1 - 40GHz, Horizontal and Vertical Antenna Orientations,  
5745 MHz - 6 Mb OFDM – Antenna 2**

Freq. [MHz]	Antenna Orientation	Detector	Level [dBµV/m]	Limit [dBµV/m]	Result
11490	Horizontal	Av	35.2	54	Pass
15500	Vertical	Av	38.1	54	Pass
17205	Vertical	Av	38.7	54	Pass
18076	Vertical	Av	38.5	54	Pass
11490	Horizontal	Pk	35.2	74	Pass
15500	Vertical	Pk	38.1	74	Pass
17205	Vertical	Pk	38.7	74	Pass
18076	Vertical	Pk	38.5	74	Pass

Note: - Peak (Pk) value already within Average (Av) limits, therefor Av not retested.  
Peak values also noted as Av value to show compliance with Av limit.  
- Peak detector used with a bandwidth of 1 MHz.

**Radiated Emission, 1 - 40GHz, Horizontal and Vertical Antenna Orientations,  
5745 MHz – 6 Mb OFDM – Antenna 2**

Freq. [MHz]	Antenna Orientation	Detector	Level [dBµV/m]	Limit [dBµV/m]	Result
11490	Horizontal	Av	35.2	54	Pass
15650	Vertical	Av	36.7	54	Pass
17254	Vertical	Av	36.4	54	Pass
18126	Vertical	Av	37.1	54	Pass
11490	Horizontal	Pk	35.2	74	Pass
15650	Vertical	Pk	36.7	74	Pass
17254	Vertical	Pk	36.4	74	Pass
18126	Vertical	Pk	37.1	74	Pass

Note: - Peak (Pk) value already within Average (Av) limits, therefor Av not retested.  
Peak values also noted as Av value to show compliance with Av limit.  
- Peak detector used with a bandwidth of 1 MHz.

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**Radiated Emission, 1 - 40GHz, Horizontal and Vertical Antenna Orientations,  
5745 MHz – HT4 20MHz – Antenna 1**

Freq. [MHz]	Antenna Orientation	Detector	Level [dBµV/m]	Limit [dBµV/m]	Result
7011	Vertical	Av	39.1	54	Pass
11490	Vertical	Av	38.6	54	Pass
18102	Vertical	Av	37.8	54	Pass
7011	Vertical	Pk	39.1	74	Pass
11490	Vertical	Pk	38.6	74	Pass
18102	Vertical	Pk	37.8	74	Pass

Note: - Peak (Pk) value already within Average (Av) limits, therefor Av not retested.  
Peak values also noted as Av value to show compliance with Av limit.  
- Peak detector used with a bandwidth of 1 MHz.

**Radiated Emission, 1 - 40GHz, Horizontal and Vertical Antenna Orientations,  
5745 MHz – HT4 20 MHz – Antenna 2**

Freq. [MHz]	Antenna Orientation	Detector	Level [dBµV/m]	Limit [dBµV/m]	Result
11490	Vertical	Av	38.7	54	Pass
18102	Horizontal	Av	40.0	54	Pass
18724	Vertical	Av	38.2	54	Pass
11490	Vertical	Pk	38.7	74	Pass
18102	Horizontal	Pk	40.0	74	Pass
18724	Vertical	Pk	38.2	74	Pass

Note: - Peak (Pk) value already within Average (Av) limits, therefor Av not retested.  
Peak values also noted as Av value to show compliance with Av limit.  
- Peak detector used with a bandwidth of 1 MHz.

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**Radiated Emission, 1 - 40GHz, Horizontal and Vertical Antenna Orientations,  
5755 MHz – HT4 40 MHz – Antenna 1**

Freq. [MHz]	Antenna Orientation	Detector	Level [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Result
11510	Vertical	Av	35.0	54	Pass
17265	Vertical	Av	32.9	54	Pass
18126	Vertical	Av	38.2	54	Pass
11510	Vertical	Pk	35.0	74	Pass
17265	Vertical	Pk	32.9	74	Pass
18126	Vertical	Pk	38.2	74	Pass

Note: - Peak (Pk) value already within Average (Av) limits, therefor Av not retested.  
Peak values also noted as Av value to show compliance with Av limit.  
- Peak detector used with a bandwidth of 1 MHz.

**Radiated Emission, 1 - 40GHz, Horizontal and Vertical Antenna Orientations,  
5755 MHz – HT4 40 MHz – Antenna 2**

Freq. [MHz]	Antenna Orientation	Detector	Level [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Result
11510	Vertical	Av	35.0	54	Pass
17265	Vertical	Av	33.0	54	Pass
18126	Vertical	Av	37.8	54	Pass
11510	Vertical	Pk	35.0	74	Pass
17265	Vertical	Pk	33.0	74	Pass
18126	Vertical	Pk	37.8	74	Pass

Note: - Peak (Pk) value already within Average (Av) limits, therefor Av not retested.  
Peak values also noted as Av value to show compliance with Av limit.  
- Peak detector used with a bandwidth of 1 MHz.

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**Radiated Emission, 1 - 40GHz, Horizontal and Vertical Antenna Orientations,  
5755 MHz – HT8 40 MHz – Antenna 1+2**

Freq. [MHz]	Antenna Orientation	Detector	Level [dBµV/m]	Limit [dBµV/m]	Result
14160	Vertical	Av	49.20	54	Pass
17250	Vertical	Av	50.70	54	Pass
18097	Vertical	Av	49.12	54	Pass
14160	Vertical	Pk	49.20	74	Pass
17250	Vertical	Pk	50.70	74	Pass
18097	Vertical	Pk	49.12	74	Pass

Note: - Peak (Pk) value already within Average (Av) limits, therefor Av not retested.  
Peak values also noted as Av value to show compliance with Av limit.  
- Peak detector used with a bandwidth of 1 MHz

**Radiated Emission, 1 - 40GHz, Horizontal and Vertical Antenna Orientations,  
5755 MHz – HT4 40 MHz – Antenna 1**

Freq. [MHz]	Antenna Orientation	Detector	Level [dBµV/m]	Limit [dBµV/m]	Result
11510	Vertical	Av	36.6	54	Pass
18102	Vertical	Av	37.2	54	Pass
18674	Vertical	Av	38.1	54	Pass
11510	Vertical	Pk	36.6	74	Pass
18102	Vertical	Pk	37.2	74	Pass
18674	Vertical	Pk	38.1	74	Pass

Note: - Peak (Pk) value already within Average (Av) limits, therefor Av not retested.  
Peak values also noted as Av value to show compliance with Av limit.  
- Peak detector used with a bandwidth of 1 MHz

**Radiated Emission, 1 - 40GHz, Horizontal and Vertical Antenna Orientations,  
5755 MHz – HT4 40 MHz – Antenna 2**

Freq. [MHz]	Antenna Orientation	Detector	Level [dBµV/m]	Limit [dBµV/m]	Result
11510	Vertical	Av	38.8	54	Pass
18102	Vertical	Av	39.5	54	Pass
18674	Vertical	Av	40.2	54	Pass
11510	Vertical	Pk	38.8	74	Pass
18102	Vertical	Pk	39.5	74	Pass
18674	Vertical	Pk	40.2	74	Pass

Note: - Peak (Pk) value already within Average (Av) limits, therefor Av not retested.  
Peak values also noted as Av value to show compliance with Av limit.  
- Peak detector used with a bandwidth of 1 MHz



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**Radiated Emission, 1 - 40GHz, Horizontal and Vertical Antenna Orientations,  
5775 MHz – VHT6 80 MHz – Antenna 1**

Freq. [MHz]	Antenna Orientation	Detector	Level [dBµV/m]	Limit [dBµV/m]	Result
11510	Vertical	Av	38.1	54	Pass
17265	Vertical	Av	37.5	54	Pass
27000	Vertical	Av	39.3	54	Pass
11510	Vertical	Pk	38.1	74	Pass
17265	Vertical	Pk	37.5	74	Pass
27000	Vertical	Pk	39.3	74	Pass

Note: - Peak (Pk) value already within Average (Av) limits, therefor Av not retested.  
Peak values also noted as Av value to show compliance with Av limit.  
- Peak detector used with a bandwidth of 1 MHz

**Radiated Emission, 1 - 40GHz, Horizontal and Vertical Antenna Orientations,  
5775 MHz – VHT6 80 MHz – Antenna 2**

Freq. [MHz]	Antenna Orientation	Detector	Level [dBµV/m]	Limit [dBµV/m]	Result
11510	Vertical	Av	40.2	54	Pass
17265	Vertical	Av	39.8	54	Pass
27000	Vertical	Av	39.6	54	Pass
11510	Vertical	Pk	40.2	74	Pass
17265	Vertical	Pk	39.8	74	Pass
27000	Vertical	Pk	39.6	74	Pass

Note: - Peak (Pk) value already within Average (Av) limits, therefor Av not retested.  
Peak values also noted as Av value to show compliance with Av limit.  
- Peak detector used with a bandwidth of 1 MHz

**Radiated Emission, 1 - 40GHz, Horizontal and Vertical Antenna Orientations,  
5775 MHz – VHT6 80 MHz – Antenna 1+2**

Freq. [MHz]	Antenna Orientation	Detector	Level [dBµV/m]	Limit [dBµV/m]	Result
11510	Vertical	Av	37.6	54	Pass
18102	Vertical	Av	37.0	54	Pass
19621	Vertical	Av	36.9	54	Pass
11510	Vertical	Pk	37.6	74	Pass
18102	Vertical	Pk	37.0	74	Pass
19621	Vertical	Pk	36.9	74	Pass

Note: - Peak (Pk) value already within Average (Av) limits, therefor Av not retested.  
Peak values also noted as Av value to show compliance with Av limit.  
- Peak detector used with a bandwidth of 1 MHz

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**Radiated Emission, 1 - 40GHz, Horizontal and Vertical Antenna Orientations,  
5785 MHz - 6 Mb OFDM – Antenna 2**

Freq. [MHz]	Antenna Orientation	Detector	Level [dBµV/m]	Limit [dBµV/m]	Result
6.928	Vertical	Av	38.0	54	Pass
17254	Vertical	Av	38.2	54	Pass
18076	Vertical	Av	39.9	54	Pass
6.928	Vertical	Pk	38.0	74	Pass
17254	Vertical	Pk	38.2	74	Pass
18076	Vertical	Pk	39.9	74	Pass

Note: - Peak (Pk) value already within Average (Av) limits, therefor Av not retested.  
Peak values also noted as Av value to show compliance with Av limit.  
- Peak detector used with a bandwidth of 1 MHz.

**Radiated Emission, 1 - 40GHz, Horizontal and Vertical Antenna Orientations,  
5785 MHz - 6 Mb OFDM – Antenna 1**

Freq. [MHz]	Antenna Orientation	Detector	Level [dBµV/m]	Limit [dBµV/m]	Result
14154	Vertical	Av	36.3	54	Pass
16557	Vertical	Av	36.7	54	Pass
18076	Vertical	Av	38.5	54	Pass
14154	Vertical	Pk	36.3	74	Pass
16557	Vertical	Pk	36.7	74	Pass
18076	Vertical	Pk	38.5	74	Pass

Note: - Peak (Pk) value already within Average (Av) limits, therefor Av not retested.  
Peak values also noted as Av value to show compliance with Av limit.  
- Peak detector used with a bandwidth of 1 MHz.

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**Radiated Emission, 1 - 40GHz, Horizontal and Vertical Antenna Orientations,  
5785 MHz – HT4 20 MHz – Antenna 1**

Freq. [MHz]	Antenna Orientation	Detector	Level [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Result
14154	Vertical	Av	38.5	54	Pass
17205	Vertical	Av	38.3	54	Pass
18126	Vertical	Av	39.2	54	Pass
14154	Vertical	Pk	38.5	74	Pass
17205	Vertical	Pk	38.3	74	Pass
18126	Vertical	Pk	39.2	74	Pass

Note: - Peak (Pk) value already within Average (Av) limits, therefor Av not retested.  
Peak values also noted as Av value to show compliance with Av limit.  
- Peak detector used with a bandwidth of 1 MHz.

**Radiated Emission, 1 - 40GHz, Horizontal and Vertical Antenna Orientations,  
5785 MHz – HT4 20 MHz – Antenna 2**

Freq. [MHz]	Antenna Orientation	Detector	Level [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Result
13756	Horizontal	Av	36.2	54	Pass
16606	Horizontal	Av	37.0	54	Pass
18126	Vertical	Av	38.0	54	Pass
13756	Horizontal	Pk	36.2	74	Pass
16606	Horizontal	Pk	37.0	74	Pass
18126	Vertical	Pk	38.0	74	Pass

Note: - Peak (Pk) value already within Average (Av) limits, therefor Av not retested.  
Peak values also noted as Av value to show compliance with Av limit.  
- Peak detector used with a bandwidth of 1 MHz.

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**Radiated Emission, 1 - 40GHz, Horizontal and Vertical Antenna Orientations,  
5785 MHz – HT8 40 MHz – Antenna 1+2**

Freq. [MHz]	Antenna Orientation	Detector	Level [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Result
15699	Horizontal	Av	37.6	54	Pass
17254	Vertical	Av	39.6	54	Pass
18126	Vertical	Av	38.7	54	Pass
15699	Horizontal	Pk	37.6	74	Pass
17254	Vertical	Pk	39.6	74	Pass
18126	Vertical	Pk	38.7	74	Pass

Note: - Peak (Pk) value already within Average (Av) limits, therefor Av not retested.  
Peak values also noted as Av value to show compliance with Av limit.  
- Peak detector used with a bandwidth of 1 MHz.

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**Radiated Emission, 1 - 40GHz, Horizontal and Vertical Antenna Orientations,  
5825 MHz – 6 Mb OFDM – Antenna 2**

Freq. [MHz]	Antenna Orientation	Detector	Level [dBµV/m]	Limit [dBµV/m]	Result
14154	Horizontal	Av	37.9	54	Pass
17254	Vertical	Av	37.8	54	Pass
18126	Vertical	Av	37.9	54	Pass
14154	Horizontal	Pk	37.9	74	Pass
17254	Vertical	Pk	37.8	74	Pass
18126	Vertical	Pk	37.9	74	Pass

Note: - Peak (Pk) value already within Average (Av) limits, therefor Av not retested.  
Peak values also noted as Av value to show compliance with Av limit.  
- Peak detector used with a bandwidth of 1 MHz.

**Radiated Emission, 1 - 40GHz, Horizontal and Vertical Antenna Orientations,  
5825 MHz – 6 Mb OFDM – Antenna 1**

Freq. [MHz]	Antenna Orientation	Detector	Level [dBµV/m]	Limit [dBµV/m]	Result
17244	Vertical	Av	37.8	54	Pass
17603	Vertical	Av	37.3	54	Pass
19571	Vertical	Av	37.3	54	Pass
17244	Vertical	Pk	37.8	74	Pass
17603	Vertical	Pk	37.3	74	Pass
19571	Vertical	Pk	37.3	74	Pass

Note: - Peak (Pk) value already within Average (Av) limits, therefor Av not retested.  
Peak values also noted as Av value to show compliance with Av limit.  
- Peak detector used with a bandwidth of 1 MHz.

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**Radiated Emission, 1 - 40GHz, Horizontal and Vertical Antenna Orientations,  
5825 MHz – HT4 20MHz – Antenna 1**

Freq. [MHz]	Antenna Orientation	Detector	Level [dBµV/m]	Limit [dBµV/m]	Result
17244	Horizontal	Av	38.0	54	Pass
18102	Vertical	Av	37.1	54	Pass
19571	Vertical	Av	37.3	54	Pass
17244	Horizontal	Pk	38.0	74	Pass
18102	Vertical	Pk	37.1	74	Pass
19571	Vertical	Pk	37.3	74	Pass

Note: - Peak (Pk) value already within Average (Av) limits, therefor Av not retested.  
Peak values also noted as Av value to show compliance with Av limit.  
- Peak detector used with a bandwidth of 1 MHz.

**Radiated Emission, 1 - 40GHz, Horizontal and Vertical Antenna Orientations,  
5825 MHz – HT4 20MHz – Antenna 2**

Freq. [MHz]	Antenna Orientation	Detector	Level [dBµV/m]	Limit [dBµV/m]	Result
17244	Horizontal	Av	37.2	54	Pass
18052	Vertical	Av	38.0	54	Pass
18674	Vertical	Av	36.7	54	Pass
17244	Horizontal	Pk	37.2	74	Pass
18052	Vertical	Pk	38.0	74	Pass
18674	Vertical	Pk	36.7	74	Pass

Note: - Peak (Pk) value already within Average (Av) limits, therefor Av not retested.  
Peak values also noted as Av value to show compliance with Av limit.  
- Peak detector used with a bandwidth of 1 MHz.

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**Radiated Emission, 1 - 40GHz, Horizontal and Vertical Antenna Orientations,  
5825 MHz – HT8 40MHz – Antenna 1+2**

Freq. [MHz]	Antenna Orientation	Detector	Level [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Result
15301	Horizontal	Av	39.5	54	Pass
17254	Vertical	Av	39.9	54	Pass
18076	Vertical	Av	39.6	54	Pass
15301	Horizontal	Pk	39.5	74	Pass
17254	Vertical	Pk	39.9	74	Pass
18076	Vertical	Pk	39.6	74	Pass

Note: - Peak (Pk) value already within Average (Av) limits, therefor Av not retested.  
Peak values also noted as Av value to show compliance with Av limit.  
- Peak detector used with a bandwidth of 1 MHz.

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## **7.2.6 Radiated Spurious Emissions of Transmitter in restricted bands**

### **RESULT: Pass**

Date of testing: 2013-01-13 / 2013-03-15

Frequency range: 4.5 – 5.15 GHz and 5.35 – 5.46 GHz

#### Requirements:

FCC 15.205, FCC 15.209 and FCC 15.247(d) and RSS-Gen

Radiated emissions which fall in the restricted bands, as defined in FCC 15.205(a), must comply with the radiated emission limits specified in FCC 15.209(a).

#### Test procedure:

ANSI C63.10: 2009 and ANSI C63.10:2009

KDB Publication No. 558074 D01: Measurement of Digital Transmission Systems Operating under Section 15.247.

The EUT was placed on a nonconductive turntable 0.8m above the ground plane. Before final measurements of radiated emissions were performed, the EUT was scanned to determine its emission spectrum profile. The physical arrangement of the test system, the associated cabling and the EUT orientation (X, Y, Z) were varied in order to ensure that maximum emission amplitudes were attained.

The spectrum was examined from 4.5 – 5.15 GHz and from 5.35 – 5.46 GHz. Final radiated emission measurements were made at 3m distance.

At each frequency where a spurious emission was found, the EUT was rotated 360° and the antenna was raised and lowered from 1 to 4m in order to determine the emission's maximum level. Measurements were taken using both horizontal and vertical antenna polarizations.

The highest emission amplitudes relative to the appropriate limit were recorded in this report. Field strength values of radiated emissions at frequencies not listed in the tables are more than 20 dB below the applicable limit.

Correction factors are incorporated in the spectrum analyzers as an automated function.

Refer to section 4.2 for the power settings and modes.

Correction factors includes: antenna factor, cable loss and pre-amplifier gain.



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Modulation	Frequency (MHz)	Antenna	Highest value in section (Peak)	Highest value in section (Peak)	Limit 15.209	Result
			4.5-5.15 GHz	5.35-5.45 GHz	Average/ Peak	Pass or Fail
6 Mb OFDM	5745	2	48.9	48.7	54 / 74	Pass
6 Mb OFDM	5745	1	52.3	50.0	54 / 74	Pass
HT4 - 20 MHz	5745	1	49.4	52.7	54 / 74	Pass
HT4 - 20 MHz	5745	2	53.9	52.7	54 / 74	Pass
HT8 - 20 MHz	5745	1+2	51.0	49.1	54 / 74	Pass
HT4 - 40 MHz	5755	2	53.3	53.3	54 / 74	Pass
HT4 - 40 MHz	5755	1	53.6	53.6	54 / 74	Pass
HT8 - 40 MHz	5755	1+2	52.9	53.2	54 / 74	Pass
VHT6 - 80 MHz	5775	1	52.7	53.3	54 / 74	Pass
VHT6 - 80 MHz	5775	2	52.8	53.2	54 / 74	Pass
VHT6 - 80 MHz	5775	1+2	53.3	53.3	54 / 74	Pass

Note:

were Peak values were already within Average limits, these were not re-tested with Average detector.

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## 7.3 Spurious emissions in receive mode

**RESULT: Pass**

Date of testing: 2013-01-10

Requirements: RSS-Gen

Radiated emissions from receiver shall not exceed the radiated limits in the table below.

Freq. [MHz]	Detector	Measurement Bandwidth	Limit [dB $\mu$ V/m]
30 – 88	Qp	120 kHz	40.0
88 – 216	Qp	120 kHz	43.5
216 – 960	Qp	120 kHz	46.0
Above 916	Av	1 MHz	54.0

Test procedure: ANSI C63.10: 2009, RSS-Gen section 4.10

The EUT was placed on a nonconductive turntable 0.8m above the ground plane. Before final measurements of radiated emissions were performed, the EUT was scanned to determine its emission spectrum profile. The physical arrangement of the test system, the associated cabling and the EUT orientation (X, Y, Z) were varied in order to ensure that maximum emission amplitudes were attained.

The spectrum was examined from 30 MHz to 17500 MHz. Emission measurements were made at 3m distance.

At each frequency where a spurious emission was found, the EUT was rotated 360° and the antenna was raised and lowered from 1 to 4m in order to determine the emission's maximum level. Measurements were taken using both horizontal and vertical antenna polarizations.

The 6 highest emission amplitudes relative to the appropriate limit were recorded in this report. Field strength values of radiated emissions at frequencies not listed in the tables are more than 20 dB below the applicable limit.

Correction factors are incorporated in the spectrum analyzers as an automated function. Correction factors includes: antenna factor, cable loss and pre-amplifier gain.

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Results:

Freq. [MHz]	Antenna Orientation	Detector/ Bandwidth	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]
47.1	Vertical	Qp / 120 kHz	27.9	40.0	-12.1
64.9	Vertical	Qp / 120 kHz	26.7	40.0	-13.3
237.5	Vertical	Qp / 120 kHz	21.7	46.0	-24.3
466.0	Vertical	Qp / 120 kHz	26.7	46.0	-19.3
5755	Vertical	Av / 1 MHz	29.5	54.0	-24.5
7673	Vertical	Av / 1 MHz	29.0	54.0	-25.0

Note: - tested up to 3 times highest tunable frequency (which is 5825 MHz), up to 17.5 GHz.  
- the EUT was tested in receive mode, set at center frequency of 5785 MHz.  
- tested with DSSS, OFDM modes, worst case values noted

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## **7.4 AC Power Line Conducted Measurements**

### **7.4.1 AC Power Line Conducted Emission of Transmitter**

AC power line conducted emissions are included in the Part 15B/ICES-003 testreport.  
Refer to document number 13e\_PD97260NG\_Testreport\_FCC-15B-ICES003.pdf

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## **Bluetooth Low Energy (BLE)**

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## 8. Test Set-up and Operation Modes

### 8.1 Test Methodology

The test methodology used is based on the requirements of RSS-GEN, RSS-210, 47 CFR Part 15, Sections 15.31, 15.33, 15.35, 15.205, 15.207, 15.209, 15.247 (DSS).

The test methods, which have been used, are based on ANSI C63.10-2009.

For details, see under each test item.

### 8.2 Operation Modes

Modulation	Duty cycle	Antenna	Test frequencies (MHz)					
			Lowest	Gain control setting	Middle	Gain control setting	Highest	Gain control setting
BLE payload 37 bytes	0.64	1	2402	--	2440	--	2480	--

Testing was performed at the lowest operating frequency, at the operating frequency in the middle of the specified frequency band and at the highest operating frequency. These operation modes were selected after review of the capabilities and characteristics of the EUT. Bluetooth operation was evaluated in BLE mode.

Antenna ports are also referred to as Chain A and Chain B, where chain A refers to Antenna-port 2 and Chain B refers to Antenna-port 1. Bluetooth is only available on Antenna 1 (Chain B).

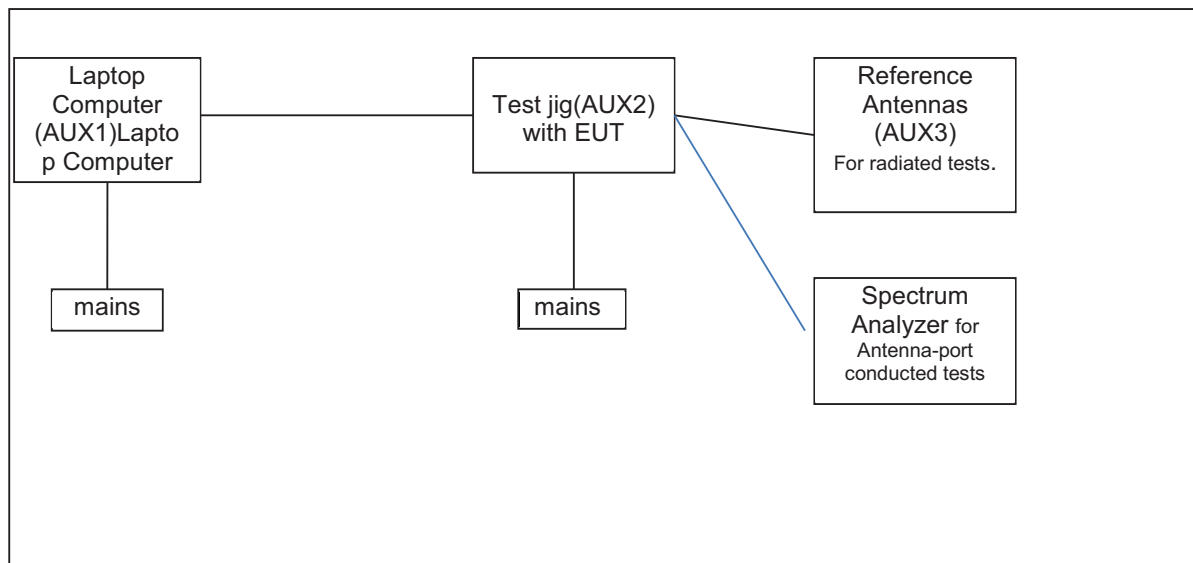
### 8.3 Physical Configuration for Testing

The EUT was installed into a test-fixture that interfaced to a laptop computer and dc power supply. The laptop computer was used to configure the EUT to continuously transmit at a specified output power and channel or continuously receive on the channel as specified in the testdata. See section 4.5 for Auxiliary details.

The EUT was tested on a stand-alone basis (only attached to the test jig) and the test system was configured in a typical fashion (as a customer would normally use it).

The justification and manipulation of cables and equipment in order to simulate a worst-case behavior of the test setup has been carried out as prescribed in ANSI C63.10:2009.

**Figure 5: Test Setup Diagram**



Notes:

For more details, refer to the document: Test Set-Up Photographs document.

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## 8.4 Test Software

The operation modes could be initiated by using test software as supplied by Intel Corporation. The test software was used to define various different operational modes of the EUT for the purpose of compliance testing. The version of the test software, as supplied by Intel Corporation and used during all tests is:

Test software : DRTU 1.6.0-0510  
Driver : 16.0.0.17

This software was running on a laptop computer (AUX1). It was used to enable the test operation modes listed in section 4.2 as appropriate.



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## 8.5 Special Accessories and Auxiliary Equipment

The product has been tested together with the following additional accessories:

### 7. AUX1

Product: Laptop Computer  
Brand: Lenovo  
Model: 9456-HTG  
Serial Number: L3-BF847 07/02  
Remark: property applicant, host for testsoftware and AUX2

### 8. AUX2

Product: Test Jig  
Brand: Intel  
Model: NGFF Extension Rev. 01  
Rated Voltage: 3.3 Vdc  
Antenna: Internal, integrated on the PCB  
Remarks: used for Antenna-port conducted tests

### 9. AUX3

Product: Reference antennas  
Manufacturer: SkyCross Electronics (Shenzhen) Co.,Ltd  
Brand: SkyCross Electronics (Shenzhen) Co.,Ltd  
Gain at 2G4: 3.0 dBi (declared by applicant)  
Remarks: used for radiated tests

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## **9. Test Results**

### **9.1 Technical Requirements**

#### **9.1.1 Voltage Requirements**

**RESULT: Pass**

Requirements:

FCC 15.31(e)

For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

Verdict:

The EUT has an internal voltage regulator to supply the RF circuit. Hence it complies with the power supply requirements.

#### **9.1.2 Antenna Requirements**

**RESULT: Pass**

Requirements:

FCC 15.203 and IC RSS-Gen section 7.1.2

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.

Verdict:

The EUT has two non standard PIFA antenna connectors which complies with the requirements.

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### **9.1.3 Restricted Bands of Operation**

#### **RESULT: Pass**

Requirements:

FCC 15.205 and IC RSS-Gen section 7.2.2

Only spurious emissions are permitted in any of the restricted frequency bands, unless otherwise specified.

Verdict: PASS

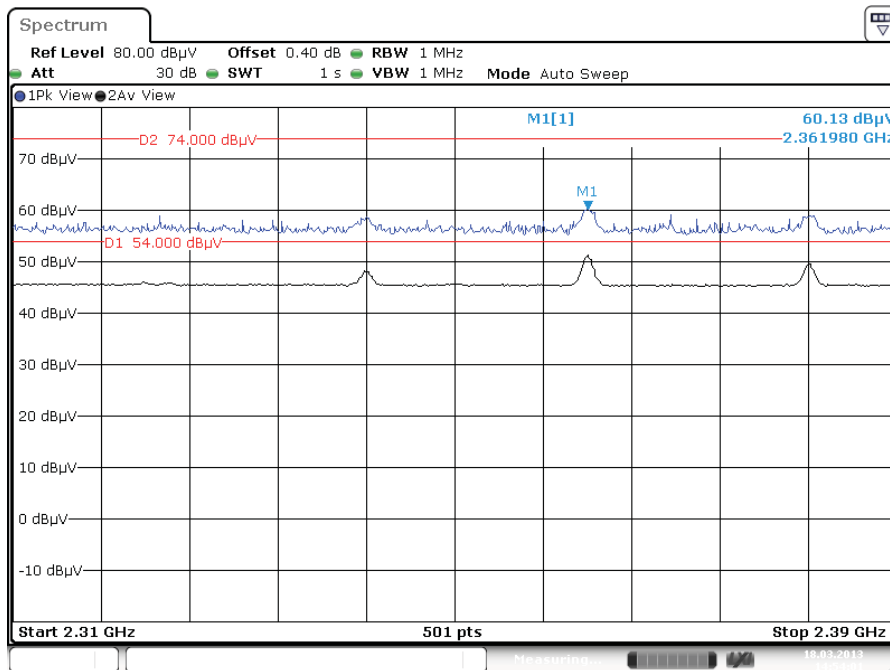
The EUT operation frequency range is 2402 MHz - 2480 MHz range. Therefore only spurious emissions may be found in the restricted bands of operation and the EUT complies with the restricted frequency band requirement.

Plots on the next pages show the peak values as a blue line, corresponding limit line is D2. Average values are shown as a black line with corresponding limit line D1.

Test Report No.:

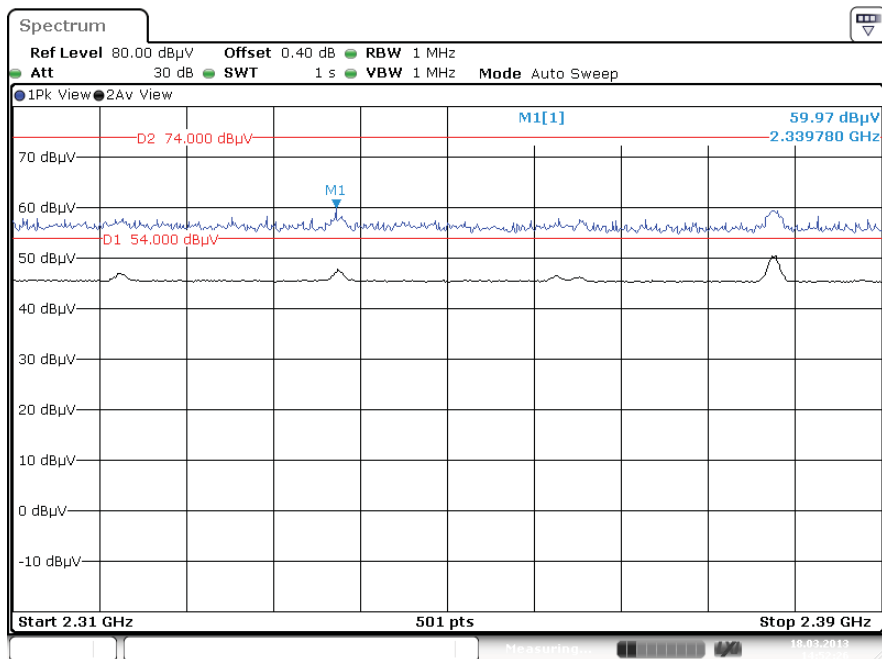
**12121201.fcc01**

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Date: 18.MAR.2013 14:54:01

Emissions in restricted band 2.31 – 2.39 GHz - 2402 MHz- BLE- Antenna 1



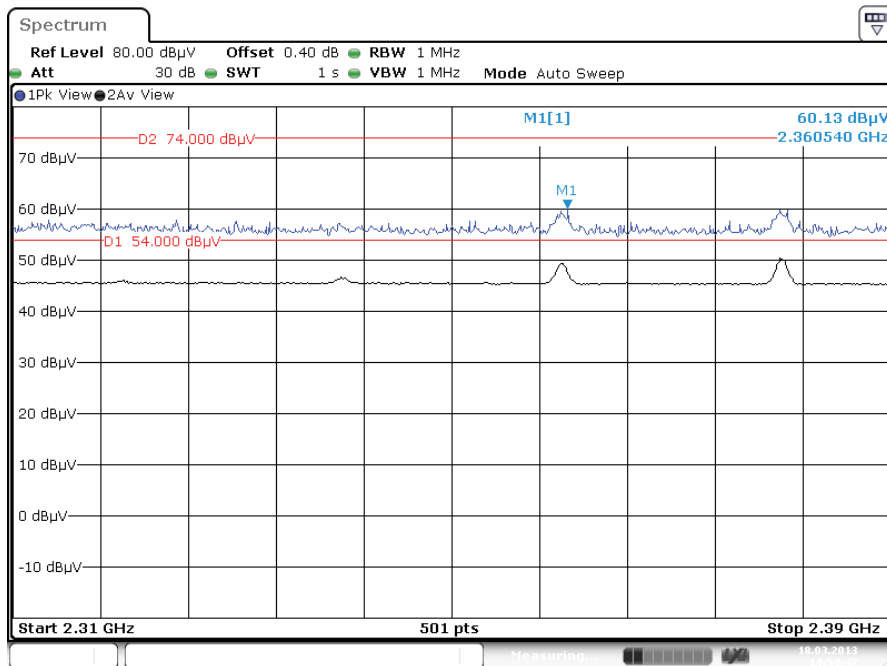
Date: 18.MAR.2013 14:52:26

Emissions in restricted band 2.31 – 2.39 GHz - 2440 MHz- BLE- Antenna 1

Test Report No.:

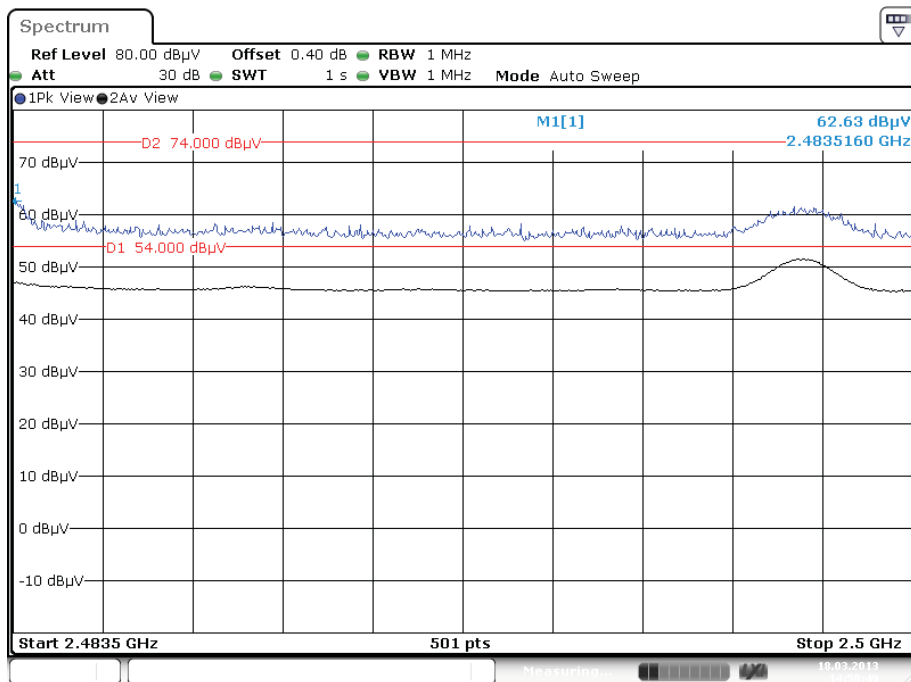
**12121201.fcc01**

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Date: 18.MAR.2013 14:54:47

Emissions in restricted band 2.31 – 2.39 GHz - 2480 MHz- BLE- Antenna 1



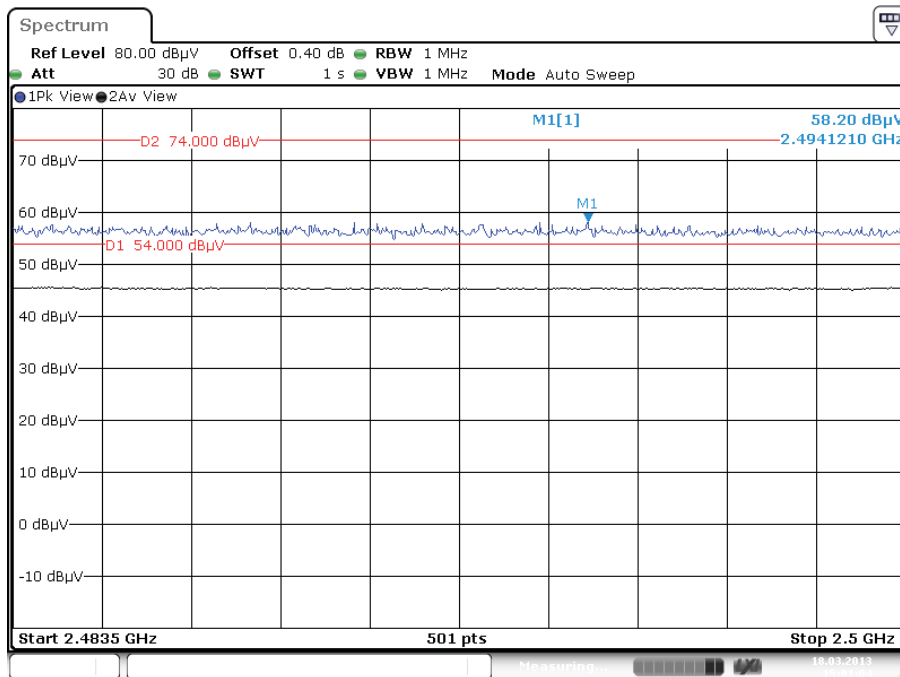
Date: 18.MAR.2013 14:58:49

Emissions in restricted band 2.4835 – 2.5 GHz - 2480 MHz- BLE- Antenna 1

Test Report No.:

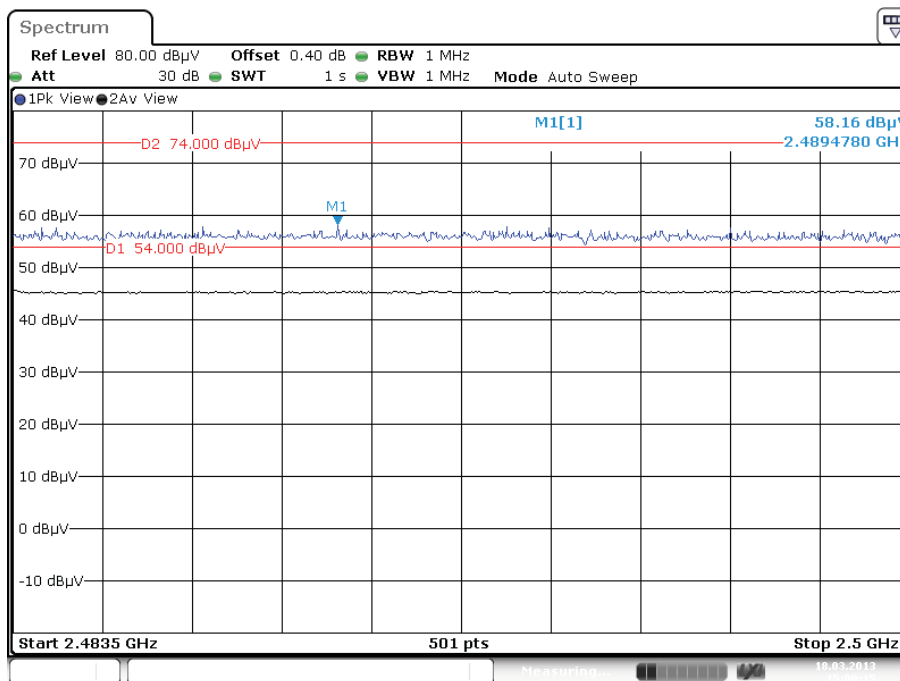
**12121201.fcc01**

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Date: 18.MAR.2013 15:01:05

Emissions in restricted band 2.4835 – 2.5 GHz - 2402 MHz- BLE- Antenna 1



Date: 18.MAR.2013 15:00:15

Emissions in restricted band 2.4835 – 2.5 GHz - 2440 MHz- BLE- Antenna 1

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## **9.2 Conducted Measurements at Antenna Port**

### **9.2.1 Conducted Output Power**

#### **RESULT: Pass**

Date of testing: 2013-01-14 & 2013-02-14

Requirements:

FCC 15.247(b)(3)

For systems using frequency hopping using at least 15 channels in the 2400-2483.5MHz band, the maximum peak output power is 1W (+30dBm).

Test procedure:

ANSI C63.10:2009

KDB Publication No. 558074 D01: Measurement of Digital Transmission Systems Operating under Section 15.247.

The Peak Conducted Output Power was measured using the channel integration method according to option 2 in KDB 558074 D01.

The maximum peak output power (conducted) was measured at the antenna connector with a spectrum analyzer. The final measurement takes into account the loss generated by all the involved cables.

Notes:  $\text{mW} = 10^{(\text{dBm}/10)}$   
 $\text{dBm} = 10 \times \log(\text{mW})$

**plots : Peak power plots,**

Plots of the Peak Power outputs are given on the next pages, correction factors included in the reading.

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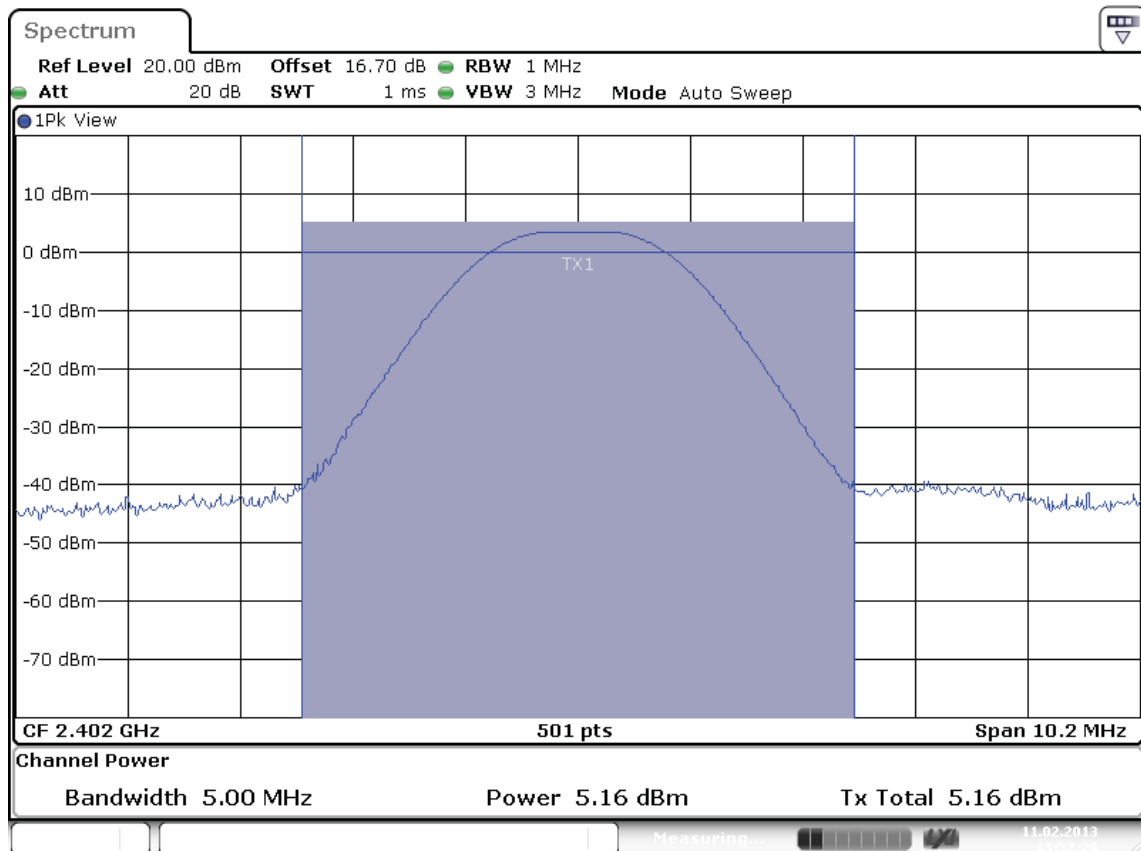
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Operation mode: BLE, Antenna 1

Frequency [MHz]	Gain control setting (dB)	Output Power [dBm]	Output Power [mW]	Limit [dBm]	Limit [mW]	Margin [dB]	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	Plot number
2402	--	+5.16	33	+30	1000	-24.84	3.0	+8.16	65	A
2440	--	+7.36	54	+30	1000	-22.64	3.0	+10.36	109	B
2480	--	+7.80	60	+30	1000	-22.20	3.0	+10.80	120	C

Note: there is no gain control for BLE mode.

The maximum directional antenna gain is less than 6 dBi and therefor the maximum output power is not required to be reduced from the stated value.



Date: 11.FEB.2013 13:52:29

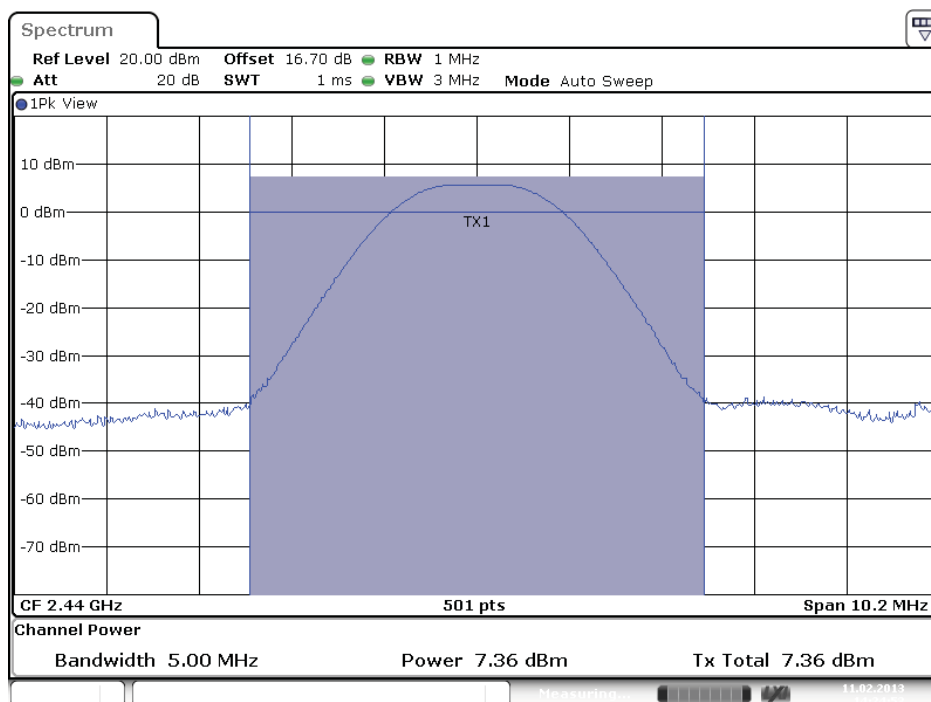
Plot A



Test Report No.:

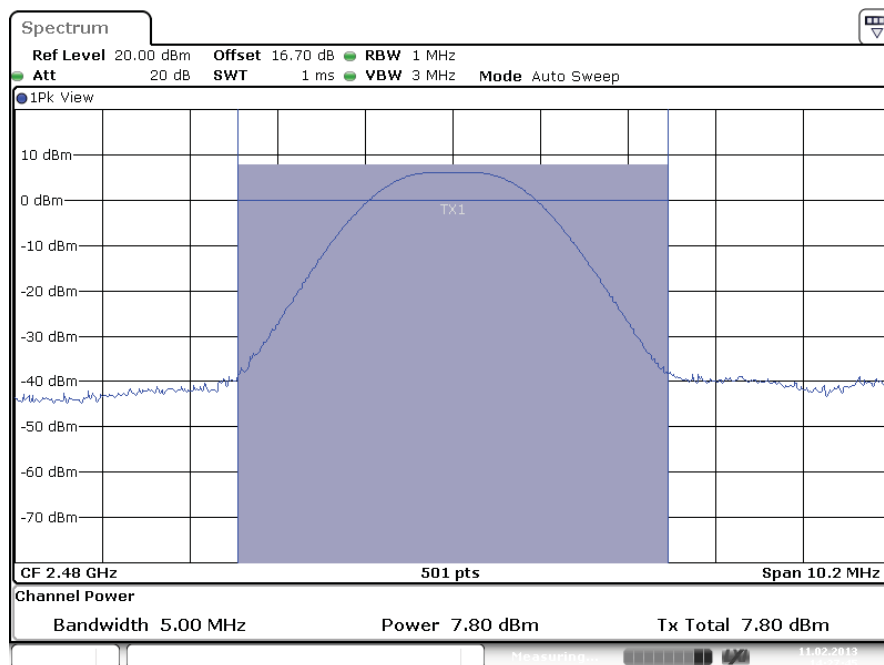
**12121201.fcc01**

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Date: 11.FEB.2013 14:24:53

Plot B



Date: 11.FEB.2013 14:27:45

Plot C

Test Report No.:

**12121201.fcc01**

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## **9.2.2 6dB and 99% Bandwidth**

**RESULT: Pass**

Date of testing:

2013-02-11 and 2013-03-18

Requirements:

FCC 15.247(a)(2) and RSS-210 Section A8.2(a)

For systems using hopping technology in the 2400-2483.5MHz band, the 6dB bandwidth shall be at least 500kHz.

For 99% Bandwidth: RSS-Gen Section 4.6.1: No requirement is given.

Test procedure 6dB bandwidth:

ANSI C63.10:2009

KDB Publication No. 558074 D01: Measurement of Digital Transmission Systems Operating under Section 15.247.

A spectrum analyzer was connected to the antenna port of the EUT. The spectrum analyzer resolution bandwidth was set to 100kHz, video bandwidth to 300kHz and the span wide enough to capture the modulated carrier.

For 99% Bandwidth:

ANSI C63.10:2009 and RSS-Gen.

The transmitter shall be operated at its maximum carrier power measured under normal test conditions. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used given that a peak or peak hold may produce a wider bandwidth than actual.

A spectrum analyzer was connected to the antenna port of the EUT. The spectrum analyzer resolution bandwidth was set to 1% of the selected span, Video bandwidth was set to 3 times the resolution bandwidth. The span was set to capture the whole modulation process. The Spectrum analyzers automated function for 99% BW was used.

Test Report No.:

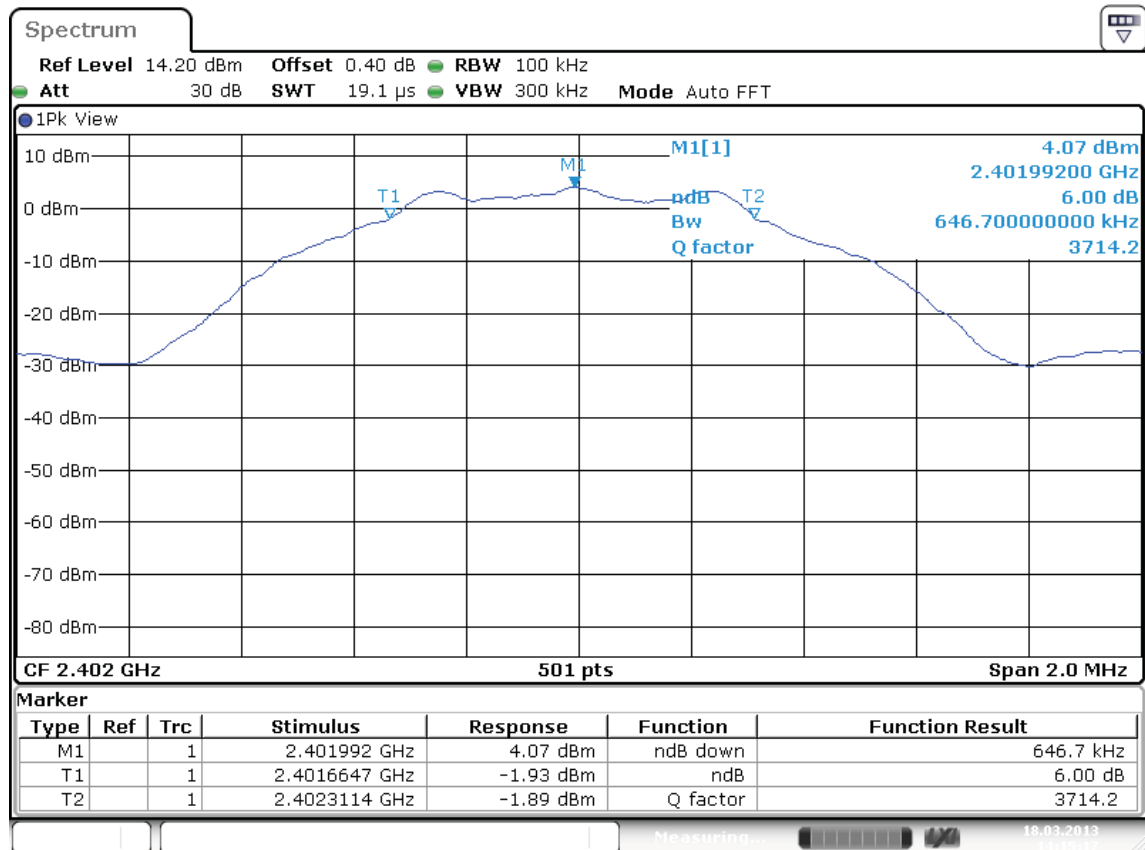
**12121201.fcc01**

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## 6dB and 99% Bandwidth

Operation mode: BLE, Antenna 1

Operating Frequency [MHz]	99% Bandwidth [kHz]	6dB Bandwidth [kHz]	Limit [kHz]	Plot number
2402	1054	646.7	500	A
2440	1054	658.7	500	B
2480	1054	670.7	500	C



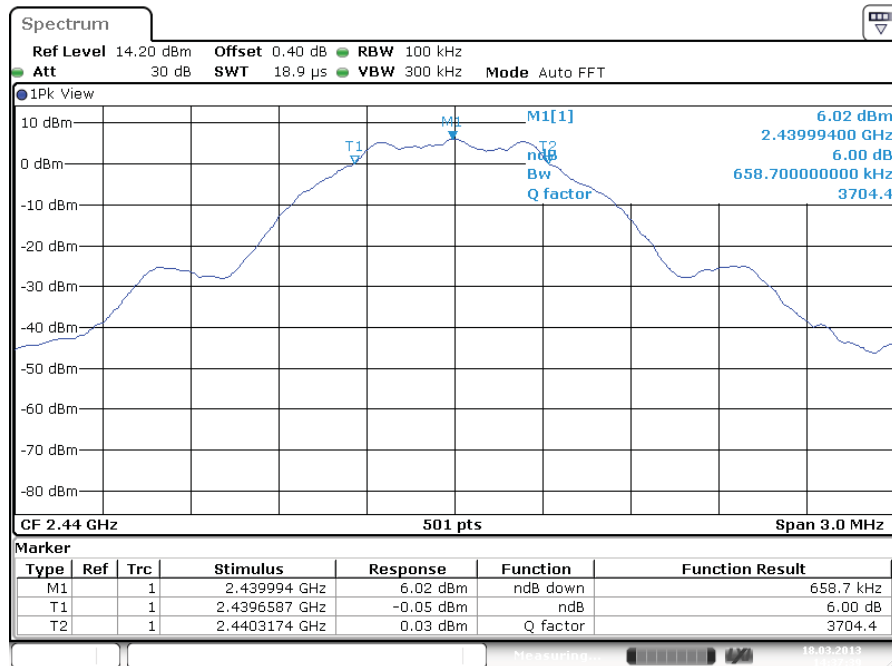
Date: 18.MAR.2013 14:15:17

Plot A

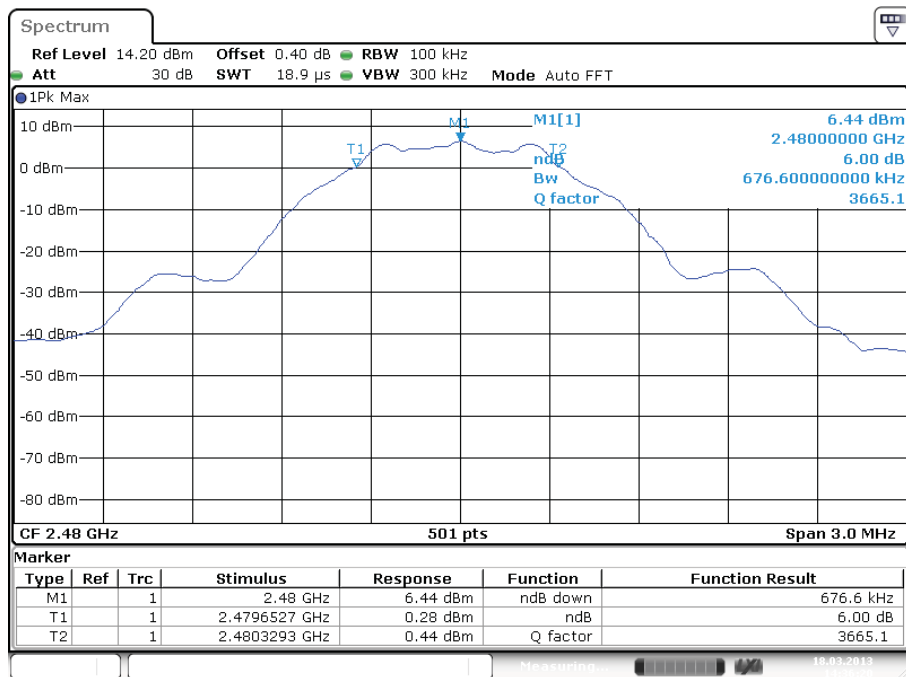
Test Report No.:

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Plot B



Plot C

Test Report No.:

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### **Peak Power Spectral Density**

RESULT: PASS

Date of testing:

2013-03-18&19

Requirements:

FCC 15.247(e) and RSS-210 section A8.2(b)

For digitally modulated systems, the power spectral density (PSD) conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.

Test procedure:

ANSI C63.10:2009

KDB Publication No. 558074 D01: Measurement of Digital Transmission Systems Operating under Section 15.247.

The Peak PSD Option 1 procedure was used. A spectrum analyzer was connected to the antenna port of the EUT. The analyzer resolution bandwidth was set to 3kHz and the video bandwidth was set to 10kHz. The sweep time was set to auto couple and the trace was allowed to stabilize before making the final measurement. By using the Peak marker function the maximum amplitude was determined. The final measurement takes into account the loss generated by all the involved cables.

Test Report No.:

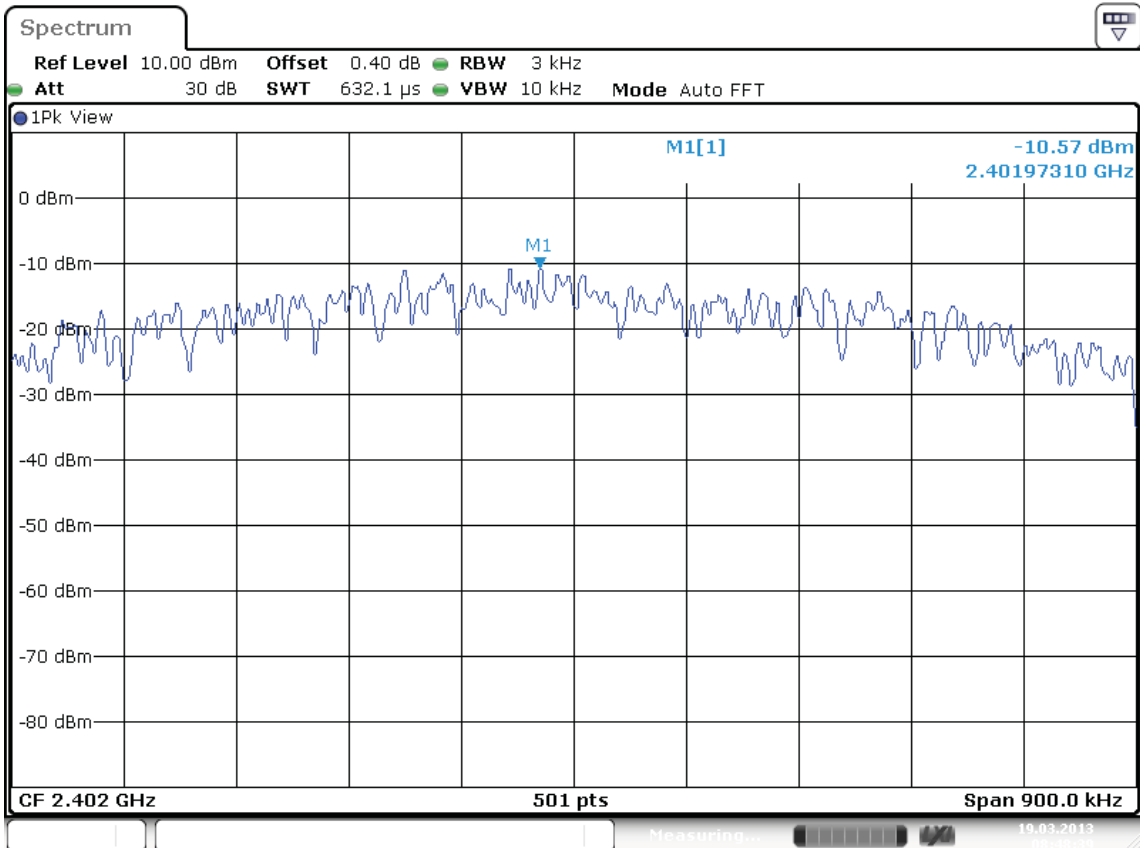
**12121201.fcc01**

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## Peak Power Spectral Density

Operation mode: BLE, Antenna 1

Operating Frequency [MHz]	Max PSD [dBm]	Limit [dBm]	Verdict [Pass/Fail]	Plot
2402	-10.6	8	Pass	A
2440	-9.37	8	Pass	B
2480	-9.05	8	Pass	C



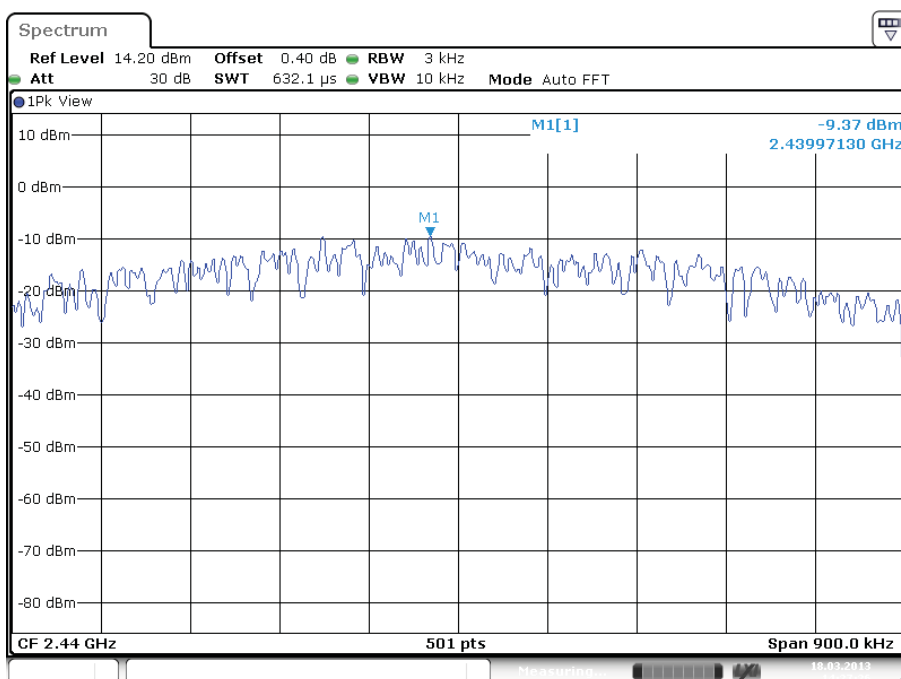
Date: 19.MAR.2013 08:48:40

Plot A

Test Report No.:

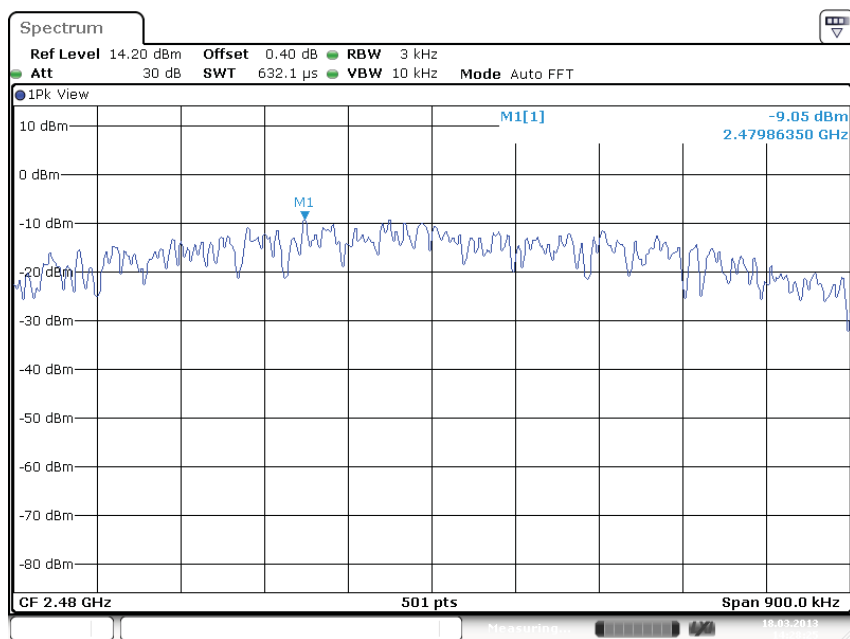
**12121201.fcc01**

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Date: 18.MAR.2013 14:27:27

Plot B



Date: 18.MAR.2013 14:28:26

Plot C

Test Report No.:

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### **9.2.3 Band Edge Conducted Emissions**

**RESULT: Pass**

Date of testing: 2013-02-11

Requirements:

FCC 15.205, FCC 15.209, FCC 15.247(d) and RSS-210 section A8.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator 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 an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

Test procedure:

ANSI C63.10:2009

KDB Publication No. 558074 D01: Measurement of Digital Transmission Systems Operating under Section 15.247.

Measurements were performed using a spectrum analyzer with a suitable span to encompass the peak of the fundamental and using the following settings:  
RBW = 100kHz, VBW = 300kHz.

The highest emission amplitudes relative to the appropriate limit were measured and recorded in this report.

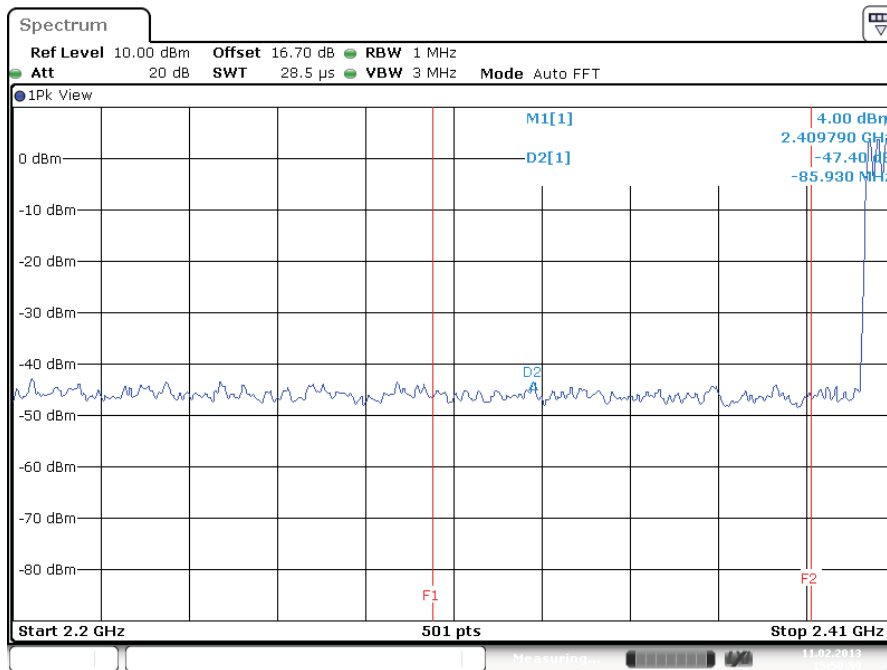
Results: All out of band spurious emissions are more than 20 dB below the fundamental.  
See the figures on the following pages.



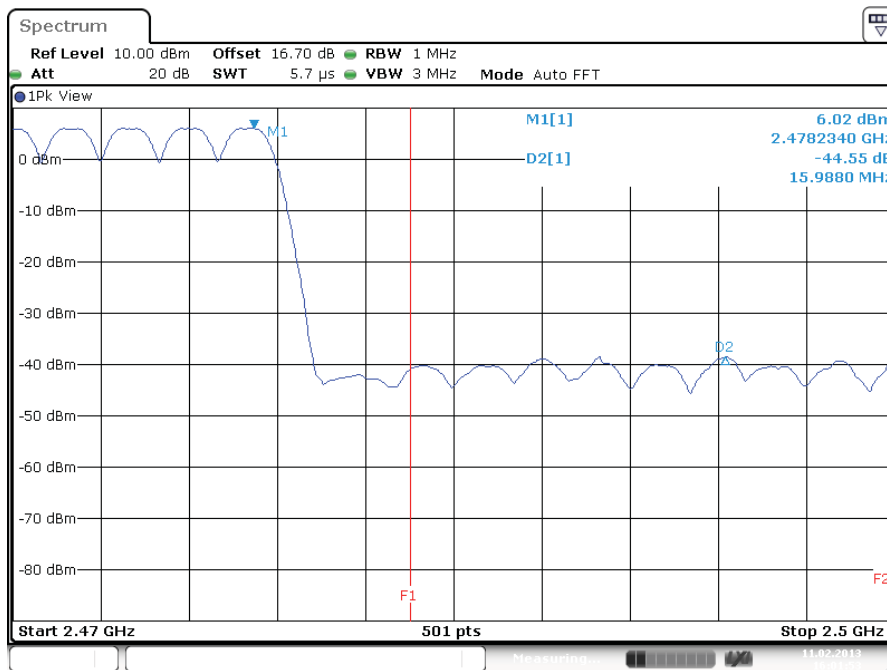
Test Report No.:

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Band Edge Conducted Emission- Lower band edge, Spectral Diagram, 2402 MHz- BLE- Antenna 1



Band Edge Conducted Emission- Higher band edge, Spectral Diagram, 2480 MHz-BLE-Antenna 1

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## 9.2.4 Radiated Spurious Emissions of Transmitter

### RESULT: Pass

Date of testing: 2012-01-10

Frequency range: 30MHz - 25GHz

#### Requirements:

FCC 15.205, FCC 15.209 and FCC 15.247(d) and RSS-Gen

Radiated emissions which fall in the restricted bands, as defined in FCC 15.205(a), must comply with the radiated emission limits specified in FCC 15.209(a).

Radiated emissions which fall outside the operation frequency band and outside restricted bands shall either meet the limit specified in FCC 15.209(a) or be attenuated at least 20dB below the power level in the 100kHz bandwidth within the band that contains the highest level of the desired power (the less severe limit applies).

#### Test procedure:

ANSI C63.10:2009

KDB Publication No. 558074 D01: Measurement of Digital Transmission Systems Operating under Section 15.247.

The EUT was placed on a nonconductive turntable 0.8m above the ground plane. Before final measurements of radiated emissions were performed, the EUT was scanned to determine its emission spectrum profile. The physical arrangement of the test system, the associated cabling and the EUT orientation (X, Y, Z) were varied in order to ensure that maximum emission amplitudes were attained.

The spectrum was examined from 30MHz to the 10th harmonic of the highest fundamental transmitter frequency (25GHz). Final radiated emission measurements were made at 3m distance.

At each frequency where a spurious emission was found, the EUT was rotated 360° and the antenna was raised and lowered from 1 to 4m in order to determine the emission's maximum level. Measurements were taken using both horizontal and vertical antenna polarizations.

The highest emission amplitudes relative to the appropriate limit were recorded in this report. Field strength values of radiated emissions at frequencies not listed in the tables are more than 20 dB below the applicable limit.

Correction factors are incorporated in the spectrum analyzers as an automated function.

Refer to section 4.2 for the power settings and modes.

Correction factors includes: antenna factor, cable loss and pre-amplifier gain.

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**Radiated Emission, 30 MHz - 25GHz, Horizontal and Vertical Antenna Orientations, 2402 MHz BLE – Antenna 1**

Freq. [MHz]	Antenna Orientation	Detector	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]
47.1	Vertical	Qp	23.4	40	-16.6
237.5	Horizontal	Qp	21.3	46	-24.7
371.0	Vertical	Qp	19.3	46	-26.7
952.6	Vertical	Qp	37.1	46	-8.9
4804	Vertical	Pk	28.1	54	-25.9
12750	Horizontal	Pk	25.2	54	-28.8

Note: - Quasi Peak detector used with a bandwidth of 120 kHz for frequencies below 1 GHz  
- Peak (Pk) value already within Average (Av) limits, therefor Av not retested.  
- Peak detector used with a bandwidth of 1 MHz.

**Radiated Emission, 30 MHz - 25GHz, Horizontal and Vertical Antenna Orientations, 2440 MHz BLE – Antenna 1**

Freq. [MHz]	Antenna Orientation	Detector	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]
47.1	Vertical	Qp	23.5	40	-16.5
237.5	Horizontal	Qp	21.3	46	-24.7
371.0	Vertical	Qp	19.5	46	-26.5
848.0	Vertical	Qp	36.2	46	-9.8
4884	Vertical	Pk	30.3	54	-23.7
12750	Horizontal	Pk	25.2	54	-28.8

Note: - Quasi Peak detector used with a bandwidth of 120 kHz for frequencies below 1 GHz  
- Peak (Pk) value already within Average (Av) limits, therefor Av not retested.  
- Peak detector used with a bandwidth of 1 MHz.

**Radiated Emission, 30 MHz - 25GHz, Horizontal and Vertical Antenna Orientations, 2480 MHz BLE – Antenna 1**

Freq. [MHz]	Antenna Orientation	Detector	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]
47.1	Vertical	Qp	23.4	40	-16.6
237.5	Horizontal	Qp	21.5	46	-24.5
371.0	Vertical	Qp	19.4	46	-26.6
954.5	Vertical	Qp	35.5	46	-10.5
4960	Vertical	Pk	25.1	54	-28.9
12750	Horizontal	Pk	25.2	54	-28.8

Note: - Quasi Peak detector used with a bandwidth of 120 kHz for frequencies below 1 GHz  
- Peak (Pk) value already within Average (Av) limits, therefor Av not retested.  
- Peak detector used with a bandwidth of 1 MHz.

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## 9.2.5 Radiated Spurious Emissions of Transmitter in restricted bands

**RESULT: PASS**

Date of testing:

2013-02-12

Requirements:

FCC 15.205, FCC 15.209 and FCC 15.247(d) and RSS-Gen

Radiated emissions which fall in the restricted bands, as defined in FCC 15.205(a), must comply with the radiated emission limits specified in FCC 15.209(a).

Frequency Range (MHz)	Field strength (μV/m)	Field strength (dBμV/m)	Detector	Measurement distance (m)
0.009-0.490	2400/F(kHz)	43.5 > 13.8	Average	300
0.490-1.705	24000/F(kHz)	33.8 > 22.9	Average	300
1.705 - 30.0	30	29.5	Quasi peak	30
30 - 88	100	40.0	Quasi peak	3
88 - 216	150	43.5	Quasi peak	3
216 - 960	200	46.0	Quasi peak	3
960 - 25000	500	54.0	Average	3

Radiated emissions which fall outside the operation frequency band and outside restricted bands shall either meet the limit specified in FCC 15.209(a) or be attenuated at least 20dB below the power level in the 100kHz bandwidth within the band that contains the highest level of the desired power (the less severe limit applies).

Test procedure:

ANSI C63.10:2009

KDB Publication No. 558074 D01: Measurement of Digital Transmission Systems Operating under Section 15.247.

The EUT was placed on a nonconductive turntable 0.8m above the ground plane. Before final measurements of radiated emissions were performed, the EUT was scanned to determine its emission spectrum profile. The physical arrangement of the test system, the associated cabling and the EUT orientation (X, Y, Z) were varied in order to ensure that maximum emission amplitudes were attained.

The spectrum was examined from 2.31GHz-2.39GHz and from 2.4835GHz-2.5GHz. Final radiated emission measurements were made at 3m distance.

At each frequency where a spurious emission was found, the EUT was rotated 360° and the antenna was raised and lowered from 1 to 4m in order to determine the emission's maximum level. Measurements were taken using both horizontal and vertical antenna polarizations.

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The highest emission amplitudes relative to the appropriate limit were recorded in this report. Field strength values of radiated emissions at frequencies not listed in the tables are more than 20 dB below the applicable limit.

Correction factors are incorporated in the spectrum analyzers as an automated function.

Refer to section 4.2 for the power settings and modes.

Correction factors includes: antenna factor, cable loss and pre-amplifier gain.

Operating frequency [GHz]	Restricted frequency band [GHz]	Antenna Orientation	Frequency of the highest peak in the restricted band [GHz]	Level Pk of the highest peak in the restricted band [dBμV/m]	Limit [dBμV/m]	Margin [dB]
2.402	2.31 – 2.39	Vertical	2.3740	43.4	54	-10.6
2.440	2.31 – 2.39	Vertical	2.3878	46.5	54	-7.5
2.480	2.31 – 2.39	Vertical	2.3880	46.6	54	-7.4
2.402	2.4835-2.5	Vertical	2.4912	45.3	54	-8.7
2.440	2.4835-2.5	Vertical	2.4917	48.4	54	-5.6
2.480	2.4835-2.5	Vertical	2.4920	48.4	54	-5.6

The highest peak in the restricted band is noted for each operating frequency.

End of report