TÜVRheinland®

Produkte
Products

Prüfbericht - Nr.: *Test Report No.:*	**10039910 001**	**Seite 1 von 95** *Page 1 of 95*
Auftraggeber: *Client:*	CyberTAN technology Inc. No. 99, Park Ave. III, Science-based Industrial Park, Hsinchu 308, Taiwan, R.O.C.	
Gegenstand der Prüfung: *Test item:*	MiracastTM Video Receiver	
Bezeichnung: *Identification:*	RF-WFD301	**Serien-Nr.:** *Serial No.:* N/A
Wareneingangs-Nr.: *Receipt No.:*	TPE80960	**Eingangsdatum:** *Date of receipt:* 2012-12-18
Zustand des Prüfgegenstandes bei Anlieferung: **Condition of test item at delivery:**	The sample is ok for testing and not damaged	
Prüfort: *Testing location:*	**TÜV Rheinland Taiwan Ltd.** 11F., No.758, Sec. 4, Bade Rd., Songshan Dist., Taipei City 105 Taiwan **FCC Registration No.: 365730**	
Prüfgrundlage: *Test specification:*	**FCC CFR47 Part 15 Subpart E** **ANSI C63.4:2009, FCC KDB789033**	
Prüfergebnis: *Test Result:*	**Der Prüfgegenstand entspricht oben genannter Prüfgrundlage(n).** *The test item passed the test specification(s).*	
Prüflaboratorium: *Testing Laboratory:*	**TÜV Rheinland Taiwan Ltd.** **11F., No.758, Sec. 4, Bade Rd., Songshan Dist., Taipei City 105, Taiwan, R.O.C.**	

geprüft/ *tested by:*

2013-1-17 Neil J. N. Tsai/Project Engineer

Datum *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*

kontrolliert/ *reviewed by:*

2013-01-17 Rene Charton/Senior Project Manager

Datum *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*

Sonstiges/ *Other Aspects:*

Abkürzungen:				*Abbreviations:*			
	P(ass)	=	*entspricht Prüfgrundlage*		*P(ass)*	=	*passed*
	F(ail)	=	*entspricht nicht Prüfgrundlage*		*F(ail)*	=	*failed*
	N/A	=	*nicht anwendbar*		*N/A*	=	*not applicable*
	N/T	=	*nicht getestet*		*N/T*	=	*not tested*

TEST SUMMARY

5.1.1 802.11A/N BAND I ANTENNA PORT ONE (TX0)

5.1.1.1 26 DB BANDWIDTH
RESULT: Passed

5.1.1.2 TRANSMIT OUTPUT POWER
RESULT: Passed

5.1.1.3 POWER EXCURSION
RESULT: Passed

5.1.1.4 POWER SPECTRAL DENSITY
RESULT: Passed

5.1.1.5 99% BANDWIDTH
RESULT: Passed

5.1.1.6 CONDUCTED SPURIOUS EMISSIONS AND FREQUENCY BAND EDGE
RESULT: Passed

5.1.1.7 SPURIOUS EMISSION
RESULT: Passed

5.1.2 802.11A/N BAND I ANTENNA PORT TWO (TX1)

5.1.2.1 26 DB BANDWIDTH
RESULT: Passed

5.1.2.2 TRANSMIT OUTPUT POWER
RESULT: Passed

5.1.2.3 POWER EXCURSION
RESULT: Passed

5.1.2.4 POWER SPECTRAL DENSITY
RESULT: Passed

5.1.2.5 99% BANDWIDTH
RESULT: Passed

5.1.2.6 CONDUCTED SPURIOUS EMISSIONS AND FREQUENCY BAND EDGE
RESULT: Passed

5.1.2.7 SPURIOUS EMISSION
RESULT: Passed

5.1.3 802.11A/N BAND I ANTENNA PORTS AGGREGATION (TX0+TX1)

5.1.3.1 POWER SPECTRAL DENSITY
RESULT: Passed

5.1.3.2 CONDUCTED SPURIOUS EMISSIONS AND FREQUENCY BAND EDGE
RESULT: Passed

Contents

1. General Remarks

1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendix:
Appendix 1: Photo
(File:10039910APPENDIX1)
Appendix 2: Test Result of Radiated Emissions
(File:10039910APPENDIX2)

Test Specifications
The following standards were applied (in bold: product standards, otherwise: basic standards).

Table 1: Applied Standard and Test Levels

Radio
FCC CFR47 Part 15 Subpart E: **2010** KDB 789033 D01 General UNII Test Procedures v01r02

2. Test Sites

2.1 Test Facilities

TUV Rheinland Taiwan Ltd.

11F. No.758, Sec. 4, Bade Rd., Songshan Dist.
Taipei City 105
Taiwan (R.O.C.)
FCC Registration No.: 365730

2.2 List of Test and Measurement Instruments

Table 2: List of Test and Measurement Equipment

Kind of Equipment	Manufacturer	Type	S/N	Calibrated until
EMI Test Receiver	R&S	ESCI 7	1166.5950K07-100797-Pt	20-Dec-13
Bilog Antenna	TESEQ	CBL6111D	29802	29-Jun-13
Pre-Amplifier	HP	8447F	2805A03335	14-Sep-13
Spectrum Analyzer	R&S	FSV 40	100921	13-Dec-13
Horn Antenna (1GHz~18GHz)	COM-POWER	AHA118	701251	28-Sep-13
Horn Antenna (18GHz~40GHz)	COM-POWER	AH840	101031	2-Nov-13
Preamplifier (30MHz -1GHz)	HP	8447F	2805A03335	14-Sep-13
Preamplifier (18 GHz -40 GHz)	COMPOWER	PAM-840	461257	17-Sep-13
Power meter	R&S	NRVD	100439	27-Mar-13
Power sensor	R&S	NRV-Z1	100013	27-Mar-13
Temp. & Humid. Chamber	Giant Force	GCT-099-40-S	MAF0103-007	13-May-13
Signal Generator	R&S	SMU200	104260	13-Aug-13
Loop Antenna	Schwarzbeck	FMZB 1513	1513-076	28-Sep-13

2.3 Traceability

All measurement equipment calibrations are traceable to NML(Taiwan)/NIST(USA) or where calibration is performed outside Taiwan, to equivalent nationally recognized standards organizations.

2.4 Calibration

Equipment requiring calibration is calibrated periodically by the manufacturer or according to manufacturer's specifications. Additionally all equipment is verified for proper performance on a regular basics using in house standards or comparisons.

2.5 Measurement Uncertainty

The estimated combined standard uncertainty for radiated emissions and conducted emissions measurements are ±3dB.

Table 3: Emission Measurement Uncertainty

Parameter	Uncertainty
Radio Frequency	± 1 x 10^{-7}
RF power, conducted	± 1 dB
Adjacent channel power	± 3 dB
Radiated emission of transmitter, valid up to 40 GHz	± 6 dB
Radiated emission of receiver, valid up to 40 GHz	± 6 dB
Temperature	± 2 ºC
Humidity	± 10 %

3. General Product Information

3.1 Product Function and Intended Use

WiFi Display HDMI Reveiver Dongle, which is intended for use with compatible devices such as phone or tablet to deliver signals to LCD TV, projector or other audio/video devices. The tested sample must insert the micro USB port on LCD TV, which is intended for charge.
For details refer to the User Guide, Data Sheet and Circuit Diagram.

3.2 Ratings and System Details

Table 4: Technical Specification of EUT

Technical Specification	Value
Kind of Equipment	MiracastTM Video Receiver
Brand Name	CyberTAN technology Inc.
FCC ID	N89-RFWFD301
Type Designation	RF-WFD301
Operating Frequency	5150 MHz ~ 5250 MHz
Operation Voltage	5V (USB input)
Modulation	OFDM
Antenna gain	Individual peak gain: 2.0 dBi, Aggregation peak gain:4.0 dBi
Antenna Type	One pair of chip antennas (2*2 MIMO)

Table 5: Frequency Channel information

Band	CH	Frequency (MHz)
802.11a Band I	36	5180.0
802.11a Band I	44	5220.0
802.11a Band I	48	5240.0
802.11n (HT20) Band I	36	5180.0
802.11n (HT20) Band I	44	5220.0
802.11n (HT20) Band I	48	5240.0
802.11n (HT40) Band I	38	5190.0
802.11n (HT40) Band I	46	5230.0

3.3 Independent Operation Modes

The basic operation modes are:

A. Transmitting
    1. Low channel
    2. Middle channel
    3. High channel
B. Receiving
C. Standby
D. Off

3.4 Noise Generating and Noise Suppressing Parts

Refer to the Circuit Diagram.

3.5 Submitted Documents

- Bill of Material
- PCB Layout
- Photo Document
- Technical Description
- Circuit Diagram
- Instruction Manual
- Rating Label

4. Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

The equipment under test (EUT) was configured to measure its maximum power level. The test modes were adapted accordingly in reference to the instructions for use.

4.2 Test Operation and Test Software

Test operation refers to test setup in chapter 4. All testing were performed according to the procedures in ANSI C63.10: 2009 and DA 00-705 of March 30, 2000.

Full test was applied on all test modes, but only worst case was shown.

TX0 stands for Antenna port one.

TX1 stands for Antenna port two.

4.3 Special Accessories and Auxiliary Equipment

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

Kind of Equipment	Manufacturer	Model Name	S/N
Laptop	MSI	MSI4532 (CX420MX)	CX420 MX-233TWK 1008000096

4.4 Countermeasures to achieve EMC Compliance

The test sample which has been tested contained the noise suppression parts as described in the Constructional Data Form or the Technical Construction File. No additional measures were employed to achieve compliance.

4.5 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test

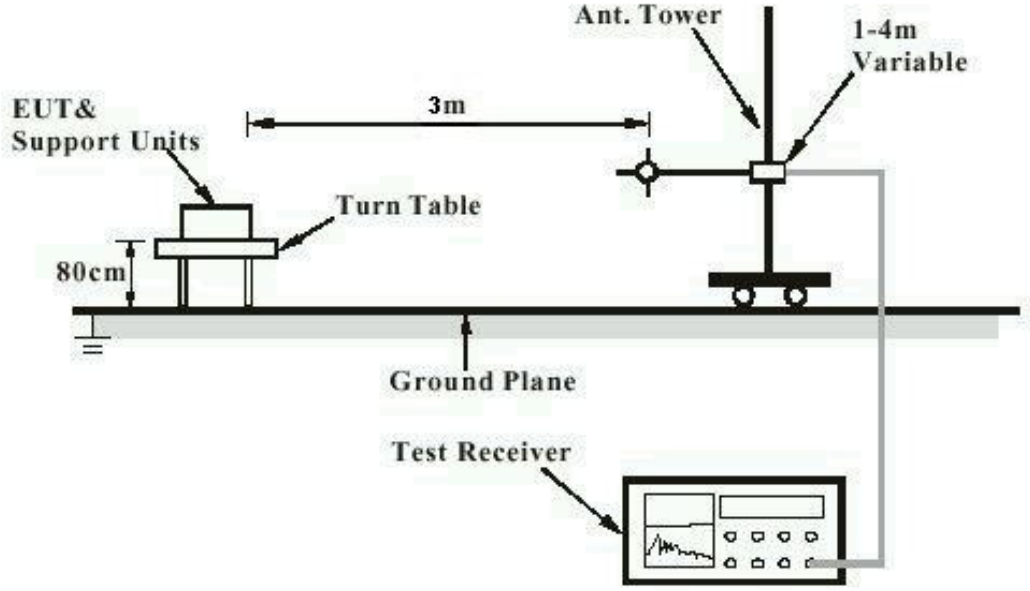


Diagram of Measurement Equipment Configuration for Mains Conduction Measurement

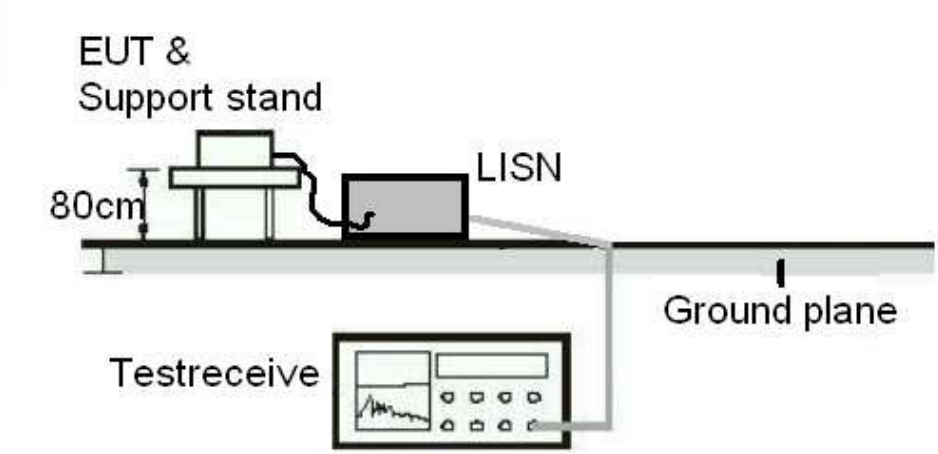
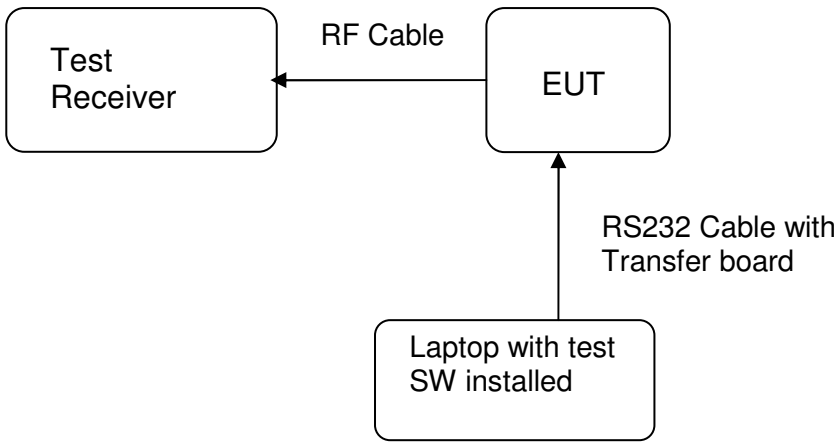


Diagram of Measurement Equipment Configuration for Conducted Transmitter Measurement

TX0 or TX1 testing



5. Antenna Port Test Results

5.1 Transmitter Requirement & Test Suites

5.1.1 802.11a/n Band I Antenna Port One (TX0)

5.1.1.1 26 dB Bandwidth

RESULT: **Passed**

Test date	:	2012-12-22
Test standard	:	FCC Part 15.407(a), RSS-210 A9.2
Kind of test site	:	Shielded room

Test setup

Test Channel	:	Low/ Middle/ High
Operation Mode	:	A
Ambient temperature	:	22℃
Relative humidity	:	52%
Atmospheric pressure	:	102 kPa

Table 6: Test result of 26dB Bandwidth

Channel	Channel Frequency (MHz)	26dB Bandwidth (MHz)	Limit (MHz)	Result
Low Channel	5180	18.813	/	Pass
Mid Channel	5220	18.813	/	Pass
High Channel	5240	18.712	/	Pass

Table 7: Test result of 26dB Bandwidth (HT20)

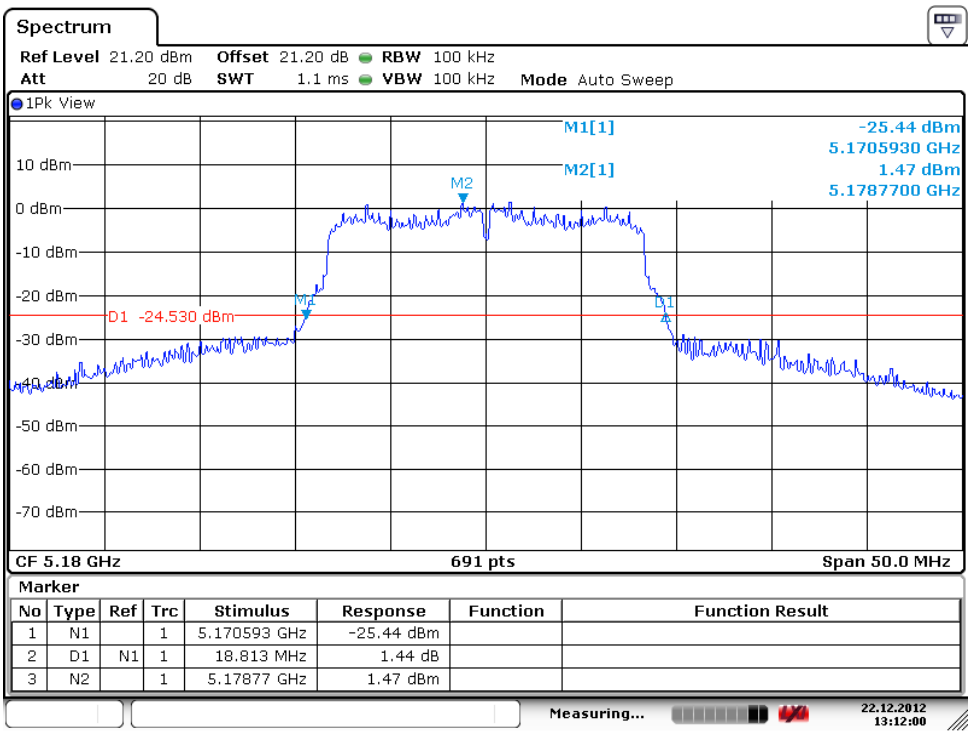
Channel	Channel Frequency (MHz)	26dB Bandwidth (MHz)	Limit (MHz)	Result
Low Channel	5180	18.669	/	Pass
Mid Channel	5220	18.669	/	Pass
High Channel	5240	18.857	/	Pass

Table 8: Test result of 26dB Bandwidth (HT40)

Channel	Channel Frequency (MHz)	26dB Bandwidth (MHz)	Limit (MHz)	Result
Low Channel	5190	38.032	/	Pass
High Channel	5230	38.148	/	Pass

Test Plot of 26dB Bandwidth

Low Channel



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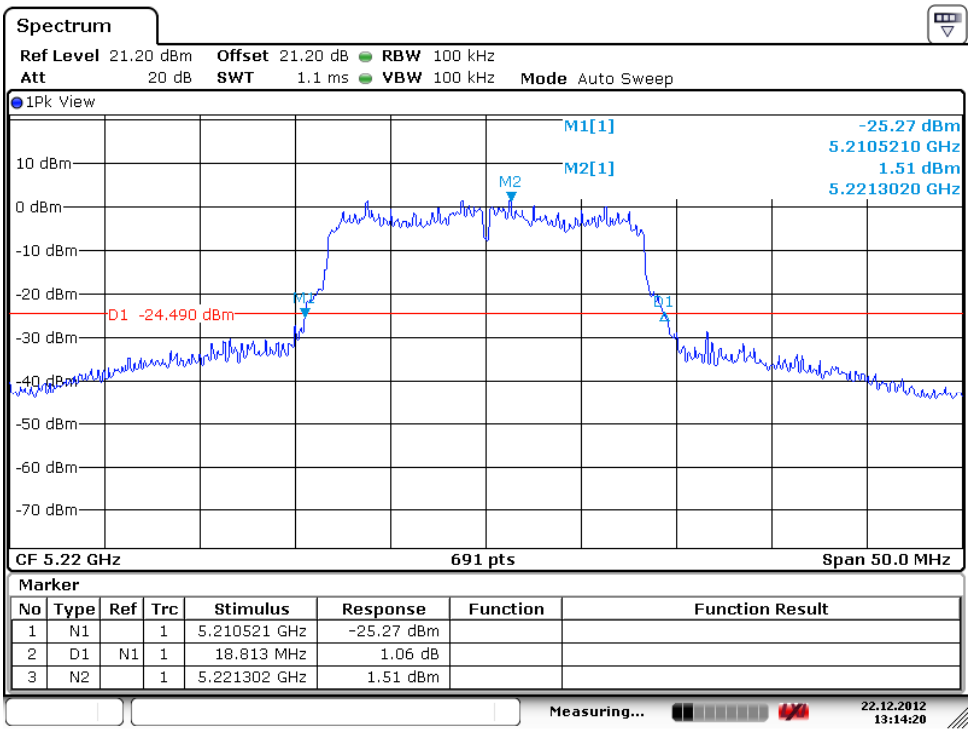
Middle Channel



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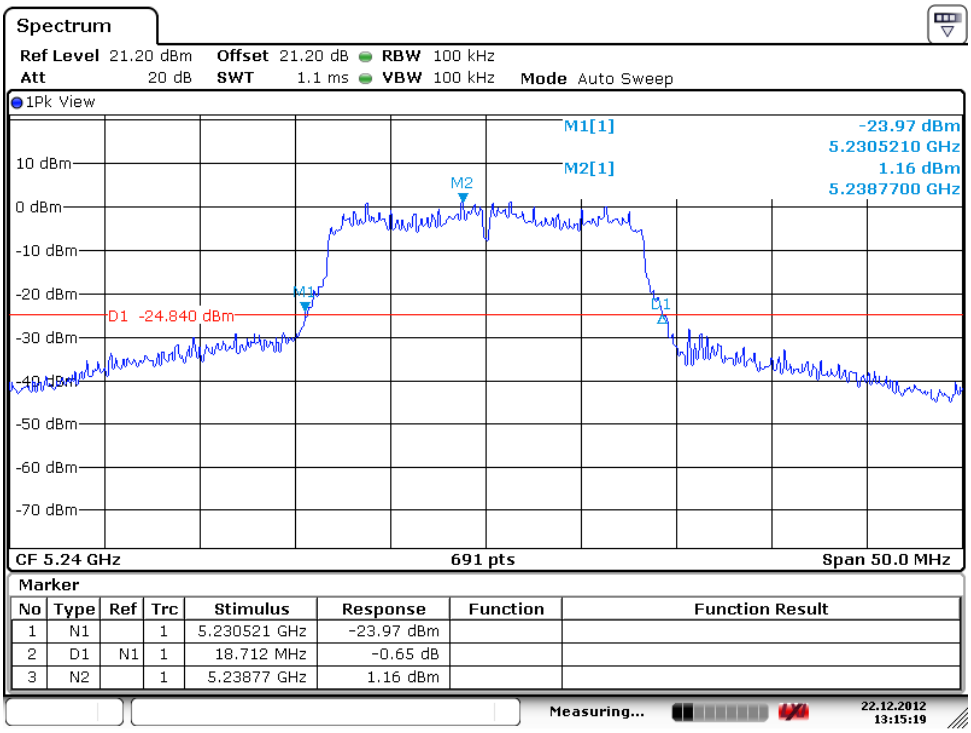
High Channel



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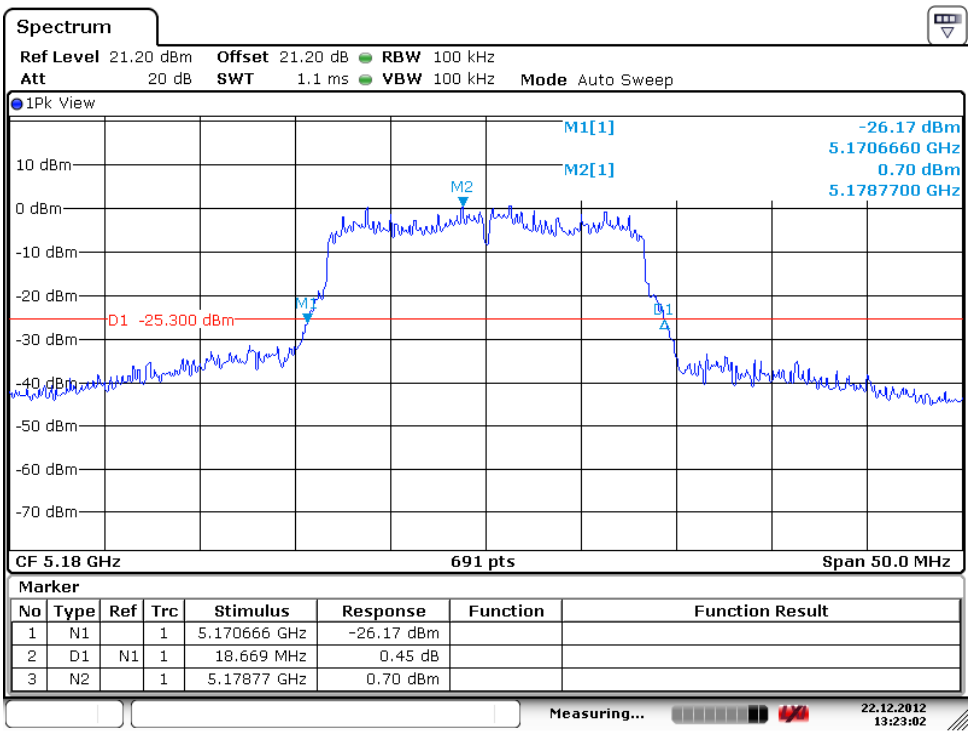
Test Plot of 26dB Bandwidth (HT20)

Low Channel



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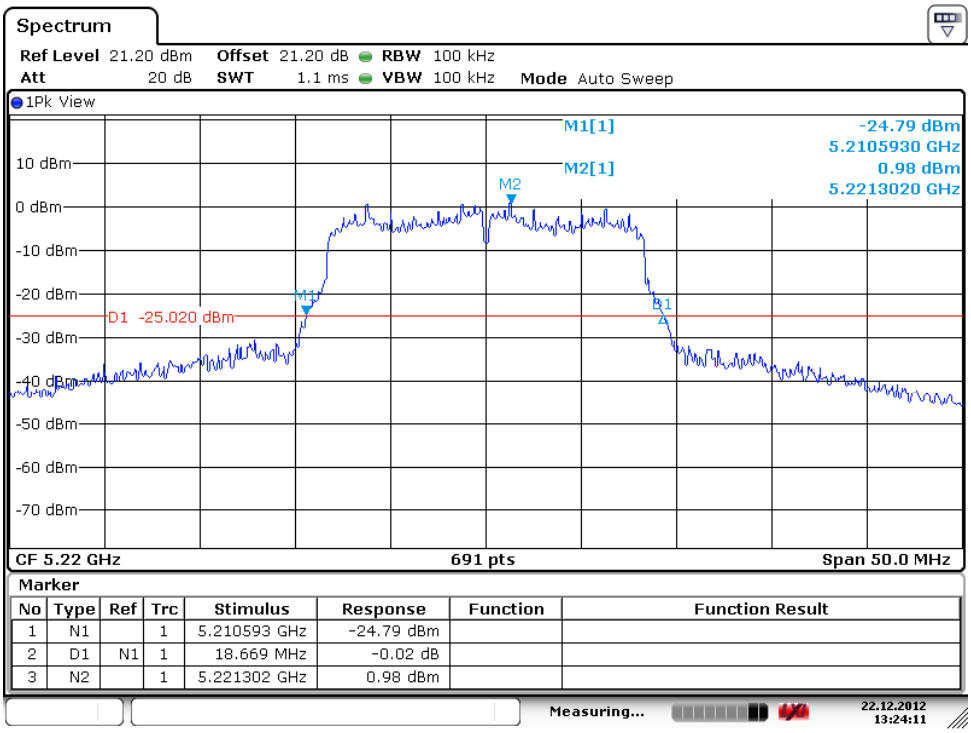
Middle Channel



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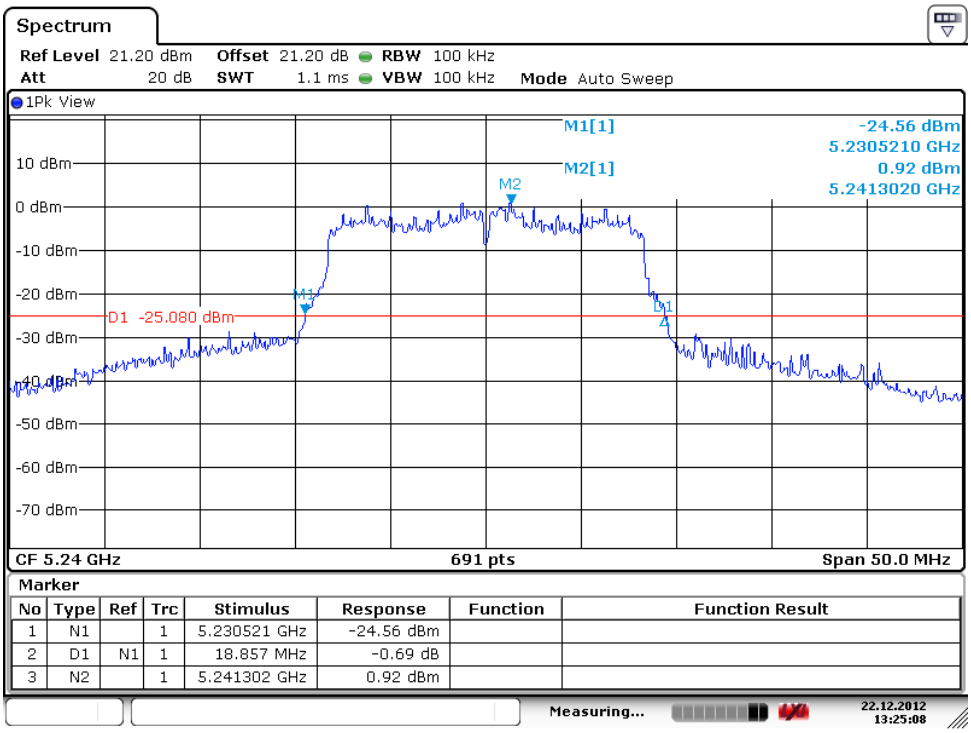
High Channel



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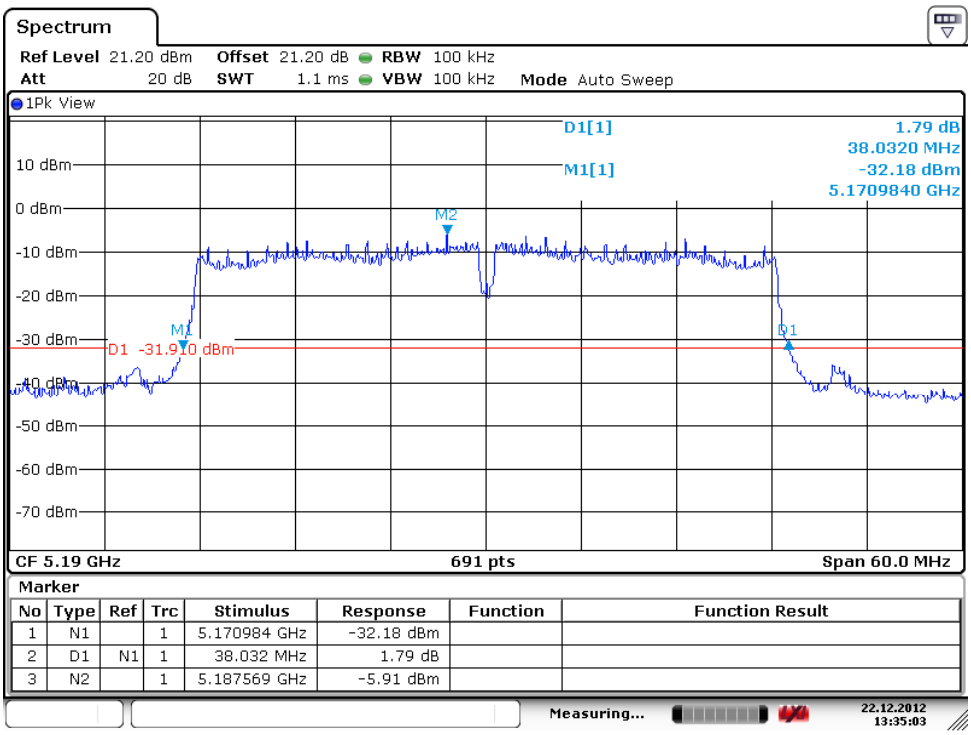
Test Plot of 26dB Bandwidth(HT40)

Low Channel



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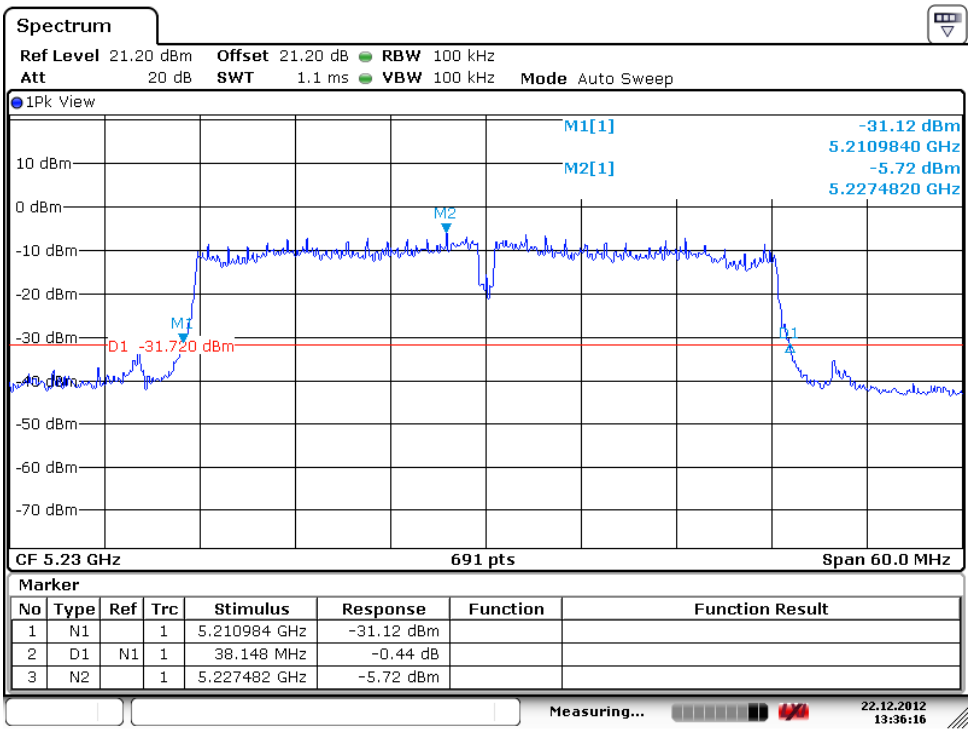
High Channel



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5.1.1.2 Transmit Output Power

RESULT: **Passed**

Test date	:	2012-12-22
Test standard	:	FCC Part 15.407(a), RSS-210 A9.2
Limit	:	1 Watt
Kind of test site	:	Shielded room, with Power Meter

Test setup

Test Channel	:	Low/ Middle/ High
Operation Mode	:	A
Ambient temperature	:	22℃
Relative humidity	:	52%
Atmospheric pressure	:	102 kPa

For the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10 log B, where B is the 26 dB emission bandwidth in MHz. If transmitting antenna sof directional gain greater than 6 dBi are used, both the peak transmit power anjd the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceed 6 dBi.

For the 802.11n modes, the EUT can be operated in 2x2 MIMO mode. Therefore, for those modes, in the tables below the limits are reduced by 3 dB.
Alternatively, the result tables show the sum of the power values for TX0 + TX1

Table 9: Test result of Transmit Power

Channel	Channel Frequency (MHz)	Power (dBm)	26dB Bandwidth (MHz)	Limit (dBm)	Result
Low Channel	5180	13.19	18.813	16.745	Pass
Mid Channel	5220	13.08	18.813	16.745	Pass
High Channel	5240	13.01	18.712	16.721	Pass

Table 10: Test result of Transmit Power (HT20)

Channel	Channel Frequency (MHz)	Power (dBm) TX0	Power (dBm) TX1	Power (dBm) sum	26dB BW (MHz) TX0	Limit (dBm) TX0	26dB BW (MHz) TX1	Limit (dBm) TX1	Result
Low Channel	5180	14.47	11.42	16.218	18.669	16.711	18.813	16.745	Pass
Mid Channel	5220	14.11	12.15	16.250	18.669	16.711	18.958	16.778	Pass
High Channel	5240	14.18	12.23	16.324	18.857	16.755	19.291	16.854	Pass

Table 11: Test result of Transmit Power (HT40)

Channel	Channel Frequency (MHz)	Power (dBm)	26dB Bandwidth (MHz)	Limit (dBm)	Result
Low Channel	5190	10.33	38.032	17-3	Pass
High Channel	5230	10.26	38.148	17-3	Pass

5.1.1.3 Power Excursion

RESULT: **Passed**

Date of testing	:	2012-12-22
Test standard	:	FCC Part 15.407(a)(6)
Kind of test site	:	Shielded room

Test setup

Test Channel	:	Low/ Middle/ High
Operation Mode	:	A
Ambient temperature	:	24℃
Relative humidity	:	53%
Atmospheric pressure	:	102 kPa

Table 12: Test result of Power Excursion

Channel	Channel Frequency (MHz)	Power Excursion (dB)	Limit (dB)	Result
Low Channel	5180	1.03	13	Pass
Mid Channel	5220	1.52	13	Pass
High Channel	5240	1.73	13	Pass

Table 13: Test result of Power Excursion(HT20)

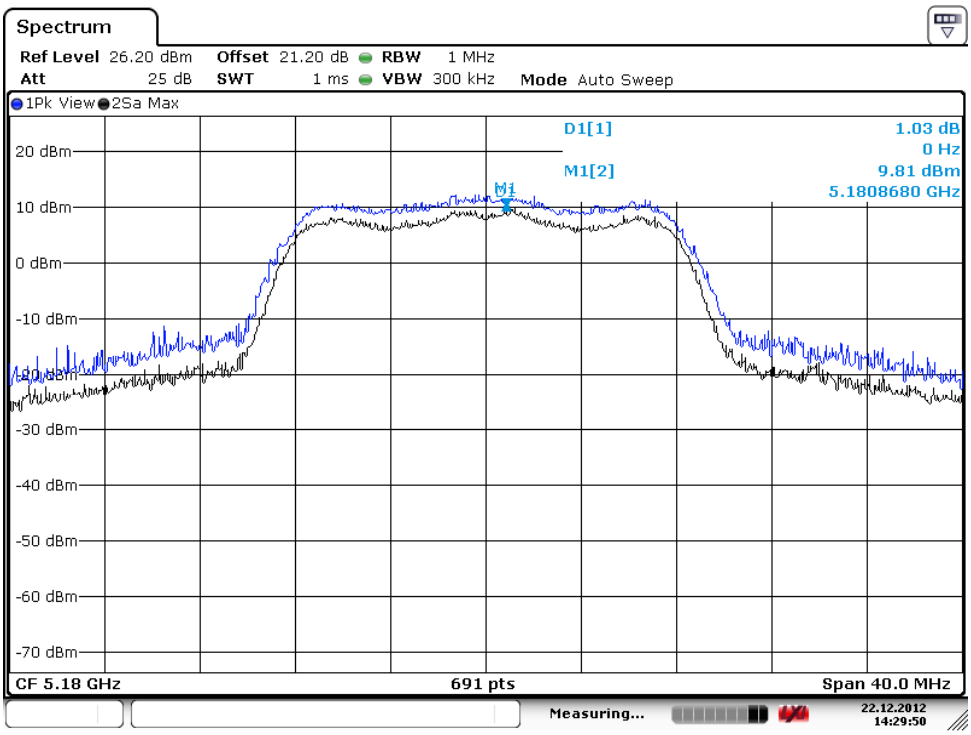
Channel	Channel Frequency (MHz)	Power Excursion (dB)	Limit (dB)	Result
Low Channel	5180	0.56	13	Pass
Mid Channel	5220	1.80	13	Pass
High Channel	5240	1.86	13	Pass

Table 14: Test result of Power Excursion(HT40)

Channel	Channel Frequency (MHz)	Power Excursion (dB)	Limit (dB)	Result
Low Channel	5190	1.61	13	Pass
High Channel	5230	1.26	13	Pass

Test Plot of Power Excursion

Low Channel



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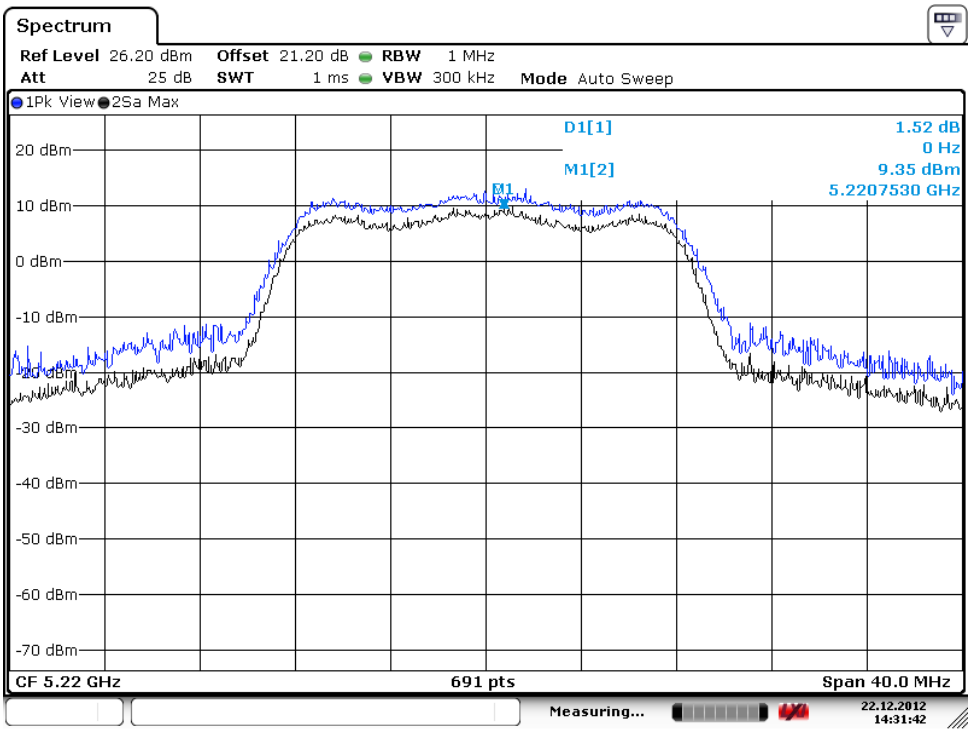
Middle Channel



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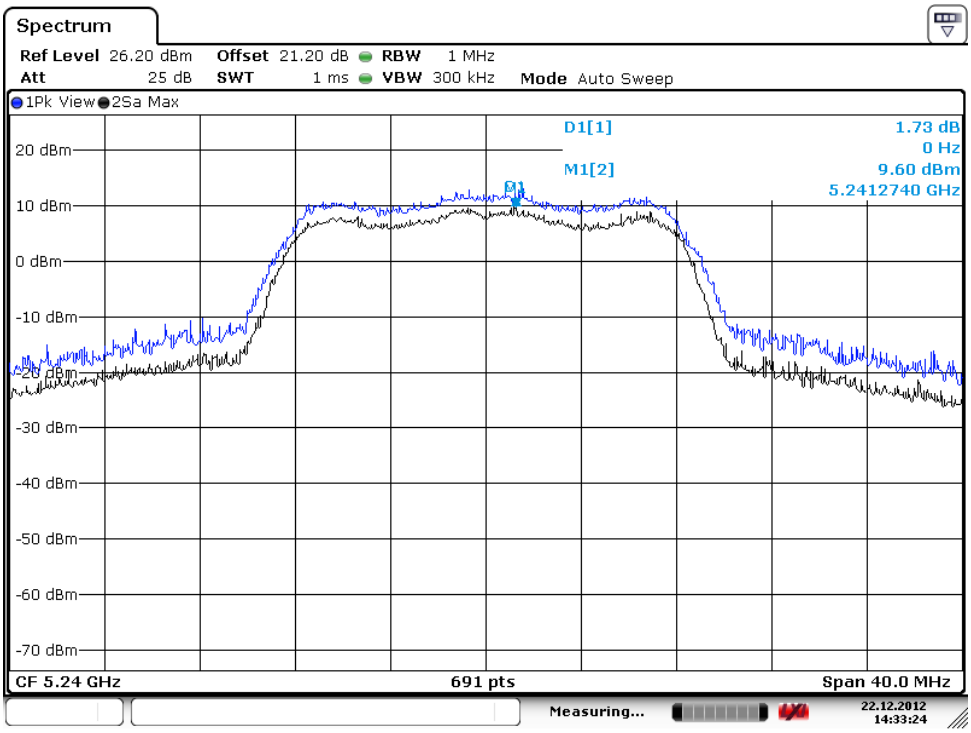
High Channel



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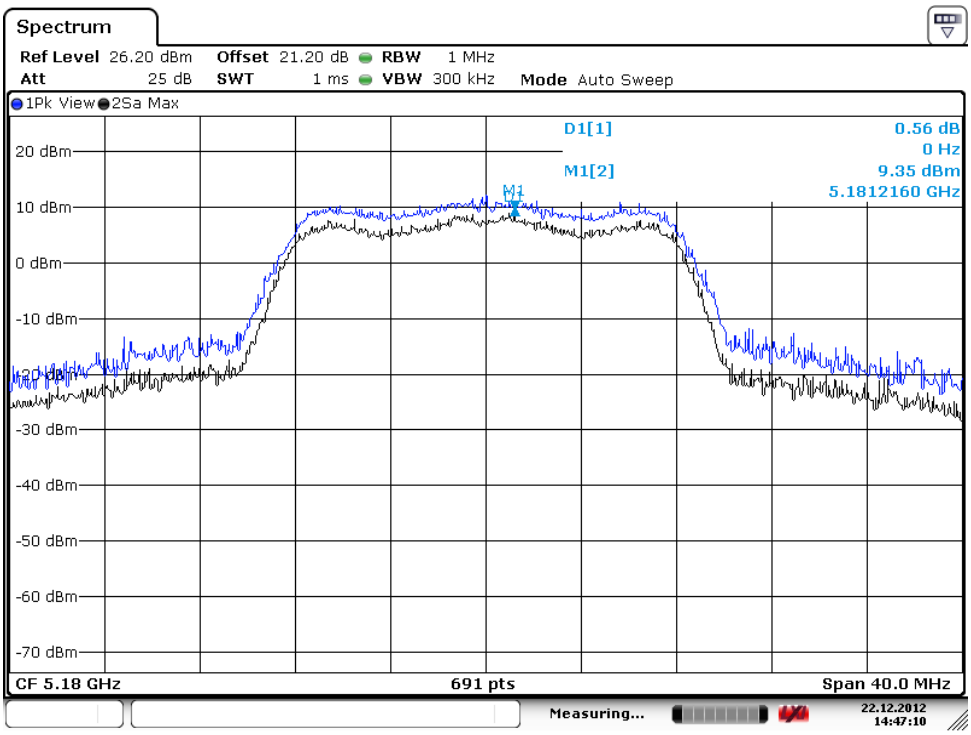
Test Plot of Power Excursion (HT20)

Low Channel



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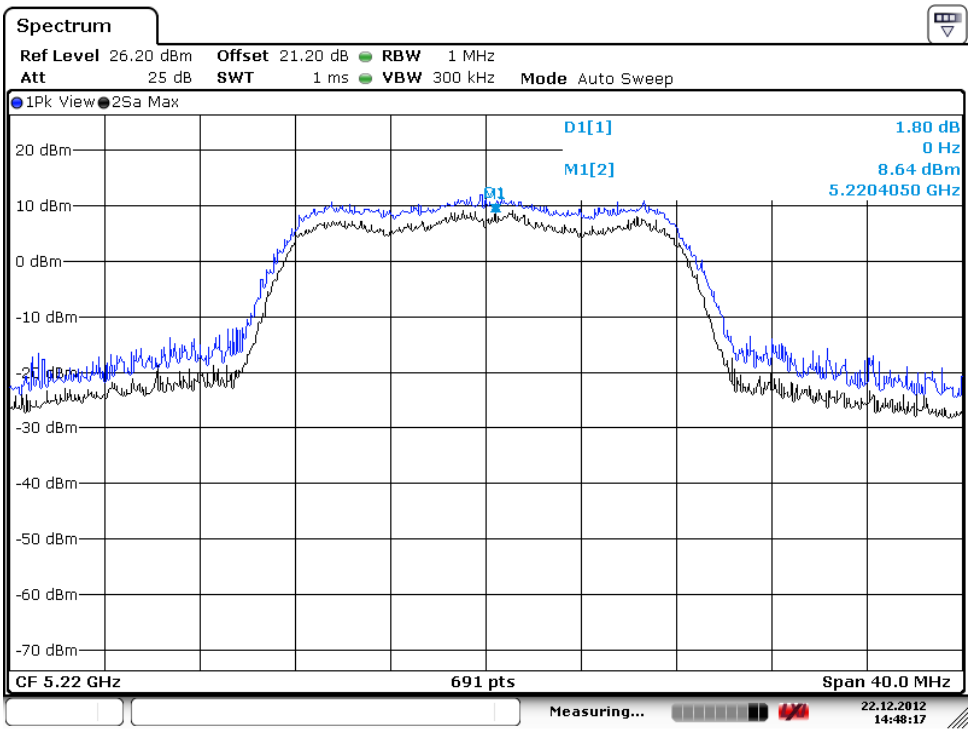
Middle Channel



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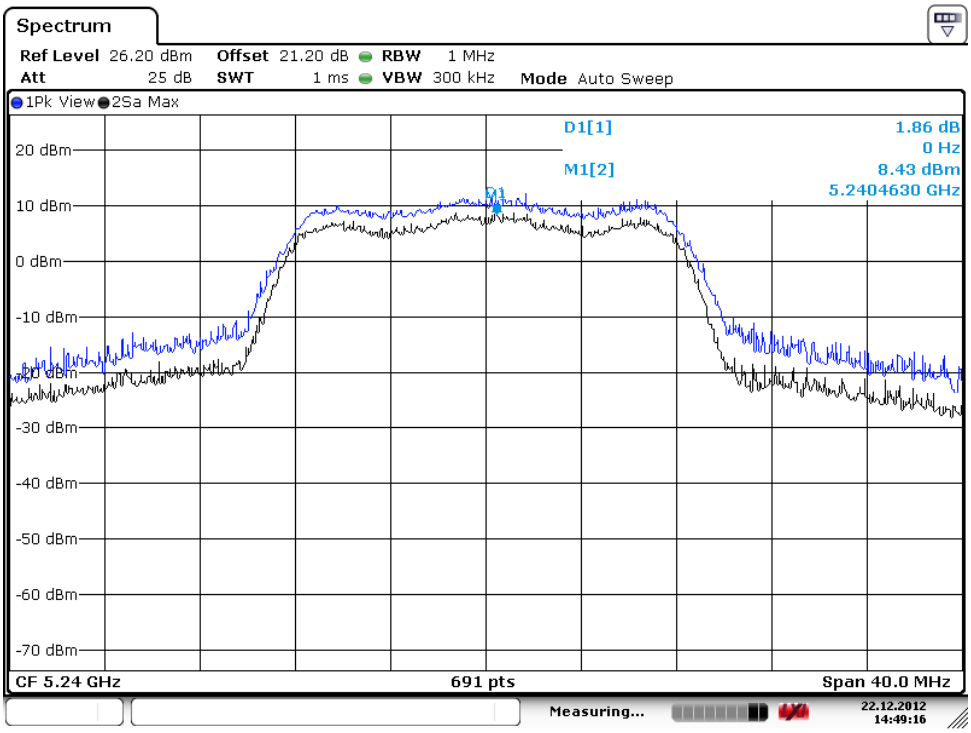
High Channel



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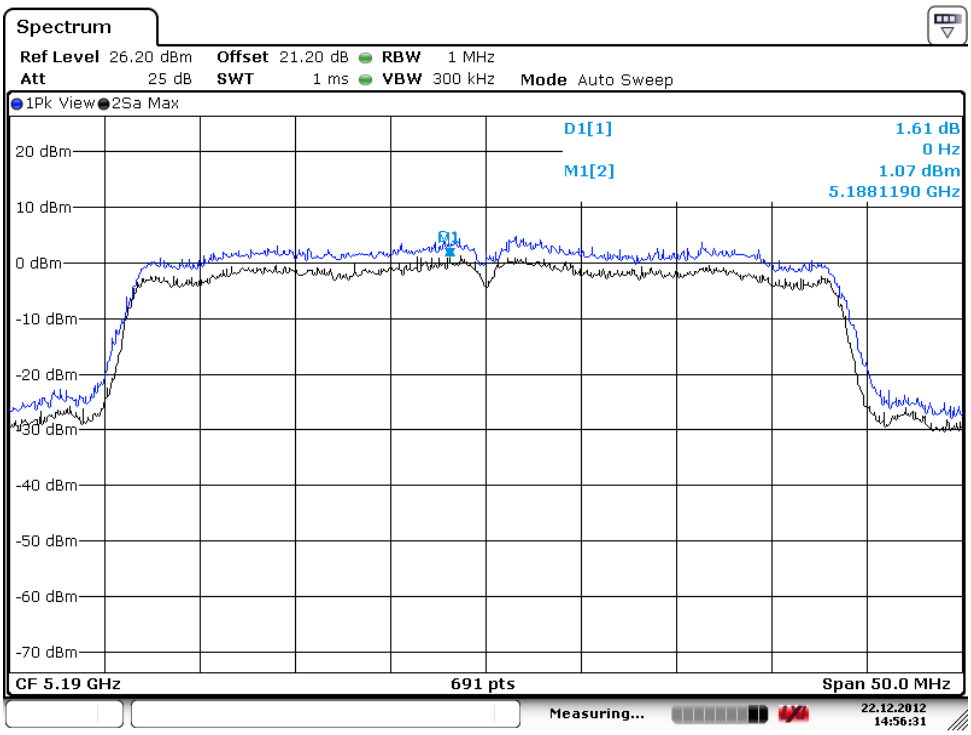
Test Plot of Power Excursion (HT40)

Low Channel



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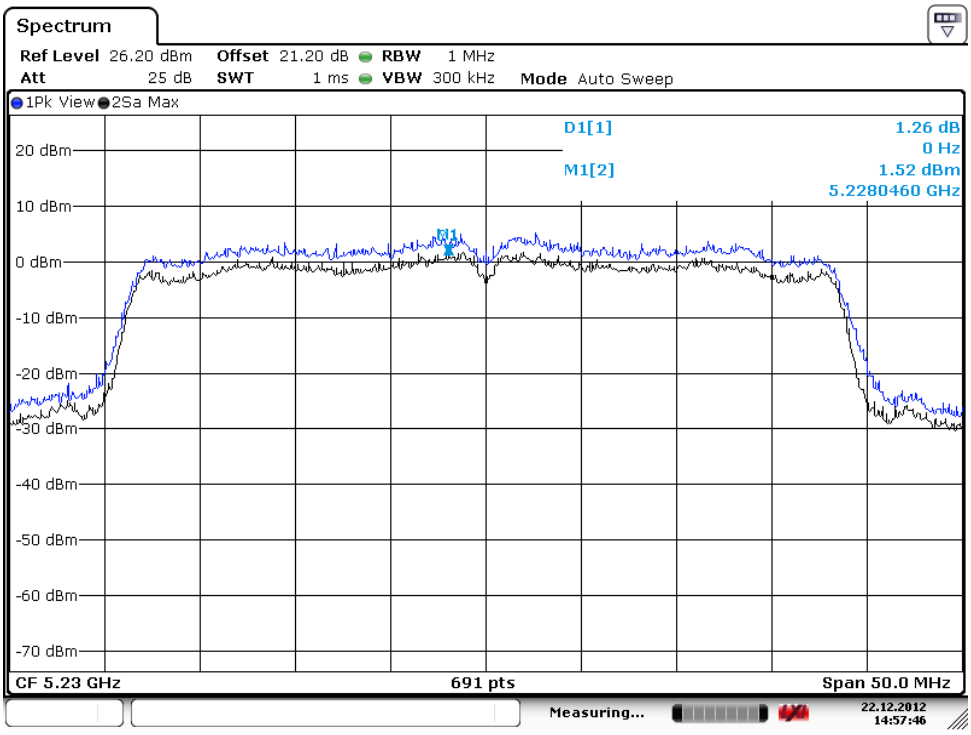
High Channel



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5.1.1.4 Power Spectral Density

RESULT: **Passed**

Date of testing	:	2012-12-22
Test standard	:	FCC Part 15.407(a)(1),(5)
Kind of test site	:	Shielded room

Test setup

Test Channel	:	Low/ Middle/ High
Operation Mode	:	A
Ambient temperature	:	24℃
Relative humidity	:	53%
Atmospheric pressure	:	102 kPa

For the 802.11n modes, the EUT can be operated in 2x2 MIMO mode. Therefore, for those modes, in the tables below the limits are reduced by 3 dB.

Table 15: Test result of Power Spectral Density

Channel	Channel Frequency (MHz)	Peak Power Density (dBm)	Limit (dBm)	Result
Low Channel	5180	-10.74	4	Pass
Mid Channel	5220	-10.79	4	Pass
High Channel	5240	-10.87	4	Pass

Table 16: Test result of Power Spectral Density (HT20)

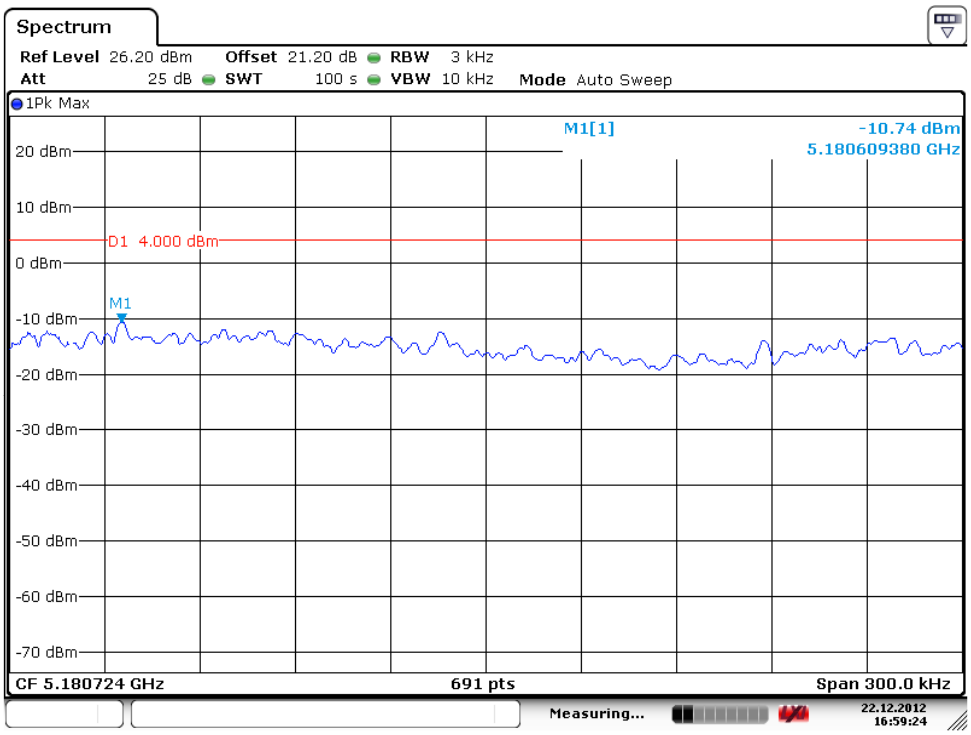
Channel	Channel Frequency (MHz)	Peak Power Density (dBm)	Limit (dBm)	Result
Low Channel	5180	-13.47	4-3	Pass
Mid Channel	5220	-12.87	4-3	Pass
High Channel	5240	-11.56	4-3	Pass

Table 17: Test result of Power Spectral Density (HT40)

Channel	Channel Frequency (MHz)	Peak Power Density (dBm)	Limit (dBm)	Result
Low Channel	5190	-20.75	4-3	Pass
High Channel	5230	-19.31	4-3	Pass

Test Plot of Power Density

Low Channel



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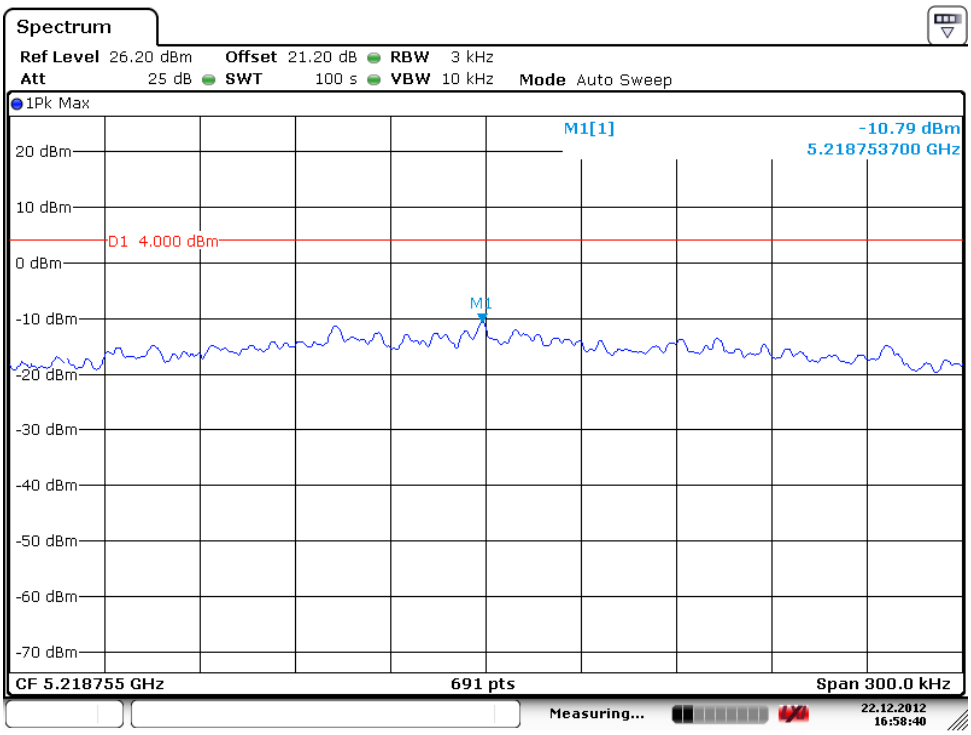
Middle Channel



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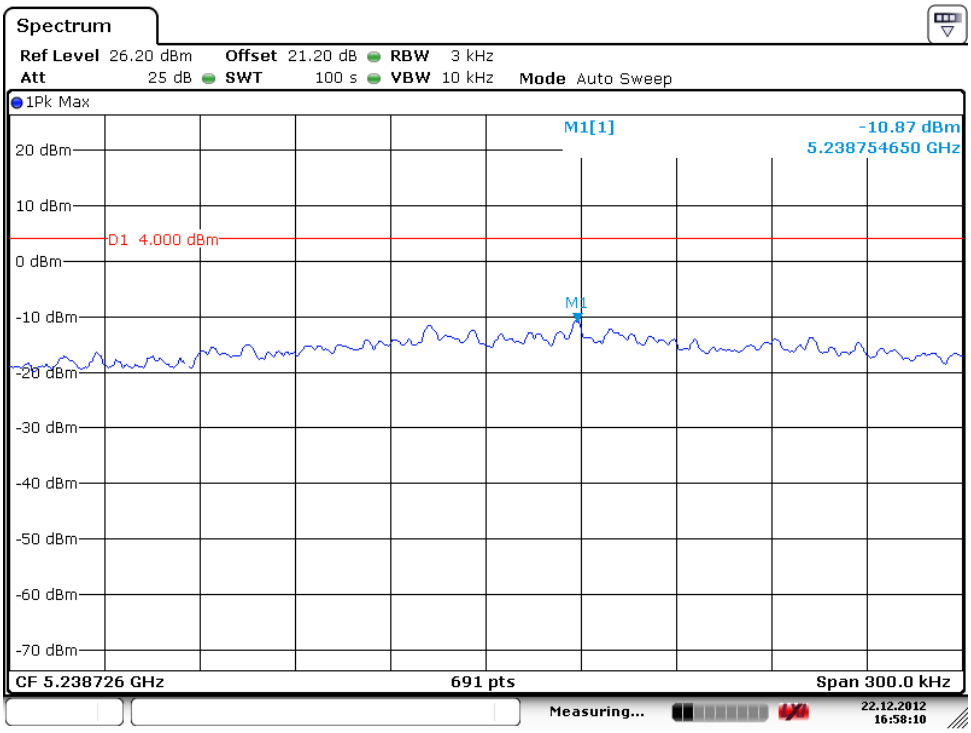
High Channel



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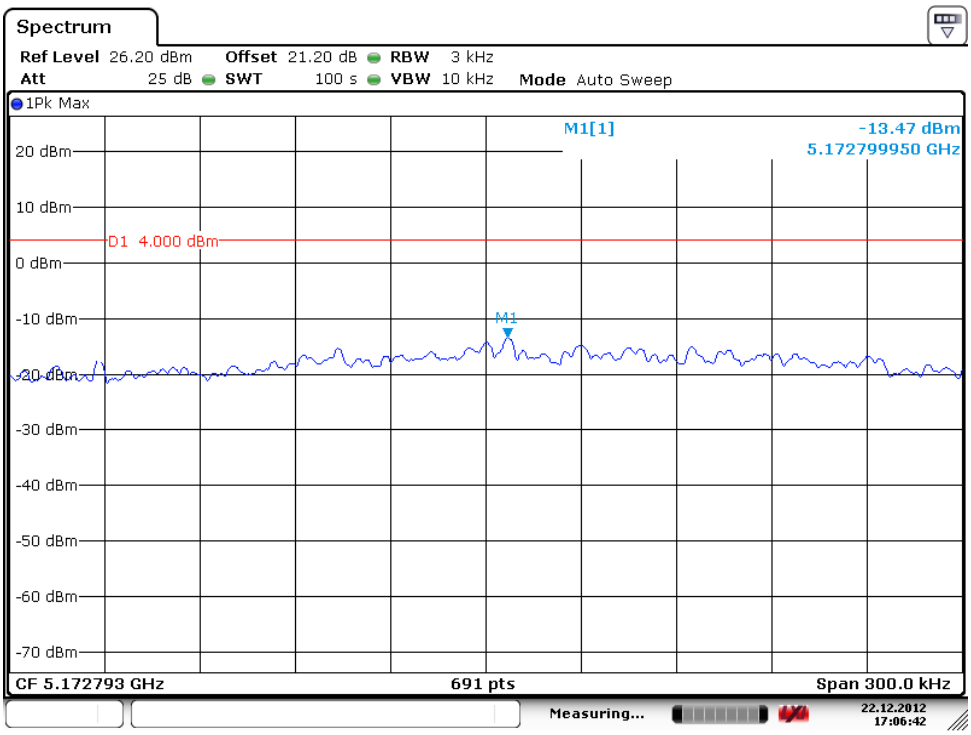
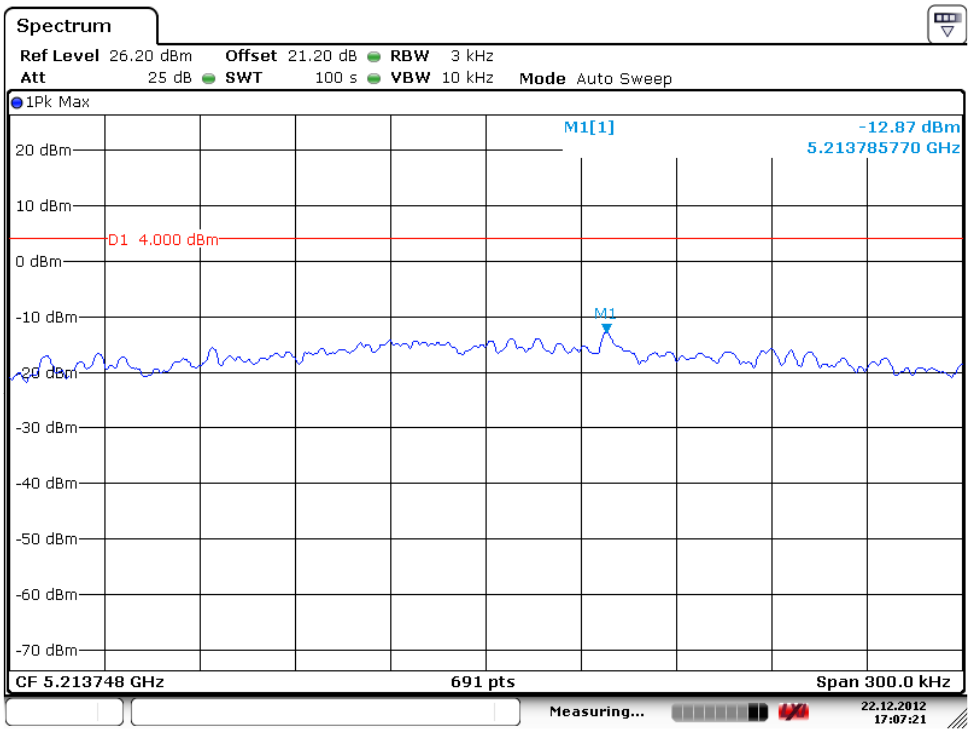
Test Plot of Power Density (HT20)

Low Channel



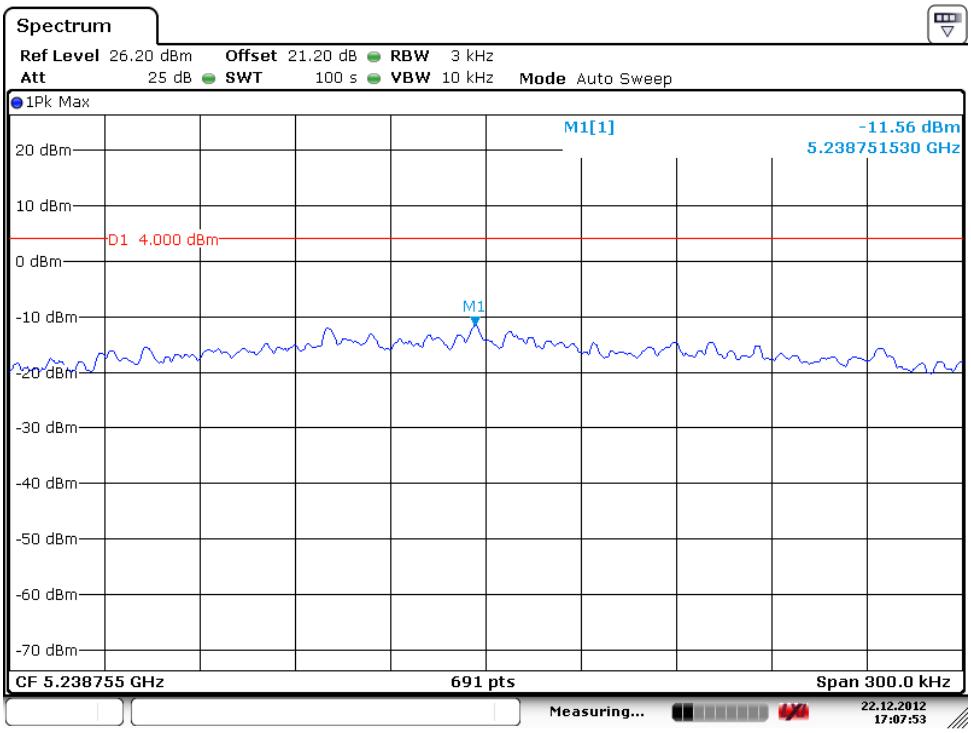
Date: 22.DEC.2012 17:06:42

Middle Channel



Date: 22.DEC.2012 17:07:21

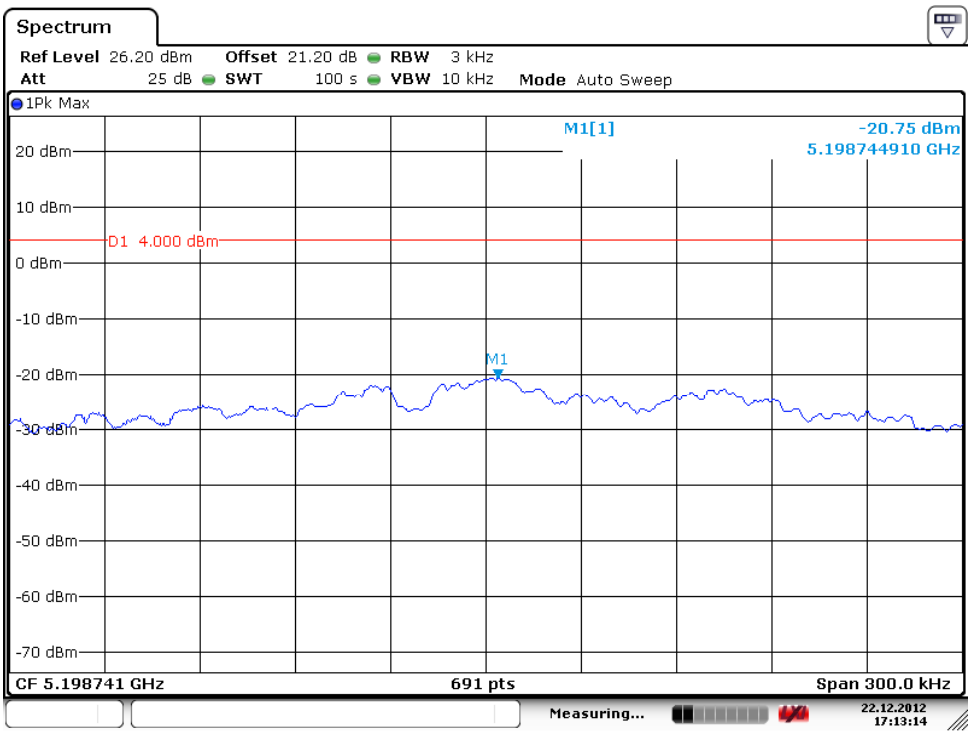
High Channel



Date: 22.DEC.2012 17:07:53

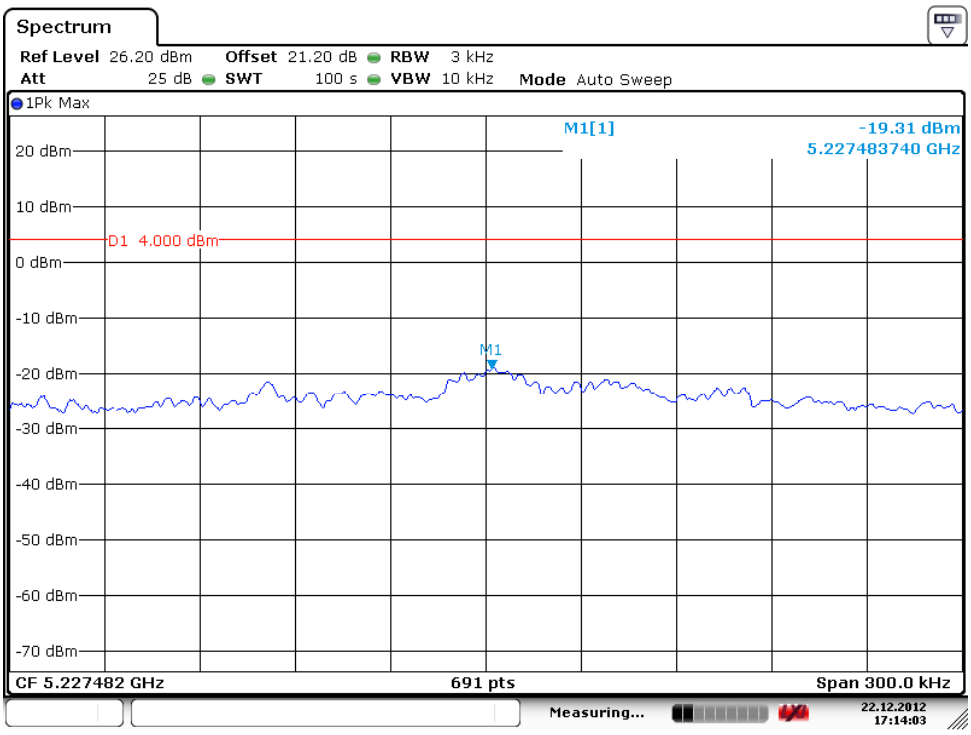
Test Plot of Power Density (HT40)

Low Channel



Date: 22.DEC.2012 17:13:15

High Channel



Date: 22.DEC.2012 17:14:04

5.1.1.5 99% Bandwidth

RESULT: **Passed**

Test date	:	2012-12-22
Test standard	:	Report purpose only
Kind of test site	:	Shielded room

Test setup

Test Channel	:	Low/ Middle/ High
Operation Mode	:	A
Ambient temperature	:	22℃
Relative humidity	:	52%
Atmospheric pressure	:	102 kPa

Table 18: Test result of 99% Bandwidth

Channel	Channel Frequency (MHz)	99% Bandwidth (MHz)	Limit (MHz)	Result
Low Channel	5180	16.643	/	Pass
Mid Channel	5220	16.643	/	Pass
High Channel	5240	16.643	/	Pass

Table 19: Test result of 99% Bandwidth (HT20)

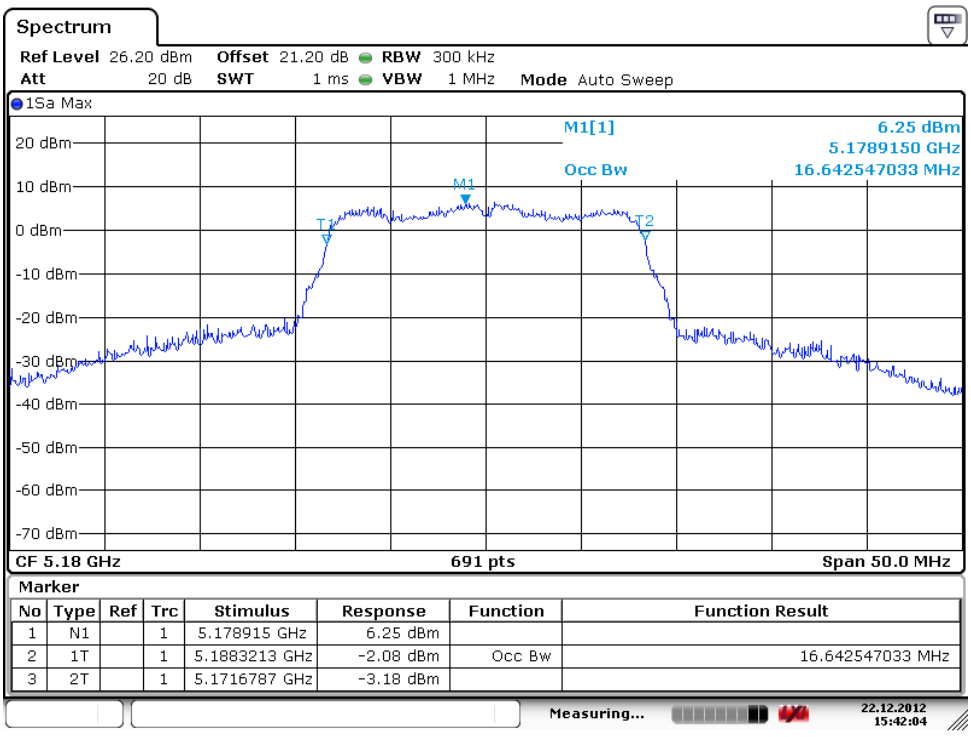
Channel	Channel Frequency (MHz)	99% Bandwidth (MHz)	Limit (MHz)	Result
Low Channel	5180	16.498	/	Pass
Mid Channel	5220	16.570	/	Pass
High Channel	5240	16.570	/	Pass

Table 20: Test result of 99% Bandwidth (HT40)

Channel	Channel Frequency (MHz)	99% Bandwidth (MHz)	Limit (MHz)	Result
Low Channel	5190	36.614	/	Pass
High Channel	5230	36.686	/	Pass

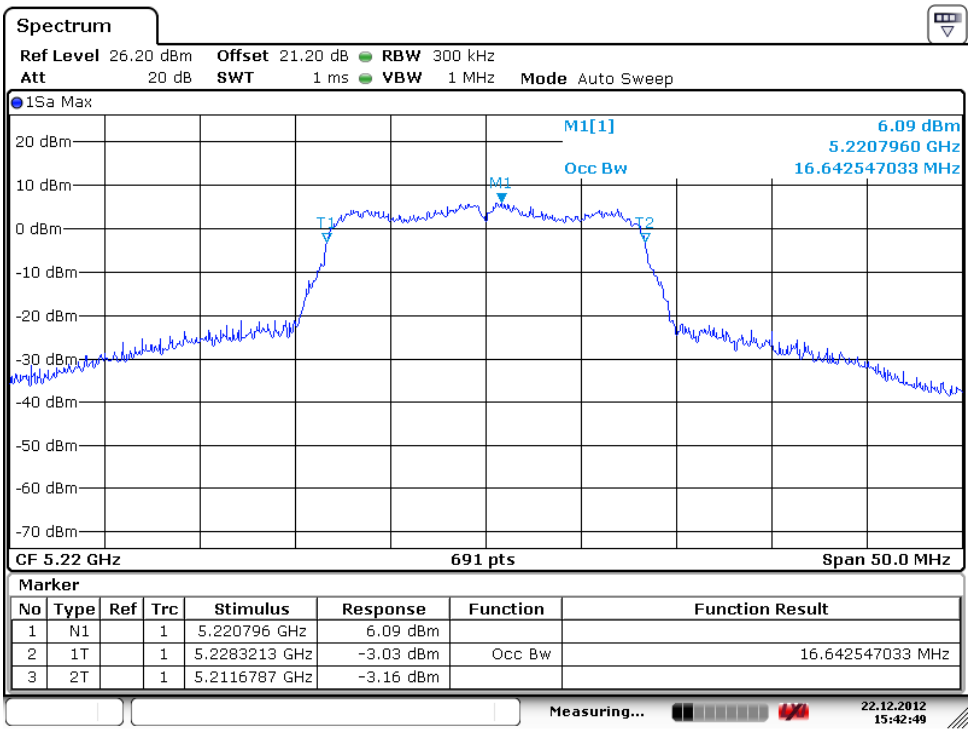
Test Plot of 99% Bandwidth

Low Channel



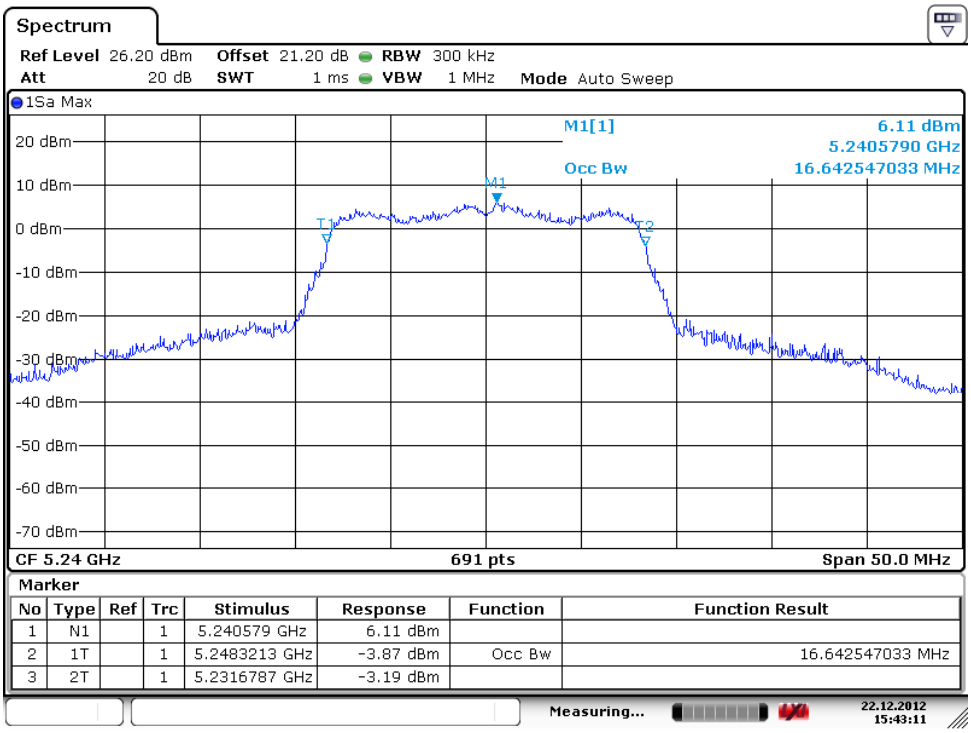
Date: 22.DEC.2012 15:42:04

Middle Channel



Date: 22.DEC.2012 15:42:49

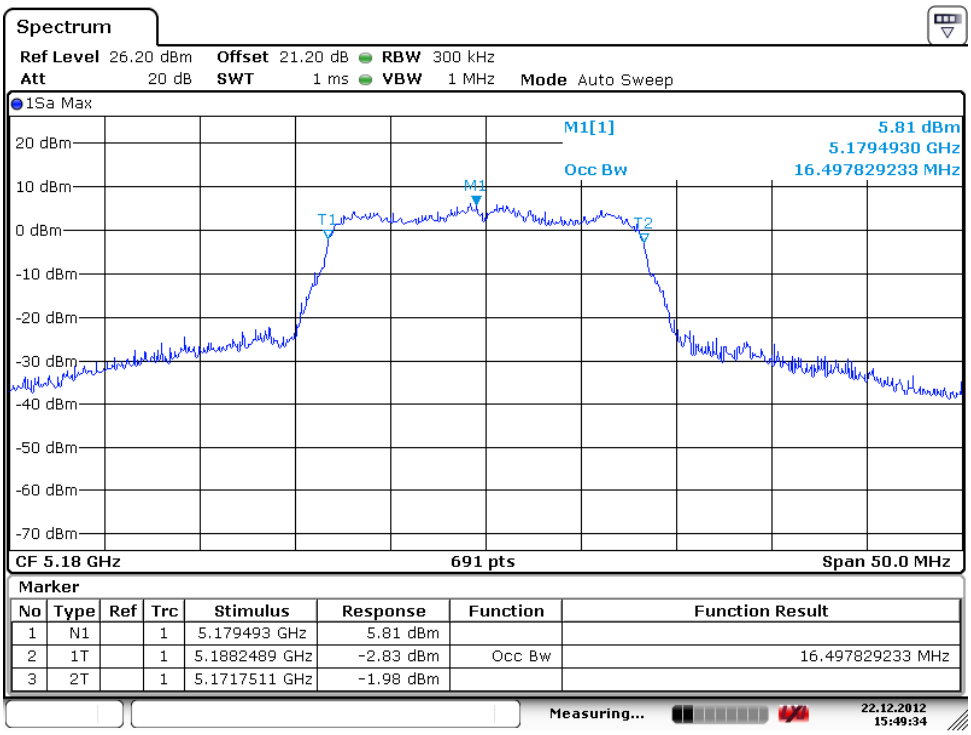
High Channel



Date: 22.DEC.2012 15:43:12

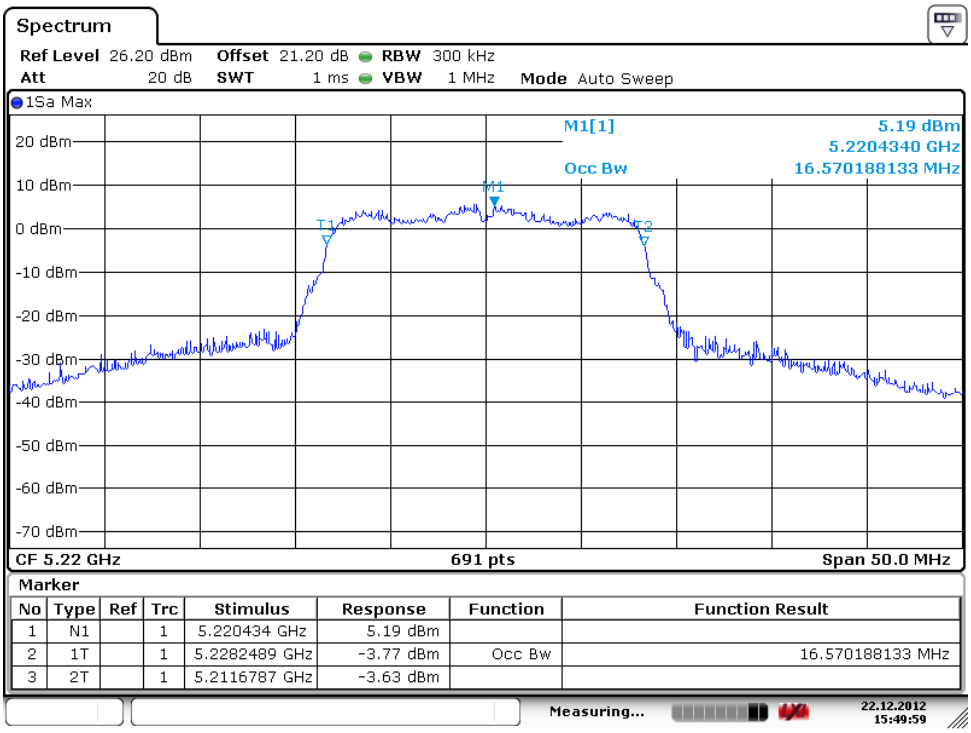
Test Plot of 99% Bandwidth (HT20)

Low Channel



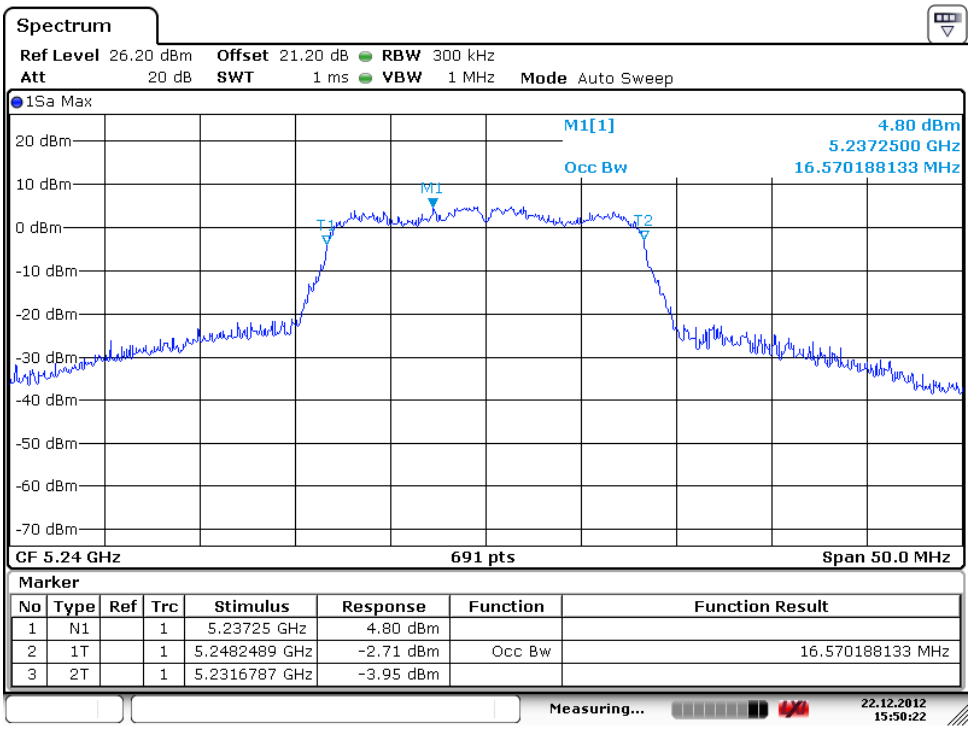
Date: 22.DEC.2012 15:49:34

Middle Channel



Date: 22.DEC.2012 15:50:00

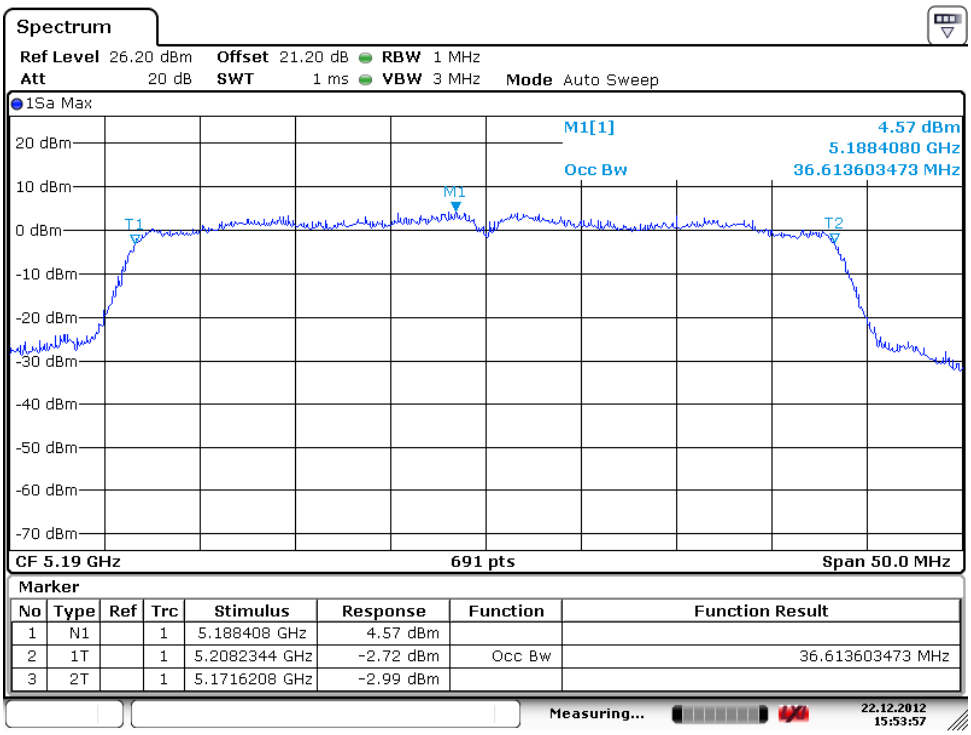
High Channel



Date: 22.DEC.2012 15:50:23

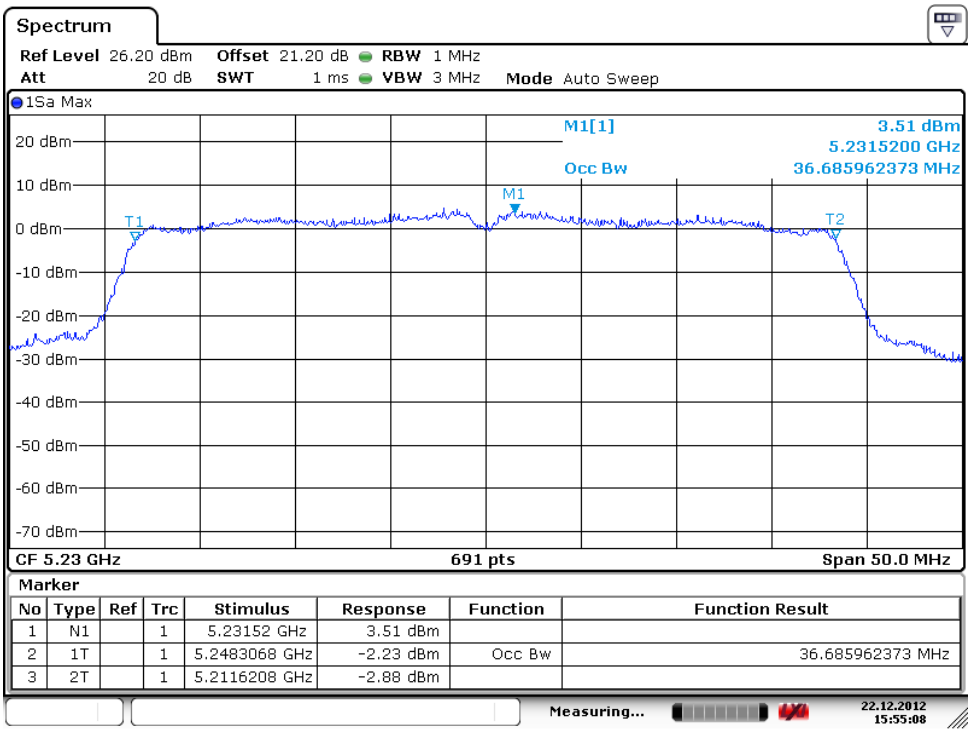
Test Plot of 99% Bandwidth(HT40)

Low Channel



Date: 22.DEC.2012 15:53:57

High Channel



Date: 22.DEC.2012 15:55:08

5.1.1.6 Conducted spurious emissions and Frequency Band Edge

RESULT: **Passed**

Date of testing	:	2012-12-22
Test standard	:	FCC part 15.407(b)(1), RSS-210 A9.3 (1)
Limit	:	-27dB
Kind of test site	:	Shielded room

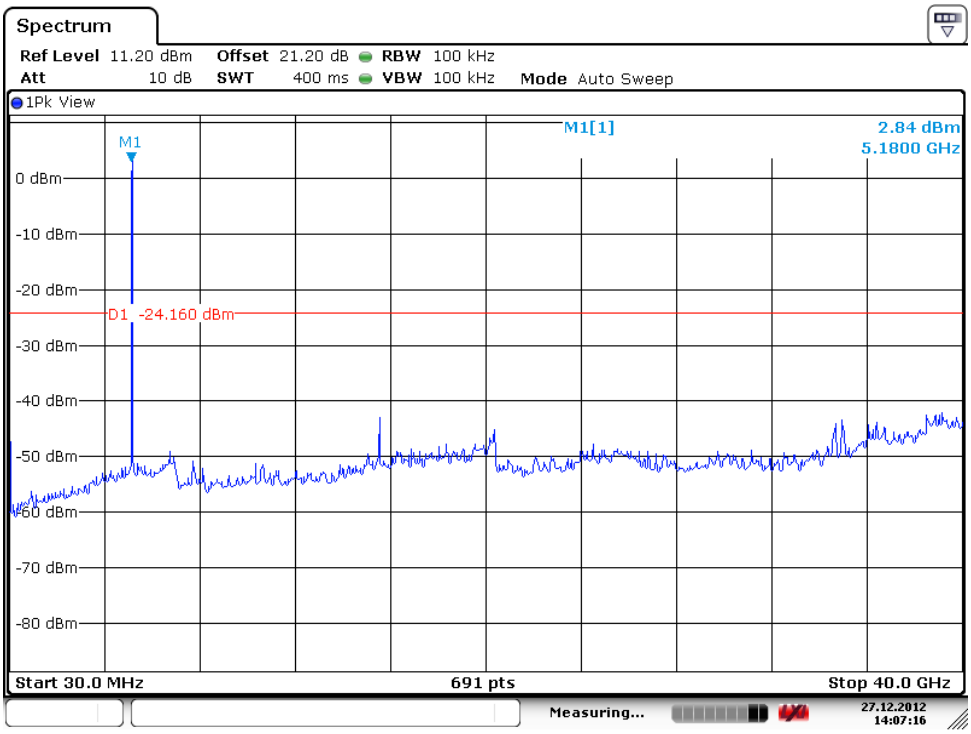
Test setup

Test Channel	:	Low/ High
Operation mode	:	A
Ambient temperature	:	22℃
Relative humidity	:	52%
Atmospheric pressure	:	102 kPa

All emissions are more than 27dB below fundamental, details refer to following test plot, and compliance is achived as well.
Due to the small size of the product and that there are no inductive components of significant size, 9kHz to 30MHz frequency range is not tested based on technical judgment.

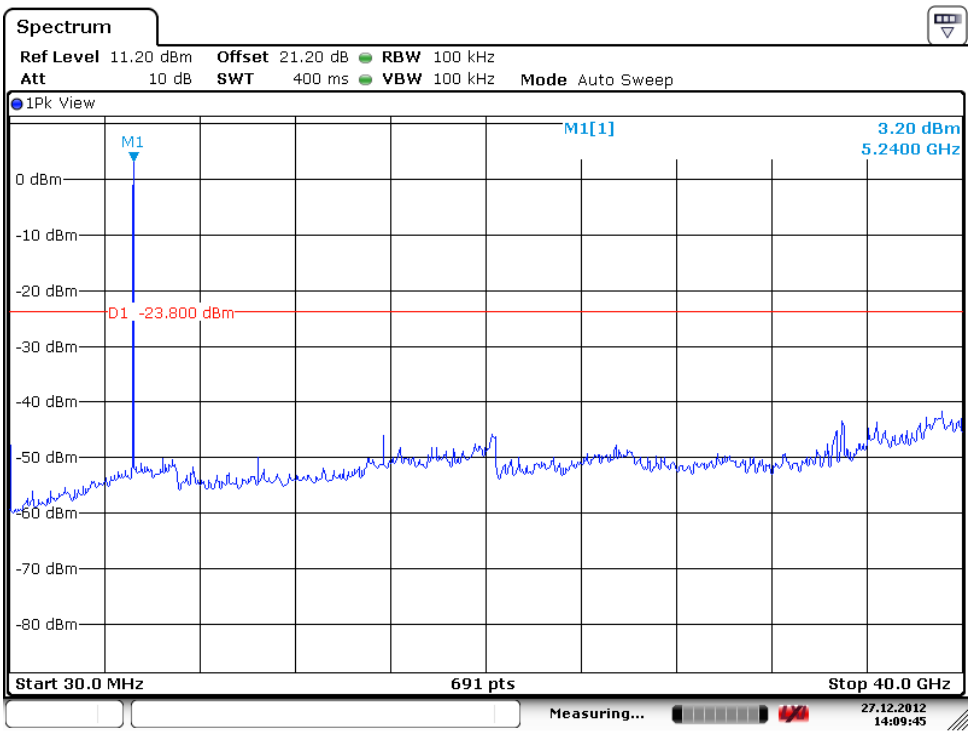
Test Plot of Conducted Emissions

Low Channel



Date: 27.DEC.2012 14:07:17

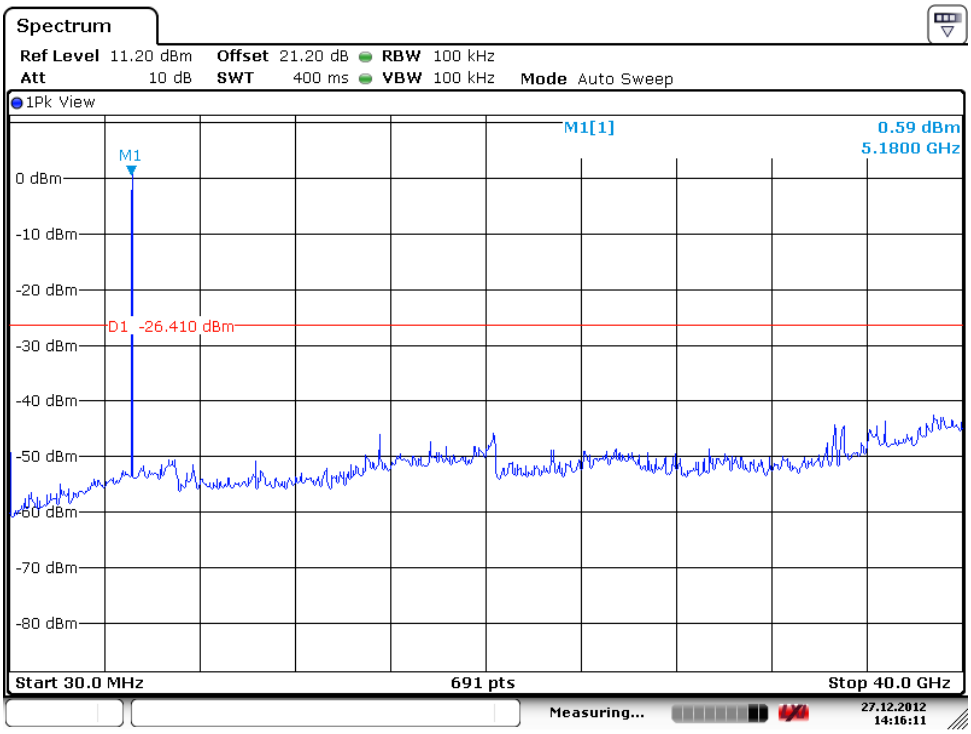
High Channel



Date: 27.DEC.2012 14:09:45

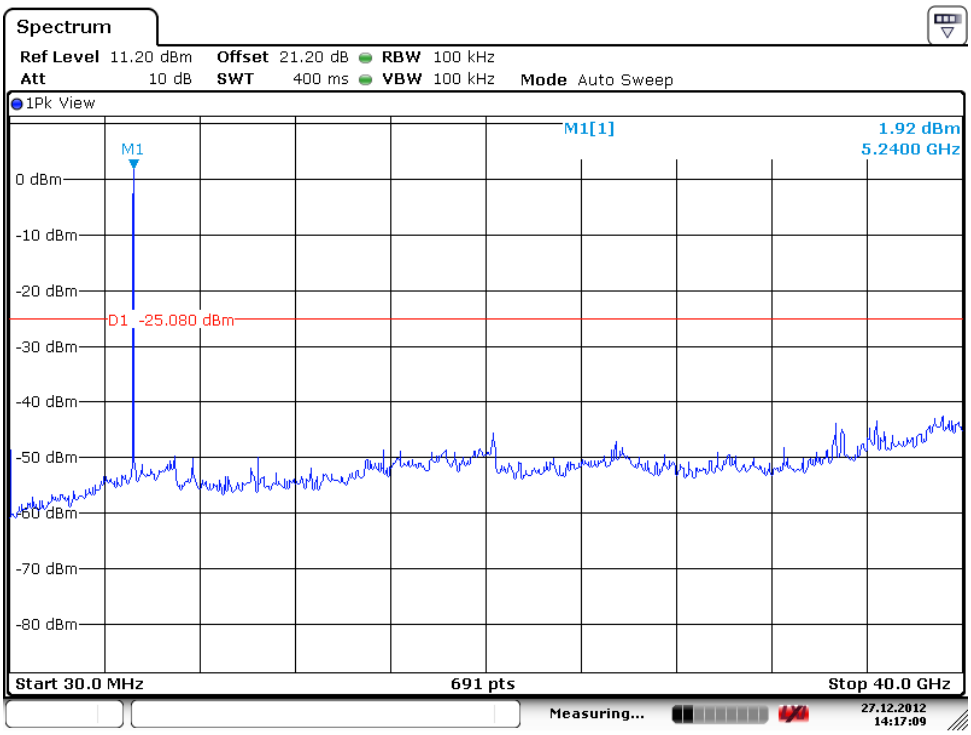
Test Plot of Conducted Emissions(HT20)

Low Channel



Date: 27.DEC.2012 14:16:11

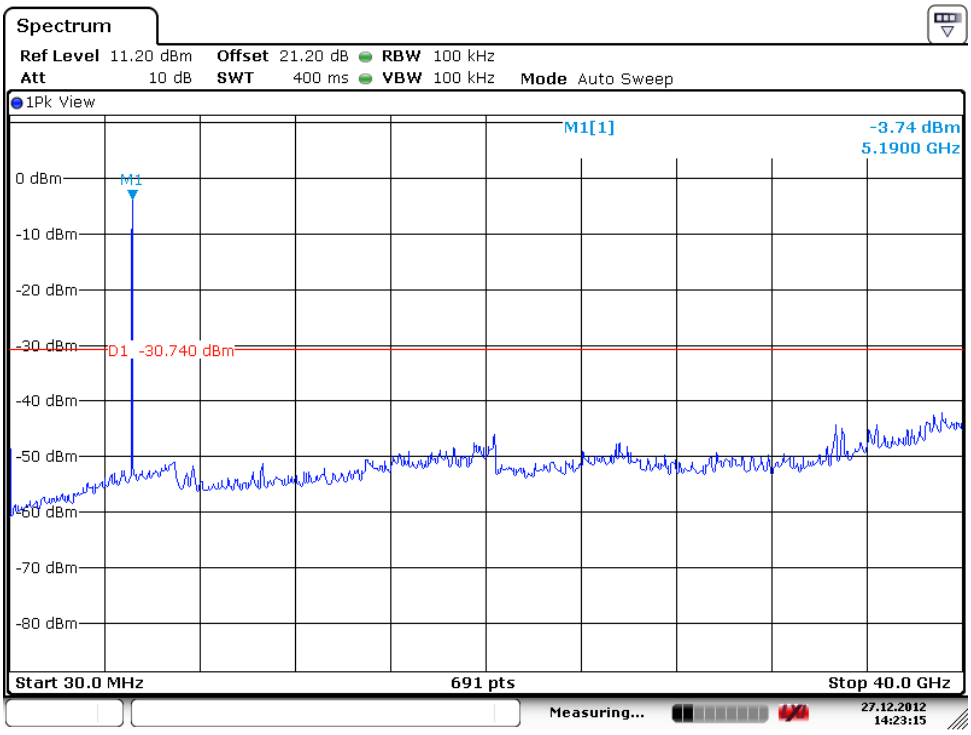
High Channel



Date: 27.DEC.2012 14:17:10

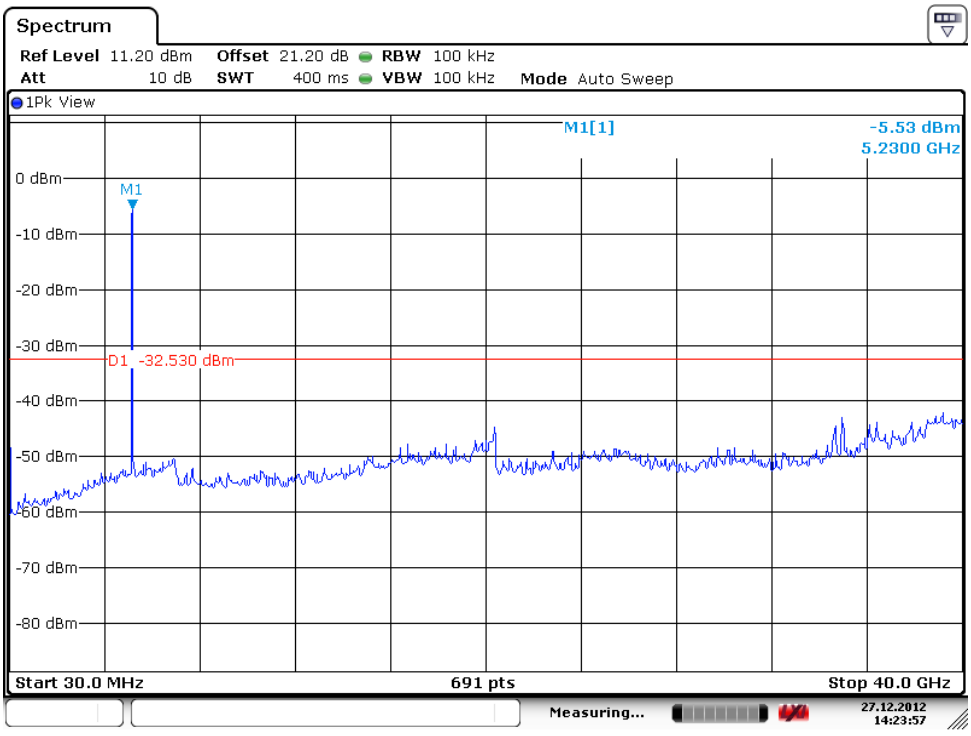
Test Plot of Conducted Emissions(HT40)

Low Channel



Date: 27.DEC.2012 14:23:15

High Channel



Date: 27.DEC.2012 14:23:57

5.1.1.7 Spurious Emission

RESULT: **Passed**

Date of testing	:	2012-12-22
Test standard	:	FCC 15.205, FCC 15.209, RSS-210 2.2, RSS-210 A8.5 and RSS-Gen 7.2.1
Basic standard	:	ANSI C63.10: 2009
Limits	:	Radiated emissions which fall in the restricted bands, as defined in FCC 15.205(a) and RSS-210 2.7 (Table 1), must comply with the radiated emission limits specified in FCC 15.209(a) and RSS-210 2.7 (Table 2 and 3). Emission radiated outside the specified frequency bands must comply with the radiated emission limits specified in FCC 15.209(a) and FCC 15.249(a), RSS-210 2.7 (Table 2 and 3) and RSS-210 A2.9(a).
Kind of test site	:	3m Semi-Anechoic Chamber

Test setup

Test Channel	:	Low/ Middle/ High
Operation mode	:	A, C
Ambient temperature	:	24℃
Relative humidity	:	56%
Atmospheric pressure	:	102 kPa

Remark: Testing was carried out within frequency range 30MHz to the tenth harmonic. For details refer to Appendix 2. The Radiated Emissions testing was performed in the X, Y and Z axis orientation. The Z Axis orientation is the worst-case and recorded in this test report. Due to the small size of the product and that there are no inductive components of significant size, 9kHz to 30MHz frequency range is not tested based on technical judgment.

5.1.2 802.11a/n Band I Antenna Port Two (TX1)

5.1.2.1 26 dB Bandwidth

RESULT: **Passed**

Test date	:	2012-12-22
Test standard	:	FCC Part 15.407(a), RSS-210 A9.2
Kind of test site	:	Shielded room

Test setup

Test Channel	:	Low/ Middle/ High
Operation Mode	:	A
Ambient temperature	:	22℃
Relative humidity	:	52%
Atmospheric pressure	:	102 kPa

Table 21: Test result of 26dB Bandwidth

Channel	Channel Frequency (MHz)	26dB Bandwidth (MHz)	Limit (MHz)	Result
Low Channel	5180	18.741	/	Pass
Mid Channel	5220	18.813	/	Pass
High Channel	5240	18.857	/	Pass

Table 22: Test result of 26dB Bandwidth (HT20)

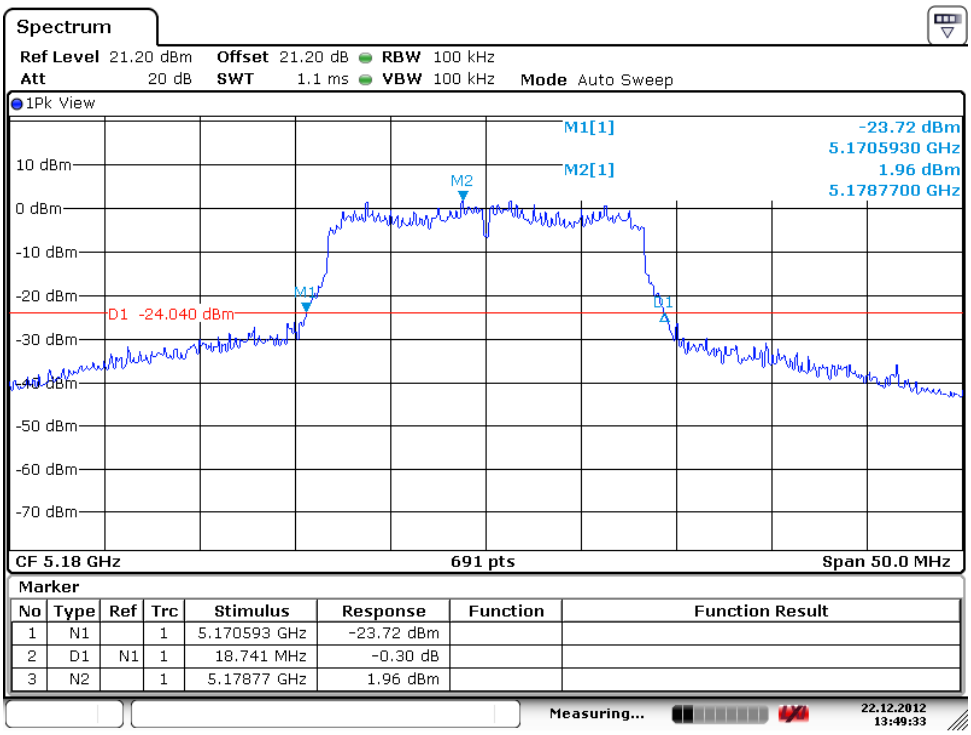
Channel	Channel Frequency (MHz)	26dB Bandwidth (MHz)	Limit (MHz)	Result
Low Channel	5180	18.813	/	Pass
Mid Channel	5220	18.958	/	Pass
High Channel	5240	19.291	/	Pass

Table 23: Test result of 26dB Bandwidth (HT40)

Channel	Channel Frequency (MHz)	26dB Bandwidth (MHz)	Limit (MHz)	Result
Low Channel	5190	38.119	/	Pass
High Channel	5230	38.234	/	Pass

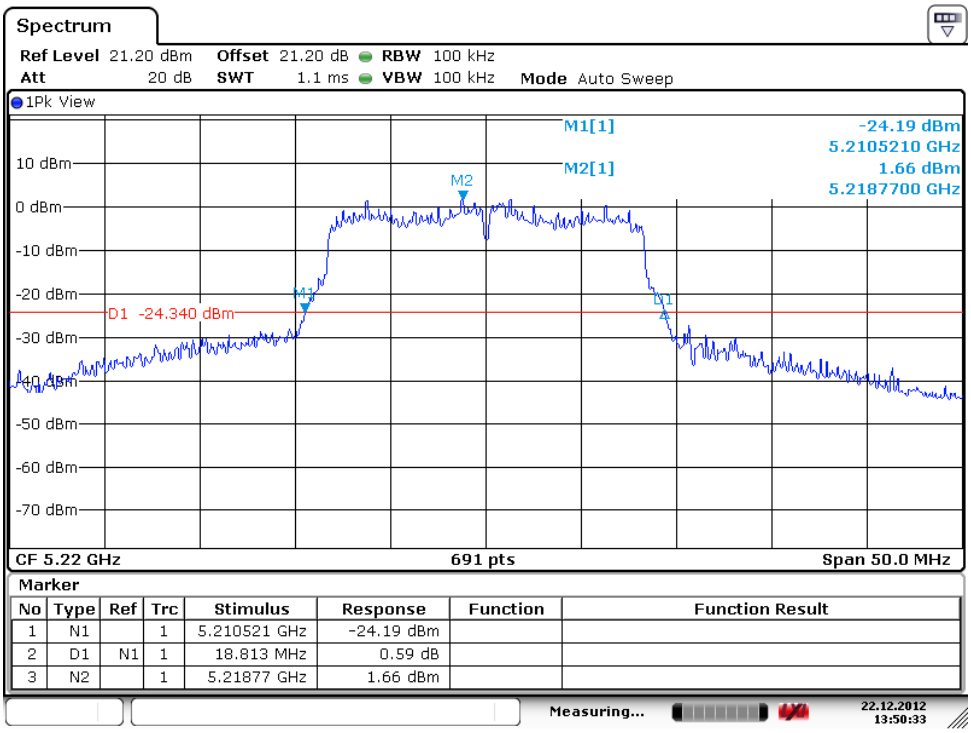
Test Plot of 26dB Bandwidth

Low Channel



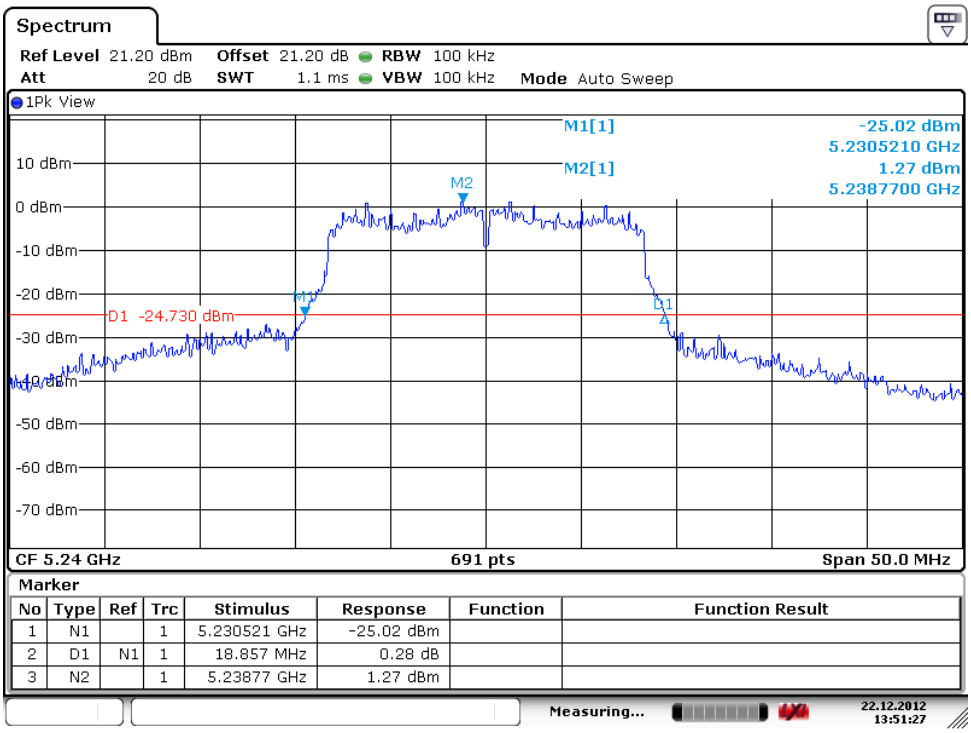
Date: 22.DEC.2012 13:49:34

Middle Channel



Date: 22.DEC.2012 13:50:32

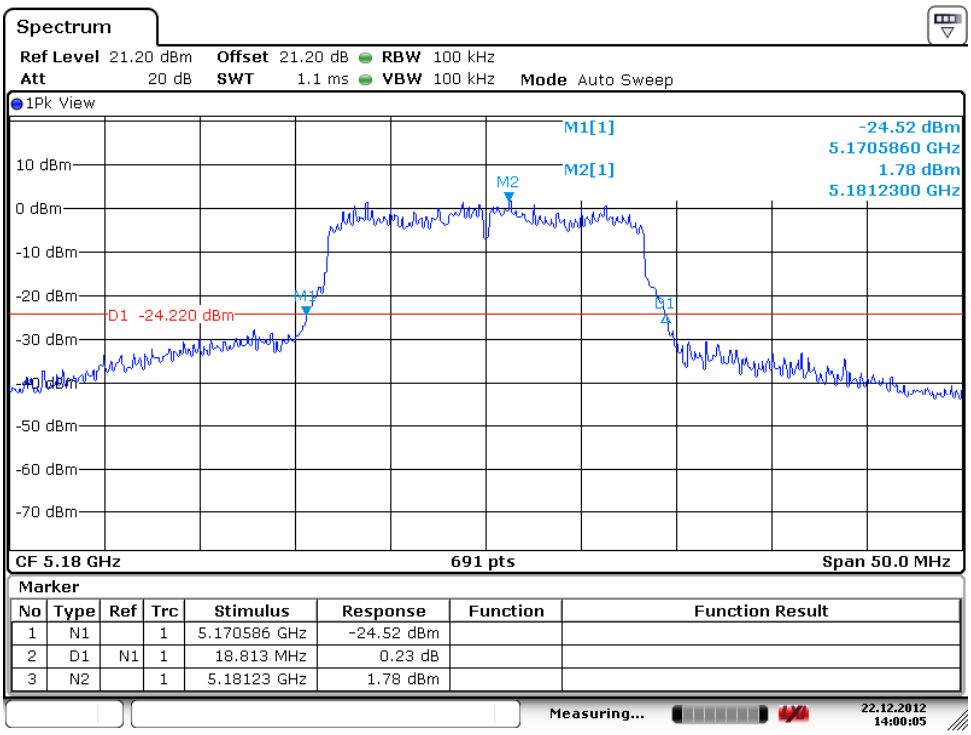
High Channel



Date: 22.DEC.2012 13:51:26

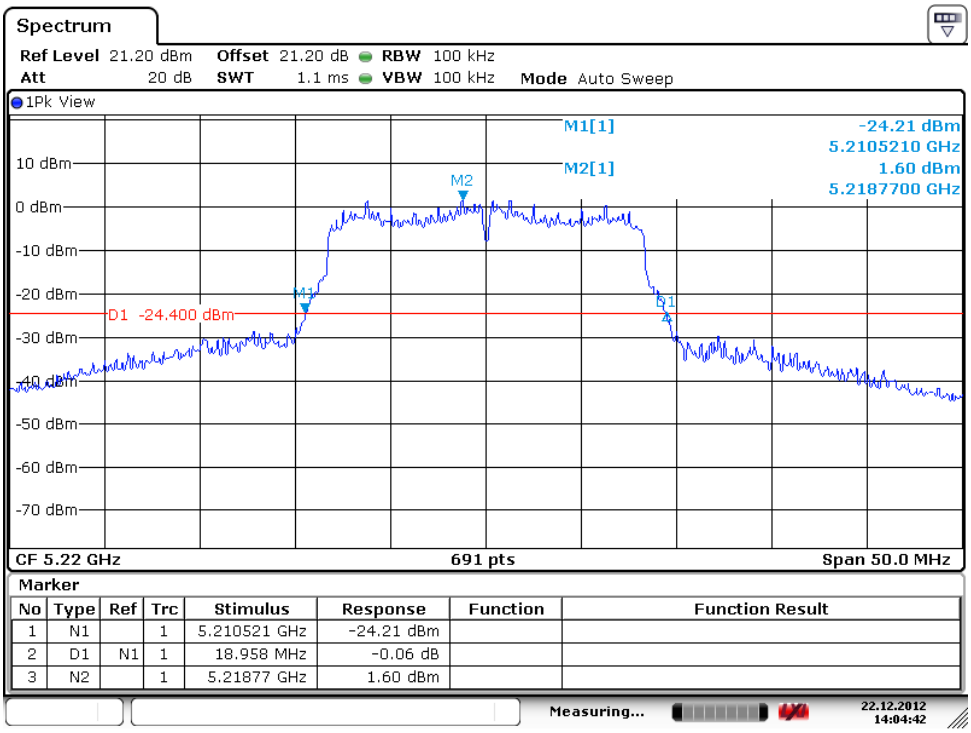
Test Plot of 26dB Bandwidth (HT20)

Low Channel



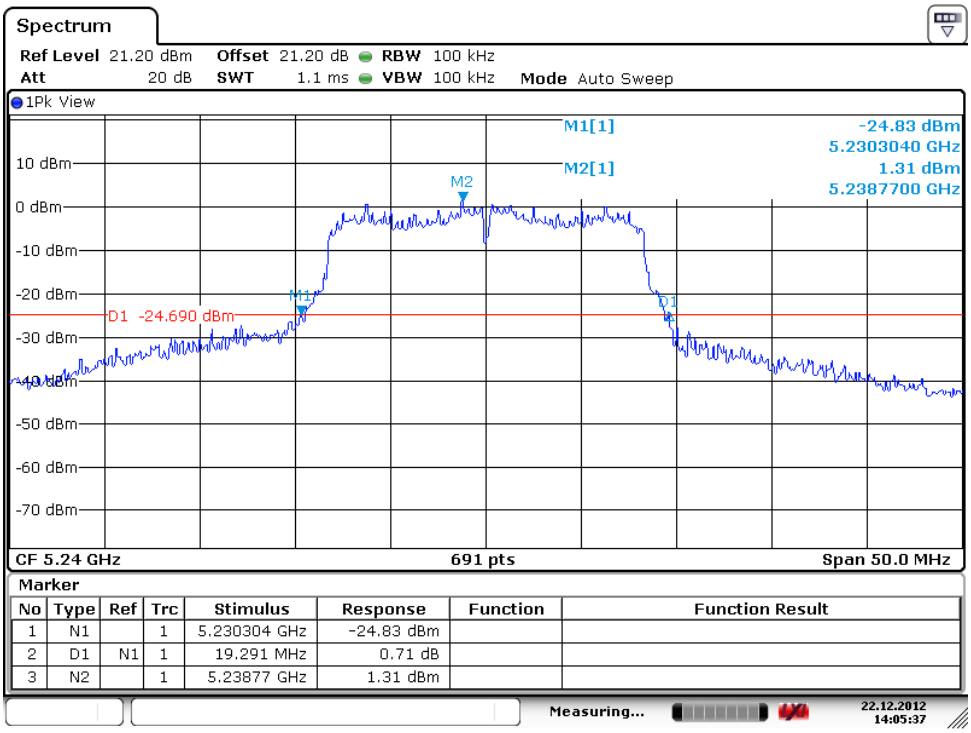
Date: 22.DEC.2012 14:00:06

Middle Channel



Date: 22.DEC.2012 14:04:42

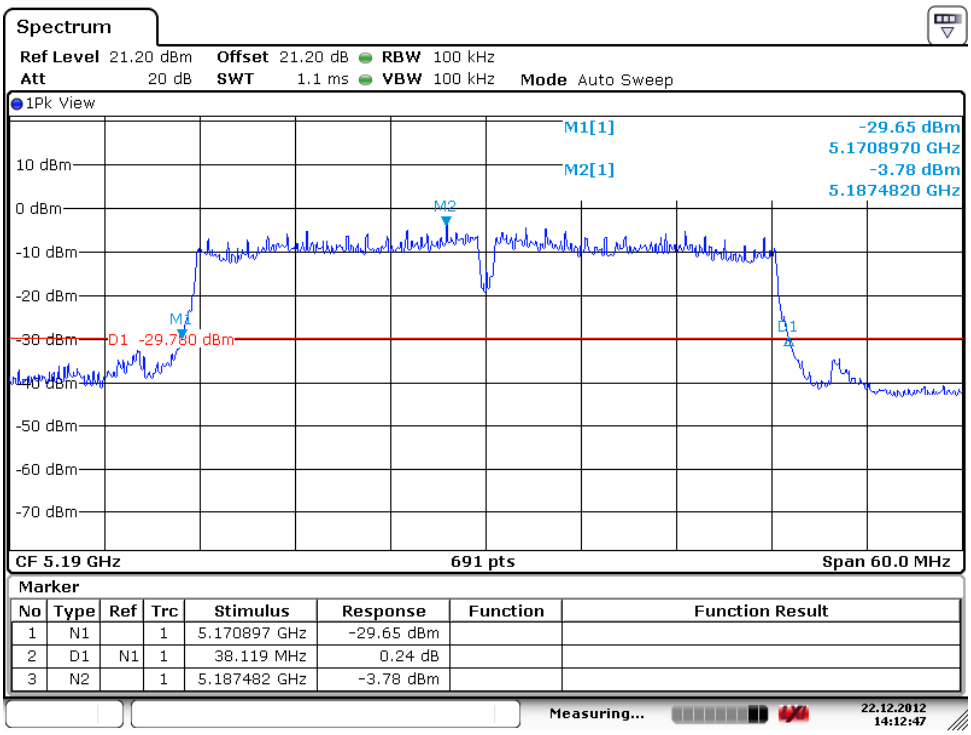
High Channel



Date: 22.DEC.2012 14:05:37

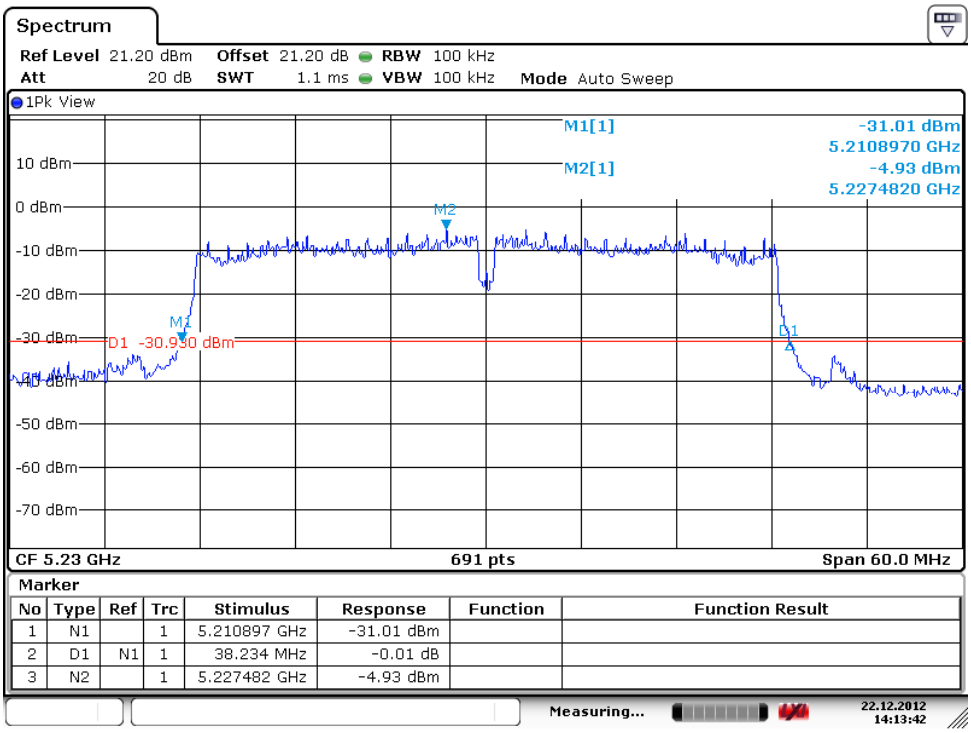
Test Plot of 26dB Bandwidth(HT40)

Low Channel



Date: 22.DEC.2012 14:12:47

High Channel



Date: 22.DEC.2012 14:13:43

5.1.2.2 Transmit Output Power

RESULT: **Passed**

Test date	:	2012-12-22
Test standard	:	FCC Part 15.407(a), RSS-210 A9.2
Limit	:	1 Watt (EBW<1MHz)
Kind of test site	:	Shielded room

Test setup

Test Channel	:	Low/ Middle/ High
Operation Mode	:	A
Ambient temperature	:	22℃
Relative humidity	:	52%
Atmospheric pressure	:	102 kPa

For the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10 log B, where B is the 26 dB emission bandwidth in MHz. If transmitting antenna sof directional gain greater than 6 dBi are used, both the peak transmit power anjd the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceed 6 dBi.

For the 802.11n modes, the EUT can be operated in 2x2 MIMO mode. Therefore, for those modes, in the tables below the limits are reduced by 3 dB.
Alternatively, the result tables show the sum of the power values for TX0 + TX1

Table 24: Test result of Transmit Power

Channel	Channel Frequency (MHz)	Power (dBm)	26dB Bandwidth (MHz)	Limit (dBm)	Result
Low Channel	5180	13.19	18.741	16.728	Pass
Mid Channel	5220	13.08	18.813	16.745	Pass
High Channel	5240	13.01	18.857	16.755	Pass

Table 25: Test result of Transmit Power (HT20)

Channel	Channel Frequency (MHz)	Power (dBm) TX0	Power (dBm) TX1	Power (dBm) sum	26dB BW (MHz) TX0	Limit (dBm) TX0	26dB BW (MHz) TX1	Limit (dBm) TX1	Result
Low Channel	5180	14.47	11.42	16.218	18.669	16.711	18.813	16.745	Pass
Mid Channel	5220	14.11	12.15	16.250	18.669	16.711	18.958	16.778	Pass
High Channel	5240	14.18	12.23	16.324	18.857	16.755	19.291	16.854	Pass

Table 26: Test result of Transmit Power (HT40)

Channel	Channel Frequency (MHz)	Power (dBm)	26dB Bandwidth (MHz)	Limit (dBm)	Result
Low Channel	5190	10.33	38.119	17-3	Pass
High Channel	5230	10.26	38.234	17-3	Pass

5.1.2.3 Power Excursion

RESULT: **Passed**

Date of testing	:	2012-12-22
Test standard	:	FCC Part 15.407(a)(6)
Kind of test site	:	Shielded room

Test setup

Test Channel	:	Low/ Middle/ High
Operation Mode	:	A
Ambient temperature	:	24℃
Relative humidity	:	53%
Atmospheric pressure	:	102 kPa

Table 27: Test result of Power Excursion

Channel	Channel Frequency (MHz)	Power Excursion (dB)	Limit (dB)	Result
Low Channel	5180	1.76	13	Pass
Mid Channel	5220	2.34	13	Pass
High Channel	5240	1.23	13	Pass

Table 28: Test result of Power Excursion(HT20)

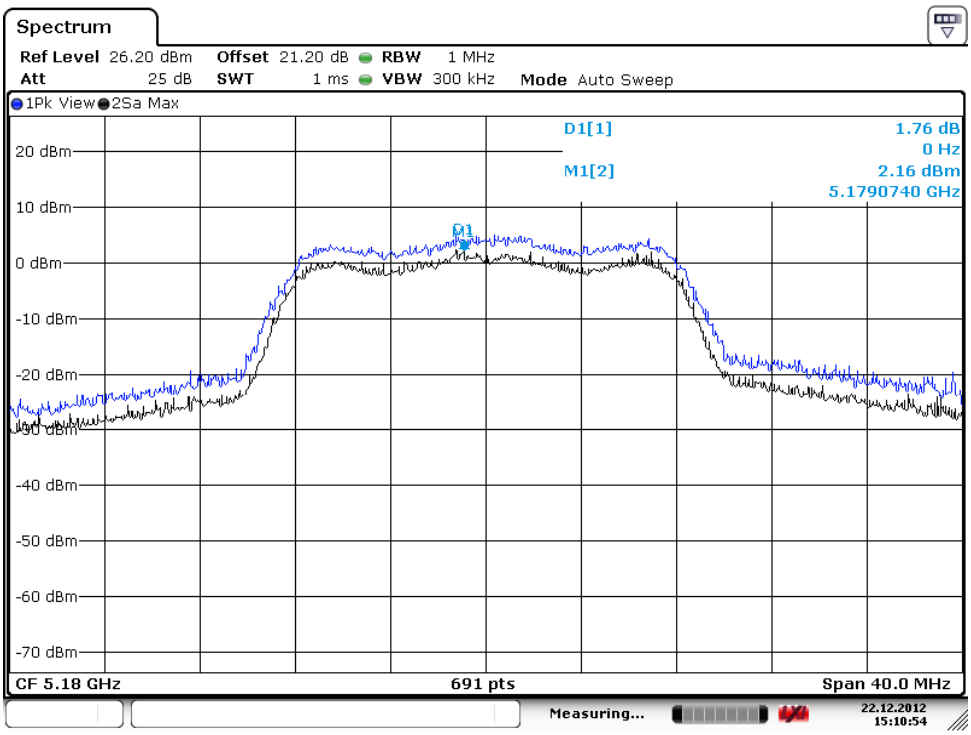
Channel	Channel Frequency (MHz)	Power Excursion (dB)	Limit (dB)	Result
Low Channel	5180	0.69	13	Pass
Mid Channel	5220	3.17	13	Pass
High Channel	5240	2.51	13	Pass

Table 29: Test result of Power Excursion(HT40)

Channel	Channel Frequency (MHz)	Power Excursion (dB)	Limit (dB)	Result
Low Channel	5190	2.24	13	Pass
High Channel	5230	2.72	13	Pass

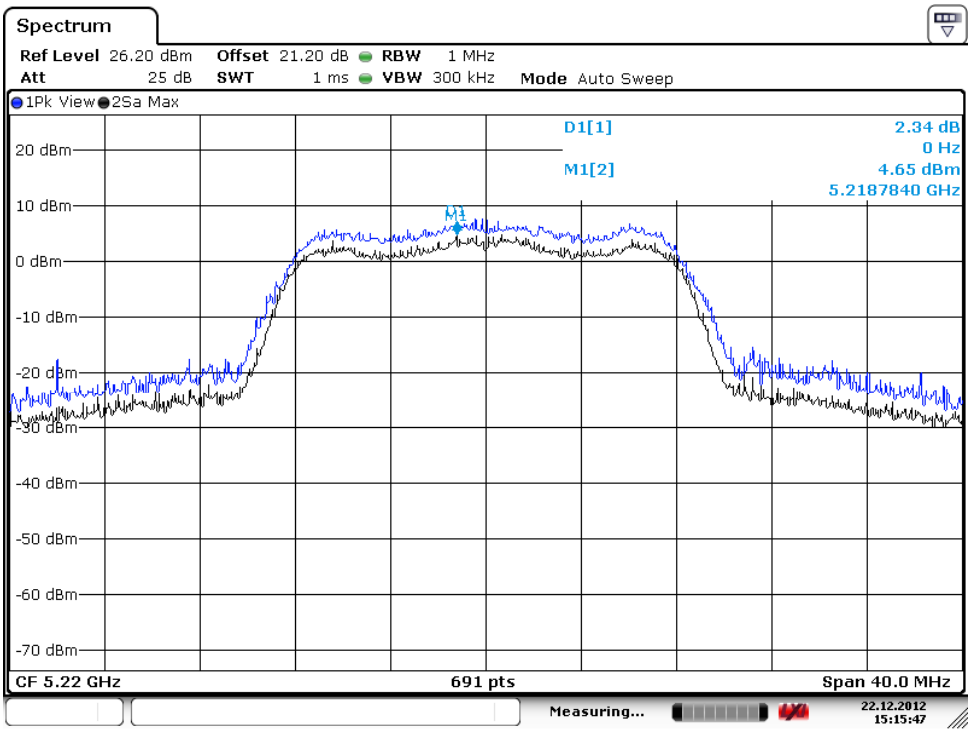
Test Plot of Power Excursion

Low Channel



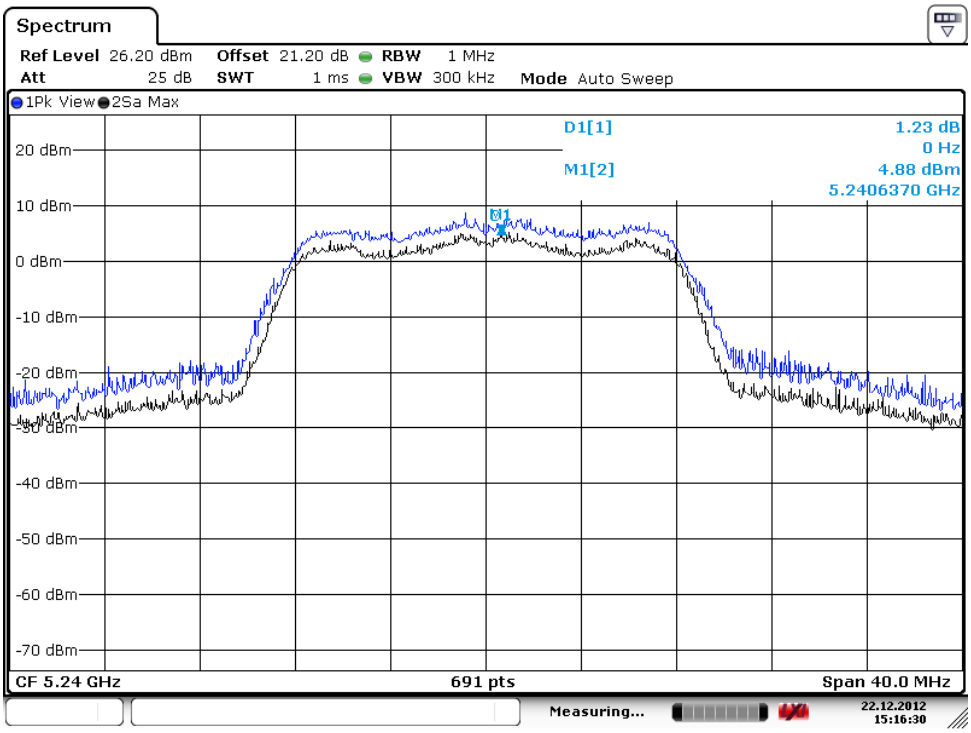
Date: 22.DEC.2012 15:10:55

Middle Channel



Date: 22.DEC.2012 15:15:48

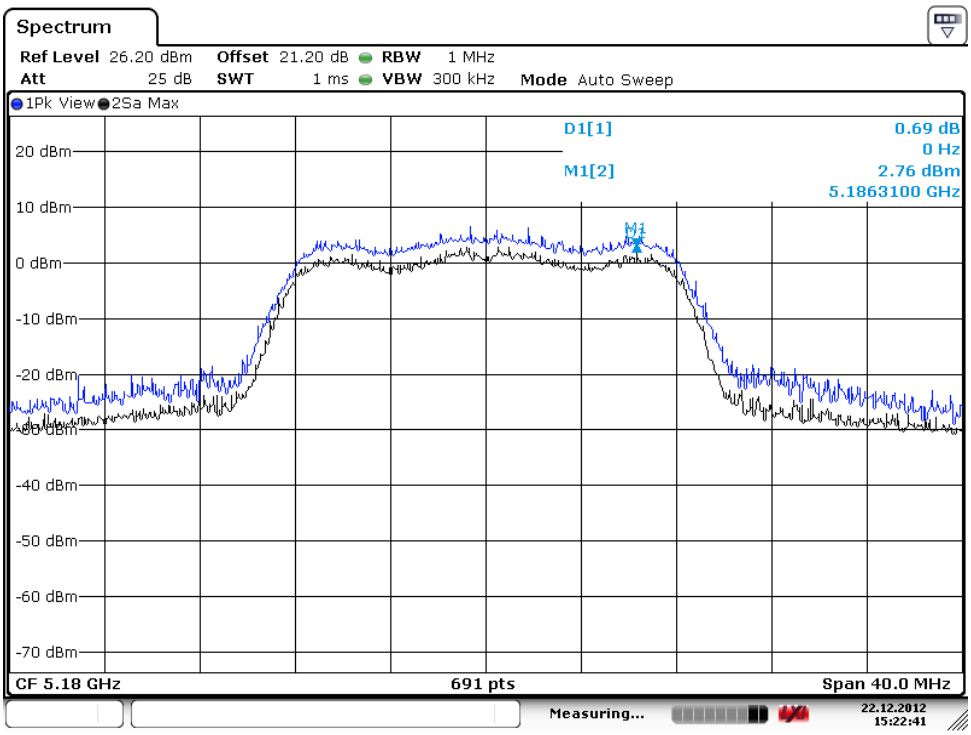
High Channel



Date: 22.DEC.2012 15:16:31

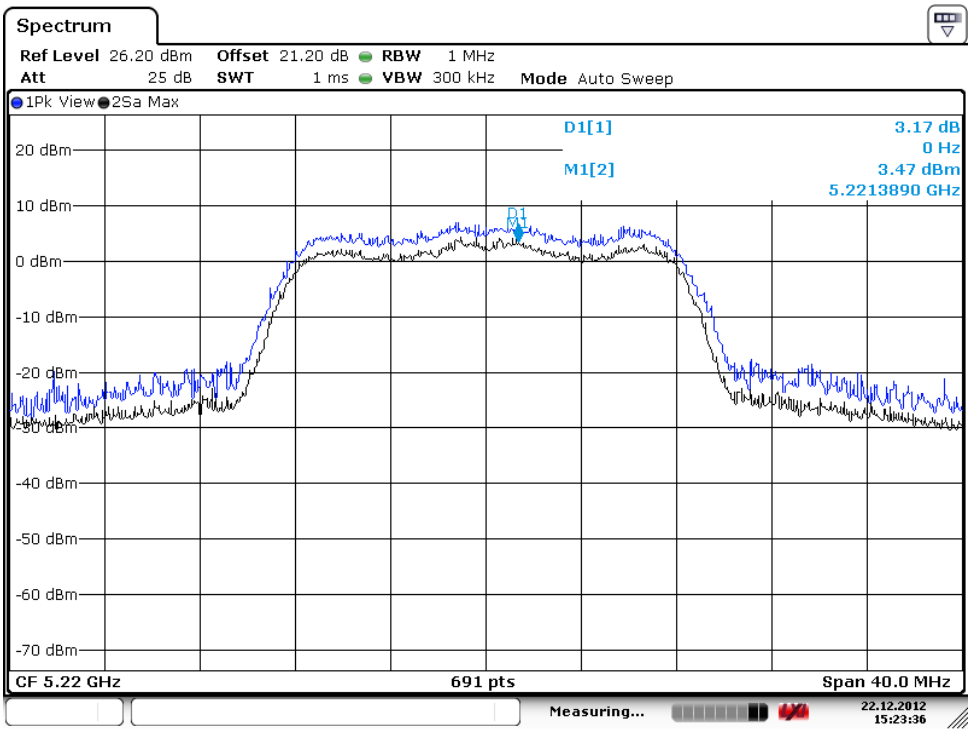
Test Plot of Power Excursion (HT20)

Low Channel



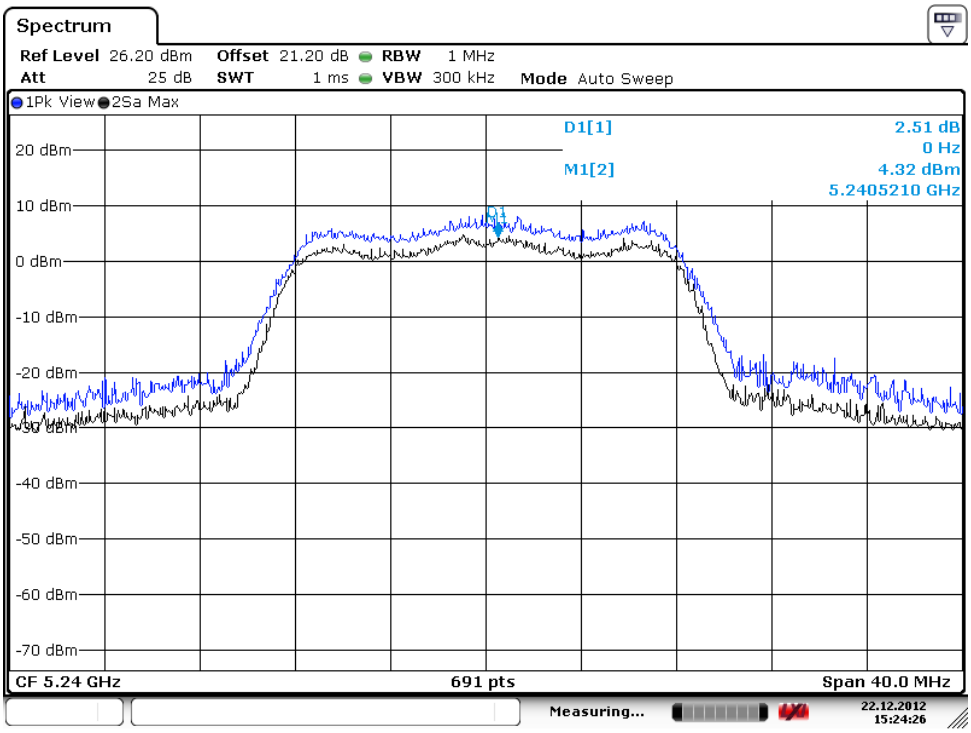
Date: 22.DEC.2012 15:22:41

Middle Channel



Date: 22.DEC.2012 15:23:37

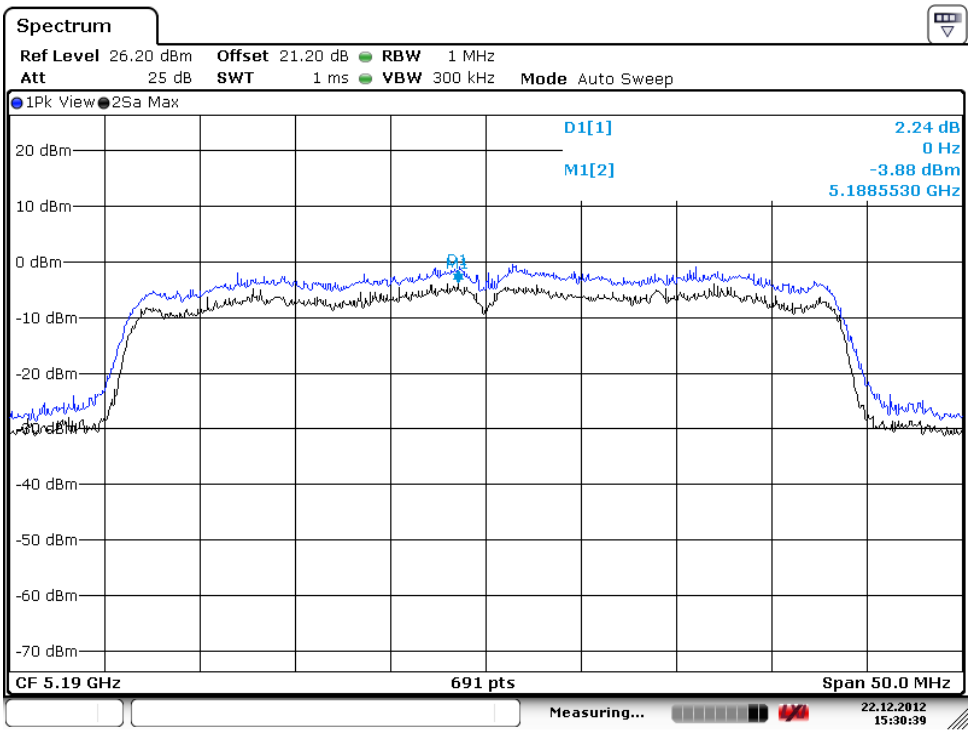
High Channel



Date: 22.DEC.2012 15:24:27

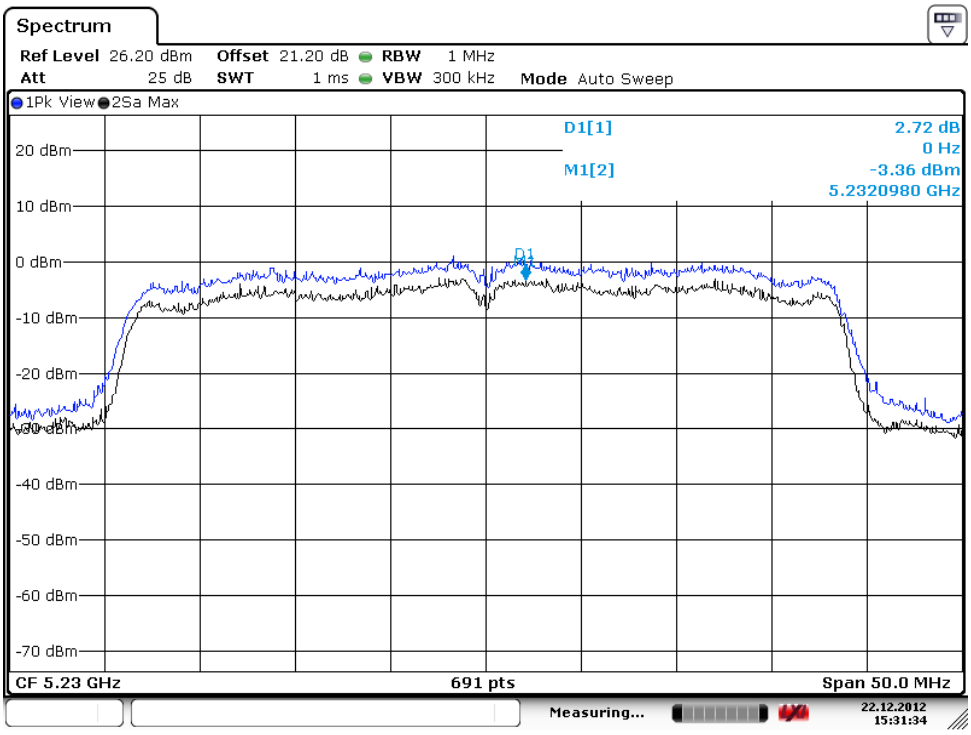
Test Plot of Power Excursion (HT40)

Low Channel



Date: 22.DEC.2012 15:30:40

High Channel



Date: 22.DEC.2012 15:31:35

5.1.2.4 Power Spectral Density

RESULT: **Passed**

Date of testing	:	2012-12-22
Test standard	:	FCC Part 15.407(a)(1),(5)
Kind of test site	:	Shielded room

Test setup

Test Channel	:	Low/ Middle/ High
Operation Mode	:	A
Ambient temperature	:	24℃
Relative humidity	:	53%
Atmospheric pressure	:	102 kPa

For the 802.11n modes, the EUT can be operated in 2x2 MIMO mode. Therefore, for those modes, in the tables below the limits are reduced by 3 dB.

Table 30: Test result of Power Spectral Density

Channel	Channel Frequency (MHz)	Peak Power Density (dBm)	Limit (dBm)	Result
Low Channel	5180	-11.68	4	Pass
Mid Channel	5220	-10.87	4	Pass
High Channel	5240	-13.67	4	Pass

Table 31: Test result of Power Spectral Density (HT20)

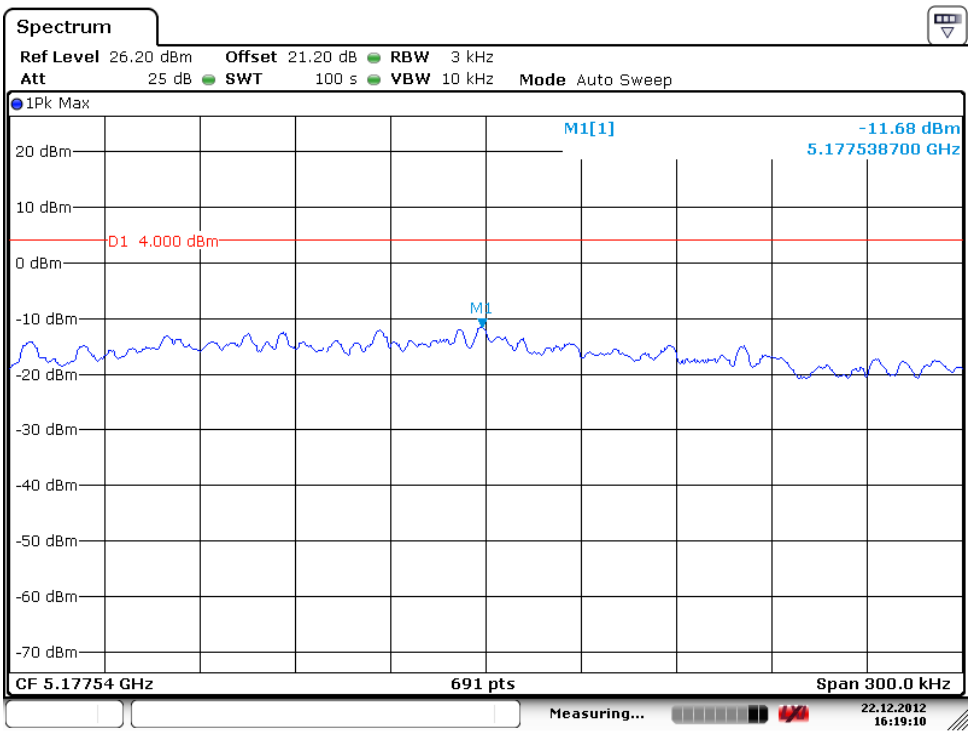
Channel	Channel Frequency (MHz)	Peak Power Density (dBm)	Limit (dBm)	Result
Low Channel	5180	-10.9	4-3	Pass
Mid Channel	5220	-11.78	4-3	Pass
High Channel	5240	-11.33	4-3	Pass

Table 32: Test result of Power Spectral Density (HT40)

Channel	Channel Frequency (MHz)	Peak Power Density (dBm)	Limit (dBm)	Result
Low Channel	5190	-19.64	4-3	Pass
High Channel	5230	-20.11	4-3	Pass

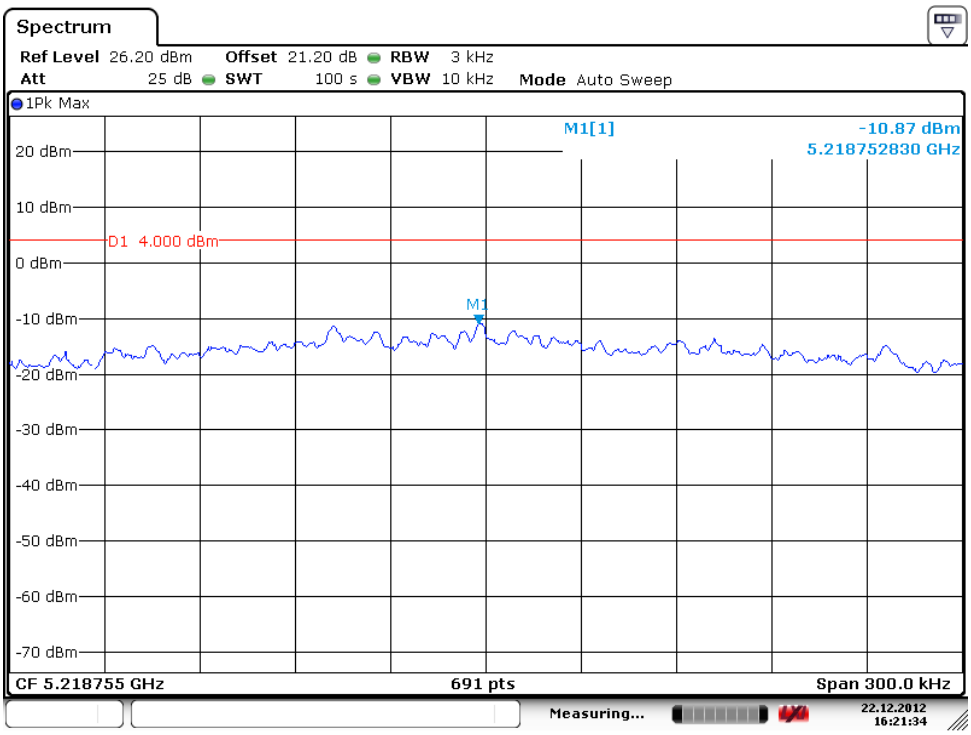
Test Plot of Power Density

Low Channel



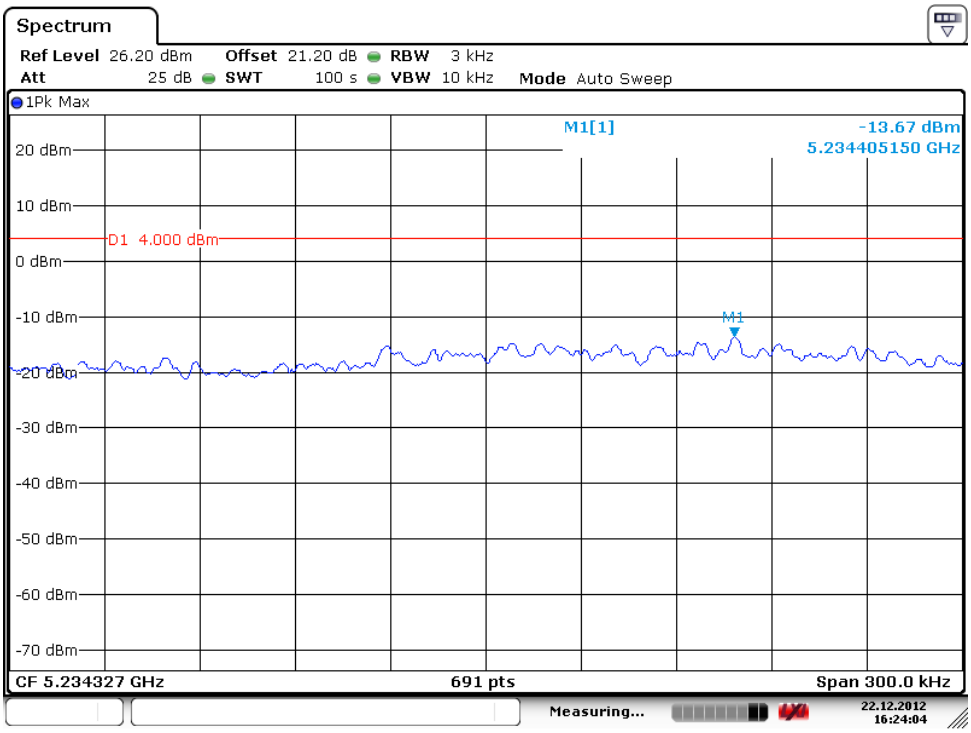
Date: 22.DEC.2012 16:19:11

Middle Channel



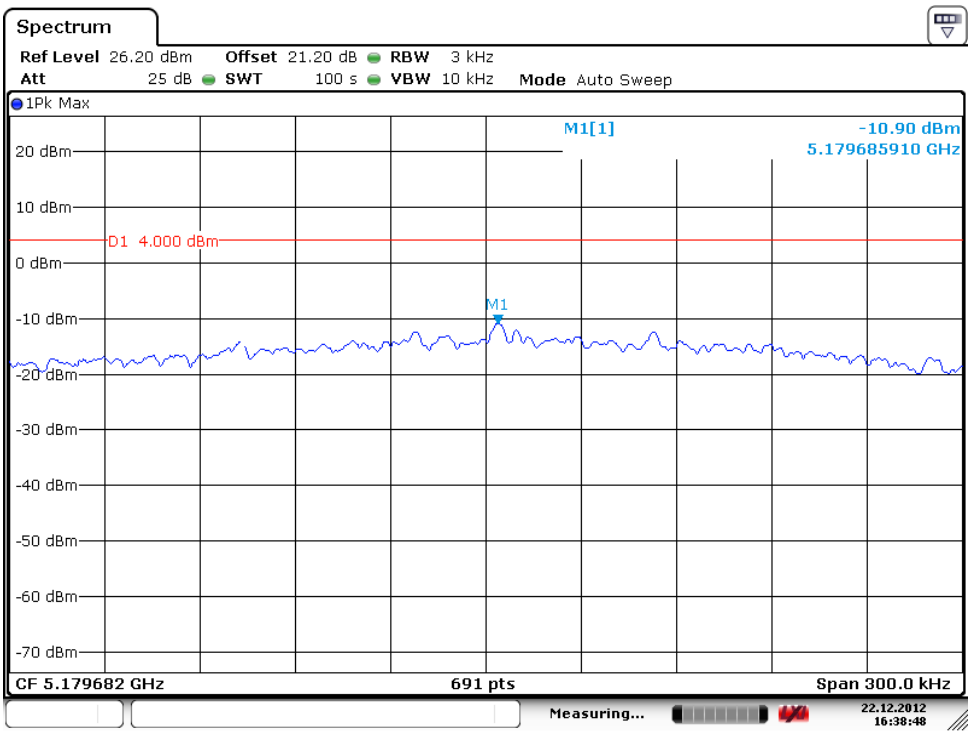
Date: 22.DEC.2012 16:21:35

High Channel



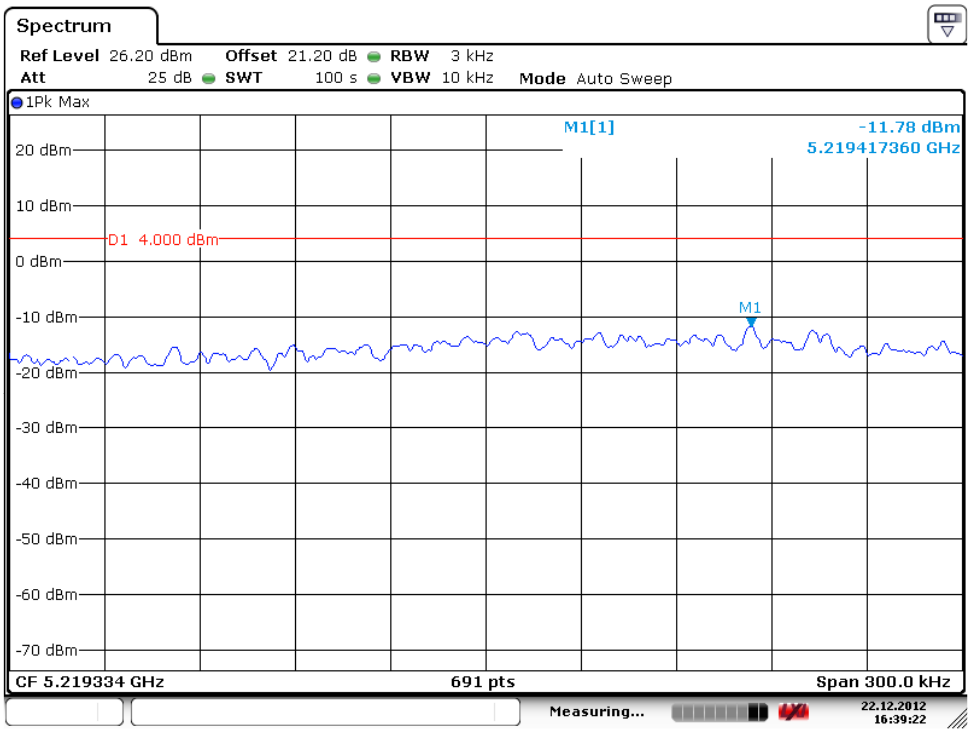
Test Plot of Power Density (HT20)

Low Channel



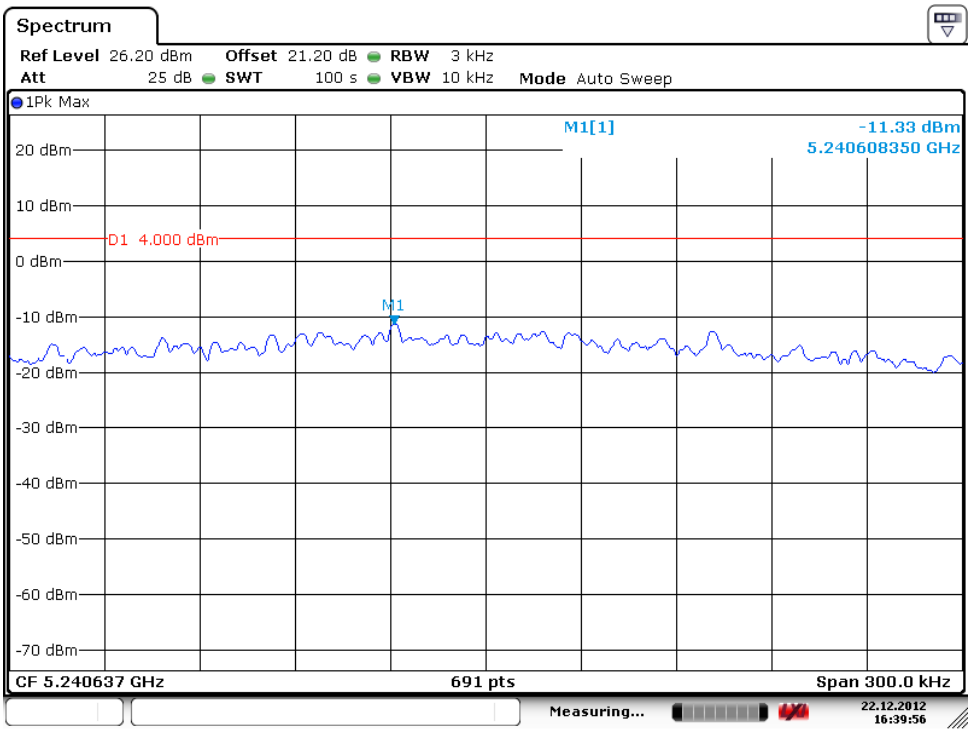
Date: 22.DEC.2012 16:38:49

Middle Channel



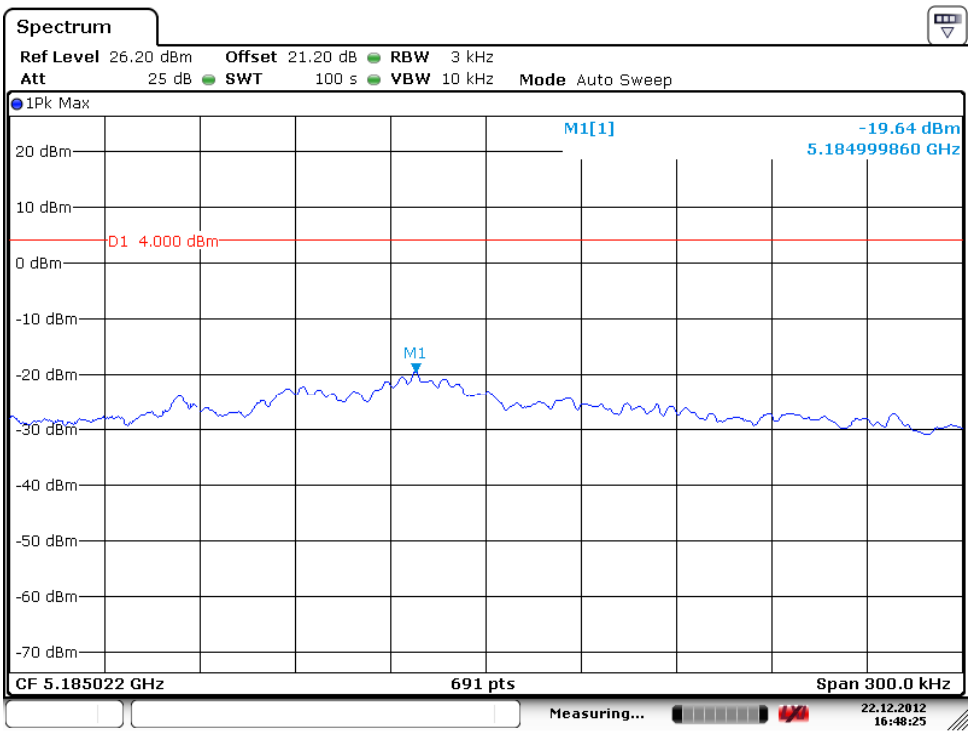
Date: 22.DEC.2012 16:39:22

High Channel



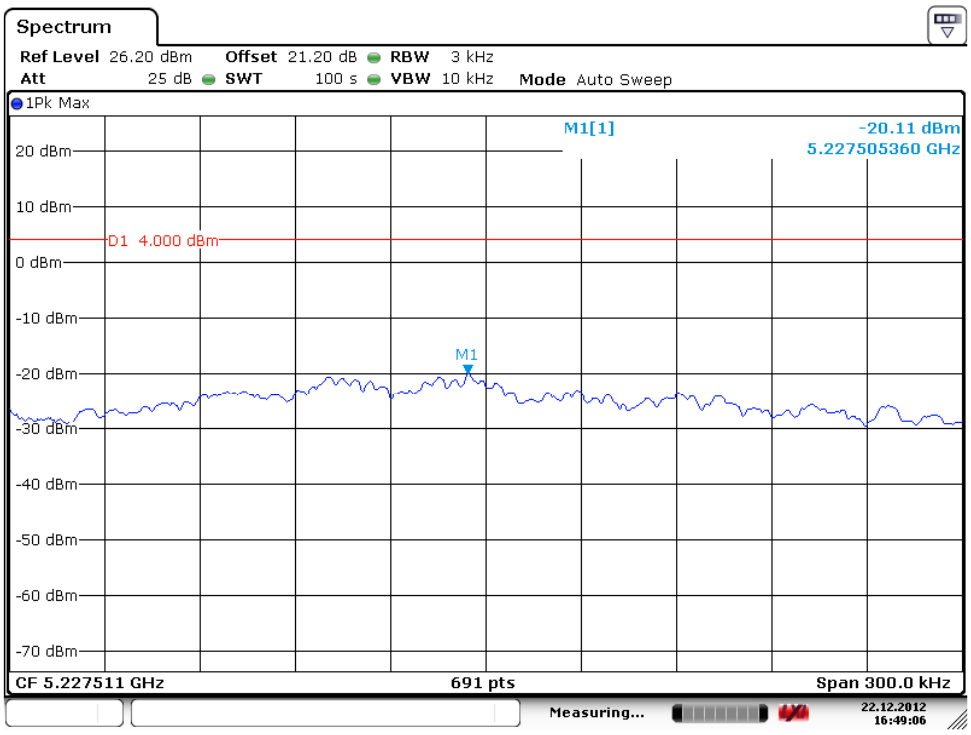
Test Plot of Power Density (HT40)

Low Channel



Date: 22.DEC.2012 16:48:26

High Channel



Date: 22.DEC.2012 16:49:07

5.1.2.5 99% Bandwidth

RESULT: **Passed**

Test date	:	2012-12-22
Test standard	:	Report purpose only
Kind of test site	:	Shielded room

Test setup

Test Channel	:	Low/ Middle/ High
Operation Mode	:	A
Ambient temperature	:	22℃
Relative humidity	:	52%
Atmospheric pressure	:	102 kPa

Table 33: Test result of 99% Bandwidth

Channel	Channel Frequency (MHz)	99% Bandwidth (MHz)	Limit (MHz)	Result
Low Channel	5180	16.57	/	Pass
Mid Channel	5220	16.57	/	Pass
High Channel	5240	16.643	/	Pass

Table 34: Test result of 99% Bandwidth (HT20)

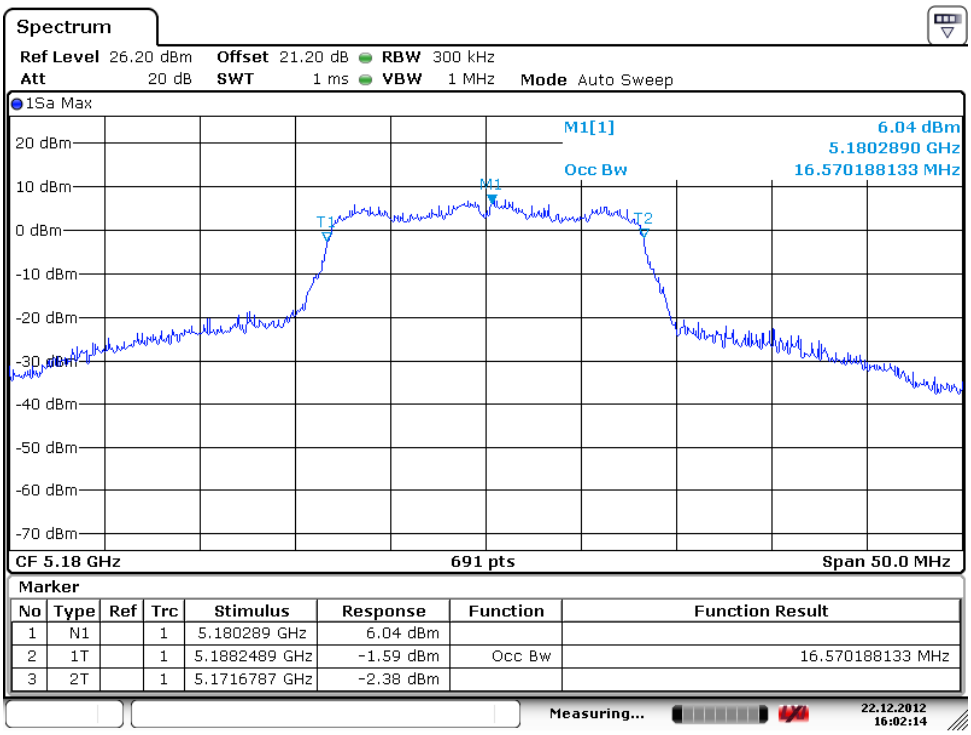
Channel	Channel Frequency (MHz)	99% Bandwidth (MHz)	Limit (MHz)	Result
Low Channel	5180	16.57	/	Pass
Mid Channel	5220	16.57	/	Pass
High Channel	5240	16.57	/	Pass

Table 35: Test result of 99% Bandwidth (HT40)

Channel	Channel Frequency (MHz)	99% Bandwidth (MHz)	Limit (MHz)	Result
Low Channel	5190	36.90	/	Pass
High Channel	5230	36.83	/	Pass

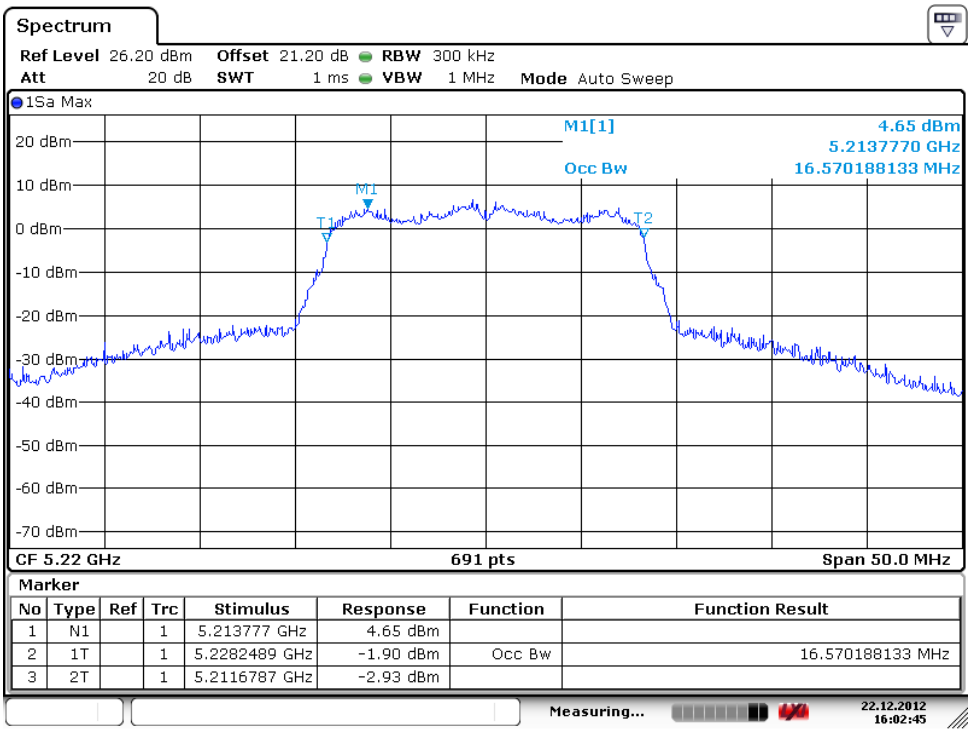
Test Plot of 99% Bandwidth

Low Channel



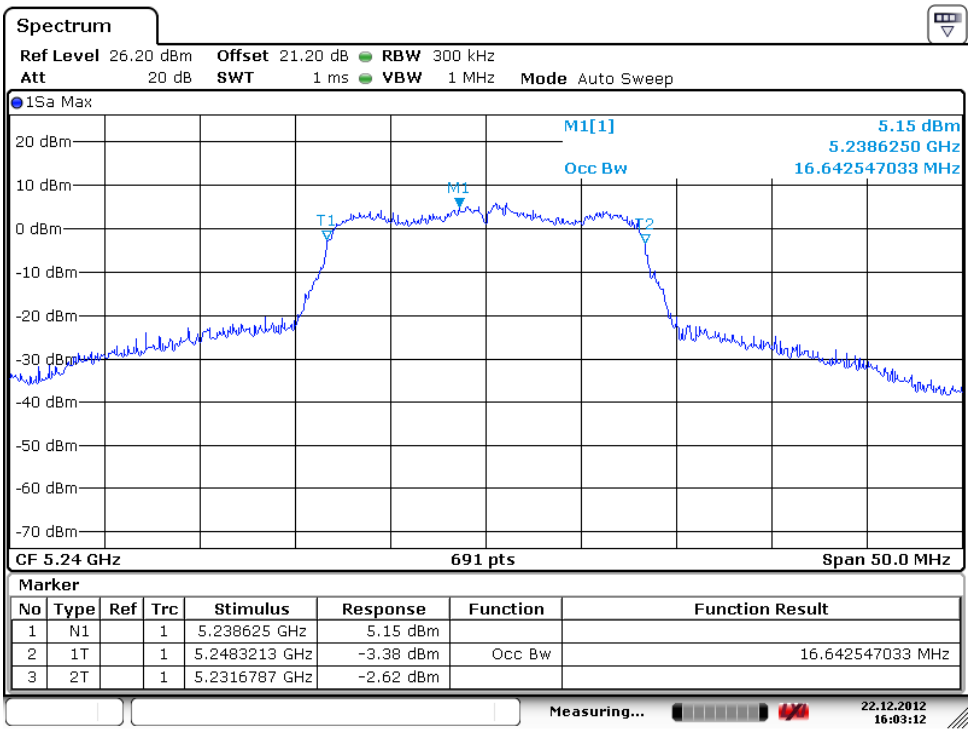
Date: 22.DEC.2012 16:02:14

Middle Channel



Date: 22.DEC.2012 16:02:45

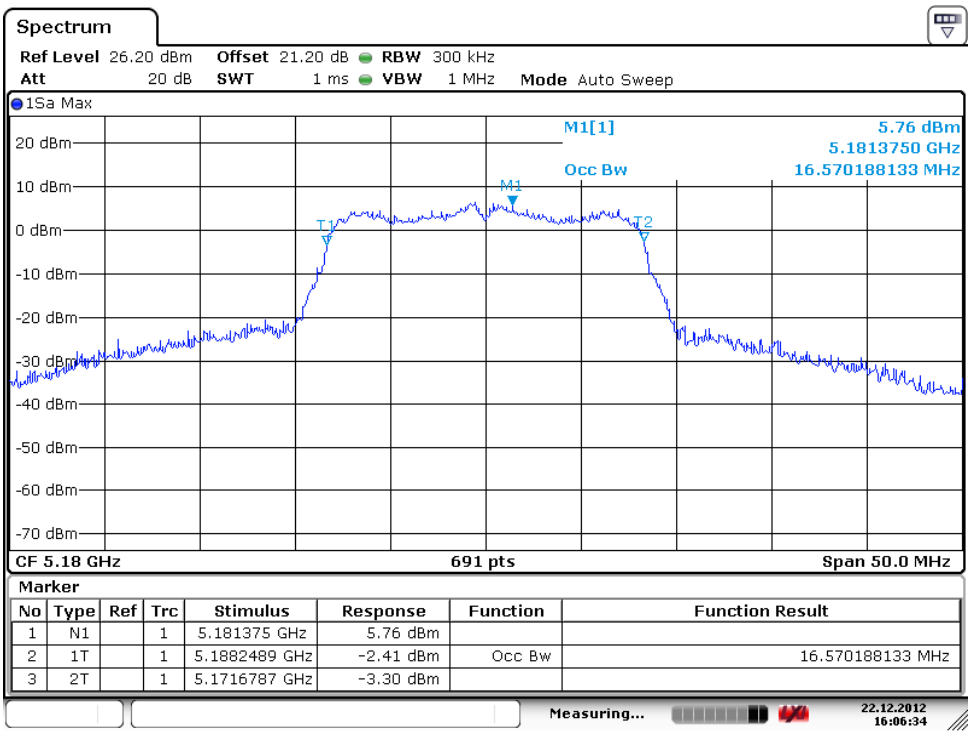
High Channel



Date: 22.DEC.2012 16:03:13

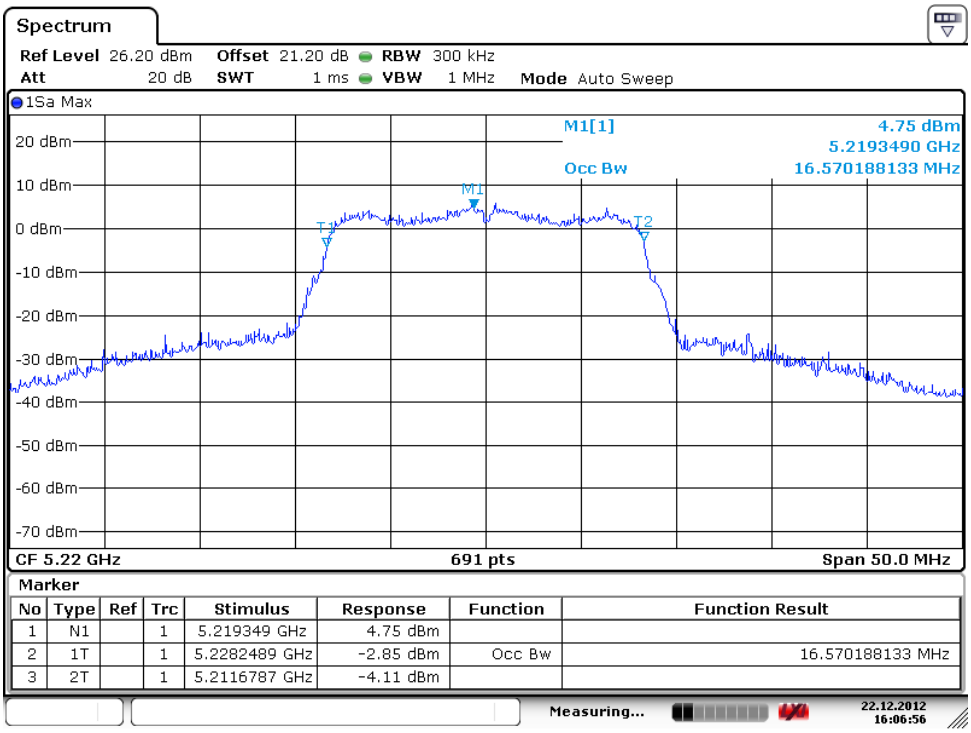
Test Plot of 99% Bandwidth (HT20)

Low Channel



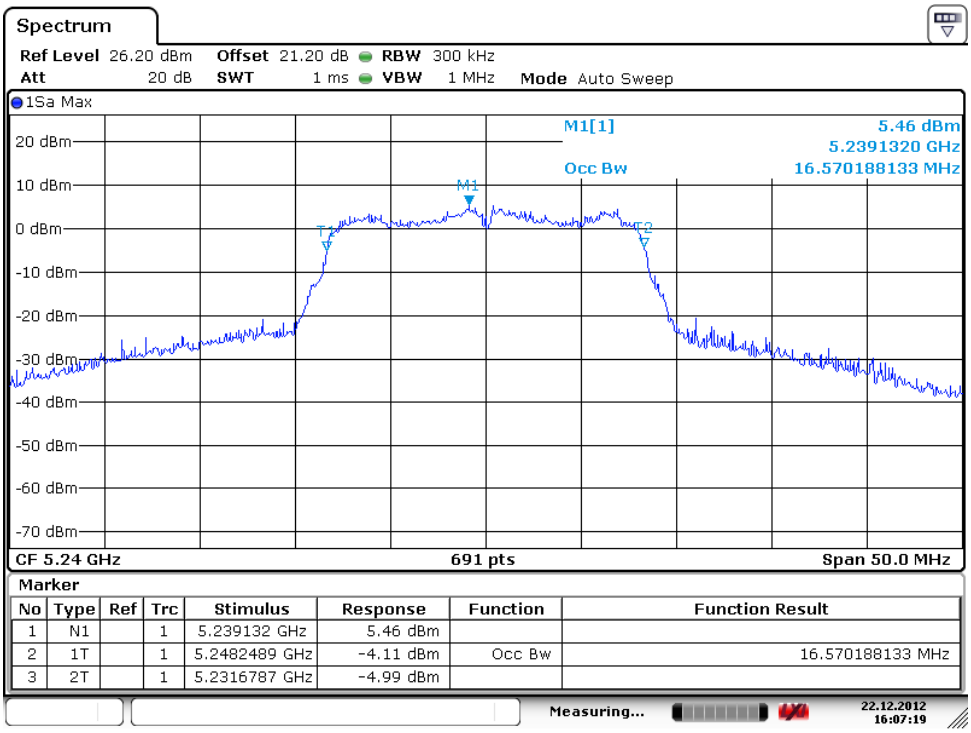
Date: 22.DEC.2012 16:06:35

Middle Channel



Date: 22.DEC.2012 16:06:57

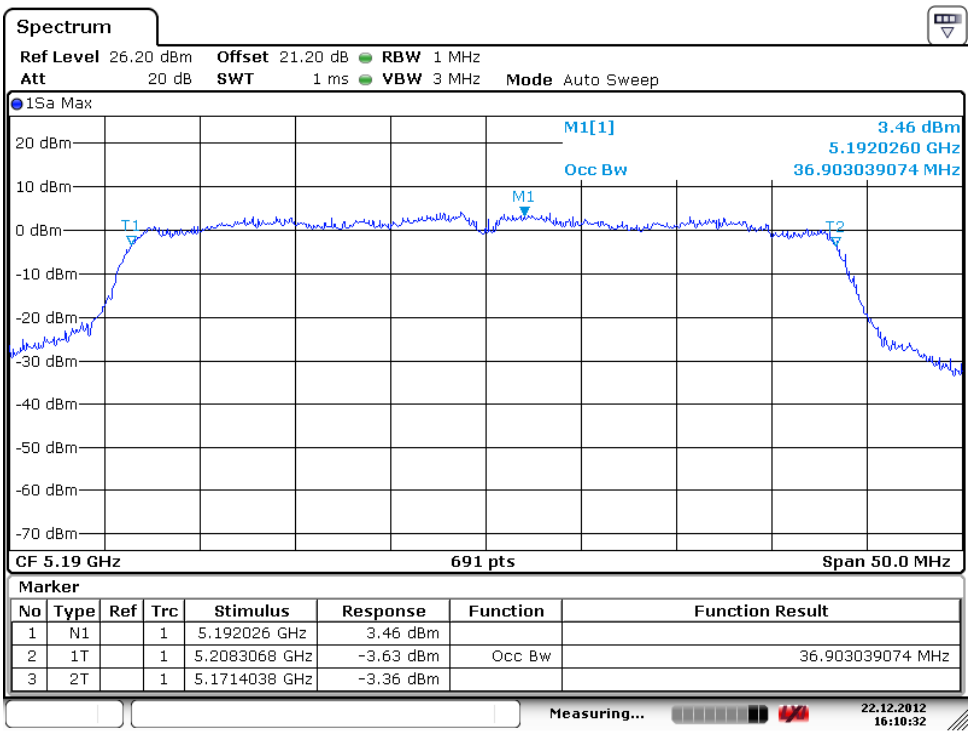
High Channel



Date: 22.DEC.2012 16:07:20

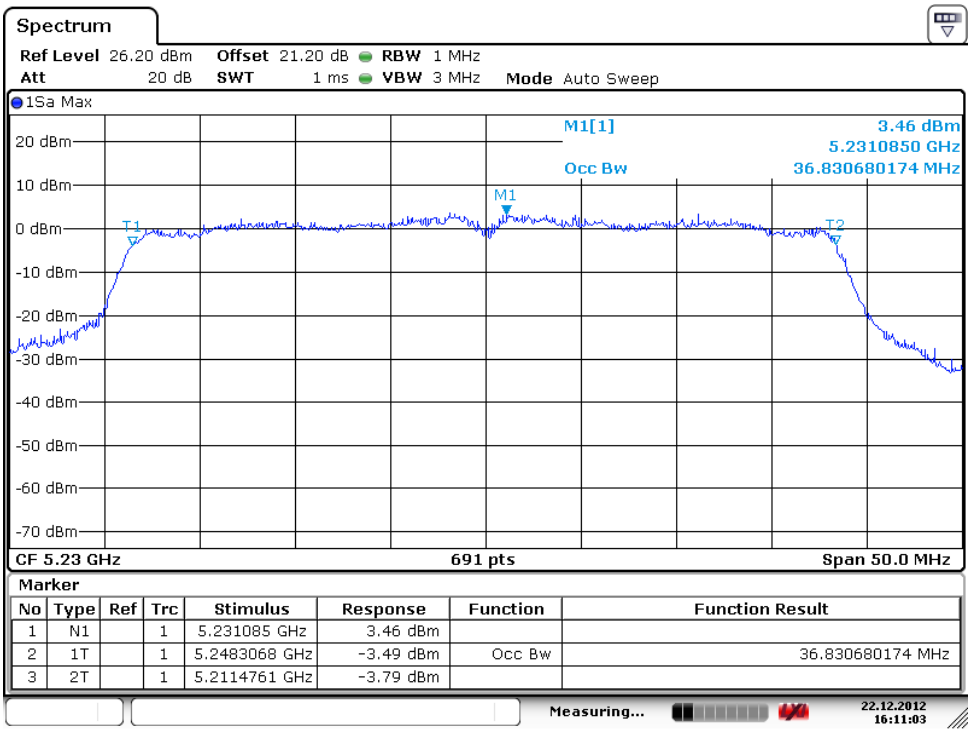
Test Plot of 99% Bandwidth(HT40)

Low Channel



Date: 22.DEC.2012 16:10:32

High Channel



Date: 22.DEC.2012 16:11:04

5.1.2.6 Conducted spurious emissions and Frequency Band Edge

RESULT: **Passed**

Date of testing	:	2012-12-22
Test standard	:	FCC part 15.407(b)(1), RSS-210 A9.3 (1)
Limit	:	-27dB
Kind of test site	:	Shielded room

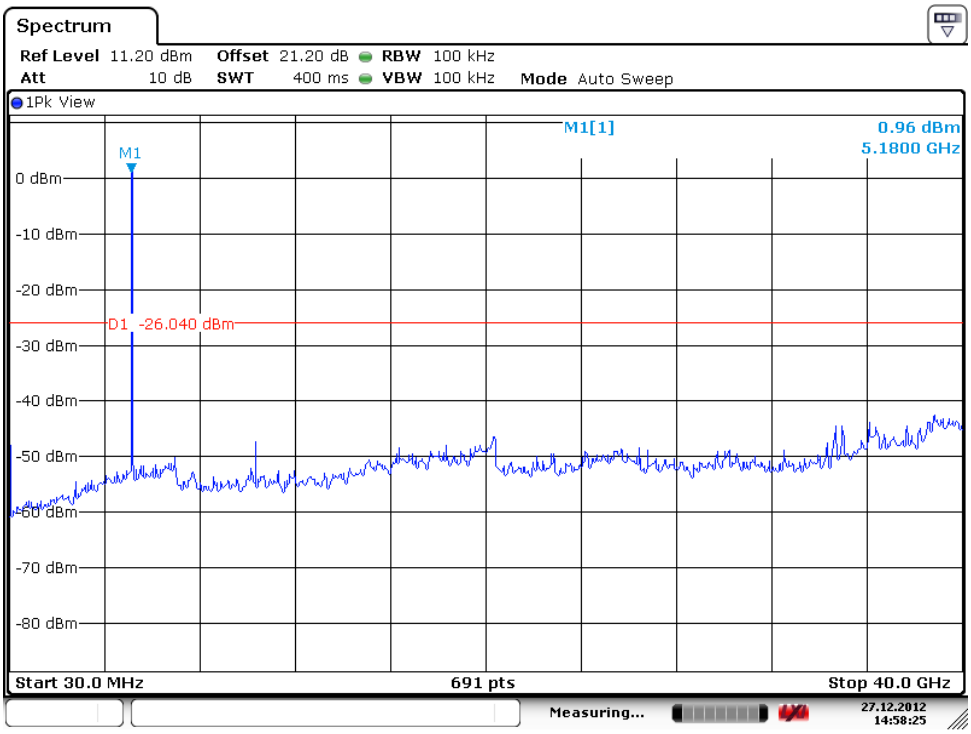
Test setup

Test Channel	:	Low/ High
Operation mode	:	A
Ambient temperature	:	22℃
Relative humidity	:	52%
Atmospheric pressure	:	102 kPa

All emissions are more than 27dB below fundamental, details refer to following test plot, and compliance is achived as well.
Due to the small size of the product and that there are no inductive components of significant size, 9kHz to 30MHz frequency range is not tested based on technical judgment.

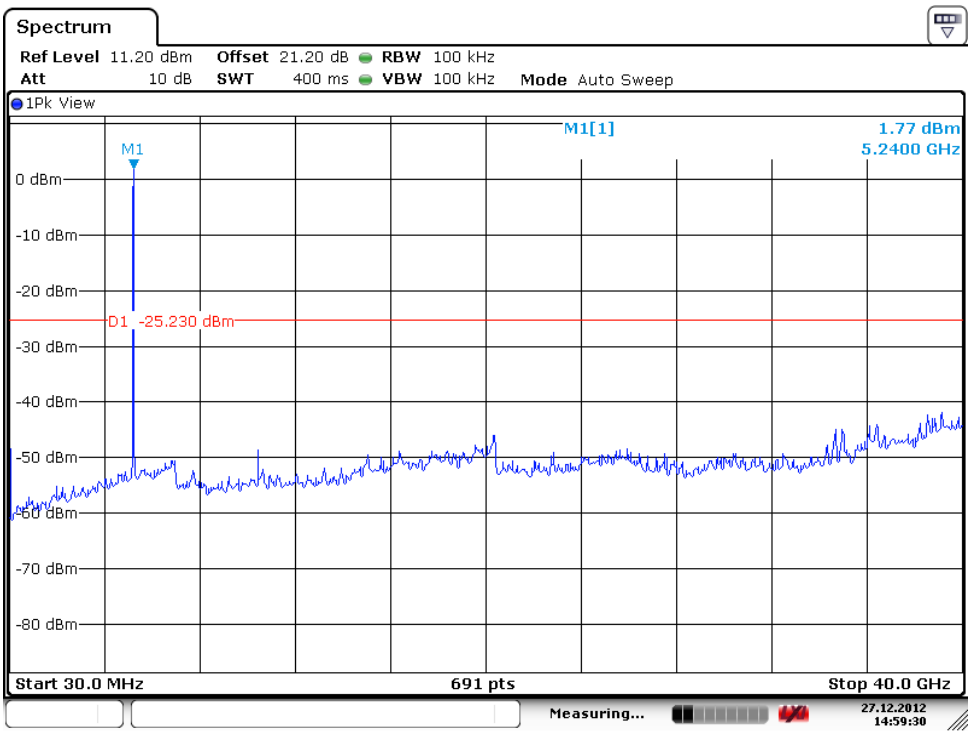
Test Plot of Conducted Emissions

Low Channel



Date: 27.DEC.2012 14:58:25

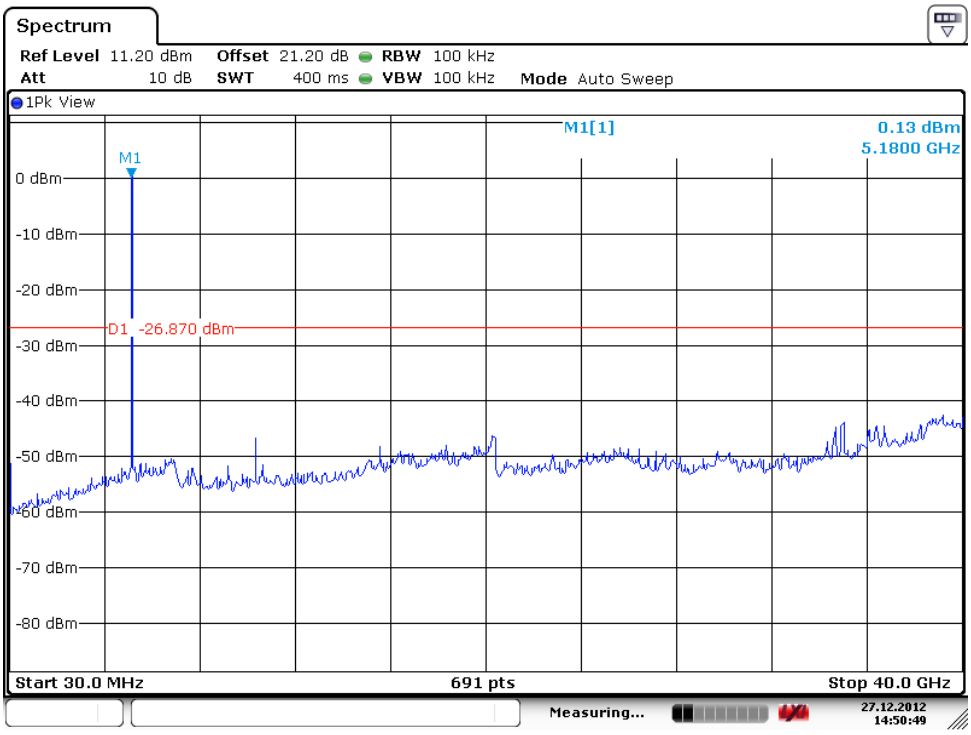
High Channel



Date: 27.DEC.2012 14:59:31

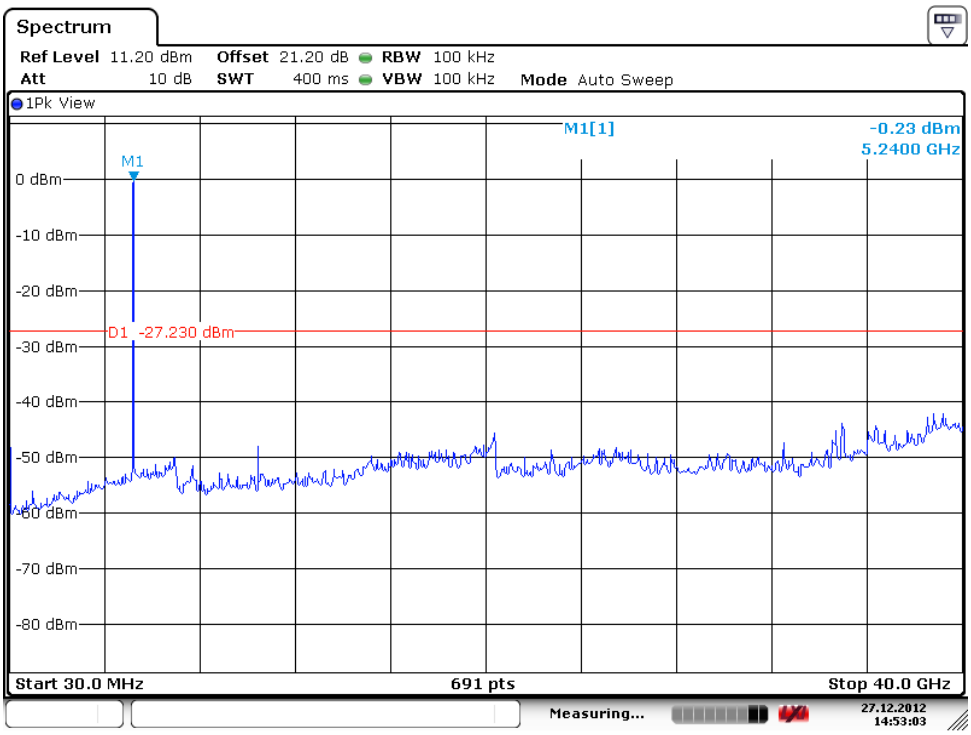
Test Plot of Conducted Emissions(HT20)

Low Channel



Date: 27.DEC.2012 14:50:50

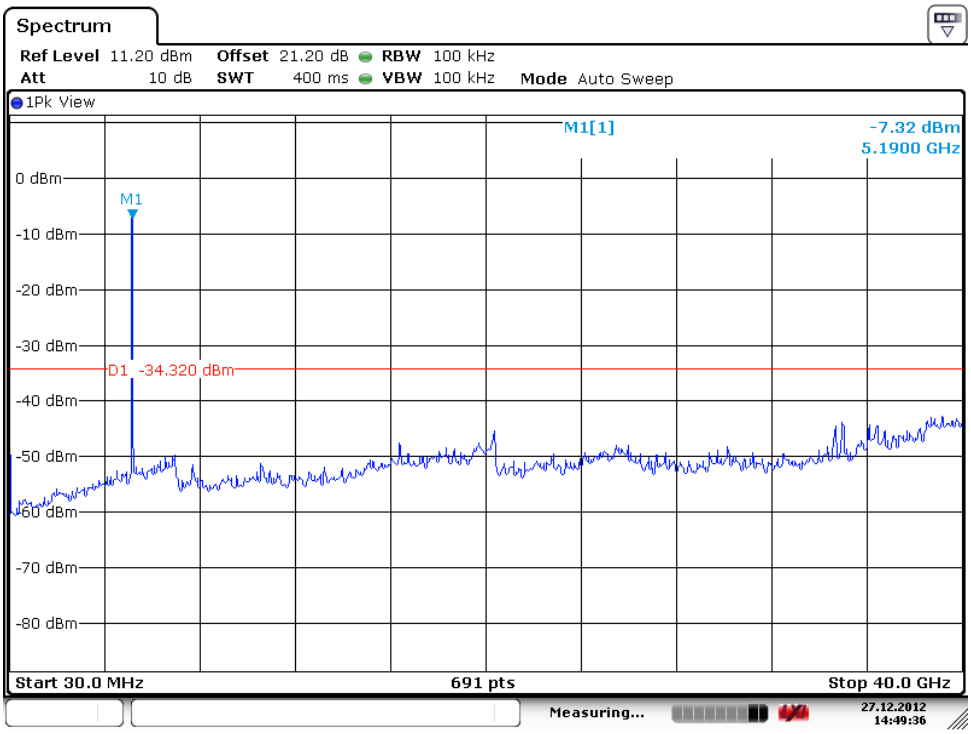
High Channel



Date: 27.DEC.2012 14:53:03

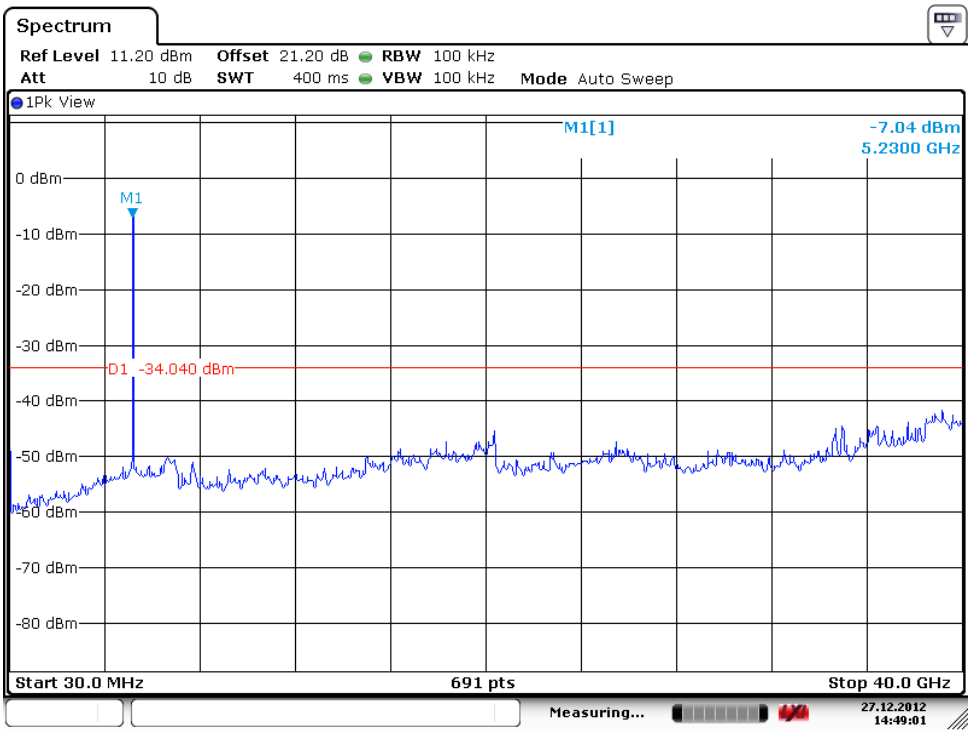
Test Plot of Conducted Emissions(HT40)

Low Channel



Date: 27.DEC.2012 14:49:37

High Channel



Date: 27.DEC.2012 14:49:01

5.1.2.7 Spurious Emission

RESULT: **Passed**

Date of testing	:	2012-12-22
Test standard	:	FCC 15.205, FCC 15.209, RSS-210 2.2, RSS-210 A8.5 and RSS-Gen 7.2.1
Basic standard	:	ANSI C63.10: 2009
Limits	:	Radiated emissions which fall in the restricted bands, as defined in FCC 15.205(a) and RSS-210 2.7 (Table 1), must comply with the radiated emission limits specified in FCC 15.209(a) and RSS-210 2.7 (Table 2 and 3). Emission radiated outside the specified frequency bands must comply with the radiated emission limits specified in FCC 15.209(a) and FCC 15.249(a), RSS-210 2.7 (Table 2 and 3) and RSS-210 A2.9(a).
Kind of test site	:	3m Semi-Anechoic Chamber

Test setup

Test Channel	:	Low/ Middle/ High
Operation mode	:	A, C
Ambient temperature	:	24℃
Relative humidity	:	56%
Atmospheric pressure	:	102 kPa

Remark: Testing was carried out within frequency range 30MHz to the tenth harmonic. For details refer to Appendix 2. The Radiated Emissions testing was performed in the X, Y and Z axis orientation. The Z Axis orientation is the worst-case and recorded in this test report. Due to the small size of the product and that there are no inductive components of significant size, 9kHz to 30MHz frequency range is not tested based on technical judgment.

5.1.3 802.11a/n Band I Antenna Ports Aggregation (TX0+TX1)

5.1.3.1 Power Spectral Density

RESULT: **Passed**

Date of testing	:	2012-12-22
Test standard	:	FCC Part 15.407(a)(1),(5)
Kind of test site	:	Shielded room

Test setup

Test Channel	:	Low/ Middle/ High
Operation Mode	:	A
Ambient temperature	:	24℃
Relative humidity	:	53%
Atmospheric pressure	:	102 kPa

For the 802.11n modes, the EUT can be operated in 2x2 MIMO mode. Therefore, for those modes, in the tables below the limits are reduced by 3 dB.

Table 36: Test result of Power Spectral Density (HT20)

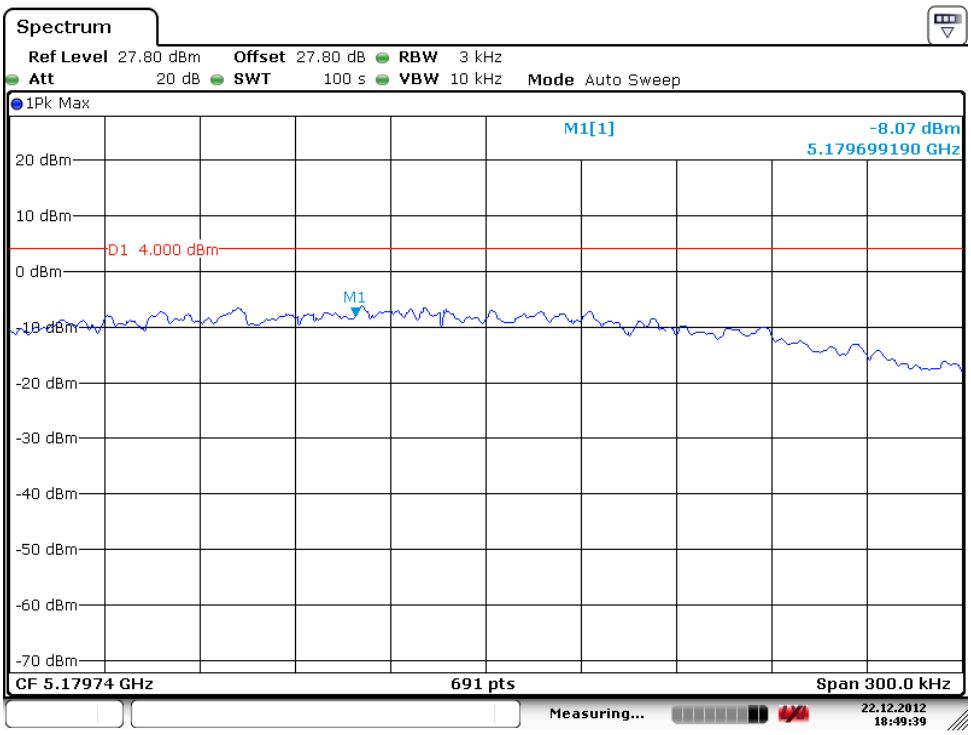
Channel	Channel Frequency (MHz)	Peak Power Density (dBm)	Limit (dBm)	Result
Low Channel	5180	-8.07	4-3	Pass
Mid Channel	5220	-8.02	4-3	Pass
High Channel	5240	-6.79	4-3	Pass

Table 37: Test result of Power Spectral Density (HT40)

Channel	Channel Frequency (MHz)	Peak Power Density (dBm)	Limit (dBm)	Result
Low Channel	5190	-15.10	4-3	Pass
High Channel	5230	-15.65	4-3	Pass

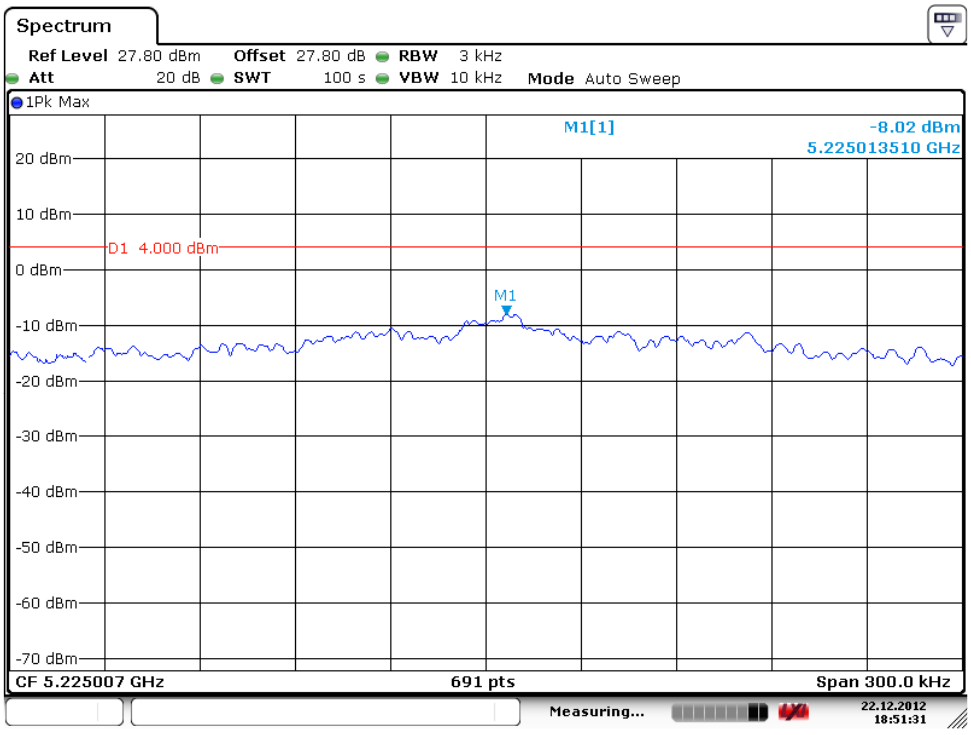
Test Plot of Power Density (HT20)

Low Channel



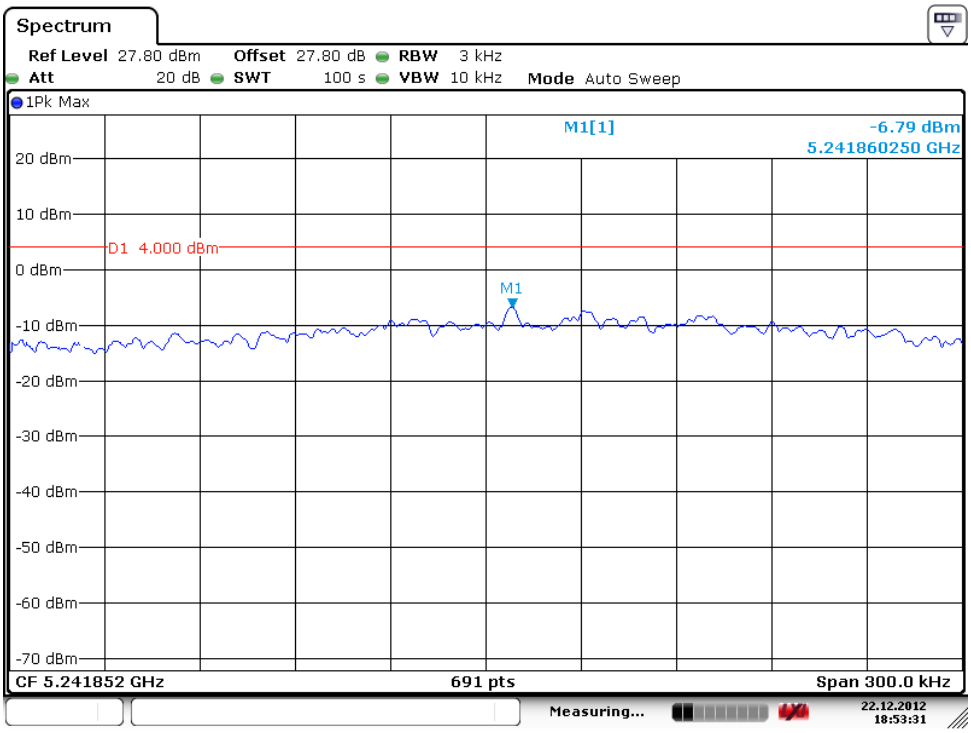
Date: 22.DEC.2012 18:49:40

Middle Channel



Date: 22.DEC.2012 18:51:32

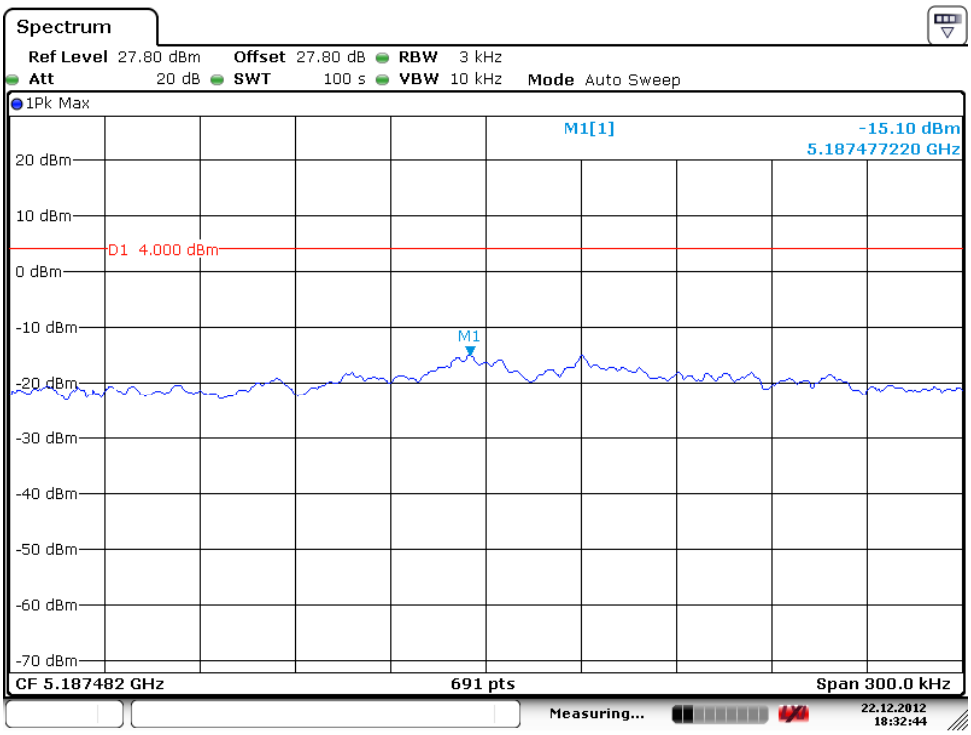
High Channel



Date: 22.DEC.2012 18:53:31

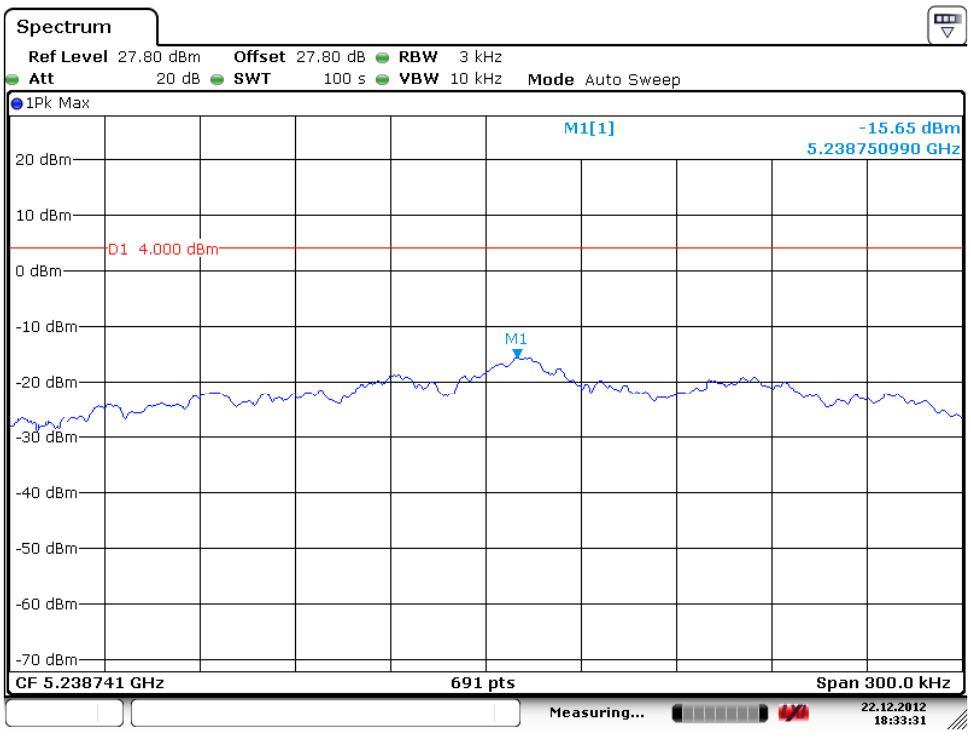
Test Plot of Power Density (HT40)

Low Channel



Date: 22.DEC.2012 18:32:45

High Channel



Date: 22.DEC.2012 18:33:31

5.1.3.2 Conducted spurious emissions and Frequency Band Edge

RESULT: **Passed**

Date of testing	:	2012-12-22
Test standard	:	FCC part 15.407(b)(1), RSS-210 A9.3 (1)
Limit	:	-27dB
Kind of test site	:	Shielded room

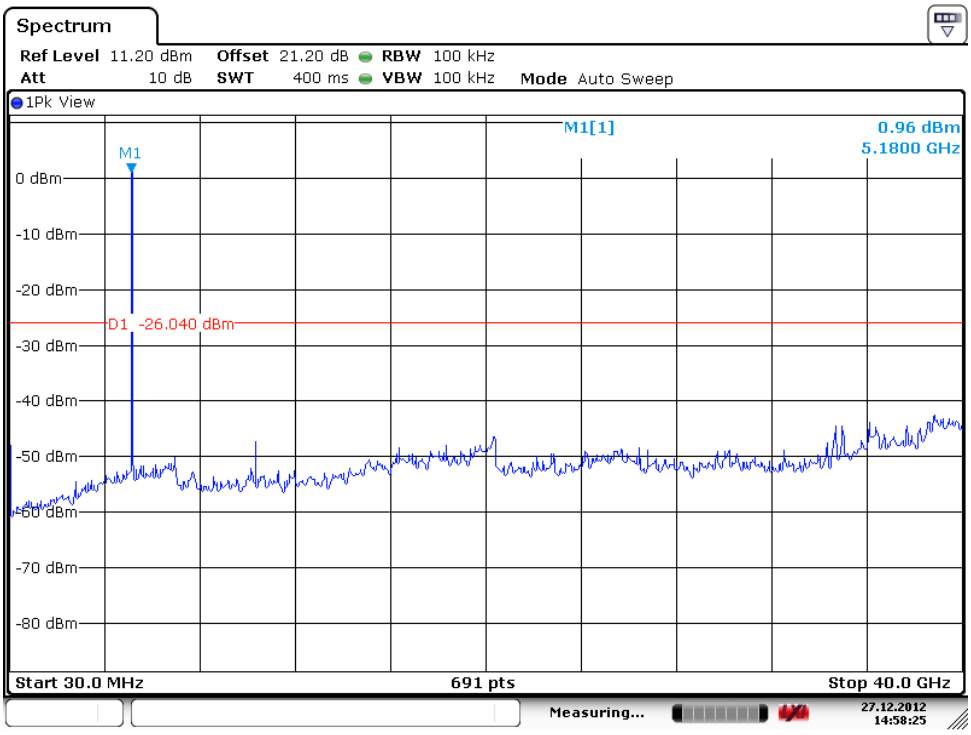
Test setup

Test Channel	:	Low/ High
Operation mode	:	A
Ambient temperature	:	22℃
Relative humidity	:	52%
Atmospheric pressure	:	102 kPa

All emissions are more than 27dB below fundamental, details refer to following test plot, and compliance is achived as well.
Due to the small size of the product and that there are no inductive components of significant size, 9kHz to 30MHz frequency range is not tested based on technical judgment.

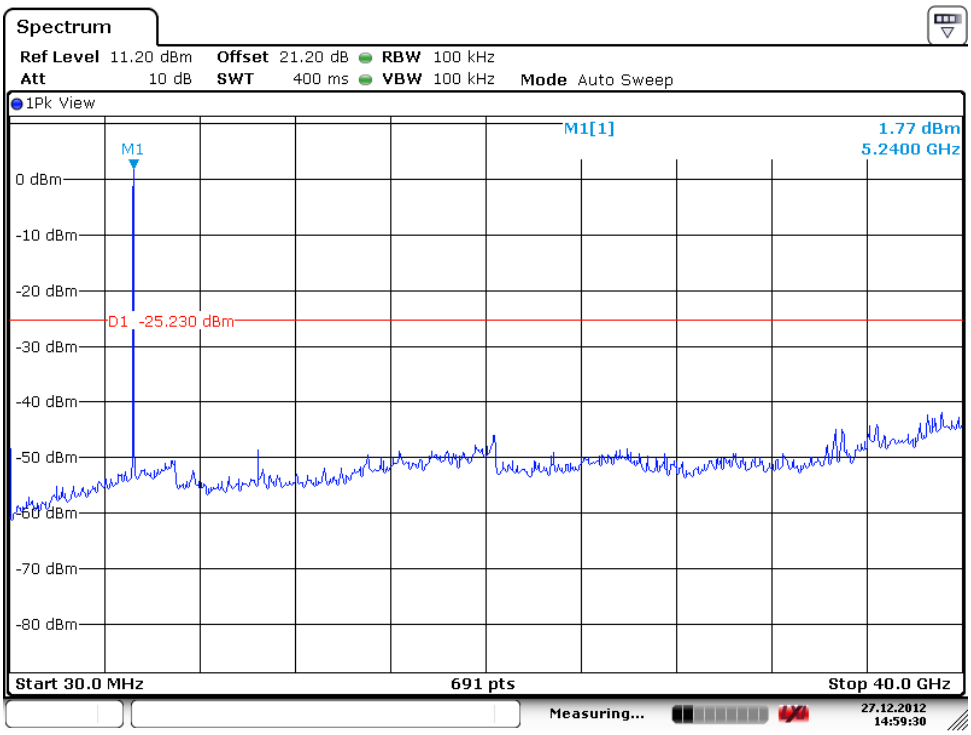
Test Plot of Conducted Emissions

Low Channel



Date: 27.DEC.2012 14:58:25

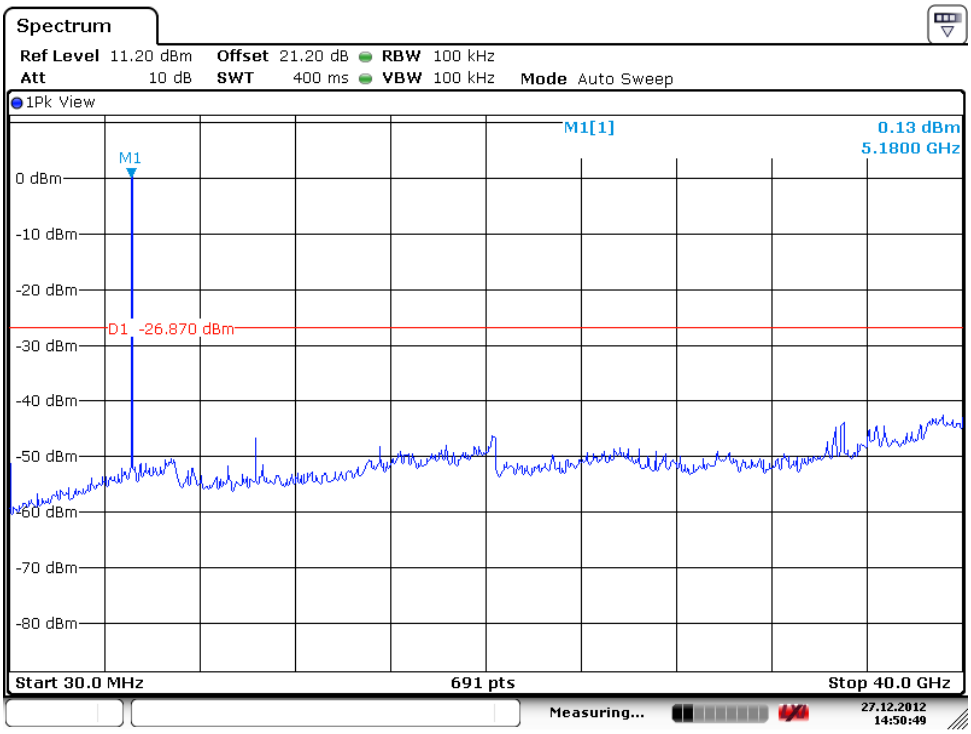
High Channel



Date: 27.DEC.2012 14:59:31

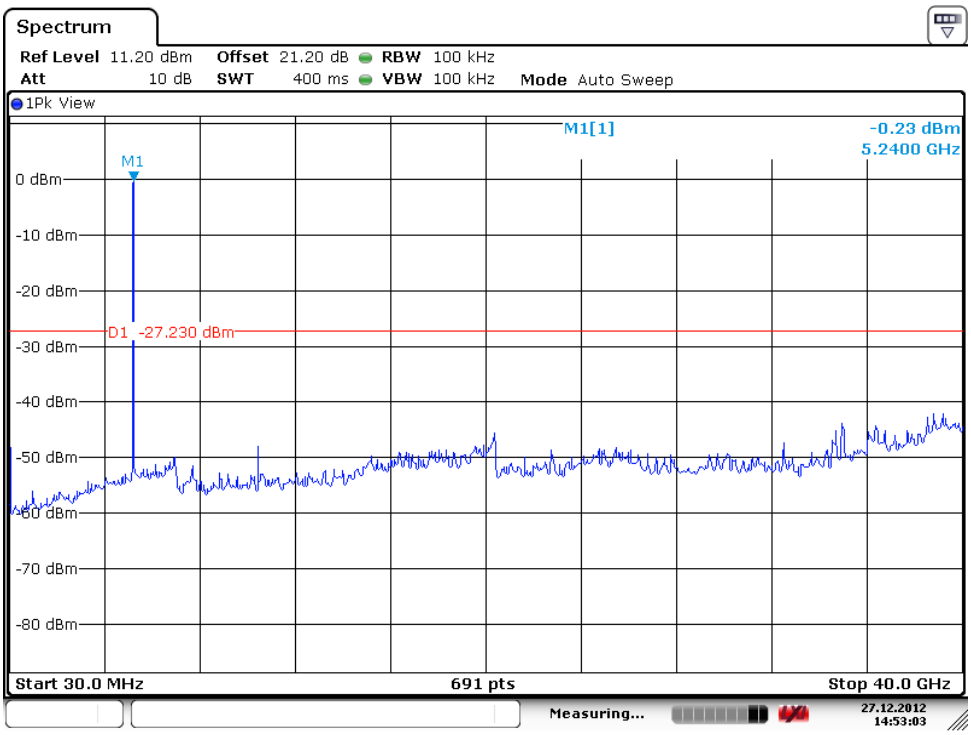
Test Plot of Conducted Emissions(HT20)

Low Channel



Date: 27.DEC.2012 14:50:50

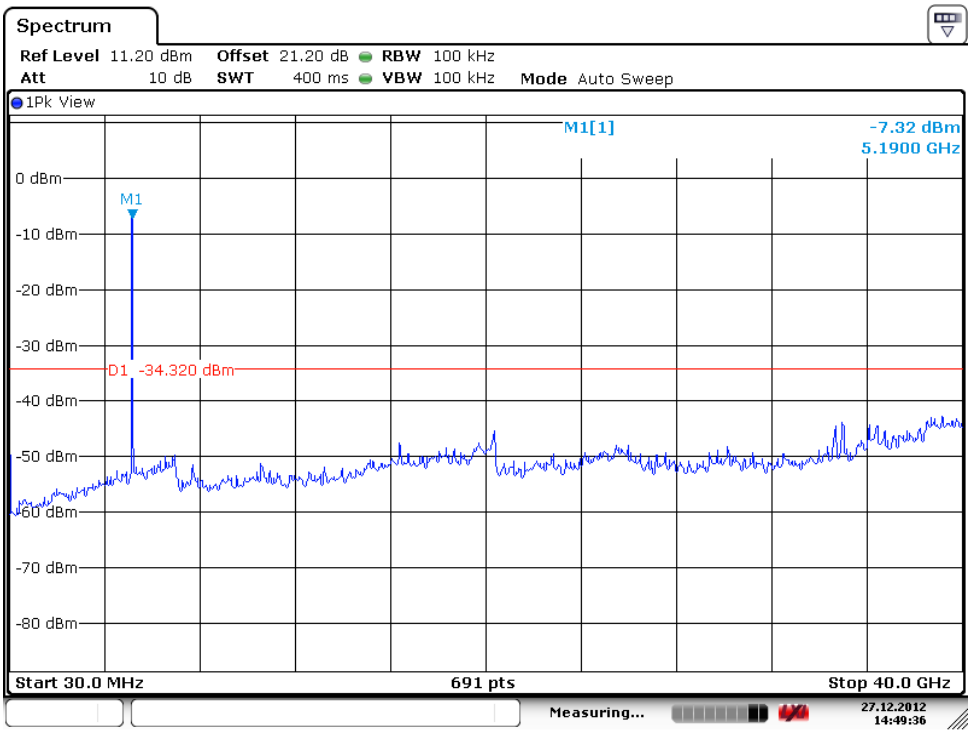
High Channel



Date: 27.DEC.2012 14:53:03

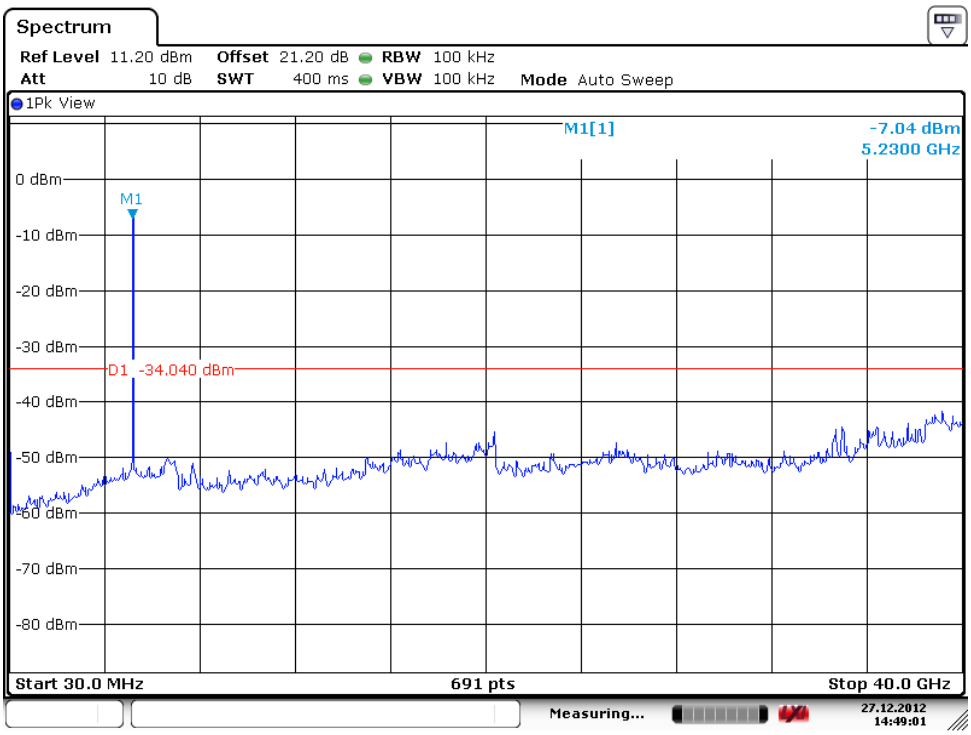
Test Plot of Conducted Emissions(HT40)

Low Channel



Date: 27.DEC.2012 14:49:37

High Channel



Date: 27.DEC.2012 14:49:01