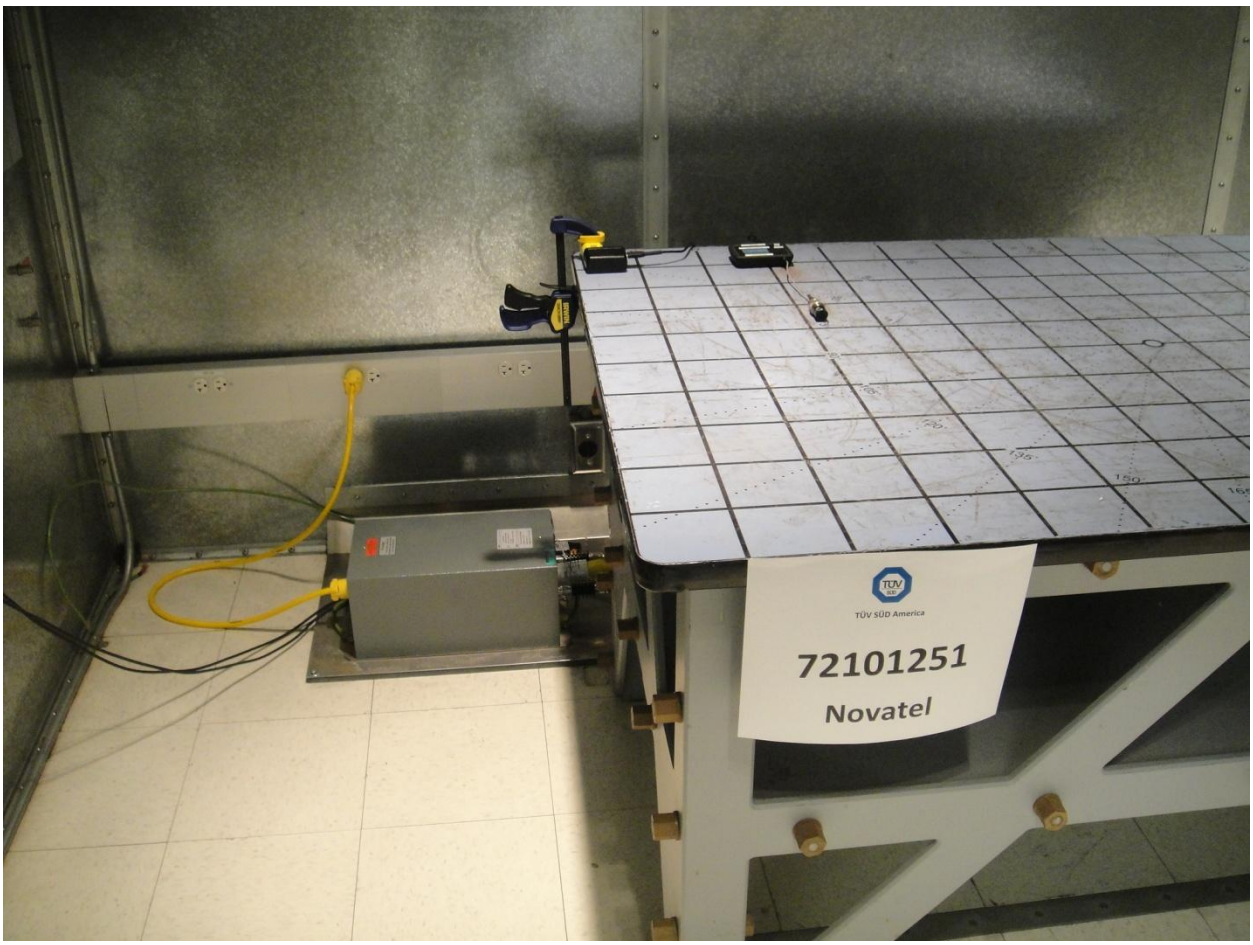
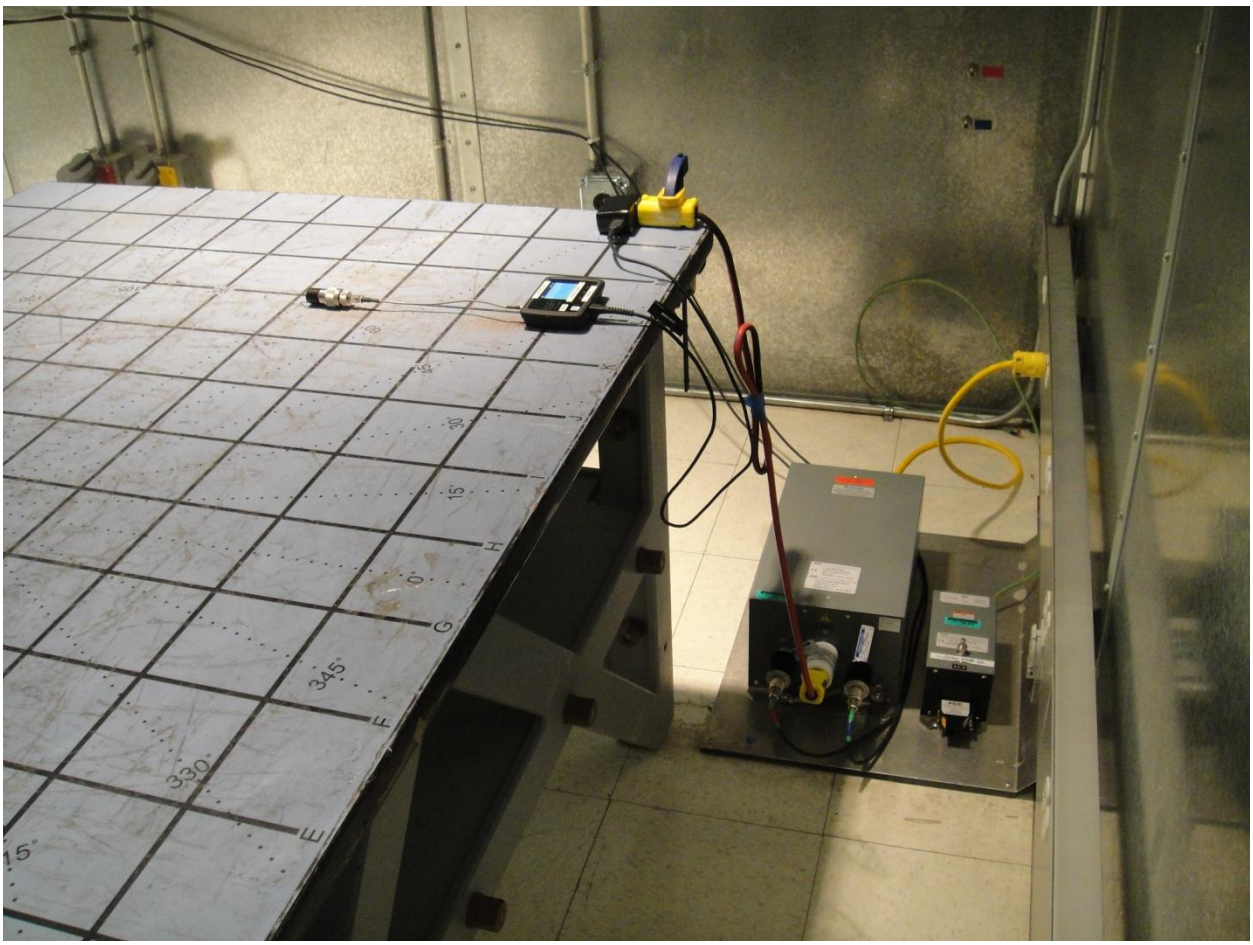
2.2.12 Test Setup Photo (Front)



2.2.13 Test Setup Photo (Back)



2.3 99% EMISSION BANDWIDTH

2.3.1 Specification Reference

RSS-Gen Clause 4.6.1

2.3.2 Standard Applicable

When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured.
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 to 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.
The trace data points are recovered and directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded. The span between the two recorded frequencies is the occupied bandwidth.

2.3.3 Equipment Under Test and Modification State

Serial No: SH181214900051 / Test Configuration A

2.3.4 Date of Test/Initial of test personnel who performed the test

March 11, 2015 / AC

2.3.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.3.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	22.3°C
Relative Humidity	30.3%
ATM Pressure	99.6 kPa

2.3.7 Additional Observations

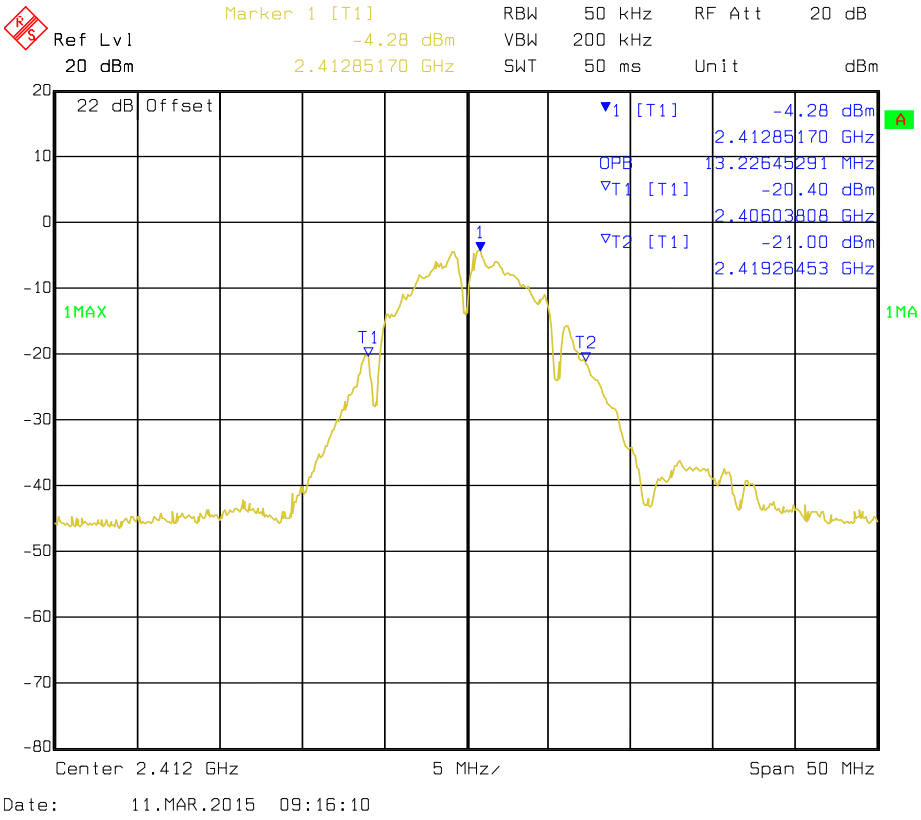
- This is a conducted test.
- An offset 22dB was added to compensate for the external attenuator and cable used.
- An offset of 31.2dB for 5745MHz, 31.0dB for 5785MHz and 31.7dB for 5825MHz were added to compensate for the external attenuator and cable used.
- Span is wide enough to capture the channel transmission.
- RBW is 1% of the span.
- VBW is 3X RBW.
- Sweep is auto.

- Detector is peak.
- The % Power Bandwidth setting in the spectrum analyzer was set to 99% (default).
- The Channel Bandwidth measurement function of the spectrum analyzer was used for this test.
- For 5GHz WLAN Band represented as 20dB Bandwidth measurement.

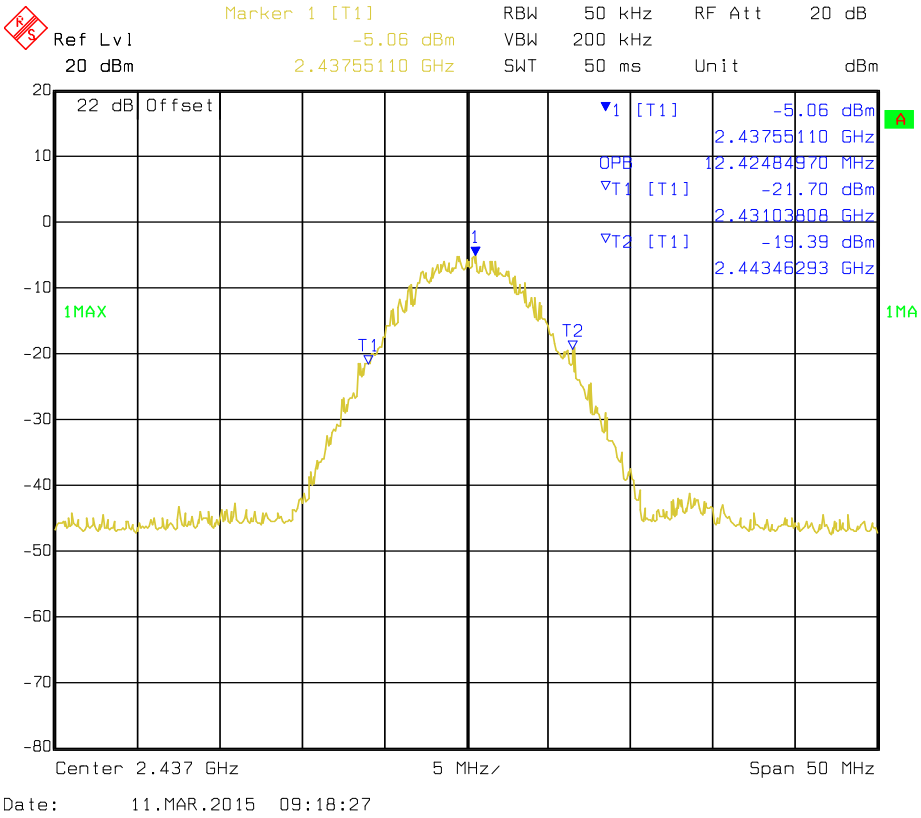
2.3.8 Test Results (For reporting purposes only)

System Mode	WLAN Mode	Channel	Measured 99% Bandwidth (MHz)
SISO	802.11b	1 (2412 MHz)	13.226
		6 (2437 MHz)	12.425
		11 (2462 MHz)	12.652
	802.11g	1 (2412 MHz)	16.433
		2 (2417 MHz)	16.633
		6 (2437 MHz)	16.533
		10 (2457 MHz)	16.834
		11 (2462 MHz)	16.633
	802.11n ht20	1 (2412 MHz)	17.735
		2 (2417 MHz)	17.836
		6 (2437 MHz)	17.936
		10 (2457 MHz)	18.236
		11 (2462 MHz)	17.936
MIMO	802.11n ht20	1 (2412 MHz)	17.635
		2 (2417 MHz)	17.735
		6 (2437 MHz)	17.836
		10 (2457 MHz)	18.036
		11 (2462 MHz)	17.836
SISO	802.11a	149 (5745 MHz)	20.0
		157 (5785 MHz)	20.0
		165 (5825 MHz)	19.9
MIMO	802.11n ht20	149 (5745 MHz)	21.4
		157 (5785 MHz)	20.9
		165 (5825 MHz)	21.5
MIMO	802.11n ht40	151 (5755 MHz)	42.0
		157 (5785 MHz)	44.8
		163 (5815 MHz)	44.8

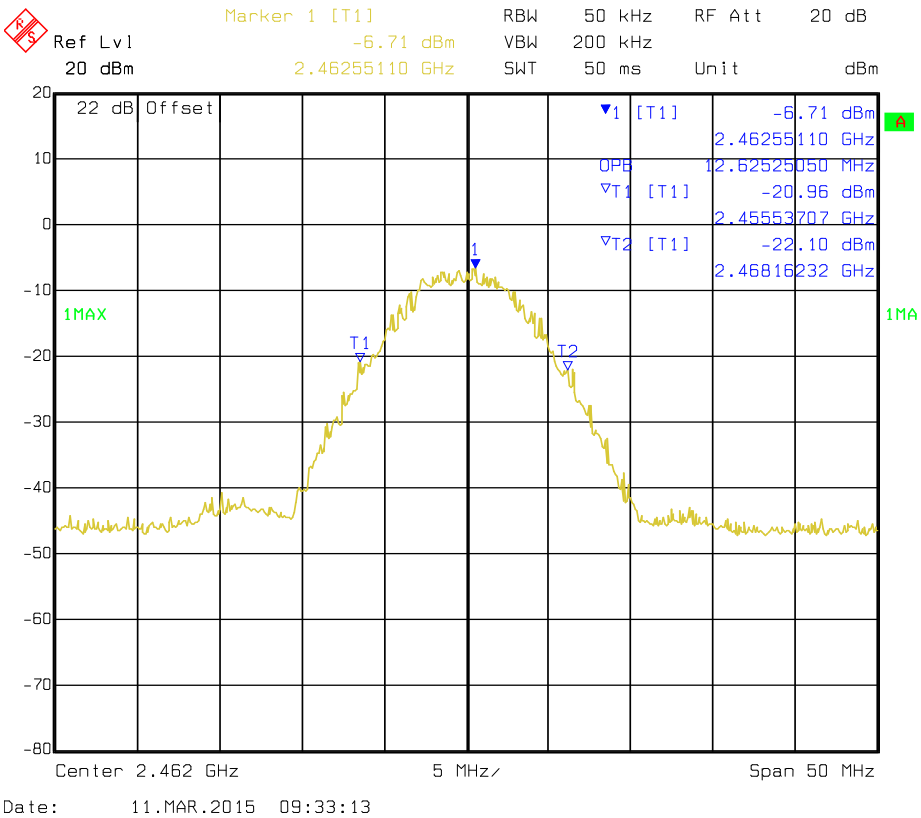
2.3.9 Sample Test Results Plots



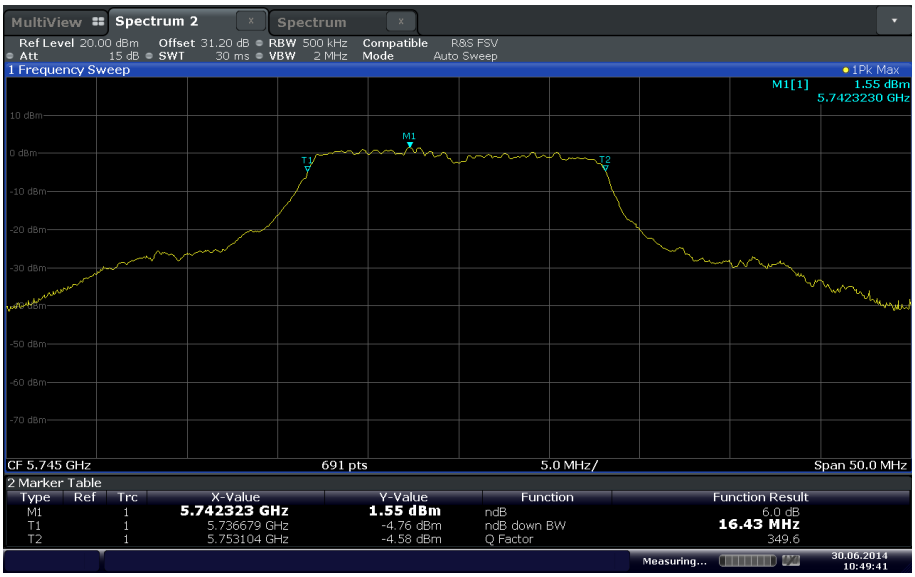
802.11b SISO mode Channel 1 (2412MHz)



802.11b SISO mode Channel 6 (2437MHz)



802.11b SISO mode Channel 11 (2462MHz)



Date: 30.JUN.2014 10:49:41

802.11a SISO mode Channel 149 (5745MHz)

2.4 MINIMUM 6 dB RF BANDWIDTH

2.4.1 Specification Reference

Part 15 Subpart C §15.247(a)(2)

2.4.2 Standard Applicable

(2) Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

2.4.3 Equipment Under Test and Modification State

Serial No: SH181214900051 / Test Configuration A

2.4.4 Date of Test/Initial of test personnel who performed the test

March 11, 2015 / AC

2.4.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.4.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	22.3°C
Relative Humidity	30.3%
ATM Pressure	99.6 kPa

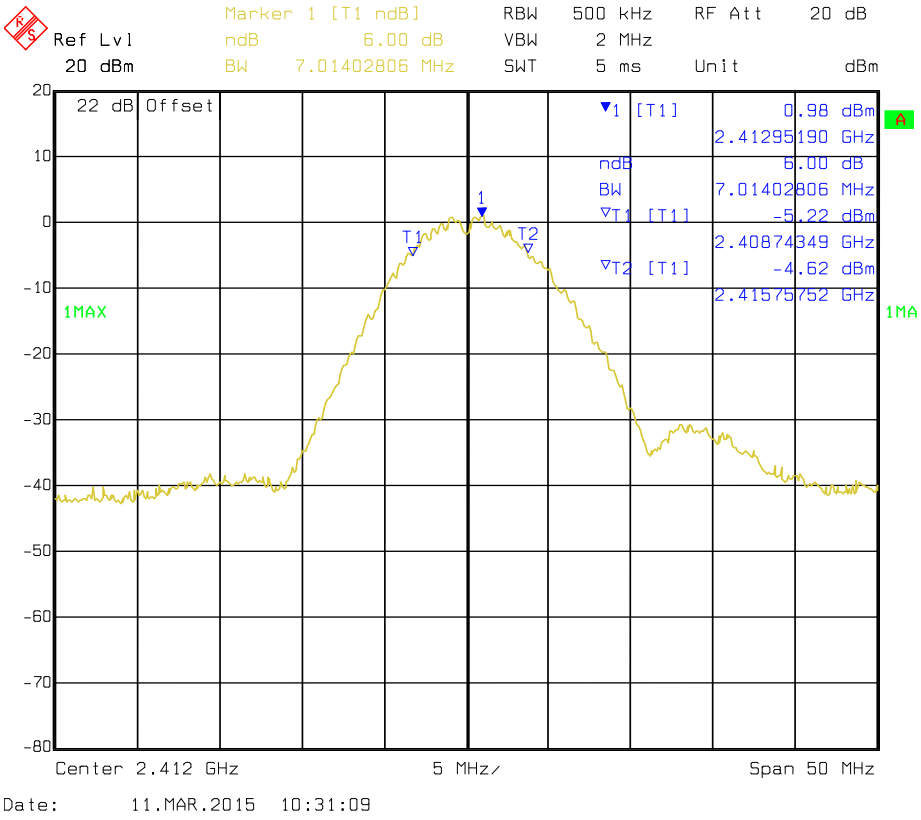
2.4.7 Additional Observations

- This is a conducted test.
- An offset 22dB was added to compensate for the external attenuator and cable used.
- An offset of 31.2dB for 5745MHz, 31.0dB for 5785MHz and 31.7dB for 5825MHz were added to compensate for the external attenuator and cable used.
- Span is wide enough to capture the channel transmission.
- 100 kHz RBW setting not possible. Any RBW setting below 500 kHz will result in inaccurate measurement due to pronounced dip in the middle of the fundamental signal dividing the bandwidth by half when using automatic bandwidth function of the spectrum analyzer.
- VBW is 3X RBW.
- Sweep is auto.
- Detector is peak.
- The “n” dB down marker function of the spectrum analyzer was used for this test.
- For signal modulation where “n” dB down marker function is not practical, a peak measurement is performed while the trace is in max hold.

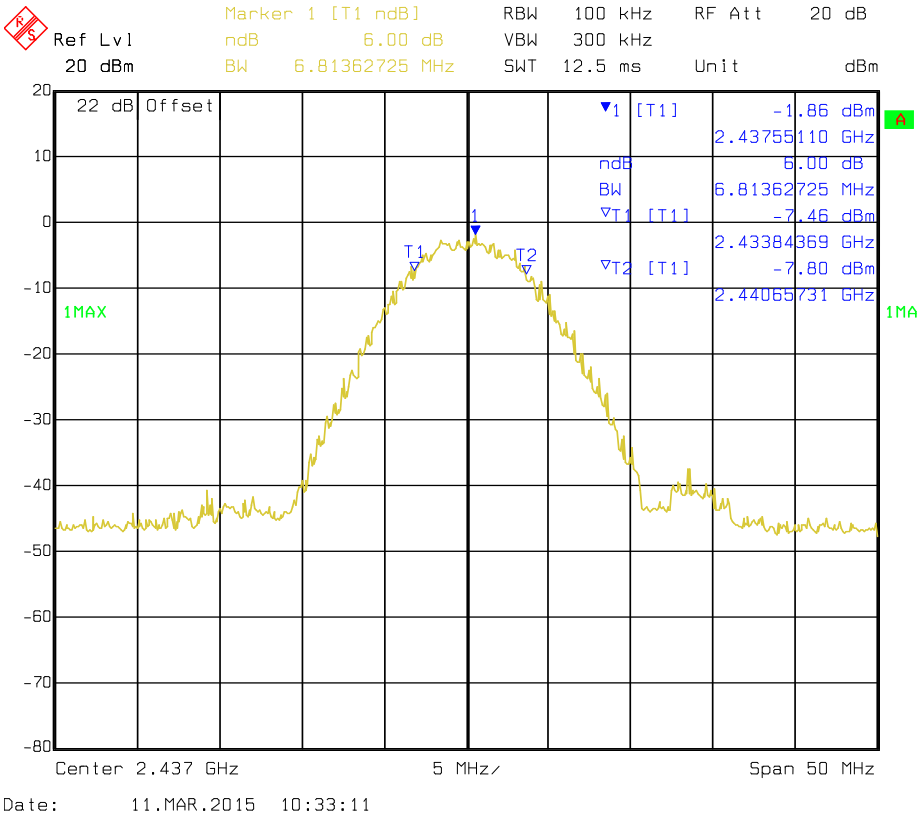
2.4.8 Test Results

System Mode	WLAN Mode	Channel	Measured Bandwidth (MHz)	Minimum Bandwidth (MHz)	Compliance
SISO	802.11b	1 (2412 MHz)	7.014	0.500	Complies
		6 (2437 MHz)	6.814	0.500	Complies
		11 (2462 MHz)	6.513	0.500	Complies
	802.11g	1 (2412 MHz)	14.539	0.500	Complies
		2 (2417 MHz)	16.333	0.500	Complies
		6 (2437 MHz)	16.433	0.500	Complies
		10 (2457 MHz)	16.333	0.500	Complies
		11 (2462 MHz)	16.433	0.500	Complies
	802.11n ht20	1 (2412 MHz)	15.030	0.500	Complies
		2 (2417 MHz)	17.635	0.500	Complies
		6 (2437 MHz)	17.535	0.500	Complies
		10 (2457 MHz)	18.036	0.500	Complies
		11 (2462 MHz)	17.936	0.500	Complies
MIMO	802.11n ht-20	1 (2412 MHz)	16.533	0.500	Complies
		2 (2417 MHz)	17.635	0.500	Complies
		6 (2437 MHz)	17.635	0.500	Complies
		10 (2457 MHz)	17.936	0.500	Complies
		11 (2462 MHz)	17.936	0.500	Complies
SISO	802.11a	149 (5745 MHz)	16.43	0.500	Complies
		157 (5785 MHz)	16.43	0.500	Complies
		165 (5825 MHz)	16.43	0.500	Complies
MIMO	802.11n ht20	149 (5745 MHz)	17.73	0.500	Complies
		157 (5785 MHz)	17.58	0.500	Complies
		165 (5825 MHz)	17.73	0.500	Complies
MIMO	802.11n ht40	151 (5755 MHz)	35.75	0.500	Complies
		157 (5785 MHz)	35.46	0.500	Complies
		163 (5815 MHz)	34.01	0.500	Complies

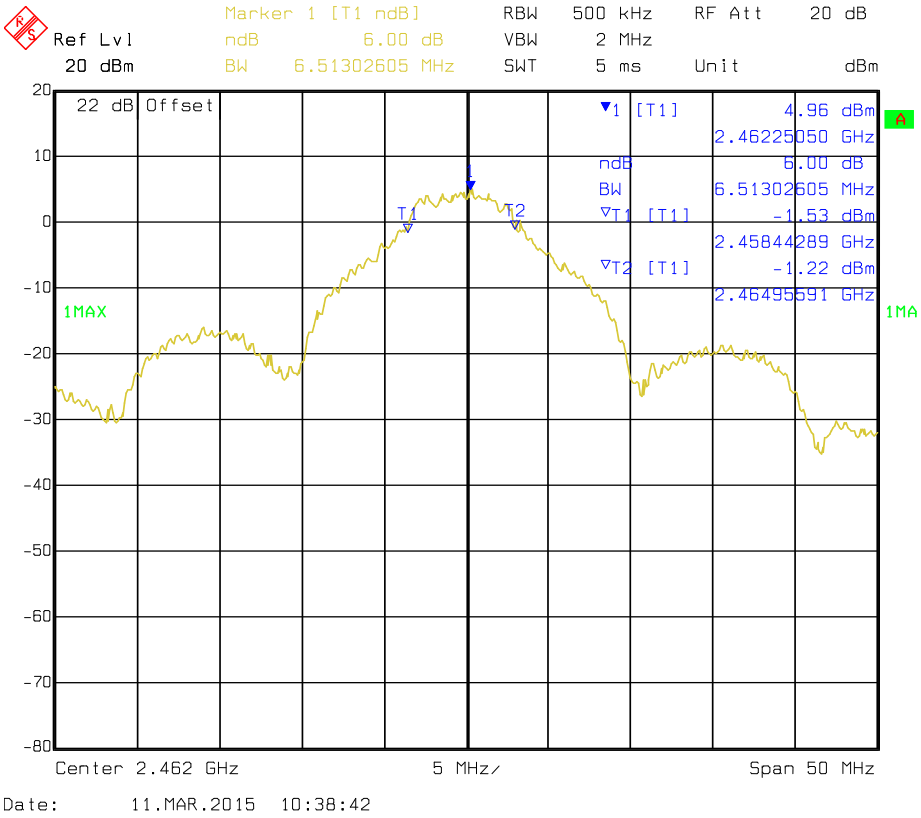
2.4.9 Sample Test Results Plots



802.11b SISO mode Channel 1 (2412MHz)



802.11b SISO mode Channel 6 (2437MHz)



802.11b SISO mode Channel 11 (2462MHz)

802.11n ht40 MIMO mode Channel 151 (5755 MHz)

2.5 OUT-OF-BAND EMISSIONS - CONDUCTED

2.5.1 Specification Reference

Part 15 Subpart C §15.247(d)

2.5.2 Standard Applicable

(d) 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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

2.5.3 Equipment Under Test and Modification State

Serial No: SH181214900051 / Test Configuration A

2.5.4 Date of Test/Initial of test personnel who performed the test

March 11, 2015 / AC

2.5.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.5.6 Environmental Conditions/ Test Location

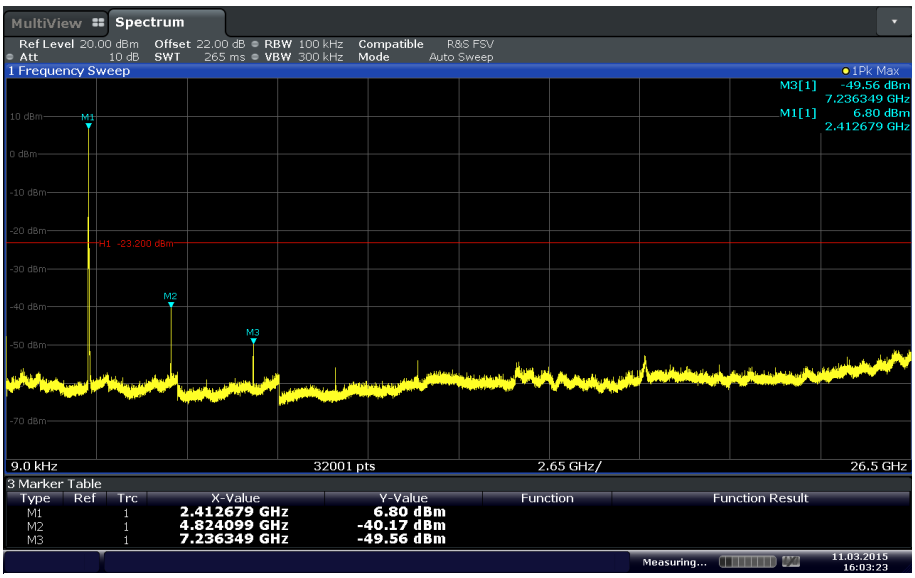
Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	22.3°C
Relative Humidity	30.3%
ATM Pressure	99.6 kPa

2.5.7 Additional Observations

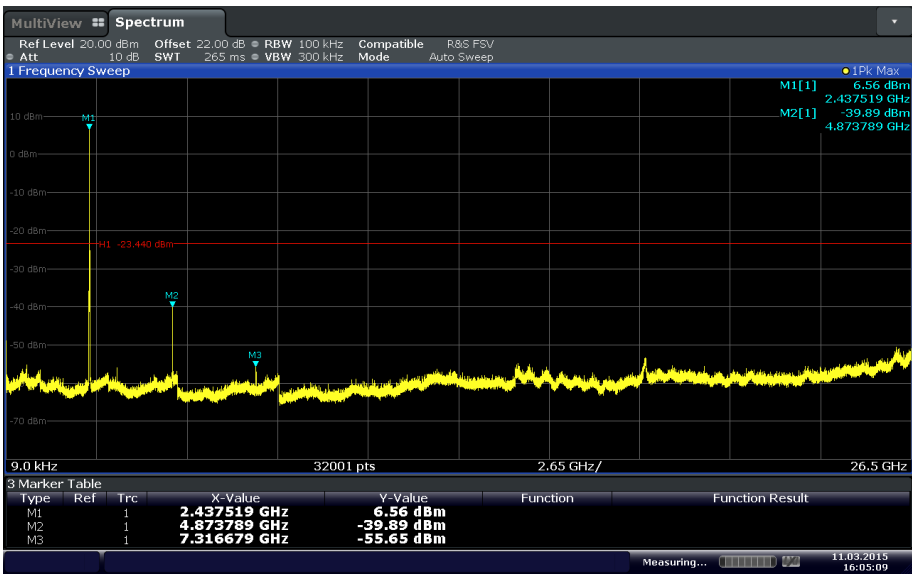
- This is a conducted test.
- An offset 22dB was added to compensate for the external attenuator and cable used.
- An offset of 31.2dB for 5745MHz, 31.0dB for 5785MHz and 31.7dB for 5825MHz were added to compensate for the external attenuator and cable used.
- RBW is 100kHz.VBW is 3X RBW.
- Sweep is auto. Detector is peak. Trace is max hold.
- Initial scan was performed to determine the highest level of the desired power within the band. Limit (display line) was drawn 30dB below this level.
- Spectrum was searched from 9 kHz up to 26.5GHz.

2.5.8 Test Results Plots



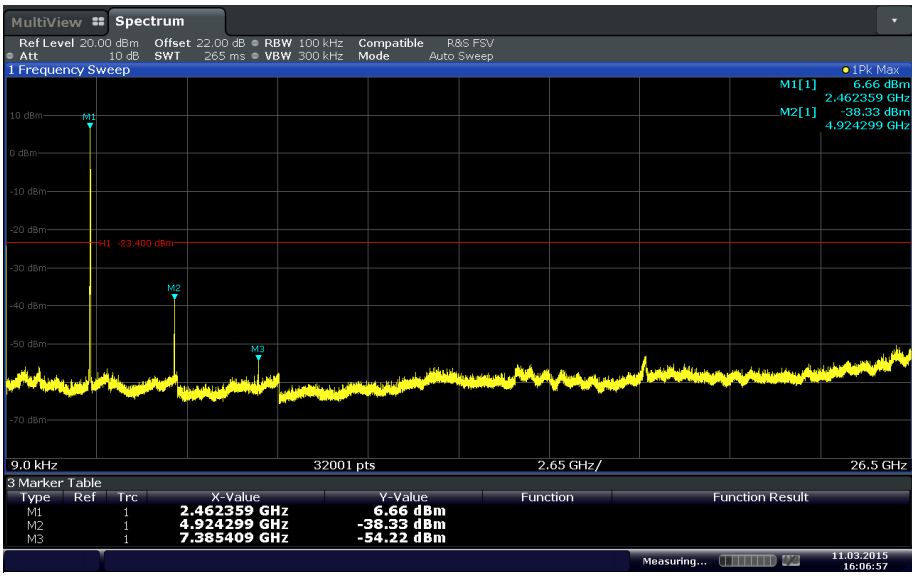
Date: 11.MAR.2015 16:03:22

802.11b SISO mode Channel 1 (2412MHz)



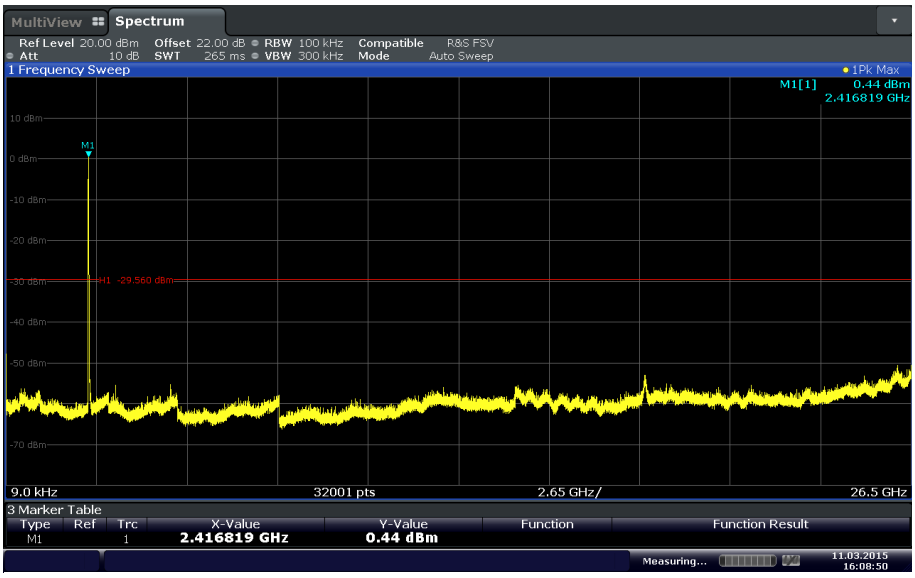
Date: 11.MAR.2015 16:05:09

802.11b SISO mode Channel 6 (2437MHz)



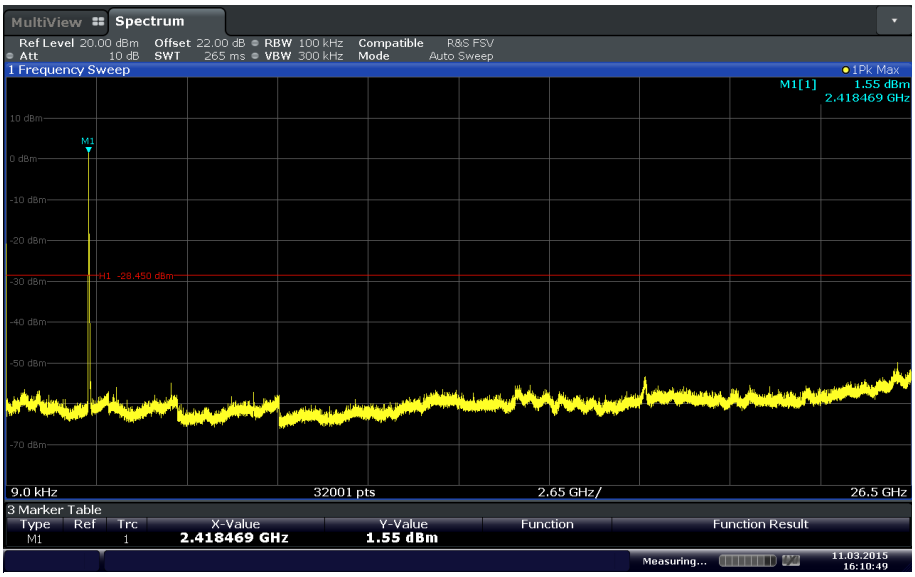
Date: 11.MAR.2015 16:06:57

802.11b SISO mode Channel 11 (2462MHz)



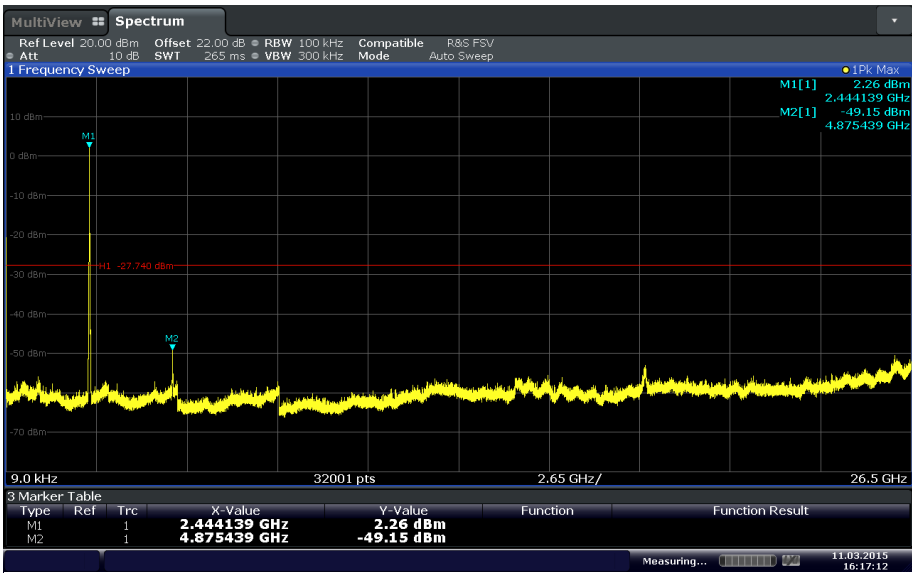
Date: 11.MAR.2015 16:08:51

802.11g SISO mode Channel 1 (2412MHz)



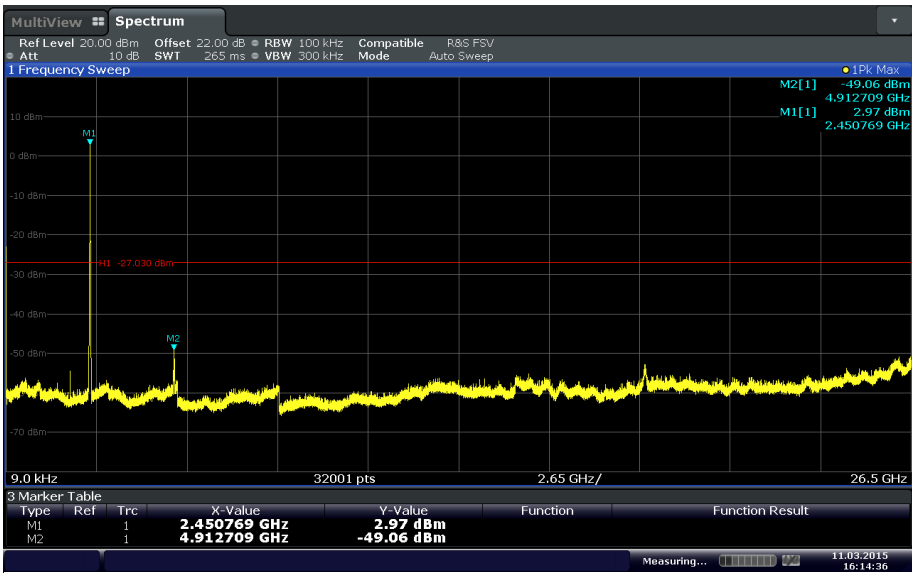
Date: 11.MAR.2015 16:10:49

802.11g SISO mode Channel 2 (2417MHz)



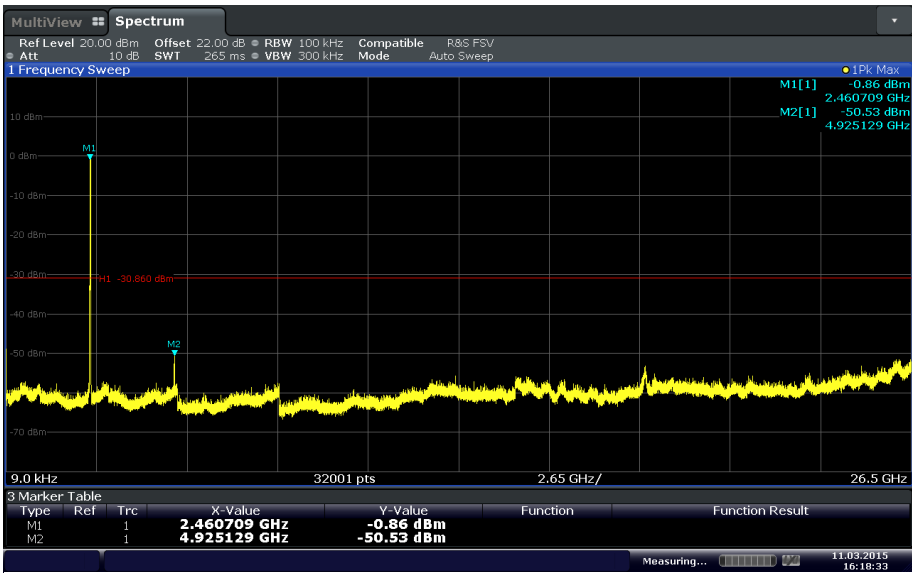
Date: 11.MAR.2015 16:17:12

802.11g SISO mode Channel 6 (2437MHz)



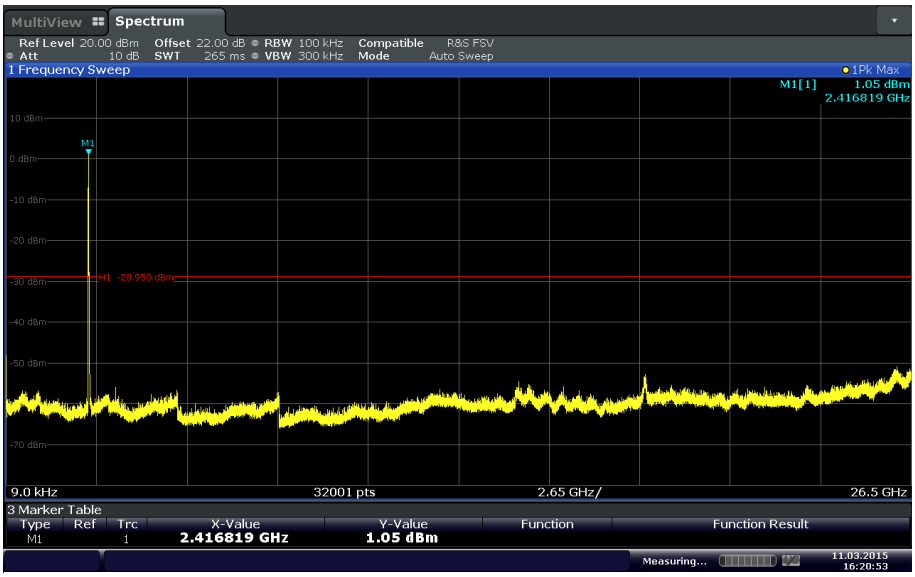
Date: 11.MAR.2015 16:14:36

802.11g SISO mode Channel 10 (2457MHz)



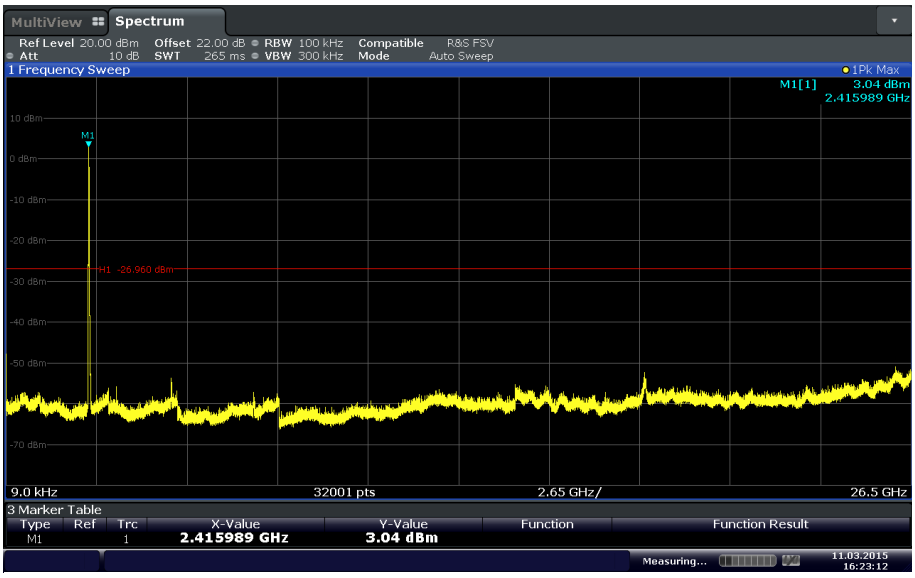
Date: 11.MAR.2015 16:18:34

802.11g SISO mode Channel 11 (2462MHz)



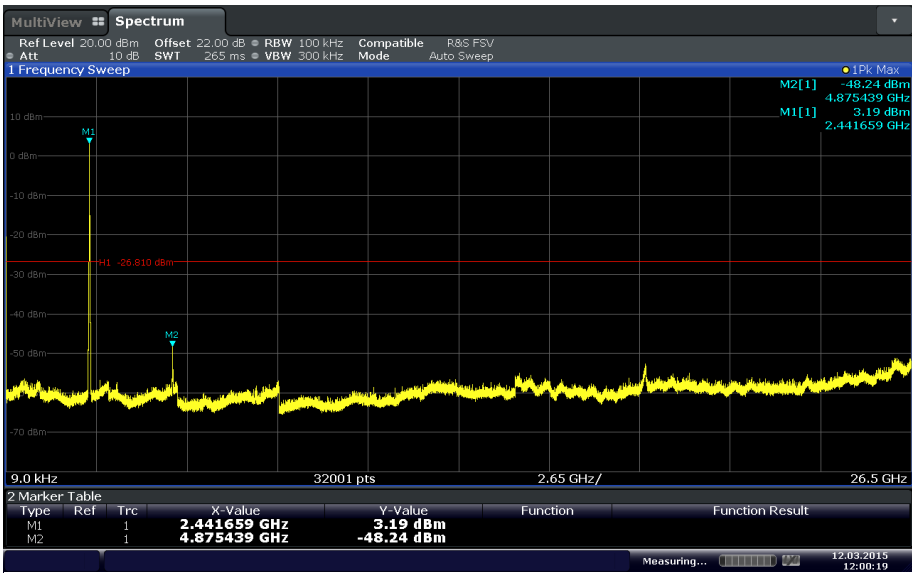
Date: 11.MAR.2015 16:20:53

802.11n ht20 SISO mode Channel 1 (2412MHz)



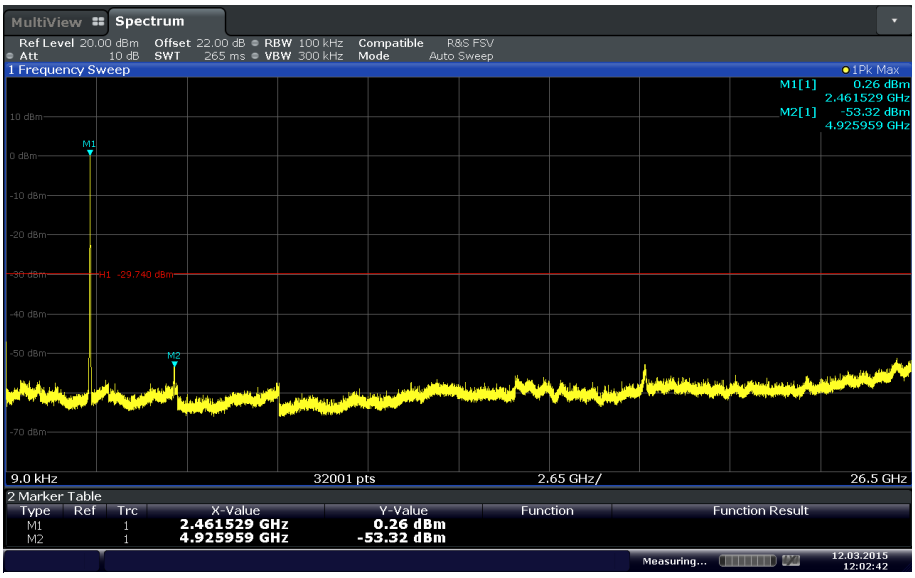
Date: 11.MAR.2015 16:23:12

802.11n ht20 SISO mode Channel 2 (2417MHz)



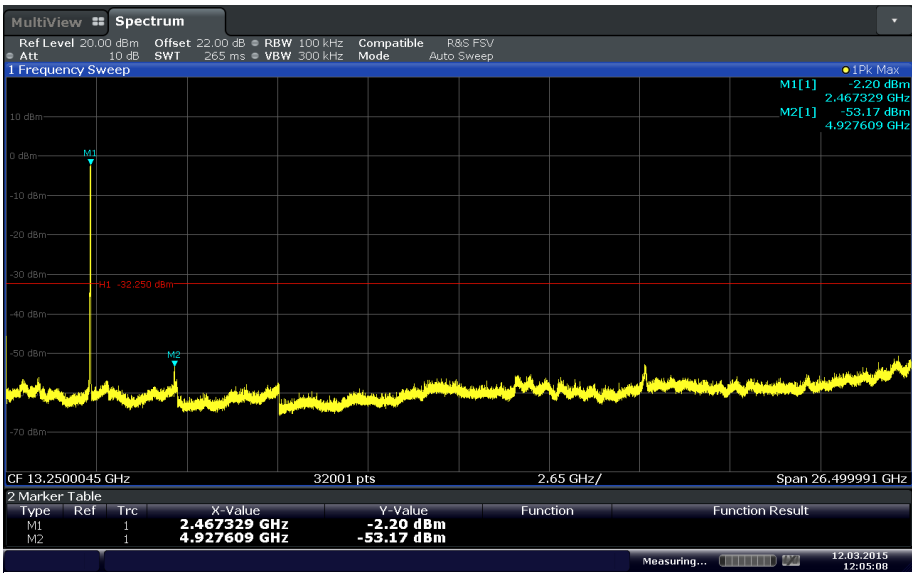
Date: 12.MAR.2015 12:00:19

802.11n ht20 SISO mode Channel 6 (2437MHz)



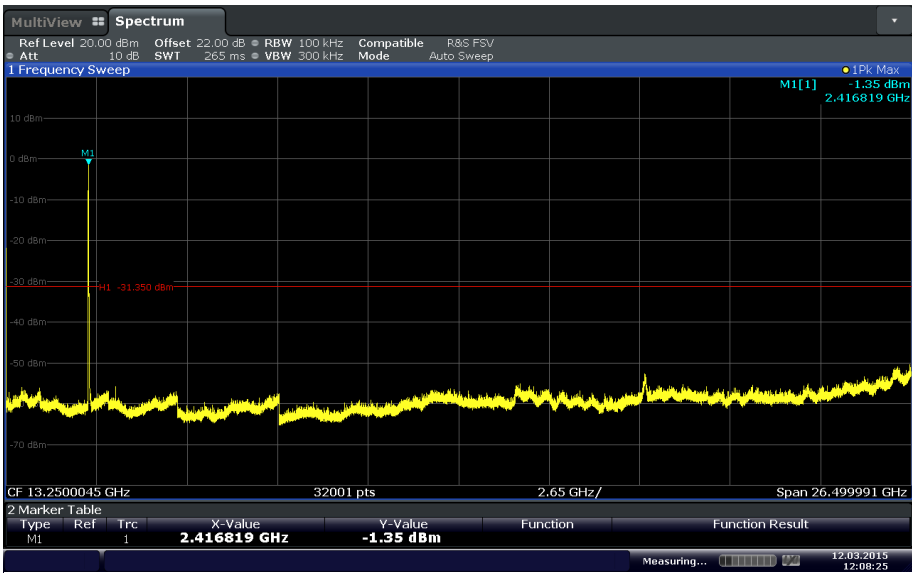
Date: 12.MAR.2015 12:02:41

802.11n ht20 SISO mode Channel 10 (2457MHz)



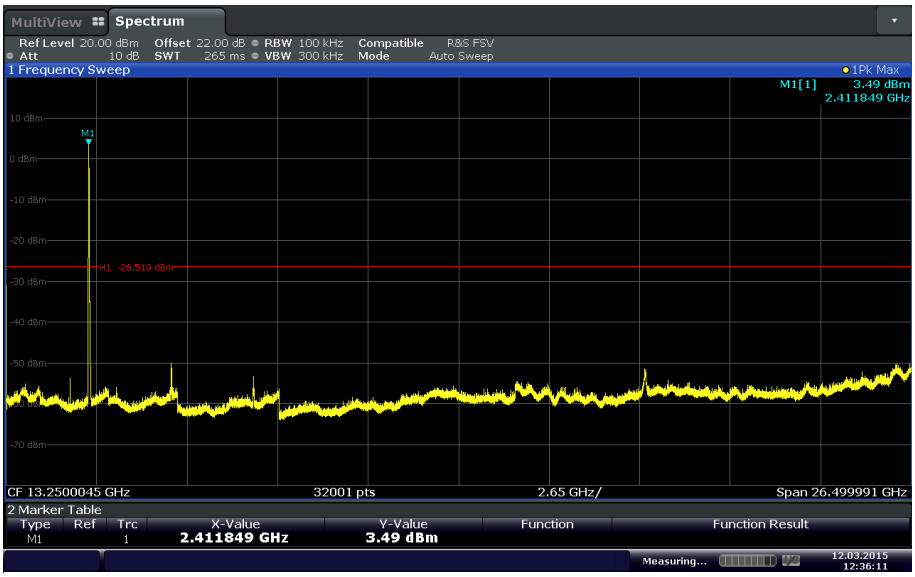
Date: 12.MAR.2015 12:05:08

802.11n ht20 SISO mode Channel 11 (2462MHz)



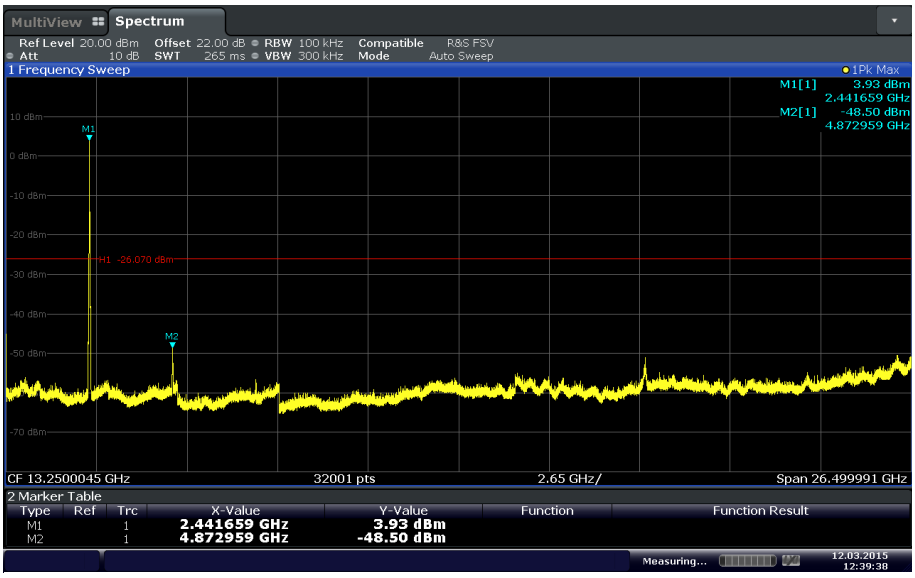
Date: 12.MAR.2015 12:08:25

802.11n ht20 MIMO mode Channel 1 (2412MHz)



Date: 12.MAR.2015 12:36:12

802.11n ht20 MIMO mode Channel 2 (2417MHz)



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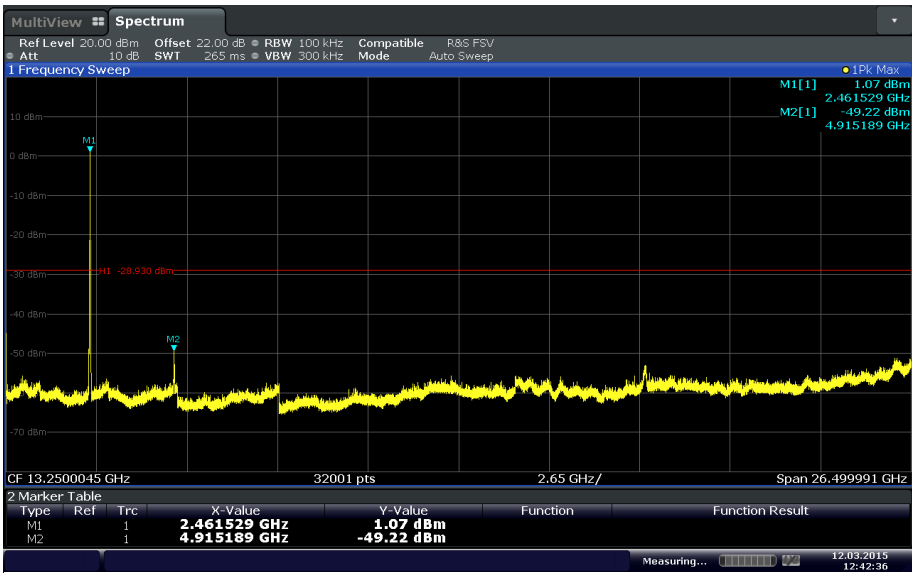
802.11n ht20 MIMO mode Channel 6 (2437MHz)



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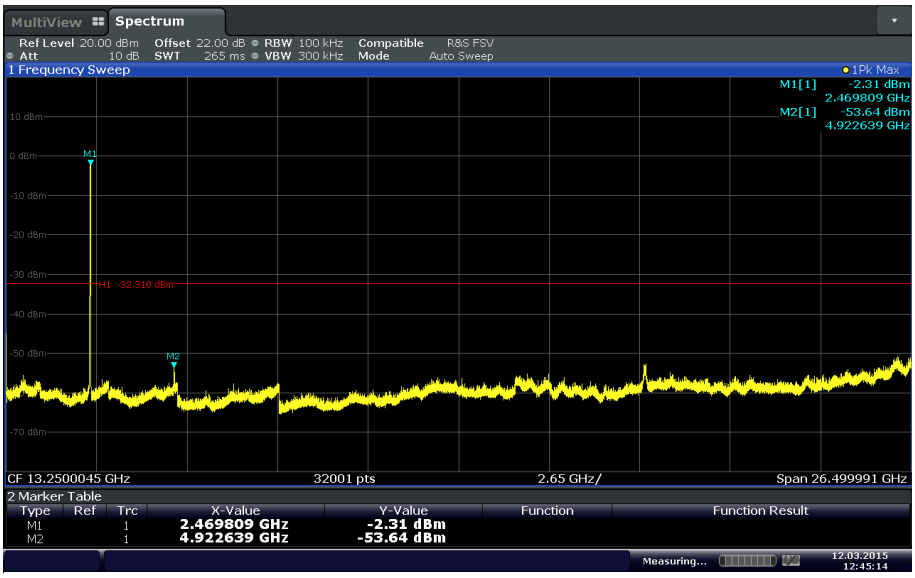
802.11n ht20 MIMO mode Channel 10 (2457MHz)



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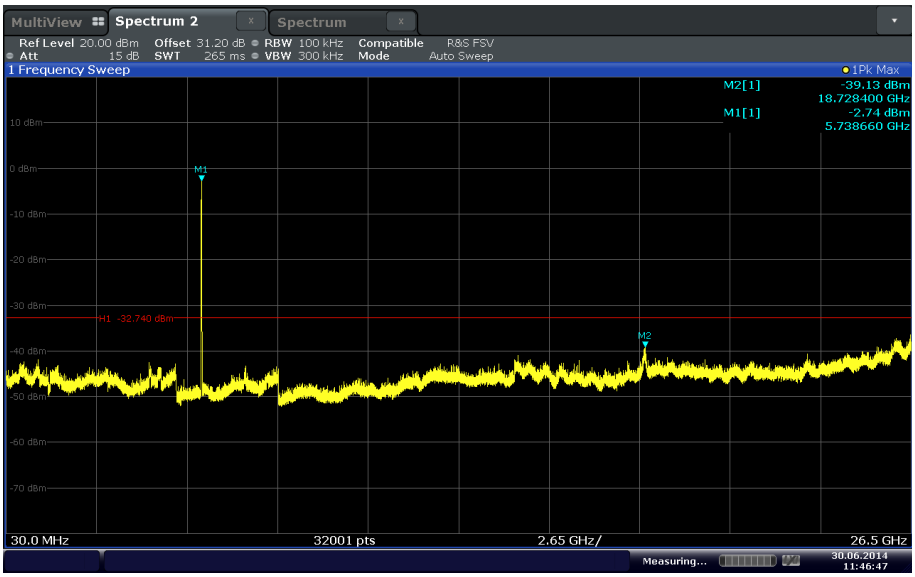
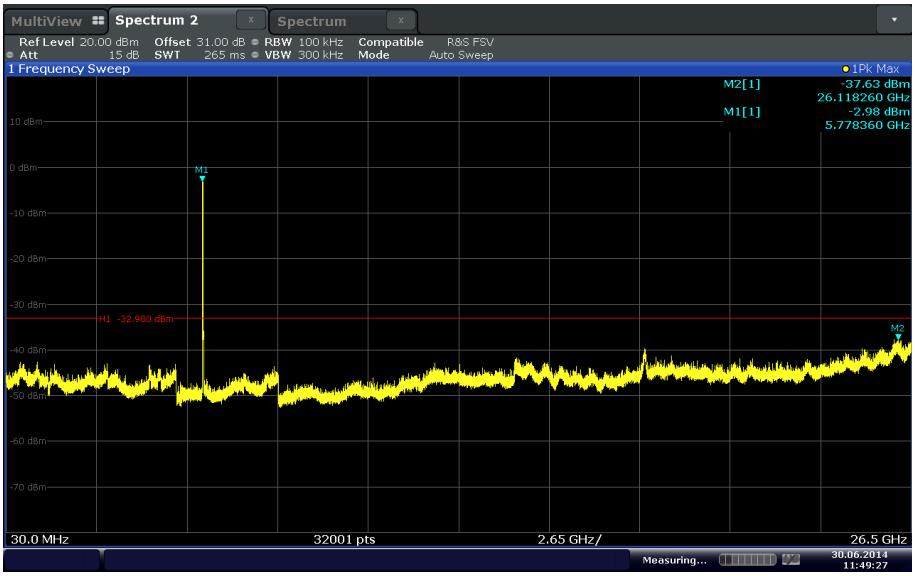
802.11n ht20 MIMO mode Channel 11 (2462MHz)



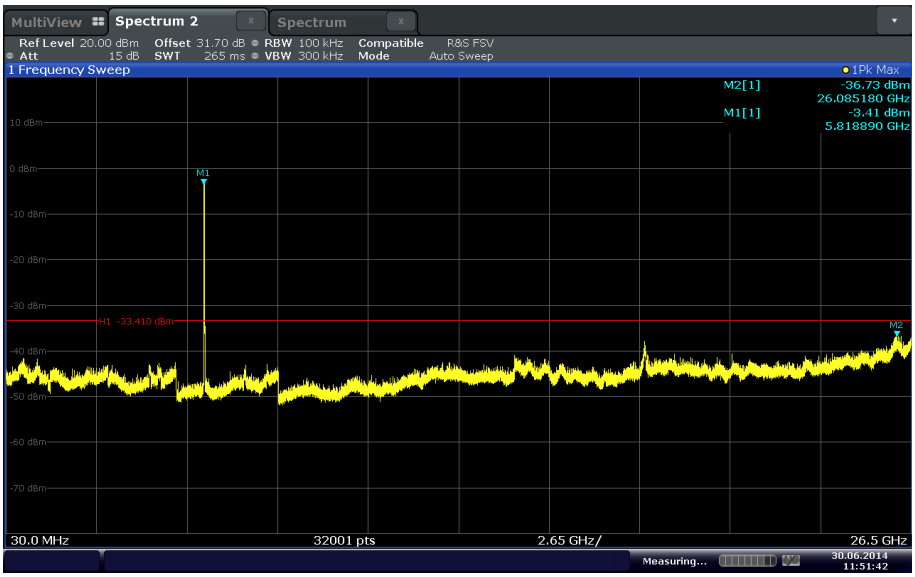
Date: 30.JUN.2014 11:46:48

802.11a mode SISO Channel 149 (5745MHz)



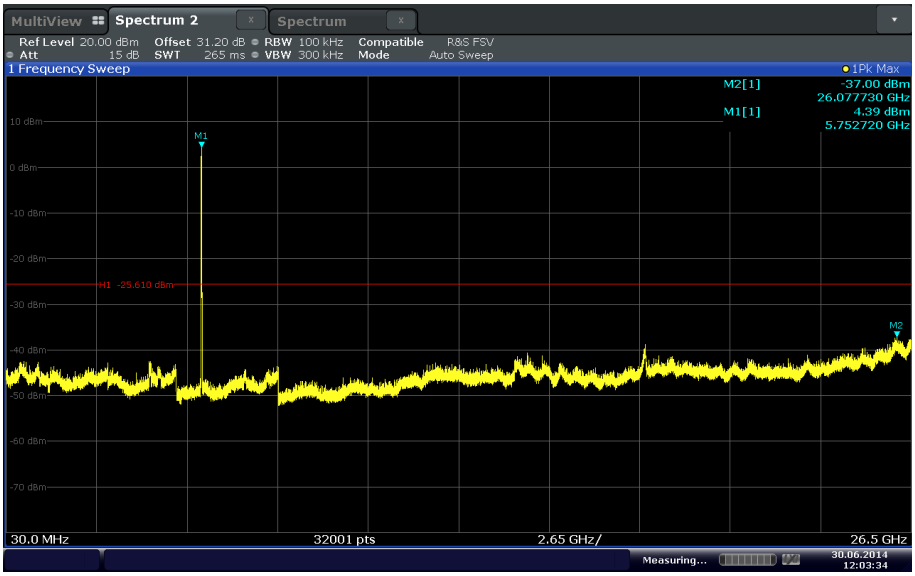
Date: 30.JUN.2014 11:49:27

802.11a mode SISO Channel 157 (5785MHz)



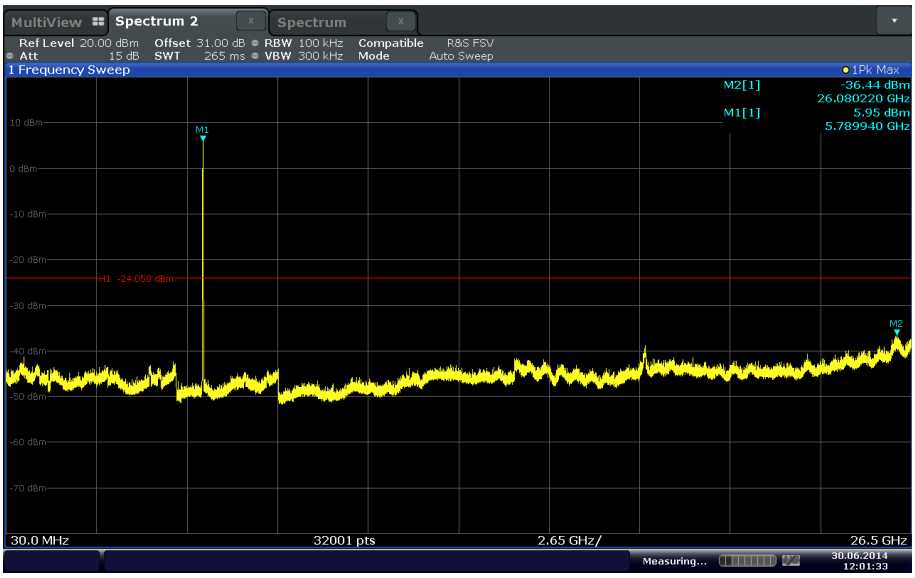
Date: 30.JUN.2014 11:51:42

802.11a mode SISO Channel 165 (5825MHz)



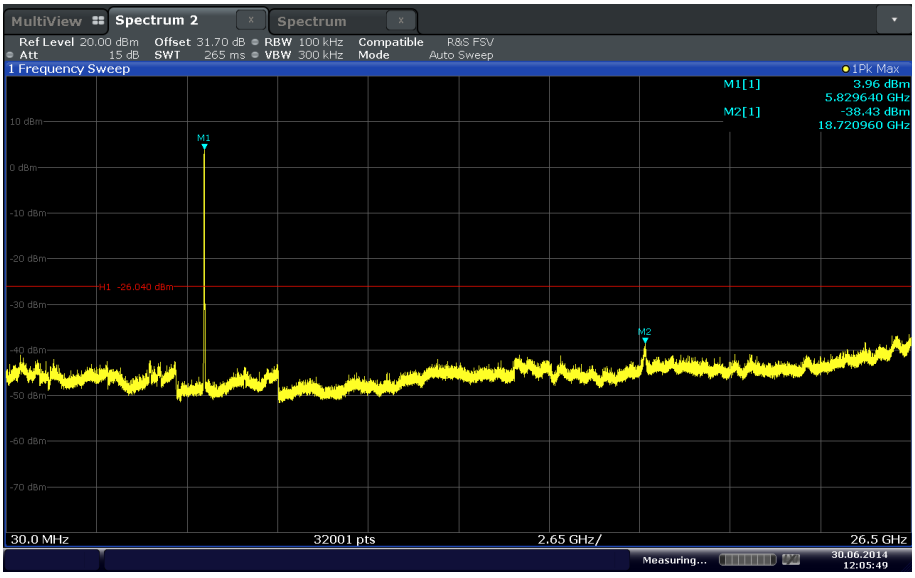
Date: 30.JUN.2014 12:03:35

802.11n ht20 mode MIMO Channel 149 (5745MHz)



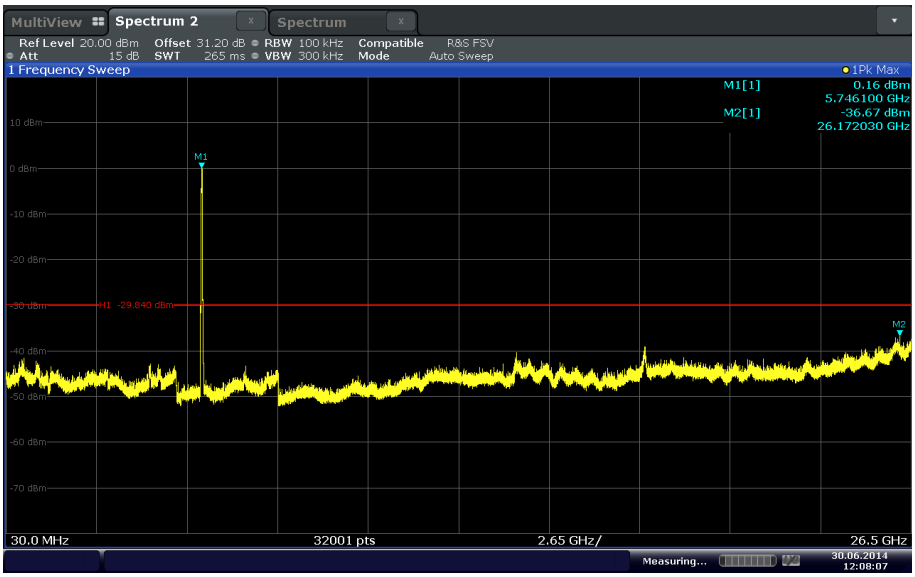
Date: 30.JUN.2014 12:01:33

802.11n ht20 mode MIMO Channel 157 (5785MHz)



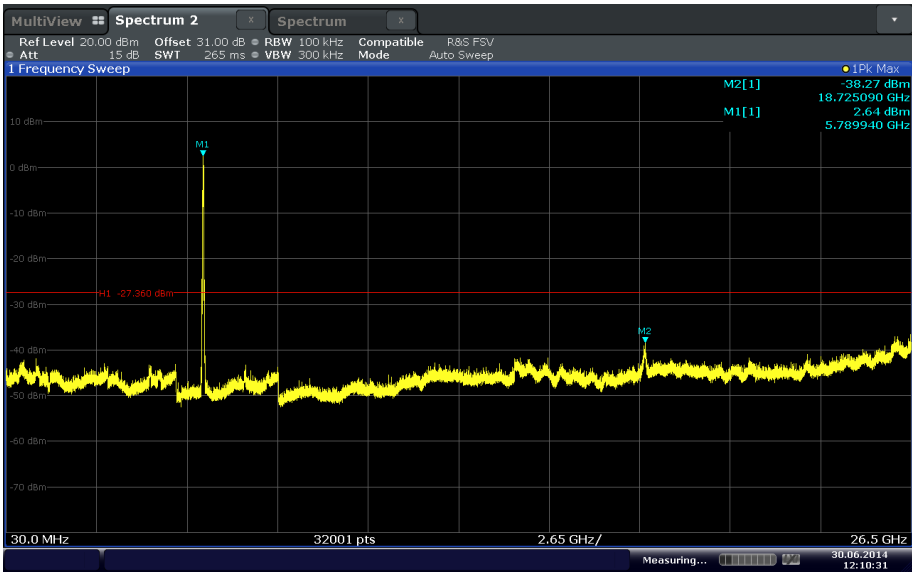
Date: 30.JUN.2014 12:05:50

802.11n ht20 mode MIMO Channel 165 (5825MHz)



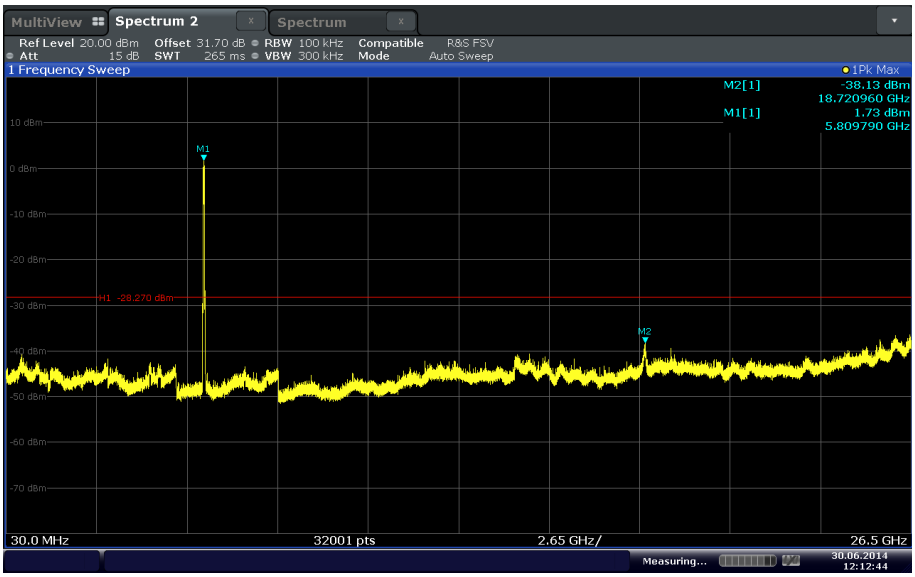
Date: 30.JUN.2014 12:08:07

802.11n ht40 mode MIMO Channel 151 (5755MHz)



Date: 30.JUN.2014 12:10:31

802.11n ht40 mode MIMO Channel 157 (5785MHz)



802.11n ht40 mode MIMO Channel 163 (5815MHz)

2.6 BAND-EDGE COMPLIANCE OF RF CONDUCTED EMISSIONS

2.6.1 Specification Reference

Part 15 Subpart C §15.247(d)

2.6.2 Standard Applicable

See previous test.

2.6.3 Equipment Under Test and Modification State

Serial No: SH181214900051 / Test Configuration A

2.6.4 Date of Test/Initial of test personnel who performed the test

March 11, 2015 / AC

2.6.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.6.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	22.3°C
Relative Humidity	30.3%
ATM Pressure	99.6 kPa

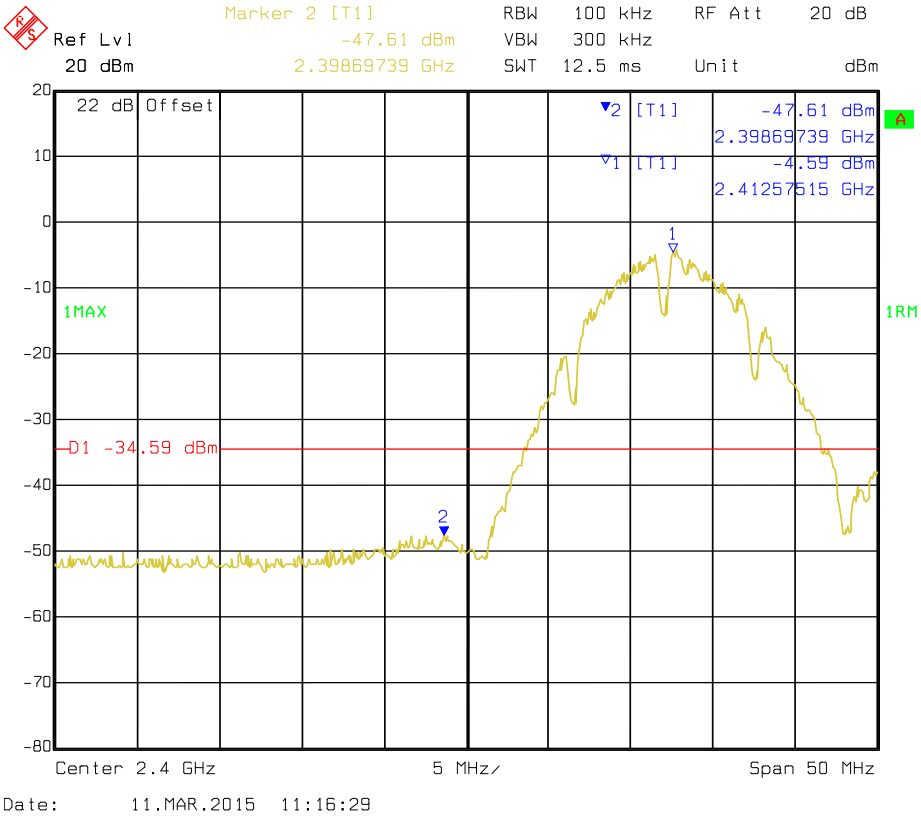
2.6.7 Additional Observations

- Setup is identical to “Out-of-Band Emissions – Conducted“ test (previous test).
- An offset 22dB was added to compensate for the external attenuator and cable used.
- An offset of 31.2dB for 5745MHz, 31.0dB for 5785MHz and 31.7dB for 5825MHz were added to compensate for the external attenuator and cable used.
- Band-edges (2400MHz and 2483.5MHz/5725MHz and 5850MHz) were verified in this test.
- Test methodology is per Clause 13.3.2 of KDB 558074 (D01 DTS Meas Guidance v03r0q, June 05, 2014); trace averaging with continuous EUT transmission at full power.
- Limits are 30dBc from the highest level of the desired power within the band.

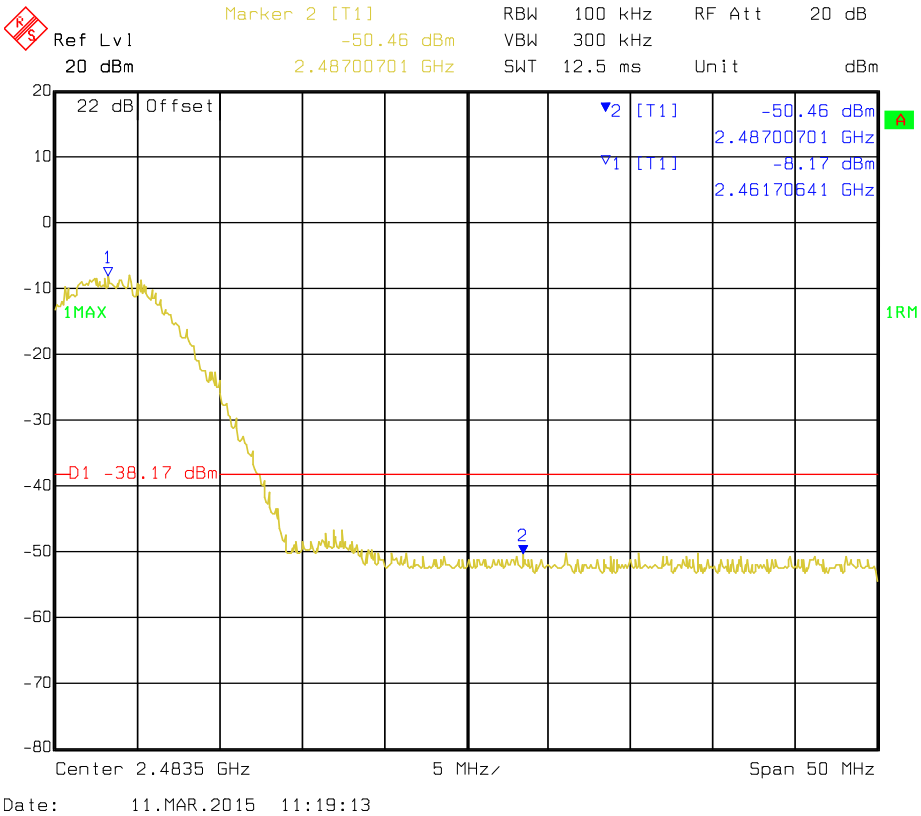
2.6.8 Test Results

Complies. See attached plots.

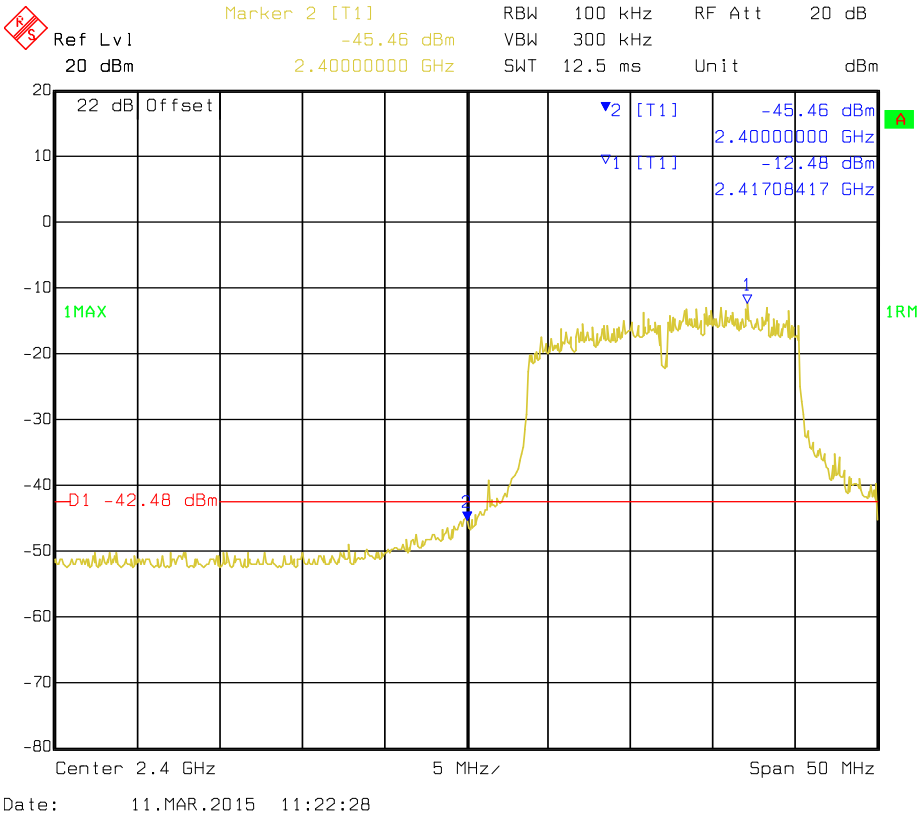
TÜV SÜD AMERICA INC 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone: 858 678 1400 FAX: 858 546 0364



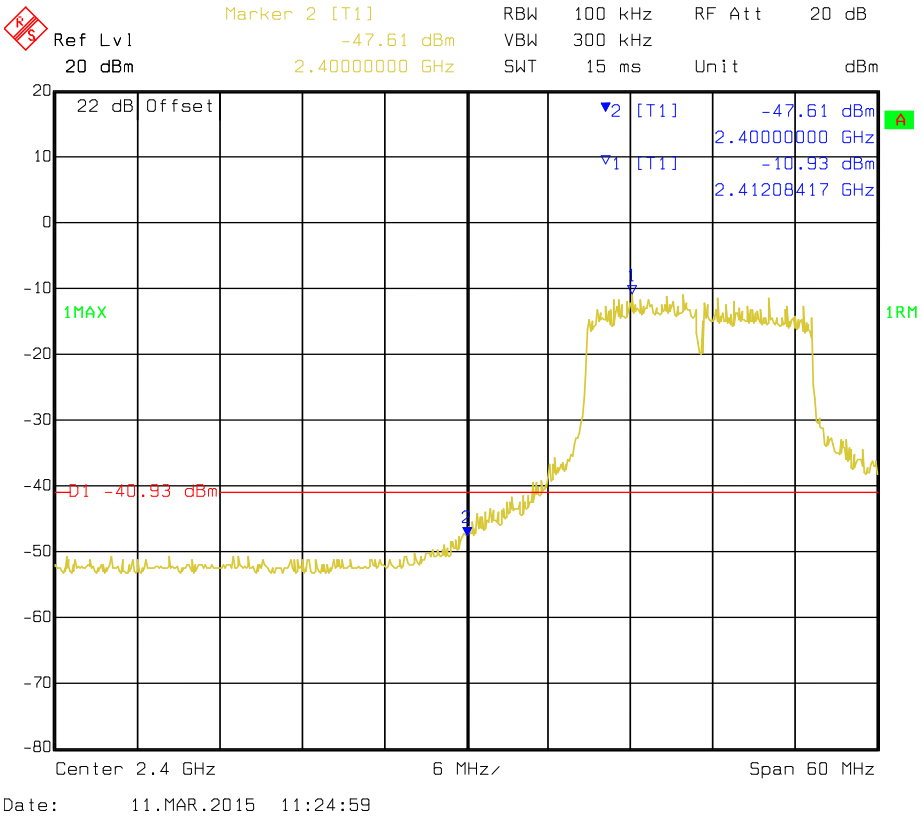
Lower Bandedge 802.11b SISO mode Channel 1 (2412MHz)



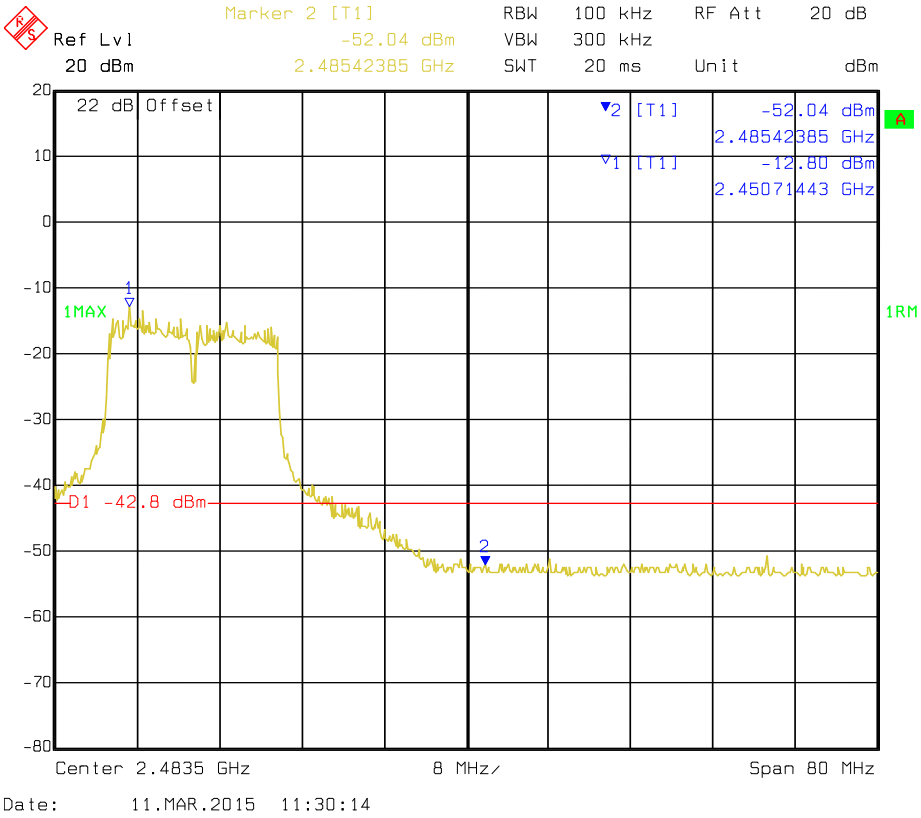
Upper Bandedge 802.11b SISO mode Channel 11 (2462MHz)



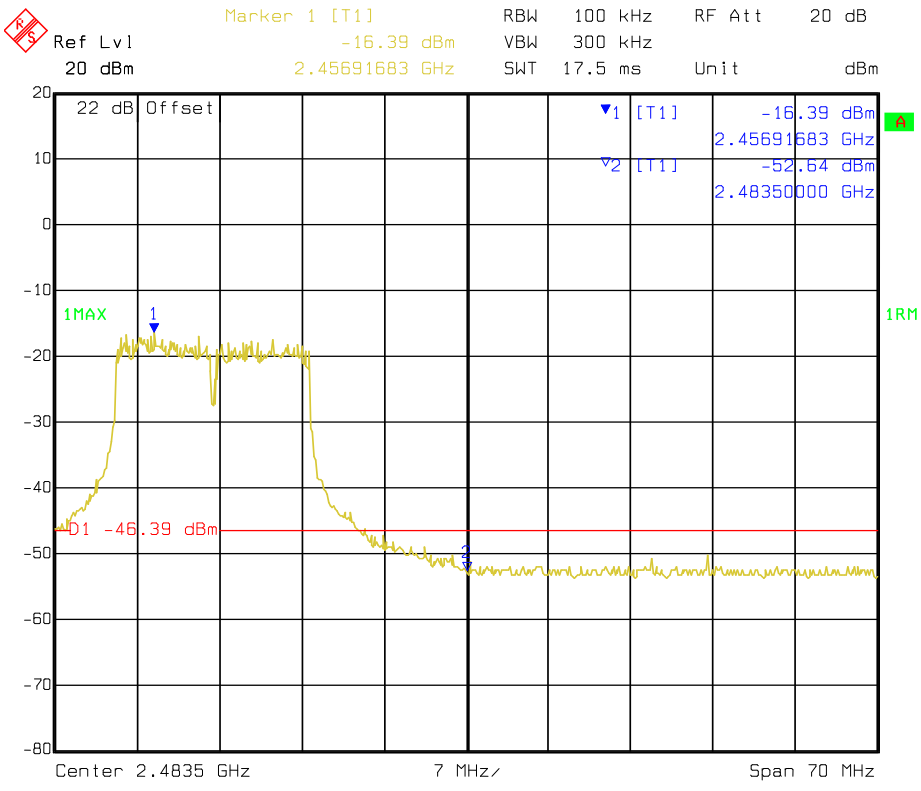
Lower Bandedge 802.11g SISO mode Channel 1 (2412MHz)



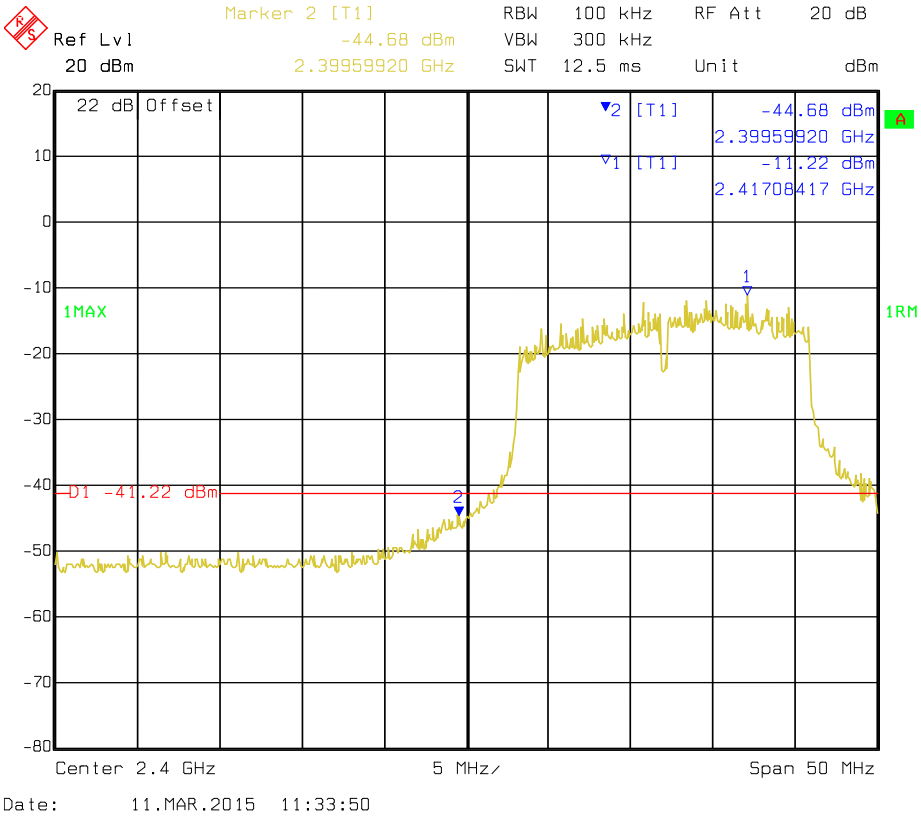
Lower Bandedge 802.11g SISO mode Channel 2 (2417MHz)



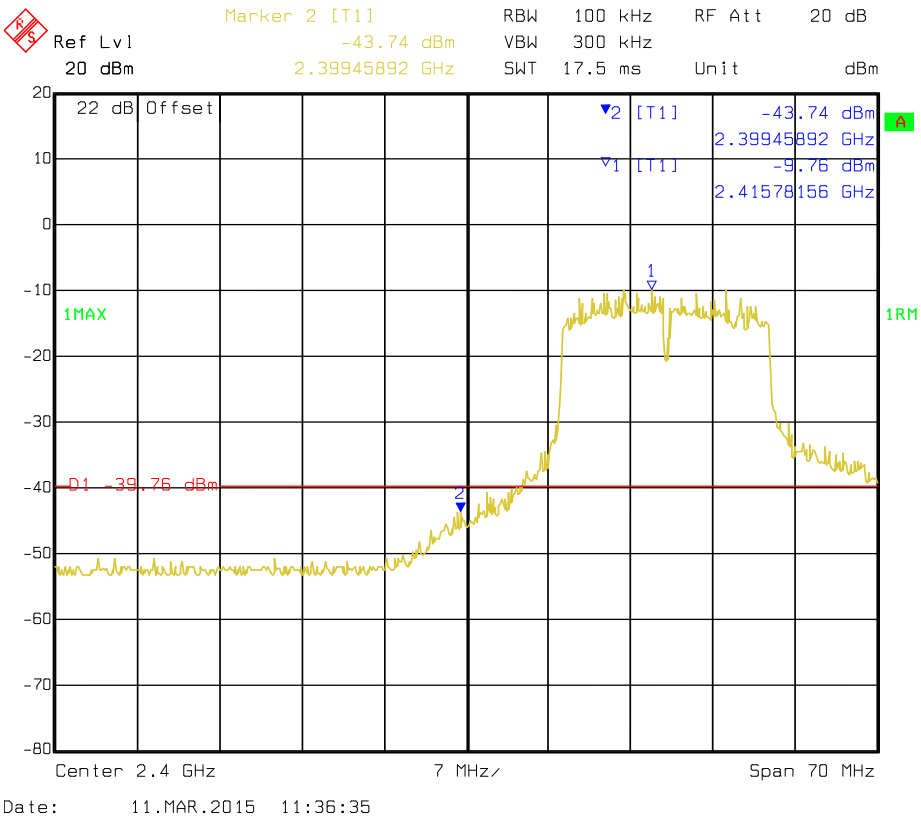
Upper Bandedge 802.11g SISO mode Channel 10 (2457MHz)



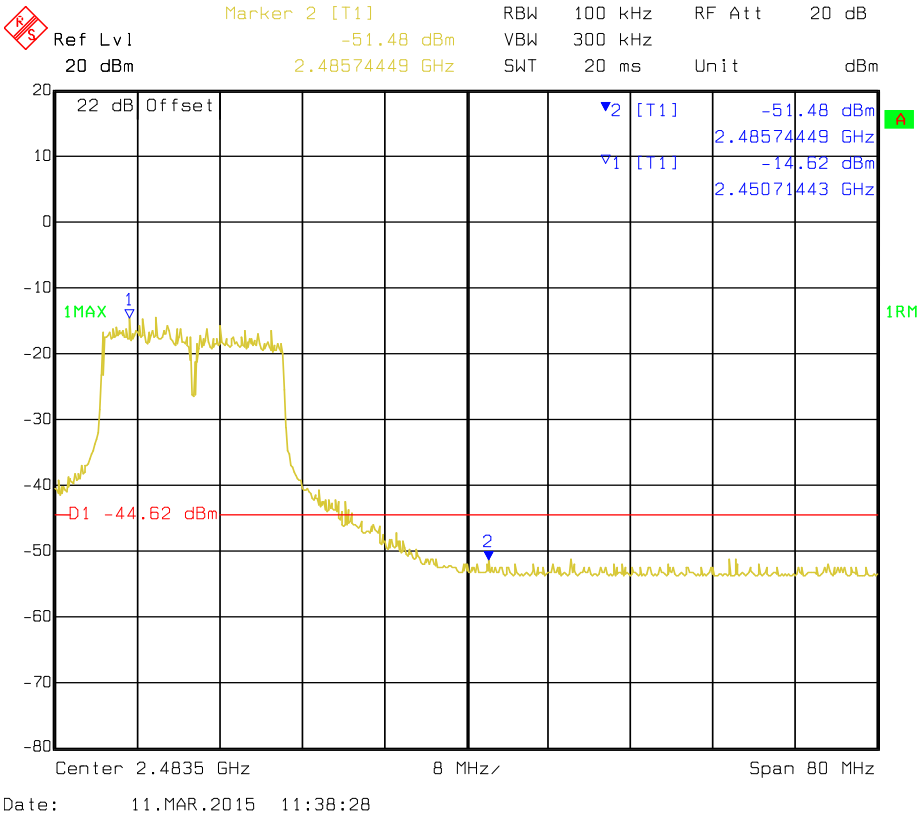
Upper Bandedge 802.11g SISO mode Channel 11 (2462MHz)



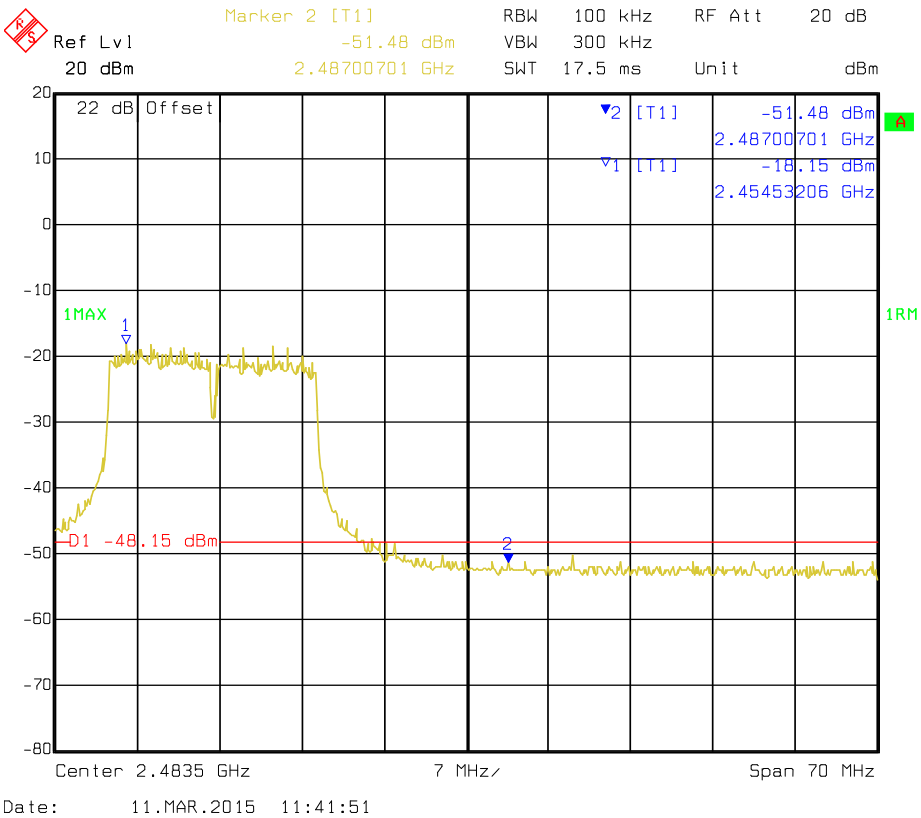
Lower Bandedge 802.11n ht20 SISO mode Channel 1 (2412MHz)



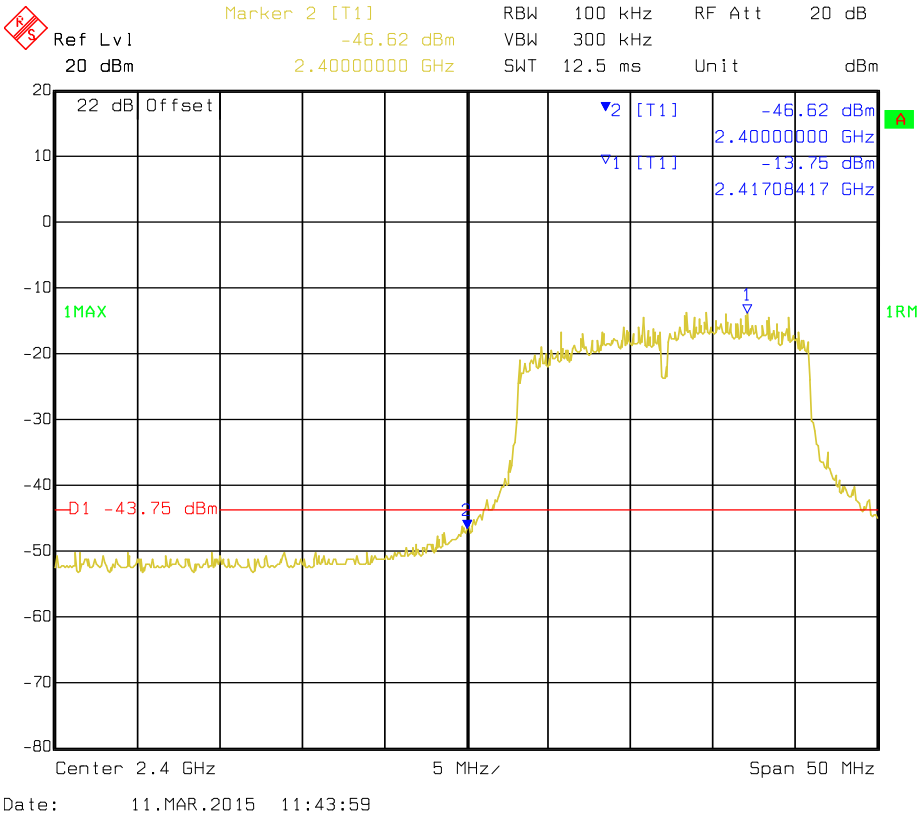
Lower Bandedge 802.11n ht20 SISO mode Channel 2 (2417MHz)



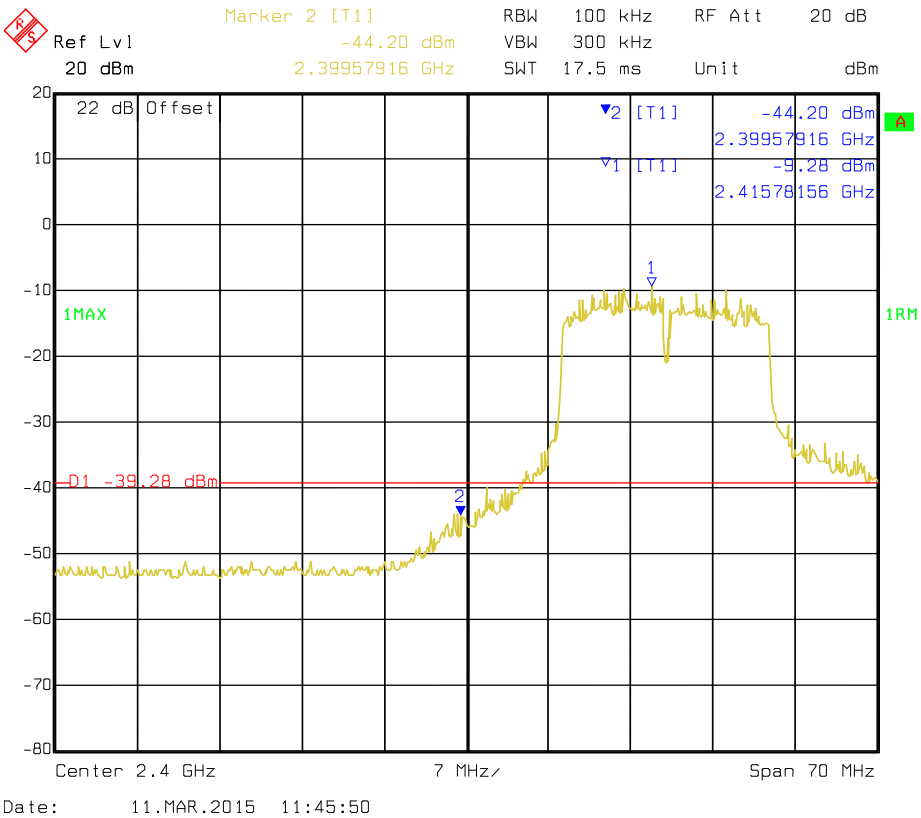
Upper Bandedge 802.11n ht20 SISO mode Channel 10 (2457MHz)



Upper Bandedge 802.11n ht20 SISO mode Channel 11 (2462MHz)



Lower Bandedge 802.11n ht20 MIMO mode Channel 1 (2412MHz)



Lower Bandedge 802.11n ht20 MIMO mode Channel 2 (2417MHz)