

# FCC TEST REPORT

Test report No.:

EMC-FCC-R0192

FCC ID:

WOT- VM1510

Type of equipment:

STB

Model Name:

VM1510

Applicant:

KAONMEDIA CO.,LTD.

Max.RF Output Power:

26.86 dBm

FCC Rule Part(s):

FCC Part 15 Subpart C 15.247

Frequency Range:

 $2~412~\text{MHz} \sim 2~462~\text{MHz}$ 

 $2422 \text{ MHz} \sim 2452 \text{ MHz}$ 

Test result:

Complied

The above equipment was tested by EMC compliance Testing Laboratory for compliance with the requirements of FCC Rules and Regulations.

The results of testing in this report apply to the product/system which was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Date of receipt: 2013. 09. 04

Date of test: 2014. 10. 13 ~ 10. 20

Issued date: 2014. 11. 19

Tested by:

AHN, BYUNG WOO

Approved by:

YU, SANG HOON

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# 1. Client information

**Applicant:** KAONMEDIA CO.,LTD.

Address: KAONMEDIA Building, 884-3, Seongnam-daero, Bundang-Gu,

Sungnam-City, Kyonggi-Do, 463-839 Korea

**Telephone number:** +82-31-724-8666

**Facsimile number:** +82-31-724-8999

Contact person: Gu, Gyo Jun / peter.gu@kaonmedia.com

**Manufacturer:** KAONMEDIA CO.,LTD.

Address: KAONMEDIA Building, 884-3, Seongnam-daero, Bundang-Gu,

Sungnam-City, Kyonggi-Do, 463-839 Korea



# 2. Laboratory information

#### Address

#### **EMC** compliance Ltd.

480-5, Sin-dong, Yeongtong-gu, Suwon-si, Gyeonggi-do, Korea

Telephone Number: 82-31-336-9919 Facsimile Number: 82-505-299-8311

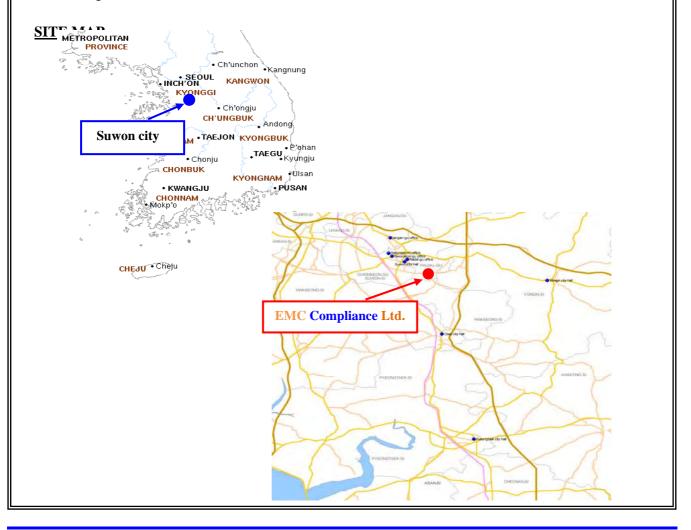
#### **Certificate**

KOLAS No.: 231

FCC Site Designation No: KR0040 FCC Site Registration No: 687132

VCCI Site Registration No.: R-3327, G-198, C-3706, T-1849

IC Site Registration No.:8035A-2





# 3. Description of E.U.T.

# 3.1 Basic description

Applicant:	KAONMEDIA CO.,LTD.
Address of Applicant	KAONMEDIA Building, 884-3, Seongnam-daero, Bundang-Gu, Sungnam-City, Kyonggi-Do, 463-839 Korea
Manufacturer#1	KAONMEDIA CO.,LTD.
Address of Manufacturer	KAONMEDIA Building, 884-3, Seongnam-daero, Bundang-Gu, Sungnam-City, Kyonggi-Do, 463-839 Korea
Type of equipment	STB
Basic Model	VM1510
Serial number	N/A



# 3.2 General description

1	
Frequency Range	2 412 Mtz ~ 2 462 Mtz (802.11b/g/n_HT20)_MIMO 2 422 Mtz ~ 2 452 Mtz (802.11n_HT40)_MIMO 5 180 Mtz ~ 5 240 Mtz (802.11a/an_HT20)_Non DFS_MIMO 5 190 Mtz ~ 5 230 Mtz (802.11an_HT40)_Non DFS_MIMO 5 260 Mtz ~ 5 320 Mtz (802.11a/an_HT20)_DFS_MIMO 5 270 Mtz ~ 5 310 Mtz (802.11an_HT40)_DFS_MIMO 5 500 Mtz ~ 5 700 Mtz (802.11a/an_HT20)_DFS_MIMO 5 510 Mtz ~ 5 670 Mtz (802.11a/an_HT20)_DFS_MIMO 5 745 Mtz ~ 5 825 Mtz (802.11a/an_HT20)_Non DFS_MIMO 5 755 Mtz ~ 5 795 Mtz (802.11an_HT40)_Non DFS_MIMO
Communication	IEEE 802.11a/b/g/n_HT20, HT40
Type of Modulation	CCK, OFDM
Number of Channels	2.0 分: 11 ch (802.11b/g/n_HT20), 9 ch (802.11n_HT40) 5.0 分: 4 ch (11a/an_HT20): 5 150 Mb Band 2 ch (802.11an_HT40): 5 150 Mb Band 4 ch (11a/an_HT20): 5 250 Mb Band 2 ch (802.11an_HT40): 5 250 Mb Band 4 ch (11a/an_HT40): 5 470 Mb Band 8 ch (11a/an_HT20): 5 470 Mb Band 5 ch (11a/an_HT20): 5 725 Mb Band 2 ch (802.11an_HT40): 5 725 Mb Band
Type of Antenna	FIPA Antenna
Antenna Gain	2 6世: 2.93 dBi 5 6世: 5 150 M世 Band: 2.96 dBi 5 250 M世 Band: 2.99 dBi 5 470 M世 Band: 2.98 dBi 5 725 M世 Band: 2.91 dBi
Transmit Power	26.86 dBm
Power supply	DC 12 V (AC Adaptor: S024WM1200200)



# 3.3 Available channel list and frequency

# 802.11b/g/n\_HT20

	Frequency
Low frequency	2 412 Mb
Middle frequency	2 437 Mb
High frequency	2 462 Mb

## 802.11n\_HT40

	Frequency
Low frequency	2 422 Mb
Middle frequency	2 437 Mb
High frequency	2 452 Mb

# 3.4 Test Voltage

mode	Voltage
Norminal voltage	DC 12 V

# 4. Summary of test results

# 4.1 Standards & results

FCC Rule Reference	IC Rule Reference	Parameter	Report Section	Test Result
15.203, 15.247(b)(4)	RSS-GEN, 7.1.2	Antenna Requirement	5.1	С
15.247(b)(3)	RSS-210, A8.4(2)	Maximum Peak Output Power	5.2	C
15.247(e)	-	Peak Power Spectral Density	5.3	С
15.247(a)(2)	RSS-GEN,4.6.2	6 dB Channel Bandwidth	5.4	C
-	RSS-210, A1.1	Occupied Bandwidth	5.4	С
15.247(d), 15.205(a), 15.209(a)	RSS-210, A8.5 RSS-210, A2.9 RSS-GEN, 7.2.3	Spurious Emission, Band Edge, and Restricted bands	5.5	С
15.207(a)	RSS-GEN, 7.2.4	Conducted Emissions	5.6	C

Note: C = complies

NC = Not complies NT = Not tested NA = Not Applicable

# 4.2 Uncertainty

Measurement Item	Expanded Uncertainty U = KUc (K = 2)		
Conducted RF power	± 1	1. <b>36</b> dB	
Conducted Spurious Emissions	± 1.52 dB		
	30 Mb ~ 300 Mb:	+ 4.94 dB, - 5.06 dB	
		+ 4.93 dB, - 5.05 dB	
Radiated Spurious Emissions	300 MHz ~ 1 000 MHz:	+ 4.97 dB, - 5.08 dB	
		+ 4.84 dB, - 4.96 dB	
	1 GHz ~ 25 GHz:	+ 6.03 dB, - 6.05 dB	
	9 kHz ~ 150 kHz:	± 3.75 dB	
Conducted Emissions	150 kHz ~ 30 MHz:	± 3.36 dB	



# 5. Test results

# 5.1 Antenna Requirement

# 5.1.1 Regulation

According to §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

And according to §15.407(a)(1)(2)(3), If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

# 5.1.2 Result

# -Complied

The transmitter has an integral PCB antenna.

The total directional peak gain of the antenna not exceeds 6.0 dBi

	2 412 ~ 2 462 Mb
ANT Gain	2.93 dBi

According to KDB 662911 D01 Multiple Transmitter Output v02r01

- Directional gain =  $G_{ANT}$  + Array Gain, where Array Gain is as follows.

For power spectral density (PSD) measurements on all devices,

Array Gain =  $10 \log(Nant/Nss)$  dB.

Total gain = 5.94 dBi (individual gain(2.93 dBi) + Array gain(3.01 dBi))

For power measurements on IEEE 802.11 devices

Array Gain = 0 dB (i.e., no array gain) for Nant  $\leq 2$ ;

Array Gain = 0 dB (i.e., no array gain) for channel widths  $\geq$  40 Mz for any Nant;

Array Gain =  $5 \log(N_{ANT}/N_{SS})$  dB or 3 dB, whichever is less, for 20-MHz channel widths with  $N_{ANT} \ge 5$ .

For power measurements on all other devices:

Array Gain = 10 log(Nant/Nss) dB.

Total gain = 2.93 dBi (individual gain(2.93 dBi) + Array gain(0 dBi))



# 5.2 Maximum Peak Output Power

# 5.2.1 Regulation

According to §15.247(b)(3), For systems using digital modulation in the 902-928 Mz, 2 400-2 483.5 Mz, and 5 725-5 850 Mz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

According to §15.247(b)(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### 5.2.2 Measurement Procedure

These test measurement settings are specified in section 9.0 of 558074 D01 DTS Meas Guidance.

#### 5.2.2.1 PKPM1 Peak power meter method

The maximum peak conducted output power may be measured using a broadband peak RF power meter.

The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.

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# 5.2.3 Test Result

# - Complied

# \* 802.11b

Channel	Frequency (Mt)	Result (dBm)	Limit (dBm)	Margin (dB)
Low	2 412	19.68	30.00	10.32
Middle	2 437	19.24	30.00	10.76
High	2 462	18.99	30.00	11.01

#### \* 802.11g

Channel	Frequency (畑)	Result (dBm)	Limit (dBm)	Margin (dB)
Low	2 412	24.62	30.00	5.38
Middle	2 437	24.80	30.00	5.20
High	2 462	24.88	30.00	5.12

#### \* 802.11n HT20

Channel	Frequency (Mb)	Result (dBm)	Limit (dBm)	Margin (dB)
Low	2 412	24.17	30.00	5.83
Middle	2 437	24.19	30.00	5.81
High	2 462	23.87	30.00	6.13

# \* 802.11n HT20\_MIMO(ANT 1+2)

Channel	Frequency (Mb)	Result (dBm)	Limit (dBm)	Margin (dB)
Low	2 412	26.79	30.00	3.21
Middle	2 437	26.86	30.00	3.14
High	2 462	25.73	30.00	4.27



#### \* 802.11n HT40

Channel	Frequency (Mt)	Result (dBm)	Limit (dBm)	Margin (dB)
Low	2 422	24.29	30.00	5.71
Middle	2 437	23.92	30.00	6.08
High	2 452	23.96	30.00	6.04

#### \* 802.11n HT40\_MIMO (ANT 1+2)

Channel	Frequency (畑)	Result (dBm)	Limit (dBm)	Margin (dB)
Low	2 422	26.66	30.00	3.34
Middle	2 437	26.72	30.00	3.28
High	2 452	26.55	30.00	3.45

#### -NOTE:

- 1. Since the directional gain of the FIPA antenna declared by the manufacturer ( $G_{ANT} = 2.93 \, dBi$ ), does not exceed 6.0 dBi , there was no need to reduce the Power measurement.
- 2. We took the insertion loss of the cable loss into consideration within the measuring instrument.

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# 5.3 Peak Power Spectral Density

# 5.3.1 Regulation

According to §15.247(e), for digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

#### 5.3.2 Measurement Procedure

These test measurement settings are specified in section 10.0 of 558074 D01 DTS Meas Guidance.

#### 5.3.2.1 Method PKPSD (peak PSD)

This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance, and is optional if the maximum conducted (average) output power was used to demonstrate compliance.

- 1) Set analyzer center frequency to DTS channel center frequency.
- 2) Set the span to 1.5 times the DTS bandwidth.
- 3) Set the RBW to:  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ .
- 4) Set the VBW  $\geq$  3 x RBW.
- 5) Detector = peak.
- 6) Sweep time = auto couple.
- 7) Trace mode = max hold.
- 8) Allow trace to fully stabilize.
- 9) Use the peak marker function to determine the maximum amplitude level within the RBW.
- 10) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

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# 5.3.3 Test Result

# - Complied

#### \* 802.11b

Channel	Result [dBm]	Limit [dBm]	Margin [dBm]
Low	6.37	8.00	1.63
Middle	6.53	8.00	1.47
High	6.65	8.00	1.35

#### \* 802.11g

Channel	Result [dBm]	Limit [dBm]	Margin [dBm]
Low	3.84	8.00	4.16
Middle	4.10	8.00	3.90
High	4.19	8.00	3.81

# \* 802.11n HT20

Channel	Result [dBm]	Limit [dBm]	<b>Margin</b> [dBm]
Low	2.53	8.00	5.47
Middle	2.23	8.00	5.77
High	2.51	8.00	5.49

# \* 802.11n HT20\_MIMO (ANT 1+2)

Channel	Result [dBm]	Limit [dBm]	Margin [dBm]
Low	4.28	8.00	3.72
Middle	4.31	8.00	3.69
High	4.56	8.00	3.44

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#### \* 802.11n HT40

Channel	Result [dBm]	Limit [dBm]	<b>Margin</b> [dBm]
Low	-0.70	8.00	8.70
Middle	-0.30	8.00	8.30
High	-0.38	8.00	8.38

# \* 802.11n HT40\_MIMO (ANT 1+2)

Channel	Result [dBm]	Limit [dBm]	<b>Margin</b> [dBm]
Low	1.63	8.00	6.37
Middle	1.66	8.00	6.34
High	1.90	8.00	6.10

#### -NOTE:

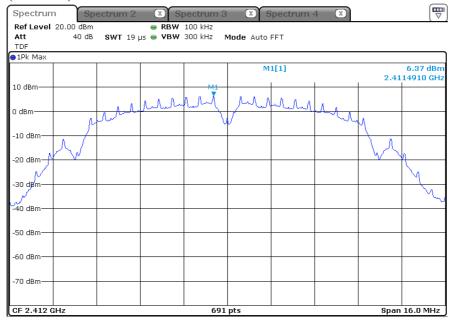
- 1. Since the directional gain of the FIPA antenna declared by the manufacturer ( $G_{ANT} = 2.93 \, \mathrm{dBi}$ ), does not exceed 6.0 dBi, here was no need to reduce the power spectral density.
- 2. In case of MIMO, Since the directional gain of the FIPA antenna declared by the manufacturer  $(G_{ANT} = 2.93 \text{ dBi}) + (Array gain = 3.01 \text{ dBi})$  does not exceed 6.0 dBi, there was no need to reduce the power spectral density.
- 3. We took the insertion loss of the cable loss into consideration within the measuring instrument.

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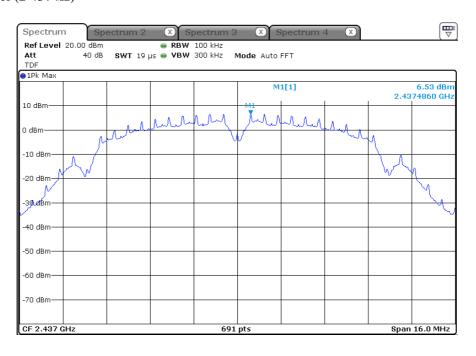


# 5.3.4 Test Plot Figure 1. Plot of the Power Density \* 802.11b

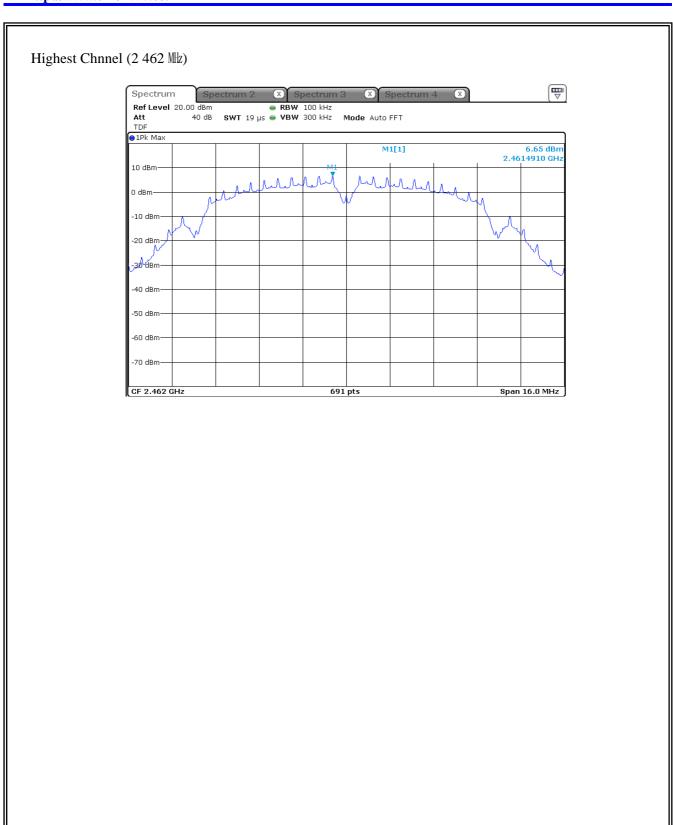
Lowest Channel(2412 5)



#### Middle Chnnel (2 437 Mb)







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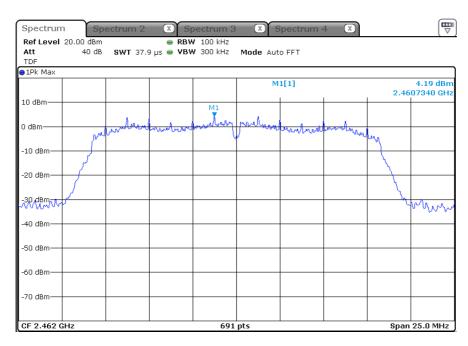


# \* 802.11g Lowest Channel (2 412 Mb) X Spectrum 4 X Ref Level 20.00 dBm ■ RBW 100 kHz Att 40 dB SWT 37.9 μs • VBW 300 kHz Mode Auto FFT ●1Pk Max M1[1] 3.84 dBn 2.4132300 GH 10 dBm 0 dBm -10 dBm -20 dBm -30 dBm MWM -40 dBm -50 dBm -60 dBm -70 dBm CF 2.412 GHz 691 pts Span 25.0 MHz Middle Chnnel (2 437 吨) Spectrum ● RBW 100 kHz SWT 37.9 µs ● VBW 300 kHz Ref Level 20.00 dBm 40 dB Mode Auto FFT Att ●1Pk Max 4.10 dBn 2.4357340 GH M1[1] 10 dBm 0 dBm -10 dBm -20 dBm 139.48my -40 dBm -50 dBm -60 dBm -70 dBm CF 2.437 GHz 691 pts Span 25.0 MHz

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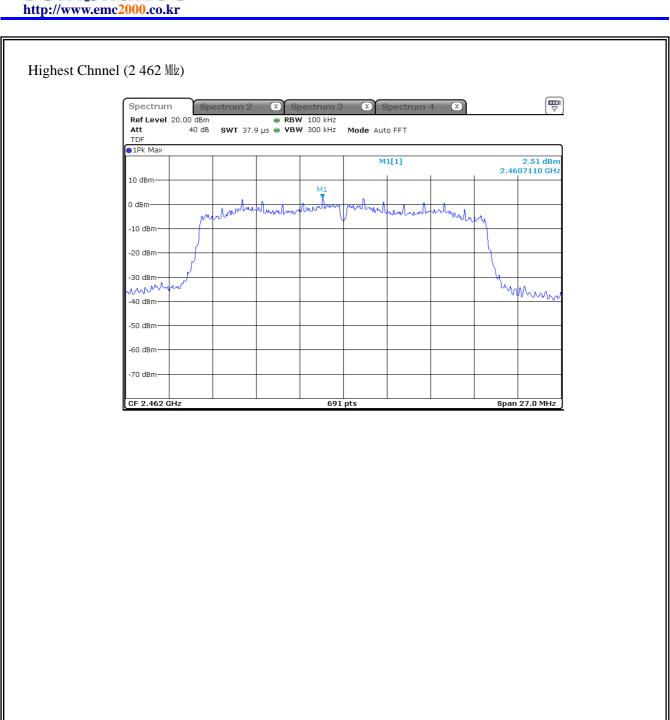
# Highest Chnnel (2 462 吨)





# \* 802.11n HT20 Lowest Channel (2 412 Mb) Ref Level 20.00 dBm ● RBW 100 kHz Att 40 dB SWT 37.9 µs ▼ VBW 300 kHz Mode Auto FFT ●1Pk Max 2.53 dBn 2.4107110 GH M1[1] 10 dBm M1 0 dBm -10 dBm -20 dBm -30 dBm 40 dBm -50 dBm -60 dBm -70 dBm CF 2.412 GHz 691 pts Span 27.0 MHz Middle Chnnel (2 437 Mb) Spectrum Ref Level 20.00 dBm RBW 100 kHz Att 40 dB SWT 37.9 µs ● VBW 300 kHz Mode Auto FFT TDF 1Pk Max 2.23 dBm 2.4357110 GHz M1[1] 10 dBm 0 dBm -10 dBm -20 dBm -30 dBm ₩<u>₩</u>₩ -50 dBm -60 dBm -70 dBm CF 2.437 GHz Span 27.0 MHz

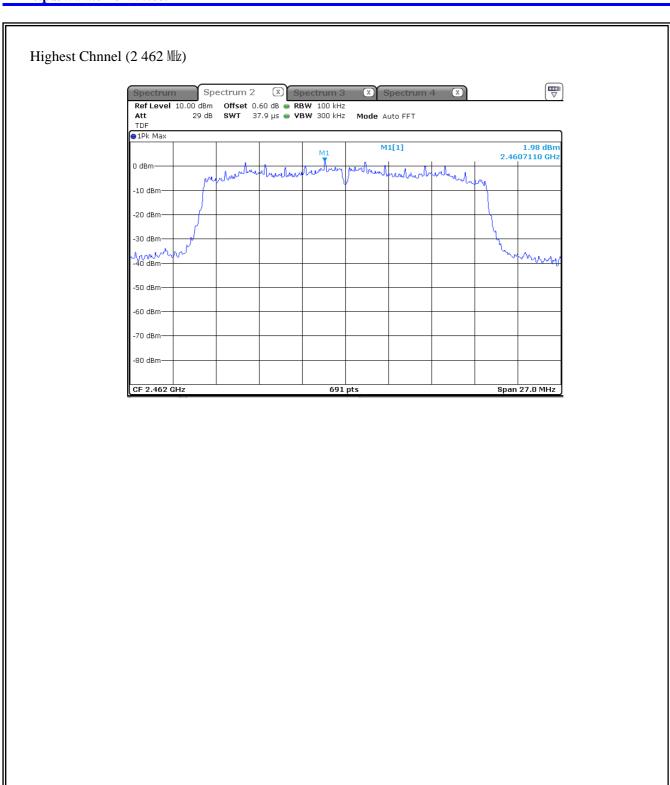




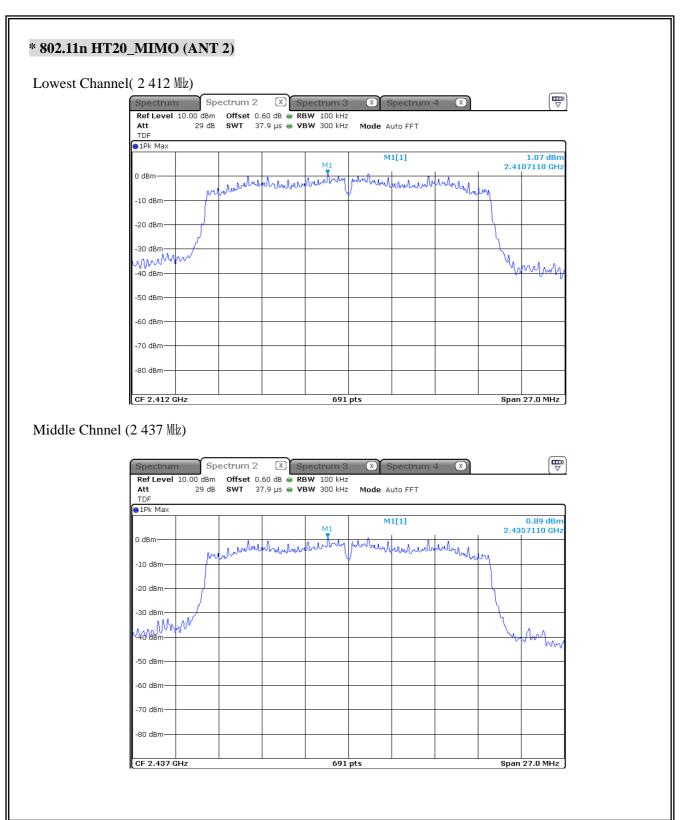


# \* 802.11n HT20\_MIMO (ANT 1) Lowest Channel (2 412 Mb) Spectrum 2 X Spectrum 4 X Spectrum 3 Offset 0.60 dB • RBW 100 kHz SWT 37.9 µs • VBW 300 kHz Ref Level 10.00 dBm Mode Auto FFT Att TDF 29 dB ●1Pk Max 1.47 dBm 2.4107110 GHz M1[1] 0 dBm -10 dBm -20 dBm -30 dBm -40 dBm -50 dBm -60 dBn 70 dBm -80 dBm Span 27.0 MHz CF 2.412 GHz 691 pts Middle Chnnel (2 437 吨) Spectrum 2 Offset 0.60 dB RBW 100 kHz SWT 37.9 µs VBW 300 kHz Ref Level 10.00 dBm Mode Auto FFT 29 dB Att ●1Pk Max 1.67 dBm 2.4357110 GHz M1[1] 0 dBm -10 dBm -20 dBn -50 dBr -60 dBm -80 dBm Span 27.0 MHz CF 2.437 GHz 691 pts

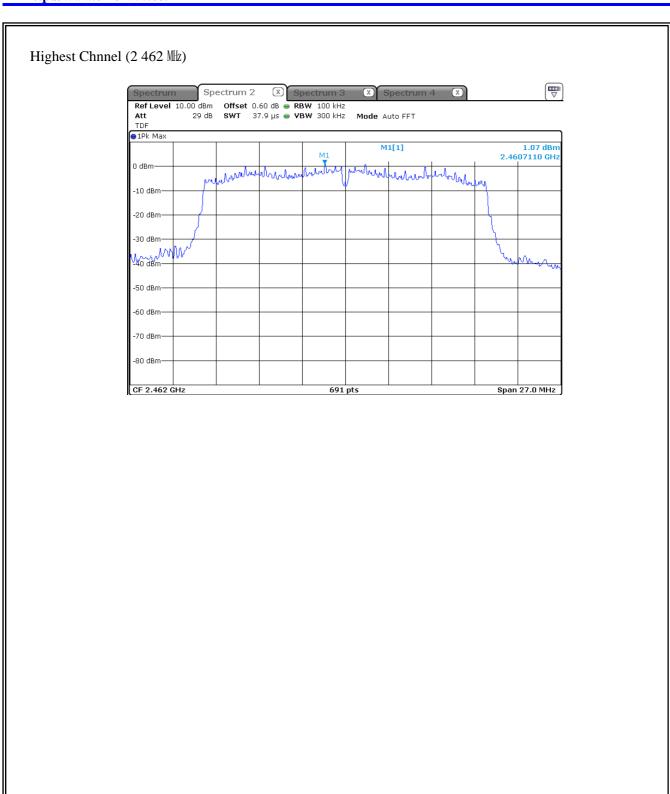




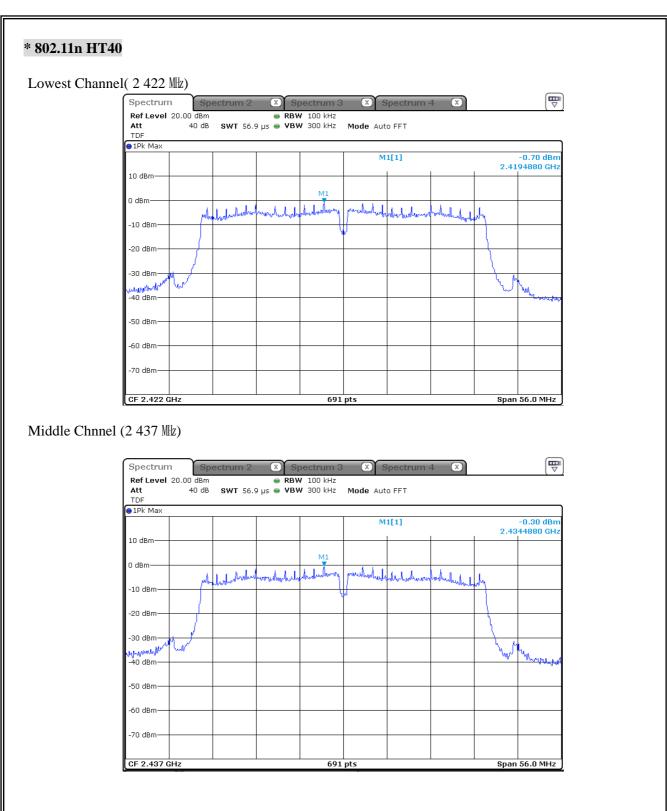






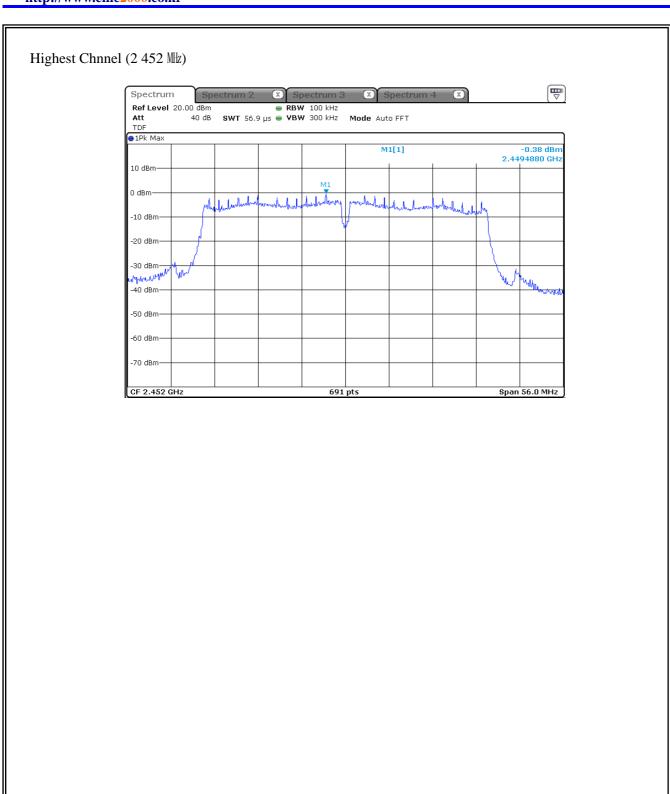




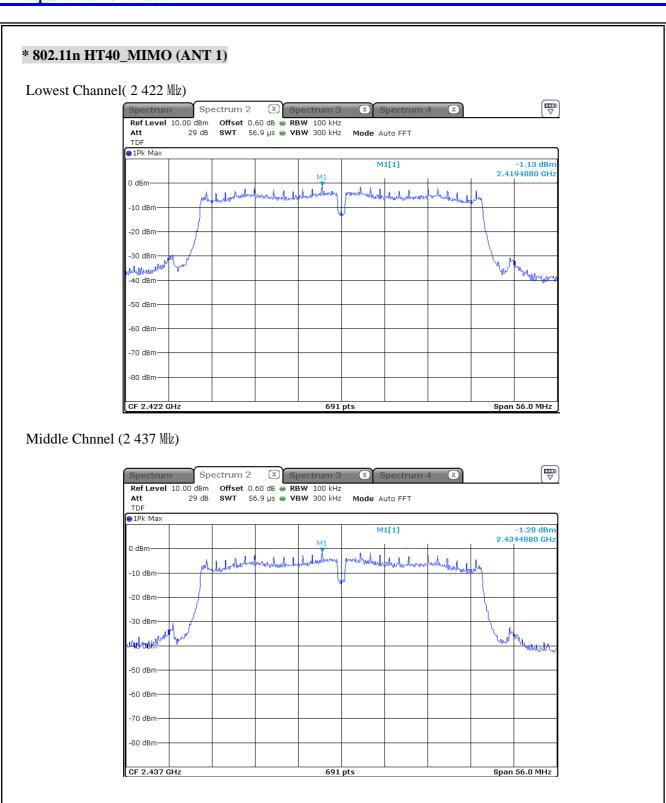


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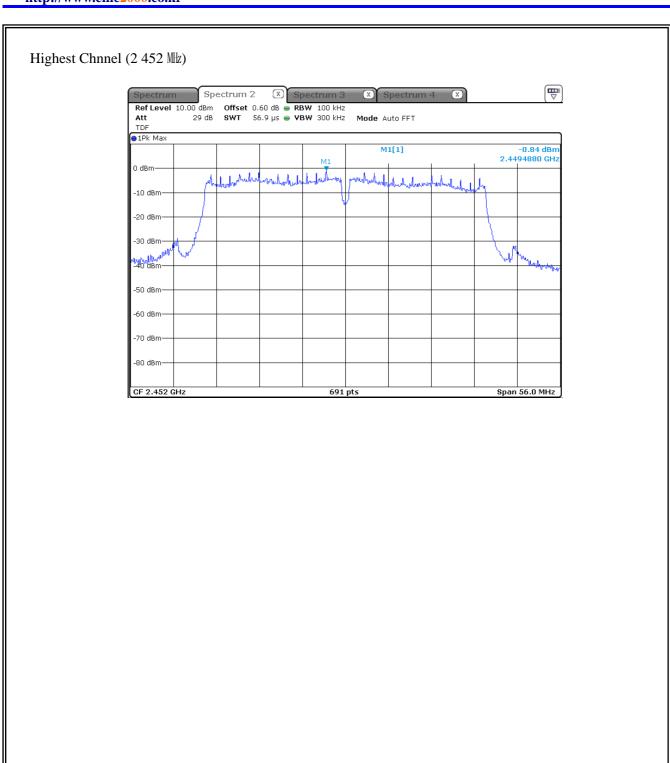








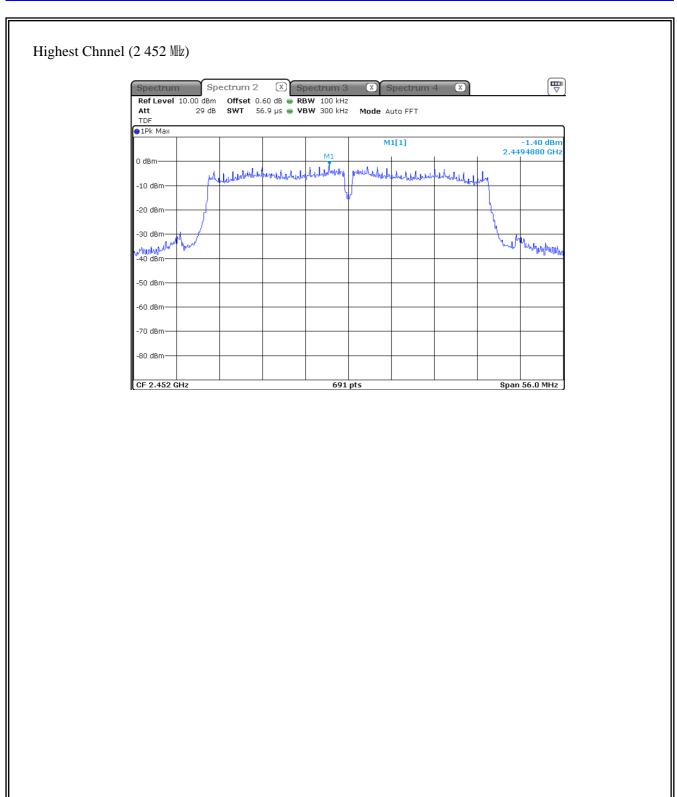






# \* 802.11n HT40\_MIMO (ANT 2) Lowest Channel (2 422 Mb) Spectrum 2 Spectrum 3 X Spectrum 4 X Ref Level 10.00 dBm Offset 0.60 dB RBW 100 kHz Att 29 dB SWT 56.9 µs VBW 300 kHz Mode Auto FFT ●1Pk Max -1.64 dBn 2.4194880 GH M1[1] 0 dBm halandarahadhadhadhadhadhadhadha rodulated and market and a factor of the second -10 dBm -20 dBm white Misselffer -40 dBm -50 dBm -60 dBm -70 dBm -80 dBm Span 56.0 MHz CF 2.422 GHz 691 pts Middle Chnnel (2 437 Mb) Spectrum Spectrum 2 Ref Level 10.00 dBm Att TDF 29 dB Mode Auto FFT ●1Pk Max -1.42 dBm M1[1] 2.4344880 GH pelandrahilandraniahan katalahan Liahan -10 dBm -20 dBn -50 dBm -70 dBm Span 56.0 MHz CF 2.437 GHz







# 5.4 6 dB Bandwidth(DTS Channel Bandwidth)

# 5.4.1 Regulation

According to \$15.247(a)(2) Systems using digital modulation techniques may operate in the 902–928 Mz, 2 400–2 483.5 Mz, and 5 725–5 850 Mz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

#### 5.4.2 Measurement Procedure

These test measurement settings are specified in section 8.0 of 558074 D01 DTS Meas Guidance.

## 5.4.2.1 DTS Channel Bandwidth-Option 1

- 1) Set RBW = 100 kHz.
- 2) Set the video bandwidth (VBW)  $\geq$  3 x RBW.
- 3) Detector = Peak.
- 4) Trace mode = max hold.
- 5) Sweep = auto couple.
- 6) Allow the trace to stabilize.
- 7) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

#### 5.4.2.2 DTS Channel Bandwidth Measurement Procedure-Option 2

The automatic bandwidth measurement capability of an instrument may be employed using the X dB bandwidth mode with X set to 6 dB, if the functionality described above (i.e., RBW = 100 kHz,  $VBW \geq 3 \times RBW$ , peak detector with maximum hold) is implemented by the instrumentation function. When using this capability, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be  $\geq 6 \text{ dB}$ .

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# 5.4.3 Test Result

# - Complied

#### \* 802.11b

Channel	Frequency (Mb)	6 dB Bandwidth (MHz)	Min. Limit (kllz)	Occupied Bandwidth (99 % BW) (Mz)
Low	2 412	8.16	500	10.07
Middle	2 437	8.16	500	10.07
High	2 462	8.16	500	10.13

#### \* 802.11g

Channel	Frequency (妣)	6 dB Bandwidth (Mb)	Min. Limit (畑)	Occupied Bandwidth (99 % BW) (雕)
Low	2 412	15.22	500	16.27
Middle	2 437	15.22	500	16.32
High	2 462	15.22	500	16.32

#### \* 802.11n HT20

Channel	Frequency (Mz)	6 dB Bandwidth (MHz)	Min. Limit (៕៤)	Occupied Bandwidth (99 % BW) (雌)
Low	2 412	15.22	500	17.42
Middle	2 437	15.22	500	17.42
High	2 462	15.22	500	17.42

# \* 802.11n HT20\_MIMO (ANT 1)

Channel	Frequency (Mb)	6 dB <b>Bandwidth</b> (Mb)	Min. Limit (₩z)	Occupied Bandwidth (99 % BW) (飐)
Low	2 412	15.22	500	17.42
Middle	2 437	15.17	500	17.42
High	2 462	16.15	500	17.42

# \* 802.11n HT20\_MIMO (ANT 2)

Channel	Frequency (Mb)	6 dB Bandwidth (Mb)	Min. Limit (Mb)	Occupied Bandwidth (99 % BW) (飐)
Low	2 412	15.80	500	17.42
Middle	2 437	15.81	500	17.42
High	2 462	16.15	500	17.42



#### \* 802.11n HT40

Channel	Frequency (Mb)	6 dB Bandwidth (Mb)	Min. Limit (배2)	Occupied Bandwidth (99 % BW) (地)
Low	2 422	36.50	500	36.25
Middle	2 437	36.38	500	36.11
High	2 452	36.04	500	36.18

# \* 802.11n HT40\_MIMO (ANT 1)

Channel	Frequency (Mb)	6 dB Bandwidth (Mb)	Min. Limit (배z)	Occupied Bandwidth (99 % BW) (Mb)
Low	2 422	36.47	500	36.25
Middle	2 437	36.47	500	36.11
High	2 452	36.40	500	36.18

#### \* 802.11n HT40 MIMO (ANT 2)

**				
Channel	Frequency (畑z)	6 dB Bandwidth (Mb)	Min. Limit (배z)	Occupied Bandwidth (99 % BW) (地)
Low	2 422	36.47	500	36.18
Middle	2 437	36.38	500	36.18
High	2 452	36.47	500	36.25

#### -NOTE:

 $1. \hspace{0.5cm} \text{We took the insertion loss of the cable loss into consideration within the measuring instrument.} \\$ 

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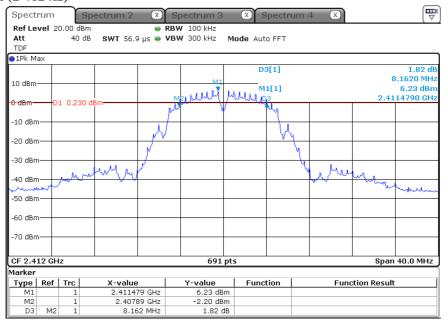


#### 5.4.4 Test Plot

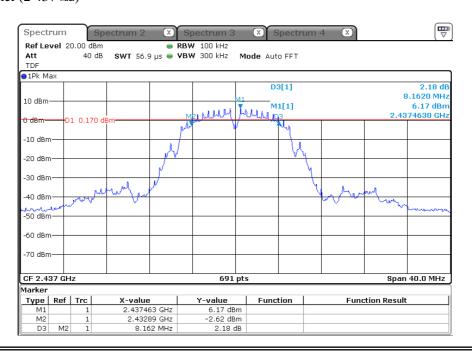
Figure 2. Plot of the 6dB Bandwidth & Occupied Bandwidth

# \* 802.11b (6 dB Bandwidth)

Lowest Channel (2 412 Mz)



#### Middle Channel (2 437 Mz)







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# Highest Channel (2 462 Mb) Spectrum Ref Level 20.00 dBm RBW 100 kHz SWT 56.9 µs ● VBW 300 kHz Mode Auto FFT Att ●1Pk Max D3[1] -0.87 dr 15.2240 MH 10 dBm 2.39 dBm 2.4607260 GHz M1[1] 0 dBm D1 -3.610 d -10 dBm -20 dBm \*4thaban www. -60 dBm -70 dBm CF 2.462 GHz 691 pts Span 40.0 MHz X-value 2.460726 GHz 2.454359 GHz 15.224 MHz **Y-value** 2.39 dBm -5.61 dBm -0.87 dB Type | Ref | Trc | Function **Function Result** M1 M2 DЗ

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#### \* 802.11n HT20 (6 dB Bandwidth) Lowest Channel (2 412 吨) Ref Level 20.00 dBm ■ RBW 100 kHz Att 40 dB **SWT** 56.9 µs ● **VBW** 300 kHz Mode Auto FFT ●1Pk Max D3[1] -0.43 d 15.2240 MH; 2.00 dBn M1[1] 2.4132160 GH 0 dBm D1 -4.000 dB -10 dBm -20 dBm -30 dBm -50 dBm 691 pts Span 40.0 MHz CF 2.412 GHz Marker Type | Ref | Trc Function **Function Result** X-value Y-value 2.413216 GHz 2.404359 GHz 2.00 dBm -6.01 dBm Middle Channel (2 437 Mb) Spectrum Ref Level 20.00 dBm RBW 100 kHz **SWT** 56.9 µs **● VBW** 300 kHz Mode Auto FFT Att 40 dB ●1Pk Max D3[1] 0.07 d 15.2240 MH 10 dBm M1[1] 1.85 dBn 2.4382160 GH 0 dBm-D1 -4.150 ( -10 dBm -20 dBm WWW Thursday -50 dBm -60 dBm -70 dBm CF 2.437 GHz 691 pts Span 40.0 MHz Markei **Y-value** 1.85 dBm -6.39 dBm **X-value** 2.438216 GHz Type | Ref | Trc | **Function Result** M2 2.429359 GHz 0.07 dB

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#### \* 802.11n HT20\_MIMO (ANT 1) (6 dB Bandwidth) Lowest Channel (2 412 Mb) Offset 0.60 dB ● RBW 100 kHz SWT 56.9 µs ● VBW 300 kHz Ref Level 10.00 dBm Att 29 dB Mode Auto FFT ● 1Pk Max D3[1] -0.73 di 15.2240 MH: \_\_\_1.86 dBn 0 dBm D1 -4.140 dB 2.4132160 GH -10 dBm -20 dBm -30 dBm More -50 dBm -60 dBm 691 pts Span 40.0 MHz CF 2.412 GHz Marker Type Ref Trc Function **Function Result** X-value Y-value 2.413216 GHz 2.404359 GHz 1.86 dBm -5.80 dBm 15.224 MHz Middle Channel (2 437 Mb) Spectrum Ref Level 10.00 dBm Att 29 dB Mode Auto FFT TDF ●1Pk Max D3[1] 15.1740 MH 0 dBm 1.59 dBr 2.4382160 GH -10 dBm -40hd8m -50 dBm -60 dBm -70 dBm -80 dBm CF 2.437 GHz 691 pts Span 40.0 MHz Marker Type | Ref | Trc | Function **Function Result** X-value Y-value 2.438216 GHz 2.429417 GHz 15.174 MHz -1.93 dB

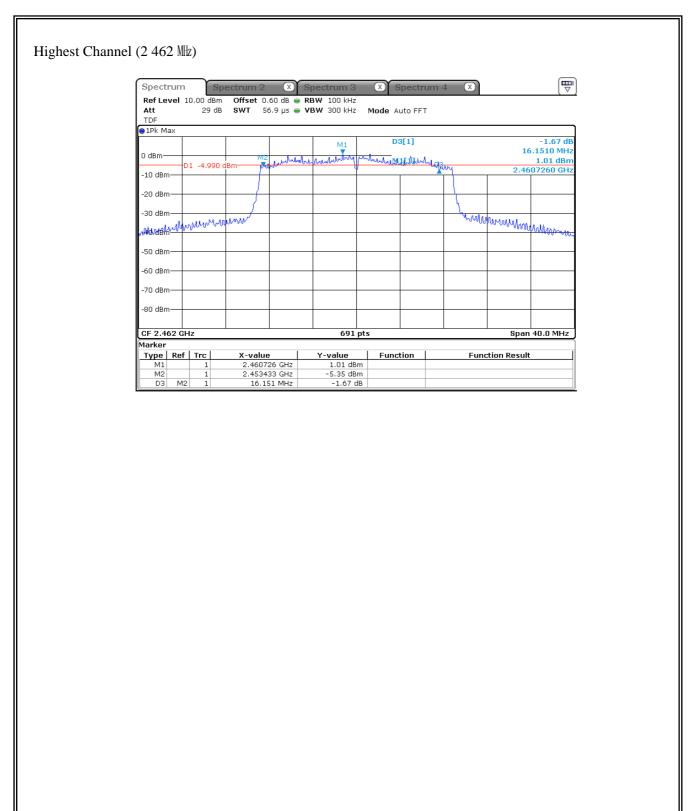






#### \* 802.11n HT20\_MIMO (ANT 2) (6 dB Bandwidth) Lowest Channel (2 412 Mb) Offset 0.60 dB ● RBW 100 kHz SWT 56.9 µs ● VBW 300 kHz Ref Level 10.00 dBm Att 29 dB Mode Auto FFT ● 1Pk Max D3[1] 15.8030 MH; 1.12 dBn 2.4107260 GH; 0 dBm Marketteller Land D1 -4.880 dBr -10 dBm -20 dBm www.www. -30 dBm Myruphaleppaper grantens -50 dBm -60 dBm 691 pts Span 40.0 MHz CF 2.412 GHz Marker Type | Ref | Trc | Function **Function Result** X-value Y-value 2.410726 GHz 2.404359 GHz 1.12 dBm -6.88 dBm Middle Channel (2 437 Mb) $\blacksquare$ Spectrum X Ref Level 10.00 dBm Offset 0.60 dB ● RBW 100 kHz SWT 56.9 µs ● VBW 300 kHz Att 29 dB TDF 1Pk Max D3[1] 15.8100 MHz 0.71 dBn 01 -5.290 -10 dBm -20 dBm -30 dBm AMAN AC CBOTO moundmenture -50 dBm -60 dBm -70 dBm Span 40.0 MHz 691 pts CF 2.437 GHz Marker Type Ref Trc **Function Result** Function X-value Y-value 0.71 dBm -7.61 dBm 2.435726 GHz 2.428773 GHz

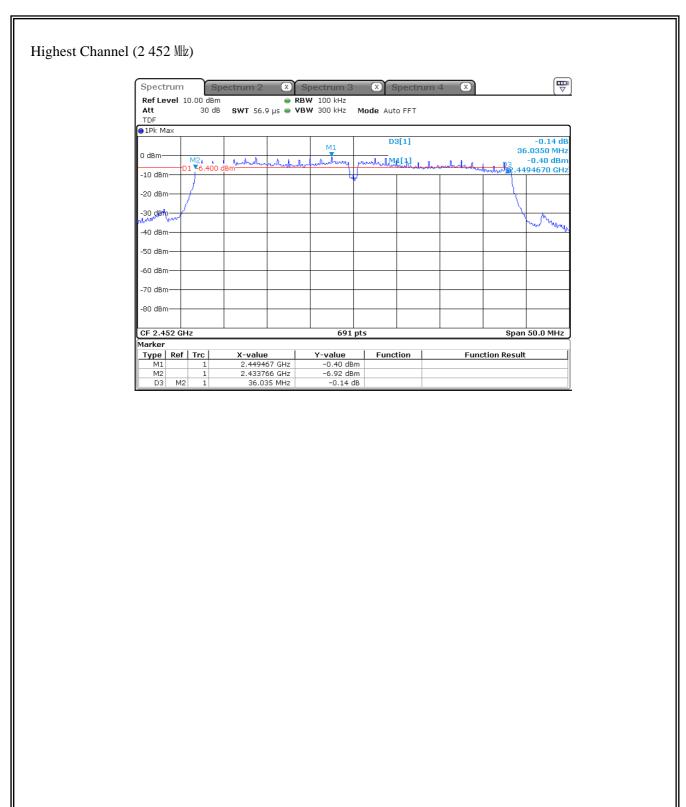








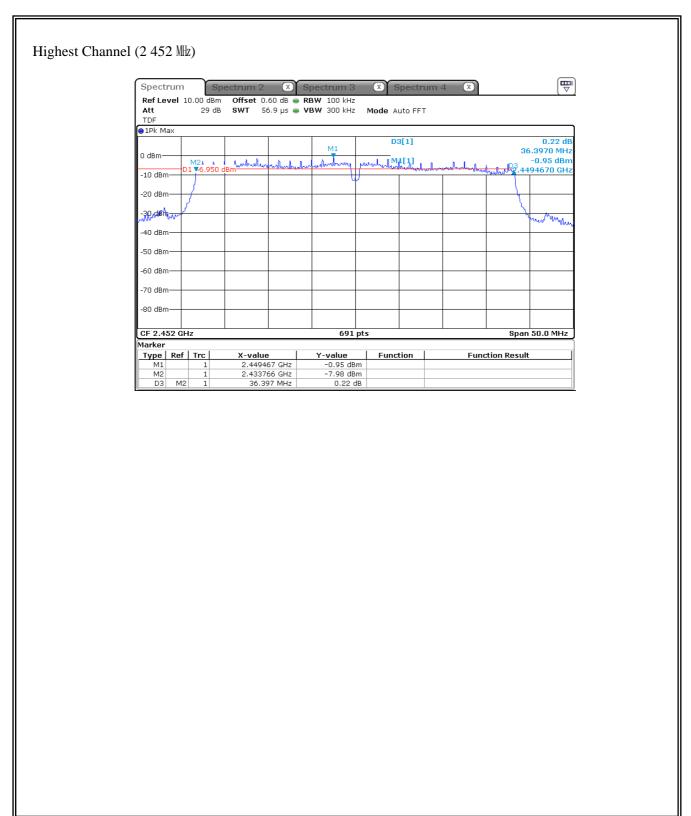














#### \* 802.11n HT40\_MIMO (ANT 2) (6 dB Bandwidth) Lowest Channel (2 422 Mb) $\Box$ Offset 0.60 dB ● RBW 100 kHz SWT 56.9 µs ● VBW 300 kHz Ref Level 10.00 dBm Att 29 dB Mode Auto FFT ● 1Pk Max D3[1] 36.4690 MH: -1.73 dBn -1.73 upm -21.73 upm -21.73 <u>MT[1] 1.73 արդես հանակական</u>ք 4194670 GH when he when he was the - highlyddlad -10 dBm -20 dBm -30 dBm--40 dBm -50 dBm -60 dBm 691 pts Span 50.0 MHz CF 2.422 GHz Marker Type | Ref | Trc | Function **Function Result** X-value Y-value 2.419467 GHz 2.403766 GHz -1.73 dBm -8.62 dBm 36.469 MHz Middle Channel (2 437 Mz) X Spectrum Ref Level 10.00 dBm Att 29 dB SWT 56.9 μs **ভ VBW** 300 kHz Mode Auto FFT TDF ●1Pk Max D3[1] 36.3750 MH 0 dBm probability MI[1] 4344670 GH -10 dBm -20 dBm -30 dBm an Malakana -40 dBm -50 dBm -60 dBm -70 dBm -80 dBm CF 2.437 GHz Span 50.0 MHz 691 pts Marker **Function Result** Type | Ref | Trc | X-value Y-value 2.434467 GHz 2.418766 GHz -1.37 dBm -8.73 dBm D3 36.375 MHz 1.57 dB



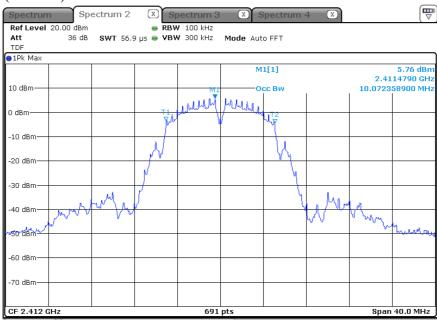


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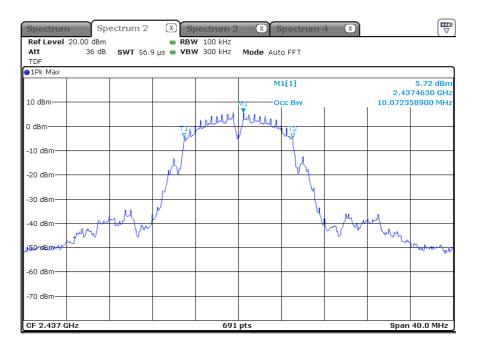


## \* 802.11b (Occupied Bandwidth)

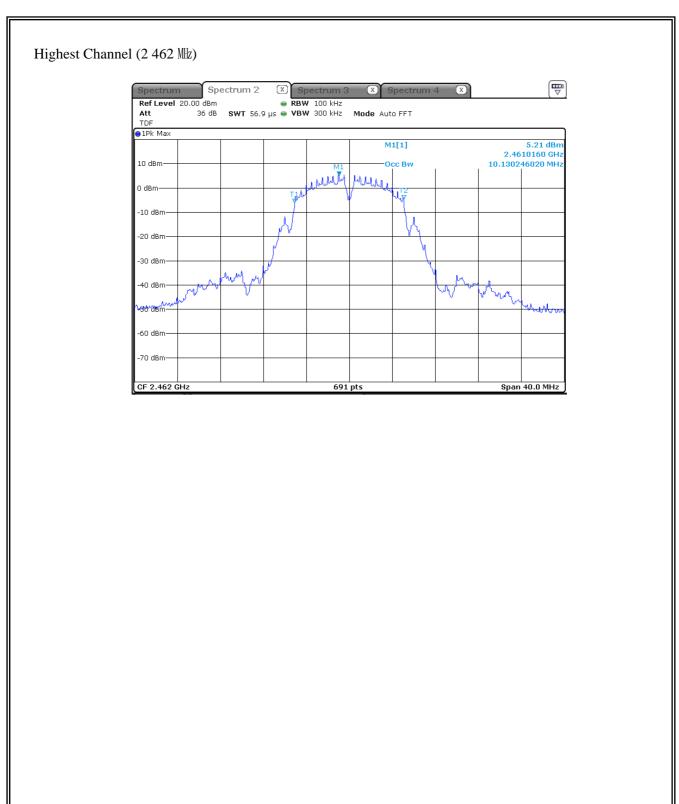
Lowest Channel (2 412 Mb)



Middle Channel (2 437 Mb)



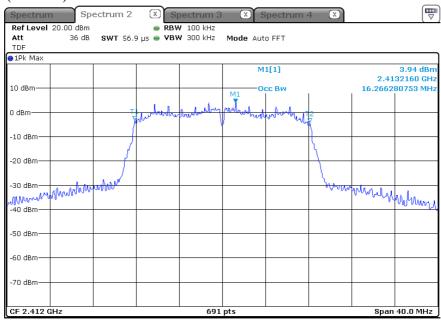




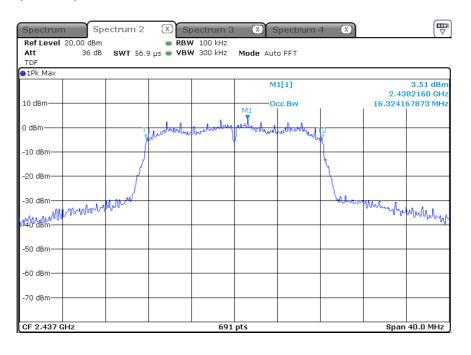


## \* 802.11g (Occupied Bandwidth)

Lowest Channel (2 412 Mb)



Middle Channel (2 437 Mz)



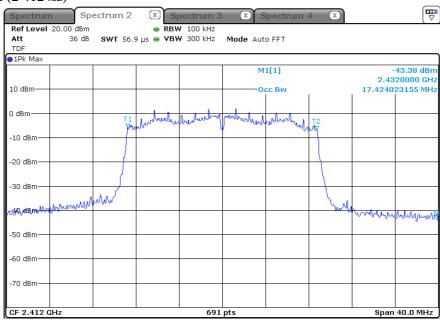


# Highest Channel (2 462 吨) Spectrum 2 ■ RBW 100 kHz SWT 56.9 µs ■ VBW 300 kHz Ref Level 20.00 dBm Att TDF Mode Auto FFT ●1Pk Max M1[1] 3.53 dBm 2.4607260 GHz 16.324167873 MHz 10 dBm 0 dBm -10 dBm -20 dBm Munnolinamon -50 dBm -60 dBm Span 40.0 MHz CF 2.462 GHz 691 pts

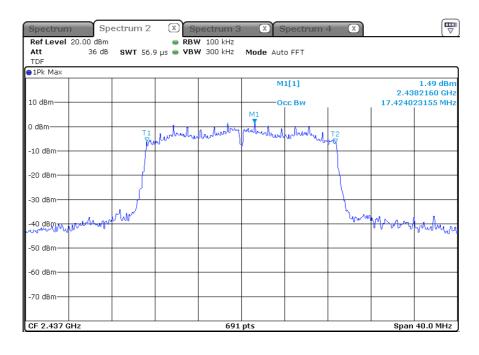


## \* 802.11n HT20 (Occupied Bandwidth)

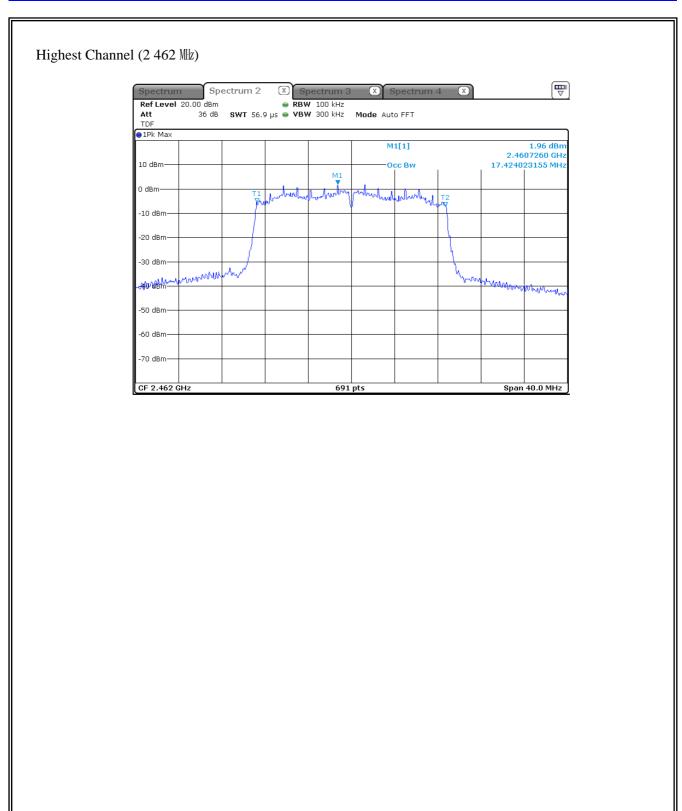
Lowest Channel (2 412 Mb)



## Middle Channel (2 437 Mz)







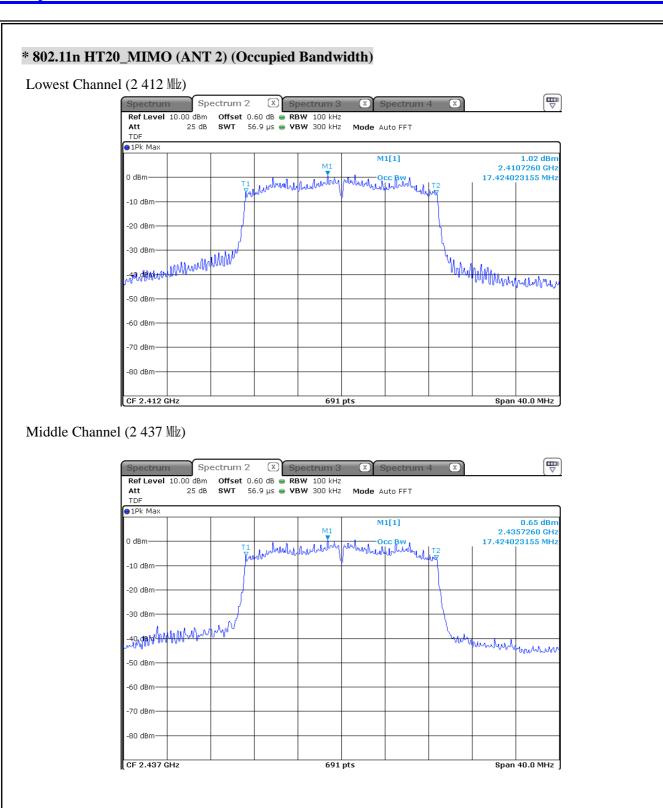


# \* 802.11n HT20\_MIMO (ANT 1) (Occupied Bandwidth) Lowest Channel (2 412 Mb) Spectrum 2 Spectrum 3 Ref Level 10.00 dBm Offset 0.60 dB RBW 100 kHz Att 25 dB SWT 56.9 µs VBW 300 kHz Mode Auto FFT ●1Pk Max M1[1] 1.67 dBn 2.4107260 GH 0 dBm 17.424023155 MH -10 dBm -20 dBm -30 dBm ## ##PV -50 dBm -60 dBm -70 dBm -80 dBm CF 2.412 GHz 691 pts Span 40.0 MHz Middle Channel (2 437 Mz) Spectrum 2 Spectrum 3 Offset 0.60 dB RBW 100 kHz SWT 56.9 µs VBW 300 kHz Ref Level 10.00 dBm Mode Auto FFT Att 25 dB TDF ●1Pk Max 2.4382160 GHz 17.424023155 MH -10 dBm -20 dBm -30 dBm 40 dBm -50 dBm -70 dBm CF 2.437 GHz 691 pts Span 40.0 MHz

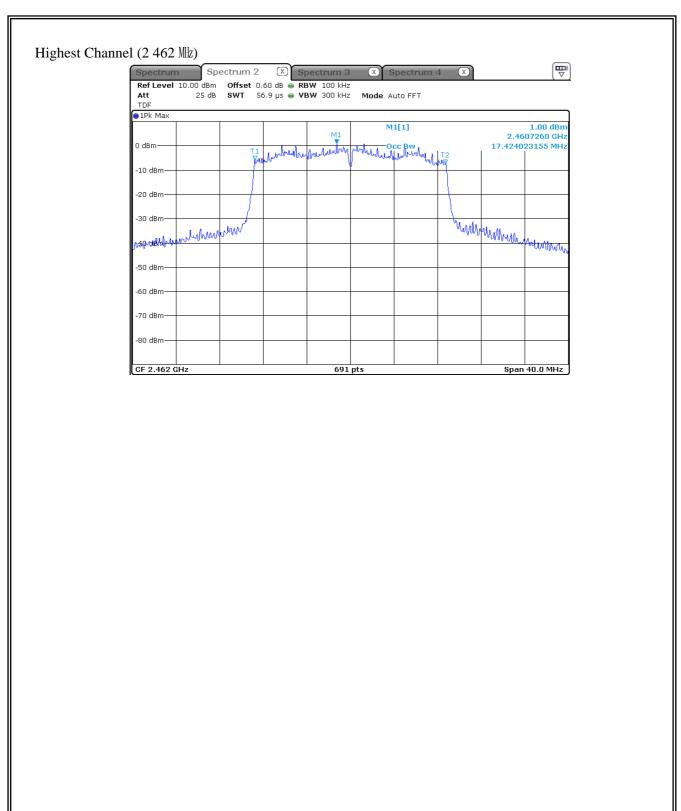








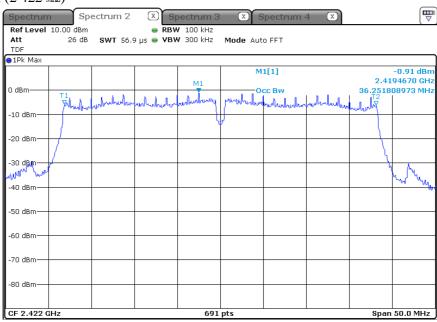






## \* 802.11n HT40 (Occupied Bandwidth)

Lowest Channel (2 422 Mb)



Middle Channel (2 437 Mz)

