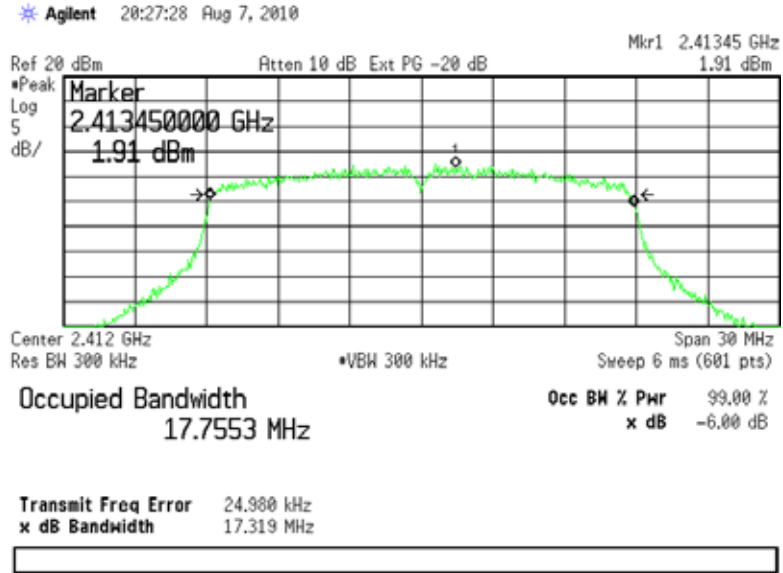
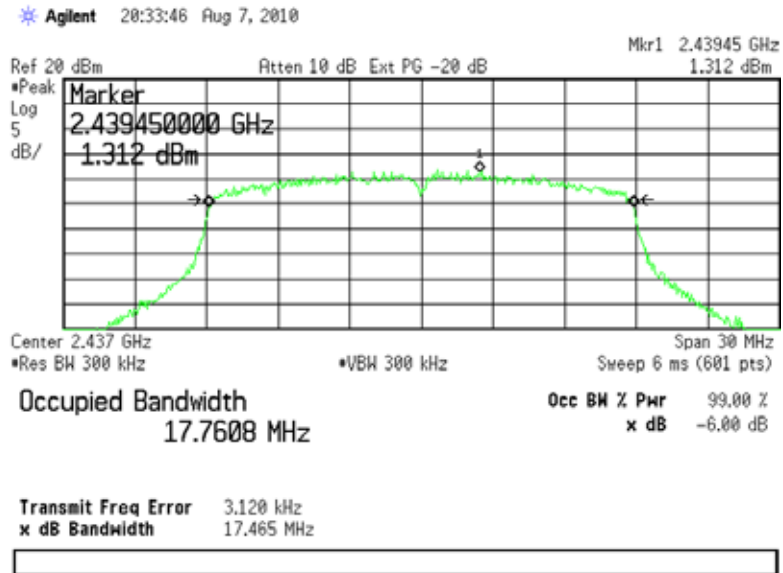


MCS7 Data Rate:

Channel 1



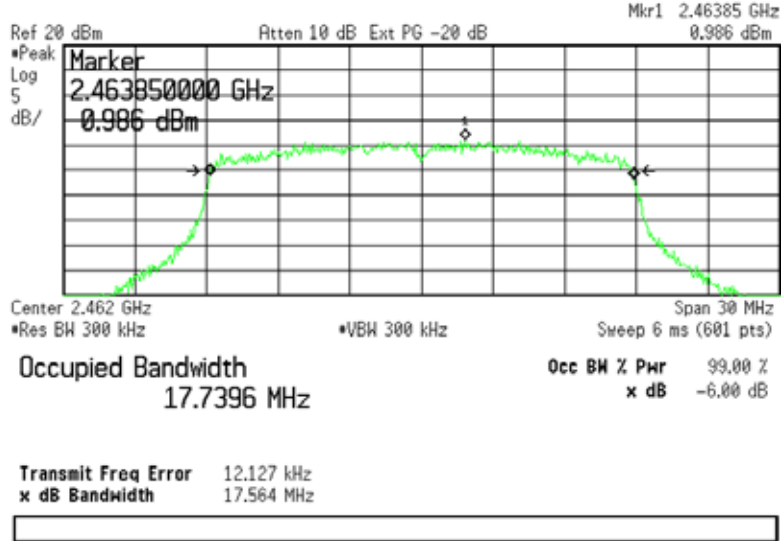
Channel 6



Prepared For: LS Research	Model Number: TiWi-BLE	Report #: 311258
EUT: Tiwi-BLE	Serial Number: 031202	LSR Job #: C-1285

Channel 11

Agilent 20:50:25 Aug 7, 2010



Prepared For: LS Research	Model Number: TiWi-BLE	Report #: 311258
EUT: Tiwi-BLE	Serial Number: 031202	LSR Job #: C-1285

EXHIBIT 8. BAND EDGE MEASUREMENTS

8.1 - Method of Measurements

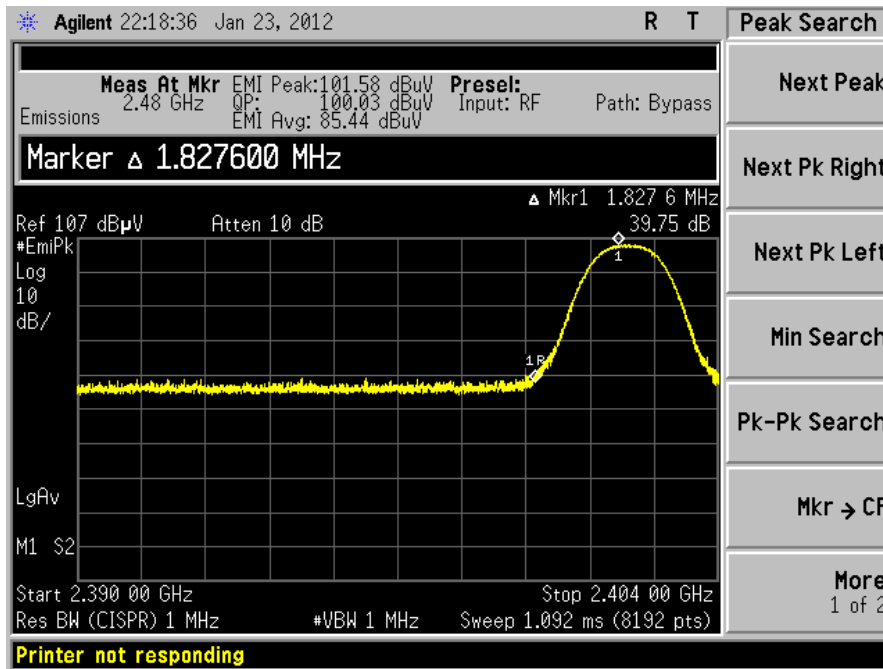
FCC 15.209(b) and 15.247(d) require a measurement of spurious emission levels to be at least 20 dB lower than the fundamental emission level, in particular at the Band-Edges where the intentional radiator operates. Also, RSS 210 Section 2.2 requires that unwanted emissions meet limits listed in tables 2 and 3 of the same standard and also to the limits in the applicable annex. The following screen captures demonstrate compliance of the intentional radiator at the 2400-2483.5 MHz Band-Edges. The EUT was operated in continuous transmit mode with continuous modulation, with internally generated data as the modulating source. The EUT was operated at the lowest channel for the investigation of the lower Band-Edge, and at the highest channel for the investigation of the higher Band-Edge.

The Lower Band-Edge limit, in this case, would be -20 dBc with respect to the fundamental level.

The Upper Band-Edge limit, in this case, would be + 54 dB μ V/m at 3m.

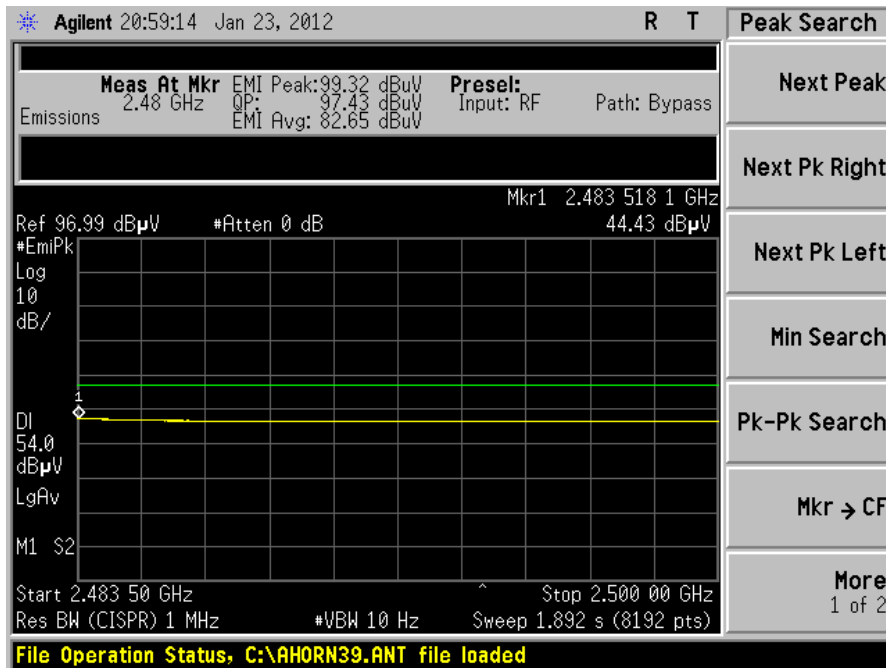
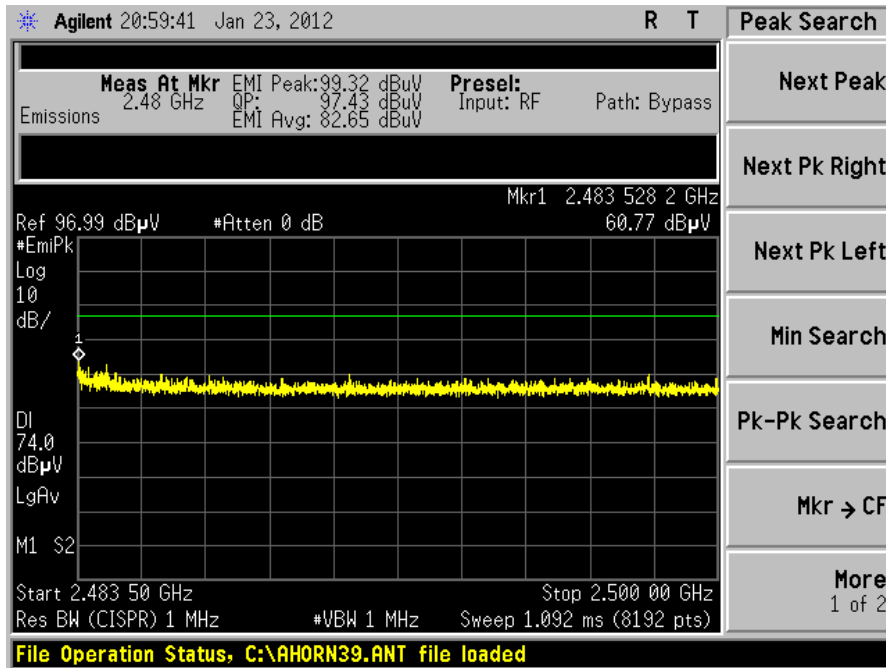
Bluetooth with Dipole Antenna:

Screen Capture Demonstrating Compliance at the Lower Band-Edge



Prepared For: LS Research	Model Number: TiWi-BLE	Report #: 311258
EUT: Tiwi-BLE	Serial Number: 031202	LSR Job #: C-1285

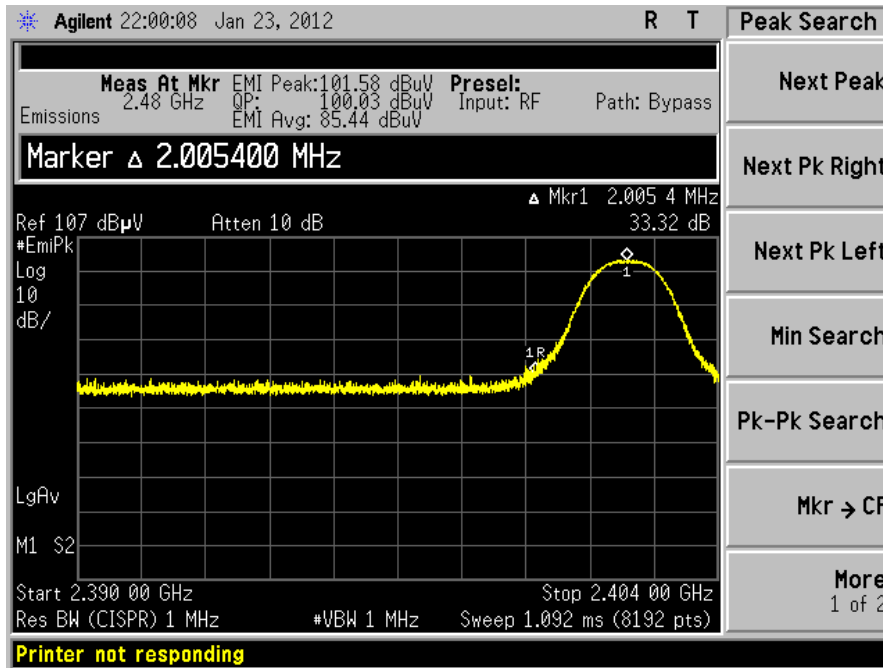
Screen Captures Demonstrating Compliance at the Higher Band-Edge



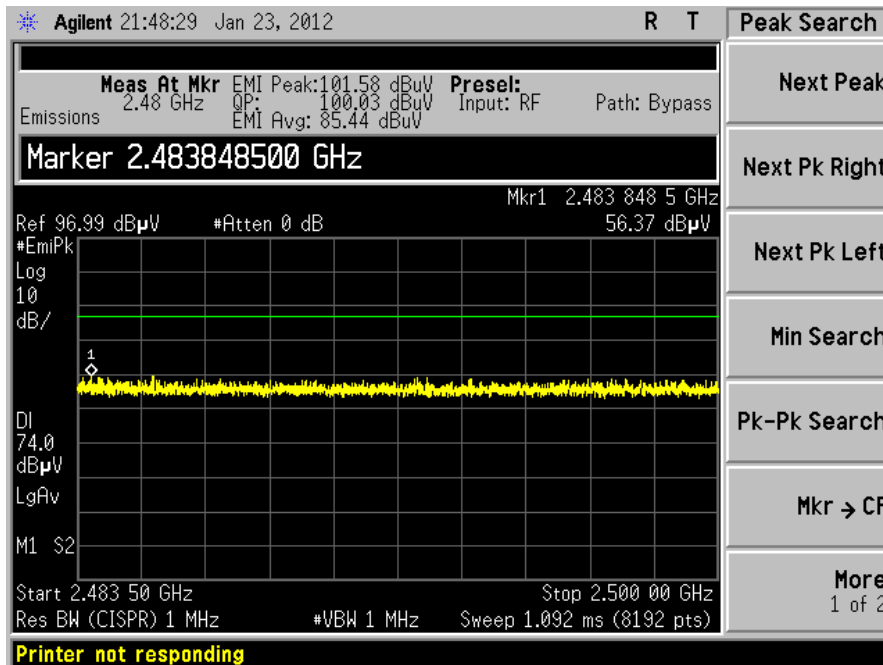
Prepared For: LS Research	Model Number: TiWi-BLE	Report #: 311258
EUT: Tiwi-BLE	Serial Number: 031202	LSR Job #: C-1285

Bluetooth with PIFA Antenna:

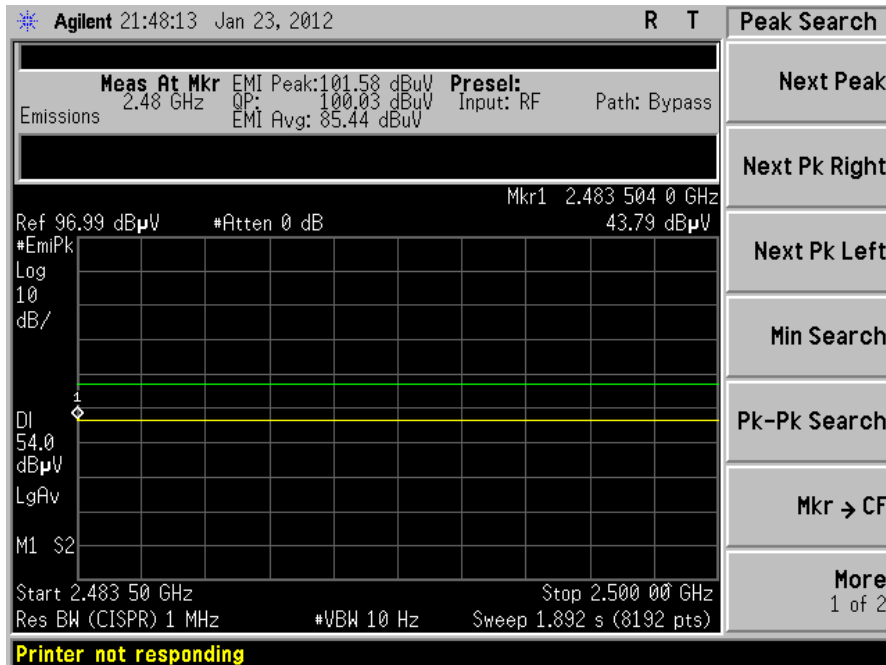
Screen Capture Demonstrating Compliance at the Lower Band-Edge



Screen Captures Demonstrating Compliance at the Higher Band-Edge

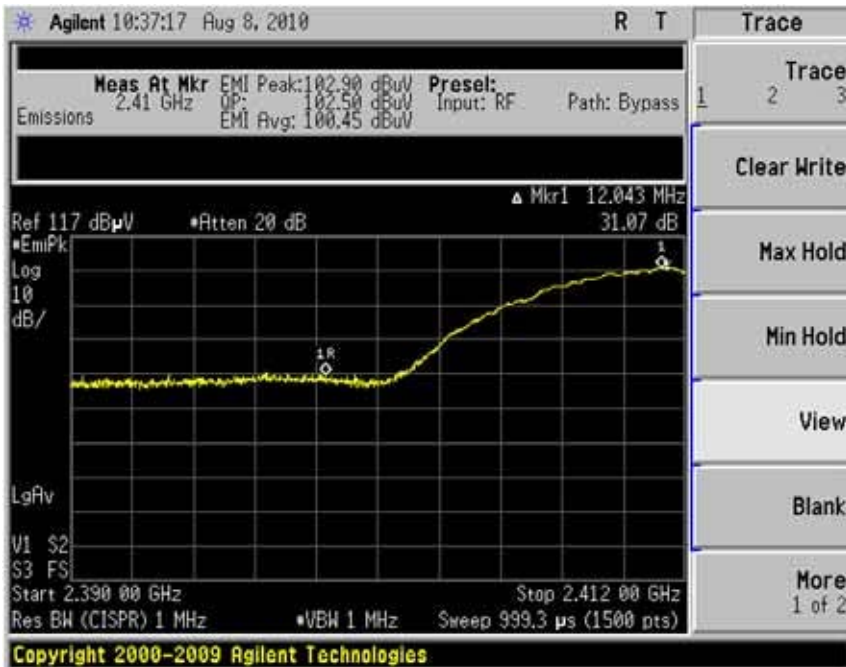


Prepared For: LS Research	Model Number: TiWi-BLE	Report #: 311258
EUT: Tiwi-BLE	Serial Number: 031202	LSR Job #: C-1285



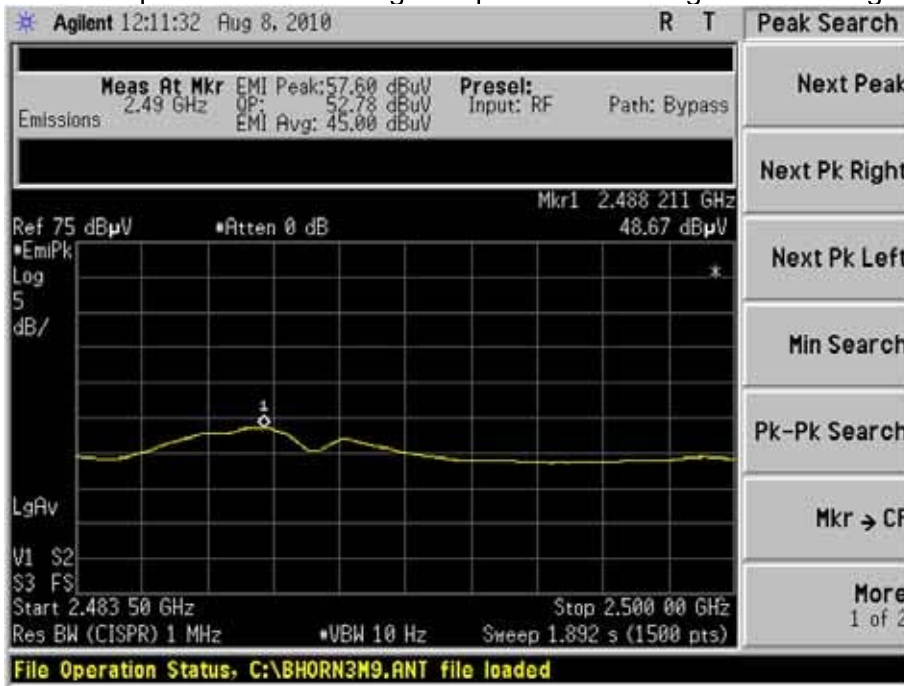
WLAN:

Screen Capture Demonstrating Compliance at the Lower Band-Edge



Prepared For: LS Research	Model Number: TiWi-BLE	Report #: 311258
EUT: Tiwi-BLE	Serial Number: 031202	LSR Job #: C-1285

Screen Capture Demonstrating Compliance at the Higher Band-Edge



Prepared For: LS Research	Model Number: TiWi-BLE	Report #: 311258
EUT: Tiwi-BLE	Serial Number: 031202	LSR Job #: C-1285

EXHIBIT 9. POWER OUTPUT (CONDUCTED): 15.247(b)

9.1 - Method of Measurements

The conducted RF output power of the EUT was measured at the antenna port using a short RF cable. The unit was configured to run in a continuous transmit mode, while being supplied with typical data as a modulation source. The spectrum analyzer was used with resolution and video bandwidths set to 3 MHz, and a span of 20 MHz, with measurements from a peak detector presented in the chart below.

9.2 - Test Equipment List

A complete list of test equipment that was used for this test can be found in Appendix A.

9.3 - Test Data

Bluetooth with Dipole Antenna:

Transmitter Channel	Freq. (MHz)	Peak Power at Antenna Terminal (dBm)	Calculated EIRP (dBm) ⁽¹⁾	Conducted Power Limit (dBm)	EIRP Limit (dBm)
1	2402	8.00	12.30	30.0	36.0
40	2442	7.70	12.00	30.0	36.0
79	2480	7.30	11.60	30.0	36.0

Bluetooth with PIFA Antenna:

Transmitter Channel	Freq. (MHz)	Peak Power at Antenna Terminal (dBm)	Calculated EIRP (dBm) ⁽¹⁾	Conducted Power Limit (dBm)	EIRP Limit (dBm)
1	2402	8.00	7.40	30.0	36.0
40	2442	7.70	7.10	30.0	36.0
79	2480	7.30	6.70	30.0	36.0

Bluetooth BLE with Dipole Antenna:

Transmitter Channel	Freq. (MHz)	Peak Power at Antenna Terminal (dBm)	Calculated EIRP (dBm) ⁽¹⁾	Conducted Power Limit (dBm)	EIRP Limit (dBm)
0	2402	9.81	14.11	30.0	36.0
20	2442	9.86	14.16	30.0	36.0
39	2480	10.05	14.35	30.0	36.0

Bluetooth BLE with PIFA Antenna:

Transmitter Channel	Freq. (MHz)	Peak Power at Antenna Terminal (dBm)	Calculated EIRP (dBm) ⁽¹⁾	Conducted Power Limit (dBm)	EIRP Limit (dBm)
0	2402	9.81	9.21	30.0	36.0
20	2442	9.86	9.26	30.0	36.0
39	2480	10.05	9.45	30.0	36.0

WLAN 1Mbps with Dipole Antenna:

Transmitter Channel	Freq. (MHz)	Peak Power at Antenna Terminal (dBm)	Calculated EIRP (dBm) ⁽¹⁾	Conducted Power Limit (dBm)	EIRP Limit (dBm)
1	2412	19.54	23.84	30.00	36.0
6	2437	19.67	23.97	30.00	36.0
11	2462	18.80	23.10	30.00	36.0

WLAN 1Mbps with PIFA Antenna:

Transmitter Channel	Freq. (MHz)	Peak Power at Antenna Terminal (dBm)	Calculated EIRP (dBm) ⁽¹⁾	Conducted Power Limit (dBm)	EIRP Limit (dBm)
1	2412	19.54	18.94	30.00	36.00
6	2437	19.67	19.07	30.00	36.00
11	2462	18.80	18.20	30.00	36.00

WLAN MCS7 with Dipole Antenna:

Transmitter Channel	Freq. (MHz)	Peak Power at Antenna Terminal (dBm)	Calculated EIRP (dBm) ⁽¹⁾	Conducted Power Limit (dBm)	EIRP Limit (dBm)
1	2412	13.07	17.37	30.00	36.00
6	2437	12.66	16.96	30.00	36.00
11	2462	12.22	16.52	30.00	36.00

WLAN MCS7 with PIFA Antenna:

Transmitter Channel	Freq. (MHz)	Peak Power at Antenna Terminal (dBm)	Calculated EIRP (dBm) ⁽¹⁾	Conducted Power Limit (dBm)	EIRP Limit (dBm)
1	2412	13.07	12.47	30.00	36.00
6	2437	12.66	12.06	30.00	36.00
11	2462	12.22	11.62	30.00	36.00

⁽¹⁾ EIRP Calculation:

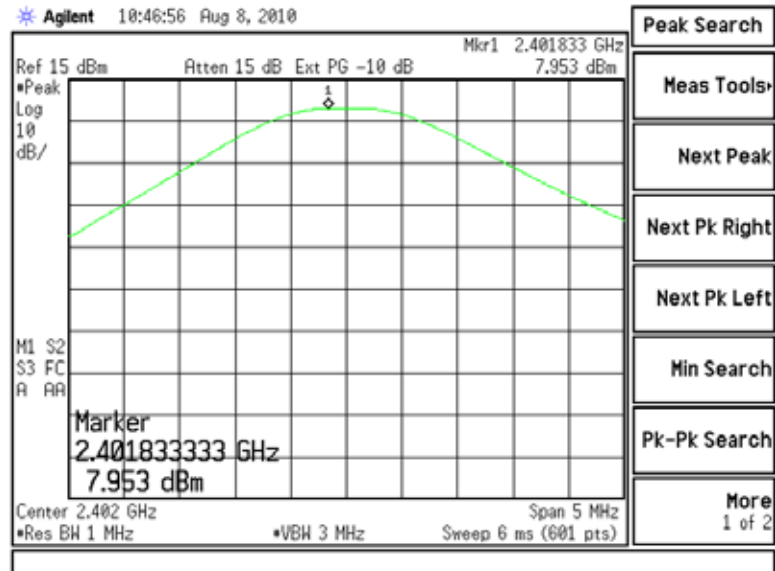
$$\text{EIRP} = (\text{Peak power at antenna terminal in dBm}) + (\text{EUT Antenna gain in dBi})$$

Prepared For: LS Research	Model Number: TiWi-BLE	Report #: 311258
EUT: Tiwi-BLE	Serial Number: 031202	LSR Job #: C-1285

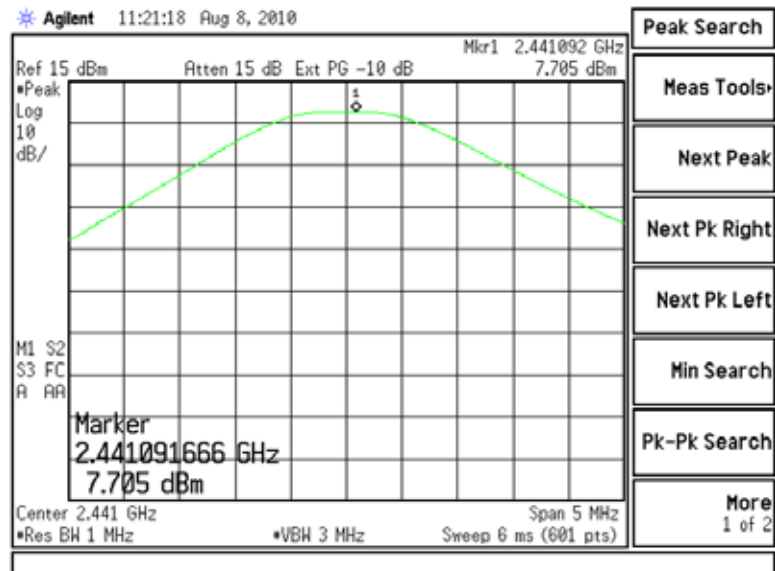
9.4 - Screen Captures - Power Output (Conducted)

Bluetooth:

Channel 1

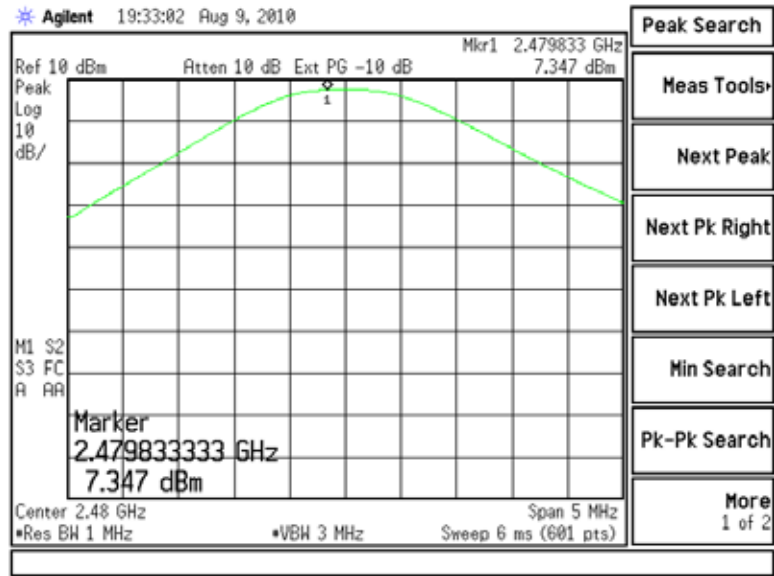


Channel 40



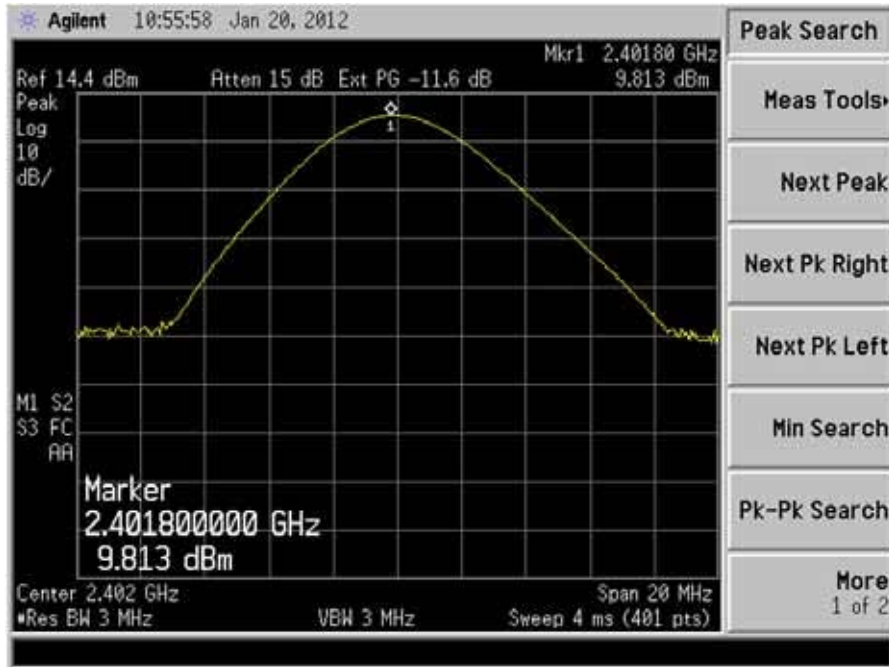
Prepared For: LS Research	Model Number: TiWi-BLE	Report #: 311258
EUT: Tiwi-BLE	Serial Number: 031202	LSR Job #: C-1285

Channel 79



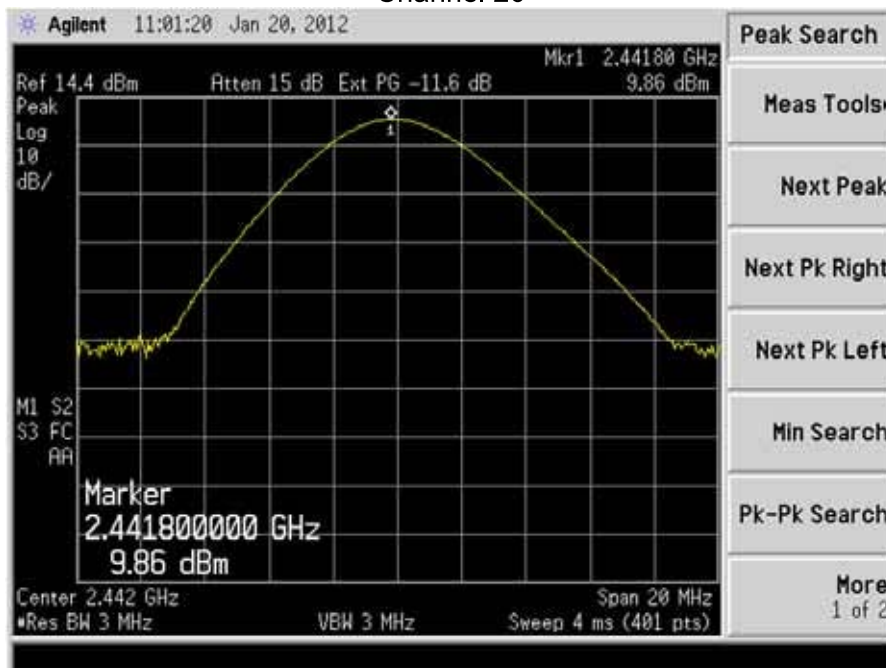
Bluetooth BLE:

Channel 0

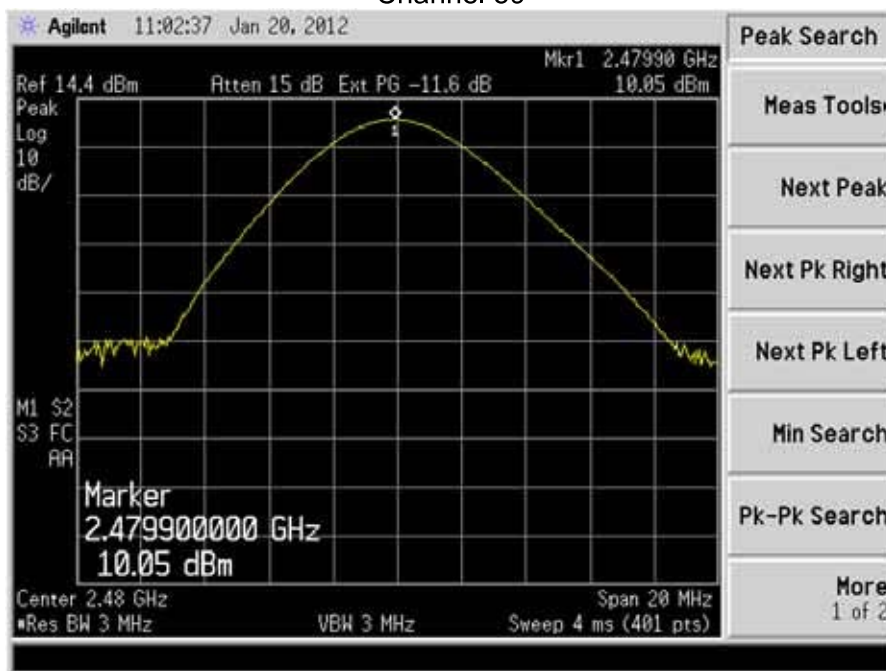


Prepared For: LS Research	Model Number: TiWi-BLE	Report #: 311258
EUT: Tiwi-BLE	Serial Number: 031202	LSR Job #: C-1285

Channel 20



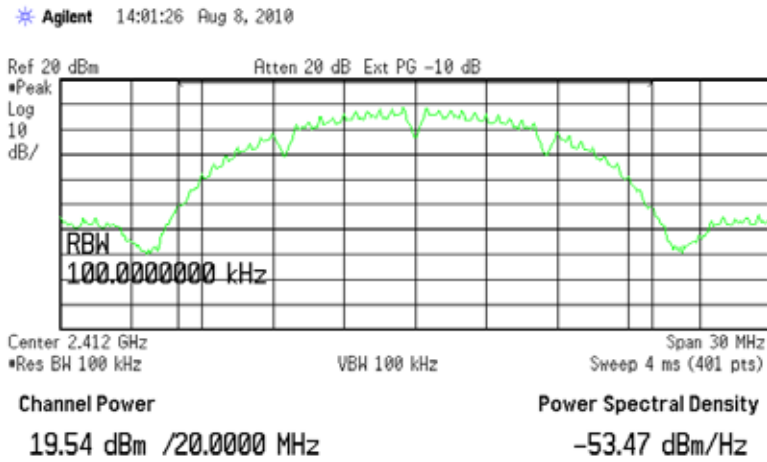
Channel 39



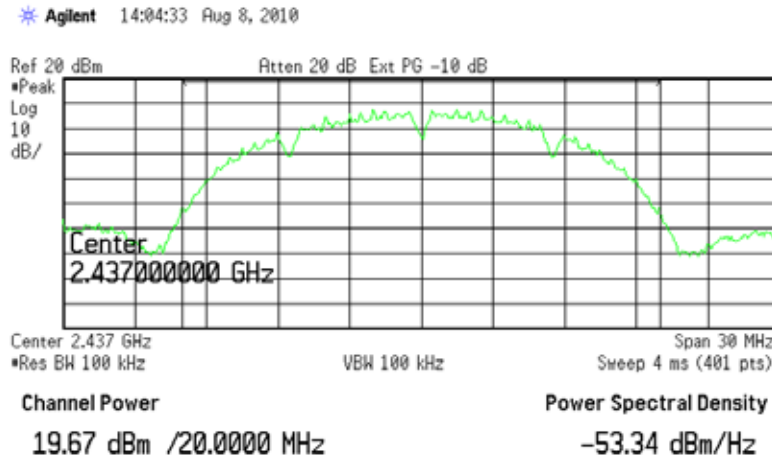
Prepared For: LS Research	Model Number: TiWi-BLE	Report #: 311258
EUT: Tiwi-BLE	Serial Number: 031202	LSR Job #: C-1285

WLAN 1 Mbps Data Rate:

Channel 1



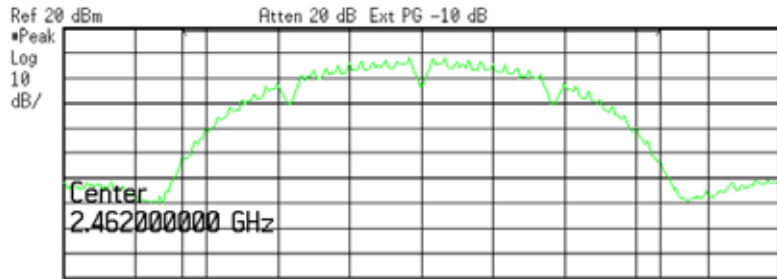
Channel 6



Prepared For: LS Research	Model Number: TiWi-BLE	Report #: 311258
EUT: Tiwi-BLE	Serial Number: 031202	LSR Job #: C-1285

Channel 11

Agilent 14:05:59 Aug 8, 2010



Center 2.462 GHz Span 30 MHz
Res BW 100 kHz VBW 100 kHz Sweep 4 ms (401 pts)

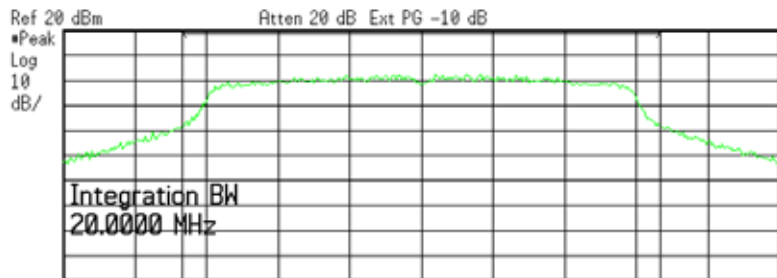
Channel Power Power Spectral Density
18.80 dBm /20.0000 MHz -54.21 dBm/Hz



WLAN MCS7:

Channel 1

Agilent 14:09:32 Aug 8, 2010



Center 2.412 GHz Span 30 MHz
Res BW 300 kHz VBW 3 MHz Sweep 4 ms (401 pts)

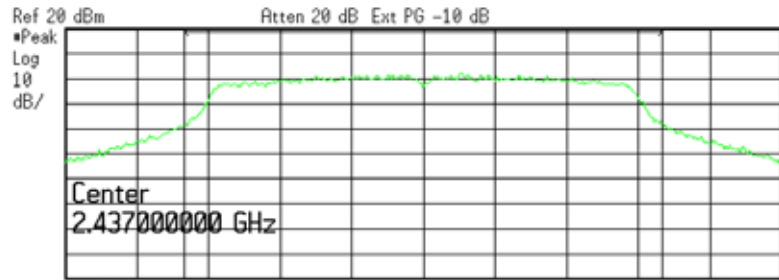
Channel Power Power Spectral Density
13.07 dBm /20.0000 MHz -59.95 dBm/Hz



Prepared For: LS Research	Model Number: TiWi-BLE	Report #: 311258
EUT: TiWi-BLE	Serial Number: 031202	LSR Job #: C-1285

Channel 6

Agilent 14:10:51 Aug 8, 2010



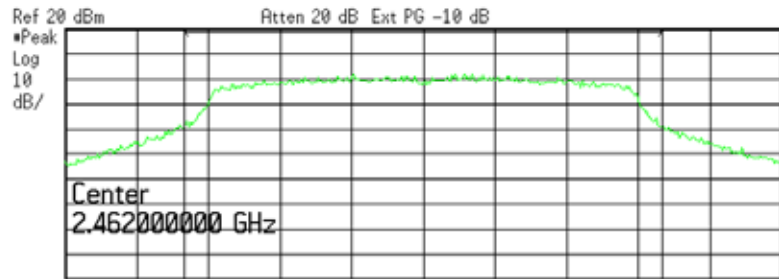
Center 2.437 GHz Span 30 MHz
•Res BW 300 kHz •VBW 3 MHz Sweep 4 ms (401 pts)

Channel Power Power Spectral Density
12.66 dBm /20.0000 MHz -60.35 dBm/Hz



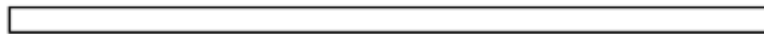
Channel 11

Agilent 14:11:54 Aug 8, 2010



Center 2.462 GHz Span 30 MHz
•Res BW 300 kHz •VBW 3 MHz Sweep 4 ms (401 pts)

Channel Power Power Spectral Density
12.22 dBm /20.0000 MHz -60.79 dBm/Hz



Prepared For: LS Research	Model Number: TiWi-BLE	Report #: 311258
EUT: Tiwi-BLE	Serial Number: 031202	LSR Job #: C-1285

EXHIBIT 10. POWER SPECTRAL DENSITY: 15.247(e)

10.1 - Limits

For digitally modulate 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.

In accordance with FCC Part 15.247(e) and RSS 210 A8.2(b), the peak power spectral density should not exceed +8 dBm in any 3 kHz band. This measurement was performed along with the conducted power output readings performed as described in previous sections. The peak output frequency for each representative frequency was scanned, with a narrow bandwidth, and reduced sweep, and a power density measurement was performed. The highest density was found to be no greater than -3.3 dBm, which is under the allowable limit by 11.3 dB.

10.2 - Test Equipment List

A complete list of test equipment can be found in Appendix A.

10.3 - Test Data

Bluetooth BLE:

Transmitter Channel	Frequency (MHz)	RF Power Level In 3 kHz BW (dBm/3 kHz)	Limit (dBm/3 kHz)	Margin (dB)	Comments Pass/Fail
0	2402	-4.9	8.0	12.9	Pass
20	2442	-4.9	8.0	12.9	Pass
39	2480	-4.8	8.0	12.8	Pass

WLAN 1Mbps:

Transmitter Channel	Frequency (MHz)	RF Power Level In 3 kHz BW (dBm/3 kHz)	Limit (dBm/3 kHz)	Margin (dB)	Comments Pass/Fail
1	2412	-4.3	8.0	12.3	Pass
6	2437	-3.3	8.0	11.3	Pass
11	2462	-4.1	8.0	12.1	Pass

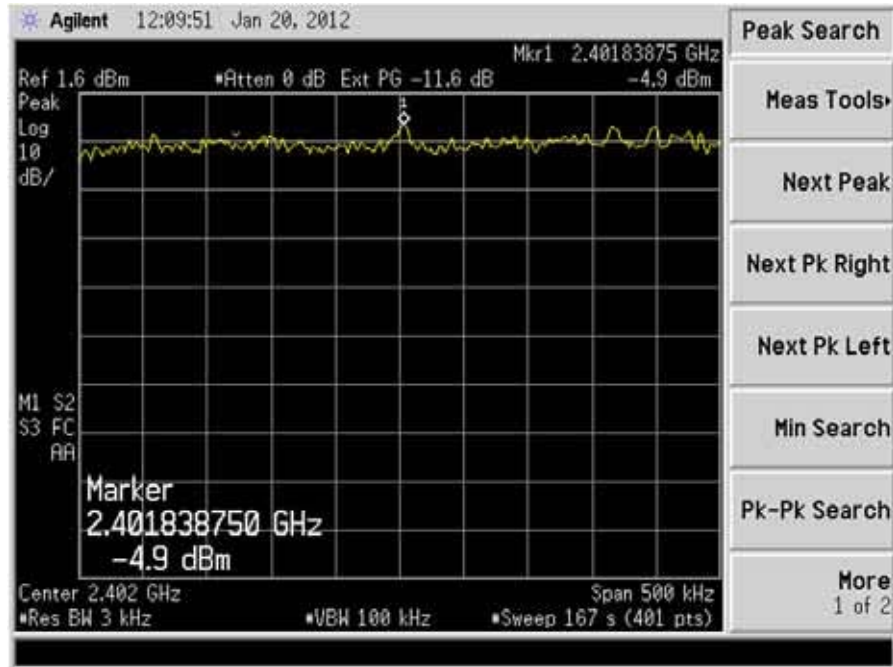
WLAN MCS7:

Transmitter Channel	Frequency (MHz)	RF Power Level In 3 kHz BW (dBm/3 kHz)	Limit (dBm/3 kHz)	Margin (dB)	Comments Pass/Fail
1	2412	-16.0	8.0	24.0	Pass
6	2437	-16.0	8.0	24.0	Pass
11	2462	-15.8	8.0	23.8	Pass

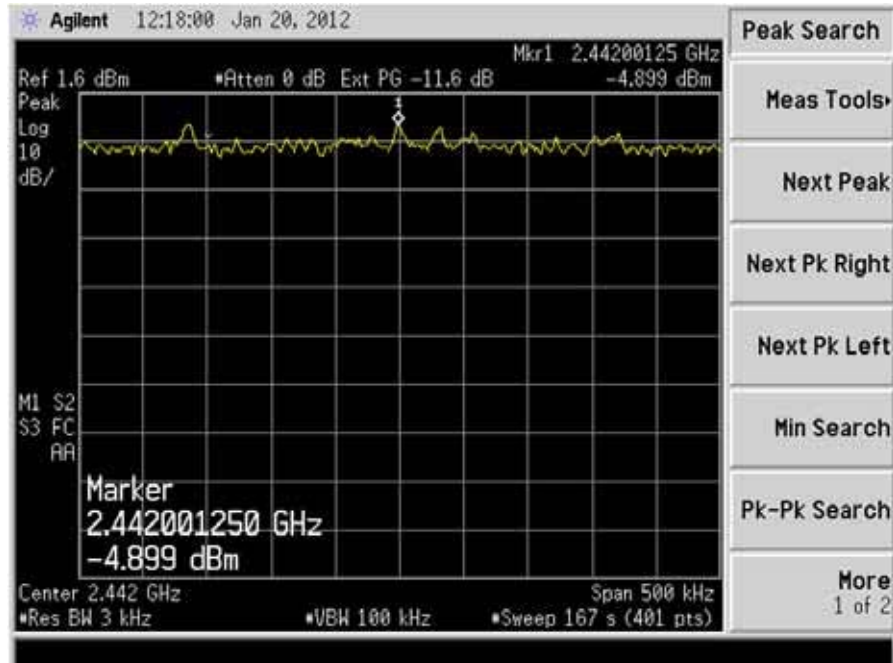
10.4 - Screen Captures – Power Spectral Density

Bluetooth BLE:

Channel 0

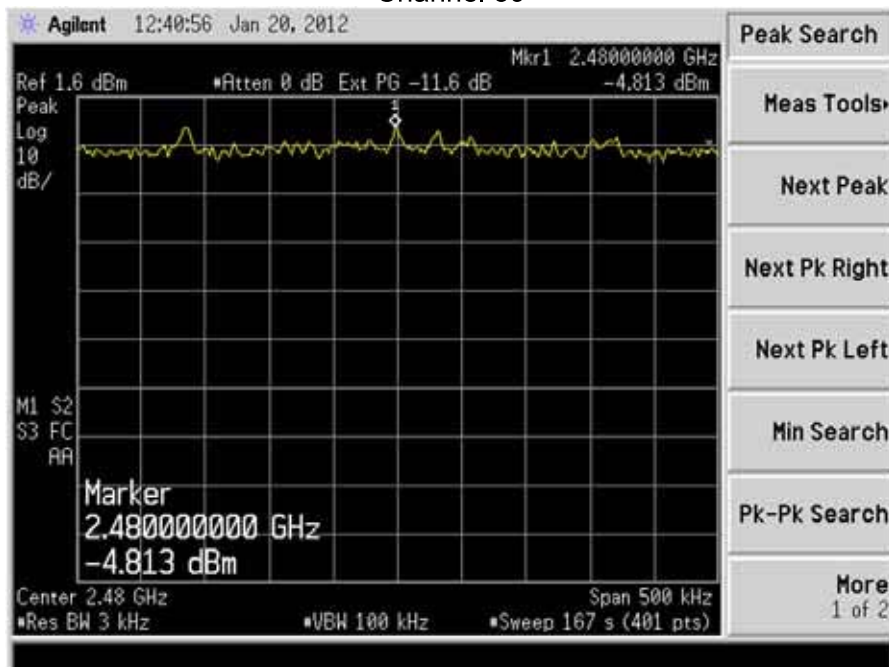


Channel 20



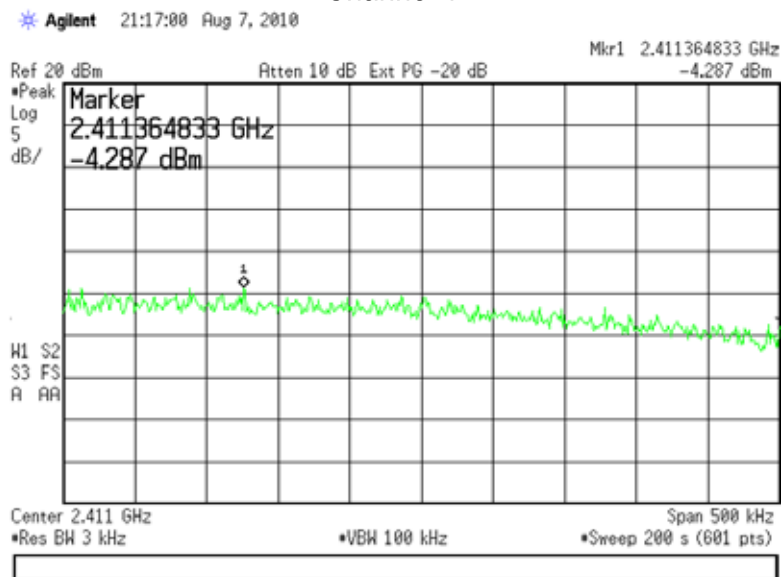
Prepared For: LS Research	Model Number: TiWi-BLE	Report #: 311258
EUT: Tiwi-BLE	Serial Number: 031202	LSR Job #: C-1285

Channel 39



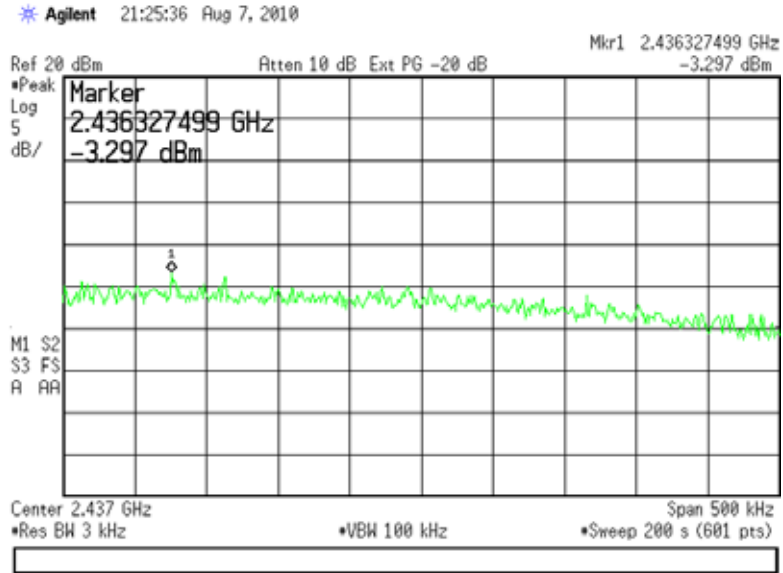
WLAN 1 Mbps:

Channel 1

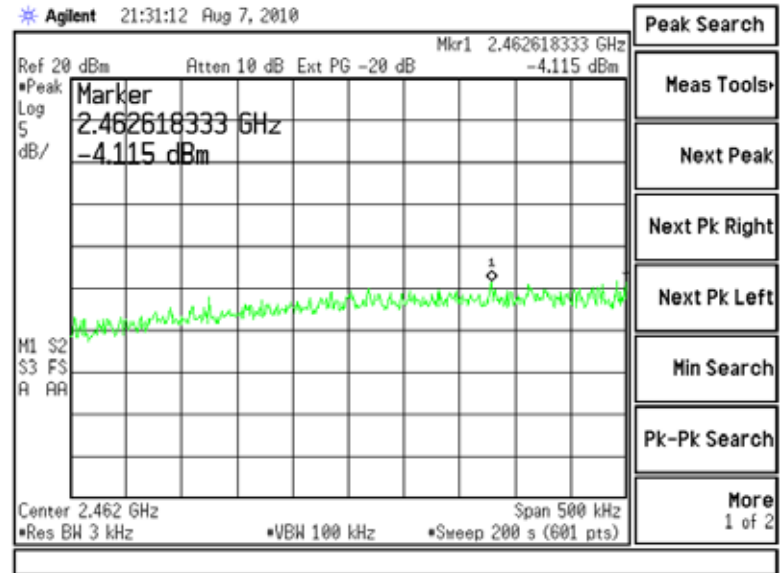


Prepared For: LS Research	Model Number: TiWi-BLE	Report #: 311258
EUT: Tiwi-BLE	Serial Number: 031202	LSR Job #: C-1285

Channel 6



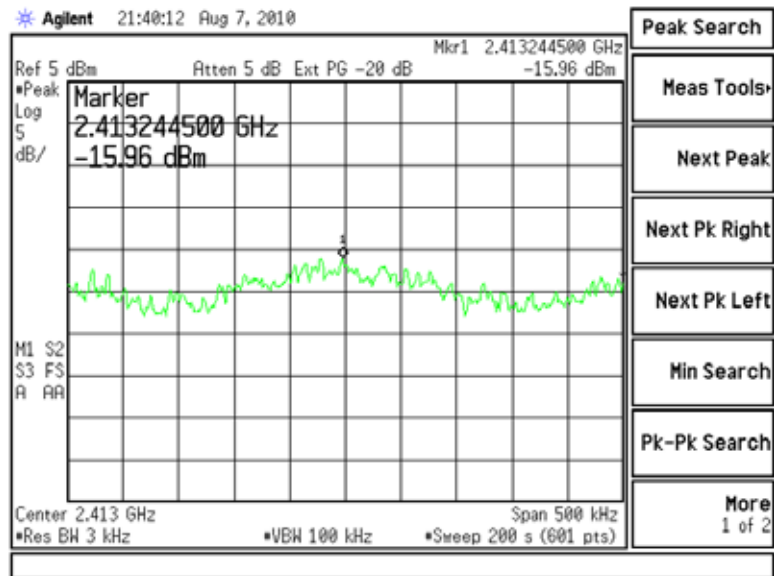
Channel 11



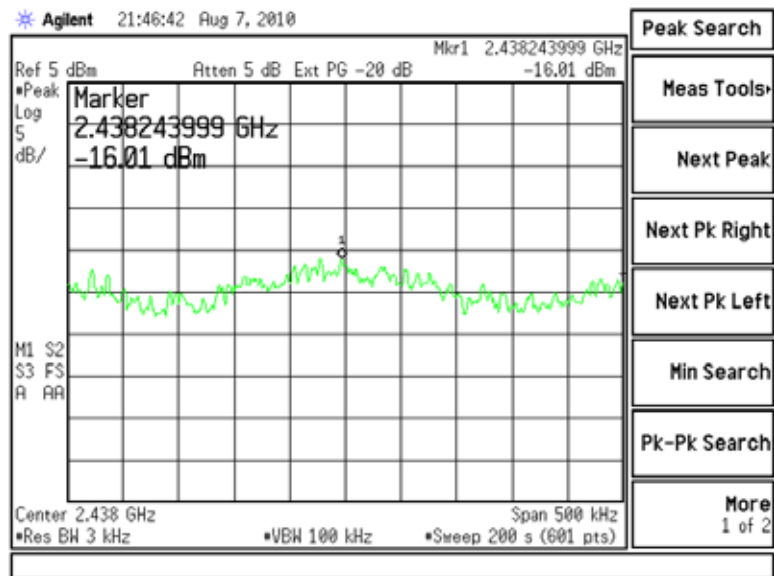
Prepared For: LS Research	Model Number: TiWi-BLE	Report #: 311258
EUT: Tiwi-BLE	Serial Number: 031202	LSR Job #: C-1285

WLAN MCS7:

Channel 1

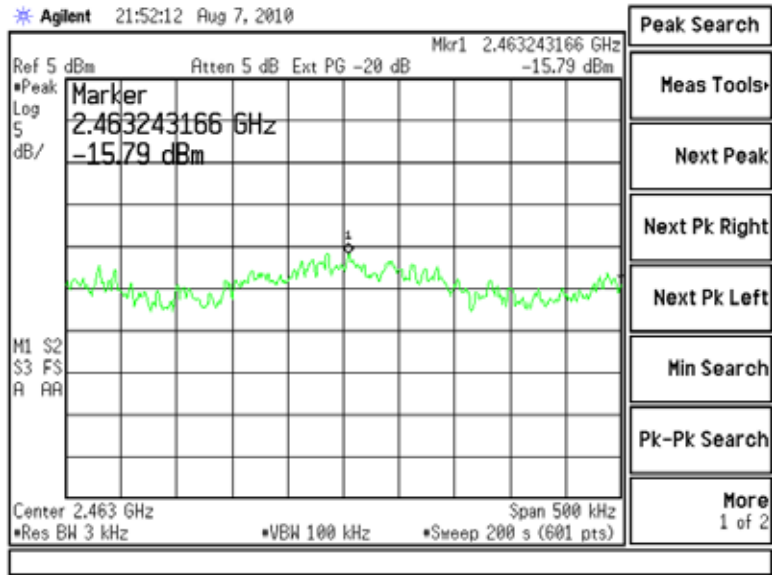


Channel 6



Prepared For: LS Research	Model Number: TiWi-BLE	Report #: 311258
EUT: Tiwi-BLE	Serial Number: 031202	LSR Job #: C-1285

Channel 11



Prepared For: LS Research	Model Number: TiWi-BLE	Report #: 311258
EUT: Tiwi-BLE	Serial Number: 031202	LSR Job #: C-1285

EXHIBIT 11. SPURIOUS CONDUCTED EMISSIONS: 15.247(d)

11.1 - Limits

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.

In addition, radiated emissions, which fall in the restricted band, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(e)

Remarks:

Applies to harmonics/spurious emissions that fall in the restricted bands listed in Section 15.205. The maximum permitted average field strength is listed in Section 15.209.

The emission limits as specified above are based on measurement instrument employing an average detector. The provisions in Section 15.35 for limiting peak emissions apply.

FCC 47 CFR 15.205(a) – Restricted Frequency Bands

MHz	MHz	MHz	GHz
0.090 – 0.110	162.0125 – 167.17	2310 – 2390	9.3 – 9.5
0.49 – 0.51	167.72 – 173.2	2483.5 – 2500	10.6 – 12.7
2.1735 – 2.1905	240 – 285	2655 – 2900	13.25 – 13.4
8.362 – 8.366	322 – 335.4	3260 – 3267	14.47 – 14.5
13.36 – 13.41	399.9 – 410	3332 – 3339	14.35 – 16.2
25.5 – 25.67	608 – 614	3345.8 – 3358	17.7 – 21.4
37.5 – 38.25	960 – 1240	3600 – 4400	22.01 – 23.12
73 – 75.4	1300 – 1427	4500 – 5250	23.6 – 24.0
108 – 121.94	1435 – 1626.5	5350 – 5460	31.2 – 31.8
123 – 138	1660 – 1710	7250 – 7750	36.43 – 36.5
149.9 – 150.05	1718.8 – 1722.2	8025 – 8500	Above 38.6
156.7 – 156.9	2200 – 2300	9000 – 9200	

Reported data is the raw data corrected for all applicable factors such as antenna factors, cable loss, etc.

Prepared For: LS Research	Model Number: TiWi-BLE	Report #: 311258
EUT: Tiwi-BLE	Serial Number: 031202	LSR Job #: C-1285

11.2 - Conducted Harmonic And Spurious RF Measurements

FCC Part 15.247(d) and IC RSS 210 A8.5 both require a measurement of conducted harmonic and spurious RF emission levels, as reference to the carrier level when measured in a 100 kHz bandwidth. For this test, the spurious and harmonic RF emissions from the EUT were measured at the EUT antenna port using a short RF cable. An Agilent E4446A spectrum analyzer was used with the resolution bandwidth set to 100 kHz for this portion of the tests. The unit was configured to run in a continuous transmit mode, while being supplied with typical data as a modulation source. The spectrum analyzer was used with measurements from a peak detector presented in the chart below. Screen captures were acquired and any noticeable spurious and harmonic signals were identified and measured.

No significant emissions could be noted within -50 dBc of the fundamental level for this product.

Bluetooth:

Frequency	2402 MHz [dBm]	2441 MHz [dBm]	2480 MHz [dBm]
2 nd Harmonic	- 55.9	- 59.2	- 53.7
3 rd Harmonic	- 61.1	- 62.7	- 63.0
4 th Harmonic	- 60.6	- 66.1	- 67.3
5 th Harmonic	- 69.6	Note (1)	- 67.6
6 th Harmonic	- 61.7	- 62.4	- 66.3
7 th Harmonic	- 65.7	- 66.8	- 67.7
8 th Harmonic	Note (1)	Note (1)	Note (1)
9 th Harmonic	Note (1)	Note (1)	Note (1)
10 th Harmonic	Note (1)	Note (1)	Note (1)

Spurious Conducted Emissions

Freq(MHz)	Channel	Level(dBm)
479.40	39	-70.2
814.10	39	-53.2
1630.00	39	-50.3
801.15	1	-52.0
1600.00	1	-51.2
827.00	79	-50.5
1660.00	79	-50.0

Prepared For: LS Research	Model Number: TiWi-BLE	Report #: 311258
EUT: Tiwi-BLE	Serial Number: 031202	LSR Job #: C-1285

Bluetooth BLE:

Frequency	2402 MHz [dBm]	2442 MHz [dBm]	2480 MHz [dBm]
Fundamental	+7.19	+6.77	+6.72
2 nd Harmonic	-48.33	-48.22	-44.98
3 rd Harmonic	-65.70	Note (1)	Note (1)
4 th Harmonic	Note (1)	Note (1)	Note (1)
5 th Harmonic	Note (1)	Note (1)	Note (1)
6 th Harmonic	Note (1)	Note (1)	Note (1)
7 th Harmonic	Note (1)	Note (1)	Note (1)
8 th Harmonic	Note (1)	Note (1)	Note (1)
9 th Harmonic	Note (1)	Note (1)	Note (1)
10 th Harmonic	Note (1)	Note (1)	Note (1)

Note 1): Measurement at system noise floor.

Spurious Conducted Emissions

Freq(MHz)	Channel	Level(dBm)
827.8	39	-57.73
837.5	20	-63.1
481.1	20	-62.59
801.2	0	-56.22

WLAN 1Mbps:

Frequency	2412 MHz [dBm]	2437 MHz [dBm]	2462 MHz [dBm]
2 nd Harmonic	- 53.0	Note (1)	- 54.8
3 rd Harmonic	Note (1)	Note (1)	Note (1)
4 th Harmonic	- 47.9	- 48.3	- 48.2
5 th Harmonic	Note (1)	Note (1)	Note (1)
6 th Harmonic	Note (1)	Note (1)	Note (1)
7 th Harmonic	Note (1)	Note (1)	Note (1)
8 th Harmonic	Note (1)	Note (1)	Note (1)
9 th Harmonic	Note (1)	Note (1)	Note (1)
10 th Harmonic	Note (1)	Note (1)	Note (1)

Note 1): Measurement at system noise floor.

Prepared For: LS Research	Model Number: TiWi-BLE	Report #: 311258
EUT: Tiwi-BLE	Serial Number: 031202	LSR Job #: C-1285

Spurious Conducted Emissions

Freq(MHz)	Channel	Level(dBm)
479.40	6	-70.2
814.10	6	-53.2
1630.00	6	-50.3
801.15	1	-52.0
1600.00	1	-51.2
827.00	11	-50.5
1660.00	11	-50.0

WLAN MCS7:

Frequency	2412 MHz [dBm]	2437 MHz [dBm]	2462 MHz [dBm]
2 nd Harmonic	Note (1)	Note (1)	Note (1)
3 rd Harmonic	Note (1)	Note (1)	Note (1)
4 th Harmonic	- 47.9	- 48.3	- 48.2
5 th Harmonic	Note (1)	Note (1)	Note (1)
6 th Harmonic	Note (1)	Note (1)	Note (1)
7 th Harmonic	Note (1)	Note (1)	Note (1)
8 th Harmonic	Note (1)	Note (1)	Note (1)
9 th Harmonic	Note (1)	Note (1)	Note (1)
10 th Harmonic	Note (1)	Note (1)	Note (1)

Note 1): Measurement at system noise floor.

Spurious Conducted Emissions

Freq(MHz)	Channel	Level(dBm)
479.40	6	-70.2
814.10	6	-53.2
1630.00	6	-50.3
801.15	1	-52.0
1600.00	1	-51.2
827.00	11	-50.5
1660.00	11	-50.0

11.3 - Test Equipment List

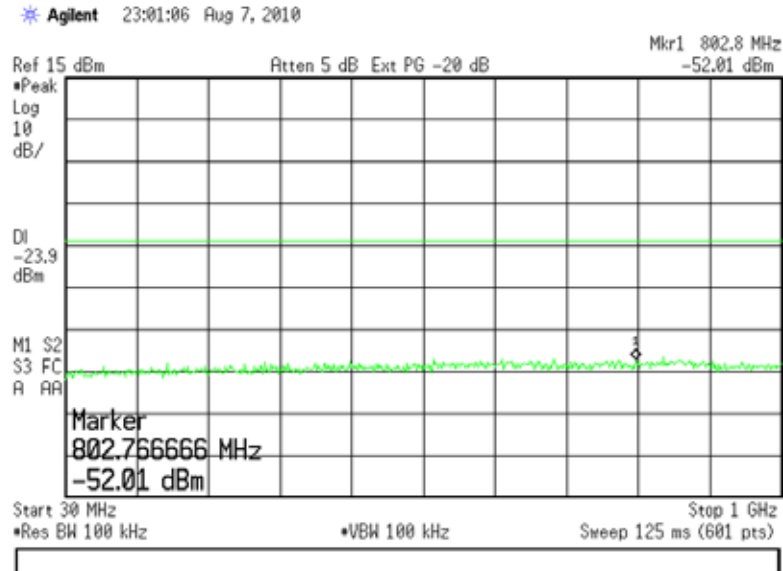
A complete list of test equipment that was used for this test can be found in Appendix A.

Prepared For: LS Research	Model Number: TiWi-BLE	Report #: 311258
EUT: Tiwi-BLE	Serial Number: 031202	LSR Job #: C-1285

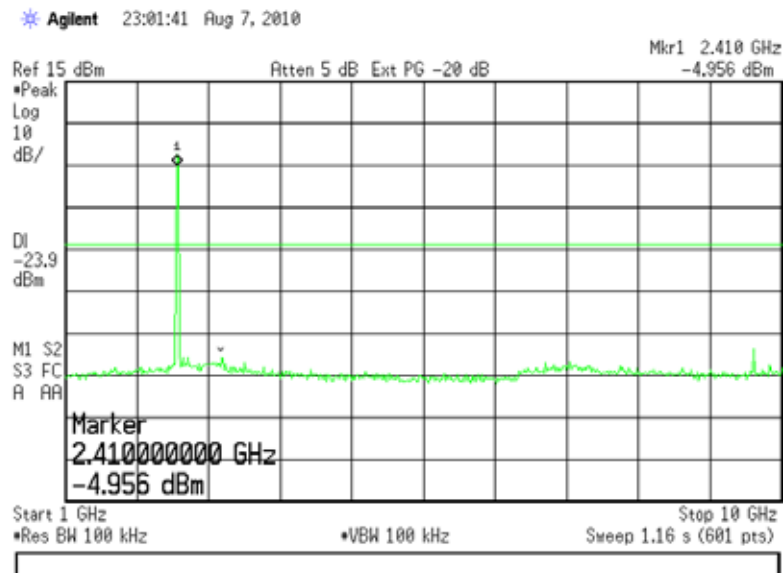
11.4 - Screen Captures – Spurious Radiated Emissions

Bluetooth:

Channel 2402, shown from 30 MHz up to 1000 MHz

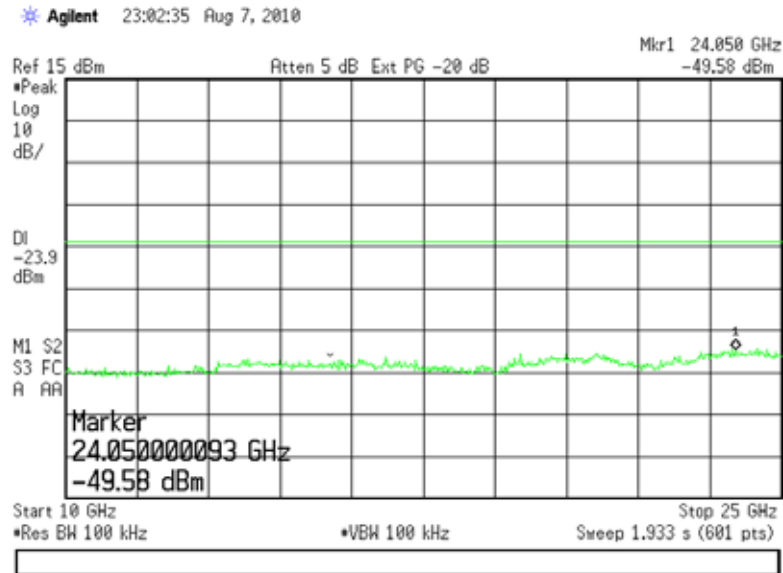


Channel 2402, shown from 1000 MHz up to 10000 MHz



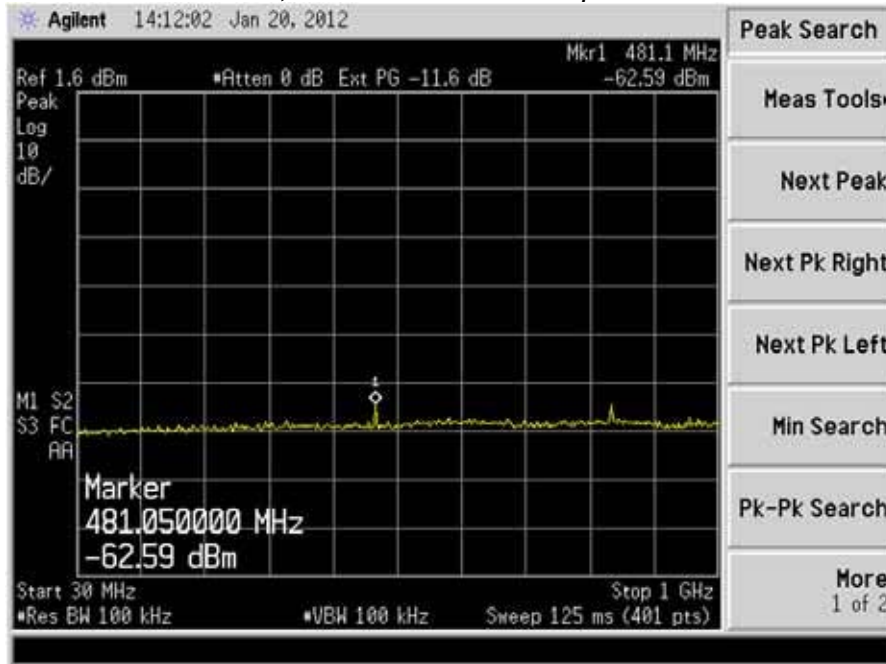
Prepared For: LS Research	Model Number: TiWi-BLE	Report #: 311258
EUT: Tiwi-BLE	Serial Number: 031202	LSR Job #: C-1285

Channel 2402, shown from 10000 MHz up to 25000 MHz



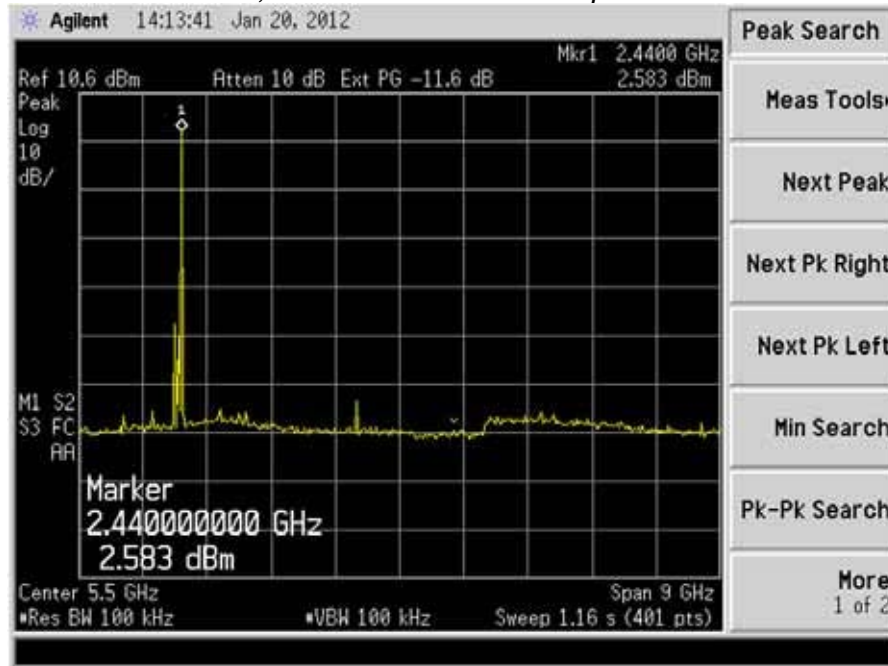
Bluetooth BLE:

Channel 20, shown from 30 MHz up to 1000 MHz



Prepared For: LS Research	Model Number: TiWi-BLE	Report #: 311258
EUT: Tiwi-BLE	Serial Number: 031202	LSR Job #: C-1285

Channel 20, shown from 1000 MHz up to 10000 MHz

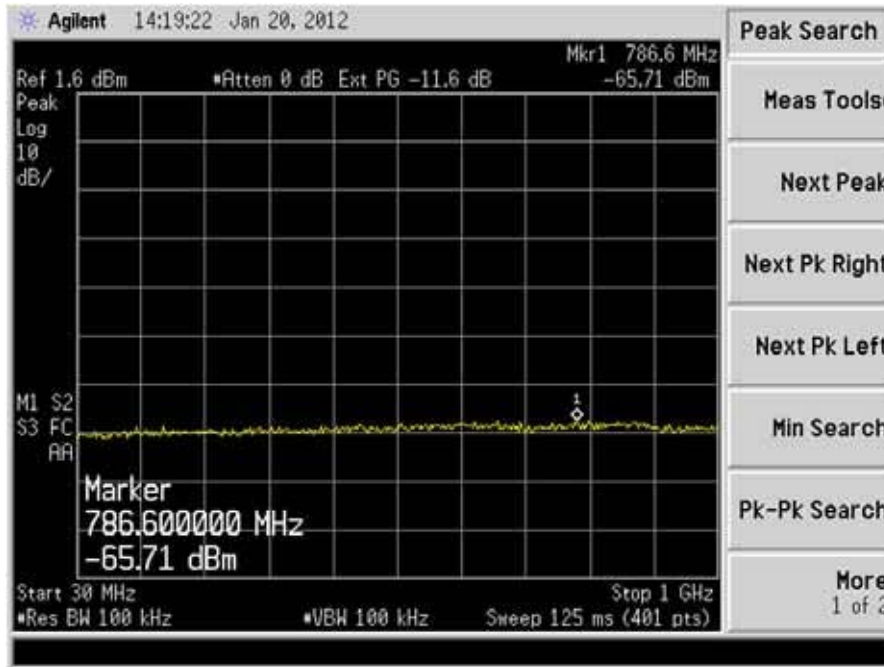


Channel 20, shown from 10000 MHz up to 25000 MHz

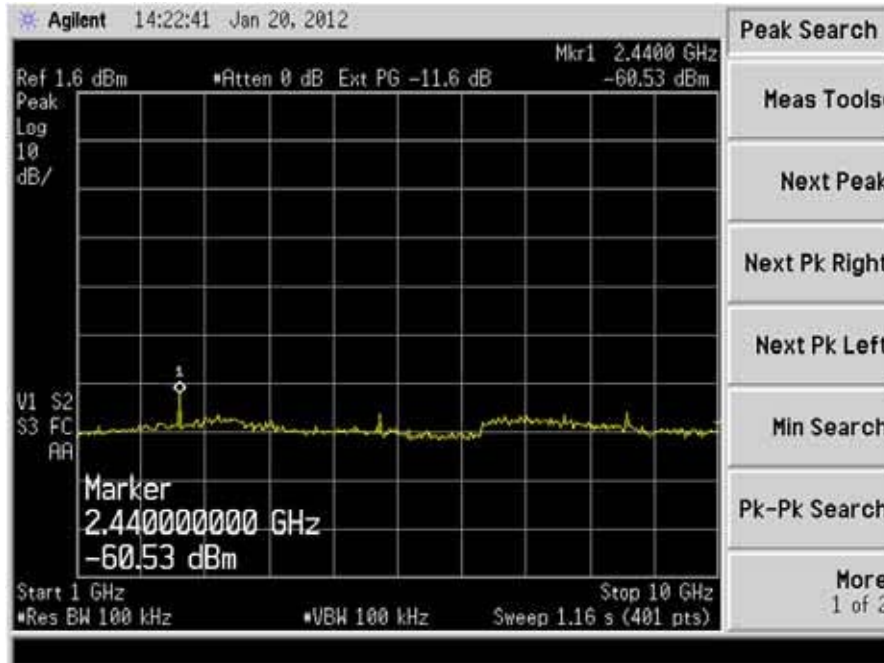


Prepared For: LS Research	Model Number: TiWi-BLE	Report #: 311258
EUT: Tiwi-BLE	Serial Number: 031202	LSR Job #: C-1285

Channel 20, shown from 30 MHz up to 1000 MHz
Receive Mode

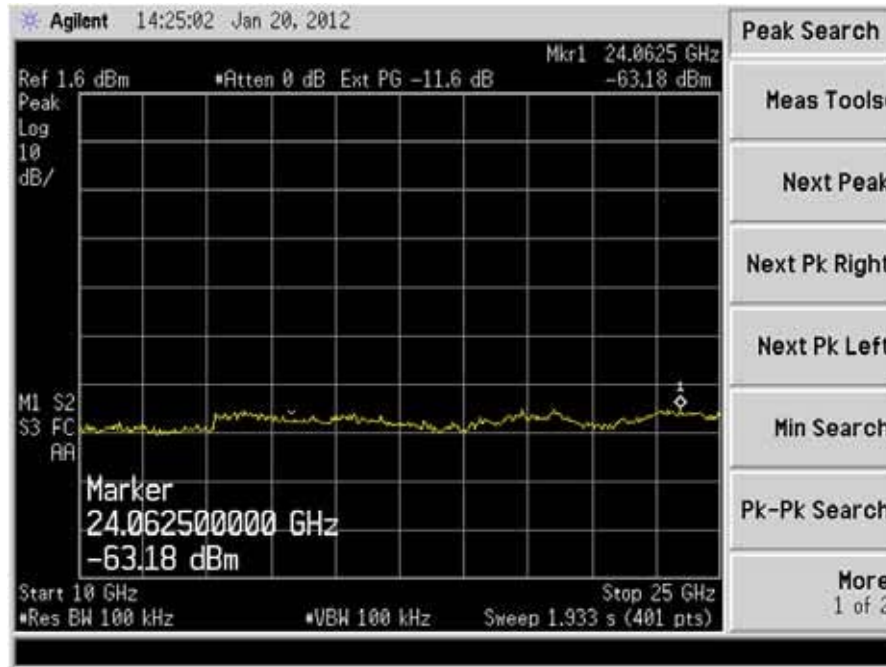


Channel 20, shown from 1000 MHz up to 10000 MHz
Receive Mode



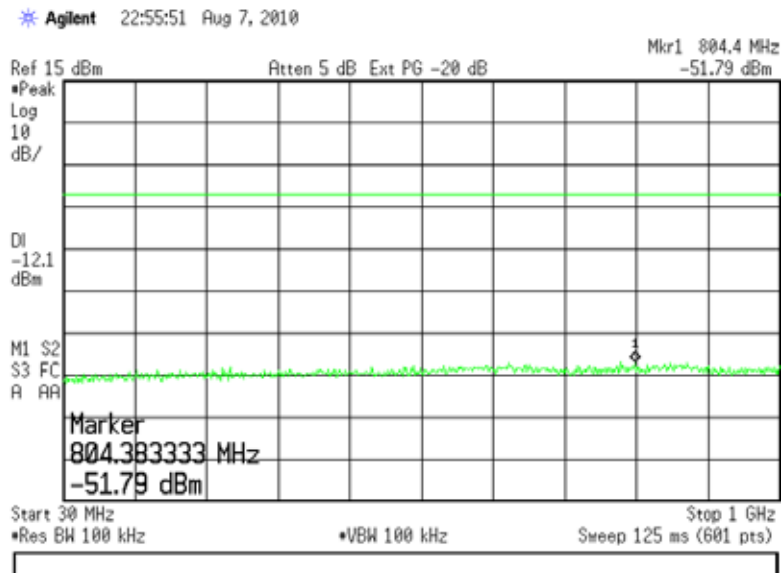
Prepared For: LS Research	Model Number: TiWi-BLE	Report #: 311258
EUT: Tiwi-BLE	Serial Number: 031202	LSR Job #: C-1285

Channel 20, shown from 10000 MHz up to 25000 MHz
Receive Mode



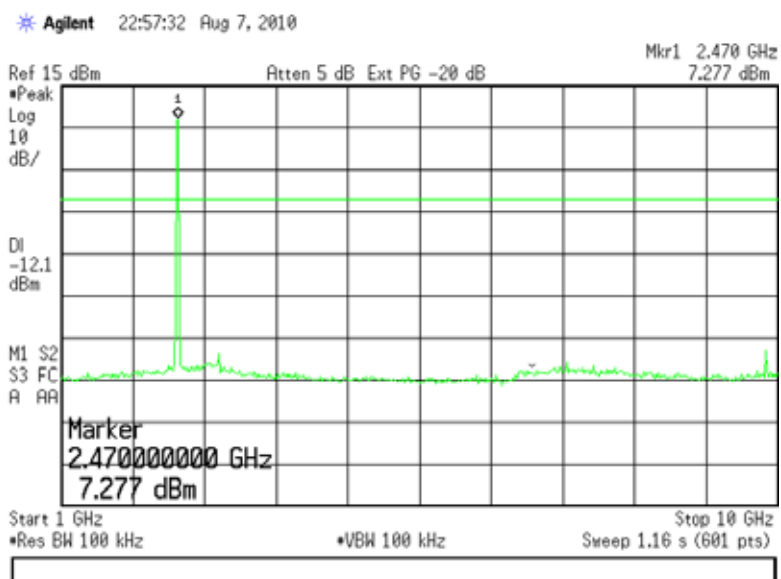
WLAN 1Mbps:

Channel 2480, shown from 30 MHz up to 1000 MHz

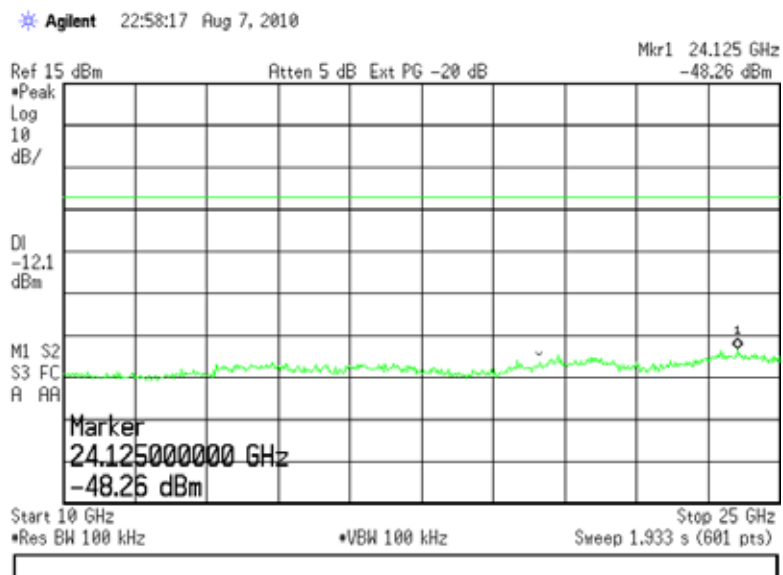


Prepared For: LS Research	Model Number: TiWi-BLE	Report #: 311258
EUT: Tiwi-BLE	Serial Number: 031202	LSR Job #: C-1285

Channel 2480, shown from 1000 MHz up to 10000 MHz



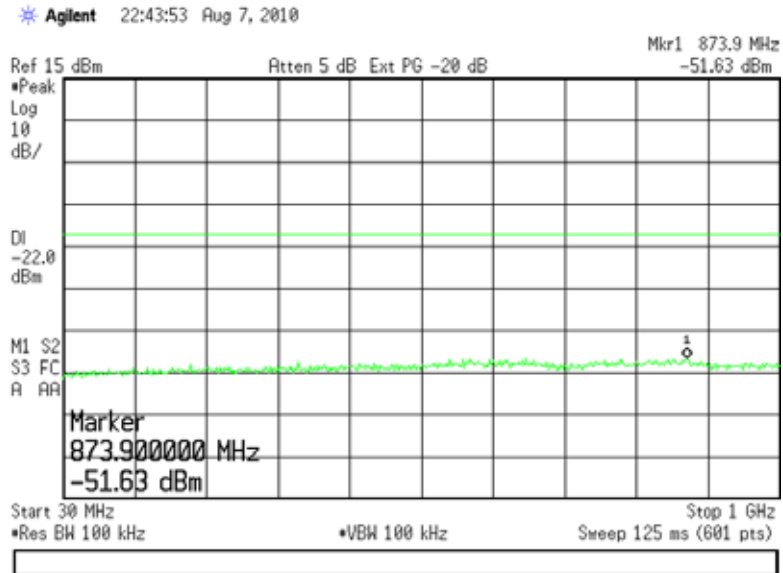
Channel 2480, shown from 10000 MHz up to 25000 MHz



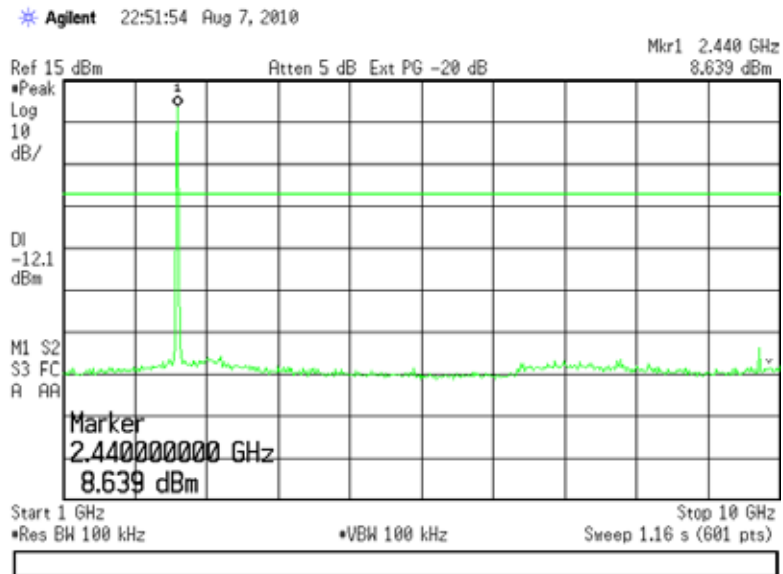
Prepared For: LS Research	Model Number: TiWi-BLE	Report #: 311258
EUT: Tiwi-BLE	Serial Number: 031202	LSR Job #: C-1285

WLAN MCS7:

Channel 2437, shown from 30 MHz up to 1000 MHz

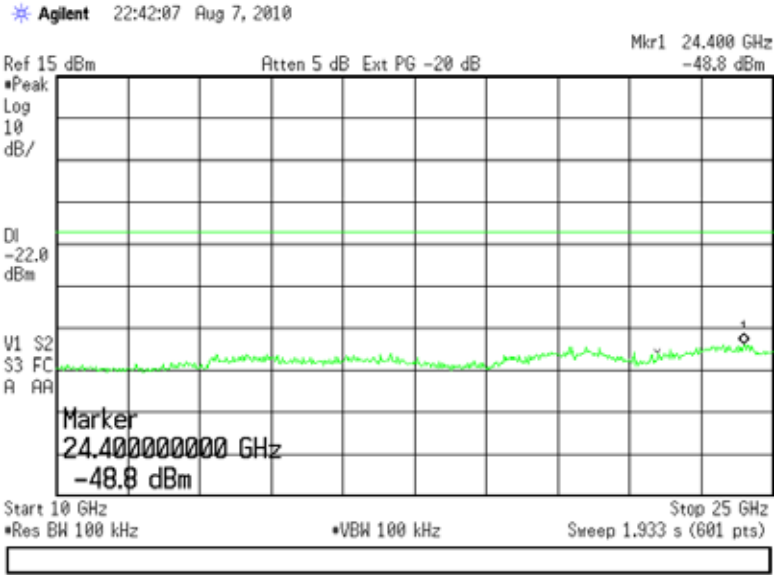


Channel 2437, shown from 1000 MHz up to 10000 MHz



Prepared For: LS Research	Model Number: TiWi-BLE	Report #: 311258
EUT: Tiwi-BLE	Serial Number: 031202	LSR Job #: C-1285

Channel 2437, shown from 10000 MHz up to 25000 MHz



Prepared For: LS Research	Model Number: TiWi-BLE	Report #: 311258
EUT: Tiwi-BLE	Serial Number: 031202	LSR Job #: C-1285

EXHIBIT 12. FREQUENCY & POWER STABILITY OVER VOLTAGE & TEMPERATURE VARIATIONS

A spectrum analyzer was used to measure the frequency at the appropriate frequency markers. For this test, the EUT was placed in continuous transmit CW mode. Power to the EUT was supplied by an external bench-type variable power supply. The frequency of operation was monitored using the spectrum analyzer with RBW=VBW=1 kHz settings while the voltage was varied.

Channel	2.8VDC		3.3VDC		3.8VDC	
	Power (dBm)	Frequency (Hz)	Power (dBm)	Frequency (Hz)	Power (dBm)	Frequency (Hz)
0	9.71	2402002000	9.757	2402002750	9.756	2402002250
20	10.02	2442254500	9.967	2442254250	9.951	2442254750
39	9.98	2479837250	9.98	2479838250	10.00	2479837000

Channel	Maximum Frequency (Hz)	Minimum Frequency (Hz)	Frequency Drift (Hz)
0	2402002750	2402002000	750
20	2442254750	2442254250	500
39	2479837250	2479835250	2000

Prepared For: LS Research	Model Number: TiWi-BLE	Report #: 311258
EUT: Tiwi-BLE	Serial Number: 031202	LSR Job #: C-1285

EXHIBIT 13. CHANNEL PLAN AND SEPARATION

An HP E4407B spectrum analyzer was used with a resolution bandwidth of 30 kHz to measure the channel separation of the Bluetooth FHSS Radio on the TiWi product.

The minimum and maximum channel-separations measured for this device are 997.50 kHz and 1021.25 kHz respectively. The maximum occupied bandwidth of the device, as reported in the previous section is 875.00 kHz. The following plots describe this spacing, and also establish the channel separation and plan.

13.1 Data Table

Range (MHz)	Number of Channels	Max Separation (Hz)
2400 - 2410.5	9.0	997.50
2410.5 - 2420	9.5	1021.25
2420 - 2430	10.0	1000.00
2430 - 2440	10.0	1000.00
2440-2450	10.0	1000.00
2450-2460	10.0	1000.00
2460-2470	10.0	1000.00
2470-2483.5	10.5	1011.25

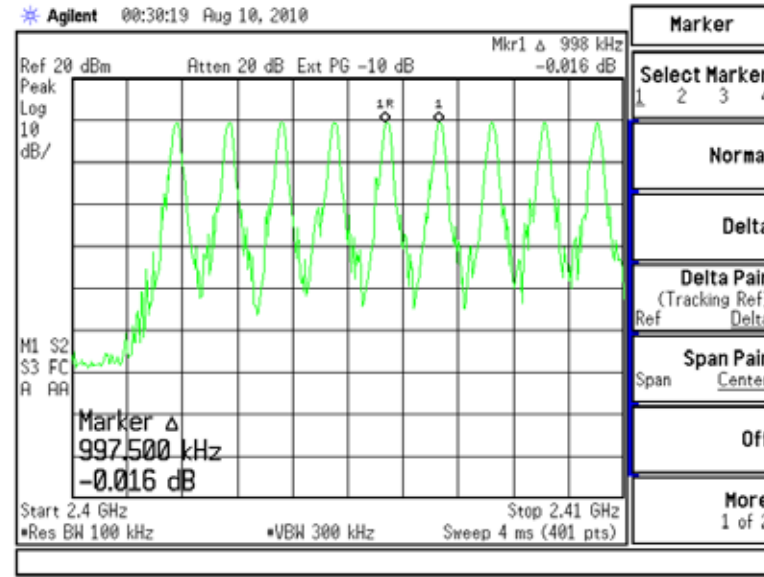
13.2 Summary Table

Total Channels	79
Max separation	1021.25
Min Separation	997.50

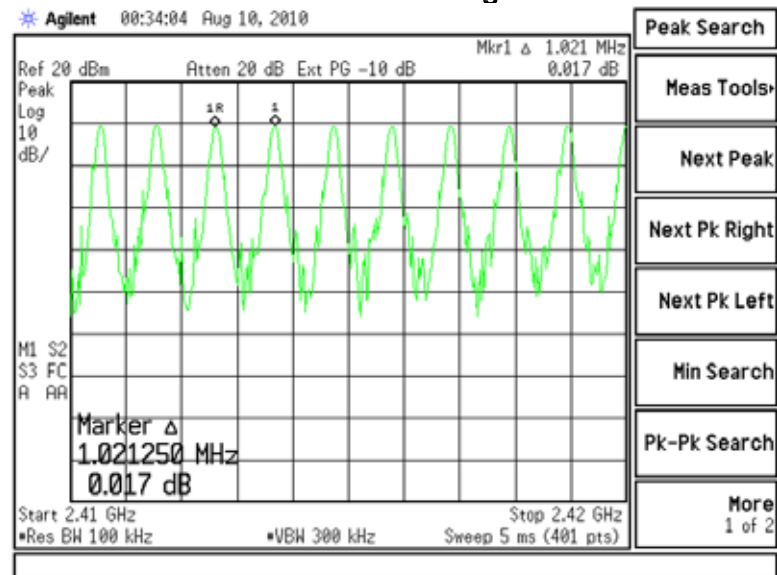
Prepared For: LS Research	Model Number: TiWi-BLE	Report #: 311258
EUT: Tiwi-BLE	Serial Number: 031202	LSR Job #: C-1285

13.3 Screen Captures – Channel Separation

Channels 01 through 09



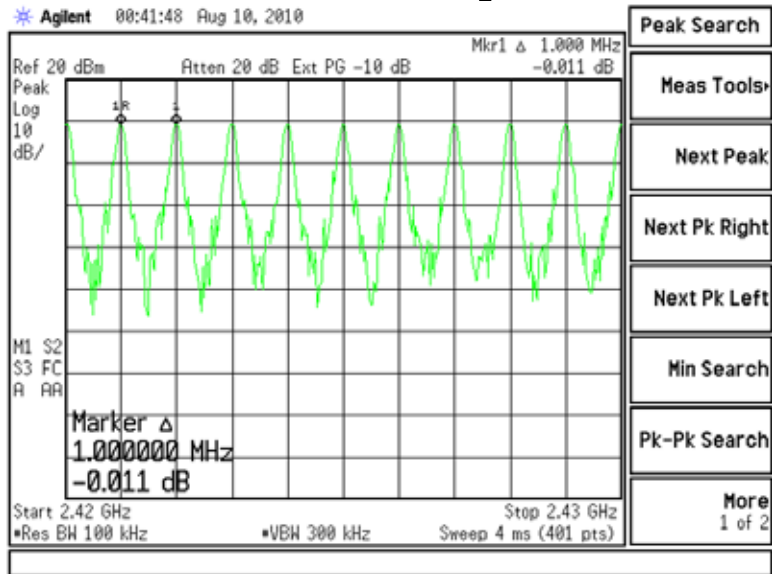
Channels 10 through 19



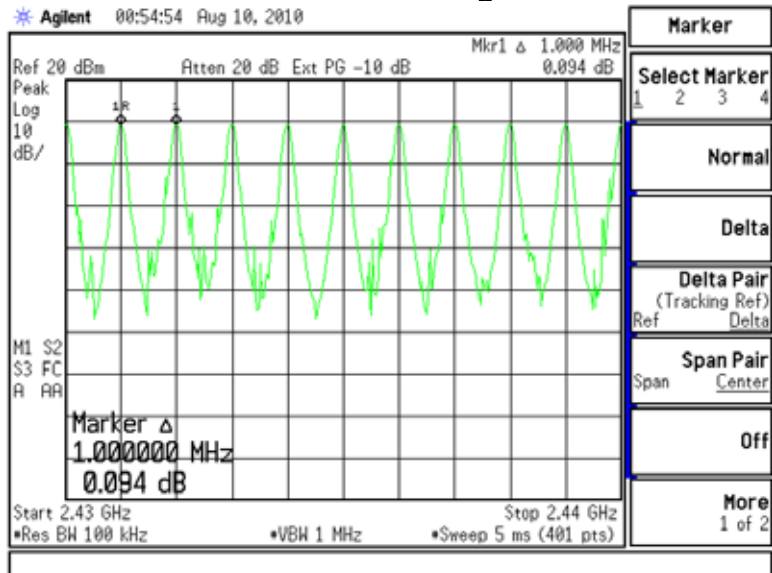
Prepared For: LS Research	Model Number: TiWi-BLE	Report #: 311258
EUT: Tiwi-BLE	Serial Number: 031202	LSR Job #: C-1285

Screen Captures – Channel Separation (continued)

Channels 19 through 29



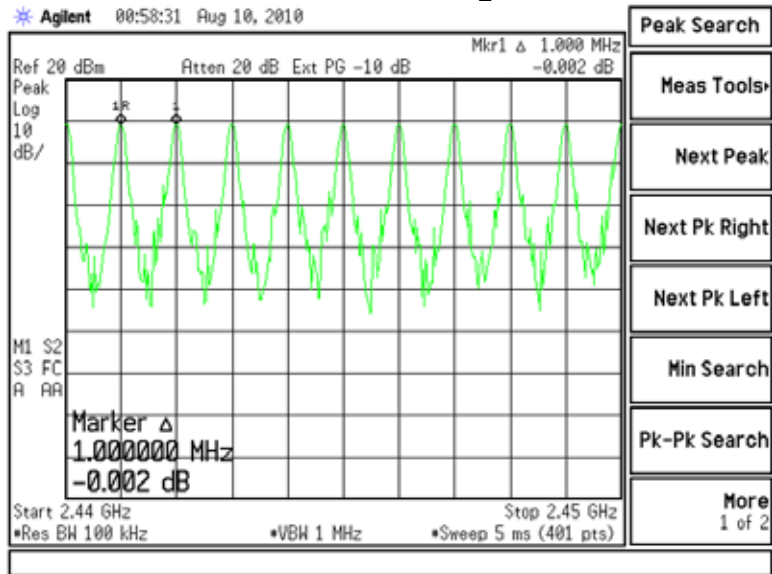
Channels 29 through 39



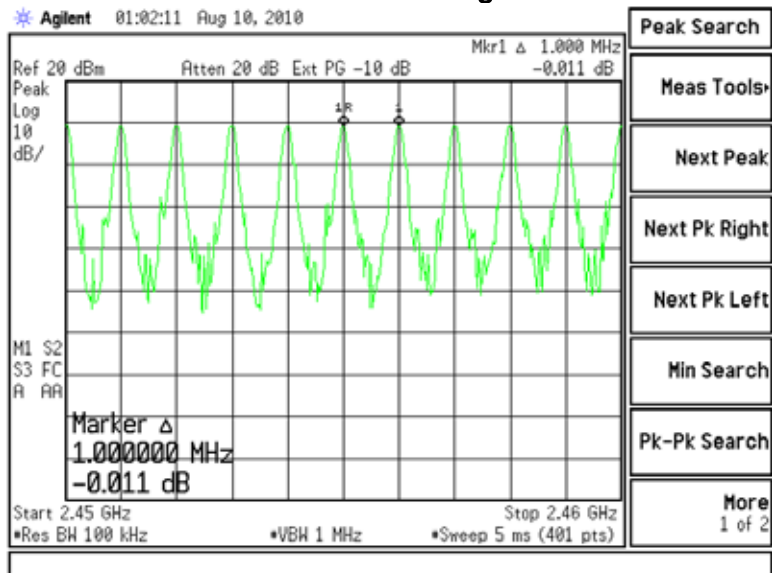
Prepared For: LS Research	Model Number: TiWi-BLE	Report #: 311258
EUT: Tiwi-BLE	Serial Number: 031202	LSR Job #: C-1285

Screen Captures – Channel Separation (continued)

Channels 39 through 49



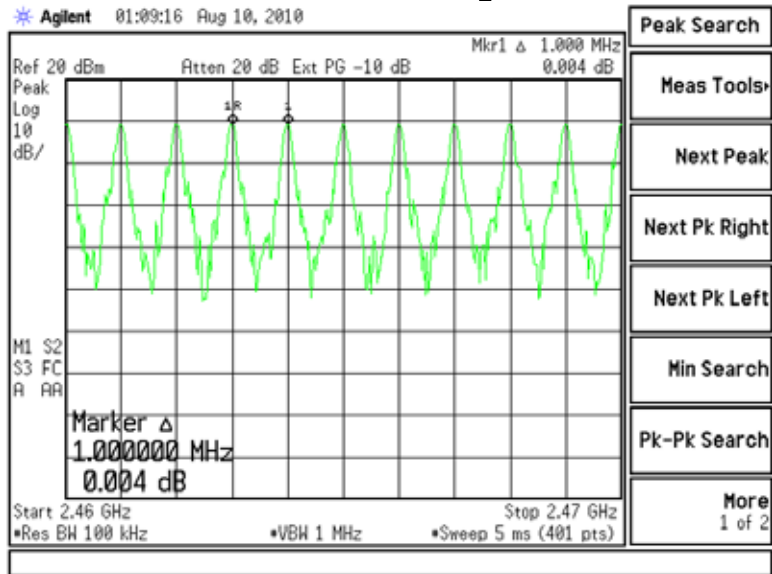
Channels 49 through 59



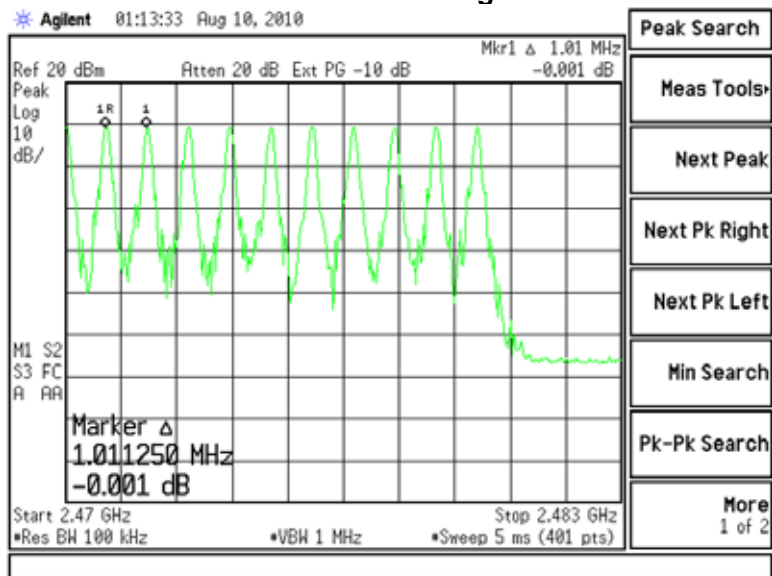
Prepared For: LS Research	Model Number: TiWi-BLE	Report #: 311258
EUT: Tiwi-BLE	Serial Number: 031202	LSR Job #: C-1285

Screen Captures – Channel Separation (continued)

Channels 59 through 69



Channels 69 through 79



Prepared For: LS Research	Model Number: TiWi-BLE	Report #: 311258
EUT: Tiwi-BLE	Serial Number: 031202	LSR Job #: C-1285

APPENDIX A – Test Equipment List



Date: 18-Jan-2012 Type Test: Spurious Emissions Job #: C-1285

Prepared By: Shane Rismeyer Customer: LSR Quote #: 311258

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	AA 960143	Phasefler	Gore	EKD0D0048.0	5546519	6/9/2011	6/9/2012	Active Calibration
2	EE 960073	Spectrum Analyzer	Agilent	E4446A	US45300564	4/25/2011	4/25/2012	Active Calibration
3	CC 000221C	Spectrum Analyzer	HP	E4407B	US3960256	5/4/2011	5/4/2012	Active Calibration

Project Engineer: *Eric Henry* Quality Assurance: *Letta Finken*



Date: 18-Jan-2012 Type Test: Power Spectral Density Job #: C-1285

Prepared By: Shane Rismeyer Customer: LSR Quote #: 311258

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	AA 960143	Phasefler	Gore	EKD0D0048.0	5546519	6/9/2011	6/9/2012	Active Calibration
2	EE 960073	Spectrum Analyzer	Agilent	E4446A	US45300564	4/25/2011	4/25/2012	Active Calibration
3	CC 000221C	Spectrum Analyzer	HP	E4407B	US3960256	5/4/2011	5/4/2012	Active Calibration

Project Engineer: *Eric Henry* Quality Assurance: *Letta Finken*



Date: 18-Jan-2012 Type Test: Occupied Bandwidth (5dB & 20dB) Job #: C-1285

Prepared By: Shane Rismeyer Customer: LSR Quote #: 311258

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	AA 960143	Phasefler	Gore	EKD0D0048.0	5546519	6/9/2011	6/9/2012	Active Calibration
2	EE 960073	Spectrum Analyzer	Agilent	E4446A	US45300564	4/25/2011	4/25/2012	Active Calibration
3	CC 000221C	Spectrum Analyzer	HP	E4407B	US3960256	5/4/2011	5/4/2012	Active Calibration

Project Engineer: *Eric Henry* Quality Assurance: *Letta Finken*

Prepared For: LS Research	Model Number: TiWi-BLE	Report #: 311258
EUT: TiWi-BLE	Serial Number: 031202	LSR Job #: C-1285



LS RESEARCH LLC
Wireless Product Development
Equipment Calibration

Date: 18-Jan-2012 Type Test: Conducted Power Output Job #: C-1285

Prepared By: Shane Rismeyer Customer: LSR Quote #: 31259

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	AA 960143	Phaseflex	Gore	EXD0D0048.0	5548519	6/9/2011	6/9/2012	Active Calibration
2	EE 960073	Spectrum Analyzer	Agilent	E4446A	US45000564	4/25/2011	4/25/2012	Active Calibration
3	CC 000221C	Spectrum Analyzer	HP	E4407B	US3960256	5/4/2011	5/4/2012	Active Calibration

Project Engineer: *Eric Rismeyer*

Quality Assurance: *Letta Feltner*



LS RESEARCH LLC
Wireless Product Development
Equipment Calibration

Date: 18-Jan-2012 Type Test: Band-Edge Job #: C-1285

Prepared By: Shane Rismeyer Customer: LSR Quote #: 31258

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	EE 960158	RF Preselector	Agilent	N9039A	MY4852010	6/19/2011	6/19/2012	Active Calibration
2	EE 960157	3Hz-13.2GHz Spectrum Analyzer	Agilent	E4445A	MY48520225	6/8/2011	6/8/2012	Active Calibration
3	AA 960007	Double Ridge Horn Antenna	EMCO	3115	9311-4138	4/27/2011	4/27/2012	Active Calibration
4	EE 960147	Pre-Amp	Adv. Micro	WLA612	123101	10/2/2011	10/2/2012	Active Calibration
5	EE 960156	100Hz-30GHz Analog Signal Generator	Agilent	N5981A	MY49080062	6/8/2011	6/8/2012	Active Calibration

Project Engineer: *Eric Rismeyer*

Quality Assurance: *Letta Feltner*



LS RESEARCH LLC
Wireless Product Development
Equipment Calibration

Date: 29-Sep-2010 Type Test: Radiated Emissions Job #: C-884

Prepared By: Peter Customer: LSR Quote #: 310117

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	EE 960157	3Hz-13.2GHz Spectrum Analyzer	Agilent	E4445A	MY48520225	3/17/2009	3/17/2010	Active Calibration
2	EE 960158	RF Preselector	Agilent	N9039A	MY48520110	7/2/2009	7/2/2010	Active Calibration
3	AA 960007	Double Ridge Horn Antenna	EMCO	3115	9311-4138	11/10/2009	11/10/2010	Active Calibration
4	AA 960078	Log Periodic Antenna	EMCO	93146	9701-4855	10/16/2009	10/16/2010	Active Calibration
5	AA 960081	Double Ridge Horn Antenna	EMCO	3115	6907	12/22/2009	12/22/2010	Active Calibration
6	EE 960147	Pre-Amp	Adv. Micro	WLA612	123101	12/28/2009	12/28/2010	Active Calibration
7	AA 960144	Phaseflex	Gore	EXD0D010720	5000373	6/25/2009	6/25/2010	Active Calibration
8	AA 960150	Bicon Antenna	ETS	3110B	0003-3346	11/3/2009	11/3/2010	Active Calibration



LS RESEARCH LLC
Wireless Product Development
Equipment Calibration

Date: 29-Sep-2010 Type Test: Spurious Emissions Job #: C-884

Prepared By: Peter Customer: LSR Quote #: 310117

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	CC 000221C	Spectrum Analyzer	HP	E4407B	US39180256	3/9/2009	3/9/2010	Active Calibration
2	AA 960143	Phaseflex	Gore	EXD0D01048.0	5548519	9/18/2009	9/18/2010	Active Calibration
3	EE 960157	3Hz-13.2GHz Spectrum Analyzer	Agilent	E4445A	MY48520225	3/17/2009	3/17/2010	Active Calibration
4	EE 960158	RF Preselector	Agilent	N9039A	MY48520110	7/2/2009	7/2/2010	Active Calibration
5	AA 960007	Double Ridge Horn Antenna	EMCO	3115	9311-4138	11/10/2009	11/10/2010	Active Calibration
6	AA 960078	Log Periodic Antenna	EMCO	93146	9701-4855	10/16/2009	10/16/2010	Active Calibration
7	AA 960081	Double Ridge Horn Antenna	EMCO	3115	6907	12/22/2009	12/22/2010	Active Calibration
8	EE 960147	Pre-Amp	Adv. Micro	WLA612	123101	12/28/2009	12/28/2010	Active Calibration
9	AA 960144	Phaseflex	Gore	EXD0D010720	5000373	6/25/2009	6/25/2010	Active Calibration
10	AA 960150	Bicon Antenna	ETS	3110B	0003-3346	11/3/2009	11/3/2010	Active Calibration

Prepared For: LS Research	Model Number: TiWi-BLE	Report #: 311258
EUT: Tiwi-BLE	Serial Number: 031202	LSR Job #: C-1285



Date: 15-Jun-2010 Type Test: Occupied Bandwidth (6dB & 20dB) Job #: C-884
 Prepared By: Peter Customer: LSR Quote #: 310117

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	CC 000221C	Spectrum Analyzer	HP	E4407B	US39160256	3/9/2009	3/9/2010	Active Calibration
2	AA 960143	Phaseflex	Gore	EKD01D01048.0	5548519	9/16/2009	9/16/2010	Active Calibration
3	EE 960073	Spectrum Analyzer	Agilent	E4448A	US45300564	9/17/2009	9/17/2010	Active Calibration
4	AA 960144	Phaseflex	Gore	EKD01D010720	5800373	6/25/2009	6/25/2010	Active Calibration



Date: 5-Jun-2010 Type Test: Conducted Power Output Job #: C-884
 Prepared By: Peter Customer: LSR Quote #: 310117

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	AA 960143	Phaseflex	Gore	EKD01D01048.0	5548519	9/16/2009	9/16/2010	Active Calibration
2	CC 000221C	Spectrum Analyzer	HP	E4407B	US39160256	3/9/2009	3/9/2010	Active Calibration
3	EE 960073	Spectrum Analyzer	Agilent	E4448A	US45300564	9/17/2009	9/17/2010	Active Calibration
4	AA 960144	Phaseflex	Gore	EKD01D010720	5800373	6/25/2009	6/25/2010	Active Calibration



Date: 15-Jun-2010 Type Test: Power Spectral Density Job #: C-884
 Prepared By: Peter Customer: LSR Quote #: 310117

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	CC 000221C	Spectrum Analyzer	HP	E4407B	US39160256	3/9/2009	3/9/2010	Active Calibration
2	AA 960143	Phaseflex	Gore	EKD01D01048.0	5548519	9/16/2009	9/16/2010	Active Calibration
3	EE 960073	Spectrum Analyzer	Agilent	E4448A	US45300564	9/17/2009	9/17/2010	Active Calibration
4	AA 960144	Phaseflex	Gore	EKD01D010720	5800373	6/25/2009	6/25/2010	Active Calibration



Date: 29-Sep-2010 Type Test: Band-Edge Job #: C-884
 Prepared By: Peter Customer: LSR Quote #: 310117

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	EE 960157	3Hz-13.2GHz Spectrum Analyzer	Agilent	E4445A	MY48260225	3/17/2010	3/17/2011	Active Calibration
2	EE 960158	RF Preselector	Agilent	N9039A	MY48201110	7/2/2009	7/2/2010	Active Calibration
3	AA 960081	Double Ridge Horn Antenna	EMCO	3115	6907	12/22/2009	12/22/2010	Active Calibration



Date: 20-Apr-2010 Type Test: Radiated Emissions (109) Job #: C-884
 Prepared By: Peter Customer: LSR Quote #: 310117

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	EE 960157	3Hz-13.2GHz Spectrum Analyzer	Agilent	E4445A	MY48260225	3/17/2009	3/17/2010	Active Calibration
2	EE 960158	RF Preselector	Agilent	N9039A	MY48201110	7/2/2009	7/2/2010	Active Calibration
3	AA 960007	Double Ridge Horn Antenna	EMCO	3115	9311-4138	11/10/2009	11/10/2010	Active Calibration
4	AA 960078	Log Periodic Antenna	EMCO	93148	9701-4855	10/16/2009	10/16/2010	Active Calibration
5	AA 960081	Double Ridge Horn Antenna	EMCO	3115	6907	12/22/2009	12/22/2010	Active Calibration
6	EE 960147	Pre-Amp	Adv. Micro	WL4612	123101	12/28/2009	12/28/2010	Active Calibration
7	AA 960150	Bicon Antenna	ETS	3110B	0003-3346	11/3/2009	11/3/2010	Active Calibration



Date: 28-Sep-2010 Type Test: Conducted AC Emissions Job #: C-884
 Prepared By: Peter Customer: LSR Quote #: 310117

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	AA 960008	LSR	EMCO	38162NM	9701-1057	12/15/2009	12/15/2010	Active Calibration
2	EE 960157	3Hz-13.2GHz Spectrum Analyzer	Agilent	E4445A	MY48260225	3/17/2009	3/17/2010	Active Calibration
3	EE 960158	RF Preselector	Agilent	N9039A	MY48201110	7/2/2009	7/2/2010	Active Calibration
4	AA 960072	Transient Limiter	HP	11947A	3107A01708	9/15/2009	10/15/2010	Active Calibration

Prepared For: LS Research	Model Number: TiWi-BLE	Report #: 311258
EUT: Tiwi-BLE	Serial Number: 031202	LSR Job #: C-1285

APPENDIX C - Uncertainty Statement

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level, using a coverage factor of k=2.

Table of Expanded Uncertainty Values, (K=2) for Specified Measurements

Measurement Type	Particular Configuration	Uncertainty Values
Radiated Emissions	3 – Meter chamber, Biconical Antenna	4.24 dB
Radiated Emissions	3-Meter Chamber, Log Periodic Antenna	4.8 dB
Radiated Emissions	10-Meter OATS, Biconical Antenna	4.18 dB
Radiated Emissions	10-Meter OATS, Log Periodic Antenna	3.92 dB
Conducted Emissions	Shielded Room/EMCO LISN	1.60 dB
Radiated Immunity	3 Volts/Meter in 3-Meter Chamber	1.128 Volts/Meter
Conducted Immunity	3 Volts level	1.0 V

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