

Test Report No. 7191072148-EEC13/01
dated 04 Nov 2013

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FORMAL REPORT ON TESTING IN ACCORDANCE WITH
47 CFR FCC Parts 15B & C : 2012
OF A
COMPACT STEREO SYSTEM
[Model : SC-HC39]
[FCC ID : ACJ-B21R1401]

TEST FACILITY

TÜV SÜD PSB Pte Ltd,
Electrical & Electronics Centre (EEC), Product Services,
No. 1 Science Park Drive, Singapore 118221

FCC REG. NO.

99142 (3m and 10m Semi-Anechoic Chamber, Science Park)

IND. CANADA REG. NO.

2932I-1 (3m and 10m Semi-Anechoic Chamber, Science Park)

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QUOTATION NUMBER

219181581

JOB NUMBER

7191072148

TEST PERIOD

17 Sept -24 Oct 2013

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TEST SUMMARY

The product was tested in accordance with the customer's specifications.

Test Results Summary

| Test Standard | Description | Pass / Fail |
|---------------------------|--|------------------------------|
| 47 CFR FCC Part 15: 2012 | | |
| 15.107(a), 15.207 | Conducted Emissions | Pass |
| 15.109(a), 15.205, 15.209 | Radiated Emissions (Spurious Emissions inclusive Restricted Bands Requirement) | Pass |
| 15.247(a)(1) | Carrier Frequency Separation | Pass |
| | Spectrum Bandwidth (20dB Bandwidth Measurement) | Pass |
| 15.247(a)(1)(iii) | Number of Hopping Frequencies | Pass |
| | Average Frequency Dwell Time | Pass |
| 15.247(b)(1) | Maximum Peak Power | Pass |
| 15.247(d) | RF Conducted Spurious Emissions | Pass |
| 15.247(d) | Band Edge Compliance (Conducted) | Pass |
| 15.247(d) | Band Edge Compliance (Radiated) | Pass |
| 15.247(e) | Peak Power Spectral Density | Pass |
| 1.1310 | Maximum Permissible Exposure | Refer to page 85 for details |

TEST SUMMARY

Notes

1. Three channels as listed below, which respectively represent the lower, middle and upper channels of the Equipment Under Test (EUT) were chosen and tested. For each channel, the EUT was configured to operate in the test mode.

| <u>Transmit Channel</u> | <u>Frequency (GHz)</u> |
|-------------------------|------------------------|
| Channel 0 | 2.402 |
| Channel 39 | 2.441 |
| Channel 78 | 2.480 |

2. All the measurements in section 15.247 were done based on conducted measurements except Band Edge Compliance (Radiated) test.
3. The EUT is a Class B device when in non-transmitting state and meets the 47 CFR FCC Part15B Class B requirements.
4. All test measurement procedures are according to ANSI C63.4: 2003.
5. The maximum measured RF power of the Equipment Under Test is 2.05dBm

Modifications

No modifications were made.



PRODUCT DESCRIPTION

| | |
|------------------------------------|--|
| Description | : The Equipment Under Test (EUT) is a COMPACT STEREO SYSTEM . |
| Applicant | : Panasonics AVC Networks Singapore 202, Bedok South Avenue 1 Singapore 469332 |
| Manufacturer | : Panasonic Corporation 1006 Oaza Kadoma Kadoma City - Osaka 571 8501, Japan |
| Factor (ies) | : Panasonic AVC Networks Johor Malaysia Sdn. Bhd. IE PLO 460, Jalan Bandar, 81700 Pasir Gudang, Johor, Malaysia |
| Model Number | : SC-HC39 |
| Contains FCC ID | : ACJ-B21R1401 |
| Serial Number | : J13RHC39P21 |
| Microprocessor | : BM94801KUT-Z Rohm Semiconductor Pte Ltd |
| Operating / Transmitting Frequency | : Bluetooth - 2.402MHz (lower channel) to 2.480MHz (upper channel) - 79 channels. FM 87.5MHz - 108MHz |
| Clock / Oscillator Frequency | : 128kHz (AM/FM), 26MHz (Bluetooth), 16MHz & 32kHz |
| Modulation | : DH1 (1Mbps): Gaussian Frequency Shift Keying (GFSK) DH3 (2Mbps): $\pi/4$ Differential-Quadrature Phase Shift Keying (DQPSK) DH5 (3Mbps): 8 Differential Phase-Shift keying Keying (DPSK) |
| Antenna Gain | : 2.0 dBi |
| Port / Connectors | : Refer to manufacturer's user manual / operating manual. |
| Rated Input Power | : 120V 60Hz |
| Accessories | : Remote Control (AA Battery) FM Antenna AC Cord Wall Mounted Bracket |

SUPPORTING EQUIPMENT DESCRIPTION

| Equipment Description (Including Brand Name) | Model, Serial & FCC ID Number | Cable Description (List Length, Type & Purpose) |
|---|---|--|
| Apple iPhone 5 | M/N: MD298ZA/A S/N: C36J91R9DTWF FCC ID: BCG-E2599A | |
| Fujitsu Lifebook | M/N: S6310 S/N: R6Z00061 FCC ID: DoC | 2.00m power cable |
| Fujitsu AC Adapter | M/N: CP293662-01 S/N: 06X00159B FCC ID: DoC | 2.00m power cable |
| Phihong Switching Power Supply | M/N: PSAC05R-050 S/N: Nil FCC ID: DoC | 2.00m power cable |



EUT OPERATING CONDITIONS

47 CFR FCC Part 15

1. Conducted Emissions
2. Radiated Emissions (Spurious Emissions inclusive Restricted Bands Requirement)
3. Spectrum Bandwidth (20dB Bandwidth Measurement)
4. Maximum Peak Power
5. RF Conducted Spurious Emissions
6. Peak Power Spectral Density
7. Maximum Permissible Exposure

The EUT was exercised by operating in maximum continuous transmission with frequency hopping off, i.e transmitting at lower, middle and upper channels respectively at one time.

47 CFR FCC Part 15

1. Carrier Frequency Separation
2. Number of Hopping Frequencies
3. Average Frequency Dwell Time
4. Band Edge Compliance (Conducted)
5. Band Edge Compliance (Radiated)

The EUT was exercised by operating in maximum continuous transmission with frequency hopping on.

CONDUCTED EMISSION TEST

47 CFR FCC Parts 15.107(a) and 15.207 Conducted Emission Limits

| Frequency Range (MHz) | Limit Values (dB μ V) | |
|--------------------------|---------------------------|--------------|
| | Quasi-peak (Q-P) | Average (AV) |
| 0.15 - 0.5 | 66 – 56 * | 56 – 46 * |
| 0.5 - 5.0 | 56 | 46 |
| 5.0 - 30.0 | 60 | 50 |

* Decreasing linearly with the logarithm of the frequency

47 CFR FCC Parts 15.107(a) and 15.207 Conducted Emission Test Instrumentation

| Instrument | Model | S/No | Cal Due Date |
|------------------------------|---------|------------|--------------|
| Schaffner EMI Receiver | SMR4503 | 040 | 20 Nov 2013 |
| Agilent EMC Analyzer-SA7 | E7403A | US41160167 | 28 May 2014 |
| Schaffner LISN –LISN7 (Ref) | NNB42 | 00008 | 28 Jan 2014 |
| Schaffner LISN –LISN10 (EUT) | NNB42 | 04/10055 | 31 Oct 2014 |



CONDUCTED EMISSION TEST

47 CFR FCC Parts 15.107(a) and 15.207 Conducted Emission Test Setup

1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table.
2. The power supply for the EUT was fed through a $50\Omega/50\mu\text{H}$ EUT LISN, connected to filtered mains.
3. The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable.
4. All other supporting equipment were powered separately from another LISN.

47 CFR FCC Parts 15.107(a) and 15.207 Conducted Emission Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. A scan was made on the NEUTRAL line over the required frequency range using an EMI test receiver.
3. High peaks, relative to the limit line, were then selected.
4. The EMI test receiver was then tuned to the selected frequencies and the necessary measurements made with a receiver bandwidth setting of 9kHz. Both Quasi-peak and Average measurements were made.
5. Steps 2 to 4 were then repeated for the LIVE line.

Sample Calculation Example

At 20 MHz

Q-P limit = 60.0 dB μ V

Transducer factor of LISN, pulse limiter & cable loss at 20 MHz = 11.2 dB

Q-P reading obtained directly from EMI Receiver = 40.0 dB μ V
(Calibrated for system losses)

Therefore, Q-P margin = 60.0 - 40.0 = 20.0

i.e. 20.0 dB below Q-P limit



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CONDUCTED EMISSION TEST

Conducted Emissions Test Setup (Front View)

Conducted Emissions Test Setup (Rear View)

CONDUCTED EMISSION TEST

47 CFR FCC Parts 15.107(a) and 15.207 Conducted Emission Results

| | | | |
|------------------|--|----------------------|---------------|
| Test Input Power | 120V 60Hz | Temperature | 24°C |
| Line Under Test | AC Mains | Relative Humidity | 60% |
| Non RF Mode | CD Playback with iPhone Charging (Worst) | Atmospheric Pressure | 1030mbar |
| | | Tested By | Chang Wai Kit |

| Frequency (MHz) | Q-P Value (dB μ V) | Q-P Limit (dB μ V) | Q-P Margin (dB) | AV Value (dB μ V) | AV Limit (dB μ V) | AV Margin (dB) | Line |
|-----------------|------------------------|------------------------|-----------------|-----------------------|-----------------------|----------------|---------|
| 0.1530 | 37.9 | 65.8 | 27.9 | 23.1 | 55.8 | 32.7 | Neutral |
| 0.2031 | 53.2 | 63.5 | 10.3 | 38.5 | 53.5 | 15.0 | Neutral |
| 0.2038 | 52.9 | 63.5 | 10.6 | 38.3 | 53.5 | 15.2 | Neutral |
| 0.2623 | 46.7 | 61.4 | 14.7 | 31.2 | 51.4 | 20.2 | Neutral |
| 0.2694 | 47.0 | 61.1 | 14.1 | 29.3 | 51.1 | 21.8 | Live |
| 0.3413 | 39.3 | 59.2 | 19.9 | 22.9 | 49.2 | 26.3 | Live |

| | | | |
|------------------|-------------------|----------------------|---------------|
| Test Input Power | 120V 60Hz | Temperature | 24°C |
| Line Under Test | AC Mains | Relative Humidity | 60% |
| Data Rate | EDR 3Mbps (Worst) | Atmospheric Pressure | 1030mbar |
| | | Tested By | Chang Wai Kit |

| Frequency (MHz) | Q-P Value (dB μ V) | Q-P Limit (dB μ V) | Q-P Margin (dB) | AV Value (dB μ V) | AV Limit (dB μ V) | AV Margin (dB) | Line | Channel |
|-----------------|------------------------|------------------------|-----------------|-----------------------|-----------------------|----------------|---------|---------|
| 0.1985 | 48.2 | 63.7 | 15.5 | 31.6 | 53.7 | 22.1 | Live | 0 |
| 0.1992 | 46.7 | 63.6 | 16.9 | 30.4 | 53.6 | 23.2 | Neutral | 0 |
| 0.2004 | 47.8 | 63.6 | 15.8 | 31.8 | 53.6 | 21.8 | Live | 0 |
| 0.3840 | 38.6 | 58.2 | 19.6 | 37.8 | 48.2 | 10.4 | Live | 0 |
| 0.3841 | 37.2 | 58.2 | 21.0 | 36.2 | 48.2 | 12.0 | Neutral | 0 |
| 0.3860 | 36.9 | 58.1 | 21.2 | 35.8 | 48.1 | 12.3 | Neutral | 0 |

Notes

1. All possible modes of operation were investigated from 150kHz to 30MHz. Only the worst case emissions measured, using the correct CISPR detectors, are reported. All other emissions were relatively insignificant.
2. A "positive" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency. Conversely, a "negative" margin indicates a FAIL.
3. EMI receiver Resolution Bandwidth (RBW) and Video Bandwidth (VBW) settings:
9kHz - 30MHz
RBW: 9kHz VBW: 30kHz
4. Conducted Emissions Measurement Uncertainty
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95%, with a coverage factor of 2, in the range 9kHz – 30MHz is ± 2.2 dB.

RADIATED EMISSION TEST

47 CFR FCC Part 15.205 Restricted Bands

| MHz | MHz | MHz | GHz |
|------------|------------|------------|------------|
| 0.090 | - | 0.110 | 16.42 |
| 0.495 | - | 0.505 | 16.69475 |
| 2.1735 | - | 2.1905 | 16.80425 |
| 4.125 | - | 4.128 | 25.5 |
| 4.17725 | - | 4.17775 | 37.5 |
| 4.20725 | - | 4.20775 | 73 |
| 6.215 | - | 6.218 | 74.8 |
| 6.26775 | - | 6.26825 | 108 |
| 6.31175 | - | 6.31225 | 123 |
| 8.291 | - | 8.294 | 149.9 |
| 8.362 | - | 8.366 | 156.52475 |
| 8.37625 | - | 8.38675 | 156.7 |
| 8.41425 | - | 8.41475 | 162.0125 |
| 12.29 | - | 12.293 | 167.72 |
| 12.51975 | - | 12.52025 | 240 |
| 12.57675 | - | 12.57725 | 322 |
| 13.36 | - | 13.41 | 335.4 |
| | | | 399.9 |
| | | | 608 |
| | | | 960 |
| | | | 1300 |
| | | | 1435 |
| | | | 1645.5 |
| | | | 1718.8 |
| | | | 2200 |
| | | | 2310 |
| | | | 2483.5 |
| | | | 2690 |
| | | | 3260 |
| | | | 3332 |
| | | | 3345.8 |
| | | | 3600 |
| | | | 410 |
| | | | 614 |
| | | | 1240 |
| | | | 1427 |
| | | | 1626.5 |
| | | | 1646.5 |
| | | | 1722.2 |
| | | | 2300 |
| | | | 2390 |
| | | | 2500 |
| | | | 2900 |
| | | | 3267 |
| | | | 3339 |
| | | | 3358 |
| | | | 4400 |
| | | | 4.5 |
| | | | 5.35 |
| | | | 7.25 |
| | | | 8.025 |
| | | | 9.0 |
| | | | 9.3 |
| | | | 10.6 |
| | | | 13.25 |
| | | | 14.47 |
| | | | 15.35 |
| | | | 17.7 |
| | | | 22.01 |
| | | | 23.6 |
| | | | 24.0 |
| | | | 31.2 |
| | | | 36.43 |
| | | | Above 38.6 |

47 CFR FCC Parts 15.109(a) and 15.209 Radiated Emission Limits

| Frequency Range (MHz) | Quasi-Peak Limit Values (dBμV/m) @ 3m |
|------------------------------|---|
| 30 - 88 | 40.0 |
| 88 - 216 | 43.5 |
| 216 - 960 | 46.0 |
| Above 960 | 54.0* |

* Above 1GHz, average detector was used. A peak limit of 20dB above the average limit does apply.

47 CFR FCC Parts 15.109(a) and 15.209 Radiated Emission Test Instrumentation

| Instrument | Model | S/No | Cal Due Date |
|---|--------------|-------------|---------------------|
| R&S Test Receiver – ESI1 | ESI40 | 100010 | 09 Jul 2014 |
| Com-Power Preamplifier (1MHz-1GHz) | PAM-103 | 441056 | 25 Jun 2014 |
| Schaffner Bilog Antenna -(30MHz-2GHz) BL3 (Ref) | CBL6112B | 2549 | 07 Jan 2014 |
| Agilent Preamplifier(1GHz-26.5GHz) (PA18) | 8449D | 3008A02305 | 04 Oct 2014 |
| TDK-RF Horn Antenna | HRN-0118 | 130256 | 08 Apr 2014 |
| ETS Horn Antenna(18GHz-40GHz)(Ref) | 3116 | 0004-2474 | 12 Oct 2014 |
| Toyo Preamplifier (26.5GHz-40GHz) | HAP26-40W | 00000005 | 12 Oct 2014 |
| Micro-Tronics Bandstop Filter (2.4-2.5 GHz) | BRM50701 | 017 | 13 Aug 2014 |

RADIATED EMISSION TEST

47 CFR FCC Parts 15.109(a) and 15.209 Radiated Emission Test Setup

1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m X 1.0m X 0.8m high, non-metallic table.
2. The filtered power supply for the EUT and supporting equipment were tapped from the appropriate power sockets located on the turntable.
3. The relevant broadband antenna was set at the required test distance away from the EUT and supporting equipment boundary.

47 CFR FCC Parts 15.109(a) and 15.209 Radiated Emission Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. A prescan was carried out to pick the worst emission frequencies from the EUT. For EUT which is a portable device, the prescan was carried out by rotating the EUT through three orthogonal axes to determine which altitude and equipment arrangement produces such emissions.
3. The test was carried out at the selected frequency points obtained from the prescan in step 2. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner:
 - a. Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen.
 - b. The EUT was then rotated to the direction that gave the maximum emission.
 - c. Finally, the antenna height was adjusted to the height that gave the maximum emission.
4. A Quasi-peak measurement was made for that frequency point if it was less than or equal to 1GHz. For frequency point that above 1GHz, both Peak and Average measurements were carried out.
5. Steps 3 and 4 were repeated for the next frequency point, until all selected frequency points were measured.
6. The frequency range covered was from 30MHz to 10th harmonics of the EUT fundamental frequency, using the Bi-log antenna for frequencies from 30MHz up to 1GHz, and the Horn antenna above 1GHz.

Sample Calculation Example

At 300 MHz

Q-P limit = 46.0 dB μ V/m

Log-periodic antenna factor & cable loss at 300 MHz = 18.5 dB

Q-P reading obtained directly from EMI Receiver = 40.0 dB μ V/m
(Calibrated level including antenna factors & cable losses)

Therefore, Q-P margin = 46.0 - 40.0 = 6.0

i.e. 6.0 dB below Q-P limit

RADIATED EMISSION TEST

30MHz-1GHz

Radiated Emissions Test Setup (Front View)

Radiated Emissions Test Setup (Rear View)

RADIATED EMISSION TEST

Above 1GHz – 26GHz

Radiated Emissions Test Setup (Front View)

Radiated Emissions Test Setup (Rear View)

RADIATED EMISSION TEST

47 CFR FCC Parts 15.109(a), 15.205 and 15.209 Radiated Emission Results

| | | | |
|------------------|--|----------------------|--------------|
| Test Input Power | 120V 60Hz | Temperature | 24°C |
| Test Distance | 3m | Relative Humidity | 56% |
| Non RF Mode | CD Playback with iPhone Charging (Worst) | Atmospheric Pressure | 1030mbar |
| | | Tested By | Stanley Siah |

Spurious Emissions ranging from 30MHz – 1GHz

| Frequency (MHz) | Q-P Value (dB μ V/m) | Q-P Limit (dB μ V/m) | Q-P Margin (dB) | Height (cm) | Azimuth (Degrees) | Pol (H/V) |
|-----------------|--------------------------|--------------------------|-----------------|-------------|-------------------|-----------|
| 56.8650 | 38.1 | 40.0 | 1.9 | 102 | 257 | V |
| 108.7240 | 36.4 | 43.5 | 7.1 | 102 | 188 | V |
| 192.0050 | 40.3 | 43.5 | 3.2 | 103 | 30 | V |
| 288.0280 | 41.2 | 46.0 | 4.8 | 106 | 172 | H |
| 384.0300 | 37.9 | 46.0 | 8.1 | 102 | 354 | H |
| 479.9730 | 42.0 | 46.0 | 4.0 | 121 | 319 | V |

Spurious Emissions above 1GHz – 26GHz

| Freq (GHz) | Peak Value (dB μ V/m) | Peak Limit (dB μ V/m) | Peak Margin (dB) | AV Value (dB μ V/m) | AV Limit (dB μ V/m) | AV Margin (dB) | Height (cm) | Azimuth (Degrees) | Pol (H/V) |
|------------|---------------------------|---------------------------|------------------|-------------------------|-------------------------|----------------|-------------|-------------------|-----------|
| 2.6648 | 43.3 | 74.0 | 30.7 | 29.9 | 54.0 | 24.1 | 100 | 53 | V |
| 4.9528 | 49.2 | 74.0 | 24.8 | 33.7 | 54.0 | 20.3 | 100 | 179 | V |
| 7.2086 | 55.2 | 74.0 | 18.8 | 37.6 | 54.0 | 16.4 | 100 | 125 | H |
| 7.2475 | 53.2 | 74.0 | 20.8 | 36.9 | 54.0 | 17.1 | 149 | 216 | H |
| 7.2948 | 51.3 | 74.0 | 22.7 | 37.5 | 54.0 | 16.5 | 100 | 0 | H |
| 7.4006 | 58.3 | 74.0 | 15.7 | 37.6 | 54.0 | 16.4 | 117 | 185 | H |

| | | | |
|------------------|-------------------|----------------------|-------------|
| Test Input Power | 120V 60Hz | Temperature | 24°C |
| Test Distance | 3m | Relative Humidity | 56% |
| Data Rate | EDR 3Mbps (Worst) | Atmospheric Pressure | 1030mbar |
| | | Tested By | Lim Kay Tak |

Spurious Emissions ranging from 30MHz – 1GHz

| Frequency (MHz) | Q-P Value (dB μ V/m) | Q-P Limit (dB μ V/m) | Q-P Margin (dB) | Height (cm) | Azimuth (Degrees) | Pol (H/V) | Channel |
|-----------------|--------------------------|--------------------------|-----------------|-------------|-------------------|-----------|---------|
| 50.5370 | 28.4 | 40.0 | 11.6 | 100 | 264 | V | 0 |
| 191.9930 | 35.0 | 43.5 | 8.5 | 100 | 17 | H | 0 |
| 288.0070 | 40.9 | 46.0 | 5.1 | 100 | 352 | H | 0 |
| 383.9980 | 37.4 | 46.0 | 8.6 | 100 | 0 | H | 0 |
| 479.9930 | 37.5 | 46.0 | 8.5 | 161 | 315 | H | 0 |
| 516.1010 | 36.1 | 46.0 | 9.9 | 100 | 183 | V | 0 |

RADIATED EMISSION TEST

47 CFR FCC Parts 15.109(a), 15.205 and 15.209 Radiated Emission Results

| | | | |
|------------------|-----------|----------------------|--------------|
| Test Input Power | 120V 60Hz | Temperature | 24°C |
| Test Distance | 3m | Relative Humidity | 60% |
| Data Rate | BDR 1Mbps | Atmospheric Pressure | 1030mbar |
| | | Tested By | Stanley Siah |

Spurious Emissions above 1GHz – 26GHz

| Freq (GHz) | Peak Value (dB μ V/m) | Peak Limit (dB μ V/m) | Peak Margin (dB) | AV Value (dB μ V/m) | AV Limit (dB μ V/m) | AV Margin (dB) | Height (cm) | Azimuth (Degrees) | Pol (H/V) | Ch |
|------------|---------------------------|---------------------------|------------------|-------------------------|-------------------------|----------------|-------------|-------------------|-----------|----|
| 1.1316 | 44.8 | 74.0 | 29.2 | -- | -- | -- | 100 | 99 | H | 0 |
| 1.1620 | 45.5 | 74.0 | 28.5 | -- | -- | -- | 100 | 76 | H | 0 |
| 1.5364 | 50.8 | 74.0 | 23.2 | -- | -- | -- | 100 | 348 | H | 0 |
| 1.5980 | 46.0 | 74.0 | 28.0 | -- | -- | -- | 100 | 343 | H | 0 |
| 1.9918 | 47.4 | 74.0 | 26.6 | -- | -- | -- | 100 | 237 | H | 0 |
| 4.8053 | 47.5 | 74.0 | 26.5 | -- | -- | -- | 100 | 229 | H | 0 |

Spurious Emissions above 1GHz – 26GHz

| Freq (GHz) | Peak Value (dB μ V/m) | Peak Limit (dB μ V/m) | Peak Margin (dB) | AV Value (dB μ V/m) | AV Limit (dB μ V/m) | AV Margin (dB) | Height (cm) | Azimuth (Degrees) | Pol (H/V) | Ch |
|------------|---------------------------|---------------------------|------------------|-------------------------|-------------------------|----------------|-------------|-------------------|-----------|----|
| 1.1519 | 49.0 | 74.0 | 25.0 | -- | -- | -- | 100 | 45 | H | 39 |
| 1.5466 | 50.6 | 74.0 | 23.4 | -- | -- | -- | 100 | 222 | H | 39 |
| 1.5466 | 45.4 | 74.0 | 28.6 | -- | -- | -- | 213 | 218 | H | 39 |
| 1.6680 | 45.7 | 74.0 | 28.3 | -- | -- | -- | 100 | 108 | H | 39 |
| 1.9919 | 46.5 | 74.0 | 27.5 | -- | -- | -- | 100 | 208 | H | 39 |
| 4.8863 | 47.9 | 74.0 | 26.1 | -- | -- | -- | 100 | 157 | H | 39 |

Spurious Emissions above 1GHz – 26GHz

| Freq (GHz) | Peak Value (dB μ V/m) | Peak Limit (dB μ V/m) | Peak Margin (dB) | AV Value (dB μ V/m) | AV Limit (dB μ V/m) | AV Margin (dB) | Height (cm) | Azimuth (Degrees) | Pol (H/V) | Ch |
|------------|---------------------------|---------------------------|------------------|-------------------------|-------------------------|----------------|-------------|-------------------|-----------|----|
| 1.1519 | 48.7 | 74.0 | 25.3 | -- | -- | -- | 101 | 103 | H | 78 |
| 1.2227 | 45.7 | 74.0 | 28.3 | -- | -- | -- | 101 | 166 | H | 78 |
| 1.5466 | 51.3 | 74.0 | 22.7 | -- | -- | -- | 101 | 221 | H | 78 |
| 1.6680 | 46.0 | 74.0 | 28.0 | -- | -- | -- | 101 | 327 | H | 78 |
| 2.0020 | 46.8 | 74.0 | 27.2 | -- | -- | -- | 101 | 166 | H | 78 |
| 4.9672 | 48.6 | 74.0 | 25.4 | -- | -- | -- | 212 | 188 | H | 78 |

RADIATED EMISSION TEST

47 CFR FCC Parts 15.109(a), 15.205 and 15.209 Radiated Emission Results

| | | | |
|------------------|-----------|----------------------|--------------|
| Test Input Power | 120V 60Hz | Temperature | 24°C |
| Test Distance | 3m | Relative Humidity | 60% |
| Data Rate | EDR 2Mbps | Atmospheric Pressure | 1030mbar |
| | | Tested By | Stanley Siah |

Spurious Emissions above 1GHz – 26GHz

| Freq (GHz) | Peak Value (dB μ V/m) | Peak Limit (dB μ V/m) | Peak Margin (dB) | AV Value (dB μ V/m) | AV Limit (dB μ V/m) | AV Margin (dB) | Height (cm) | Azimuth (Degrees) | Pol (H/V) | Ch |
|------------|---------------------------|---------------------------|------------------|-------------------------|-------------------------|----------------|-------------|-------------------|-----------|----|
| 1.1519 | 46.2 | 74.0 | 27.8 | -- | -- | -- | 100 | 100 | H | 0 |
| 1.5466 | 51.6 | 74.0 | 22.4 | -- | -- | -- | 100 | 7 | H | 0 |
| 1.6073 | 47.1 | 74.0 | 26.9 | -- | -- | -- | 211 | 7 | H | 0 |
| 1.6579 | 46.0 | 74.0 | 28.0 | -- | -- | -- | 100 | 353 | H | 0 |
| 1.9919 | 47.1 | 74.0 | 26.9 | -- | -- | -- | 100 | 128 | H | 0 |
| 4.8053 | 47.8 | 74.0 | 26.2 | -- | -- | -- | 100 | 150 | H | 0 |

Spurious Emissions above 1GHz – 26GHz

| Freq (GHz) | Peak Value (dB μ V/m) | Peak Limit (dB μ V/m) | Peak Margin (dB) | AV Value (dB μ V/m) | AV Limit (dB μ V/m) | AV Margin (dB) | Height (cm) | Azimuth (Degrees) | Pol (H/V) | Ch |
|------------|---------------------------|---------------------------|------------------|-------------------------|-------------------------|----------------|-------------|-------------------|-----------|----|
| 1.1519 | 46.5 | 74.0 | 27.5 | -- | -- | -- | 100 | 62 | H | 39 |
| 1.5466 | 53.2 | 74.0 | 20.8 | 51.7 | 54 | 2.3 | 100 | 22 | H | 39 |
| 1.5668 | 47.9 | 74.0 | 26.1 | -- | -- | -- | 100 | 27 | H | 39 |
| 1.9919 | 47.3 | 74.0 | 26.7 | -- | -- | -- | 100 | 253 | H | 39 |
| 2.0020 | 47.3 | 74.0 | 26.7 | -- | -- | -- | 100 | 245 | H | 39 |
| 4.8863 | 47.7 | 74.0 | 26.3 | -- | -- | -- | 100 | 157 | H | 39 |

Spurious Emissions above 1GHz – 26GHz

| Freq (GHz) | Peak Value (dB μ V/m) | Peak Limit (dB μ V/m) | Peak Margin (dB) | AV Value (dB μ V/m) | AV Limit (dB μ V/m) | AV Margin (dB) | Height (cm) | Azimuth (Degrees) | Pol (H/V) | Ch |
|------------|---------------------------|---------------------------|------------------|-------------------------|-------------------------|----------------|-------------|-------------------|-----------|----|
| 1.0000 | 47.3 | 74.0 | 26.7 | -- | -- | -- | 100 | 167 | H | 78 |
| 1.5566 | 52.0 | 74.0 | 22.0 | -- | -- | -- | 100 | 37 | H | 78 |
| 1.708.4 | 45.9 | 74.0 | 28.1 | -- | -- | -- | 100 | 350 | H | 78 |
| 2.0019 | 46.8 | 74.0 | 27.2 | -- | -- | -- | 100 | 131 | H | 78 |
| 2.0525 | 45.2 | 74.0 | 28.8 | -- | -- | -- | 100 | 129 | H | 78 |
| 4.9671 | 48.9 | 74.0 | 25.1 | -- | -- | -- | 212 | 175 | H | 78 |

RADIATED EMISSION TEST

47 CFR FCC Parts 15.109(a), 15.205 and 15.209 Radiated Emission Results

| | | | |
|------------------|-----------|----------------------|--------------|
| Test Input Power | 120V 60Hz | Temperature | 24°C |
| Test Distance | 3m | Relative Humidity | 60% |
| Data Rate | EDR 3Mbps | Atmospheric Pressure | 1030mbar |
| | | Tested By | Stanley Siah |

Spurious Emissions above 1GHz – 26GHz

| Freq (GHz) | Peak Value (dB μ V/m) | Peak Limit (dB μ V/m) | Peak Margin (dB) | AV Value (dB μ V/m) | AV Limit (dB μ V/m) | AV Margin (dB) | Height (cm) | Azimuth (Degrees) | Pol (H/V) | Ch |
|------------|---------------------------|---------------------------|------------------|-------------------------|-------------------------|----------------|-------------|-------------------|-----------|----|
| 1.1519 | 43.5 | 74.0 | 30.5 | -- | -- | -- | 100 | 92 | H | 0 |
| 1.5365 | 50.9 | 74.0 | 23.1 | -- | -- | -- | 100 | 34 | H | 0 |
| 1.5972 | 46.4 | 74.0 | 27.6 | -- | -- | -- | 100 | 28 | H | 0 |
| 1.6680 | 45.7 | 74.0 | 28.3 | -- | -- | -- | 100 | 14 | H | 0 |
| 1.9919 | 44.3 | 74.0 | 29.7 | -- | -- | -- | 100 | 132 | H | 0 |
| 4.8053 | 46.4 | 74.0 | 27.6 | -- | -- | -- | 100 | 234 | H | 0 |

Spurious Emissions above 1GHz – 26GHz

| Freq (GHz) | Peak Value (dB μ V/m) | Peak Limit (dB μ V/m) | Peak Margin (dB) | AV Value (dB μ V/m) | AV Limit (dB μ V/m) | AV Margin (dB) | Height (cm) | Azimuth (Degrees) | Pol (H/V) | Ch |
|------------|---------------------------|---------------------------|------------------|-------------------------|-------------------------|----------------|-------------|-------------------|-----------|----|
| 1.1519 | 44.1 | 74.0 | 29.9 | -- | -- | -- | 100 | 83 | H | 39 |
| 1.5365 | 49.5 | 74.0 | 24.5 | -- | -- | -- | 100 | 25 | H | 39 |
| 1.6680 | 42.8 | 74.0 | 31.2 | -- | -- | -- | 100 | 14 | H | 39 |
| 1.9919 | 43.8 | 74.0 | 30.2 | -- | -- | -- | 100 | 121 | H | 39 |
| 4.8863 | 45.9 | 74.0 | 28.1 | -- | -- | -- | 100 | 234 | H | 39 |
| 5.6352 | 47.3 | 74.0 | 26.7 | -- | -- | -- | 100 | 276 | H | 39 |

Spurious Emissions above 1GHz – 26GHz

| Freq (GHz) | Peak Value (dB μ V/m) | Peak Limit (dB μ V/m) | Peak Margin (dB) | AV Value (dB μ V/m) | AV Limit (dB μ V/m) | AV Margin (dB) | Height (cm) | Azimuth (Degrees) | Pol (H/V) | Ch |
|------------|---------------------------|---------------------------|------------------|-------------------------|-------------------------|----------------|-------------|-------------------|-----------|----|
| 1.1620 | 44.3 | 74.0 | 29.7 | -- | -- | -- | 101 | 153 | H | 78 |
| 1.5365 | 50.8 | 74.0 | 23.2 | -- | -- | -- | 101 | 28 | H | 78 |
| 1.6579 | 44.5 | 74.0 | 29.5 | -- | -- | -- | 101 | 10 | H | 78 |
| 1.7288 | 44.8 | 74.0 | 29.2 | -- | -- | -- | 101 | 122 | H | 78 |
| 1.9919 | 47.8 | 74.0 | 26.2 | -- | -- | -- | 101 | 72 | H | 78 |
| 4.9672 | 48.9 | 74.0 | 25.1 | -- | -- | -- | 212 | 177 | H | 78 |

RADIATED EMISSION TEST

Notes

1. All possible modes of operation were investigated. Only the worst case emissions measured, using the correct CISPR detectors, are reported. All other emissions were relatively insignificant.
2. As the measured peak shows compliance to the average limit, as such no average measurement was required.
3. Quasi-peak measurement was used for frequency measurement up to 1GHz. Average and peak measurements were used for emissions above 1GHz. The average measurement was done by averaging over a complete cycle of the pulse train, including the blanking interval as the pulse train duration does not exceed 0.1 second.
4. A "positive" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency. Conversely, a "negative" margin indicates a FAIL.
5. EMI receiver Resolution Bandwidth (RBW) and Video Bandwidth (VBW) settings:
30MHz - 1GHz
RBW: 120kHz VBW: 1MHz
>1GHz
RBW: 1MHz VBW: 1MHz
6. The upper frequency of radiated emission investigations was according to requirements stated in Section 15.33(a) for intentional radiators & Section 15.33(b) for unintentional radiators.
7. The channel in the table refers to the transmit channel of the EUT.
8. Radiated Emissions Measurement Uncertainty
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95%, with a coverage factor of 2, in the range 30MHz – 25GHz is $\pm 4.0\text{dB}$.

CARRIER FREQUENCY SEPARATION TEST

47 CFR FCC Part 15.247(a)(1) Carrier Frequency Separation Limits

The EUT shows compliance to the requirements of this section, which states the adjacent carrier frequencies must be separated by a minimum of 25kHz or the 20dB bandwidth of the hopping channel, whichever is greater. Alternatively, the EUT may have hopping channel carrier frequencies that are separated by 25kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125mW (21dBm).

47 CFR FCC Part 15.247(a)(1) Carrier Frequency Separation Test Instrumentation

| Instrument | Model | S/No | Cal Due Date |
|---------------------------|--------|------------|--------------|
| Agilent Spectrum Analyzer | E7405A | MY45106084 | 01 Aug 2014 |

47 CFR FCC Part 15.247(a)(1) Carrier Frequency Separation Test Setup

1. The EUT and supporting equipment were set up as shown in the setup photo.
2. The power supply for the EUT was connected to a filtered mains.
3. The RF antenna connector was connected to the spectrum analyser via a low-loss coaxial cable.
4. The resolution bandwidth (RBW) and the video bandwidth (VBW) of the spectrum analyser were respectively set to 100kHz and 300kHz.
5. All other supporting equipment were powered separately from another filtered mains.

47 CFR FCC Part 15.247(a)(1) Carrier Frequency Separation Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition. The EUT was then configured to operate in the test mode with frequency hopping sequence on.
2. The start and stop frequencies of the spectrum analyser were set to 2.400GHz and 2.405GHz.
3. The spectrum analyser was set to max hold to capture the two adjacent transmitting frequencies within the span. The signal capturing was continuous until no further signals were detected.
4. The carrier frequency separation of the two adjacent transmitting / operating frequency was measured by finding the carrier frequency difference between the two adjacent channels.
5. The steps 2 to 4 were repeated with the following start and stop frequencies settings:
 - a. 2.4385GHz to 2.4435GHz
 - b. 2.478GHz to 2.481GHz

CARRIER FREQUENCY SEPARATION TEST

Carrier Frequency Separation Test Setup

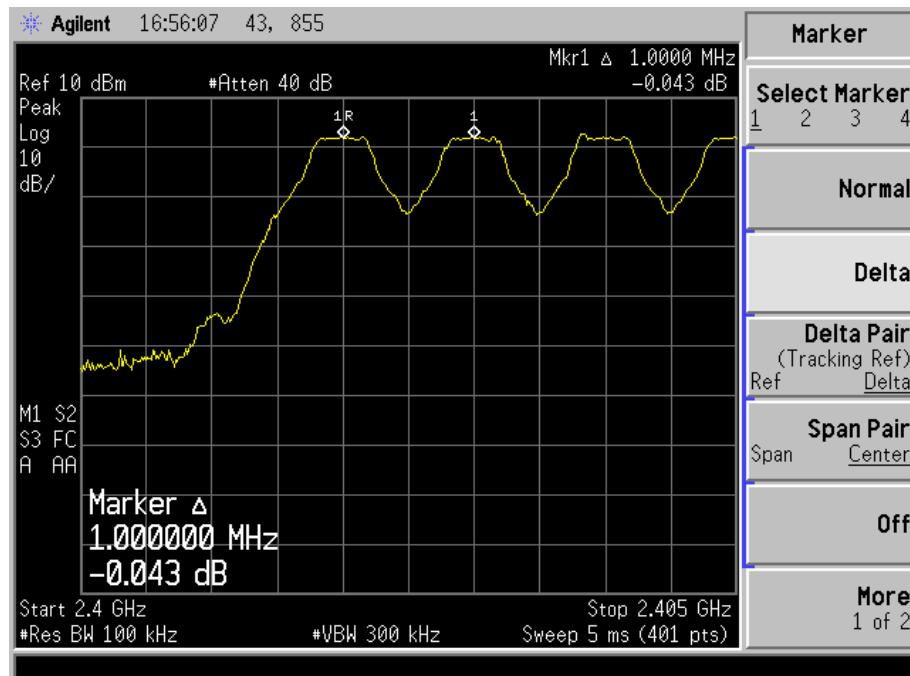
47 CFR FCC Part 15.247(a)(1) Carrier Frequency Separation Results

| | | | |
|------------------|-----------|----------------------|---------------|
| Test Input Power | 120V 60Hz | Temperature | 26°C |
| Attached Plots | 1 – 4 | Relative Humidity | 60% |
| | | Atmospheric Pressure | 1030mbar |
| | | Tested By | Chang Wai Kit |

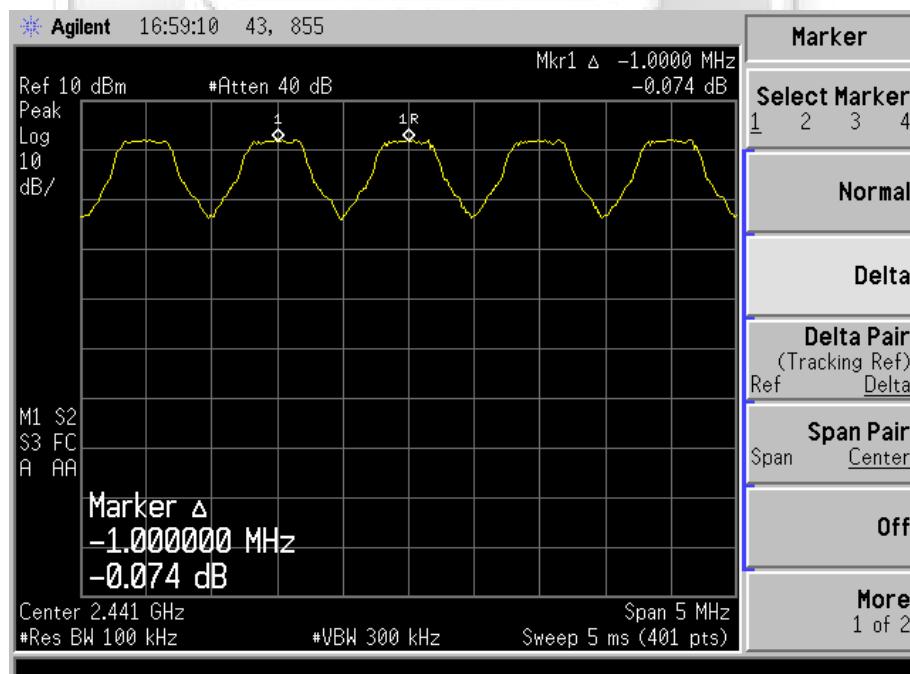
| Adjacent Channels | Channel Separation (MHz) |
|-----------------------------------|--------------------------|
| 0 and 1 (2.402GHz and 2.403GHz) | 1.000 |
| 38 and 39 (2.440GHz and 2.441GHz) | 1.000 |
| 39 and 40 (2.441GHz and 2.442GHz) | 1.000 |
| 77 and 78 (2.479GHz and 2.480GHz) | 1.005 |

CARRIER FREQUENCY SEPARATION TEST

Carrier Frequency Separation Plots



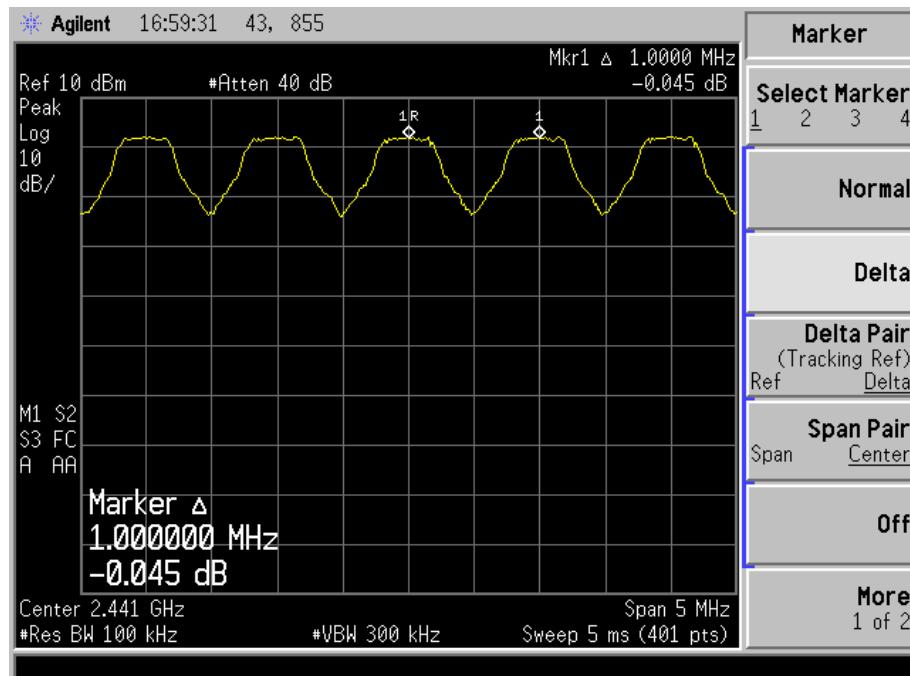
Plot 1 - Channels 0 (lower ch) and 1 (ch after lower ch) Separation



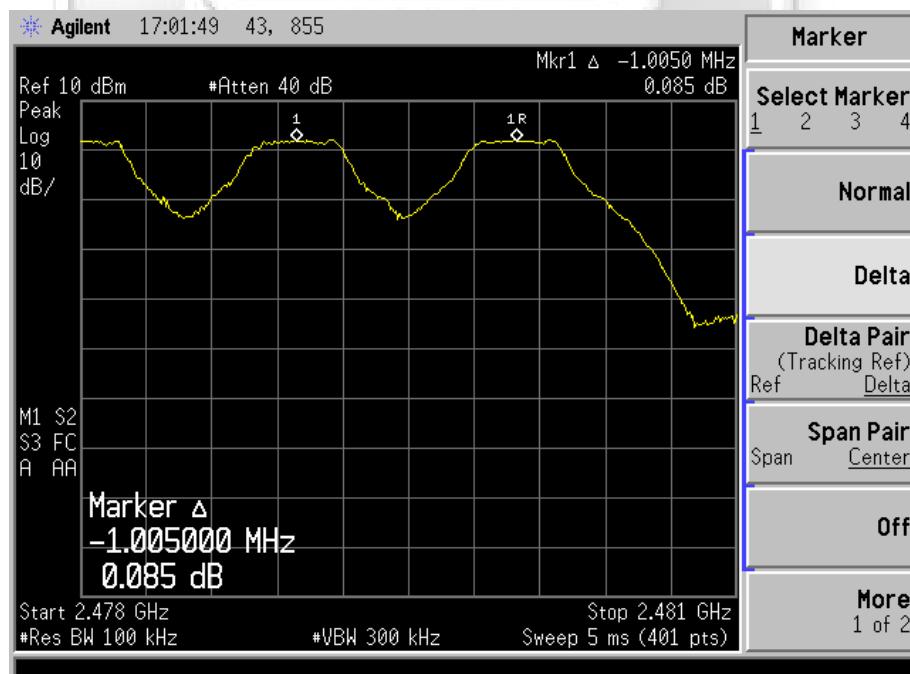
Plot 2 – Channels 38 (preceding mid ch) and 39 (mid ch) Separation

CARRIER FREQUENCY SEPARATION TEST

Carrier Frequency Separation Plots



Plot 3 - Channels 39 (mid ch) and 40 (ch after mid ch) Separation



Plot 4 - Channels 77 (preceding upper ch) and 78 (upper ch) Separation

SPECTRUM BANDWIDTH (20dB BANDWIDTH MEASUREMENT) TEST

47 CFR FCC Part 15.247(a)(1) Spectrum Bandwidth (20dB Bandwidth Measurement) Limits

The EUT shows compliance to the requirements of this section, which states that the 20dB bandwidth of the hopping channel shall be the channel frequency separation by a minimum of 25kHz or the 20dB bandwidth of the hopping channel, whichever is greater.

47 CFR FCC Part 15.247(a)(1) Spectrum Bandwidth (20dB Bandwidth Measurement) Test Instrumentation

| Instrument | Model | S/No | Cal Due Date |
|---------------------------|--------|------------|--------------|
| Agilent Spectrum Analyzer | E7405A | MY45106084 | 01 Aug 2014 |

47 CFR FCC Part 15.247(a)(1) Spectrum Bandwidth (20dB Bandwidth Measurement) Test Setup

1. The EUT and supporting equipment were set up as shown in the setup photo.
2. The power supply for the EUT was connected to a filtered mains.
3. The RF antenna connector was connected to the spectrum analyser via a low-loss coaxial cable.
4. The resolution bandwidth (RBW) and the video bandwidth (VBW) of the spectrum analyser were respectively set to 10kHz and 30kHz.
5. All other supporting equipment were powered separately from another filtered mains.

47 CFR FCC Part 15.247(a)(1) Spectrum Bandwidth (20dB Bandwidth Measurement) Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition. The EUT was then configured to operate in the test mode, non-hopping with transmitting frequency at Channel 0 (2.402GHz) (*lower ch*).
2. The center frequency of the spectrum analyser was set to the transmitting frequency with the frequency span wide enough to capture the 20dB bandwidth of the transmitting frequency.
3. The spectrum analyser was set to max hold to capture the transmitting frequency. The signal capturing was continuous until no further changes were observed.
4. The peak of the transmitting frequency was detected with the marker peak function of the spectrum analyser. The frequencies below the 20dB peak frequency at lower (f_L) and upper (f_H) sides of the transmitting frequency were marked and measured by using the marker-delta function of the spectrum analyser.
5. The 20dB bandwidth of the transmitting frequency is the frequency difference between the marked lower and upper frequencies, $|f_H - f_L|$.
6. The steps 2 to 5 were repeated with the transmitting frequency was set to Channel 39 (2.441GHz) (*mid ch*) and Channel 78 (2.480GHz) (*upper ch*) respectively.

SPECTRUM BANDWIDTH (20dB BANDWIDTH MEASUREMENT) TEST

Spectrum Bandwidth (20dB Bandwidth Measurement) Test Setup



SPECTRUM BANDWIDTH (20dB BANDWIDTH MEASUREMENT) TEST

47 CFR FCC Part 15.247(a)(1) Spectrum Bandwidth (20dB Bandwidth Measurement) Results

| | | | |
|------------------|-----------|----------------------|---------------|
| Test Input Power | 120V 60Hz | Temperature | 26°C |
| Attached Plots | 5 – 7 | Relative Humidity | 60% |
| Data Rate | BDR 1Mbps | Atmospheric Pressure | 1030mbar |
| | | Tested By | Chang Wai Kit |

| Channel | Channel Frequency (GHz) | 20dB Bandwidth (MHz) |
|------------------------|-------------------------|----------------------|
| 0 (<i>lower ch</i>) | 2.402 | 0.968 |
| 39 (<i>mid ch</i>) | 2.441 | 0.938 |
| 78 (<i>upper ch</i>) | 2.480 | 0.953 |

| | | | |
|------------------|-----------|----------------------|---------------|
| Test Input Power | 120V 60Hz | Temperature | 26°C |
| Attached Plots | 8 – 10 | Relative Humidity | 60% |
| Data Rate | EDR 2Mbps | Atmospheric Pressure | 1030mbar |
| | | Tested By | Chang Wai Kit |

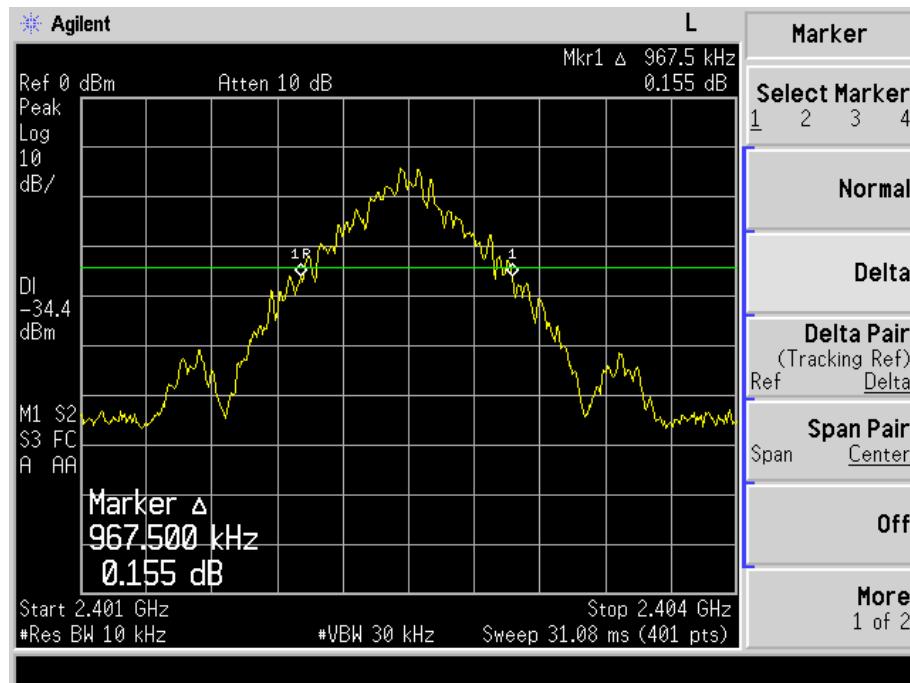
| Channel | Channel Frequency (GHz) | 20dB Bandwidth (MHz) |
|------------------------|-------------------------|----------------------|
| 0 (<i>lower ch</i>) | 2.402 | 1.332 |
| 39 (<i>mid ch</i>) | 2.441 | 1.324 |
| 78 (<i>upper ch</i>) | 2.480 | 1.324 |

| | | | |
|------------------|-----------|----------------------|---------------|
| Test Input Power | 120V 60Hz | Temperature | 26°C |
| Attached Plots | 11 – 13 | Relative Humidity | 60% |
| Data Rate | EDR 3Mbps | Atmospheric Pressure | 1030mbar |
| | | Tested By | Chang Wai Kit |

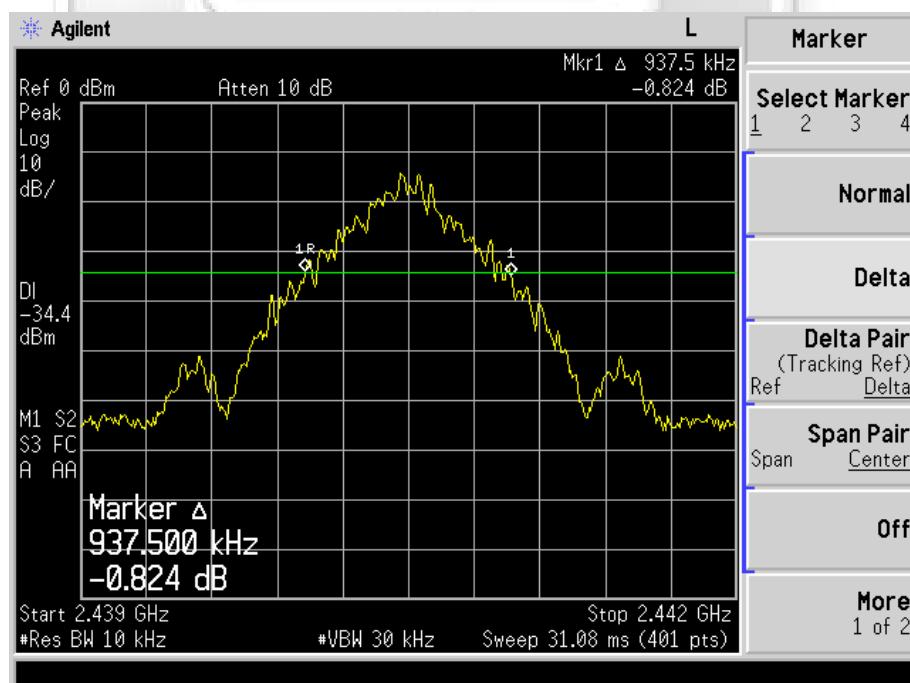
| Channel | Channel Frequency (GHz) | 20dB Bandwidth (MHz) |
|------------------------|-------------------------|----------------------|
| 0 (<i>lower ch</i>) | 2.402 | 1.332 |
| 39 (<i>mid ch</i>) | 2.441 | 1.332 |
| 78 (<i>upper ch</i>) | 2.480 | 1.332 |

SPECTRUM BANDWIDTH (20dB BANDWIDTH MEASUREMENT) TEST

Spectrum Bandwidth (20dB Bandwidth Measurement) Plots – 1Mbps



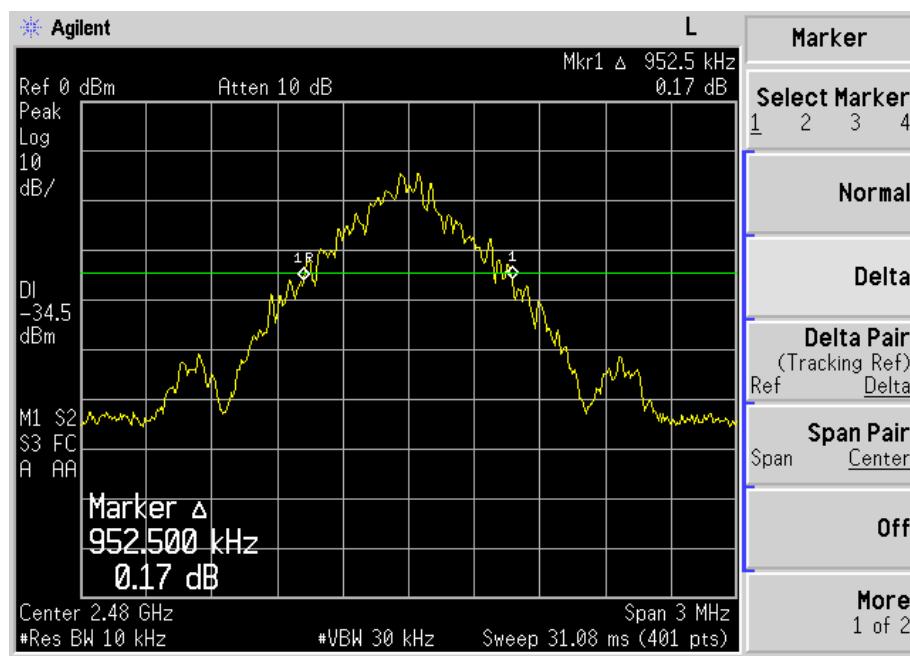
Plot 5 – Channel 0 (lower ch)



Plot 6 – Channel 39 (mid ch)

SPECTRUM BANDWIDTH (20dB BANDWIDTH MEASUREMENT) TEST

Spectrum Bandwidth (20dB Bandwidth Measurement) Plots – 1Mbps

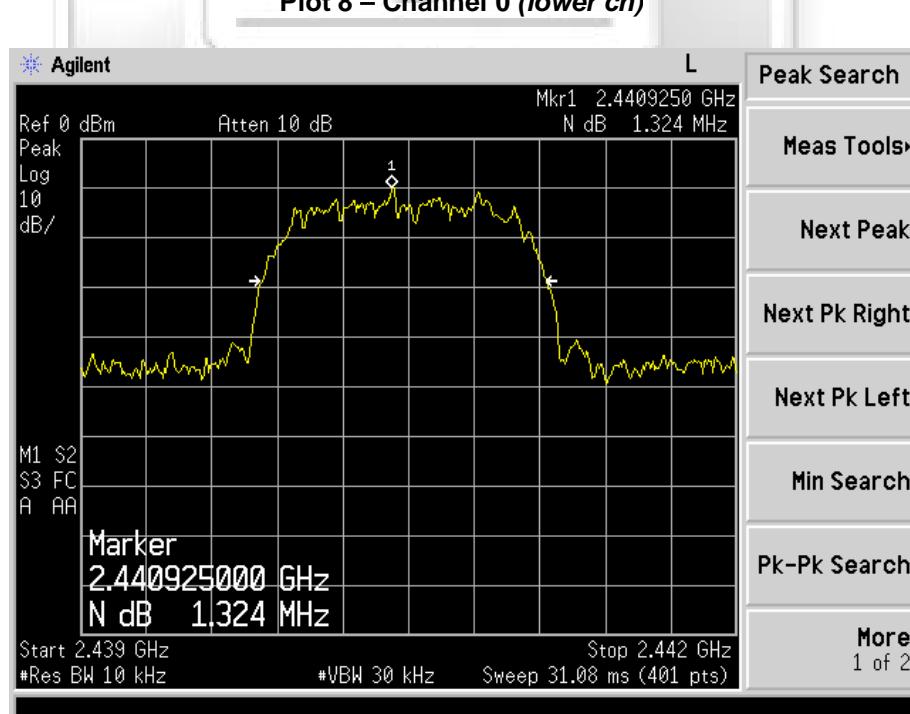
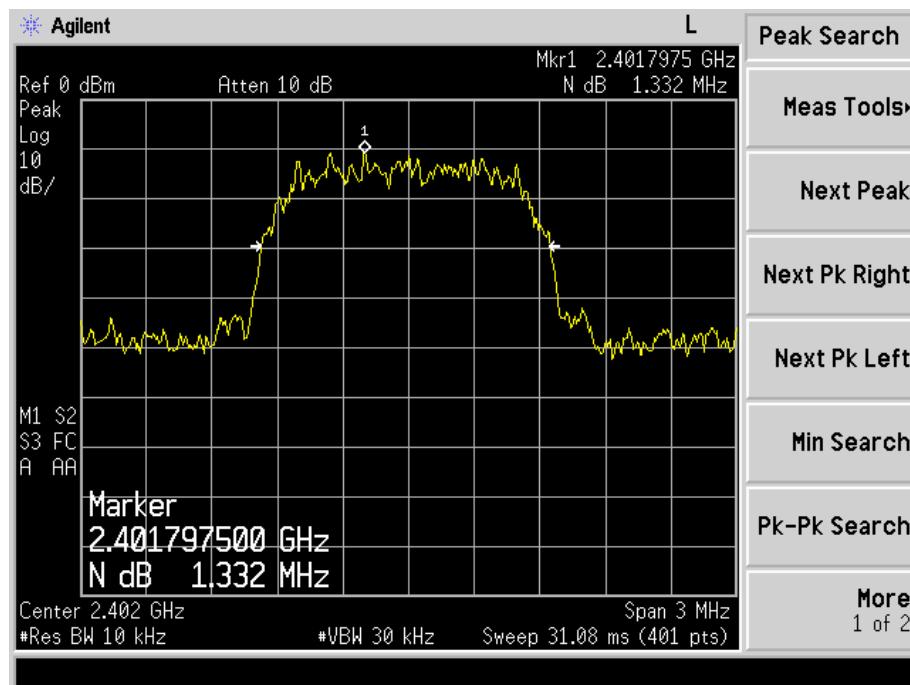


Plot 7 – Channel 78 (upper ch)

SÜD

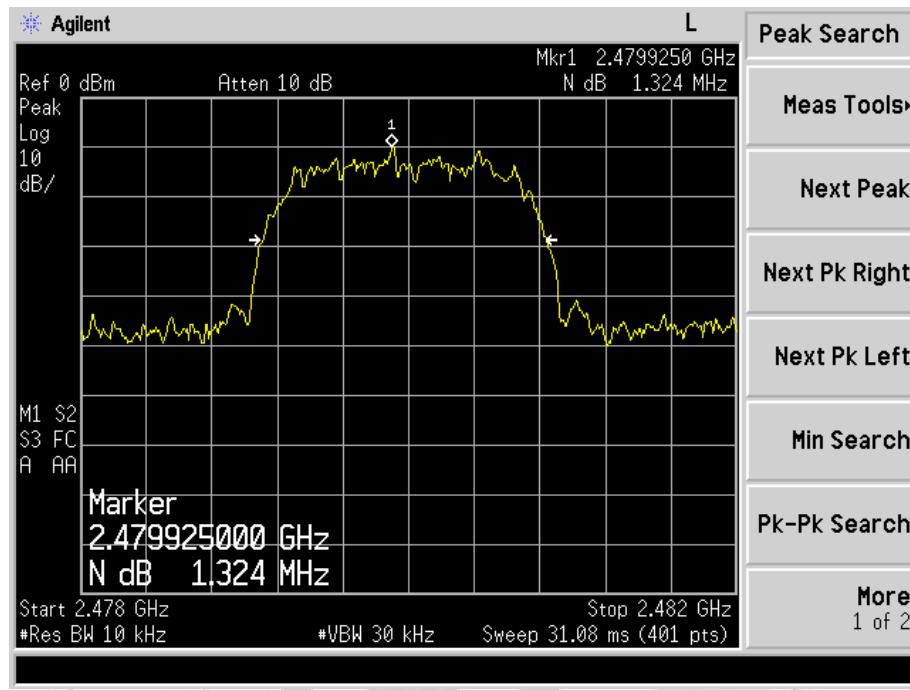
SPECTRUM BANDWIDTH (20dB BANDWIDTH MEASUREMENT) TEST

Spectrum Bandwidth (20dB Bandwidth Measurement) Plots – 2Mbps



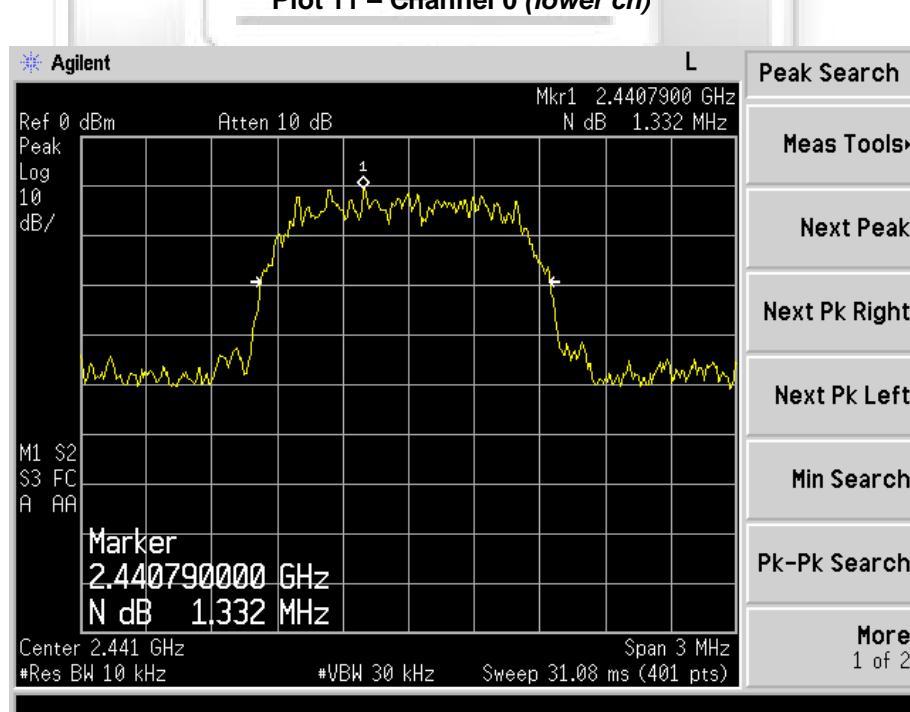
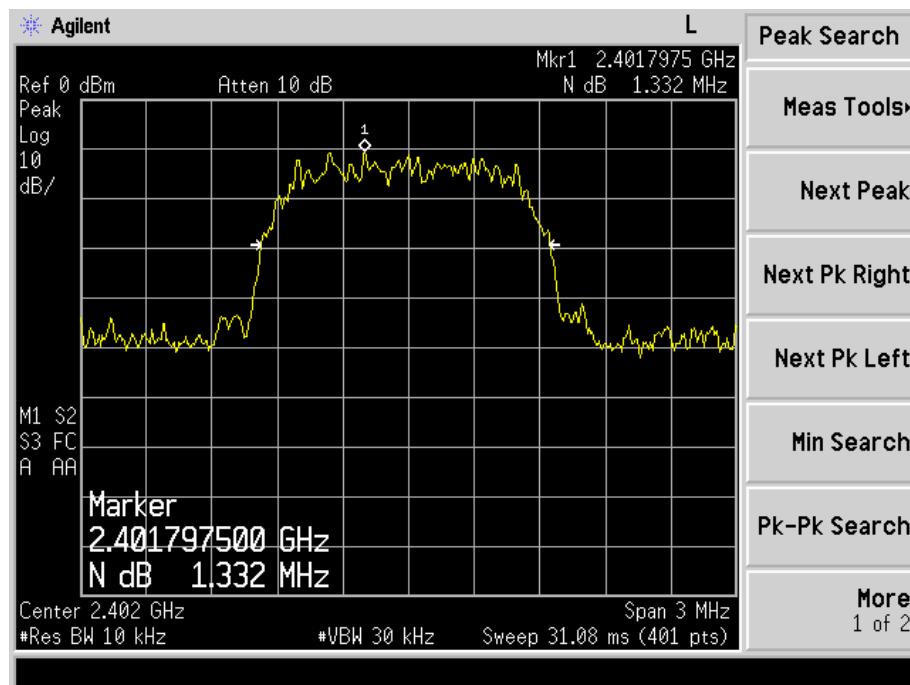
SPECTRUM BANDWIDTH (20dB BANDWIDTH MEASUREMENT) TEST

Spectrum Bandwidth (20dB Bandwidth Measurement) Plots – 2Mbps



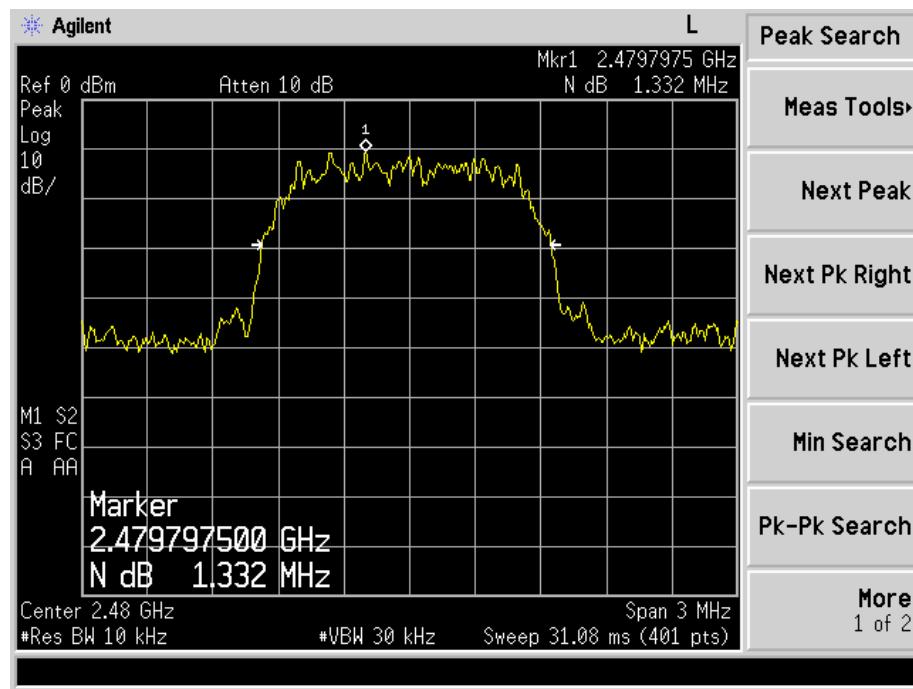
SPECTRUM BANDWIDTH (20dB BANDWIDTH MEASUREMENT) TEST

Spectrum Bandwidth (20dB Bandwidth Measurement) Plots – 3Mbps



SPECTRUM BANDWIDTH (20dB BANDWIDTH MEASUREMENT) TEST

Spectrum Bandwidth (20dB Bandwidth Measurement) Plots – 3Mbps



NUMBER OF HOPPING FREQUENCIES TEST

47 CFR FCC Part 15.247(a)(1)(iii) Number of Hopping Frequencies Limits

The EUT shows compliance to the requirements of this section, which states the EUT shall use at least 15 channels.

47 CFR FCC Part 15.247(a)(1)(iii) Number of Hopping Frequencies Test Instrumentation

| Instrument | Model | S/No | Cal Due Date |
|---------------------------|--------|------------|--------------|
| Agilent Spectrum Analyzer | E7405A | MY45106084 | 01 Aug 2014 |

47 CFR FCC Part 15.247(a)(1)(iii) Number of Hopping Frequencies Test Setup

1. The EUT and supporting equipment were set up as shown in the setup photo.
2. The power supply for the EUT was connected to a filtered mains.
3. The RF antenna connector was connected to the spectrum analyser via a low-loss coaxial cable.
4. The resolution bandwidth (RBW) and the video bandwidth (VBW) of the spectrum analyser were respectively set to 100kHz and 300kHz.
5. All other supporting equipment were powered separately from another filtered mains.

47 CFR FCC Part 15.247(a)(1)(iii) Number of Hopping Frequencies Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition. The EUT was then configured to operate in the test mode with frequency hopping sequence on.
2. The start and stop frequencies of the spectrum analyser were set to 2.39GHz and 2.42GHz.
3. The spectrum analyser was set to max hold to capture all the transmitting frequencies within the span. The signal capturing was continuous until all the transmitting frequencies were captured and no further signals were detected.
4. The numbers of transmitting frequencies were counted and recorded.
5. The steps 2 to 4 were repeated with the following start and stop frequencies settings:
 - a. 2.420GHz to 2.441GHz
 - b. 2.441GHz to 2.461GHz
 - c. 2.461GHz to 2.4835GHz
6. The total number of hopping frequencies is the sum of the number of the hopping frequencies found for each span.

NUMBER OF HOPPING FREQUENCIES TEST

Number of Hopping Frequencies Test Setup

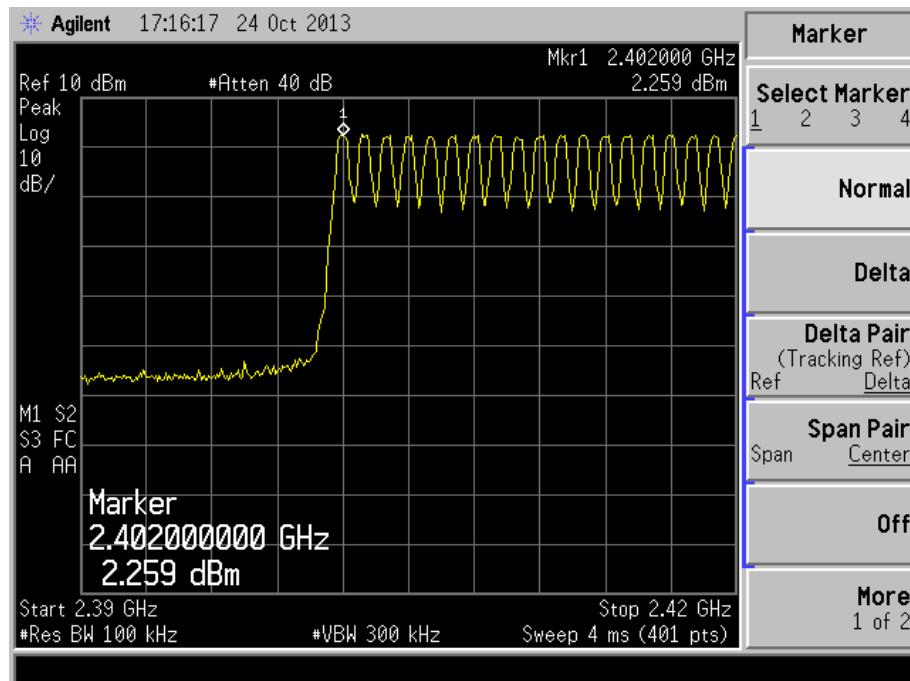
47 CFR FCC Part 15.247(a)(1)(iii) Number of Hopping Frequencies Results

| | | | |
|------------------|-----------|----------------------|---------------|
| Test Input Power | 120V 60Hz | Temperature | 26°C |
| Attached Plots | 14 – 17 | Relative Humidity | 60% |
| | | Atmospheric Pressure | 1030mbar |
| | | Tested By | Chang Wai Kit |

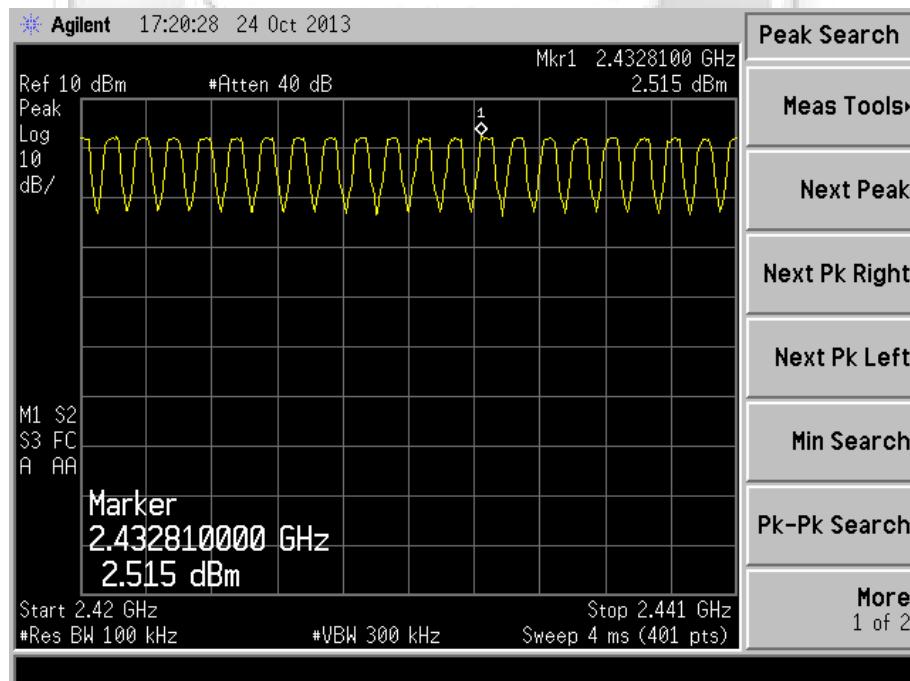
The EUT was found to have 79 hopping frequencies. Please refer to the attached plots.

NUMBER OF HOPPING FREQUENCIES TEST

Number Of Hopping Frequencies Plots



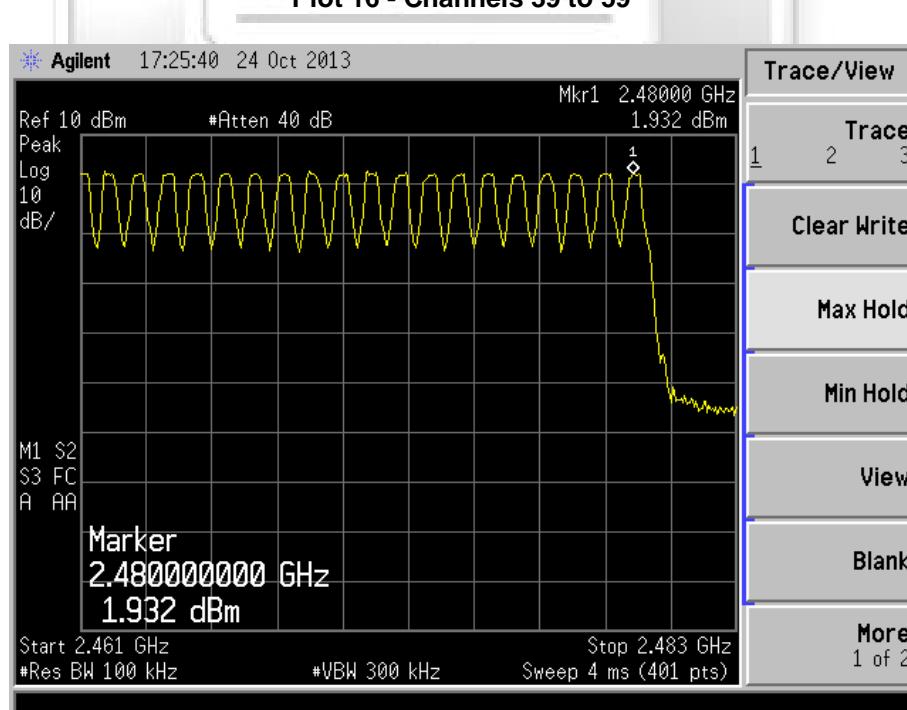
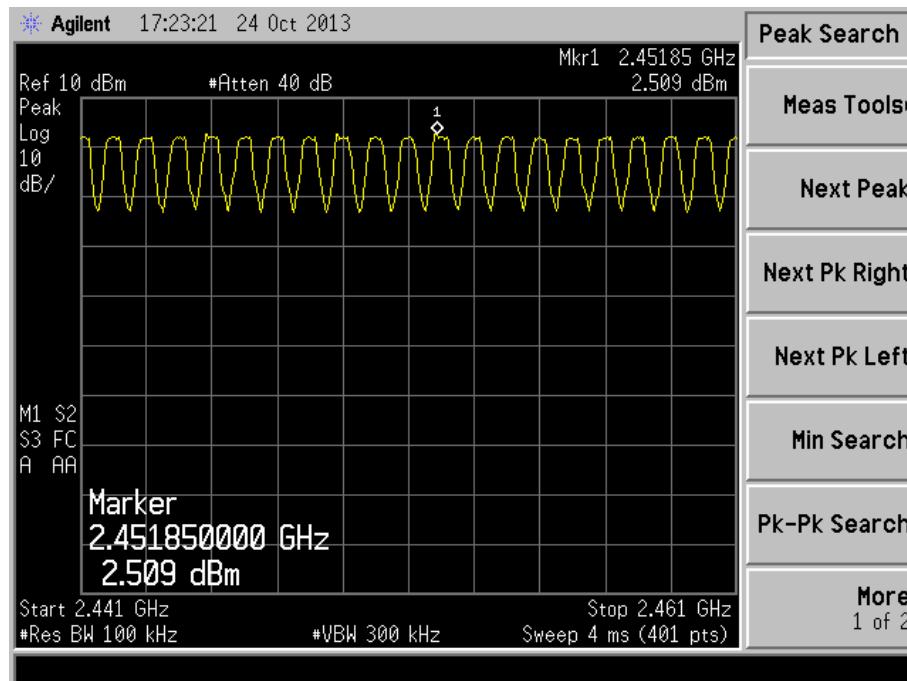
Plot 14 - Channels 0 to 18



Plot 15 - Channels 18 to 39

NUMBER OF HOPPING FREQUENCIES TEST

Number Of Hopping Frequencies Plots



AVERAGE FREQUENCY DWELL TIME TEST

47 CFR FCC Part 15.247(a)(1)(iii) Average Frequency Dwell Time Limits

The EUT shows compliance to the requirements of this section, which states the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

47 CFR FCC Part 15.247(a)(1)(iii) Average Frequency Dwell Time Test Instrumentation

| Instrument | Model | S/No | Cal Due Date |
|---------------------------|--------|------------|--------------|
| Agilent Spectrum Analyzer | E7405A | MY45106084 | 01 Aug 2014 |

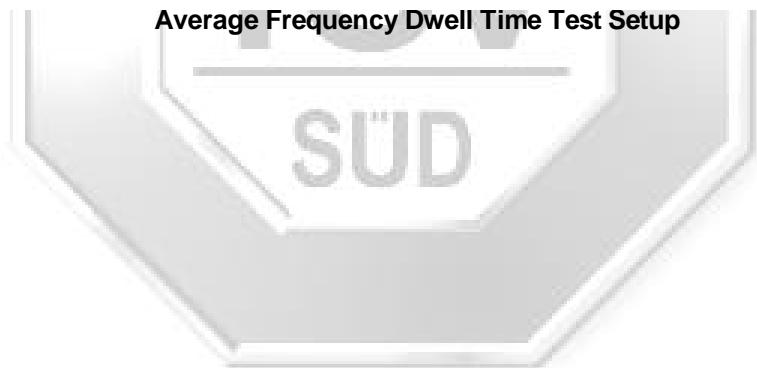
47 CFR FCC Part 15.247(a)(1)(iii) Average Frequency Dwell Test Setup

1. The EUT and supporting equipment were set up as shown in the setup photo.
2. The power supply for the EUT was connected to a filtered mains.
3. The RF antenna connector was connected to the spectrum analyser via a low-loss coaxial cable.
4. The resolution bandwidth (RBW) and the video bandwidth (VBW) of the spectrum analyser were respectively set to 1MHz and 3MHz.
5. All other supporting equipment were powered separately from another filtered mains.

47 CFR FCC Part 15.247(a)(1)(iii) Average Frequency Dwell Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition. The EUT was then configured to operate in the test mode with frequency hopping sequence on.
2. The center frequency of the spectrum analyser was set to 2.402GHz (*lower ch*) with zero frequency span (spectrum analyser acts as an oscilloscope).
3. The sweep time of the spectrum analyser was adjusted until a stable signal can be seen on the spectrum analyser.
4. The duration (dwell time) of a packet was measured using the marker-delta function of the spectrum analyser. The average dwell time of the transmitting frequency was computed based on general expression as shown below:
Average Frequency Dwell Time = [measured time slot length x hopping rate / number of hopping channels] x [0.4 x number of hopping channels]
5. The steps 2 to 4 were repeated with the center frequency of the spectrum analyser were set to 2.441GHz (*mid ch*) and 2.4835GHz (*upper ch*) respectively.

AVERAGE FREQUENCY DWELL TIME TEST



AVERAGE FREQUENCY DWELL TIME TEST

47 CFR FCC Part 15.247(a)(1)(iii) Average Frequency Dwell Time Results

| | | | |
|----------------------------|---------------|----------------------|---------------|
| Test Input Power | 120V 60Hz | Temperature | 26°C |
| Attached Plots | 18 – 20 | Relative Humidity | 60% |
| Hopping Rate | 1600 hops / s | Atmospheric Pressure | 1030mbar |
| Number of Hopping Channels | 79 channels | Tested By | Chang Wai Kit |
| Data Rate | BDR 1Mbps | | |

| Channel | Channel Frequency (GHz) | Measured Time Slot Length (ms) | Average Frequency Dwell Time (s) | Average Occupancy Limit (s) |
|---------------|-------------------------|--------------------------------|----------------------------------|-----------------------------|
| 0 (lower ch) | 2.402 | 1.2500 | 0.200 | 0.4 |
| 39 (mid ch) | 2.441 | 1.2500 | 0.200 | 0.4 |
| 78 (upper ch) | 2.480 | 1.2375 | 0.198 | 0.4 |

| | | | |
|----------------------------|----------------|----------------------|---------------|
| Test Input Power | 120V 60Hz | Temperature | 26°C |
| Attached Plots | 21 – 23 | Relative Humidity | 60% |
| Hopping Rate | 533.3 hops / s | Atmospheric Pressure | 1030mbar |
| Number of Hopping Channels | 79 channels | Tested By | Chang Wai Kit |
| Data Rate | EDR 2Mbps | | |

| Channel | Channel Frequency (GHz) | Measured Time Slot Length (ms) | Average Frequency Dwell Time (s) | Average Occupancy Limit (s) |
|---------------|-------------------------|--------------------------------|----------------------------------|-----------------------------|
| 0 (lower ch) | 2.402 | 2.5125 | 0.134 | 0.4 |
| 39 (mid ch) | 2.441 | 2.5125 | 0.134 | 0.4 |
| 78 (upper ch) | 2.480 | 2.5125 | 0.134 | 0.4 |

| | | | |
|----------------------------|--------------|----------------------|---------------|
| Test Input Power | 120V 60Hz | Temperature | 26°C |
| Attached Plots | 24 – 26 | Relative Humidity | 60% |
| Hopping Rate | 320 hops / s | Atmospheric Pressure | 1030mbar |
| Number of Hopping Channels | 79 channels | Tested By | Chang Wai Kit |
| Data Rate | EDR 3Mbps | | |

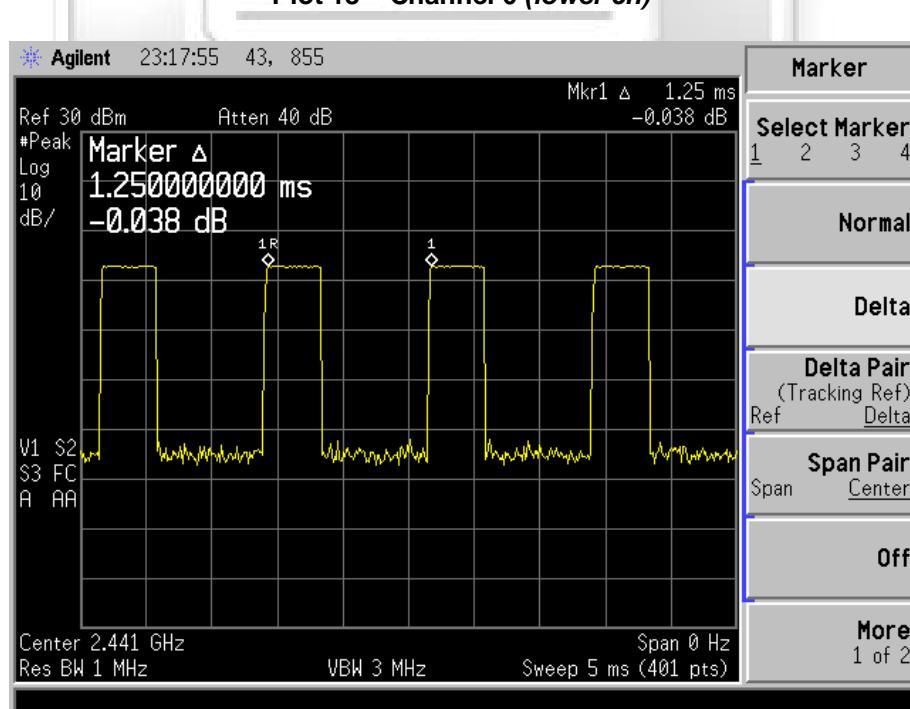
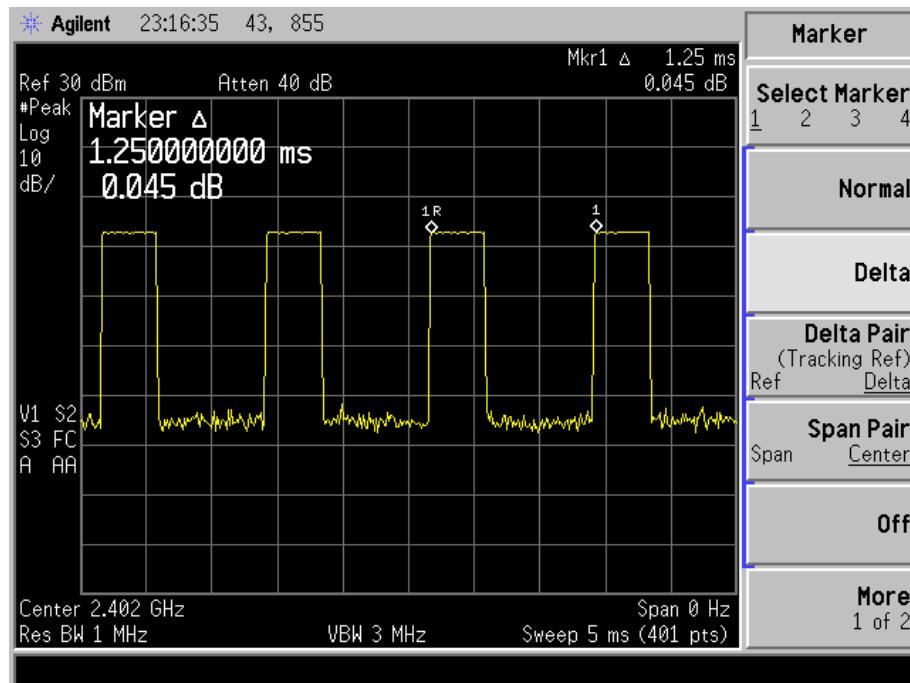
| Channel | Channel Frequency (GHz) | Measured Time Slot Length (ms) | Average Frequency Dwell Time (s) | Average Occupancy Limit (s) |
|---------------|-------------------------|--------------------------------|----------------------------------|-----------------------------|
| 0 (lower ch) | 2.402 | 3.7500 | 0.120 | 0.4 |
| 39 (mid ch) | 2.441 | 3.7500 | 0.120 | 0.4 |
| 78 (upper ch) | 2.480 | 3.7500 | 0.120 | 0.4 |

Notes

1. The EUT operates based on 1-slot transmission and 1-slot reception basis. As such, there are [1600 / (1 + 1)] transmissions per second and the time occupancy per channel is [measured time slot length / 2].
2. Average Frequency Dwell Time = [measured time slot length / 2 x hopping rate / 2 / number of hopping channels] x [0.4 x number of hopping channels]

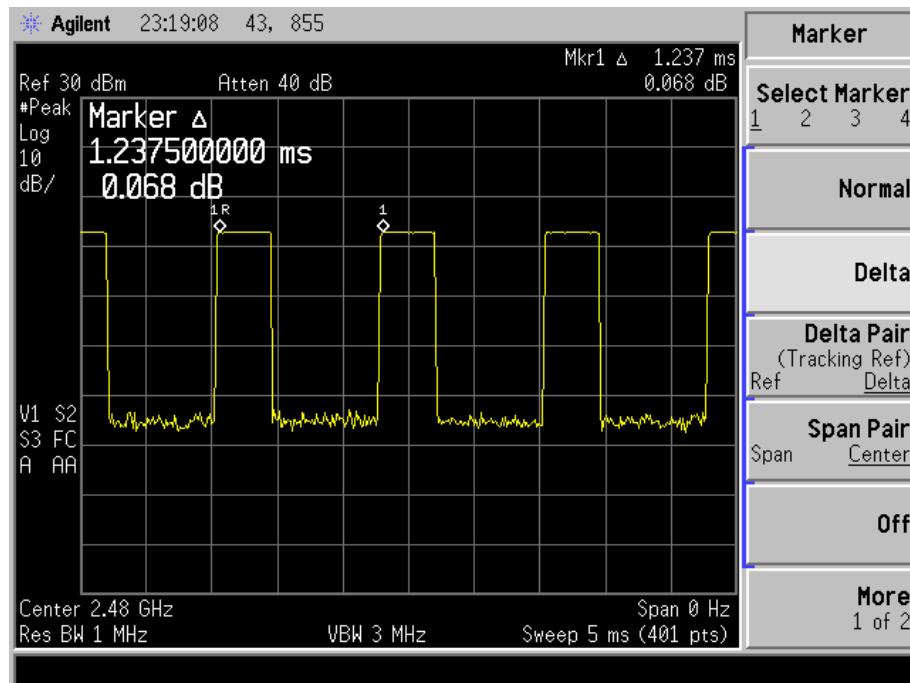
AVERAGE FREQUENCY DWELL TIME TEST

Average Frequency Dwell Time Plots - BDR 1Mbps



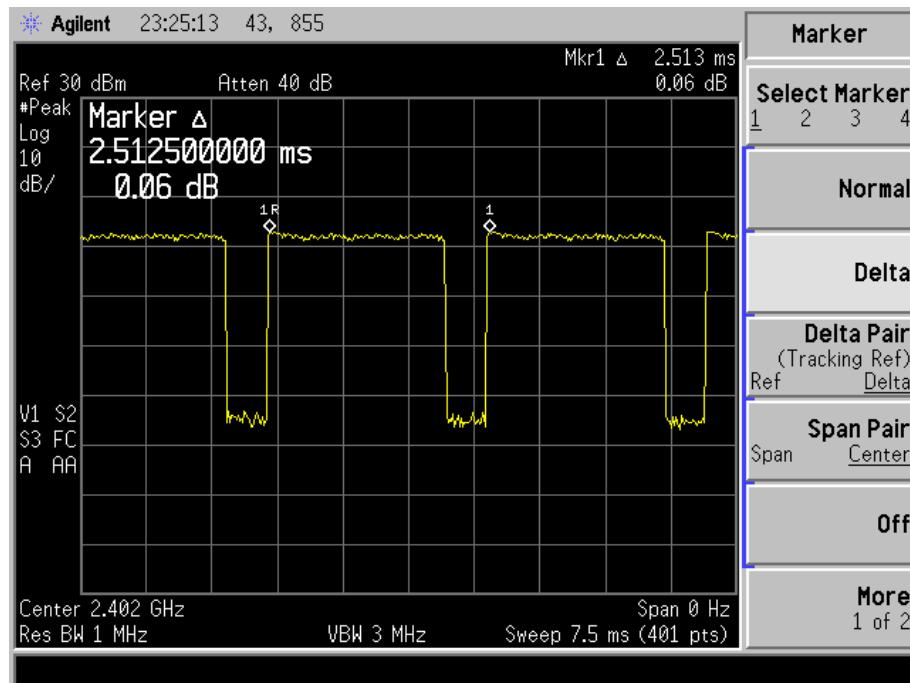
AVERAGE FREQUENCY DWELL TIME TEST

Average Frequency Dwell Time Plots - BDR 1Mbps

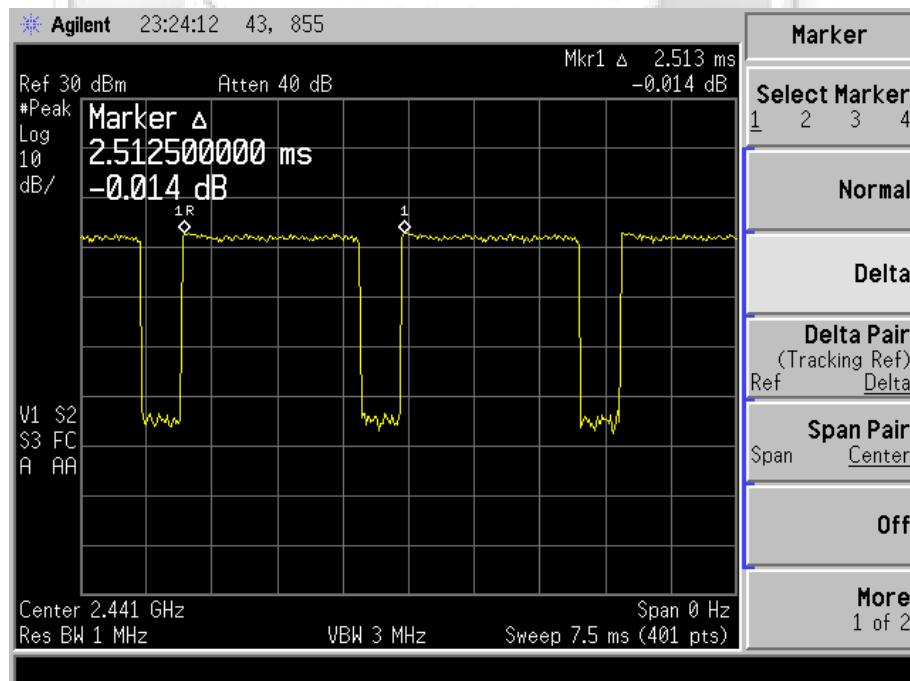


AVERAGE FREQUENCY DWELL TIME TEST

Average Frequency Dwell Time Plots - EDR 2Mbps



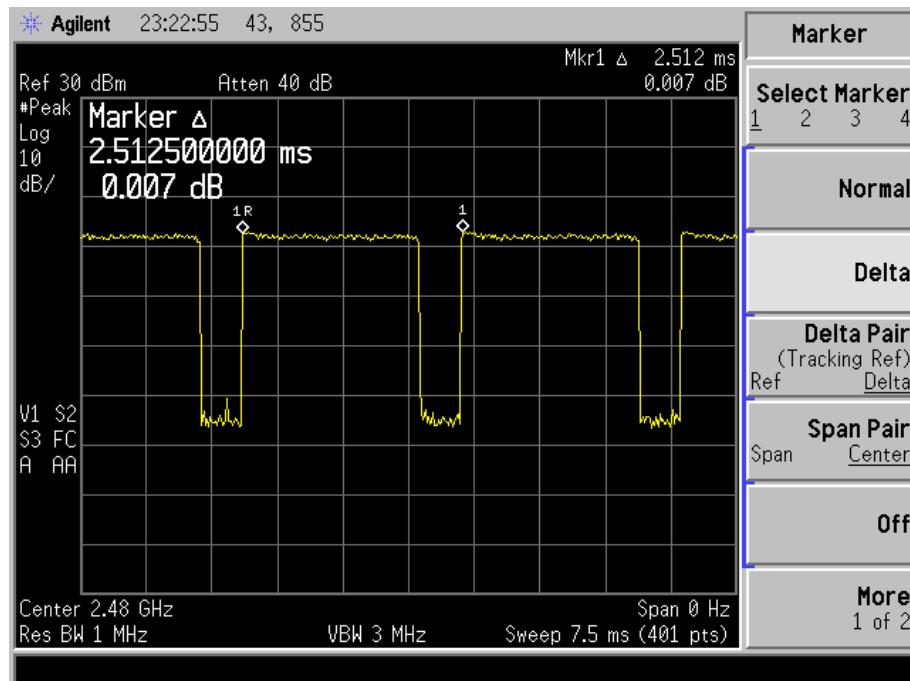
Plot 21 – Channel 0 (lower ch)



Plot 22 – Channel 39 (mid ch)

AVERAGE FREQUENCY DWELL TIME TEST

Average Frequency Dwell Time Plots - EDR 2Mbps

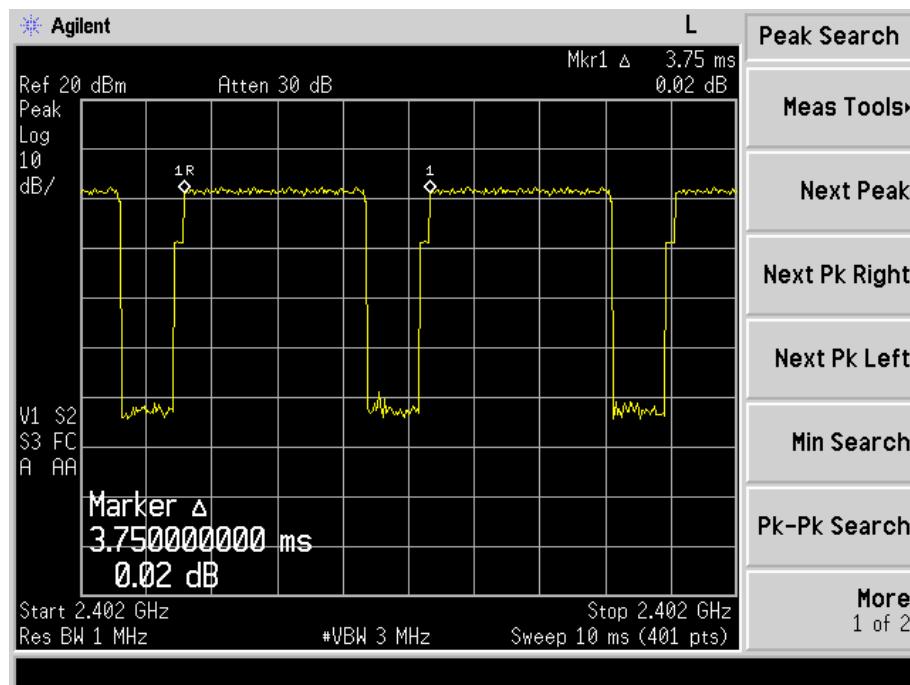


Plot 23 – Channel 78 (upper ch)

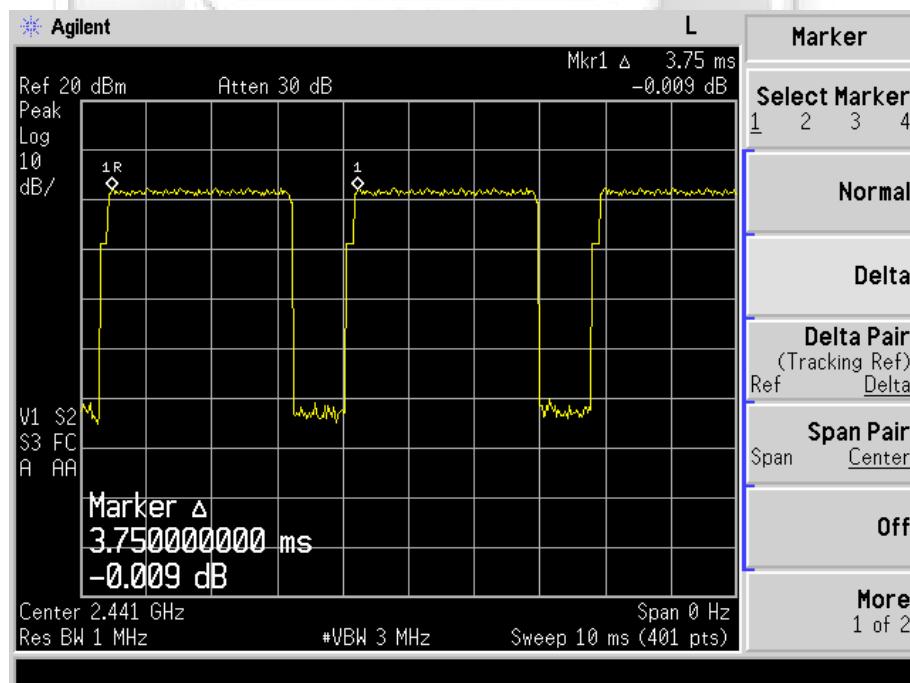
SÜD

AVERAGE FREQUENCY DWELL TIME TEST

Average Frequency Dwell Time Plots - EDR 3Mbps



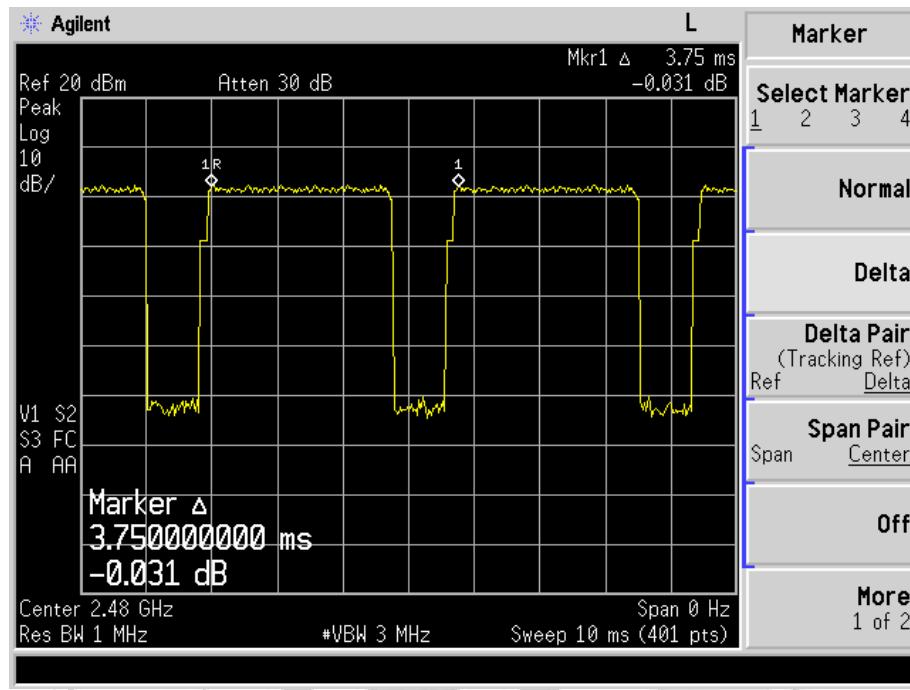
Plot 24 – Channel 0 (lower ch)



Plot 25 – Channel 39 (mid ch)

AVERAGE FREQUENCY DWELL TIME TEST

Average Frequency Dwell Time Plots - EDR 3Mbps



Plot 26 – Channel 78 (upper ch)

SÜD

MAXIMUM PEAK POWER TEST

47 CFR FCC Part 15.247(b)(1) Maximum Peak Power Limits

The EUT shows compliance to the requirements of this section, which states the EUT employing at least 75 non-overlapping hopping channels shall not exceed 1W (30dBm). For the EUT employs other frequency hopping systems, the peak power shall not greater than 0.125W (21dBm).

47 CFR FCC Part 15.247(b)(1) Maximum Peak Power Test Instrumentation

| Instrument | Model | S/No | Cal Due Date |
|------------------------|-----------|-------|--------------|
| Boonton RF Power Meter | 4532 | 72901 | 13 Dec 2013 |
| Boonton Power Sensor | 56218-S/1 | 32097 | 13 Dec 2013 |

47 CFR FCC Part 15.247(b)(1) Maximum Peak Power Test Setup

1. The EUT and supporting equipment were set up as shown in the setup photo.
2. The power supply for the EUT was connected to a filtered mains.
3. The RF antenna connector was connected to the Universal Radio Communication Tester, which set into power analyser mode via a low-loss coaxial cable.
4. All other supporting equipment were powered separately from another filtered mains.

47 CFR FCC Part 15.247(b)(1) Maximum Peak Power Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition. The EUT was then configured to operate in the test mode, non-hopping with transmitting frequency at Channel 0 (2.402GHz) (*lower ch*).
2. The maximum peak power of the transmitting frequency was detected and recorded.
3. The Equivalent Isotropic Radiated Power (EIRP) of the EUT was computed by adding its antenna gain to the measured maximum peak power.
4. The steps 2 to 3 were repeated with the transmitting frequency was set to Channel 39 (2.441GHz) (*mid ch*) and Channel 78 (2.480GHz) (*upper ch*) respectively.

MAXIMUM PEAK POWER TEST

Maximum Peak Power Test Setup

47 CFR FCC Part 15.247(b)(1) Maximum Peak Power Results

| | | | |
|------------------|-----------|----------------------|---------------|
| Test Input Power | 120V 60Hz | Temperature | 26°C |
| Antenna Gain | 2.0 dBi | Relative Humidity | 60% |
| | | Atmospheric Pressure | 1030mbar |
| | | Tested By | Chang Wai Kit |

| Channel | Channel Frequency (GHz) | Data Rate (Mbps) | Maximum Peak Power (W) | Maximum EIRP (W) | Limit (W) |
|---------------|-------------------------|------------------|------------------------|------------------|-----------|
| 0 (lower ch) | 2.402 | 1.0 | 0.0016 | 0.0025 | 1.0 |
| 39 (mid ch) | 2.441 | | 0.0016 | 0.0025 | 1.0 |
| 78 (upper ch) | 2.480 | | 0.0016 | 0.0025 | 1.0 |
| 0 (lower ch) | 2.402 | 2.0 | 0.0012 | 0.0019 | 1.0 |
| 39 (mid ch) | 2.441 | | 0.0012 | 0.0019 | 1.0 |
| 78 (upper ch) | 2.480 | | 0.0012 | 0.0019 | 1.0 |
| 0 (lower ch) | 2.402 | 3.0 | 0.0012 | 0.0019 | 1.0 |
| 39 (mid ch) | 2.441 | | 0.0012 | 0.0019 | 1.0 |
| 78 (upper ch) | 2.480 | | 0.0012 | 0.0019 | 1.0 |

RF CONDUCTED SPURIOUS EMISSIONS TEST

47 CFR FCC Part 15.247(d) RF Conducted Spurious Emissions Limits

The EUT shows compliance to the requirements of this section, which states in any 100kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator (EUT) is operating, the radio frequency power that is produced by the EUT shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of desired power.

47 CFR FCC Part 15.247(d) RF Conducted Spurious Test Instrumentation

| Instrument | Model | S/No | Cal Due Date |
|---------------------------|--------|------------|--------------|
| Agilent Spectrum Analyzer | E7405A | MY45106084 | 01 Aug 2014 |

47 CFR FCC Part 15.247(d) RF Conducted Spurious Emissions Test Setup

1. The EUT and supporting equipment were set up as shown in the setup photo.
2. The power supply for the EUT was connected to a filtered mains.
3. The RF antenna connector was connected to the spectrum analyser via a low-loss coaxial cable.
4. The resolution bandwidth (RBW) and the video bandwidth (VBW) of the spectrum analyser were respectively set to 100kHz and 300kHz.
5. All other supporting equipment were powered separately from another filtered mains.

47 CFR FCC Part 15.247(d) RF Conducted Spurious Emissions Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition. The EUT was then configured to operate in the test mode, non-hopping with transmitting frequency at Channel 0 (2.402GHz) (*lower ch*).
2. The start and stop frequencies of the spectrum analyser were set to 30MHz and 10GHz.
3. The spectrum analyser was set to max hold to capture any spurious emissions within the span. The signal capturing was continuous until no further spurious emissions were detected.
4. The steps 2 to 3 were repeated with frequency span was set from 10GHz to 25GHz.
5. The steps 2 to 4 were repeated with the transmitting frequency was set to Channel 39 (2.441GHz) (*mid ch*) and Channel 78 (2.480GHz) (*upper ch*) respectively.

RF CONDUCTED SPURIOUS EMISSIONS TEST

RF Conducted Spurious Emissions Test Setup

47 CFR FCC Part 15.247(d) RF Conducted Spurious Emissions Results

| | | | |
|------------------|-----------|----------------------|---------------|
| Test Input Power | 120V 60Hz | Temperature | 26°C |
| Attached Plots | 27 – 32 | Relative Humidity | 60% |
| Data Rate | BDR 1Mbps | Atmospheric Pressure | 1030mbar |
| | | Tested By | Chang Wai Kit |

All spurious signals found were below the specified limit. Please refer to the attached plots.

| | | | |
|------------------|-----------|----------------------|---------------|
| Test Input Power | 120V 60Hz | Temperature | 26°C |
| Attached Plots | 33 – 38 | Relative Humidity | 60% |
| Data Rate | EDR 2Mbps | Atmospheric Pressure | 1030mbar |
| | | Tested By | Chang Wai Kit |

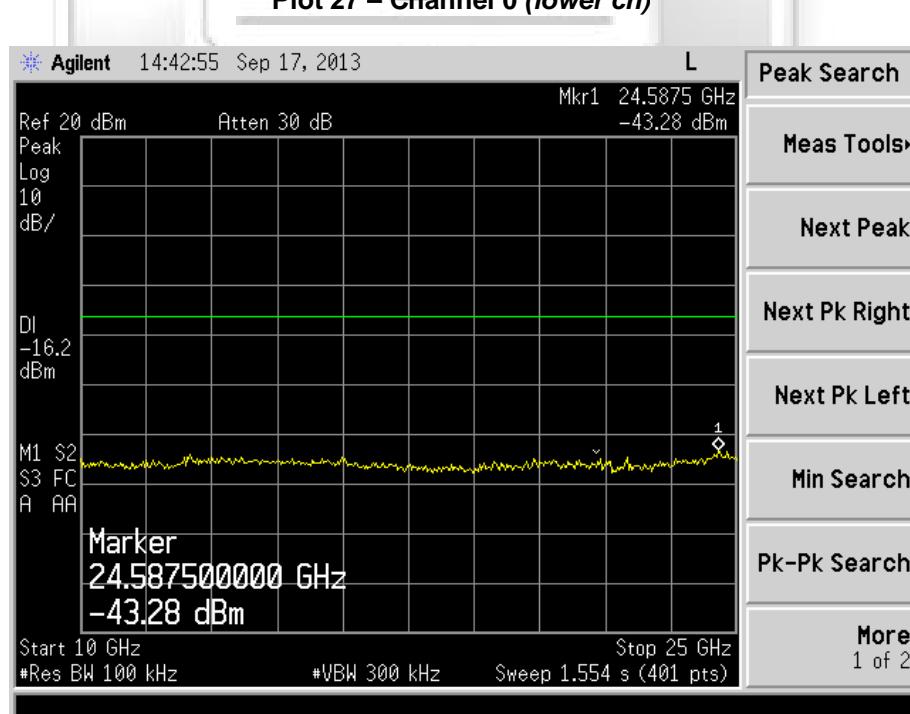
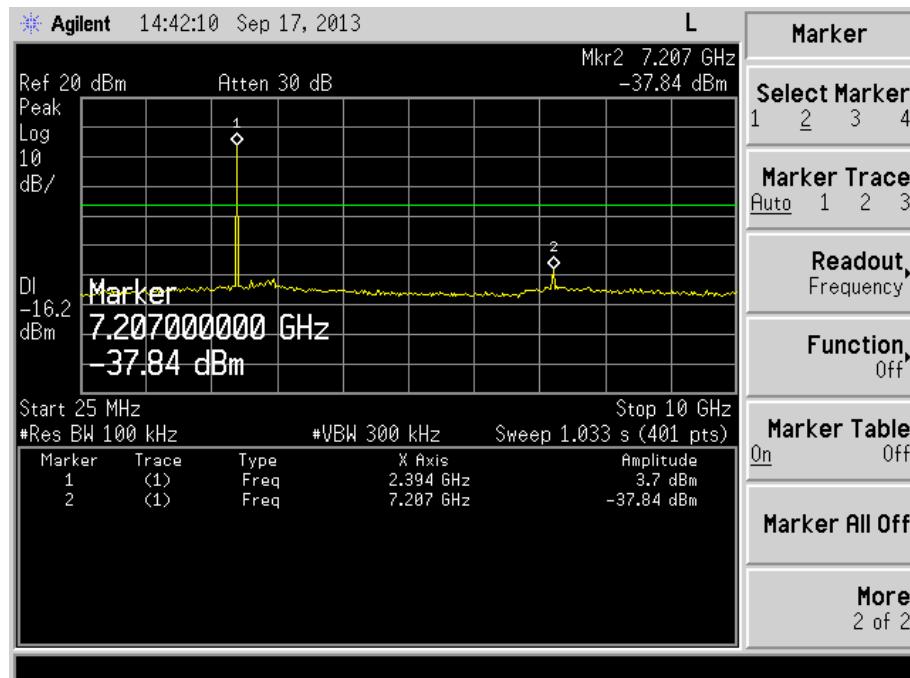
All spurious signals found were below the specified limit. Please refer to the attached plots.

| | | | |
|------------------|-----------|----------------------|---------------|
| Test Input Power | 120V 60Hz | Temperature | 26°C |
| Attached Plots | 39 – 44 | Relative Humidity | 60% |
| Data Rate | EDR 3Mbps | Atmospheric Pressure | 1030mbar |
| | | Tested By | Chang Wai Kit |

All spurious signals found were below the specified limit. Please refer to the attached plots.

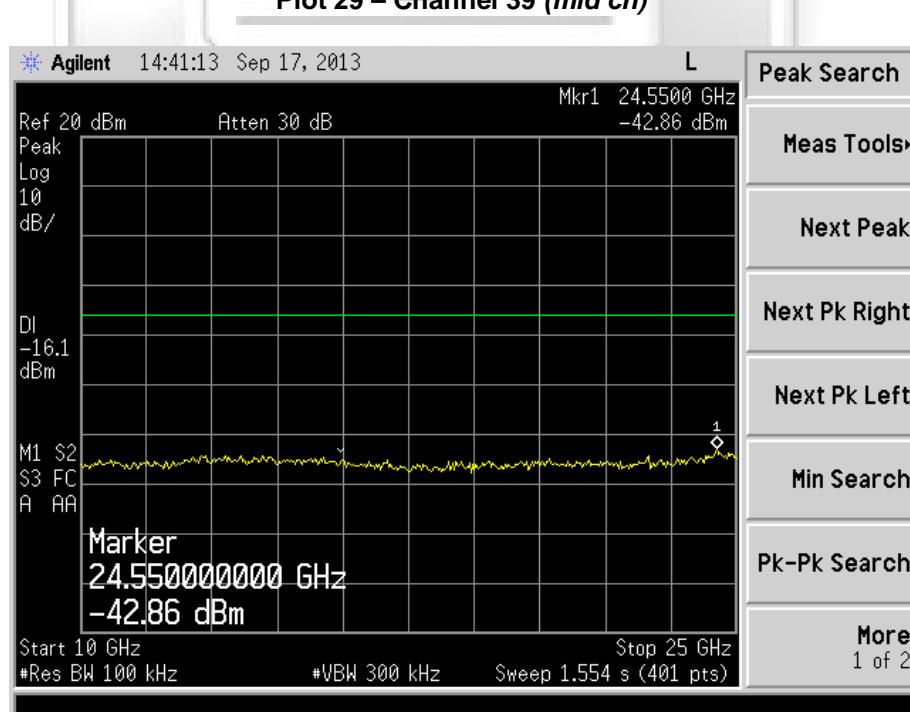
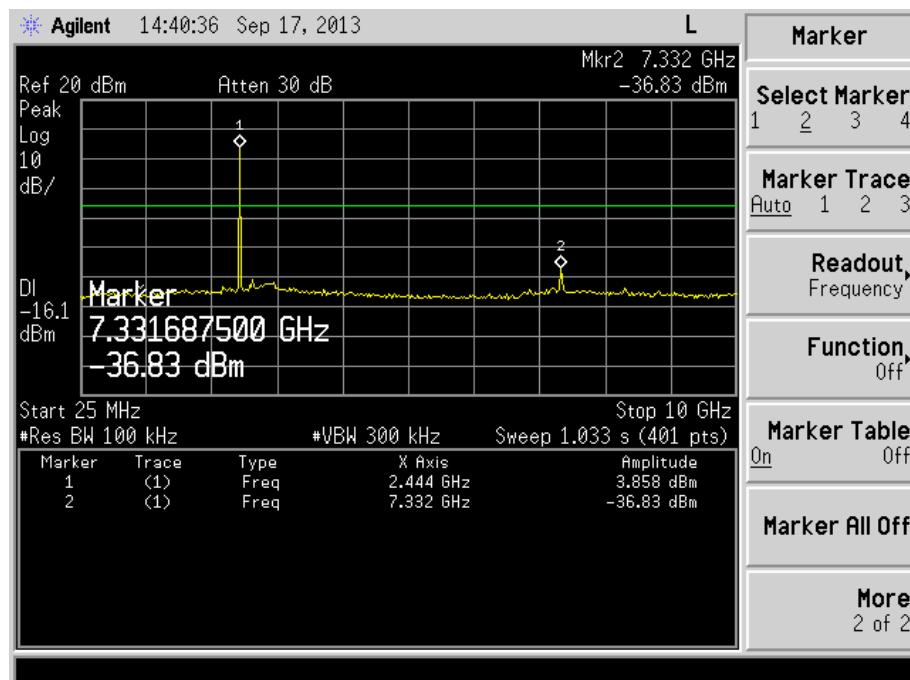
RF CONDUCTED SPURIOUS EMISSIONS TEST

RF Conducted Spurious Emissions Plots - BDR 1Mbps



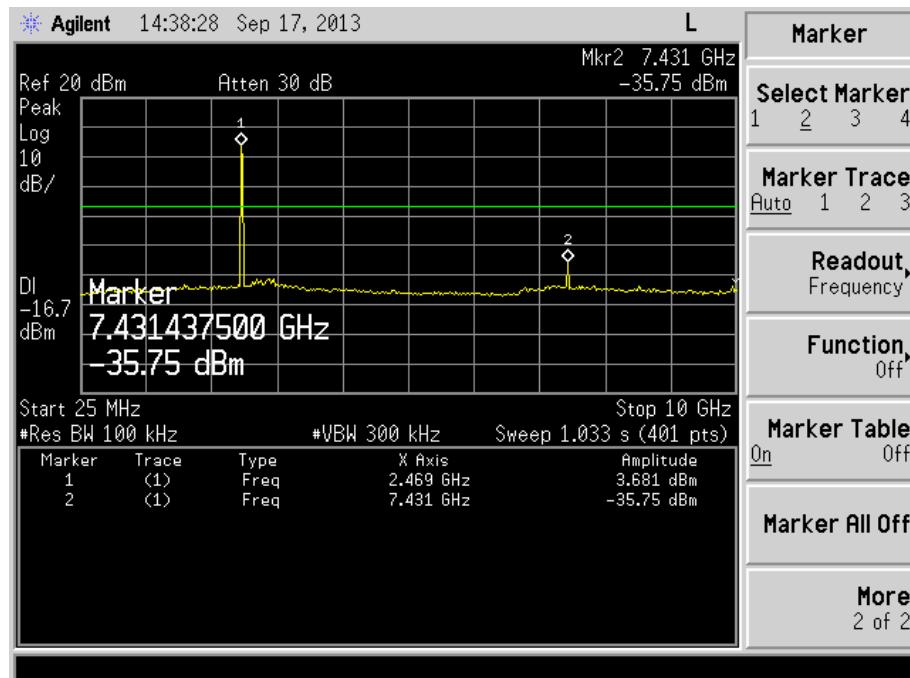
RF CONDUCTED SPURIOUS EMISSIONS TEST

RF Conducted Spurious Emissions Plots - BDR 1Mbps

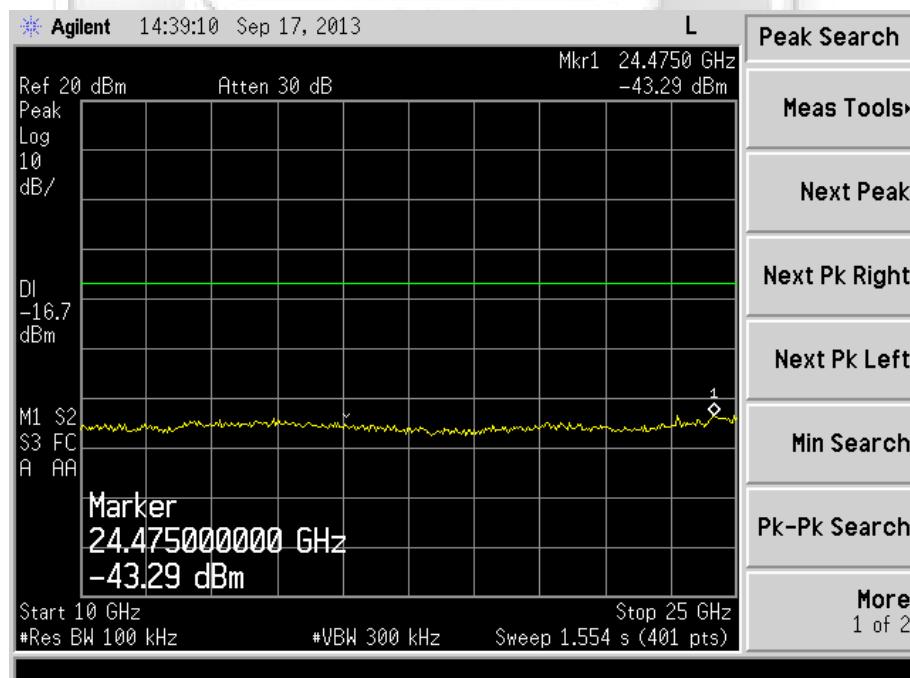


RF CONDUCTED SPURIOUS EMISSIONS TEST

RF Conducted Spurious Emissions Plots - BDR 1Mbps



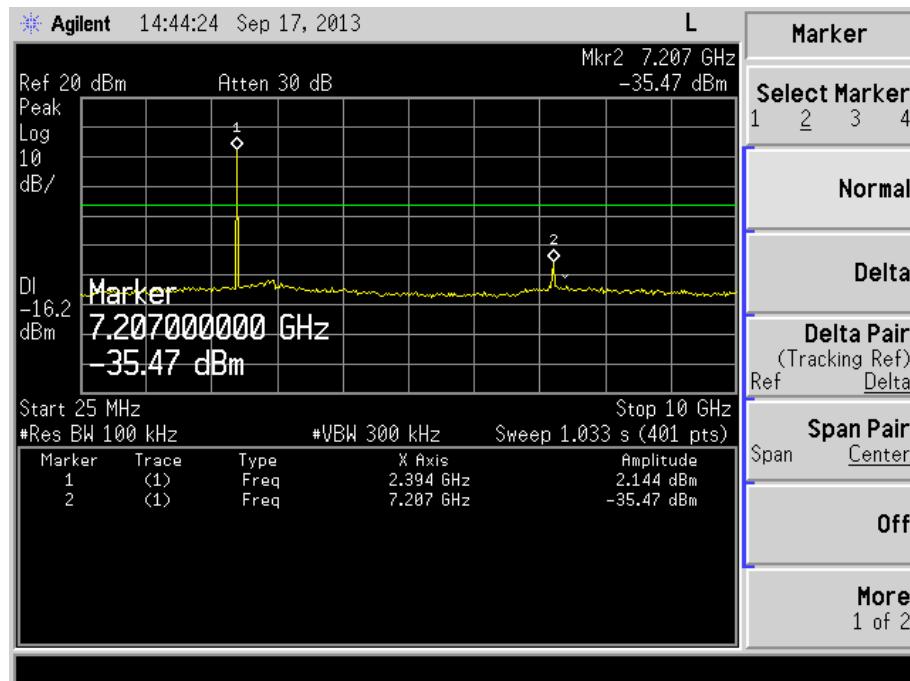
Plot 31 – Channel 78 (upper ch)



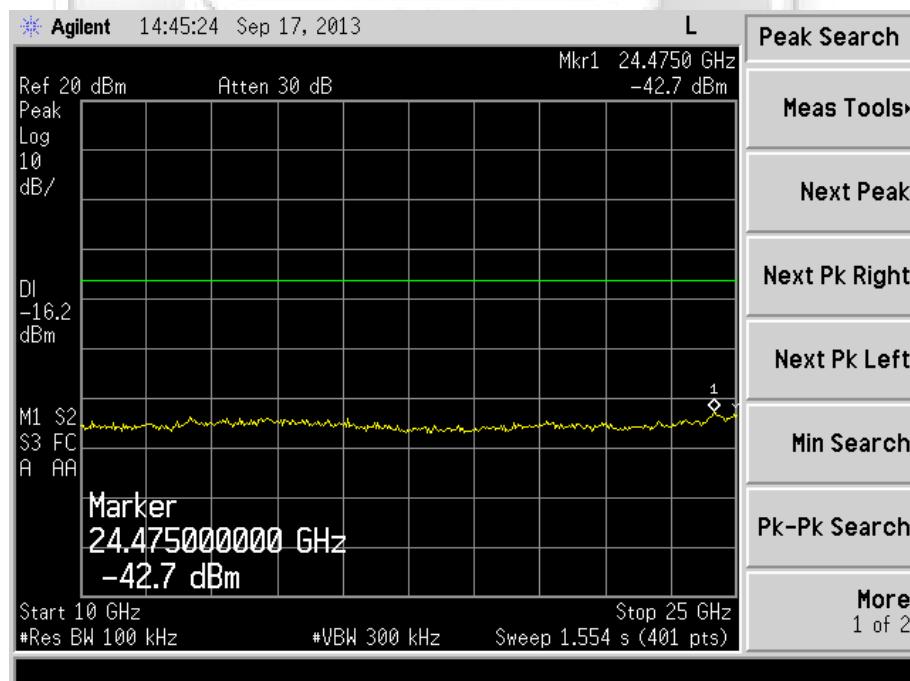
Plot 32 – Channel 78 (upper ch)

RF CONDUCTED SPURIOUS EMISSIONS TEST

RF Conducted Spurious Emissions Plots - EDR 2Mbps



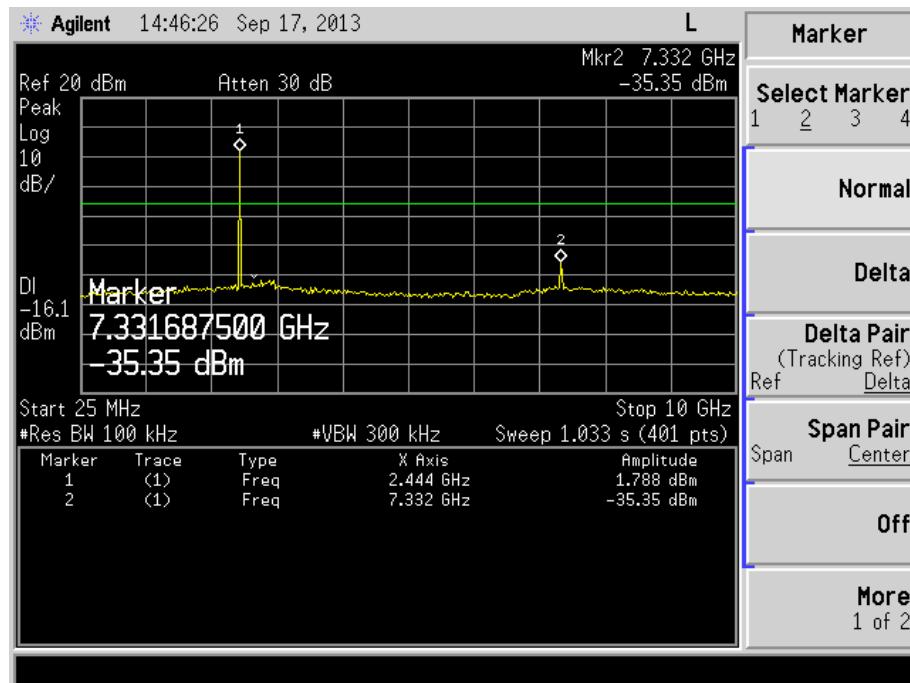
Plot 33 – Channel 0 (lower ch)



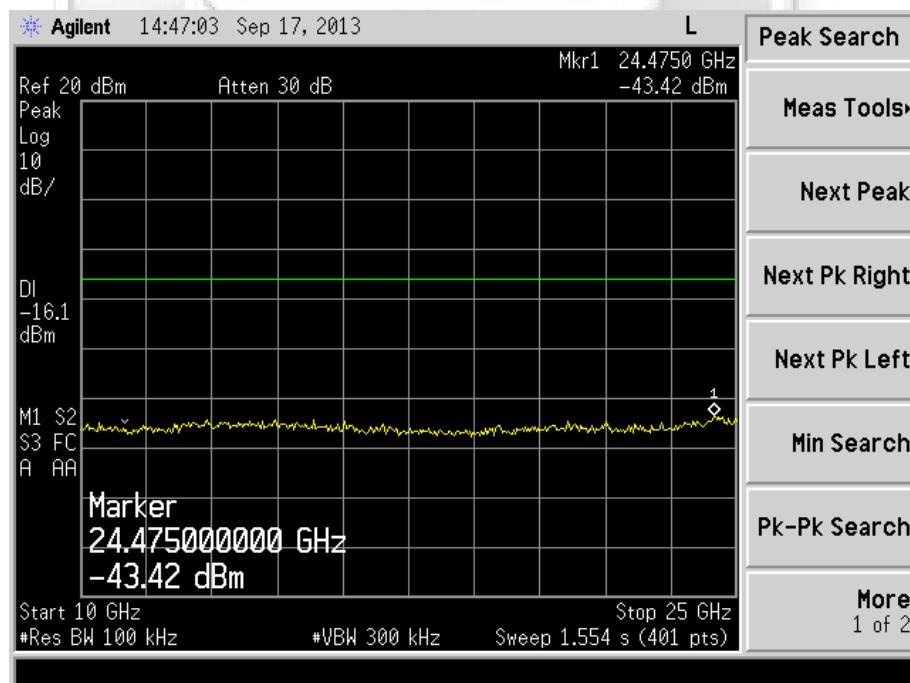
Plot 34 – Channel 0 (lower ch)

RF CONDUCTED SPURIOUS EMISSIONS TEST

RF Conducted Spurious Emissions Plots - EDR 2Mbps



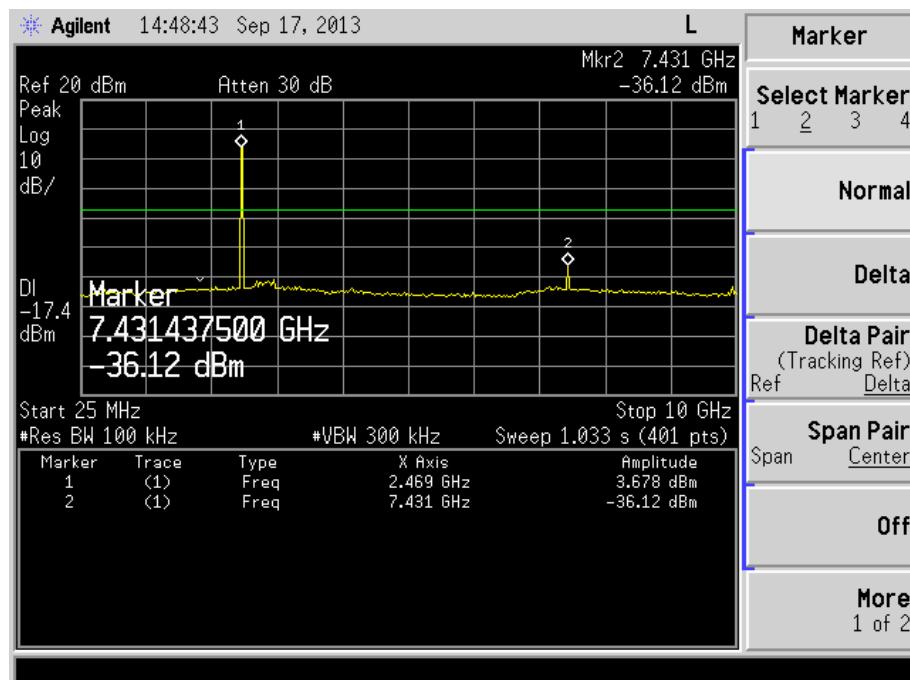
Plot 35 – Channel 39 (mid ch)



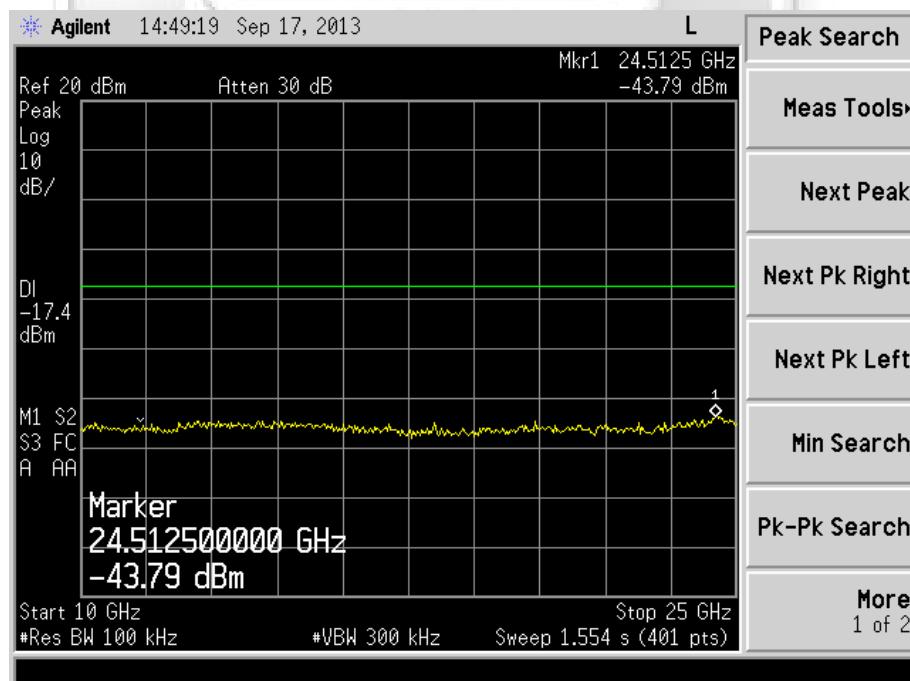
Plot 36 – Channel 39 (mid ch)

RF CONDUCTED SPURIOUS EMISSIONS TEST

RF Conducted Spurious Emissions Plots - EDR 2Mbps



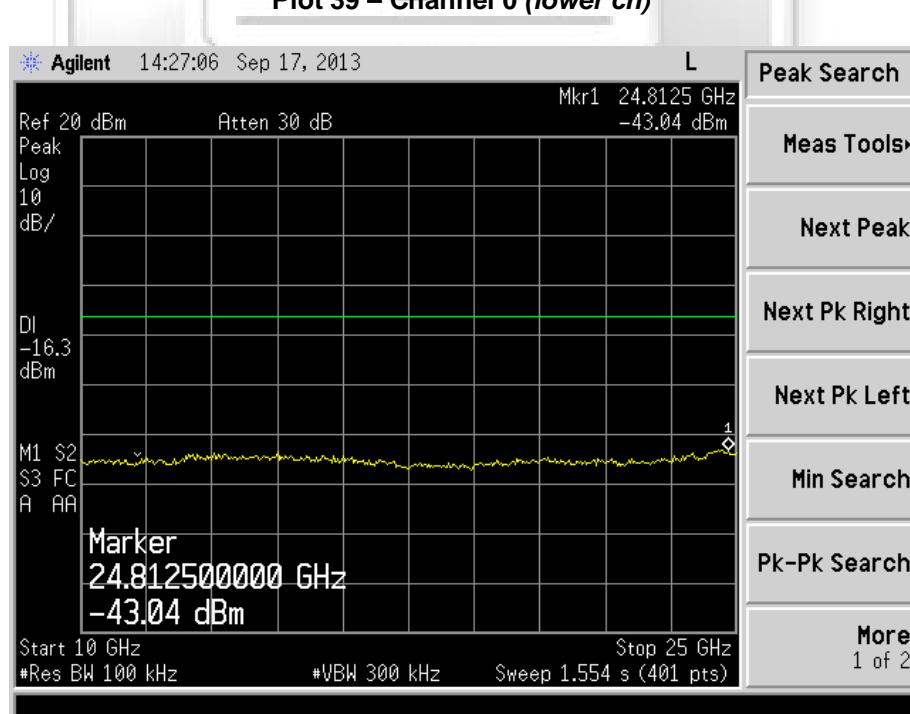
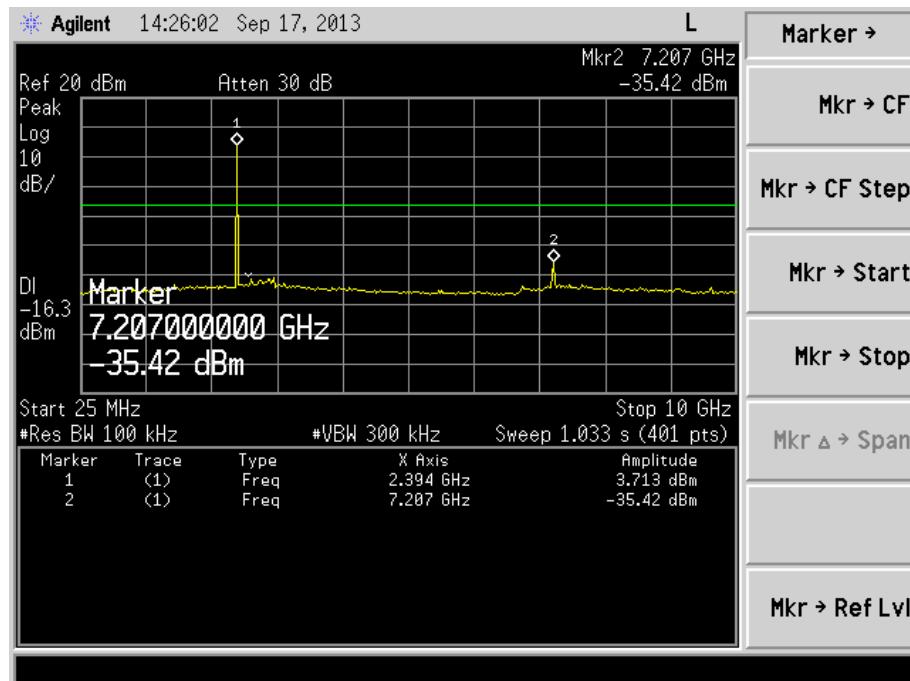
Plot 37 – Channel 78 (upper ch)



Plot 38 – Channel 78 (upper ch)

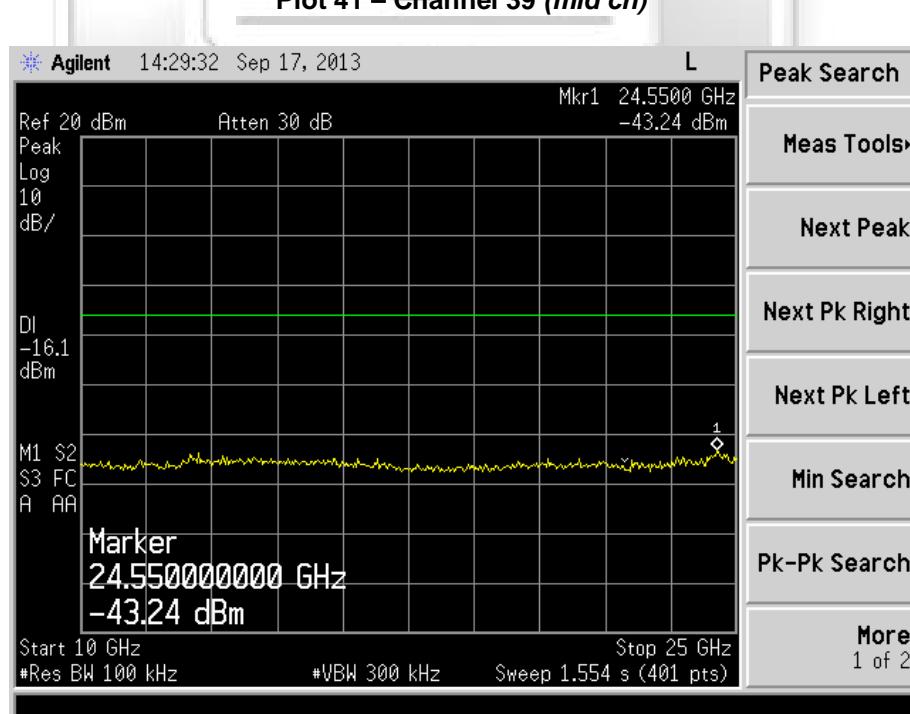
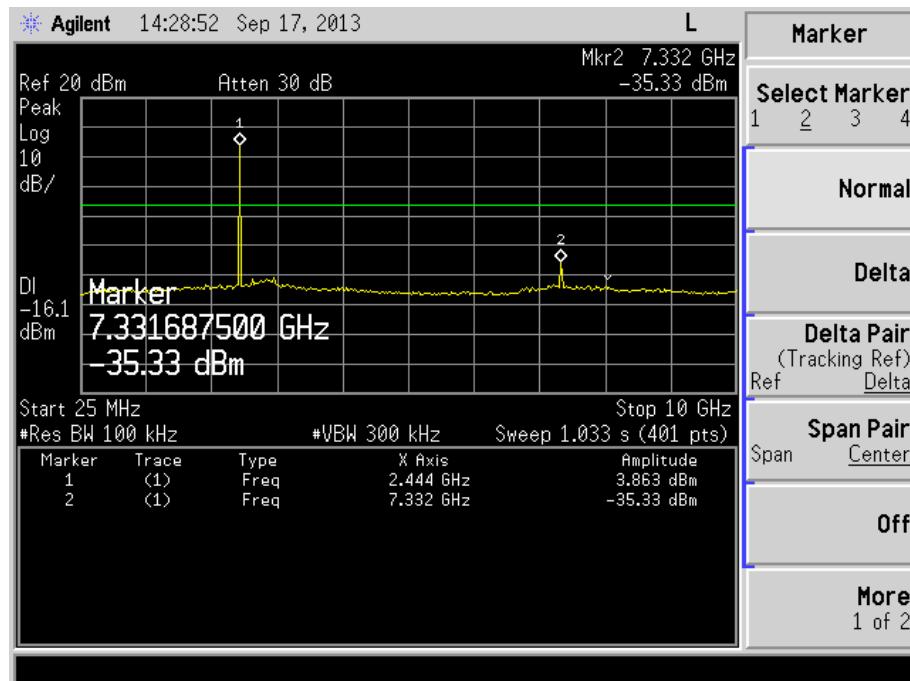
RF CONDUCTED SPURIOUS EMISSIONS TEST

RF Conducted Spurious Emissions Plots - EDR 3Mbps



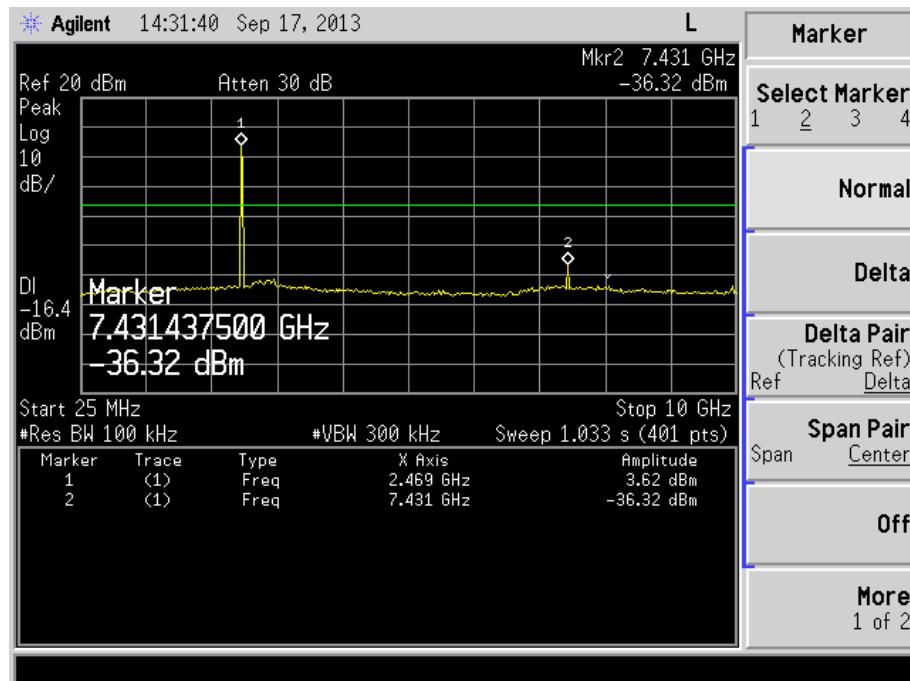
RF CONDUCTED SPURIOUS EMISSIONS TEST

RF Conducted Spurious Emissions Plots - EDR 3Mbps

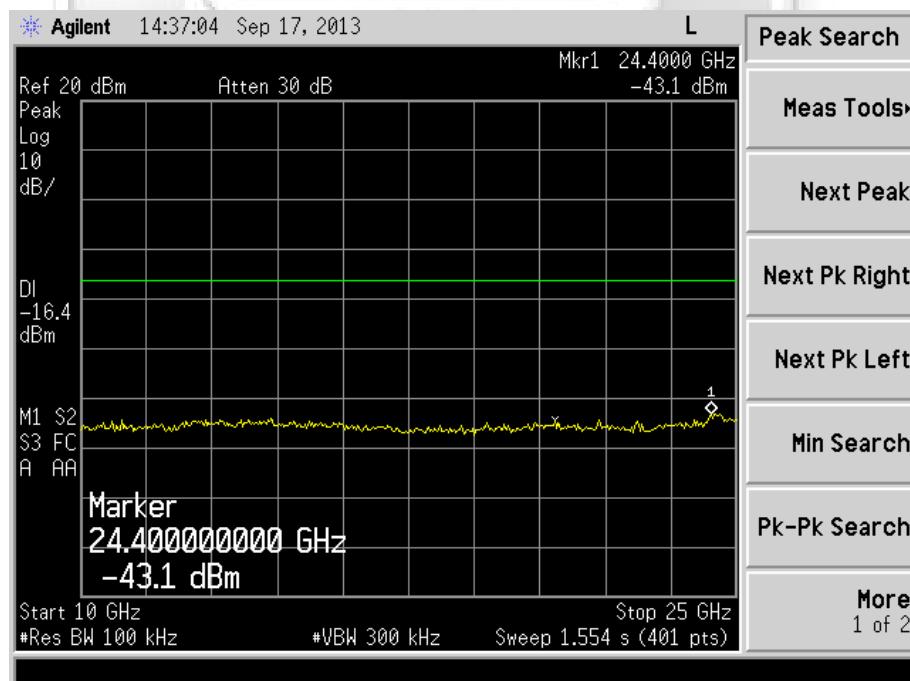


RF CONDUCTED SPURIOUS EMISSIONS TEST

RF Conducted Spurious Emissions Plots - EDR 3Mbps



Plot 43 – Channel 78 (upper ch)



Plot 44 – Channel 78 (upper ch)

BAND EDGE COMPLIANCE (CONDUCTED) TEST

47 CFR FCC Part 15.247(d) Band Edge Compliance (Conducted) Limits

The EUT shows compliance to the requirements of this section, which states in any 100kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator (EUT) is operating, the radio frequency power that is produced by the EUT shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of desired power.

47 CFR FCC Part 15.247(d) Band Edge Compliance (Conducted) Test Instrumentation

| Instrument | Model | S/No | Cal Due Date |
|---------------------------|--------|------------|--------------|
| Agilent Spectrum Analyzer | E7405A | MY45106084 | 01 Aug 2014 |

47 CFR FCC Part 15.247(d) Band Edge Compliance (Conducted) Test Setup

1. The EUT and supporting equipment were set up as shown in the setup photo.
2. The power supply for the EUT was connected to a filtered mains.
3. The RF antenna connector was connected to the spectrum analyser via a low-loss coaxial cable.
4. The resolution bandwidth (RBW) and the video bandwidth (VBW) of the spectrum analyser were respectively set to 100kHz and 300kHz.
5. All other supporting equipment were powered separately from another filtered mains.

47 CFR FCC Part 15.247(d) Band Edge Compliance (Conducted) Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition. The EUT was then configured to operate in the test mode with frequency hopping sequence on.
2. The frequency span of the spectrum analyser was set to wide enough to capture the lower band edge of the transmission band, 2.400GHz and any spurious emissions at the band edge.
3. The spectrum analyser was set to max hold to capture any spurious emissions within the span. The signal capturing was continuous until no further spurious emissions were detected.
4. The steps 2 to 3 were repeated with the frequency span of the spectrum analyser was set to wide enough to capture the upper band edge frequency of the transmission band, 2.4835GHz and the any spurious emissions at the band-edge.

BAND EDGE COMPLIANCE (CONDUCTED) TEST

Band Edge Compliance (Conducted) Test Setup

47 CFR FCC Part 15.247(d) Band Edge Compliance (Conducted) Results

| | | | |
|------------------|-----------|----------------------|---------------|
| Test Input Power | 120V 60Hz | Temperature | 26°C |
| Attached Plots | 45 – 46 | Relative Humidity | 60% |
| Data Rate | BDR 1Mbps | Atmospheric Pressure | 1030mbar |
| | | Tested By | Chang Wai Kit |

No significant signal was found and they were below the specified limit.

| | | | |
|------------------|-----------|----------------------|---------------|
| Test Input Power | 120V 60Hz | Temperature | 26°C |
| Attached Plots | 47 – 48 | Relative Humidity | 60% |
| Data Rate | EDR 2Mbps | Atmospheric Pressure | 1030mbar |
| | | Tested By | Chang Wai Kit |

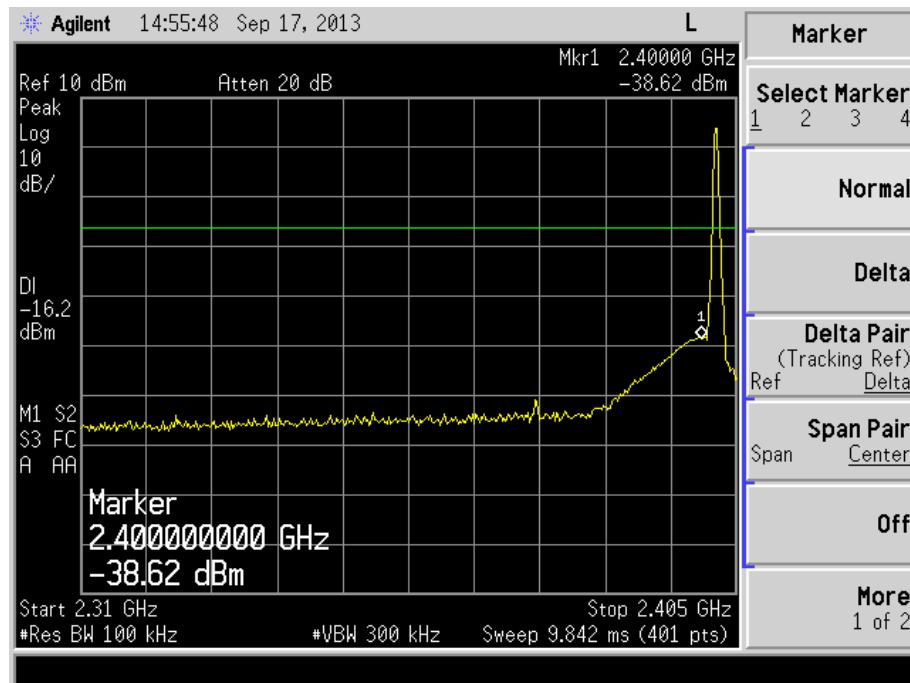
No significant signal was found and they were below the specified limit.

| | | | |
|------------------|-----------|----------------------|---------------|
| Test Input Power | 120V 60Hz | Temperature | 26°C |
| Attached Plots | 49 – 50 | Relative Humidity | 60% |
| Data Rate | EDR 3Mbps | Atmospheric Pressure | 1030mbar |
| | | Tested By | Chang Wai Kit |

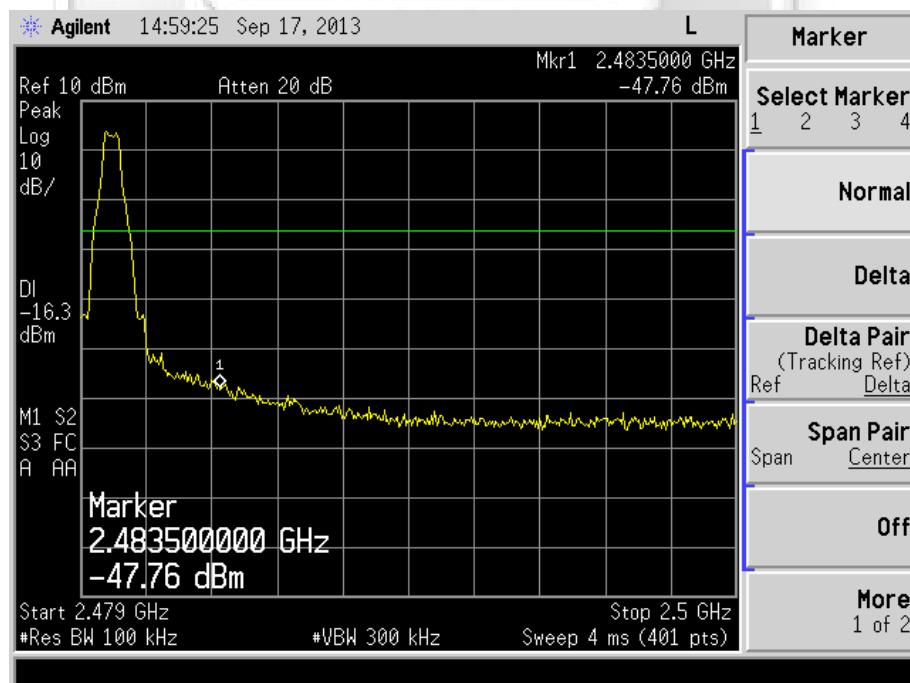
No significant signal was found and they were below the specified limit.

BAND EDGE COMPLIANCE (CONDUCTED) TEST

Band Edge Compliance (Conducted) Plots - BDR 1Mbps



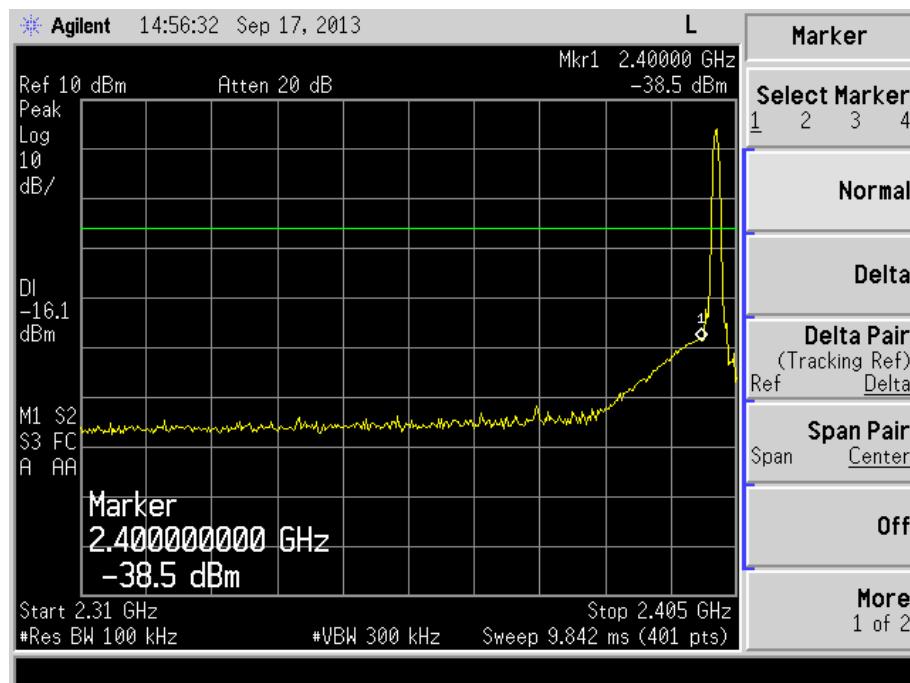
Plot 45 – Lower Band Edge at 2.4000GHz



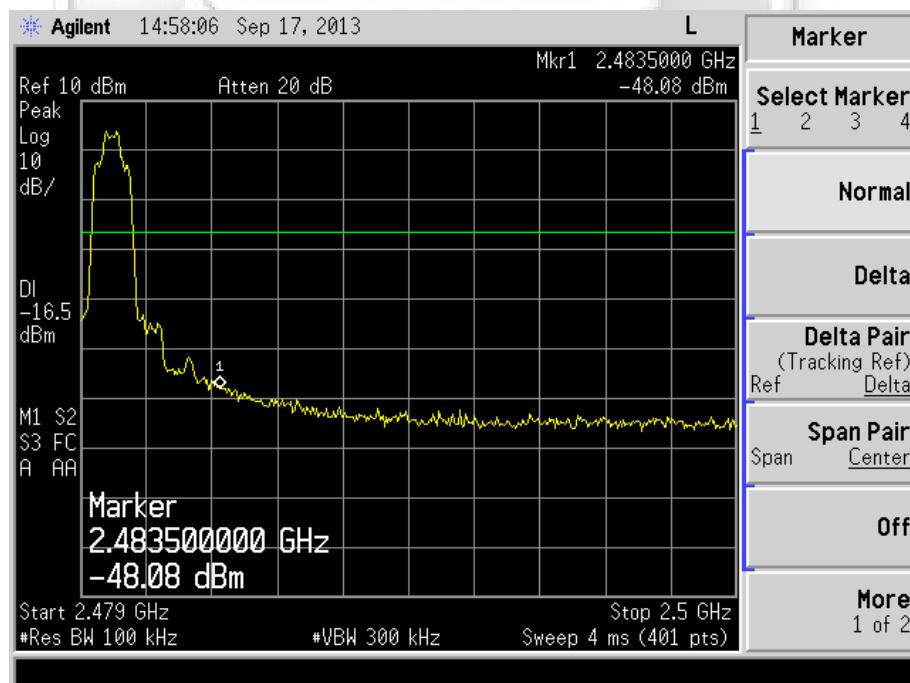
Plot 46 – Upper Band Edge at 2.4835GHz

BAND EDGE COMPLIANCE (CONDUCTED) TEST

Band Edge Compliance (Conducted) Plots - EDR 2Mbps



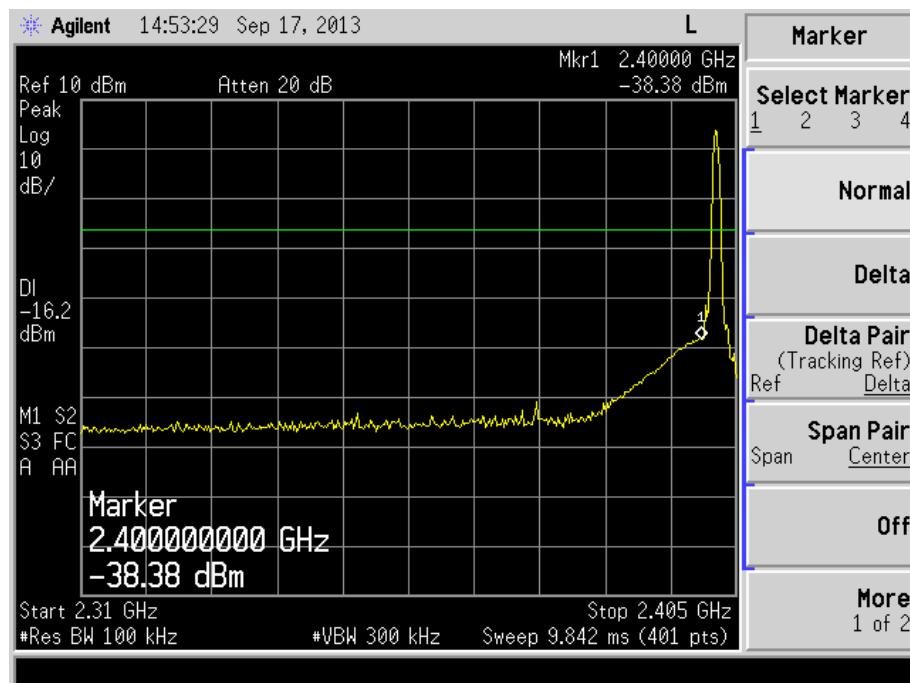
Plot 47 – Lower Band Edge at 2.4000GHz



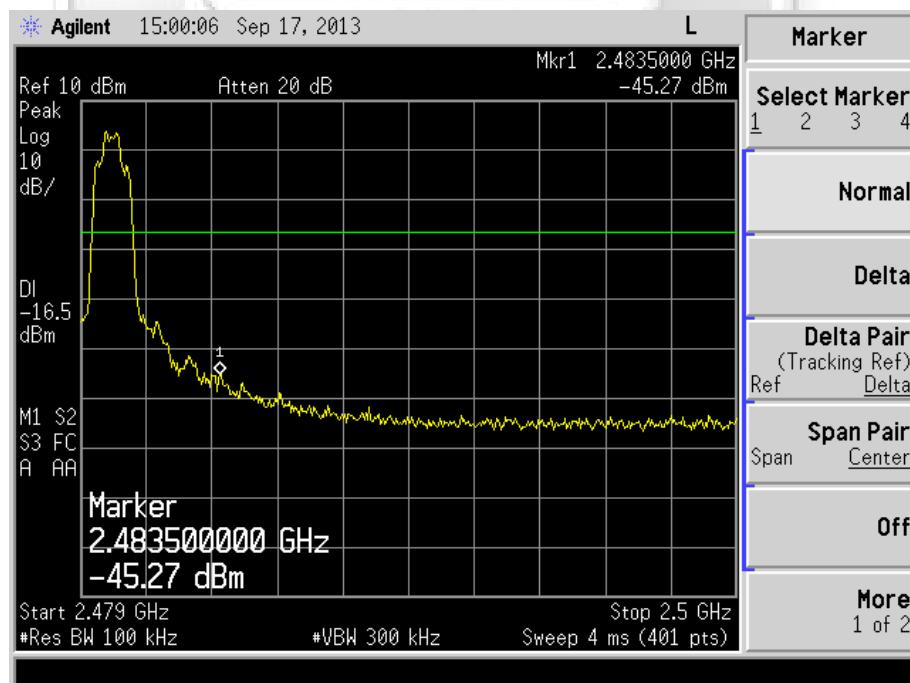
Plot 48 – Upper Band Edge at 2.4835GHz

BAND EDGE COMPLIANCE (CONDUCTED) TEST

Band Edge Compliance (Conducted) Plots - EDR 3Mbps



Plot 49 – Lower Band Edge at 2.4000GHz



Plot 50 – Upper Band Edge at 2.4835GHz

BAND EDGE COMPLIANCE (RADIATED) TEST

47 CFR FCC Part 15.247(d) Band Edge Compliance (Radiated) Limits

The EUT shows compliance to the requirements of this section, which states in any 100kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator (EUT) is operating, the radio frequency power that is produced by the EUT shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of desired power. In addition, radiated emissions which fall in the restricted bands shall comply to the radiated emission limits specified in 15.209.

47 CFR FCC Part 15.247(d) Band Edge Compliance (Radiated) Test Instrumentation

| Instrument | Model | S/No | Cal Due Date |
|---|------------|--------------------------|--------------|
| Rohde & Schwarz EMI Test Receiver (20Hz – 26.5GHz) | ESMI | 848926/007 849182/003 | 24 Oct 2014 |
| Eletro-Metrics Double Ridged Antenna (Horn) Antenna (1-18GHz) | EM-6961 | 6525 | 12 Apr 2014 |
| Toyo MicroWave Preamplifier (1GHz - 8GHz) | TPA0108-40 | 0636 | 09 Jun 2014 |

47 CFR FCC Part 15.247(d) Band Edge Compliance (Radiated) Test Setup

1. The EUT and supporting equipment were set up as shown in the setup photo.
2. The power supply for the EUT was connected to a filtered mains.
3. The resolution bandwidth (RBW) and the video bandwidth (VBW) of the spectrum analyser were respectively set to 100kHz and 300kHz to show compliance of spurious at band edges are at least 20dB below the carriers. For restricted band spurious at band edges, peak and average measurement plots were taken using the following setting:
 - a. Peak Plot:
RBW = VBW = 1MHz
 - b. Average Plot
RBW = 1MHz, VBW = 10Hz
4. All other supporting equipment were powered separately from another filtered mains.

47 CFR FCC Part 15.247(d) Band Edge Compliance (Radiated) Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition. The EUT was then configured to operate in the test mode with frequency hopping sequence on.
2. The frequency span of the spectrum analyser was set to wide enough to capture the lower band edge of the transmission band, 2.400GHz and any spurious emissions at the band edge.
3. The spectrum analyser was set to max hold to capture any spurious emissions within the span. The signal capturing was continuous until no further spurious emissions were detected.
4. The steps 2 to 3 were repeated with the frequency span of the spectrum analyser was set to wide enough to capture the upper band edge frequency of the transmission band, 2.4835GHz and the any spurious emissions at the band-edge.

BAND EDGE COMPLIANCE (RADIATED) TEST

Band Edge Compliance (Radiated) Test Setup

47 CFR FCC Part 15.247(d) Band Edge Compliance (Radiated) Results

| | | | |
|------------------|-----------|----------------------|---------------|
| Test Input Power | 230V 50Hz | Temperature | 26°C |
| Attached Plots | 51 – 56 | Relative Humidity | 60% |
| Data Rate | BDR 1Mbps | Atmospheric Pressure | 1030mbar |
| | | Tested By | Kyaw Soe Hein |

No significant signal was found and they were below the specified limit.

| | | | |
|------------------|-----------|----------------------|---------------|
| Test Input Power | 230V 50Hz | Temperature | 26°C |
| Attached Plots | 57 – 62 | Relative Humidity | 60% |
| Data Rate | EDR 2Mbps | Atmospheric Pressure | 1030mbar |
| | | Tested By | Kyaw Soe Hein |

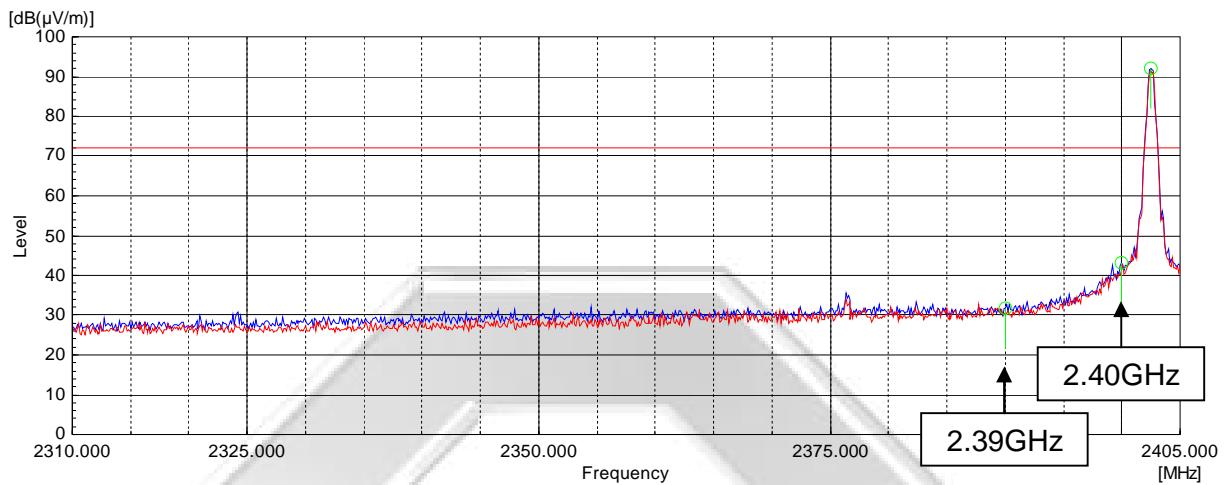
No significant signal was found and they were below the specified limit.

| | | | |
|------------------|-----------|----------------------|---------------|
| Test Input Power | 230V 50Hz | Temperature | 26°C |
| Attached Plots | 63 - 68 | Relative Humidity | 60% |
| Data Rate | EDR 3Mbps | Atmospheric Pressure | 1030mbar |
| | | Tested By | Kyaw Soe Hein |

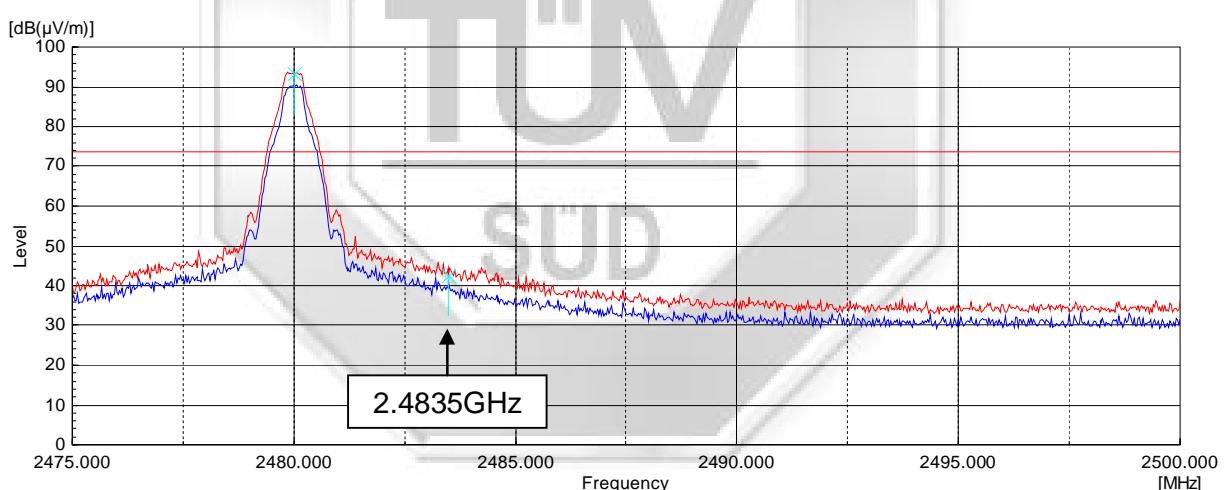
No significant signal was found and they were below the specified limit.

BAND EDGE COMPLIANCE (RADIATED) TEST

Band Edge Compliance (Radiated) Plots (20dB Delta from Carrier at Band Edge) - BDR 1Mbps



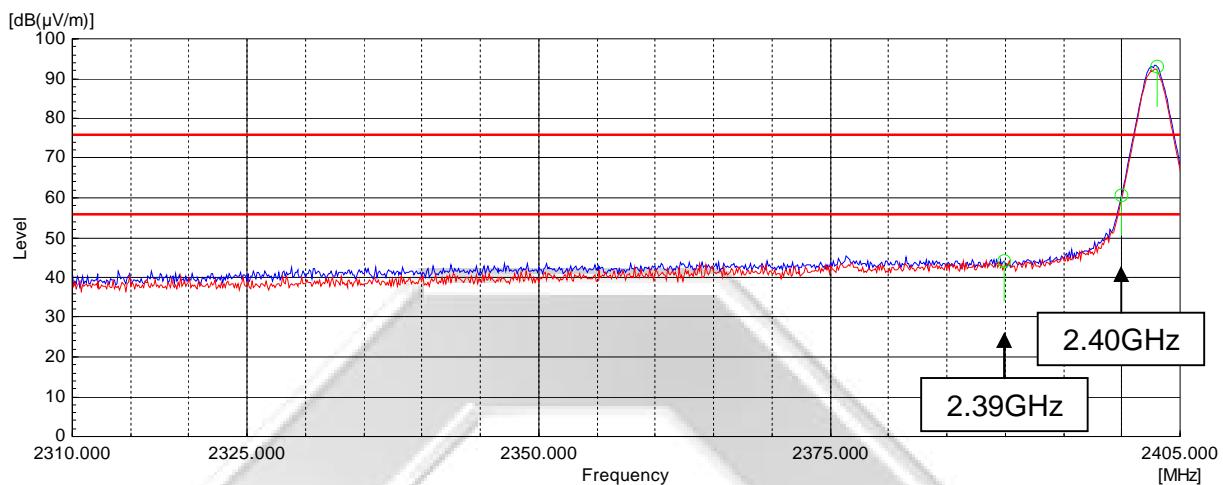
Plot 51 – Lower Band Edge at 2.4000GHz



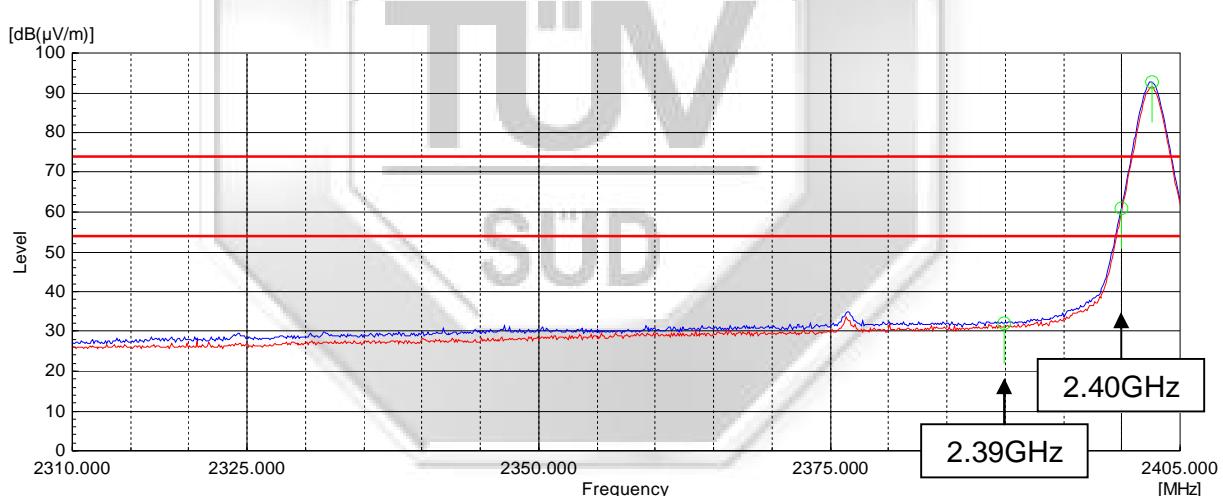
Plot 52 – Upper Band Edge at 2.4835GHz

BAND EDGE COMPLIANCE (RADIATED) TEST

Band Edge Compliance (Radiated) Plots (Restricted Band) - BDR 1Mbps



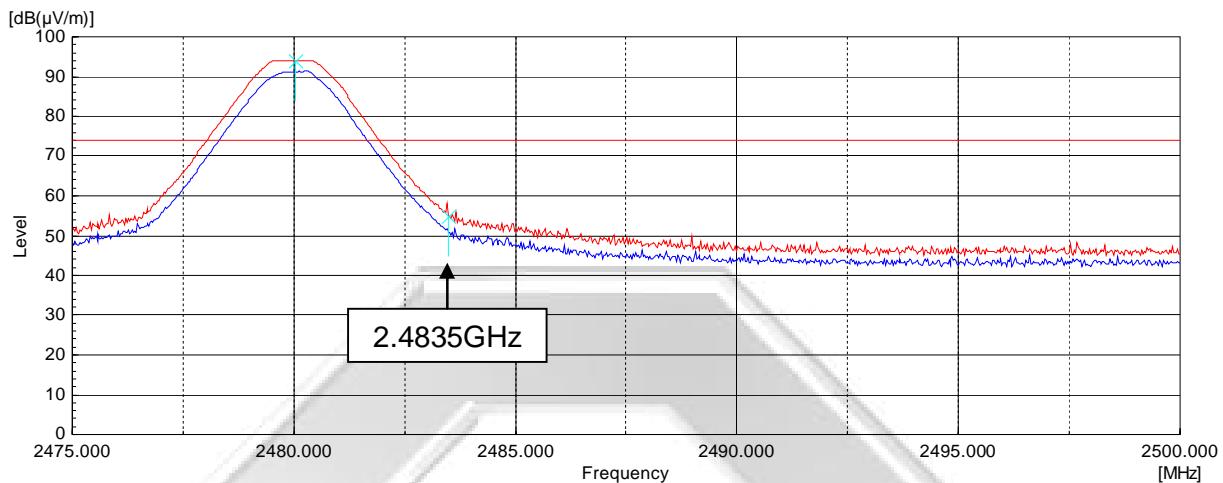
Plot 53 – Peak Plot at Lower Band Edge at 2.4000GHz



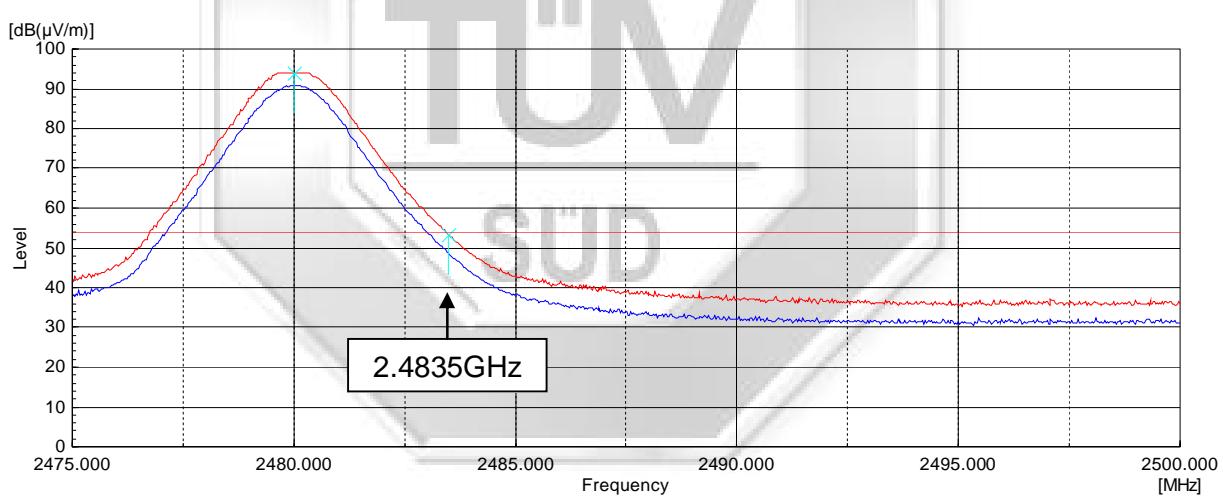
Plot 54 – Average Plot at Lower Band Edge at 2.4000GHz

BAND EDGE COMPLIANCE (RADIATED) TEST

Band Edge Compliance (Radiated) Plots (Restricted Band) - BDR 1Mbps



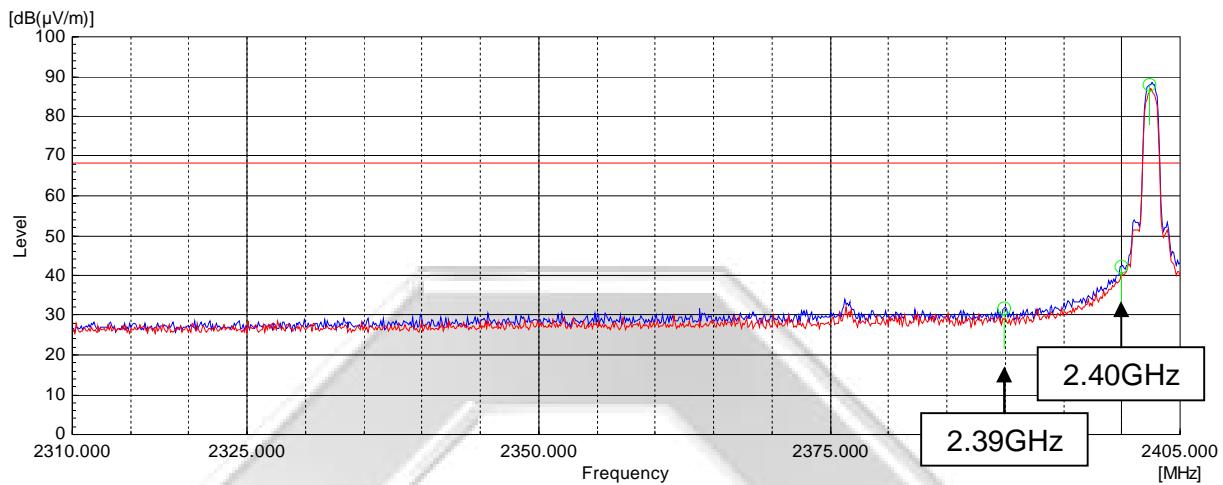
Plot 55 – Peak Plot at Upper Band Edge at 2.4835GHz



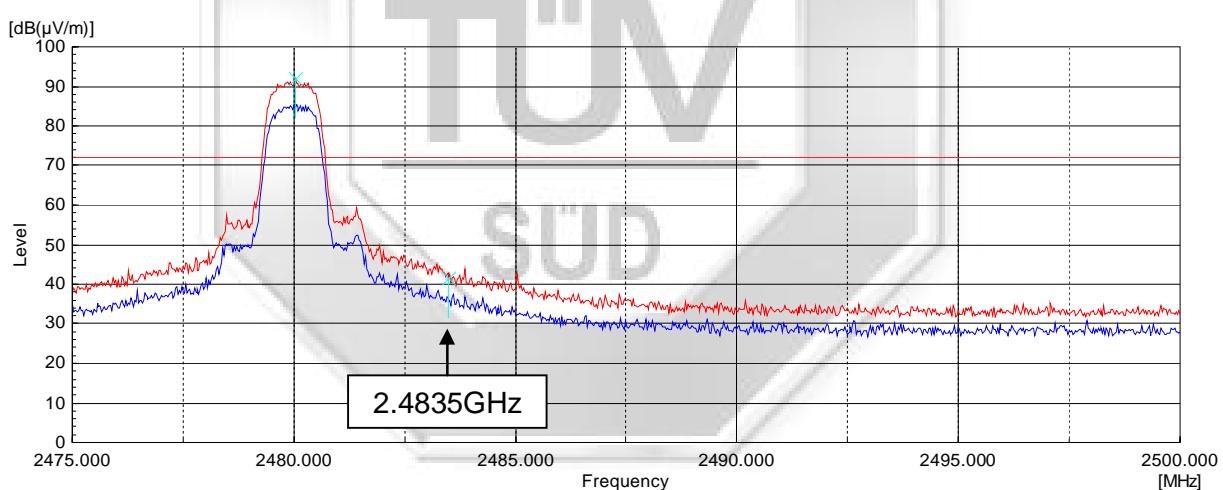
Plot 56 – Average Plot at Upper Band Edge at 2.4835GHz

BAND EDGE COMPLIANCE (RADIATED) TEST

Band Edge Compliance (Radiated) Plots (20dB Delta from Carrier at Band Edge) - EDR 2Mbps



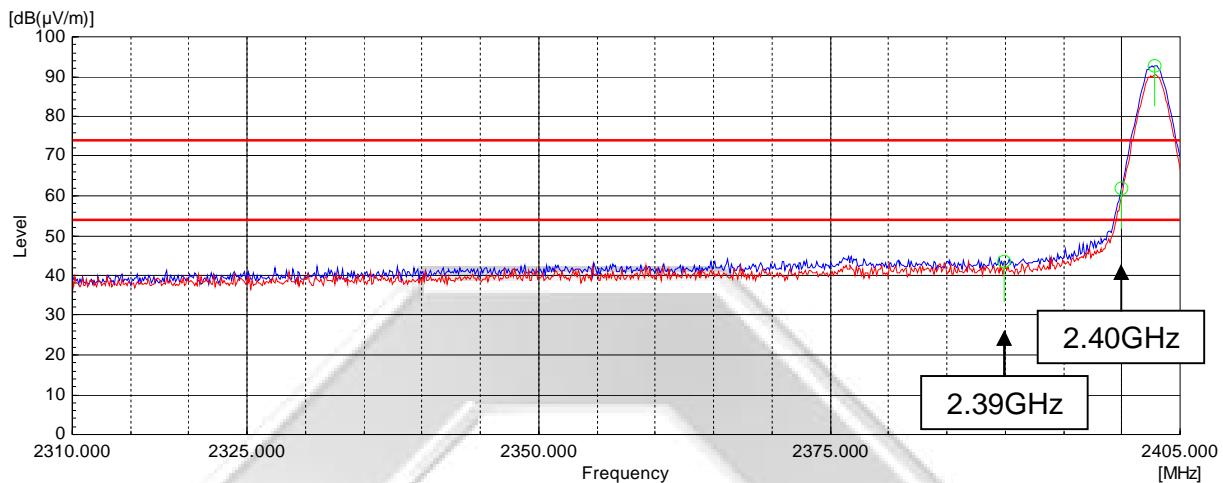
Plot 57 – Lower Band Edge at 2.4000GHz



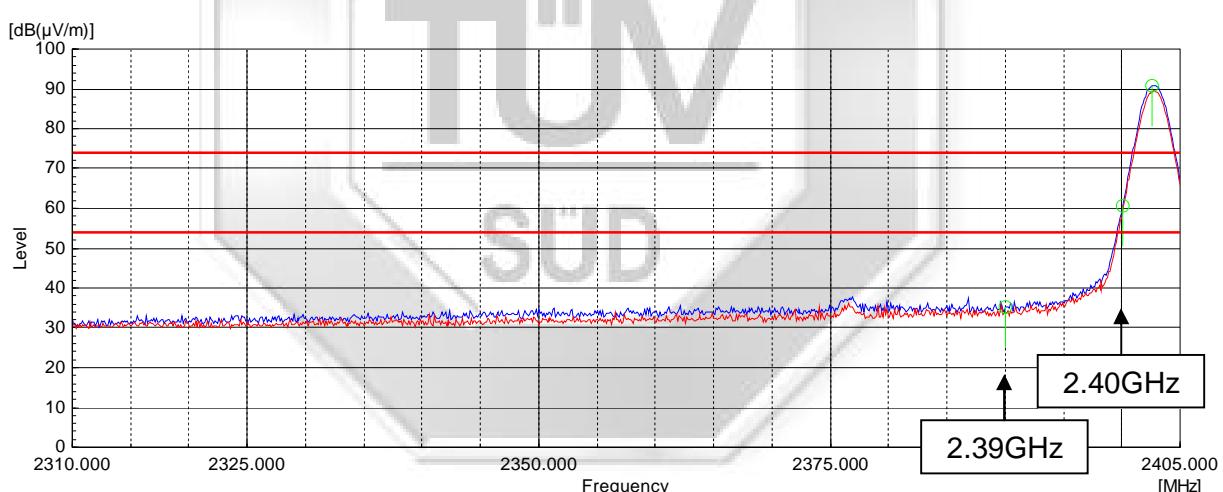
Plot 58 – Upper Band Edge at 2.4835GHz

BAND EDGE COMPLIANCE (RADIATED) TEST

Band Edge Compliance (Radiated) Plots (Restricted Band) - EDR 2Mbps



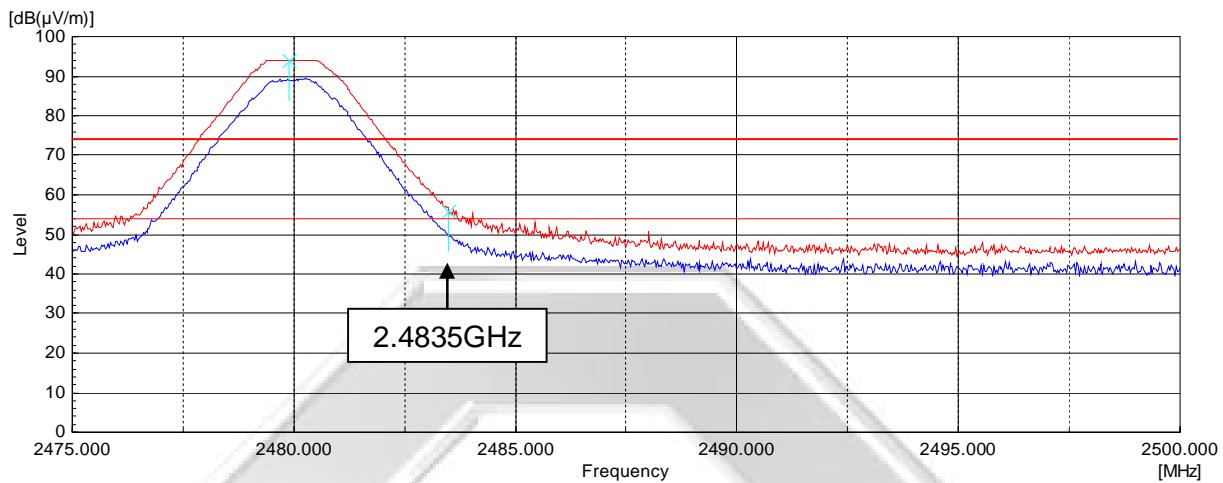
Plot 59 – Peak Plot at Lower Band Edge at 2.4000GHz



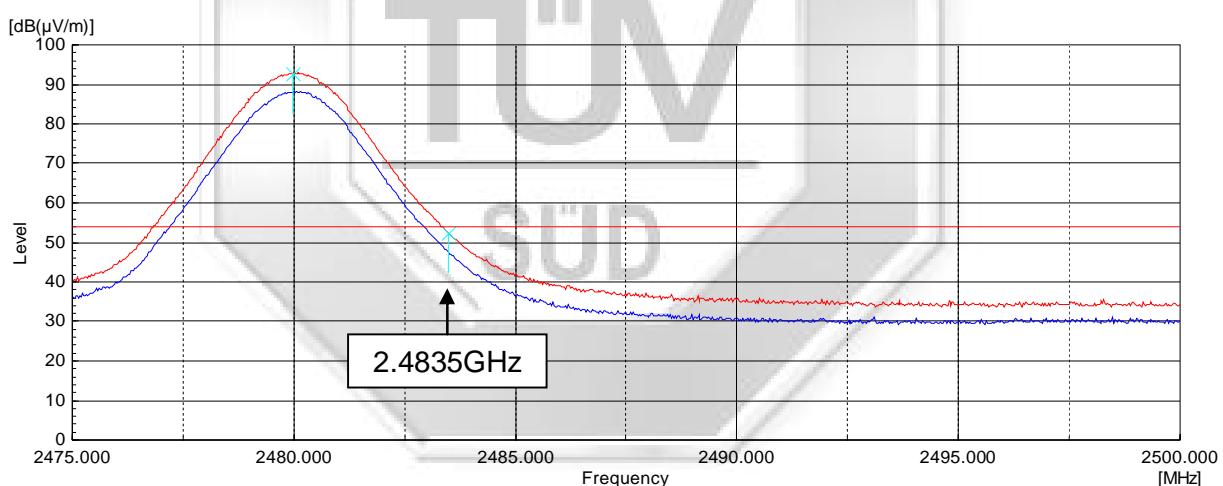
Plot 60 – Average Plot at Lower Band Edge at 2.4000GHz

BAND EDGE COMPLIANCE (RADIATED) TEST

Band Edge Compliance (Radiated) Plots (Restricted Band) - EDR 2Mbps



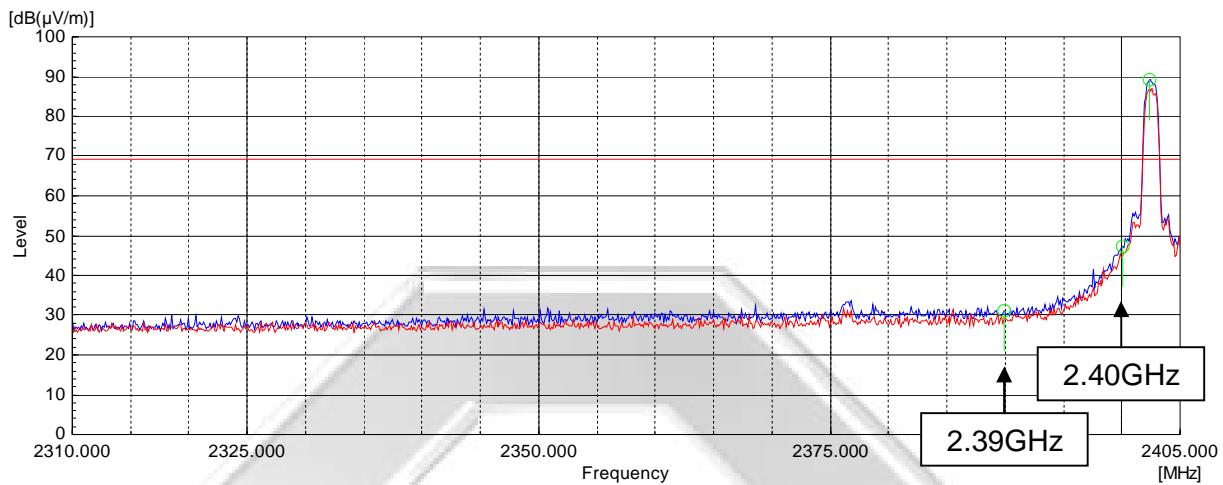
Plot 61 – Peak Plot at Upper Band Edge at 2.4835GHz



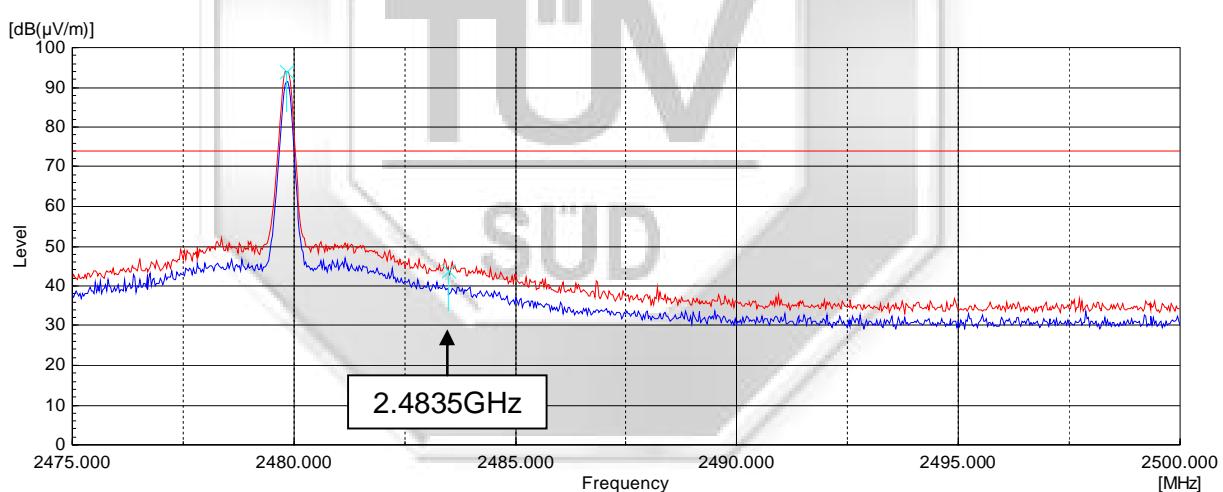
Plot 62 – Average Plot at Upper Band Edge at 2.4835GHz

BAND EDGE COMPLIANCE (RADIATED) TEST

Band Edge Compliance (Radiated) Plots (20dB Delta from Carrier at Band Edge) - EDR 3Mbps



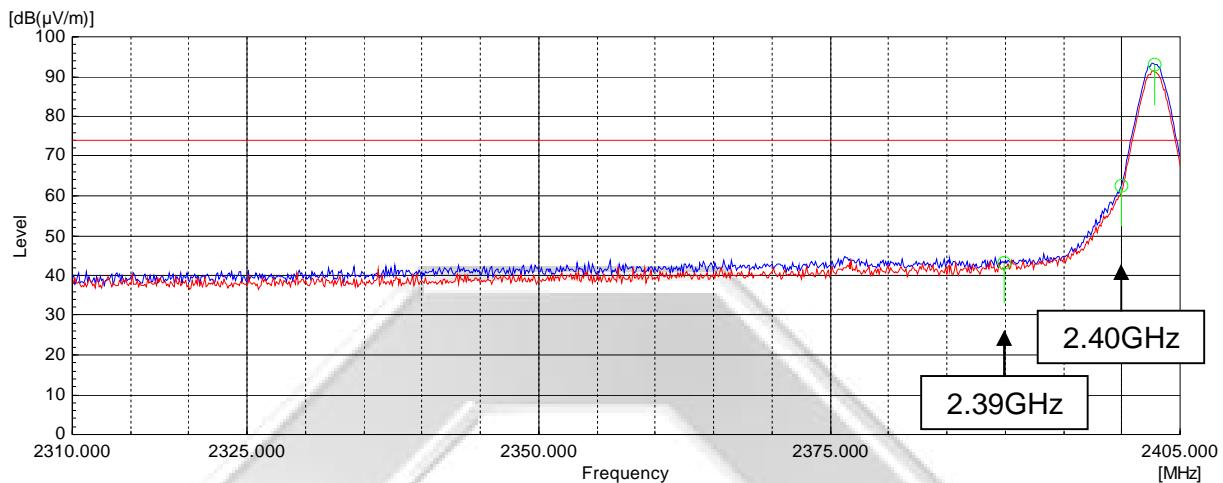
Plot 63 – Lower Band Edge at 2.4000GHz



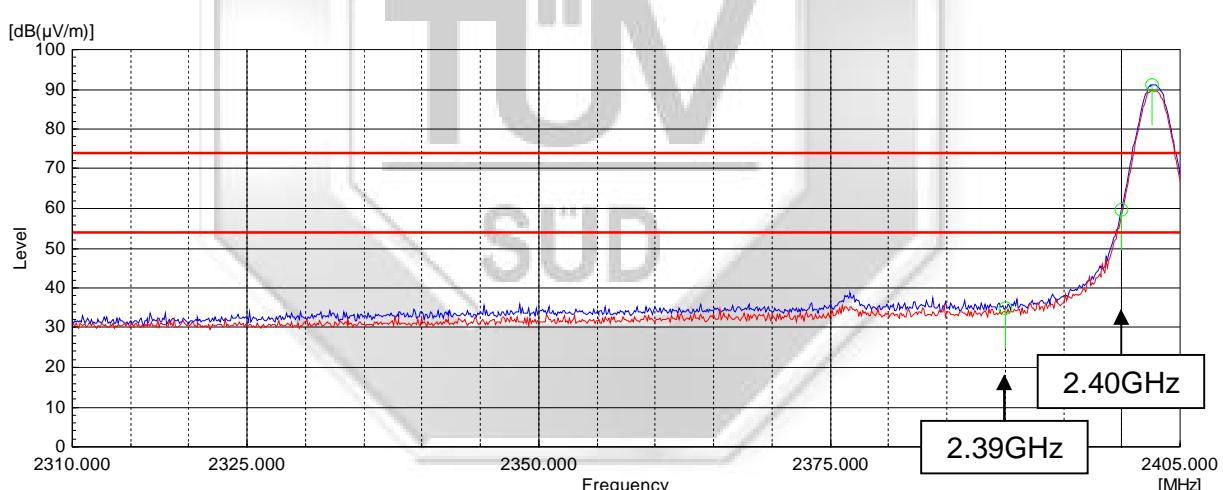
Plot 64 – Upper Band Edge at 2.4835GHz

BAND EDGE COMPLIANCE (RADIATED) TEST

Band Edge Compliance (Radiated) Plots (Restricted Band) - EDR 3Mbps



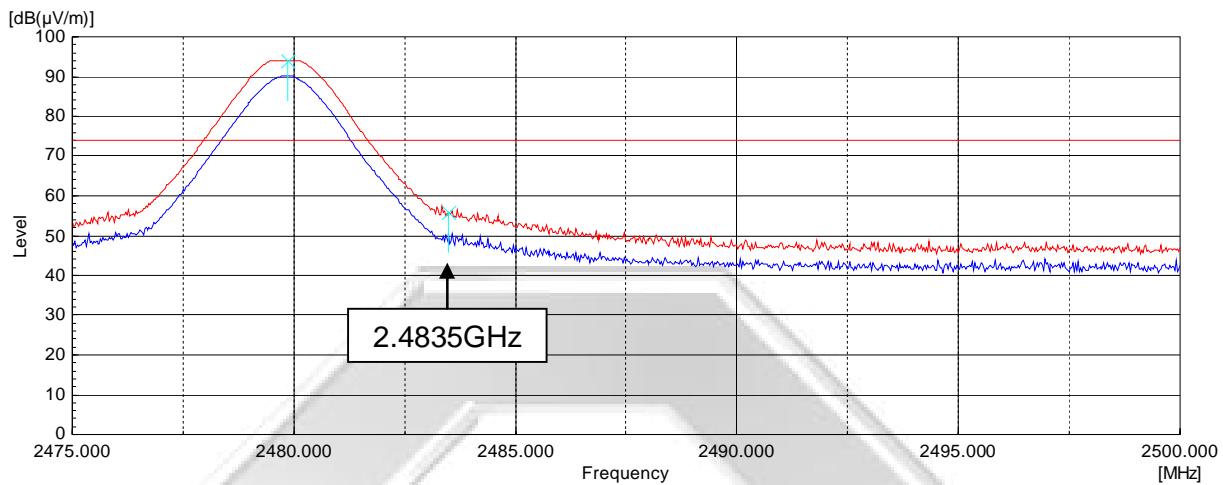
Plot 65 – Peak Plot at Lower Band Edge at 2.4000GHz



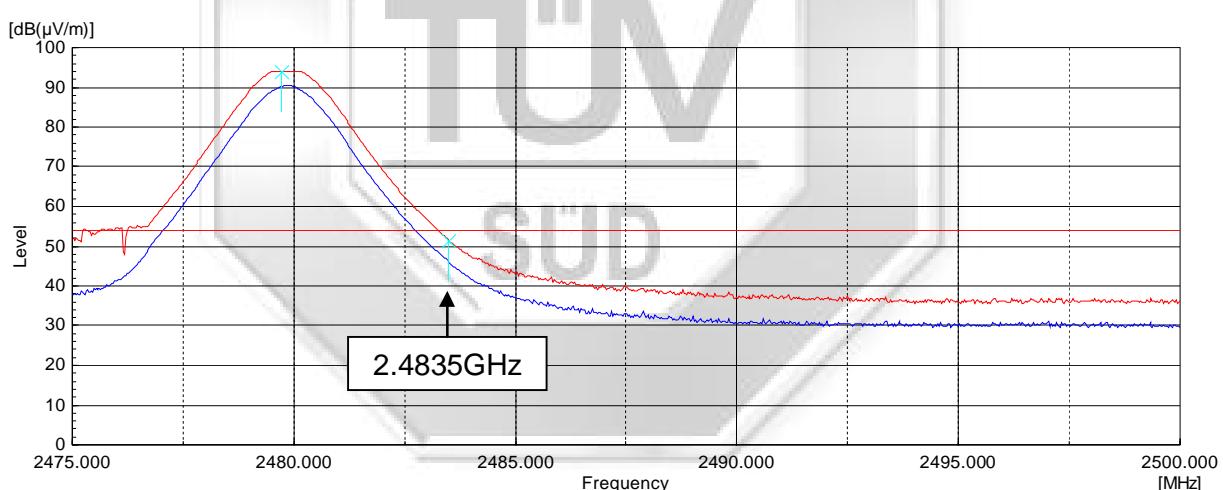
Plot 66 – Average Plot at Lower Band Edge at 2.4000GHz

BAND EDGE COMPLIANCE (RADIATED) TEST

Band Edge Compliance (Radiated) Plots (Restricted Band) - EDR 3Mbps



Plot 67 – Peak Plot at Upper Band Edge at 2.4835GHz



Plot 68 – Average Plot at Upper Band Edge at 2.4835GHz

PEAK POWER SPECTRAL DENSITY TEST

47 CFR FCC Part 15.247(e) Peak Power Spectral Density Limits

The EUT shows compliance to the requirements of this section, which states the peak power spectral density conducted from the intentional radiator (EUT) to the antenna shall not be greater than 8dBm (6.3mW) in any 3kHz band during any time interval of continuous transmission.

47 CFR FCC Part 15.247(e) Peak Power Spectral Density Test Instrumentation

| Instrument | Model | S/No | Cal Due Date |
|---------------------------|--------|------------|--------------|
| Agilent Spectrum Analyzer | E7405A | MY45106084 | 01 Aug 2014 |

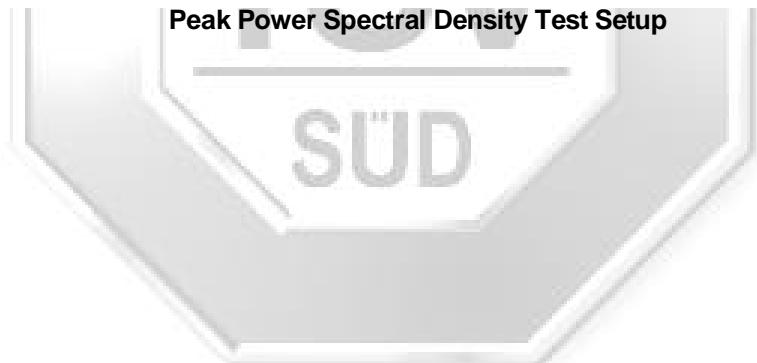
47 CFR FCC Part 15.247(e) Peak Power Spectral Density Test Setup

1. The EUT and supporting equipment were set up as shown in the setup photo.
2. The power supply for the EUT was connected to a filtered mains.
3. The RF antenna connector was connected to the spectrum via a low-loss coaxial cable.
4. The resolution bandwidth (RBW) and the video bandwidth (VBW) of the spectrum analyser were respectively set to 3kHz and 10kHz.
5. All other supporting equipment were powered separately from another filtered mains.

47 CFR FCC Part 15.247(e) Peak Power Spectral Density Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition. The EUT was then configured to operate in the test mode, non-hopping with transmitting frequency at Channel 0 (2.402GHz) (*lower ch*).
2. The sweep time of the spectrum analyser was set to the value of the ratio of the frequency span divided by the RBW.
3. The peak power density of the transmitting frequency was detected and recorded.
4. The step 3 was repeated with the transmitting frequency was set to Channel 39 (2.441GHz) (*mid ch*) and Channel 78 (2.480GHz) (*upper ch*) respectively.

PEAK POWER SPECTRAL DENSITY TEST



PEAK POWER SPECTRAL DENSITY TEST

47 CFR FCC Part 15.247(e) Peak Power Spectral Density Results

| | | | |
|------------------|-----------|----------------------|---------------|
| Test Input Power | 120V 60Hz | Temperature | 26°C |
| Attached Plots | 69 – 71 | Relative Humidity | 60% |
| Data Rate | BDR 1Mbps | Atmospheric Pressure | 1030mbar |
| | | Tested By | Chang Wai Kit |

| Channel | Channel Frequency (GHz) | Peak Power Spectral Density (mW) | Limit (mW) |
|------------------------|-------------------------|----------------------------------|------------|
| 0 (<i>lower ch</i>) | 2.402 | 0.143 | 6.3 |
| 39 (<i>mid ch</i>) | 2.441 | 0.142 | 6.3 |
| 78 (<i>upper ch</i>) | 2.480 | 0.141 | 6.3 |

| | | | |
|------------------|-----------|----------------------|---------------|
| Test Input Power | 120V 60Hz | Temperature | 26°C |
| Attached Plots | 72 – 74 | Relative Humidity | 60% |
| Data Rate | EDR 2Mbps | Atmospheric Pressure | 1030mbar |
| | | Tested By | Chang Wai Kit |

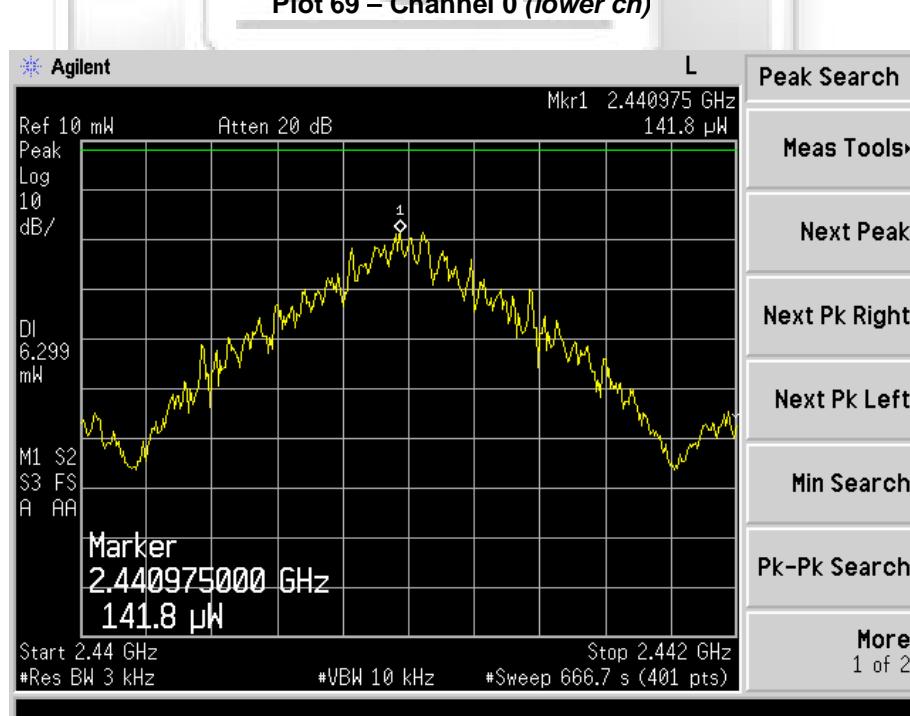
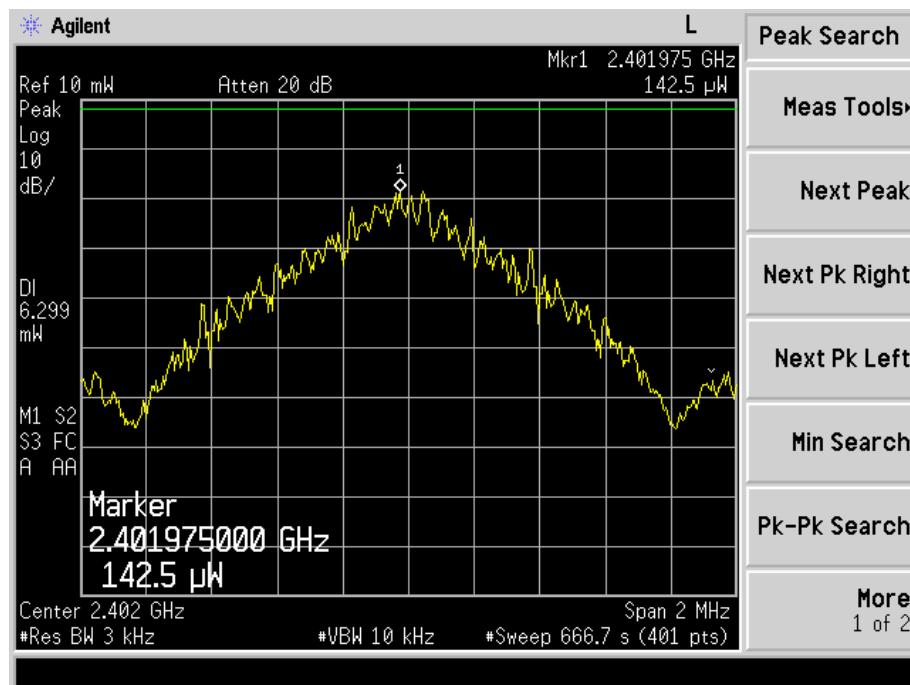
| Channel | Channel Frequency (GHz) | Peak Power Spectral Density (mW) | Limit (mW) |
|------------------------|-------------------------|----------------------------------|------------|
| 0 (<i>lower ch</i>) | 2.402 | 0.036 | 6.3 |
| 39 (<i>mid ch</i>) | 2.441 | 0.036 | 6.3 |
| 78 (<i>upper ch</i>) | 2.480 | 0.036 | 6.3 |

| | | | |
|------------------|-----------|----------------------|---------------|
| Test Input Power | 120V 60Hz | Temperature | 26°C |
| Attached Plots | 75 – 77 | Relative Humidity | 60% |
| Data Rate | EDR 3Mbps | Atmospheric Pressure | 1030mbar |
| | | Tested By | Chang Wai Kit |

| Channel | Channel Frequency (GHz) | Peak Power Spectral Density (mW) | Limit (mW) |
|------------------------|-------------------------|----------------------------------|------------|
| 0 (<i>lower ch</i>) | 2.402 | 0.035 | 6.3 |
| 39 (<i>mid ch</i>) | 2.441 | 0.035 | 6.3 |
| 78 (<i>upper ch</i>) | 2.480 | 0.034 | 6.3 |

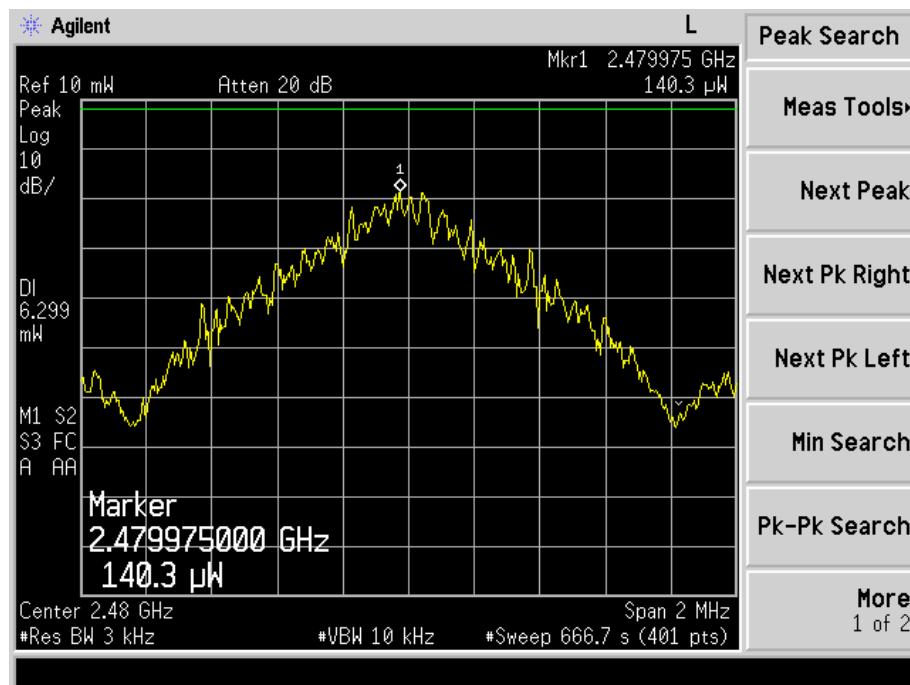
PEAK POWER SPECTRAL DENSITY TEST

Peak Power Spectral Density Plots - BDR 1Mbps



PEAK POWER SPECTRAL DENSITY TEST

Peak Power Spectral Density Plots - BDR 1Mbps



Plot 71 – Channel 78 (upper ch)

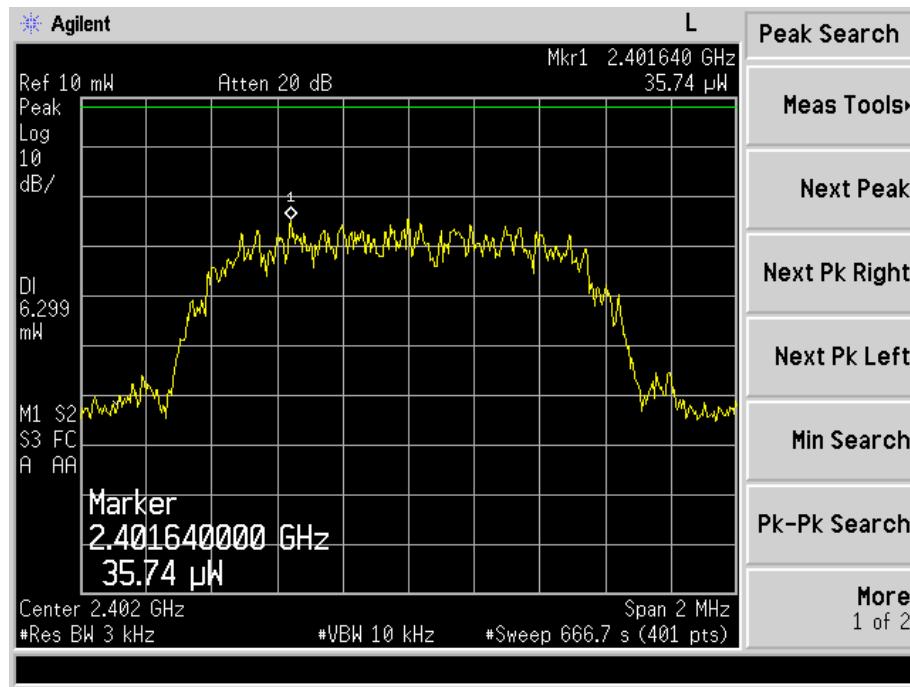
SÜD



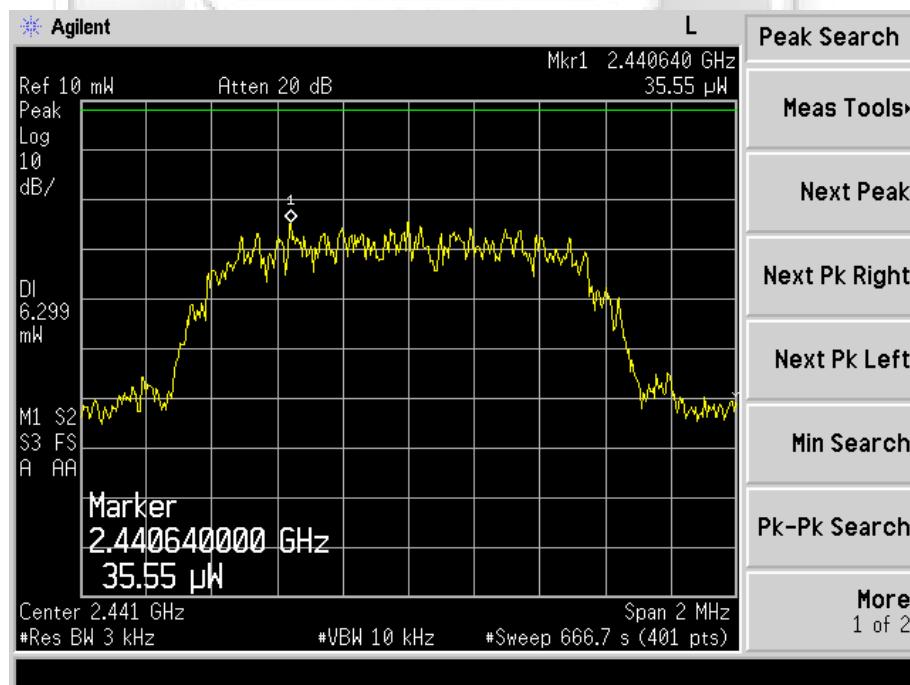
PSB Singapore

PEAK POWER SPECTRAL DENSITY TEST

Peak Power Spectral Density Plots - EDR 2Mbps



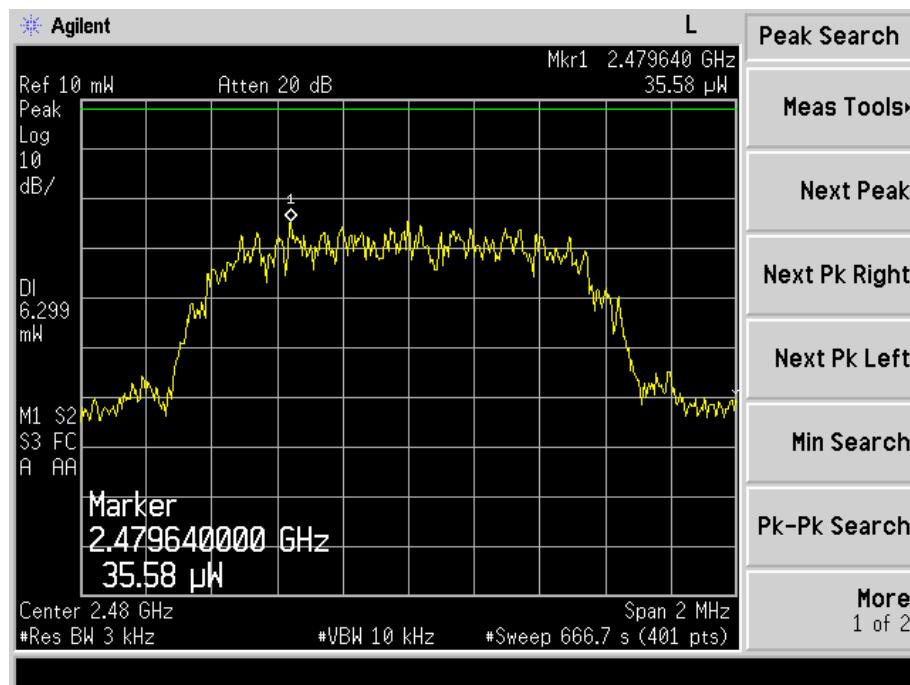
Plot 72 – Channel 0 (lower ch)



Plot 73 – Channel 39 (*mid ch*)

PEAK POWER SPECTRAL DENSITY TEST

Peak Power Spectral Density Plots - EDR 2Mbps

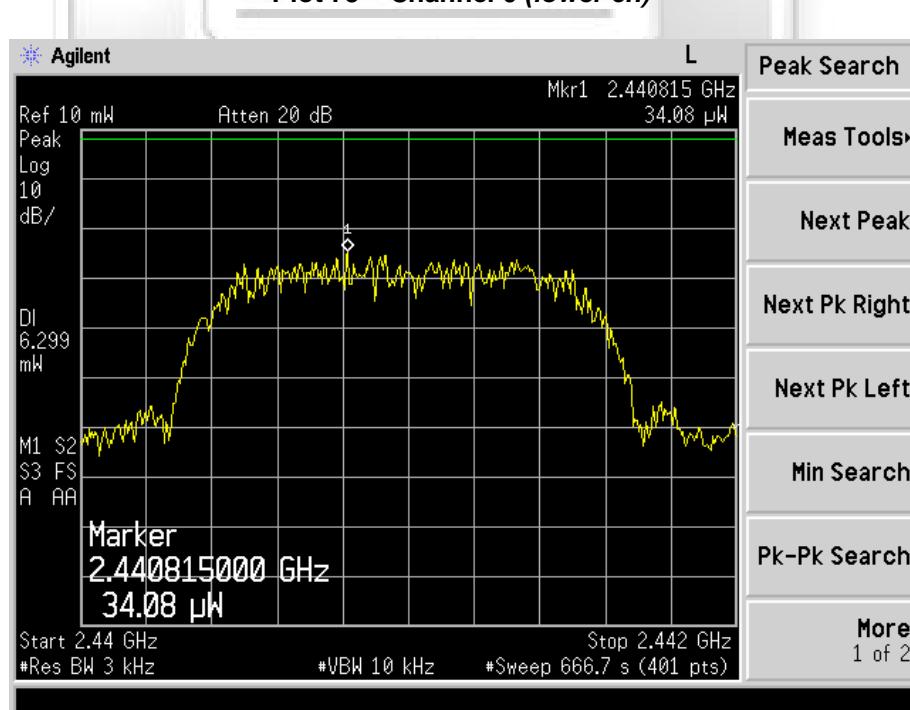
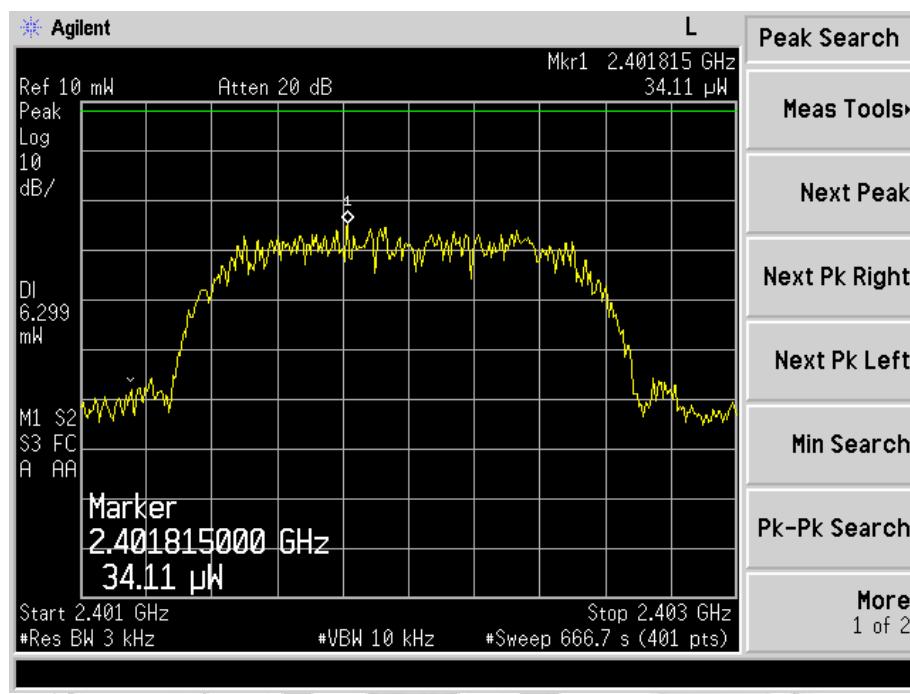


Plot 74 – Channel 78 (upper ch)

SÜD

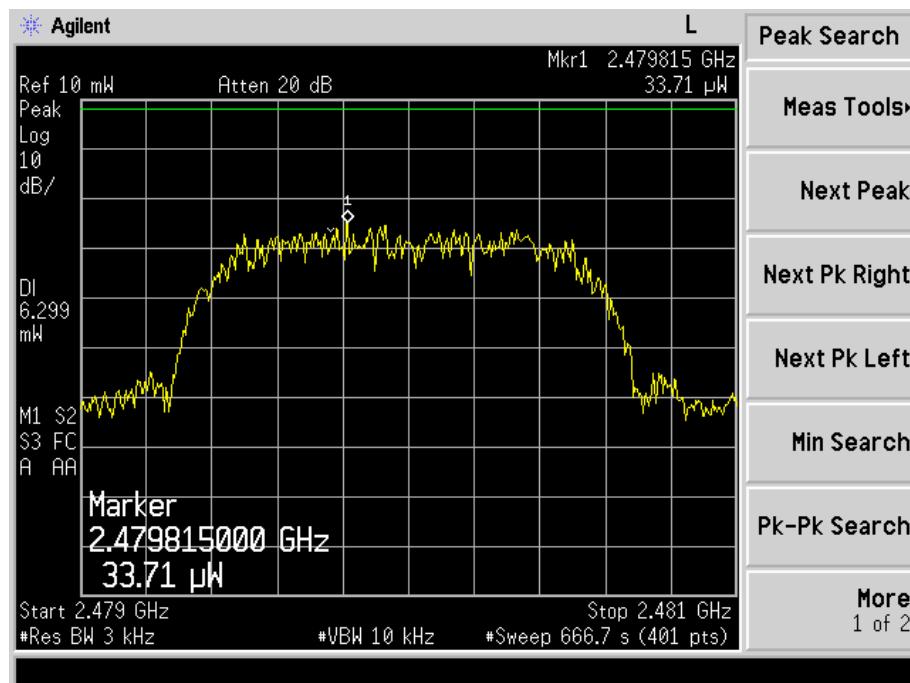
PEAK POWER SPECTRAL DENSITY TEST

Peak Power Spectral Density Plots - EDR 3Mbps



PEAK POWER SPECTRAL DENSITY TEST

Peak Power Spectral Density Plots - EDR 3Mbps



MAXIMUM PERMISSIBLE EXPOSURE (MPE) TEST

47 CFR FCC Part 1.1310 Maximum Permissible Exposure (MPE) Limits

The EUT shows compliance to the requirements of this section, which states the MPE limits for general population / uncontrolled exposure are as shown below:

| Frequency Range (MHz) | Electric Field Strength (V/m) | Magnetic Field Strength (A/m) | Power Density (mW/cm ²) | Average Time (min) |
|-----------------------|-------------------------------|-------------------------------|--|--------------------|
| 0.3 - 1.34 | 614 | 1.63 | 100 ^{Note 2} | 30 |
| 1.34 - 30 | 824 / f | 2.19 / f | 180 / f ² ^{Note 2} | 30 |
| 30 - 300 | 27.5 | 0.073 | 0.2 | 30 |
| 300 - 1500 | - | - | f / 1500 | 30 |
| 1500 - 100000 | - | - | 1.0 | 30 |

Notes

1. f = frequency in MHz
2. Plane wave equivalent power density

47 CFR FCC Part 1.1310 Maximum Permissible Exposure Computation

The power density at 20cm distance was computed from the following formula:

$$\begin{aligned}
 S &= (30GP) / (377d^2) \\
 \text{where } S &= \text{Power density in W/m}^2 \\
 P &= 0.0016W \text{ (maximum peak measured from Maximum Peak Power)} \\
 d &= \text{Test distance at 0.2m} \\
 G &= \text{Numerical isotropic gain, 1.59 (2.0dBi)}
 \end{aligned}$$

Substituting the relevant parameters into the formula:

$$\begin{aligned}
 S &= [(30GP) / 377d^2] \\
 &= 0.0050 \text{ W/m}^2 \\
 &= 0.0005 \text{ mW/cm}^2
 \end{aligned}$$

∴ The power density of the EUT at 20cm distance is 0.005mW/cm² based on the above computation and found to be lower than the power density limit of 1.0mW/cm².

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July 2011

