



RADIO TEST REPORT

Test Report No. : 33CE0171-HO-D

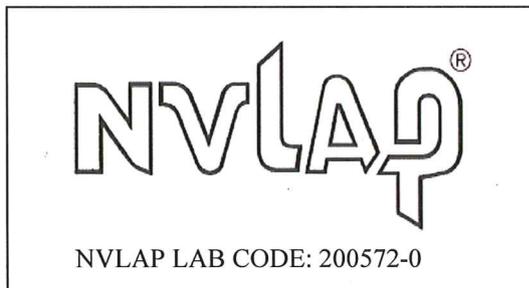
Applicant : Sharp Corporation, Communication Systems Group.
Type of Equipment : Cellular Phone
Model No. : 200SH
FCC ID : APYHRO00181
Test regulation : FCC Part 15 Subpart C: 2012
Test Result : Complied

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

Date of test: October 16 to 30, 2012

Representative test engineer: 
Yutaka Yoshida
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UL Verification Service

Approved by: 
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SECTION 1: Customer information

Company Name : Sharp Corporation, Communication Systems Group.
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Contact Person : Hiroyuki Uwatoko

SECTION 2: Equipment under test (E.U.T.)

2.1 Identification of E.U.T.

Type of Equipment : Cellular Phone
Model No. : 200SH
Serial No. : Refer to Section 4, Clause 4.2
Rating : AC110-240V, DC3.7V-4.0V
Receipt Date of Sample : October 13, 2012
Country of Mass-production : China
Condition of EUT : Production prototype
(Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT : No Modification by the test lab

2.2 Product Description

Model No.: 200SH (referred to as the EUT in this report) is Cellular Phone.

General Specification

Clock frequency(ies) in the system : CPU: 1.512GHz (max)
RTC: 32.768kHz
Source oscillation: 19.2MHz / 27MHz (CPU) / 27.12MHz (NFC)

Radio Specification

RFID

| | |
|------------------------|--------------|
| Equipment Type | Transceiver |
| Frequency of Operation | 13.56MHz |
| Type of Modulation | ASK |
| Antenna Type | Loop antenna |
| Antenna Gain | 0dBi |

Bluetooth (BDR/EDR)

| | |
|-----------------------------|--------------|
| Equipment Type | Transceiver |
| Frequency of Operation | 2402-2480MHz |
| Type of Modulation | FHSS |
| Bandwidth & Channel spacing | 1MHz & 1MHz |
| Antenna Type | L Type |
| Antenna Gain | 0dBi |

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Bluetooth (Low Energy)

| | |
|-----------------------------|--------------------|
| Equipment Type | Transceiver |
| Frequency of Operation | 2402-2480MHz |
| Type of Modulation | Digital modulation |
| Bandwidth & Channel spacing | 1MHz & 2MHz |
| Antenna Type | L Type |
| Antenna Gain | 0dBi |

WLAN (IEEE802.11a/b/g/n-20)

| | | |
|-----------------------------|--------------|--|
| Equipment Type | Transceiver | |
| Frequency of Operation | 2412-2462MHz | 5180-5240MHz 5260-5320MHz 5500-5700MHz |
| Type of Modulation | DSSS, OFDM | OFDM |
| Bandwidth & Channel spacing | 20MHz & 5MHz | 20MHz & 20MHz |
| Antenna Type | L Type | |
| Antenna Gain | 0dBi | |

WLAN (IEEE802.11n-40)

| | |
|-----------------------------|--|
| Equipment Type | Transceiver |
| Frequency of Operation | 5190-5230MHz 5270-5310MHz 5510-5670MHz |
| Type of Modulation | OFDM |
| Bandwidth & Channel spacing | 40MHz & 40MHz |
| Antenna Type | L Type |
| Antenna Gain | 0dBi |

GSM (PCS 1900)

| | |
|------------------------|--|
| Equipment Type | Transceiver |
| Frequency of Operation | [Up Link] 1850 – 1910MHz [Down Link] 1930 – 1990MHz |
| Type of Modulation | GMSK |
| Emission Designator | 249KGXW |
| Antenna Type | L Type |
| Antenna Gain | 0dBi |

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C: 2012, final revised on August 13, 2012 and effective September 12, 2012

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.207 Conducted limits
Section 15.247 Operation within the bands 902-928MHz,
2400-2483.5MHz, and 5725-5850MHz

* The EUT complies with FCC Part 15 Subpart B: 2012, final revised on August 13, 2012 and effective September 12, 2012

3.2 Procedures and results

| Item | Test Procedure | Specification | Worst margin | Results | Remarks |
|---|---|---|---|---|-----------|
| Conducted Emission | FCC: ANSI C63.4:2003 7. AC powerline Conducted Emission measurements ----- IC: RSS-Gen 7.2.4 | FCC: Section 15.207 ----- IC: RSS-Gen 7.2.4 | [WLAN] QP 18.7dB, 2.19709MHz, N AV 27.6dB, 3.78051MHz, N [Bluetooth LE] QP 19.0dB, 0.406518MHz, N AV 26.1dB, 0.41428MHz, L | Complied | - |
| 6dB Bandwidth | FCC: "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247(issued on October 4, 2012)" ----- IC: RSS-Gen 4.6.2 | FCC: Section 15.247(a)(2) ----- IC: RSS-210 A8.2(a) | See data. | Complied | Conducted |
| Maximum Peak Output Power | FCC: "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247(issued on October 4, 2012)" ----- IC: RSS-Gen 4.8 | FCC: Section 15.247(b)(3) ----- IC: RSS-210 A8.4(4) | | Complied | Conducted |
| Power Density | FCC: "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247(issued on October 4, 2012)" ----- IC: - | FCC: Section 15.247 (e) ----- IC: RSS-210 A8.2(b) | | Complied | Conducted |
| Spurious Emission Restricted Band Edges | FCC: "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247(issued on October 4, 2012)" ----- IC: RSS-Gen 4.9 | FCC: Section15.247(d) ----- IC: RSS-210 A8.5 RSS-Gen 7.2.3 | | [WLAN] 1.5dB 2483.500MHz, AV, Hori [Bluetooth LE] 9.2dB 9848.000MHz, AV, Vert. | Complied |

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420.

* In case any questions arise about test procedure, ANSI C63.4: 2003 is also referred.

FCC 15.31 (e)

This EUT provides stable voltage (DC4.0V) constantly to RF part regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203.

3.3 Addition to standard

| Item | Test Procedure | Specification | Worst margin | Results | Remarks |
|------------------------|-------------------|-------------------|--------------|---------|-----------|
| 99% Occupied Bandwidth | IC: RSS-Gen 4.6.1 | IC: RSS-Gen 4.6.1 | N/A | - | Conducted |

Other than above, no addition, exclusion nor deviation has been made from the standard.

3.4 Uncertainty

EMI

The following uncertainties have been calculated to provide a confidence level of 95% using a coverage factor k=2.

| Test room (semi-anechoic chamber) | Conducted emission (+dB) |
|--------------------------------------|-----------------------------|
| | 150kHz-30MHz |
| No.1 | 3.5dB |
| No.2 | 3.6dB |
| No.3 | 3.6dB |
| No.4 | 3.6dB |

| Test room (semi-anechoic chamber) | Radiated emission | | | | | | |
|--------------------------------------|-------------------|------------------|-----------------|----------------|-----------------|-------------------|-------------------|
| | (3m*)(+dB) | | | | (1m*)(+dB) | | (0.5m*)(+dB) |
| | 9kHz -30MHz | 30MHz -300MHz | 300MHz -1GHz | 1GHz -10GHz | 10GHz -18GHz | 18GHz -26.5GHz | 26.5GHz -40GHz |
| No.1 | 4.3dB | 5.0dB | 5.1dB | 4.9dB | 5.8dB | 4.4dB | 4.3dB |
| No.2 | 4.3dB | 5.2dB | 5.1dB | 5.0dB | 5.7dB | 4.3dB | 4.2dB |
| No.3 | 4.6dB | 5.0dB | 5.1dB | 5.0dB | 5.7dB | 4.5dB | 4.2dB |
| No.4 | 4.8dB | 5.2dB | 5.0dB | 5.0dB | 5.7dB | 5.2dB | 4.2dB |

*3m/1m/0.5m = Measurement distance

| Power meter (+dB) | |
|-------------------|------------|
| Below 1GHz | Above 1GHz |
| 1.0dB | 1.0dB |

| Antenna terminal conducted emission and Power density (+dB) | | | Antenna terminal conducted emission (+dB) | | Channel power (+dB) |
|---|-----------|------------|---|---------------|---------------------|
| Below 1GHz | 1GHz-3GHz | 3GHz-18GHz | 18GHz-26.5GHz | 26.5GHz-40GHz | |
| 1.0dB | 1.1dB | 2.7dB | 3.2dB | 3.3dB | 1.5dB |

Conducted Emission test

The data listed in this test report has enough margin, more than the site margin.

Radiated emission test(3m)

The data listed in this report meets the limits unless the uncertainty is taken into consideration.

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3.5 Test Location

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| | FCC Registration Number | IC Registration Number | Width x Depth x Height (m) | Size of reference ground plane (m) / horizontal conducting plane | Other rooms |
|----------------------------|-------------------------|------------------------|----------------------------|--|------------------------|
| No.1 semi-anechoic chamber | 313583 | 2973C-1 | 19.2 x 11.2 x 7.7m | 7.0 x 6.0m | No.1 Power source room |
| No.2 semi-anechoic chamber | 655103 | 2973C-2 | 7.5 x 5.8 x 5.2m | 4.0 x 4.0m | - |
| No.3 semi-anechoic chamber | 148738 | 2973C-3 | 12.0 x 8.5 x 5.9m | 6.8 x 5.75m | No.3 Preparation room |
| No.3 shielded room | - | - | 4.0 x 6.0 x 2.7m | N/A | - |
| No.4 semi-anechoic chamber | 134570 | 2973C-4 | 12.0 x 8.5 x 5.9m | 6.8 x 5.75m | No.4 Preparation room |
| No.4 shielded room | - | - | 4.0 x 6.0 x 2.7m | N/A | - |
| No.5 semi-anechoic chamber | - | - | 6.0 x 6.0 x 3.9m | 6.0 x 6.0m | - |
| No.6 shielded room | - | - | 4.0 x 4.5 x 2.7m | 4.75 x 5.4 m | - |
| No.6 measurement room | - | - | 4.75 x 5.4 x 3.0m | 4.75 x 4.15 m | - |
| No.7 shielded room | - | - | 4.7 x 7.5 x 2.7m | 4.7 x 7.5m | - |
| No.8 measurement room | - | - | 3.1 x 5.0 x 2.7m | N/A | - |
| No.9 measurement room | - | - | 8.0 x 4.5 x 2.8m | 2.0 x 2.0m | - |
| No.10 measurement room | - | - | 2.6 x 2.8 x 2.5m | 2.4 x 2.4m | - |
| No.11 measurement room | - | - | 3.1 x 3.4 x 3.0m | 2.4 x 3.4m | - |

* Size of vertical conducting plane (for Conducted Emission test) : 2.0 x 2.0m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

3.6 Data of EMI, Test instruments, and Test set up

Refer to APPENDIX.

SECTION 4: Operation of E.U.T. during testing

4.1 Operating Mode(s)

Test operating mode was determined as follows according to “Section 1 of 6 802.11 a/b/g/n testing- Managing Complex Regulatory Approvals - ” of TCB Council Workshop October 2009.

| Mode | Remarks* |
|---|--------------------------|
| IEEE 802.11b (11b) | 11Mbps, PN9 |
| IEEE 802.11g (11g) | 24Mbps, PN9 |
| IEEE 802.11n 20MHz BW (11n-20) | MCS3, PN9 |
| Bluetooth(BT) LE(Low Energy) | Maximum Packet Size, PN9 |
| *Transmitting duty was close to 100% on all tests of IEEE 802.11 WLAN. *The worst condition was determined based on the test result of Maximum Peak Output Power (Mid Channel) | |

Power of the EUT was set by the software as follows;

[Power settings]

<IEEE 802.11b/g/n-20 Power Setting>

11b 11Mbps

1ch: WBTX2 00010051100000020
6ch: WBTX2 00060051100000020
11ch: WBTX2 00110051100000020

11g 24Mbps

1ch: WBTX2 00010080800000020
6ch: WBTX2 00060080900000020
11ch: WBTX2 00110080700000020

11n-20 MCS 3

1ch: WBTX2 00010150700000020
6ch: WBTX2 00060150800000020
11ch: WBTX2 00110150750000020

<BT LE Power Setting>

| Channel | Input command |
|---------|---------------|
| 0ch | BTLE 2002500 |
| 20ch | BTLE 2142500 |
| 39ch | BTLE 2272500 |

[Software]

AA170

*This setting of software is the worst case.

Any conditions under the normal use do not exceed the condition of setting.

In addition, end users cannot change the settings of the output power of the product.

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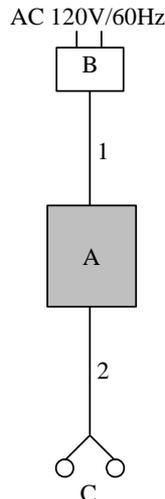
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*Details of Operating mode(s)

| Test Item | Operating Mode | Tested frequency |
|---|-------------------------------|-------------------------------|
| Conducted Emission Spurious Emission (Conducted) | 11g Tx *1) | 2437MHz *1) |
| | BT LE | 2402MHz 2442MHz 2480MHz |
| 6dB Bandwidth Maximum Peak Output Power Spurious Emission (Radiated) Power Density 99% Occupied Bandwidth | 11b Tx 11g Tx 11n-20 Tx | 2412MHz 2437MHz 2462MHz |
| | BT LE | 2402MHz 2442MHz 2480MHz |

*1) The mode was tested as a representative, because it had the highest power at antenna terminal test and the noise levels at the mode/tested frequencies were equivalent to those of other modes/tested frequencies.

4.2 Configuration and peripherals



*Cabling and setup(s) were taken into consideration and test data was taken under worse case conditions.

Description of EUT and Support equipment

| No. | Item | Model number | Serial number | Manufacturer | Remarks |
|-----|----------------|--------------|--|-------------------|---------|
| A | Cellular Phone | 200SH | 004401/11/441657/7 *1) 004401/11/441666/8 *2) | Sharp Corporation | EUT |
| B | AC Adapter | SHCEJ1 | 100 | Sharp Corporation | - |
| C | Earphone | - | - | Sharp Corporation | - |

*1) Used for Conducted Emission and Radiated Spurious Emission tests

*2) Used for Antenna Terminal Conducted tests

List of cables used

| No. | Name | Length (m) | Shield | | Remarks |
|-----|----------------|------------|------------|------------|---------|
| | | | Cable | Connector | |
| 1 | DC Cable | 1.5 | Unshielded | Unshielded | - |
| 2 | Earphone Cable | 1.5 | Unshielded | Unshielded | - |

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SECTION 5: Conducted Emission

Test Procedure and conditions

EUT was placed on a urethane platform of nominal size, 0.5m by 1.0m, raised 0.8m above the conducting ground plane.

The rear of tabletop was located 40cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80cm from any other grounded conducting surface. EUT was located 80cm from a Line Impedance Stabilization Network (LISN)/ Artificial mains Network (AMN) and excess AC cable was bundled in center.

For the tests on EUT with other peripherals (as a whole system)

I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30cm to 40cm long and were hanged at a 40cm height to the ground plane. All unused 50ohm connectors of the LISN(AMN) were resistivity terminated in 50ohm when not connected to the measuring equipment.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a Semi Anechoic Chamber.

The EUT was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

The test results and limit are rounded off to one decimal place, so some differences might be observed.

Detector : QP and AV
Measurement range : 0.15-30MHz
Test data : APPENDIX
Test result : Pass

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SECTION 6: Radiated Spurious Emission

Test Procedure

It was measured based on "10.0 MAXIMUM UNWANTED EMISSION LEVELS" of "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under § 15.247 (Issued on October 4, 2012)".

EUT was placed on a urethane platform of nominal size, 0.5m by 1.0m, raised 0.8m above the conducting ground plane.

The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

The height of the measuring antenna varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.

The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.

The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).

The test was made with the detector (RBW/VBW) in the following table.

When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

Test Antennas are used as below;

| | | | |
|--------------|-----------------|----------------|------------|
| Frequency | 30MHz to 300MHz | 300MHz to 1GHz | Above 1GHz |
| Antenna Type | Biconical | Logperiodic | Horn |

In any 100kHz bandwidth outside the restricted band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator confirmed 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on a radiated measurement.

20dBc was applied to the frequency over the limit of FCC 15.209 / Table 5 of RSS-Gen 7.2.5(IC) and outside the restricted band of FCC15.205 / Table 3 of RSS-Gen 7.2.2 (IC).

| | | | | |
|-----------------|----------------|--|--|--|
| Frequency | Below 1GHz | Above 1GHz | | 20dBc |
| Instrument used | Test Receiver | Spectrum Analyzer | | Spectrum Analyzer |
| Detector | QP | PK | AV | PK |
| IF Bandwidth | BW 120kHz(T/R) | RBW: 1MHz VBW: 3MHz (Peak Power Method: Option 2) | Average Power Method: Option 1 RBW: 1MHz VBW: 3MHz Detector: Power Averaging (RMS) Trace: Free Run(Duty cycle is \geq 98%) Signal Gating (Duty cycle is < 98%) (For BTLE) Alternative Method1 RBW: 1MHz VBW: 3MHz Trace: Free Run Detector: Power Averaging (RMS) Duty factor was added to the results. | RBW: 100kHz VBW: 300kHz (S/A) |
| Test Distance | 3m | 3m (below 10GHz), 1m*1) (above 10GHz), | | 3m (below 10GHz), 1m*1) (above 10GHz) |

*1) Distance Factor: $20 \times \log(3.0\text{m}/1.0\text{m}) = 9.5\text{dB}$

- The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

The test results and limit are rounded off to one decimal place, so some differences might be observed.

Measurement range : 30M-26.5GHz
Test data : APPENDIX
Test result : Pass

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SECTION 7: Antenna Terminal Conducted Tests

Test Procedure

The tests were made with below setting connected to the antenna port.

| Test | Span | RBW | VBW | Sweep time | Detector | Trace | Instrument used |
|-----------------------------|--|-----------------|--------------------|-------------------|----------------------|-------------------------|--|
| 6dB Bandwidth | 20MHz, 3MHz | 100kHz 30kHz | 300kHz 100kHz | Auto | Peak | Max Hold | Spectrum Analyzer |
| 99% Occupied Bandwidth | Enough width to display 20dB Bandwidth | 1 to 3% of Span | Three times of RBW | Auto | Sample, Peak | Clear Write Max Hold | Spectrum Analyzer |
| Maximum Peak Output Power | - | - | - | Auto | Peak/ Average *1) | - | Power Meter (Option 3) (Sensor: 50MHz BW) |
| Peak Power Density | 1.5 times the 6dB bandwidth | 3kHz | 10kHz | Auto | Peak | Max Hold | Spectrum Analyzer *2) |
| Conducted Spurious Emission | 9kHz to 150kHz | 200Hz | 620Hz | Auto | Peak | Max Hold | Spectrum Analyzer |
| | 150kHz to 30MHz | 9.1kHz | 27kHz | | | | |

*1) Testing using an average detector was performed in order to confirm that the output power of the EUT met the exclusion limits stated in FCC Part 2 Section 2.1093 and FCC radio frequency (RF) Exposure Guidelines in Supplement C to OET 65 and the EUT was exempt from RF exposure SAR evaluation.
*2) PSD Option 1 of "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 (Issued on October 4, 2012)".

The test results and limit are rounded off to two decimals place, so some differences might be observed.

Test data : **APPENDIX**
Test result : **Pass**

APPENDIX 1: Data of EMI test

Conducted Emission

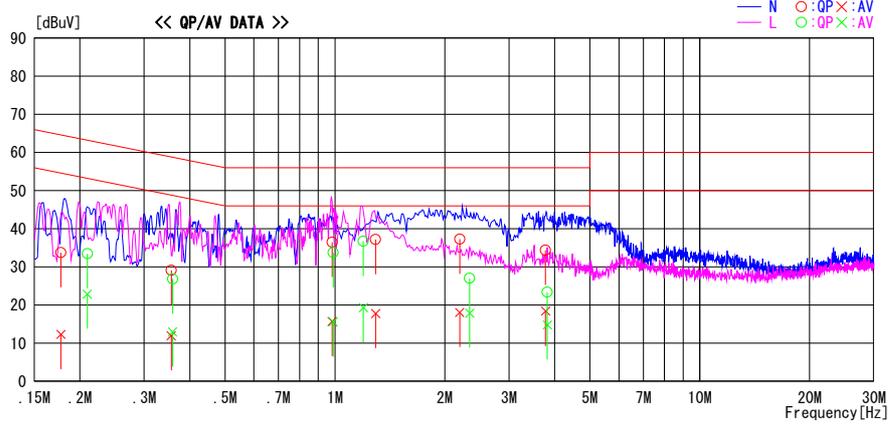
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber

Report No. : 33CE0171-HO
Temp./Humi. : 23deg. C / 52% RH
Engineer : Kazuya Yoshioka

Mode / Remarks : WLAN 11g Tx 2437MHz

LIMIT : FCC15.207 QP
FCC15.207 AV



| Frequency [MHz] | Reading Level | | Corr. Factor | Results | | Limit | | Margin | | Phase | Comment |
|--------------------|---------------|--------------|-----------------|--------------|--------------|--------------|--------------|------------|------------|-------|---------|
| | QP [dBuV] | AV [dBuV] | | QP [dBuV] | AV [dBuV] | QP [dBuV] | AV [dBuV] | QP [dB] | AV [dB] | | |
| 0.17741 | 20.4 | -1.0 | 13.3 | 33.7 | 12.3 | 64.6 | 54.6 | 30.9 | 42.3 | N | |
| 0.35595 | 15.7 | -1.4 | 13.4 | 29.1 | 12.0 | 58.8 | 48.8 | 29.7 | 36.8 | N | |
| 0.98192 | 23.1 | 2.3 | 13.4 | 36.5 | 15.7 | 56.0 | 46.0 | 19.5 | 30.3 | N | |
| 1.29290 | 23.7 | 4.3 | 13.5 | 37.2 | 17.8 | 56.0 | 46.0 | 18.8 | 28.2 | N | |
| 2.19709 | 23.7 | 4.5 | 13.6 | 37.3 | 18.1 | 56.0 | 46.0 | 18.7 | 27.9 | N | |
| 3.78051 | 20.4 | 4.4 | 14.0 | 34.4 | 18.4 | 56.0 | 46.0 | 21.6 | 27.6 | N | |
| 0.20951 | 20.2 | 9.6 | 13.3 | 33.5 | 22.9 | 63.2 | 53.2 | 29.7 | 30.3 | L | |
| 0.35932 | 13.4 | -0.4 | 13.4 | 26.8 | 13.0 | 58.7 | 48.7 | 31.9 | 35.7 | L | |
| 0.98880 | 20.3 | 2.2 | 13.4 | 33.7 | 15.6 | 56.0 | 46.0 | 22.3 | 30.4 | L | |
| 1.19652 | 23.2 | 5.8 | 13.5 | 36.7 | 19.3 | 56.0 | 46.0 | 19.3 | 26.7 | L | |
| 2.34035 | 13.4 | 4.3 | 13.6 | 27.0 | 17.9 | 56.0 | 46.0 | 29.0 | 28.1 | L | |
| 3.82234 | 9.4 | 0.8 | 14.0 | 23.4 | 14.8 | 56.0 | 46.0 | 32.6 | 31.2 | L | |

CHART: WITH FACTOR, Peak hold data. CALCULATION: RESULT=READING+C.F (LISN LOSS+ATT LOSS +CABLE LOSS)
Except for the above table : adequate margin data below the limits.

Conducted Emission

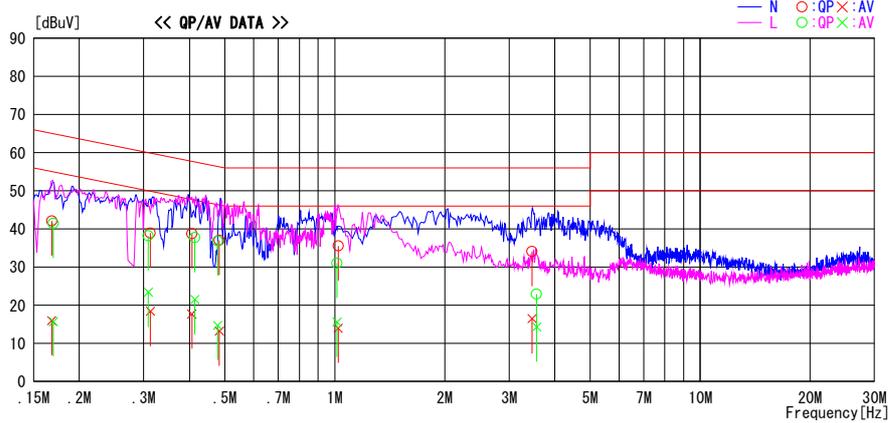
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber

Report No. : 33CE0171-H0
Temp./Humi. : 23deg. C / 52% RH
Engineer : Kazuya Yoshioka

Mode / Remarks : BT LE Tx 2402MHz

LIMIT : FCC15.207 QP
FCC15.207 AV

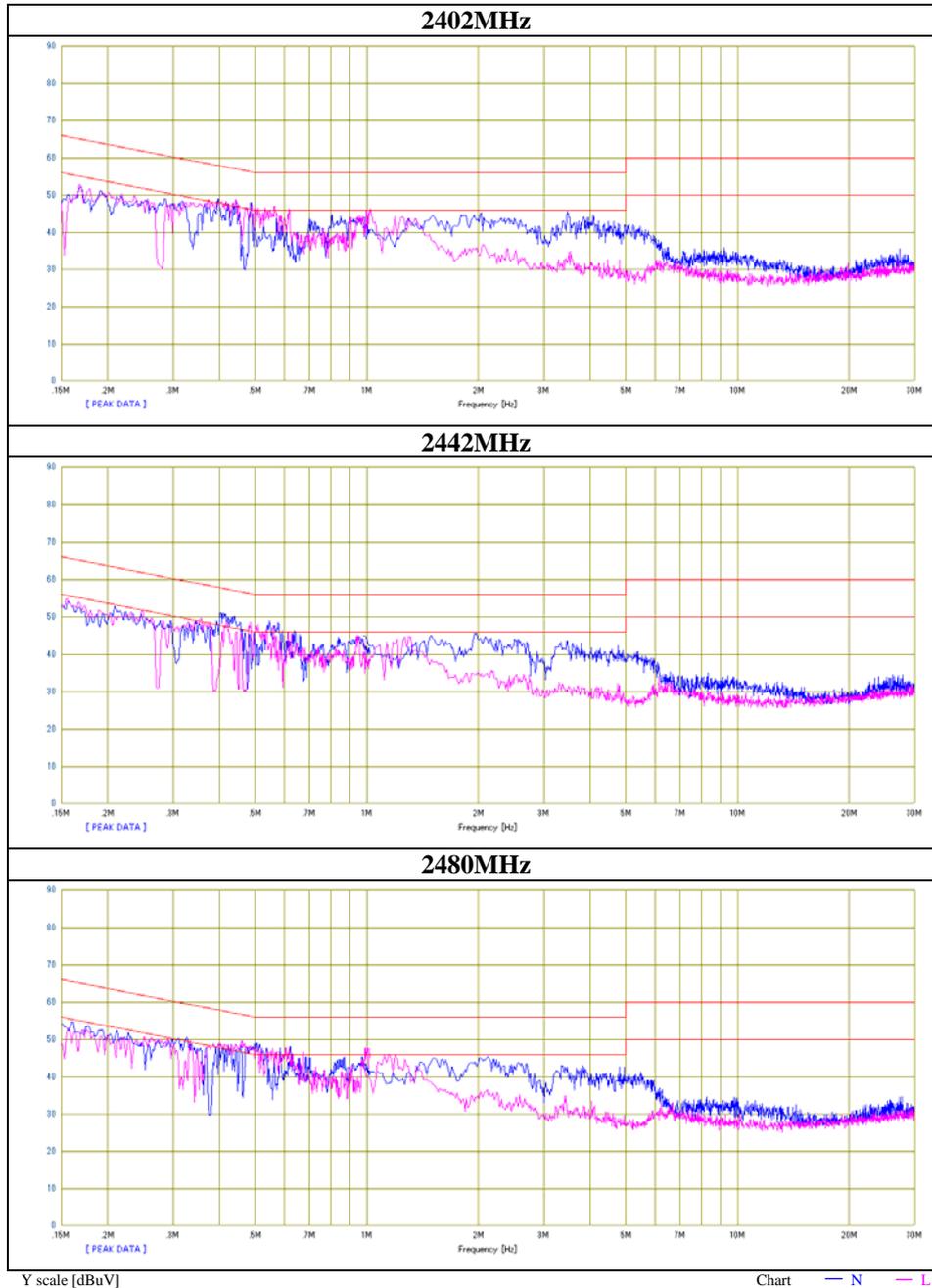


| Frequency [MHz] | Reading Level | | Corr. Factor [dB] | Results | | Limit | | Margin | | Phase | Comment |
|-----------------|---------------|-----------|-------------------|-----------|-----------|-----------|-----------|---------|---------|-------|---------|
| | QP [dBuV] | AV [dBuV] | | QP [dBuV] | AV [dBuV] | QP [dBuV] | AV [dBuV] | QP [dB] | AV [dB] | | |
| 0.16817 | 28.8 | 2.7 | 13.3 | 42.1 | 16.0 | 65.1 | 55.1 | 23.0 | 39.1 | N | |
| 0.31275 | 25.5 | 5.0 | 13.4 | 38.9 | 18.4 | 59.9 | 49.9 | 21.0 | 31.5 | N | |
| 0.40651 | 25.3 | 4.3 | 13.4 | 38.7 | 17.7 | 57.7 | 47.7 | 19.0 | 30.0 | N | |
| 0.48321 | 23.6 | -0.2 | 13.4 | 37.0 | 13.2 | 56.3 | 46.3 | 19.3 | 33.1 | N | |
| 1.02220 | 22.2 | 0.6 | 13.4 | 35.6 | 14.0 | 56.0 | 46.0 | 20.4 | 32.0 | N | |
| 3.46725 | 20.2 | 2.6 | 13.9 | 34.1 | 16.5 | 56.0 | 46.0 | 21.9 | 29.5 | N | |
| 0.16973 | 28.2 | 2.4 | 13.3 | 41.5 | 15.7 | 65.0 | 55.0 | 23.5 | 39.3 | L | |
| 0.30885 | 24.8 | 10.0 | 13.4 | 38.2 | 23.4 | 60.0 | 50.0 | 21.8 | 26.6 | L | |
| 0.41428 | 24.3 | 8.1 | 13.4 | 37.7 | 21.5 | 57.6 | 47.6 | 19.9 | 26.1 | L | |
| 0.47851 | 23.4 | 1.3 | 13.4 | 36.8 | 14.7 | 56.4 | 46.4 | 19.6 | 31.7 | L | |
| 1.01440 | 17.6 | 2.2 | 13.4 | 31.0 | 15.6 | 56.0 | 46.0 | 25.0 | 30.4 | L | |
| 3.56734 | 9.0 | 0.4 | 13.9 | 22.9 | 14.3 | 56.0 | 46.0 | 33.1 | 31.7 | L | |

CHART: WITH FACTOR, Peak hold data. CALCULATION: RESULT=READING+C.F (LISN LOSS+ATT LOSS +CABLE LOSS)
Except for the above table : adequate margin data below the limits.

Conducted Emission

| | |
|-----------------------|---|
| Test place | Head Office EMC Lab. No.3 Semi Anechoic Chamber |
| Report No. | 33CE0171-HO |
| Date | 10/28/2012 |
| Temperature/ Humidity | 23 deg.C./ 52% |
| Engineer | Kazuya Yoshioka |
| Mode | BT LE Tx |



6dB Bandwidth

Test place Head Office EMC Lab. No.7 Shielded Room
Report No. 33CE0171-HO
Date 10/23/2012
Temperature/ Humidity 24deg. C / 54% RH
Engineer Yutaka Yoshida
Mode Tx

11b

| Frequency [MHz] | 6dB Bandwidth [MHz] | Limit [kHz] |
|--------------------|------------------------|----------------|
| 2412 | 8.112 | >500 |
| 2437 | 8.083 | >500 |
| 2462 | 8.843 | >500 |

11g

| Frequency [MHz] | 6dB Bandwidth [MHz] | Limit [kHz] |
|--------------------|------------------------|----------------|
| 2412 | 16.517 | >500 |
| 2437 | 16.500 | >500 |
| 2462 | 16.502 | >500 |

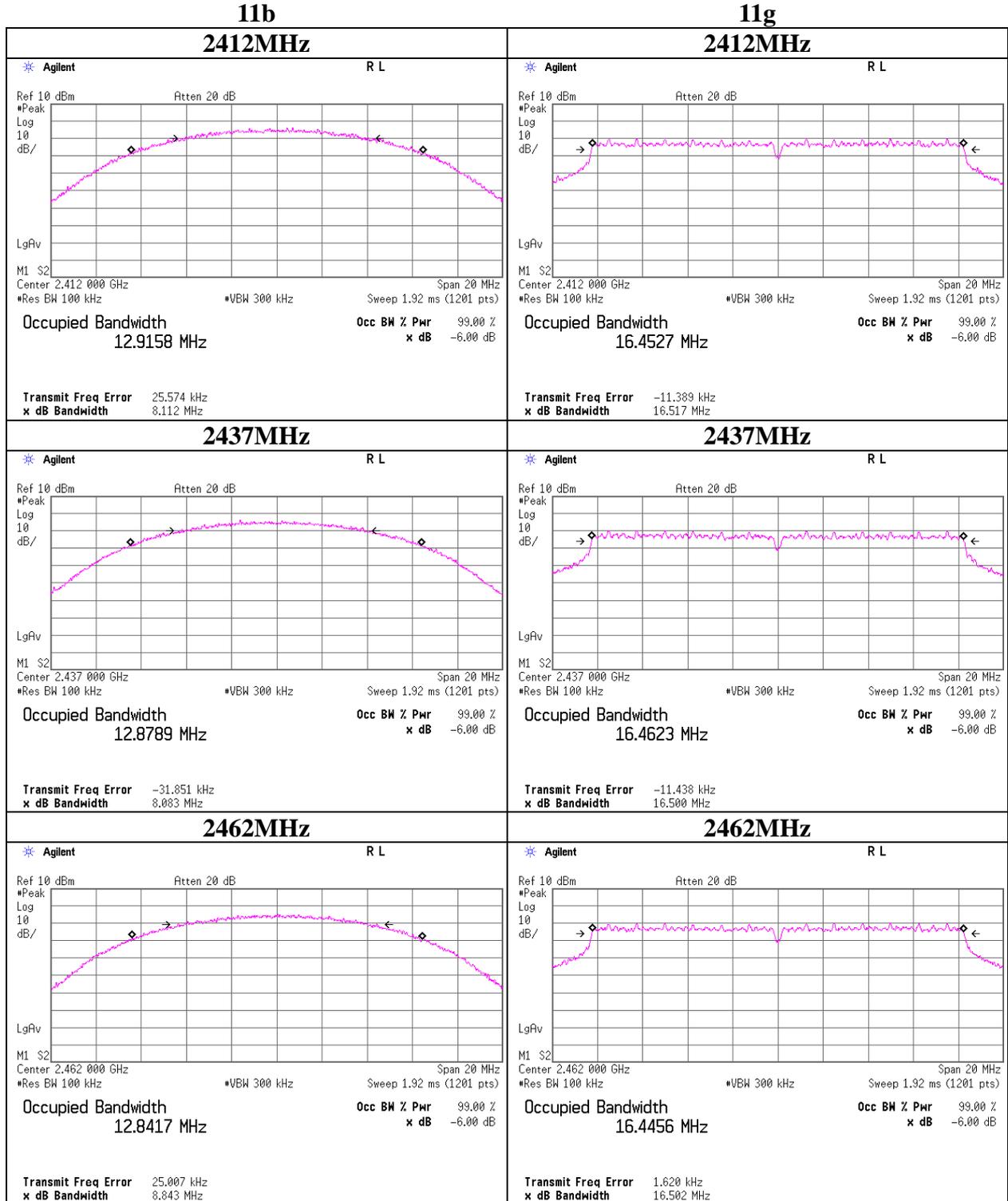
11n-20

| Frequency [MHz] | 6dB Bandwidth [MHz] | Limit [kHz] |
|--------------------|------------------------|----------------|
| 2412 | 17.732 | >500 |
| 2437 | 17.724 | >500 |
| 2462 | 17.741 | >500 |

BT LE

| Frequency [MHz] | 6dB Bandwidth [kHz] | Limit [kHz] |
|--------------------|------------------------|----------------|
| 2402 | 651.510 | >500 |
| 2442 | 651.141 | >500 |
| 2480 | 647.722 | >500 |

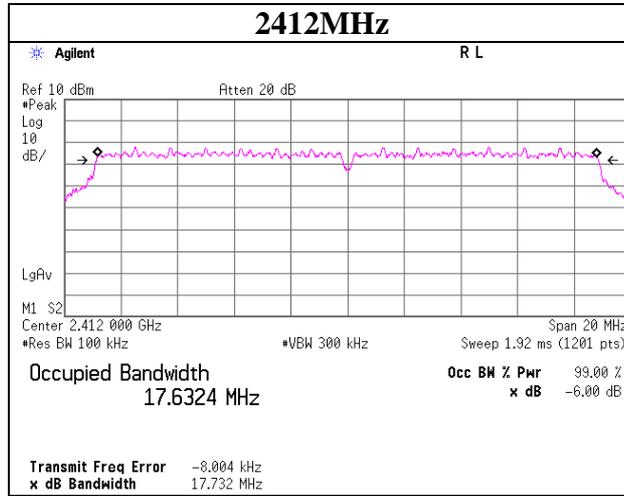
6dB Bandwidth



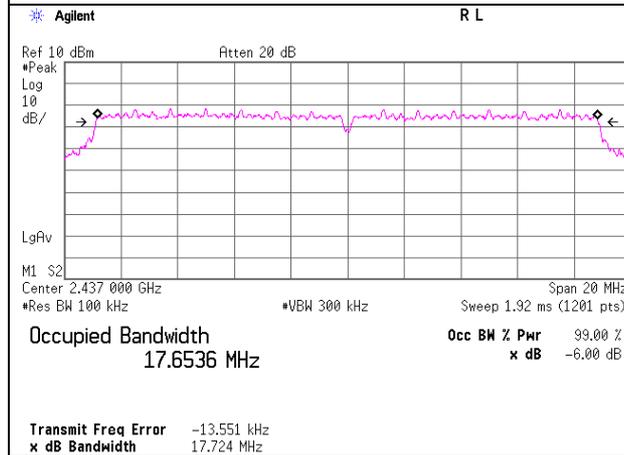
6dB Bandwidth

11n-20

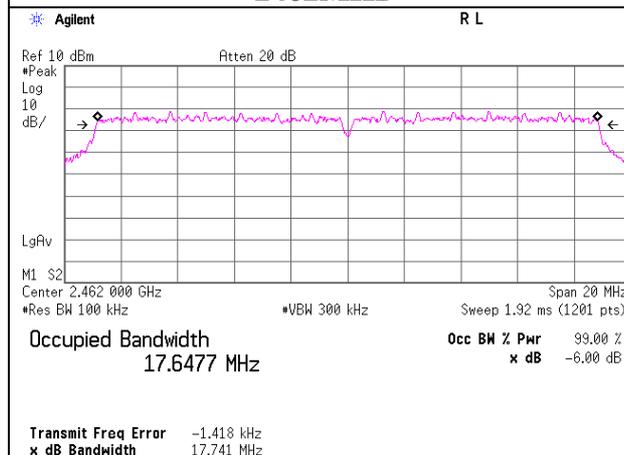
2412MHz



2437MHz



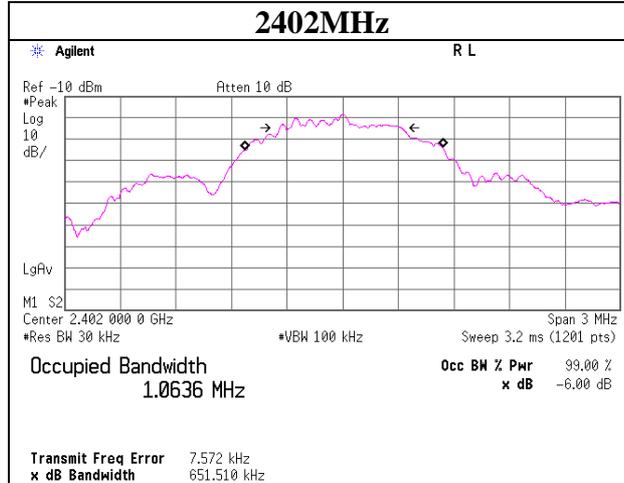
2462MHz



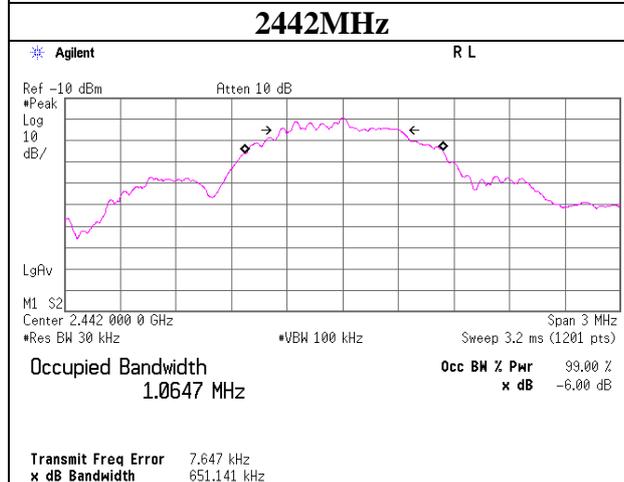
6dB Bandwidth

BT LE

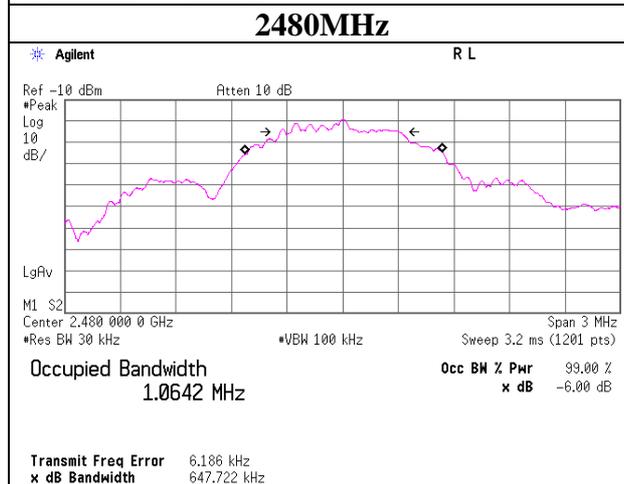
2402MHz



2442MHz



2480MHz



Maximum Peak Output Power

Test place Head Office EMC Lab. No.4 Measurement Room
Report No. 33CE0171-HO
Date 10/16/2012
Temperature/ Humidity 24 deg.C./ 62%
Engineer Hisayoshi Sato
Mode 11b Tx

| Freq. [MHz] | Reading P/M PK [dBm] | Cable Loss [dB] | Atten. [dB] | Result | | Limit | | Margin [dB] |
|----------------|----------------------------|-----------------------|----------------|--------|-------|-------|------|----------------|
| | | | | [dBm] | [mW] | [dBm] | [mW] | |
| 2412 | 7.33 | 0.30 | 10.08 | 17.71 | 59.02 | 30.00 | 1000 | 12.29 |
| 2437 | 7.51 | 0.30 | 10.08 | 17.89 | 61.52 | 30.00 | 1000 | 12.11 |
| 2462 | 7.36 | 0.30 | 10.09 | 17.75 | 59.57 | 30.00 | 1000 | 12.25 |

Sample Calculation:

Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator

2437MHz

| Rate [Mbps] | Reading P/M PK [dBm] | Remark |
|----------------|----------------------------|--------|
| 1 | 7.43 | |
| 2 | 7.39 | |
| 5.5 | 7.45 | |
| 11 | 7.51 | * |

*: Worst Rate

All comparison were carried out on same frequency and measurement factors.

Maximum Peak Output Power

| | | |
|-----------------------|--|------------------|
| Test place | Head Office EMC Lab. No.4 Measurement Room | |
| Report No. | 33CE0171-HO | |
| Date | 10/16/2012 | 10/30/2012 |
| Temperature/ Humidity | 24 deg.C./ 62% | 23deg. C/ 41% RH |
| Engineer | Hisayoshi Sato | Hisayoshi Sato |
| Mode | 11g Tx | |

| Freq. [MHz] | Reading P/M PK [dBm] | Cable Loss [dB] | Atten. [dB] | Result | | Limit | | Margin [dB] |
|----------------|----------------------------|-----------------------|----------------|--------|--------|-------|------|----------------|
| | | | | [dBm] | [mW] | [dBm] | [mW] | |
| 2412 | 9.35 | 0.30 | 10.07 | 19.72 | 93.76 | 30.00 | 1000 | 10.28 |
| 2437 | 10.80 | 0.30 | 10.08 | 21.18 | 131.22 | 30.00 | 1000 | 8.82 |
| 2462 | 9.35 | 0.30 | 10.07 | 19.72 | 93.76 | 30.00 | 1000 | 10.28 |

Sample Calculation:

Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator

2437MHz

| Rate [Mbps] | Reading P/M PK [dBm] | Remark |
|----------------|----------------------------|--------|
| 6 | 10.67 | |
| 9 | 10.64 | |
| 12 | 10.75 | |
| 18 | 10.74 | |
| 24 | 10.80 | * |
| 36 | 10.72 | |
| 48 | 10.76 | |
| 54 | 10.75 | |

*: Worst Rate

All comparison were carried out on same frequency and measurement factors.

Maximum Peak Output Power

| | | |
|-----------------------|--|-------------------|
| Test place | Head Office EMC Lab. No.4 Measurement Room | |
| Report No. | 33CE0171-HO | |
| Date | 10/16/2012 | 10/30/2012 |
| Temperature/ Humidity | 24 deg.C./ 62% | 23deg. C / 41% RH |
| Engineer | Hisayoshi Sato | Yutaka Yoshida |
| Mode | 11n-20 Tx | |

| Freq. [MHz] | Reading P/M PK [dBm] | Cable Loss [dB] | Atten. [dB] | Result | | Limit | | Margin [dB] |
|----------------|----------------------------|-----------------------|----------------|--------|--------|-------|------|----------------|
| | | | | [dBm] | [mW] | [dBm] | [mW] | |
| 2412 | 8.97 | 0.30 | 10.07 | 19.34 | 85.90 | 30.00 | 1000 | 10.66 |
| 2437 | 9.82 | 0.30 | 10.08 | 20.20 | 104.71 | 30.00 | 1000 | 9.80 |
| 2462 | 9.13 | 0.30 | 10.07 | 19.50 | 89.13 | 30.00 | 1000 | 10.50 |

Sample Calculation:

Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator

2437MHz

| Rate | Reading P/M PK [dBm] | Remark |
|------|----------------------------|--------|
| MCS0 | 9.69 | |
| MCS1 | 9.76 | |
| MCS2 | 9.74 | |
| MCS3 | 9.82 | * |
| MCS4 | 9.55 | |
| MCS5 | 9.81 | |
| MCS6 | 9.72 | |
| MCS7 | 9.80 | |

*: Worst Rate

All comparison were carried out on same frequency and measurement factors.

Maximum Peak Output Power

Test place Head Office EMC Lab. No.7 Shielded Room
Report No. 33CE0171-HO
Date 10/23/2012
Temperature/ Humidity 24deg. C / 54% RH
Engineer Yutaka Yoshida
Mode BT LE Tx

| Freq. [MHz] | Reading P/M PK [dBm] | Cable Loss [dB] | Atten. [dB] | Result | | Limit | | Margin [dB] |
|----------------|----------------------------|-----------------------|----------------|--------|------|-------|------|----------------|
| | | | | [dBm] | [mW] | [dBm] | [mW] | |
| 2402 | -15.04 | 1.66 | 10.00 | -3.38 | 0.46 | 30.00 | 1000 | 33.38 |
| 2442 | -15.59 | 1.67 | 10.00 | -3.92 | 0.41 | 30.00 | 1000 | 33.92 |
| 2480 | -15.34 | 1.68 | 10.00 | -3.66 | 0.43 | 30.00 | 1000 | 33.66 |

Sample Calculation:

Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator

Maximum Average Output Power (Reference data for SAR testing)

IEEE802.11b 1Mbps

| Ch | Frequency [MHz] | P/M Reading | Cable Loss [dB] | Atten. [dB] | Result | |
|----|--------------------|----------------|-----------------------|----------------|--------------|-------------|
| | | AVG | | | [dBm] AVG | [mW] AVG |
| 1 | 2412 | 4.14 | 0.30 | 10.08 | 14.52 | 28.31 |
| 6 | 2437 | 4.42 | 0.30 | 10.08 | 14.80 | 30.20 |
| 11 | 2462 | 4.38 | 0.30 | 10.09 | 14.77 | 29.99 |

IEEE802.11g 6Mbps

| Ch | Frequency [MHz] | P/M Reading | Cable Loss [dB] | Atten. [dB] | Result | |
|----|--------------------|----------------|-----------------------|----------------|--------------|-------------|
| | | AVG | | | [dBm] AVG | [mW] AVG |
| 1 | 2412 | -0.41 | 0.30 | 10.08 | 9.97 | 9.93 |
| 6 | 2437 | 2.16 | 0.30 | 10.08 | 12.54 | 17.95 |
| 11 | 2462 | -1.00 | 0.30 | 10.00 | 9.30 | 8.51 |

IEEE802.11n-20 MCS0

| Ch | Frequency [MHz] | P/M Reading | Cable Loss [dB] | Atten. [dB] | Result | |
|----|--------------------|----------------|-----------------------|----------------|--------------|-------------|
| | | AVG | | | [dBm] AVG | [mW] AVG |
| 1 | 2412 | -1.53 | 0.30 | 10.08 | 8.85 | 7.67 |
| 6 | 2437 | 0.43 | 0.30 | 10.08 | 10.81 | 12.05 |
| 11 | 2462 | -0.94 | 0.30 | 10.00 | 9.36 | 8.63 |

[BT LE]

| ch | Frequency [MHz] | Reading P/M AV [dBm] | Cable Loss [dB] | Atten. [dB] | Result | |
|----|--------------------|----------------------------|-----------------------|----------------|--------|------|
| | | | | | [dBm] | [mW] |
| 0 | 2402 | -18.11 | 1.66 | 10.00 | -6.45 | 0.23 |
| 20 | 2442 | -18.73 | 1.67 | 10.00 | -7.06 | 0.20 |
| 39 | 2480 | -18.47 | 1.68 | 10.00 | -6.79 | 0.21 |

Radiated Spurious Emission

Test place Head Office EMC Lab. No.3 Semi Anechoic Chamber
Report No. 33CE0171-HO
Date 10/26/2012 10/27/2012
Temperature/ Humidity 22 deg.C./ 47% 26 deg.C./ 42%
Engineer Keisuke Kawamura Takayuki Shimada
1G-10GHz 10G-26.5GHz
Mode 11b Tx 2437MHz

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|-----------------|----------------|-------------|--------|
| Hori | 4874.000 | PK | 39.3 | 31.9 | 4.0 | 31.4 | 43.8 | 73.9 | 30.1 | |
| Hori | 7311.000 | PK | 42.4 | 36.5 | 4.7 | 32.5 | 51.1 | 73.9 | 22.8 | |
| Hori | 9748.000 | PK | 42.4 | 38.3 | 5.4 | 33.0 | 53.1 | 73.9 | 20.8 | |
| Hori | 4874.000 | AV | 31.5 | 31.9 | 4.0 | 31.4 | 36.0 | 53.9 | 17.9 | |
| Hori | 7311.000 | AV | 33.7 | 36.5 | 4.7 | 32.5 | 42.4 | 53.9 | 11.5 | |
| Hori | 9748.000 | AV | 33.7 | 38.3 | 5.4 | 33.0 | 44.4 | 53.9 | 9.5 | |
| Vert | 4874.000 | PK | 39.6 | 31.9 | 4.0 | 31.4 | 44.1 | 73.9 | 29.8 | |
| Vert | 7311.000 | PK | 41.8 | 36.5 | 4.7 | 32.5 | 50.5 | 73.9 | 23.4 | |
| Vert | 9748.000 | PK | 42.4 | 38.3 | 5.4 | 33.0 | 53.1 | 73.9 | 20.8 | |
| Vert | 4874.000 | AV | 31.3 | 31.9 | 4.0 | 31.4 | 35.8 | 53.9 | 18.1 | |
| Vert | 7311.000 | AV | 33.6 | 36.5 | 4.7 | 32.5 | 42.3 | 53.9 | 11.6 | |
| Vert | 9748.000 | AV | 33.9 | 38.3 | 5.4 | 33.0 | 44.6 | 53.9 | 9.3 | |

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

*The 10th harmonic was not seen so the result was its base noise level.

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

Radiated Spurious Emission

Test place Head Office EMC Lab. No.3 Semi Anechoic Chamber
Report No. 33CE0171-HO
Date 10/26/2012 10/27/2012 10/28/2012
Temperature/ Humidity 22 deg.C./ 47% 26 deg.C./ 42% 23 deg.C./ 52%
Engineer Keisuke Kawamura Takayuki Shimada Kazuya Yoshioka
1G-10GHz 10G-26.5GHz 30-1000MHz
Mode 11g Tx 2437MHz

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|-----------------|----------------|-------------|----------|
| Hori | 43.150 | QP | 23.2 | 13.1 | 7.3 | 32.2 | 11.4 | 40.0 | 28.6 | |
| Hori | 134.998 | QP | 38.1 | 14.2 | 8.5 | 32.3 | 28.5 | 43.5 | 15.0 | |
| Hori | 161.990 | QP | 30.8 | 15.4 | 8.8 | 32.2 | 22.8 | 43.5 | 20.7 | |
| Hori | 460.799 | QP | 36.2 | 17.8 | 11.1 | 32.0 | 33.1 | 46.0 | 12.9 | |
| Hori | 630.395 | QP | 29.9 | 19.6 | 12.1 | 32.0 | 29.6 | 46.0 | 16.4 | |
| Hori | 655.995 | QP | 30.9 | 19.9 | 12.2 | 32.0 | 31.0 | 46.0 | 15.0 | |
| Hori | 4874.000 | PK | 39.3 | 31.9 | 4.0 | 31.4 | 43.8 | 73.9 | 30.1 | NS MHF06 |
| Hori | 7311.000 | PK | 42.4 | 36.5 | 4.7 | 32.5 | 51.1 | 73.9 | 22.8 | NS MHF06 |
| Hori | 9748.000 | PK | 42.4 | 38.3 | 5.4 | 33.0 | 53.1 | 73.9 | 20.8 | NS MHF06 |
| Hori | 4874.000 | AV | 31.5 | 31.9 | 4.0 | 31.4 | 36.0 | 53.9 | 17.9 | NS MHF06 |
| Hori | 7311.000 | AV | 33.7 | 36.5 | 4.7 | 32.5 | 42.4 | 53.9 | 11.5 | NS MHF06 |
| Hori | 9748.000 | AV | 33.7 | 38.3 | 5.4 | 33.0 | 44.4 | 53.9 | 9.5 | NS MHF06 |
| Vert | 43.550 | QP | 29.2 | 12.9 | 7.3 | 32.2 | 17.2 | 40.0 | 22.8 | |
| Vert | 134.998 | QP | 36.2 | 14.2 | 8.5 | 32.3 | 26.6 | 43.5 | 16.9 | |
| Vert | 162.003 | QP | 33.0 | 15.4 | 8.8 | 32.2 | 25.0 | 43.5 | 18.5 | |
| Vert | 460.799 | QP | 34.4 | 17.8 | 11.1 | 32.0 | 31.3 | 46.0 | 14.7 | |
| Vert | 630.395 | QP | 33.2 | 19.6 | 12.1 | 32.0 | 32.9 | 46.0 | 13.1 | |
| Vert | 655.999 | QP | 33.7 | 19.9 | 12.2 | 32.0 | 33.8 | 46.0 | 12.2 | |
| Vert | 4874.000 | PK | 39.6 | 31.9 | 4.0 | 31.4 | 44.1 | 73.9 | 29.8 | NS MHF06 |
| Vert | 7311.000 | PK | 41.8 | 36.5 | 4.7 | 32.5 | 50.5 | 73.9 | 23.4 | NS MHF06 |
| Vert | 9748.000 | PK | 42.4 | 38.3 | 5.4 | 33.0 | 53.1 | 73.9 | 20.8 | NS MHF06 |
| Vert | 4874.000 | AV | 31.3 | 31.9 | 4.0 | 31.4 | 35.8 | 53.9 | 18.1 | NS MHF06 |
| Vert | 7311.000 | AV | 33.6 | 36.5 | 4.7 | 32.5 | 42.3 | 53.9 | 11.6 | NS MHF06 |
| Vert | 9748.000 | AV | 33.9 | 38.3 | 5.4 | 33.0 | 44.6 | 53.9 | 9.3 | NS MHF06 |

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

*The 10th harmonic was not seen so the result was its base noise level.

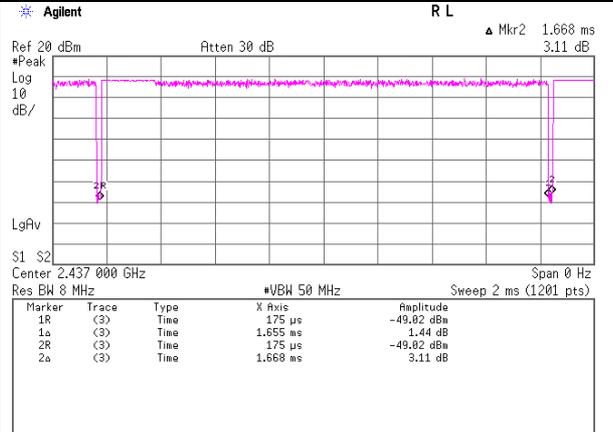
Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

Duty rate confirmation

11b 11Mbps

Tx on/(Tx on+Tx off)=1.655/1.668

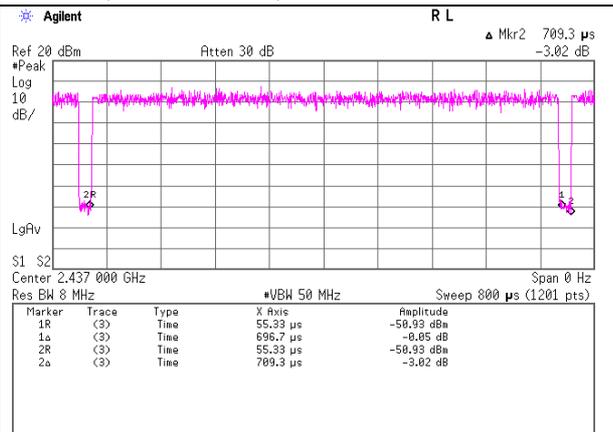
Tx on/(Tx on+Tx off)*100=99.8%



11g 24Mbps

Tx on/(Tx on+Tx off)=696.7/709.3

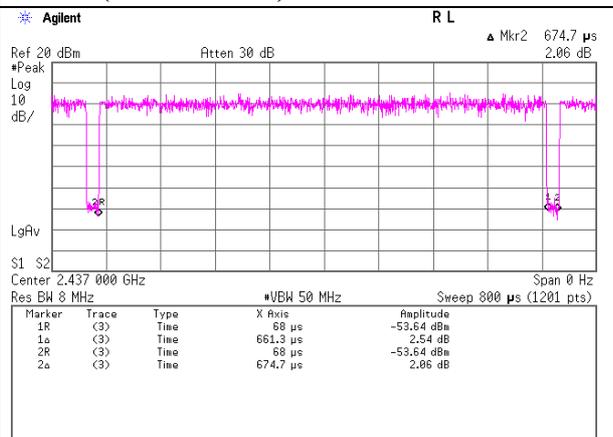
Tx on/(Tx on+Tx off)*100=98.2%



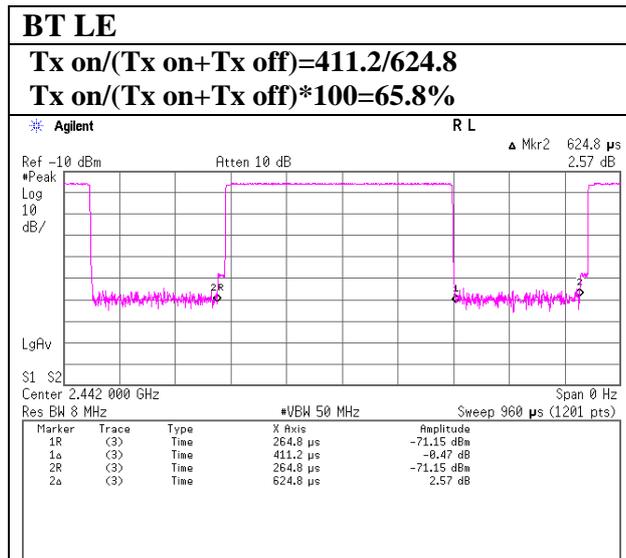
11n20 MCS 3

Tx on/(Tx on+Tx off)=661.3/674.7

Tx on/(Tx on+Tx off)*100=98.0%

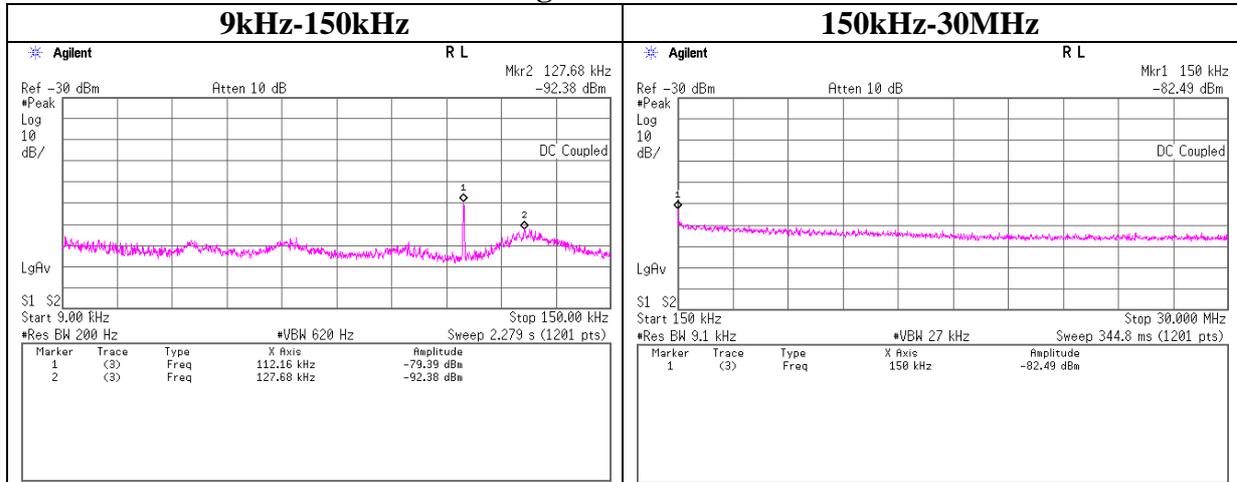


Duty rate confirmation



Conducted Spurious Emission

11g Tx 2437MHz



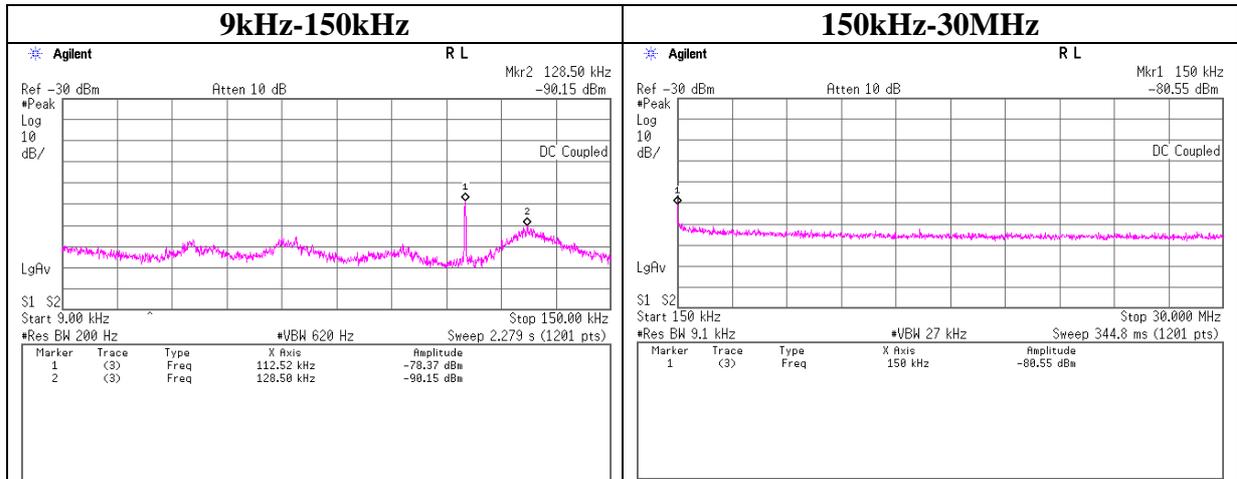
| Frequency [kHz] | Reading [dBm] | Cable Loss [dB] | Attenuator [dB] | Antenna Gain [dB] | EIRP [dBm] | Distance [m] | Ground bounce [dB] | E (field strength) [dBuV/m] | Limit [dBuV/m] |
|-----------------|---------------|-----------------|-----------------|-------------------|------------|--------------|--------------------|-----------------------------|----------------|
| 112.160 | -79.4 | 0.3 | 9.8 | 2.0 | -67.3 | 300.0 | 6.0 | -6.0 | 26.6 |
| 127.680 | -92.4 | 0.3 | 9.8 | 2.0 | -80.2 | 300.0 | 6.0 | -19.0 | 25.5 |
| 150.000 | -82.5 | 0.3 | 9.8 | 2.0 | -70.4 | 300.0 | 6.0 | -9.1 | 24.1 |

$E = \text{EIRP} - 20\log(D) + \text{Ground bounce} + 104.8 [\text{dBuV/m}]$

$\text{EIRP} = \text{Reading} + \text{Cable Loss} + \text{Attenuator} + \text{Antenna Gain}$

Conducted Spurious Emission

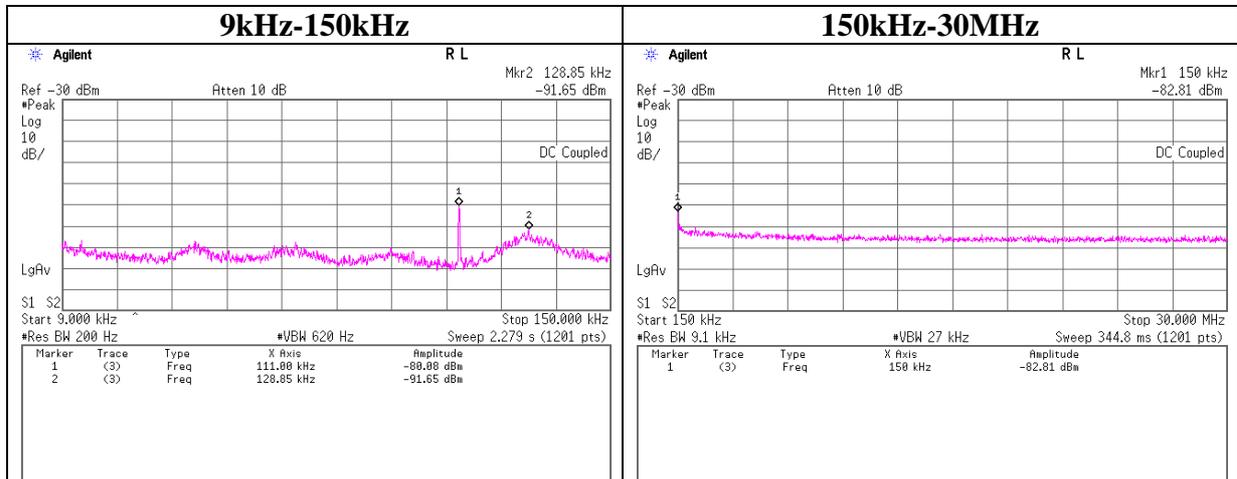
BT LE Tx 2402MHz



| Frequency [kHz] | Reading [dBm] | Cable Loss [dB] | Attenuator [dB] | Antenna Gain [dB] | EIRP [dBm] | Distance [m] | Ground bounce [dB] | E (field strength) [dBuV/m] | Limit [dBuV/m] |
|-----------------|---------------|-----------------|-----------------|-------------------|------------|--------------|--------------------|-----------------------------|----------------|
| 112.520 | -78.4 | 0.3 | 9.8 | 2.0 | -66.2 | 300.0 | 6.0 | -5.0 | 26.6 |
| 128.500 | -90.2 | 0.3 | 9.8 | 2.0 | -78.0 | 300.0 | 6.0 | -16.8 | 25.4 |
| 150.000 | -80.6 | 0.3 | 9.8 | 2.0 | -68.4 | 300.0 | 6.0 | -7.2 | 24.1 |

$E = \text{EIRP} - 20\log(D) + \text{Ground bounce} + 104.8$ [dBuV/m]
 $\text{EIRP} = \text{Reading} + \text{Cable Loss} + \text{Attenuator} + \text{Antenna Gain}$ [dBm]

BT LE Tx 2442MHz

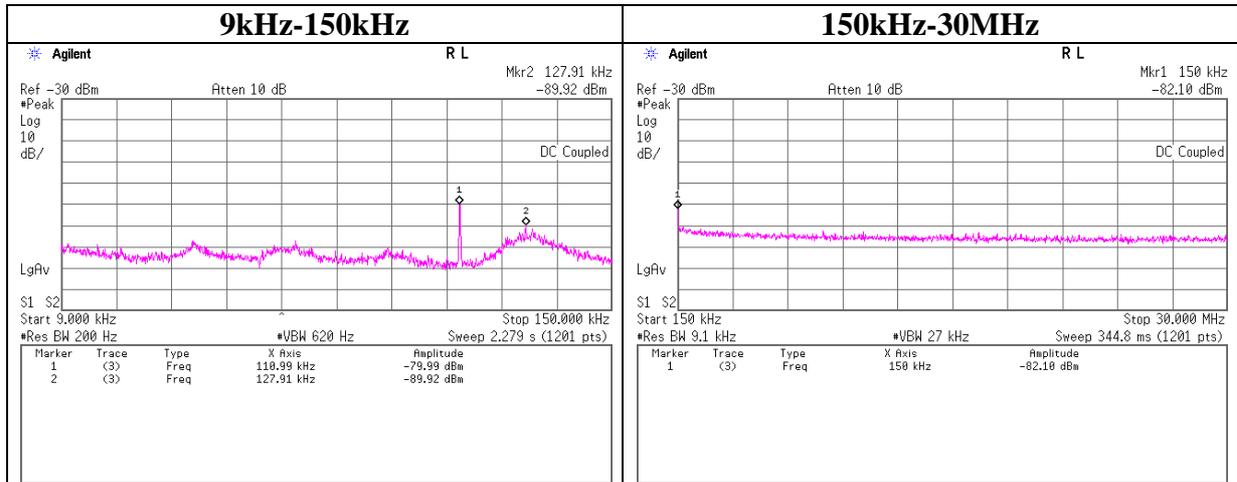


| Frequency [kHz] | Reading [dBm] | Cable Loss [dB] | Attenuator [dB] | Antenna Gain [dB] | EIRP [dBm] | Distance [m] | Ground bounce [dB] | E (field strength) [dBuV/m] | Limit [dBuV/m] |
|-----------------|---------------|-----------------|-----------------|-------------------|------------|--------------|--------------------|-----------------------------|----------------|
| 111.000 | -80.1 | 0.3 | 9.8 | 2.0 | -67.9 | 300.0 | 6.0 | -6.7 | 26.7 |
| 128.850 | -91.7 | 0.3 | 9.8 | 2.0 | -79.5 | 300.0 | 6.0 | -18.3 | 25.4 |
| 150.000 | -82.8 | 0.3 | 9.8 | 2.0 | -70.7 | 300.0 | 6.0 | -9.4 | 24.1 |

$E = \text{EIRP} - 20\log(D) + \text{Ground bounce} + 104.8$ [dBuV/m]
 $\text{EIRP} = \text{Reading} + \text{Cable Loss} + \text{Attenuator} + \text{Antenna Gain}$ [dBm]

Conducted Spurious Emission

BT LE Tx 2480MHz

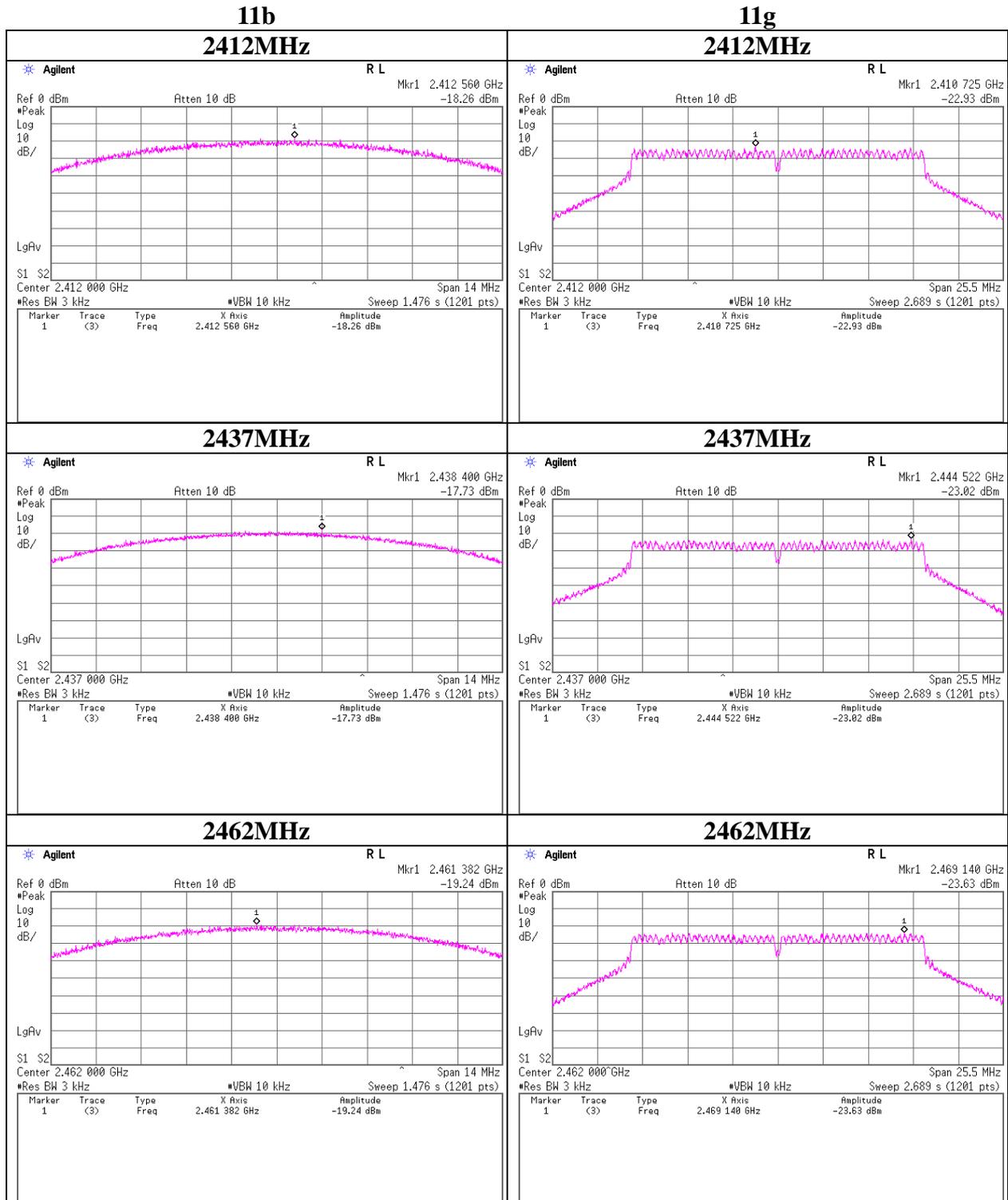


| Frequency [kHz] | Reading [dBm] | Cable Loss [dB] | Attenuator [dB] | Antenna Gain [dB] | EIRP [dBm] | Distance [m] | Ground bounce [dB] | E (field strength) [dBuV/m] | Limit [dBuV/m] |
|--------------------|------------------|-----------------------|--------------------|-------------------------|---------------|-----------------|--------------------------|-----------------------------------|-------------------|
| 110.990 | -80.0 | 0.3 | 9.8 | 2.0 | -67.9 | 300.0 | 6.0 | -6.6 | 26.7 |
| 127.910 | -89.9 | 0.3 | 9.8 | 2.0 | -77.8 | 300.0 | 6.0 | -16.5 | 25.5 |
| 150.000 | -82.1 | 0.3 | 9.8 | 2.0 | -70.0 | 300.0 | 6.0 | -8.7 | 24.1 |

$E = \text{EIRP} - 20\log(D) + \text{Ground bounce} + 104.8$ [dBuV/m]

$\text{EIRP} = \text{Reading} + \text{Cable Loss} + \text{Attenuator} + \text{Antenna Gain}$ [dBm]

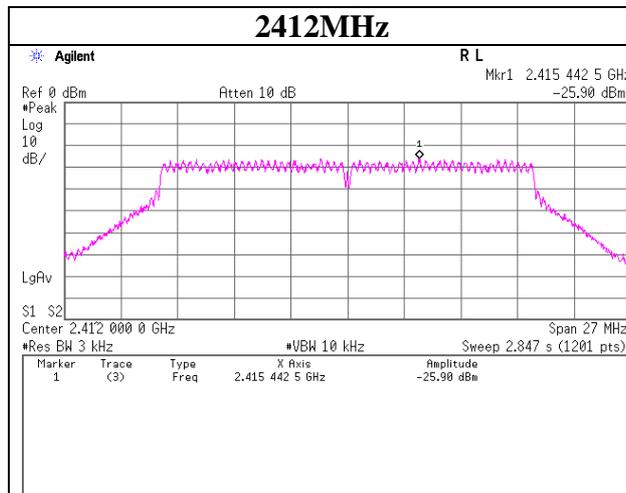
Power Density



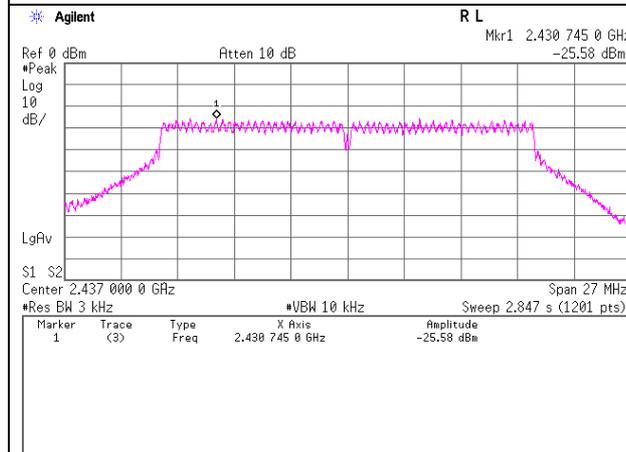
Power Density

11n-20

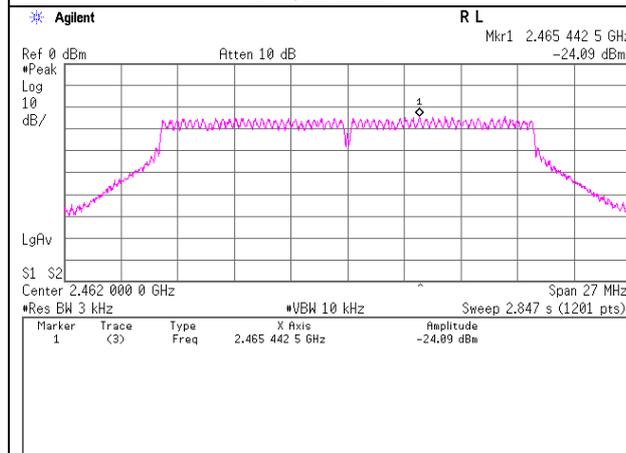
2412MHz



2437MHz



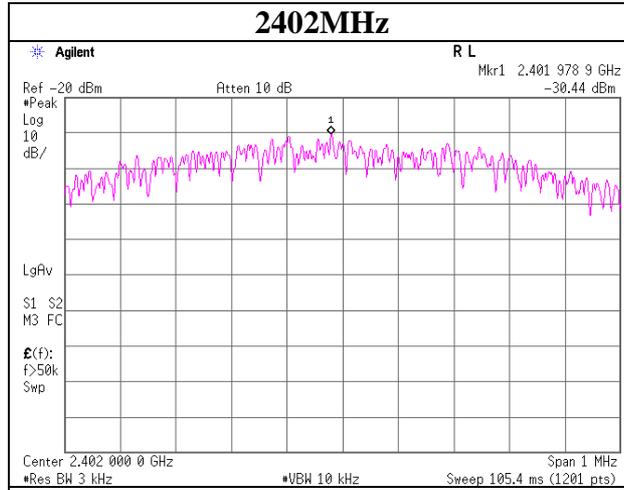
2462MHz



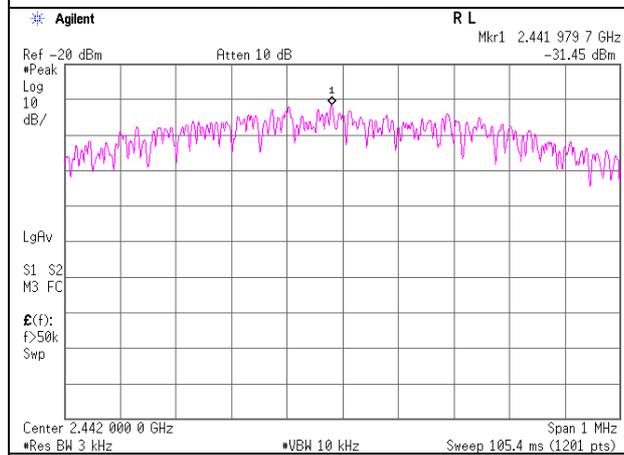
Power Density

BT LE

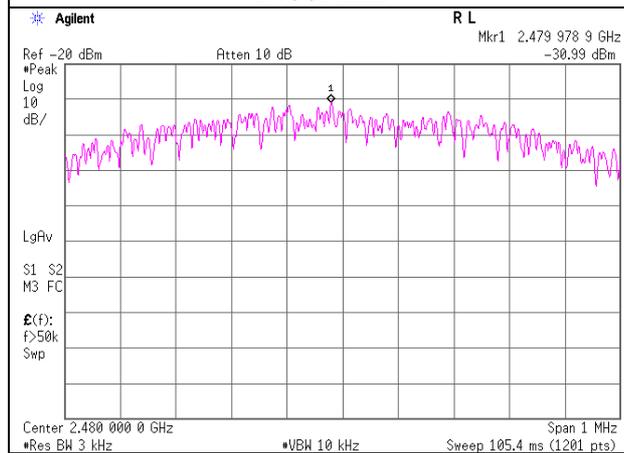
2402MHz



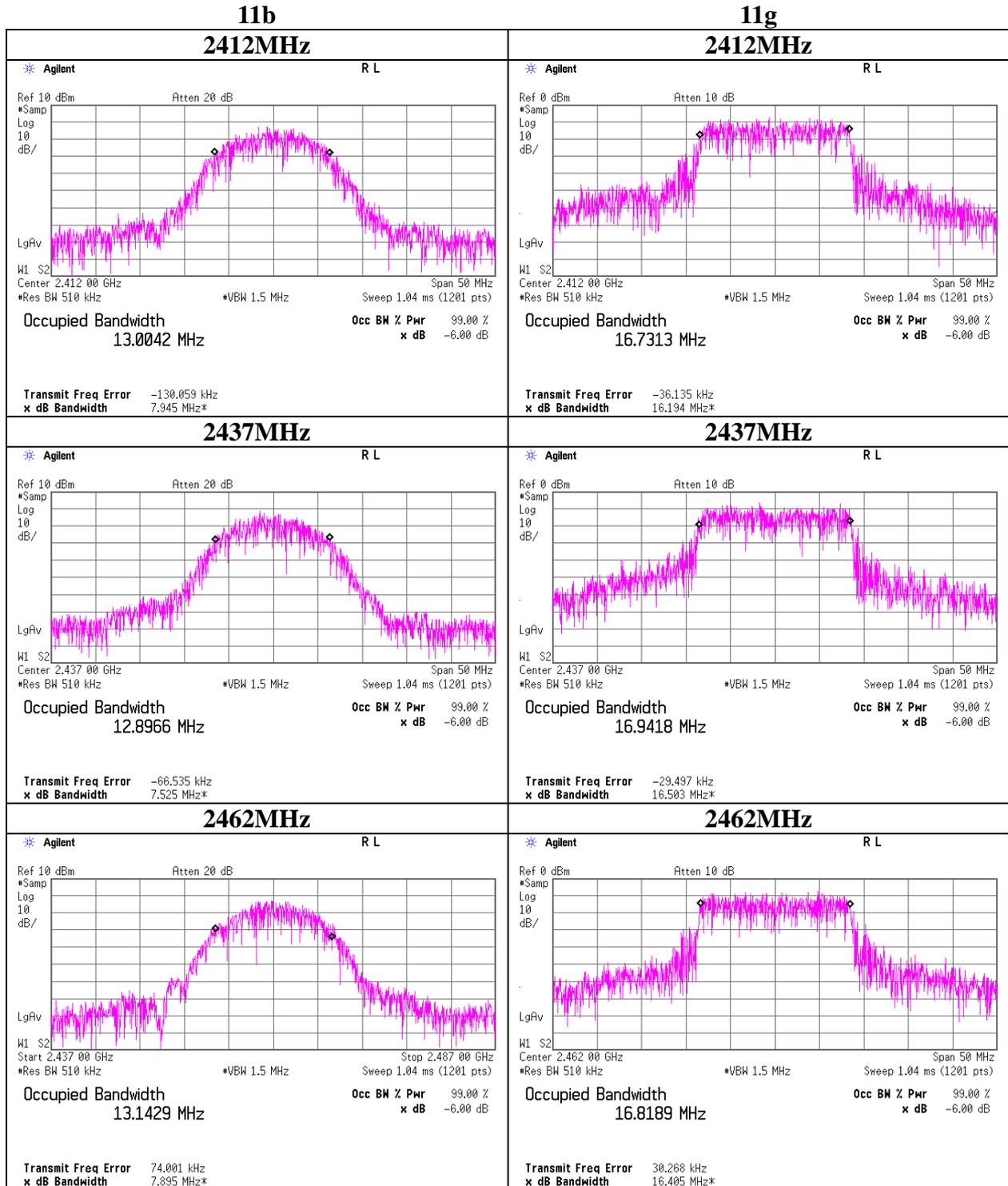
2442MHz



2480MHz



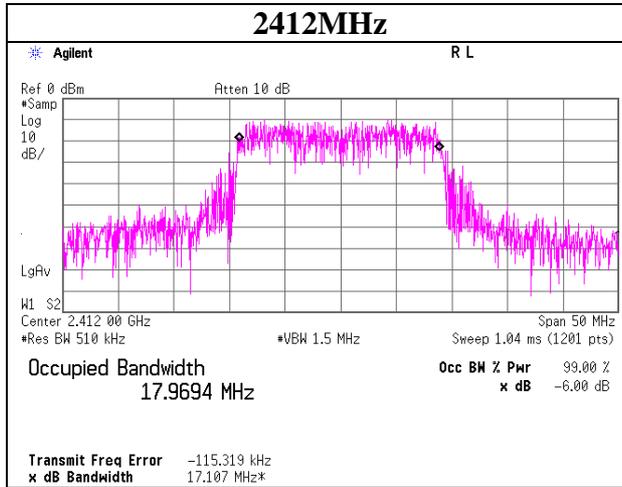
99% Occupied Bandwidth



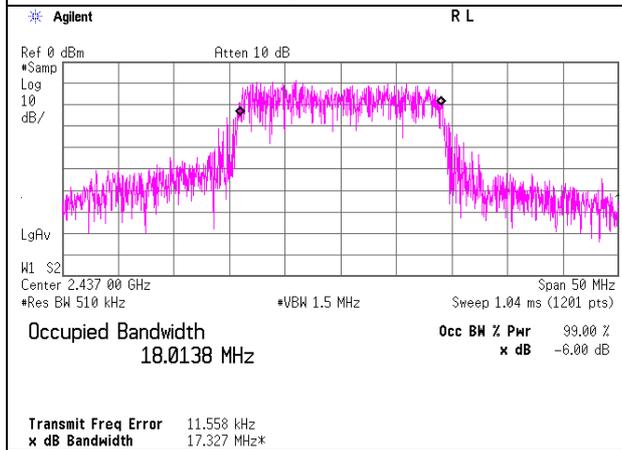
99% Occupied Bandwidth

11n-20

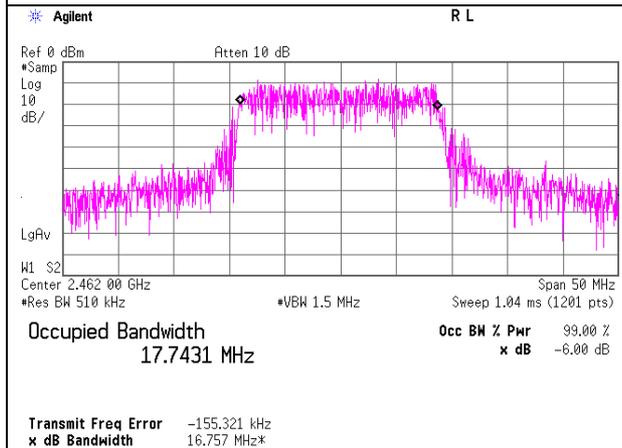
2412MHz



2437MHz



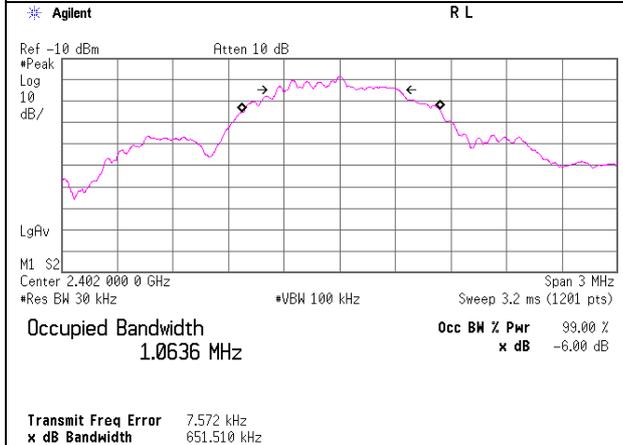
2462MHz



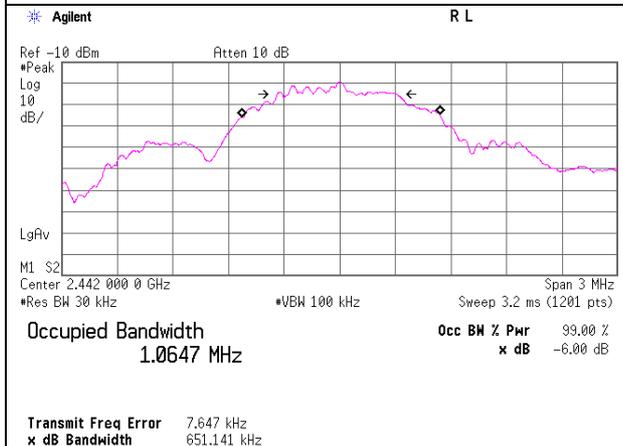
99% Occupied Bandwidth

BT LE

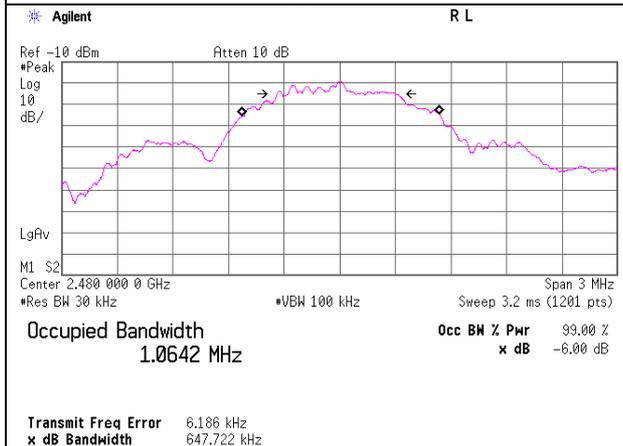
2402MHz



2442MHz



2480MHz



APPENDIX 2: Test instruments

EMI test equipment

| Control No. | Instrument | Manufacturer | Model No | Serial No | Test Item | Calibration Date * Interval(month) |
|-------------|------------------------------|--------------------------|--------------------------|--------------------------------|-----------|---------------------------------------|
| MAT-20 | Attenuator(10dB)(above 1GHz) | HIROSE ELECTRIC CO.,LTD. | AT-110 | - | AT | 2012/01/12 * 12 |
| MPM-12 | Power Meter | Anritsu | ML2495A | 0825002 | AT | 2012/06/01 * 12 |
| MPSE-17 | Power sensor | Anritsu | MA2411B | 0738285 | AT | 2012/06/01 * 12 |
| MCC-137 | Microwave cable | HUBER+SUHNER | SUCOFLEX 102 | 37954/2 | AT | 2012/10/19 * 12 |
| MRENT-95 | Spectrum Analyzer | Agilent | E4440A | MY46185823 | AT | 2012/06/19 * 12 |
| MOS-04 | Digital Humidity Indicator | N.T | NT-1800 | MOS04 | AT | 2012/02/06 * 12 |
| MAEC-04 | Semi Anechoic Chamber(NSA) | TDK | Semi Anechoic Chamber 3m | DA-10005 | RE | 2012/02/29 * 12 |
| MOS-15 | Thermo-Hygrometer | Custom | CTH-180 | - | RE/CE | 2012/02/06 * 12 |
| MJM-07 | Measure | PROMART | SEN1955 | - | RE | - |
| COTS-MEMI | EMI measurement program | TSJ | TEPTO-DV | - | RE/CE | - |
| MSA-05 | Spectrum Analyzer | Advantest | R3273 | 160400285 | RE | 2011/11/23 * 12 |
| MHA-21 | Horn Antenna 1-18GHz | Schwarzbeck | BBHA9120D | 9120D-557 | RE | 2012/08/17 * 12 |
| MCC-141 | Microwave Cable | Junkosha | MWX221 | 1203S212(1m) / 1204S062(5m) | RE | 2012/04/23 * 12 |
| MPA-12 | MicroWave System Amplifier | Agilent | 83017A | MY39500780 | RE | 2012/03/28 * 12 |
| MAEC-02 | Semi Anechoic Chamber(NSA) | TDK | Semi Anechoic Chamber 3m | DA-06902 | RE | 2012/06/29 * 12 |
| MOS-22 | Thermo-Hygrometer | Custom | CTH-201 | 0003 | RE | 2012/02/06 * 12 |
| MJM-14 | Measure | KOMELON | KMC-36 | - | RE | - |
| MSA-03 | Spectrum Analyzer | Agilent | E4448A | MY44020357 | RE/CE | 2011/11/23 * 12 |
| MTR-03 | Test Receiver | Rohde & Schwarz | ESCI | 100300 | RE | 2012/04/03 * 12 |
| MBA-02 | Biconical Antenna | Schwarzbeck | BBA9106 | VHA91032008 | RE | 2012/10/08 * 12 |
| MLA-02 | Logperiodic Antenna | Schwarzbeck | USLP9143 | 201 | RE | 2012/10/08 * 12 |
| MCC-12 | Coaxial Cable | Fujikura/Agilent | - | - | RE | 2012/02/16 * 12 |
| MAT-07 | Attenuator(6dB) | Weinschel Corp | 2 | BK7970 | RE | 2011/11/02 * 12 |
| MPA-09 | Pre Amplifier | Agilent | 8447D | 2944A10845 | RE | 2012/09/11 * 12 |
| MSA-04 | Spectrum Analyzer | Agilent | E4448A | US44300523 | RE | 2012/04/06 * 12 |
| MHA-06 | Horn Antenna 1-18GHz | Schwarzbeck | BBHA9120D | 254 | RE | 2012/02/22 * 12 |
| MPA-10 | Pre Amplifier | Agilent | 8449B | 3008A02142 | RE | 2012/01/25 * 12 |
| MHA-17 | Horn Antenna 15-40GHz | Schwarzbeck | BBHA9170 | BBHA9170307 | RE | 2012/06/27 * 12 |

| Control No. | Instrument | Manufacturer | Model No | Serial No | Test Item | Calibration Date * Interval(month) |
|-------------|--------------------------------|----------------------|---|------------------------------|-----------|---------------------------------------|
| MCC-132 | Microwave Cable | HUBER+SUHNER | SUCOFLEX104 | 336161/4(1m) / 340639(5m) | RE | 2012/09/05 * 12 |
| MHF-06 | High Pass Filter 3.5- 24GHz | TOKIMEC | TF323DCA | 601 | RE | 2012/05/30 * 12 |
| MAEC-03 | Semi Anechoic Chamber(NSA) | TDK | Semi Anechoic Chamber 3m | DA-10005 | CE | 2012/02/24 * 12 |
| MOS-13 | Thermo-Hygrometer | Custom | CTH-180 | - | CE | 2012/02/06 * 12 |
| MJM-15 | Measure | KOMELON | KMC-36 | - | CE | - |
| MTR-08 | Test Receiver | Rohde & Schwarz | ESCI | 100767 | CE/RE | 2012/08/23 * 12 |
| MLS-06 | LISN(AMN) | Schwarzbeck | NSLK8127 | 8127363 | CE(EUT) | 2012/02/06 * 12 |
| MJM-09 | Measure | KDS | E19-55 | - | RE/CE | - |
| MHA-20 | Horn Antenna 1-18GHz | Schwarzbeck | BBHA9120D | 258 | RE | 2012/05/25 * 12 |
| MCC-133 | Microwave Cable | HUBER+SUHNER | SUCOFLEX104 | 336164/4(1m) / 340640(5m) | RE | 2012/09/05 * 12 |
| MPA-11 | MicroWave System Amplifier | Agilent | 83017A | MY39500779 | RE | 2012/03/29 * 12 |
| MHA-16 | Horn Antenna 15-40GHz | Schwarzbeck | BBHA9170 | BBHA9170306 | RE | 2012/05/21 * 12 |
| MCC-112 | Coaxial cable | Fujikura/Suhner/TSJ | 5D- 2W(10m)/SFM141(3m)/sucoform141- PE(1m)/421- 010(1.5m)/RFM- E321(Switcher) | -/00640 | CE | 2012/07/12 * 12 |
| MAT-66 | Attenuator(13dB) | JFW Industries, Inc. | 50FP-013H2 N | - | CE | 2012/01/28 * 12 |
| MBA-03 | Biconical Antenna | Schwarzbeck | BBA9106 | 1915 | RE | 2012/10/08 * 12 |
| MLA-03 | Logperiodic Antenna | Schwarzbeck | USLP9143 | 174 | RE | 2012/10/08 * 12 |
| MCC-51 | Coaxial cable | UL Japan | - | - | RE | 2012/07/12 * 12 |
| MAT-09 | Attenuator(6dB) | Weinschel Corp | 2 | BK7973 | RE | 2011/11/02 * 12 |
| MPA-13 | Pre Amplifier | SONOMA INSTRUMENT | 310 | 260834 | RE | 2012/03/16 * 12 |

The expiration date of the calibration is the end of the expired month.

All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

**Test Item: CE: Conducted Emission
RE: Radiated Emission
AT: Antenna Terminal Conducted test**