

FCC Test Report

Equipment : RTLS Tag
Brand Name : Convergence Systems Limited
Model No. : CS3151BBCD
FCC ID : UB4CS3151BBCD
Standard : 47 CFR FCC Part 15.247
Operating Band : 2400 MHz – 2483.5 MHz
Equipment Class : DTS
Applicant : Convergence Systems Limited
Manufacturer : 20/F Chung Nam Building, 1 Lockhart Road,
Wanchai, Hong Kong

The product sample received on Oct. 30, 2012 and completely tested on Nov. 19, 2012. We, SPORTON, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2009 and shown compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by:

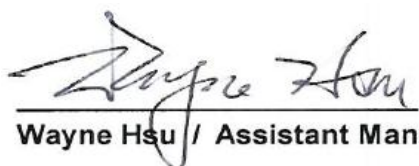

Wayne Hsu / Assistant Manager





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Summary of Test Result

| Conformance Test Specifications | | | | | |
|---------------------------------|------------------|---|---|--|----------|
| Report Clause | Ref. Std. Clause | Description | Measured | Limit | Result |
| 1.1.2 | 15.203 | Antenna Requirement | Antenna connector mechanism complied | FCC 15.203 | Complied |
| 3.1 | 15.207 | AC Power-line Conducted Emissions | [dBuV]: 0.361462MHz 36.10 (Margin 12.59dB) - AV 43.46 (Margin 15.23dB) - QP | FCC 15.207 | Complied |
| 3.2 | 15.247(a) | 6dB Bandwidth | 6dB Bandwidth Unit [MHz] 1M:55.05 | ≥500kHz | Complied |
| 3.3 | 15.247(b) | RF Output Power (Maximum Peak Conducted Output Power) | Power [dBm]:13.93 | Power [dBm]:30 | Complied |
| 3.4 | 15.247(d) | Power Spectral Density | PSD [dBm/3kHz]:-19.20 | PSD [dBm/3kHz]:8 | Complied |
| 3.5 | 15.247(c) | Transmitter Radiated Bandedge Emissions | Restricted Bands [dBuV/m at 3m]: 2484.61MHz 60.35 (Margin 13.65dB) - PK 52.43 (Margin 1.57dB) - AV | Non-Restricted Bands: > 20 dBc Restricted Bands: FCC 15.209 | Complied |
| 3.6 | 15.247(c) | Transmitter Radiated Unwanted Emissions | Restricted Bands [dBuV/m at 3m]: 40.67MHz 35.47 (Margin 4.53dB) - PK | Non-Restricted Bands: > 20 dBc Restricted Bands: FCC 15.209 | Complied |

1 General Description

1.1 Information

1.1.1 RF General Information

| RF General Information | | | | | | |
|---|------------|-----------------|----------------|------------------------------------|-----------------------|-------------|
| Frequency Range (MHz) | Modulation | Ch. Freq. (MHz) | Channel Number | Transmit Chains (N _{TX}) | RF Output Power (dBm) | Co-location |
| 2400-2483.5 | CSS | 2402-2478 | 1 | 1 | 13.93 | N/A |
| Note 1: RF output power specifies that Maximum Peak Conducted Output Power. Note 2: Co-location, Co-location is generally defined as simultaneously transmitting (co-transmitting) antennas within 20 cm of each other. (i.e., EUT has simultaneously co-transmitting that operating 2.4GHz and 5GHz.) | | | | | | |

1.1.2 Antenna Information

| Antenna Category | |
|-------------------------------------|---|
| <input checked="" type="checkbox"/> | Integral antenna (antenna permanently attached) |
| <input type="checkbox"/> | Temporary RF connector provided |
| <input checked="" type="checkbox"/> | No temporary RF connector provided Transmit chains bypass antenna and soldered temporary RF connector provided for connected measurement. In case of conducted measurements the transmitter shall be connected to the measuring equipment via a suitable attenuator and correct for all losses in the RF path. |

| Antenna General Information | | | |
|-----------------------------|-----------|-----------|------------|
| No. | Ant. Cat. | Ant. Type | Gain (dBi) |
| 1 | Integral | PIFA | 2.5 |

Reminder: The EUT tested with ANT2 the other ANT1 is not used unless in special operation condition.

1.1.3 Type of EUT

| Identify EUT | |
|-------------------------------------|---|
| EUT Serial Number | N/A |
| Presentation of Equipment | <input type="checkbox"/> Production ; <input checked="" type="checkbox"/> Pre-Production ; <input type="checkbox"/> Prototype |
| Type of EUT | |
| <input checked="" type="checkbox"/> | Stand-alone |
| <input type="checkbox"/> | Combined (EUT where the radio part is fully integrated within another device) Combined Equipment - Brand Name / Model No.: ... |
| <input type="checkbox"/> | Plug-in radio (EUT intended for a variety of host systems) Host System - Brand Name / Model No.: ... |
| <input type="checkbox"/> | Other: |



1.1.4 Test Signal Duty Cycle

| Operated Mode for Worst Duty Cycle | |
|---|---------------------------------------|
| <input type="checkbox"/> Operated normally mode for worst duty cycle | |
| <input checked="" type="checkbox"/> Operated test mode for worst duty cycle | |
| Test Signal Duty Cycle (x) | Power Duty Factor [dB] – (10 log 1/x) |
| <input checked="" type="checkbox"/> 100% | 0 |

1.1.5 EUT Operational Condition

| | | | |
|-------------------|---|---|---|
| Supply Voltage | <input type="checkbox"/> AC mains | <input checked="" type="checkbox"/> DC | |
| Type of DC Source | <input type="checkbox"/> Internal DC supply | <input checked="" type="checkbox"/> External DC adapter | <input checked="" type="checkbox"/> Battery |

1.2 Accessories

| Accessories | | | | |
|---------------------|--------------|--|------------|---------------|
| I.T.E. power supply | Brand Name | CSL | Model Name | GFP051-0510-1 |
| | Power Rating | Input : 100-240V~50-60Hz 0.2A+ Output : 5V 1000mA | | |
| USB Charging Cable | Brand Name | CSL | S/N | 3151BBCD0044 |

Note: Regarding to more detail and other information, please refer to user manual.

1.3 Support Equipment

| Support Equipment | | | | |
|-------------------|------------|------------|------------|------------|
| No. | Equipment | Brand Name | Model Name | Serial No. |
| 1 | Notebook | DELL | E5500 | DOC |
| 2 | USB Dongle | CSL | CS508 | N/A |

1.4 Testing Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ◆ 47 CFR FCC Part 15
- ◆ ANSI C63.10-2009
- ◆ FCC KDB 558074
- ◆ FCC KDB 662911
- ◆ FCC KDB 412172

1.5 Testing Location Information

| Testing Location | | | | |
|-------------------------------------|---------------|--|----------------------|---------------------|
| <input checked="" type="checkbox"/> | HWA YA | ADD : No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C | | |
| | | TEL : 886-3-327-3456 | FAX : 886-3-327-0973 | |
| Test Condition | Test Site No. | Test Engineer | Test Environment | Test Date |
| RF Conducted | TH01-HY | Shiming | 25.5°C / 47% | 09-Nov-12~10-Nov-12 |
| AC Conduction | CO04-HY | Bill | 25.3°C / 51% | 12-Nov-12 |
| Radiated Emission | 03CH02-HY | Daniel | 24.3°C / 56% | 10-Nov-12~13-Nov-12 |

1.6 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2))

| Measurement Uncertainty | | | |
|-----------------------------------|---------------|-------------|-------|
| Test Item | | Uncertainty | Limit |
| AC power-line conducted emissions | | ±2.26 dB | N/A |
| Emission bandwidth, 6dB bandwidth | | ±1.42 % | N/A |
| RF output power, conducted | | ±0.63 dB | N/A |
| Power density, conducted | | ±0.81 dB | N/A |
| Unwanted emissions, conducted | 30 – 1000 MHz | ±0.51 dB | N/A |
| | 1 – 18 GHz | ±0.67 dB | N/A |
| | 18 – 40 GHz | ±0.83 dB | N/A |
| | 40 – 200 GHz | N/A | N/A |
| All emissions, radiated | 30 – 1000 MHz | ±2.56 dB | N/A |
| | 1 – 18 GHz | ±3.59 dB | N/A |
| | 18 – 40 GHz | ±3.82 dB | N/A |
| | 40 – 200 GHz | N/A | N/A |
| Temperature | | ±0.8 °C | N/A |
| Humidity | | ±3 % | N/A |
| DC and low frequency voltages | | ±3 % | N/A |
| Time | | ±1.42 % | N/A |
| Duty Cycle | | ±1.42 % | N/A |

2 Test Configuration of EUT

2.1 The Worst Case Modulation Configuration

| Worst Modulation Used for Conformance Testing | | |
|---|------------------------------------|-----------------------|
| Modulation Mode | Transmit Chains (N _{TX}) | RF Output Power (dBm) |
| CSS | 1 | 13.93 |

Note 1: RF output power specifies that Maximum Peak Conducted Output Power.

2.2 Test Channel Frequencies Configuration

| Test Channel Frequencies Configuration | |
|--|--------------------------------|
| Modulation Mode | Test Channel Frequencies (MHz) |
| CSS | 2442-(F1) |

2.3 The Worst Case Measurement Configuration

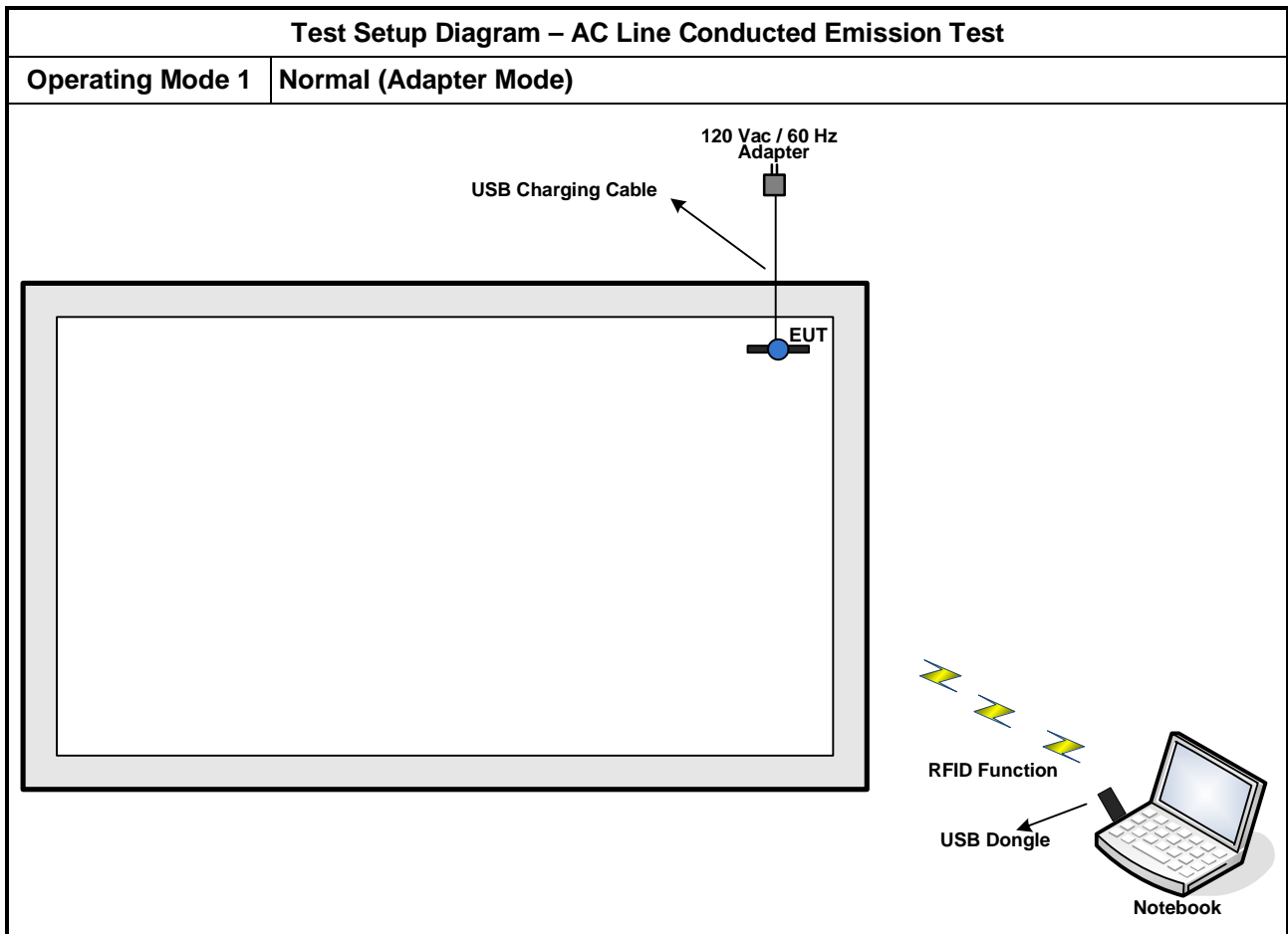
| The Worst Case Mode for Following Conformance Tests | |
|---|---|
| Tests Item | AC power-line conducted emissions |
| Condition | AC power-line conducted measurement for line and neutral Test Voltage: 120Vac / 60Hz |
| Operating Mode | Operating Mode Description |
| 1 | Normal (Adapter Mode) |
| 2 | Normal (USB Mode) |

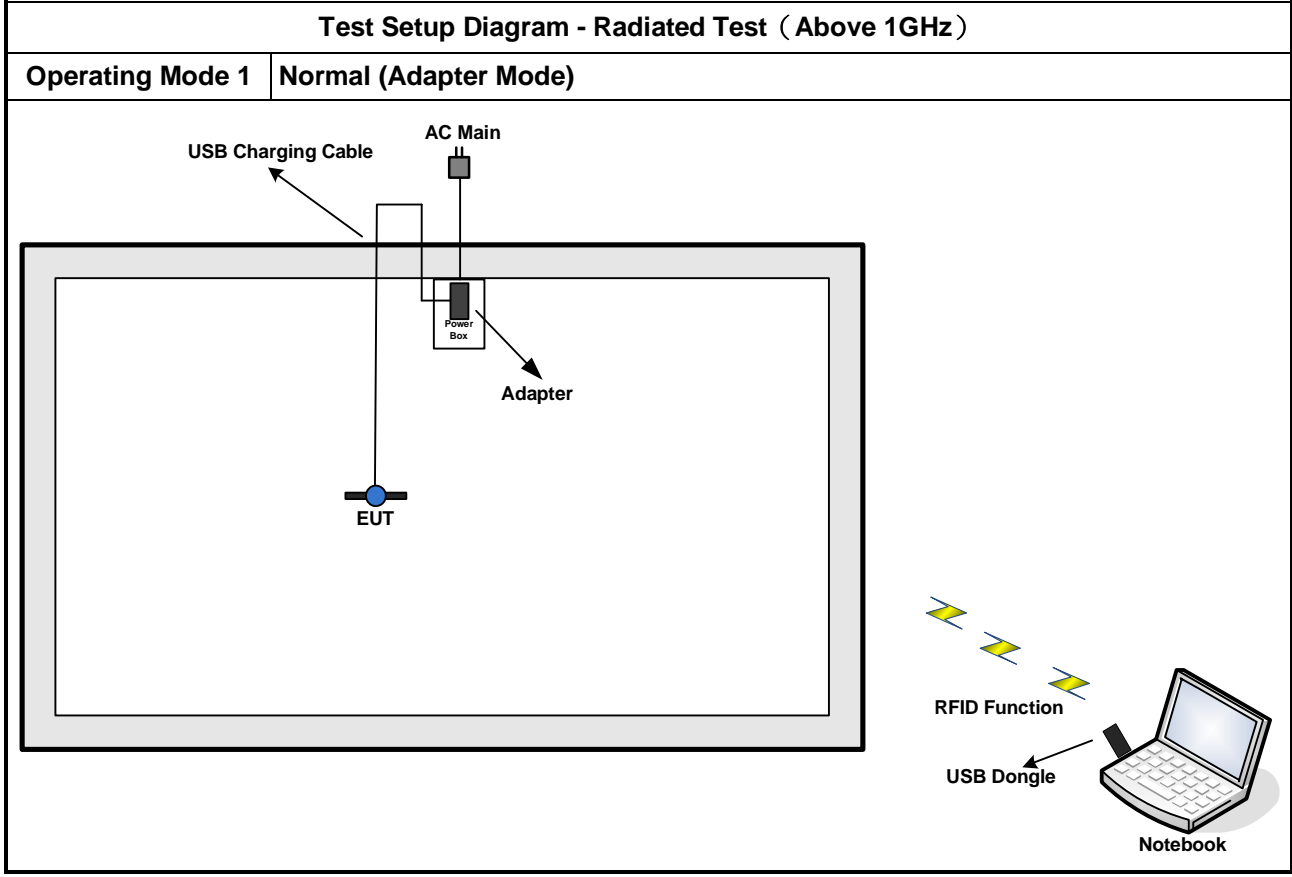
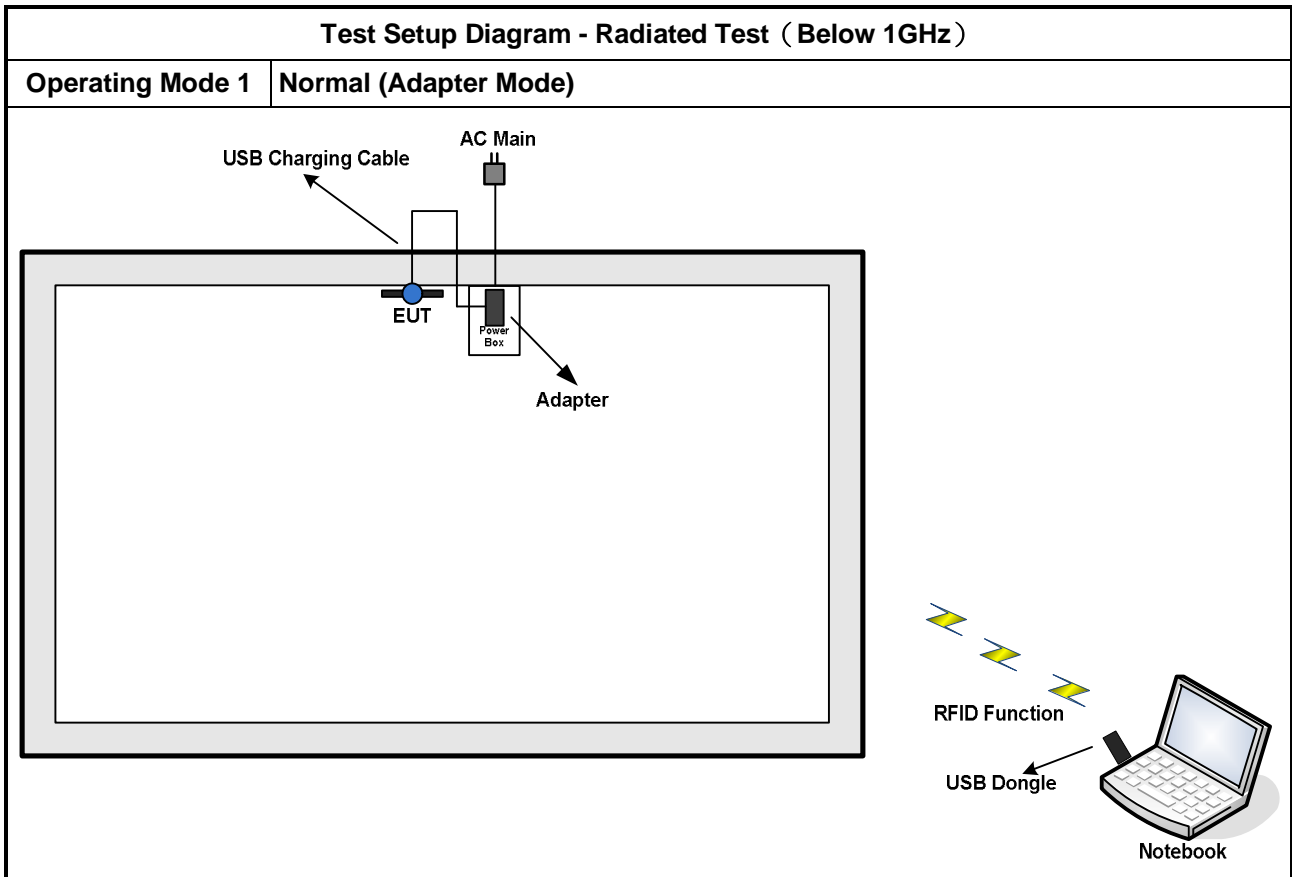
For operating mode 1 is the worst case and it was record in this test report.

| The Worst Case Mode for Following Conformance Tests | |
|---|---|
| Tests Item | RF Output Power, Power Spectral Density, 6 dB Bandwidth |
| Test Condition | Conducted measurement at transmit chains |
| Modulation Mode | CSS |

| The Worst Case Mode for Following Conformance Tests | |
|---|--|
| Tests Item | Transmitter Radiated Unwanted Emissions Transmitter Radiated Bandedge Emissions |
| Test Condition | Radiated measurement If EUT consist of multiple antenna assembly (multiple antenna are used in EUT regardless of spatial multiplexing MIMO configuration), the radiated test should be performed with highest antenna gain of each antenna type. |
| User Position | <input type="checkbox"/> EUT will be placed in fixed position. <input type="checkbox"/> EUT will be placed in mobile position and operating multiple positions. EUT shall be performed two orthogonal planes. The worst planes is X. <input checked="" type="checkbox"/> EUT will be a hand-held or body-worn battery-powered devices and operating multiple positions. EUT shall be performed two or three orthogonal planes. |
| Operating Mode < 1GHz | <input checked="" type="checkbox"/> Normal (Adapter Mode) <input checked="" type="checkbox"/> Normal (USB Mode) |
| Modulation Mode | CSS |
| For operating mode 1 is the worst case and it was record in this test report. | |

2.4 Test Setup Diagram





3 Transmitter Test Result

3.1 AC Power-line Conducted Emissions

3.1.1 AC Power-line Conducted Emissions Limit

| AC Power-line Conducted Emissions Limit | | |
|---|------------|-----------|
| Frequency Emission (MHz) | Quasi-Peak | Average |
| 0.15-0.5 | 66 - 56 * | 56 - 46 * |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |

Note 1: * Decreases with the logarithm of the frequency.

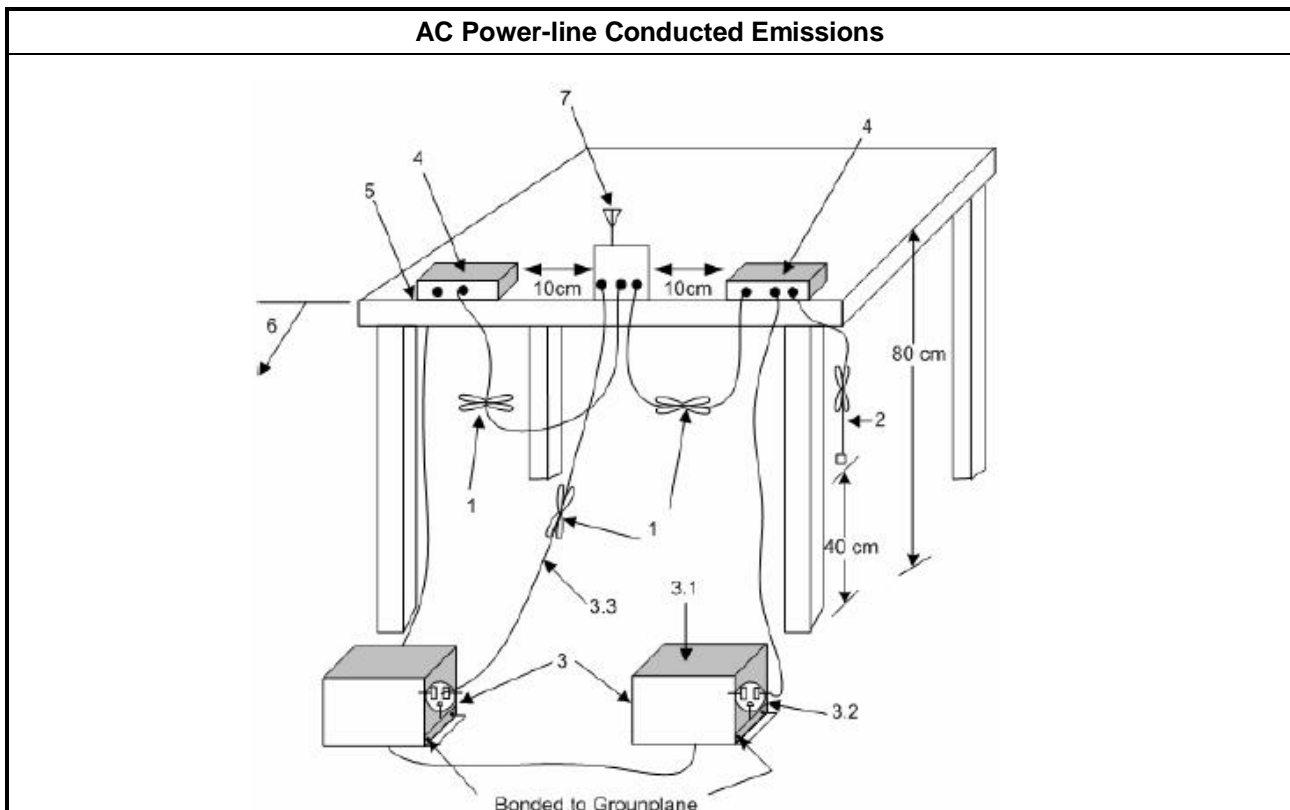
3.1.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

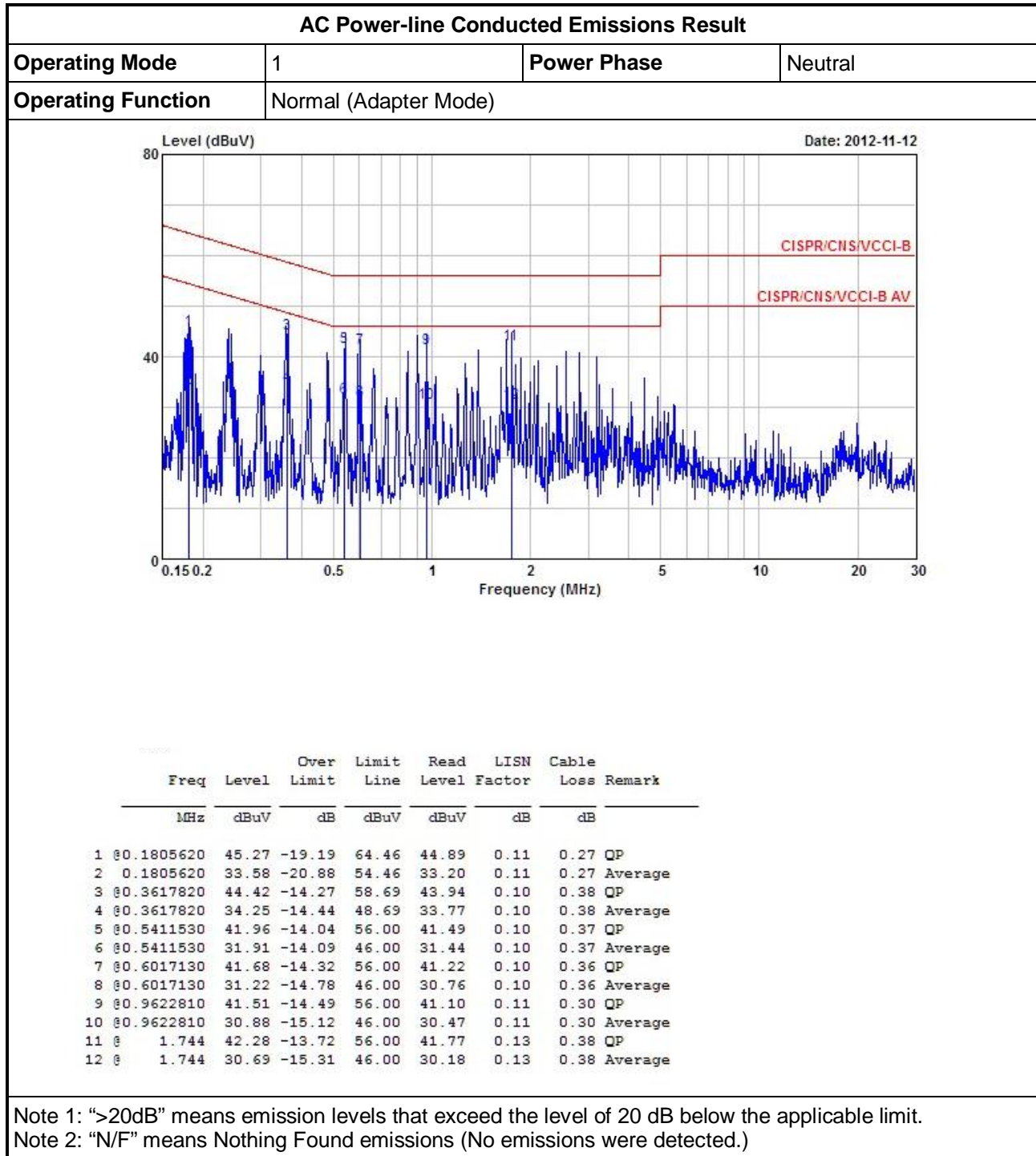
3.1.3 Test Procedures

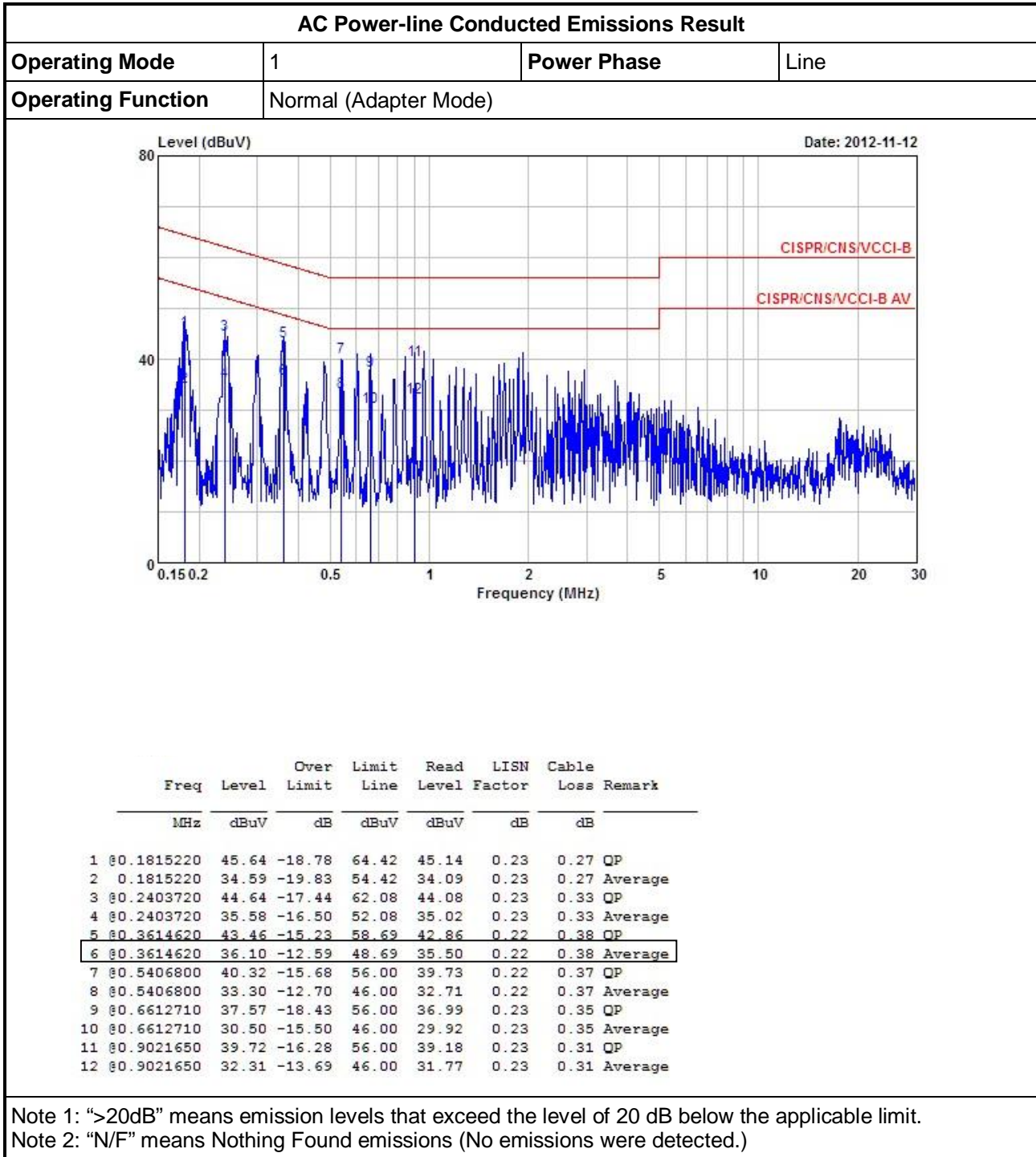
| Test Method |
|--|
| <input checked="" type="checkbox"/> Refer as ANSI C63.10-2009, clause 6.2 for AC power-line conducted emissions. |

3.1.4 Test Setup



3.1.5 Test Result of AC Power-line Conducted Emissions





3.2 6dB Bandwidth

3.2.1 6dB Bandwidth Limit

| 6dB Bandwidth Limit | |
|--|--------------------------------|
| Systems using digital modulation techniques: | |
| <input checked="" type="checkbox"/> | 6 dB bandwidth \geq 500 kHz. |

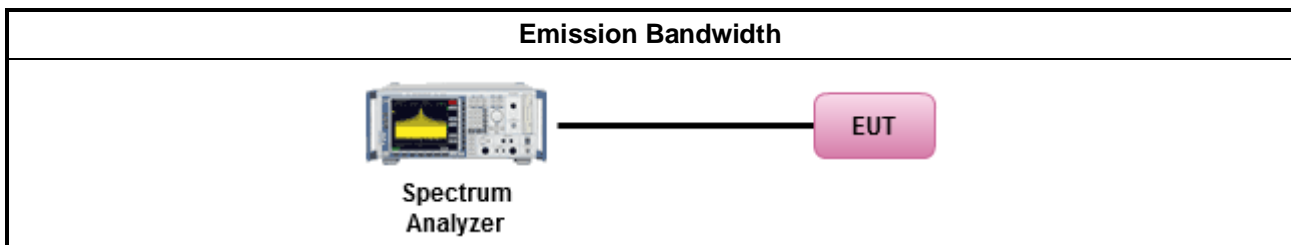
3.2.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.2.3 Test Procedures

| Test Method | |
|-------------------------------------|---|
| <input checked="" type="checkbox"/> | For the emission bandwidth shall be measured using one of the options below: |
| <input checked="" type="checkbox"/> | Refer as FCC KDB 558074, clause 7.1 Option 1 for 6 dB bandwidth measurement. |
| <input type="checkbox"/> | Refer as FCC KDB 558074, clause 7.2 Option 2 for 6 dB bandwidth measurement. |
| <input type="checkbox"/> | Refer as ANSI C63.10, clause 6.9.1 for occupied bandwidth testing. |
| <input checked="" type="checkbox"/> | For conducted measurement. |
| <input checked="" type="checkbox"/> | The EUT supports single transmit chain and measurements performed on this transmit chain. |
| <input checked="" type="checkbox"/> | The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case. |

3.2.4 Test Setup



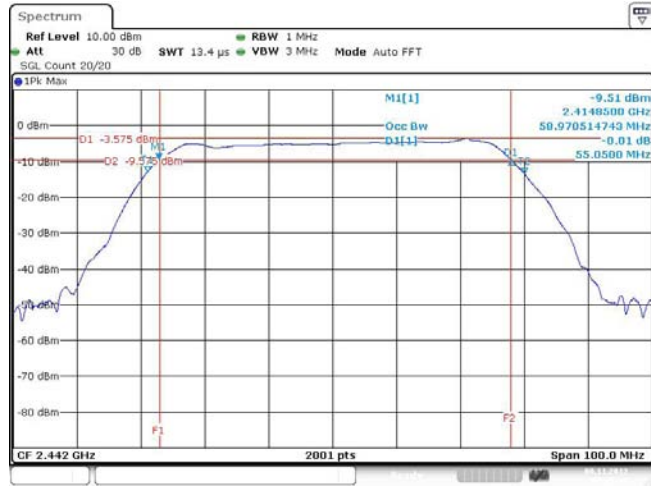
3.2.5 Test Result of Emission Bandwidth

| Emission Bandwidth Result | | | | | | | | | | |
|---------------------------|-----------------|-------------|--------------------------|---|---|---|----------------|---|---|---|
| Condition | | | Emission Bandwidth (MHz) | | | | | | | |
| Modulation Mode | N _{TX} | Freq. (MHz) | 99% Bandwidth | | | | 6dB Bandwidth | | | |
| | | | Chain-Port 1 | - | - | - | Chain-Port 1 | - | - | - |
| CSS | 1 | 2442 | 58.97 | - | - | - | 55.05 | - | - | - |
| Limit | | | N/A | | | | \geq 500 kHz | | | |
| Result | | | Complied | | | | | | | |

Note 1: N_{TX} = Number of Transmit Chains

Worst Emission Bandwidth Plots

CSS



3.3 RF Output Power

3.3.1 RF Output Power Limit

| RF Output Power Limit | |
|--|---|
| Maximum Peak Conducted Output Power or Maximum Conducted Output Power Limit | |
| <input checked="" type="checkbox"/> 2400-2483.5 MHz Band: | |
| <input checked="" type="checkbox"/> | If $G_{TX} \leq 6$ dBi, then $P_{Out} \leq 30$ dBm (1 W) |
| <input checked="" type="checkbox"/> | Point-to-multipoint systems (P2M): If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)$ dBm |
| <input type="checkbox"/> | Point-to-point systems (P2P): If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)/3$ dBm |
| <input type="checkbox"/> | Smart antenna system (SAS): |
| <input type="checkbox"/> | Single beam: If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)/3$ dBm |
| <input type="checkbox"/> | Overlap beam: If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)/3$ dBm |
| <input type="checkbox"/> | Aggregate power on all beams: If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)/3 + 8$ dBm |
| e.i.r.p. Power Limit: | |
| <input checked="" type="checkbox"/> 2400-2483.5 MHz Band | |
| <input checked="" type="checkbox"/> | Point-to-multipoint systems (P2M): $P_{eirp} \leq 36$ dBm (4 W) |
| <input type="checkbox"/> | Point-to-point systems (P2P): $P_{eirp} \leq \text{MAX}(36, [P_{Out} + G_{TX}])$ dBm |
| <input type="checkbox"/> | Smart antenna system (SAS) |
| <input type="checkbox"/> | Single beam: $P_{eirp} \leq \text{MAX}(36, P_{Out} + G_{TX})$ dBm |
| <input type="checkbox"/> | Overlap beam: $P_{eirp} \leq \text{MAX}(36, P_{Out} + G_{TX})$ dBm |
| <input type="checkbox"/> | Aggregate power on all beams: $P_{eirp} \leq \text{MAX}(36, [P_{Out} + G_{TX} + 8])$ dBm |
| P_{Out} = maximum peak conducted output power or maximum conducted output power in dBm, G_{TX} = the maximum transmitting antenna directional gain in dBi. P_{eirp} = e.i.r.p. Power in dBm. | |

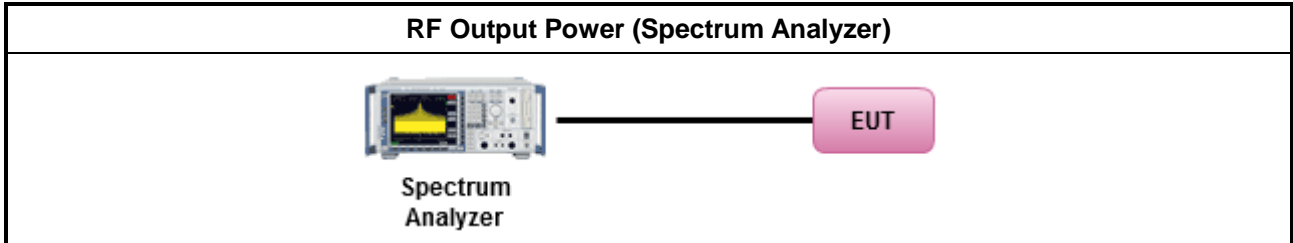
3.3.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.3.3 Test Procedures

| Test Method | |
|-------------------------------------|--|
| <input checked="" type="checkbox"/> | Maximum Peak Conducted Output Power |
| <input type="checkbox"/> | Refer as FCC KDB 558074, clause 8.1.1 Option 1 (RBW ≥ EBW method). |
| <input type="checkbox"/> | Refer as FCC KDB 558074, clause 8.1.2 Option 2 (integrated band power method). |
| <input checked="" type="checkbox"/> | Refer as FCC KDB 558074, clause 8.1.3 Option 2 (peak power meter for VBW ≥ DTS BW) |
| <input checked="" type="checkbox"/> | Maximum Conducted (Average) Output Power |
| <input type="checkbox"/> | Refer as FCC KDB 558074, clause 8.2.1 Option 1 (spectral trace averaging). |
| <input checked="" type="checkbox"/> | Refer as FCC KDB 558074, clause 8.2.2 Option 2 (slow sweep speed). |
| <input type="checkbox"/> | Refer as FCC KDB 558074, clause 8.2.3 Option 3 (average power meter). |
| <input checked="" type="checkbox"/> | For conducted measurement. |
| <input checked="" type="checkbox"/> | The EUT supports single transmit chain and measurements performed on this transmit chain. |
| <input checked="" type="checkbox"/> | The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case. |
| <input checked="" type="checkbox"/> | The EUT supports multiple transmit chains using options given below: Refer as FCC KDB 662911, In-band power measurements. Using the measure-and-sum approach, measured all transmit ports individually. Sum the power (in linear power units e.g., mW) of all ports for each individual sample and save them. |
| <input checked="" type="checkbox"/> | If multiple transmit chains, EIRP calculation could be following as methods: $P_{total} = P_1 + P_2 + \dots + P_n$ (calculated in linear unit [mW] and transfer to log unit [dBm]) $EIRP_{total} = P_{total} + DG$ |

3.3.4 Test Setup



3.3.5 Directional Gain for Power Measurement

| Directional Gain (DG) Result | | | | | |
|--------------------------------|----------|-----------------|-----------------|------|-----------------|
| Transmit Chains No. | | 1 | - | - | - |
| Maximum G _{ANT} (dBi) | | 2.5 | - | - | - |
| Modulation Mode | DG (dBi) | N _{TX} | N _{SS} | STBC | Array Gain (dB) |
| CSS | 2.5 | 1 | 1 | - | - |

Note 1: For all transmitter outputs with equal antenna gains, directional gain is to be computed as follows:
 Any transmit signals are correlated, Directional Gain = G_{ANT} + 10 log(N_{TX})
 All transmit signals are completely uncorrelated, Directional Gain = G_{ANT}

Note 2: For all transmitter outputs with unequal antenna gains, directional gain is to be computed as follows:
 Any transmit signals are correlated, Directional Gain = 10 log[(10^{G₁/20} + ... + 10^{G_N/20})² / N_{TX}]
 All transmit signals are completely uncorrelated, Directional Gain = 10 log[(10^{G₁/10} + ... + 10^{G_N/10}) / N_{TX}]

Note 3: For Spatial Multiplexing, Directional Gain (DG) = G_{ANT} + 10 log(N_{TX}/N_{SS}),
 where N_{SS} = the number of independent spatial streams data.

Note 4: For CDD transmissions, directional gain is calculated as power measurements:
 Directional Gain (DG) = G_{ANT} + Array Gain, where Array Gain is as follows:
 Array Gain = 0 dB (i.e., no array gain) for N_{TX} ≤ 4;
 Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{TX};

3.3.6 Test Result of Maximum Peak Conducted Output Power

| Maximum Peak Conducted Output Power Result | | | | | | | | | | | |
|--|-----------------|-------------|-----------------------|--------------|--------------|--------------|-----------|-------------|----------|------------|------------|
| Condition | | | RF Output Power (dBm) | | | | | | | | |
| Modulation Mode | N _{TX} | Freq. (MHz) | Chain Port 1 | Chain Port 2 | Chain Port 3 | Chain Port 4 | Sum Chain | Power Limit | DG (dBi) | EIRP Power | EIRP Limit |
| CSS | 1 | 2442 | 13.93 | - | - | - | 13.93 | 30 | 2.5 | 16.43 | 36 |
| Result | | | Complied | | | | | | | | |

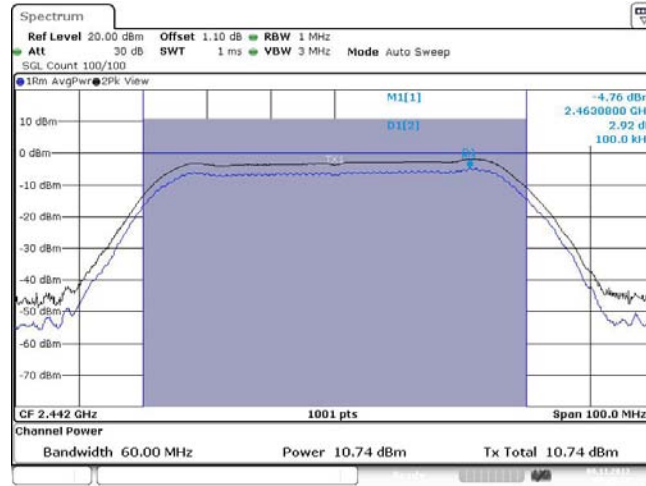
3.3.7 Test Result of Maximum Conducted Output Power

| Maximum Conducted Output Power | | | | | | | | | | | |
|--------------------------------|-----------------|-------------|-----------------------|--------------|--------------|--------------|-----------|-------------|----------|------------|------------|
| Condition | | | RF Output Power (dBm) | | | | | | | | |
| Modulation Mode | N _{TX} | Freq. (MHz) | Chain Port 1 | Chain Port 2 | Chain Port 3 | Chain Port 4 | Sum Chain | Power Limit | DG (dBi) | EIRP Power | EIRP Limit |
| CSS | 1 | 2442 | 10.74 | - | - | - | 10.74 | 30 | 2.5 | 13.24 | 36 |
| Result | | | Complied | | | | | | | | |



Worst RF Output Power Plots

CSS



3.4 Power Spectral Density

3.4.1 Power Spectral Density Limit

| Power Spectral Density Limit | |
|-------------------------------------|--|
| <input checked="" type="checkbox"/> | Power Spectral Density (PSD) \leq 8 dBm/3kHz |

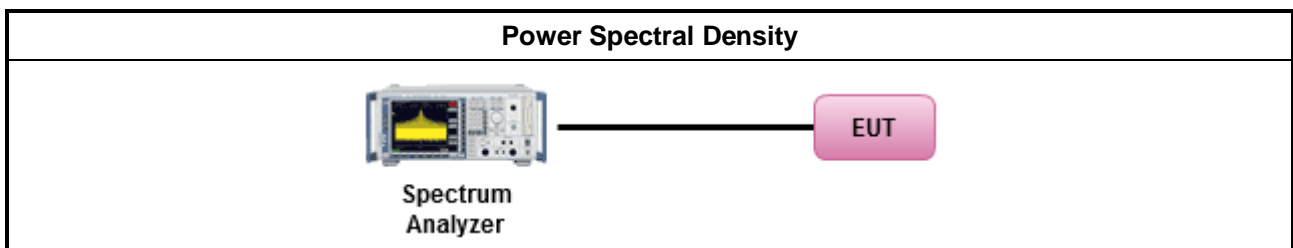
3.4.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.4.3 Test Procedures

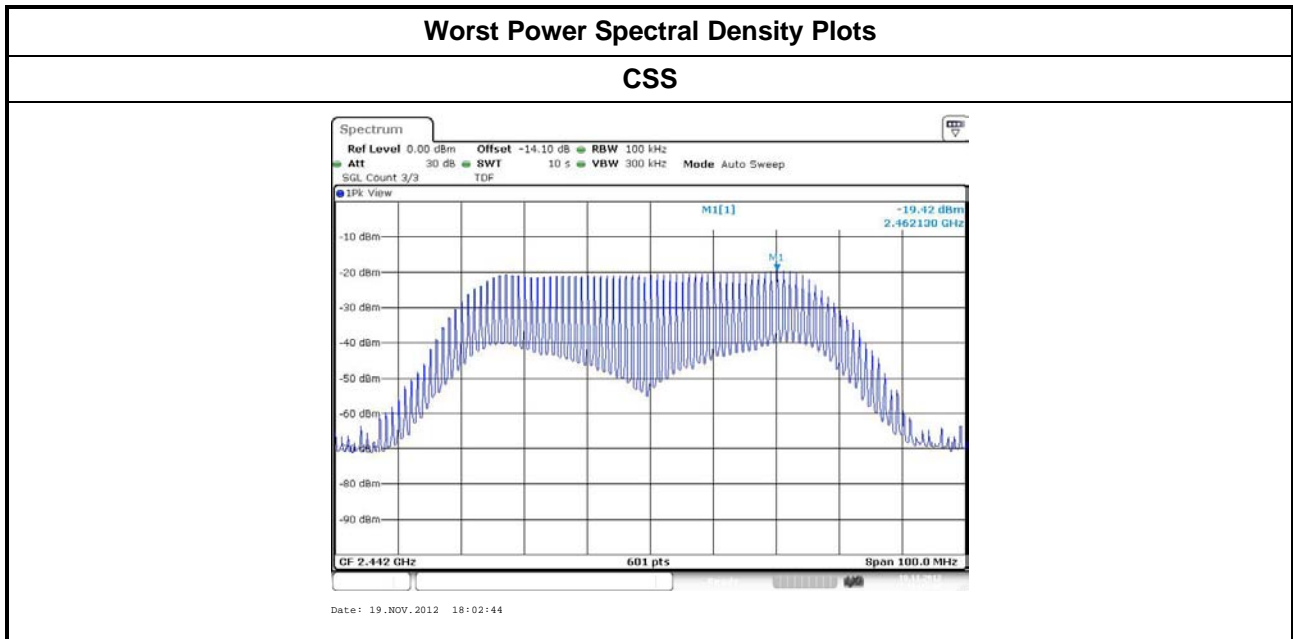
| Test Method | |
|-------------------------------------|--|
| <input checked="" type="checkbox"/> | Power spectral density procedures that the same method as used to determine the conducted output power shall be used to determine the power spectral density. In addition, the use of a peak PSD procedure will always result in a "worst-case" measured level for comparison to the limit. Therefore, whenever the DTS bandwidth exceeds 500 kHz, it is acceptable to utilize the peak PSD procedure to demonstrate compliance to the PSD limit, regardless of how the fundamental output power was measured. For the power spectral density shall be measured using below options: |
| <input checked="" type="checkbox"/> | Refer as FCC KDB 558074, clause 9.1 Option 1 - (RBW \geq 3kHz; sweep=auto, detector=peak). |
| <input type="checkbox"/> | Refer as FCC KDB 558074, clause 9.2 Option 2 - (RBW \geq 3kHz; sweep=auto, average=100). |
| <input type="checkbox"/> | Refer as FCC KDB 558074, clause 9.3 Option 3 - (RBW \geq 3kHz; slow sweep speed). |
| <input type="checkbox"/> | Refer as FCC KDB 558074, clause 9.4 Alternative 1 (average PSD; Add 10log (1/duty cycle)). |
| <input checked="" type="checkbox"/> | RBW>3kHz, add the bandwidth correction factor (BWCF) adjusting in PSD per 3kHz. |
| <input checked="" type="checkbox"/> | For conducted measurement. |
| <input checked="" type="checkbox"/> | The EUT supports single transmit chain and measurements performed on this transmit chain. |
| <input checked="" type="checkbox"/> | The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case. |

3.4.4 Test Setup



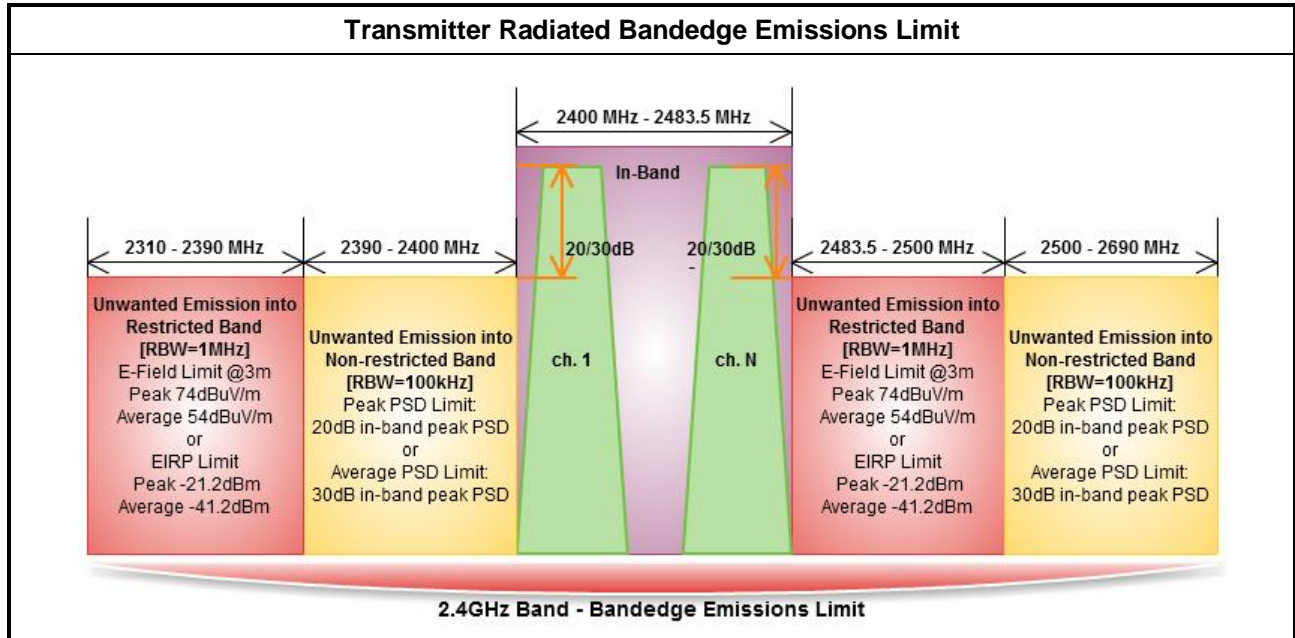
3.4.5 Test Result of Power Spectral Density

| Power Spectral Density Result | | | | | | | | |
|--|-----------------|-------------|-----------------------------------|---|---|---|---|-------------|
| Condition | | | Power Spectral Density (dBm/3kHz) | | | | | |
| Modulation Mode | N _{TX} | Freq. (MHz) | Sum Chain | - | - | - | - | Power Limit |
| CSS | 1 | 2442 | -19.42 | - | - | - | - | 8 |
| Result | | | Complied | | | | | |
| Note 1: PSD [dBm/3kHz] = sum each transmit chains by bin-to-bin PSD [dBm/100kHz] + BWFC [-15.2 dB] | | | | | | | | |



3.5 Transmitter Radiated Bandedge Emissions

3.5.1 Transmitter Radiated Bandedge Emissions Limit



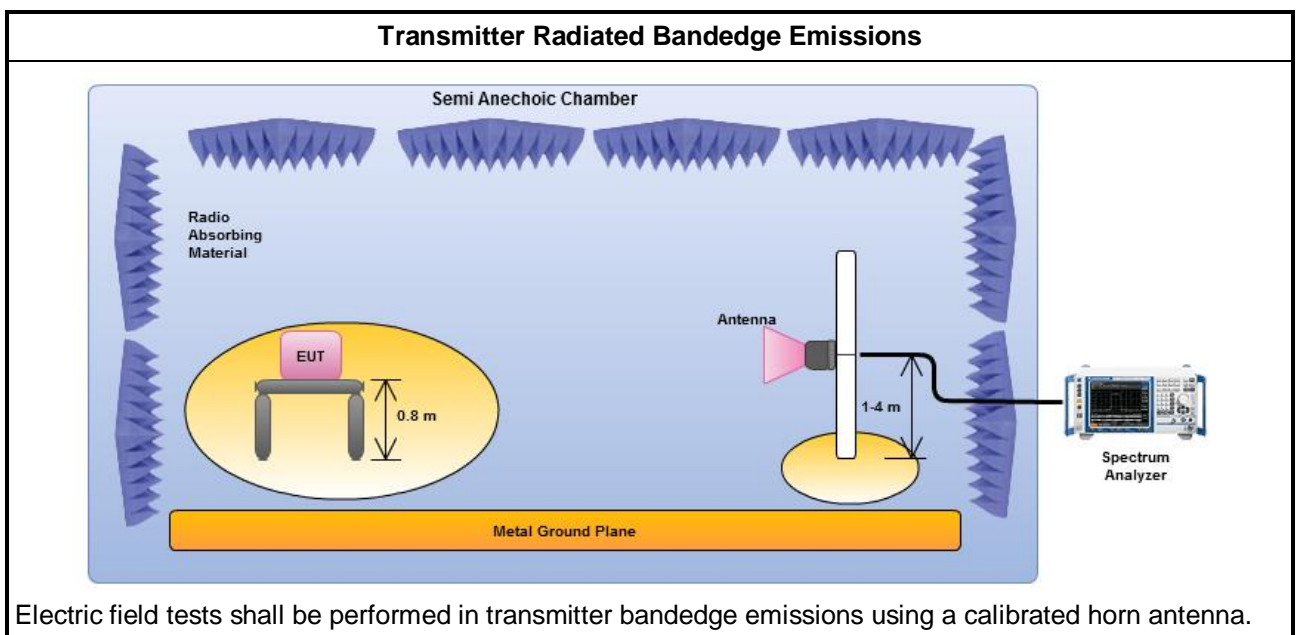
3.5.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

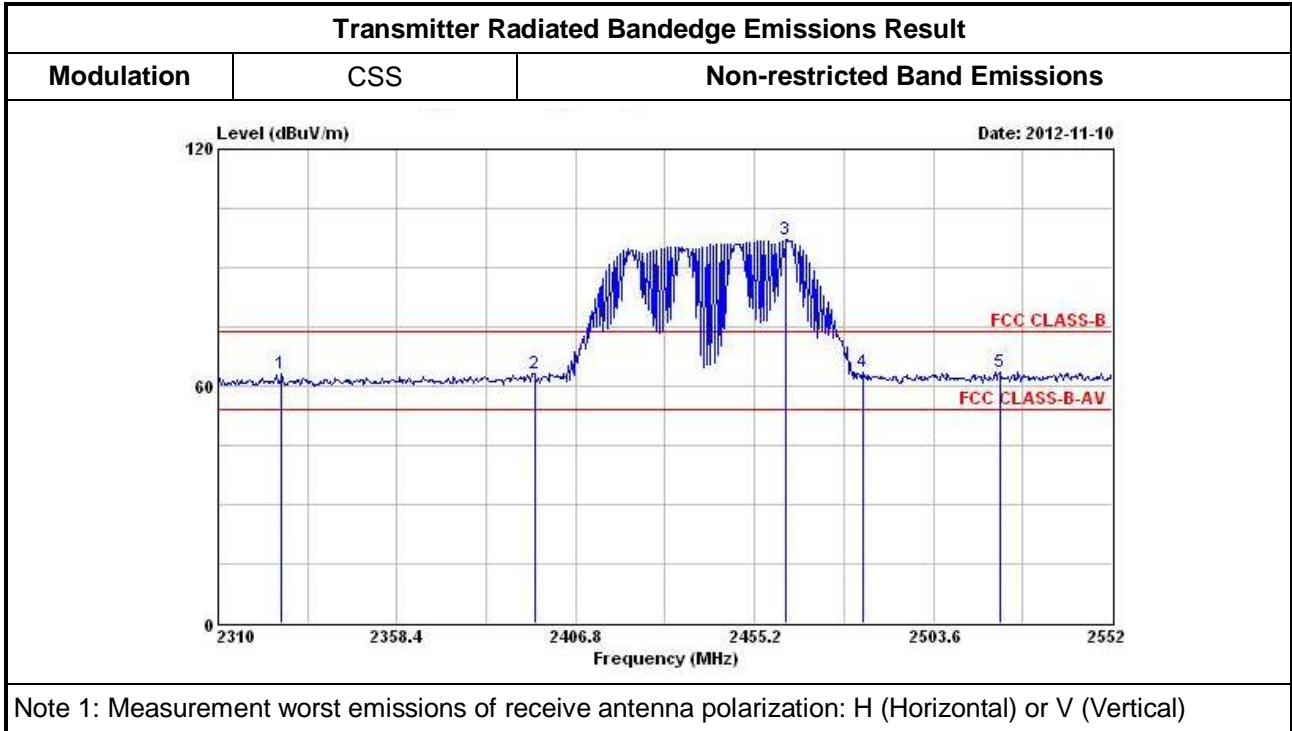
3.5.3 Test Procedures

| Test Method | |
|-------------------------------------|---|
| <input checked="" type="checkbox"/> | The average emission levels shall be measured in [duty cycle \geq 98 or duty factor]. |
| <input checked="" type="checkbox"/> | Refer as ANSI C63.10, clause 6.9.2.2 bandedge testing shall be performed at the lowest frequency channel and highest frequency channel within the allowed operating band. |
| <input checked="" type="checkbox"/> | For the transmitter unwanted emissions shall be measured using following options below: |
| <input checked="" type="checkbox"/> | Refer as FCC KDB 558074, clause 10.1 for unwanted emissions into non-restricted bands. |
| <input checked="" type="checkbox"/> | Refer as FCC KDB 558074, clause 10.2 for unwanted emissions into restricted bands. |
| <input type="checkbox"/> | Refer as FCC KDB 558074, clause 10.2.3.3 and 8.2.1 Option 1 (spectral trace averaging) |
| <input type="checkbox"/> | Refer as FCC KDB 558074, clause 10.2.3.3 and 8.2.1 Option 2 (slow sweep speed). |
| <input checked="" type="checkbox"/> | Refer as ANSI C63.10, clause 4.2.3.2.3 (Reduced VBW). |
| <input type="checkbox"/> | Refer as ANSI C63.10, clause 4.2.3.2.4 average value of pulsed emissions. |
| <input checked="" type="checkbox"/> | Refer as FCC KDB 558074, clause 10.2.3.2 and 8.1.1 measurement procedure peak limit. |
| <input checked="" type="checkbox"/> | For the transmitter bandedge emissions shall be measured using following options below: |
| <input type="checkbox"/> | Refer as FCC KDB 558074, clause 10.2.5.2 for narrower resolution bandwidth using the band power and summing the spectral levels (i.e., 100 kHz or 1 MHz). |
| <input checked="" type="checkbox"/> | Refer as ANSI C63.10, clause 6.9.2 for band-edge testing. |
| <input type="checkbox"/> | Refer as ANSI C63.10, clause 6.9.3 for marker-delta method for band-edge measurements. |
| <input checked="" type="checkbox"/> | For radiated measurement, refer as FCC KDB 558074, clause 10.2.1. |
| <input checked="" type="checkbox"/> | For conducted measurement, refer as FCC KDB 558074, clause 10.2.2. |

3.5.4 Test Setup



3.5.5 Test Result of Transmitter Radiated Bandedge Emissions



| Transmitter Radiated Bandedge Emissions Result | | | | | | | | |
|---|----------------------|-----------------------------|---------------------------|----------------------|-------------------------|----------------|------------|-------------|
| Modulation | CSS | | Restricted Band Emissions | | | | | |
| Restricted Band (MHz) | Test Ch. Freq. (MHz) | In-band PSD [i] (dBuV/1MHz) | RBE Freq. (MHz) | Measure Distance (m) | Out-Band Level (dBuV/m) | Limit (dBuV/m) | Level Type | Pol. note 1 |
| 2310-2390 | 2442 | 98.12 | 2382.01 | 3 | 60.35 | 74 | PK | H |
| 2310-2390 | 2442 | 96.12 | 2484.61 | 3 | 52.43 | 54 | AV | H |
| <p>Note 1: Measurement worst emissions of receive antenna polarization: H (Horizontal) or V (Vertical).</p> | | | | | | | | |

3.6 Transmitter Radiated Unwanted Emissions

3.6.1 Transmitter Radiated Unwanted Emissions Limit

| Restricted Band Emissions Limit | | | |
|---------------------------------|-----------------------|-------------------------|----------------------|
| Frequency Range (MHz) | Field Strength (uV/m) | Field Strength (dBuV/m) | Measure Distance (m) |
| 0.009~0.490 | 2400/F(kHz) | 48.5 - 13.8 | 300 |
| 0.490~1.705 | 24000/F(kHz) | 33.8 - 23 | 30 |
| 1.705~30.0 | 30 | 29 | 30 |
| 30~88 | 100 | 40 | 3 |
| 88~216 | 150 | 43.5 | 3 |
| 216~960 | 200 | 46 | 3 |
| Above 960 | 500 | 54 | 3 |

Note 1: Test distance for frequencies at or above 30 MHz, measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).

Note 2: Test distance for frequencies at below 30 MHz, measurements may be performed at a distance closer than the EUT limit distance; however, an attempt should be made to avoid making measurements in the near field. When performing measurements below 30 MHz at a closer distance than the limit distance, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two or more distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). The test report shall specify the extrapolation method used to determine compliance of the EUT.

| Un-restricted Band Emissions Limit | |
|------------------------------------|------------|
| RF output power procedure | Limit (dB) |
| Peak output power procedure | 20 |
| Average output power procedure | 30 |

Note 1: If the peak output power procedure is used to measure the fundamental emission power to demonstrate compliance to requirements, then the peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum measured in-band peak PSD level.

Note 2: If the average output power procedure is used to measure the fundamental emission power to demonstrate compliance to requirements, then the power in any 100 kHz outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum measured in-band average PSD level.

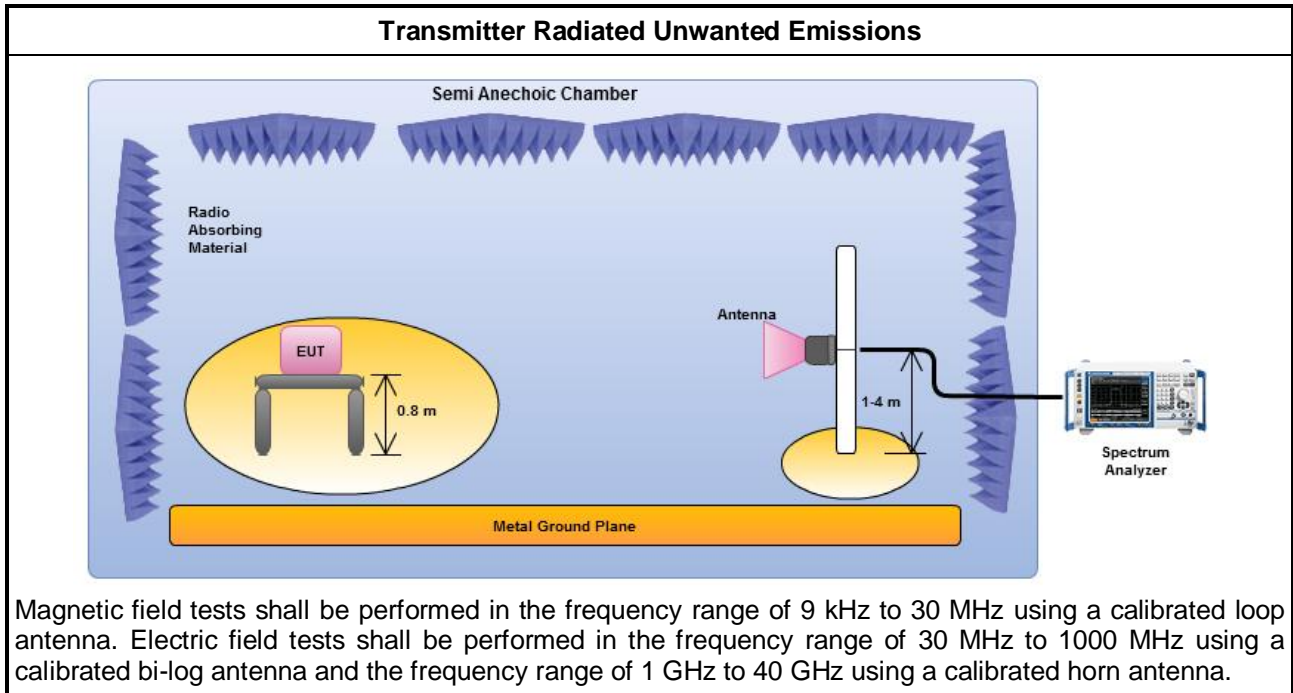
3.6.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.6.3 Test Procedures

| Test Method | |
|-------------------------------------|---|
| <input checked="" type="checkbox"/> | Measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements). |
| <input checked="" type="checkbox"/> | Measurements in the frequency range 10 GHz - 18GHz are typically made at a closer distance 1m, because the instrumentation noise floor is typically close to the radiated emission limit. |
| <input checked="" type="checkbox"/> | Measurements in the frequency range above 18 GHz - 25GHz are typically made at a closer distance 0.5m, because the instrumentation noise floor is typically close to the radiated emission limit. |
| <input checked="" type="checkbox"/> | The average emission levels shall be measured in [duty cycle \geq 98 or duty factor]. |
| <input checked="" type="checkbox"/> | For the transmitter unwanted emissions shall be measured using following options below: |
| <input checked="" type="checkbox"/> | Refer as FCC KDB 558074, clause 10.1 for unwanted emissions into non-restricted bands. |
| <input checked="" type="checkbox"/> | Refer as FCC KDB 558074, clause 10.2 for unwanted emissions into restricted bands. |
| <input type="checkbox"/> | Refer as FCC KDB 558074, clause 10.2.3.3 and 8.2.1 Option 1 (spectral trace averaging) |
| <input type="checkbox"/> | Refer as FCC KDB 558074, clause 10.2.3.3 and 8.2.1 Option 2 (slow sweep speed). |
| <input checked="" type="checkbox"/> | Refer as ANSI C63.10, clause 4.2.3.2.3 (Reduced VBW) – Duty cycle \geq 98%. |
| <input type="checkbox"/> | Refer as ANSI C63.10, clause 4.2.3.2.4 average value of pulsed emissions. |
| <input checked="" type="checkbox"/> | Refer as FCC KDB 558074, clause 10.2.3.2 and 8.1.1 measurement procedure peak limit. |
| <input type="checkbox"/> | Refer as FCC KDB 558074, clause 10.2.3.1 measurement procedure Quasi-Peak limit. |
| <input checked="" type="checkbox"/> | For radiated measurement, refer as FCC KDB 558074, clause 10.2.1. |
| <input checked="" type="checkbox"/> | Refer as ANSI C63.10, clause 6.4 for radiated emissions from below 30 MHz. |
| <input checked="" type="checkbox"/> | Refer as ANSI C63.10, clause 6.5 for radiated emissions from 30 MHz to 1000 MHz. |
| <input checked="" type="checkbox"/> | Refer as ANSI C63.10, clause 6.6 for radiated emissions from above 1 GHz. |
| <input checked="" type="checkbox"/> | For conducted and cabinet radiation measurement, refer as FCC KDB 558074, clause 10.2.2. |
| <input checked="" type="checkbox"/> | For conducted unwanted emissions into non-restricted bands (relative emission limits). Devices with multiple transmit chains: Refer as FCC KDB 662911, when testing out-of-band and spurious emissions against relative emission limits, tests may be performed on each output individually without summing or adding 10 log(N) if the measurements are made relative to the in-band emissions on the individual outputs. |
| <input checked="" type="checkbox"/> | For conducted unwanted emissions into restricted bands (absolute emission limits). Devices with multiple transmit chains using options given below: (1) Measure and sum the spectra across the outputs or (2) Measure and add 10 log(N) dB |

3.6.4 Test Setup



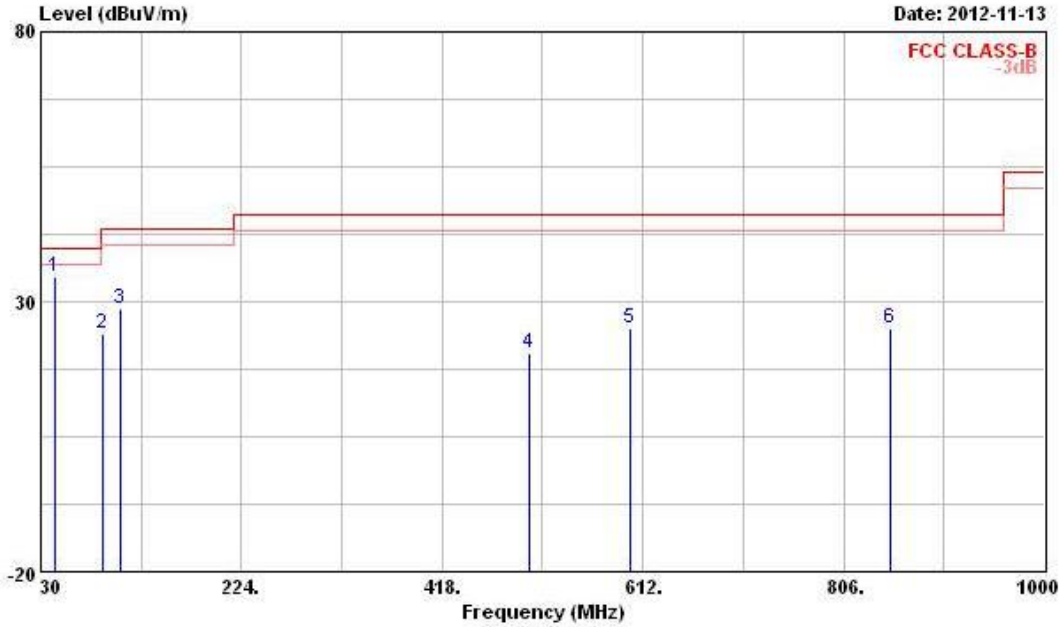
3.6.5 Transmitter Radiated Unwanted Emissions (Below 30MHz)

All amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.



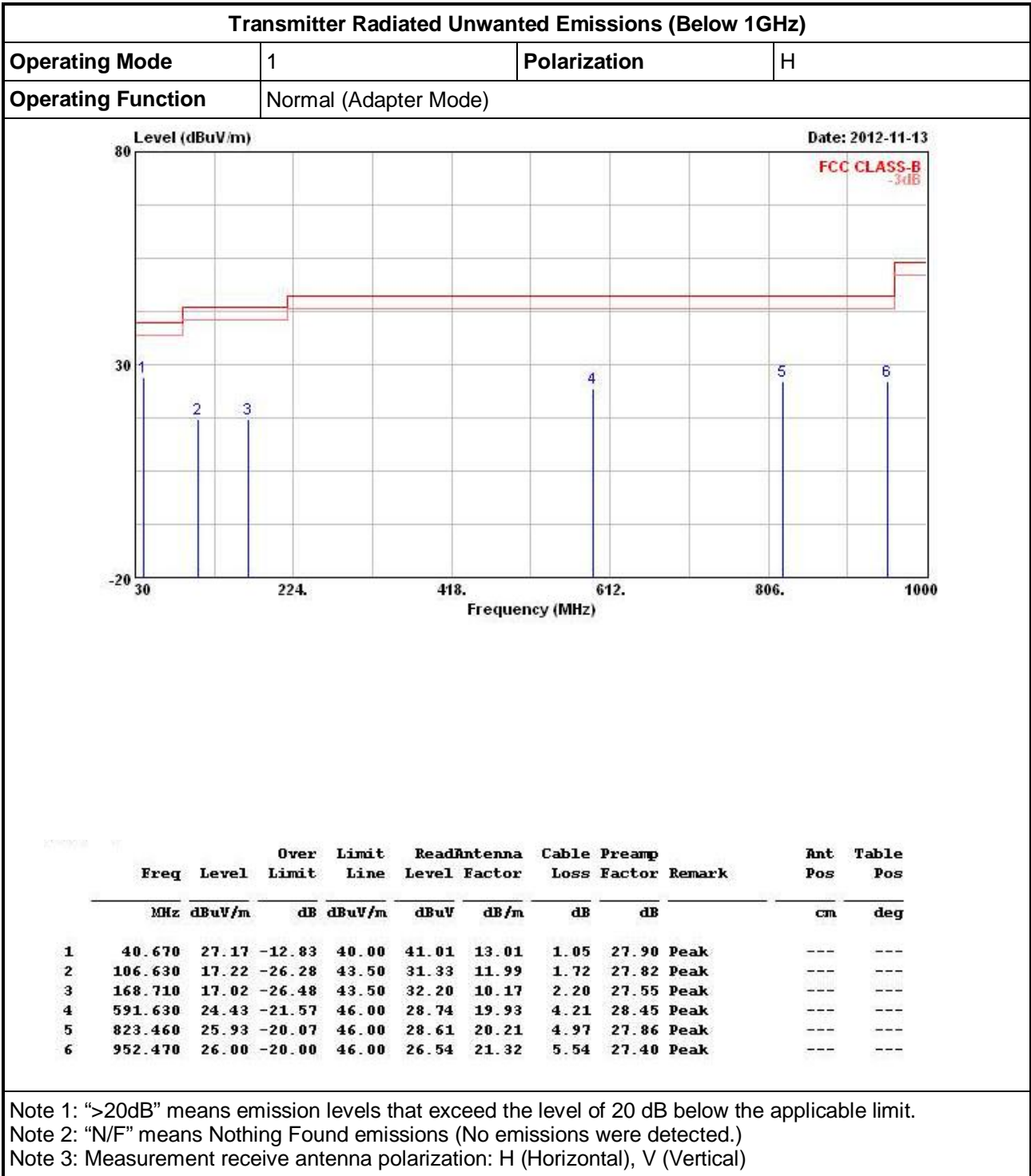
3.6.6 Transmitter Radiated Unwanted Emissions (Below 1GHz)

| Transmitter Radiated Unwanted Emissions (Below 1GHz) | | | |
|--|-----------------------|--------------|---|
| Operating Mode | 1 | Polarization | V |
| Operating Function | Normal (Adapter Mode) | | |



| Line | Freq MHz | Level dBuV/m | Over Limit dB | Limit Line dBuV/m | ReadAntenna Level dBuV | Antenna Factor dB/m | Cable Loss dB | Preamp Factor dB | Remark | Ant Pos cm | Table Pos deg |
|------|-------------|-----------------|---------------------|-------------------------|------------------------------|---------------------------|---------------------|------------------------|--------|------------------|---------------------|
| 1 | 43.580 | 34.60 | -5.40 | 40.00 | 49.12 | 12.27 | 1.09 | 27.88 | Peak | --- | --- |
| 2 | 90.140 | 24.15 | -19.35 | 43.50 | 40.92 | 9.50 | 1.58 | 27.85 | Peak | --- | --- |
| 3 | 106.630 | 28.52 | -14.98 | 43.50 | 42.63 | 11.99 | 1.72 | 27.82 | Peak | --- | --- |
| 4 | 501.420 | 20.39 | -25.61 | 46.00 | 27.58 | 17.34 | 3.84 | 28.37 | Peak | --- | --- |
| 5 | 599.390 | 25.02 | -20.98 | 46.00 | 29.09 | 20.15 | 4.24 | 28.46 | Peak | --- | --- |
| 6 | 850.620 | 25.14 | -20.86 | 46.00 | 27.71 | 20.15 | 5.05 | 27.77 | Peak | --- | --- |

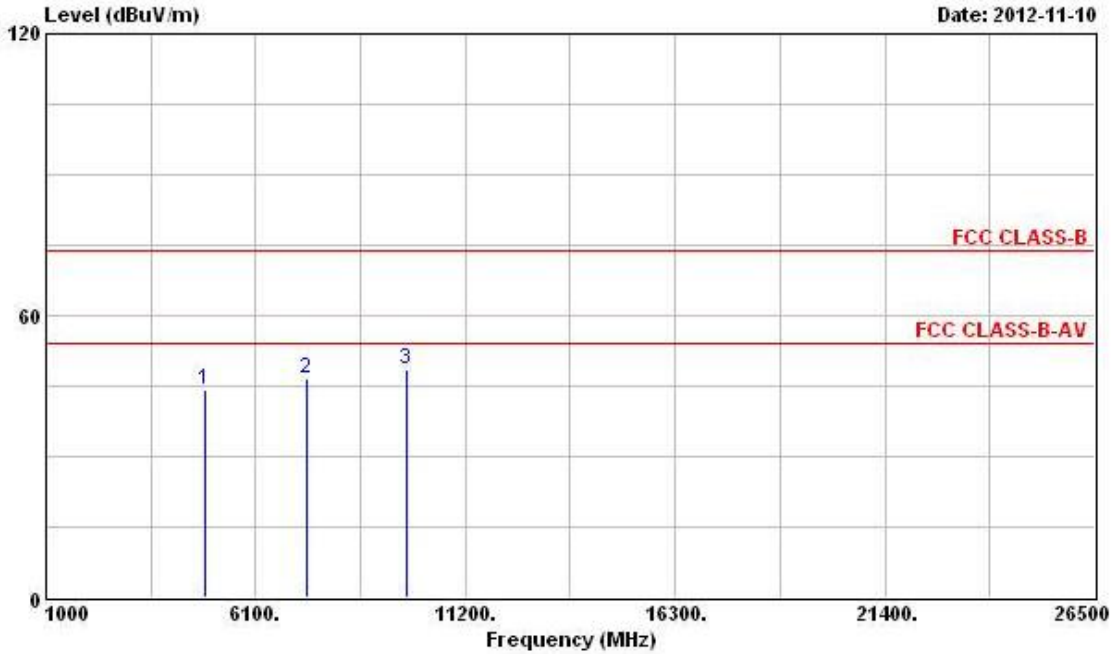
Note 1: ">20dB" means emission levels that exceed the level of 20 dB below the applicable limit.
 Note 2: "N/F" means Nothing Found emissions (No emissions were detected.)
 Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)





3.6.7 Transmitter Radiated Unwanted Emissions (Above 1GHz) for CSS

| Transmitter Radiated Unwanted Emissions (Above 1GHz) | | | |
|--|----------|-----------------|----|
| Modulation Mode | CSS | Test Freq. (FX) | F1 |
| Operating Function | Transmit | Polarization | V |

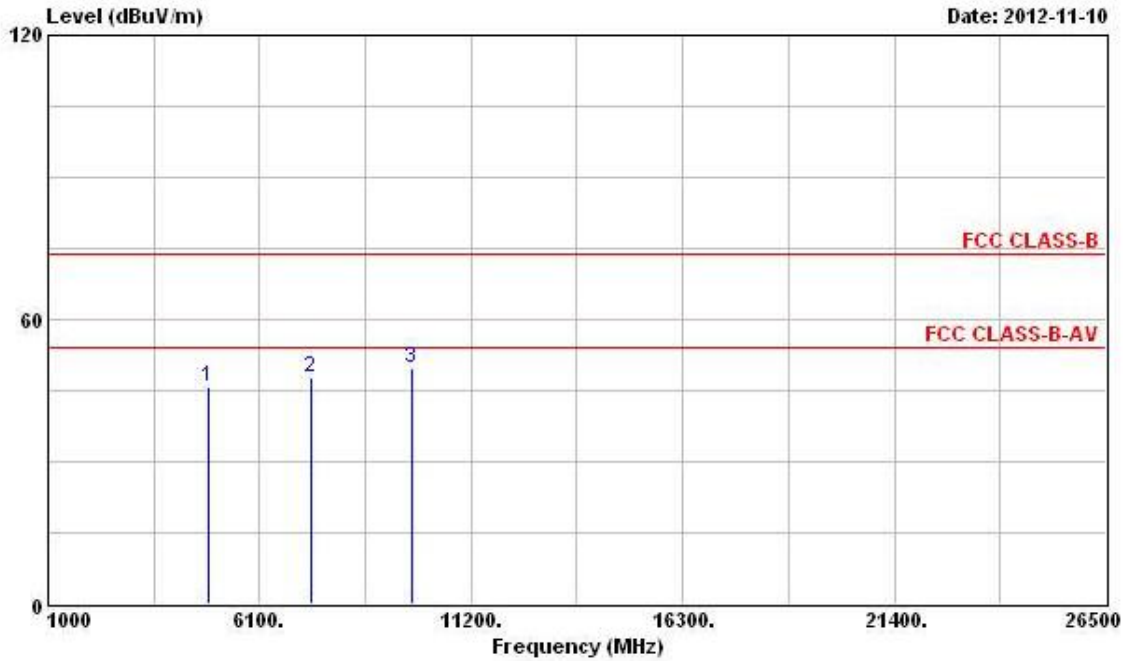


| | Freq | Level | Over Limit | Limit Line | ReadAntenna Level | Antenna Factor | Cable Loss | Preamp Factor | Remark | Ant Pos | Table Pos |
|---|----------|--------|------------|------------|-------------------|----------------|------------|---------------|--------|---------|-----------|
| | MHz | dBuV/m | dB | dBuV/m | dBuV | dB/m | dB | dB | | cm | deg |
| 1 | 4884.000 | 44.31 | -9.69 | 54.00 | 39.27 | 35.18 | 4.64 | 34.78 | PK | --- | --- |
| 2 | 7326.000 | 46.53 | -7.47 | 54.00 | 39.06 | 36.93 | 5.64 | 35.10 | PK | --- | --- |
| 3 | 9768.000 | 48.74 | -25.26 | 74.00 | 39.13 | 38.73 | 6.36 | 35.48 | Peak | --- | --- |

Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.
 Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)
 Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)
 Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.
 Note 5: For un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level.



| Transmitter Radiated Unwanted Emissions (Above 1GHz) | | | |
|--|----------|-----------------|----|
| Modulation Mode | CSS | Test Freq. (FX) | F1 |
| Operating Function | Transmit | Polarization | H |



| Freq | Level | Over Limit | Limit Line | ReadAntenna Level | Antenna Factor | Cable Loss | Preamp Factor | Remark | Ant Pos | Table Pos |
|------|----------|------------|------------|-------------------|----------------|------------|---------------|------------|---------|-----------|
| MHz | dBUV/m | dB | dBUV/m | dBuV | dB/m | dB | dB | | cm | deg |
| 1 | 4884.000 | 45.84 | -8.16 | 54.00 | 40.15 | 35.83 | 4.64 | 34.78 PK | --- | --- |
| 2 | 7326.000 | 47.81 | -6.19 | 54.00 | 39.40 | 37.87 | 5.64 | 35.10 PK | --- | --- |
| 3 | 9768.000 | 49.66 | -24.34 | 74.00 | 39.25 | 39.53 | 6.36 | 35.48 Peak | --- | --- |

Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.
 Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)
 Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)
 Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.
 Note 5: For un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level.

4 Test Equipment and Calibration Data

| Instrument | Manufacturer | Model No. | Serial No. | Characteristics | Calibration Date | Remark |
|------------------------|--------------------------------|-----------|------------|-----------------|------------------|----------------------|
| EMC Receiver | R&S | ESCS 30 | 100174 | 9kHz ~ 2.75GHz | Mar. 23, 2012 | Conduction (CO04-HY) |
| LISN | SCHWARZBECK MESS-ELEKTRONIK | NSLK 8127 | 8127-477 | 9kHz ~ 30MHz | Feb. 08, 2012 | Conduction (CO04-HY) |
| LISN (Support Unit) | EMCO | 3810/2NM | 9703-1839 | 9kHz ~ 30MHz | Apr. 20, 2012 | Conduction (CO04-HY) |
| RF Cable-CON | HUBER+SUHNER | RG213/U | CB049 | 9kHz ~ 30MHz | Apr. 25, 2012 | Conduction (CO04-HY) |

Note: Calibration Interval of instruments listed above is one year.

| Instrument | Manufacturer | Model No. | Serial No. | Characteristics | Calibration Date | Remark |
|----------------------------|--------------|------------------|-------------|-----------------|------------------|---------------------|
| Spectrum Analyzer | R&S | FSP 40 | 100305 | 9KHz~40GHz | Feb. 21, 2012 | Conducted (TH01-HY) |
| DC Power Source | G.W. | GPC-6030D | C671845 | DC 1V ~ 60V | Jun. 19, 2012 | Conducted (TH01-HY) |
| Temp. and Humidity Chamber | Giant Force | GTH-225-20-SP-SD | MAA1112-007 | -20 ~ 100°C | Dec. 07, 2011 | Conducted (TH01-HY) |
| Signal Generator | R&S | SMR40 | 100116 | 10MHz ~ 40GHz | Jun. 26, 2012 | Conducted (TH01-HY) |
| Power Sensor | Anritsu | MA2411B | 0917017 | 300MHz ~ 40GHz | Jan. 12, 2012 | Conducted (TH01-HY) |
| Power Meter | Anritsu | ML2495A | 0949003 | 300MHz ~ 40GHz | Jan. 12, 2012 | Conducted (TH01-HY) |
| RF Cable-2m | HUBER+SUHNER | SUCOFLEX_104 | SN 345675/4 | 1GHz ~ 26.5GHz | NA | Conducted (TH01-HY) |
| RF Cable-3m | HUBER+SUHNER | SUCOFLEX_104 | SN 345669/4 | 1GHz ~ 26.5GHz | NA | Conducted (TH01-HY) |

Note: Calibration Interval of instruments listed above is one year.



| Instrument | Manufacturer | Model No. | Serial No. | Characteristics | Calibration Date | Remark |
|--------------------------|----------------|-----------|-------------|--------------------|------------------|-----------------------|
| Spectrum Analyzer | R&S | FSP40 | 100593 | 9kHz ~ 40GHz | Sep. 14, 2012 | Radiation (03CH02-HY) |
| 3m Semi Anechoic Chamber | SIDT FRANKONIA | SAC-3M | 03CH02-HY | 30MHz ~ 1GHz 3m | May 10, 2012 | Radiation (03CH02-HY) |
| Amplifier | Agilent | 8447D | 2944A11146 | 100kHz ~ 1.3GHz | Jul. 23, 2012 | Radiation (03CH02-HY) |
| Amplifier | Agilent | 8449B | 3008A02373 | 1GHz ~ 26.5GHz | Aug. 10, 2012 | Radiation (03CH02-HY) |
| Horn Antenna | ETS-LINDGREN | 3117 | 00091920 | 1GHz~18GHz | Nov. 11, 2010 | Radiation (03CH02-HY) |
| Horn Antenna | SCHWARZBECK | BBHA9170 | BBHA9170154 | 15GHz ~ 40GHz | Jan.13, 2012 | Radiation (03CH02-HY) |
| RF Cable-R03m | Jye Bao | RG142 | CB021 | 9kHz ~ 1GHz | Nov. 11, 2011 | Radiation (03CH02-HY) |
| Bilog Antenna | SCHAFFNER | CBL61128 | 2723 | 30MHz ~ 2GHz | Oct. 22, 2012 | Radiation (03CH02-HY) |
| Turn Table | HD | DS 420 | 420/649/00 | 0~ 360 degree | N/A | Radiation (03CH02-HY) |
| Antenna Mast | HD | MA 240 | 240/559/00 | 1 ~ 4 m | N/A | Radiation (03CH02-HY) |

Note: Calibration Interval of instruments listed above is one year.


| Instrument | Manufacturer | Model No. | Serial No. | Characteristics | Calibration Date | Remark |
|--------------|--------------|-----------|-------------|-----------------|------------------|-----------------------|
| Loop Antenna | R&S | HFH2-Z2 | 860004/0001 | 9 kHz - 30 MHz | Jul. 03, 2012 | Radiation (03CH02-HY) |

Note: Calibration Interval of instruments listed above is two year.

5 Certification of TAF Accreditation



The image shows a TAF Accreditation Certificate for Sporton International Inc. The certificate is framed in a purple border and contains the following text:


Certificate No. : L1190-120405
財團法人全國認證基金會
Taiwan Accreditation Foundation

Certificate of Accreditation

This is to certify that

Sporton International Inc.
EMC & Wireless Communications Laboratory
No.52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien,
Taiwan, R.O.C.

is accredited in respect of laboratory

Accreditation Criteria : ISO/IEC 17025:2005
Accreditation Number : 1190
Originally Accredited : December 15, 2003
Effective Period : January 10, 2010 to January 09, 2013
Accredited Scope : Testing Field, see described in the Appendix
Specific Accreditation Program : Accreditation Program for Designated Testing Laboratory for Commodities Inspection
Accreditation Program for Telecommunication Equipment Testing Laboratory
Accreditation Program for BSMI Mutual Recognition Arrangement with Foreign Authorities


Jay-San Chen
President, Taiwan Accreditation Foundation
Date: April 05, 2012

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