



RF TEST REPORT



Report No.: RF_SL14062001-SOL-002

Supersede Report No.: None

| | |
|--|---|
| Applicant | Solectek Corporation |
| Product Name | Broadband Point to Point and Multipoint Radio Units |
| Model No. | XL100t and AS59 |
| Test Standard | 47 CFR Part 90 Subpart M |
| Test Procedure | 47 CFR Part 90 Subpart M ASTM E2213-03 8.9.2 |
| FCC ID | KA359WAN1 |
| Date of test | 09/09/2014 - 09/17/2014 |
| Issue Date | 09/22/2013 |
| Test Result | <u>Pass</u> Fail |
| Equipment complied with the specification | [x] |
| Equipment did not comply with the specification | [] |
| | |
| | |
|  |  |
| Angel Escamilla | Nima Molaei |
| Test Engineer | Engineer Reviewer |
| This test report may be reproduced in full only Test result presented in this test report is applicable to the tested sample only | |

Issued By:
SIEMIC Laboratories
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Accreditations for Conformity Assessment

| Country/Region | Accreditation Body | Scope |
|----------------|------------------------|-----------------------------------|
| USA | FCC, A2LA | EMC, RF/Wireless, Telecom |
| Canada | IC, A2LA, NIST | EMC, RF/Wireless, Telecom |
| Taiwan | BSMI, NCC, NIST | EMC, RF, Telecom, Safety |
| Hong Kong | OFTA, NIST | RF/Wireless, Telecom |
| Australia | NATA, NIST | EMC, RF, Telecom, Safety |
| Korea | KCC/RRR, NIST | EMI, EMS, RF, Telecom, Safety |
| Japan | VCCI, JATE, TELEC, RFT | EMI, RF/Wireless, Telecom |
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| Israel | COM, NIST | EMC, RF, Telecom, Safety |

Accreditations for Product Certifications

| Country | Accreditation Body | Scope |
|-----------|--------------------|-----------------------|
| USA | FCC TCB, NIST | EMC, RF, Telecom |
| Canada | IC FCB, NIST | EMC, RF, Telecom |
| Singapore | iDA, NIST | EMC, RF, Telecom |
| EU | NB | EMC & R&TTE Directive |
| Japan | MIC (RCB 208) | RF, Telecom |
| Hong Kong | OFTA (US002) | RF, Telecom |

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1 Report Revision History

| Report No. | Report Version | Description | Issue Date |
|-----------------------|----------------|-------------|------------|
| RF_SL14062001-SOL-002 | - | Original | 09/22/2014 |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

2 Executive Summary

The purpose of this test program was to demonstrate compliance of following product

Company: Solectek Corporation
Product: Broadband Point to Point and Multipoint Radio Units
Model: XL100t and AS59

against the current Stipulated Standards. The specified model product stated above has demonstrated compliance with the Stipulated Standard listed on 1st page.

3 Customer information

| | |
|----------------------|--|
| Applicant Name | Solectek Corporation |
| Applicant Address | 8969 Kenamar Drive, Suite 113, San Diego, CA 92121 |
| Manufacturer Name | Solectek Corporation |
| Manufacturer Address | 8969 Kenamar Drive, Suite 113, San Diego, CA 92121 |

4 Test site information

| | |
|----------------------|---|
| Lab performing tests | SIEMIC Laboratories |
| Lab Address | 775 Montague Expressway, Milpitas, CA 95035 |
| FCC Test Site No. | 881796 |
| IC Test Site No. | 4842D-2 |
| VCCI Test Site No. | A0133 |

5 Modification

| Index | Item | Description | Note |
|-------|------|-------------|------|
| - | - | - | - |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

6 EUT Information

6.1 EUT Description

| | |
|---------------------------|---|
| Product Name | Broadband Point to Point and Multipoint Radio Units |
| Model No. | XL100t and AS59 |
| Trade Name | Solectek |
| Serial No. | 1142900007 |
| Input Power via PoE | 24VDC |
| Power Adapter Manu/Model | Solectek/1581401 |
| Power Adapter SN | N/A |
| Hardware version | N/A |
| Software version | N/A |
| Date of EUT received | 08/04/2014 |
| Equipment Class/ Category | TNB |
| Highest Clock Frequency | 266MHz |
| Port/Connectors | RJ45, N-Type |

6.2 Radio Description

Spec for Radio -

| Radio Type | |
|------------------------|---|
| Operating Frequency | 5860MHz – 5920MHz |
| Modulation | BPSK, QPSK, 16-QAM, 64-QAM |
| Channel Spacing | 10MHz and 20MHz |
| Number of Channels | 7 (10MHz), 2 (20MHz) |
| Antenna Gain | 16dBi: Dual-pol antenna 20dBi: Dual-pol antenna 23dBi: Dual-pol antenna |
| Antenna Type | 16dBi: External antenna 20dBi: Integrated antenna 23dBi: Integrated antenna |
| Antenna Connector Type | N-type, U.FL |
| Note: | The antenna with 23dBi gain will be used only in channels 172, 174, 176, 178 and 184. |

6.3 EUT test modes/configuration Description

| Test Mode | Note |
|-------------|---------------------|
| Test_mode_1 | Continuous Transmit |
| Test_mode_2 | - |
| Remark: | |

6.4 EUT Photos - External



EUT – Front View



EUT – Rear View



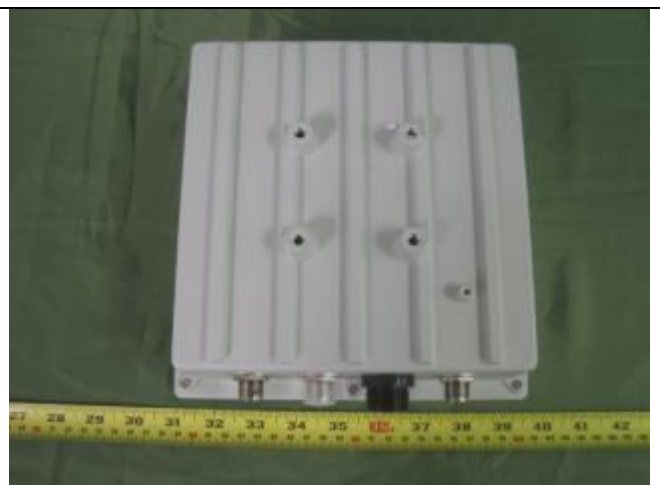
EUT – Left View



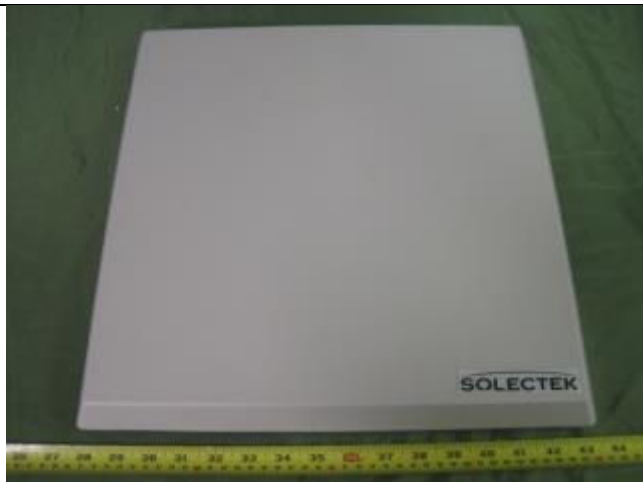
EUT – Right View



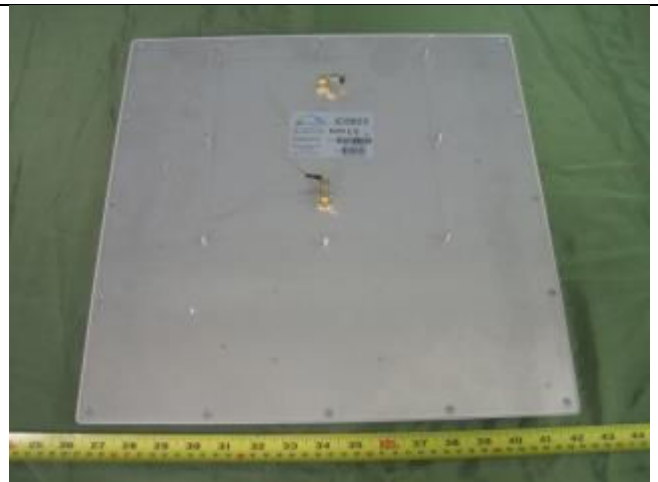
EUT – Top View



EUT – Bottom View



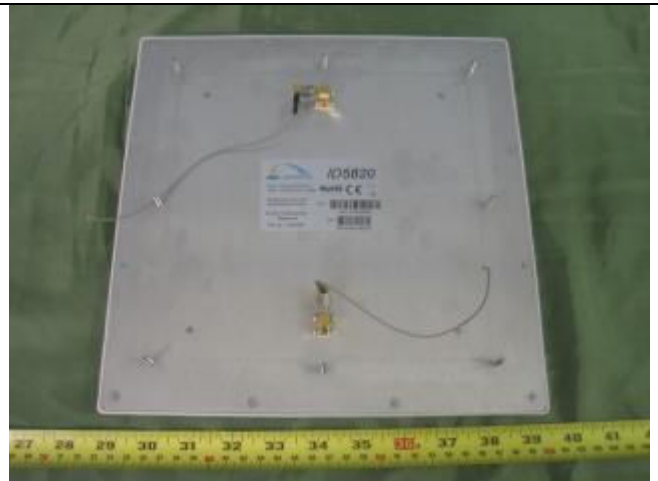
23dBi Antenna – Top View



23dBi Antenna – Bottom View



20dBi Antenna – Top View



20dBi Antenna – Bottom View



16dBi Antenna – Top View



16dBi Antenna – Bottom View



PoE Adapter – Top View



PoE Adapter – Bottom View

6.5 EUT Photos - Internal



EUT – Cover off View 1



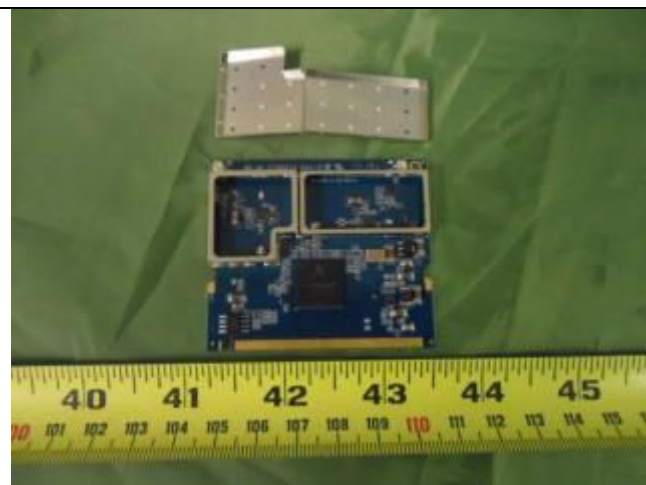
EUT – Main PCBA Top View



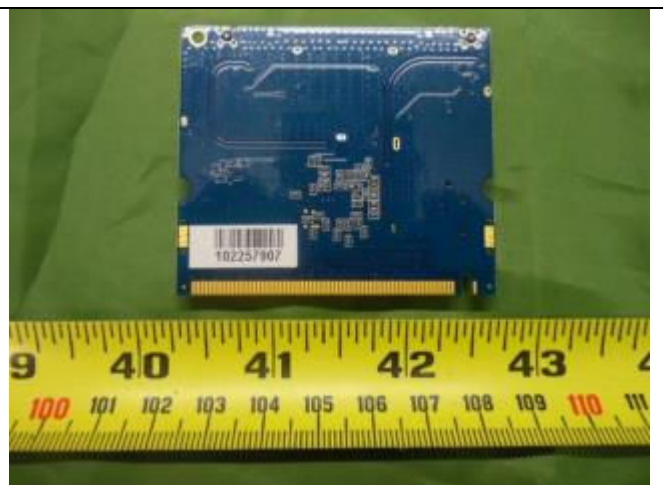
EUT – Main PCBA Bottom View



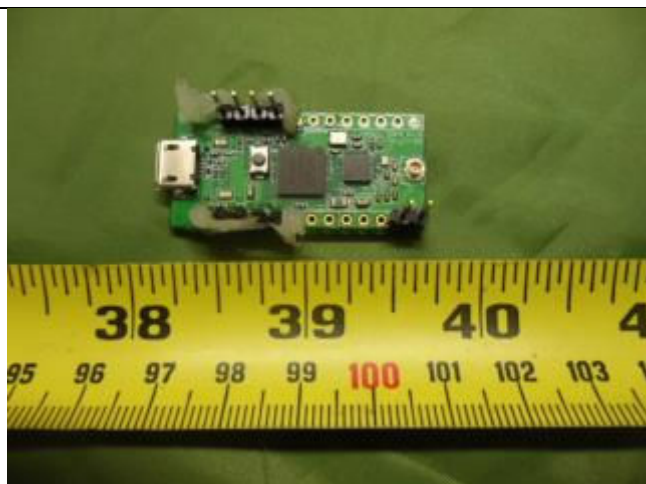
EUT – RF Module with Shielding Top View



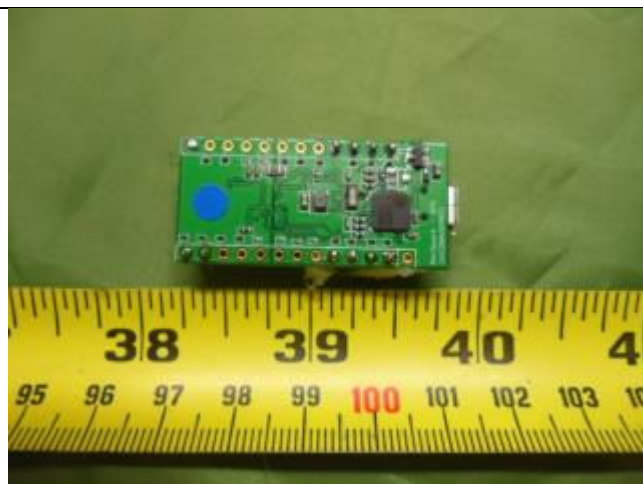
EUT – RF Module w/o Shielding Top View



EUT – RF Module Bottom View

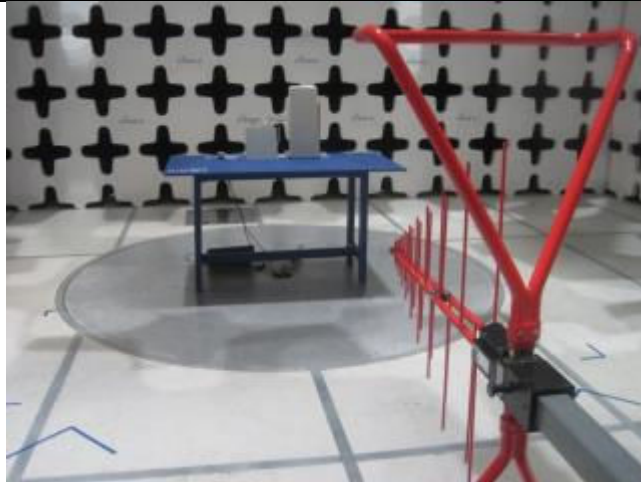


EUT – Sub PCBA Top View

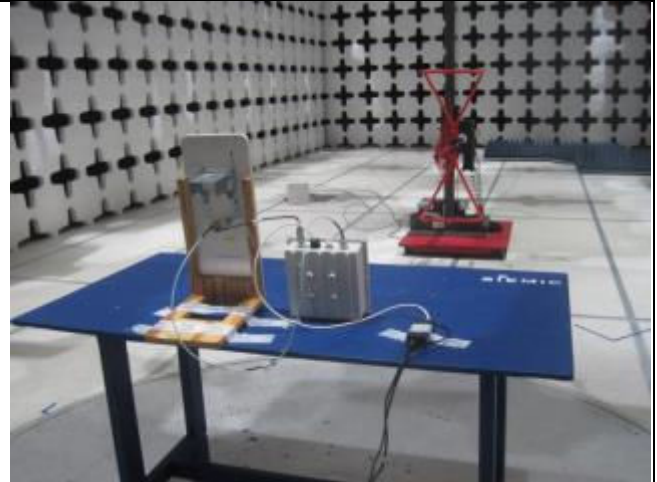


EUT – Sub PCBA Bottom View

6.6 EUT Test Setup Photos



Radiated Spurious Emissions <1GHz (16dBi Ant) – Front View



Radiated Spurious Emissions <1GHz (16dBi Ant) – Rear View



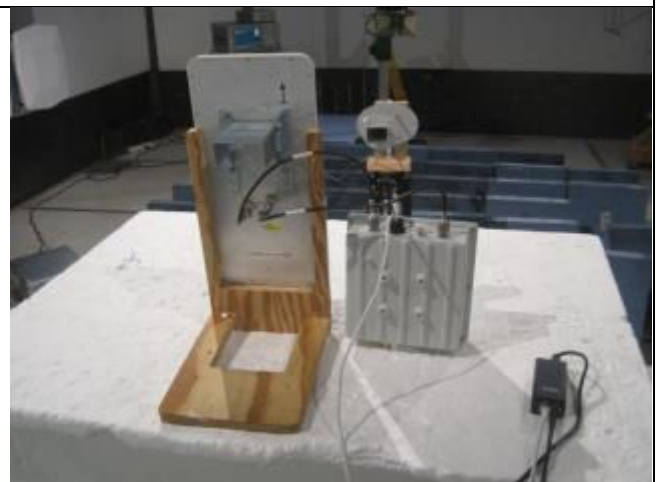
Radiated Spurious Emissions 1-18GHz (16dBi Ant) – Front View



Radiated Spurious Emissions 1-18GHz (16dBi Ant) – Rear View



Radiated Spurious Emissions 18-40GHz (16dBi Ant) – Front View



Radiated Spurious Emissions 18-40GHz (16dBi Ant) – Rear View



Radiated Spurious Emissions <1GHz (20dBi Ant) – Front View



Radiated Spurious Emissions <1GHz (20dBi Ant) – Rear View



Radiated Spurious Emissions 1-18GHz (20dBi Ant) – Front View



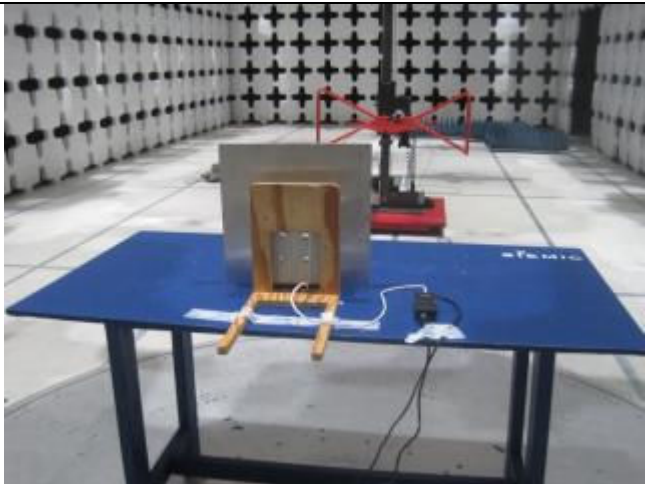
Radiated Spurious Emissions 1-18GHz (20dBi Ant) – Rear View



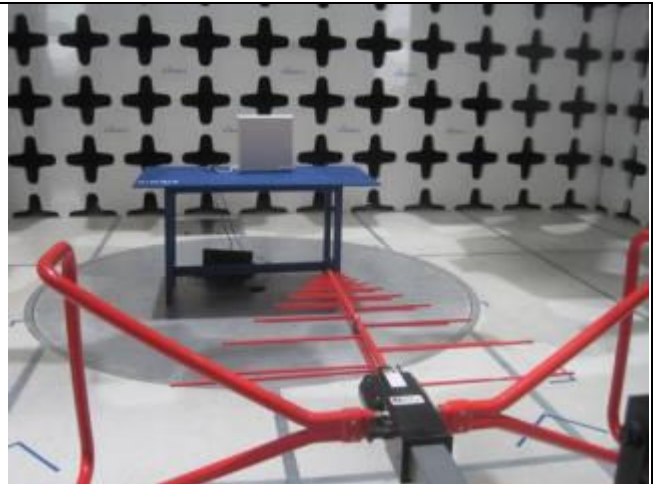
Radiated Spurious Emissions 18-40GHz (20dBi Ant) – Front View



Radiated Spurious Emissions 18-40GHz (20dBi Ant) – Rear View



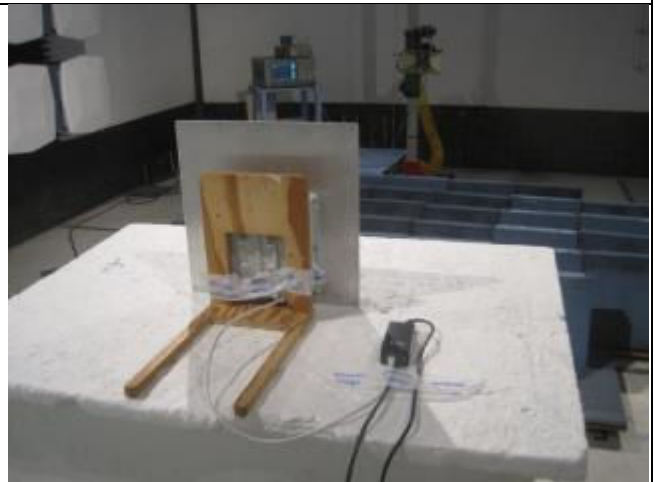
Radiated Spurious Emissions <1GHz (23dBi Ant) – Front View



Radiated Spurious Emissions <1GHz (23dBi Ant) – Rear View



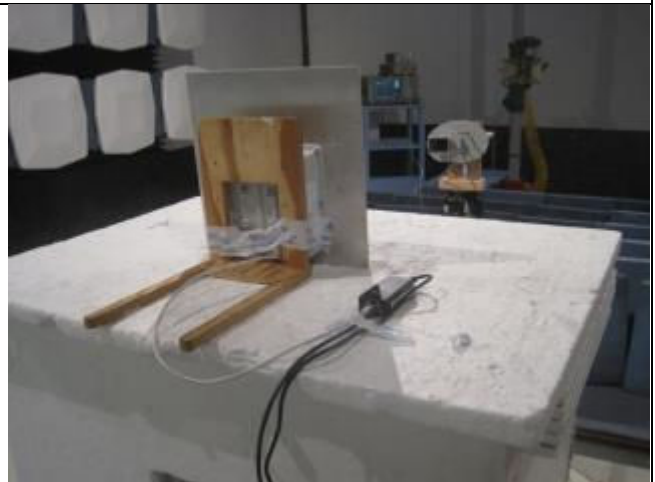
Radiated Spurious Emissions 1-18GHz (23dBi Ant) – Front View



Radiated Spurious Emissions 1-18GHz (23dBi Ant) – Rear View



Radiated Spurious Emissions 18-40GHz (23dBi Ant) – Front View



Radiated Spurious Emissions 18-40GHz (23dBi Ant) – Rear View

7 Supporting Equipment/Software and cabling Description

7.1 Supporting Equipment

| Item | Supporting Equipment Description | Model | Serial Number | Manufacturer | Note |
|------|----------------------------------|-------------|---------------|--------------|------|
| 1 | Laptop | Pavilion g4 | 5CD2135VQM | HP | - |
| 2 | Laptop | T60 | L3-AX990 | Lenovo | - |
| | | | | | |
| | | | | | |

7.2 Test Software Description

| Test Item | Software | Description |
|-----------|-----------------------------------|---|
| RF Tests | Software provided by manufacturer | Set the EUT to different channels and modulations |
| | | |
| | | |
| | | |
| | | |

8 Test Summary

| Test Item | Test standard | | Test Method/Procedure | Pass / Fail |
|--|--|---------------|---|--|
| Modulation Characteristics | FCC | §90 Subpart M | FCC §2.1047, §90.207 ASTM E2213-03 Table 3 | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> N/A |
| Emissions Bandwidth | FCC | §90 Subpart M | FCC §2.1049 ASTM E2213-03 8.9.2 | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> N/A |
| Maximum Transmitter Power | FCC | §90 Subpart M | FCC §90.377 ASTM E2213-03 8.9.1 | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> N/A |
| Transmit Spectrum Mask | FCC | §90 Subpart M | FCC §90.379 ASTM E2213-03 8.9.2 | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> N/A |
| Transmitter Conducted Unwanted Emissions | FCC | §90 Subpart M | ASTM E2213-03 8.9.2 | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> N/A |
| Transmitter Radiated Unwanted Emissions | FCC | §90 Subpart M | ASTM E2213-03 8.9.2 | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> N/A |
| Frequency Stability | FCC | §90 Subpart M | FCC §2.1055 ASTM E2213-03 8.9.4 | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> N/A |
| Remark | <ol style="list-style-type: none"> All measurement uncertainties do not take into consideration for all presented test results. The applicant shall ensure frequency stability by showing that an emission is maintained within the band of operation under all normal operating conditions as specified in the user's manual. | | | |

9 Measurement Uncertainty

| Emissions | | | |
|-----------------------------|-----------------|---|---------------|
| Test Item | Frequency Range | Description | Uncertainty |
| Radiated Spurious Emissions | 30MHz – 1GHz | Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m) | +5.6dB/-4.5dB |
| Radiated Spurious Emissions | 1GHz – 40GHz | Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m) | +4.3dB/-4.1dB |

10 Measurements, Examination and Derived Results

10.1 Modulation characteristics


Requirement(s):

| Spec | Requirement | Applicable | | | | | | | | | | | | | | | | | | |
|----------------------------|--|------------|------------|---|------|-----|------|---|------|---|------|----|--------|----|--------|----|--------|----|--------|--------------|
| FCC §2.1047 FCC §90.207 | <p>Per FCC §2.1047 and §90.207 the modulation parameters dependent on the data rate used shall be set according to the below Table from ASTM E2213-03.</p> <p style="text-align: center;"><u>Modulation Characteristics</u></p> <table><tr><th>Data Rate</th><th>Modulation</th></tr><tr><td>3</td><td>BPSK</td></tr><tr><td>4.5</td><td>BPSK</td></tr><tr><td>6</td><td>QPSK</td></tr><tr><td>9</td><td>QPSK</td></tr><tr><td>12</td><td>16-QAM</td></tr><tr><td>18</td><td>16-QAM</td></tr><tr><td>24</td><td>64-QAM</td></tr><tr><td>27</td><td>64-QAM</td></tr></table> | Data Rate | Modulation | 3 | BPSK | 4.5 | BPSK | 6 | QPSK | 9 | QPSK | 12 | 16-QAM | 18 | 16-QAM | 24 | 64-QAM | 27 | 64-QAM | <div>☒</div> |
| Data Rate | Modulation | | | | | | | | | | | | | | | | | | | |
| 3 | BPSK | | | | | | | | | | | | | | | | | | | |
| 4.5 | BPSK | | | | | | | | | | | | | | | | | | | |
| 6 | QPSK | | | | | | | | | | | | | | | | | | | |
| 9 | QPSK | | | | | | | | | | | | | | | | | | | |
| 12 | 16-QAM | | | | | | | | | | | | | | | | | | | |
| 18 | 16-QAM | | | | | | | | | | | | | | | | | | | |
| 24 | 64-QAM | | | | | | | | | | | | | | | | | | | |
| 27 | 64-QAM | | | | | | | | | | | | | | | | | | | |
| Test Procedure | N/A | | | | | | | | | | | | | | | | | | | |
| Remark | - | | | | | | | | | | | | | | | | | | | |
| Result | <div>☒ Pass</div> <div>☐ Fail</div> | | | | | | | | | | | | | | | | | | | |

Test Data ☐ Yes ☒ N/A
Test Plot ☐ Yes ☒ N/A

10.2 Emissions Bandwidth

Requirement(s):

| Spec | Item | Requirement | Applicable |
|------------------------------------|--|---|-------------------------------------|
| FCC §2.1049 ASTM E2213-03 8.9.2 | a) | The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured. | <input checked="" type="checkbox"/> |
| Test Setup |  | | |
| Test Procedure | <u>Emission bandwidth measurement procedure</u> <ul style="list-style-type: none"> - Set RBW = 1MHz. - Set the video bandwidth (VBW) $\geq 3 * RBW$. - Detector = Peak. - Trace mode = max hold. - Sweep = auto couple. - Allow the trace to stabilize. | | |
| Remark | - | | |
| Environmental conditions | Temperature (°C) Humidity (%) Atmospheric (mbar) | 23 °C 42% 1019 mbar | |
| Test Date | 09/11/2014 | | |
| Result | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail | | |

Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes ☐ N/A

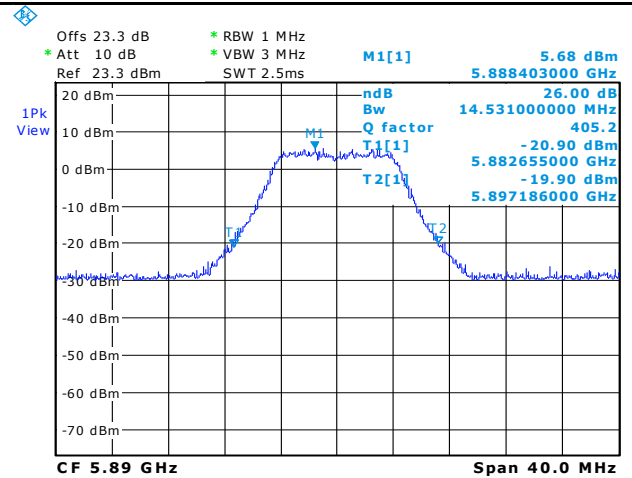
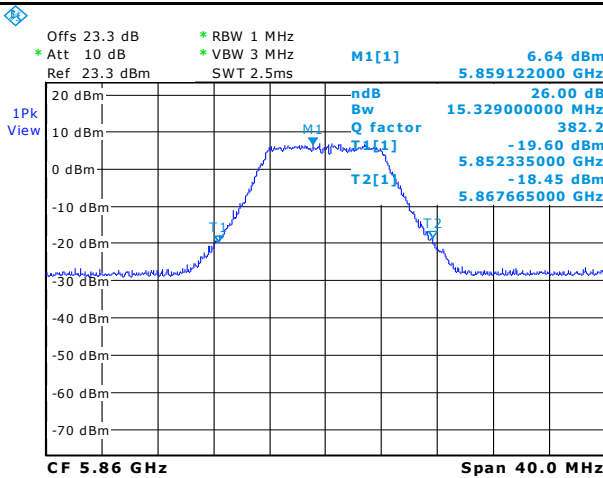
10MHz Bandwidth Measurement Results

| Frequency (MHz) | 26dB Bandwidth (MHz) | 99% Bandwidth (MHz) |
|-----------------|----------------------|---------------------|
| 5860 | 15.329 | 11.018 |
| 5890 | 14.531 | 11.018 |
| 5920 | 14.850 | 11.099 |

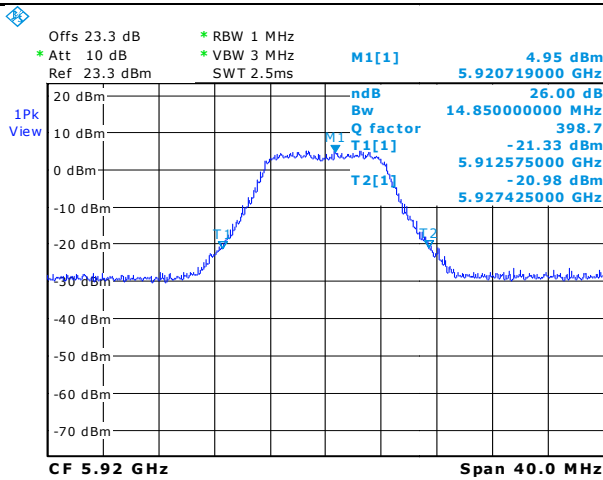
20MHz Bandwidth Measurement Results

| Frequency (MHz) | 26dB Bandwidth (MHz) | 99% Bandwidth (MHz) |
|-----------------|----------------------|---------------------|
| 5875 | 27.705 | 19.800 |
| 5905 | 27.158 | 19.960 |

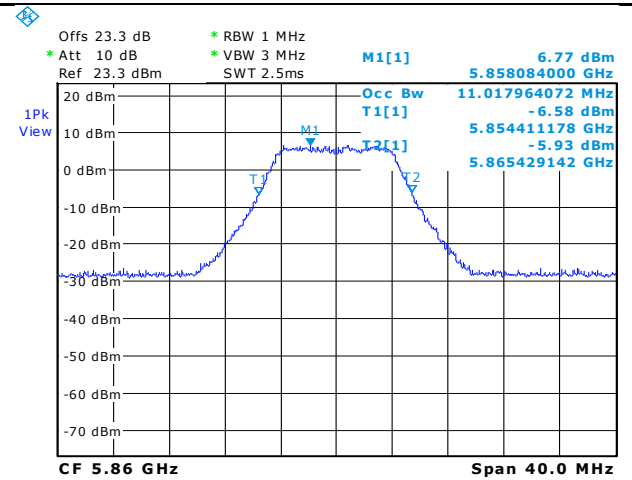
Test Plots



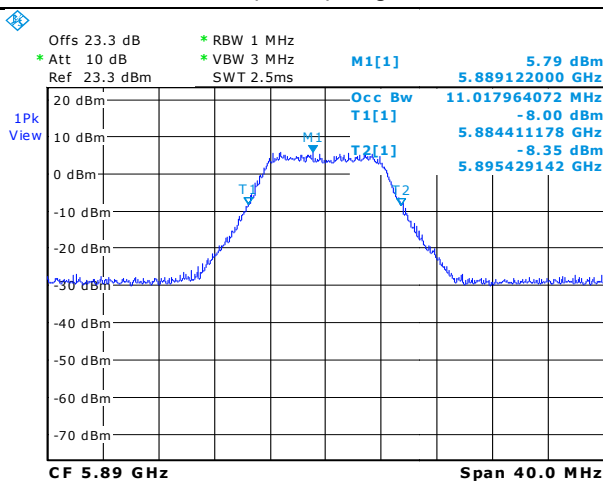
26dB Bandwidth (10MHz) - Low CH 5860MHz



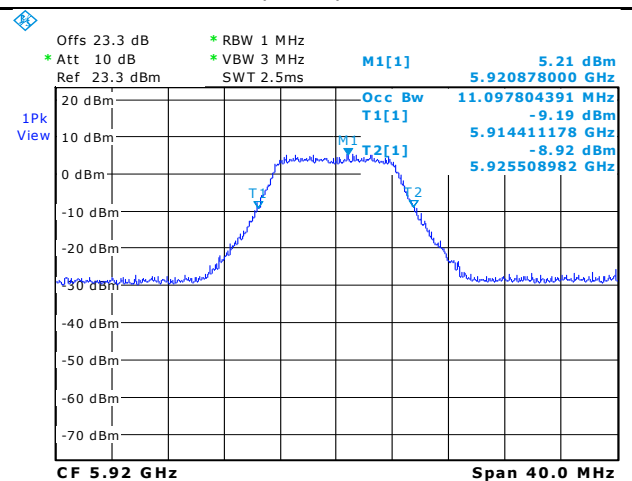
26dB Bandwidth (10MHz) - Mid CH 5890MHz



26dB Bandwidth (10MHz) - High CH 5920MHz

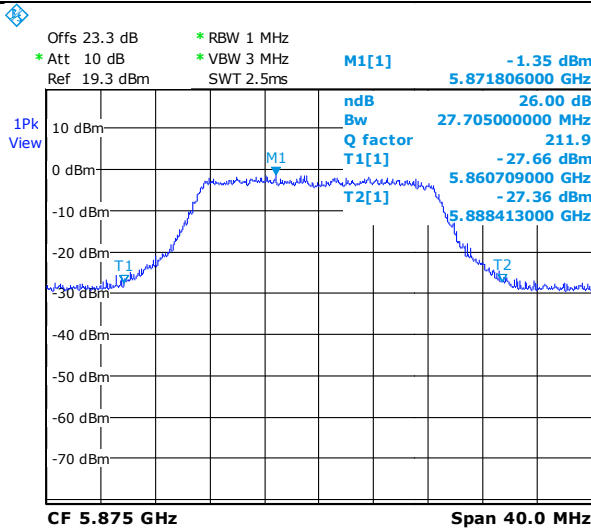


99% Bandwidth (10MHz) - Low CH 5860MHz

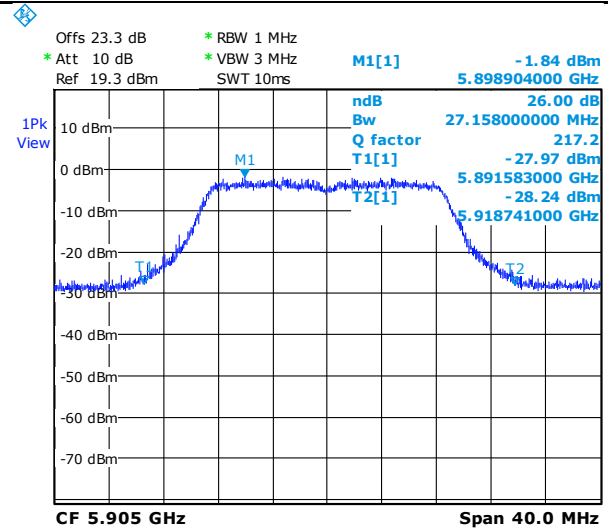


99% Bandwidth (10MHz) - Mid CH 5890MHz

99% Bandwidth (10MHz) - High CH 5920MHz

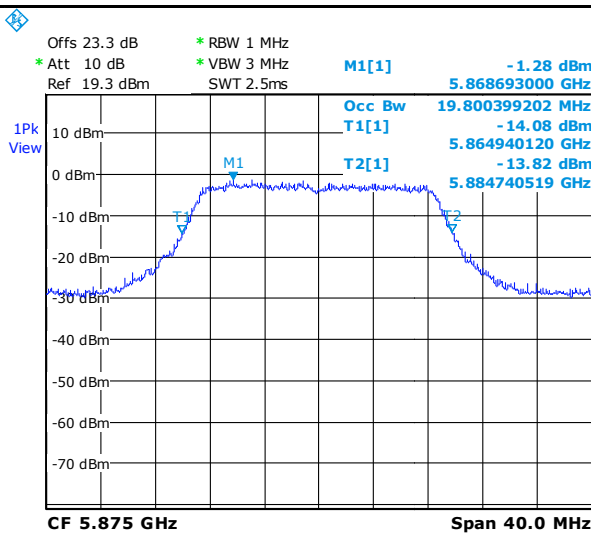


Date: 11.SEP.2014 18:48:38



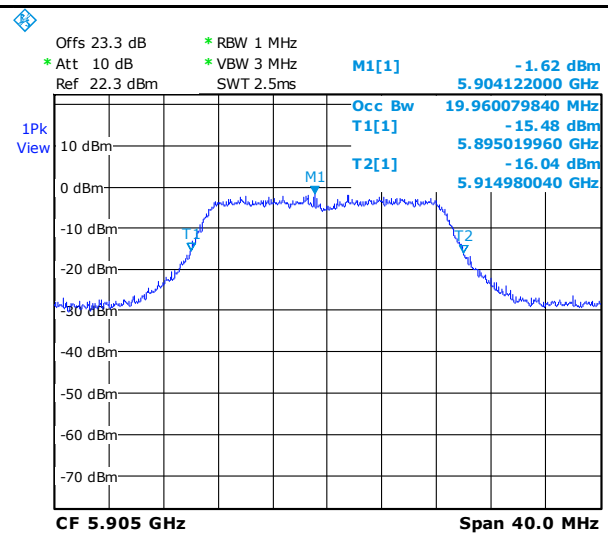
Date: 11.SEP.2014 18:21:27

26dB Bandwidth (20MHz) - Low CH 5875MHz



Date: 11.SEP.2014 18:51:07

26dB Bandwidth (20MHz) - High CH 5905MHz



Date: 11.SEP.2014 17:47:05

99% Bandwidth (20MHz) - Low CH 5875MHz

99% Bandwidth (10MHz) - High CH 5905MHz

10.3 Maximum Transmitter Power

Requirement(s):

| Spec | Requirement | Applicable | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|---------------------------|---|-----------------|---|--|--|--|--|-----|-----------|----|------|-----|-----------|----|------|-----|-----------|----|------|-----|-----------|----|------|-----|-----------|----|------|-----|-----------|----|------|-----|-----------|----|------|--|--|--|--|-----|-----------|----|------|-----|-----------|----|------|--------------|
| FCC §90.377 ASTM E2213-03 8.9.1 | <p>Per FCC §90.377, frequencies available for assignment to eligible applicants within the 5850-5925 MHz band for RSUs and the maximum EIRP permitted for an RSU with an antenna height not exceeding 8 meters above the roadway bed surface are specified in the table below. Where two EIRP limits are given, the higher limit is permitted only for state or local governmental entities.</p> <table><thead><tr><th>Channel No.</th><th>Frequency range (MHz)</th><th>Max. EIRP (dBm)</th><th>¹Max. Conducted Power (dBm)</th></tr></thead><tbody><tr><td colspan="4">5850 – 5925 MHz Band (10MHz Bandwidth)</td></tr><tr><td>172</td><td>5855-5865</td><td>33</td><td>28.8</td></tr><tr><td>174</td><td>5865-5875</td><td>33</td><td>28.8</td></tr><tr><td>176</td><td>5875-5885</td><td>33</td><td>28.8</td></tr><tr><td>178</td><td>5885-5895</td><td>33</td><td>28.8</td></tr><tr><td>180</td><td>5895-5905</td><td>23</td><td>10.0</td></tr><tr><td>182</td><td>5905-5915</td><td>23</td><td>10.0</td></tr><tr><td>184</td><td>5915-5925</td><td>33</td><td>28.8</td></tr><tr><td colspan="4">5850 – 5925 MHz Band (20MHz Bandwidth)</td></tr><tr><td>175</td><td>5865-5885</td><td>23</td><td>10.0</td></tr><tr><td>181</td><td>5895-5915</td><td>23</td><td>10.0</td></tr></tbody></table> <p>¹Maximum conducted power per ASTM E2213-03 8.9.1</p> | Channel No. | Frequency range (MHz) | Max. EIRP (dBm) | ¹ Max. Conducted Power (dBm) | 5850 – 5925 MHz Band (10MHz Bandwidth) | | | | 172 | 5855-5865 | 33 | 28.8 | 174 | 5865-5875 | 33 | 28.8 | 176 | 5875-5885 | 33 | 28.8 | 178 | 5885-5895 | 33 | 28.8 | 180 | 5895-5905 | 23 | 10.0 | 182 | 5905-5915 | 23 | 10.0 | 184 | 5915-5925 | 33 | 28.8 | 5850 – 5925 MHz Band (20MHz Bandwidth) | | | | 175 | 5865-5885 | 23 | 10.0 | 181 | 5895-5915 | 23 | 10.0 | <div>☒</div> |
| Channel No. | Frequency range (MHz) | Max. EIRP (dBm) | ¹ Max. Conducted Power (dBm) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5850 – 5925 MHz Band (10MHz Bandwidth) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 172 | 5855-5865 | 33 | 28.8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 174 | 5865-5875 | 33 | 28.8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 176 | 5875-5885 | 33 | 28.8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 178 | 5885-5895 | 33 | 28.8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 180 | 5895-5905 | 23 | 10.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 182 | 5905-5915 | 23 | 10.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 184 | 5915-5925 | 33 | 28.8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5850 – 5925 MHz Band (20MHz Bandwidth) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 175 | 5865-5885 | 23 | 10.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 181 | 5895-5915 | 23 | 10.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Test Setup | <div><div>Laptop</div><div>Power Sensor & attenuator</div><div>EUT</div></div> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Environmental conditions | Temperature (°C) Humidity (%) Atmospheric (mbar) | 23 °C 42% 1019 mbar | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Test Date | 09/09/2014 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Remark | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Result | <div><input checked="" type="checkbox"/> Pass<input type="checkbox"/> Fail</div> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Test Data ☒ Yes ☐ N/A

Test Plot ☐ Yes (See below) ☒ N/A

10 MHz Bandwidth Maximum Transmit Power measurement results

| Channel No. | Frequency (MHz) | EUT Power Setting (dBm) | Conducted Power (dBm) | | | Output Power Limit (dBm) | Result |
|-------------|-----------------|-------------------------|-----------------------|---------|---------------------------------|--------------------------|--------|
| | | | Chain 1 | Chain 2 | Combined Power or Highest Power | | |
| 172 | 5860 | 10 | 4.70 | 4.80 | 7.76 | 28.8 | Pass |
| 174 | 5870 | 10 | 4.20 | 4.80 | 7.52 | 28.8 | Pass |
| 176 | 5880 | 10 | 4.30 | 4.70 | 7.51 | 28.8 | Pass |
| 178 | 5890 | 10 | 4.30 | 4.70 | 7.51 | 28.8 | Pass |
| 180 | 5900 | 6 | -1.60 | 0.00 | 2.34 | 10.0 | Pass |
| 182 | 5910 | 6 | -1.70 | -0.20 | 2.12 | 10.0 | Pass |
| 184 | 5920 | 10 | 3.70 | 4.30 | 7.02 | 28.8 | Pass |

10 MHz Bandwidth EIRP Measurement

| Channel No. | Frequency (MHz) | EUT Power Setting (dBm) | Combined or Highest Conducted Power (dBm) | Antenna Gain (dBi) | Measured EIRP (dBm) | EIRP Limit (dBm) | Result |
|-------------|-----------------|-------------------------|---|--------------------|---------------------|------------------|--------|
| 172 | 5860 | 10 | 7.76 | 16 | 23.76 | 33 | Pass |
| | | | | 20 | 27.76 | 33 | |
| | | | | 23 | 30.76 | 33 | |
| 174 | 5870 | 10 | 7.52 | 16 | 23.52 | 33 | Pass |
| | | | | 20 | 27.52 | 33 | |
| | | | | 23 | 30.52 | 33 | |
| 176 | 5880 | 10 | 7.51 | 16 | 23.51 | 33 | Pass |
| | | | | 20 | 27.51 | 33 | |
| | | | | 23 | 30.51 | 33 | |
| 178 | 5890 | 10 | 7.51 | 16 | 23.51 | 33 | Pass |
| | | | | 20 | 27.51 | 33 | |
| | | | | 23 | 30.51 | 33 | |
| 180 | 5900 | 6 | 2.34 | 16 | 18.34 | 23 | Pass |
| | | | | 20 | 22.34 | 23 | |
| | | | | 23 | N/A | 23 | |
| 182 | 5910 | 6 | 2.12 | 16 | 18.12 | 23 | Pass |
| | | | | 20 | 22.12 | 23 | |
| | | | | 23 | N/A | 23 | |
| 184 | 5920 | 10 | 30.52 | 16 | 23.02 | 33 | Pass |
| | | | | 20 | 27.02 | 33 | |
| | | | | 23 | 30.02 | 33 | |

20 MHz Bandwidth Maximum Transmit Power measurement results

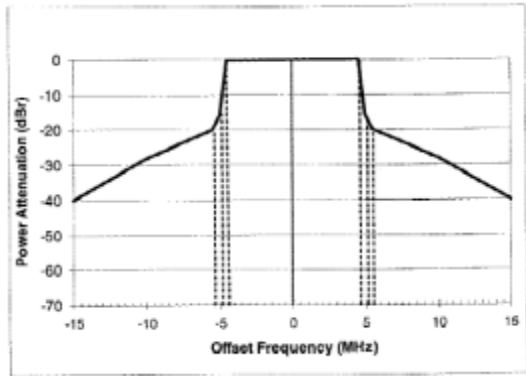
| Channel No. | Frequency (MHz) | EUT Power Setting (dBm) | Conducted Power (dBm) | | | Output Power Limit (dBm) | Result |
|-------------|-----------------|-------------------------|-----------------------|---------|---------------------------------|--------------------------|--------|
| | | | Chain 1 | Chain 2 | Combined Power or Highest Power | | |
| 175 | 5875 | 6 | -1.90 | -0.40 | 1.92 | 10 | Pass |
| 181 | 5905 | 6 | -2.20 | -0.70 | 1.62 | 10 | Pass |

20 MHz Bandwidth EIRP Measurement

| Channel No. | Frequency (MHz) | EUT Power Setting (dBm) | Combined or Highest Conducted Power (dBm) | Antenna Gain (dBi) | Measured EIRP (dBm) | EIRP Limit (dBm) | Result |
|-------------|-----------------|-------------------------|---|--------------------|---------------------|------------------|--------|
| 175 | 5875 | 6 | 1.92 | 16 | 17.92 | 23 | Pass |
| | | | | 20 | 21.92 | 23 | |
| | | | | 23 | N/A | 23 | |
| 181 | 5905 | 6 | 1.62 | 16 | 17.62 | 23 | Pass |
| | | | | 20 | 21.62 | 23 | |
| | | | | 23 | N/A | 23 | |

10.4 Transmit Spectrum Mask

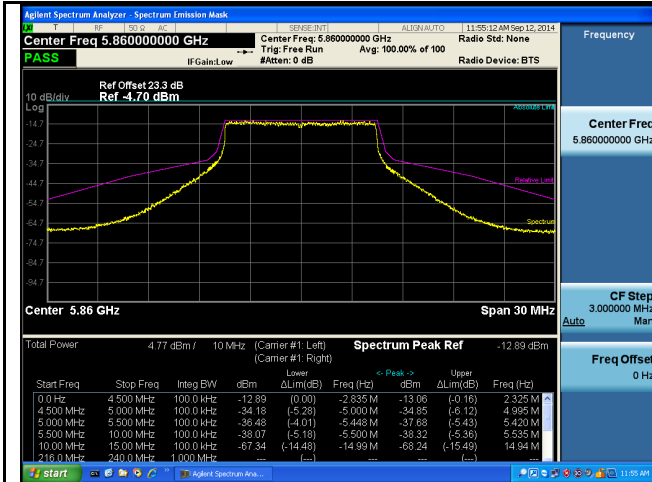
Requirement(s):

| Spec | Item | Requirement | Applicable | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------------------------|---|---|-----------------|-----------------|-----------------|-----------------|----------------|----------------|---------|---|-----|-----|-----|-----|---------|---|-----|-----|-----|-----|---------|---|-----|-----|-----|-----|---------|---|-----|-----|-----|-----|--|
| FCC §90.379 ASTM E2213-03 8.9.2 | a) | <p>The DSRC transmitted spectrum mask is relative to the device class of operation. The power in the transmitted spectrum for all DSRC devices shall be -25 dBm or less within 100 kHz outside all channel and band edges. This will be accomplished by attenuating the transmitted signal 100 kHz outside the channel and band edges by $55 + 10\log(P)$ dB, where P is the total transmitted power in watts. The transmitted spectral density of the transmitted signal for all devices shall fall within the spectral mask, as detailed in Table 10.</p> <p style="text-align: center;">Table 10. DSRC Spectrum Mask</p> <table><tr><th>Class</th><th>±4.5-MHz Offset</th><th>±5.0-MHz Offset</th><th>±5.5-MHz Offset</th><th>±10-MHz Offset</th><th>±15-MHz Offset</th></tr><tr><td>Class A</td><td>0</td><td>-10</td><td>-20</td><td>-28</td><td>-40</td></tr><tr><td>Class B</td><td>0</td><td>-16</td><td>-20</td><td>-28</td><td>-40</td></tr><tr><td>Class C</td><td>0</td><td>-26</td><td>-32</td><td>-40</td><td>-50</td></tr><tr><td>Class D</td><td>0</td><td>-35</td><td>-45</td><td>-55</td><td>-65</td></tr></table> <p>Note: Reduction in Power Spectral Density, dBr.</p> <div></div> | Class | ±4.5-MHz Offset | ±5.0-MHz Offset | ±5.5-MHz Offset | ±10-MHz Offset | ±15-MHz Offset | Class A | 0 | -10 | -20 | -28 | -40 | Class B | 0 | -16 | -20 | -28 | -40 | Class C | 0 | -26 | -32 | -40 | -50 | Class D | 0 | -35 | -45 | -55 | -65 | <div><input checked="" type="checkbox"/></div> |
| Class | ±4.5-MHz Offset | ±5.0-MHz Offset | ±5.5-MHz Offset | ±10-MHz Offset | ±15-MHz Offset | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Class A | 0 | -10 | -20 | -28 | -40 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Class B | 0 | -16 | -20 | -28 | -40 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Class C | 0 | -26 | -32 | -40 | -50 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Class D | 0 | -35 | -45 | -55 | -65 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Test Setup | <div><div>Spectrum Analyzer</div><div>EUT</div></div> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Test Procedure | The measurements shall be made using a 100 kHz resolution bandwidth and a 30 kHz video bandwidth. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Environmental conditions | Temperature (°C) Humidity (%) Atmospheric (mbar) | 22°C 45% 1020 mbar | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Test Date | 09/12/2014 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Remark | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Result | <div><input checked="" type="checkbox"/> Pass</div> <div><input type="checkbox"/> Fail</div> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

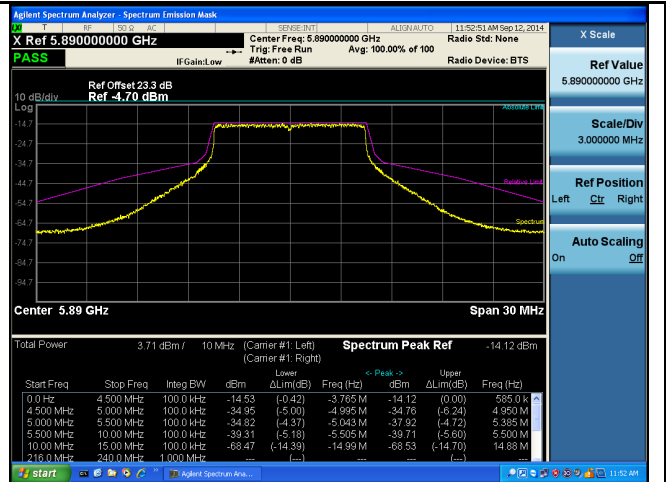
Test Data ☐ Yes ☒ N/A

Test Plot ☒ Yes (See below) ☐ N/A

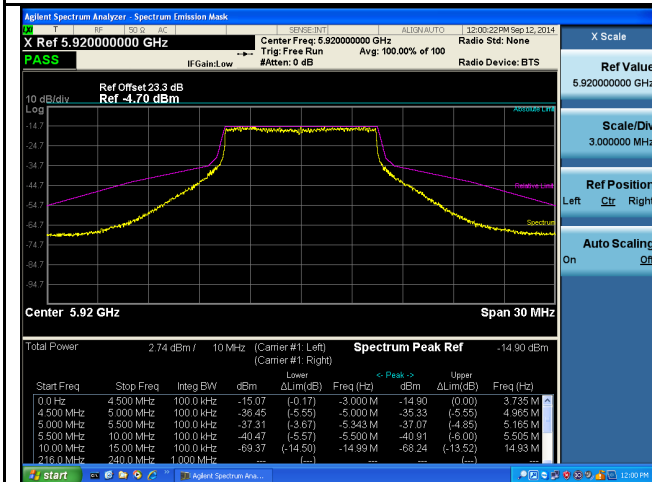
Class B Equipment Test Plots



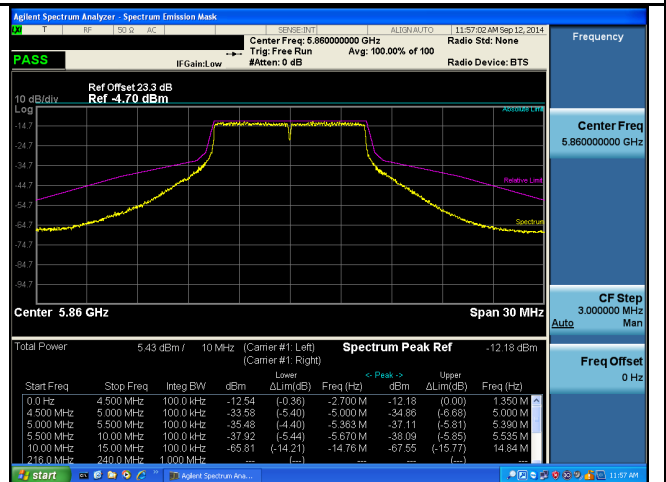
Emissions Mask (10MHz) - Low CH 5860MHz: Ant Port 1



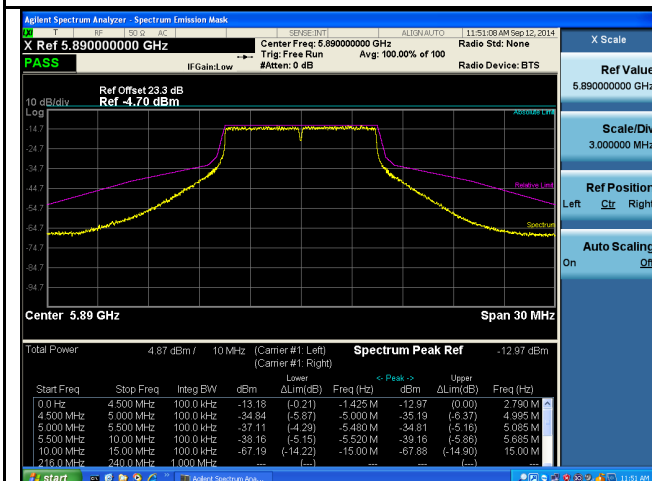
Emissions Mask (10MHz) - Mid CH 5890MHz: Ant Port 1



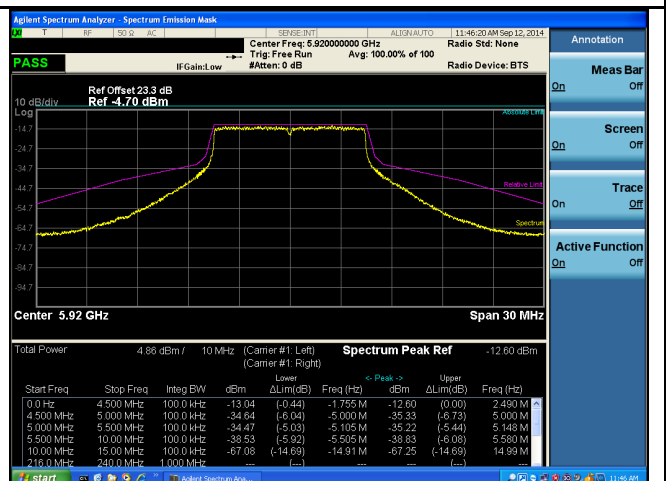
Emissions Mask (10MHz) - High CH 5920MHz: Ant Port 1



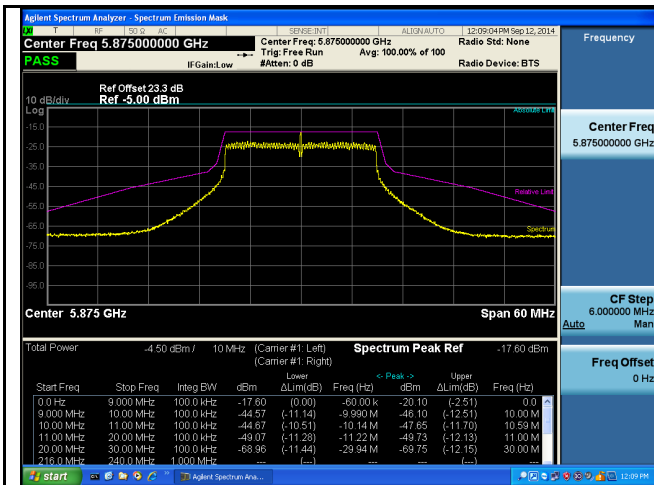
Emissions Mask (10MHz) - Low CH 5860MHz: Ant Port 2



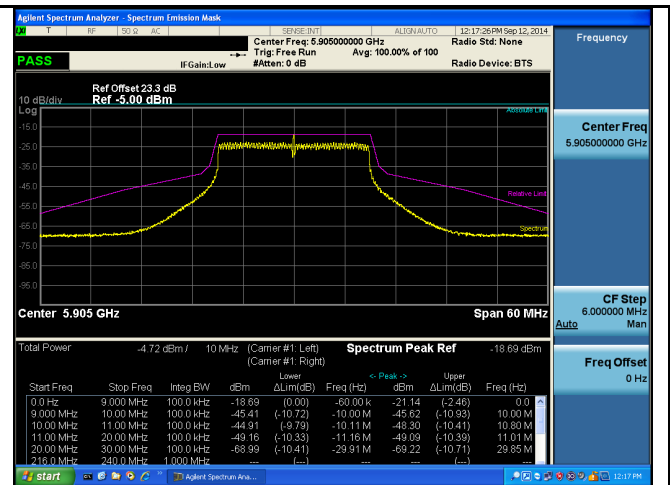
Emissions Mask (10MHz) - Mid CH 5890MHz: Ant Port 2



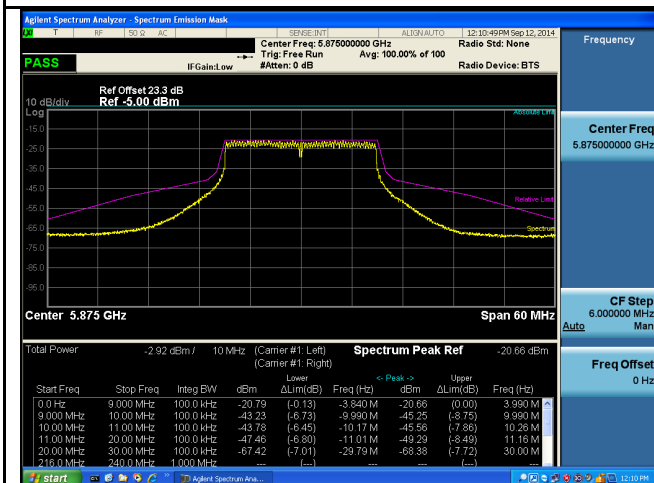
Emissions Mask (10MHz) - High CH 5920MHz: Ant Port 2



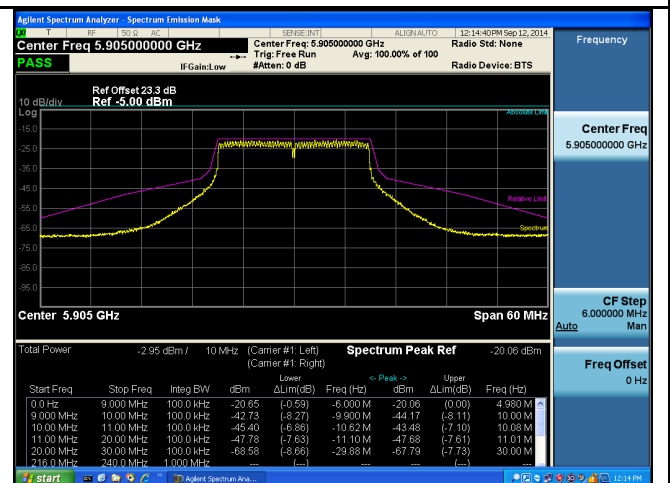
Emissions Mask (20MHz) - Low CH 5875MHz: Ant Port 1



Emissions Mask (20MHz) - High CH 5905MHz: Ant Port 1




Emissions Mask (20MHz) - Low CH 5875MHz: Ant Port 2



Emissions Mask (20MHz) - High CH 5905MHz: Ant Port 2

10.5 Transmitter Conducted Unwanted Emissions

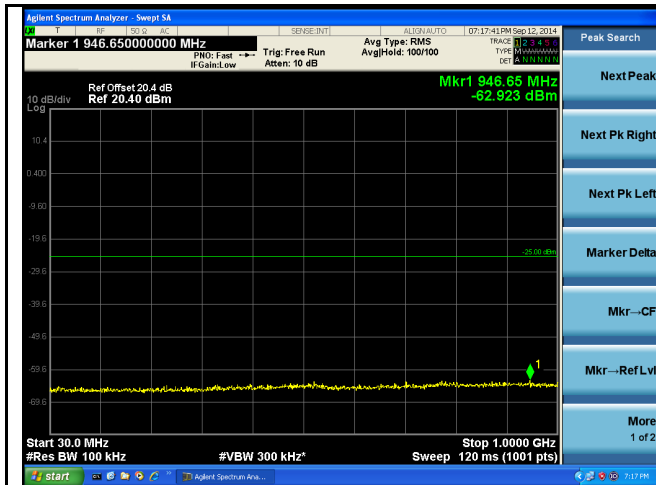
Requirement(s):

| Spec | Requirement | Applicable |
|--------------------------|--|-------------------------------------|
| ASTM E2213-03 8.9.2 | The power in the transmitted spectrum for all DSRC devices shall be -25 dBm or less within 100 kHz outside all channel and band edges. This will be accomplished by attenuating the transmitted signal 100 kHz outside the channel and band edges by $55 + 10\log(P)$ dB, where P is the total transmitted power in watts. | <input checked="" type="checkbox"/> |
| Test Setup |  | |
| Test Procedure | The conducted measurement procedure shall be as per ASTM E2213-03 Clause 8.9.2. | |
| Environmental conditions | Temperature (°C) 21 °C Humidity (%) 46% Atmospheric (mbar) 1020 mbar | |
| Test Date | 09/12/2014 | |
| Remark | - | |
| Result | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail | |

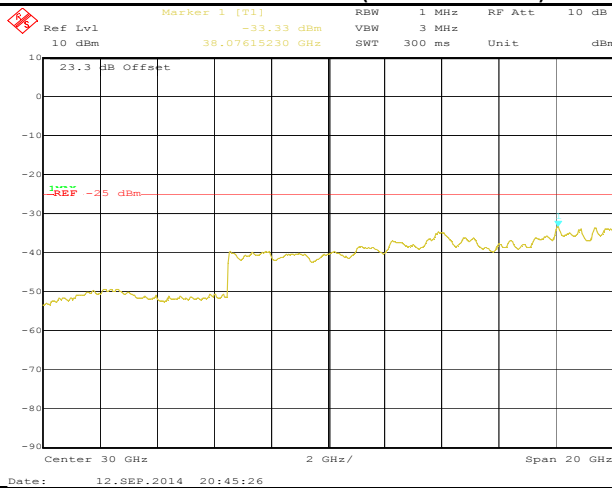
Test Data ☐ Yes ☒ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Conducted Spurious Emissions Test Plots (10MHz Bandwidth)



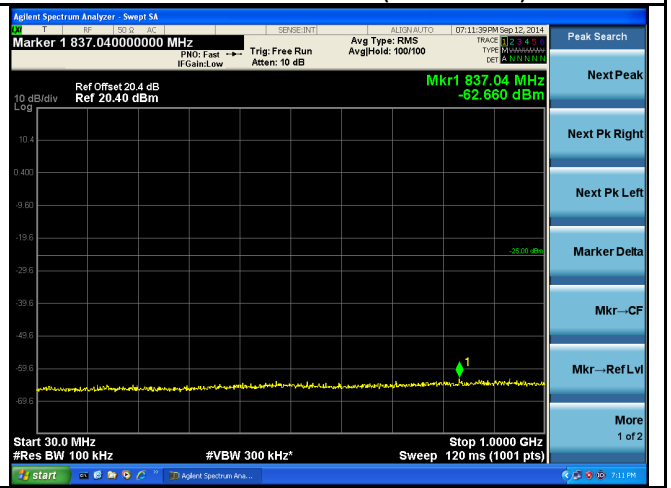
CSE - Low CH 5860MHz (30MHz-1000MHz)



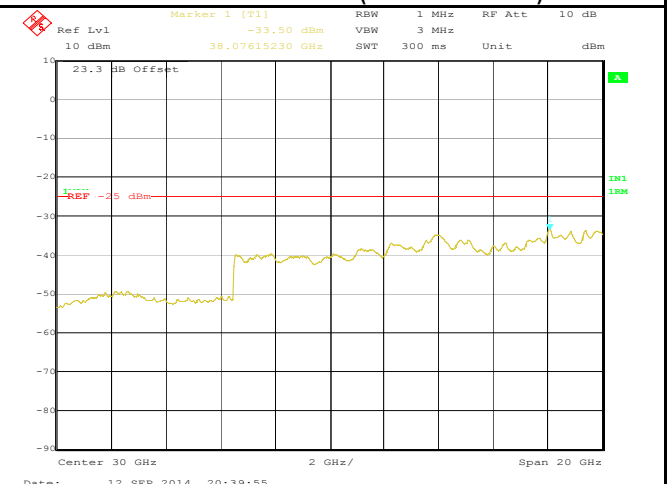
CSE - Mid CH 5890MHz (1GHz-20GHz)



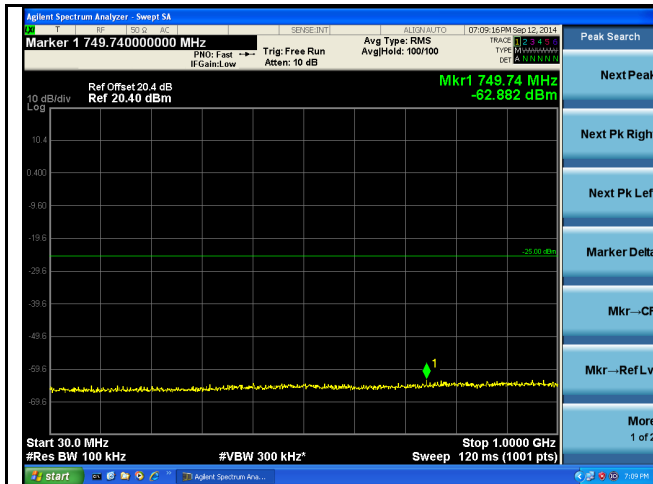
CSE - Low CH 5860MHz (1GHz-20GHz)



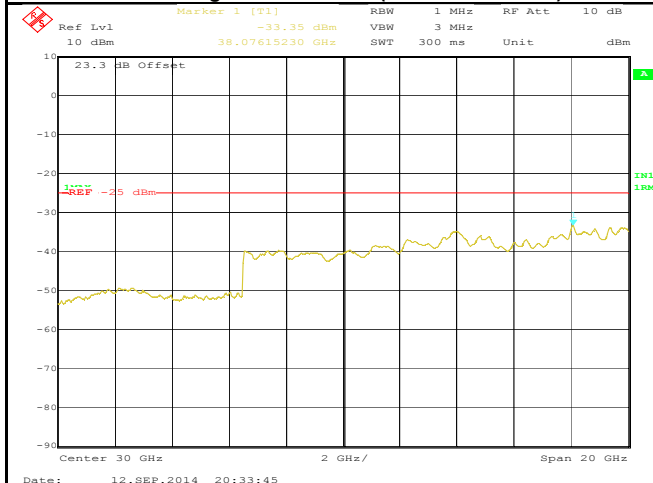
CSE - Mid CH 5890MHz (30MHz-1000MHz)



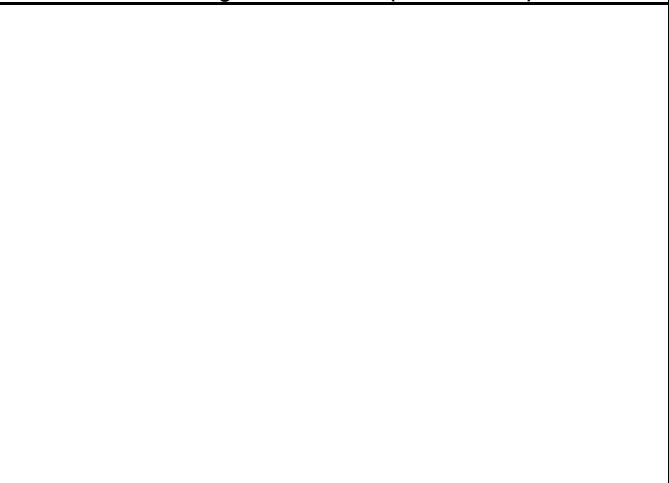
CSE - Low CH 5860MHz (20GHz-40GHz)



CSE - High CH 5920MHz (30MHz-1000MHz)

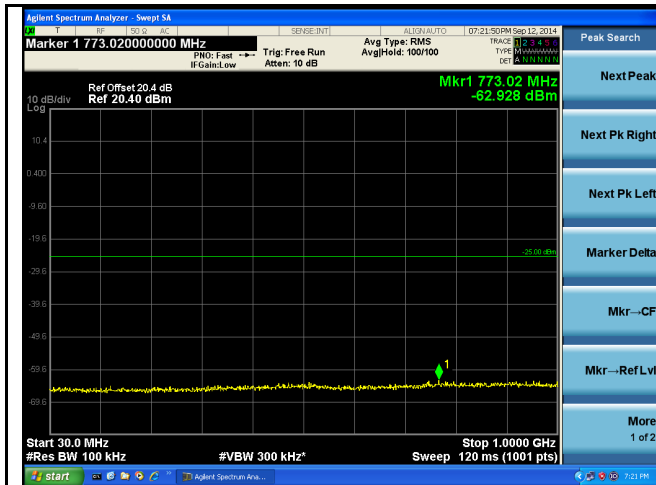


CSE - High CH 5920MHz (1GHz-20GHz)



CSE - High CH 5920MHz (20GHz-40GHz)

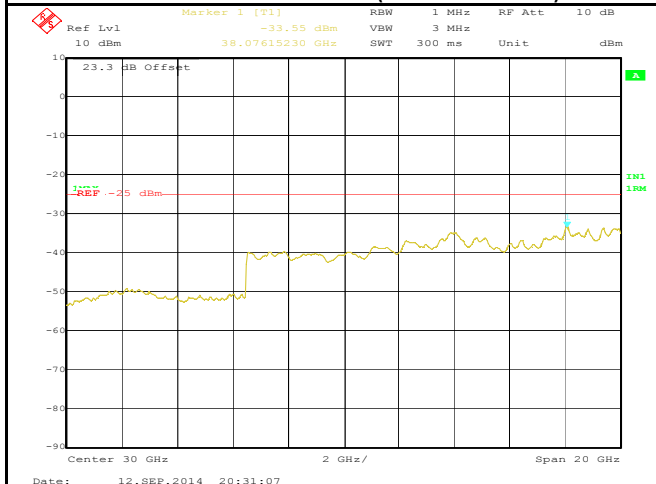
Conducted Spurious Emissions Test Plots (20MHz Bandwidth)



CSE - Low CH 5875MHz (30MHz-1000MHz)



CSE - Low CH 5875MHz (1GHz-20GHz)



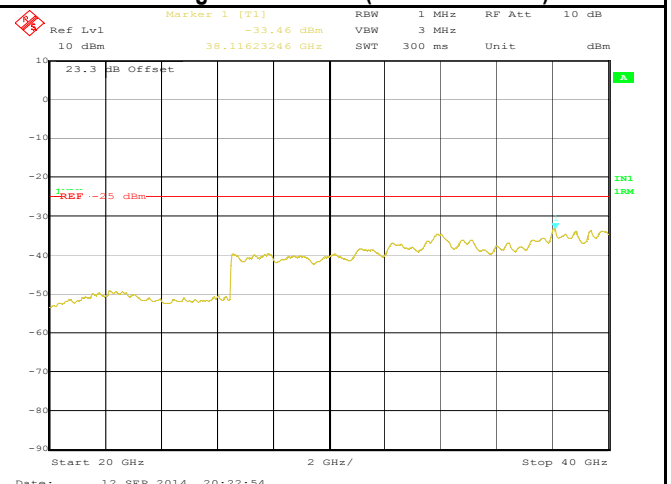
CSE - Low CH 5875MHz (20GHz-40GHz)



CSE - High CH 5905MHz (30MHz-1000MHz)



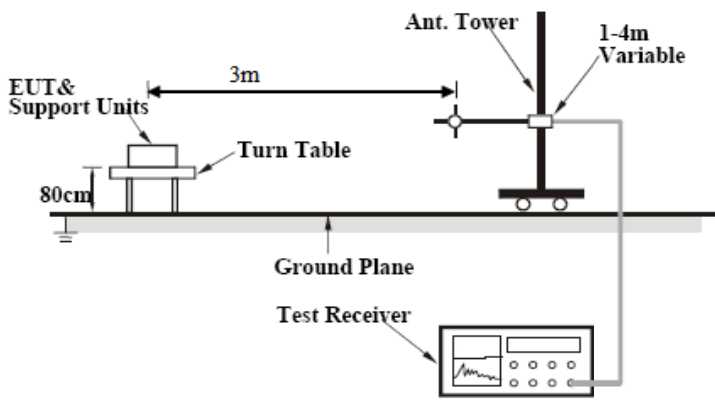
CSE - High CH 5905MHz (1GHz-20GHz)



CSE - High CH 5905MHz (20GHz-40GHz)

10.6 Transmitter Radiated Unwanted Emissions

Requirement(s):

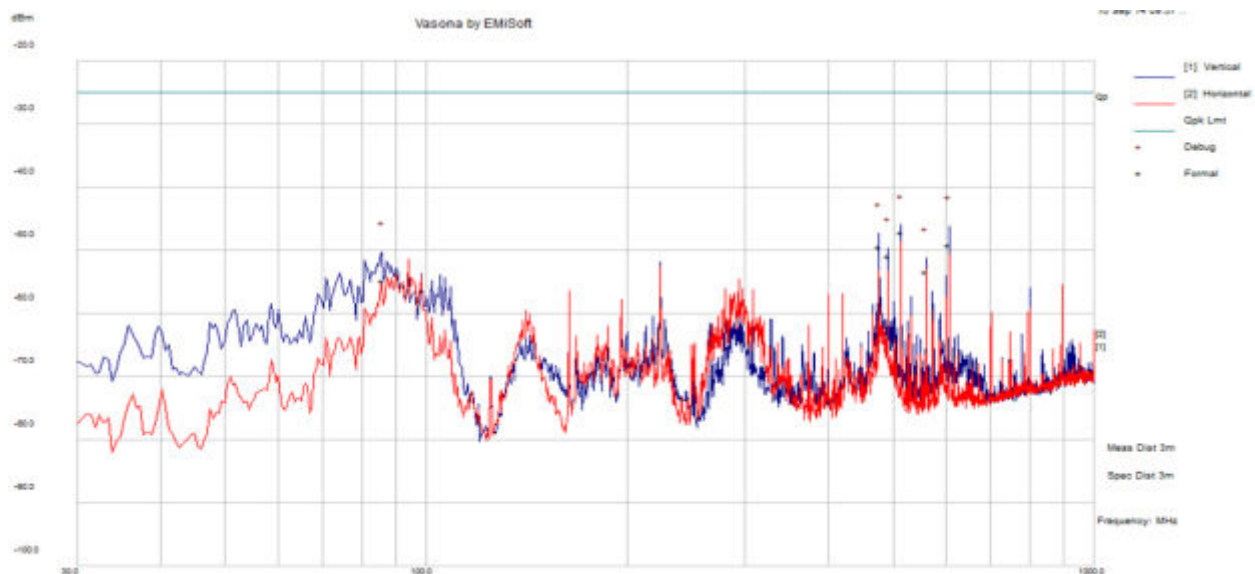
| Spec | Requirement | Applicable |
|---------------------|--|-------------------------------------|
| ASTM E2213-03 8.9.2 | The power in the transmitted spectrum for all DSRC devices shall be -25 dBm or less within 100 kHz outside all channel and band edges. This will be accomplished by attenuating the transmitted signal 100 kHz outside the channel and band edges by $55 + 10\log(P)$ dB, where P is the total transmitted power in watts. | <input checked="" type="checkbox"/> |
| Test Setup |  | |
| Test Procedure | <ol style="list-style-type: none"> 1. The EUT was switched on and allowed to warm up to its normal operating condition. 2. Measurement was made at a distance of 3 m. 3. The measuring antenna was set to 1 meter away from the ground plain. 4. Maximization of the emissions was carried out by rotating the EUT, and adjusting the antenna azimuth. 5. The test was done in both horizontal and vertical antenna polarizations. 6. The measurement shall be made with the transmitter set to the lowest operating frequency and with the transmitter set to the highest operating frequency | |
| Remark | <ul style="list-style-type: none"> - Low, middle and high channels were verified. - Only the worst channel was selected for the final measurement below 1GHz. - The test distance from receiving antenna and EUT above 18GHz was 1m. | |
| Result | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail | |

Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Radiated Emission Test Results (Below 1GHz)

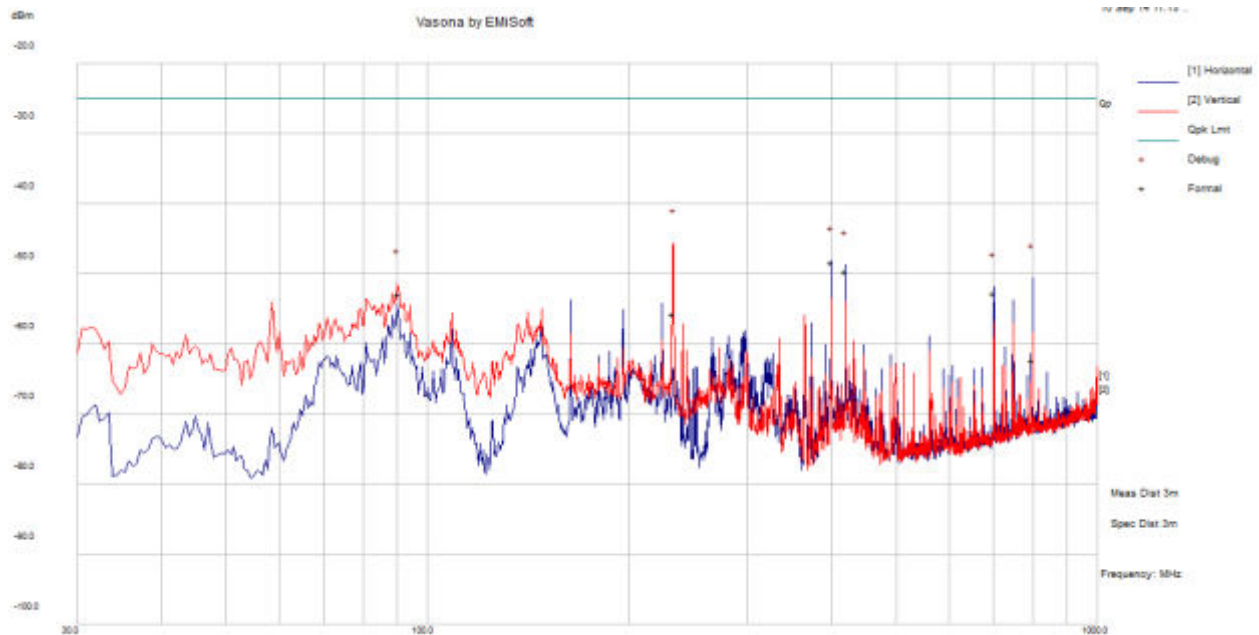
| Test specification | Transmitter Radiated Unwanted Emissions | | | |
|---------------------------|--|------|--------|------|
| Environmental Conditions: | Temp (°C): | 21 | Result | PASS |
| | Humidity (%) | 44 | | |
| | Atmospheric (mbar): | 1019 | | |
| Mains Power: | 120VAC/60Hz | | | |
| Tested by: | Angel Escamilla | | | |
| Test Date: | 09/10/2014 | | | |
| Remarks: | Mid Ch: 5890MHz, 10MHz BW, 16dBi Antenna | | | |



30MHz – 1000MHz at 3m distance

| Frequency MHz | Raw dBm | Cable Loss | AF dB | Level dBm/m | Measurement Type | Pol | Hgt cm | Azt Deg | Limit dBm/m | Margin dB | Pass /Fail |
|---------------|--|------------|--------|-------------|------------------|-----|--------|---------|-------------|-----------|------------|
| 86.02 | -36.09 | 13.38 | -32.06 | -54.77 | Quasi Max | V | 102.00 | 309.00 | -25.00 | -29.77 | Pass |
| 476.01 | -42.93 | 15.75 | -22.28 | -49.46 | Quasi Max | V | 103.00 | 230.00 | -25.00 | -24.46 | Pass |
| 491.03 | -44.92 | 15.86 | -21.81 | -50.87 | Quasi Max | V | 101.00 | 153.00 | -25.00 | -25.87 | Pass |
| 513.33 | -41.17 | 15.93 | -21.90 | -47.13 | Quasi Max | V | 100.00 | 163.00 | -25.00 | -22.13 | Pass |
| 560.00 | -48.04 | 15.94 | -21.20 | -53.30 | Quasi Max | V | 101.00 | 346.00 | -25.00 | -28.30 | Pass |
| 606.66 | -44.34 | 15.96 | -20.69 | -49.07 | Quasi Max | V | 101.00 | 335.00 | -25.00 | -24.07 | Pass |
| Note: | Both horizontal and vertical polarizations were verified. In this case vertical polarization was the worst case. | | | | | | | | | | |

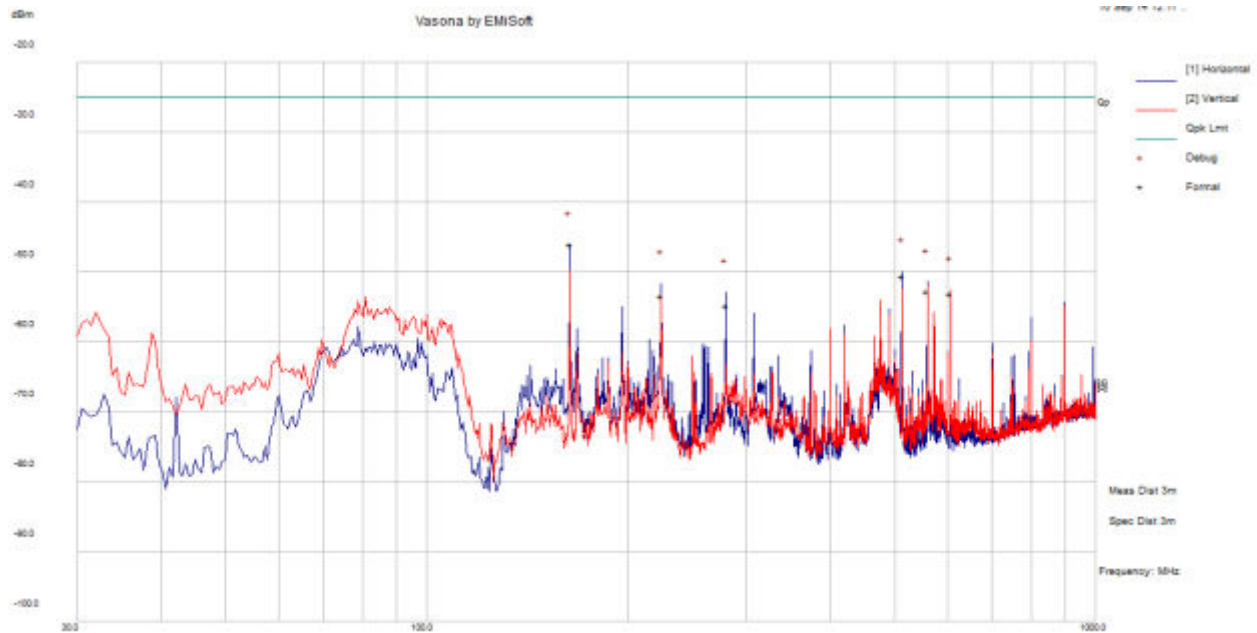
| Test specification | Transmitter Radiated Unwanted Emissions | | | |
|---------------------------|--|------|--------|------|
| Environmental Conditions: | Temp (°C): | 23 | Result | PASS |
| | Humidity (%) | 46 | | |
| | Atmospheric (mPa): | 1020 | | |
| Mains Power: | 120VAC/60Hz | | | |
| Tested by: | Angel Escamilla | | | |
| Test Date: | 09/10/2014 | | | |
| Remarks: | Mid Ch: 5890MHz, 10MHz BW, 20dBi Antenna | | | |



30MHz – 1000MHz at 3m distance

| Frequency MHz | Raw dBm | Cable Loss | AF dB | Level dBm/m | Measurement Type | Pol | Hgt cm | Azt Deg | Limit dBm/m | Margin dB | Pass /Fail |
|---------------|---------|------------|--------|-------------|------------------|-----|--------|---------|-------------|-----------|------------|
| 90.39 | -34.42 | 13.45 | -31.98 | -52.95 | Quasi Max | V | 105.00 | 149.00 | -25.00 | -27.95 | Pass |
| 232.67 | -41.82 | 14.46 | -28.36 | -55.73 | Quasi Max | V | 136.00 | 269.00 | -25.00 | -30.73 | Pass |
| 399.99 | -39.47 | 15.10 | -24.07 | -48.44 | Quasi Max | H | 101.00 | 172.00 | -25.00 | -23.44 | Pass |
| 420.00 | -41.44 | 15.28 | -23.43 | -49.59 | Quasi Max | H | 100.00 | 185.00 | -25.00 | -24.59 | Pass |
| 700.02 | -49.80 | 16.27 | -19.23 | -52.76 | Quasi Max | H | 110.00 | 168.00 | -25.00 | -27.76 | Pass |
| 799.99 | -61.05 | 16.61 | -17.76 | -62.20 | Quasi Max | H | 161.00 | 169.00 | -25.00 | -37.20 | Pass |

| Test specification | Transmitter Radiated Unwanted Emissions | | | |
|---------------------------|--|------|--------|------|
| Environmental Conditions: | Temp (°C): | 22 | Result | PASS |
| | Humidity (%) | 44 | | |
| | Atmospheric (mbar): | 1019 | | |
| Mains Power: | 120VAC/60Hz | | | |
| Tested by: | Angel Escamilla | | | |
| Test Date: | 09/10/2014 | | | |
| Remarks: | Mid Ch: 5890MHz, 10MHz BW, 23dBi Antenna | | | |



30MHz – 1000MHz at 3m distance

| Frequency MHz | Raw dBm | Cable Loss | AF dB | Level dBm/m | Measurement Type | Pol | Hgt cm | Azt Deg | Limit dBm/m | Margin dB | Pass /Fail |
|---------------|---------|------------|--------|-------------|------------------|-----|--------|---------|-------------|-----------|------------|
| 163.67 | -32.23 | 14.08 | -27.88 | -46.03 | Quasi Max | H | 146.00 | 76.00 | -25.00 | -21.03 | Pass |
| 223.99 | -39.11 | 14.41 | -28.71 | -53.41 | Quasi Max | H | 114.00 | 165.00 | -25.00 | -28.41 | Pass |
| 280.01 | -43.11 | 14.68 | -26.40 | -54.83 | Quasi Max | H | 100.00 | 227.00 | -25.00 | -29.83 | Pass |
| 513.32 | -44.51 | 15.93 | -21.90 | -50.47 | Quasi Max | H | 199.00 | 9.00 | -25.00 | -25.47 | Pass |
| 560.00 | -47.45 | 15.94 | -21.20 | -52.72 | Quasi Max | H | 193.00 | 200.00 | -25.00 | -27.72 | Pass |
| 606.66 | -48.25 | 15.96 | -20.69 | -52.98 | Quasi Max | V | 100.00 | 267.00 | -25.00 | -27.98 | Pass |

Radiated Emission Test Results (1GHz-40GHz) – 16dBi Antenna

Frequency range 1GHz-40GHz – Low CH (5860MHz) – 10MHz Bandwidth

| Frequency MHz | Raw dBm | Cable Loss | AF dB | Level dBm/m | Measurement Type | Pol | Hgt cm | Azt Deg | Limit dBm/m | Margin dB | Pass /Fail |
|---------------|---|------------|-------|-------------|------------------|-----|--------|---------|-------------|-----------|------------|
| 14259.27 | -76.91 | 16.96 | 10.51 | -49.45 | RMS Max | H | 150 | 300 | -25 | -24.45 | Pass |
| 17853.15 | -79.48 | 17.37 | 13.97 | -48.14 | RMS Max | H | 255 | 165 | -25 | -23.14 | Pass |
| Remark | Emissions were scanned up to 40GHz; no emissions were detected above the noise floor which was at least 20dB below the specification limit. Both horizontal and vertical polarizations were verified. | | | | | | | | | | |

Frequency range 1GHz-40GHz – Mid CH (5890MHz) – 10MHz Bandwidth

| Frequency MHz | Raw dBm | Cable Loss | AF dB | Level dBm/m | Measurement Type | Pol | Hgt cm | Azt Deg | Limit dBm/m | Margin dB | Pass /Fail |
|---------------|---|------------|-------|-------------|------------------|-----|--------|---------|-------------|-----------|------------|
| 14009.88 | -75.97 | 16.86 | 10.02 | -49.10 | RMS Max | H | 216.00 | 301.00 | -25.00 | -24.10 | Pass |
| 18001.33 | -65.01 | 17.38 | 0.00 | -47.63 | RMS Max | H | 149.00 | 220.00 | -25.00 | -22.63 | Pass |
| Remark | Emissions were scanned up to 40GHz; no emissions were detected above the noise floor which was at least 20dB below the specification limit. Both horizontal and vertical polarizations were verified. | | | | | | | | | | |

Frequency range 1GHz-40GHz – Low CH (5920MHz) – 10MHz Bandwidth

| Frequency MHz | Raw dBm | Cable Loss | AF dB | Level dBm/m | Measurement Type | Pol | Hgt cm | Azt Deg | Limit dBm/m | Margin dB | Pass /Fail |
|---------------|---|------------|-------|-------------|------------------|-----|--------|---------|-------------|-----------|------------|
| 14115.50 | -76.09 | 16.90 | 10.23 | -48.96 | RMS Max | H | 132.00 | 52.00 | -25.00 | -23.96 | Pass |
| 17827.86 | -79.36 | 17.36 | 13.89 | -48.11 | RMS Max | H | 119.00 | 239.00 | -25.00 | -23.11 | Pass |
| Remark | Emissions were scanned up to 40GHz; no emissions were detected above the noise floor which was at least 20dB below the specification limit. Both horizontal and vertical polarizations were verified. | | | | | | | | | | |

Frequency range 1GHz-40GHz – Low CH (5875MHz) – 20MHz Bandwidth

| Frequency MHz | Raw dBm | Cable Loss | AF dB | Level dBm/m | Measurement Type | Pol | Hgt cm | Azt Deg | Limit dBm/m | Margin dB | Pass /Fail |
|---------------|---|------------|-------|-------------|------------------|-----|--------|---------|-------------|-----------|------------|
| 14144.62 | -74.12 | 16.91 | 10.28 | -46.92 | RMS Max | H | 123.00 | 256.00 | -25.00 | -21.92 | Pass |
| 17875.08 | -77.59 | 17.37 | 14.05 | -46.18 | RMS Max | V | 103.00 | 276.00 | -25.00 | -21.18 | Pass |
| Remark | Emissions were scanned up to 40GHz; no emissions were detected above the noise floor which was at least 20dB below the specification limit. Both horizontal and vertical polarizations were verified. | | | | | | | | | | |

Frequency range 1GHz-40GHz – Low CH (5905MHz) – 20MHz Bandwidth

| Frequency MHz | Raw dBm | Cable Loss | AF dB | Level dBm/m | Measurement Type | Pol | Hgt cm | Azt Deg | Limit dBm/m | Margin dB | Pass /Fail |
|---------------|---|------------|-------|-------------|------------------|-----|--------|---------|-------------|-----------|------------|
| 14536.41 | -74.31 | 17.07 | 10.81 | -46.43 | RMS Max | H | 134.00 | 302.00 | -25.00 | -21.43 | Pass |
| 17784.24 | -76.72 | 17.36 | 13.74 | -45.62 | RMS Max | V | 102.00 | 43.00 | -25.00 | -20.62 | Pass |
| Remark | Emissions were scanned up to 40GHz; no emissions were detected above the noise floor which was at least 20dB below the specification limit. Both horizontal and vertical polarizations were verified. | | | | | | | | | | |

Radiated Emission Test Results (1GHz-40GHz) – 20dBi Antenna

Frequency range 1GHz-40GHz – Low CH (5860MHz) – 10MHz Bandwidth

| Frequency MHz | Raw dBm | Cable Loss | AF dB | Level dBm/m | Measurement Type | Pol | Hgt cm | Azt Deg | Limit dBm/m | Margin dB | Pass /Fail |
|---------------|---|------------|-------|-------------|------------------|-----|--------|---------|-------------|-----------|------------|
| 14053.38 | -76.02 | 16.87 | 10.10 | -49.05 | RMS Max | H | 100.00 | 15.00 | -25.00 | -24.05 | Pass |
| 17933.89 | -79.46 | 17.38 | 14.24 | -47.84 | RMS Max | H | 270.00 | 46.00 | -25.00 | -22.84 | Pass |
| Remark | Emissions were scanned up to 40GHz; no emissions were detected above the noise floor which was at least 20dB below the specification limit. Both horizontal and vertical polarizations were verified. | | | | | | | | | | |

Frequency range 1GHz-40GHz – Mid CH (5890MHz) – 10MHz Bandwidth

| Frequency MHz | Raw dBm | Cable Loss | AF dB | Level dBm/m | Measurement Type | Pol | Hgt cm | Azt Deg | Limit dBm/m | Margin dB | Pass /Fail |
|---------------|---|------------|-------|-------------|------------------|-----|--------|---------|-------------|-----------|------------|
| 14564.18 | -76.52 | 17.09 | 10.69 | -48.74 | RMS Max | H | 131.00 | 224.00 | -25.00 | -23.74 | Pass |
| 17962.60 | -79.52 | 17.38 | 14.34 | -47.80 | RMS Max | H | 103.00 | 155.00 | -25.00 | -22.80 | Pass |
| Remark | Emissions were scanned up to 40GHz; no emissions were detected above the noise floor which was at least 20dB below the specification limit. Both horizontal and vertical polarizations were verified. | | | | | | | | | | |

Frequency range 1GHz-40GHz – Low CH (5920MHz) – 10MHz Bandwidth

| Frequency MHz | Raw dBm | Cable Loss | AF dB | Level dBm/m | Measurement Type | Pol | Hgt cm | Azt Deg | Limit dBm/m | Margin dB | Pass /Fail |
|---------------|---|------------|-------|-------------|------------------|-----|--------|---------|-------------|-----------|------------|
| 14529.63 | -76.74 | 17.07 | 10.84 | -48.83 | RMS Max | H | 286.00 | 104.00 | -25.00 | -23.83 | Pass |
| 18000.56 | 0.00 | 17.38 | 45.73 | -47.64 | RMS Max | H | 168.00 | 357.00 | -25.00 | -22.64 | Pass |
| Remark | Emissions were scanned up to 40GHz; no emissions were detected above the noise floor which was at least 20dB below the specification limit. Both horizontal and vertical polarizations were verified. | | | | | | | | | | |

Frequency range 1GHz-40GHz – Low CH (5875MHz) – 20MHz Bandwidth

| Frequency MHz | Raw dBm | Cable Loss | AF dB | Level dBm/m | Measurement Type | Pol | Hgt cm | Azt Deg | Limit dBm/m | Margin dB | Pass /Fail |
|---------------|---|------------|-------|-------------|------------------|-----|--------|---------|-------------|-----------|------------|
| 14107.07 | -76.18 | 16.90 | 10.21 | -49.07 | RMS Max | H | 167.00 | 71.00 | -25.00 | -24.07 | Pass |
| 17957.72 | -79.48 | 17.38 | 14.32 | -47.78 | RMS Max | H | 297.00 | 329.00 | -25.00 | -22.78 | Pass |
| Remark | Emissions were scanned up to 40GHz; no emissions were detected above the noise floor which was at least 20dB below the specification limit. Both horizontal and vertical polarizations were verified. | | | | | | | | | | |

Frequency range 1GHz-40GHz – Low CH (5905MHz) – 20MHz Bandwidth

| Frequency MHz | Raw dBm | Cable Loss | AF dB | Level dBm/m | Measurement Type | Pol | Hgt cm | Azt Deg | Limit dBm/m | Margin dB | Pass /Fail |
|---------------|---|------------|-------|-------------|------------------|-----|--------|---------|-------------|-----------|------------|
| 14019.89 | -76.03 | 16.86 | 10.04 | -49.14 | RMS Max | H | 201.00 | 156.00 | -25.00 | -24.14 | Pass |
| 17994.91 | -79.50 | 17.38 | 14.45 | -47.67 | RMS Max | H | 258.00 | 189.00 | -25.00 | -22.67 | Pass |
| Remark | Emissions were scanned up to 40GHz; no emissions were detected above the noise floor which was at least 20dB below the specification limit. Both horizontal and vertical polarizations were verified. | | | | | | | | | | |

Radiated Emission Test Results (1GHz-40GHz) – 23dBi Antenna

Frequency range 1GHz-40GHz – Low CH (5860MHz) – 10MHz Bandwidth

| Frequency MHz | Raw dBm | Cable Loss | AF dB | Level dBm/m | Measurement Type | Pol | Hgt cm | Azt Deg | Limit dBm/m | Margin dB | Pass /Fail |
|---------------|---|------------|-------|-------------|------------------|-----|--------|---------|-------------|-----------|------------|
| 14156.44 | -76.33 | 16.92 | 10.31 | -49.11 | RMS Max | H | 197.00 | 240.00 | -25.00 | -24.11 | Pass |
| 17975.91 | -79.62 | 17.38 | 14.38 | -47.85 | RMS Max | H | 194.00 | 166.00 | -25.00 | -22.85 | Pass |
| Remark | Emissions were scanned up to 40GHz; no emissions were detected above the noise floor which was at least 20dB below the specification limit. Both horizontal and vertical polarizations were verified. | | | | | | | | | | |

Frequency range 1GHz-40GHz – Mid CH (5890MHz) – 10MHz Bandwidth

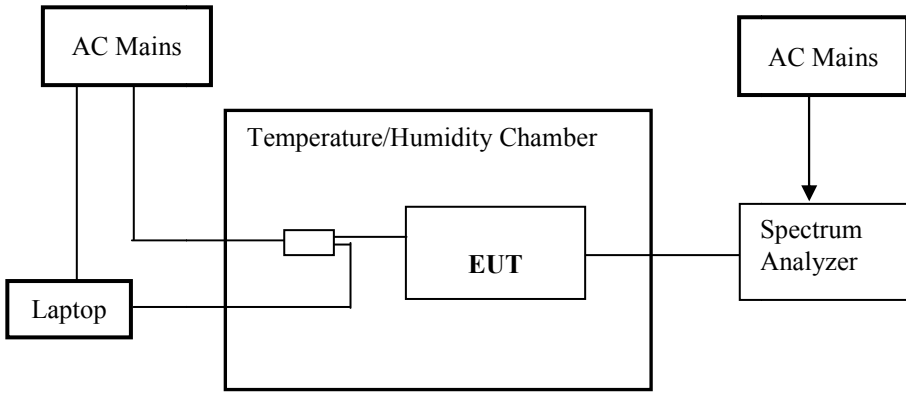
| Frequency MHz | Raw dBm | Cable Loss | AF dB | Level dBm/m | Measurement Type | Pol | Hgt cm | Azt Deg | Limit dBm/m | Margin dB | Pass /Fail |
|---------------|---|------------|-------|-------------|------------------|-----|--------|---------|-------------|-----------|------------|
| 14110.92 | -76.11 | 16.9 | 10.22 | -48.99 | RMS Max | H | 204 | 149 | -25 | -23.99 | Pass |
| 17932.59 | -79.47 | 17.38 | 14.24 | -47.86 | RMS Max | H | 193 | 91 | -25 | -22.86 | Pass |
| Remark | Emissions were scanned up to 40GHz; no emissions were detected above the noise floor which was at least 20dB below the specification limit. Both horizontal and vertical polarizations were verified. | | | | | | | | | | |

Frequency range 1GHz-40GHz – Low CH (5920MHz) – 10MHz Bandwidth

| Frequency MHz | Raw dBm | Cable Loss | AF dB | Level dBm/m | Measurement Type | Pol | Hgt cm | Azt Deg | Limit dBm/m | Margin dB | Pass /Fail |
|---------------|---|------------|-------|-------------|------------------|-----|--------|---------|-------------|-----------|------------|
| 14584.12 | -76.42 | 17.09 | 10.60 | -48.72 | RMS Max | H | 101.00 | 219.00 | -25.00 | -23.72 | Pass |
| 17932.01 | -79.48 | 17.38 | 14.24 | -47.86 | RMS Max | H | 118.00 | 360.00 | -25.00 | -22.86 | Pass |
| Remark | Emissions were scanned up to 40GHz; no emissions were detected above the noise floor which was at least 20dB below the specification limit. Both horizontal and vertical polarizations were verified. | | | | | | | | | | |

10.7 Frequency Stability

Requirement(s):

| Spec | Requirement | Applicable |
|------------------------------------|--|-------------------------------------|
| FCC §2.1055 ASTM E2213-03 8.9.4 | The transmitted center frequency tolerance shall be ± 10 ppm maximum for RSUs and ± 10 ppm maximum for OBUs. The transmit center frequency and the symbol clock frequency shall be derived from the same reference oscillator. The test shall be performed at normal and extreme test conditions. From -30°C to $+50^{\circ}\text{C}$ and vary the primary supply voltage from 85% to 115% of the nominal value. | <input checked="" type="checkbox"/> |
| Test Setup |  | |
| Test Procedure | <ul style="list-style-type: none"> - The EUT was switched on and allowed to warm up to its normal operating condition. - An SMA cable was used to replace the EUT antenna during the measurements. - Normal and extreme test conditions were measured | |
| Test Data | 09/15/2014 | |
| Remark | - | |
| Result | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail | |

Test Data ☒ Yes ☐ N/A

Test Plot ☐ Yes (See below) ☒ N/A

Test Results

Temperature Vs Frequency Stability: Center Frequency = 5860MHz

| Temperature (°C) | Measured Frequency (MHz) | Deviation (MHz) | Deviation (ppm) | Limit (ppm) | Result |
|------------------|--------------------------|-----------------|-----------------|-------------|--------|
| 50 | 5859.95 | 0.05 | 8.53 | ±10 | Pass |
| 40 | 5859.97 | 0.03 | 5.12 | ±10 | Pass |
| 30 | 5859.99 | 0.01 | 1.71 | ±10 | Pass |
| 20 | 5860.00 | 0.00 | 0.00 | ±10 | Pass |
| 10 | 5860.00 | 0.00 | 0.00 | ±10 | Pass |
| 0 | 5860.03 | -0.03 | -5.12 | ±10 | Pass |
| -10 | 5860.05 | -0.05 | -8.53 | ±10 | Pass |
| -20 | 5860.02 | -0.02 | -3.41 | ±10 | Pass |
| -30 | 5860.05 | -0.05 | -8.70 | ±10 | Pass |

Voltage Vs Frequency Stability: Center Frequency = 5860MHz

| Voltage (AC) | Measured Frequency (MHz) | Deviation (MHz) | Deviation (ppm) | Limit (ppm) | Result |
|--------------|--------------------------|-----------------|-----------------|-------------|--------|
| 138 | 5859.98 | 0.02 | 3.41 | ±10 | Pass |
| 120 | 5860.00 | 0.00 | 0.00 | ±10 | Pass |
| 102 | 5859.99 | 0.01 | 1.71 | ±10 | Pass |

Temperature Vs Frequency Stability: Center Frequency = 5890MHz

| Temperature (°C) | Measured Frequency (MHz) | Deviation (MHz) | Deviation (ppm) | Limit (ppm) | Result |
|------------------|--------------------------|-----------------|-----------------|-------------|--------|
| 50 | 5889.98 | 0.02 | 3.40 | ±10 | Pass |
| 40 | 5889.97 | 0.03 | 5.09 | ±10 | Pass |
| 30 | 5889.99 | 0.01 | 2.04 | ±10 | Pass |
| 20 | 5889.98 | 0.02 | 3.40 | ±10 | Pass |
| 10 | 5889.96 | 0.04 | 6.79 | ±10 | Pass |
| 0 | 5889.97 | 0.03 | 5.09 | ±10 | Pass |
| -10 | 5890.04 | -0.04 | -6.26 | ±10 | Pass |
| -20 | 5890.03 | -0.03 | -5.09 | ±10 | Pass |
| -30 | 5890.04 | -0.04 | -6.79 | ±10 | Pass |

Voltage Vs Frequency Stability: Center Frequency = 5890MHz

| Voltage (AC) | Measured Frequency (MHz) | Deviation (MHz) | Deviation (ppm) | Limit (ppm) | Result |
|--------------|--------------------------|-----------------|-----------------|-------------|--------|
| 138 | 5890.03 | -0.03 | -5.09 | ±10 | Pass |
| 120 | 5889.98 | 0.02 | 3.40 | ±10 | Pass |
| 102 | 5890.03 | -0.03 | -4.50 | ±10 | Pass |

Temperature Vs Frequency Stability: Center Frequency = 5920MHz

| Temperature (°C) | Measured Frequency (MHz) | Deviation (MHz) | Deviation (ppm) | Limit (ppm) | Result |
|------------------|--------------------------|-----------------|-----------------|-------------|--------|
| 50 | 5919.98 | 0.02 | 3.38 | ±10 | Pass |
| 40 | 5919.95 | 0.05 | 8.45 | ±10 | Pass |
| 30 | 5919.96 | 0.04 | 6.76 | ±10 | Pass |
| 20 | 5919.96 | 0.04 | 6.76 | ±10 | Pass |
| 10 | 5919.98 | 0.02 | 3.38 | ±10 | Pass |
| 0 | 5919.99 | 0.01 | 1.69 | ±10 | Pass |
| -10 | 5920.03 | -0.03 | -5.07 | ±10 | Pass |
| -20 | 5920.04 | -0.04 | -6.76 | ±10 | Pass |
| -30 | 5920.05 | -0.05 | -9.12 | ±10 | Pass |

Voltage Vs Frequency Stability: Center Frequency = 5920MHz

| Voltage (AC) | Measured Frequency (MHz) | Deviation (MHz) | Deviation (ppm) | Limit (ppm) | Result |
|--------------|--------------------------|-----------------|-----------------|-------------|--------|
| 138 | 5919.98 | 0.02 | 2.87 | ±10 | Pass |
| 120 | 5919.96 | 0.04 | 6.76 | ±10 | Pass |
| 102 | 5920.02 | -0.02 | -3.95 | ±10 | Pass |

Temperature Vs Frequency Stability: Center Frequency = 5875MHz

| Temperature (°C) | Measured Frequency (MHz) | Deviation (MHz) | Deviation (ppm) | Limit (ppm) | Result |
|------------------|--------------------------|-----------------|-----------------|-------------|--------|
| 50 | 5875.04 | -0.04 | -7.23 | ±10 | Pass |
| 40 | 5875.03 | -0.03 | -5.82 | ±10 | Pass |
| 30 | 5875.02 | -0.02 | -3.98 | ±10 | Pass |
| 20 | 5874.97 | 0.03 | 4.68 | ±10 | Pass |
| 10 | 5874.96 | 0.04 | 7.49 | ±10 | Pass |
| 0 | 5874.96 | 0.04 | 6.47 | ±10 | Pass |
| -10 | 5875.02 | -0.02 | -2.72 | ±10 | Pass |
| -20 | 5875.04 | -0.04 | -6.13 | ±10 | Pass |
| -30 | 5875.05 | -0.05 | -7.66 | ±10 | Pass |

Voltage Vs Frequency Stability: Center Frequency = 5875MHz

| Voltage (AC) | Measured Frequency (MHz) | Deviation (MHz) | Deviation (ppm) | Limit (ppm) | Result |
|--------------|--------------------------|-----------------|-----------------|-------------|--------|
| 138 | 5874.98 | 0.02 | 2.89 | ±10 | Pass |
| 120 | 5874.97 | 0.03 | 4.68 | ±10 | Pass |
| 102 | 5874.98 | 0.02 | 3.68 | ±10 | Pass |

Temperature Vs Frequency Stability: Center Frequency = 5905MHz

| Temperature (°C) | Measured Frequency (MHz) | Deviation (MHz) | Deviation (ppm) | Limit (ppm) | Result |
|------------------|--------------------------|-----------------|-----------------|-------------|--------|
| 50 | 5905.043 | -0.042 | -7.197 | ±10 | Pass |
| 40 | 5905.025 | -0.025 | -4.234 | ±10 | Pass |
| 30 | 5905.010 | -0.010 | -1.693 | ±10 | Pass |
| 20 | 5904.983 | 0.017 | 2.964 | ±10 | Pass |
| 10 | 5905.023 | -0.023 | -3.912 | ±10 | Pass |
| 0 | 5905.026 | -0.026 | -4.471 | ±10 | Pass |
| -10 | 5905.042 | -0.042 | -7.180 | ±10 | Pass |
| -20 | 5905.013 | -0.013 | -2.218 | ±10 | Pass |
| -30 | 5905.045 | -0.045 | -7.621 | ±10 | Pass |

Voltage Vs Frequency Stability: Center Frequency = 5905MHz

| Voltage (AC) | Measured Frequency (MHz) | Deviation (MHz) | Deviation (ppm) | Limit (ppm) | Result |
|--------------|--------------------------|-----------------|-----------------|-------------|--------|
| 138 | 5905.014 | -0.014 | -2.371 | ±10 | Pass |
| 120 | 5904.983 | 0.017 | 2.964 | ±10 | Pass |
| 102 | 5904.992 | 0.008 | 1.355 | ±10 | Pass |
















Annex A. TEST INSTRUMENT







| Instrument | Model | Serial # | Cal Date | Cal Cycle | Cal Due | In use |
|---|----------|---------------|------------|-----------|------------|-------------------------------------|
| Radiated Unwanted Emissions | | | | | | |
| R & S Receiver | ESL6 | 100178 | 03/01/2014 | 1 Year | 03/01/2015 | <input checked="" type="checkbox"/> |
| R & S Receiver | ESIB 40 | 100179 | 05/24/2014 | 1 Year | 05/24/2015 | <input checked="" type="checkbox"/> |
| ETS-Lingren Loop Antenna | 6512 | 00049120 | 08/22/2014 | 1 Year | 08/22/2015 | <input type="checkbox"/> |
| Bi-Log antenna (30MHz~2GHz) | JB1 | A030702 | 08/12/2014 | 1 Year | 08/12/2015 | <input checked="" type="checkbox"/> |
| Horn Antenna (1-26.5GHz) | 3115 | 10SL0059 | 04/26/2014 | 1 Year | 04/26/2015 | <input checked="" type="checkbox"/> |
| Horn Antenna (18-40 GHz) | AH-840 | 101013 | 04/23/2014 | 1 Year | 04/23/2015 | <input checked="" type="checkbox"/> |
| Pre-Amplifier (1-26.5GHz) | 8449B | 3008A00715 | 05/30/2014 | 1 Year | 05/30/2015 | <input checked="" type="checkbox"/> |
| Microwave Preamplifier (18-40 GHz) | PA-840 | 181251 | 05/30/2014 | 1 Year | 05/30/2015 | <input checked="" type="checkbox"/> |
| 3 Meters SAC | 3M | N/A | 10/13/2013 | 1 Year | 10/13/2014 | <input checked="" type="checkbox"/> |
| 10 Meters SAC | 10M | N/A | 06/05/2014 | 1 Year | 06/05/2015 | <input checked="" type="checkbox"/> |
| Sekonic Hygro Hermograph | ST-50 | HE01-000092 | 05/25/2014 | 1 Year | 05/25/2015 | <input checked="" type="checkbox"/> |
| RF Conducted Measurements | | | | | | |
| Spectrum Analyzer | N9010A | MY50210206 | 08/13/2014 | 1 Year | 08/13/2015 | <input checked="" type="checkbox"/> |
| Spectrum Analyzer | E4407B | US88441016 | 05/31/2014 | 1 Year | 05/31/2015 | <input type="checkbox"/> |
| R & S Receiver | ESIB 40 | 100179 | 05/24/2014 | 1 Year | 05/24/2015 | <input checked="" type="checkbox"/> |
| RF Power Sensor | 7002-006 | 13I00030SNO82 | 08/01/2014 | 1 Year | 08/01/2015 | <input checked="" type="checkbox"/> |
| Frequency Stability Measurements | | | | | | |
| Spectrum Analyzer | 8564E | 3738A00962 | 09/04/2013 | 1 Year | 09/04/2015 | <input checked="" type="checkbox"/> |
| Test Equity Environment Chamber | 1007H | 61201 | 07/30/2014 | 1 Year | 07/30/2015 | <input checked="" type="checkbox"/> |

Annex B. USER MANUAL, BLOCK & CIRCUIT DIAGRAM

Please see attachment

Annex C. SIEMIC Accreditation

| Accreditations | Document | Scope / Remark |
|---|---|---|
| ISO 17025 (A2LA) |  | Please see the documents for the detailed scope |
| ISO Guide 65 (A2LA) |  | Please see the documents for the detailed scope |
| TCB Designation | | A1, A2, A3, A4, B1, B2, B3, B4, C |
| FCC DoC Accreditation |  | FCC Declaration of Conformity Accreditation |
| FCC Site Registration |  | 3 meter site |
| FCC Site Registration |  | 10 meter site |
| IC Site Registration |  | 3 meter site |
| IC Site Registration |  | 10 meter site |
| EU NB |  | Radio & Telecommunications Terminal Equipment: EN45001 – EN ISO/IEC 17025 |
| |  | Electromagnetic Compatibility: EN45001 – EN ISO/IEC 17025 |
| Singapore iDA CB(Certification Body) |  | Phase I, Phase II |
| Vietnam MIC CAB Accreditation |  | Please see the document for the detailed scope |
| Hong Kong OFCA |  | (Phase II) OFCA Foreign Certification Body for Radio and Telecom |
| |  | (Phase I) Conformity Assessment Body for Radio and Telecom |
| Industry Canada CAB |  | Radio: Scope A – All Radio Standard Specification in Category I |
| |  | Telecom: CS-03 Part I, II, V, VI, VII, VIII |

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| Japan Recognized Certification Body Designation |  | Radio: A1. Terminal equipment for purpose of calling Telecom: B1. Specified radio equipment specified in Article 38-2, Paragraph 1, Item 1 of the Radio Law |
| Korea CAB Accreditation |  | EMI: KCC Notice 2008-39, RRL Notice 2008-3: CA Procedures for EMI KN22: Test Method for EMI EMS: KCC Notice 2008-38, RRL Notice 2008-4: CA Procedures for EMS KN24, KN61000-4-2, -4-3, -4-4, -4-5, -4-6, -4-8, -4-11: Test Method for EMS Radio: RRL Notice 2008-26, RRL Notice 2008-2, RRL Notice 2008-10, RRL Notice 2007-49, RRL Notice 2007-20, RRL Notice 2007-21, RRL Notice 2007-80, RRL Notice 2004-68 Telecom: President Notice 20664, RRL Notice 2007-30, RRL Notice 2008-7 with attachments 1, 3, 5, 6; President Notice 20664, RRL Notice 2008-7 with attachment 4 |
| Taiwan NCC CAB Recognition |  | LP0002, PSTN01, ADSL01, ID0002, IS6100, CNS14336, PLMN07, PLMN01, PLMN08 |
| Taiwan BSMI CAB Recognition |  | CNS 13438 |
| Japan VCCI |  | R-3083: Radiation 3 meter site C-3421: Main Ports Conducted Interference Measurement T-1597: Telecommunication Ports Conducted Interference Measurement |
| Australia CAB Recognition |  | EMC: AS/NZS CISPR 11, AS/NZS CISPR 14.1, AS/NZS CISPR22, AS/NZS 61000.6.3, AS/NZS 61000.6.4 Radio-communications: AS/NZS 4281, AS/NZS 4268, AS/NZS 4280.1, AS/NZS 4280.2, AS/NZS 4295, AS/NZS 4582, AS/NZS 4583, AS/NZS 4769.1, AS/NZS 4769.2, AS/NZS 4770, AS/NZS 4771 Telecommunications: AS/ACIF S002:05, AS/ACIF S003:06, AS/ACIF S004:06 AS/ACIF S006:01, AS/ACIF S016:01, AS/ACIF S031:01, AS/ACIF S038:01, AS/ACIF S040:01, AS/ACIF S041:05, AS/ACIF S043.2:06, AS/ACIF S60950.1 |
| Australia NATA Recognition |  | AS/ACIF S002, AS/ACIF S003, AS/ACIF S004, AS/ACIF S006, AS/ACIF S016, AS/ACIF S031, AS/ACIF S038, AS/ACIF S040, AS/ACIF S041, AS/ACIF S043.2 |