



Report No.: HKEM180600037201
Page: 1 of 61
FCC ID: 2AP8YEBHUB

TEST REPORT

| | |
|-------------------------|--------------------------------------|
| Application No.: | HKEM1806000372AV |
| Applicant: | ENERGYBOX LIMITED |
| FCC ID: | 2AP8YEBHUB |
| Product Description: | Gateway |
| Model No.: | EB/HUB-00/01 |
| Country of Origin: | China |
| Country of Destination: | US |
| Standards: | 47 CFR Part 15, Subpart C 15.247 |
| Date of Receipt: | 2018-06-01 |
| Date of Test: | 2018-06-14 to 2018-06-15, 2018-11-08 |
| Date of Issue: | 2018-11-08 |
| Test Result : | Pass* |

* In the configuration tested, the EUT detailed in this report complied with the standards specified above. Please refer to section 3 of this report for further detail.

Authorized Signature:

CHEN Jian-feng, Jeffrey

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2 Test Summary

| Test | Test Requirement | Test method | Result |
|---|---|---|--------|
| Antenna Requirement | FCC PART 15 C section 15.247 (c) and Section 15.203 | FCC PART 15 C section 15.247 (c) and Section 15.203 | PASS |
| Occupied Bandwidth | FCC PART 15 C section 15.247 (a)(1) | ANSI C63.10: Clause 6.9.1 | PASS |
| Carrier Frequencies Separated | FCC PART 15 C section 15.247(a)(1) | ANSI C63.10: Clause 7.8.2 | PASS |
| Hopping Channel Number | FCC PART 15 C section 15.247(a)(1)(iii) | ANSI C63.10: Clause 7.8.3 | PASS |
| Dwell Time | FCC PART 15 C section 15.247(a)(1)(iii) | ANSI C63.10: Clause 7.8.4 | PASS |
| Pseudorandom Frequency Hopping Sequence | FCC PART 15 C section 15.247(a)(1) | ANSI C63.10: Clause 7.7.5 | PASS |
| Maximum Peak Output Power | FCC PART 15 C section 15.247(b)(1) | ANSI C63.10: Clause 7.8.5 | PASS |
| Conducted Spurious Emission | FCC PART 15 C section 15.247(d) | ANSI C63.10: Clause 7.8.8 | PASS |
| Radiated Spurious Emission | FCC PART 15 C section 15.247(d) | ANSI C63.10: Clause 6.10.4 | PASS |
| Band Edges Measurement | FCC PART 15 C section 15.247 (d) & 15.205 | ANSI C63.10: clause 7.8.6 | PASS |



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4 General Information

4.1 Client Information

Applicant: ENERGYBOX LIMITED
Address of Applicant: 8F, Green 18, Hong Kong Science Park,
Shatin, N.T., Hong Kong.

4.2 General Description of E.U.T.

Product Name: Gateway
Model No.: EB/HUB-00/01

4.3 Details of E.U.T.

Operating Frequency 903 MHz to 927 MHz
Type of Modulation: GFSK
Number of Channels 121 Channels
Channel Separation: 200 kHz
Dwell time Per channel is less than 0.4s.
Antenna Type Integral
Antenna gain: 3 dBi
Speciality: --
Function: Gateway
Power Supply: AC120V ~ 60Hz to DC 5V
Adapter: SAPA05010US
Power cord: None.

Remark: The device meets the requirements stated within Parts 15.247(g) & (h) in that they were developed under the protocol and operate as a true frequency hopping system. The device does not have the ability to be coordinated with other FHSS systems in an effort to avoid the simultaneous occupancy of individual hopping frequencies by multiple transmitters.

4.4 Modulation configure

None.

4.5 Description of Support Units

The EUT has been tested as an independent unit for fixed frequency by testing lab.

4.6 Deviation from Standards

Biconical and log periodic antennas were used instead of dipole antennas.

4.7 Abnormalities from Standard Conditions

None.

4.8 Other Information Requested by the Customer

None.

4.9 Test Location

All tests were performed at:

SGS IECC Limited (Member of the SGS Group (SGS SA))

No. 16-B, Yip Wo Street, On Lok Tsuen, Fanling, N.T., Hong Kong

Tel: +852 2305 2570 Fax: +852 2756 4480.

No tests were sub-contracted.

4.10 Test Facility

The test facility is recognized or accredited by the following organizations:

- **HOKLAS (Lab Code: 125)**

SGS IECC Limited has been accepted by HKAS Executive, on the recommendation of the Accreditation Advisory Board, as a HOKLAS Accredited Laboratory, this laboratory meets the requirements of ISO/IEC 17025:2005 and it has been accredited for performing specific test as listed in the scope of accreditation within the test category of Electrical and Electronic Products.

- **FCC Recognized Accredited Test Firm(CAB Registration No.: 446297)**

SGS IECC Limited has been accredited and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Designation Number: HK0010, Test Firm Registration Number: 446297.

- **Industry Canada (Registration No.: 5193A-2)**

The 3m Alternative Semi-anechoic chamber of SGS IECC Limited has been registered by Certification and Engineering of Industry Canada for radio equipment testing with Registration No. **5193A-2**.

4.11 Measurement Uncertainty (95% confidence levels, k=2)

| No. | Item | Measurement Uncertainty |
|-----|------------------------------------|---------------------------------|
| 1 | Radio frequency | $\pm 7.25 \times 10^{-8}$ |
| 2 | RF power (conducted) | $\pm 0.75\text{dB}$ |
| 3 | Radiated Spurious emission | $\pm 4.5\text{dB}$ (30MHz-1GHz) |
| | | $\pm 4.8\text{dB}$ (1GHz-25GHz) |
| 4 | Temperature test | $\pm 1^\circ\text{C}$ |
| 5 | Humidity test | $\pm 3\%$ |
| 6 | DC and low frequency voltages test | $\pm 0.5\%$ |

5 Equipment Used during Test

| Radiated Emission | | | |
|---|-----------------|--|---------------|
| Equipment | Manufacturer | Model / Serial No. | Cal. Due Date |
| 3m Semi-Anechoic Chamber | ChamPro | N/A | 2020/09/14 |
| Test Receiver | Rohde & Schwarz | ESCS 30 / 100388 | 2019/09/26 |
| EMI Test Receiver | Rohde & Schwarz | ESR3 | 2019/08/15 |
| Signal Generator | Rohde & Schwarz | SMT03 / 832939/017 | 2019/06/04 |
| Spectrum Analyzer | Rohde & Schwarz | FSP 30 / 101474 | 2019/05/30 |
| Loop Antenna | Rohde & Schwarz | HFH2-Z2 / 871336/48 | 2019/01/22 |
| Antenna 30-1000MHz | Schaffner | CBL6111C / 2791 | 2019/10/26 |
| Antennas (30MHz-300MHz) | Schwarzbeck | BBA9106, VHA9103 | 2019/11/14 |
| Log-periodic Antennas (300MHz-1000MHz) | Schwarzbeck | UHALP9107 | 2019/11/14 |
| Horn Antenna 1-18GHz | Schwarzbeck | BBHA9120D / 9120D-1070 | 2019/01/22 |
| Double Ridge Horn Antenna 2-18 GHz | Schwarzbeck | BBHA 9120 C | 2020/03/13 |
| Horn Antenna 15-40GHz | Schwarzbeck | BBHA9170 / 9170-492 | 2019/11/23 |
| Highpass Filter | Wainwright | WHNX3.5/26.5G-6SS / nil | 2018/12/18 |
| Band Reject Filter | Wainwright | WRCJV 2400/2500-2100/2800-40/3SS / nil | 2018/12/18 |
| Preamplifier 10MHz – 6GHz | Schwarzbeck | BBV9743 / 9743-052 | 2019/04/18 |
| Preamplifier 1-18GHz | Schwarzbeck | BBV9718 / 9718-223 | 2019/01/22 |
| Preamplifier 18- 26.5GHz | Schwarzbeck | BBV9719 / 9719-019 | 2019/11/18 |
| Coaxial Cable | -- | E167 | 2019/10/09 |
| RF Cable | HUBER+SUHNER | E207 | 2019/11/16 |
| Boresight Mast Controller | ChamPro | AM-BS-4500-E / 060860-ABS | -- |
| Turntable with Controller | ChamPro | EM1000 / 60860 | -- |

| Conducted Emission | | | |
|---------------------------------|---------------------|---------------------------|------------------------|
| Equipment | Manufacturer | Model / Serial No. | Calibration Due |
| Test Receiver | Rohde & Schwarz | ESHS 30 / 839667/002 | 2019/09/26 |
| Signal Generator | Rohde & Schwarz | SMT03 / 832939/017 | 2019/06/04 |
| Artificial Mains Network (LISN) | Schwarzbeck | NSLK 8127 / 8127309 | 2019/09/26 |
| Impulse Limiter | Rohde & Schwarz | ESH-3-Z2 / 357881052 | 2019/01/22 |

| RF Conducted | | | |
|-------------------------------------|---------------------|---------------------------|----------------------|
| Equipment | Manufacturer | Model / Serial No. | Cal. Due Date |
| Wireless Conn. Tester (CMW) | Rohde & Schwarz | CMW270 | 2019/08/12 |
| OSP | Rohde & Schwarz | OSP-B157W8 | 2019/09/17 |
| FSV40 SIGNAL ANALYZER 40GHz | Rohde & Schwarz | FSV40 | 2019/08/12 |
| SMBV100A VECTOR SIGNAL GENERATOR | Rohde & Schwarz | SMBV100A | 2019/08/12 |
| Cable | Rohde & Schwarz | J12J103539-00-2 | 2019/08/12 |

6 Test Results

6.1 E.U.T. test conditions

Test Voltage: AC120V
Temperature: 20.0 -25.0 °C
Humidity: 38-50 % RH
Atmospheric Pressure: 1000 -1010 mbar

Requirements: **15.31(e):** For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

15.32: Power supplies and CPU boards used with personal computers and for which separate authorizations are required to be obtained shall be tested as follows: Testing shall be in accordance with the procedures specified in Section 15.31 of this part.

Test frequencies and frequency range:

According to the 15.31(m) Measurements on intentional radiators or receivers, other than TV broadcast receivers, shall be performed and, if required, reported for each band in which the device can be operated with the device operating at the number of frequencies in each band specified in the following table:

According to the 15.33 (a) For an intentional radiator, the spectrum shall be investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to at least the frequency shown in the following table:

Number of fundamental frequencies to be tested in EUT transmit band

| Frequency range in which device operates | Number of frequencies | Location in frequency range of operation |
|--|-----------------------|---|
| 1 MHz or less | 1 | Middle |
| 1 MHz to 10 MHz | 2 | 1 near top and 1 near bottom |
| More than 10 MHz | 3 | 1 near top, 1 near middle and 1 near bottom |

Frequency range of radiated emission measurements

| Lowest frequency generated in the device | Upper frequency range of measurement |
|--|---|
| 9 kHz to below 10 GHz | 10th harmonic of highest fundamental frequency or to 40 GHz, whichever is lower |
| At or above 10 GHz to below 30 GHz | 5th harmonic of highest fundamental frequency or to 100 GHz, whichever is lower |
| At or above 30 GHz | 5th harmonic of highest fundamental frequency or to 200 GHz, whichever is lower, unless otherwise specified |



EUT channels and frequencies list:

| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|---------|-----------------|
| 0 | -- | 46 | 911.4 | 92 | 920.6 |
| 1 | -- | 47 | 911.6 | 93 | 920.8 |
| 2 | -- | 48 | 911.8 | 94 | 921.0 |
| 3 | -- | 49 | 912.0 | 95 | 921.2 |
| 4 | 903.0 | 50 | 912.2 | 96 | 921.4 |
| 5 | 903.2 | 51 | 912.4 | 97 | 921.6 |
| 6 | 903.4 | 52 | 912.6 | 98 | 921.8 |
| 7 | 903.6 | 53 | 912.8 | 99 | 922.0 |
| 8 | 903.8 | 54 | 913.0 | 100 | 922.2 |
| 9 | 904.0 | 55 | 913.2 | 101 | 922.4 |
| 10 | 904.2 | 56 | 913.4 | 102 | 922.6 |
| 11 | 904.4 | 57 | 913.6 | 103 | 922.8 |
| 12 | 904.6 | 58 | 913.8 | 104 | 923.0 |
| 13 | 904.8 | 59 | 914.0 | 105 | 923.2 |
| 14 | 905.0 | 60 | 914.2 | 106 | 923.4 |
| 15 | 905.2 | 61 | 914.4 | 107 | 923.6 |
| 16 | 905.4 | 62 | 914.6 | 108 | 923.8 |
| 17 | 905.6 | 63 | 914.8 | 109 | 924.0 |
| 18 | 905.8 | 64 | 915.0 | 110 | 924.2 |
| 19 | 906.0 | 65 | 915.2 | 111 | 924.4 |
| 20 | 906.2 | 66 | 915.4 | 112 | 924.6 |
| 21 | 906.4 | 67 | 915.6 | 113 | 924.8 |
| 22 | 906.6 | 68 | 915.8 | 114 | 925.0 |
| 23 | 906.8 | 69 | 916.0 | 115 | 925.2 |
| 24 | 907.0 | 70 | 916.2 | 116 | 925.4 |
| 25 | 907.2 | 71 | 916.4 | 117 | 925.6 |
| 26 | 907.4 | 72 | 916.6 | 118 | 925.8 |
| 27 | 907.6 | 73 | 916.8 | 119 | 926.0 |
| 28 | 907.8 | 74 | 917.0 | 120 | 926.2 |
| 29 | 908.0 | 75 | 917.2 | 121 | 926.4 |



| | | | | | |
|----|-------|----|-------|-----|-------|
| 30 | 908.2 | 76 | 917.4 | 122 | 926.6 |
| 31 | 908.4 | 77 | 917.6 | 123 | 926.8 |
| 32 | 908.6 | 78 | 917.8 | 124 | 927.0 |
| 33 | 908.8 | 79 | 918.0 | 125 | -- |
| 34 | 909.0 | 80 | 918.2 | 126 | -- |
| 35 | 909.2 | 81 | 918.4 | 127 | -- |
| 36 | 909.4 | 82 | 918.6 | 128 | -- |
| 37 | 909.6 | 83 | 918.8 | / | / |
| 38 | 909.8 | 84 | 919.0 | / | / |
| 39 | 910.0 | 85 | 919.2 | / | / |
| 40 | 910.2 | 86 | 919.4 | / | / |
| 41 | 910.4 | 87 | 919.6 | / | / |
| 42 | 910.6 | 88 | 919.8 | / | / |
| 43 | 910.8 | 89 | 920.0 | / | / |
| 44 | 911.0 | 90 | 920.2 | / | / |
| 45 | 911.2 | 91 | 920.4 | / | / |

Test frequencies are the lowest channel: 4 channel(903.0 MHz), middle channel: 64 channel(915.0 MHz) and highest channel: 124 channel(927.0 MHz)

6.2 Antenna Requirement

Standard requirement

15.203 requirement:

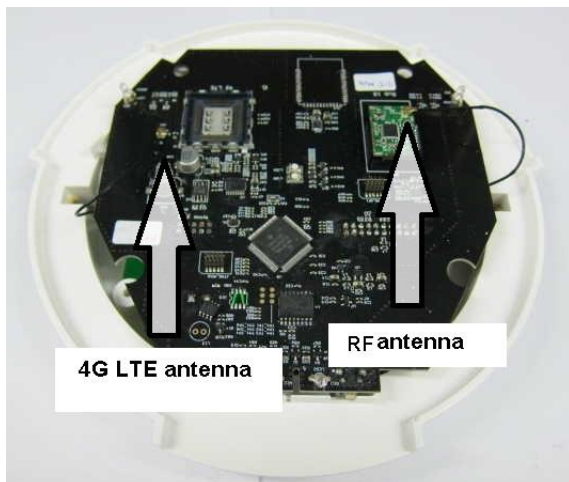
For intentional device. According to 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

15.247(c) (1)(i) requirement:

(i) Systems operating in the 2400-2483.5 MHz bands that are used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

EUT Antenna

The antenna is integrated on the main PCB and no consideration of replacement. The maximum gain of the antenna is 3 dBi.



Test result: The unit does meet the FCC requirements.

6.3 Conducted Disturbance at AC Power Line(150kHz-30MHz)

Test Requirement 47 CFR Part 15, Subpart C 15.207
 Test Method: ANSI C63.10 (2013) Section 6.2
 Limit:

Frequency of emission(MHz) Conducted limit(dBµV)

| | Quasi-peak | Average |
|----------|------------|-----------|
| 0.15-0.5 | 66 to 56* | 56 to 46* |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |

*Decreases with the logarithm of the frequency.

6.3.1 E.U.T. Operation

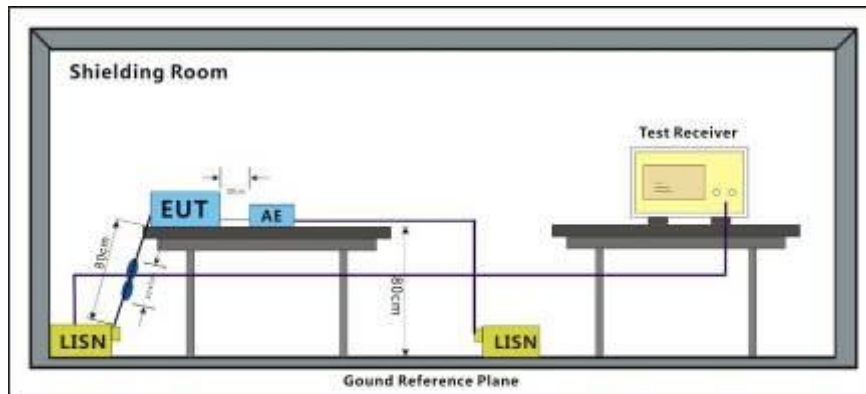
Operating Environment:

Temperature: 25.0 °C Humidity: 55 % RH Atmospheric Pressure: 1015 mbar

Test mode Pre-test the EUT in continuous transmitting mode at the lowest (903MHz), middle (915 MHz) and highest (927 MHz) channel.

The worst case for final test: Final test the EUT in continuous transmitting mode at middle (915 MHz) channel as worst case mode.

6.3.2 Test Setup Diagram



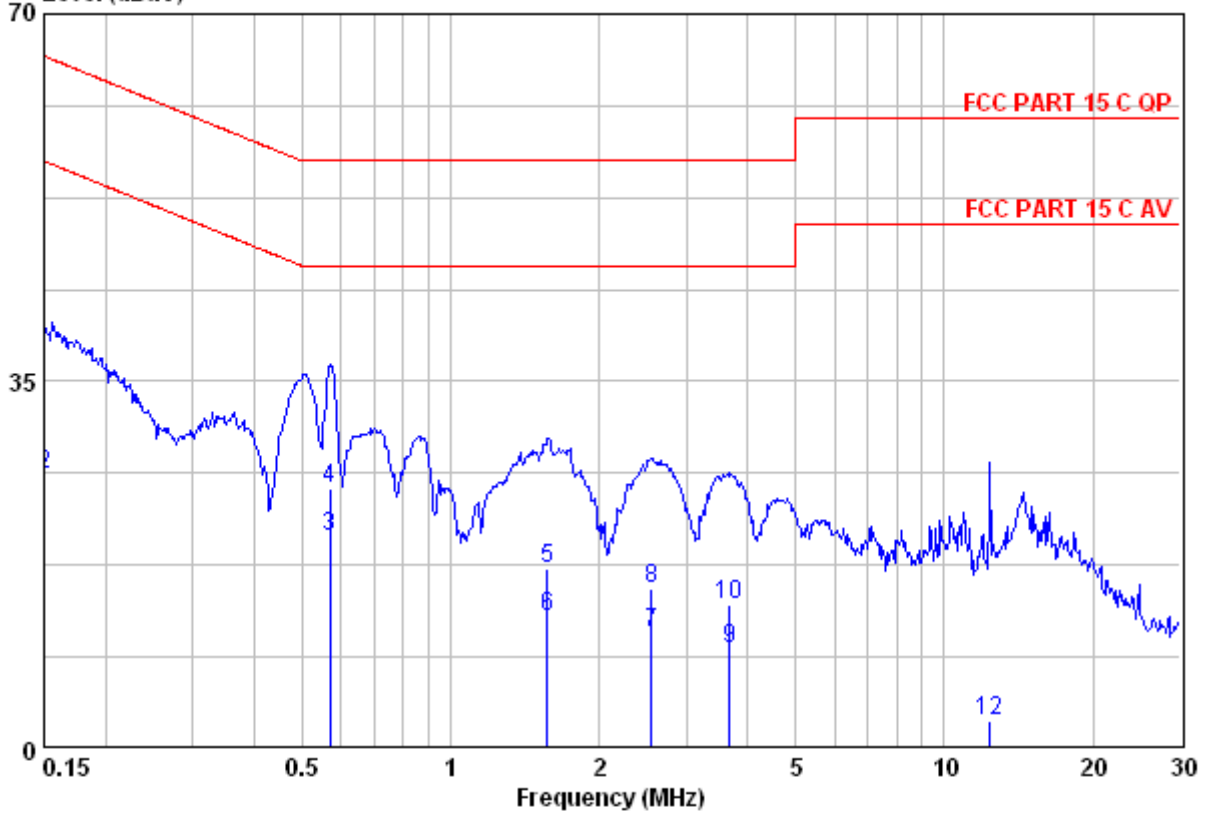
6.3.3 Measurement Data

- 1) The mains terminal disturbance voltage test was conducted in a shielded room.
- 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50ohm/50μH + 5ohm linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
- 3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,
- 4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.
- 5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

Line: Live Line

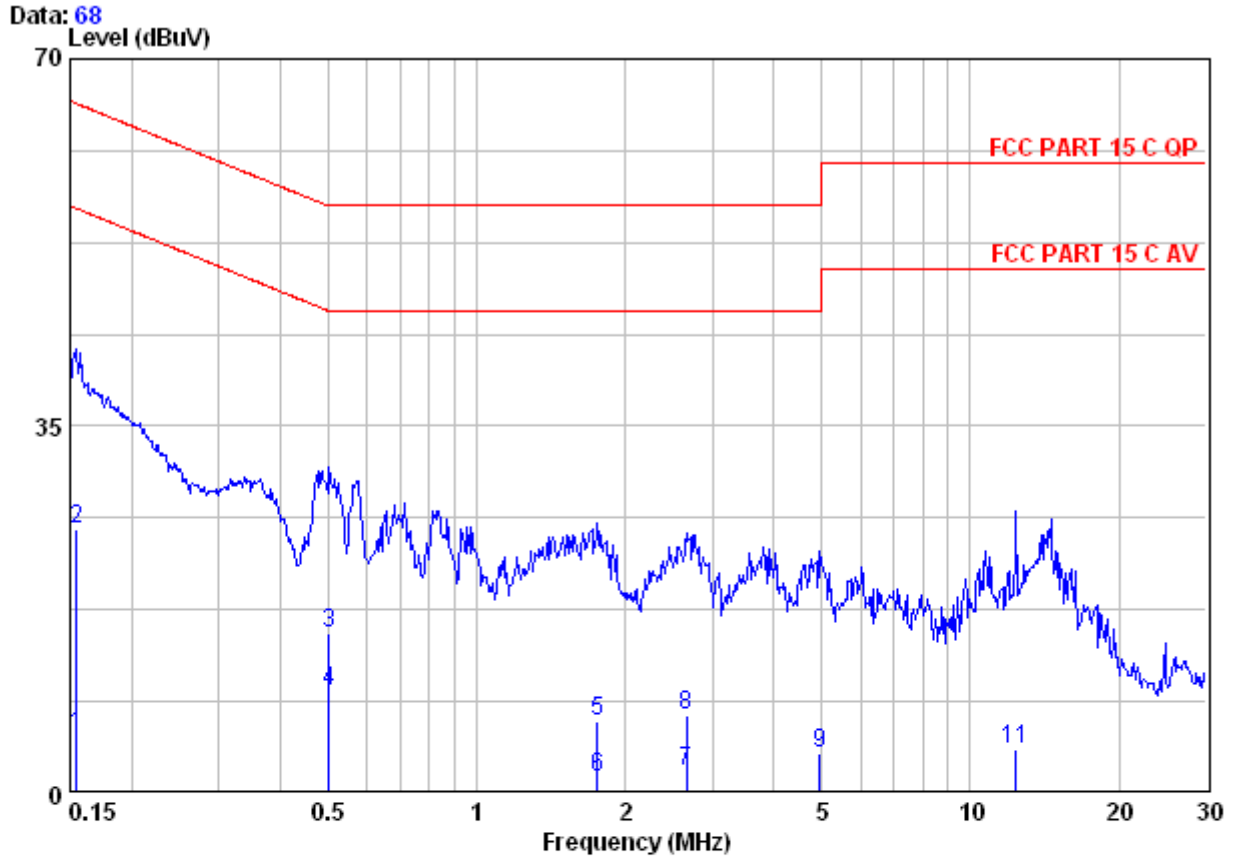
Data: 67

Level (dBuV)



| | Freq | Cable Loss | LISN Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|--------|-------|------------|-------------|------------|-------|------------|------------|---------|
| | MHz | dB | dB | dBuV | dBuV | dBuV | dB | |
| 1 | 0.15 | 0.00 | 0.00 | 9.33 | 9.33 | 56.00 | -46.67 | AVERAGE |
| 2 | 0.15 | 0.00 | 0.00 | 26.22 | 26.22 | 66.00 | -39.78 | QP |
| 3 peak | 0.57 | 0.00 | 0.00 | 20.27 | 20.27 | 46.00 | -25.73 | AVERAGE |
| 4 | 0.57 | 0.00 | 0.00 | 24.82 | 24.82 | 56.00 | -31.18 | QP |
| 5 | 1.57 | 0.00 | 0.00 | 17.10 | 17.10 | 56.00 | -38.90 | QP |
| 6 | 1.57 | 0.00 | 0.00 | 12.58 | 12.58 | 46.00 | -33.42 | AVERAGE |
| 7 | 2.55 | 0.00 | 0.00 | 10.98 | 10.98 | 46.00 | -35.02 | AVERAGE |
| 8 | 2.55 | 0.00 | 0.00 | 15.34 | 15.34 | 56.00 | -40.66 | QP |
| 9 | 3.68 | 0.00 | 0.00 | 9.51 | 9.51 | 46.00 | -36.49 | AVERAGE |
| 10 | 3.68 | 0.00 | 0.00 | 13.78 | 13.78 | 56.00 | -42.22 | QP |
| 11 | 12.38 | 0.00 | 0.00 | -6.88 | -6.88 | 50.00 | -56.88 | AVERAGE |
| 12 | 12.38 | 0.00 | 0.00 | 2.72 | 2.72 | 60.00 | -57.28 | QP |

Line: Neutral Line



| | Freq | Cable Loss | LISN Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|--------|-------|------------|-------------|------------|-------|------------|------------|---------|
| | MHz | dB | dB | dBuV | dBuV | dBuV | dB | |
| 1 | 0.15 | 0.00 | 0.00 | 5.54 | 5.54 | 55.74 | -50.20 | AVERAGE |
| 2 | 0.15 | 0.00 | 0.00 | 25.10 | 25.10 | 65.74 | -40.64 | QP |
| 3 | 0.50 | 0.00 | 0.00 | 15.28 | 15.28 | 56.00 | -40.72 | QP |
| 4 peak | 0.50 | 0.00 | 0.00 | 9.80 | 9.80 | 46.00 | -36.20 | AVERAGE |
| 5 | 1.75 | 0.00 | 0.00 | 6.92 | 6.92 | 56.00 | -49.08 | QP |
| 6 | 1.75 | 0.00 | 0.00 | 1.49 | 1.49 | 46.00 | -44.51 | AVERAGE |
| 7 | 2.66 | 0.00 | 0.00 | 2.07 | 2.07 | 46.00 | -43.93 | AVERAGE |
| 8 | 2.66 | 0.00 | 0.00 | 7.36 | 7.36 | 56.00 | -48.64 | QP |
| 9 | 4.95 | 0.00 | 0.00 | 3.82 | 3.82 | 56.00 | -52.18 | QP |
| 10 | 4.95 | 0.00 | 0.00 | -2.84 | -2.84 | 46.00 | -48.84 | AVERAGE |
| 11 | 12.38 | 0.00 | 0.00 | 4.26 | 4.26 | 60.00 | -55.74 | QP |
| 12 | 12.38 | 0.00 | 0.00 | -7.60 | -7.60 | 50.00 | -57.60 | AVERAGE |

6.4 Occupied Bandwidth

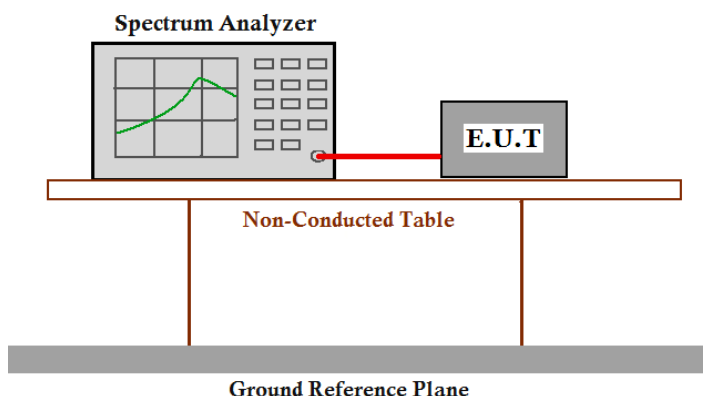
Test Requirement: FCC Part 15 C section 15.247

(a)(1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

Test Method: ANSI C63.10: Clause 6.9.1

Test Status: Pre-test the EUT in continuous transmitting mode at the lowest (903MHz), middle (915 MHz) and highest (927 MHz) channel.

Test Configuration:



Test Procedure:

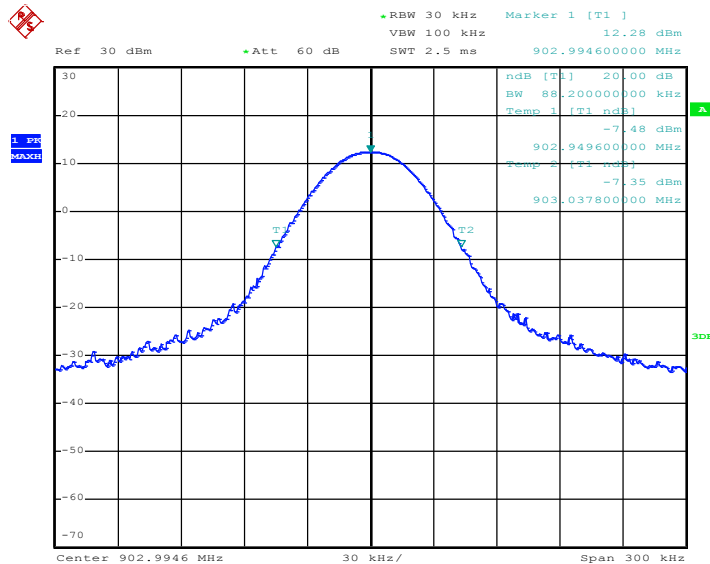
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: Span = approximately 2 to 3 times the 20dB bandwidth, centring on a hopping channel;
3. Set the spectrum analyzer: RBW \geq 1% of the 20dB bandwidth VBW \geq RBW. Sweep = auto; Detector Function = Peak. Trace = Max Hold.
4. Mark the peak frequency and -20 dB points bandwidth.

Test result:

| Test Channel | Bandwidth(kHz) | Limit(KHz) |
|--------------|----------------|---------------|
| Lowest | 88.2 | Less than 250 |
| Middle | 88.2 | Less than 250 |
| Highest | 88.2 | Less than 250 |

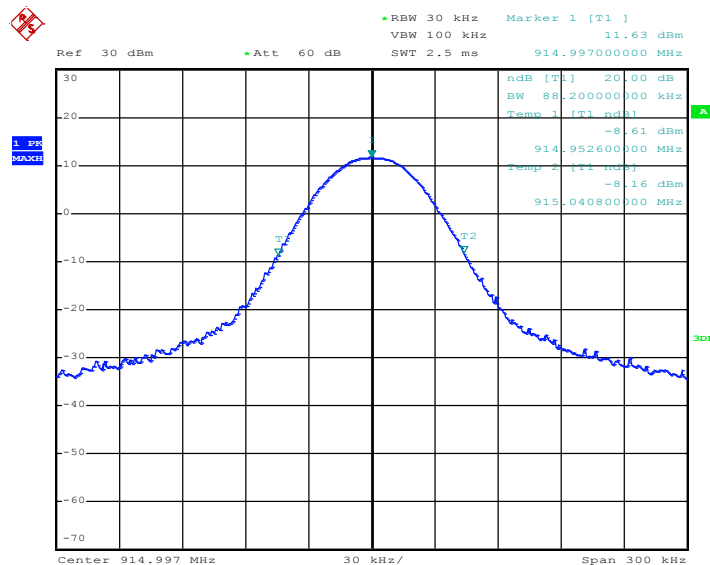
Result plot as follows:

Lowest Channel (903 MHz):



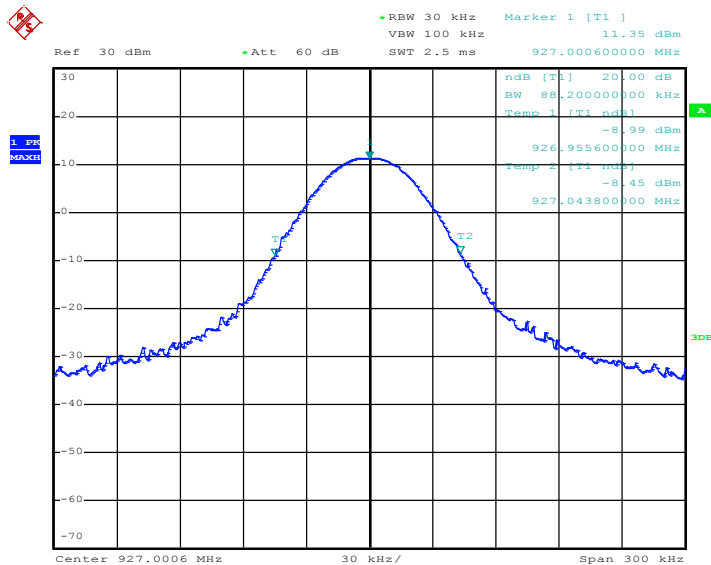
Date: 14.JUN.2018 11:55:51

Middle Channel (915 MHz):



Date: 14.JUN.2018 11:59:02

Highest Channel (927 MHz):



Date: 14.JUN.2018 12:00:00

6.5 Carrier Frequencies Separated

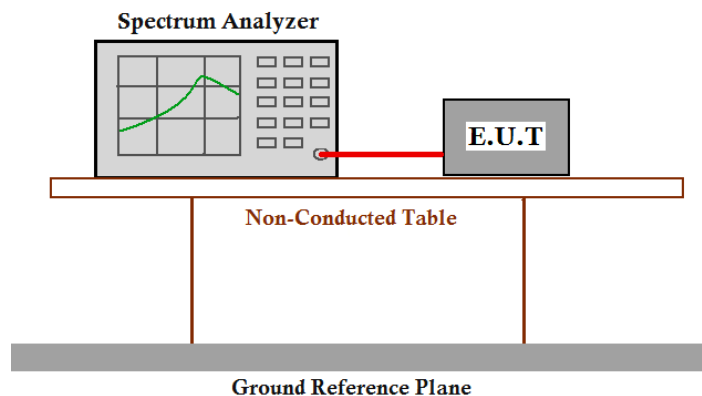
Test Requirement: FCC Part 15 C section 15.247

(a),(1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

Test Method: ANSI C63.10: Clause 7.7.2

Test Status: Pre-test the EUT in hopping mode.

Test Configuration:



Test Procedure:

1. Remove the antenna from the EUT and then connect a low attenuation RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW \geq 1% of the span, VBW \geq RBW. Sweep = auto; Detector Function = Peak. Trace = Max, hold.
3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section. Submit this plot.

Test result:

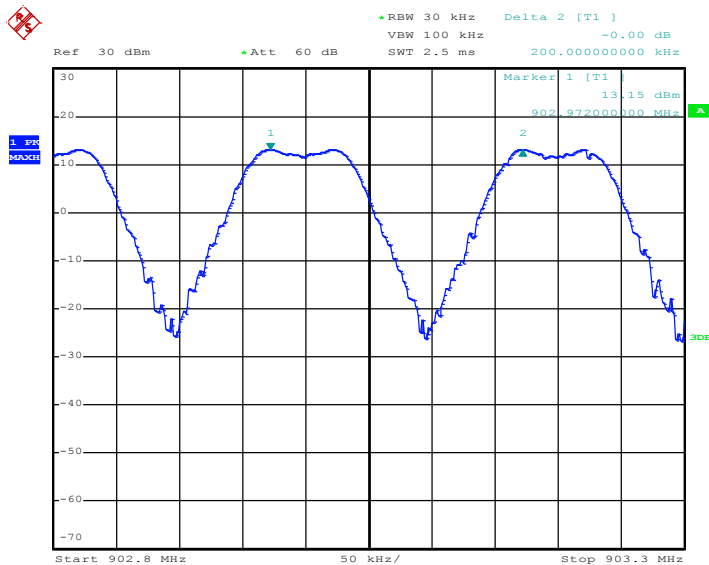
| Test Channel | Carrier Frequencies Separated (kHz) | Limit①(kHz) | Pass/Fail |
|---|-------------------------------------|-------------|-----------|
| Lower Channels (channel 4 and channel 5) | 200.0 | 58.8 | Pass |
| Middle Channels (channel 64 and channel 65) | 200.0 | 58.8 | Pass |
| Upper Channels (channel 124 and channel 125) | 200.0 | 58.8 | Pass |

Remark:

- ① The limit is two-thirds of the 20 dB bandwidth.

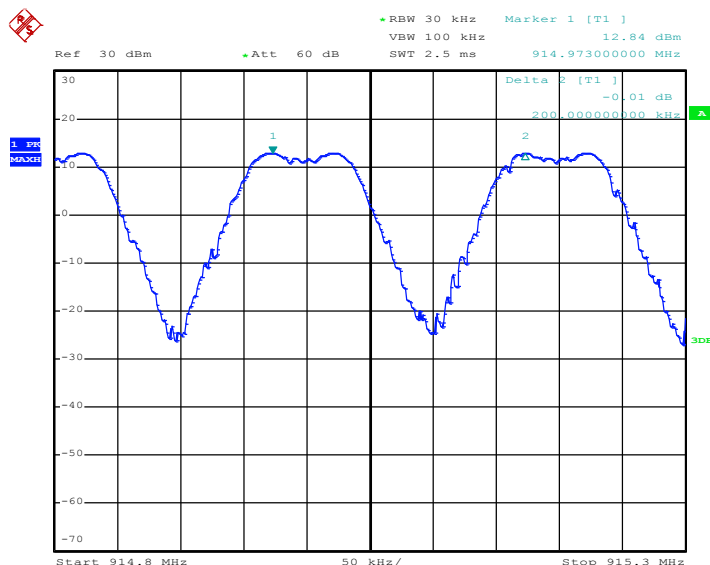
Result plot as follows:

Lowest Channels: Carrier Frequencies Separated



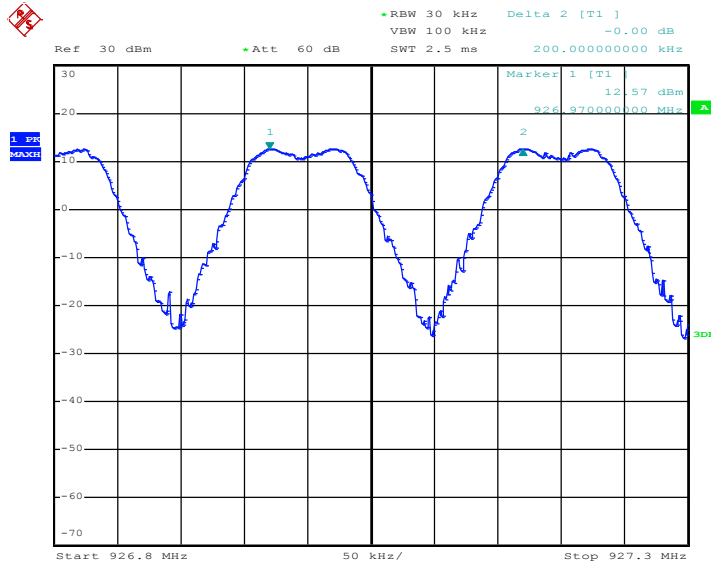
Date: 14.JUN.2018 12:25:43

Middle Channels: Carrier Frequencies Separated



Date: 14.JUN.2018 12:34:25

Highest Channels: **Carrier Frequencies Separated**



Date: 14.JUN.2018 12:36:51

Test result: The unit does meet the FCC requirements.

6.6 Hopping Channel Number

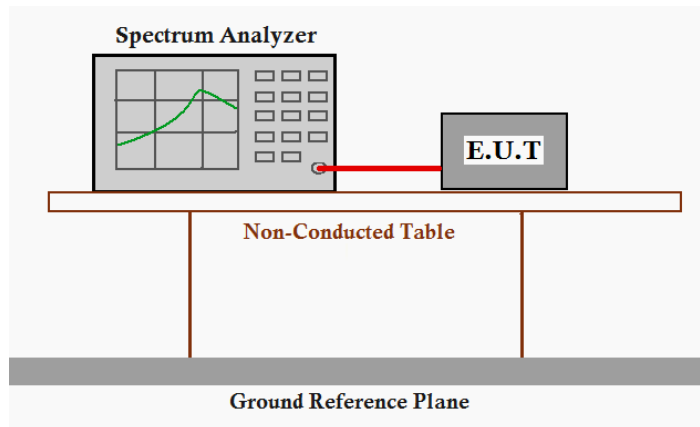
Test Requirement: FCC Part15 C section 15.247

(a)(1)(iii) Frequency hopping systems in the 903-927 MHz band shall use at least 15 channels.

Test Method: ANSI C63.10: Clause 7.7.3

Test Status: Pre-test the EUT in hopping mode.

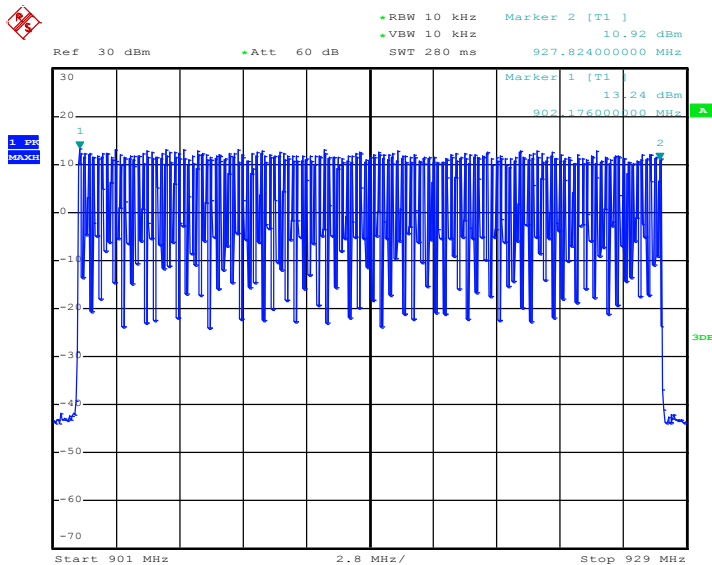
Test Configuration:



Test Procedure:

1. Remove the antenna from the EUT and then connect a low attenuation RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 10 kHz. VBW = 10 kHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. It may prove necessary to break the span up to sections. in order to clearly show all of the hopping frequencies. The limit is specified in one of the subparagraphs of this Section.
4. Set the spectrum analyzer: start frequency = 901 MHz. stop frequency = 929 MHz. Submit the test result graph.

Test result: Total channels are 129 channels.



Date: 14.JUN.2018 13:41:50

Test result: The unit does meet the FCC requirements.

6.7 Dwell Time

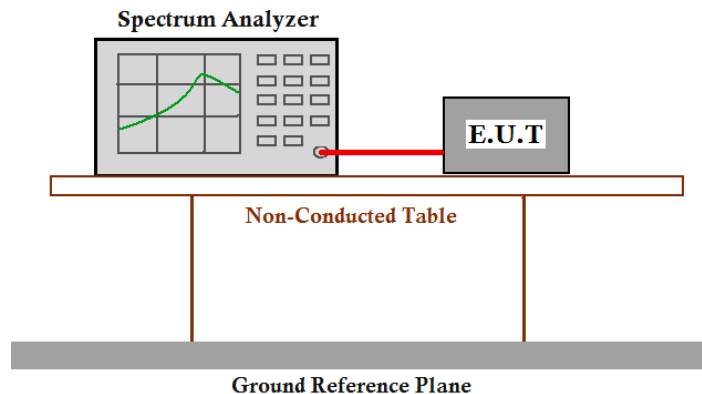
Test Requirement: FCC Part 15 C section 15.247

(a)(1)(iii) Frequency hopping systems in the 902-928 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

Test Method: ANSI C63.10: Clause 7.7.4

Test Status: Test the EUT in hopping mode at the lowest (903 MHz), middle (915 MHz) and highest (927 MHz) channel.

Test Configuration:



Test Procedure:

1. Remove the antenna from the EUT and then connect a low attenuation RF cable from the antenna port to the spectrum.
2. Set spectrum analyzer span = 0. centered on a hopping channel;
3. Set RBW = 100 kHz and VBW = 100 kHz. Sweep = as necessary to capture the entire dwell time per hopping channel. Detector Function = Peak. Trace = Max hold;
4. Use the marker-delta function to determine the dwell time. If this value varies with different modes of operation (e.g. data rate. modulation format. etc.). Repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s). An oscilloscope may be used instead of a spectrum analyzer.

Test Result:

The test period: T= 20 s

| | | | | | | | | | |
|--------------------------------|---|-------|------|---|---|---|-------|-------|----|
| 1. Channel 4: 903 MHz | | | | | | | | | |
| time slot | = | 10.23 | (ms) | * | 4 | = | 40.92 | ms | |
| 2. Channel 64: 915 MHz | | | | | | | | | |
| time slot | = | 10.23 | (ms) | * | 5 | * | = | 51.15 | ms |
| 3. Channel 124: 927 MHz | | | | | | | | | |
| time slot | = | 10.23 | (ms) | * | 5 | * | = | 51.15 | ms |

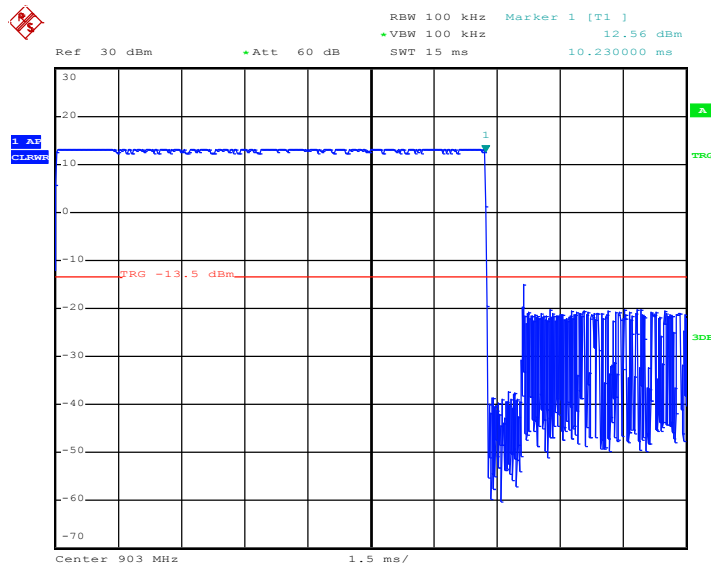
The results are not greater than 0.4 seconds.

The unit does meet the FCC requirements.

Result plot as follows:

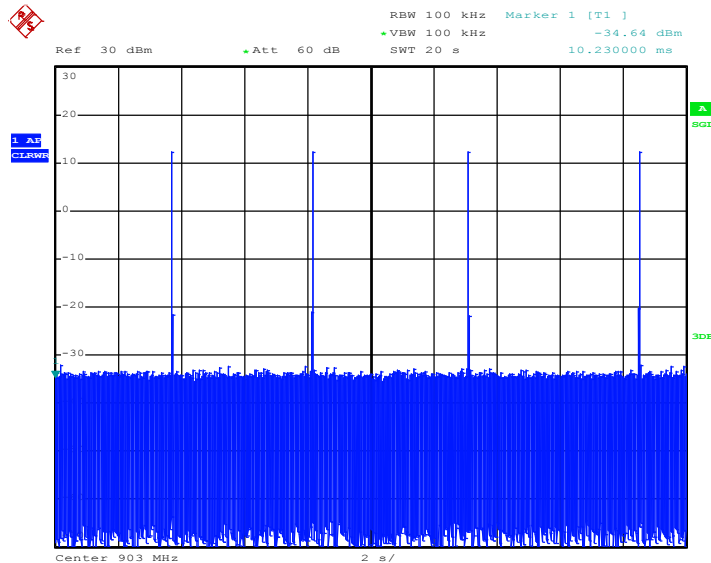
1. Lowest channel (903 MHz):

Pulse Width:



Date: 14.JUN.2018 14:25:48

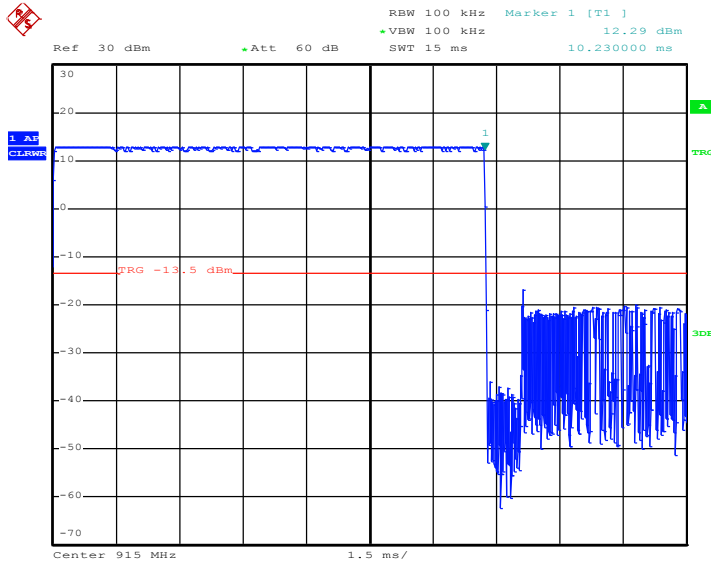
Number of Pulses in 20s observation period:



Date: 14.JUN.2018 14:30:56

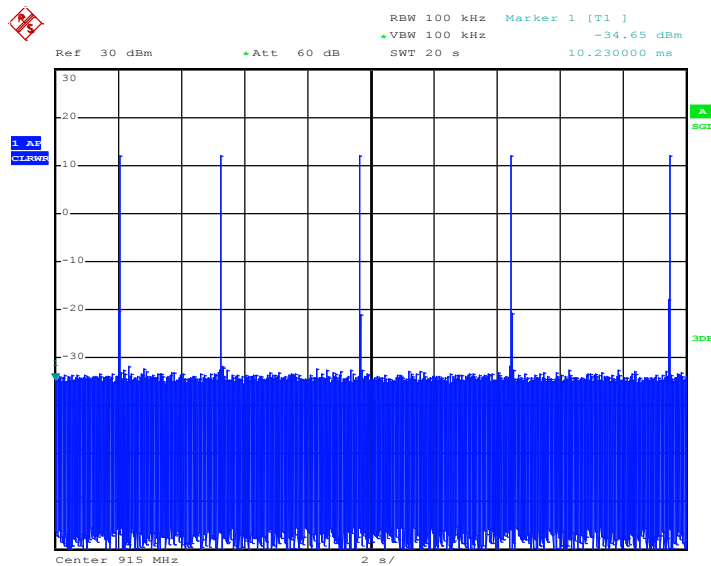
2. Middle Channel (915 MHz):

Pulse Width:



Date: 14.JUN.2018 14:26:18

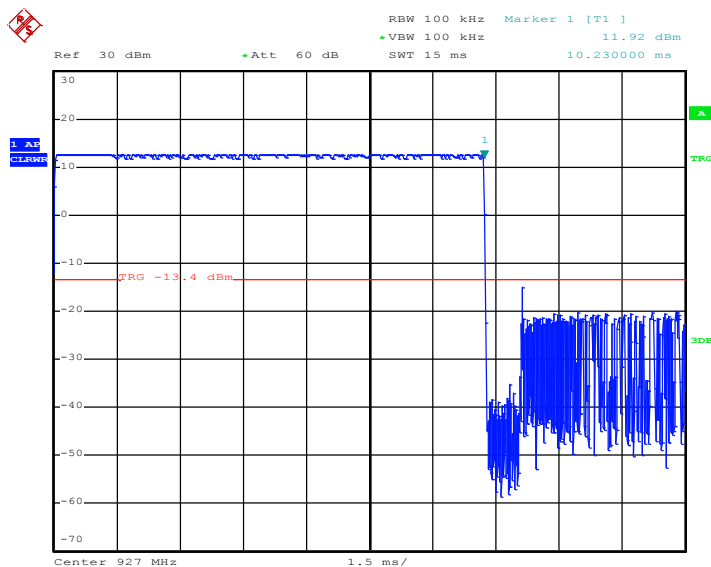
Number of Pulses in 20s observation period:



Date: 14.JUN.2018 14:30:17

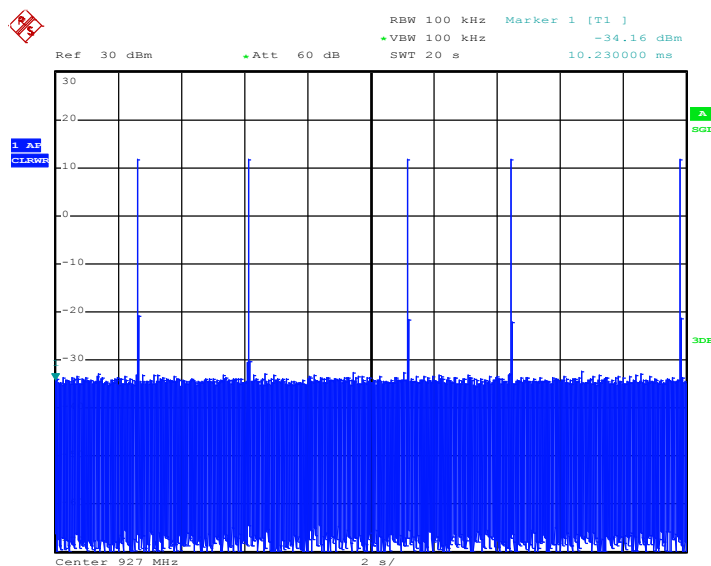
2. Highest Channel (927 MHz):

Pulse Width:



Date: 14.JUN.2018 14:27:25

Number of Pulses in 20s observation period:



Date: 14.JUN.2018 14:29:37

6.8 Pseudorandom Frequency Hopping Sequence

6.8.1 Standard requirement

15.247(a)(1) requirement:

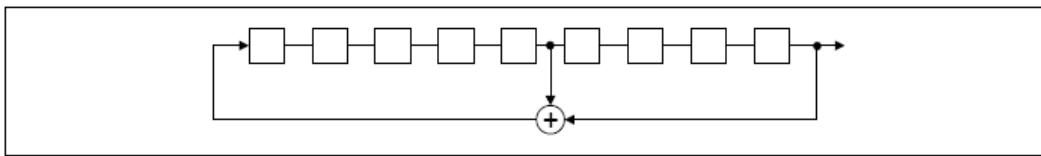
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Alternatively. Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a Pseudorandom ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

6.8.2 EUT Pseudorandom Frequency Hopping Sequence

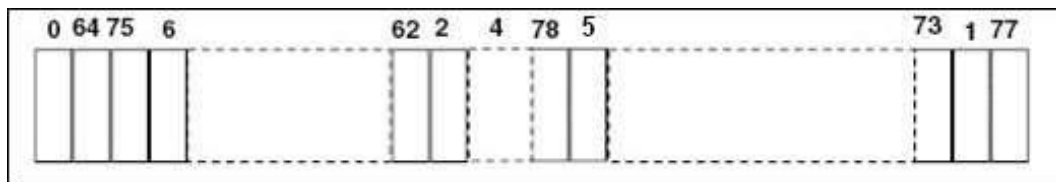
The pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONEs; i.e. the shift register is initialized with nine ones.

- Number of shift register stages: 9
- Length of pseudo-random sequence: $2^9 - 1 = 511$ bits
- Longest sequence of zeros: 8 (non-inverted signal)



Linear Feedback Shift Register for Generation of the PRBS sequence

An example of Pseudorandom Frequency Hopping Sequence as follow:



Each frequency used equally on the average by each transmitter.

The system receivers have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies in synchronization with the transmitted signals.

6.9 Maximum Peak Output Power

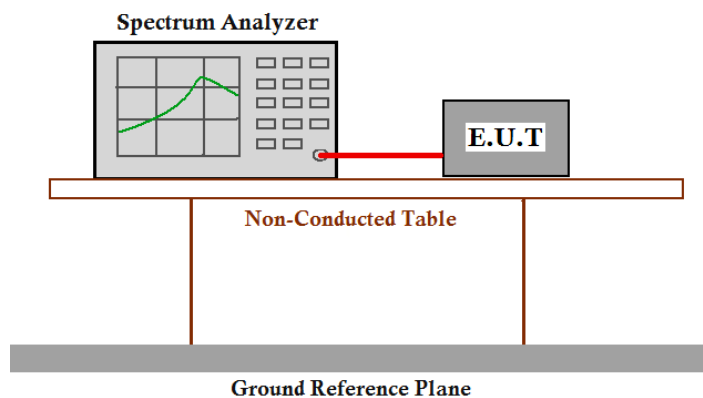
Test Requirement: FCC Part 15 C section 15.247
 (b)(1) For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels.
 Refer to the result "Hopping channel number" of this document. The 1 watt (30.0 dBm) limit applies.

Test Method: ANSI C63.10: Clause 6.10.1

Test Limit:

Test mode: Pre-test the EUT in continuous transmitting mode at the lowest (903 MHz), middle (915 MHz) and highest (927 MHz) channel.

Test Configuration:



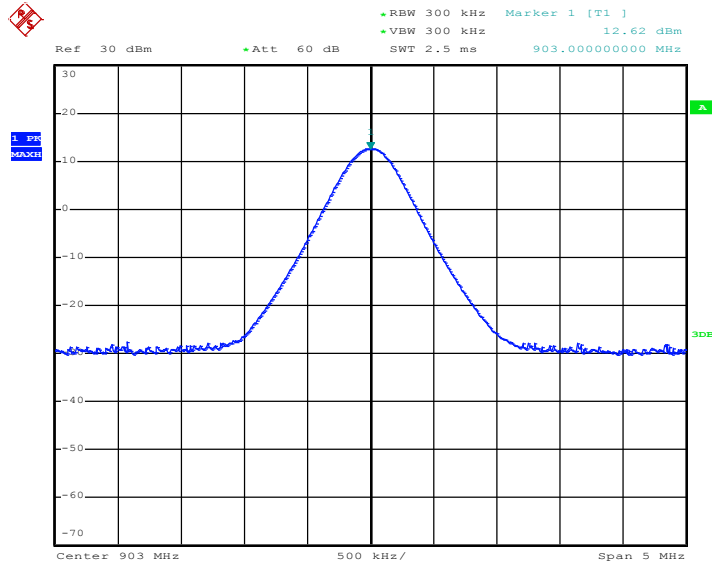
Test Procedure:

1. Remove the antenna from the EUT and then connect a low attenuation RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 300 kHz. VBW = 300 kHz. Sweep = auto; Detector Function = Peak.
3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.

| Test Result: | | | | |
|--|------------------------------------|---------------------------|--------------------|---------------|
| Test Channel | Fundamental Frequency (MHz) | Output Power (dBm) | Limit (dBm) | Result |
| Lowest | 903 | <u>12.62</u> | 30.0 | Pass |
| Middle | 915 | 12.00 | 30.0 | Pass |
| Highest | 927 | 11.69 | 30.0 | Pass |
| Remark: cable lose=1.5 dB | | | | |
| Test result: The unit does meet the FCC requirements. | | | | |

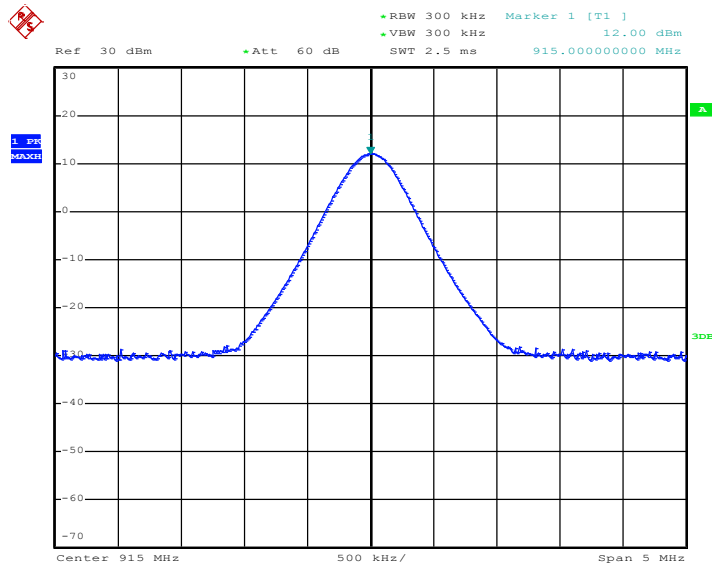
Result plot as follows:

Lowest Channel (903 MHz):



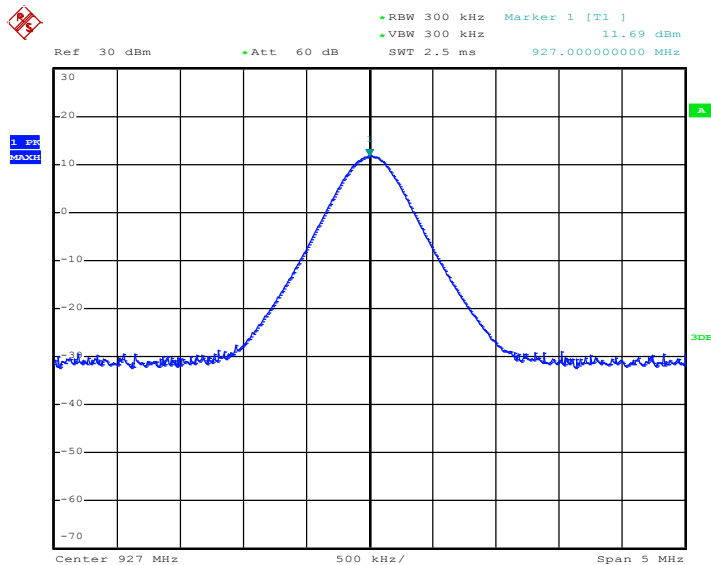
Date: 14.JUN.2018 14:41:06

Middle Channel (915 GHz):



Date: 14.JUN.2018 14:42:14

Highest Channel (927 GHz):



Date: 14.JUN.2018 14:42:49

6.10 Conducted Spurious Emissions

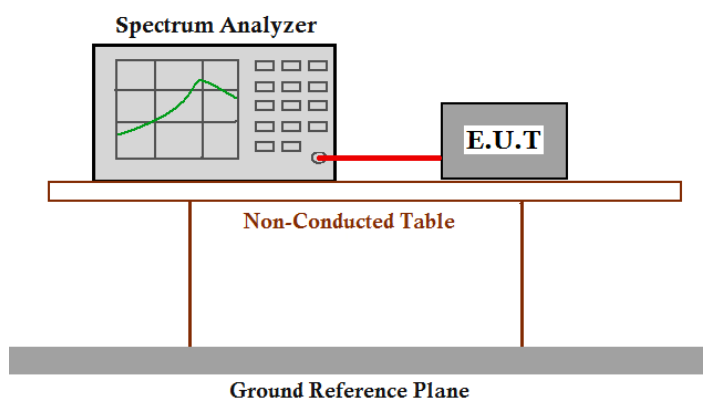
Test Requirement: FCC Part15 C section 15.247

(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating. The radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. Based on either an RF conducted or a radiated measurement. Provided the transmitter demonstrates compliance with the peak conducted power limits.

Test Method: ANSI C63.10: Clause 6.7

Test Status: Pre-test the EUT in continuous transmitting mode at the lowest (903 MHz), middle (915 MHz) and highest (927 MHz) channel.

Test Configuration:

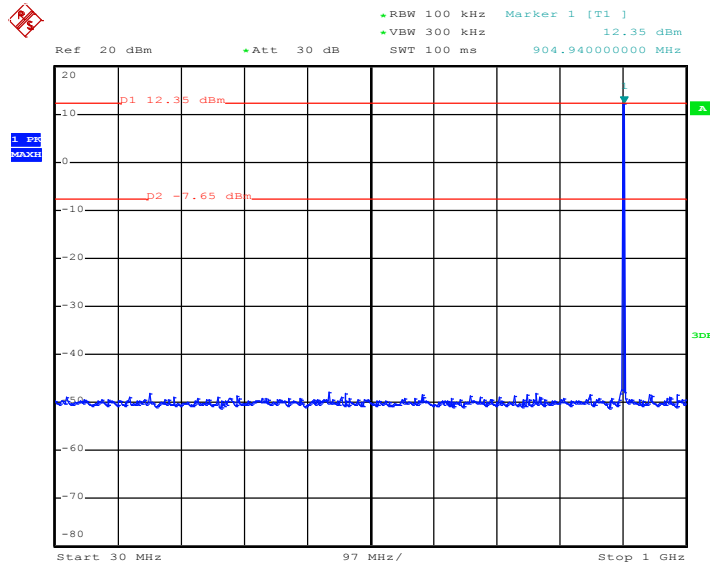


Test Procedure:

1. Remove the antenna from the EUT and then connect a low attenuation RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 100 kHz. VBW \geq RBW. Sweep = auto; Detector Function = Peak (Max. hold).

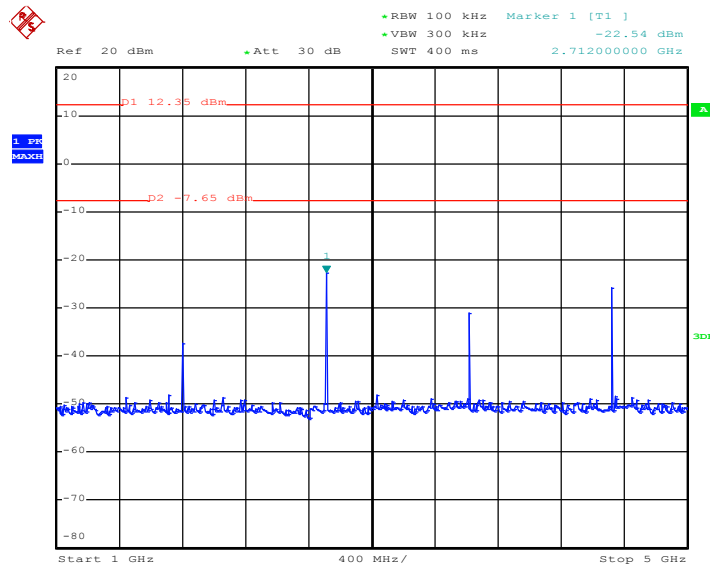
Result plot as follows:

Lowest Channel: 30 MHz to 1 GHz



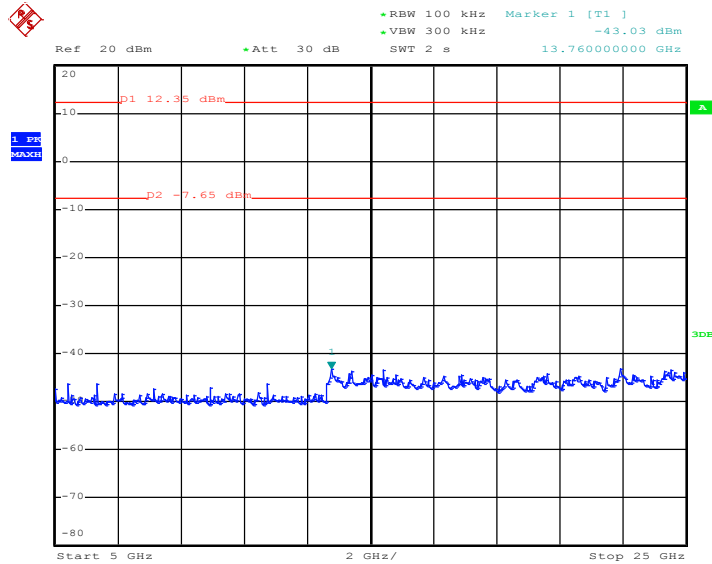
Date: 14.JUN.2018 14:54:49

Lowest Channel: 1 GHz to 5 GHz



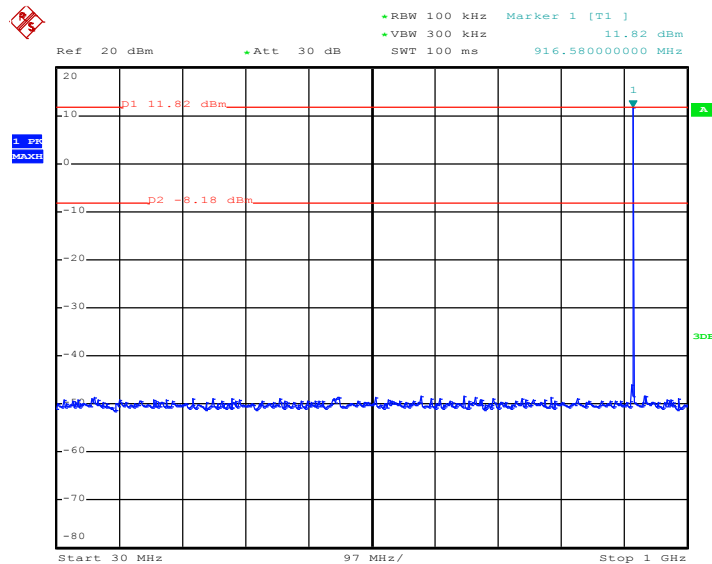
Date: 14.JUN.2018 14:55:12

Lowest Channel: 5 GHz to 25 GHz



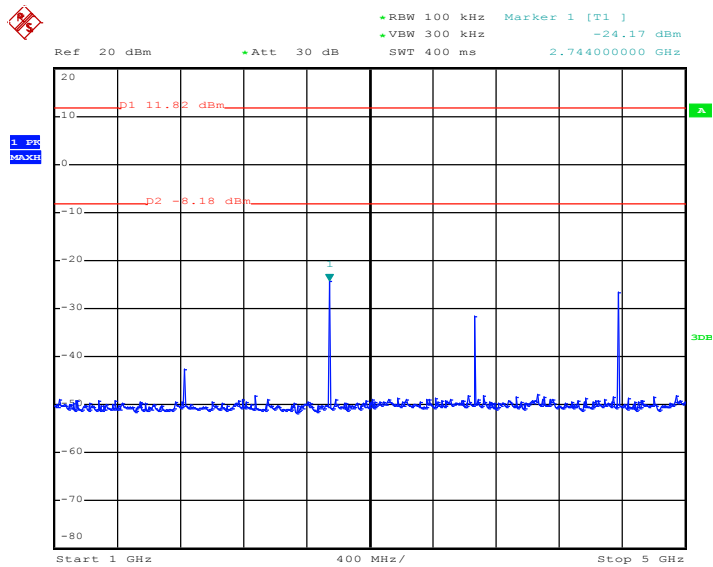
Date: 14.JUN.2018 14:55:57

Middle Channel: 30 MHz to 1 GHz



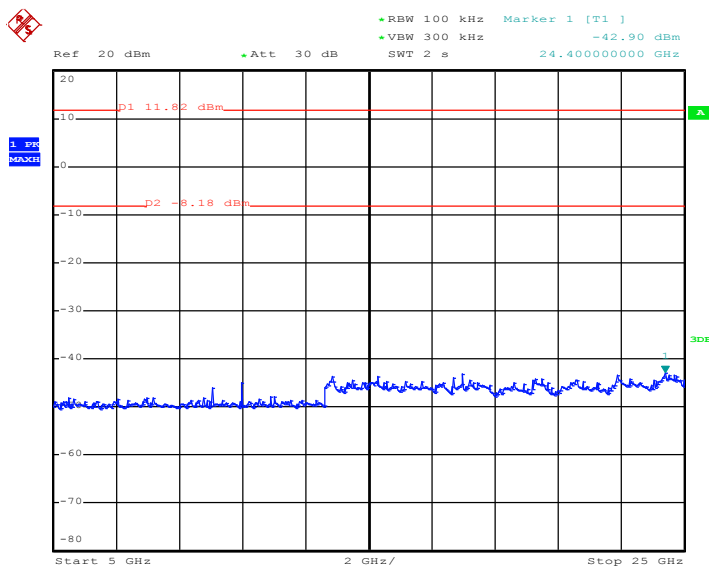
Date: 14.JUN.2018 14:50:37

Middle Channel: 1 GHz to 5 GHz



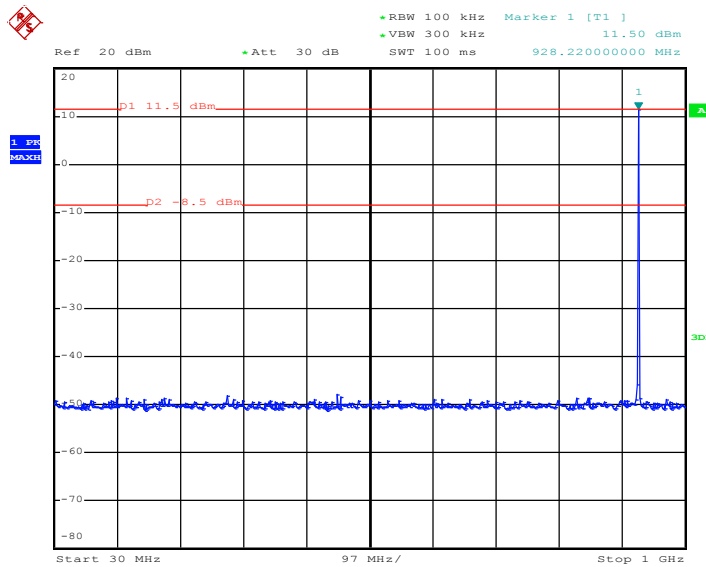
Date: 14.JUN.2018 14:51:14

Middle Channel: 5 GHz to 25 GHz



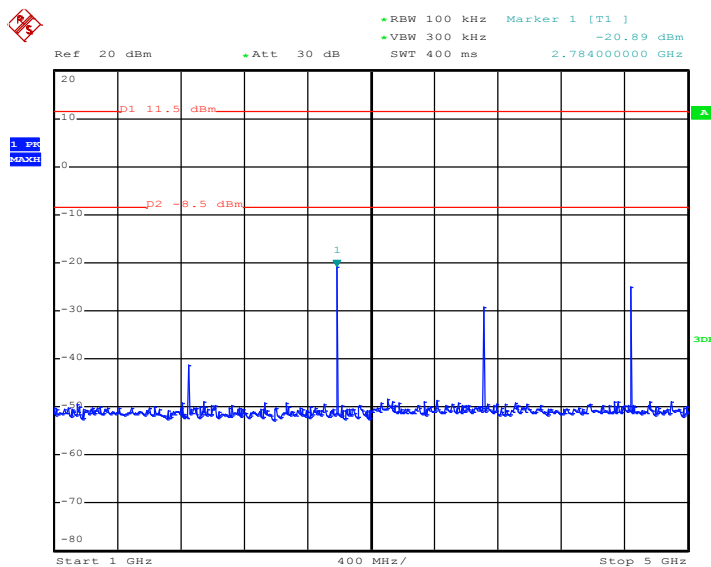
Date: 14.JUN.2018 14:52:34

Highest Channel: 30 MHz to 1 GHz



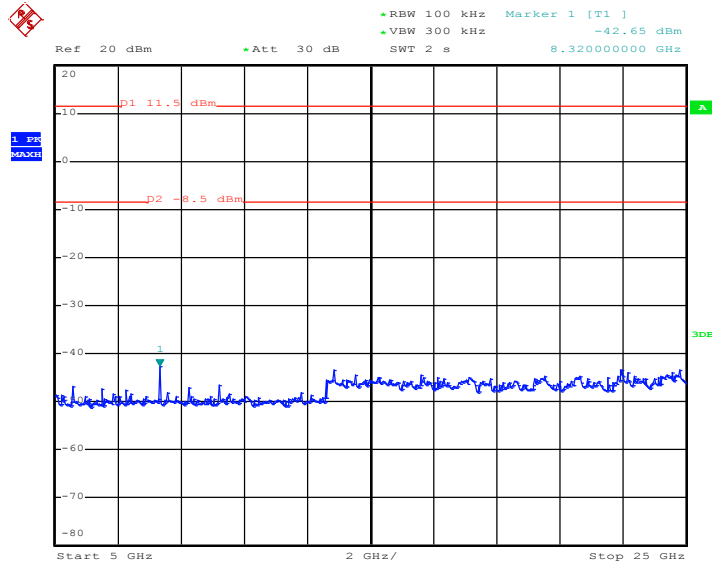
Date: 14.JUN.2018 14:48:25

Highest Channel: 1 GHz to 5 GHz



Date: 14.JUN.2018 14:48:43

Highest Channel: 5 GHz to 25 GHz



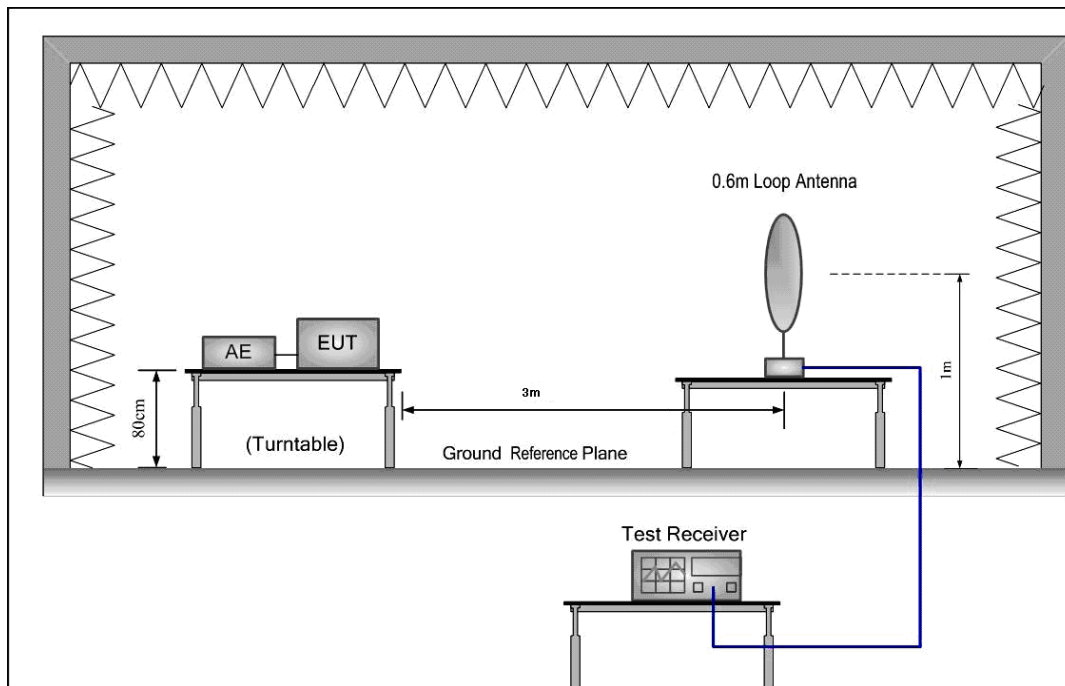
Date: 14.JUN.2018 14:49:10

6.11 Radiated Spurious Emissions

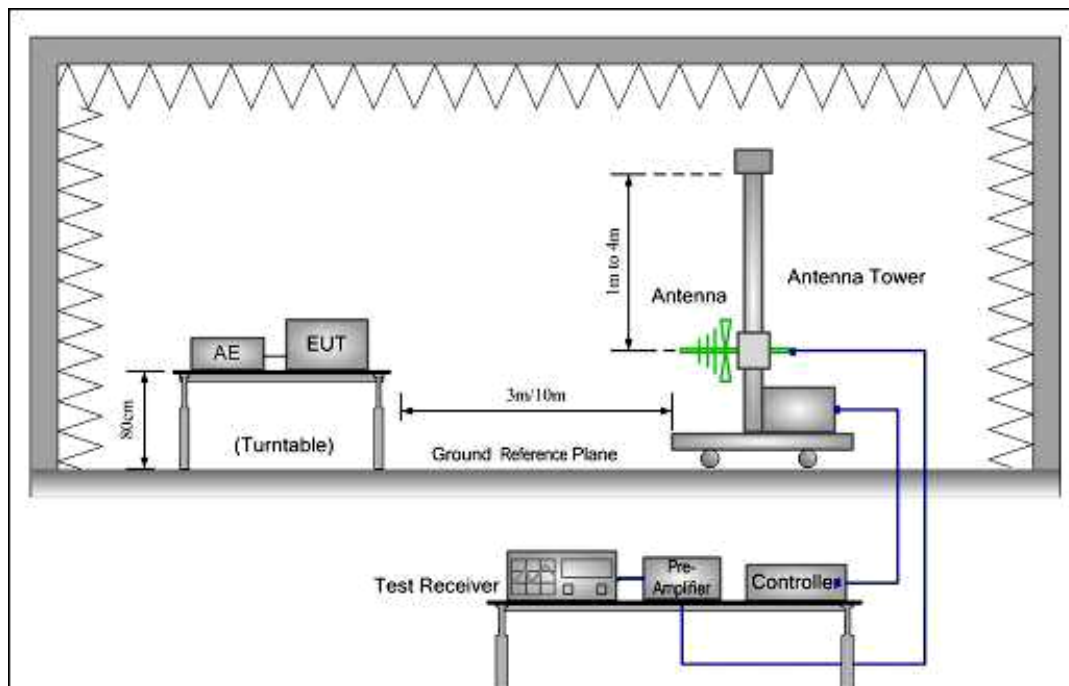
| | |
|--------------------------|--|
| Test Requirement: | FCC Part15 C section 15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating. The radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that Contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, and provided the transmitter demonstrates compliance with the peak conducted power limits. |
| Test Method: | ANSI C63.10: Clause 6.4, 6.5 and 6.6 |
| Test Status: | Pre-test the EUT in continuous transmitting mode at the lowest (903 MHz), middle (915 MHz) and highest (927 MHz) channel. |
| Detector: | For PK value: RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz VBW \geq RBW Sweep = auto Detector function = peak Trace = max hold For AV value: RBW = 1 MHz for $f \geq 1$ GHz, VBW =10 Hz Sweep = auto Detector function = peak Trace = max hold |
| 15.209 Limit: | 40.0 dB μ V/m between 30MHz & 88MHz 43.5 dB μ V/m between 88MHz & 216MHz 46.0 dB μ V/m between 216MHz & 960MHz 54.0 dB μ V/m above 960MHz |

Test Configuration:

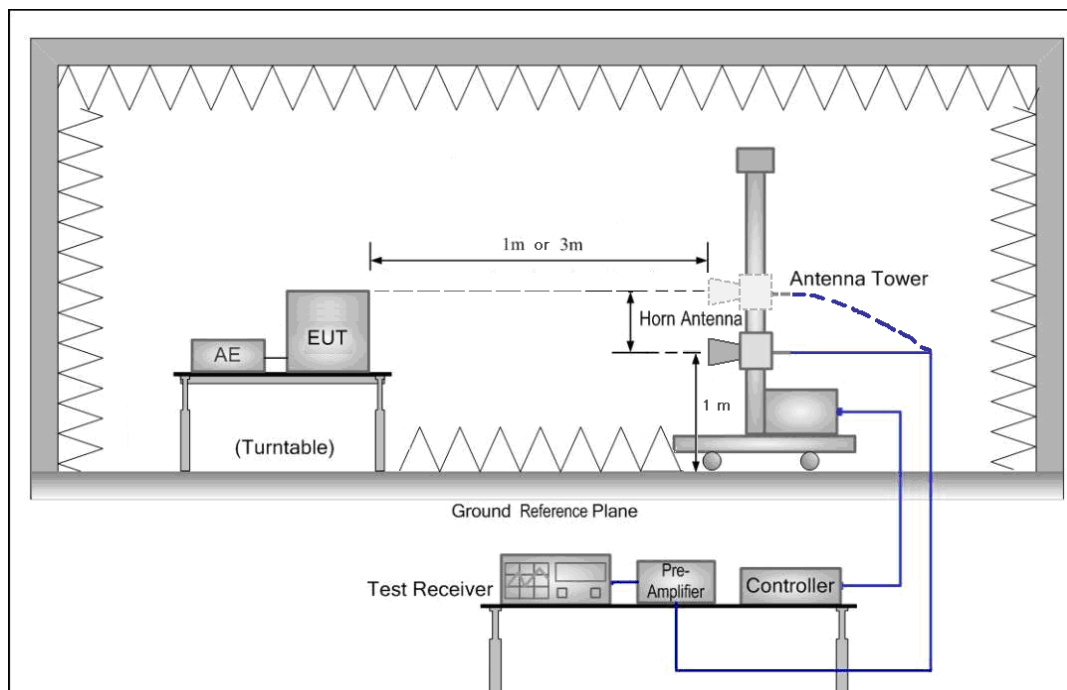
- 1) 9 kHz to 30 MHz emissions:



- 2) 30 MHz to 1 GHz emissions:



3) 1 GHz to 40 GHz emissions:



Test Procedure:

Test site with RF absorbing material covering the ground plane that met the site validation criterion called out in CISPR 16-1-4:2007 was used to perform radiated emission test above 1 GHz.

The receiver scanned from the lowest frequency generated within the EUT to 25GHz. When an emission was found, the table was rotated to produce the maximum signal strength. An initial pre-scan was performed for in peak detection mode using the receiver. The EUT was measured for both the Horizontal and Vertical polarities and performed a pre-test three orthogonal planes. For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. The worst-case emissions were reported.

Now set the VBW to 10 Hz, while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209. If the dwell time per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a "duty cycle correction factor", derived from $20\log(\text{dwell time}/100 \text{ ms})$, in an effort to demonstrate compliance with the 15.209 limit.

Submit this data.

6.11.1 Harmonic and other spurious emissions

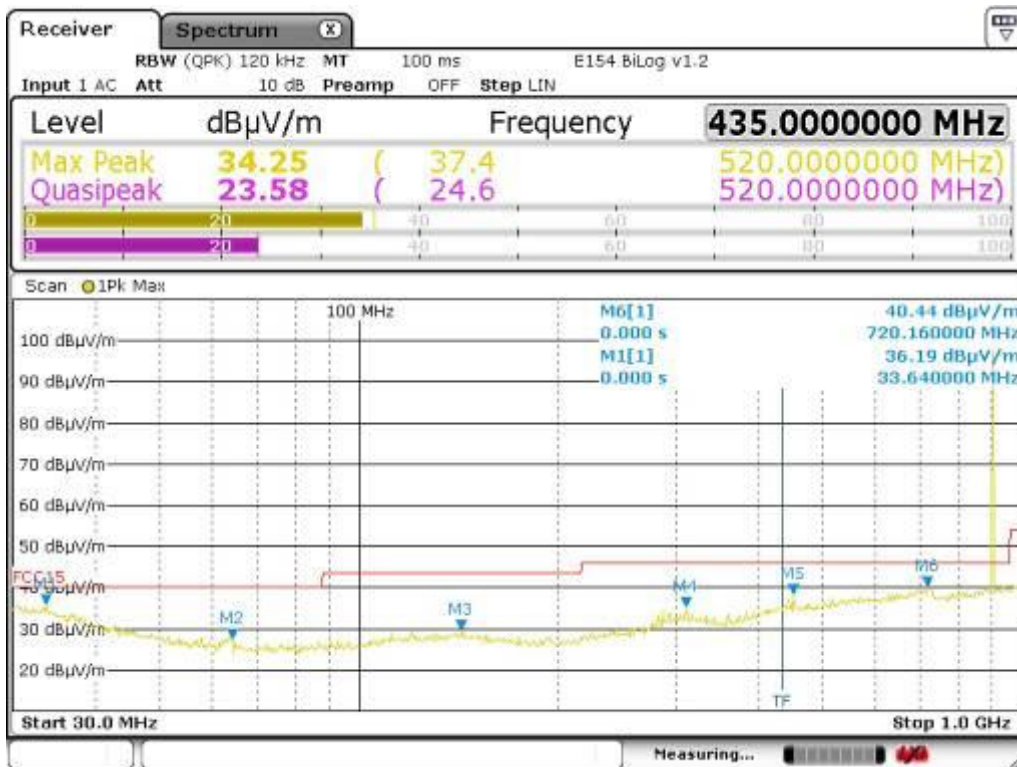
6.11.1.1 Test the lowest Channel in transmitting status

9 kHz~30 MHz Field Strength of Unwanted Emissions. Quasi-Peak Measurement

The measurements with active loop antenna were greater than 20dB below the limit, so the test data were not recorded in the test report.

30 MHz~1 GHz Spurious Emissions .Quasi-Peak Measurement

Quasi-peak measurement:



| Frequency (MHz) | Antenna Polarization | Correction Factor (dB/m) | Receiver QP Reading (dBµV) | Emission Level (dBµV/m) | Limit (dBµV/m) | Over Limit (dB) |
|-----------------|----------------------|--------------------------|----------------------------|-------------------------|----------------|-----------------|
| 31.850 | V | 18.1 | 8.5 | 26.6 | 40 | -13.4 |
| 62.220 | V | 9.5 | 25.1 | 34.6 | 40 | -5.4 |
| 142.630 | V | 11.0 | 7.2 | 18.2 | 43.5 | -25.3 |
| 308.860 | H | 13.2 | 6.7 | 19.9 | 46 | -26.1 |
| 449.600 | H | 17.0 | 6.9 | 23.9 | 46 | -22.1 |
| 720.020 | V | 19.6 | 8.0 | 27.6 | 46 | -18.4 |

1. All readings are Quasi-Peak values.

2. Correction Factor = Antenna Factor + Cable Loss.



1~25 GHz Harmonics & Spurious Emissions. Peak & Average Measurement:

| Frequency (MHz) | Antenna Polarization | Emission Level (dB μ V/m) | | Limit (dB μ V/m) | | Remark |
|-----------------|----------------------|-------------------------------|---------|----------------------|---------|--------|
| | | Peak | Average | Peak | Average | |
| 1806.00 | H | 53.90 | 37.97 | 74 | 54 | Pass |
| 3122.00 | H | 42.12 | 22.22 | 74 | 54 | Pass |
| 3612.00 | V | 59.39 | 45.41 | 74 | 54 | Pass |
| 4515.00 | V | 63.61 | 49.62 | 74 | 54 | Pass |
| 5418.00 | V | 50.29 | 31.76 | 74 | 54 | Pass |
| 6321.00 | V | 59.15 | 41.60 | 74 | 54 | Pass |

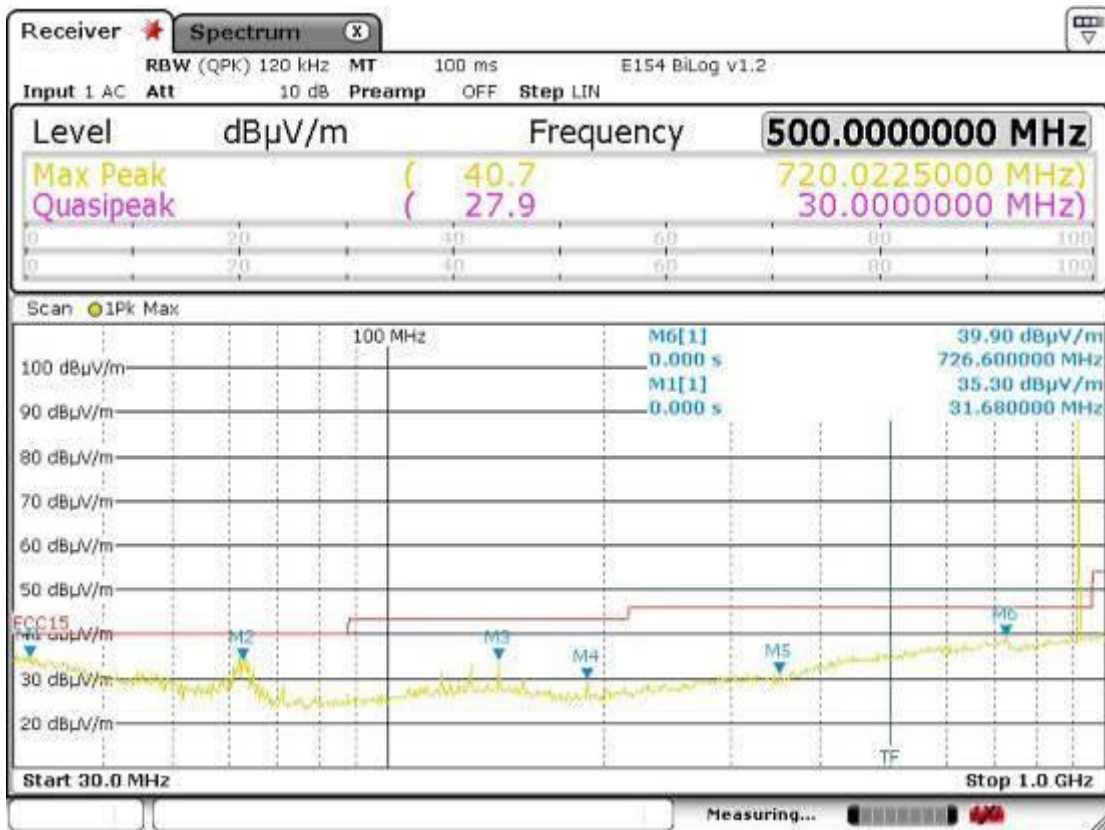
6.11.1.2 Test the middle Channel in transmitting status

9 kHz~30 MHz Field Strength of Unwanted Emissions. Quasi-Peak Measurement

The measurements with active loop antenna were greater than 20dB below the limit, so the test data were not recorded in the test report.

30 MHz~1 GHz Spurious Emissions .Quasi-Peak Measurement

Quasi-peak measurement:



| Frequency (MHz) | Antenna Polarization | Correction Factor (dB/m) | Receiver QP Reading (dBµV) | Emission Level (dBµV/m) | Limit (dBµV/m) | Over Limit (dB) |
|-----------------|----------------------|--------------------------|----------------------------|-------------------------|----------------|-----------------|
| 30.700 | V | 18.6 | 7.2 | 25.8 | 40 | -14.2 |
| 62.930 | V | 9.4 | 27.0 | 36.4 | 40 | -3.6 |
| 142.100 | V | 11.0 | 23.6 | 34.6 | 43.5 | -8.9 |
| 189.720 | V | 8.7 | 19.1 | 27.8 | 43.5 | -15.7 |
| 351.800 | H | 13.1 | 7.8 | 20.9 | 46 | -25.1 |
| 728.120 | H | 19.7 | 9.7 | 29.4 | 46 | -16.6 |

1. All readings are Quasi-Peak values.
2. Correction Factor = Antenna Factor + Cable Loss.

1~25 GHz Harmonics & Spurious Emissions. Peak & Average Measurement:

| Frequency (MHz) | Antenna Polarization | Emission Level (dB μ V/m) | | Limit (dB μ V/m) | | Remark |
|-----------------|----------------------|-------------------------------|---------|----------------------|---------|--------|
| | | Peak | Average | Peak | Average | |
| 1830.00 | V | 29.45 | 20.96 | 74 | 54 | Pass |
| 2648.00 | V | 32.54 | 18.02 | 74 | 54 | Pass |
| 3660.00 | V | 60.28 | 40.76 | 74 | 54 | Pass |
| 4564.00 | V | 64.03 | 46.39 | 74 | 54 | Pass |
| 5490.00 | V | 50.50 | 32.13 | 74 | 54 | Pass |
| 6213.00 | H | 41.90 | 25.12 | 74 | 54 | Pass |

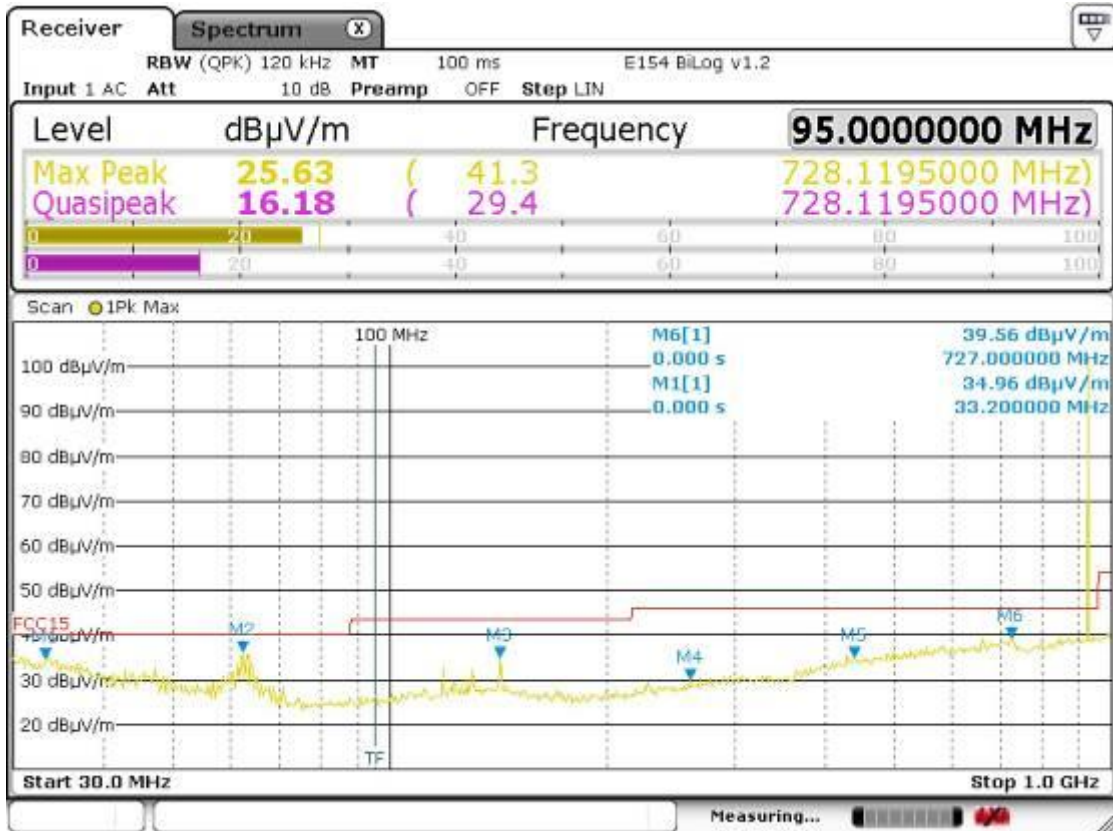
6.11.1.3 Test the highest Channel in transmitting status

9 kHz~30 MHz Field Strength of Unwanted Emissions.Quasi-Peak Measurement

The measurements with active loop antenna were greater than 20dB below the limit, so the test data were not recorded in the test report.

30 MHz~1 GHz Spurious Emissions .Quasi-Peak Measurement

Quasi-peak measurement:



| Frequency (MHz) | Antenna Polarization | Correction Factor (dB/m) | Receiver QP Reading (dBµV) | Emission Level (dBµV/m) | Limit (dBµV/m) | Over Limit (dB) |
|-----------------|----------------------|--------------------------|----------------------------|-------------------------|----------------|-----------------|
| 30.750 | V | 18.6 | 7.1 | 25.7 | 40 | -14.3 |
| 62.450 | V | 9.5 | 26.9 | 36.4 | 40 | -3.6 |
| 141.600 | V | 11.1 | 21.0 | 32.1 | 43.5 | -11.4 |
| 258.990 | H | 11.5 | 7.5 | 19.0 | 46 | -27.0 |
| 437.990 | V | 16.5 | 7.4 | 23.9 | 46 | -22.1 |
| 726.770 | H | 19.7 | 9.6 | 29.3 | 46 | -16.7 |

1. All readings are Quasi-Peak values.
2. Correction Factor = Antenna Factor + Cable Loss.

1~25 GHz Harmonics & Spurious Emissions. Peak & Average Measurement:

| Frequency (MHz) | Antenna Polarization | Emission Level (dBµV/m) | | Limit (dBµV/m) | | Remark |
|-----------------|----------------------|-------------------------|---------|----------------|---------|--------|
| | | Peak | Average | Peak | Average | |
| 1854.00 | H | 44.83 | 27.63 | 74 | 54 | Pass |
| 3708.00 | H | 54.81 | 32.69 | 74 | 54 | Pass |
| 4635.00 | V | 64.88 | 46.95 | 74 | 54 | Pass |
| 5562.00 | V | 49.29 | 31.49 | 74 | 54 | Pass |
| 6489.00 | V | 51.24 | 35.92 | 74 | 54 | Pass |
| 8343.00 | V | 55.63 | 40.00 | 74 | 54 | Pass |

Remark:

1). The field strength is calculated by adding the Antenna Factor. Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level = Receiver Reading + Antenna Factor + Cable Loss – Preamplifier Factor.

2). As shown in Section, for frequencies above 1000 MHz. the above field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

3). The test only perform the EUT in transmitting status since the test frequencies were over 1GHz only required transmitting status.

Test result: The unit does meet the FCC requirements.

6.11.2 Radiated Emissions which fall in the restricted bands

| | |
|------------------------------|--|
| Test Requirement: | FCC Part15 C Section 15.247 (d) In addition, radiated emissions which fall in the restricted bands. as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)). |
| Test Method: | ANSI C63.10: Clause 6.4, 6.5 and 6.6 |
| Test Status: | Pre-test the EUT in continuous transmitting mode at the lowest (903 MHz) and highest (927 MHz) channel. |
| Measurement Distance: | 3m (Semi-Anechoic Chamber) |
| Limit: | Section 15.209(a) 40.0 dB μ V/m between 30MHz & 88MHz; 43.5 dB μ V/m between 88MHz & 216MHz; 46.0 dB μ V/m between 216MHz & 960MHz; 54.0 dB μ V/m above 960MHz. |
| Detector: | For PK value: RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz VBW \geq RBW Sweep = auto Detector function = peak Trace = max hold For AV value: RBW = 1 MHz for $f \geq 1$ GHz, VBW =10 Hz Sweep = auto Detector function = peak Trace = max hold |

Test Result:

Test at lowest Channel (903 MHz) in transmitting status

| Frequency (MHz) | Antenna Polarization | Emission Level (dB μ V/m) | Limit (dB μ V/m) | Remark |
|-----------------|----------------------|-------------------------------|----------------------|--------|
| | | QP | QP | |
| 902 | H | 35.9 | 46 | PASS |
| 902 | V | 43.8 | 46 | PASS |

Test at highest Channel (927 MHz) in transmitting status

| Frequency (MHz) | Antenna Polarization | Emission Level (dB μ V/m) | Limit (dB μ V/m) | Remark |
|-----------------|----------------------|-------------------------------|----------------------|--------|
| | | QP | QP | |
| 928.0 | H | 35.8 | 46 | PASS |
| 928.0 | V | 41.1 | 46 | PASS |

Remark: above table only record the worse data of emissions in restricted frequency bands.

Test result: The unit does meet the FCC requirements.

Section 15.205 Restricted bands of operation.

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

| MHz | MHz | MHz | GHz |
|---------------------|-----------------------|-----------------|---------------|
| 0.090 - 0.110 | 16.42 - 16.423 | 399.9 - 410 | 4.5 - 5.15 |
| 10.495 - 0.505 | 16.69475 - 16.69525 | 608 - 614 | 5.35 - 5.46 |
| 2.1735 - 2.1905 | 16.80425 - 16.80475 | 960 - 1240 | 7.25 - 7.75 |
| 4.125 - 4.128 | 25.5 - 25.67 | 1300 - 1427 | 8.025 - 8.5 |
| 4.17725 - 4.17775 | 37.5 - 38.25 | 1435 - 1626.5 | 9.0 - 9.2 |
| 4.20725 - 4.20775 | 73 - 74.6 | 1645.5 - 1646.5 | 9.3 - 9.5 |
| 6.215 - 6.218 | 74.8 - 75.2 | 1660 - 1710 | 10.6 - 12.7 |
| 6.26775 - 6.26825 | 108 - 121.94 | 1718.8 - 1722.2 | 13.25 - 13.4 |
| 6.31175 - 6.31225 | 123 - 138 | 2200 - 2300 | 14.47 - 14.5 |
| 8.291 - 8.294 | 149.9 - 150.05 | 2310 - 2390 | 15.35 - 16.2 |
| 8.362 - 8.366 | 156.52475 - 156.52525 | 2483.5 - 2500 | 17.7 - 21.4 |
| 8.37625 - 8.38675 | 156.7 - 156.9 | 2655 - 2900 | 22.01 - 23.12 |
| 8.41425 - 8.41475 | 162.0125 - 167.17 | 3260 - 3267 | 23.6 - 24.0 |
| 12.29 - 12.293 | 167.72 - 173.2 | 3332 - 3339 | 31.2 - 31.8 |
| 12.51975 - 12.52025 | 240 - 285 | 3345.8 - 3358 | 36.43 - 36.5 |
| 12.57675 - 12.57725 | 322 - 335.4 | 3600 - 4400 | |
| 13.36 - 13.41 | | | |

6.12 Band Edges Requirement

Test Requirement: FCC Part15 C section 15.247

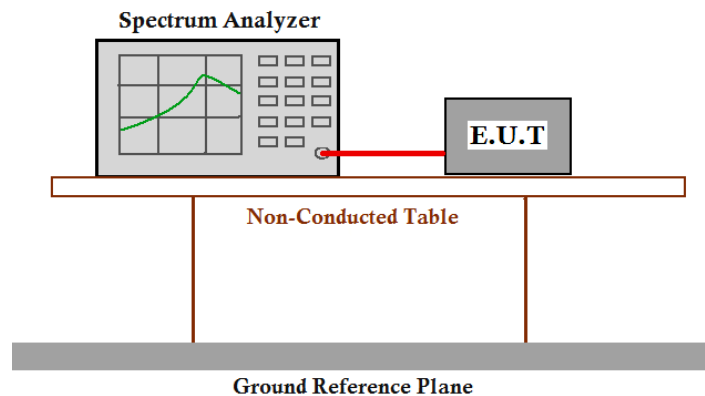
(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

Frequency Band: 902 MHz to 928 MHz

Test Method: ANSI C63.10 (2013) Section 7.8.6

Test Status: Pre-test the EUT in continuous transmitting mode at the lowest (2402 MHz), and highest (2480 MHz) channel and hopping mode with different data packet. Compliance test in continuous transmitting mode with normal (DH5) and EDR mode (3DH5) as the worst case was found.

Test Configuration:



Test Procedure:

Use the following spectrum analyzer settings:

Span = 10MHz (wide enough to capture the peak level of the emission operating on the channel closest to the bandedge, as well as any modulation products which fall outside of the authorized band of operation.)

RBW = 100 kHz (1% of the span) and VBW = 300 kHz

Sweep = auto

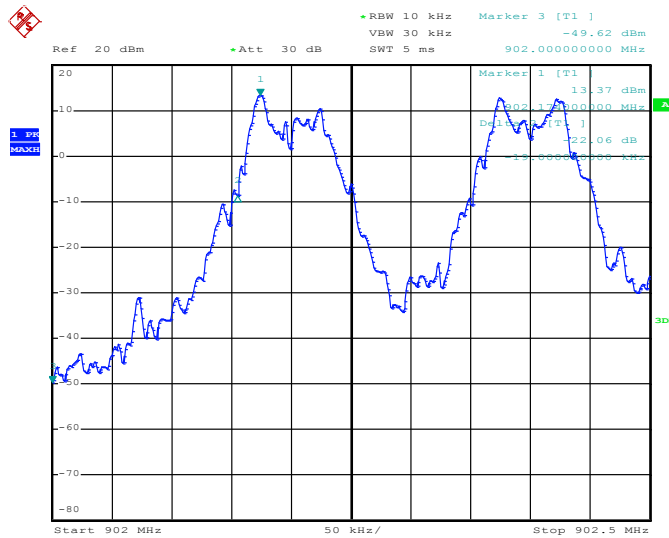
Detector function = peak

Trace = max hold

Test Result:

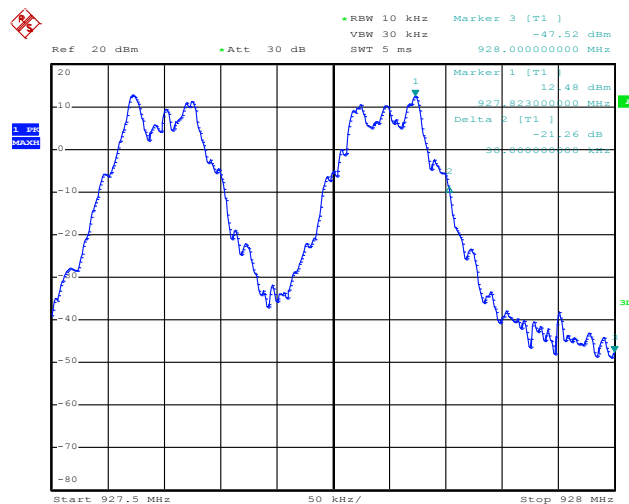
Compare with the output power of the lowest frequency, the Lower Edges attenuated more than 20dB
 Compare with the output power of the highest frequency, the Upper Edges attenuated more than 20dB.

Lowest channel (903 MHz):



Date: 14.JUN.2018 15:07:33

Highest Channel (927 MHz):

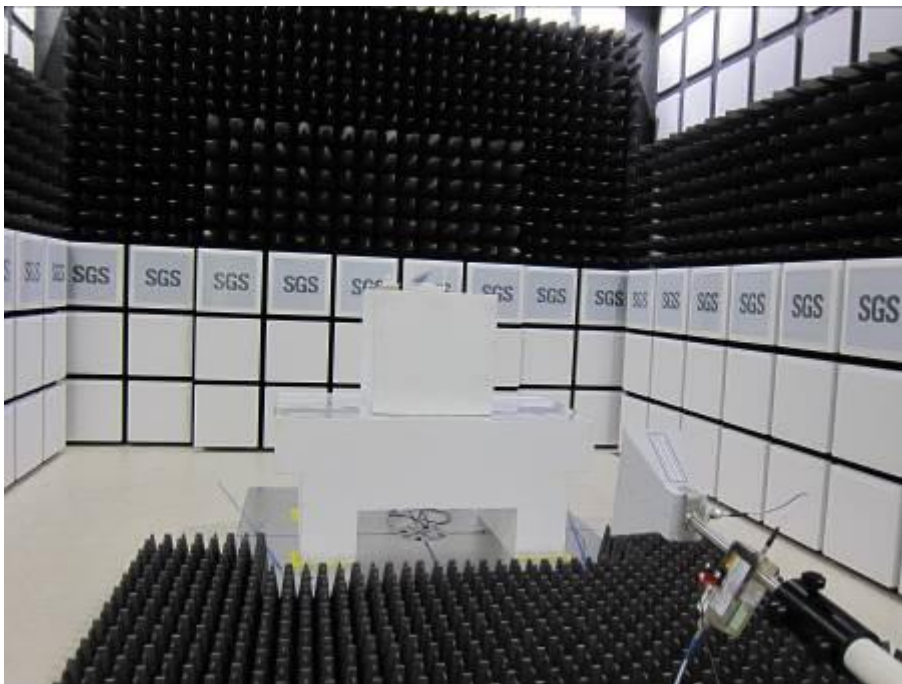
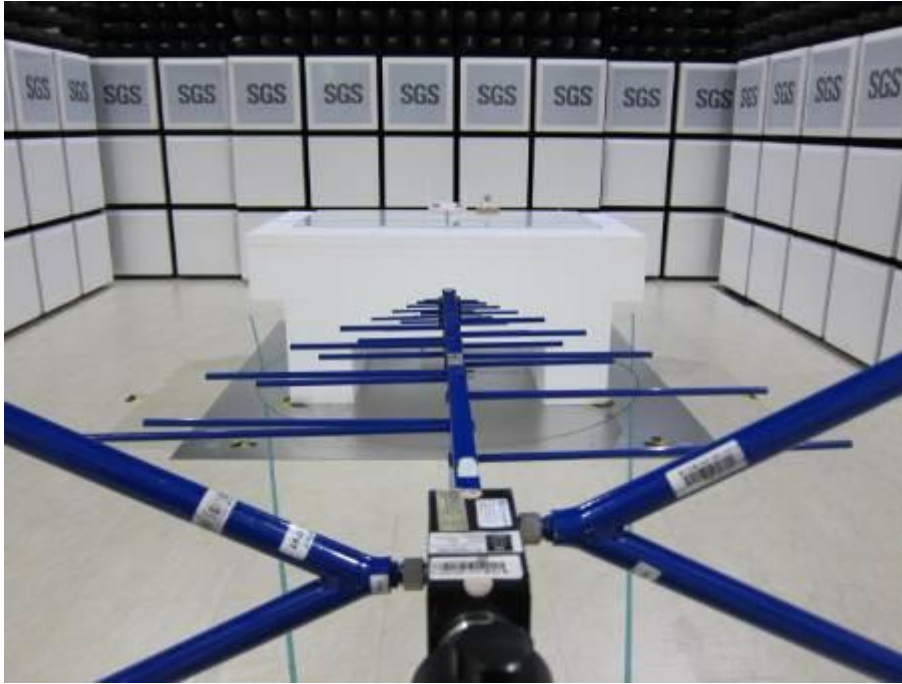


Date: 14.JUN.2018 15:09:23

Test result: The unit does meet the FCC requirements.

7 Photographs

7.1 Radiated Spurious Emission Test Setup



8 EUT Constructional Details



--End of Report--