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RADIO TEST REPORT

Report No.: STS2008346W01

Issued for

STAR SYSTEMS INTERNATIONAL LIMITED

UNIT 7B, 8/F VANTA INDUSTRIAL CENTRE, 21-33 TAI LIN
PAI ROAD, KWAI CHUNG, HK

| | |
|-----------------------|---|
| Product Name: | INTEGRATED READER |
| Brand Name: | TARVOS |
| Model Name: | HRD27009 |
| Series Model: | N/A |
| FCC ID: | 2AA7KTARVOSHRD27000 |
| IC: | 20068-TARVOS27000 |
| Test Standard: | FCC Part 15.247 RSS-247 Issue 2, February 2017 |

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TEST RESULT CERTIFICATION

Applicant's Name: STAR SYSTEMS INTERNATIONAL LIMITED
Address: UNIT 7B, 8/F VANTA INDUSTRIAL CENTRE, 21-33 TAI LIN PAI ROAD, KWAI CHUNG, HK
Manufacturer's Name: STAR SYSTEMS INTERNATIONAL LIMITED
Address: UNIT 7B, 8/F VANTA INDUSTRIAL CENTRE, 21-33 TAI LIN PAI ROAD, KWAI CHUNG, HK

Product Description

Product Name: INTEGRATED READER
Brand Name: TARVOS
Model Name: HRD27009
Series Model: N/A
Test Standards: FCC Part15.247
RSS-247 Issue 2, February 2017
Test Procedure: ANSI C63.10-2013

This device described above has been tested by STS, the test results show that the equipment under test (EUT) is in compliance with the FCC/IC requirements. And it is applicable only to the tested sample identified in the report.
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Date of Test.....:
Date of receipt of test item.....: 26 May 2020
Date (s) of performance of tests.: 26 May 2020 ~ 30 June 2020
01 Sept. 2020 ~ 28 Sept. 2020
Date of Issue: 28 Sept. 2020
Test Result: Pass

Testing Engineer : [Signature: Chris Chen]

(Chris Chen)

Technical Manager : [Signature: Sean She]

(Sean she)

Authorized Signatory : [Signature: Vita Li]

(Vita Li)





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**Revision History**

| Rev. | Issue Date | Report No. | Effect Page | Contents |
|------|---------------|---------------|-------------|---|
| 00 | 30 June 2020 | STS2005237W01 | ALL | Initial Issue |
| 00 | 28 Sept. 2020 | STS2008346W01 | ALL | Updated antenna and Radiated test data. |
| | | | | |





1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:
KDB 558074 D01 15.247 Meas Guidance v05r02.

| FCC Part 15.247, Subpart C RSS-247 Issue 2, February 2017 | | | |
|--|---|-----------|--------|
| Standard Section | Test Item | Judgement | Remark |
| 15.207 RSS-Gen 8.8 | Conducted Emission | PASS | -- |
| 15.247(a)(1) RSS-247 5.1(b) | Hopping Channel Separation | PASS | -- |
| 15.247(b)(2) RSS-247 5.4(a) | Output Power | PASS | -- |
| 15.209 RSS-247 5.5 | Radiated Spurious Emission | PASS | -- |
| 15.247(d) RSS-247 5.5 | Conducted Spurious & Band Edge Emission | PASS | -- |
| 15.247(a)(1)(i) RSS-247 5.1(c) | Number of Hopping Frequency | PASS | -- |
| 15.247(a)(1)(i) RSS-247 5.1(c) | Dwell Time | PASS | -- |
| 15.247(a)(1)(i) RSS-247 5.1(c) | Bandwidth | PASS | -- |
| 15.205 RSS-Gen 8.10 | Restricted bands of operation | PASS | -- |
| Part 15.247(d)/part 15.209(a) RSS-Gen 8.10 | Band Edge Emission | PASS | -- |
| 15.203 RSS-Gen 8.3 | Antenna Requirement | PASS | -- |

NOTE:

- (1) 'N/A' denotes test is not applicable in this Test Report.
- (2) All tests are according to ANSI C63.10-2013.



1.1 TEST FACTORY

SHENZHEN STS TEST SERVICES CO., LTD

Add. : A 1/F, Building B, Zhuoke Science Park, No.190 Chongqing Road, HepingShequ, Fuyong Sub-District, Bao'an District, Shenzhen, Guang Dong, China

FCC test Firm Registration Number: 625569

IC test Firm Registration Number: 12108A

A2LA Certificate No.: 4338.01

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately **95 %**.

| No. | Item | Uncertainty |
|-----|-----------------------------------|----------------------|
| 1 | RF output power, conducted | $\pm 0.68\text{dB}$ |
| 2 | Unwanted Emissions, conducted | $\pm 2.988\text{dB}$ |
| 3 | All emissions, radiated 30-1GHz | $\pm 5.6\text{dB}$ |
| 4 | All emissions, radiated 1G-6GHz | $\pm 5.5\text{dB}$ |
| 5 | All emissions, radiated >6G | $\pm 5.8\text{dB}$ |
| 6 | Conducted Emission (9KHz-150KHz) | $\pm 3.37\text{dB}$ |
| 7 | Conducted Emission (150KHz-30MHz) | $\pm 3.83\text{dB}$ |



2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF THE EUT

| | |
|-------------------------|--|
| Product Name | INTEGRATED READER |
| Trade Name | TARVOS |
| Model Name | HRD27009 |
| Series Model | N/A |
| Model Difference | N/A |
| Channel List | Please refer to the Note 2. |
| RF Information | Frequency: 902~928MHz Modulation: FHSS |
| Antenna Type | Please refer to the Note 3. |
| Adapter | Input: AC 100-240V, 800mA, 50/60 Hz Output: DC 24V, 1.25A |
| Operation mode | Dense reader mode |
| | Single reader mode |
| Hardware version number | R5 |
| Software version number | 1.5.2.23029 |
| Connecting I/O Port(s) | Please refer to the Note 1. |

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User Manual.



2. Operation Frequency of channel

| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|---------|-----------------|
| 0 | 902.75 | 17 | 911.25 | 34 | 919.75 |
| 1 | 903.25 | 18 | 911.75 | 35 | 920.25 |
| 2 | 903.75 | 19 | 912.25 | 36 | 920.75 |
| 3 | 904.25 | 20 | 912.75 | 37 | 921.25 |
| 4 | 904.75 | 21 | 913.25 | 38 | 921.75 |
| 5 | 905.25 | 22 | 913.75 | 39 | 922.25 |
| 6 | 905.75 | 23 | 914.25 | 40 | 922.75 |
| 7 | 906.25 | 24 | 914.75 | 41 | 923.25 |
| 8 | 906.75 | 25 | 915.25 | 42 | 923.75 |
| 9 | 907.25 | 26 | 915.75 | 43 | 924.25 |
| 10 | 907.75 | 27 | 916.25 | 44 | 924.75 |
| 11 | 908.25 | 28 | 916.75 | 45 | 925.25 |
| 12 | 908.75 | 29 | 917.25 | 46 | 925.75 |
| 13 | 909.25 | 30 | 917.75 | 47 | 926.25 |
| 14 | 909.75 | 31 | 918.25 | 48 | 926.75 |
| 15 | 910.25 | 32 | 918.75 | 49 | 927.25 |
| 16 | 910.75 | 33 | 919.25 | | |

3. Table for Filed Antenna

| Ant. | Brand | Model Name | Antenna Type | Connector | Gain (dBi) | Antenna Cable loss (dB) | Antenna combination (dBi) |
|------|--------|------------|--------------|-----------|------------|-------------------------|---------------------------|
| 1 | TARVOS | HRD27009 | Avior | N/A | 15 | 12 | 3 |
| 2 | TARVOS | HRD27009 | Cheetah II | N/A | 12 | 12 | 0 |
| 3 | TARVOS | HRD27009 | Bobcat | N/A | 8 | 12 | -4 |
| 4 | TARVOS | HRD27009 | Kuma | N/A | 10 | 12 | -2 |

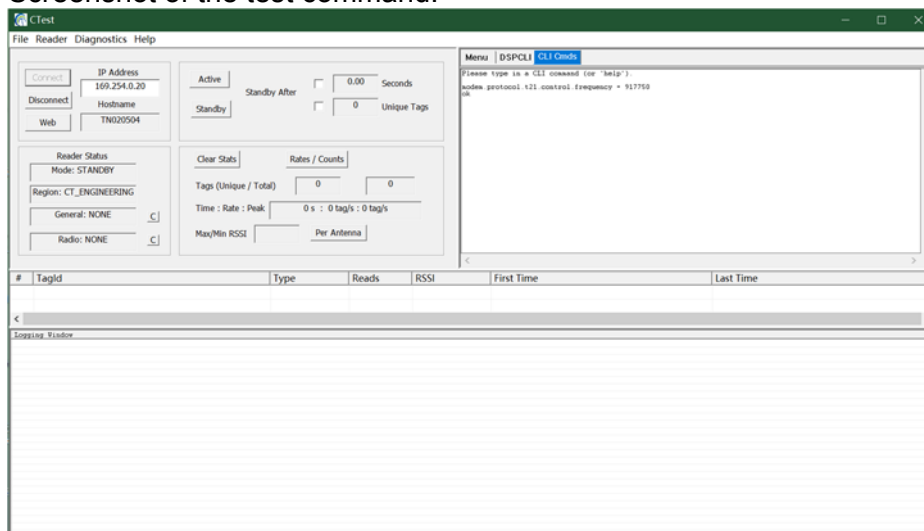
Note: All antennas have been tested for conducted emission and radiated spurious emission, but the report only shows the worst data of the Avior antenna.

4. The EUT has been programmed to continuously transmit during test by the PC via an Ethernet cable. The combination of antenna gain and antenna cable loss is 3dBi.

Power setting by the firmware is:

lowest channel=33dBm,middle channel=33dBm ,highest channel =33dBm

Screenshot of the test command:





2.2 DESCRIPTION OF THE TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

| Worst Mode | Description | Operation mode |
|------------|-------------|--------------------|
| Mode 1 | CH00 | Dense reader mode |
| Mode 2 | CH25 | Dense reader mode |
| Mode 3 | CH49 | Dense reader mode |
| Mode 4 | CH00 | Single reader mode |
| Mode 5 | CH25 | Single reader mode |
| Mode 6 | CH49 | Single reader mode |

Note:

- (1) The measurements are performed at all Bit Rate of Transmitter, the worst data was reported.
- (2) We tested for all available U.S. voltage and frequencies (For 120V,50/60Hz and 240V, 50/60Hz) for which the device is capable of operation, and the worst case of 120V/ 60Hz is shown in the report.
- (3) The battery is fully-charged during the radiated and RF conducted test.

For AC Conducted Emission

| Test Case | |
|-----------------------|---------------------|
| AC Conducted Emission | Mode 7 : Keeping TX |

2.3 TABLE OF PARAMETERS OF TEST SOFTWARE SETTING

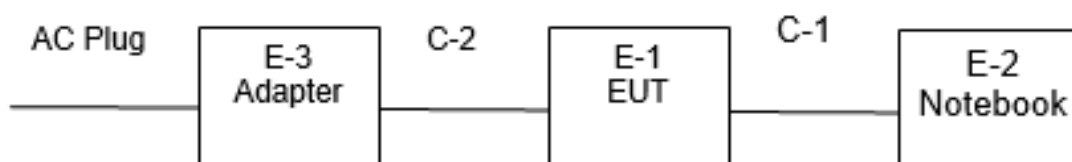
During testing, the channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters of FHSS.

2.4 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Radiated Spurious Emission Test



Conducted Emission Test





2.5 DESCRIPTION OF NECESSARY ACCESSORIES AND SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Necessary accessories

| Item | Equipment | Mfr/Brand | Model/Type No. | Length | Note |
|------|-----------|-----------|----------------|--------|------|
| E-3 | Adapter | N/A | PSAC30U-240L6 | N/A | N/A |
| C-2 | DC Cable | N/A | N/A | 100cm | N/A |
| | | | | | |
| | | | | | |

Support units

| Item | Equipment | Mfr/Brand | Model/Type No. | Length | Note |
|------|-----------|-----------|----------------|--------|------|
| E-2 | Notebook | DELL | VOSTRO.3800 | N/A | N/A |
| C-1 | USB Cable | N/A | N/A | 100cm | N/A |
| | | | | | |
| | | | | | |

Note:

- (1) For detachable type I/O cable should be specified the length in cm in 『Length』 column.



2.7 EQUIPMENTS LIST

Radiation Test equipment

| Kind of Equipment | Manufacturer | Type No. | Serial No. | Last calibration | Calibrated until |
|----------------------------------|--------------|----------------------------|------------------|------------------|------------------|
| Test Receiver | R&S | ESCI | 101427 | 2019.10.09 | 2020.10.08 |
| Signal Analyzer | Agilent | N9020A | MY51110105 | 2020.03.05 | 2021.03.04 |
| Active loop Antenna | ZHINAN | ZN30900C | 16035 | 2018.03.11 | 2021.03.10 |
| Bilog Antenna | TESEQ | CBL6111D | 34678 | 2017.11.02 | 2020.11.01 |
| Horn Antenna | SCHWARZBECK | BBHA 9120D(1201) | 9120D-1343 | 2018.10.19 | 2021.10.18 |
| SHF-EHF Horn Antenna (18G-40GHz) | A-INFO | LB-180400-KF | J211020657 | 2018.03.11 | 2021.03.10 |
| Pre-Amplifier(0.1M-3G Hz) | EM | EM330 | 060665 | 2019.10.09 | 2020.10.08 |
| Pre-Amplifier (1G-18GHz) | SKET | LNPA-01018G-45 | SK201808090 1 | 2019.10.12 | 2020.10.11 |
| Pre-Amplifier (18G-40GHz) | SKET | LNPA-1840-50 | SK201810180 1 | 2019.10.12 | 2020.10.11 |
| Temperature & Humidity | HH660 | Mieo | N/A | 2019.10.17 | 2020.10.16 |
| turn table | EM | SC100_1 | 60531 | N/A | N/A |
| Antenna mast | EM | SC100 | N/A | N/A | N/A |
| Test Receiver | R&S | ESCI | 101427 | 2019.10.09 | 2020.10.08 |
| Test SW | FARAD | EZ-EMC(Ver.STSLAB-03A1 RE) | | | |

Conduction Test equipment

| Kind of Equipment | Manufacturer | Type No. | Serial No. | Last calibration | Calibrated until |
|------------------------|--------------|----------------------------|------------|------------------|------------------|
| Test Receiver | R&S | ESCI | 101427 | 2019.10.09 | 2020.10.08 |
| LISN | R&S | ENV216 | 101242 | 2019.10.09 | 2020.10.08 |
| LISN | EMCO | 3810/2NM | 23625 | 2019.10.09 | 2020.10.08 |
| Temperature & Humidity | HH660 | Mieo | N/A | 2019.10.17 | 2020.10.16 |
| Test SW | FARAD | EZ-EMC(Ver.STSLAB-03A1 CE) | | | |

RF Connected Test

| Kind of Equipment | Manufacturer | Type No. | Serial No. | Last calibration | Calibrated until |
|------------------------|--------------|-----------------|---------------|------------------|------------------|
| USB RF power sensor | DARE | RPR3006W | 15I00041SNO03 | 2019.10.09 | 2020.10.08 |
| Signal Analyzer | Agilent | N9020A | MY49100060 | 2019.10.09 | 2020.10.08 |
| Temperature & Humidity | HH660 | Mieo | N/A | 2019.10.17 | 2020.10.16 |
| Test SW | FARAD | LZ-RF /LzRf-3A3 | | | |



3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 POWER LINE CONDUCTED EMISSION LIMITS

The radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table.

| FREQUENCY (MHz) | Conducted Emission limit (dBuV) | |
|-----------------|---------------------------------|-----------|
| | Quasi-peak | Average |
| 0.15 -0.5 | 66 - 56 * | 56 - 46 * |
| 0.50 -5.0 | 56.00 | 46.00 |
| 5.0 -30.0 | 60.00 | 50.00 |

Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of “ * ” marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

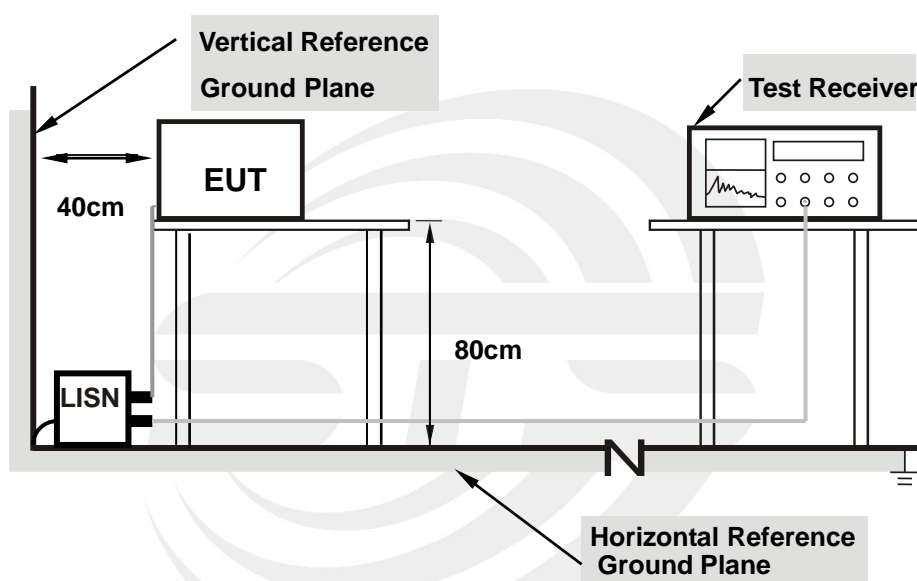
The following table is the setting of the receiver

| Receiver Parameters | Setting |
|---------------------|----------|
| Attenuation | 10 dB |
| Start Frequency | 0.15 MHz |
| Stop Frequency | 30 MHz |
| IF Bandwidth | 9 kHz |

3.1.2 TEST PROCEDURE

- a. The EUT is 0.8 m from the horizontal ground plane and 0.4 m from the vertical ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments are powered from additional LISN(s). The LISN provides 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- d. LISN is at least 80 cm from the nearest part of EUT chassis.
- e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.1.3 TEST SETUP



- Note:**
- 1.Support units were connected to second LISN.
 - 2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes support.

3.1.4 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.



3.1.5 TEST RESULT

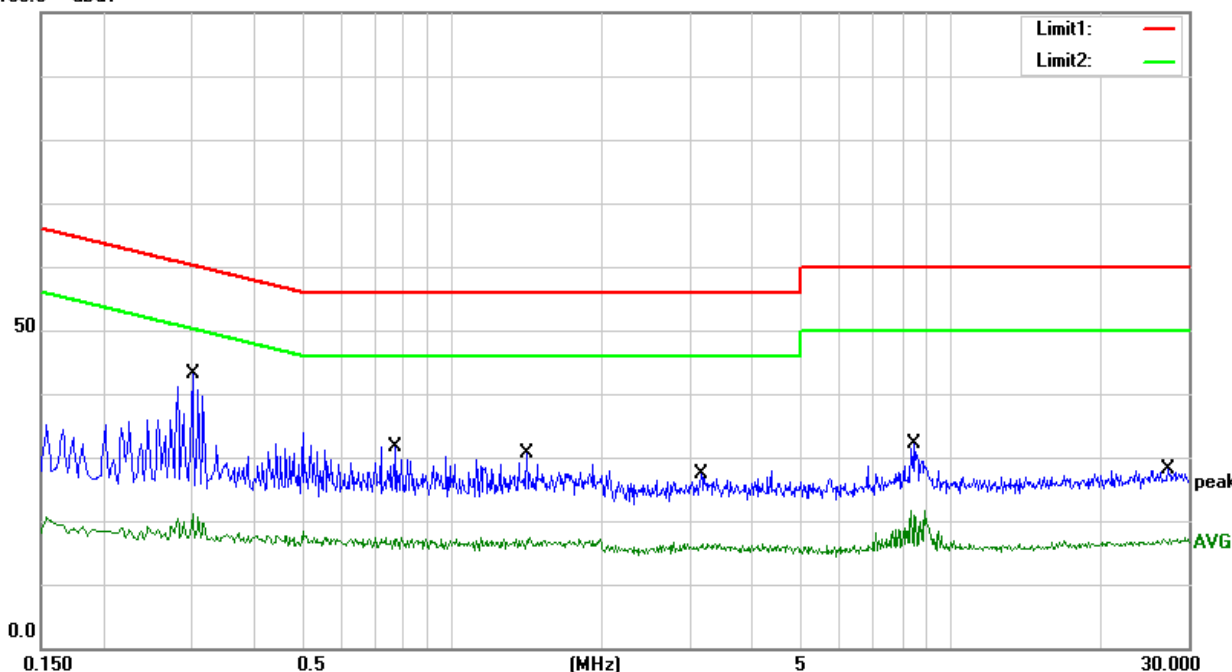
| | | | |
|---------------|--------------|--------------------|-------|
| Temperature: | 26.8°C | Relative Humidity: | 68%RH |
| Test Voltage: | AC 120V/60Hz | Phase: | L |
| Test Mode: | Mode 7 | | |

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB) | Result (dBuV) | Limit (dBuV) | Margin (dB) | Remark |
|-----|-----------------|----------------|--------------------|---------------|--------------|-------------|--------|
| 1 | 0.3020 | 22.38 | 20.72 | 43.10 | 60.19 | -17.09 | QP |
| 2 | 0.3020 | 0.30 | 20.72 | 21.02 | 50.19 | -29.17 | AVG |
| 3 | 0.7740 | 11.41 | 20.24 | 31.65 | 56.00 | -24.35 | QP |
| 4 | 0.7740 | -2.83 | 20.24 | 17.41 | 46.00 | -28.59 | AVG |
| 5 | 1.4140 | 10.58 | 20.12 | 30.70 | 56.00 | -25.30 | QP |
| 6 | 1.4140 | -2.79 | 20.12 | 17.33 | 46.00 | -28.67 | AVG |
| 7 | 3.1660 | 7.45 | 19.97 | 27.42 | 56.00 | -28.58 | QP |
| 8 | 3.1660 | -3.58 | 19.97 | 16.39 | 46.00 | -29.61 | AVG |
| 9 | 8.4340 | 12.21 | 20.02 | 32.23 | 60.00 | -27.77 | QP |
| 10 | 8.4340 | 1.49 | 20.02 | 21.51 | 50.00 | -28.49 | AVG |
| 11 | 27.3100 | 7.41 | 20.64 | 28.05 | 60.00 | -31.95 | QP |
| 12 | 27.3100 | -3.47 | 20.64 | 17.17 | 50.00 | -32.83 | AVG |

Remark:

1. All readings are Quasi-Peak and Average values
2. Margin = Result (Result = Reading + Factor) – Limit
3. Factor=LISN factor+Cable loss+Limiter (10dB)

100.0 dBuV





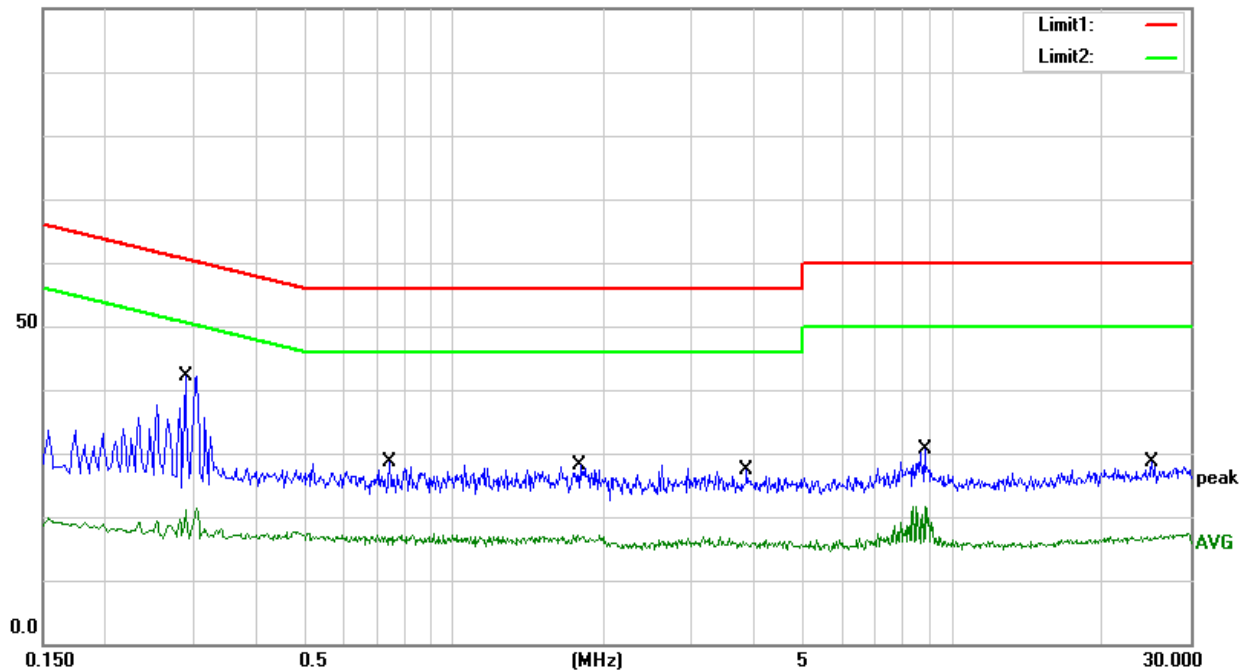
| | | | |
|---------------|--------------|--------------------|-------|
| Temperature: | 26.8°C | Relative Humidity: | 68%RH |
| Test Voltage: | AC 120V/60Hz | Phase: | N |
| Test Mode: | Mode 7 | | |

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB) | Result (dBuV) | Limit (dBuV) | Margin (dB) | Remark |
|-----|-----------------|----------------|--------------------|---------------|--------------|-------------|--------|
| 1 | 0.2900 | 21.43 | 20.67 | 42.10 | 60.52 | -18.42 | QP |
| 2 | 0.2900 | 0.43 | 20.67 | 21.10 | 50.52 | -29.42 | AVG |
| 3 | 0.7460 | 8.29 | 20.24 | 28.53 | 56.00 | -27.47 | QP |
| 4 | 0.7460 | -3.04 | 20.24 | 17.20 | 46.00 | -28.80 | AVG |
| 5 | 1.7940 | 8.12 | 20.08 | 28.20 | 56.00 | -27.80 | QP |
| 6 | 1.7940 | -3.25 | 20.08 | 16.83 | 46.00 | -29.17 | AVG |
| 7 | 3.8700 | 7.45 | 19.96 | 27.41 | 56.00 | -28.59 | QP |
| 8 | 3.8700 | -3.87 | 19.96 | 16.09 | 46.00 | -29.91 | AVG |
| 9 | 8.8180 | 10.55 | 20.05 | 30.60 | 60.00 | -29.40 | QP |
| 10 | 8.8180 | 1.49 | 20.05 | 21.54 | 50.00 | -28.46 | AVG |
| 11 | 25.0900 | 8.00 | 20.55 | 28.55 | 60.00 | -31.45 | QP |
| 12 | 25.0900 | -3.65 | 20.55 | 16.90 | 50.00 | -33.10 | AVG |

Remark:

1. All readings are Quasi-Peak and Average values
2. Margin = Result (Result =Reading + Factor)–Limit
3. Factor=LISN factor+Cable loss+Limiter (10dB)

100.0 dBuV





3.2 RADIATED EMISSION MEASUREMENT

3.2.1 RADIATED EMISSION LIMITS

In case the emission fall within the Restricted band specified on Part15.205 (a)&209(a), RSS-Gen&RSS-247 limit in the table and according to ANSI C63.10-2013 below has to be followed.

LIMITS OF RADIATED EMISSION MEASUREMENT (0.009MHz - 1000MHz)

| Frequencies (MHz) | Field Strength (microvolts/meter) | Measurement Distance (meters) |
|-------------------|-----------------------------------|-------------------------------|
| 0.009~0.490 | 2400/F(KHz) | 300 |
| 0.490~1.705 | 24000/F(KHz) | 30 |
| 1.705~30.0 | 30 | 30 |
| 30~88 | 100 | 3 |
| 88~216 | 150 | 3 |
| 216~960 | 200 | 3 |
| Above 960 | 500 | 3 |

LIMITS OF RADIATED EMISSION MEASUREMENT (1GHz-25 GHz)

| FREQUENCY (MHz) | (dBuV/m) (at 3M) | |
|-----------------|------------------|---------|
| | PEAK | AVERAGE |
| Above 1000 | 74 | 54 |

Notes:

- (1) The limit for radiated test was performed according to FCC PART 15C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20 log Emission level (uV/m).

LIMITS OF RESTRICTED FREQUENCY BANDS

FCC:

| FREQUENCY (MHz) | FREQUENCY (MHz) | FREQUENCY (MHz) | FREQUENCY (GHz) |
|-------------------|---------------------|-----------------|-----------------|
| 0.090-0.110 | 16.42-16.423 | 399.9-410 | 4.5-5.15 |
| 0.495-0.505 | 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 | 2690-2900 | 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 | Above 38.6 |
| 13.36-13.41 | | | |



IC:

| FREQUENCY (MHz) | FREQUENCY (MHz) | FREQUENCY (GHz) |
|---------------------|-----------------------|-----------------|
| 0.090 - 0.110 | 149.9 - 150.05 | 9.0 - 9.2 |
| 0.495 - 0.505 | 156.52475 - 156.52525 | 9.3 - 9.5 |
| 2.1735 - 2.1905 | 156.7 - 156.9 | 10.6 - 12.7 |
| 3.020 - 3.026 | 162.0125 - 167.17 | 13.25 - 13.4 |
| 4.125 - 4.128 | 167.72 - 173.2 | 14.47 - 14.5 |
| 4.17725 - 4.17775 | 240 - 285 | 15.35 - 16.2 |
| 4.20725 - 4.20775 | 322 - 335.4 | 17.7 - 21.4 |
| 5.677 - 5.683 | 399.9 - 410 | 22.01 - 23.12 |
| 6.215 - 6.218 | 608 - 614 | 23.6 - 24.0 |
| 6.26775 - 6.26825 | 960 - 1427 | 31.2 - 31.8 |
| 6.31175 - 6.31225 | 1435 - 1626.5 | 36.43 - 36.5 |
| 8.291 - 8.294 | 1645.5 - 1646.5 | Above 38.6 |
| 8.362 - 8.366 | 1660 - 1710 | |
| 8.37625 - 8.38675 | 1718.8 - 1722.2 | |
| 8.41425 - 8.41475 | 2200 - 2300 | |
| 12.29 - 12.293 | 2310 - 2390 | |
| 12.51975 - 12.52025 | 2483.5 - 2500 | |
| 12.57675 - 12.57725 | 2655 - 2900 | |
| 13.36 - 13.41 | 3260 - 3267 | |
| 16.42 - 16.423 | 3332 - 3339 | |
| 16.69475 - 16.69525 | 3345.8 - 3358 | |
| 16.80425 - 16.80475 | 3500 - 4400 | |
| 25.5 - 25.67 | 4500 - 5150 | |
| 37.5 - 38.25 | 5350 - 5460 | |
| 73 - 74.6 | 7250 - 7750 | |
| 74.8 - 75.2 | 8025 - 8500 | |
| 108 - 138 | | |



For Radiated Emission

| Spectrum Parameter | Setting |
|---------------------------------------|---|
| Attenuation | Auto |
| Detector | Peak/QP/AV |
| Start Frequency | 9 KHz/150KHz(Peak/QP/AV) |
| Stop Frequency | 150KHz/30MHz(Peak/QP/AV) |
| RB / VB (emission in restricted band) | 200Hz (From 9kHz to 0.15MHz)/ 9KHz (From 0.15MHz to 30MHz); 200Hz (From 9kHz to 0.15MHz)/ 9KHz (From 0.15MHz to 30MHz) |

| Spectrum Parameter | Setting |
|---------------------------------------|--------------------|
| Attenuation | Auto |
| Detector | Peak/QP |
| Start Frequency | 30 MHz(Peak/QP) |
| Stop Frequency | 1000 MHz (Peak/QP) |
| RB / VB (emission in restricted band) | 120 KHz / 300 KHz |

| Spectrum Parameter | Setting |
|---------------------------------------|---|
| Attenuation | Auto |
| Detector | Peak/AV |
| Start Frequency | 1000 MHz(Peak/AV) |
| Stop Frequency | 10th carrier hamonic(Peak/AV) |
| RB / VB (emission in restricted band) | 1 MHz / 3 MHz(Peak) 1 MHz/1/T MHz(AVG) |

For Band Edge

| Spectrum Parameter | Setting |
|----------------------|--|
| Detector | Peak/AV |
| Start/Stop Frequency | Lower Band Edge: 890 to 905 MHz Upper Band Edge: 925 to 940 MHz |
| RB / VB | 1 MHz / 3 MHz(Peak) 1 MHz/1/T MHz(AVG) |



| Receiver Parameter | Setting |
|------------------------|--------------------------------------|
| Attenuation | Auto |
| Start ~ Stop Frequency | 9kHz~90kHz / RB 200Hz for PK & AV |
| Start ~ Stop Frequency | 90kHz~110kHz / RB 200Hz for QP |
| Start ~ Stop Frequency | 110kHz~490kHz / RB 200Hz for PK & AV |
| Start ~ Stop Frequency | 490kHz~30MHz / RB 9kHz for QP |
| Start ~ Stop Frequency | 30MHz~1000MHz / RB 120kHz for QP |

3.2.2 TEST PROCEDURE

- The measuring distance at 3 m shall be used for measurements at frequency 0.009MHz up to 1GHz, and above 1GHz.
- The EUT was placed on the top of a rotating table 0.8 m (above 1GHz is 1.5 m) above the ground at a 3 m anechoic chamber test site. The table was rotated 360 degree to determine the position of the highest radiation.
- The height of the equipment shall be 0.8 m(above 1GHz is 1.5 m); the height of the test antenna shall vary between 1 m to 4 m. Horizontal and vertical polarization of the antenna are set to make the measurement.
- The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and QuasiPeak detector mode will be re-measured.
- If the Peak Mode measured value is compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and no additional QP Mode measurement was performed.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

Note:

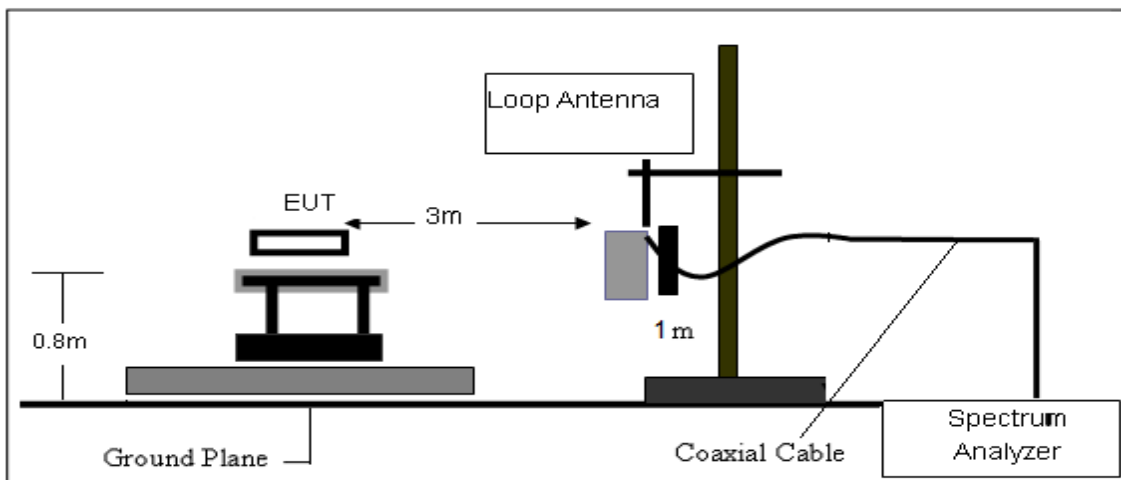
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported.

3.2.3 DEVIATION FROM TEST STANDARD

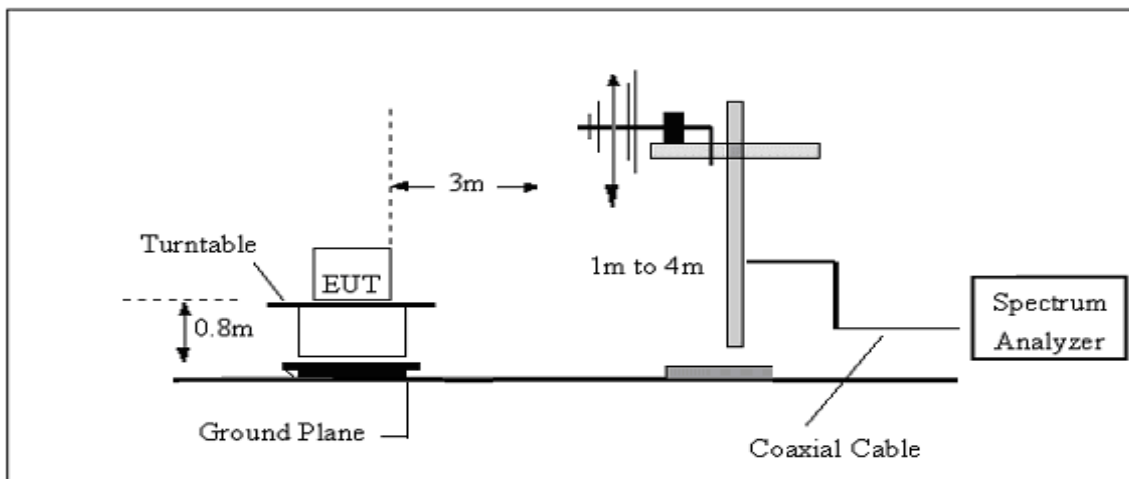
No deviation.

3.2.4 TESTSETUP

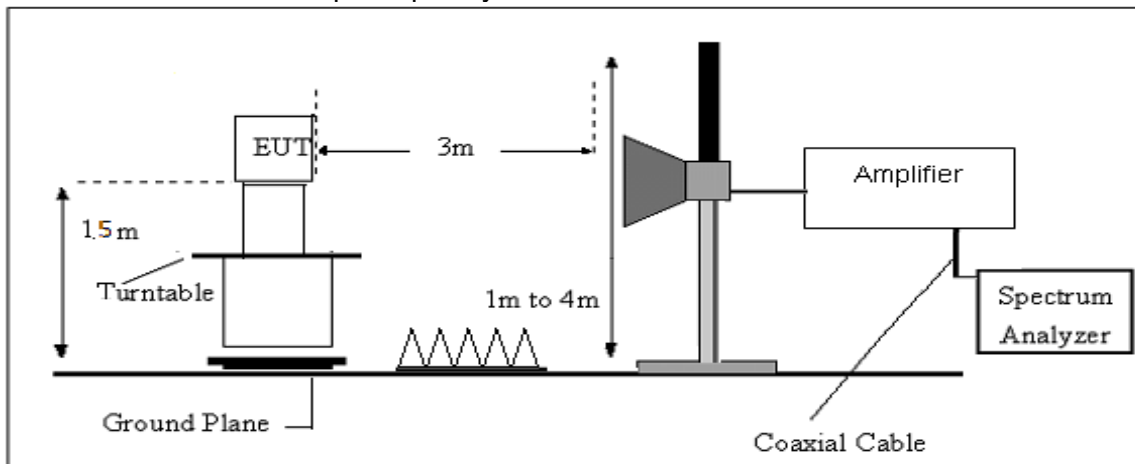
(A) Radiated Emission Test-Up Frequency Below 30MHz



(B) Radiated Emission Test-Up Frequency 30MHz~1GHz



(C) Radiated Emission Test-Up Frequency Above 1GHz



3.2.5 EUT OPERATING CONDITIONS

Please refer to section 2.4 of this report.



3.2.6 FIELD STRENGTH CALCULATION

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

Where

FS = Field Strength

CL = Cable Attenuation Factor (Cable Loss)

RA = Reading Amplitude

AG = Amplifier Gain

AF = Antenna Factor

For example

| Frequency (MHz) | FS (dB μ V/m) | RA (dB μ V/m) | AF (dB) | CL (dB) | AG (dB) | Factor (dB) |
|--------------------|----------------------|----------------------|------------|------------|------------|----------------|
| 300 | 40 | 58.1 | 12.2 | 1.6 | 31.9 | -18.1 |

$$\text{Factor} = \text{AF} + \text{CL} - \text{AG}$$





3.2.7 TEST RESULTS

(9KHz-30MHz)

| | | | |
|---------------|--------|--------------------|---------|
| Temperature: | 24°C | Relative Humidity: | 54%RH |
| Test Voltage: | DC 24V | Test Mode: | TX Mode |

| Freq. (MHz) | Reading (dBuV/m) | Limit (dBuV/m) | Margin (dB) | State P/F | Test Result |
|----------------|---------------------|-------------------|----------------|--------------|-------------|
| -- | -- | -- | -- | -- | PASS |
| -- | -- | -- | -- | -- | PASS |

Note:

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

Distance extrapolation factor = $40 \log (\text{specific distance}/\text{test distance})$ (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor.



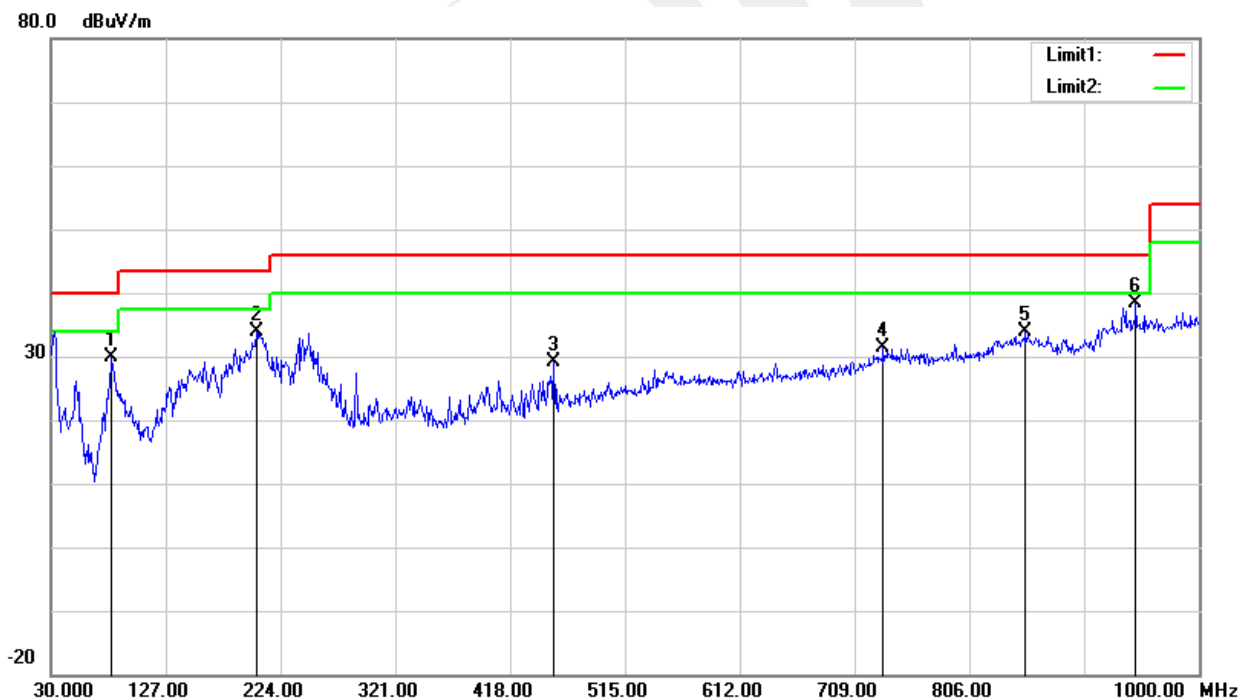
(30MHz-1000MHz)

| | | | |
|---------------|--------------------------------|--------------------|------------|
| Temperature: | 24°C | Relative Humidity: | 54%RH |
| Test Voltage: | DC 24V | Phase: | Horizontal |
| Test Mode: | Mode 1/2/3 (Mode 3 worst mode) | | |

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|----------------|----------------------|-----------------|----------------|-------------|--------|
| 1 | 81.4100 | 52.60 | -22.82 | 29.78 | 40.00 | -10.22 | QP |
| 2 | 203.6300 | 54.69 | -20.86 | 33.83 | 43.50 | -9.67 | QP |
| 3 | 454.8600 | 38.71 | -9.57 | 29.14 | 46.00 | -16.86 | QP |
| 4 | 733.2500 | 33.76 | -2.35 | 31.41 | 46.00 | -14.59 | QP |
| 5 | 853.5300 | 34.55 | -0.64 | 33.91 | 46.00 | -12.09 | QP |
| 6 | 946.6500 | 36.92 | 1.52 | 38.44 | 46.00 | -7.56 | QP |

Remark:

1. Margin = Result (Result =Reading + Factor)-Limit



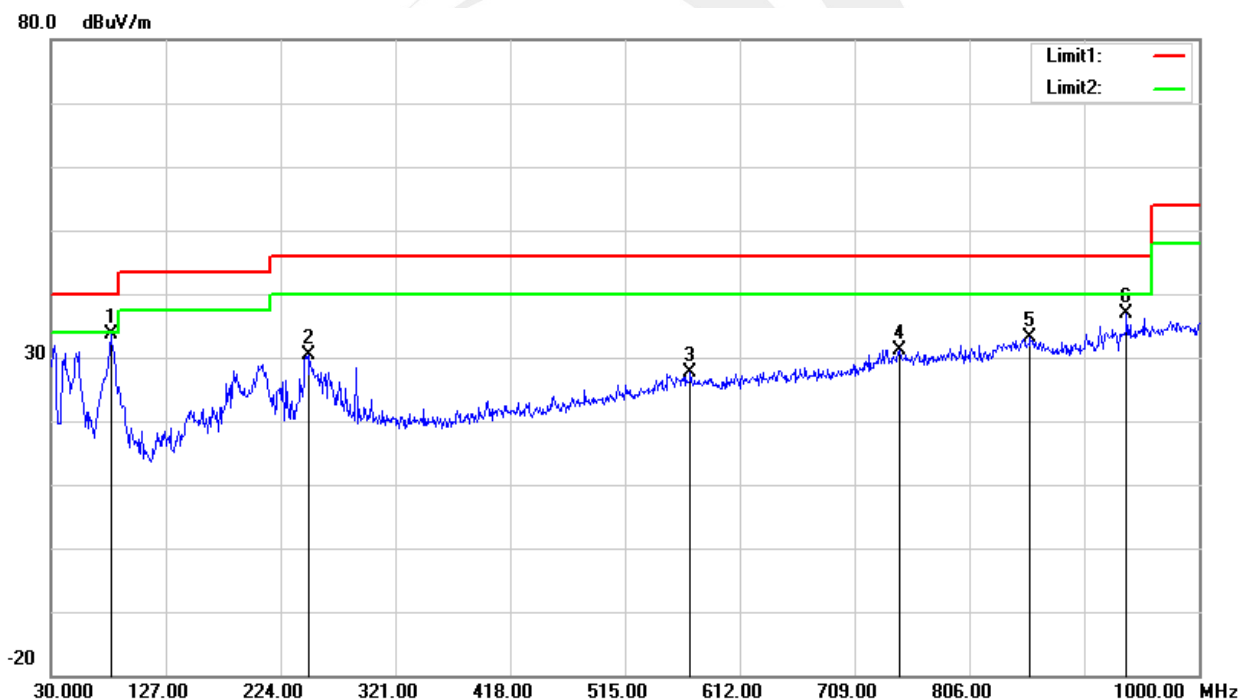


| | | | |
|---------------|--------------------------------|--------------------|----------|
| Temperature: | 24℃ | Relative Humidity: | 54%RH |
| Test Voltage: | DC 24V | Phase: | Vertical |
| Test Mode: | Mode 1/2/3 (Mode 3 worst mode) | | |

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|----------------|----------------------|-----------------|----------------|-------------|--------|
| 1 | 80.4400 | 56.68 | -22.93 | 33.75 | 40.00 | -6.25 | QP |
| 2 | 247.2800 | 46.98 | -16.59 | 30.39 | 46.00 | -15.61 | QP |
| 3 | 570.2900 | 33.36 | -5.61 | 27.75 | 46.00 | -18.25 | QP |
| 4 | 746.8300 | 33.30 | -2.15 | 31.15 | 46.00 | -14.85 | QP |
| 5 | 857.4100 | 33.62 | -0.50 | 33.12 | 46.00 | -12.88 | QP |
| 6 | 938.8900 | 35.67 | 1.29 | 36.96 | 46.00 | -9.04 | QP |

Remark:

1. Margin = Result (Result =Reading + Factor)-Limit



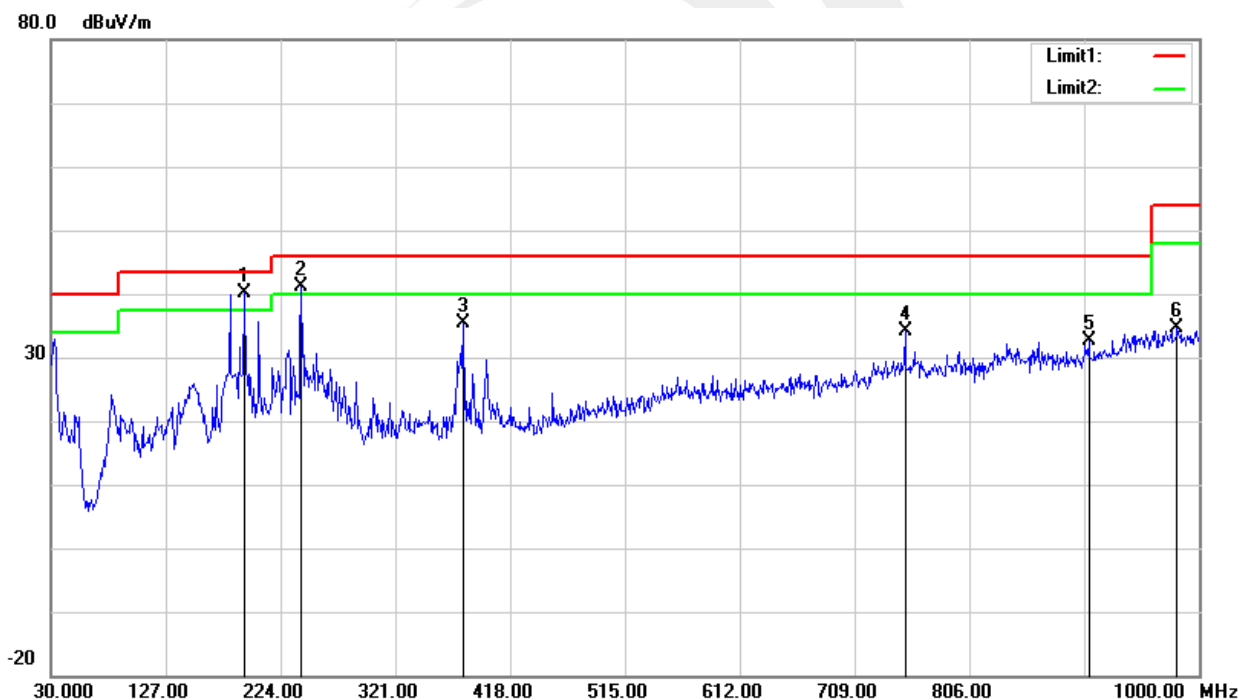


| | | | |
|---------------|--------------------------------|--------------------|------------|
| Temperature: | 24°C | Relative Humidity: | 54%RH |
| Test Voltage: | DC 24V | Phase: | Horizontal |
| Test Mode: | Mode 4/5/6 (Mode 6 worst mode) | | |

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|----------------|----------------------|-----------------|----------------|-------------|--------|
| 1 | 192.9600 | 61.25 | -21.08 | 40.17 | 43.50 | -3.33 | QP |
| 2 | 241.4600 | 58.94 | -17.73 | 41.21 | 46.00 | -4.79 | QP |
| 3 | 378.2300 | 47.73 | -12.31 | 35.42 | 46.00 | -10.58 | QP |
| 4 | 751.6800 | 36.27 | -2.17 | 34.10 | 46.00 | -11.90 | QP |
| 5 | 906.8800 | 32.84 | -0.27 | 32.57 | 46.00 | -13.43 | QP |
| 6 | 981.5700 | 32.12 | 2.57 | 34.69 | 54.00 | -19.31 | QP |

Remark:

1. Margin = Result (Result =Reading + Factor)-Limit



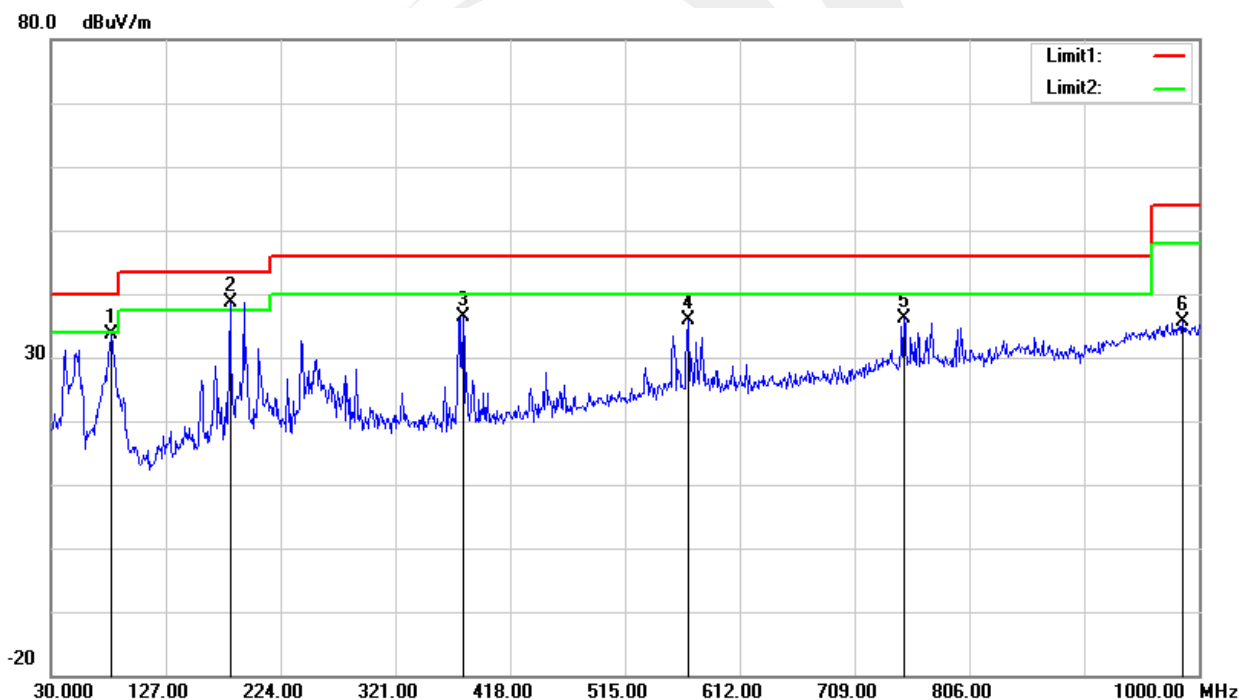


| | | | |
|---------------|--------------------------------|--------------------|----------|
| Temperature: | 24℃ | Relative Humidity: | 54%RH |
| Test Voltage: | DC 24V | Phase: | Vertical |
| Test Mode: | Mode 4/5/6 (Mode 6 worst mode) | | |

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|----------------|----------------------|-----------------|----------------|-------------|--------|
| 1 | 80.4400 | 56.49 | -22.93 | 33.56 | 40.00 | -6.44 | QP |
| 2 | 181.3200 | 58.72 | -20.11 | 38.61 | 43.50 | -4.89 | QP |
| 3 | 378.2300 | 48.64 | -12.31 | 36.33 | 46.00 | -9.67 | QP |
| 4 | 568.3500 | 41.48 | -5.58 | 35.90 | 46.00 | -10.10 | QP |
| 5 | 750.7100 | 38.30 | -2.16 | 36.14 | 46.00 | -9.86 | QP |
| 6 | 986.4200 | 33.37 | 2.27 | 35.64 | 54.00 | -18.36 | QP |

Remark:

1. Margin = Result (Result =Reading + Factor)-Limit





(1GHz~25GHz) Spurious emission Requirements

Dense reader mode
Low channel-Horizontal

| Frequency (MHz) | Peak Reading (dBuV/m) | Average Reading (dBuV/m) | Factor (dB) | Peak Level (dBuV/m) | Duty Factor (dB) | Average Level (dBuV/m) | PK Limit (dBuV/m) | AV Limit (dBuV/m) | PK Over Limit (dB) | AV Over Limit (dB) | Min Margin (dB) | ANT |
|-----------------|-----------------------|--------------------------|-------------|---------------------|------------------|------------------------|-------------------|-------------------|--------------------|--------------------|-----------------|------------|
| 1440.5 | 41.83 | 30.38 | -0.6 | 41.23 | 0.00 | 29.78 | 74.00 | 54.00 | -32.77 | -24.22 | -24.22 | Horizontal |
| 1806 | 47.69 | 41.51 | 0.01 | 47.70 | 0.00 | 41.52 | 74.00 | 54.00 | -26.30 | -12.48 | -12.48 | Horizontal |
| 2966.5 | 40.98 | 28.49 | 5.97 | 46.95 | 0.00 | 34.46 | 74.00 | 54.00 | -27.05 | -19.54 | -19.54 | Horizontal |
| 11735.5 | 51.96 | 43.52 | 9.36 | 61.32 | 0.00 | 52.88 | 74.00 | 54.00 | -12.68 | -1.12 | -1.12 | Horizontal |
| 14416.75 | 50.30 | 39.94 | 11.23 | 61.53 | 0.00 | 51.17 | 74.00 | 54.00 | -12.47 | -2.83 | -2.83 | Horizontal |
| 17142 | 50.31 | 39.96 | 10.24 | 60.55 | 0.00 | 50.20 | 74.00 | 54.00 | -13.45 | -3.80 | -3.80 | Horizontal |

Vertical

| Frequency (MHz) | Peak Reading (dBuV/m) | Average Level (dBuV/m) | Factor (dB) | Peak Level (dBuV/m) | Duty Factor (dB) | Average Level (dBuV/m) | PK Limit (dBuV/m) | AV Limit (dBuV/m) | PK Over Limit (dB) | AV Over Limit (dB) | Min Margin (dB) | ANT |
|-----------------|-----------------------|------------------------|-------------|---------------------|------------------|------------------------|-------------------|-------------------|--------------------|--------------------|-----------------|----------|
| 1135.5 | 45.74 | 29.82 | -1.41 | 44.33 | 0.00 | 28.41 | 74.00 | 54.00 | -29.67 | -25.59 | -25.59 | Vertical |
| 1769 | 56.12 | 51.35 | 0 | 56.12 | 0.00 | 51.35 | 74.00 | 54.00 | -17.88 | -2.65 | -2.65 | Vertical |
| 2866 | 39.49 | 28.50 | 5.61 | 45.10 | 0.00 | 34.11 | 74.00 | 54.00 | -28.90 | -19.89 | -19.89 | Vertical |
| 5783 | 55.74 | 46.08 | -3.9 | 51.84 | 0.00 | 42.18 | 74.00 | 54.00 | -22.16 | -11.82 | -11.82 | Vertical |
| 11094.75 | 51.25 | 41.05 | 9.71 | 60.96 | 0.00 | 50.76 | 74.00 | 54.00 | -13.04 | -3.24 | -3.24 | Vertical |
| 14392.001 | 50.07 | 38.70 | 11.38 | 61.45 | 0.00 | 50.08 | 74.00 | 54.00 | -12.55 | -3.92 | -3.92 | Vertical |



Mid channel-Horizontal

| Frequency (MHz) | Peak Reading (dBuV/m) | Average Reading (dBuV/m) | Factor (dB) | Peak Level (dBuV/m) | Duty Factor (dB) | Average Level (dBuV/m) | PK Limit (dBuV/m) | AV Limit (dBuV/m) | PK Over Limit (dB) | AV Over Limit (dB) | Min Margin (dB) | ANT |
|-----------------|-----------------------|--------------------------|-------------|---------------------|------------------|------------------------|-------------------|-------------------|--------------------|--------------------|-----------------|------------|
| 1202.5 | 41.62 | 29.40 | -1.2 | 40.42 | 0.00 | 28.20 | 74.00 | 54.00 | -33.58 | -25.80 | -25.80 | Horizontal |
| 1805.5 | 45.21 | 42.97 | 0.01 | 45.22 | 0.00 | 42.98 | 74.00 | 54.00 | -28.78 | -11.02 | -11.02 | Horizontal |
| 2975.5 | 39.25 | 28.43 | 6 | 45.25 | 0.00 | 34.43 | 74.00 | 54.00 | -28.75 | -19.57 | -19.57 | Horizontal |
| 10720.75 | 52.08 | 40.89 | 8.33 | 60.41 | 0.00 | 49.22 | 74.00 | 54.00 | -13.59 | -4.78 | -4.78 | Horizontal |
| 14444.25 | 50.02 | 38.83 | 10.9 | 60.92 | 0.00 | 49.73 | 74.00 | 54.00 | -13.08 | -4.27 | -4.27 | Horizontal |
| 15203.25 | 50.25 | 39.46 | 11.01 | 61.26 | 0.00 | 50.47 | 74.00 | 54.00 | -12.74 | -3.53 | -3.53 | Horizontal |

Vertical

| Frequency (MHz) | Peak Reading (dBuV/m) | Average Level (dBuV/m) | Factor (dB) | Peak Level (dBuV/m) | Duty Factor (dB) | Average Level (dBuV/m) | PK Limit (dBuV/m) | AV Limit (dBuV/m) | PK Over Limit (dB) | AV Over Limit (dB) | Min Margin (dB) | ANT |
|-----------------|-----------------------|------------------------|-------------|---------------------|------------------|------------------------|-------------------|-------------------|--------------------|--------------------|-----------------|----------|
| 1106.5 | 41.82 | 30.61 | -1.47 | 40.35 | 0.00 | 29.14 | 74.00 | 54.00 | -33.65 | -24.86 | -24.86 | Vertical |
| 1998.5 | 42.15 | 31.04 | 1.48 | 43.63 | 0.00 | 32.52 | 74.00 | 54.00 | -30.37 | -21.48 | -21.48 | Vertical |
| 2999 | 39.02 | 28.44 | 6.11 | 45.13 | 0.00 | 34.55 | 74.00 | 54.00 | -28.87 | -19.45 | -19.45 | Vertical |
| 11364.25 | 51.69 | 40.59 | 9.67 | 61.36 | 0.00 | 50.26 | 74.00 | 54.00 | -12.64 | -3.74 | -3.74 | Vertical |
| 14414 | 50.08 | 39.85 | 11.26 | 61.34 | 0.00 | 51.11 | 74.00 | 54.00 | -12.66 | -2.89 | -2.89 | Vertical |
| 15813.75 | 51.28 | 40.42 | 9.45 | 60.73 | 0.00 | 49.87 | 74.00 | 54.00 | -13.27 | -4.13 | -4.13 | Vertical |



High channel-Horizontal

| Frequency (MHz) | Peak Reading (dBuV/m) | Average Reading (dBuV/m) | Factor (dB) | Peak Level (dBuV/m) | Duty Factor (dB) | Average Level (dBuV/m) | PK Limit (dBuV/m) | AV Limit (dBuV/m) | PK Over Limit (dB) | AV Over Limit (dB) | Min Margin (dB) | ANT |
|-----------------|-----------------------|--------------------------|-------------|---------------------|------------------|------------------------|-------------------|-------------------|--------------------|--------------------|-----------------|------------|
| 1203.5 | 41.12 | 29.11 | -1.19 | 39.93 | 0.00 | 27.92 | 74.00 | 54.00 | -34.07 | -26.08 | -26.08 | Horizontal |
| 2346.5 | 40.32 | 28.01 | 4.4 | 44.72 | 0.00 | 32.41 | 74.00 | 54.00 | -29.28 | -21.59 | -21.59 | Horizontal |
| 2870 | 39.19 | 28.18 | 5.61 | 44.80 | 0.00 | 33.79 | 74.00 | 54.00 | -29.20 | -20.21 | -20.21 | Horizontal |
| 8716 | 51.17 | 40.56 | 5.11 | 56.28 | 0.00 | 45.67 | 74.00 | 54.00 | -17.72 | -8.33 | -8.33 | Horizontal |
| 11009.5 | 49.91 | 39.41 | 10.17 | 60.08 | 0.00 | 49.58 | 74.00 | 54.00 | -13.92 | -4.42 | -4.42 | Horizontal |
| 17098 | 50.13 | 39.07 | 10.47 | 60.60 | 0.00 | 49.54 | 74.00 | 54.00 | -13.40 | -4.46 | -4.46 | Horizontal |

Vertical

| Frequency (MHz) | Peak Reading (dBuV/m) | Average Level (dBuV/m) | Factor (dB) | Peak Level (dBuV/m) | Duty Factor (dB) | Average Level (dBuV/m) | PK Limit (dBuV/m) | AV Limit (dBuV/m) | PK Over Limit (dB) | AV Over Limit (dB) | Min Margin (dB) | ANT |
|-----------------|-----------------------|------------------------|-------------|---------------------|------------------|------------------------|-------------------|-------------------|--------------------|--------------------|-----------------|----------|
| 1205.5 | 40.04 | 28.88 | -1.18 | 38.86 | 0.00 | 27.70 | 74.00 | 54.00 | -35.14 | -26.30 | -26.30 | Vertical |
| 2119.5 | 39.80 | 28.89 | 4.12 | 43.92 | 0.00 | 33.01 | 74.00 | 54.00 | -30.08 | -20.99 | -20.99 | Vertical |
| 2965 | 39.13 | 28.30 | 5.96 | 45.09 | 0.00 | 34.26 | 74.00 | 54.00 | -28.91 | -19.74 | -19.74 | Vertical |
| 10157 | 52.09 | 41.58 | 7.14 | 59.23 | 0.00 | 48.72 | 74.00 | 54.00 | -14.77 | -5.28 | -5.28 | Vertical |
| 11394.5 | 51.01 | 40.36 | 9.73 | 60.74 | 0.00 | 50.09 | 74.00 | 54.00 | -13.26 | -3.91 | -3.91 | Vertical |
| 14416.75 | 49.68 | 39.54 | 11.23 | 60.91 | 0.00 | 50.77 | 74.00 | 54.00 | -13.09 | -3.23 | -3.23 | Vertical |



Single reader mode
Low channel-Horizontal

| Frequency (MHz) | Peak Reading (dBuV/m) | Average Reading (dBuV/m) | Factor (dB) | Peak Level (dBuV/m) | Duty Factor (dB) | Average Level (dBuV/m) | PK Limit (dBuV/m) | AV Limit (dBuV/m) | PK Over Limit (dB) | AV Over Limit (dB) | Min Margin (dB) | ANT |
|-----------------|-----------------------|--------------------------|-------------|---------------------|------------------|------------------------|-------------------|-------------------|--------------------|--------------------|-----------------|------------|
| 1206 | 41.35 | 45.05 | -1.17 | 40.18 | 28.04 | 43.88 | 74.00 | 54.00 | -33.82 | -10.12 | -10.12 | Horizontal |
| 2191 | 39.63 | 29.64 | 4.2 | 43.83 | 32.47 | 33.84 | 74.00 | 54.00 | -30.17 | -20.16 | -20.16 | Horizontal |
| 2955.5 | 38.68 | 37.05 | 5.92 | 44.60 | 34.38 | 42.97 | 74.00 | 54.00 | -29.40 | -11.03 | -11.03 | Horizontal |
| 10091 | 51.11 | 29.49 | 7 | 58.11 | 48.19 | 36.49 | 74.00 | 54.00 | -15.89 | -17.51 | -15.89 | Horizontal |
| 11103 | 50.82 | 33.92 | 9.68 | 60.50 | 49.83 | 43.60 | 74.00 | 54.00 | -13.50 | -10.40 | -10.40 | Horizontal |
| 14408.5 | 49.46 | 34.06 | 11.32 | 60.78 | 50.29 | 45.38 | 74.00 | 54.00 | -13.22 | -8.62 | -8.62 | Horizontal |

Vertical

| Frequency (MHz) | Peak Reading (dBuV/m) | Average Level (dBuV/m) | Factor (dB) | Peak Level (dBuV/m) | Duty Factor (dB) | Average Level (dBuV/m) | PK Limit (dBuV/m) | AV Limit (dBuV/m) | PK Over Limit (dB) | AV Over Limit (dB) | Min Margin (dB) | ANT |
|-----------------|-----------------------|------------------------|-------------|---------------------|------------------|------------------------|-------------------|-------------------|--------------------|--------------------|-----------------|----------|
| 1329.5 | 40.40 | 30.21 | -0.85 | 39.55 | 0.00 | 29.36 | 74.00 | 54.00 | -34.45 | -24.64 | -24.64 | Vertical |
| 2128 | 39.72 | 28.34 | 4.26 | 43.98 | 0.00 | 32.60 | 74.00 | 54.00 | -30.02 | -21.40 | -21.40 | Vertical |
| 2883.5 | 39.52 | 28.12 | 5.61 | 45.13 | 0.00 | 33.73 | 74.00 | 54.00 | -28.87 | -20.27 | -20.27 | Vertical |
| 8776.5 | 51.12 | 40.75 | 4.92 | 56.04 | 0.00 | 45.67 | 74.00 | 54.00 | -17.96 | -8.33 | -8.33 | Vertical |
| 11056.25 | 50.38 | 40.19 | 9.92 | 60.30 | 0.00 | 50.11 | 74.00 | 54.00 | -13.70 | -3.89 | -3.89 | Vertical |
| 17026.5 | 50.97 | 39.31 | 9.95 | 60.92 | 0.00 | 49.26 | 74.00 | 54.00 | -13.08 | -4.74 | -4.74 | Vertical |



Mid channel-Horizontal

| Frequency (MHz) | Peak Reading (dBuV/m) | Average Reading (dBuV/m) | Factor (dB) | Peak Level (dBuV/m) | Duty Factor (dB) | Average Level (dBuV/m) | PK Limit (dBuV/m) | AV Limit (dBuV/m) | PK Over Limit (dB) | AV Over Limit (dB) | Min Margin (dB) | ANT |
|-----------------|-----------------------|--------------------------|-------------|---------------------|------------------|------------------------|-------------------|-------------------|--------------------|--------------------|-----------------|------------|
| 1200.5 | 40.41 | 28.95 | -1.21 | 39.20 | 0.00 | 27.74 | 74.00 | 54.00 | -34.80 | -26.26 | -26.26 | Horizontal |
| 2157 | 39.44 | 28.31 | 4.56 | 44.00 | 0.00 | 32.87 | 74.00 | 54.00 | -30.00 | -21.13 | -21.13 | Horizontal |
| 2871.5 | 39.55 | 27.79 | 5.61 | 45.16 | 0.00 | 33.40 | 74.00 | 54.00 | -28.84 | -20.60 | -20.60 | Horizontal |
| 8262.25 | 51.10 | 40.73 | 4.22 | 55.32 | 0.00 | 44.95 | 74.00 | 54.00 | -18.68 | -9.05 | -9.05 | Horizontal |
| 11391.75 | 51.14 | 40.01 | 9.73 | 60.87 | 0.00 | 49.74 | 74.00 | 54.00 | -13.13 | -4.26 | -4.26 | Horizontal |
| 15140 | 50.14 | 39.13 | 10.6 | 60.74 | 0.00 | 49.73 | 74.00 | 54.00 | -13.26 | -4.27 | -4.27 | Horizontal |

Vertical

| Frequency (MHz) | Peak Reading (dBuV/m) | Average Level (dBuV/m) | Factor (dB) | Peak Level (dBuV/m) | Duty Factor (dB) | Average Level (dBuV/m) | PK Limit (dBuV/m) | AV Limit (dBuV/m) | PK Over Limit (dB) | AV Over Limit (dB) | Min Margin (dB) | ANT |
|-----------------|-----------------------|------------------------|-------------|---------------------|------------------|------------------------|-------------------|-------------------|--------------------|--------------------|-----------------|----------|
| 1198.5 | 41.11 | 30.53 | -1.22 | 39.89 | 0.00 | 29.31 | 74.00 | 54.00 | -34.11 | -24.69 | -24.69 | Vertical |
| 2123 | 39.72 | 29.03 | 4.18 | 43.90 | 0.00 | 33.21 | 74.00 | 54.00 | -30.10 | -20.79 | -20.79 | Vertical |
| 2889.5 | 39.38 | 28.08 | 5.61 | 44.99 | 0.00 | 33.69 | 74.00 | 54.00 | -29.01 | -20.31 | -20.31 | Vertical |
| 8749 | 51.19 | 40.76 | 5.01 | 56.20 | 0.00 | 45.77 | 74.00 | 54.00 | -17.80 | -8.23 | -8.23 | Vertical |
| 10976.5 | 50.60 | 39.99 | 10.04 | 60.64 | 0.00 | 50.03 | 74.00 | 54.00 | -13.36 | -3.97 | -3.97 | Vertical |
| 14878.75 | 51.36 | 39.66 | 9.93 | 61.29 | 0.00 | 49.59 | 74.00 | 54.00 | -12.71 | -4.41 | -4.41 | Vertical |



High channel-Horizontal

| Frequency (MHz) | Peak Reading (dBuV/m) | Average Reading (dBuV/m) | Factor (dB) | Peak Level (dBuV/m) | Duty Factor (dB) | Average Level (dBuV/m) | PK Limit (dBuV/m) | AV Limit (dBuV/m) | PK Over Limit (dB) | AV Over Limit (dB) | Min Margin (dB) | ANT |
|-----------------|-----------------------|--------------------------|-------------|---------------------|------------------|------------------------|-------------------|-------------------|--------------------|--------------------|-----------------|------------|
| 1203.5 | 40.18 | 29.19 | -1.19 | 38.99 | 0.00 | 28.00 | 74.00 | 54.00 | -35.01 | -26.00 | -26.00 | Horizontal |
| 1805.5 | 44.30 | 41.88 | 0.01 | 44.31 | 0.00 | 41.89 | 74.00 | 54.00 | -29.69 | -12.11 | -12.11 | Horizontal |
| 2930.5 | 38.75 | 28.01 | 5.78 | 44.53 | 0.00 | 33.79 | 74.00 | 54.00 | -29.47 | -20.21 | -20.21 | Horizontal |
| 10162.5 | 52.18 | 40.78 | 7.14 | 59.32 | 0.00 | 47.92 | 74.00 | 54.00 | -14.68 | -6.08 | -6.08 | Horizontal |
| 11394.5 | 51.17 | 40.16 | 9.73 | 60.90 | 0.00 | 49.89 | 74.00 | 54.00 | -13.10 | -4.11 | -4.11 | Horizontal |
| 15203.25 | 49.62 | 39.12 | 11.01 | 60.63 | 0.00 | 50.13 | 74.00 | 54.00 | -13.37 | -3.87 | -3.87 | Horizontal |

Vertical

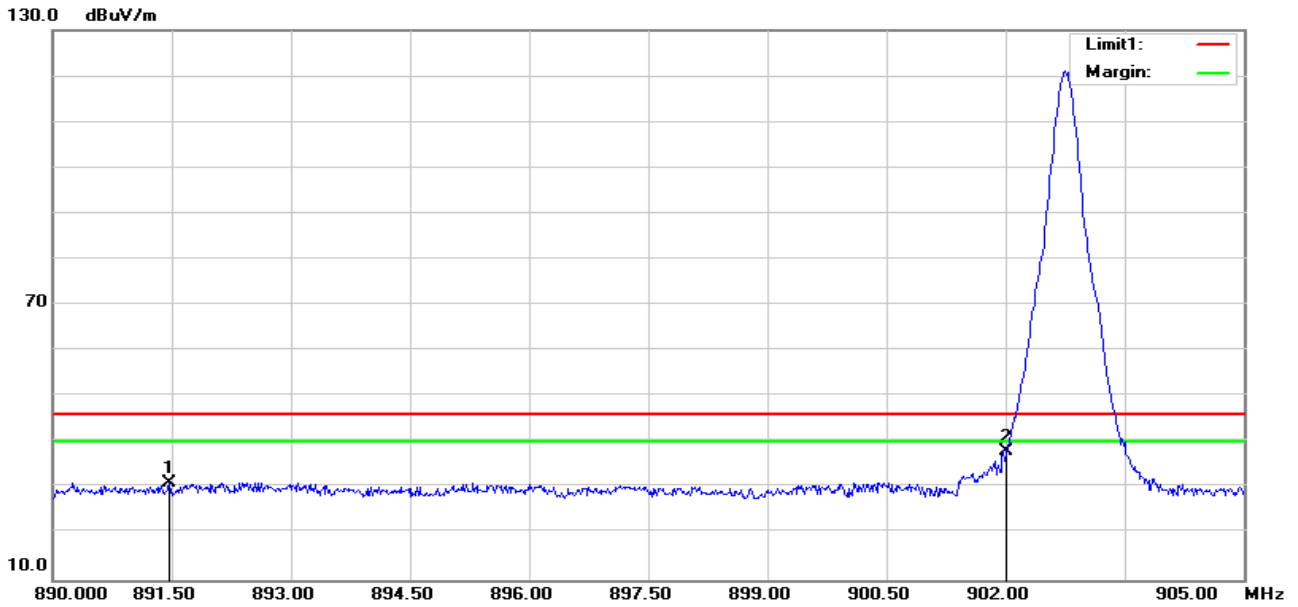
| Frequency (MHz) | Peak Reading (dBuV/m) | Average Level (dBuV/m) | Factor (dB) | Peak Level (dBuV/m) | Duty Factor (dB) | Average Level (dBuV/m) | PK Limit (dBuV/m) | AV Limit (dBuV/m) | PK Over Limit (dB) | AV Over Limit (dB) | Min Margin (dB) | ANT |
|-----------------|-----------------------|------------------------|-------------|---------------------|------------------|------------------------|-------------------|-------------------|--------------------|--------------------|-----------------|----------|
| 1206 | 40.68 | 28.28 | -1.17 | 39.51 | 0.00 | 27.11 | 74.00 | 54.00 | -34.49 | -26.89 | -26.89 | Vertical |
| 1805.5 | 45.87 | 43.59 | 0.01 | 45.88 | 0.00 | 43.60 | 74.00 | 54.00 | -28.12 | -10.40 | -10.40 | Vertical |
| 2923.5 | 39.03 | 28.50 | 5.74 | 44.77 | 0.00 | 34.24 | 74.00 | 54.00 | -29.23 | -19.76 | -19.76 | Vertical |
| 8746.25 | 50.84 | 40.94 | 5.02 | 55.86 | 0.00 | 45.96 | 74.00 | 54.00 | -18.14 | -8.04 | -8.04 | Vertical |
| 10993 | 50.20 | 39.64 | 10.17 | 60.37 | 0.00 | 49.81 | 74.00 | 54.00 | -13.63 | -4.19 | -4.19 | Vertical |
| 14419.5 | 49.91 | 39.67 | 11.19 | 61.10 | 0.00 | 50.86 | 74.00 | 54.00 | -12.90 | -3.14 | -3.14 | Vertical |

Note: The frequency emission of peak points that did not show above the forms are at least 20dB below the limit, the frequency emission is mainly from the environment noise.



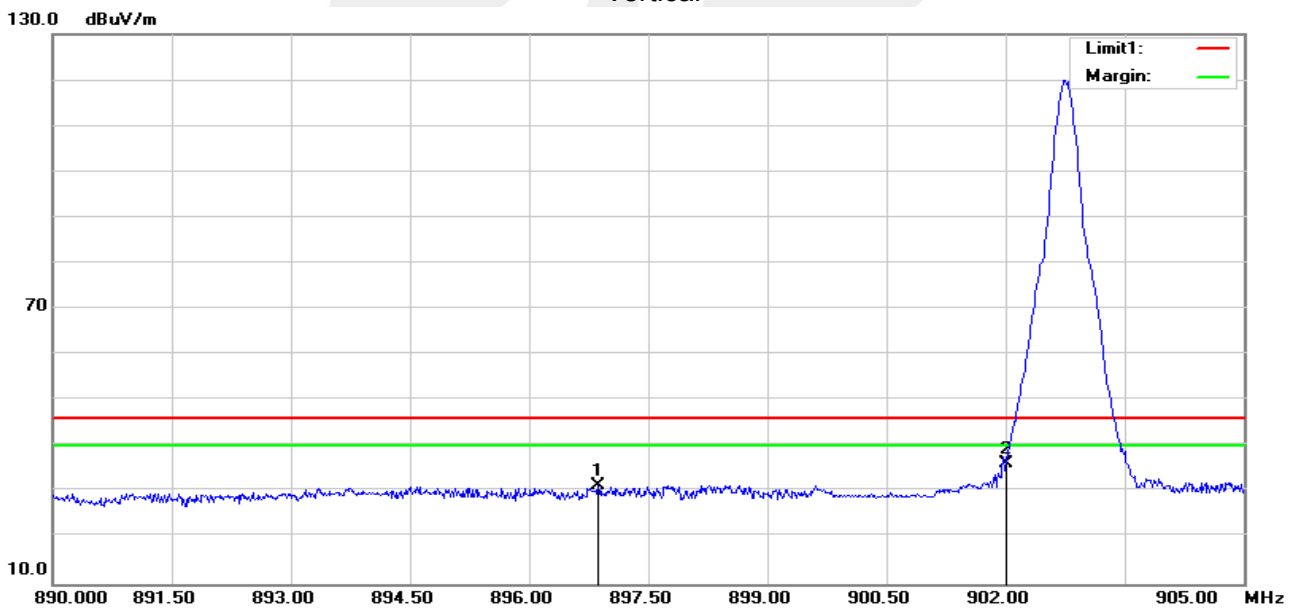
(Radiation Band edge)

Dense reader mode
Low channel-Horizontal



| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|----------------|----------------------|-----------------|----------------|-------------|--------|
| 1 | 891.4700 | 31.74 | -0.65 | 31.09 | 46.00 | -14.91 | peak |
| 2 | 902.0000 | 38.40 | -0.40 | 38.00 | 46.00 | -8.00 | peak |

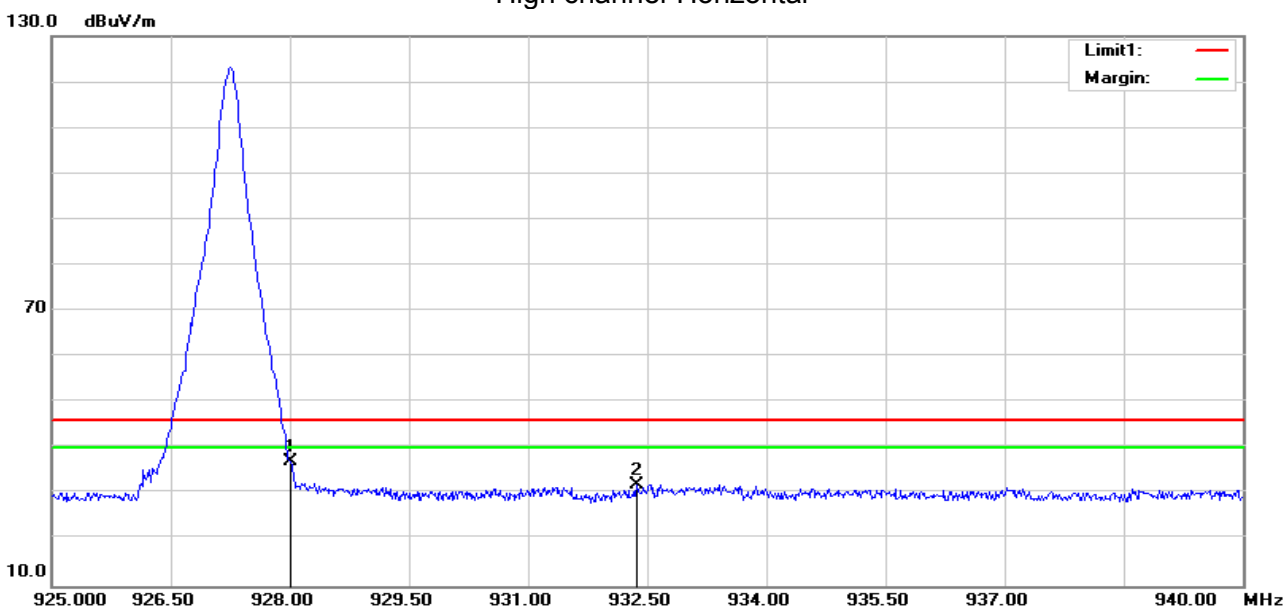
Vertical



| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|----------------|----------------------|-----------------|----------------|-------------|--------|
| 1 | 896.8700 | 31.98 | -0.53 | 31.45 | 46.00 | -14.55 | peak |
| 2 | 902.0000 | 36.55 | -0.40 | 36.15 | 46.00 | -9.85 | peak |

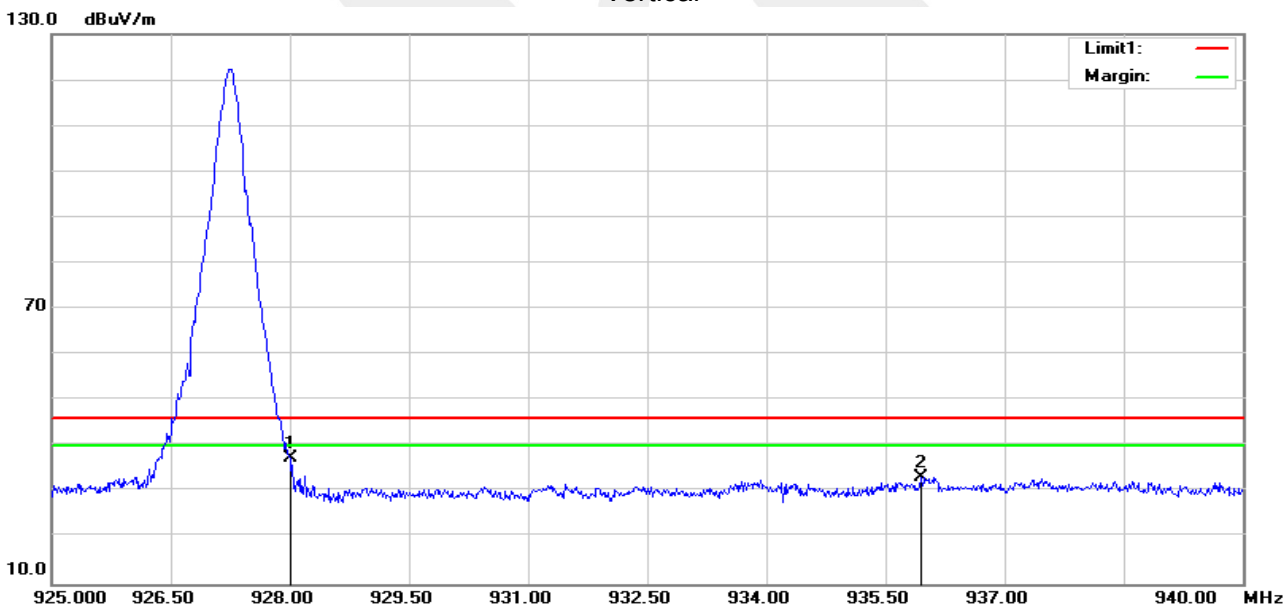


High channel-Horizontal



| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|----------------|----------------------|-----------------|----------------|-------------|--------|
| 1 | 928.0000 | 36.76 | 0.43 | 37.19 | 46.00 | -8.81 | peak |
| 2 | 932.3650 | 31.41 | 0.74 | 32.15 | 46.00 | -13.85 | peak |

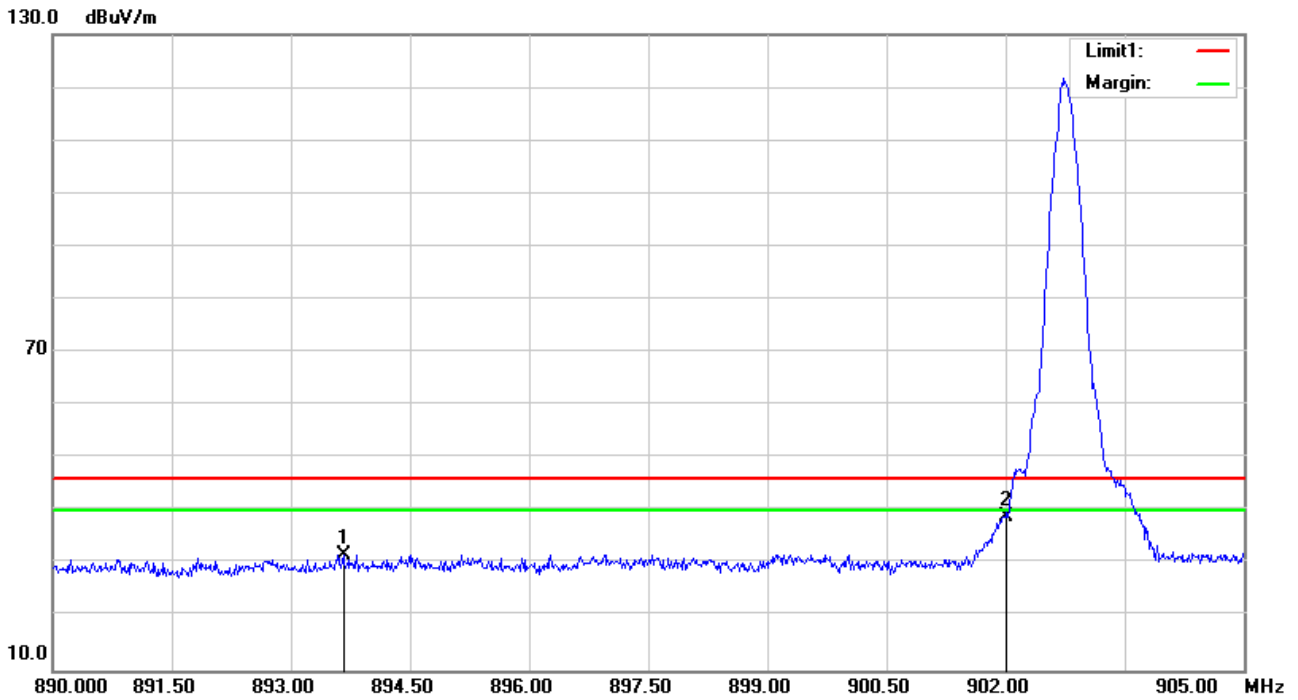
Vertical



| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|----------------|----------------------|-----------------|----------------|-------------|--------|
| 1 | 928.0000 | 36.99 | 0.43 | 37.42 | 46.00 | -8.58 | peak |
| 2 | 935.9500 | 32.14 | 1.04 | 33.18 | 46.00 | -12.82 | peak |

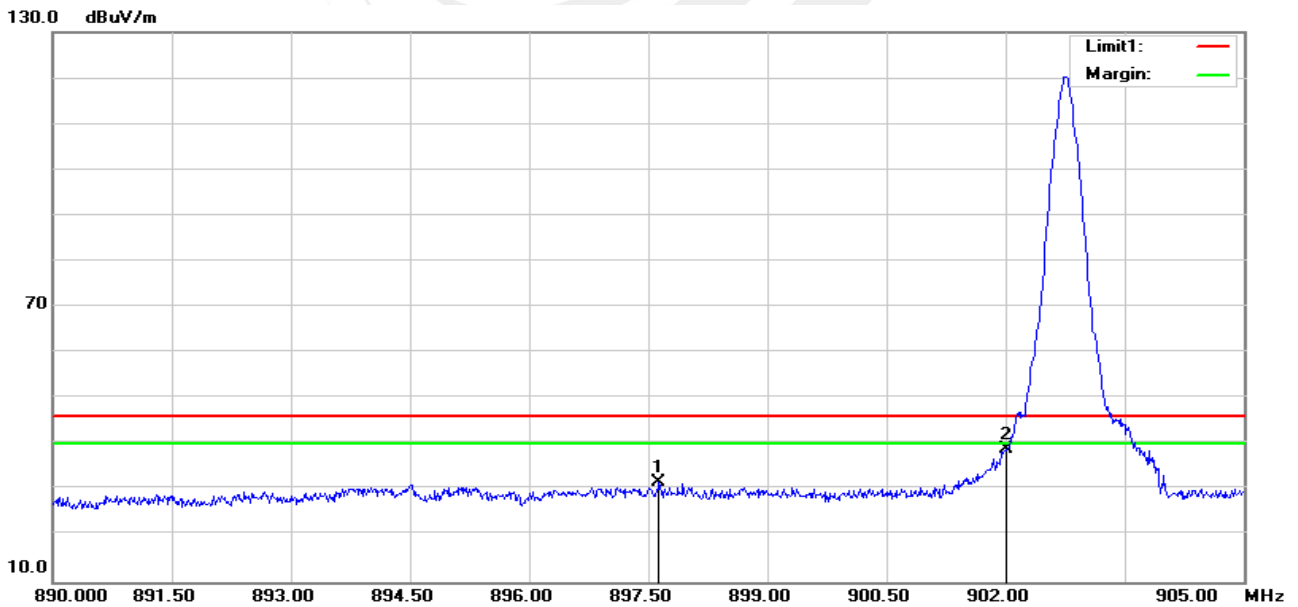


Single reader mode
Low channel-Horizontal



| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|----------------|----------------------|-----------------|----------------|-------------|--------|
| 1 | 893.6600 | 32.49 | -0.60 | 31.89 | 46.00 | -14.11 | peak |
| 2 | 902.0000 | 39.32 | -0.40 | 38.92 | 46.00 | -7.08 | peak |

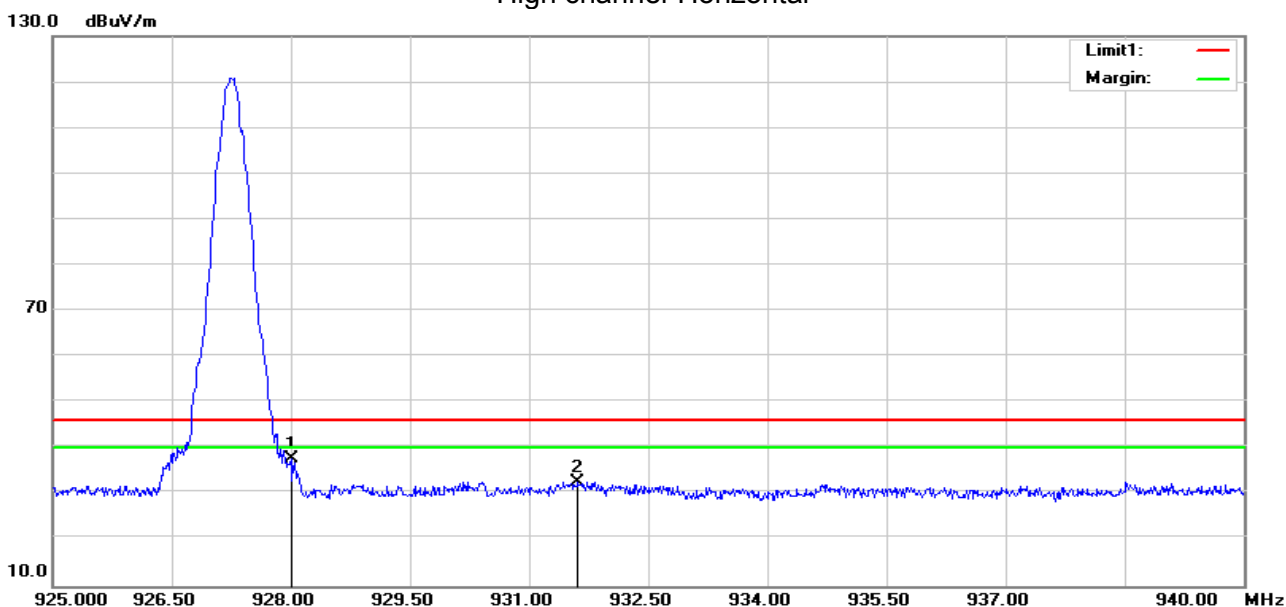
Vertical



| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|----------------|----------------------|-----------------|----------------|-------------|--------|
| 1 | 897.6350 | 32.33 | -0.51 | 31.82 | 46.00 | -14.18 | peak |
| 2 | 902.0000 | 39.38 | -0.40 | 38.98 | 46.00 | -7.02 | peak |

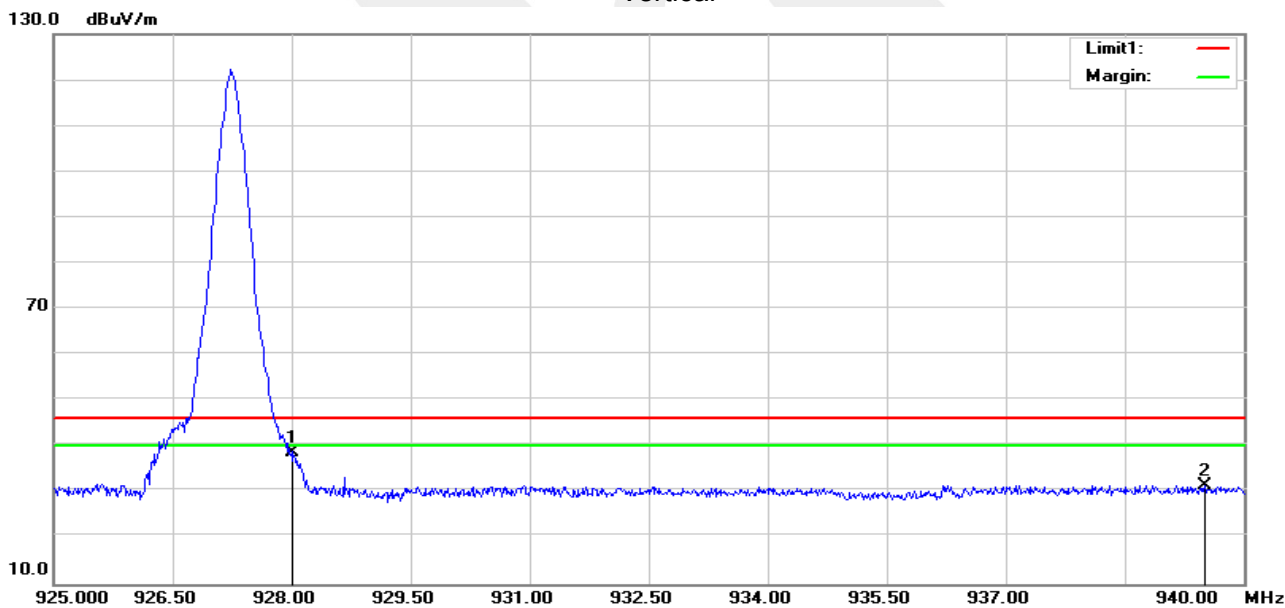


High channel-Horizontal



| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|----------------|----------------------|-----------------|----------------|-------------|--------|
| 1 | 928.0000 | 37.45 | 0.43 | 37.88 | 46.00 | -8.12 | peak |
| 2 | 931.6150 | 32.01 | 0.68 | 32.69 | 46.00 | -13.31 | peak |

Vertical



| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|----------------|----------------------|-----------------|----------------|-------------|--------|
| 1 | 928.0000 | 38.37 | 0.43 | 38.80 | 46.00 | -7.20 | peak |
| 2 | 939.5050 | 30.21 | 1.34 | 31.55 | 46.00 | -14.45 | peak |

4. CONDUCTED SPURIOUS & BAND EDGE EMISSION

4.1 LIMIT

According to FCC section 15.247(d)&RSS-247 5.5, in any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

4.2 TEST PROCEDURE

| Spectrum Parameter | Setting |
|---------------------------------------|---------------------------------|
| Detector | Peak |
| Start/Stop Frequency | 30 MHz to 10th carrier harmonic |
| RB / VB (emission in restricted band) | 100 KHz/300 KHz |
| Trace-Mode: | Max hold |

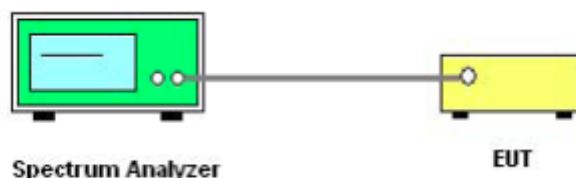
For Band edge

| Spectrum Parameter | Setting |
|---------------------------------------|---|
| Detector | Peak |
| Start/Stop Frequency | Lower Band Edge: 800 - 904 MHz Upper Band Edge: 924 - 1000 MHz |
| RB / VB (emission in restricted band) | 100 KHz/300 KHz |
| Trace-Mode: | Max hold |

For Hopping Band edge

| Spectrum Parameter | Setting |
|---------------------------------------|---|
| Detector | Peak |
| Start/Stop Frequency | Lower Band Edge: 800 - 904 MHz Upper Band Edge: 924 - 1000 MHz |
| RB / VB (emission in restricted band) | 100 KHz/300 KHz |
| Trace-Mode: | Max hold |

4.3 TEST SETUP



The EUT is connected to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. Tune the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. In order to make an accurate measurement, the span is set to be greater than RBW.

4.4 EUT OPERATION CONDITIONS

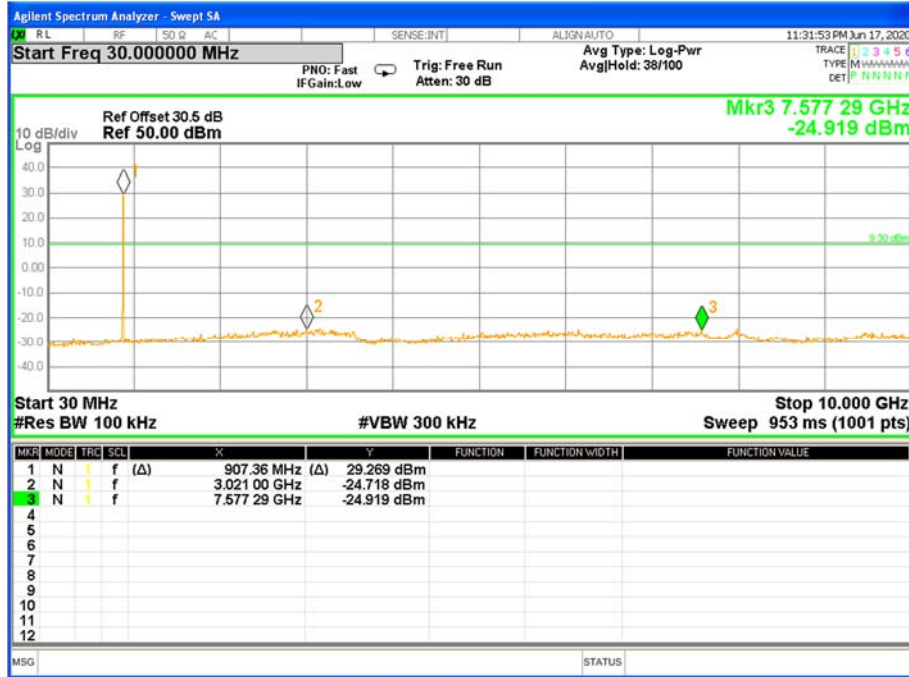
Please refer to section 2.4 of this report.



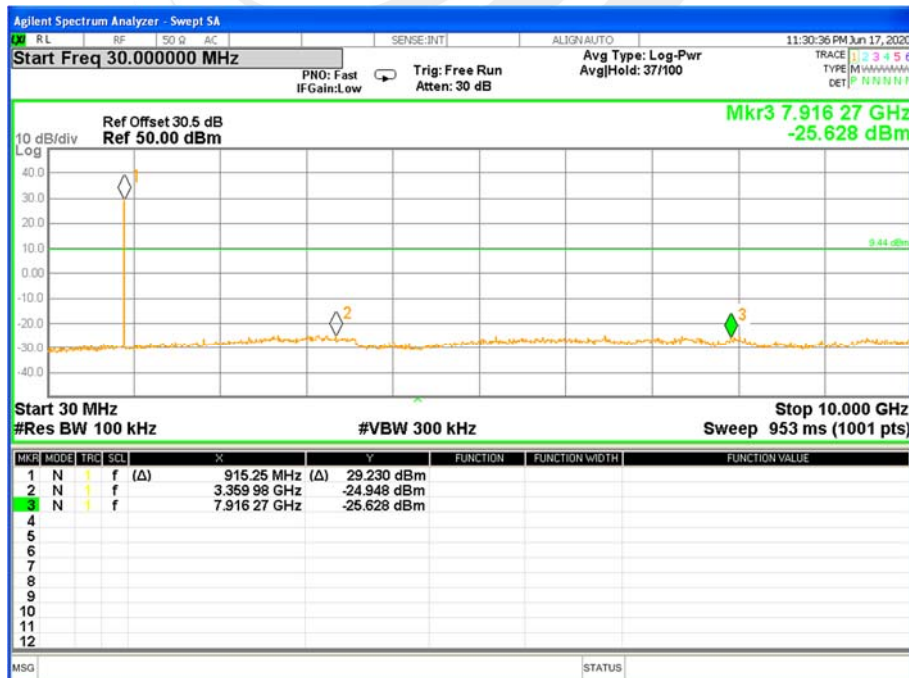
4.5 TEST RESULTS

| | | | |
|--------------|--------------------------------------|--------------------|--------|
| Temperature: | 25°C | Relative Humidity: | 50% |
| Test Mode: | Dense reader mode / CH00, CH25, CH49 | Test Voltage: | DC 24V |

CH 00

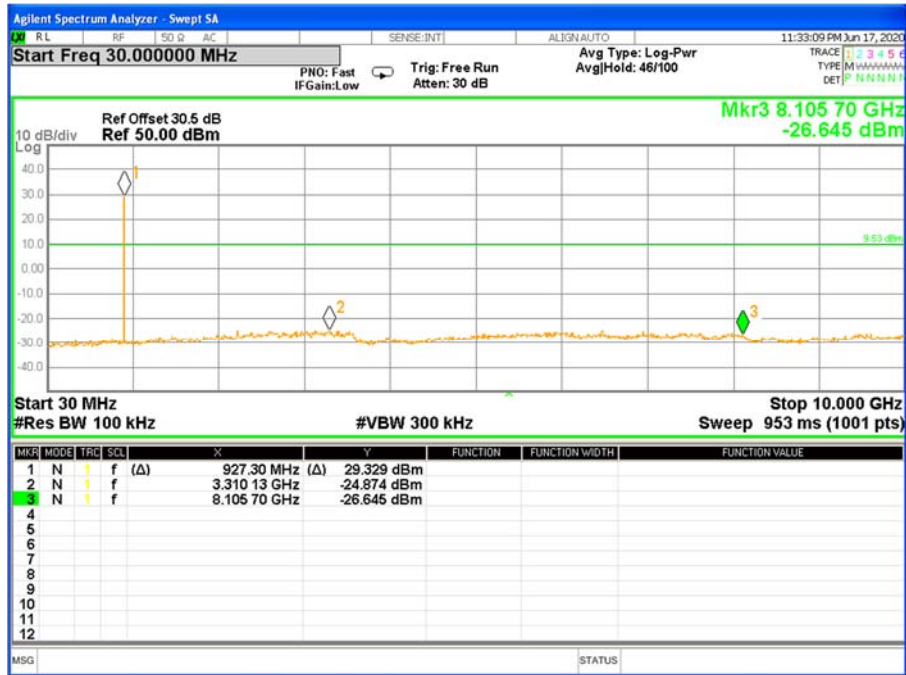


CH 25





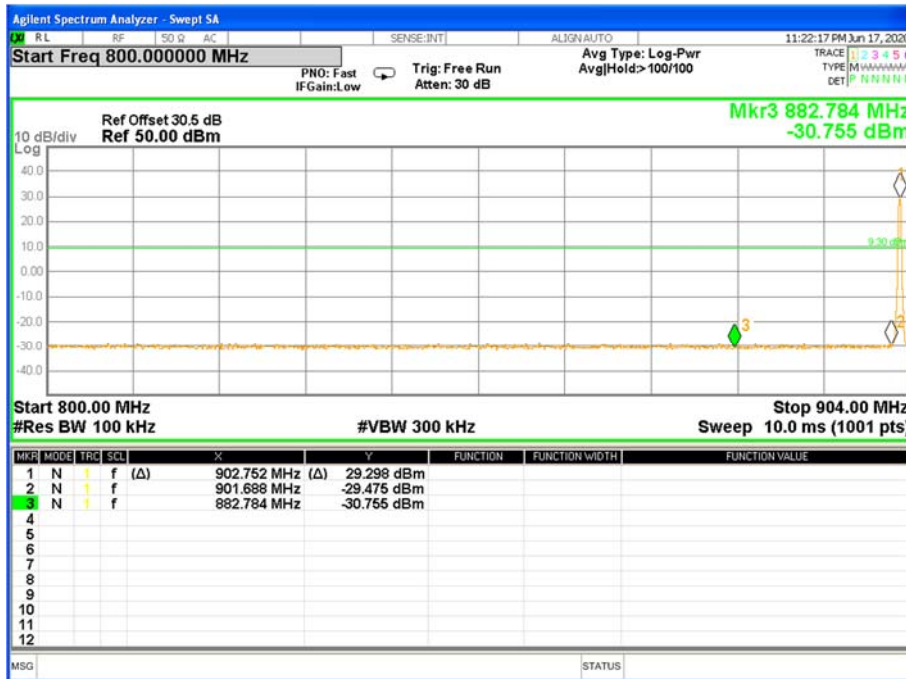
CH 49



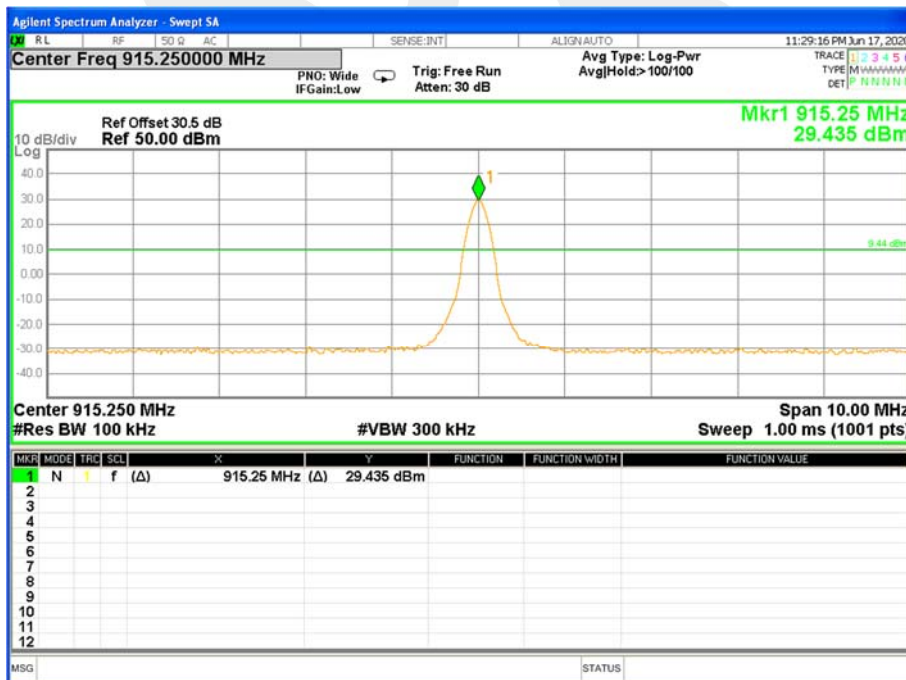


For Band edge(it's also the reference level for conducted spurious emission)

CH 00

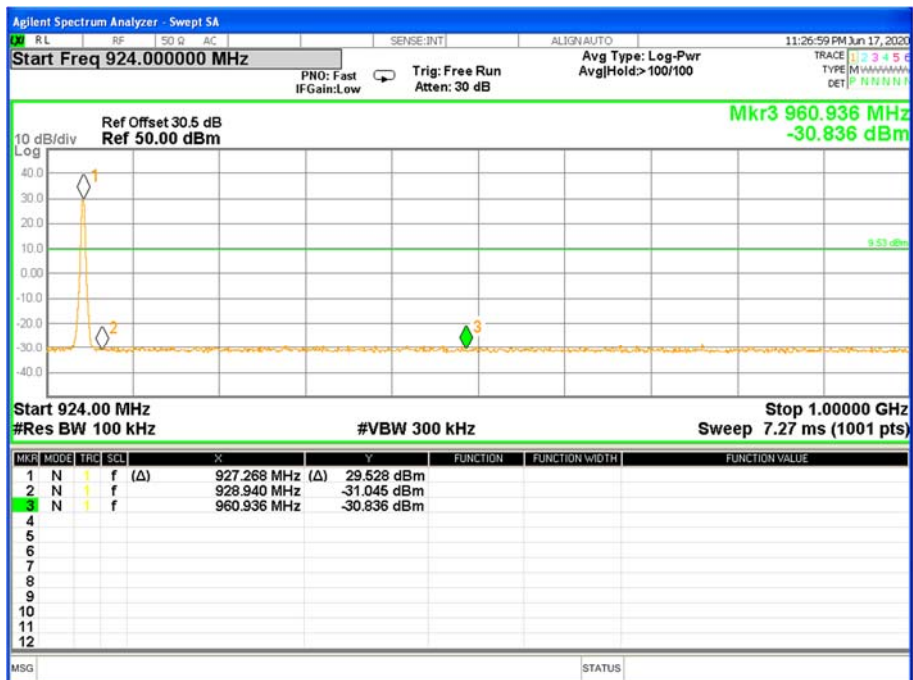


CH 25





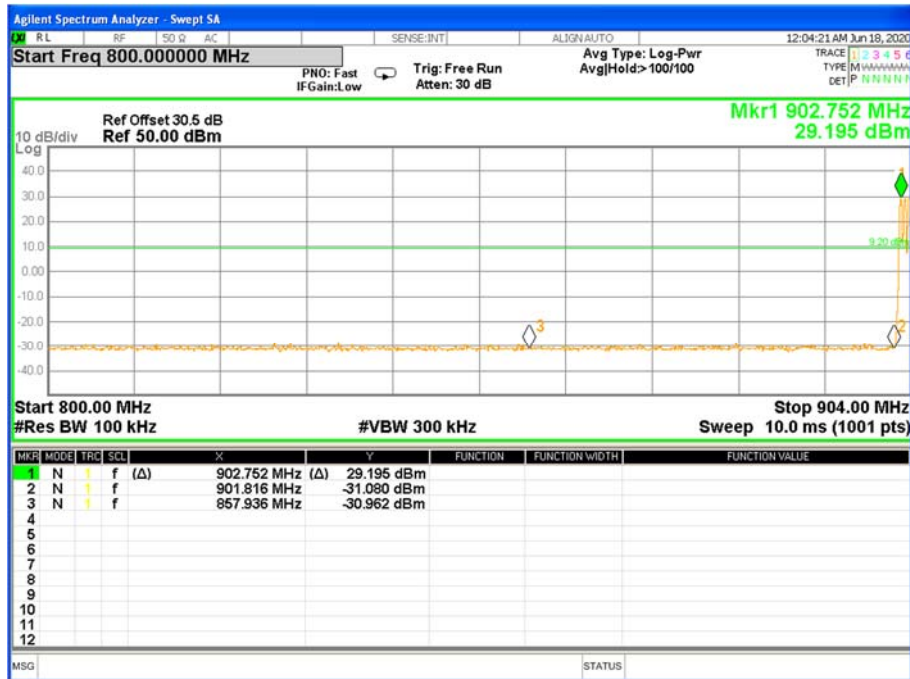
CH 49





For Hopping Band edge

CH 00



CH 49



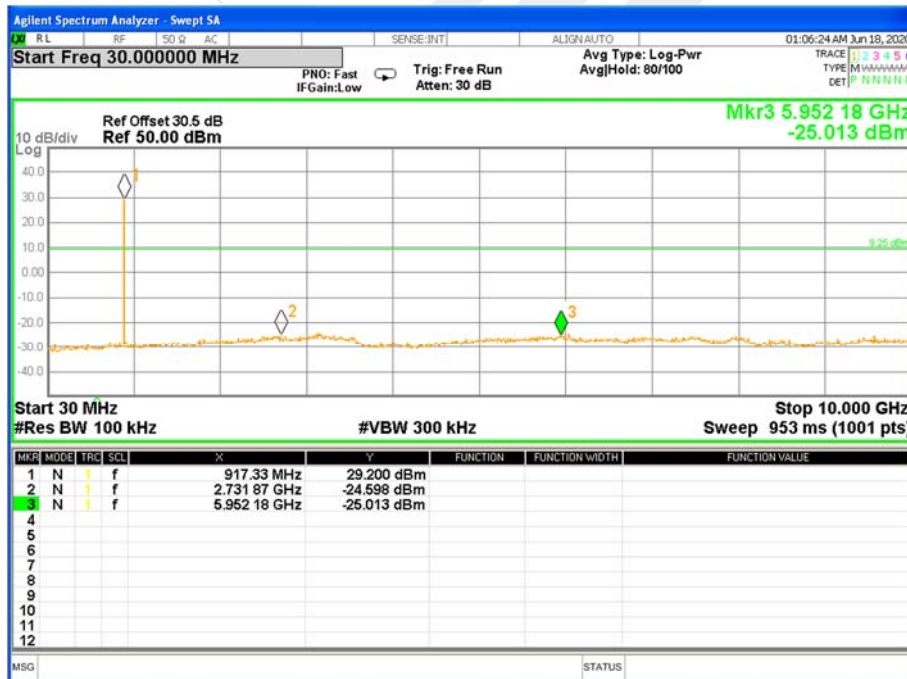


| | | | |
|--------------|---------------------------------------|--------------------|--------|
| Temperature: | 25°C | Relative Humidity: | 50% |
| Test Mode: | Single reader mode / CH00, CH25, CH49 | Test Voltage: | DC 24V |

CH 00

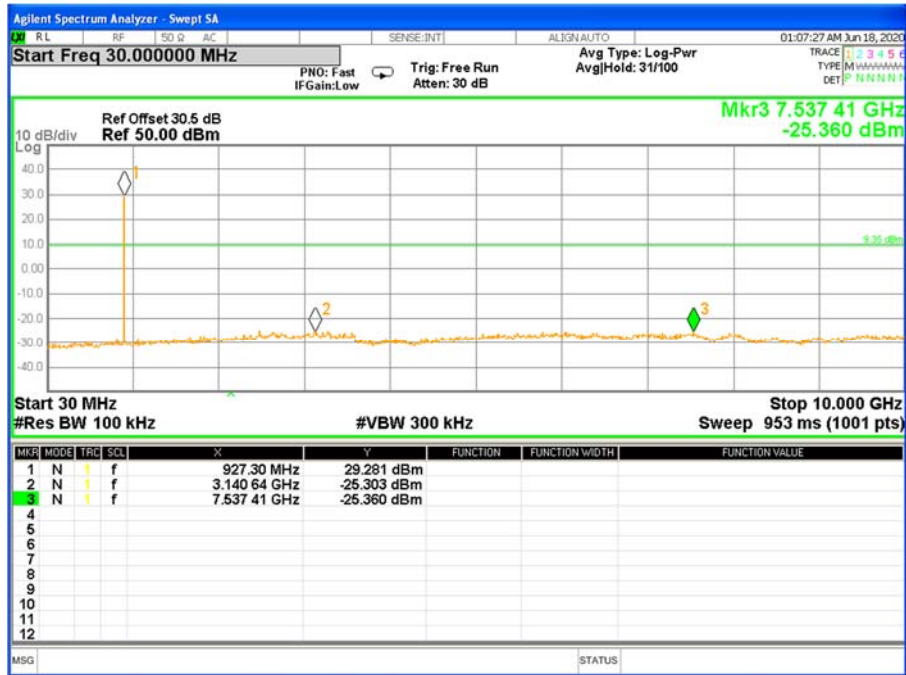


CH 25





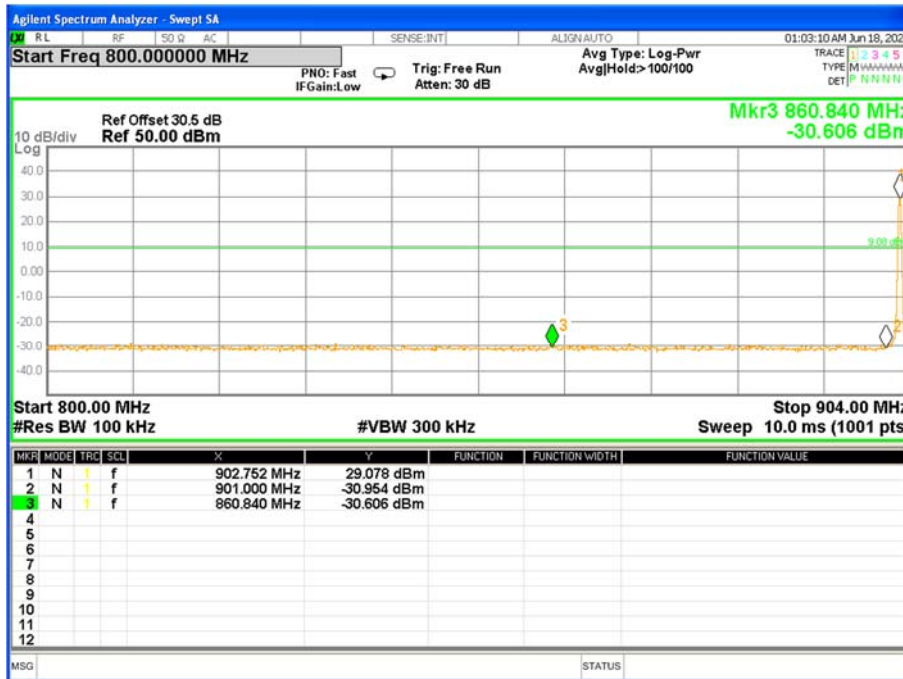
CH 49



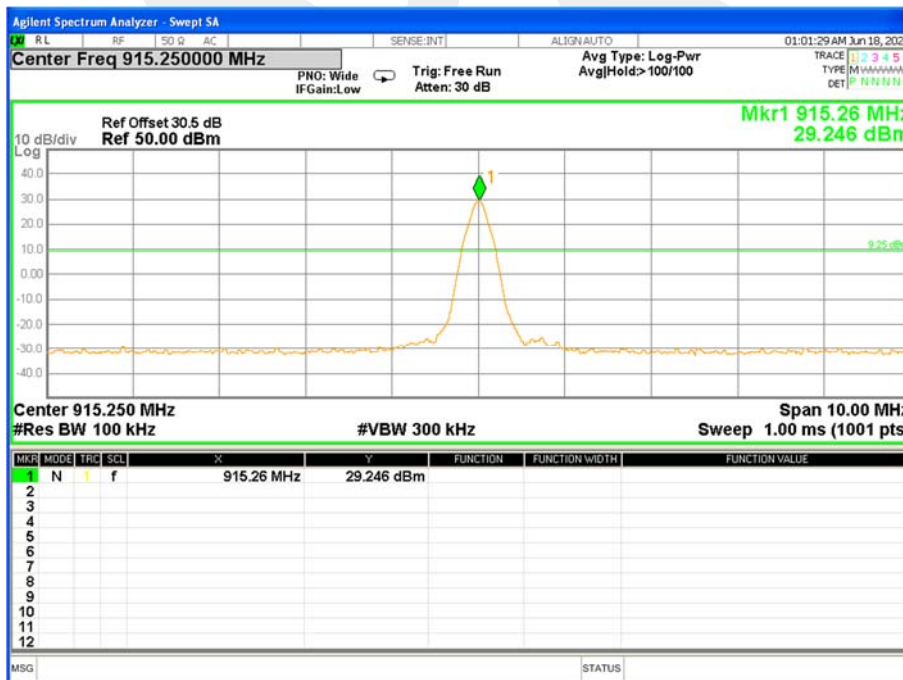


For Band edge(it's also the reference level for conducted spurious emission)

CH 00

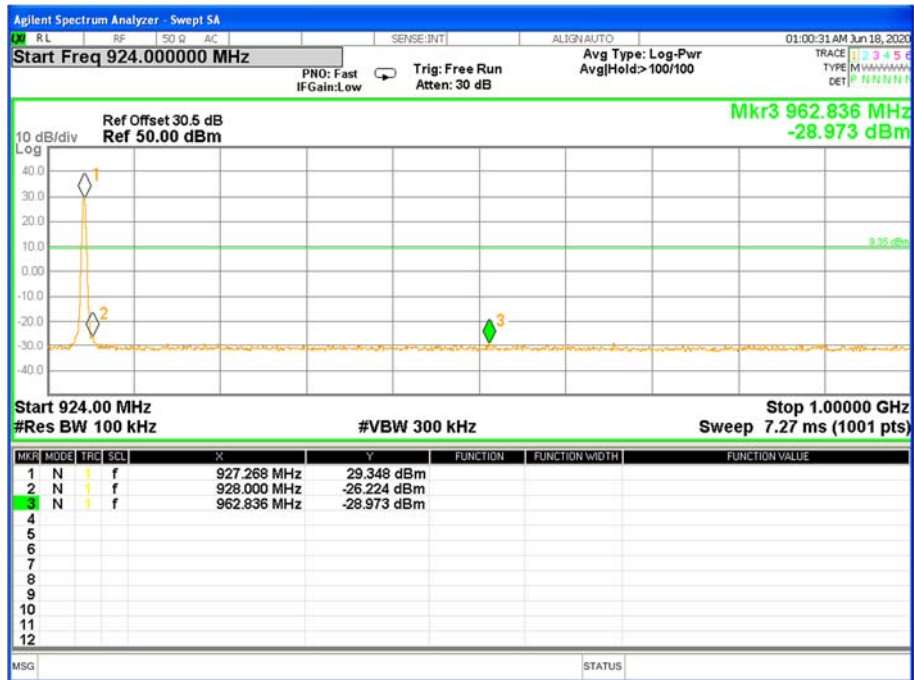


CH 25





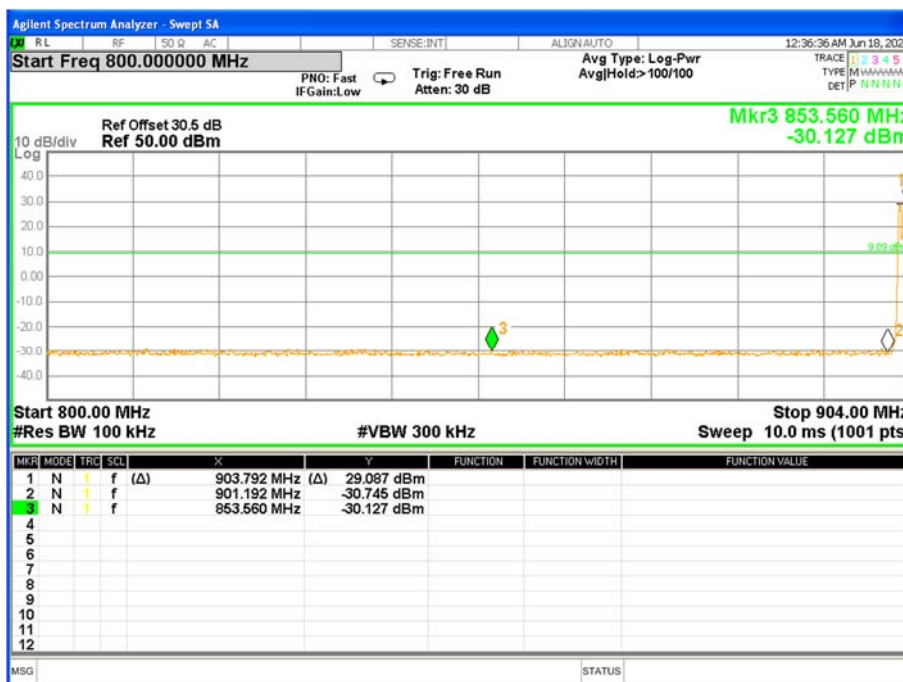
CH 49



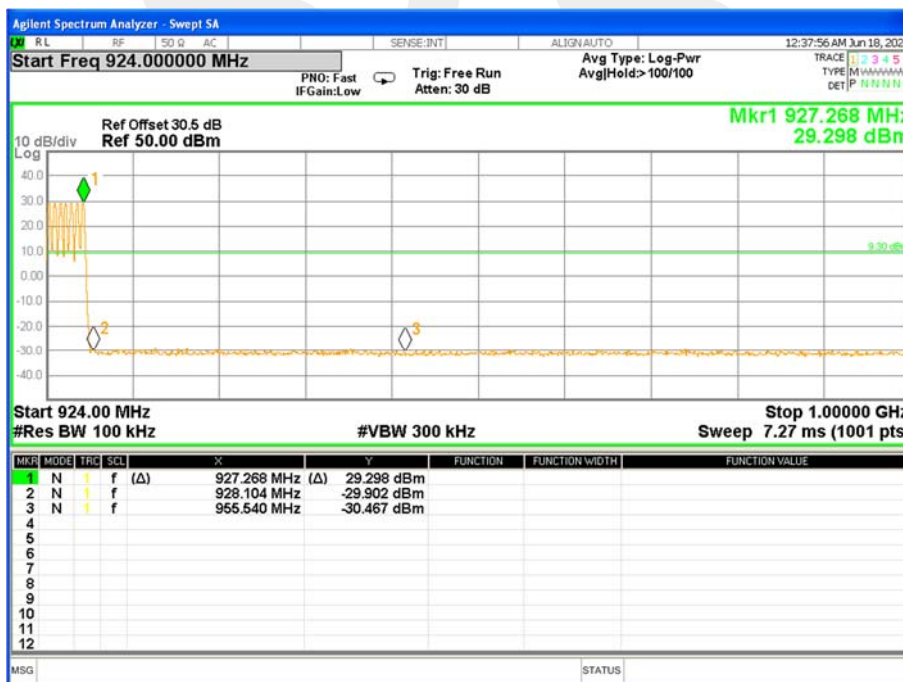


For Hopping Band edge

CH 00



CH 49





5. NUMBER OF HOPPING CHANNEL

5.1 LIMIT

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

EUT 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50.

| Spectrum Parameters | Setting |
|---------------------|-----------------------------|
| Attenuation | Auto |
| Span Frequency | > Operating Frequency Range |
| RB | 100KHz |
| VB | 300KHz |
| Detector | Peak |
| Trace | Max Hold |
| Sweep Time | Auto |

5.2 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as shown in the block diagram below.
- Spectrum Setting: RBW= 100KHz, VBW=300KHz, Sweep time = Auto.

5.3 TEST SETUP



5.4 EUT OPERATION CONDITIONS

Please refer to section 2.4 of this report.

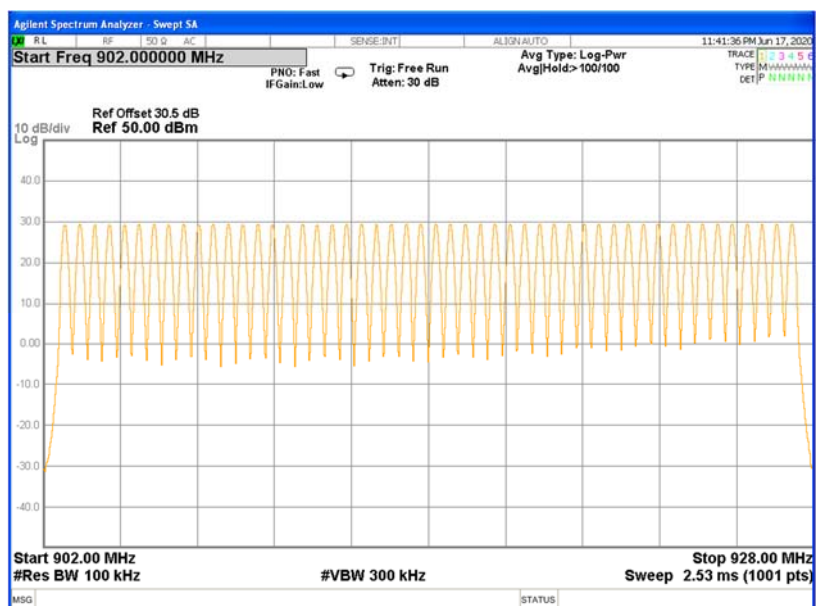


5.5 TEST RESULTS

| | | | |
|--------------|-------------------------------------|--------------------|--------|
| Temperature: | 25°C | Relative Humidity: | 60% |
| Test Mode: | Hopping Mode (Dense reader mode) | Test Voltage: | DC 24V |

Number of Hopping Channel 50

Hopping channel





| | | | |
|--------------|--------------------------------------|--------------------|--------|
| Temperature: | 25°C | Relative Humidity: | 60% |
| Test Mode: | Hopping Mode (Single reader mode) | Test Voltage: | DC 24V |

Number of Hopping Channel

50

Hopping channel





6. AVERAGE TIME OF OCCUPANCY

6.1 LIMIT

| FCC Part 15.247, Subpart C RSS-247 | | | | |
|---------------------------------------|---------------------------|--------|-----------------------|--------|
| Section | Test Item | Limit | Frequency Range (MHz) | Result |
| 15.247 (a)(1)(i) RSS-247 5.1(c) | Average Time of Occupancy | 0.4sec | 902-928 | PASS |

6.2 TEST PROCEDURE

- The transmitter output (antenna port) was connected to the spectrum analyzer.
- Set RBW =100KHz/VBW =300KHz.
- Use a video trigger with the trigger level set to enable triggering only on full pulses.
- Sweep Time is 20 second.
- Set the center frequency on any frequency would be measured and set the frequency span to zero span.
- Measure the maximum time duration of one single pulse.

6.3 TEST SETUP



6.4 EUT OPERATION CONDITIONS

Please refer to section 2.4 of this report.

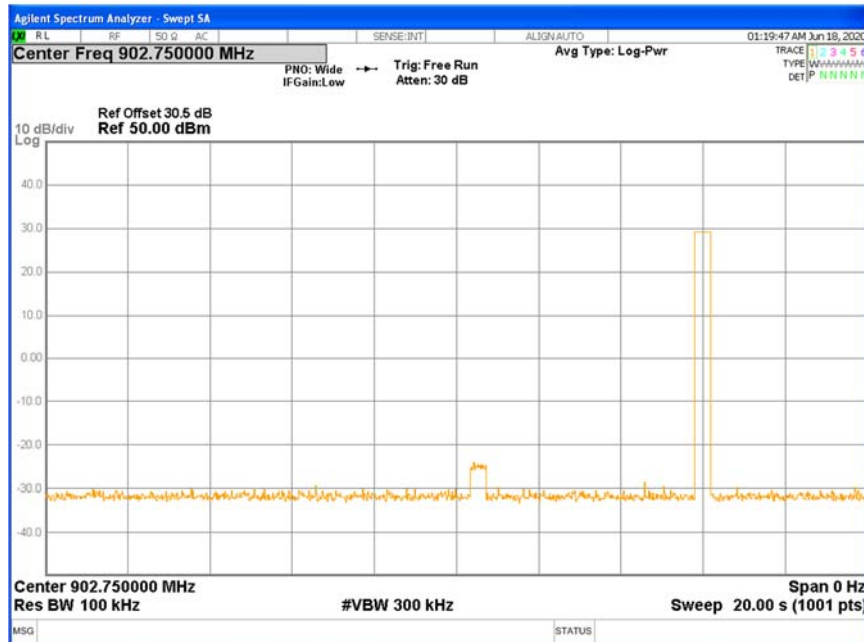


6.5 TEST RESULTS

| | | | |
|--------------|--------------------------------------|--------------------|--------|
| Temperature: | 25°C | Relative Humidity: | 50% |
| Test Mode: | Dense reader mode / CH00, CH25, CH49 | Test Voltage: | DC 24V |

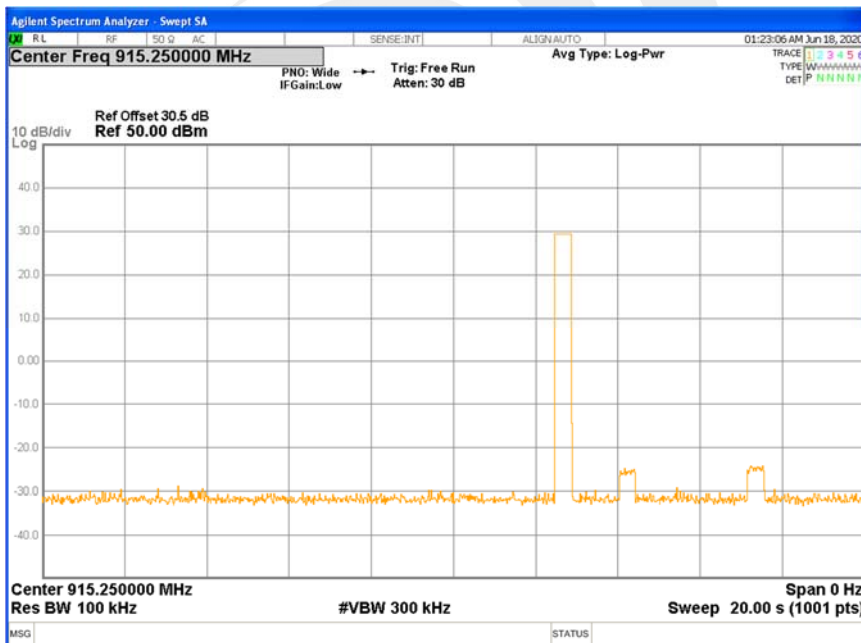
| Frequency | Dwell Time(s) | Limits(s) | result |
|------------|---------------|-----------|--------|
| 902.75 MHz | 0.383 | 0.4 | Pass |
| 915.25 MHz | 0.384 | 0.4 | Pass |
| 927.25 MHz | 0.383 | 0.4 | Pass |

CH 00





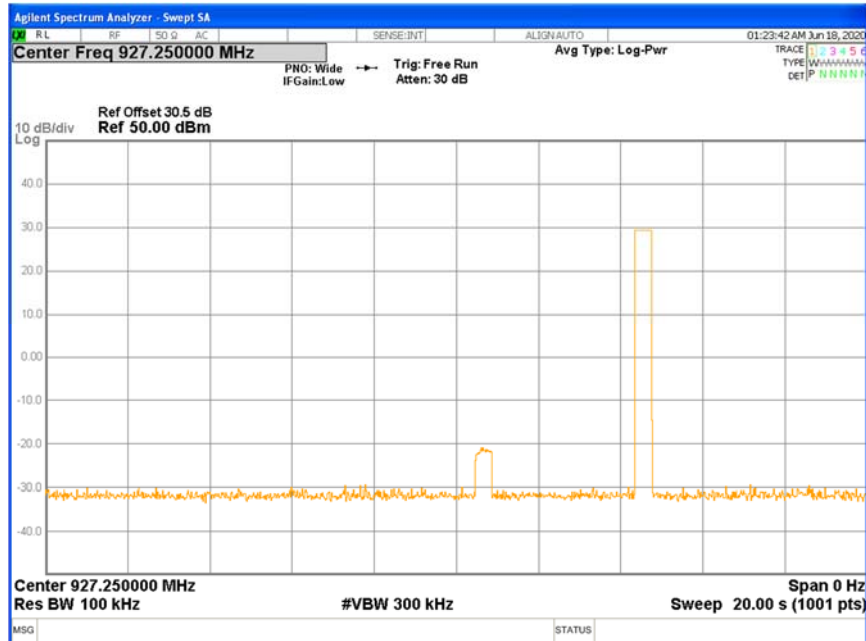
CH 25







CH 49

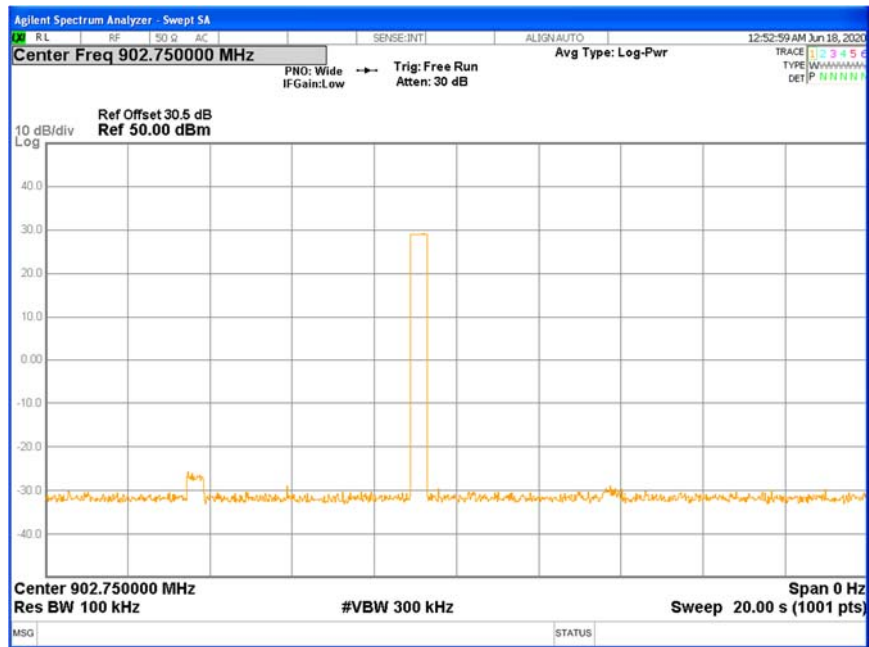




| | | | |
|--------------|---------------------------------------|--------------------|--------|
| Temperature: | 25°C | Relative Humidity: | 50% |
| Test Mode: | Single reader mode / CH00, CH25, CH49 | Test Voltage: | DC 24V |

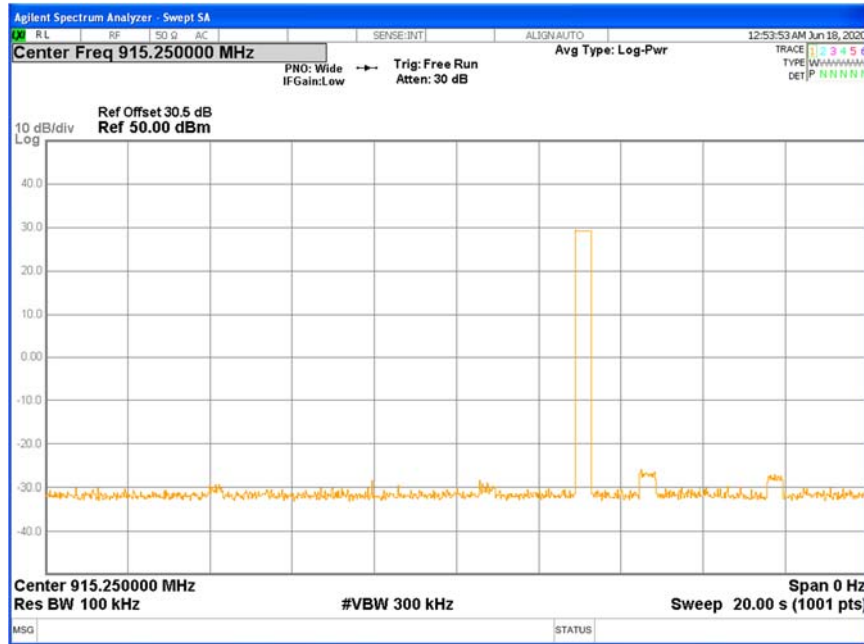
| Frequency | Dwell Time(s) | Limits(s) | result |
|------------|---------------|-----------|--------|
| 902.75 MHz | 0.383 | 0.4 | Pass |
| 915.25 MHz | 0.383 | 0.4 | Pass |
| 927.25 MHz | 0.383 | 0.4 | Pass |

CH 00



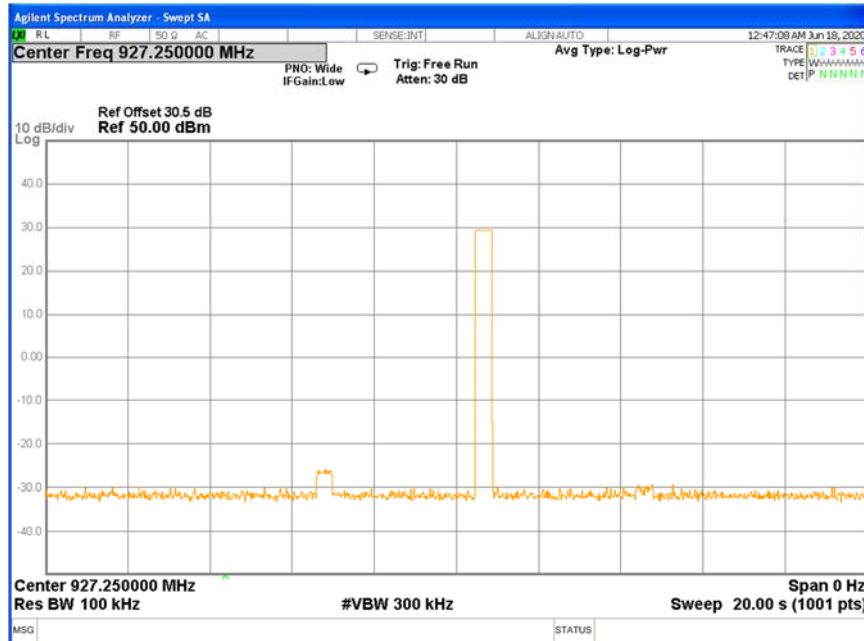


CH 25





CH 49



7. HOPPING CHANNEL SEPARATION MEASUREMENT

7.1 LIMIT

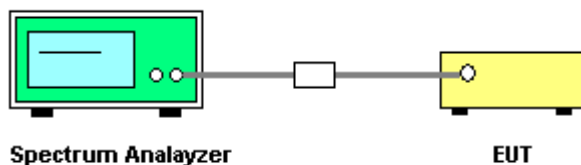
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operating 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 pseudo randomly 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.

| Spectrum Parameter | Setting |
|--------------------|----------|
| Attenuation | Auto |
| Span | 1MHz |
| RB | 30KHz |
| VB | 100KHz |
| Detector | Peak |
| Trace | Max Hold |
| Sweep Time | Auto |

7.2 TEST PROCEDURE

- a. The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.
- b. Spectrum Setting: RBW= 30KHz, VBW= 100KHz, Sweep time = Auto.

7.3 TEST SETUP



7.4 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuous transmitting mode.



7.5 TEST RESULTS

| | | | |
|--------------|--------------------------------------|--------------------|--------|
| Temperature: | 25°C | Relative Humidity: | 50% |
| Test Mode: | Dense reader mode / CH00, CH25, CH49 | Test Voltage: | DC 24V |

| Frequency | Mark1 Frequency (MHz) | Mark2 Frequency (MHz) | Ch. Separation (MHz) | Limit (MHz) | Result |
|------------|-----------------------|-----------------------|----------------------|-------------|--------|
| 902.75 MHz | 902.750 | 903.251 | 0.501 | 0.09536 | Comply |
| 915.25 MHz | 915.250 | 915.750 | 0.500 | 0.09500 | Comply |
| 927.25 MHz | 926.752 | 927.248 | 0.496 | 0.09448 | Comply |

Ch. Separation Limits: > 20dB bandwidth

CH 00

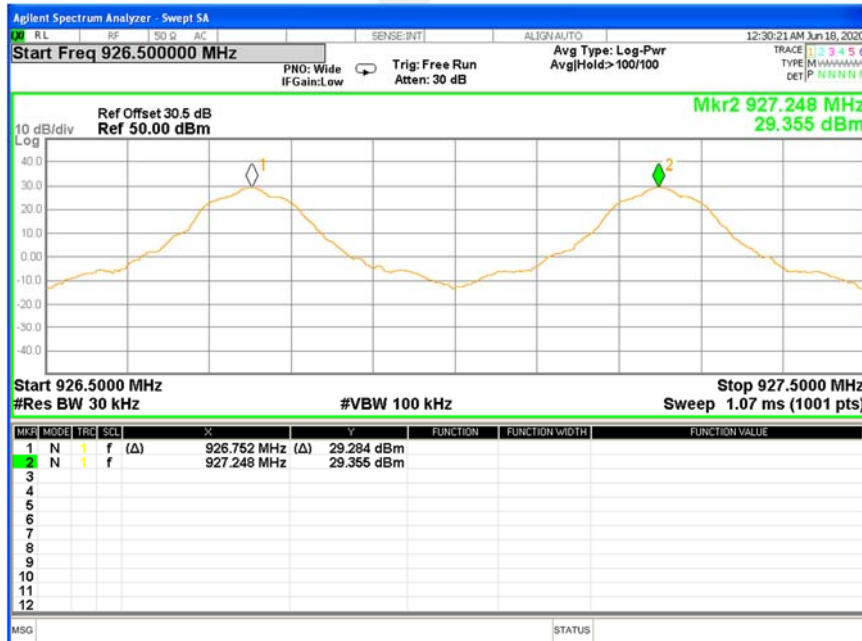




CH 25



CH 49



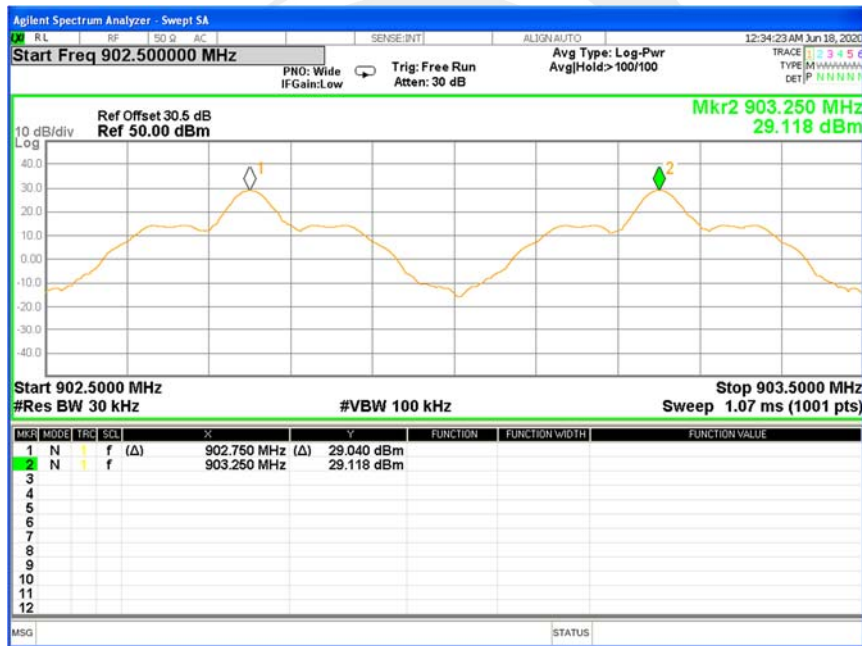


| | | | |
|--------------|---------------------------------------|--------------------|--------|
| Temperature: | 25°C | Relative Humidity: | 50% |
| Test Mode: | Single reader mode / CH00, CH25, CH49 | Test Voltage: | DC 24V |

| Frequency | Mark1 Frequency (MHz) | Mark2 Frequency (MHz) | Ch. Separation (MHz) | Limit (KHz) | Result |
|------------|-----------------------|-----------------------|----------------------|-------------|----------|
| 902.75 MHz | 902.750 | 903.250 | 0.500 | 25 | Complies |
| 915.25 MHz | 915.250 | 915.751 | 0.501 | 25 | Complies |
| 927.25 MHz | 926.750 | 927.250 | 0.500 | 25 | Complies |

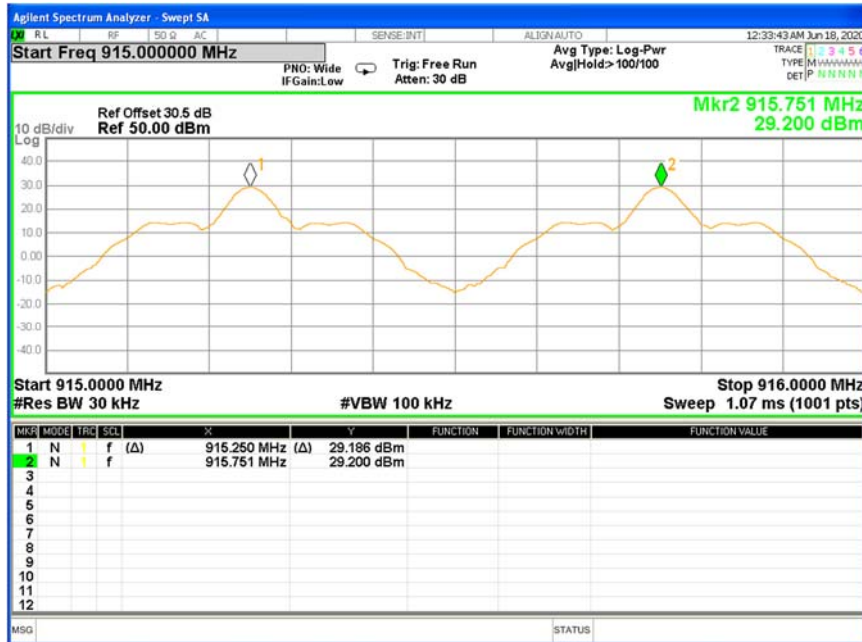
Ch. Separation Limits: > 25KHz

CH 00

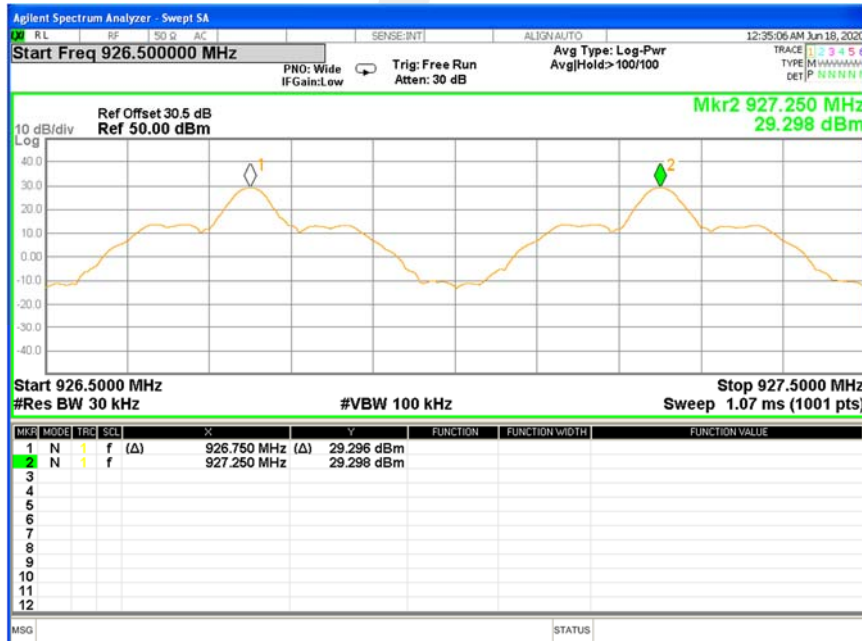




CH 25



CH 49





8. BANDWIDTH TEST

8.1 LIMIT

| FCC Part15 15.247,Subpart C RSS-247 | | | | |
|--|-------------------|--------|-------------------------|--------|
| Section | Test Item | Limit | FrequencyRange (MHz) | Result |
| 15.247 (a)(1)(i) RSS-247 5.1(c) | 20dB Bandwidth | 500KHz | 902-928 | PASS |

| Spectrum Parameter | Setting |
|--------------------|----------|
| Attenuation | Auto |
| Span | 500 KHz |
| RB | 1 KHz |
| VB | 3 KHz |
| Detector | Peak |
| Trace | Max Hold |
| Sweep Time | Auto |

8.2 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as shown in the block diagram below.
- Spectrum Setting: RBW= 1KHz, VBW=3KHz, Sweep time = Auto.

8.3 TEST SETUP



8.4 EUT OPERATION CONDITIONS

Please refer to section 2.4 of this report.

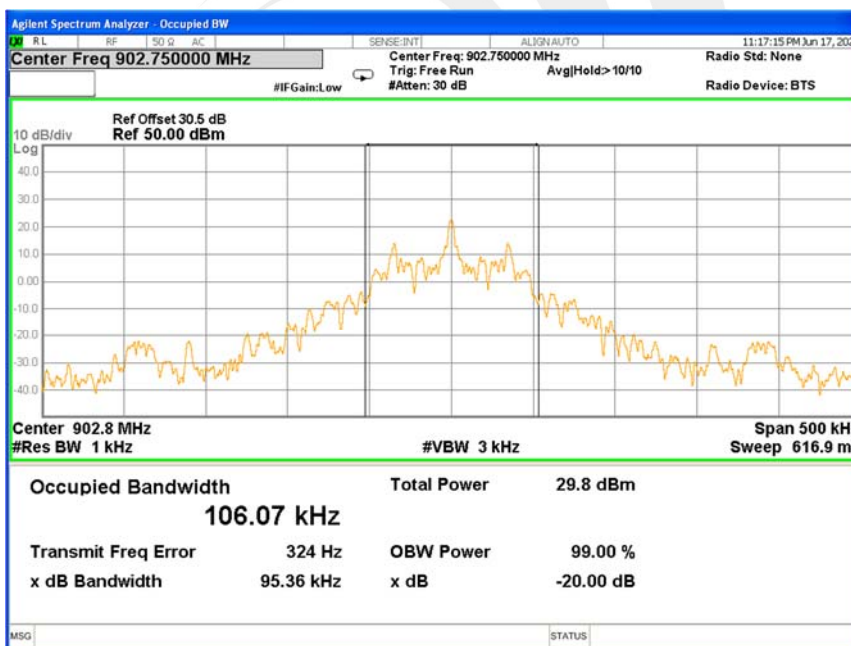


8.5 TEST RESULTS

| | | | |
|--------------|--------------------------------------|--------------------|--------|
| Temperature: | 25°C | Relative Humidity: | 50% |
| Test Mode: | Dense reader mode / CH00, CH25, CH49 | Test Voltage: | DC 24V |

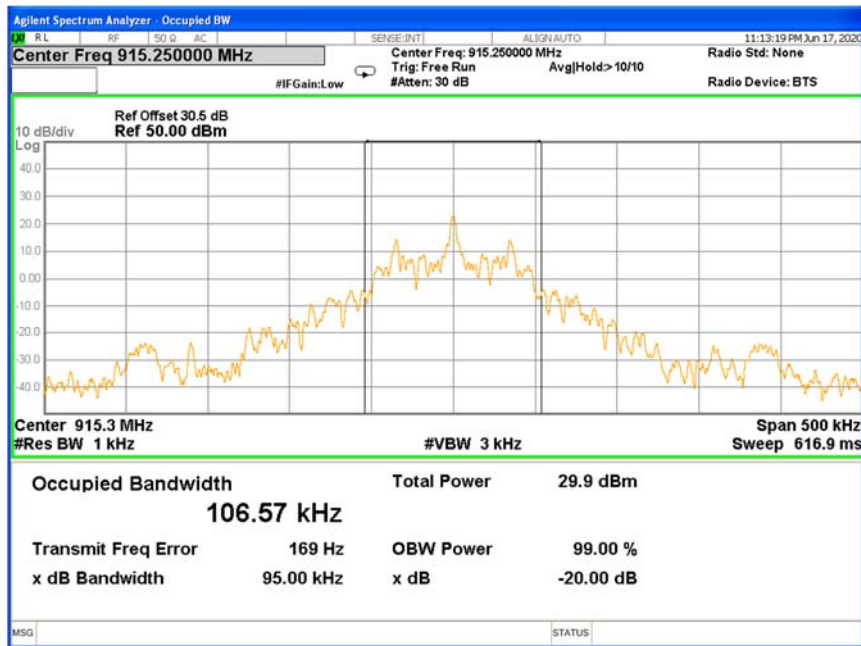
| Frequency | 20dB Bandwidth(kHz) | 99% Bandwidth(kHz) | Limit (KHz) | Result |
|------------|---------------------|--------------------|-------------|--------|
| 902.75 MHz | 95.36 | 106.07 | 500 | PASS |
| 915.25 MHz | 95.00 | 106.57 | 500 | PASS |
| 927.25 MHz | 94.48 | 121.44 | 500 | PASS |

CH 00

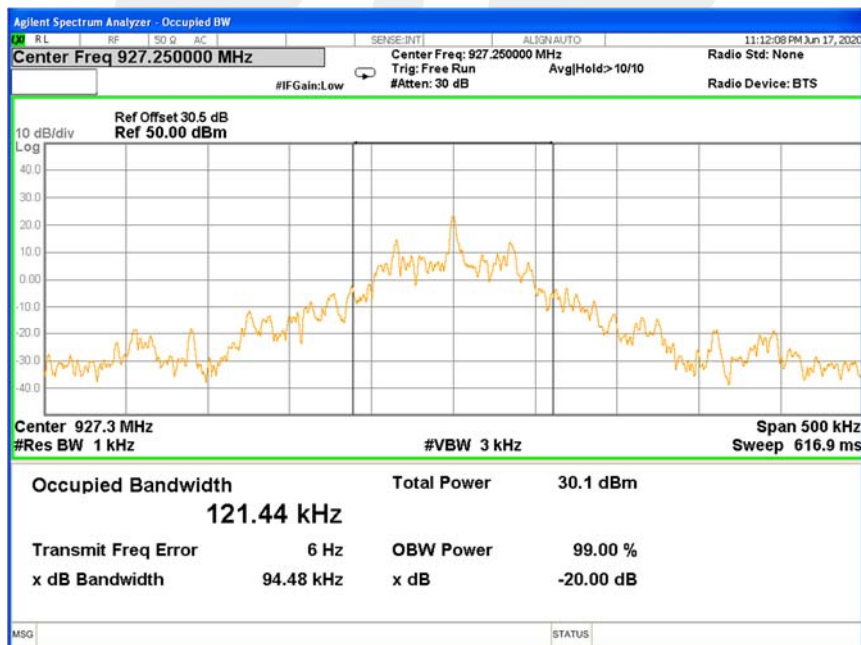




CH 25



CH 49

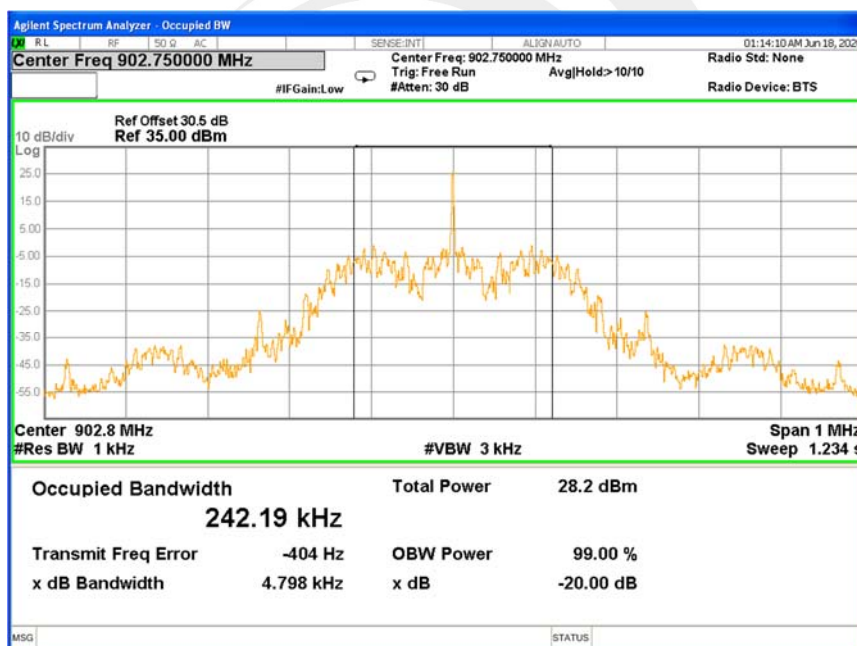




| | | | |
|--------------|---------------------------------------|--------------------|--------|
| Temperature: | 25°C | Relative Humidity: | 50% |
| Test Mode: | Single reader mode / CH00, CH25, CH49 | Test Voltage: | DC 24V |

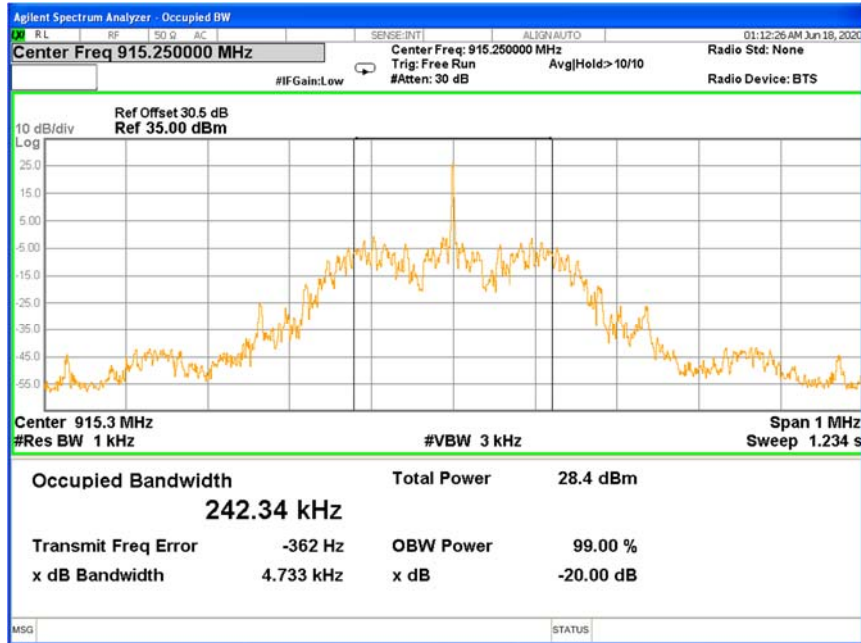
| Frequency | 20dB Bandwidth(kHz) | 99% Bandwidth(kHz) | Limit (KHz) | Result |
|------------|---------------------|--------------------|-------------|--------|
| 902.75 MHz | 4.798 | 242.19 | 500 | PASS |
| 915.25 MHz | 4.733 | 242.34 | 500 | PASS |
| 927.25 MHz | 4.644 | 234.73 | 500 | PASS |

CH 00

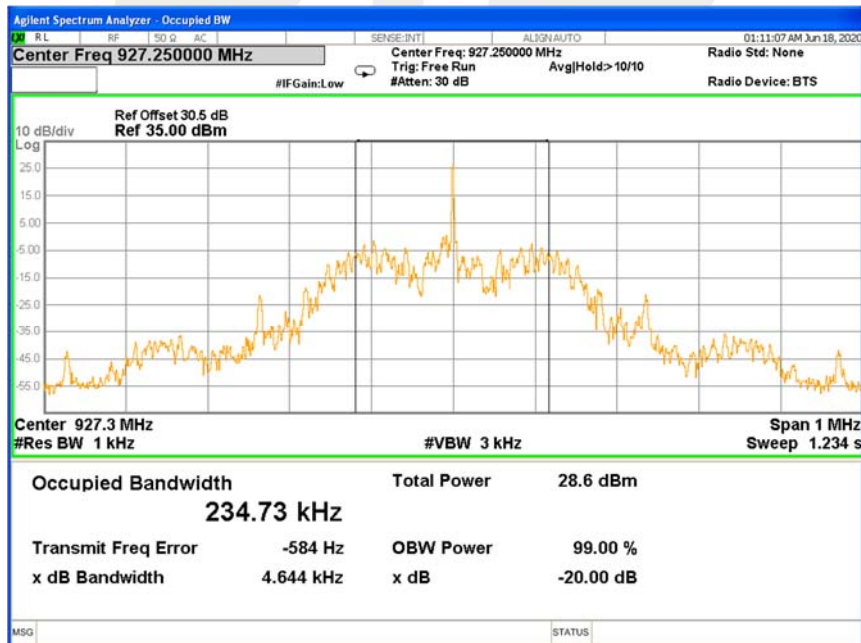




CH 25



CH 49





9. OUTPUT POWER TEST

9.1 LIMIT

| FCC Part 15.247, Subpart C RSS-247 | | | | |
|---------------------------------------|--------------|-------|-----------------------|--------|
| Section | Test Item | Limit | Frequency Range (MHz) | Result |
| 15.247 (b)(2) RSS-247 5.4(a) | Output Power | 1 W | 902-928 | PASS |
| RSS-247 5.4(a) | EIRP | 4W | | |

9.2 TEST PROCEDURE

This is a RF-conducted test to evaluate the maximum peak output power. Use a direct connection between the antenna port of the unlicensed wireless device and the spectrum analyzer, through suitable attenuation. The hopping shall be disabled for this test:

a) Use the following spectrum analyzer settings:

- 1) Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel.
- 2) RBW > 20 dB bandwidth of the emission being measured.
- 3) VBW \geq RBW.
- 4) Sweep: Auto.
- 5) Detector function: Peak.
- 6) Trace: Max hold.

b) Allow trace to stabilize.

c) Use the marker-to-peak function to set the marker to the peak of the emission.

d) The indicated level is the peak output power, after any corrections for external attenuators and cables.

e) A plot of the test results and setup description shall be included in the test report.

NOTE—A peak responding power meter may be used, where the power meter and sensor system video bandwidth is greater than the occupied bandwidth of the unlicensed wireless device, rather than a spectrum analyzer.

PKPM1 Peak power meter method:

The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DSS bandwidth and shall use a fast-responding diode detector.

9.3 TEST SETUP



9.4 EUT OPERATION CONDITIONS

Please refer to section 2.4 of this report.



9.5 TEST RESULTS

| | | | |
|---------------|--------|--------------------|-----|
| Temperature: | 25°C | Relative Humidity: | 60% |
| Test Voltage: | DC 24V | | |

| Dense reader mode | | | |
|-------------------|-----------|------------------------|-------|
| Test Channel | Frequency | Conducted Output Power | LIMIT |
| | (MHz) | Peak (dBm) | dBm |
| CH 00 | 902.75 | 29.244 | 30 |
| CH 25 | 915.25 | 29.384 | 30 |
| CH 49 | 927.25 | 29.482 | 30 |

| Single reader mode | | | |
|--------------------|-----------|------------------------|-------|
| Test Channel | Frequency | Conducted Output Power | LIMIT |
| | (MHz) | Peak (dBm) | dBm |
| CH 00 | 902.75 | 29.101 | 30 |
| CH 25 | 915.25 | 29.252 | 30 |
| CH 49 | 927.25 | 29.355 | 30 |

| EIRP Power | | | | | | | |
|-------------------|----------------|-----------------|------------|------------|--------------|------------|-------|
| Mode | Channel Number | Frequency (MHz) | Peak Power | Cable Loss | Antenna Gain | EIRP Power | Limit |
| | | | (dBm) | (dB) | (dBi) | (dBm) | (dBm) |
| Dense reader mode | 0 | 902.75 | 29.24 | 12.00 | 15.00 | 32.24 | 36.02 |
| | 25 | 915.25 | 29.38 | 12.00 | 15.00 | 32.38 | 36.02 |
| | 49 | 927.25 | 29.48 | 12.00 | 15.00 | 32.48 | 36.02 |

| Mode | Channel Number | Frequency (MHz) | Peak Power | Cable Loss | Antenna Gain | EIRP Power | Limit |
|--------------------|----------------|-----------------|------------|------------|--------------|------------|-------|
| | | | (dBm) | (dB) | (dBi) | (dBm) | (dBm) |
| Single reader mode | 0 | 902.75 | 29.10 | 12.00 | 15.00 | 32.10 | 36.02 |
| | 25 | 915.25 | 29.25 | 12.00 | 15.00 | 32.25 | 36.02 |
| | 49 | 927.25 | 29.36 | 12.00 | 15.00 | 32.36 | 36.02 |



10. ANTENNA REQUIREMENT

10.1 STANDARD REQUIREMENT

FCC Part 15.203&RSS-Gen requirement: For intentional device, according to FCC Part 15.203&RSS-Gen: 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.

Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

10.2 EUT ANTENNA

The EUT antenna should be installed by professional installer only so that the limits in this part **do not exceed**.





11. FREQUENCY STABILITY

11.1 LIMITS OF FREQUENCY STABILITY MEASUREMENT

The frequency tolerance of the carrier signal shall be maintained within +/-0.02% of the operating frequency over a temperature variation of -30 °C to 50 °C at normal supply voltage, and for a variation in primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 °C.

11.2 TEST PROCEDURE

1. The EUT was placed inside the environmental test chamber and powered by nominal DC voltage.
2. Turn the EUT on and couple its output to spectrum analyzer.
3. Turn the EUT off and set the chamber to the highest temperature specified.
4. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT on and measure the operating frequency after 2, 5, and 10 minutes.
5. Repeat step 2 and 3 with the temperature chamber set to the lowest temperature.
6. The test chamber was allowed to stabilize at +20 °C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and record the frequency.

11.3 TEST RESULT

Dense reader mode

Channel 25 (915.25MHz)

Voltage vs. Frequency Stability

| Voltage(V) | Measurement Frequency(MHz) |
|--------------------|----------------------------|
| 27.6 | 915.2501 |
| 24 | 915.2495 |
| 20.4 | 915.2499 |
| Max.Deviation(MHz) | 0.0001 |
| Max.Deviation(ppm) | 0.11 |

Rated working voltage: DC 24V

Temperature vs. Frequency Stability

| Temperature(°C) | Measurement Frequency(MHz) |
|--------------------|----------------------------|
| -30 | 915.2503 |
| -20 | 915.2494 |
| -10 | 915.2502 |
| 0 | 915.2503 |
| 10 | 915.2501 |
| 20 | 915.2500 |
| 30 | 915.2501 |
| 40 | 915.2502 |
| 50 | 915.2499 |
| Max.Deviation(MHz) | 0.0003 |
| Max.Deviation(ppm) | 0.33 |



Single reader mode

Channel 25 (915.25MHz)

Voltage vs. Frequency Stability

| Voltage(V) | Measurement Frequency(MHz) |
|--------------------|----------------------------|
| 27.6 | 915.2503 |
| 24 | 915.2499 |
| 20.4 | 915.2494 |
| Max.Deviation(MHz) | 0.0003 |
| Max.Deviation(ppm) | 0.33 |

Rated working voltage: DC 24V

Temperature vs. Frequency Stability

| Temperature(°C) | Measurement Frequency(MHz) |
|--------------------|----------------------------|
| -30 | 915.2504 |
| -20 | 915.2498 |
| -10 | 915.2501 |
| 0 | 915.2503 |
| 10 | 915.2502 |
| 20 | 915.2500 |
| 30 | 915.2502 |
| 40 | 915.2503 |
| 50 | 915.2495 |
| Max.Deviation(MHz) | 0.0004 |
| Max.Deviation(ppm) | 0.44 |



12. RF EXPOSURE COMPLIANCE

12.1 LIMIT

The limit for Maximum Permissible Exposure (MPE) specified in FCC 1.1310 is followed. According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environmental impact of the human exposure to radio-frequency (RF) radiation as specified in 1.1307 (b).

Limits for Maximum Permissible Exposure (MPE)

| Frequency Range (MHz) | Electric Field Strength (V/m) | Magnetic Field Strength (A/m) | Power Density (mW/cm ²) |
|---|-------------------------------|-------------------------------|-------------------------------------|
| Limits for Occupational / controlled Exposures | | | |
| 300 - 1500 | -- | -- | F/300 |
| 1500 – 100000 | -- | -- | 5.0 |
| Limits for General population / Uncontrolled Exposure | | | |
| 300 - 1500 | -- | -- | F/1500 |
| 1500 – 100000 | -- | -- | 1.0 |

For the purpose of this standard, Industry Canada has adopted the SAR and RF field strength limits established in Health Canada’s RF exposure guideline

Table 4: RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)

| Frequency Range (MHz) | Electric Field (V/m rms) | Magnetic Field (A/m rms) | Power Density (W/m ²) | Reference Period (minutes) |
|------------------------|---------------------------|--|-----------------------------------|----------------------------|
| 0.003-10 ²¹ | 83 | 90 | - | Instantaneous* |
| 0.1-10 | - | 0.73/ f | - | 6** |
| 1.1-10 | 87/ f ^{0.5} | - | - | 6** |
| 10-20 | 27.46 | 0.0728 | -2 | 6 |
| 20-48 | 58.07/ f ^{0.25} | 0.1540/ f ^{0.25} | 8.944/ f ^{0.5} | 6 |
| 48-300 | 22.06 | 0.05852 | 1.291 | 6 |
| 300-6000 | 3.142 f ^{0.3417} | 0.008335 f ^{0.3417} | 0.02619 f ^{0.6834} | 6 |
| 6000-15000 | 61.4 | 0.163 | 10 | 6 |
| 15000-150000 | 61.4 | 0.163 | 10 | 616000/ f ^{1.2} |
| 150000-300000 | 0.158 f ^{0.5} | 4.21 x 10 ⁻⁴ f ^{0.5} | 6.67 x 10 ⁻⁵ f | 616000/ f ^{1.2} |

Note: f is frequency in MHz.

* Based on nerve stimulation (NS).

** Based on specific absorption rate (SAR).



12.2 RESULT

Friss Transmission Formula: $P_d = (P_{out} * G) / (4 * \pi * r^2)$

Where

P_d = power density in mW/cm²

P_{out} = antenna power in mW

G = gain of antenna in linear scale

π = 3.1416

R = Distance between observation point and the center of radiator in cm, $R=100$ cm

ANT Gain (G)

Combination gain: 3dBi (gain of antenna in linear scale=2.00)

FCC:

| Protocol | MAX Power (dBm) | MAX Power (mW) | Power Density (mW/cm ²) | Limit (mW/cm ²) | Result |
|----------|-----------------|----------------|-------------------------------------|-----------------------------|--------|
| FHSS | 29.482 | 887.565 | 0.0141 | 0.6182 | Pass |

IC:

| Protocol | MAX Power (dBm) | MAX Power (mW) | Power Density (mW/cm ²) | Limit (mW/cm ²) | Result |
|----------|-----------------|----------------|-------------------------------------|-----------------------------|--------|
| FHSS | 29.482 | 887.565 | 0.0141 | 0.2792 | Pass |



APPENDIX-PHOTOS OF TEST SETUP

Note: See test photos in setup photo document for the actual connections between Product and support equipment.

※※※※※END OF THE REPORT※※※※※

