

FCC Test Report

| FCC ID : | 1 | RID-LS134 |
|-----------------|---|--|
| Equipment : | 1 | LoRa [®] Smoke and Heat Detector |
| Model No. : | | LS-134XX (X can be any alphanumeric character for marketing purpose) |
| Brand Name : | | GlobalSat |
| Applicant : | | GlobalSat WorldCom Corporation |
| Address : | | 16F., No.186, Jian 1st Rd., Zhonghe Dist., New Taipei City, 23553, Taiwan |
| Standard : | | 47 CFR FCC Part 15.247 |
| Received Date : | | Sep. 19, 2017 |
| Tested Date : | | Jun. 05 ~ Aug. 30, 2018 |

We, International Certification Corp., would like to declare that the tested sample has been evaluated and in compliance with the requirement of the above standards. The test results contained in this report refer exclusively to the product. It may be duplicated completely for legal use with the approval of the applicant. It shall not be reproduced except in full without the written approval of our laboratory.

Reviewed by:

na Chei

Along Chei) Assistant Manager

Approved by:

Gary Chang / Manager





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Release Record

| Report No. | Version | Description | Issued Date |
|---------------|---------|---------------|---------------|
| FR791901-01-1 | Rev. 01 | Initial issue | Sep. 13, 2018 |



| FCC Rules | Test Items | Measured | Result |
|-----------------|----------------------------|-------------------------------|--------|
| 15.207 | Conducted Emissions | Note | N/A |
| 15.247(d) | Radiated Emissions | [dBuV/m at 3m]: 955.38MHz | Deer |
| 15.209 | Radiated Emissions | 42.80 (Margin -3.20dB) - PK | Pass |
| 15.247(d) | Band Edge | Meet the requirement of limit | Pass |
| 15.247(b)(2)(3) | Conducted Output Power | Power [dBm]: 18.56 | Pass |
| 15.247(a)(1)(i) | Number of Hopping Channels | Meet the requirement of limit | Pass |
| 15.247(a)(1) | Hopping Channel Separation | Meet the requirement of limit | Pass |
| 15.247(f) | Dwell Time | Meet the requirement of limit | Pass |
| 15.247(f) | Power spectral density | Meet the requirement of limit | Pass |
| 15.203 | Antenna Requirement | Meet the requirement of limit | Pass |

Summary of Test Results

Note: The EUT consumes DC power, so the test is not required.



General Description 1

Information 1.1

1.1.1 Specification of the Equipment under Test (EUT)

| RF General Information | | | | | |
|--|-----------------|-------------------|------------------------------|---------------|-------------------------------|
| Frequency Range (MHz) | Ch. Freq. (MHz) | Channel Number | Physical bit rate (bit/s) | Spread Factor | Channel Bandwidth (kHz) |
| 902 ~ 928 | 902.3 ~ 914.9 | 0-63 [64] | 5470~ 980 | 7~10 | 125 |
| 902 ~ 928 | 903.0 ~ 914.2 | 0-7 [8] | 12500 | 8 | 500 |
| Note 1: RF output power specifies that Maximum Conducted (Average) Output Power. | | | | | |

te 1: RF output power specifies that Maximum Conducted (Average) Output Power.

Note 2: The device uses FSK modulation.

Note 3: The device supports hybrid mode.

1.1.2 Antenna Details

| Ant. No. | Туре | Connector | Gain (dBi) |
|----------|------|-----------|------------|
| 1 | chip | N/A | 1.6 |

1.1.3 Power Supply Type of Equipment under Test (EUT)

| Power Supply Type | 3Vdc from battery |
|-------------------|-------------------|
|-------------------|-------------------|

1.1.4 Accessories

| | Accessories | | | |
|-----|---------------------------|---|--|--|
| No. | Equipment | Description | | |
| 1 | Lithium battery | Brand: Panasonic Model: CR123A Power Rating: 3Vdc | | |
| 2 | Sensor Programmable Cable | 1m non-shielded without core. | | |



1.1.5 Channel List

| Channel Ba | Channel Bandwidth (kHz): 125 | | | | | | |
|------------|------------------------------|---------|--------------------|---------|--------------------|---------|--------------------|
| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
| 0 | 902.3 | 16 | 905.5 | 32 | 908.7 | 48 | 911.9 |
| 1 | 902.5 | 17 | 905.7 | 33 | 908.9 | 49 | 912.1 |
| 2 | 902.7 | 18 | 905.9 | 34 | 909.1 | 50 | 912.3 |
| 3 | 902.9 | 19 | 906.1 | 35 | 909.3 | 51 | 912.5 |
| 4 | 903.1 | 20 | 906.3 | 36 | 909.5 | 52 | 912.7 |
| 5 | 903.3 | 21 | 906.5 | 37 | 909.7 | 53 | 912.9 |
| 6 | 903.5 | 22 | 906.7 | 38 | 909.9 | 54 | 913.1 |
| 7 | 903.7 | 23 | 906.9 | 39 | 910.1 | 55 | 913.3 |
| 8 | 903.9 | 24 | 907.1 | 40 | 910.3 | 56 | 913.5 |
| 9 | 904.1 | 25 | 907.3 | 41 | 910.5 | 57 | 913.7 |
| 10 | 904.3 | 26 | 907.5 | 42 | 910.7 | 58 | 913.9 |
| 11 | 904.5 | 27 | 907.7 | 43 | 910.9 | 59 | 914.1 |
| 12 | 904.7 | 28 | 907.9 | 44 | 911.1 | 60 | 914.3 |
| 13 | 904.9 | 29 | 908.1 | 45 | 911.3 | 61 | 914.5 |
| 14 | 905.1 | 30 | 908.3 | 46 | 911.5 | 62 | 914.7 |
| 15 | 905.3 | 31 | 908.5 | 47 | 911.7 | 63 | 914.9 |

| Channel Bandwidth (kHz): 500 | | |
|------------------------------|-----------------|--|
| Channel | Frequency (MHz) | |
| 0 | 903.0 | |
| 1 | 904.6 | |
| 2 | 906.2 | |
| 3 | 907.8 | |
| 4 | 909.4 | |
| 5 | 911.0 | |
| 6 | 912.6 | |
| 7 | 914.2 | |



1.1.6 Test Tool and Duty Cycle

| Channel Bandwidth (kHz): 125 | | |
|------------------------------|-----------------------------|--|
| Test Tool | Realterm, version: 2.0.0.70 | |
| Duty cycle | 100.00% | |

| Channel Bandwidth (kHz): 500 | | |
|------------------------------|-----------------------------|--|
| Test Tool | Realterm, version: 2.0.0.70 | |
| Duty cycle | 94.86% | |

1.1.7 Power Setting

| Channel | Modulation | | Test Frequency (MHz) | |
|--------------------|------------|-------|----------------------|-------|
| Bandwidth (kHz) | Mode | 902.3 | 908.5 | 914.9 |
| 125 | FSK | 7 | 7 | 7 |

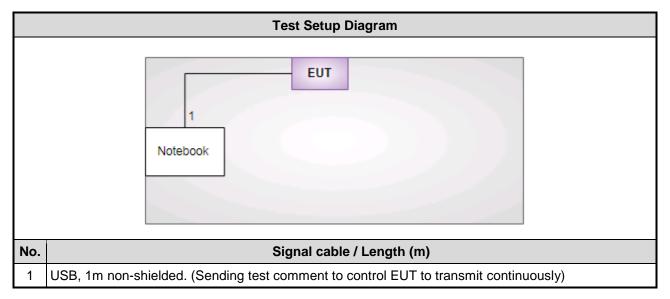
| Channel | Modulation | | Test Frequency (MHz) | |
|--------------------|------------|-------|----------------------|-------|
| Bandwidth (kHz) | Mode | 903.0 | 907.8 | 914.2 |
| 500 | FSK | 7 | 7 | 7 |



1.2 Local Support Equipment List

| | | Sı | upport Equipment | List | |
|-----|-----------|-------|------------------|--------|---------|
| No. | Equipment | Brand | Model | FCC ID | Remarks |
| 1 | Notebook | DELL | Latitude E6440 | DoC | |

1.3 Test Setup Chart





1.4 The Equipment List

| Test Item | Radiated Emission | | | | |
|-------------------------|--------------------------|--------------------------|------------------|------------------|-------------------|
| Test Site | 966 chamber1 / (03Cl | H01-WS) | | | |
| Tested Date | Jun. 05, 2018 | | | | |
| Instrument | Manufacturer | Model No. | Serial No. | Calibration Date | Calibration Until |
| Spectrum Analyzer | R&S | FSV40 | 101498 | Dec. 04, 2017 | Dec. 03, 2018 |
| Receiver | R&S | ESR3 | 101658 | Nov. 20, 2017 | Nov. 19, 2018 |
| Bilog Antenna | SCHWARZBECK | VULB9168 | VULB9168-522 | Jul. 25, 2017 | Jul. 24, 2018 |
| Horn Antenna 1G-18G | SCHWARZBECK | BBHA 9120 D | BBHA 9120 D 1096 | Dec. 20, 2017 | Dec. 19, 2018 |
| Horn Antenna 18G-40G | SCHWARZBECK | BBHA 9170 | BBHA 9170517 | Nov. 23, 2017 | Nov. 22, 2018 |
| Loop Antenna | R&S | HFH2-Z2 | 100330 | Nov. 13, 2017 | Nov. 12, 2018 |
| Loop Antenna Cable | KOAX KABEL | 101354-BW | 101354-BW | Dec. 07, 2017 | Dec. 06, 2018 |
| Preamplifier | EMC | EMC02325 | 980225 | Jul. 28, 2017 | Jul. 27, 2018 |
| Preamplifier | Agilent | 83017A | MY39501308 | Oct. 06, 2017 | Oct. 05, 2018 |
| Preamplifier | EMC | EMC184045B | 980192 | Aug. 22, 2017 | Aug. 21, 2018 |
| RF Cable | HUBER+SUHNER | SUCOFLEX104 | MY16014/4 | Dec. 07, 2017 | Dec. 06, 2018 |
| RF Cable | HUBER+SUHNER | SUCOFLEX104 | MY16019/4 | Dec. 07, 2017 | Dec. 06, 2018 |
| RF Cable | HUBER+SUHNER | SUCOFLEX104 | MY16139/4 | Dec. 07, 2017 | Dec. 06, 2018 |
| LF cable 1M | EMC | EMCCFD400-NM-N M-1000 | 16052 | Dec. 07, 2017 | Dec. 06, 2018 |
| LF cable 3M | Woken | CFD400NL-LW | CFD400NL-001 | Dec. 07, 2017 | Dec. 06, 2018 |
| LF cable 10M | Woken | CFD400NL-LW | CFD400NL-002 | Dec. 07, 2017 | Dec. 06, 2018 |
| Measurement Software | AUDIX | e3 | 6.120210g | NA | NA |
| Note: Calibration Inter | val of instruments liste | d above is one year. | | | |

| Test Item | RF Conducted | | | | |
|-------------------------|-----------------------|-----------|------------|------------------|-------------------|
| Test Site | (TH01-WS) | | | | |
| Tested Date | Aug. 29 ~ Aug. 30, 20 | 18 | | | |
| Instrument | Manufacturer | Model No. | Serial No. | Calibration Date | Calibration Until |
| Spectrum Analyzer | R&S | FSV40 | 101486 | Nov. 21, 2017 | Nov. 20, 2018 |
| Power Meter | Anritsu | ML2495A | 1241002 | Oct. 16, 2017 | Oct. 15, 2018 |
| Power Sensor | Anritsu | MA2411B | 1207366 | Oct. 16, 2017 | Oct. 15, 2018 |
| AC POWER SOURCE | APC | AFC-500W | F312060012 | Dec. 01, 2017 | Nov. 30, 2018 |
| Measurement Software | Sporton | Sporton_1 | 1.3.30 | NA | NA |



| Test Item | Radiated Emission | | | | |
|-------------------------|-----------------------|--------------------------|------------------|------------------|-------------------|
| Test Site | 966 chamber1 / (03Cl | H01-WS) | | | |
| Tested Date | Aug. 30 ~ Aug. 31, 20 | 18 | | | |
| Instrument | Manufacturer | Model No. | Serial No. | Calibration Date | Calibration Until |
| Spectrum Analyzer | R&S | FSV40 | 101498 | Dec. 04, 2017 | Dec. 03, 2018 |
| Receiver | R&S | ESR3 | 101658 | Nov. 20, 2017 | Nov. 19, 2018 |
| Bilog Antenna | SCHWARZBECK | VULB9168 | VULB9168-522 | Jul. 18, 2018 | Jul. 17, 2019 |
| Horn Antenna 1G-18G | SCHWARZBECK | BBHA 9120 D | BBHA 9120 D 1096 | Dec. 20, 2017 | Dec. 19, 2018 |
| Horn Antenna 18G-40G | SCHWARZBECK | BBHA 9170 | BBHA 9170517 | Nov. 23, 2017 | Nov. 22, 2018 |
| Loop Antenna | R&S | HFH2-Z2 | 100330 | Nov. 13, 2017 | Nov. 12, 2018 |
| Loop Antenna Cable | KOAX KABEL | 101354-BW | 101354-BW | Dec. 07, 2017 | Dec. 06, 2018 |
| Preamplifier | EMC | EMC02325 | 980225 | Jul. 20, 2018 | Jul. 19, 2019 |
| Preamplifier | Agilent | 83017A | MY39501308 | Oct. 06, 2017 | Oct. 05, 2018 |
| Preamplifier | EMC | EMC184045B | 980192 | Aug. 09, 2018 | Aug. 08, 2019 |
| RF Cable | HUBER+SUHNER | SUCOFLEX104 | MY16140/4 | May 09, 2018 | May 08, 2019 |
| RF Cable | HUBER+SUHNER | SUCOFLEX104 | MY16019/4 | Dec. 07, 2017 | Dec. 06, 2018 |
| RF Cable | HUBER+SUHNER | SUCOFLEX104 | MY16139/4 | Dec. 07, 2017 | Dec. 06, 2018 |
| LF cable 1M | EMC | EMCCFD400-NM-N M-1000 | 16052 | Dec. 07, 2017 | Dec. 06, 2018 |
| LF cable 3M | Woken | CFD400NL-LW | CFD400NL-001 | Dec. 07, 2017 | Dec. 06, 2018 |
| LF cable 10M | Woken | CFD400NL-LW | CFD400NL-002 | Dec. 07, 2017 | Dec. 06, 2018 |
| Measurement Software | AUDIX | e3 | 6.120210g | NA | NA |

1.5 Test Standards

According to the specification of EUT, the EUT must comply with following standards and KDB documents.

47 CFR FCC Part 15.247 ANSI C63.10-2013 FCC KDB 558074 D01 15.247 Meas Guidance v05



1.6 Measurement Uncertainty

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

| Measurement Uncertainty | |
|--------------------------|-------------|
| Parameters | Uncertainty |
| Bandwidth | ±34.134 Hz |
| Conducted power | ±0.808 dB |
| Power density | ±0.463 dB |
| Conducted emission | ±2.670 dB |
| AC conducted emission | ±2.90 dB |
| Radiated emission ≤ 1GHz | ±3.66 dB |
| Radiated emission > 1GHz | ±5.63 dB |



Test Configuration 2

2.1 **Testing Condition**

| Test Item | Test Site | Ambient Condition | Tested By |
|--------------------|-----------|-------------------|------------------------|
| Radiated Emissions | 03CH01-WS | 24-25°C / 61-62% | Akun Chung Roger Lu |
| RF Conducted | TH01-WS | 24°C / 66% | Felix Sung |

➢ FCC Designation No.: TW2732

➢ FCC site registration No.: 181692

IC site registration No.: 10807A-1

The Worst Test Modes and Channel Details 2.2

| Test Frequency (MHz) | Channel Bandwidth (kHz) | Modulation / SF |
|-------------------------|---|---|
| 902.3 / 908.5 / 914.9 | 125 | FSK / 10 |
| 902.3 ~ 914.9 | 125 | FSK / 10 |
| 902.3 | 125 | FSK: 10/9/8/7 |
| | (MHz) 902.3 / 908.5 / 914.9 902.3 ~ 914.9 | (MHz) (kHz) 902.3 / 908.5 / 914.9 125 902.3 ~ 914.9 125 |

NOTE:

1. The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement - X, Y, and Z-plane. The X-plane results were found as the worst case and were shown in this report.

Channel Bandwidth (kHz): 500

| | Toot Fragmanay | Channal Bandwidth | |
|-----------------------------|-------------------------|----------------------------|-----------------|
| Test item | Test Frequency (MHz) | Channel Bandwidth (kHz) | Modulation / SF |
| Radiated Emissions ≤ 1GHz | | | |
| Radiated Emissions > 1GHz | | | |
| Conducted Output Power | | 500 | 501/ / 0 |
| Hopping Channel Separation | 903.0 / 907.8 / 914.2 | 500 | FSK/8 |
| 20dB and Occupied bandwidth | | | |
| Power Spectral Density | | | |
| Number of Hopping Channels | 903.0 ~ 914.2 | 500 | FSK / 8 |
| Dwell Time | 903.0 | 500 | FSK / 8 |
| NOTE: | | | I |

The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement – X, Y, and 1. Z-plane. The X-plane results were found as the worst case and were shown in this report.



3 Transmitter Test Results

3.1 Unwanted Emissions into Restricted Frequency Bands

3.1.1 Limit of Unwanted Emissions into Restricted Frequency Bands

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

Note 1:

Qusai-Peak value is measured for frequency below 1GHz except for 9–90 kHz, 110–490 kHz frequency band. Peak and average value are measured for frequency above 1GHz. The limit on average radio frequency emission is as above table. The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit **Note 2:**

Measurements may be performed at a distance other than what is specified provided. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor as below, Frequency at or above 30 MHz: 20 dB/decade Frequency below 30 MHz: 40 dB/decade.

3.1.2 Test Procedures

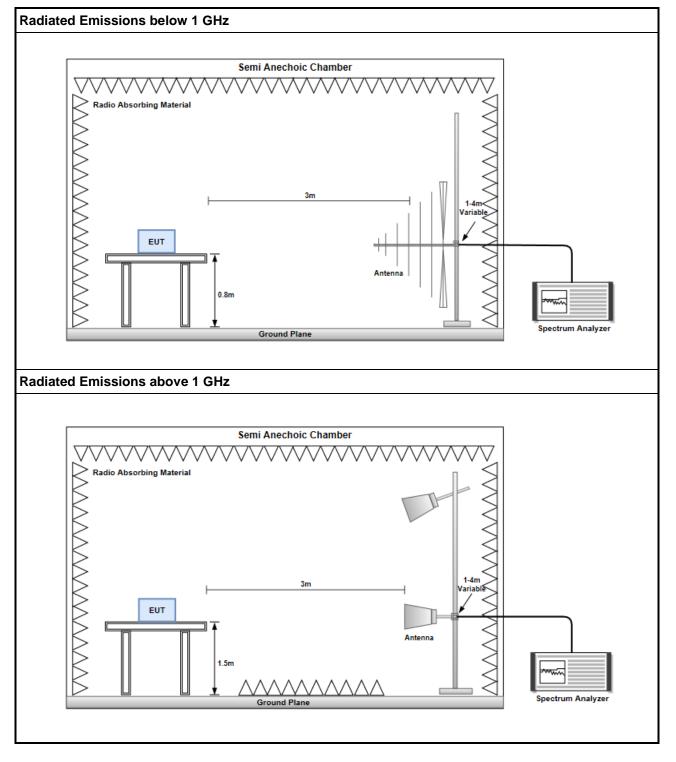
- Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency. The EUT is placed at test table. For emissions testing at or below 1 GHz, the table height is 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height is 1.5 m
- Measurement is made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna is varied in height (1m ~ 4m) above the reference ground plane to obtain the maximum signal strength. Distance between EUT and antenna is 3 m.
- 3. This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.

Note:

- 1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
- 2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
- 3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above 1GHz.



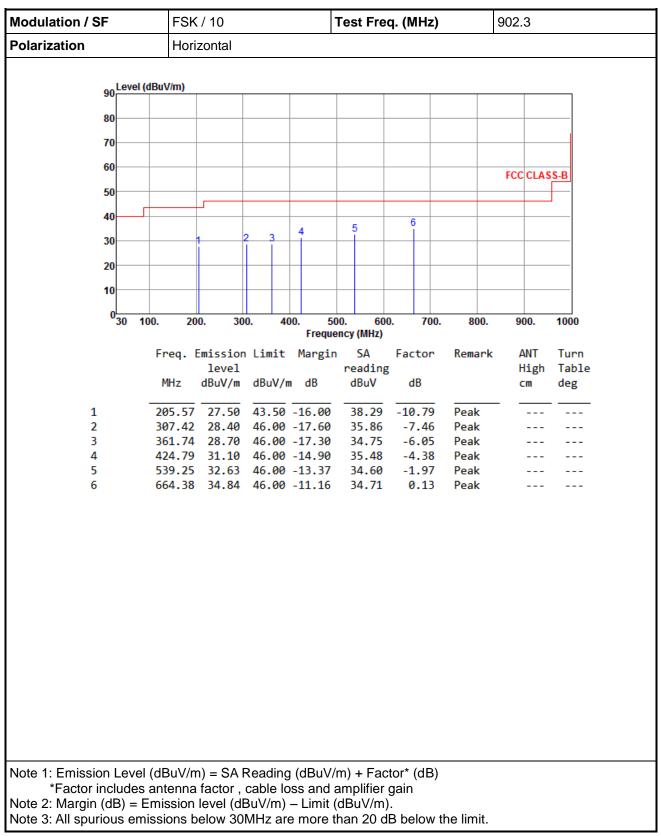
3.1.3 Test Setup





Channel Bandwidth (kHz): 125

3.1.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)





| Modulation / SF | FSK | / 10 | | - | Test Fre | q. (MHz) | | 902.3 | |
|------------------------|---------|----------|---------|------------------|---------------------|----------------|--------------|---------|-------|
| Polarization | Vert | ical | | | | | | | |
| | | | | | | | | | |
| 90 Level (| dBuV/m) | | | | | | | | |
| 80 | | | | | | | | | |
| 70 | | | | | | | | | |
| | | | | | | | | | |
| 60 | | | | | | | | FCC CLA | SS-B |
| 50 | | | | | | | | | |
| 40 | | | | | | | | | • |
| 20 | | | 2 | 4 | 1 | | | | |
| 30 | | 1 | Î | | | | | | |
| 20 | | | | | | | | | |
| 10 | | | | | | | | | + |
| 0 | | | | | | | | | |
| 0 ^L 30 1 | 00. 20 | 0. 30 | 0. 4 | 00. 50 Freque | 0. 600 ncy (MHz) | 0. 700. | . 800. | 900. | 1000 |
| | Freq. H | Emissior | n Limit | Margin | SA | Factor | Remark | ANT | Turn |
| | | level | | - | reading | | | High | |
| | MHz | dBuV/m | dBuV/r | n dB | dBuV | dB | | cm | deg |
| 1 | 240.49 | 24.13 | 46.00 | -21.87 | 33.77 | -9.64 | Peak | | |
| 2 | 327.79 | | | -18.09 | 34.87 | -6.96 | Peak | | |
| 3 4 | | | | -16.79 -14.31 | 34.25 36.07 | -5.04 -4.38 | Peak Peak | | |
| 5 | | | | -11.13 | 35.62 | -4.38 | Peak | | |
| 6 | 955.38 | | | -3.20 | 37.87 | 4.93 | Peak | | |
| | | | | | | | | | |
| | | | | | | | | | |



| Modulation / SF | FSK | / 10 | | - | Test Free | q. (MHz) | | 908.5 | |
|---|----------|-----------|----------|------------------|---------------------|----------------|--------------|----------|-------|
| Polarization | Hori | zontal | | | | | | | |
| Lovel (d | Dull(m) | | | | | | | | |
| 90 Level (d | BUV/III) | | | | | | | | |
| 80 | | | | | | | | | |
| 70 | | | | | | | | | |
| 60 | | | | | | | | FCC CLAS | S P |
| 50 | | | | | | | | | - |
| 40 | | | | | | | 6 | | |
| 30 | | 1 | 2 3 | 4 | 5 | | ľ – | | |
| | | | | | | | | | |
| 20 | | | | | | | | | |
| 10 | | | | | | | | | |
| 0 <mark></mark> | 0. 20 | 0. 30 | 0. 4 | 00. 50 | |). 700. | 800. | 900. | 1000 |
| | Freq. F | mission | limit | Margin | ncy (MHz) SA | Factor | Remark | ANT | Turn |
| | | level | | - | reading | | | High | Table |
| | MHz | dBuV/m | dBuV/I | m dB | dBuV | dB | | CM | deg |
| 1 | | | | -15.30 | | -10.79 | Peak | | |
| 2 3 | | | | -17.85 -17.55 | 35.56 33.71 | -7.41 -5.26 | Peak Peak | | |
| 4 | 480.08 | 31.76 | 46.00 | -14.24 | 34.98 | -3.22 | Peak | | |
| 5 | | | | -12.72 -10.29 | | -0.75 1.44 | Peak Peak | | |
| Ū | / | 55171 | 40100 | 10125 | 54127 | | 1 Curt | | |
| | | | | | | | | | |
| | | | | | | | | | |
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| | | | | | | | | | |
| | | | | | | | | | |
| Note 1: Emission Level | (dBuV/m | ר) = SA I | Reading | g (dBuV/ | m) + Fac | tor* (dB) | | | |
| *Factor includes a Note 2: Margin (dB) = E | antenna | factor, | cable lo | oss and a | amplifier | gain | | | |
| M = H = M = M = M = H | meeinn | | | | / MB (I \ / / MO \ | | | | |



| Modulation / SF | FSK | / 10 | | 1 | Fest Fre | q. (MHz) | | 908.5 | |
|---|---------|---------|---------|------------------|--------------------|----------|--------------|----------|-------|
| Polarization | Verti | cal | | | | | | | |
| | dBuV/m) | | | | | | | | |
| 90 | | | | | | | | | |
| 80 | | | | | | | | | |
| 70 | | | | | | | | | |
| 60 | | | | | | | | | |
| 50 | | | | | | | | FCC CLAS | S-B |
| F | | | | | | | | - 0 | |
| 40 | | | | | 4 5 | 5 | | | |
| 30 | | 1 | 23 | | | | | | |
| 20 | | | | | | | | | |
| 10 | | | | | | | | | |
| | | | | | | | | | |
| 0 <mark></mark> | 00. 20 | 0. 30 | 0. 4 | 00. 50 Freque | 0. 60 ncy (MHz) | 0. 700. | 800. | 900. | 1000 |
| | Frea. E | mission | h Limit | Margin | | Factor | Remark | ANT | Turn |
| | | level | | - | reading | 5 | | High | Table |
| | MHz | dBuV/m | dBuV/ı | n dB | dBuV | dB | | cm | deg |
| 1 | 236.61 | 24.41 | 46.00 | -21.59 | 34.26 | -9.85 | Peak | | |
| 2 | 362.71 | | | -17.29 | 34.74 | -6.03 | Peak | | |
| 3 4 | | | | -16.65 -13.63 | 34.61 34.57 | | Peak Peak | | |
| 5 | | | | -12.50 | | | Peak | | |
| 6 | 955.38 | 42.50 | 46.00 | -3.50 | 37.57 | 4.93 | Peak | | |
| | | | | | | | | | |
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| | | | | | | | | | |
| Note 1: Emission Level | | | | | | | | | |
| *Factor includes Note 2: Margin (dB) = E | | | | | | | | | |
| Note 3: All spurious em | | | | | | | | | |

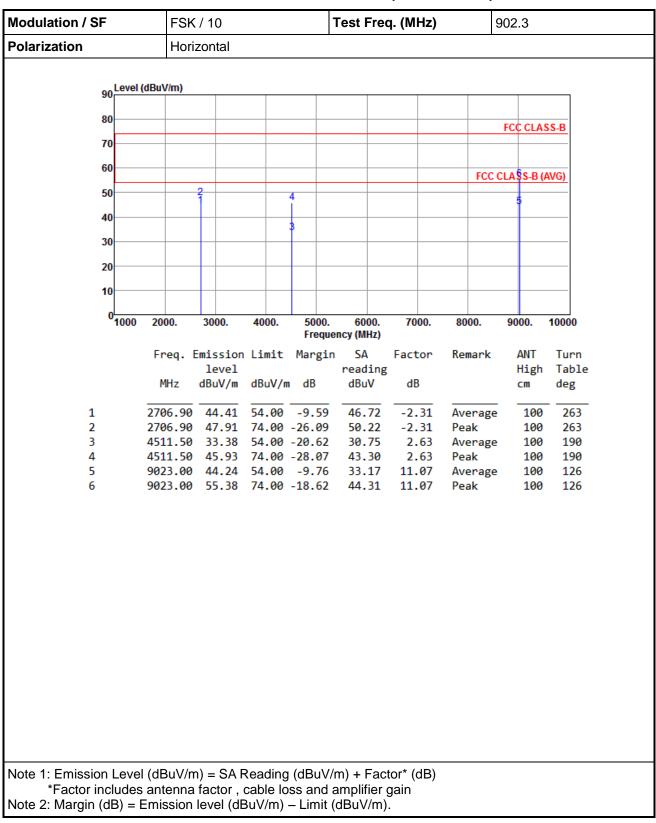


| Modulation / SF | FSK | / 10 | | • | Test Fre | q. (MHz |) | 914 | .9 | |
|--|----------|-----------|----------|------------------|------------------|----------------|-----------|------|------|-------|
| Polarization | Horiz | zontal | | | | | | | | |
| Lovel (d | Dull(m) | | | | | | | | | |
| 90 Level (d | Buv/m) | | | | | | | | | |
| 80 | | | | | | | | | | |
| 70 | | | | | | | | | | |
| 60 | | | | | | | | FC | CLAS | S R |
| 50 | | | | | | | | | | |
| 40 | | | | | | | | | | J |
| 30 | | 1 | 2 3 | 4 | 5 | | 6 | | | |
| | | | Ī | | | | | | | |
| 20 | | | | | | | | | | |
| 10 | | | | | | | | | | |
| 0 <mark></mark> | 0. 20 | 0. 30 | 0. 4 | |)0. 60 | 0. 700 |). 800 |). 9 | 00. | 1000 |
| | Freq F | mission | jmi+ | Freque Margin | ency (MHz) SA | Factor | Remar | nk - | ANT | Turn |
| | - | level | | - | reading | g | iteliai | | High | Table |
| | MHz | dBuV/m | dBuV/ | n dB | dBuV | dB | | | cm | deg |
| 1 | | | | -16.44 | | -10.79 | | | | |
| 2 3 | | | | -18.14 -17.59 | 35.27 34.05 | -7.41 -5.64 | | | | |
| 4 | 481.05 | 30.93 | 46.00 | -15.07 | 34.13 | -3.20 | Peak | | | |
| 5 | | | | -12.87 -10.44 | | | | | | |
| Ū | 720.40 | 55.50 | 40.00 | 10.44 | 54.10 | 1.50 | T Curk | | | |
| | | | | | | | | | | |
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| | | | | | | | | | | |
| Note 1: Emission Level (| (dBuV/m | i) = SA I | Reading | a (dBuV/ | m) + Fac | tor* (dB |) | | | |
| *Factor includes a | antenna | factor, | cable lo | oss and a | amplifier | gain | , | | | |
| Note 2: Margin (dB) = E Note 3: All spurious emis | | | | | | | the limit | ŀ | | |
| ote 3: All spurious emis | ssions b | elow 30 | MHZ ar | e more t | nan 20 d | IR Delow | the limit | [. | | |



| Modulation / SF | FSK | / 10 | | - | Test Fre | eq. | (MHz) | | 914.9 | |
|-------------------------|------------|------------------|----------|------------------|----------------|------|----------------|--------------|-------------|---------------|
| Polarization | Verti | cal | | | | | | | | |
| Lovel | (dDu\//m) | | | | | | | | | |
| 90 | (dBuV/m) | | | | | | | | | |
| 80 | | | | | | | | | | |
| 70 | | | | | | | | | | |
| 60 | | | | | | | | | FCC CLA | CC D |
| 50 | | | | | | | | | FUULA | |
| 40 | | | | | | | | | | 6 |
| | | | 1 | 2 | 3 4 | | 5 I | | | |
| 30 | | | | Ī | | | | | | |
| 20 | | | | | | | | | | |
| 10 | | | | | | | | | | |
| 0 <mark>0</mark> | 00. 20 | 0. 30 | 0 4 |)0. 50 | 0 6 | 00. | 700. | 800. | 900. | 1000 |
| | 20 | | | | ncy (MHz) | | | | | |
| | Freq. E | missior level | l Limit | Margin | SA readin | | actor | Remark | ANT High | Turn Table |
| | MHz | dBuV/m | dBuV/r | n dB | dBuV | g | dB | | cm | deg |
| 1 | 220 72 | 28.49 | 16 00 | 17 51 | 35.40 | _ | -6.91 | Peak | | |
| 2 | | 20.49 | | | 34.10 | | -4.46 | Peak | | |
| 3 | | | | -14.06 | 34.14 | | -2.20 | Peak | | · |
| 4 5 | | | | -13.11 -11.89 | 34.09 34.32 | | -1.20 -0.21 | Peak Peak | | |
| 6 | | | | -3.84 | | | 4.93 | Peak | | |
| | | | | | | | | | | |
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| Note 1: Emission Leve | l (dBu\//m | a = SA | Reading | ı (dBu\// | m) + Fa | cto | r* (dR) | | | |
| *Factor includes | antenna | factor, | cable lo | ss and a | amplifie | . ga | | | | |
| Note 2: Margin (dB) = I | Emission | level (dl | 3uV/m) | – Limit (| dBuV/m | ı). | | ha line't | | |
| Note 3: All spurious em | nissions b | elow 30 | MHz ar | e more t | han 20 (| dB | below t | ne limit. | | |





3.1.5 Transmitter Radiated Unwanted Emissions (Above 1GHz)



| Modulation / SF | FSK | / 10 | | • | Test Free | q. (MHz) | ç | 02.3 | |
|-----------------------|------------|-----------------|---------|-----------------|---------------------|---------------|-----------------|------------|--------------|
| Polarization | Vert | ical | | | | | | | |
| Leve | l (dBuV/m) | | | | | | | | |
| 90 | | | | | | | | | |
| 80 | | | | | | | | FCC CLAS | SS-B |
| 70 | | | | | | | | | |
| 60 | | | | | | | | | |
| 50 | | 2 | | | | | FCC (| CLASS-B (/ | AVG) |
| | | | | 4 | | | | 5 | |
| 40 | | | | 3 | | | | | |
| 30 | | | | | | | | | |
| 20 | | | | | | | | | |
| 10 | | | | | | | | | |
| 0 | | | | | | | | | |
| 01000 | 2000. | 3000. | 4000. | 5000. Freque | 6000. ency (MHz) | 7000. | 8000. | 9000. | 10000 |
| | Freq. | Emission | Limit | Margin | | Factor | Remark | ANT | Turn |
| | MHz | level dBuV/m | dBuV/m | dB | reading dBuV | dB | | High cm | Table deg |
| | | | ubuv/ii | | | | | CIII | |
| 1 | | 46.47 | | | 48.78 | -2.31 | Average | | |
| 2 3 | | 50.11 33.28 | | | 52.42 30.65 | -2.31 2.63 | Peak Average | 247 100 | |
| 4 | 4511.50 | 45.96 | 74.00 | -28.04 | 43.33 | 2.63 | Peak | 100 | 3 |
| 5 6 | | 44.43 55.33 | | | | | Average Peak | 100 100 | |
| 0 | 9025.00 | 33.33 | 74.00 | -10.07 | 44.20 | 11.07 | reak | 100 | 250 |
| | | | | | | | | | |
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| | | | | | | | | | |
| Note 1: Emission Leve | | | | | | | | | |
| *Factor include | | | | | | | | | |
| Note 2: Margin (dB) = | | ievel (dE | suv/m) | – Limit (| uBuV/M) | | | | |



| Modulation / SF | FSK | / 10 | | ٦ | Test Free | q. (MHz) | ę | 908.5 | |
|--|------------|-----------------|---------------|--------|-----------------|---------------|-----------------|------------|--------------|
| Polarization | Hori | zontal | | | | | | | |
| Lovo | (dDu)//m) | | | | | | | | |
| 90 | l (dBuV/m) | | | | | | | | |
| 80 | | | | | | | | FCC CLAS | SS-B |
| 70 | | | | | | | | TOUCER | |
| 60 | | | | | | | | | |
| | | 2 | | | | | FCC | CLASS-B (/ | AVG) |
| 50 | | 1 | | 4 | | | | 5 | |
| 40 | | | | | | | | | |
| 30 | | | | 1 | | | | | |
| 20 | | | | | | | | | |
| | | | | | | | | | |
| 10 | | | | | | | | | |
| 0 <mark></mark> | 2000. | 3000. | 4000. | 5000. | 6000. | 7000. | 8000. | 9000. | 10000 |
| | | | | | ncy (MHz) | | | | |
| | Freq. I | Emission | Limit | Margin | | Factor | Remark | ANT | Turn |
| | MHz | level dBuV/m | dBuV/m | dB | reading dBuV | dB | | High cm | Table deg |
| | | | | | | | | | |
| 1 | | 45.77 | | | 48.01 | -2.24 | Average | | |
| 2 3 | | 49.39 33.55 | | | 51.63 30.83 | -2.24 2.72 | Peak Average | 121 100 | |
| 4 | | 46.14 | | | | 2.72 | _ | 100 | |
| 5 | | 45.80 | | | | | - | | |
| 6 | 9085.00 | 56.11 | /4.00 | -17.89 | 44.88 | 11.23 | Peak | 100 | 125 |
| | | | | | | | | | |
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| Note 4. Encircles L | | |) o o climini | | ··· | | | | |
| Note 1: Emission Leve *Factor include | | | | | | | | | |
| Note 2: Margin (dB) = | | | | | | | | | |



| Polarization 90 Level 80 70 60 50 40 30 20 10 | 2000. | 2 | | 4 | | | FCC C | FCC CLAS | |
|---|--------------------|-----------------|---------|--------|-----------------|--------------|-----------------|--------------------------|-------|
| 90 80 70 60 50 40 30 20 | | 2 | | 4 | | | FCC C | | |
| 90 80 70 60 50 40 30 20 | | 2 | | 4 | | | FCC C | | |
| 70 60 50 40 30 20 | 2000. | 2 | | 4 | | | FCC C | | |
| 60 50 40 30 20 | 2000. | 2 | | 4 | | | FCC C | | |
| 50 40 30 20 | 2000. | 2 | | 4 | | | FCC C | <u>сца\$\$-в (/</u> 5 | AVG) |
| 50 40 30 20 | 2000. | 2 | | 3 | | | FCC C | <u>LA\$\$-B (/</u> 5 | AVG) |
| 40 30 20 | 2000. | | | 3 | | | | 5 | |
| 30 20 | 2000. | | | 3 | | | | | |
| 20 | 2000. | | | | | | | | |
| 20 | 2000. | | | | 1 | | | | |
| | 2000. | | | | | | | | |
| 10 | 2000. | | 1 | | | | | | |
| | 2000. | | | | | | | | |
| 0 <mark>0</mark> 0 | | 3000. | 4000. | 5000. | 6000. | 7000. | 8000. | 9000. | 10000 |
| | | | | | ncy (MHz) | | | | |
| | Freq. E | mission | Limit | Margin | | Factor | Remark | ANT | Turn |
| | MHz | level dBuV/m | dD. M/m | db. | reading dBuV | dB | | High cm | |
| | ru 12 | ubuv/iii | ubuv/m | ub | ubuv | ub | | CIII | deg |
| 1 | 2725.50 | | | | 49.76 | -2.24 | Average | | |
| 2 3 | 2725.50 4542.50 | | | | 53.94 | -2.24 | Peak | 100 | |
| 4 | 4542.50 | | | | 30.72 43.40 | 2.72 2.72 | Average Peak | 100 100 | |
| 5 | 9085.00 | | | | | | | | 217 |
| 6 | 9085.00 | 56.42 | 74.00 | -17.58 | 45.19 | 11.23 | Peak | 100 | 217 |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| Note 1: Emission Leve *Factor includes | | | | | | | | _ | |



| Iodulation / SF | FSK | / 10 | | 1 | est Frec | ą. (MHz) | 9 | 14.9 | |
|-----------------------|------------|----------------|---------|------------------|--------------------|--------------|---------|------------|-------|
| olarization | Hori | zontal | | | | | | | |
| Loval | (dBuV/m) | | | | | | | | |
| 90 | | | | | | | | | |
| 80 | | | | | | | | FCC CLAS | S.B. |
| 70 | | | | | | | | TCCCLAS | |
| 60 | | | | | | | | | |
| 60 | | , | | | | | FCC C | CLASS-B (A | VG) |
| 50 | | 1 | | 4 | | | | 5 | |
| 40 | | | | | | | | | |
| 30 | | | | 3 | | | | | |
| | | | | | | | | | |
| 20 | | | | | | | | | |
| 10 | | | | | | | | | |
| 0 | | | | | | | | | |
| ¥1000 | 2000. | 3000. | 4000. | 5000. Frequei | 6000. ncy (MHz) | 7000. | 8000. | 9000. | 10000 |
| | Freq. H | Emission | Limit | Margin | | Factor | Remark | ANT | Turn |
| | | level | | | reading | | | High | Table |
| | MHz | dBuV/m | dBuV/m | dB | dBuV | dB | | cm | deg |
| 1 | 2744.70 | 46.68 | 54.00 | -7.32 | 48.87 | -2.19 | Average | 117 | 273 |
| 2 | | 50.01 | | | 52.20 | -2.19 | Peak | 117 | 273 |
| 3 4 | | 33.65 46.24 | | | 30.86 | 2.79 2.79 | - | 100 100 | |
| 5 | | 46.24 | | | | 11.38 | | | |
| 6 | | 56.67 | | | | 11.38 | Peak | 100 | 129 |
| | | | | | | | | | |
| lote 1: Emission Leve | el (dBuV/n |) = SA R | Reading | (dBuV/r | n) + Fact | or* (dB) | | | |

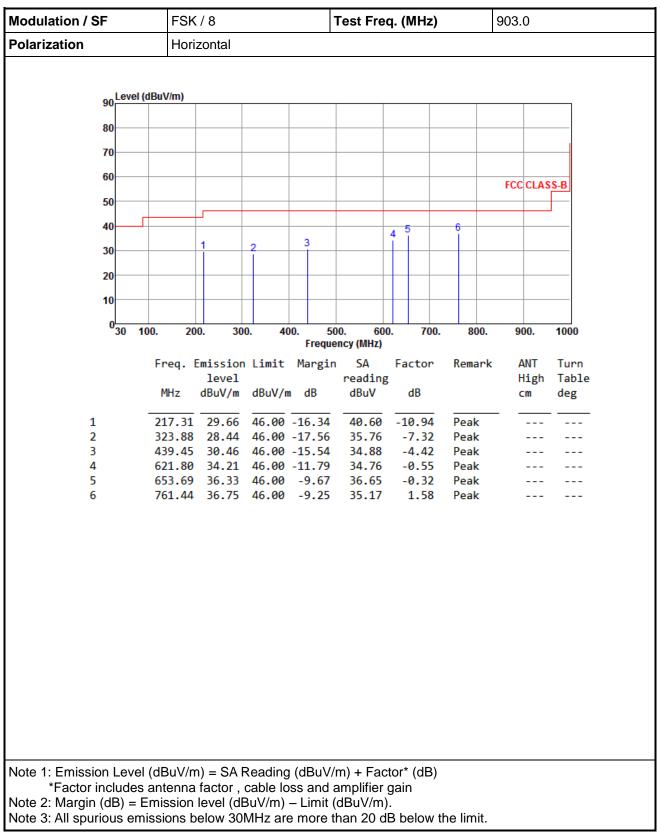


| Modulation / SF | FSK | / 10 | | ٦ | Test Fred | ą. (MHz) | g | 914.9 | | | |
|---|----------|-----------------|--------|-----------------|--------------------|----------------|-----------------|------------|--------------|--|--|
| Polarization | Vertical | | | | | | | | | | |
| Lovol | (dBuV/m) | | | | | | | | | | |
| 90 | | | | | | | | | | | |
| 80 | | | | | | | | FCC CLA | SS-B | | |
| 70 | | | | | | | | | | | |
| 60 | | | | | | | | | | | |
| | | 2 | | | | | FCC (| CLASS-B (| AVG) | | |
| 50 | | | | 4 | | | | 5 | | | |
| 40 | | | | 3 | | | | | | | |
| 30 | | | | 1 | | | | | | | |
| 20 | | | | | | | | | | | |
| | | | | | | | | | | | |
| 10 | | | | | | | | | | | |
| 0 <mark>-</mark> 1000 | 2000. | 3000. | 4000. | 5000. Freque | 6000. ncy (MHz) | 7000. | 8000. | 9000. | 10000 | | |
| | Freq. 1 | Emission | Limit | | SA | Factor | Remark | ANT | Turn | | |
| | MHz | level dBuV/m | dBuV/m | dB | reading dBuV | dB | | High cm | Table deg | | |
| | | | | | | | | | | | |
| 1 | | 47.90 | | | 50.09 | -2.19 | Average | | | | |
| 2 3 | | 51.15 33.49 | | | 53.34 30.70 | -2.19 2.79 | Peak Average | 100 100 | | | |
| 4 | 4574.50 | 46.23 | 74.00 | -27.77 | 43.44 | 2.79 | Peak | 100 | 4 | | |
| 5 | | 46.27 56.53 | | | | 11.38 11.38 | Average Peak | 100 100 | | | |
| 0 | 9149.00 | 50.55 | 74.00 | -1/.4/ | 45.15 | 11.50 | геак | 100 | 212 | | |
| | | | | | | | | | | | |
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| | | <u> </u> | | | · - | · · · · · · · | | | | | |
| Note 1: Emission Leve Factor includes* | | | | | | | | | | | |
| Factor includes | | level (dB | | 55 anu a | unpiller (| Jalli | | | | | |

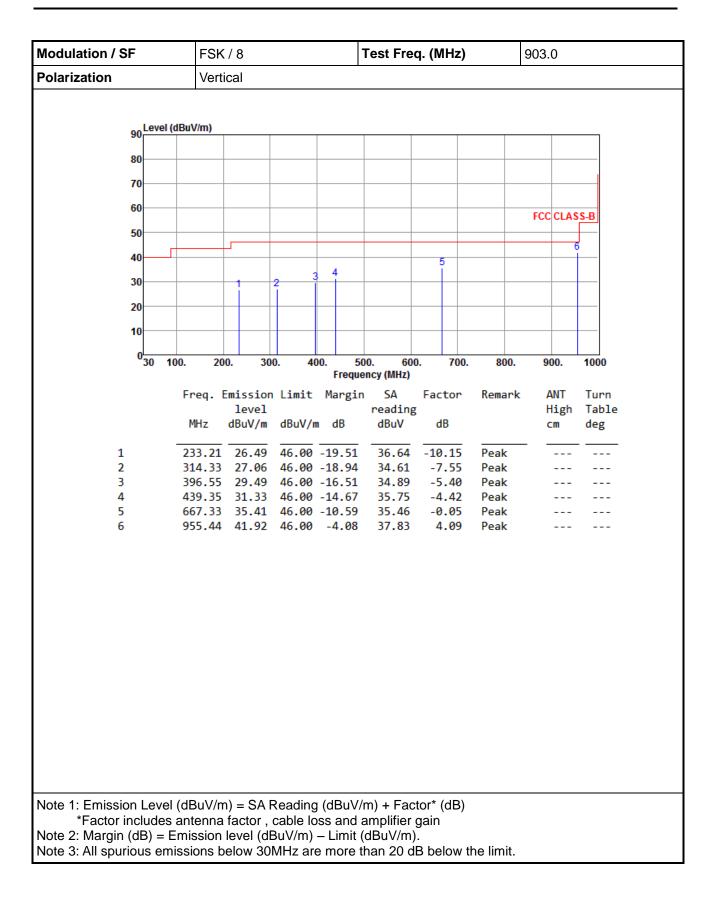


Channel Bandwidth (kHz): 500

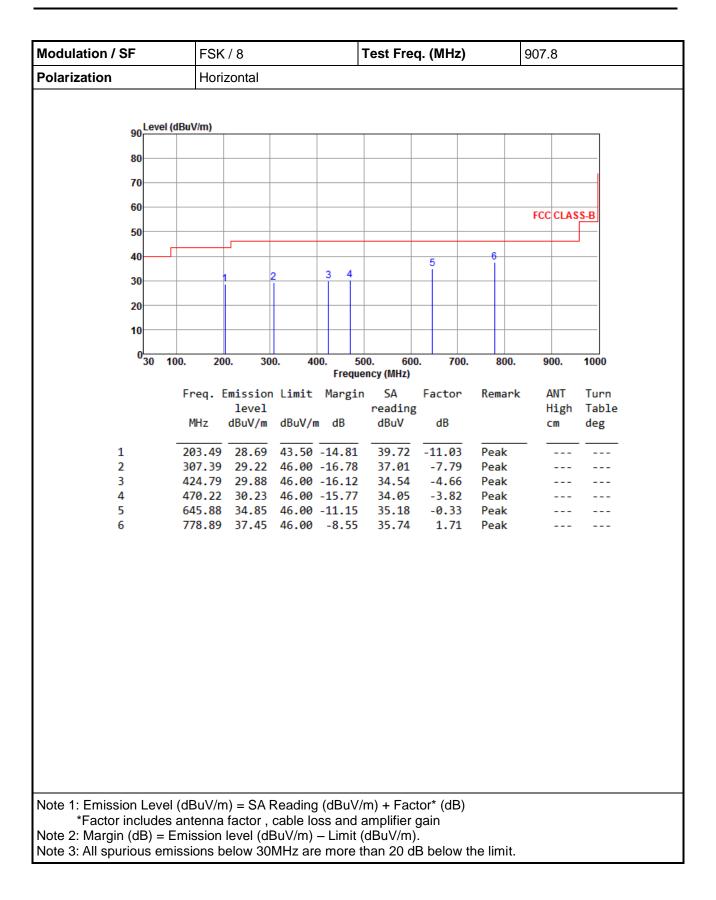
3.1.6 Transmitter Radiated Unwanted Emissions (Below 1GHz)



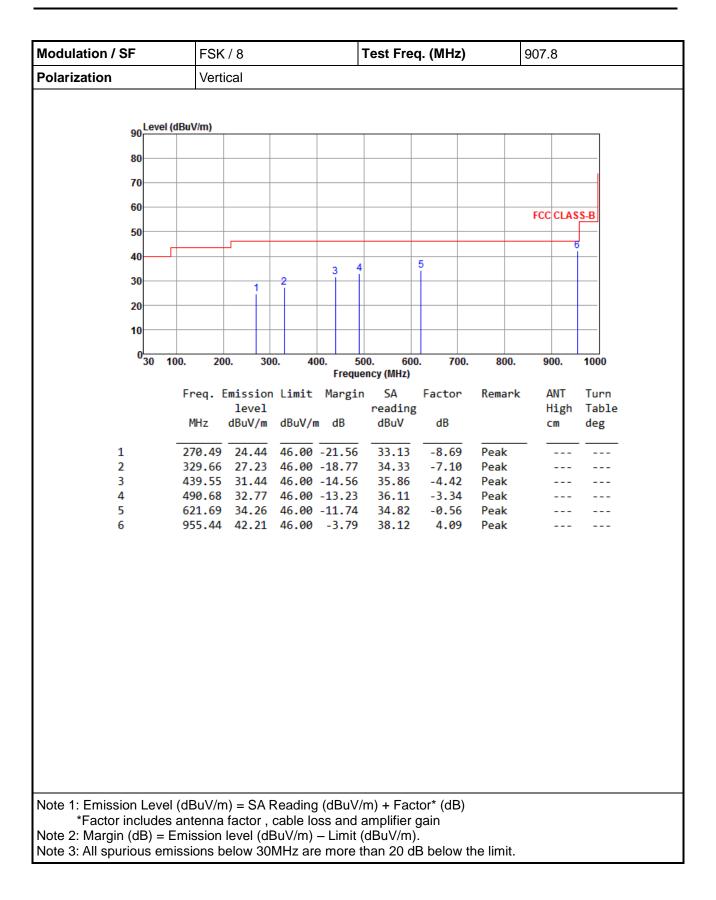




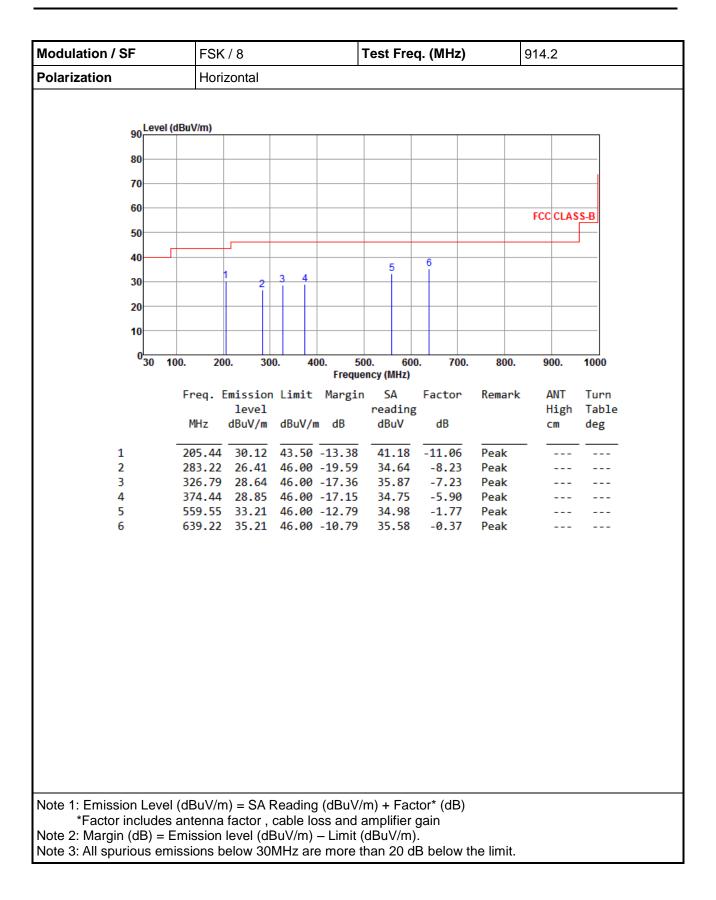




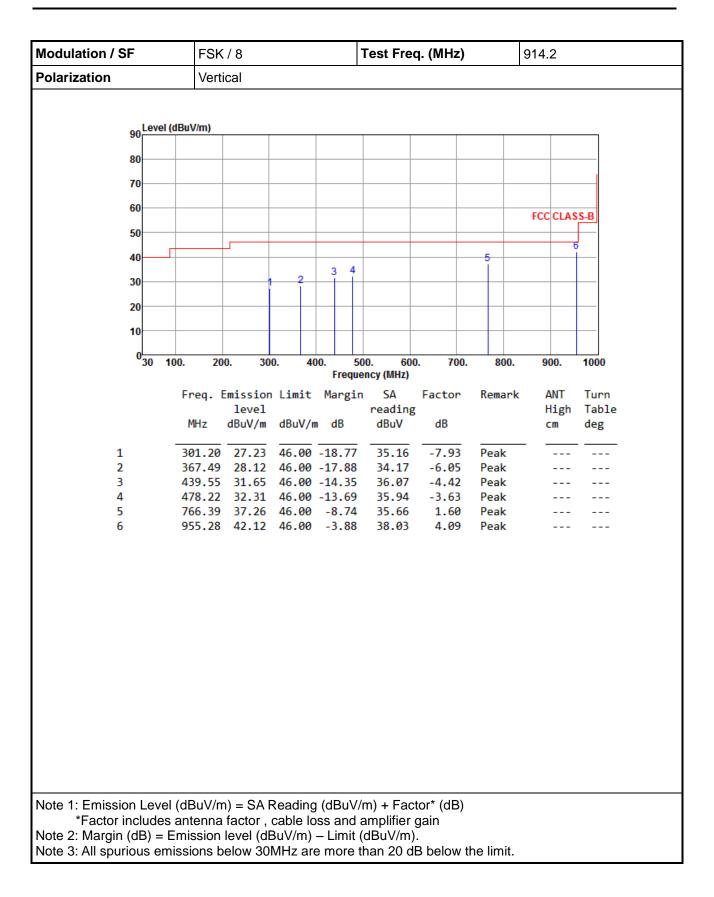




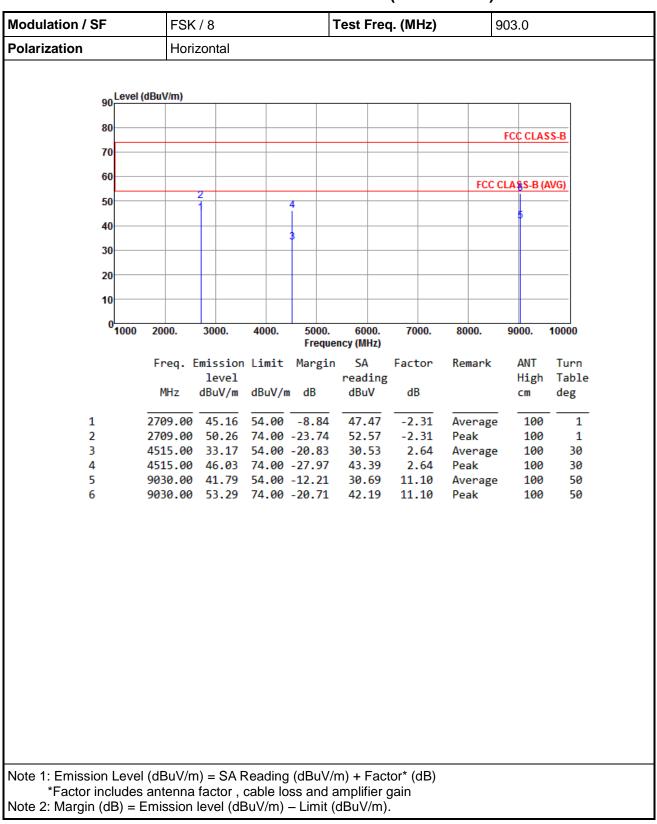










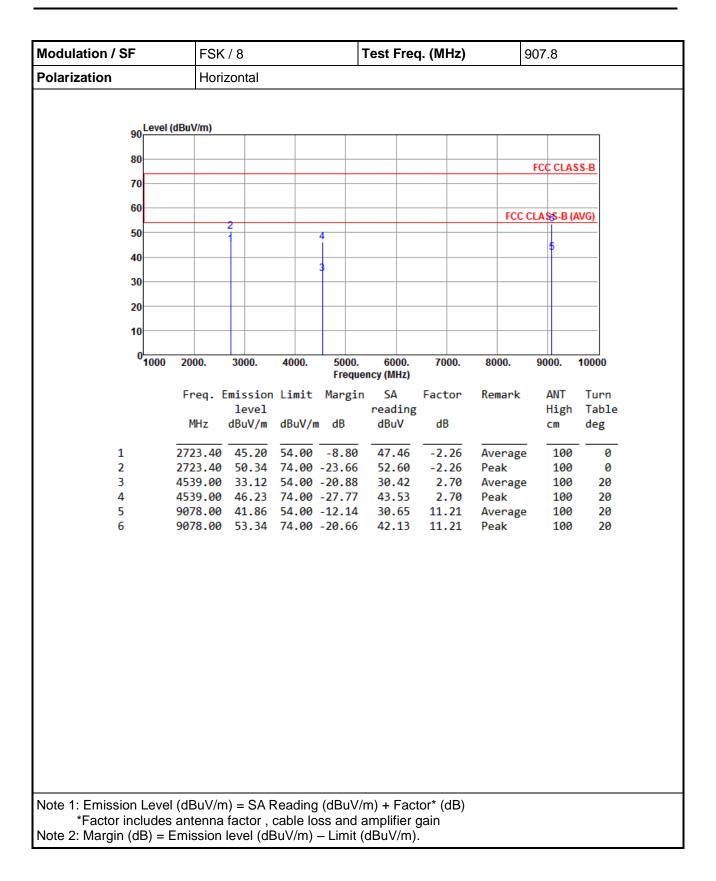


3.1.7 Transmitter Radiated Unwanted Emissions (Above 1GHz)



| Modulation / SF | FSK | / 8 | | 1 | est Free | q. (MHz) | ę | 903.0 | | | |
|---|--------------------|-----------------|---------|-----------------|--------------------|----------------|-----------------|------------|--------------|--|--|
| Polarization | Vertical | | | | | | | | | | |
| | | | | | | | | | | | |
| 90 Level | (dBuV/m) | | | | | | | | | | |
| 80 | | | | | | | | FCC CLA | SS R | | |
| 70 | | | | | | | | | 33-0 | | |
| 60 | | | | | | | | | | | |
| 50 | | 2 | | | | | FCC | CLASS-B(| AVG) | | |
| | | 1 | | 4 | | | | 5 | | | |
| 40 | | | | 3 | | | | | | | |
| 30 | | | | | | | | | | | |
| 20 | | | | | | | | | — | | |
| 10 | | | | | | | | | | | |
| 0 <mark></mark> | 2000. | 3000. | 4000. | 5000. Freque | 6000. ncy (MHz) | 7000. | 8000. | 9000. | 10000 | | |
| | Freq. E | mission | Limit | | | Factor | Remark | ANT | Turn | | |
| | MHz | level dBuV/m | dBuV/m | dB | reading dBuV | dB | | High cm | Table deg | | |
| | | | ubuv/ii | | ubuv | | | CIII | | | |
| 1 2 | 2709.00 2709.00 | | | -9.49 -24.85 | 46.82 51.46 | -2.31 -2.31 | Average Peak | 298 298 | | | |
| 3 | 4515.00 | | | | 30.58 | 2.64 | Average | | | | |
| 4 5 | 4515.00 9030.00 | | | | 43.58 30.91 | 2.64 11.10 | Peak Average | 100 100 | | | |
| 6 | 9030.00 | | | | 43.03 | 11.10 | Peak | 100 | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| Note 1: Emission Leve *Factor includes | | | | | | | | | | | |







| Modulation / SF | FSK | / 8 | | Т | est Free | q. (MHz) | ç | 907.8 | |
|---|--------------------|-----------------|--------|------------------|--------------------|----------------|-----------------|------------|--------------|
| Polarization | Verti | cal | | | | | | | |
| | | | | | | | | | |
| 90 Lev | el (dBuV/m) | | | | | | | | |
| 80 | | | | | | | | TOO OL A | <u></u> |
| 70 | | | | | | | | FCC CLA | <u>.55-B</u> |
| 60 | | | | | | | | | |
| | | 2 | | | | | FCC | CLASS-B | (AVG) |
| 50 | | 1 | | 4 | | | | 5 | |
| 40 | | | | 3 | | | | | |
| 30 | | | | | | | | | |
| 20 | | | | | | | | | |
| 10 | | | | | | | | | |
| | | | | | | | | | |
| 0 | 0 2000. | 3000. | 4000. | 5000. Frequer | 6000. icy (MHz) | 7000. | 8000. | 9000. | 10000 |
| | Freq. E | mission | Limit | Margin | | Factor | Remark | ANT | Turn |
| | MHz | level dBuV/m | dBuV/m | a de | reading dBuV | dB | | High cm | |
| | PINZ | | ubuv/i | u ub | ubuv | ub | | CIII | deg |
| 1 | 2723.40 | | | | 46.88 | -2.26 | Average | | |
| 2 3 | 2723.40 4539.00 | | | -24.74 -20.74 | 51.52 30.56 | -2.26 2.70 | Peak Average | 299 100 | |
| 4 | 4539.00 | | | | 43.56 | 2.70 | Peak | 100 | 60 |
| 5 | 9078.00 9078.00 | | | | 30.78 42.82 | 11.21 11.21 | Average Peak | 100 100 | |
| 0 | 9070.00 | 54.05 | 74.00 | -19.97 | 42.02 | 11.21 | reak | 100 | 90 |
| | | | | | | | | | |
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| | | | | | | | | | |
| Note 1: Emission Lev | | | | | | | | | |
| *Factor includ • Note 2: Margin (dB) | | | | iss and a | mplifier | gaın | | | |



| Modulation / SF | | FSK / 8 Test Freq. (MHz) 914.2 | | | | | | | | | | |
|--------------------|----------------|--|-----------------|---------|------------|--------------|----------------|--------------|----|-----------------|----------|---------|
| Polarization | | Horizontal | | | | | | | | | | |
| | | | | | | | | | | | | |
| 90 <mark>L</mark> | evel (dB | uV/m) | | | | | | | | | | |
| 80 | | | | | | | | | | | TOO OI | 100 D |
| 70 | | | | | | | | | | | FCC CL | ASS-B |
| 60- | | | | | | | | | | | | |
| | | | 2 | | | | | | | FCC (| CLAS§-E | 3 (AVG) |
| 50 | | | 1 | | 4 | | | | | | 5 | |
| 40 | | | | | 3 | | | | | | -+ | |
| 30 | | | | | | | | | | | | |
| 20 | | | | | | | _ | | | | | |
| 10 | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | |
| 0 <mark>1</mark> | 000 2 | 000. | 3000. | 4000. | 500 Fre | 0. quency | 6000. (MHz) | 700 | 0. | 8000. | 9000. | 10000 |
| | F | req. E | mission | Limit | Marg | in | SA | Facto | or | Remark | ANT | Turn |
| | | MHz | level dBuV/m | dD. M. | | | ading BuV | dB | | | Hig | |
| | | MHZ | abuv/m | abuv/r | n ab | a | buv | ab | | | cm | deg |
| 1 | | | 45.31 | | | | 7.51 | -2.2 | | Average | | |
| 2 3 | | | 50.46 33.26 | | | | 2.66 0.47 | -2.2 2.7 | | Peak Average | 10 10 | |
| 4 | 45 | 71.00 | 46.12 | 74.00 | -27.8 | 8 4 | 3.33 | 2.7 | 79 | Peak | 10 | 0 30 |
| 5 | | | 41.79 53.46 | | | | 0.43 2.10 | 11.3 11.3 | | Average Peak | 10 10 | |
| 0 | 91 | 42.00 | 55.40 | 74.00 | -20.5 | 4 4 | 2.10 | 11.5 | 00 | геак | 16 | 51 |
| | | | | | | | | | | | | |
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| Note 1: Emission L | | | | | | | | | B) | | | |
| *Factor inclu | | | | | | | | | | | | |
| Note 2: Margin (dB | <i>)</i> = ⊏11 | 1991011 | ievei (ub | uv/III) | | ונ נטשנ | iv/III) | • | | | | |



| Modulation / S | F | FSK | / 8 | | ٦ | est Fre | q. (MHz) | ç | 914.2 | |
|-----------------|---------------------|--------------------|-----------|----------|-----------------|--------------------|---------------|-----------------|------------|-------|
| Polarization | | Verti | cal | | | | | | | |
| | | | | | | | | | | |
| | 90 Level | (dBuV/m) | | | | | | | | |
| | 80 | | | | | | | | | |
| | | | | | | | | | FCC CLA | SS-B |
| | 70 | | | | | | | | | |
| | 60 | | | | | | | FCC (| CLASS-B | AVG) |
| | 50 | | 2 | | 4 | | | | | |
| | 40 | | | | | | | | 5 | |
| | | | | | 3 | | | | | |
| | 30 | | | | | | | | | |
| | 20 | | | | | | | | | |
| | 10 | | | | | | | | | |
| | 0 | | | | | | | | | |
| | 0 <mark>1000</mark> | 2000. | 3000. | 4000. | 5000. Freque | 6000. ncy (MHz) | 7000. | 8000. | 9000. | 10000 |
| | | Freq. F | mission | limit | Margin | | Factor | Remark | ANT | Turn |
| | | | level | | 1101 8211 | reading | | include it | High | |
| | | MHz | dBuV/m | dBuV/n | ı dB | dBuV | dB | | cm | deg |
| 1 | | 2742.60 | 44.59 | 54.00 | -9.41 | 46.79 | -2.20 | Average | 295 | 135 |
| 2 | | 2742.60 | | | | 51.51 | -2.20 | Peak | 295 | |
| 3 | | 4571.00 | | | | 30.70 | 2.79 | Average | | |
| 4 | | 4571.00 9142.00 | | | | 43.54 30.67 | 2.79 11.36 | Peak Average | 100 100 | |
| 6 | | 9142.00 | | | | 42.70 | 11.36 | Peak | 100 | |
| | | | | | | | | | | |
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| lote 1: Emissic | n l eve | l (dBuV/m | | eading | (dBu\//r | n) + Fac | tor* (dR) | | | |
| *Factor i | ncludes | antenna | factor, o | cable lo | ss and a | mplifier | gain | | | |
| Note 2: Margin | (dB) = I | Emission | level (dE | 3uV/m) | – Limit (| dBuV/m) | - | | | |



3.2 Unwanted Emissions into Non-Restricted Frequency Bands

3.2.1 Limit of Unwanted Emissions into Non-Restricted Frequency Bands

The peak output power measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum in-band peak PSD level in 100 kHz.

3.2.2 Test Procedures

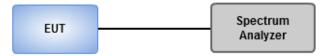
Reference Level Measurement

- 1. Set the RBW = 100 kHz, VBW = 300 kHz, Detector = peak.
- 2. Set Sweep time = auto couple, Trace mode = max hold.
- 3. Allow trace to fully stabilize.
- 4. Use the peak marker function to determine the maximum amplitude level.

Unwanted Emissions Level Measurement

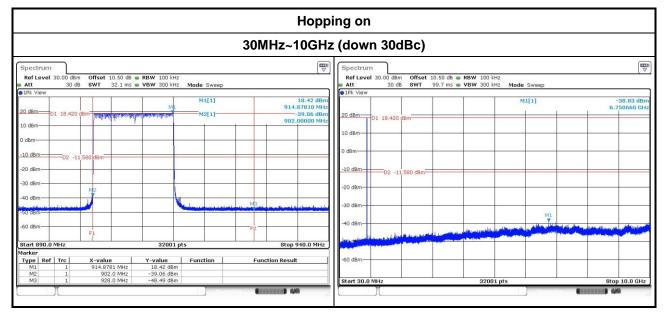
- 1. Set RBW = 100 kHz, VBW = 300 kHz, Detector = peak.
- 2. Trace Mode = max hold, Sweep = auto couple.
- 3. Allow the trace to stabilize.
- 4. Use peak marker function to determine maximum amplitude of all unwanted emissions within any 100 kHz bandwidth.

3.2.3 Test Setup

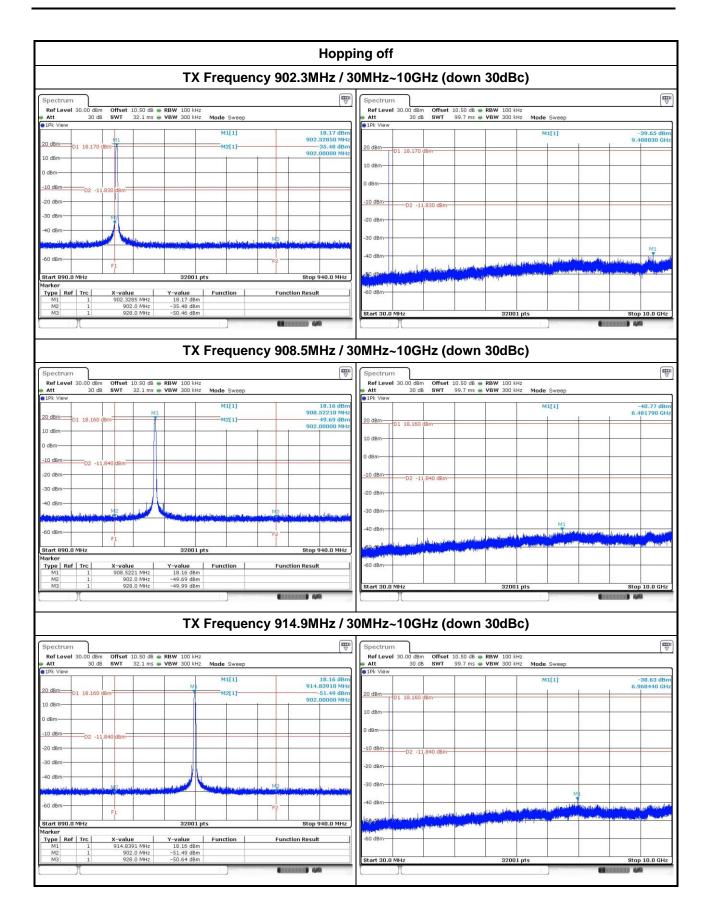




3.2.4 Unwanted Emissions into Non-Restricted Frequency Bands

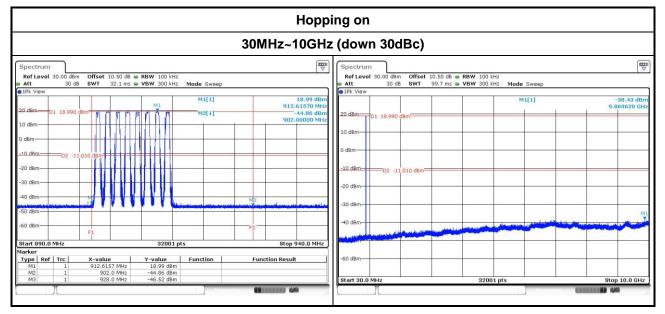




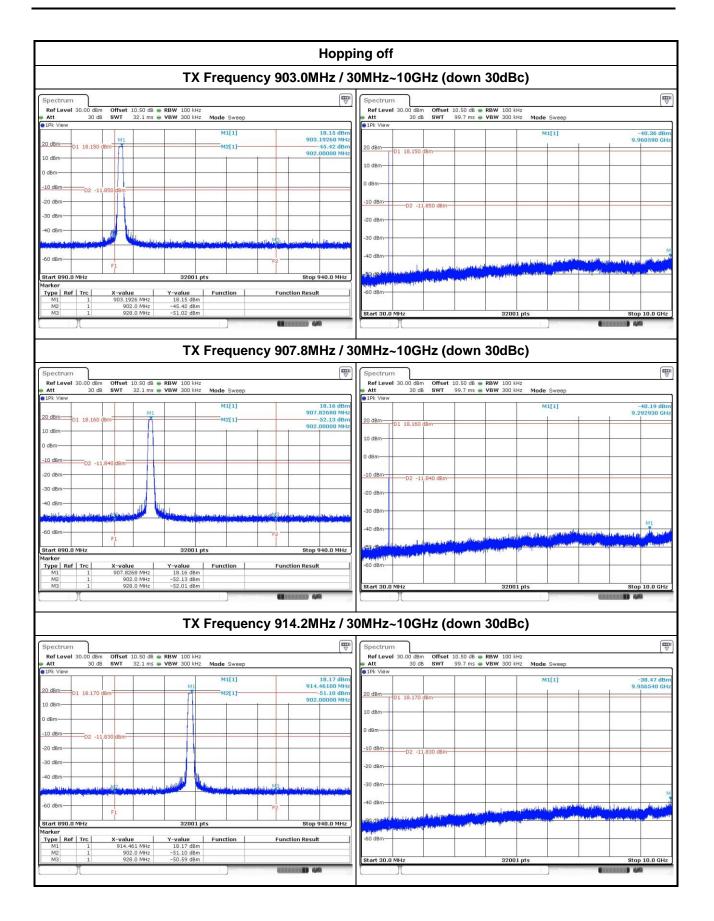














3.3 Conducted Output Power

3.3.1 Limit of Conducted Output Power

1 Watt

3.3.2 Test Procedures

- 1. A wideband power meter is used for power measurement. Bandwidth of power senor and meter is 50MHz
- 2 If duty cycle of test signal is not 100 %, trigger and gating function of power meter will be enabled to capture transmission burst for measuring output power

3.3.3 Test Setup



3.3.4 Test Result of Conducted Output Power

Channel Bandwidth (kHz): 125

| Modulation / SF | Freq. (MHz) | Output Power (mW) | Output Power (dBm) | Limit (W) |
|-----------------|-------------|----------------------|-----------------------|-----------|
| FSK / 10 | 902.3 | 71.78 | 18.56 | 1 |
| FSK / 10 | 908.5 | 71.61 | 18.55 | 1 |
| FSK / 10 | 914.9 | 71.29 | 18.53 | 1 |

| Modulation / SF | Freq. (MHz) | Output Power (mW) | Output Power (dBm) | Limit (W) |
|-----------------|-------------|----------------------|-----------------------|-----------|
| FSK / 8 | 903.0 | 70.47 | 18.48 | 1 |
| FSK / 8 | 907.8 | 70.63 | 18.49 | 1 |
| FSK / 8 | 914.2 | 70.15 | 18.46 | 1 |



3.4 Number of Hopping Frequency

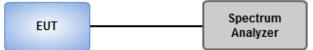
3.4.1 Limit of Number of Hopping Frequency

| | Number of Hopping Frequencies Limit for Frequency Hopping Systems | | | | | | |
|--------------|---|--|--|--|--|--|--|
| \square | ☑ 902-928 MHz Band: | | | | | | |
| | □ N ≥ 50, 20 dB bandwidth of the hopping channel is less than 250 kHz | | | | | | |
| | □ N ≥ 25, 20 dB bandwidth of the hopping channel is 250 kHz or greater | | | | | | |
| | Hybrid mode, No minimum number of hopping channels associated with hybrid system. | | | | | | |
| N : N | N: Number of Hopping Frequencies | | | | | | |

3.4.2 Test Procedures

- 1. Set RBW = 100kHz, VBW = 300kHz, Sweep time = Auto, Detector = Peak Trace max hold.
- 2 Allow trace to stabilize.

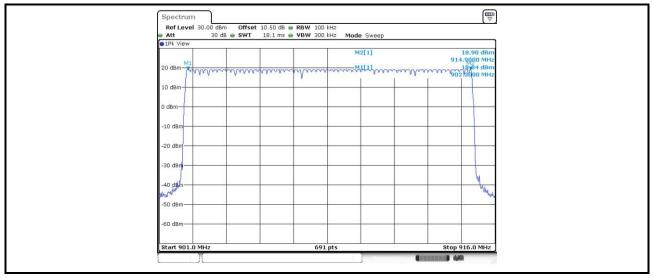
3.4.3 Test Setup

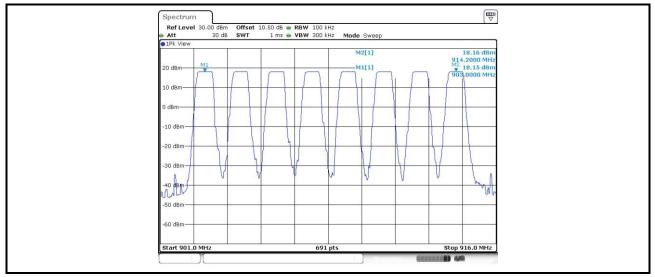




3.4.4 Test Result of Number of Hopping Frequency

Channel Bandwidth (kHz): 125







3.5 20dB and Occupied Bandwidth

3.5.1 Test Procedures

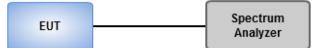
20dB Bandwidth

- 1. Set RBW = 3kHz, VBW = 10kHz, Sweep time = Auto, Detector = Peak, Trace max hold.
- 2 Allow trace to stabilize.
- 3 Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission.

Occupied Bandwidth

- 1. Set RBW = 3kHz, VBW = 10kHz, Sweep time = Auto, Detector = Peak, Trace max hold
- 2 Allow trace to stabilize
- 3. Use Occupied bandwidth function of spectrum analyzer to measuring 99% occupied bandwidth

3.5.2 Test Setup





3.5.3 Test result of 20dB and Occupied Bandwidth

| Modulation / SF | Freq. (MHz) | 20dB Bandwidth (kHz) | Occupied Bandwidth (kHz) |
|-----------------|-------------|-------------------------|-----------------------------|
| FSK / 10 | 902.3 | 137.83 | 126.20 |
| FSK / 10 | 908.5 | 137.83 | 125.80 |
| FSK / 10 | 914.9 | 137.83 | 126.00 |

| Worst Plot of 20 | | W | orst Plot | of Occu | pied Ba | ndwidth | | |
|---|------------|--|------------------------|------------------------------------|------------------------|-----------------|------------|---|
| Spectrum | | | Spectrum | | | | | |
| Ref Level 30.00 dBm Offset 10.50 dB RBW 3 kHz Att 30 dB SWT 3.3 ms VBW 10 kHz | Mode Sweep | | RefLevel 30.00 de | | BBW 3 kHz BW 10 kHz | Mode Sweep | | |
| 20 dBm | M1[1] | -1.67 dBm 902.225217 MHz 125.470332851 kHz | 1Pk View 20 dBm | | | M1[1] Occ Bw | | 13.47 dBm 2.3525670 MHz 200000000 kHz |
| D1 17.567 dBm T1 | DII1 75 | -0.58 dB 137.826 kHz | 10 dBm | | | | | |
| 0 dBm | | | -10 dBm | | | | 5 | ~ |
| -10 dBm | | | -20-d8m -30 d8m | | | | | and |
| -30 dBm | | M | -40 dBm | | | | | |
| -49.489-AD | | | -60 dBm | | | | | |
| -50 dBm | | | CF 902.3 MHz Marker | 1 1 | 3000 pt | 5 | s | pan 200.0 kHz |
| -60 dBm | F2 | | Type Ref Trc M1 1 | X-value 902.352567 MHz | Y-value 13.47 dBm | Function | Function R | |
| CF 902.3 MHz 691 p | its | Span 300.0 kHz | T1 1 T2 1 | 902.2301667 MHz 902.3563667 MHz | 7.97 dBm 8.33 dBm | Occ Bw | | 126.2 kHz |
| | | 100 AVA | | | | | Constant | 4,49 |



| Modulation / SF | Freq. (MHz) | 20dB Bandwidth (kHz) | Occupied Bandwidth (kHz) |
|-----------------|-------------|-------------------------|-----------------------------|
| FSK / 8 | 903.0 | 703.30 | 622.00 |
| FSK / 8 | 907.8 | 703.30 | 617.67 |
| FSK / 8 | 914.2 | 699.00 | 614.00 |

| Worst Plot of 20dB Bandwidth | Worst Plot of Occupied Bandwidth | | | | |
|---|---|--|--|--|--|
| Spectrum @ Ref Level 30.00 dBm Offset 10.50 dB @ RBW 10 kHz | Spectrum Image: Construction of the sector of | | | | |
| Att 30 dB SWT 1 ms VBW 30 kHz Mode Sweep | Att 30 dB SWT 3 ms VBW 30 kHz Mode Sweep IPk View | | | | |
| 20 dbm M1[1] 902.62320 HHz 20 dbm 01 14.420 dbm 01[1] 625.100897250 HHz 10 dbm 11 703.30 kHz 703.30 kHz 20 dbm 10 dbm 12 703.30 kHz 20 dbm 10 10 dbm 12 | 20 dBm M1[1] 1 4 31 dBm 20 dBm M1 002.79800 MHz 10 dBm 0 cc Bw 622.000000000 MHz 0 dBm T1 0 -10 dBm -10 dBm -10 dBm -30 dBm -30 dBm -50 dBm | | | | |
| -50 dBm | -60 d8m | | | | |
| | Marker | | | | |
| -60 dBm F2 | Type Ref Trc X-value Y-value Function Function Result | | | | |
| F1 | M1 1 902.7995 MHz 14.31 dBm T1 1 902.6735 MHz -0.79 dBm Occ Bw 622.0 kHz T2 1 903.2955 MHz 2.66 dBm 622.0 kHz | | | | |
| CF 903.0 MHz 691 pts Span 1.0 MHz | T2 1 903.2955 MHz 2.66 dBm 1 | | | | |



3.6 Channel Separation

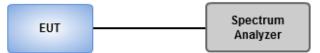
3.6.1 Limit of Channel Separation

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.

3.6.2 Test Procedures

- 1. Set RBW=10kHz, VBW=30kHz, Sweep time=Auto, Detector=Peak Trace max hold.
- 2 Allow trace to stabilize.
- 3 Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The EUT shall show compliance with the appropriate regulatory limit

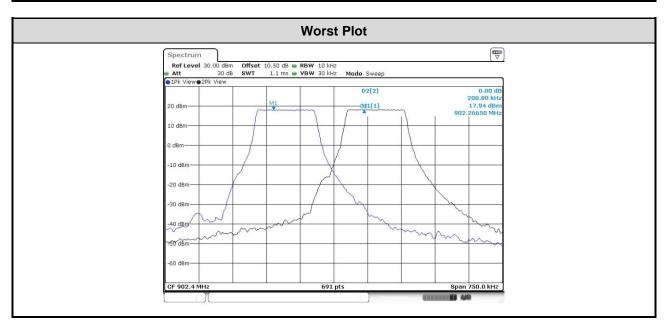
3.6.3 Test Setup





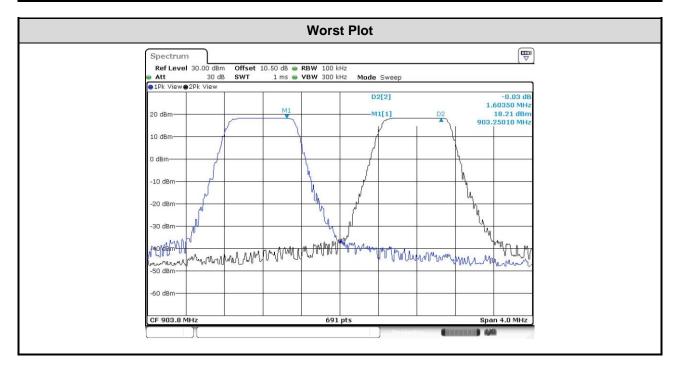
3.6.4 Test result of Channel Separation

| Modulation / SF | Freq. (MHz) | Adjacent Channel Separation (kHz) | 20dB Bandwidth (kHz) | Pass/Fail |
|-----------------|-------------|---|-------------------------|-----------|
| FSK / 10 | 902.3 | 200.80 | 137.83 | Pass |
| FSK / 10 | 908.5 | 200.80 | 137.83 | Pass |
| FSK / 10 | 914.9 | 200.80 | 137.83 | Pass |





| Modulation / SF | Freq. (MHz) | Adjacent Channel Separation (kHz) | 20dB Bandwidth (kHz) | Pass/Fail |
|-----------------|-------------|---|-------------------------|-----------|
| FSK / 8 | 903.0 | 1603.50 | 703.30 | Pass |
| FSK / 8 | 907.8 | 1603.50 | 703.30 | Pass |
| FSK / 8 | 914.2 | 1603.50 | 699.00 | Pass |





3.7 Number of Dwell Time

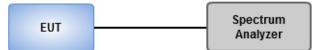
3.7.1 Limit of Dwell time

| | Time of Occupancy (Dwell Time) Limit for Frequency Hopping Systems | | | | | | | |
|-------------|--|--|--|--|--|--|--|--|
| \boxtimes | 902-928 MHz Band: | | | | | | | |
| | | \leq 0.4 second within a 20 second period, 20 dB bandwidth of the hopping channel is less than 250 kHz | | | | | | |
| | | \leq 0.4 second within a 10 second period, 20 dB bandwidth of the hopping channel is 250 kHz or greater | | | | | | |
| | | Hybrid mode ,an average time of occupancy on any frequency not to exceed 0.4 seconds within a time period in seconds equal to the number of hopping frequencies employed multiplied by 0.4 | | | | | | |

3.7.2 Test Procedures

- 1. Set RBW=100 kHz, VBW=300 kHz, Sweep time=6.4s / 500ms, Detector=Peak, Span=0Hz, Trace max hold.
- 2. Measure and record the burst on time.

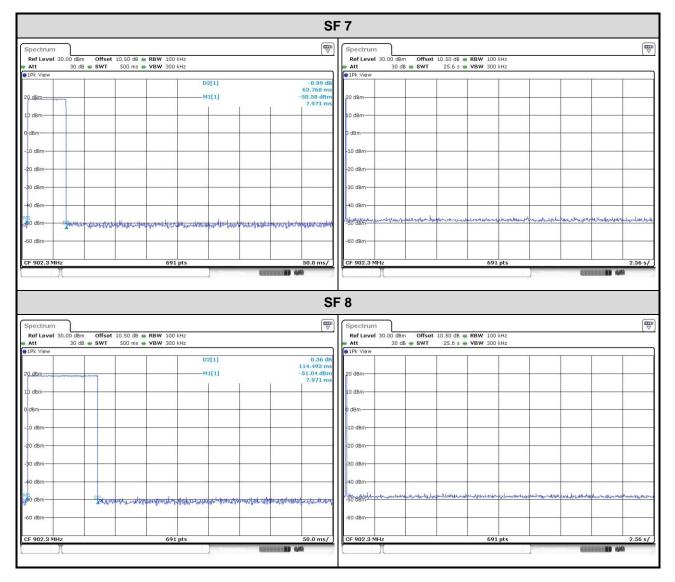
3.7.3 Test Setup



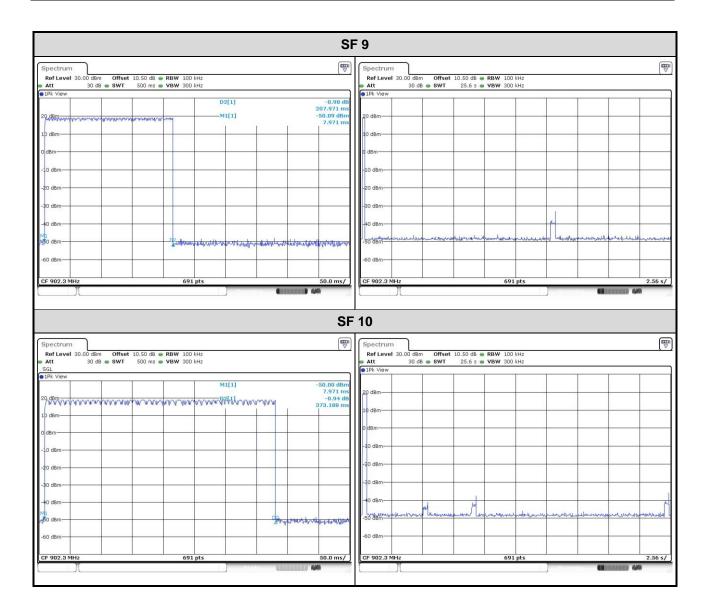


3.7.4 Test Result of Dwell Time

| Modulation / SF | Freq. (MHz) | Length of Transmission Time (sec) | Number of Transmission in a 25.6 s (64 Hopping*0.4s) | Result (s) | Limit (s) |
|-----------------|-------------|---|---|------------|-----------|
| FSK / 7 | 902.3 | 0.063768 | 1 | 0.063768 | 0.4 |
| FSK / 8 | 902.3 | 0.114493 | 1 | 0.114493 | 0.4 |
| FSK / 9 | 902.3 | 0.207971 | 1 | 0.207971 | 0.4 |
| FSK / 10 | 902.3 | 0.373188 | 1 | 0.373188 | 0.4 |

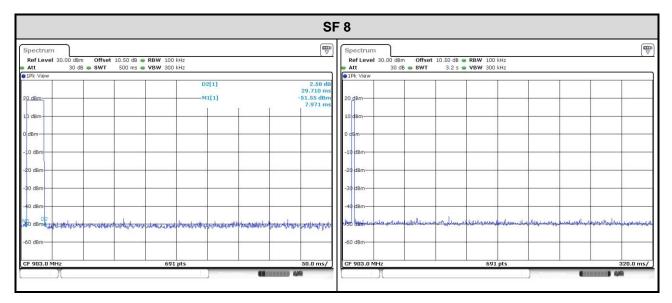








| Modulation / SF | Freq. (MHz) | Length of Transmission Time (sec) | Number of Transmission in a 25.6 s (64 Hopping*0.4s) | Result (s) | Limit (s) |
|-----------------|-------------|---|---|------------|-----------|
| FSK/8 | 903.0 | 0.029710 | 1 | 0.029710 | 0.4 |





3.8 **Power Spectral Density**

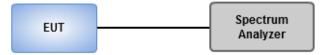
3.8.1 Limit of Power Spectral Density

Power spectral density shall not be greater than 8 dBm in any 3 kHz band. This item is for Hybrid mode.

3.8.2 Test Procedures

- Maximum peak conducted output power was used to demonstrate compliance to the fundamental output power limit.
 - 1. Set the RBW = 3kHz, VBW = 10kHz.
 - 2. Detector = Peak, Sweep time = auto couple.
 - 3. Trace mode = max hold, allow trace to fully stabilize.
 - 4. Use the peak marker function to determine the maximum amplitude level.
- Maximum (average) conducted output power was used to demonstrate compliance to the fundamental output power limit.
 - 1. Set the RBW = 3kHz, VBW = 10 kHz.
 - 2. Detector = RMS, Sweep time = auto couple.
 - 3. Employ trace averaging (RMS) mode over a minimum of 100 traces
 - 4. Use the peak marker function to determine the maximum amplitude level.

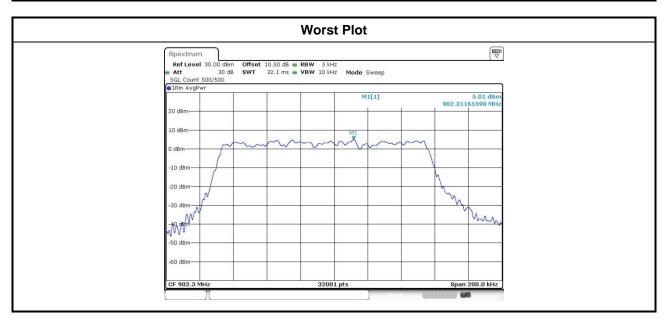
3.8.3 Test Setup





3.8.4 Test Result of Power Spectral Density

| Modulation / SF | Freq. (MHz) | Total Power Spectral Density (dBm/3kHz) | Limit (dBm/3kHz) |
|-----------------|-------------|---|------------------|
| FSK / 10 | 902.3 | 5.01 | 8.00 |
| FSK / 10 | 908.5 | 4.60 | 8.00 |
| FSK / 10 | 914.9 | 5.01 | 8.00 |





| Modulation / SF | Freq. (MHz) | Total Power Spectral Density (dBm/3kHz) | Limit (dBm/3kHz) |
|-----------------|-------------|---|------------------|
| FSK / 8 | 903.0 | -1.75 | 8.00 |
| FSK / 8 | 907.8 | -1.84 | 8.00 |
| FSK / 8 | 914.2 | -1.75 | 8.00 |





4 Test laboratory information

Established in 2012, ICC provides foremost EMC & RF Testing and advisory consultation services by our skilled engineers and technicians. Our services employ a wide variety of advanced edge test equipment and one of the widest certification extents in the business.

International Certification Corp (EMC and Wireless Communication Laboratory), it is our definitive objective is to institute long term, trust-based associations with our clients. The expectation we set up with our clients is based on outstanding service, practical expertise and devotion to a certified value structure. Our passion is to grant our clients with best EMC / RF services by oriented knowledgeable and accommodating staff.

Our Test sites are located at Linkou District and Kwei Shan District. Location map can be found on our website <u>http://www.icertifi.com.tw</u>.

Linkou Tel: 886-2-2601-1640 No. 30-2, Ding Fwu Tsuen, Lin Kou District, New Taipei City, Taiwan, R.O.C. Kwei Shan Tel: 886-3-271-8666 No. 3-1, Lane 6, Wen San 3rd St., Kwei Shan District, Tao Yuan City 333, Taiwan, R.O.C. Kwei Shan Site II Tel: 886-3-271-8640 No. 14-1, Lane 19, Wen San 3rd St., Kwei Shan District, Tao Yuan City 333, Taiwan, R.O.C.

If you have any suggestion, please feel free to contact us as below information.

Tel: 886-3-271-8666 Fax: 886-3-318-0155 Email: ICC_Service@icertifi.com.tw

—END—