

# FCC/ISED CO-LOCATION RADIO TEST REPORT

FCC ID : PKRISGM1000  
IC : 3229A-M1000  
Equipment : M1000  
Brand Name : inseego  
Model Name : M1000  
Marketing Name : 5G MiFi M1000  
HVIN : M1000  
PMN : 5G MiFi M1000  
Applicant : Inseego Corp.  
9605 Scranton Road, Suite 300, San Diego, CA 92121  
Manufacturer : Inseego Corp.  
9605 Scranton Road, Suite 300, San Diego, CA 92121  
Standard : 47 CFR Part 2, 22(H), 24(E), 27  
ISED RSS-132 Issue 3  
ISED RSS-133 Issue 6  
ISED RSS-130 Issue 2  
ISED RSS-139 Issue 3

The product was received on May 03, 2019 and testing was started from May 09, 2019 and completed on May 10, 2019. We, SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures given in ANSI / TIA-603-E and has been in compliance with the applicable technical standards.

The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.

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



*Jones Tsai*

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**Approved by: Jones Tsai**

**SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory**

*No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)*

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## History of this test report

| Report No. | Version | Description             | Issued Date  |
|------------|---------|-------------------------|--------------|
| FG950301B  | 01      | Initial issue of report | May 11, 2019 |
|            |         |                         |              |
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|            |         |                         |              |

## Summary of Test Result

| Report Clause | FCC Ref Std. Clause                                                                | ISED Ref Std. Clause                                       | Test Items                                                            | Result (PASS/FAIL) | Remark                                     |
|---------------|------------------------------------------------------------------------------------|------------------------------------------------------------|-----------------------------------------------------------------------|--------------------|--------------------------------------------|
| 3.2           | §2.1053<br>§22.917 (a)<br>§24.238 (a)<br>§27.53 (c)(2)<br>§27.53 (f)<br>§27.53 (h) | RSS-132 5.5<br>RSS-133 6.5.1<br>RSS-130 4.7<br>RSS-139 6.6 | Radiated Spurious Emission<br>(Band 2) (Band 4) (Band 5)<br>(Band 13) | Pass               | Under limit<br>18.64 dB at<br>5640.000 MHz |

**Note:** This is report for colocation test.

### Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

### Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

**Reviewed by:** Wii Chang

**Report Producer:** Natasha Hsieh

# 1 General Description

## 1.1 Product Feature of Equipment Under Test

The EUT supports UMTS/LTE/NR/WiFi. The details please find the Operating Description.

## 1.2 Modification of EUT

No modifications are made to the EUT during all test items.

## 1.3 Testing Location

|                           |                                                                                                                       |                              |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------|------------------------------|
| <b>Test Site</b>          | SPORTON INTERNATIONAL INC.                                                                                            |                              |
| <b>Test Site Location</b> | No.52, Huaya 1st Rd., Guishan Dist.,<br>Taoyuan City, Taiwan (R.O.C.)<br>TEL: +886-3-327-3456<br>FAX: +886-3-328-4978 |                              |
| <b>Test Site No.</b>      | <b>Sporton Site No.</b>                                                                                               | <b>ISED Registration No.</b> |
|                           | 03CH07-HY                                                                                                             | 4086B                        |
| <b>Test Engineer</b>      | Jesse Wang, Stan Hsieh, and Nick Yu                                                                                   |                              |
| <b>Temperature</b>        | 22~24°C                                                                                                               |                              |
| <b>Relative Humidity</b>  | 53~55%                                                                                                                |                              |

**Note:** The test site complies with ANSI C63.4 2014 requirement.

|                           |                                                                                                                                           |                              |
|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| <b>Test Site</b>          | SPORTON INTERNATIONAL INC.                                                                                                                |                              |
| <b>Test Site Location</b> | No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist.,<br>Taoyuan City, Taiwan (R.O.C.)<br>TEL: +886-3-327-0868<br>FAX: +886-3-327-0855 |                              |
| <b>Test Site No.</b>      | <b>Sporton Site No.</b>                                                                                                                   | <b>ISED Registration No.</b> |
|                           | 03CH15-HY                                                                                                                                 | 4086B                        |
| <b>Test Engineer</b>      | Watt Tseng                                                                                                                                |                              |
| <b>Temperature</b>        | 23~24°C                                                                                                                                   |                              |
| <b>Relative Humidity</b>  | 55~56%                                                                                                                                    |                              |

**Note:** The test site complies with ANSI C63.4 2014 requirement.

FCC Designation No. TW1190 and TW0007



## **1.4 Applicable Standards**

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

- ♦ ANSI C63.26-2015
- ♦ ANSI / TIA-603-E
- ♦ 47 CFR Part 2, 22(H), 24(E), 27
- ♦ FCC KDB 971168 D01 Power Meas. License Digital Systems v03r01
- ♦ ISED RSS-132 Issue 3
- ♦ ISED RSS-133 Issue 6
- ♦ ISED RSS-130 Issue 2
- ♦ ISED RSS-139 Issue 3

**Remark:** All test items were verified and recorded according to the standards and without any deviation during the test.

## 2 Test Configuration of Equipment Under Test

### 2.1 Test Mode

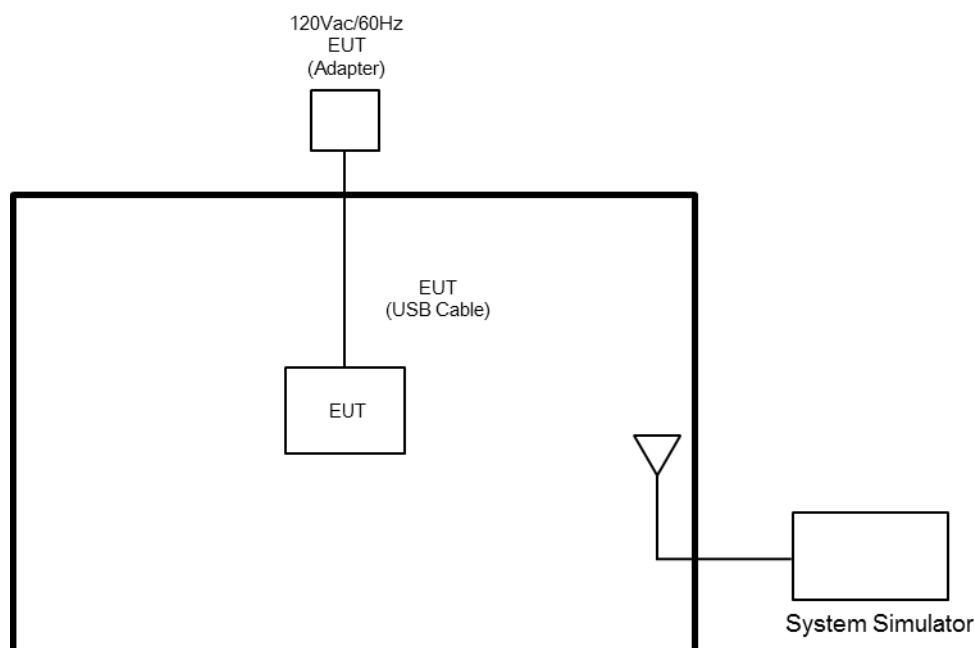
Antenna port conducted and radiated test items listed below are performed according to KDB 971168 D01 Power Meas. License Digital Systems v03r01 with maximum output power.

For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (LF: X Plane for Co-Location Band 4 + Band 5, Z Plane for Co-Location Band 2 + Band 5, Band 2 + Band 13 and Band 4 + Band 13 ; HF: Y Plane for Co-Location Band 2 + Band 5 and Band 4 + Band 5, and X Plane for Co-Location Band 2 + Band 13 and Band 4 + Band 13) were recorded in this report.

#### <Co-Location>

| Test Mode      |                                                    |
|----------------|----------------------------------------------------|
| <b>Mode 1:</b> | Band 2 (20M 1RB49 QPSK) + Band 5 (10M 1RB24 QPSK)  |
| <b>Mode 2:</b> | Band 4 (20M 1RB49 QPSK) + Band 5 (10M 1RB24 QPSK)  |
| <b>Mode 3:</b> | Band 2 (20M 1RB49 QPSK) + Band 13 (10M 1RB24 QPSK) |
| <b>Mode 4:</b> | Band 4 (20M 1RB49 QPSK) + Band 13 (10M 1RB24 QPSK) |

### 2.2 Connection Diagram of Test System





## 2.3 Support Unit used in test configuration and system

| Item | Equipment        | Trade Name | Model No. | FCC ID | Data Cable | Power Cord        |
|------|------------------|------------|-----------|--------|------------|-------------------|
| 1.   | LTE Base Station | Anritsu    | 8821C     | N/A    | N/A        | Unshielded, 1.8 m |

## 2.4 Frequency List of Low/Middle/High Channels

| LTE Band 2 Channel and Frequency List |                        |        |        |         |
|---------------------------------------|------------------------|--------|--------|---------|
| BW [MHz]                              | Channel/Frequency(MHz) | Lowest | Middle | Highest |
| 20                                    | Channel                | 18700  | 18900  | 19100   |
|                                       | Frequency              | 1860   | 1880   | 1900    |
| 15                                    | Channel                | 18675  | 18900  | 19125   |
|                                       | Frequency              | 1857.5 | 1880   | 1902.5  |
| 10                                    | Channel                | 18650  | 18900  | 19150   |
|                                       | Frequency              | 1855   | 1880   | 1905    |
| 5                                     | Channel                | 18625  | 18900  | 19175   |
|                                       | Frequency              | 1852.5 | 1880   | 1907.5  |
| 3                                     | Channel                | 18615  | 18900  | 19185   |
|                                       | Frequency              | 1851.5 | 1880   | 1908.5  |
| 1.4                                   | Channel                | 18607  | 18900  | 19193   |
|                                       | Frequency              | 1850.7 | 1880   | 1909.3  |

| LTE Band 4 Channel and Frequency List |                        |        |        |         |
|---------------------------------------|------------------------|--------|--------|---------|
| BW [MHz]                              | Channel/Frequency(MHz) | Lowest | Middle | Highest |
| 20                                    | Channel                | 20050  | 20175  | 20300   |
|                                       | Frequency              | 1720   | 1732.5 | 1745    |
| 15                                    | Channel                | 20025  | 20175  | 20325   |
|                                       | Frequency              | 1717.5 | 1732.5 | 1747.5  |
| 10                                    | Channel                | 20000  | 20175  | 20350   |
|                                       | Frequency              | 1715   | 1732.5 | 1750    |
| 5                                     | Channel                | 19975  | 20175  | 20375   |
|                                       | Frequency              | 1712.5 | 1732.5 | 1752.5  |
| 3                                     | Channel                | 19965  | 20175  | 20385   |
|                                       | Frequency              | 1711.5 | 1732.5 | 1753.5  |
| 1.4                                   | Channel                | 19957  | 20175  | 20393   |
|                                       | Frequency              | 1710.7 | 1732.5 | 1754.3  |

| LTE Band 5 Channel and Frequency List |                        |        |        |         |
|---------------------------------------|------------------------|--------|--------|---------|
| BW [MHz]                              | Channel/Frequency(MHz) | Lowest | Middle | Highest |
| 10                                    | Channel                | 20450  | 20525  | 20600   |
|                                       | Frequency              | 829    | 836.5  | 844     |
| 5                                     | Channel                | 20425  | 20525  | 20625   |
|                                       | Frequency              | 826.5  | 836.5  | 846.5   |
| 3                                     | Channel                | 20415  | 20525  | 20635   |
|                                       | Frequency              | 825.5  | 836.5  | 847.5   |
| 1.4                                   | Channel                | 20407  | 20525  | 20643   |
|                                       | Frequency              | 824.7  | 836.5  | 848.3   |

| LTE Band 13 Channel and Frequency List |                        |        |        |         |
|----------------------------------------|------------------------|--------|--------|---------|
| BW [MHz]                               | Channel/Frequency(MHz) | Lowest | Middle | Highest |
| 10                                     | Channel                | -      | 23230  | -       |
|                                        | Frequency              | -      | 782    | -       |
| 5                                      | Channel                | 23205  | 23230  | 23255   |
|                                        | Frequency              | 779.5  | 782    | 784.5   |

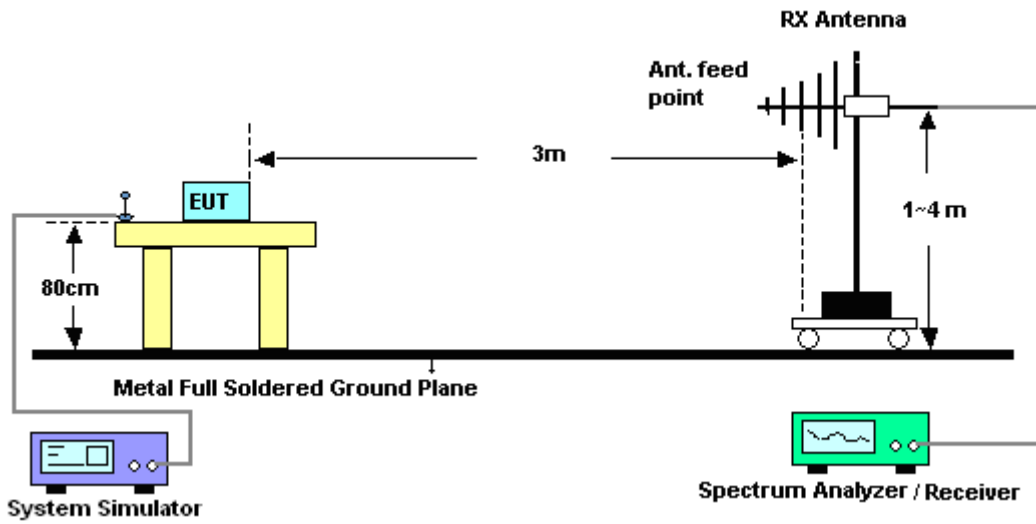
### 3 Radiated Test Items

#### 3.1 Measuring Instruments

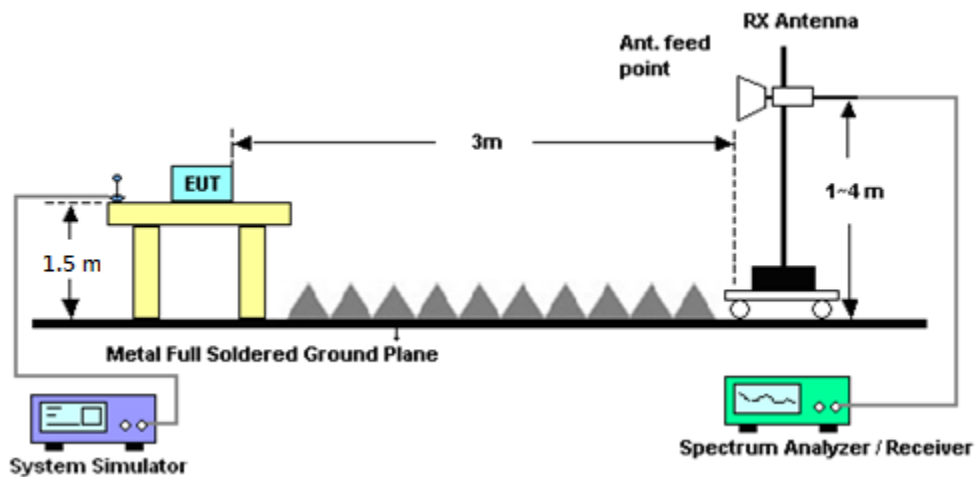
See list of measuring instruments of this test report.

##### 3.1.1 Test Setup

For radiated test from 30MHz to 1GHz



For radiated test above 1GHz



##### 3.1.2 Test Result of Radiated Test

Please refer to Appendix A.

## 3.2 Radiated Spurious Emission Measurement

### 3.2.1 Description of Radiated Spurious Emission Measurement

#### 22.917(a) / RSS-132

For operations in the 824 – 849 MHz band, the FCC limit is  $43 + 10\log_{10}(P[\text{Watts}])$  dB below the transmitter power  $P(\text{Watts})$  in a 100kHz bandwidth. However, in the 1MHz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

#### 24.238 (a) / RSS-133

For operations in the 1850-1910 and 1930-1990 MHz band, the FCC limit is  $43 + 10\log_{10}(P[\text{Watts}])$  dB below the transmitter power  $P(\text{Watts})$  in a 1MHz bandwidth. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

#### 27.53 (c) / RSS-130

For operations in the 776-788 MHz band, the FCC limit is  $43 + 10\log_{10}(P[\text{Watts}])$  dB below the transmitter power  $P(\text{Watts})$  in a 100 kHz bandwidth. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed. In addition, the power of any unwanted emissions in any 6.25 kHz bandwidth for all frequencies between 763-775 MHz and 793-806 MHz shall be attenuated below the transmitter power,  $P$  (dBW), by at least  $65 + 10 \log_{10} p(\text{watts})$ , dB, for mobile and portable equipment.

#### 27.53 (h) / RSS-139

For operations in the 1710 – 1755 MHz band, the FCC limit is  $43 + 10\log_{10}(P[\text{Watts}])$  dB below the transmitter power  $P(\text{Watts})$  in a 1 MHz bandwidth. However, in the 1MHz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

The radiated spurious emission was measured by substitution method according to ANSI / TIA-603-E. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power ( $P$ ) by a factor of at least  $43 + 10 \log (P)$  dB.

For LTE Band 13

For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth.

The spectrum is scanned from 30 MHz up to a frequency including its 10th harmonic.

### 3.2.2 Test Procedures

The testing follows FCC KDB 971168 D01 v03r01 Section 5.8, ANSI C63.26 Section 5.5.3 and ANSI / TIA-603-E Section 2.2.12.

1. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
2. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest spurious emission.
4. The height of the receiving antenna is varied between one meter and four meters to search the maximum spurious emission for both horizontal and vertical polarizations.
5. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking the record of maximum spurious emission.
6. A horn antenna was substituted in place of the EUT and was driven by a signal generator.
7. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
8. Taking the record of output power at antenna port.
9. Repeat step 7 to step 8 for another polarization.
10. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

The limit line is derived from  $43 + 10\log(P)$  dB below the transmitter power P(Watts)

## 4 List of Measuring Equipment

| Instrument                | Manufacturer       | Model No.                              | Serial No.                            | Characteristics | Calibration Date | Test Date                     | Due Date      | Remark                   |
|---------------------------|--------------------|----------------------------------------|---------------------------------------|-----------------|------------------|-------------------------------|---------------|--------------------------|
| Double Ridge Horn Antenna | ESCO               | 3117                                   | 00075962                              | 1GHz ~ 18GHz    | Dec. 02, 2018    | May 09, 2019~<br>May 10, 2019 | Dec. 03, 2019 | Radiation<br>(03CH07-HY) |
| EMI Test Receiver         | Agilent            | N9038A(MXE)                            | MY53290053                            | 20Hz to 26.5GHz | Jan. 23, 2019    | May 09, 2019~<br>May 10, 2019 | Jan. 22, 2020 | Radiation<br>(03CH07-HY) |
| Preamplifier              | Agilent            | 8449B                                  | 3008A02362                            | 1GHz~ 26.5GHz   | Nov. 02, 2018    | May 09, 2019~<br>May 10, 2019 | Nov. 01, 2019 | Radiation<br>(03CH07-HY) |
| Notch Filter              | Wainwright         | WRCT698/798<br>-10/40 8SSK             | SN1                                   | AWS Band        | Nov. 07, 2018    | May 09, 2019~<br>May 10, 2019 | Nov. 06, 2019 | Radiation<br>(03CH07-HY) |
| Filter                    | Microwave          | H1G013G1                               | SN477215                              | 1.0G High Pass  | Nov. 02, 2018    | May 09, 2019~<br>May 10, 2019 | Nov. 01, 2019 | Radiation<br>(03CH07-HY) |
| RF Cable                  | HUBER +<br>SUHNER  | SUCOFLEX<br>104                        | MY28655/4,<br>MY24971/4,<br>MY15682/4 | 1GHz~18GHz      | Feb. 26, 2019    | May 09, 2019~<br>May 10, 2019 | Feb. 25, 2020 | Radiation<br>(03CH07-HY) |
| Antenna Mast              | Max-Full           | MFA520BS                               | N/A                                   | 1m~4m           | N/A              | May 09, 2019~<br>May 10, 2019 | N/A           | Radiation<br>(03CH07-HY) |
| Turn Table                | ChainTek           | Chaintek 3000                          | N/A                                   | 0~360 Degree    | N/A              | May 09, 2019~<br>May 10, 2019 | N/A           | Radiation<br>(03CH07-HY) |
| Horn Antenna              | ESCO               | 3117                                   | 00143261                              | 1GHz~18GHz      | Jan. 07, 2019    | May 09, 2019~<br>May 10, 2019 | Jan. 06, 2020 | Radiation<br>(03CH07-HY) |
| Notch Filter              | Wainwright         | WRCD1700/20<br>00-0.2/40-10S<br>SK     | SN37                                  | DCS 1900        | Aug. 23, 2018    | May 09, 2019~<br>May 10, 2019 | Aug. 22, 2019 | Radiation<br>(03CH07-HY) |
| Filter                    | Microwave          | H3G018G1                               | SN477220                              | 3.0G High Pass  | Aug. 23, 2018    | May 09, 2019~<br>May 10, 2019 | Aug. 22, 2019 | Radiation<br>(03CH07-HY) |
| Notch Filter              | Wainwright         | WRCG1710/17<br>55-1690/1755-<br>45/7SS | SN2                                   | AWS Band        | Nov. 06, 2018    | May 09, 2019~<br>May 10, 2019 | Nov. 05, 2019 | Radiation<br>(03CH07-HY) |
| Software                  | Audix              | E3 6.2009-8-2<br>4                     | 80504004656<br>H                      | N/A             | N/A              | May 09, 2019~<br>May 10, 2019 | N/A           | Radiation<br>(03CH07-HY) |
| Signal Generator          | Rohde &<br>Schwarz | SMF100A                                | 101107                                | 100kHz~40GHz    | May. 22, 2018    | May 09, 2019~<br>May 10, 2019 | May 21, 2019  | Radiation<br>(03CH07-HY) |
| Loop Antenna              | Rohde &<br>Schwarz | HFH2-Z2                                | 100488                                | 9 kHz~30 MHz    | Jan. 07, 2019    | May 10, 2019                  | Jan. 06, 2020 | Radiation<br>(03CH15-HY) |
| Amplifier                 | SONOMA             | 310N                                   | 363440                                | 9kHz~1GHz       | Dec. 28, 2018    | May 10, 2019                  | Dec. 27, 2019 | Radiation<br>(03CH15-HY) |
| Bilog Antenna             | TESEQ              | CBL6111D&00<br>800N1D01N-0<br>6        | 41912&05                              | 30MHz to 1GHz   | Feb. 12, 2019    | May 10, 2019                  | Feb. 11, 2020 | Radiation<br>(03CH15-HY) |
| Spectrum Analyzer         | Agilent            | N9010A                                 | MY53470118                            | 10Hz~44GHz      | Apr. 18, 2019    | May 10, 2019                  | Apr. 17, 2020 | Radiation<br>(03CH15-HY) |
| Antenna Mast              | ChainTek           | MBS-520-1                              | N/A                                   | 1m~4m           | N/A              | May 10, 2019                  | N/A           | Radiation<br>(03CH15-HY) |
| Turn Table                | ChainTek           | T-200-S-1                              | N/A                                   | 0~360 Degree    | N/A              | May 10, 2019                  | N/A           | Radiation<br>(03CH15-HY) |
| Signal Generator          | Rohde &<br>Schwarz | SMF100A                                | 101107                                | 100kHz~40GHz    | May 22, 2018     | May 10, 2019                  | May 21, 2019  | Radiation<br>(03CH15-HY) |
| Software                  | Audix              | E3 6.2009-8-24                         | RK-000451                             | N/A             | N/A              | May 10, 2019                  | N/A           | Radiation<br>(03CH15-HY) |
| Bilog Antenna             | TESEQ              | CBL<br>6111D&00800<br>N1D01N-06        | 40103&07                              | 30MHz to 1GHz   | Apr. 30, 2019    | May 10, 2019                  | Apr. 29, 2020 | Radiation<br>(03CH15-HY) |
| Filter                    | Wainwright         | WLK4-1000-15<br>30-8000-40SS           | SN11                                  | 1G Low Pass     | Sep. 16, 2018    | May 10, 2019                  | Sep. 15, 2019 | Radiation<br>(03CH15-HY) |

**RADIO TEST REPORT****Report No. : FG950301B**

| Instrument   | Manufacturer   | Model No.              | Serial No.             | Characteristics | Calibration Date | Test Date    | Due Date      | Remark                |
|--------------|----------------|------------------------|------------------------|-----------------|------------------|--------------|---------------|-----------------------|
| Notch Filter | Wainwright     | WRCG824/849-40/8SS     | SN35                   | CDMA 850        | Nov.07, 2018     | May 10, 2019 | Nov.06, 2019  | Radiation (03CH15-HY) |
| Notch Filter | Wainwright     | WRCT698/798-10/40 8SSK | SN1                    | AWS Band        | Nov.07, 2018     | May 10, 2019 | Nov.06, 2019  | Radiation (03CH15-HY) |
| RF Cable     | HUBER + SUHNER | SUCOFLEX 104           | MY36980/4              | 30M-18G         | Apr. 15, 2019    | May 10, 2019 | Apr. 14, 2020 | Radiation (03CH15-HY) |
| RF Cable     | HUBER + SUHNER | SUCOFLEX 104           | MY9838/4               | 30M-18G         | Apr. 15, 2019    | May 10, 2019 | Apr. 14, 2020 | Radiation (03CH15-HY) |
| RF Cable     | HUBER + SUHNER | MTJ                    | 000000-MT18 A-100D3210 | 30M-18G         | Apr. 15, 2019    | May 10, 2019 | Apr. 14, 2020 | Radiation (03CH15-HY) |

## 5 Uncertainty of Evaluation

<03CH07-HY>

### Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

|                                                                         |      |
|-------------------------------------------------------------------------|------|
| Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ ) | 3.05 |
|-------------------------------------------------------------------------|------|

### Uncertainty of Radiated Emission Measurement (1 GHz ~ 18 GHz)

|                                                                         |      |
|-------------------------------------------------------------------------|------|
| Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ ) | 3.44 |
|-------------------------------------------------------------------------|------|

### Uncertainty of Radiated Emission Measurement (18 GHz ~ 40 GHz)

|                                                                         |      |
|-------------------------------------------------------------------------|------|
| Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ ) | 3.95 |
|-------------------------------------------------------------------------|------|

<03CH15-HY>

### Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

|                                                                         |      |
|-------------------------------------------------------------------------|------|
| Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ ) | 3.17 |
|-------------------------------------------------------------------------|------|

### Uncertainty of Radiated Emission Measurement (1 GHz ~ 18 GHz)

|                                                                         |      |
|-------------------------------------------------------------------------|------|
| Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ ) | 3.48 |
|-------------------------------------------------------------------------|------|

### Uncertainty of Radiated Emission Measurement (18 GHz ~ 40 GHz)

|                                                                         |      |
|-------------------------------------------------------------------------|------|
| Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ ) | 4.00 |
|-------------------------------------------------------------------------|------|



## Appendix A. Test Results of Radiated Test

### **Radiated Spurious Emission**

#### **Mode 1 Band 2 20M 1RB49 QPSK+Band5 10M 1RB24 QPSK**

| Band 2_20M 1RB49 QPSK+Band5_10M 1RB24 QPSK |                      |                 |                  |                         |                         |                          |                            |                             |                       |
|--------------------------------------------|----------------------|-----------------|------------------|-------------------------|-------------------------|--------------------------|----------------------------|-----------------------------|-----------------------|
| Channel                                    | Frequency<br>( MHz ) | EIRP<br>( dBm ) | Limit<br>( dBm ) | Over<br>Limit<br>( dB ) | SPA<br>Reading<br>(dBm) | S.G.<br>Power<br>( dBm ) | TX Cable<br>loss<br>( dB ) | TX Antenna<br>Gain<br>(dBi) | Polarization<br>(H/V) |
| Middle                                     | 207                  | -74.15          | -13              | -61.15                  | -67.64                  | -74.70                   | 0.34                       | 0.89                        | H                     |
|                                            | 629.5                | -72.63          | -13              | -59.63                  | -76.01                  | -72.12                   | 0.61                       | 0.10                        | H                     |
|                                            | 1043.5               | -63.34          | -13              | -50.34                  | -73.92                  | -65.1                    | 0.71                       | 2.47                        | H                     |
|                                            | 1673                 | -61.81          | -13              | -48.81                  | -74.93                  | -65.64                   | 0.99                       | 4.82                        | H                     |
|                                            | 2509.5               | -58.86          | -13              | -45.86                  | -77.31                  | -62.97                   | 1.29                       | 5.41                        | H                     |
|                                            | 3346                 | -56.91          | -13              | -43.91                  | -77.48                  | -62.68                   | 1.56                       | 7.32                        | H                     |
|                                            | 3553                 | -56.42          | -13              | -43.42                  | -77.65                  | -62.86                   | 1.62                       | 8.06                        | H                     |
|                                            | 3760                 | -53.19          | -13              | -40.19                  | -74.26                  | -59.82                   | 1.69                       | 8.31                        | H                     |
|                                            | 3967                 | -56.62          | -13              | -43.62                  | -77.56                  | -63.43                   | 1.75                       | 8.56                        | H                     |
|                                            | 4389                 | -56.38          | -13              | -43.38                  | -78.33                  | -63.07                   | 1.99                       | 8.68                        | H                     |
|                                            | 5640                 | -31.64          | -13              | -18.64                  | -57.21                  | -38.69                   | 2.71                       | 9.76                        | H                     |
|                                            | 6683.5               | -50.54          | -13              | -37.54                  | -77.37                  | -58.27                   | 2.69                       | 10.42                       | H                     |
|                                            | 7313                 | -50.65          | -13              | -37.65                  | -77.92                  | -59.59                   | 2.49                       | 11.43                       | H                     |
|                                            | 7520                 | -50.05          | -13              | -37.05                  | -77.57                  | -59.44                   | 2.42                       | 11.81                       | H                     |
|                                            | 8356.5               | -48.24          | -13              | -35.24                  | -77.09                  | -58.28                   | 2.34                       | 12.38                       | H                     |

|        |        |        |     |        |        |        |      |       |   |
|--------|--------|--------|-----|--------|--------|--------|------|-------|---|
| Middle | 207    | -74.37 | -13 | -61.37 | -73.71 | -74.92 | 0.34 | 0.89  | V |
|        | 629.5  | -69.98 | -13 | -56.98 | -75.88 | -69.47 | 0.61 | 0.10  | V |
|        | 1043.5 | -62.82 | -13 | -49.82 | -73.72 | -64.58 | 0.71 | 2.47  | V |
|        | 1673   | -61.04 | -13 | -48.04 | -74.7  | -64.87 | 0.99 | 4.82  | V |
|        | 2509.5 | -58.55 | -13 | -45.55 | -77.49 | -62.66 | 1.29 | 5.41  | V |
|        | 3346   | -56.66 | -13 | -43.66 | -77.36 | -62.43 | 1.56 | 7.32  | V |
|        | 3553   | -56.12 | -13 | -43.12 | -77.25 | -62.56 | 1.62 | 8.06  | V |
|        | 3760   | -53.74 | -13 | -40.74 | -74.83 | -60.37 | 1.69 | 8.31  | V |
|        | 3967   | -56.32 | -13 | -43.32 | -77.32 | -63.13 | 1.75 | 8.56  | V |
|        | 4389   | -56.28 | -13 | -43.28 | -78.28 | -62.97 | 1.99 | 8.68  | V |
|        | 5640   | -33.92 | -13 | -20.92 | -59.49 | -40.97 | 2.71 | 9.76  | V |
|        | 6683.5 | -50.75 | -13 | -37.75 | -77.5  | -58.48 | 2.69 | 10.42 | V |
|        | 7313   | -50.17 | -13 | -37.17 | -77.61 | -59.11 | 2.49 | 11.43 | V |
|        | 7520   | -49.77 | -13 | -36.77 | -77.63 | -59.16 | 2.42 | 11.81 | V |
|        | 8356.5 | -47.73 | -13 | -34.73 | -77.05 | -57.77 | 2.34 | 12.38 | V |

**Remark:** Spurious emissions within 30-1000MHz were found more than 20dB below limit line.

## Mode 2 Band 4 20M 1RB49 QPSK+Band5 10M 1RB24 QPSK

| Band 4_20M 1RB49 QPSK+Band5_10M 1RB24 QPSK |                      |                 |                  |                         |                         |                          |                            |                             |                       |
|--------------------------------------------|----------------------|-----------------|------------------|-------------------------|-------------------------|--------------------------|----------------------------|-----------------------------|-----------------------|
| Channel                                    | Frequency<br>( MHz ) | EIRP<br>( dBm ) | Limit<br>( dBm ) | Over<br>Limit<br>( dB ) | SPA<br>Reading<br>(dBm) | S.G.<br>Power<br>( dBm ) | TX Cable<br>loss<br>( dB ) | TX Antenna<br>Gain<br>(dBi) | Polarization<br>(H/V) |
| Middle                                     | 59.5                 | -56.91          | -13              | -43.91                  | -53.48                  | -47.19                   | 0.17                       | -9.55                       | H                     |
|                                            | 777                  | -70.28          | -13              | -57.28                  | -76.63                  | -69.62                   | 0.64                       | -0.02                       | H                     |
|                                            | 896                  | -69.61          | -13              | -56.61                  | -77.56                  | -69.15                   | 0.68                       | 0.22                        | H                     |
|                                            | 1673                 | -61.19          | -13              | -48.19                  | -74.51                  | -65.02                   | 0.99                       | 4.82                        | H                     |
|                                            | 1792                 | -60.39          | -13              | -47.39                  | -74.83                  | -63.83                   | 1.04                       | 4.48                        | H                     |
|                                            | 2509.5               | -58.51          | -13              | -45.51                  | -76.88                  | -62.62                   | 1.29                       | 5.41                        | H                     |
|                                            | 3346                 | -57.06          | -13              | -44.06                  | -77.57                  | -62.83                   | 1.56                       | 7.32                        | H                     |
|                                            | 3405.5               | -57.91          | -13              | -44.91                  | -77.77                  | -63.92                   | 1.57                       | 7.58                        | H                     |
|                                            | 3465                 | -52.22          | -13              | -39.22                  | -73.36                  | -58.47                   | 1.59                       | 7.85                        | H                     |
|                                            | 3524.5               | -56.44          | -13              | -43.44                  | -77.71                  | -62.86                   | 1.61                       | 8.03                        | H                     |
|                                            | 4242                 | -55.37          | -13              | -42.37                  | -76.98                  | -62.12                   | 1.90                       | 8.65                        | H                     |
|                                            | 5197.5               | -35.41          | -13              | -22.41                  | -59.91                  | -42.66                   | 2.45                       | 9.70                        | H                     |
|                                            | 6093.5               | -51.52          | -13              | -38.52                  | -78.06                  | -58.59                   | 2.88                       | 9.96                        | H                     |
|                                            | 6870.5               | -50.99          | -13              | -37.99                  | -78                     | -59                      | 2.63                       | 10.64                       | H                     |
|                                            | 6930                 | -50.58          | -13              | -37.58                  | -77.75                  | -58.68                   | 2.61                       | 10.72                       | H                     |
|                                            | 7766.5               | -48.25          | -13              | -35.25                  | -76.24                  | -57.87                   | 2.34                       | 11.96                       | H                     |
|                                            |                      |                 |                  |                         |                         |                          |                            |                             | H                     |

|        |        |        |     |        |        |        |      |       |   |
|--------|--------|--------|-----|--------|--------|--------|------|-------|---|
| Middle | 59.5   | -56.42 | -13 | -43.42 | -47.88 | -46.70 | 0.17 | -9.55 | V |
|        | 777    | -69.01 | -13 | -56.01 | -76.8  | -68.35 | 0.64 | -0.02 | V |
|        | 896    | -67.41 | -13 | -54.41 | -77.54 | -66.95 | 0.68 | 0.22  | V |
|        | 1673   | -61.18 | -13 | -48.18 | -74.95 | -65.01 | 0.99 | 4.82  | V |
|        | 1792   | -59.54 | -13 | -46.54 | -74.32 | -62.98 | 1.04 | 4.48  | V |
|        | 2509.5 | -58.22 | -13 | -45.22 | -77.01 | -62.33 | 1.29 | 5.41  | V |
|        | 3346   | -56.66 | -13 | -43.66 | -77.53 | -62.43 | 1.56 | 7.32  | V |
|        | 3405.5 | -56.76 | -13 | -43.76 | -77.7  | -62.77 | 1.57 | 7.58  | V |
|        | 3465   | -52.77 | -13 | -39.77 | -73.81 | -59.02 | 1.59 | 7.85  | V |
|        | 3524.5 | -56.61 | -13 | -43.61 | -77.68 | -63.03 | 1.61 | 8.03  | V |
|        | 4242   | -55.12 | -13 | -42.12 | -69.91 | -61.87 | 1.90 | 8.65  | V |
|        | 5197.5 | -37.11 | -13 | -24.11 | -61.44 | -44.36 | 2.45 | 9.70  | V |
|        | 6093.5 | -51.46 | -13 | -38.46 | -77.98 | -58.53 | 2.88 | 9.96  | V |
|        | 6870.5 | -51.01 | -13 | -38.01 | -78.08 | -59.02 | 2.63 | 10.64 | V |
|        | 6930   | -50.47 | -13 | -37.47 | -77.64 | -58.57 | 2.61 | 10.72 | V |
|        | 7766.5 | -48.26 | -13 | -35.26 | -76.6  | -57.88 | 2.34 | 11.96 | V |
|        |        |        |     |        |        |        |      |       | V |

**Remark:** Spurious emissions within 30-1000MHz were found more than 20dB below limit line.

## **Mode 3 Band 2 20M 1RB49 QPSK+Band13 10M 1RB24 QPSK**

| Band 2_20M 1RB49 QPSK+Band13_10M 1RB24 QPSK |                      |                 |                  |                         |                         |                          |                            |                             |                       |
|---------------------------------------------|----------------------|-----------------|------------------|-------------------------|-------------------------|--------------------------|----------------------------|-----------------------------|-----------------------|
| Channel                                     | Frequency<br>( MHz ) | EIRP<br>( dBm ) | Limit<br>( dBm ) | Over<br>Limit<br>( dB ) | SPA<br>Reading<br>(dBm) | S.G.<br>Power<br>( dBm ) | TX Cable<br>loss<br>( dB ) | TX Antenna<br>Gain<br>(dBi) | Polarization<br>(H/V) |
| Middle                                      | 466                  | -74.70          | -13              | -61.70                  | -76.1                   | -74.32                   | 0.50                       | 0.12                        | H                     |
|                                             | 1248                 | -63.02          | -13              | -50.02                  | -73.85                  | -65.96                   | 0.80                       | 3.74                        | H                     |
|                                             | 1414                 | -63.19          | -13              | -50.19                  | -74.56                  | -67.08                   | 0.87                       | 4.77                        | H                     |
|                                             | 1564                 | -63.25          | -40              | -23.25                  | -75.41                  | -67.43                   | 0.94                       | 5.12                        | H                     |
|                                             | 2346                 | -59.31          | -13              | -46.31                  | -77                     | -63.01                   | 1.24                       | 4.94                        | H                     |
|                                             | 2662                 | -58.62          | -13              | -45.62                  | -77.18                  | -62.81                   | 1.34                       | 5.53                        | H                     |
|                                             | 2978                 | -58.15          | -13              | -45.15                  | -77.38                  | -62.49                   | 1.44                       | 5.78                        | H                     |
|                                             | 3128                 | -57.65          | -13              | -44.65                  | -77.16                  | -62.53                   | 1.49                       | 6.36                        | H                     |
|                                             | 3760                 | -56.74          | -13              | -43.74                  | -77.81                  | -63.37                   | 1.69                       | 8.31                        | H                     |
|                                             | 4542                 | -55.12          | -13              | -42.12                  | -77.56                  | -61.83                   | 2.07                       | 8.78                        | H                     |
|                                             | 5008                 | -53.75          | -13              | -40.75                  | -77.78                  | -61.11                   | 2.34                       | 9.70                        | H                     |
|                                             | 5324                 | -52.71          | -13              | -39.71                  | -77.58                  | -59.89                   | 2.52                       | 9.70                        | H                     |
|                                             | 5640                 | -52.78          | -13              | -39.78                  | -77.43                  | -59.83                   | 2.71                       | 9.76                        | H                     |
|                                             | 6106                 | -51.76          | -13              | -38.76                  | -78.33                  | -58.84                   | 2.88                       | 9.96                        | H                     |
|                                             | 6422                 | -50.63          | -13              | -37.63                  | -77.36                  | -58.01                   | 2.78                       | 10.15                       | H                     |
|                                             | 7520                 | -49.77          | -13              | -36.77                  | -77.34                  | -59.16                   | 2.42                       | 11.81                       | H                     |

|        |      |        |     |        |        |        |      |       |   |
|--------|------|--------|-----|--------|--------|--------|------|-------|---|
| Middle | 466  | -74.55 | -13 | -61.55 | -76.6  | -74.17 | 0.50 | 0.12  | V |
|        | 1248 | -62.73 | -13 | -49.73 | -73.94 | -65.67 | 0.80 | 3.74  | V |
|        | 1414 | -62.93 | -13 | -49.93 | -74.79 | -66.82 | 0.87 | 4.77  | V |
|        | 1564 | -62.81 | -40 | -22.81 | -75.54 | -66.99 | 0.94 | 5.12  | V |
|        | 2346 | -58.52 | -13 | -45.52 | -76.65 | -62.22 | 1.24 | 4.94  | V |
|        | 2662 | -57.74 | -13 | -44.74 | -76.9  | -61.93 | 1.34 | 5.53  | V |
|        | 2978 | -57.13 | -13 | -44.13 | -77.22 | -61.47 | 1.44 | 5.78  | V |
|        | 3128 | -55.54 | -13 | -42.54 | -75.76 | -60.42 | 1.49 | 6.36  | V |
|        | 3760 | -57.19 | -13 | -44.19 | -78.24 | -63.82 | 1.69 | 8.31  | V |
|        | 4542 | -55.58 | -13 | -42.58 | -78.02 | -62.29 | 2.07 | 8.78  | V |
|        | 5008 | -54.02 | -13 | -41.02 | -78.02 | -61.38 | 2.34 | 9.70  | V |
|        | 5324 | -52.83 | -13 | -39.83 | -77.56 | -60.01 | 2.52 | 9.70  | V |
|        | 5640 | -51.74 | -13 | -38.74 | -77.39 | -58.79 | 2.71 | 9.76  | V |
|        | 6106 | -52.07 | -13 | -39.07 | -78.46 | -59.15 | 2.88 | 9.96  | V |
|        | 6422 | -50.75 | -13 | -37.75 | -77.26 | -58.13 | 2.78 | 10.15 | V |
|        | 7520 | -49.93 | -13 | -36.93 | -77.7  | -59.32 | 2.42 | 11.81 | V |

**Remark:** Spurious emissions within 30-1000MHz were found more than 20dB below limit line.

## Mode 4 Band 4 20M 1RB49 QPSK+Band13 10M 1RB24 QPSK

| Band 4_20M 1RB49 QPSK+Band13_10M 1RB24 QPSK |                      |                 |                  |                         |                         |                          |                            |                             |                       |
|---------------------------------------------|----------------------|-----------------|------------------|-------------------------|-------------------------|--------------------------|----------------------------|-----------------------------|-----------------------|
| Channel                                     | Frequency<br>( MHz ) | EIRP<br>( dBm ) | Limit<br>( dBm ) | Over<br>Limit<br>( dB ) | SPA<br>Reading<br>(dBm) | S.G.<br>Power<br>( dBm ) | TX Cable<br>loss<br>( dB ) | TX Antenna<br>Gain<br>(dBi) | Polarization<br>(H/V) |
| Middle                                      | 1119                 | -63.09          | -13              | -50.09                  | -73.57                  | -65.28                   | 0.74                       | 2.94                        | H                     |
|                                             | 1395.5               | -63.16          | -13              | -50.16                  | -74.44                  | -66.94                   | 0.87                       | 4.65                        | H                     |
|                                             | 1564                 | -63.17          | -40              | -23.17                  | -75.45                  | -67.35                   | 0.94                       | 5.12                        | H                     |
|                                             | 2346                 | -59.00          | -13              | -46.00                  | -76.68                  | -62.7                    | 1.24                       | 4.94                        | H                     |
|                                             | 2514.5               | -57.44          | -13              | -44.44                  | -75.87                  | -61.56                   | 1.30                       | 5.41                        | H                     |
|                                             | 2683                 | -57.81          | -13              | -44.81                  | -76.51                  | -62.01                   | 1.35                       | 5.55                        | H                     |
|                                             | 3128                 | -57.28          | -13              | -44.28                  | -76.82                  | -62.16                   | 1.49                       | 6.36                        | H                     |
|                                             | 3465                 | -51.41          | -13              | -38.41                  | -72.54                  | -57.66                   | 1.59                       | 7.85                        | H                     |
|                                             | 4247                 | -55.16          | -13              | -42.16                  | -76.75                  | -61.91                   | 1.90                       | 8.65                        | H                     |
|                                             | 4415.5               | -56.52          | -13              | -43.52                  | -78.58                  | -63.2                    | 2.00                       | 8.68                        | H                     |
|                                             | 4860.5               | -53.39          | -13              | -40.39                  | -76.91                  | -60.55                   | 2.26                       | 9.42                        | H                     |
|                                             | 5029                 | -53.48          | -13              | -40.48                  | -77.56                  | -60.83                   | 2.35                       | 9.70                        | H                     |
|                                             | 5197.5               | -53.10          | -13              | -40.10                  | -77.61                  | -60.35                   | 2.45                       | 9.70                        | H                     |
|                                             | 5811                 | -51.24          | -13              | -38.24                  | -77.25                  | -58.26                   | 2.80                       | 9.82                        | H                     |
|                                             | 5979.5               | -51.86          | -13              | -38.86                  | -78.24                  | -58.85                   | 2.90                       | 9.89                        | H                     |
|                                             | 6930                 | -50.67          | -13              | -37.67                  | -77.84                  | -58.77                   | 2.61                       | 10.72                       | H                     |

|        |        |        |     |        |        |        |      |       |   |
|--------|--------|--------|-----|--------|--------|--------|------|-------|---|
| Middle | 1119   | -62.94 | -13 | -49.94 | -73.66 | -65.13 | 0.74 | 2.94  | V |
|        | 1395.5 | -62.43 | -13 | -49.43 | -74.17 | -66.21 | 0.87 | 4.65  | V |
|        | 1564   | -62.53 | -40 | -22.53 | -75.31 | -66.71 | 0.94 | 5.12  | V |
|        | 2346   | -58.68 | -13 | -45.68 | -76.77 | -62.38 | 1.24 | 4.94  | V |
|        | 2514.5 | -57.42 | -13 | -44.42 | -76.13 | -61.54 | 1.30 | 5.41  | V |
|        | 2683   | -57.24 | -13 | -44.24 | -76.59 | -61.44 | 1.35 | 5.55  | V |
|        | 3128   | -56.33 | -13 | -43.33 | -76.59 | -61.21 | 1.49 | 6.36  | V |
|        | 3465   | -56.41 | -13 | -43.41 | -77.46 | -62.66 | 1.59 | 7.85  | V |
|        | 4247   | -55.29 | -13 | -42.29 | -77.01 | -62.04 | 1.90 | 8.65  | V |
|        | 4415.5 | -56.19 | -13 | -43.19 | -78.34 | -62.87 | 2.00 | 8.68  | V |
|        | 4860.5 | -53.88 | -13 | -40.88 | -77.27 | -61.04 | 2.26 | 9.42  | V |
|        | 5029   | -53.84 | -13 | -40.84 | -77.73 | -61.19 | 2.35 | 9.70  | V |
|        | 5197.5 | -53.21 | -13 | -40.21 | -77.58 | -60.46 | 2.45 | 9.70  | V |
|        | 5811   | -50.90 | -13 | -37.90 | -76.91 | -57.92 | 2.80 | 9.82  | V |
|        | 5979.5 | -51.81 | -13 | -38.81 | -78.21 | -58.8  | 2.90 | 9.89  | V |
|        | 6930   | -50.50 | -13 | -37.50 | -77.67 | -58.6  | 2.61 | 10.72 | V |

**Remark:** Spurious emissions within 30-1000MHz were found more than 20dB below limit line.