

## FCC/ISED RF Test Report

**Report No.:** FCC\_IC\_SL19110601-TCG-001\_900MHz Rev 1.0

**FCC ID:** HBW9545

**IC:** 2666A-9545

**Test Model:** MYQ-G0401

**Series Model:** MYQ-G0401-E, 821LMC

**Received Date:** 12/20/2019

**Test Date:** 12/23/2019 - 01/24/2020

**Issued Date:** 02/06/2020

**Applicant:** Chamberlain Group, Inc

**Address:** 300 Windsor Drive, Oakbrook, IL 60523

**Manufacturer:** Jabil, Inc.

**Address:** Jabil Circuit India Pvt. Ltd.

B -26, MIDC Industrial Area, Ranjangaon

Taluka Shirur, Pune - 412220,

Maharashtra, India

**Issued By:** Bureau Veritas Consumer Products Services, Inc.

**Lab Address:** 775 Montague Expressway, Milpitas, CA 95035

**Test Location (1):** 775 Montague Expressway, Milpitas, CA 95035

**FCC/IC Registration /  
Designation Number:** 540430/4842D



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### Release Control Record

| Issue No.                                | Description      | Date Issued |
|--|------------------|-------------|
| FCC_IC_RF_SL19110601-TCG001 _900MHz      | Original Release | 01/29/2020  |
| FCC_IC_SL19110601-TCG-001_900MHz Rev 1.0 | Revised          | 02/06/2020  |

## 1 Certificate of Conformity

**Product:** Smart Garage Control – C-Hub

**Brand:** Chamberlain

**Test Model:** MYQ-G0401

**Sample Status:** Engineering Sample

**Applicant:** Chamberlain Group, Inc

**Test Date:** 12/23/2019 - 01/24/2020

**Standards:** 47 CFR FCC Part 15, Subpart C (Section 15.249)

ISED RSS-210 Issue 10

ISED RSS-GEN Issue 5

ANSI C63.10: 2013

The above equipment has been tested by **Bureau Veritas Consumer Products Services, Inc., Milpitas Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

**Prepared by :**



**Date:**

01/29/2020

Yao-Wei Lee / Test Engineer

**Approved by :**



**Date:**

01/29/2020

Shuo Zhang / Engineer Reviewer

## 2 Summary of Test Results

| 47 CFR FCC Part 15, Subpart C (Section 15.249)/ISED RSS-210 |                                 |  |        |                                 |
|---|---------------------------------|--|--------|---------------------------------|
| FCC Clause  | RSS Section(s)                  | Test Item                                    | Result | Remarks                         |
| 15.207  | RSS-Gen[8.8]                    | AC Power Conducted Emission                  | PASS   | Meet the requirement of limit.  |
| 15.205 & 15.209 & 15.249(a)(c)                              | RSS-Gen[8.9]<br>RSS-210 [A.1.1] | Radiated Emissions and Band Edge Measurement | PASS   | Meet the requirement of limit.  |
| 15.249(a)   | RSS-210 [A.1.2]                 | Field Strength of Fundamental Signal         | PASS   | Meet the requirement of limit   |
| 2.1049  | RSS-210 [A.1.3]                 | 20dB Bandwidth & 99% Bandwidth Measurement   | PASS   | Meet the requirement of limit.  |
| 15.203  |                                 | Antenna Requirement                          | PASS   | Antenna is permanently attached |

### 2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

| Measurement                        | Frequency      | Expanded Uncertainty (k=2) (±) |
|------------------------------------|----------------|--------------------------------|
| Conducted Emissions at mains ports | 150kHz ~ 30MHz | 3.51dB                         |
| Radiated Emissions up to 1 GHz     | 30MHz ~ 1GHz   | 3.73dB                         |
| Radiated Emissions above 1 GHz     | 1GHz ~ 6GHz    | 4.64dB                         |
|                                    | 6GHz ~ 18GHz   | 4.82dB                         |
|                                    | 18GHz ~ 40GHz  | 4.91dB                         |

### 2.2 Modification Record

There were no modifications required for compliance.

### 3 General Information

#### 3.1 General Description of EUT

|                           |                               |
|---------------------------|-------------------------------|
| Product                   | Smart Garage Control – C-Hub  |
| Brand                     | Chamberlain                   |
| Test Model                | MYQ-G0401                     |
| Series Model              | MYQ-G0401-E, 821LMC           |
| Identification No. of EUT | 446195020226                  |
| Power Supply Rating       | 5.0VDC @ 1.5A                 |
| Modulation Type           | FSK                           |
| Modulation Technology     | FHSS                          |
| Transfer Rate             | 256kbps                       |
| Operating Frequency       | 902.25, 914.75, 926.75 MHz    |
| Antenna Type              | Monopole (wire), 5.19dBi gain |
| Antenna Connector         | N/A                           |

### 3.2 Description of Test Modes

#### 3 Transmit Channels

| Channel | Freq. (MHz) |
|---------|-------------|
| Low     | 902.25      |
| Mid     | 914.75      |
| High    | 926.75      |

### 3.2.1 Test Mode Applicability and Tested Channel Detail

| EUT CONFIGURE MODE | APPLICABLE TO |       |     |      | DESCRIPTION |
|--------------------|---------------|-------|-----|------|-------------|
|                    | RE $\geq$ 1G  | RE<1G | PLC | APCM |             |
| -                  | √             | √     | √   | -    | -           |

Where RE $\geq$ 1G: Radiated Emission above 1GHz & Bandedge Measurement  
 RE<1G: Radiated Emission below 1GHz  
 PLC: Power Line Conducted Emission  
 APCM: Antenna Port Conducted Measurement

NOTE: "-" means no effect.

#### **Radiated Emission Test (Above 1GHz):**

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

| AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION Technology | DATA RATE (kbps) |
|-------------------|----------------|-----------------------|------------------|
| 1 to 3            | 1, 2, 3        | FHSS                  | 256              |

#### **Radiated Emission Test (Below 1GHz):**

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

| AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION Technology | DATA RATE (kbps) |
|-------------------|----------------|-----------------------|------------------|
| 1 to 3            | 3              | FHSS                  | 256              |

#### **Power Line Conducted Emission Test:**

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

| AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TYPE | DATA RATE (Mbps) |
|-------------------|----------------|-----------------|------------------|
| 1 to 3            | 3              | FHSS            | 256              |

#### **Antenna Port Conducted Measurement:**

- ☐ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).



### Test Condition:

| APPLICABLE TO | ENVIRONMENTAL CONDITIONS | INPUT POWER  | TESTED BY   |
|---------------|--------------------------|--------------|-------------|
| RE $\geq$ 1G  | 25deg. C, 65%RH          | 120Vac, 60Hz | Yao Wei Lee |
| RE<1G         | 25deg. C, 65%RH          | 120Vac, 60Hz | Yao Wei Lee |
| PLC           | 25deg. C, 65%RH          | 120Vac, 60Hz | Yao Wei Lee |
| APCM          | N/A                      | N/A          | N/A         |

### 3.3 Description of Support Units

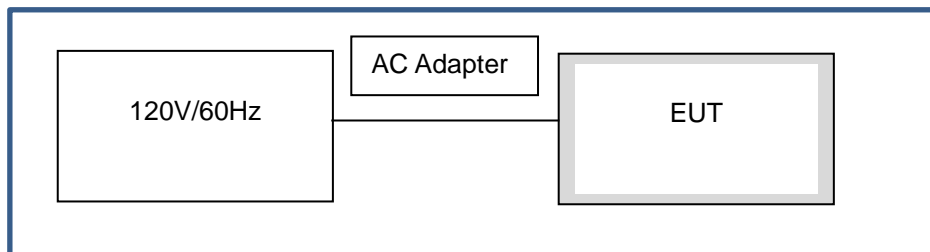
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

| ID | Product    | Brand             | Model No.        | Serial No. | FCC ID | Remarks         |
|----|------------|-------------------|------------------|------------|--------|-----------------|
| A. | Laptop     | Dell              | Latitude 3550    | 2MHWY32    | N/A    | Provided by Lab |
| B. | AC Adapter | QQJQ Power Supply | A912-050150W-US1 | N/A        | N/A    | To Power Up EUT |

Note: The core(s) is (are) originally attached to the cable(s).

#### 3.3.1 Configuration of System under Test

Test Chamber



### 3.4 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

**FCC Part 15, Subpart C (15.249)**  
**RSS-210 Issue 10**  
**RSS-GEN Issue 5**  
**ANSI C63.10-2013**

All test items have been performed and recorded as per the above standards.

## 4 Test Types and Results

### 4.1 Radiated Emission and Bandedge Measurement

#### 4.1.1 Limits of Radiated Emission and Bandedge Measurement

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power:

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

#### NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

Per FCC part 15.249 (a)(c)(d)(e) the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

r FCC part 15.249 (a)(c)(d)(e) the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

| Frequencies (MHz)            | Field Strength (microvolts/meter) | Measurement Distance (meters) |
|------------------------------|-----------------------------------|-------------------------------|
| Fundamental 902 – 928 MHz    | 94.0 dBμV/m                       | 3                             |
| Fundamental 2.4 – 2.4835 GHz | 94.0 dBμV/m                       | 3                             |
| Harmonics                    | 54.0 dBμV/m                       | 3                             |

#### 4.1.2 Test Instruments

| DESCRIPTION & MANUFACTURER      | MODEL NO. | SERIAL NO. | DATE OF CALIBRATION | DUE DATE OF CALIBRATION |
|---------------------------------|-----------|------------|---------------------|-------------------------|
| PXA Signal Analyzer<br>KEYSIGHT | N9030B    | MY57140584 | 03/05/2019          | 03/05/2020              |
| Horn Antenna<br>ETS-Lindgren    | 3117      | 218554     | 11/06/2019          | 11/06/2020              |
| Biconilog Antenna<br>Sunol      | JB1       | A030702    | 03/09/2018          | 03/09/2020              |
| Preamplifier<br>RF BAY INC      | LPA-6-30  | 11170601   | 04/27/2019          | 04/27/2020              |

**NOTE:**

1. The horn antenna and HP preamplifier (model: 3117) are used only for the measurement of emission frequency above 1GHz if tested.

#### 4.1.3 Test Procedures

##### **For Radiated emission below 30MHz**

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

##### **NOTE:**

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

##### **For Radiated emission above 30MHz**

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak and average detects function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

##### **Note:**

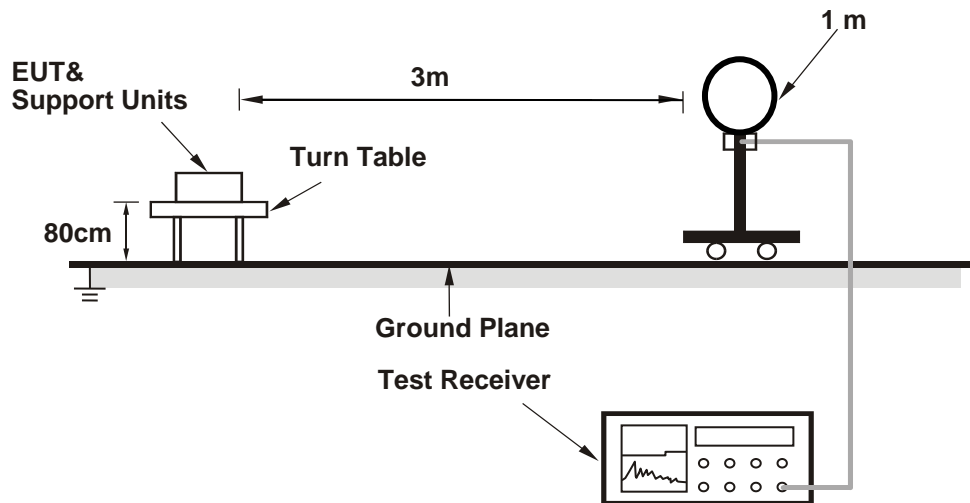
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is  $\geq 1/T$  (Duty cycle < 98%) or 10Hz (Duty cycle  $\geq 98\%$ ) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

#### 4.1.4 Deviation from Test Standard

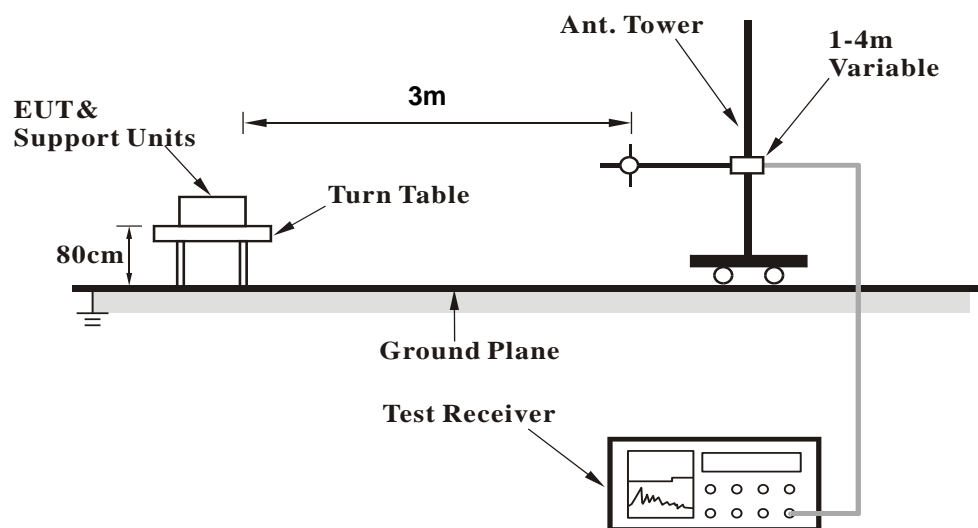
No deviation.

#### 4.1.5 Test Setup

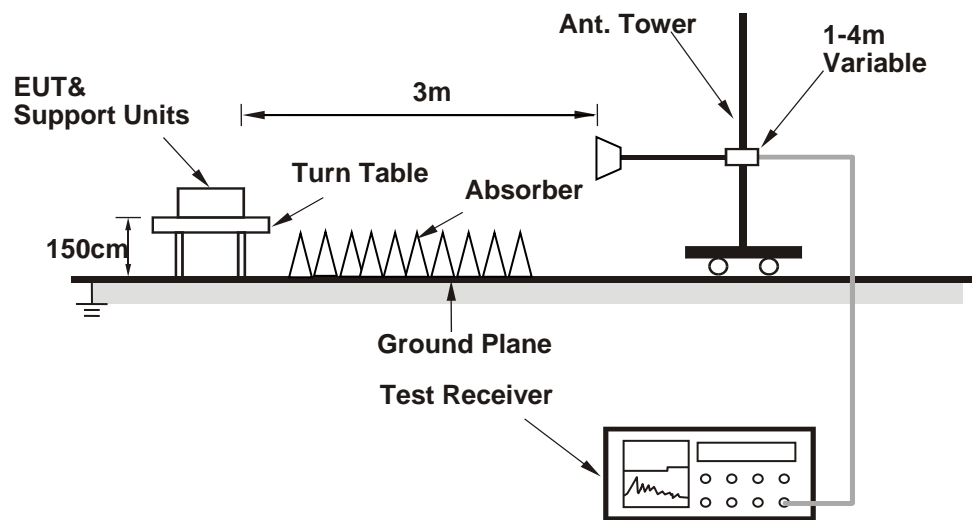
##### For Radiated emission below 30MHz



##### For Radiated emission 30MHz to 1GHz



## For Radiated emission above 1GHz



For the actual test configuration, please refer to the attached file (Test Setup Photo).

### 4.1.6 EUT Operating Conditions

- EUT is powered by connecting to an AC power source.
- Controlling software has been activated to set the EUT on specific status.

#### 4.1.7 Test Results

##### Correction Factor Measurement Result

Maximum transmit time on any frequency in a 100ms period  
 = 2 network packets + 1 command packet  
 = 1.25ms\*2 + 3mss  
 = 5.5ms

Modulation Correction Factor =  $20 \log (5.5/100) = -25.2 \text{ dB}$  (This is the systems worst case condition)

##### EMISSION WORST-CASE DATA:

| Freq (MHz) | Reading (dBuV/m) | Angle (Deg) | Height (m) | Polar H/V | Factors (dB) | CF    | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Comment |
|------------|------------------|-------------|------------|-----------|--------------|-------|----------------|----------------|-------------|---------|
| 1804.5     | 82.58            | 257         | 186        | H         | -10.9        | -     | 71.68          | 74             | 2.32        | Peak    |
| 1804.5     | -                | -           | -          | H         | -            | -25.2 | 46.48          | 54             | 7.52        | Average |
| 1804.5     | 78.21            | 265         | 178        | V         | -10.8        | -     | 67.41          | 74             | 6.59        | Peak    |
| 1804.5     | -                | -           | -          | V         | -            | -25.2 | 42.21          | 54             | 11.79       | Average |
| 1829.5     | 81.22            | 207         | 182        | H         | -11          | -     | 70.22          | 74             | 3.78        | Peak    |
| 1829.5     | -                | -           | -          | H         | -            | -25.2 | 45.02          | 54             | 8.98        | Average |
| 1829.5     | 80.58            | 34          | 205        | V         | -11.1        | -     | 69.48          | 74             | 4.52        | Peak    |
| 1829.5     | -                | -           | -          | V         | -            | -25.2 | 44.28          | 54             | 9.72        | Average |
| 1853.5     | 81.99            | 222         | 178        | H         | -11.1        | -     | 70.89          | 74             | 3.11        | Peak    |
| 1853.5     | -                | -           | -          | H         | -            | -25.2 | 45.69          | 54             | 8.31        | Average |
| 1853.5     | 82.36            | 28          | 159        | V         | -11.1        | -     | 71.26          | 74             | 2.74        | Peak    |
| 1853.5     | -                | -           | -          | V         | -            | -25.2 | 46.06          | 54             | 7.94        | Average |
| 2706.75    | 79.5             | 158         | 161        | H         | -9           | -     | 70.5           | 74             | 3.5         | Peak    |
| 2706.75    | -                | -           | -          | H         | -            | -25.2 | 45.3           | 54             | 8.7         | Average |
| 2706.75    | 70.66            | 237         | 184        | V         | -9           | -     | 61.66          | 74             | 12.34       | Peak    |
| 2706.75    | -                | -           | -          | V         | -            | -25.2 | 36.46          | 54             | 17.54       | Average |
| 2744.25    | 81.02            | 68          | 171        | H         | -9.1         | -     | 71.92          | 74             | 2.08        | Peak    |
| 2744.25    | -                | -           | -          | H         | -            | -25.2 | 46.72          | 54             | 7.28        | Average |
| 2744.25    | 74.48            | 112         | 198        | V         | -9.1         | -     | 65.38          | 74             | 8.62        | Peak    |
| 2744.25    | -                | -           | -          | V         | -            | -25.2 | 40.18          | 54             | 13.82       | Average |
| 2780.25    | 82.01            | 96          | 183        | H         | -9.3         | -     | 72.71          | 74             | 1.29        | Peak    |
| 2780.25    | -                | -           | -          | H         | -            | -25.2 | 47.51          | 54             | 6.49        | Average |
| 2780.25    | 80.7             | 178         | 192        | V         | -9.3         | -     | 71.4           | 74             | 2.6         | Peak    |
| 2780.25    | -                | -           | -          | V         | -            | -25.2 | 46.2           | 54             | 7.8         | Average |

##### REMARKS:

1. Peak Emission level (dBuV/m) = Reading Value (dBuV) + Factors(dB)
2. Average Emission level (dBuV/m) = Peak Emission level (dBuV/m) + Correction Factor (CF)
3. Frequency range is up to 4GHz.
4. The emission levels of other frequencies were less than 20dB margin against the limit.
5. Margin value = Emission level – Limit value.

## Field Strength of Fundamental Signal

| Freq (MHz) | Reading (dBuV/m) | Angle (Deg) | Height (m) | Polar H/V | Factors (dB) | CF    | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Comment |
|------------|------------------|-------------|------------|-----------|--------------|-------|----------------|----------------|-------------|---------|
| 902.25     | 75.37            | 185         | 171        | H         | 31.1         | -     | 106.47         | 114            | 7.53        | Peak    |
| 902.25     | -                | -           | -          | H         | -            | -25.2 | 81.27          | 94             | 12.73       | Average |
| 902.25     | 66.81            | 139         | 166        | V         | 31           | -     | 97.81          | 114            | 16.19       | Peak    |
| 902.25     | -                | -           | -          | V         | -            | -25.2 | 72.61          | 94             | 21.39       | Average |
| 914.75     | 77.82            | 265         | 183        | H         | 30.3         | -     | 108.12         | 114            | 5.88        | Peak    |
| 914.75     | -                | -           | -          | H         | -            | -25.2 | 82.92          | 94             | 11.08       | Average |
| 914.75     | 66.49            | 79          | 184        | V         | 30.3         | -     | 96.79          | 114            | 17.21       | Peak    |
| 914.75     | -                | -           | -          | V         | -            | -25.2 | 71.59          | 94             | 22.41       | Average |
| 926.75     | 79.42            | 243         | 172        | H         | 30.7         | -     | 110.12         | 114            | 3.88        | Peak    |
| 926.75     | -                | -           | -          | H         | -            | -25.2 | 84.92          | 94             | 9.08        | Average |
| 926.75     | 59.59            | 311         | 189        | V         | 30.7         | -     | 90.29          | 114            | 23.71       | Peak    |
| 926.75     | -                | -           | -          | V         | -            | -25.2 | 65.09          | 94             | 28.91       | Average |

### REMARKS:

1. Peak Emission level (dBuV/m) = Reading Value (dBuV) + Factors(dB)
2. Average Emission level (dBuV/m) = Peak Emission level (dBuV/m) + Correction Factor (CF)
3. Frequency range is up to 4GHz.
4. The emission levels of other frequencies were less than 20dB margin against the limit.
5. Margin value = Emission level – Limit value.



## 4.2 Conducted Emissions Measurement

### 4.2.1 Limits of Conducted Emission Measurement

| Frequency (MHz) | Conducted Limit (dBuV) |         |
|-----------------|------------------------|---------|
|                 | Quasi-peak             | Average |
| 0.15 - 0.5      | 66 - 56                | 56 - 46 |
| 0.50 - 5.0      | 56                     | 46      |
| 5.0 - 30.0      | 60                     | 50      |

Note: 1. The lower limit shall apply at the transition frequencies.

2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

### 4.2.2 Test Instruments

| Description & Manufacturer           | Model No. | Serial No. | Date Of Calibration | Due Date Of Calibration |
|--------------------------------------|-----------|------------|---------------------|-------------------------|
| EMI Test Receiver<br>ROHDE & SCHWARZ | ESIB 40   | 100179     | 08/28/2018          | 08/28/2020              |
| Transient Limiter<br>ELECTRO-METRICS | EM-7600-5 | 106        | 07/30/2019          | 07/30/2020              |
| LISN EMCO                            | 3816/2NM  | 214372     | 01/14/2020          | 01/14/2021              |

#### 4.2.3 Test Procedures

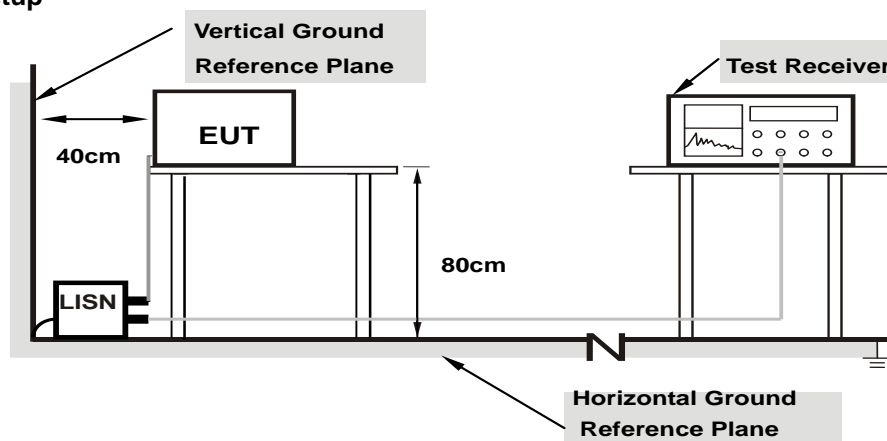
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- The frequency range from 150 kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

**NOTE:** The resolution bandwidth and video bandwidth of test receiver is 9 kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

#### 4.2.4 Deviation from Test Standard

No deviation.

#### 4.2.5 Test Setup



**Note:** 1.Support units were connected to second LISN.

For the actual test configuration, please refer to the attached file (Test Setup Photo).

#### 4.2.6 EUT Operating Conditions

- EUT is powered by connecting an AC power source.
- Controlling software has been activated to set the EUT on specific status.

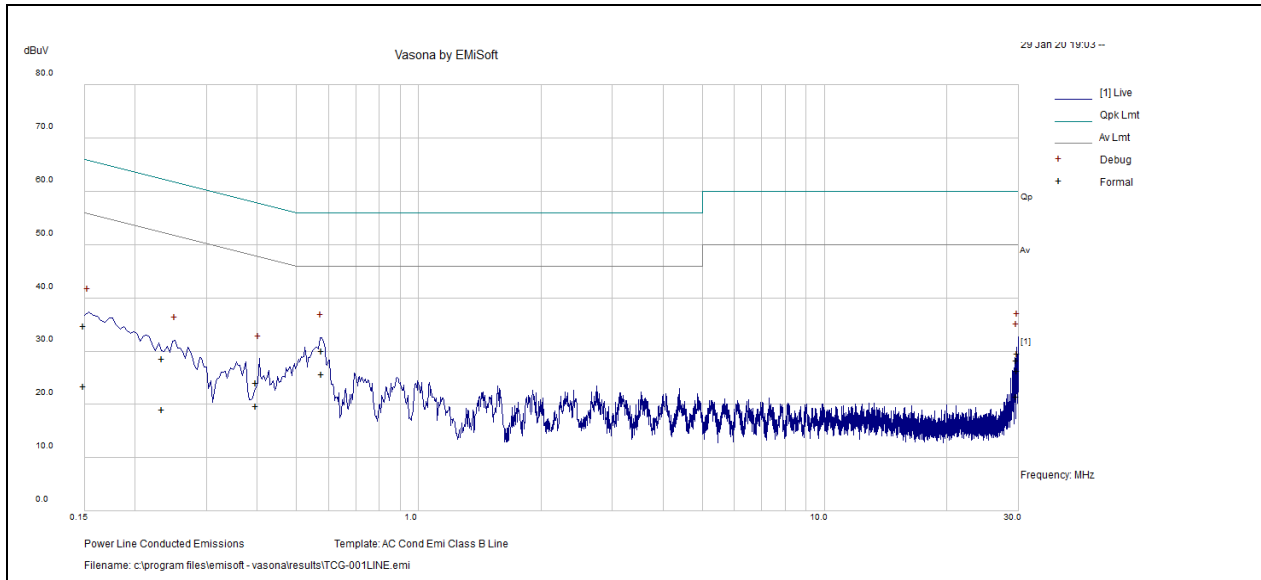
#### 4.2.7 Test Results

| Phase | Line (L) | Detector Function | Quasi-Peak / Average |
|-------|----------|-------------------|----------------------|
|-------|----------|-------------------|----------------------|

| No | Frequency (MHz) | Reading Value (dBuV) | Cable Loss (dB) | Insertion Loss (dB) | Emission Level Corrected (dBuV) | Measurement Type | Line/ Neutral | Limit (dBuV) | Margin (dB) | Pass/ Fail |
|----|-----------------|----------------------|-----------------|---------------------|---------------------------------|------------------|---------------|--------------|-------------|------------|
| 1  | 0.578141        | 20.55                | 9.46            | 0.04                | 30.04                           | Quasi Peak       | Line          | 56           | -25.96      | Pass       |
| 2  | 29.9978         | 18.98                | 9.95            | 0.66                | 29.59                           | Quasi Peak       | Line          | 60           | -30.41      | Pass       |
| 3  | 0.15            | 25.43                | 9.29            | 0.04                | 34.76                           | Quasi Peak       | Line          | 66           | -31.24      | Pass       |
| 4  | 0.397756        | 14.54                | 9.44            | 0.04                | 24.02                           | Quasi Peak       | Line          | 57.9         | -33.88      | Pass       |
| 5  | 29.78703        | 17.66                | 9.95            | 0.66                | 28.26                           | Quasi Peak       | Line          | 60           | -31.74      | Pass       |
| 6  | 0.233976        | 19.11                | 9.41            | 0.04                | 28.57                           | Quasi Peak       | Line          | 62.31        | -33.74      | Pass       |
| 7  | 0.578141        | 16.17                | 9.46            | 0.04                | 25.66                           | Average          | Line          | 46           | -20.34      | Pass       |
| 8  | 29.9978         | 15.79                | 9.95            | 0.66                | 26.4                            | Average          | Line          | 50           | -23.6       | Pass       |
| 9  | 0.15            | 14.05                | 9.29            | 0.04                | 23.38                           | Average          | Line          | 56           | -32.62      | Pass       |
| 10 | 0.397756        | 10.3                 | 9.44            | 0.04                | 19.78                           | Average          | Line          | 47.9         | -28.12      | Pass       |
| 11 | 29.78703        | 10.82                | 9.95            | 0.66                | 21.43                           | Average          | Line          | 50           | -28.57      | Pass       |
| 12 | 0.233976        | 9.57                 | 9.41            | 0.04                | 19.03                           | Average          | Line          | 52.31        | -33.28      | Pass       |

#### REMARKS:

1. The emission levels of other frequencies were very low against the limit.
2. Margin value = Emission level - Limit value
3. Emission Level = Correction Factor + Raw Value + Factors Value.

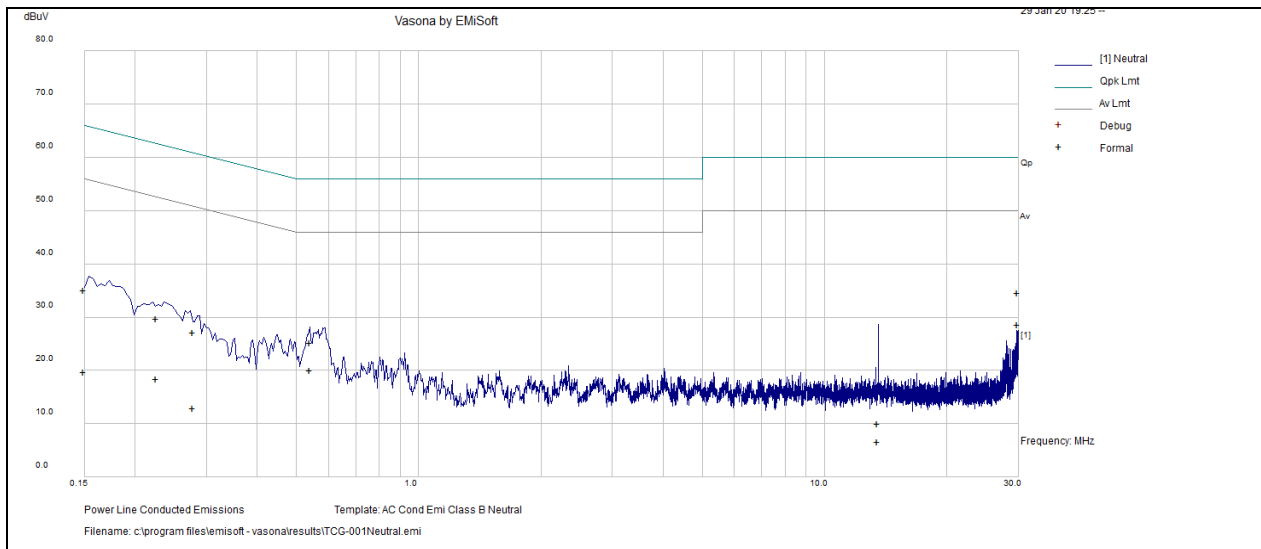


| Phase | Neutral (N) | Detector Function | Quasi-Peak / Average |
|-------|-------------|-------------------|----------------------|
|-------|-------------|-------------------|----------------------|

| No | Frequency (MHz) | Reading Value (dBuV) | Cable Loss (dB) | Insertion Loss (dB) | Emission Level Corrected (dBuV) | Measurement Type | Line/ Neutral | Limit (dBuV) | Margin (dB) | Pass/Fail |
|----|-----------------|----------------------|-----------------|---------------------|---------------------------------|------------------|---------------|--------------|-------------|-----------|
| 1  | 0.541467        | 15.81                | 9.45            | 0.03                | 25.3                            | Quasi Peak       | Neutral       | 56           | -30.7       | Pass      |
| 2  | 0.15            | 25.82                | 9.29            | 0.03                | 35.15                           | Quasi Peak       | Neutral       | 66           | -30.85      | Pass      |
| 3  | 0.225727        | 20.26                | 9.4             | 0.03                | 29.69                           | Quasi Peak       | Neutral       | 62.61        | -32.91      | Pass      |
| 4  | 13.567389       | -0.01                | 9.68            | 0.3                 | 9.97                            | Quasi Peak       | Neutral       | 60           | -50.03      | Pass      |
| 5  | 0.278634        | 17.7                 | 9.44            | 0.03                | 27.16                           | Quasi Peak       | Neutral       | 60.86        | -33.69      | Pass      |
| 6  | 30              | 23.87                | 9.95            | 0.78                | 34.6                            | Quasi Peak       | Neutral       | 60           | -25.4       | Pass      |
| 7  | 0.541467        | 10.57                | 9.45            | 0.03                | 20.06                           | Average          | Neutral       | 46           | -25.94      | Pass      |
| 8  | 0.15            | 10.4                 | 9.29            | 0.03                | 19.72                           | Average          | Neutral       | 56           | -36.28      | Pass      |
| 9  | 0.225727        | 8.94                 | 9.4             | 0.03                | 18.38                           | Average          | Neutral       | 52.61        | -34.23      | Pass      |
| 10 | 13.567389       | -3.31                | 9.68            | 0.3                 | 6.67                            | Average          | Neutral       | 50           | -43.33      | Pass      |
| 11 | 0.278634        | 3.41                 | 9.44            | 0.03                | 12.88                           | Average          | Neutral       | 50.86        | -37.98      | Pass      |
| 12 | 30              | 17.85                | 9.95            | 0.78                | 28.58                           | Average          | Neutral       | 50           | -21.42      | Pass      |

#### REMARKS:

1. The emission levels of other frequencies were very low against the limit.
2. Margin value = Emission level - Limit value
3. Emission Level = Correction Factor + Raw Value + Factors Value.

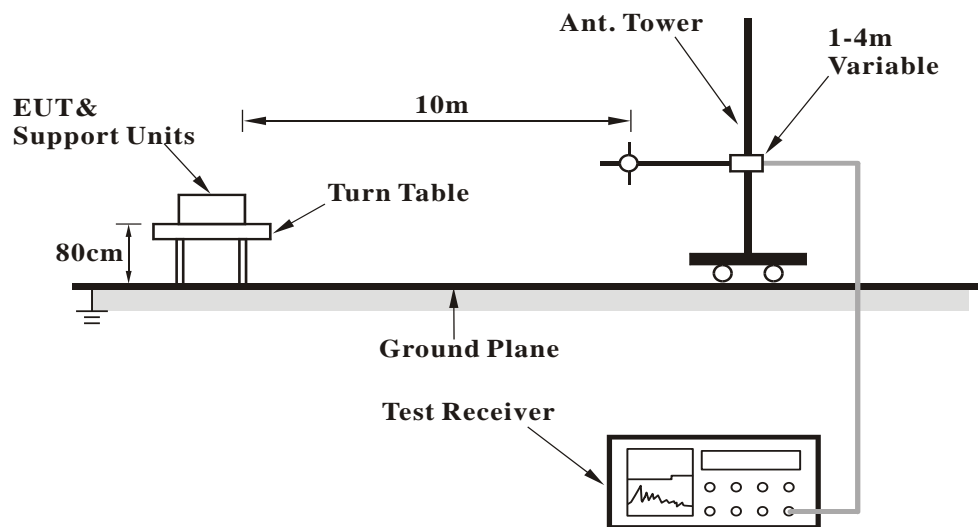


### 4.3 20dB Channel Bandwidth & 99% Bandwidth Measurements

#### 4.3.1 Limits of Emission Bandwidth

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

#### 4.3.2 Test Setup



#### 4.3.3 Test Procedure

- Turn on the EUT and set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
- Connect a dipole antenna to the measurement instrument. Make sure waveform is received by test antenna which is connected to the spectrum analyzer. Plot the 20 dB bandwidth

#### 4.3.4 Deviation from Test Standard

No Deviation.

#### 4.3.5 EUT Operating Condition

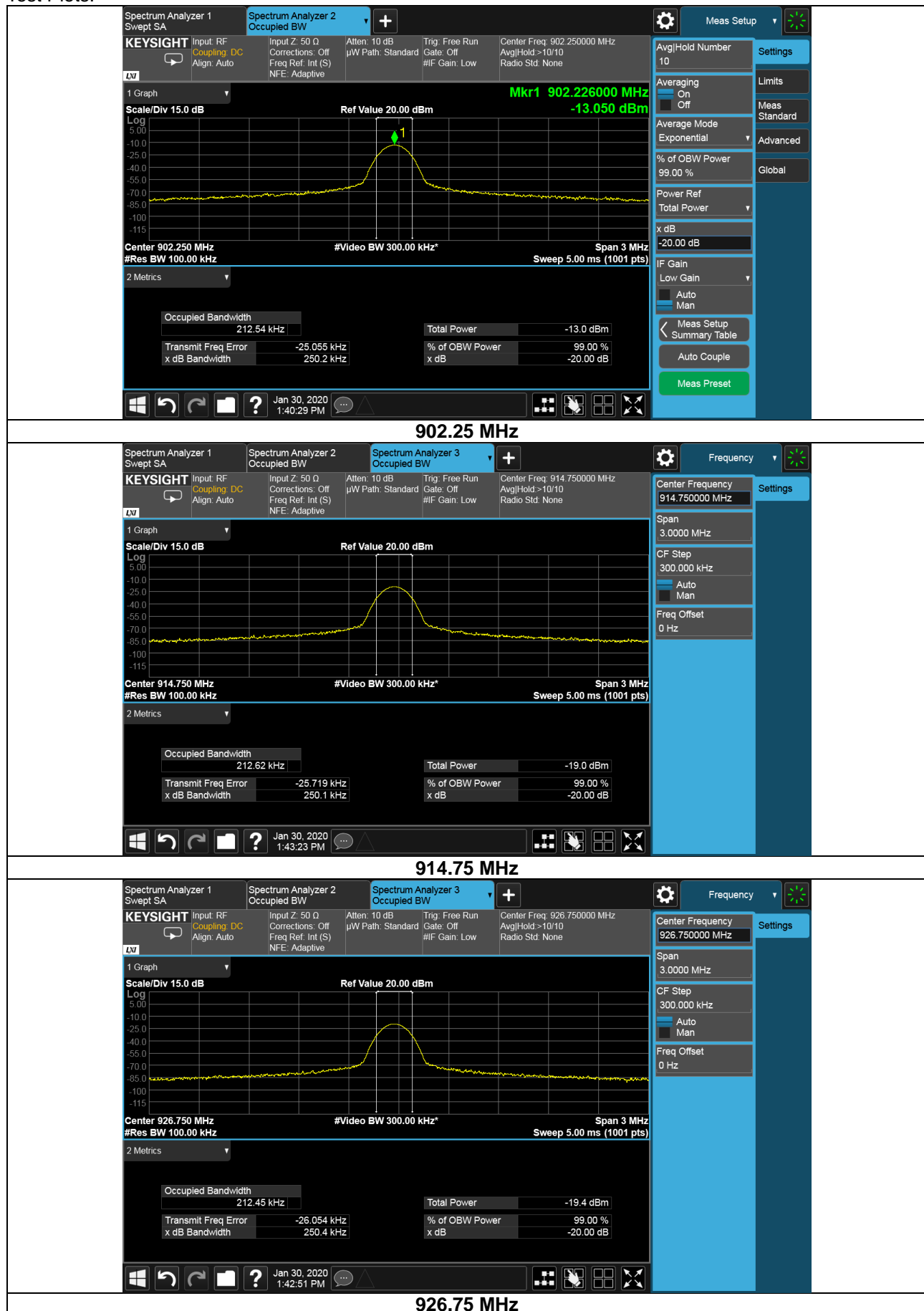
Same as 4.2.6

#### 4.3.6 Test Results

| Channel | Frequency(MHz) | 20 dB<br>Bandwidth(kHz) | 99%<br>OBW(kHz) | Limit(kHz) | Results |
|---------|----------------|-------------------------|-----------------|------------|---------|
| 1       | 902.25         | 250.2                   | 212.54          | 4573.75    | Pass    |
| 2       | 914.75         | 250.1                   | 212.62          | 4573.75    | Pass    |
| 3       | 926.75         | 250.4                   | 212.45          | 4573.75    | Pass    |

Note: Limit = 0.5% \* 914.75 MHz = 4573.75 kHz

## Test Plots:



## 5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).



## Appendix – Information on the Testing Laboratories

Bureau Veritas is a global leader in testing, inspection and certification (TIC) services. We help businesses improve safety, sustainability and productivity; and our clients include the majority of leading brands in retail, manufacturing and other industries. With a presence in every major country around the world, our quality assurance and compliance solutions are vital in helping our customers enhance product quality and concept-to-consumer journeys. We also assist with increasing speed to market, profitability and brand equity throughout the supply chain. Bureau Veritas is a leading wireless/IoT testing, inspection, audit and certification provider, with a global network of test laboratories to support the IoT industry in areas of connectivity, security, interoperability as well as quality, health & safety, and environmental/chemical requirements.

If you have any comments, please feel free to contact us at the following:

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**Web Site:** [www.cpsusa-bureauveritas.com](http://www.cpsusa-bureauveritas.com)

The address and road map of all our labs can be found in our web site also.

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