



中国认可  
国际互认  
检测  
TESTING  
CNAS L0310



# FCC RF Test Report

**Product Name: Smart Phone**

**Model Number: HUAWEI VNS-L31, VNS-L31**

**Report No: SYBH(Z-RF)014022016-2002**

**FCC ID: QISVNS-L31**

**Reliability Laboratory of Huawei Technologies Co., Ltd.**

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## Notice

1. The laboratory has Passed the accreditation by China National Accreditation Service for Conformity Assessment (CNAS). The accreditation number is L0310.
2. The laboratory has Passed the accreditation by The American Association for Laboratory Accreditation (A2LA). The accreditation number is 2174.01.
3. The laboratory has been listed by the US Federal Communications Commission to perform electromagnetic emission measurements. The site recognition number is 97456.
4. The laboratory has been listed by Industry Canada to perform electromagnetic emission measurements. The recognition numbers of test site are 6369A-1.
5. The test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.
6. The test report is invalid if there is any evidence of erasure and/or falsification.
7. The test report is only valid for the test samples.
8. Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.
9. The laboratory (Reliability Lab of Huawei Technologies Co., Ltd) is also named as “Global Compliance and Testing Center of Huawei Technologies Co., Ltd”, the both names have coexisted since 2009.



**Applicant:** Huawei Technologies Co., Ltd.  
**Address:** Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C

**Date of Receipt Sample:** 2016-04-07  
**Start Date of Test:** 2016-04-07  
**End Date of Test:** 2016-04-08

**Test Result:** Pass

**Approved by Senior**

2016-04-08

Liu Chunlin

**Engineer:**

Date

Name

Signature

**Prepared by:**

2016-04-08

Feng Nianwei

Date

Name

Signature



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## 1 General Information

|                                         |                                                                                                                             |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| <b>1.1 Applied Standard</b>             |                                                                                                                             |
|                                         |                                                                                                                             |
| Applied Rules:                          | 47 CFR FCC Part 02: 2014<br>FCC Part 15 Subpart C (15.225): 2014                                                            |
| <b>1.2 Test Location</b>                |                                                                                                                             |
|                                         |                                                                                                                             |
| Test Location 1:                        | Reliability Laboratory of Huawei Technologies Co., Ltd.                                                                     |
| Address:                                | Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C |
|                                         |                                                                                                                             |
| <b>1.3 Test Environmental Condition</b> |                                                                                                                             |
|                                         |                                                                                                                             |
| Ambient Temperature:                    | 20 – 25 °C                                                                                                                  |
| Ambient Relative Humidity:              | 45 – 55 %                                                                                                                   |
| Atmospheric Pressure:                   | 101 kPa                                                                                                                     |
|                                         |                                                                                                                             |



## 2 Summary

| FCC Part Section    | Test Description                            | Test Limit                                                                                                                 | Test Condition         | Test Result | Reference          |
|---------------------|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|------------------------|-------------|--------------------|
| TRANSMITTER MODE    |                                             |                                                                                                                            |                        |             |                    |
| 15.225 (a)          | In-Band Emissions                           | 15,848 $\mu$ V/m @ 30m<br>13.553 – 13.567 MHz                                                                              | RADIATED               | Pass        | Section 5.2        |
| 2.1049              | 20 dB Bandwidth                             | N/A                                                                                                                        |                        | Pass        | Section 5.1        |
| 15.225(b)           | In-Band Emissions                           | 334 $\mu$ V/m @ 30m<br>13.410 – 13.553 MHz<br>13.567 – 13.710 MHz                                                          |                        | Pass        | Section 5.2        |
| 15.225(c)           | In-Band Emissions                           | 106 $\mu$ V/m @ 30m<br>13.110 – 13.410 MHz<br>13.710 – 14.010 MHz                                                          |                        | Pass        | Section 5.2        |
| 15.225(d)<br>15.209 | Out-of-Band Emissions                       | Emissions outside of the<br>specified band (13.110 –<br>14.010 MHz) must meet the<br>radiated limits detailed in<br>15.209 |                        | Pass        | Section 5.3        |
| 15.225(e)           | Frequency Stability<br>Tolerance            | $\pm$ 0.01% of Operating<br>Frequency                                                                                      | Temperature<br>Chamber | Pass        | Section 5.4        |
| 15.207              | AC Conducted<br>Emissions 150kHz –<br>30MHz | < FCC 15.207 limits                                                                                                        | LINE<br>CONDUCTED      | Pass        | Part 15B<br>report |



## 3 Product Description

### 3.1 Product Information

#### 3.1.1 General Description

HUAWEI VNS-L31, VNS-L31 is subscriber equipment in the GSM/UMTS/LTE system. The GSM frequency band includes GSM850 and GSM900 and DCS1800 and PCS1900. The UMTS frequency band is band I/II/VIII. The LTE frequency band is band I/III/VII/VIII/XX. The Mobile Phone implements such functions as RF signal receiving/transmitting, LTE/UMTS and GSM/GPRS/EDGE protocol processing, voice, video MMS service, GPS, NFC and WIFI etc. Externally it provides micro SD card interface, earphone port (to provide voice service) and USIM card interface. It also provides bluetooth module to synchronize data between a PC and the phone, or to use the built-in modem of the phone to access the Internet with a PC, or to exchange data with other bluetooth devices.

NOTE: Only NFC test data included in this report.

### 3.2 EUT Identity

NOTE: Unless otherwise noted in the report, the functional boards installed in the units shall be selected from the below list, but not means all the functional boards listed below shall be installed in one unit.

#### 3.2.1 Board

| Board       |                  |                  |
|-------------|------------------|------------------|
| Description | Hardware Version | Software Version |
| Main Board  | HL2VENUSM        | VNS-L31C900B020  |

#### 1.3.1 Sub-Assembly

| Sub-Assembly      |              |                               |                                                                                                                                          |
|-------------------|--------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| Sub-Assembly Name | Model        | Manufacturer                  | Description                                                                                                                              |
| Adapter           | HW-050100U01 | Huawei Technologies Co., Ltd. | Input Voltage: ~100-240V 50/60Hz<br>Output Voltage: 5V/1A                                                                                |
| Battery           | HB366481ECW  | Huawei Technologies Co., Ltd. | Rated capacity: 2900mAh<br>Nominal Voltage:  +3.82V |



## 4 Main Test Instruments

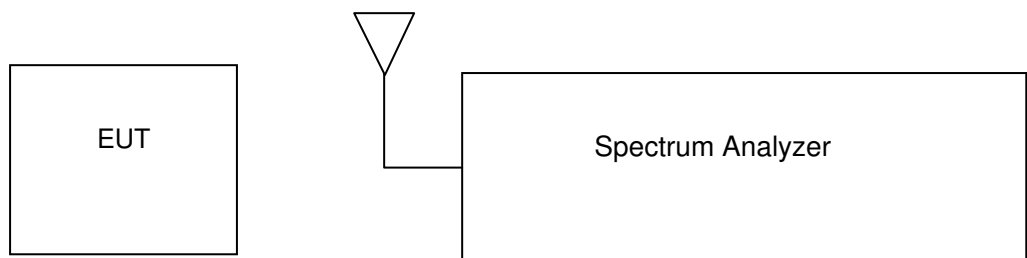
| Equipment Name                                  | Manufacturer | Model     | Serial Number  | Cal Date   | Cal- Due   |
|-------------------------------------------------|--------------|-----------|----------------|------------|------------|
| Power supply                                    | KEITHLEY     | 2303      | 1342889        | 2015-09-16 | 2017-09-15 |
| Wireless Communication Test set                 | Agilent      | N4010A    | MY49081592     | 2015-10-30 | 2016-10-29 |
| Universal Radio Communication Tester            | R&S          | CMU200    | 123299         | 2015-10-30 | 2016-10-29 |
| Spectrum Analyzer                               | Agilent      | N9020A    | MY52090652     | 2015-07-08 | 2016-07-07 |
| Universal Radio Communication Tester            | R & S        | CMW500    | 126854         | 2016-01-08 | 2017-01-07 |
| Spectrum Analyzer                               | Agilent      | E4440A    | MY48250119     | 2015-07-08 | 2016-07-07 |
| Signal Analyzer                                 | R&S          | FSQ31     | 200021         | 2015-10-30 | 2016-10-29 |
| Spectrum Analyzer                               | Agilent      | N9030A    | MY49431698     | 2015-10-30 | 2016-10-29 |
| Temperature Chamber                             | WEISS        | WKL64     | 56246002940010 | 2016-01-21 | 2017-01-20 |
| Signal generator                                | Agilent      | E8257D    | MY49281095     | 2015-10-30 | 2016-10-29 |
| Vector Signal Generator                         | R&S          | SMU200A   | 104162         | 2015-10-30 | 2016-10-29 |
| Test receiver                                   | R&S          | ESU26     | 100387         | 2015-06-24 | 2016-06-23 |
| Test receiver                                   | R&S          | ESCI      | 101163         | 2015-06-24 | 2016-06-23 |
| Spectrum analyzer                               | R&S          | FSU3      | 200474         | 2015-06-15 | 2016-06-14 |
| Spectrum analyzer                               | R&S          | FSU43     | 100144         | 2015-06-15 | 2016-06-14 |
| LOOP Antennas(9kHz-30MHz)                       | R&S          | HFH2-Z2   | 100262         | 2015-04-30 | 2017-04-29 |
| LOOP Antennas(9kHz-30MHz)                       | R&S          | HFH2-Z2   | 100263         | 2015-04-30 | 2017-04-29 |
| Trilog Broadband Antenna (30M~3GHz)             | SCHWARZBEC K | VULB 9163 | 9163-490       | 2015-04-30 | 2017-04-29 |
| Trilog Broadband Antenna (30M~3GHz)             | SCHWARZBEC K | VULB 9163 | 9163-520       | 2015-04-30 | 2017-04-29 |
| Double-Ridged Waveguide Horn Antenna (1G~18GHz) | R&S          | HF907     | 100304         | 2015-04-30 | 2017-04-29 |
| double ridged horn antenna (0.8G-18GHz)         | R&S          | HF907     | 100305         | 2015-04-30 | 2017-04-29 |
| Pyramidal Horn Antenna(18GHz-26.5GHz)           | ETS-Lindgren | 3160-09   | 5140299        | 2015-07-15 | 2017-07-14 |
| Artificial Main Network                         | R&S          | ENV4200   | 100134         | 2015-06-24 | 2016-06-23 |
| Line Impedance Stabilization Network            | R&S          | ENV216    | 100382         | 2015-06-24 | 2016-06-23 |
| Signal Generator                                | Agilent      | E4438C    | MY49071538     | 2016-03-01 | 2017-02-28 |
| Power Detecting & Sampling Unit                 | R&S          | OSP-B157  | 100914         | 2015-07-27 | 2016-07-26 |

## 5 Test Results

### 5.1 20dB Bandwidth Measurement

The 20dB bandwidth is measured with a spectrum analyzer connected via a receive antenna placed near the EUT while the EUT is operating in transmission mode.

#### 5.1.1 Test Setup



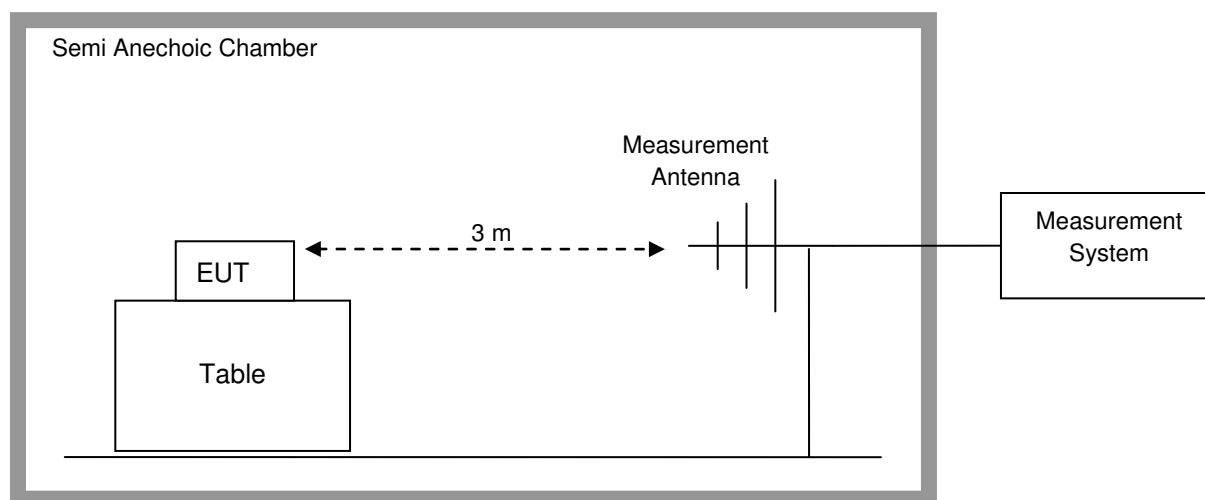
#### 5.1.2 Test Result

| Frequency | Occupied Bandwidth |
|-----------|--------------------|
| 13.56MHz  | 200KHz             |

**The result of the measurement is passed.**

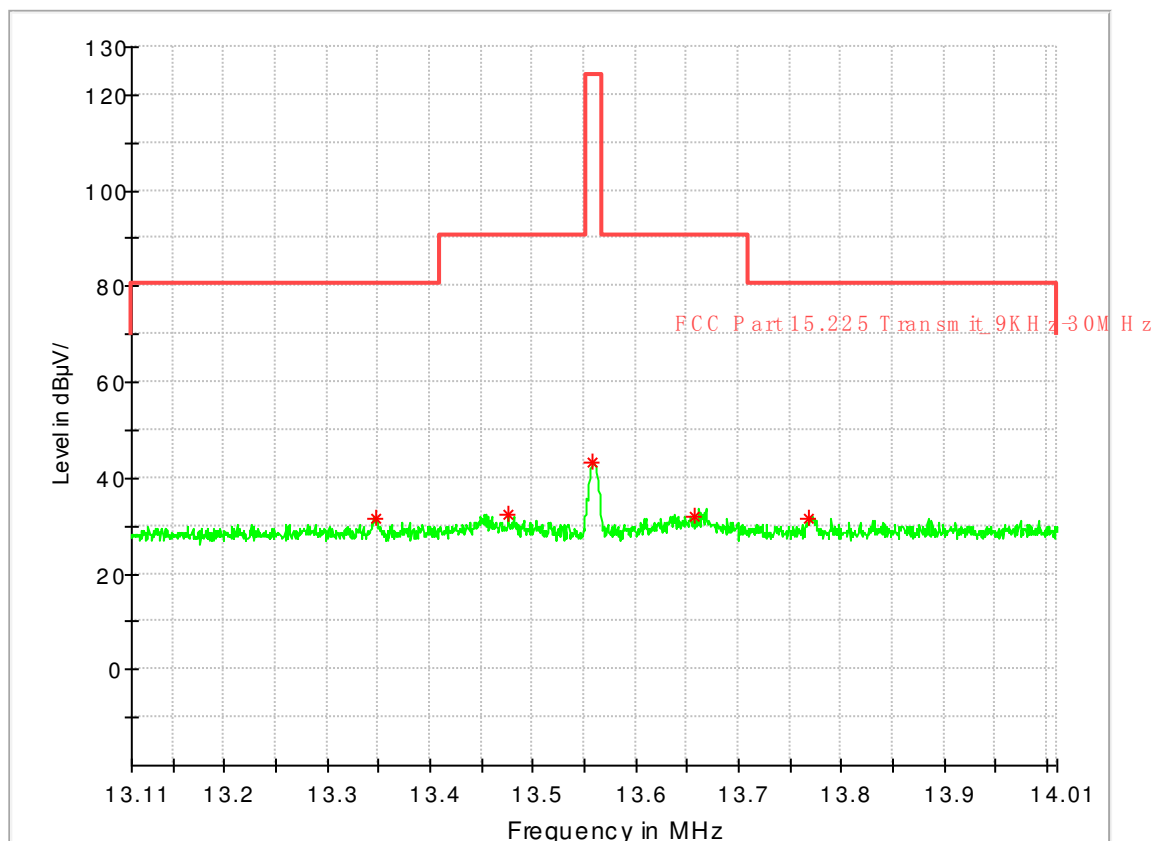
## 5.2 In-Band Radiated Spurious Emission Measurements

### 5.2.1 Test Setup



| Measurement parameters |            |
|------------------------|------------|
| Detector:              | Quasi Peak |
| Sweep time:            | -/-        |
| Resolution bandwidth:  | 10 kHz     |
| Video bandwidth:       | 10 kHz     |
| Span:                  | -/-        |
| Trace-Mode:            | Max Hold   |

### 5.2.2 Test Result



#### Final Result 1

| Frequency (MHz) | QuasiPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Azimuth (deg) | Corr. (dB) |
|-----------------|--------------------|----------------|-------------|---------------|------------|
| 13.347214       | 31.74              | 80.50          | -48.76      | 0.0           | 20.8       |
| 13.476429       | 32.18              | 90.50          | -58.32      | 0.0           | 20.8       |
| 13.558714       | 43.23              | 124.00         | -80.77      | 0.0           | 20.8       |
| 13.656429       | 31.96              | 90.50          | -58.54      | 0.0           | 20.8       |
| 13.768286       | 31.60              | 80.50          | -48.90      | 270.0         | 20.8       |

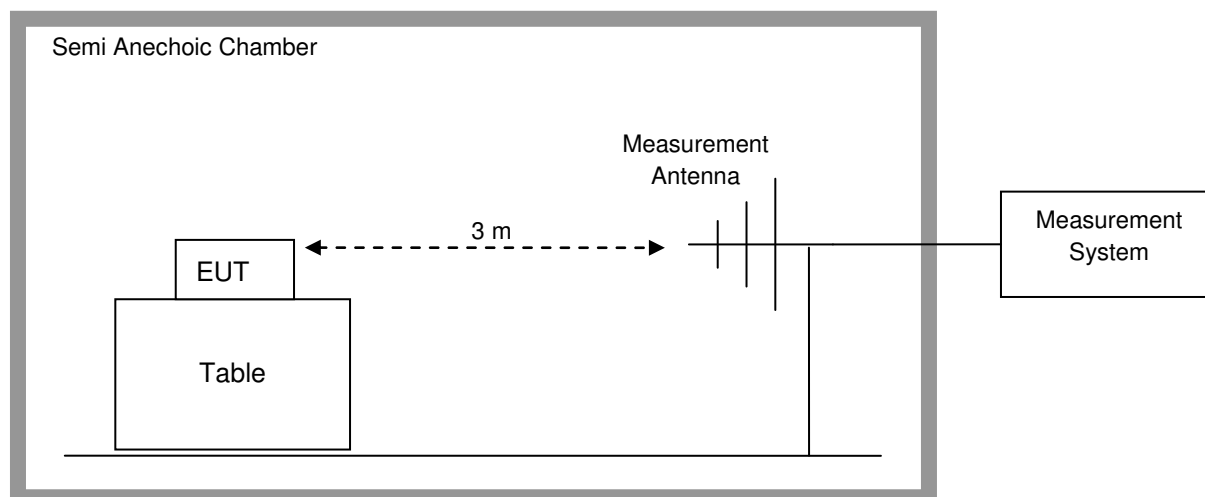
#### NOTES:

1. All measurements were performed using a loop antenna. The antenna was positioned in three orthogonal positions (X front, Y side, Z top) and the position with the highest emission level was recorded.
2. Measurements were performed at 3m and the data was extrapolated to the specified measurement distance of 30m using the square of an inverse linear distance extrapolation factor (40 dB/decade) as specified in §15.31(f)(2). Extrapolation Factor =  $20 \log_{10}(30/3)^2 = 40\text{dB}$
3. All measurements were recorded using a spectrum analyzer employing a quasi-peak detector.

**The result of the measurement is passed.**

## 5.3 Radiated Spurious Emission Measurements, Out-of-Band

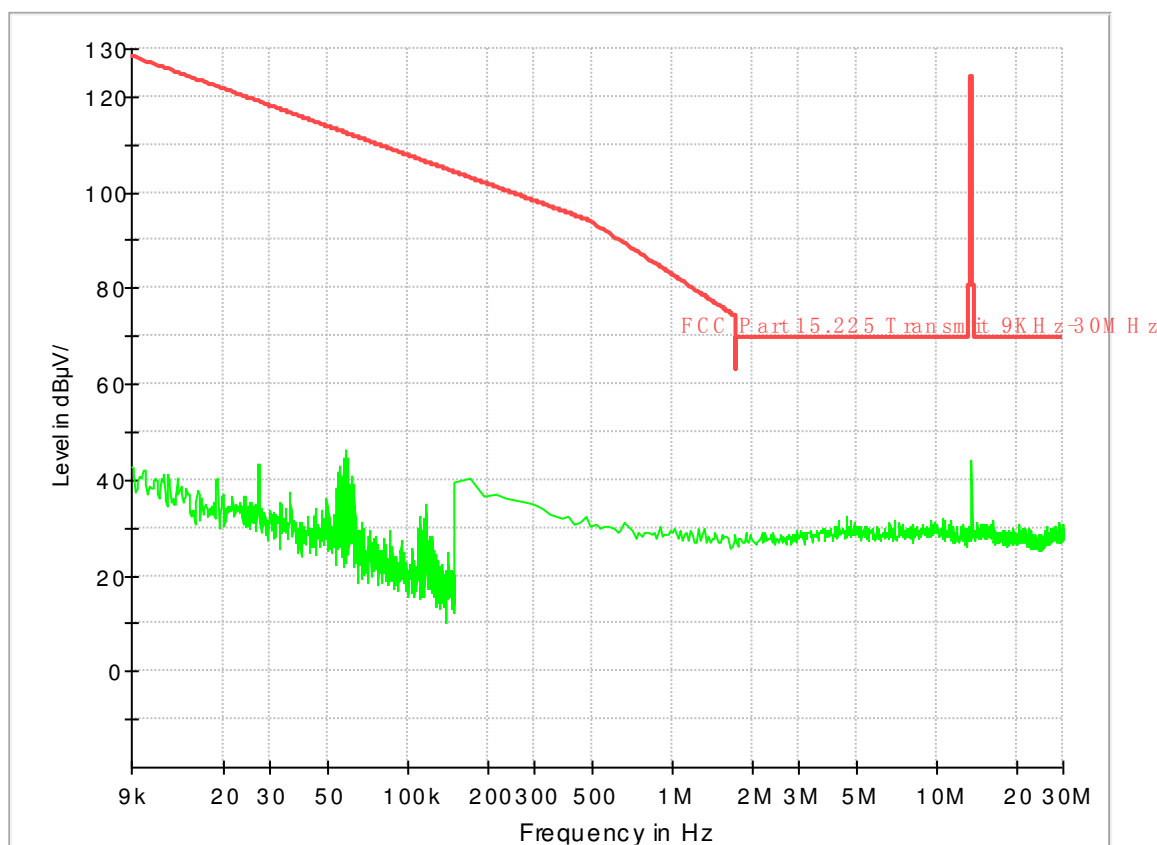
### 5.3.1 Test Setup



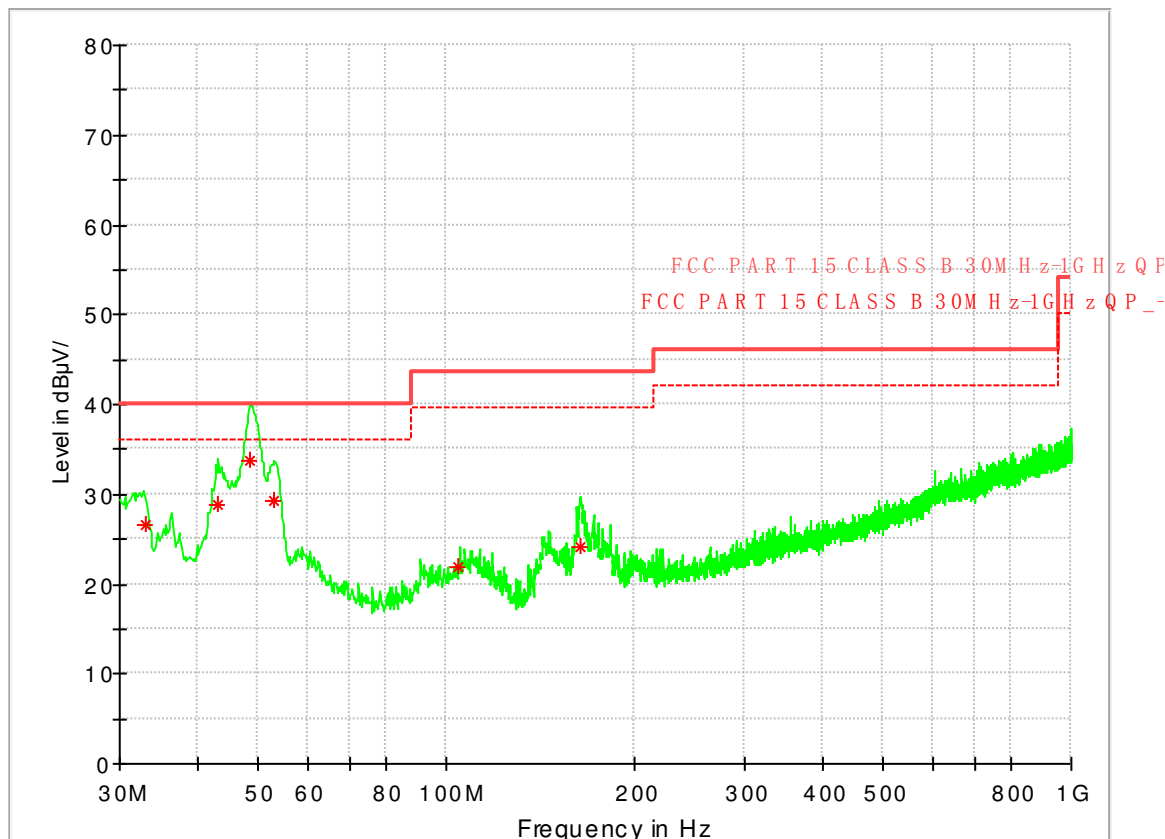
| Measurement parameters |                                                                                  |
|------------------------|----------------------------------------------------------------------------------|
| Detector:              | Quasi Peak                                                                       |
| Sweep time:            | Auto                                                                             |
| Resolution bandwidth:  | 9 kHz – 150 kHz: 200 Hz<br>150 kHz – 30 MHz: 9 kHz<br>30 MHz – 1000 MHz: 100 kHz |
| Video bandwidth:       | 9 kHz – 150 kHz: 200 Hz<br>150 kHz – 30 MHz: 9 kHz<br>30 MHz – 1000 MHz: 100 kHz |
| Span:                  | See Plots                                                                        |
| Trace-Mode:            | Max Hold                                                                         |

### 5.3.2 Test Result

9k~30MHz



30M~1GHz



## Final\_Result

| Frequency (MHz) | QuasiPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|--------------------|----------------|-------------|-------------|-----|---------------|------------|
| 32.966320       | 26.64              | 40.00          | -13.36      | 137.0       | V   | 228.0         | 14.8       |
| 42.950160       | 28.87              | 40.00          | -11.13      | 100.0       | V   | 325.0         | 15.2       |
| 48.641680       | 33.71              | 40.00          | -6.29       | 100.0       | V   | 336.0         | 15.1       |
| 52.907120       | 29.38              | 40.00          | -10.62      | 100.0       | V   | 285.0         | 14.9       |
| 104.794800      | 21.92              | 43.50          | -21.58      | 200.0       | V   | -2.0          | 13.7       |
| 163.464960      | 24.17              | 43.50          | -19.33      | 100.0       | V   | 278.0         | 10.6       |

## NOTES:

1. All measurements were recorded using a spectrum analyzer employing a quasi-peak detector for emissions below 960MHz.
2. Both Vertical and Horizontal polarities of the receive antenna were evaluated with the worst case emissions being reported. Below 30MHz the Loop antenna was positioned in 3 separate radials.
3. The EUT is supplied with nominal AC voltage and/or a new/fully-recharged battery.
4. The spectrum is measured from 9kHz to the 10th harmonic and the worst-case emissions are reported.

The result of the measurement is passed.



## 5.4 Frequency Stability

### 5.4.1 Test Setup

The EUT was placed in a Climatic Chamber. A small whip antenna was placed close to the EUT, and connected to the measuring Spectrum Analyzer. Measurement performed without modulation on TX.

### 5.4.2 Test Result

| VOLTAGE (%)       | POWER Battery | TEMP (°C) | Frequency (Hz) | Freq. Dev. (Hz) | Deviation (%)   |
|-------------------|---------------|-----------|----------------|-----------------|-----------------|
| 100%              |               | -20       | 13559980       | 13              | 0.00000140118   |
| 100%              |               | -10       | 13559983       | -9              | -0.000000221239 |
| 100%              |               | 0         | 13560016       | 17              | 0.00000169616   |
| 100%              |               | 10        | 13560011       | 21              | 0.00000199115   |
| 100%              |               | 20        | 13560007       | -15             | -0.000000663716 |
| 100%              |               | 30        | 13560012       | 8               | 0.00000103245   |
| 100%              |               | 40        | 13560015       | 15              | 0.00000154867   |
| 100%              |               | 50        | 13559987       | -13             | -0.000000516225 |
| Battery End Point | 3.6           | 20        | 13560010       | 12              | 0.00000132743   |
| 115%              | 4.35          | 20        | 13559987       | 14              | 0.00000147493   |

The result of the measurement is passed.

-----The END-----