

**ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT****INTENTIONAL RADIATOR CERTIFICATION TO  
FCC PART 15 SUBPART C AND INDUSTRY CANADA RSS 210 REQUIREMENT**

OF

Applicant: **Razer Inc.  
201 3rd Street, Suite 900, San Francisco, CA 94103, USA**

Product Name: **Smart Phone**

Brand Name: **RAZER**

Model No.: **RZ35-0215**

Model Difference: **N/A**

FCC ID: **RWO-RZ350215**

IC: **8092D- RZ350215**

Report No.: **E2/2017/80128**

FCC Rule Part: **§15.225**

IC Rule Part: **RSS-210 issue 9 Aug. 2016 Annex B**

Issue Date: **Oct. 03, 2017**

Date of Test: **Aug. 30, 2017 ~ Oct. 02, 2017**

Date of EUT Received: **Aug. 30, 2017**

**We hereby certify that:**

The above equipment was tested by SGS Taiwan Ltd. Electronics & Communication Laboratory. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10:2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits.

The test results of this report relate only to the tested sample identified in this report.

**Prepared By:***Violetta Tang***Violetta Tang / Clerk****Approved By:***Jim Chang***Jim Chang / Asst. Manager**

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## Revision History

| Report Number | Revision | Description                  | Issue Date    |
|---------------|----------|------------------------------|---------------|
| E2/2017/80128 | Rev.00   | Initial creation of document | Oct. 03, 2017 |
|               |          |                              |               |
|               |          |                              |               |
|               |          |                              |               |

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## 1 GENERAL INFORMATION

### 1.1 Product Description

General:

|                              |   |  |
|------------------------------|---|--|
| Product Name:                | Smart Phone   |  |
| Brand Name:                  | RAZER   |  |
| Model No.:                   | RZ35-0215   |  |
| Model Difference:            | N/A   |  |
| Product SW/HW version:       | N/A / DVT   |  |
| Radio SW/HW version:         | N/A / N/A   |  |
| Test SW Version:             | N/A   |  |
| RF power setting in TEST SW: | N/A   |  |
| USB Cable:                   | Mode No.: RC30-02150700-0000, Supplier: Razer<br>Marketing Name: RC30-021507    |  |
| Audio Dongle:                | Mode No.: RC30-021505, Supplier: Razer  |  |
| Power Supply:                | 3.85Vdc from Rechargeable Li-ion Battery<br>or 5V/9V/12V by AC/DC Power Adapter |  |
|                              | Battery:  | Mode No.: RC30-0215, Supplier: Razer   |
|                              | Adapter:  | Mode No.: RC30-021501, Supplier: Razer |

NFC:

|                      |                       |
|----------------------|-----------------------|
| Operating Frequency: | 13.56MHz              |
| Transmit Power:      | < 123.90dBuV/m at 3m. |
| Number of Channels:  | 1                     |
| Antenna Type:        | Loop Antenna          |
| Modulation Type:     | ASK                   |

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## 1.2 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.225

IC RSS 210 issue 9 Aug. 2016 Annex B

RSS-Gen. issue 4 Nov. 2014

ANSI C63.10:2013

Note: All test items have been performed and record as per the above standards.

## 1.3 Test Facility

SGS Taiwan Ltd. Electronics & Communication Laboratory No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333 (TAF code 0513)

FCC Registration Numbers are: 735305

Canada Registration Number: 4620A-5

## 1.4 Special Accessories

There is no special accessory used while test was conducted.

## 1.5 Equipment Modifications

There was no modification incorporated into the EUT.

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## 2 SYSTEM TEST CONFIGURATION

### 2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

### 2.2 EUT Exercise

An engineering test mode (software/firmware) that applicant provided was utilized to manipulate the EUT into transmit, selection of the test channel, and modulation scheme.

### 2.3 Test Procedure

#### 2.3.1 Conducted Emissions

The EUT is placed on a turn table which is 0.8 m above ground plan. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz,. The CISPR Quasi-Peak and Average detector mode is employed according to §15.207. 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.

#### 2.3.2 Radiated Emissions

The EUT is placed on a turn table which is 0.8 m above ground plan. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through one orthogonal axis and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made “while keeping the antenna in the ‘cone of radiation’ from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response.” is still within the 3dB illumination BW of the measurement antenna.

### 2.4 Measurement Results Explanation Example

#### For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuation factor between EUT conducted port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly EUT RF output level.

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## 2.5 Configuration of Tested System

Fig. 2-1 Radiated Emission



Fig. 2-2 AC Power Line Conducted Emission

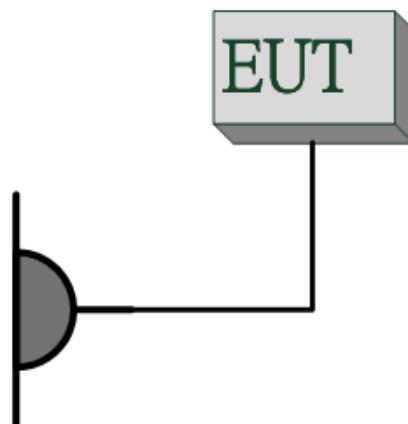


Fig. 2-3 Conducted (Antenna Port) Emission

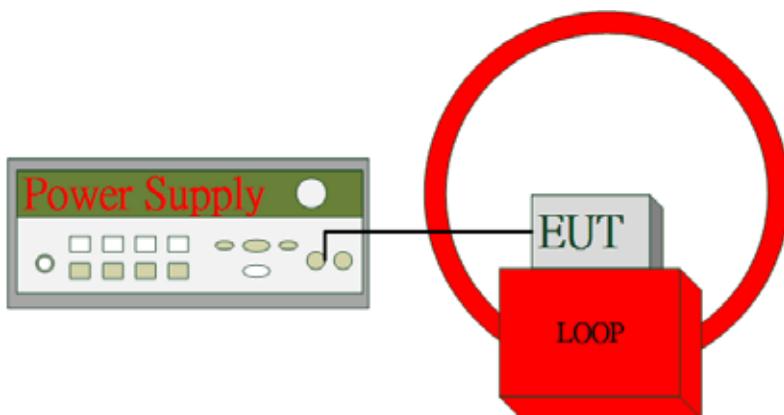


Table 2-1 Equipment Used in Tested System

| Item | Equipment         | Mfr/Brand | Model / Type No. | Series No. | Data Cable | Power Cord |
|------|-------------------|-----------|------------------|------------|------------|------------|
| 1.   | NFC Test Software | N/A       | N/A              | N/A        | N/A        | N/A        |
| 2.   | DC Power Supply   | Agilent   | E3640A           | MY53140006 | N/A        | Unshielded |

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### 3 SUMMARY OF TEST RESULTS

| FCC Rules              | IC Rules             | Description Of Test                           | Result    |
|------------------------|----------------------|---|-----------|
| §15.207                | RSS-Gen § 8.8        | AC Power Line Conducted Emission              | Compliant |
| §15.225 (a)-(d)        | RSS210 Annex B B.6   | Radiated Emission                             | Compliant |
| §15.209                | RSS-Gen § 8.9        | Radiated Emission Limits, general requirement | Compliant |
| §15.225 (e)            | RSS-Gen § 8.11       | Frequency Stability                           | Compliant |
| §2.1049<br>§15.215 (c) | RSS-Gen § 6.6        | 20 dB & 99% OCCUPIED BANDWIDTH                | Compliant |
| §15.203                | RSS-Gen § 6.7, § 8.3 | Antenna Requirement                           | Compliant |

### 4 DESCRIPTION OF TEST MODES

#### 4.1 The Worst Test Modes and Channel Details

1. The EUT stay in continuous transmitting mode.
2. The frequency 13.56 MHz is the default channel to test, where it is the only manipulative channel as this application supports.
3. Investigation has been done on all the possible configurations for searching the worst case.

| RADIATED EMISSION TEST |                   |                |            |
|------------------------|-------------------|----------------|------------|
| MODE                   | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION |
| NFC                    | 1                 | 1              | ASK        |
| FREQUENCY STABILITY    |                   |                |            |
| MODE                   | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION |
| NFC                    | 1                 | 1              | ASK        |
| 20dB BANDWIDTH         |                   |                |            |
| MODE                   | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION |
| NFC                    | 1                 | 1              | ASK        |

The field strength of spurious radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for NFC Transmitter for channel the worst case E2 position was reported.

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## 5 MEASUREMENT UNCERTAINTY

| Test Items                       | Uncertainty                 |
|----------------------------------|-----------------------------|
| AC Power Line Conducted Emission | +/- 2.586 dB                |
| Frequency Stability              | +/- 51.33 Hz                |
| 20 dB & 99% OCCUPIED BANDWIDTH   | +/- 51.33 Hz                |
| Temperature                      | +/- 0.65 °C                 |
| Humidity                         | +/- 4.6 %                   |
| DC / AC Power Source             | DC= +/- 0.13%, AC= +/- 0.2% |

Radiated Spurious Emission:

|  |                            |
|--|----------------------------|
| Measurement uncertainty<br>(Polarization : <b>Vertical</b> ) | 9kHz - 30MHz: +/- 2.87dB   |
|  | 30MHz - 180MHz: +/- 3.37dB |
|  | 180MHz -417MHz: +/- 3.19dB |
|  | 0.417GHz-1GHz: +/- 3.19dB  |

|  |                            |
|--|----------------------------|
| Measurement uncertainty<br>(Polarization : <b>Horizontal</b> ) | 9kHz - 30MHz: +/- 2.87dB   |
|  | 30MHz - 167MHz: +/- 4.22dB |
|  | 167MHz -500MHz: +/- 3.44dB |
|  | 0.5GHz-1GHz: +/- 3.39dB    |

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

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## 6 CONDUCTED EMISSION TEST

### 6.1 Standard Applicable:

Frequency range within 150kHz to 30MHz shall not exceed the Limit table as below.

| Frequency range<br>MHz | Limits<br>dB(uV) |          |
|------------------------|------------------|----------|
|                        | Quasi-peak       | Average  |
| 0.15 to 0.50           | 66 to 56         | 56 to 46 |
| 0.50 to 5              | 56               | 46       |
| 5 to 30                | 60               | 50       |

**Note**

- 1.The lower limit shall apply at the transition frequencies
- 2.The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

### 6.2 Measurement Equipment Used:

| Conducted Emission Test Site |             |                   |                  |              |            |
|------------------------------|-------------|-------------------|------------------|--------------|------------|
| EQUIPMENT<br>TYPE            | MFR         | MODEL<br>NUMBER   | SERIAL<br>NUMBER | LAST<br>CAL. | CAL DUE.   |
| EMI Test Receiver            | R&S         | ESCI 7            | 100950           | 12/12/2016   | 12/11/2017 |
| Coaxial Cables               | N/A         | N30N30-1042-150cm | N/A              | 08/30/2017   | 08/29/2018 |
| LISN                         | Schwarzbeck | NSLK 8127         | 8127-648         | 06/13/2017   | 06/12/2018 |
| Test Software                | Farad       | EZ-EMC            | Ver.<br>SGS-03A2 | N.C.R.       | N.C.R.     |

### 6.3 EUT Setup:

1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.10:2013.
2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
3. The LISN was connected with 120Vac/60Hz power source.

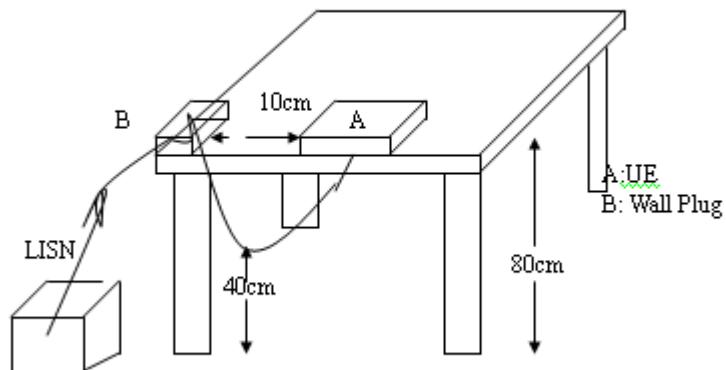
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## 6.4 Test SET-UP (Block Diagram of Configuration)



## 6.5 Measurement Procedure:

1. The EUT was placed on a table which is 0.8m above ground plan.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

## 6.6 Measurement Result:

Note: Refer to next page for measurement data and plots.

Note2: The \* reveals the worst-case results that closet to the limit

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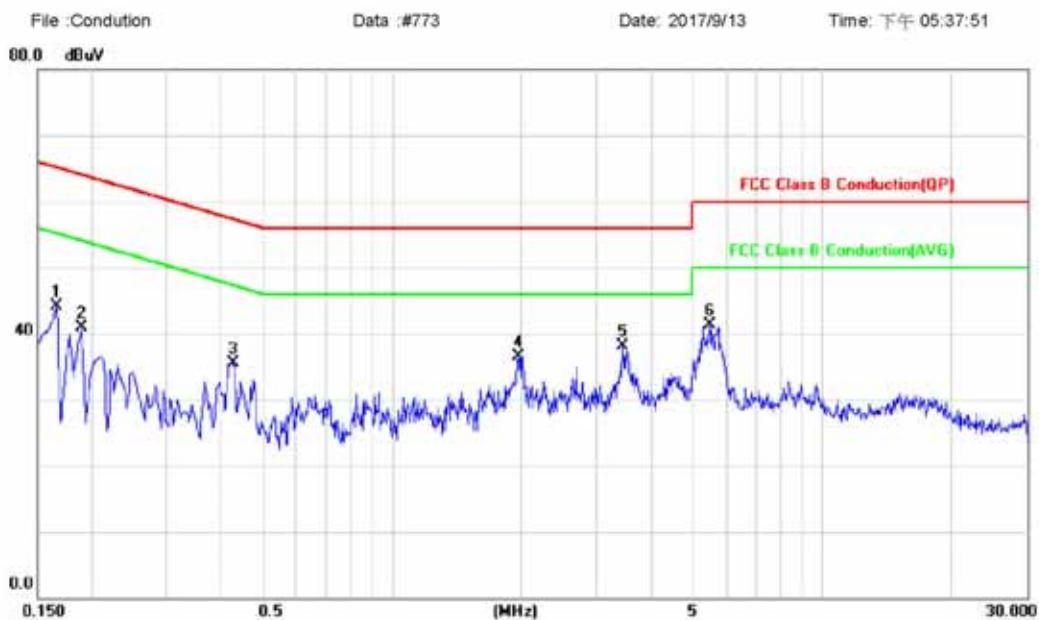
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## AC POWER LINE CONDUCTED EMISSION TEST DATA

|                 |                |           |      |            |               |
|-----------------|----------------|-----------|------|------------|---------------|
| Operation Mode: | Operation mode |           |      | Test Date: | Sep. 13, 2017 |
| Temperature:    | 23             | Humidity: | 71 % | Test By:   | Jerry         |
|                 |                |           |      | Phase:     | L1            |

Site : Conduction Room Phase: **L1** Temperature: 23 °C  
 Limit: FCC Class B Conduction(QP) Power: AC 120V/60Hz Humidity: 71 %  
 Mode:  
 Note:

## Conducted Emission



| No. | Mk.    | Freq. | Reading | Correct | Measure- | Limit  | Over | Detector | Comment |
|-----|--------|-------|---------|---------|----------|--------|------|----------|---------|
|     |        |       | Level   | Factor  | ment     |        |      |          |         |
|     |        | MHz   | dBuV    | dB      | dBuV     | dBuV   | dB   |          |         |
| 1   | 0.1660 | 24.40 | 19.65   | 44.05   | 65.16    | -21.11 | peak |          |         |
| 2   | 0.1900 | 21.24 | 19.64   | 40.88   | 64.04    | -23.16 | peak |          |         |
| 3   | 0.4300 | 15.56 | 20.01   | 35.57   | 57.25    | -21.68 | peak |          |         |
| 4   | 1.9740 | 15.99 | 20.54   | 36.53   | 56.00    | -19.47 | peak |          |         |
| 5 * | 3.4380 | 17.70 | 20.33   | 38.03   | 56.00    | -17.97 | peak |          |         |
| 6   | 5.5020 | 21.21 | 20.09   | 41.30   | 60.00    | -18.70 | peak |          |         |

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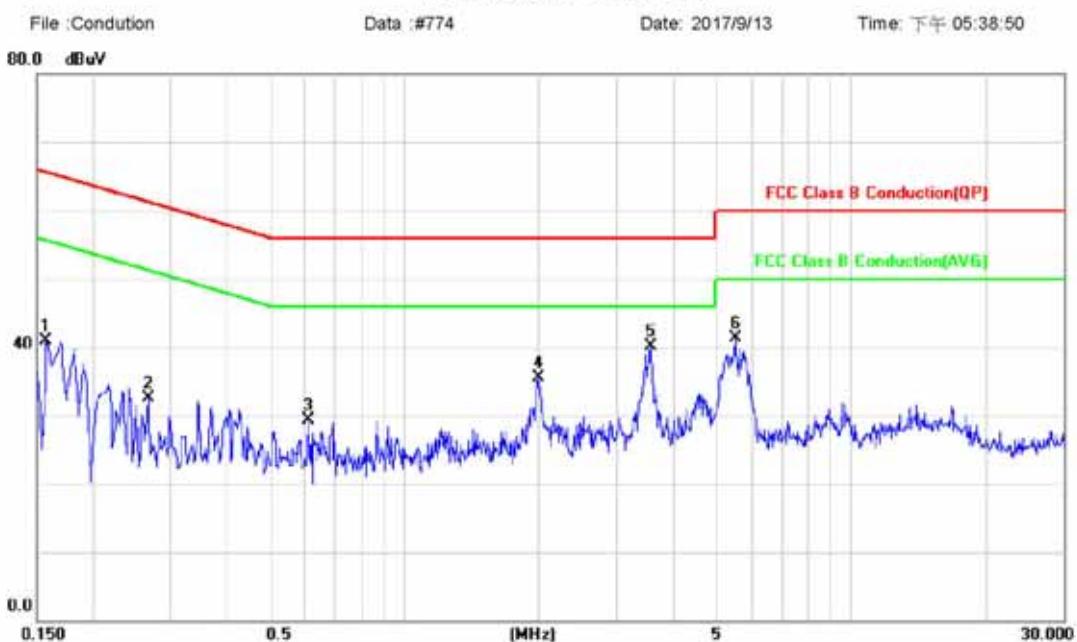
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Site : Conduction Room  
Limit: FCC Class B Conduction(QP)  
Mode:  
Note:

Phase: **N**  
Power: AC 120V/60Hz

Temperature: 23 °C  
Humidity: 71 %

### Conducted Emission



| No. | Mk.    | Freq. | Reading | Correct | Measure- | Limit  | Over | Detector | Comment |
|-----|--------|-------|---------|---------|----------|--------|------|----------|---------|
|     |        |       | Level   | Factor  | ment     |        |      |          |         |
|     |        | MHz   | dBuV    | dB      | dBuV     | dB     |      |          |         |
| 1   | 0.1580 | 21.32 | 19.50   | 40.82   | 65.57    | -24.75 | peak |          |         |
| 2   | 0.2660 | 12.96 | 19.60   | 32.56   | 61.24    | -28.68 | peak |          |         |
| 3   | 0.6100 | 9.32  | 19.93   | 29.25   | 56.00    | -26.75 | peak |          |         |
| 4   | 1.9980 | 15.15 | 20.42   | 35.57   | 56.00    | -20.43 | peak |          |         |
| 5 * | 3.5740 | 19.86 | 20.18   | 40.04   | 56.00    | -15.96 | peak |          |         |
| 6   | 5.5180 | 21.33 | 19.96   | 41.29   | 60.00    | -18.71 | peak |          |         |

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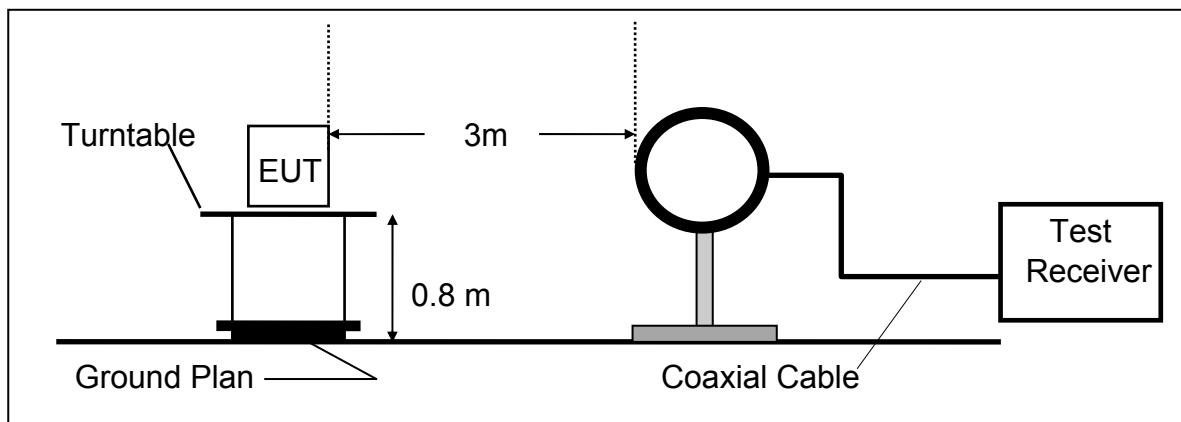
## 7 RADIATED TEST ITEMS

### 7.1 Measurement Procedure

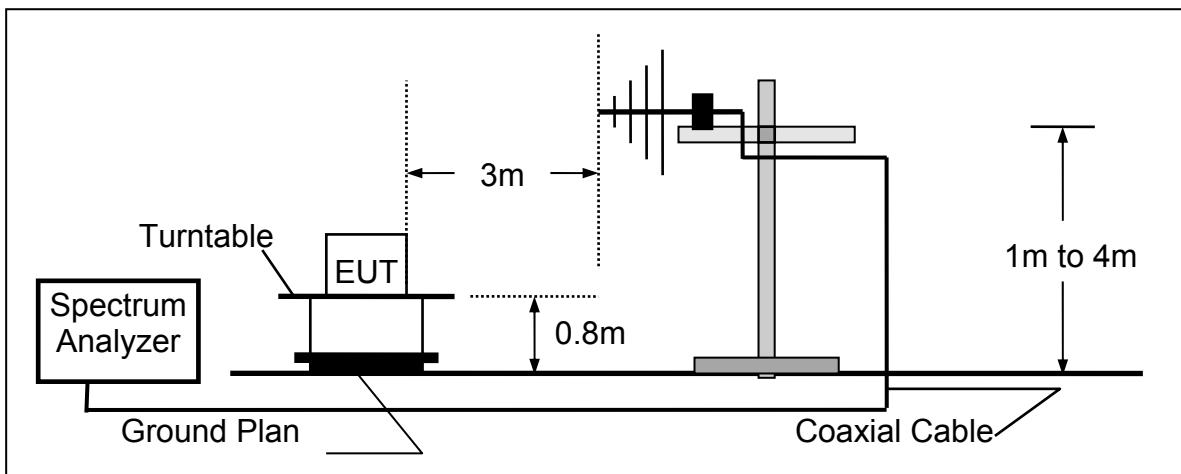
1. Configure the EUT according to ANSI C63.10.
2. The EUT was placed on a turn table which is 0.8m above ground plan.
3. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
4. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission.
5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
6. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
7. Repeat above procedures until all default test channel measured were complete

### 7.2 Test SET-UP

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



#### (B) Radiated Emission Test Set-Up, Frequency Below 1000MHz



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### 7.3 Measurement Equipment Used

| 966 Chamber       |                 |                       |               |            |            |
|-------------------|-----------------|-----------------------|---------------|------------|------------|
| EQUIPMENT TYPE    | MFR             | MODEL NUMBER          | SERIAL NUMBER | LAST CAL.  | CAL DUE.   |
| EMI Test Receiver | R&S             | ESU 40                | 100363        | 04/18/2017 | 04/17/2018 |
| Loop Antenna      | ETS-Lindgren    | 6502                  | 00143303      | 12/23/2016 | 12/22/2017 |
| Broadband Antenna | TESEQ           | CBL 6112D             | 35240         | 11/03/2016 | 11/02/2017 |
| Pre Amplifier     | EMC Instruments | EMC330                | 980096        | 12/12/2016 | 12/11/2017 |
| Coaxial Cable     | Huber+Suhner    | RG 214/U              | 966Rx 9K-30M  | 12/12/2016 | 12/11/2017 |
| Coaxial Cable     | Huber+Suhner    | RG 214/U SUCOFLEX 104 | 966Rx 30M-3G  | 12/12/2016 | 12/11/2017 |
| Site NSA          | SGS             | 966 Chamber C         | SAC-C         | 03/02/2017 | 03/01/2018 |
| Site VSWR         | SGS             | 966 Chamber C         | SAC-C         | 03/02/2017 | 03/01/2018 |
| DC Power Supply   | HOLA            | DP-3003               | D7070035      | 05/04/2017 | 05/03/2018 |
| Controller        | MF              | MF-7802               | N/A           | N.C.R.     | N.C.R.     |
| Antenna Master    | MF              | N/A                   | N/A           | N.C.R.     | N.C.R.     |
| Turn Table        | MF              | N/A                   | N/A           | N.C.R.     | N.C.R.     |
| Test Software     | World-Pallas    | Dr. E                 | V 3.0 Lite    | N.C.R.     | N.C.R.     |

### 7.4 Field Strength Calculation

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

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

|       |                        |  |
|-------|------------------------|--|
| Where | FS = Field Strength    | CL = Cable Attenuation Factor (Cable Loss) |
|       | RA = Reading Amplitude | AG = Amplifier Gain                        |
|       | AF = Antenna Factor    |  |

The limit of the emission level is expressed in dB $\mu$ V/m, which converts  $20 * \log(\mu\text{V}/\text{m})$

Actual FS(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB)

Factor(dB) = Antenna Factor(dB $\mu$ V/m) + Cable Loss(dB) - Pre\_Amplifier Gain(dB)

#### Note :

“F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

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## 7.5 Field Strength of Fundamental Emissions and Mask Measurement

### 7.5.1 Standard Applicable

Limit:

| Rules and specifications    | CFR 47 Part 15 section 15.225(a)-(d) |                                      |                                     |
|-----------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Frequency of Emission (MHz) | Field Strength ( $\mu$ V/m) at 30m   | Field Strength (dB $\mu$ V/m) at 30m | Field Strength (dB $\mu$ V/m) at 3m |
| 1.705~13.110                | 30                                   | 29.5                                 | 69.5                                |
| 13.110~13.410               | 106                                  | 40.5                                 | 80.5                                |
| 13.410~13.553               | 334                                  | 50.5                                 | 90.47                               |
| 13.553~13.567               | 15848                                | 84                                   | 123.9                               |
| 13.567~13.710               | 334                                  | 50.5                                 | 90.47                               |
| 13.710~14.010               | 106                                  | 40.5                                 | 80.5                                |
| 14.010~30.00                | 30                                   | 29.5                                 | 69.5                                |

Field strength of fundamental emissions limit:

The field strength of fundamental emissions shall not exceed 15848 micorvolts/meter at 30 meters. The Limit is converted to 124.00dB $\mu$ V/m by offsetting the distance extrapolation factor as measurement distance is taken place at 3 meters.

Distance extrapolation =  $40 * \log (30/3) = 40$  dB

Limit is re-adjusted in terms of limit taken in 3m =  $20 * \log (15848 \mu\text{V}/\text{m}) + 40 = 124.00\text{dB}\mu\text{V}/\text{m}$

1. Emission level in dB $\mu$ V/m=20 log ( $\mu$ V/m)
2. Distance extrapolation factor =  $40 \log (\text{required distance}/\text{test distance})$  (dB)
3. The lower limit shall apply at the transition frequencies.
4. The measurement was undertaken in closer distance at 3m, where extrapolation factor is offset to convert the limit of the measurement.

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## Radiated Mask for RSS 210 Annex B B6

- (a) 15.848 millivolts/m (84 dB $\mu$ V/m) at 30 m, within the band 13.553-13.567 MHz.
- (b) 334 microvolts/m (50.5 dB $\mu$ V/m) at 30 m, within the bands 13.410-13.553 MHz and 13.567-13.710 MHz.
- (c) 106 microvolts/m (40.5 dB $\mu$ V/m) at 30 m, within the bands 13.110-13.410 MHz and 13.710-14.010 MHz.
- (d) RSS-Gen general field strength limits for frequencies outside the band 13.110-14.010 MHz.

Distance extrapolation =  $40 * \log (30/3) = 40$  dB

Limit is re-adjusted in terms of limit taken in 3m for the following frequency segment of the interest:

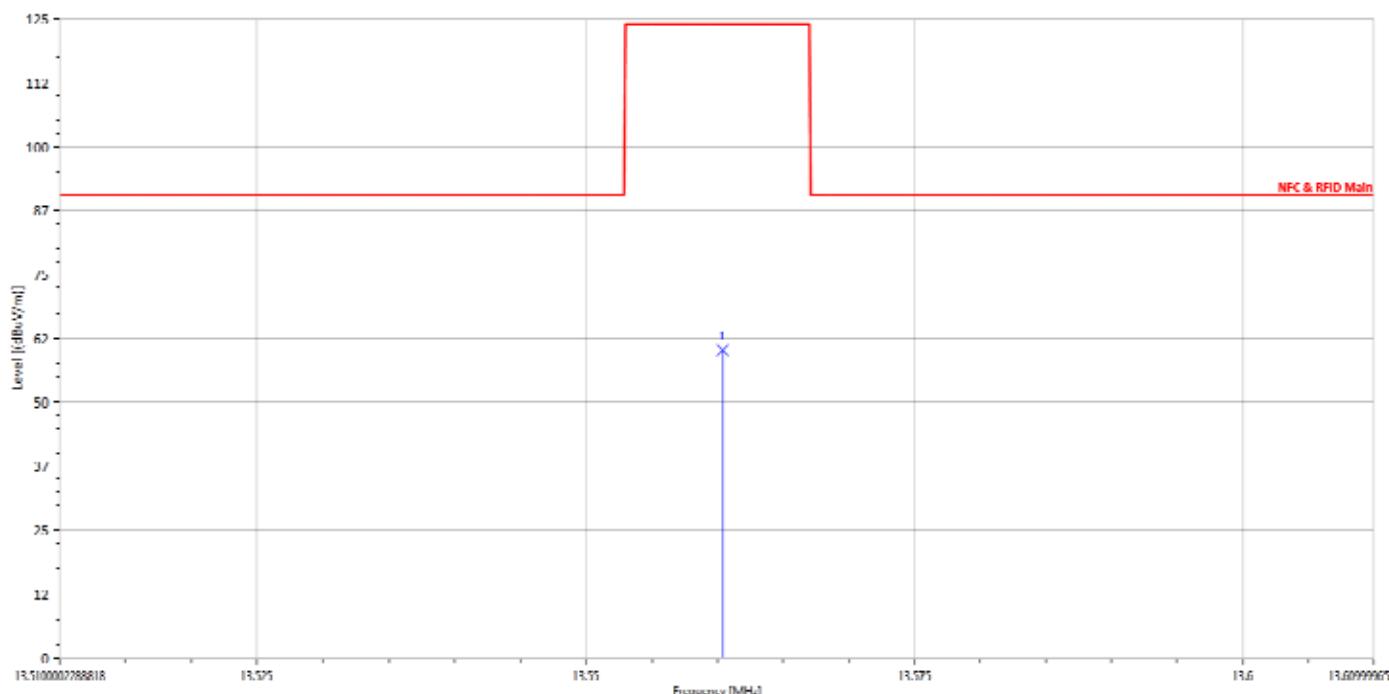
- a)  $20 * \log (15848\mu\text{V}/\text{m}) + 40\text{dB} = 124.00\text{dBuV}/\text{m}$
- b)  $20 * \log(334\mu\text{V}/\text{m}) + 40\text{dB} = 90.47\text{dBuV}/\text{m}$
- c)  $20 * \log(106\mu\text{V}/\text{m}) + 40\text{dB} = 80.50\text{dBuV}/\text{m}$

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### 7.5.2 Field Strength of Fundamental Emission Measurement Result

Operation Mode : NFC Test Date : 2017/9/11  
Fundamental Frequency : 13.56 MHz Temp. / Humi. : 22.7deg\_C/57RH  
Operation Band : Main CH Mid Test Engineer : Ashton  
EUT Pol. : E2 Measurement Antenna Pol. : Vertical



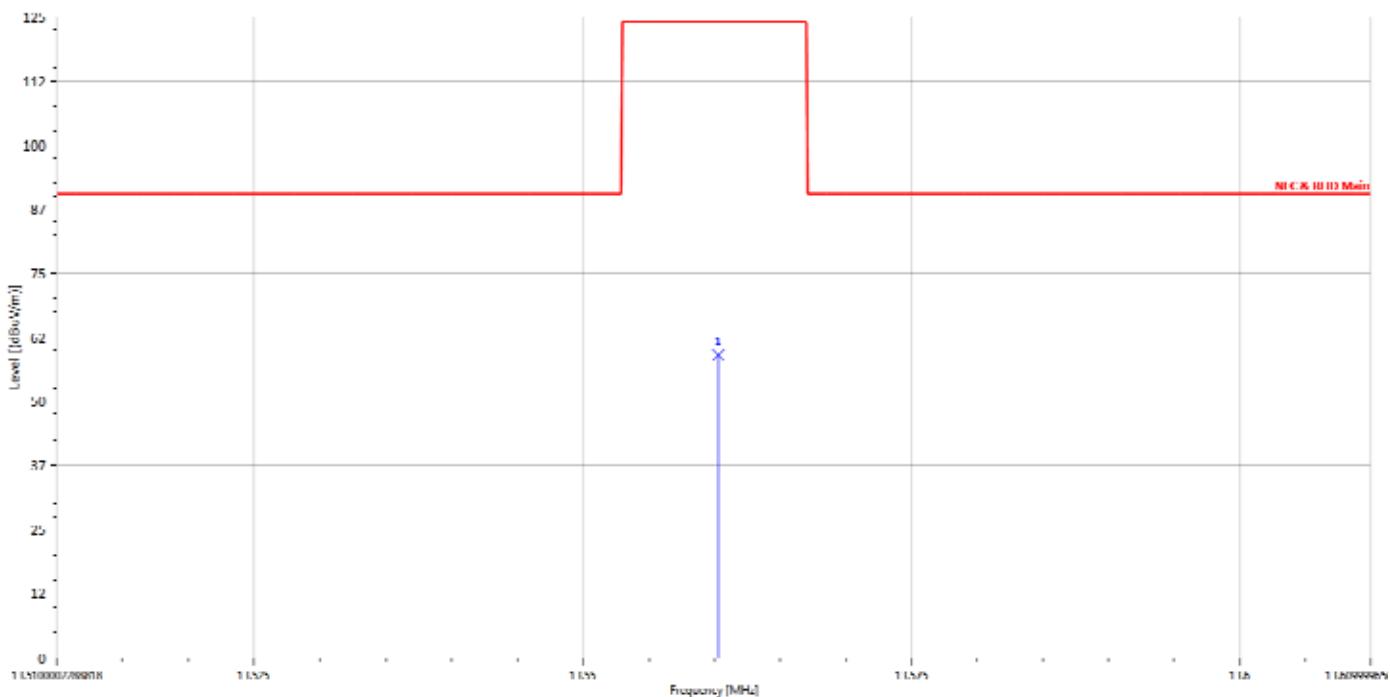
| Freq. | Note    | Detector Mode | Spectrum Reading Level | Factor | Actual FS    | Limit @3m    | Margin |
|-------|---------|---------------|------------------------|--------|--------------|--------------|--------|
| MHz   | F/H/E/S | PK/QP/AV      | dB $\mu$ V             | dB     | dB $\mu$ V/m | dB $\mu$ V/m | dB     |
| 13.56 | F       | Peak          | 48.63                  | 11.59  | 60.22        | 123.9        | -63.68 |

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Operation Mode : NFC Test Date : 2017/9/11  
Fundamental Frequency : 13.56 MHz Temp. / Humi. : 22.7deg\_C/57RH  
Operation Band : Main CH Mid Test Engineer : Ashton  
EUT Pol. : E2 Measurement Antenna Pol. : Horizontal



| Freq. | Note    | Detector Mode | Spectrum Reading Level | Factor | Actual FS    | Limit @3m    | Margin |
|-------|---------|---------------|------------------------|--------|--------------|--------------|--------|
| MHz   | F/H/E/S | PK/QP/AV      | dB $\mu$ V             | dB     | dB $\mu$ V/m | dB $\mu$ V/m | dB     |
| 13.56 | F       | Peak          | 47.45                  | 11.59  | 59.04        | 123.9        | -64.86 |

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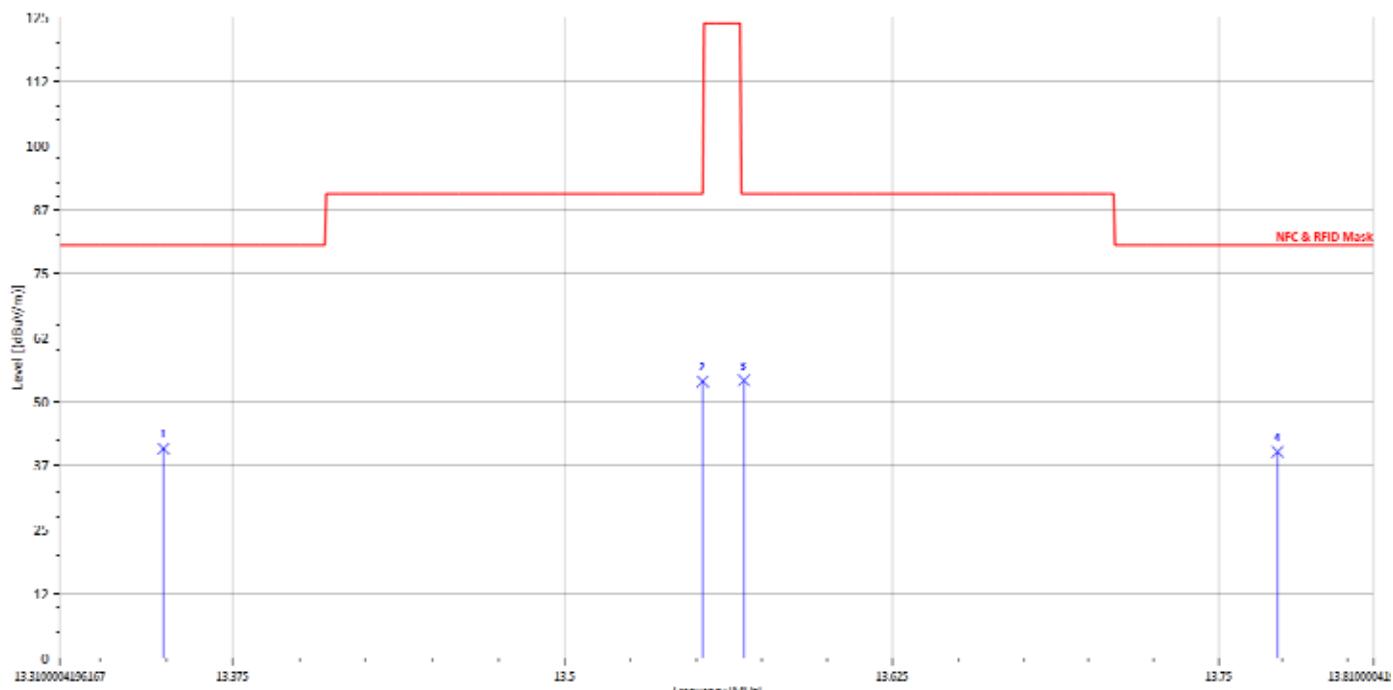
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## 7.5.3 Mask Measurement Result

Operation Mode : NFC      Test Date : 2017/9/11  
 Fundamental Frequency : 13.56 MHz      Temp. / Humi. : 22.7deg\_C/57RH  
 Operation Band : Mask CH Mid      Test Engineer : Ashton  
 EUT Pol. : E2      Measurement Antenna Pol. : Vertical



| Freq. | Note    | Detector Mode | Spectrum Reading | Factor | Actual FS    | Limit @3m    | Margin |
|-------|---------|---------------|------------------|--------|--------------|--------------|--------|
| MHz   | F/H/E/S | PK/QP/AV      | Level dB $\mu$ V | dB     | dB $\mu$ V/m | dB $\mu$ V/m | dB     |
| 13.35 | S       | Peak          | 29.21            | 11.60  | 40.81        | 80.5         | -39.69 |
| 13.55 | S       | Peak          | 42.28            | 11.59  | 53.87        | 90.47        | -36.60 |
| 13.57 | S       | Peak          | 42.47            | 11.59  | 54.06        | 90.47        | -36.41 |
| 13.77 | S       | Peak          | 28.59            | 11.58  | 40.17        | 80.5         | -40.33 |

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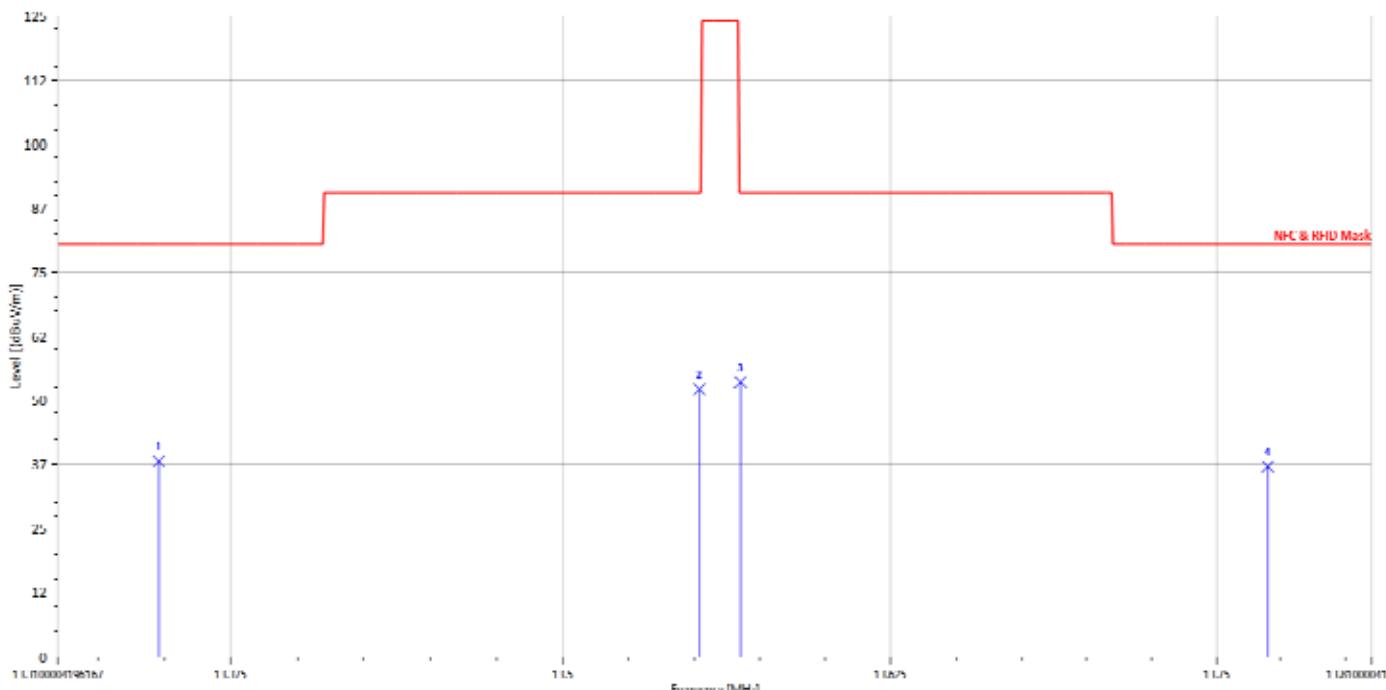
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Operation Mode : NFC      Test Date : 2017/9/11  
 Fundamental Frequency : 13.56 MHz      Temp. / Humi. : 22.7deg\_C/57RH  
 Operation Band : Mask CH Mid      Test Engineer : Ashton  
 EUT Pol. : E2      Measurement Antenna Pol. : Horizontal



| Freq.<br>MHz | Note<br>F/H/E/S | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Reading Level<br>dB $\mu$ V | Factor<br>dB | Actual<br>FS<br>dB $\mu$ V/m | Limit<br>@3m<br>dB $\mu$ V/m | Margin<br>dB |
|--------------|-----------------|------------------------------|---|--------------|------------------------------|------------------------------|--------------|
| 13.35        | S               | Peak                         | 26.52                                   | 11.60        | 38.11                        | 80.5                         | -42.39       |
| 13.55        | S               | Peak                         | 40.53                                   | 11.59        | 52.12                        | 90.47                        | -38.35       |
| 13.57        | S               | Peak                         | 41.95                                   | 11.59        | 53.54                        | 90.47                        | -36.93       |
| 13.77        | S               | Peak                         | 25.49                                   | 11.58        | 37.08                        | 80.5                         | -43.42       |

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## 7.6 Radiated Emission Measurement

### 7.6.1 Standard Applicable

The field strength of any emission which appear outside of 13.553~13.567MHz Band shall not exceed the general radiated emissions limits.

| Frequency (MHz) | Field strength ( $\mu$ V/m) | Distance (meters) |
|-----------------|-----------------------------|-------------------|
| 0.009~0.490     | 2400/F(kHz)                 | 300               |
| 0.490~1.705     | 24000/F(kHz)                | 30                |
| 1.705-30        | 30                          | 30                |
| 30-88           | 100                         | 3                 |
| 88-216          | 150                         | 3                 |
| 216-960         | 200                         | 3                 |
| Above 960       | 500                         | 3                 |

**Note:**

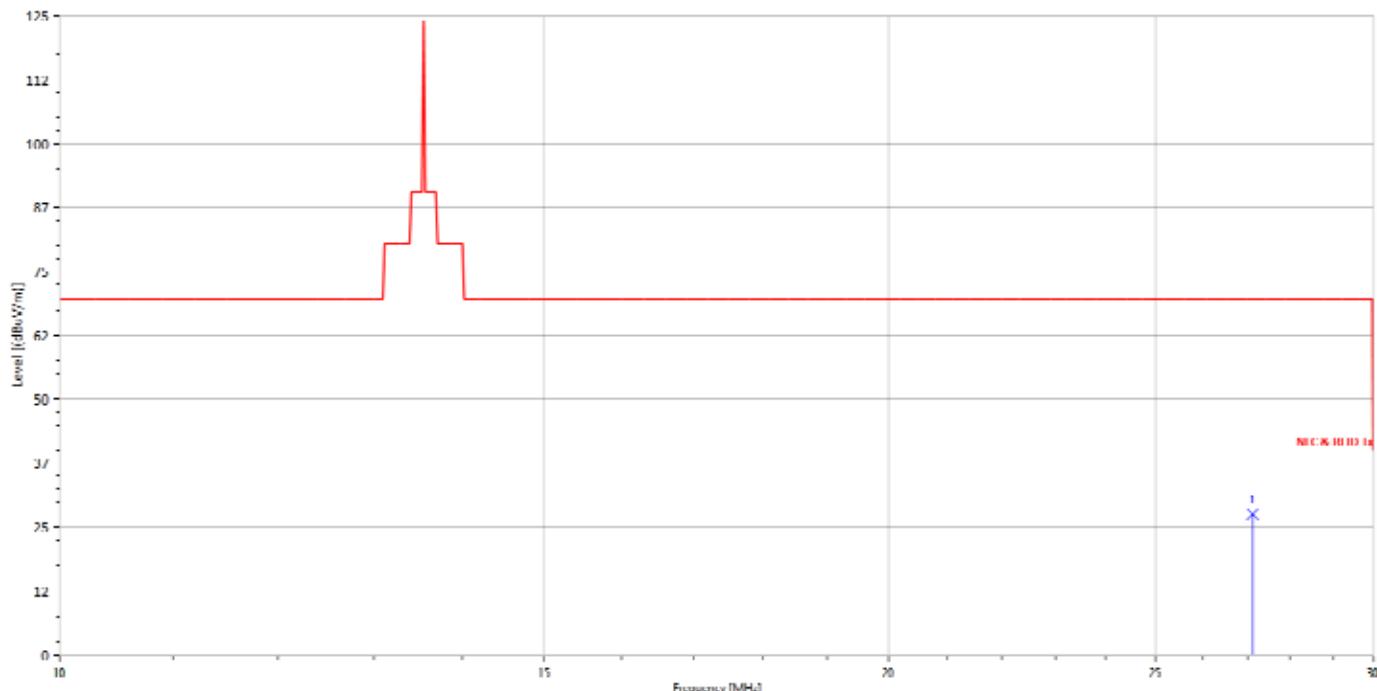
1. Emission level in  $\text{dB}\mu\text{V}/\text{m} = 20 \log (\mu\text{V}/\text{m})$
2. Distance extrapolation factor =  $40 \log (\text{required distance}/ \text{test distance})$  (dB)
3. The lower limit shall apply at the transition frequencies.
4. The measurement was undertaken in closer distance at 3m, where extrapolation factor is offset to convert the limit of the measurement.

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**Radiated Emission Measurement Result**

Operation Mode : NFC Test Date : 2017/9/11  
Fundamental Frequency : 13.56 MHz Temp. / Humi. : 22.7deg\_C/57RH  
Operation Band : Tx CH Mid Test Engineer : Ashton  
EUT Pol. : E2 Measurement Antenna Pol. : Vertical



| Freq.<br>MHz | Note | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Reading Level<br>dB $\mu$ V | Factor<br>dB | Actual<br>FS<br>dB $\mu$ V/m | Limit<br>@3m<br>dB $\mu$ V/m | Margin<br>dB |
|--------------|------|------------------------------|---|--------------|------------------------------|------------------------------|--------------|
| 27.12        | H    | Peak                         | 17.94                                   | 9.67         | 27.60                        | 69.54                        | -41.94       |

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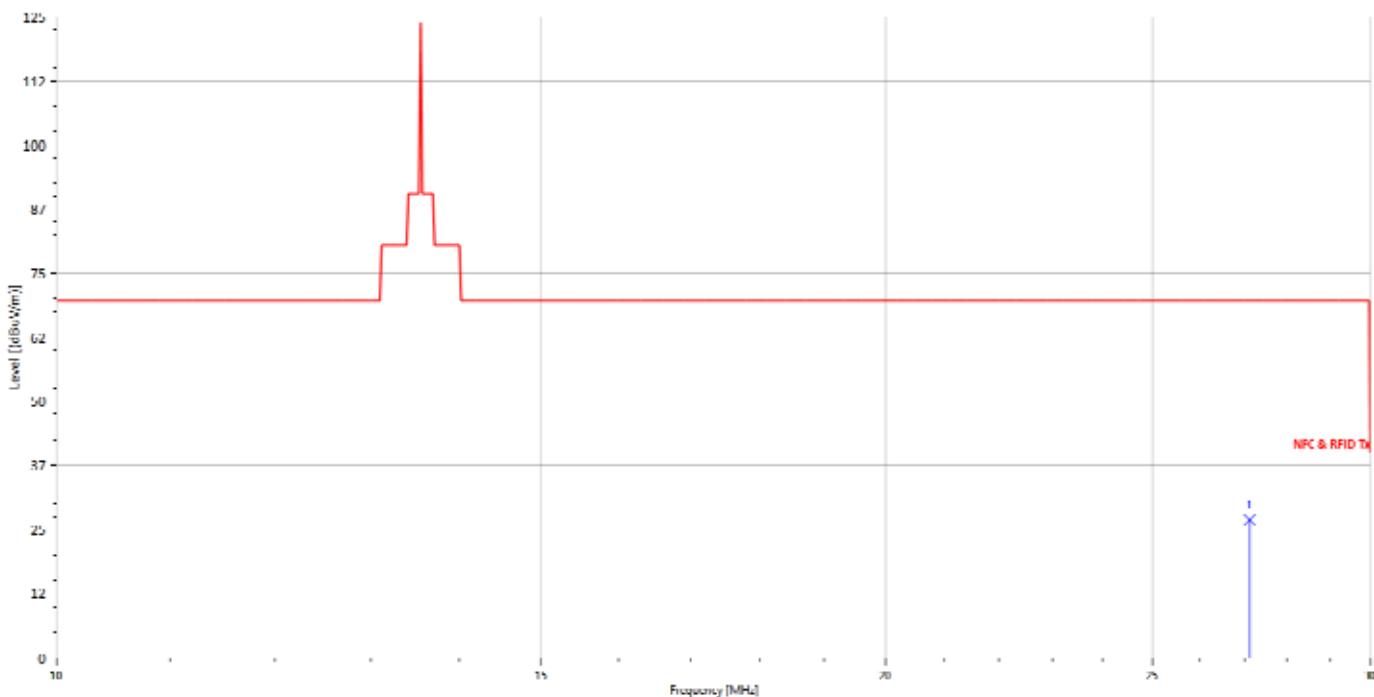
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Operation Mode : NFC Test Date : 2017/9/11  
Fundamental Frequency : 13.56 MHz Temp. / Humi. : 22.7deg\_C/57RH  
Operation Band : Tx CH Mid Test Engineer : Ashton  
EUT Pol. : E2 Measurement Antenna Pol. : Horizontal



| Freq. | Note    | Detector Mode | Spectrum Reading Level | Factor | Actual FS    | Limit @3m    | Margin |
|-------|---------|---------------|------------------------|--------|--------------|--------------|--------|
| MHz   | F/H/E/S | PK/QP/AV      | dB $\mu$ V             | dB     | dB $\mu$ V/m | dB $\mu$ V/m | dB     |
| 27.12 | H       | Peak          | 17.27                  | 9.67   | 26.94        | 69.54        | -42.60 |

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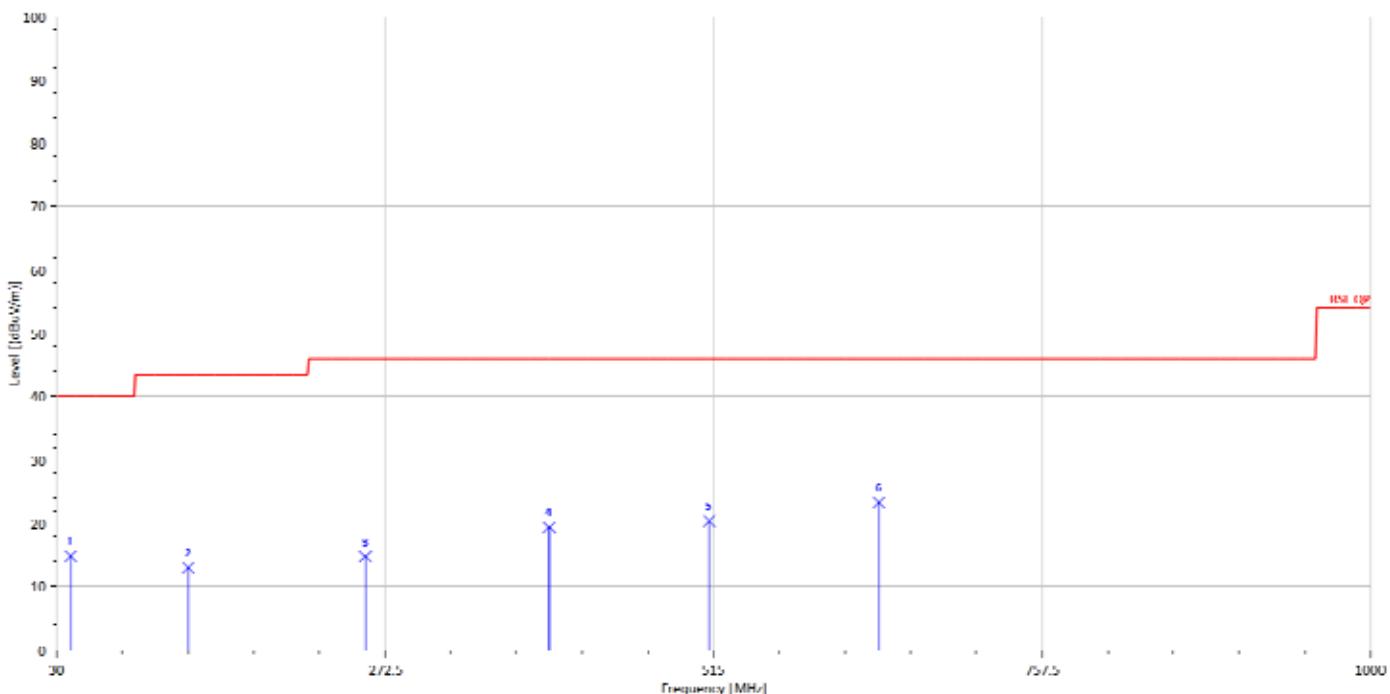
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Fundamental Frequency : 13.56 MHz      Temp. / Humi. : 22.7deg\_C/57RH  
Operation Band : Tx CH Mid      Test Engineer : Ashton  
EUT Pol. : E2      Measurement Antenna Pol. : Vertical



| Freq.<br>MHz | Note<br>F/H/E/S | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Reading Level |             | Factor<br>dB | Actual<br>FS<br>dBuV/m | Limit<br>@3m<br>dBuV/m | Margin<br>dB |
|--------------|-----------------|------------------------------|---------------------------|-------------|--------------|------------------------|------------------------|--------------|
|              |                 |                              | Reading<br>dB $\mu$ V     | Level<br>dB |              |                        |                        |              |
| 40.68        | H               | Peak                         | 28.11                     | -13.30      | 14.81        | 40                     | -25.19                 |              |
| 127.00       | S               | Peak                         | 28.63                     | -15.65      | 12.98        | 43.5                   | -30.52                 |              |
| 257.95       | S               | Peak                         | 28.61                     | -13.86      | 14.75        | 46                     | -31.25                 |              |
| 393.75       | S               | Peak                         | 29.33                     | -9.91       | 19.42        | 46                     | -26.58                 |              |
| 512.09       | S               | Peak                         | 27.93                     | -7.51       | 20.42        | 46                     | -25.58                 |              |
| 637.22       | S               | Peak                         | 28.29                     | -5.08       | 23.20        | 46                     | -22.80                 |              |

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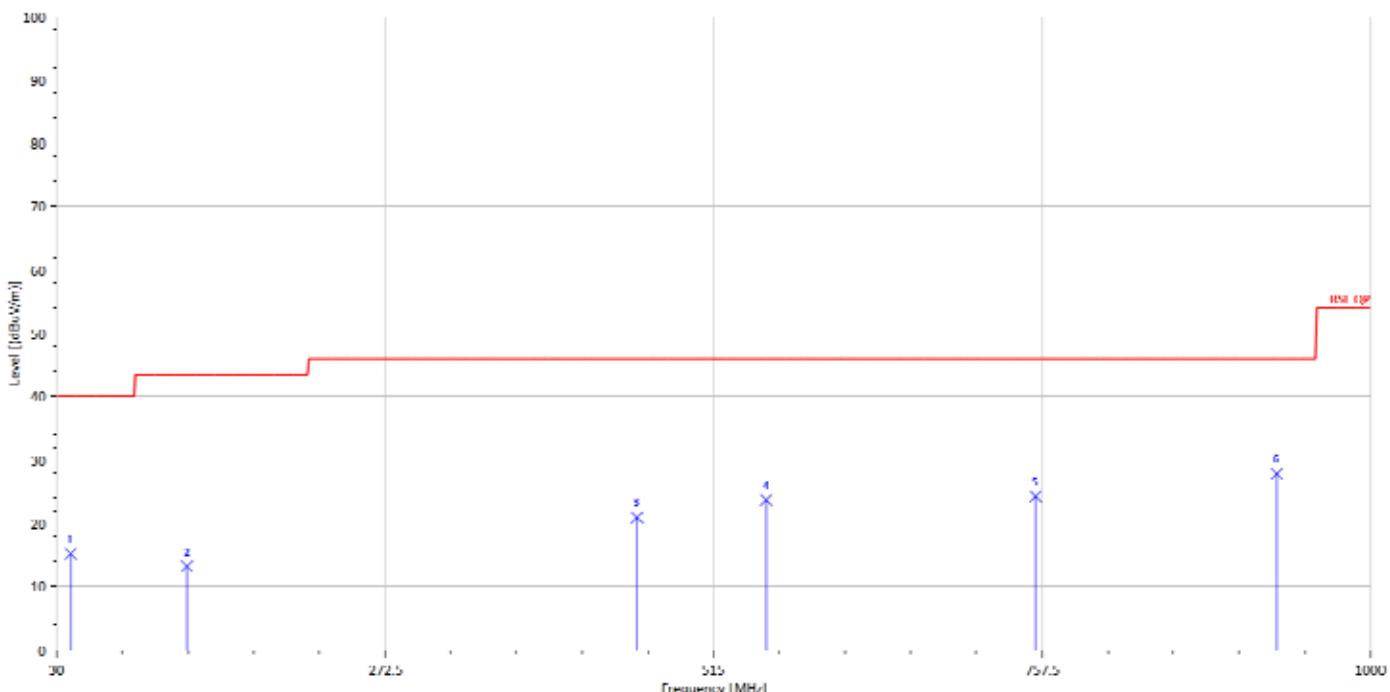
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Operation Mode : NFC      Test Date : 2017/9/11  
 Fundamental Frequency : 13.56 MHz      Temp. / Humi. : 22.7deg\_C/57RH  
 Operation Band : Tx CH Mid      Test Engineer : Ashton  
 EUT Pol. : E2      Measurement Antenna Pol. : Horizontal



| Freq.<br>MHz | Note<br>F/H/E/S | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Reading Level |             | Factor<br>dB | Actual<br>FS<br>dBµV/m | Limit<br>@3m<br>dBµV/m | Margin<br>dB |
|--------------|-----------------|------------------------------|---------------------------|-------------|--------------|------------------------|------------------------|--------------|
|              |                 |                              | Reading<br>dBµV           | Level<br>dB |              |                        |                        |              |
| 40.68        | H               | Peak                         | 28.51                     | -13.30      | 15.21        | 40                     | -24.79                 |              |
| 126.03       | S               | Peak                         | 28.84                     | -15.65      | 13.19        | 43.5                   | -30.31                 |              |
| 458.74       | S               | Peak                         | 29.06                     | -8.09       | 20.97        | 46                     | -25.03                 |              |
| 553.80       | S               | Peak                         | 30.47                     | -6.84       | 23.63        | 46                     | -22.37                 |              |
| 752.65       | S               | Peak                         | 28.35                     | -4.13       | 24.21        | 46                     | -21.79                 |              |
| 931.13       | S               | Peak                         | 29.50                     | -1.70       | 27.80        | 46                     | -18.20                 |              |

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## 8 FREQUENCY STABILITY

### 8.1 Standard Applicable

The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

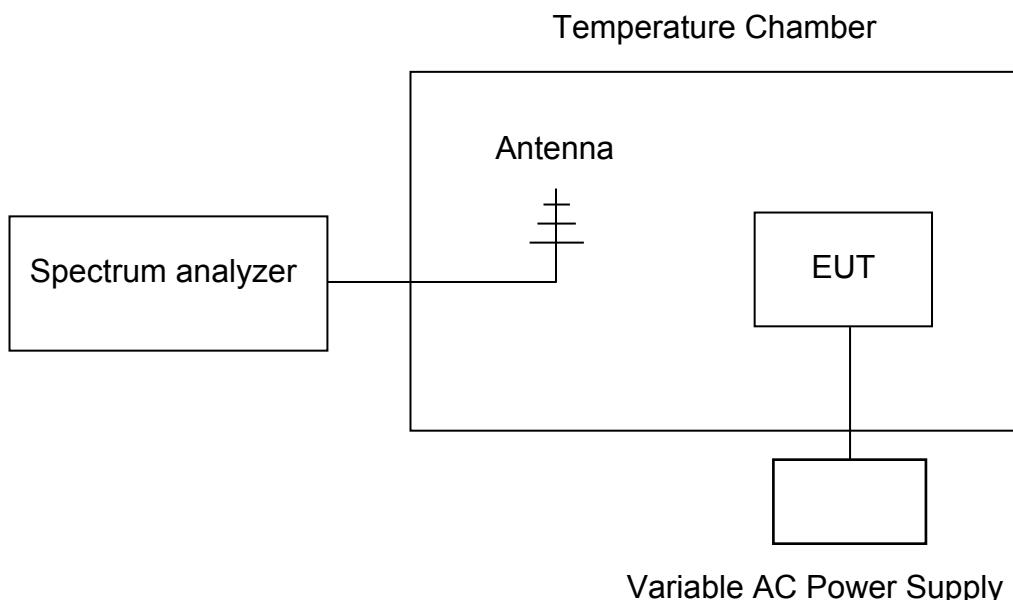
Carrier frequency stability shall be maintained to  $\pm 0.01\%$  ( $\pm 100$  ppm).

For licence-exempt radio apparatus, the frequency stability shall be measured at temperatures of -20°C (-4°F), +20°C (+68°F) and +50°C (+122°F).

### 8.2 Measurement Procedure

1. The EUT was placed inside temperature chamber and powered and powered by nominal DC voltage.
2. Set EUT as normal operation.
3. Turn the EUT on and couple its output to spectrum.
4. Turn the EUT off and set the chamber to the highest temperature specified.
5. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT and measure the operating frequency.
6. Repeat step with the temperature chamber set to the lowest temperature.
7. Set spectrum Center Frequency = fundamental frequency, RBW, VBW= 10 kHz, Span =100 kHz, Detector =Max hold, Mark peak.

### 8.3 Test SET-UP



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## 8.4 Measurement Equipment Used

| Conducted Emission Test Site |           |              |               |            |            |
|------------------------------|-----------|--------------|---------------|------------|------------|
| EQUIPMENT TYPE               | MFR       | MODEL NUMBER | SERIAL NUMBER | LAST CAL.  | CAL DUE.   |
| Power Meter                  | Anritsu   | ML2496A      | 1326001       | 06/23/2017 | 06/22/2018 |
| Power Sensor                 | Anritsu   | MA2411B      | 1315048       | 06/23/2017 | 06/22/2018 |
| Spectrum Analyzer            | KEYSIGHT  | N9010A       | MY51440113    | 06/20/2017 | 06/19/2018 |
| DC Block                     | PASTERNAK | PE8210       | RF29          | 12/12/2016 | 12/11/2017 |

## 8.5 Measurement Results:

### Startup:

#### A. Temperature Variation

| Power Supply | Environment     | Frequency | Delta (Hz) | Limit (KHz) |
|--------------|-----------------|-----------|------------|-------------|
| Vdc          | Temperature ( ) | (MHz)     |            |             |
| 3.85         | -20             | 13.5603   | 0.00000    | +/- 1.356   |
| 3.85         | -10             | 13.5604   | -100.00000 | +/- 1.356   |
| 3.85         | 0               | 13.5602   | 100.00000  | +/- 1.356   |
| 3.85         | 10              | 13.5603   | 0.00000    | +/- 1.356   |
| 3.85         | 20              | 13.5603   | 0.00000    | +/- 1.356   |
| 3.85         | 30              | 13.5605   | -200.00000 | +/- 1.356   |
| 3.85         | 40              | 13.5604   | -100.00000 | +/- 1.356   |
| 3.85         | 50              | 13.5603   | 0.00000    | +/- 1.356   |

#### B. Supply Voltage Variation

| Power Supply | Environment     | Frequency | Delta (Hz) | Limit (KHz) |
|--------------|-----------------|-----------|------------|-------------|
| Vdc          | Temperature ( ) | (MHz)     |            |             |
| 4.42         | 20              | 13.5603   | 0.00000    | +/- 1.356   |
| 3.85         | 20              | 13.5603   | 0.00000    | +/- 1.356   |
| 3.4          | 20              | 13.5605   | -200.00000 | +/- 1.356   |

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**2 minutes:****A. Temperature Variation**

| Power Supply | Environment     | Frequency | Delta (Hz) | Limit (KHz) |
|--------------|-----------------|-----------|------------|-------------|
| Vdc          | Temperature ( ) | (MHz)     |            |             |
| 3.85         | -20             | 13.5602   | 200.00000  | +/- 1.356   |
| 3.85         | -10             | 13.5603   | 100.00000  | +/- 1.356   |
| 3.85         | 0               | 13.5602   | 200.00000  | +/- 1.356   |
| 3.85         | 10              | 13.5603   | 100.00000  | +/- 1.356   |
| 3.85         | 20              | 13.5604   | 0.00000    | +/- 1.356   |
| 3.85         | 30              | 13.5603   | 100.00000  | +/- 1.356   |
| 3.85         | 40              | 13.5602   | 200.00000  | +/- 1.356   |
| 3.85         | 50              | 13.5603   | 100.00000  | +/- 1.356   |

**B. Supply Voltage Variation**

| Power Supply | Environment     | Frequency | Delta (Hz) | Limit (KHz) |
|--------------|-----------------|-----------|------------|-------------|
| Vdc          | Temperature ( ) | (MHz)     |            |             |
| 4.42         | 20              | 13.5605   | -200.00000 | +/- 1.356   |
| 3.85         | 20              | 13.5603   | 0.00000    | +/- 1.356   |
| 3.4          | 20              | 13.5604   | -100.00000 | +/- 1.356   |

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**5 minutes:****A. Temperature Variation**

| Power Supply | Environment     | Frequency | Delta (Hz) | Limit (KHz) |
|--------------|-----------------|-----------|------------|-------------|
| Vdc          | Temperature ( ) | (MHz)     |            |             |
| 3.85         | -20             | 13.5605   | 0.00000    | +/- 1.356   |
| 3.85         | -10             | 13.5605   | 0.00000    | +/- 1.356   |
| 3.85         | 0               | 13.5604   | 100.00000  | +/- 1.356   |
| 3.85         | 10              | 13.5605   | 0.00000    | +/- 1.356   |
| 3.85         | 20              | 13.5605   | 0.00000    | +/- 1.356   |
| 3.85         | 30              | 13.5604   | 100.00000  | +/- 1.356   |
| 3.85         | 40              | 13.5603   | 200.00000  | +/- 1.356   |
| 3.85         | 50              | 13.5604   | 100.00000  | +/- 1.356   |

**B. Supply Voltage Variation**

| Power Supply | Environment     | Frequency | Delta (Hz) | Limit (KHz) |
|--------------|-----------------|-----------|------------|-------------|
| Vdc          | Temperature ( ) | (MHz)     |            |             |
| 4.42         | 20              | 13.5603   | 0.00000    | +/- 1.356   |
| 3.85         | 20              | 13.5603   | 0.00000    | +/- 1.356   |
| 3.4          | 20              | 13.5603   | 0.00000    | +/- 1.356   |

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**10 minutes:****A. Temperature Variation**

| Power Supply | Environment     | Frequency | Delta (Hz) | Limit (KHz) |
|--------------|-----------------|-----------|------------|-------------|
| Vdc          | Temperature ( ) | (MHz)     |            |             |
| 3.85         | -20             | 13.5603   | 0.00000    | +/- 1.356   |
| 3.85         | -10             | 13.5603   | 0.00000    | +/- 1.356   |
| 3.85         | 0               | 13.5604   | -100.00000 | +/- 1.356   |
| 3.85         | 10              | 13.5603   | 0.00000    | +/- 1.356   |
| 3.85         | 20              | 13.5603   | 0.00000    | +/- 1.356   |
| 3.85         | 30              | 13.5605   | -200.00000 | +/- 1.356   |
| 3.85         | 40              | 13.5604   | -100.00000 | +/- 1.356   |
| 3.85         | 50              | 13.5603   | 0.00000    | +/- 1.356   |

**B. Supply Voltage Variation**

| Power Supply | Environment     | Frequency | Delta (Hz) | Limit (KHz) |
|--------------|-----------------|-----------|------------|-------------|
| Vdc          | Temperature ( ) | (MHz)     |            |             |
| 4.42         | 20              | 13.5603   | 0.00000    | +/- 1.356   |
| 3.85         | 20              | 13.5603   | 0.00000    | +/- 1.356   |
| 3.4          | 20              | 13.5605   | -200.00000 | +/- 1.356   |

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## 9 20 dB & 99% OCCUPIED BANDWIDTH MEASUREMENT

### 9.1 Standard Applicable:

§2.1049 & §15.215 (c)

### 9.2 Limit:

None

### 9.3 Test Set-up



### 9.4 Measurement Procedure

1. The transmitter output (antenna port) was connected to the spectrum analyzer in peak mode.
2. 20dB Bandwidth the resolution bandwidth of 1 kHz and the video bandwidth of 3 kHz were used.
3. Measured the spectrum width with power higher than 20dB below carrier.

### 9.5 Measurement Equipment Used

| Conducted Emission Test Site |           |              |               |            |            |
|------------------------------|-----------|--------------|---------------|------------|------------|
| EQUIPMENT TYPE               | MFR       | MODEL NUMBER | SERIAL NUMBER | LAST CAL.  | CAL DUE.   |
| Spectrum Analyzer            | KEYSIGHT  | N9010A       | MY51440113    | 06/20/2017 | 06/19/2018 |
| DC Block                     | PASTERNAK | PE8210       | RF29          | 12/12/2016 | 12/11/2017 |
| Attenuator                   | WOKEN     | 218FS-10     | RF23          | 12/12/2016 | 12/11/2017 |

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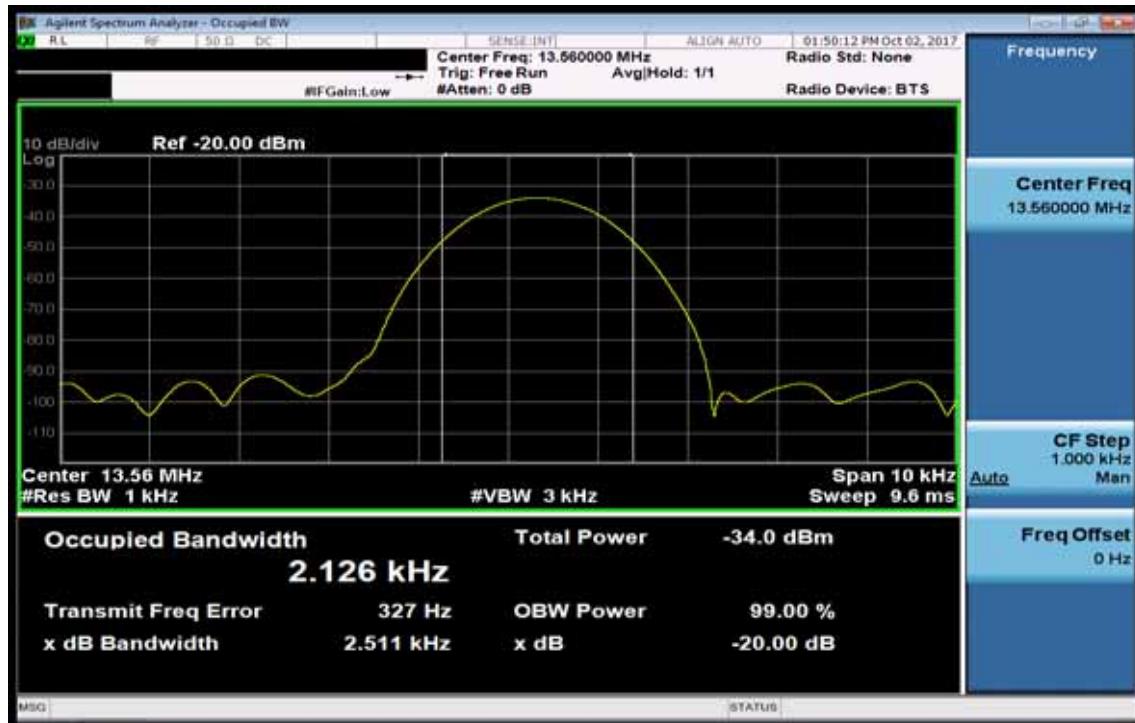
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## 9.6 Measurement Result:

| 20dB Bandwidth (kHz) |
|----------------------|
| 2.511                |

| Operation Range | Frequency (MHz) | Limit (MHz) |
|-----------------|-----------------|-------------|
| Low             | 13.55915        | >13.11      |
| High            | 13.56155        | <14.01      |

## -20dB Bandwidth



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## Operation Range Low



## Operation Range High



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## 10 ANTENNA REQUIREMENT

### 10.1. Standard Applicable

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on measurement or on data from the antenna manufacturer.

For transmitters of RF output power of 10 milliwatts or less, only the portion of the antenna gain that is in excess of 6 dBi (6 dB above isotropic gain) shall be added to the measured RF output power to demonstrate compliance with the radiated power limits specified in the applicable standard. For transmitters of output power greater than 10 milliwatts, the total antenna gain shall be added to the measured RF output power to demonstrate compliance to the specified radiated power limits.

According to RSS-GEN 8.3

The applicant for equipment certification, as per RSP-100, must provide a list of all antenna types that may be used with the licence-exempt transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna.

Licence-exempt transmitters that have received equipment certification may operate with different types of antennas. However, it is not permissible to exceed the maximum equivalent isotropically radiated power (e.i.r.p.) limits specified in the applicable standard (RSS) for the licence-exempt apparatus.

Testing shall be performed using the highest gain antenna of each combination of licence-exempt transmitter and antenna type, with the transmitter output power set at the maximum level.<sup>9</sup> When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna manufacturer.

### 10.2. Antenna Connected Construction

The antenna connector is designed with unique type RF connector and no consideration of replacement. Please see EUT photo and antenna spec. for details.

*~ End of Report ~*

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