

# ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

## INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

OF

**Brand Name:** Sony

**FCC ID:** PY7-55364J

**Report No.:** ER/2016/C0049

**Issue Date:** Mar. 09, 2017

**FCC Rule** §15.225

**Prepared for:** Sony Mobile Communications Inc.  
4-12-3, Higashi-Shinagawa, Shinagawa-ku,  
Tokyo, 140-0002 Japan

**Prepared by:** SGS Taiwan Ltd.  
Electronics & Communication Laboratory  
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24803



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## VERIFICATION OF COMPLIANCE

**Applicant:** Sony Mobile Communications Inc.  
4-12-3, Higashi-Shinagawa, Shinagawa-ku, Tokyo, 140-0002 Japan

**Brand Name:** Sony

**FCC ID:** PY7-55364J

**File Number:** ER/2016/C0049

**Date of test:** Dec. 09, 2016 ~ Mar. 08, 2017

**Date of EUT Received:** Dec. 09, 2016

### We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. 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.

**Test By:**

*Louis Chen*

**Date:**

Mar. 09, 2017

*Louis Chen / Engineer*

**Prepared By:**

*Karen Huang*

**Date:**

Mar. 09, 2017

*Karen Huang / Clerk*

**Approved By:**

*Jim Chang*

**Date:**

Mar. 09, 2017

*Jim Chang / Asst. Manager*

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## Revision History

Report Number	Revision	Description	Issue Date
ER/2016/C0049	Rev.00	Initial creation of document	Jan. 09, 2017
ER/2016/C0049	Rev.01	Add SAC data on page 20~21	Jan. 19, 2017
ER/2016/C0049	Rev.02	Provide measurement plot of radiation from P20 to P28.	Jan. 23, 2017
ER/2016/C0049	Rev.03	Update general information & add SAC data on page 19~30.	Feb. 07, 2017
ER/2016/C0049	Rev.04	Provide measurement plot of SAC data	Feb. 09, 2017
ER/2016/C0049	Rev.05	Add ferrite core & update conduction setup photo.	Mar. 01, 2017
ER/2016/C0049	Rev.06	Update description on page 19	Mar. 07, 2017
ER/2016/C0049	Rev.07	Update description on page 19~27	Mar. 07, 2017
ER/2016/C0049	Rev.08	Update revision history and OATS data	Mar. 09, 2017

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# 1 GENERAL INFORMATION

## 1.1 Product Description

General:

Brand Name:	Sony	
Hardware Version:	A	
Software Version:	0.20	
Data Cable (USB):	Model No.: UCB20, Supplier: Sony, Length:100 cm	
BT Headset:	Model No.: MW600, Supplier: Sony	
HDMI Cable:	Model No.: DLC-HEU10A, Supplier: Sony	
Ferrite Core:	Type No.: ZCAT-2035-0930A-BK, Supplier: TDK	
Power Supply:	11.1Vdc	
	Battery:	Model No.: N/A, Supplier: N/A
	Adapter:	Model No.:UCH30C, Supplier: Sony

NFC:

Operating Frequency:	13.56MHz
Transmit Power:	< 30uV/m at 30.
Number of Channels:	1
Antenna Type:	Loop Antenna
Modulation Type:	ASK

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## 1.2 Product Feature of Equipment Under Test

The equipment under Test (Hereafter Called: EUT) supports below functions.

Product Feature	
Bluetooth Version	V4.2 dual mode
Wi-Fi- Specification	802.11a/b/g/n/ac
NFC Specification	NFC

**Note:** The above EUT information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

## 1.3 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.225

ANSI C63.10:2013

Note:

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

## 1.4 Test Facility

SGS Taiwan Ltd. Electronics & Communication Laboratory No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803 (TAF code 0513)

OATS: SGS Far East Limited Taiwan EMC Laboratory  
No.34-2, Dingfu, Linkou Dist., New Taipei City 24442, Taiwan (R.O.C.)

FCC Registration Numbers are: 509634

Canada Registration Number: 4620A-5.

## 1.5 Special Accessories

There is no special accessory used while test was conducted.

## 1.6 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 a placed on as 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 a placed on as 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 three orthogonal axes 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 Configuration



Fig. 2-2 AC Power Line Conducted Emission Configuration

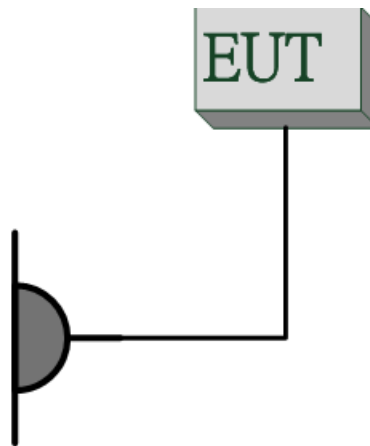


Table 2-1 Equipment Used in Tested System

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

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### 3 SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§15.207	AC Power Line Conducted Emission	Compliant
§15.225 (a)-(d)	Radiated Emission	Compliant
§15.209	Radiated Emission Limits, general requirement	Compliant
§15.225 (e)	Frequency Stability	Compliant
§2.1049 §15.215 (c)	20 dB OCCUPIED BANDWIDTH	Compliant
§15.203	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

**Note:**

The field strength of spurious radiation emission was measured as NFC Transmitter for channel the worst case 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 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 (Polarization : <b>Vertical</b> )	9kHz - 30MHz: +/- 2.87dB
	30MHz - 180MHz: +/- 3.37dB
	180MHz -417MHz: +/- 3.19dB
	0.417GHz-1GHz: +/- 3.19dB

Measurement uncertainty (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 MHz	Limits 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

- The lower limit shall apply at the transition frequencies
- 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 TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESCI7	100760	05/10/2016	05/09/2017
LISN	SCHWARZBECK	NSLK 8127	8127-649	05/16/2016	05/15/2017
LISN	MESS TEC	FCC-LISN-50/250 -25-2-01	4034	05/16/2016	05/15/2017
Coaxial Cables	N/A	WK CE Cable	N/A	11/26/2016	11/25/2017

### 6.3 EUT Setup:

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

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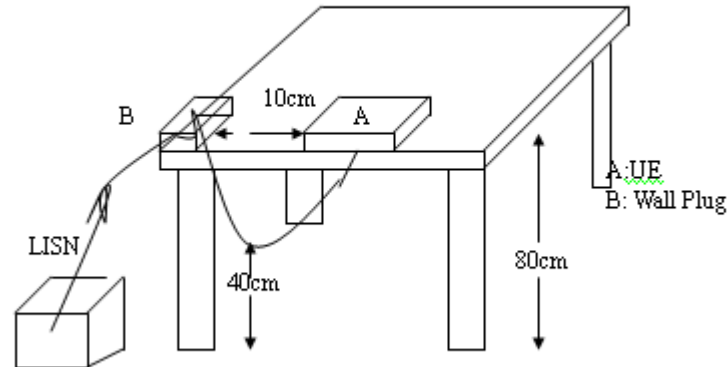
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## 6.4 Test SET-UP (Block Diagram of Configuration)



## 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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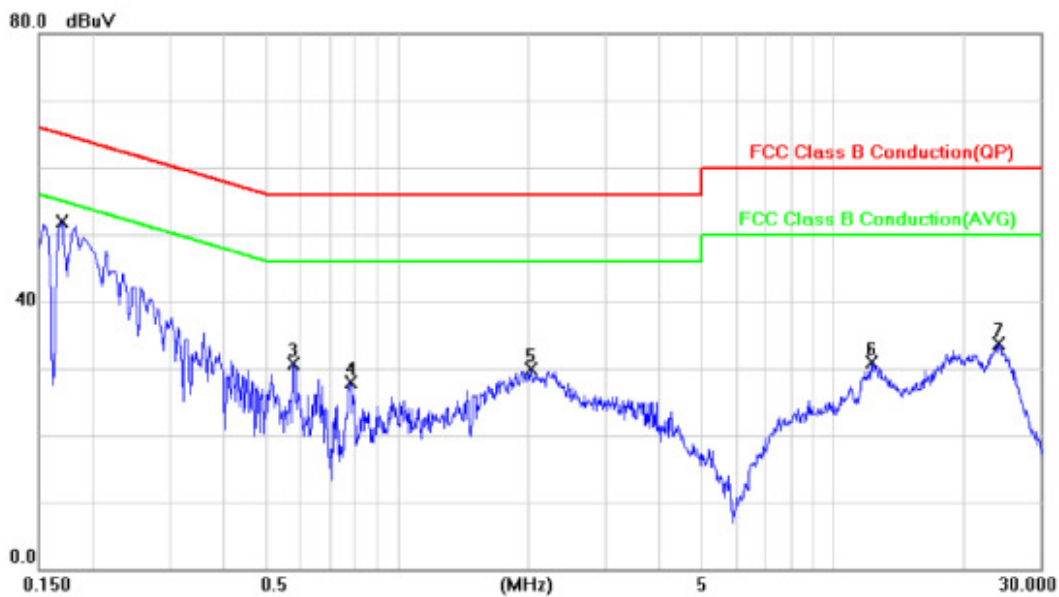
## AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	Operation mode		Test Date:	Dec. 22, 2016	
Temperature:	20 °C	Humidity:	58 %	Test By:	Louis
				Phase:	L1 / N

Site Conduction Room	Phase: <span style="color: blue;">L1</span>	Temperature: 20 °C
Limit: FCC Class B Conduction(QP)	Power: AC 120V/60Hz	Humidity: 58 %
Mode:		

### Conducted Emission

Data :#1                      Date: 2016/12/22                      Time: 上午 10:47:03



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV	dBuV	dB		
1	*	0.1700	45.80	0.10	45.90	64.96	-19.06	QP	
2		0.1700	26.90	0.10	27.00	54.96	-27.96	AVG	
3		0.5780	30.62	0.13	30.75	56.00	-25.25	peak	
4		0.7820	27.73	0.13	27.86	56.00	-28.14	peak	
5		2.0260	29.71	0.17	29.88	56.00	-26.12	peak	
6		12.3140	30.43	0.40	30.83	60.00	-29.17	peak	
7		24.1220	33.26	0.47	33.73	60.00	-26.27	peak	

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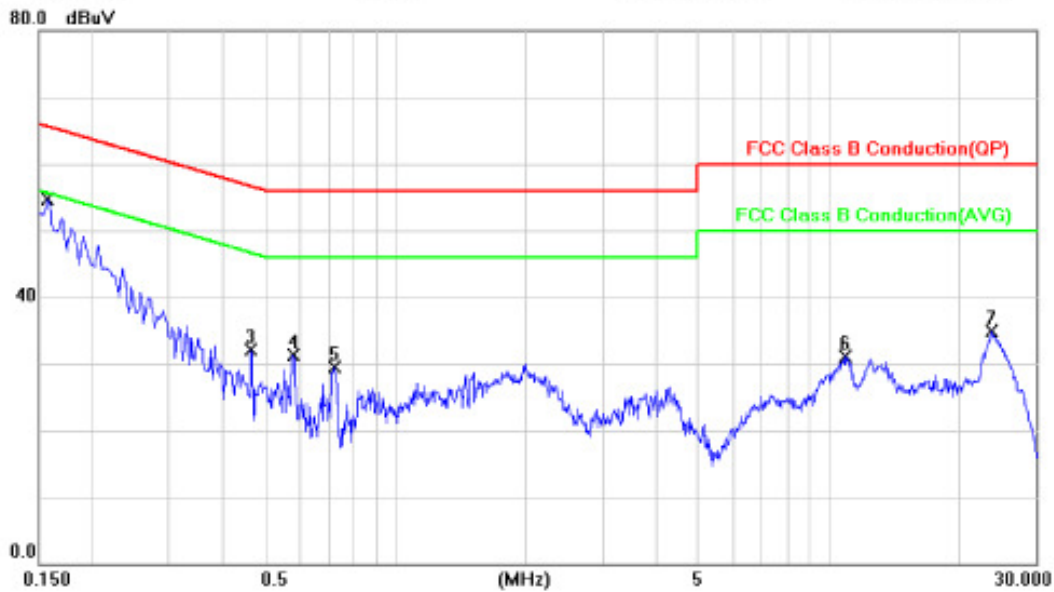
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Site: Conduction Room	Phase: <b>N</b>	Temperature: 20 °C
Limit: FCC Class B Conduction(QP)	Power: AC 120V/60Hz	Humidity: 58 %
Mode:		

### Conducted Emission

Data :#2 Date: 2016/12/22 Time: 上午 10:52:22



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1	*	0.1580	48.60	0.10	48.70	65.57	-16.87	QP	
2		0.1580	30.90	0.10	31.00	55.57	-24.57	AVG	
3		0.4660	31.94	0.12	32.06	56.58	-24.52	peak	
4		0.5820	31.13	0.13	31.26	56.00	-24.74	peak	
5		0.7260	29.35	0.13	29.48	56.00	-26.52	peak	
6		10.8980	30.75	0.40	31.15	60.00	-28.85	peak	
7		23.7500	34.37	0.47	34.84	60.00	-25.16	peak	

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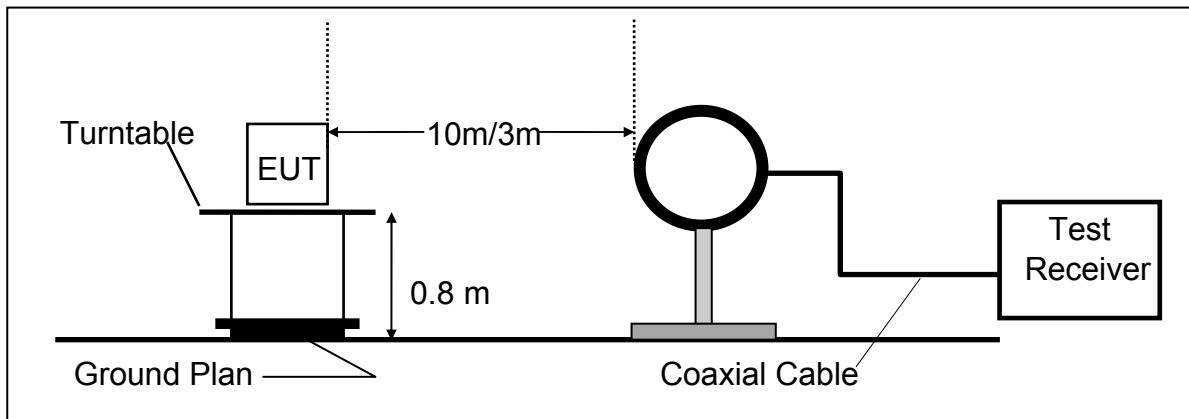
## 7 RADIATED TEST ITEMS

### 7.1 Measurement Procedure

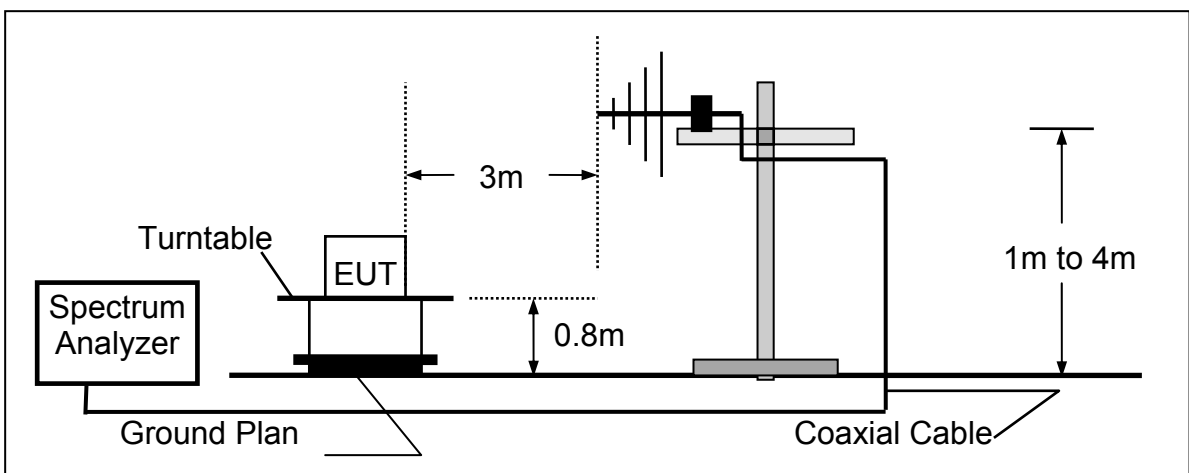
1. Configure the EUT according to ANSI C63.4.
2. The EUT was placed on a turn table which is 0.8m above ground plan.
3. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
4. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out 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 completed.

### 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

SGS SAC-III					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESCI7	100760	05/10/2016	05/09/2017
Spectrum Analyzer	Agilent	E4446A	MY51100003	01/29/2016	01/28/2017
Loop Antenna	ETS-Lindgren	6502	148045	09/20/2016	09/19/2017
Bilog Antenna	SCHWAZBECK	VULB9168	378	12/19/2016	12/18/2017
Horn Antenna	Schwarzbeck	BBHA9120D	1441	08/01/2016	07/31/2017
Pre-Amplifier	Agilent	8447D	2944A07676	01/02/2016	01/01/2017
Pre-Amplifier	EMC Instruments Corp.	EMC0126530	980038	01/02/2016	01/01/2017
Turn Table	HD	DT420	N/A	N.C.R	N.C.R
Antenna Tower	ChamPro	AM-BS-4500-B	060776-ABS	N.C.R	N.C.R
Controller	ChamPro	EM1000	60776	N.C.R	N.C.R
Low Loss Cable	Huber Suhner	966_RX	9	01/02/2016	01/01/2017
3m Site NSA	SGS	966 chamber	N/A	07/01/2016	06/30/2017
Low Loss Cable	Huber Suhner	966 TX	1	01/02/2016	01/01/2017
Horn Antenna	Schwarzbeck	BBHA9170	184	12/12/2016	12/11/2017
Pre-Amplifier	EMC Instruments Corp.	EMC184045	980135	01/02/2016	01/01/2017

Note: N.C.R refers to Not Calibrated Required.

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Open Area Test Site

SGS Open Area Test Site No.1					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESCI 3	101342	12/21/2016	12/20/2017
Pre Amplifier	EMC Instruments	EMC330	980122	06/09/2016	06/08/2017
Broadband Antenna	TESEQ	CBL 6112D	23189	05/23/2016	05/22/2017
Coaxial Cable	Huber+Suhner	RG 214	30m	06/22/2016	06/21/2017
Turn Table	Chance Most	N/A	N/A	N.C.R.	N.C.R.
Antenna Tower	Chance Most	N/A	N/A	N.C.R.	N.C.R.
Controller	Chance Most	N/A	N/A	N.C.R.	N.C.R.
Site NSA	SGS	OATS 1	N/A	06/13/2016	06/12/2017
Test S/W	Farad	EZ-EMC	Ver. SGS-03A2	N.C.R.	N.C.R.

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#### 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 dBuV/m, which converts  $20 \cdot \log(\mu\text{V}/\text{m})$

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 ( $\mu\text{V/m}$ ) at 30m	Field Strength ( $\text{dB}\mu\text{V/m}$ ) at 30m
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 124.00dBuV/m by offsetting the distance extrapolation factor as measurement distance is taken place at 3 meters.

#### 30m to 3m

Distance extrapolation =  $40 \cdot \log(30/3) = 40 \text{ dB}$

Limit is re-adjusted in terms of limit taken in 3m =  $20 \cdot \log(15848 \text{ uV/m}) + 40 = 124.00\text{dBuV/m}$

#### 30m to 10m

Distance extrapolation =  $40 \cdot \log(30/10) = 19.08 \text{ dB}$

Limit is re-adjusted in terms of limit taken in 3m =  $20 \cdot \log(15848 \text{ uV/m}) + 19.08 = 103.08\text{dBuV/m}$

#### 10m to 3m

Distance extrapolation =  $40 \cdot \log(10/3) = 20.92 \text{ dB}$

Limit is re-adjusted in terms of limit taken in 3m =  $20 \cdot \log(15848 \text{ uV/m}) + 20.92 = 104.92\text{dBuV/m}$

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1. Emission level in dBuV/m=20 log ( $\mu$ V/m)
2. Distance extrapolation factor = 40 log (required distance/ test distance) (dB)
3. The lower limit shall apply at the transition frequencies.
4. The measurement was undertaken in closer distance below 30MHz at 10m and above 30MHz at 3m, where extrapolation factor is offset to convert the limit of the measurement.
5. KDB 937606 OATS and 3m semi-anechoic chamber Justification:  
Base on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field. OATS and 3m SAC chamber testing had been performed and 3m SAC measured test result is the worst case test result.

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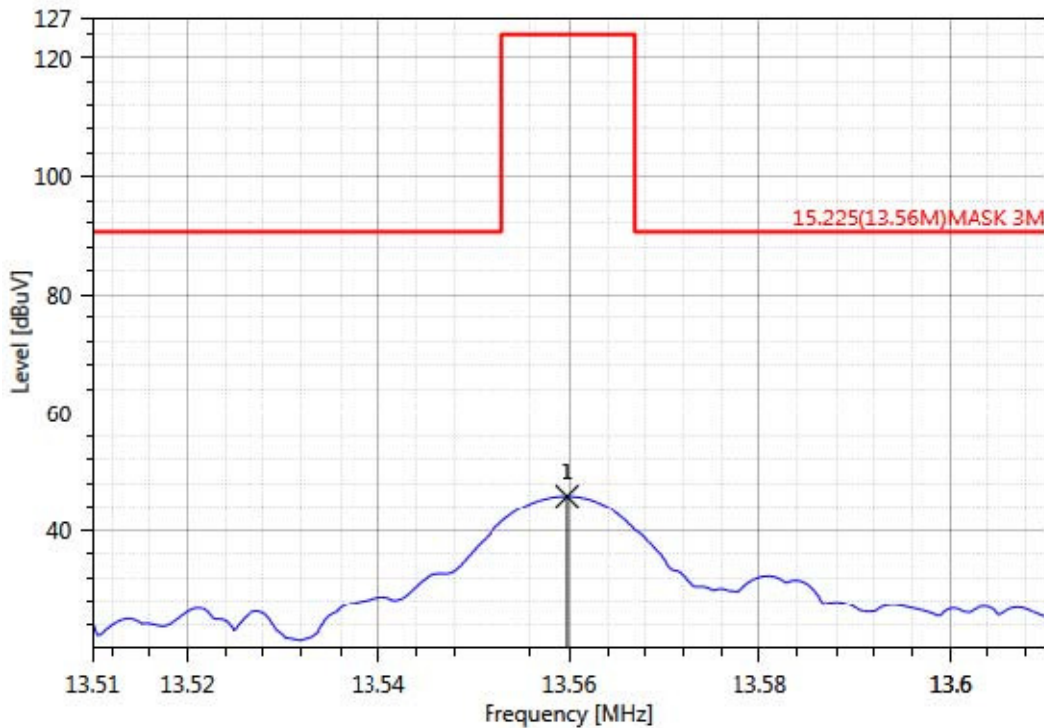
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### 7.5.2 Field Strength of Fundamental Emission Measurement Result

#### 3m Chamber:

Operation Mode :	RFID	Test Date :	12/23/2016
Fundamental Frequency :	13.56 MHz	Temp. / Humi. :	23.8 deg_C/59 RH
Operation Band :	Main	Test Engineer :	Mike
EUT Pol. :	E2 Plane	Measurement Antenna Pol. :	VERTICAL



Freq.	Note	Decetor Mode	Actual Reading Level	Spectrum FS	Factor	Limit @3m	Margin
MHz	F/H/E/S	QP/AV/PK	dBuV/m	dBuV/m	dB	dBuV/m	dB
13.56	F	Peak	<b>45.86</b>	34.42	11.44	123.90	-78.04

Transfer the test data from the testing distance at 3M to 30M: **5.86 dBuV/m**

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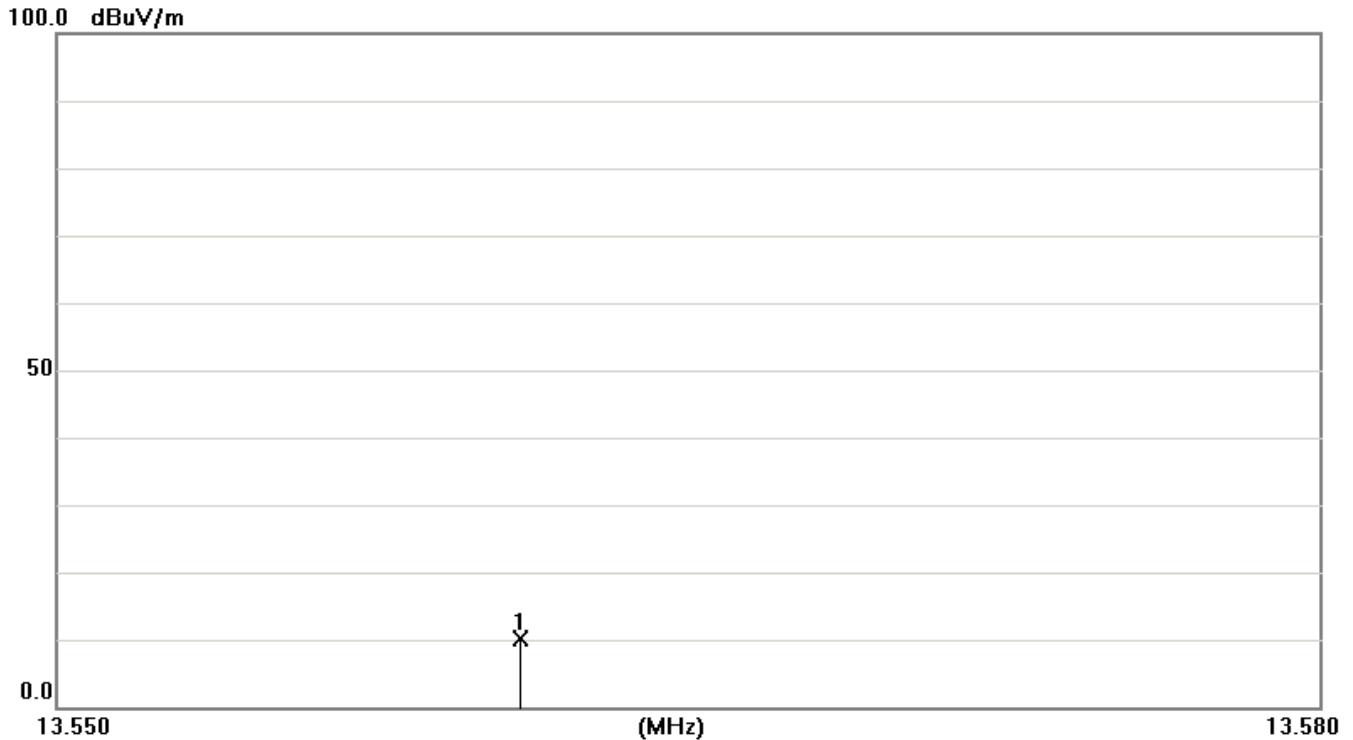
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**OATS:**

Operation Mode :	RFID	Test Date :	03/08/2017
Fundamental Frequency :	13.56 MHz	Temp. / Humi. :	22 deg_C/69 RH
Operation Band :	Main	Test Engineer :	Mike
EUT Pol. :	E2 Plane	Measurement Antenna Pol.:	VERTICAL



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	13.5610	-1.99	12.20	10.21	103.08	-92.87	peak

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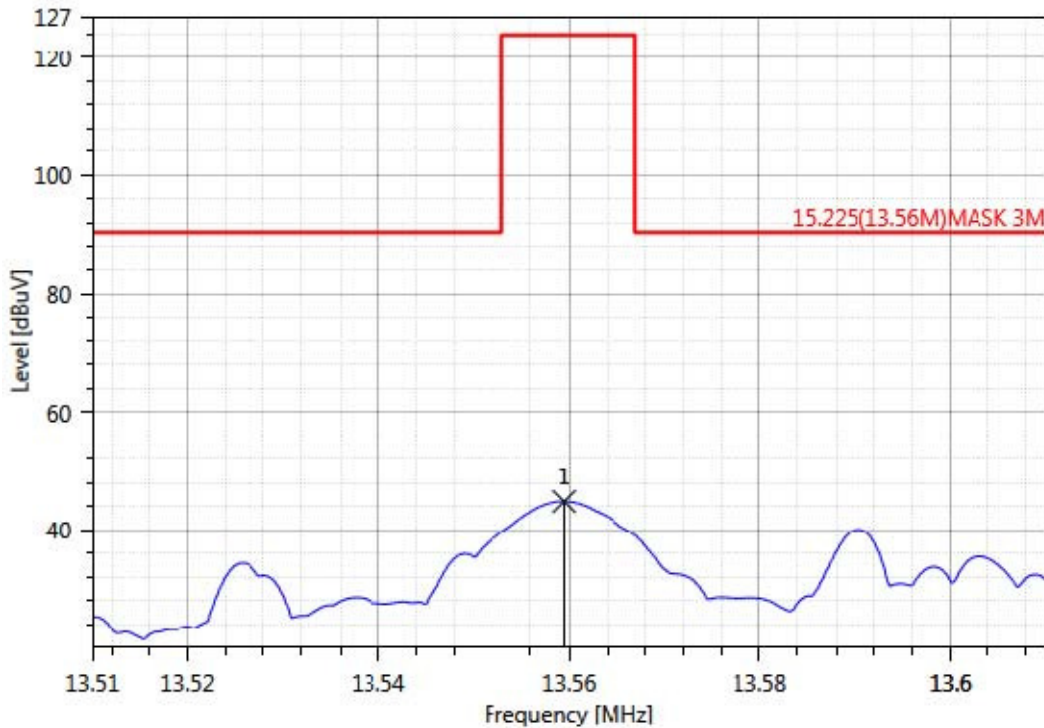
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**3m Chamber:**

Operation Mode :	RFID	Test Date :	12/23/2016
Fundamental Frequency :	13.56 MHz	Temp. / Humi. :	23.8 deg_C/59 RH
Operation Band :	Main	Test Engineer :	Mike
EUT Pol. :	E2 Plane	Measurement Antenna Pol. :	HORIZONTAL



Freq.	Note	Decetor Mode	Actual Reading Level	Spectrum FS	Factor	Limit @3m	Margin
MHz	F/H/E/S	QP/AV/PK	dBμV/m	dBμV/m	dB	dBuV/m	dB
13.56	F	Peak	44.84	33.40	11.44	123.90	-79.06

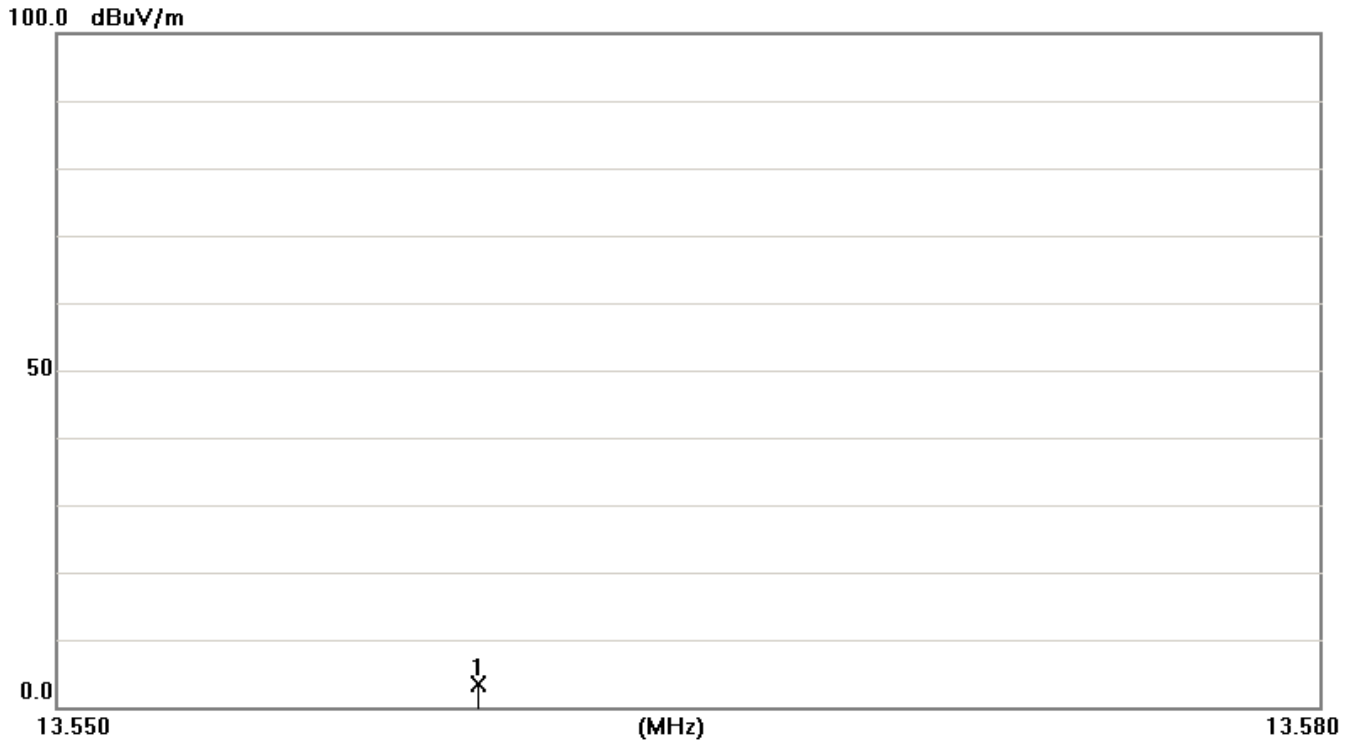
Transfer the test data from the testing distance at 3M to 30M: **4.84 dBuV/m**

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**OATS:**

Operation Mode :	RFID	Test Date :	03/08/2017
Fundamental Frequency :	13.56 MHz	Temp. / Humi. :	22 deg_C/69 RH
Operation Band :	Main	Test Engineer :	Mike
EUT Pol. :	E2 Plane	Measurement Antenna Pol.:	HORIZONTAL



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	13.5600	-8.87	12.20	3.33	103.08	-99.75	peak

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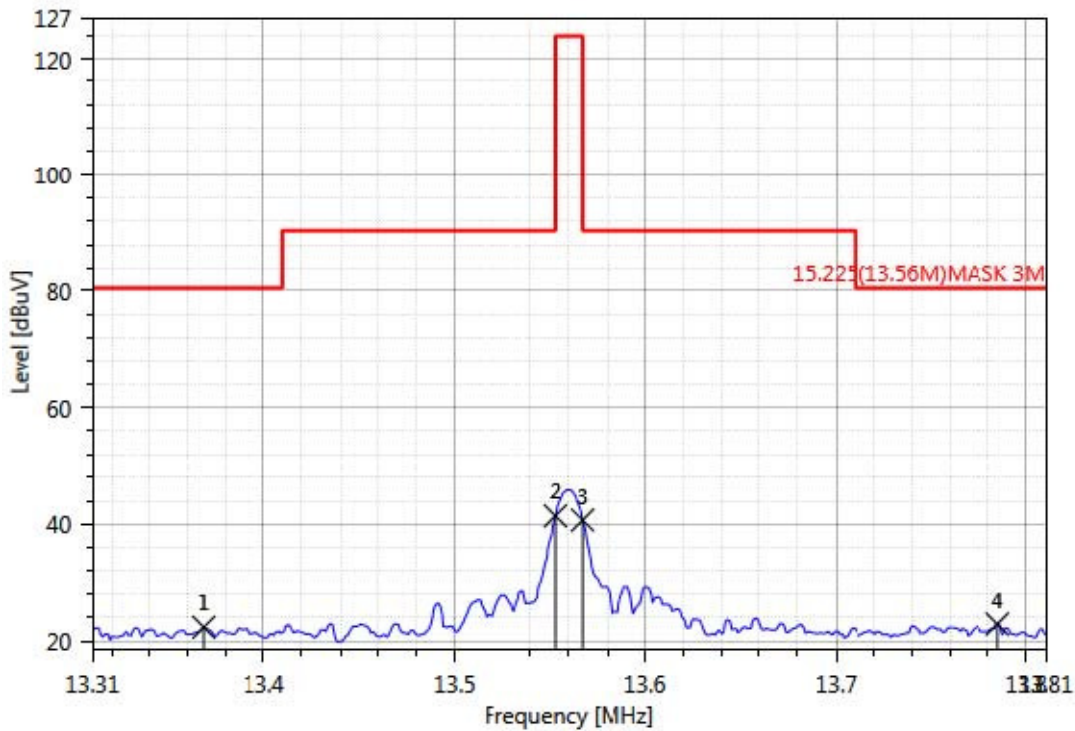
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### 7.5.3 Mask Measurement Result 3m Chamber:

Operation Mode :	RFID	Test Date :	12/23/2016
Fundamental Frequency :	13.56 MHz	Temp. / Humi. :	23.8 deg_C/59 RH
Operation Band :	Mask	Test Engineer :	Mike
EUT Pol. :	E2 Plane	Measurement Antenna Pol. :	VERTICAL



Freq. MHz	Note F/H/E/S	Decetor Mode QP/AV/PK	Actual Reading Level dBuV/m	Spectrum FS dBuV/m	Factor dB	Limit @3m dBuV/m	Margin dB
13.37	S	Peak	22.32	10.89	11.43	80.50	-58.18
13.55	F	Peak	41.43	29.99	11.44	90.47	-49.04
13.57	F	Peak	40.71	29.28	11.44	90.47	-49.76
13.79	S	Peak	22.87	11.43	11.44	80.50	-57.63

Transfer the test data from the testing distance at 3M to 30M:

$$22.32-40= -17.68 \text{ dBuV/m}$$

$$41.43-40= 1.43 \text{ dBuV/m}$$

$$40.71-40= 0.71 \text{ dBuV/m}$$

$$22.87-40= -17.13 \text{ dBuV/m}$$

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

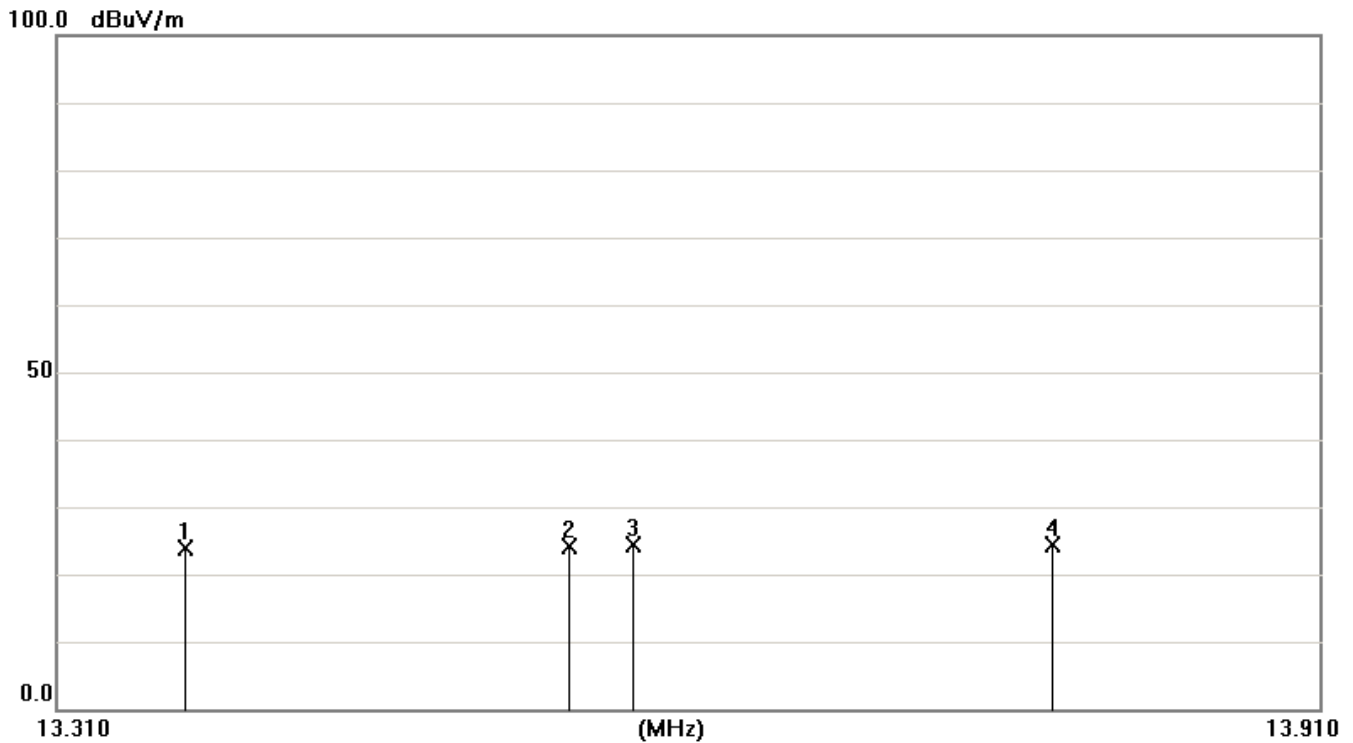
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**OATS:**

Operation Mode :	RFID	Test Date :	03/08/2017
Fundamental Frequency :	13.56 MHz	Temp. / Humi. :	22 deg_C/69 RH
Operation Band :	Mask	Test Engineer :	Mike
EUT Pol. :	E2 Plane	Measurement Antenna Pol.:	VERTICAL



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	13.3700	11.63	12.20	23.83	59.58	-35.75	peak
2	13.5500	11.90	12.20	24.10	69.58	-45.48	peak
3	13.5800	12.10	12.20	24.30	69.58	-45.28	peak
4	13.7800	12.11	12.20	24.31	59.58	-35.27	peak

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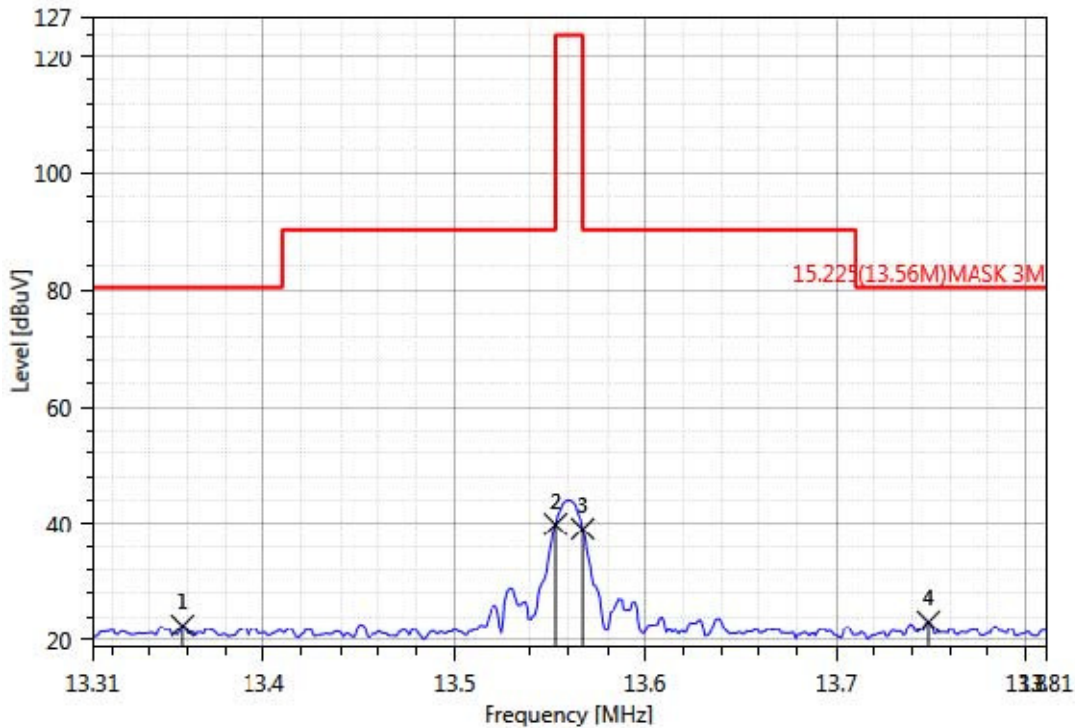
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**3m Chamber:**

Operation Mode :	RFID	Test Date :	12/23/2016
Fundamental Frequency :	13.56 MHz	Temp. / Humi. :	23.8 deg_C/59 RH
Operation Band :	Mask	Test Engineer :	Mike
EUT Pol. :	E2 Plane	Measurement Antenna Pol. :	HORIZONTAL



Freq. MHz	Note F/H/E/S	Decetor Mode QP/AV/PK	Actual Reading Level dBμV/m	Spectrum FS dBμV/m	Factor dB	Limit @3m dBuV/m	Margin dB
13.36	S	Peak	22.48	11.05	11.43	80.50	-58.02
13.55	F	Peak	39.92	28.48	11.44	90.47	-50.55
13.57	F	Peak	39.08	27.64	11.44	90.47	-51.39
13.75	S	Peak	23.17	11.73	11.44	80.50	-57.33

Transfer the test data from the testing distance at 3M to 30M:

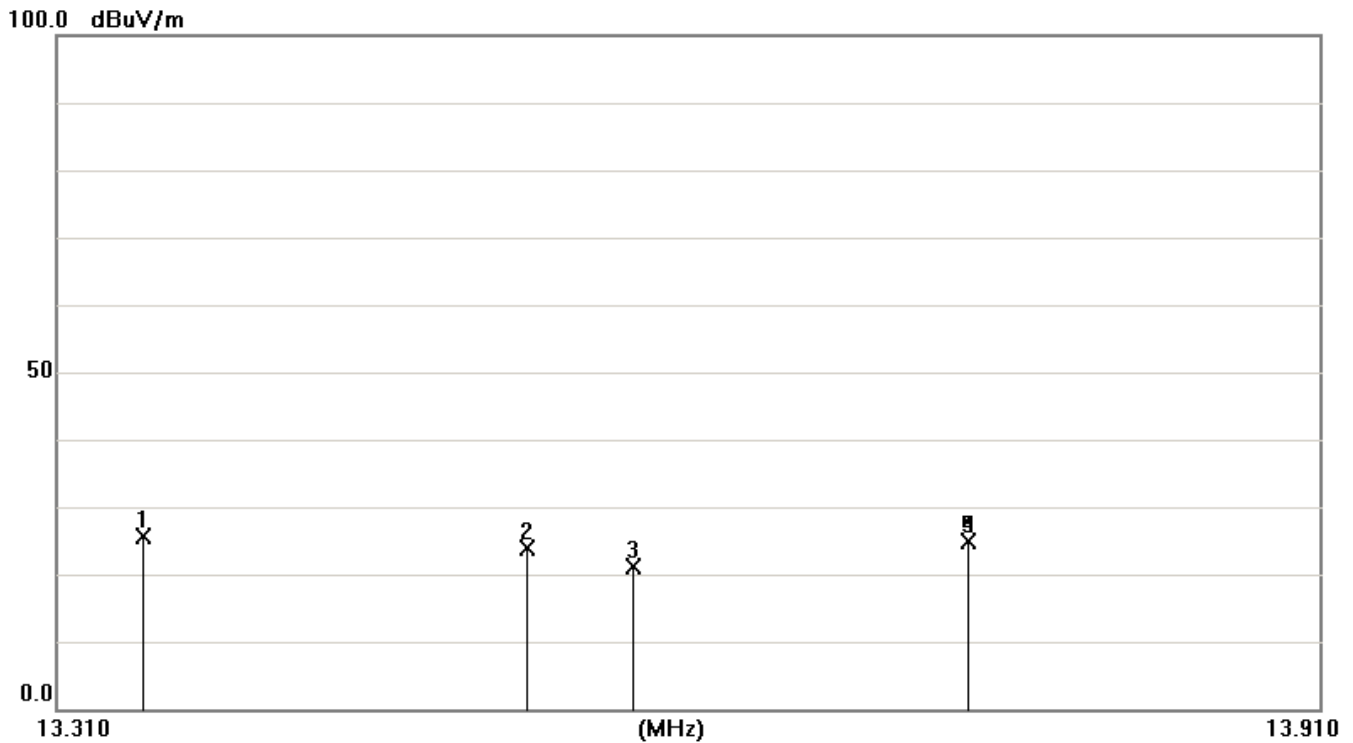
- 22.48-40= -17.52 dBuV/m
- 39.92-40= -0.08 dBuV/m
- 39.08-40= -0.92 dBuV/m
- 23.17-40= -16.83 dBuV/m

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**OATS:**

Operation Mode :	RFID	Test Date :	03/08/2017
Fundamental Frequency :	13.56 MHz	Temp. / Humi. :	22deg_C/69 RH
Operation Band :	Mask	Test Engineer :	Mike
EUT Pol. :	E2 Plane	Measurement Antenna Pol.:	HORIZONTAL



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	13.3500	13.33	12.20	25.53	59.58	-34.05	peak
2	13.5300	11.61	12.20	23.81	69.58	-45.77	peak
3	13.5800	8.96	12.20	21.16	69.58	-48.42	peak
4	13.7400	12.68	12.20	24.88	59.58	-34.70	peak

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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 ( $\mu\text{V/m}$ )	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  $\text{dB}\mu\text{V/m} = 20 \log (\mu\text{V/m})$
2. Distance extrapolation factor =  $40 \log (\text{required distance/ test distance})$  (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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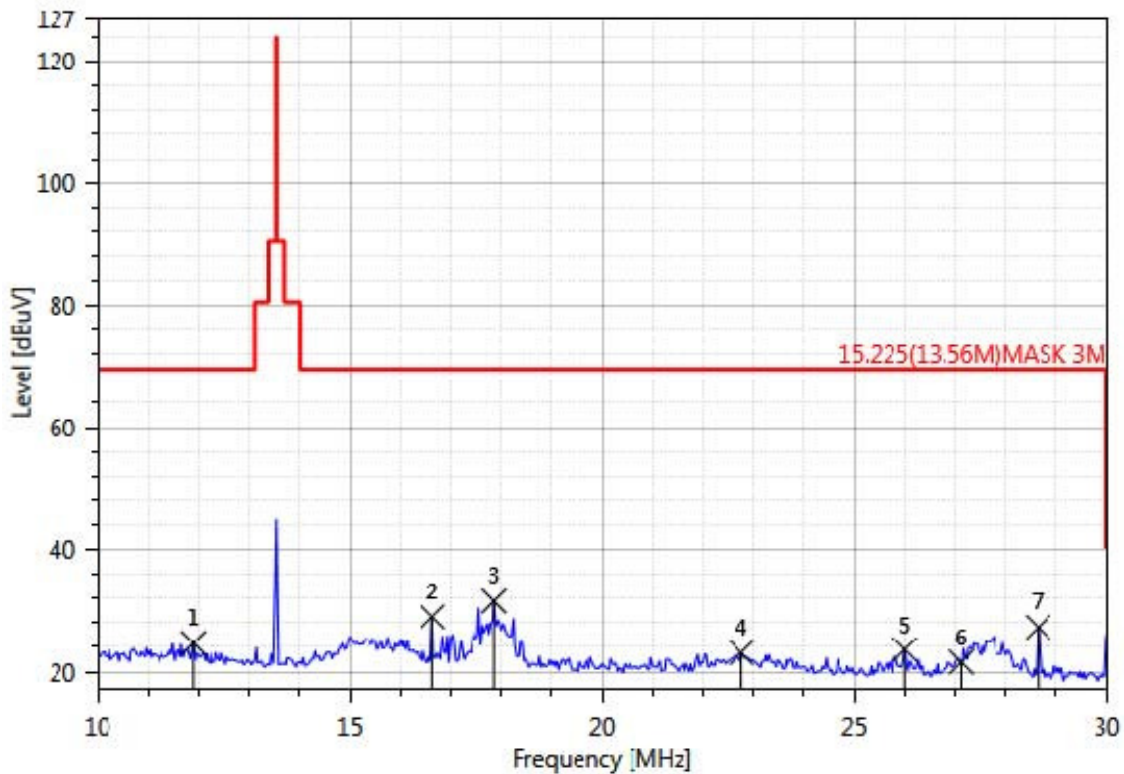
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### Radiated Emission Measurement Result

Operation Mode :	RFID	Test Date :	12/23/2016
Fundamental Frequency :	13.56 MHz	Temp. / Humi. :	23.8 deg_C/59 RH
Operation Band :	Tx CH MID	Test Engineer :	Mike
EUT Pol. :	E2 Plane	Measurement Antenna Pol. :	VERTICAL



Freq. MHz	Note F/H/E/S	Decetor Mode QP/AV/PK	Actual Reading Level dBμV/m	Spectrum FS dBμV/m	Factor dB	Limit @3m dBuV/m	Margin dB
11.90	S	Peak	24.68	13.28	11.39	69.54	-44.86
16.64	S	Peak	28.96	17.46	11.50	69.54	-40.58
17.86	S	Peak	31.51	19.97	11.53	69.54	-38.03
22.76	S	Peak	23.10	12.33	10.77	69.54	-46.44
26.00	S	Peak	23.59	13.63	9.96	69.54	-45.95
27.12	H	Peak	21.57	11.87	9.70	69.54	-47.97
28.64	S	Peak	27.26	17.90	9.36	69.54	-42.28

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Transfer the test data from the testing distance at 3M to 30M:

24.68-40= -15.32 dBuV/m

28.96-40= -11.04 dBuV/m

31.51-40= -8.49 dBuV/m

23.10-40= -16.9 dBuV/m

23.59-40= -16.41 dBuV/m

21.57-40= -18.43 dBuV/m

27.26-40= -12.74 dBuV/m

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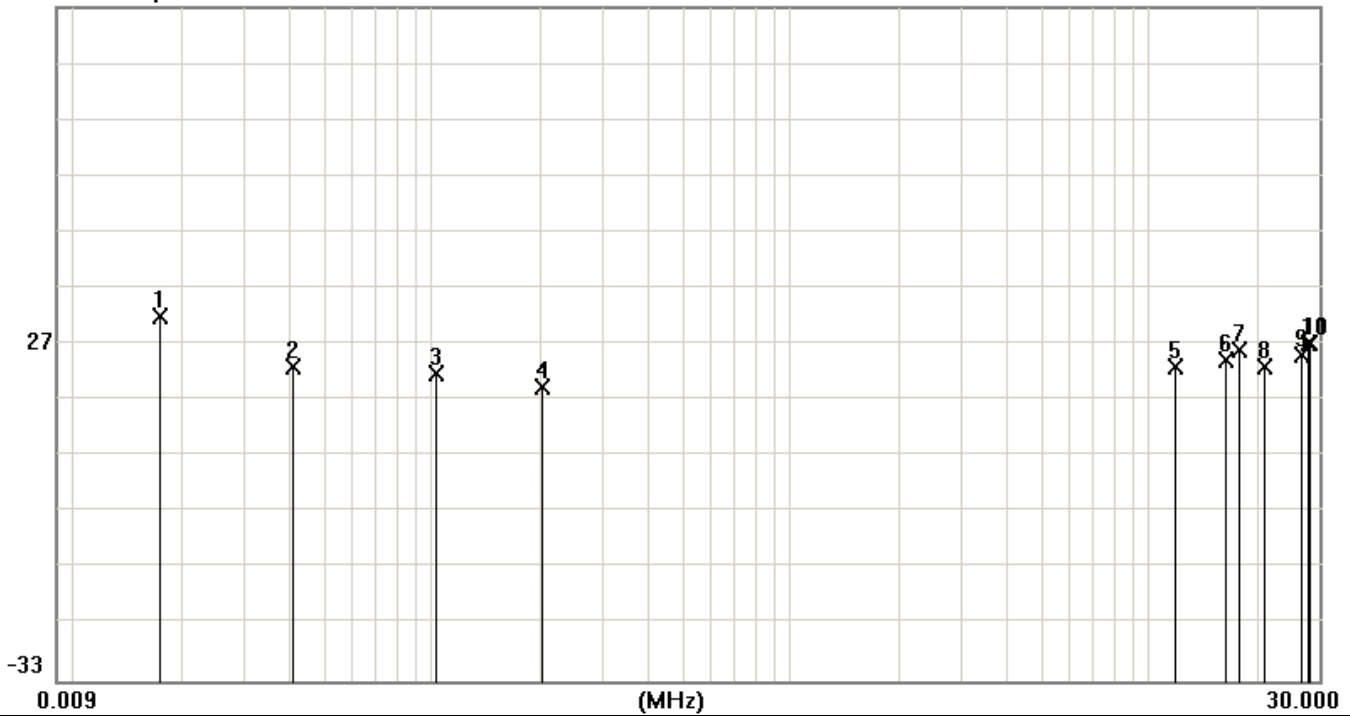
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**OATS:**

Operation Mode : RFID                      Test Date : 03/08/2017  
 Fundamental Frequency : 13.56 MHz              Temp. / Humi. : 22 deg\_C/69 RH  
 Operation Band : Tx CH MID              Test Engineer : Mike  
 EUT Pol. : E2 Plane              Measurement Antenna Pol.: VERTICAL

87.0 dBuV/m



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.0175	15.17	16.89	32.06	101.83	-69.77	peak
2	0.0410	9.56	13.26	22.82	94.56	-71.74	peak
3	0.1018	9.91	11.90	21.81	88.53	-66.72	peak
4	0.2044	7.55	11.74	19.29	79.49	-60.20	peak
5	11.8100	10.90	12.20	23.10	48.62	-25.52	peak
6	16.3400	11.97	12.20	24.17	48.62	-24.45	peak
7	17.9600	13.68	12.20	25.88	48.62	-22.74	peak
8	21.1600	11.14	11.96	23.10	48.62	-25.52	peak
9	26.5800	14.29	10.88	25.17	48.62	-23.45	peak
10	27.8200	16.42	10.64	27.06	48.62	-21.56	peak
11	28.1500	16.54	10.57	27.11	48.62	-21.51	peak

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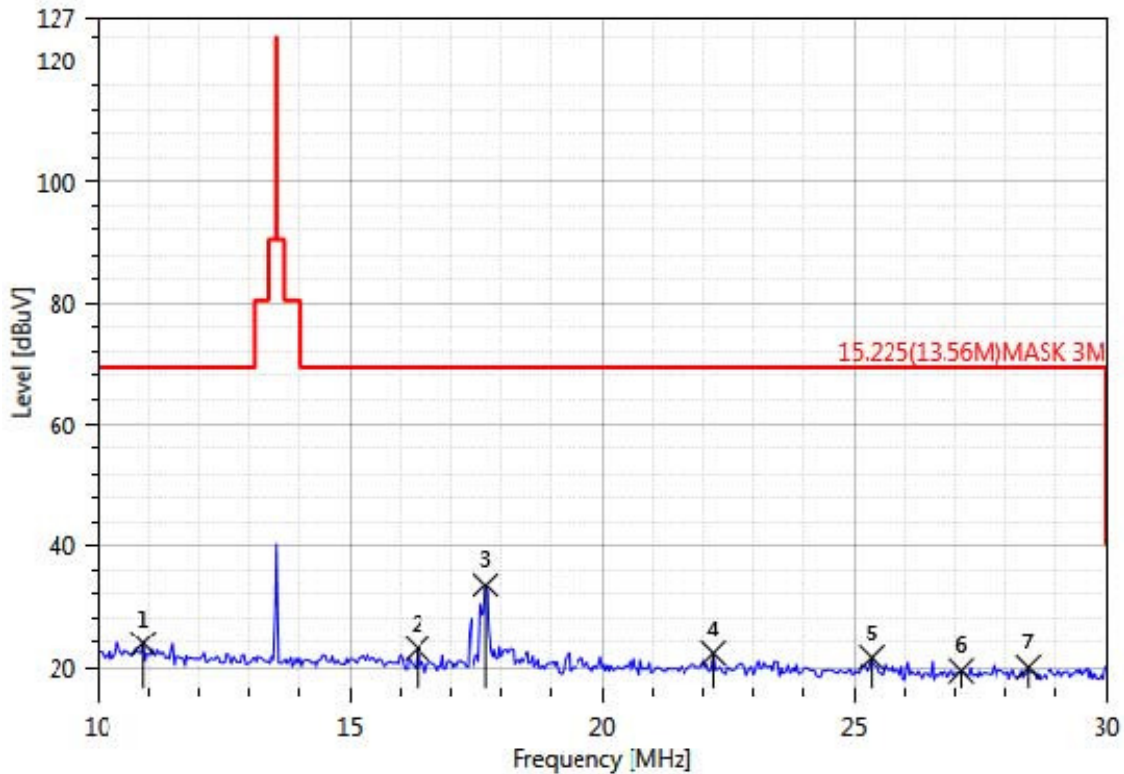
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Operation Mode :	RFID	Test Date :	12/23/2016
Fundamental Frequency :	13.56 MHz	Temp. / Humi. :	23.8 deg_C/59 RH
Operation Band :	Tx CH MID	Test Engineer :	Mike
EUT Pol. :	E2 Plane	Measurement Antenna Pol. :	HORIZONTAL



Freq. MHz	Note F/H/E/S	Decetor Mode QP/AV/PK	Actual Reading Level dBuV/m	Spectrum FS dBuV/m	Factor dB	Limit @3m dBuV/m	Margin dB
10.90	S	Peak	23.91	12.54	11.36	69.54	-45.63
16.34	S	Peak	23.04	11.55	11.50	69.54	-46.50
17.70	S	Peak	33.56	22.04	11.53	69.54	-35.98
22.20	S	Peak	22.29	11.36	10.92	69.54	-47.25
25.34	S	Peak	21.57	11.45	10.11	69.54	-47.97
27.12	H	Peak	19.47	9.77	9.70	69.54	-50.07
28.44	S	Peak	20.02	10.61	9.41	69.54	-49.52

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Transfer the test data from the testing distance at 3M to 30M:

23.91-40= -16.09 dBuV/m

23.04-40= -16.96 dBuV/m

33.56-40= -6.44 dBuV/m

22.29-40= -17.71 dBuV/m

21.57-40= -18.43 dBuV/m

19.47-40= -20.53 dBuV/m

20.02-40= -19.98 dBuV/m

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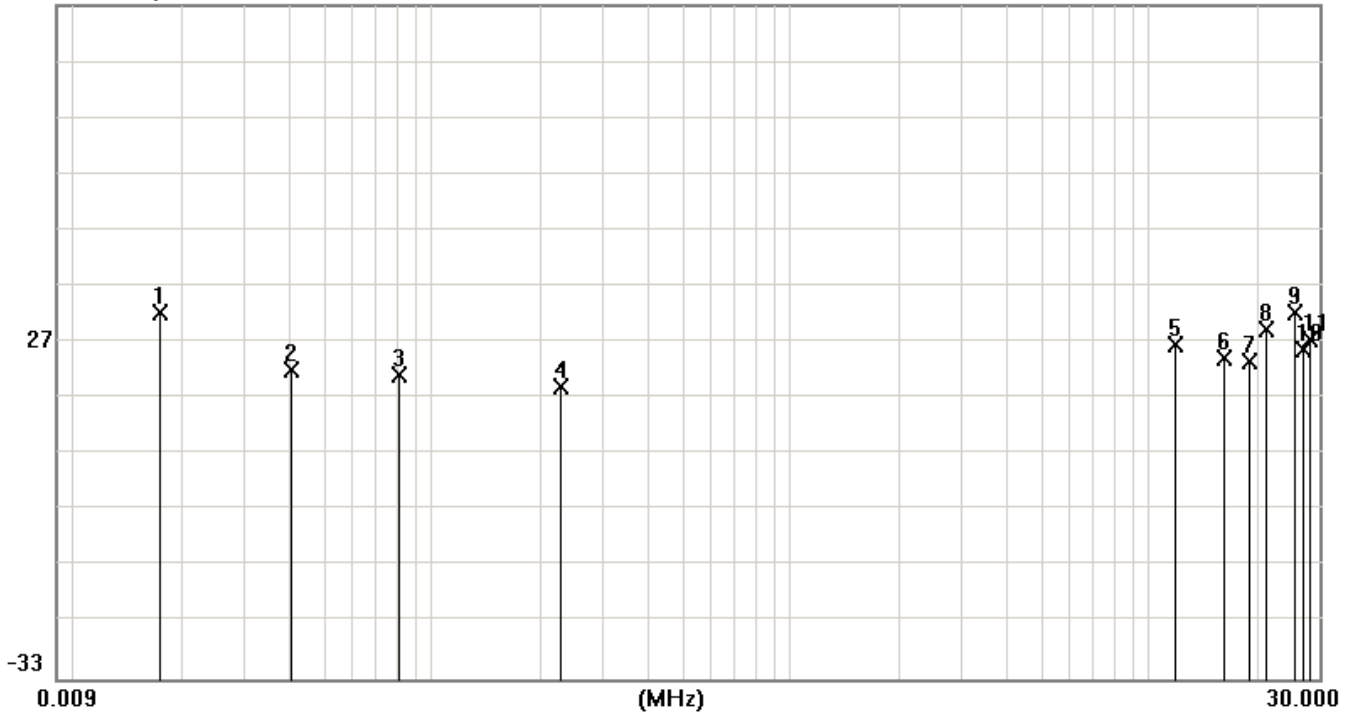
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**OATS:**

Operation Mode :	RFID	Test Date :	03/08/2017
Fundamental Frequency :	13.56 MHz	Temp. / Humi. :	22 deg_C/69 RH
Operation Band :	Tx CH MID	Test Engineer :	Mike
EUT Pol. :	E2 Plane	Measurement Antenna Pol.:	HORIZONTAL

87.0 dBuV/m



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.0175	15.44	16.89	32.33	101.83	-69.5	peak
2	0.0404	8.77	13.32	22.09	94.56	-72.47	peak
3	0.0810	9.08	12.13	21.21	88.53	-67.32	peak
4	0.2290	7.37	11.71	19.08	79.49	-60.41	peak
5	11.8900	14.33	12.20	26.53	48.62	-22.09	peak
6	16.1500	11.92	12.20	24.12	48.62	-24.5	peak
7	18.9600	11.30	12.20	23.50	48.62	-25.12	peak
8	21.1800	17.35	11.96	29.31	48.62	-19.31	peak
9	25.6400	21.06	11.07	32.13	48.62	-16.49	peak
10	26.9600	14.72	10.81	25.53	48.62	-23.09	peak
11	27.9800	16.74	10.60	27.34	48.62	-21.28	peak

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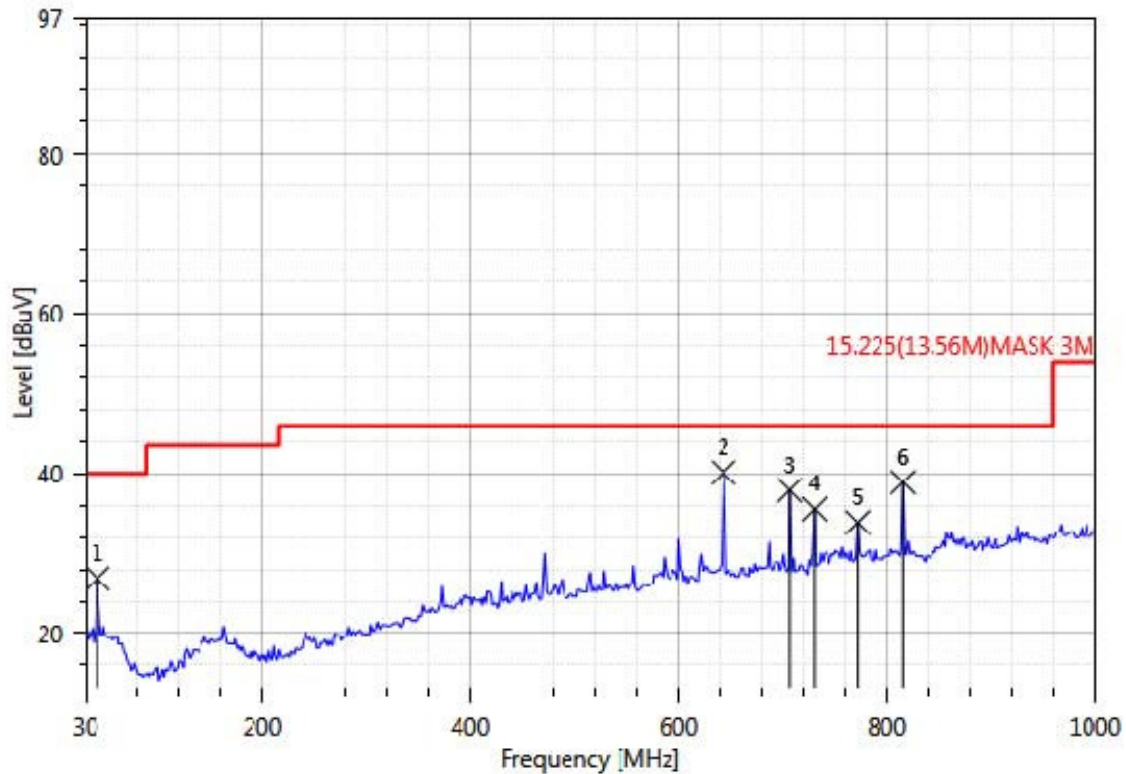
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Operation Mode :	RFID	Test Date :	12/23/2016
Fundamental Frequency :	13.56 MHz	Temp. / Humi. :	23.8 deg_C/59 RH
Operation Band :	Tx CH MID	Test Engineer :	Mike
EUT Pol. :	E2 Plane	Measurement Antenna Pol. :	VERTICAL



Freq. MHz	Note F/H/E/S	Decetor Mode QP/AV/PK	Actual Reading Level dBuV/m	Spectrum FS dBuV/m	Factor dB	Limit @3m dBuV/m	Margin dB
41.64	S	Peak	26.86	35.23	-8.38	40.00	-13.14
643.04	S	Peak	40.12	39.46	0.65	46.00	-5.88
707.06	S	Peak	37.90	36.50	1.40	46.00	-8.10
730.34	S	Peak	35.56	33.89	1.67	46.00	-10.44
772.05	S	Peak	33.88	31.19	2.69	46.00	-12.12
815.70	S	Peak	38.91	35.55	3.36	46.00	-7.09

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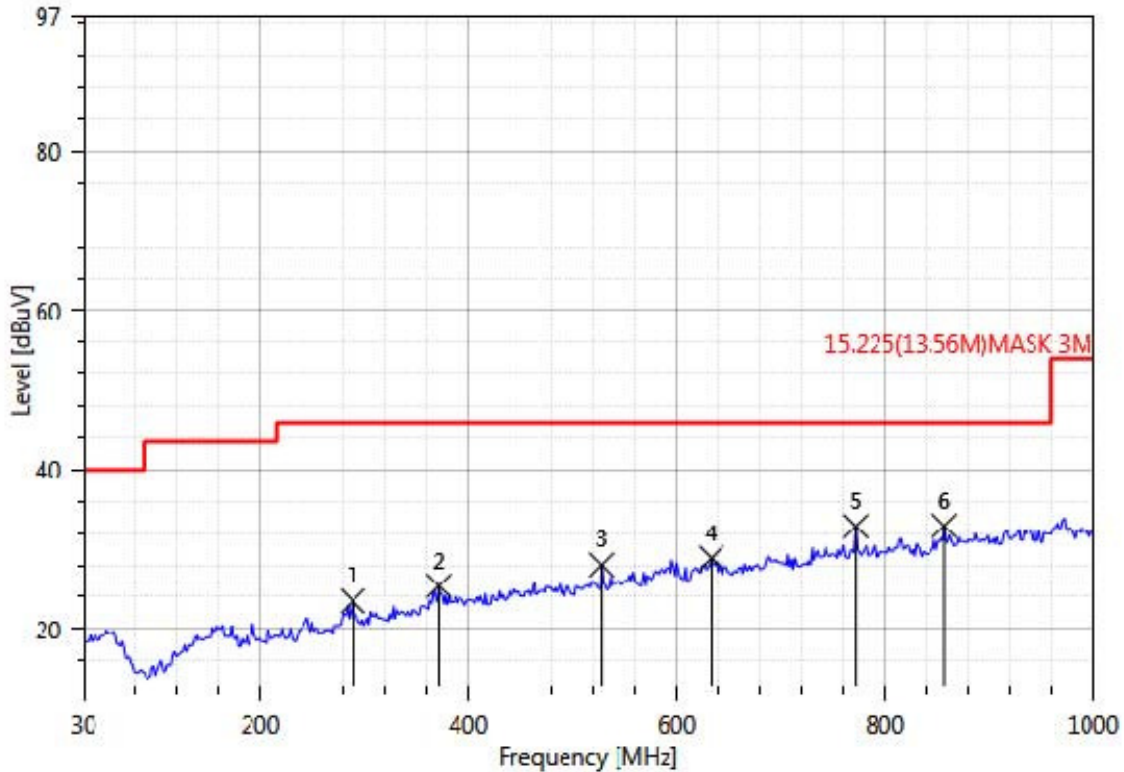
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Operation Mode :	RFID	Test Date :	12/23/2016
Fundamental Frequency :	13.56 MHz	Temp. / Humi. :	23.8 deg_C/59 RH
Operation Band :	Tx CH MID	Test Engineer :	Mike
EUT Pol. :	E2 Plane	Measurement Antenna Pol. :	HORIZONTAL



Freq. MHz	Note F/H/E/S	Decetor Mode QP/AV/PK	Actual Reading Level dBuV/m	Spectrum FS dBuV/m	Factor dB	Limit @3m dBuV/m	Margin dB
288.99	S	Peak	23.48	29.56	-6.08	46.00	-22.52
371.44	S	Peak	25.41	29.97	-4.56	46.00	-20.59
527.61	S	Peak	28.05	29.36	-1.32	46.00	-17.95
633.34	S	Peak	28.89	28.49	0.40	46.00	-17.11
772.05	S	Peak	32.90	30.21	2.69	46.00	-13.10
857.41	S	Peak	32.96	28.44	4.52	46.00	-13.04

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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.

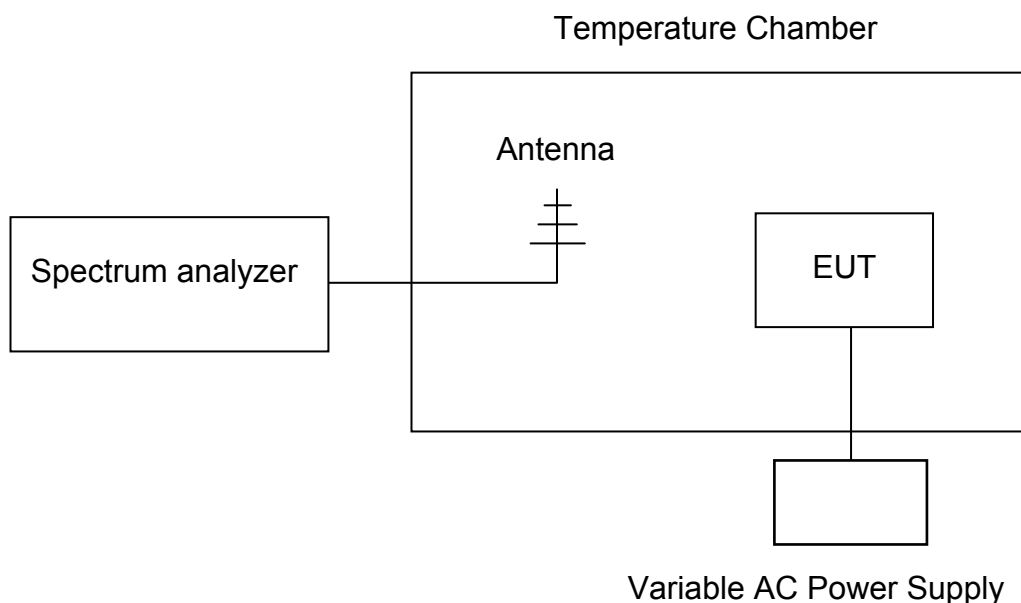
Carrier frequency stability shall be maintained to  $\pm 0.01\%$  ( $\pm 100$  ppm).

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

SGS Conducted Room					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Power Meter	Anritsu	ML2495A	1005007	12/15/2016	12/14/2017
Power Sensor	Anritsu	MA2411B	917032	12/15/2016	12/14/2017
EXA Spectrum Analyzer	Agilent	N9030A	MY53120760	02/26/2016	02/25/2017
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2016	01/01/2017
Coaxial Cable	HUBER+SUHNER	SUCOFLEX 102	23670/2	01/02/2016	01/01/2017
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2016	01/01/2017
Splitter	Agilent	11636B	N/A	01/02/2016	01/01/2017
DC Power Supply	Agilent	E3640A	MY52410006	11/21/2016	11/20/2017
Temperature Chamber	TERCHY	MHG-120LF	911009	05/17/2016	05/16/2017

#### 8.5 Measurement Results

##### A. Temperature Variation

Power Supply	Environment	Frequency	Delta (Hz)	Limit (KHz)
Vdc	Temperature	(MHz)		
11.1	-20	13.55931474	685.25900	+/- 1.356
11.1	-10	13.55925415	745.85000	+/- 1.356
11.1	0	13.56015142	-151.42000	+/- 1.356
11.1	10	13.56021893	-218.93000	+/- 1.356
11.1	20	13.56	0.00000	+/- 1.356
11.1	30	13.56028145	-281.44700	+/- 1.356
11.1	40	13.56098734	-987.34000	+/- 1.356
11.1	50	13.56018844	-188.44000	+/- 1.356

##### B. Supply Voltage Variation

Power Supply	Environment	Frequency	Delta (Hz)	Limit (KHz)
Vdc	Temperature	(MHz)		
10	20	13.56015941	-159.41110	+/- 1.356
11.1	20	13.56	0.00000	+/- 1.356
12.2	20	13.56018422	-184.21584	+/- 1.356

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## 9 20 dB OCCUPIED BANDWIDTH MEASUREMENT

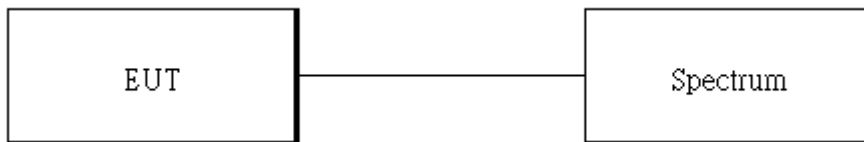
### 9.1 Standard Applicable:

The 20 dB bandwidth shall be specified in operating frequency band.

### 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

SGS Conducted Room					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Power Meter	Anritsu	ML2495A	1005007	12/15/2016	12/14/2017
Power Sensor	Anritsu	MA2411B	917032	12/15/2016	12/14/2017
EXA Spectrum Analyzer	Agilent	N9030A	MY53120760	02/26/2016	02/25/2017
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2016	01/01/2017
Coaxial Cable	HUBER+SUHNER	SUCOFLEX 102	23670/2	01/02/2016	01/01/2017
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2016	01/01/2017
Splitter	Agilent	11636B	N/A	01/02/2016	01/01/2017
DC Power Supply	Agilent	E3640A	MY52410006	11/21/2016	11/20/2017
Temperature Chamber	TERCHY	MHG-120LF	911009	05/17/2016	05/16/2017

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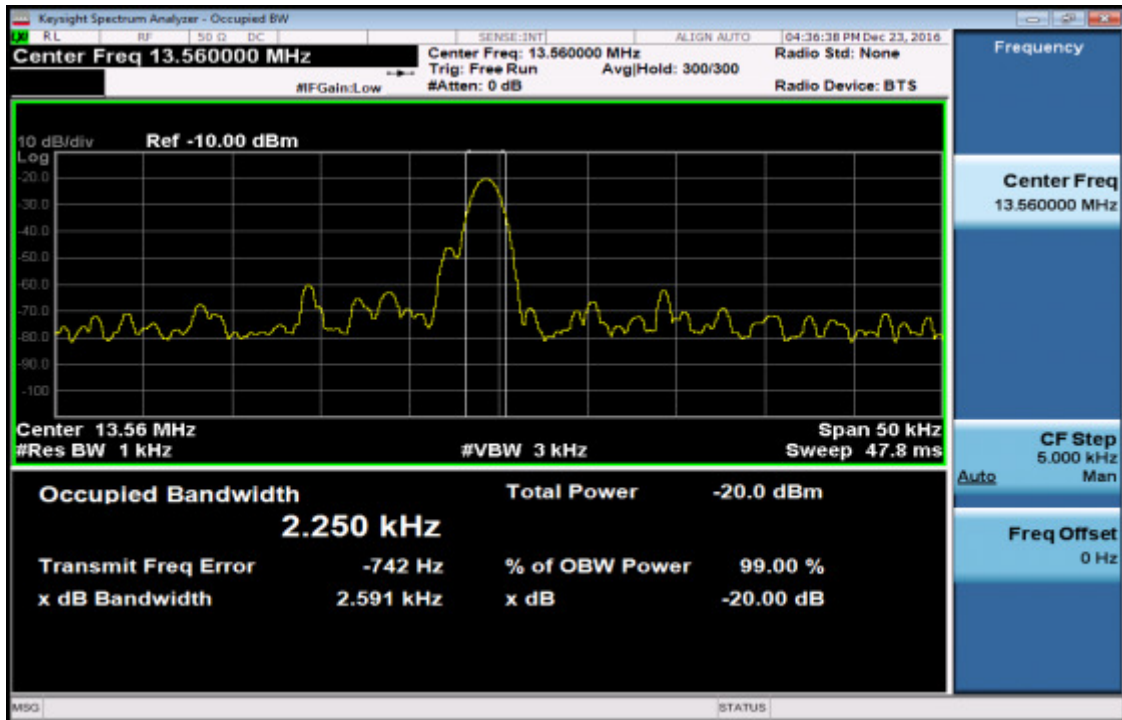
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## 9.6 Measurement Result



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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.

### 10.2. Antenna Connected Construction

An embedded-in antenna design is used.

The antenna is designed as permanently attached and no consideration of replacement. Please see EUT photo and antenna spec. for details.

The antenna gain is less than 6dBi. Therefore, it is not necessary to reduce maximum output power limit.

~ End of Report ~

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