

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

	OF
Brand Name:	Sony
FCC ID:	PY7-47130J
Report No.:	ER/2016/C0038
Issue Date:	Mar. 10, 2017
FCC Rule	§15.225
Prepared for:	Sony Mobile Communications Inc. 4-12-3, Higashi-Shinagawa, Shinagawa-ku, Tokyo, 140-0002 Japan SGS Taiwan Ltd.
Prepared by:	Electronics & Communication Laboratory No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803
BIG MRA Testing Laboratory 0513	Note: This report shall not be reproduced except in full, without the written approval of SGS Taiwan Ltd. This document may be altered or revised by SGS Taiwan Ltd. personnel only, and shall be noted in the revision section of the document.

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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:	PY7-47130J
File Number:	ER/2016/C0038
Date of test:	Dec. 12, 2016 ~ Mar. 08, 2017
Date of EUT Received:	Dec. 12, 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. 10, 2017
Prepared By:	Louis Chen / Engineer Vroletta Tang	Date:	Mar. 10, 2017
Approved By:	Violetta Tang / Clerk Jim Chang Jim Chang / Asst. Manager	Date:	Mar. 10, 2017

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Revision History

Report Number	Revision	Description	Issue Date
ER/2016/C0038	Rev.00	Initial creation of document	Jan. 09, 2017
ER/2016/C0038	Rev.01	Add SAC data on page 21~22.	Jan. 19, 2017
ER/2016/C0038	Rev.02	Provide measurement plot of radiation from P21 to P29.	Jan. 23, 2017
ER/2016/C0038	Rev.03	Update general information & add SAC data on page 20~31.	Feb. 07, 2017
ER/2016/C0038	Rev.04	Provide measurement plot of SAC data.	Feb. 09, 2017
ER/2016/C0038	Rev.05	Add ferrite core & update conduction setup photo.	Mar. 01, 2017
ER/2016/C0038	Rev.06	Update description on page 18~35, revision history & OATS data.	Mar. 10, 2017

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GENERAL INFORMATION 1

1.1 **Product Description**

General:

Brand Name:	Sony		
Hardware Version:	А		
Software Version:	0.20		
Data Cable (USB):	Model No.:	UCB20, Supplier: Sony, Length: 100cm	
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		
	11.1Vdc		
Power Supply:	Battery: Model No.: N/A, Supplier: N/A		
	Adapter: Model No.: UCH30C, Supplier: Sony		

NFC:

Operating Frequency:	13.56MHz	
Transmit Power:	< 30uV/m at 30m.	
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		
GSM Operating Band(s)	GSM 850/1900MHz	
GPRS / EGPRS Multi Slot Class	GPRS Class 12 / Class 12	
WCDMA Operating Band(s)	FDD Band II / IV / V	
WCDMA Rel. Version	Rel.9	
LTE Operating Band(s)	FCC Band 2 / 4 / 5 / 7 / 12 / 17 / 26 / 41	
LTE Rel. Version	Rel.10	
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.

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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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SYSTEM TEST CONFIGURATION 2

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

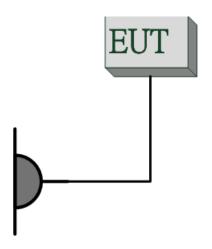


Table 2-1 Equipment Used in Tested System

ltem	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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J 1 V I I					
	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		

SUMMARY OF TEST RESULTS 3

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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MEASUREMENT UNCERTAINTY 5

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:

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

	9kHz - 30MHz: +/- 2.87dB
Measurement uncertainty	30MHz - 167MHz: +/- 4.22dB
(Polarization : Horizontal)	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	Limits dB(uV)				
MHz	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	MFR	MODEL	SERIAL	LAST	CAL DUE.		
TYPE		NUMBER	NUMBER	CAL.			
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:

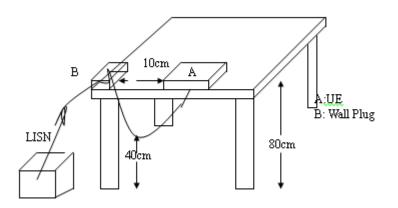
- 1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.10:2013.
- 2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
- 3. The LISN was connected with 120Vac/60Hz power source.

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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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AC POWER LINE CONDUCTED EMISSION TEST DATA

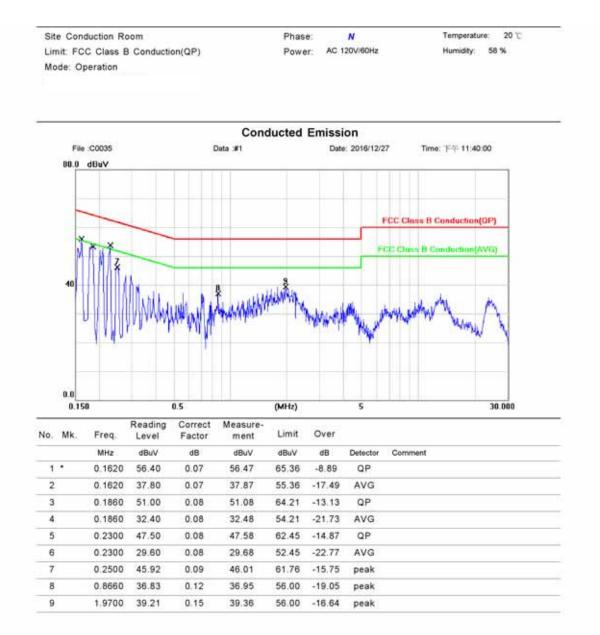
Operation Mode: Operation mode Temperature: 20

Test Date: Dec. 27, 2016

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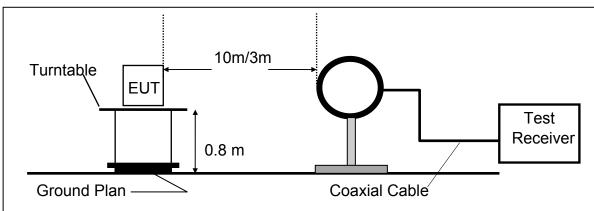
RADIATED TEST ITEMS 7

7.1 Measurement Procedure

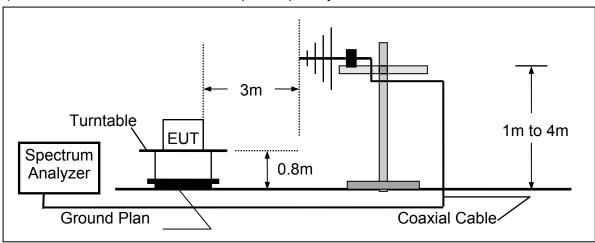
- 1. Configure the EUT according to ANSI C63.4.
- 2. The EUT was placed on a turn table which is 0.8m above ground plan.
- 3. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
- 4. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find 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	MFR	MODEL	SERIAL	LAST	CAL DUE.		
TYPE		NUMBER	NUMBER	CAL.			
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	EQUIPMENT MFR MODEL SERIAL LAST CAL DUE							
TYPE		NUMBER	NUMBER	CAL.				
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.			

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	6	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*log(uV/m) Actual FS(dB μ V/m) = SPA. Reading level(dB μ V) + Factor(dB) Factor(dB) = Antenna Factor(dB μ 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 specifiactions	CFR 47 Part 15 section 15.225(a)-(d)				
Frequency of Emission (MHz)	Field Strength (μV/m)at 30m	Field Strength (dBµV/m)at 30m	Field Strength (dBµV/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 124.00dBuV/m by offsetting the distance extrapolation factor as measurement distance is taken place at 3 meters.

30m to 3m

Distance extrapolation = $40 \times \log(30/3) = 40 \text{ dB}$ Limit is re-adjusted in terms of limit taken in 3m = 20 *log (15848 uV/m) + 40 = 124.00dBuV/m

30m to 10m

Distance extrapolation = 40 *log (30/10) = 19.08 dB Limit is re-adjusted in terms of limit taken in 3m = 20 *log (15848 uV/m) + 19.08 = 103.08dBuV/m

10m to 3m

Distance extrapolation = 40 *log (10/3) = 20.92 dBLimit is re-adjusted in terms of limit taken in 3m = 20 *log (15848 uV/m) + 20.92 = 104.92dBuV/m

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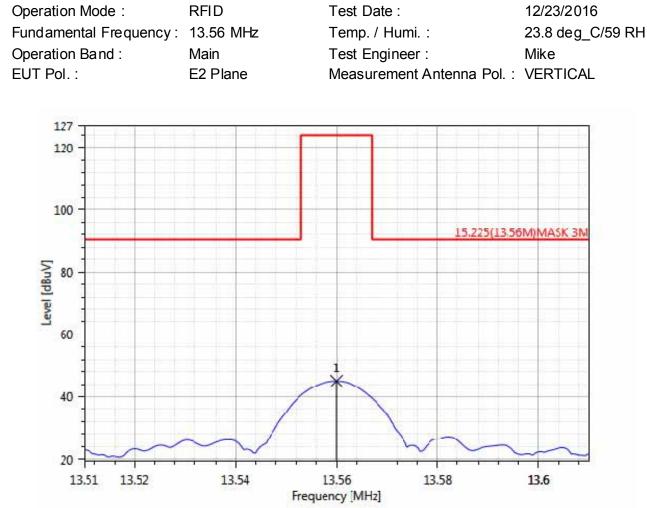
- 1. Emission level in dBuV/m=20 log (µV/m)
- 2. Distance extrapolation factor = 40 log (required distance/ test distance) (dB)
- 3. The lower limit shall apply at the transition frequencies.
- 4. The measurement was undertaken in closer distance below 30MHz at 10m and above 30MHz at 3m, where extrapolation 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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7.5.2 Field Strength of Fundamental Emission Measurement Result 3m Chamber



Freq.	Note	Decetor	Actual	Spectrum	Factor	Limit	Margin
		Mode	Reading Level	FS		@3m	
 MHz	F/H/E/S	QP/AV/PK	dBµV/m	dBµV/m	dB	dBuV/m	dB
 13.56	F	Peak	45.02	33.58	11.44	123.90	-78.88
Transfer the test data from the testing distance at 3M to 30M: 5.02 dBuV/m							

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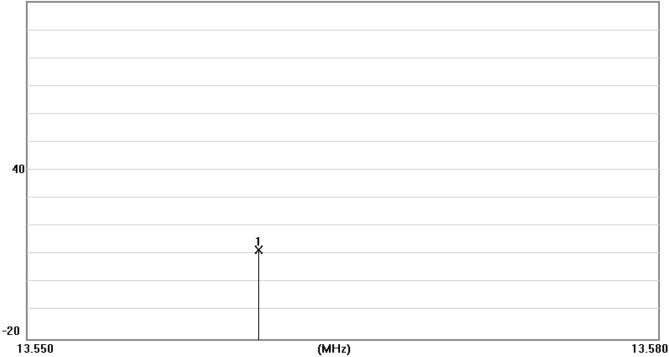
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OATS:

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

100.0 dBuV/m



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	13.5610	-0.53	12.20	11.67	103.08	-91.39	Peak

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3m Chamber:

Operation Mode: Fundamental Frequency: Operation Band: EUT Pol.:	RFID 13.56 MHz Main E2 Plane	Test Date : Temp. / Humi. : Test Engineer : Measurement Antenna Pol.	12/23/2016 23.8 deg_C/59 RH Mike : HORIZONTAL
127			
100		15.225(13.5	56M)MASK 3M
08 08			
60		1 ¥	
40	~~~~		~ <u>`</u>
13.51 13.52	13.54 Frequ	13.56 13.58 Jency [MHz]	13.6

Freq.	Note	Decetor	Actual	Spectrum	Factor	Factor Limit Ma	
		Mode	Reading Level	FS		@3m	
MHz	F/H/E/S	QP/AV/PK	dBµV/m	dBµV/m	dB	dBuV/m	dB
13.56	F	Peak	45.88	34.45	11.44	123.90	-78.02

Transfer the test data from the testing distance at 3M to 30M: 5.88 dBuV/m

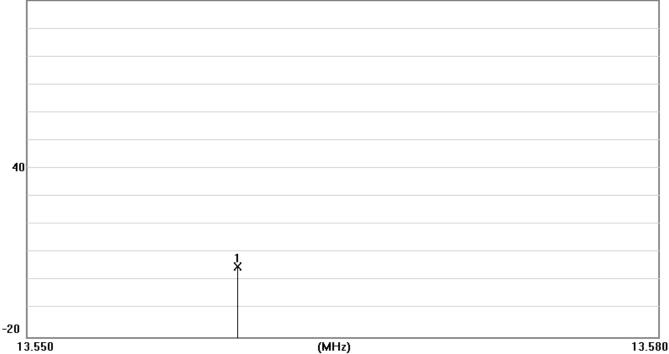
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OATS:

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

100.0 dBuV/m

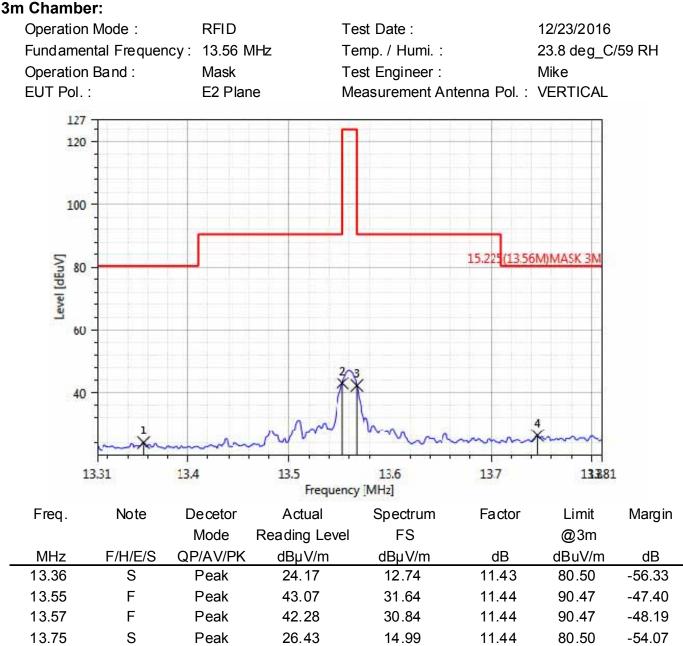


No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	13.5600	-7.09	12.20	5.11	103.08	-97.97	Peak

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7.5.3 Mask Measurement Result



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

24.17-40= -15.83 dBuV/m

43.07-40= 3.07 dBuV/m

42.28-40= 2.28 dBuV/m

26.43-40= -13.57 dBuV/m

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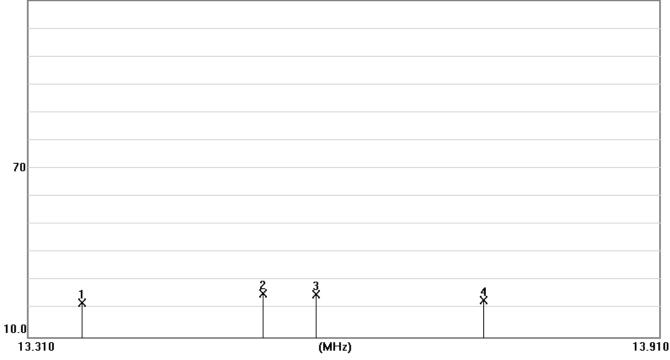
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OATS:

RFID	Test Date :	03/08/2017
13.56 MHz	Temp. / Humi. :	22 deg_C/69 RH
Mask	Test Engineer :	Mike
E2 Plane	Measurement Antenna Pol.:	VERTICAL
	13.56 MHz Mask	13.56 MHzTemp. / Humi. :MaskTest Engineer :

130.0 dBuV/m



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	13.3600	9.98	12.20	22.18	59.58	-37.40	Peak
2	13.5300	13.25	12.20	25.45	69.58	-44.13	Peak
3	13.5800	12.93	12.20	25.13	69.58	-44.45	Peak
4	13.7400	10.93	12.20	23.13	59.58	-36.45	Peak

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3m Chamber:

••									
Operation Mode : Fundamental Frequency :			RFID icy: 13.56 M		est Date : emp. / Humi. :		12/23/2016 23.8 deg_C/59 RH		
	Operation		Mask		est Engineer :		Mike		
	EUT Pol. :	Barra .	E2 Plan		easurement An	tenna Pol ·		4 1	
	201101.								
	127 -	-							
	120 -	-							
	5555								
	100 -								
	5	-				15,229(13,56	M)MASK 3M		
	Level [dEuV] 8								
	evel								
	- 60	-							
	9	· · · · · · · · · · · · · · · · · · ·		2-					
	40 -			× X	× ×				
	10			1	<u> </u>				
		-	1				4		
	20 -	mm	Frank	mm	man	mm	myn		
		3.31	13.4	13.5	13.6	13.7	13381		
				Frequency	y [MHz]				
	Freq.	Note	Decetor	Actual	Spectrum	Factor	Limit	Margin	
			Mode	Reading Level	FS		@3m		
	MHz	F/H/E/S	QP/AV/PK	dBµV/m	dBµV/m	dB	dBuV/m	dB	
	13.40	S	Peak	22.53	11.09	11.43	80.50	-57.97	
	13.55	F	Peak	41.71	30.28	11.44	90.47	-48.76	
	13.57	F	Peak	40.71	29.27	11.44	90.47	-49.76	
	13.79	S	Peak	23.28	11.84	11.44	80.50	-57.22	
	, , , ,								

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

22.53-40= -17.47 dBuV/m

41.71-40= 1.71 dBuV/m

40.71-40= 0.71 dBuV/m

23.28-40= -16.72 dBuV/m

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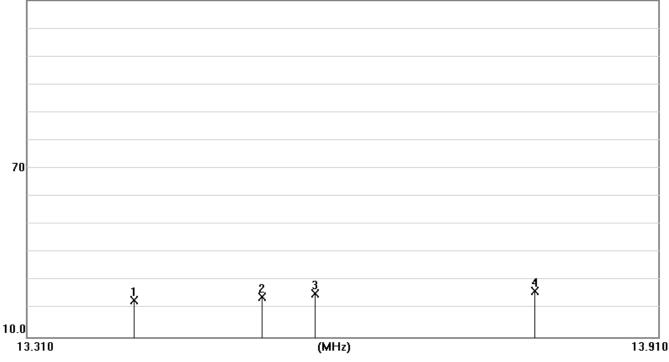
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OATS:

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

130.0 dBuV/m



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	13.4100	10.90	12.20	23.10	59.58	-36.48	Peak
2	13.5300	12.18	12.20	24.38	69.58	-45.20	Peak
3	13.5800	13.32	12.20	25.52	69.58	-44.06	Peak
4	13.7900	14.11	12.20	26.31	59.58	-33.27	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 (μV/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 $dB\mu V/m=20 \log (\mu V/m)$

- 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 at 3m, where extrapolation factor is offset to convert the limit of the measurement.

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.

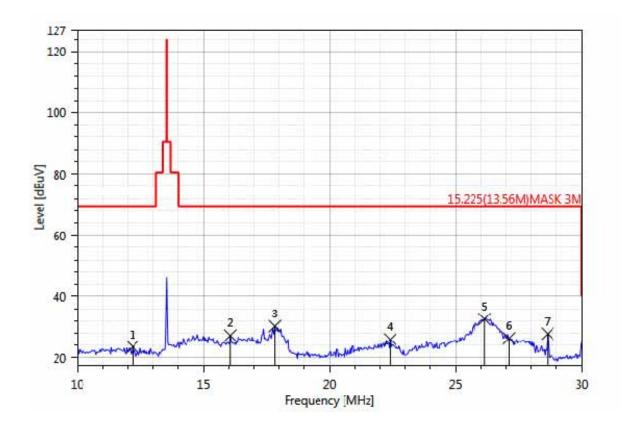
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Radiated Emission Measurement Result

Operation Mode :	RFID
Fundamental Frequency:	13.56 MHz
Operation Band :	Tx CH MID
EUT Pol.:	E2 Plane

Test Date : 12/23/2016 Temp. / Humi. : 23.8 deg_C/59 RH Test Engineer : Mike Measurement Antenna Pol. : VERTICAL



Freq.	Note	Decetor	Actual	Spectrum	Factor	Limit	Margin
		Mode	Reading Level	FS		@3m	
MHz	F/H/E/S	QP/AV/PK	dBµV/m	dBµV/m	dB	dBuV/m	dB
12.20	S	Peak	23.55	12.15	11.40	69.54	-45.99
16.06	S	Peak	27.24	15.75	11.49	69.54	-42.30
17.84	S	Peak	30.28	18.74	11.53	69.54	-39.26
22.40	S	Peak	25.97	15.10	10.87	69.54	-43.57
26.14	S	Peak	32.59	22.67	9.93	69.54	-36.95
27.12	Н	Peak	26.33	16.63	9.70	69.54	-43.21
28.64	S	Peak	27.82	18.46	9.36	69.54	-41.72

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

23.55-40= -16.45 dBuV/m

27.24-40= -12.76 dBuV/m

30.28-40= -9.72 dBuV/m

25.97-40= -14.03 dBuV/m

32.59-40= -7.41 dBuV/m

26.33-40= -13.67 dBuV/m

27.82-40= -12.18 dBuV/m

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OATS:

9

10

11

12

23.6000

26.8800

28.3440

29.1400

UAIU.									
Oper	ation Mode :	RFIE) -	Test Date :		03/08/20	03/08/2017		
Fund	lamental Frequ	uency : 13.5	13.56 MHz Temp. / Humi. :			22 deg_	22 deg_C/69 RH		
Oper	ation Band :	Tx C		Test Enginee		Mike			
	Pol. :	E2 P	lane	Measurement	t Antenna Pol	: VERTIC	AL		
87.0 dl	BuV/m								
	1								
27	* ¿					5	8 112		
~	1	з Ж	4			×	\$ ₹ * *		
-33				1-2					
0.009	-	D "	(MF				30.000		
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark		
	(MHz)	(dBuV/m)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)			
1	0.0136	15.49	17.73	33.22	104.02	-70.80	Peak		
2	0.0230	11.84	15.71	27.55	99.45	-71.90	Peak		
3	0.0766	9.22	12.18	21.40	89.00	-67.60	Peak		
4	0.1963	8.51	11.76	20.27	80.83	-60.56	Peak		
5	11.3800	12.81	12.20	25.01	48.62	-23.61	Peak		
6	14.1000	9.91	12.20	22.11	48.62	-26.51	Peak		
7	17.5600	9.18	12.20	21.38	48.62	-27.24	Peak		
8	23.3200	14.07	11.54	25.61	48.62	-23.01	Peak		
	1				1		1		

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11.48

10.83

10.53

10.37

13.97

14.35

4.43

17.73

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25.45

25.18

14.96

28.10

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-23.17

-23.44

-33.66

-20.52

Peak

Peak

Peak

Peak

48.62

48.62

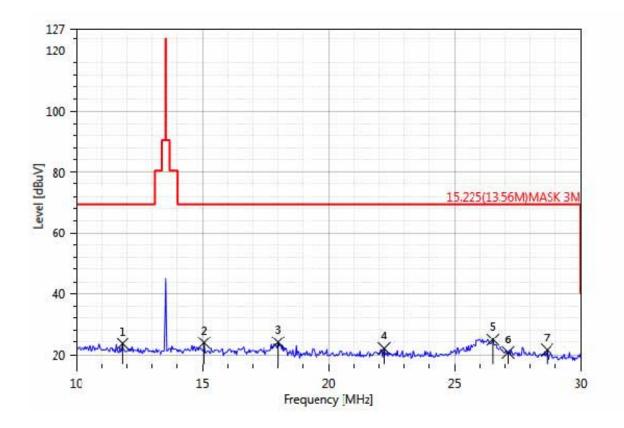
48.62

48.62



Operation Mode : RFID Fundamental Frequency: 13.56 MHz **Operation Band :** Tx CH MID EUT Pol.: E2 Plane

Test Date : 12/23/2016 Temp. / Humi. : 23.8 deg_C/59 RH Test Engineer : Mike Measurement Antenna Pol. : HORIZONTAL

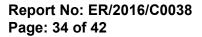


Freq.	Note	Decetor	Actual	Spectrum	Factor	Limit	Margin
		Mode	Reading Level	FS		@3m	
MHz	F/H/E/S	QP/AV/PK	dBµV/m	dBµV/m	dB	dBuV/m	dB
11.84	S	Peak	23.58	12.19	11.39	69.54	-45.96
15.06	S	Peak	23.86	12.40	11.47	69.54	-45.68
18.00	S	Peak	24.01	12.47	11.54	69.54	-45.53
22.20	S	Peak	22.01	11.08	10.92	69.54	-47.53
26.50	S	Peak	24.96	15.12	9.84	69.54	-44.58
27.12	Н	Peak	20.74	11.04	9.70	69.54	-48.80
28.66	S	Peak	21.57	12.21	9.36	69.54	-47.97

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

23.58-40= -16.42 dBuV/m

23.86-40= -16.14 dBuV/m

24.01-40= -15.99 dBuV/m

22.01-40= -17.99 dBuV/m

24.96-40= -15.04 dBuV/m

20.74-40= -19.26 dBuV/m

21.57-40= -18.43 dBuV/m

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OATS:

0/110.									
Operation Mode :		RFID		Test Date :			03/08/2017		
Fundamental Frequency: 13.56 MHz Temp. / Humi.:					•=	C/69 RH			
•	ation Band :			Test Enginee		Mike			
	Pol. :	E2 P	lane l	e Measurement Antenna Pol.: HORIZONT					
87.0 di	BuV/m								
	1 X 2 X						910		
27	1		3×	*			\$7 8 *		
			*						
-33									
0.009			(MF	iz)			30.000		
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark		
	(MHz)	(dBuV/m)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)			
1	0.0150	15.05	17.43	32.48	103.17	-70.69	Peak		
2	0.0225	13.25	15.81	29.06	99.65	-70.59	Peak		
3	0.1590	8.05	11.81	19.86	82.66	-62.80	Peak		
4	0.5500	12.82	11.53	24.35	71.88	-47.53	Peak		
5	11.6500	12.18	12.20	24.38	48.62	-24.24	Peak		

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12.20

12.19

11.73

10.88

10.58

10.54

10.90

8.92

12.41

17.23

16.73

15.04

16.6600

18.5000

22.3800

26.5800

28.1000

28.3400

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23.10

21.11

24.14

28.11

27.31

25.58

48.62

48.62

48.62

48.62

48.62

48.62

-25.52

-27.51

-24.48

-20.51

-21.31

-23.04

Peak

Peak

Peak

Peak

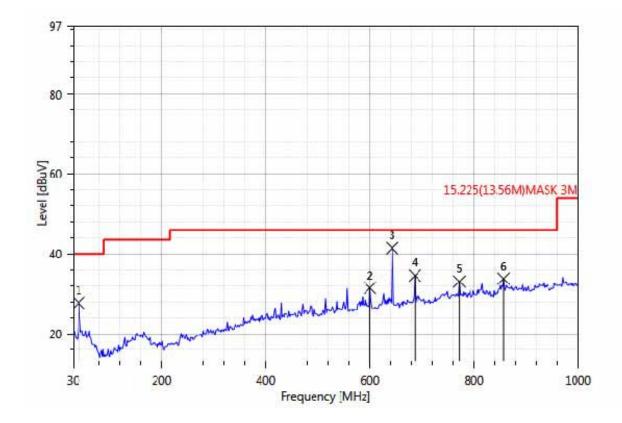
Peak

Peak



Operation Mode : RFID Fundamental Frequency: 13.56 MHz **Operation Band :** Tx CH MID EUT Pol.: E2 Plane

Test Date : 12/23/2016 Temp. / Humi. : 23.8 deg_C/59 RH Test Engineer : Mike Measurement Antenna Pol. : VERTICAL



Freq.	Note	Decetor	Actual	Spectrum	Factor	Limit	Margin
		Mode	Reading Level	FS		@3m	
MHz	F/H/E/S	QP/AV/PK	dBµV/m	dBµV/m	dB	dBuV/m	dB
40.68	S	Peak	27.70	36.16	-8.46	40.00	-12.30
600.36	S	Peak	31.43	31.57	-0.13	46.00	-14.57
643.04	S	Peak	41.43	40.78	0.65	46.00	-4.57
686.69	S	Peak	34.55	33.33	1.21	46.00	-11.45
772.05	S	Peak	33.04	30.35	2.69	46.00	-12.96
857.41	S	Peak	33.76	29.23	4.52	46.00	-12.24

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.

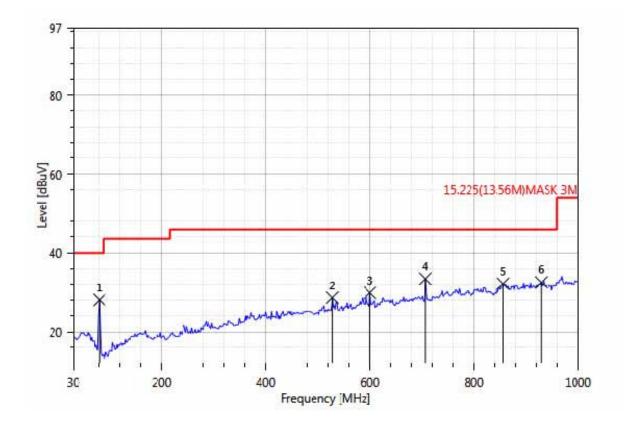
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Operation Mode : RFID Fundamental Frequency: 13.56 MHz **Operation Band :** Tx CH MID EUT Pol.: E2 Plane

Test Date : 12/23/2016 Temp. / Humi. : 23.8 deg_C/59 RH Test Engineer : Mike Measurement Antenna Pol. : HORIZONTAL



Freq.	Note	Decetor	Actual	Spectrum	Factor	Limit	Margin
		Mode	Reading Level	FS		@3m	
MHz	F/H/E/S	QP/AV/PK	dBµV/m	dBµV/m	dB	dBuV/m	dB
80.44	S	Peak	28.08	40.46	-12.38	40.00	-11.92
527.61	S	Peak	28.63	29.94	-1.32	46.00	-17.37
600.36	S	Peak	29.84	29.97	-0.13	46.00	-16.16
707.06	S	Peak	33.43	32.03	1.40	46.00	-12.57
856.44	S	Peak	32.17	27.69	4.48	46.00	-13.83
929.19	S	Peak	32.52	27.27	5.25	46.00	-13.48

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FREQUENCY STABILITY 8

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.

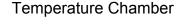
Carrier frequency stability shall be maintained to $\pm 0.01\%$ (± 100 ppm).

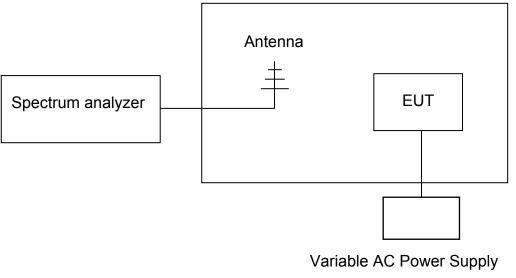
For licence-exempt radio apparatus, the frequency stability shall be measured at temperatures of -20°C (-4°F), +20°C (+68°F) and +50°C (+122°F).

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.
- 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	MFR	MODEL	SERIAL	LAST	CAL DUE.			
TYPE		NUMBER	NUMBER	CAL.				
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			

Measurement Results 8.5

A. Temperature Variation

Power Supply	Environment	Frequency		
Vdc	Temperature	(MHz)	Delta (Hz)	Limit (kHz)
11.1	-20	13.56015651	-156.51200	+/- 1.356
11.1	-10	13.56047131	-471.31000	+/- 1.356
11.1	0	13.56057841	-578.41000	+/- 1.356
11.1	10	13.56074892	-748.92000	+/- 1.356
11.1	20	13.56	0.00000	+/- 1.356
11.1	30	13.56018173	-181.73000	+/- 1.356
11.1	40	13.56041372	-413.72000	+/- 1.356
11.1	50	13.56014231	-142.31000	+/- 1.356

B. Supply Voltage Variation

Power Supply	Environment	Frequency		
Vdc	Temperature	(MHz)	Delta (Hz)	Limit (kHz)
10	20	13.56018934	-189.34100	+/- 1.356
11.1	20	13.56	0.00000	+/- 1.356
12.2	20	13.56058984	-589.84100	+/- 1.356

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20 dB OCCUPIED BANDWIDTH MEASUREMENT 9

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

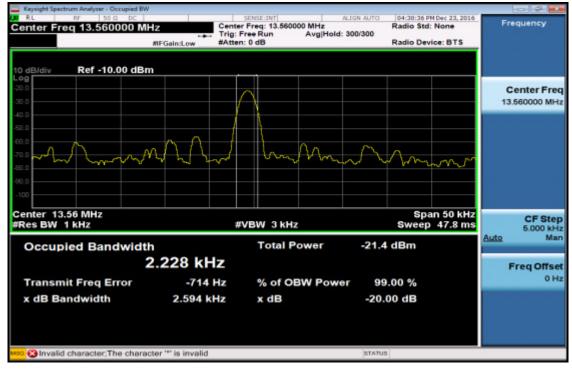
SGS Conducted Room								
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.			
TYPE		NUMBER	NUMBER	CAL.				
Power Meter	Anritsu	ML2495A	1005007	12/15/2016	12/14/2017			
Power Sensor	Anritsu	MA2411B	917032	12/15/2016	12/14/2017			
EXA Spectrum Analyzer	Agilent	N9030A	MY53120760	02/26/2016	02/25/2017			
DC Block	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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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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