

# ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

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

OF

**Product Name:** Tablet PC

**Brand Name:** hp

**Model No.:** HSTNN-Q93C

**FCC ID:** B94HNQ93CSPNAC

**Report No.:** E2/2015/30021

**Issue Date:** Apr. 30, 2015

**FCC Rule Part:** §15.225

**Prepared for:** Hewlett-Packard Company  
1501 Page Mill Road, M/S1419, Palo Alto, CA  
94304, United States

**Prepared by:** SGS Taiwan Ltd.  
Electronics & Communication Laboratory  
No.2, Keji 1st Rd., Guishan District, Taoyuan  
City, Taiwan 333



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## VERIFICATION OF COMPLIANCE

**Applicant:** Hewlett-Packard Company  
 1501 Page Mill Road, M/S1419, Palo Alto, CA, 94304, United States

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**Brand Name:** hp

**Model No.:** HSTNN-Q93C

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**File Number:** E2/2015/30021

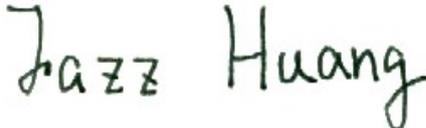
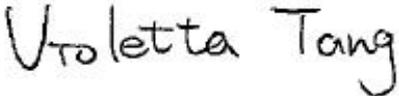
**Date of test:** Mar. 16, 2015 ~ Apr. 13, 2015

**Date of EUT Received:** Mar. 16, 2015

### 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.

<b>Test By:</b>	 <hr/> <i>Jazz Huang / Asst. Supervisor</i>	<b>Date</b>	<hr/> Apr. 30, 2015
<b>Prepared By:</b>	 <hr/> <i>Violetta Tang / Clerk</i>	<b>Date</b>	<hr/> Apr. 30, 2015
<b>Approved By:</b>	 <hr/> <i>Jim Chang / Asst. Manager</i>	<b>Date</b>	<hr/> Apr. 30, 2015

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## Revision History

Report Number	Revision	Description	Issue Date
E2/2015/30021	Rev.00	Initial creation of document	Apr. 30, 2015

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# 1 GENERAL INFORMATION

## 1.1 Product Description

General:

Product Name:	Tablet PC	
Brand Name:	hp	
Model No.:	HSTNN-Q93C	
Product SW/HW version	Win 8.1 / 1.0	
Radio SW/HW version	7.7.2.0 / 1.0	
Power Supply:	3.8Vdc form Rechargeable Li-ion Battery or 5.25V from AC/DC Adapter	
	Battery:	1. Model No.: HSTNH-C408M-SD, Supplier: Dynapack
		2. Model No.: HSTNH-C408M-SS, Supplier: SDI (SQ)
	Adapter:	1. Model No.: TPN-AA01, Supplier: AcBel
		2. Model No.: TPN-DA01, Supplier: Delta
		3. Model No.: TPN-LA01, Supplier: Lite-On

NFC:

Operating Frequency	13.56MHz
Transmit Power	< 123dBuV/m at 3m.
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) is Tablet PC supporting, GSM / WCDMA / CDMA / LTE, Wi-Fi 802.11abgn & ac, Bluetooth with NFC and GPS features, and below is details of information.

Product Feature	
Product Name:	Tablet PC
Brand Name:	hp
Model No.:	HSTNN-Q93C
FCC ID	B94HNQ93CSPNAC
GSM Operating Band(s)	GSM 850/1900MHz
GPRS / EGPRS Multi Slot Class	GPRS Class 12 / Class 12
CDMA / EVDO	BC0 / BC1
WCDMA Operating Band(s)	FDD Band II / IV / V
WCDMA Rel. Version	Rel.8
LTE Operating Band(s)	FCC Band 2 / 4 / 5 / 13 / 17 / 25
LTE Rel. Version	Rel.9
Wi-Fi Specification	802.11a/b/g/n/ac
Bluetooth Version	V4.0 dual mode + HS
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:

1. All test items have been performed and record as per the above standards.
2. The composite system is compliance with FCC Subpart B is authorized under the certification procedure.
3. The EUT was placed 1.5m height for frequency above 1GHz in accordance with ANSI C63.10:2013.

### 1.4 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: 628985

Canada Registration Number: 4620A-5

### 1.5 Special Accessories

There are no special accessories 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 placed on a turn table which is 0.8 m above ground plane. 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 §15.107. 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 plane. 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.

#### Note:

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Following shows an offset computation example with cable loss 1dB.

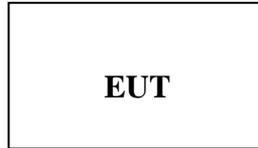
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## 2.5 Configuration of Tested System

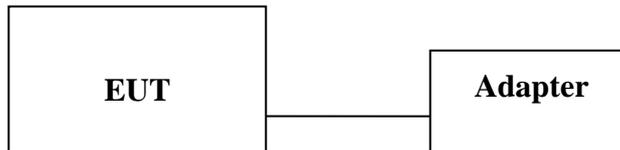
**Fig. 2-1 Radiated Emission & Conducted (Antenna Port) Configuration**



**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

**Fig. 2-2 AC Power Line Conducted Emission**



**Table 2-2 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)	20dB OCCUPIED BANDWIDTH	Compliant
§15.203	Antenna Requirement	Compliant

### 4 DESCRIPTION OF TEST MODES

The EUT stay in continuous transmitting mode. The frequency 13.56 MHz is the default channel to test, where it is the only manipulative channel as this application supports.

**Note:**

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

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## 5 MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.586 dB
Peak Output Power	+/- 0.84 dB
6dB Bandwidth	+/- 51.33 Hz
100 KHz Bandwidth Of Frequency Band Edges	+/- 1.55 dB
Peak Power Density	+/- 1.3 dB
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> )	30MHz - 180MHz: +/- 3.37dB
	180MHz -417MHz: +/- 3.19dB
	0.417GHz-1GHz: +/- 3.19dB
	1GHz - 18GHz: +/- 4.04dB
	18GHz - 40GHz: +/- 4.04dB

Measurement uncertainty (Polarization : <b>Horizontal</b> )	30MHz - 167MHz: +/- 4.22dB
	167MHz -500MHz: +/- 3.44dB
	0.5GHz-1GHz: +/- 3.39dB
	1GHz - 18GHz: +/- 4.08dB
	18GHz - 40GHz: +/- 4.08dB

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					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
EMI Test Receiver	R&S	ESCI 3	101311	06/20/2014	06/19/2015
Coaxial Cables	N/A	N30N30-1042-150cm	N/A	01/06/2015	01/07/2016
LISN	Schwarzbeck	NSLK 8127	8127-648	06/10/2014	06/09/2015
LISN	Rolf-Heine	NNB-2/16Z	99012	03/04/2015	03/03/2016
Test Software	Farad	EZ-EMC	Ver. SGS-03A2	N.C.R.	N.C.R.

### 6.3 EUT Setup:

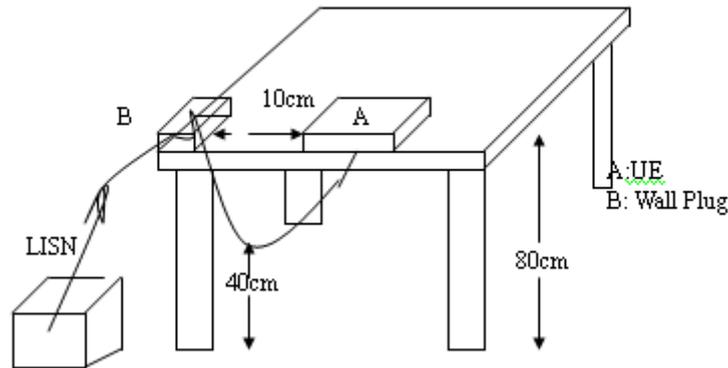
- The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.10:2013.
- The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
- The LISN was connected with 120Vac/60Hz power source.

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#### 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 plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all phases of power being supplied by given UE are completed

#### 6.6 Measurement Result:

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

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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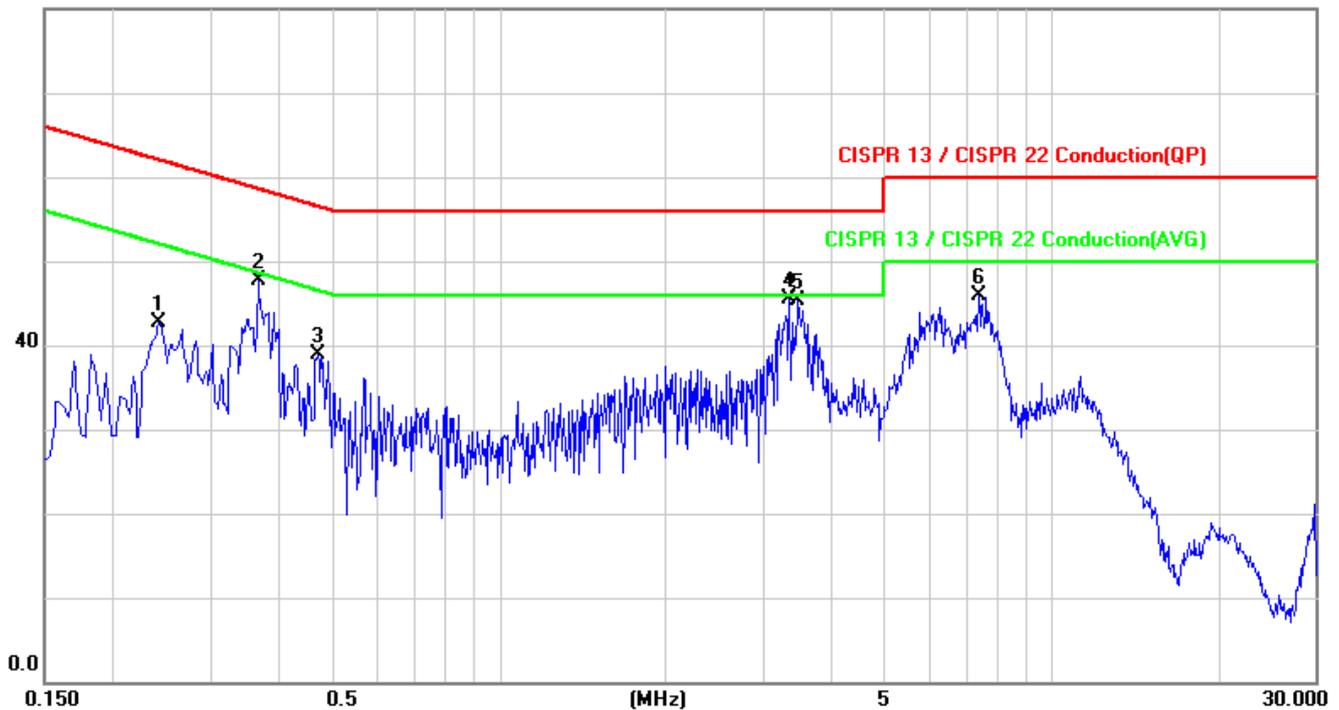
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### AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	Operation mode			Test Date:	Apr. 10, 2015
Temperature:	20	Humidity:	64 %	Test By:	Ashton
Adapter Model No.:	TPN-AA01				

80.0 dBuV



No.	Mk.	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Comment
		(MHz)	dBuV	(dB)	(dBuV)	(dBuV)	(dB)		
1		0.2420	42.53	0.10	42.63	62.03	-19.40	peak	
2		0.3660	47.52	0.15	47.67	58.59	-10.92	peak	
3		0.4700	38.63	0.21	38.84	56.51	-17.67	peak	
4	*	3.3620	44.84	0.60	45.44	56.00	-10.56	peak	
5		3.4740	44.75	0.60	45.35	56.00	-10.65	peak	
6		7.4020	45.27	0.65	45.92	60.00	-14.08	peak	

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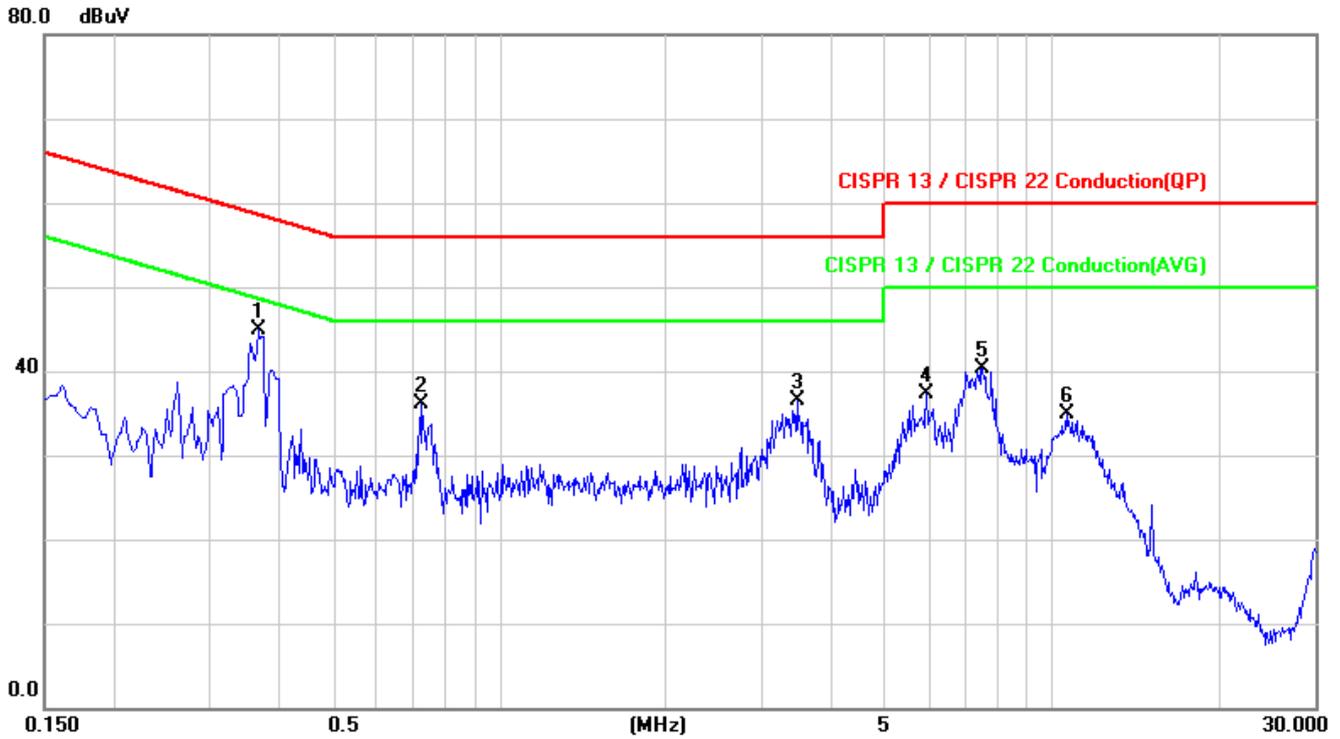
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No.	Mk.	Freq. (MHz)	Reading dBuV	Factor (dB)	Measurement (dBuV)	Limit (dBuV)	Over (dB)	Detector	Comment
1	*	0.3660	44.81	0.16	44.97	58.59	-13.62	peak	
2		0.7260	35.72	0.33	36.05	56.00	-19.95	peak	
3		3.4620	35.82	0.60	36.42	56.00	-19.58	peak	
4		5.9420	36.59	0.63	37.22	60.00	-22.78	peak	
5		7.5140	39.71	0.66	40.37	60.00	-19.63	peak	
6		10.6620	34.14	0.68	34.82	60.00	-25.18	peak	

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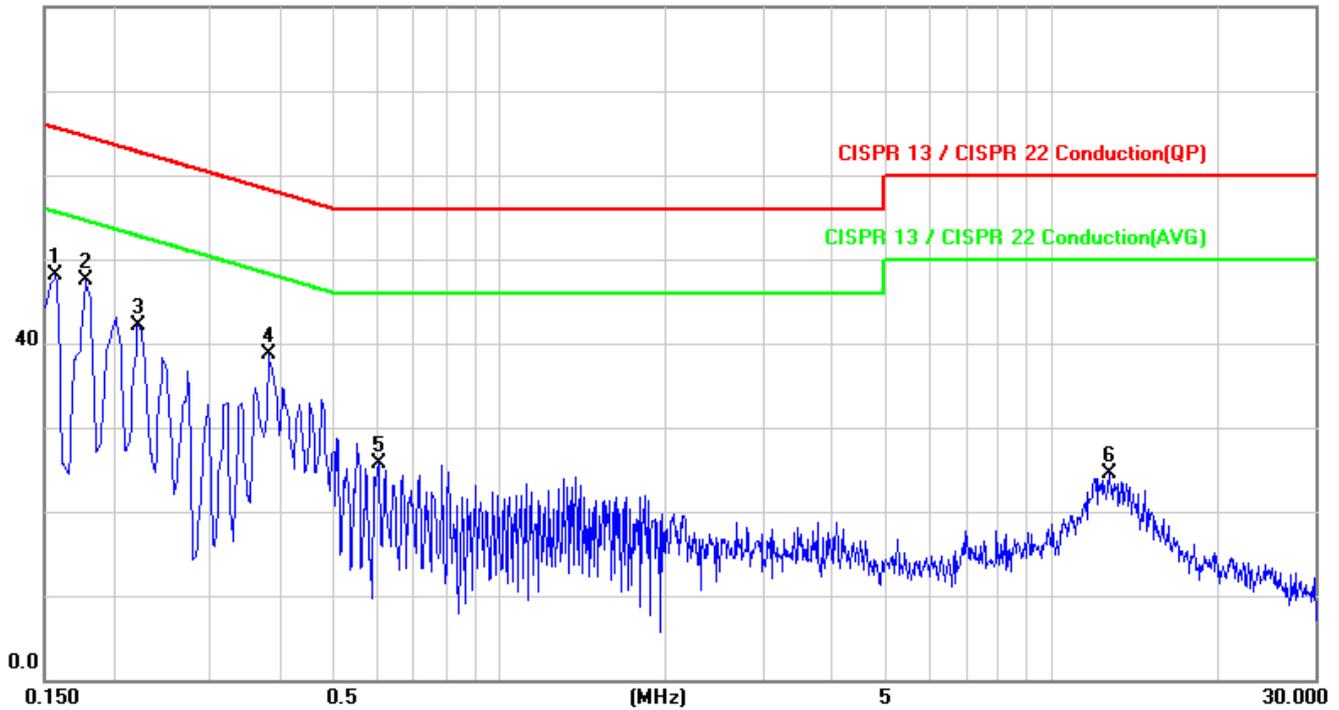
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### AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	Operation mode			Test Date:	Apr. 10, 2015
Temperature:	20	Humidity:	64 %	Test By:	Ashton
Adapter Model No.:	TPN-DA01				

80.0 dBuV



No.	Mk.	Freq. (MHz)	Reading dBuV	Factor (dB)	Measurement (dBuV)	Limit (dBuV)	Over (dB)	Detector	Comment
1		0.1580	48.00	0.09	48.09	65.57	-17.48	peak	
2	*	0.1780	47.38	0.10	47.48	64.58	-17.10	peak	
3		0.2220	42.02	0.10	42.12	62.74	-20.62	peak	
4		0.3820	38.54	0.17	38.71	58.24	-19.53	peak	
5		0.6060	25.40	0.26	25.66	56.00	-30.34	peak	
6		12.7180	23.82	0.64	24.46	60.00	-35.54	peak	

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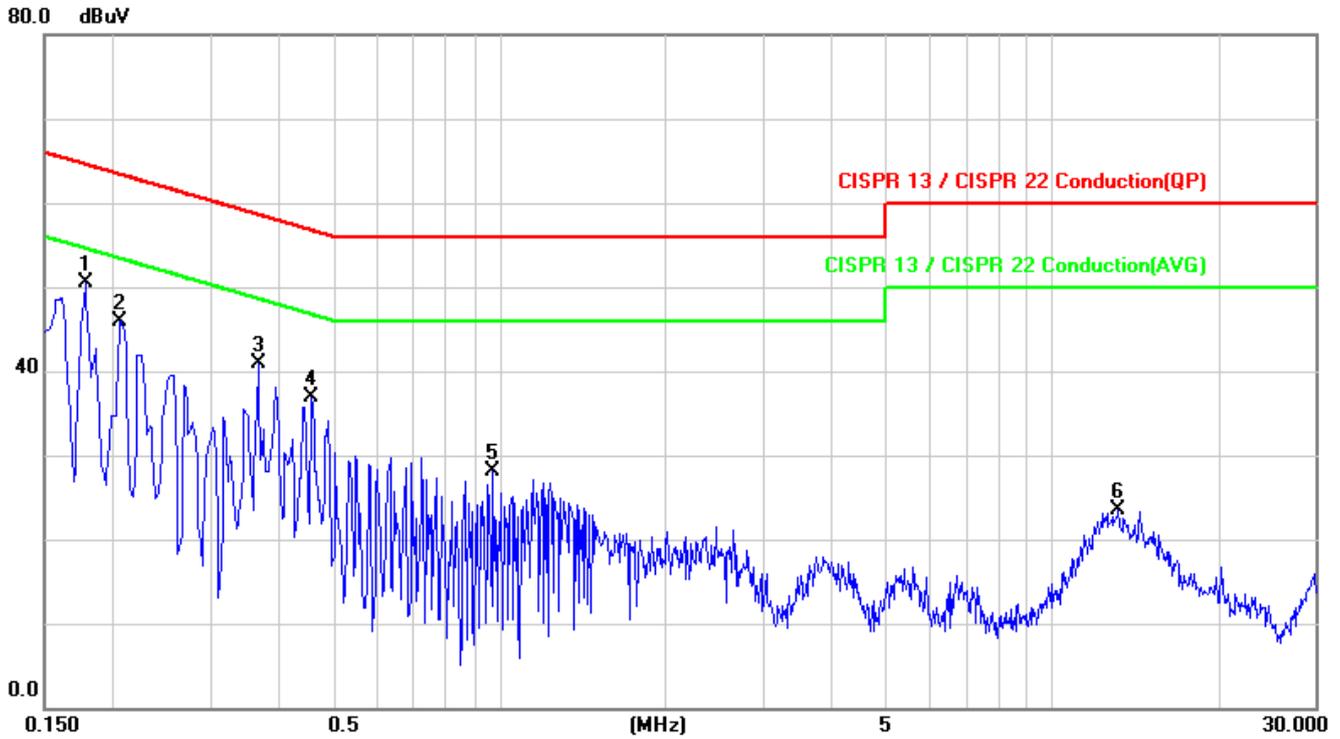
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No.	Mk.	Freq. (MHz)	Reading dBuV	Factor (dB)	Measurement (dBuV)	Limit (dBuV)	Over (dB)	Detector	Comment
1	*	0.1780	50.39	0.10	50.49	64.58	-14.09	peak	
2		0.2060	45.87	0.09	45.96	63.37	-17.41	peak	
3		0.3660	40.72	0.16	40.88	58.59	-17.71	peak	
4		0.4580	36.77	0.21	36.98	56.73	-19.75	peak	
5		0.9780	27.75	0.42	28.17	56.00	-27.83	peak	
6		13.2140	22.81	0.64	23.45	60.00	-36.55	peak	

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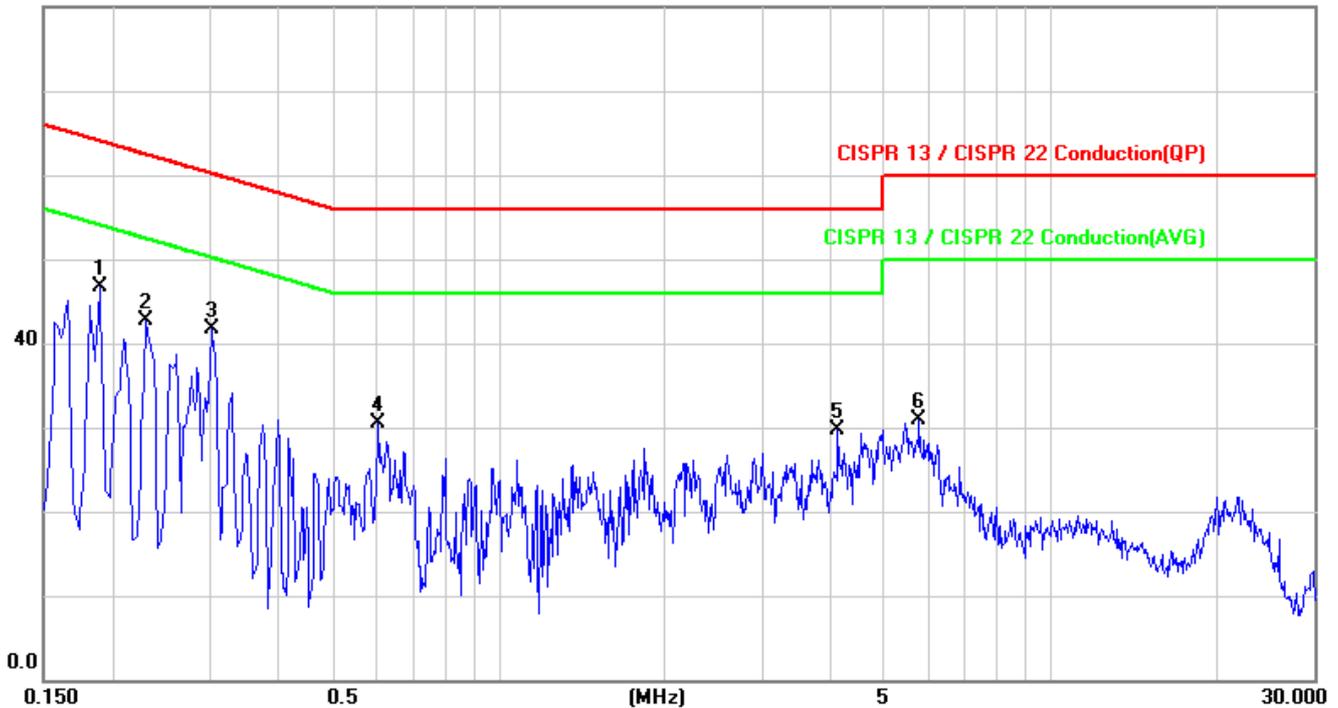
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### AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	Operation mode			Test Date:	Apr. 10, 2015
Temperature:	20	Humidity:	64 %	Test By:	Ashton
Adapter Model No.:	TPN-LA01				

80.0 dBuV



No.	Mk.	Freq. (MHz)	Reading dBuV	Factor (dB)	Measurement (dBuV)	Limit (dBuV)	Over (dB)	Detector	Comment
1	*	0.1900	46.71	0.09	46.80	64.04	-17.24	peak	
2		0.2300	42.63	0.10	42.73	62.45	-19.72	peak	
3		0.3020	41.61	0.13	41.74	60.19	-18.45	peak	
4		0.6060	30.31	0.26	30.57	56.00	-25.43	peak	
5		4.1140	29.09	0.61	29.70	56.00	-26.30	peak	
6		5.8020	30.32	0.62	30.94	60.00	-29.06	peak	

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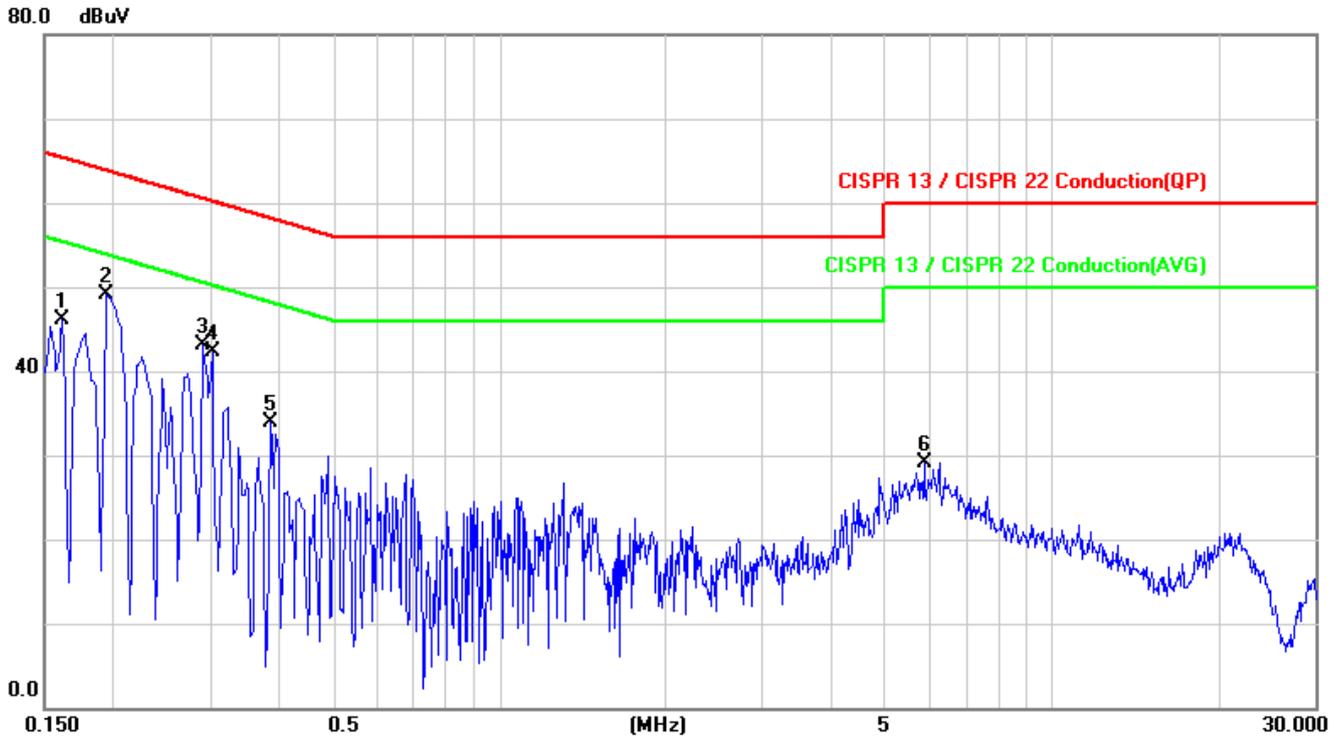
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No.	Mk.	Freq. (MHz)	Reading dBuV	Factor (dB)	Measurement (dBuV)	Limit (dBuV)	Over (dB)	Detector	Comment
1		0.1620	46.02	0.09	46.11	65.36	-19.25	peak	
2	*	0.1940	49.05	0.09	49.14	63.86	-14.72	peak	
3		0.2900	42.97	0.13	43.10	60.52	-17.42	peak	
4		0.3020	42.17	0.13	42.30	60.19	-17.89	peak	
5		0.3860	33.64	0.17	33.81	58.15	-24.34	peak	
6		5.8860	28.45	0.62	29.07	60.00	-30.93	peak	

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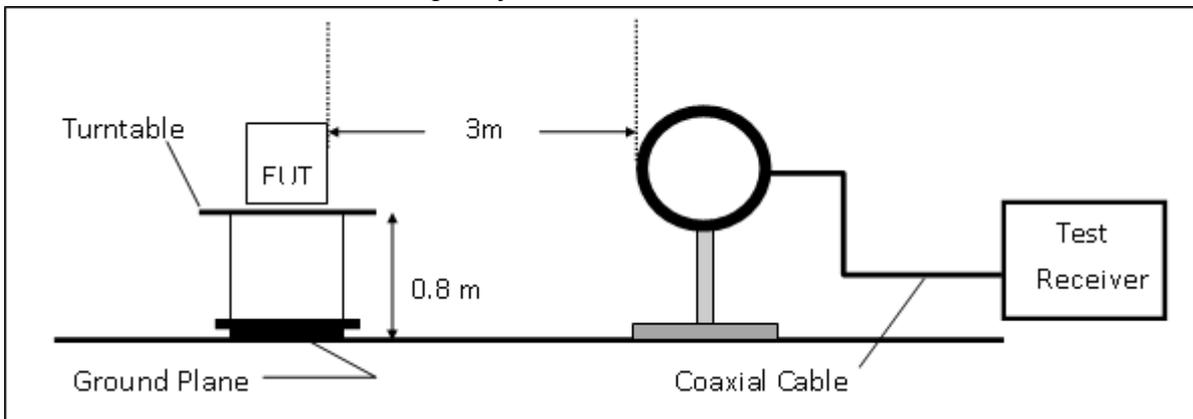
## 7 RADIATED EMISSION TEST

### 7.1 Measurement Procedure

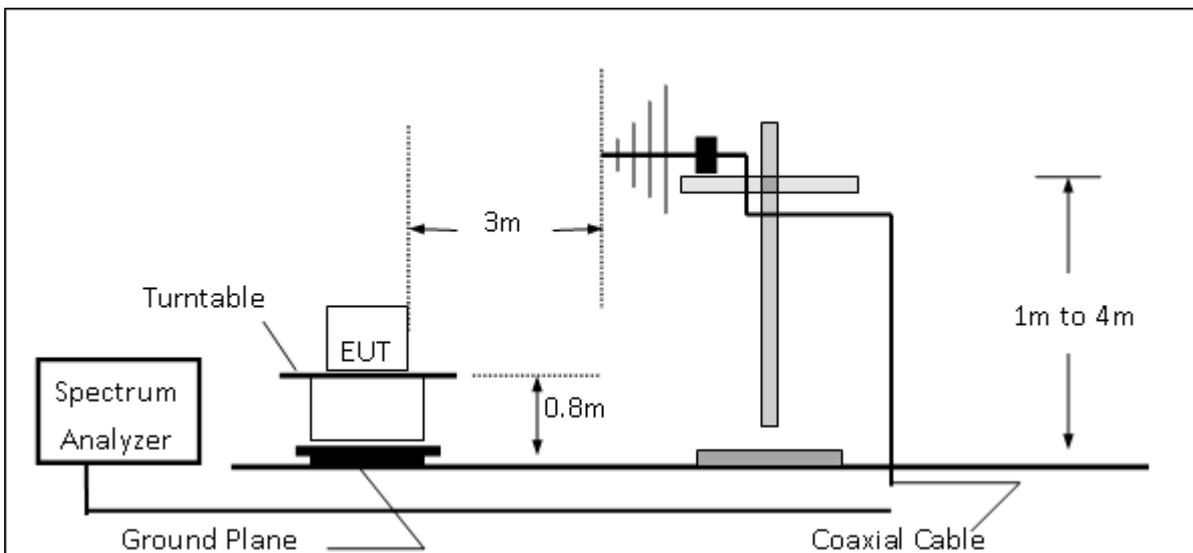
- 1 The EUT was placed on a turn table which is 0.8m above ground plane.
- 2 Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 3 And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.

### 7.2 Test SET-UP (Block Diagram of Configuration):

(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



(B) Radiated Emission Test Set-Up, Frequency form 30MHz to 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	04/09/2015	04/08/2016
Loop Antenna	ETS-Lindgren	6502	00143303	12/09/2014	12/08/2015
Broadband Antenna	TESEQ	CBL 6112D	35240	12/05/2014	12/04/2015
Pre Amplifier	EMC Instruments	EMC330	980096	12/19/2014	12/18/2015
Coaxial Cable	Huber+Suhner	RG 214/U	966Rx 9K-30M	12/19/2014	12/18/2015
Coaxial Cable	Huber+Suhner	RG 214/U SUCOFLEX 104	966Rx 30M-3G	12/19/2014	12/18/2015
Site NSA	SGS	966 Chamber C	SAC-C	03/04/2015	03/03/2016
Site VSWR	SGS	966 Chamber C	SAC-C	03/04/2015	03/03/2016
DC Power Supply	HOLA	DP-3003	D7070035	05/31/2014	05/30/2015
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.

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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	

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/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.

## 7.5 Field Strength of Fundamental Emission

### 7.5.1 Limit

Field strength of fundamental emissions limit:

The field strength of fundamental emissions shall not exceed 15848 microrvolts/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.

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

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

Note:

Actual FS(dBμV/m) = Spectrum. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/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.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we’ve employed is peak detector.

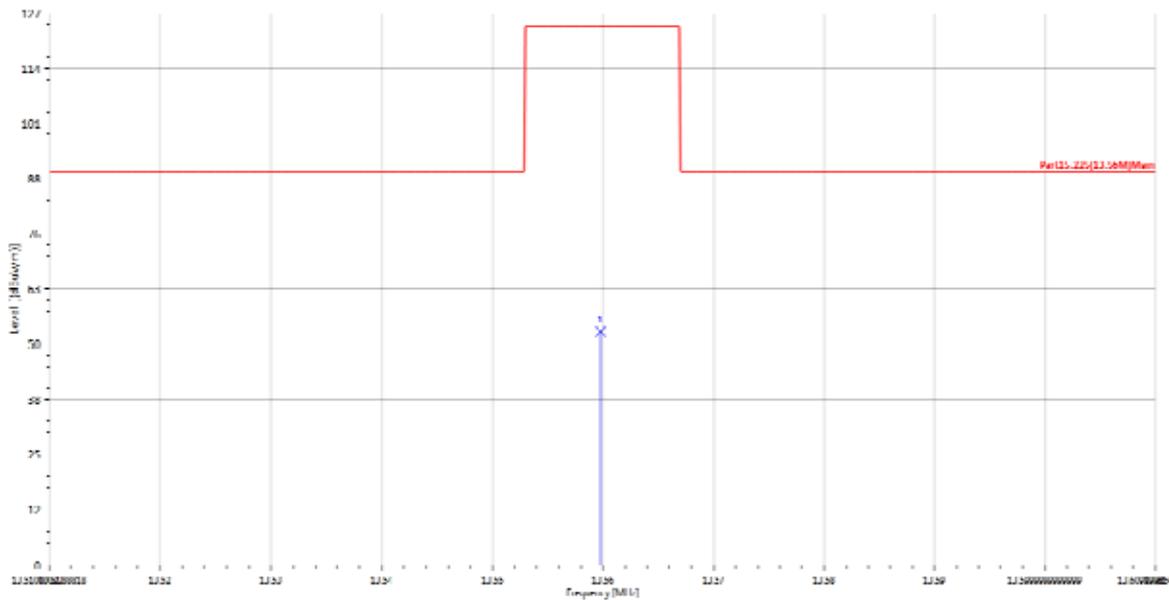
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Operation Band	:NFC	Test Date	:2015-04-10
Fundamental Frequency	:13.56 MHz	Temp./Humi.	:17.9 deg_C/ 51 RH
Operation Mode	:MAIN	Engineer	:Ashton
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL

Freq.	Detector	Note	Spectrum	Factor	Actual	Limit	Margin
MHz	PK/QP/AV	F/H/E/S	Reading Level	dB	dBμV/m	dBμV/m	dB
13.56	Peak	F	42.54	11.16	53.71	123.90	-70.19



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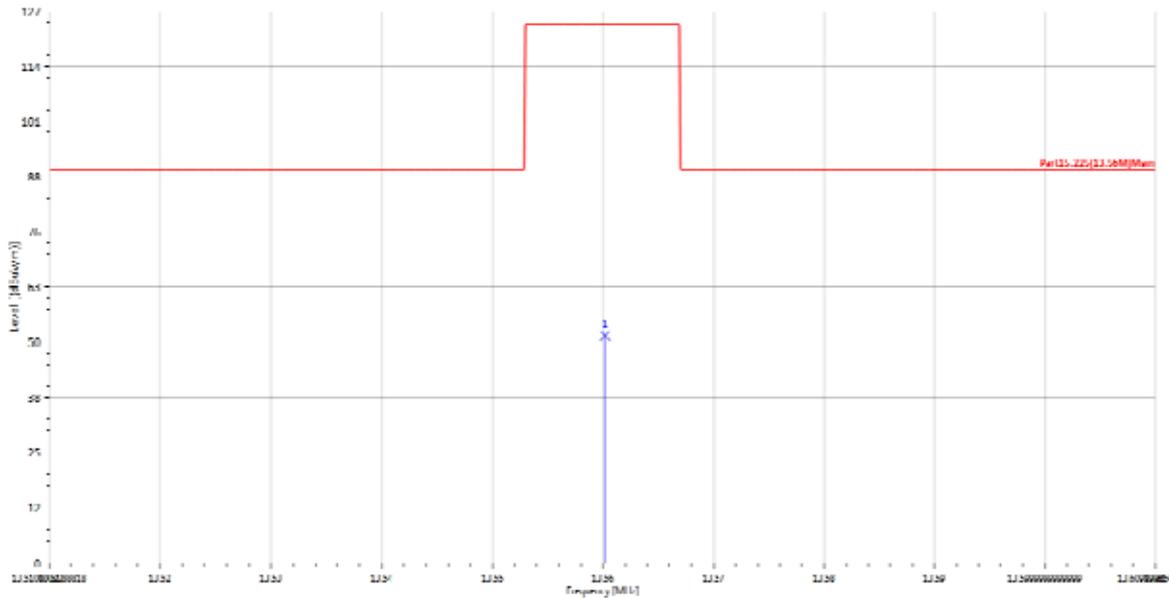
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Operation Band	:NFC	Test Date	:2015-04-10
Fundamental Frequency	:13.56 MHz	Temp./Humi.	:17.9 deg_C/ 51 RH
Operation Mode	:MAIN	Engineer	:Ashton
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL

Freq. MHz	Detector Mode	Note F/H/E/S	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
13.56	Peak	F	41.16	11.16	52.32	123.90	-71.58



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## 7.5.2 Radiated Mask

- (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.

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

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

1.  $20 \cdot \log(15848 \mu\text{V/m}) + 40\text{dB} = 124.00\text{dBuV/m}$
2.  $20 \cdot \log(334 \mu\text{V/m}) + 40\text{dB} = 90.47\text{dBuV/m}$
3.  $20 \cdot \log(106 \mu\text{V/m}) + 40\text{dB} = 80.50\text{dBuV/m}$

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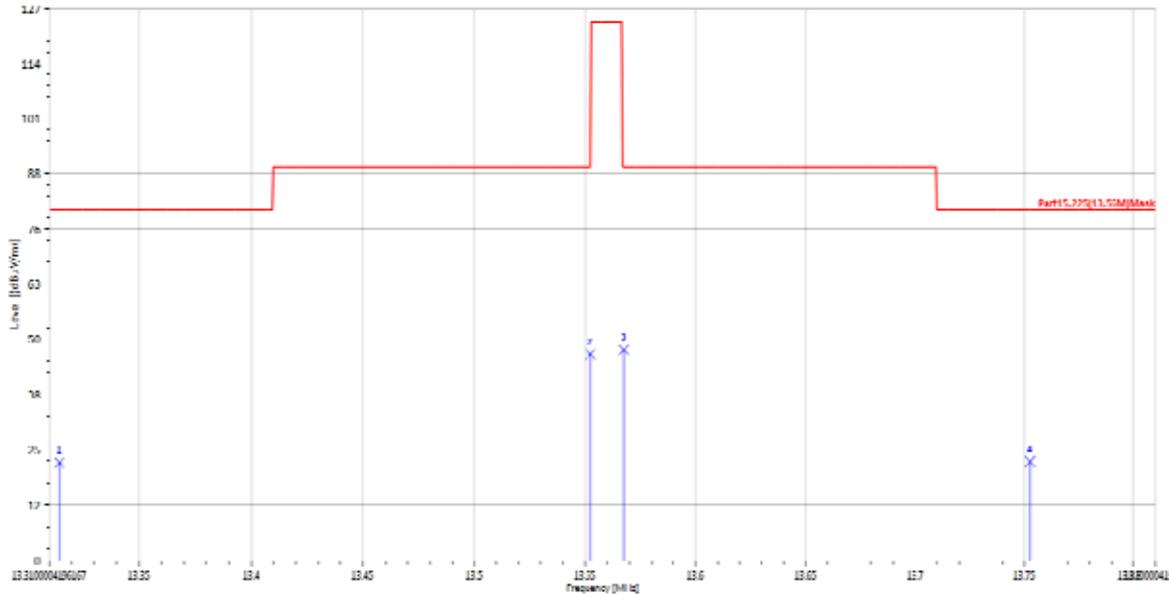
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Operation Band	:NFC	Test Date	:2015-04-10
Fundamental Frequency	:13.56 MHz	Temp./Humi.	:17.9 deg_C/ 51 RH
Operation Mode	:MASK	Engineer	:Ashton
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



Freq. MHz	Detector Mode	Note F/H/E/S	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
13.31	Peak	S	11.21	11.17	22.38	80.50	-58.12
13.55	Peak	S	36.23	11.17	47.40	90.47	-43.07
13.57	Peak	S	37.25	11.16	48.41	90.47	-42.06
13.75	Peak	S	11.48	11.15	22.63	80.50	-57.87

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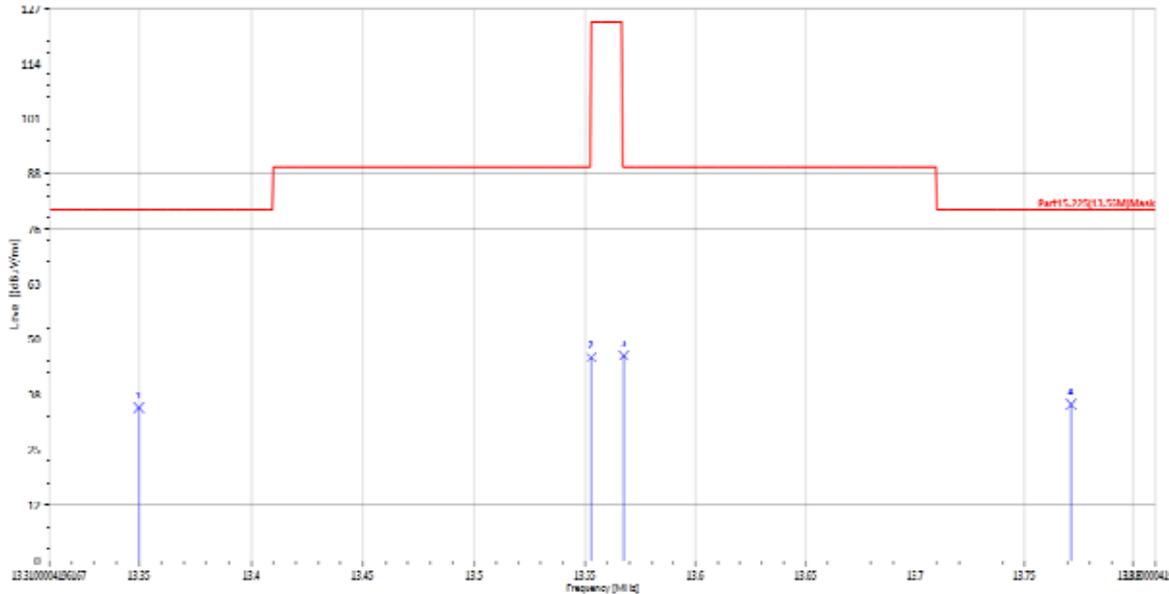
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Operation Mode	:MASK	Engineer	:Ashton
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq. MHz	Detector Mode	Note F/H/E/S	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
13.35	Peak	S	23.92	11.18	35.10	80.50	-45.40
13.55	Peak	S	35.43	11.17	46.60	90.47	-43.87
13.57	Peak	S	35.85	11.16	47.01	90.47	-43.46
13.77	Peak	S	24.64	11.15	35.79	80.50	-44.71

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### 7.5.3 Radiated Emission –

Limit:

§ 15.225

(d) The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in §15.209.

a)  $20 \cdot \log(30 \mu\text{V/m}) + 40\text{dB} = 69.54 \text{ dBuV/m}$

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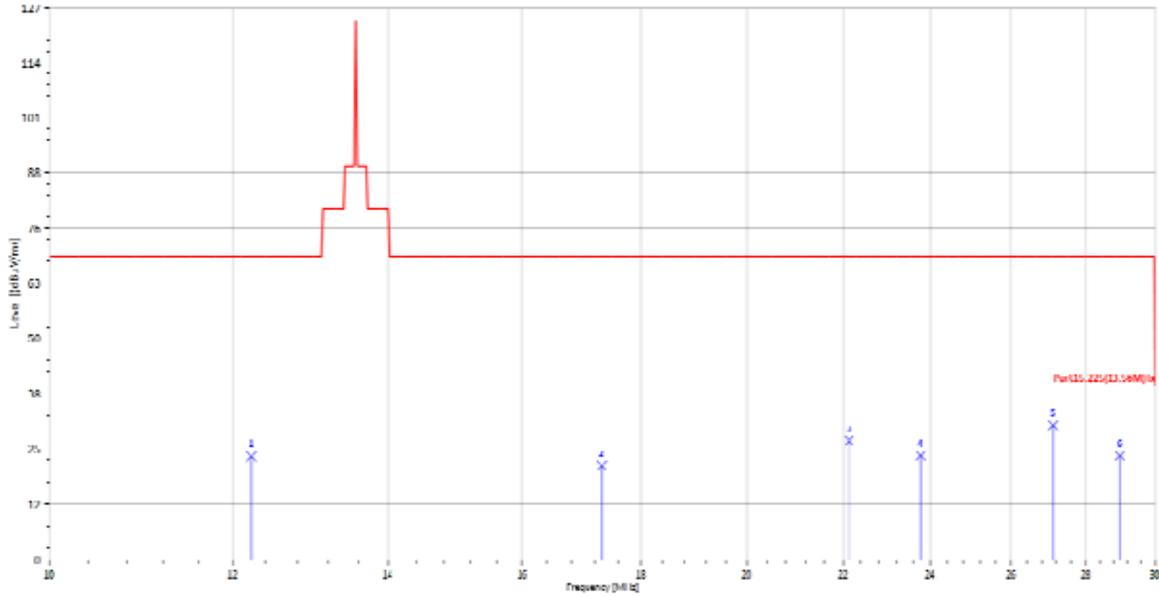
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Operation Band	:NFC	Test Date	:2015-04-10
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Operation Mode	:TX	Engineer	:Ashton
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



Freq. MHz	Detector Mode	Note F/H/E/S	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
12.22	Peak	S	12.45	11.21	23.66	69.54	-45.88
17.32	Peak	S	10.46	11.06	21.51	69.54	-48.03
22.14	Peak	S	16.67	10.56	27.24	69.54	-42.30
23.78	Peak	S	13.57	10.27	23.84	69.54	-45.70
27.12	Peak	S	21.16	9.64	30.80	69.54	-38.74
28.98	Peak	S	14.51	9.29	23.80	69.54	-45.74

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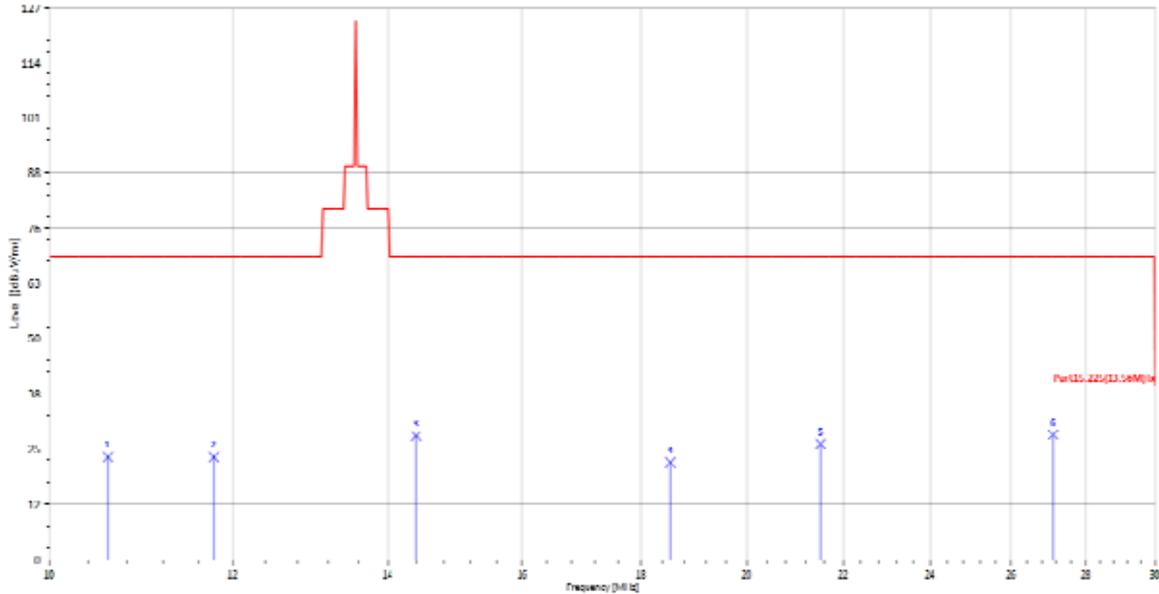
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Operation Mode	:TX	Engineer	:Ashton
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq. MHz	Detector Mode	Note F/H/E/S	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
10.60	Peak	S	12.22	11.26	23.48	69.54	-46.06
11.78	Peak	S	12.25	11.22	23.47	69.54	-46.07
14.40	Peak	S	17.24	11.13	28.37	69.54	-41.17
18.54	Peak	S	11.25	11.00	22.25	69.54	-47.29
21.52	Peak	S	15.82	10.67	26.50	69.54	-43.04
27.12	Peak	S	18.99	9.64	28.62	69.54	-40.92

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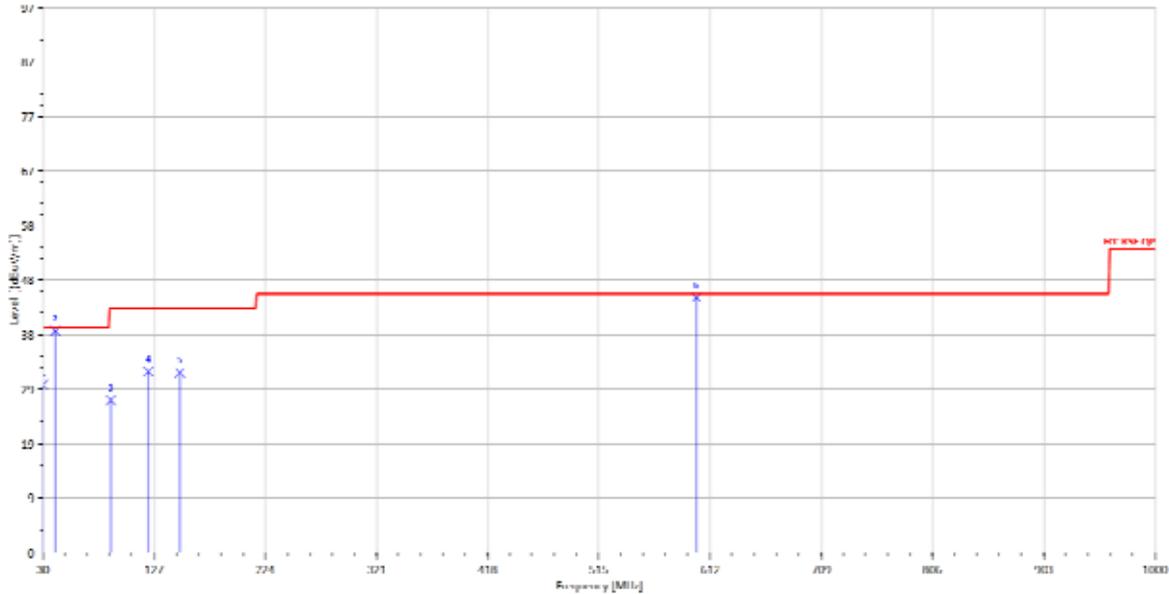
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Operation Band	:NFC	Test Date	:2015-04-10
Fundamental Frequency	:13.56 MHz	Temp./Humi.	:17.9 deg_C/ 51 RH
Operation Mode	:TX	Engineer	:Ashton
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



Freq. MHz	Detector Mode	Note F/H/E/S	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
30.11	QP	S	42.99	-13.17	29.82	40.00	-10.18
40.69	QP	S	58.90	-19.44	39.46	40.00	-0.54
89.17	Peak	S	52.82	-25.74	27.08	43.50	-16.42
122.15	Peak	S	53.61	-21.40	32.21	43.50	-11.29
149.31	Peak	S	54.60	-22.61	31.99	43.50	-11.51
599.96	QP	S	57.81	-12.46	45.35	46.00	-0.65

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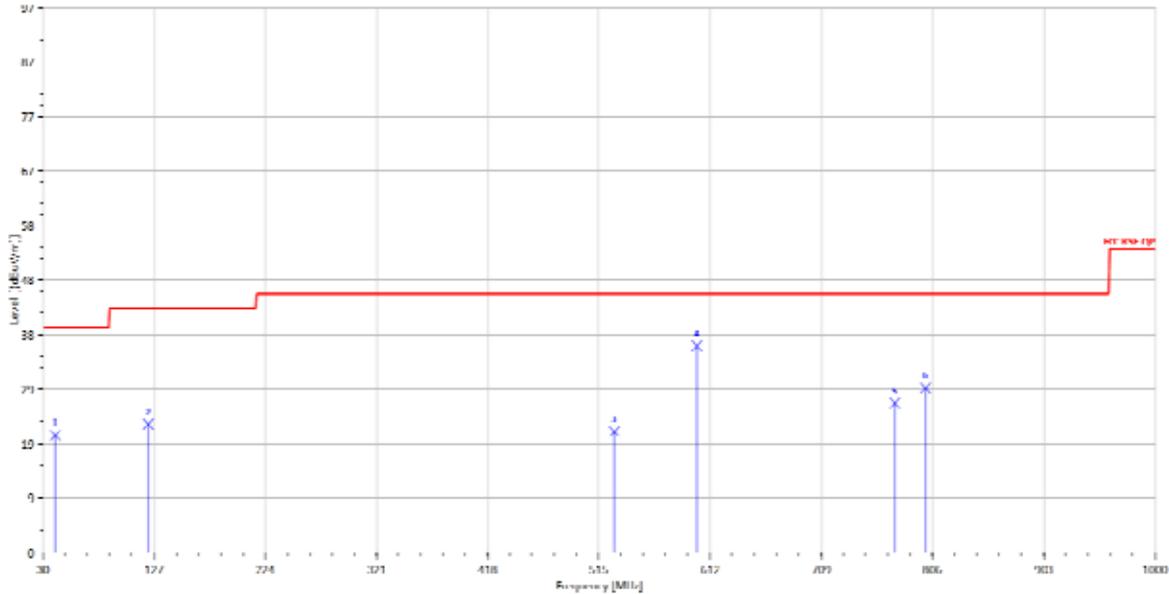
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Operation Band	:NFC	Test Date	:2015-04-10
Fundamental Frequency	:13.56 MHz	Temp./Humi.	:17.9 deg_C/ 51 RH
Operation Mode	:TX	Engineer	:Ashton
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq. MHz	Detector Mode	Note F/H/E/S	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
40.67	Peak	S	40.25	-19.43	20.82	40.00	-19.18
122.15	Peak	S	44.22	-21.40	22.82	43.50	-20.68
528.58	Peak	S	34.65	-13.16	21.49	46.00	-24.51
600.36	Peak	S	49.18	-12.45	36.73	46.00	-9.27
773.02	Peak	S	36.83	-10.26	26.57	46.00	-19.43
800.18	Peak	S	38.77	-9.49	29.28	46.00	-16.72

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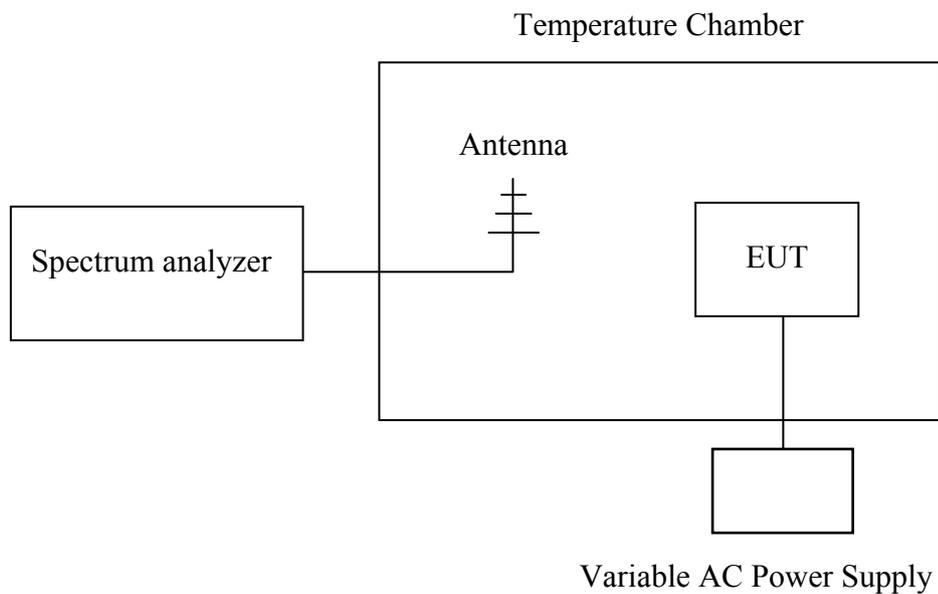
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## 8 Frequency Tolerance

### 8.1 Measurement Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set EUT as normal operation
3. Set SPA Center Frequency = fundamental frequency, RBW, VBW= 10kHz, Span =100kHz.
4. Set SPA Max hold. Mark peak.

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



### 8.3 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	N9010A	MY53400256	10/15/2014	10/14/2015
Coaxial Cable 30cm	WOKEN	00100A1F1A195C	RF01	12/19/2014	12/18/2015
DC Block	PASTERNAK	PE8210	RF29	12/19/2014	12/18/2015
Attenuator	WOKEN	218FS-10	RF23	12/19/2014	12/18/2015
DC Power Supply	Agilent	E3640A	MY53140006	05/31/2014	05/30/2015
Loop Antenna	ETS-Lindgren	6502	00143303	12/09/2014	12/08/2015

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## 8.4 Measurement Results

### A. Temperature Variation

Power Supply	Environment	Frequency	Delta (Hz)	Limit (KHz)
Vdc	Temperature ( )	(MHz)		
3.8	-20	13.560345	55.000	±1.356
3.8	-10	13.560355	45.000	±1.356
3.8	0	13.560360	40.000	±1.356
3.8	10	13.560335	65.000	±1.356
3.8	20	13.560400	0.000	±1.356
3.8	30	13.560305	95.000	±1.356
3.8	40	13.560295	105.000	±1.356
3.8	50	13.560300	100.000	±1.356

### B. Supply Voltage Variation

Power Supply	Environment	Frequency	Delta (Hz)	Limit (KHz)
Vdc	Temperature ( )	(MHz)		
4.35	20	13.560350	50.000	+/- 1.356
3.8	20	13.560400	0.000	+/- 1.356
3.3	20	13.560380	20.000	+/- 1.356

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## 9 20dB OCCUPIED BANDWIDTH MEASUREMENT

### 9.1 Limit:

None

### 9.3 Test Set-up

Refer to section 7.2 in this report

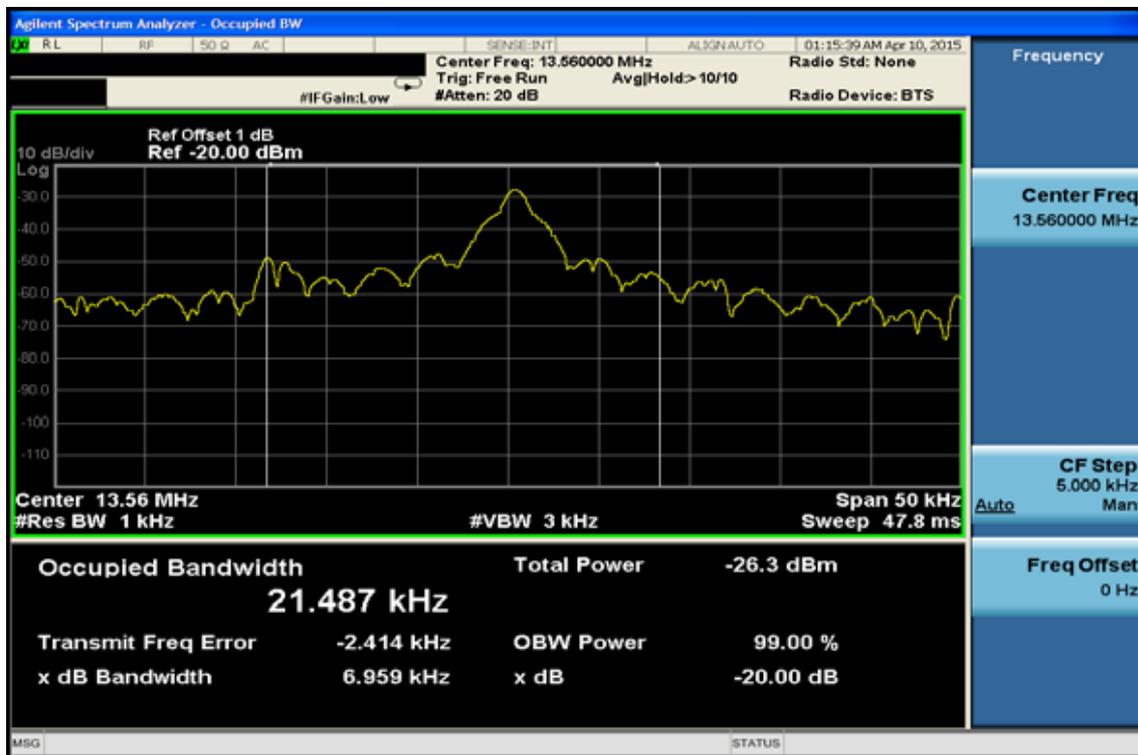
### 9.4 Measurement Procedure

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:

Frequency (MHz)	20dB Bandwidth(kHz)
13.56	6.959

#### -20dB Bandwidth



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## 10 ANTENNA REQUIREMENT

### 10.1 Standard Applicable:

According to §15.203, Antenna requirement.

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.

### 10.2 Antenna Connected Construction:

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

*~ End of Report ~*

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