

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

OF

Product Name: PeopleNet Connected Tablet

Brand Name: PeopleNet

Model No.: MS5

Model Difference: N/A

FCC ID: NKS-MS5N2

Report No.: E2/2015/10032-03

Issue Date: Aug. 22, 2018

FCC Rule Part: §15.225

Prepared for: PEOPLENET
4400 Baker Road, Minnetonka, MN 55343,
USA

Prepared by: SGS Taiwan Ltd.
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VERIFICATION OF COMPLIANCE

Applicant: PeopleNet
4400 Baker Road, Minnetonka, MN 55343, USA
Product Name: PeopleNet Connected Tablet
Brand Name: PeopleNet
Model No.: MS5
Model Difference: N/A
FCC ID: NKS-MS5N2
File Number: E2/2015/10032-03
Date of test: Jul. 25, 2018 ~ Aug. 20, 2018
Date of EUT Received: Jul. 25, 2018

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 C63.4:2014 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.225.

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

Test By:

Vito Pei

Date:

Aug. 22, 2018

Vito Pei / Engineer

Prepared By:

Yuri Tsai

Date:

Aug. 22, 2018

Yuri Tsai / Clerk

Approved By

Jim Chang

Date:

Aug. 22, 2018

Jim Chang / Manager

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Revision History

Report Number	Revision	Description	Issue Date
E2/2015/10032-01	Rev.00	Initial creation of document	Jan. 04, 2017
E2/2015/10032-02	Rev.01	Change Tablet Docking Station	Jul. 30, 2018
E2/2015/10032-03	Rev.02	Change of NFC Chip	Aug. 22, 2018

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1 GENERAL INFORMATION

1.1 Product Description

General:

Product Name:	PeopleNet Connected Tablet	
Brand Name:	PeopleNet	
Model No.:	MS5	
Model Difference:	N/A	
Hardware Version:	N/A	
Software Version:	N/A	
Tablet Docking Station:	Model No.: MS-57603, Supplier: MSI	
Power Cable	P/N: L016-0576, Supplier: ELECTRI-CORD MFG.CO.	
Power Supply:	7.4Vdc from LITHIUM-ION rechargeable battery or 12/24Vdc from DC Car battery	
	Battery:	Model No.: MS5760 , Supplier: Getac

NFC:

Operating Frequency	13.56MHz
Transmit Power	61.42dBuV/m at 3m.
Number of Channels	1
Antenna Type	Loop Antenna
Modulation Type	ASK

This report complies with FCC regulatory radio rule with respect to RFID that operates on 13.56MHz.

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1.2 Test Methodology

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..

1.3 Test Facility

SGS Taiwan Ltd. Electronics & Communication Laboratory

No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333 (TAF code 0513)

FCC Registration Numbers are: 735305 / TW0002

1.4 Special Accessories

There is no special accessory used while test was conducted.

1.5 Equipment Modifications

There was no modification incorporated into the EUT.

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2 SYSTEM TEST CONFIGURATION

2.1 EUT Configuration

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

2.2 EUT Exercise

The Transmitter was operated in the normal operating mode. the Tx frequency was fixed which was for the purpose of the measurements.

2.3 Test Procedure

2.3.1 Conducted Emissions (Not apply in the report)

The EUT is a placed on as turn table which is 0.8m 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 a placed on as turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m above the reference 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.

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2.4 Limitation

(1) Conducted Emission

According to section 15.207(a) Conducted Emission Limits is as following.

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 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.		

(2) Radiated Emission

- The field strength of any emission within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.
- Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.
- Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.
- The field strength of any emissions appearing outside of the 13.110-14.010 MHz shall not exceed the general radiated emission limits in section 15.209 as below.

Frequency (MHz)	Field strength $\mu\text{V/m}$	Distance (m)	Field strength at 3m $\text{dB}\mu\text{V/m}$
1.705-30	30	30	69.54
30-88	100	3	40
88-216	150	3	43.5
216-960	200	3	46
Above 960	500	3	54

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- Remark 1. Emission level in dBuV/m=20 log (uV/m)
:
2. Measurement was performed at an antenna to the closed point of EUT distance of meters.
 3. Distance extrapolation factor = $40 \log (\text{required distance} / \text{test distance})$ (dB);
 4. The measurement was undertaken in closer distance at 3m, where extrapolation factor is offset to convert the limit of the measurement.
Ex. $20 \cdot \log(30) + 40 \cdot \log(30/3) = 69.54 \text{ dBuV/m}$
 5. Only spurious frequency is permitted to locate within the Restricted Bands specified in provision of ξ 15.205 and RSS-Gen 7.2.5 Table 3.
 6. The general radiated emission limits in ξ 15.209 and RSS-Gen 7.2.5 Table 5 and Table 6 apply for the spurious emission generate from UE, except for the fundamental emission where the respective section specifies otherwise.

(3) Frequency Tolerance

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.

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2.5 Configuration of Tested System

Fig. 2-1 Radiated & Conducted Emission

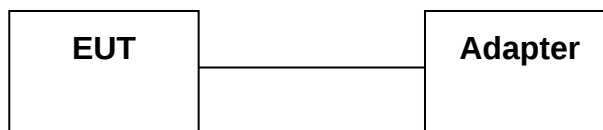


Fig. 2-2 Conducted (Antenna Port)

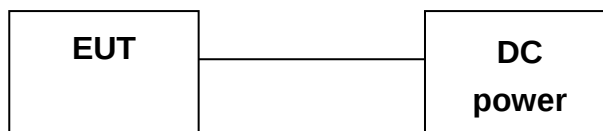


Table 2-1 Equipment Used in Tested System

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

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3 SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§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)	99% & 20 dB OCCUPIED BANDWIDTH	Compliant
§15.203	Antenna Requirement	Compliant

4 DESCRIPTION OF TEST MODES

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

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

The data rate as the lowest supported is selected while tests are conducted.

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5 MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.586 dB
Frequency Stability	+/- 123.36 Hz
20 dB OCCUPIED BANDWIDTH	+/- 123.36 Hz
Temperature	+/- 0.8 °C
Humidity	+/- 4.7 %
DC / AC Power Source	DC= +/- 1%, AC=+/- 0.2%

Radiated Spurious Emission:

Measurement uncertainty	9kHz - 30MHz: +/- 2.3dB
-------------------------	-------------------------

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

Measurement uncertainty (Polarization : Horizontal)	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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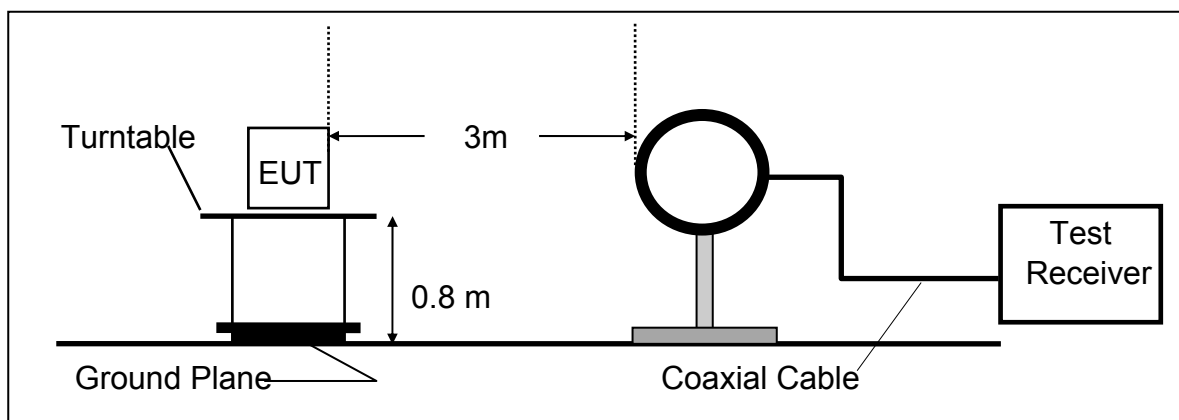
6 RADIATED EMISSION TEST

6.1 Measurement Procedure

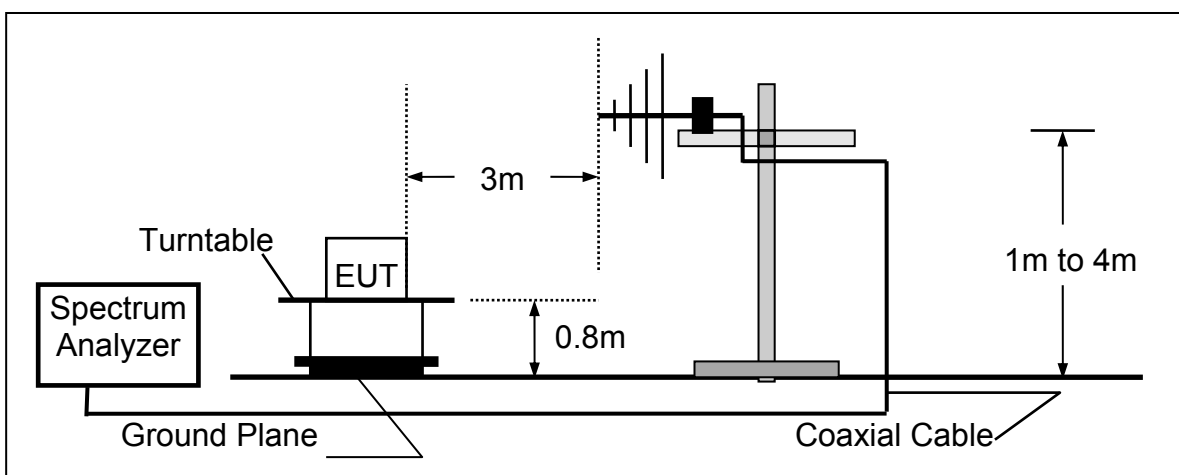
1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.

6.2 Test SET-UP (Block Diagram of Configuration)

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



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



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6.3 Measurement Equipment Used:

SGS 966 Chamber No.C					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Broadband Antenna	TESEQ	CBL 6112D	35243	2017/11/10	2018/11/9
Loop Antenna	ETS.LINDGREN	6502	148045	2017/09/26	2018/9/25
EMI Test Receiver	R&S	ESU 40	100363	2018/04/11	2019/4/10
Pre-Amplifier	EMC Instruments	EMC330	980096	2017/12/26	2018/12/25
Coaxial Cable	Huber+Suhner	RG 214/U	W21.01	2017/12/26	2018/12/25
Coaxial Cable	Huber Suhner	SUCOFLEX 104	MY17388/4	2017/12/26	2018/12/25
Coaxial Cable	Huber Suhner	RG 214/U	W22.03	2017/12/26	2018/12/25

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6.4 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	

6.5 Field Strength of Fundamental Emission

6.5.1 Limit

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 123.90dBuV/m by offsetting the distance extrapolation factor as measurement distance is taken place at 3 meters.

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

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

Note:

$$\text{Actual FS(dB}\mu\text{V/m)} = \text{Spectrum. Reading level(dB}\mu\text{V)} + \text{Factor(dB)}$$

$$\text{Factor(dB)} = \text{Antenna Factor(dB}\mu\text{V/m)} + \text{Cable Loss(dB)} - \text{Pre_Amplifier Gain(dB)}$$

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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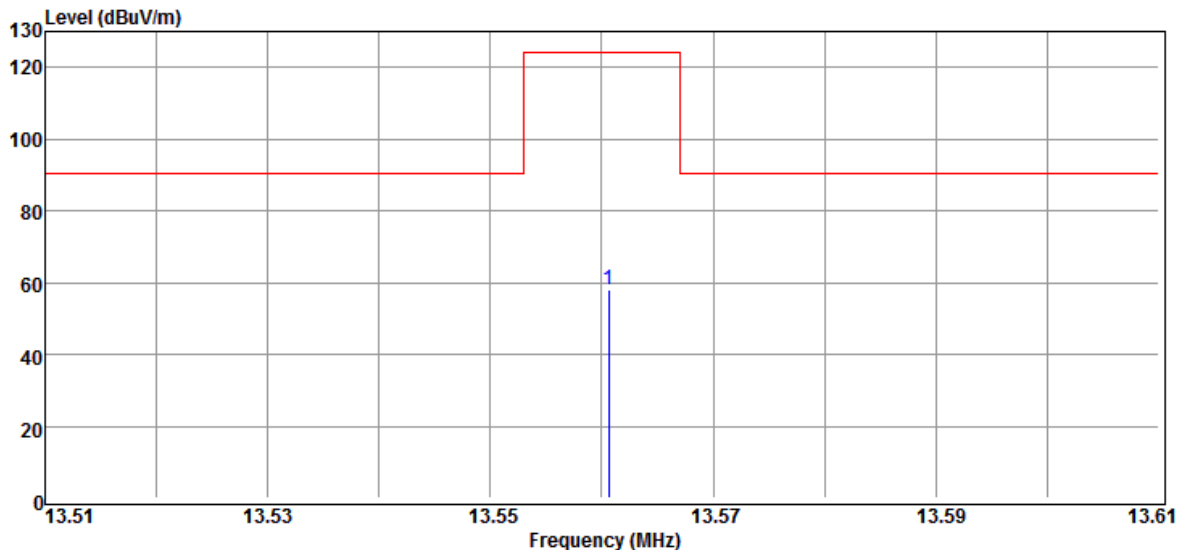
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Operation Mode	:NFC	Test Date	:2018-08-10
Test Mode	:Main CH MID	Temp./Humi.	:25/60
EUT Pol	:H Plan	Antenna Pol.	:VERTICAL
Test Channel	:13.56 MHz	Engineer	:Ashton



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBuV	dB	dBuV/m	dBuV/m	dB
13.56	Peak	46.22	11.99	58.21	124.00	-65.79

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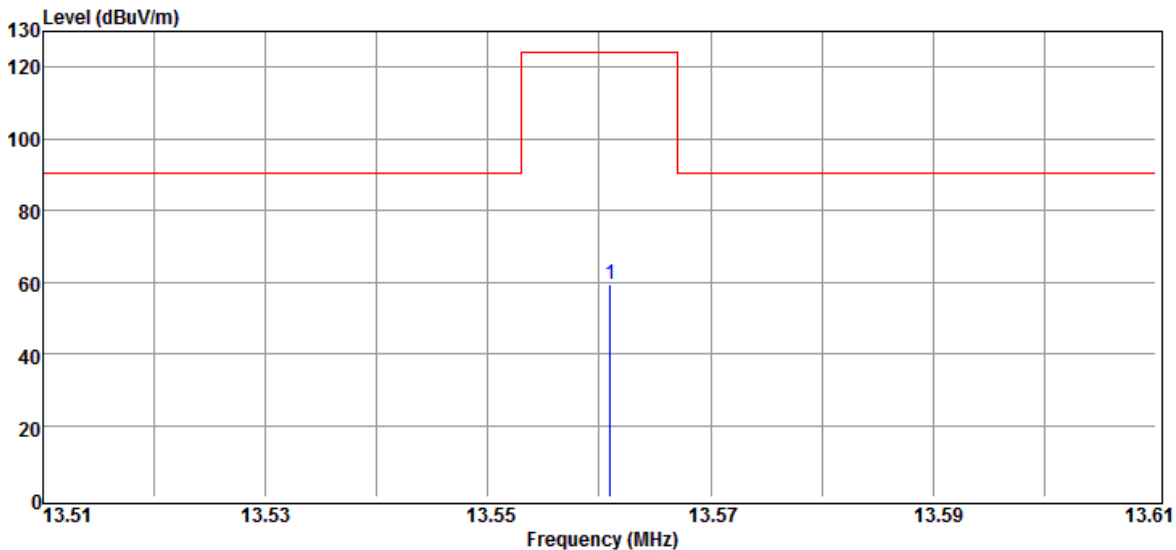
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Operation Mode	:NFC	Test Date	:2018-08-10
Test Mode	:Main CH MID	Temp./Humi.	:25/60
EUT Pol	:H Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:13.56 MHz	Engineer	:Ashton



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBuV	dB	dBuV/m	dBuV/m	dB
13.56	Peak	47.40	11.99	59.39	124.00	-64.61

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6.5.2 Radiated Mask

- (a) 15.848 millivolts/m (84 dB μ V/m) at 30 m, within the band 13.553-13.567 MHz.
- (b) 334 microvolts/m (50.5 dB μ 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 μ 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 taken in 3m for the following frequency segment of the interest:

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

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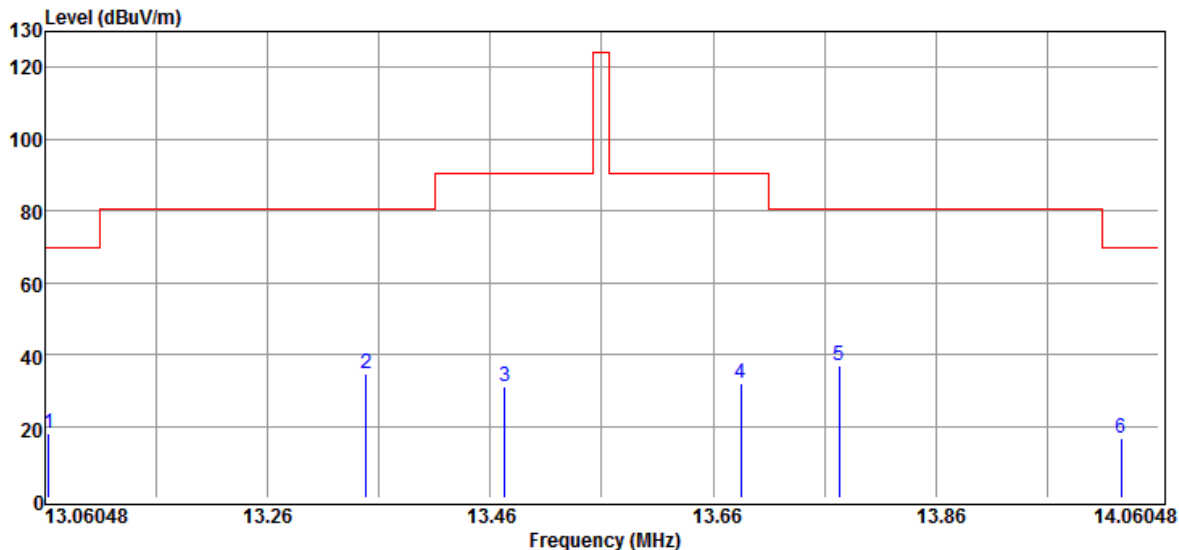
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Operation Mode	:NFC	Test Date	:2018-08-10
Test Mode	:Mask CH MID	Temp./Humi.	:25/60
EUT Pol	:H Plan	Antenna Pol.	:VERTICAL
Test Channel	:13.56 MHz	Engineer	:Ashton



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
	PK/QP/AV	dBuV	dB	dBuV/m	dBuV/m	dB
13.06	Peak	5.81	12.02	17.83	69.54	-51.71
13.35	Peak	22.50	12.00	34.50	80.54	-46.04
13.47	Peak	18.93	11.99	30.92	90.47	-59.55
13.69	Peak	19.81	11.98	31.79	90.47	-58.68
13.77	Peak	24.99	11.98	36.97	80.50	-43.53
14.03	Peak	4.75	11.96	16.71	69.54	-52.83

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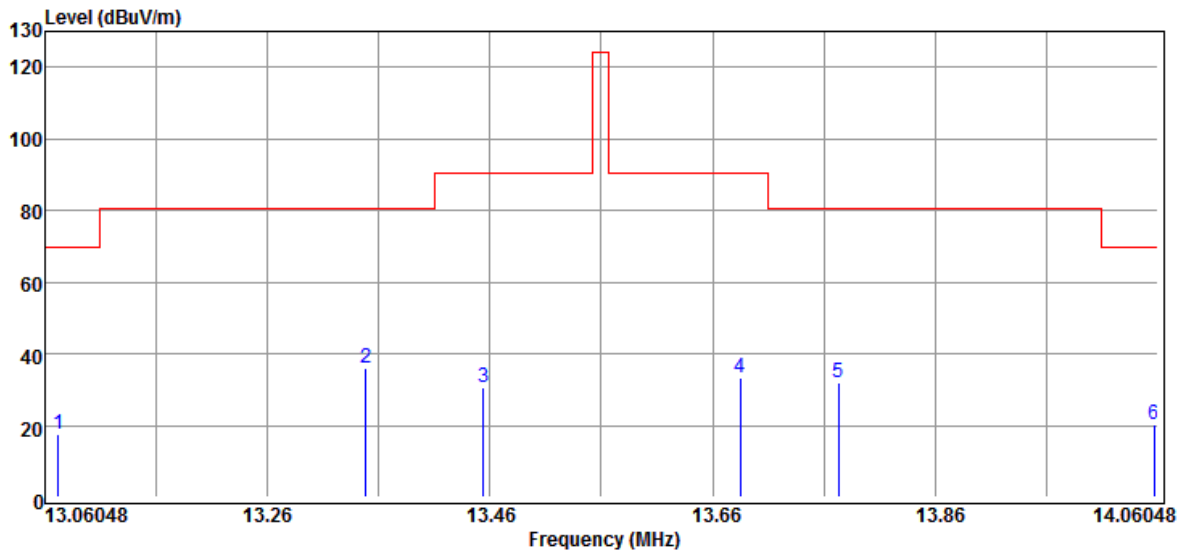
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Test Mode	:Mask CH MID	Temp./Humi.	:25/60
EUT Pol	:H Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:13.56 MHz	Engineer	:Ashton



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBuV	dB	dBuV/m	dBuV/m	dB
13.07	Peak	5.54	12.02	17.56	69.54	-51.98
13.35	Peak	24.04	12.00	36.04	80.54	-44.50
13.45	Peak	18.58	11.99	30.57	90.47	-59.90
13.69	Peak	21.51	11.98	33.49	90.47	-56.98
13.77	Peak	20.09	11.98	32.07	80.50	-48.43
14.06	Peak	8.10	11.96	20.06	69.54	-49.48

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6.5.3 Radiated Emission –

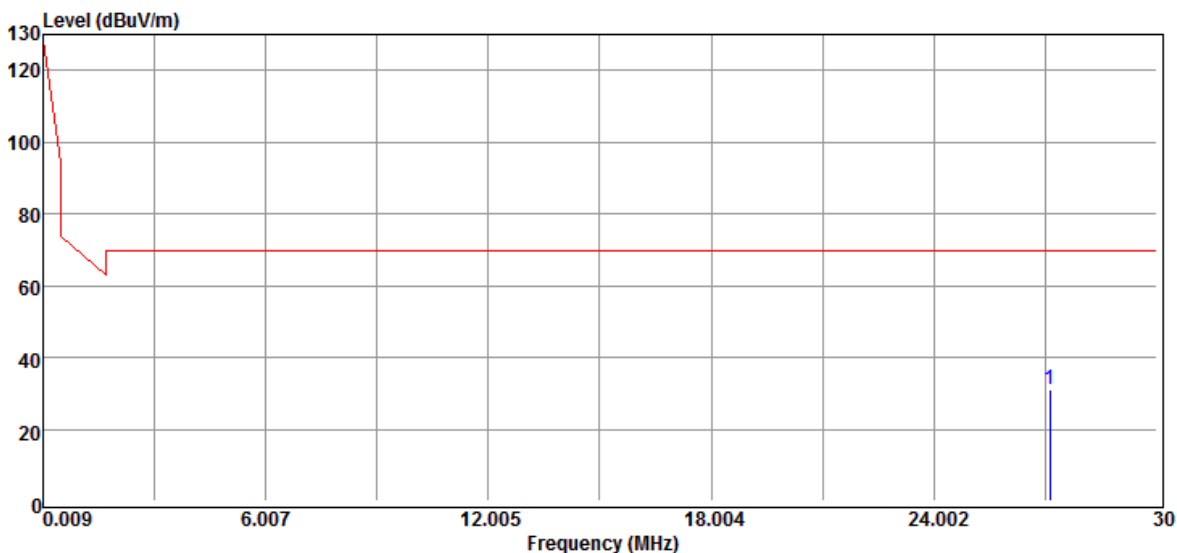
Limit:

§15.225 (d) 30 microvolts/m (29.4 dBμV/m) at 30 m, outside the band 13.110-14.010 MHz. Limit is converted by adding the distance extrapolation factor as the measurement distance was taken place at 3m.

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

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

Operation Mode	:NFC	Test Date	:2018-08-10
Test Mode	:TX CH MID	Temp./Humi.	:25/60
EUT Pol	:H Plan	Antenna Pol.	:VERTICAL
Test Channel	:13.56 MHz	Engineer	:Ashton



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
27.12	Peak	20.95	10.21	31.16	69.54	-38.38

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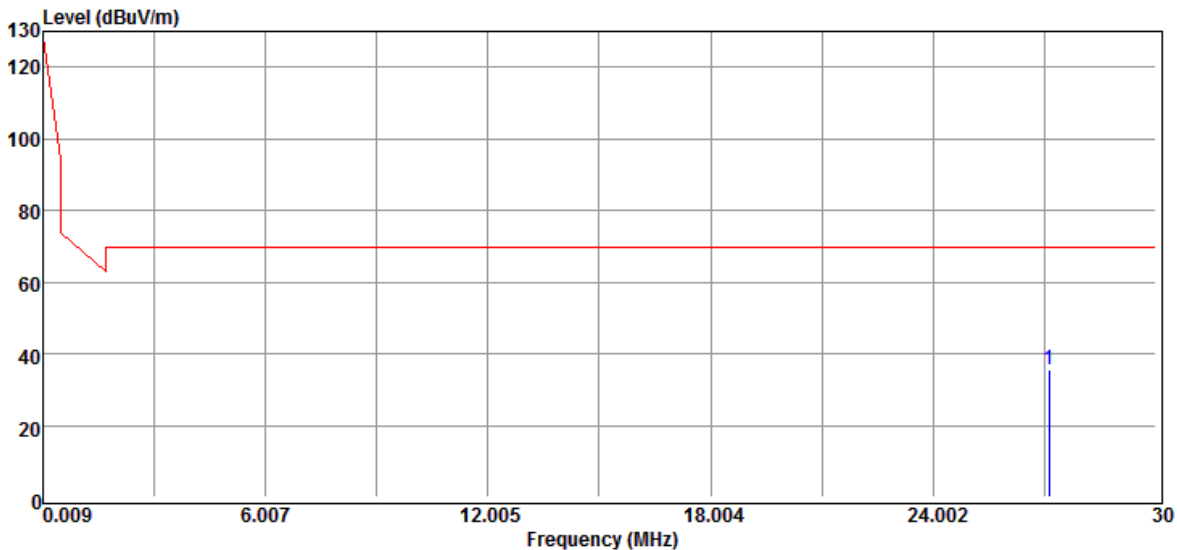
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Operation Mode	:NFC	Test Date	:2018-08-10
Test Mode	:TX CH MID	Temp./Humi.	:25/60
EUT Pol	:H Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:13.56 MHz	Engineer	:Ashton



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
27.12	Peak	25.30	10.21	35.51	69.54	-34.03

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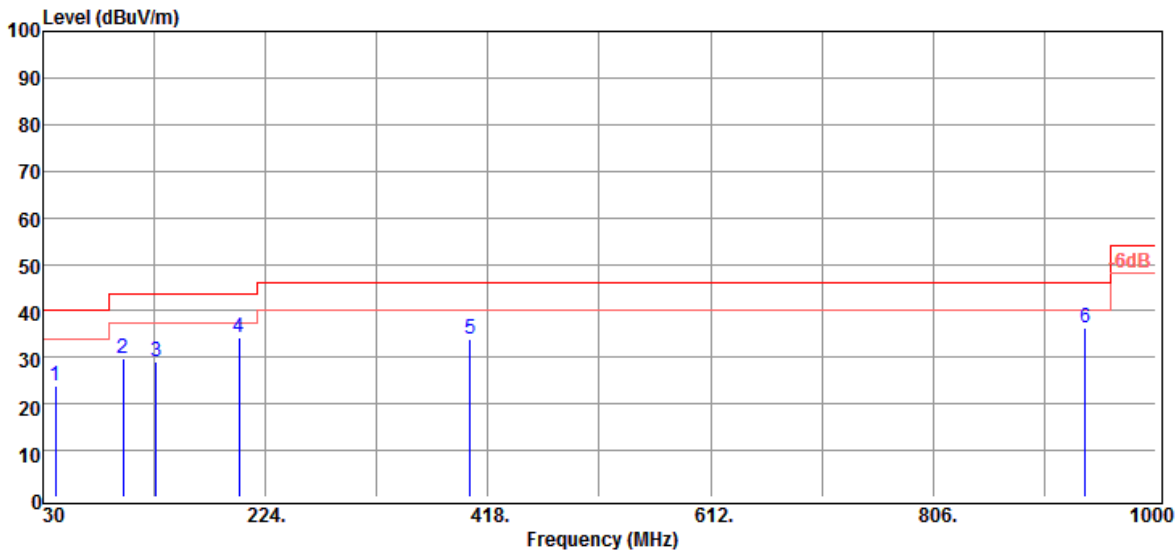
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Operation Mode	:NFC	Test Date	:2018-08-10
Test Mode	:TX CH MID	Temp./Humi.	:25/60
EUT Pol	:H Plan	Antenna Pol.	:VERTICAL
Test Channel	:13.56 MHz	Engineer	:Ashton



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
	PK/QP/AV	dBuV	dB	dBuV/m	dBuV/m	dB
40.68	Peak	33.11	-9.17	23.94	40.00	-16.06
99.84	Peak	44.71	-14.81	29.90	43.50	-13.60
128.94	Peak	40.46	-11.51	28.95	43.50	-14.55
200.72	Peak	47.29	-12.92	34.37	43.50	-9.13
402.48	Peak	40.00	-5.99	34.01	46.00	-11.99
938.89	Peak	34.50	1.86	36.36	46.00	-9.64

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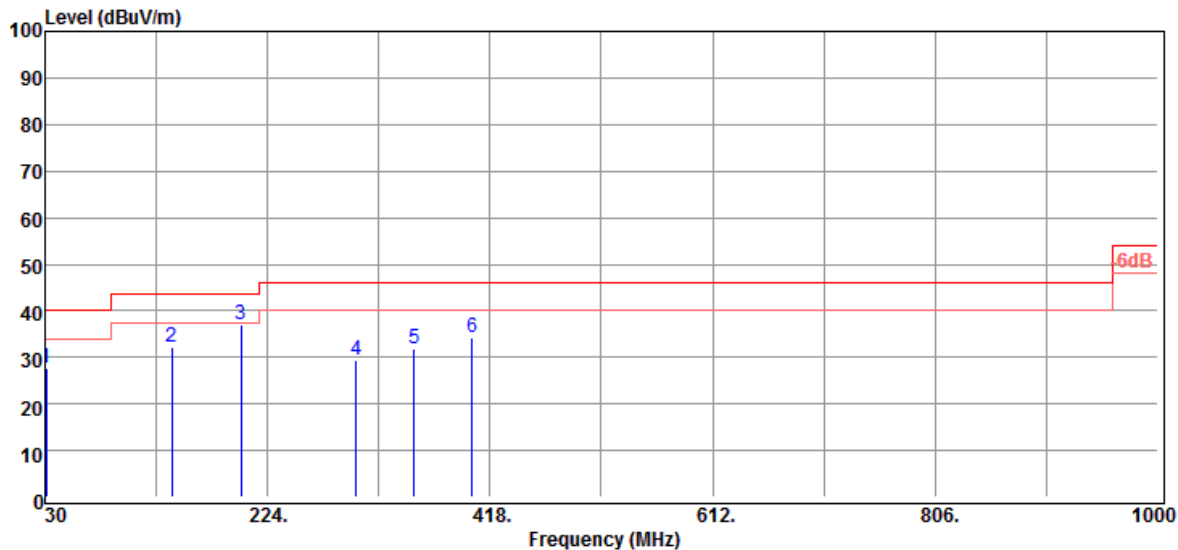
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Operation Mode	:NFC	Test Date	:2018-08-10
Test Mode	:TX CH MID	Temp./Humi.	:25/60
EUT Pol	:H Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:13.56 MHz	Engineer	:Ashton



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBuV	dB	dBuV/m	dBuV/m	dB
30.97	Peak	31.94	-4.16	27.78	40.00	-12.22
140.58	Peak	44.12	-11.93	32.19	43.50	-11.31
200.72	Peak	49.84	-12.92	36.92	43.50	-6.58
301.60	Peak	39.20	-9.83	29.37	46.00	-16.63
352.04	Peak	39.93	-7.95	31.98	46.00	-14.02
402.48	Peak	40.32	-5.99	34.33	46.00	-11.67

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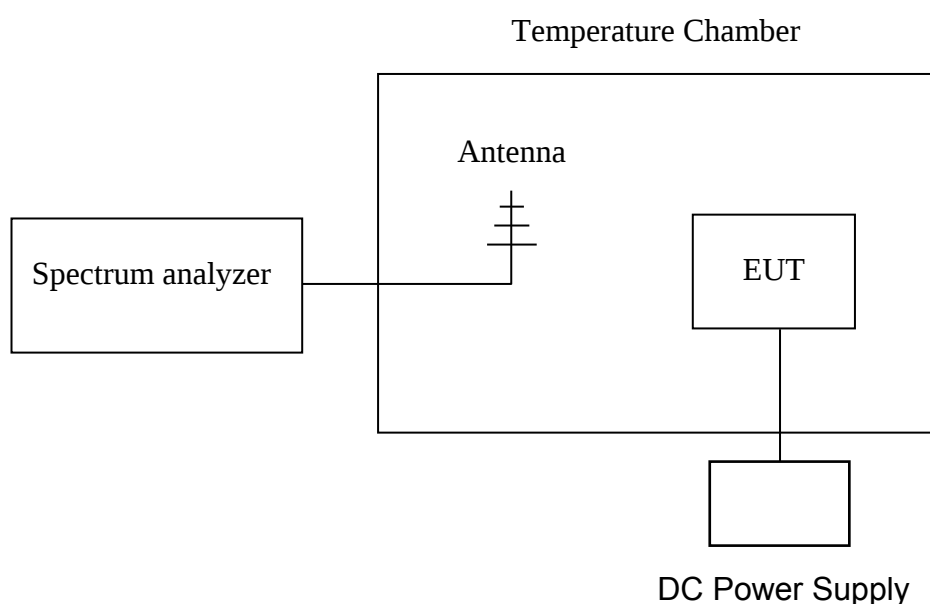
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8 FREQUENCY TOLERANCE

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	2017/10/30	2018/10/29
Temperature Chamber	TERCHY	MHK-120LK	1020582	2018/06/19	2019/06/18
DC Block	PASTERNAK	PE8210	RF29	2017/12/08	2018/12/07
Loop Antenna	ETS-Lindgren	6502	00143303	2017/12/04	2018/12/03
DC Power Supply	Agilent	E3640A	MY53140006	2018/05/02	2019/05/01

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8.4 Measurement Results

Startup

A. Temperature Variation

Power Supply Vdc	Environment Temperature ()	Frequency (MHz)	Delta (KHz)	Limit (KHz)
7.4	-20	13.5607	-0.91000	+/- 1.356
7.4	-10	13.55959	0.20000	+/- 1.356
7.4	0	13.56025	-0.46000	+/- 1.356
7.4	10	13.56025	-0.46000	+/- 1.356
7.4	20	13.55979	0.00000	+/- 1.356
7.4	30	13.56107	-1.28000	+/- 1.356
7.4	40	13.56056	-0.77000	+/- 1.356
7.4	50	13.5608	-1.01000	+/- 1.356

B. Supply Voltage Variation

Power Supply Vdc	Environment Temperature ()	Frequency (MHz)	Delta (KHz)	Limit (KHz)
8.51	20	13.56084	-0.24000	+/- 1.356
7.4	20	13.5606	0.00000	+/- 1.356
6.29	20	13.55994	0.66000	+/- 1.356

2 minutes

A. Temperature Variation

Power Supply Vdc	Environment Temperature ()	Frequency (MHz)	Delta (KHz)	Limit (KHz)
7.4	-20	13.56074	0.21000	+/- 1.356
7.4	-10	13.55993	1.02000	+/- 1.356
7.4	0	13.56066	0.29000	+/- 1.356
7.4	10	13.56088	0.07000	+/- 1.356
7.4	20	13.56095	0.00000	+/- 1.356
7.4	30	13.56054	0.41000	+/- 1.356
7.4	40	13.56023	0.72000	+/- 1.356
7.4	50	13.56143	-0.48000	+/- 1.356

B. Supply Voltage Variation

Power Supply Vdc	Environment Temperature ()	Frequency (MHz)	Delta (KHz)	Limit (KHz)
8.51	20	13.5611	470.00000	+/- 1.356
7.4	20	13.56157	0.00000	+/- 1.356
6.29	20	13.56003	1540.00000	+/- 1.356

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5 minutes

A. Temperature Variation

Power Supply Vdc	Environment Temperature ()	Frequency (MHz)	Delta (KHz)	Limit (KHz)
7.4	-20	13.56007	1400.00000	+/- 1.356
7.4	-10	13.55918	2290.00000	+/- 1.356
7.4	0	13.55952	1950.00000	+/- 1.356
7.4	10	13.56092	550.00000	+/- 1.356
7.4	20	13.56147	0.00000	+/- 1.356
7.4	30	13.56009	1380.00000	+/- 1.356
7.4	40	13.56174	-270.00000	+/- 1.356
7.4	50	13.56064	830.00000	+/- 1.356

B. Supply Voltage Variation

Power Supply Vdc	Environment Temperature ()	Frequency (MHz)	Delta (KHz)	Limit (KHz)
8.51	20	13.56097	-1210.00000	+/- 1.356
7.4	20	13.55976	0.00000	+/- 1.356
6.29	20	13.5616	-1840.00000	+/- 1.356

10minutes

A. Temperature Variation

Power Supply Vdc	Environment Temperature ()	Frequency (MHz)	Delta (KHz)	Limit (KHz)
7.4	-20	13.55911	1190.00000	+/- 1.356
7.4	-10	13.56086	-560.00000	+/- 1.356
7.4	0	13.55922	1080.00000	+/- 1.356
7.4	10	13.56069	-390.00000	+/- 1.356
7.4	20	13.5603	0.00000	+/- 1.356
7.4	30	13.56008	220.00000	+/- 1.356
7.4	40	13.56068	-380.00000	+/- 1.356
7.4	50	13.56208	-1780.00000	+/- 1.356

B. Supply Voltage Variation

Power Supply Vdc	Environment Temperature ()	Frequency (MHz)	Delta (KHz)	Limit (KHz)
8.51	20	13.56017	1010.00000	+/- 1.356
7.4	20	13.56118	0.00000	+/- 1.356
6.29	20	13.56125	-70.00000	+/- 1.356

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9 20 dB OCCUPIED BANDWIDTH MEASUREMENT

9.1 Standard Applicable:

§2.1049 & §15.215 (c)

9.2 Limit:

None

9.3 Test Set-up

Refer to section 6.2 in this report

9.4 Measurement Procedure

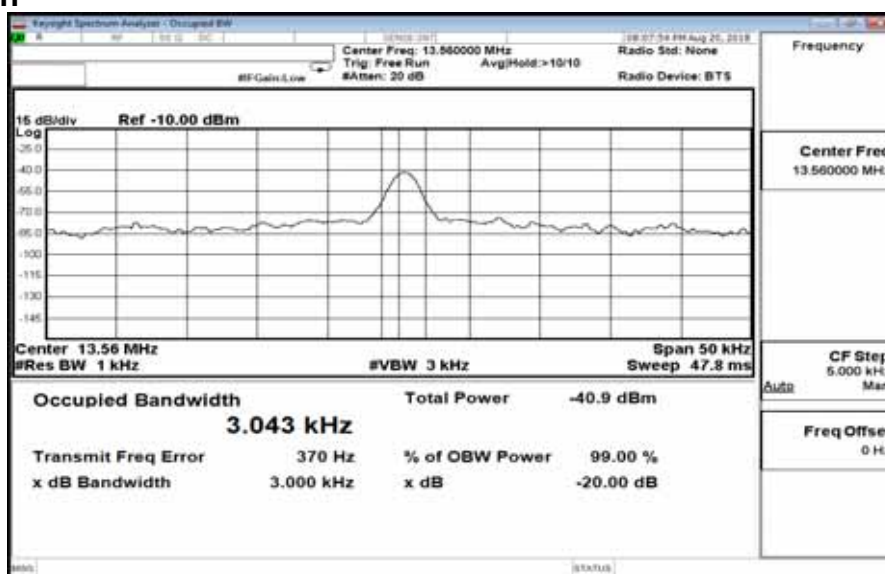
20dB bandwidth

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 1 kHz were used.
3. Measured the spectrum width with power higher than 20dB below carrier.

9.5 Measurement Equipment Used:

Refer to section 6.3 in this report

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

~ End of Report ~

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