

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT INDUSTRY CANADA RSS-210

OF

Product Name: Tablet
Brand Name: TomTom
Model No.: 4FI73
Model Difference: N/A
FCC ID: S4L4FI73
IC: 5767A-4FI73
Report No.: E2/2014/40052
Issue Date: May. 26, 2014
FCC Rule Part: §15.225
IC Rule Part: RSS-210 issue 8: 2010, Annex 2 A2.6
Prepared for: TomTom International B.V.
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SGS Taiwan Ltd.
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VERIFICATION OF COMPLIANCE

Applicant: TomTom International B.V.
De Ruijterkade 154, Amsterdam 1011 AC Netherlands

Product Name: Tablet

Brand Name: TomTom

Model No.: 4FI73

Model Difference: N/A

FCC ID: S4L4FI73

IC: 5767A-4FI73

File Number: E2/2014/40055

Date of test: Apr. 23, 2014 ~ May. 23, 2014

Date of EUT Received: Apr. 23, 2014

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 C63.4:2009 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 and RSS-210 issue 8: 2010 Annex 2 A2.6.

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

Test By:

Jazz Huang

Date:

May. 26, 2014

Jazz Huang / Sr. Engineer

Prepared By:

Tiffany Kao

Date:

May. 26, 2014

Tiffany Kao / Clerk

Approved By

Jim Chang

Date:

May. 26, 2014

Jim Chang / Supervisor

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Version

Version No.	Date	Description
00	May. 26, 2014	Initial creation of document

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Table of Contents

1	GENERAL INFORMATION	6
1.1	PRODUCT DESCRIPTION.....	6
1.2	RELATED SUBMITTAL(S) / GRANT (S)	7
1.3	TEST METHODOLOGY.....	7
1.4	TEST FACILITY	7
1.5	SPECIAL ACCESSORIES	7
1.6	EQUIPMENT MODIFICATIONS	7
2	SYSTEM TEST CONFIGURATION	8
2.1	EUT CONFIGURATION	8
2.2	EUT EXERCISE	8
2.3	TEST PROCEDURE.....	8
2.4	LIMITATION	9
2.5	CONFIGURATION OF TESTED SYSTEM	11
3	SUMMARY OF TEST RESULTS.....	13
4	DESCRIPTION OF TEST MODES.....	13
5	MEASUREMENT UNCERTAINTY	14
6	CONDUCTED EMISSIONS TEST.....	15
6.1	STANDARD APPLICABLE:	15
6.2	MEASUREMENT EQUIPMENT USED:	15
6.3	EUT SETUP:.....	15
6.4	TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	16
6.5	MEASUREMENT PROCEDURE:.....	16
6.6	MEASUREMENT RESULT:.....	16
7	RADIATED EMISSION TEST	19
7.1	MEASUREMENT PROCEDURE.....	19
7.2	TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	19
7.3	MEASUREMENT EQUIPMENT USED:	20
7.4	FIELD STRENGTH CALCULATION	21
7.5	FIELD STRENGTH OF FUNDAMENTAL EMISSION	21
8	FREQUENCY TOLERANCE	30
8.1	MEASUREMENT PROCEDURE.....	30
8.2	TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	30
8.3	MEASUREMENT EQUIPMENT USED:	31
8.4	MEASUREMENT RESULTS	31

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9	99% & 20 DB OCCUPIED BANDWIDTH MEASUREMENT	33
9.1	STANDARD APPLICABLE:	33
9.2	LIMIT:	33
9.3	TEST SET-UP	33
9.4	MEASUREMENT PROCEDURE.....	33
9.5	MEASUREMENT EQUIPMENT USED:	33
10	ANTENNA REQUIREMENT	35
10.1.	STANDARD APPLICABLE:	35
10.2.	ANTENNA CONNECTED CONSTRUCTION:	35

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1 GENERAL INFORMATION

1.1 Product Description

General:

Product Name:	Tablet	
Brand Name:	TomTom	
Model No.:	4FI73	
Model difference:	N/A	
Hardware Version:	v03	
Software Version:	Version 4.3	
DC Power Cable:	Model No.: 4FI0.000.00, Supplier: TomTom	
Car Charger:	Model No.: 4UFI.001.00, Supplier: TomTom	
MIC:	Model No.: NEIM1100106, Supplier: TomTom	
MIC Cable:	Model No.: P7051-13, Supplier: TomTom	
Basic Cradle:	Model No.: 4FI74, Supplier: TomTom	
Video Cradle:	Model No.: 4FI75, Supplier: TomTom	
Power Supply:	3.8Vdc form Rechargeable Li-ion Battery or 5Vdc from Micro USB port	
	Battery:	Model No.: UZ6, Supplier: TomTom

NFC:

Operating Frequency	13.56MHz
Transmit Power	< 123dBuV/m at 3m.
Number of Channels	1
Antenna Type	Loop Antenna
Modulation Type	ASK, BPSK
Type of Emission:	24K3F1D

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

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1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: S4L4FI73** filing to comply with Section 15.225 of the FCC Part 15, Subpart C Rules and **IC: 5767A-4FI73** filing to comply with Industry Canada RSS-210 issue 8: 2010 Annex 2.

1.3 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4:2009 and RSS-Gen: 2010. Radiated testing was performed at an antenna to EUT distance 3 meters.

1.4 Test Facility

The measurement facilities used to collect the 3m Radiated Emission and AC power line conducted data are located on the address of SGS Taiwan Ltd. Electronics & Communication Laboratory No.2, Keji 1st Rd., Guishan Township, Taoyuan County, Taiwan which are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4: 2009. FCC Registration Number: 628985. The address of SGS Taiwan Ltd. Electronics & Communication Laboratory 1F, No.134, Wukung Road New Taipei City TAIWAN 24803, Canada Registration Number: 4620A-5.

The 10 m Open Area Test Sites located on the address of SGS Taiwan Ltd. Electronics & Communication Laboratory No.2, Keji 1st Rd., Guishan Township, Taoyuan County, Taiwan which is constructed and calibrated to meet the CISPR 22/EN 55022 requirements. FCC Registration Number: 455997. The address of SGS Taiwan Ltd. Electronics & Communication Laboratory 1F, No.134, Wukung Road New Taipei City TAIWAN 24803, IC Registration Number: 4620A-6.

1.5 Special Accessories

There is no special accessory used while test was conducted.

1.6 Equipment Modifications

There was no modification incorporated into the EUT.

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2 System Test Configuration

2.1 EUT Configuration

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

2.2 EUT Exercise

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

2.3 Test Procedure

2.3.1 Conducted Emissions

The EUT is placed on a turn table which is 0.8 m above ground plane. According to the general criterion in Section 7.1 of ANSI C63.4:2009 and RSS-Gen:2010. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz, and the measurement procedure 7.3 in ANSI 63.4:2009 is followed to carry out the test. The CISPR Quasi-Peak and Average detector mode is employed according to §15.107

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 according to the requirements in Section 8 and 13 and of ANSI C63.4:2009 and RSS-Gen:2010.

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2.4 Limitation

(1) Conducted Emission

According to section 15.207(a) and RSS-Gen 7.2.4 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 and RSS-210 7.2.5 Table 5 and Table 6 (Intentional Radiators general limit).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 = $20 \log (\mu\text{V/m})$
 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. $20 * \log(30) + 40 * \log(30/3) = 69.54 \text{ dBuV/m}$
 5. Only spurious frequency is permitted to locate within the Restricted Bands specified in provision of § 15.205 and RSS-Gen 7.2.5 Table 3.
 6. The general radiated emission limits in § 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 Emission

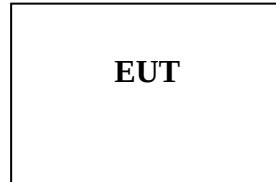


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	NFC Test Software	N/A	N/A	N/A	N/A	N/A

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Fig. 2-3 AC Power Line Conducted Emission

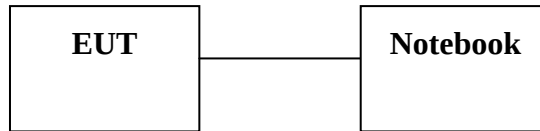


Table 2-2 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	Notebook	Lenovo	L412	LR-027LM	Shield	Un-shield
2.	NFC Test Software	N/A	N/A	N/A	N/A	N/A

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3 Summary of Test Results

FCC / IC Rules	Description Of Test	Result
§ 15.207 RSS-Gen §7.2.4	AC Power Line Conducted Emission	Compliant
§ 15.225 (a)-(d) RSS210 Annex 2 A2.6	Radiated Emission	Compliant
§15.209 RSS-Gen §7.2.5	Radiated Emission Limits, general requirement	Compliant
§ 15.225 (e) RSS210 Annex 2 A2.6	Frequency Stability	Compliant
§2.1049 § 15.215 (c) RSS-Gen §4.6.1	99% & 20 dB OCCUPIED BANDWIDTH	Compliant
§15.203 RSS-GEN §7.1.2,	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.

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 E2 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
99% & 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 (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 Conducted Emissions Test

6.1 Standard Applicable:

According to §15.207 and RSS-Gen §7.2.4, 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 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:

SGS Conducted Emission Test Site No.A					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
EMI Test Receiver	R&S	ESCI 3	101311	2013/06/27	2014/06/26
Coaxial Cables	N/A	N30N30-1042-150cm	N/A	2014/02/07	2015/02/06
LISN	Schwarzbeck	NSLK 8127	8127-648	2013/06/17	2014/06/16
LISN	Rolf-Heine	NNB-2/16Z	99012	2014/03/26	2015/03/25
Test Software	Farad	EZ-EMC	Ver. SGS-03A2	N.C.R.	N.C.R.

6.3 EUT Setup:

1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.4-2009.
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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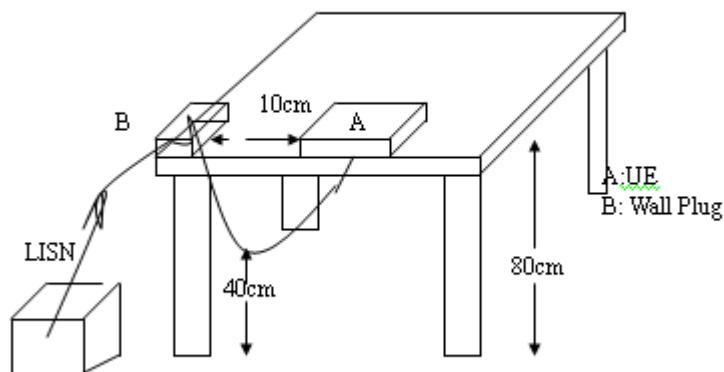
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6.4 Test SET-UP (Block Diagram of Configuration)



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 frequency measured were complete.

6.6 Measurement Result:

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

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

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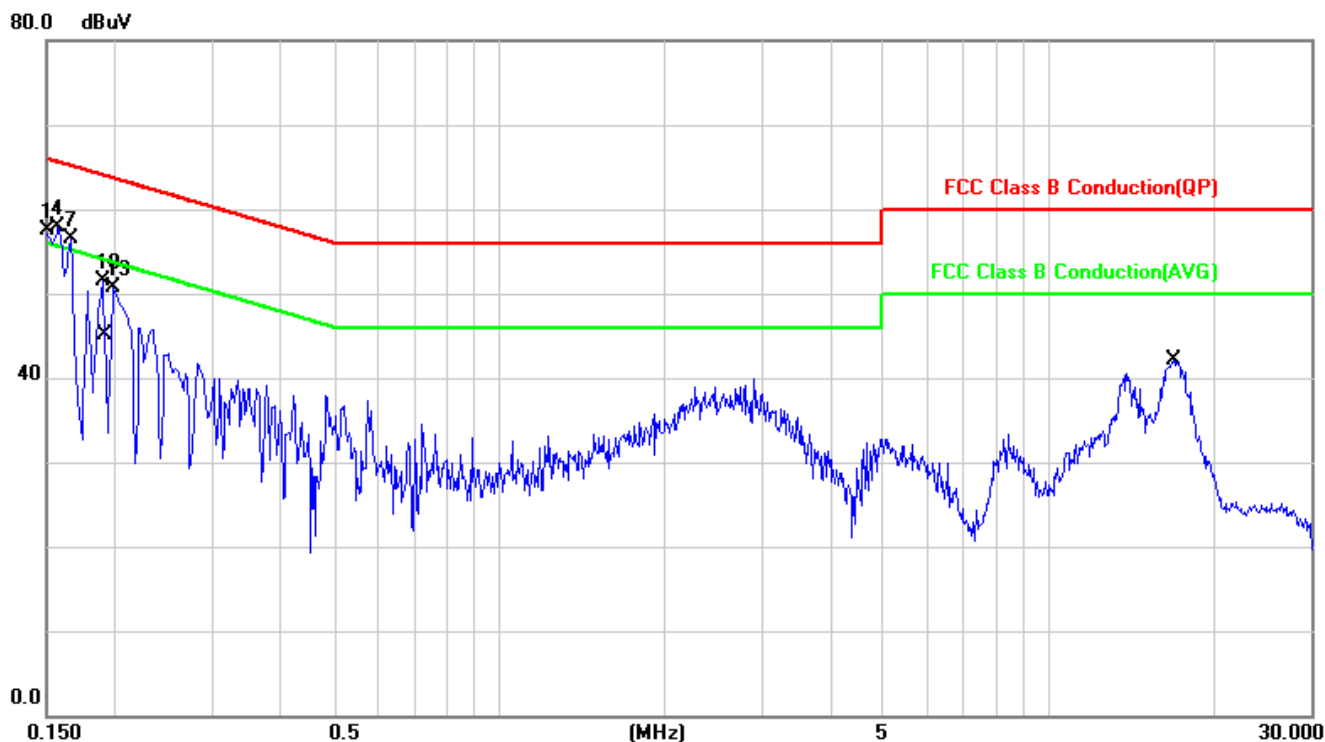
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AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	Operation mode			Test Date:	May. 20, 2013
Temperature:	26 °C	Humidity:	60 %	Test By:	Jazz
				Probe:	L1/N



No.	Mk.	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Comment
		(MHz)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dB)		
1		0.1500	56.87	0.54	57.41	66.00	-8.59	peak	
2		0.1500	56.40	0.54	56.94	66.00	-9.06	QP	
3		0.1500	42.10	0.54	42.64	56.00	-13.36	AVG	
4	*	0.1580	57.36	0.54	57.90	65.57	-7.67	peak	
5		0.1580	53.50	0.54	54.04	65.57	-11.53	QP	
6		0.1580	34.80	0.54	35.34	55.57	-20.23	AVG	
7		0.1660	55.94	0.54	56.48	65.16	-8.68	peak	
8		0.1676	50.70	0.54	51.24	65.08	-13.84	QP	
9		0.1676	31.00	0.54	31.54	55.08	-23.54	AVG	
10		0.1900	50.94	0.53	51.47	64.04	-12.57	peak	
11		0.1940	47.50	0.53	48.03	63.86	-15.83	QP	
12		0.1940	34.80	0.53	35.33	53.86	-18.53	AVG	
13		0.1980	50.24	0.53	50.77	63.69	-12.92	peak	
14		0.1991	46.20	0.53	46.73	63.65	-16.92	QP	
15		0.1991	33.10	0.53	33.63	53.65	-20.02	AVG	
16		16.8890	35.00	1.29	36.29	60.00	-23.71	QP	

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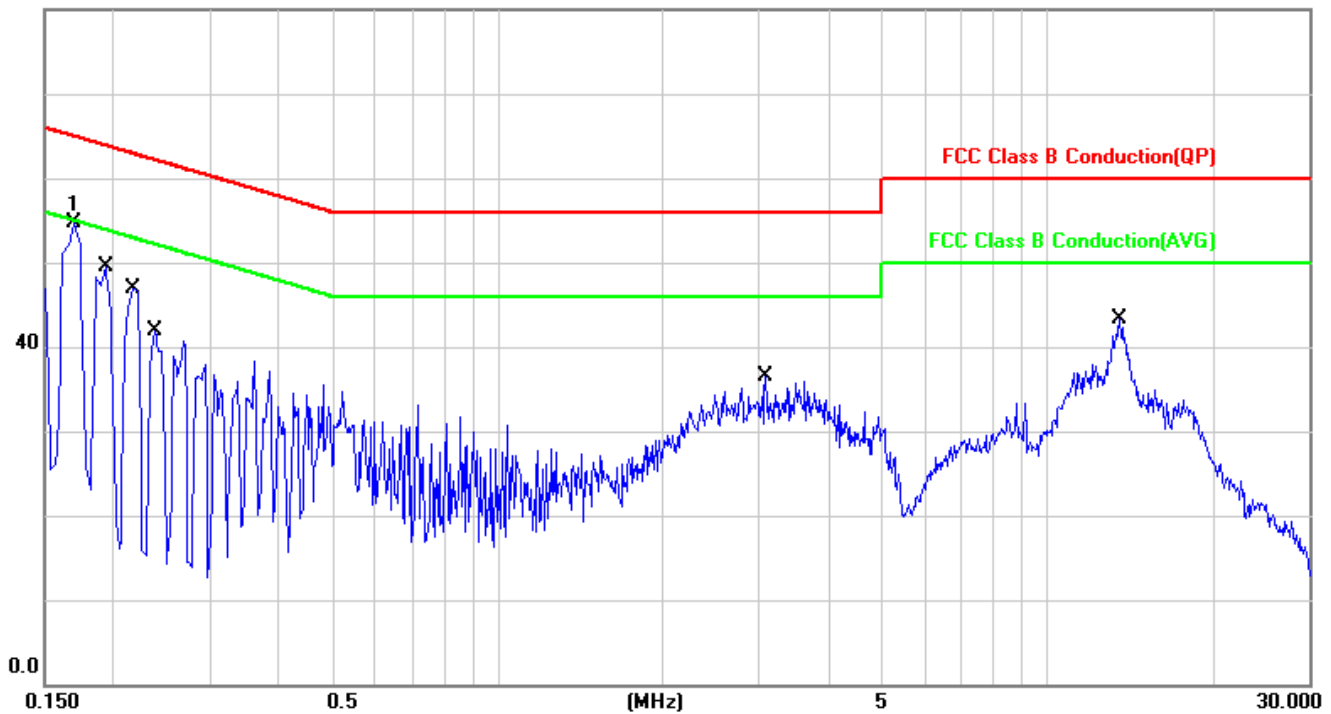
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80.0 dBuV



No.	Mk.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Measurement (dBuV)	Limit (dBuV)	Over (dB)	Detector	Comment
1	*	0.1700	54.43	0.18	54.61	64.96	-10.35	peak	
2		0.1712	49.00	0.18	49.18	64.90	-15.72	QP	
3		0.1712	26.60	0.18	26.78	54.90	-28.12	AVG	
4		0.1932	50.30	0.18	50.48	63.90	-13.42	QP	
5		0.2175	43.20	0.19	43.39	62.91	-19.52	QP	
6		0.2360	42.50	0.20	42.70	62.24	-19.54	QP	
7		3.0960	30.70	0.75	31.45	56.00	-24.55	QP	
8		13.5565	37.90	0.80	38.70	60.00	-21.30	QP	

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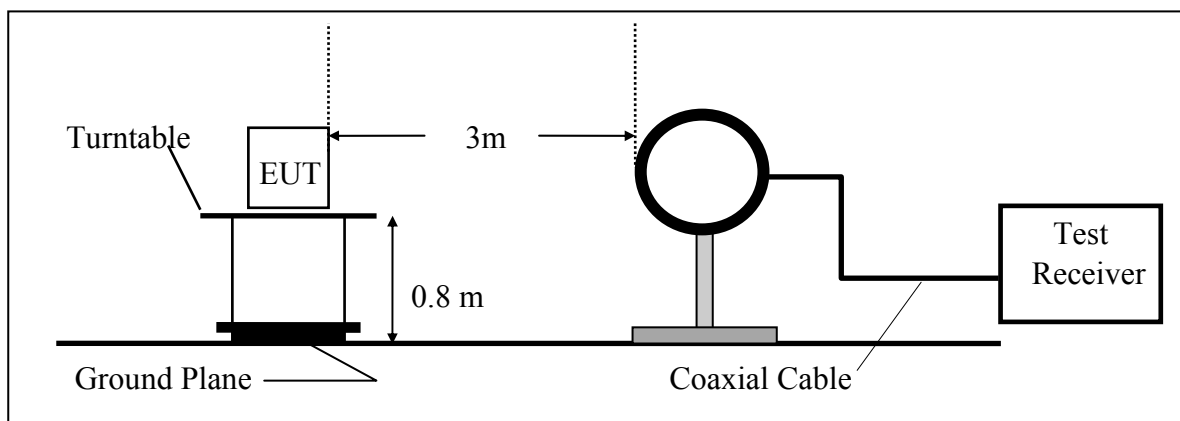
7 Radiated Emission Test

7.1 Measurement Procedure

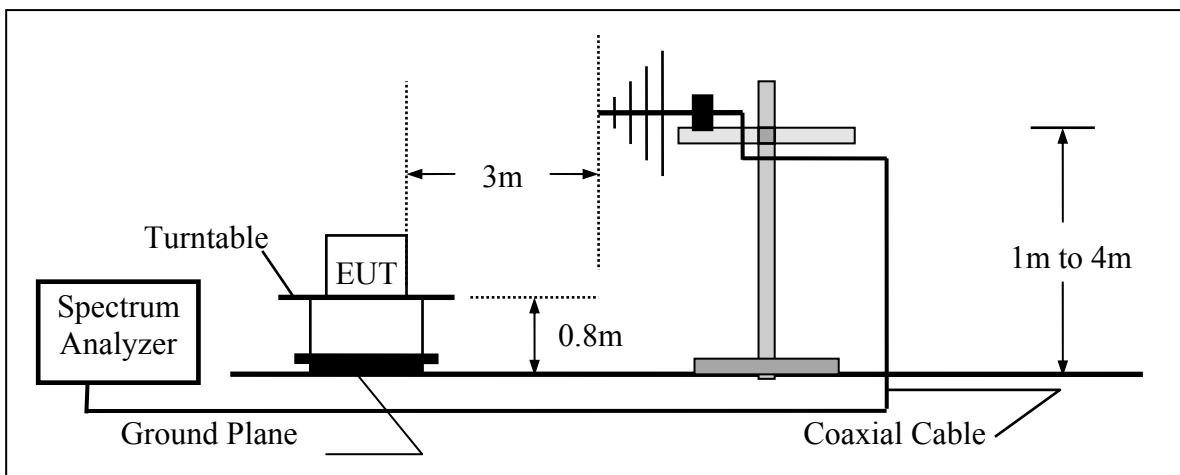
1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.

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 Below 1000MHz



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7.3 Measurement Equipment Used:

SGS SAC Chamber No.C (FCC/IC/NCC)					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
EMI Test Receiver	R&S	ESU 40	100363	2014/04/12	2015/04/11
Loop Antenna	ETS-Lindgren	6502	00143303	2014/01/16	2015/01/15
Broadband Antenna	TESEQ	CBL 6112D	35240	2014/01/17	2015/01/16
Horn Antenna	ETS-Lindgren	3117	00143272	2014/01/27	2015/01/26
Horn Antenna	Schwarzbeck	BBHA9170	BBHA9170-184	2014/01/23	2015/01/22
Horn Antenna	ETS-Lindgren	3160-09	00117911	2014/01/22	2015/01/21
Horn Antenna	ETS-Lindgren	3160-10	00117783	2014/01/22	2015/01/21
Pre Amplifier	R&S	SCU-18	10204	2014/03/26	2015/03/25
Pre Amplifier	R&S	SCU-26	100780	2014/03/26	2015/03/25
Pre Amplifier	R&S	SCU-40	100356	2014/03/26	2015/03/25
Pre Amplifier	EMC Instruments	EMC330	980096	2014/03/26	2015/03/25
Pre Amplifier	EMC Instruments	EMC184045	980135	2014/01/24	2015/01/23
Coaxial Cable	Huber+Suhner	RG 214/U	W21.03	2014/03/26	2015/03/25
Coaxial Cable	Huber+Suhner	RG 214/U	W22.03	2014/03/26	2015/03/25
Coaxial Cable	Huber+Suhner	SUCCOFLEX 104	MY17413/4	2014/03/26	2015/03/25
Coaxial Cable	Huber+Suhner	SUCCOFLEX 104	MY17404/4	2014/03/26	2015/03/25
Coaxial Cable	Huber+Suhner	SUCCOFLEX 104	MY17394/4	2014/03/26	2015/03/25
Coaxial Cable	Huber+Suhner	SUCCOFLEX 104	MY17386/4	2014/03/26	2015/03/25
Coaxial Cable	Huber+Suhner	SUCCOFLEX 104	MY17388/4	2014/03/26	2015/03/25
Attenuator	WOKEN	218FS-10	HY-151	2014/01/06	2015/01/05
Communication Tester	R&S	CMW500	131121	2014/01/16	2015/01/15
Communication Tester	Anritsu	MT8820C	6201107337	2014/04/23	2015/04/22
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.
Site NSA	SGS	966 Chamber C	SAC-C	2014/03/05	2015/03/04
Site VSWR	SGS	966 Chamber C	SAC-C	2014/04/10	2015/04/09
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	

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 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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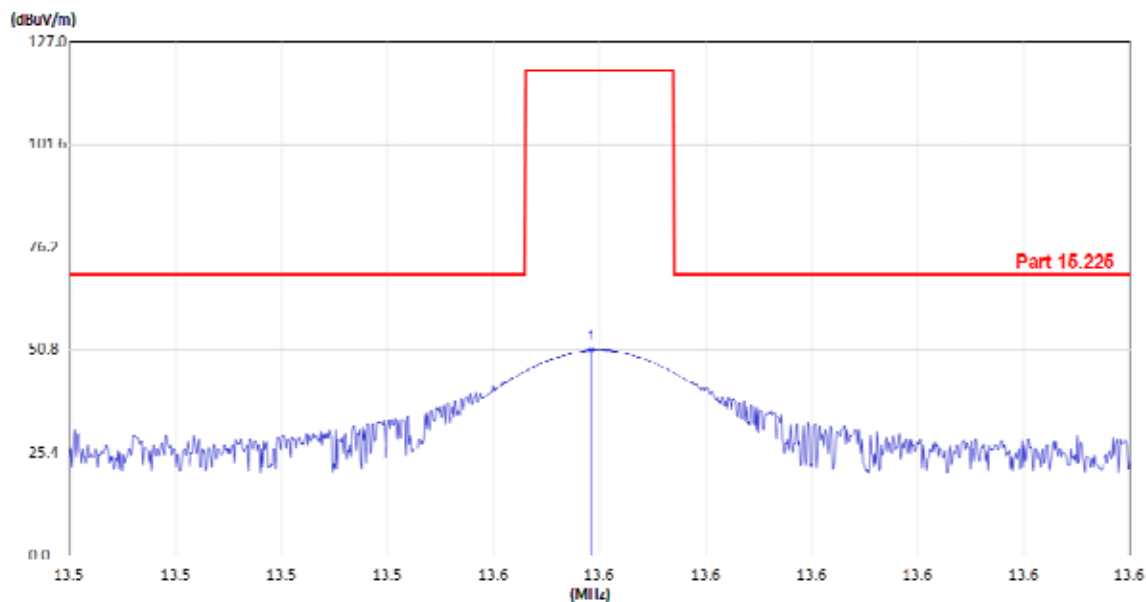
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Operation Band	:NFC	Test Date	:2014-05-20
Fundamental Frequency	:13.56 MHz	Temp./Humi.	:19.2 deg_C/58RH
Operation Mode	:MAIN	Engineer	:Aken
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

Freq.	Detector	Note	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	F/H/E/S	Reading Level	dB	FS	@3m	dB
	PK/QP/AV		dBμV		dBμV / m	dBμV / m	
13.56	Peak	F	40.86	10.14	51.00	120.00	-69.00



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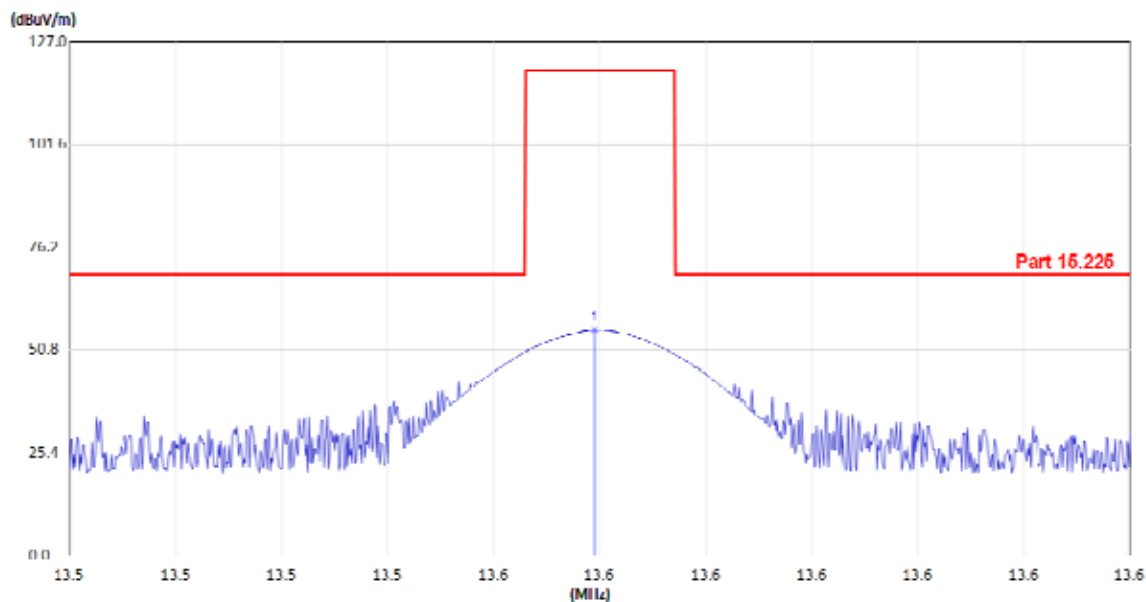
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Operation Band	:NFC	Test Date	:2014-05-20
Fundamental Frequency	:13.56 MHz	Temp./Humi.	:19.2 deg_C/58RH
Operation Mode	:MAIN	Engineer	:Aken
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

Freq.	Detector	Note	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	F/H/E/S	Reading Level	dB	FS	@3m	dB
	PK/QP/AV		dBμV		dBμV / m	dBμV / m	
13.56	Peak	F	45.73	10.14	55.87	120.00	-64.13



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7.5.2 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 = $40 * \log(30/3) = 40$ dB

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

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

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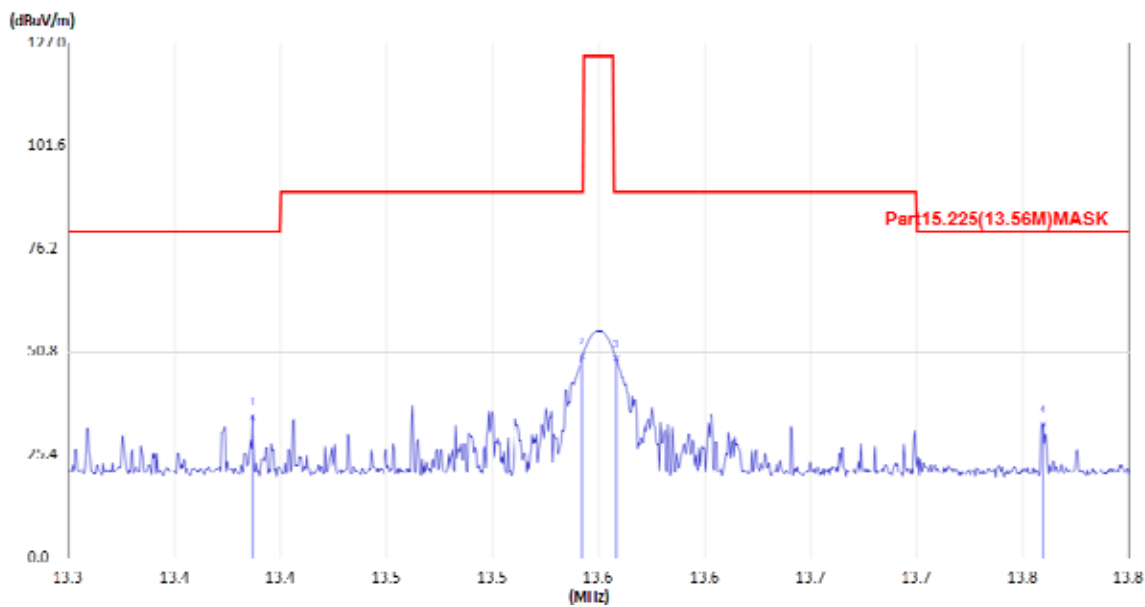
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Operation Band	:NFC	Test Date	:2014-05-20
Fundamental Frequency	:13.56 MHz	Temp./Humi.	:19.2 deg_C/58RH
Operation Mode	:MASK	Engineer	:Aken
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL



Freq.	Detector	Note	Spectrum	Factor	Actual	Limit	Margin
	Mode		Reading Level		FS	@3m	
MHz	PK/QP/AV	F/H/E/S	dBμV	dB	dBμV / m	dBμV / m	dB
13.40	Peak	S	24.66	10.15	34.81	80.50	-45.69
13.55	Peak	S	39.56	10.14	49.70	90.47	-40.77
13.57	Peak	S	39.04	10.14	49.18	90.47	-41.29
13.77	Peak	S	22.88	10.13	33.01	80.50	-47.49

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Operation Band	:NFC	Test Date	:2014-05-20
Fundamental Frequency	:13.56 MHz	Temp./Humi.	:19.2 deg_C/58RH
Operation Mode	:MASK	Engineer	:Aken
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq.	Detector	Note	Spectrum	Factor	Actual	Limit	Margin
	Mode		Reading Level		FS	@3m	
MHz	PK/QP/AV	F/H/E/S	dBμV	dB	dBμV / m	dBμV / m	dB
13.34	Peak	S	27.59	10.16	37.75	80.50	-42.75
13.55	Peak	S	42.35	10.14	52.49	90.47	-37.98
13.57	Peak	S	39.29	10.14	49.43	90.47	-41.04
13.77	Peak	S	24.73	10.13	34.86	80.50	-45.64

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7.5.3 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.

§ RSS-210 A2.6

(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.

$$a) 20 * \log(30 \mu\text{V/m}) + 40\text{dB} = 69.40 \text{ dBuV/m}$$

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Operation Band	:NFC	Test Date	:2014-05-20
Fundamental Frequency	:13.56 MHz	Temp./Humi.	:19.2 deg_C/58RH
Operation Mode	:TX	Engineer	:Aken
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV / m	dBμV / m	dB
10.46	Peak	S	14.49	10.37	24.86	69.54	-44.68
10.76	Peak	S	14.08	10.35	24.42	69.54	-45.12
12.50	Peak	S	14.47	10.22	24.69	69.54	-44.85
16.38	Peak	S	13.29	9.95	23.24	69.54	-46.30
17.72	Peak	S	13.79	9.85	23.64	69.54	-45.90
21.34	Peak	S	13.24	9.48	22.72	69.54	-46.82
27.12	Peak	H	10.53	8.41	18.94	69.54	-50.60
40.68	Peak	H	-	-	-	-	-
54.24	Peak	H	-	-	-	-	-
67.80	Peak	H	-	-	-	-	-
81.36	Peak	H	-	-	-	-	-
94.92	Peak	H	-	-	-	-	-
108.48	Peak	H	-	-	-	-	-
122.04	Peak	H	-	-	-	-	-
135.60	Peak	H	-	-	-	-	-

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Operation Mode	:TX	Engineer	:Aken
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV / m	dBμV / m	dB
11.38	Peak	S	14.33	10.30	24.64	69.54	-44.90
12.50	Peak	S	14.16	10.22	24.38	69.54	-45.16
12.96	Peak	S	13.70	10.18	23.89	69.54	-45.65
16.78	Peak	S	14.26	9.93	24.19	69.54	-45.35
20.48	Peak	S	12.83	9.61	22.44	69.54	-47.10
22.54	Peak	S	12.77	9.30	22.07	69.54	-47.47
27.12	Peak	H	12.17	8.41	20.58	69.54	-48.96
40.68	Peak	H	-	-	-	-	-
54.24	Peak	H	-	-	-	-	-
67.80	Peak	H	-	-	-	-	-
81.36	Peak	H	-	-	-	-	-
94.92	Peak	H	-	-	-	-	-
108.48	Peak	H	-	-	-	-	-
122.04	Peak	H	-	-	-	-	-
135.60	Peak	H	-	-	-	-	-

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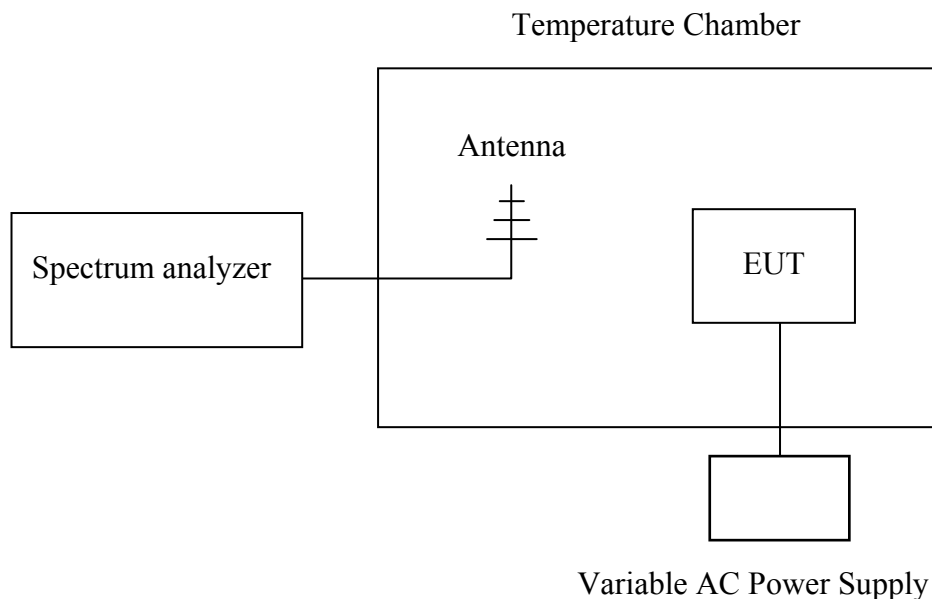
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8 Frequency Tolerance

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)



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8.3 Measurement Equipment Used:

SGS Conducted Room(ALL)					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Spectrum Analyzer	Agilent	N9010A	MY53400256	2013/10/26	2014/10/25
Power Meter	Anritsu	ML2496A	1326001	2013/06/28	2014/06/27
Power Sensor	Anritsu	MA2411B	1315048	2013/06/28	2014/06/27
Power Sensor	Anritsu	MA2411B	1315049	2013/06/28	2014/06/27
Signal Generator	R&S	SMR40	100210	2014/01/13	2015/01/12
Signal Generator	R&S	SMC100A	10920	2013/05/23	2014/05/22
Coaxial Cable 30cm	WOKEN	00100A1F1A195C	2	2014/01/06	2015/01/05
Coaxial Cable 30cm	WOKEN	00100A1F1A195C	3	2014/01/06	2015/01/05
Coaxial Cable 80cm	WOKEN	00100A1F1A185C	1	2014/01/06	2015/01/05
DC Block	Mini-Circuits	BLK-18-S+	4	2014/01/06	2015/01/05
DC Block	PASTERNAK	PE8210	5	2014/01/06	2015/01/05
Splitter	RF-LAMBDA	RFLT2W1G18G	11-JSPF412-019	2014/01/06	2015/01/05
Splitter	WOKEN	NA	DOM35LW1A2	2014/01/06	2015/01/05
Attenuator	Mini-Circuits	BW-S10W2+	6	2014/01/06	2015/01/05
Attenuator	WOKEN	218FS-10	7	2014/01/06	2015/01/05
Temperature Chamber	TERCHY	MHK-120LK	1020582	2013/06/19	2014/06/18
Communication Tester	R&S	CMW500	131121	2014/01/16	2015/01/15
Communication Tester	Anritsu	MT8820C	6201107337	2014/04/24	2015/04/23
DC Power Supply	Agilent	E3640A	MY53140006	2013/06/10	2014/06/09
DC Power Supply	Agilent	E3640A	MY53130054	2013/06/04	2014/06/03

8.4 Measurement Results

Refer to attached data chart.

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A. Temperature Variation

Power Supply	Environment	Frequency	Delta (Hz)	Limit (KHz)
Vdc	Temperature (°C)	(MHz)		
3.8	-20	13.559492	7.000	±1.356
3.8	-10	13.559480	19.000	±1.356
3.8	0	13.559452	47.000	±1.356
3.8	10	13.559450	49.000	±1.356
3.8	20	13.559499	0.000	±1.356
3.8	30	13.559477	22.000	±1.356
3.8	40	13.559495	4.000	±1.356
3.8	50	13.559481	18.000	±1.356

B. Supply Voltage Variation

Power Supply	Environment	Frequency	Delta (Hz)	Limit (KHz)
Vdc	Temperature (°C)	(MHz)		
4.35	20	13.559486	13.00	+/- 1.356
3.8	20	13.559499	0.00	+/- 1.356
3.4	20	13.559462	37.00	+/- 1.356

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9 99% & 20 dB OCCUPIED BANDWIDTH MEASUREMENT

9.1 Standard Applicable:

§2.1049 & RSS-Gen 4.6.1 §15.215 (c)

9.2 Limit:

None

9.3 Test Set-up

Refer to section 7.2 in this report

9.4 Measurement Procedure

99% bandwidth

The EUT's output RF connector was connected with a short cable to the spectrum analyzer, RBW (10KHz) was set to about 1% of span, VBW= 3 times RBW(10KHz), -26dBc display line was placed on the screen (or 99%), the occupied bandwidth is the delta frequency between the two points where the display line intersects the signal trace.

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

9.5 Measurement Equipment Used:

Refer to section 7.3 in this report

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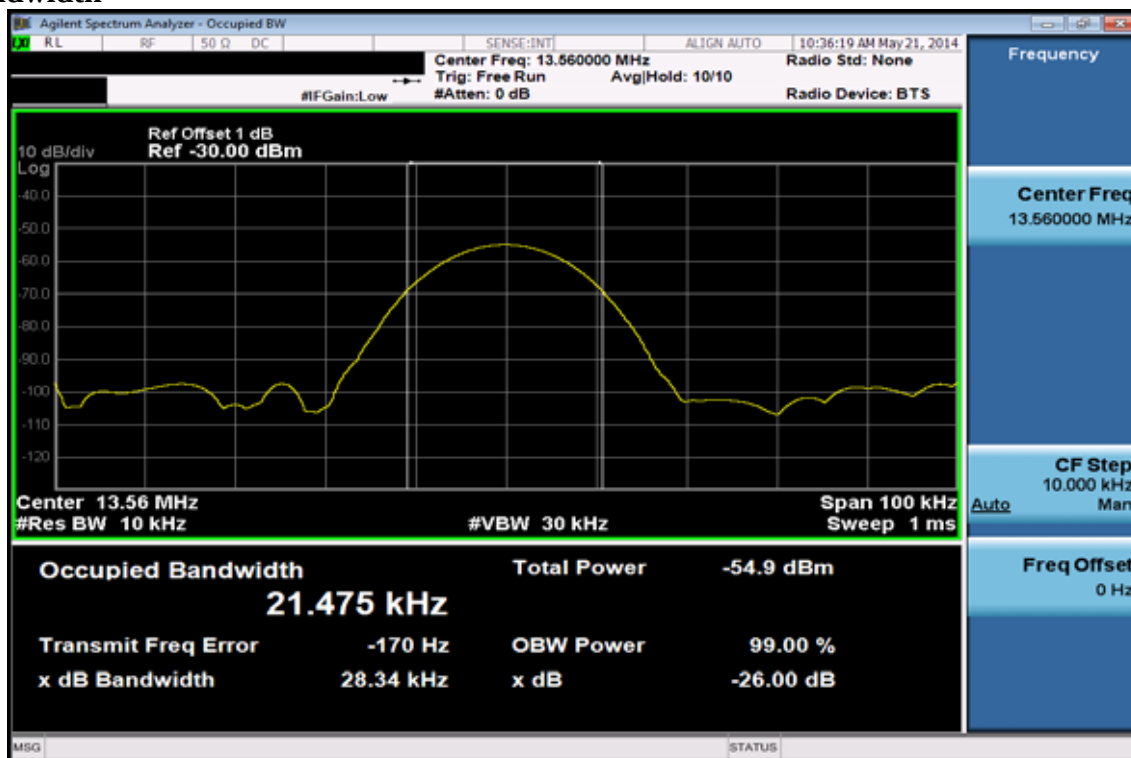
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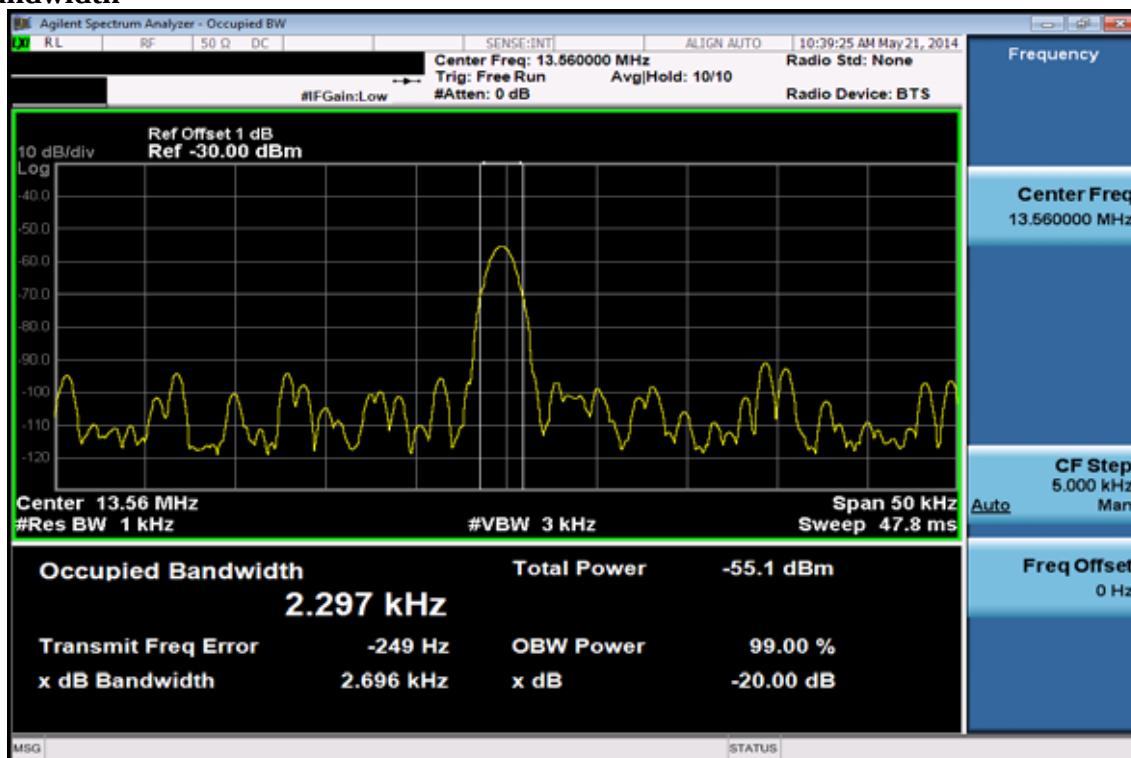
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99% Bandwidth



-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.

According to RSS-GEN 7.1.2, a transmitter can only be sold or operated with antennas with which it was certified. A transmitter may be certified with multiple antenna types. An antenna type comprises antennas having similar in-band and out-of-band radiation patterns. Testing shall be performed using the highest-gain antenna of each combination of transmitter and antenna type for which certification is being sought, with the transmitter output power set at the maximum level. Any antenna of the same type and having equal or lesser gain as an antenna that had been successfully tested for certification with the transmitter, will also be considered certified with the transmitter, and may be used and marketed with the transmitter. The manufacturer shall include with the application for certification a list of acceptable antenna types to be used with the transmitter.

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:

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

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