

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

OF

Product Name: Card Reader
Brand Name: IDTECH
Model No.: IDVV-120101,
IDVV-1X0Y0Z (X=1~2, Y=0~4, Z=1~2)
Model Difference: Please refer to page 7
FCC ID: WQJ-VENDI
Report No.: ER/2014/A0073
Issue Date: Nov. 26, 2014
FCC Rule Part: §15.225

Prepared for: ID TECH
10721 Walker St. Cypress, CA 90630

Prepared by: SGS Taiwan Ltd.
Electronics & Communication Laboratory
No.134, Wu Kung Road, New Taipei Industrial
Park, Wuku District, New Taipei City, Taiwan 24803



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VERIFICATION OF COMPLIANCE

Applicant: ID TECH
 10721 Walker St. Cypress, CA 90630

Product Name: Card Reader

Brand Name: IDTECH

Model No.: IDVV-120101,
 IDVV-1X0Y0Z (X=1~2, Y=0~4, Z=1~2)

Model Difference: Please refer to page 7

FCC ID: WQJ-VENDI

File Number: ER/2014/A0073

Date of test: Oct. 24, 2014 ~ Nov. 26, 2014

Date of EUT Received: Oct. 24, 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.

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

Test By: Marcus Tseng *Date:* Nov. 26, 2014

Marcus Tseng / Engineer

Prepared By: Tiffany Kao *Date:* Nov. 26, 2014

Tiffany Kao / Clerk

Approved By Jim Chang *Date:* Nov. 26, 2014

Jim Chang / Supervisor

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Version

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

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Table of Contents

GENERAL INFORMATION	6
1.1 PRODUCT DESCRIPTION.....	6
1.2 RELATED SUBMITTAL(S) / GRANT (S)	8
1.3 TEST METHODOLOGY	8
1.4 TEST FACILITY	8
1.5 SPECIAL ACCESSORIES	8
1.6 EQUIPMENT MODIFICATIONS	8
2 SYSTEM TEST CONFIGURATION	9
2.1 EUT CONFIGURATION.....	9
2.2 EUT EXERCISE	9
2.3 TEST PROCEDURE.....	9
2.4 LIMITATION	10
2.5 CONFIGURATION OF TESTED SYSTEM.....	12
3 SUMMARY OF TEST RESULTS	13
4 DESCRIPTION OF TEST MODES	13
5 MEASUREMENT UNCERTAINTY	14
6 CONDUCTED EMISSIONS TEST	15
6.1 MEASUREMENT PROCEDURE:.....	15
6.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	15
6.3 MEASUREMENT EQUIPMENT USED:	15
6.4 MEASUREMENT RESULT:.....	15
7 RADIATED EMISSION TEST	18
7.1 MEASUREMENT PROCEDURE.....	18
7.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	18
7.3 MEASUREMENT EQUIPMENT USED:	19
7.4 FIELD STRENGTH CALCULATION	20
7.5 FIELD STRENGTH OF FUNDAMENTAL EMISSION	20
8 FREQUENCY TOLERANCE	29
8.1 MEASUREMENT PROCEDURE.....	29
8.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	29
8.3 MEASUREMENT EQUIPMENT USED:	29
8.4 MEASUREMENT RESULTS.....	30
9 20 DB OCCUPIED BANDWIDTH MEASUREMENT	31
9.1 STANDARD APPLICABLE:	31

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9.2	LIMIT:	31
9.3	TEST SET-UP	31
9.4	MEASUREMENT PROCEDURE.....	31
9.5	MEASUREMENT EQUIPMENT USED:	31
10	ANTENNA REQUIREMENT	33
10.1.	STANDARD APPLICABLE:	33
10.2.	ANTENNA CONNECTED CONSTRUCTION:	33
	PHOTOGRAPHS OF SET UP.....	34
	PHOTOGRAPHS OF EUT	39

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GENERAL INFORMATION

1.1 Product Description

General:

Product Name:	Card Reader
Brand Name:	IDTECH
Model No.:	IDVV-120101, IDVV-1X0Y0Z (X=1~2, Y=0~4, Z=1~2)
Hardware Version:	80139110
Software Version:	N/A
Power Supply:	7.5Vdc to 45Vdc from interior cable

NFC:

Operating Frequency	13.56MHz
Transmit Power	< 123dBuV/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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Model Difference:

	1	X	0	Y	0	Z
	Generatio n	Technology	SRED	Overlay	SAM	LED
0			No SRED	No Overlay	0 SAM Slots	
1	Generation 1.5	NFC Only		ADMV Overlay		Standard LED (All Green)
2		NFC+MSR		ADMV + Google +ISIS Overlay		Green, Yellow, Red LED
3				ADMV + ISIS Overlay		
4				ADMV + Google Overlay		

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1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: **WQJ-VENDI** filing to comply with Section 15.225 of the FCC Part 15, Subpart C Rules. The composite system (digital device) is compliance with Subpart B is authorized under a DoC procedure.

1.3 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4:2009. 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.134, Wu Kung Road, Wuku Industrial Zone, Taipei County, Taiwan which are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4:2009. FCC Registration Number is: 990257. Canada Registration Number: 4620A-4.

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 a placed on as turn table which is 0.8 m above ground plane. According to the general criterion in Section 7.1 of ANSI C63.4:2009. 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 & 6.2.2 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 a placed on as 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, & Section 6.3, 6.4, 6.5.

While performing the measurement in the frequency range of 9 kHz to 30 MHz, loop antenna is being employed. It is positioned with its plane vertical at the specified distance from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. The center of the loop shall be 1m above the ground. The position of antenna referencing to the feed point is adjusted in order to measure the polarity of horizontal, and vertical, respectively, according to section 8 of ANSI 63.4: 2009.

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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

- a. The field strength of any emission within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.
- b. 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.
- c. 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.
- d. 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 $\mu\text{V}/\text{m}$	Distance (m)	Field strength at 3m $\text{dB}\mu\text{V}/\text{m}$
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 (required distance/ 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 Emission & Conducted (Antenna Port) Configuration

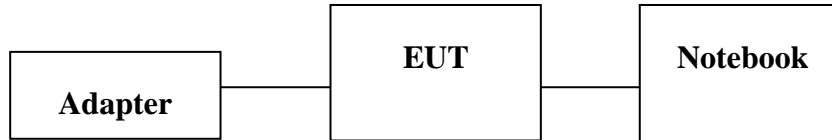


Fig. 2-2 AC Power Line Conducted Emission

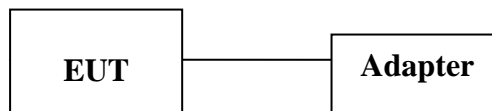


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	Notebook	DELL	D505	34056609472	Shield	Un-Shield

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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)	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 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
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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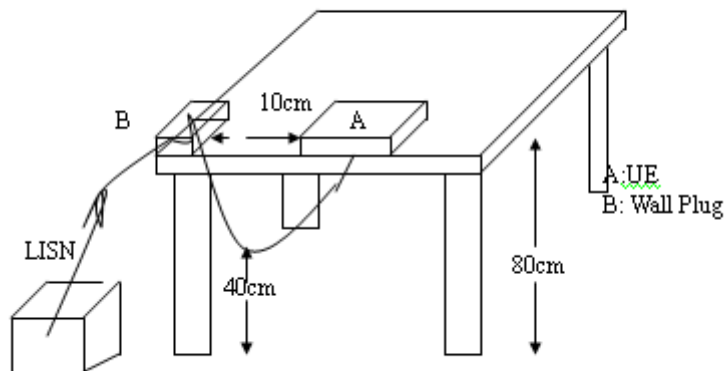
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6 Conducted Emissions Test

6.1 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. Sweep frequency starting from 150 kHz to 30 MHz for phase L1.
4. Repeating the measurement as lists above for phase neutral.

6.2 Test SET-UP (Block Diagram of Configuration)



6.3 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESCI7	100760	05/26/2014	05/25/2015
LISN	Rolf-Heine	NNB-2/16Z	99012	03/26/2014	03/25/2015
LISN	FCC	FCC-LISN-50/250-25-2-01	04034	03/19/2014	03/18/2015
Coaxial Cables	N/A	WK CE Cable	N/A	11/26/2014	11/25/2015

6.4 Measurement Result:

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

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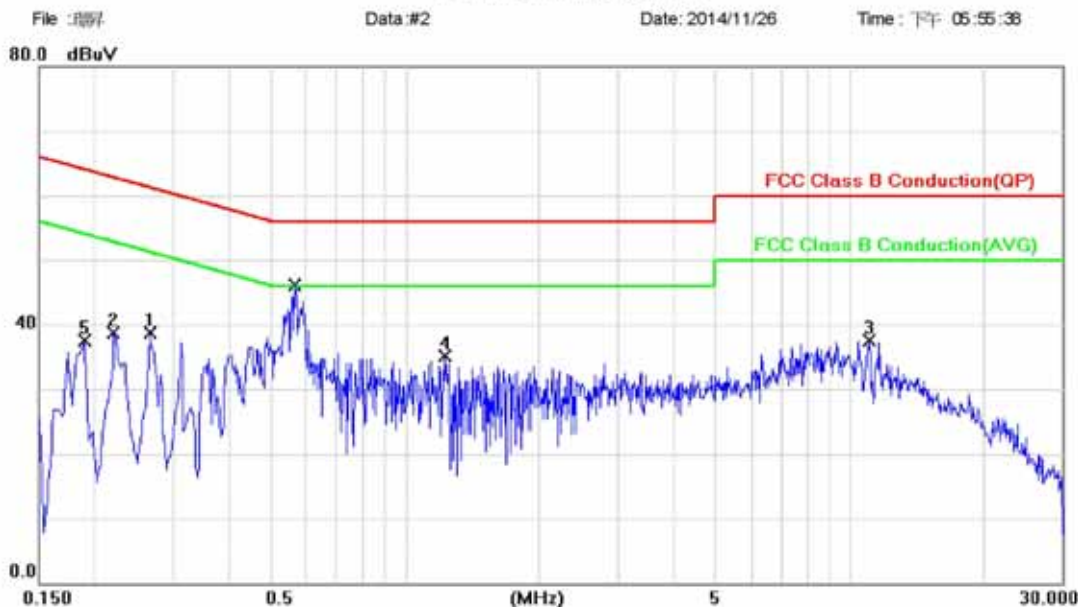
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AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	Operation mode	Test Date:	Nov. 26, 2014
Temperature:	26	Humidity:	60 %
		Test By:	Tin

Site: ConductionRoom	Phase: L1	Temperature: 24 °C
Limit: FCC Class B Conduction(QP)	Power: AC 120V/60Hz	Humidity: 66%
Mode: Operation		
Note: Adapter:3A066WP09		

Conducted Emission



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV	dBuV	dB		
1		0.2660	38.70	0.06	38.76	61.24	-22.48	peak	
2		0.2220	38.63	0.06	38.69	62.74	-24.05	peak	
3		11.0380	37.09	0.36	37.45	60.00	-22.55	peak	
4		1.2260	34.93	0.10	35.03	56.00	-20.97	peak	
5		0.1900	37.37	0.06	37.43	64.04	-26.61	peak	
6		0.5660	40.92	0.08	41.00	56.00	-15.00	QP	
7	*	0.5660	32.60	0.08	32.68	46.00	-13.32	AVG	

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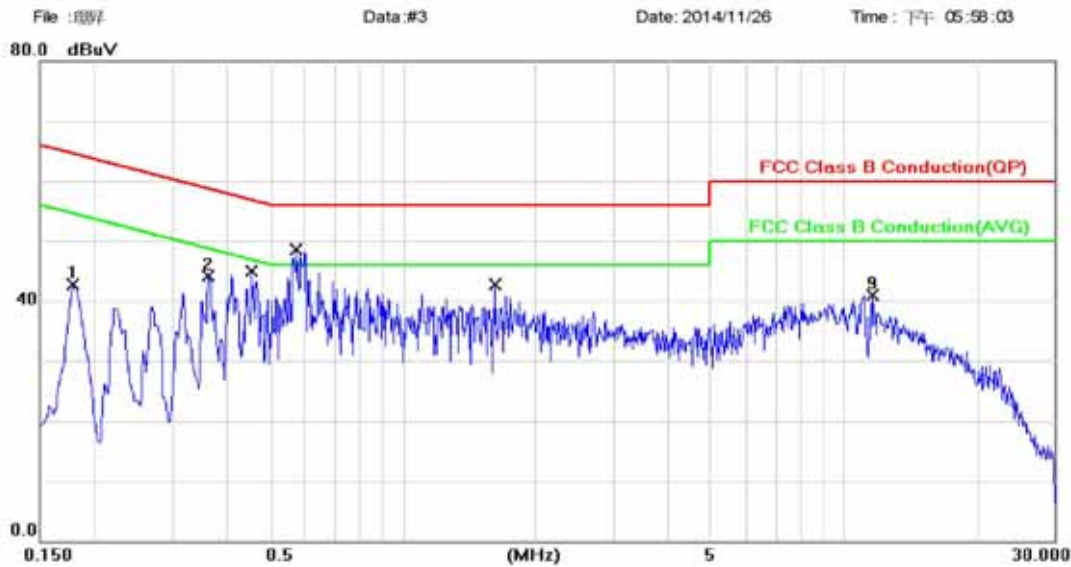
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Site: ConductionRoom	Phase: N	Temperature: 24 °C
Limit: FCC Class B Conduction(QP)	Power: AC 120V/60Hz	Humidity: 66%
Mode: Operation		
Note: Adapter:3A066WP09		

Conducted Emission



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV	dBuV	dB		
1		0.1780	42.60	0.06	42.66	64.58	-21.92	peak	
2		0.3620	44.07	0.07	44.14	58.68	-14.54	peak	
3		0.4540	41.26	0.07	41.33	56.80	-15.47	QP	
4		0.4540	29.20	0.07	29.27	46.80	-17.53	AVG	
5 *		0.5740	46.44	0.08	46.52	56.00	-9.48	QP	
6		0.5740	34.40	0.08	34.48	46.00	-11.52	AVG	
7		1.6220	35.83	0.11	35.94	56.00	-20.06	QP	
8		1.6220	24.20	0.11	24.31	46.00	-21.69	AVG	
9		11.6220	40.61	0.38	40.99	60.00	-19.01	peak	

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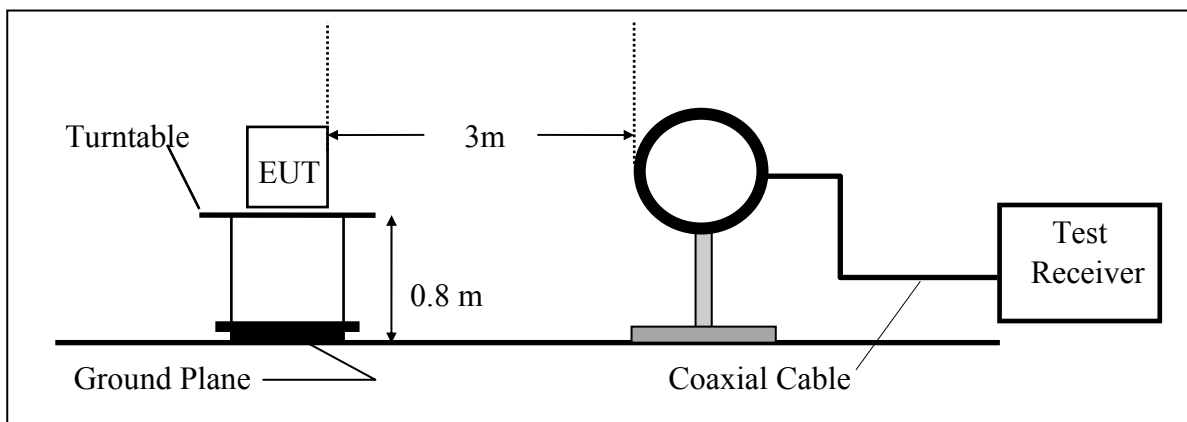
7 Radiated Emission Test

7.1 Measurement Procedure

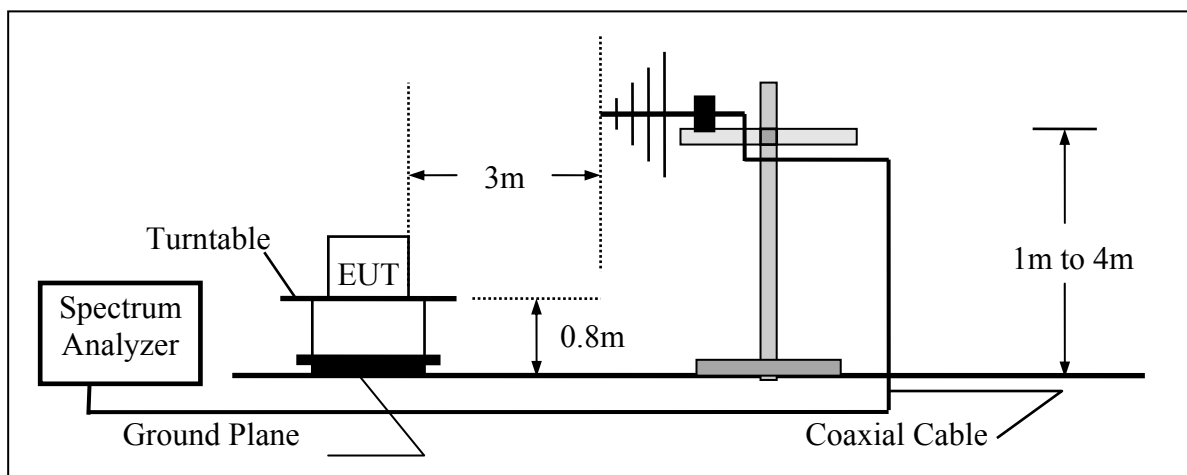
1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.

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 Below 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	ESC17	100760	05/26/2014	05/25/2015
Spectrum Analyzer	Agilent	E4446A	MY51100003	05/19/2014	05/18/2015
EXA Spectrum Analyzer	Agilent	N9010A	MY50420195	01/20/2014	01/19/2015
Spectrum Analyzer	R&S	FSV-30	101398	10/07/2014	10/06/2015
Loop Antenna	ETS.LINDGREN	6502	00148045	07/03/2014	07/02/2015
Bilog Antenna	SCHWAZBECK	VULB9168	378	01/02/2014	01/01/2015
Horn antenna	ETS.LINDGREN	3117	123995	05/19/2014	05/18/2015
Horn Antenna	Schwarzbeck	BBHA9170	184	01/23/2014	01/22/2015
Pre-Amplifier	Agilent	8447D	2944A07676	01/03/2014	01/02/2015
Pre-Amplifier	Agilent	8449B	3008A00578	01/03/2014	01/02/2015
Pre-Amplifier	EMC Instruments Corp.	EMC184045	980135	01/24/2014	01/23/2015
Filter 2400-2483.5 MHz	EWT	EWT-14-0166	M2	02/27/2014	02/26/2015
Attenuator	Mini-Circuit	BW-S10W2+	004	02/27/2014	02/26/2015
Turn Table	HD	DT420	N/A	N.C.R	N.C.R
Antenna Tower	HD	MA240-N	240/657	N.C.R	N.C.R
Controller	HD	HD100	N/A	N.C.R	N.C.R
Low Loss Cable	Huber Suhner	966_Rx	9	01/03/2014	01/02/2015
3m Site NSA	SGS	966 chamber	N/A	07/15/2014	07/14/2015

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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 microrvolts/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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Operation Band	:NFC	Test Date	:2014-11-04
Fundamental Frequency	:13.56 MHz	Temp./Humi.	:24.3 deg_C/58RH
Operation Mode	:MAIN	Engineer	:Curry
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Safe Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
13.56	F	Peak	64.96	11.72	76.68	123.90	-47.22

Operation Band	:NFC	Test Date	:2014-11-04
Fundamental Frequency	:13.56 MHz	Temp./Humi.	:24.3 deg_C/58RH
Operation Mode	:MAIN	Engineer	:Curry
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Safe Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
13.56	F	Peak	64.13	11.72	75.85	123.90	-48.05

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

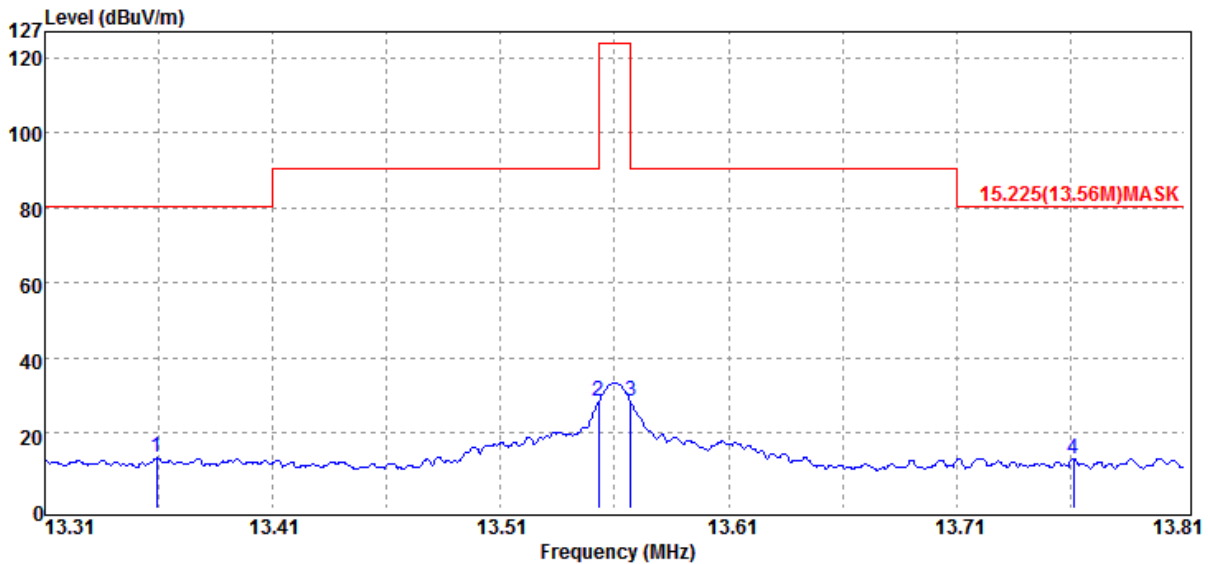
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Operation Band	:NFC	Test Date	:2014-11-04
Fundamental Frequency	:13.56 MHz	Temp./Humi.	:24.3 deg_C/58RH
Operation Mode	:MASK	Engineer	:Curry
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Safe Margin dB
13.48	S	Peak	17.92	11.73	29.65	90.47	-60.82
13.55	S	Peak	58.84	11.72	70.56	90.47	-19.91
13.57	S	Peak	60.88	11.72	72.60	90.47	-17.87
13.66	S	Peak	16.48	11.71	28.19	90.47	-62.28

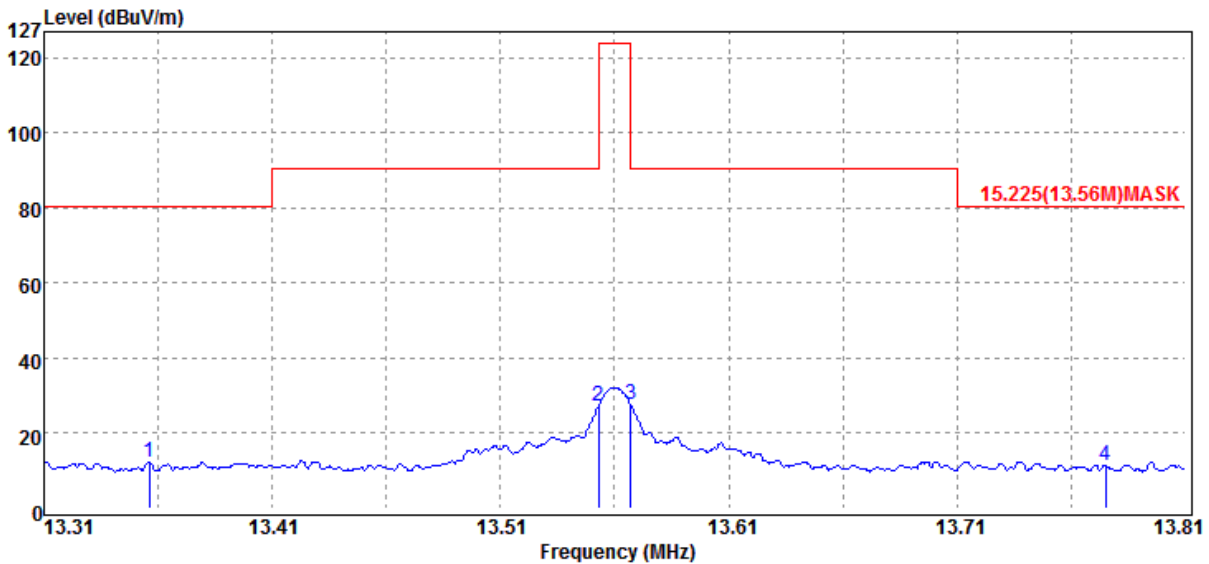
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Fundamental Frequency	:13.56 MHz	Temp./Humi.	:24.3 deg_C/58RH
Operation Mode	:MASK	Engineer	:Curry
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Safe Margin dB
13.44	S	Peak	16.21	11.73	27.94	90.47	-62.53
13.55	S	Peak	58.07	11.72	69.79	90.47	-20.68
13.57	S	Peak	60.09	11.72	71.81	90.47	-18.66
13.69	S	Peak	17.40	11.71	29.11	90.47	-61.36

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

Operation Band	:NFC	Test Date	:2014-11-04
Fundamental Frequency	:13.56 MHz	Temp./Humi.	:24.3 deg_C/58RH
Operation Mode	:RX	Engineer	:Curry
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
10.74	S	Peak	18.18	11.95	30.13	69.54	-39.41
16.04	S	Peak	23.50	11.55	35.05	69.54	-34.49
19.74	S	Peak	11.32	11.35	22.67	69.54	-46.87
23.52	S	Peak	12.87	10.38	23.25	69.54	-46.29
27.12	H	Peak	11.97	9.53	21.50	69.54	-48.04
29.30	S	Peak	19.98	9.08	29.06	69.54	-40.48
29.78	S	Peak	18.65	8.99	27.64	69.54	-41.90

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Operation Band	:NFC	Test Date	:2014-11-04
Fundamental Frequency	:13.56 MHz	Temp./Humi.	:24.3 deg_C/58RH
Operation Mode	:RX	Engineer	:Curry
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
11.24	S	Peak	12.86	11.90	24.76	69.54	-44.78
16.44	S	Peak	15.69	11.53	27.22	69.54	-42.32
18.90	S	Peak	12.51	11.40	23.91	69.54	-45.63
21.10	S	Peak	11.27	11.02	22.29	69.54	-47.25
23.58	S	Peak	11.71	10.36	22.07	69.54	-47.47
25.78	S	Peak	12.71	9.83	22.54	69.54	-47.00
27.12	H	Peak	10.34	9.53	19.87	69.54	-49.67

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Operation Band	:NFC	Test Date	:2014-11-04
Fundamental Frequency	:13.56 MHz	Temp./Humi.	:24.3 deg_C/58RH
Operation Mode	:TX	Engineer	:Curry
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
40.68	H	---					
51.24	S	Peak	44.81	-13.00	31.81	40.00	-8.19
67.80	H	---					
81.36	H	---					
94.92	H	---					
108.48	H	---					
122.04	H	---					
135.60	H	---					
218.18	S	Peak	37.88	-14.46	23.42	46.00	-22.58
298.69	S	Peak	35.85	-11.17	24.68	46.00	-21.32
460.68	S	Peak	39.80	-7.92	31.88	46.00	-14.12
487.84	S	Peak	40.53	-7.58	32.95	46.00	-13.05

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Fundamental Frequency	:13.56 MHz	Temp./Humi.	:24.3 deg_C/58RH
Operation Mode	:TX	Engineer	:Curry
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
40.68	H	---					
51.24	S	Peak	35.42	-13.00	22.42	40.00	-17.58
67.80	H	---					
81.36	H	---					
94.92	H	---					
108.48	H	---					
122.04	H	---					
135.60	H	---					
221.09	S	Peak	43.42	-14.30	29.12	46.00	-16.88
298.69	S	Peak	39.32	-11.17	28.15	46.00	-17.85
460.68	S	Peak	45.30	-7.92	37.38	46.00	-8.62
487.84	S	Peak	46.54	-7.58	38.96	46.00	-7.04
515.00	S	Peak	42.06	-7.30	34.76	46.00	-11.24

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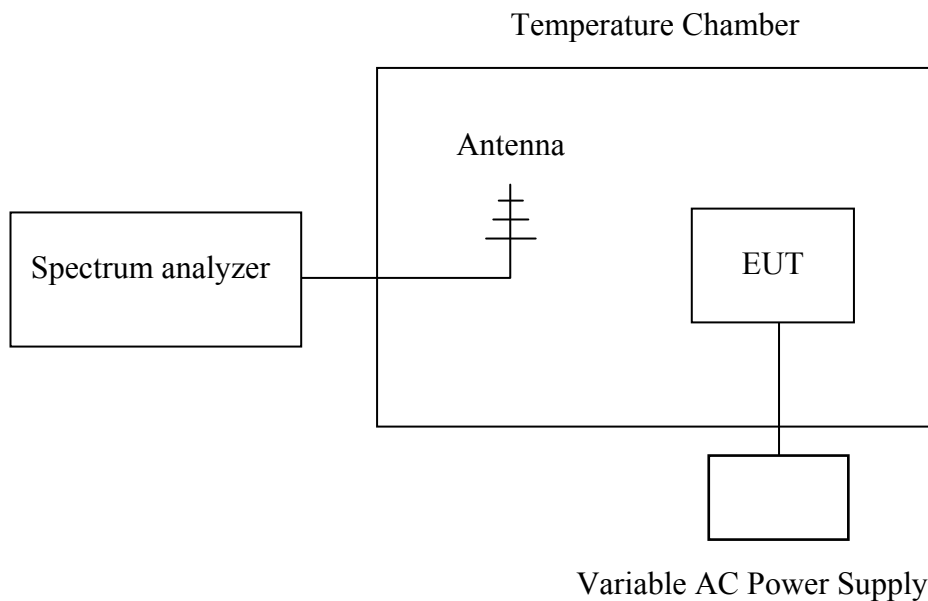
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8 Frequency Tolerance

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.
Power Meter	Anritsu	ML2495A	1005007	01/13/2014	01/12/2015
Power Sensor	Anritsu	MA2411B	917032	01/13/2014	01/12/2015
Spectrum Analyzer	Agilent	E4446A	MY51100003	05/19/2014	05/18/2015
Spectrum Analyzer	Agilent	E4440A	MY45304525	03/08/2014	03/07/2015
DC Block	Mini-Circuits	BLK-18-S+	1	02/27/2014	02/26/2015
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	01/03/2014	01/02/2015
Attenuator	Mini-Circuit	BW-S10W2+	002	02/27/2014	02/26/2015
Splitter	Agilent	11636B	N/A	02/27/2014	02/26/2015

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8.4 Measurement Results

A. Temperature Variation

Power Supply	Environment	Frequency	Delta (Hz)	Limit (KHz)
Vdc	Temperature ()	(MHz)		
9	-20	13.5615	-1000.00	+/- 1.356
9	-10	13.5613	-800.00	+/- 1.356
9	0	13.5612	-700.00	+/- 1.356
9	10	13.5609	-400.00	+/- 1.356
9	20	13.5605	0.00	+/- 1.356
9	30	13.5603	200.00	+/- 1.356
9	40	13.5602	300.00	+/- 1.356
9	50	13.5600	500.00	+/- 1.356

B. Supply Voltage Variation

Power Supply	Environment	Frequency	Delta (Hz)	Limit (KHz)
Vdc	Temperature ()	(MHz)		
10.35	20	13.5606	-300.00	+/- 1.356
9.00	20	13.5603	0.00	+/- 1.356
7.65	20	13.5603	0.00	+/- 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

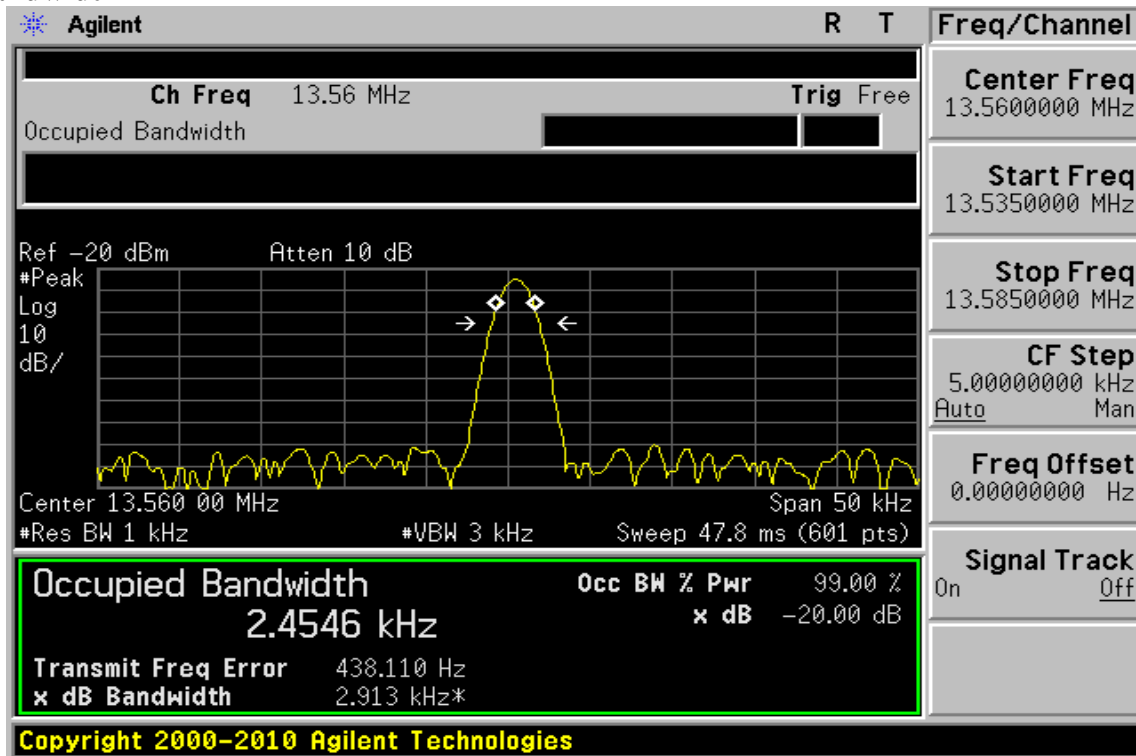
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-20dB Bandwidth



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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.

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

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