



Report No.:SZ12020068E05



FCC TEST REPORT

Issued to

ToughShield Devices Limited

For

WCDMA/GSM digital mobile phone

Model Name: R500
Trade Name: Toughshield
Brand Name: Toughshield
FCC ID: OHV-R500
Standard: 47 CFR Part 15 Subpart C
Test date: June 10, 2012 – July 6, 2012
Issue date: July 16, 2012

By

Shenzhen Morlab Communications Technology Co., Ltd.

Tested by

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Tu Lang

Date

2012.7.16

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Date

2012.7.16

Review by

Huang Pulong
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Date

2012.7.16



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Version		
Version NO.	Date	Description
1.0	July 16, 2012	Initial creation of document

1. GENERAL INFORMATION

1.1 EUT Description

EUT Type : WCDMA/GSM digital mobile phone
Serial No..... : (n.a, marked #1 by test site)
Hardware Version..... : S042M001P000
Software Version : ROCK_V_2.0_01017_120510
Modulation : ASK
Channel Number : 1
Test Fre. Range..... : 13.553 ~ 13.567MHz
Carrier Frequencies : 13.56 MHz (Ch. 1)
Applicant ToughShield Devices Limited
Toughshield Devices Limited, 104A Park Street, London W1K 6NG,
Manufacturer : UK
ToughShield Devices Limited
Toughshield Devices Limited, 104A Park Street, London W1K 6NG,
UK
Power Supply : Battery
Brand Name: N/A
Model No.: ROCK
Serial No.: (n.a. marked #1 by test site)
Capacitance: 1500mAh
Rated Voltage: 3.7V
Ancillary Equipment 1 : AC Adapter (Charger for Battery)
Brand Name: N/A
Model Name: XHY050080U
Serial No.: (n.a. marked #1 by test site)
Rated Input: ~ 100-240V, 0.25A, 50/60Hz
Rated Output: = 5V, 800mA

Note 1: The EUT is a WCDMA/GSM digital mobile phone, it supports GSM 850MHz, 900MHz, 1800MHz, 1900MHz, GPRS, EGPRS, WCDMA 850MHz, 1900MHz, 2100MHz, HSDPA, GPS, NFC, ISM 2.4GHz Bluetooth and Wifi bands. and only NFC band was tested in this report.

Note 2: For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

1.2 Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart C:

No.	Identity	Document Title
1	47 CFR Part 15 (11-10-01Edition)	Radio Frequency Devices

Test detailed items/section required by FCC rules and results are as below:

No.	Section	Description	Result
1	15.203	Antenna Requirement	PASS
2	15.207	Conducted Emission	PASS
3	15.225(a)(b)(c)(d)	Radiated Emission	PASS
4	15.225(e)	Frequency Stability	PASS
5	15.215(c)	20dB Bandwidth	PASS

NOTE:

- 1 All measurements contained in this report were conducted with ANSI C63.4-2009.

1.3 Test Equipments Used

Description	Manufacturer	Model	Serial No.	Cal. Date
EMC Analyzer	Agilent	E7405A	US44210471	2012.05
Receiver	Narda	PMM 9060	001WX1100 1	2011.12
Receiver	Narda	PMM 9010	595WX1100 7	2011.11
Amplifier	Lucix	S10M100L3802	46732	2012.05
Full-Anechoic Chamber	Albatross	9m*6m*6m	(n.a.)	2012.05
Test Antenna - Bi-Log	Schwarzbeck	VULB 9163	9163-274	2012.05
Test Antenna - Horn	Schwarzbeck	BBHA 9120D	9120D-963	2012.05
Test Antenna -Loop	Schwarzbeck	FMZB 1519	1519-022	2012.05
LISN	Schwarzbeck	NSLK 8127	812744	2012.05
Pulse Limiter (20dB)	Schwarzbeck	VTSD 9561-D	9391	(n.a.)
Temperature Chamber	YinHe Experimental Equip.	HL4003T	(n.a.)	2012.05

1.4 Facilities and Accreditations

1.4.1 Facilities

Shenzhen Morlab Communications Technology Co., Ltd. Morlab Laboratory is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L3572.

All measurement facilities used to collect the measurement data are located at 3/F, Electronic Testing Building, Shahe Road, Xili, Nanshan District, Shenzhen, 518055 P. R. China. The test site is constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22; the FCC registration number is 741109.

1.4.2 Test Environment Conditions

During the measurement, the environmental conditions were within the listed ranges:

Temperature (°C):	15 - 35
Relative Humidity (%):	30 - 60
Atmospheric Pressure (kPa):	86 - 106

1.4.3 Measurement Uncertainty

The uncertainty is calculated using the methods suggested in the "Guide to the Expression of Uncertainty in Measurement" (GUM) published by ISO.

Uncertainty of Conducted Emission:	$\pm 1.8\text{dB}$
Uncertainty of Radiated Emission:	$\pm 3.1\text{dB}$

2. REQUIREMENTS

2.1 Antenna requirement

2.1.1 Applicable Standard

According to FCC 15.203, 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.

Result: Compliant

The EUT has a permanently and irreplaceable attached antenna. Please refer to the EUT internal photos.

2.2 Conducted Emission

2.2.1 Requirement

According to FCC section 15.207, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 Ω line impedance stabilization network (LISN).

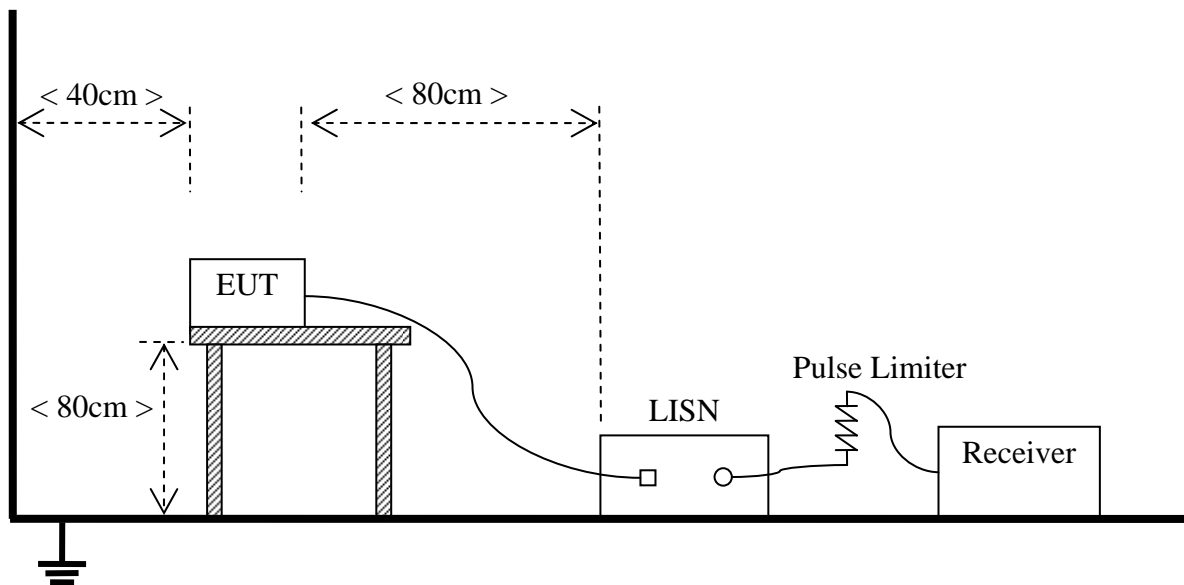
Frequency range (MHz)	Conducted Limit (dB μ V)	
	Quasi-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

NOTE:

- The limit subjects to the Class B digital device.
- The lower limit shall apply at the band edges.
- The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

2.2.2 Test Description

A. Test Setup:



The EUT is placed on a 0.8m high insulating table, which stands on the grounded conducting floor, and keeps 0.4m away from the grounded conducting wall. The EUT is connected to the power mains through a LISN which provides 50 Ω /50 μ H of coupling impedance for the measuring instrument. The RF Card is used for the call between with the EUT, and the EUT was measured by transmitter mode

continuously. A Pulse Limiter is used to protect the measuring instrument. The factors of the whole test system are calibrated to correct the reading.

B. Equipments List:

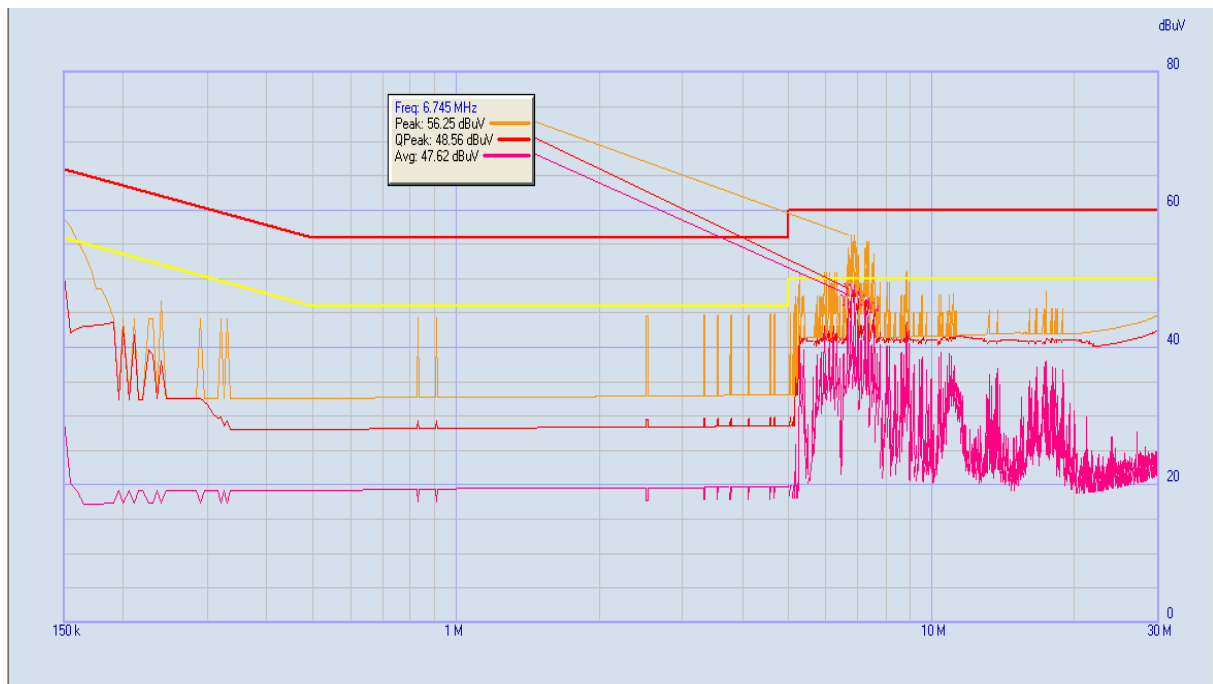
Description	Manufacturer	Model	Serial No.	Cal. Date
EMC Analyzer	Agilent	E7405A	US44210471	2012.05
Receiver	Narda	PMM 9060	001WX11001	2011.12
Receiver	Narda	PMM 9010	595WX11007	2011.11
LISN	Schwarzbeck	NSLK 8127	812744	2012.05
Pulse Limiter (20dB)	Schwarzbeck	VTSD 9561-D	9391	(n.a.)

2.2.3 Test Result

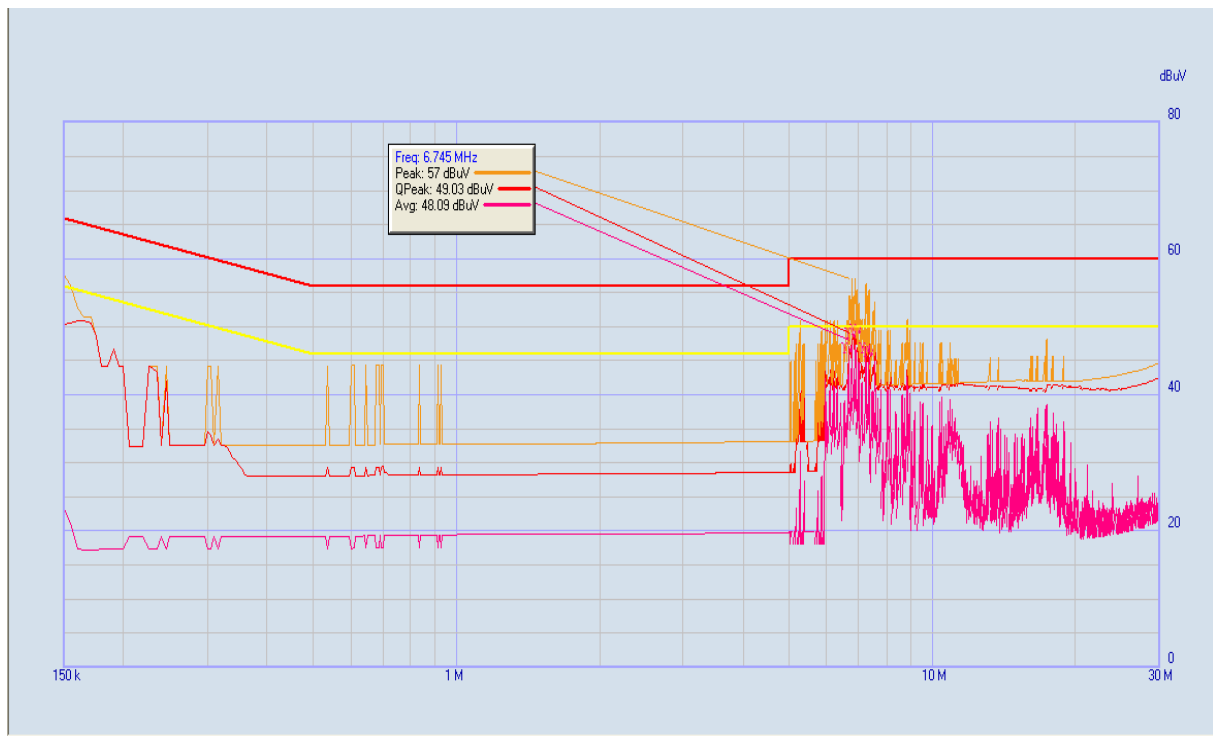
The maximum conducted interference is searched using Peak (PK), Quasi-peak (QP) and Average (AV) detectors; the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. All test modes are considered, refer to recorded points and plots below.

4.1.3.1 Test Mode

A. Test Plots And Suspicious Points:



(Plot A: L Phase)



(Plot B: N Phase)

Result: PASS

2.3 Radiated Emission

2.3.1 Requirement

Radiated Emission <30MHz (9KHz-30MHz, H-field)

According to FCC section 15.225, for <30MHz, Radiated emissions were measured according to ANSIC63.4. The EUT was set to transmit at the highest output power. The EUT was set 10 meter away from the measuring antenna. The loop antenna was positioned 1 meter above the ground from the center of the loop. The measuring bandwidth was set to 10KHz. (Note: During testing the receive antenna was rotated about its axis to maximize the emission from the EUT)

Field strength of fundamental emissions limit:

The field strength of fundamental emissions shall not exceed 15848 micorvolts/meter at 30 meters.

The emissions limit in this paragraph is based on measurement instrumentation employing a QP detector.

Frequency range (MHz)	Field Strength@30m (micorvolts/meter)	Field Strength (dB μ V/m) at 10m	Field Strength (dB μ V/m) at 3m
13.553~13.567	15848 at 30m	103.08 (QP)	124 (QP)

Mask limit:

Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Rules and Specifications	CFR 47 Part 15 section 15.225(a)-(d)				
Description	Compliance with the spectrum mask is tested using a spectrum analyzer with RB set to a 1kHz for the band 13.553~13.567MHz				
Limit	Fre. of Emission (MHz)	Field Strength (uV/m) at 30m	Field Strength (dBuV/m) at 30m	Field Strength (dBuV/m) at 10m	Field Strength (dBuV/m) at 3m
	1.705~13.110	30	29.5	48.58	69.5
	13.110~13.410	106	40.5	49.58	80.5
	13.410~13.553	334	50.5	69.58	90.5
	13.553~13.567	15848	84.0	103.08	124.0
	13.567~13.710	334	50.5	69.58	90.5
	13.710~14.010	106	40.5	59.58	80.5
	14.010~30.000	30	29.5	48.58	69.5

Radiated Emission >30MHz (30MHz-1GHz, E-field)

According to FCC section 15.225, the field strength of radiated emissions from unintentional

radiators at a distance of 3 meters shall not exceed the following values:

Frequency range (MHz)	Field Strength	
	$\mu\text{V/m}$	$\text{dB}\mu\text{V/m}$
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

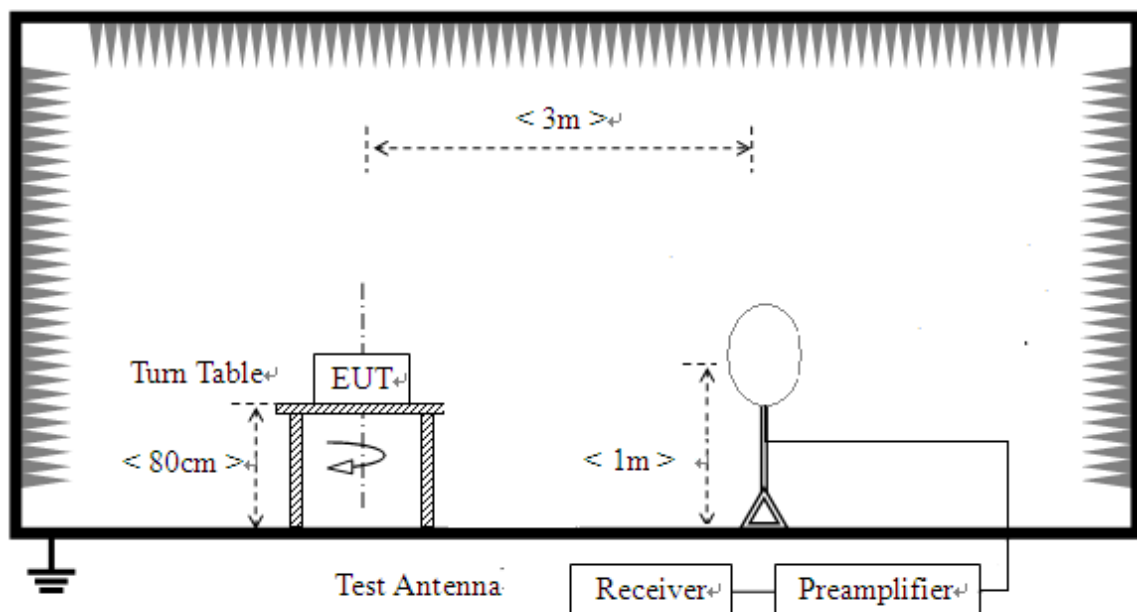
NOTE:

- Field Strength ($\text{dB}\mu\text{V/m}$) = $20 \cdot \log[\text{Field Strength } (\mu\text{V/m})]$.
- In the emission tables above, the tighter limit applies at the band edges.

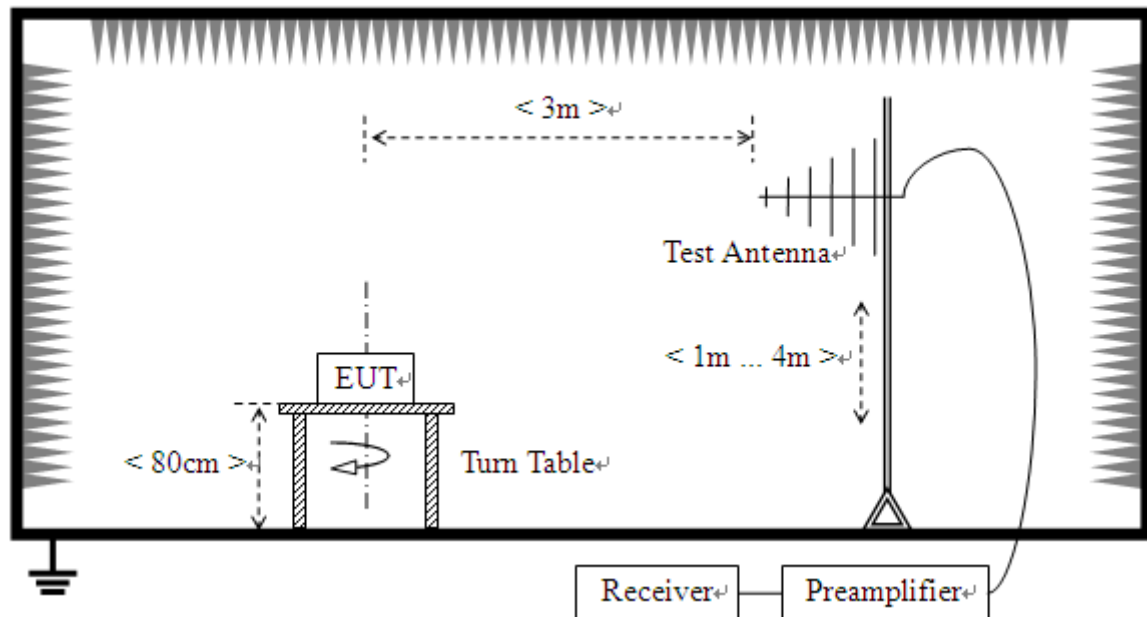
2.3.2 Test Description

A. Test Setup:

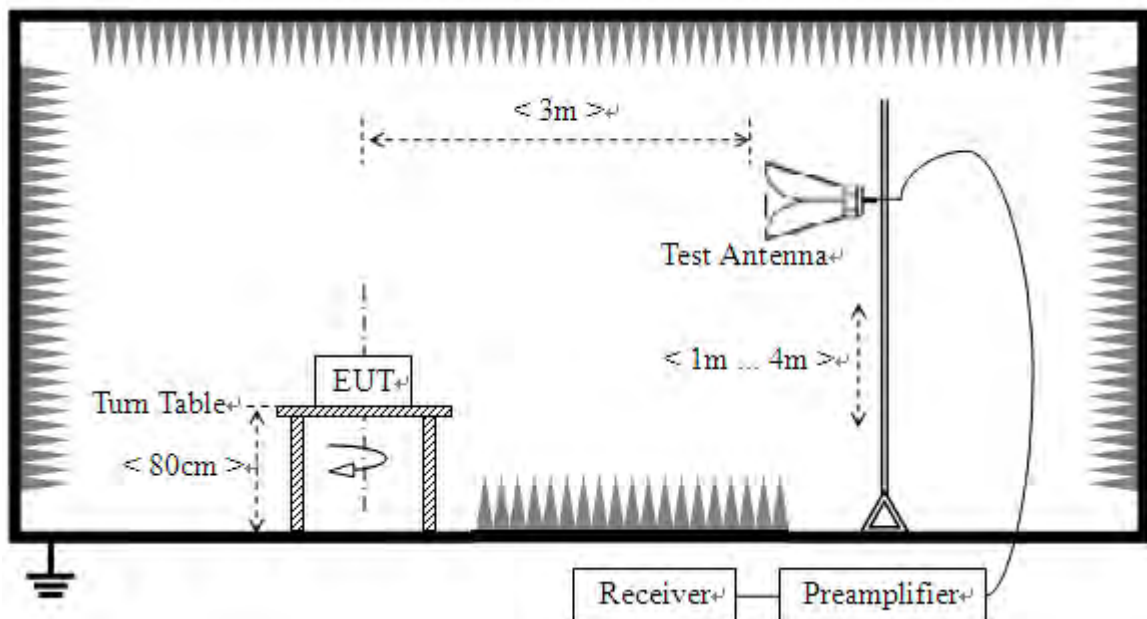
- For radiated emissions from 9kHz to 30MHz



- For radiated emissions from 30MHz to 1GHz



3) For radiated emissions above 1GHz



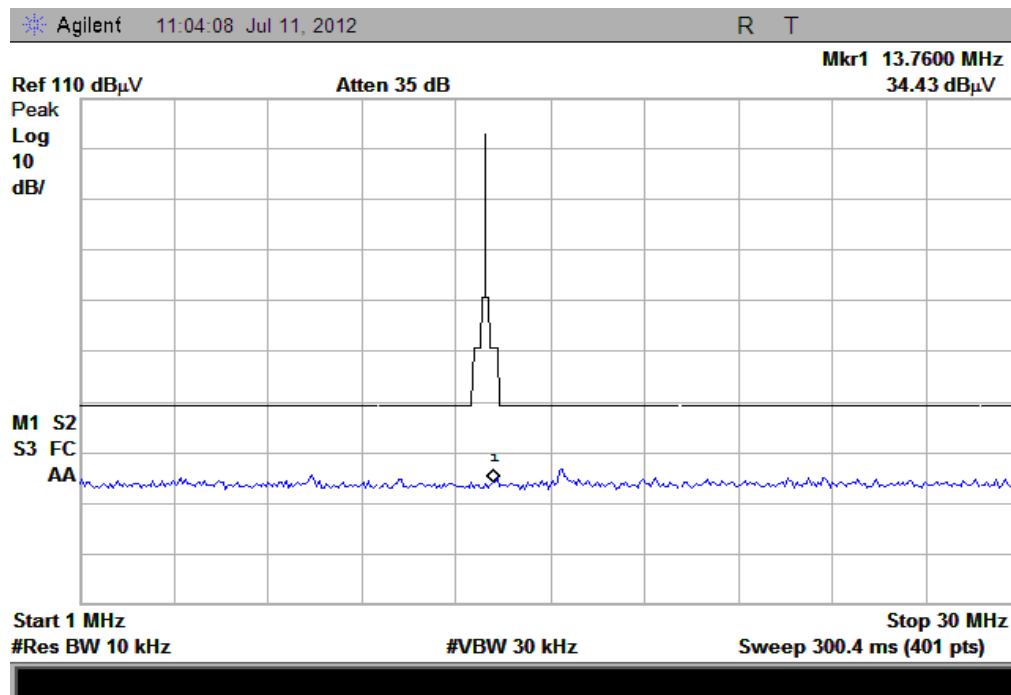
The test is performed in a 3m Semi-Anechoic Chamber; the antenna factor, cable loss and so on of the site (factors) is calculated to correct the reading. The EUT is placed on a 0.8m high insulating Turn Table, and keeps 3m away from the Test Antenna, which is mounted on a variable-height antenna master tower. The RF Card is used for the call between with the EUT, and the EUT was measured by transmitter mode continuously. All radiated emission tests were performed in X, Y, Z axis direction, and only the worst axis test condition was recorded in this test report.

The amplitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be reported.

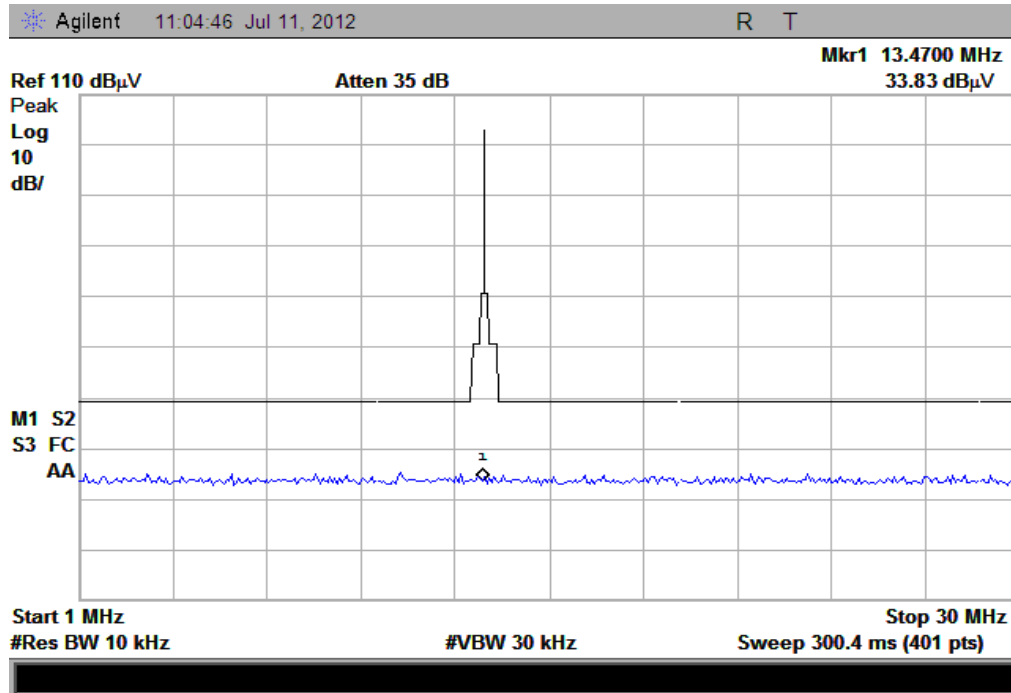
2.3.3 Test Result

2.3.3.1 Radiated Emission <30MHz (9KHz-30MHz, H-field)

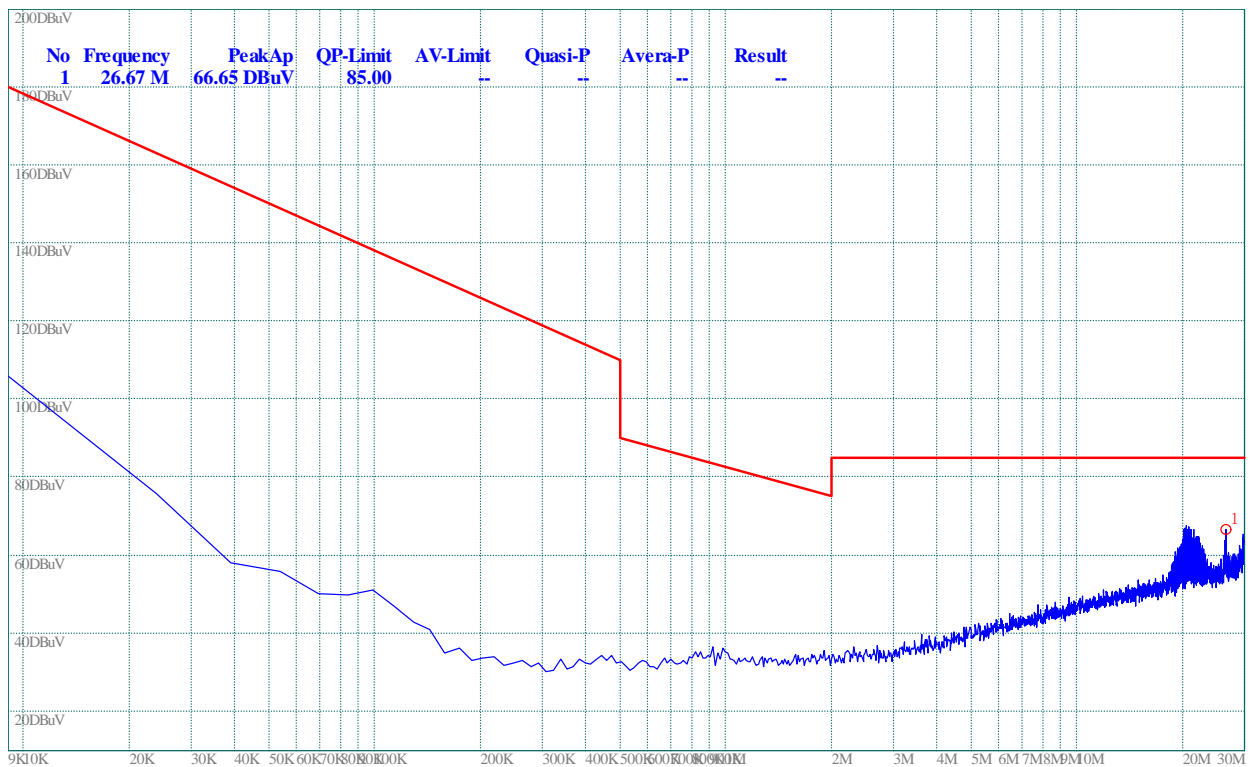
A. Test Plots



(Plot A: Test Antenna Vertical)



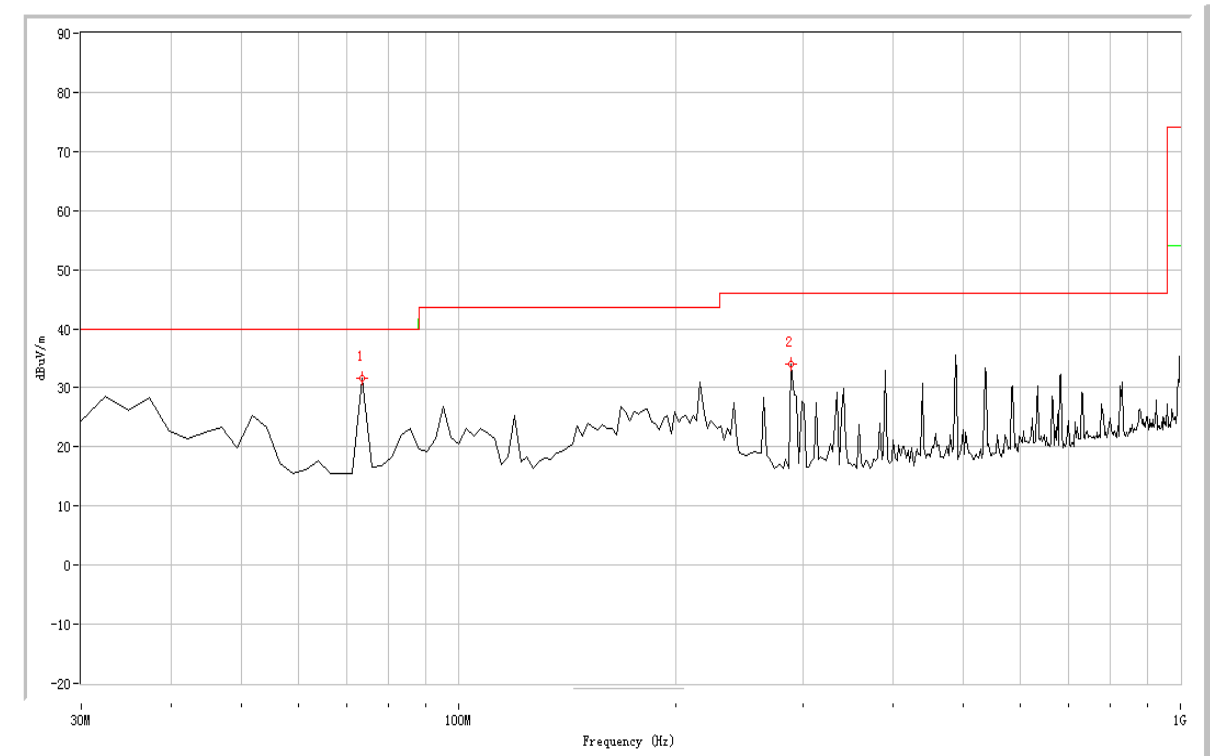
(Plot B: Test Antenna Horizontal)



(Plot C: Test Antenna Horizontal)

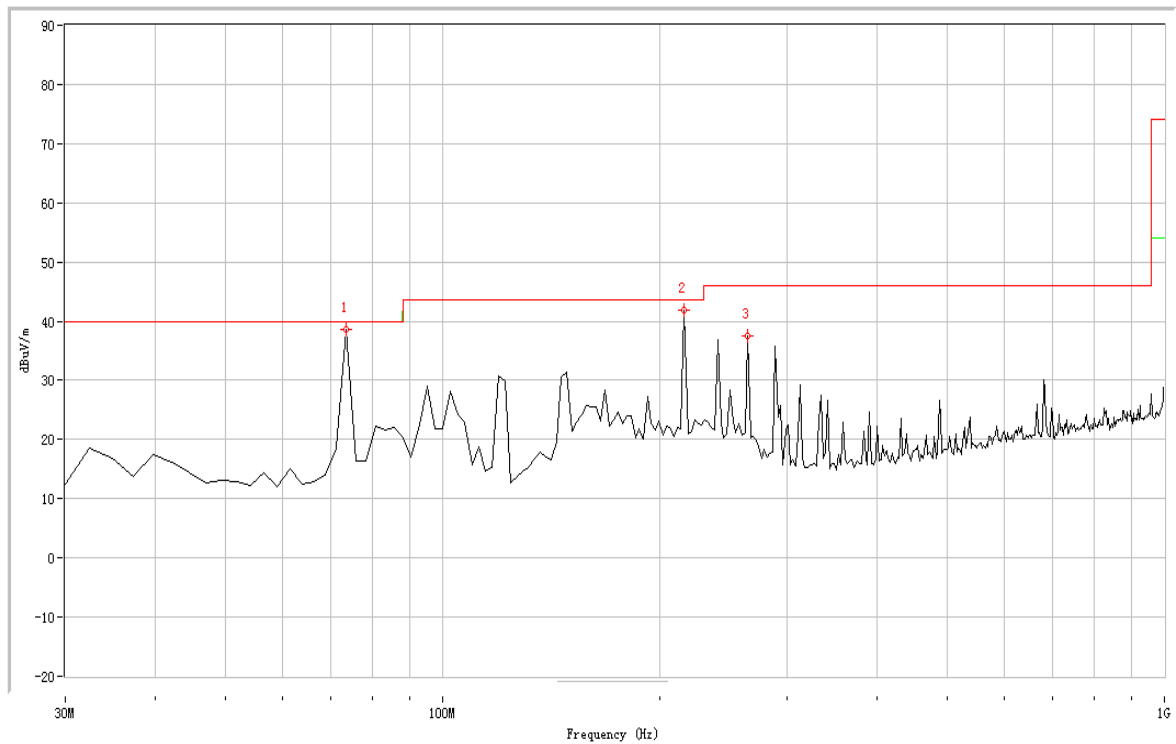
2.3.3.2 Radiated Emission >30MHz (30MHz~1GHz, E-field)

A. Test Plots:



(Plot A: Test Antenna Vertical)

NO.	Fre. (MHz)	Pk	QP	AV	Limit- PK	Limit- QP	Limit- AV	Degree	Antenna	Verdict
1	73.541	31.69	N.A	N.A	N.A	40.0	N.A	292.2	Vertical	Pass
2	288.828	34.08	N.A	N.A	N.A	46.0	N.A	120.0	Vertical	Pass



(Plot B: Test Antenna Horizontal)

NO.	Fre. (MHz)	Pk	QP	AV	Limit -PK	Limit- QP	Limit- AV	Antenna	Verdict
1	73.541	38.60	35.52	35.41	N.A	40.0	N.A	Horizontal	Pass
2	216.259	41.87	37.38	37.04	N.A	43.5	N.A	Horizontal	Pass
	264.638	37.60	N.A	N.A	N.A	46.0	N.A	Horizontal	Pass

Result: PASS

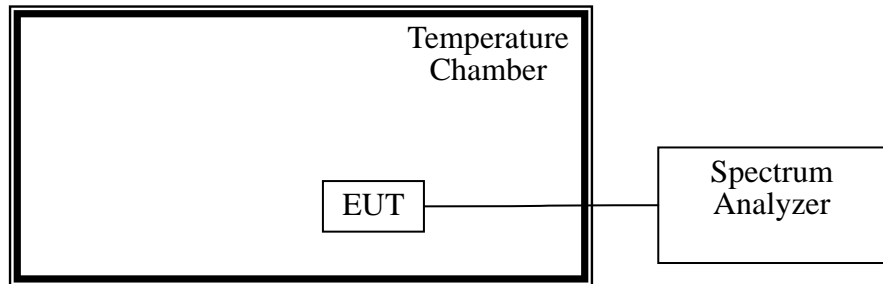
2.4 Frequency Tolerance

2.4.1 Requirement

According to FCC section 15.225, the devices operating in the 13.553 – 13.567 MHz shall maintain the carrier frequency within 0.01% of the operating frequency over the temperature variation of -20°C to +50°C using an environmental chamber. The primary supply voltage is varied from 85% to 115% of the voltage normally at the input to the device or at the power supply terminals if cables are not normally supplied.

2.4.2 Test Description

Test Setup:



The EUT, which is powered by the DC Power Supply directly, is located in the Temperature Chamber. The RF Card is used for the call between with the EUT, and the EUT was measured by transmitter mode continuously.

2.4.3 Test Result

Operating Frequency: 13,560,000 Hz

Deviant Limit: $\pm 0.01\%$

Voltage vs. Frequency Stability

Voltage (V)	Measurement Frequency (MHz)
126.5	13.559760

110	13.559780
93.5	13.559740
Max. Deviation (MHz)	0.00260
Max. Deviation (ppm)	19.1740

Temperature vs. Frequency Stability

Temperature (°C)	Measurement Frequency (MHz)
-30	13.559760
-20	13.559780
-10	13.559820
0	13.559800
10	13.559800
20	13.559800
30	13.559760
40	13.559780
50	13.559760
Max. Deviation (MHz)	0.000240
Max. Deviation (ppm)	17.6991

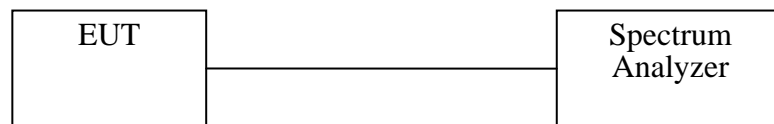
Result: PASS

2.5 20dB Bandwidth

2.5.1 Requirement

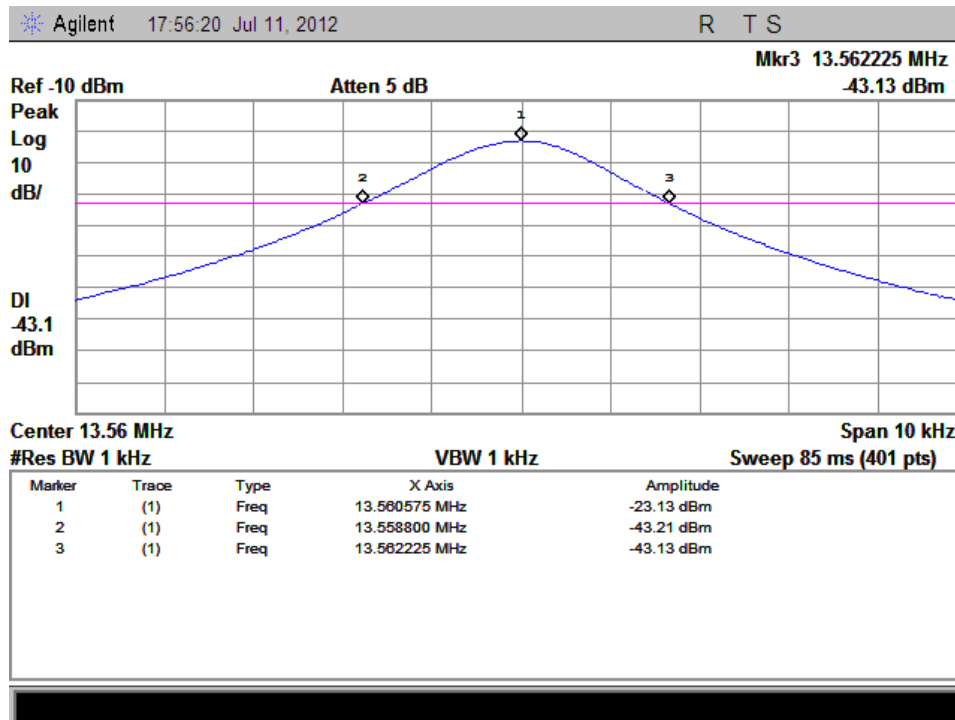
According to FCC section 15.215(c), the 20dB bandwidth is measured with a spectrum analyzer connected the EUT while the EUT is operating in transmission mode.

2.5.2 Test Setup:

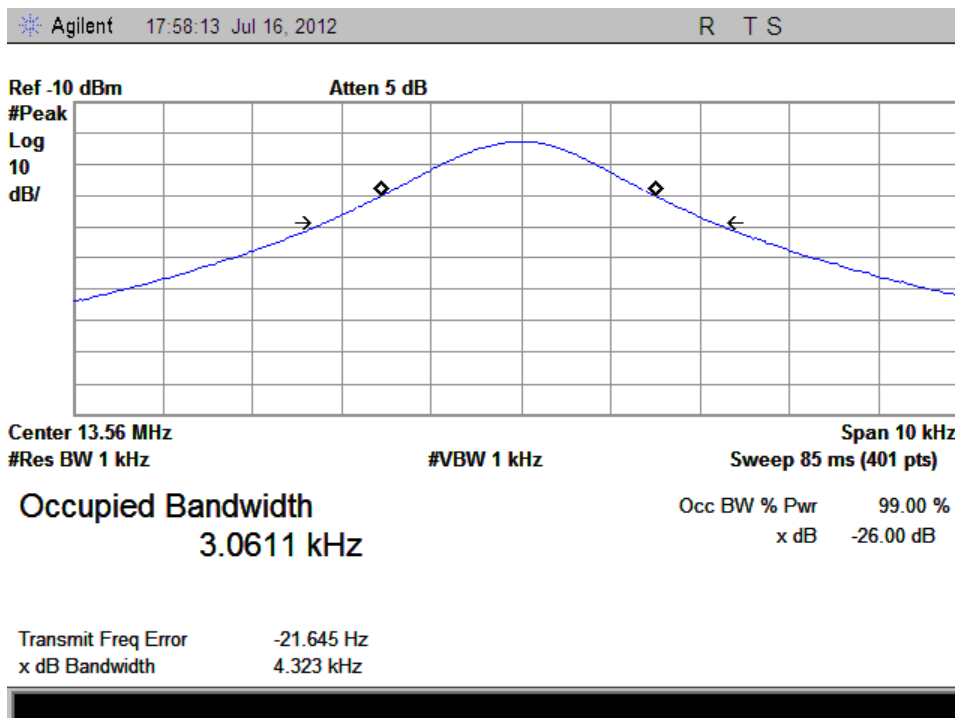


2.5.3 Test Verdict

Frequency	20dB BW	99% OBW	Frequency range (MHz) $f_L > 13.553\text{MHz}$	Frequency range (MHz) $f_H < 13.567\text{MHz}$	Test Result
13.56MHz	1.65kHz	3.06kHz	13.560575	13.562225	Pass



(Plot A: 20dB bandwidth)



(Plot B : 99% occupied bandwidth)

Result: Compliant

**** END OF REPORT ****