

FCC Part 15C

Measurement and Test Report

For
Shenzhen Handheld-Wireless Technology Co., Ltd.

FCC ID: 2AKFL-C5000

FCC Rules:	<u>FCC Part 15C</u>	
Product Description:	<u>Mobile Data Terminal</u>	
Tested Model:	<u>C5000</u>	
Report No.:	<u>BSL190312066004RF</u>	
Tested Date:	<u>April 16,2019-April 19,2019</u>	
Issued Date:	<u>April 22, 2019</u>	
Tested By:	<u>Messi Wang / Engineer</u>	<i>Messi Wang</i>
Reviewed By:	<u>Steven Wen / EMC Manager</u>	<i>Steven Wen</i>
Approved & Authorized By:	<u>Mike mo / PSQ Manager</u>	<i>Mike mo</i>
Prepared By:	BSL Testing Co.,LTD. NO. 24, ZH Park, Nantou, Shenzhen, 518000 China Tel: 400-882-9628 Fax: 86- 755-26508703	

TABLE OF CONTENTS

1. GENERAL INFORMATION..... 3

- 1.1 Product Description for Equipment Under Test (EUT).....3
- 1.2 Test Standards..... 4
- 1.3 Test Methodology..... 4
- 1.4 Test Facility..... 4
- 1.5 EUT Setup and Operation Mode.....5
- 1.6 Measurement Uncertainty..... 5
- 1.7 Test Equipment List and Details..... 6

2. SUMMARY OF TEST RESULTS..... 7

3. CONDUCTED EMISSIONS..... 8

- 3.1 Test Procedure..... 8
- 3.2 Basic Test Setup Block Diagram..... 8
- 3.3 Environmental Conditions..... 8
- 3.4 Summary of Test Results/Plots..... 9
- 3.5 Conducted Emissions Test Data.....9

4. RADIATED EMISSION.....12

- 4.1 Test Procedure..... 12
- 4.2 Test Receiver Setup..... 13
- 4.3 Corrected Amplitude & Margin Calculation..... 13
- 4.4 Environmental Conditions..... 13
- 4.5 Summary of Test Results/Plots..... 14

1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: Shenzhen Handheld-Wireless Technology Co., Ltd.
 Address of applicant: 16th Floor, Block B, Dongfangtiande Bldg., Minzhi Street, Longhua New District, Shenzhen, China

Manufacturer: Shenzhen Handheld-Wireless Technology Co., Ltd.
 Address of manufacturer: 16th Floor, Block B, Dongfangtiande Bldg., Minzhi Street, Longhua New District, Shenzhen, China

General Description of EUT	
Product Name:	Mobile Data Terminal
Trade Name:	Handheld-Wireless
Model No.:	C5000
Adding Model(s):	C5100
<i>Note: The test data is gathered from a production sample, provided by the manufacturer.</i>	

Technical Characteristics of EUT	
Frequency Range:	134.2KHz
Modulation Type:	ASK
Channel Number:	1
Antenna Description:	Coil Antenna,0dBi

1.2 Test Standards

The following report is prepared on behalf of the Shenzhen Handheld-Wireless Technology Co., Ltd. in accordance with Part 2, Subpart J, and FCC Part 15, Subpart B, Subpart C, and section 15.203, 15.205 and 15.209 of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC Part 15, Subpart B, and section 15.205, 15.207, and 15.209 rules.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission, should be checked to ensure compliance has been maintained.

1.3 Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard for Testing Unlicensed Wireless Devices, and ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

1.4 Test Facility

BSL Testing Co.,LTD.
NO. 24, ZH Park, Nantou, Shenzhen, 518000 China
Designation Number : CN1217
Test Firm Registration Number: 866035
Tel: 86- 755-26508703
Fax: 86- 755-26508703

1.5 EUT Setup and Operation Mode

The equipment under test (EUT) was configured to measure its highest possible emission level. The test modes were adapted according to the operation manual for use, more detailed description as follows:

Test Mode List:

Test Mode	Description	Remark
TM1	Operating	/

Note: Test was performed with TM1 and TM2, TM1 is the worst case so it is only showed in this report.

EUT Cable List and Details

Cable Description	Length (M)	Shielded/Unshielded	With Core/Without Core
/	/	/	/

Auxiliary Equipment List and Details

Description	Manufacturer	Model	Serial Number
/	/	/	/
/	/	/	/

Special Cable List and Details

Cable Description	Length (M)	Shielded/Unshielded	With Core/Without Core
/	/	/	/

1.6 Measurement Uncertainty

Measurement uncertainty		
Parameter	Conditions	Uncertainty
Conducted Emissions	Conducted	$\pm 2.88\text{dB}$
Transmitter Spurious Emissions	Radiated	$\pm 5.1\text{dB}$

1.7 Test Equipment List and Details

Description	Manufacturer	Model	Serial No.	Cal Date	Due. Date
Communication Tester	Rohde & Schwarz	CMW500	100358	2018-11-08	2019-11-07
Spectrum Analyzer	R&S	FSP40	100550	2018-10-08	2019-10-07
Test Receiver	R&S	ESC17	US47140102	2018-10-08	2019-10-07
Signal Generator	HP	83630B	3844A01028	2018-10-08	2019-10-07
Test Receiver	R&S	ESPI-3	100180	2018-10-08	2019-10-07
Amplifier	Agilent	8449B	4035A00116	2018-10-08	2019-10-07
Amplifier	HP	8447E	2945A02770	2018-10-08	2019-10-07
Signal Generator	IFR	2023A	202307/242	2018-10-08	2019-10-07
Broadband Antenna	SCHAFFNER	2774	2774	2018-10-21	2019-10-20
Biconical and log periodic antennas	ELECTRO-METRICS	EM-6917B-1	171	2018-10-21	2019-10-20
Horn Antenna	R&S	HF906	100253	2018-10-21	2019-10-20
Horn Antenna	EM	EM-6961	6462	2018-10-21	2019-10-20
LISN	R&S	ESH3-Z5	100196	2018-10-08	2019-10-07
LISN	COM-POWER	LI-115	02027	2018-10-08	2019-10-07
3m Semi-Anechoic Chamber	Chengyu Electron	9 (L)*6 (W)* 6 (H)	BSL086	2018-10-08	2019-10-07
Horn Antenna	Schwarzbeck	BBHA9170	00814	2018-10-21	2019-10-20
Loop Antenna	Schwarz beck	FMZB 1516	9773	2018-06-16	2019-06-15

2. SUMMARY OF TEST RESULTS

Description of Test	Result
§15.207 (a) Conducted Emission	Compliant
§15.209(a) Radiated Emission	Compliant

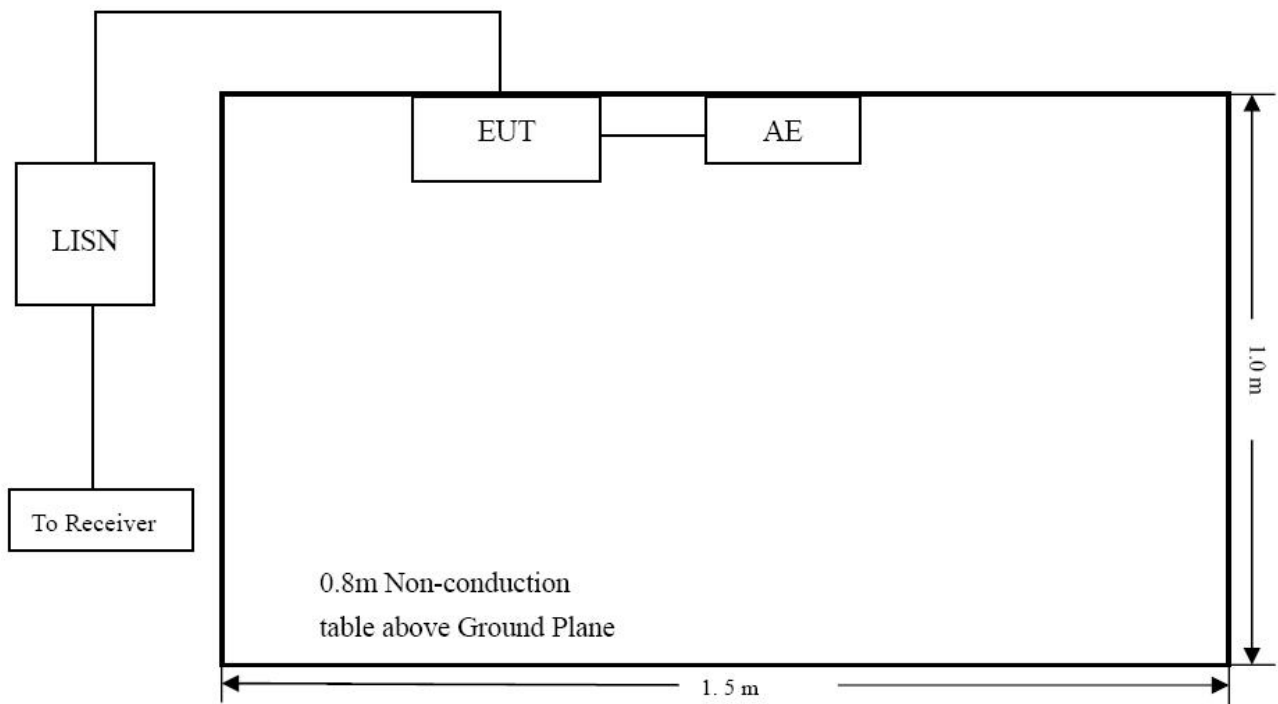
N/A: not applicable

3. CONDUCTED EMISSIONS

3.1 Test Procedure

Test is conducting under the description of ANSI C63.10-2013, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

3.2 Basic Test Setup Block Diagram



3.3 Environmental Conditions

Temperature:	23 °C
Relative Humidity:	52%
ATM Pressure:	1011 mbar

3.4 Summary of Test Results/Plots

According to the data in section 3.5, the EUT complied with the FCC Part 15.207(a) Conducted margin for this device, with the *worst* margin reading of:

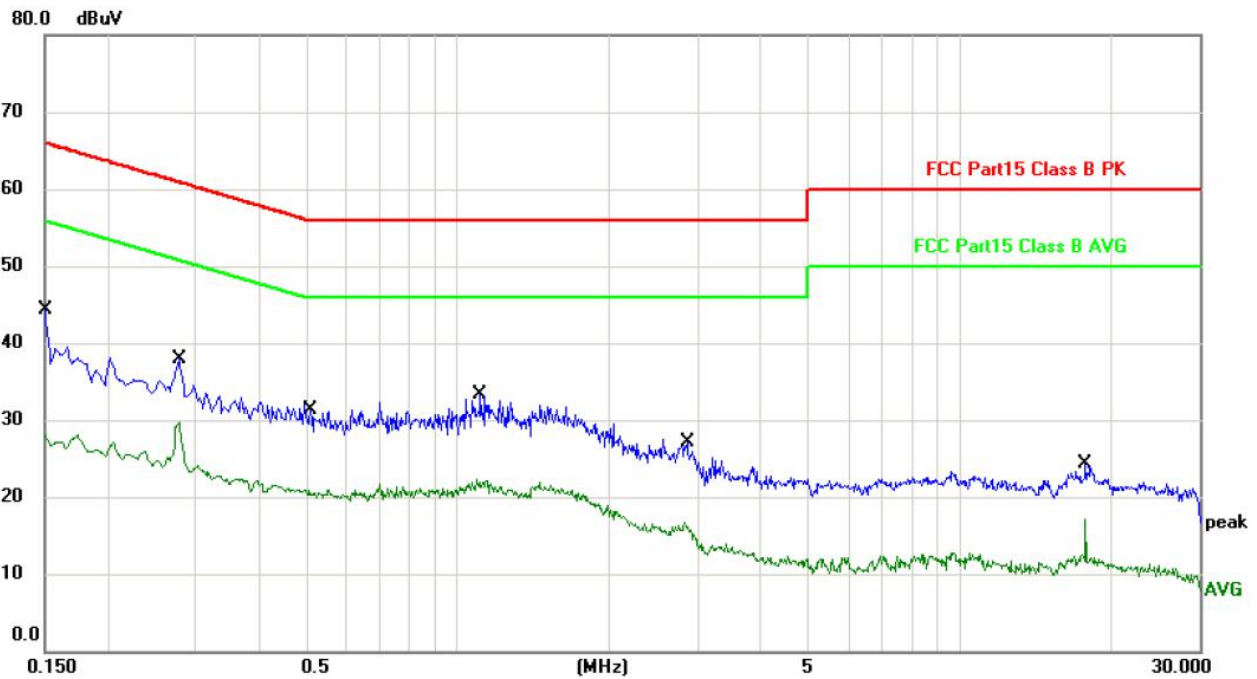
-21.6 dB at 0.1500 MHz in the **Neutral, QP** detector, 0.15-30MHz

3.5 Conducted Emissions Test Data

Plot of Conducted Emissions Test Data

EUT: *Mobile Data Terminal*
 Tested Model: *C5000*
 Operating Condition: *TMI*
 Comment: *120V/60Hz; Adapter DC 5V*

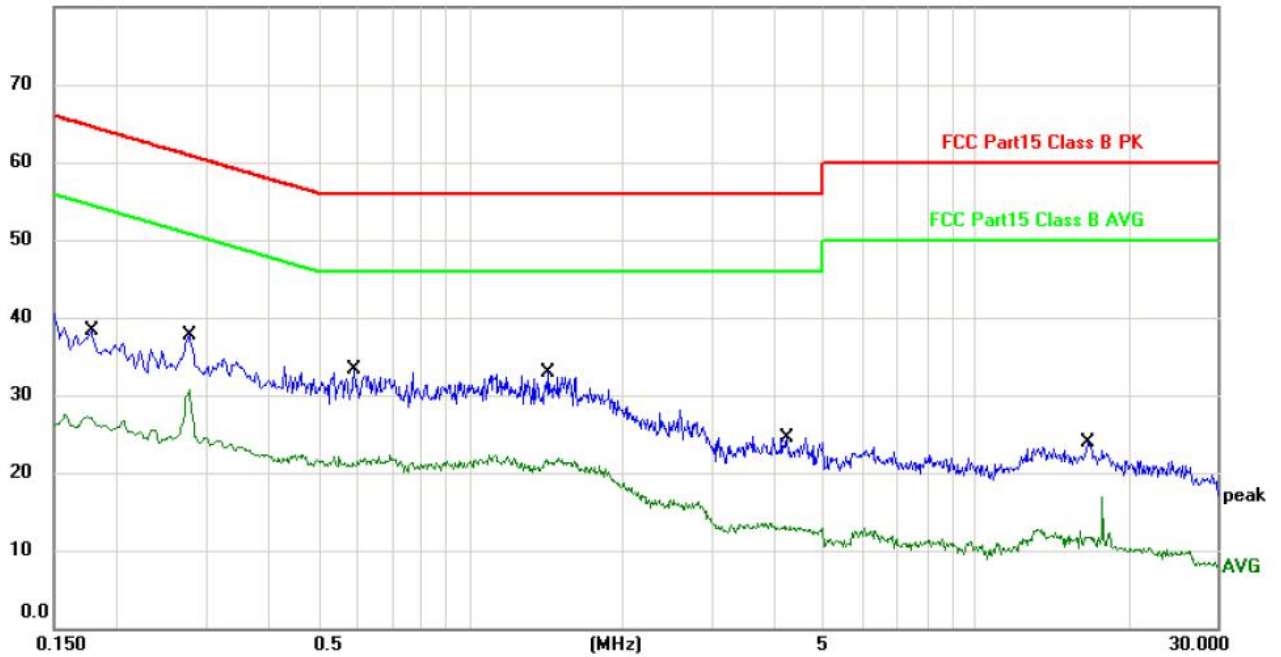
Test Specification: *Neutral*



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1	*	0.1500	43.78	0.61	44.39	65.99	-21.60	QP	
2		0.1500	26.56	0.61	27.17	55.99	-28.82	AVG	
3		0.2779	37.22	0.61	37.83	60.88	-23.05	QP	
4		0.2779	22.77	0.61	23.38	50.88	-27.50	AVG	
5		0.5100	30.57	0.65	31.22	56.00	-24.78	QP	
6		0.5100	19.60	0.65	20.25	46.00	-25.75	AVG	
7		1.1100	32.63	0.68	33.31	56.00	-22.69	QP	
8		1.1100	21.37	0.68	22.05	46.00	-23.95	AVG	
9		2.8580	26.23	0.83	27.06	56.00	-28.94	QP	
10		2.8580	12.67	0.83	13.50	46.00	-32.50	AVG	
11		17.8100	23.38	0.95	24.33	60.00	-35.67	QP	
12		17.8100	11.07	0.95	12.02	50.00	-37.98	AVG	

Test Specification: Line

80.0 dBuV



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV	dBuV	dB		
1		0.1780	37.74	0.50	38.24	64.57	-26.33	QP	
2		0.1780	26.20	0.50	26.70	54.57	-27.87	AVG	
3		0.2779	37.13	0.49	37.62	60.88	-23.26	QP	
4		0.2779	24.13	0.49	24.62	50.88	-26.26	AVG	
5	*	0.5899	32.79	0.52	33.31	56.00	-22.69	QP	
6		0.5899	20.89	0.52	21.41	46.00	-24.59	AVG	
7		1.4299	32.15	0.67	32.82	56.00	-23.18	QP	
8		1.4299	20.89	0.67	21.56	46.00	-24.44	AVG	
9		4.2300	23.55	0.86	24.41	56.00	-31.59	QP	
10		4.2300	11.82	0.86	12.68	46.00	-33.32	AVG	
11		16.6860	23.02	0.89	23.91	60.00	-36.09	QP	
12		16.6860	10.49	0.89	11.38	50.00	-38.62	AVG	

NOTE:

Corret Factor=LISN Factor+Cable loss.

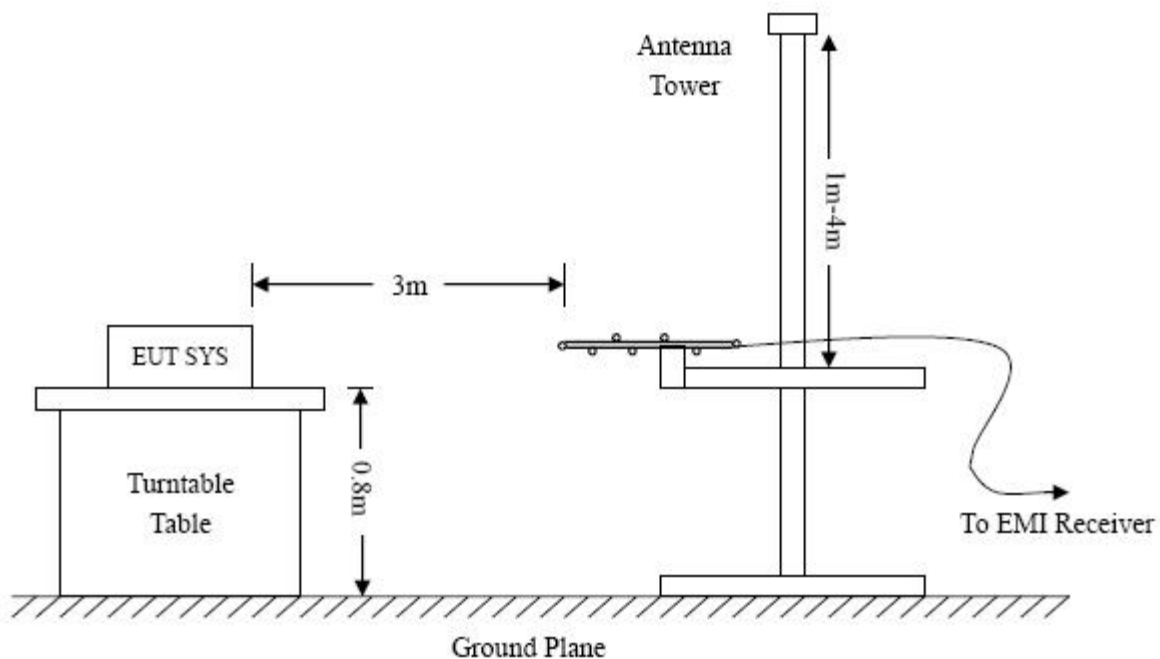
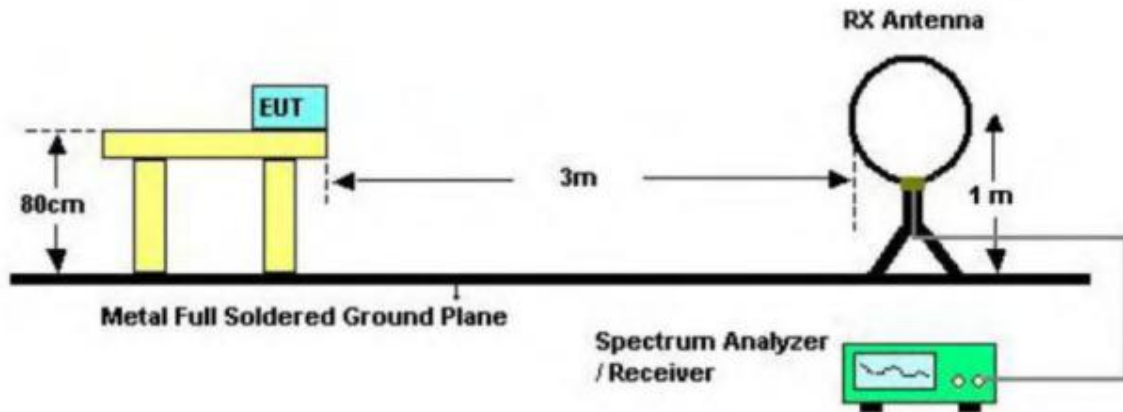
Measurementt=Reading level+Corret Factor.

4. RADIATED EMISSION

4.1 Test Procedure

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.209 Limit.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle. The spacing between the peripherals was 10 cm.



4.2 Test Receiver Setup

Frequency :9kHz-30MHz
 RBW=10KHz,
 VBW =30KHz
 Sweep time= Auto
 Trace = max hold
 Detector function = peak

Frequency :30MHz-1GHz
 RBW=120KHz,
 VBW=300KHz
 Sweep time= Auto
 Trace = max hold
 Detector function = peak, QP

Frequency :Above 1GHz
 RBW=1MHz,
 VBW=3MHz(Peak), 10Hz(AV)
 Sweep time= Auto
 Trace = max hold
 Detector function = peak, AV

4.3 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and the Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} - \text{Corr. Factor}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -6dB μ V means the emission is 6dB μ V below the maximum limit for this device. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{FCC Part 15.209(a) Limit}$$

4.4 Environmental Conditions

Temperature:	23 °C
Relative Humidity:	55 %
ATM Pressure:	1011 mbar

4.5 Summary of Test Results/Plots

According to the data, the EUT complied with the FCC Part 15.209(a) rule, and had the worst margin of:

-12.57 dB at 827.4934 MHz in the 9 KHz to 1 GHz, Horizontal,3Meters

Plot of Radiated Emissions Test Data(Below 30MHz)

EUT: Mobile Data Terminal
Tested Model: C5000
Operating Condition: TMI
Comment: 120V/60Hz; Adapter DC 5V
Test Specification: Loop Antenna

No.	Frequency (KHz)	Reading (dBuV)	Factor (dB)	Emission (dBuV/m)	Detector (PK/QP/A)	Limit (dBuV/m)	Margin (dB)
1	26	59.77	23.21	82.98	AV	119.30	-36.32
2	26	80.48	23.21	103.69	PK	139.30	-35.61
3	69	47.92	24.66	72.58	AV	110.83	-38.25
4	69	69.92	24.66	94.58	PK	130.83	-36.25
5	120	49.42	22.33	71.75	AV	106.02	-34.27
6	120	71.19	22.33	93.52	PK	126.02	-32.50
7	252	37.54	25.78	63.32	AV	99.58	-36.26
8	252	59.21	25.78	84.99	PK	119.58	-34.59
9	388	41.81	24.66	66.47	AV	95.83	-29.36
10	388	62.32	24.66	86.98	PK	115.83	-28.85
11	432	44.39	26.35	70.74	AV	94.89	-24.15
12	432	66.18	26.35	92.53	PK	114.89	-22.36
13	1239	22.46	24.41	46.87	QP	65.74	-18.87
14	2524	16.71	24.41	41.12	QP	59.56	-18.44

1. Factor=Ant. Factor+ Cable Loss .

2. Emission Level= Reading + Factor

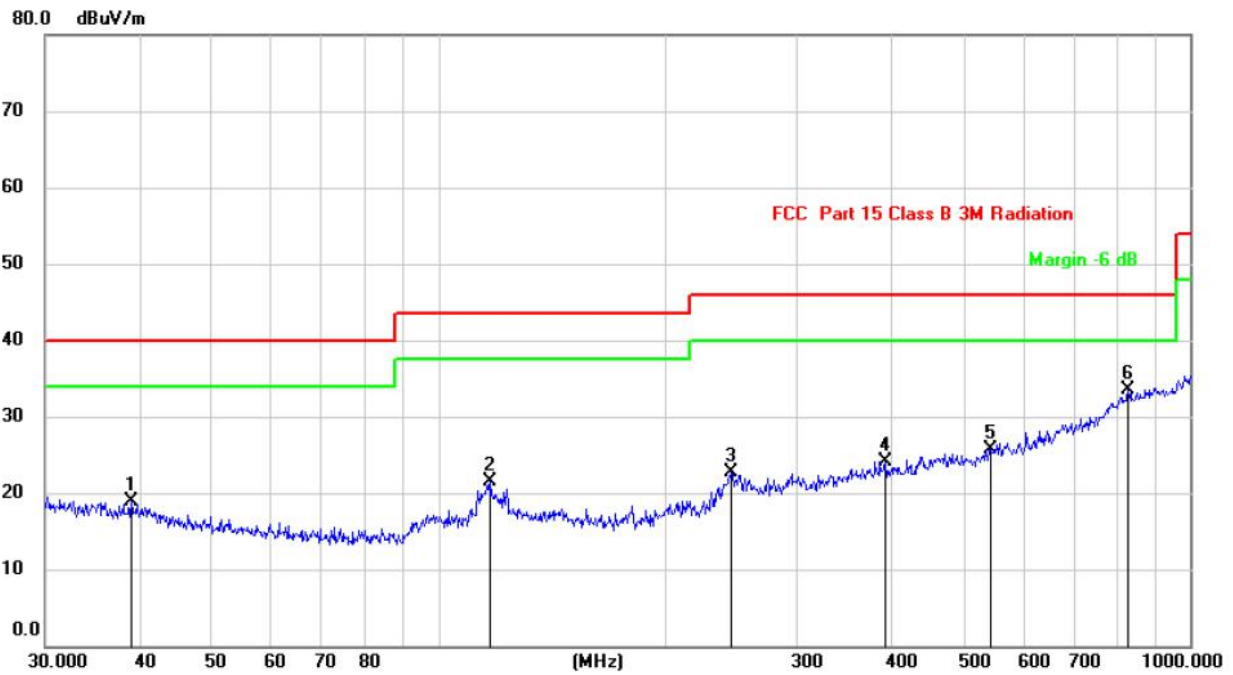
3.Margin = Emission Level- Limit

4.Limit calculation: Limit at specified distance + 40log (300/3) = Limit + 80 dB for up to 0.49 MHz Limit at specified distance + 40log (30/3) = Limit + 40 dB for above 0.49 MHz, Below 30 MHz

Plot of Radiated Emissions Test Data (From 30MHz to 1GHz)

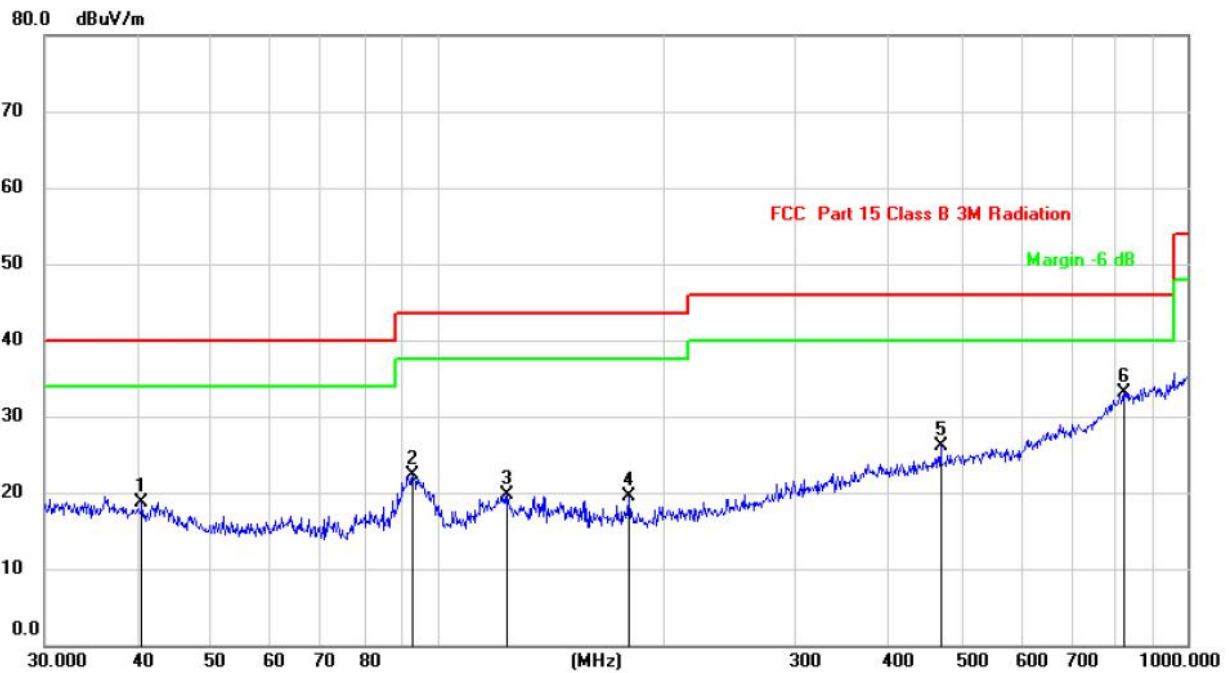
EUT: *Mobile Data Terminal*
 Tested Model: *C5000*
 Operating Condition: *TM1*
 Comment: *120V/60Hz; Adapter DC 5V*

Test Specification: *Horizontal*



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dBuV/m	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector
1		39.0245	14.58	4.42	19.00	40.00	-21.00	QP
2		117.3603	17.53	3.88	21.41	43.50	-22.09	QP
3		245.0900	18.16	4.48	22.64	46.00	-23.36	QP
4		393.4723	14.65	9.50	24.15	46.00	-21.85	QP
5		543.2742	14.21	11.54	25.75	46.00	-20.25	QP
6	*	827.4934	15.41	18.02	33.43	46.00	-12.57	QP

Test Specification: Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dBuV/m	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector
1		40.4172	14.31	4.43	18.74	40.00	-21.26	QP
2		92.7871	21.25	1.10	22.35	43.50	-21.15	QP
3		124.1330	15.88	3.91	19.79	43.50	-23.71	QP
4		180.0165	16.79	2.66	19.45	43.50	-24.05	QP
5		468.8762	15.63	10.46	26.09	46.00	-19.91	QP
6	*	821.7103	15.30	17.88	33.18	46.00	-12.82	QP

***** END OF REPORT *****