

FCC Test Report

Product Name	Key programming device
Model No.	KeyReader Plus
FCC ID.	QLXKRP

Applicant	TeraTron GmbH
Address	Bunsenstr. 10, 51647 Gummersbach, Germany

Date of Receipt	Aug. 02, 2016
Issued Date	Aug. 25, 2016
Report No.	1680089R-RFUSP20V00
Report Version	V1.0



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration report of the equipment and evaluated measurement uncertainty herein.

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Applicant	TeraTron GmbH
Address	Bunsenstr. 10, 51647 Gummersbach, Germany
Manufacturer	TeraTron GmbH
Model No.	KeyReader Plus
FCC ID.	QLXKRP
EUT Rated Voltage	DC 3.6V (Power by Battery)
EUT Test Voltage	DC 3.6V (Power by Battery)
Trade Name	TeraTron
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2015 ANSI C63.4: 2014, ANSI C63.10: 2013
Test Result	Complied

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Approved By :

Vincent Lin

(Director / Vincent Lin)

TABLE OF CONTENTS

Description	Page
1. GENERAL INFORMATION.....	4
1.1. EUT Description	4
1.2. Operational Description.....	5
1.3. Test System Details	6
1.4. Configuration of Test System	6
1.5. EUT Exercise Software	6
1.6. Test Facility.....	7
2. Conducted Emission	8
2.1. Test Equipment.....	8
2.2. Test Setup.....	8
2.3. Limits.....	9
2.4. Test Procedure.....	9
2.5. Uncertainty.....	9
2.6. Test Result of Conducted Emission.....	10
3. Radiated Emission	12
3.1. Test Equipment.....	12
3.2. Test Setup.....	12
3.3. Limits.....	13
3.4. Test Procedure.....	14
3.5. Uncertainty.....	14
3.6. Test Result of Radiated Emission.....	15
4. EMI Reduction Method During Compliance Testing	18
Attachment 1: EUT Test Photographs	
Attachment 2: EUT Detailed Photographs	

1. GENERAL INFORMATION

1.1. EUT Description

Product Name	Key programming device
Trade Name	TeraTron
Model No.	KeyReader Plus
FCC ID.	QLXKRP
Frequency Range	125kHz
Type of Modulation	ASK
Type of antenna	Loop Antenna
Number of Channel	1
USB Cable	Shielded, 2m

Frequency of Each Channel:

Channel	Frequency
1	125kHz

Note:

1. The EUT is a Key programming device with built-in 125kHz transmitter.
2. These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15 Subpart C Paragraph 15.209
3. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.

Test Mode	Mode 1: Transmit
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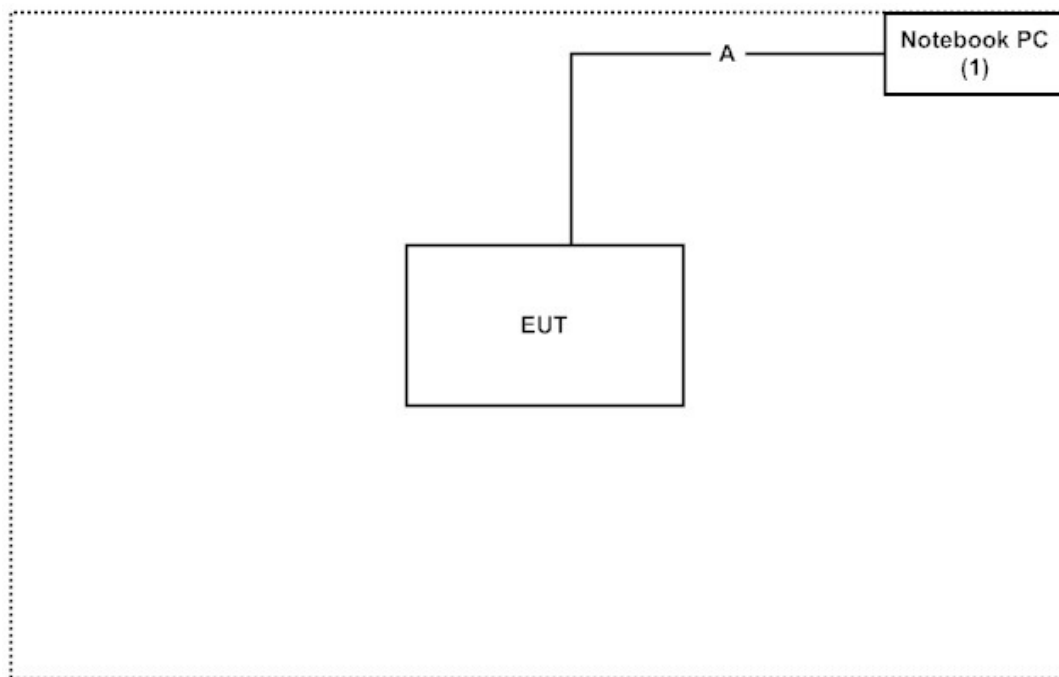
1.3. Test System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

	Product	Manufacturer	Model No.	Serial No.	Power Cord
1	Notebook PC	ASUS	X206H	X206HA	Non-Shielded, 1.8m

Signal Cable Type	Signal cable Description
A USB Cable	Shielded, 2m

1.4. Configuration of Test System



1.5. EUT Exercise Software

- (1) Setup the EUT as shown in Section 1.4
- (2) Turn on the power of all equipment.
- (3) Start the continuous transmitter.
- (4) Verify that the EUT works properly.

1.6. Test Facility

Ambient conditions in the laboratory:

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	20-35
Humidity (%RH)	25-75	50-65
Barometric pressure (mbar)	860-1060	950-1000

The related certificate for our laboratories about the test site and management system can be downloaded from QuieTek Corporation's Web Site: <http://www.quietek.com/chinese/about/certificates.aspx?bval=5>

The address and introduction of QuieTek Corporation's laboratories can be founded in our Web site: <http://www.quietek.com/>

Site Description: File on
Federal Communications Commission
FCC Engineering Laboratory
7435 Oakland Mills Road
Columbia, MD 21046
Registration Number: 92195

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FCC Accreditation Number: TW1014

2. Conducted Emission

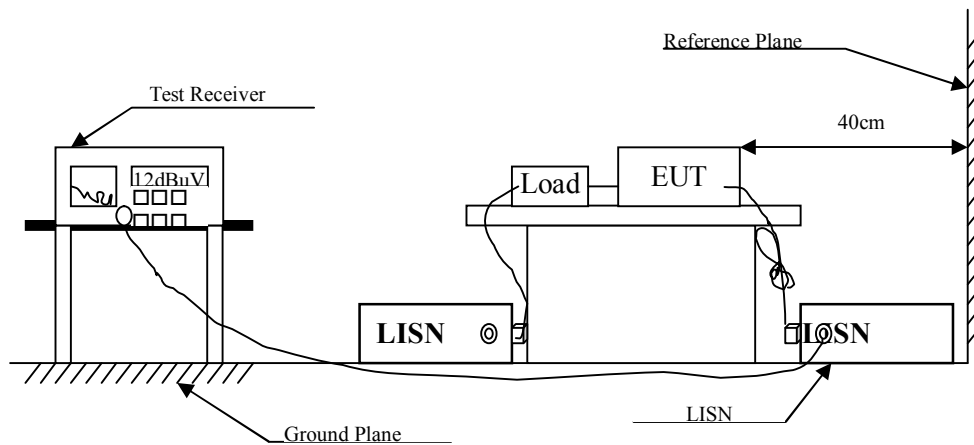
2.1. Test Equipment

	Equipment	Manufacturer	Model No. / Serial No.	Last Cal.	Due Cal.	Remark
X	Test Receiver	R & S	ESCS 30 / 825442/018	2015/12/18	2016/12/16	
X	LISN	R & S	ESH3-Z5 / 836679/017	2016/1/7	2017/1/6	EUT
	DC LISN	Schwarzbeck	8226 / 176	2016/1/5	2017/1/3	EUT
X	Pulse Limiter	R & S	ESH3-Z2 / 357.8810.52	2015/9/30	2016/9/28	
	No.1 Shielded Room					

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked by "X" are used to measure the final test results.

2.2. Test Setup



2.3. Limits

FCC Part 15 Subpart C Paragraph 15.207 (dBuV) Limit		
Frequency MHz	Limits	
	QP	AV
0.15 - 0.50	66-56 _(註)	56-46 _(註)
0.50-5.0	56	46
5.0 - 30	60	50

2.4. Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm /50uH coupling impedance with 50ohm termination. (Please refers to the block diagram of the test setup and photographs.)

Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4: 2014 on conducted measurement.

Conducted emissions were invested over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

2.5. Uncertainty

± 2.26 dB

2.6. Test Result of Conducted Emission

Product : Key programming device
Test Item : Conducted Emission Test
Power Line : Line 1
Test date : 2016.8.9
Test Mode : Mode 1: Transmit

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dBuV	dBuV	dB	dBuV
LINE 1					
Quasi-Peak					
0.170	9.681	38.760	48.442	-16.987	65.429
0.263	9.678	23.770	33.448	-29.323	62.771
0.470	9.675	31.220	40.895	-15.962	56.857
1.498	9.723	8.550	18.274	-37.726	56.000
3.115	9.768	14.250	24.018	-31.982	56.000
6.877	9.834	19.510	29.344	-30.656	60.000
Average					
0.170	9.681	25.640	35.322	-20.107	55.429
0.263	9.678	12.380	22.058	-30.713	52.771
0.470	9.675	25.250	34.925	-11.932	46.857
1.498	9.723	2.100	11.824	-34.176	46.000
3.115	9.768	7.670	17.438	-28.562	46.000
6.877	9.834	13.660	23.494	-26.506	50.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. “” means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : Key programming device
Test Item : Conducted Emission Test
Power Line : Line 2
Test date : 2016.8.9
Test Mode : Mode 1: Transmit

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dBuV	dBuV	dB	dBuV
LINE 2					
Quasi-Peak					
0.193	9.736	31.510	41.246	-23.525	64.771
0.459	9.744	31.380	41.124	-16.047	57.171
1.998	9.803	19.610	29.413	-26.587	56.000
3.545	9.842	18.930	28.772	-27.228	56.000
4.529	9.862	20.560	30.422	-25.578	56.000
14.927	10.083	13.120	23.203	-36.797	60.000
Average					
0.193	9.736	23.450	33.186	-21.585	54.771
0.459	9.744	21.620	31.364	-15.807	47.171
1.998	9.803	13.210	23.013	-22.987	46.000
3.545	9.842	12.540	22.382	-23.618	46.000
4.529	9.862	12.510	22.372	-23.628	46.000
14.927	10.083	7.580	17.663	-32.337	50.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. “ ” means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

3. Radiated Emission

3.1. Test Equipment

The following test equipments are used during the radiated emission test:

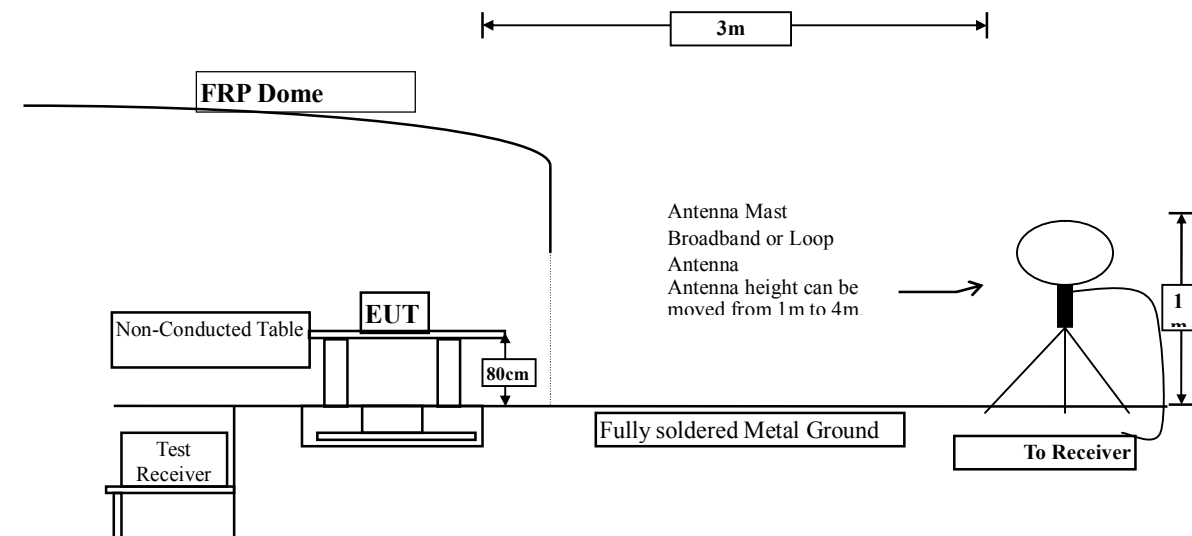
Test Site		Equipment	Manufacturer	Model No./Serial No.	Last Cal.	Due Cal.
☒ Site # 3	X	Magnetic Loop Antenna	Teseq	HLA6121/ 37133	2016/3/18	2017/3/17
	X	Bilog Antenna	Schaffner Chase	CBL6112B/ 2707	2016/6/11	2017/6/10
	X	EMI Test Receiver	R&S	ESCS 30/838251/ 001	2016/7/21	2017/7/20
	X	Coaxial Cable	QTK(Armist)	RG 214/ LC003-RG	2016/6/16	2017/6/15
	X	Coaxial signal switch	Armist	MP59B/ 6201415889	2016/6/16	2017/6/15

Test Site		Equipment	Manufacturer	Model No./Serial No.	Last Cal.	Due Cal.
☒ CB # 8		Spectrum Analyzer	R&S	FSP40/ 100339	2015/11/27	2016/11/25
		Horn Antenna	ETS-Lindgren	3117/ 35205	2016/4/6	2017/4/5
		Horn Antenna	Schwarzbeck	BBHA9170/209	2016/4/14	2017/4/13
		Pre-Amplifier	EMCI	EMC012630SE/980210	2016/1/26	2017/1/24

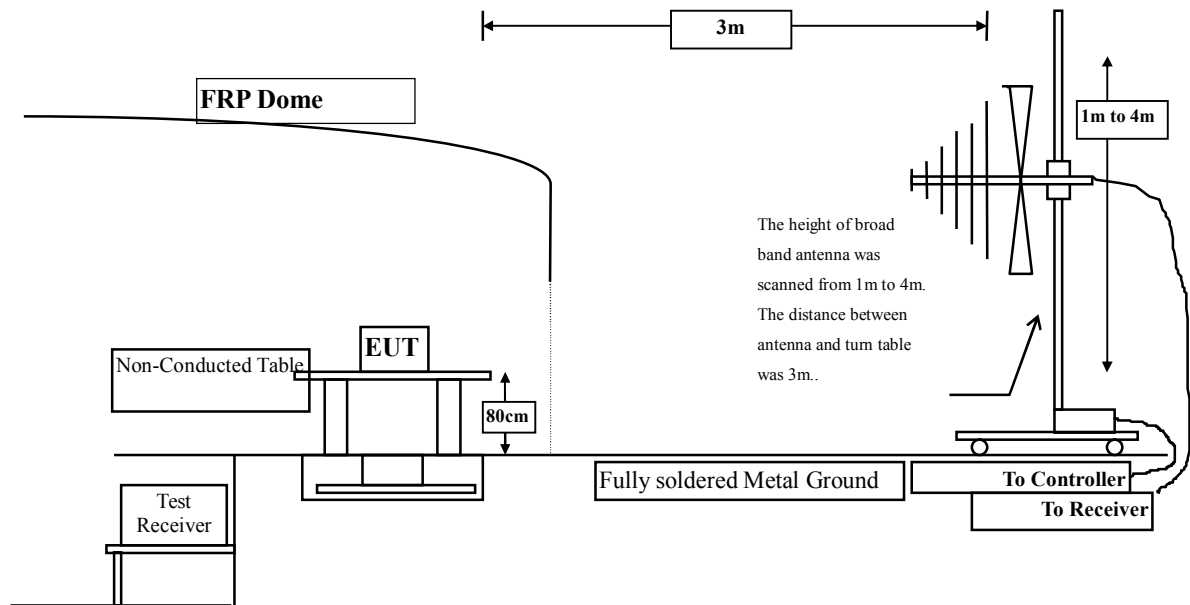
- Note: 1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
2. The test instruments marked with "X" are used to measure the final test results.

3.2. Test Setup

Under 30MHz Test Setup



Radiated Emission Below 1GHz



3.3. Limits

FCC Part 15 Subpart B Paragraph 15.209 Limits		
Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 - 0.490	2,400/F(kHz)	300
0.490– 1.705	24,000/F(kHz)	30
1.705 – 30	30	30
30 – 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

- Remarks :
1. RF Voltage (dBuV) = 20 log RF Voltage (uV)
 2. In the Above Table, the tighter limit applies at the band edges.
 3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

3.4. Test Procedure

The EUT was setup according to ANSI C63.10, 2013 and tested compliance to FCC 47CFR 15.209 requirements.

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.10: 2013 on radiated measurement.

The resolution bandwidth below 1GHz setting on the field strength meter is 120 kHz and above 1GHz is 1MHz. Radiated emission measurements below 1GHz are made using broadband Bilog antenna and above 1GHz are made using Horn Antennas.

The measurement is divided into the Preliminary Measurement and the Final Measurement.

The suspected frequencies are searched for in Preliminary Measurement with the measurement antenna kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. The antenna is pointed at an angle towards the source of the emission, and the EUT is rotated in both height and polarization to maximize the measured emission. The emission is kept within the illumination area of the 3 dB bandwidth of the antenna.

The worst radiated emission is measured on the Final Measurement.

The measurement frequency range from 9kHz - 10th Harmonic of fundamental was investigated.

3.5. Uncertainty

± 4.08 dB above 1GHz

± 4.22 dB below 1GHz

3.6. Test Result of Radiated Emission

Product : Key programming device
Test Item : Fundamental Radiated Emission
Test Site : No.3 OATS
Test date : 2016.8.9
Test Mode : Mode 1: Transmit

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
X-axis					
Peak					
Horizontal					
0.125	19.731	25.500	45.231	-80.435	125.666
Vertical					
0.125	19.731	25.000	44.731	-80.935	125.666
Y-axis					
Peak					
Horizontal					
0.125	19.731	28.000	47.731	-77.935	125.666
Vertical					
0.125	19.731	25.800	45.531	-80.135	125.666
Z-axis					
Peak					
Horizontal					
0.125	19.731	18.100	37.831	-87.835	125.666
Vertical					
0.125	19.731	9.800	29.531	-96.135	125.666

Note:

1. Limit=25.666dBuV/m + 40*Log (300(m)/3(m))=105.666dBuV/m(Average detector), 125.666666dBuV/m (Peak detector)
2. All Readings below 1GHz are Quasi-Peak, above are average value.
3. Measurement Level = Reading Level + Correct Factor.
4. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Product : Key programming device
Test Item : Fundamental Radiated Emission
Test Site : No.3 OATS
Test date : 2016.8.9
Test Mode : Mode 1: Transmit

9kHz~30MHz

Frequency	Correct	Reading	Measurement	Margin	Limit
	Factor	Level	Level		
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Quasi-Peak					
Horizontal					
0.250	19.700	10.200	29.900	-81.224	111.124
0.375	19.680	26.800	46.480	-55.621	102.101
0.500	19.680	6.000	25.680	-48.031	73.711
0.625	19.680	17.500	37.180	-35.417	72.597
0.750	19.680	5.300	24.980	-46.502	71.482
0.875	19.680	12.600	32.280	-38.088	70.368
1.000	19.670	5.100	24.770	-44.484	69.254
1.125	19.680	9.400	29.080	-39.060	68.140
1.250	19.680	5.000	24.680	-42.346	67.026
Vertical					
0.250	19.700	10.100	29.800	-81.324	111.124
0.375	19.680	24.700	44.380	-57.721	102.101
0.500	19.680	5.900	25.580	-48.131	73.711
0.625	19.680	15.900	35.580	-37.017	72.597
0.750	19.680	5.500	25.180	-46.302	71.482
0.875	19.680	11.300	30.980	-39.388	70.368
1.000	19.670	5.200	24.870	-44.384	69.254
1.125	19.680	8.700	28.380	-39.760	68.140
1.250	19.680	5.900	25.580	-41.446	67.026

Note:

1. All Readings below 1GHz are Quasi-Peak.
2. Measurement Level = Reading Level + Correct Factor.
3. "■" means the worst emission level.
4. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Product : Key programming device
Test Item : General Radiated Emission
Test Site : No.3 OATS
Test date : 2016.8.9
Test Mode : Mode 1: Transmit

30MHz~1GHz

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
66.551	-13.054	38.259	25.205	-14.795	40.000
270.391	-11.143	40.168	29.025	-16.975	46.000
325.217	-9.580	42.711	33.130	-12.870	46.000
380.043	-8.268	39.264	30.996	-15.004	46.000
791.942	-1.132	39.065	37.933	-8.067	46.000
981.725	1.386	31.369	32.754	-21.246	54.000
Vertical					
66.551	-13.054	44.120	31.066	-8.934	40.000
270.391	-11.143	38.511	27.368	-18.632	46.000
325.217	-9.580	40.720	31.139	-14.861	46.000
380.043	-8.268	38.674	30.406	-15.594	46.000
746.957	-1.513	35.897	34.384	-11.616	46.000
973.290	1.273	30.323	31.595	-22.405	54.000

Note:

1. The reading levels below 1GHz are quasi-peak values.
2. "■" means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.
4. The radiated emissions below 1GHz of the lowest, middle, highest frequency are pretested. Only the worst case is shown on the report.

4. EMI Reduction Method During Compliance Testing

No modification was made during testing.