

EMC TEST REPORT

Test item : Digital Trunking Handheld Radio Scanner
Model No. : PRO-651
Order No. : DEMC1403-00776
Date of receipt : 2014-03-03
Test duration : 2014-03-10 ~ 2014-03-11
Use of report : FCC CoC Marking
Date of Issue : 2014-03-27

Applicant : The Whistler Group, Inc.

168 Ayer Road, Littleton, MA 01460, USA

Test laboratory : Digital EMC Co., Ltd.

42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 449-935

Test specification : ANSI C 63.4:2009
FCC Part 15 Subpart B
(Scanning receiver)

Test environment : Temperature : (20 ~ 22) °C,
Humidity : (30 ~ 39) % R.H.

Test result : ☒ Comply ☐ Not Comply

The test results presented in this test report are limited only to the sample supplied by applicant and
the use of this test report is inhibited other than its purpose.

This test report shall not be reproduced except in full, without the written approval of DIGITAL EMC CO., LTD.

Tested by:



Manager
DaeHwa Eun

Reviewed by:



Manager
YoungKyu Shin

PRESIDENT OF DIGITAL EMC CO., LTD.

CONTENTS

1. General Remarks	3
2. Test Laboratory	3
3. General Information of EUT	4
4. Test Summary	5
4.1 Applied standards and test results	5
4.2 Test environment and conditions	5
4.3 Test result Summary	5
5. Test Set-up and operation mode	6
5.1 Principle of Configuration Selection	6
5.2 Test Operation Mode	6
5.3 Support Equipment Used	6
6. Test Results : Emission	7
6.1 Conducted Disturbance	7
6.2 Radiated Disturbance	10
6.3 Antenna Power Conduction	18
Appendix 1	20
List of Test and Measurement Instruments	20
Appendix 2	22
Report Revision History	22

1. General Remarks

This report contains the result of tests performed by:

DIGITAL EMC CO., LTD.

Address : 42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 449-935

<http://www.digitalemc.com>

Tel: +82-31-321-2664 Fax: +82-31-321-1664

2. Test Laboratory

Digital EMC Co., Ltd. has been accredited / filed / authorized by the agencies listed in the following table;

Certificate	Nation	Agency	Code	Mark
Accreditation	Korea	KOLAS	393	ISO/IEC 17025
Site Filing	USA	FCC	101842 678747 596748	Test Facility list & NSA Data
	Canada	IC	5740A-1 5740A-2	Test Facility list & NSA Data
	Japan	VCCI	C-1427 R-1364, R-3385, R-4076, T-1442, G-338, G754	Test Facility list & NSA Data
Certification	Korea	KC	KR0034	Test Facility list & NSA Data
	Germany	TUV	CARAT 13 11 86721 001	ISO/IEC 17025

Quality control in the testing laboratory is implemented as per ISO/IEC 17025 which is the "General requirements for the competent of calibration and testing laboratory".

3. General Information of EUT

Model No.	PRO-651
Serial No	None
FCC ID	HSXSC03
Rating Power Supply (Use for Adapter)	Model Name : 41-090-0400 Input : 120 V AC 60 Hz 0.2 A Output : 9 V DC 400 mA 3.6 W
Supplied Power for Test	120 V, 60 Hz
Clock Frequency	None
Applicant	The Whistler Group, Inc. 168 Ayer Road, Littleton, MA 01460, USA
Manufacturer	RDX, Inc 106 Daeryung Techno Twon 3, 115 Gasan Digital 2-ro, Guemcheon-gu, Seoul, Korea
Factory	Radix Telecom Phils., Industries Inc. P-IMES Bldg.2. Block 16, Phase IV Peza Rosario Cavite, Philippines

Related Submittal(s) / Grant(s)

Original submittal only.

4. Test Summary

4.1 Applied standards and test results

Test Items	Applied Standards	Results
Conducted Disturbance	ANSI C63.4:2009	C
Radiated Disturbance	ANSI C63.4:2009	C
Antenna Power Conduction	ANSI C63.4:2009	C
C=Comply N/C=Not Comply N/T=Not Tested N/A=Not Applicable		

The data in this test report are traceable to the national or international standards.

4.2 Test environment and conditions

Test Items	Test date (YYYY-MM-DD)	Temp (°C)	Humidity (% R.H.)
Conducted Disturbance	2014-03-11	20	39
Radiated Disturbance	2014-03-10	22	30
Antenna Power Conduction	2014-03-11	20	35

4.3 Test result Summary

(1) Conducted Emission (AUTO SCAN MODE)

Frequency [MHz]	Phase	Result [dBμV]	Detector	Limit [dBμV]	Margin [dB]
2.335	N	24.7	Average-Peak	46.0	21.3

(2) Radiated Emission (AUTO SCAN MODE)

Frequency [MHz]	Pol.	Result [dB(μV/m)]	Detector	Limit [dB(μV/m)]	Margin [dB]
356.296	H	29.4	Quasi-Peak	46.0	16.6

5. Test Set-up and operation mode

5.1 Principle of Configuration Selection

Emission : The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use.

5.2 Test Operation Mode

- AUTO SCAN MODE : The EUT was set to constantly scan all bands.

5.3 Support Equipment Used

Unit	Model No.	Serial No.	Manufacturer	CABLE			Backshell	FCC ID
				Connect type	Length (m)	shield		
Headset	COV903	N/A	COSY	STEREO	2.0	Non Shield	Plastic	-
AC Adapter	41-090-04400	N/A	RADIOSHACK CORPORATION	DC OUT	2.0	Non Shield	Plastic	-
USB SCANNER PRO GRAMMING CABLE	20-546	N/A	RADIOSHACK CORPORATION	STEREO	1.6	Non Shield	Plastic	-

6. Test Results : Emission

6.1 Conducted Disturbance

6.1.1 Measurement Procedure

In the range of 0.15 MHz to 30 MHz, the conducted disturbance was measured and set-up was made accordance with **ANSI C63.4**.

If the EUT is table top equipment, it was placed on a wooden table with a height of 0.8 m above the reference ground plane and 0.4 m from the conducting wall of the shielded room.

Also if the EUT is floor-standing equipment, it was placed on a non-conducted support with a height up to 0.15 m above the reference ground plane.

Connect the EUT's power source lines to the appropriate power mains / peripherals through the LISN. All the other peripherals are connected to the 2nd LISN, if any.

Unused measuring port of the LISN was resistively terminated by 50 ohm terminator.

The measuring port of the LISN for EUT was connected to spectrum analyzer.

Using conducted emission test software, the emissions were scanned with peak detector mode.

After scanning over the frequency range, suspected emissions were selected to perform final measurement. When performing final measurement, the receiver was used which has Quasi-Peak detector and Average detector.

By varying the configuration of the test sample and the cable routing it was attempted to maximize the emission.

For further description of the configuration refer to the picture of the test set-up.

6.1.2 Limit for Conducted Disturbance

(1) Conducted disturbance at mains ports.

Frequency range (MHz)	Limits dB(μV)			
	Quasi-peak		Average	
	Class A	Class B	Class A	Class B
0.15 to 0.50	79	66 to 56	66	56 to 46
0.50 to 5	73	56	60	46
5 to 30		60		50
Note 1 The lower limit shall apply at the transition frequencies.				
Note 2 The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.				

Note) 1. Emission Level = Reading Value + Correction Factor.

2. Correction Factor = Cable Loss + Insertion Loss of LISN

3. Margin = Limit - Emission level

Test Result

< AUTO SCAN MODE >

Results of Conducted Emission

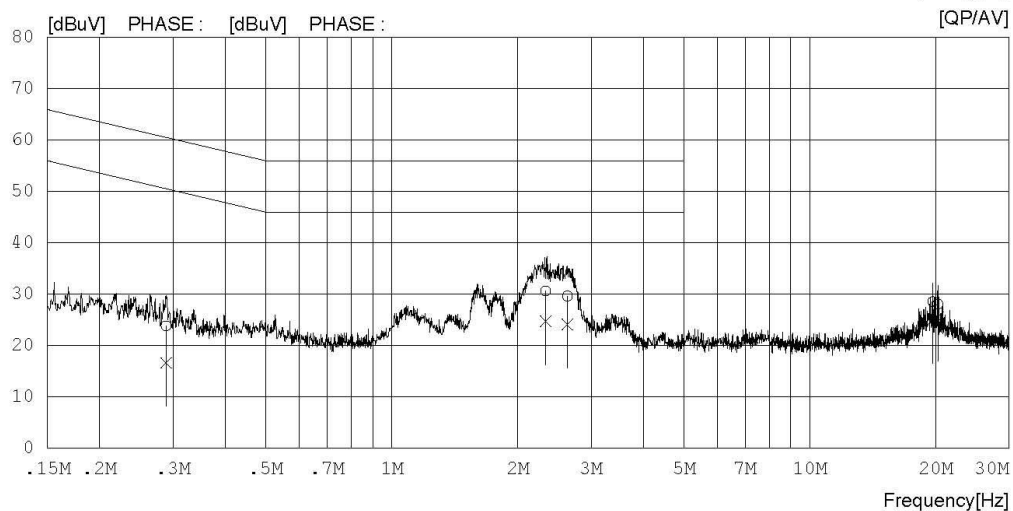
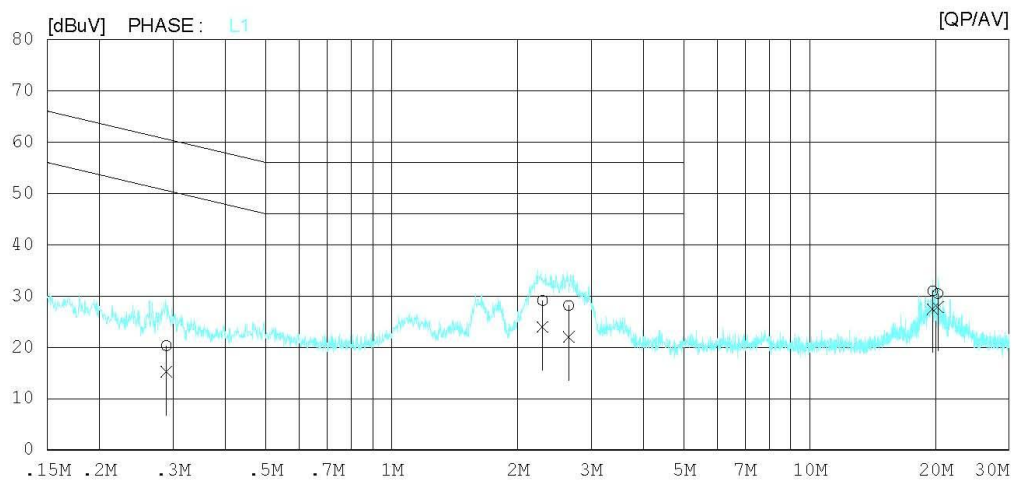
Digital EMC
Date : 2014-03-11

Model No. : PRO-651
Type :
Serial No. :
Test Condition : AUTO SCAN

Reference No. :
Power Supply : 120V 60Hz
Temp/Humi. : 20 °C 39 % R.H.
Operator :

Memo :

LIMIT : CISPR22_B QP
CISPR22_B AV



Results of Conducted Emission

Digital EMC
Date : 2014-03-11

Model No. : PRO-651
Type :
Serial No. :
Test Condition : AUTO SCAN

Reference No. :
Power Supply : 120V 60Hz
Temp/Humi. : 20 °C 39 % R.H.
Operator :

Memo :

LIMIT : CISPR22_B QP
CISPR22_B AV

NO	FREQ [MHz]	READING		C.FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.28888	10.0	4.9	10.3	20.3	15.2	60.6	50.6	40.3	35.4	L1
2	2.29600	18.8	13.6	10.3	29.1	23.9	56.0	46.0	26.9	22.1	L1
3	2.64800	17.8	11.7	10.3	28.1	22.0	56.0	46.0	27.9	24.0	L1
4	19.70850	20.3	16.7	10.7	31.0	27.4	60.0	50.0	29.0	22.6	L1
5	20.25700	19.8	17.1	10.7	30.5	27.8	60.0	50.0	29.5	22.2	L1
6	0.28835	13.5	6.3	10.3	23.8	16.6	60.6	50.6	36.8	34.0	N
7	2.33500	20.3	14.4	10.3	30.6	24.7	56.0	46.0	25.4	21.3	N
8	2.63250	19.4	13.8	10.3	29.7	24.1	56.0	46.0	26.3	21.9	N
9	19.70900	17.9	14.3	10.7	28.6	25.0	60.0	50.0	31.4	25.0	N
10	20.25700	17.4	14.8	10.7	28.1	25.5	60.0	50.0	31.9	24.5	N

6.2 Radiated Disturbance

6.2.1 Measurement Procedure

The radiated disturbance was measured and set-up was made accordance with **ANSI C63.4**.

If the EUT is tabletop equipment, it was placed on a wooden table with a height of 0.8 m above the reference ground plane and 3 m or 10 m away from the interference receiving antenna in the **10m semi-anechoic chamber**.

Also if the EUT is floor-standing equipment, it was placed on a non-conducted support with a height up to 0.15 m above the reference ground plane.

Rotate the EUT from (0 - 360)° and position the receiving antenna at heights from (1 - 4) m above the reference ground plane continuously to determine associated with higher emission levels and record them.

The measurement was made in both the vertical and horizontal polarization, and the maximum value is presented in the report.

For below 1 GHz frequency range, Quasi-Peak detector with 120 kHz RBW was used.

Peak detector with 1 MHz RBW and 1 MHz VBW were used for above 1 GHz frequency range. also used linear average detector with defined in CISPR 16-1-1.

For further description of the configuration refer to the picture of the test set-up.

6.2.2 Limit for Radiated Disturbance

- The test frequency range of Radiated Disturbance measurements are listed below.

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 108	1 000
108 – 500	2 000
500 – 1 000	5 000
Above 1 000	5 th harmonic of the highest frequency or 40 GHz, whichever is lower

(1) Limit for Radiated Emission below 1 000MHz

Frequency range (MHz)	Class A Equipment (10 m distance)	Class B Equipment (3 m distance)
	Quasi-peak (dBμV/m)	Quasi-peak (dBμV/m)
30 to 88	39.1	40
88 to 216	43.5	43.5
216 to 960	46.4	46
960 to 1 000	49.5	54

Note 1 The lower limit shall apply at the transition frequency.

Note 2 Additional provisions may be required for cases where interference occurs.

Note 3 According to 15.109(g), as an alternative to the radiated emission limit shown above, digital devices may be shown to comply with the standards(CISPR), Pub. 22 shown as below.

Frequency range (MHz)	Class A Equipment (10 m distance)	Class B Equipment (10 m distance)
	Quasi-peak (dBμV/m)	Quasi-peak (dBμV/m)
30 to 230	40	30
230 to 1 000	47	37

(2) Limits for Radiated Emission above 1 000MHz at a measuring distance of 3 m

Frequency (GHz)	Class A Equipment		Class B Equipment	
	Peak (dBμV/m)	Average (dBμV/m)	Peak (dBμV/m)	Average (dBμV/m)
1 to 40	80	60	74	54

Note) 1. Emission Level = Reading Value + Correction Factor.

2. Correction Factor = Cable loss - Amp gain + Antenna Factor

3. Margin = Limit - Emission level

Test Result

< 30 MHz ~ 1 GHz _ AUTO SCAN MODE >

RADIATED EMISSION

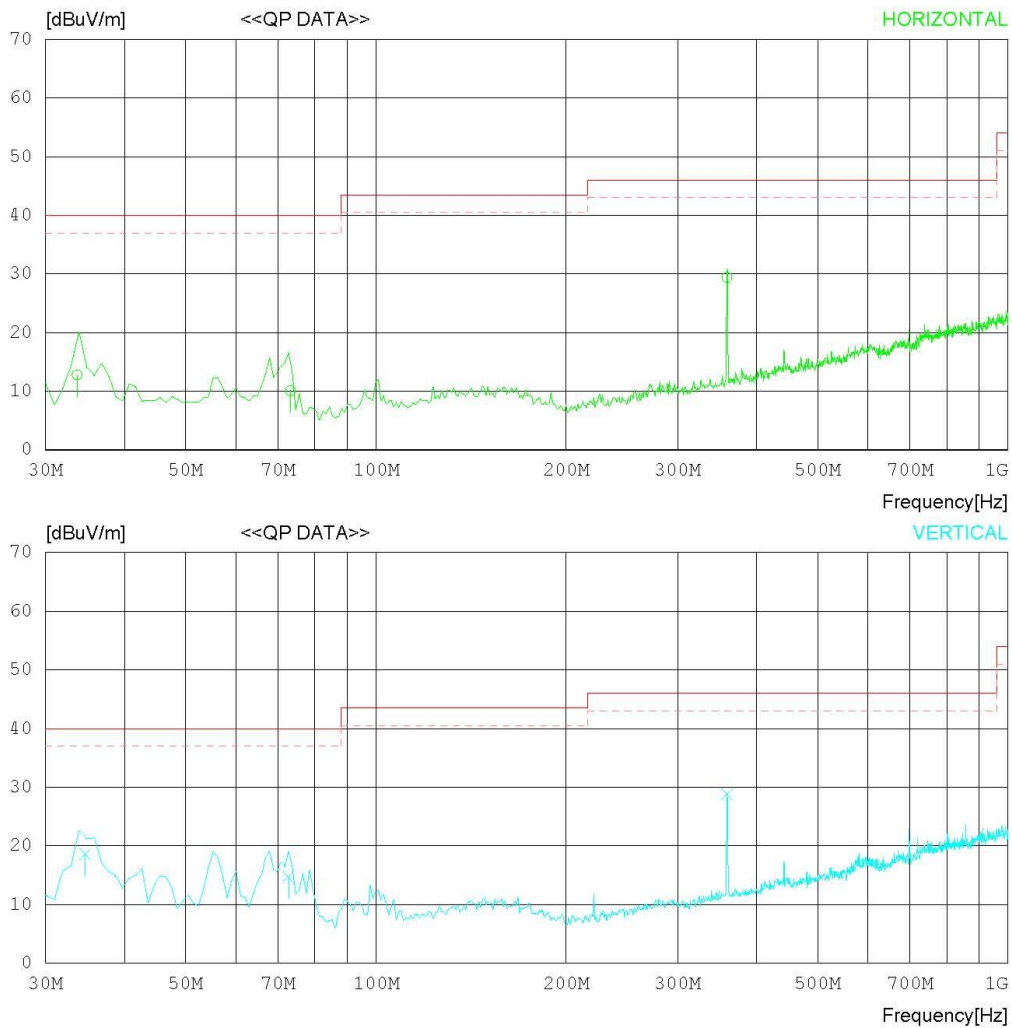
Date : 2014-03-10

Model Name : PRO-651
Model No. :
Serial No. :
Test Condition : AUTO SCAN

Reference No. :
Power Supply : 120V 60Hz
Temp/Humi : 22°C 30 % R.H.
Operator :

Memo :

LIMIT : FCC Part15 Subpart.B Class B (3m)
MARGIN: 3 dB



RADIATED EMISSION

Date : 2014-03-10

Model Name : PRO-651	Reference No. :
Model No. :	Power Supply : 120V 60Hz
Serial No. :	Temp/Humi : 22 'C 30 % R.H.
Test Condition : AUTO SCAN	Operator :

Memo :

LIMIT : FCC Part15 Subpart.B Class B (3m)
MARGIN: 3 dB

No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	33.650	26.5	12.3	0.6	26.6	12.8	40.0	27.2	100	240
2	73.240	25.7	10.3	0.8	26.7	10.1	40.0	29.9	188	69
3	359.296	39.5	14.4	1.9	26.4	29.4	46.0	16.6	100	175
----- Vertical -----										
4	34.640	32.2	12.4	0.6	26.6	18.6	40.0	21.4	100	235
5	72.680	30.2	10.4	0.8	26.7	14.7	40.0	25.3	400	164
6	359.296	38.9	14.4	1.9	26.4	28.8	46.0	17.2	135	164

< (1 ~ 6) GHz_Peak _ AUTO SCAN MODE >

RADIATED EMISSION

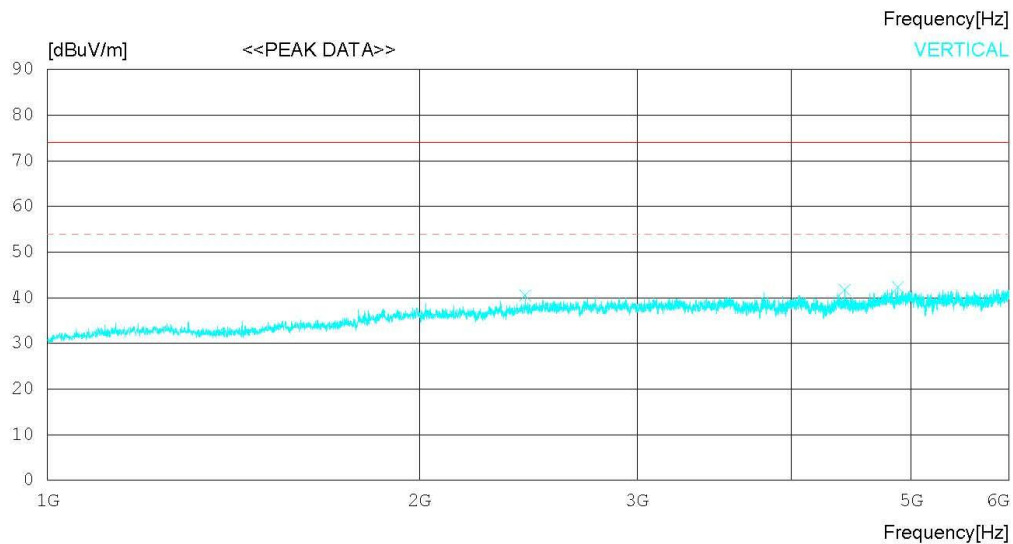
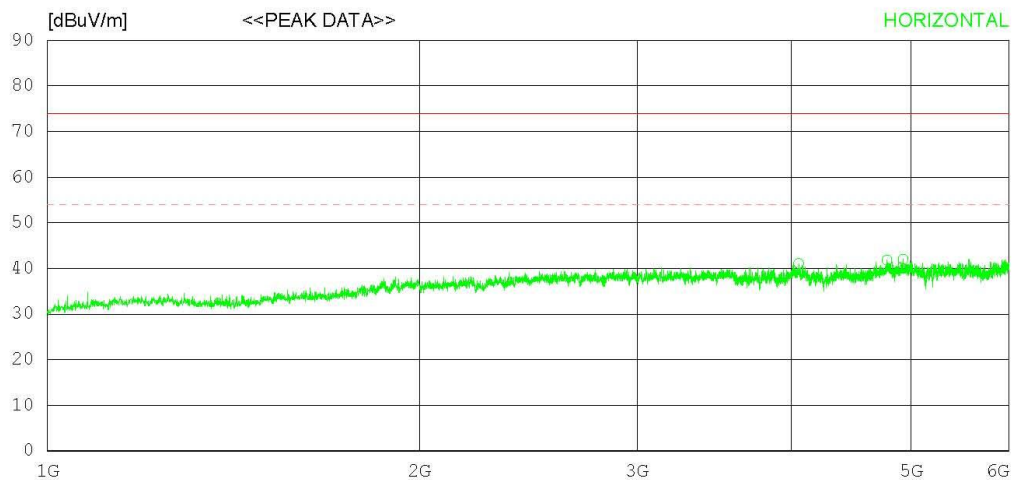
Date : 2014-03-10

Model Name : PRO-651
Model No. :
Serial No. :
Test Condition : AUTO SCAN

Reference No. :
Power Supply : 120V 60Hz
Temp/Humi : 22°C 30 % R.H.
Operator :

Memo :

LIMIT : FCC Part15 Subpart.B Class B (3m) - 18G(Peak)
FCC Part15 Subpart.B Class B (3m) - 18G(Avg)



RADIATED EMISSION

Date : 2014-03-10

Model Name : PRO-651	Reference No. :
Model No. :	Power Supply : 120V 60Hz
Serial No. :	Temp/Humi : 22 'C 30 % R.H.
Test Condition : AUTO SCAN	Operator :

Memo :

LIMIT : FCC Part15 Subpart B Class B (3m) - 18G(Peak)
FCC Part15 Subpart B Class B (3m) - 18G(Avg)

No.	FREQ [MHz]	READING PEAK [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	4053.750	40.0	-6.7	7.8	0.0	41.1	74.0	32.9	100	169
2	4780.000	38.3	-5.7	9.2	0.0	41.8	74.0	32.2	100	29
3	4923.750	37.9	-5.8	9.9	0.0	42.0	74.0	32	100	188
----- Vertical -----										
4	2435.000	43.6	-8.9	5.8	0.0	40.5	74.0	33.5	100	347
5	4417.500	39.7	-5.9	7.9	0.0	41.7	74.0	32.3	100	133
6	4877.500	38.5	-5.8	9.7	0.0	42.4	74.0	31.6	100	5

< (1 ~ 6) GHz_Average _ AUTO SCAN MODE >

RADIATED EMISSION

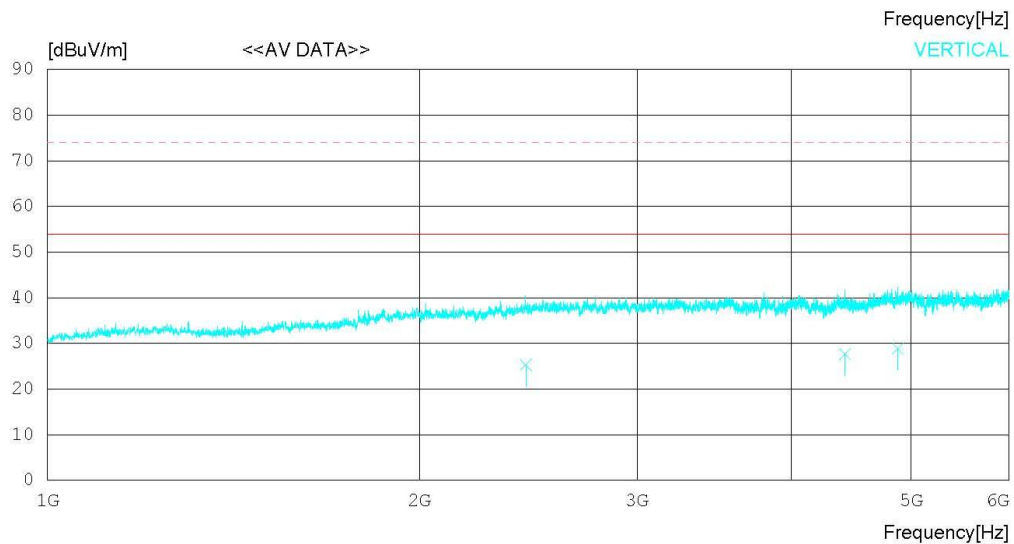
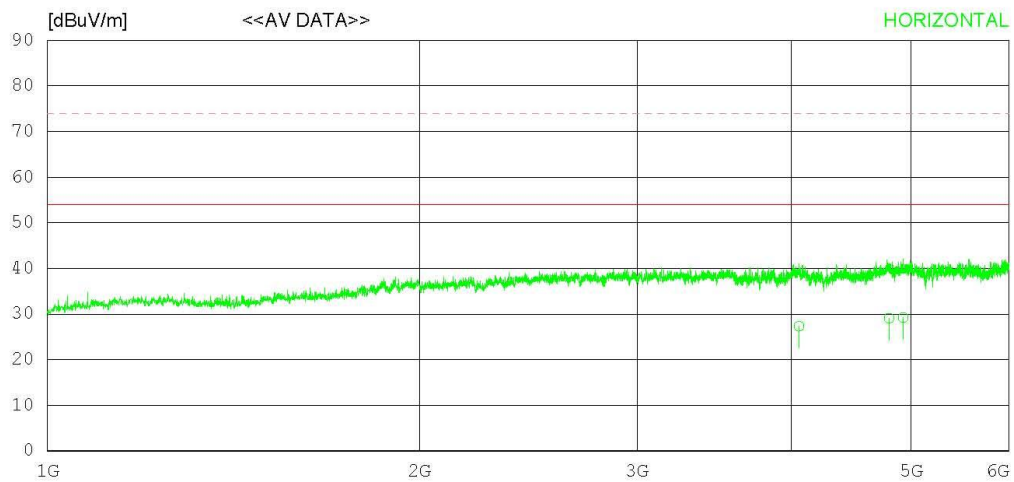
Date : 2014-03-10

Model Name : PRO-651
Model No. :
Serial No. :
Test Condition : AUTO SCAN

Reference No. :
Power Supply : 120V 60Hz
Temp/Humi : 22 °C 30 % R.H.
Operator :

Memo :

LIMIT : FCC Part15 Subpart.B Class B (3m) - 18G(Avg)
FCC Part15 Subpart.B Class B (3m) - 18G(Peak)



RADIATED EMISSION

Date : 2014-03-10

Model Name : PRO-651	Reference No. :
Model No. :	Power Supply : 120V 60Hz
Serial No. :	Temp/Humi : 22 'C 30 % R.H.
Test Condition : AUTO SCAN	Operator :

Memo :

LIMIT : FCC Part15 Subpart B Class B (3m) - 18G(Avg)
FCC Part15 Subpart B Class B (3m) - 18G(Peak)

No.	FREQ [MHz]	READING AV [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	4056.987	26.2	-6.7	7.8	0.0	27.3	54.0	26.7	100	52
2	4797.781	25.5	-5.7	9.3	0.0	29.1	54.0	24.9	100	29
3	4924.661	25.1	-5.8	9.9	0.0	29.2	54.0	24.8	100	182
----- Vertical -----										
4	2438.036	28.4	-8.9	5.8	0.0	25.3	54.0	28.7	100	223
5	4420.174	25.7	-5.9	7.9	0.0	27.7	54.0	26.3	100	261
6	4878.832	25.0	-5.8	9.7	0.0	28.9	54.0	25.1	100	177

6.3 Antenna Power Conduction

6.3.1 Measurement Procedure

Power on the receive antenna terminals was to be determined by measurement of the voltage present at these terminals.

Antenna conducted power measurements was performed with the EUT antenna terminals connected directly to measuring instrument using a impedance-Matching network to connect the measurement Instrument to the antenna terminals of the EUT.

The losses in decibels in impedance-matching network and cables was added to the measured values in dBuV.

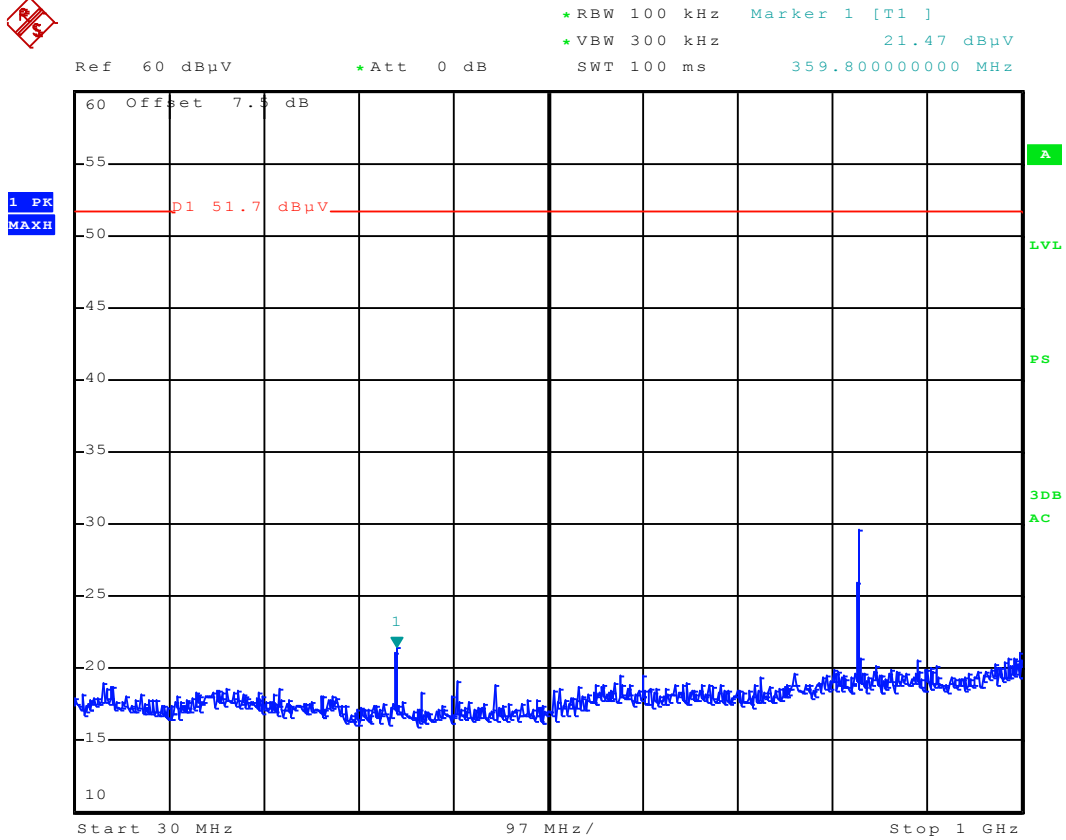
The measurements were repeated with the receiver tuned to a frequency until all of frequencies had been successively measured.

Power in the receive antenna terminals in the ratio of V^2 / R , where V is the loss-corrected voltage measured at the antenna terminals, and R is the impedance of the measuring instrument.

6.3.2 Limit for Antenna Power Conduction

- Limit : **2nW(51.7 dB μ V)**

Test Result



Appendix 1

List of Test and Measurement Instruments

To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment is identified by the Test Laboratory.

1. Conducted Disturbance

Name of Instrument	Model No.	Manufacturer	Serial No.	Cal. Date	Next Cal. Date
☐ SPECTRUM ANALYZER	8591E	H/P	3649A05889	2014.02.27	2015.02.27
☐ RFI/FIELD INTENSITY METER	KNM-2402	KYORITSU	4N-170-3	2013.06.28	2014.06.28
☐ LISN	KNW-407	KYORITSU	8-317-8	2014.01.08	2015.01.08
☐ LISN	PMM L2-16B	NARDA S.T.S. / PMM	000WX20305	2013.06.27	2014.06.27
☐ 50 OHM TERMINATOR	CT-01	TME	N/A	2014.01.08	2015.01.08
☒ EMI TEST RECEIVER	ESCI7	ROHDE&SCHWARZ	100910	2014.02.27	2015.02.27
☒ LISN	NNLK8121	SCHWARZBECK	NNLK8121-580	2013.08.12	2014.08.12
☒ PULSE LIMITER	ESH3-Z2	ROHDE&SCHWARZ	101334	2014.01.08	2015.01.08
☐ 50 OHM TERMINATOR	CT-01	TME	N/A	2014.01.08	2015.01.08

2. Radiated Disturbance

Name of Instrument	Model No.	Manufacturer	Serial No.	Cal. Date	Next Cal. Date
☒ EMI TEST RECEIVER	ESU 8	ROHDE&SCHWARZ	100348	2013.10.22	2014.10.22
☒ TRILOG BROAD BAND ANTENNA	VULB9160	SCHWARZBECK	9160-3339	2013.02.05	2015.02.05
☒ HORN ANTENNA WITH PREAMPLIFIER	3117	ETS-LINDGREN	00143291	2013.03.06	2015.03.06
☒ HORN ANTENNA WITH PREAMPLIFIER	MLA-0106-B03-36	TSJ	1784347	2013.03.06	2015.03.06
☐ SPECTRUM ANALYZER	E4411B	AGILENT	US41062735	2013.06.27	2014.06.27
☐ AMPLIFIER	8447D	AGILENT	2443A03690	2013.06.28	2014.06.28
☐ EMI TEST RECEIVER	ESCI	ROHDE & SCHWARZ	100364	2014.02.27	2015.02.27
☐ BICONICAL ANT.	VHA 9103	SCHWARZBECK	91032789	2012.04.10	2014.04.10
☐ LOG-PERIODIC ANT.	UHALP 9108A	SCHWARZBECK	590	2012.10.04	2014.10.04
☐ BICONICAL ANT.	VHA 9103	SCHWARZBECK	91031946	2013.05.16	2015.05.16
☐ LOG-PERIODIC ANT.	UHALP 9108-A1	SCHWARZBECK	0411	2013.05.16	2015.05.16
☒ AMPLIFIER	MLA-100K01-B01-26	TSJ	1252741	2014.02.28	2015.02.28

3. Antenna Power Conduction

Name of Instrument	Model No.	Manufacturer	Serial No.	Cal. Date	Next Cal. Date
☒ EMI TEST RECEIVER	ESCI	ROHDE & SCHWARZ	100364	2014.02.27	2015.02.27
☒ SPLITTER	ZFRSC-41	MINI CIRCUITS	SF624000603	2013.06.28	2014.06.28
☐ MULTI SYSTEM DIGITAL MODULATOR	3513A	EIDEN	FE102335	N/A	N/A

Appendix 2

Report Revision History

Revision Date	Description	Revised By	Revision Reviewed By
None	Original	N/A	N/A