Korea Technology Institute Co., Ltd.

Test Report

Test Report No.:	**KTI08EF03004**		
Registration No.:	**99058**		
Applicant:	**INTERFACE CO., LTD.**		
Applicant Address:	**Peugeot B/D, 2294, Daewha-Dong, Ilsanseo-Gu Goyang-City, GyeongGi-Do, KOREA**		
Product:	**DMB Navigator**		
FCC ID:	**VZ2-NAVIST**	**Model No.**	**NAVIst 1 V.2**
Receipt No.:	**08-0123**	**Date of receipt:**	**January 23, 2008**
Date of Issue:	**March 30, 2008**		
Testing location	**Korea Technology Institute Co., Ltd. 51-19, Sanglim3-Ri, Docheok-Myeun, Gwangju-Shi, Gyeungki-Do, Korea**		
Test Standards:	**FCC/ANSI. C63.4: 2003**		
Rule Parts: FCC	**Part 15, Class B**		
Equipment Class:	**Digital device**		
Test Result:	**The above-mentioned product has been tested with compliance.**		

Tested by: T.W. Lee
/ Engineer

Signature **Date**

Approved by: G. C. Min
/President

Signature **Date**

Other Aspects:	
Abbreviations:	**∗ OK, Pass=passed ∗ Fail=failed ∗ N/A=not applicable**

☞ **- This test report is not permitted to copy partly without our permission.**

- This test result is dependent on only equipment to be used.

- This test result is based on a single evaluation of one sample of the above mentioned.

- This test report must not be used by the client to claim product endorsement by NVLAP or any agency of the U.S Government.

- We certify this test report has been based on the measurement standards that is traceable to the national or international standards.

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1. General

This equipment has been shown to be capable of compliance with the applicable technical standards and was tested in accordance with the measurement procedures as indicated in this report.

We attest to the accuracy of data. Korea Technology Institute Co., Ltd. performed all measurements reported herein. And were made under Chief Engineer's supervisor.
We assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

2. Test Site

Korea Technology Institute Co., Ltd.

Location

51-19, Sanglim3-Ri, Docheok-Myeun, Gwangju-Shi, Gyeungki-Do, Korea

The Test Site is in compliance with ANSI C63.4/2003 for measurement of radio Interference.

List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

- Radiated Emissions

Kind of Equipment	Type	S/N	Calibrated until
Field Strength Meter	ESIB40	100093	07.2008
Biconic Logarithmic Periodic Antenna	VULB9163	9163-281	09.2008
Open Site Cable	N/A	N/A	11.2008
Antenna Mast	DETT-03	N/A	N / A
Antenna & Turntable controller	DETT-04	91X519	N / A

Test Date

Date of Application: January 25, 2008

Date of Test: February 29, 2008

Test Environment

Indoor: 22℃/35%/1005mbar

Outdoor: 2.6℃/20%/1015mbar

3. Description of the tested samples

The EUT is DMB Navigator

Rating and Physical Characteristics

Function		Spec.
CPU	Processor	RMI / AU1250
	Clock	600 MHz
OS		WIN CE 5.0
Memory	ROM	2M
	RAM	DDR2 128 MB
Display	Dimension	8''
	Contrast ratio	300 CR
	Color Depth	8 bit
	Resolution	800 * 480
Power	DC Power	12 – 24 V
GPS	Chip SET	GSC2X
	Internal / External	Internal
	Signal	TTL UART interface
	Channel	11
	Protocol	NULL, NMEA
	Baud rate	9600 bps
Storage Device	Type	SD 2G
	Available Memory Capacitance	SD 4G
USB Interface		USB 2.0 Host
Operating Temperature		(-) 10 ℃ – (+) 60 ℃

Submitted Documents

- **User's Guide**
- **Block Diagram**

4. Measurement Conditions

Testing Input Voltage: DC 12V

Modes of Operation

The EUT was in the operation mode during all testing;

Additional Equipment

DEVICE TYPE	Manufacturer	M/N	S/N	FCC ID
LCD Monitor	MICROFACE	CM-730D	M3C04729	-
Adapter	TAEYEONG ELECTRONICS	TY-9000	N/A	-

Uncertainty

1) Radiated disturbance

Uc (Combined standard Uncertainty) = ± 1.8dB

Expanded uncertainty U=KUc

K = 2

∴ U = ± 3.6dB

4.4 Test Setup

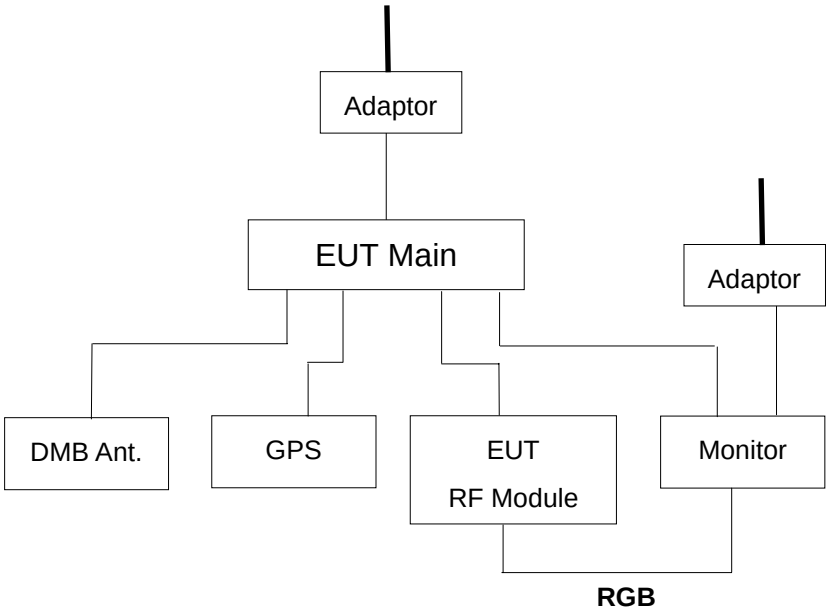


Figure 1. Test setup

5. EMISSION Test

5.1 Conducted Emissions N/A

This EUT is excused from investigation of conduction of conducted emission, for it is powered by DC battery only. According to section 15.207(d), measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which not operate from the AC power lines or contain provisions for operation while connected to the AC power lines.

5.2 Radiated Emissions

Result: Pass

Preliminary measurements were made indoors at 1 meter using broadband antennas, broadband Amplifier, and spectrum analyzer to determine the frequency producing the maximum EME. Appropriate precaution was taken to ensure that all EME from the EUT were maximized and Investigated. The system configurations, clock speed, mode of operation or video resolution, turntable azimuth with respect to the antenna were noted for each frequency found. The spectrum was scanned from 30MHz to 1GHz using Biconic Logarithmic Periodic Antenna. Above 1GHz, Double ridged horn Antenna was used.

Final measurements were made outdoors at 3-meter test range using Schwarzbeck antennas. The test equipment was placed on a wooden table situated on a 4x4 meter area adjacent to the measurement area. Turntable was to protect from weather in the dome that made with Polyethylene film. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. Each frequency found during pre-scan measurements was re-examined and investigated using EMI/Field Intensity Meter (ESIB40). The detector function was set to CISPR quasi-peak or peak mode as appropriate and the bandwidth of the receiver was set to 120kHz or 1 MHz depending on the frequency or type or signal.

The EUT, support equipment and interconnecting cables were re-configured to the set-up producing the maximum emission for the frequency and were placed on top of a 0.8meter high non-metallic 1 x 1.5 meter table.

The EUT, support equipment, and interconnecting cables were re-arranged and manipulated to maximize each EME emission. The turntable containing the system was rotated; the antenna height was varied 1 to 4 meters and stopped at the azimuth or height producing the maximum emission. Each emission was maximized by: varying the mode of operation or resolution; clock or data exchange speed, and/or support equipment, if applicable; and changing the polarity of the antenna and rotating the EUT in turns with three orthogonal axes for portable devices, whichever determined the worst-case emission.

Photographs of the worst-case emission can be seen in photograph of radiated emission test.

Each EME reported was calibrated using self-calibrating mode.

Table 2: Test Data, Radiated Emissions

Frequency (MHz)	Pol.	Height [m]	Angle [°]	(1) Reading (dBμV)	(2) AFCL (dB/m)	(3) Actual (dBμV/m)	(4) Limit (dBμV/m)	(5) Margin (dB)
45.20	V	1.08	32	20.73	13.68	34.41	40.00	5.59
158.12	V	1.19	192	29.43	10.59	40.02	43.50	3.48
508.24	V	1.28	45	18.94	22.99	41.93	46.00	4.07
700.24	V	1.56	50	14.14	26.46	40.60	46.00	5.40
816.00	V	1.49	38	13.67	28.15	41.82	46.00	4.18
864.00	V	1.12	40	18.59	21.95	40.54	46.00	5.46

Table. Radiated Measurements at 3-meters

Notes: 1.All modes of operation were investigated.
And the worst-case emission are reported.

2.All other emission is non-significant.

3.All readings are calibrated by self-mode in receiver.

4.Measurements using CISPR quasi-peak mode.

5.AFCL = Antenna factor and cable loss

6.H = Horizontal, V = Vertical Polarization

7. The limit for Class B digital device is 100uV(40dBuV) from 30MHz to 88MHz, 150 uV (43.5dBuV) from 88MHz to 216MHz, 200uV(46dBuV) from 216MHz to 960MHz and 500 uV (54dBuV) from above 960MHz.

♠ Margin Calculation

(5) Margin = (4) Limit – (3) Actual

[(3) Actual = (1) Reading + (2) AFCL]

6. TEST AND MEASUREMENTS

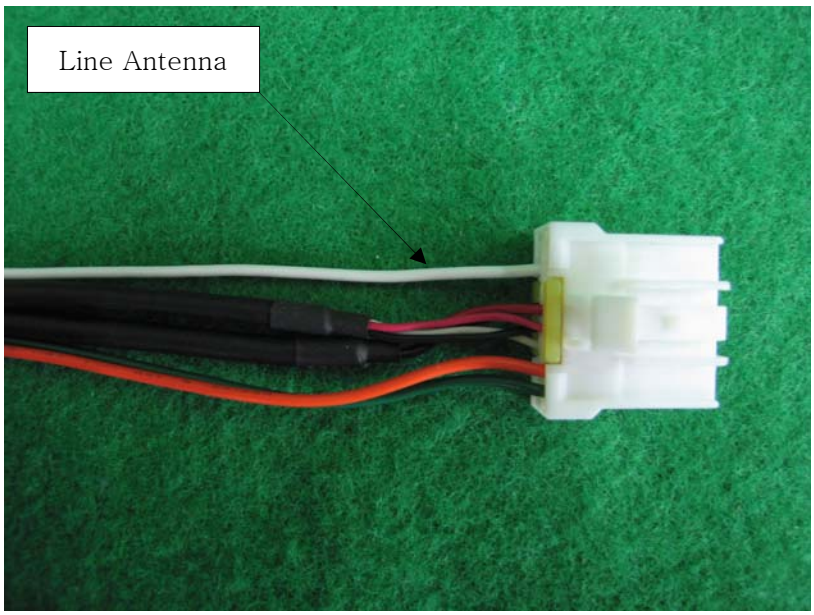
6.1 Antenna Requirement

6.1.1 Regulation

FCC section 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 Part 15C. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack of 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, 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.

6.1.2 Results: PASS

The photograph shown below is the Back Panel of the EUT and the line antenna to transmit the FM signal is found on a specific socket. Therefore, the EUT complies the antenna requirement described at the Section 15.203.



Photograph 1. Antenna socket

6.2 Field Strength of Fundamental Emissions

6.2.1. Regulation

FCC 47CFR15-15.239(b)

The field strength of any emissions within the permitted 200 kHz band shall not exceed 250 microvolts/meter at 3 meters. The emissions limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in Section 15.35 for limiting peak emissions apply.

6.2.2. Measurement Procedure

For tabletop equipment, the EUT is placed on a 1 meter by 1.5 meters wide and 0.8 meter high nonconductive table that sits on a flush mounted metal turntable. With the EUT operating, emissions from the unit are maximized by adjusting the polarization and height of the receive antenna and rotating the EUT on the turntable.

The initial step in collecting radiated data is a peak scan of the measurement range with an EMI test receiver under closer distances as given in the rule.

6.2.3. Test Results : PASS

Table 3: Test Data, Field Strength of Fundamental Emissions

Frequency (MHz)	Pol.	Reading (dBμV)		AFCL (dB/m)	Actual (dBμV/m)		Limit (dBμV/m)		Margin (dB)	
		Peak	Average		Peak	Average	Peak	Average	Peak	Average
89.4	H	26.87	20.13	12.44	39.31	32.57	67.9	47.9	-28.59	-15.33
	V	33.53	30.19	12.44	45.97	42.63	67.9	47.9	-21.93	-5.27
98.4	H	35.97	29.82	13.74	49.71	44.56	67.9	47.9	-18.19	-3.34
	V	36.65	29.72	13.74	50.39	44.46	67.9	47.9	-17.51	-3.44
107.4	H	32.29	29.27	13.15	45.44	42.42	67.9	47.9	-22.46	-5.48
	V	33.24	30.16	13.15	46.39	43.31	67.9	47.9	-21.51	-4.59

6.3 20dB Bandwidth

6.3.1. Regulation

FCC 47CFR15-15.239(a)

Emissions from the intentional radiator shall be confined within a band 200 kHz wide centered on the operating frequency. The 200 kHz band shall lie wholly within the frequency range of 88-108 MHz

FCC 47CFR15-15-215(c)

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in section 15.217 through section 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment is operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

6.3.2 Measurement Procedure

The analyzer was set for a maximum hold scan to capture the profile of the signal. The peak level was then determined, and a reference line was drawn 20 dB below the peak level. The bandwidth was determined at the points where the 20 dB reference line intercepted the power envelope of the emission.

6.3.3 Test Results : PASS

Table 4: Test Data, 20 dB Bandwidth

Frequency (kHz)	20dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)
89.4	122.24	200	77.76
98.4	118.24	200	81.76
107.4	114.23	200	85.77

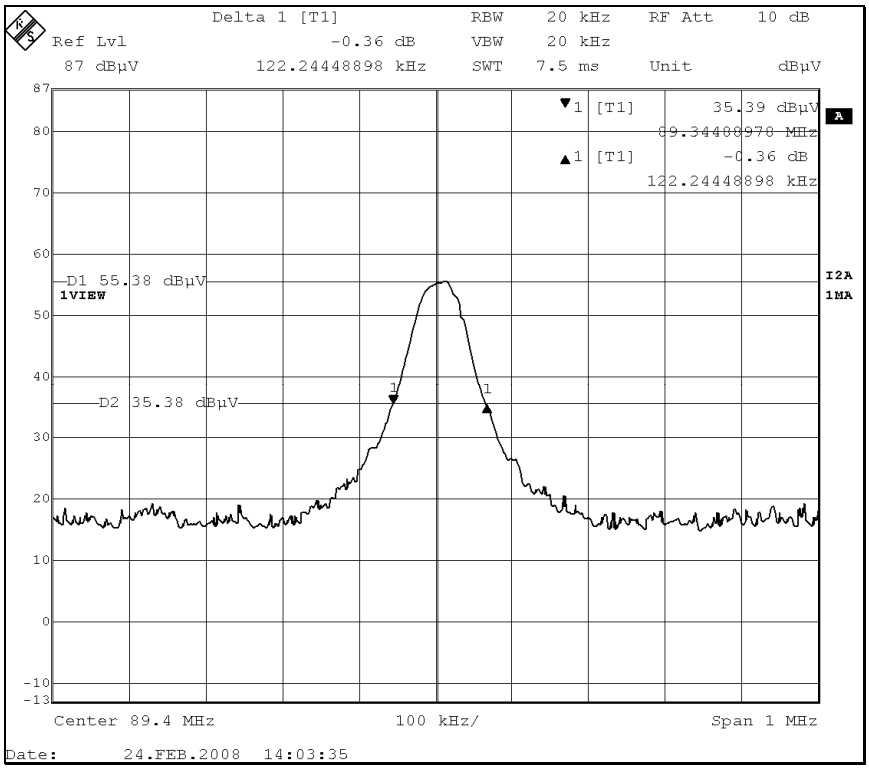


Figure 2. 20dB Bandwidth for 89.4 MHz

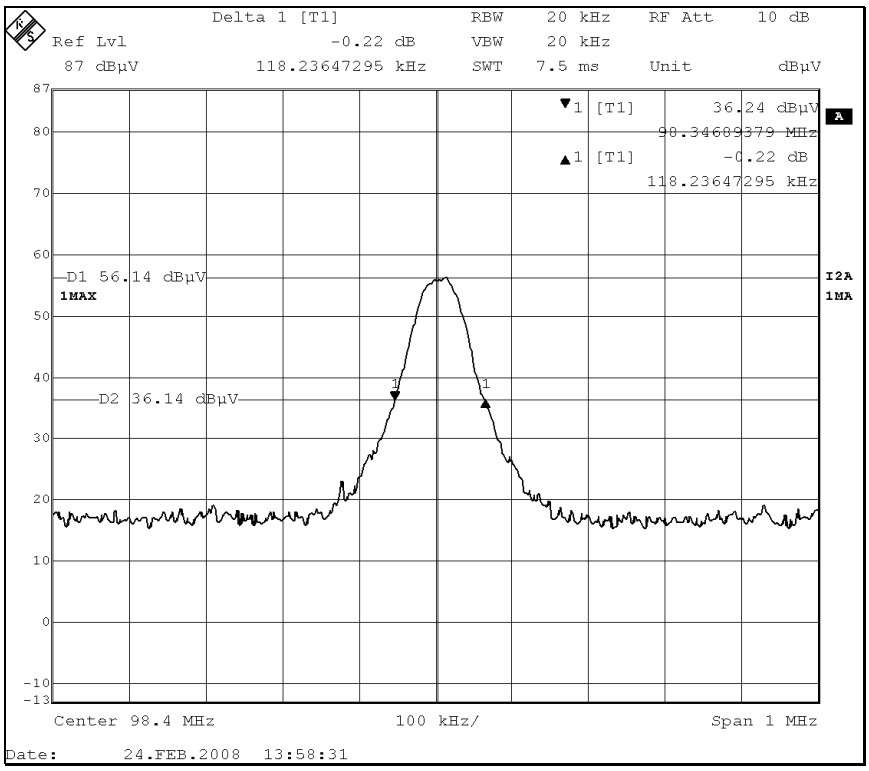


Figure 3. 20dB Bandwidth for 98.4 MHz

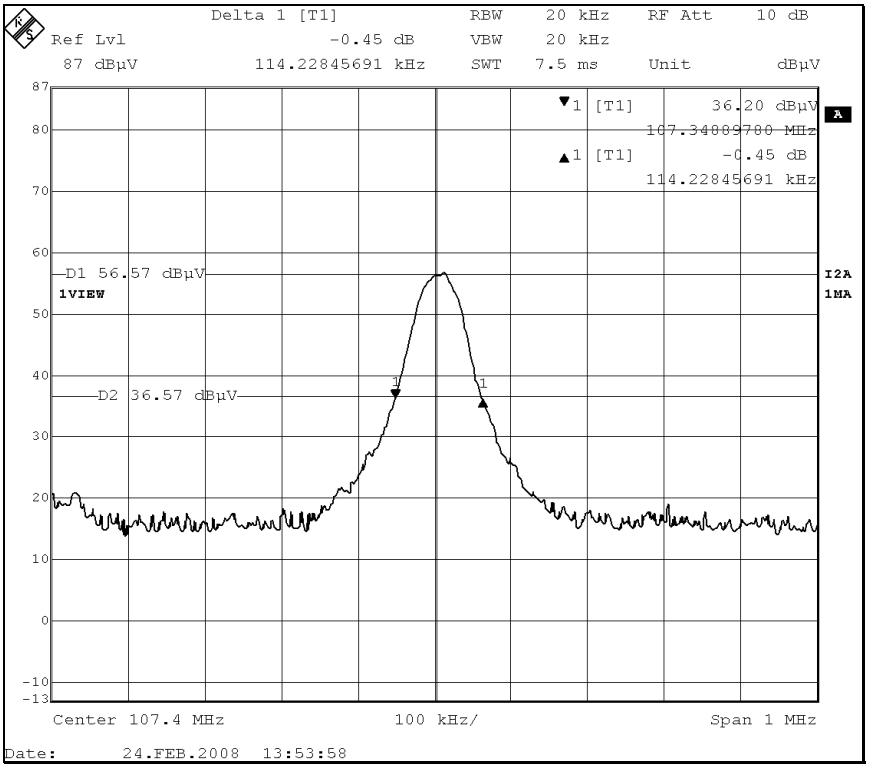


Figure 4. 20dB Bandwidth for 107.4 MHz

6.4 Radiated Emission

6.4.1. Regulation

FCC 47CFR15-15.239(c)

The Field strength of any emissions radiated on any frequency outside of the specified 200 kHz band shall not exceed the general radiated emission limits in Section 15.209.

FCC 47CFR15-15.209

Except as provided elsewhere in this subpart the emissions from an intentional radiator shall not exceed the field strength levels specified.

6.4.2. Measurement Procedure

For tabletop equipment, the EUT is placed on a 1 meter by 1.5 meters wide and 0.8meter high nonconductive table that sits on a flush mounted metal turntable. With the EUT operating, emissions from the unit are maximized by adjusting the polarization and height of the receive antenna and rotating the EUT on the turntable.

The initial step in collecting radiated data is a peak scan of the measurement range with an EMI test receiver under closer distances as given in the rule.

6.4.3 Test Results

6.4.3.1 Harmonic Emissions

Table 5: Test Data, Harmonic Emissions

(1) 89.4 MHz

Frequency (MHz)	Pol.	Height [m]	Angle [°]	Reading (dBμV)	AFCL (dB/m)	Actual (dBμV/m)	Limit (dBμV/m)	Margin (dB)
178.80	H	1.09	29	16.51	11.22	27.73	43.50	15.77
268.20	H	1.15	32	9.82	16.15	25.97	46.00	20.03
357.60	V	1.22	36	7.52	19.16	26.68	46.00	19.32
447.00	H	1.31	23	5.28	21.23	26.51	46.00	22.49
536.40	V	1.26	30	3.68	23.89	27.48	46.00	18.52
625.80	H	1.21	21	2.33	25.91	28.24	46.00	17.76

(2) 98.4 MHz

Frequency (MHz)	Pol.	Height [m]	Angle [°]	Reading (dBμV)	AFCL (dB/m)	Actual (dBμV/m)	Limit (dBμV/m)	Margin (dB)
196.80	V	1.14	31	14.83	13.32	28.15	43.50	14.85
295.20	V	1.21	36	6.52	17.18	23.70	46.00	22.30
393.60	H	1.17	18	4.93	20.17	25.10	46.00	20.90
492.00	V	1.26	33	3.27	22.52	25.79	46.00	20.21
590.40	H	1.28	23	1.07	25.45	26.52	46.00	19.48
688.80	V	1.22	28	2.11	26.38	28.49	46.00	17.51

(3) 107.4 MHz

Frequency (MHz)	Pol.	Height [m]	Angle [°]	Reading (dBμV)	AFCL (dB/m)	Actual (dBμV/m)	Limit (dBμV/m)	Margin (dB)
214.80	H	1.06	31	15.51	14.00	29.51	43.50	13.99
322.20	H	1.15	28	4.87	17.82	22.69	46.00	23.31
429.60	V	1.32	41	2.46	20.94	23.40	46.00	22.60
537.00	V	1.45	33	0.34	23.89	24.23	46.00	21.77
644.40	H	1.31	20	1.26	26.69	27.95	46.00	18.05
751.80	V	1.54	26	5.46	27.22	32.68	46.00	13.32

Notes: 1.All modes of operation were investigated.

2.All readings are calibrated by self-mode in receiver.

3.Measurements using CISPR quasi-peak mode.

4.AFCL = Antenna factor and cable loss

5.H = Horizontal, V = Vertical Polarization

♠ Margin Calculation

Margin = Limit – Actual

Actual = Reading + AFCL

6.4.3.2 Spurious Emissions

Table 6: Test Data, Spurious Emissions

(1) 89.4 MHz

Frequency (MHz)	Pol.	Height [m]	Angle [°]	Reading (dBμV)	AFCL (dB/m)	Actual (dBμV/m)	Limit (dBμV/m)	Margin (dB)
50.08	V	1.14	25	20.93	13.40	34.33	40.00	5.67
55.08	V	1.14	25	21.38	13.16	34.54	40.00	5.46
180.72	H	1.73	34	26.50	12.22	38.72	43.50	4.78
225.88	V	1.24	37	24.35	14.56	38.91	46.00	7.09
343.68	H	2.08	28	21.22	18.91	40.13	46.00	5.87
624.00	V	1.17	46	15.22	25.89	41.11	46.00	4.89

(2) 98.4 MHz

Frequency (MHz)	Pol.	Height [m]	Angle [°]	Reading (dBμV)	AFCL (dB/m)	Actual (dBμV/m)	Limit (dBμV/m)	Margin (dB)
46.72	V	1.05	32	21.16	13.35	34.51	40.00	5.49
158.12	V	1.21	43	26.84	10.59	37.43	43.50	6.07
214.60	V	1.27	58	21.93	13.99	35.92	43.50	7.58
508.24	H	1.43	72	14.23	22.99	37.22	46.00	8.78
607.52	V	1.13	49	11.68	25.77	37.45	46.00	8.55
837.00	H	1.09	39	12.41	28.52	40.93	46.00	5.07

(3) 107.4 MHz

Frequency (MHz)	Pol.	Height [m]	Angle [°]	Reading (dBμV)	AFCL (dB/m)	Actual (dBμV/m)	Limit (dBμV/m)	Margin (dB)
36.36	V	1.45	33	21.00	12.53	33.53	40.00	6.47
49.44	H	1.58	26	18.78	13.43	32.21	40.00	7.79
225.88	H	1.43	30	24.28	14.56	38.84	46.00	7.16
384.04	H	1.38	28	26.01	15.22	41.23	46.00	4.77
607.52	H	1.23	16	16.78	25.77	42.55	46.00	3.45
837.00	V	1.68	43	11.22	28.52	39.74	46.00	6.26

Notes: **1.All modes of operation were investigated.**

2.All readings are calibrated by self-mode in receiver.

3.Measurements using CISPR quasi-peak mode.

4.AFCL = Antenna factor and cable loss

5.H = Horizontal, V = Vertical Polarization

♠ **Margin Calculation**

Margin = Limit – Actual

Actual = Reading + AFCL