

TEST REPORT

Ref. Report No.

04-1341-020

Name and address of the applicant

KI RYUNG Electronics Co., Ltd.
219-6, Gasan-Dong, Kumchun-Ku, Seoul 153-023, Korea

Standard / Test regulation

FCC Part 15, Subpart C

Test result

Pass

Incoming date : July 28, 2004

Test date : August 6, 2004

Test item(s) ;

Low Power Communication Device
Transmitter (Digital Satellite Radio
with FM Transmitter)

Model/type ref. ;

SP-R1

Manufacturer ;

KI RYUNG Electronics Co., Ltd.

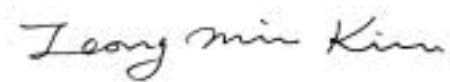
Additional information ;

-Required Authorization : Certification
-FCC ID. : P3HSPR1-1

Issue date : August 9, 2004

This test report only responds to the tested sample and shall not be reproduced except in full without written approval of the Korea Testing Laboratory.

Tested and reported by



Jeong-Min Kim, Senior Engineer

Reviewed by



Won-Seo Cho, Telecommunication Team
Manager

KOREA TESTING LABORATORY

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I. GENERAL INFORMATION

1. Grantee's Name and : KI RYUNG Electronics Co., Ltd.
Mailing Address : 219-6, Gasan-Dong, Kumchun-Ku, Seoul, 153-023, Korea

2. Manufacturer's Name and : KI RYUNG Electronics Co., Ltd.
Mailing Address : 219-6, Gasan-Dong, Kumchun-Ku, Seoul, 153-023, Korea

3. Equipment Descriptions

3.1 Operating Frequency : 88.1 MHz ~ 107.9 MHz
3.2 Power Supply : DC 12 V (AC/DC Adapter)
3.3 Test Configuration

Device	Model	Manufacturer	FCC ID	Connected to
EUT (FM Transmitter)	SP-R1	KI RYUNG Electronics Co., Ltd.	P3HSPR1-1	--
External Antenna	SIRIUS	SIRIUS	N/A	EUT
AC/DC adapter	DSA-0131F-12	DVE	N/A	EUT
Speaker	--	--	N/A	EUT

4. Rules and Regulations : FCC Part 15, Subpart C

5. Measuring Procedure : ANSI C63.4-2001

6. Place of Measurement : Absorber-lined Room (KTL)

7. Date of Measurement

7.1 Conducted Emission : August 6, 2004
7.2 Radiated Emission : August 6, 2004

II. GENERAL REQUIREMENTS OF THE EUT

1. Labeling Requirement (Section 15.19)

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interface, and (2) this device must accept any interference received, including interference that may cause undesired operation.

1.1 Location of Label : Rear side of EUT

1.2 How Applied : Printed on adhesive label

2. Information to User (Section 15.21)

The following or similar statements were provided in the manual for user instruction.

Please refer page 4 of the attached manual for details.

CAUTION : Any changes or modifications in construction of this device which are not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

3. Special Accessories (Section 15.27)

3.1 Were the special Accessories provided? [] yes, [☒] no

3.2 If yes, details for the special accessories are as follows :

3.3 If yes, were the appropriate instructions provided on the first page of the text concerned with the installation of the device?

[] yes, [] no

3.4 Are these accessories provided of the type which can be readily obtained from multiple retail outlets ?

[] yes, [] no

And therefore does the manual specify what additional components or accessories are required to used in order to comply with the Rules?

[] yes, [] no

III. CONDUCTED EMISSION MEASUREMENT (Section 15.207)

1. Test Procedure

The EUT is designed to transmit on one of 99 channels in the band 88.1 to 107.9 MHz. Therefore measurements were performed with the equipment operating on three frequencies, which were the top(107.9 MHz), middle(98.1 MHz) and bottom(88.1 MHz) in the band, as per Section 15.31(m). Test mode was transmitting mode.

Conducted emission measurements on the EUT were performed by "AC Power Line Conducted Emissions Testing" procedure as per ANSI C63.4. The EUT was set up on a wooden table 0.8 meters height, 1.0 by 1.5 meters in size, placed in the shielded enclosed with a side of wall of which constituted a vertical conducting surface of 2.2 m X 3.1 m in size to maintain 40 cm from the rear of EUT

LISN (Line Impedance Stabilization Network, R & S, ESH3-Z5, 50 ohm/50 uH) was installed and electrically bonded to the conducting ground plane. The EUT was connected to the LISN.

The frequency range from 150 kHz to 30 MHz was examined and the peak values that are within 6 dB of the limit would be compared to quasi-peak values using the Quasi-Peak mode.

The position of connecting cables of the EUT was changed to find the worst case configuration during measurements. The maximum emission level from the EUT occurred in such configuration as shown in the following photograph.

2. Photograph for the test configuration



3. Sample Calculation

The emission level measured in decibels was shown in following sample calculation.

For example :

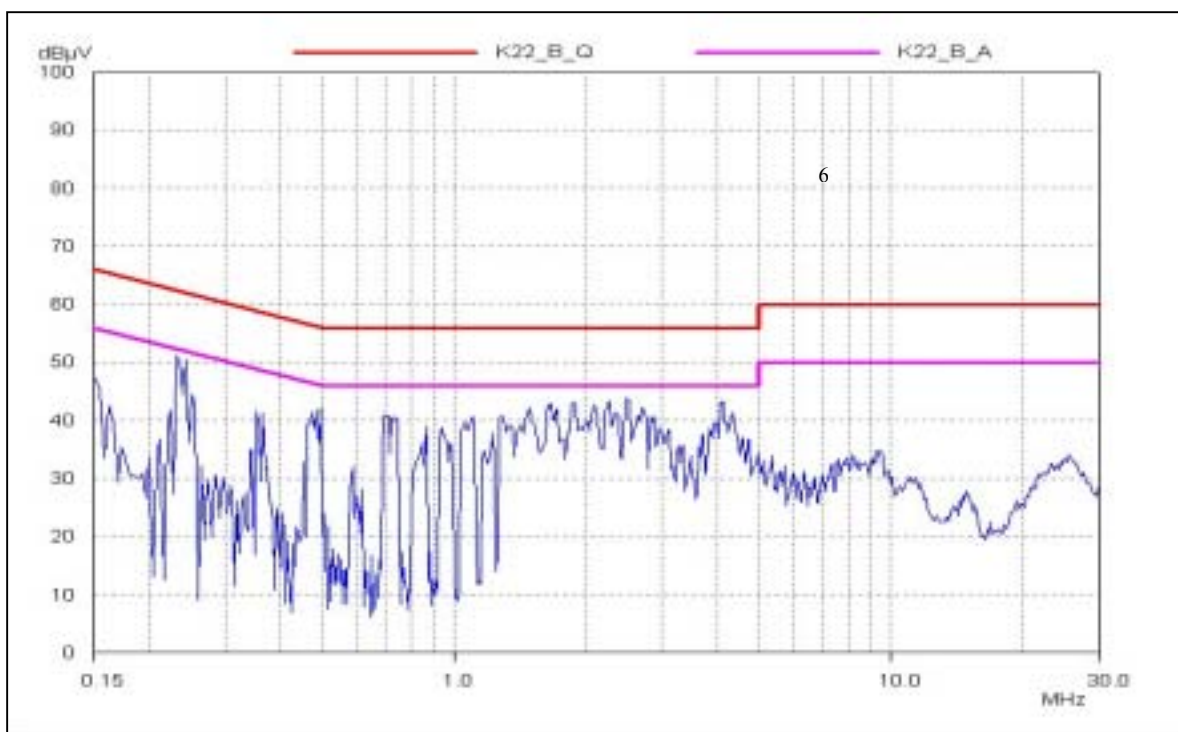
Measured Value at	<u>0.23 MHz</u>	33.1 dB μV	@ Average mode
+	Cable Loss *	0.0 dB	
=	Conducted Emission	33.1 dB μV	

* In case of RG214/ RF cable 15Ft, the loss is about 0.17dB at the frequency of 30 MHz which is negligible.

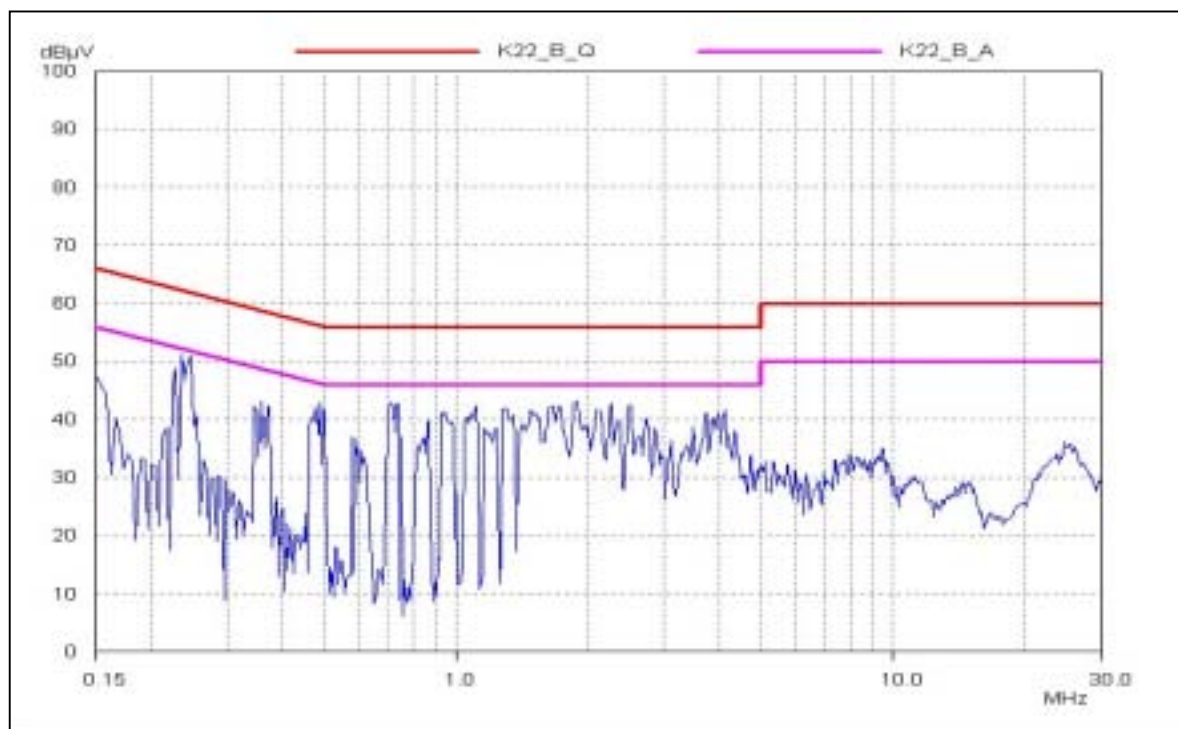
4. Measurement Data

- Operating Frequency : 107.9 MHz
- Resolution Bandwidth : x CISPR Quasi-Peak (6dB Bandwidth : 9 kHz)
- x Average (6dB Bandwidth : 9 kHz)

Power Lead Tested	Frequency (MHz)	Emission Level		Limit		(*) Margin	
		Q-Peak (dB μ V)	Average (dB μ V)	Q-Peak (dB μ V)	Average (dB μ V)	Q-Peak (dB μ V)	Average (dB μ V)
Live to Ground	0.23	48.7	33.1	62.5	52.5	-13.8	-19.4
	0.24	48.0	38.8	62.1	52.1	-14.1	-13.3
	0.49	40.7	29.0	56.2	46.2	-15.5	-17.2
	0.71	38.1	22.8	56.0	46.0	-17.9	-23.2
	2.46	40.6	25.1	56.0	46.0	-15.4	-20.9
	--	--	--	--	--	--	--
Neutral to Ground	0.23	48.3	38.0	62.5	52.5	-14.2	-14.5
	0.24	49.6	37.1	62.1	52.1	-12.5	-15.0
	0.70	41.1	25.8	56.0	46.0	-14.9	-20.2
	1.89	40.1	15.7	56.0	46.0	-15.9	-30.3
	2.45	38.6	22.0	56.0	46.0	-17.4	-24.0
	--	--	--	--	--	--	--
Note : Refer to measured graphs on next page. * Margin(dB) : Emission Level (dB) - Limit (dB)							



(Test side : Live-Ground side)



(Test side : Neutral-Ground side)

IV. RADIATED EMISSION MEASUREMENT (Section 15.239 & 15.209)

1. Test Procedure

1.1 Preliminary Testing for Reference

Preliminary testing was performed in a KTL absorber-lined room to determine the emission characteristics of the EUT. The EUT was placed on the wooden table which has dimensions of 0.8 meters in height, 1 meter in length and 1.5 meters in width. Receiving antenna (Biconi-Log antenna : 30 to 1000 MHz or Horn Antenna : 1 to 18 GHz) was placed at the distance of 1 meter from the EUT.

An attempt was made to maximize the emission level with the various configurations of the EUT. Emission levels from the EUT with various configurations were examined on a spectrum analyzer connected with a RF amplifier and graphed by a plotter.

1.2 Final Radiated Emission Test at an Absorber-Lined Room

The final measurement of radiated field strength was carried out in a KTL absorber-lined Room that was listed up at FCC according to the "Radiated Emissions Testing" procedure specified by ANSI C63.4.

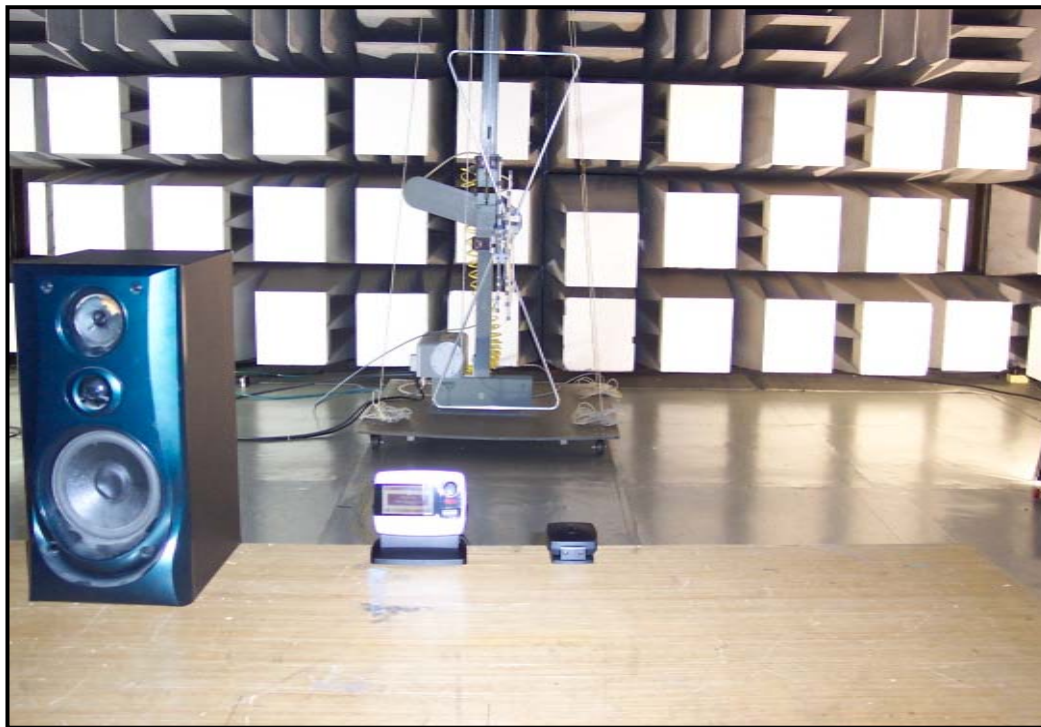
Based on the test results in preliminary test, measurement was made in same test set up and configuration with 3 orthogonal planes which produced maximum emission level. Receiving antenna was installed at 3-meter distance from the EUT, and was connected to an EMI receiver or spectrum analyzer with a RF amplifier.

Turntable was rotated through 360 degrees and receiving antenna height was varied from 1 to 4 meters above the ground plane with horizontal and vertical polarization to read maximum emission level.

If necessary, the radiated emission measurements could be performed at a closer distance than specified distance to ensure higher accuracy and their results were extrapolated to the specified distance using an inverse linear distance extrapolation factor(20dB/decade) as per Section 15.31(f).

The maximum emission level from the EUT occurred in such configuration as shown in the following photograph.

2. Photograph of the test configuration



3. Sample Calculation

The emission level measured in decibels above one microvolt ($\text{dB } \mu\text{V}$) was calculated as shown in following sample calculation.

For example :

Measured Value at	<u>88.1 MHz</u>	29.7 $\text{dB } \mu\text{V}$
+	Antenna Factor	8.3 dB/m
+	Cable Loss	1.2 dB
-	Preamplifier	0.0 dB
-	Distance Correction Factor *	0.0 dB
=	Radiated Emission	39.2 $\text{dB } \mu\text{V/m}$

* Extrapolated from the measured distance to the specified distance by an inverse linear distance extrapolation.

4. Measurement Data

4.1 Within the permitted 200 kHz band (Operating Frequency : 88.1 MHz, 98.1 MHz, 107.9 MHz)

- Resolution Bandwidth : Peak (3dB Bandwidth : 120 kHz)
- Measurement Distance : 3 Meter

Frequency (MHz)	* D.M.	* A.P.	Measured Value (dB μ V)	* A.F. + C.L. (dB)	* A.G. (dB)	* D.C.F.	Emission Level (dB μ V/m)	Limit (dB μ V/m)	** Margin (dB)
88.1	P	H	13.4	9.5	--	--	22.9	48.0	-25.1
88.1	P	V	29.7	9.5	--	--	39.2	48.0	- 8.8
98.1	P	H	20.9	10.1	--	--	31.0	48.0	-17.0
98.1	P	V	30.5	10.1	--	--	40.6	48.0	- 7.4
107.9	P	H	17.0	11.2	--	--	28.2	48.0	-19.8
107.9	P	V	28.3	11.2	--	--	39.5	48.0	- 8.5
--	--	--	--	--	--	--	--	--	--

Note

* D.M. : Detect Mode (P : Peak, Q : Quasi-Peak, A : Average)
 A.P. : Antenna Polarization (H : Horizontal, V : Vertical)
 A.F. : Antenna Factor
 C.L. : Cable Loss
 A.G. : Amplifier Gain
 D.C.F. : Distance Correction Factor

** Margin (dB) = Emission Level (dB) - Limit (dB)

Average detector mode was not measured because the peak emission values were under the average limits.

4.2 Outside of the specified 200 kHz band

- Resolution Bandwidth : CISPR Quasi-Peak (6dB Bandwidth : 120kHz)
- Measurement Distance : 3 Meter
- Measured Frequency Range : 30 MHz ~ 1000 MHz

Frequency (MHz)	* D.M.	* A.P.	Measured Value (dB μ V)	* A.F. + C.L. (dB)	* A.G. (dB)	* D.C.F.	Emission Level (dB μ V/m)	Limit (dB μ V/m)	** Margin (dB)
99.9	Q	V	23.1	10.4	--	--	33.5	43.5	-10.0
120.4	Q	V	19.5	12.4	--	--	31.9	43.5	-11.6
660.0	Q	V	4.5	23.6	--	--	28.1	46.0	-17.9
--	--	--	--	--	--	--	--	--	--

Note

* D.M. : Detect Mode (P : Peak, Q : Quasi-Peak, A : Average)
 A.P. : Antenna Polarization (H : Horizontal, V : Vertical)
 A.F. : Antenna Factor
 C.L. : Cable Loss
 A.G. : Amplifier Gain
 D.C.F. : Distance Correction Factor

** Margin (dB) = Emission Level (dB) - Limit (dB)

Note ;

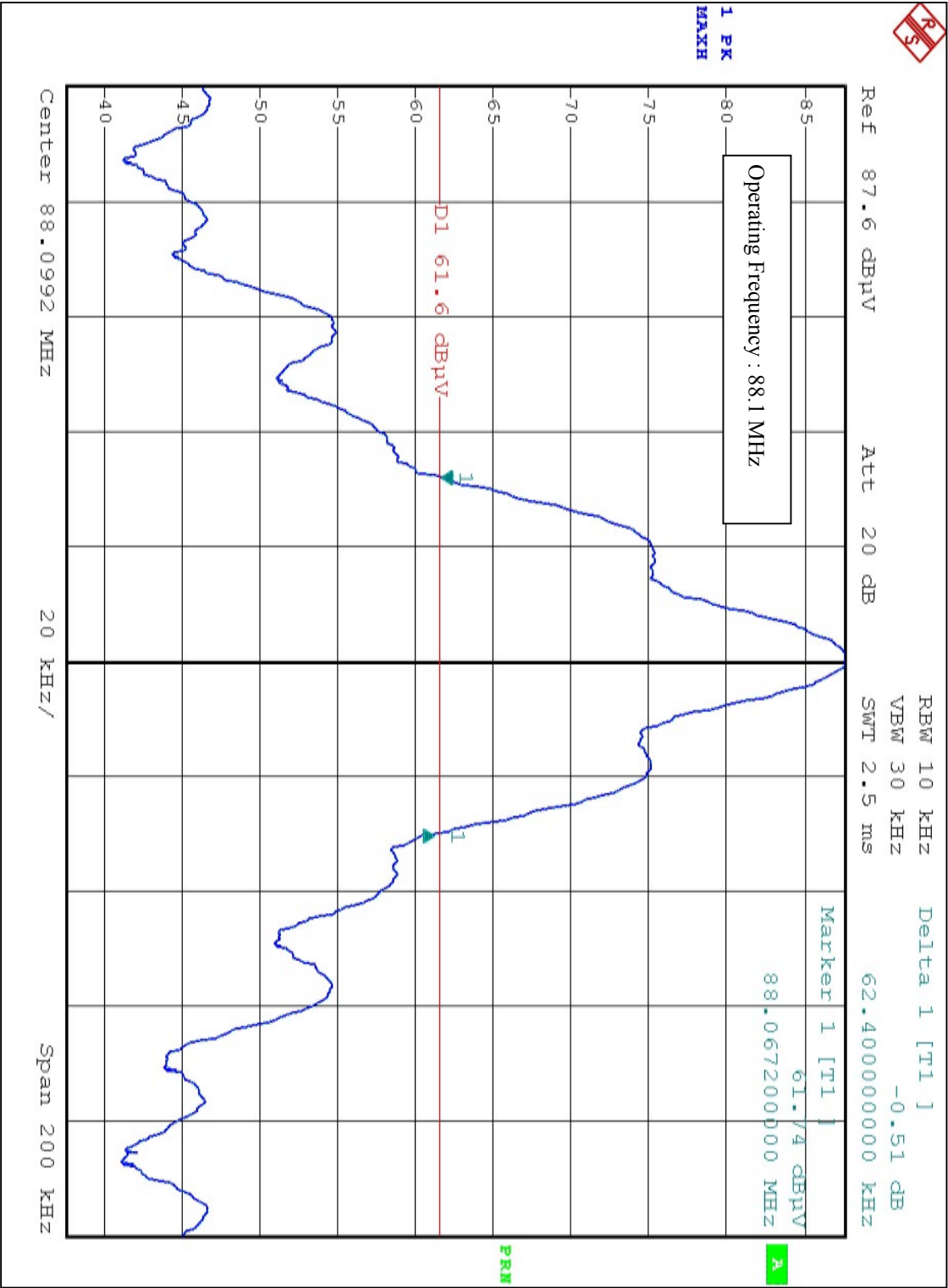
- (1) Fundamental emissions from the intentional radiators were not located within any of frequency bands described in section 15.205(a) listed below ;

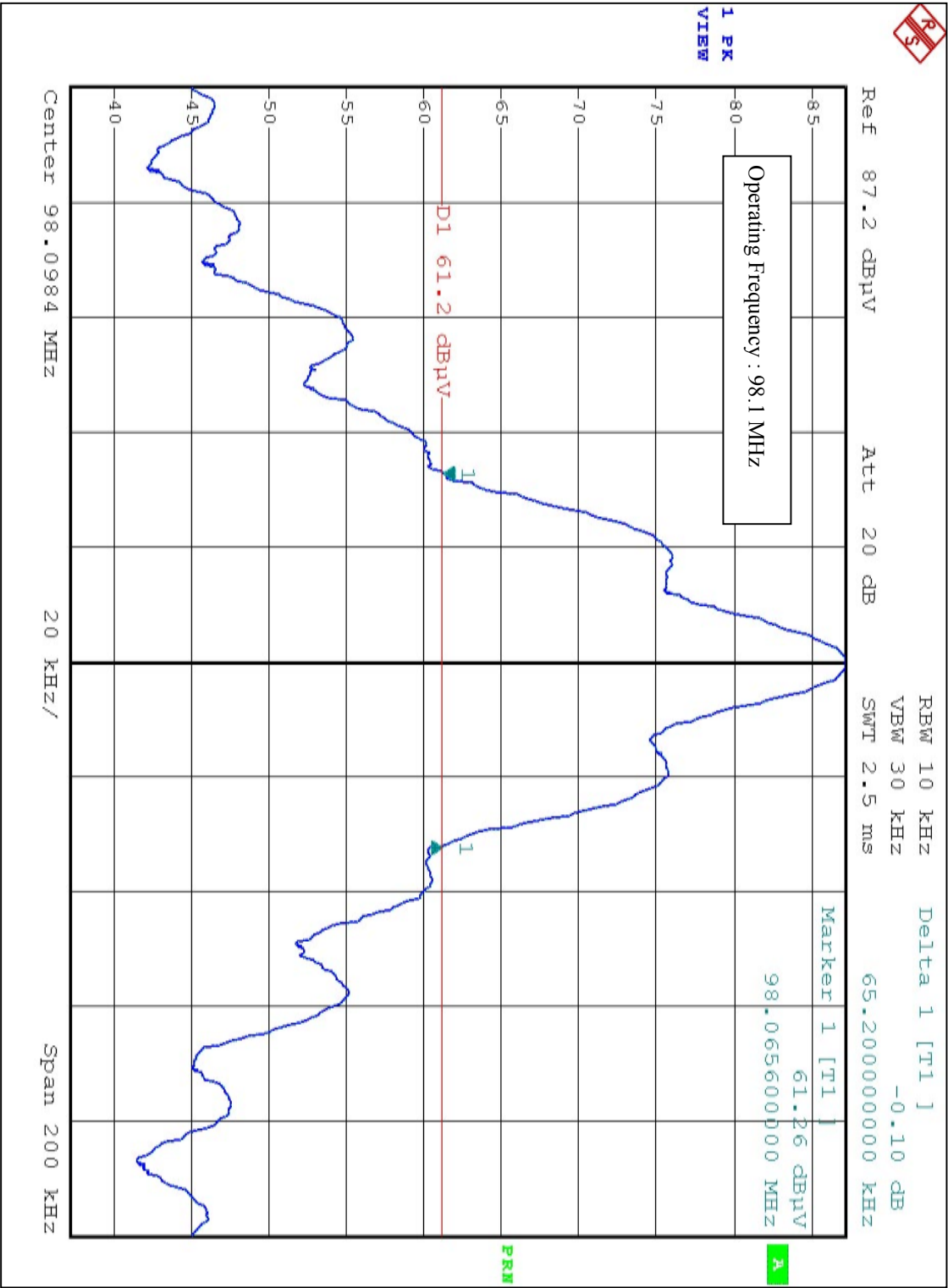
MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.25
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.1775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2655-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	
13.36-13.41			

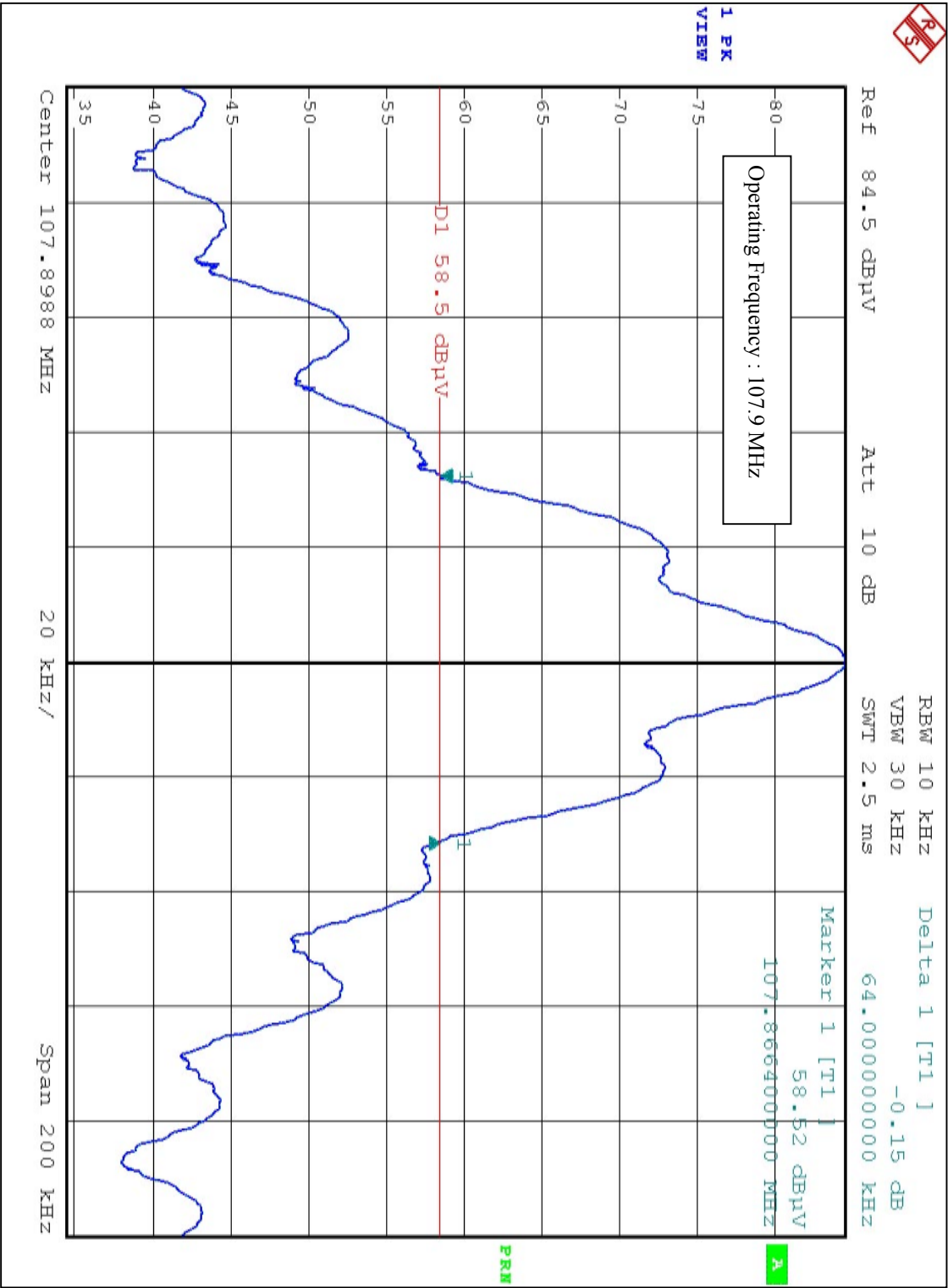
The field strength of emissions appearing within above frequency bands did not exceed the limits shown in section 15.209. At frequency equal to or less than 1000 MHz, compliance with the limits section 15.209 was demonstrated using measurement employing a CISPR quasi-peak detector. Above 1000 MHz, demonstrated based on the average value of the measured emissions.

- (2) If the intentional radiator was operated under the radiated emission limits of the general requirements of section 15.209, it's fundamental emissions were not located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz, 470-860 MHz.
- (3) The level of any unwanted emissions from an intentional radiator did not exceed the level of the fundamental emission.
- (4) Radiated and spurious emissions were checked from 30 MHz to 1 GHz. And all other emissions not reported on data were more than 20 dB below the permitted level.

V. OCCUPIED BANDWIDTH MEASUREMENT (Section 15.239)







VI. TEST EQUIPMENT USED FOR MEASUREMENTS

<u>Equipment</u>	<u>Specification</u>	<u>Model No.</u>	<u>Manufacturer</u>	<u>Serial No.</u>
EMI Receiver	20 MHz - 1 GHz	ESVS30	R & S	830516/002
EMI Receiver	20 Hz - 7 GHz	ESI	R & S	835571/004
Spectrum Analyzer	9 kHz - 26.5 GHz	8563A	H. P.	3222A02069
Spectrum Analyzer	3 Hz - 50 GHz	E4448A	Agilent	MY43360322
Synthesized Sweeper	10 MHz - 20 GHz	83620A	H. P.	3250A01653
Pre-Amplifier	0.1 - 3000 MHz, 30 dB	8347A	H. P.	2834A00543
Pre-Amplifier	1 - 26.5 GHz, 35 dB	8449B	H. P.	3008A00302
LISN(50 Ω , 50 μ H)	9 kHz - 30 MHz	3825/2	EMCO	9010-1710
LISN(50 Ω , 50 μ H)	9 kHz - 30 MHz	ESH3-Z5	R & S	826789/009
Biconical Ant.	30 MHz - 300 MHz	BBA 9106	Schwarzbeck	--
Trilog-Broadband Ant.	30 MHz - 1000 MHz	VULB9168	Schwarzbeck	9168-167
Log Periodic Ant.	200 MHz - 1 GHz	3146	EMCO	--
Horn Ant.	1 GHz - 18 GHz	3115	EMCO	--
Horn Ant.	18GHz - 40 GHz	3116	EMCO	--
Active Loop Ant.	9 kHz - 30 MHz	6502	EMCO	2532