

III. RADIATED EMISSION MEASUREMENT (Section 15.109)

1. Test Procedure

1.1 Preliminary Testing for Reference

This pager receiver(EUT) is designed to operate in the band 139.675MHz to 172.850MHz by changing a local oscillator installed in internal PCB. According to section 15.31(m), the measurements were performed with three equipments which were selected as bottom, middle, and top frequency in the operating band.

Preliminary testing was performed in a KAITECH 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(Biconical antenna : 30 to 300MHz, Log-periodic antenna : 200 to 1000MHz or Horn Antenna : 1 to 18GHz) 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 while rotating the table and varying antenna height.

Emissions level 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 a Absorber-Lined Room

The final measurement of radiated field strength was carried out in a KAITECH 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 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(for above 1GHz) 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 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.

4. Measurement Data

4.1 Operating Frequency (Bottom : 139.675MHz Tuning)

- Resolution Bandwidth : x CISPR Quasi-Peak (6dB Bandwidth : 120kHz)
 Peak (3dB Bandwidth : 300kHz)
- Measurement Distance : 3 Meter

Frequency (MHz)	* D.M.	* A.P.	Measured Value (dBμV)	* A.F. + C.L. (dB)	* A.G. (dB)	* D.C.F. (dB)	Emission Level		Limit (μV/m)	** Margin (dB)
							(dBμV/m)	(μV/m)		
*** 59.14	Q	V	4.0	9.2	-	-	13.2	4.6	100	-26.8
*** 118.27	Q	H/V	**** <2.0	13.7	-	-	<15.7	<6.1	150	<-27.8
-	-	-	-	-	-	-	-	-	-	-

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)

*** Reference Data

**** < means less than. The observed EMI receiver(ESVS30) noise floor level was 2.0dBμV. And all other emissions not reported on data were more than 25dB below the permitted level.

4.2 Operating Frequency (Middle : 156.600MHz Tuning)

- Resolution Bandwidth : x CISPR Quasi-Peak (6dB Bandwidth : 120kHz)
 Peak (3dB Bandwidth : 300kHz)
- 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. (dB)	Emission Level		Limit (μ V/m)	** Margin (dB)
							(dB μ V/m)	(μ V/m)		
*** 67.60	Q	V	5.0	7.4	-	-	12.4	4.2	100	-27.6
*** 135.20	Q	H/V	**** <2.0	15.4	-	-	<17.4	<7.4	150	<-26.1
-	-	-	-	-	-	-	-	-	-	-

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)
- *** Reference Data
- **** < means less than. The observed EMI receiver(ESVS30) noise floor level was 2.0dB μ V. And all other emissions not reported on data were more than 25dB below the permitted level.

4.3 Operating Frequency (Top : 172.850MHz Tuning)

- Resolution Bandwidth : x CISPR Quasi-Peak (6dB Bandwidth : 120kHz)
- Peak (3dB Bandwidth : 300kHz)
- Measurement Distance : 3 Meter

Frequency (MHz)	* D.M.	* A.P.	Measured Value (dBμV)	* A.F. + C.L. (dB)	* A.G. (dB)	* D.C.F. (dB)	Emission Level		Limit (μV/m)	** Margin (dB)
							(dBμV/m)	(μV/m)		
*** 75.72	Q	V	4.5	7.0	-	-	11.5	3.8	100	-28.5
*** 151.44	Q	H/V	**** <2.0	16.9	-	-	<18.9	<8.8	150	<-24.6
168.48	Q	V	8.0	18.0	-	-	26.0	20.0	150	-17.5
-	-	-	-	-	-	-	-	-	-	-

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)

*** Reference Data

**** < means less than. The observed EMI receiver(ESVS30) noise floor level was 2.0dBμV. And all other emissions not reported on data were more than 25dB below the permitted level.

IV. TEST EQUIPMENT USED FOR MEASUREMENTS

<u>Equipment</u>	<u>Model No.</u>	<u>Manufacturer</u>	<u>Serial No.</u>	<u>Effective Cal. Duration</u>
[x] EMI Receiver (20MHz-1GHz)	ESVS30	R & S	830516/002	07/04/97-07/04/98
[x] Spectrum Analyzer (9kHz-26.5GHz)	8563A	H. P.	3222A02069	01/30/98-01/30/99
[] Spectrum Analyzer (100Hz-22GHz)	8566B	H. P.	3014A07057	05/29/97-05/29/98
[] Quasi-Peak Adapter (10kHz-1GHz)	85650A	H. P.	3107A01511	05/29/97-05/29/98
[] RF-Preselector (20Hz-2GHz)	85685A	H. P.	3010A01181	05/29/97-05/29/98
[] Test Receiver (9kHz-30MHz)	ESH3	R & S	860905/001	07/04/96-07/04/98
[x] Pre-Amplifier (0.1-3000MHz, 30dB)	8347A	H. P.	2834A00543	05/29/97-05/29/98
[] Pre-Amplifier (1-26.5GHz, 35dB)	8449B	H. P.	3008A00302	06/30/97-06/30/98
[] LISN(50Ω, 50μH) (10kHz-100MHz)	3825/2	EMCO	9010-1710	-
[] LISN(50Ω, 50μH) (10kHz-100MHz)	3825/2	EMCO	9011-1720	-
[x] Plotter	7470A	H. P.	3104A21292	-
[] Tuned Dipole Ant. (30MHz-300MHz)	VHA 9103	Schwarzbeck	-	*
[] Tuned Dipole Ant. (300MHz-1GHz)	UHA 9105	Schwarzbeck	-	*
[x] Biconical Ant. (30MHz-300MHz)	BBA9106	Schwarzbeck	-	*
[x] Log Periodic Ant. (200MHz-1GHz)	3146	EMCO	-	*
[] Horn Ant. (1GHz-18GHz)	3115	EMCO	-	*
[] Audio Generator	LAV-190	LEADER	5020297	07/01/96-07/01/98
[] DC Power Supply	6260B	H.P.	1145A04822	-
[] Shielded Room (5.0m x 4.5m)		SIN-MYUNG	-	-

* Each set of antennas has been calibrated to ensure correlation with ANSI C63.5 standard.
The calibration of antennas is traceable to Korea Standard Research Institute(KSRI).