REPORT OF MEASUREMENT

CERTIFICATION

Product	:	Security/Remote Control Transmitter(Car Alarm)
Applicant	:	Dong Yang Security Electronics Co.
Grantee Name	:	Dong Yang Security Electronics Co.
FCC ID.	:	HH8-DYTH2240-TX
Trade Name	:	THORN
Model No.	:	THORN 55
Report No.	:	341-034
Date	:	June 17, 1998

KOREA ACADEMY OF INDUSTRIAL TECHNOLOGY(KAITECH)

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III. INPUT POWER MEASUREMENT (Section 15.31)

INPUT POWER
38.52 mW

Note : 1. Input Power : $P_{ove} = (P_p \times D)_{pulse} + P_D$

Where, P_p : Input Peak Power (= V x I_p)

P_D : Input DC Power (= V x I_D)

D : Duty Cycle (= τ_{eff} x PRF)

Measured Input Voltage (V) = 12.15 DCV

Measured Input Peak Current (I_p) = 2.60 mA

Measured Input Bias Current (I_D) = 2.52 mA

Measured An Effective Pulse Width (τ_{eff}) = 0.50 msec

Measured Pulse Repetition Frequency (PRF) = 500 Hz

2. Input current was measured using the current probe and the oscilloscope.

3. τ_{eff} and PRF were measured using the spectrum analyzer.

4. P_p = 12.15 DCV × 2.60 mA = 31.59 mW

P_D = 12.15 DCV × 2.52 mA = 30.62 mW

D = 0.50 msec × 500 Hz = 0.250

Ⅳ. RADIATED EMISSION MEASUREMENT (Section 15.231)

1. Test Procedure

1.1 Preliminary Testing for Reference

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.

The measurement was performed with three buttons respectively. An attempt was made to maximize the emission level with the various configurations of the EUT. The position of the EUT was horizontally or vertically changed to find the worst case configuration.

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 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 when EUT was set to Button upper in such configuration as shown in the following photograph.

The field strengths were calculated as follows ;

- E_{peak} (dB) = $E_{reading}$ (dB) + α_p + Ant. Factor & Cable Loss (dB)
- To get the average voltage values in the one complete pulse train blanking intervals,

$$E_{averg.}(\mu V) = \frac{E_{peak}(\mu V) \times \text{Total pulse time of transmitter in the one complete pulse train (sec)}}{T_t \text{ (sec)}}$$

where,

Pulse desensitization (α_p) = 20log(τ_{eff} x B x K), HP AN150-2 (page 14)
= 0 (See 1.4)

Total pulse time of transmitter in the one complete pulse train = 21.50 msec (See the graph of page 11)

One complete pulse train time including blanking interval (T_t) = 62.0 msec (See graphs of page 11)

For example :

the average values at 303.3 MHz

	Spectrum Analyzer measured values	: 90.2	dB
-	Preamplifier	: 30.0	dB
+	Pulse Desensitization (α_p)	: 0.0	dB
+	Ant.Factor & Cable Loss	: 21.4	dB
	Voltage Peak Levels	: 81.6	dBμV
		(= 12022.6	μV)

Voltage Average Levels

$$= \frac{E_{peak} \times \text{Total pulse time of transmitter in the one complete pulse train}}{T_t}$$

$$= \frac{12022.6\ \mu V \times 21.50 \text{ msec}}{62.0 \text{ msec}} = 4169.1\ \mu V$$

4. Measurement Data

- Measurement Button : Button Upper
- Resolution Bandwidth : Peak (3dB Bandwidth : 100kHz for 1GHz below)
  Peak (3dB Bandwidth : 1MHz for 1GHz over)
- 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 Peak (μV/m)	Emission Level Average (μV/m)	Limit (μV/m)	** Margin (dB)
303.3	P	H	90.2	21.4	-30.0	-	12022.6	4169.1	5554.2	-2.5
606.6	P	H	46.5	29.7	-30.0	-	204.2	70.8	555.4	-17.9
909.9	P	H	39.8	35.1	-30.0	-	175.8	61.0	555.4	-19.2
1213.2	P	V	46.8	31.6	-30.0	-	263.0	91.2	500.0	-14.8
1516.5	P	V	46.3	33.3	-30.0	-	302.0	104.7	500.0	-13.6
1819.8	P	V	41.5	35.5	-30.0	-	223.9	77.6	555.4	-17.1
*** 2123.1	P	H/V	**** <32.0	37.6	-30.0	-	<95.5	<33.1	555.4	<-24.5
*** 2426.4	P	H/V	**** <32.0	38.9	-30.0	-	<110.9	<38.5	555.4	<-23.2
-	-	-	-	-	-	-	-	-	-	-

-74.2

Note

* D.M. : Detect Mode (P : Peak, Q : Quasi-Peak, A : Average)
A.P. : Antenna Polarization (H : Horizental, 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)

*** The measured values of emission at thease frequencies were 20dB below the permitted level.

**** < means less than. The observed spectrum analyzer noise floor level with RF preamplifier(Model No. : 8347A) was 32.0 dBμV/m.

Note ;

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

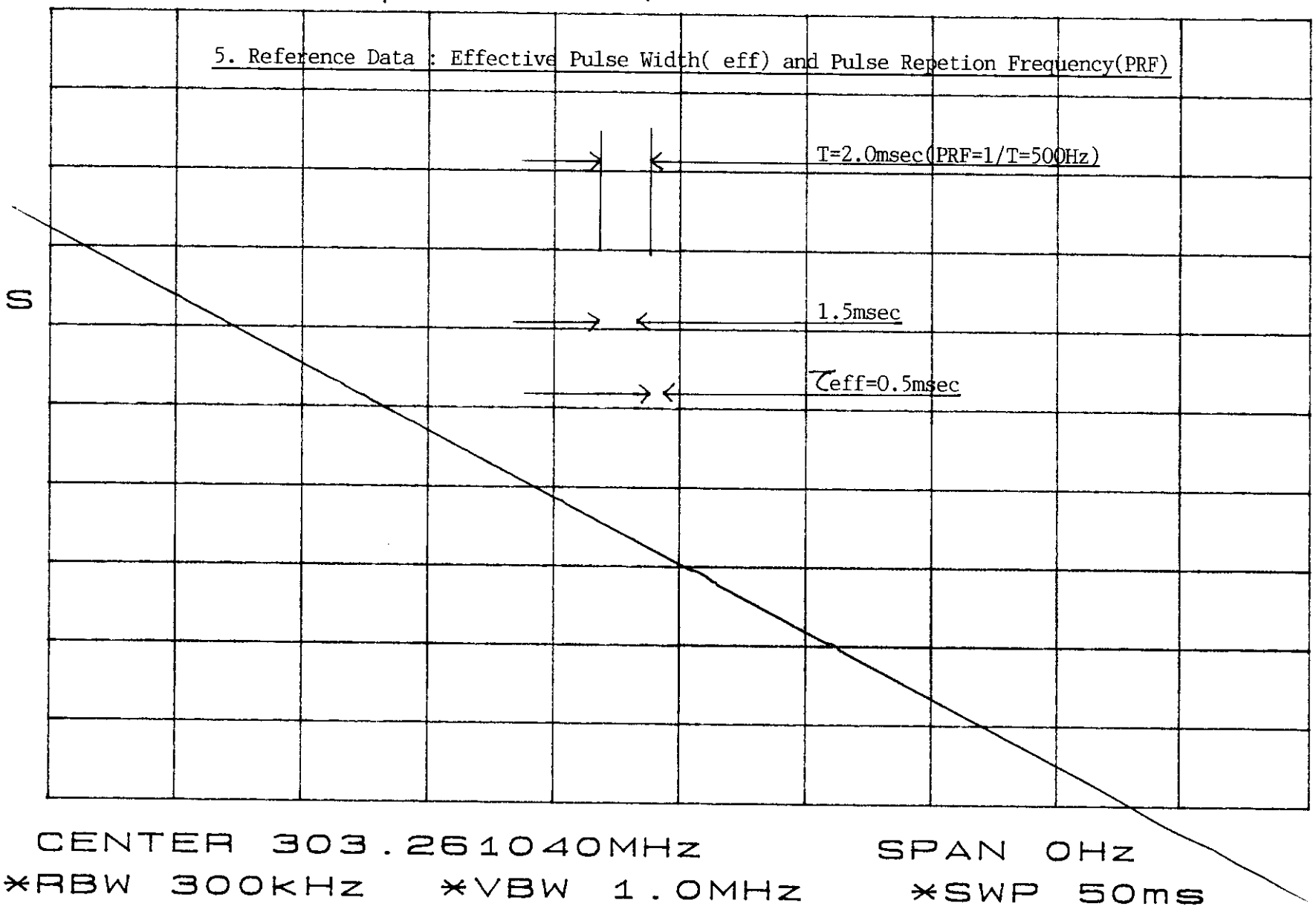
MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.25
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.1775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	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 1000MHz, compliance with the limits section 15.209 was demonstrated using measurement employing a CISPR quasi-peak detector. Above 1000MHz, 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 54-72MHz, 76-88MHz, 174-216MHz, 470-860MHz.

(3) The level of any unwanted emissions from an intentional radiator did not exceed the level of the fundamental emission.

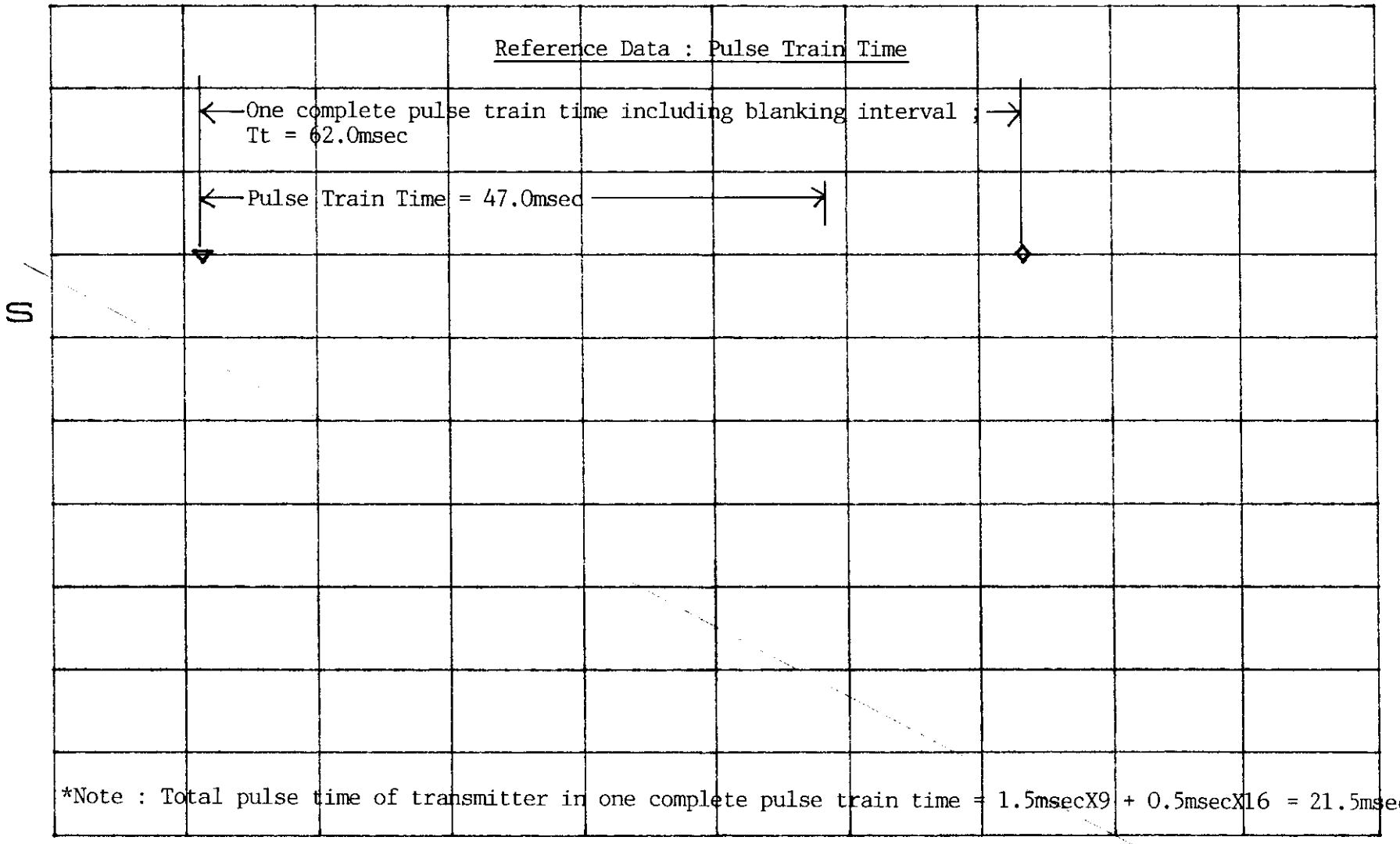
(4) Radiated and spurious emissions were checked from 30MHz to 3GHz. And all other emissions not reported on data were more than 20 dB below the permitted level.


ATTEN 10dB
RL 107.0dBμV 10dB/
5. Reference Data : Effective Pulse Width(eff) and Pulse Repetion Frequency(PRF)
T=2.0msec(PRF=1/T=500Hz)
S
1.5msec
τeff=0.5msec
CENTER 303.261040MHz
SPAN 0Hz
*RBW 300kHz
*VBW 1.0MHz
*SWP 50ms

ATTEN 10dB

△MKR 0dB

RL 107.0dBμV 10dB/ 62ms



CENTER 303.261040MHz

SPAN 0Hz

*RBW 300kHz *VBW 1.0MHz *SWP 100ms

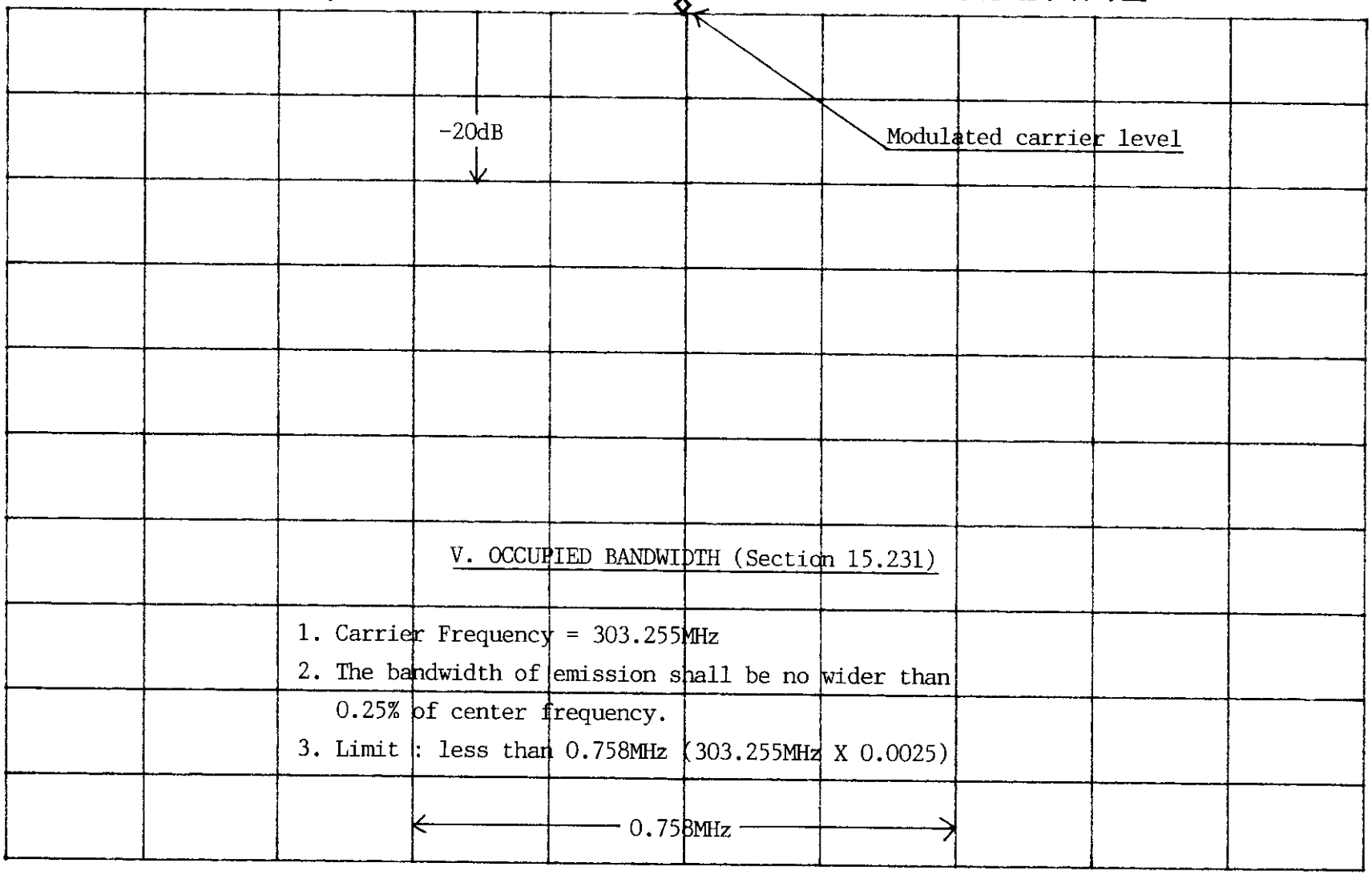
ATTEN 10dB

RL 76.2dBμV

10dB/

MKR 76.20dBμV

303.255MHz



CENTER 303.261MHz

SPAN 1.895MHz

*RBW 3.0kHz *VBW 10kHz *SWP 5.0sec

VI. TEST EQUIPMENT USED FOR FCC COMPLIANCE TESTING

Equipment	Model No.	Manufacturer	Serial No.	Effective Cal. Duration
[ ] 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	05/29/98-05/29/99
[ ] Quasi-Peak Adapter (10kHz-1GHz)	85650A	H. P.	3107A01511	05/29/98-05/29/99
[ ] RF-Preselector (20Hz-2GHz)	85685A	H. P.	3010A01181	05/29/98-05/29/99
[ ] Test Receiver (9kHz-30MHz)	ESH3	R & S	860905/001	07/04/97-07/04/98
[x] Pre-Amplifier (0.1-3000MHz, 30dB)	8347A	H. P.	2834A00543	05/29/98-05/29/99
[ ] 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	-
[x] Tuned Dipole Ant. (30MHz-300MHz)	VHA 9103	Schwarzbeck	-	*
[x] Tuned Dipole Ant. (300MHz-1GHz)	UHA 9105	Schwarzbeck	-	*
[x] Biconical Ant. (20MHz-200MHz)	BBA9106	Schwarzbeck	-	*
[x] Log Periodic Ant. (200MHz-1GHz)	3146	EMCO	-	*
[x] Horn Ant. (1GHz-18GHz)	3115	EMCO	-	*
[x] Oscilloscope	TDS540	Tektronix	B023930	09/26/97-09/26/98
[x] Volt Meter	3438A	H.P.	1717A-00613	05/29/98-05/29/99
[ ] DC Power Supply	6206B	H.P.	1145A04822	-
[x] 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).