TEST REPORT

Ref. Report No.
03-341-016

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.

Name and address of the applicant

U-Tek Engineering
1F, #256-1, Simgok-dong, Seo-gu, Inchon, 404-190 Korea

Standard / Test regulation

FCC Part 15, Subpart C

Test result

Pass

Incoming date : April 16, 2003

Test date : May 23, 2003

Test item(s) ;

Security/Remote Control Transmitter
(Onw Way Car Alarm System / Remote)

Model/type ref. ;

Falcon

Manufacturer ;

U-Tek Engineering

Additional information ;

-Required Authorization : Certification
-FCC ID. : PATTX3UTEK

Issue date : May 27, 2003

Tested and reported by

Jeong-Min Kim, Senior Engineer

Reviewed by

Hee-Soo Kim , Telecommunication Team Manager

KOREA TESTING LABORATORY

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□. GENERAL INFORMATION

1. Grantee's Name and Mailing Address : U-Tek Engineering
   1F, #256-1, Simgok-dong, Seo-gu, Inchon, 404-190, Korea

2. Manufacturer's Name and Mailing Address : U-Tek Engineering
   1F, #256-1, Simgok-dong, Seo-gu, Inchon, 404-190, Korea

3. Equipment Descriptions

   3.1 Operating Frequency : 311.0 MHz
   3.2 Type of Emission : Pulse Code Signal
   3.3 Power Supply : DC 6 V(Battery)

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 : Not Applicable
   7.2 Radiated Emission : May 23, 2003

□. 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 : User's Guide Manual
1.2 How Applied : Printed

2. Information to User (Section 15.21)

The following or similar statements were provided in the manual for user instruction.
Please refer page 6 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, [x] 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

4. Compliant Conditions (Section 15.231)

4.1 Was the EUT used for continuous transmissions, such as voice or video, and data transmission ?

[ ] yes, [x] no

4.2 Was the EUT manually operated ?

[x] yes, [ ] no

If yes, did the EUT employ a switch that would automatically deactivate the transmitter within not more than 5 seconds of being released ?

[x] yes, [ ] no

4.3 Was the EUT automatically activated ?

[ ] yes, [x] no

If yes, did the EUT cease transmission within 5 seconds after deactivation ?

[ ] yes, [ ] no

4.4 Was the EUT used for periodic transmissions at regular predetermined intervals ?

[ ] yes, [x] no

□. RADIATED EMISSION MEASUREMENT (Section 15.231)

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 (Biconical antenna : 30 to 300 MHz, Log-periodic antenna : 200 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.

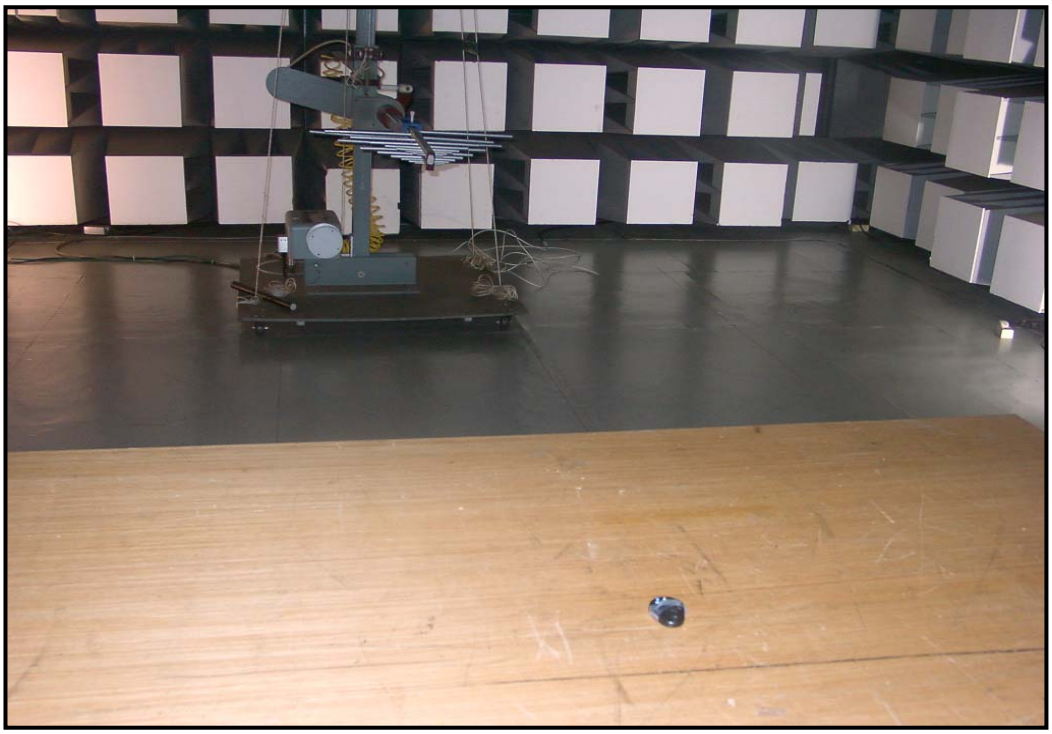
Based on the test results in preliminary test, measurement was made in same test set up and configuration with 3 orthogonal planes which produced maximum emission level. Receiving antenna was installed at 3-meter distance from the EUT, and was connected to an EMI receiver or spectrum analyzer with a 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 measured field strength was determined by averaging one complete pulse train including blanking interval because the pulse repetition time of the EUT(=55.8ms) does not exceeds 0.1 seconds (15.35(c)). See graphs of page 12.

With the resolution bandwidth set at 100 kHz, the EUT produces a pulse spectrum on the spectrum analyzer because the bandwidth of the analyzer is greater than or equal to the PRF (= 625 Hz).

Therefore, as mentioned in HP Application Note 150-2 (page 11), the pulse desensitization(α_p) equals zero and the display amplitude is essentially a peak level.

.

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,

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

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 = 22.0 msec (See the graph of page 12)

One complete pulse train time including blanking interval (T_t) = 55.8 msec (See the graph of page 12)

For example :

the average values at 312.2 MHz

	Spectrum Analyzer measured values	: 60.4	dB□
-	Preamplifier	: 0.0	dB
+	Pulse Desensitization (α_p)	: 0.0	dB
+	Ant.Factor & Cable Loss	: 17.3	dB/m
	Voltage Peak Levels	: 77.7	dB□/m
		(= 7673.6	□/m)

Voltage Average Levels

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

$$= \frac{7673.6\ \square/m \times 22.0\ \text{msec}}{55.8\ \text{msec}} = 3025.4\ \square/m = 69.6\ \text{dB}\square/m$$

4. Measurement Data

- Resolution Bandwidth : Peak (6 dB Bandwidth : 120 kHz for ranges below 1 GHz)
  Peak (6 dB Bandwidth : 1 MHz for ranges over 1 GHz)
- Measurement Distance: 3 Meter

Frequency (MHz)	* D.M.	* A.P.	Measured Value (dB□)	* A.F. + C.L. (dB/m)	* A.G. (dB)	* D.C.F. (dB)	Emission Level		Limit (dB□/m)	** Margin (dB)
							Peak (dB□/m)	Average (dB□/m)		
312.2	P	H	60.4	17.3	-	-	77.7	69.6	75.4	- 5.8
624.2	P	H	15.2	23.0	-	-	38.2	30.1	55.4	- 25.3
933.0	P	H/V	< 35.0	28.6	-30.0	-	< 33.6	< 25.5	55.4	< -29.9
1248.6	P	V	45.5	31.4	-35.0	-	41.9	33.8	55.4	- 21.6
1561.0	P	V	43.7	33.4	-35.0	-	42.1	34.0	54.0	- 20.0
1873.0	P	H/V	< 40.0	35.0	-35.0	-	< 40.0	< 31.9	55.4	< -23.5
2185.5	P	H/V	< 40.0	36.9	-35.0	-	< 41.9	< 33.8	55.4	< -21.6
-	-	-	-	-	-	-	-	-	-	-

Note

The upper frequency range of this test was 5 GHz. The observed EMI Test Receiver's noise floor level with RF preamplifier was 35.0 dB□ for range below 1GHz and 40.0 dB□ for range above 1GHz. And all other emissions not reported on data were more than 30 dB below the permitted level.

* 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
< : Less than

** 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			

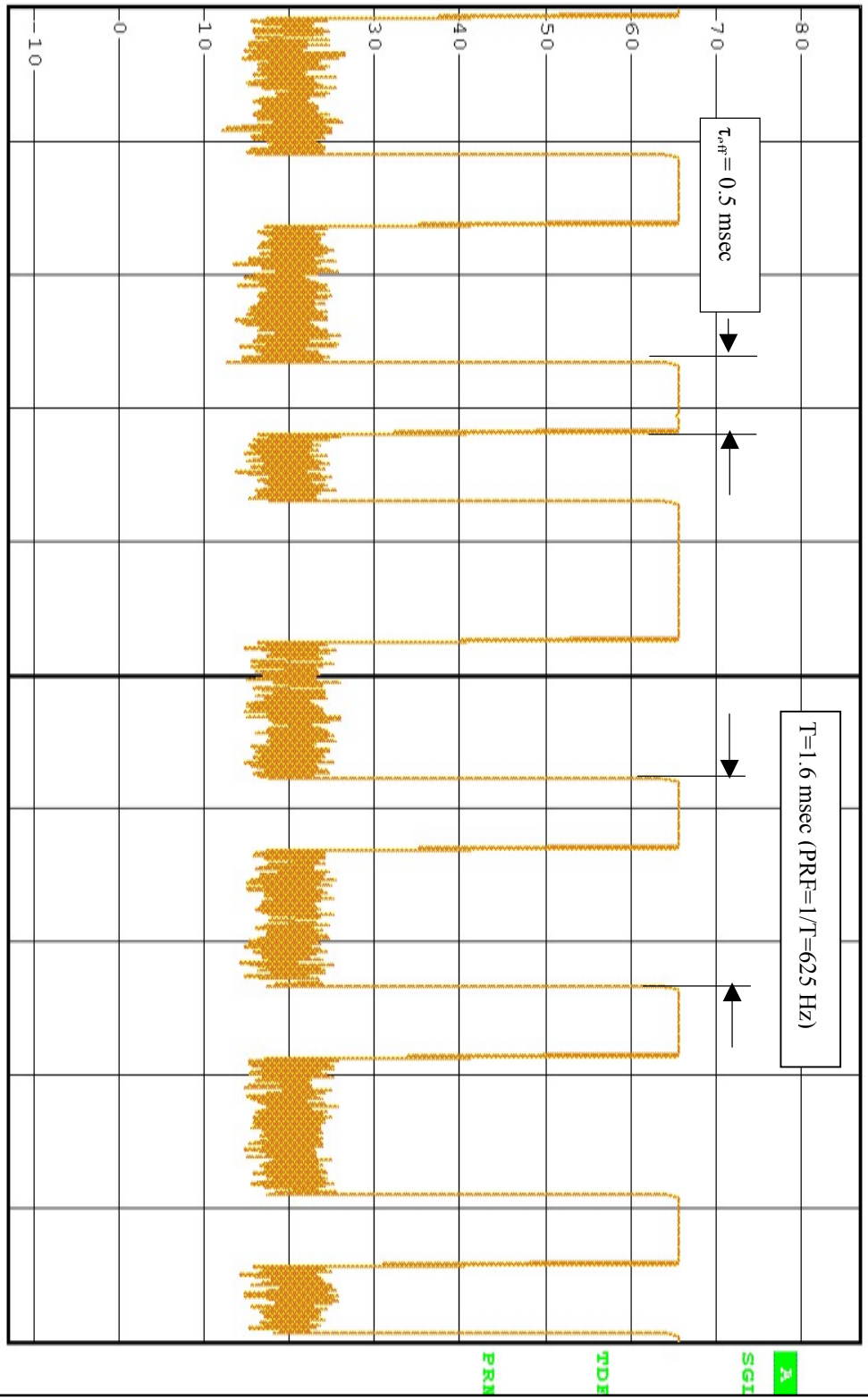
The field strength of emissions appearing within above frequency bands did not exceed the limits shown in section 15.209. At frequency equal to or less than 1000MHz, compliance with the limits section 15.209 was demonstrated using measurement employing a CISPR quasi-peak detector. Above 1000MHz, demonstrated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

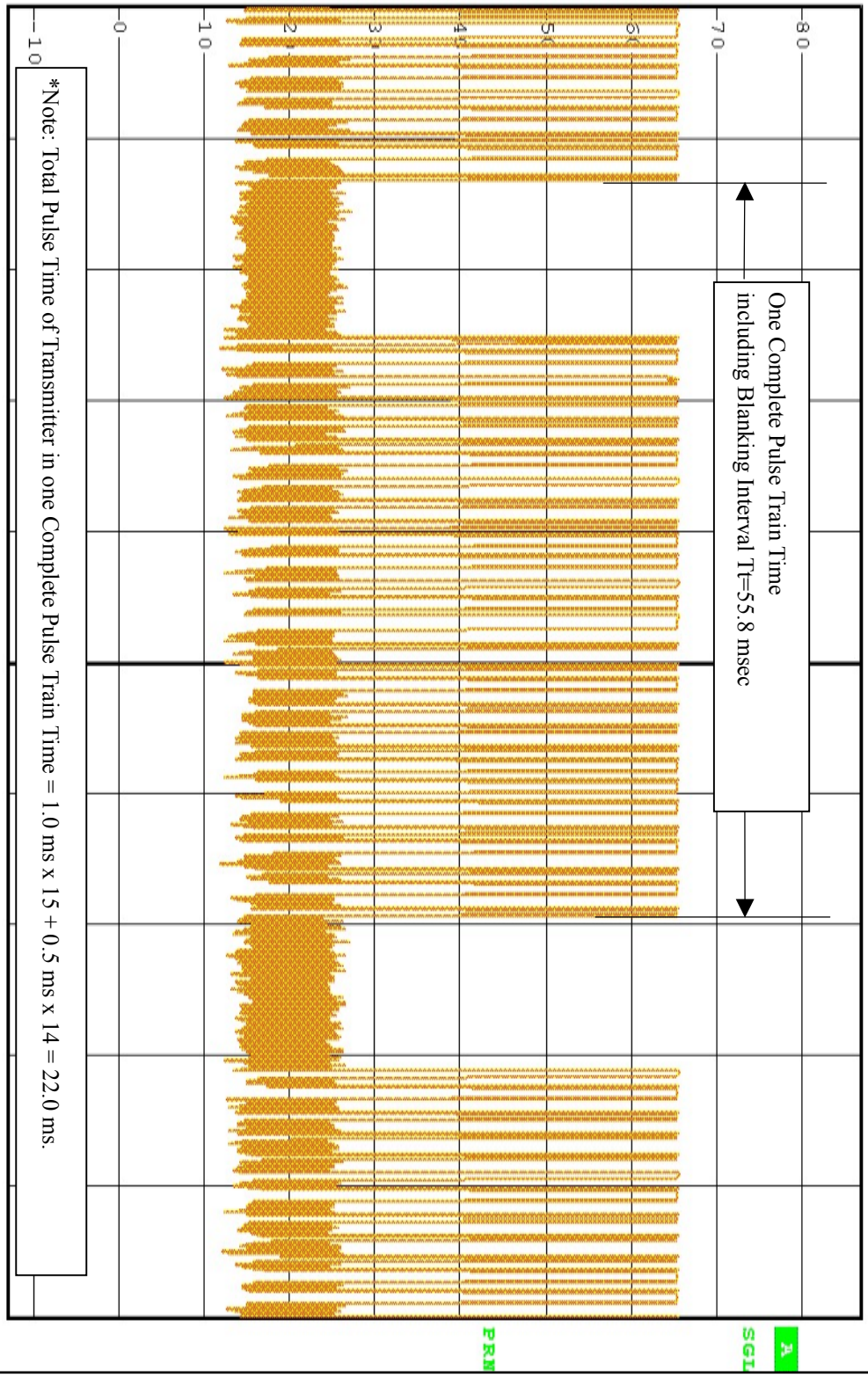
(3) The level of any unwanted emissions from an intentional radiator did not exceed the level of the fundamental emission.

(4) Radiated and spurious emissions were checked from 30MHz to 5GHz. And all other emissions not reported on data were more than 20 dB below the permitted level.

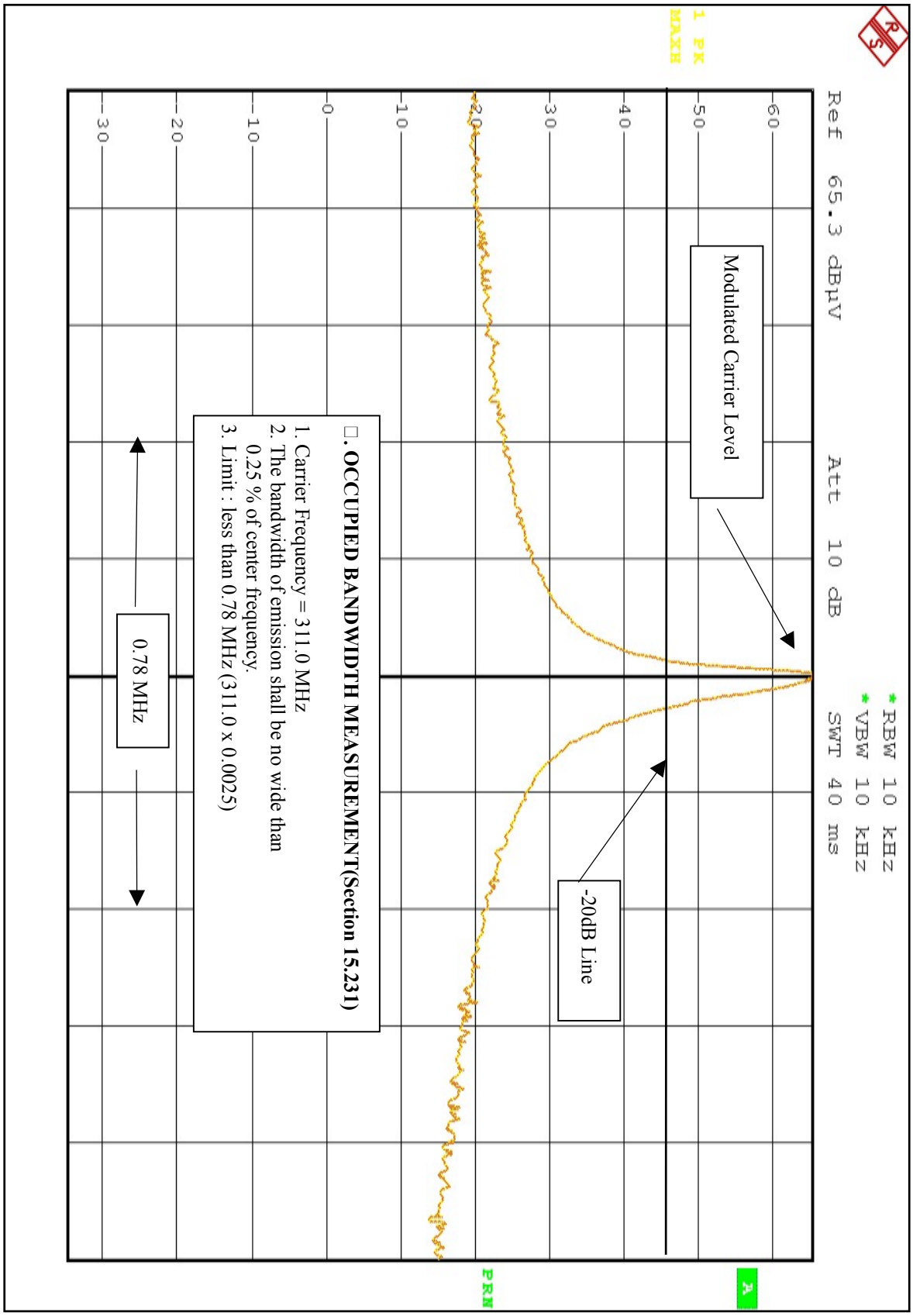
5. Reference Data : Frequency Pulse Wide(τ_{eff}) and Pulse Repetition Frequency(PRF)



Reference Data : Pulse Train Time



*Note: Total Pulse Time of Transmitter in one Complete Pulse Train Time = 1.0 ms x 15 + 0.5 ms x 14 = 22.0 ms.



□. **OCCUPIED BANDWIDTH MEASUREMENT(Section 15.231)**

1. Carrier Frequency = 311.0 MHz
2. The bandwidth of emission shall be no wide than 0.25 % of center frequency.
3. Limit : less than 0.78 MHz (311.0 x 0.0025)

□. TEST EQUIPMENT USED FOR MEASUREMENTS

Equipment	Model No.	Manufacturer	Serial No.	Effective Cal. Duration
[x] EMI Receiver (20 MHz-1 GHz)	ESVS30	R & S	830516/002	06/13/02-06/13/03
[x] EMI Receiver (20 Hz-7 GHz)	ESI	R & S	835571/004	09/05/02-09/05/03
[x] Spectrum Analyzer (9 kHz-26.5 GHz)	8563A	H. P.	3222A02069	03/27/03-03/27/04
[x] Spectrum Analyzer (100 Hz-22 GHz)	8566B	H. P.	3014A07057	05/26/03-05/26/04
[x] Quasi-Peak Adapter (10 kHz-1 GHz)	85650A	H. P.	3107A01511	05/26/03-05/26/04
[x] RF-Preselector (20 Hz-2 GHz)	85685A	H. P.	3010A01181	05/26/03-05/26/04
[x] Test Receiver (9 kHz-7GHz)	ESPI	R & S	1142800707	04/15/03-04/15/04
[x] Pre-Amplifier (0.1-3000 MHz, 30 dB)	8347A	H. P.	2834A00543	05/26/03-05/26/04
[x] Pre-Amplifier (1-26.5 GHz, 35 dB)	8449B	H. P.	3008A00302	05/26/03-05/26/04
[ ] LISN(50 Ω , 50 μH) (10 kHz-100 MHz)	3825/2	EMCO	9010-1710	05/26/03-05/26/04
[x] Plotter	7470A	H. P.	3104A21292	-
[ ] Tuned Dipole Ant. (30 MHz-300 MHz)	VHA 9103	Schwarzbeck	-	*
[ ] Tuned Dipole Ant. (300 MHz-1 GHz)	UHA 9105	Schwarzbeck	-	*
[x] Biconical Ant. (30 MHz-300 MHz)	BBA 9106	Schwarzbeck	-	*
[x] Log Periodic Ant. (200 MHz-1 GHz)	3146	EMCO	-	*
[x] Horn Ant. (1 GHz-18 GHz)	3115	EMCO	-	*
[ ] Active Loop Ant. (9 kHz-30 MHz)	6502	EMCO	2532	*
[ ] DC Power Supply	6260B	H.P.	1145A04822	-
[x] Shielded Room (5.0 m x 4.5 m)	-	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).