

THRULab & Engineering.

**RM302, BOKJO, 29-15, CHONGPA3-DONG
YONGSAN-GU, SEOUL, KOREA
81221095059F81221095056 email thrukang@kornet.net**

Test Report

Product Name: Paging Transmitter

FCC ID: QBTLTK-1900T

**Applicant:
LEE TECHNOLOGY KOREA CO.,LTD.**

**3rd FL #499-2, Sang 3-dong, Wonmi-gu,
Bucheon-city, Kyungki-do,
KOREA**

Date Receipt: 10/28/2008

Date Tested: 11/04/2008

THRU Lab & Engineering.

477-6, Hager-Ri, Yoju-Up, Yoju-Gun
Kyunggi-Do, 469-803, Korea
T820318835092F820318835169 email thrukang@kornet.net

TABLE OF CONTENTS LIST

APPLICANT: LEE TECHNOLOGY KOREA CO.,LTD.

FCC ID: QBTLTK-1900T

TEST REPORT CONTAINING:

PAGE 1-2.....TEST EQUIPMENT LIST
PAGE 3.....TEST PROCEDURE
PAGE 4-5.....RADIATION INTERFERENCE TEST DATA
PAGE 6.....DUTY CYCLE
PAGE 7-8.....DUTY CYCLE PLOT
PAGE 9.....OCCUPIED BANDWIDTH
PAGE 10.....OCCUPIED BANDWIDTH PLOT
PAGE 11.....POWER LINE CONDUCTED INTERFERENCE

EXHIBITS CONTAINING:

EXHIBIT 1.....BLOCK DIAGRAM
EXHIBIT 2.....SCHEMATIC
EXHIBIT 3.....INSTRUCTION MANUAL
EXHIBIT 4.....SAMPLE OF FCC ID LABEL
EXHIBIT 5.....LOCATION OF FCC ID LABEL
EXHIBIT 6.....EXTERNAL PHOTO - FRONT SIDE
EXHIBIT 7.....EXTERNAL PHOTO - BACK SIDE
EXHIBIT 8.....INTERNAL PHOTO - COMPONENT SIDE
EXHIBIT 9.....INTERNAL PHOTO - COPPER SIDE
EXHIBIT 10.....CIRCUIT DESCRIPTION
EXHIBIT 11.....TEST SET UP PHOTO

APPLICANT: LEE TECHNOLOGY KOREA CO.,LTD.

FCC ID: QBTLTK-1900T

REPORT #: TK-FR8003

TABLE OF CONTENTS

THRU Lab & Engineering.

477-6, Hager-Ri, Yoju-Up, Yoju-Gun

Kyunggi-Do, 469-803, Korea

T820318835092F820318835169 email thrukang@kornet.net

Test Equipment List

No	Description	Manufacturer	Model No.	Serial No.	Due Cal.	Used
1	Test Receiver	Rohde & Schwarz	ESHS 10	862970/018	2009.05.13	<input type="checkbox"/>
2	Test Receiver	Rohde & Schwarz	ESVS 10	826008/014	2009.06.20	<input checked="" type="checkbox"/>
3	Spectrum Analyzer	Hewlett Packard	8566B	2311A02394	2009.06.10	<input checked="" type="checkbox"/>
4	Spectrum Analyzer	Advantest Corp.	R3261C	61720208	2009.06.10	<input type="checkbox"/>
	Spectrum Analyzer	Advantest Corp.	R3273	101003536	2009.09.05	<input type="checkbox"/>
5	Modulation Analyzer	Hewlett Packard	8901B	3438A05094	2009.05.29	<input type="checkbox"/>
6	Audio analyzer	Hewlett Packard	8903B	3011A12915	2009.05.29	<input type="checkbox"/>
7	Preamplifier	Hewlett Packard	8447F	2805A02570	2009.05.26	<input type="checkbox"/>
8	Preamplifier	A.H. Systems	PAM-0118	164	2009.04.27	<input type="checkbox"/>
9	Signal Generator	Hewlett Packard	8673D	2708A00448	2009.06.10	<input type="checkbox"/>
10	Power Meter	Hewlett Packard	437B	312U24787	2009.04.29	<input type="checkbox"/>
11	Power Sensor	Hewlett Packard	8482B	3318A06943	2009.06.29	<input type="checkbox"/>
12	Loop Antenna	Rohde & Schwarz	HFH2-Z2.335.4711.52	826532/006	2009.01.31	<input type="checkbox"/>
13	Dipole Antenna	Rohde & Schwarz	VHAP	574	2010.07.07	<input type="checkbox"/>
14	Dipole Antenna	Rohde & Schwarz	VHAP	575	2010.07.17	<input type="checkbox"/>
15	Dipole Antenna	Rohde & Schwarz	UHAP	546	2010.07.07	<input type="checkbox"/>
16	Dipole Antenna	Rohde & Schwarz	UHAP	547	2010.07.07	<input type="checkbox"/>
17	Biconical Antenna	Eaton Corp.	94455-1	0977	2010.07.03	<input type="checkbox"/>
18	Biconical Antenna	EMCO	3104C	9111-2468	2010.07.03	<input type="checkbox"/>
19	Log Periodic Antenna	EMCO	3146	2051	2010.06.05	<input checked="" type="checkbox"/>
20	Log Periodic Antenna	EMCO	3146	8901-2320	2010.07.03	<input type="checkbox"/>
21	Horn Antenna	A.H. Systems	SAS-571	414	2009.03.17	<input checked="" type="checkbox"/>
22	LISN	EMCO	3825/2	9111-1912	2008.12.12	<input type="checkbox"/>
23	LISN	Kyoritsu	KNW-242	8-923-2	2009.05.23	<input type="checkbox"/>

APPLICANT: LEE TECHNOLOGY KOREA CO., LTD.

FCC ID: QBTLLK-1900T

REPORT #: TK-FR8003

THRU Lab & Engineering.

477-6, Hager-Ri, Yoju-Up, Yoju-Gun

Kyunggi-Do, 469-803, Korea

T820318835092F820318835169 email thrukang@kornet.net

24	Waveform Generator	Hewlett Packard	33120A	US34001190	2009.05.29	<input type="checkbox"/>
25	Digital Oscilloscope	Tektronix	TDS 340A	B012287	2009.06.10	<input type="checkbox"/>
26	Dummy Load	Bird Electronics	8251	11511	2009.02.02	<input type="checkbox"/>

APPLICANT: LEE TECHNOLOGY KOREA CO., LTD.

FCC ID: QBTLLK-1900T

REPORT #: TK-FR8003

THRU Lab & Engineering.

477-6, Hager-Ri, Yoju-Up, Yoju-Gun

Kyunggi-Do, 469-803, Korea

T820318835092F820318835169 email thrukang@kornet.net

TEST PROCEDURE

GENERAL: This report shall NOT be reproduced except in full without the written approval of THRU Lab & ENGINEERING.

RADIATION INTERFERENCE: The test procedure used was ANSI STANDARD C63.4-2003 using a HEWLETT PACKARD spectrum analyzer with a preselector. The bandwidth of the spectrum analyzer was 100 kHz with an appropriate sweep speed. The analyzer was calibrated in dB above a microvolt at the output of the antenna. The resolution bandwidth was 100 kHz and the video bandwidth was 300 kHz. The ambient temperature of the UUT was 24.9°C with a humidity of 25%.

FORMULA OF CONVERSION FACTORS: The Field Strength at 3m was established by adding the meter reading of the spectrum analyzer (which is set to read in units of dBuV) to the antenna correction factor supplied by the antenna manufacturer. The antenna correction factors are stated in terms of dB. The gain of the Preselector was accounted for in the Spectrum Analyzer Meter Reading.

Example:

$$\begin{aligned} \text{Freq (MHz) METER READING} + \text{ACF} &= \text{FS} \\ 33 \quad 20 \text{ dBuV} + 10.36 \text{ dB} &= 30.36 \text{ dBuV/m} @ 3m \end{aligned}$$

ANSI STANDARD C63.4-2003 10.1.7 MEASUREMENT PROCEDURES: The unit under test was placed on a table 80 cm high and with dimensions of 1m by 1.5m. The table used for radiated measurements is capable of continuous rotation.

When an emission was found, the table was rotated to produce the maximum signal strength. At this point, the antenna was raised and lowered from 1m to 4m. The antenna was placed in both the horizontal and vertical planes.

The situation was similar for the conducted measurement except that the table did not rotate. The EUT was setup as described in ANSIC63.4-1992 with the EUT 40 cm from the vertical ground wall.

Power line conducted Emission : The test procedure used was ANSI C63.4-2003. The testing range .15 – 30MHz

APPLICANT: LEE TECHNOLOGY KOREA CO., LTD.

FCC ID: QBTLLK-1900T

REPORT #: TK-FR8003

THRU Lab & Engineering.

477-6, Hager-Ri, Yoju-Up, Yoju-Gun

Kyunggi-Do, 469-803, Korea

T820318835092F820318835169 email thrukang@kornet.net

APPLICANT: LEE TECHNOLOGY KOREA CO.,LTD.

FCC ID: QBTLTK-1900T

NAME OF TEST: RADIATION INTERFERENCE

RULES PART NO.: 15.231

REQUIREMENTS:

Fundamental Frequency (MHz)	Field Strength of Fundamental (dB μ V/m)	Field Strength of Harmonics and Spurious Emissions (dB μ V/m @ 3m)
40.66 to 40.70	67.04	47.04
70 to 130	61.94	41.94
130 to 174	61.94 to 71.48	41.94 to 51.48
174 to 260	71.48	51.48
260 to 470	71.48 to 81.94	51.48 to 61.94
470 and above	81.94	61.94

No fundamental frequency is allowed in the restricted bands.

Spurious emissions in the restricted bands must be less than 54 dB μ V/m or to the limits of 15.209.

Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows:

- 1) for the band 130-174 MHz, uV/m at 3 meters = $56.81818(F) - 6136.3636$;
- 2) for the band 260-470 MHz, uV/m at 3 meters = $41.6667(F) - 7083.3333$.

Sample calculation of limit @ 315 MHz:

$$41.6667(315) - 7083.3333 = 6041.68 \text{ uV/m}$$

$$20\log(6041.68) = 75.62 \text{ dBuV/m limit @ 315 MHz}$$

Sample calculation of limit @ 433.92 MHz:

$$41.6667(433.9) - 7083.3333 = 10,995.85 \text{ uV/m}$$

$$20\log(10,995.85) = 80.82 \text{ dBuV/m limit @ 433.9 MHz}$$

APPLICANT: LEE TECHNOLOGY KOREA CO.,LTD.

FCC ID: QBTLTK-1900T

REPORT #: TK-FR8003

THRU Lab & Engineering.

477-6, Hager-Ri, Yoju-Up, Yoju-Gun

Kyunggi-Do, 469-803, Korea

T820318835092F820318835169 email thrukang@kornet.net

TEST DATA:

No	Emission Frequency (MHz)	Meter Reading dBuV	Ant. Polaritry	Correction Factor dB	Cable Loss dB	Duty Cycle Factor dB	Field Strength (dBuV/m)	Margin (dBuv)	Limit (dBuv/m)
1	311.0	60.6	H	15.8	3.5	34.53	45.3	30.0	75.4
2	622.0	36.6	H	20.5	5.7	34.53	28.2	17.8	46.0
3	933.0	42.2	H	23.1	7.4	34.53	38.2	7.8	46.0
4	1244.0	57.5	H	23.7	2.3	34.53	49.0	5.0	54.0
5	1555.0	43.8	H	24.3	2.6	34.53	36.2	17.8	54.0
6	1866.0	31.2	H	26.3	2.9	34.53	25.8	28.2	54.0
7	2177.0	31.7	H	27.6	3.2	34.53	28.0	26.0	54.0
8	2488.0	30.5	H	27.9	3.3	34.53	27.2	26.8	54.0
9	2799.0	33.4	H	29.0	3.6	34.53	31.5	22.5	54.0
10	3110.0	31.3	H	29.9	3.8	34.53	30.4	23.6	54.0

No	Emission Frequency (MHz)	Meter Reading dBuV	Ant. Polaritry	Correction Factor dB	Cable Loss dB	Duty Cycle Factor (dB)	Field Strength (dBuV/m)	Margin (dBuv)	Limit (dBuv/m)
11	311.0	55.6	V	15.8	3.5	34.53	40.3	35.0	75.4
12	622.0	27.4	V	20.5	5.7	34.53	19.0	27.0	46.0
13	933.0	32.5	V	23.1	7.4	34.53	28.5	17.5	46.0
14	1244.0	35.5	V	23.7	2.3	34.53	27.0	27.0	54.0
15	1555.0	39.6	V	24.3	2.6	34.53	32.0	22.0	54.0
16	1866.0	34.5	V	26.3	2.9	34.53	29.1	24.9	54.0
17	2177.0	32.8	V	27.6	3.2	34.53	29.1	24.9	54.0
18	2488.0	32.2	V	27.9	3.3	34.53	28.9	25.1	54.0
19	2799.0	31.5	V	29.0	3.6	34.53	29.6	24.4	54.0
20	3110.0	30.4	V	29.9	3.8	34.53	29.5	24.5	54.0

TEST PROCEDURE: The procedure used was ANSI STANDARD C63.4-2003. The spectrum was scanned from 30 MHz to 1000 MHz. When an emission was found, the table was rotated to produce the maximum signal strength. The antenna was placed in both the horizontal and vertical planes and the worse case emissions were reported. The UUT was tested in 3 orthogonal planes.

TEST RESULTS: THE UNIT DOES MEET THE FCC REQUIREMENTS.

PERFORMED BY: T.Y. Kim

DATE: 11/04/2008

APPLICANT: LEE TECHNOLOGY KOREA CO., LTD.

FCC ID: QBTLLK-1900T

REPORT #: TK-FR8003

THRU Lab & Engineering.

477-6, Hager-Ri, Yoju-Up, Yoju-Gun

Kyunggi-Do, 469-803, Korea

T820318835092F820318835169 email thrukang@kornet.net

APPLICANT: LEE TECHNOLOGY KOREA CO.,LTD.

FCC ID: QBTLTK-1900T

NAME OF TEST: Duty Cycle

TEST RESULTS:

Duty Cycle(%) = Total on interval in complete pulse train / Length of a complete pulse train * %

Duty Cycle Correction Factor(dB) = 20 * log10(duty cycle(%))

Pulse Train	Number of Pulse	T(ms)	Total time(ms)
Long Pulse	11	1.6	17.6
Short Pulse	14	0.6	8.4

Total on interval in a complete pulse train	26ms
Length of complete pulse train	48.75ms
Duty cycle(%)	53.33%
Duty Cycle Correction Factor(dB)	34.53

APPLICANT: LEE TECHNOLOGY KOREA CO.,LTD.

FCC ID: QBTLTK-1900T

REPORT #: TK-FR8003

THRU Lab & Engineering.

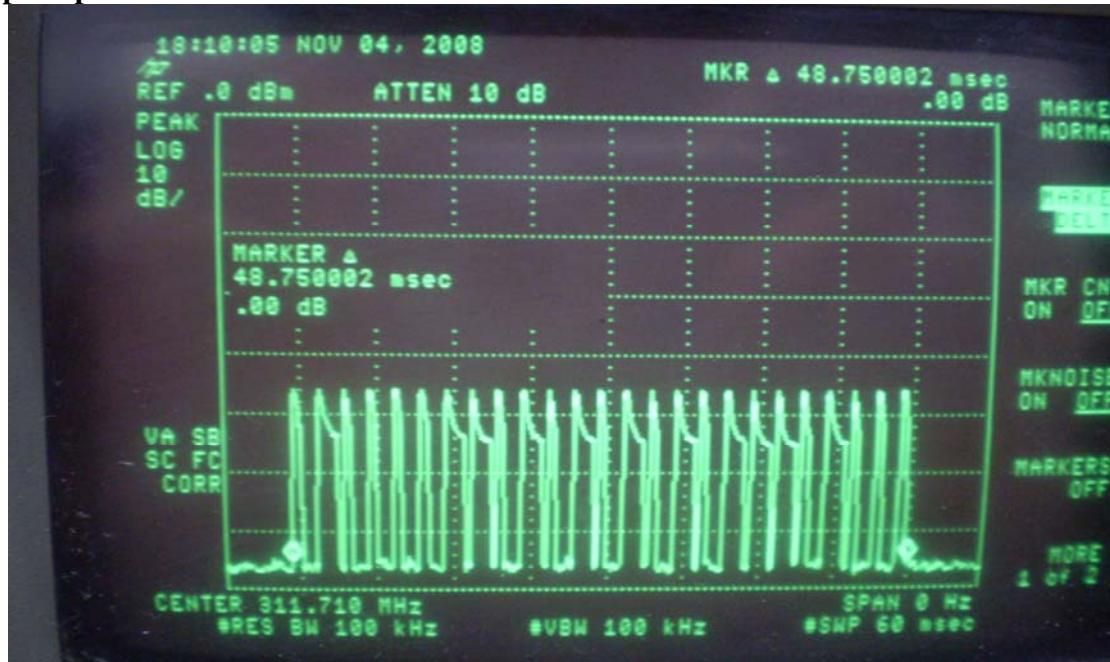
477-6, Hager-Ri, Yoju-Up, Yoju-Gun

Kyunggi-Do, 469-803, Korea

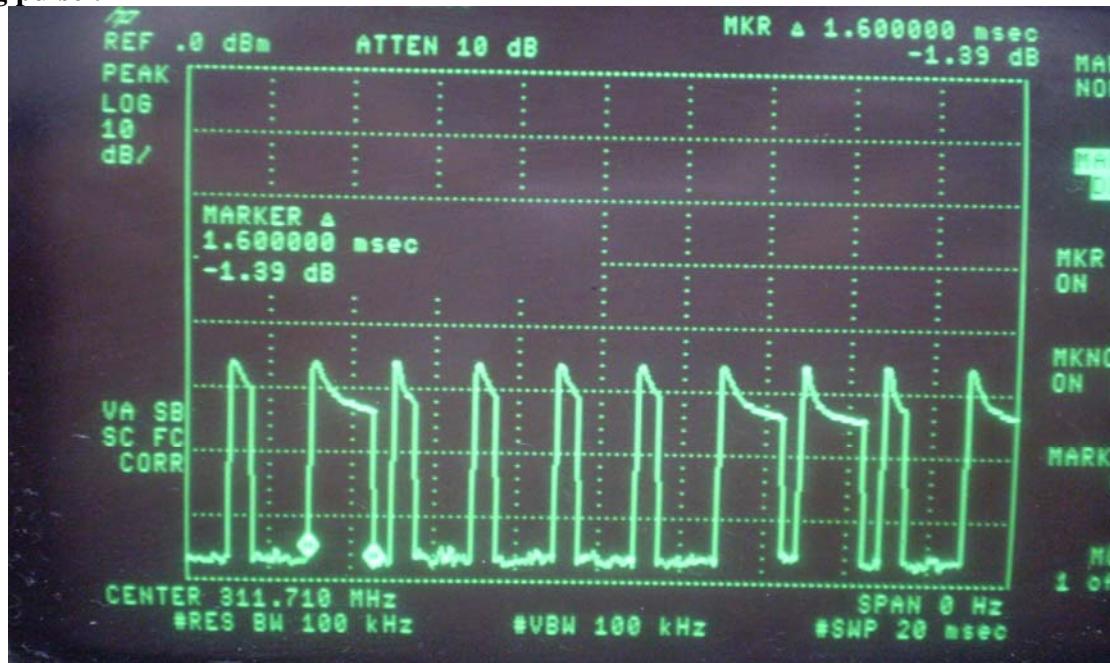
T820318835092F820318835169 email thrukang@kornet.net

Duty Cycle Plot

Complete pulse train



Long pulse :



APPLICANT: LEE TECHNOLOGY KOREA CO., LTD.

FCC ID: QBTLLK-1900T

REPORT #: TK-FR8003

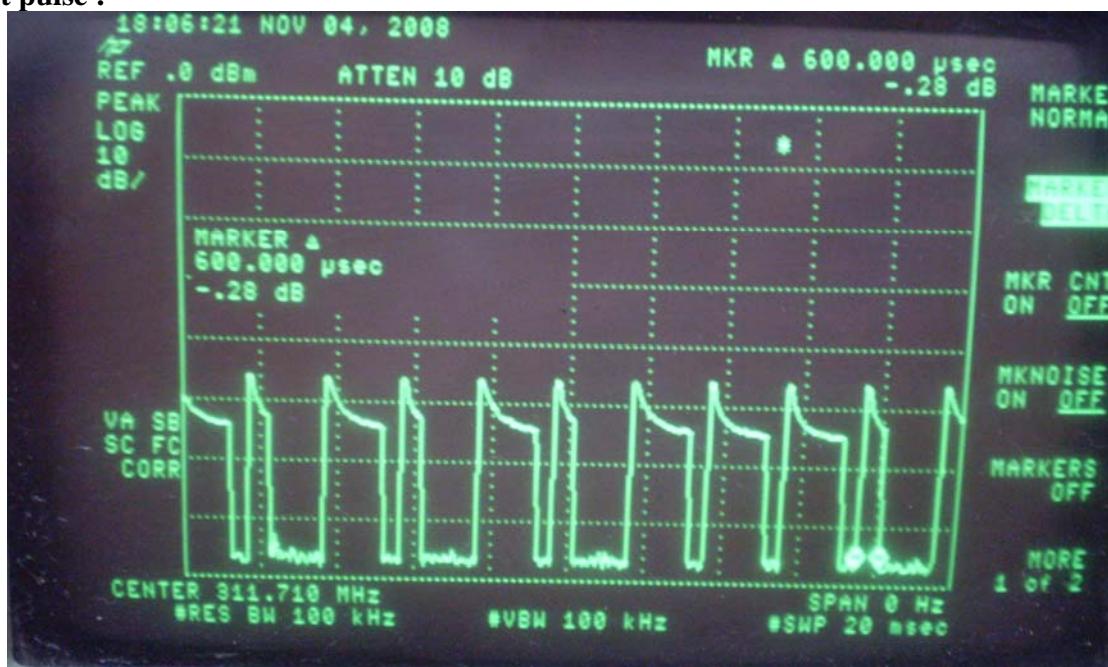
THRU Lab & Engineering.

477-6, Hager-Ri, Yoju-Up, Yoju-Gun

Kyunggi-Do, 469-803, Korea

T820318835092F820318835169 email thrukang@kornet.net

Short pulse :



APPLICANT: LEE TECHNOLOGY KOREA CO., LTD.

FCC ID: QBTLLTK-1900T

REPORT #: TK-FR8003

THRU Lab & Engineering.

477-6, Hager-Ri, Yoju-Up, Yoju-Gun
Kyunggi-Do, 469-803, Korea
T820318835092F820318835169 email thrukang@kornet.net

APPLICANT: LEE TECHNOLOGY KOREA CO.,LTD.

FCC ID: QBTLTK-1900T

NAME OF TEST: Occupied Bandwidth

RULES PART NO.: 15.231

REQUIREMENTS: The bandwidth of the emission shall be no wider than .25% of the center frequency for devices operating between 70 and 900MHz. bandwidth is determined at the points 20dB down from the modulated carrier. permits the higher emission levels.

TEST DATA :

Frequency(MHz)	Bandwidth Emission(kHz)	Limit(kHz)	Result
311.0	182	777.5	Pass

PERFORMED BY: T.Y. Kim

DATE: 11/04/2008

APPLICANT: LEE TECHNOLOGY KOREA CO.,LTD.

FCC ID: QBTLTK-1900T

REPORT #: TK-FR8003

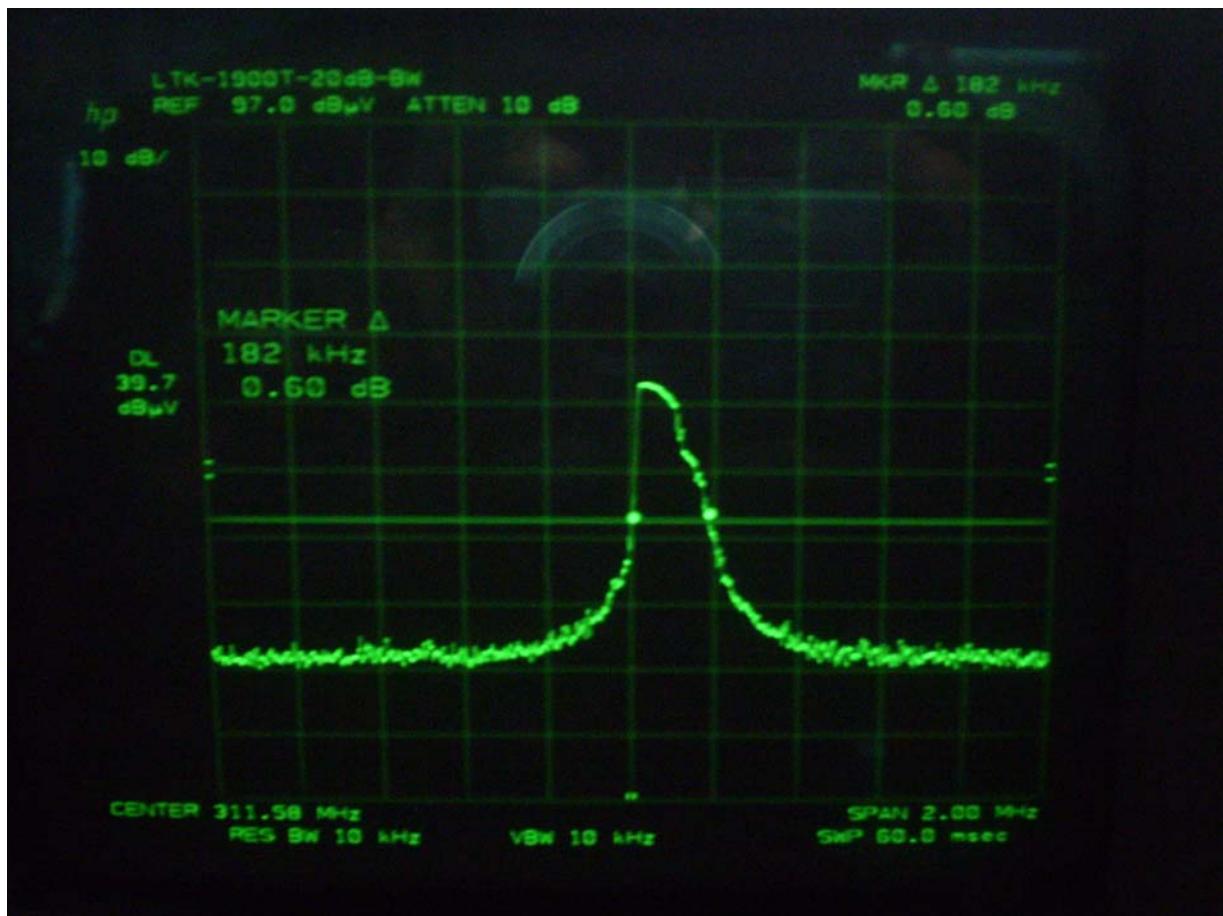
THRU Lab & Engineering.

477-6, Hager-Ri, Yoju-Up, Yoju-Gun

Kyunggi-Do, 469-803, Korea

T820318835092F820318835169 email thrukang@kornet.net

OCCUPIED BANDWIDTH PLOT



APPLICANT: LEE TECHNOLOGY KOREA CO., LTD.

FCC ID: QBT-LTK-1900T

REPORT #: TK-FR8003

THRU Lab & Engineering.

477-6, Hager-Ri, Yoju-Up, Yoju-Gun
Kyunggi-Do, 469-803, Korea
T820318835092F820318835169 email thrukang@kornet.net

APPLICANT: LEE TECHNOLOGY KOREA CO.,LTD.

FCC ID: QBTLTK-1900T

NAME OF TEST: POWER LINE CONDUCTED INTERFERENCE

Rules Part No.: 15.207

REQUIREMENTS:

Frequency (MHz)	Quasi Peak Limits (dBuV)	Average Limits (dBuV)
0.15 – 0.5	66 – 56	56 – 46
0.5 – 5.0	56	46
5.0 – 30	60	50

TES DATA: Not applicable because the EUT is battery operated exclusively.

APPLICANT: LEE TECHNOLOGY KOREA CO.,LTD.

FCC ID: QBTLTK-1900T

REPORT #: TK-FR8003