

THRU Lab & 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-1400A

Applicant:

LEE TECHNOLOGY KOREA CO.,LTD.

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

Date Receipt:09/21/2005

Date Tested: 09/23/2005

APPLICANT: LEE TECHNOLOGY KOREA CO.,LTD.

FCC ID: QBTLTK-1400A

REPORT #: THRU-509001

COVER SHEET

THRU Lab & Engineering.

RM302,Bokjo,29-15 , Chongpa3-Dong

Yongsan-Gu, Seoul, Korea

81221095059F81221095056 email thrukang@kornet.net

TABLE OF CONTENTS LIST FOR PART 90 UHF DEVICE

APPLICANT: LEE TECHNOLOGY KOREA CO.,LTD.

FCC ID: QBTLTK-1400A

TEST REPORT CONTAINING:

PAGE 1.....GENERAL INFORMATION & TECHNICAL DESCRIPTION
PAGE 2.....TECHNICAL DESCRIPTION CONTINUED & RF POWER OUTPUT
PAGE 3.....RF POWER OUTPUT PLOT
PAGE 4-6.....FIELD STRENGTH OF SPURIOUS EMISSIONS
PAGE 7-8.....UNWANTED RADIATION
PAGE 9.....BANDWIDTH LIMITATION
PAGE 10-11.....OCCUPIED BANDWIDTH
PAGE 12.....FREQUENCY STABILITY
PAGE 13-14.....POWERLINE CONDUCTED INTERFERENCE
PAGE 15-17.....TRANSIENT FREQUENCY BEHAVIOR
PAGE 18.....LIST OF TEST EQUIPMENT

EXHIBITS CONTAINING:

EXHIBIT 1.....FCC ID LABEL SAMPLE AND SKETCH OF LOCATION
EXHIBIT 2.....SCHEMATIC
EXHIBIT 3.....BLOCK DIAGRAM
EXHIBIT 4.....EXTERNAL PHOTOGRAPHS
EXHIBIT 5.....INTERNAL PHOTOGRAPHS
EXHIBIT 6.....USERS MANUAL
EXHIBIT 7.....OPERATIONAL DESCRIPTION
EXHIBIT 8.....PARTS LIST
EXHIBIT 9.....TUNING PROCEDURE
EXHIBIT 10.....TEST SETUP PHOTOGRAPH

APPLICANT: LEE TECHNOLOGY KOREA CO.,LTD.

FCC ID: QBTLTK-1400A

REPORT #: THRU-509001

TABLE OF CONTENTS

THRU Lab & Engineering.

RM302,Bokjo,29-15 , Chongpa3-Dong

Yongsan-Gu, Seoul, Korea

81221095059F81221095056 email thrukang@kornet.net

GENERAL INFORMATION REQUIRED FOR TYPE ACCEPTANCE

2.1033 LEE TECHNOLOGY KOREA CO.,LTD.. will sell the
(c)(1)(2) FCC ID: QBTLTK-1400A
UHF transceiver in quantity,
for use under FCC RULES PART 90 .

2.1033 (C) TECHNICAL DESCRIPTION
2.1033 (3) User Manual See Exhibit 6

2.1033 (4) Type of Emission: 10K2F1D
FOR 25kHz

$B_n = 2M + 2DK$

$M = 1,200$ Bits per second

$D = 4.5$ kHz (Peak Deviation)

$K = 1$

$B_n = 2(1,200\text{bps}/2) + 2(4500)(1) = 10.2\text{k}$

ALLOWED AUTHORIZED BANDWIDTH = 10.2 kHz.

90.209(b) (5)

2.1033 (5) Frequency Range: 457.5750 MHz

2.1034

(6) Power Range and Controls: There are NO user Power
controls.

(7) Maximum Output Power Rating:
see Next Page.

(8) DC Voltages and Current into Final Amplifier:

POWER INPUT

FIANL AMPLIFIER ONLY

Vce = 4.7 Volts

IC = 180 mA

(9) Tune-up procedure. The tune-up procedure is given
in EXHIBIT 9.

2.1033 (10) Complete Circuit Diagrams: The circuit diagram is
included as EXHIBIT 2. The block diagram is
included as EXHIBIT 3.

(11) Function of each electron tube or semiconductor
device or other active circuit device:
- SEE EXHIBIT 8.

APPLICANT: LEE TECHNOLOGY KOREA CO.,LTD.

FCC ID: QBTLTK-1400A

REPORT #: THRU-509001

THRU Lab & Engineering.

RM302,Bokjo,29-15 , Chongpa3-Dong

Yongsan-Gu, Seoul, Korea

81221095059F81221095056 email thrukang@kornet.net

(8) Instruction book. The instruction manual is included as EXHIBIT 6.

(10) Description of all circuitry and devices provided for determining and stabilizing frequency is included in the circuit description in Exhibit #7.

2.1033(c)(11) A photograph or drawing of the equipment identification label is shown in Exhibit 1.

2.1033(c)(12) Photographs of the equipment of sufficient clarity to reveal equipment construction and layout and label location are shown in Exhibit 4-5.

2.1033(c)(13) For equipment employing digital modulation, a detail description of the modulation technique. This UUT uses FSK to modulate the transmitter.

2.1033(c)(14) Data required for 2.1046 to 2.1057 See Below

2.1046(a) RF power output.
& 90.205

MAXIMUM PEAK OUTPUT POWER(CONDUCTED)

Maximum peak output power(W)
457.575MHz
(0.489W) 26.9 dBm

APPLICANT: LEE TECHNOLOGY KOREA CO.,LTD.

FCC ID: QBTCLK-1400A

REPORT #: THRU-509001

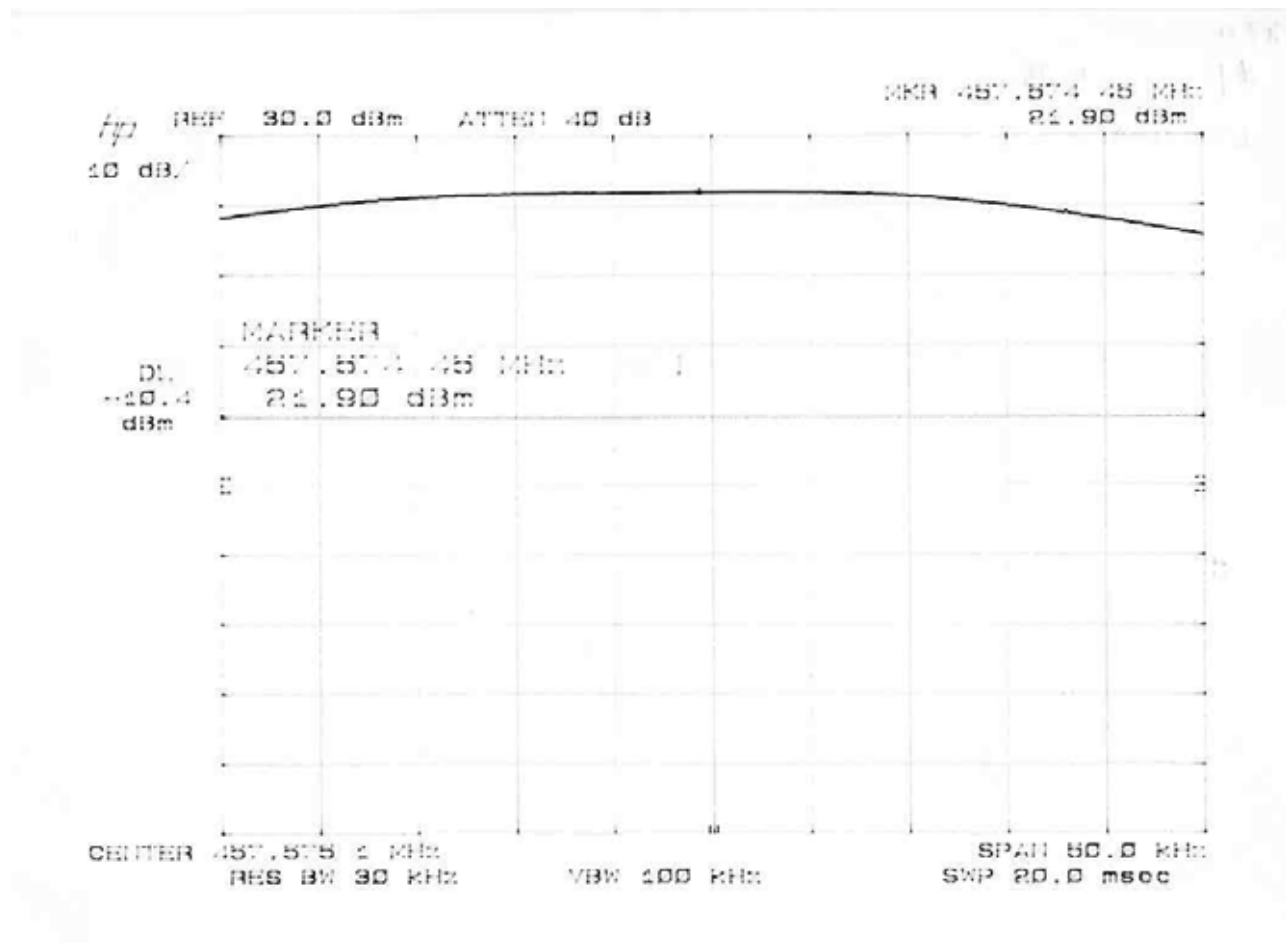
THRU Lab & Engineering.

RM302,Bokjo,29-15 , Chongpa3-Dong

Yongsan-Gu, Seoul, Korea

81221095059F81221095056 email thrukang@kornet.net

PLOT



C-factor : 5dB ; (C-factor = Attenuator + Cable Loss)

APPLICANT: LEE TECHNOLOGY KOREA CO.,LTD.

FCC ID: QBTLTK-1400A

REPORT #: THRU-509001

THRU Lab & Engineering.

RM302,Bokjo,29-15 , Chongpa3-Dong

Yongsan-Gu, Seoul, Korea

81221095059F81221095056 email thrukang@kornet.net

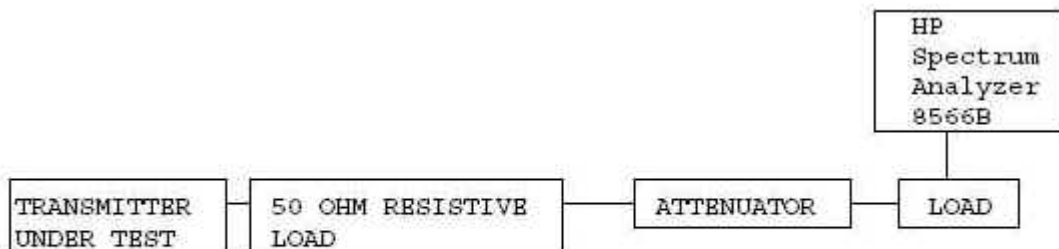
SPURIOUS EMISSIONS (Conducted)

2.1057 SPECTRUM RANGE TO BE INVESTIGATED

Lowest radio frequency signal generated in the equipment, without going below 9kHz, up to at least the frequency shown below:

- (1) If the equipment operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40GHz, whichever is lower.
- (2) If the equipment operates at or above 10GHz and below 30GHz: to the fifth harmonic of the highest fundamental frequency or to 100 GHz, whichever is lower.
- (3) If the equipment operates at or above 30GHz: to the fifth harmonic of the highest fundamental frequency or to 200GHz, whichever is lower.
- (b) Particular attention should be paid to harmonics and sub-harmonics of the carrier frequency as well as to those frequencies removed from the carrier by multiples of the oscillator frequency. Radiation at the frequencies of multiplier stages should also be checked.
- (c) The amplitude of spurious emissions, which are attenuated more than 20dB below the permissible value, need not be reported.
- (d) Unless otherwise specified, measurements above 40GHz shall be performed using a minimum resolution bandwidth of 1MHz.

Method of Measuring Conducted Spurious Emissions



APPLICANT: LEE TECHNOLOGY KOREA CO.,LTD.

FCC ID: QBTCLK-1400A

REPORT #: THRU-509001

THRU Lab & Engineering.

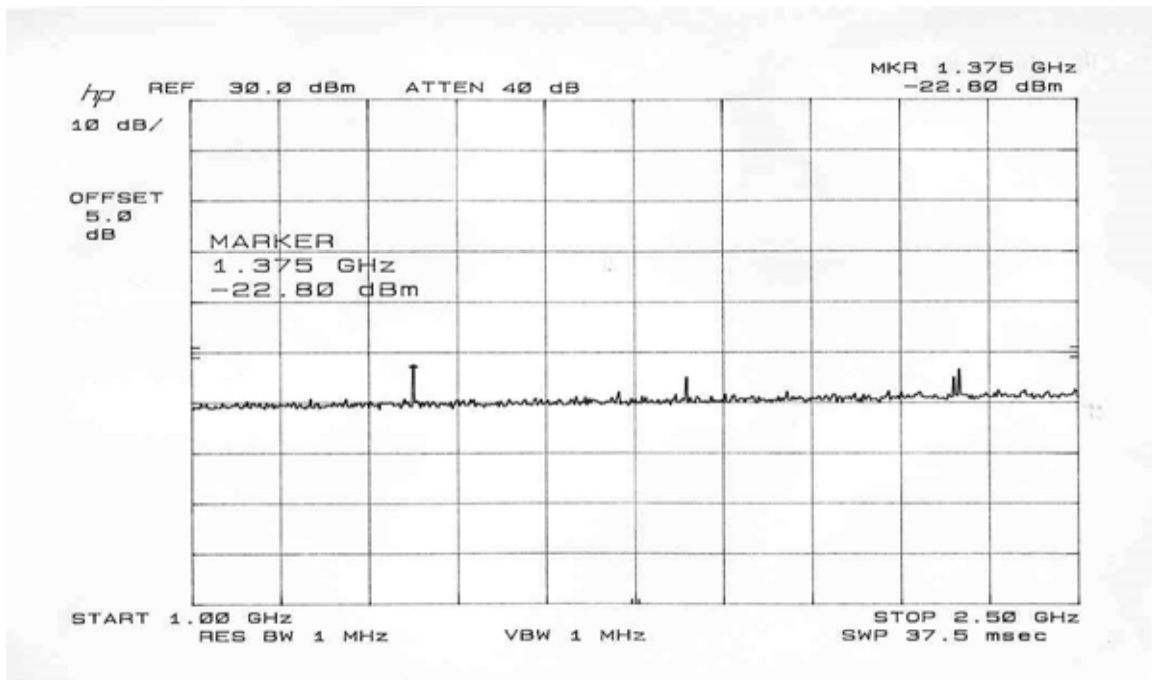
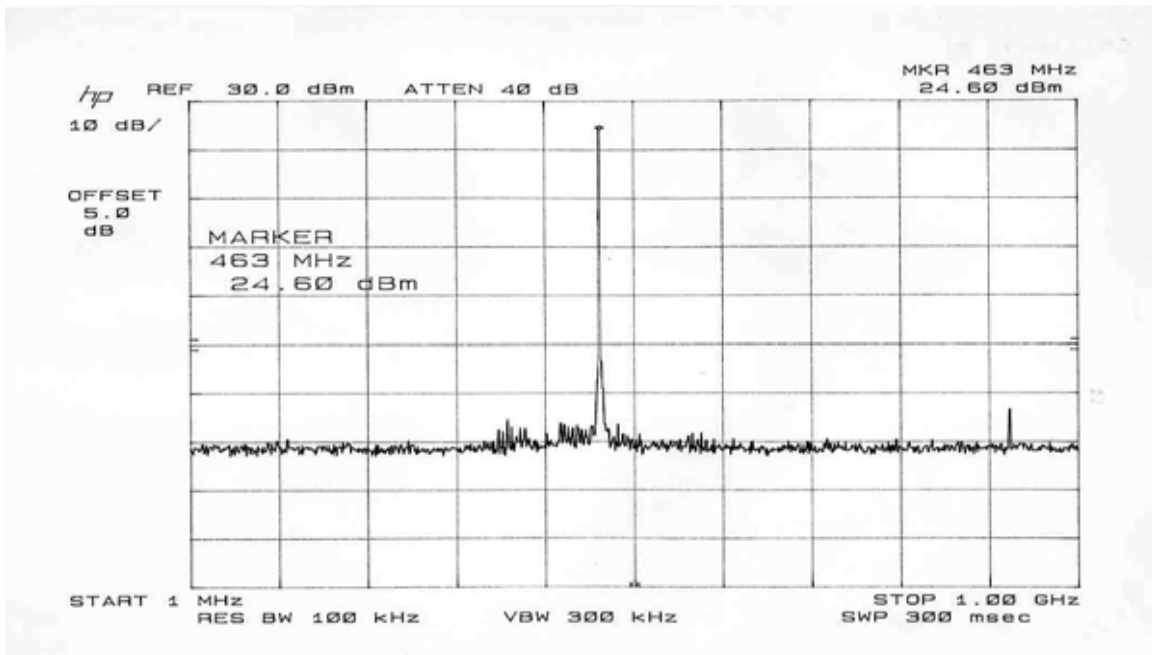
RM302,Bokjo,29-15 , Chongpa3-Dong

Yongsan-Gu, Seoul, Korea

81221095059F81221095056 email thrukang@kornet.net

PLOT

REQUIREMENTS : $43 + 10\log(0.489) = 39.8930 \text{ dB}$



APPLICANT: LEE TECHNOLOGY KOREA CO.,LTD.

FCC ID: QBTLTK-1400A

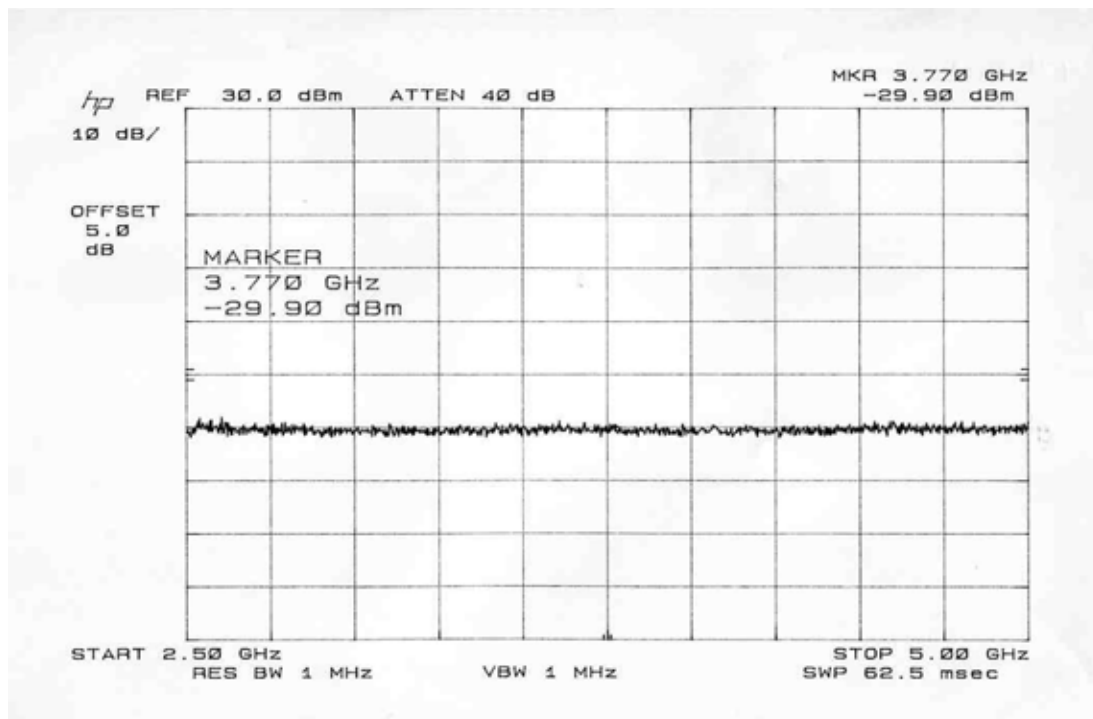
REPORT #: THRU-509001

THRU Lab & Engineering.

RM302,Bokjo,29-15 , Chongpa3-Dong

Yongsan-Gu, Seoul, Korea

81221095059F81221095056 email thrukang@kornet.net



APPLICANT: LEE TECHNOLOGY KOREA CO.,LTD.

FCC ID: QBTLLTK-1400A

REPORT #: THRU-509001

THRU Lab & Engineering.

RM302,Bokjo,29-15 , Chongpa3-Dong

Yongsan-Gu, Seoul, Korea

81221095059F81221095056 email thrukang@kornet.net

2.1053

UNWANTED RADIATION

90.210 (g) (3)

The tabulated Data shows the results of the radiated Field strength emissions test. The spectrum was Scanned from 30 MHz to at least the 10th harmonic of The fundamental. This test was conducted per ANSI C63.4 - 2003

REQUIREMENTS: $43 + 10\log(0.489) = 39.8930 \text{ dB}$

test result

Vertical			Horizontal		
Emission Frequency	ATTN dBc	Margin dB	Emission Frequency	ATTN dBc	Margin dB
457.58	0.00	0.00	457.58	0.00	0.00
915.15	59.66	19.76	915.15	66.76	26.86
1372.73	62.12	22.23	1372.73	67.62	27.73
1830.30	64.07	24.17	1830.30	69.37	29.47
2287.88	47.78	7.88	2287.88	51.78	11.88
2745.45	70.09	30.19	2745.45	70.69	30.79
3203.03	69.63	29.73	3203.03	71.03	31.13
3660.60	68.38	28.48	3660.60	69.48	29.58
4118.18	65.94	26.04	4118.18	67.34	27.44
4575.75	65.19	25.29	4575.75	66.09	26.19

METHOD OF MEASUREMENT : The tabulated data shows the results of the radiated field strength emissions test. The spectrum was scanned from 30 MHz to at least the tenth harmonic of the fundamental. This test was conducted per TIA/EIA STANDARD 603 using the substitution method. Measurements were made at the open field test site of ThruLab & ENGINEERING. located at 389 JeAm-Rhi HyangNam-Myun,HwaSung-Shi,KyoungKi-Do Korea.

APPLICANT: LEE TECHNOLOGY KOREA CO.,LTD.

FCC ID: QBTLTK-1400A

REPORT #: THRU-509001

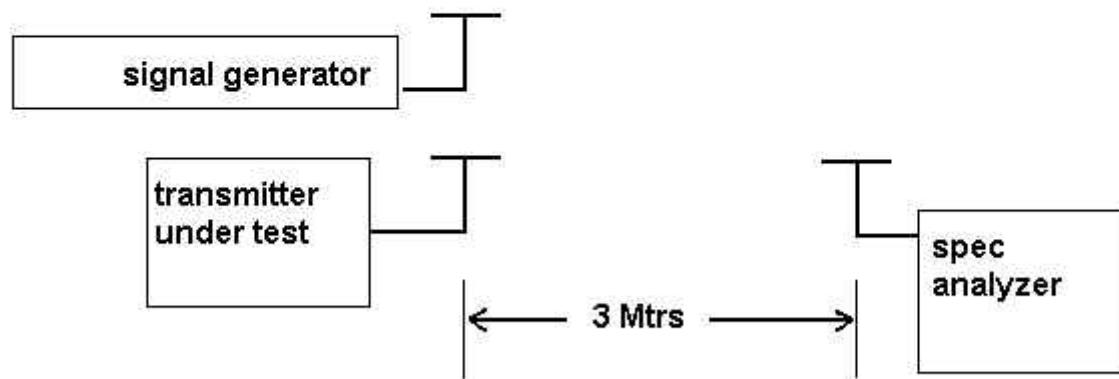
THRU Lab & Engineering.

RM302,Bokjo,29-15 , Chongpa3-Dong

Yongsan-Gu, Seoul, Korea

81221095059F81221095056 email thrukang@kornet.net

Method of Measuring Radiated Spurious Emissions



APPLICANT: LEE TECHNOLOGY KOREA CO.,LTD.

FCC ID: QBTLTK-1400A

REPORT #: THRU-509001

THRU Lab & Engineering.

RM302,Bokjo,29-15 , Chongpa3-Dong

Yongsan-Gu, Seoul, Korea

81221095059F81221095056 email thrukang@kornet.net

BANDWIDTH LIMITATION

90.209 According to 90.203(3) For all other types of emissions, the maximum authorized bandwidth shall not be more than that normally authorized for voice operations.
According to 90.200(5), Unless specified elsewhere, channel spacing and bandwidths that will be authorized in the following frequency bands are given in the following "STANDARD CHANNEL SPACING/BANDWIDTH" table.

Standard Channel Spacing/Bandwidth

Frequency band (MHz)	Channel spacing (KHz)	Authorized Bandwidth(kHz)
Below 25		
25-50.	20	20
72-76	20	20
150-174	1)7.5	1,3)20/11.25/6
220-222	5	4
421-512	1)6.25	1,3)20/11.25/6
806-821/851-866	25	20
821-824/866-869	12.5	20
896-901/935-940	12.5	13.6
902-928.....		
929-930	25	20
1427-1435.....		
2450-2483.52.....		
Above 2500.....		

- 1) For stations authorized on or after August 18,1995.
- 3) Operations using equipment designed to operate with a 25kHz channel bandwidth will be authorized a 20kHz bandwidth.
Operations using equipment designed to operate with a 12.5kHz channel bandwidth will be authorized an 11.25kHz bandwidth.
Operations using equipment designed to operate with a 6.25kHz channel bandwidth will be authorized a 6kHz bandwidth.

Specification Limit: 20kHz

APPLICANT: LEE TECHNOLOGY KOREA CO.,LTD.

FCC ID: QBTCLK-1400A

REPORT #: THRU-509001

THRU Lab & Engineering.

RM302,Bokjo,29-15 , Chongpa3-Dong

Yongsan-Gu, Seoul, Korea

81221095059F81221095056 email thrukang@kornet.net

2.1049

Audio Low Pass Filter

This UUT does not have a low pass filter

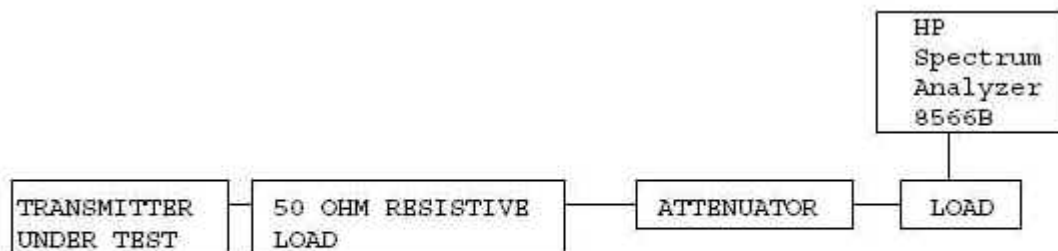
2.1049

Occupied bandwidth:

90.210(g)Emission Mask G.

For transmitters that are not equipped with an audio low pass filter pursuant to S90.211(b), the power of any emission must be attenuated below the unmodulated carrier power(P) as follows; (1) On any frequency removed from the center of the authorized bandwidth by a displacement frequency(f_d in kHz) of more than 5 kHz but no more than 10kHz: At least $83\log(f_d/5)$ dB; (2) ON any frequency removed from the center of the authorized bandwidth by a displacement frequency(f_d in kHz) of more than 10 kHz, but no more than 250% of the authorized bandwidth: At least $116\log(f_d/6.1)$ dB or $50+10\log(P)$, or 70dB, whichever is the lesser attenuation; (3) On any frequency removed from the center of the authorized bandwidth by more than 250% of the authorized bandwidth: At least $43+10\log(P)$ dB.

Method of Measuring Occupied Bandwidth



APPLICANT: LEE TECHNOLOGY KOREA CO.,LTD.

FCC ID: QBTLTK-1400A

REPORT #: THRU-509001

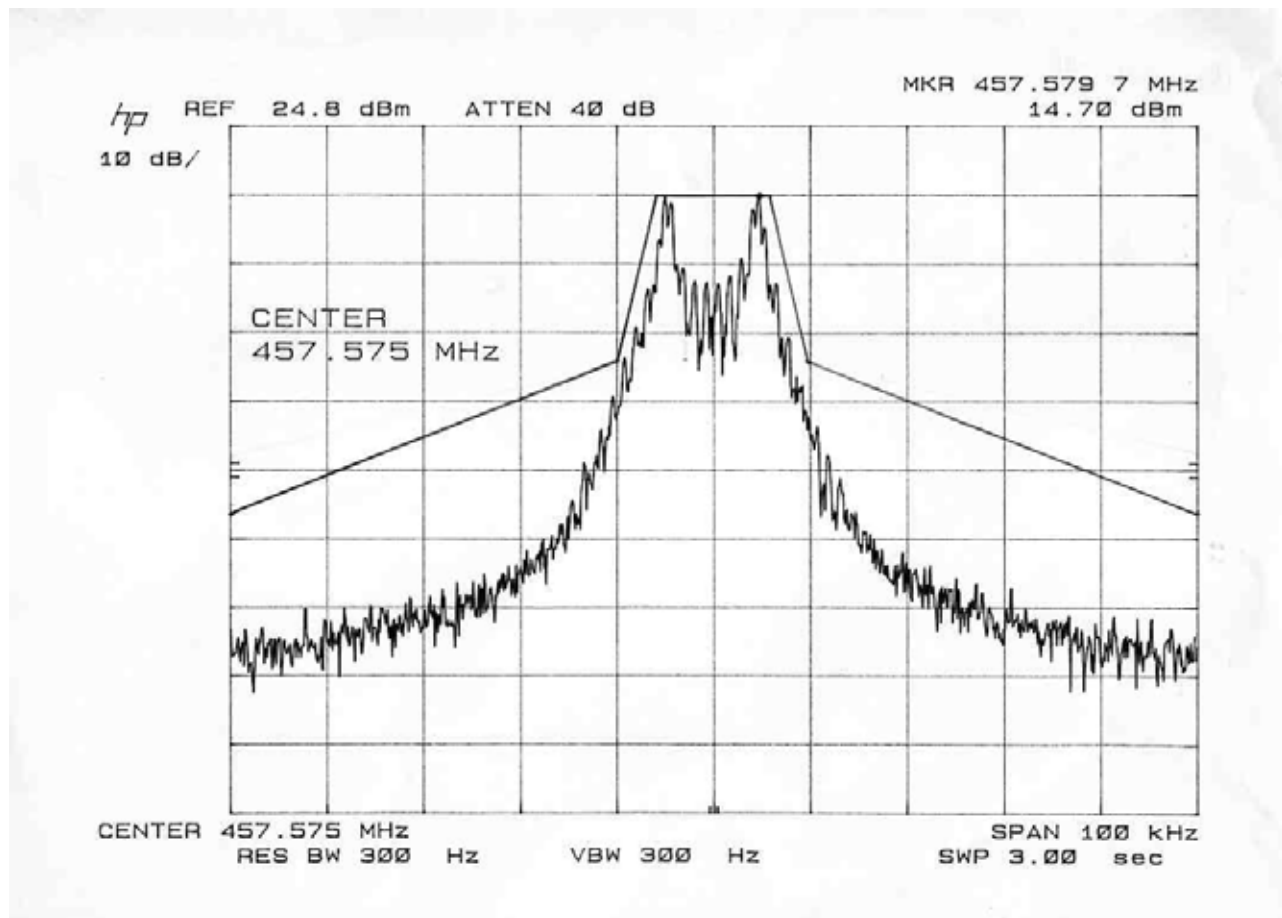
THRU Lab & Engineering.

RM302,Bokjo,29-15 , Chongpa3-Dong

Yongsan-Gu, Seoul, Korea

81221095059F81221095056 email thrukang@kornet.net

EMISSIONS MASK(G) PLOT



APPLICANT: LEE TECHNOLOGY KOREA CO.,LTD.

FCC ID: QBTCLK-1400A

REPORT #: THRU-509001

THRU Lab & Engineering.

RM302,Bokjo,29-15 , Chongpa3-Dong

Yongsan-Gu, Seoul, Korea

81221095059F81221095056 email thrukang@kornet.net

2.1055 Frequency stability:

90.213 (a)(11)

Temperature and voltage tests were performed to verify that the frequency remains within the .00025%, 2.5 ppm specification limit, for 25 kHz spacing. The test was conducted as follows: The transmitter was placed in the temperature chamber at 25 degrees C and allowed to stabilize for one hour. The transmitter was keyed ON for one minute during which four frequency readings were recorded at 15 second intervals. The worse case number was taken for temperature plotting. The assigned channel frequency was considered to be the reference frequency. The temperature was then reduced to -30 degrees C after which the transmitter was again allowed to stabilize for one hour. The transmitter was keyed ON for one minute, and again frequency readings were noted at 15 second intervals. The worst case number was recorded for temperature plotting. This procedure was repeated in 10 degree increments up to +50 degrees C.

MEASUREMENT DATA:

Assigned Frequency (Ref. Frequency) :457.5750

TEMPERATURE	FREQUENCY (MHz)	ppm	LIMIT (ppm)
REFERENCE	457.57500	0	
-30	457.57499	-0.02	2.5
-20	457.57484	-0.35	2.5
-10	457.57483	-0.37	2.5
0	457.57491	-0.20	2.5
10	457.57491	-0.20	2.5
20	457.57476	-0.52	2.5
30	457.57465	-0.76	2.5
40	457.57455	-0.98	2.5
50	457.57446	-1.18	2.5
END POINT OF BATTERY : 7.1V	457.57423	-1.68	2.5

APPLICANT: LEE TECHNOLOGY KOREA CO.,LTD.

FCC ID: QBTCLK-1400A

REPORT #: THRU-509001

THRU Lab & Engineering.

RM302,Bokjo,29-15 , Chongpa3-Dong

Yongsan-Gu, Seoul, Korea

81221095059F81221095056 email thrukang@kornet.net

APPLICANT: LEE TECHNOLOGY KOREA CO.,LTD.

FCC ID: QBTLTK-1400A

NAME OF TEST: POWER LINE CONDUCTED INTERFERENCE

RULES PART NO.: 15.207

REQUIREMENTS:	QUASI-PEAK	AVERAGE
.15 - 0.5 MHz	66-56 dBuV	56-46 dBuV
0.5 - 5.0	56	46
5.0 - 30.	60	50

TEST PROCEDURE: ANSI STANDARD C63.4-1992. The spectrum was scanned from .15 to 30 MHz.

The highest emission read for Line 1 was 27.23MHz @ 39.2 dBuv/m

The highest emission read for Line 2 was 2.528MHz @ 42.5 dbuv/m

THE GRAPHS ON THE FOLLOWING PAGES REPRESENT THE EMISSIONS READ FOR POWER LINE CONDUCTED FOR THIS DEVICE.

TEST RESULTS: Both lines were observed. The measurements indicate that the unit DOES appear to meet the FCC requirements for this class of equipment.

APPLICANT: LEE TECHNOLOGY KOREA CO.,LTD.

FCC ID: QBTLTK-1400A

REPORT #: THRU-509001

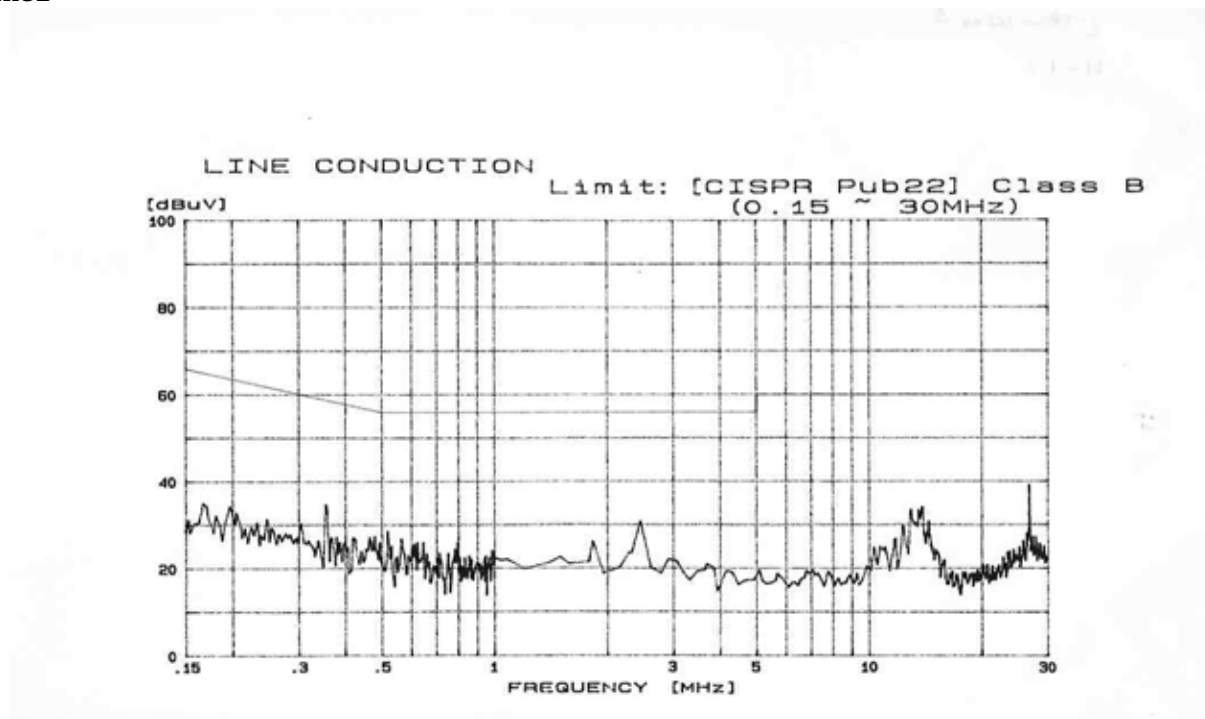
THRU Lab & Engineering.

RM302,Bokjo,29-15 , Chongpa3-Dong

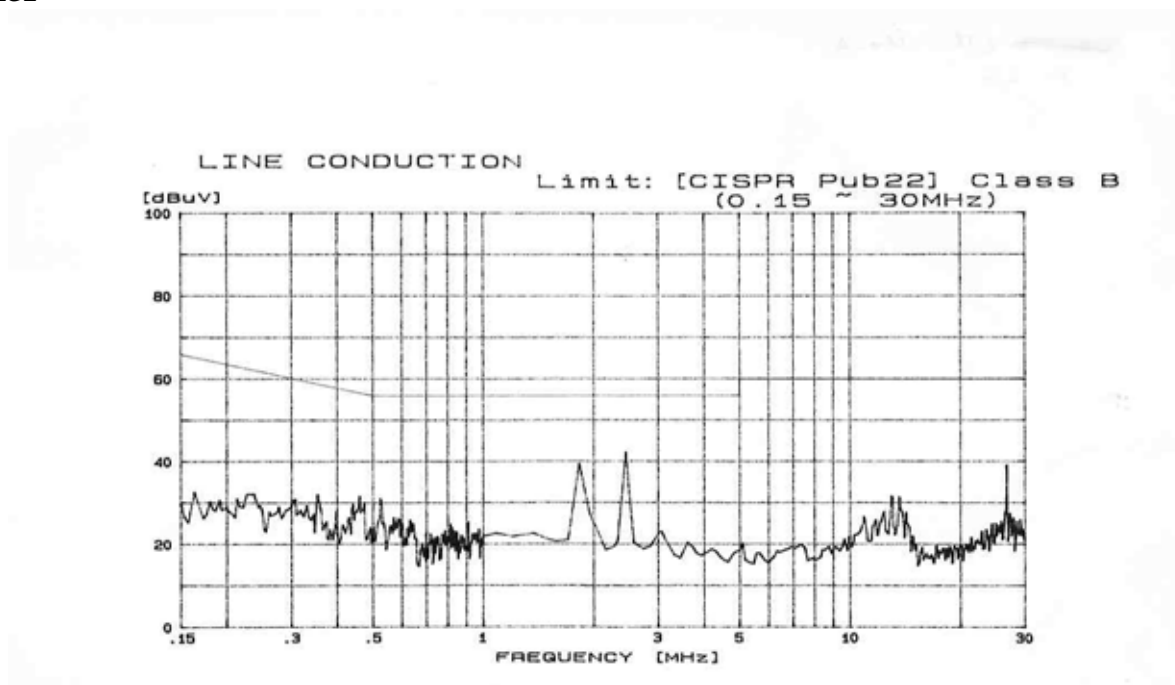
Yongsan-Gu, Seoul, Korea

81221095059F81221095056 email thrukang@kornet.net

Line1



Line2



APPLICANT: LEE TECHNOLOGY KOREA CO.,LTD.

FCC ID: QBTLTK-1400A

REPORT #: THRU-509001

THRU Lab & Engineering.

RM302,Bokjo,29-15 , Chongpa3-Dong

Yongsan-Gu, Seoul, Korea

81221095059F81221095056 email thrukang@kornet.net

2.1055(a)(1) Frequency stability:
90.214 Transient Frequency Behavior

REQUIREMENTS: In the 450-500MHz frequency band, transient frequencies must be within the maximum frequency difference limits during the time interval indicated below for 25kHz Channels:

Time Interval	Maximum Frequency	Portable Radios 450-500 MHz
t 1	+25 kHz	10.0 ms
t 2	+12.5 kHz	25.0 ms
t 3	+25 kHz	10.0 ms

TEST PROCEEDURE: TIA/EIA TS603 PARA 2.2.19, the levels were set as follows;

1. Using the variable attenuator the transmitter level was set to 40 dB below the test receivers maximum input level, then the transmitter was turned off.
2. With the transmitter off the signal generator was set 20dB below the level of the transmitter in the above step, this level will be maintained with the signal generator through-out the test.
3. Reduce the attenuation between the transmitter and the RF detector by 30 dB.
4. With the levels set as above the transient frequency behavior was observed & recorded

APPLICANT: LEE TECHNOLOGY KOREA CO.,LTD.

FCC ID: QBTCLK-1400A

REPORT #: THRU-509001

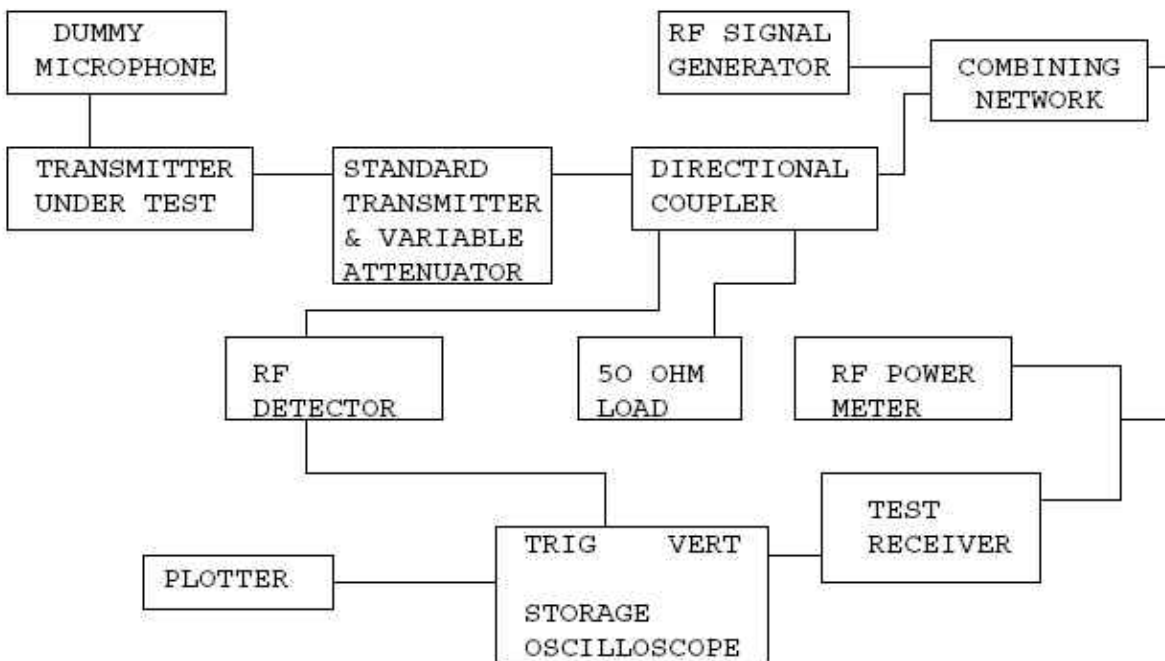
THRU Lab & Engineering.

RM302,Bokjo,29-15 , Chongpa3-Dong

Yongsan-Gu, Seoul, Korea

81221095059F81221095056 email thrukang@kornet.net

2.1055 Frequency stability:
90.214 Transient Frequency Behavior
(Continued)



APPLICANT: LEE TECHNOLOGY KOREA CO.,LTD.

FCC ID: QBTCLK-1400A

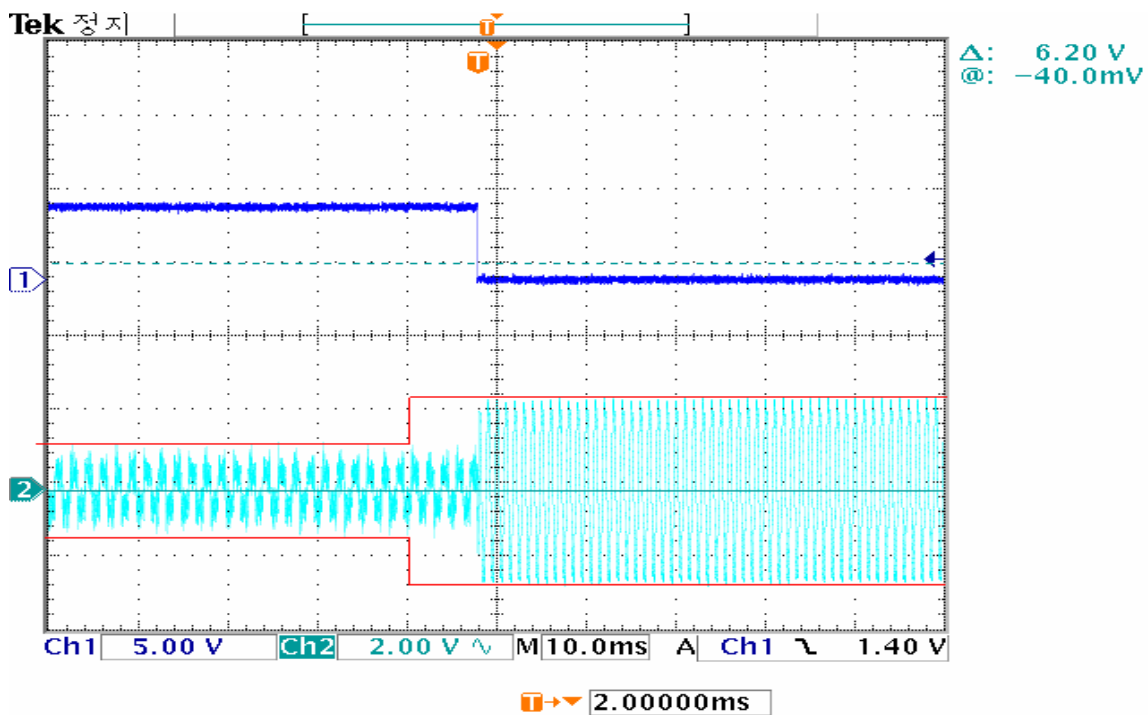
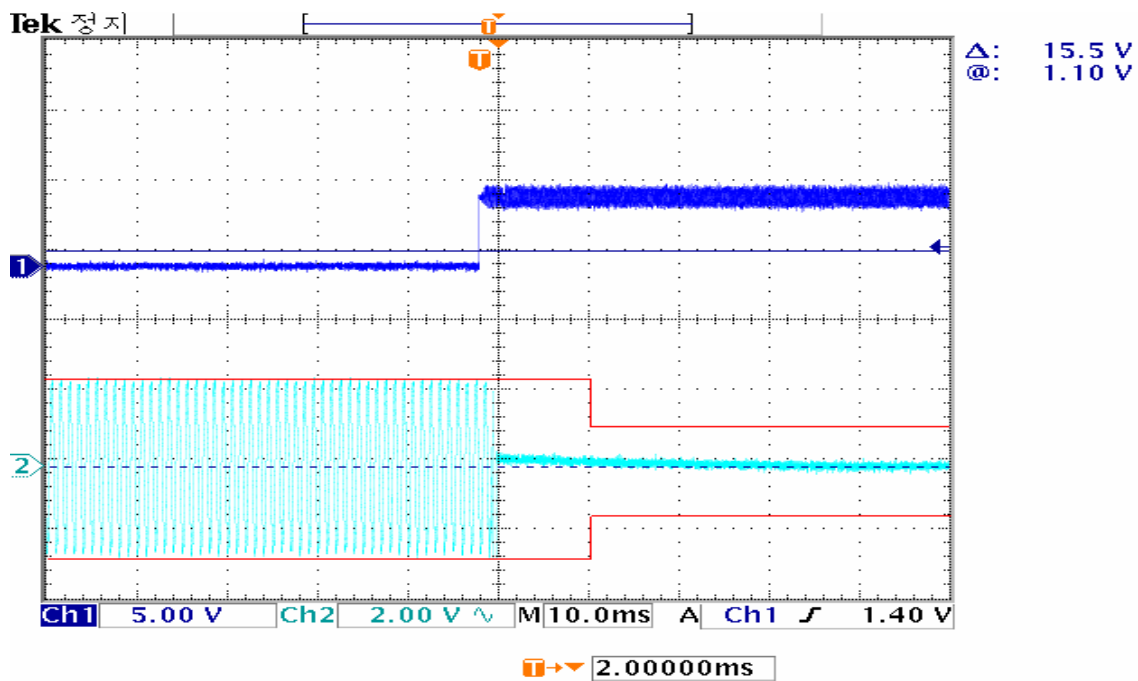
REPORT #: THRU-509001

THRU Lab & Engineering.

RM302,Bokjo,29-15 , Chongpa3-Dong

Yongsan-Gu, Seoul, Korea

81221095059F81221095056 email thrukang@kornet.net



APPLICANT: LEE TECHNOLOGY KOREA CO.,LTD.

FCC ID: QBTLTK-1400A

REPORT #: THRU-509001

THRU Lab & Engineering.

RM302,Bokjo,29-15 , Chongpa3-Dong

Yongsan-Gu, Seoul, Korea

81221095059F81221095056 email thrukang@kornet.net

Test Equipment List

DEVICE	MODEL	MFGR	SERNO	DUE.CAL
EMI Test Receiver	ESVS 10	Rohde & Schwarz	830489/001	2006.04.23.
Spectrum Analyzer	8566B	Hewlett Packard	2311A02394	2006.04.23
Spectrum Display	85662A	Hewlett Packard	2542A12429	2006.04.23.
Quasi-Peak Adapter	85650A	Hewlett Packard	2521A00887	2006.04.23.
RF Preselector	85685A	Hewlett Packard	2648A00504	2006.04.23
Pre-Amplifier	8449B	Hewlett Packard	3008A00375	2006.04.23.
Pre-Amplifier	8447F	Hewlett Packard	3113A05367	2006.04.23.
Spectrum Monitor	EZM	Rohde & Schwarz	862304/007	2006.04.23.
Bico-Antenna	94455-1	Eaton	977	2007.04.01.
Log-Periodic Antenna	3146	EMCO	2051	2007.04.01.
Dipole Antenna	TDA25/1/2	Electro Metrics	176/200/200	2007.04.01.
Horn Antenna	SAS-571	A.H Systems	414	2007.04.01.
Spectrum Analyzer	R3261C	Advantest	71720189	2006.04.23
LISN	KNW-242	Kyoritsu	8-923-2	2007.04.25.
LISN	8012-50-R-24	Solar	8379121	2007.04.25..
Loop Ant	6507	EMCO	1435	2005.10.06.
Signal Generator	SMS	Rohde & Schwarz	872165/100	2006.04.23.
Modulation Analyzer	8901B	Hewlett Packard	3438A05094	2006.04.23.
Frequency Counter	CMC251	Tektronic	CMC-251TW52489	2006.04.23.

APPLICANT: LEE TECHNOLOGY KOREA CO.,LTD.

FCC ID: QBTLTK-1400A

REPORT #: THRU-509001

THRU Lab & Engineering.

RM302,Bokjo,29-15 , Chongpa3-Dong

Yongsan-Gu, Seoul, Korea

81221095059F81221095056 email thrukang@kornet.net



APPLICANT: LEE TECHNOLOGY KOREA CO.,LTD.

FCC ID: QBTLTK-1400A

REPORT #: THRU-509001

THRU Lab & Engineering.

RM302,Bokjo,29-15 , Chongpa3-Dong

Yongsan-Gu, Seoul, Korea

81221095059F81221095056 email thrukang@kornet.net



APPLICANT: LEE TECHNOLOGY KOREA CO.,LTD.

FCC ID: QBTLTK-1400A

REPORT #: THRU-509001

THRU Lab & Engineering.

RM302,Bokjo,29-15 , Chongpa3-Dong

Yongsan-Gu, Seoul, Korea

81221095059F81221095056 email thrukang@kornet.net



APPLICANT: LEE TECHNOLOGY KOREA CO.,LTD.

FCC ID: QBTLTK-1400A

REPORT #: THRU-509001