THRU Lab & Engineering.

477-6, Hager-Ri, Yoju-Up, Yoju-Gun
Kyunggi-Do,469-803, Korea
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THRU

Test Report

Product Name: UHF Alpha Transmitter

FCC ID: WDC-IQBASE

Applicant:
LEE TECHNOLOGY KOREA CO.,LTD.

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

Date Receipt:08/30/2008

Date Tested:09/08/2008

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TABLE OF CONTENTS LIST FOR PART 90 UHF DEVICE

APPLICANT: LEE TECHNOLOGY KOREA CO.,LTD.

FCC ID: WDC-IQBASE

TEST REPORT CONTAINING:

EXHIBITS CONTAINING:

THRU Lab & Engineering.

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GENERAL INFORMATION REQUIRED FOR TYPE ACCEPTANCE

2.1033 (c)(1)(2) LEE TECHNOLOGY KOREA CO.,LTD.. will sell the FCC ID: WDC-IQBASE 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

Bn = 2M + 2DK
M = 1,200 Bits per second
D = 4.5 kHz (Peak Deviation)
K = 1
Bn = 2(1,200bps/2) + 2(4500)(1) = 10.2k

ALLOWED AUTHORIZED BANDWIDTH = 10.2 kHz.

90.209(b) (5)

2.1033 (5) Frequency Range: 450,0000 ~ 467,8750 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 = 12 Volts
IC = 680 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.

(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) & 90.205 RF power output.

MAXIMUM PEAK OUTPUT POWER(CONDUCTED)

Maximum peak output power(W)		
Low	Mid	HIGH
1.95	1.95	1.79
32.91dBm	32.91dBm	32.55dBm

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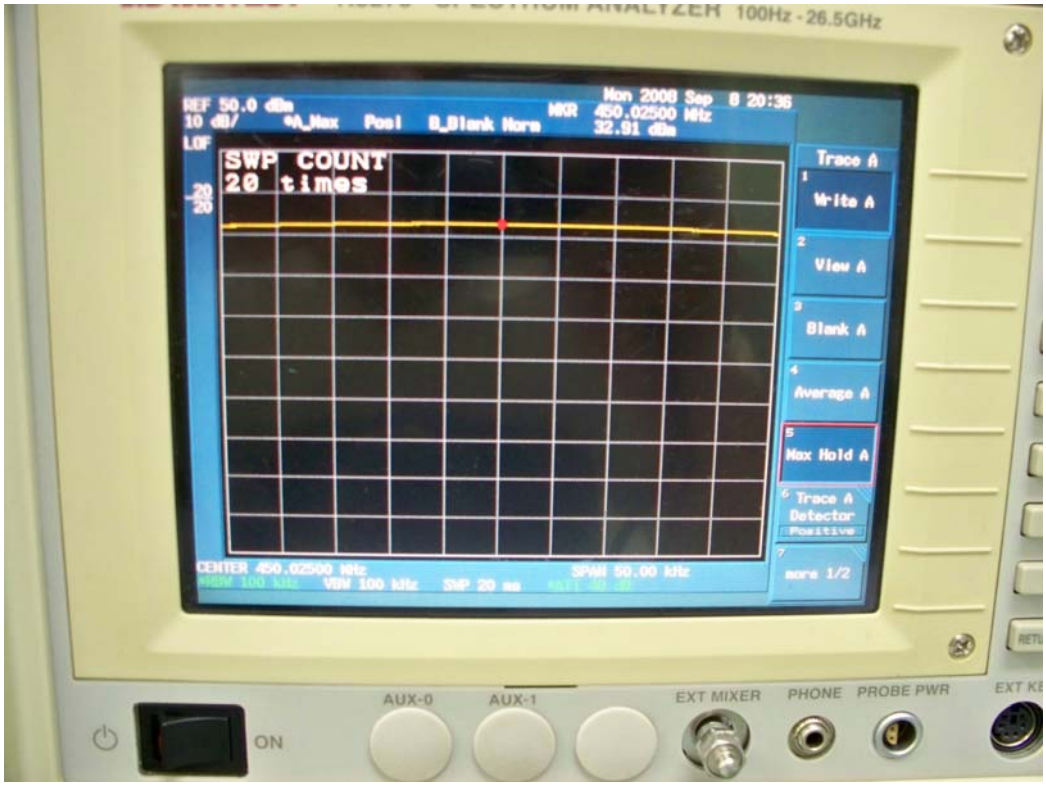
PLOT

LOW



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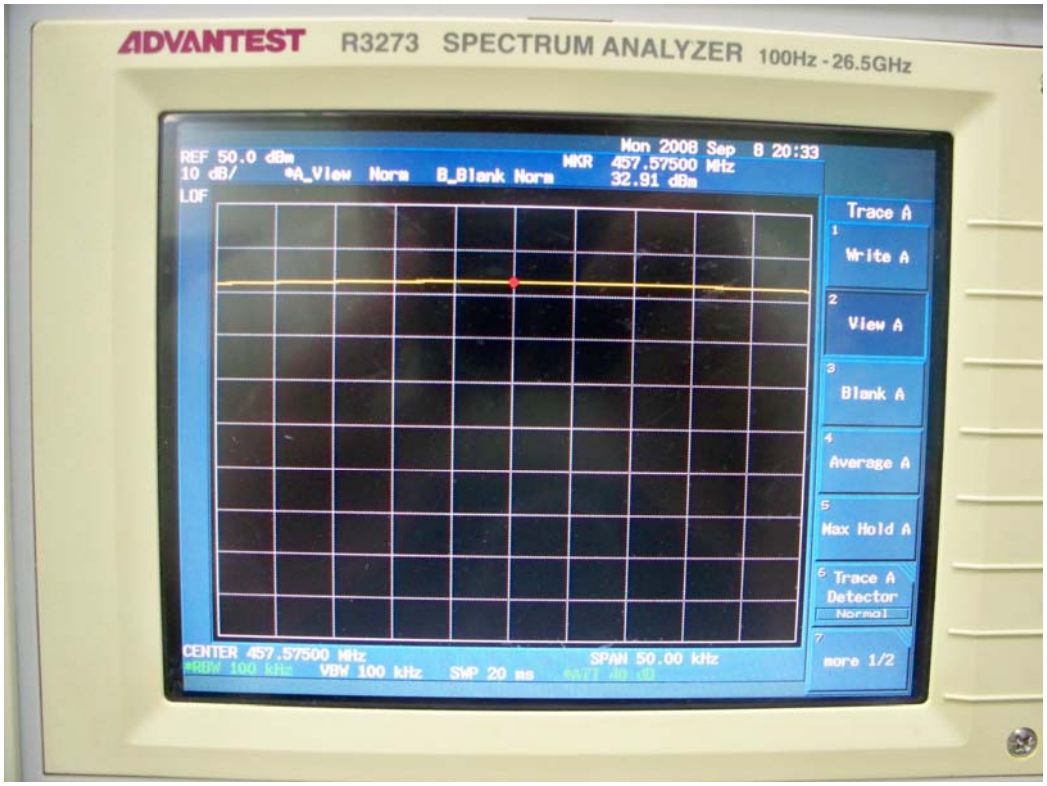
Mid



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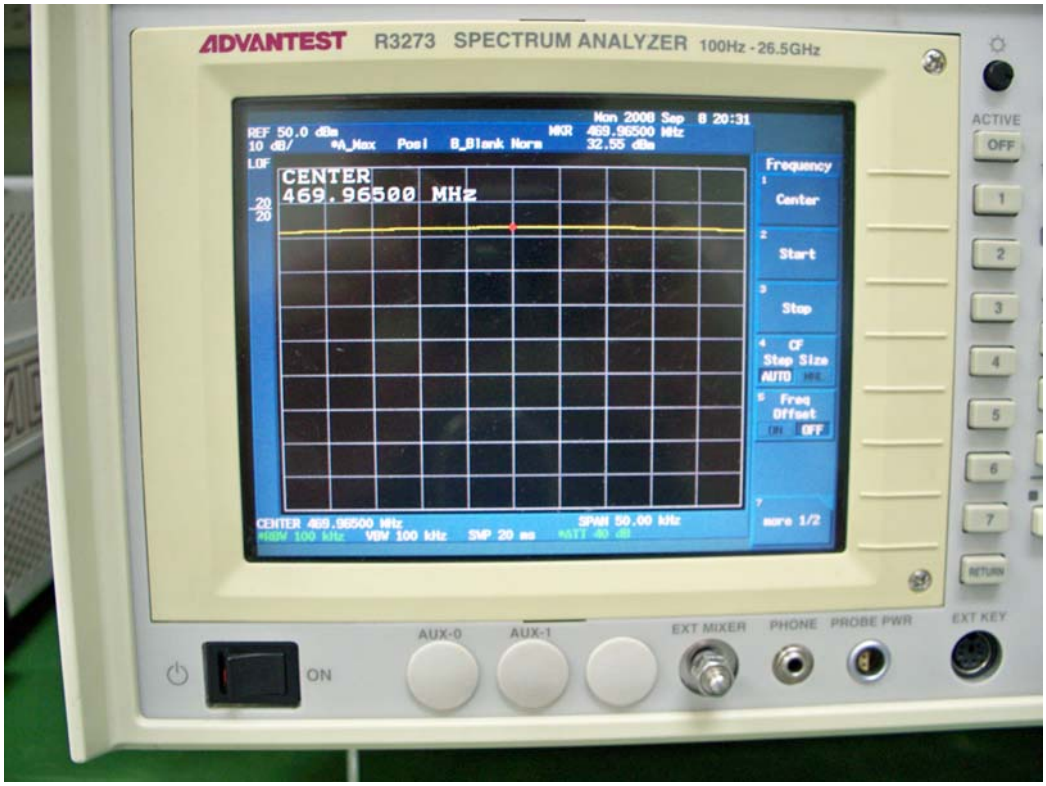
High



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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 100GHz, whichever is lower.

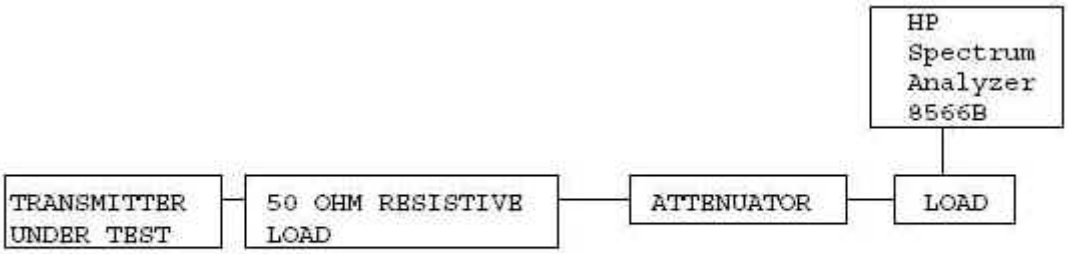
(3)If the equipment operates at or above 30GHz: to the fifth harmonic of the highest fundamental frequency or to 200GHz, whichever is lower.

(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 Sprious Emissions



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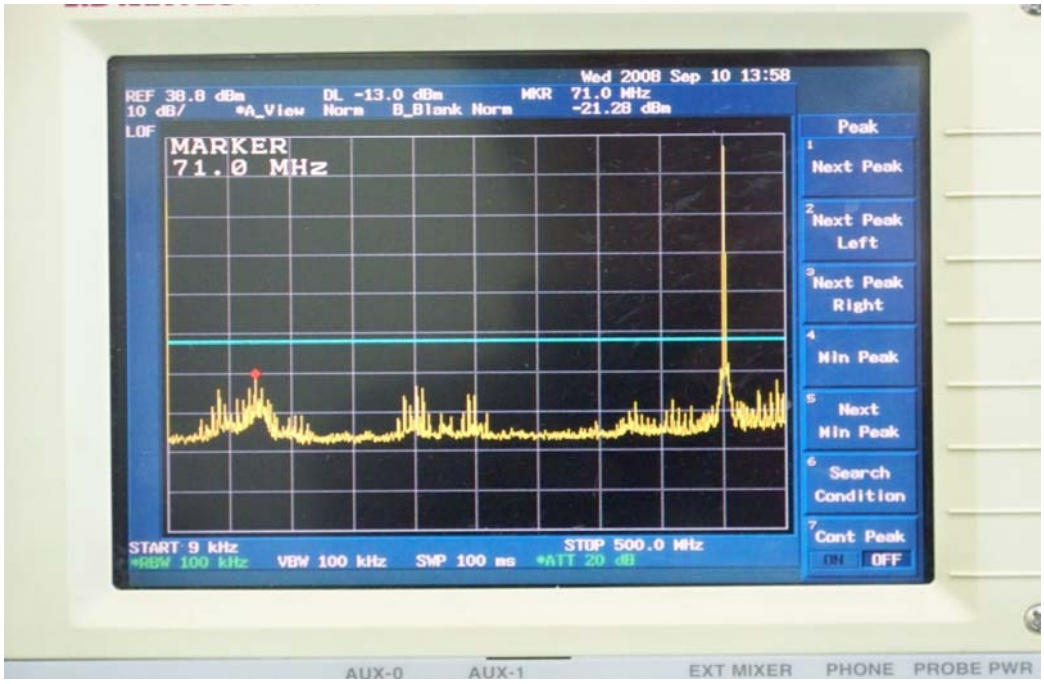
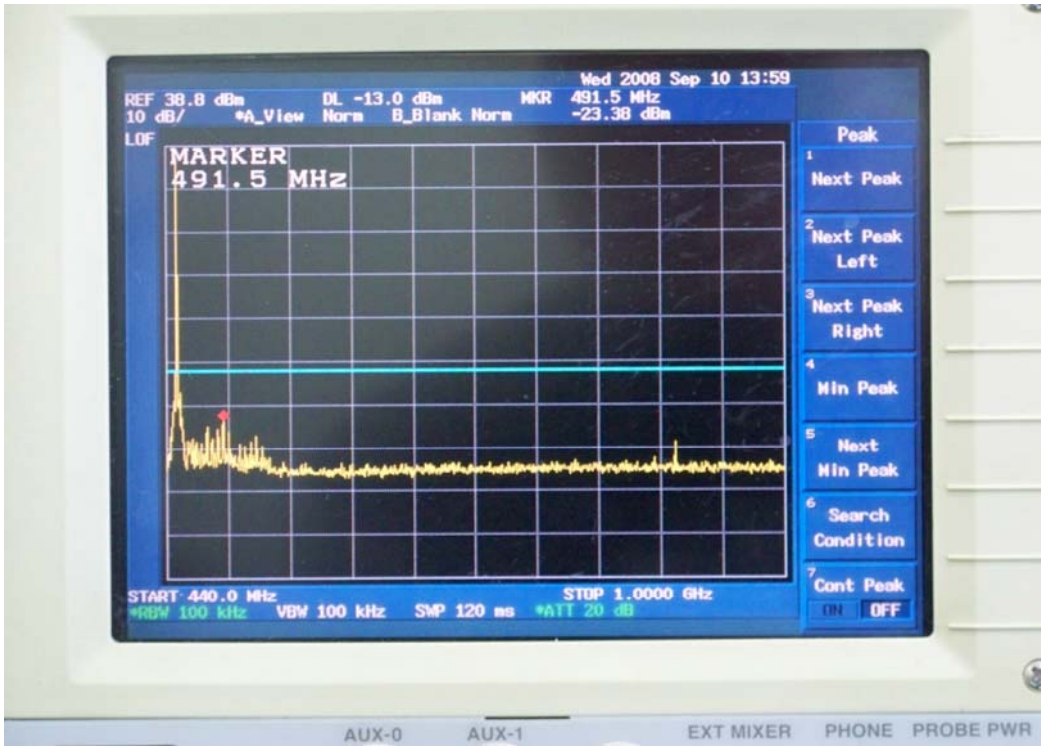
PLOT

REQUIREMENTS : 43 + 10log(1.95) = 45.90 dB

LOW





APPLICANT: LEE TECHNOLOGY KOREA CO.,LTD.
FCC ID: WDC-IQBASE
REPORT #: TK-FR8001

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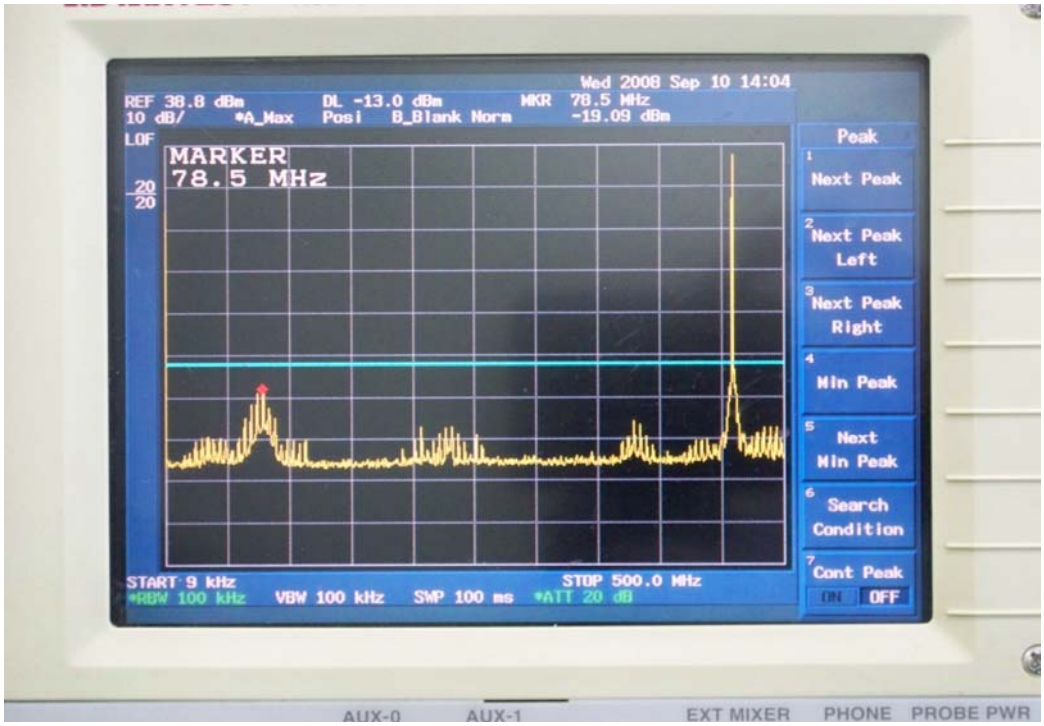
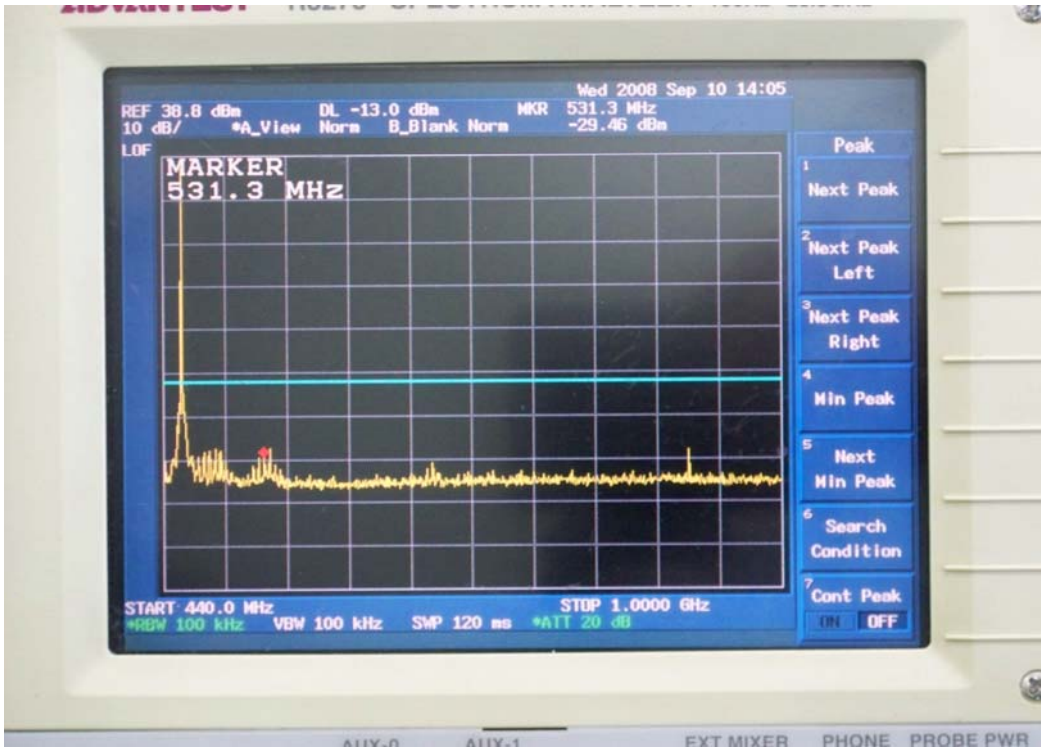
Mid

REQUIREMENTS : 43 + 10log(1.95) = 45.90 dB





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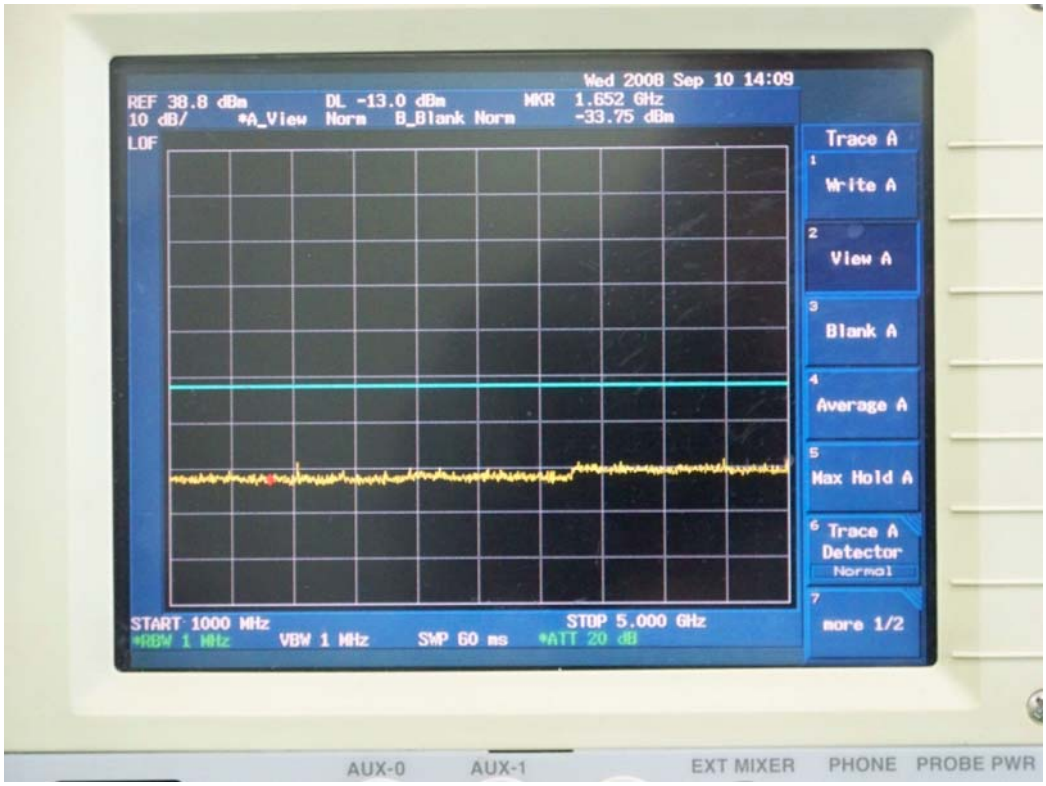
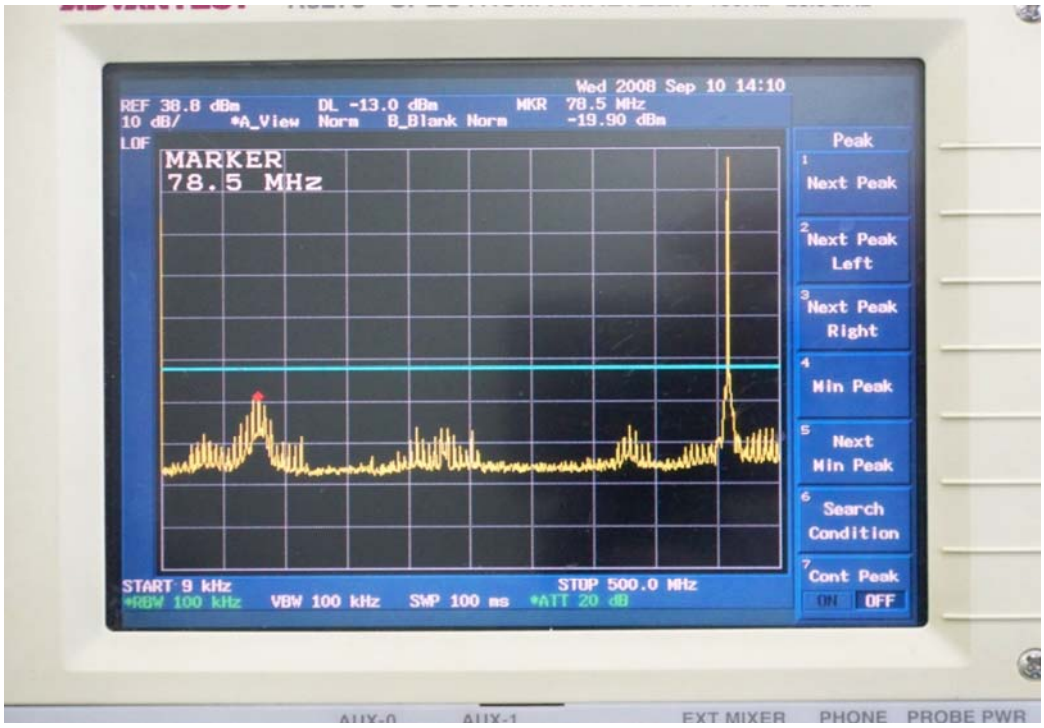
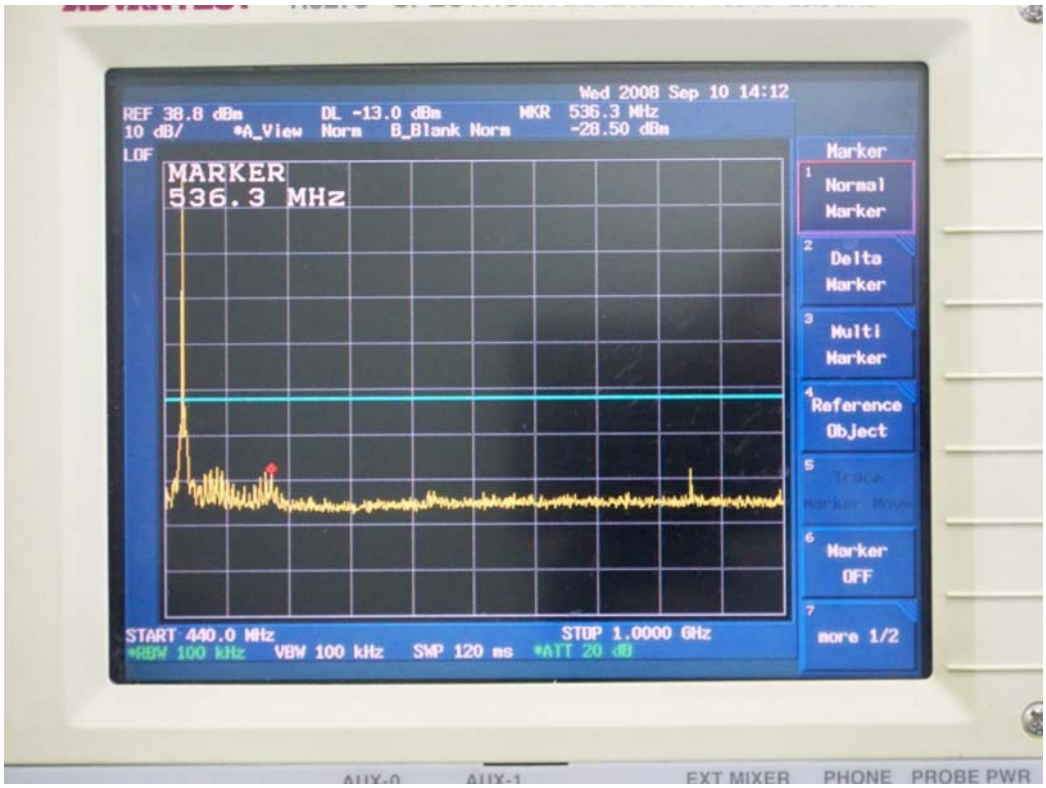


HIGH

REQUIREMENTS : 43 + 10log(1.75) = 45.43 dB





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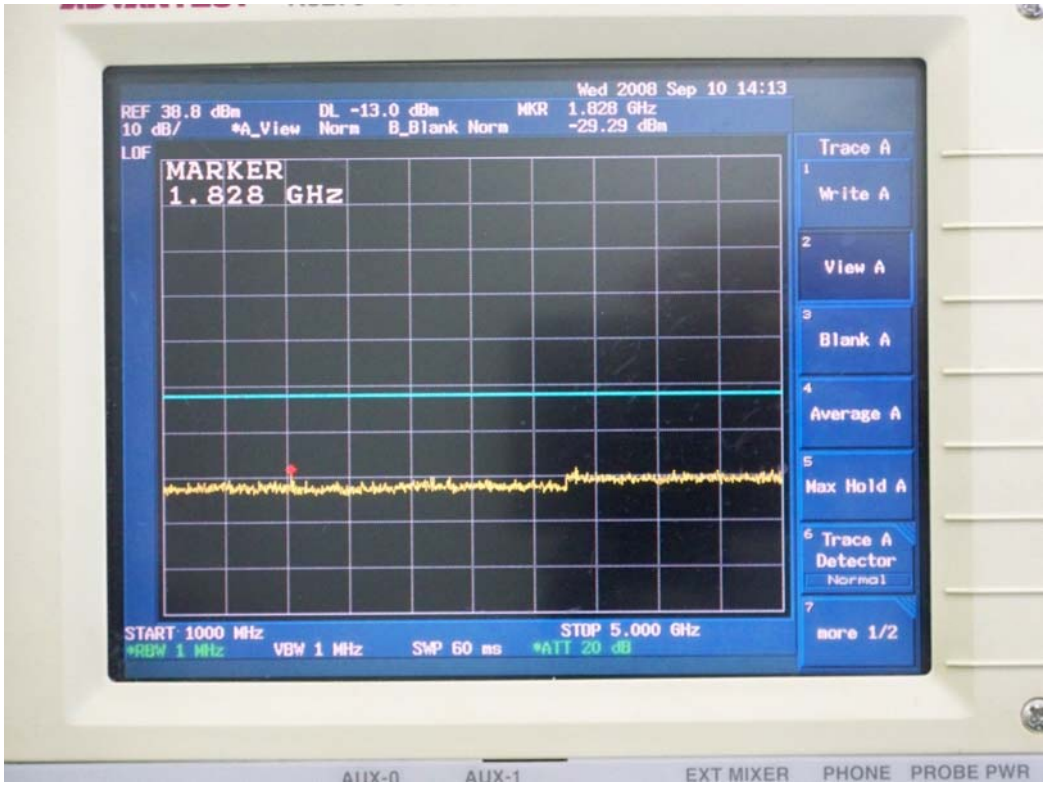

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2.1053 **UNWANTED RADIATION**

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.

REQUIREMENTS: REQUIREMENTS : 43 + 10log(1.95) = 45.90 dB

Test result : Low

Horizontal				Vertical			
frequency	dBc	Margin	dBm	frequency	dBc	Margin	dBm
450.0250	0	0		450.0250	0	0	
900.0500	61.79	15.89	-28.88	900.0500	60.49	14.59	-27.58
1350.0750	60.30	14.40	-27.39	1350.0750	53.70	7.80	-20.79
1800.1000	54.01	8.11	-21.10	1800.1000	49.81	3.91	-16.90
2250.1250	63.75	17.85	-30.84	2250.1250	59.55	13.65	-26.64
2700.1500	60.38	14.48	-27.47	2700.1500	58.48	12.58	-25.57
3150.1750	59.37	13.47	-26.46	3150.1750	57.97	12.07	-25.06
3600.2000	60.75	14.85	-27.84	3600.2000	61.65	15.75	-28.74
4050.2250	63.15	17.25	-30.24	4050.2250	61.15	15.25	-28.24
4500.2500	60.79	14.89	-27.88	4500.2500	56.19	10.29	-23.28

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 477-6, Hager-Ri, Yoju-Up, Yoju-Gun, Kyunggi-Do,469-803, Korea

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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.

REQUIREMENTS: REQUIREMENTS : 43 + 10log(1.95) = 45.90 dB

Test result : Mid

Horizontal				Vertical			
frequency	dBc	Margin	dBm	frequency	dBc	Margin	dBm
457.5750	0	0		457.5750			
915.1500	62.08	16.18	-29.17	915.1500	63.68	17.78	-30.77
1372.7250	60.99	15.09	-28.08	1372.7250	55.89	9.99	-22.98
1830.3000	56.44	10.54	-23.53	1830.3000	54.34	8.44	-21.43
2287.8750	66.74	20.84	-33.83	2287.8750	60.24	14.34	-27.33
2745.4500	58.26	12.36	-25.35	2745.4500	56.16	10.26	-23.25
3203.0250	56.46	10.56	-23.55	3203.0250	50.66	4.76	-17.75
3660.6000	61.65	15.75	-28.74	3660.6000	55.95	10.05	-23.04
4118.1750	64.97	19.07	-32.06	4118.1750	62.07	16.17	-29.16
4575.7500	58.18	12.28	-25.27	4575.7500	52.48	6.58	-19.57

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 477-6, Hager-Ri, Yoju-Up, Yoju-Gun, Kyunggi-Do,469-803, Korea

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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.

REQUIREMENTS: REQUIREMENTS : 43 + 10log(1.75) = 45.43 dB

Test result : HIGH

Horizontal				Vertical			
frequency	**dBc**	**Margin**	**dBm**	**frequency**	**dBc**	**Margin**	**dBm**
469.9650	0	0	32.55	469.9650	0	0	32.55
939.9300	62.21	16.66	-29.66	939.9300	62.21	16.66	-29.66
1409.8950	58.79	13.24	-26.24	1409.8950	53.89	8.34	-21.34
1879.8600	47.26	1.71	-14.71	1879.8600	47.56	2.01	-15.01
2349.8250	64.36	18.81	-31.81	2349.8250	59.96	14.41	-27.41
2819.7900	60.89	15.34	-28.34	2819.7900	56.09	10.54	-23.54
3289.7550	53.95	8.40	-21.40	3289.7550	48.45	2.90	-15.90
3759.7200	64.75	19.20	-32.20	3759.7200	60.55	15.00	-28.00
4229.6850	64.81	19.26	-32.26	4229.6850	61.51	15.96	-28.96
4699.6500	61.16	15.61	-28.61	4699.6500	57.06	11.51	-24.51

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 477-6, Hager-Ri, Yoju-Up, Yoju-Gun, Kyunggi-Do,469-803, Korea

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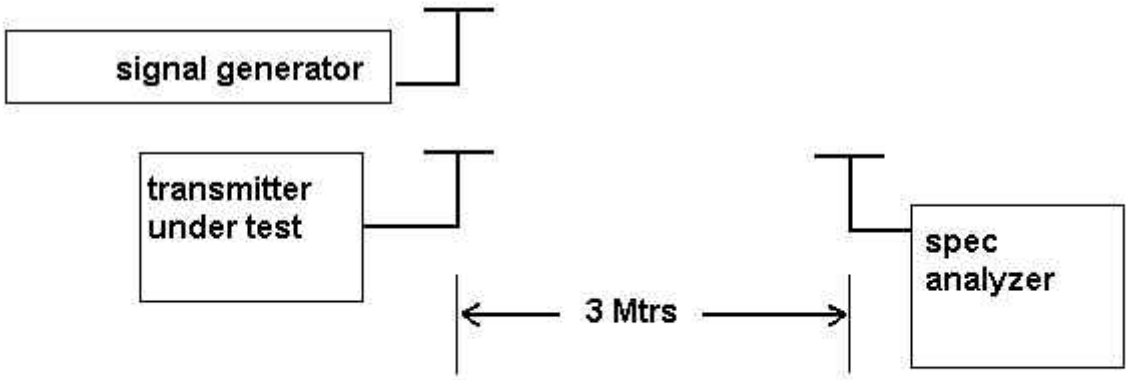
Method of Measuring Radiated Spurious Emissions



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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

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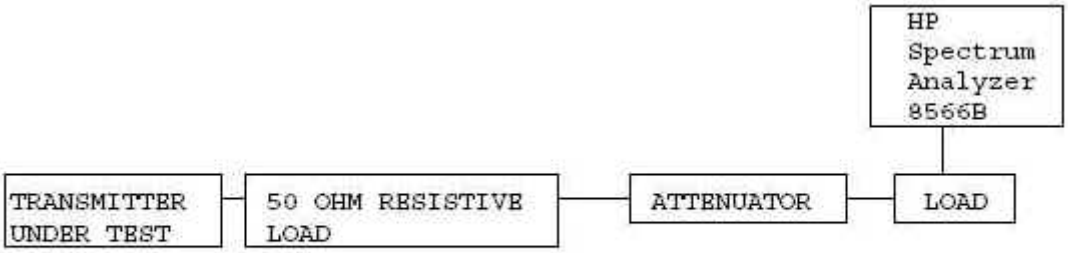
2.1049 Audio Low Pass Filter
This UUT does not have a low pass filter

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(fd in kHz) of more than 5 kHz but no more than 10kHz: At least 83log(fd/5)dB; (2) ON any frequency removed from the center of the authorized bandwidth by a displacement frequency(fd in kHz) of more than 10 kHz, but no more than 250% of the authorized bandwidth: At least 116log(fd/6.1)dB or 50+10log(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+10log(P)dB.

Method of Measuring Occupied Bandwidth



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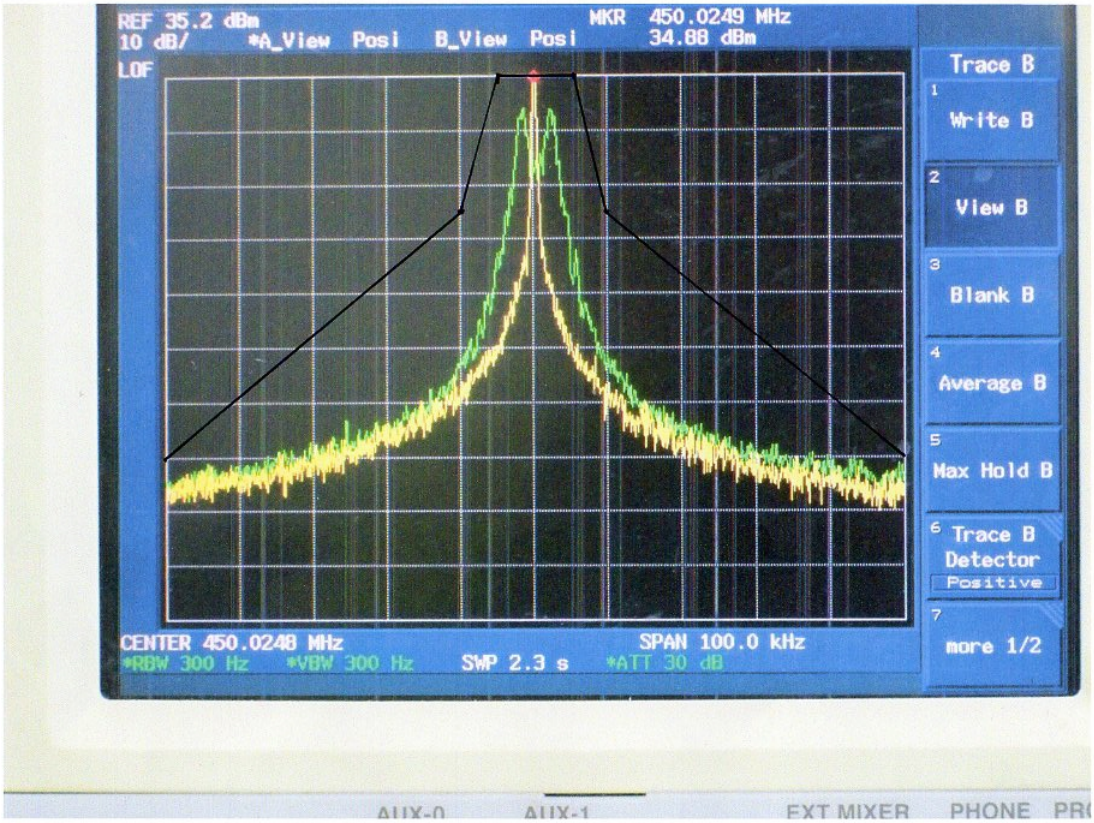
EMISSIONS MASK(G) PLOT

Low



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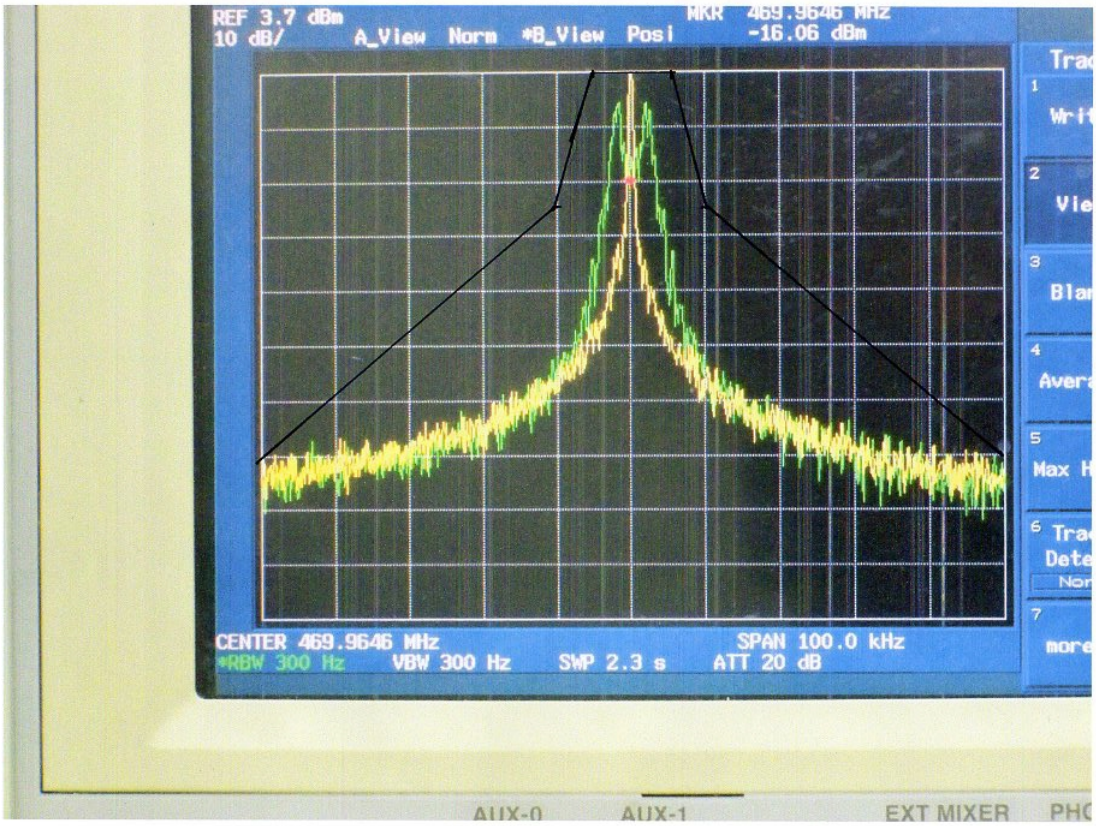
Mid



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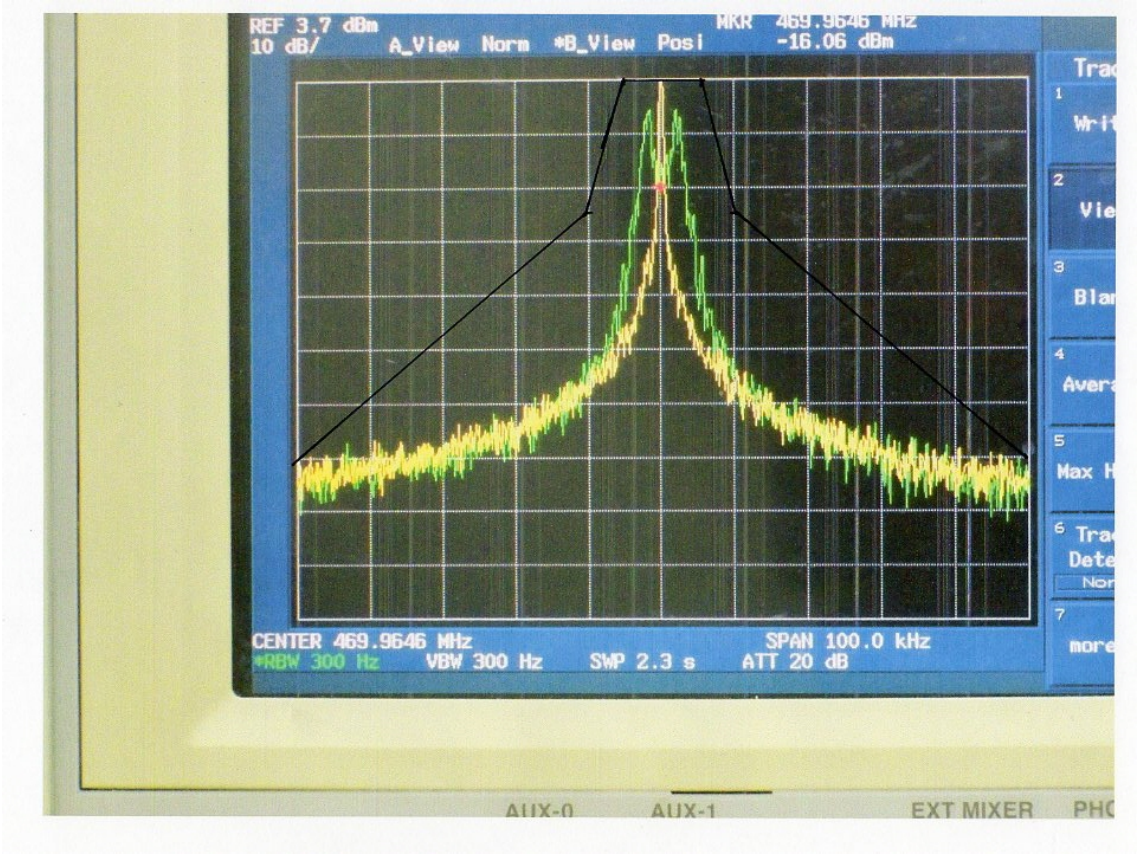
High



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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

Model : IQBASE				
REFERENCE VOTAGE (V DC)	12.0	REFERENCE FREQUENCY (MHz)	457.57500	
TEMPERATURE	FREQUENCY(MHz)	PPM	LIMIT(ppm)	비 고
-30	457.576270	2.78	5.0	**pass**
-20	457.575687	1.50	2.5	**pass**
-10	457.575463	1.01	2.5	**pass**
0	457.575343	0.75	2.5	**pass**
10	457.575253	0.55	2.5	**pass**
20	457.575066	0.14	2.5	**pass**
30	457.575024	0.05	2.5	**pass**
40	457.575075	0.16	2.5	**pass**
50	457.575424	0.93	2.5	**pass**
+15% Battery : 13.8V	457.575803	1.75	2.5	**pass**
-15% Battery : 10.2V	457.575640	1.40	2.5	**pass**

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APPLICANT: LEE TECHNOLOGY KOREA CO.,LTD.

FCC ID: WDC-IQBASE

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 C63.4-2003. The spectrum was scanned from .15 to 30 MHz.

The highest emission read for Line 1 was 0.168MHz @ 42.2 dBuv/m

The highest emission read for Line 2 was 23.5MHz @ 40 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.

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Line1(H)

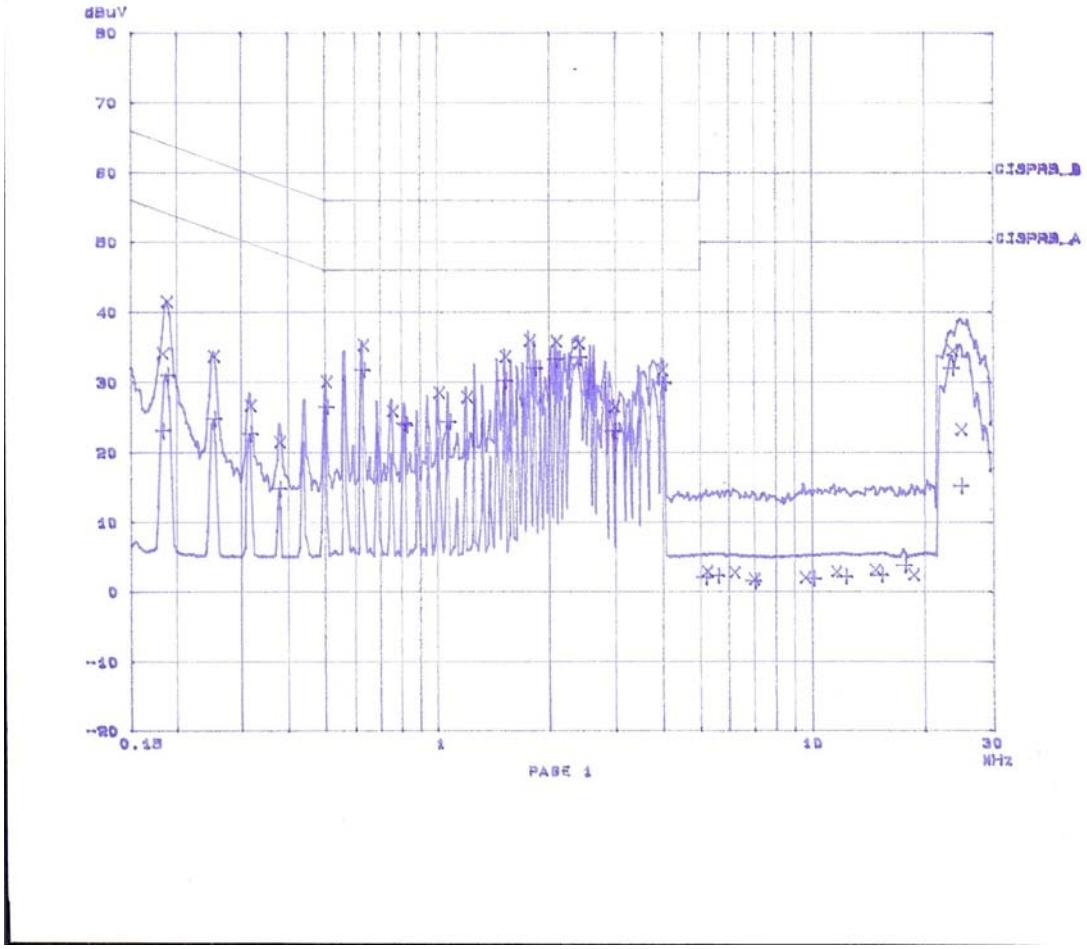
CONDUCTED EMISSION
CONDUCTED.TEST

EUT: ACTIVE
Manuf: HME
Op Cond: LINE1
Operator: THRU
Test Spec: EN22

Scan Settings (2 Ranges)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150k	3M	3k	10k	PK+AV	100ms	AUTO	LN OFF	60dB
3M	30M	9k	10k	PK+AV	20ms	AUTO	LN OFF	60dB

Final Measurement: x QP / + AV
Meas Time: 1 s
Subranges: 25
Acc Margin: 30dB



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Line2(N)

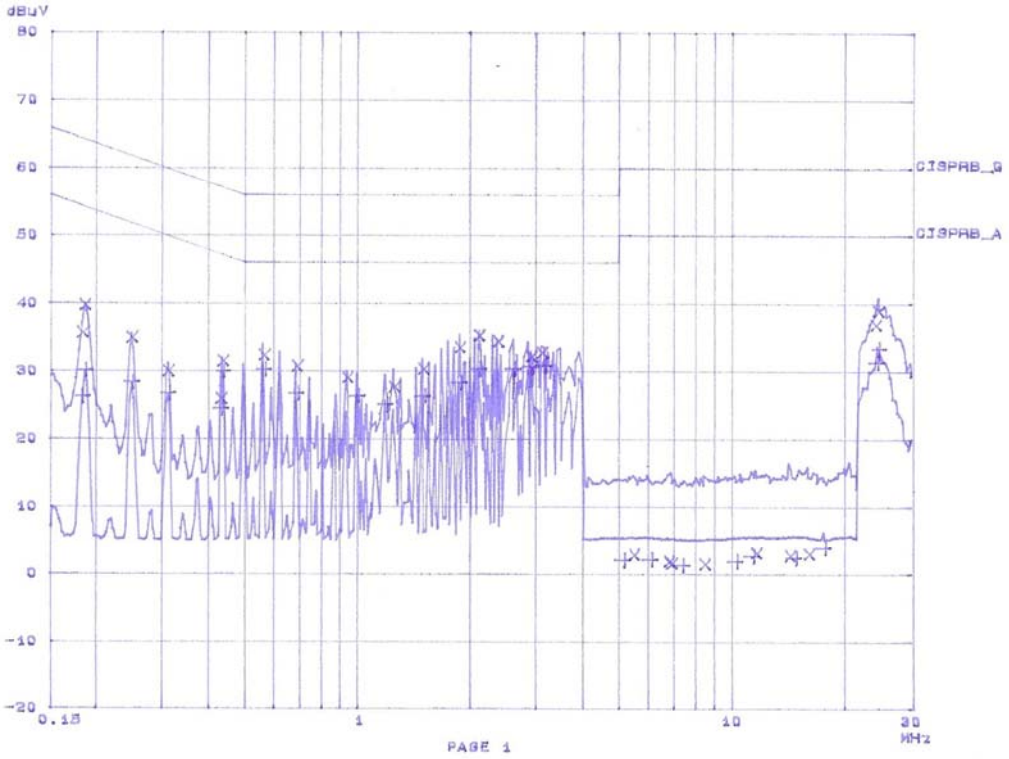
CONDUCTED EMISSION
CONDUCTED.TEST

EUT: ACTIVE
Manuf: HME
Op Cond: LINE2
Operator: THRU
Test Spec: EN22

Scan Settings (2 Ranges)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	DspRge
150K	3M	3K	10K	PK+AV	100ms	AUTO	LN OFF	60dB
3M	30M	9K	10K	PK+AV	20ms	AUTO	LN OFF	60dB

Final Measurement: x QP / + AV
Meas Time: 1 s
Subranges: 25
Acc Margin: 20dB



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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

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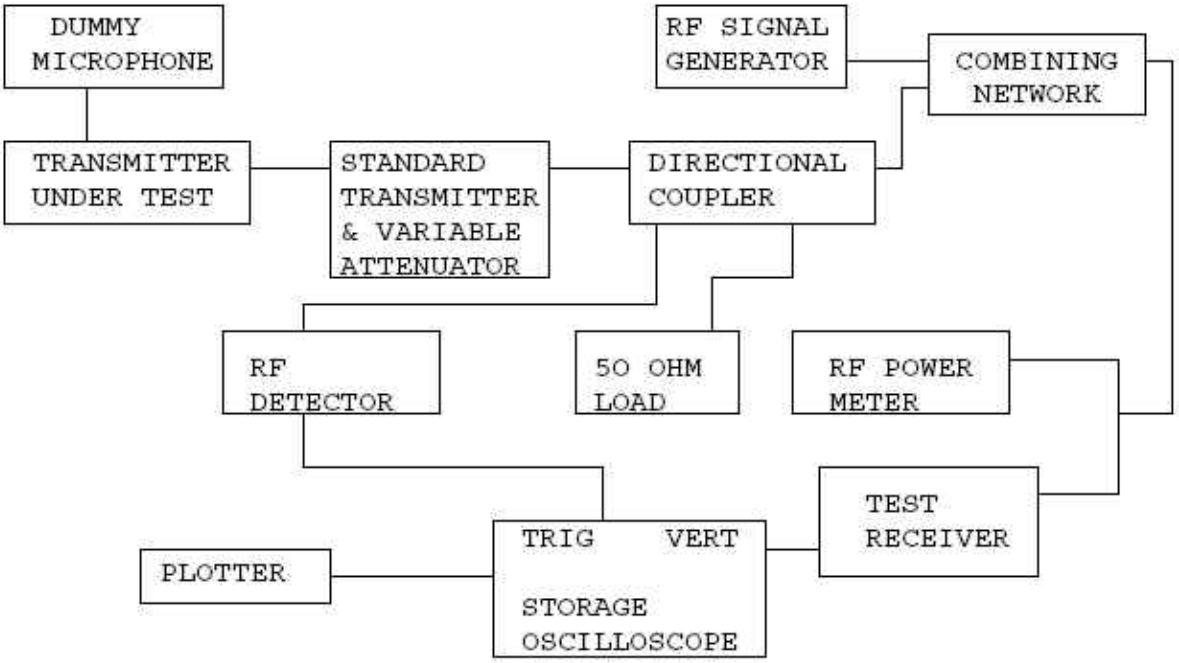
2.1055 Frequency stability:
90.214 Transient Frequency Behavior
(Continued)



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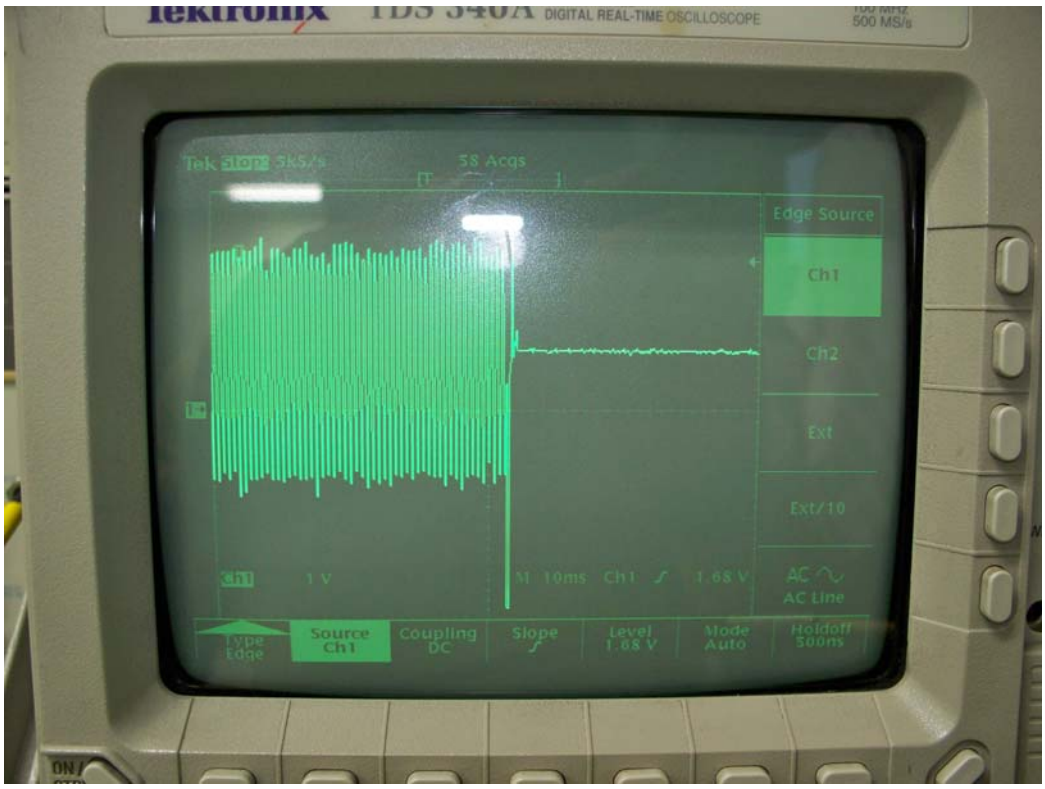

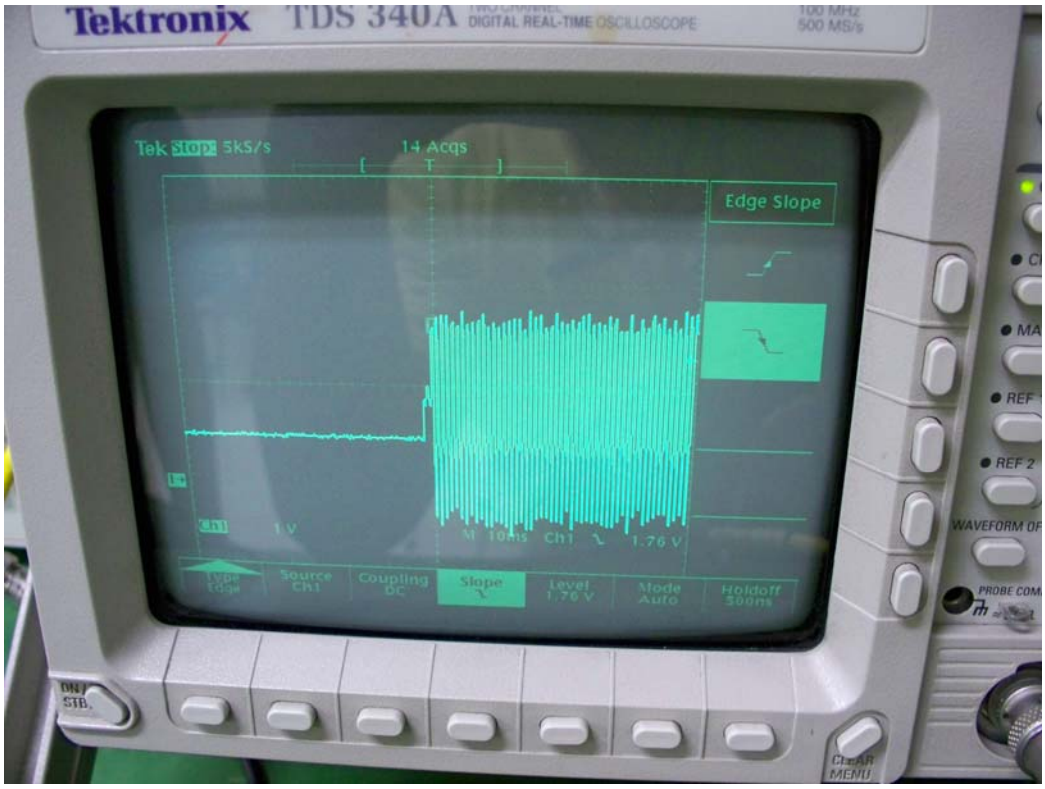

APPLICANT: LEE TECHNOLOGY KOREA CO.,LTD.
FCC ID: WDC-IQBASE
REPORT #: TK-FR8001

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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	☒
2	Test Receiver	Rohde & Schwarz	ESVS 10	826008/014	2009.06.20	☒
3	Spectrum Analyzer	Hewlett Packard	8566B	2311A02394	2009.06.10	☒
4	Spectrum Analyzer	Advantest Corp.	R3261C	61720208	2009.06.10	☒
	Spectrum Analyzer	Advantest Corp.	R3273	101003536	2009.09.05	☒
5	Modulation Analyzer	Hewlett Packard	8901B	3438A05094	2009.05.29	☐
6	Audio analyzer	Hewlett Packard	8903B	3011A12915	2009.05.29	☒
7	Preamplifer	Hewlett Packard	8447F	2805A02570	2009.05.26	☐
8	Preamplifer	A.H. Systems	PAM-0118	164	2009.04.27	☒
9	Signal Generator	Hewlett Packard	8673D	2708A00448	2009.06.10	☐
10	Power Meter	Hewlett Packard	437B	312U24787	2009.04.29	☐
11	Power Sensor	Hewlett Packard	8482B	3318A06943	2009.06.29	☐
12	Loop Antenna	Rohde & Schwarz	HFH2-Z2.335.4711.52	826532/006	2009.01.31	☐
13	Dipole Antenna	Rohde & Schwarz	VHAP	574	2010.07.07	☐
14	Dipole Antenna	Rohde & Schwarz	VHAP	575	2010.07.17	☐
15	Dipole Antenna	Rohde & Schwarz	UHAP	546	2010.07.07	☐
16	Dipole Antenna	Rohde & Schwarz	UHAP	547	2010.07.07	☐
17	Biconical Antenna	Eaton Corp.	94455-1	0977	2010.07.03	☐
18	Biconical Antenna	EMCO	3104C	9111-2468	2010.07.03	☒
19	Log Periodic Antenna	EMCO	3146	2051	2010.06.05	☒
20	Log Periodic Antenna	EMCO	3146	8901-2320	2010.07.03	☐
21	Horn Antenna	A.H. Systems	SAS-571	414	2009.03.17	☒
22	LISN	EMCO	3825/2	9111-1912	2008.12.12	☐
23	LISN	Kyoritsu	KNW-242	8-923-2	2009.05.23	☒
24	Waveform Generator	Hewlett Packard	33120A	US34001190	2009.05.29	☐
25	Digital Oscilloscope	Tektronix	TDS 340A	B012287	2009.06.10	☐

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26	Dummy Load	Bird Electronics	8251	11511	2009.02.02	☐