TEST REPORT For FCC

Test Report No.	: TK-FR9009
Date of Issue	: 07/27/2009
FCC ID	: QBTLTK-2000M
Description of Product	: Multicall Charger Paging System
Model No.	: LTK-2000MS
Applicant	: **Lee Technology Korea Co., Ltd.** 3rd Floor # 499-2 Sang 3-Dong, Wonmi-Gu Bucheon-City, Kyungki-Do, Korea
Manufacturer	: **Lee Technology Korea Co., Ltd.** 3rd Floor # 499-2 Sang 3-Dong, Wonmi-Gu Bucheon-City, Kyungki-Do, Korea
Standards	: FCC Part90
Test Date	: 07/15/2009 - 07/26/2009
Test Results	: ☒ PASS ☐ FAIL

The test results relate only to the items tested.

Tested by: Kyoung-Moon Choi
Test Engineer
Date: 07/27/2009

Reviewed by: K. T. Kang
Technical Manager
Date: 07/27/2009

THRU-KES
Testing & Certification Partners
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TABLE OF CONTENTS

1.0 General Product Description

EUT Type	:	Paging Transmitter with Charging cradle
FCC Rule Part(s)	:	§2; §15; §90
Model name	:	LTK-2000MC
Serial number	:	Identical prototype
Tx Freq. Range	:	450.0250 ~ 469.9975 MHz
Channel Space Bandwidth		12.5kHz
Type of Modulation	:	10K2F1D
Frequency Tolerance:	:	± 0.00025 % (2.5ppm)
Maximum Output Power	:	Conducted: 1.743 W
Power Source	:	12 Vdc
Antenna type	:	Helical antenna Gain: -2dBi

1.1 Tested Frequency

	LOW	MID	HIGH
Frequency (MHz)	450.0250	460.0000	469.9775

1.2 Power Input into the Final Amplifier

DC Voltages and currents info the final amplifier :

Vce : 12 volts
Ic : 680mA

1.3 Model Differences

None

1.4 Device Modifications

The following modifications were necessary for compliance:
Not applicable

1.5 Peripheral Devices

Device	Manufacturer	Model No.	Serial No.
E U T	Lee Technology korea Co.,Ltd.	LTK-2000MS	-
AC Adaptor	HJC Hua Jung Comp.Co., Ltd.	HASU11FB42	662401200738 4

1.6 Calibration Details of Equipment Used for Measurement

Test equipment and test accessories are calibrated on regular basis. The maximum time between calibrations is one year or what is recommended by the manufacturer, whichever is less. All test equipment calibrations are traceable to RRA & HCT, therefore, all test data recorded in this report is traceable to RRA & HCT.

1.7 Test Facility

The measurement facility is located at 477-6, Hager-Ri, Yoju-Up, Yoju-Gun Kyunggi-Do,469-803, Korea. Tel: +82-31-883-5092/Fax: +82-31-883-5169. The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

1.8 Laboratory Accreditations and Listings

Country	Agency	Scope of Accreditation	Logo
USA	**FCC**	3 & 10 meter Open Area Test Sites and one conducted site to perform FCC Part 15/18 measurements.	343818
KOREA	**KCC**	EMI (10 meter Open Area Test Site and two conducted sites) Radio(3 & 10 meter Open Area Test Sites and one conducted site)	KR100
Canada	**IC**	3 & 10 meter Open Area Test Sites and one conducted site	4769B-1

2.0 Summary of tests

FCC Part Section(s)	Parameter	Test Condition	Status (note 1)
90.205	Power Limit	Conducted	C
90.207	Type of Emission		C
2.1057	Transmitter Spurious Conducted Emission		C
90.210	Field Strength of Spurious Radiation	Radiated	C

Note 1: C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable

Note 2: The data in this test report are traceable to the national or international standards.

The sample was tested according to the following specification:

2.1 Technical Characteristic Test

2.1.1 Power Limit

90.205(h) 450–470 MHz:
The maximum allowable station effective radiated power(ERP) is dependent upon the station's antenna HAAT and required service area and will be authorized in accordance with table 2. (I.e. 2W for service area less than 3 km.)
Table 2-450-470 MHz-Maximum ERP/Reference HAAT for a Specific Service Area Radius

Service area radius (km)										
	3	8	13	16	24	32	40	48	64	80
Max. ERP(W)1	2	100	500	500	500	500	500	500	500	500
Up to reference HAAT (m)3	15	15	15	27	63	125	250	410	950	2700

1 Maximum ERP indicated provides for a 39 dBu signal strength at the edge of the service area per FCCReport R-6602, Fig. 29 (See Sec. 73.699, Fig. 10 b).
3 When the actual antenna HAAT is greater than the reference HAAT, the allowable ERP will be reducedin accordance with the following equation:
ERP allow = ERPmax X (HAATref / HAATactual)

Test Setup Layout

CONDUCTED OUTPUT POWER

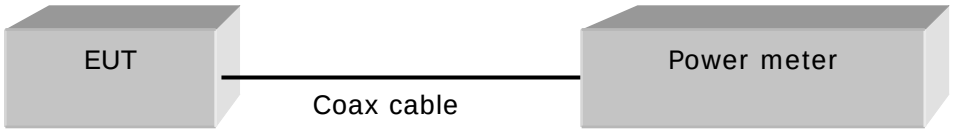


Figure 1 : Measurement setup for the carrier frequency seperation

Limit : 2Watts

Test Results

CONDUCTED OUTPUT POWER

Frequency (MHz)	Peak output power(dBm)	Peak output power(W)	Result
450.0250	32.40	1.740	Complies
460.0000	32.41	1.743	Complies
469.9975	32.37	1.726	Complies

2.1.2 Type of Emission

90.207(e):
For non-voice paging operations, only A1A, A1D, A2B, A2D, F1B, F1D,F2B, F2D, G1B, G1D, G2B, or G2D emissions will be authorized.

LTK-2000MI : F1D

This equipment is a non-voice only paging operations

This equipment does not have audio low pass filter

2.1003 (4) Type of Emission : 10K2F1D

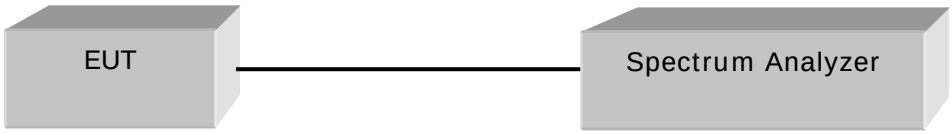
Bn =2M +2DK
M = 1200 bits per second
D = 4.5 KHz (Peak Deviation)
K = 1
Bn = 2(1200bps/2) + 2(4500) = 10.2k

2.1.3 Transmitter Spurious Conducted Emission

2.1057 Frequency spectrum to be investigated.
(a) In all of the measurements set forth in 2.1051 and 2.1053, the spectrum shall be investigated from the lowest radio frequency signal generated in the equipment, without going below 9 kHz, 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 40 GHz, whichever is lower.

The spectrum analyzer is set to:
Center frequency = the highest, middle, and the lowest channels
RBW = 100 kHz
VBW = 100 kHz (≥ RBW)
Span = 100 MHz
Trace = max hold
Detector function = peak
Sweep = auto

Test Setup Layout

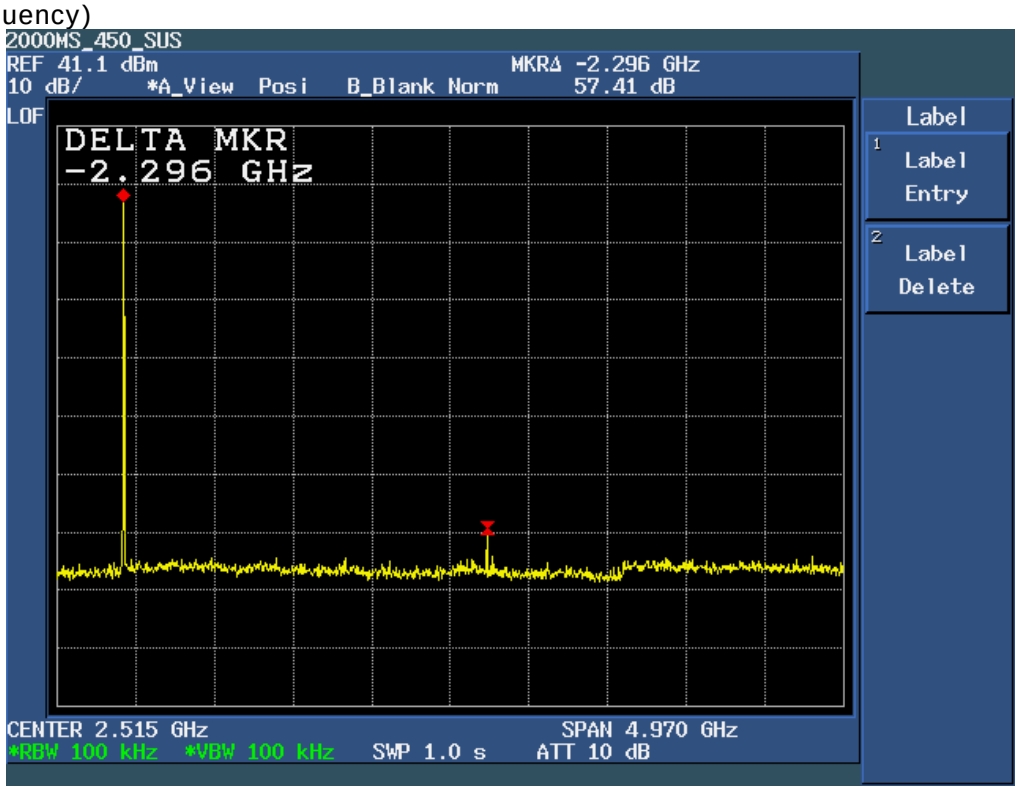


Limit

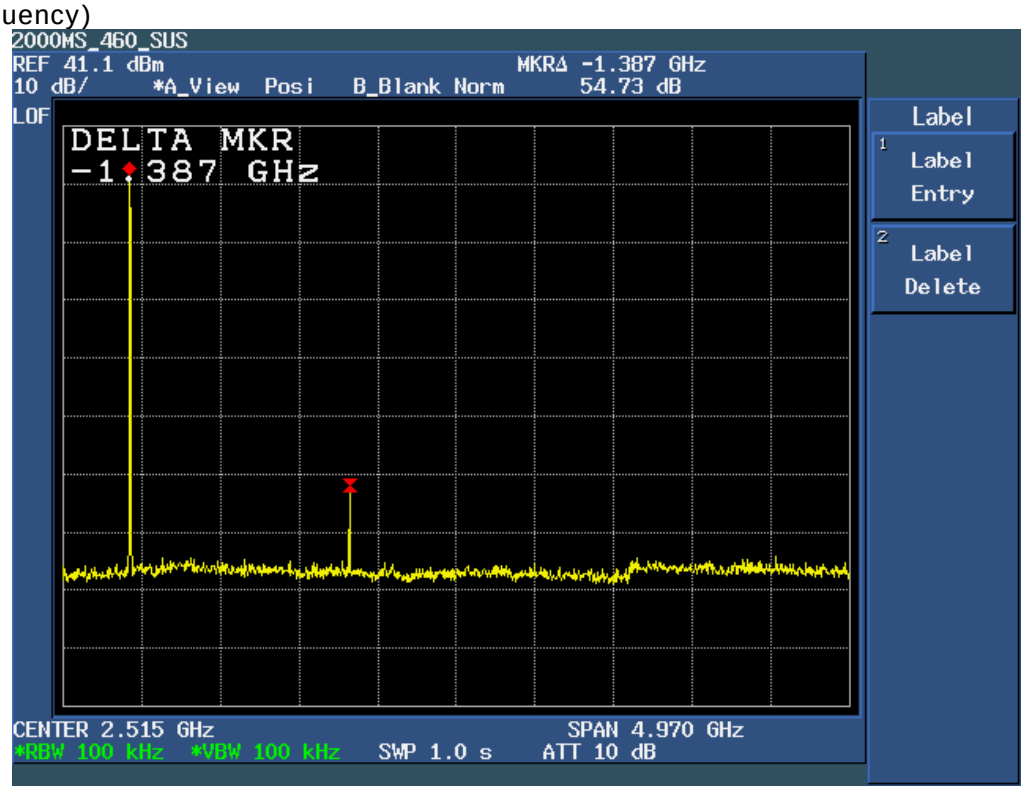
-13dBm

See next pages for actual measured spectrum plots.

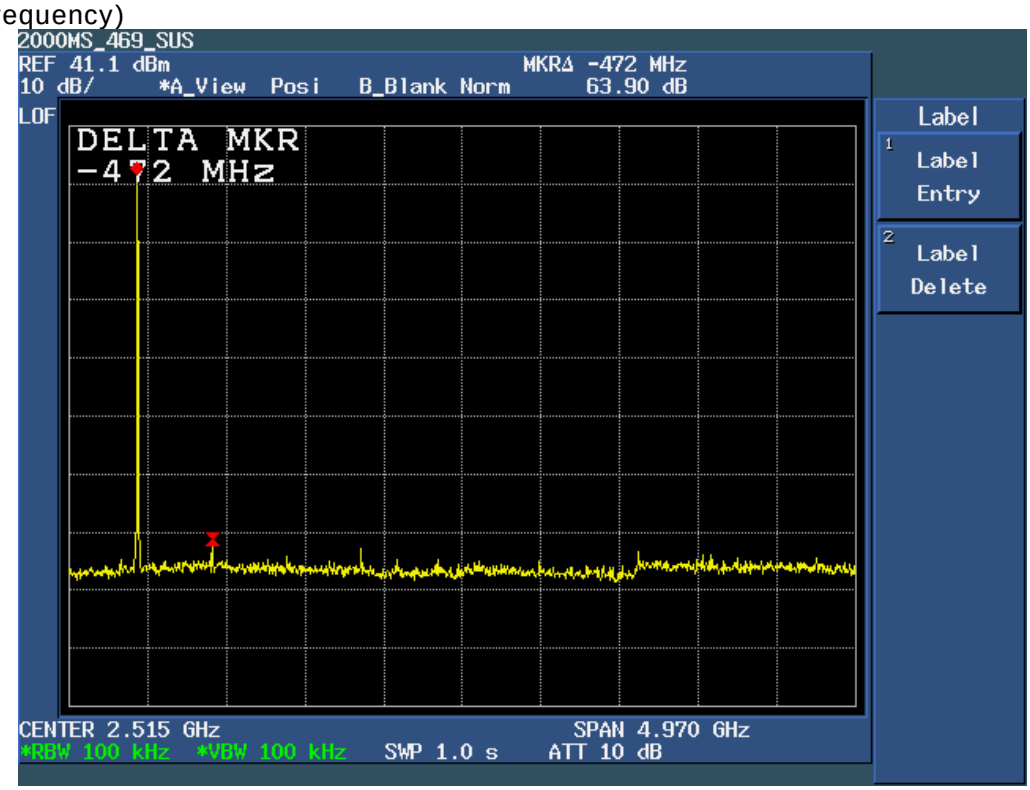
(Low Frequency)



(Mid Frequency)



(High Frequency)



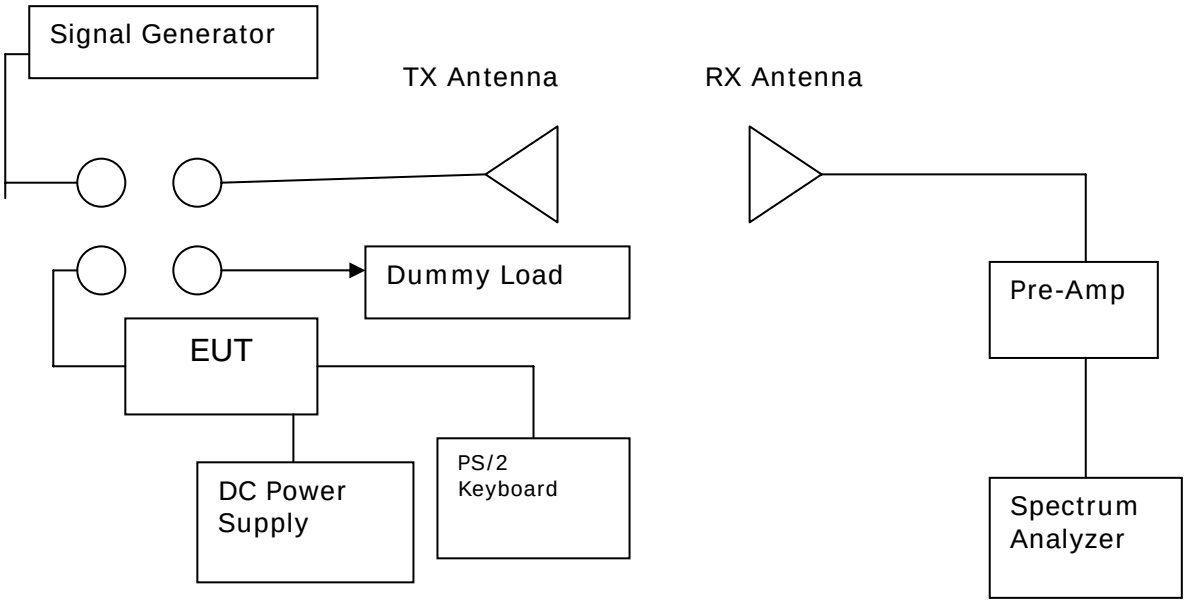
2.1.4 Field Strength of Spurious Radiation

REGULATIONS	: 2.1053 , 90.210
TEST METHOD/GUIDE	: ANSI/TIA-603-C

Test Procedure

1. Adjust the spectrum analyzer for the following Setting:
   a) WBW : 10kHz(<1GHz), 1MHz(>1GHz).
   b) VBW : 300kHz(<1GHz), 3MHz(>1GHz).
   C) Sweep Speed : 50mS
   d) Detector mode : Positive Peak
2. The transmitter was placed on a wooden turntable, and it was transmitting into non-radiation load which was also placed on the turntable.
3. The measurement antenna was placed at a distance of 3meters from the EUT. During test, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT The test was performed by placing the EUT on 3-orthogonal axis.
4. The frequency range up to tenth harmonic of the fundamental frequency was investigated.
5. Remove the EUT and replace it with substitution antenna A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Measuring Equipment Configuration



Test result : Low Frequency : **43 +10LOG(1.740)=45.41 dB**

Emission Frequency (MHz)	Spectrum Reading (dBm)	Generator Reading (dBm)	Ant. Polaritry	Antenna Gain (dBi)	Cable Loss (dB)	Result (dBm)	Margin (dBm)	Limit (dBm)
450.0250								
900.0500	-73.84	-38.2	H	6.80	2.74	-36.29	-23.29	-13.00
1350.0750	-83.58	-54.21	H	7.75	3.45	-52.06	-39.06	-13.00

Emission Frequency (MHz)	Spectrum Reading (dBm)	Generator Reading (dBm)	Ant. Polaritry	Antenna Gain (dBi)	Cable Loss (dB)	Result (dBm)	Margin (dBm)	Limit (dBm)
450.0250								
900.0500	-78.04	-49.52	V	6.80	2.74	-47.61	-34.61	-13.00
1350.0750	-83.41	-53.7	V	7.75	3.45	-51.55	-38.55	-13.00

Test result : mid Frequency : **43 +10LOG(1.743)= 45.41 dB**

Emission Frequency (MHz)	Spectrum Reading (dBm)	Generator Reading (dBm)	Ant. Polaritry	Antenna Gain (dBi)	Cable Loss (dB)	Result (dBm)	Margin (dBm)	Limit (dBm)
460.0000								
920.0000	-69.62	-35	H	6.80	2.69	-33.04	-20.04	-13.00
1380.0000	-83.01	-51.2	H	7.60	3.74	-49.49	-36.49	-13.00
1840.0000	-77.94	-43.3	H	8.00	4.40	-41.85	-28.85	-13.00

Emission Frequency (MHz)	Spectrum Reading (dBm)	Generator Reading (dBm)	Ant. Polaritry	Antenna Gain (dBi)	Cable Loss (dB)	Result (dBm)	Margin (dBm)	Limit (dBm)
460.0000								
920.0000	-74.43	-46.12	V	6.80	2.69	-44.16	-31.16	-13.00
1380.0000	-72.84	-41.22	V	7.60	3.74	-39.51	-26.51	-13.00
1840.0000	-69.88	-41.13	V	8.00	4.40	-39.68	-26.68	-13.00

Test result : High Frequency : **43 +10LOG(1.726)=45.37 dB**

Emission Frequency (MHz)	Spectrum Reading (dBm)	Generator Reading (dBm)	Ant. Polaritry	Antenna Gain (dBi)	Cable Loss (dB)	Result (dBm)	Margin (dBm)	Limit (dBm)
469.9975								
939.9995	-73.34	-40.5	H	6.90	2.77	-38.52	-25.52	-13.00
1410.0015	-80.89	-50.92	H	7.70	3.71	-49.08	-36.08	-13.00

Emission Frequency (MHz)	Spectrum Reading (dBm)	Generator Reading (dBm)	Ant. Polaritry	Antenna Gain (dBi)	Cable Loss (dB)	Result (dBm)	Margin (dBm)	Limit (dBm)
469.9975								
939.9995	-75.78	-46.32	V	6.90	2.77	-44.34	-31.34	-13.00
1410.0015	-82.87	-50.24	V	7.70	3.71	-48.40	-35.40	-13.00

APPENDIX A – Test Equipment Used For Tests

No	Description	Manufacturer	Model No.	Serial No.	Due Cal.
1	Test Receiver	Rohde & Schwarz	ESHS 10	862970/018	2010.06.11
2	Test Receiver	Rohde & Schwarz	ESVS 10	826008/014	2010.05.20
3	Spectrum Analyzer	Hewlett Packard	8566B	2311A02394	2010.05.15
4	Spectrum Analyzer	Rohde & Schwarz	FSP13	100130	2010.05.15
5	Modulation Analyzer	Hewlett Packard	8901B	3438A05094	2010.05.15
6	Audio analyzer	Hewlett Packard	8903B	3011A12915	2010.05.15
7	Preamplifer	Hewlett Packard	8447F	2805A02570	2010.05.15
8	Preamplifer	A.H. Systems	PAM-0118	164	2010.04.17
9	Signal Generator	Hewlett Packard	8673D	2708A00448	2010.05.15
10	Power Meter	Hewlett Packard	437B	312U24787	2010.04.21
11	Power Sensor	Hewlett Packard	8482B	3318A06943	2010.05.15
12	Digital Multi Meter	Tektronix	DMM916	138401	2010.05.15
13	Loop Antenna	Rohde & Schwarz	HFH2-Z2.335.4711.52	826532/006	2011.02.06
14	Dipole Antenna	Rohde & Schwarz	VHAP	574	2010.07.07
15	Dipole Antenna	Rohde & Schwarz	VHAP	575	2010.07.17
16	Dipole Antenna	Rohde & Schwarz	UHAP	545	2010.07.17
17	Dipole Antenna	Rohde & Schwarz	UHAP	546	2010.07.07
18	Biconical Antenna	Eaton Corp.	94455-1	0977	2010.07.03
19	Biconical Antenna	EMCO	3104C	9111-2468	2010.07.03
20	Log Periodic Antenna	EMCO	3146	2051	2010.06.05
21	Log Periodic Antenna	EMCO	3146	8901-2320	2010.07.03
22	Horn Antenna	A.H. Systems	SAS-571	414	2011.03.16
23	Trilog-Broadband Antenna	SCHWARZBECK	VULB 9168	9168-350	2011.03.27
24	LISN	EMCO	3810/2	2228	2010.05.15
25	Waveform Generator	Hewlett Packard	33120A	US34001190	2010.05.15
26	Digital Oscilloscope	Tektronix	TDS 340A	B012287	2010.05.15
27	Dummy Load	Bird Electronics	8251	11511	2010.04.17