

# CERTIFICATION TEST REPORT

## FCC CFR47 Part 15 Subpart C

Test Report File No.	13-IST-0657	<input checked="" type="checkbox"/> Basic	<input type="checkbox"/> Alternate
Date of Receipt	August 06, 2013	Begin of test date	August 19, 2013
Date of Issue	September 13, 2013	End of test date	September 13, 2013
Kind of Product	Biometrics Fingerprint Reader		
Model(s)	KJ-3500		
FCC ID	PVRKJ-3500		
Applicant	KJ TECH Co., Ltd.		
Address	(Hogye-dong, HOGYEDONG, 3 <sup>RD</sup> FLOOR) 88-6, Anyangcheondong-ro Dong-an-gu Anyang-si, Gyeonggi-do, Korea		
Manufacturer	KJ TECH Co., Ltd.		
Address	(Hogye-dong, HOGYEDONG, 3 <sup>RD</sup> FLOOR) 88-6, Anyangcheondong-ro Dong-an-gu Anyang-si, Gyeonggi-do, Korea		

### Test Result

Positive

Negative

Tested By



B.O. KO.

Reviewed By



S.J. CHO

### Comment(s)

- Investigations requested : Measurement to the relevant clauses of FCC rules and regulations Part 15 Subpart C.
- The test report is consists of 18 pages.
- The test result only responds to the tested sample.
- It is not allowed to copy this report even partly without the allowance of IST Co., Ltd.
- This equipment as for has been shown to be capable of continued compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4
- I assume full responsibility for accuracy and completeness of these data.



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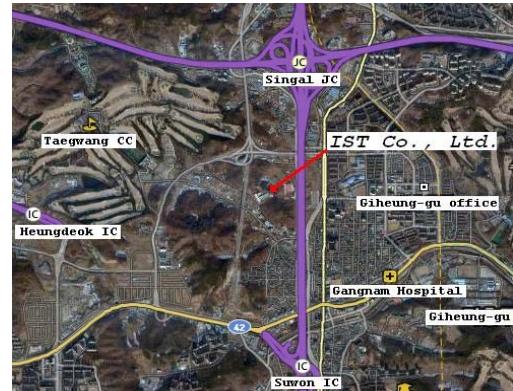
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Note:

## INFORMATIONS OF TEST LABORATORY

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 Gyeonggi-do, 446-599, Korea  
 TEL : +82 31 326 6700 FAX : +82 31 326 6797

**KOLAS Testing No. : 118**  
**RRA Designation No. : KR0018**  
**FCC Registration No. : 400603**  
**VCCI Member No. : 1739**



## Product Information

### Portable Music Player

CPU	32bit CPU
Display	2.8" TFT Color LCD
Sensor	500 dpi Optical sensor Multi Spectra image sensor (option)
RF Reader	13.56 MHz
Communication type	TCP/IP, RS-485
External Interface	Wiegand, USB Memory Card
Fingerprint Capacity	2K, 5K, 10K, 30K 50K
FAR / FRR	0.00001 / 0.1(%)
Event log	Maximum 500,000 events
Operation Mode	Password/Fingerprint/card mixture
Inputs & Outputs	4In / 2Out
Power	12V DC 500mA
Product size	150(H) x 148(W) x 42(D)mm
Certification	CE, FCC Certified
Other	Firmware upgrade available Error search function available

**Note:** All the testing were performed according to the procedures in  
**FCC CFR47 PART 15 SUBPART C**

## Measurement Uncertainty Calculations

The measurement uncertainties stated were calculated in accordance with the requirements of NIST Technical Note 1297 and NIS 81 (1994).

TYPE	Contribution	Probability Distribution	Uncertainty	Remark
B	<b>AMN</b> Impedance Voltage Division Factor Attenuation : AMN to Receiver	Triangular normal(k=2) normal(k=2)	+2.6/-2.7 dB ±0.2 ±0.1	CISPR
	<b>Receiver(ESCI(S/N:100374))</b> Sine-Wave Voltage Accuracy Pulse Amplitude Response Pulse Repetition Rate Response	normal(k=2) Rectangular Rectangular	±1.0 dB ±1.5 dB ±1.5 dB	CISPR
	Mismatch AMN to Receiver	U-Shaped	+0.7/-0.8 dB	CISPR
	Reading	normal(k=1)	±0.1	
	Combined Standard Uncertainty	normal	<b>± 1.8 dB</b>	
	Expanded Uncertainty U	normal(k=2)	<b>± 3.6 dB</b>	<b>95 %</b>

$$U = -3.70 / +3.42 \text{ (k=2, 95.45% confidence level)}$$

TYPE	Contribution	Probability Distribution	Uncertainty	Remark
B	<b>Antenna</b> AF factor AF frequency interpolation AF height deviations directivity difference phase center location(3 m) phase center location(10 m)	Normal(k=2) Rectangular Rectangular Rectangular Rectangular	±0.56 ±0.30 dB ±0.50 dB ±0.30 dB +1.0/-0.0 dB ±1.0 dB ±0.30 dB	CAL. CISPR CISPR CISPR CISPR
	<b>Receiver</b> Sine Wave Voltage Accuracy Pulse Amplitude Sensibility Pulse Frequency Response Random Noise	Normal(k=2) Normal(k=2) Normal(k=2) Normal(k=2)	±0.20 dB ±0.40 dB ±0.57 dB ±0.35 dB	CAL. CAL. CAL. CAL.
	Mismatch : Antenna - receiver	U-Shaped	+0.9/-1.0 dB	CISPR
	Table height	Normal(k=2)	±0.01 dB	CISPR
	Separation distance(3 m ) Separation distance(10 m )	Rectangular	±0.30 dB ±0.10 dB	CISPR
	Combined standard Uncertainty	Normal	<b>± 1.13</b>	
	Expanded Uncertainty U	Normal(k=2)	<b>± 2.26 dB</b>	<b>95 %</b>

$$U = ±2.26 \text{ (k=2, 95% confidence level)}$$

## Equipment Under Test

### EUT Type :

- Table-Top.
- Floor-Standing.
- Table-Top and Floor-Standing (Combination).
- Built-in

### Operation - mode of the E.U.T. : RFID Active mode

The equipment under test was operated during the measurement under following conditions :

- Standby Mode
- Operational Condition : RFID Active mode

## SUMMARY

### Test Descriptions

■ <b>Conducted Emission</b>	PASS
- <b>Conducted Emission Result</b>	
■ <b>Radiated Emission-15.225(a)</b>	PASS
- <b>Radiated Emission Result</b>	
■ <b>Radiated Electric Field Emission-15.225(b)(c)</b>	PASS
- <b>Test result</b>	
■ <b>Radiated Electric Field Emission-15.209, 15.225(d)</b>	PASS
- <b>Test result</b>	
■ <b>Frequency Stability -15.225(e)</b>	PASS
<b>Test Result</b>	

### Note :

- ■ means that the test is applicable,
- □ means that the test is not applicable.

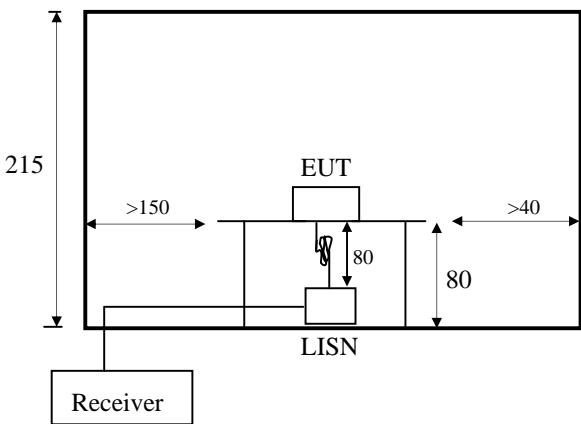
## Description of Test

### Conducted Emissions:

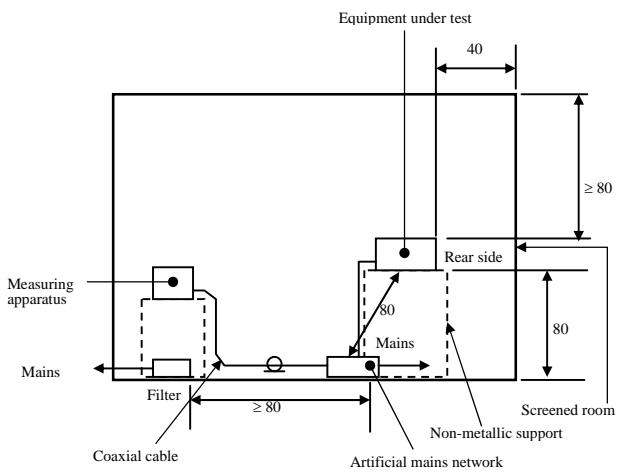
The measurement were performed over the frequency range of 0.15 MHz to 30 MHz using a  $50 \Omega/50 \mu\text{H}$  LISN as the input transducer to a Spectrum Analyzer or a Field Intensity Meter. The measurements were made with the detector set for "Peak" amplitude within a bandwidth of 10 kHz or for "quasi-peak" & "Average" within a bandwidth of 9 KHz.

#### - Procedure of Test

The line-conducted facility is located inside a shielded room No.1. A 1 m X 1.5 m wooden table 80 cm height is placed 40 cm away from the vertical wall and 1.5 m away from the other wall of the shielded room. The R/S ESCI and Hyup-Rip KNW-407 LISN are bonded to bottom of the shielded room. The EUT is located on the wooden table with distance more than 80 cm from the LISN and powered from the EMCO LISN. The peripheral equipment is powered from the other LISN. Power to the LISNs are filtered by a noise cut power line filters. All electrical cables are shielded by braided tinned steel tubing with inner  $\phi$  1.2 cm. If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and this supply lines will be connected to the EMCO LISN. All interconnecting cables more than 1m were shortened by non-inductive bundling to a 1m length. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating conditions. The RF output of the LISN was connected to the R/S receiver to determine the frequency producing the maximum emission from the EUT. The frequency producing the maximum level was reexamined using Quasi-Peak mode by manual measurement, after scanned by automatic Peak mode for frequency range from 0.15 to 30 MHz. The bandwidth of the receiver was set to 10 kHz. The EUT, peripheral equipment, and interconnecting cables were arranged and manipulated to maximize each EME emission.



< Side View >



< Concept Drawing >

### Conducted Emissions

#### **[Applicable]**

#### ◆ Test Equipment Used

Model Name	Description	Manufacturer	Calibration Date	Serial No.
ESCI	Test Receiver	Rohde & Schwarz	Jul. 16, 2013	100373
ESH2-Z5	LISN	Rohde & Schwarz	Oct. 10, 2012	842966/014
ESH3-Z2	Pulse Limiter	Rohde & Schwarz	May. 10, 2013	357.8810.52

#### ◆ Test Accessories Used

Type	Manufacturer
Aneroid Barometer	Sato
Hygrometer	Sato

#### ◆ Environmental Conditions

Temperature (25.8 ± 0.2) °C

Humidity (44.1 ± 0.2) % R.H.

Atmosphere pressure 1 004 hPa

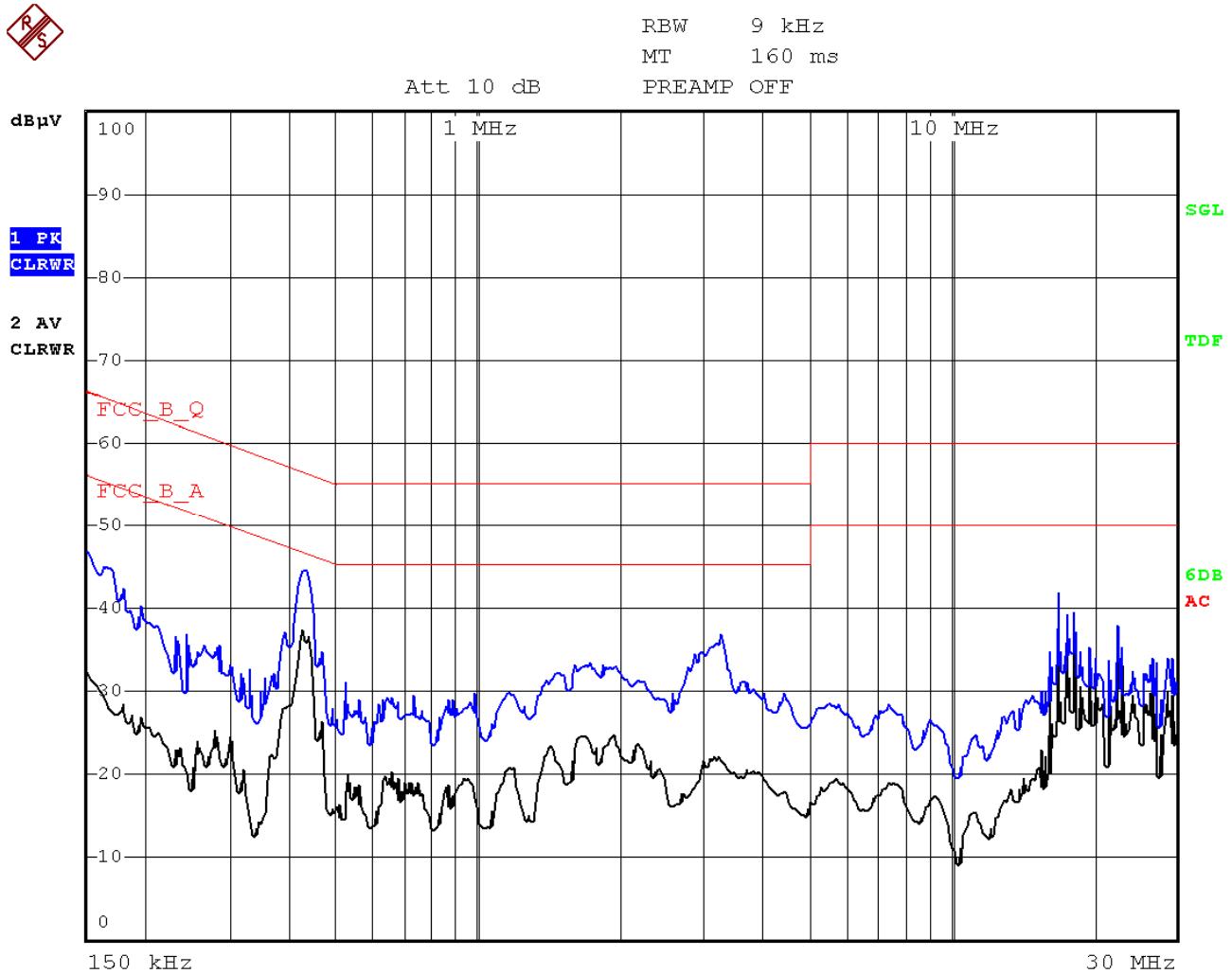
◆ Test Date September. 13, 2013

◆ Test Area Conducted Room #1

*Note : The equipment used is calibrated in regular for every year.*

Conducted Emissions

Live



Model Name: KJ-3500 120Vac 60Hz Live

Freq. [MHz]	Measurement [dB $\mu$ V]		Limit [dB $\mu$ V]		Insertion Loss [dB]	Cable Loss [dB]	Result [dB $\mu$ V]		Margin [dB]	
	Q-peak	Average	Q-peak	Average			Q-peak	Average	Q-peak	Average
0.150	43.45	30.98	66.00	56.00	0.10	0.03	43.58	31.11	22.42	24.89
0.282	30.35	23.26	60.76	50.76	0.10	0.03	30.48	23.39	30.28	27.37
0.430	43.87	36.63	57.25	47.25	0.11	0.04	44.03	36.79	13.23	10.47
3.274	31.70	21.02	56.00	46.00	0.20	0.08	31.97	21.29	24.03	24.71
16.930	40.62	40.27	60.00	50.00	0.59	0.16	41.37	41.02	18.63	8.98
22.502	36.48	36.35	60.00	50.00	0.52	0.19	37.18	37.05	22.82	12.95

Note :

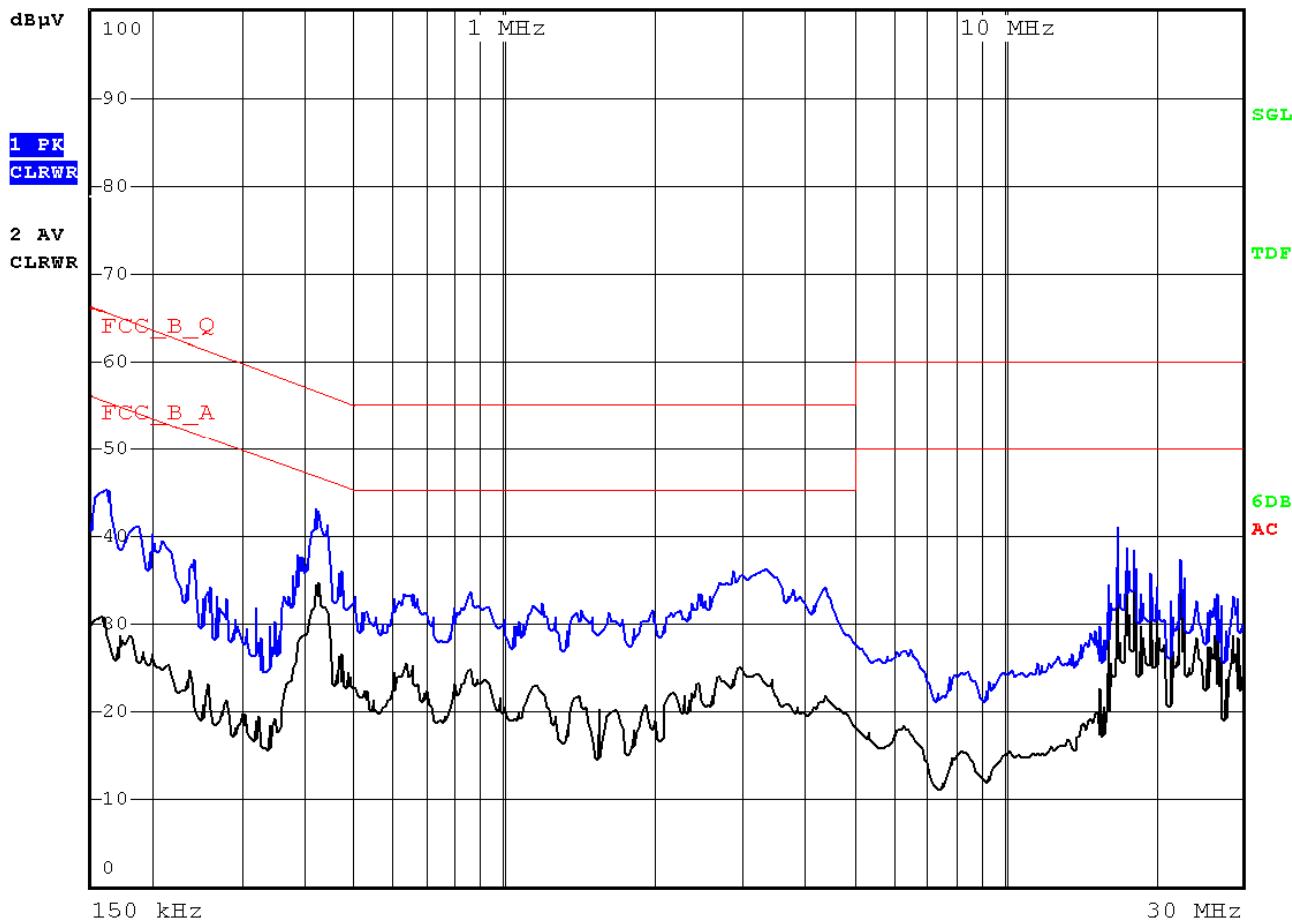
Conducted Emissions

Neutral



Att 10 dB

RBW 9 kHz  
MT 160 ms  
PREAMP OFF



Model Name: KJ-3500 120Vac 60Hz Neutral

Freq. [MHz]	Measurement [dB $\mu$ N]		Limit [dB $\mu$ N]		Insertion Loss [dB]	Cable Loss [dB]	Result [dB $\mu$ N]		Margin [dB]	
	Q-peak	Average	Q-peak	Average			Q-peak	Average	Q-peak	Average
0.158	42.44	31.28	65.57	55.57	0.11	0.03	42.58	31.42	22.99	24.15
0.422	42.38	35.89	57.41	47.41	0.12	0.05	42.55	36.06	14.86	11.35
0.442	39.54	33.26	57.02	47.02	0.12	0.04	39.71	33.43	17.32	13.60
3.342	31.98	23.01	56.00	46.00	0.22	0.08	32.28	23.31	23.72	22.69
16.930	40.41	39.80	60.00	50.00	0.69	0.16	41.26	40.65	18.74	9.35
22.502	35.94	35.46	60.00	50.00	0.55	0.19	36.68	36.20	23.32	13.80

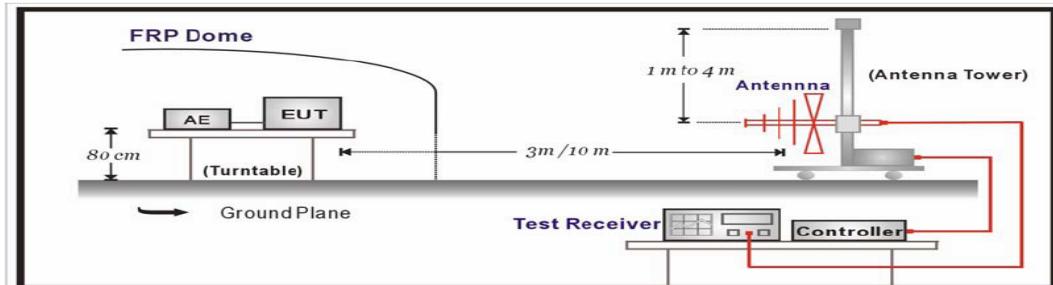
Note :

## **Radiated Emissions:**

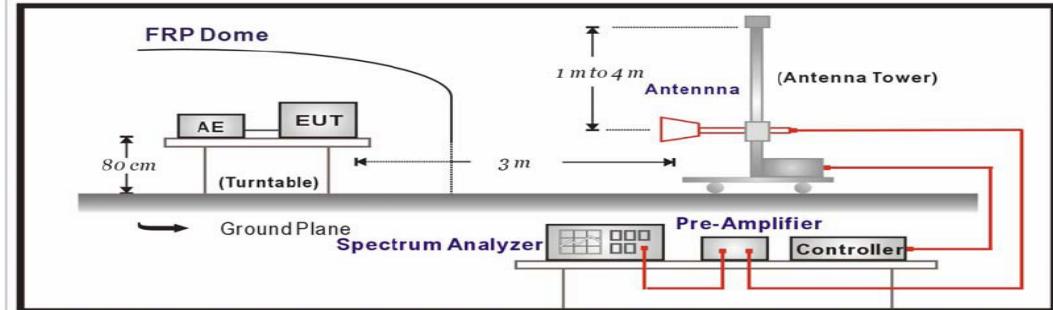
The measurement was performed over the frequency range of 30MHz to 1GHz using antenna as the input transducer to a Spectrum analyzer or a Field Intensity Meter. The measurement was made with the detector set for "quasi-peak" within a bandwidth of 120kHz. Procedure of Test

Preliminary measurements were made at 3 meter using bi-log antennas, and spectrum analyzer to determine the frequency producing the max. emission in anechoic chamber. Appropriate precaution was taken to ensure that all emission from the EUT were maximized and investigated. The system configuration, mode of operation, turn-table azimuth and height with respect to the antenna were noted for each frequency found. The spectrum was scanned from 30MHz to 1000MHz using bi-log antenna. Above 1GHz, linearly polarized double ridge horn antennas were used. Final measurements were made at open site with 3-meters test distance using bi-log antenna or horn antenna. The OATS have been verified in regular for its normalized site attenuation. The test equipment was placed on a wooden table. Sufficient time for the EUT, peripheral equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. Each frequency found during pre-scan measurements was re-examined by manual. The detector function was set to CISPR quasi-peak mode and the bandwidth of the receiver was set to 120kHz or 1MHz depending on the frequency of type of signal. The EUT, peripheral equipment and interconnecting cables were re-configured to the set-up producing the max. emission for the frequency and were placed on top of a 0.8-meter high nonmetallic 1 x 1.5 meter table. The EUT, peripheral equipment, and interconnecting cables were re-arranged and manipulated to maximize each emission. The turntable containing the system was rotated; the antenna height was varied 1 to 4 meters and stopped at the azimuth or height producing the maximum emission. Each emission was maximized by: varying the mode of operation to the EUT and/or peripheral equipment and changing the polarity of the antenna, whichever determined the worst-case emission. (The bandwidth below 1GHz setting on the field strength meter is 120KHz and above 1GHz is 1MHz.)

### **Under 1GHz Test Setup:**



### **Above 1GHz Test Setup:**



### **Radiated Emissions Test, 9 kHz to 30 MHz (Magnetic Field Test)**

1. The preliminary radiated measurements were performed to determine the frequency producing the maximum emissions at a distance of 3 meters according to Section 15.31(f)(2).
2. The EUT was placed on the top of the 0.8-meter height, 1 x 1.5 meter non-metallic table.
3. Emissions from the EUT are maximized by adjusting the orientation of the Loop antenna and rotating the EUT on the turntable. Manipulating the system cables also maximizes EUT emissions if applicable.
4. To obtain the final measurement data, each frequency found during preliminary measurements was re-examined and investigated. The test-receiver system was set up to average, peak, and quasi-peak detector with specified bandwidth.

### Radiated Spurious Emission

[Applicable]

◆ Test Equipment Used

Name	Type	Manufacturer	Calibration. Date	Serial Number
ESCS30	EMI Receiver	Rohde & Schwarz	May. 10, 2013	100171
SPECTRUM ANALYZER	R3273	ADVANTEST	May 09, 2013	110600587
Loop Antenna	HFH2-Z2	Rohde & Schwarz	Oct. 26, 2012	8620771017
Log-bicon Antenna	VULB9161SE	Schwarz beck	Mar. 28, 2012	3047

*Note : 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to RRA, KRISS, KTL and HCT.  
 2. The calibration interval of horn ant, and loop ant. is 24 months*

#### Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. For the limit is employed average value, therefore the peak value can be transferred to average value by subtracting the duty factor. The basic equation with a sample calculation is as follows:

$$\text{Peak} = \text{Reading} + \text{Corrected Factor}$$

Where

$$\text{Corr. Factor} = \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain (if any)}$$

#### Limit

Emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209 as following:

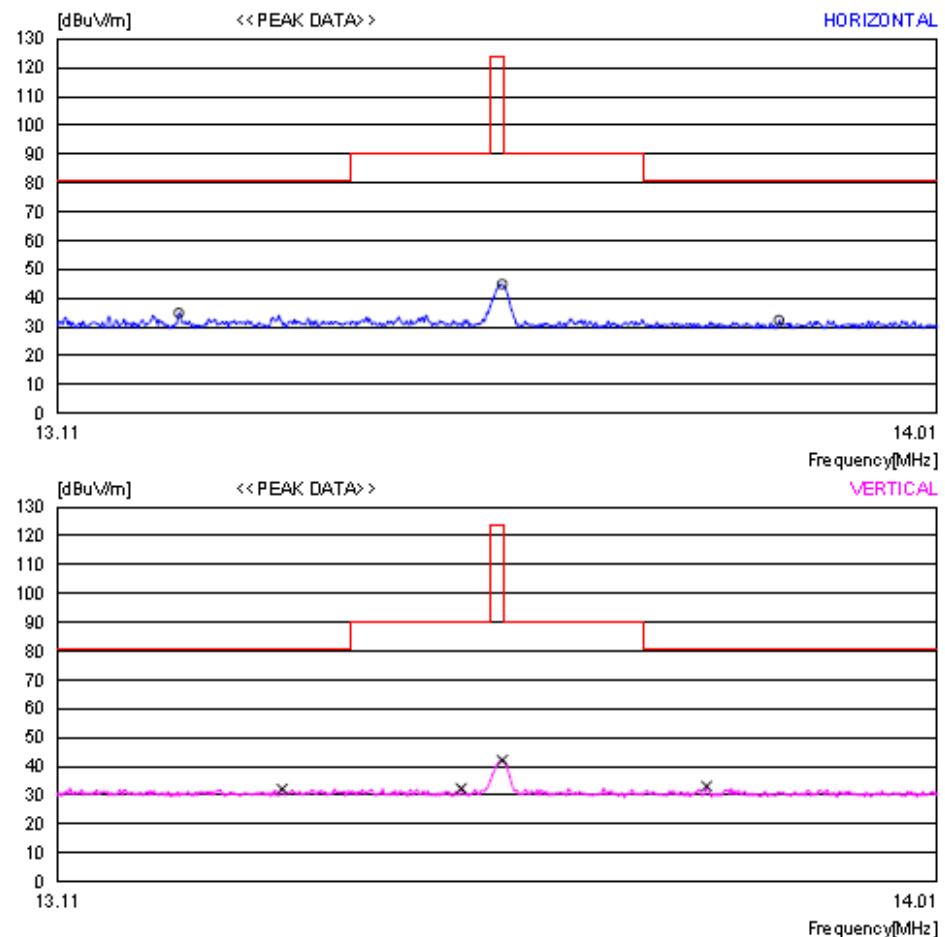
Frequencies(MHz)	Field Strength(microvolt/meter)	Measurement Distance(meter)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.750	24000/F(kHz)	30
1.750 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~960	200	3
Above 960	500	3

Radiated Field Emission-15.225(a)

Frequency(MHz)	Field Strength of Fundamental uv/m	Field Strength of Fundamental dBuV/m(30m)	Field Strength of Fundamental dBuV/m(3m)
13.553 – 13.567	15,848	83.9	123.9

[Applicable]

Freq. [MHz]	Reading [dBuV]	Height [m]	Antenna Factor [dB/m]	Cable Loss [dB]	Polar. [H/V]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]
13.5612	21.7	1	22.7	0.4	H	44.8	123.9	79.1
13.5612	19.0	1	22.7	0.4	V	42.1	123.9	81.8



Note :

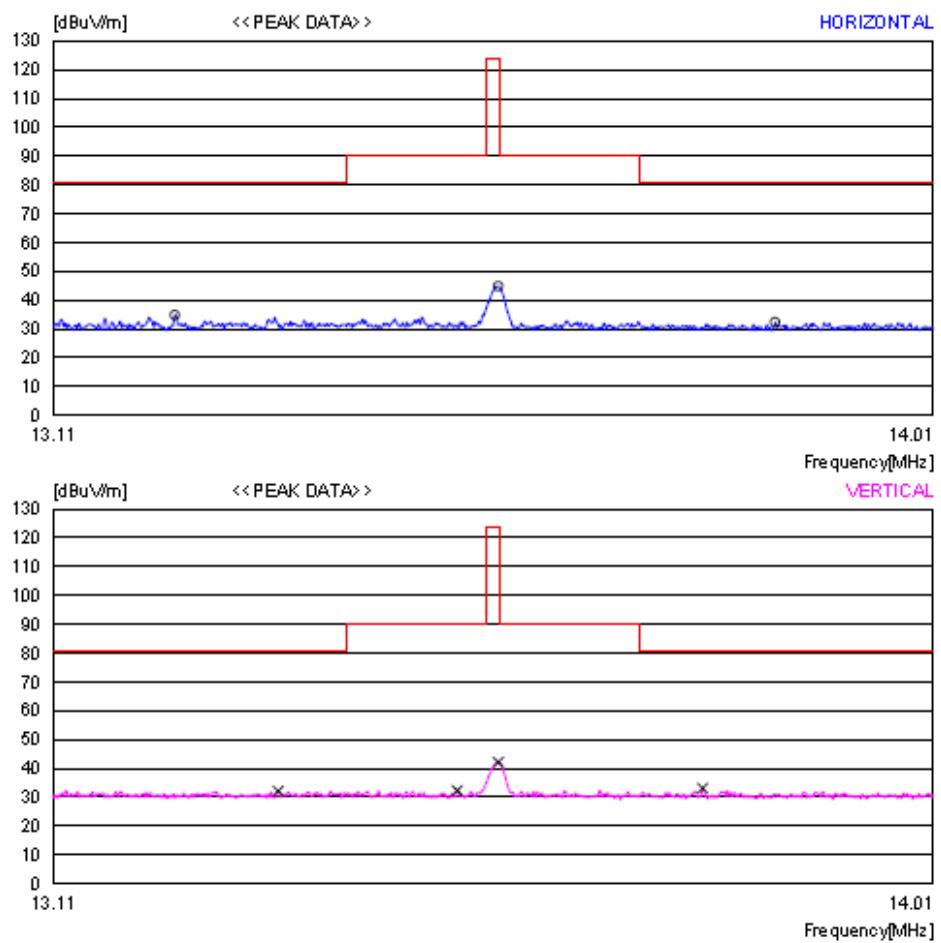
Radiated Electric Field Emission-15.225(b)(c)

Frequency (MHz)	Field Strength of Fundamental uV/m	Field Strength of Fundamental dBuV/m(30m)	Field Strength of Fundamental dBuV/m(3m)
13.110 - 13.410	106	40.5	80.5
13.410 - 13.553	334	50.4	90.4
13.567 - 13.710	334	50.4	90.4
13.710 - 14.010	106	40.5	80.5

[Applicable]

Freq. [MHz]	Reading [dBuV]	Height [m]	Antenna Factor [dB/m]	Cable Loss [dB]	Polar. [H/V]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]
-	-	-	-	-	-	-	-	-

Note : Other emission don't exceed the level 20dB below the applicable limit.



**Radiated Electric Field Emission-15.209, 15.225(d)**

Frequencies(MHz)	Field Strength(microvolt/meter)	Measurement Distance(meter)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.750	24000/F(kHz)	30
1.750 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~960	200	3
Above 960	500	3

**[Applicable]**

Freq. [MHz]	Reading [dBuV]	Antenna Factor [dB/m]	Cable Loss [dB]	Polar. [H/V]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]
27.130	10.40	23.6	0.7	H	34.70	69.50	-34.80
50.450	12.20	12.16	1.21	V	25.57	40.00	-14.43
140.710	10.60	12.61	1.97	H	25.18	43.50	-18.32
186.170	10.90	10.98	2.29	H	24.17	43.50	-19.33
285.050	16.60	12.42	2.84	H	31.86	46.00	-14.14
354.950	14.80	14.30	3.14	H	32.24	46.00	-13.76
431.580	13.20	16.13	3.48	V	32.81	46.00	-13.19
507.240	11.60	17.69	3.86	H	33.15	46.00	-12.85
609.080	8.80	19.45	4.40	V	32.65	46.00	-13.35

\*note : Measurement at 27.130 MHz is tested with a loop Antenna.

### Frequency Stability -15.225(e)

◆ Test Equipment Used

Name	Type	Manufacturer	Calibration. Date	Serial Number
R3273	SPECTRUM ANALYZER	ADVANTEST	May 09, 2013	110600587
HY-LTH2	Temp&Humi Chamber	Hanyoung STE	May 10, 2013	A33-080910

The frequency tolerance of the carrier signal shall be maintained within  $\pm 0.01\%$  of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery

**[Applicable]**

Table 1 : Frequency Tolerance

Reference Frequency : 13.5612 MHz, Limit : within  $\pm 1356.12$  Hz

Environment Temperature [°C]	Power Supplied [Vdc]	Carrier Frequency Measured with Time Elapsed							
		STARTUP		2 minutes		5 minutes		10 minutes	
		[MHz]	Err[Hz]	[MHz]	Err[Hz]	[MHz]	Err[Hz]	[MHz]	Err[Hz]
-20	12	13.561240	40	13.561235	35	13.561232	32	13.561227	27
-10	12	13.561233	33	13.561231	31	13.561228	28	13.561226	26
0	12	13.561226	26	13.561221	21	13.561212	12	13.561198	-2
10	12	13.561192	-8	13.561188	-12	13.561181	-19	13.561172	-28
20	12	13.561185	-15	13.561183	-17	13.561180	-20	13.561174	-26
30	12	13.561160	-40	13.561152	-48	13.561145	-55	13.561135	-65
40	12	13.561156	-44	13.561146	-54	13.561137	-63	13.561128	-72
50	12	13.561154	-46	13.561147	-53	13.561140	-60	13.561136	-64

Table 2 : Frequency Tolerance

Reference Frequency : 13.5612 MHz, Limit : within  $\pm 1356.12$  Hz

Power Supplied [Vdc]	Carrier Frequency Measured with Time Elapsed							
	STARTUP		2 minutes		5 minutes		10 minutes	
	[MHz]	Err[Hz]	[MHz]	Err[Hz]	[MHz]	Err[Hz]	[MHz]	Err[Hz]
85%	13.561179	-21	13.561175	-25	13.561168	-32	13.561160	-40
100%	13.561185	-15	13.561183	-17	13.561180	-20	13.561178	-22
115%	13.561182	-18	13.561180	-20	13.561178	-22	13.561175	-25

**Err[Hz] = Measured carrier frequency (MHz) – Reference Frequency (13.5612 MHz)**

### Antenna requirements

#### **According to FCC 47 CFR 15.203**

“an intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached or an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section”

\* the antenna of this EUT are permanently attached(PCB Loop Antenna).

\* the EUT complies with the requirement of 15.203