



HCT CO., LTD.

PRODUCT COMPLIANCE DIVISION
SAN 136-1, AMI-RI, BUBAL-EUP, ICHEON-SI, KYOUNGKI-DO, 467-701, KOREA
TEL : +82 31 639 8539 FAX : +82 31 639 8525 www.hct.co.kr

EMI VERIFICATION REPORT

Applicant:
JUNI KOREA
E603 Bundang Techno Park 151 Yatap-Dong
Bundang-Gu Seongnam-Si Gyeonggi-Do, Korea

Date of Issue: March 17, 2011
Test Report No.: HCTE1103FE05-1
Test Site: HCT CO., LTD.
HCT FRN: 0005-8664-21

MODEL:

JL-20

Rule Part(s) / Standard(s) : FCC PART 15 Subpart B Class A
Equipment Type : LTE 700M RF Repeater
Trade Name : JUNI KOREA
Port / Connector(s) : AC, DC IN Port / LAN1, 2 Port / Donor, Service Port

The device bearing the trade name and model specified above, has been shown to comply with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4-2003. (See Test Report if any modifications were made for compliance)

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Report prepared by
: Kyung Hee Yoon
Test Engineer of EMC Team

Approved by
: Sang Jun Lee
Manager of EMC Team

TABLE OF CONTENTS

	PAGE
1. GENERAL INFORMATION	
1.1 Product description	3
1.2 Related submittal(s)/Grant(s)	3
1.3 Tested system details	4
1.4 Cable description	5
1.5 Noise suppression parts on cable. (I/O cable)	5
1.6 Test methodology	6
1.7 Test facility	6
1.8 Frequency Range of Radiated Measurements	6
2. SYSTEM TEST CONFIGURATION	
2.1 Conducted Emission test	7
2.2 Radiated Emission test	7
3. PRELIMINARY TEST	
3.1 Conducted Emission test	8
3.2 Radiated Emission test	8
4. CONDUCTED AND RADIATED EMISSION TESTS SUMMARY	
4.1 Conducted Emission test	10
4.2 Radiated Emission test	15
4.3 Test setup photos	17
5. FIELD STRENGTH CALCULATION	19
6. TEST EQUIPMENT	20
7. CONCLUSION	21

1. GENERAL INFORMATION

1.1 Product Description

Equipment Under Test (E.U.T) is **LTE 700M RF Repeater, Model: JL-20** manufactured by **JUNI KOREA**. Its basic purpose is used for communications.

Model (s)	JL-20
E.U.T Type	LTE 700M RF Repeater
UL Frequency	777.0 MHz to 787.0 MHz 698.5 MHz to 703.5 MHz 704.5 MHz to 709.5 MHz
DL Frequency	746.0 MHz to 756.0 MHz 728.5 MHz to 733.5 MHz 734.5 MHz to 739.5 MHz

1.2 Related Submittal(s) / Grant(s)

Original submittal only.

1.3 Tested System Details

All equipment descriptions used in the tested system (including inserted cards) are:

Device Type	Manufacturer	Model Number/ Serial Number	FCC ID / DoC	Connected To
LTE 700M RF Repeater	JUNI KOREA	JL-20	-	E.U.T
Switching adaptor	BT Telecom	DSA-60W-121 BT805C000098	-	E.U.T
Notebook PC	SAMSUNG	NT-R519 ZLA693AS900033M	DoC	E.U.T
Notebook PC adaptor	DELTA	ADP-60ZH D AD-6019R DA44-00242A	-	Notebook PC
Notebook PC	H.P	Compaq 6730b CNU9082TXV	-	Router
Notebook PC adaptor	H.P	Series PPP014H-S F3-08090296490E	-	Notebook PC
Mouse	Microsoft	Intellimouse optical USB and PS/2 compatible 3902B008	DoC	Notebook PC
Router	SDT	WLB5054AIP 615061401854	-	Notebook PC
250 W Louder	Weinschel	1433-3 MJ716	-	E.U.T

1.4 Cable Description

Product Name	Port	Power Cord Shielded (Y/N)	I/O Cable Shielded (Y/N)	Length (m)
LTE 700M RF Repeater	DC in	N	-	(P)3.6
	LAN 1	-	N	(D)2.0
	LAN 2	-	N	(D)8.0
	Donor	-	Y	(D)1.0
	Service	-	Y	(D)1.0
Notebook PC	DC in	N	-	(P)1.8
	AC in	N	-	(P)1.8
	USB1	-	Y	(D)1.5
Notebook PC adaptor	AC in	N	-	(P)1.8

* The marked "(D)" means the data cable and "(P)" means the power cable.

1.5 Noise Suppression Parts on Cable. (I/O cable)

Product Name	Port	Ferrite Bead (Y/N)	Location	Metal Hood (Y/N)	Location
LTE 700M RF Repeater	DC in	N	-	Y	E.U.T end
	LAN 1	N	-	N	-
	LAN 2	N	-	N	-
	Donor	N	-	Y	Both end
	Service	N	-	Y	Both end
Notebook PC	DC in	N	-	Y	Notebook PC End
	AC in	N	-	Y	Both end
	USB1	Y	Notebook PC End	Y	Notebook PC End
Notebook PC adaptor	AC in	N	-	Y	Both end

1.6 Test Methodology

Both Conducted and Radiated testing was performed according to the procedures in ANSI C63.4/2003. Radiated testing was performed at an antenna to E.U.T distance of 10 m

1.7 Test Facility

The 10 m semi anechoic chamber used to collect the radiated data is located at the 105-1, Jangam-Ri, Majang-Myeon, Icheon-Si, Kyoungki-Do, South Korea, and the conducted measurement facility used to measure the conducted data are located at San 136-1, Ami-Ri Bubal-Eup, Icheon-Si, Kyoungki-Do, 467-701, South Korea. Those measurement facilities are constructed in conformance with the requirements of ANSI C63.4 and CISPR Publication 22. Detailed description of test facilities was submitted to the Commission and accepted dated Sep. 03, 2010 (Registration Number: 90661)

1.8 Frequency Range of Radiated Measurements

An unintentional radiator, including a digital device, the spectrum shall be investigated from the lowest radio frequency signal generated or used in the device, without going below the lowest frequency for which a Radiated Emission limit is specified, up to the frequency shown in the following table

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30
1.705 to 108	1 000
108 to 500	2 000
500 to 1 000	5 000
Above 1 000	5 th harmonic of the highest frequency or 40 GHz, whichever is lower

2. SYSTEM TEST CONFIGURATION

2.1 Conducted Emissions Test

E.U.T was connected to LISN via Notebook PC adaptor.

Preliminary Power Line Conducted Emission tests were performed by using the procedure in ANSI C63.4/2003 7.2.3 to determine the worst operating conditions.

[Conducted Emission Limits]

Freq. Range	Quasi-Peak	Average
150 kHz to 0.5 MHz	79 dB(μV)	66 dB(μV)
0.5 MHz to 30 MHz	73 dB(μV)	60 dB(μV)

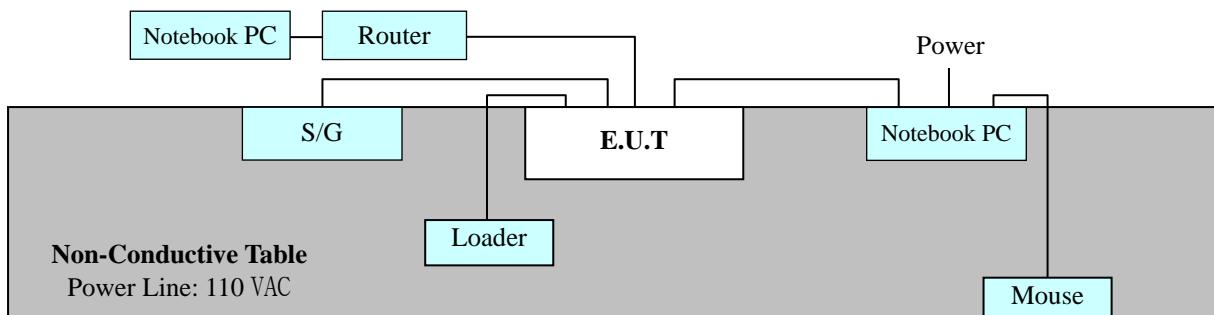
2.2 Radiated Emission Test

Preliminary Radiated Emission tests were performed by using the procedure in ANSI C63.4/2003 8.3.1.1 to determine the worst operating condition. Final Radiated Emission tests were performed at 10 m semi anechoic chamber.

[Radiated Emission Limits]

Freq. Range	Quasi-Peak
30 MHz to 88 MHz	39.0 dB(μV/m)
88 MHz to 216 MHz	43.5 dB(μV/m)
216 MHz to 960 MHz	46.4 dB(μV/m)
960 MHz to 1 000 MHz	49.5 dB(μV/m)

[Configuration of Test System]



3. PRELIMINARY TEST

3.1 Conducted Emission Test

During preliminary tests, the following operating mode was investigated:

- Standby & Data Communication Mode

3. 2 Radiated Emission Test

During preliminary tests, the following operating mode was investigated:

- Standby & Data Communication Mode

4. CONDUCTED AND RADIATED EMISSION TEST SUMMARY

4.1 Conducted Emission Test

The following table shows the highest levels of conducted emissions on both polarization of hot and neutral line.

Limit apply to	: FCC PART 15 Subpart B Class A
Detector	: Quasi-Peak, Average (6 dB Bandwidth: 9 kHz)
Temperature	: 20.0 °C
Humidity level	: 30.8 %
Test date	: March 01, 2011

* **NOTE:** Refer to page 11 to page 14 for details

HCT

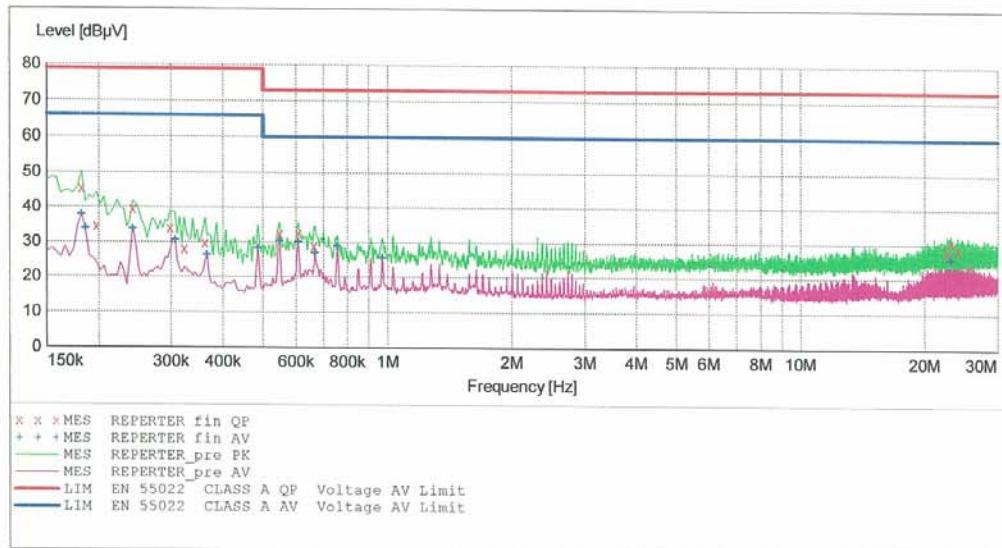
EMC

EUT: JL-20
 Manufacturer: JUNI KOREA
 Operating Condition: STANDBY MODE
 Test Site: SHIELD ROOM
 Operator: KH-YOON
 Test Specification: FCC PART 15 CLASS A
 Comment: H

SCAN TABLE: "FCC PART 15 CLASS A"

Short Description: FCC PART 15 CLASS A

Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
150.0 kHz	500.0 kHz	4.0 kHz	MaxPeak	10.0 ms	9 kHz	None
500.0 kHz	30.0 MHz	4.0 kHz	MaxPeak	10.0 ms	9 kHz	None
			Average			
			MaxPeak			
			Average			



MEASUREMENT RESULT: "REPENTER_fin QP"

3/1/2011 3:49PM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.182000	45.60	10.1	79	33.4	---	---
0.198000	34.60	10.1	79	44.4	---	---
0.242000	39.60	10.1	79	39.4	---	---
0.298000	34.00	10.1	79	45.0	---	---
0.322000	28.10	10.1	79	50.9	---	---
0.362000	29.80	10.1	79	49.2	---	---
0.548000	32.40	10.1	73	40.6	---	---
0.608000	32.80	10.1	73	40.2	---	---
0.664000	28.90	10.1	73	44.1	---	---
22.584000	28.00	11.7	73	45.0	---	---
23.132000	30.70	11.7	73	42.3	---	---
24.044000	28.40	11.8	73	44.6	---	---

MEASUREMENT RESULT: "REPERTER fin AV"

3/1/2011 3:49PM

Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Line dB	PE
0.182000	37.90	10.1	66	28.1	---	---
0.186000	33.90	10.1	66	32.1	---	---
0.242000	33.70	10.1	66	32.3	---	---
0.306000	30.60	10.1	66	35.4	---	---
0.366000	26.40	10.1	66	39.6	---	---
0.486000	28.20	10.1	66	37.8	---	---
0.548000	30.30	10.1	60	29.7	---	---
0.608000	30.10	10.1	60	29.9	---	---
0.668000	26.90	10.1	60	33.1	---	---
0.756000	29.00	10.1	60	31.0	---	---
0.972000	25.70	10.2	60	34.3	---	---
23.132000	25.80	11.7	60	34.2	---	---

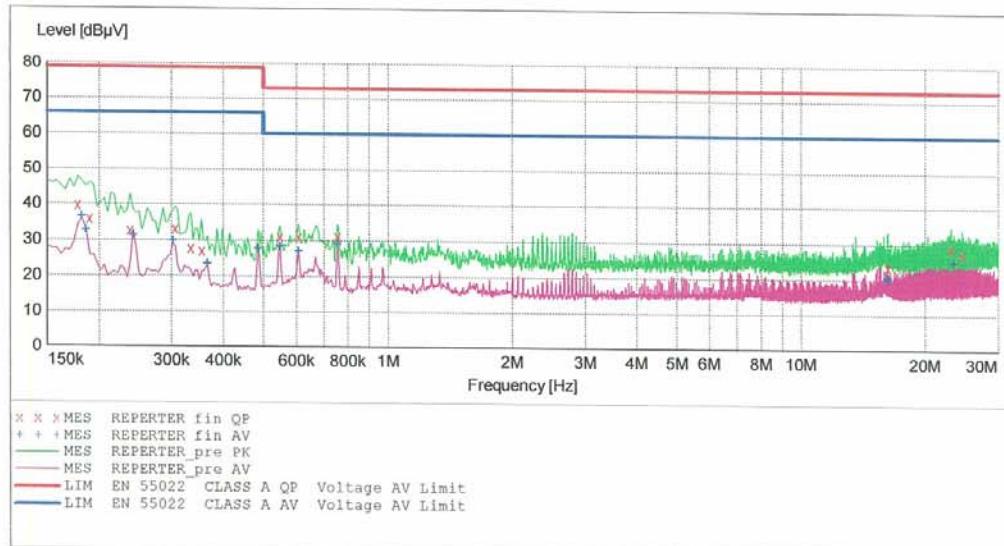
HCT

EMC

EUT: JL-20
 Manufacturer: JUNI KOREA
 Operating Condition: STANDBY MODE
 Test Site: SHIELD ROOM
 Operator: KH-YOON
 Test Specification: FCC PART 15 CLASS A
 Comment: N

SCAN TABLE: "FCC PART 15 CLASS A"

FCC PART 15 CLASS A						
Start Frequency	Stop Frequency	Step Width	Detector	Meas.	IF Time	Transducer
150.0 kHz	500.0 kHz	4.0 kHz	MaxPeak	10.0 ms	9 kHz	None
			Average			
500.0 kHz	30.0 MHz	4.0 kHz	MaxPeak	10.0 ms	9 kHz	None
			Average			



MEASUREMENT RESULT: "REPENTER_fin_QP"

3/1/2011 3:46PM	Frequency	Level	Transd	Limit	Margin	Line	PE
	MHz	dB μ V	dB	dB μ V	dB		
	0.178000	39.70	10.1	79	39.3	---	---
	0.190000	35.90	10.1	79	43.1	---	---
	0.238000	32.80	10.1	79	46.2	---	---
	0.306000	33.20	10.1	79	45.8	---	---
	0.334000	27.70	10.1	79	51.3	---	---
	0.354000	27.10	10.1	79	51.9	---	---
	0.548000	31.20	10.1	73	41.8	---	---
	0.608000	31.20	10.1	73	41.8	---	---
	0.756000	31.30	10.1	73	41.7	---	---
	16.228000	23.80	11.3	73	49.2	---	---
	23.128000	28.90	11.7	73	44.1	---	---
	24.536000	27.40	11.8	73	45.6	---	---

MEASUREMENT RESULT: "REPERTER_fin AV"

3/1/2011 3:46PM

Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Line dB	PE
0.182000	36.50	10.1	66	29.5	---	---
0.186000	32.80	10.1	66	33.2	---	---
0.242000	31.30	10.1	66	34.7	---	---
0.302000	29.80	10.1	66	36.2	---	---
0.366000	23.60	10.1	66	42.4	---	---
0.486000	27.90	10.1	66	38.1	---	---
0.548000	28.40	10.1	60	31.6	---	---
0.608000	27.10	10.1	60	32.9	---	---
0.756000	29.10	10.1	60	30.9	---	---
16.168000	20.80	11.3	60	39.2	---	---
16.232000	20.00	11.3	60	40.0	---	---
23.436000	25.00	11.8	60	35.0	---	---

4.2 Radiated Emission Test

The following table shows the highest levels of Radiated Emissions on both polarization of horizontal and vertical.

Limit apply to	: FCC PART 15 Subpart B Class A
Detector	: Quasi-Peak (6 dB Bandwidth: 120 kHz)
Temperature	: 20.0 °C
Humidity level	: 30.4 %
Test date	: March 02, 2011

※ **NOTE:** For measurement above 1 GHz, noise level is more than 10 dB below the limit, specified in FCC Part 15.35

EMI Auto Test(1)

1 / 1

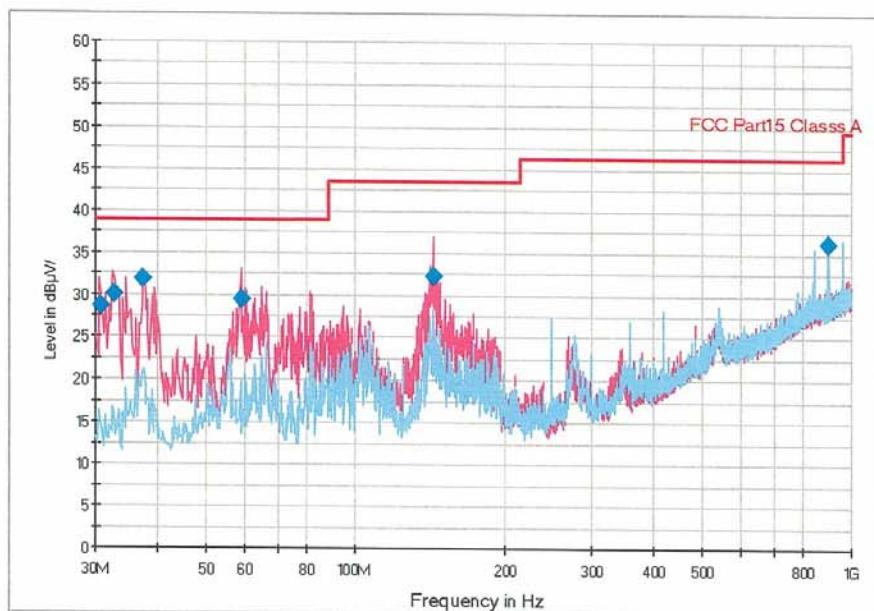
HCT Test Report

Common Information

EUT Name: JU-20 / JUNI KOREA
Test Description: STANDBY MODE
Operator Name: KH, YOUN
Environment Conditions: EUT + S/G + NOTEBOOK + MODEM
Comment:

FCC Part15 Class A

FCC Part15 Class A



Final Result 1

Frequency (MHz)	QuasiPeak (dB μ V/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)	Comment
30.634900	28.8	280.0	V	204.0	12.4	10.2	39.0	
32.589800	30.1	150.0	V	123.0	12.5	8.9	39.0	
37.349700	31.9	150.0	V	123.0	12.9	7.1	39.0	
58.702200	29.4	350.0	V	98.0	13.2	9.6	39.0	
143.352200	32.2	100.0	V	-10.0	14.9	11.3	43.5	
900.417700	36.3	100.0	H	277.0	28.8	10.1	46.4	

4.3 Test Setup Photos

[Conducted Emission]



[Radiated Emission]



5. FIELD STRENGTH CALCULATION

The field strength is calculated by adding the antenna factor and cable factor.
The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF$$

Where FS = Field Strength

RA = Receiver Amplitude

AF = Antenna Factor

CF = Cable Attenuation Factor

Assume a receiver reading of 21.5 dB μ V is obtained. The antenna factor of 7.4 dB/m and a cable factor of 1.1 dB are added. The 30 dB μ V/m value is mathematically converted to its corresponding level in μ V/m.

$$FS = 21.5 + 7.4 + 1.1 = 30 \text{ dB}\mu\text{V/m}$$

6. TEST EQUIPMENT

<u>Type</u>	<u>Manufacturer</u>	<u>Model Number</u>	<u>Serial Number</u>	<u>Next CAL Date</u>
-------------	---------------------	---------------------	----------------------	----------------------

Conducted Emission

<input checked="" type="checkbox"/> EMI Test Receiver	Rohde & Schwarz	ESCI	100584	2011.05.28
<input checked="" type="checkbox"/> LISN	Rohde & Schwarz	ESH3-Z5	100282	2012.02.01
<input checked="" type="checkbox"/> LISN	Rohde & Schwarz	ENV216	3560.6550.02	2011.04.05
<input checked="" type="checkbox"/> Attenuator	Rohde & Schwarz	ESH3-Z2	357.8810.52	2011.10.25
<input checked="" type="checkbox"/> SIGNAL GENERATOR	Agilent	E4438C	MY47270136	-

Radiated Emission

<input type="checkbox"/> EMI Test Receiver	Rohde & Schwarz	ESI40	831564103	2011.10.29
<input checked="" type="checkbox"/> EMI Test Receiver	Rohde & Schwarz	ESU26	100241	2011.09.01
<input checked="" type="checkbox"/> Trilog Antenna	Schwarzbeck	VULB9160	3301	2012.09.13
<input checked="" type="checkbox"/> Antenna master	INNCO Systems	MA4000-EP	MA4000/283	-
<input checked="" type="checkbox"/> Turn Table	INNCO Systems	DT3000-3T	DT3000/69	-
<input checked="" type="checkbox"/> Communication Antenna	Schwarzbeck	USLP9142	9142-248	-
<input type="checkbox"/> RF-Amplifier	MITEQ	AMF-6D-0010 1800-35.20P.PS	-	2011.05.20
<input type="checkbox"/> Base Station	Rohde & Schwarz	CMU 200	1100000802	2012.02.16

7. CONCLUSION

The data collected shows that the **JUNI KOREA, LTE 700M RF Repeater, Model: JL-20** complies with §15.107 and §15.109 of the FCC rules.