TEST REPORT

Korea EMC Laboratory Co., Ltd.
390 Bora-dong, Giheung-gu, Yongin-si, Gyeonggi-do,
Republic of Korea (446-904)
Tel : 82-31-286-5881 Fax : 82-31-286-2661
www.koreaemc.com

KEL
Korea EMC Laboratory

1. Client

- Name : Samsung Electronics Co., Ltd.
- Address : 416, Maetan3-Dong, Yeongtong-Gu, Suwon-City, Kyunggi-Do 442-742, Korea
- Date of Receipt : August 23, 2011

2. Use of Report : -

3. Name of Product / Model : RF Control handle / ROH-20S

4. FCC ID : A3LROH20S

5. Manufacturer and country of origin : Samsung Electronics Co., Ltd. / Korea

6. Date of Test : August 31, 2011 – November 01, 2011

7. Applied Standard : FCC Part 15, Subpart C(Section 15.231)
ANSI C63.4

8. Testing Location : ☒ In Laboratory ☐ In Chamber ☐ On Site Test

9. Test Results : ☒ Pass ☐ Fail

Affirmation	Tested by Name : Sang-Hoon Lee (Signature)	Technical Manager Name : Su-Gil Moon (Signature)

November 22, 2011

Korea EMC Laboratory Co., Ltd.

As a test result of the sample which was submitted from the client, this report does not guarantee the whole product quality. This test report should not be used and copied without a written agreement by Korea EMC Laboratory Co., Ltd.

0. REPORT REVISION HISTORY

Date	Revision	Page No
November 22, 2011	Issued	All

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1. Test Laboratory

General

Name of Test Laboratory	Korea EMC Laboratory Co., Ltd.
President	Won-Hyang Oh
Address	390 Bora-dong, Giheung-gu, Yongin-si, Gyeonggi-do, Republic of Korea (446-904)
TEL	+82-31-286-5881
FAX	+82-31-286-2661
e-mail	webmaster@koreaemc.com

Certificate of Designated Testing Laboratory

Area and Category	Regulation	Registration & Certification No.	Mark.
Radio Research Agency EMI(Radiated & Conducted emission) EMS(Radiated Immunity) Safety Radio Communication Part	Regulation of KCC No. 2011-12 (2011.02.18)	KR0002	방송통신위원회
Korea Laboratory Accreditation Scheme (KOLAS) EMI(Radiated & Conducted emission) EMS(Radiated Immunity) Safety Road Vehicle component test(EMC) Military EMC(MIL-STD-461E)	KS Q ISO/IEC 17025:2006	No. 154	KOLAS
FCC Part 15 & 18 EMI(Radiated & Conducted emission)	ANSI 63.4:2003	90751 (KR0002)	FC
VCCI EMI(Radiated & Conducted emission)	VCCI	C-2314 R-2139 R-2140	VCCI
UL Korea Ltd. Safety	Star Alliance Program	-	c UL us
European Conformity EMC & Safety	2004/108/EC 2006/95/EC	-	CE
TUV SUD Certification after Recognition of Agent's Testing EMC	ISO/IEC 17025:2005	ROK1006C	TÜV SÜD Product Service

2. DESCRIPTION OF THE EQUIPMENT UNDER TEST

The product specification described herein was obtained from the product data sheet or user's manual

2.1 Characteristics

Product name	RF Control handle
Model no.	ROH-20S
FCC ID	A3LROH20S
Operation frequency	434.1 MHz
Modulation type	ASK
Number of channel	1 Channel
Antenna type	Pattern antenna, Wire Antenna
Power source	DC 3 V(DC 1.5 V AA Size Battery X 2)
Size	330 mm X 60 mm X 145 mm
Interface ports	-
Accessory	-

2.2 Applied standard

- FCC part 15, subpart C(15.231)
- ANSI C63.4

Note : It has been verified to comply with requirements of FCC part 15, subpart B, Class B(DoC). The test report has been issued separately(KEL11-F08142)

2.3 Submitted documents

- Block diagram
- Schematic diagram
- Part list(B.O.M)
- User manual

3. TEST CONDITIONS

3.1 Description of test configuration

The EUT has been tested as an independent unit with other necessary accessories or support unit. The following support units or accessories were used to form a representative test configuration during the tests.

3.2 List of peripherals

Type	Model no.	Serial no.	Manufacturer
EUT(RF Control handle)	ROH-20S	-	Samsung Electronics Co., Ltd.
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-

3.3 Uncertainty

Measurement	Frequency	Uncertainty
Conducted Emission	150 kHz ~ 30 MHz	1.5
Radiated Emission	30 MHz ~ 1 GHz	4.4
	1 GHz ~ 40 GHz	4.1

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level using a coverage factor if k=2.

3.4 Environment condition

Measurement	Temperature	Humidity	Atmospheric pressure
Conducted Emission	22 ± 4 ℃	30 – 60 % R.H.	101.5 kPa
Radiated Emission	20 ± 4 ℃	30 – 60 % R.H.	101.4 kPa

4. SUMMARY OF TEST RESULTS

Section	Test Type	Remark	Result
15.207	▪ AC Power conducted emission	NA (Use only battery)	NA
15.209, 15.231(b)	▪ Radiated emission test	Meet the requirement	Pass
15.231(c)	▪ Emission bandwidth measurement	Meet the requirement	Pass
15.231(a)	▪ Deactivation time	Meet the requirement	Pass

5. TEST AND RESULTS

5.1 AC Power conducted emission

NA

5.2 Radiated Emission Test

5.2.1 Test procedures

1. The preliminary radiated measurements were performed to determine the frequency producing the maximum emissions in an anechoic chamber at a distance of 3 meters.

2. The EUT was placed on the top of the 0.8 m height, 1 × 1.5 m non-metallic table. To find the maximum emission levels, the height of a measuring antenna was changed and the turntable was rotated 360°.

3. The antenna polarization was also changed from vertical to horizontal. The spectrum was scanned from 30 to 1000 MHz using the Bi-Log antenna, and from 1000 MHz to 5000 MHz using the horn antenna.

4. To obtain the final measurement data, the EUT was arranged on a turntable situated on a 4 × 4 m at the test Site.

5. 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 function with specified bandwidth.

6. The presence of ambient signals was verified by turning the EUT off. In case an ambient signal was detected, the measurement bandwidth was reduced temporarily and verification was made that an additional adjacent peak did not exist. This ensures that the ambient signal does not hide any emissions from the EUT.

7. The field strength is calculated by adding the Antenna Factor, Cable factor, & preamplifier.
The basic equation with a sample calculation is as follow :
Final Test Level = Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

5.2.2 Limits of radiated emission test

According to 15.231(b), In addition to the provisions of section 15.205, the field strength of emissions from intentional radiators operated under this section shall not exceed the following :

Fundamental Frequency(MHz)	Field strength of fundamental		Field strength of spurious emissions	
	uV/m @ 3 m	dBuV/m @ 3 m	uV/m @ 3 m	dBuV/m @ 3 m
40.66 – 40.70	2,250	67.04	225	47.04
70 – 130	1,250	61.94	125	41.94
130 – 174	1,250 to 3,750**	61.94 to 71.48**	125 to 375**	41.94 to 51.48**
174 – 260	3,750	71.48	375	51.48
260 – 470	3,750 to 12,500**	71.48 to 81.94**	375 to 1250**	51.48 to 61.94**
Above 470	12,500	81.94	1250	61.94

Note : Where F is the frequency in MHz, the formula for calculating the maximum permitted fundamental field strengths are as follows : for the band 130-174 MHz, uV/m at 3 m = 56.81818(F)-6136.3636; for the band 260-470 MHz, uV/m at 3 m = 41.6667(F)-7083.3333. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.

5.2.3 Test instruments

Description	Manufacturer	Model no.	Serial no.	Due cal.	Use
Test Receiver / Spectrum Analyzer	Rohde&Schwarz	ESU40	100027	2012.07.17	☒
Horn Antenna	AH Systems	SAS-571	500	2012.03.21	☒
Bi-Log Antenna	VULB9160	Schwarzbeck	3049	2013.10.06	☒
Pre Amplifier	8447E	HP	2434A02093	2012.01.10	☒
Pre Amplifier	87405-60021	AGILENT	10004	2012.01.04	☒
Test Receiver / Spectrum Analyzer	Rohde&Schwarz	ESCI	100561	2012.07.17	☒
Attenuator	AGILENT	8491A	51517	2012.10.04	☐

5.2.4 Test results

The EUT met the field strength and bandwidth requirements of section 15.231 for fundamental and spurious emissions. See below table for the measured fundamental and spurious emissions. The peak value of the fundamental and spurious emissions did not exceed the limits of section 15.231(b). Additionally, there were no radiated emissions from the device in the restricted bands of section 15.205 which exceeded the limit of section 15.209.

Frequency [MHz]	Reading [dBuV]	Pol. [H/V]	Height [m]	Correction Factor		Result Value		
				Ant. Factor [dB]	Cable+Amp. [dB]	Limit(AV) [dBuV/m]	Result [dBuV/m]	Margin [dB]
144.7	29.8(PK)	H	1.2	12.7	18.8	43.52	23.7	19.82
385.6	37.7(PK)	H	1.1	14.5	16.6	46.02	35.6	10.42
434.1**	79.3(PK)	H	1.1	15.8	16.0	80.83	79.1	**1.73**
531.1	31.8(PK)	V	1.2	17.5	15.3	46.02	34.0	12.02
867.4	32.8(PK)	H	1.2	22.2	12.5	60.83	42.5	18.33
1301.2	32.1(PK)	H	1.0	24.9	25.9	54.00	31.1	22.90

Note : 1. Result level(dBuV/m) = Reading level(dBuV) + Ant. Factor(dB)-[Cable+Amp(dB)]
2. The other emission levels were very low against the limit.
3. Margin = Limit level - Result level
4. "**" = Fundamental frequency

5.3 Emission bandwidth measurement

5.3.1 Test procedures

1. The measurements were performed at operating frequency.

2. The bandwidth of the fundamental frequency was measured by Spectrum analyzer with RBW=30 kHz, VBW=30 kHz.

3. The bandwidth value was determined between the two points of 20 dB down from fundamental level.

5.3.2 Limit of emission bandwidth measurement

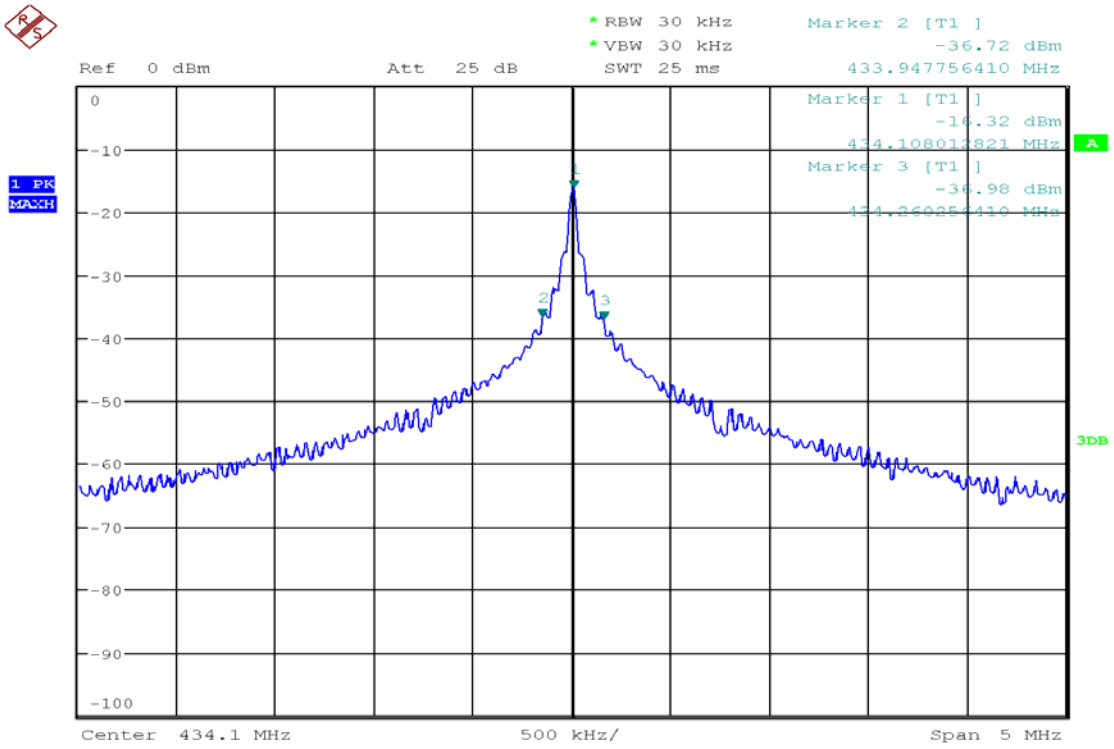
The bandwidth of emission shall be no wider than 0.25 % of the centre frequency for devices operating between 70 ~ 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5 % of t he centre frequency.

5.3.3 Test instruments

Description	Manufacturer	Model no.	Serial no.	Due cal.	Use
Spectrum analyzer	Rohde&Schwarz	FSQ40	200062	2012.10.04	☒

5.3.4 Test Results

Frequency[MHz]	Emission bandwidth[kHz]	limit[kHz]	Result
434.1	312.5	1085.25	Pass



5.4 Deactivation time

5.4.1 Test procedures

1. The measurements were performed at operating frequency.

2. Set the resolution bandwidth to 100 kHz, video bandwidth to 100 kHz, zero span.

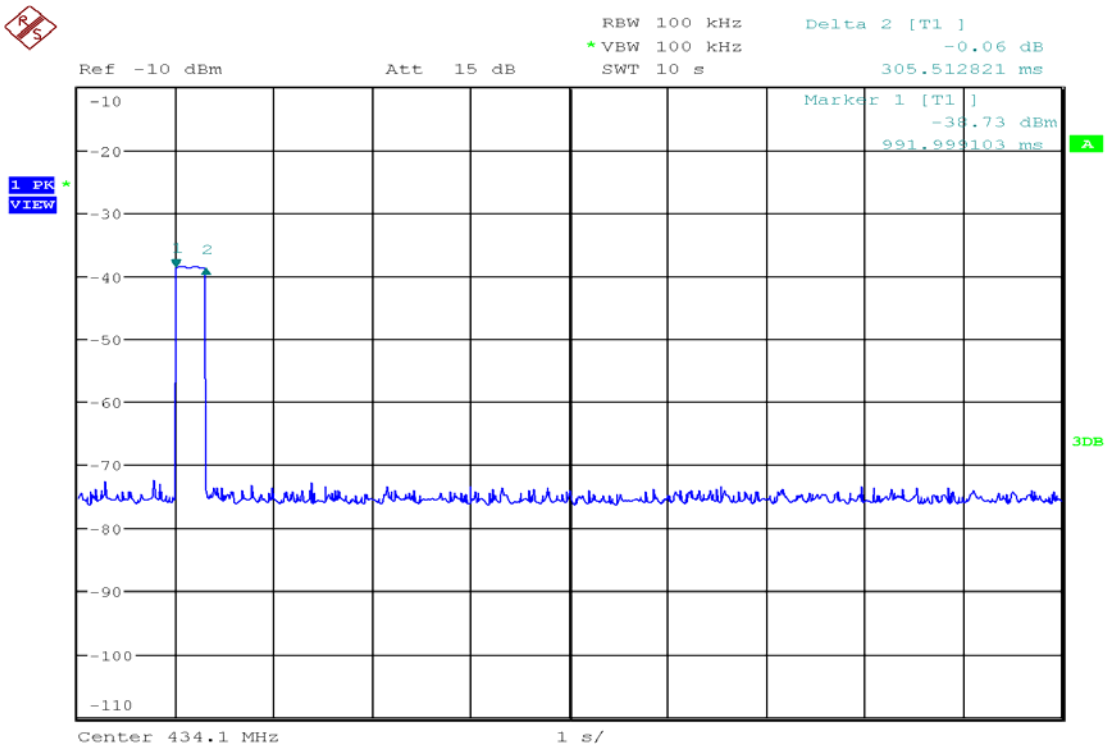
3. The transmission duration was measured and recorded.

5.4.2 Limit of deactivation time

A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more 5 seconds of being released.

5.4.3 Test instruments

Description	Manufacturer	Model no.	Serial no.	Due cal.	Use
Spectrum analyzer	Rohde&Schwarz	FSQ40	200062	2012.10.04	☒

5.4.4 Test Results

Frequency[MHz]	Limit[S]	Result[S]	Result
434.1	5	0.991	Pass