

ELECTROMAGNETIC EMISSION COMPLIANCE REPORT

Test Report No. : W17OR-D040

AGR No. : A17OA-215

Applicant : Samsung Electronics Co Ltd

Address : 19 Chapin Rd., Building D, Pine Brook, New Jersey, 07058, United States

Manufacturer : Samsung Electronics Co Ltd

Address : Maetan dong 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do 16677, Korea

Type of Equipment : LFD monitor

FCC ID : A3LWM55H

Model Name : LH55WMHP

Multiple Model Name : WM55H, LH55WMHPTWC/**

Serial number : N/A

Total page of Report : 21 pages (including this page)

Date of Incoming : September 28, 2017

Date of Issuing : October 26, 2017

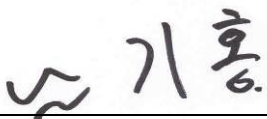
SUMMARY

The equipment complies with the requirements of **FCC CFR 47 PART 15 SUBPART C Section 15.225**

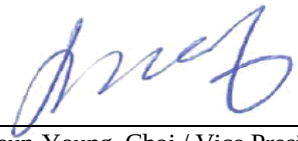
This test report contains only the result of a single test of the sample supplied for the examination.

It is not a general valid assessment of the features of the respective products of the mass-production.

Reviewed by:


Ki-Hong, Nam / Asst, Chief Engineer
ONETECH Corp.

Approved by:


Keun-Young, Choi / Vice President
ONETECH Corp.

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REVISION HISTORY

Issued Report No.	Issued Date	Revisions	Effect Section
W17OR-D040	October 26, 2017	Initial Issue	All

1. VERIFICATION OF COMPLIANCE

-. APPLICANT : Samsung Electronics Co Ltd
 -. ADDRESS : 19 Chapin Rd., Building D, Pine Brook, New Jersey, 07058, United States
 -. CONTACT PERSON : Chan Ho, Youn / General Manager
 -. TELEPHONE NO : +973-808-6362
 -. FCC ID : A3LWM55H
 -. MODEL NO/NAME : LH55WMHP
 -. SERIAL NUMBER : N/A
 -. DATE : October 26, 2017

DEVICE TYPE	DXX – Low Power Communication Device Transmitter
E.U.T. DESCRIPTION	LFD monitor
THIS REPORT CONCERNS	Original Grant
MEASUREMENT PROCEDURES	ANSI C63.10: 2013
TYPE OF EQUIPMENT TESTED	Pre-Production
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	Certification
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	FCC CFR47 Part 15 Subpart C Section 15.225
MODIFICATIONS ON THE EQUIPMENT TO ACHIEVE COMPLIANCE	None
FINAL TEST WAS CONDUCTED ON	10 m Semi Anechoic Chamber

-. The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

2. GENERAL INFORMATION

2.1 Product Description

The Samsung Electronics Co Ltd, Model LH55WMHP (referred to as the EUT in this report) is an LFD monitor, Product specification information described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	LFD monitor
TRANSMITTING FREQUENCY	13.560 2 MHz
NUMBER OF CHANNELS	1
MODULATION	ASK
ANTENNA TYPE	PCB Pattern Antenna
LIST OF EACH OSC. or CRY. FREQ.(FREQ. >= 1 MHz)	24.576 MHz

2.2 Model Differences:

-. The following lists consist of the added model and their differences.

Model Name	Differences	Tested
LH55WMHP	Basic Model	☒
WM55H, LH55WMHPTWC/**	The model is identical to basic model except for the model name only. (* can be any alphanumeric character)	☐

Note: 1. Applicant consigns only basic model to test. Therefore this test report just guarantees the units, which have been tested.

2. The Applicant/manufacturer is responsible for the compliance of all variants.

2.3 Related Submittal(s) / Grant(s)

Original submittal only

2.4 Purpose of the test

To determine whether the equipment under test fulfills the requirements of the regulation stated in FCC PART 15 SUBPART C Section 15.225.

2.5 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10: 2013. Radiated testing was performed at a distance of 3 m from EUT to the antenna.

2.6 Test Facility

The Onetech Corp. has been designated to perform equipment testing in compliance with ISO/IEC 17025.

The Electromagnetic compatibility measurement facilities are located at 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea

-. Site Filing:

VCCI (Voluntary Control Council for Interference) – Registration No. R-4112/ C-14617/ G-10666 / T-1842

IC (Industry Canada) – Registration No. Site# 3736A-3

-. Site Accreditation:

KOLAS (Korea Laboratory Accreditation Scheme) - Accreditation NO. KT085

FCC (Federal Communications Commission) - Accreditation No. KR0013

RRA (Radio Research Agency) – Designation No. KR0013

3. SYSTEM TEST CONFIGURATION

3.1 Justification

This device was configured for testing in a typical way as a normal customer is supposed to be used. During the test, the following components were installed inside of the EUT.

DEVICE TYPE	MANUFACTURER	MODEL/PART NUMBER	FCC ID
Main Board	N/A	KANT_M_SIGNAGE	N/A
Power Board	N/A	L55E6_KHS	N/A
Sub Board	Flatfrog Laboratories	RXA_110086	N/A
Motion Sensor Board	N/A	MOTION SENSOR	N/A
Display	N/A	N/A	N/A
NFC Board	N/A	PEN BOARD	N/A
NFC Antenna	N/A	NFC_ANTENNA	N/A
Wi-Fi/BT Module	Samsung Electronics Co Ltd	WCM730Q	A3LWCM730Q

3.2 Peripheral equipment

Defined as equipment needed for correct operation of the EUT, but not considered as tested: None

3.3 Mode of operation during the test

- . The EUT has Bluetooth LE, Bluetooth, WLAN, NFC and program was used for making continuous transmission mode for only NFC during the test.
- . The EUT has Bluetooth LE, Bluetooth, WLAN mode has already been certified (FCC ID: A3LWCM730Q). So, tested only NFC.

3.4 Equipment Modifications

- . None

3.5 Configuration of Test System

Line Conducted Test : The EUT was connected to LISN. All supporting equipments were connected to another LISN. Preliminary Power line Conducted Emission test was performed by using the procedure in ANSI C63.10: 2013 to determine the worse operating conditions.

Radiated Emission Test : Preliminary radiated emissions test were conducted using the procedure in ANSI C63.10: 2013 to determine the worse operating conditions. The radiated emissions measurements were performed on the 10 m Semi Anechoic Chamber.

For frequencies from 150 kHz to 30 MHz measurements were made of the magnetic H field. The measuring antenna is an electrically screened loop antenna.

The frequency spectrum from 30 MHz to 1 000 MHz was scanned and maximum emission levels maximized at each frequency recorded. The system was rotated 360°, and the antenna was varied in the height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

3.6 Antenna Requirement

For intentional device, according to section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Antenna Construction:

The transmitter antenna of the EUT is a PCB pattern antenna so there is no consideration of replacement by the user.

4. PRELIMINARY TEST

4.1 AC Power line Conducted Emissions Tests

During Preliminary Tests, the following operating mode was investigated

Operation Mode	The Worse operating condition (Please check one only)
Tx Mode	X

4.2 Radiated Emissions Tests

During Preliminary Tests, the following operating modes were investigated

Operation Mode	The Worse operating condition (Please check one only)
Tx Mode	X

5. FINAL RESULT OF MEASUREMENT

Preliminary test was done in normal operation mode. And the final measurement was selected for the maximized emission level.

5.1 CONDUCTED EMISSION TEST

Humidity Level : 46.2 % R.H.

Temperature: 24.1 °C

Limits apply to : FCC CFR 47, PART 15, SUBPART B, SECTION 15.207(a)

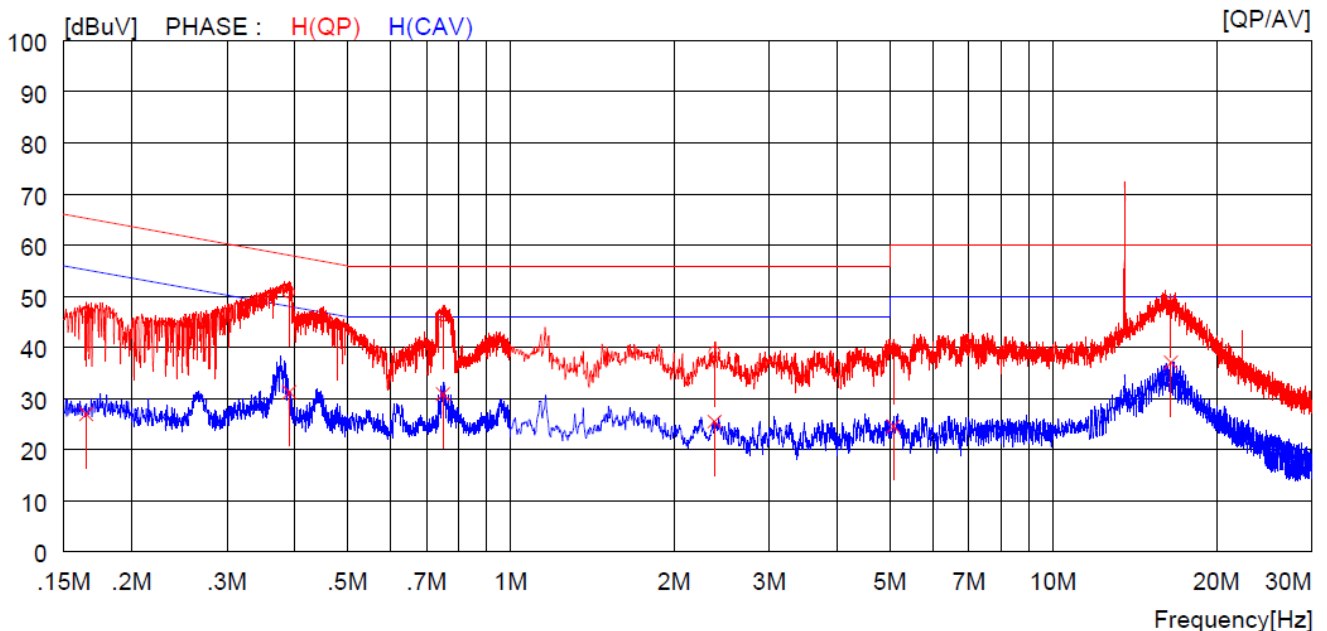
Result : PASSED

EUT : LFD monitor

Date: October 17, 2017

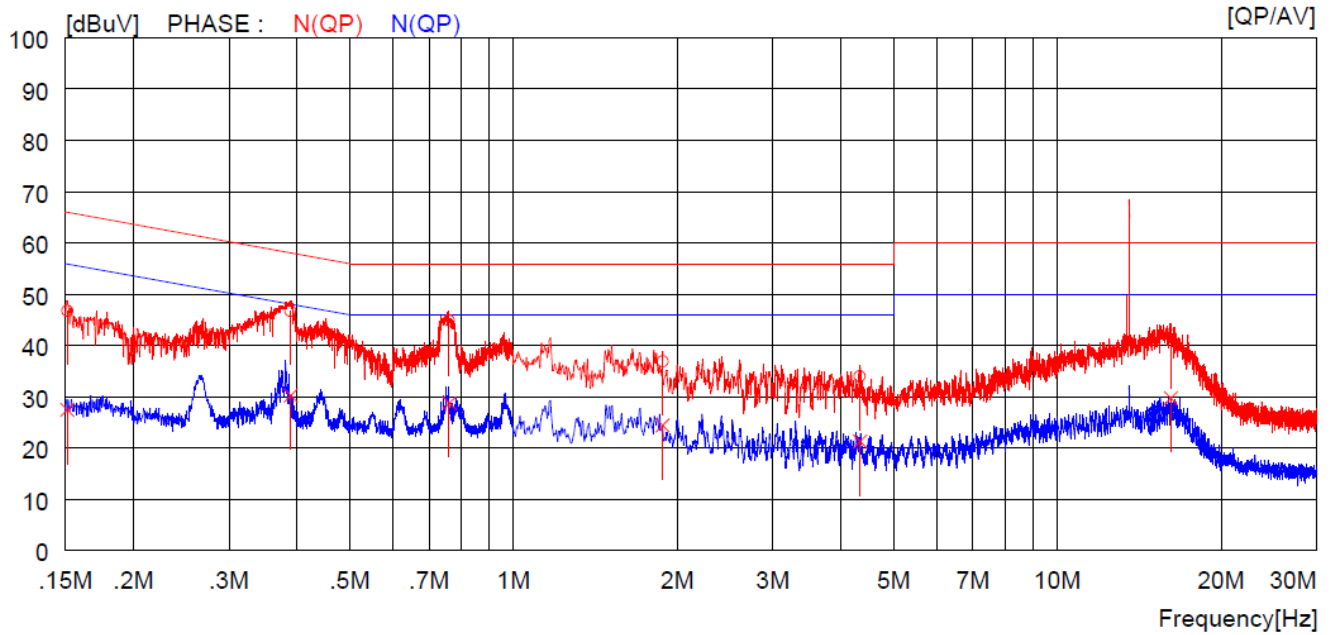
Detector : CISPR Quasi-Peak (6 dB Bandwidth: 9 kHz)

Tested Line : HOT LINE



NO	FREQ [MHz]	READING		C.FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.16500	36.9	----	10.0	46.9	----	65.2	----	18.3	----	H (QP)
2	0.39000	40.8	----	10.0	50.8	----	58.1	----	7.3	----	H (QP)
3	0.75000	36.1	----	10.1	46.2	----	56.0	----	9.8	----	H (QP)
4	2.37600	28.9	----	10.1	39.0	----	56.0	----	17.0	----	H (QP)
5	5.08000	29.4	----	10.2	39.6	----	60.0	----	20.4	----	H (QP)
6	16.47000	37.9	----	10.6	48.5	----	60.0	----	11.5	----	H (QP)
7	0.16500	----	17.0	10.0	----	27.0	----	55.2	----	28.2	H (CAV)
8	0.39000	----	21.3	10.0	----	31.3	----	48.1	----	16.8	H (CAV)
9	0.75000	----	20.8	10.1	----	30.9	----	46.0	----	15.1	H (CAV)
10	2.37600	----	15.4	10.1	----	25.5	----	46.0	----	20.5	H (CAV)
11	5.08000	----	14.4	10.2	----	24.6	----	50.0	----	25.4	H (CAV)
12	16.47000	----	26.5	10.6	----	37.1	----	50.0	----	12.9	H (CAV)

Tested Line : NEUTRAL LINE



NO	FREQ [MHz]	READING		C. FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.15100	36.8	----	10.0	46.8	----	65.9	----	19.1	----	N (QP)
2	0.38900	36.8	----	10.0	46.8	----	58.1	----	11.3	----	N (QP)
3	0.76200	34.7	----	10.1	44.8	----	56.0	----	11.2	----	N (QP)
4	1.88000	26.8	----	10.1	36.9	----	56.0	----	19.1	----	N (QP)
5	4.33600	23.8	----	10.2	34.0	----	56.0	----	22.0	----	N (QP)
6	16.16000	31.5	----	10.6	42.1	----	60.0	----	17.9	----	N (QP)
7	0.15100	----	17.5	10.0	----	27.5	----	55.9	----	28.4	N (CAV)
8	0.38900	----	20.3	10.0	----	30.3	----	48.1	----	17.8	N (CAV)
9	0.76200	----	18.7	10.1	----	28.8	----	46.0	----	17.2	N (CAV)
10	1.88000	----	14.3	10.1	----	24.4	----	46.0	----	21.6	N (CAV)
11	4.33600	----	11.1	10.2	----	21.3	----	46.0	----	24.7	N (CAV)
12	16.16000	----	19.2	10.6	----	29.8	----	50.0	----	20.2	N (CAV)

Remark: Margin (dB) = Limit – Level (Result)

The emission level in above table is included the transducer factor that means insertion loss (LISN), cable loss and attenuator.

Tested by: Tae-Ho, Kim / Manager

5.2 RADIATED EMISSION TEST

5.2.1 Operation frequency band: (13.553 ~ 13.567) MHz

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.

Humidity Level : 46.2 % R.H. Temperature: 24.1 °C
 Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.209
 Type of Test : Low Power Transmitter below 1 705 kHz
 Result : PASSED

EUT : LFD monitor Date: October 17, 2017

Operating Condition : Transmitting Mode

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 9 kHz)

Distance : 3 m

Radiated Emission		Ant	Correction Factors		Total	FCC	
Freq. (MHz)	Amplitud (dBμV)	Pol.	Antenna (dB/m)	Cable (dB)	Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
13.560 2	18.45	H	19.98	1.09	39.52	124	84.48
13.560 2	17.63	V	19.98	1.09	38.7	124	85.3

Remark. The EUT was tested at 3 m, so conversation factor was included at above limit.



Tested by: Tae-Ho, Kim / Manager

5.2.2 Operation frequency band: Below 13.553 MHz and above 13.567 MHz

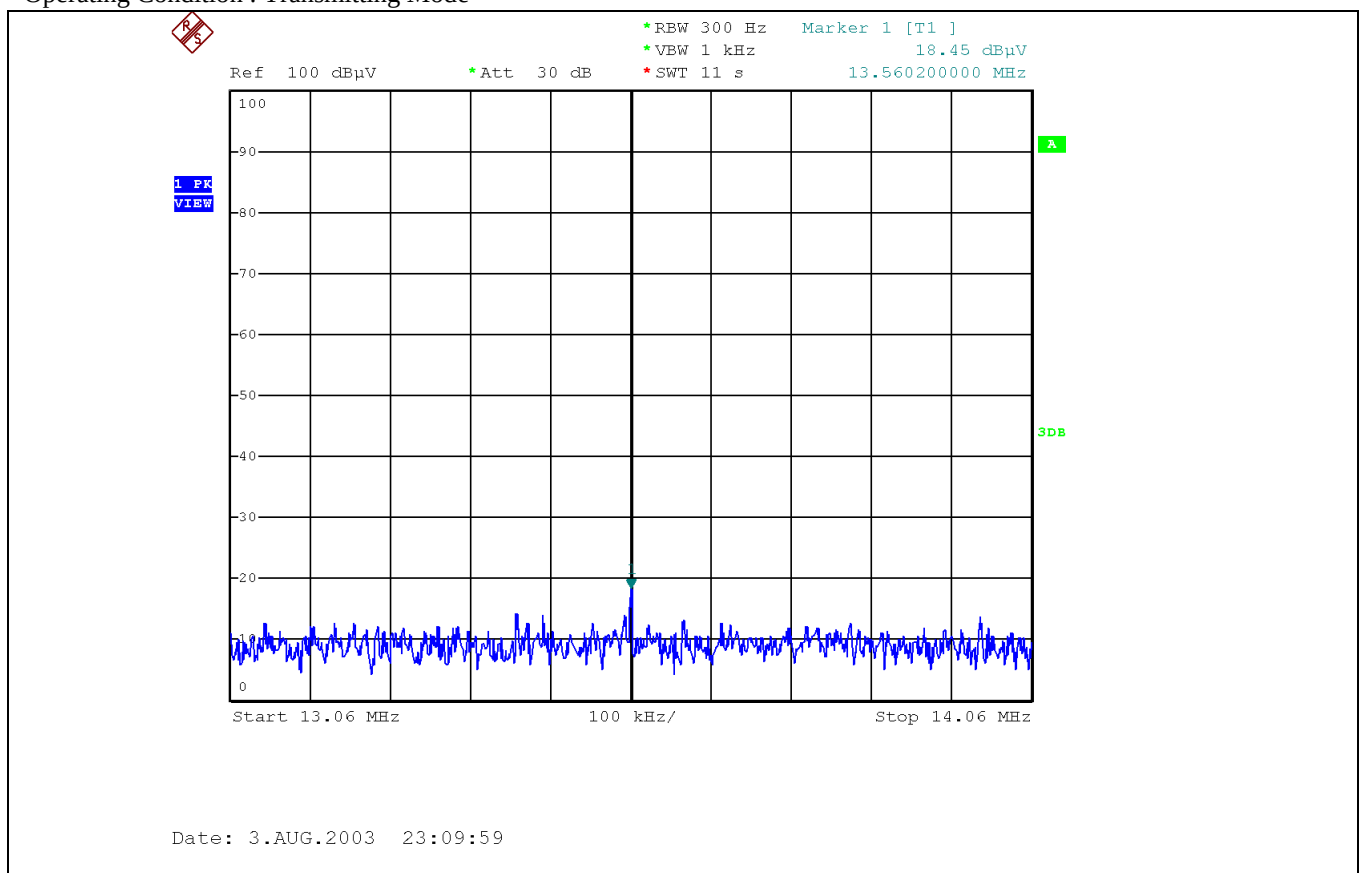
The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.

Humidity Level	: <u>46.2 % R.H.</u>	Temperature: <u>24.1 °C</u>
Limits apply to	: <u>FCC CFR 47, PART 15, SUBPART C, SECTION 15.209</u>	
Type of Test	: <u>Low Power Transmitter below 1 705 kHz</u>	
Result	: <u>PASSED</u>	

EUT : LFD monitor

Date: October 17, 2017

Operating Condition : Transmitting Mode



cc. to above test data, the field strength level of 13.560 2 MHz is 18.45 dBuV/m and the worst limit subject to 15.225 (b) and (c) is 80.5 dBuV/m, so the EUT meets the requirement.

Tested by: Tae-Ho, Kim / Manager

5.3 SPURIOUS EMISSION TEST

5.3.1 Spurious Radiated Emission Below 30 MHz

Humidity Level : 46.2 % R.H. Temperature: 24.1 °C
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.209
Type of Test : Low Power Transmitter below 1 705 kHz
Frequency Range : 9 kHz ~ 30 MHz
Result : PASSED

EUT : LFD monitor Date: October 17, 2017

Operating Condition : Transmitting Mode

Distance : 3 m

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
It was not observed any emissions from the EUT.									



Tested by: Tae-Ho, Kim / Manager

5.3.2 Spurious Radiated Emission below 1 GHz

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.

Humidity Level : 46.2 % R.H.

Temperature: 24.1 °C

Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.209

Type of Test : Low Power Transmitter below 1 705 kHz

Frequency range : 30 MHz ~ 1 000 MHz

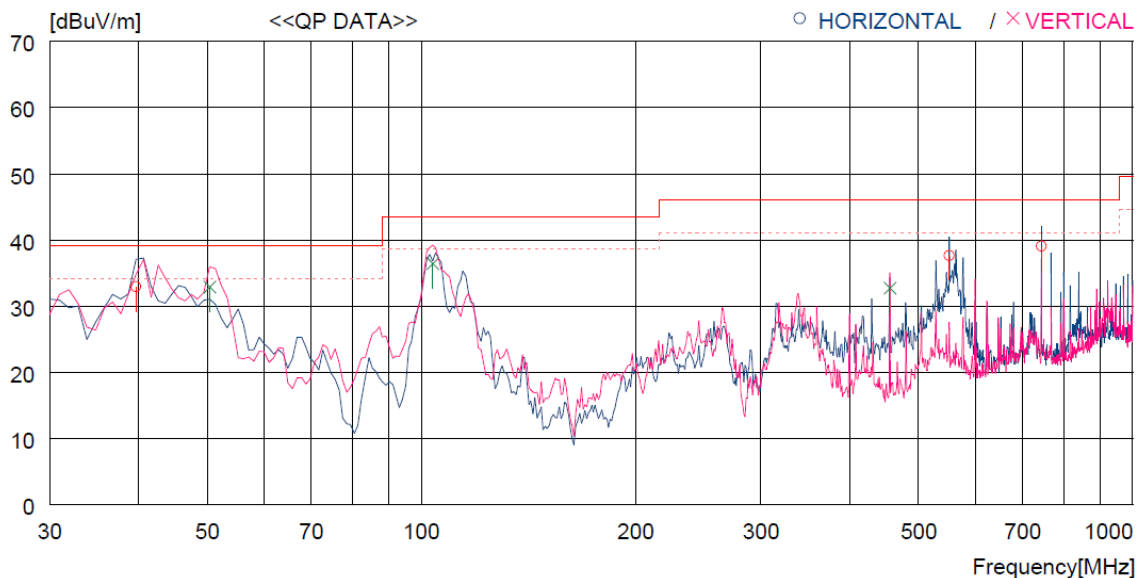
Result : PASSED

EUT : LFD monitor

Date: October 17, 2017

Operating Condition : Transmitting Mode

Distance : 3 m



No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA TABLE [cm]	TABLE [DEG]
----- Horizontal -----										
1	39.700	50.6	13.3	1.8	32.8	32.9	39.1	6.2	400	359
2	552.829	46.6	17.6	6.2	32.8	37.6	46.0	8.4	100	132
3	743.914	44.1	20.4	7.3	32.8	39.0	46.0	7.0	100	34
----- Vertical -----										
4	50.370	49.9	13.7	2.0	32.8	32.8	39.1	6.3	100	129
5	103.720	54.2	12.0	2.8	32.6	36.4	43.5	7.1	200	28
6	455.831	43.4	16.4	5.7	32.8	32.7	46.0	13.3	100	306

Tested by: Tae-Ho, Kim / Manager

5.4 20 dB BANDWIDTH

5.4.1 Operating environment

Temperature : 24.1 °C
Relative humidity : 46.2 % R.H.

5.4.2 Test set-up

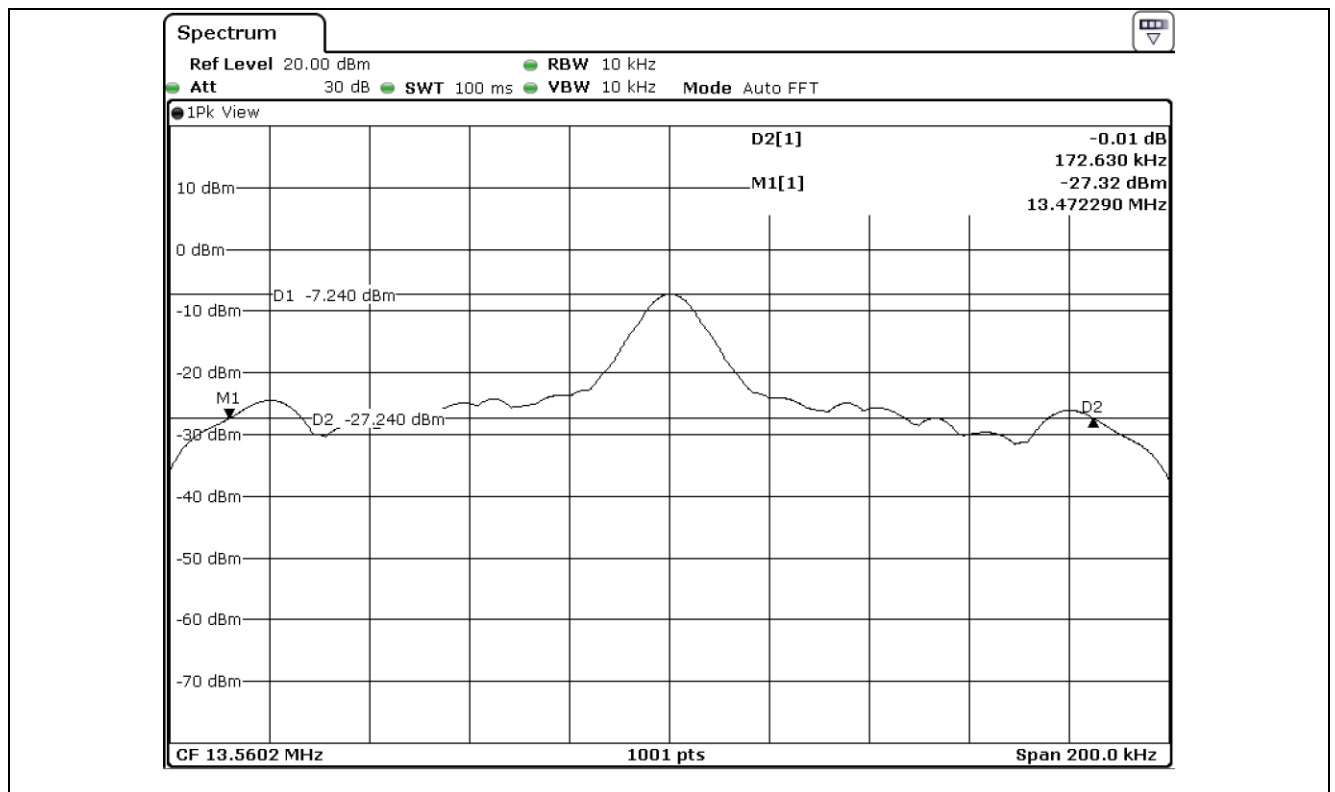
The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 10 kHz, and peak detection was used. The 20 dB bandwidth is defined as the total spectrum over which the power is higher than the peak power minus 20 dB.



5.4.3 Test data

- . Test Date : October 17, 2017
- . Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.209

Operating Freq. (MHz)	Measured Value (kHz)	Assigned Operating Frequency Band (kHz)	Result
13.560 2	172.63	900	PASS




Tested by: Tae-Ho, Kim / Manager

5.5 FREQUENCY STABILITY WITH TEMPERATURE VARIATION

5.5.1 Operating environment

Temperature : 24.1 °C
Relative humidity : 46.2 % R.H.

5.5.2 Test set-up

Turn EUT off and set chamber temperature to -20 °C and then allow sufficient time (approximately 20 to 30 minutes after chamber reach the assigned temperature) for EUT to stabilize. Turn ON EUT and measure the EUT operating frequency and then turn off the EUT after the measurement. The temperature in the chamber was raised 10 °C step from -20 °C to +50°C. Repeat above method for frequency measurements every 10 °C step and then record all measured frequencies on each temperature step.

5.5.3 Test data

-. Test Date : October 17, 2017

-. Result : PASSED

Temperature (°C)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Margin (Hz)	Limit (Hz)
-20	13 560 200	13 560 336	1 220.02	± 1 356.02
-10		13 560 312	1 244.02	
0		13 560 325	1 231.02	
10		13 560 317	1 239.02	
20		13 560 310	1 246.02	
30		13 560 283	1 273.02	
40		13 560 292	1 264.02	
50		13 560 308	1 248.02	



Tested by: Tae-Ho, Kim / Manager

5.6 FREQUENCY STABILITY WITH VOLTAGE VARIATION

5.6.1 Operating environment

Temperature : 24.1 °C
Relative humidity : 46.2 % R.H.

5.6.2 Test set-up

An external DC power supply was connected to the input of the EUT. The voltage of EUT set to 115 % of the nominal value and then was reduced to 85 % of nominal voltage. The output frequency was recorded at each step.

5.6.3 Test data

-. Test Date : October 17, 2017
-. Result : PASSED

Voltage (Vac)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Margin (Hz)	Limit (Hz)
264.5(115 %)	13 560 200	13 560 282	1 274.02	± 1 356.02
230(100 %)		13 560 283	1 273.02	
195.5(85 %)		13 560 295	1 261.02	



Tested by: Tae-Ho, Kim / Manager

6. FIELD STRENGTH CALCULATION

Meter readings are compared to the specification limit correcting for antenna and cable losses.

+	Meter reading	(dB μ V)
-	Amplifier Gain	(dB)
+	Cable Loss	(dB)
-	Antenna Factor	(dB/m)
=	Corrected Result	(dB μ V/m)

Margin (dB)

	Specification Limit	(dB μ V/m)
-	Corrected Result	(dB μ V/m)
=	dB Relative to Spec	($\pm$ dB)

7. LIST OF TEST EQUIPMENT

No.	EQUIPMENTS	MFR.	MODEL	SER. NO.	LAST CAL	DUE CAL	USE
1.	Test receiver	R/S	ESCI	101013	Apr. 04, 2017	One Year	□
2.		R/S	ESPI	101278	Nov. 01, 2016	One Year	■
3.		R/S	ESU	100261	Apr. 05, 2017	One Year	□
4.	Spectrum analyzer	R/S	FSU26	200319	Apr. 04, 2017	One Year	□
5.	Spectrum analyzer	R/S	FSV30	101199	Apr. 05, 2017	One Year	■
6.	Amplifier	Sonoma Instrument	310N	312544	Apr. 04, 2017	One Year	■
7.	Amplifier	Sonoma Instrument	310N	312545	Apr. 04, 2017	One Year	□
8.	TRILOG Broadband Antenna	Schwarzbeck	VULB9163	9163-255	May. 20, 2016	Two Year	□
9.	TRILOG Broadband Antenna	Schwarzbeck	VULB9163	9163-419	Aug. 05, 2016	Two Year	■
10.	Controller	Innco System	CO3000	CO3000/904/ 37211215/L	N/A	N/A	■
11.	LISN	EMCO	3825/2	9109-1867	Apr. 07, 2017	One Year	□
				9109-1869	Apr. 06, 2017	One Year	□
		Schwarzbeck	NSLK8126	8126-404	Apr. 03, 2017	One Year	□
		Schwarzbeck	NSLK8128	8128-216	Apr. 05, 2017	One Year	□
12.	Turn Table	Innco System	DT3000	930611	N/A	N/A	■
13.	Antenna Master	Innco System	MA-4000XPET	MA4000/509/ 37211215/L	N/A	N/A	■
14.	Antenna Master	Innco System	MA4000-EP	MA4000/332/ 27030611/L	N/A	N/A	□
15.	Loop Antenna	Schwarzbeck	FMZB 1513	1513-235	Jun. 10, 2016	Two Year	■
16.	Frequency Counter	HP	53152A	US39270295	Sep. 05, 2017	One Year	■
17.	Chamber	ESPEC	EBE- 5E30W6PT2L- 22	3015006449	Mar. 22, 2017	One Year	■
18.	DC Power Supply	Digital Electronics	DRP-305DN	4030195	Sep. 01, 2017	One Year	□
19.	Slidacs	Dea Kwang Elec.	DH-60	N/A	Sep. 01, 2017	One Year	■