

ELECTROMAGNETIC EMISSION COMPLIANCE REPORT

Test Report No. : OT-196-RWD-022
AGR No. : A195A-062
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 : Samsung Flip Tray
FCC ID : A3LCYTF65BRC
Model Name : CY-TF65BRC
Multiple Model Name : CY-TF65BRC***
Serial number : N/A
Total page of Report : 21 pages (including this page)
Date of Incoming : May 17, 2019
Date of Issuing : June 12, 2019

SUMMARY

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

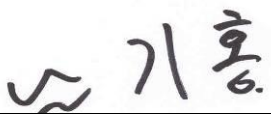
This test report contains only the result of a single test of the sample supplied for the examination.

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

Reviewed by:


 Tae-Ho, Kim / Senior Manager
 ONETECH Corp.

Approved by:


 Ki-Hong, Nam / Chief Engineer
 ONETECH Corp.

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Revision History

Rev. No.	Issue Report No.	Issued Date	Revisions	Section Affected
0	OT-196-RWD-022	June 12, 2019	Initial Release	All

1. VERIFICATION OF COMPLIANCE

-. 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
 -. CONTACT PERSON : Jenni, Chun / General Manager
 -. TELEPHONE NO : +973-808-6375
 -. FCC ID : A3LCYTF65BRC
 -. MODEL NO/NAME : CY-TF65BRC
 -. SERIAL NUMBER : N/A
 -. DATE : June 12, 2019

DEVICE TYPE	DXX – Low Power Communication Device Transmitter
E.U.T. DESCRIPTION	Samsung Flip Tray
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	3 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. TEST SUMMARY

2.1 Test items and results

SECTION	TEST ITEMS	RESULTS
15.215 (c)	20 dB BANDWIDTH	Met the Limit / PASS
15.225 (e)	FREQUENCY STABILITY WITH TEMPERATURE VARIATION / FREQUENCY STABILITY WITH VOLTAGE VARIATION	Met the Limit / PASS
15.225 (a),(b),(c)	Radiated Emission Limits	Met the Limit / PASS
15.209, 15.225(e)	SPURIOUS EMISSION TEST	Met the Limit / PASS
15.207	Conducted Limits	Met the Limit / PASS
15.203	Antenna Requirement	Met requirement / PASS

2.2 Related Submittal(s) / Grant(s)

Original submittal only

2.3 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.

2.4 Test Methodology

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

2.5 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. GENERAL INFORMATION

3.1 Product Description

The Samsung Electronics Co Ltd, Model CY-TF65BRC (referred to as the EUT in this report) is an Samsung Flip Tray, Product specification information described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	Samsung Flip Tray
TRANSMITTING FREQUENCY	13.560 7 MHz
MODULATION	ASK
ANTENNA TYPE	PCB Pattern Antenna
LIST OF EACH OSC. or CRY. FREQ.(FREQ. >= 1 MHz)	27.12 MHz

3.2 Model Differences:

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

Model Name	Differences	Tested
CY-TF65BRC	Basic Model	☒
CY-TF65BRC***	The model is identical to basic model except for the model name only. ("*" can be any character or blank)	☐

Note: 1. Applicant consigns only basic model to test. Therefore this test report just guarantees the units, which have been tested.
2. The Applicant/manufacture is responsible for the compliance of all variants.

4. SYSTEM TEST CONFIGURATION

4.1 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	N/A	N/A
CONNECTOR BOARD	JIG_VX	N/A	N/A
ANTENNA BOARD	FILP NFC	N/A	N/A

4.2 Peripheral equipment

Defined as equipment needed for correct operation of the EUT, but not considered as tested:

Model	Manufacturer	Description	Connected to
CY-TF65BRC	Samsung Electronics Co Ltd	Samsung Flip Tray (EUT)	-
WM65R-W	Samsung Electronics Co Ltd	Color Display Unit	EUT

4.3 Mode of operation during the test

-. The EUT has 13.560 7 MHz RF boards for reading Card and continuous transmission and receive mode during the test.

4.4 Equipment Modifications

-. None

4.5 Configuration of Test System

Line Conducted Test : The EUT was connected to Color Display Unit and the power of Color Display Unit 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.

4.6 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.

5. PRELIMINARY TEST

5.1 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)
Transmitting Mode	X

5.2 Radiated Emissions Tests

During Preliminary Tests, the following operating modes were investigated

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

6. FINAL RESULT OF MEASUREMENT

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

6.1 Conducted Emission Test

Humidity Level : (46 ~ 47) % R.H.

Temperature: (23 ~ 24) °C

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

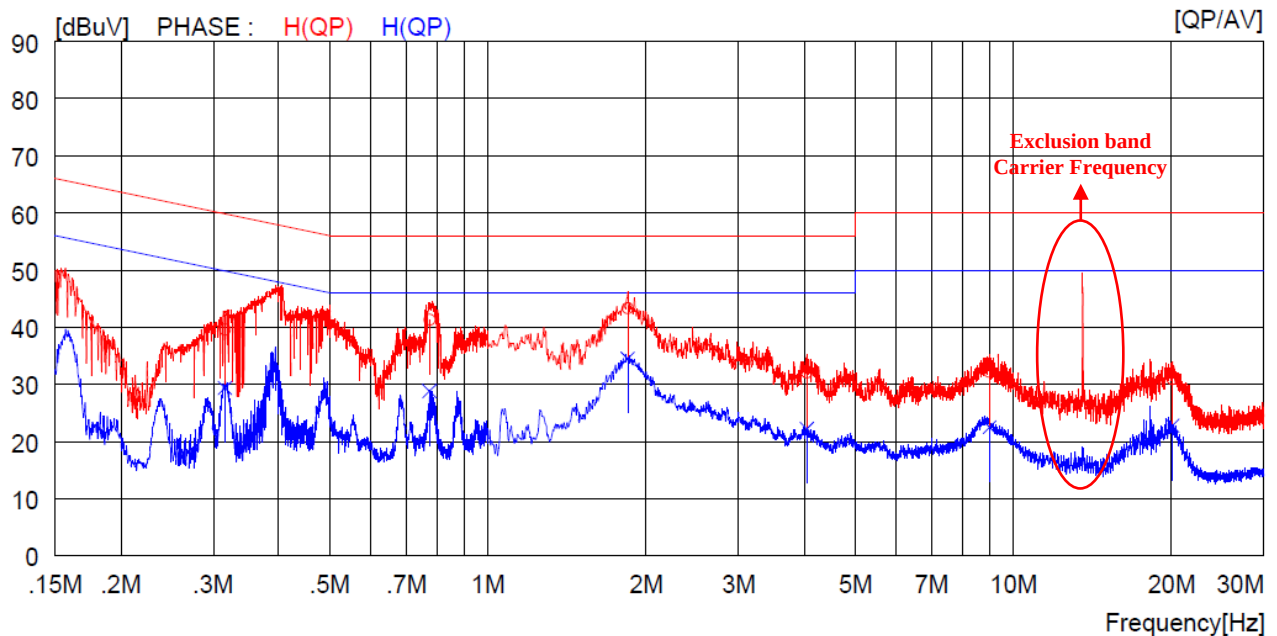
Result : PASSED

EUT : Samsung Flip Tray

Date: June 11, 2019

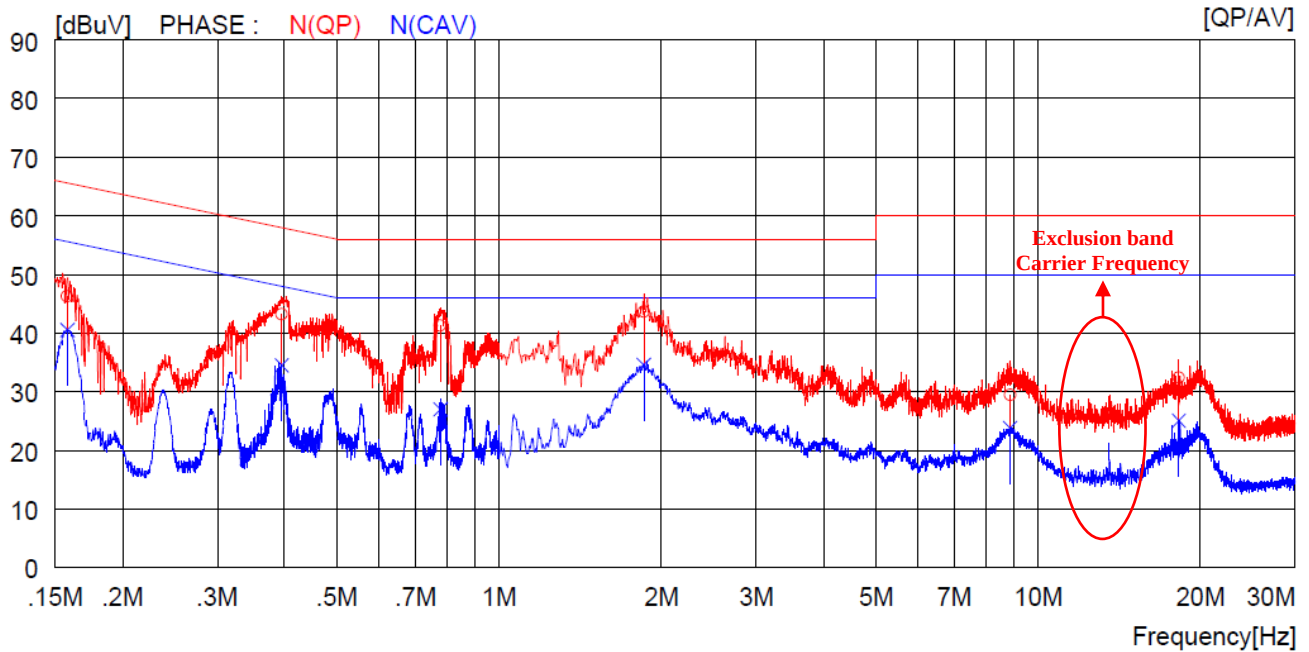
Detector : CISPR Quasi-Peak (6 dB Bandwidth: 9 kHz)

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	0.31600	29.5	----	10.1	39.6	----	59.8	----	20.2	----	H (QP)
2	0.77400	31.0	----	10.2	41.2	----	56.0	----	14.8	----	H (QP)
3	1.84400	33.1	----	10.2	43.3	----	56.0	----	12.7	----	H (QP)
4	4.04800	21.8	----	10.2	32.0	----	56.0	----	24.0	----	H (QP)
5	9.01500	21.9	----	10.3	32.2	----	60.0	----	27.8	----	H (QP)
6	20.09000	20.4	----	10.5	30.9	----	60.0	----	29.1	----	H (QP)
7	0.31600	----	19.3	10.1	----	29.4	----	49.8	----	20.4	H (CAV)
8	0.77400	----	18.6	10.2	----	28.8	----	46.0	----	17.2	H (CAV)
9	1.84400	----	24.3	10.2	----	34.5	----	46.0	----	11.5	H (CAV)
10	4.04800	----	12.0	10.2	----	22.2	----	46.0	----	23.8	H (CAV)
11	9.01500	----	12.2	10.3	----	22.5	----	50.0	----	27.5	H (CAV)
12	20.09000	----	12.3	10.5	----	22.8	----	50.0	----	27.2	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	0.15800	36.2	----	10.1	46.3	----	65.6	----	19.3	----	N (QP)
2	0.39500	33.0	----	10.2	43.2	----	58.0	----	14.8	----	N (QP)
3	0.77800	31.1	----	10.2	41.3	----	56.0	----	14.7	----	N (QP)
4	1.85600	33.5	----	10.2	43.7	----	56.0	----	12.3	----	N (QP)
5	8.87500	19.1	----	10.3	29.4	----	60.0	----	30.6	----	N (QP)
6	18.25000	22.0	----	10.4	32.4	----	60.0	----	27.6	----	N (QP)
7	0.15800	----	30.4	10.1	----	40.5	----	55.6	----	15.1	N (CAV)
8	0.39500	----	24.3	10.2	----	34.5	----	48.0	----	13.5	N (CAV)
9	0.77800	----	16.8	10.2	----	27.0	----	46.0	----	19.0	N (CAV)
10	1.85600	----	24.4	10.2	----	34.6	----	46.0	----	11.4	N (CAV)
11	8.87500	----	13.5	10.3	----	23.8	----	50.0	----	26.2	N (CAV)
12	18.25000	----	14.7	10.4	----	25.1	----	50.0	----	24.9	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: Ju Yun Park / Assistant Manager

6.2 RADIATED EMISSION TEST

6.2.1 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 % R.H. Temperature: 23 °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 : Samsung Flip Tray Date: June 07, 2019 ~ June 11, 2019
 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 7	33.48	H	20.37	0.3	54.15	124	69.85
13.560 7	26.72	V	20.37	0.3	47.39	124	76.61

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


 Tested by: Ju Yun Park / Assistant Manager

6.2.2 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 : 46 % R.H.

Temperature: 23 °C

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

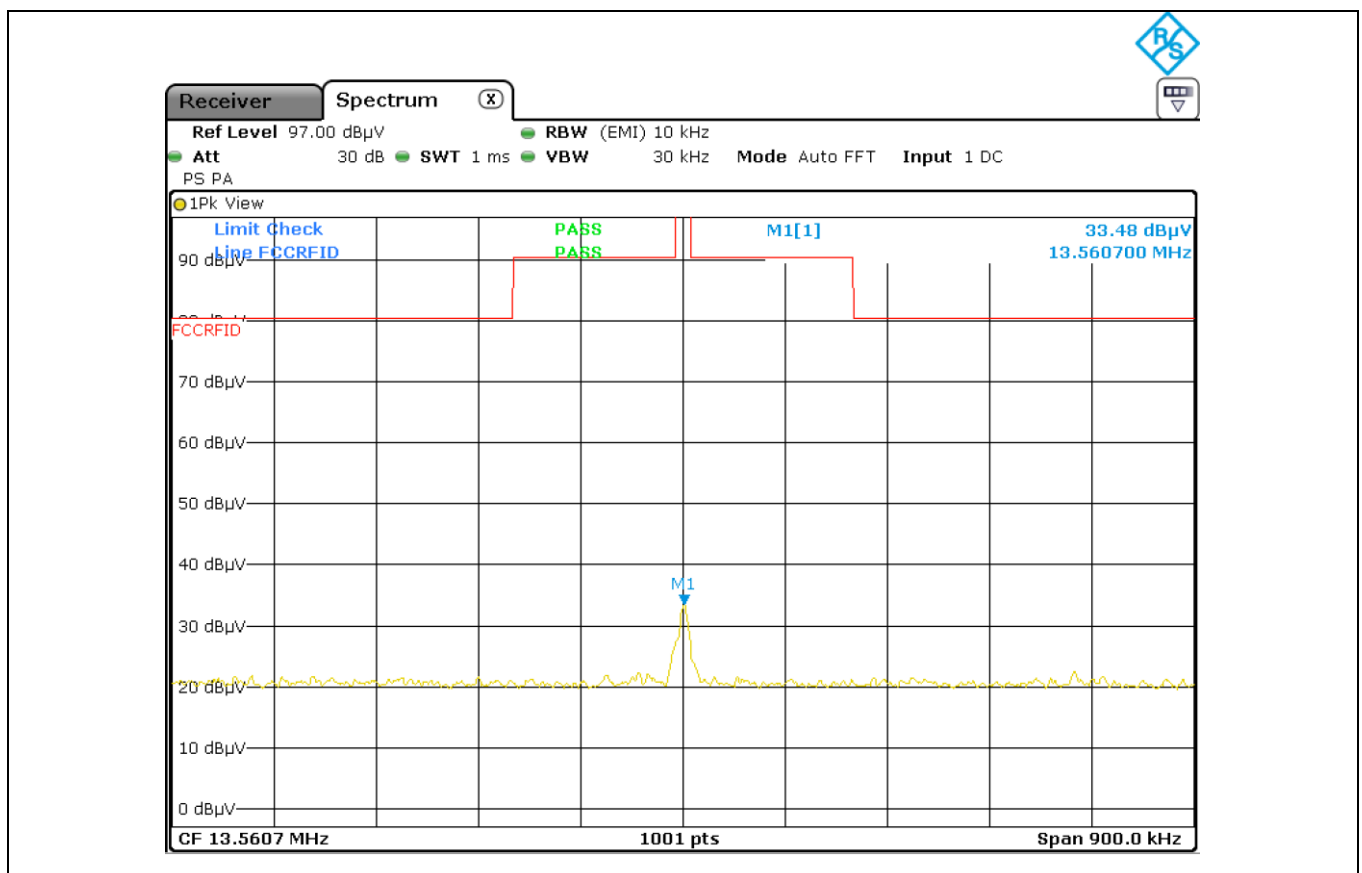
Type of Test : Low Power Transmitter below 1 705 kHz

Result : PASSED

EUT : Samsung Flip Tray

Date: June 07, 2019 ~ June 11, 2019

Operating Condition : Transmitting Mode



cc. to above test data, the field strength level of 13.560 7 MHz is 33.48 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: Ju Yun Park / Assistant Manager

6.3 SPURIOUS EMISSION TEST

6.3.1 Spurious Radiated Emission Below 30 MHz

Humidity Level : (49 ~ 50) % R.H. Temperature: (22 ~ 23) °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 : Samsung Flip Tray Date: Date: June 11, 2019
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: Ju Yun Park / Assistant Manager

6.3.2 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 : (49 ~ 50) % R.H.

Temperature: (22 ~ 23) °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

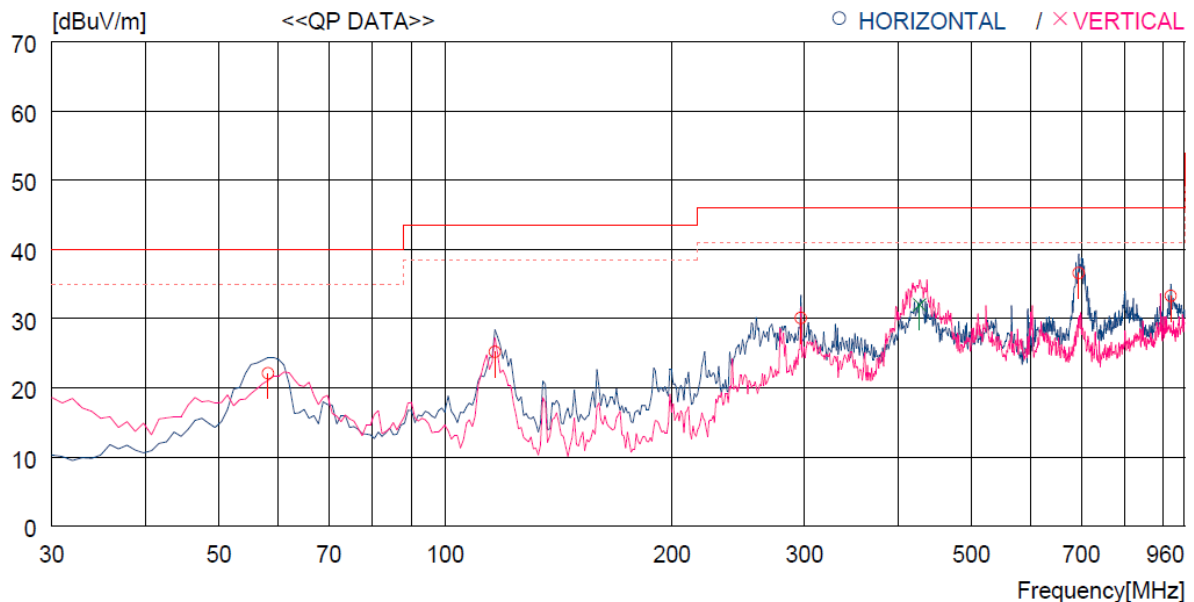
Result : PASSED

EUT : Samsung Flip Tray

Date: June 11, 2019

Operating Condition : Transmitting Mode

Distance : 3 m



No.	FREQ	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	QP	FACTOR	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
		[dBuV]	[dB]							
----- Horizontal -----										
1	58.130	39.7	13.5	2.0	33.1	22.1	40.0	17.9	400	359
2	116.330	44.6	10.8	2.8	33.0	25.2	43.5	18.3	300	183
3	296.750	45.3	13.3	4.5	33.0	30.1	46.0	15.9	100	333
4	694.445	43.6	19.5	7.0	33.5	36.6	46.0	9.4	100	0
5	920.448	35.5	22.1	8.1	32.4	33.3	46.0	12.7	200	64
----- Vertical -----										
6	426.731	43.0	16.8	5.4	33.2	32.0	46.0	14.0	100	359

Tested by: Ju Yun Park / Assistant Manager

6.4 20 dB BANDWIDTH

6.4.1 Operating environment

Temperature : 23 °C
Relative humidity : 46 % R.H.

6.4.2 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.

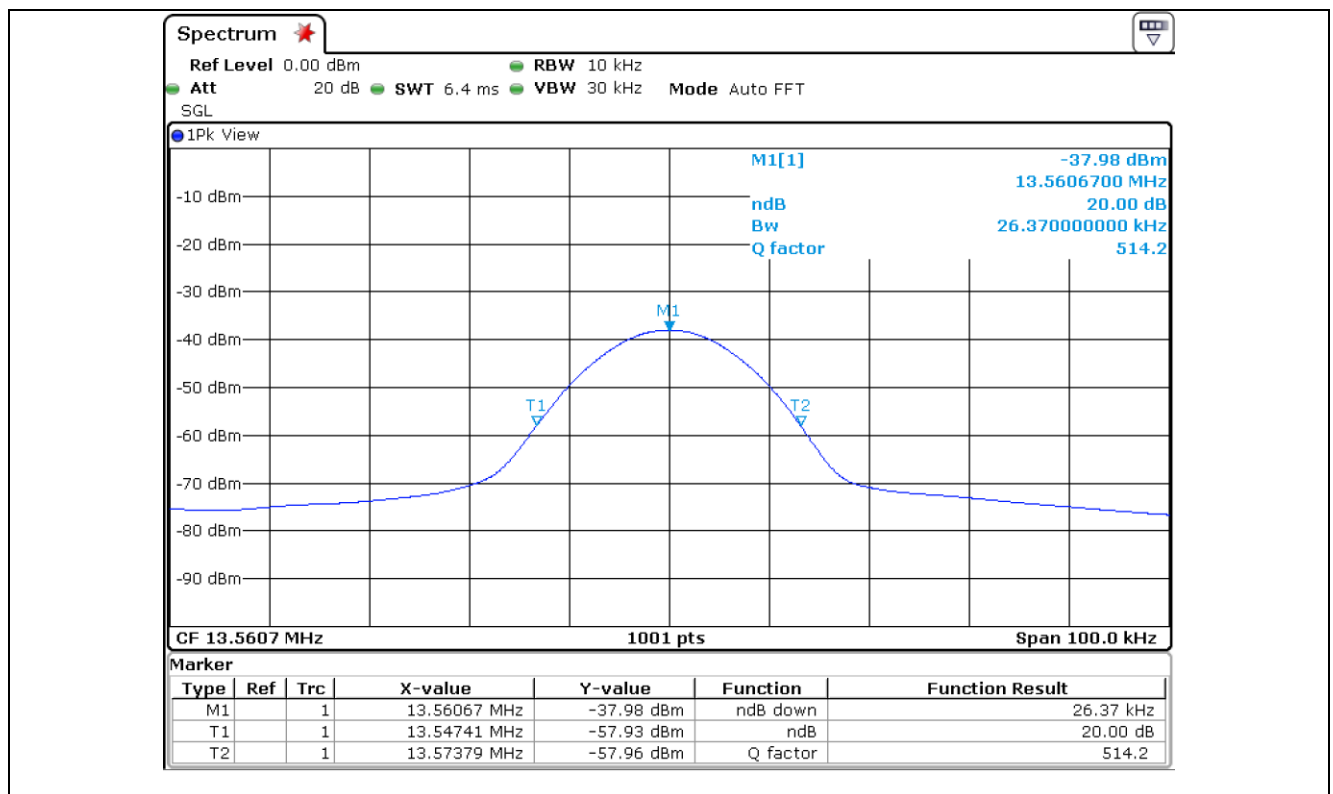


6.4.3 Test data

- Test Date : June 07, 2019 ~ June 11, 2019
- 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 7	26.37	900	PASS

Tested by: Ju Yun Park / Assistant Manager



6.5 FREQUENCY STABILITY WITH TEMPERATURE VARIATION

6.5.1 Operating environment

Temperature : 23 °C
Relative humidity : 46 % R.H.

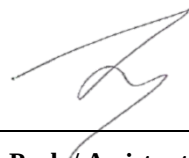
6.5.2 Test set-up

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.

6.5.3 Test data

-. Test Date : June 07, 2019 ~ June 11, 2019
-. Result : PASSED

Temperature (°C)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Margin (Hz)	Limit (Hz)
-20	13,560,700	13,560,738	38	± 1 356.07
-10		13,560,794	94	
0		13,560,793	93	
10		13,560,824	124	
20		13,560,813	113	
30		13,560,822	122	
40		13,560,848	148	
50		13,560,854	154	



Tested by: Ju Yun Park / Assistant Manager

6.6 FREQUENCY STABILITY WITH VOLTAGE VARIATION

6.6.1 Operating environment

Temperature : 23 °C
Relative humidity : 46 % R.H.

6.6.2 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.

6.6.3 Test data

-. Test Date : June 07, 2019 ~ June 11, 2019
-. Result : PASSED

Voltage (Vdc)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Margin (Hz)	Limit (Hz)
138(115 %)	13,560,700	13,560,832	132	± 1 356.07
120(100 %)		13,560,819	119	
102(85 %)		13,560,866	166	

Note: The EUT is powered by the color display unit. Therefore, tested the operation voltage of color display unit.



Tested by: Ju Yun Park / Assistant Manager

7. 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)

8. LIST OF TEST EQUIPMENT

No.	EQUIPMENTS	MFR.	MODEL	SER. NO.	LAST CAL	DUE CAL	USE
1.	Test receiver	R/S	ESCI	101012	Oct. 22, 2018	One Year	-
2.		R/S	ESR	101470	Oct. 22, 2018	One Year	■
3.		R/S	ESPI	101278	Oct. 20, 2018	One Year	-
4.	Spectrum analyzer	R/S	FSV30	101372	Aug. 23, 2018	One Year	■
5.	Amplifier	Sonoma Instrument	310N	312544	Mar. 18, 2019	One Year	■
6.	Amplifier	Sonoma Instrument	310N	312545	Mar. 18, 2019	One Year	-
7.	TRILOG Broadband Antenna	Schwarzbeck	VULB9163	9163-255	Jun. 05, 2018	Two Year	■
8.	TRILOG Broadband Antenna	Schwarzbeck	VULB9163	9163-419	Aug. 09, 2018	Two Year	-
9.	Controller	Innco System	CO3000	CO3000/904/ 37211215/L	N/A	N/A	■
10.	LISN	EMCO	3825/2	9109-1867	Mar. 27, 2019	One Year	-
				9109-1869	Mar. 19, 2019	One Year	■
		Schwarzbeck	NNLK8121	804	Oct. 22, 2018	One Year	■
		Schwarzbeck	NSLK8128	8128-216	Mar. 20, 2019	One Year	■
11.	Turn Table	Innco System	DT3000	930611	N/A	N/A	■
12.	Antenna Master	Innco System	MA4000-EP	MA4000/332	N/A	N/A	-
13.	Antenna Master	Innco System	MA-4000XPET	MA4000/509	N/A	N/A	■
14.	Loop Antenna	Schwarzbeck	FMZB 1513	1513-235	May 13, 2018	Two Year	■
15.	Frequency Counter	HP	53152A	US39270295	Aug. 23, 2018	One Year	■
16.	Environmental Test Chamber	ESPEC	EBE- 5E30W6PT2L-22	3015006449	Dec. 27, 2018	One Year	■
17.	DC Power Supply	Protek	PWS-3003D	4020409	Aug. 24, 2018	One Year	-