

TEST REPORT



CTK Co., Ltd.
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Report No.:
CTK-2019-02684
Page (1) / (19) Pages

1. Client

- Name : Samsung SDS Co., Ltd.
- Address : (Sincheon-Dong) 125, Olympic-Ro, 35-Gil, Songpa-Gu Seoul,
Republic of Korea
- Date of Receipt : 2019-06-14

2. Manufacturer

- Name : Seongji Industrial Co., Ltd.
- Address : 54-33, Dongtanhana 1-gil, Hwaseong-si, Gyeonggi-do, Korea

3. Use of Report : For FCC Certification

4. Test Sample / Model : Digital door lock / 365plusZ3

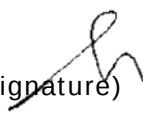
5. Date of Test : 2019-06-25 to 2019-07-08

6. Test Standard(method) used : FCC 47 CFR part 15 subpart C 15.225

7. Testing Environment : Temp.: (23 ± 1) °C, Humidity: (51 ± 3) % R.H.

8. Test Results : Compliance

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This Test Report cannot be reproduced, except in full.

Affirmation	Tested by	Technical Manager
	Bong-seok Kim : (Signature) 	Young-taek Lee : (Signature) 

2019-07-08

Republic of KOREA **CTK Co., Ltd.**



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Page (2) / (19) Pages

REPORT REVISION HISTORY

Date	Revision	Page No
2019-07-08	Issued (CTK-2019-02684)	all

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CONTENTS

1. General Product Description	4
1.1 Client Information	4
1.2 Product Information	4
1.3 Peripheral Devices	4
2. Facility and Accreditations	5
2.1 Test Facility	5
2.2 Laboratory Accreditations and Listings	5
2.3 Calibration Details of Equipment Used for Measurement	5
3. Test Specifications	6
3.1 Standards	6
3.2 Mode of operation during the test	6
3.3 Maximum Measurement Uncertainty	7
3.4 Description of Test	8
Radiated Emission	8
4. Technical Characteristic Test	9
4.1 Radiated Electric Field Emissions - 15.225(a)(b)(C)	9
4.2 Radiated Electric Field Emissions - 15.109, 15.209, 15.225(d)	11
4.3 Frequency Stability-15.225(e)	16
APPENDIX A – Test Equipment Used For Tests	18
APPENDIX B – EUT Photographs	19

	CTK Co., Ltd. (Ho-dong), 113, Yejik-ro, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea Tel: +82-31-339-9970 Fax: +82-31-624-9501	Report No.: CTK-2019-02684 Page (4) / (19) Pages	
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1. General Product Description

1.1 Client Information

Company	Samsung SDS Co., Ltd.
Contact Point	(Sincheon-Dong) 125, Olympic-Ro, 35-Gil, Songpa-Gu Seoul, Republic of Korea
Contact Person	Name: Myoung Kue Lee E-mail: myoungkue.lee@samsung.com Tel : +82-02-6155-6392

1.2 Product Information

FCC ID	P4Y365PLUSZ3
Product Description	Digital door lock
Model name	365plusZ3
Derivative model	-
Operating Frequency	Zigbee : 2 405 MHz - 2 480 MHz (DSSS) RFID : 13.3601 MHz
RF Output Power	Zigbee : 0.26 dBm (1.06 mW) RFID : 44.44 dBuV
Antenna Specification	Zigbee -Antenna type : Wire Antenna -Peak Gain : 2.5 dBi
	RFID -Antenna type : PCB Antenna -Peak Gain : -
Number of channels	Zigbee :16 RFID : 1
Channel Spacing	Zigbee : 5 MHz RFID : -
Type of Modulation	OQPSK, ASK
Power Source	DC 6.0 V(AA Battery * 4 EA)
RF Power setting in Test SW	Initial value

1.3 Peripheral Devices

- For Conducted Measurement and Radiated Measurement

Device	Manufacturer	Model No.	Serial No.
-	-	-	-

2. Facility and Accreditations

2.1 Test Facility

The measurement facility is located at (Ho-dong), 113, Yejik-ro, Cheoin-gu, Yong-in-si, Gyeonggi-do, Korea.

2.2 Laboratory Accreditations and Listings

Country	Agency	Registration Number
USA	FCC	805871
CANADA	ISED	8737A-2
KOREA	NRRA	KR0025

2.3 Calibration Details of Equipment Used for Measurement

Test equipment and test accessories are calibrated on regular basis. The maximum time between calibrations is one year or what is recommended by the manufacturer, whichever is less. All test equipment calibrations are traceable to the Korea Research Institute of Standards and Science (KRISS), therefore, all test data recorded in this report is traceable to KRISS.

3. Test Specifications

3.1 Standards

Section in RSS	Requirement(s)	Status (Note 1)	Test Condition
15.225 (a), (b), (c)	Radiated Electric Field Emissions	C	Radiated
15.109, 15.209, 15.225 (d)	Radiated Electric Field Emissions	C	
15.225 (e)	Frequency Stability	C	
15.207	AC Conducted Emission	NA(Note 3)	Line Conducted
<u>Note 1:</u> C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable			
<u>Note 2:</u> The data in this test report are traceable to the national or international standards.			
<u>Note 3:</u> The equipment is operated on battery power only.			
<u>Note 4:</u> The sample was tested according to the following specification: FCC Part 15.225, ANSI C63.10-2013			

3.2 Mode of operation during the test

The EUT is operated in a manner representative of the typical of the equipments.
During at testing, system components were manipulated within the confines of typical usage to maximize each emission. All modulation modes were tests.
The results are only attached worst cases.

Test Frequency

F1
13 560 160 Hz

3.3 Maximum Measurement Uncertainty

The value of the measurement uncertainty for the measurement of each parameter.
Coverage factor $k = 2$, Confidence levels of 95 %

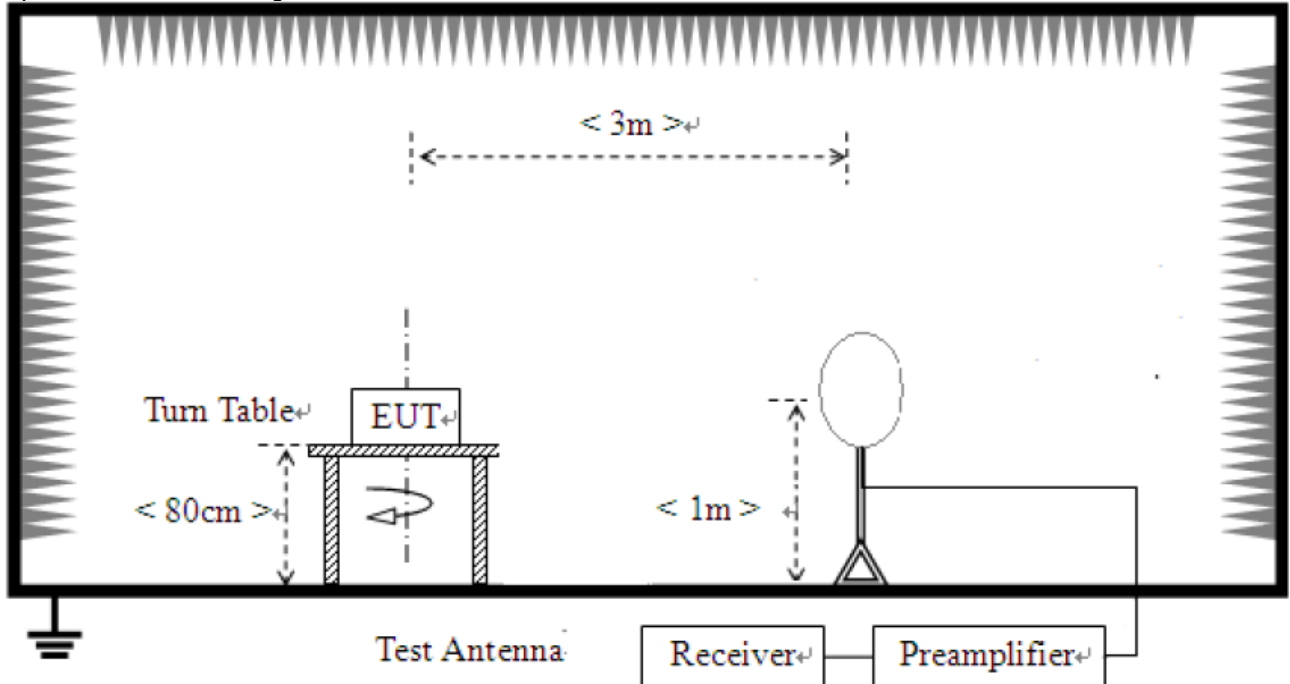
Description	Uncertainty
Conducted RF Output Power	1.5 dB
Occupied Bandwidth	0.1 MHz
Unwanted Emission(conducted)	3.0 dB
Radiated Emissions ($f \leq 1$ GHz)	4.0 dB
Radiated Emissions ($f > 1$ GHz)	5.0 dB

3.4 Description of Test

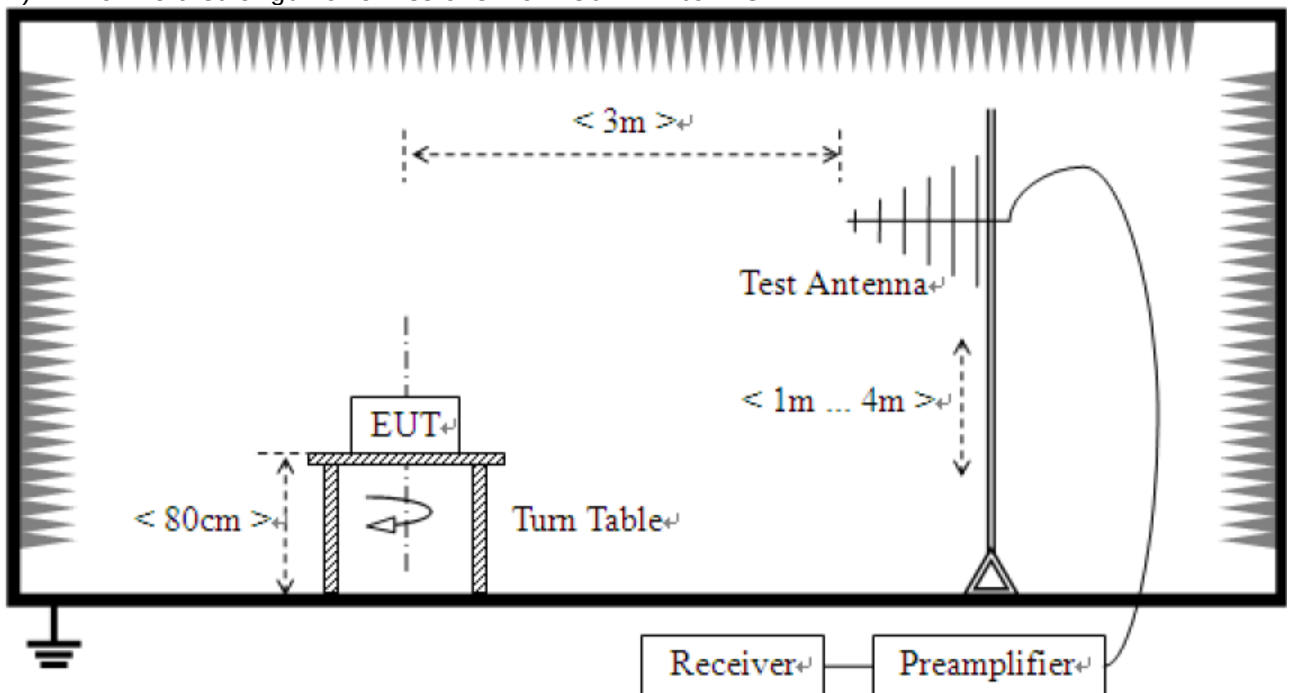
Test Setup:

Radiated Emission

- 1) For field strength of emissions from 9 kHz to 30 MHz



- 2) For field strength of emissions from 30 MHz to 1 GHz



4. Technical Characteristic Test

4.1 Radiated Electric Field Emissions - 15.225(a)(b)(C)

Test Location

☒ 10 m SAC (test distance : ☐ 10 m, ☒ 3 m)

Test Procedures

(a) The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

(b) Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

(c) Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

Limit :

Frequency [MHz]	Field strength limit ($\mu\text{V/m}$) @ 30 m	Field strength limit ($\text{dB}\mu\text{V/m}$) @ 30 m	Field strength limit ($\text{dB}\mu\text{V/m}$) @ 3 m
13.110-13.410	106	40.5	80.5
13.410-13.553	334	50.4	90.4
13.553-13.567	15 848	83.9	123.9
13.567-13.710	334	50.4	90.4
13.710-14.010	106	40.5	80.5

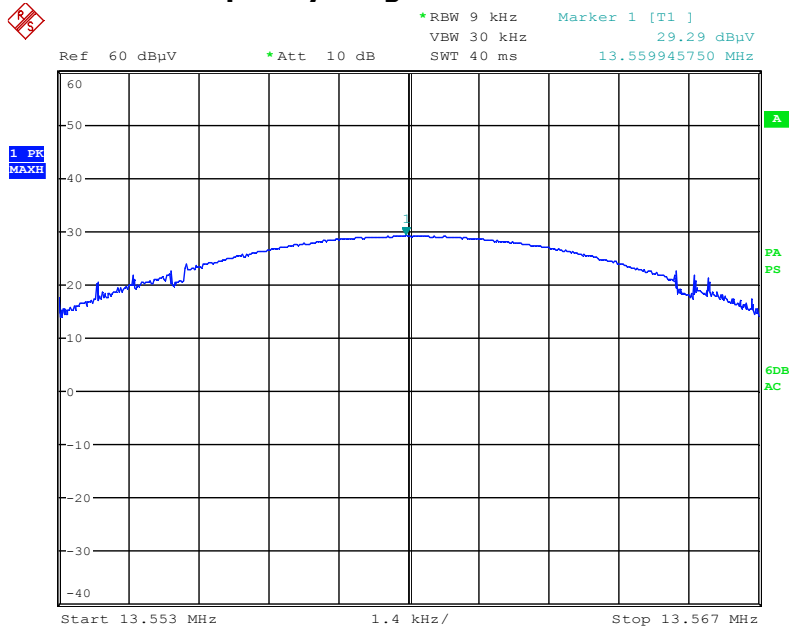
Test Data :

Frequency [MHz]	Frequency [kHz]	Reading* [$\text{dB}\mu\text{V/m}$]	c.f [dB/m]	Result [$\text{dB}\mu\text{V/m}$]	Limit [$\text{dB}\mu\text{V/m}$]
13.110-13.410	13.256	1.64	26.13	27.77	80.5
13.410-13.553	13.487	-16.00	26.14	10.14	90.4
13.553-13.567	13.560	18.30	26.14	44.44	123.9
13.567-13.710	13.573	-15.32	26.14	10.82	90.4
13.710-14.010	13.884	1.90	26.16	28.06	80.5

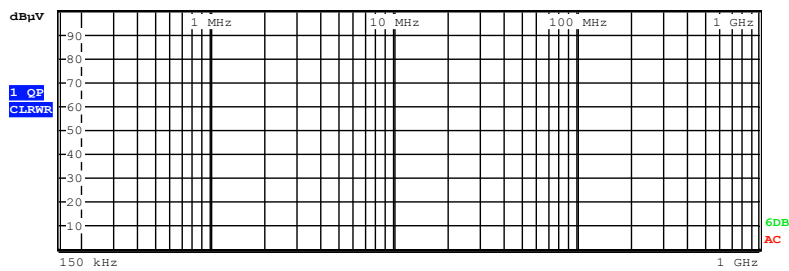
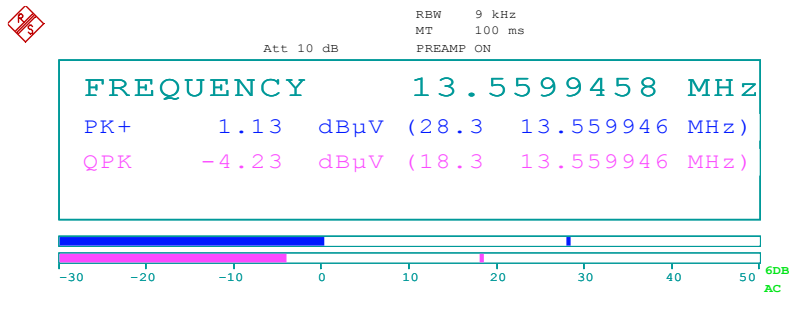
Note :

1. Measuring position : EUT stand-up position(X)
2. Result = Reading + c.f(correction factor)
3. Correction factor = Antenna factor + Cable loss - Amp Gain

Frequency range : 13.553-13.567 MHz



Date: 4.JUL.2019 06:10:42



Date: 4.JUL.2019 06:11:53

4.2 Radiated Electric Field Emissions - 15.109, 15.209, 15.225(d)

Test Location

☒ 10 m SAC (test distance : ☐ 10 m, ☒ 3 m)

Test Procedures

(d) The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in §15.209.

- 1) In the frequency range of 9 kHz to 30 MHz, magnetic field is measured with Loop Antenna. The center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.
- 2) In the frequency range above 30 MHz, Bi-Log Test Antenna(30 MHz to 1 GHz) and Horn Test Antenna(above 1 GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is carried from 1m to 4m above the ground to determine the maximum value of the field strength. The emissions levels at both horizontal and vertical polarizations should be tested.

Instrument Settings

Frequency Range = 9 kHz ~ 1 GHz

a) RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz, 9 kHz for $f < 30$ MHz

b) VBW $\geq$ RBW

c) Sweep time = auto couple

Limit :

FCC Part 15 § 15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

Table 1. Restricted Frequency Bands

MHz	MHz	MHz	MHz	MHz	GHz
0.09-0.11	8.37626-8.38675	73-74.6	399.9-410	2690-2900	10.6-12.7
¹ 0.495-0.505	8.41425-8.41475	74.8-75.2	608-614	3260-3267	13.25-13.4
2.1735-2.1905	12.29-12.293	108-121.94	960-1240	3332-3339	14.47-14.5
4.125-4.128	12.51975-12.52025	123-138	1300-1427	3345.8-3358	15.35-16.2
4.17725-4.17775	12.57675-12.57725	149.9-150.05	1435-1626.5	3600-4400	17.7-21.4
4.20725-4.20775	13.36-13.41	156.52475-156.52525	1645.5-1646.5	4500-5150	22.01-23.12
6.215-6.218	16.42-16.423	156.7-156.9	1660-1710	5350-5460	23.6-24
6.26775-6.26825	16.69475-16.69525	162.0125-167.17	1718.8-1722.2	7250-7750	31.2-31.8
6.31175-6.31225	16.80425-16.80475	167.72-173.2	2200-2300	8025-8500	36.43-36.5
8.291-8.294	25.5-25.67	240-285	2310-2390	9000-9200	² Above 38.6
8.362-8.366	37.5-38.25	322-335.4	2483.5-2500	9300-9500	

¹ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

² Above 38.6

§ 15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

FCC Part 15 § 15.209 (a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table :

Except when the requirements applicable to a given device state otherwise, emissions from licence-exempt transmitters shall comply with the field strength limits shown in Table 2. Additionally, the level of any transmitter emission shall not exceed the level of the transmitter's fundamental emission.

Table 2. General Field Strength Limits for Licence-Exempt Transmitters

Frequency (MHz)	Field Strength (uV/m)	Field Strength dBuV/m@3m	Measurement Distance (meters)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	30
1.705-30	30	-	30
30-88	100**	40	3
88-216	150**	43.5	3
216-960	200**	46	3
Above 960	500	54	3

** Except as provided in 15.209(g).fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72MHz, 76-88MHz, 174-216MHz, 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g.15.231 and 15.241.

Note :

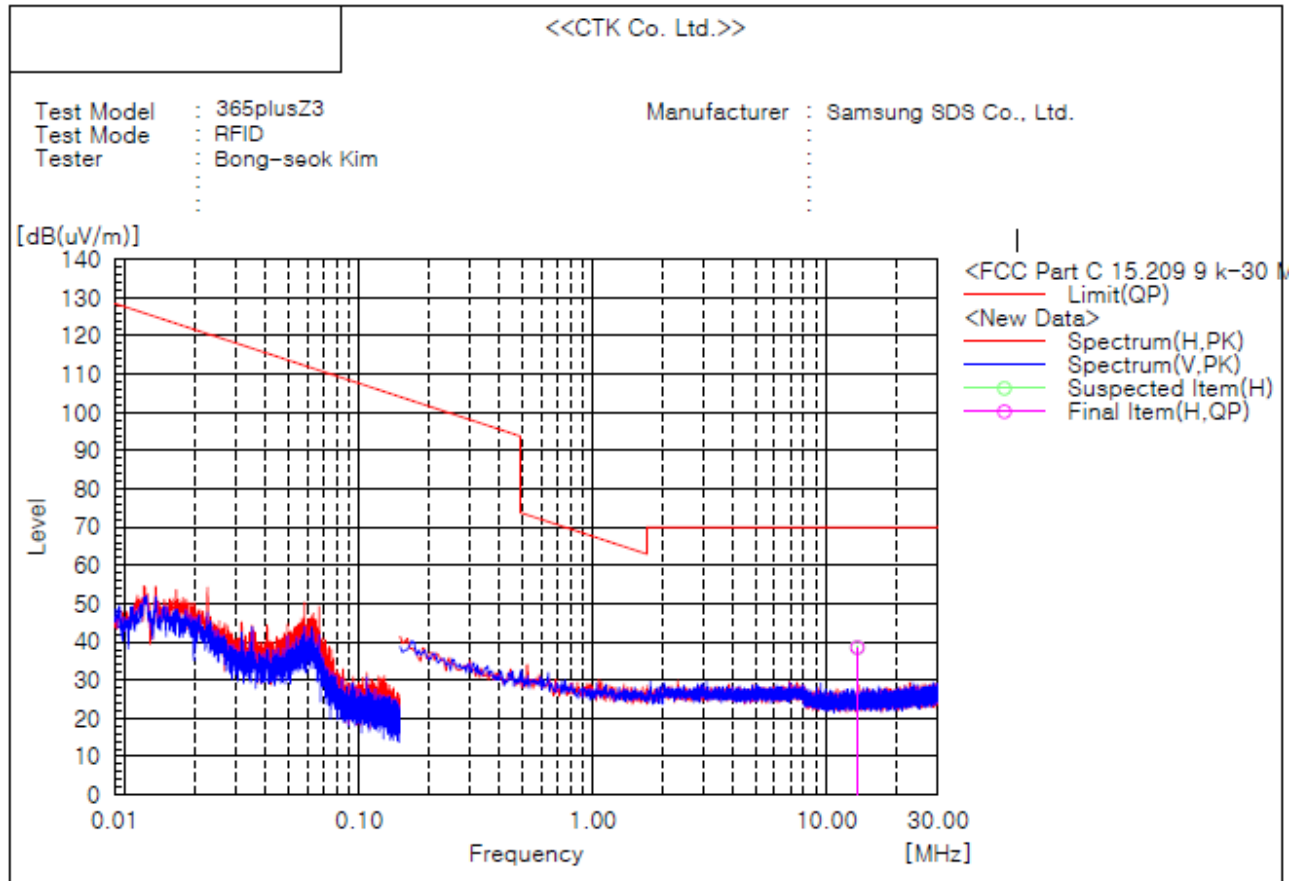
- 1) For above 1 GHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit.
- 2) For above 1 GHz, limit field strength of harmonics : 54 dBuV/m@3m (AV) and 74 dBuV/m@3m (PK)

Test Data :

1) 9 kHz to 30 MHz

The requirements are:

☒ Complies



Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]
1	13.560	H	12.7	25.8	38.5	70.0	31.5	100.0	192.0

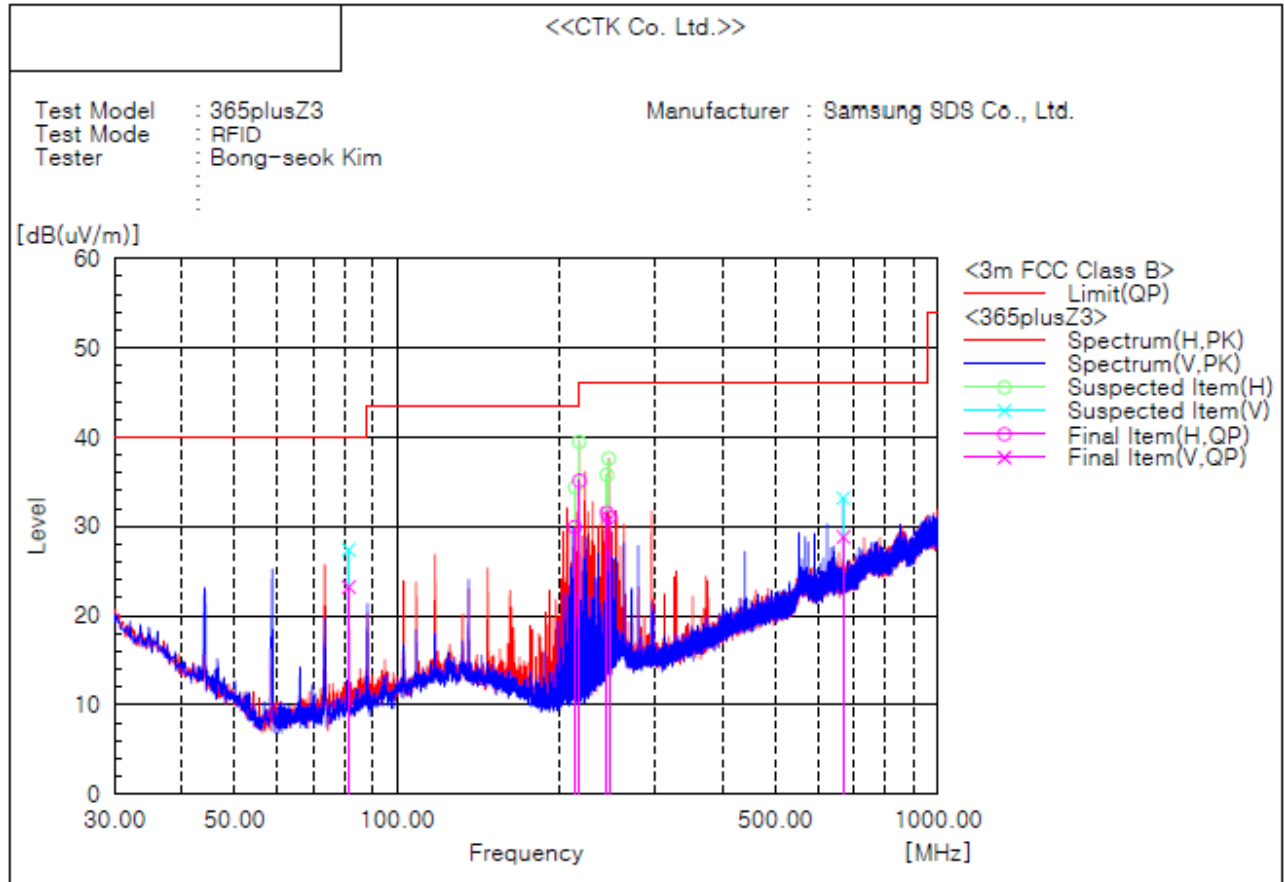
Note :

1. Measuring position : EUT stand-up position(X)
2. Result = Reading + c.f(correction factor)
3. Correction factor = Antenna factor + Cable loss - Amp Gain
4. Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB)

2) 30 MHz to 1 GHz

The requirements are:

☒ Complies



Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]
1	81.357	V	39.2	-16.0	23.2	40.0	16.8	305.0	55.0
2	213.005	H	43.2	-13.3	29.9	43.5	13.6	104.0	279.0
3	217.349	H	48.3	-13.2	35.1	46.0	10.9	196.0	33.0
4	244.240	H	41.6	-10.1	31.5	46.0	14.5	130.0	110.0
5	246.371	H	40.9	-9.9	31.0	46.0	15.0	117.0	331.0
6	668.382	V	28.3	0.5	28.8	46.0	17.2	101.0	187.0

Remark :

1. Measuring position : EUT stand-up position(X)
2. Result = Reading + c.f(Correction factor)
3. Correction factor = Antenna factor + Cable loss + 6 dB attenuator - Amp Gain
4. This data is the Peak(PK) value.

4.3 Frequency Stability-15.225(e)

Test Procedures

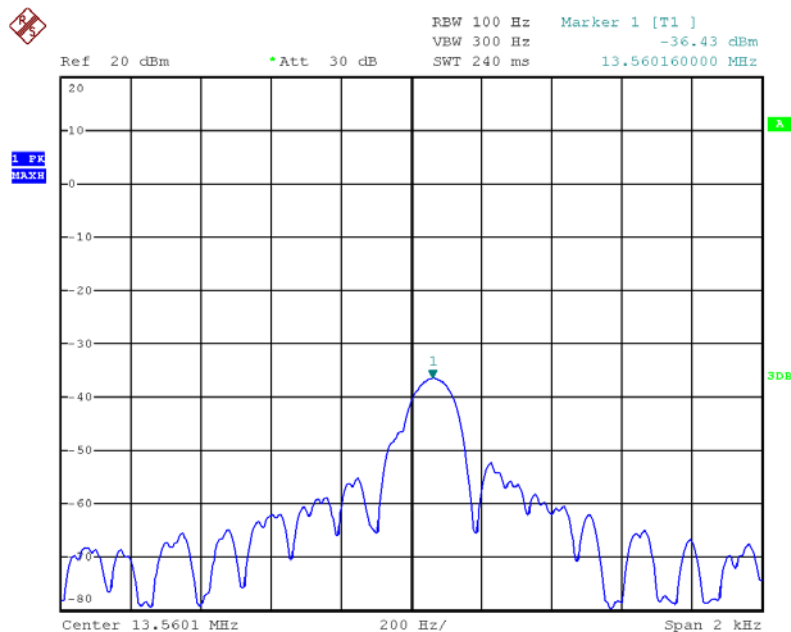
The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature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

Limit :

Frequency error = $\pm 0.01\%$ ($\pm 1\,356.061\text{ Hz}$)

Test Data :

Reference Frequency: 13 560 160 Hz



Date: 5.JUL.2019 03:48:56

Tem* [°C]	Carrier Frequency Measured with Time Elapsed								Result
	Start up		2 minutes		5 minutes		10 minutes		
+50	13.560060	-100	13.560060	-100	13.560060	-100	13.560080	-80	Pass
+40	13.560084	-76	13.560050	-110	13.560116	-44	13.560114	-46	Pass
+30	13.560120	-40	13.560120	-40	13.560144	-16	13.560116	-44	Pass
+20	13.560132	-28	13.560168	8	13.560156	-4	13.560175	15	Pass
+10	13.560180	30	13.560164	4	13.560208	48	13.560164	4	Pass
0	13.560200	40	13.560192	32	13.560196	36	13.560204	44	Pass
-10	13.560248	88	13.560184	24	13.560192	32	13.560214	54	Pass
-20	13.500148	-12	13.560192	32	13.560198	38	13.560214	54	Pass

Sup* [%]	Carrier Frequency Measured with Time Elapsed								Result
	Start up		2 minutes		5 minutes		10 minutes		
115	13.560144	-16	13.560128	-32	13.560134	-26	13.560136	-24	Pass
100	13.560150	-10	13.560160	0	13.560158	-2	13.560157	-3	Pass
85	13.560212	52	13.560188	28	13.560210	50	13.560214	54	Pass

Note :

1. Tem : Temperature, Sup : Power Supplied

APPENDIX A – Test Equipment Used For Tests

No.	Name of Equipment	Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date
1	Signal Analyzer	R&S	FSV30	100925	2019-01-21	2020-01-21
2	EMI Test Receiver	Rohde & Schwarz	ESCI7	100814	2018-10-25	2019-10-25
3	Active Loop Antenna	SCHWARZBECK	FMZB 1513	1513-126	2019-01-17	2021-01-17
4	Bilog Antenna	Schaffner	CBL6111C	2551	2019-04-17	2021-04-17
5	AMPLIFIER	SONOMA	310	291721	2019-01-28	2020-01-28
6	6dB Attenuator	R&S	DNF	272.4110.50-2	2018-10-25	2019-10-25
7	EMI Test Receiver	Rohde & Schwarz	ESU40	100336	2019-01-29	2020-01-29
8	Horn Antenna	ETS-Lindgren	3117	00154525	2019-02-22	2021-02-22
9	Preamplifier	Agilent	8449B	3008A02011	2018-12-03	2019-12-03

No.	Name of Equipment	Manufacturer	Model No.	Serial No.	Check Date
1	RF Cable (conducted)	Junkosha Inc.	MWX221	1510S087	2019-02-02
2	RF Cable (Radiated)	HUBER+SUHNER	SUCOFLEX 104	MY27558/4	2019-02-02
3	RF Cable (Radiated)	HUBER+SUHNER	SUCOFLEX 104	N/A (below 1GHz)	2019-02-02
4	RF Cable (Radiated)	HUBER+SUHNER	SUCOFLEX 104	MY27573/4	2018-11-30
5	RF Cable (Radiated)	HUBER+SUHNER	SUCOFLEX 106	N/A (above 1GHz)	2018-11-30

APPENDIX B – EUT Photographs

