CTK Co., Ltd.
386-1, Ho-dong, Cheoin-gu, Yongin-si, Gyeonggi-do, 449-100, Korea
Tel: +82-31-339-9970 Fax: +82-31-339-9855
www.e-ctk.com

TEST REPORT For FCC

Test Report No.	:	CTK-2013-00278
Date of Issue	:	2013-02-26
FCC ID	:	WQRSHN-WDS700
Model/Type No.	:	SHN-WDS700
Kind of Product	:	Digital Doorlock
Applicant	:	SAMSUNG SNS CO., LTD.
Applicant Address	:	207, Gangdong-daero, Gangdong-gu, Seoul, Korea
Manufacturer	:	VEGATECH Co., Ltd.
Manufacturer Address	:	146-7 Sangdaewondong, Jungwongu, Sungnamsi, Kyungki-Do Korea
Contact Person	:	Jinhee Kim / Senior Engineer
Telephone	:	+82-2-2225-6883
Received Date	:	2013-02-08
Test period	:	Start : 2013-02-12 End : 2013-02-26

The test results presented in this report relate only to the object tested.

Tested by

Won-Jae, Hwang
Test Engineer
Date: 2013-02-26

Reviewed by

Young-Joon, Park
Technical Manager
Date: 2013-02-26

REPORT REVISION HISTORY

Date	Revision	Page No
2013-02-26	Issued (CTK-2013-00278)	All

This report shall not be reproduced except in full, without the written approval of CTK Co., Ltd. This document may be altered or revised by CTK Co., Ltd. personnel only, and shall be noted in the revision section of the document. Any alteration of this document not carried out by CTK Co., Ltd. will constitute fraud and shall nullify the document.

TABLE OF CONTENTS

1.0 General Product Description

Equipment model name	SHN-WDS700
Serial number	Prototype
EUT condition	Pre-production, not damaged
Frequency Range	2405 MHz - 2480 MHz
RF output power	9.34 dBm
Number of channels	16
Transfer Rate	250 Kbps
Type of Modulation	DSSS
Channel Spacing	5 MHz
Duty cycle TX power	1.0
Power Source	6 Vdc (4 AA Alkaline 1.5 V Batteries (LR6))
Antenna Type	Chip antenna Gain : 1.79 dBi

1.1 Tested Frequency

	LOW	MID	HIGH
Frequency (MHz)	2405	2445	2480

1.2 Device Modifications

The following modifications were necessary for compliance:

Not applicable

1.3 Peripheral Devices

Device	Manufacturer	Model No.	Serial No.
Note Computer	DELL INC.	Inspiron 6400	-
Switching Adapter2	DDongguang Lite Power 2nd Plant	LA65NS0-00	-

1.4 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.

1.5 Test Facility

The measurement facility is located at 386-1, Ho-dong, Cheoin-gu, Yongin-si, Gyeonggi-do, 449-100, Korea. The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

1.6 Laboratory Accreditations and Listings

Country	Agency	Scope of Accreditation	Logo
USA	**FCC**	3 m & 10 m SAC and Conducted Test Site to perform FCC Part 15/18 measurements	805871
JAPAN	**VCCI**	3 m & 10 m SAC and Conducted Test Site	R-948, C-986, T-1843
KOREA	**KCC**	EMI (10 m SAC and Conducted Test Site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and Interruptions)	No. 51, KR0025
International	**KOLAS**	EMC	

2 Summary of tests

FCC Part Section(s)	Parameter	Limit	Test Condition	Status (note 1)
15.247(a)	6 dB Bandwidth	> 500 kHz	Conducted	C
15.247(b)	Maximum Output Power	< 1 Watt		C
15.247(d)	Conducted Spurious emission	> 20 dBc		C
15.247(d)	Band Edge	> 20 dBc		C
15.247(e)	Transmitter Power Spectral Density	< 8 dBm @ 3 kHz		C
				C
15.209	Field Strength of Harmonics	15.209(a)	Radiated	C
15.207	AC Conducted Emissions	15.207(a)	Line Conducted	NA

Note 1: C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable

Note 2: The data in this test report are traceable to the national or international standards.

The sample was tested according to the following specification:
- FCC Part 15.247, ANSI C63.4-2003

The tests were performed according to the method of measurements prescribed in

KDB No.558074

2.1 Technical Characteristic Test

2.1.1 6dB Bandwidth

Procedure:

The bandwidth at 6dB below the highest in-band spectral density was measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate frequencies.

After the trace being stable, Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 6dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 6 dB bandwidth of the emission.

The spectrum analyzer is set to:

Center frequency = the highest, middle and the lowest channels

RBW = 100 kHz

VBW = 100 kHz (VBW ≥ RBW)

Trace = max hold

Span = 40 MHz

Sweep = auto

Detector function = peak

Measurement Data:

Frequency (MHz)	Channel No.	Test Results		
		6dB Bandwidth (MHz)	Occupied Bandwidth (MHz)	Result
2405	11	1.59	2.43	Complies
2445	19	1.60	2.45	Complies
2480	26	1.61	2.48	Complies

Minimum Standard:

6 dB Bandwidth > 500kHz

See next pages for actual measured spectrum plots.

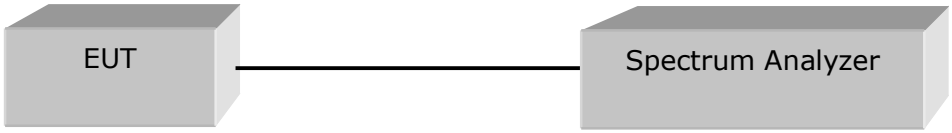
2.1.2 Maximum peak Conducted Output Power

Test Location

RF Test Room

Test Procedures

The transmitter output is connected to a spectrum analyzer and the analyzer's internal channel power integration function is used to integrate the power over a bandwidth greater than or equal to the 99% bandwidth.



Limit

< 1 W

Test Results

Cable loss : 3.65 dB

Frequency (MHz)	Channel No.	Mesurement data (dBm)	Total Power (dBm)	Limit	Result
2405	11	5.69	9.34	30dBm	Complies
2445	19	5.61	9.26		Complies
2480	26	5.45	9.10		Complies

2.1.3 Power Spectral Density

Procedure:

The peak power density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating in transmission mode at the appropriate frequencies.

The spectrum analyzer is set to:

RBW = 3 kHz VBW = (VBW ≥ RBW)

Sweep = Auto Span = 5 MHz

Detector function = peak Trace = max hold

Test Results

Mode	Frequency (MHz)	Ch.	Test Results	
			dBm	Result
ANT1	2405	11	-8.26	Complies
	2445	19	-8.52	Complies
	2480	26	-7.96	Complies

Minimum Standard:

Power Spectral Density	< 8dBm @ 3 kHz BW

See next pages for actual measured spectrum plots.

Power Density Measurement

2.1.4 Band - edge

Procedure:

The bandwidth at 20dB down from the highest inband spectral density is measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate frequencies.

After the trace being stable, Use the marker-to-peak function to measure 20 dB down both sides of the intentional emission.

The spectrum analyzer is set to:

Center frequency = the highest, middle and the lowest channels

RBW = 100 kHz	VBW = 100 kHz
Span = 20 MHz	Detector function = peak
Trace = max hold	Sweep = auto

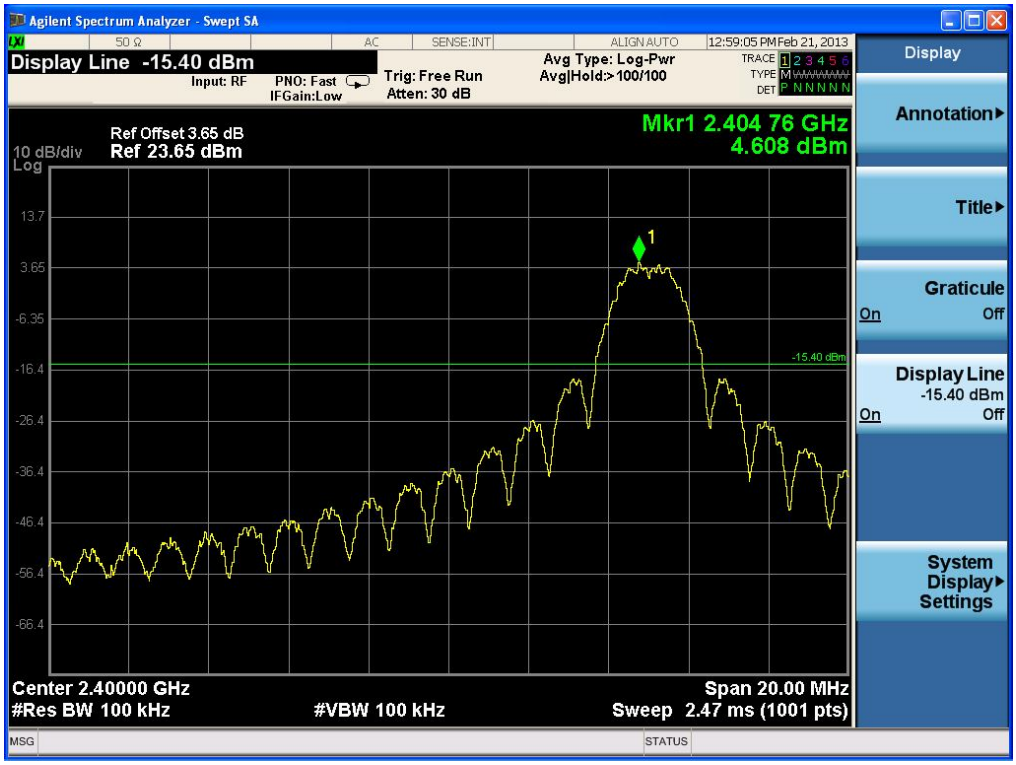
Measurement Data: Complies

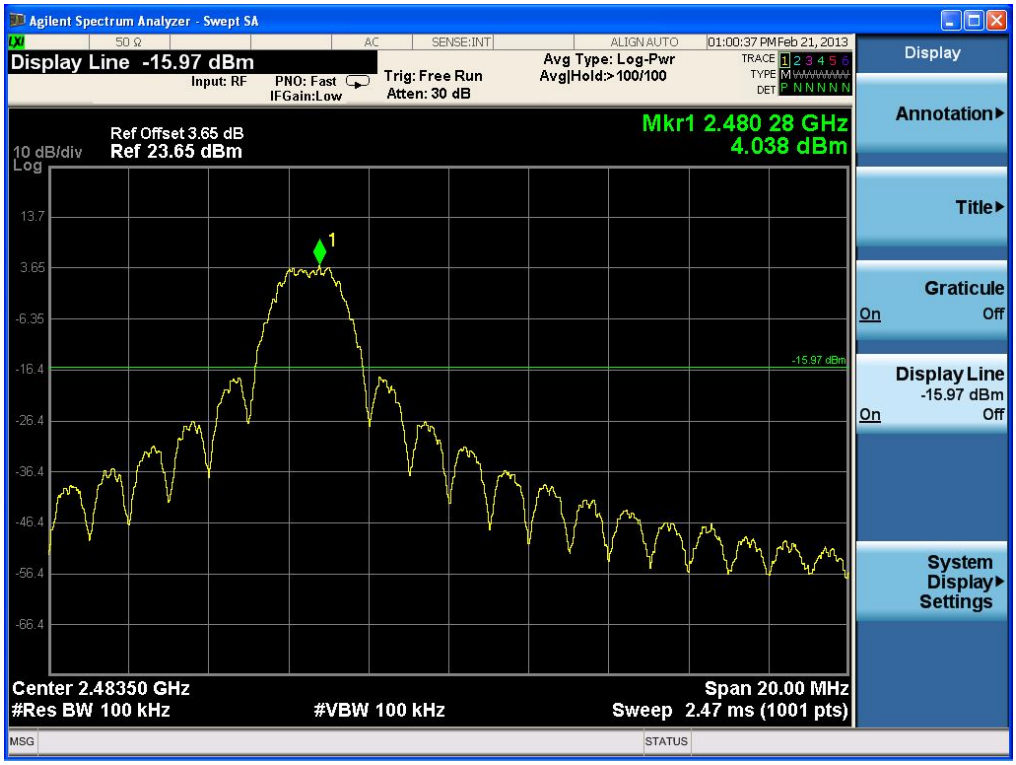
- All conducted emission in any 100 kHz bandwidth outside of the spread spectrum band was at least 20dB lower than the highest inband spectral density. Therefore the applying equipment meets the requirement.

Minimum Standard:	> 20 dBc

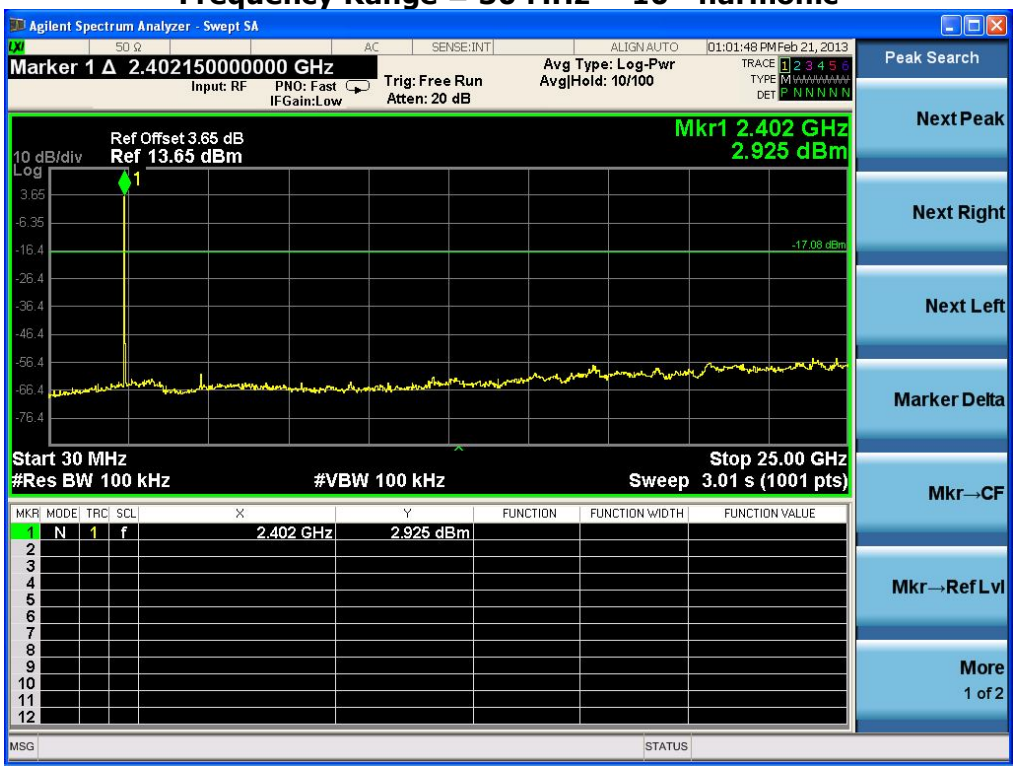
See next pages for actual measured spectrum plots.

Band–edge Measurements

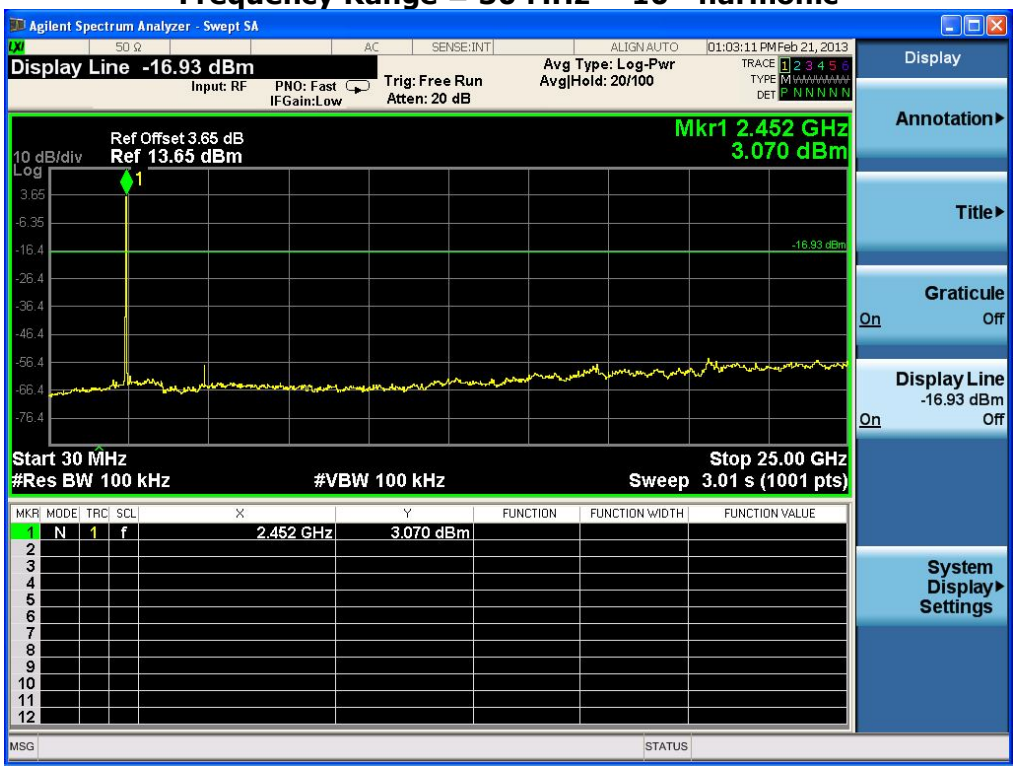




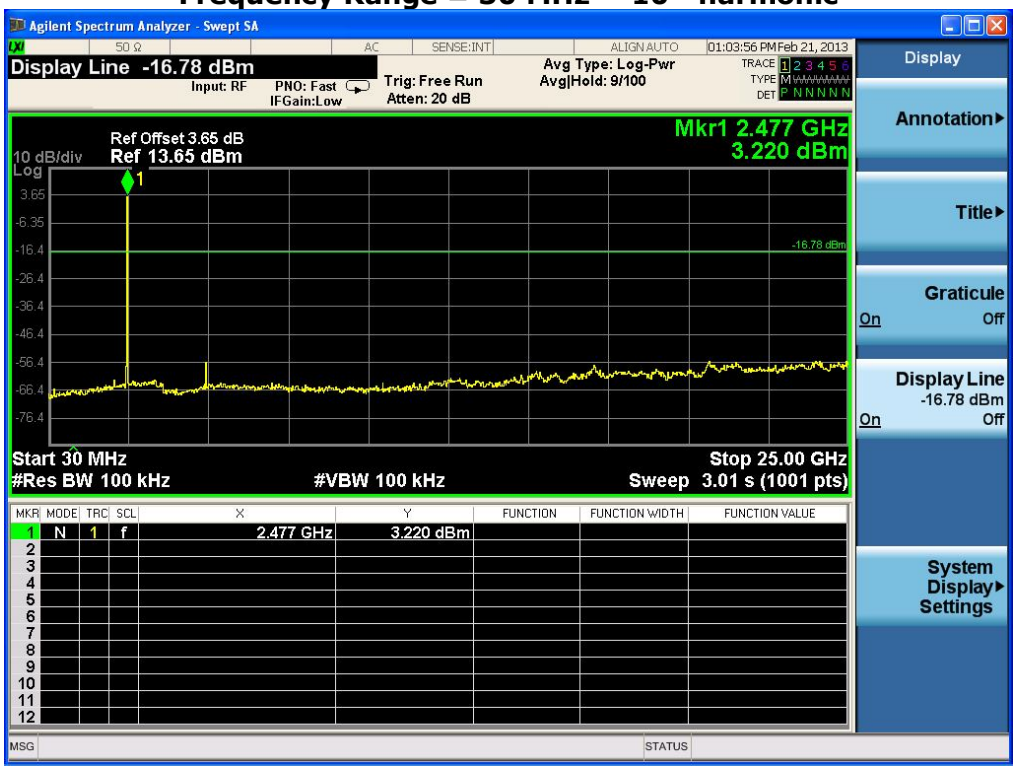
Band – edge (at 20 dB blow) – Low channel
Frequency Range = 30 MHz ~ 10th harmonic



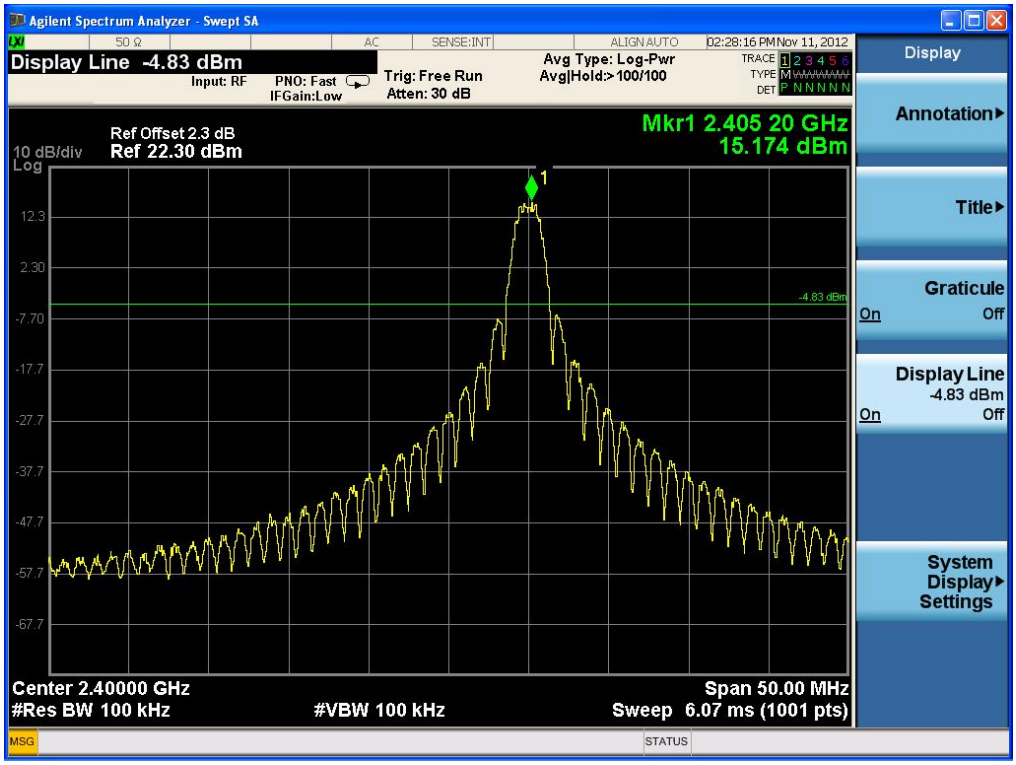
Band – edge (at 20 dB blow) – Mid channel
Frequency Range = 30 MHz ~ 10th harmonic

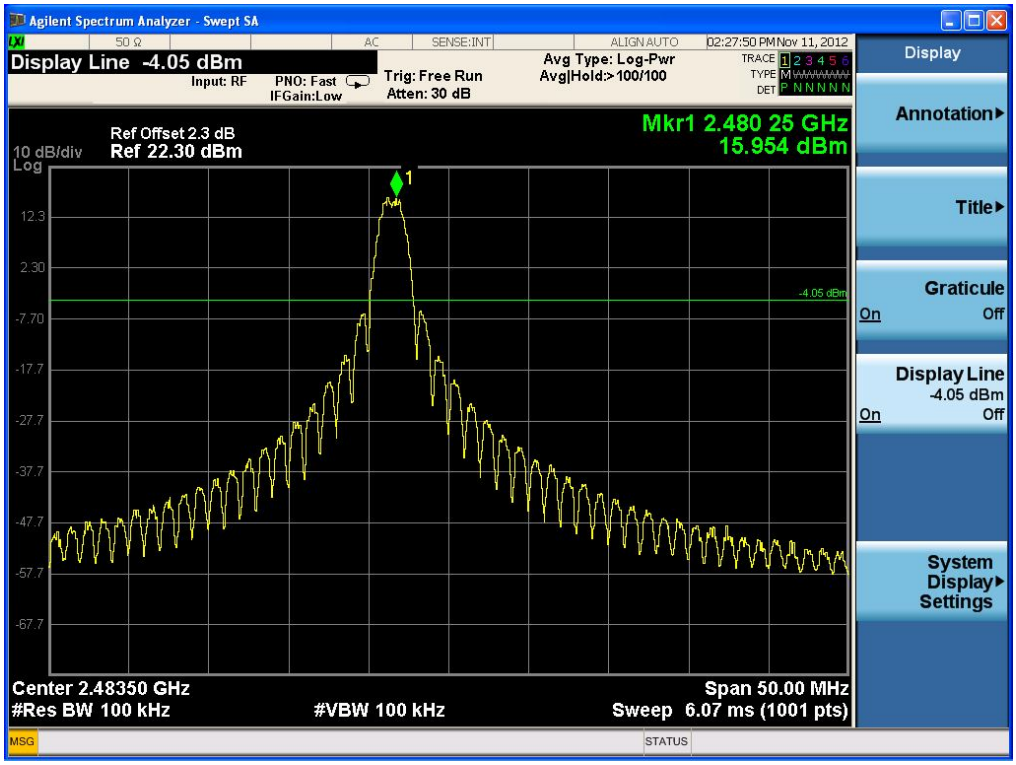


Band – edge (at 20 dB blow) – High channel
Frequency Range = 30 MHz ~ 10th harmonic

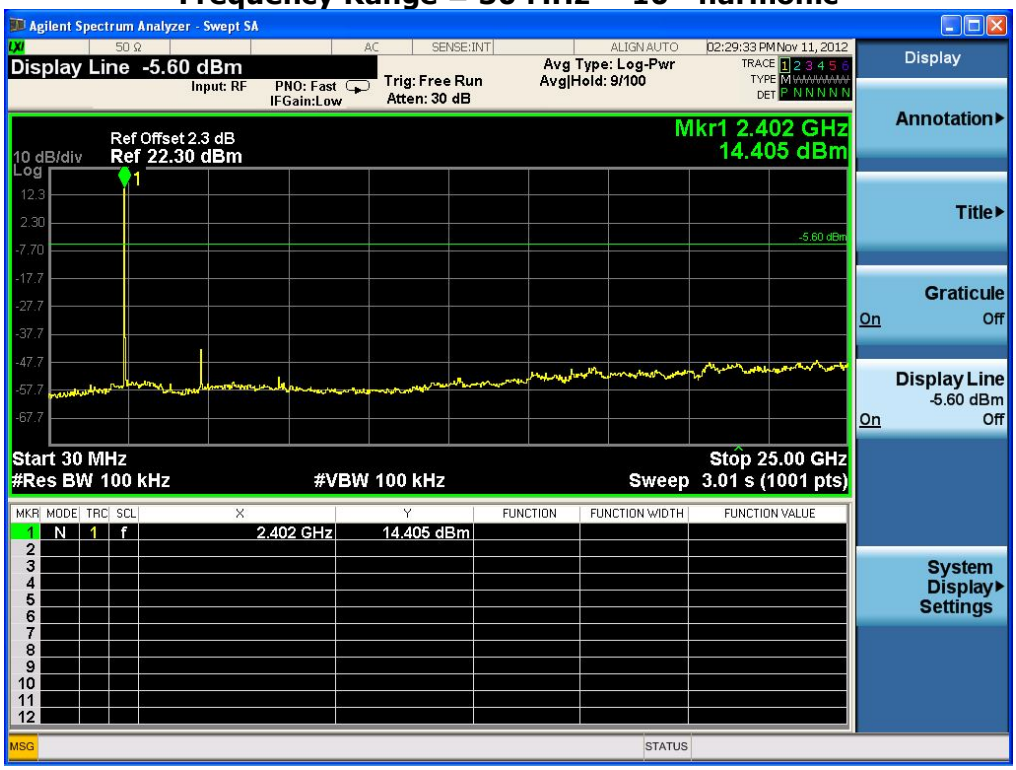


ANT2 Band–edge Measurements

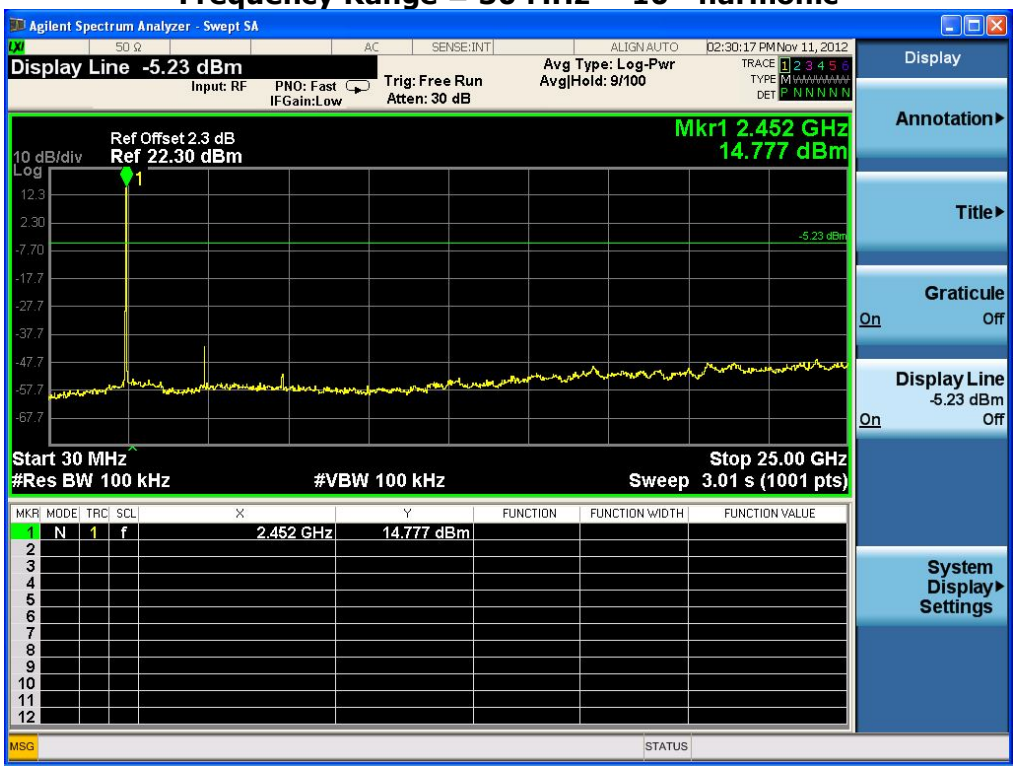




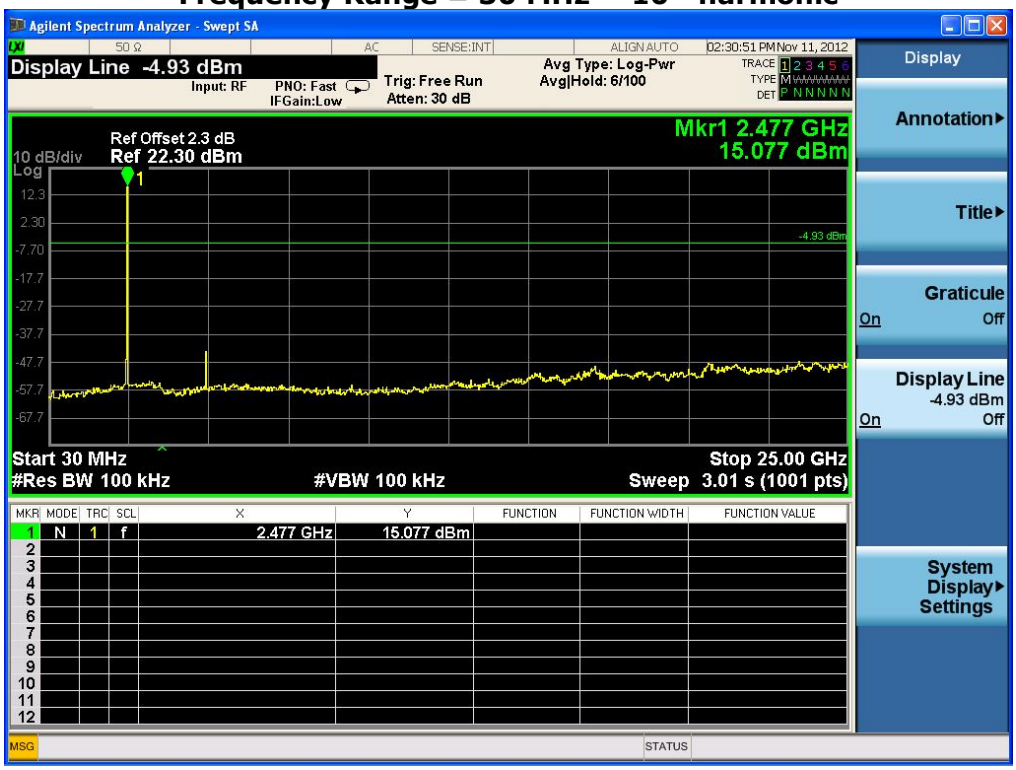
Band – edge (at 20 dB blow) – Low channel
Frequency Range = 30 MHz ~ 10th harmonic



Band – edge (at 20 dB blow) – Mid channel
Frequency Range = 30 MHz ~ 10th harmonic



Band – edge (at 20 dB blow) – High channel
Frequency Range = 30 MHz ~ 10th harmonic



2.1.5 Field Strength of Emissions

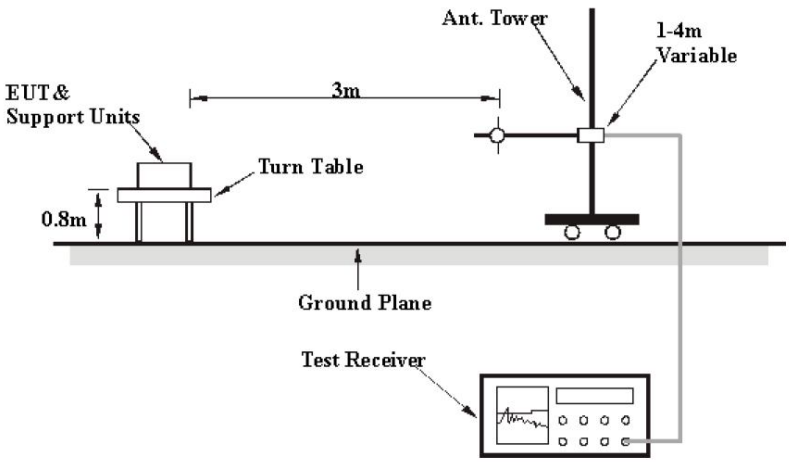
Test Location

☒ Testing was performed at a test distance of 3 meter SAC

Test Procedures

The height of the measuring antenna was varied between 1 to 4 m and the table was rotated a full revolution in order to obtain maximum values of the electric field intensity. The measurement was made in both the vertical and horizontal polarization, and the maximum value is presented in the report.

The spectrum analyzer is set to:
Center frequency = the worst channel
Frequency Range =30 MHz ~ 10th harmonic
RBW = 120 kHz (30 MHz ~ 1 GHz) VBW ≥ RBW
= 1 MHz (1 GHz ~ 10th harmonic)
Span = 100 MHz Detector function = Quasi-peak
Trace = max hold



Limit

- **15.209(a)**

Frequency(MHz)	Field Strength uV/m@3m	Field Strength dBuV/m@3m
30-88	100**	40
88-216	150**	43.5
216-960	200**	46
Above 960	500	54

** 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.

Test Results

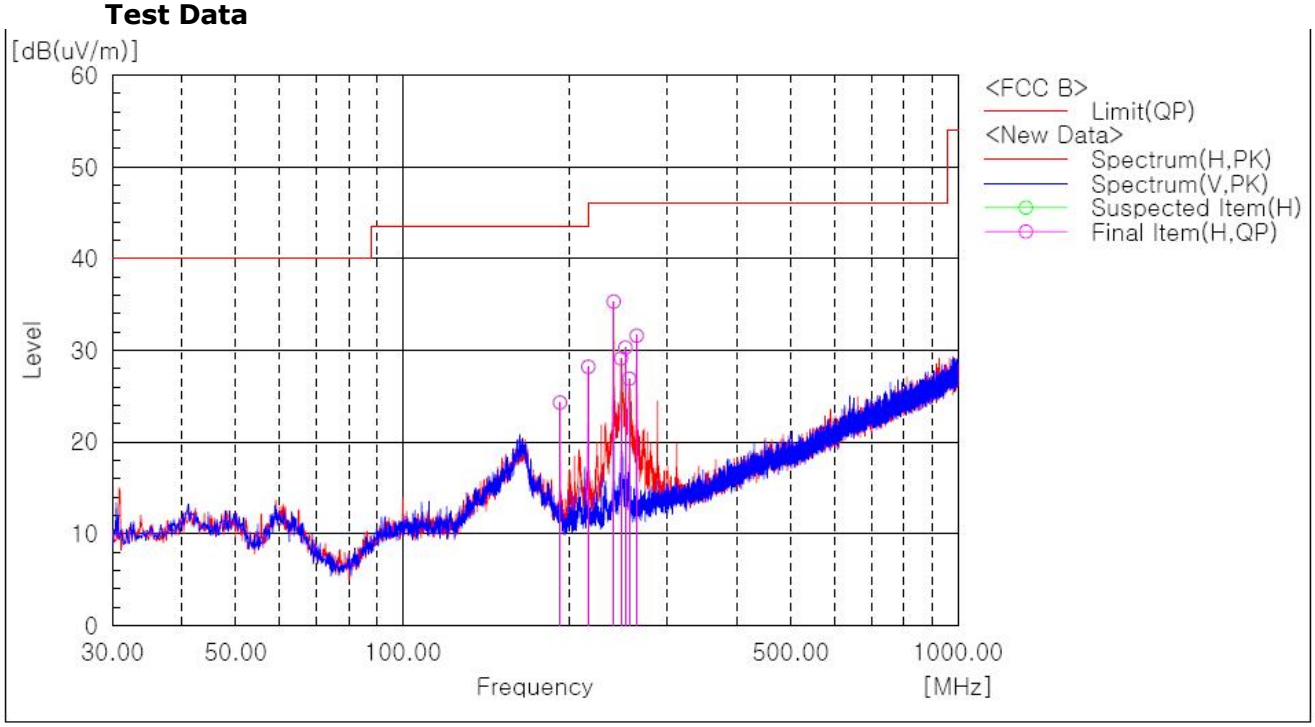
EUT	Digital Doorlock	Measurement Detail	
Model	SHN-WDS700	Frequency Range	Below 1000MHz
Mode	Ch.26 (Worst Case)	Detector function	Quasi-Peak

The requirements are:

☒ Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
240.005	35.3	10.7	Quasi-peak

Test Data



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	191.990	H	36.3	-12.0	24.3	43.5	19.2	207.0	177.0
2	215.998	H	40.7	-12.5	28.2	43.5	15.3	100.0	243.0
3	240.005	H	47.8	-12.5	35.3	46.0	10.7	100.0	92.0
4	247.401	H	41.6	-12.5	29.1	46.0	16.9	100.0	243.0
5	252.009	H	42.8	-12.5	30.3	46.0	15.7	100.0	243.0
6	256.010	H	39.1	-12.2	26.9	46.0	19.1	100.0	243.0
7	264.013	H	43.2	-11.6	31.6	46.0	14.4	207.0	290.0

Remark :
1. The field strength of spurious emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in stand-up position(X axis) and the worst case was recorded.

Test Results

EUT	Digital Doorlock	Measurement Detail	
Model	SHN-WDS700	Frequency Range	1-25GHz
		Detector function	Average / Peak

Remarks
We have tested three mode (X, Y, Z). The worst mode (X axis) for final test.

The requirements are:

☒ Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
2483.73	38.5	15.5	Average

Test Data

Frequency [MHz]	Reading [dBuV/m] AV / Peak	Pol.	Height [m]	Correction Factor			Limits [dBuV/m] AV / Peak	Result [dBuV/m] AV / Peak	Margin [dB] AV / Peak
				Antenna	Amp. Gain	Cable			
No emissions were detected at a level greater than 20dB below limit.									

Restricted band edge test data

Measured frequency range : 2310-2390 MHz, 2483.5-2500 MHz

Frequency [MHz]	Reading [dBuV/m] AV / Peak		Pol.	Height [m]	Correction Factor			Limits [dBuV/m] AV / Peak		Result [dBuV/m] AV / Peak		Margin [dB] AV / Peak	
					Antenna	Amp. Gain	Cable						
2483.73	38.2	43.4	V	1.2	28.2	35.3	7.4	54.0	74.0	38.5	43.7	15.5	30.3

2.1.6 AC Conducted Emissions

Test Location
Shielded Room

Frequency Range of Measurement
150 kHz to 30 MHz

Instrument Settings
IF Band Width: 9 kHz

Test Procedures

The EUT was placed on a non-metallic table 0.8m above the metallic, grounded floor and 0.4m from the reference ground plane wall. The distance to other metallic surfaces was at least 0.8m.
Amplitude measurements were performed with a quasi-peak detector and an average detector.

Limit

- **15.207(a)**

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 ~ 0.5	66 to 56*	56 to 46*
0.5 ~ 5	56	46
5 ~ 30	60	50

* Decreases with the logarithm of the frequency.

Test Results
The requirements are:

☒ **Not Applicable**

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
-	-	-	-

Test Data

[HOT]

Not Applicable

Not Applicable

[NEUTRAL]

Not Applicable

Not Applicable

APPENDIX A – Test Equipment Used For Tests

	Name of Equipment	Manufacturer	Model No.	Serial No.	Due Date
1	Signal Analyzer	Agilent	N9020A	MY48011598	2013-11-08
2	Spectrum Analyzer	Rohde & Schwarz	FSP-30	100994	2013-11-08
3	EMI Test Receiver	Rohde & Schwarz	ESCI7	100814	2013-12-14
4	EMI Test Receiver	Rohde & Schwarz	ESCI7	100816	2013-12-14
5	Trilog Broadband Antenna	SCHWARZBECK	VULB 9161 SE	9161-4133	2014-06-11
6	Active Loop Antenna	SCHWARZBECK	FMZB 1513	1513-125	2014-06-06
7	Attenuator	HP	8498A	1801A06913	2013-11-09
8	EPM Series Power Meter	HP	E4418A	GB38272734	2013-11-08
9	Power Sensor	HP	8487A	3318A03524	2013-07-10
10	Audio Analyzer	HP	8903B	2747A03432	2013-11-08
11	ESG-D Series Signal Generator	Agilent	E4432B	US40054094	2013-11-08
12	SYNTHESIZED SWEEPER	HP	8341B	2819A01563	2013-11-08
13	Attenuator	HP	8494A	3308A33351	2013-11-09
14	Temp&Humi Chamber	Kunpoong	JT-TH-556-1	9QE5-002	2014-01-16
15	DC POWER SUPPLY	Agilent	E3632A	MY40011638	2013-11-08
16	Horn Antenna	ETS-Lindgren	3115	00078894	2013-03-22
17	Horn Antenna	ETS-Lindgren	3115	00078895	2013-03-22
18	Horn Antenna	ETS-Lindgren	3116	00062916	2013-03-22
19	Horn Antenna	ETS-Lindgren	3116	00062504	2013-03-22
20	Dipole Antenna	SCHWARZBECK	VHA 9103	VHA91032557	2013-11-04
21	Dipole Antenna	SCHWARZBECK	UHA 9105	UHA91052417	2013-11-04
22	OPT H64 AMPLIFIER	HP	8447F	3113A06814	2013-03-27
23	PREAMPLIFIER	Agilent	8449B	3008A02307	2013-11-09
24	Radio Communication Tester	Rohde & Schwarz	CMU200	106765	2014-02-04
25	LISN	Rohde & Schwarz	ENV216	101235	2013-08-06
26	LISN	Rohde & Schwarz	ENV216	101236	2013-08-06
27	DC POWER SUPPLY	Agilent	E3632A	MY40011638	2013-11-08
28	EMI Test Receiver	Rohde & Schwarz	ESCI3	100032	2014-02-04
29	6dB Attenuator	R&S	DNF	272.4110.50	2013-11-09
30	AMPLIFIER	Sonoma Instrument Co.	310	291721	2013-03-27
31	EMI Test Receiver	Rohde & Schwarz	ESU40	100336	2013-06-29
32	Signal Generator	Rohde & Schwarz	SMB100A	175528	2013-10-08