TEST REPORT

of

FCC Part 15 Subpart C

☒ New Application; ☐ Class I PC; ☐ Class II PC

Product :	**Smart Lock**
Brand:	**LEON**
Model:	**CL5510; CL4510**
Model Difference:	**The color of these two are same. The hardware of unlocking are different, CL5510 is cylindrical to drive latch. CL4510 is tubular to drive latch.**
FCC ID:	**2ADR8CL455510**
FCC Rule Part:	**§15.225, Cat:DXX**
Applicant:	**Leon Specialty Inc.**
Address:	**7F,No.95, Minquan Road,Xindian Dist., New Taipei City 23141, Taiwan (R.O.C.)**

Test Performed by:

International Standards Laboratory
<Lung-Tan LAB>
*Site Registration No.
BSMI: SL2-IN-E-0013; MRA TW1036; TAF: 0997; IC: IC4067B-3;
*Address:
No. 120, Lane 180, San Ho Tsuen, Hsin Ho Rd.
Lung-Tan Hsiang, Tao Yuan County 325, Taiwan
*Tel : 886-3-407-1718; Fax: 886-3-407-1738

Report No.: **ISL-15LR355FC**

Issue Date : **2016/01/04**

VERIFICATION OF COMPLIANCE

Applicant:	Leon Specialty Inc.
Product Description:	Smart Lock
Brand Name:	LEON
Model No.:	CL5510; CL4510
Model Difference:	The color of these two are same. The hardware of unlocking are different. CL5510 is cylindrical to drive latch. CL4510 is tubular to drive latch.
FCC ID:	2ADR8CL455510
Date of test:	2015/12/23 ~ 2015/12/31
Date of EUT Received:	2015/12/23

We hereby certify that:

All the tests in this report have been performed and recorded in accordance with the standards described above and performed by an independent electromagnetic compatibility consultant, International Standards Laboratory.

The test results contained in this report accurately represent the measurements of the characteristics and the energy generated by sample equipment under test at the time of the test. The sample equipment tested as described in this report is in compliance with the limits of above standards.

Test By:		***Date:***	2016/01/04
	Dion Chang / Engineer		
Prepared By:		***Date:***	2016/01/04
	Gigi Yeh / Specialist		
Approved By:		***Date:***	2016/01/04
	Vincent Su / Technical Manager		

Version

Version No.	Date	Description
00	2016/01/04	Initial creation of document

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1 GENERAL INFORMATION

1.1 Product Description

Product Name	Smart Lock
Brand Name	LEON
Model Name	CL5510; CL4510
Model Difference	The color of these two are same. The hardware of unlocking are different. CL5510 is cylindrical to drive latch. CL4510 is tubular to drive latch..
Power Supply	6Vdc(1.5Vdc AA battery*4)

Bluetooth:

Frequency Range:	2402 – 2480MHz
Bluetooth Version:	V4.0
Channel number:	40 channels, 2MHz step
Modulation type:	Wide band Modulation (GFSK)
Transmit Power:	-3.35 dBm Peak
Dwell Time:	N/A
Antenna Designation:	Chip Antenna , 2.5dBi

NFC:

Operating Frequency	13.56MHz
Transmit Power	70.25 dBuV/m Peak at 3m
Number of Channels	1
Antenna Type	Loop Antenna
Module Type	ASK

The Test report is applied for NFC.

Remark: The above DUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: 2ADR8CL455510 filing to comply with Section 15.225 of the FCC Part 15, Subpart C Rules.

1.3 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI 63.4: 2014. Radiated testing was performed at an antenna to EUT distance 3 meters. Radiated testing was performed at an antenna to EUT distance 3 meters.

1.4 Test Facility

The measurement facilities used to collect the 3m Radiated Emission and AC power line conducted data are located on the address of **International Standards Laboratory** <Lung-Tan LAB> No. 120, Lane 180, Hsin Ho Rd., Lung-Tan Dist., Tao Yuan City 325, Taiwan which are constructed and calibrated to meet the FCC requirements in documents ANSI 63.4: 2014. FCC Registration Number is: TW1036, Canada Registration Number: 4067B-3.

1.5 Special Accessories

Not available for this EUT intended for grant.

1.6 Equipment Modifications

Not available for this EUT intended for grant.

2 System Test Configuration

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

The EUT (Transmitter) was tested with a test program to fix the Tx frequency that was for the purpose of the measurements. For more information please see test data and APPENDIX 1 for set-up photographs.

2.3 Test Procedure

2.3.1 Conducted Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the requirements in Section 7 and 13 of ANSI C63.4: 2014.Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and Average detector mode.

2.3.2 Radiated Emissions

The EUT is a placed on as turn table which is 0.8 m/1.5m(Frequency above 1GHz) above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter(EUT) was rotated through three orthogonal axes according to the requirements in Section 6 and 11 of ANSI C63.10: 2013.

2.4 Limitation

(1) Conducted Emission

According to section 15.207(a) Conducted Emission Limits is as following.

Frequency range MHz	Limits dB (uV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
Note 1.The lower limit shall apply at the transition frequencies 2.The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.		

(2) Radiated Emission

1. The field strength of any emission within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters. (124dBuV/m at 3m)
2. 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. (90.47dBuV/m at 3m.)
3. 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. (80.5dBuV/m at 3m.)
4. The field strength of any emissions appearing outside of the 13.110-14.010 MHz shall not exceed the general radiated emission limits in section 15.209(Intentional Radiators general limit).as below.

Frequency (MHz)	Field strength μV/m	Distance (m)	Field strength at 3m dBμV/m
1.705-30	30	30	69.54
30-88	100	3	40
88-216	150	3	43.5
216-960	200	3	46
Above 960	500	3	54

Remark:
1. Emission level in dBuV/m=20 log (uV/m)
2. Measurement was performed at an antenna to the closed point of EUT distance of meters.
3. Only spurious frequency is permitted to locate within the Restricted Bands specified in provision of ξ 15.205
4. Emission spurious frequency which appearing within the Restricted Bands specified in provision of ξ15.205, then the general radiated emission limits in ξ 15.209 apply.
5.

Limitation Calculation:

15,848 microvolts/meter at 30 meters =20log(15,848) dBuV/m at 30m = 84dBuV/m at 30m = 124dBuV/m at 3m

30m to 3m distance correction factor: 40log(30/3) = 40dB

(3) Frequency Tolerance

The frequency tolerance of the carrier signal shall be maintained within +/- 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.

2.5 Configuration of Tested System

Fig. 2-1 Configuration of Tested System

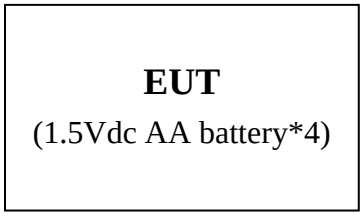


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/ Type No.	Series No.	Data Cable	Power Cord
1.	N/A					

3 Summary of Test Results

FCC Rules	Description Of Test	Result
§15.207	Conducted Emission	N/A
§15.225 (a)-(d)	Radiated Emission	Compliant
§15.225 (e)	Frequency Stability	Compliant

4 Description of test modes

The EUT was tested when placed vertically on the table and the EUT stay in continuous transmitting mode.

5 Conducted Emissions Test

5.1 Measurement Procedure:

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

5.2 Test SET-UP (Block Diagram of Configuration)

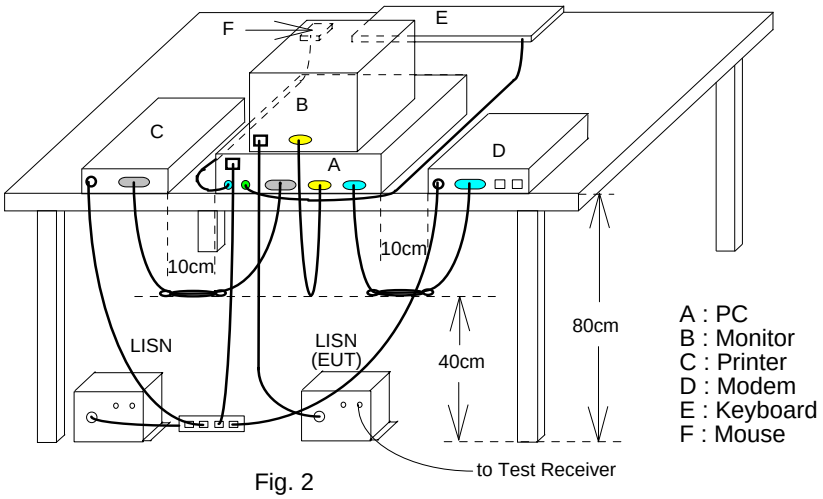


Fig. 2

5.3 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
Conduction 04-3 Cable	WOKEN	CFD 300-NL	Conduction 04 -3	07/28/2015	07/27/2016
EMI Receiver 17	Rohde & Schwarz	ESCI 7	100887	09/08/2015	09/07/2016
LISN 18	ROHDE & SCHWARZ	ENV216	101424	02/11/2015	02/10/2016
LISN 19	ROHDE & SCHWARZ	ENV216	101425	03/12/2015	03/11/2016

5.4 Measurement Result:

N/A, the device is powered from battery.

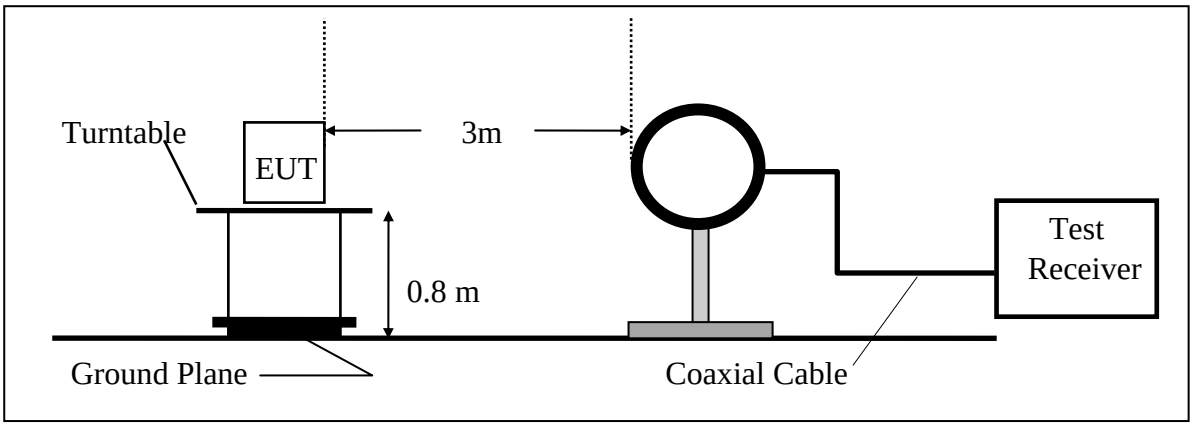
6 Radiated Emission Test

6.1 Measurement Procedure

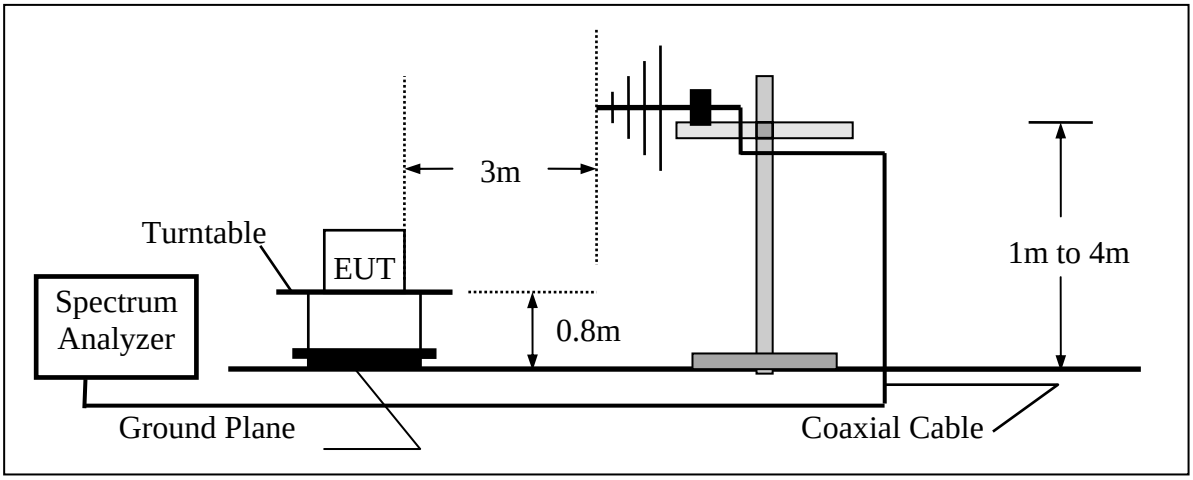
1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measured were complete.

6.2 Test SET-UP (Block Diagram of Configuration)

(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



(B) Radiated Emission Test Set-Up, Frequency Below 1000MHz



6.3 Measurement Equipment Used:

966 Chamber					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
Spectrum Analyzer 21(26.5GHz)	Agilent	N9010A	MY49060537	07/30/2015	07/29/2016
Spectrum Analyzer 20(6.5GHz)	Agilent	E4443A	MY48250315	05/21/2015	05/20/2016
Spectrum Analyzer 22(43GHz)	R&S	FSU43	100143	05/23/2015	05/22/2016
Loop Antenna9K-30M	A.H.SYSTEM	SAS-564	294	06/17/2015	06/16/2017
Bilog Antenna30-1G	Schaffner	CBL 6112D	37873	06/16/2015	06/15/2016
Horn antenna1-18G	ETS	3117	00066665	11/27/2015	11/26/2016
Horn antenna26-40G(05)	Com-power	AH-640	100A	01/21/2015	01/20/2017
Horn antenna18-26G(04)	Com-power	AH-826	081001	07/24/2015	07/23/2017
Preamplifier9-1000M	HP	8447D	NA	03/12/2015	03/11/2016
Cable1-18G	HUBER SUHNER	Sucoflex 106	NA	12/02/2014	12/01/2015
Cable UP to 1G	HUBER SUHNER	RG 214/U	NA	10/02/2015	10/01/2016
SUCOFLEX 1GHz~40GHz cable	HUBER SUHNER	Sucoflex 102	27963/2&37421/2	11/03/2015	11/02/2017

6.4 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

6.5 Measurement Result

Fundamental Measurement Result

Operation Mode	: TX mode	Test Date	: 2015/12/28
Fundamental Frequency	: 13.56 MHz	Test By	: Dino
Temp	: 25 ℃	Hum.	: 60%

Freq MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
13.56	56.48	13.77	70.25	124.00	-53.75	Peak	VERTICAL
13.56	46.11	13.77	59.88	124.00	-64.12	Peak	HORIZONTAL

Radiated Spurious Emission Measurement Result (below 1GHz)

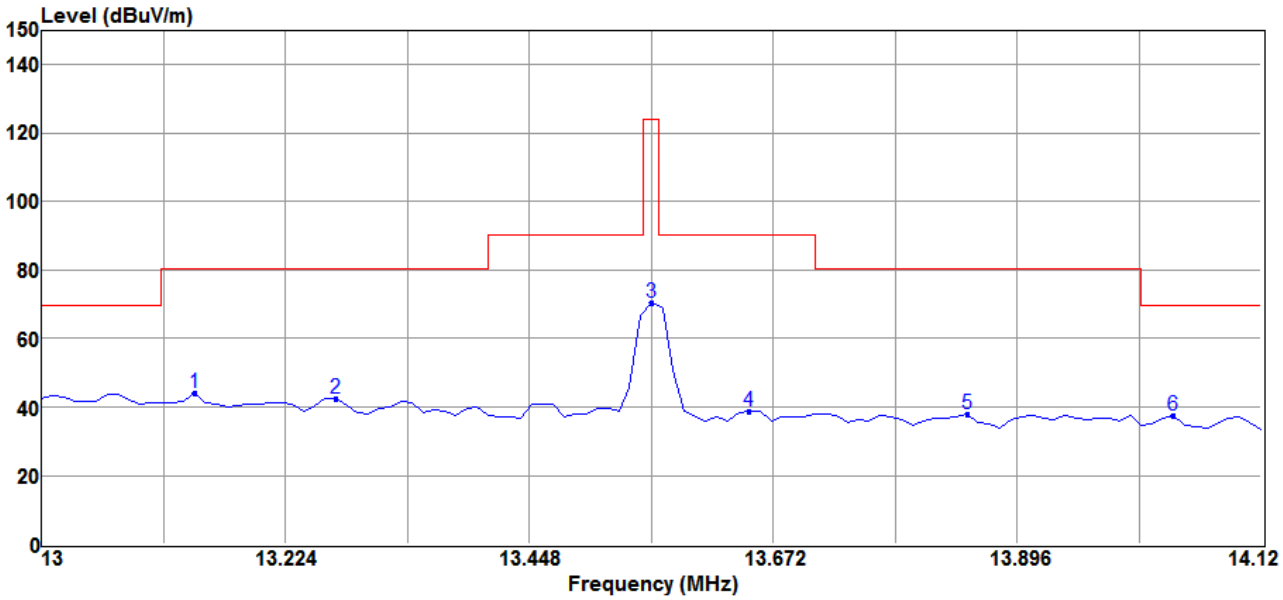
Operation Mode: Transmitting Mode
Test Date: 2015/12/28
Fundamental Frequency: 13.56MHz
Test By: Dino
Temperature : 25 ℃
Humidity : 65 %

No	Freq MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	6.22	37.63	16.36	53.99	69.54	-15.55	Peak	VERTICAL
2	10.42	50.08	13.85	63.93	69.54	-5.61	Peak	VERTICAL
3	19.68	27.46	13.41	40.87	69.54	-28.67	Peak	VERTICAL
4	22.17	39.26	13.27	52.53	69.54	-17.01	Peak	VERTICAL
5	26.22	33.41	13.31	46.72	69.54	-22.82	Peak	VERTICAL
6	29.31	30.61	13.68	44.29	69.54	-25.25	Peak	VERTICAL
7	106.63	46.93	-15.99	30.94	43.50	-12.56	Peak	VERTICAL
8	213.33	41.79	-14.50	27.29	43.50	-16.21	Peak	VERTICAL
9	353.01	41.17	-9.99	31.18	46.00	-14.82	Peak	VERTICAL
10	433.52	41.84	-8.28	33.56	46.00	-12.44	Peak	VERTICAL
11	487.84	37.19	-7.51	29.68	46.00	-16.32	Peak	VERTICAL
12	868.08	28.03	-1.04	26.99	46.00	-19.01	Peak	VERTICAL
1	6.34	36.97	16.27	53.24	69.54	-16.30	Peak	HORIZONTAL
2	10.00	44.05	13.86	57.91	69.54	-11.63	Peak	HORIZONTAL
3	13.57	28.22	13.77	41.99	69.54	-27.55	Peak	HORIZONTAL
4	19.59	38.67	13.42	52.09	69.54	-17.45	Peak	HORIZONTAL
5	20.79	37.81	13.35	51.16	69.54	-18.38	Peak	HORIZONTAL
6	26.43	31.10	13.33	44.43	69.54	-25.11	Peak	HORIZONTAL
7	106.63	45.93	-15.99	29.94	43.50	-13.56	Peak	HORIZONTAL
8	380.17	43.41	-9.44	33.97	46.00	-12.03	Peak	HORIZONTAL
9	433.52	45.06	-8.28	36.78	46.00	-9.22	Peak	HORIZONTAL
10	487.84	41.89	-7.51	34.38	46.00	-11.62	Peak	HORIZONTAL
11	569.32	37.40	-6.09	31.31	46.00	-14.69	Peak	HORIZONTAL
12	922.40	30.73	-0.07	30.66	46.00	-15.34	Peak	HORIZONTAL

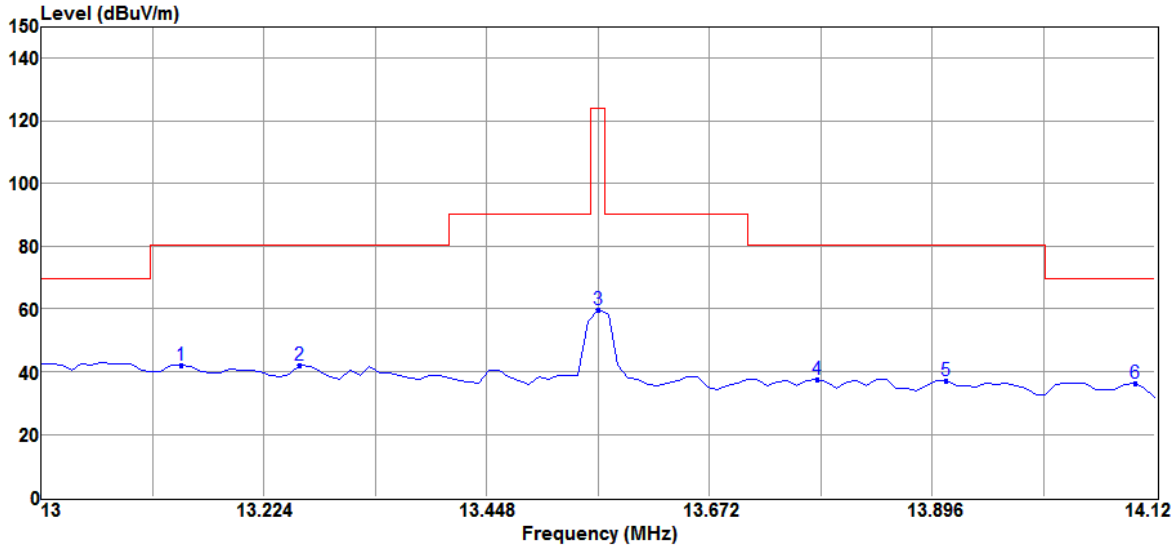
Remark:

1 No further spurious emissions detected from the lowest internal frequency and 30MHz.
2 Measuring frequencies from the lowest internal frequency to the 1GHz.
3 Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak / QP detector mode.
4 Measurement result within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5 The IF bandwidth of SPA between 30MHz to 1GHz was 100KHz, VBW=300KHz.
6 Peak is below the average limit, so that the average result is not measured

Radiated Mask



No	Freq MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	13.14	30.13	13.78	43.91	80.54	-36.63	Peak	VERTICAL
2	13.27	28.62	13.77	42.39	80.54	-38.15	Peak	VERTICAL
3	13.56	56.62	13.77	70.39	124.00	-53.61	Peak	VERTICAL
4	13.65	25.18	13.77	38.95	90.47	-51.52	Peak	VERTICAL
5	13.85	24.07	13.76	37.83	80.50	-42.67	Peak	VERTICAL
6	14.04	23.81	13.75	37.56	69.54	-31.98	Peak	VERTICAL



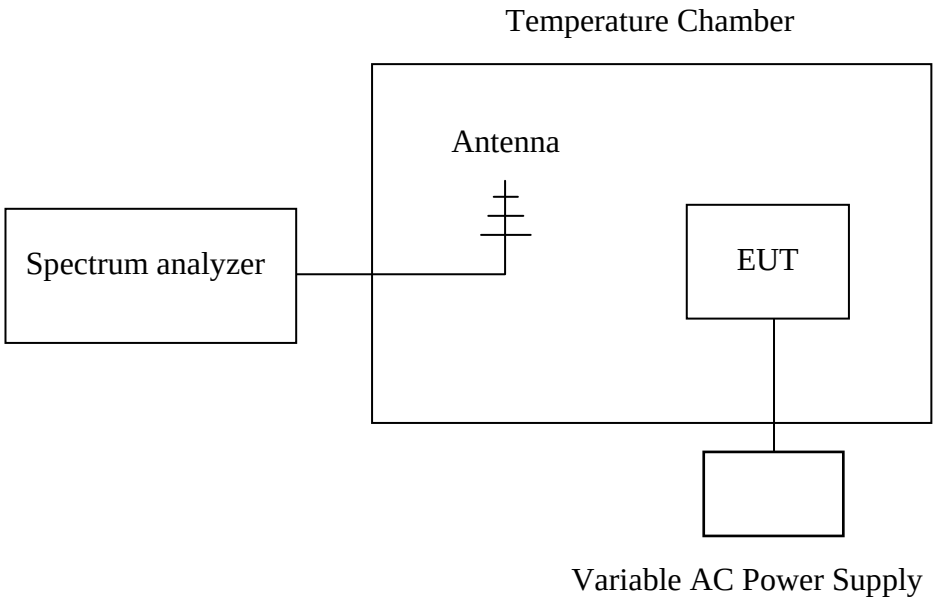
No	Freq MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	13.14	28.23	13.78	42.01	80.54	-38.53	Peak	HORIZONTAL
2	13.26	28.10	13.77	41.87	80.54	-38.67	Peak	HORIZONTAL
3	13.56	45.90	13.77	59.67	124.00	-64.33	Peak	HORIZONTAL
4	13.78	23.87	13.76	37.63	80.50	-42.87	Peak	HORIZONTAL
5	13.91	23.31	13.76	37.07	80.50	-43.43	Peak	HORIZONTAL
6	14.10	22.35	13.75	36.10	69.54	-33.44	Peak	HORIZONTAL

7 Frequency Tolerance

7.1 Measurement Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set EUT as normal operation
3. Set SPA Center Frequency = fundamental frequency, RBW, VBW= 10kHz, Span =100kHz.
4. Set SPA Max hold. Mark peak.
5.

7.2 Test SET-UP (Block Diagram of Configuration)



7.3 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
Spectrum Analyzer	Agilent	N9030A	MY51360021	05/02/2015	05/01/2016
Temperature Chamber	KSON	THS-B4H100	2287	03/17/2015	03/16/2016
DC Power supply	ABM	8185D	N/A	07/16/2015	07/15/2016

7.4 Measurement Results

Refer to attached data chart.

A. Temperature Variation

Limit: +/- 0.01%					
Power Supply	Environment	Frequency	Delta (KHz)	Limit (KHz)	**Result**
Vdc	Temperature (℃)	(MHz)			
6	-20	13.560813	-0.002	1.356	**Pass**
	-10	13.560824	0.009		**Pass**
	0	13.560822	0.007		**Pass**
	10	13.560803	-0.012		**Pass**
	20	13.560815	0.000		**Pass**
	30	13.560829	0.014		**Pass**
	40	13.560821	0.006		**Pass**
	50	13.560832	0.017		**Pass**

B. Supply Voltage Variation

voltage test					
Limit: +/- 0.01%					
Power Supply	Environment	Frequency	Delta (KHz)	Limit (KHz)	Result
Vdc	Temperature (℃)	(MHz)			
6	20	13.560815	0.000	1.356	**Pass**
6.6	20	13.560823	0.008		**Pass**
5.4	20	13.560818	0.003		**Pass**