TEST REPORT

of

FCC Part 15 Subpart C

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

Product :	**Smart Lock**
Brand:	**LEON**
Model:	**DB9000**
Model Difference:	**N/A**
FCC ID:	**2ADR8DB509000**
FCC Rule Part:	**§15.225, Cat:DXX**
Applicant:	**LEON SPECIALTY INC.**
Address:	**7F, No. 95, Minquan Road, Xindian Dist., New Taipei City 23141, Taiwan**

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, Hsin Ho Rd., Lung-Tan Dist., Tao Yuan City 325, Taiwan
*Tel : 886-3-407-1718; Fax: 886-3-407-1738

Report No.: **ISL-16LR326FCDXX**
Issue Date : **2016/12/20**

Testing laboratory
0997

VERIFICATION OF COMPLIANCE

Applicant:	LEON SPECIALTY INC.
Product Description:	Smart Lock
Brand Name:	LEON
Model No.:	DB9000
Model Difference:	N/A
FCC ID:	2ADR8DB509000
Date of test:	2016/12/01 ~ 2016/12/19
Date of EUT Received:	2016/12/01

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:	Lake Cheng	***Date:***	2016/12/20
	Lake Cheng / Engineer		
Prepared By:	Gigi yeh	***Date:***	2016/12/20
	Gigi Yeh / Specialist		
Approved By:	Vincent Su	***Date:***	2016/12/20
	Vincent Su / Technical Manager		

Version

Version No.	Date	Description
00	2016/12/20	Initial creation of document

Table of Contents

1 GENERAL INFORMATION

1.1 Product Description

Product Name	Smart Lock
Brand Name	LEON
Model Name	DB9000
Model Difference	N/A
Power Supply	6Vdc (1.5Vdc AA battery*4)

Bluetooth:

FCC ID:	2AI6W-MCRYA01
Frequency Range:	2402 – 2480MHz
Bluetooth Version:	V4.0
Channel number:	40 channels, 2MHz step
Modulation type:	GFSK
Tune-up power	-6.0 dBm
Power Tolerance:	+/- 1dBm
Dwell Time:	N/A
Antenna Designation:	Chip Antenna, 2.5dBi max

NFC:

Operating Frequency	13.56MHz
Transmit Power	55.03 dBuV/m Peak at 3m
Number of Channels	1
Antenna Type	Loop Antenna
Module Type	ASK

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: **2ADR8DB509000** 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 C63.10: 2013. and RSS-Gen: 2010. Radiated testing was performed at an antenna to EUT dis-tance 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 C63.10: 2013 FCC Registration Number is: TW1036, Canada Registration Number: 4067B-4.

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 6 of C63.10: 2013.Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR 16-1-1 Quasi-Peak and Average detector mode.

2.3.2 Radiated Emissions

The EUT is a placed on as turn table which is 0.8/1.5 m 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 and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made “while keeping the antenna in the ‘cone of radiation’ from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response.” Is still within the 3dB illumination BW of the measurement antenna. According to the requirements in Section 8 and 13 and Subclause 8.3.1.2 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

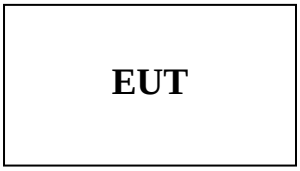


Table 2-1 Equipment Used in Tested System

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 MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
Radiated Emission	+/- 2.96 dB

6 Conducted Emissions Test

6.1 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.

6.2 Test SET-UP (Block Diagram of Configuration)

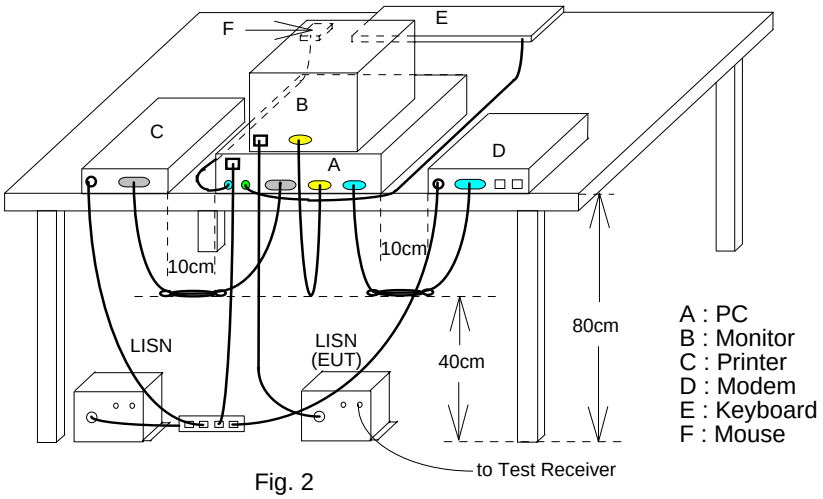


Fig. 2

6.3 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	07/27/2016	07/26/2017
EMI Receiver 17	Rohde & Schwarz	ESCI 7	100887	09/08/2016	09/07/2017
LISN 18	ROHDE & SCHWARZ	ENV216	101424	02/11/2016	02/10/2017
LISN 19	ROHDE & SCHWARZ	ENV216	101425	03/12/2016	03/11/2017
Test Software	Farad	EZEMC Ver:ISL-03A2	N/A	N/A	N/A

6.4 Measurement Result:

N/A, the device is powered by battery.

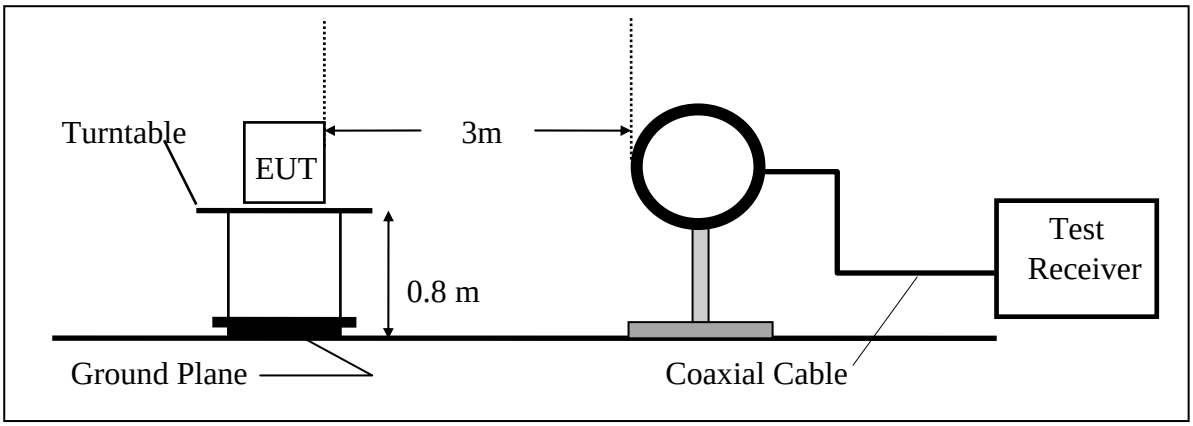
7 Radiated Emission Test

7.1 Measurement Procedure

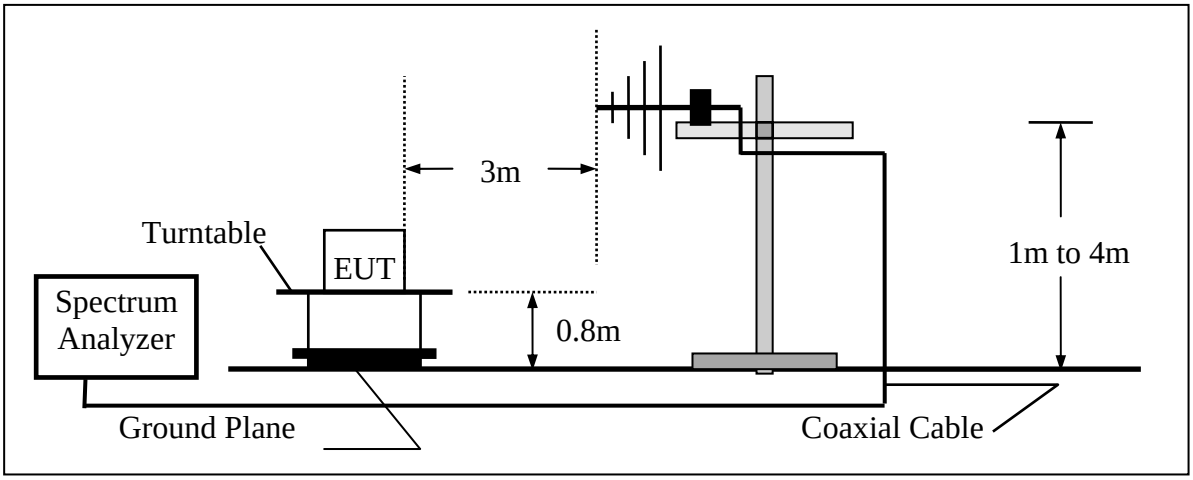
1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above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

7.2 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



7.3 Measurement Equipment Used:

966 Chamber					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
966 Chamber	Chance Most	Chamber 19	N/A	08/15/2016	08/14/2017
Spectrum Analyzer 21(3Hz-44GHz)	Agilent	N9030A	MY51360021	11/14/2016	11/13/2017
EMI Receiver	SCHWARZBECK	FCVU1534	1534149	11/30/2016	11/29/2017
Loop Antenna(9K-30M)	EM	EM-6879	271	11/01/2016	10/31/2018
Loop Antenna (9K-30M)	A.H.SYSTEM	SAS-564	294	06/17/2015	06/16/2017
Bilog Antenna (30M-1G)	SCHWARZBECK	VULB9168 w 5dB Att	736	07/22/2016	07/21/2017
Horn antenna (1G-18G)	SCHWARZBECK	9120D	9120D-1627	07/22/2016	07/21/2017
Horn antenna (18G-26G)	Com-power	AH-826	081001	07/24/2015	07/23/2017
Preamplifier (9k-1000M)	HP	8447F	3113A06362	11/13/2016	11/12/2017
Preamplifier(1G-26G)	Agilent	8449B	3008A02471	08/25/2016	08/24/2017
Preamplifier (26G-40G)	MITEQ	JS4-26004000-27-5A	818471	07/23/2015	07/22/2017
RF Cable (9k-18G)	HUBER SUHNER	SUCOFLEX 104A	MY1397/4A	08/25/2016	08/24/2017
RF cable (18G~40G)	HUBER SUHNER	Sucoflex 102	27963/2&37421/2	11/03/2015	11/02/2017
Test Software	Audix	E3 Ver:6.12023	N/A	N/A	N/A
Test Software	Farad	EZEMC Ver:ISL-03A2	N/A	N/A	N/A

7.4 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	

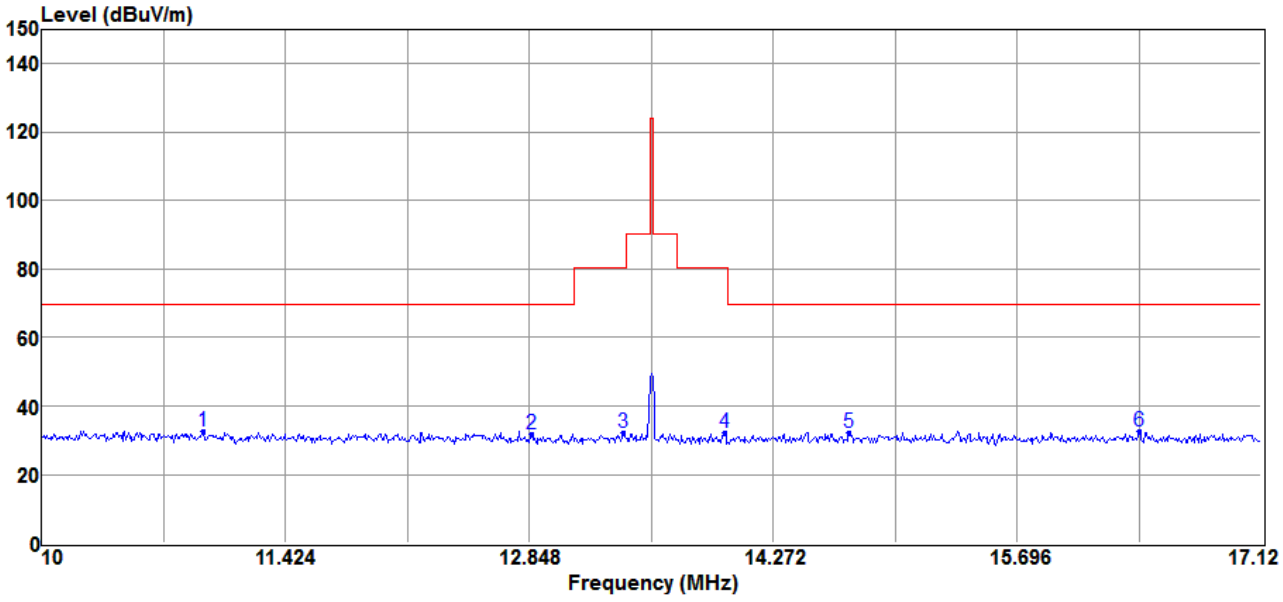
7.5 Measurement Result

Fundamental Measurement Result

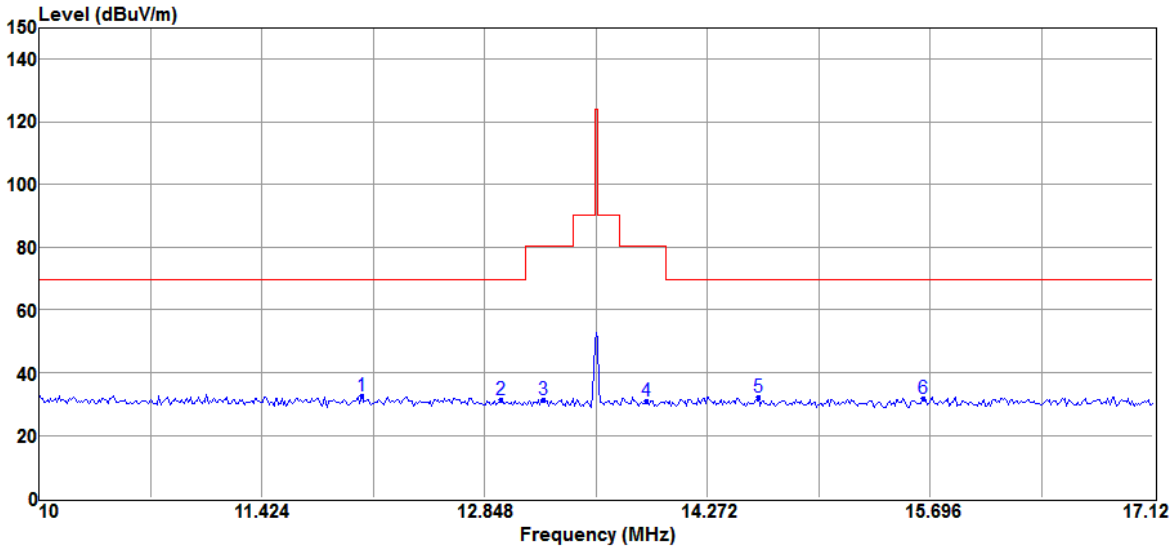
Operation Mode	: TX mode	Test Date	: 2016/12/09
Fundamental Frequency	: 13.56 MHz	Test By	: Lake
Temp	: 25 ℃	Hum.	: 60%

Freq MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
13.56	40.31	14.72	55.03	124.00	-68.97	Peak	VERTICAL
13.56	37.93	14.72	52.65	124.00	-71.35	Peak	HORIZONTAL

Radiated Mask



No	Freq MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	10.95	17.86	14.76	32.62	69.54	-36.92	Peak	VERTICAL
2	12.86	16.91	14.73	31.64	69.54	-37.90	Peak	VERTICAL
3	13.40	17.55	14.73	32.28	80.54	-48.26	Peak	VERTICAL
4	13.99	17.51	14.71	32.22	80.50	-48.28	Peak	VERTICAL
5	14.71	17.55	14.70	32.25	69.54	-37.29	Peak	VERTICAL
6	16.41	18.06	14.61	32.67	69.54	-36.87	Peak	VERTICAL



No	Freq MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	12.06	17.96	14.74	32.70	69.54	-36.84	Peak	HORIZONTAL
2	12.95	16.49	14.72	31.21	69.54	-38.33	Peak	HORIZONTAL
3	13.22	16.66	14.72	31.38	80.54	-49.16	Peak	HORIZONTAL
4	13.88	16.36	14.72	31.08	80.50	-49.42	Peak	HORIZONTAL
5	14.60	17.43	14.70	32.13	69.54	-37.41	Peak	HORIZONTAL
6	15.65	17.29	14.66	31.95	69.54	-37.59	Peak	HORIZONTAL

Radiated Spurious Emission Measurement Result (below 1GHz)

Operation Mode: Transmitting Mode Test Date: 2016/12/09
Fundamental Frequency: 13.56MHz Test By: Lake
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	12.08	18.40	14.74	33.14	69.54	-36.40	Peak	VERTICAL
2	16.24	18.71	14.62	33.33	69.54	-36.21	Peak	VERTICAL
3	19.00	17.78	14.45	32.23	69.54	-37.31	Peak	VERTICAL
4	23.40	18.42	14.23	32.65	69.54	-36.89	Peak	VERTICAL
5	27.12	19.38	14.46	33.84	69.54	-35.70	Peak	VERTICAL
6	28.24	22.52	14.60	37.12	69.54	-32.42	Peak	VERTICAL
7	96.93	35.32	-11.07	24.25	43.50	-19.25	Peak	VERTICAL
8	257.95	33.78	-5.44	28.34	46.00	-17.66	Peak	VERTICAL
9	496.57	34.49	-0.85	33.64	46.00	-12.36	Peak	VERTICAL
10	514.03	34.81	-0.32	34.49	46.00	-11.51	Peak	VERTICAL
11	759.44	28.72	4.00	32.72	46.00	-13.28	Peak	VERTICAL
12	931.13	27.64	6.65	34.29	46.00	-11.71	Peak	VERTICAL
1	15.76	17.60	14.65	32.25	69.54	-37.29	Peak	HORIZONTAL
2	18.04	18.30	14.49	32.79	69.54	-36.75	Peak	HORIZONTAL
3	20.32	18.91	14.38	33.29	69.54	-36.25	Peak	HORIZONTAL
4	22.76	17.93	14.26	32.19	69.54	-37.35	Peak	HORIZONTAL
5	27.12	19.10	14.46	33.56	69.54	-35.98	Peak	HORIZONTAL
6	28.44	20.72	14.62	35.34	69.54	-34.20	Peak	HORIZONTAL
7	96.93	34.30	-11.07	23.23	43.50	-20.27	Peak	HORIZONTAL
8	257.95	32.55	-5.44	27.11	46.00	-18.89	Peak	HORIZONTAL
9	520.82	31.98	-0.19	31.79	46.00	-14.21	Peak	HORIZONTAL
10	650.80	29.91	2.05	31.96	46.00	-14.04	Peak	HORIZONTAL
11	827.34	28.33	4.88	33.21	46.00	-12.79	Peak	HORIZONTAL
12	914.64	27.84	6.16	34.00	46.00	-12.00	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.

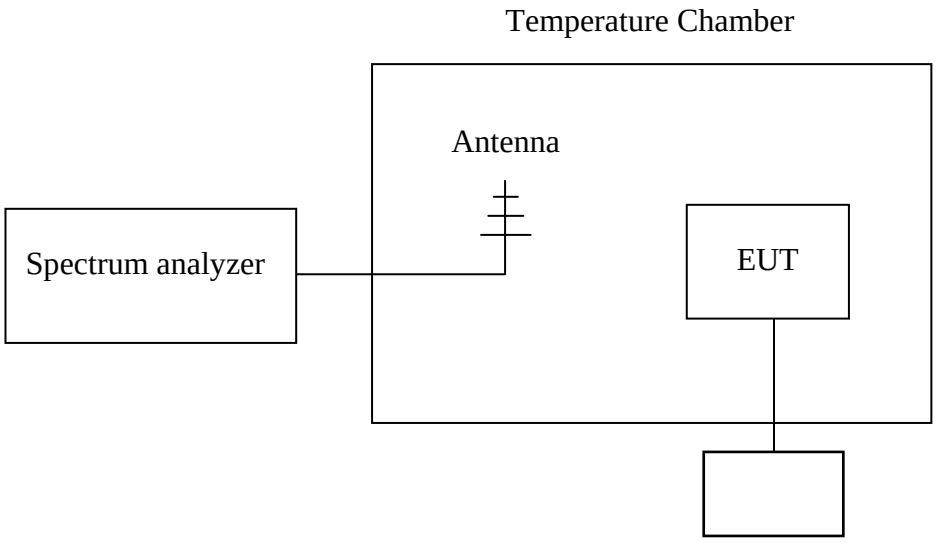
6 Peak is below the average limit, so that the average result is not measured

8 Frequency Tolerance

8.1 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.

8.2 Test SET-UP (Block Diagram of Configuration)



8.3 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
Spectrum analyzer	Agilent	N9030A	MY51360021	10/02/2016	10/01/2017
Temperature Chamber	KSON	THS-B4H100	2287	06/28/2016	06/27/2017
DC Power supply	ABM	8185D	N/A	09/05/2016	09/04/2017

8.4 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	13.560034	0.013	1.356	**Pass**
	-10	13.560027	0.006		**Pass**
	0	13.560046	0.025		**Pass**
	10	13.560043	0.022		**Pass**
	20	13.560021	0.000		**Pass**
	30	13.560055	0.034		**Pass**
	40	13.560034	0.013		**Pass**
	50	13.560048	0.027		**Pass**

B. Supply Voltage Variation

voltage test					
Limit: +/- 0.01%					
Power Supply	Environment	Frequency	Delta (KHz)	Limit (KHz)	Result
Vdc	Temperature (℃)	(MHz)			
6	20	13.560021	0.000	1.356	**Pass**
6.9	20	13.560053	0.032		**Pass**
5.1	20	13.560042	0.021		**Pass**