

FCC Radio Test Report

FCC ID: 2ABSTRPH0002

This report concerns: Original Grant

Project No. : 1907C242
Equipment : WiFi Lock
Brand Name : Lynkd
Test Model : Alert Lock
Series Model : N/A
Applicant : RPH Engineering, LLC
Address : 1601 N. State St. Suite 1A, LEHI, UT, United States, 84043
Manufacturer : Iton Technology Corp.
Address : 7 Floor East, Building C, Shenzhen International Innovation Center, No. 1006 Shennan Road, Futian District, Shenzhen, China
Factory : Iton Technology Corp.
Address : 7 Floor East, Building C, Shenzhen International Innovation Center, No. 1006 Shennan Road, Futian District, Shenzhen, China
Date of Receipt : Jul. 30, 2019
Date of Test : Jul. 30, 2019 ~ Oct. 17, 2019
Issued Date : Nov. 18, 2019
Report Version : R01
Test Sample : Engineering Sample No.: DG2019092634, DG2019092635
Standard(s) : FCC Part 15, Subpart C (15.225)
ANSI C63.10-2013

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc.

Rose . Liu

Prepared by : Rose Liu

Ethan Ma

Approved by : Ethan Ma



Certificate #5123.02

Add: No.3, Jinshagang 1st Road, Shixia, Dalang Town, Dongguan, Guangdong, China.

Tel: +86-769-8318-3000

Web: www.newbtl.com

Declaration

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BTL's laboratory quality assurance procedures are in compliance with the **ISO/IEC 17025** requirements, and accredited by the conformity assessment authorities listed in this test report.

BTL is not responsible for the sampling stage, so the results only apply to the sample as received.

The information, data and test plan are provided by manufacturer which may affect the validity of results, so it is manufacturer's responsibility to ensure that the apparatus meets the essential requirements of applied standards and in all the possible configurations as representative of its intended use.

Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

Please note that the measurement uncertainty is provided for informational purpose only and are not use in determining the Pass/Fail results.

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REPORT ISSUED HISTORY

Report Version	Description	Issued Date
R00	Original Issue.	Nov. 11, 2019
R01	Revised the Eurofins's comments.	Nov. 18, 2019

1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

FCC Part15, Subpart C (15.225)				
Standard(s) Section	Test Item	Test Result	Judgment	Remark
15.207	AC Power Line Conducted Emissions	APPENDIX A	PASS	-----
15.205(a) 15.209(a) 15.225(a)-(d)	Radiated Emission	APPENDIX B APPENDIX C	PASS	-----
15.225(e)	Frequency Tolerance	APPENDIX D	PASS	-----
15.203	Antenna Requirement	-----	PASS	Note(2)

Note:

- (1) "N/A" denotes test is not applicable in this test report
- (2) The device what use a permanently attached antenna were considered sufficient to comply with the provisions of 15.203.

1.1 TEST FACILITY

The test facilities used to collect the test data in this report is at the location of No.3, Jinshagang 1st Road, Shixia, Dalang Town, Dongguan, Guangdong, China
 BTL's Test Firm Registration Number for FCC: 357015
 BTL's Designation Number for FCC: CN1240

1.2 MEASUREMENT UNCERTAINTY

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2))

The BTL measurement uncertainty as below table:

A. AC power line conducted emissions test:

Test Site	Method	Measurement Frequency Range	U, (dB)
DG-C02	CISPR	150 kHz ~ 30 MHz	2.32

B. Radiated emissions test:

Test Site	Method	Measurement Frequency Range	Ant. H / V	U, (dB)
DG-CB03	CISPR	9kHz ~ 30MHz	V	3.79
		9kHz ~ 30MHz	H	3.57
		30MHz ~ 200MHz	V	4.88
		30MHz ~ 200MHz	H	4.14
		200MHz ~ 1,000MHz	V	4.62
		200MHz ~ 1,000MHz	H	4.80
		1GHz ~ 6GHz	-	4.58
		6GHz ~ 18GHz	-	5.18
		18GHz ~ 26.5GHz	-	3.80
		26.5GHz ~ 40GHz	-	4.30

Note: Unless specifically mentioned, the uncertainty of measurement has not been taken into account to declare the compliance or non-compliance to the specification.

1.3 TEST ENVIRONMENT CONDITIONS

Test Item	Temperature	Humidity	Test Voltage	Tested By
AC Power Line Conducted Emissions	25°C	53%	DC 5V	Laughing Zhang
Radiated Emissions-9K-30MHz	25°C	60%	DC 3.7V	Laughing Zhang
Radiated Emissions-30 MHz to 1GHz	24°C	68%	DC 3.7V	Berton Luo
Frequency Tolerance	Normal, Extreme			Jonas Chen

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	WiFi Lock
Brand Name	Lynkd
Test Model	Alert Lock
Series Model	N/A
Model Difference(s)	N/A
Hardware Version	R003588_05_03_01_0E
Software Version	R003475_05
Operation Frequency	13.56 MHz
Antenna Type	Printed Antenna
Power Source	1# Battery supplied. Model: LP573040 2# Supplied from USB port.
Power Rating	1# DC 3.7V 700mAh 2# DC 5V

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.

2.2 DESCRIPTION OF TEST MODES

The test system was pre-tested based on the consideration of all possible combinations of EUT operation mode.

Pretest Mode	Description
Mode 1	TX Mode_13.56MHz

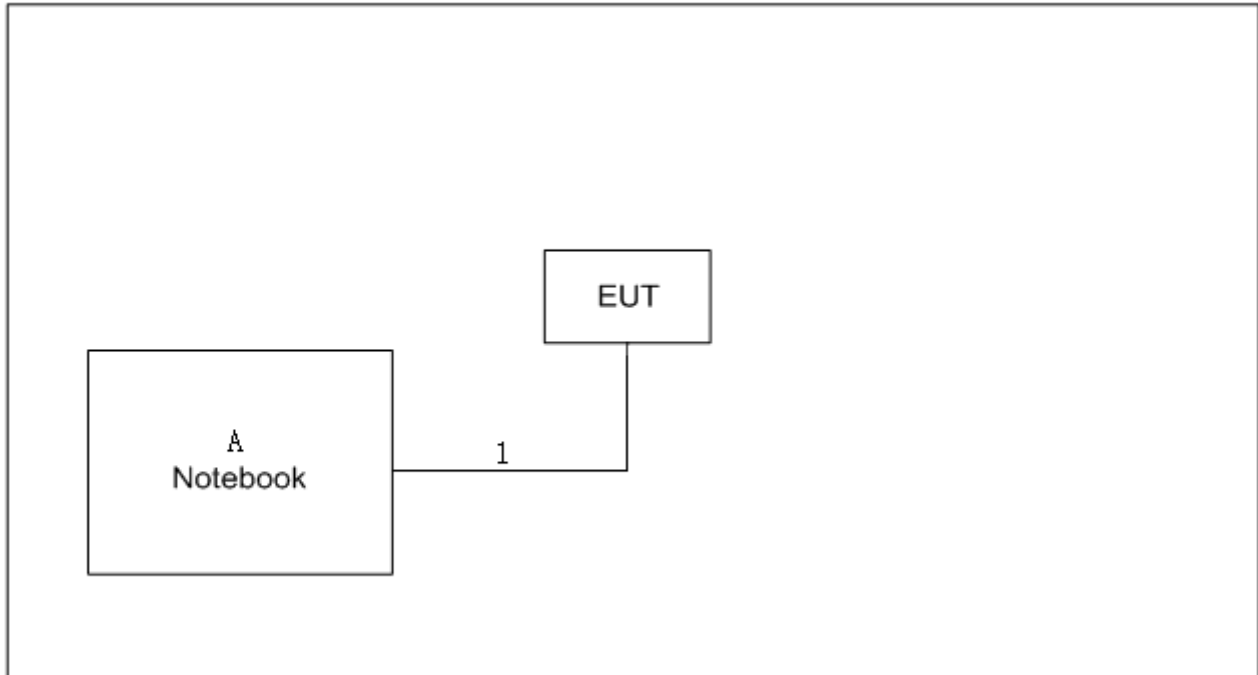
Following mode(s) was (were) found to be the worst case(s) and selected for the final test.

AC power line conducted emissions test	
Final Test Mode	Description
Mode 1	TX Mode_13.56MHz

Radiated emissions test - Below 1GHz	
Final Test Mode	Description
Mode 1	TX Mode_13.56MHz

Conducted test	
Final Test Mode	Description
Mode 1	TX Mode_13.56MHz

2.3 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



2.4 SUPPORT UNITS

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.
A	Notebook	Dell	Inspiron 15-7559	N/A

Item	Cable Type	Shielded Type	Ferrite Core	Length
1	USB Cable	NO	NO	0.8m

3. AC POWER LINE CONDUCTED EMISSIONS TEST

3.1 LIMIT

Frequency of Emission (MHz)	Limit (dB μ V)	
	Quasi-peak	Average
0.15 - 0.50	66 to 56*	56 to 46*
0.50 - 5.0	56	46
5.0 - 30.0	60	50

Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

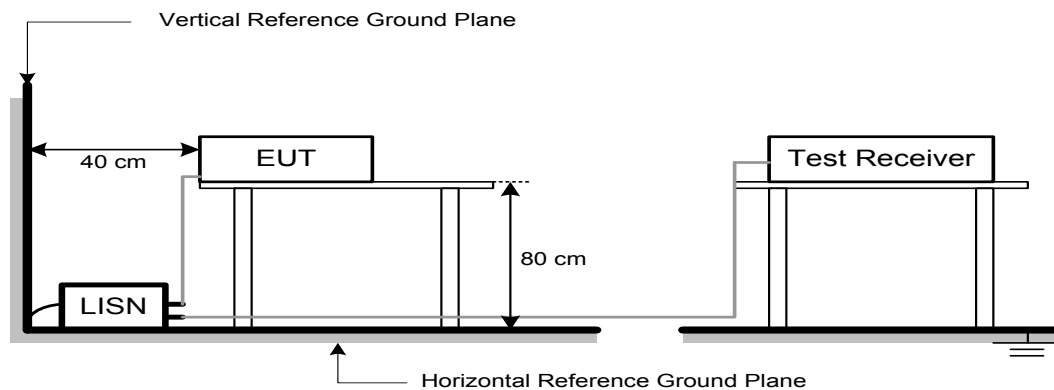
3.2 TEST PROCEDURE

- a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipment powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- d. LISN at least 80 cm from nearest part of EUT chassis.
- e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.3 DEVIATION FROM TEST STANDARD

No deviation

3.4 TEST SETUP



3.5 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical function (as a customer would normally use it), EUT was programmed to be in continuously transmitting data or hopping on mode.

3.6 TEST RESULTS

Please refer to the APPENDIX A.

Remark:

- (1) All readings are QP Mode value unless otherwise stated AVG in column of 'Note'. If the QP Mode Measured value compliance with the QP Limits and lower than AVG Limits, the EUT shall be deemed to meet both QP & AVG Limits and then only QP Mode was measured, but AVG Mode didn't perform in this case, a "*" marked in AVG Mode column of Interference Voltage Measured.
- (2) Measuring frequency range from 150 kHz to 30 MHz.

4. RADIATED EMISSION TEST

4.1 LIMIT

Clause 15.225(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.

Clause 15.225(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.

Clause 15.225(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.

Clause 15.225(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.

§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:

LIMITS OF RADIATED EMISSION MEASUREMENT (9 kHz-1000 MHz)

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Note:

- (1) The limit for radiated test was performed according to FCC PART 15C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

4.2 TEST PROCEDURE

The test set-up was made in accordance to the general provisions of ANSI C63.10-2013. The Equipment Under Test (EUT) was set up on a non-conductive table in the semi-anechoic chamber. The test was performed at the distance of 3 m between the EUT and the receiving antenna. The radiated emissions measurements were made in a typical installation configuration.

Sweep the whole frequency band through the range from 9 kHz to the 10th harmonic of the carrier, and the emissions less than 20 dB below the permissible value are reported.

During the test, below 30MHz, the center of the loop shall be 1 meters; above 30MHz, the height of receive antenna shall be moved from 1 to 4 meters, and the antenna shall be performed under horizontal and vertical polarization. The turntable shall be rotated from 0 to 360 degrees for detecting the maximum of radiated spurious signal level. The measurements shall be repeated with orthogonal polarization of the test antenna. The data of cable loss and antenna factor has been calibrated in full testing frequency range before the testing.

Set the spectrum analyzer in the following:

Below 1GHz (detector: Peak and Quasi-Peak)

RBW=100 kHz / VBW=300 kHz / Sweep=AUTO

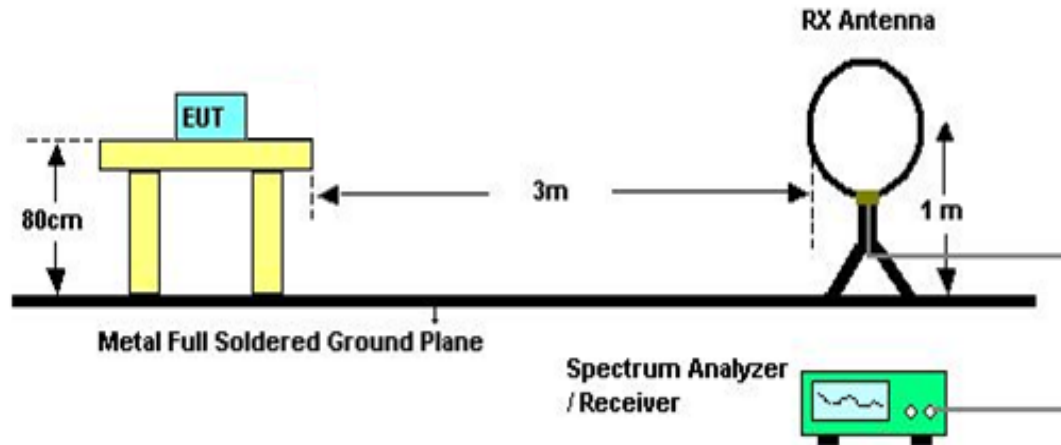
The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in stand-up position (Z axis) and the worst case was recorded.

4.3 DEVIATION FROM TEST STANDARD

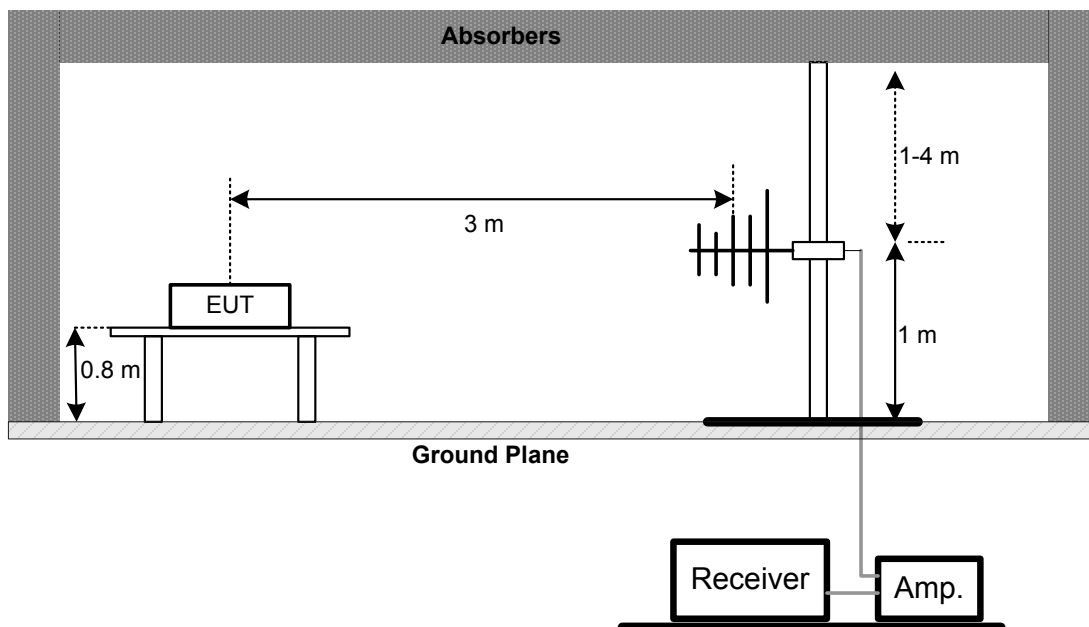
No deviation

4.4 TEST SETUP

9 kHz-30 MHz



30 MHz to 1000 MHz



4.5 EUT OPERATING CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

4.6 TEST RESULTS - 9 kHz TO 30 MHz

Please refer to the APPENDIX B

Remark:

- (1) Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB).
- (2) Limit line = specific limits (dBuV) + distance extrapolation factor.

4.7 TEST RESULTS - 30 MHz TO 1000 MHz

Please refer to the APPENDIX C.

5. FREQUENCY TOLERANCE TEST

5.1 LIMIT

FCC Part15 Subpart C		
Section	Test Item	Limit
15.225(e)	Frequency Tolerance	$\pm 0.001\text{MHz}$

5.2 TEST PROCEDURE

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.

5.3 DEVIATION FROM STANDARD

No deviation.

5.4 TEST SETUP

Temperature And Humidity Box



5.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 3.5 unless otherwise a special operating condition is specified in the follows during the testing.

5.6 TEST RESULTS

Please refer to the APPENDIX D.

6. MEASUREMENT INSTRUMENTS LIST

AC Power Line Conducted Emissions					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	EMI Test Receiver	R&S	ESCI	100382	Mar. 10, 2020
2	LISN	EMCO	3816/2	52765	Mar. 10, 2020
3	TWO-LINE V-NETWORK	R&S	ENV216	101447	May. 19, 2020
4	50Ω Terminator	SHX	TF5-3	15041305	Mar. 10, 2020
5	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A
6	Cable	N/A	RG223	12m	Mar. 12, 2020

Radiated Emissions - 9 kHz to 30 MHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Loop Antenna	EM	EM-6876-1	230	Jan. 15, 2020
2	Cable	N/A	RG 213/U	C-102	May 31, 2020
3	EMI Test Receiver	R&S	ESCI	100895	Mar. 10, 2020
4	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A

Radiated Emissions - 30 MHz to 1 GHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Antenna	Schwarzbeck	VULB9160	9160-3232	Mar. 09, 2020
2*	Amplifier	HP	8447D	2944A09673	Aug. 11, 2021
3	Receiver	Agilent	N9038A	MY52130039	Aug. 03, 2020
4	Cable	emci	LMR-400(30MHz-1GHz)(8m+5m)	N/A	May 24, 2020
5	Controller	CT	SC100	N/A	N/A
6	Controller	MF	MF-7802	MF780208416	N/A
7	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A

Frequency Tolerance					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100185	Aug. 03, 2020
2	Precision Oven Tester	Bell	BTH-50C	20170306001	Mar. 10, 2020

Remark "N/A" denotes no model name, serial no. or calibration specified.

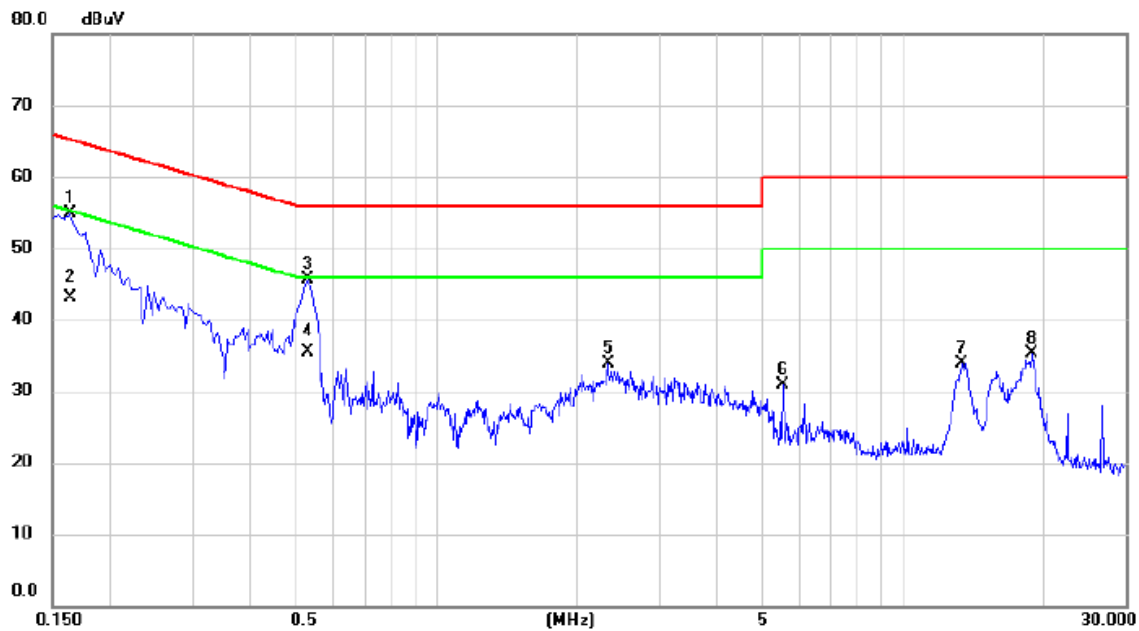
"*" calibration period of equipment list is three year.

Except * item, all calibration period of equipment list is one year.

APPENDIX A - AC POWER LINE CONDUCTED EMISSIONS

Test Mode	TX Mode_13.56MHz
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Line



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1		0.1635	45.12	9.82	54.94	65.28	-10.34	peak	
2		0.1635	33.35	9.82	43.17	55.28	-12.11	AVG	
3	*	0.5280	35.81	9.88	45.69	56.00	-10.31	peak	
4		0.5280	25.65	9.88	35.53	46.00	-10.47	AVG	
5		2.3280	23.89	10.02	33.91	56.00	-22.09	peak	
6		5.5275	20.64	10.23	30.87	60.00	-29.13	peak	
7		13.3935	23.30	10.67	33.97	60.00	-26.03	peak	
8		18.9240	24.22	11.10	35.32	60.00	-24.68	peak	

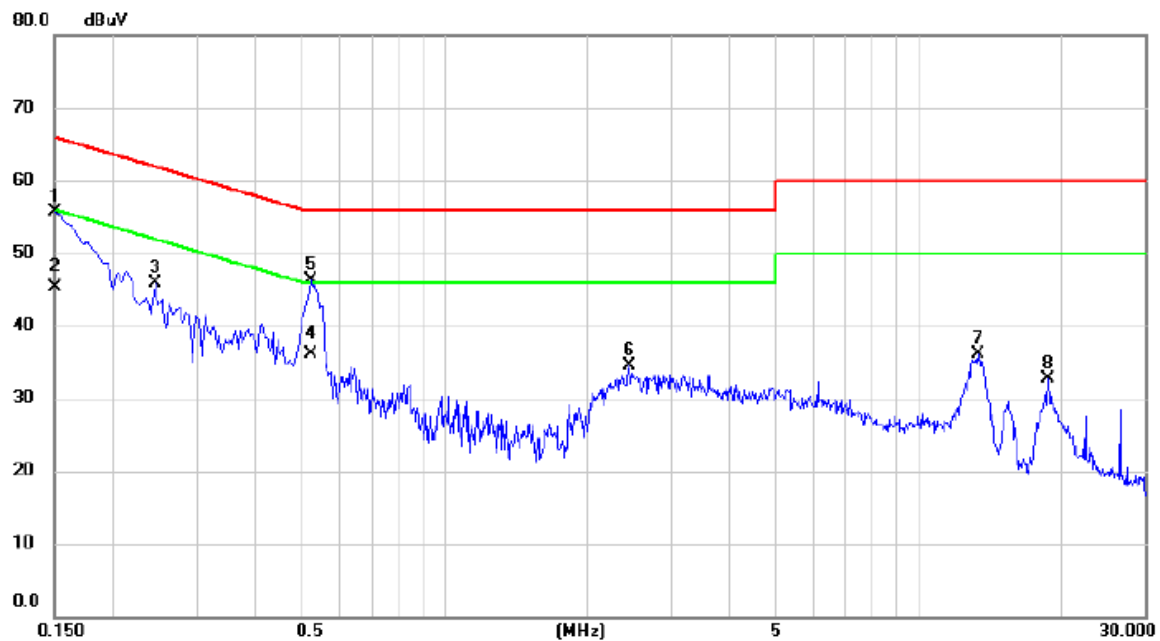
REMARKS:

(1) Measurement Value = Reading Level + Correct Factor.

(2) Margin Level = Measurement Value - Limit Value.

Test Mode TX Mode_13.56MHz

Neutral



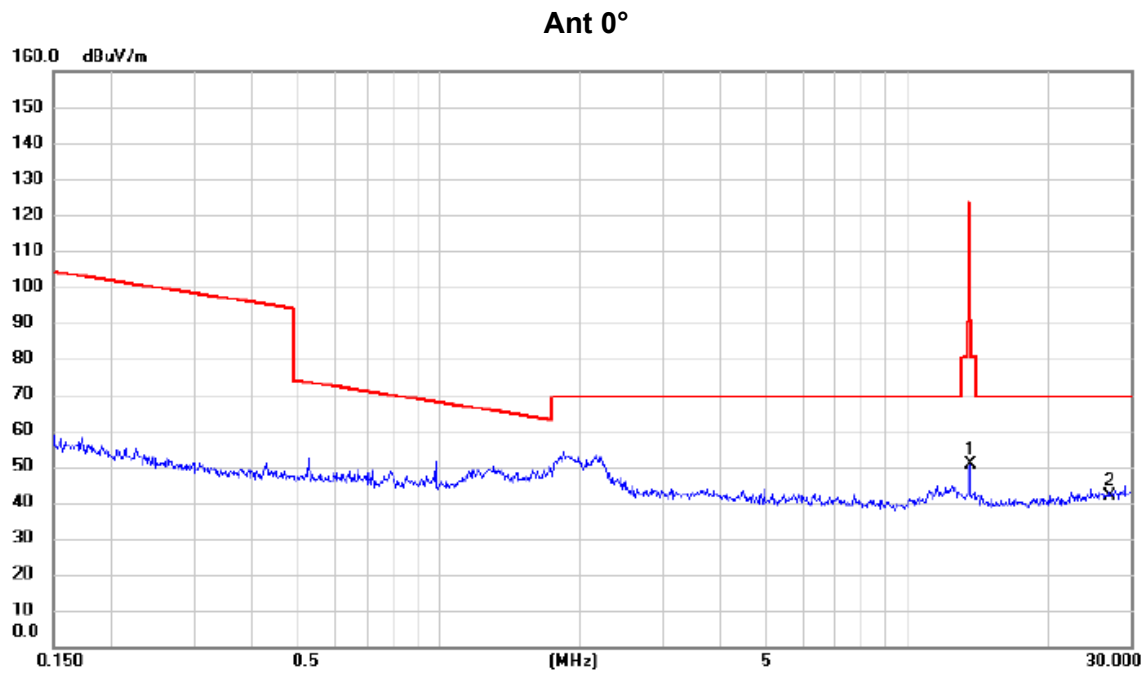
No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Margin		
		MHz	Level	Factor	ment			Detector	Comment
			dBuV	dB	dBuV	dBuV	dB		
1		0.1500	45.82	9.91	55.73	66.00	-10.27	peak	
2		0.1500	35.32	9.91	45.23	56.00	-10.77	AVG	
3		0.2445	36.04	9.93	45.97	61.94	-15.97	peak	
4		0.5233	25.98	10.03	36.01	46.00	-9.99	AVG	
5	*	0.5234	36.21	10.03	46.24	56.00	-9.76	peak	
6		2.4540	24.22	10.21	34.43	56.00	-21.57	peak	
7		13.3755	25.19	10.98	36.17	60.00	-23.83	peak	
8		18.7665	21.23	11.38	32.61	60.00	-27.39	peak	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

APPENDIX B - RADIATED EMISSION - 9 KHZ-30 MHZ

Test Mode	TX Mode_13.56MHz
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No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		13.6227	35.80	14.65	50.45	90.50	-40.05	peak	
2	*	27.1200	22.21	19.48	41.69	69.50	-27.81	peak	

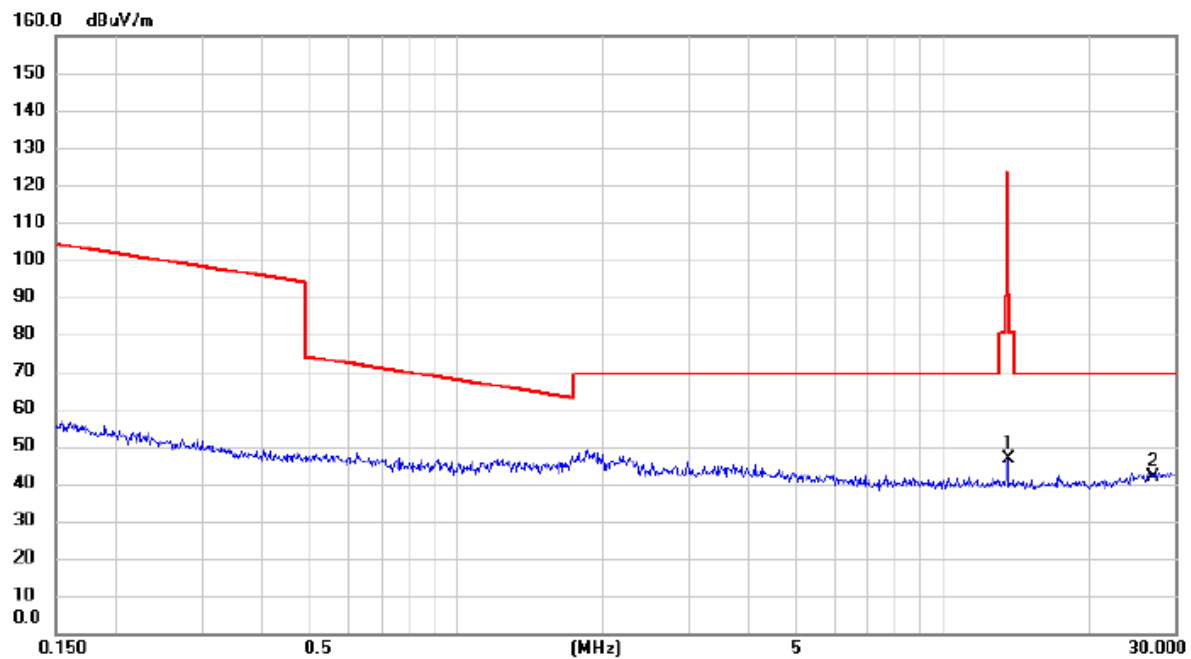
REMARKS:

(1) Measurement Value = Reading Level + Correct Factor.

(2) Margin Level = Measurement Value - Limit Value.

Test Mode	TX Mode_13.56MHz
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Ant 90°

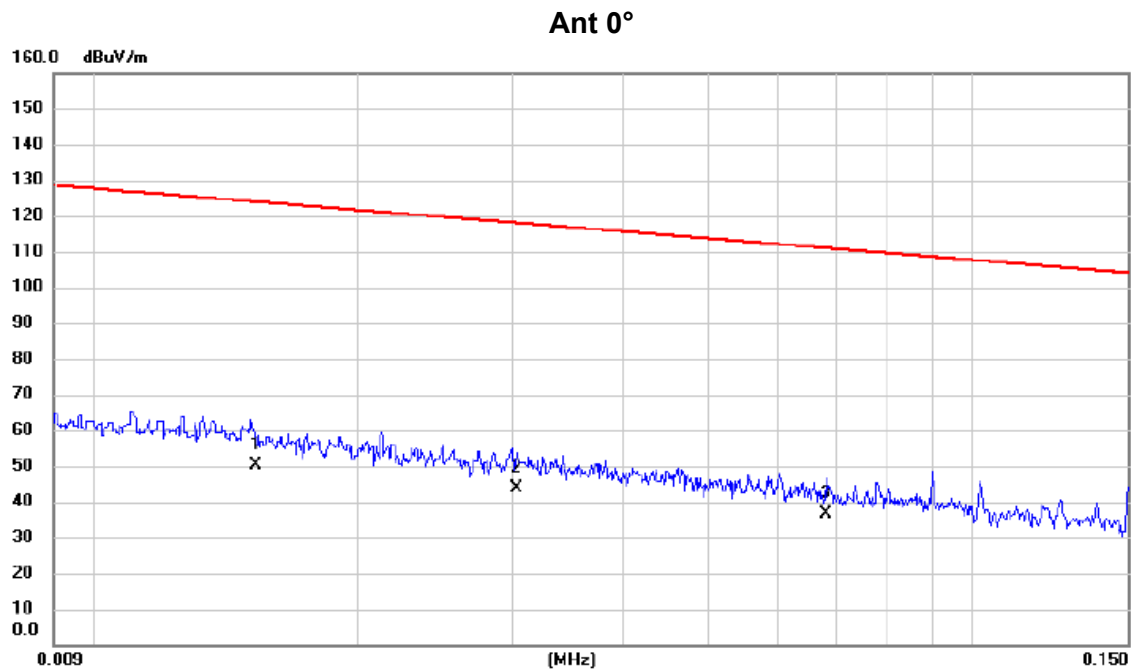


No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		13.6227	31.95	14.65	46.60	90.50	-43.90	peak	
2	*	27.1200	22.23	19.48	41.71	69.50	-27.79	peak	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
 (2) Margin Level = Measurement Value - Limit Value.

Test Mode	TX Mode_13.56MHz
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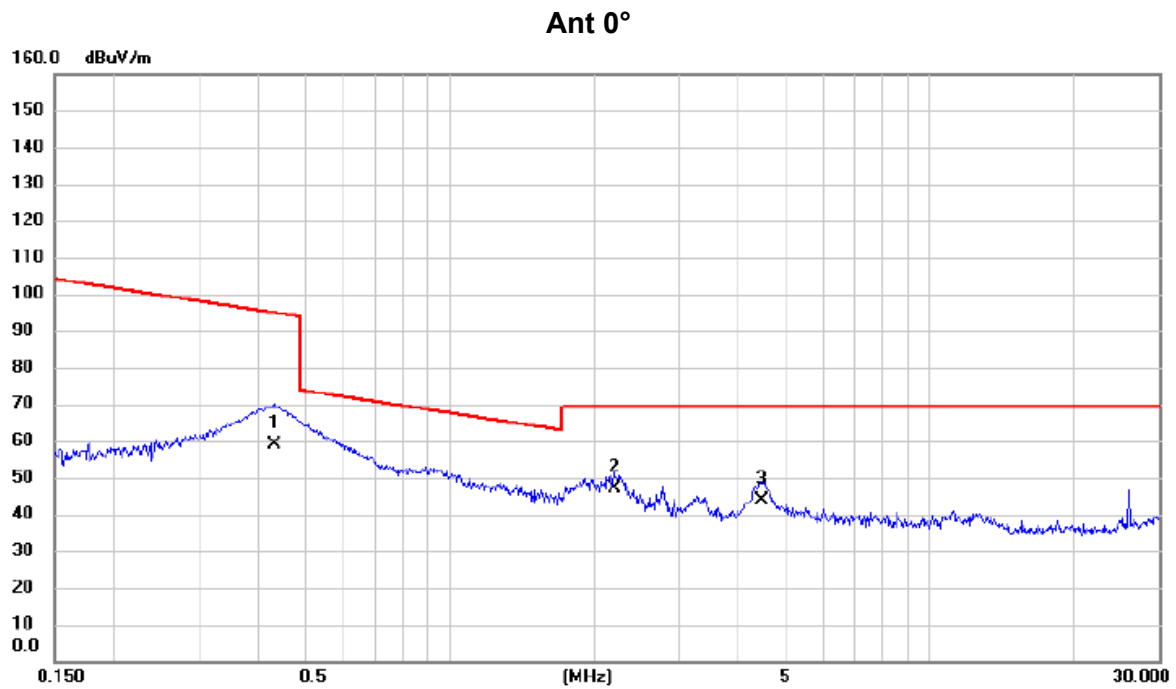


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	*	0.0153	34.81	15.23	50.04	123.91	-73.87	AVG	
2		0.0303	29.87	13.85	43.72	117.98	-74.26	AVG	
3		0.0680	22.83	13.64	36.47	110.95	-74.48	AVG	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

Test Mode	TX Mode_13.56MHz
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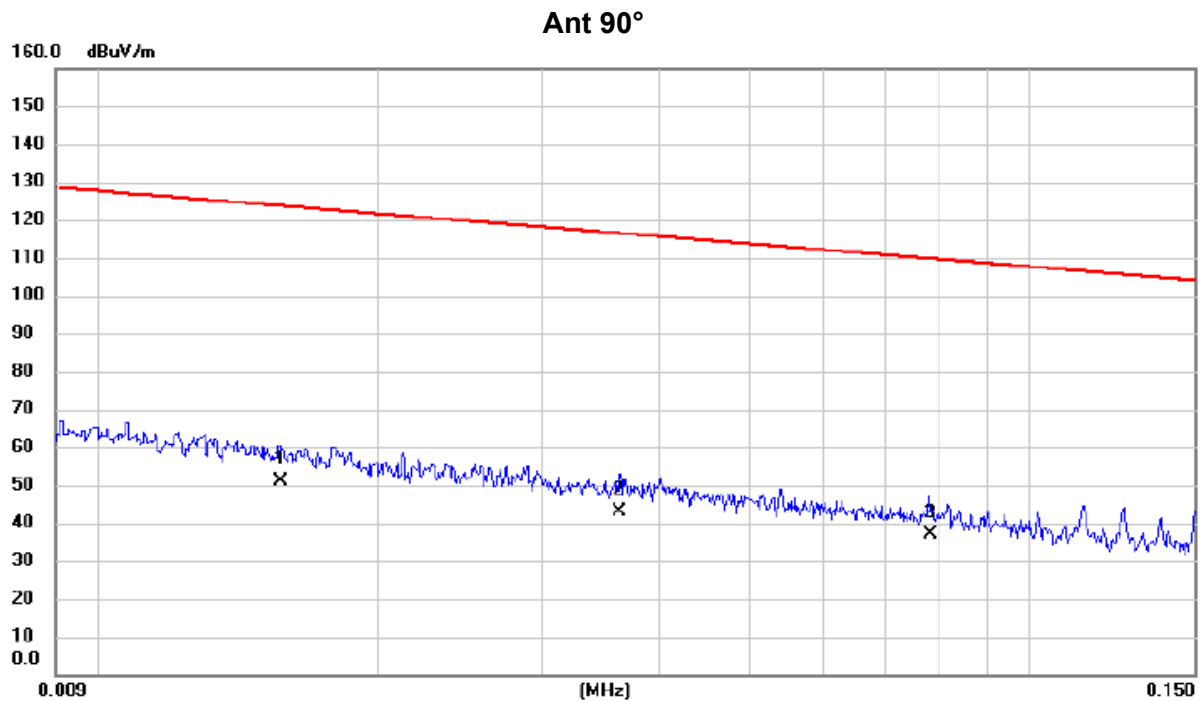
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		0.4305	45.81	13.23	59.04	94.92	-35.88	AVG	
2	*	2.2015	35.26	11.70	46.96	69.54	-22.58	QP	
3		4.4777	32.77	10.90	43.67	69.54	-25.87	QP	

REMARKS:

(1) Measurement Value = Reading Level + Correct Factor.

(2) Margin Level = Measurement Value - Limit Value.

Test Mode	TX Mode_13.56MHz
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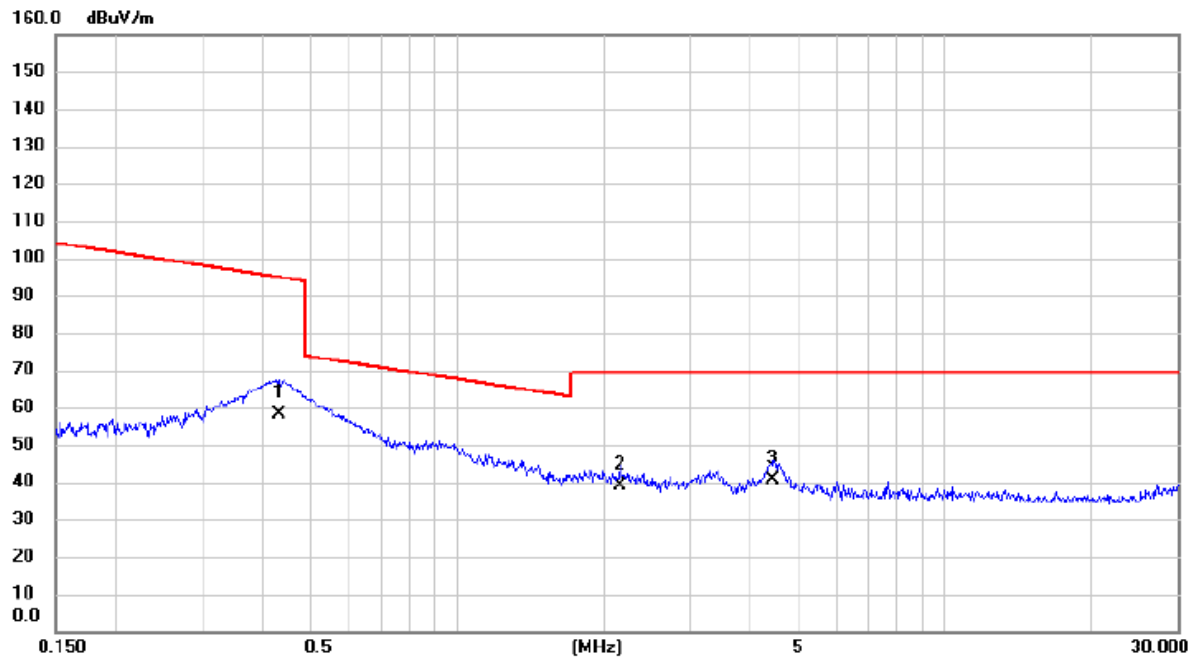
No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	0.0157	35.84	15.11	50.95	123.69	-72.74	AVG	
2		0.0363	29.24	13.88	43.12	116.41	-73.29	AVG	
3		0.0781	23.31	13.54	36.85	109.75	-72.90	AVG	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

Test Mode	TX Mode
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Ant 90°



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		0.4305	45.14	13.23	58.37	94.92	-36.55	AVG	
2		2.1552	27.36	11.73	39.09	69.54	-30.45	QP	
3	*	4.4540	29.86	10.90	40.76	69.54	-28.78	QP	

REMARKS:

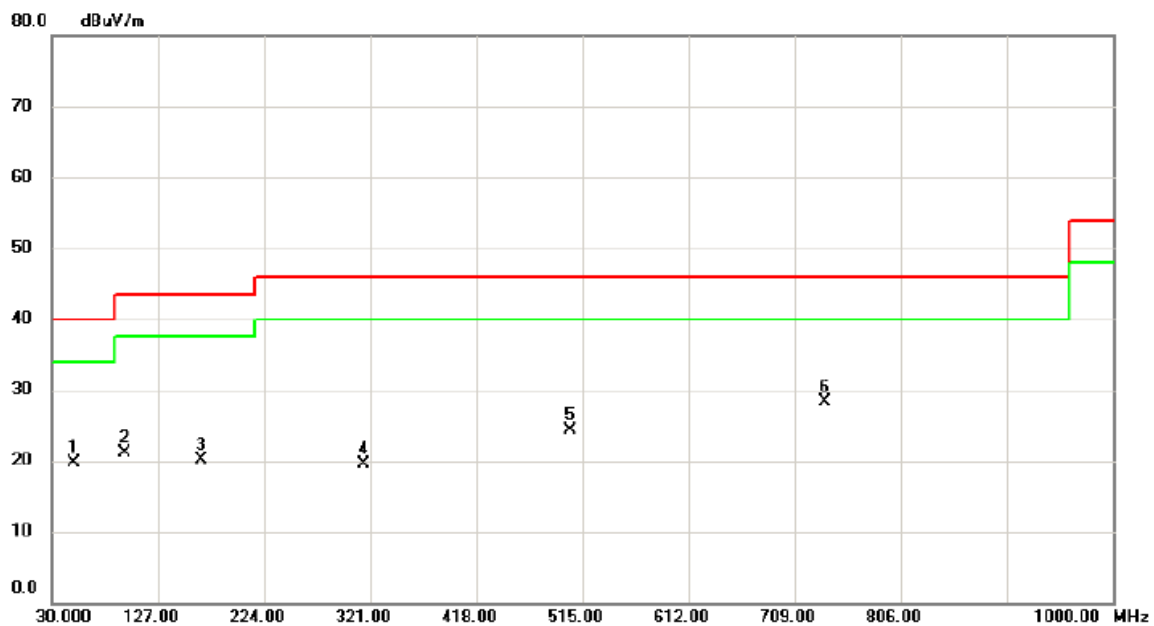
(1) Measurement Value = Reading Level + Correct Factor.

(2) Margin Level = Measurement Value - Limit Value.

APPENDIX C - RADIATED EMISSION - 30 MHZ TO 1000 MHZ

Test Mode	TX Mode_13.56MHz
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Vertical



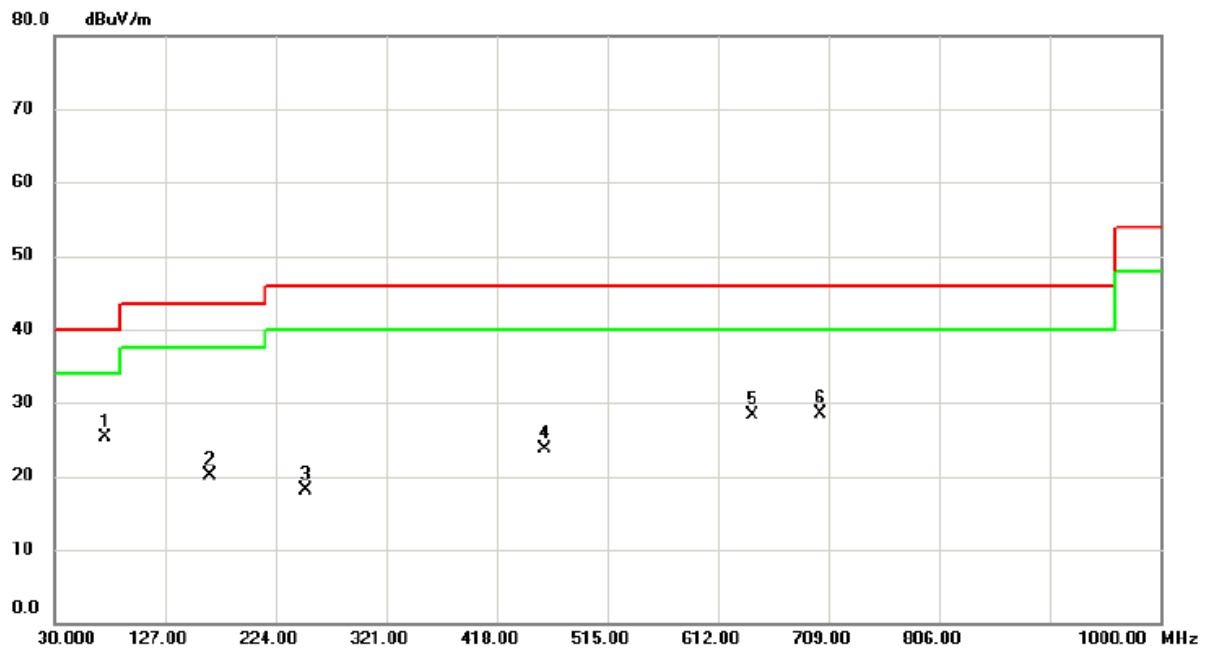
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		49.400	33.73	-13.99	19.74	40.00	-20.26	peak	
2		95.960	36.59	-15.52	21.07	43.50	-22.43	peak	
3		165.800	31.90	-11.89	20.01	43.50	-23.49	peak	
4		315.180	30.73	-11.31	19.42	46.00	-26.58	peak	
5		504.330	32.03	-7.71	24.32	46.00	-21.68	peak	
6 *		737.130	32.15	-3.76	28.39	46.00	-17.61	peak	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

Test Mode	TX Mode_13.56MHz
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Horizontal



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	*	74.620	42.43	-17.11	25.32	40.00	-14.68	peak	
2		165.800	31.90	-11.89	20.01	43.50	-23.49	peak	
3		250.190	31.89	-13.77	18.12	46.00	-27.88	peak	
4		459.710	31.69	-8.07	23.62	46.00	-22.38	peak	
5		642.070	33.21	-4.88	28.33	46.00	-17.67	peak	
6		702.210	32.43	-4.01	28.42	46.00	-17.58	peak	

REMARKS:

(1) Measurement Value = Reading Level + Correct Factor.

(2) Margin Level = Measurement Value - Limit Value.

APPENDIX D - FREQUENCY TOLERANCE

Test Mode	TX Mode_13.56MHz
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Frequency Tolerance Versus Environmental Temperature						
	Temperature (°C)	Voltage (V)	Frequency (MHz)	Frequency Error (kHz)	Limit (kHz)	Result
	25	3.7	13.56		-	-
0 min	70	3.7	13.561	1	+/- 1.356	PASS
	-20	3.7	13.5609	0.9	+/- 1.356	PASS
2 min	70	3.7	13.5605	0.5	+/- 1.356	PASS
	-20	3.7	13.5602	0.2	+/- 1.356	PASS
5 min	70	3.7	13.5608	0.8	+/- 1.356	PASS
	-20	3.7	13.5595	-0.5	+/- 1.356	PASS
10 min	70	3.7	13.5601	0.1	+/- 1.356	PASS
	-20	3.7	13.5604	0.4	+/- 1.356	PASS

Frequency Tolerance Versus Input Voltage						
Temperature (°C)	Voltage (V)		Frequency (MHz)	Frequency Error (kHz)	Limit (kHz)	Result
25	V-nom	3.7	13.56	-	-	-
25	V-min	3.33	13.5602	0.2	+/- 1.356	PASS
25	V-max	4.07	13.5605	0.5	+/- 1.356	PASS

End of Test Report