

Test Report

FCC ID: OF6EIMWRC07

Date of issue: June 18, 2019

Report Number:	MTi190615E111
Sample Description:	LD3X
Model(s):	EI-MW-RC-07
Applicant:	EXPEDITE INTERNATIONAL, INC.
Address:	1950 8TH AVE BALDWIN, WI54002, USA.
Date of Test:	June 10, 2019 to June 18, 2019

Shenzhen Microtest Co., Ltd.
<http://www.mtitest.com>

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Test Result Certification

Applicant's name: EXPEDITE INTERNATIONAL, INC.

Address: 1950 8TH AVE BALDWIN, WI54002, USA.

Manufacture's Name: MW PRODUCTS LTD.

Address: 2D, Effort Ind., Bldg 2-8 Kung Yip St., Kwai Chung, Hong Kong.

Product name: LD3X

Trademark: LUCKY DUCK

Model name: EI-MW-RC-07

Standards: FCC Part 15.231

Test Procedure: ANSI C63.10-2013
DA 00-705

This device described above has been tested by Shenzhen Microtest Co., Ltd. and the test results show that the equipment under test (EUT) compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

Tested by:



Jone Lee

June 18, 2019

Reviewed by:



Blue Zheng

June 18, 2019

Approved by:



Smith Chen

June 18, 2019

1 General description

1.1 Descriptions of EUT

Product name:	LD3X
Model name:	EI-MW-RC-07
Series model:	N/A
Difference of series model:	N/A
Tx/Rx frequency range:	Tx:434MHz
Modulation type:	ASK
Power source:	DC 4.5V from battery
Adapter information:	N/A
Antenna designation:	Spring Antenna(Antenna Gain:2.15dBi)
Hardware version:	22019-1_V1.1
Software version:	Caller Remote Ver1.2

1.2 Operation channel list

Channel	Frequency
1	434MHz

1.3 Frequency Channel Under Test

Channel	Frequency
1	434MHz

1.4 Ancillary equipment list

Equipment	Model	S/N	Manufacturer
/	/	/	/

1.5 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Brand	Model/Type No.	Series No.	Note
/	/	/	/	/	
/	/	/	/	/	

Note:

(1)The support equipment was authorized by Declaration of Confirmation.

(2)For detachable type I/O cable should be specified the length in cm in 『Length』 column.

2 Summary of Test Results

Test procedures according to the technical standards:

Item	FCC Part No.	Description of Test	Result	Remark
1	15.203	Antenna requirement	Pass	
2	15.207	AC power line conducted emission	Pass	
3	15.231(b)	Field strength of fundamental and harmonic emissions	Pass	
4	15.205 and 15.209	Radiated emission and bandedge	Pass	
5	15.215	Occupied Bandwidth	Pass	
6	15.231(a)(2)	Release time	Pass	
The meaning of symbols: "EI-MW-RC-07" – Not Applicable				

3 Test Facilities and Accreditations

3.1 Test laboratory

Test Laboratory	Shenzhen Microtest Co., Ltd
Location	No.102A & 302A, East Block, Hengfang Industrial Park, Xingye Road, Xixiang, Bao'an District, Shenzhen, Guangdong, China
FCC Registration No.:	FCC Registration No.: 448573

3.2 Environmental conditions

Temperature:	15°C~35°C
Humidity	20%~75%
Atmospheric pressure	98kPa~101kPa

3.3 Measurement uncertainty

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95 %

RF frequency	1×10^{-7}
RF power, conducted	$\pm 1.38\text{dB}$
Conducted emission(150kHz~30MHz)	$\pm 0.21\text{dB}$
Radiated emission(30MHz~1GHz)	$\pm 4.68\text{dB}$
Radiated emission (above 1GHz)	$\pm 4.89\text{dB}$
Temperature	$\pm 0.5^{\circ}\text{C}$
Humidity	$\pm 2 \%$

3.4 Test software

Software Name	Manufacturer	Model	Version
RF Test System	Farad	LZ-RF	Lz_Rf 3A3

4 Equipment list

Equipment No.	Equipment Name	Manufacturer	Model	Serial No.	Calibration date	Due date
MTI-E001	Spectrum Analyzer	Agilent	E4407B	MY41441082	2018/09/18	2019/09/17
MTI-E004	EMI Test Receiver	Rohde&schwarz	ESPI	1000314	2018/09/18	2019/09/17
MTI-E006	Broadband antenna	schwarabeck	VULB9163	872	2018/09/18	2019/09/17
MTI-E007	Horn antenna	schwarabeck	BBHA9120D	1201	2018/09/18	2019/09/17
MTI-E014	amplifier	America	8447D	3113A06150	2018/09/18	2019/09/17
MTI-E015	Conduction Immunity Signal Generator	Schloder	CDG6000	126A1343/2015	2018/09/18	2019/09/17
MTI-E016	Coupled decoupling network	Schloder	CND M2/M3	A2210332/2015	2018/09/18	2019/09/17
MTI-E034	amplifier	Agilent	8449B	3008A02400	2018/09/18	2019/09/17
MTI-E037	Artificial power network	Schwarzbeck	NSLK8127	#841	2018/09/18	2019/09/17
MTI-E040	Spectrum analyzer	Agilent	N9020A	MY49100060	2018/09/18	2019/09/17
MTI-E041	Signal generator	Agilent	N5182A	MY49060455	2018/09/18	2019/09/17
MTI-E042	Analog signal generator	Agilent	E4421B	GB40051240	2018/09/18	2019/09/17
MTI-E043	Power probe	Dare Instruments	RPR3006W	16I00054SN O16	2018/09/18	2019/09/17
MTI-E047	10dB attenuator	Mini-Circuits	UNAT-10+	15542	2018/09/18	2019/09/17
MTI-E049	spectrum analyzer	Rohde&schwarz	FSP-38	100019	2018/09/18	2019/09/17
MTI-E050	PSG Signal generator	Agilent	E8257D	MY46520873	2018/09/18	2019/09/17
MTI-E061	Active Loop Antenna 9kHz - 30MHz	Schwarzbeek	FMZB 1519 B	00044	2018/09/18	2019/09/17
MTI-E052	18-40GHz amplifier	Chengdu step Micro Technology	ZLNA-18-40G-21	1608001	2018/09/18	2019/09/17
MTI-E053	15-40G Antenna	Schwarzbeek	BBHA9170	BBHA9170582	2018/09/18	2019/09/17
MTI-E058	Artificial power network	Schwarzbeck	NSLK8127	#841	2018/09/18	2019/09/17
Note: the calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).						

5 Test Result

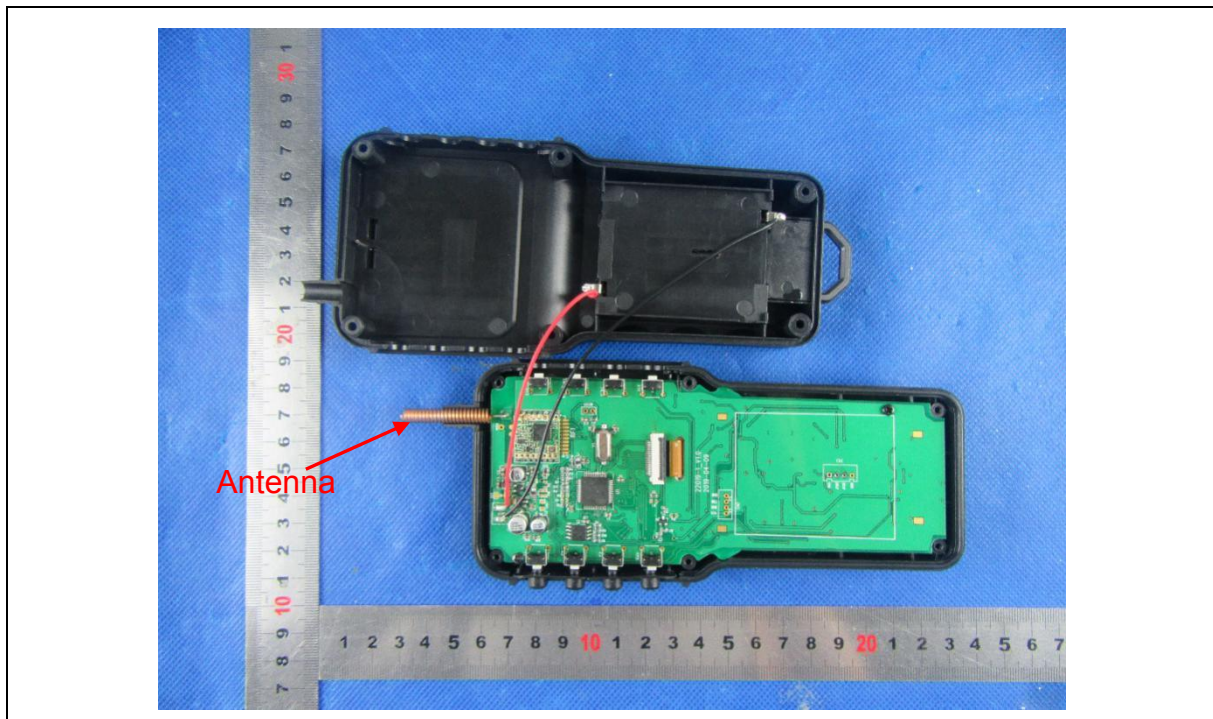
5.1 Antenna requirement

5.1.1 Requirement defined in FCC 15.203

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

5.1.2 EUT antenna description

The radio antenna of EUT is an Spring antenna, the maximum gain is 2.15dBi. So the antenna meets the requirement of this part.



5.2 AC power line conducted emission

5.2.1 Limit

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

Note: Decreases with the logarithm of the frequency from 0.15MHz to 0.5MHz.

5.2.2 Test method

1. 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.
2. 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.
3. 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.
4. LISN is at least 80 cm from nearest part of EUT chassis.
5. The resolution bandwidth of EMI test receiver is set at 9kHz.

5.2.3 Test Result

Note: The device is a DC power supply and does not apply to conducted emissions.

5.3 Field strength of fundamental and harmonic emissions

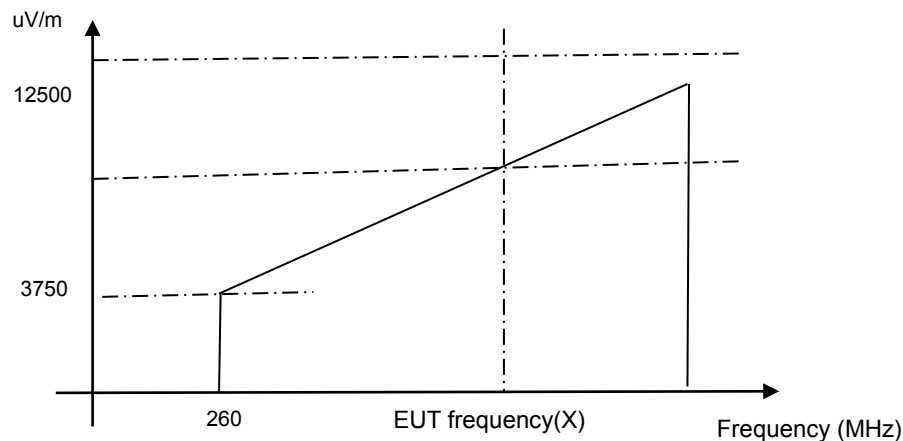
5.3.1 Limits

Intentional radiators may operate at a periodic rate exceeding that specified in paragraph (a) of this section and may be employed for any type of operation, including operation prohibited in paragraph (a) of this section, provided the intentional radiator complies with the provisions of paragraphs (b) through (d) of this section, except the field strength table in paragraph (b) of this section is replaced by the following:

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)
40.66-40.70	2.250	225
70-130	1.250	125
130-174	¹ 1250 to 3750	¹ 125 to 375
174-260	3.750	375
260-470	¹ 3750 to 12500	¹ 375 to 1250
Above 470	12500	1250

¹Linear interpolations.

For example for 433.925MHz



The Field Strength of Fundamental Emissions (Operating Frequency) is:

$$3750 \text{ uV/m} = 20 \cdot \log(3750) \text{ dBuV/m} = 71.48 \text{ dBuV/m}$$

$$12500 \text{ uV/m} = 20 \cdot \log(12500) \text{ dBuV/m} = 81.94 \text{ dBuV/m}$$

For example the Fundamental emission is 433.925MHz, the limit is X.

$$(433.925-260)/(470-260)=(X-3750)/(12500-3750)$$

$$173.925/210 =(X-3750)/8750$$

$$X = 10996.875 \text{ uV/m}$$

$$\text{AV Limit} = 20 \cdot \log(10996.875) \text{ dBuV/m} = 80.83 \text{ dBuV/m}$$

$$\text{PK Limit} = 100.83 \text{ dBuV/m}$$

5.3.2 Test Method

1. The EUT is placed on a turntable, which is 0.8m above ground plane for test frequency range below 1GHz, and 1.5m above ground plane for test frequency range above 1GHz.
2. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
3. Use the following spectrum analyzer settings:
 - Span = wide enough to fully capture the emission being measured
 - RBW = 1 MHz for $f \geq 1\text{GHz}$
 - RBW = 100 kHz for $f < 1\text{GHz}$
 - VBW $\geq$ RBW
 - Sweep = Auto
 - Detector function = Peak
 - Trace = max hold
4. Follow the guidelines in ANSI C63.4-2014 with respect to maximizing the emission by rotating the EUT, adjusting the measurement antenna height and polarization, etc. The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, submit this data. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
5. The peak level, once corrected, must comply with the limit specified in Section 15.209. Set the spectrum to
 - RBW = 1MHz
 - VBW = 10Hz
 - Detector = PK for AV value, while maintaining all of the other instrument settings

5.3.3 Test Result

Field Strength of Fundamental Emissions and Field strength of spurious emissions Value					
Operating Frequency (MHz)	Field Strength (dBuV/m)	Detector	Limit @3m (dBuV/m)	Margin (dB)	Antenna
434.0650	79.23	Peak	100.83	21.60	Vertical
	76.01	Average	80.83	4.82	Vertical
	77.61	Peak	100.83	23.22	Horizontal
	74.39	Average	80.83	6.44	Horizontal
869.1301	54.34	Peak	80.83	26.49	Vertical
	51.12	Average	60.83	9.71	Vertical
	53.45	Peak	80.83	27.38	Horizontal
	50.23	Average	60.83	10.6	Horizontal

Note: If the PK measured values lower than average mode limit, the EUT shall be deemed to meet average limits and then no additional average mode measurement performed.

Note: 1. EUT Pre-scan X/Y/Z orientation, only worst case is presented in the report(Y orientation).

2. *Calculate Average value based on Duty Cycle correction factor:

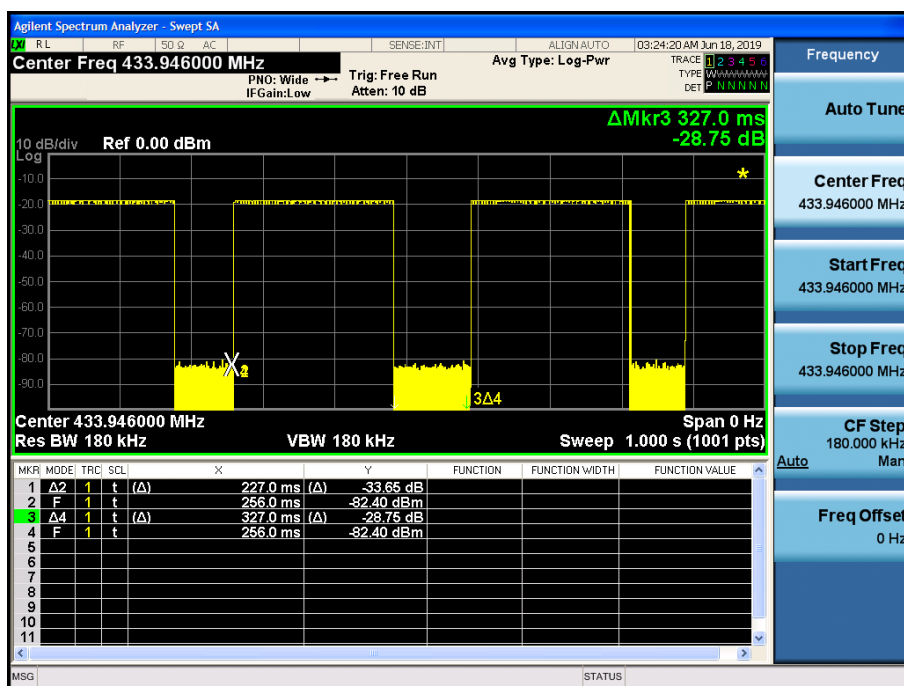
$$\text{Duty Cycle} = \text{Ton} / (\text{Ton} + \text{Toff}) = 227\text{ms} / 327\text{ms} = 0.69 = 69\%$$

$$\text{Duty Cycle factor} = 20\lg(\text{Duty Cycle}) = 20\lg(0.69) = -3.22\text{dB}$$

$$\text{Average} = \text{Peak} + \text{Duty Cycle factor}$$

3. Margin: Limit- Field Strength

434MHz



5.4 Occupied Bandwidth

5.4.1 Test method

Use the following spectrum analyzer settings:

Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel
 RBW $\geq 1\%$ of the 20 dB bandwidth
 VBW $\geq$ RBW
 Sweep = auto
 Detector function = peak
 Trace = max hold

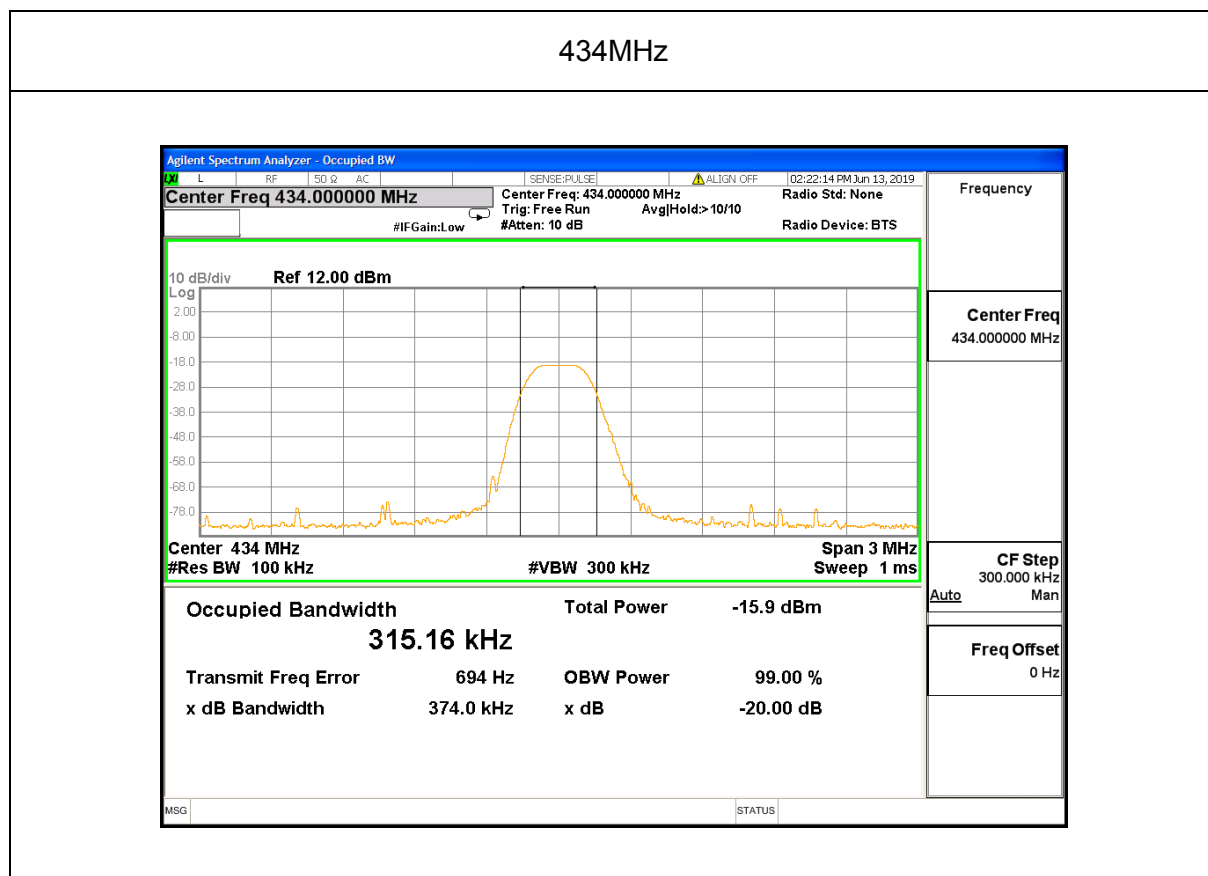
The EUT should be transmitting at its maximum data rate. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the marker-delta function, and move the marker to the 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 20 dB bandwidth and 99% occupied bandwidth of the emission.

5.4.2 Test result

Test modulation: ASK

Frequency (MHz)	20dB emission bandwidth (MHz)	99% occupied bandwidth (MHz)
434	0.374	0.31516

Test plots as below



5.5 Radiated emission and Band edge spurious emission

5.5.1 Limit

Emissions radiated outside of the specified frequency bands, except for harmonic emissions, (b) shall be attenuated by at least 50 dB below the level of the fundamental emissions or to the general field strength limits listed in RSS-Gen, whichever is less stringent.

Frequency (MHz)	Field strength $\mu\text{V/m}$	Field strength $\text{dB}\mu\text{V/m}$	Detector	Measurement distance
30-88	100	40	QP	3m
88-216	150	43.5	QP	
216-960	200	46	QP	
960-1000	500	54	QP	
Above 1000	500	54	AV	
Above 1000	5000	74	PK	

5.5.2 Test method

1. The EUT is placed on a turntable, which is 0.8m above ground plane for test frequency range below 1GHz, and 1.5m above ground plane for test frequency range above 1GHz.

2. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.

3. Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for $f \geq 1\text{GHz}$

100 kHz for $f < 1\text{GHz}$, VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

4. Follow the guidelines in ANSI C63.4-2014 with respect to maximizing the emission by rotating the EUT, adjusting the measurement antenna height and polarization, etc. The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, submit this data. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.

5. The peak level, once corrected, must comply with the limit specified in Section 15.209. Set the RBW = 1MHz, VBW = 10Hz, Detector = PK for AV value, while maintaining all of the other instrument settings.

5.5.3 Test Result

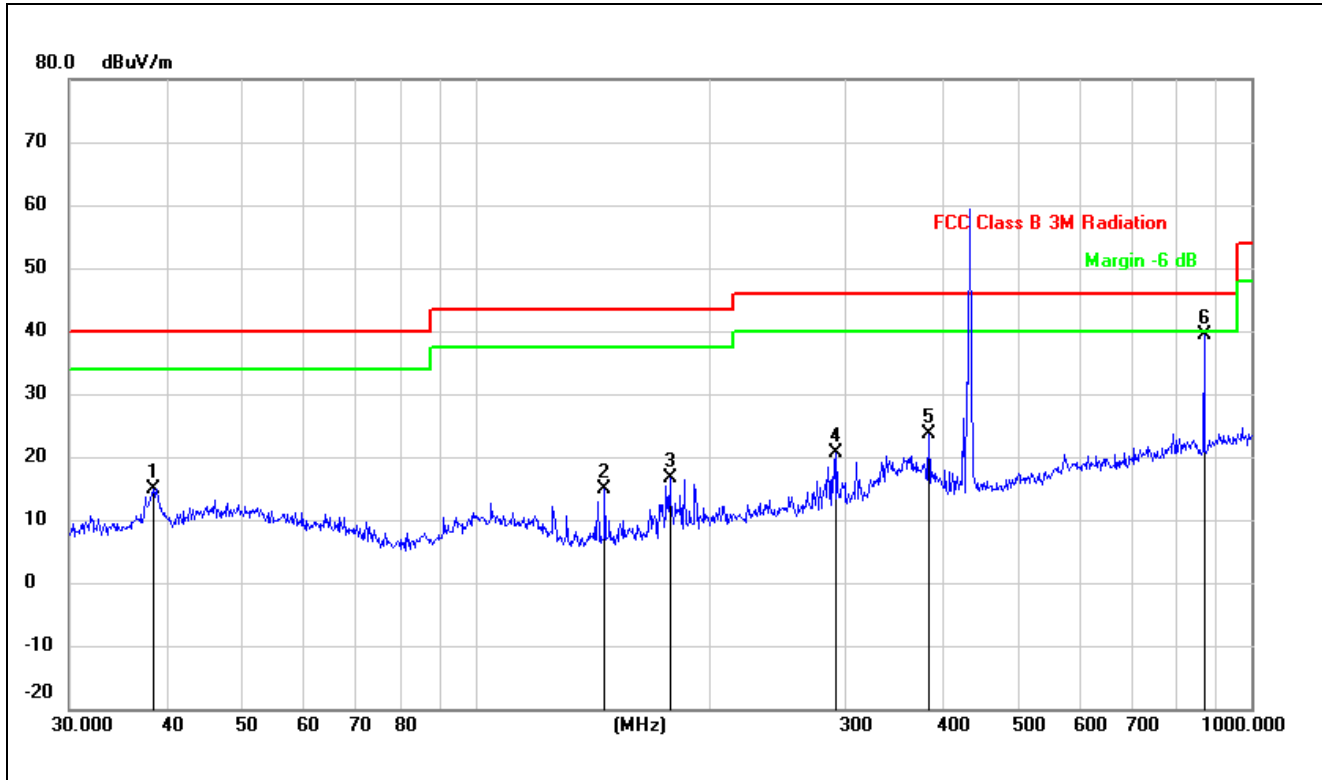
Remark:

If the PK measured values lower than average mode limit, the EUT shall be deemed to meet average limits and then no additional average mode measurement performed.

Radiated emission

Between 30MHz – 1GHz

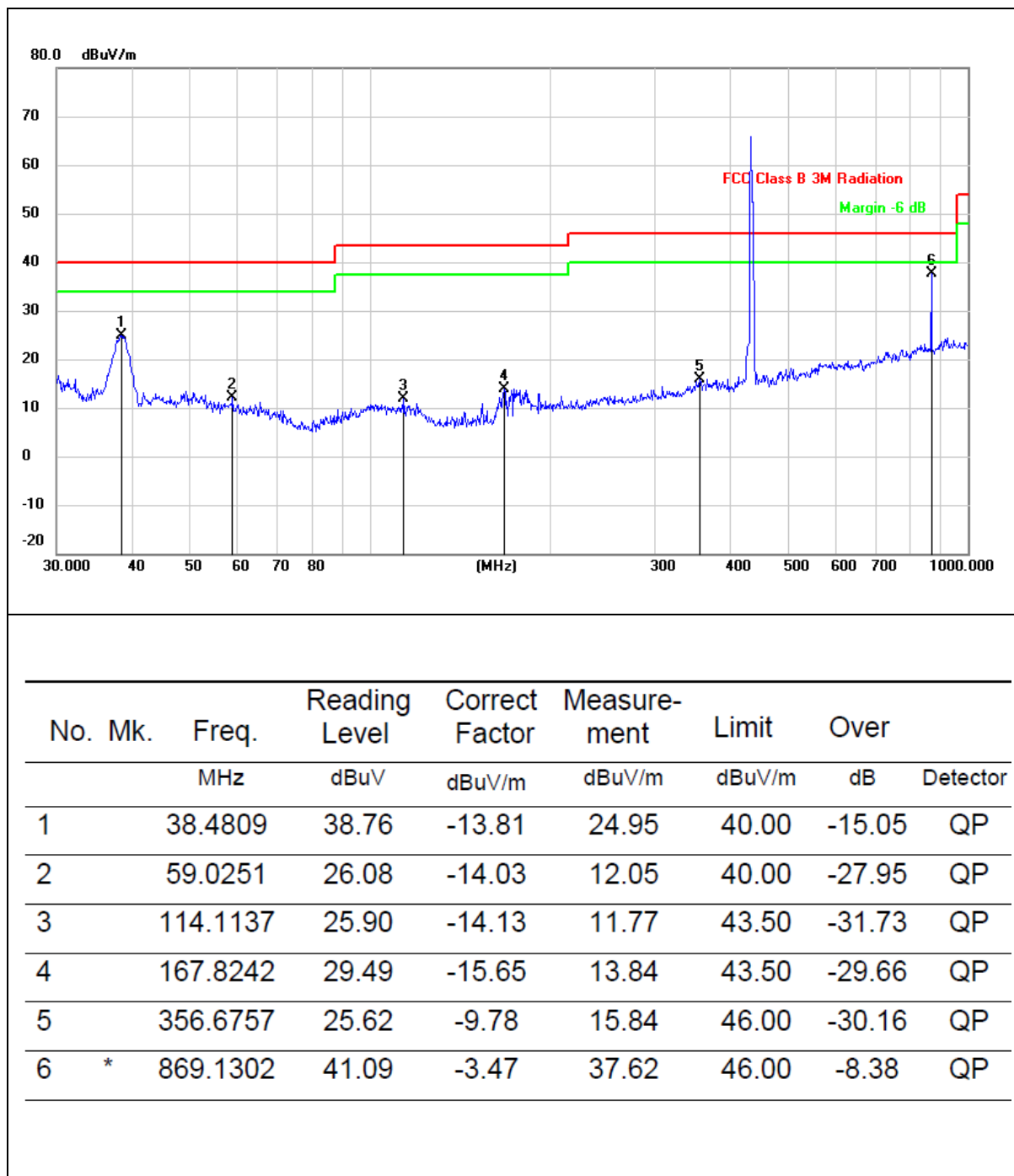
EUT:	LD3X	Model Name :	EI-MW-RC-07
Relative Humidity:	52%	Phase:	H
Pressure:	1010 hPa	Test Voltage :	DC 4.5V from battery
Test Mode :	TX		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	
		MHz	dBuV	dBuV/m	dBuV/m	dBuV/m	dB	Detector
1		38.4808	28.81	-13.81	15.00	40.00	-25.00	QP
2		146.8875	31.53	-16.57	14.96	43.50	-28.54	QP
3		178.1325	31.78	-15.23	16.55	43.50	-26.95	QP
4		292.0581	31.71	-11.14	20.57	46.00	-25.43	QP
5		383.9318	33.59	-9.92	23.67	46.00	-22.33	QP
6	*	869.1300	42.94	-3.47	39.47	46.00	-6.53	QP

Note: Exceeding the emission limit is the main frequency.

EUT:	LD3X	Model Name :	EI-MW-RC-07
Relative Humidity:	52%	Phase:	V
Pressure:	1010 hPa	Test Voltage :	DC 4.5V from battery
Test Mode :	TX		



Note: Exceeding the emission limit is the main frequency.

1G-6GHz

No.	Frequency (MHz)	Meter Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Polar (H/V)
1	1355.798	43.32	-9.96	33.36	74	-40.64	Horizontal
2	2070.151	44.98	-9.17	35.81	74	-38.19	Horizontal
3	3157.119	44.76	-9.25	35.51	74	-38.49	Horizontal
4	3852.256	43.02	-9.04	33.98	74	-40.02	Horizontal
5	4902.934	47.71	-9.96	37.75	74	-36.25	Horizontal
6	5613.536	43.64	-9.65	33.99	74	-40.01	Horizontal
1	1526.394	47.79	-9.77	38.02	74	-35.98	Vertical
2	2202.580	48.11	-9.93	38.18	74	-35.82	Vertical
3	3053.890	47.66	-9.10	38.55	74	-35.45	Vertical
4	3928.969	46.45	-9.90	36.55	74	-37.45	Vertical
5	5199.746	52.59	-9.11	43.48	74	-30.52	Vertical
6	5680.605	49.44	-9.87	39.57	74	-34.43	Vertical

Note1 : Absolute Level = Reading Level+ Factor, Margin= Absolute Level- Limit, Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Note2 :The peak value is less than the AV value, AV value is not required Factor added by measurement software automatically.

5.6 Transmitter timeout

5.6.1 Limit

A transmitter activated automatically shall cease transmission within 5 seconds after activation.

5.6.2 Test method

Setup the EUT as show in the block diagram above.

Set Spectrum Analyzer

Centre Frequency = Fundamental Frequency

RBW=100 kHz, VBW= 300 kHz

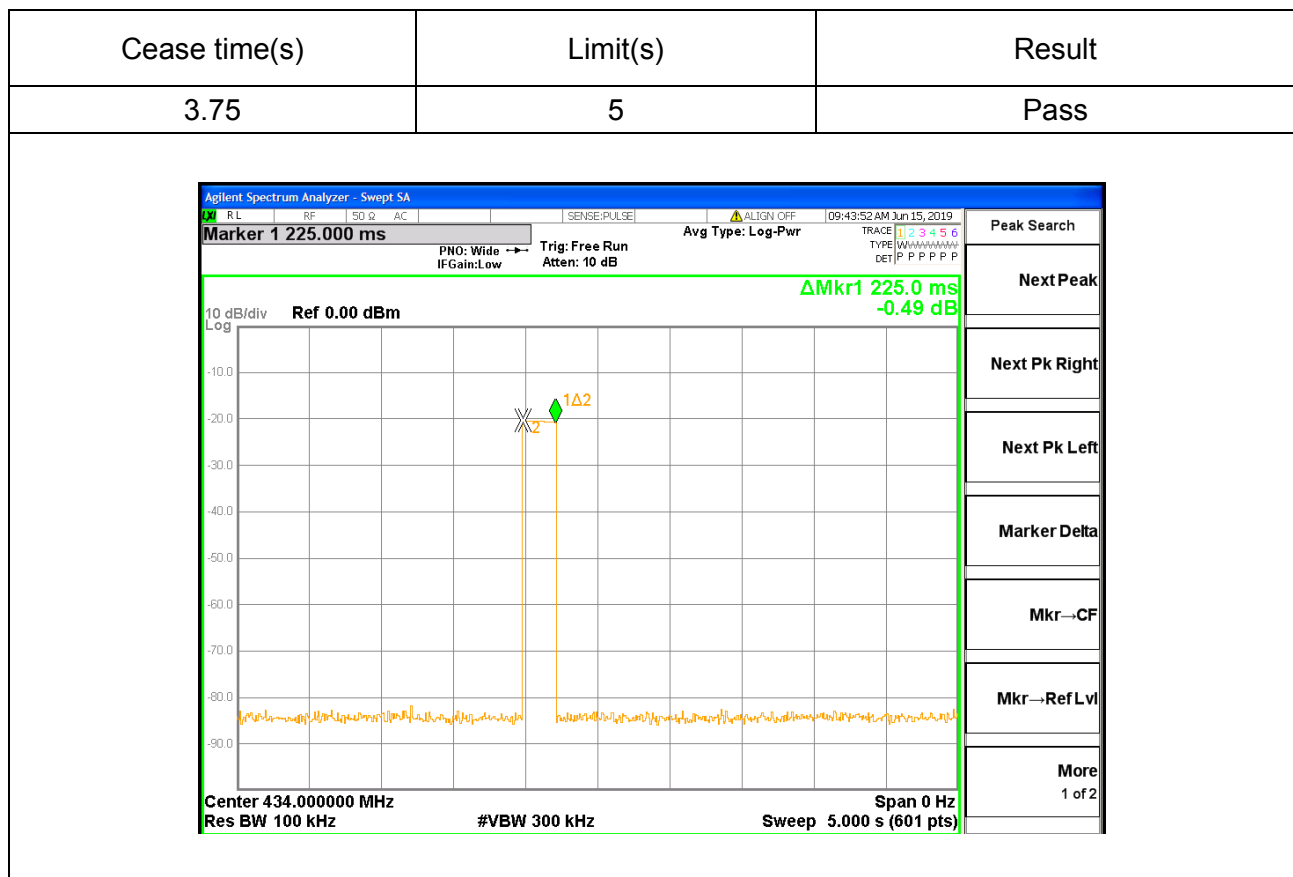
Span= 0 Hz

Sweep Time= 5 Seconds.

Setup the EUT as normal operation and press Transmitter button

Release the button, use Delta Mark function to test the time.

5.6.3 Test Result



Photographs of the EUT

See the APPENDIX 1: EUT PHOTO in the report No.: MTi190615E111-1

-----End of Report-----