

FCC&ISED Radio Test Report

FCC ID: OMOLTV-R3 IC: 5049A-LTVR3

This report concerns: Original Grant

Project No. Equipment Brand Name Test Model	: 1907C230 : RAIN SENSOR : LA CROSSE : LTV-R3
Series Model for FCC	: LTV-R3-INT, LTV-R3vX, LTV-R3vX-INT, LTV-R3-XX, LTV-R3-XX-INT (X can be 0~9, the difference for different version are the product shell color, software, and packaging upgrade version number, when upgrade a version the number progressed to next number)
Series Model for ISED	: N/A
Applicant	: La Crosse Technology Ltd.
Address	: 2809 Losey Blvd. S. La Crosse Wisconsin 54601 United States
Manufacturer	: La Crosse Technology Ltd.
Address	: 2809 Losey Blvd. S. La Crosse Wisconsin 54601 United States
Factory	: La Crosse Technology Ltd.
Address	: 2809 Losey Blvd. S. La Crosse Wisconsin 54601 United States
Date of Receipt	: Jul. 29, 2019
Date of Test	: Jul. 29, 2019 ~ Aug. 14, 2019
Issued Date	: Aug. 19, 2019
Report Version	: R00
Test Sample	: Engineering Sample No.: DG1907308
Standard(s)	: FCC Part15, Subpart C(15.249) ANSI C63.10-2013 RSS-210 Issue 9, August 2016 RSS-Gen Issue 5, Apr. 2018

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

Rose.Lin

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Declaration

BTL represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with standards traceable to international standard(s) and/or national standard(s).

BTL's reports apply only to the specific samples tested under conditions. It is manufacture's responsibility to ensure that additional production units of this model are manufactured with the identical electrical and mechanical components. **BTL** shall have no liability for any declarations, inferences or generalizations drawn by the client or others from **BTL** issued reports.

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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	Aug. 19, 2019	





1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

	FCC Part15, Subpart C (15.249) RSS-210 Issue 9, August 2016, RSS-Gen Issue 5, Apr. 2018				
Standa	ard Section	Test Item	Judgment	Remark	
FCC	ISED	rest item	Judgment	Kennark	
15.207	RSS-Gen 8.8	Conducted Emission	N/A	Note (1)	
15.209 15.249	RSS-Gen 8.9 RSS-210, Issue 9, Annex B.10	Radiated Spurious Emission	PASS		
-	RSS-Gen 6.7	Bandwidth	PASS		

NOTE:

(1)"N/A" denotes test is not applicable in this test report.

(2) EUT is used new battery.



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 number for FCC: 357015

BTL's designation number for FCC: CN1240

BTL's Test Firm Registration Number for ISED: 4428B

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. Radiated Measurement:

Test Site	Method	Measurement Frequency Range	Ant. H / V	U, (dB)
		9kHz ~ 30MHz	V	3.79
		9kHz ~ 30MHz	Н	3.57
		30MHz ~ 200MHz	V	4.88
	CISPR	30MHz ~ 200MHz	Н	4.14
DG-CB03 CI		200MHz ~ 1,000MHz	V	4.62
	CISER	200MHz ~ 1,000MHz	Н	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
Radiated Emissions-9K-30MHz	25°C	60%	DC 3V	Robin Zhuang
Radiated Emissions-30 MHz to 1GHz	24°C	68%	DC 3V	Sheldon Ou
Radiated Emissions-Above 1000 MHz	24°C	68%	DC 3V	Sheldon Ou
Bandwidth	24.8°C	63.5%	DC 3V	Jonas Chen



2.GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	RAIN SENSOR		
Brand Name	LA CROSSE		
Model Name	LTV-R3		
Series Model for FCC	LTV-R3-INT, LTV-R3vX, LTV-R3vX-INT, LTV-R3-XX, LTV-R3-XX-INT		
Series Model for ISED	N/A		
Model Difference(s)	X can be 0~9, the difference for different version are the product shell color, software, and packaging upgrade version number, when upgrade a version the number progressed to next number.		
PowerSource	Supplied from 2*AA battery.		
Power Rating	DC 3V		
	Operation Frequency	915 MHz	
Draduat Description	Modulation Technology	FSK	
Product Description	Data rate	9.6bps	
	Field Strength	78.72dBuV/m	

Note:

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

2. Channel List:

Channel	Frequency (MHz)
01	915

3. Table for Filed Antenna:

Ant.	Manufacturer	Model Name	Antenna Type	Connector	Gain (dBi)
1	N/A	N/A	Loop	N/A	0



2.2 DESCRIPTION OF TEST MODES

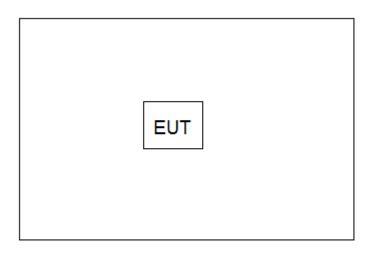
To investigate the maximum EMI emission characteristics generated from EUT, the test system was pre-scanning tested based on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	TX Mode

Final Test Mode	Description
Mode 1	TX Mode



2.3 BLOCKDIAGRAMSHOWINGTHECONFIGURATIONOFSYSTEMTESTED



2.4 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	Mfr/Brand	Model/Type No.	Series No.
-	-	-	-	-

Item	Cable Type	Shielded Type	Ferrite Core	Length
-	-	-	-	-



3. EMC EMISSION TEST

3.1 RADIATED EMISSION MEASUREMENT

3.1.1 LIMITS

For FCC 15.209 and 15.249

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

Frequencies (MHz)	Field Strength (micorvolts/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
960~1000	500	3

Harmonic emissions limits comply with below 54dBuV/m at 3m. Other emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or comply with the radiated emissions limits specified in section15.209(a) limit in the table below has to be followed.

Fundamental Frequency	Field Strength of Fundamental (micorvolts/meter)	Field Strength of Harnibucs (micorvolts/meter)	
902-928 MHz	50	500	

For RSS-210 B.10

Devices shall comply with the following requirements:

(a) The field strength of fundamental and harmonic emissions, measured at 3 m, shall not exceed 50 mV/m and 0.5 mV/m respectively.

The field strength limits shall be measured using an average detector, except for the fundamental emission in the frequency band 902-928 MHz, which is based on measurements using an International Special Committee on Radio Interference (CISPR) quasi-peak detector.

(b) Emissions radiated outside of the specified frequency bands, except for harmonic emissions, 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.

The provisions of RSS-Gen regarding pulsed operation do not apply to CISPR measurement for the band 902-928 MHz.



LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000 MHz)							
	(dBuV/m) (at 3m)						
FREQUENCY (MHz)	PEAK	AVERAGE					
Above 1000	74	54					
Notes:	Notes:						
(1) The limit for radiated tes	t 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).					
Spectrum Parameter		Setting					
Attenuation		Auto					
Start Frequency	1	000 MHz					
Stop Frequency	10th ca	arrier harmonic					
Receiver Parameter	Receiver Parameter Setting						
Attenuation	Auto						
Start ~ Stop Frequency	9kHz~90kHz	for PK/AVG detector					

Start ~ Stop Frequency	9kHz~90kHz for PK/AVG detector
Start ~ Stop Frequency	90kHz~110kHz for QP detector
Start ~ Stop Frequency	110kHz~490kHz for PK/AVG detector
Start ~ Stop Frequency	490kHz~30MHz for QP detector
Start ~ Stop Frequency	30MHz~1000MHz for QP detector

DWELL TIME OF PERIODIC OPERATION MEASUREMENT

Duty Cycle = On Time/Total Time

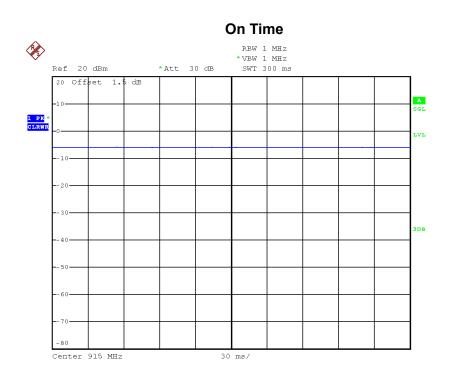
T_{ON}: 100 ms

BIL

T_{Total}: 100 ms

Duty cycle=100/100= 100.00%

Average Reading = Peak value + 20log(Duty cycle), AV=Peak



Date: 9.AUG.2019 17:18:09



3.1.2 TESTPROCEDURE

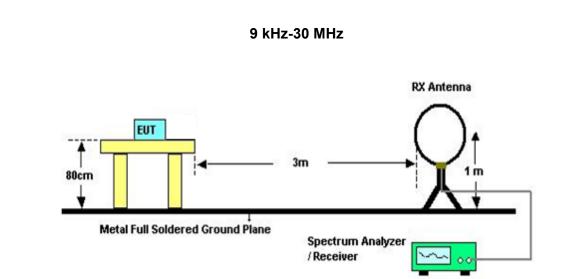
- a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
- b. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 1.5 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(above 1GHz)
- c. The height of the equipment or of the substitution antenna shall be 0.8 m or 1.5m, the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights find the maximum reading (used Bore sight function).
- e. The receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1GHz.
- f. The initial step in collecting radiated emission data is a receiver peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- g. All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform. (below 1GHz)
- h. All readings are Peak Mode value unless otherwise stated AVG in column of Note. If the Peak Mode Measured value compliance with the Peak Limits and lower than AVG Limits, the EUT shall be deemed to meet both Peak & AVG Limits and then only Peak Mode was measured, but AVG Mode didn't perform. (above 1GHz)
- i. For the actual test configuration, please refer to the related Item -EUT Test Photos.

3.1.3 DEVIATIONFROMTESTSTANDARD

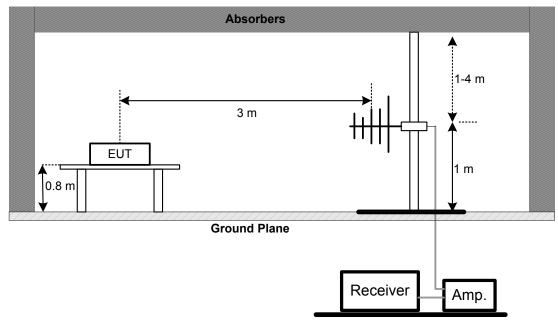
No deviation

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3.1.4 TESTSETUP

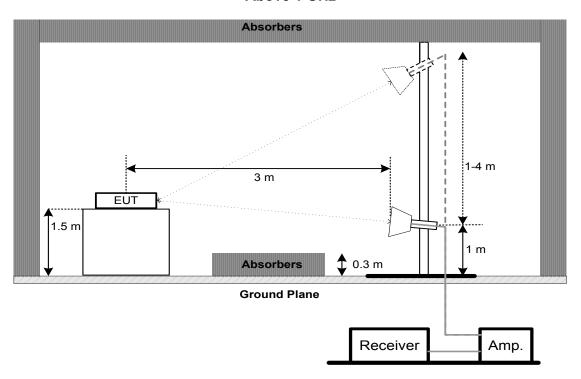


30 MHz to 1 GHz



BIL





3.1.5 TEST RESULTS (9 KHZ TO 30 MHZ)

Please refer to the Appendix A.

Remark:

- (1) The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.
- (2) Distance extrapolation factor = 40 log (specific distance / test distance) (dB).
- (3) Limit line = specific limits (dBuV) + distance extrapolation factor.

3.1.6 TEST RESULTS (30 TO 1000 MHz)

Please refer to the Appendix B

3.1.7 TEST RESULTS (ABOVE1000 MHz)

Please refer to the Appendix C

Remark:

- (1) EUT Orthogonal Axis:
 - "X" denotes Laid on Table ; "Y" denotes Vertical Stand ; "Z" denotes Side Stand
- (2) During the measurements above 1 GHz it is taken care of that the EUT is always within the 3 dB cone of radiation BW of the used antenna





4. BANDWIDTH TEST

4.1 TEST PROCEDURE

- a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
- b. Spectrum Setting: RBW= 100kHz, VBW=300kHz, Sweep time = Auto.

4.2 DEVIATION FROM STANDARD

No deviation.

4.3 TEST SETUP



4.4 TEST RESULTS

Please refer to the Appendix D



5. MEASUREMENT INSTRUMENTS LIST AND SETTING

	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	e N/A RG 213/U	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	Cable emci		N/A	May 24, 2020				
5	Controller	СТ	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				

Radiated Emissions - Above 1 GHz							
Item Kind of Equipment Man		Manufacturer	Type No.	Serial No.	Calibrated until		
1	Double Ridged Guide Antenna	ETS	3115	75789	Mar. 09, 2020		
2	Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170319	Jun. 23, 2020		
3	Amplifier	Agilent	8449B	3008A02333	Mar. 10, 2020		
4	Microwave Preamplifier With Adaptor	EMC INSTRUMENT	EMC2654045	980039 & HA01	Mar. 10, 2020		
5	Receiver	Agilent	N9038A	MY52130039	Aug. 03, 2020		
6	Controller	СТ	SC100	N/A	N/A		
7	Controller	MF	MF-7802	MF780208416	N/A		
8	Cable	mitron	B10-01-01-12M	18072744	Jun. 29, 2020		
9	Measurement		EZ-EMC Ver.NB-03A1-01	N/A	N/A		

Bandwidth							
	Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until	
	1	Spectrum Analyzer	R&S	FSP40	100185	Aug. 03, 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.



6. EUT TEST PHOTO

Radiated Emissions Test Photos

9KHz to 30MHz

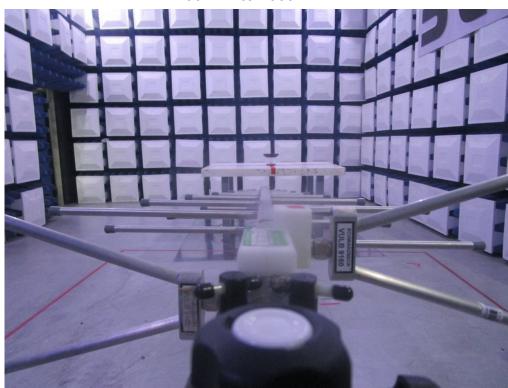






Radiated Emissions Test Photos

30MHz to 1000MHz

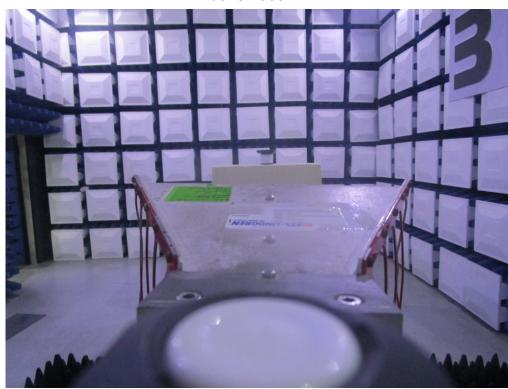






Radiated Emissions Test Photos

Above 1000MHz



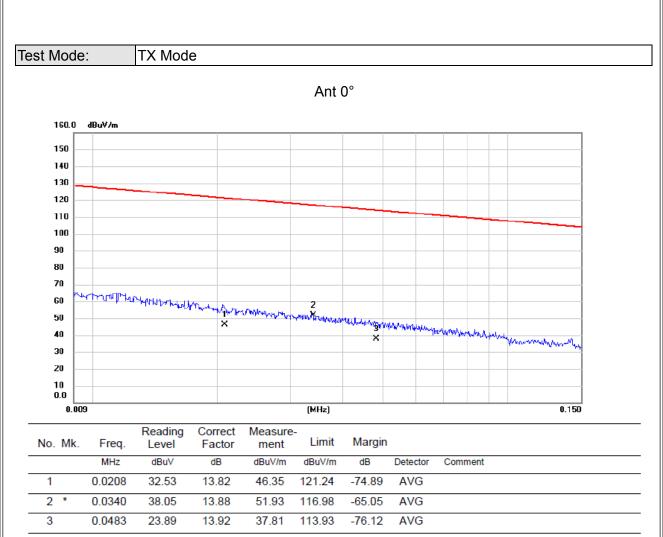




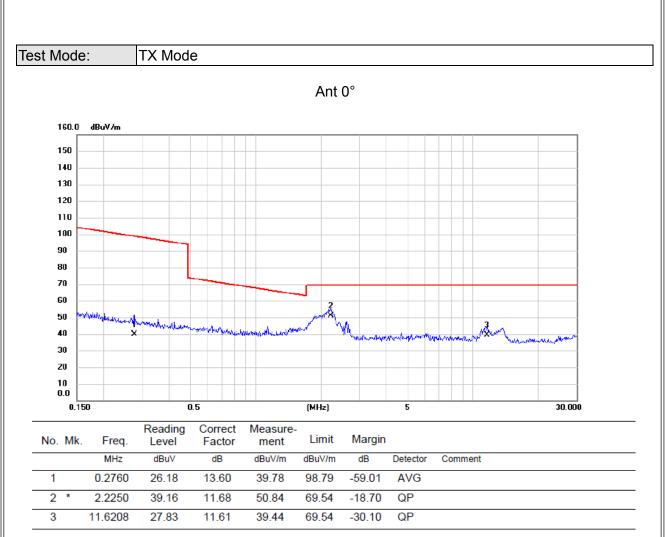


APPENDIX A -RADIATED EMISSION (9KHZ to 30MHZ)

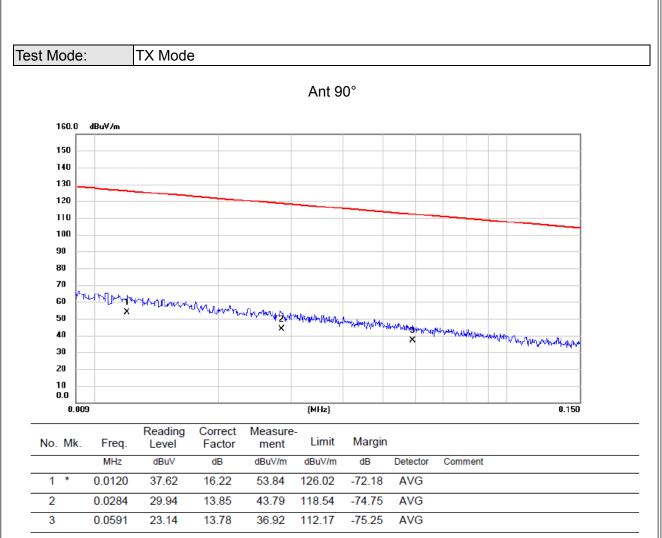
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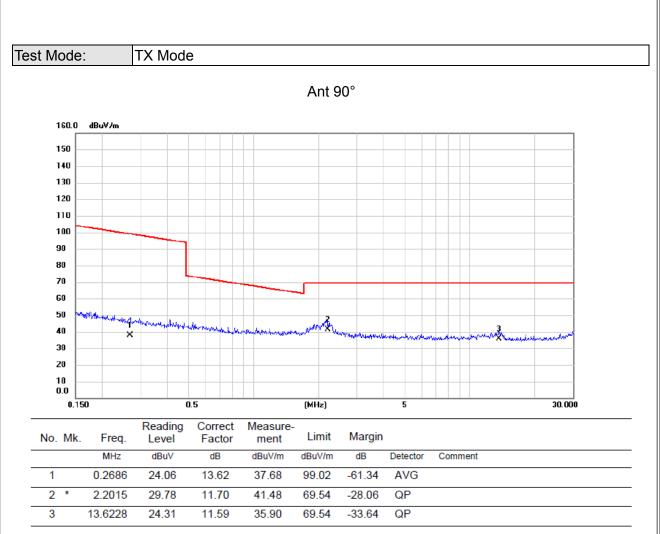
<u>3TL</u>



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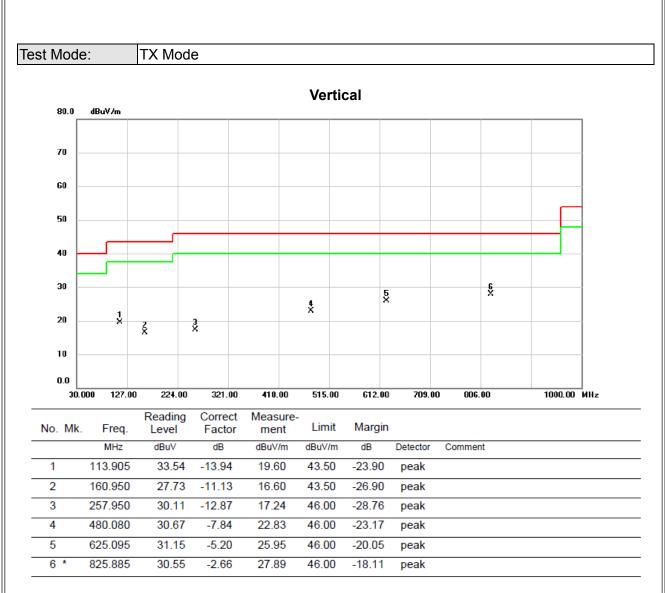
<u>3ĩL</u>



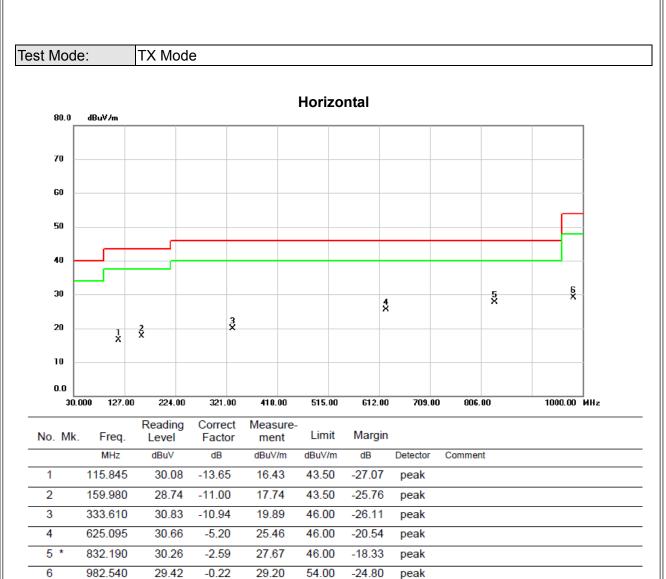


APPENDIX B -RADIATED EMISSION (30MHZ TO 1000MHZ)

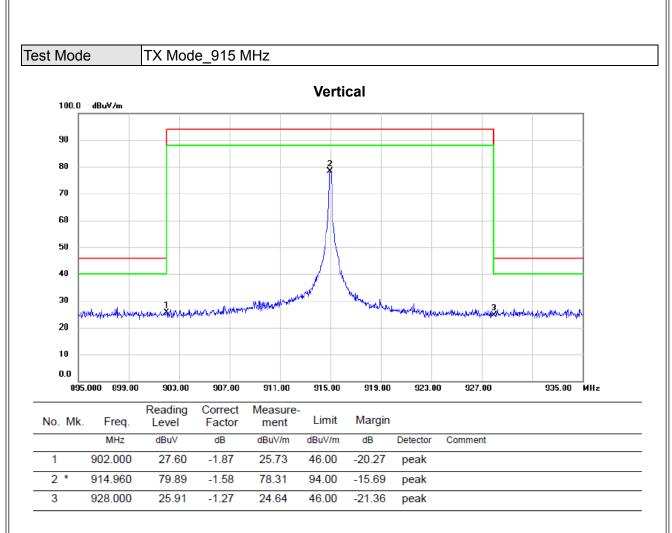
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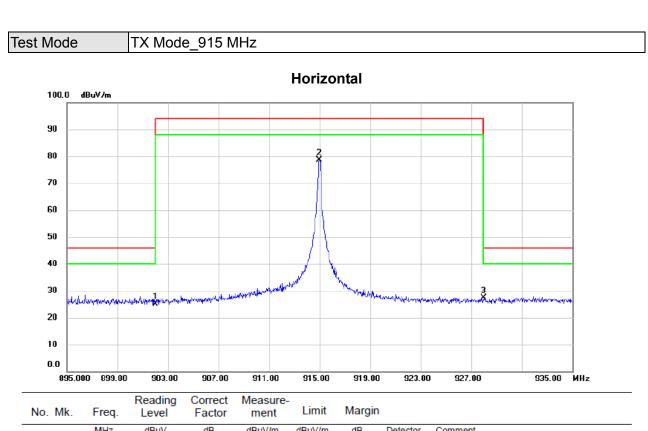
Remark:

(1) The QP value of fundamental frequency is:

QP Reading = Peak value + 20log(Duty cycle) , QP=Peak

Frequency	Peak value	QP value	QP Limit	Result	
(MHz)	(dBuV/m)	(dBuV/m)	(dBuV/m)		
915	78.31	78.31	94	PASS	

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No. Mk.	Freq.	Level	Factor	ment	Limit	Margin		
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	902.000	27.09	-1.87	25.22	46.00	-20.78	peak	
2 *	914.960	80.30	-1.58	78.72	94.00	-15.28	peak	
3	928.000	28.67	-1.27	27.40	46.00	-18.60	peak	

Remark:

(1) The QP value of fundamental frequency is:

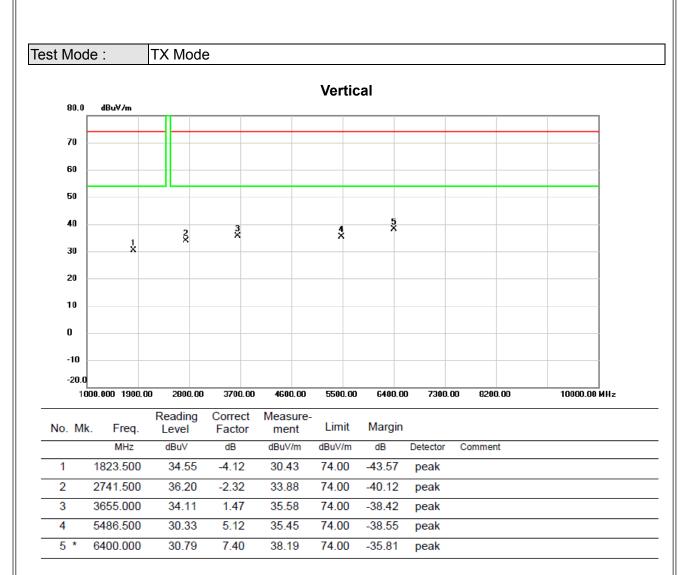
QP Reading = Peak value + 20log(Duty cycle) , QP=Peak

Frequency	Peak value	QP value	QP Limit	Result	
(MHz)	(dBuV/m)	(dBuV/m)	(dBuV/m)		
915	78.72	78.72	94	PASS	



APPENDIX C -RADIATED EMISSION (ABOVE 1000MHZ)

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Remark:

(1) The average value of fundamental frequency is:

Average Reading = Peak value + 20log(Duty cycle), AV = Peak

Frequency	Peak value	AV value	AV Limit	Result
(MHz)	(dBuV/m)	(dBuV/m)	(dBuV/m)	
6400.00	38.19	38.19	94	PASS

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Remark:

(1) The average value of fundamental frequency is:

Average Reading = Peak value + 20log(Duty cycle) , AV =Peak

Frequency	Peak value	AV value	AV Limit	Deput	
(MHz)	(dBuV/m)	(dBuV/m)	(dBuV/m)	Result	
6400.00	37.69	37.69	94	PASS	



APPENDIX D - BANDWIDTH



