

#### **FCC&IC Radio Test Report**

#### FCC ID:OMOTX17R

IC:5049A-TX17R

This report concerns (check one): ⊠Original Grant ☐Class II Change

Project No. : 1412C086 Equipment : Rain Sensor Model Name

: TX17R : LA CROSSE TECHNOLOGY LTD Applicant

: 2809 Losey Blvd.S.La Crosse Wisconsin 54601, USA Address

Date of Receipt : Dec. 09, 2014

Date of Test : Dec. 09, 2014 ~ Dec. 25, 2014 | Ssued Date : Dec. 29, 2014 | BTL Inc.

**Testing Engineer** 

David Mao)

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**Authorized Signatory** 

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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 the standards traceable to National Measurement Laboratory (**NML**) of **R.O.C.**, or National Institute of Standards and Technology (**NIST**) of **U.S.A.** 

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#### 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.

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#### **REPORT ISSUED HISTORY**

Issued No.	Description	Issued Date
BTL-FICP-1-1412C086	Original Issue.	Dec. 29, 2014

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#### 1. CERTIFICATION

Equipment : Rain Sensor

Brand Name : N/A Model Name : TX17R

Applicant : LA CROSSE TECHNOLOGY LTD Manufacturer : LA CROSSE TECHNOLOGY LTD

Address : 2809 Losey Blvd.S.La Crosse Wisconsin 54601, USA

Factory : LA CROSSE TECHNOLOGY LTD

Address : 2809 Losey Blvd.S.La Crosse Wisconsin 54601, USA

Date of Test : Dec. 09, 2014 ~ Dec. 25, 2014

Test Sample : Engineering Sample

Standard(s) : FCC Part15, Subpart C(15.249)/ ANSI C63.4-2009

Canada RSS-210:2010

RSS-GEN Issue 4, November 2014

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

The test data, data evaluation, and equipment configuration contained in our test report (Ref No. BTL-FCCP-1-1412C086) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of TAF according to the ISO-17025 quality assessment standard and technical standard(s).

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#### 2. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

FCC Part15, Subpart C (15.249) / Canada RSS-210:2010 RSS-GEN Issue 4, November 2014				
Standard	dSection	Test Item	Judgment	Remark
FCC	IC	. oot nom	oudgo	. torridant
15.207	RSS-GEN Issue 4 8.8	Conducted Emission	N/A	
15.209 15.249	RSS-210, Issue 8, Annex 8, Section 8.5	Radiated Spurious Emission	PASS	

#### NOTE:

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

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#### 2.1 TEST FACILITY

The test facilities used to collect the test data in this report is **DG-C02/DG-CB03** at the location of No.3, Jinshagang 1st Road, Shixia, Dalang Town, Dongguan, Guangdong, China.523792 BTL's test firm number for FCC: 319330

BTL's test firm number for IC 4428B-1

#### 2.2 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

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

#### A. Conducted Measurement:

Test Site	Method	Measurement Frequency Range	U, (dB)	NOTE
DG-C02	CISPR	150 KHz ~ 30MHz	1.94	

#### B. Radiated Measurement:

Test Site	Method	Measurement Frequency Range	Ant. H / V	U,(dB)	NOTE
		9KHz~30MHz	V	3.79	
		9KHz~30MHz	Н	3.57	
		30MHz ~ 200MHz	V	3.82	
		30MHz ~ 200MHz	Н	3.60	
DG-CB03	CISPR	200MHz ~ 1,000MHz	V	3.86	
DG-CB03	CISER	200MHz ~ 1,000MHz	Н	3.94	
		1GHz~18GHz	V	3.12	
		1GHz~18GHz	Н	3.68	
		18GHz~40GHz	V	4.15	
		18GHz~40GHz	Н	4.14	

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#### 3. GENERAL INFORMATION

#### 3.1 GENERAL DESCRIPTION OF EUT

Equipment	Rain Sensor		
Brand Name	N/A		
Model Name	TX17R		
Model Difference	N/A		
	Operation Frequency	915MHz	
Draduat Description	Modulation Technology	MCK/QMbpa)	
Product Description	Data rate	MSK(2Mbps)	
	Field Strength	64.97 dBuV/m(PK Max)	
Power Source	Supplied from 2*AA battery.		
Power Rating	DC 3V		

#### Note:

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

2.		
	Channe	Frequency (MHz)
	01	915

#### 3. Table for Filed Antenna

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

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#### 3.2 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

	For Radiated Test
Final Test Mode	Description
Mode 1	TX Mode

Note: New battery is used during whole test.

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### 3.3 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED EUT 3.4 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. FCC ID Item Equipment Mfr/Brand Model/Type No. Series No. Note Item Shielded Type Ferrite Core Length Note

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#### 4. EMC EMISSION TEST

#### **4.1** CONDUCTED EMISSION MEASUREMENT

#### 4.1.1 POWER LINE CONDUCTED EMISSION (FREQUENCY RANGE 150KHZ-30MHZ)

Fraguency of Emission (MUz)	Conducted Li	mit (dBµV)
Frequency of Emission (MHz)	Quasi-peak	Average
0.15 -0.5	66 to 56*	56 to 46*
0.50 -5.0	56	46
5.0 -30.0	60	50

#### Note:

(1) The limit of " \* " decreases with the logarithm of the frequency

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	

#### 4.1.2 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 equipments 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.

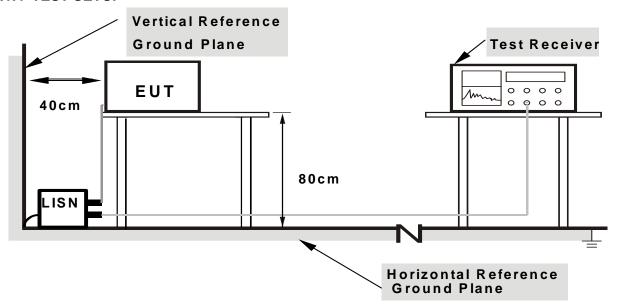
#### 4.1.3 DEVIATION FROM TEST STANDARD

No deviation

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#### 4.1.4 TEST SETUP



Note: 1.Support units were connected to second LISN.

2.Both of LISNs (AMN) are 80 cm from EUT and at least 80

from other units and other metal planes

#### 4.1.5 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

The EUT was programmed to be in continuously transmitting mode.

#### **4.1.6 EUT TEST CONDITIONS**

Temperature: 25°C Relative Humidity: 55% Test Voltage: N/A

#### 4.1.7 TEST RESULTS

Please refer to the Attachment 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 150KHz to 30MHz.

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#### 4.2 RADIATED EMISSION MEASUREMENT

#### 4.2.1 RADIATED EMISSION LIMITS (FCC 15.209)

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 54 dBuV/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 section 15.209(a) limit in the table below has to be followed.

#### Note:

- (1) The tighter limit applies at the band edges.
- (2) Emission level (dBuV/m)=20log Emission level (uV/m).

LIMITS OF RADIATED EMISSION MEASUREMENT (FCC 15.209)

FREQUENCY (MHz)	(dBuV/m) (at 3m)		
	PEAK	AVERAGE	
Above 1000	74	54	

#### Notes:

- (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).

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Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic

Receiver Parameter	Setting	
Attenuation	Auto	
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	

#### **4.2.2 TEST PROCEDURE**

- a. The EUT was placed on the top of a rotating table 0.8 meters 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 EUT was placed on the top of a rotating table 0.8 meters 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; 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. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then AV detector mode re-measured.
- e. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
- f. For the actual test configuration, please refer to the related Item –EUT Test Photos.

#### 4.2.3 DEVIATION FROM TEST STANDARD

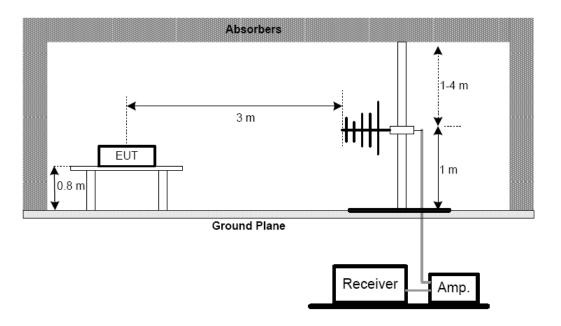
No deviation

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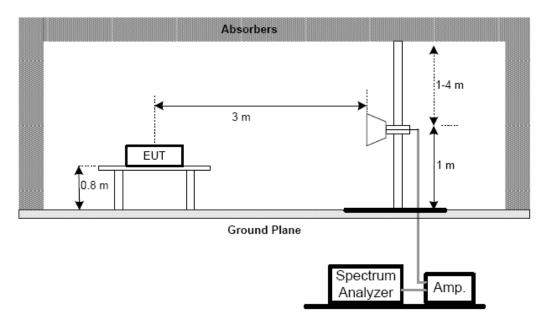


#### 4.2.4 TEST SETUP

(A) Radiated Emission Test Set-Up Frequency Below 1 GHz



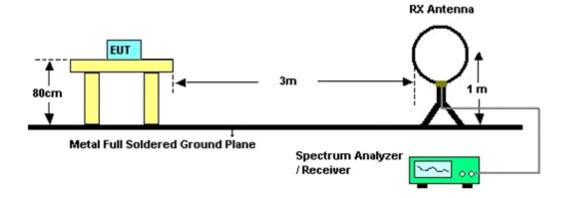
(B) Radiated Emission Test Set-Up Frequency Above 1 GHz



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#### (C) For radiated emissions below 30MHz



#### 4.2.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of **4.1.6** Unless otherwise a special operating condition is specified in the follows during the testing.

#### 4.2.6 EUT TEST CONDITIONS

Temperature: 25°C Relative Humidity: 55% Test Voltage: DC 3V

#### **4.2.7** TEST RESULTS (BELOW 30MHz)

Please refer to the Attachment B.

#### 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..

#### **4.2.8** TEST RESULTS (BETWEEN 30 – 1000 MHz)

Please refer to the Attachment C

#### Remark:

- (1) 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.
- (2) Measuring frequency range from 30MHz to 1000MHz or the 10th harmonic of highest fundamental frequency. "F" denotes fundamental frequency; "H" denotes spurious frequency. "E" denotes band edge frequency.
- (3) Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made with an instrument using Peak detector mode or QP detector mode of the emission .
- (4) RBW 100kHz VBW 300kHz Pk detector.

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#### **4.2.9** TEST RESULTS (ABOVE 1000 MHz)

Please refer to the Attachment D

#### Remark:

- (1) 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.
- (2) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode and AV detector mode of the emission .
- (3) Data of measurement 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.
- (4) A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.
- (5) EUT Orthogonal Axis:
  - "X" denotes Laid on Table; "Y" denotes Vertical Stand; "Z" denotes Side Stand
- (6) 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
- (7) No limit: This is fundamental signal, the judgment is not applicable. For fundamental signal judgment was referred to Peak output test.
- (8) RBW1MHz VBW1MHz Peak detector for PK value > RBW 1MHz VBW 10Hz peak detector for AV value

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#### 5. BANDWIDTH TEST

#### **5.1 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= 3kHz, VBW=3kHz, Sweep time = Auto.

#### **5.2 DEVIATION FROM STANDARD**

No deviation.

#### **5.3 TEST SETUP**

EUT	SPECTRUM
	ANALYZER

#### **5.4 EUT OPERATION CONDITIONS**

The EUT tested system was configured as the statements of 4.1.6 Unless otherwise a special operating condition is specified in the follows during the testing.

#### **5.5 EUT TEST CONDITIONS**

Temperature: 25°C Relative Humidity: 55% Test Voltage: DC 3V

#### **5.6 TEST RESULTS**

Please refer to the Attachment E

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#### 6. MEASUREMENT INSTRUMENTS LIST AND SETTING

	Radiated Emission Measurement							
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until			
1	Antenna	Schwarbeck	VULB9160	9160-3232	Mar. 29, 2015			
2	Amplifier	HP	8447D	2944A09673	Mar. 29, 2015			
3	Receiver	AGILENT	N9038A	MY52130039	Sep. 30, 2015			
4	Test Cable	N/A	C-01_CB03	N/A	Jul. 01, 2015			
5	Controller	СТ	SC100	N/A	N/A			
6	6 Measurement Farad		EZ-EMC Ver.NB-03A1-01	N/A	N/A			
7	Antenna	ETS	3115	00075789	Mar. 29, 2015			
8	Amplifier	Agilent	8449B	3008A02274	Mar. 29, 2015			
9	Receiver	AGILENT	N9038A	MY52130039	Sep. 30, 2015			
10	Test Cable	HUBER+SUHNER	C-48	N/A	Apr. 30, 2015			
11	Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170319	Feb. 22, 2015			
12	Microwave Preamplifier With Adaptor  EMC INSTRUMENT		EMC2654045	980039 & HA01	Feb. 22, 2015			
13	Active Loop Antenna	R&S	HFH2-Z2	830749/020	Mar. 29, 2015			
14	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A			

	Bandwidth						
Item Kind of Equipment Manufacturer Type No. Serial No. Ca							
1	Spectrum Analyzer	R&S	FSP 40	100185	Nov. 10, 2015		

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

All calibration period of equipment list is one year.

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#### 7. EUT TEST PHOTO

#### **Radiated Measurement Photos**

#### 9KHz to 30MHz





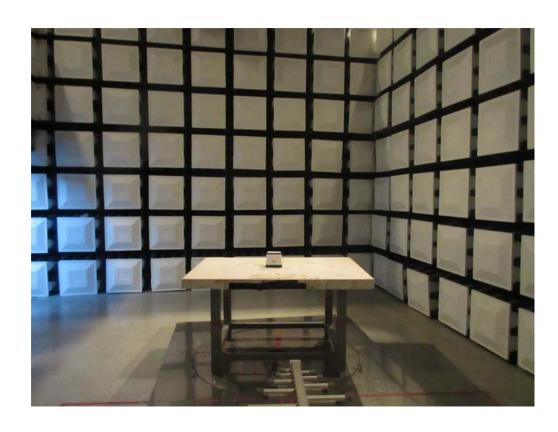
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#### **Radiated Measurement Photos**

#### 30MHz to 1000MHz





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#### **Radiated Measurement Photos**

#### Above 1000MHz





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#### **ATTACHMENT A - CONDUCTED EMISSION**

#### **Test Mode: N/A**

Note: "N/A" denotes test is not applicable to this device.

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ATTACHMENT B - RADIATED EMISSION (9KHZ to 30MHZ)

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Test Mode:	TX Mode

Frequency	Ant	Read level	Factor	Measured(FS)	Limit(QP)	Margin	Note
(MHz)	0°/90°	dBuV/m	(dB)	(dBuV/m)	(dBuV/m)	(dB)	Note
0.0094	0°	13.35	24.30	37.65	128.18	-90.53	AVG
0.0094	0°	15.48	24.30	39.78	148.18	-108.40	PEAK
0.0237	0°	12.38	24.07	36.45	120.11	-83.66	AVG
0.0237	0°	14.37	24.07	38.44	140.11	-101.67	PEAK
0.0318	0°	15.45	23.55	39.00	117.56	-78.55	AVG
0.0318	0°	16.39	23.55	39.94	137.56	-97.61	PEAK
0.0429	0°	12.38	22.85	35.23	114.96	-79.73	AVG
0.0429	0°	13.39	22.85	36.24	134.96	-98.72	PEAK
0.4912	0°	17.45	19.82	37.27	73.78	-36.51	QP
1.7156	0°	18.63	19.53	38.16	69.54	-31.38	QP

Frequency	Ant	Read level	Factor	Measured(FS)	Limit(QP)	Margin	Note
(MHz)	0°/90°	dBuV/m	(dB)	(dBuV/m)	(dBuV/m)	(dB)	Note
0.0094	90°	13.31	24.30	37.61	128.18	-90.57	AVG
0.0094	90°	14.28	24.30	38.58	148.18	-109.60	PEAK
0.0237	90°	15.44	24.07	39.51	120.11	-80.60	AVG
0.0237	90°	16.29	24.07	40.36	140.11	-99.75	PEAK
0.0318	90°	17.35	23.55	40.90	117.56	-76.65	AVG
0.0318	90°	18.19	23.55	41.74	137.56	-95.81	PEAK
0.0429	90°	12.24	22.85	35.09	114.96	-79.87	AVG
0.0429	90°	13.35	22.85	36.20	134.96	-98.76	PEAK
0.4912	90°	14.45	19.82	34.27	73.78	-39.51	QP
1.7156	90°	19.61	19.53	39.14	69.54	-30.40	QP

#### 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.

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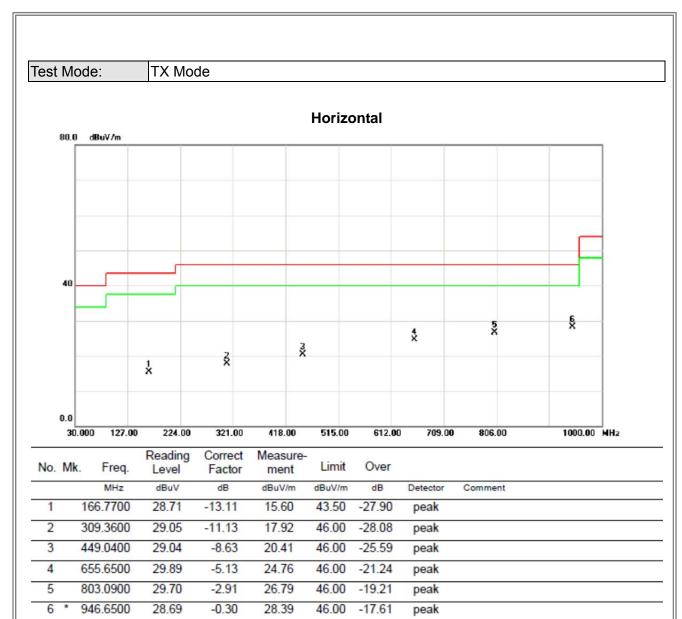
ATTACHMENT C - RADIATED EMISSION (30MHZ TO 1000MHZ)

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## ATTACHMENT D - RADIATED EMISSION (900MHZ to 10000MHz)

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Orthogonal Axis: X
Test Mode: TX Mode

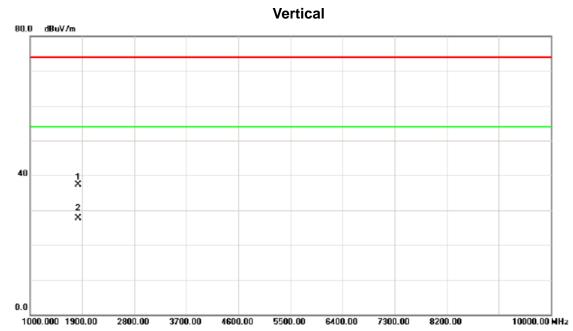
# Vertical 80.0 dBuV/m 40 40 0.0 900.000 903.00 906.00 909.00 915.00 918.00 921.00 924.00 930.00 MHz

140.	Mk.	Freq.	Level	Factor	Measure- ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		902.0000	27.06	-1.48	25.58	46.00	-20.42	peak	
2	*	914.8200	66.10	-1.13	64.97	46.00	18.97	peak	
3		928.0000	25.85	-0.79	25.06	46.00	-20.94	peak	

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Orthogonal Axis: X
Test Mode: TX Mode



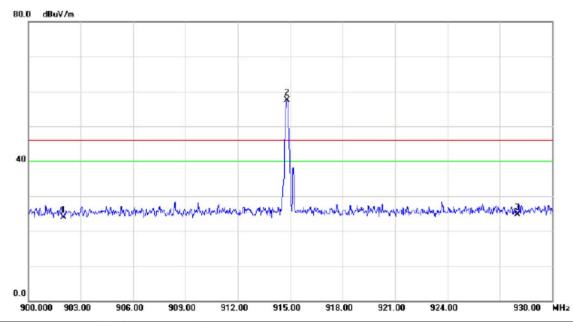
No.	Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		1829.610	41.30	-3.91	37.39	74.00	-36.61	peak	
2	*	1829.620	31.66	-3.91	27.75	54.00	-26.25	AVG	

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Orthogonal Axis: X
Test Mode: TX Mode

#### Horizontal



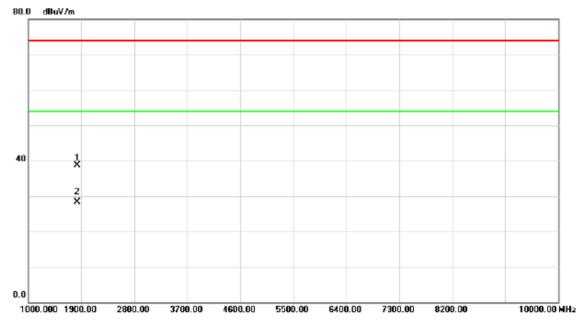
No.	Mk.	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over			
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment	
1		902.0000	25.43	-1.48	23.95	46.00	-22.05	peak		
2	×	914.8200	58.67	-1.13	57.54	46.00	11.54	peak		
3		928.0000	25.59	-0.79	24.80	46.00	-21.20	peak		

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Orthogonal Axis: X
Test Mode: TX Low Channel

#### Horizontal



No.	Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		1830.730	42.66	-3.90	38.76	74.00	-35.24	peak	
2	*	1830.780	32.19	-3.90	28.29	54.00	-25.71	AVG	

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ATTACHMENT E - BANDWIDTH

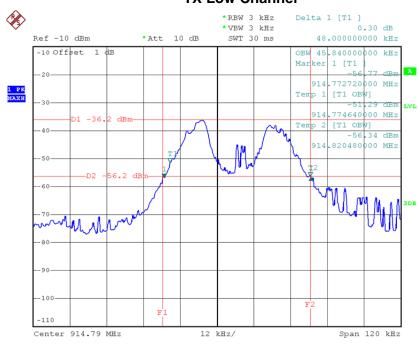
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Test Mode :	TV Mode
Test Mode :	IX Mode

Frequency (MHz)	20dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
915.0	0.04800	0.04584

#### **TX Low Channel**



Date: 23.DEC.2014 13:54:17