

FCC&IC Radio Test Report


FCC ID: OMOTX231RW


IC: 5049A-TX231RW

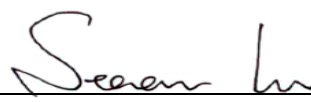
This report concerns (check one): Original Grant Class II Change

Project No. : 1509C317
Equipment : Wireless Professional Weather Station
Model Name : TX231RW
Applicant : La Crosse Technology Ltd.
Address : 2809 Losey Blvd. South La Crosse, WI 54601. U.S A

Date of Receipt : Sep. 29, 2015
Date of Test : Sep. 29, 2015 ~ Oct. 16, 2015
Issued Date : Oct. 19, 2015
Tested by : BTL Inc.

Testing Engineer : 
(Niklaus Lai)

Technical Manager : 
(David Mao)

Authorized Signatory : 
(Steven Lu)

B T L I N C .

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

TEL: +86-769-8318-3000 FAX: +86-769-8319-6000

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.

Table of Contents	Page
1 . CERTIFICATION	6
2 . SUMMARY OF TEST RESULTS	7
2.1 TEST FACILITY	8
2.2 MEASUREMENT UNCERTAINTY	8
3 . GENERAL INFORMATION	9
3.1 GENERAL DESCRIPTION OF EUT	9
3.2 DESCRIPTION OF TEST MODES	10
3.3 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED	11
3.4 DESCRIPTION OF SUPPORT UNITS	11
4 . EMC EMISSION TEST	12
4.1 CONDUCTED EMISSION MEASUREMENT	12
4.1.1 POWER LINE CONDUCTED EMISSION	12
4.1.2 TEST PROCEDURE	12
4.1.3 DEVIATION FROM TEST STANDARD	12
4.1.4 TEST SETUP	13
4.1.5 EUT OPERATING CONDITIONS	13
4.1.6 EUT TEST CONDITIONS	13
4.1.7 TEST RESULTS	13
4.2 RADIATED EMISSION MEASUREMENT	14
4.2.1 RADIATED EMISSION LIMITS	14
4.2.2 TEST PROCEDURE	15
4.2.3 DEVIATION FROM TEST STANDARD	15
4.2.4 TEST SETUP	16
4.2.5 EUT OPERATING CONDITIONS	17
4.2.6 EUT TEST CONDITIONS	17
4.2.7 TEST RESULTS (BELOW 30MHz)	17
4.2.8 TEST RESULTS (BETWEEN 30 – 1000 MHz)	17
4.2.9 TEST RESULTS (ABOVE 1000 MHz)	18
5 . BANDWIDTH TEST	19
5.1 TEST PROCEDURE	19
5.2 DEVIATION FROM STANDARD	19
5.3 TEST SETUP	19
5.4 EUT OPERATION CONDITIONS	19
5.5 EUT TEST CONDITIONS	19
5.6 TEST RESULTS	19
6 . MEASUREMENT INSTRUMENTS LIST AND SETTING	20
7 . EUT TEST PHOTO	21

Table of Contents

Page

ATTACHMENT A - CONDUCTED EMISSION	24
ATTACHMENT B - RADIATED EMISSION (9KHZ to 30MHZ)	25
ATTACHMENT C - RADIATED EMISSION (30MHZ TO 1000MHZ)	27
ATTACHMENT D - RADIATED EMISSION	30
(900MHZ to 10000MHz)	30
ATTACHMENT E - BANDWIDTH	35

REPORT ISSUED HISTORY

Issued No.	Description	Issued Date
BTL-FICP-1-1509C317	Original Issue.	Oct. 19, 2015

1. CERTIFICATION

Equipment : Wireless Professional Weather Station
Brand Name : La Crosse Technology
Model Name : TX231RW
Applicant : La Crosse Technology Ltd.
Manufacturer : La Crosse Technology Ltd.
Address : 2809 Losey Blvd. South La Crosse, WI 54601. U.S A
Date of Test : Sep. 29, 2015 ~ Oct. 16, 2015
Test Sample : Engineering Sample
Standard(s) : FCC Part15, Subpart C(15.249)/ ANSI C63.10-2013
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-FICP-1-1509C317) 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).

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				
StandardSection		Test Item	Judgment	Remark
FCC	IC			
15.207	RSS-GEN Issue 4 8.8	Conducted Emission	N/A	Note(1)
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.

2.1 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: 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 BTL measurement uncertainty is less than the CISPR 16-4-2 U_{CISPR} requirement.

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 %.

A. Radiated Measurement :

Test Site	Method	Measurement Frequency Range	Ant. H / V	U,(dB)
DG-CB03 (3m)	CISPR	9KHz ~ 30MHz	V	3.79
		9KHz ~ 30MHz	H	3.57
		30MHz ~ 200MHz	V	3.82
		30MHz ~ 200MHz	H	3.78
		200MHz ~ 1,000MHz	V	4.10
		200MHz ~ 1,000MHz	H	4.06

Test Site	Method	Measurement Frequency Range	Ant. H / V	U,(dB)
DG-CB03 (3m)	CISPR	1GHz ~ 18GHz	V	3.12
		1GHz ~ 18GHz	H	3.68
		18GHz ~ 40GHz	V	4.15
		18GHz ~ 40GHz	H	4.14

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

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

Equipment	Wireless Professional Weather Station	
Brand Name	La Crosse Technology	
Model Name	TX231RW	
Model Difference	N/A	
Product Description	Operation Frequency	915MHz
	Modulation Technology	FSK(17.2Kbps)
	Data rate	
	Field Strength	93.39 dBuV/m(PK Max)
Power Source	Supplied from 3*AAbattery	
Power Rating	DC 4.5V	

Note:

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

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

3.2 DESCRIPTION OF TEST MODES

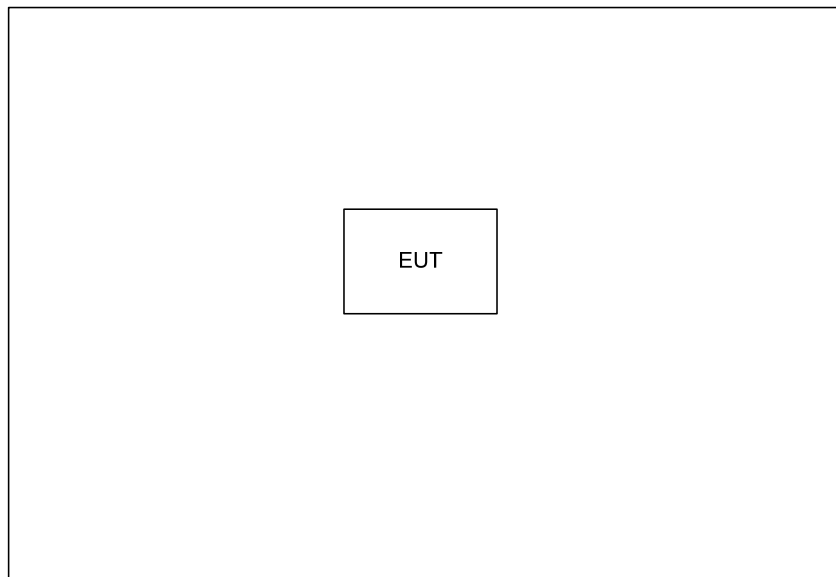
To investigate the maximum EMI emission characteristics generated from EUT, the test system was pre-scanning tested based on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration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

3.3 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



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.

Item	Equipment	Mfr/Brand	Model/Type No.	FCC ID	Series No.	Note
-	-	-	-	-	-	-

Item	Shielded Type	Ferrite Core	Length	Note
-	-	-	-	-

4. EMC EMISSION TEST

4.1 CONDUCTED EMISSION MEASUREMENT

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

Frequency of Emission (MHz)	Conducted Limit (dBμV)	
	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
- (2) The test result calculated as following:
 Measurement Value = Reading Level + Correct Factor
 Correct Factor = Insertion Loss + Cable Loss + Attenuator Factor(if use)
 Margin Level = Measurement Value - Limit Value

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

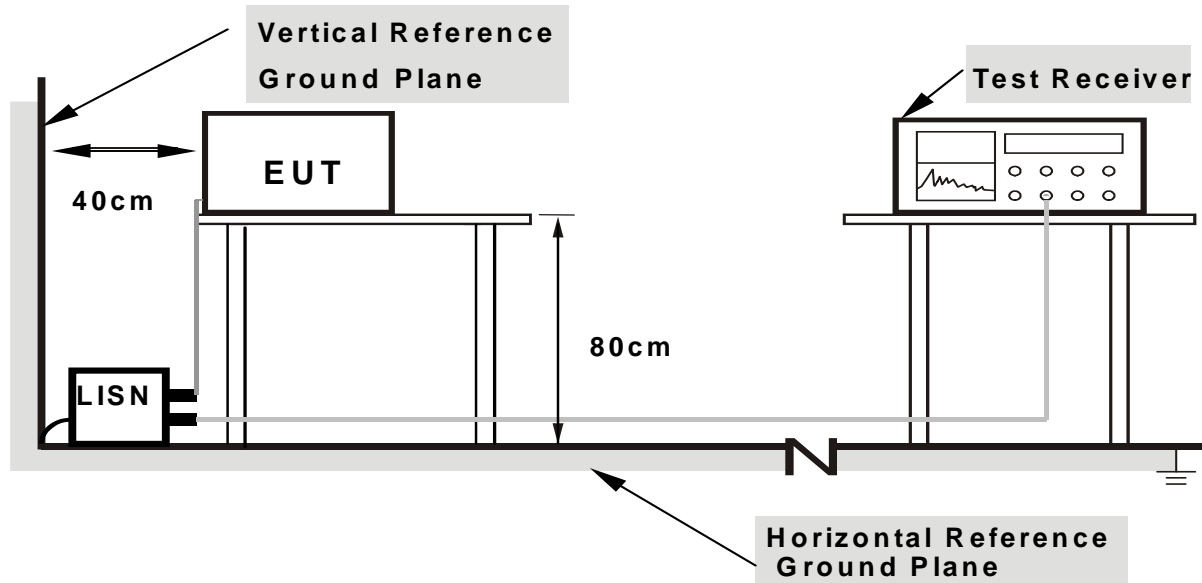
4.1.2 TEST PROCEDURE

- 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

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.

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).
- (3) The test result calculated as following:
 Measurement Value = Reading Level + Correct Factor
 Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain(if use)
 Margin Level = Measurement Value - Limit Value

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).

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

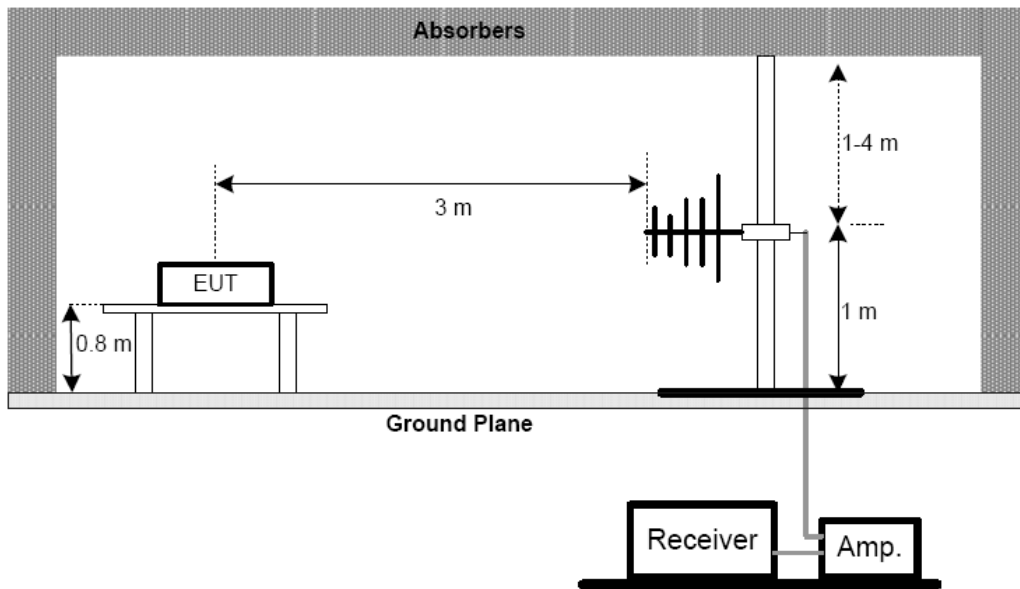
- a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
- b. The measuring distance 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. 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.
- e. 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)
- f. 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)
- g. For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.2.3 DEVIATION FROM TEST STANDARD

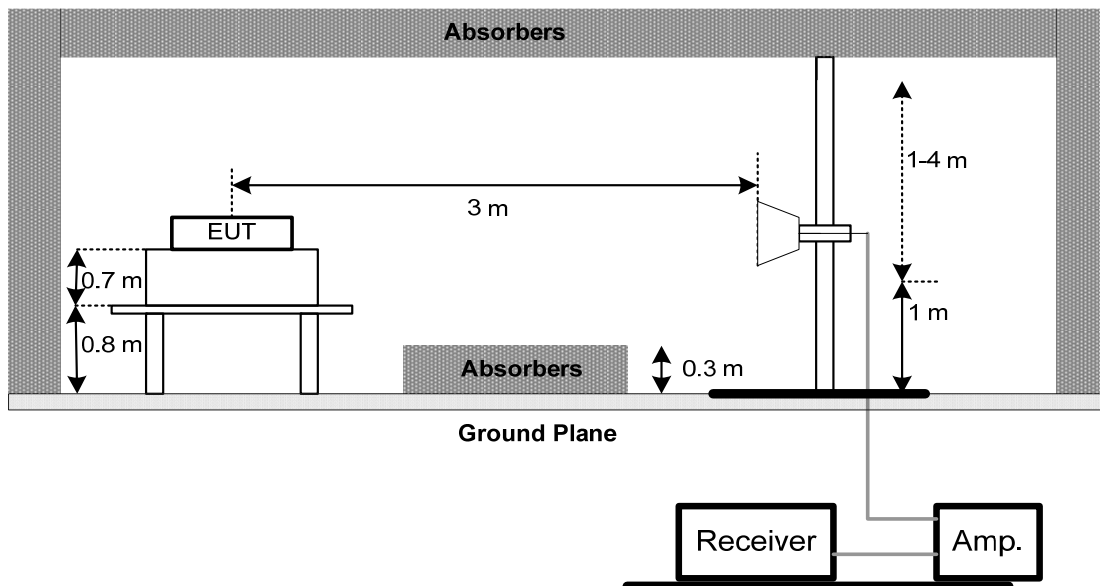
No deviation

4.2.4 TEST SETUP

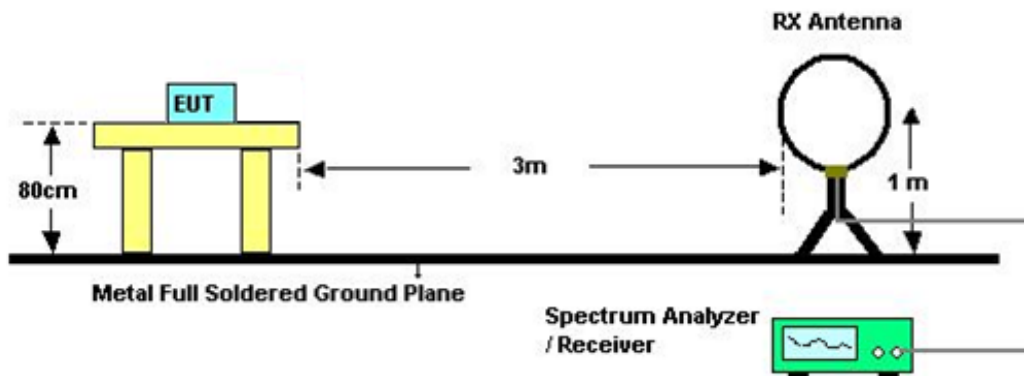
(A) Radiated Emission Test Set-Up Frequency Below 1 GHz



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



(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 4.5V

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 = $40 \log(\text{specific distance} / \text{test distance})$ (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.

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

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



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 4.5V

5.6 TEST RESULTS

Please refer to the Attachment E

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. 28, 2016
2	Amplifier	HP	8447D	2944A09673	Nov. 17, 2015
3	Receiver	AGILENT	N9038A	MY52130039	Oct. 11, 2016
4	Test Cable	emci	LMR-400(30MHz-1GHz)	C-01	Jun. 28, 2016
5	Controller	CT	SC100	N/A	N/A
6	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A
7	Antenna	ETS	3115	00075789	Mar. 28, 2016
8	Amplifier	Agilent	8449B	3008A02274	Nov. 02, 2015
9	Test Cable	emci	EMC104-SM-S M-10000(1GHz-26.5GHz)	C-68	Jun. 28, 2016
10	Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170319	Mar. 28, 2016
11	Microwave Preamplifier With Adaptor	EMC INSTRUMENT	EMC2654045	980039 & HA01	Mar. 28, 2016
12	Active Loop Antenna	R&S	HFH2-Z2	830749/020	Sep. 07, 2016

Bandwidth					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
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.

7. EUT TEST PHOTO

Radiated Measurement Photos

9KHz to 30MHz



Radiated Measurement Photos

30MHz to 1000MHz



Radiated Measurement Photos

Above 1000MHz



ATTACHMENT A - CONDUCTED EMISSION

Test Mode: N/A

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

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

Test Mode:	TX Mode
------------	---------

Frequency (MHz)	Ant 0°/90°	Read level dBuV/m	Factor (dB)	Measured(FS) (dBuV/m)	Limit(QP) (dBuV/m)	Margin (dB)	Note
0.0093	0°	12.67	24.98	37.65	128.23	-90.59	AVG
0.0093	0°	13.14	24.98	38.12	148.23	-110.12	PEAK
0.0127	0°	6.91	24.76	31.67	125.53	-93.86	AVG
0.0127	0°	7.26	24.76	32.02	145.53	-113.51	PEAK
0.0375	0°	4.47	23.19	27.66	116.12	-88.46	AVG
0.0375	0°	4.09	23.19	27.28	136.12	-108.84	PEAK
0.0940	0°	2.25	21.52	23.77	108.14	-84.37	AVG
0.0940	0°	2.56	21.52	24.08	128.14	-104.06	PEAK
0.6954	0°	20.71	20.43	41.14	70.76	-29.62	QP
2.2576	0°	21.05	19.35	40.40	69.54	-29.14	QP

Frequency (MHz)	Ant 0°/90°	Read level dBuV/m	Factor (dB)	Measured(FS) (dBuV/m)	Limit(QP) (dBuV/m)	Margin (dB)	Note
0.0096	90°	13.24	24.30	37.54	127.96	-90.42	AVG
0.0096	90°	14.11	24.30	38.41	147.96	-109.55	PEAK
0.0492	90°	7.54	22.45	29.99	113.76	-83.77	AVG
0.0492	90°	8.35	22.45	30.80	133.76	-102.96	PEAK
0.0684	90°	5.18	22.03	27.21	110.90	-83.69	AVG
0.0684	90°	6.03	22.03	28.06	130.90	-102.84	PEAK
0.1924	90°	1.68	20.52	22.20	101.92	-79.72	AVG
0.1924	90°	2.31	20.52	22.83	121.92	-99.09	PEAK
0.8469	90°	22.09	20.21	42.30	69.05	-26.75	QP
1.3674	90°	24.14	19.56	43.70	64.89	-21.18	QP

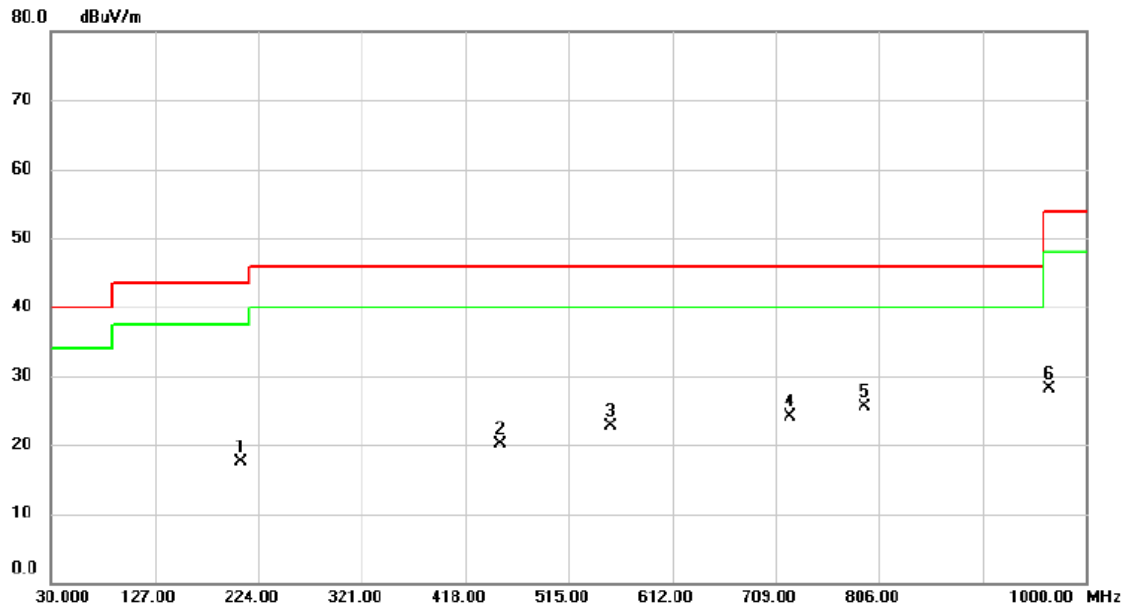
Remark:

- (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.

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

Test Mode: TX Mode

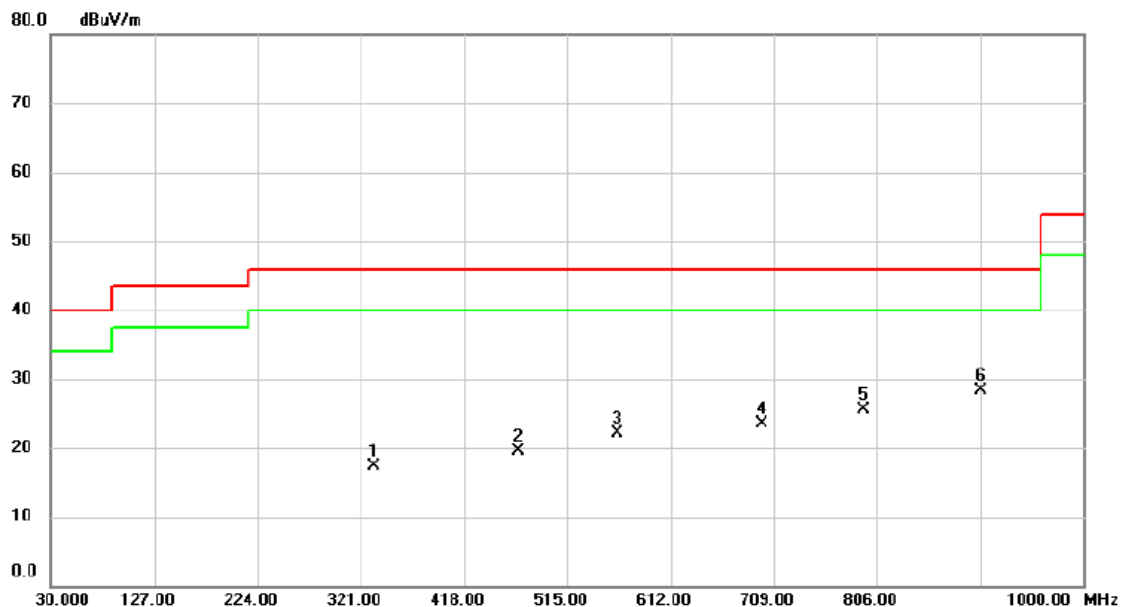
Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		207.5100	32.52	-14.92	17.60	43.50	-25.90	peak	
2		450.9800	28.12	-8.09	20.03	46.00	-25.97	peak	
3		554.7700	28.09	-5.40	22.69	46.00	-23.31	peak	
4		722.5800	28.44	-4.38	24.06	46.00	-21.94	peak	
5	*	792.4200	28.05	-2.46	25.59	46.00	-20.41	peak	
6		966.0500	28.38	-0.25	28.13	54.00	-25.87	peak	

Test Mode: TX Mode

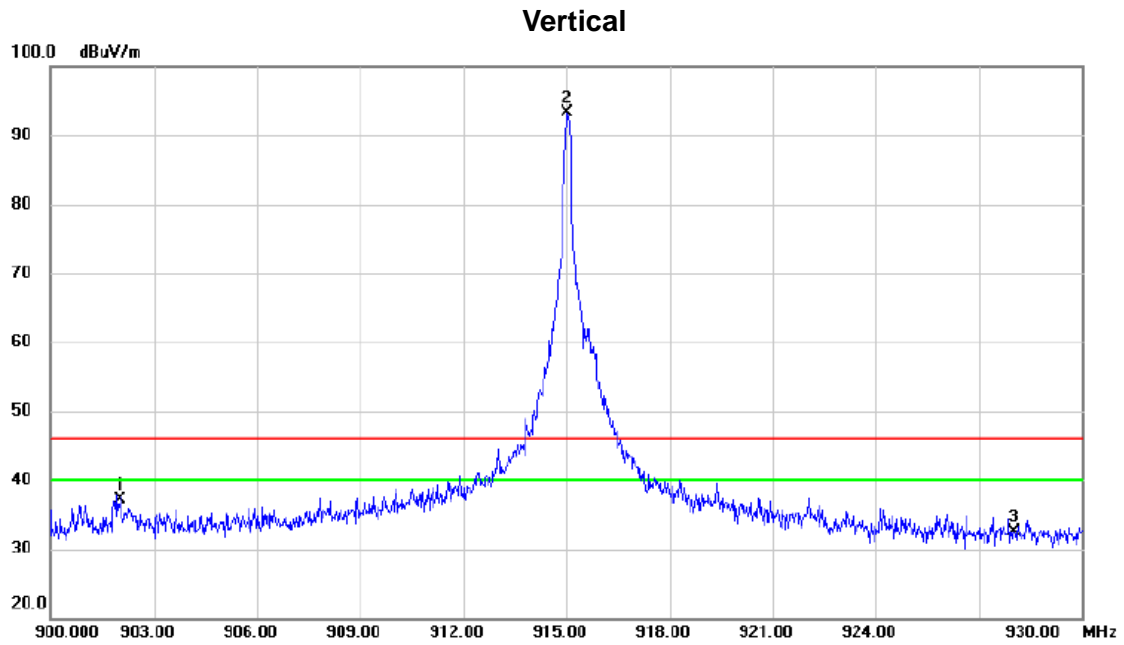
Horizontal



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		333.6100	28.31	-11.06	17.25	46.00	-28.75	peak	
2		468.4400	28.25	-8.76	19.49	46.00	-26.51	peak	
3		562.5300	27.90	-5.82	22.08	46.00	-23.92	peak	
4		698.3300	27.81	-4.22	23.59	46.00	-22.41	peak	
5		793.3900	27.82	-2.41	25.41	46.00	-20.59	peak	
6	*	903.0000	27.80	0.42	28.22	46.00	-17.78	peak	

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

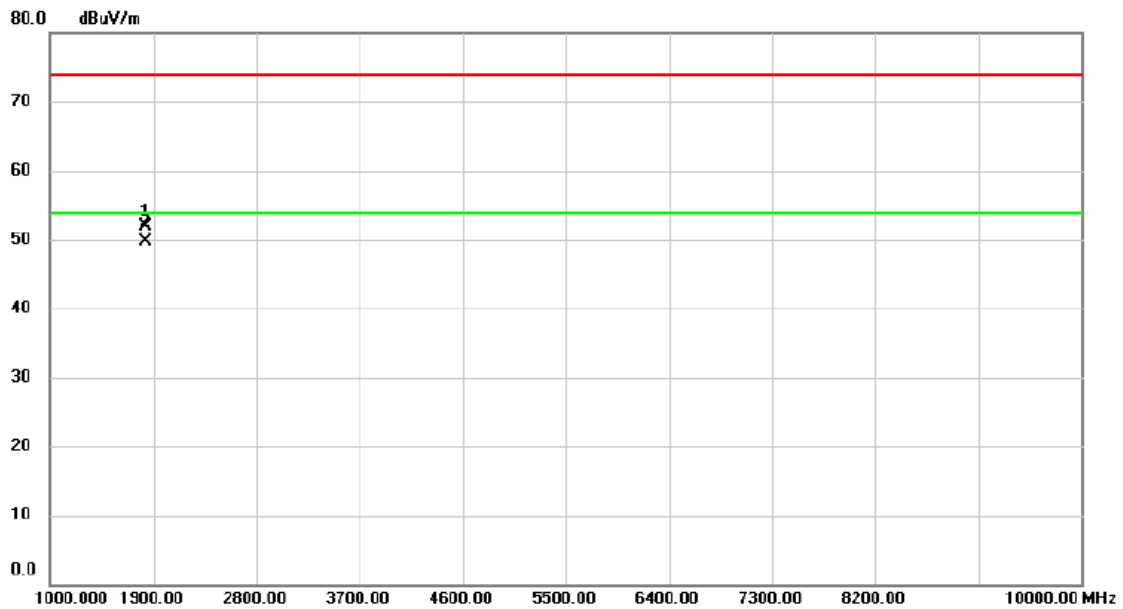
Orthogonal Axis :	X
Test Mode :	TX Mode



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		902.0000	36.60	0.42	37.02	46.00	-8.98	peak	
2	*	915.0300	93.13	0.26	93.39	46.00	47.39	peak	No Limit
3		928.0000	32.49	0.10	32.59	46.00	-13.41	peak	

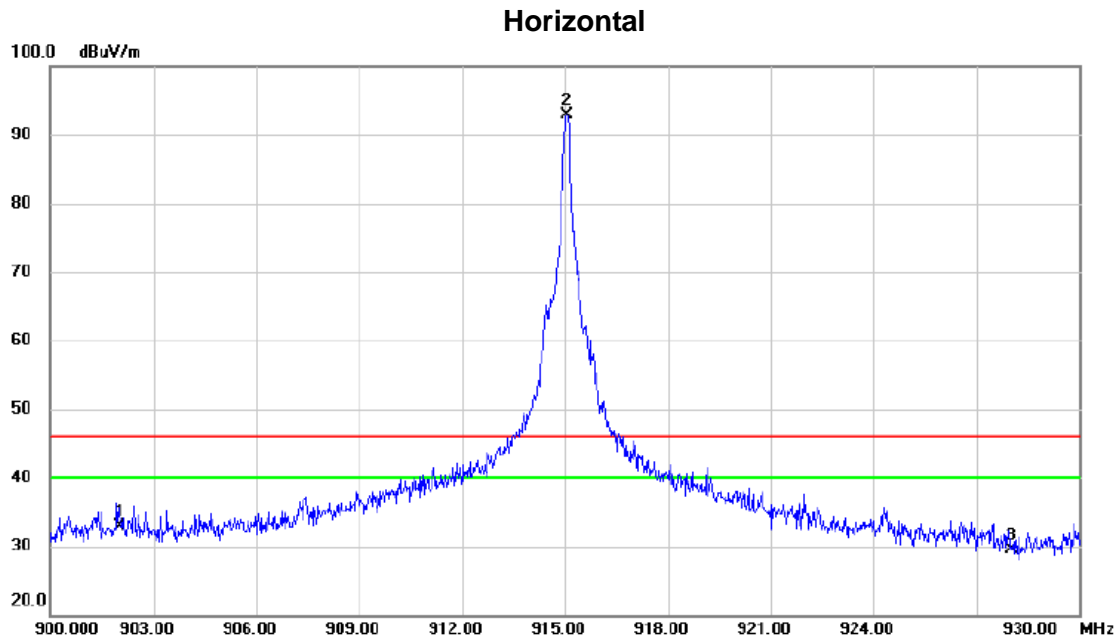
Orthogonal Axis :	X
Test Mode :	TX Mode

Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		1830.254	54.33	-2.43	51.90	74.00	-22.10	peak	
2	*	1830.254	52.08	-2.43	49.65	54.00	-4.35	AVG	

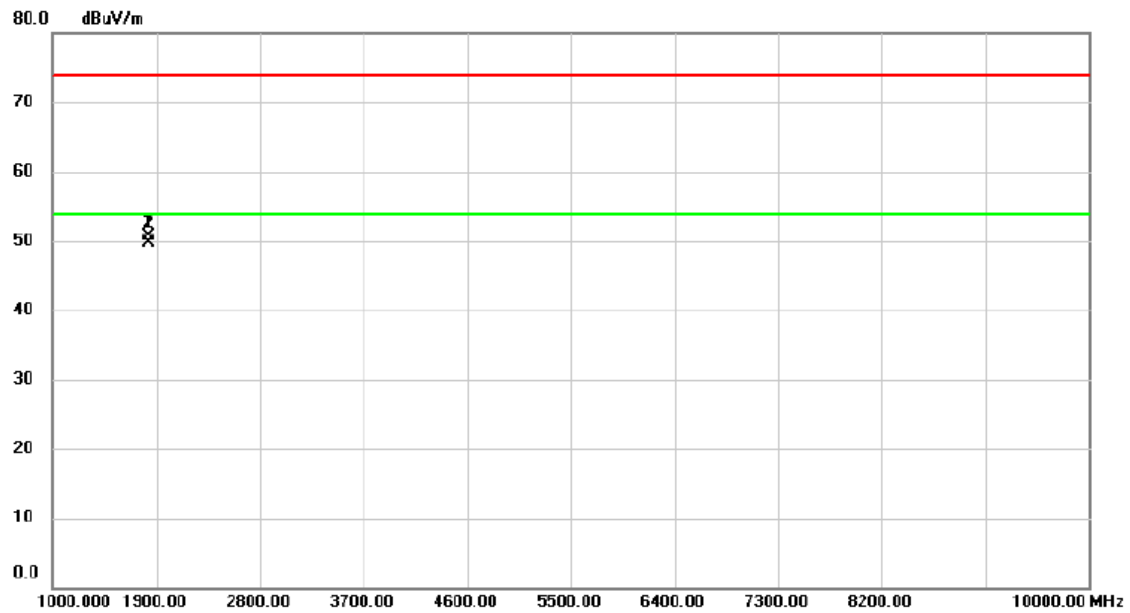
Orthogonal Axis :	X
Test Mode :	TX Mode



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		902.0000	32.40	0.42	32.82	46.00	-13.18	peak	
2	*	915.0600	92.69	0.27	92.96	46.00	46.96	peak	No Limit
3		928.0000	29.49	0.10	29.59	46.00	-16.41	peak	

Orthogonal Axis :	X
Test Mode :	TX Low Channel

Horizontal



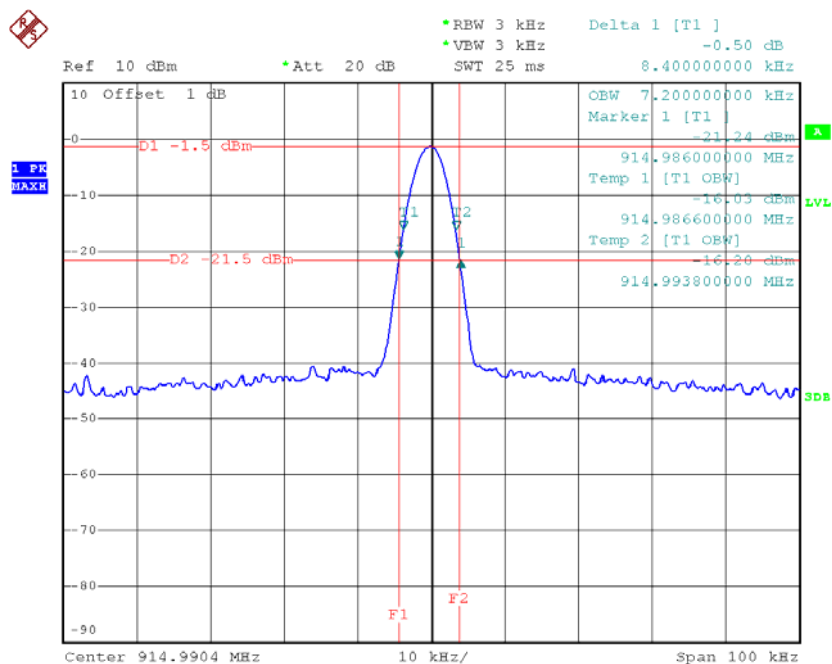
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		1830.548	53.10	-2.43	50.67	74.00	-23.33	peak	
2	*	1830.548	52.16	-2.43	49.73	54.00	-4.27	AVG	

ATTACHMENT E - BANDWIDTH

Test Mode : TX Mode

Frequency (MHz)	20dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
915.0	0.840	0.720

TX Low Channel



Date: 15.OCT.2015 12:06:00