

FCC Radio Test Report

FCC ID: OMOTX233RW

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

Project No. : 1607C271
Equipment : Professional Weather Station
Model Name : TX233RW
Applicant : La Crosse Technology Ltd.
Address : 2809 Losey Blvd. South La Crosse, WI 54601. U.S A.

Date of Receipt : Jul. 26, 2016
Date of Test : Jul. 26, 2016 ~ Aug. 18, 2016
Issued Date : Aug. 19, 2016
Tested by : BTL Inc.

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Declaration

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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-FCCP-1-1607C271	Original Issue.	Aug. 19, 2016

1. CERTIFICATION

Equipment : Professional Weather Station
Brand Name : La Crosse Technology
Model Name : TX233RW
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 : Jul. 26, 2016 ~ Aug. 18, 2016
Test Sample : Engineering Sample
Standard(s) : FCC Part15, Subpart C(15.249)/ ANSI C63.10-2013

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-1-1607C271) 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)			
StandardSection	Test Item	Judgment	Remark
15.207	Conducted Emission	N/A	Note (1)
15.209 15.249	Radiated Spurious Emission	PASS	
-	Bandwidth	PASS	

NOTE:

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

(2) EUT is used new battery.

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, DalangTown,Dongguan, Guangdong, China.

BTL's test firm number for FCC: 319330

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)	NOTE
DG-CB03	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	
		1GHz~18GHz	V	3.12	
		1GHz~18GHz	H	3.68	
		18GHz~40GHz	V	4.15	
		18GHz~40GHz	H	4.14	

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

Equipment	Professional Weather Station	
Brand Name	La Crosse Technology	
Model Name	TX233RW	
Model Difference	N/A	
Product Description	Operation Frequency	915 MHz
	Modulation Technology	FSK
	Data rate	17.2Kbps
	Field Strength	91.67dBuV/m
PowerSource	Supplied from 3*AA battery	
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. Channel List:

Channe	Frequency (MHz)
01	915

Table for Filed Antenna:

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

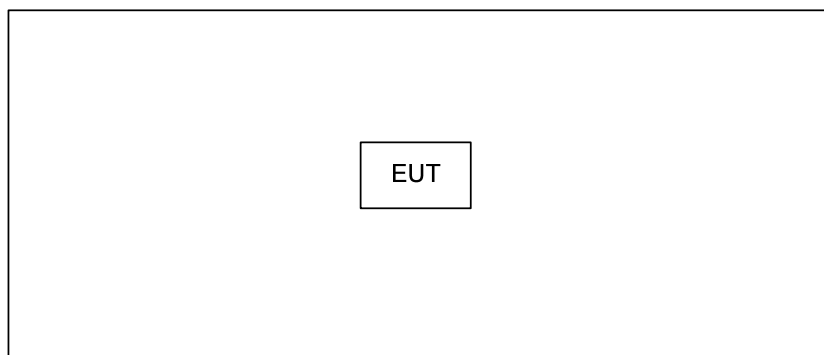
3.2 DESCRIPTION OF TEST MODES

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

Final Test Mode	Description
Mode 1	TX Mode

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.
-	-	-	-	-	-

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

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

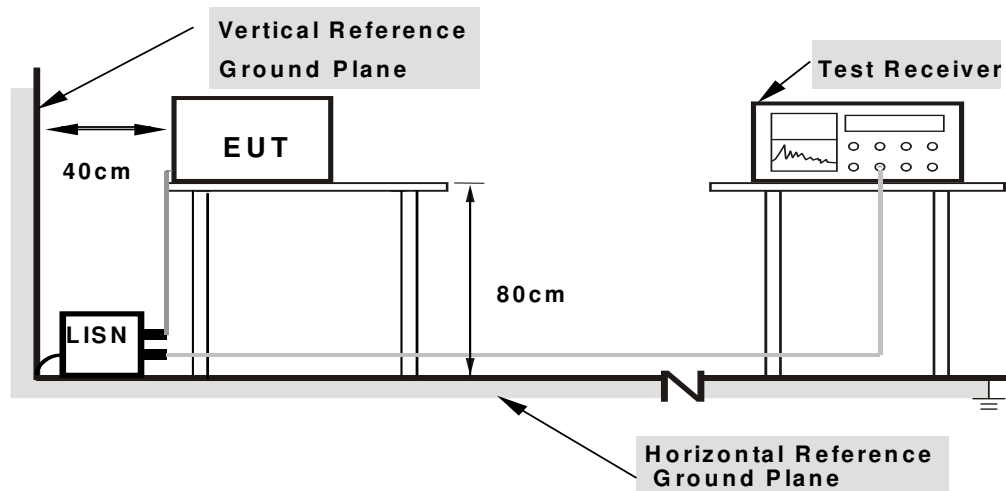
4.1.2 TESTPROCEDURE

- 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.
- Interconnecting cables that hang closer than 40 cm to the groundplane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- 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.
- LISN at least 80 cm from nearest part of EUT chassis.
- 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 TESTSETUP



- 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: N/A

Relative Humidity: N/A

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 (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
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 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).

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

DWELL TIME OF PERIODIC OPERATION MEASUREMENT

Duty Cycle = On Time/Total Time

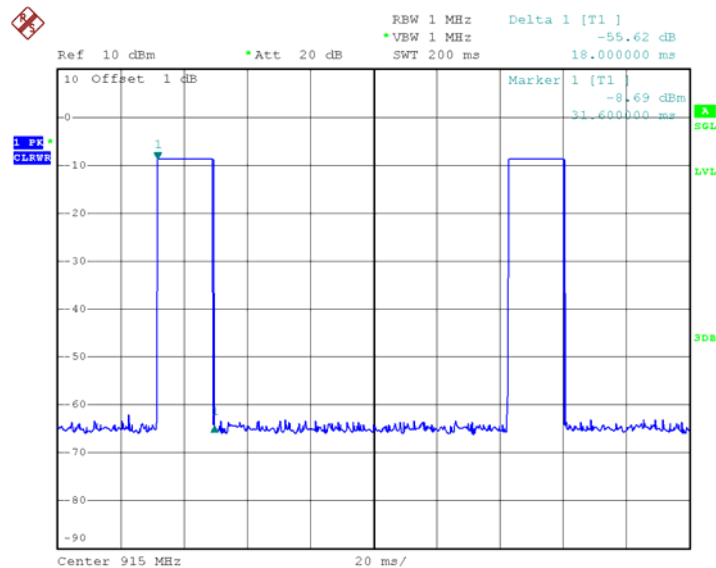
T_{ON} :18.0 ms

$T_{ON} + T_{OFF}$:(total time):111.2 ms

Duty cycle: 15.817%

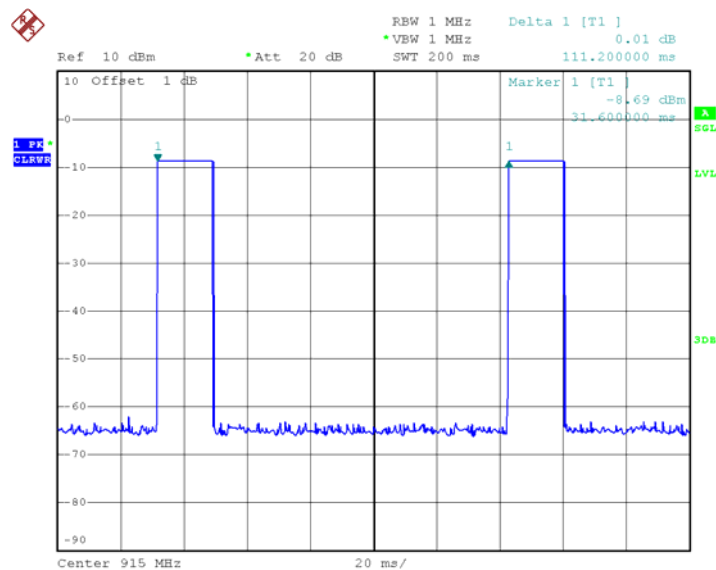
Average Reading = Peak value + $20\log(\text{Duty cycle})$, $AV = \text{Peak} - 15.817$

On Time



Date: 15.AUG.2016 09:55:35

Total Time



Date: 15.AUG.2016 09:55:46

4.2.2 TESTPROCEDURE

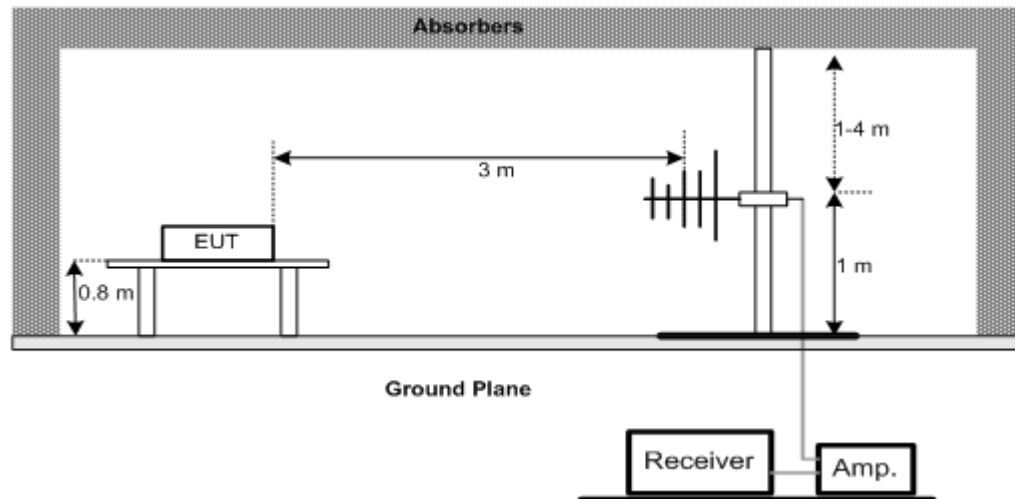
- a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
- b. The measuring distance 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.

4.2.3DEVIATIONFROMTESTSTANDARD

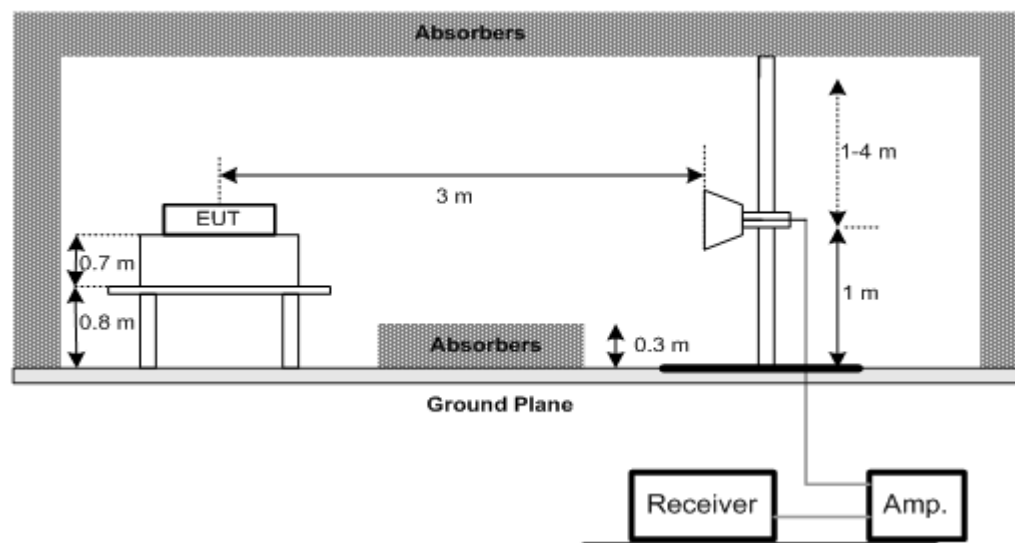
No deviation

4.2.4 TESTSETUP

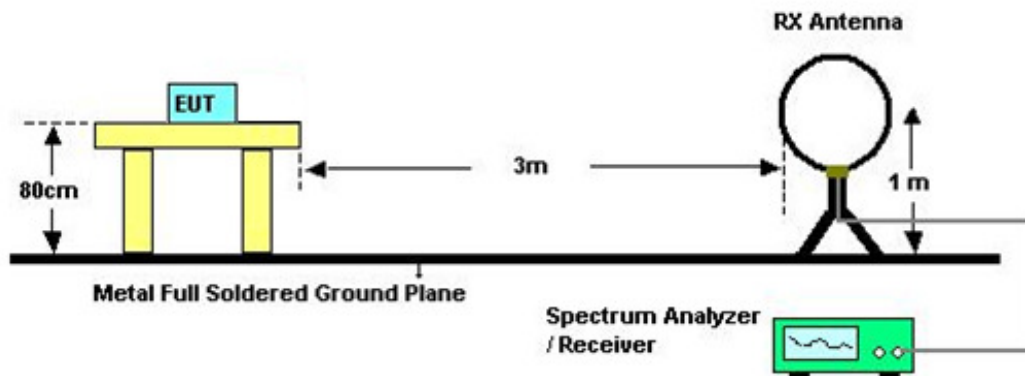
(A) Radiated Emission Test Set-Up Frequency Below 1 GHz



(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 4.1.5 unless otherwise a special operating condition is specified in the follows during the testing.

4.2.6 EUT TEST CONDITIONS

Temperature: 24°C

Relative Humidity: 52%

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 (30 TO 1000 MHz)

Please refer to the Attachment C

4.2.9 TEST RESULTS (ABOVE 1000 MHz)

Please refer to the Attachment D

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

5.BANDWIDTH TEST

5.1TEST 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.

5.2DEVIATION FROM STANDARD

No deviation.

5.3TEST SETUP



5.4EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 4.1.5 unless otherwise a special operating condition is specified in the follows during the testing.

5.5EUT 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. 27, 2017
2	Amplifier	HP	8447D	2944A09673	Nov. 09, 2016
3	Receiver	AGILENT	N9038A	MY52130039	Oct. 11, 2016
4	Test Cable	emci	LMR-400(30MHz-1GHz)	C-01	Jun. 27, 2017
5	Antenna	ETS	3115	00075789	Mar. 27, 2017
6	Amplifier	Agilent	8449B	3008A02274	Nov. 01, 2016
7	Receiver	AGILENT	N9038A	MY52130039	Oct. 11, 2016
8	Test Cable	emci	EMC104-SM-SM-10000(1GHz – 26.5GHz)	C-68	Jun. 27, 2017
9	Controller	CT	SC100	N/A	N/A
10	Position Control	MF	MF-7802	MF780208416	N/A
11	Active Loop Antenna	R&S	HFH2-Z2	830749/020	Sep. 07, 2016
12	Measurement Software	Farad	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	FSP 40	100185	Oct. 11, 2016
2	Test Cable	emci	EMC104-SM-SM-9000(0.01GHz – 26.5GHz)	C-100	N/A

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



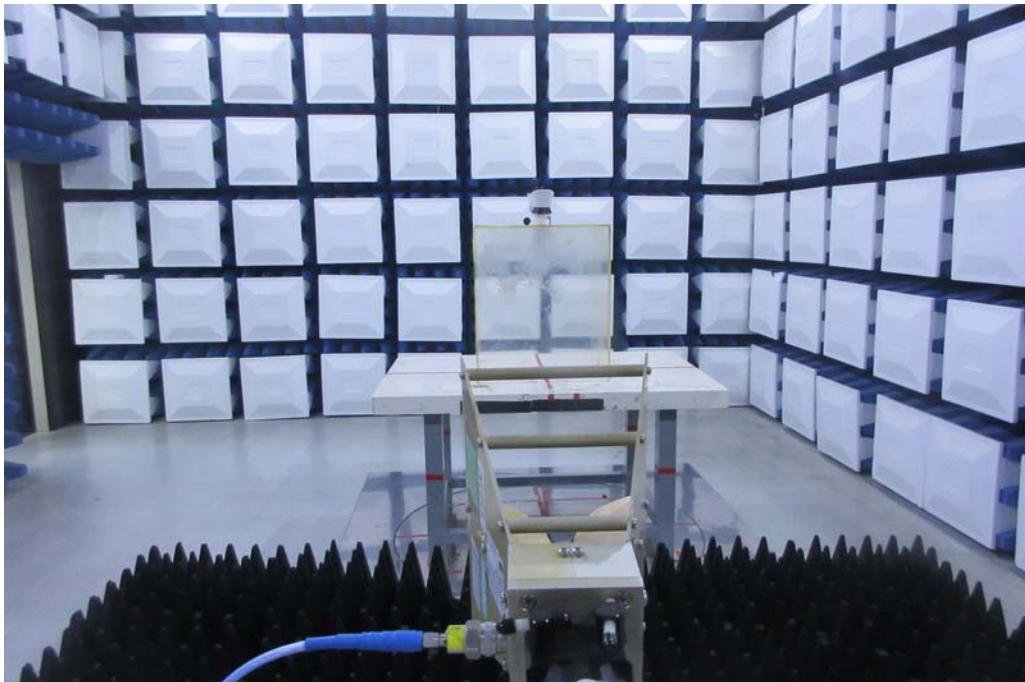
Radiated Measurement Photos

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.

ATTACHMENTB -RADIATED EMISSION (9KHZ to 30MHZ)

Test Mode: TX Mode

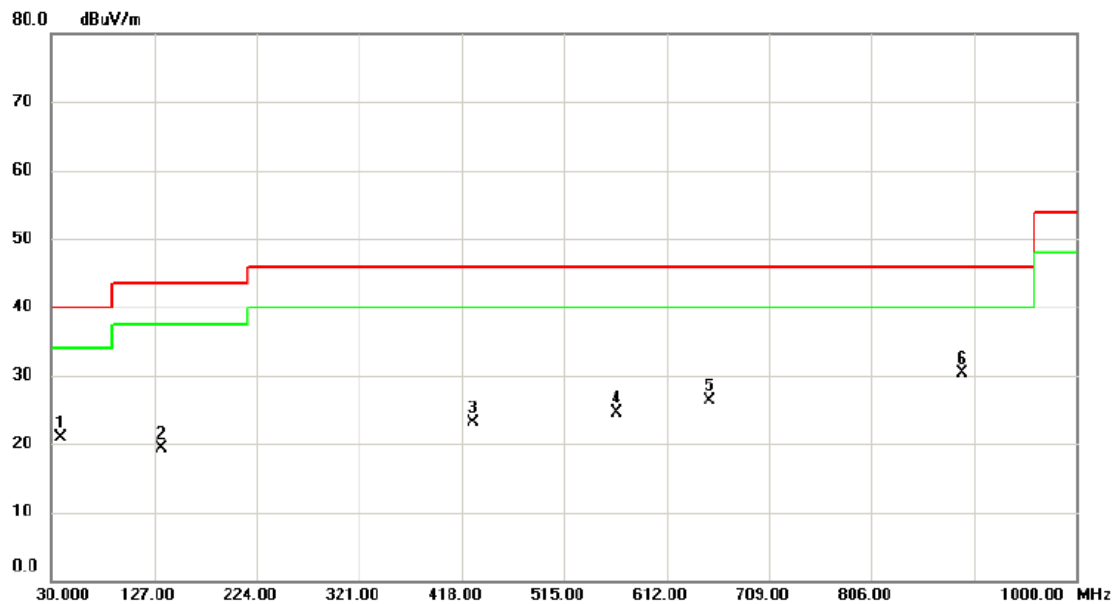
Frequency (MHz)	Ant 0°/90°	Read level dBuV/m	Factor (dB)	Measured(FS) (dBuV/m)	Limit(QP) (dBuV/m)	Margin (dB)	Note
0.0095	0°	13.45	24.97	38.42	128.05	-89.63	AVG
0.0095	0°	14.54	24.97	39.51	148.05	-108.54	PEAK
0.0279	0°	6.67	23.80	30.47	118.69	-88.22	AVG
0.0279	0°	8.43	23.80	32.23	138.69	-106.46	PEAK
0.0358	0°	3.41	23.30	26.71	116.53	-89.82	AVG
0.0358	0°	5.47	23.30	28.77	136.53	-107.76	PEAK
0.0581	0°	1.34	22.24	23.58	112.32	-88.74	AVG
0.0581	0°	2.47	22.24	24.71	132.32	-107.61	PEAK
0.5089	0°	19.30	19.83	39.13	73.47	-34.34	QP
1.9520	0°	23.82	19.50	43.32	69.54	-26.22	QP

Frequency (MHz)	Ant 0°/90°	Read level dBuV/m	Factor (dB)	Measured(FS) (dBuV/m)	Limit(QP) (dBuV/m)	Margin (dB)	Note
0.0125	90°	13.57	24.30	37.87	125.67	-87.80	AVG
0.0125	90°	14.79	24.30	39.09	145.67	-106.58	PEAK
0.0258	90°	7.45	23.93	31.38	119.37	-87.99	AVG
0.0258	90°	8.87	23.93	32.80	139.37	-106.57	PEAK
0.0437	90°	5.52	22.80	28.32	114.79	-86.48	AVG
0.0437	90°	6.36	22.80	29.16	134.79	-105.64	PEAK
0.0578	90°	1.48	22.24	23.72	112.37	-88.64	AVG
0.0578	90°	2.67	22.24	24.91	132.37	-107.45	PEAK
0.6221	90°	22.53	20.19	42.72	71.73	-29.01	QP
2.0538	90°	24.67	19.47	44.14	69.54	-25.40	QP

ATTACHMENTC -RADIATED EMISSION (30MHZ TO 1000MHZ)

Test Mode: TX Mode

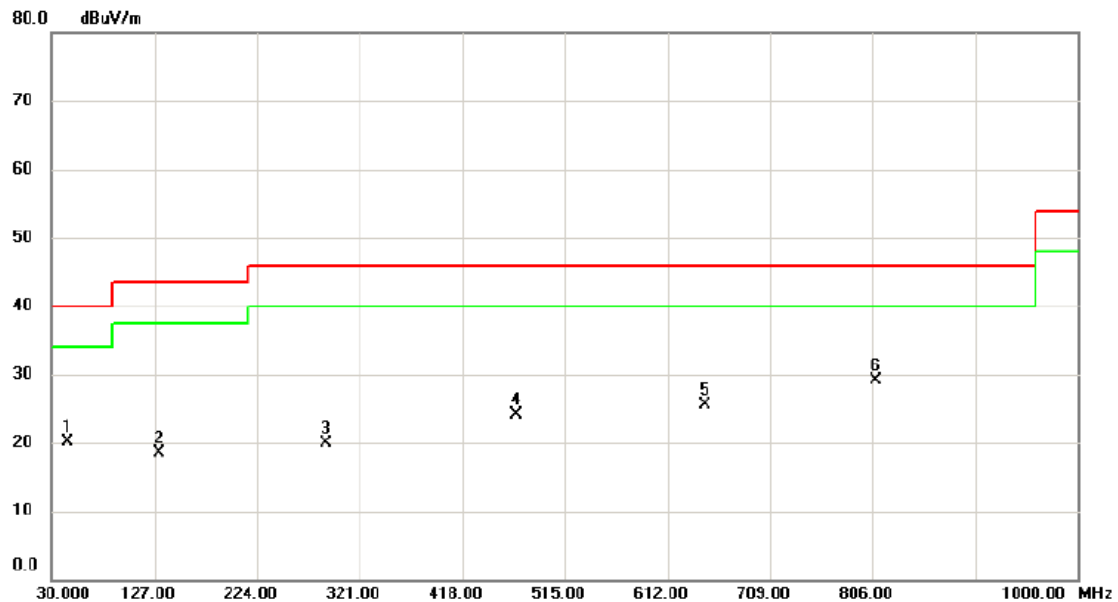
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		38.7300	33.68	-12.71	20.97	40.00	-19.03	peak	
2		134.2750	30.79	-11.45	19.34	43.50	-24.16	peak	
3		429.1550	30.21	-7.13	23.08	46.00	-22.92	peak	
4		564.9550	29.08	-4.56	24.52	46.00	-21.48	peak	
5		653.2250	27.85	-1.62	26.23	46.00	-19.77	peak	
6	*	891.3600	28.79	1.49	30.28	46.00	-15.72	peak	

Test Mode: TX Mode

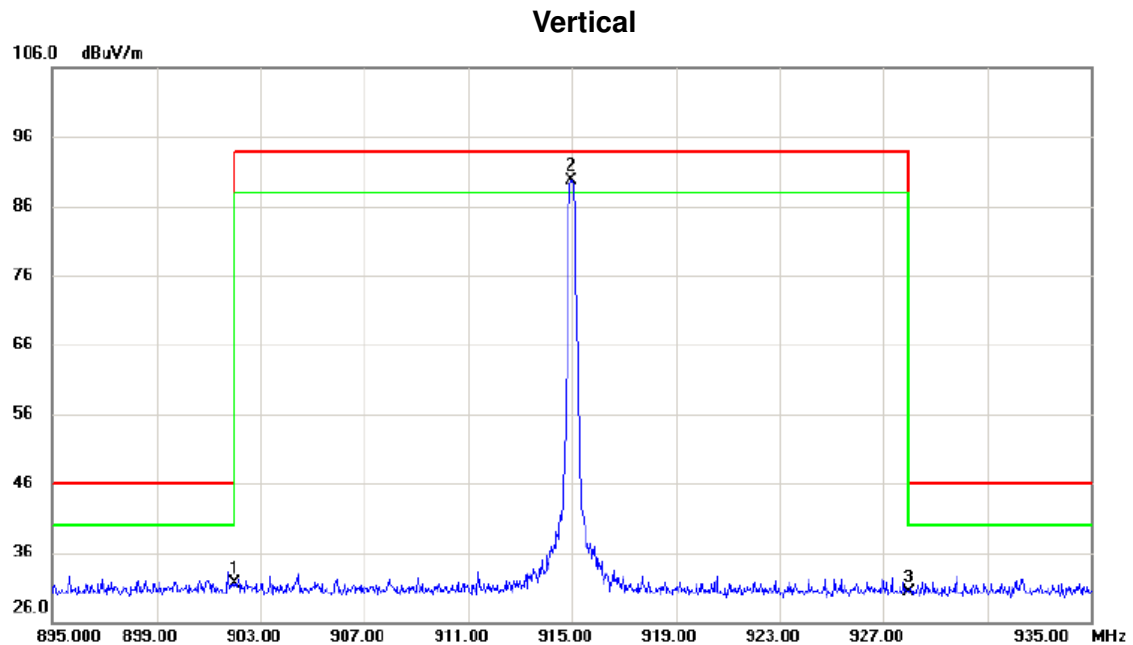
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		45.0350	32.05	-11.89	20.16	40.00	-19.84	peak	
2		131.3650	29.83	-11.24	18.59	43.50	-24.91	peak	
3		289.4750	29.98	-10.08	19.90	46.00	-26.10	peak	
4		468.4400	31.41	-7.29	24.12	46.00	-21.88	peak	
5		647.8900	27.34	-1.82	25.52	46.00	-20.48	peak	
6	*	809.3950	28.55	0.61	29.16	46.00	-16.84	peak	

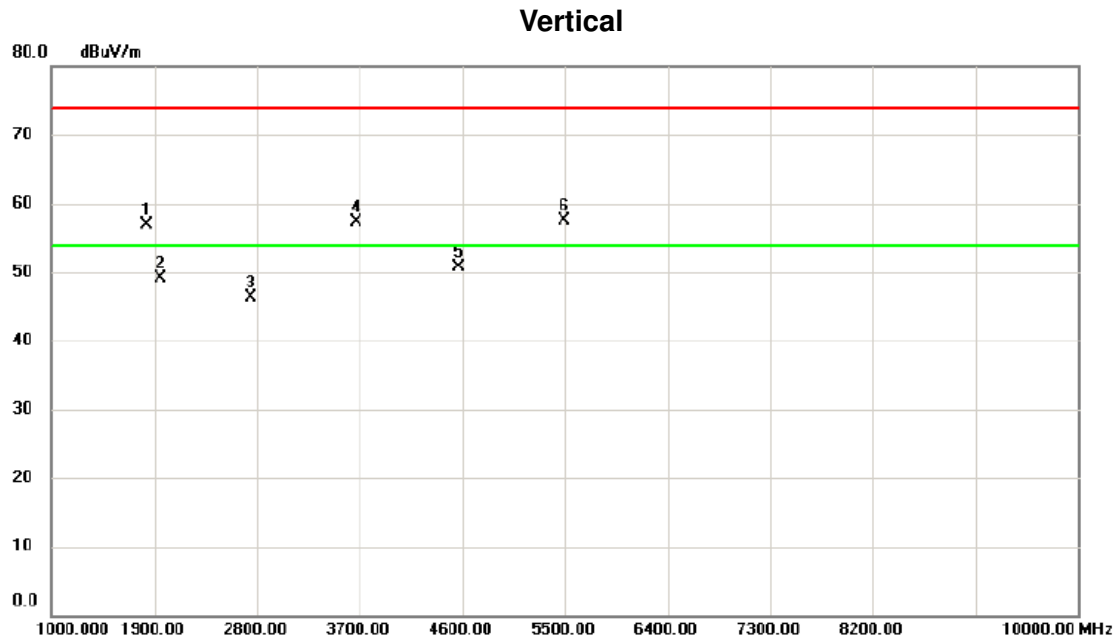
ATTACHMENTD -RADIATED EMISSION (ABOVE 1000MHZ)

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	28.83	2.64	31.47	46.00	-14.53	peak	
2	*	914.9600	87.07	2.58	89.65	94.00	-4.35	peak	
3		928.0000	27.80	2.52	30.32	46.00	-15.68	peak	

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		1828.000	61.03	-4.14	56.89	74.00	-17.11	peak	
2		1954.000	52.36	-3.18	49.18	74.00	-24.82	peak	
3		2746.000	45.99	0.25	46.24	74.00	-27.76	peak	
4		3664.000	55.45	1.85	57.30	74.00	-16.70	peak	
5		4573.000	46.94	3.79	50.73	74.00	-23.27	peak	
6	*	5491.000	50.37	7.20	57.57	74.00	-16.43	peak	

Remark:

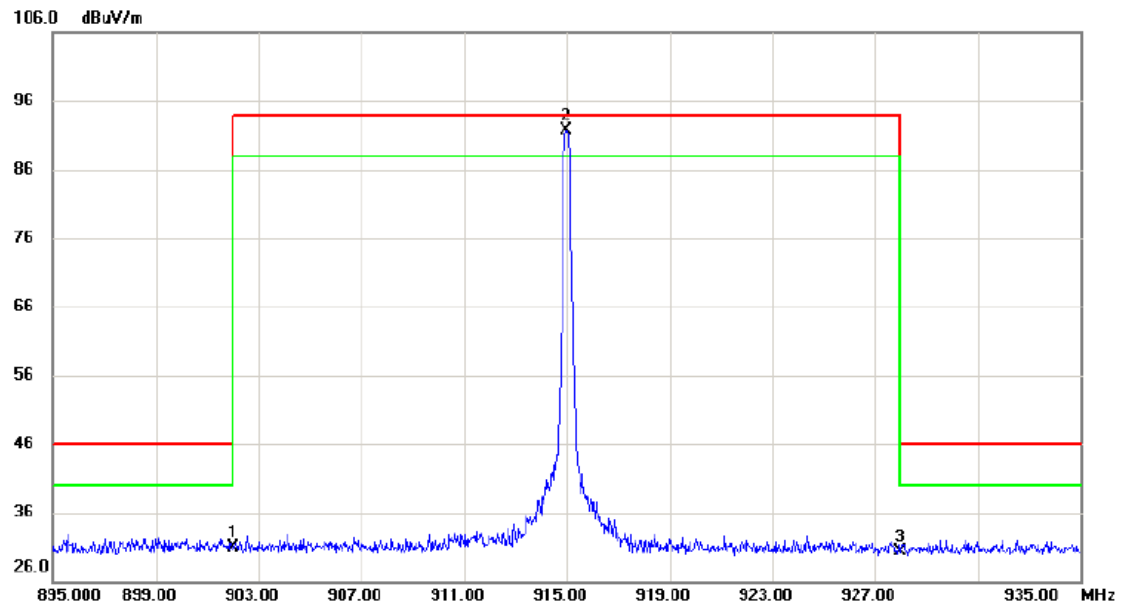
- (1) QP value is much lower than the limit, so AV value isn't shown on this test item.
- (2) The average value of fundamental frequency is:

Average Reading = Peak value + 20log(Duty cycle) , AV=Peak-15.817

Frequency (MHz)	Peak value (dBuV/m)	AV value (dBuV/m)	AV Limit (dBuV/m)	Result
3664.000	55.45	36.933	54.00	PASS

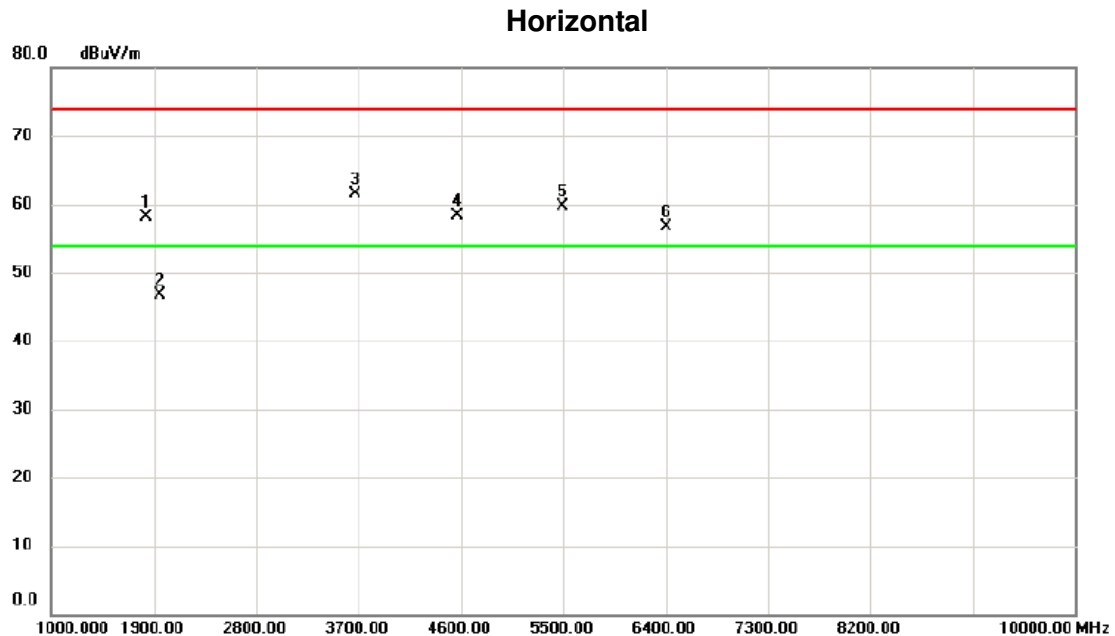
Orthogonal Axis :	X
Test Mode :	TX Mode

Horizontal



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		902.0000	28.30	2.64	30.94	46.00	-15.06	peak	
2	*	914.9600	89.09	2.58	91.67	94.00	-2.33	peak	
3		928.0000	27.88	2.52	30.40	46.00	-15.60	peak	

Orthogonal Axis :	X
Test Mode :	TX Low Channel



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		1828.000	62.32	-4.14	58.18	74.00	-15.82	peak	
2		1954.000	49.84	-3.18	46.66	74.00	-27.34	peak	
3	*	3664.000	59.60	1.85	61.45	74.00	-12.55	peak	
4		4573.000	54.61	3.79	58.40	74.00	-15.60	peak	
5		5491.000	52.60	7.20	59.80	74.00	-14.20	peak	
6		6409.000	46.06	10.55	56.61	74.00	-17.39	peak	

Remark:

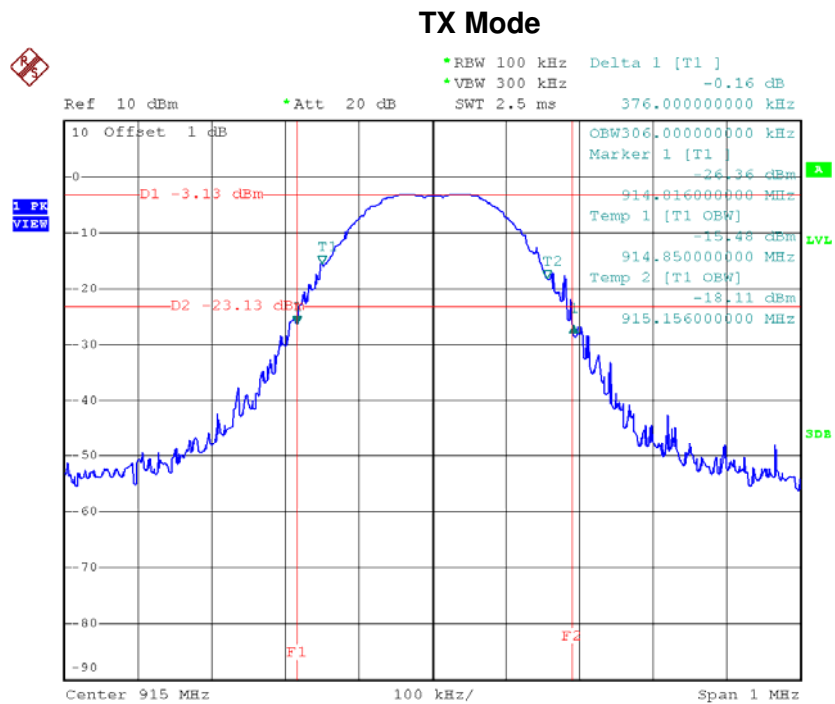
- (1) QP value is much lower than the limit, so AV value isn't shown on this test item.
- (2) The average value of fundamental frequency is:
Average Reading = Peak value + 20log(Duty cycle) , AV=Peak-15.817

Frequency (MHz)	Peak value (dBuV/m)	AV value (dBuV/m)	AV Limit (dBuV/m)	Result
1828.000	62.32	46.503	54.00	PASS
1949.500	49.84	34.023	54.00	PASS

ATTACHMENTE - BANDWIDTH

Test Mode :	TX Mode
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Frequency (MHz)	20dB Bandwidth (MHz)	99% Occupied BW (MHz)
915	0.376	0.306



Date: 15.AUG.2016 10:01:12