

TEST REPORT



DT&C Co., Ltd.

42, Yurim-ro, 154Beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea, 17042
Tel : 031-321-2664, Fax : 031-321-1664

1. Report No : DRTFCC1905-0179

2. Customer

- Name (FCC) : Janam Technologies LLC / Name (IC) : JANAM TECHNOLOGIES LLC
- Address : 100 Crossways Park West Suite 105, Woodbury, New York, 11797, United States

3. Use of Report : FCC & IC Original Grant

4. Product Name / Model Name : Mobile Computer / XT2WE
FCC ID : UTWXT2WE / IC : 6914A-XT2WE

5. Test Method Used : ANSI C63.10-2013

Test Specification : FCC Part 15.225

RSS-210 Issue 9, RSS-GEN Issue 5

6. Date of Test : 2019.02.12 ~ 2019.03.10, 2019.04.16

7. Testing Environment : See appended test report.

8. Test Result : Refer to the attached test result.

Affirmation	Tested by	Technical Manager
	Name : SunGeun Lee (Signature)	Name : GeunKi Son (Signature)

The test results presented in this test report are limited only to the sample supplied by applicant and the use of this test report is inhibited other than its purpose. This test report shall not be reproduced except in full, without the written approval of DT&C Co., Ltd.

2019 . 05 . 03 .

DT&C Co., Ltd.

If this report is required to confirmation of authenticity, please contact to report@dtnc.net

Test Report Version

Test Report No.	Date	Description
DRTFCC1905-0179	May. 03, 2019	Initial issue
		Added test for OBW

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1. General Information

1.1. Testing Laboratory

DT&C Co., Ltd.		
The 3 m test site and conducted measurement facility used to collect the radiated data are located at the 42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 17042. The test site complies with the requirements of § 2.948 according to ANSI C63.4-2014.		
- FCC MRA Accredited Test Firm No. : KR0034		
- IC Test site No. : 5740A		
www.dtnc.net		
Telephone	:	+ 82-31-321-2664
FAX	:	+ 82-31-321-1664

1.2. Testing Environment

Ambient Condition	
▪ Temperature	+20 ~ +24 °C
▪ Relative Humidity	40 % ~ 45 %

1.3. Measurement Uncertainty

Test items	Measurement uncertainty
AC conducted emission	2.4 dB (The confidence level is about 95 %, k = 2)
Radiated spurious emission (1 GHz Below)	5.1 dB (The confidence level is about 95 %, k = 2)

1.4. Details of Applicant

Applicant (FCC) : Janam Technologies LLC
Applicant (IC) : JANAM TECHNOLOGIES LLC
Address : 100 Crossways Park West Suite 105, Woodbury, NY 11797 USA
Contact person (FCC) : Harry Lerner
Contact person (IC) : Scott Leung

1.5. Description of EUT

FCC Equipment Class	Low Power Communications Device Transmitter(DXX)
EUT	Mobile computer
Model Name(FCC, IC)	XT2WE
Add Model Name(FCC, IC)	NA
Serial Number	Identical prototype
Hardware version	MP
Software version	71.xx
Power Supply	DC 3.8 V
Frequency Band	13.56 MHz
Modulation Type	ASK
Channel(s)	1
Antenna type	Loop Antenna

2. Information about test items

2.1 Test mode

Test mode1	Continuous transmitting mode
------------	------------------------------

Note: For this test mode, a test program was supported by manufacturer.

2.2 Support equipment

Equipment	Model No.	Serial No.	Manufacturer	Note
-	-	-	-	-

2.3 Tested frequency

Channel	TX Frequency(MHz)	RX Frequency(MHz)
Lowest	13.56	13.56
Middle	-	-
Highest	-	-

2.4 EMI Suppression Device(s)/Modifications

EMI suppression device(s) added and/or modifications made during testing
→ None

3. Antenna requirements

“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can 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 antenna is attached to the battery cover, and it is coupled use the special tension.(Refer to Internal photo file)
Therefore this E.U.T Complies with the requirement of §15.203

4. Test report

4.1 Summary of tests

FCC part section(s)	RSS section(s)	Parameter	Limit	Test condition	Status Note 1
2.1049	-	20 dB Bandwidth	-	Radiated	C
-	RSS-Gen [6.7]	Occupied Bandwidth	-		C
15.225 (a)	RSS-210 [B6(a)]	In-Band Emissions	15,848 $\mu\text{V}/\text{m}$ @ 30 m 13.553 – 13.567 MHz		C
15.225 (b)	RSS-210 [B6(b)]	In-Band Emissions	334 $\mu\text{V}/\text{m}$ @ 30 m 13.410 – 13.553 MHz 13.567 – 13.710 MHz		C
15.225 (c)	RSS-210 [B6(c)]	In-Band Emissions	106 $\mu\text{V}/\text{m}$ @ 30 m 13.110 – 13.410 MHz 13.710 – 14.010 MHz		C
15.225 (d) 15.209	RSS-210 [B6(d)] RSS-GEN [8.9]	Out-of Band Emissions	Emissions outside of the specified band (13.110-14.010 MHz) must meet the radiated limits detailed in 15.209		C
15.225 (e)	RSS-210 [B6]	Frequency Stability	± 0.01 % of operating frequency	Temp & Humid Test Chamber	C
15.207	RSS-Gen [8.8]	AC Conducted Emissions	FCC Part 15.207	AC Line Conducted	C
15.203	-	Antenna Requirements	FCC Part 15.203	-	C

Note 1: C=Comply NC=Not Comply NT=Not Tested NA=Not Applicable

Note 2: For radiated emission tests below 30 MHz were performed on semi-anechoic chamber which is correlated with OATS.

4.2 Transmitter requirements

4.2.1 20dB bandwidth

- Procedure:

The 20 dB Bandwidth is measured with a spectrum analyzer connected via a receive antenna placed near the EUT while the EUT is operating in transmission mode.

And spectrum analyzer setting use following test procedure of **ANCSI C63.10-2013 – Section 6.9.2.**

1. Center frequency = EUT channel center frequency
2. Span = 2 ~ 5 times the OBW
3. RBW = 1 % ~ 5 % OBW
4. VBW $\geq 3 \times$ RBW
5. Detector = Peak
6. Trace = Max hold
7. The trace was allowed to stabilize
8. Determine the reference value = Set the spectrum analyzer marker to the highest level of the displayed trace
9. Using the marker-delta function of the instrument, determine the “-xx dB down amplitude” using [(reference value) - xx].
10. Reset the marker-delta function and move the marker to the other side of the emission until the delta marker amplitude is at the same level as the reference marker amplitude. The marker-delta frequency reading at this point is the specified emission bandwidth.

- Measurement Data: **Comply**



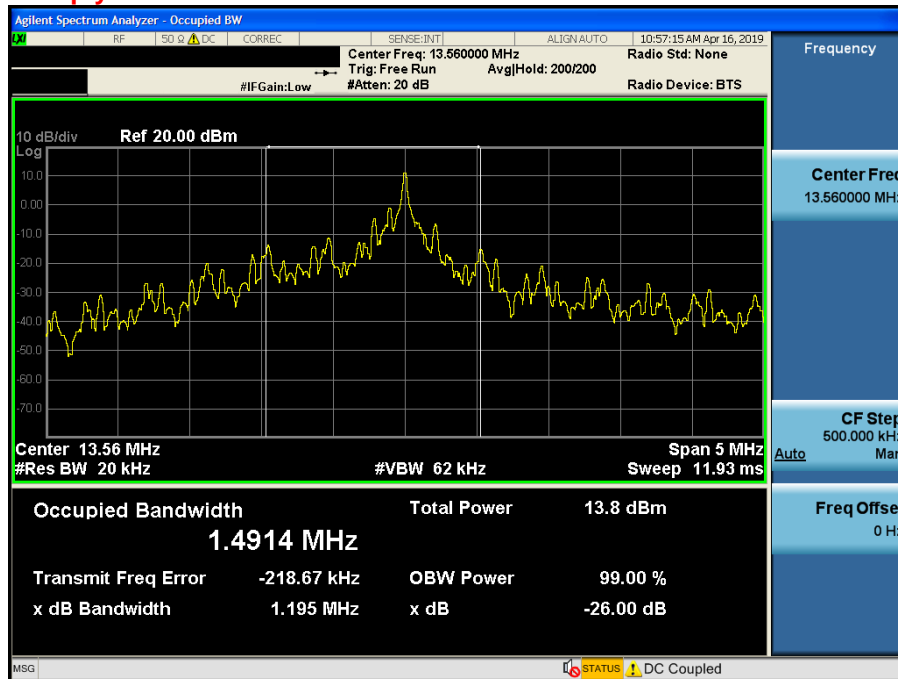
- Minimum Standard: NA

4.2.2 Occupied bandwidth

- Procedure:

The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.
The resolution bandwidth (RBW) shall be in the range of 1 % to 5 % of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately 3 x RBW.

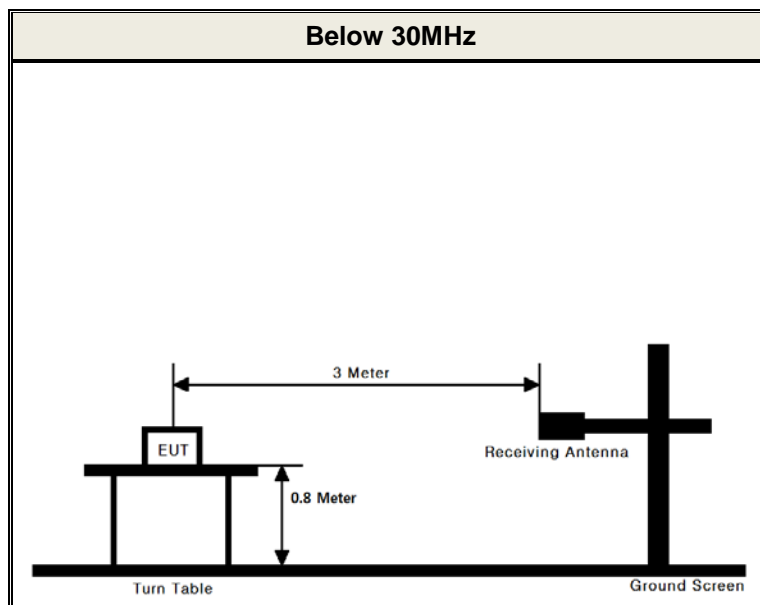
- Measurement Data: **Comply**



- Minimum Standard: NA

4.2.3 In-band emissions

- Test Configuration



- **Procedure:** The radiated emission was tested according to the **section 6.4 of the ANSI C63.10-2013**.

The EUT was placed on a 0.8 m high non-conductive table and it was placed at 3m distance from the antenna. Measurements were performed for each of the three antenna orientations. (ie. parallel, perpendicular, and ground-parallel)

Also, measurements were performed with the EUT oriented in 3 orthogonal axis and rotated 360 degrees to determine worst-case orientation for maximum emissions.

RBW = As specified in below table, VBW $\geq 3 \times$ RBW, Sweep = Auto, Detector = Peak
Trace mode = Max Hold until the trace stabilizes.

Frequency	RBW
9-150 kHz	200-300 Hz
0.15-30 MHz	9-10 kHz
30-1000 MHz	100-120 kHz
> 1000 MHz	1 MHz

- **Minimum Standard: Part 15.225(a), (b), (c) & RSS-210 [B6(a), (b), (c)]**

Frequency Band [MHz]	Limit at 30 m measurement distance	
	[uV/m]	[dBuV/m]
13.553-13.567	15,848	84.00
13.410-13.553 13.567-13.710	334	50.47
13.110-13.410 13.710-14.010	106	40.51

- Measurement Data: Comply

Tested Frequency : 13.56 MHz
Measurement Distance : 3 Meters

Test Frequency Band [MHz]	Freq. [MHz]	EUT Posi.	ANT Pol (Note 1)	Reading Level [dBuV]	T.F [dB/m]	Field Strength @3 m [dBuV/m]	Field Strength @30 m [dBuV/m]	Limit [dBuV/m]	Margin [dB]
13.110 ~ 13.410	13.348	Z	F	19.50	20.19	39.69	-0.31	40.51	40.82
13.410 ~ 13.553	13.476	Z	F	21.60	20.20	41.80	1.80	50.47	48.67
13.553 ~ 13.567	13.560	Z	F	39.10	20.20	59.30	19.30	84.00	64.70
13.567 ~ 13.710	13.644	Z	F	21.20	20.20	41.40	1.40	50.47	49.07
13.710 ~ 14.010	13.772	Z	F	21.00	20.20	41.20	1.20	40.51	39.31

Note 1. This test item was performed using a loop antenna.

“F”: = Facing the antenna / “T” = antenna shifted / turned 90s degrees [Loop antenna]

Note 2. This test item was performed at 3 m and the data were extrapolated to the specified measurement distance of 30 m using the square of an inverse linear distance extrapolation factor (40 dB/decade) as specified in §15.31(f)2.

▪ Extrapolation Factor = $20 \log_{10}(30/3)^2 = 40 \text{ dB}$

Note 3. All data were recorded using a spectrum analyzer employing a peak detector.

If PK results were meet Quasi-peak limit, Quasi-peak measurements were omitted.

Note 4. Sample Calculation.

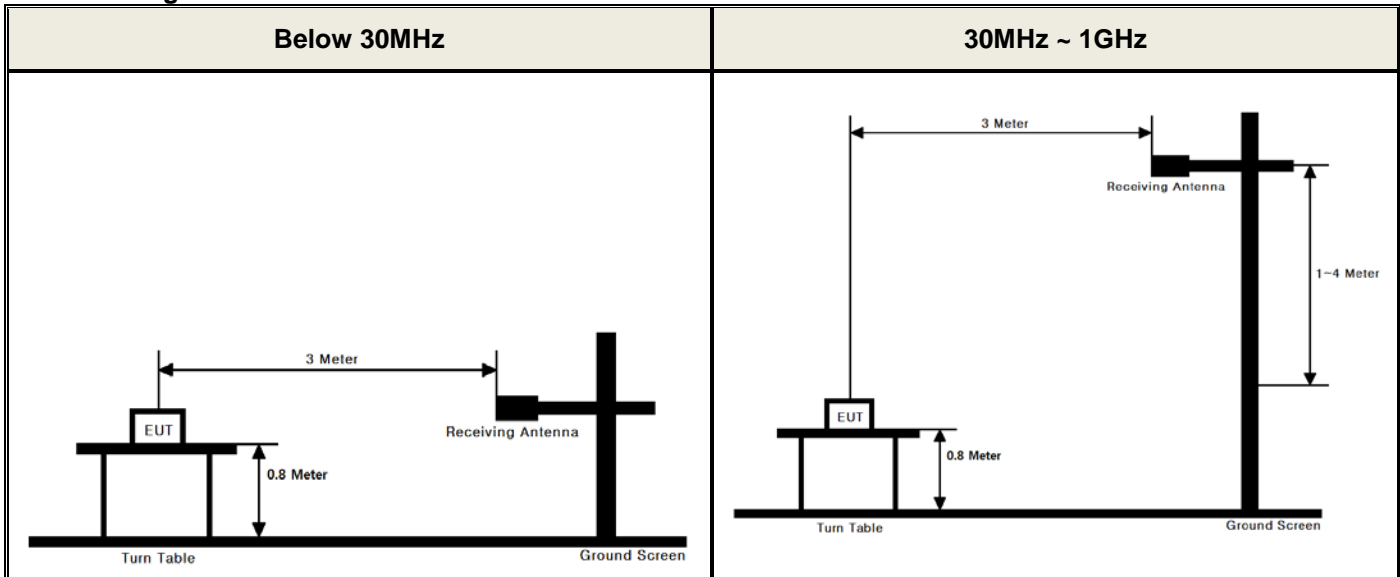
Margin = Limit – Field Strength @ 30 m / Field Strength @ 30 m = Field Strength @ 3 m – 40 dB

Field Strength @ 3 m = Reading + T.F / T.F = AF + CL – AG

Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain

4.2.4 Out-of-band emissions

- Test configuration



- **Procedure:** The radiated emission was tested according to the **section 6.4, 6.5 of the ANSI C63.10-2013.**

The EUT was tested from 9 kHz up to the 1 GHz excluding the band 13.110-14.010 MHz.

The EUT was placed on a 0.8 m high non-conductive table and it was placed at 3m distance from the antenna. For measurements below 30MHz were performed for each of the three antenna orientations.

(ie. parallel, perpendicular, and ground-parallel) For measurements above 30MHz were performed for each of the both horizontal and vertical polarizations.

Also, measurements were performed with the EUT oriented in 3 orthogonal axis and rotated 360 degrees to determine worst-case orientation for maximum emissions.

RBW = As specified in below table, VBW $\geq 3 \times$ RBW, Sweep = Auto, Detector = Peak
Trace mode = Max Hold until the trace stabilizes.

Frequency	RBW
9-150 kHz	200-300 Hz
0.15-30 MHz	9-10 kHz
30-1000 MHz	100-120 kHz
> 1000 MHz	1 MHz

- **Minimum Standard: Part 15.209, 225(d) & RSS-210[B6(d)], RSS-GEN[8.9]**

• **FCC Part 15.209(a):**

Frequency [MHz]	Field Strength [$\mu\text{V/m}$]	Measurement Distance [Meters]
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30	30	30
30 ~ 88	100 **	3
88 ~ 216	150 **	3
216 ~ 960	200 **	3
Above 960	200	3

** Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

• **FCC Part 15.209(b):**

In the emission table above, the tighter limit applies at the band edges.

- Measurement Data: Comply

Tested Frequency : 13.56 MHz
Measurement Distance : 3 Meters

Frequency [MHz]	EUT Posi.	ANT Pol (Note 1)	Detector	Reading [dBuV]	T.F [dB/m]	Distance factor [dB]	Field Strength [dBuV/m]	Limit [dBuV/m]	Margin [dB]
3.802	Z	P	PK	28.20	19.70	40	7.90	29.5	21.60
4.006	Z	P	PK	28.60	19.70	40	8.30	29.5	21.20
4.268	Z	P	PK	33.30	19.68	40	12.98	29.5	16.52
30.970	Y	V	PK	36.40	-9.73	NA	26.67	40.0	13.33
40.68	Y	V	QP	40.94	-8.62	NA	32.32	40.0	7.68
67.709	Y	V	PK	38.00	-10.18	NA	27.82	40.0	12.18
94.868	Y	V	PK	33.10	-11.39	NA	21.71	43.5	21.79
122.027	Y	V	PK	30.80	-7.67	NA	23.13	43.5	20.37
149.065	Y	V	PK	28.50	-6.20	NA	22.30	43.5	21.20

Note 1. "F": = Facing the antenna / "T" = antenna shifted / turned 90s degrees [Loop antenna]

"H": = Horizontal / "V" = Vertical [Bilog antenna]

Note 2. All measurements were recorded using a spectrum analyzer employing a peak detector for below 30 MHz and a Quasi-peak detector for above 30 MHz.

Note 3. No other spurious and harmonic emissions were reported greater than listed emissions above table.

Note 4. Sample calculation

Margin = Limit – Field Strength

Field Strength = Reading + T.F – Distance factor

T.F = AF + CL – AG

Distance factor = $20\log(\text{Measurement distance} / \text{The measured distance})^2$

Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain

4.2.5 Frequency Stability

- Procedure:

Part 15.225 requires that devices operating in the 13.553 – 13.567 MHz shall maintain the carrier frequency within 0.01 % of the operating frequency over the temperature variation of -20 degrees to + 50 degrees C at normal supply voltage.

- Measurement Data: **Comply**

Operating Frequency : 13,560,000 Hz

VOLTAGE (%)	POWER (V _{DC})	TEMP (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100%	3.80	+20(ref)	13,559,337	-663	0.004888
100%		-20	13,559,457	-543	0.004005
100%		-10	13,559,406	-594	0.004380
100%		0	13,559,382	-618	0.004555
100%		+10	13,559,360	-640	0.004719
100%		+20	13,559,337	-663	0.004888
100%		+30	13,559,331	-669	0.004937
100%		+40	13,559,306	-694	0.005118
100%		+50	13,559,299	-701	0.005172
115%	4.37	+20	13,559,352	-648	0.004779
BATT.ENDPOINT	3.50	+20	13,559,348	-652	0.004808

- Minimum Standard: Part 15. 225(e) & RSS-210 [B6]

The frequency tolerance of the carrier signal shall be maintained within ± 0.01 % of the operating frequency.

4.2.6 AC Line Conducted Emissions

- Test Requirements and limit

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN).

Frequency Range (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15 ~ 0.5	66 to 56 *	56 to 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50

* Decreases with the logarithm of the frequency

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

Test Configuration

See test photographs for the actual connections between EUT and support equipment.

TEST PROCEDURE

1. The EUT is placed on a wooden table 80 cm above the reference ground plane.
2. The EUT is connected via LISN to a test power supply.
3. The measurement results are obtained as described below:
4. Detectors – Quasi Peak and Average Detector.

- **Measurement Data: Comply** (refer to the next page)

Measurement Data

Results of Conducted Emission

DTNC

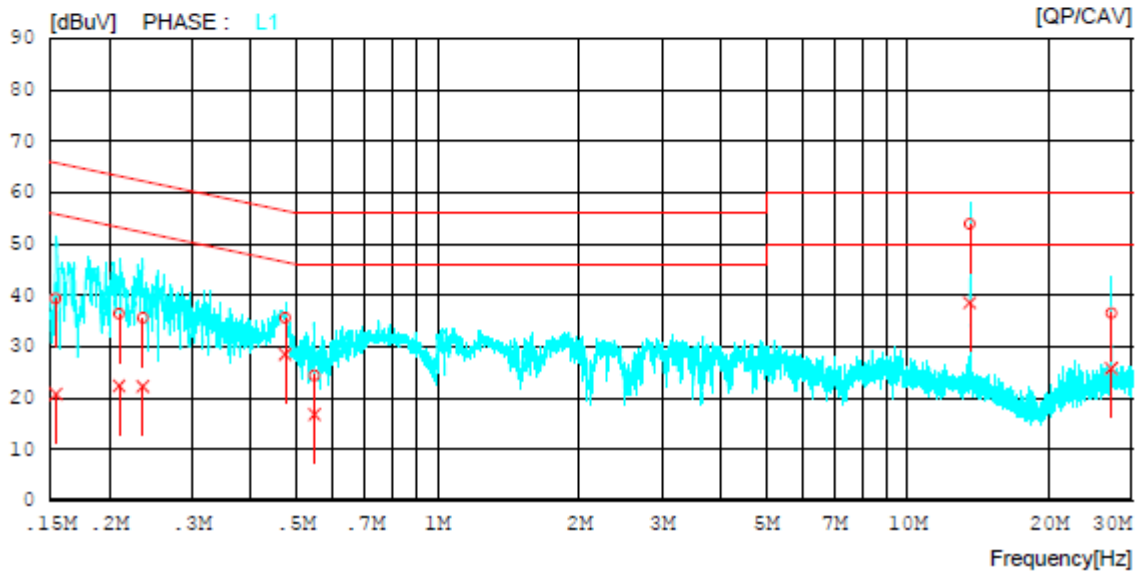
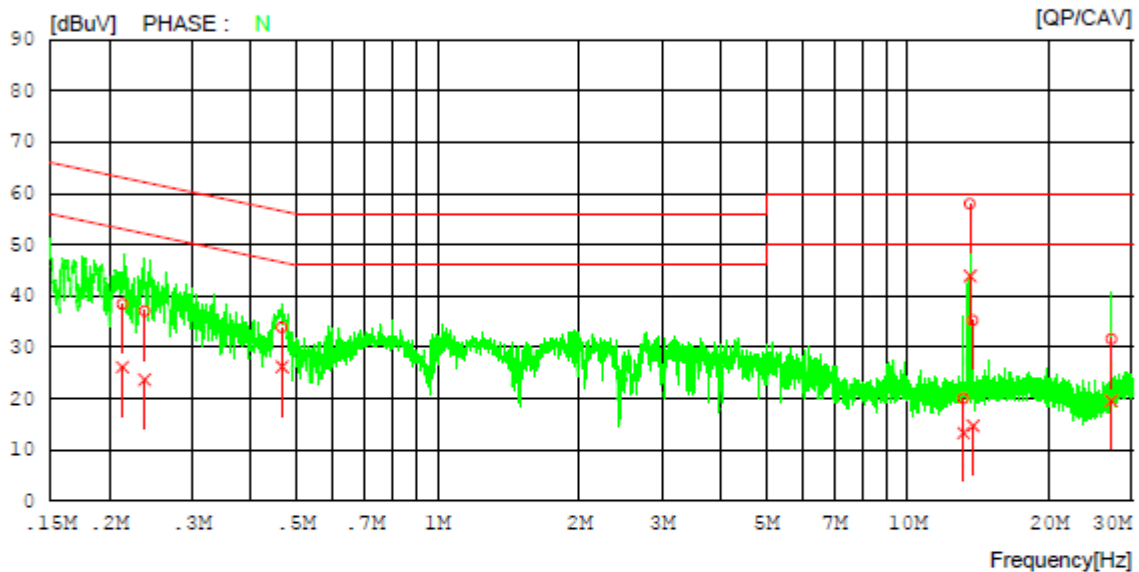
Date 2019-03-10

Order No.
Model No. XT2WE
Serial No.
Test Condition NFC

Reference No.
Power Supply 120 V, 60 Hz
Temp/Humi. 21 °C / 40 %
Operator S.G LEE

Memo

LIMIT : FCC P15.207 QP
FCC P15.207 AV



Measurement Data

Results of Conducted Emission

DTNC

Date 2019-03-10

Order No.
Model No. XT2WE
Serial No.
Test Condition NFC

Reference No.
Power Supply 120 V, 60 Hz
Temp/Humi. 21 °C / 40 %
Operator S.G LEE

Memo

LIMIT : FCC P15.207 QP
FCC P15.207 AV

NO	FREQ [MHz]	READING		C.FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	CAV [dBuV]		QP [dBuV]	CAV [dBuV]	QP [dBuV]	CAV [dBuV]	QP [dBuV]	CAV [dBuV]	
1	0.21350	28.43	16.17	9.98	38.41	26.15	63.07	53.07	24.66	26.92	N
2	0.23822	27.06	13.71	9.98	37.04	23.69	62.16	52.16	25.12	28.47	N
3	0.46657	23.85	16.21	9.98	33.83	26.19	56.57	46.57	22.74	20.38	N
4	13.13940	9.60	2.85	10.44	20.04	13.29	60.00	50.00	39.96	36.71	N
5	13.56000	47.51	33.51	10.45	57.96	43.96	60.00	50.00	2.04	6.04	N
6	13.77100	24.77	4.29	10.46	35.23	14.75	60.00	50.00	24.77	35.25	N
7	27.11620	20.91	8.91	10.67	31.58	19.58	60.00	50.00	28.42	30.42	N
8	0.15394	29.31	10.70	9.96	39.27	20.66	65.78	55.78	26.51	35.12	L1
9	0.21007	26.37	12.28	9.96	36.33	22.24	63.20	53.20	26.87	30.96	L1
10	0.23594	25.55	12.26	9.95	35.50	22.21	62.24	52.24	26.74	30.03	L1
11	0.47385	25.55	18.45	9.96	35.51	28.41	56.45	46.45	20.94	18.04	L1
12	0.54704	14.31	6.74	9.96	24.27	16.70	56.00	46.00	31.73	29.30	L1
13	13.55960	43.48	28.07	10.41	53.89	38.48	60.00	50.00	6.11	11.52	L1
14	27.11820	25.86	15.08	10.61	36.47	25.69	60.00	50.00	23.53	24.31	L1

APPENDIX

TEST EQUIPMENT FOR TESTS

Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
Spectrum Analyzer	Agilent Technologies	N9020A	18/12/20	19/12/20	MY50200828
Multimeter	FLUKE	17B	18/12/18	19/12/18	26030065WS
DC Power Supply	Agilent Technologies	66332A	18/12/18	19/12/18	US37473833
Signal Generator	Rohde Schwarz	SMBV100A	18/12/19	19/12/19	255571
Signal Generator	ANRITSU	MG3695C	18/12/10	19/12/10	173501
Thermohygrometer	BODYCOM	BJ5478	18/12/27	19/12/27	120612-1
HYGROMETER	TESTO	608-H1	19/01/31	20/01/31	34862883
DIGITAL HUMIDITY/ TEMPERATURE/BAROMETER	ACURITE	02010	18/08/06	19/08/06	N/A
Loop Antenna	Schwarzbeck	FMZB1513	18/01/30	20/01/30	1513-128
BILOG ANTENNA	Schwarzbeck	VULB 9160	18/07/13	20/07/13	3359
PreAmplifier	TSJ	MLA-100-100K01- B01-26	19/02/28 19/02/18	19/02/28 20/02/18	1252741
EMI Test Receiver	Rohde Schwarz	ESU40	18/12/18	19/12/18	100525
EMI Test Receiver	Rohde Schwarz	ESCI7	19/01/30	20/01/30	100910
PULSE LIMITER	Rohde Schwarz	ESH3-Z2	18/09/27	19/09/27	101333
LISN	SCHWARZBECK	NNLK 8121	18/03/20 19/03/19	19/03/20 20/03/19	06183
Temp & Humi Test Chamber	MG Indus	THP31R1	18/07/05	19/07/05	20131002-1
Cable	JUNFLON	MWX315	18/04/30	19/04/30	J12J101978-00
Cable	Fairview Microwave	FM-F141	18/04/30	19/04/30	17050010
Cable	Fairview Microwave	FM-F141	18/04/30	19/04/30	17050011
Cable	Fairview Microwave	FM-F141	18/04/30	19/04/30	17050012
Cable	DT&C	Cable	18/07/05	19/07/05	RF-82
Cable	DTNC	Cable	18/07/05	19/07/05	RF-55

Note1: The measurement antennas were calibrated in accordance to the requirements of ANSI C63.5-2017

Note2: The cable is not a regular calibration item, so it has been calibrated by DT & C itself.