

CFR 47 FCC Part 15.231

Industry Canada RSS-210

TEST REPORT

Product : Transmitter

Trade Name : N/A

Model Number : TX2SM ; GX1002SM; GX1002CSM;
CD-TX-1SM; TX-1SM; GX1004SM;
GX1004CSM

FCC ID : ZJM-TX1-2

IC : 2225A-ITPA

Prepared for

Condoplex Monitoring Systems Inc

7-75 Horner Ave Etobicoke ON Canada M8Z 4X5

Prepared by

Interocean EMC Technology Corp.

No. 5-2, Lin 1, Tin-Fu, Lin-Kou Dist., New Taipei City,
Taiwan 244, R.O.C.

TEL.: +886 2 2600 6861

FAX.: +886 2 2600 6859

Remark:

The test report consists of **30** pages in total. It shall not be reproduced except in full, without the written approval of IETC. This document may be altered or revised by IETC only, and shall be noted in the revision section of the document.
The test result in the report is only subjected to the test sample.

Statement of Compliance

Applicant: Condoplex Monitoring Systems Inc
Manufacturer: Nutek Corporation
Product: Transmitter
Model No.: TX2SM ; GX1002SM; GX1002CSM; CD-TX-1SM; TX-1SM;
GX1004SM; GX1004CSM
Tested Power Supply: DC 3V
Date of Final Test: Dec. 04, 2015
Revision of Report: Rev. 00

Configuration of Measurements and Standards Used :

FCC Rules and Regulations Part 15 Subpart C
Industry Canada RSS-Gen Issue 4 Nov. 2014
Industry Canada RSS-210 Issue 8 Dec. 2010

1. The result of the testing report relate only to the item tested.
2. The testing report shall not be reproduced expect in full, without the written approval of IETC.

Report Issued: 2016/01/14

Project Engineer:



Vic Tsao

Approved:



Jerry Liu

Table of Contents

1	Summary of Measurement	4
2	General Information	5
2.1	Description of Equipment Under Test	5
2.2	Details of Tested Peripheral Equipment	6
2.3	Test Facility	7
3	Test Specifications	8
3.1	Test Standard	8
3.2	Operation Mode	8
3.3	Test Step of EUT	8
3.4	Test Equipment	9
4	Radiated Emission Test	10
4.1	Limits	10
4.2	Calculation of Average Factor	11
4.3	Configuration of Measurement	16
4.4	Test Procedure	16
4.5	Test Result	16
5	Emission Bandwidth	20
5.1	Limits	20
5.2	Test Result	20
6	99% Occupied Bandwidth	22
6.1	Limits	22
6.2	Test Result	22
7	Photographs of Test	24
7.1	Radiated Emission Measurement	24
8	Photographs of EUT	26

1 Summary of Measurement

Report Clause	Test Parameter	Reference Document		Results
4	Timing Requirement	§FCC15.231(a)	RSS-210 A1.1.1	Pass
4	Radiated Emission	§FCC15.231(b), 15.209	RSS-210 A1.1.2	Pass
5	Emission Bandwidth	§FCC15.231(c)		Pass
6	99% Occupied Bandwidth		RSS-210 A1.1.3	Pass

2 General Information

2.1 Description of Equipment Under Test

- Product** : Transmitter
- Model Number** : TX2SM ; GX1002SM; GX1002CSM; CD-TX-1SM; TX-1SM;
GX1004SM; GX1004CSM
- Applicant** : **Condoplex Monitoring Systems Inc**
7-75 Horner Ave Etobicoke ON Canada M8Z 4X5
- Manufacturer** : **Nutek Corporation**
No.167, Lane 235, Bauchiau Rd., Shindian City,
Taipei Country 23145, Taiwan
- Power Supply** : DC 3V
- Operating Frequency** : 433.92MHz
- Type of Modulation** : ASK
- Product SW/HW version** : GX1004CSM
- Radio SW/HW version** : 001
- Test SW Version** : N/A ,no test SW was used during testing” Parameters are fixed by hardware design.
- RF power setting in TEST SW** : N/A , RF power setting was not able to alter during testing” RF power output is fixed by hardware design.
- Antenna Description** : This device uses PCB Printed.

The antenna is integral to the device, thereby meeting the requirement of FCC 15.203.
- Date of Test** : Nov. 10 ~ Dec. 04, 2015
- Additional Description** : 1) The Model Number “**TX-1SM**” is representative selected in the test and included in this report.
2) The differences for all models included in this report are as follows:

Model No.	Quantity of keys
TX-1SM	4
CD-TX-1SM	
GX1004SM	
GX1004CSM	
TX2SM	2
GX1002SM	
GX1002CSM	

- 3) For more detail specification about EUT, please refer to the user’s manual.

2.2 Details of Tested Peripheral Equipment

N/A

2.3 Test Facility

- Site Description** : ☒ Chamber 3
- Name of Firm** : Interocean EMC Technology Corp.
- Company web** : <http://www.ietc.com.tw>
- Location** : No. 5-2, Lin 1, Tin-Fu, Lin-Kou Dist., New Taipei City, Taiwan 244, R.O.C.
- Site Filing** :
- Federal Communication Commissions – USA
Registration No.: 96399 (OATS 1, 2, 3 & Chamber 3)
Designation No.: TW1020
 - Industry Canada (IC)
OUR FILE: 46405-4437
Registration No. (OATS 1): Site# 4437A-1
Registration No. (OATS 3): Site# 4437A-3
Registration No. (Chamber 3): Site# 4437A-5
Registration No. (OATS 5): Site# 4437A-6
 - Voluntary Control Council for Interference by Information Technology Equipment (VCCI) – Japan
Member No.: 1349
Registration No. (Conducted Room): C-1094
Registration No. (Conducted Room): T-1562
Registration No. (OATS 1): R-1040; G-274
- Site Accreditation** :
- Bureau of Standards and Metrology and Inspection (BSMI) – Taiwan, R.O.C.
Accreditation No.:
SL2-IN-E-0026 for CNS13438 / CISPR 22
SL2-IN-E-0026 for CNS14757-2 / IEC 62040-2
SL2-R1-E-0026 for CNS13439 / CISPR 13
SL2-R2-E-0026 for CNS13439 / CISPR 13
SL2-A1-E-0026 for CNS13783-1 / CISPR 14-1
SL2-L1-E-0026 for CNS 14115 / CISPR 15
 - Taiwan Accreditation Foundation (TAF)
Accreditation No.: 1113
 - Vehicle Safety Certification Center (VSCC)
Approval No.: TW16-11-0
 - TÜV NORD
Certificate No: TNTW0801R-04

3 Test Specifications

3.1 Test Standard

The EUT was performed according to FCC Part 15 Subpart C Section 15.231 and Industry Canada RSS-210 procedure and setup followed by ANSI C63.10, 2013 requirements.

3.2 Operation Mode

By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that “Z axis” position was the worst, then the final test was executed the worst condition and test data were recorded in this report.

The EUT was operated in continuous transmission mode during all of the tests.



X axis mode



Y axis mode



Z axis mode

3.3 Test Step of EUT

- 3.3.1 Setup the fixture to EUT for power supplying.
- 3.3.2 Turn on the power of all equipment.
- 3.3.3 Let the EUT continuous transmission. Executed the test.

3.4 Test Equipment

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
Spectrum Analyzer	R&S	FSP40	100478	2016/06/03
EMI Test Spectrum Analyzer & Receiver	Rohde & Schwarz	ESI7	830154/002	2016/09/24
Preamplifier	Burgeon	BPA-530	100216	2016/06/30
Preamplifier	Schaffner	CAP9231A	3351	2016/08/25
Preamplifier	Mini-Circuits	ZVA-213-S+	491801136	2016/08/25
Preamplifier	EMCI	EMC 051845	980110	2016/10/20
Preamplifier	Agilent	83050A	3950M00225	2016/09/21
Bilog Antenna	Schwarzbeck	VULB 9163	113	2016/07/26
Horn Antenna	Schwarzbeck	BBHA 9120	9120D-583	2016/09/29
Horn Antenna	Schwarzbeck	BBHA 9170	213	2016/07/19
RF Cable	HARBOUR	27478LL142	CBL22	2016/03/23
RF Cable	Jye Bao	N30N30-5006	CBL53	2016/03/30
RF Cable	HARBOUR	27478LL142	CBL65	2016/03/23

Note: The above equipments are within the valid calibration period.

4 Radiated Emission Test

4.1 Limits

According to FCC 15.231(b) and RSS-210 Annex 1 requirement:

In addition to the provisions of §15.205, the field strength of emissions from intentional radiator operated under this section shall not exceed the following:

Fundamental and harmonics emission limits

Frequency	Field Strength of Fundamental		Field Strength of Harmonics	
(MHz)	(μ V/m@3m)	(dB μ V/m@3m)	(μ V/m@3m)	(dB μ V/m@3m)
433.92	10996	80.8	1099.6	60.8

General Radiated Emission Limit

Spurious Emission tested through until 10th harmonic. Radiated emissions, which fall in the restricted bands, as defined in §15.205 (a), comply with the radiated emission limits specified in §15.209 (a) and defined in RSS-Gen Table 3, comply with the radiated emission limits specified in RSS-Gen 7.2.5.

Frequency	15.209 Limits	
(MHz)	(μ V/m@3m)	(dB μ V/m@3m)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

Remark :

1. The table above tighter limit applies at the band edges.
2. The measurement distance in meters, which that between form closest point of EUT to instrument antenna.

4.2 Calculation of Average Factor

The output field strengths of specification in accordance with the rules specify measurements with an average detector. During the test, a spectrum analyzer incorporating a peak detector was used. Therefore, a reduction factor can be applied to the resultant peak signal level and compared to the limit for measurement instrumentation incorporating an average detector. The duty cycle is measured in 100 ms or the repetition cycle period, whichever is a shorter time frame. The duty cycle is measured by placing the spectrum analyzer to set zero span at 100kHz resolution bandwidth.

Averaging factor in dB = $20 \log (\text{duty cycle})$

The duration of one cycle = 114.24ms

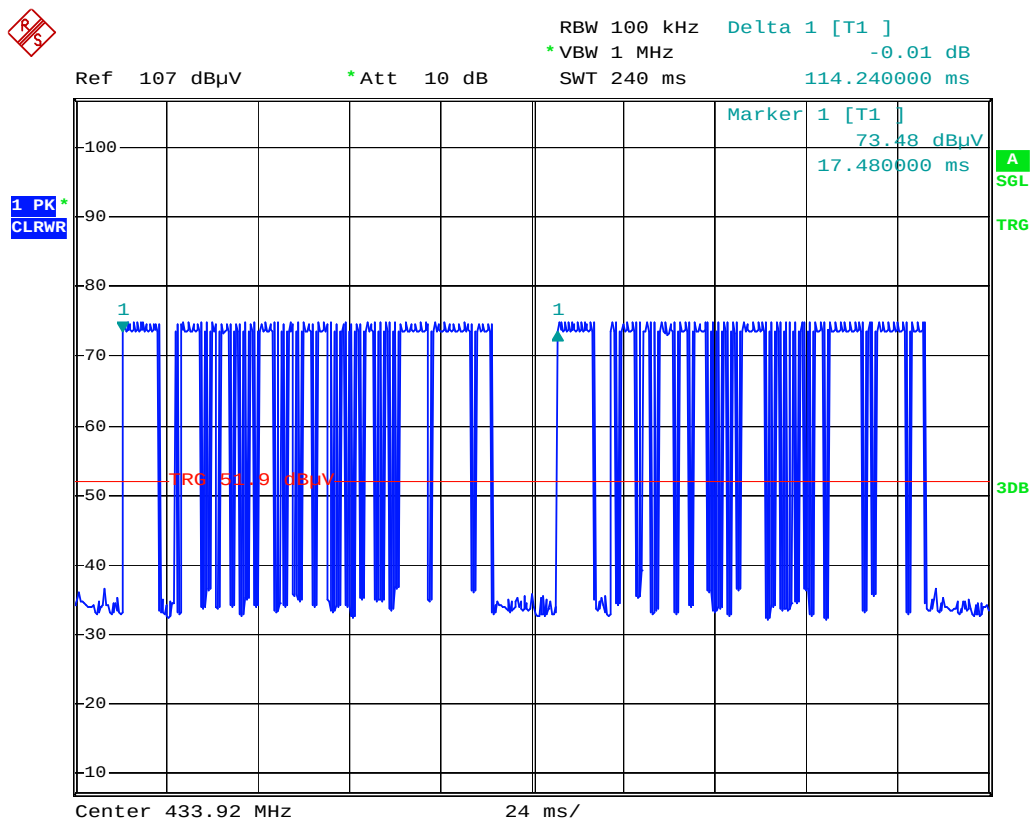
The duty cycle is simply the on-time divided by 100ms

Duty Cycle = $(0.84\text{ms} \times 35 + 0.4\text{ms} \times 44) = 47 \text{ ms} / 100\text{ms}$

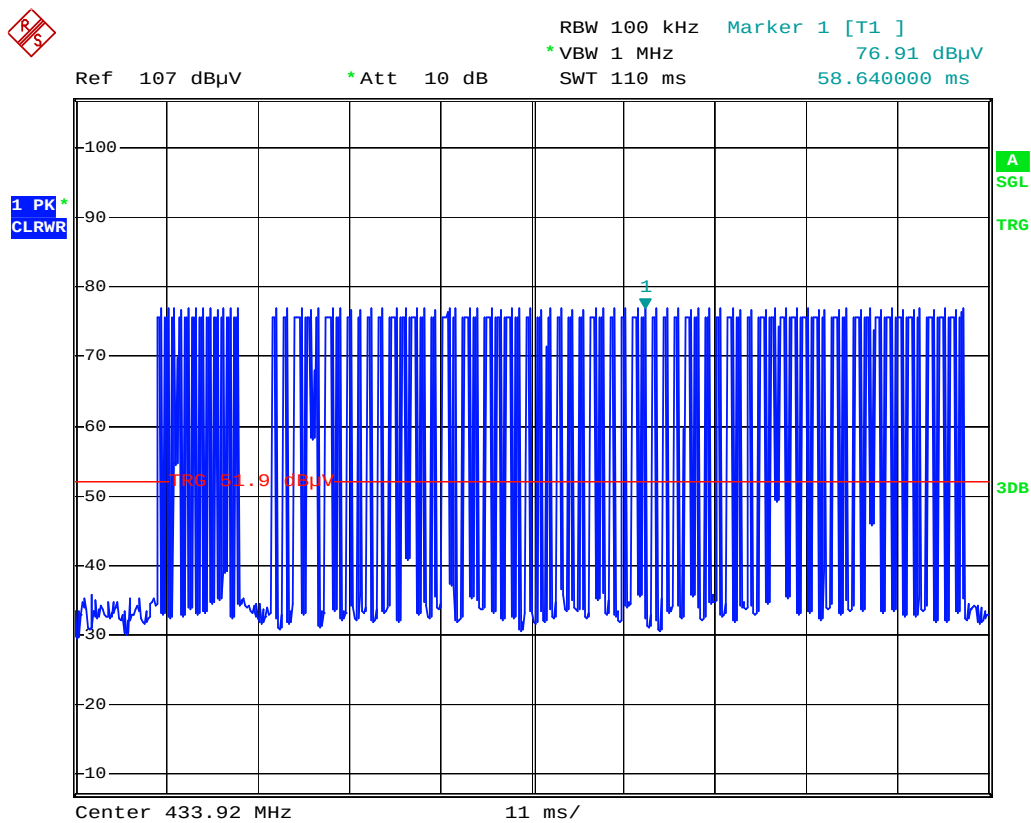
Therefore, the averaging factor is found by $20 \log 0.47 = - 6.56\text{dB}$

Please see the diagrams below.

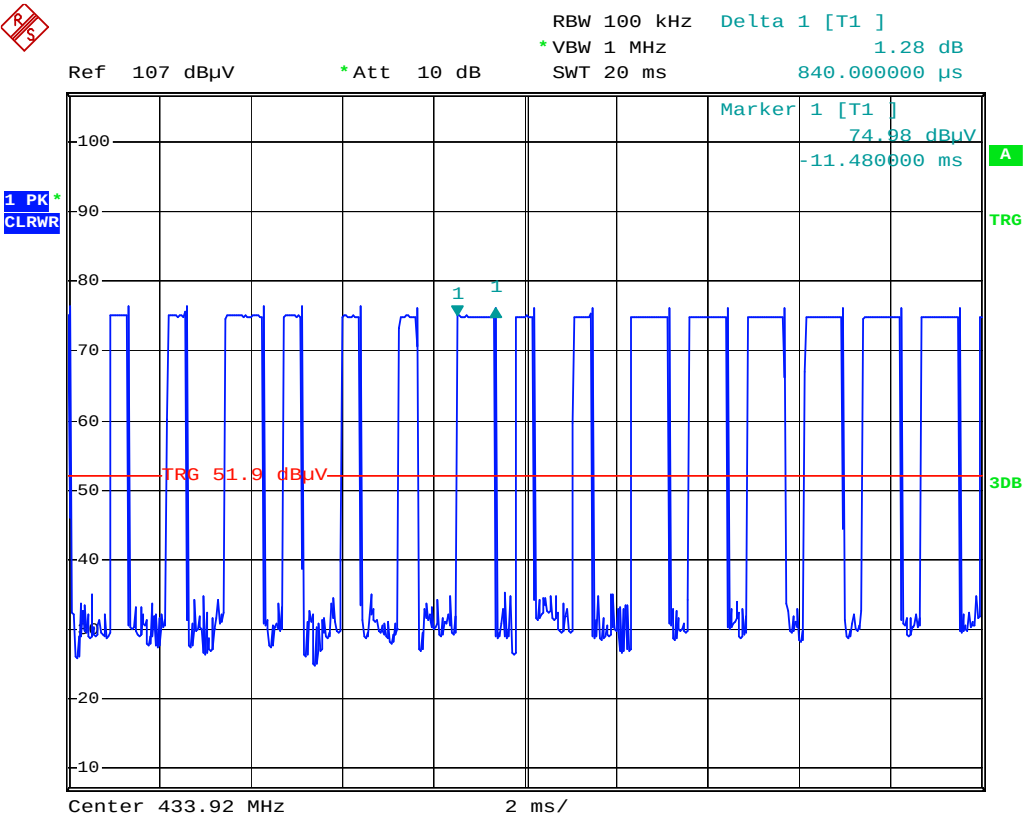
Duty Cycle



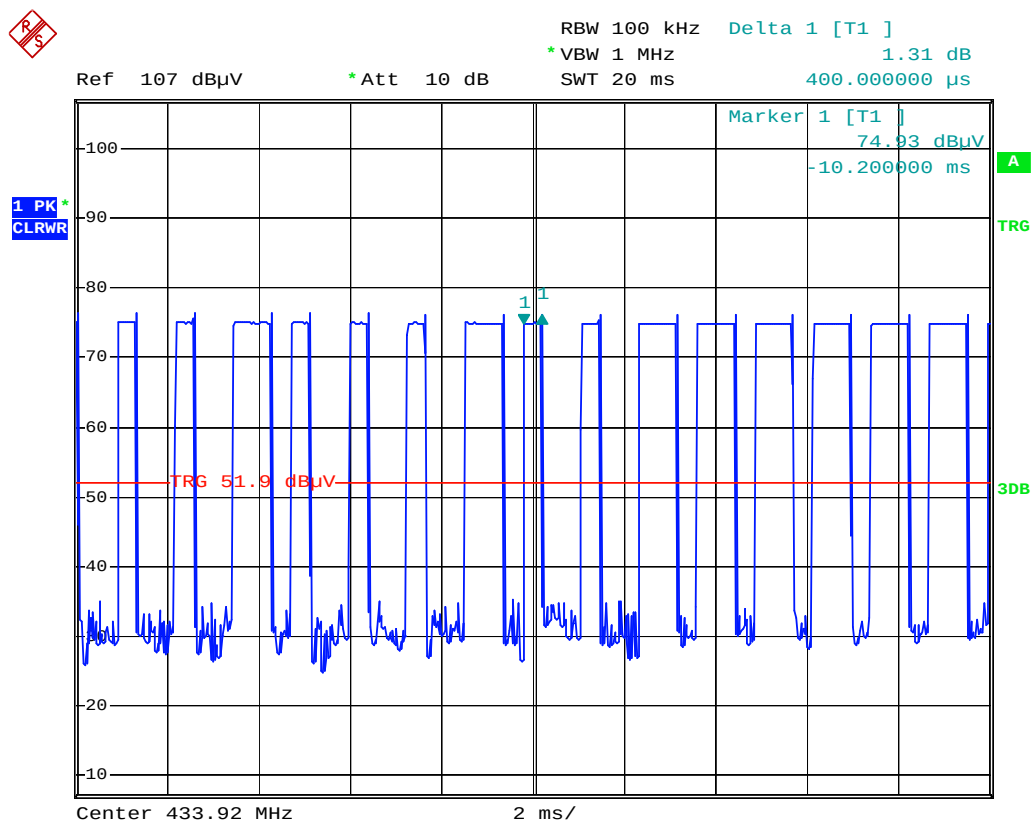
Time Slot



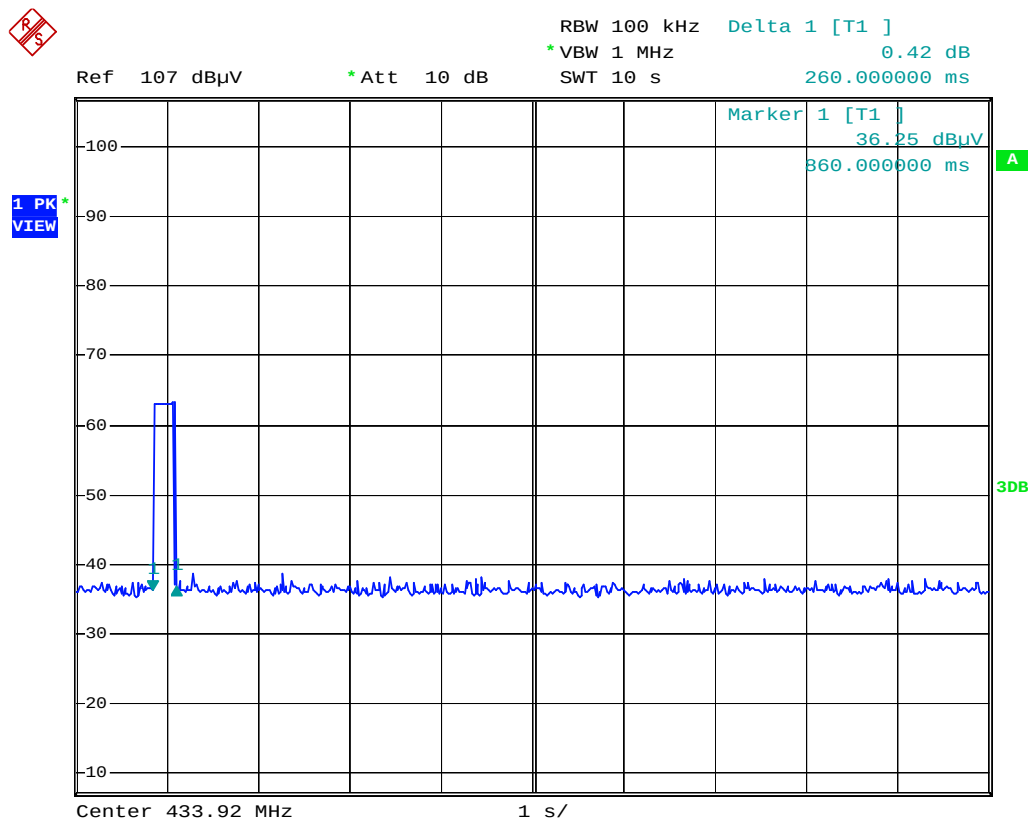
Time Slot



Time Slot 1

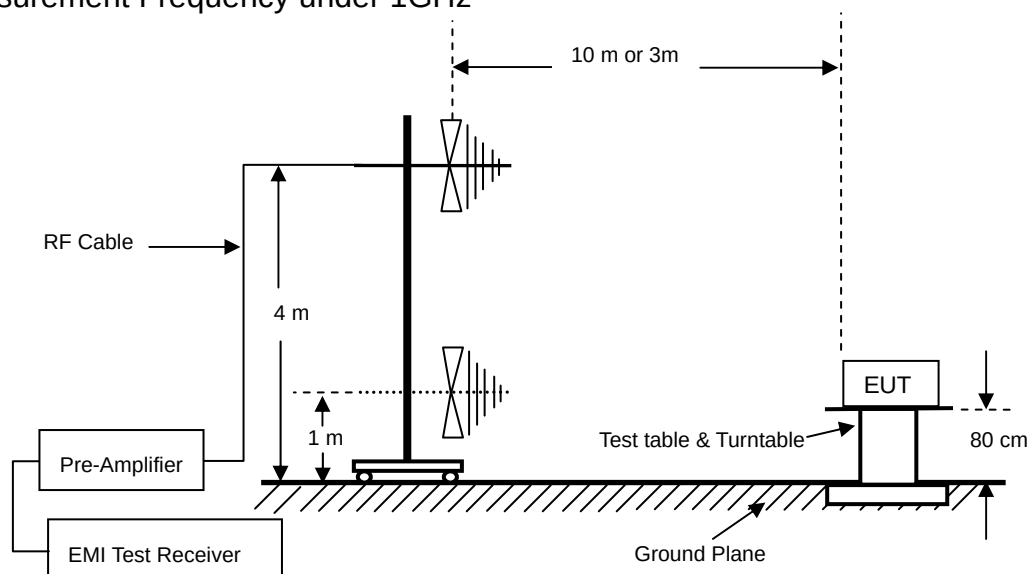


Time Slot 2

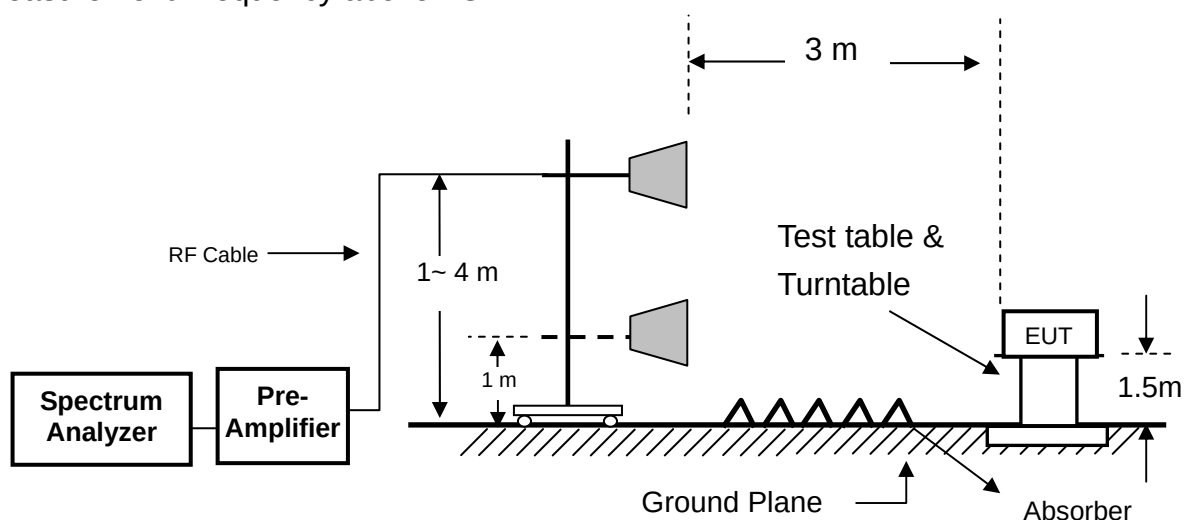


4.3 Configuration of Measurement

Measurement Frequency under 1GHz



Measurement Frequency above 1GHz



4.4 Test Procedure

Radiated emission measurements frequency range were performed from 30MHz to 5GHz. Spectrum Analyzer Resolution Bandwidth set to 100kHz or greater for frequencies from 30MHz to 1GHz, and set 1MHz Resolution Bandwidth for frequencies above 1GHz.

The EUT is place on non-conductive turntable for the test. If peripheral devices apply to the EUT, the peripheral devices will be connected to EUT and whole system. During the emission test, the signal is maximized through rotation and all cables were present worst-case emissions. The height of antenna and polarization is constantly changed for exploring maximum signal reading. The height of antenna can be up form reference ground to 4 meter and down to 1 meter.

4.5 Test Result

PASS.

The final test emission data is shown as following tables.

Radiated emission below 1GHz

Worse case: ASK Modulation

Frequency	Antenna	Reading	Preamp	Correction Factor	Corrected Level	Limits	Margin	Det
(MHz)	Polarization	(dBuV)	(dB)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Mode
83.90	H	47.30	31.54	9.18	24.94	40.00	-15.06	PK
124.00	H	50.10	31.41	9.73	28.42	43.52	-15.10	PK
186.00	H	49.10	31.16	11.66	29.60	43.52	-13.92	PK
220.00	H	53.40	31.07	12.36	34.69	46.02	-11.33	PK
286.00	H	49.40	31.11	14.66	32.95	46.02	-13.07	PK
310.00	H	50.10	31.19	15.10	34.01	46.02	-12.01	PK
82.00	V	49.50	31.54	8.55	26.51	40.00	-13.49	PK
130.00	V	46.80	31.42	9.27	24.65	43.52	-18.87	PK
149.00	V	49.20	31.28	8.82	26.74	43.52	-16.78	PK
183.00	V	51.10	31.17	10.98	30.91	43.52	-12.61	PK
210.00	V	50.60	31.10	11.68	31.18	43.52	-12.34	PK
284.00	V	50.70	31.11	14.61	34.20	46.02	-11.82	PK

Remark : Corrected Level = Reading + Correction Factor – Preamp
Correction Factor = Antenna Factor + Cable Loss

Fundamental and Harmonics Emissions

Freq.	Antenna	Reading	Preamp	Correction Factor	Average Factor	Corrected Level	Limits	Margin	Det
(MHz)	Polarization	(dBuV)	(dB)	(dB/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	Mode
433.92(X axis)	H	54.10	0.00	21.68	--	75.78	100.8	-25.02	PK
433.92(X axis)	H	54.10	0.00	21.68	-6.56	69.22	80.8	-11.58	AV
433.92(Y axis)	H	50.23	0.00	21.68	--	71.91	100.8	-28.89	PK
433.92(Y axis)	H	50.23	0.00	21.68	-6.56	65.35	80.8	-15.45	AV
433.92(Z axis)	H	59.49	0.00	21.68	--	81.17	100.8	-19.63	PK
433.92(Z axis)	H	59.49	0.00	21.68	-6.56	74.61	80.8	-6.19	AV
867.84	H	51.90	29.48	29.68	--	52.10	80.8	-28.70	PK
867.84	H	51.90	29.48	29.68	-6.56	45.54	60.8	-15.26	AV
1301.76	H	52.13	27.38	28.27	--	53.02	74.0	-20.98	PK
1301.76	H	52.13	27.38	28.27	-6.56	46.46	54.0	-7.54	AV
1735.68	H	49.85	27.71	29.58	--	51.72	80.8	-29.08	PK
1735.68	H	49.85	27.71	29.58	-6.56	45.16	60.8	-15.64	AV
2169.60	H	45.11	27.86	31.04	--	48.29	80.8	-32.51	PK
2169.60	H	45.11	27.86	31.04	-6.56	41.73	60.8	-19.07	AV
2603.52	H	38.91	27.91	32.68	--	43.68	80.8	-37.12	PK
2603.52	H	38.91	27.91	32.68	-6.56	37.12	60.8	-23.68	AV
3037.44	H	45.92	27.91	33.89	--	51.90	80.8	-28.90	PK
3037.44	H	45.92	27.91	33.89	-6.56	45.34	60.8	-15.46	AV
3471.36	H	46.07	27.72	34.50	--	52.85	80.8	-27.95	PK
3471.36	H	46.07	27.72	34.50	-6.56	46.29	60.8	-14.51	AV
3905.28	H	45.08	27.82	36.14	--	53.40	74.0	-20.60	PK
3905.28	H	45.08	27.82	36.14	-6.56	46.84	54.0	-7.16	AV
4339.20	H	42.66	27.80	37.29	--	52.15	74.0	-21.85	PK
4339.20	H	42.66	27.80	37.29	-6.56	45.59	54.0	-8.41	AV
433.92(X axis)	V	57.22	0.00	21.68	--	78.90	100.8	-21.90	PK
433.92(X axis)	V	57.22	0.00	21.68	-6.56	72.34	80.8	-8.46	AV
433.92(Y axis)	V	57.60	0.00	21.68	--	79.28	100.8	-21.52	PK
433.92(Y axis)	V	57.60	0.00	21.68	-6.56	72.72	80.8	-8.08	AV
433.92(Z axis)	V	45.74	0.00	21.68	--	67.42	100.8	-33.38	PK
433.92(Z axis)	V	45.74	0.00	21.68	-6.56	60.86	80.8	-19.94	AV
867.84	V	45.14	29.48	29.68	--	45.34	80.8	-35.46	PK
867.84	V	45.14	29.48	29.68	-6.56	38.78	60.8	-22.02	AV

1301.76	V	44.73	27.38	28.27	--	45.62	74.0	-28.38	PK
1301.76	V	44.76	27.38	28.27	-6.56	39.09	54.0	-14.91	AV
1735.68	V	43.71	27.71	29.58	--	45.58	80.8	-35.22	PK
1735.68	V	43.71	27.71	29.58	-6.56	39.02	60.8	-21.78	AV
2169.60	V	38.61	27.86	31.04	--	41.79	80.8	-39.01	PK
2169.60	V	38.61	27.86	31.04	-6.56	35.23	60.8	-25.57	AV
2603.52	V	37.07	27.91	32.68	--	41.84	80.8	-38.96	PK
2603.52	V	37.07	27.91	32.68	-6.56	35.28	60.8	-25.52	AV
3037.44	V	42.03	27.91	33.89	--	48.01	80.8	-32.79	PK
3037.44	V	42.03	27.91	33.89	-6.56	41.45	60.8	-19.35	AV
3471.36	V	40.23	27.72	34.50	--	47.01	80.8	-33.79	PK
3471.36	V	40.23	27.72	34.50	-6.56	40.45	60.8	-20.35	AV
3905.28	V	41.16	27.82	36.14	--	49.48	74.0	-24.52	PK
3905.28	V	41.16	27.82	36.14	-6.56	42.92	54.0	-11.08	AV
4339.20	V	40.68	27.80	37.29	--	50.17	74.0	-23.83	PK
4339.20	V	40.68	27.80	37.29	-6.56	43.61	54.0	-10.39	AV

- Remark : 1. Corrected Level = Reading + Correction Factor – Preamp
2. Correction Factor = Antenna Factor + Cable Loss
3. “ * ” Mark indicated Background Noise Level

5 Emission Bandwidth

5.1 Limits

According to FCC 15.231(c) requirement:

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating between 70 MHz to 900 MHz. Those devices operating above 900 MHz, the emission spurious shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

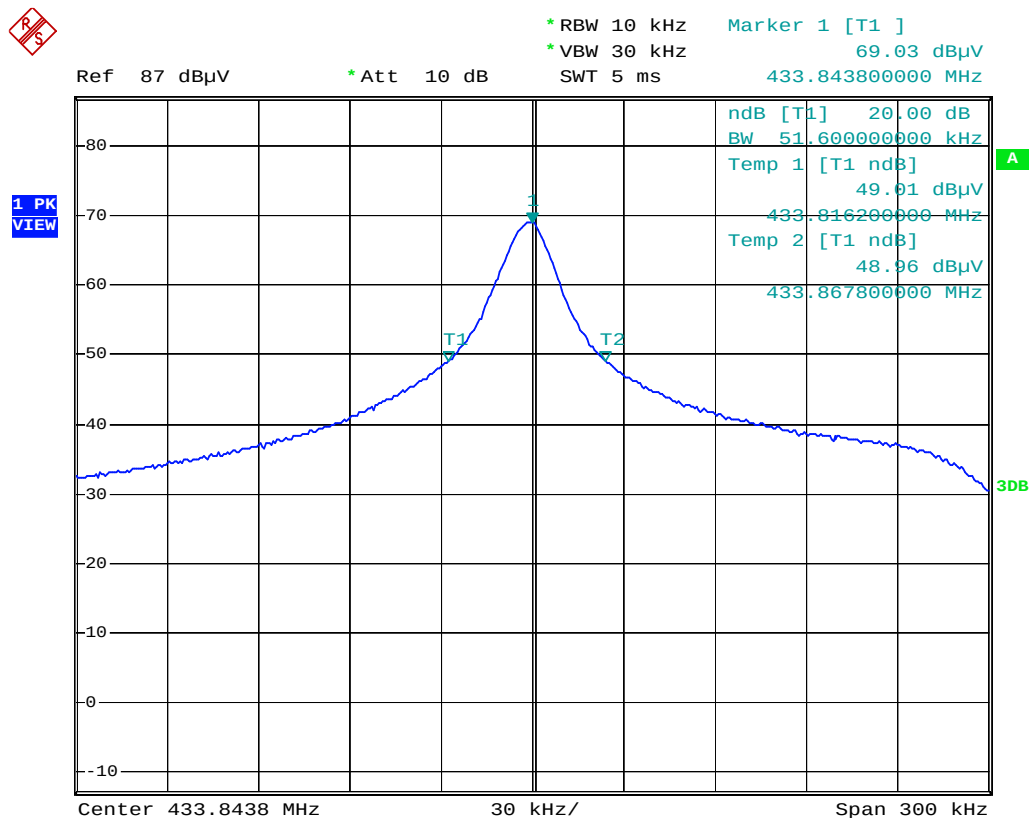
B.W (20dBc) Limit = $0.25\% * f(\text{MHz}) = 0.25\% * 433.92\text{MHz} = 1084.8\text{kHz}$

5.2 Test Result

PASS.

The final test data is shown as following.

Channel Frequency (MHz)	Measured 20dB Bandwidth (kHz)	Limit (kHz)	Result
433.92	51.6	1084.8	PASS



6 99% Occupied Bandwidth

6.1 Limits

According to RSS-210 Annex 1 requirement:

The 99% bandwidth shall be no wider than 0.25% of the centre frequency for devices operating between 70 MHz and 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the centre frequency.

99% OBW Limit = $0.25\% * f(\text{MHz}) = 0.25\% * 433.92\text{MHz} = 1084.8\text{kHz}$

6.2 Test Result

PASS.

The final test data is shown as following.

Channel Frequency (MHz)	Measured 99% Bandwidth (kHz)	Limit (kHz)	Result
433.92	39	1084.8	PASS

