CMA Testing and Certification Laboratories
廠商會檢定中心

TEST REPORT

Report No. : AV0062044(5) Date : 31 Oct 2017

Application No. : LV034476(2)

Applicant : 9141-0720 Quebec Inc. DBA MANARAS/OPERA
136 Oneida Drive, Pointe-Claire
Canada, H9R 1A8

Sample Description : One(1) item of submitted sample stated to be:

Sample Description	Model No.
313MHz Transmitter	EM-901

Radio Frequency : 313MHz
Rating : 1 x 12V A23 size battery
No. of submitted sample : Two (2) piece (s)
Sample registration No. : RV043674-002

Date Received : 19 Oct 2017

Test Period : 20 Oct 2017 to 26 Oct 2017.

Test Requested : FCC 47CFR Part 15 Certification.
ISED Canada Radio Standards Specification RSS-210.

Test Method : 47 CFR Part 15 (10-1-16 Edition)
ANSI C63.10 – 2013
RSS-210 Issue 9
RSS-GEN Issue 4

Test Result : See attached sheet(s) from page 2 to 21.

Conclusion : The submitted sample was found to comply with requirement of FCC 47CFR Part 15 Subpart C and ISED Canada RSS-210 Issue 9.

For and on behalf of
CMA Industrial Development Foundation Limited

Authorized Signature : _____ Page 1 of 21
Mr. WONG Lap-pong, Andrew
Manager
Electrical Division

FCC ID: X7ORADIOEM901
IC: 8860A-RADIOEM901

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IC: 8860A-RADIOEM901

CMA Industrial Development Foundation Limited
Room 1302, Yan Hing Centre, 9-13 Wong Chuk Yeung St., Fo Tan, Shatin, N.T., Hong Kong.
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1 General Information

1.1 General Description

The equipment under test (EUT) model EM-901 is a wireless transmitter. It operates at frequency 313MHz for transmitter. The oscillation of radio control is generated by a 9.78125 MHz crystal for RF transmitter. The EUT is powered by one 12V A23 size battery. The EUT contains a button and a DIP switch to setup the remote.

The antenna is PCB Type permanently attached in EUT and the radio output power cannot be adjusted.

The brief circuit description is listed as follows:

-U1	and its associated circuit act as MCU
-SW4	and its associated circuit act as code combination
-U2	and its associated circuit act as RF IC
-Y1, C5, C6	and its associated circuit act as oscillation clock
-L3, C10, C7	and its associated circuit act as matching network

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1.2 Location of the test site

Radiated emissions measurements are investigated and taken pursuant to the procedures of ANSI C63.10 – 2013. A Semi-Anechoic Chamber Testing Site is set up for investigation and located at:

Ground Floor, Yan Hing Centre,
9 – 13 Wong Chuk Yeung Street,
Fo Tan, Shatin,
New Territories,
Hong Kong.

Conducted emissions measurements are investigated and also taken pursuant to the procedures of ANSI C63.10 – 2013. A shielded room is located at :

Ground Floor, Yan Hing Centre,
9 – 13 Wong Chuk Yeung Street,
Fo Tan, Shatin,
New Territories,
Hong Kong.

FCC Accredited Lab Designation Number: HK0004
IC Assigned Code: 4093A-2

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1.3 List of measuring equipment

Equipment	Manufacturer	Model No.	Serial No.	Calibration Due Date
EMI Test Receiver	Rohde & Schwarz	ESCI	100152	16 Nov 2017
Spectrum Analyzer	Rohde & Schwarz	FSV 40	100964	08 Feb 2018
Biconical Antenna	Rohde & Schwarz	HK116	837414/004	17 Aug 2018
Log Periodic Antenna	Teseq	UPA6109	43666	27 Jul 2018
Horn Antenna	Schwarzbeck	BBHA 9120D	9120D-531	19 Dec 2018
Broadband Pre-Amplifier	Schwarzbeck	BBV 9718	9718-119	21 Dec 2018
Loop Antenna	EMCO	6502	00056620	25 Jan 2018
Coaxial Cable	Schaffner	RG213/U	N/A	18 May 2018
Coaxial Cable	Suhner	RG214/U	N/A	18 May 2018

1.4 Measurement Uncertainty

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%.

Radiated emissions

Frequency	Uncertainty (U_{lab})
30MHz ~ 200MHz (Horizontal)	4.59dB
30MHz ~ 200MHz (Vertical)	4.49dB
200MHz ~1000MHz (Horizontal)	4.94dB
200MHz ~1000MHz (Vertical)	4.97dB
1GHz ~ 6GHz	4.52dB

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1.5 Test Summary

TEST ITEM	FCC REFERANCE	IC REFERANCE	RESULT
Radiated emission	15.231(b)	RSS-210 Issue 9 Annex A1.1 Table A & Clause 2.2	Comply
Assigned bandwidth (20dB bandwidth)	15.231(c)	-	Comply
Occupied bandwidth >0.25% of the centre frequency	-	RSS-210 Issue 9 Annex A1.1.3	Comply
Transmission time after manual activation	15.231(a)	RSS-210 Issue Annex A1.1.1	Comply

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2 Description of the radiated emission test

2.1 Test Procedure

Radiated emissions measurements are investigated and taken pursuant to the procedures of ANSI C63.10 – 2013.

A non-conductive turntable with dimensions of 1.5m x 0.4m x 0.8m (L x W x H) placed above the reference ground plane. The equipment under test (EUT) was placed at 0.8m height for below 1GHz measurement and 1.5m height for above 1GHz measurement. The test distance is 3m between EUT and receiving antenna. A broadband antenna mounting on the mast received the signal strength. The turntable was rotated to maximize the emission level. The antenna was moving along the mast from 1m up to 4m until no more higher value was found. Both horizontal and vertical polarization of the antenna were placed and investigated. Additional absorbing material will be placed between the EUT and receiving antenna for above 1GHz measurement.

For below 30MHz, a loop antenna with its vertical plane is placed 3m from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. And the centre of the loop shall be 1 m above the ground.

The device was rotated through three orthogonal axes to determine which attitude and configuration produce the highest emission during measurement.

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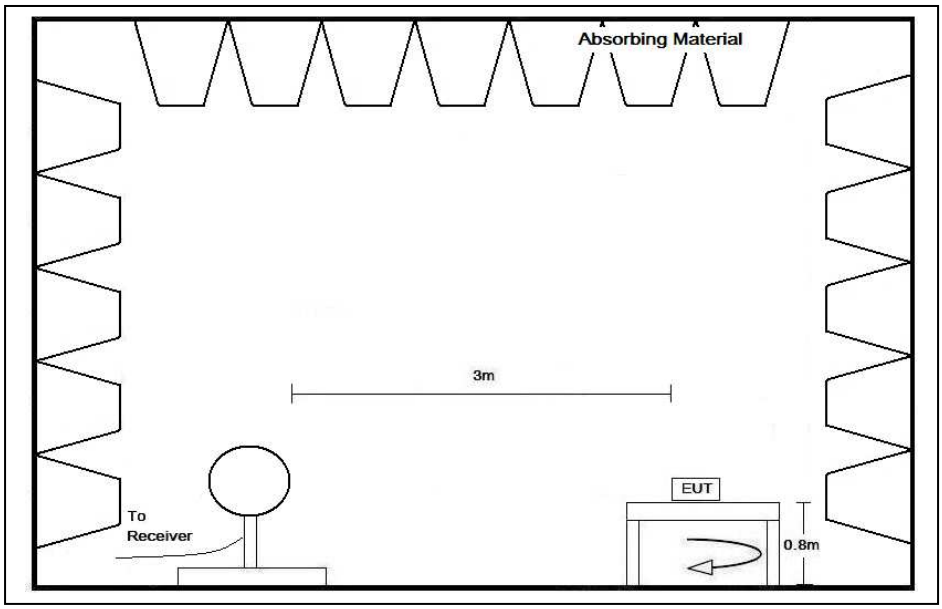
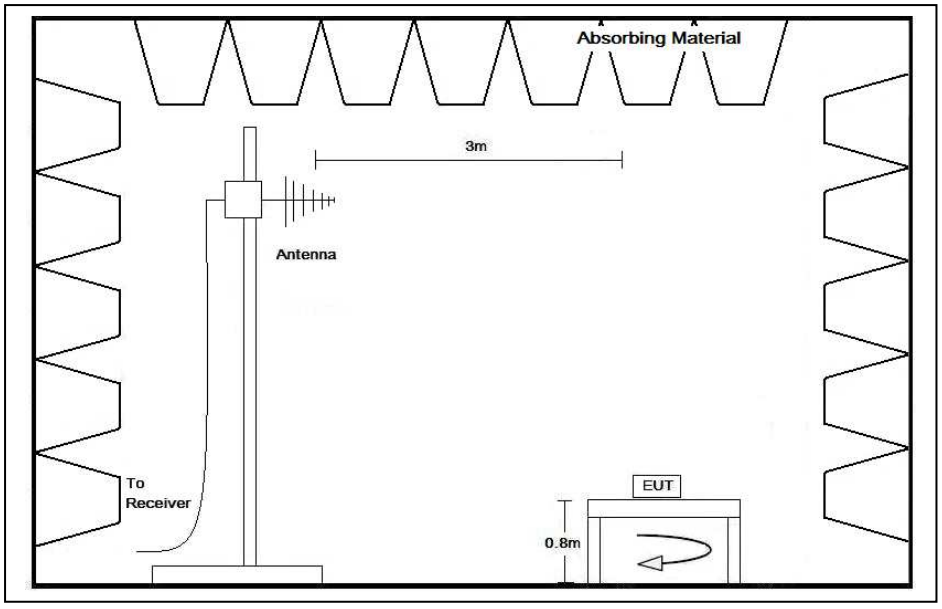
2.2 Test Setup



Below 30MHz



30MHz – 1GHz

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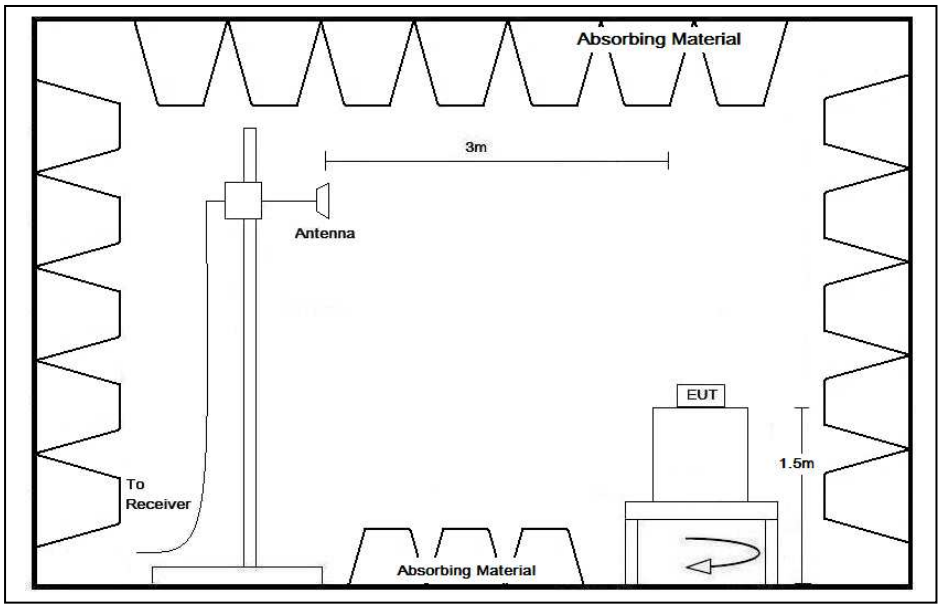
2.2 Test Setup



Above 1GHz

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2.3 Test Result

Peak Detector data was measured unless otherwise stated.

The radiated emissions are measured from 9kHz to 4GHz (the tenth harmonics)

The worst case configuration is shown on the worst case configuration of test setup photo.

"#" means emissions appearing within the restricted bands of 47 CFR Part 15 section 15.205 and "*" means emission appearing within the restricted bands of RSS-GEN section 8.10.

The frequencies from fundamental up to tenth harmonics were investigated, and emissions more 20dB below limit were not reported. Thus, those highest emissions were presented in next pages.

The EUT has been tested in Transmission mode.

It was found that the EUT meet the FCC and RSS requirement.

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2.4 Radiated Emission Measurement Data

Radiated emission

Environmental conditions:

Parameter	Recorded value	
Ambient temperature:	26	° C
Relative humidity:	58	%

Frequency (MHz)	Polarity (H/V)	Reading at 3m (dBµV)	Antenna Factor and Cable Loss (dB/m)	Field Strength at 3m (dBµV/m)	Limit at 3m (dBµV/m)	Margin (dB)	Detector Type
312.997	H	41.6	16.9	58.5	95.5	-37.0	Peak
312.999	V	38.2	16.9	55.1	95.5	-40.4	Peak
938.987	H	12.7	28.3	41.0	75.5	-34.5	Peak
938.987	V	12.0	28.3	40.3	75.5	-35.2	Peak
*1252.066	H	48.1	-8.2	39.9	74.0	-34.1	Peak
*1251.978	V	48.5	-8.2	40.3	74.0	-33.7	Peak
*#1565.041	H	51.4	-8.0	43.4	74.0	-30.6	Peak
*#1564.984	V	48.3	-8.0	40.3	74.0	-33.7	Peak
1877.967	H	52.7	-7.6	45.1	75.5	-30.4	Peak
1877.951	V	52.7	-7.6	45.1	75.5	-30.4	Peak
2191.037	H	51.1	-6.7	44.4	75.5	-31.1	Peak
2190.849	V	49.8	-6.7	43.1	75.5	-32.4	Peak
2504.001	H	49.1	-4.7	44.4	75.5	-31.1	Peak
2503.869	V	50.2	-4.7	45.5	75.5	-30.0	Peak
*#2816.855	H	45.0	-4.7	40.3	74.0	-33.7	Peak
*#2816.964	V	46.9	-4.7	42.2	74.0	-31.8	Peak
3130.075	H	42.6	-3.3	39.3	75.5	-36.2	Peak
3130.120	V	44.0	-3.3	40.7	75.5	-34.8	Peak

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2.4 Radiated Emission Measurement Data (cont'd)

Radiated emission

Environmental conditions:

Parameter	Recorded value	
Ambient temperature:	26	° C
Relative humidity:	58	%

Frequency (MHz)	Polarity (H/V)	Peak Reading at 3m (dBμVm)	Average Factor (dB)	Average Value at 3m (dBμV/m)	Limit at 3m (dBμV/m)	Margin (dB)
312.997	H	58.5	-3.1	55.4	75.5	-20.1
312.999	V	55.1	-3.1	52.0	75.5	-23.5
938.987	H	41.0	-3.1	37.9	55.5	-17.6
938.987	V	40.3	-3.1	37.2	55.5	-18.3
*1252.066	H	39.9	-3.1	36.8	54.0	-17.2
*1251.978	V	40.3	-3.1	37.2	54.0	-16.8
*#1565.041	H	43.4	-3.1	40.3	54.0	-13.7
*#1564.984	V	40.3	-3.1	37.2	54.0	-16.8
1877.967	H	45.1	-3.1	42.0	55.5	-13.5
1877.951	V	45.1	-3.1	42.0	55.5	-13.5
2191.037	H	44.4	-3.1	41.3	55.5	-14.2
2190.849	V	43.1	-3.1	40.0	55.5	-15.5
2504.001	H	44.4	-3.1	41.3	55.5	-14.2
2503.869	V	45.5	-3.1	42.4	55.5	-13.1
*#2816.855	H	40.3	-3.1	37.2	54.0	-16.8
*#2816.964	V	42.2	-3.1	39.1	54.0	-14.9
3130.075	H	39.3	-3.1	36.2	55.5	-19.3
3130.120	V	40.7	-3.1	37.6	55.5	-17.9

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Remark: According to FCC Part15 C clause 15.231 (b) and (or) RSS-210 Issued 9 Annex 1, the EUT shall demonstrate the compliance with the limits on the field strength of emissions based on the average value of the measured emissions. The equation with a sample calculation as follow: Average value = Peak value + 20 Log_{10} (Duty cycle), where the Duty cycle is calculated from following section 4.2.

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3 Description of the Line-conducted Test

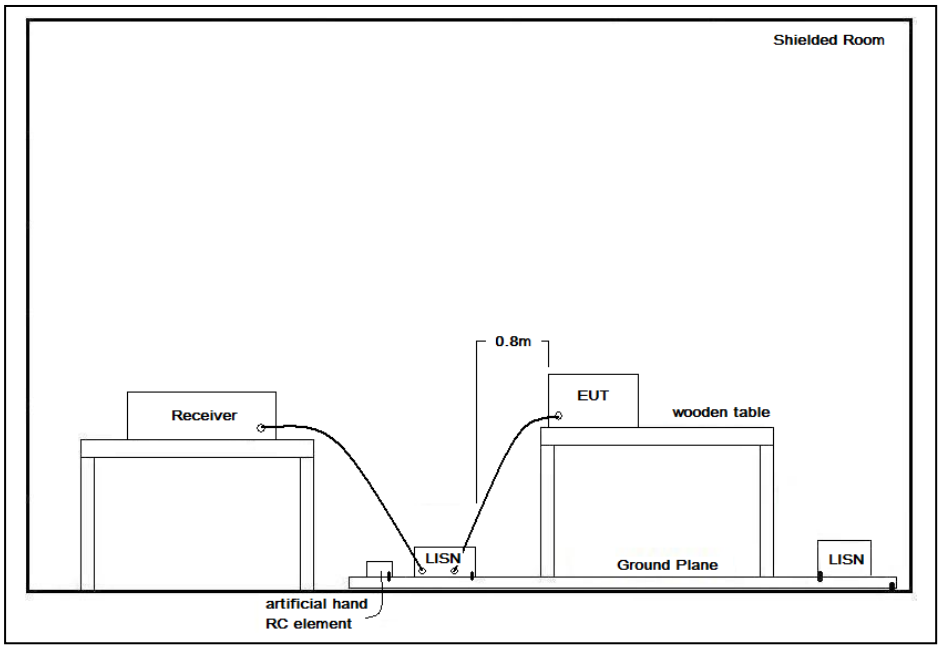
3.1 Test Procedure

Conducted emissions measurements are investigated and also taken pursuant to the procedures of ANSI C63.10 – 2013. The EUT was setup as described in the procedures, and both lines were measured.

3.2 Test Result

No measurement is required as the EUT is a battery-operated product.

3.3 Test Setup



3.4 Graph and Table of Conducted Emission Measurement Data

Not Applicable

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4 Supplementary document

The following document were submitted by applicant, and for electronic filing, the document are saved with the following filenames:

Document	Filename
ID Label/Location	LabelSmp.pdf
Block Diagram	BlkDia.pdf
Schematic Diagram	Schem.pdf
Users Manual	UserMan.pdf
Operational Description	OpDes.pdf

4.1 Bandwidth

Appendices A1 is shown the fundamental emission is confined in the specified band. The 20dB bandwidth is 58.1kHz and 99% bandwidth is 56.9kHz. The bandwidth requirement is 0.25% of 313MHz = 782.5kHz. It also shows that the EUT met the FCC Part 15.231(c) and RSS-210 Annex A1.1.3 bandwidth requirement.

4.2 Duty cycle

Since the device has difference code from switch 1. All combinations of switch are checked, the worst case duty cycle is used for the average factor calculation.

Worst case at following setting:
Dip switch: '1111111010'

The duty cycle is simply the on-time divided by the period:

Time duration of one cycle = 100 ms

Effective period of one cycle = 18 x 3.9 ms
= 70.2 ms

Duty Cycle = 70.2 ÷ 100
= 0.702

Therefore, the average correction factor is found by $20 \log_{10} 0.702 = -3.1$dB

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4.3 Transmission time

All combinations of switch 1 are checked and the following worst case found.

Worst case at following setting:
Dip switch: '1111111010'

Duration of each transmission =0.835s

The duration of the transmission is less than 5s after the transmission is activated by remote controller. An Appendices A3 is shown the EUT to comply with FCC part 15, section 15.231(a)(1) and RSS-210, Annex 1, section A1.1.1.

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5 Appendices

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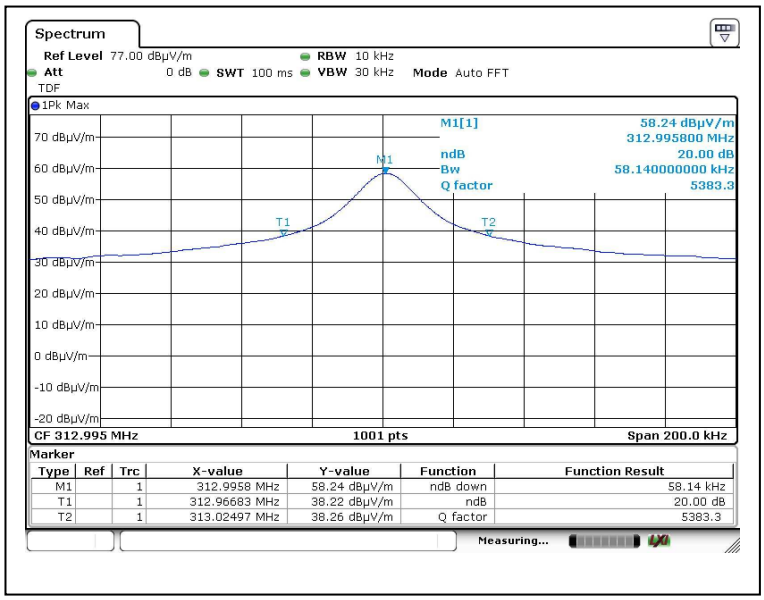
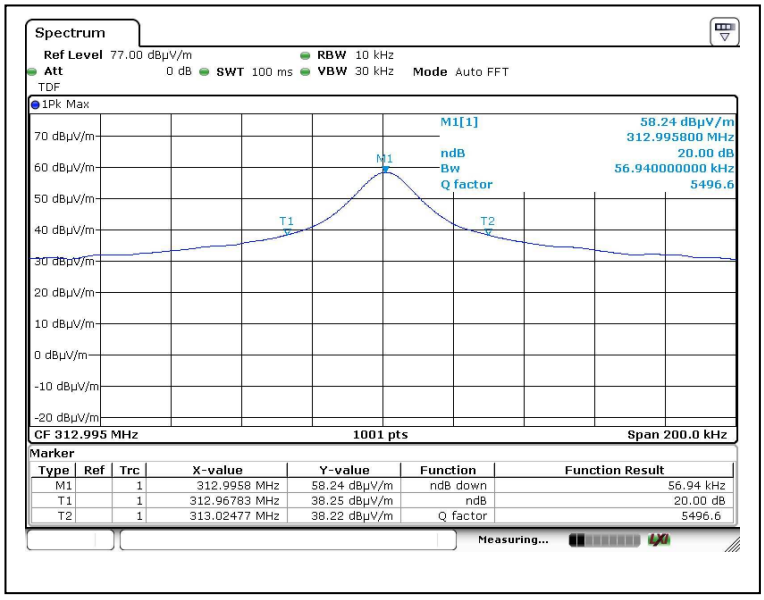
A1. Bandwidth Plot



20dB bandwidth



99% occupied bandwidth

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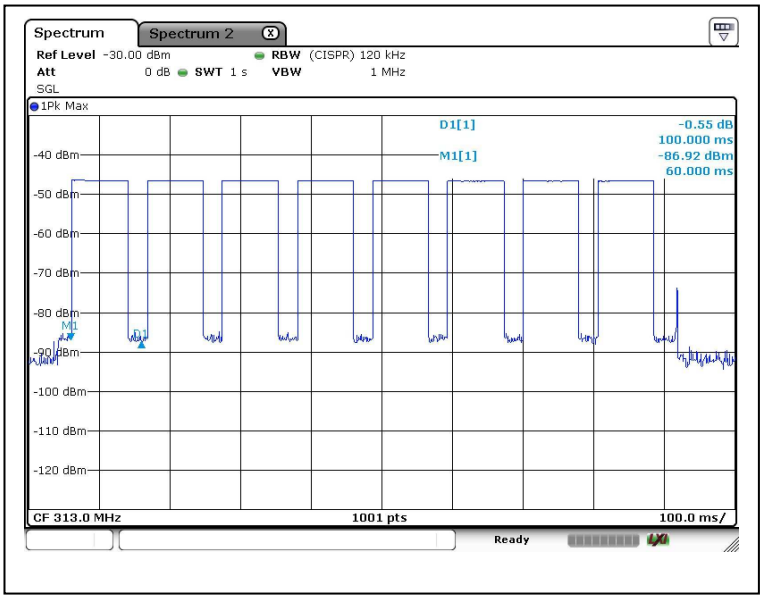
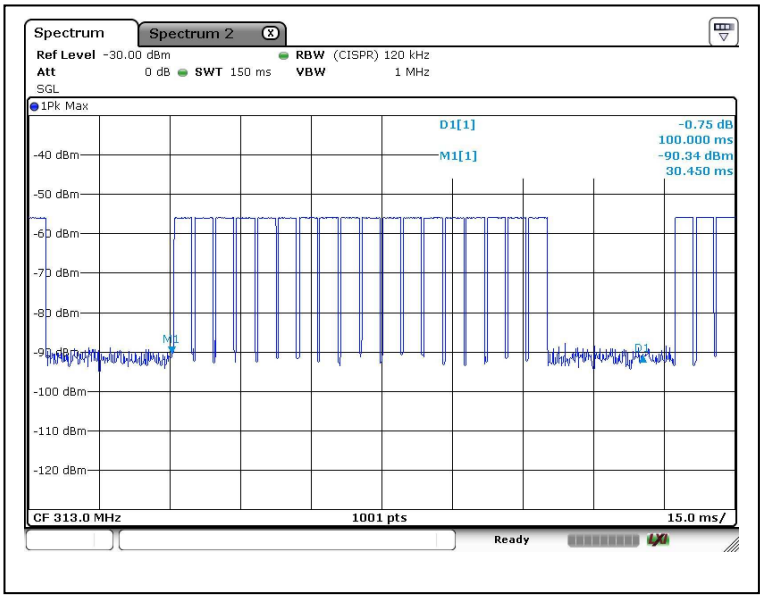
A2. Duty Cycle





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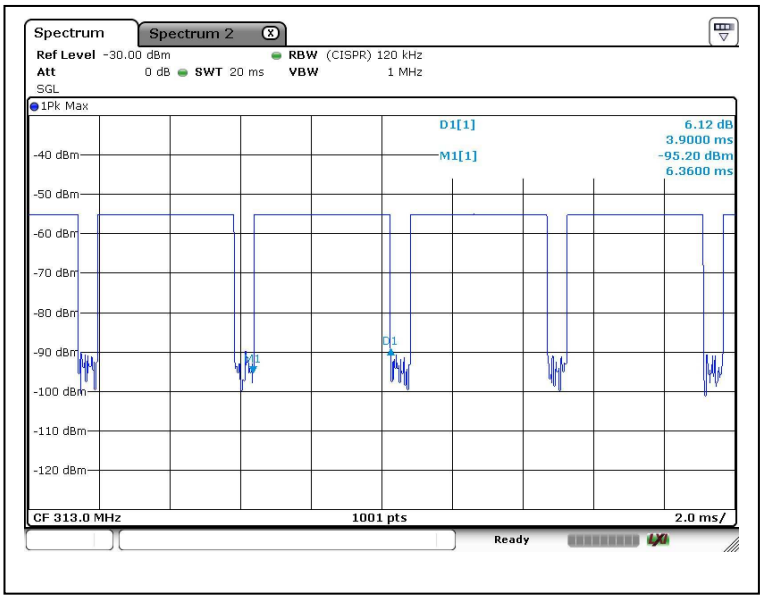
A2. Duty Cycle



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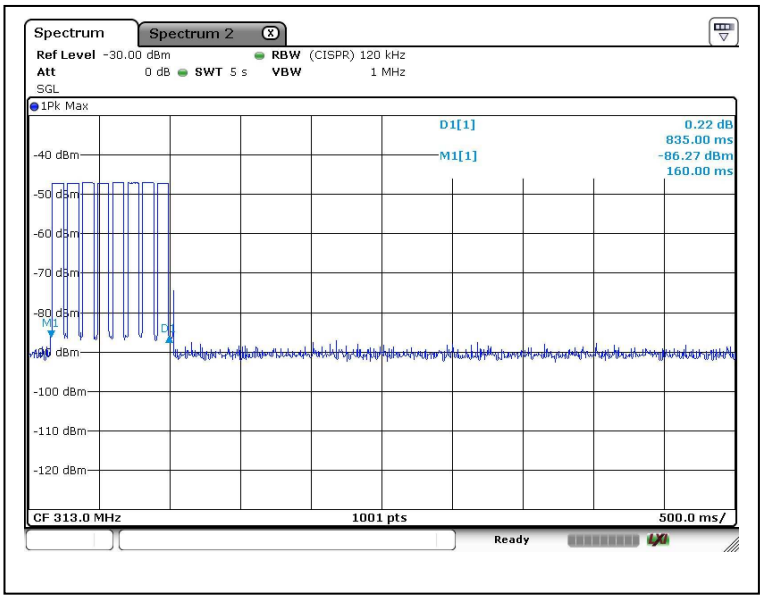
A3. Transmission time



***** End of Report *****

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