TEST REPORT

Report No. : AA0044615(9) Date : 2021-09-01

Application No. : LA024942(0)

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

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

Sample Description	Model No.	Serial Number
Remote Control	RADIOEM101R3, RADIOEM103MDR3, RADIOEM103SDR3, RADIOEM104R3	ES0001, ES0002, ES0003, ES0004

Radio Frequency : 390MHz
Rating : 1 x 3V CR2032 button cell
No. of submitted sample : Six (6) piece (s) per models
Sample registration No. : RA020238-001(5)

Date Received : Aug 10, 2021

Test Period : Aug 10, 2021 – August 23, 2021

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

Test Method : 47 CFR Part 15 (10-1-20 Edition)
ANSI C63.10 – 2013
RSS-210 Issue 9
RSS-GEN Issue 5

Test Result : See attached sheet(s) from page 2 to 16.

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 16

Wong Lap Pong / Andrew
Deputy Technical Manager

FCC ID: X7ORADIOEM10XR3
IC: 8860A-RADIOEM10X3

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1 General Information

1.1 General Description

The equipment under test (EUT) model RADIOEM101R3, RADIOEM103MDR2, RADIOEM103SDR3 and RADIOEM104R3 are a wireless transmitter. It operates at frequency 390MHz for transmitter with data rates up to 10kbps ASK modulation. The oscillation of radio control is generated by a 12.1875MHz crystal for RF transmitter. The EUT is powered by one 3V CR2032 button cell. The EUT contains one key, 3 keys and 4 keys for model RADIOEM101R3, RADIOEM103MDR3, RADIOEM-03SDR3 and RADIOEM104R3 respectively. The key(s) is/are used to control the corresponding receiver.

The 0dBi PCB antenna is used in EUT and the radio output power is unable to adjust.

RADIOEM101R3, RADIOEM103MDR3, RADIOEM103SDR3 and RADIOEM104R3 are same PCB and circuitry and only difference on the number of keys used and coding used. Therefore, RADIOEM104R2 is selected as test model for radiated emission and bandwidth test and all models are selected for timing test and average factor test.

Model:	RADIOEM101R3	RADIOEM103MDR3	RADIOEM103SDR3	RADIOEM104R3
No. of Keys:	1	3	3	4

The brief circuit description is listed as follows:

-SW1, SW2, SW3, SW4, SW5, SW6, SW7	and its associated circuit act as the keys
-U1	and its associated circuit act as RFIC, SYN115
-Y2	and its associated circuit act as oscillation clock, 12.1875MHz
-L1, C3, C5, C8	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 C63.4 – 2014. 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 C63.4 – 2014. A shielded room is located at:

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

FCC Accredited Lab (Designation Number: HK0004)
ISED Wireless Test Site (ISED Assigned Code: 4093A)

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1.3 List of measuring equipment

Equipment	Manufacturer	Model No.	Serial No.	Calibration Due Date	Calibration Period
EMI Test Receiver	Rohde & Schwarz	ESCI	100152	23 Dec 2021	1Year
Spectrum Analyzer	R&S	FSV40	100964	14 Dec 2021	2Years
Log Periodic Antenna	TESEQ	UPA6109	Log Periodic Antenna	29 Nov 2022	2Years
Biconical Antenna	Rohde & Schwarz	HK116	Biconical Antenna	29 Nov 2022	2Years
Horn Antenna	Schwarzbeck	BBHA 9120D	9120D-531	02 Feb 2023	3Years
Broadband Pre-Amplifier	Schwarzbeck	BBV 9718	9718-119	02 Feb 2023	3Years
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170442	15 Sep 2021	2Years
Broadband Pre-Amplifier	Schwarzbeck	BBV 9719	9719-010	12 Sep 2021	2Years
Coaxial Cable	Suhner	Sucoflex 106	N/A	03 May 2022	1Year
Coaxial Cable	Suhner	Sucoflex_104	N/A	14 Jan 2022	2Years
LISN	Rohde & Schwarz	ENV216	101323	23 Dec 2021	1Year
Coaxial Cable	Tyco Electronics	RG 58C/U	N/A	19 Oct 2021	1Year

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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

1.5 Test Summary

TEST ITEM	FCC REFERANCE	IC REFERANCE	RESULT
Radiated emission	15.231(b)	RSS-210 Annex A1.2	Comply
Assigned bandwidth (20dB)	15.231(c)	-	Comply
Occupied bandwidth >0.25% of the center frequency	-	RSS-210 Annex A1.3	Comply
Transmission time after manual activation	15.231(a)	RSS-210 Issue 9 Annex A1.1.1	Comply
Frequency Stability	-	RSS-Gen, Clause 8.11	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.

The EUT was pressed to make the continuous transmission during Radiated Emission test.

Model: RADIOEM103MDR3 and RADIOEM104R3 were pre-scanned and found the Upper-left key as worst case for final test.

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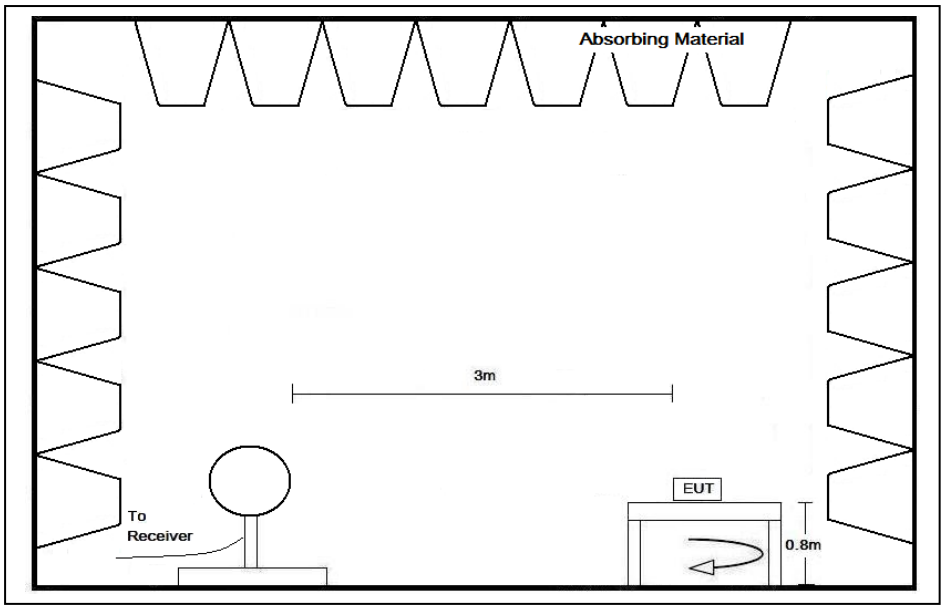
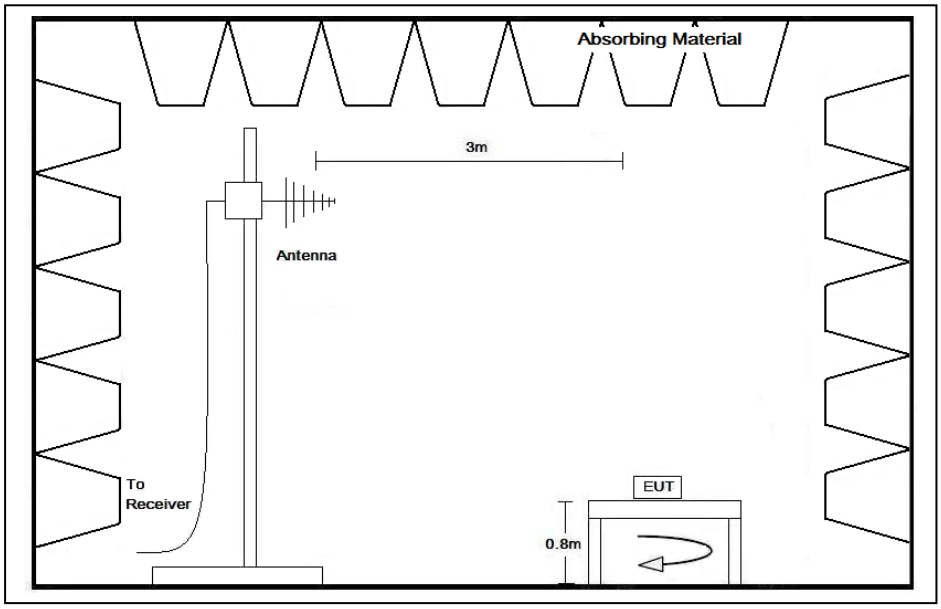
2.2 Test Setup



Below 30MHz



30MHz – 1GHz

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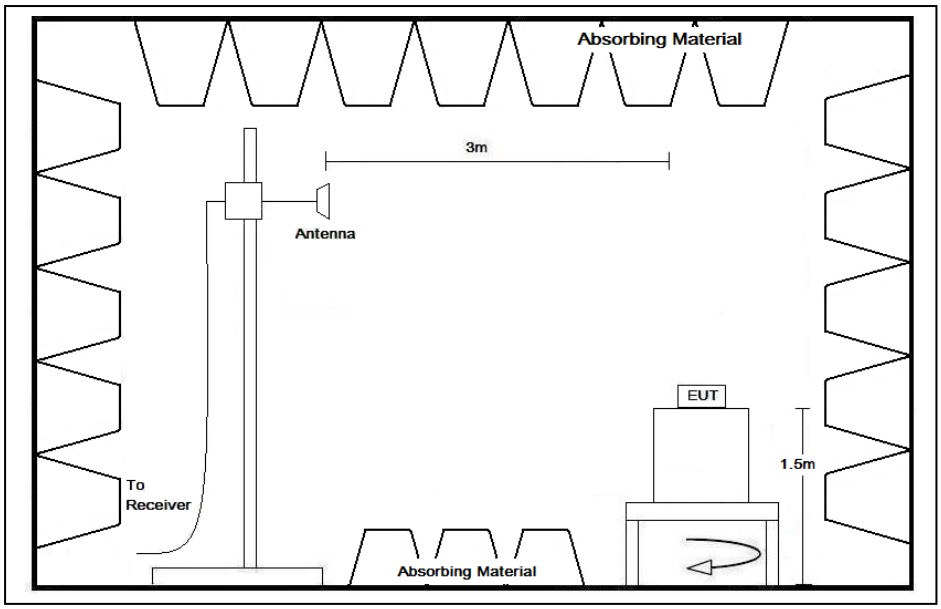
2.2 Test Setup



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 band 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:	26.1	° C
Relative humidity:	51.2	%

Polarization	Frequency (MHz)	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
H	389.986	31.6	16.9	48.5	79.2	-30.7	Peak
V	389.999	30.6	16.9	47.5	79.2	-31.7	Peak
H	779.943	21.6	25.1	46.7	59.2	-12.5	Peak
V	*# 1169.691	39.8	-9.0	30.8	54.0	-23.2	Peak
V	*# 1560.111	39.4	-8.0	31.4	54.0	-22.6	Peak
H	1949.588	38.7	-7.2	31.5	54.0	-22.5	Peak
H	*# 2340.437	40.2	-6.7	33.5	54.0	-20.5	Peak
H	*# 2730.081	38.6	-4.7	33.9	54.0	-20.1	Peak

Remark: 1) Since the Peak value of all measured frequencies are less than the average limit, the average value will not be measured or calculated to comply the shall be calculated with average limit.
2) * The emission is fall in the restricted band of FCC section 15.205.
3) # The emission is fall in the restricted band of RSS-Gen Table 6.

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3 Description of the Line-conducted Test

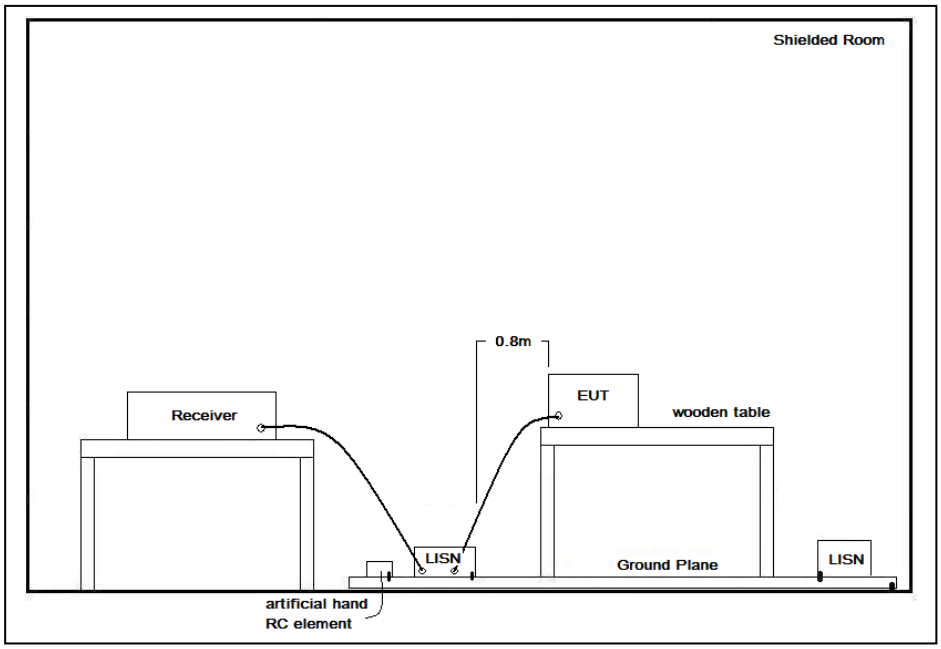
3.1 Test Procedure

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	Label Artwork and Location.pdf
Block Diagram	Block Diagram.pdf
Schematic Diagram	Schematic.pdf
Users Manual	User Manual.pdf
Operational Description	Operation Description.pdf

4.1 Bandwidth

Appendices A1 is shown the fundamental emission is confined in the specified band. The 20dB bandwidth is 4.055kHz and 99% bandwidth is 8.117kHz. The bandwidth requirement is 0.25% of 390MHz = 975kHz . It also shows that the EUT met the FCC Part 15.231(c) and RSS-210 Annex A1.3 bandwidth requirement and frequency stability requirement.

4.2 Transmission time

All keys of 4 models are tested and following worst case found:
Worst case: the key of EM-101R2

Duration of each transmission = 1.3775s

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

A1.	Bandwidth Plot	1	page
A2.	Transmission Time Plot	1	page

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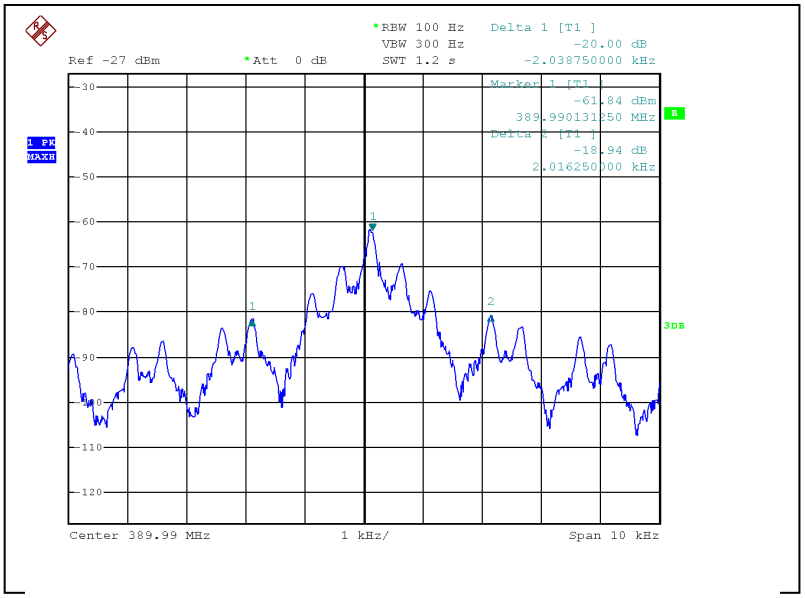
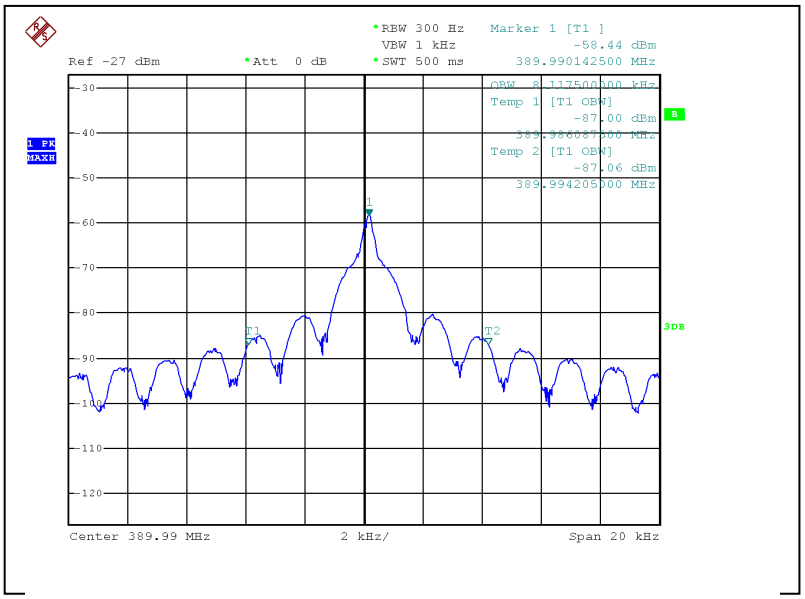
A1. Bandwidth Plot





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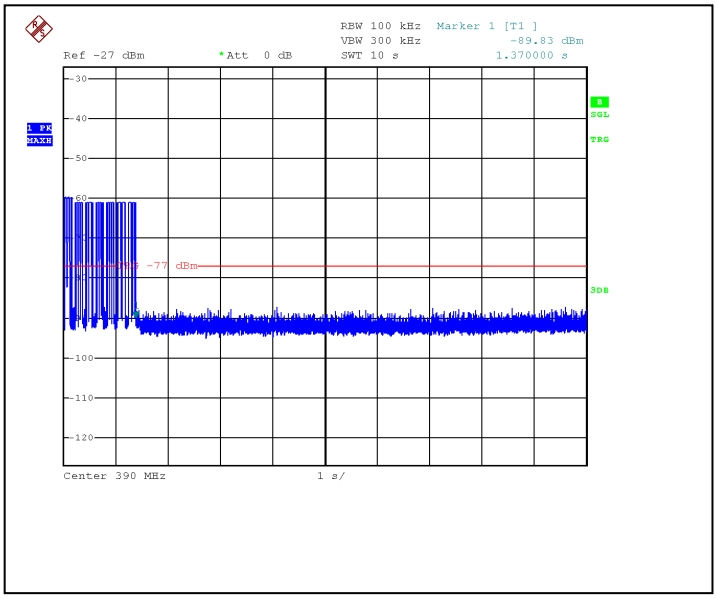
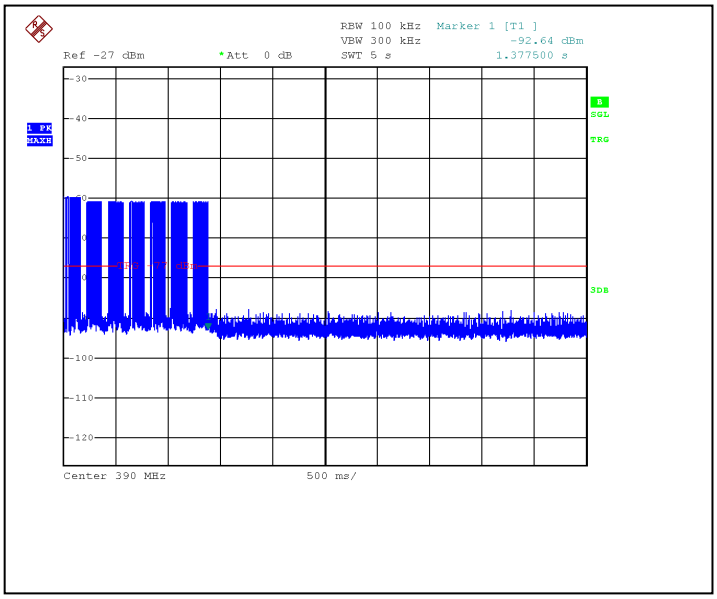
A2. Transmission Time Plot





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

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