



CMA Testing and Certification Laboratories

廠商會檢定中心

TEST REPORT

Report No. : AY0047975(0) Date : August 26, 2019

Application No. : LY024559 (3)

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.
Remote Control	EM-101R2, EM-103MDR2, EM-103SDR2, EM-104R2

Radio Frequency : 390MHz

Rating : 1 x 3V CR2032 button cell

No. of submitted sample : Two (2) piece (s) per models

Sample registration No. : RW023478-001 to RW023478-008

Date Received : Aug 2, 2019

Test Period : Aug 3, 2019 – August 23, 2019

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

Test Method : 47 CFR Part 15 (10-1-18 Edition)
ANSI C63.10 – 2013
RSS-210 Issue 9
RSS-GEN Issue 5

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 :

Mr. WONG Lap-ping, Andrew
Manager

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FCC ID: X7ORADIOEM10XR2
IC: 8860A-RADIOEM10X2

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1 General Information

1.1 General Description

The equipment under test (EUT) model EM-101R2, EM-103MDR2, EM-103SDR2 and EM-104R2 are a wireless transmitter. It operates at frequency 390MHz for transmitter. The oscillation of radio control is generated by a 26MHz 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 EM-101R2, EM-103MDR2, EM-103SDR2 and EM-104R2 respectively. The key(s) is/are used to control the corresponding receiver .

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

EM-101R2, EM-103MDR2, EM-103SDR2 and EM-104R2 are same PCB and circuitry and only difference on the number of switch used and coding used. Therefore, EM-103MDR2 is selected as test model for radiated emission and bandwidth test and all models are selected for timing test and average factor test.

Model:	EM-101R2	EM-103MDR2	EM-103SDR2	EM-104R2
No. of Keys:	1	3	3	4

The brief circuit description is listed as follows:

- SW1, SW2, SW3, SW5, SW8 and its associated circuit act as switch
- U1 and its associated circuit act as RFIC, CMT2189B
- Y2 and its associated circuit act as oscillation clock, 26MHz
- L1, C5, C7,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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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	ESCS30	100001	29 Mar 2020	1Year
Spectrum Analyzer	R&S	FSV40	100964	11 Sep 2019	1Year
Log Periodic Antenna	TESEQ	UPA6109	Log Periodic Antenna	08 Oct 2019	2Years
Biconical Antenna	Rohde & Schwarz	HK116	Biconical Antenna	08 Oct 2020	2Years
Horn Antenna	Schwarzbeck	BBHA 9120D	9120D-531	21 Dec 2019	2Years
Broadband Pre-Amplifier	Schwarzbeck	BBV 9718	9718-119	21 Dec 2019	2Years
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170442	24 Aug 2019	2Years
Broadband Pre-Amplifier	Schwarzbeck	BBV 9719	9719-010	23 Aug 2019	2Years
Coaxial Cable	Schaffner	RG 214/U	N/A	16 May 2020	1Year
Coaxial Cable	Suhner	RG 214/U	N/A	16 May 2020	1Year
Coaxial Cable	Suhner	Sucoflex_104	N/A	23 Aug 2019	1Year
LISN	Rohde & Schwarz	ENV216	101323	22 Jan 2020	1Year
Coaxial Cable	Tyco Electronics	RG 58C/U	N/A	21 Oct 2019	1Year
Rohde & Schwarz TS8997 Testing System					
Spectrum Analyzer	Rohde & Schwarz	FSV 40	101190	05 Dec 2019	1Year
OSP	Rohde & Schwarz	OSP	OSP-B157W	24 Apr 2020	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.

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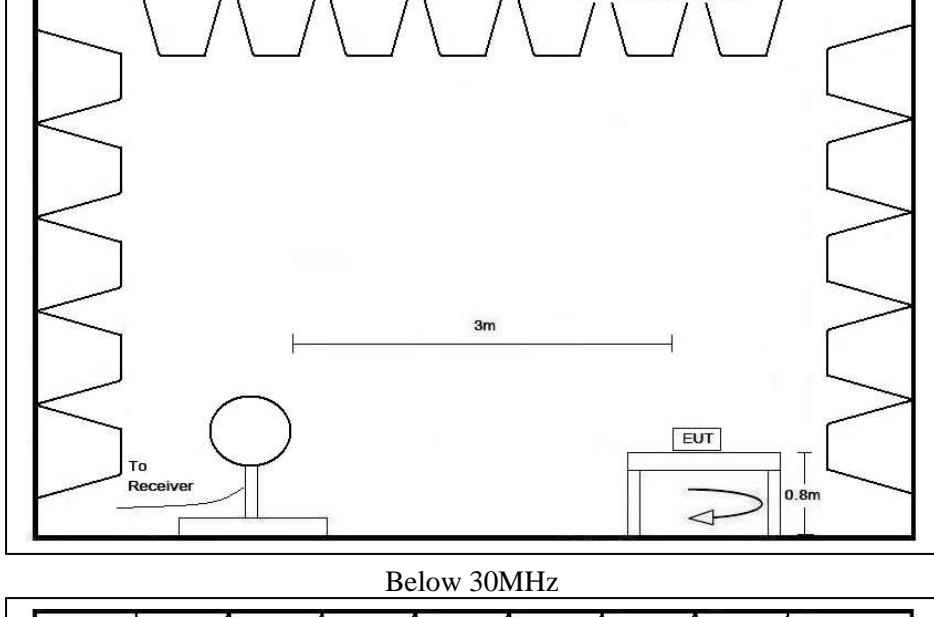
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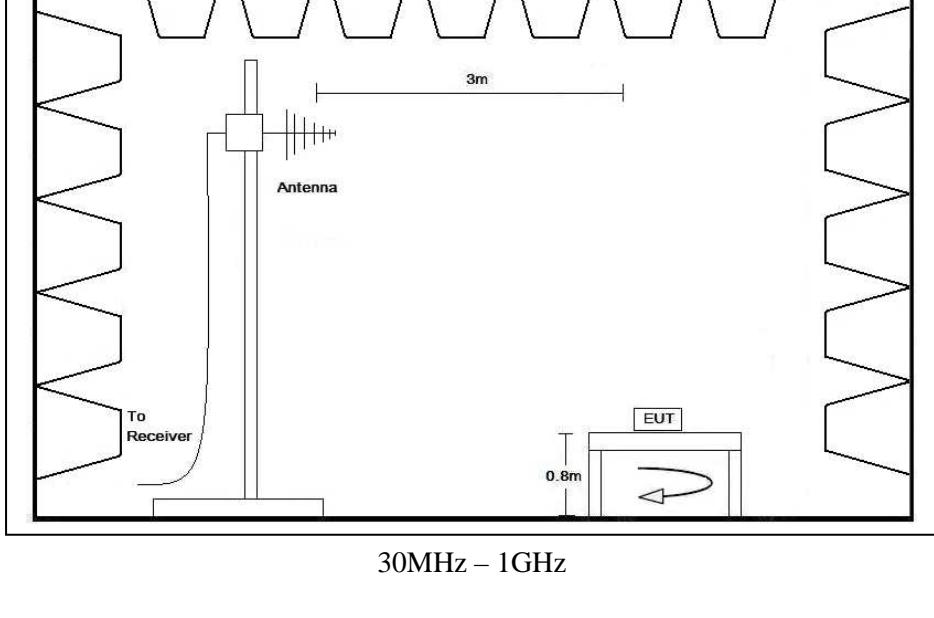
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2.2 Test Setup



Below 30MHz



30MHz – 1GHz

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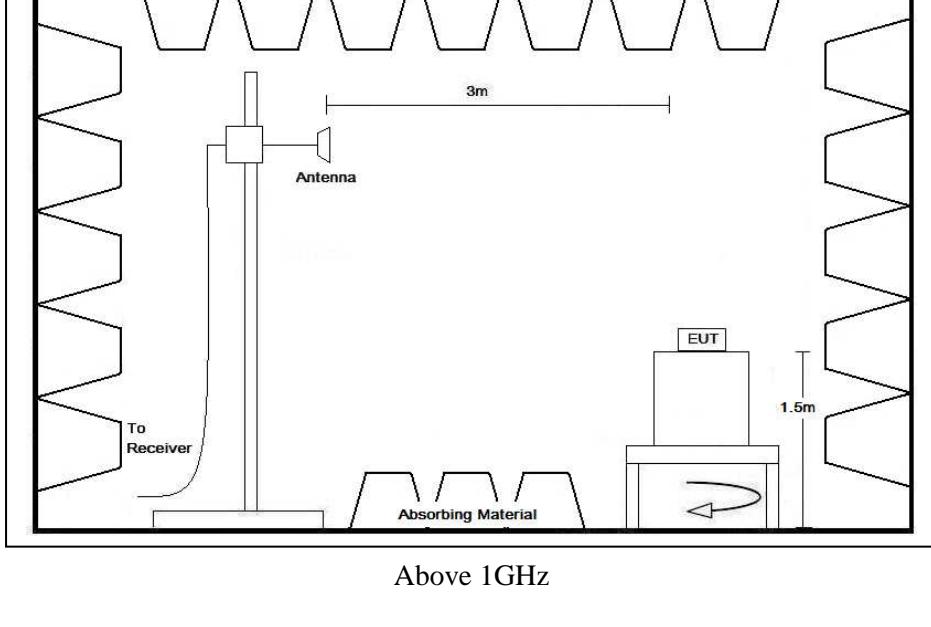
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2.2 Test Setup



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:	28.7 °C
Relative humidity:	45.6 %

Polarization	Frequency (MHz)	Reading at 3m (dB μ V)	Antenna Factor and Cable Loss (dB/m)	Field Strength at 3m (dB μ V/m)	Limit at 3m (dB μ V/m)	Margin (dB)	Detector Type
H	389.977	51.0	16.9	67.9	79.2	-11.3	Peak
V	389.976	50.0	16.9	66.9	79.2	-12.3	Peak
H	779.943	21.6	25.1	46.7	59.2	-12.5	Peak
V	*#1169.914 ¹	68.6	-9.0	59.6	74.0	-14.4	Peak
V	*#1559.840	42.5	-8.0	34.5	54.0	-19.5	Peak
H	1949.872	64.4	-7.2	57.2	59.2	-2.0	Peak
H	*#2339.878	60.2	-6.7	53.5	54.0	-0.5	Peak
H	*#2729.822 ¹	62.6	-4.7	57.9	74.0	-16.1	Peak
V	3119.902	55.4	-3.3	52.1	59.2	-7.1	Peak
V	#3509.810	50.1	-2.3	47.8	54.0	-6.2	Peak
V	*#3899.872	47.9	-2.3	45.6	54.0	-8.4	Peak

Remark: 1) Since the Peak value of frequency 1169.914MHz and 2729.822 are higher than the average limit, the average value shall be calculated with average factor to compare 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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Polarization	Frequency (MHz)	Peak Value at 3m (dB μ V/m)	Average Factor ¹ (dB)	Calculated Average Value at 3m ⁴ (dB μ V/m)	Average Limit at 3m (dB μ V/m)	Margin (dB)	Detector Type
V	*#1169.914	59.6	-5.9	53.7	54.0	-0.3	Peak
H	*#2729.822	57.9	-5.9	52.0	54.0	-2.0	Peak

Remark:

- 1) The average factor is measured and calculated in section 4.2 of this report.
- 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.
- 4) Calculated average value (dB μ V/m) = Peak value (dB μ V/m) + average factor (dB)

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3 Description of the Line-conducted Test

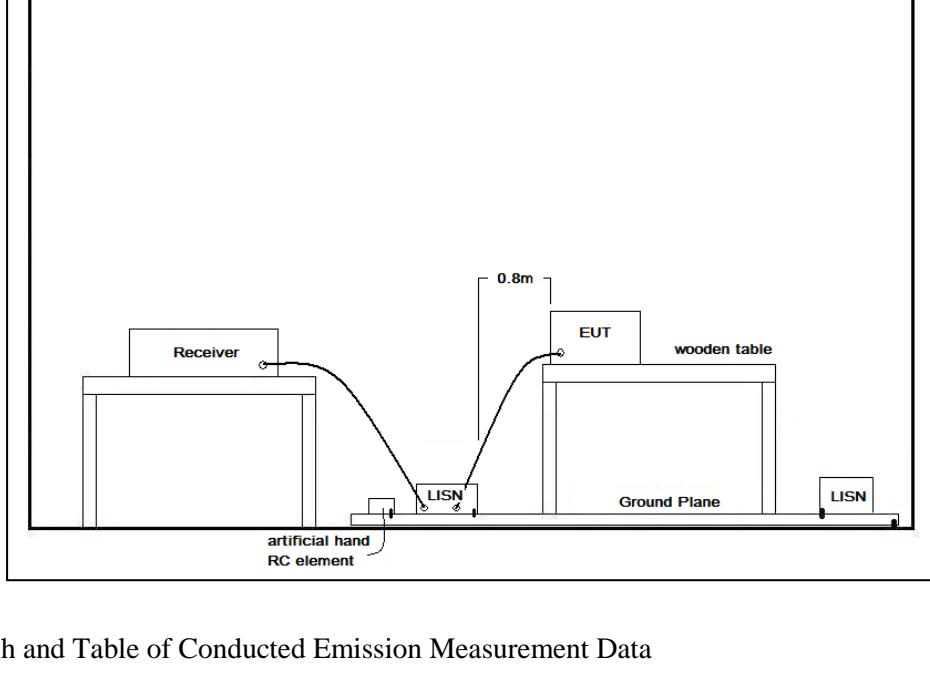
3.1 Test Procedure

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 6.174kHz and 99% bandwidth is 17.63kHz. 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 Average Factor

All keys of four models are tested and found that the lowest key of EM-103MDR2 is the worst case of average factor.

Note: Where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval.

$$\text{Duty Cycle} = \frac{4.05 + 1.37 * 18 + 4.05 + 0.70 * 26}{100} = 0.5096$$

Therefore, the average factor is found by $20 \log_{10} 0.5096 = -5.9 \text{ dB}$

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4.3 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 = 1.55s

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.	Average Factor Plot	3	pages
A3.	Transmission Time Plot	1	Page

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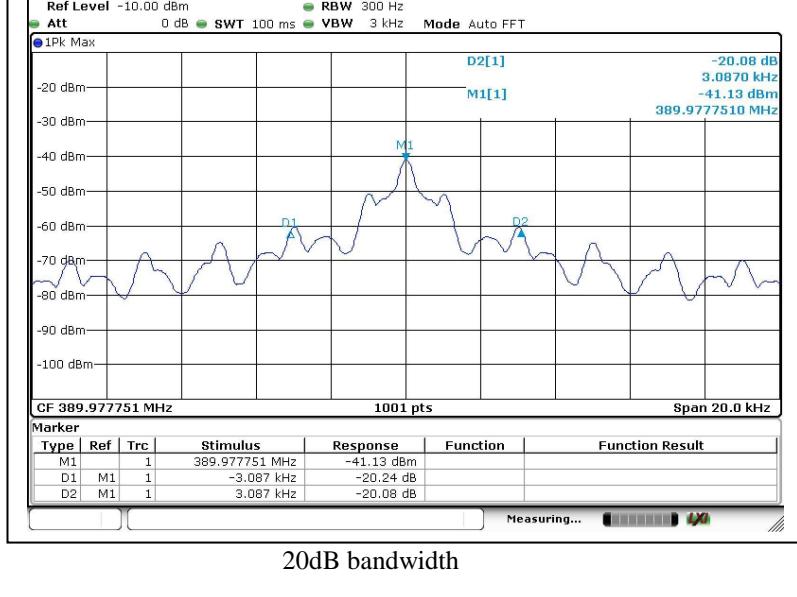
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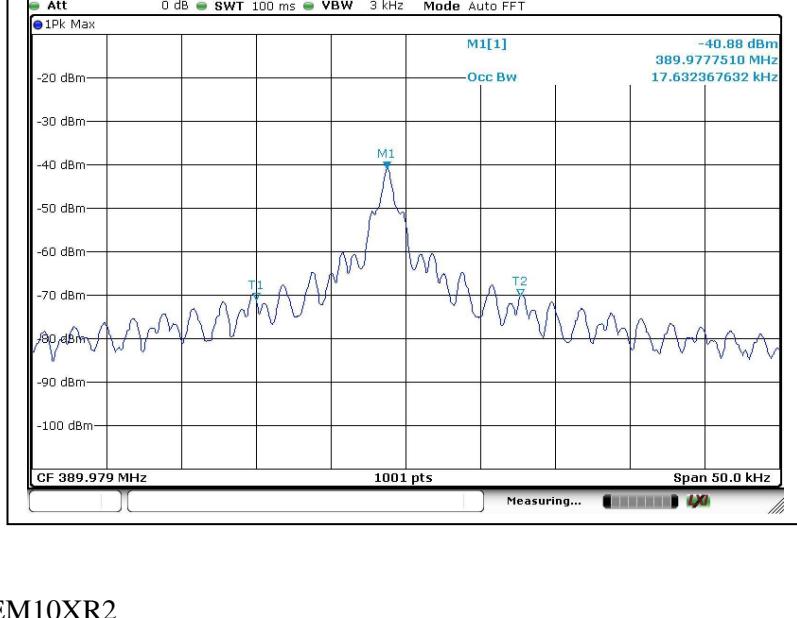
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A1. Bandwidth Plot



20dB bandwidth



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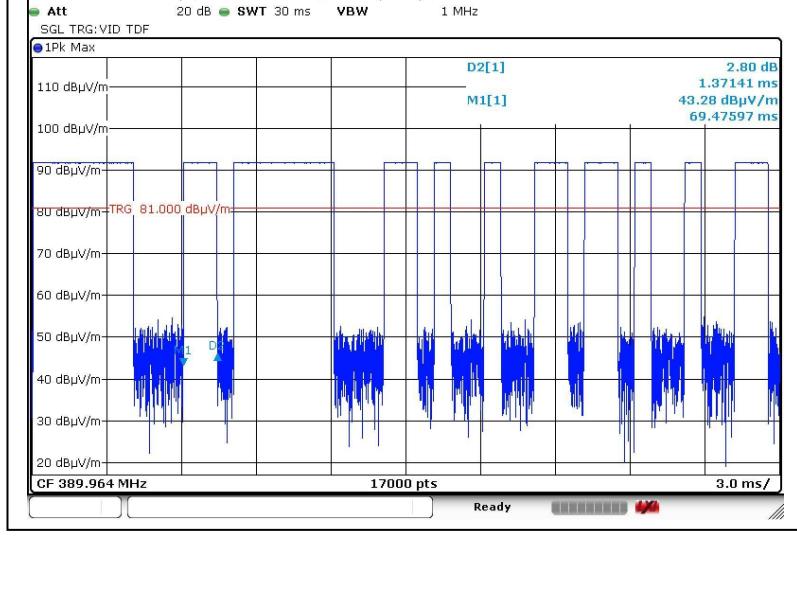
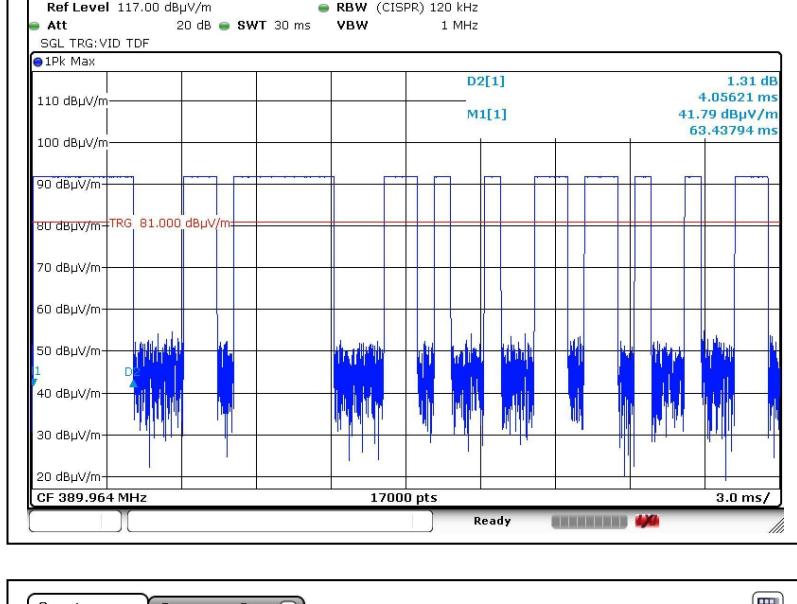
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A2. Average Factor Plot



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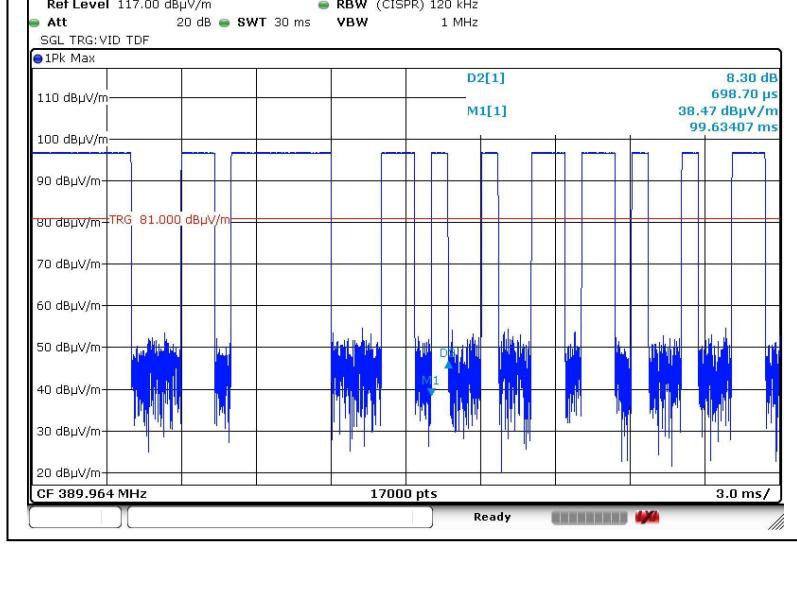
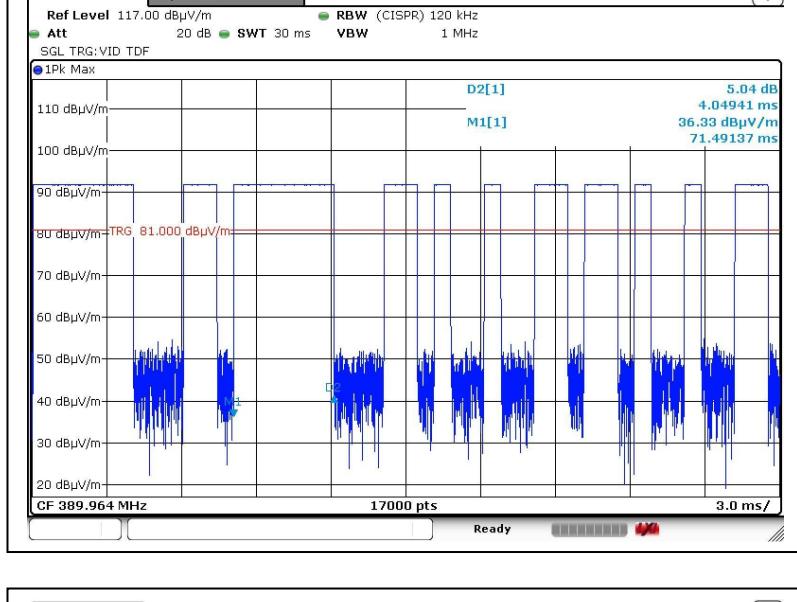
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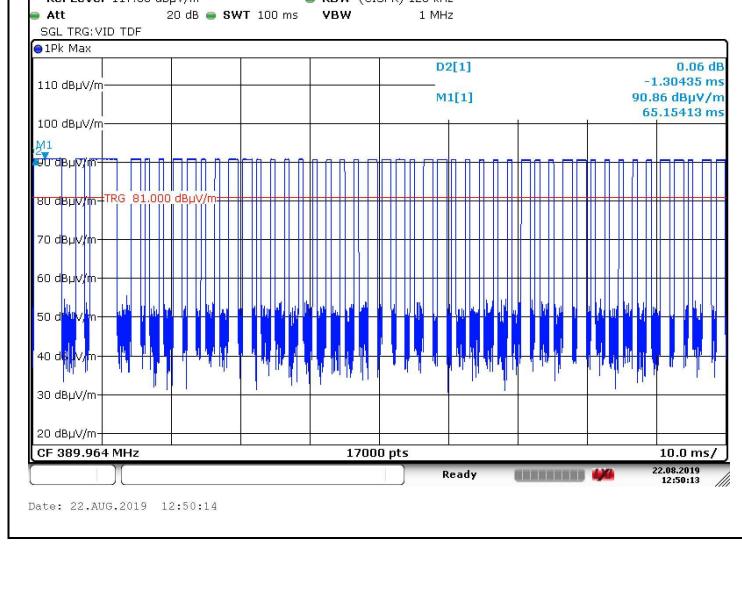
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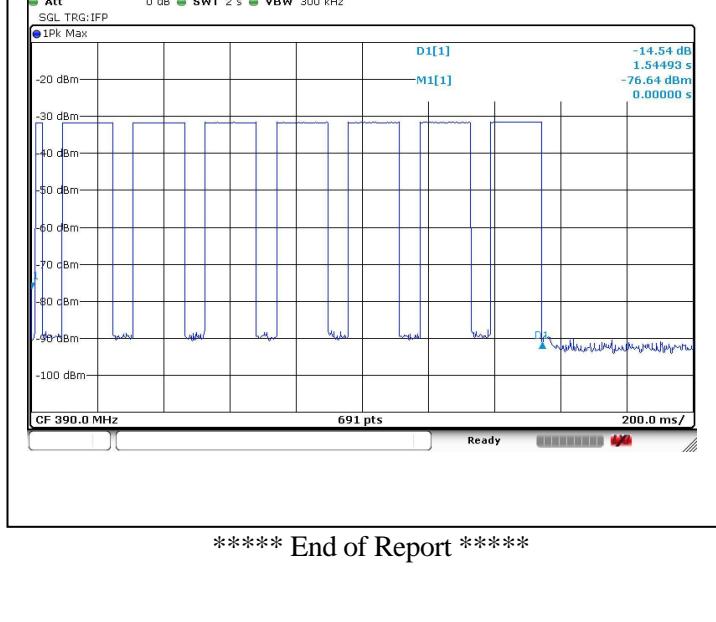
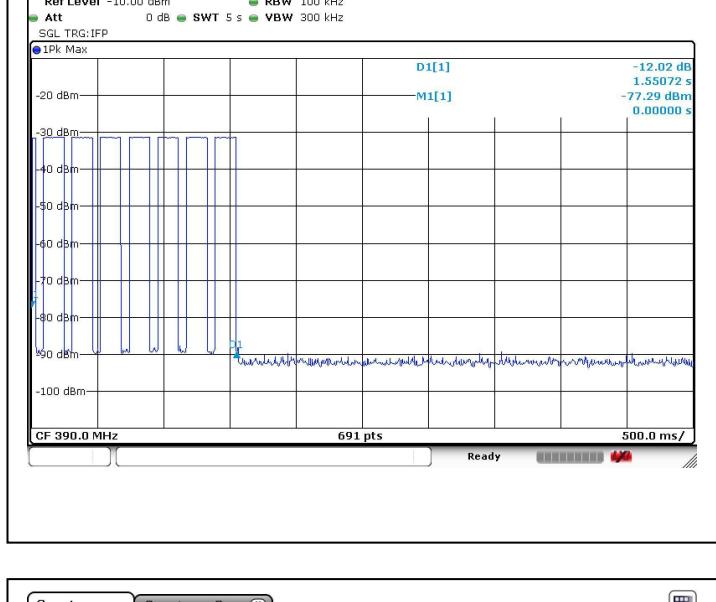
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A3. Transmission Time Plot



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

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