



# CMA Testing and Certification Laboratories

廠商會檢定中心

## TEST REPORT

Report No. : AW0016415(6) Date : April 8, 2018

Application No. : LW008151(4)

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. |
|--------------------|-----------|
| 390MHz Transmitter | EM-102    |

Radio Frequency : 390MHz  
Rating : 1 x 3V button cell  
No. of submitted sample : Two (2) piece (s)  
Sample registration No. : RW011330

Date Received : March 22, 2018

Test Period : March 28, 2018 – April 4, 2018

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


Test Method : 47 CFR Part 15 (10-1-17 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 : \_\_\_\_\_

  
Mr. WONG Lap-pong, Andrew  
Manager  
Electrical Division

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FCC ID: X7ORADIOEM102  
IC: 8860A-RADIOEM102



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### 1 General Information

#### 1.1 General Description

The equipment under test (EUT) model EM-102 is a wireless transmitter. It operates at frequency 390MHz for transmitter. The oscillation of radio control is generated by a 12.1875 MHz crystal for RF transmitter. The EUT is powered by one 3V of CR2032 lithium battery. The EUT contains a button to setup the remote.

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

The brief circuit description is listed as follows:

- |                |   |
|----------------|---|
| -U1            | and its associated circuit act as RF IC             |
| -SW1, SW2, SW3 | and its associated circuit act as switch            |
| -Y2, C11, C12  | and its associated circuit act as oscillation clock |
| -L2, C3, C7,C5 | 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,  
Fo Tan, Shatin,  
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  | ESCS30       | 100001      | 01 Feb 2019          | 1 Year             |
| EMI Test Receiver       | Rohde & Schwarz  | ESCI         | 100152      | 07 Dec 2018          | 1 Year             |
| Spectrum Analyzer       | R&S              | FSV40        | 100964      | 08 Feb 2019          | 1 Year             |
| Spectrum Analyzer       | Rohde & Schwarz  | FSP30        | 100628      | 27 Mar 2019          | 1 Year             |
| Broadband Antenna       | Schaffner        | CBL6112B     | 2692        | 28 Mar 2020          | 2 Years            |
| Loop Antenna            | EMCO             | 6502         | 00056620    | 25 Jan 2020          | 2 Years            |
| Horn Antenna            | Schwarzbeck      | BBHA 9120D   | 9120D-531   | 21 Dec 2018          | 2 Years            |
| Broadband Pre-Amplifier | Schwarzbeck      | BBV 9718     | 9718-119    | 21 Dec 2018          | 2 Years            |
| Horn Antenna            | Schwarzbeck      | BBHA 9170    | BBHA9170442 | 02 Aug 2018          | 2 Years            |
| Broadband Pre-Amplifier | Schwarzbeck      | BBV 9719     | 9719-010    | 02 Aug 2018          | 2 Years            |
| Coaxial Cable           | Schaffner        | RG 213/U     | N/A         | 18 May 2018          | 1 Year             |
| Coaxial Cable           | Suhner           | RG 214/U     | N/A         | 18 May 2018          | 1 Year             |
| Coaxial Cable           | Suhner           | Sucoflex_104 | N/A         | 21 Dec 2018          | 1 Year             |
| LISN                    | Rohde & Schwarz  | ENV216       | 101323      | 16 Jan 2019          | 1 Year             |
| Coaxial Cable           | Tyco Electronics | RG 58C/U     | N/A         | 24 Oct 2018          | 1 Year             |



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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 <sub>lab</sub> ) |
|------------------------------|---------------------------------|
| 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 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 center frequency | -             | RSS-210 Issue 9 Annex A1.1.3                    | Comply |
| Transmission time after manual activation         | 15.231(a)     | RSS-210 Issue 9 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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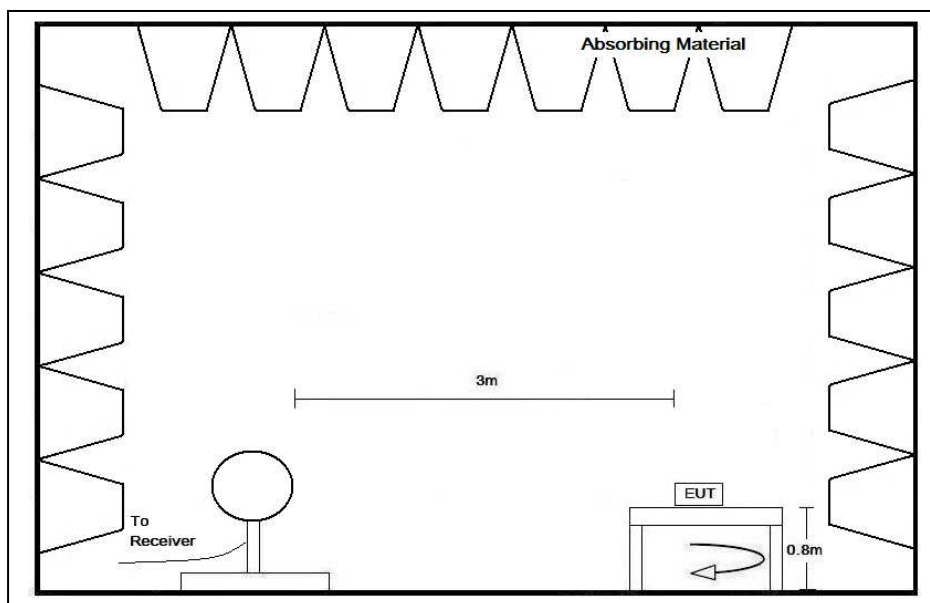
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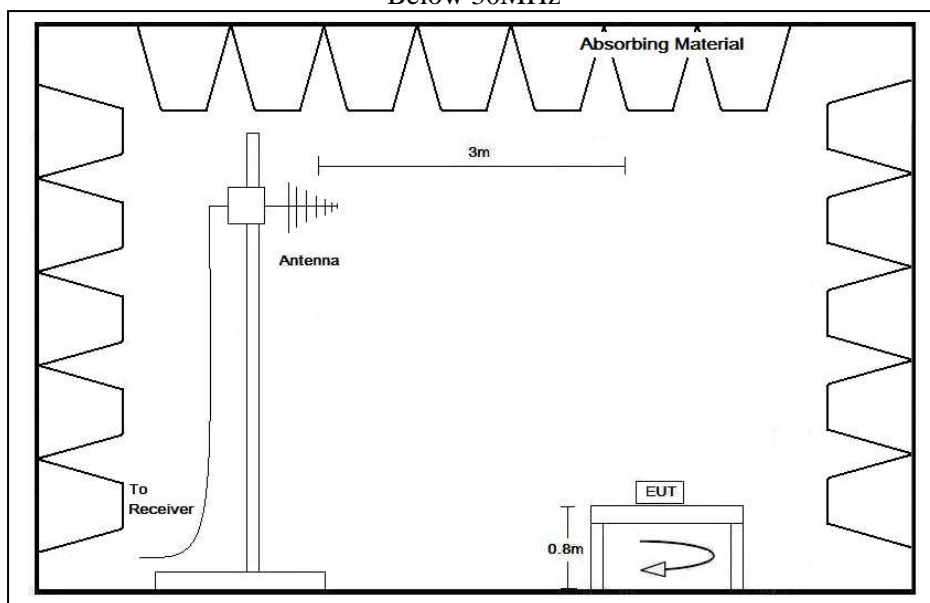
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### 2.2 Test Setup



Below 30MHz



30MHz – 1GHz

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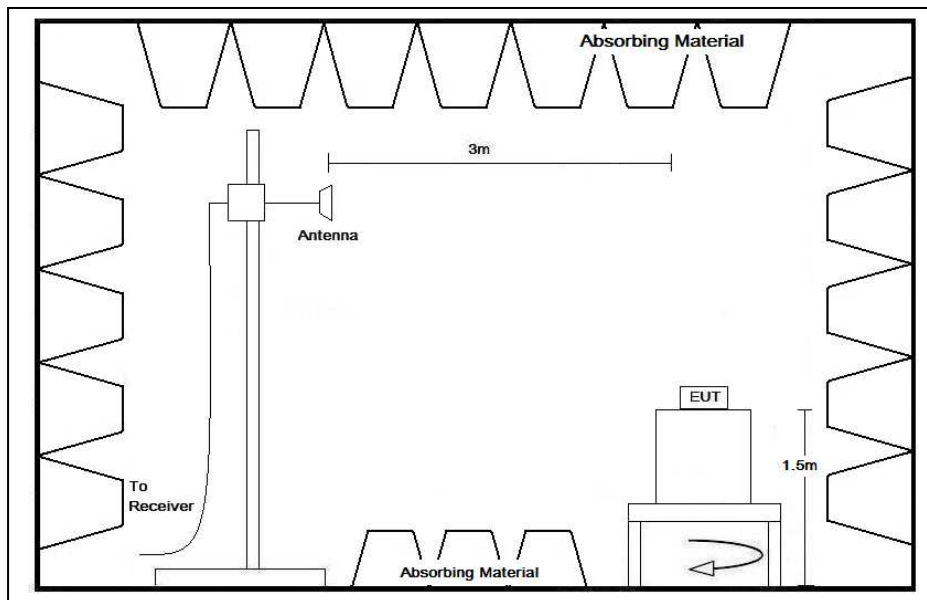
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### 2.2 Test Setup



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: | 24.2 °C        |
| Relative humidity:   | 64.1 %         |

| 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            | 389.989         | 51.4                 | 16.9                                 | 68.3                          | 79.2                 | -10.9       | Peak          |
| V            | 389.986         | 48.7                 | 16.9                                 | 65.6                          | 79.2                 | -13.6       | Peak          |
| H            | *#1169.952      | 57.5                 | -9.0                                 | 48.5                          | 54.0                 | -5.5        | Peak          |
| V            | *#1560.004      | 54.2                 | -8.0                                 | 46.2                          | 54.0                 | -7.8        | Peak          |
| V            | 1949.884        | 56.0                 | -7.2                                 | 48.8                          | 59.2                 | -10.4       | Peak          |
| V            | *#2729.884      | 45.9                 | -4.7                                 | 41.2                          | 54.0                 | -12.8       | Peak          |
| V            | 3119.896        | 49.2                 | -3.3                                 | 45.9                          | 59.2                 | -13.3       | Peak          |
| V            | #3509.980       | 51.5                 | -2.3                                 | 49.2                          | 59.2                 | -10.0       | Peak          |
| V            | *#^3899.896     | 56.7                 | -2.3                                 | 54.4                          | 74.0                 | -19.6       | Peak          |

- Remark: 1) The peak detector value is below the average limit except emission of 3899.896MHz, so no average measurement is done.  
 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) ^ The average value of the emission will be calculated by the average factor measured in next table to compare with average limit



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### 2.4 Radiated Emission Measurement Data

#### Radiated emission

##### Environmental conditions:

| Parameter            | Recorded value |     |
|----------------------|----------------|-----|
| Ambient temperature: | 24.2           | ° C |
| Relative humidity:   | 64.1           | %   |

| Polarization | Frequency (MHz) | Peak value at 3m (dBµV/m) | Average Factor (dB) | Average Value at 3m (dBµV/m) | Average Limit at 3m (dBµV/m) | Margin (dB) | Detector Type |
|--------------|-----------------|---------------------------|---------------------|------------------------------|------------------------------|-------------|---------------|
| V            | 3899.896        | 54.4                      | -5.4                | 49.0                         | 54.0                         | -5.0        | Peak          |

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<sub>10</sub> (Duty cycle), where the Duty cycle is calculated from following section 4.2.



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### 3 Description of the Line-conducted Test

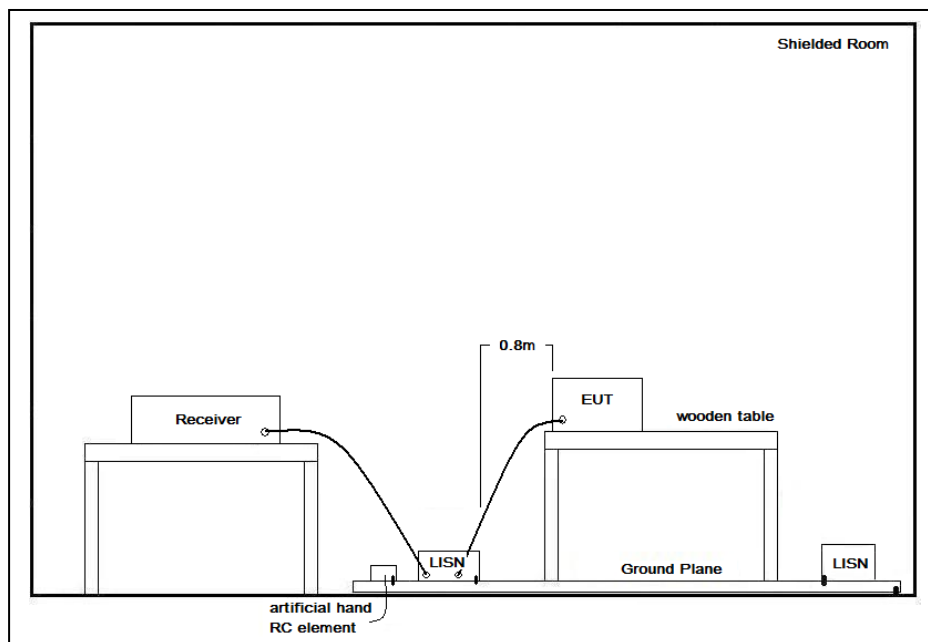
#### 3.1 Test Procedure

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       | 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 4.06kHz and 99% bandwidth is 12.7kHz. 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 A1.1.3 bandwidth requirement.

#### 4.2 Duty cycle

Since the device has difference code from 3 keys are tested, ; the worst case duty cycle is used for the average factor calculation.

Worst case: Key 1

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

$$\text{Time duration of one cycle} = 100 \text{ ms}$$

$$\begin{aligned} \text{Duty Cycle in 100ms} &= (3.24+4.2+22*1.38+22*0.72) \text{ ms}/100\text{ms} \\ &= 53.64 \text{ ms}/100\text{ms} \\ &= 0.5364 \end{aligned}$$

Therefore, the average correction factor is found by  $20 \log_{10} 0.5364 = -5.4\text{dB}$



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### 4.3 Transmission time

All 3 keys are tested and following worst case found:  
Worst case: Key 1

Duration of each transmission = 0.948s

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(s) |
| A2. | Average Factor    | 2 | page(s) |
| A3. | Transmission time | 1 | page(s) |





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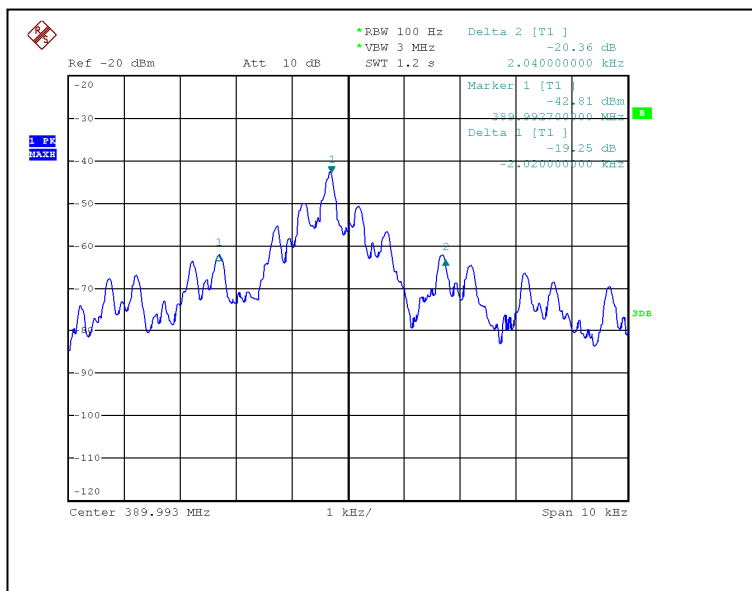
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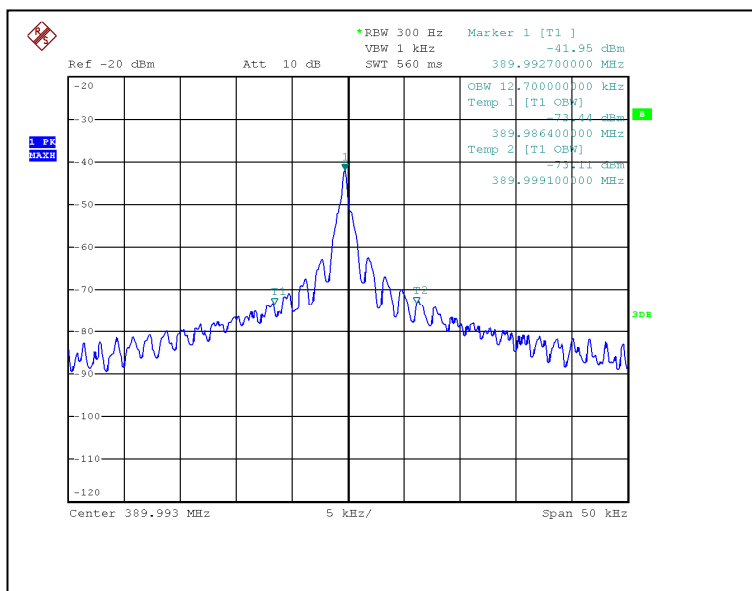
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### A1. Bandwidth Plot



20dB bandwidth



99% occupied bandwidth



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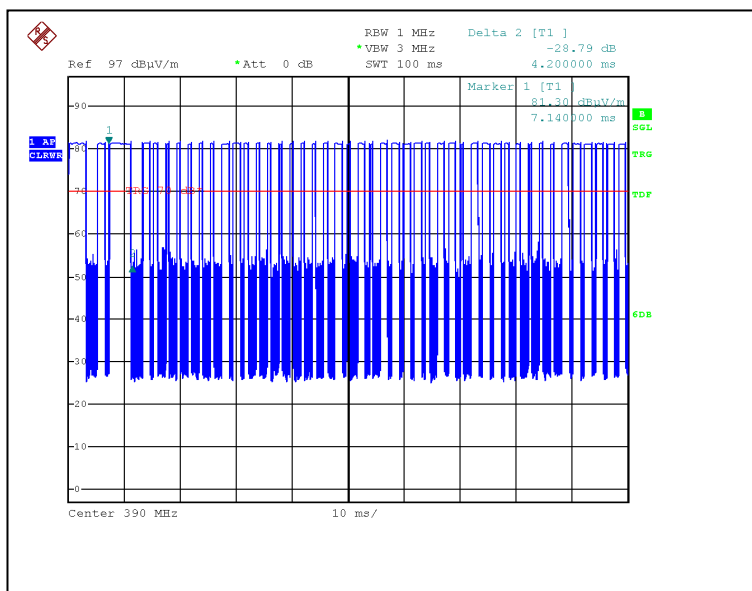
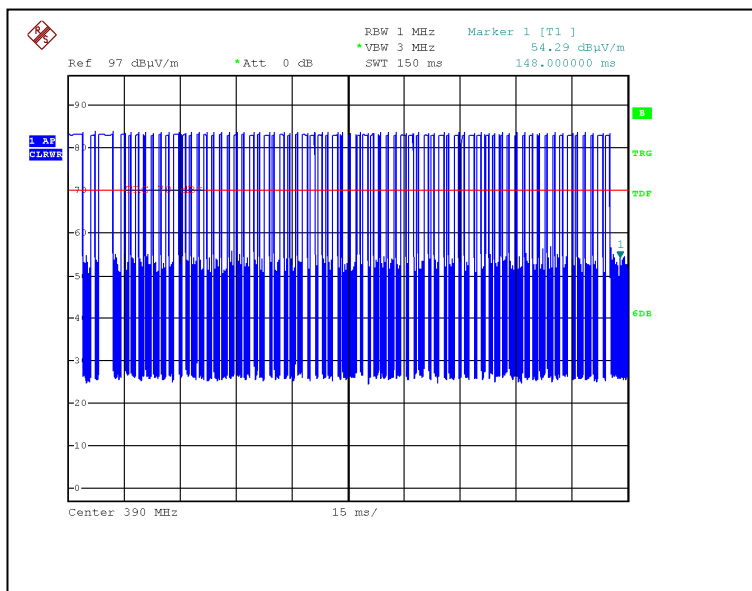
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### A2. Duty Cycle





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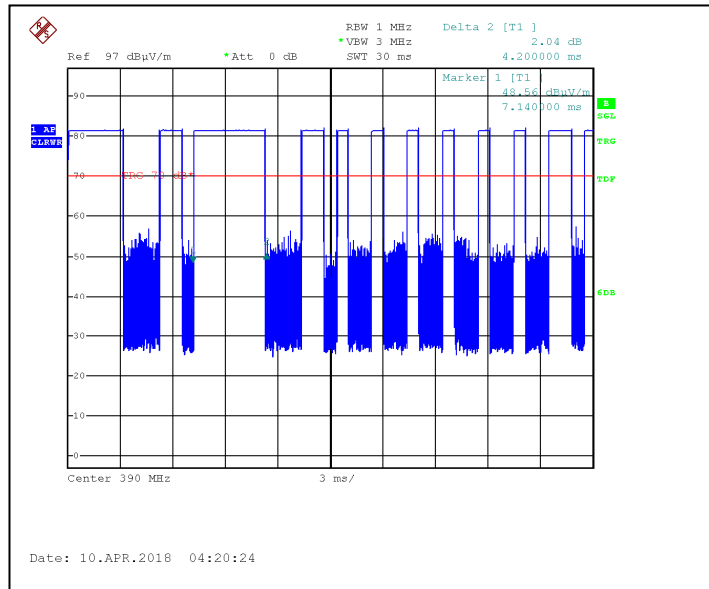
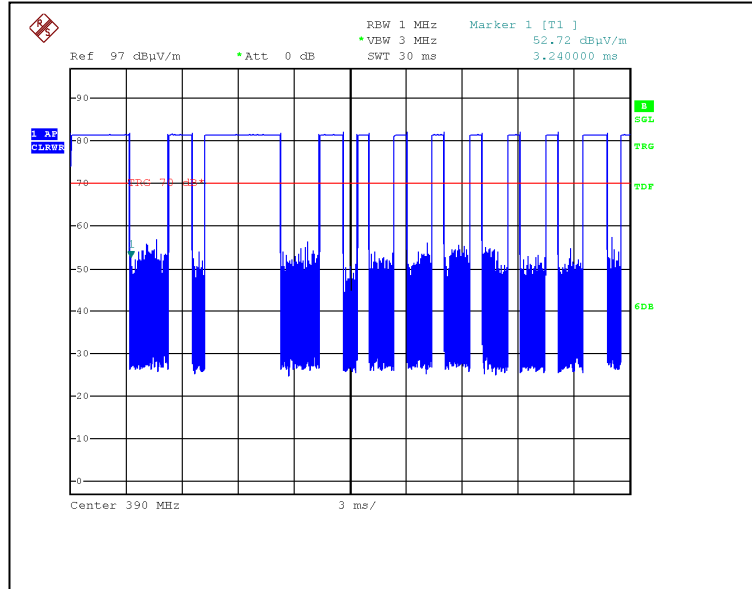
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### A2. Duty Cycle





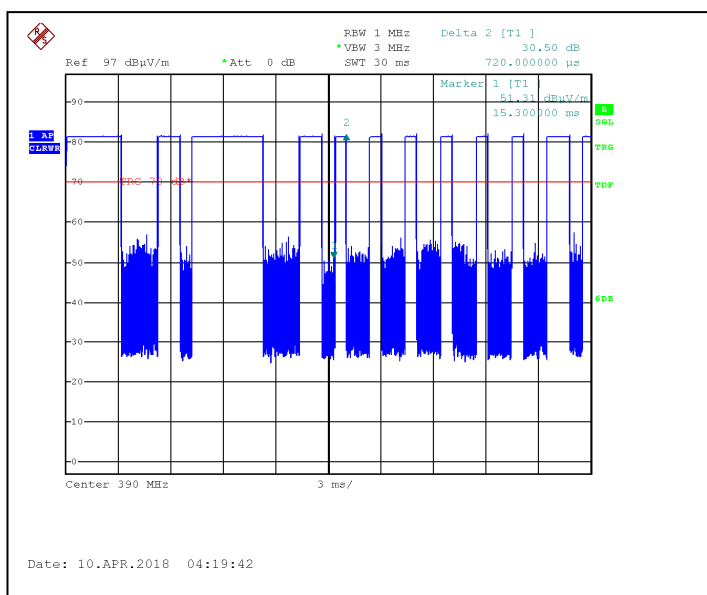
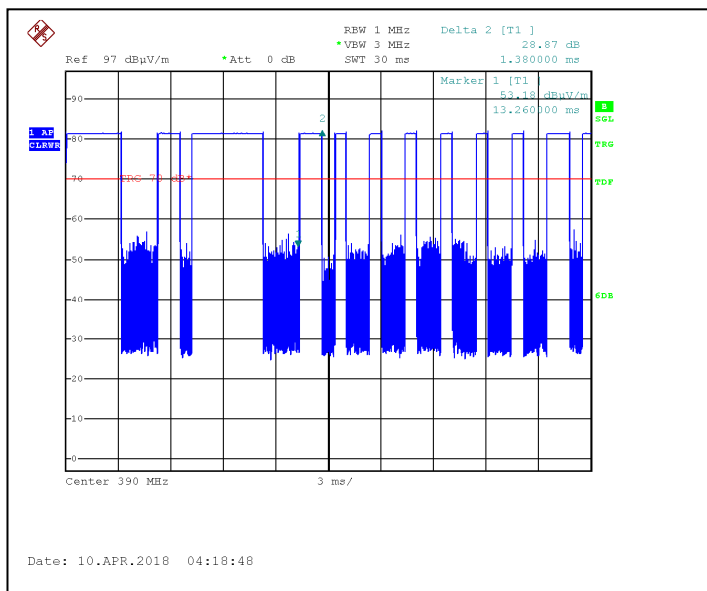
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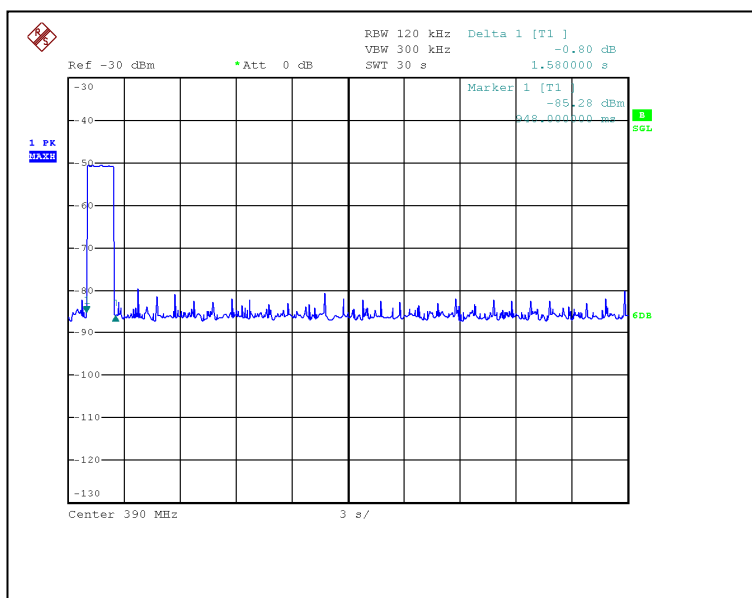
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### A3. Transmission time



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

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