



# CMA Testing and Certification Laboratories

廠商會檢定中心

## TEST REPORT

Report No. : AW0047304(7) Date : August 22, 2018

Application No. : LW021744(7)

Applicant : Toy Shock International Limited  
Unit 302-303, 3/F, Tower B,  
New Mandarin Plaza, 14 Science Museum Road,  
Tsim Sha Tsui East, Kowloon,  
Hong Kong

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

| Sample Description | Model No. |
|--------------------|-----------|
| Air Invader        | 530001A   |

Radio Frequency : 2420 – 2465MHz

Rating : 6 x 1.5V AA batteries

No. of submitted sample : One (1) piece

Sample registration No. : RW021746-001(0)

Date Received : Jul. 17, 2018

Test Period : Jul. 18, 2018 – Aug. 17, 2018

Test Requested : FCC 47CFR Part 15 Certification

Test Method : 47 CFR Part 15 (10-1-17 Edition)  
ANSI C63.10 – 2013  
ANSI C63.4 – 2014

Test Result : See attached sheet(s) from page 2 to 18.

Conclusion : The submitted sample was found to comply with requirement of FCC 47CFR Part 15 Subpart C, section 15.249.

For and on behalf of  
CMA Industrial Development Foundation Limited

Authorized Signature :

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Mr. WONG Lap-pong, Andrew  
Manager  
Electrical Division

FCC ID: 2AHUVLHT0001

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### 1 General Information

#### 1.1 General Description

The equipment under test (EUT) model 530001 is a remote control of the remote controlled helicopter. It operates at frequency band 2420 - 2465MHz for transmitter. The oscillation of radio control is generated by a 16 MHz crystal for RF IC, XNS104. The EUT is powered by six 1.5V AA batteries. The EUT contains two control lever to control ascending, descending, steering, forward and backward of the helicopter; four switch used for left trimming, right trimming, light control and landing control; and a ON/OFF switch.

The brief circuit description is listed as follows:

|                              |  |
|------------------------------|--|
| - U2                         | and its associated circuit act as RF IC, XNS104            |
| - Y1                         | and its associated circuit act as oscillator               |
| - DW1, DW2, K1,K2,K3,K4, KG1 | and its associated circuit act as control lever and switch |
| - L1,C1,C2                   | and its associated circuit act as matching network         |
| - U1                         | and its associated circuit act as power regulator          |

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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,  
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FCC Accredited Lab (Designation Number: HK0004)

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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       | Rohde & Schwarz  | FSV40        | 100964       | 08 Feb 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    | BBHA917 0442 | 01 Aug 2020          | 2 Years            |
| Broadband Pre-Amplifier | Schwarzbeck      | BBV 9719     | 9719-010     | 01 Aug 2020          | 2 Years            |
| Coaxial Cable           | Schaffner        | RG 213/U     | N/A          | 17 May 2019          | 1 Year             |
| Coaxial Cable           | Suhner           | RG 214/U     | N/A          | 17 May 2019          | 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 ( $U_{lab}$ ) |
|-------------------------------|---------------------------|
| 30MHz ~ 200MHz (Horizontal)   | 4.59dB                    |
| 30MHz ~ 200MHz (Vertical)     | 4.49dB                    |
| 200MHz ~ 1000MHz (Horizontal) | 4.94dB                    |
| 200MHz ~ 1000MHz (Vertical)   | 4.97dB                    |
| 1GHz ~ 6GHz                   | 4.52dB                    |
| 6GHz ~ 18GHz                  | 4.58dB                    |

### 1.5 Test Summary

| TEST ITEM         | FCC REFERANCE | RESULT |
|-------------------|---------------|--------|
| Radiated emission | 15.249(a)     | Comply |
| Out-band emission | 15.249(d)     | Comply |
| Peak Limit        | 15.249(e)     | Comply |
| Bandwidth         | 15.215(c)     | 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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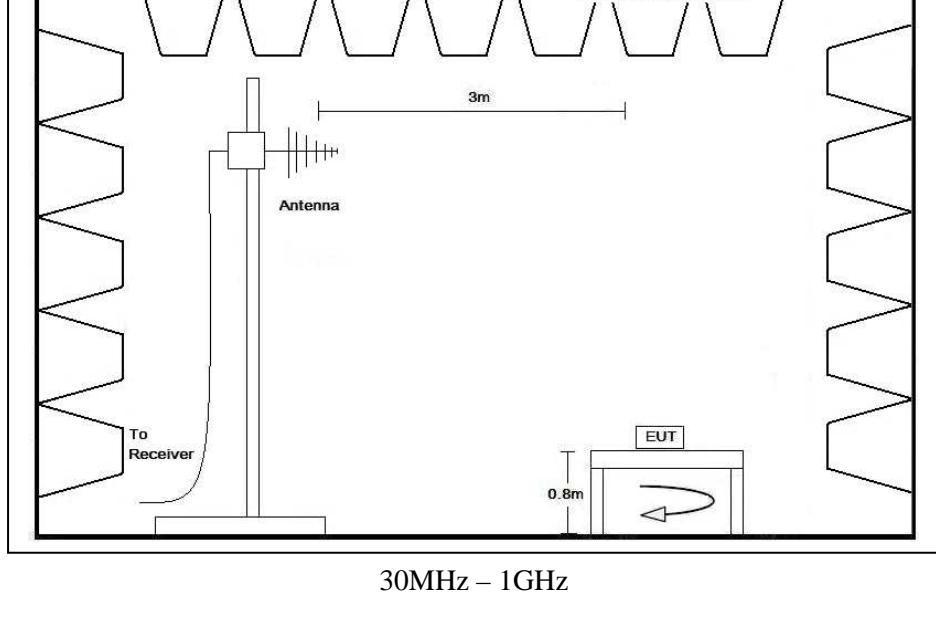
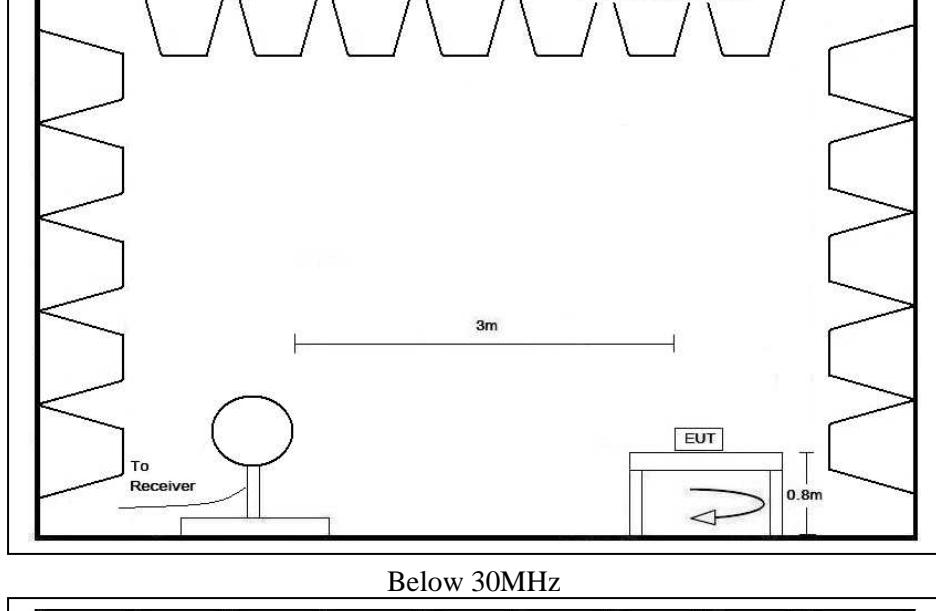
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### 2.2 Test Setup



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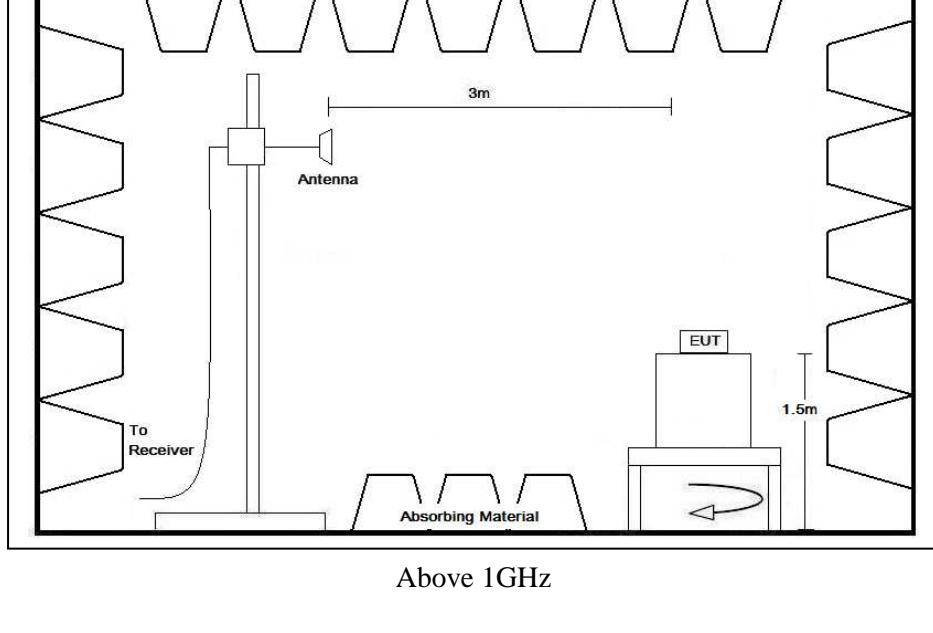
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### 2.2 Test Setup



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 26GHz (the tenth harmonics)

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

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 requirement.

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### 2.4 Radiated Emission Measurement Data

#### Radiated emission

Environmental conditions:

| Parameter            | Recorded value |
|----------------------|----------------|
| Ambient temperature: | 26.7 ° C       |
| Relative humidity:   | 57.5 %         |

Channel: 2420MHz

| Polarization | Frequency (MHz)       | Reading at 3m (dB $\mu$ V) | Antenna Factor and Cable Loss (dB/m) | Field Strength at 3m (dB $\mu$ V/m) | Limit at 3m (dB $\mu$ V/m) | Margin (dB) | Detector Type |
|--------------|-----------------------|----------------------------|--------------------------------------|-------------------------------------|----------------------------|-------------|---------------|
| H            | 2421.248              | 100.1                      | -4.7                                 | 95.4                                | 114.0                      | -18.6       | Peak          |
| H            | 2420.234              | 84.7                       | -4.7                                 | 80.0                                | 94.0                       | -14.0       | Average       |
| V            | 2421.165 <sup>1</sup> | 96.2                       | -4.7                                 | 91.5                                | 94.0                       | -2.5        | Peak          |
| H            | 2400.000              | 59.3                       | -4.7                                 | 54.6                                | 74.0                       | -19.4       | Peak          |
| H            | 2400.000              | 27.7                       | -4.7                                 | 23.0                                | 54.0                       | -31.0       | Average       |
| V            | 4840.129              | 61.1                       | 2.3                                  | 63.4                                | 74.0                       | -10.6       | Peak          |
| V            | 4840.175              | 45.3                       | 2.3                                  | 47.6                                | 54.0                       | -6.4        | Average       |
| V            | 7260.107 <sup>1</sup> | 43.7                       | 9.6                                  | 53.3                                | 54.0                       | -0.7        | Peak          |
| V            | 9680.157 <sup>1</sup> | 36.5                       | 12.7                                 | 49.2                                | 54.0                       | -4.8        | Peak          |

Remark: 1) The peak value of emission 2421.165MHz, 7260.107MHz and 9680.157MHz are below the average limit, so no average measurement is performed.

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Channel: 2445 MHz

| Polarization | Frequency (MHz)       | Reading at 3m (dB $\mu$ V) | Antenna Factor and Cable Loss (dB/m) | Field Strength at 3m (dB $\mu$ V/m) | Limit at 3m (dB $\mu$ V/m) | Margin (dB) | Detector Type |
|--------------|-----------------------|----------------------------|--------------------------------------|-------------------------------------|----------------------------|-------------|---------------|
| H            | 2445.721              | 100.2                      | -4.7                                 | 95.5                                | 114.0                      | -18.5       | Peak          |
| H            | 2445.136              | 85.3                       | -4.7                                 | 80.6                                | 94.0                       | -13.4       | Average       |
| V            | 2445.020 <sup>1</sup> | 96.1                       | -4.7                                 | 91.4                                | 94.0                       | -2.6        | Peak          |
| V            | 4890.152              | 60.7                       | 2.3                                  | 63.0                                | 74.0                       | -11.0       | Peak          |
| V            | 4890.142              | 45.2                       | 2.3                                  | 47.5                                | 54.0                       | -6.5        | Average       |
| H            | 7334.466 <sup>1</sup> | 43.5                       | 9.6                                  | 53.1                                | 54.0                       | -0.9        | Peak          |
| V            | 9780.136 <sup>1</sup> | 33.5                       | 12.7                                 | 46.2                                | 54.0                       | -7.8        | Peak          |

Remark: 1) The peak value of emission 2445.020MHz, 7334.466MHz and 9780.136MHz are below the average limit, so no average measurement is performed.

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Channel: 2465MHz

| Polarization | Frequency (MHz)       | Reading at 3m (dB $\mu$ V) | Antenna Factor and Cable Loss (dB/m) | Field Strength at 3m (dB $\mu$ V/m) | Limit at 3m (dB $\mu$ V/m) | Margin (dB) | Detector Type |
|--------------|-----------------------|----------------------------|--------------------------------------|-------------------------------------|----------------------------|-------------|---------------|
| H            | 2465.467              | 99.9                       | -4.7                                 | 95.2                                | 114.0                      | -18.8       | Peak          |
| H            | 2465.101              | 85.1                       | -4.7                                 | 80.4                                | 94.0                       | -13.6       | Average       |
| V            | 2465.461 <sup>1</sup> | 96.2                       | -4.7                                 | 91.5                                | 94.0                       | -2.5        | Peak          |
| H            | 2483.500              | 59.0                       | -4.7                                 | 54.3                                | 74.0                       | -19.7       | Peak          |
| H            | 2483.500              | 27.5                       | -4.7                                 | 22.8                                | 54.0                       | -31.2       | Average       |
| V            | 4930.685              | 60.0                       | 2.8                                  | 62.8                                | 74.0                       | -11.2       | Peak          |
| V            | 4930.181              | 44.6                       | 2.8                                  | 47.4                                | 54.0                       | -6.6        | Average       |
| V            | 7395.115 <sup>1</sup> | 43.9                       | 9.6                                  | 53.5                                | 54.0                       | -0.5        | Peak          |
| V            | 9860.235 <sup>1</sup> | 35.5                       | 12.7                                 | 48.2                                | 54.0                       | -5.8        | Peak          |

Remark: 1) The peak value of emission 2465.461MHz, 7395.115MHz and 9860.235MHz are below the average limit, so no average measurement is performed.

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### 3 Description of the Line-conducted Test

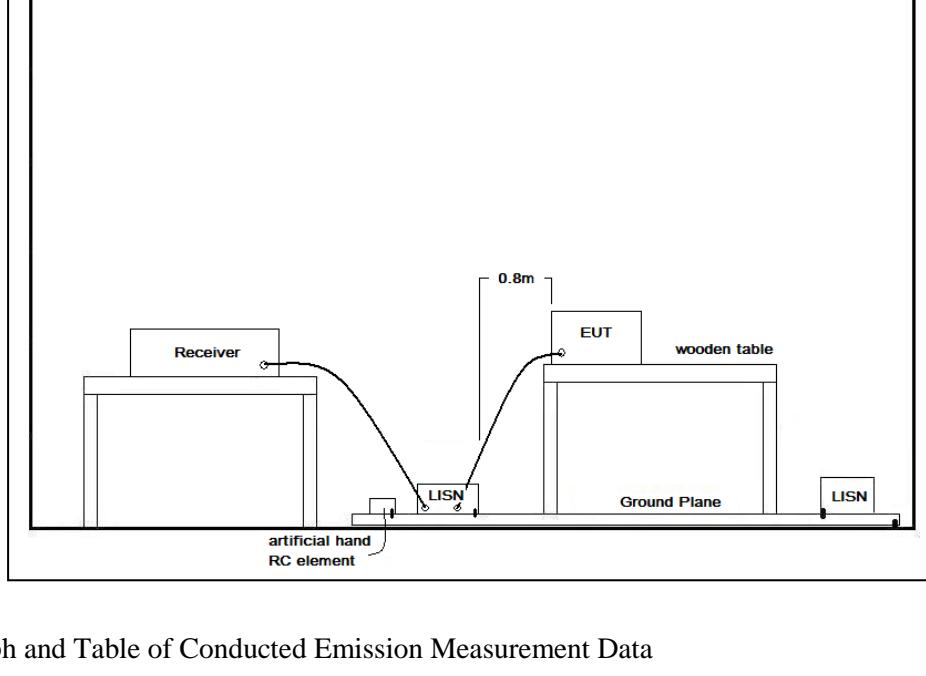
#### 3.1 Test Procedure

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 are shown the fundamental emission is confined in the specified band. 20dB bandwidth is 3.34MHz . The bandwidth fall in the band of 2400 – 2483.5MHz It also shows that the EUT met the requirement of FCC Part 15.215(c).

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### 5 Appendices

A1. 20dB Bandwidth Plot 2 page(s)



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### A1. 20dB Bandwidth Plot



Channel: 2420MHz



Channel: 2445MHz

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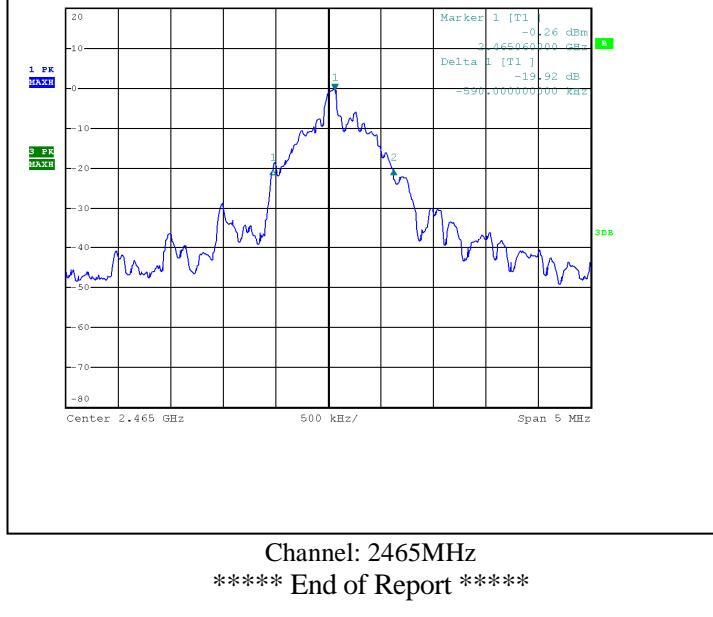
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Channel: 2465MHz  
\*\*\*\*\* End of Report \*\*\*\*\*

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