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 : _____ Page 1 of 18

Mr. WONG Lap-pong, Andrew
Manager
Electrical Division

FCC ID: 2AHUVLHT0001

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TEST REPORT

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

Table of Contents

1 General Information 3
1.1 General Description 3
1.2 Location of the test site 4
1.3 List of measuring equipment 5
1.4 Measurement Uncertainty 6
1.5 Test Summary 6
2 Description of the radiated emission test 7
2.1 Test Procedure 7
2.2 Test Setup 8
2.3 Test Result 10
3.1 Test Procedure 14
3.2 Test Result 14
3.3 Test Setup 14
3.4 Graph and Table of Conducted Emission Measurement Data 14
4 Supplementary document 15
4.1 Bandwidth 15
5 Appendices 16

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TEST REPORT

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

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,
New Territories,
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FCC Accredited Lab (Designation Number: HK0004)

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TEST REPORT

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

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	1Year
EMI Test Receiver	Rohde & Schwarz	ESCI	100152	07 Dec 2018	1Year
Spectrum Analyzer	Rohde & Schwarz	FSV40	100964	08 Feb 2019	1Year
Broadband Antenna	Schaffner	CBL6112B	2692	28 Mar 2020	2Years
Loop Antenna	EMCO	6502	00056620	25 Jan 2020	2Years
Horn Antenna	Schwarzbeck	BBHA 9120D	9120D-531	21 Dec 2018	2Years
Broadband Pre-Amplifier	Schwarzbeck	BBV 9718	9718-119	21 Dec 2018	2Years
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170442	01 Aug 2020	2Years
Broadband Pre-Amplifier	Schwarzbeck	BBV 9719	9719-010	01 Aug 2020	2Years
Coaxial Cable	Schaffner	RG 213/U	N/A	17 May 2019	1Year
Coaxial Cable	Suhner	RG 214/U	N/A	17 May 2019	1Year
Coaxial Cable	Suhner	Sucoflex_104	N/A	21 Dec 2018	1Year
LISN	Rohde & Schwarz	ENV216	101323	16 Jan 2019	1Year
Coaxial Cable	Tyco Electronics	RG 58C/U	N/A	24 Oct 2018	1Year

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TEST REPORT

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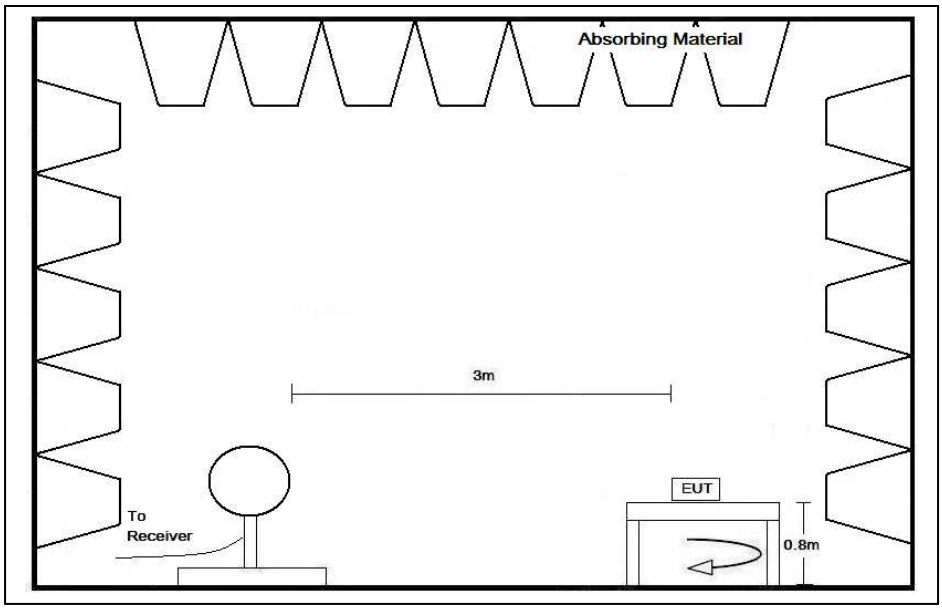
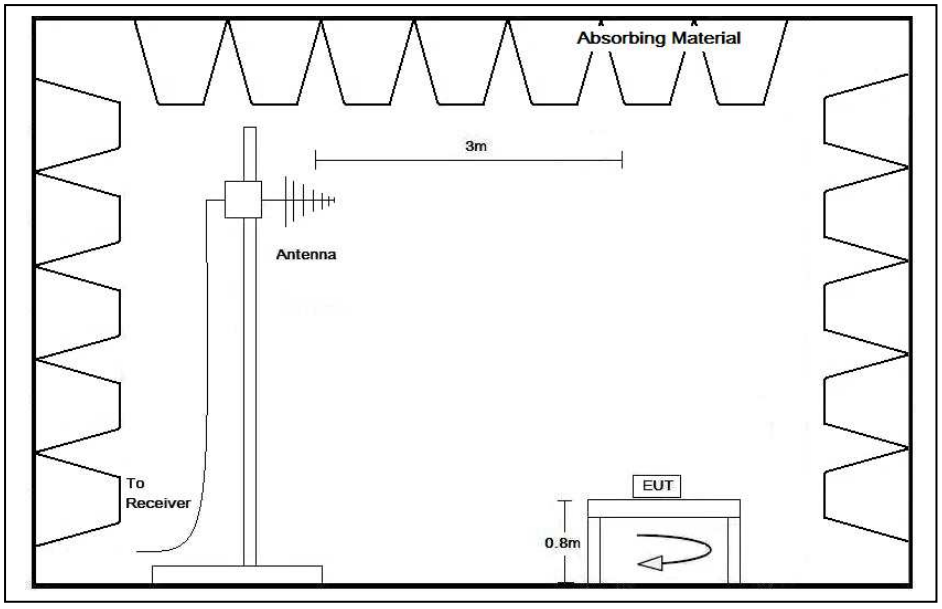
Report No. : AW0047304(7) Date : August 22, 2018

2.2 Test Setup



Below 30MHz



30MHz – 1GHz

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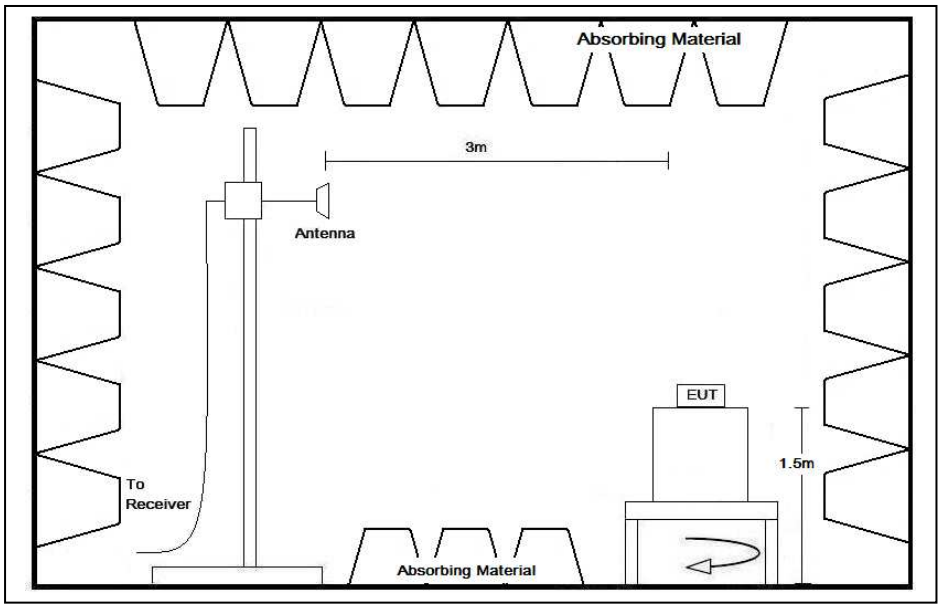
TEST REPORT

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

2.2 Test Setup



Above 1GHz

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TEST REPORT

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

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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TEST REPORT

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

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 (dBμV)	Antenna Factor and Cable Loss (dB/m)	Field Strength at 3m (dBμV/m)	Limit at 3m (dBμV/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[1]	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[1]	43.7	9.6	53.3	54.0	-0.7	Peak
V	9680.157[1]	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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TEST REPORT

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

Channel: 2445 MHz

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	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[1]	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[1]	43.5	9.6	53.1	54.0	-0.9	Peak
V	9780.136[1]	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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TEST REPORT

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

Channel: 2465MHz

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	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[1]	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[1]	43.9	9.6	53.5	54.0	-0.5	Peak
V	9860.235[1]	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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TEST REPORT

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

3 Description of the Line-conducted Test

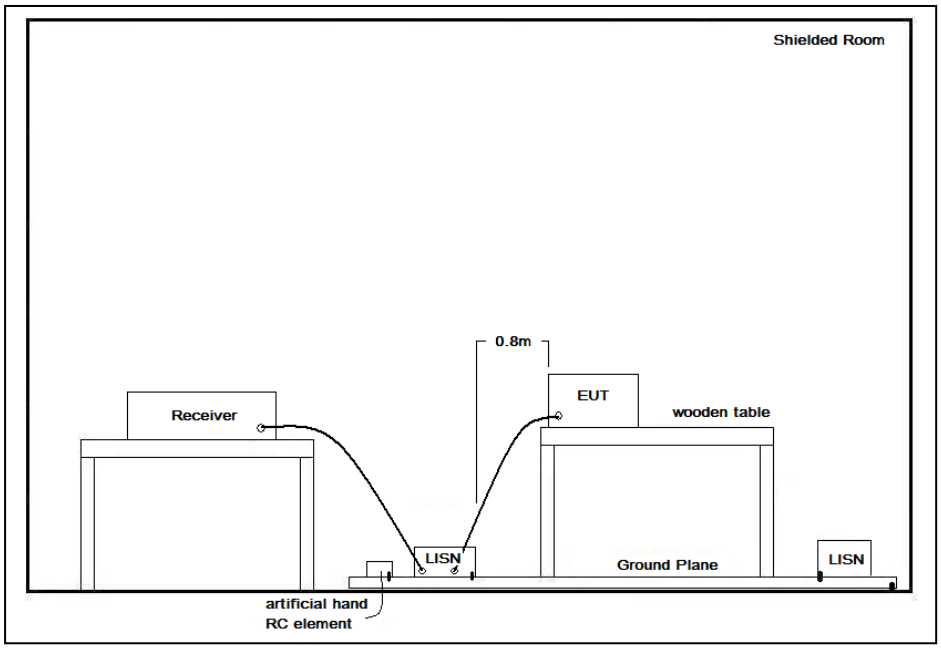
3.1 Test Procedure

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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TEST REPORT

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

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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TEST REPORT

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

5 Appendices

A1. 20dB Bandwidth Plot 2 page(s)

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TEST REPORT

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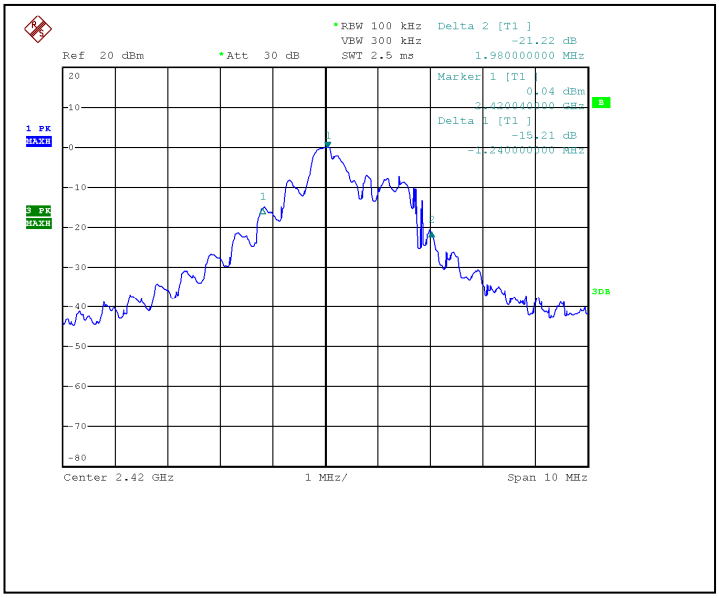
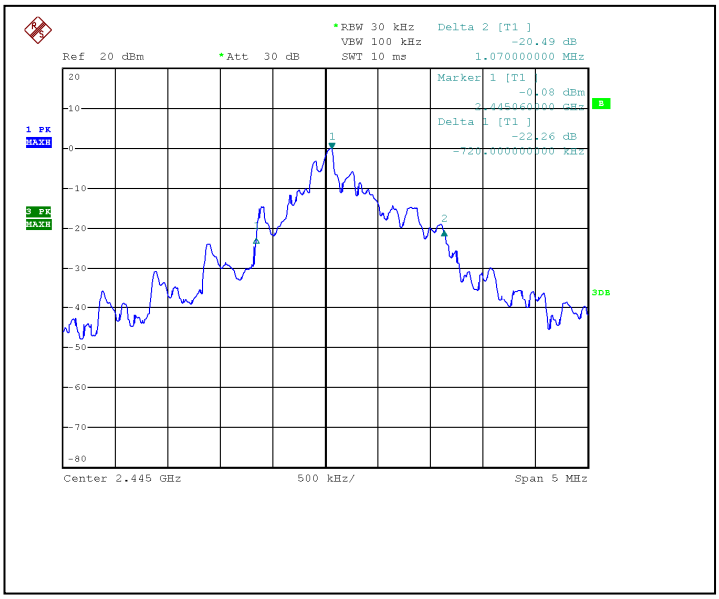
A1. 20dB Bandwidth Plot



Channel: 2420MHz



Channel: 2445MHz

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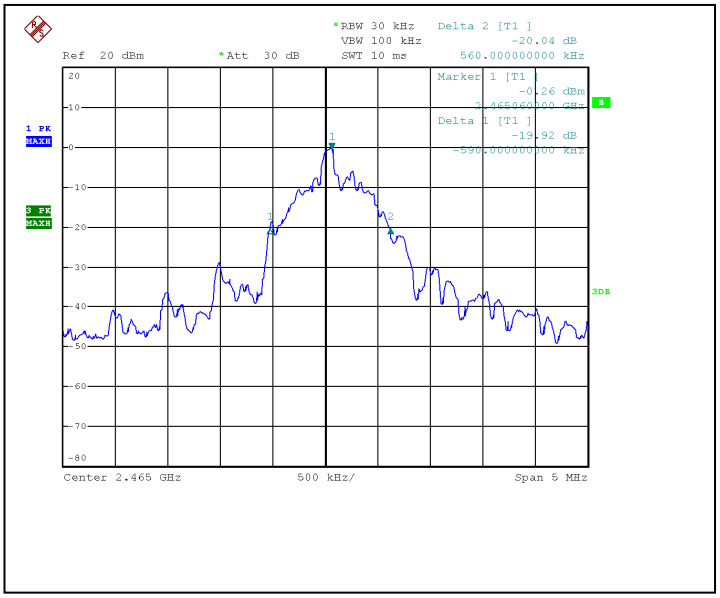

Channel: 2465MHz

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

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