

FCC Test report for parts 15.109

Product name : DS02
Applicant : TWTG R&D B.V.

Test report No. : P000052180 002 Ver 3.00

Laboratory information

Accreditation

Telefication complies with the accreditation criteria for test laboratories as laid down in ISO/IEC 17025:2017. The accreditation covers the quality system of the laboratory as well as the specific activities as described in the authorized annex bearing the accreditation number L021 and is granted on 30 November 1990 by the Dutch Council For Accreditation (RvA: Raad voor Accreditatie).

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Documentation

The test report must always be reproduced in full; reproduction of an excerpt only is subject to written approval of the testing laboratory. The documentation of the testing performed on the tested devices is archived for 10 years at Telefication Netherlands.

Testing Location

Test Site	Telefication BV
Test Site location	Edisonstraat 12a 6902 PK Zevenaar The Netherlands Tel. +31316583180 Fax. +31316583189
Test Site FCC	NL0001

Revision History

Version	Date	Remarks	By
v0.50	04-10-2022	First draft	KK
v1.00	08-11-2022	Release version	KK
v2.00	14-11-2022	Product name changed	KK
v3.00	14-12-2022	Chapter 1.8 EUT descriptions added Chapter 3.1.6 limit line information added Chapter 1.6 standard information corrected	KK

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Summary of Test results

FCC part 15B	ISED	Description	Section in report	Verdict
15.109 (b)	RSS-Gen 8.9	Radiated spurious emissions	3.1	Pass

1 General Description

1.1 Applicant

Client name:	TWTG R&D B.V.
Address	Schaardijk 386, Zuid Holland, Capelle a/d IJssel, The Netherlands
Zip code:	2909LA
Telephone:	+31 10 203 7905
E-mail:	wesley.kerstens@twtg.io
Contact name:	Wesley Kerstens

1.2 Manufacturer

Manufacturer name:	TWTG R&D B.V.
Address:	Schaardijk 386, Zuid Holland, Capelle a/d IJssel, The Netherlands
Zip code:	2909LA
Telephone:	+31 10 203 7905
E-mail:	wesley.kerstens@twtg.io
Contact name:	Wesley Kerstens

1.3 Tested Equipment Under Test (EUT)

Product name:	DS02
Brand name:	TWTG R&D B.V.
Model(s):	-
Batch and/or serial No.	-
Software version:	1.0
Hardware version:	A8
Date of receipt	17-11-2021
Tests started:	27-07-2022
Testing ended:	27-09-2022

1.4 Product specifications of Equipment under test

Tx Frequency:	902 – 928 MHz
Rx frequency:	902 – 928 MHz
Antenna type	PCB Antenna
Antenna gain:	-0.54 dBd
Type of modulation:	Proprietary

1.5 Environmental conditions

Test date	27-07-2022
Ambient temperature	21.5 °C
Humidity	43.4 %

1.6 Measurement standards

- ANSI C63.4:2014

1.7 Applicable standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15 Subpart B §15.109

1.8 Observation and remarks

The EUT is considered class B equipment. EUT is battery powered device that's why conducted emission test is not applicable. The EUT has been tested in worst case orientations. In the report 3 model has been tested which are:

- DS-LD-02-00
Wireless LoRaWAN LVDS Transmitter. Used in conjunction with DS-VB-02-00 (non-radio) Vibration Sensor to wireless monitor vibrations.
- DS-TT-02-00
Wireless LoRaWAN Temperature Transmitter. Used with Thermocouple or RTD (PT100) sensors to measure temperature. The sensors can be connected to the M12 connector of the Transmitter.
- DS-RT-02-00
Wireless LoRaWAN Ratiometric Transmitter. Used with ratiometric sensors like pressure sensors. The sensor can be connected to the M12 connector of the transmitter.

1.9 Conclusions

The sample of the product showed **NO NON-COMPLIANCES** to the specifications stated in paragraph 1.7 of this report.

The results of the test as stated in this report, are exclusively applicable to the product items as identified in this report. Telefication accepts no responsibility for any properties of product items in this test report, which are not supported by the tests as specified in paragraph 1.7 *"Applicable standards"*.

All conducted tests are performed by:

Name : Koray Korcum, MSc

Review of test methods and report by:

Name : Raoul Tolud, MSc

The above conclusions have been verified by the following signatory:

Date : 14-12-2022

Name : P. van Wanrooij

Function : Test Engineer

Signature :



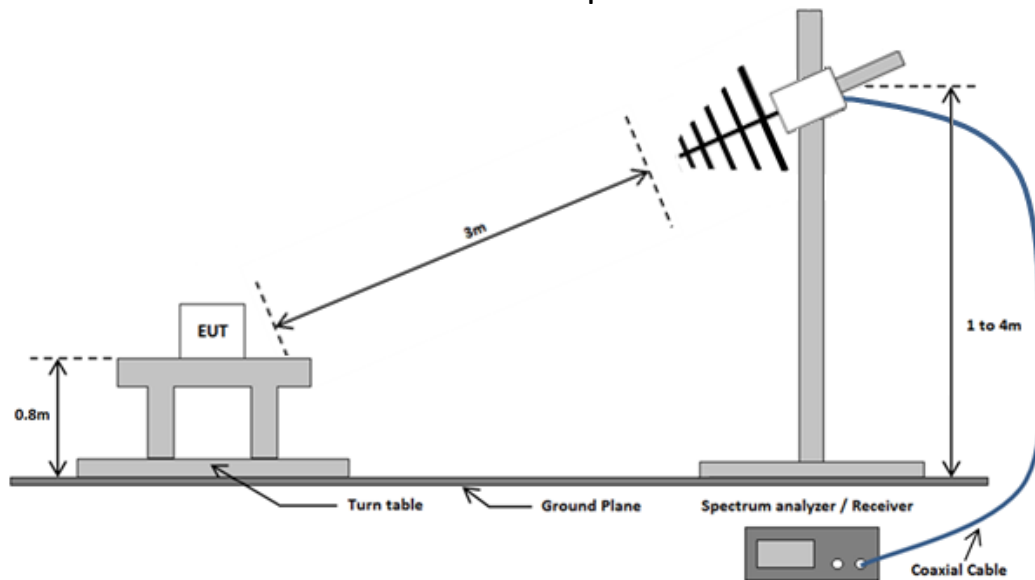
2 Test configuration of the Equipment Under Test

2.1 Test mode

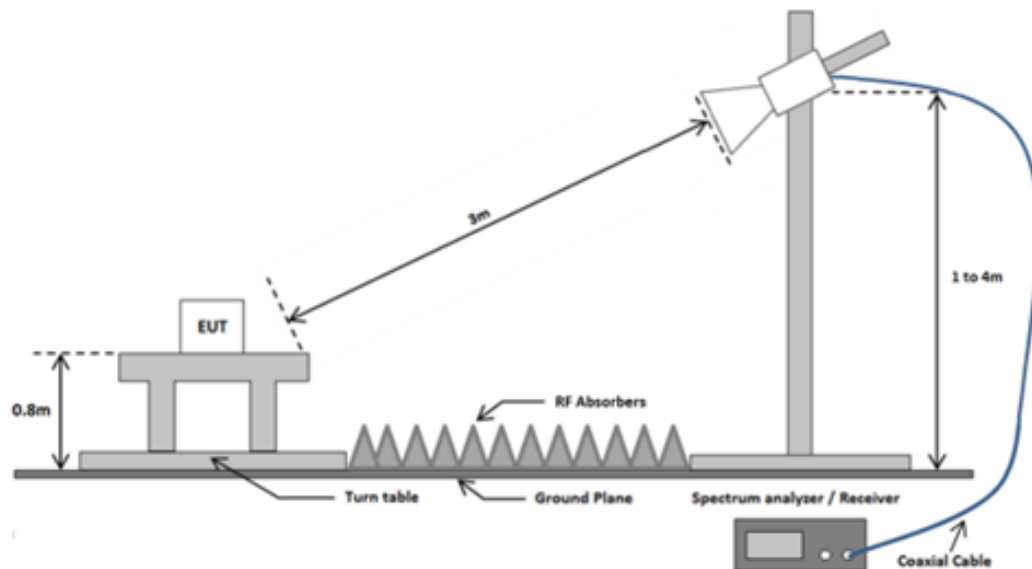
The EUT is tested in normal operating mode, with all ports connected.

2.2 Test setups

Radiated emissions test setup 30 MHz - 1 GHz



Radiated emissions test setup above 1 GHz



2.3 Equipment used in the test configuration

Description	Manufacturer	Model	ID	Cal. Done date	Cal. due date	Used at Par.
Spectrum analyzer	Rohde & Schwarz	FSP40	TE11125	03-2022	03-2023	3.1
EMI Receiver	Rohde & Schwarz	ESR7	114534	04-2022	04-2023	3.1
Test software	DARE	Radimation	--	-	-	3.1
Biconical antenna + 6dB attenuator	Schwarzbeck + HP	VHA9103 + 8491A	114436 + 114254	03-2021	03-2024	3.1
Logperiodic antenna	EMCO	3147	114385	03-2021	03-2024	3.1
Horn antenna	EMCO	3115	114607	01-2021	01-2024	3.1
Preamplifier 1-18 GHz	µComp Nordic	MCNA-40-0010800-25-10P	TE11175	01-2022	01-2023	3.1

3 Test results

3.1 Radiated spurious emissions

3.1.1 Limit

15.109 (b)

The field strength of radiated emissions from a Class B digital device shall not exceed the following:

Frequency of emission (MHz)	Field strength at 3m (dB μ V/m)
30 – 88	40.0
88 – 216	43.5
216 – 960	46.0
960 and above	54.0

3.1.2 Measurement instruments

The measurement instruments are listed in chapter 2.3 of this report.

3.1.3 Test setup

The test setup is as shown in chapter 2.2 of this report.

3.1.4 Test procedure

9 kHz – 30 MHz: According to ANSI C63.4-2014, section 5.4.2 and 8.2.3

30 MHz to 26.5 GHz: According to ANSI C63.4-2014, section 8.3

9 kHz to 30 MHz: IRN 026 – Method 10

30 MHz to 1 GHz: IRN 026 – Method 1

1 GHz to 18 GHz: IRN 026 – Method 2

18 to 26.5 GHz: IRN 026 – Method 3

3.1.5 Measurement Uncertainty

Frequency range	Polarization	Uncertainty
30 – 200 MHz	Horizontal	± 4.5 dB
	Vertical	± 5.4 dB
200 -1000 MHz	Horizontal	± 3.6 dB
	Vertical	± 4.6 dB
1 – 18 GHz	Horizontal	± 5.7 dB
	Vertical	± 5.7 dB
18 – 26.5 GHz	Horizontal	± 4.9 dB
	Vertical	± 4.9 dB

3.1.6 Peak table

Frequency	Peak	Peak Limit	Average	Average Limit	Status	Angle	Height	Polarization
2,624 GHz	42,6 dB μ V/m	74 dB μ V/m	30,8 dB μ V/m	54 dB μ V/m	Pass	152 degrees	1 m	Horizontal
2,602 GHz	52,7 dB μ V/m	74 dB μ V/m	51,4 dB μ V/m	54 dB μ V/m	Pass	149 degrees	1,5 m	Vertical
5,204 GHz	55,8 dB μ V/m	74 dB μ V/m	52,7 dB μ V/m	54 dB μ V/m	Pass	59 degrees	2 m	Vertical
512,313 MHz	36,9 dB μ V/m	46 dB μ V/m	-	-	Pass	294 degrees	3,5 m	Vertical
494,125 MHz	36,5 dB μ V/m	46 dB μ V/m	-	-	Pass	217 degrees	1 m	Vertical
996,625 MHz	44,1 dB μ V/m	54 dB μ V/m	-	-	Pass	140 degrees	3,5 m	Horizontal

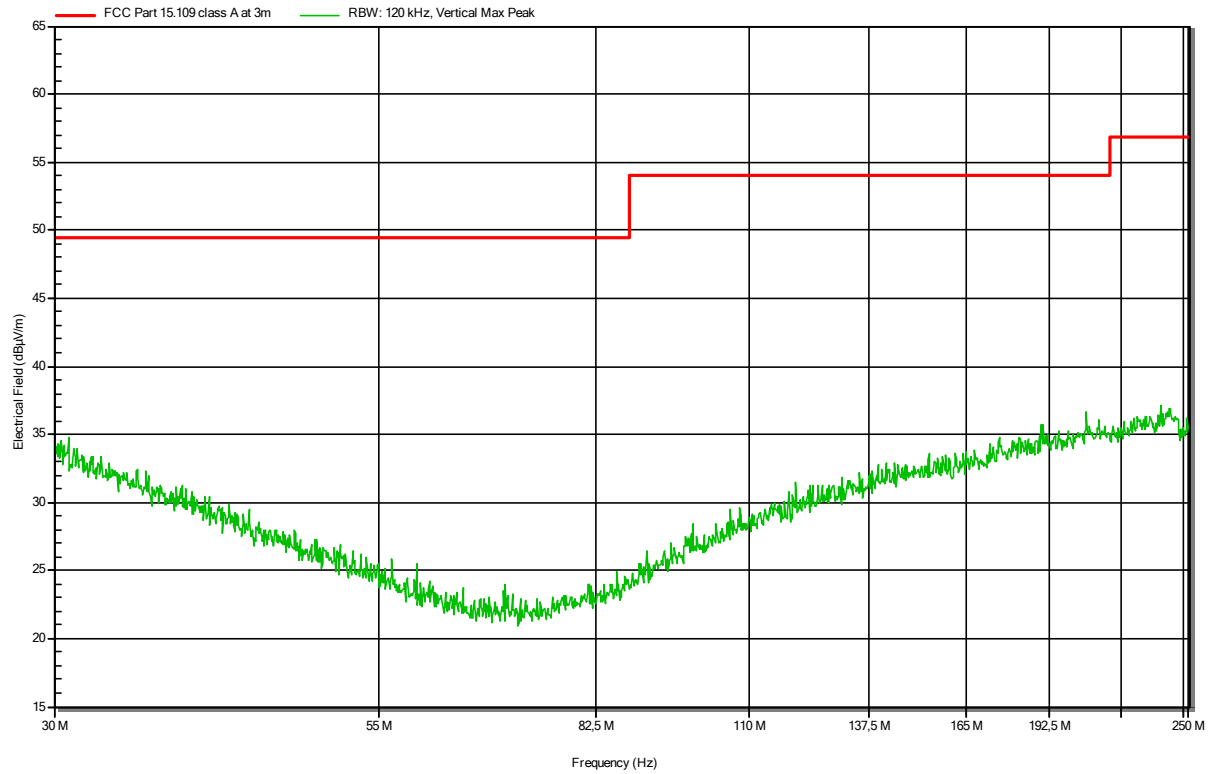
Note: Radiated spurious emission measurement plots shown in the chapter 3.1.7, has been presented with class A limit line below 1 GHz, however the measurements are performed according to class B and complies with the class B limit.

3.1.7 Plots of the Radiated Spurious Emissions Measurement

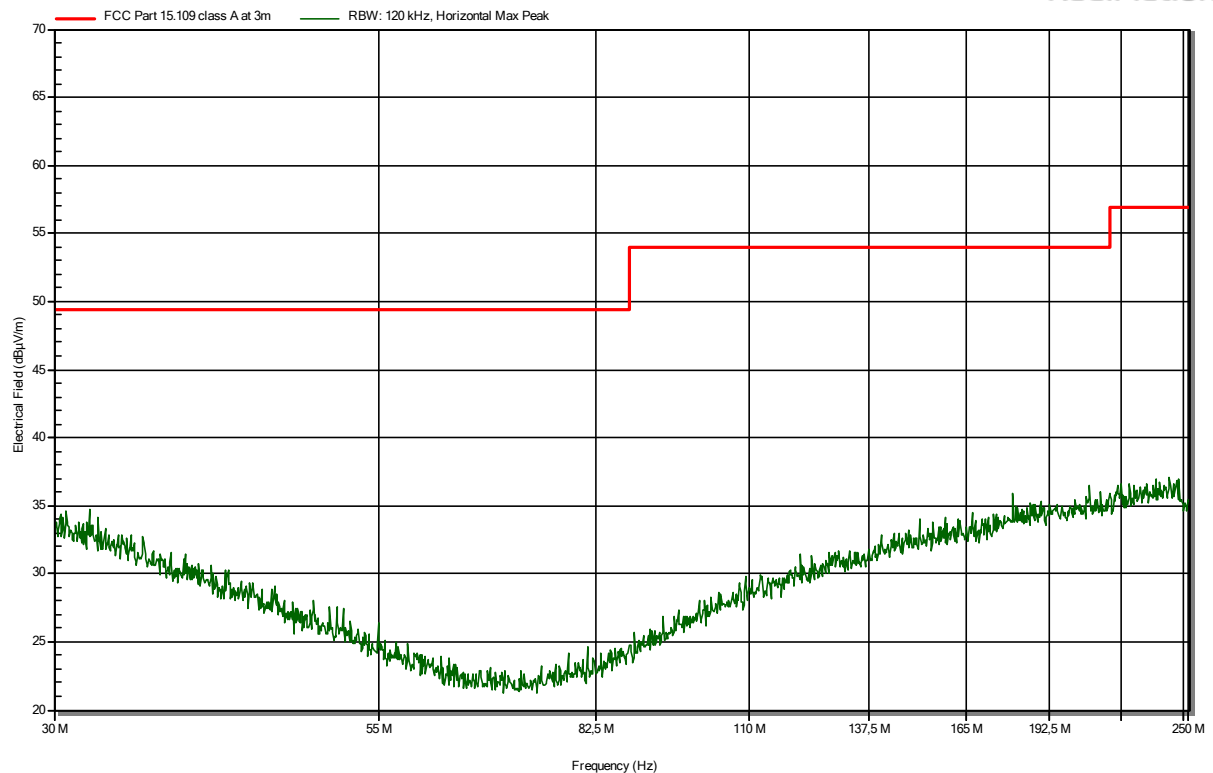
30 -250 MHz

TWTG DS-VB-01-02

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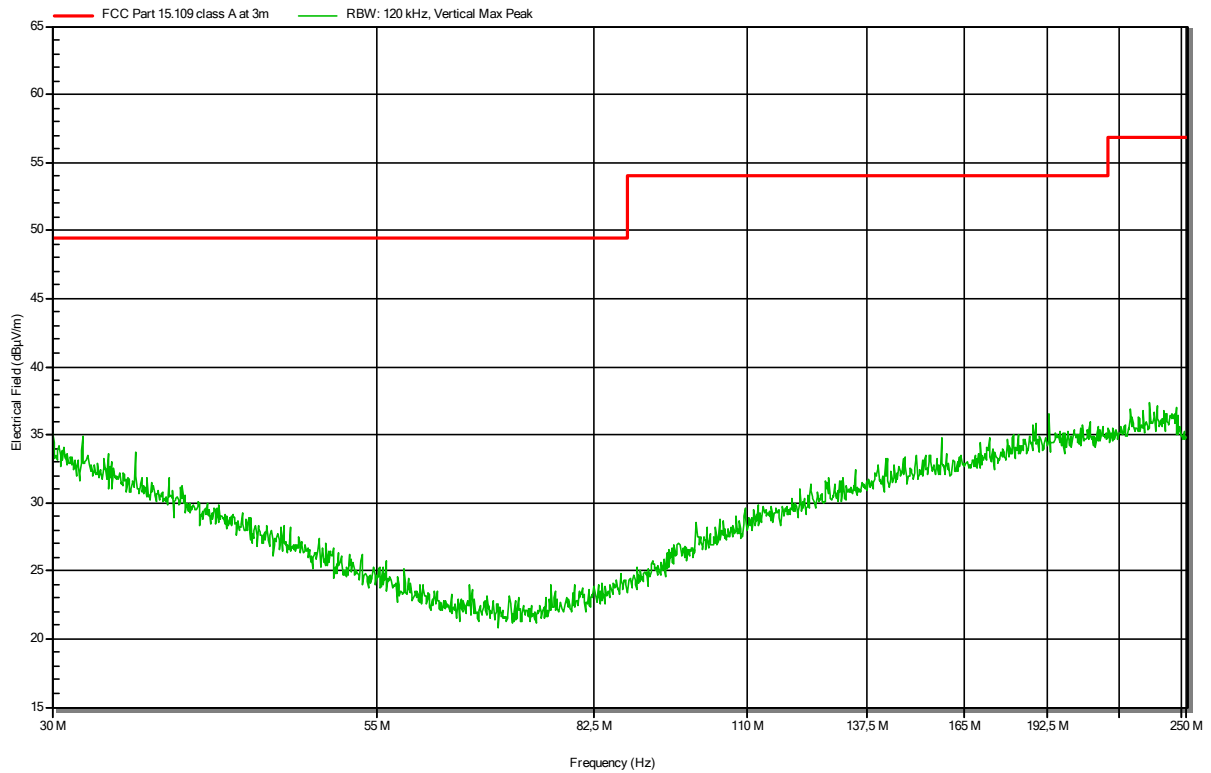


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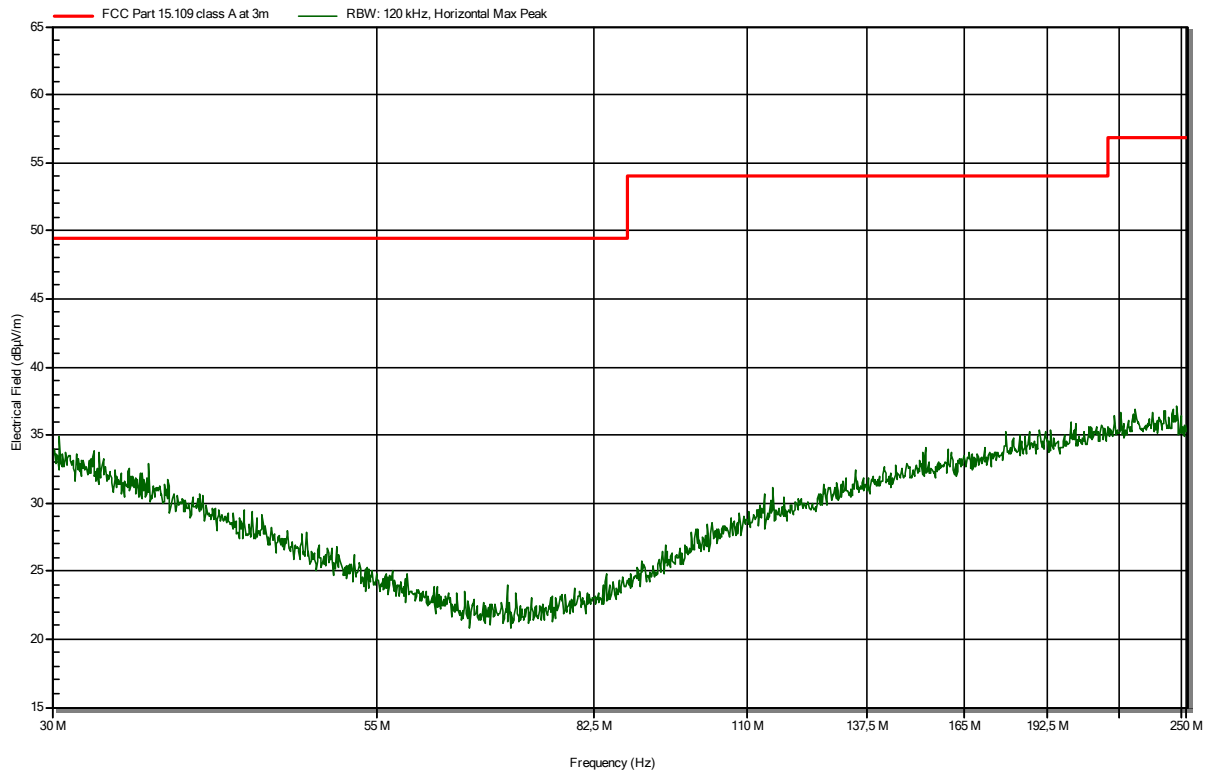


TWTG DS-LD-02-02

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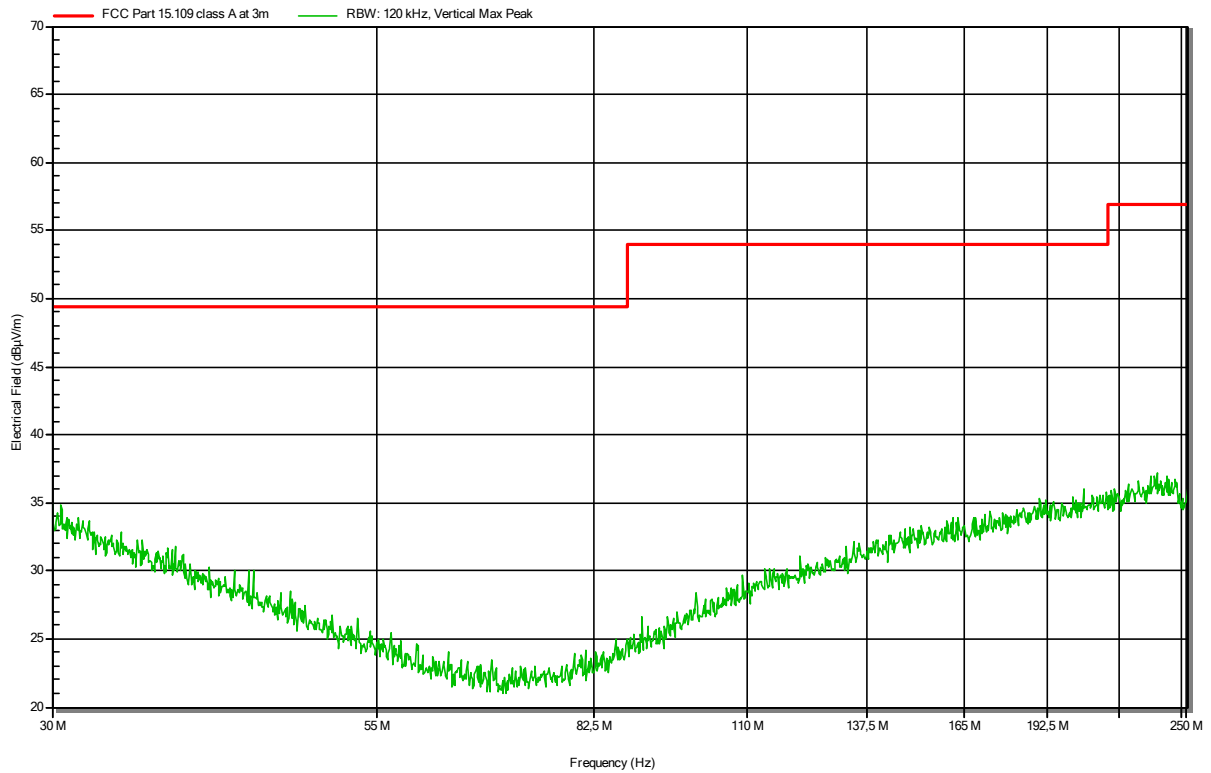


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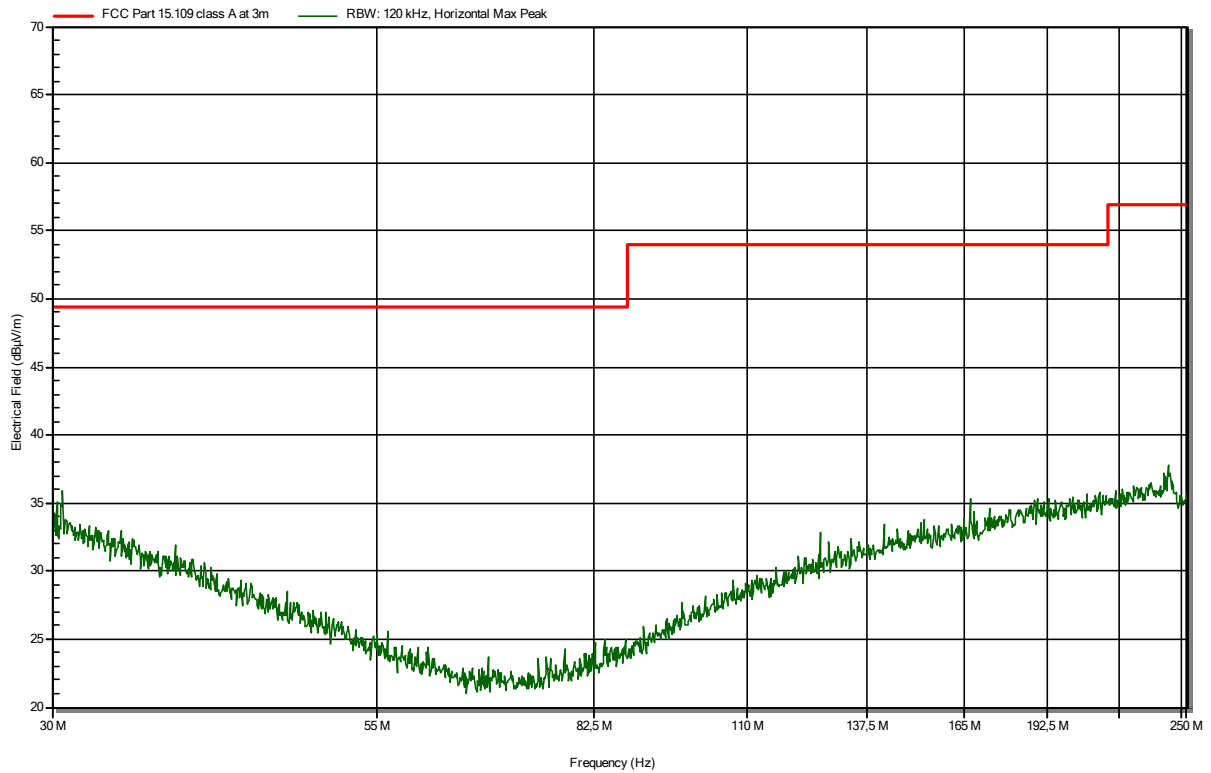


TWTG DS-TT-02-02

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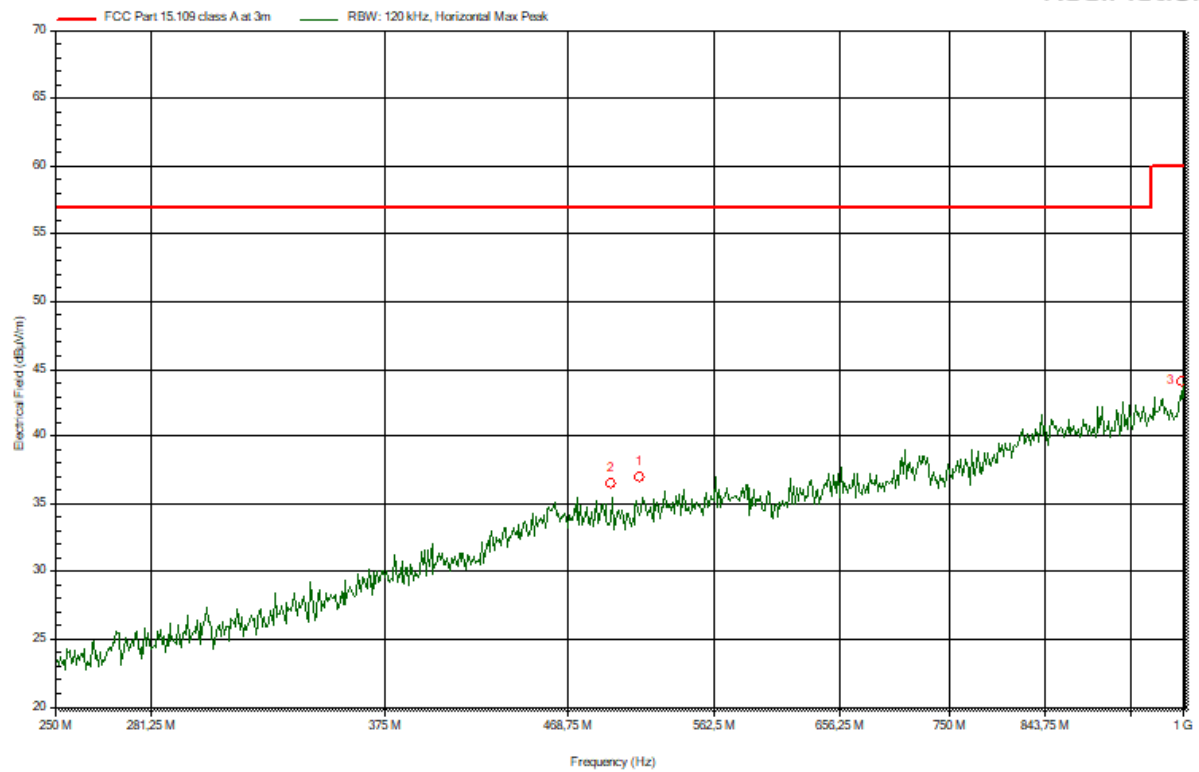
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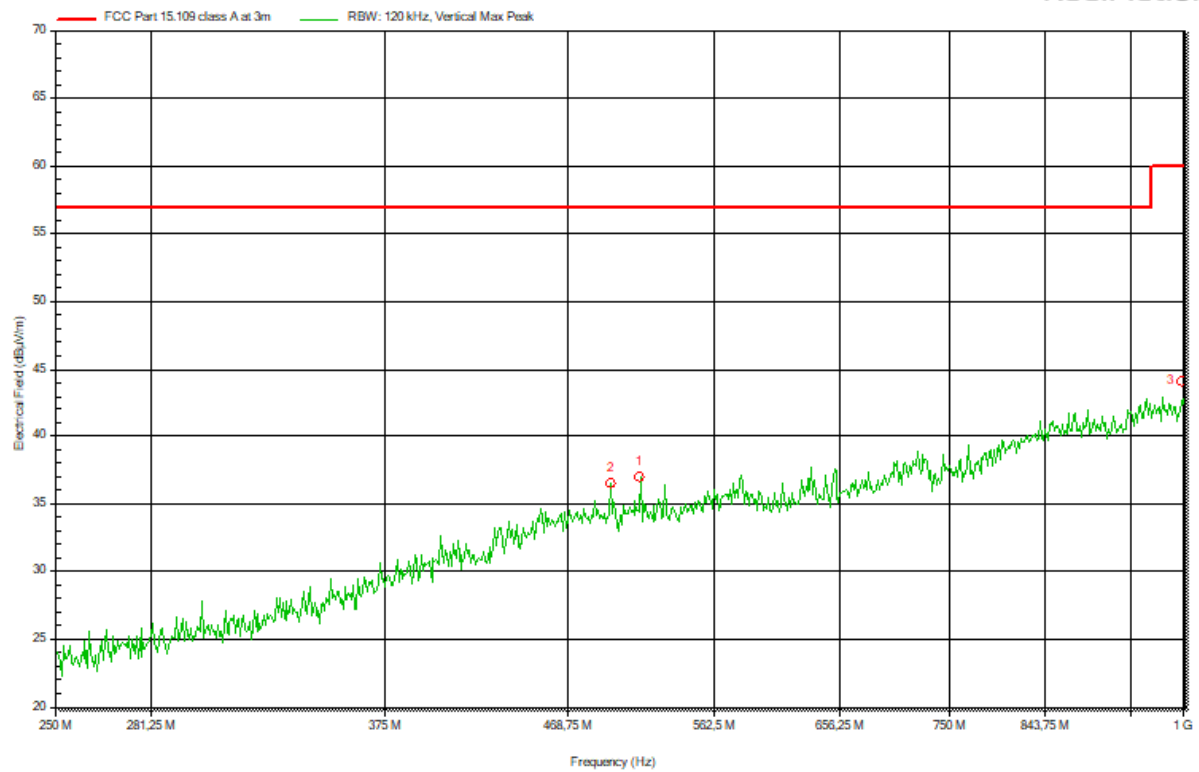
250 – 1000 MHz

TWTG DS-TT-02-02

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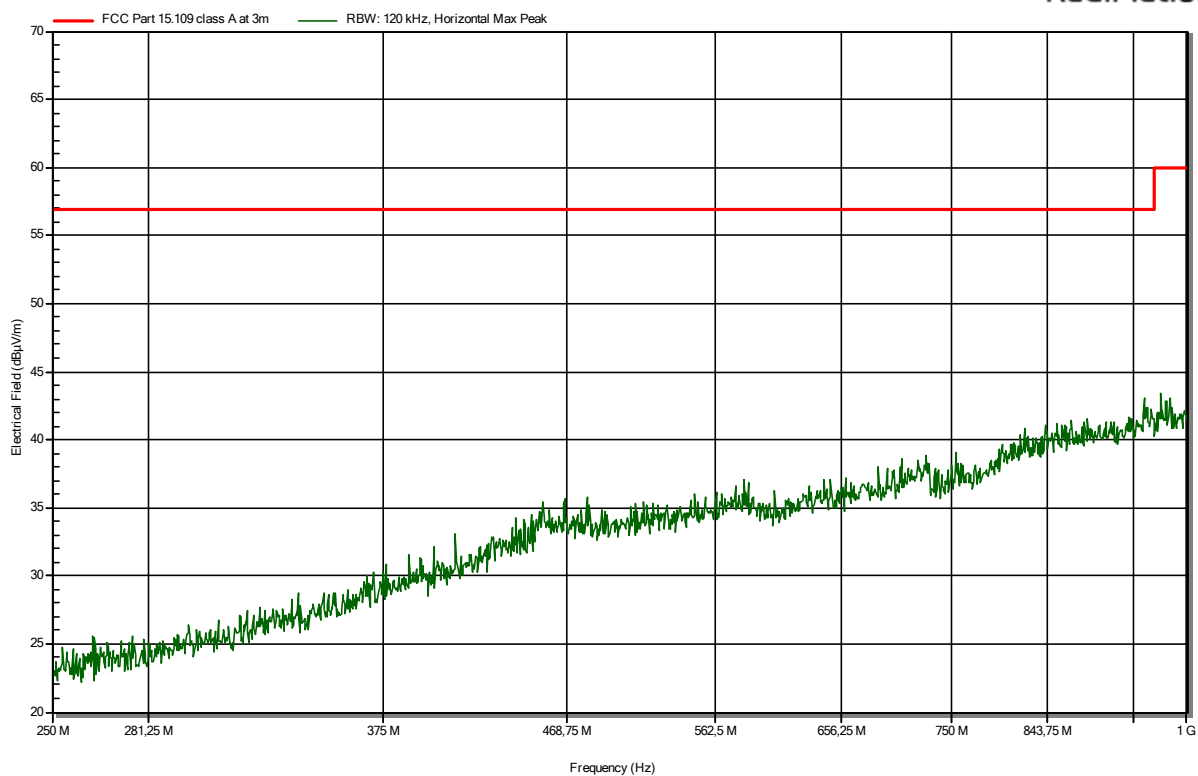


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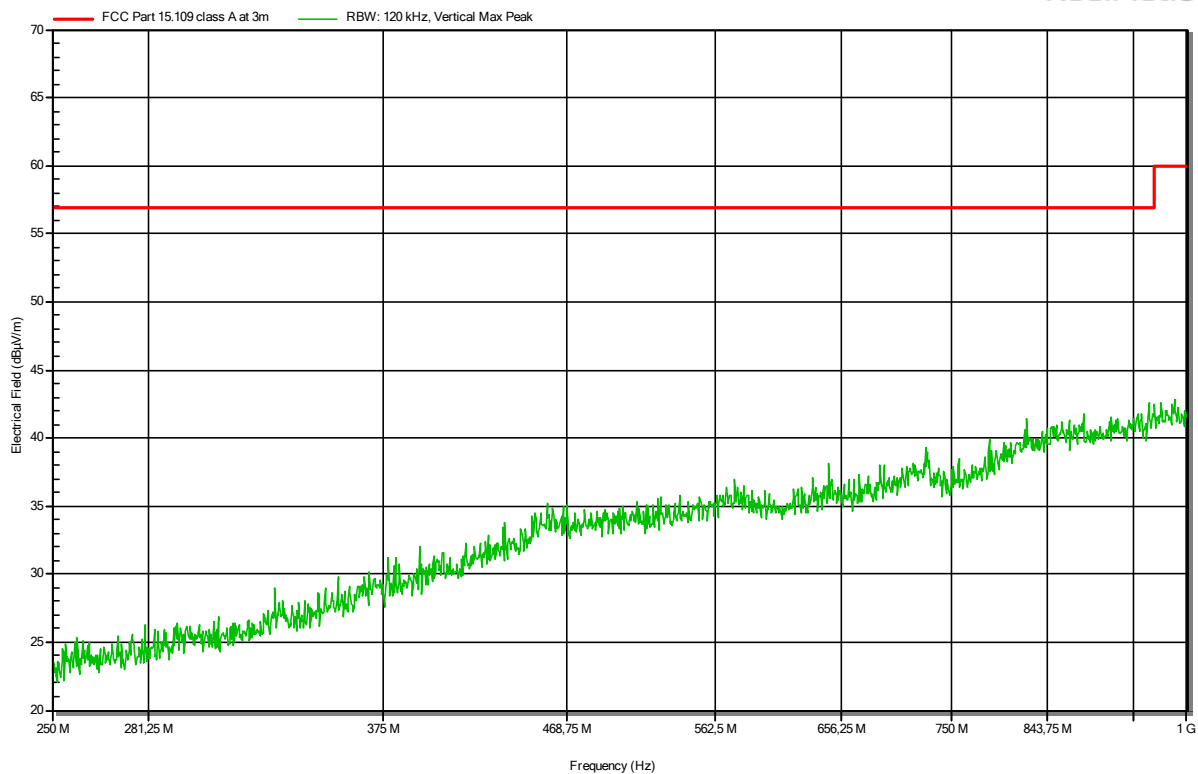


TWTG DS-LD-02-02

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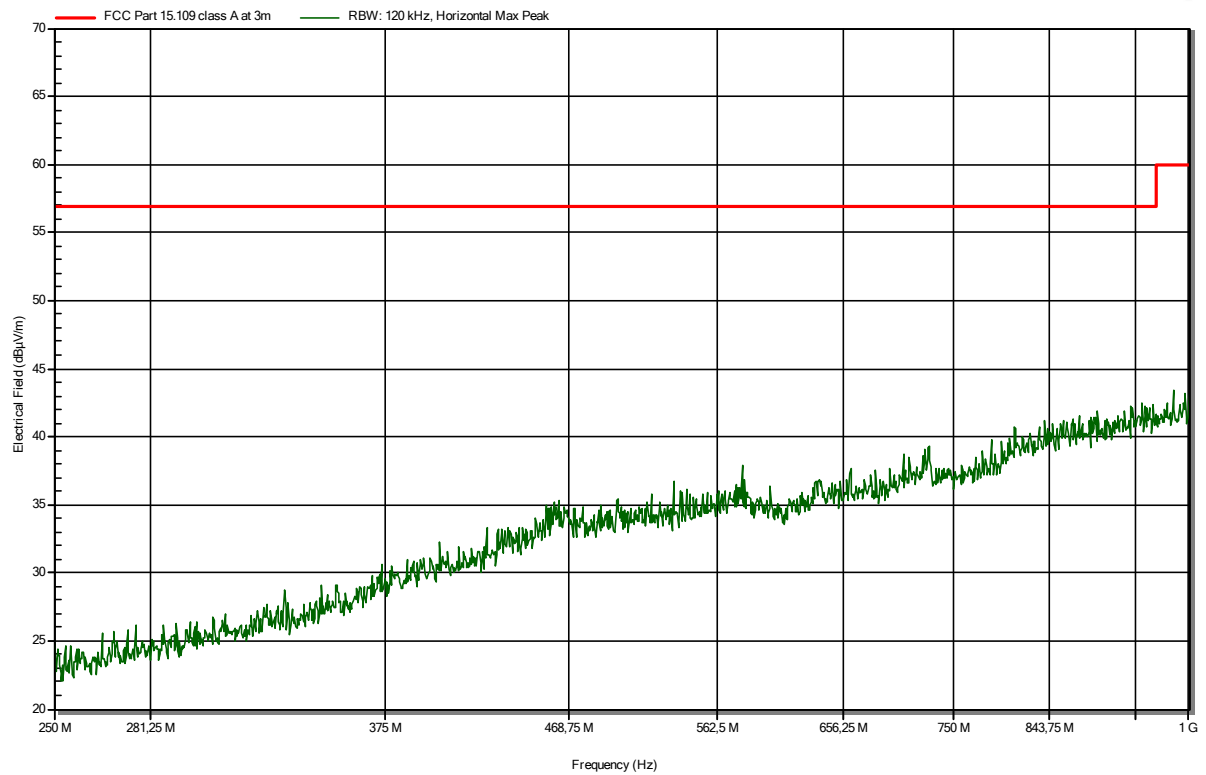


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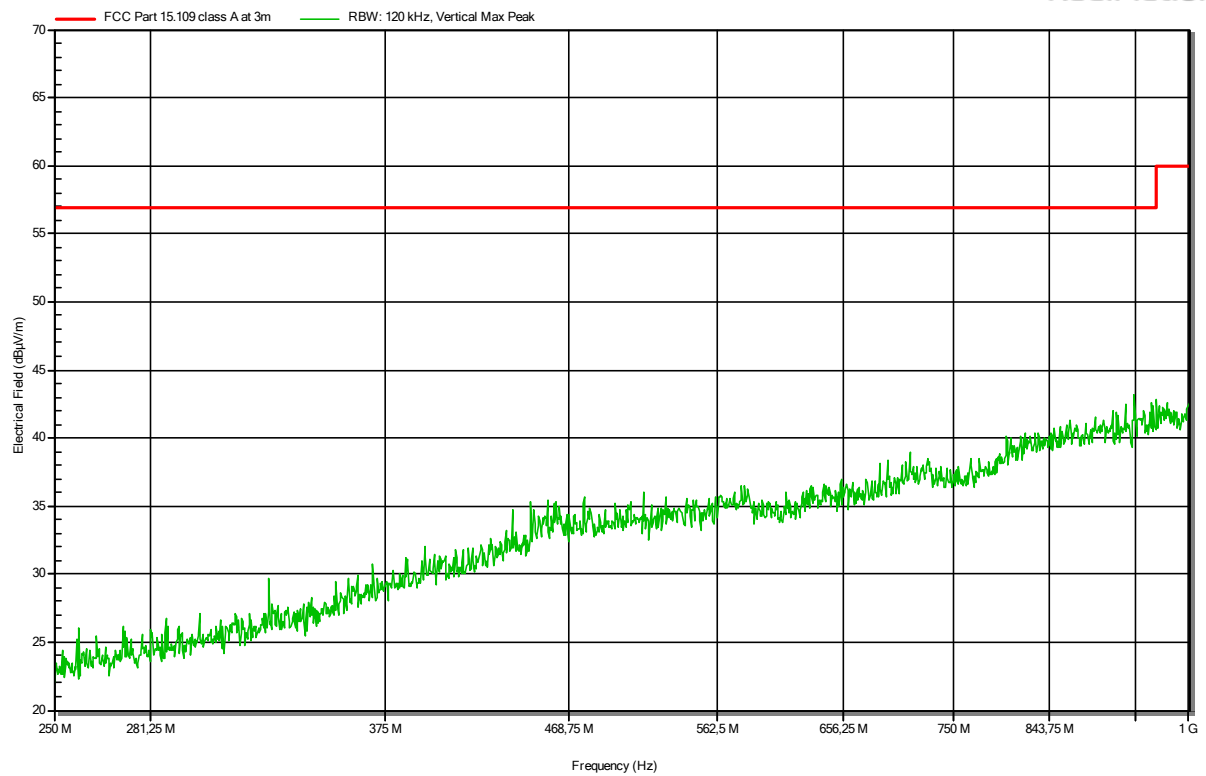


TWTG DS-VB-01-02

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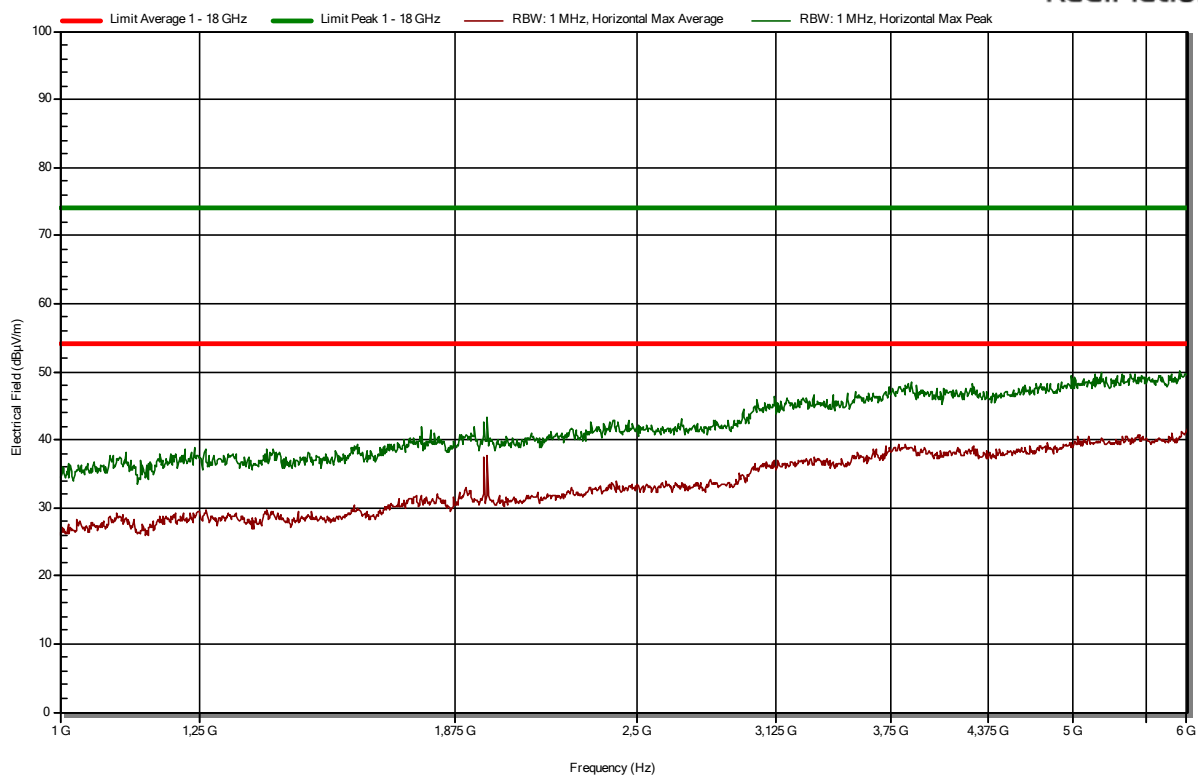


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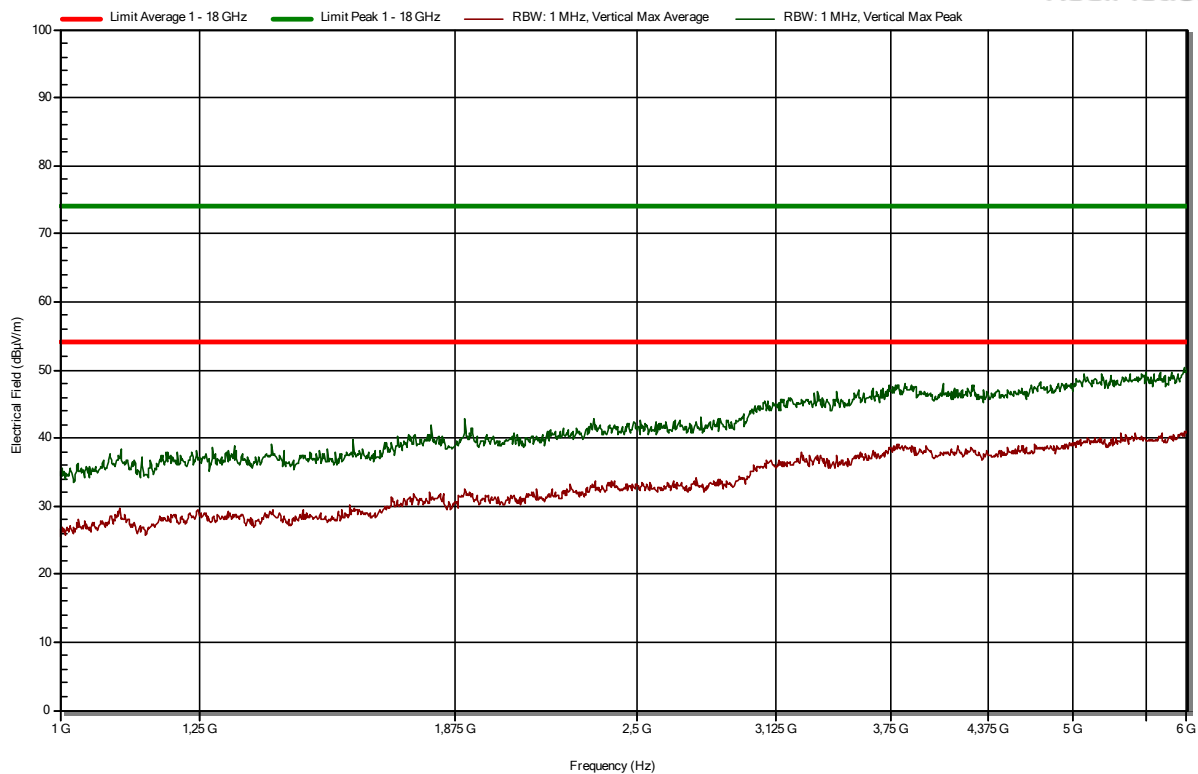


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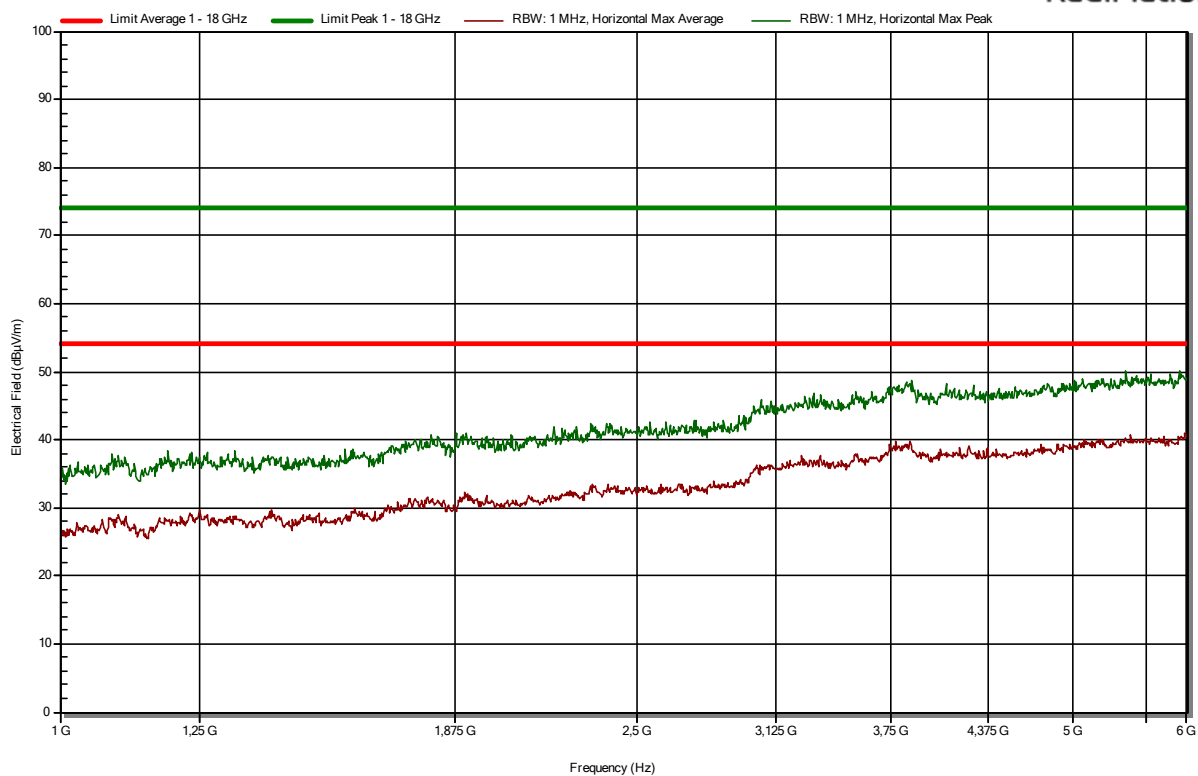


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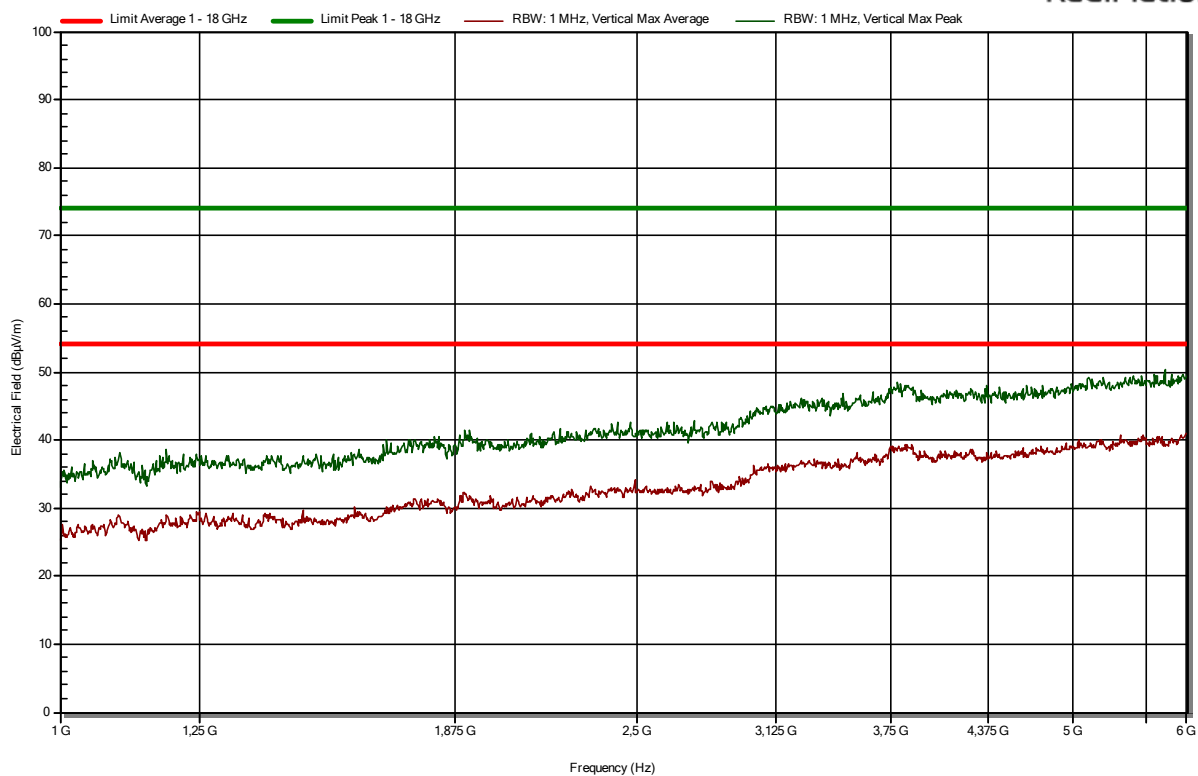


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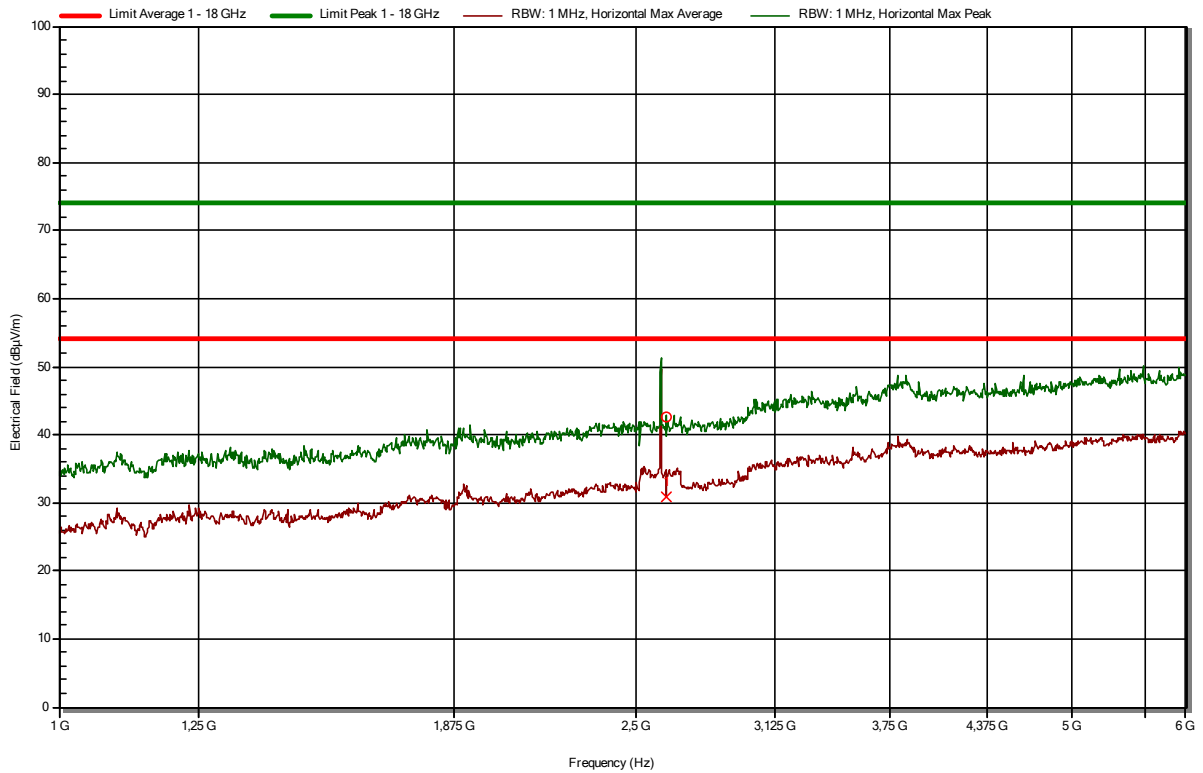


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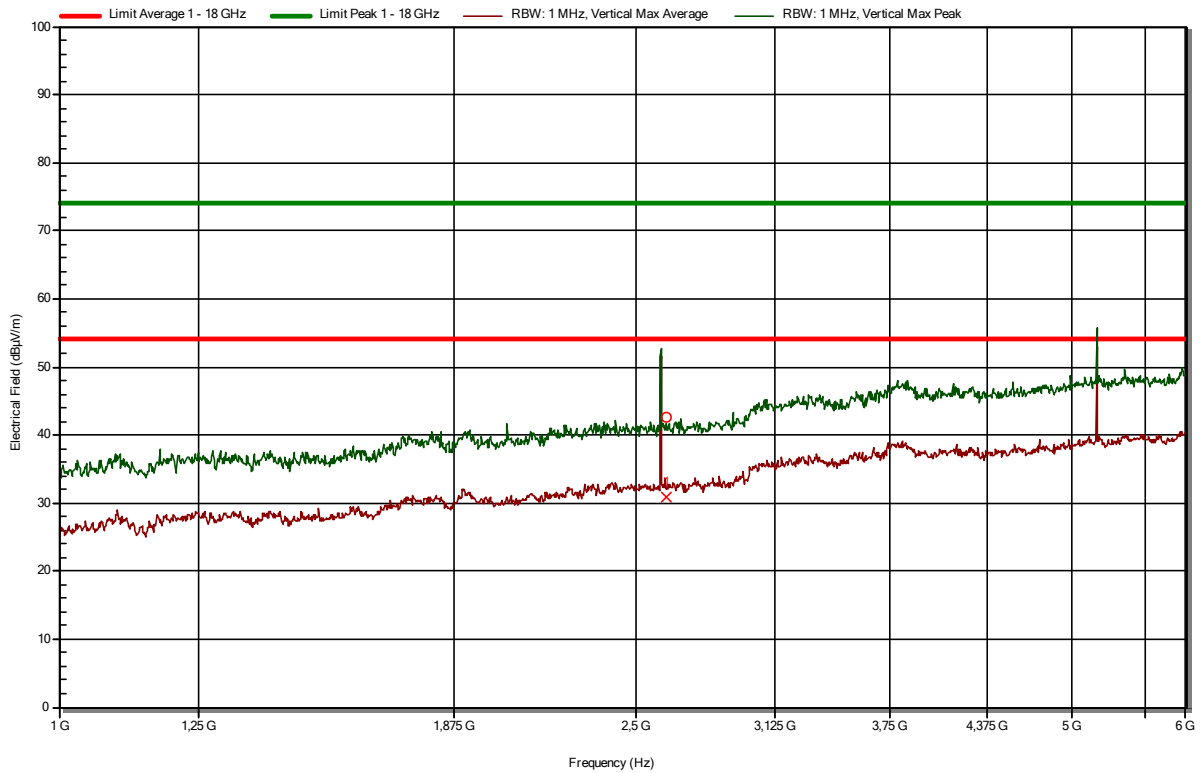


TWTG DS-VB-01-02

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