Prüfbericht-Nr.: *Test Report No.:*	14050229 001	**Auftrags-Nr.:** *Order No.:*	144150618	**Seite 1 von 23** *Page 1 of 23*
Kunden-Referenz-Nr.: *Client Reference No.:*	N/A	**Auftragsdatum:** *Order date.:*	15 Jun, 2017	
Auftraggeber: *Client:*	HK TECH SCIENCE & TECHNOLOGY CO., LTD Xiehe Industrial B Zone, Laimei Road, Chenghai District, 515800, Shantou, Guangdong, China			
Prüfgegenstand: *Test item:*	Short Range Device - Radio Controlled Toy Quadcopter (2.4GHz)	**FCC ID:** *FCC ID:*	2AFDJHKFX22C	
Bezeichnung / Typ-Nr.: *Identification / Type No.:*	FX-22C			
Auftrags-Inhalt: *Order content:*	TUV Rheinland - EMC service			
Prüfgrundlage: *Test specification:*	CFR47 FCC Part 15: Subpart C Section 15.247 CFR47 FCC Part 15: Subpart C Section 15.207 FCC KDB Publication 447498 D01 v06			
Wareneingangsdatum: *Date of receipt:*	08 Feb, 2018			
Prüfmuster-Nr.: *Test sample No.:*	A000696486-001			
Prüfzeitraum: *Testing period:*	Refer to test report			
Ort der Prüfung: *Place of testing:*	Refer to section 2.1			
Prüflaboratorium: *Testing laboratory:*	TÜV Rheinland (Guangdong) Ltd.			
Prüfergebnis*: *Test result*:*	Pass			

geprüft von / *tested by:*			**kontrolliert von** / *reviewed by:*		
23 Feb, 2018	Amy Wang/ Project Manager		28 Feb, 2018	Storm Shu/ TC	
Datum *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*	**Datum** *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*

Sonstiges / *Other:*

This report covers partial test requirement under CFR47 FCC Part 15: Subpart C Section 15.247.
This report should be read in conjunction with report number 171027003RFC-1.

Zustand des Prüfgegenstandes bei Anlieferung: *Condition of the test item at delivery:* **Prüfmuster vollständig und unbeschädigt** *Test item complete and undamaged:*

* Legende:	1 = sehr gut	2 = gut	3 = befriedigend	4 = ausreichend	5 = mangelhalt
	P(ass) = entspricht o.g. Prüfgrundlage(n)		F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
Legend:	1 = very good	2 = good	3 = satisfactory	4 = sufficient	5 = poor
	P(ass) = passed a.m. test specifications(s)		F(ail) = failed a.m. test specifications(s)	N/A = not applicable	N/T = not tested

Test Summary

5.1.1 ANTENNA REQUIREMENT
RESULT: Passed

5.1.2 6DB BANDWIDTH MEASUREMENT
RESULT: Passed

5.1.3 MAXIMUM CONDUCTED OUTPUT POWER
RESULT: Passed

5.1.4 POWER SPECTRAL DENSITY
RESULT: Passed

5.1.5 CONDUCTED SPURIOUS EMISSIONS MEASURED IN 100 KHZ BANDWIDTH
RESULT: Passed

5.1.6 CONDUCTED EMISSIONS
RESULT: N/A

6.1.1 ELECTROMAGNETIC FIELDS
RESULT: Passed

Contents

1 General Remarks

1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendix:

Appendix 1: Test result

2 Test Sites

2.1 Test Facilities

TÜV RHEINLAND (GUANGDONG) LTD.
No.102, 1F of Southwest and No.205, 2F of West Warehouse Building, No.767 Tianyuan Road, Tianhe District, Guangzhou 510650, Guangdong, P.R. China.

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
6dB Bandwidth Measurement / Maximum Conducted (Average) Output Power / Power Spectral Density / Conducted Spurious Emissions in 100 kHz Bandwidth				
Spectrum Analyzer	Rohde & Schwarz	FSP30	100286	15 Mar 2018

2.3 Traceability

All measurement equipment calibrations are traceable to NIM (National Institute of Metrology) or where calibration is performed in other countries, to equivalent nationally recognized standards organizations.

2.4 Calibration

Equipment requiring calibration is calibrated periodically by the manufacturer or according to manufacturer's specifications. Additionally all equipment is verified for proper performance on a regular basic using in house standards or comparisons.

2.5 Measurement Uncertainty

Uncertainty for conducted emissions measurements is ±2.68dB.

Uncertainty for radiated emissions measurements is ±5.16dB (30M-1GHz) and ±2.22dB (> 1GHz).

Uncertainty for radio spectrum measurements is ±4.15dB

The reported expanded uncertainty is based on a standard uncertainty multiply by a coverage factor k=2, providing a level of confidence of approximately 95%.

2.6 Location of original data

The original copies of test data taken during actual testing were attached at Appendix 1 of this report and delivered to the applicant. A copy has been retained in the TÜV Rheinland (Guangdong) file for certification follow-up purposes.

2.7 Status of facility used for testing

TÜV RHEINLAND (GUANGDONG) LTD.
No.102, 1F of Southwest and No.205, 2F of West Warehouse Building, No.767 Tianyuan Road, Tianhe District, Guangzhou 510650, Guangdong, P.R. China whose designation number is CN1207.

3 General Product Information

3.1 Product Function and Intended Use

The submitted sample FX-22C is radio controlled toy helicopter embedded with WiFi camera. It is intended to use in following electromagnetic environment: residential and urban outdoors.

3.2 Ratings and System Details

Table 2: Rating of EUT

Kind of Equipment	Radio controlled toy quadcopter
Type Designation	FX-22C, FX-2, FX-3, FX-3V, FX-4, FX-4VCI, FX-4V, FX-5, FX-5W, FX-6, FX-6C, FX-6CI, FX-7, FX-7C, FX-7CI, FX-7S, FX-8A, FX-8E, FX-8C, FX-9A, FX-9E, FX-9C, FX-11, FX-12V, FX-12, FX-13, FX-14, FX-15, FX-15C, FX-15CI, FX-16, FX-16C, FX-16CI, FX-17, FX-18, FX-19, FX-20, FX-21, FX-22A, FX-22E, FX-23, FX-24, FX-25, FX-25CI, FX-26,FX-26CI, FX-27A, FX-27E, FX-27C, FX-28, FX-29, FX-29CI, FX-30, FX-31, FX-32, FX-33, FX-34, FX-35A, FX-35E, FX-35C, FX-36, FX-37, D2, D3, D3V, D4, D4VCI, D4V, D5, D5W, D6, D6C, D6CI, D7, D7C, D7CI, D7S, D8A, D8E, D8C, D9A, D9E, D9C, D11, D12V, D12, D13, D14, D15, D15C, D15CI, D16, D16C, D16CI, D17, D18, D19, D20, D21, D22A, D22E, D22C, D23, D24, D25, D25CI, D26, D27A, D27E, D27C, D28, D29, D29CI, D30, D31, D32, D33, D34, D35A, D35E, D35C, D36, D37
FCC ID	2AFDJHKFX22C

Table 3: Technical Specification of WiFi

Technical Specification	Value
Operating Frequency	2412 MHz (Single Channel)
Operation Voltage	DC 3.7V
Modulation	802.11b: DSSS (CCK, DQPSK, DBPSK)
Antenna Type	Internal Antenna, Non-User Replaceable
Antenna Gain	2.5 dBi
RF Output Power	0.0041W (6.16dBm)

Table 4: RF channel and frequency

RF Channel	Frequency (MHz)
0	2412.00

3.3 Independent Operation Modes

The basic operation modes are:

A. On

1. Transmitting on channel 0 under IEEE802.11B

B. On, WiFi connecting mode

3.4 Noise Generating and Noise Suppressing Parts

Refer to the Circuit Diagram.

3.5 Submitted Documents

1. Block Diagram
2. Circuit Diagram
3. Operation Description
4. PCB Layout
5. BOM
6. FCC label and location
7. User Manual
8. Internal Photos
9. External Photos
10. Application form

4 Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

The equipment under test (EUT) was configured to measure its maximum power level.

The test modes were adapted accordingly in reference to the instructions for use.

4.2 Test Operation and Test Software

During testing, Channel & Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power was selected according to the instruction given by the manufacturer. The setting of the RF output power expected by the customer shall be fixed on the firmware of the final end product.

All testing were performed according to the procedures in ANSI C63.4: 2014 & ANSI C63.10: 2013.

4.3 Special Accessories and Auxiliary Equipment

The product has been tested together with the following additional accessories:

Kind of Equipment	Manufacturer	Model Name	S/N
Notebook	Lenovo	80Q6	PF0BEWWR

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4.4 Countermeasures to achieve EMC Compliance

The test sample, which has been tested, contained the noise suppression parts as described in the technical document. No additional measures were employed to achieve compliance.

4.5 Test set-up

Diagram of Measurement Configuration for Radiation Test

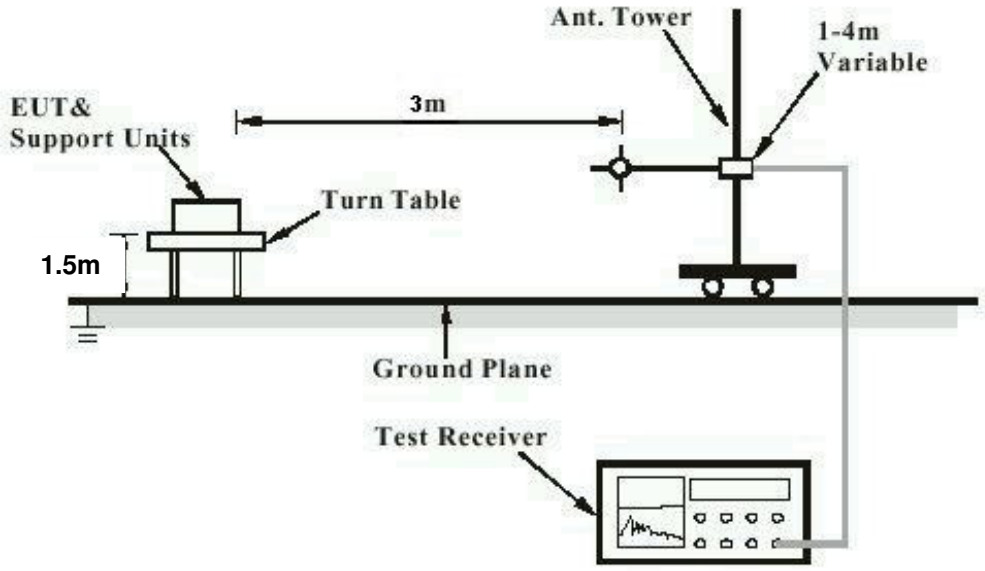


Diagram of Measurement Configuration for Mains Conduction Measurement

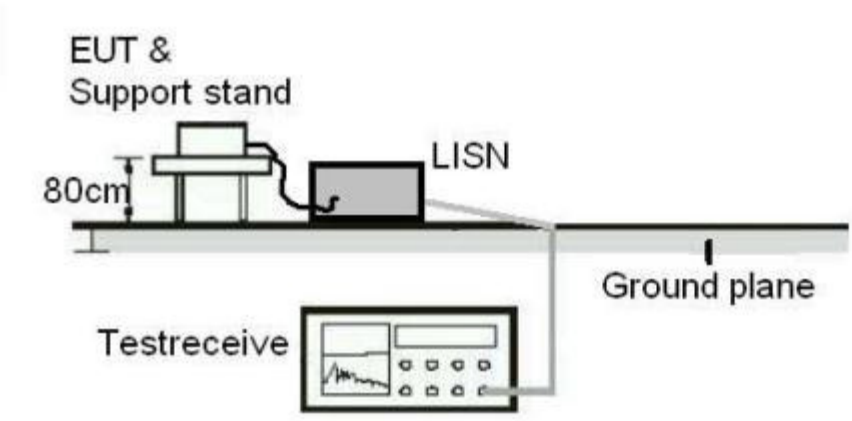
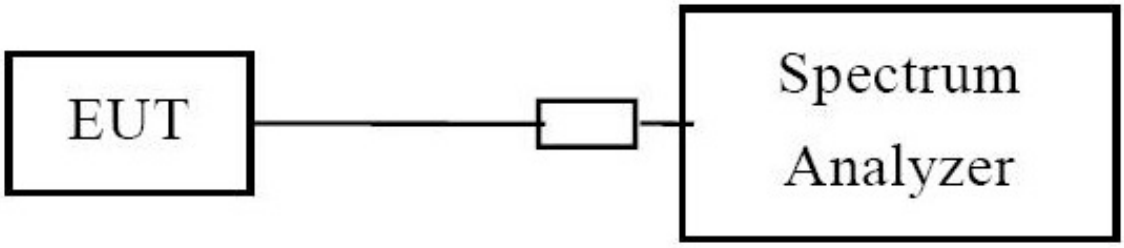


Diagram of Measurement Configuration for Conducted Transmitter Measurement



5 Test Results

5.1 Transmitter Requirement & Test Suites

5.1.1 Antenna Requirement

RESULT: **Passed**

Test Specification

Test standard	:	FCC Part 15.247(b)(4) and Part 15.203
Limits	:	the use of antennas with directional gains that do not exceed 6 dBi

According to the manufacturer declared, the EUT has an internal antenna, the directional gain of antenna is 2.5 dBi, and the antenna connector is designed with permanent attachment and no consideration of replacement.
Therefore the EUT is considered sufficient to comply with the provision.

For more details, refer to EUT photo.

5.1.2 6dB Bandwidth Measurement

RESULT: **Passed**

Test Specification

Test standard	:	FCC Part 15.247(a)(2)
Basic standard	:	ANSI C63.10: 2013
Limits	:	The minimum 6dB bandwidth shall be at least 500kHz
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	08 Feb, 2018
Power supply	:	DC 3.7V
Operation mode	:	A (See 3.3)
Test channel	:	Channel 0
Ambient temperature	:	23.5 °C
Relative Humidity	:	50 %
Atmospheric pressure	:	101 kPa

For the measurement records, refer to the appendix 1.

Table 5: Test result of 6dB Bandwidth, IEEE 802.11B

Channel	Channel Frequency (MHz)	6dB Left (MHz)	6dB Right (MHz)	6dB Bandwidth (MHz)	Limit (kHz)
Channel 0	2412	2406.960	2416.960	10.00	>500

5.1.3 Maximum Conducted Output Power

RESULT: **Passed**

Test Specification

Test standard	:	FCC Part 15.247(b)(3)
Basic standard	:	ANSI C63.10: 2013
Limits	:	For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850MHz bands: 1 Watt (30dBm)
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	08 Feb, 2018
Power supply	:	DC 3.7V
Operation mode	:	A (See 3.3)
Test channel	:	Channel 0
Ambient temperature	:	23.5 °C
Relative Humidity	:	50 %
Atmospheric pressure	:	101 kPa

Table 6: Test result of Output Power, IEEE 802.11B

Channel	Channel Frequency (MHz)	Measured Output Power (dBm)	Limit (W / dBm)
Channel 0	2412	6.16	1 / 30.0

5.1.4 Power Spectral Density

RESULT: **Passed**

Test Specification

Test standard	:	FCC Part 15.247(e)
Basic standard	:	ANSI C63.10: 2013
Limits	:	For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	08 Feb, 2018
Power supply	:	DC 3.7V
Operation mode	:	A (See 3.3)
Test channel	:	Channel 0
Ambient temperature	:	23.5 °C
Relative Humidity	:	50 %
Atmospheric pressure	:	101 kPa

For the measurement records, refer to the appendix 1.

Table 7: Test result of Power Spectral Density, IEEE 802.11B

Channel	Channel Frequency (MHz)	Measured Power Density (dBm/3kHz)	Limit (dBm/3kHz)
Channel 0	2412	3.04	8.0

5.1.5 Conducted Spurious Emissions Measured in 100 kHz Bandwidth

RESULT: **Passed**

Test Specification

Test standard	:	FCC Part 15.247(d)
Basic standard	:	ANSI C63.10: 2013
Limits	:	20dB (below that in the 100kHz bandwidth within the band that contains the highest level of the desired power); In addition, radiated emissions which fall in the restricted bands, must also comply with the radiated emission limits specified in 15.209(a)
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	08 Feb, 2018
Power supply	:	DC 3.7V
Operation mode	:	A (See 3.3)
Test channel	:	Channel 0
Ambient temperature	:	23.5 °C
Relative Humidity	:	50 %
Atmospheric pressure	:	101 kPa

All emissions are more than 20dB below fundamental, compliance is achieved as well.

For the measurement records, refer to the appendix 1.

5.1.6 Conducted Emissions

RESULT: **N/A**

Test Specification

Test standard	:	FCC part 15.207
Basic standard	:	ANSI C63.4: 2014
Frequency range	:	0.15 – 30MHz
Limits	:	FCC Part 15.207(a)
Kind of test site	:	Shielded Room

This test is not applicable due to there is no AC power input or output ports on the EUT.

6 Safety Human exposure

6.1 Radio Frequency Exposure Compliance

6.1.1 Electromagnetic Fields

RESULT: **Passed**

Test Specification

Test standard : FCC KDB Publication 447498 v06

The minimum distance for the EUT is less than 5mm.

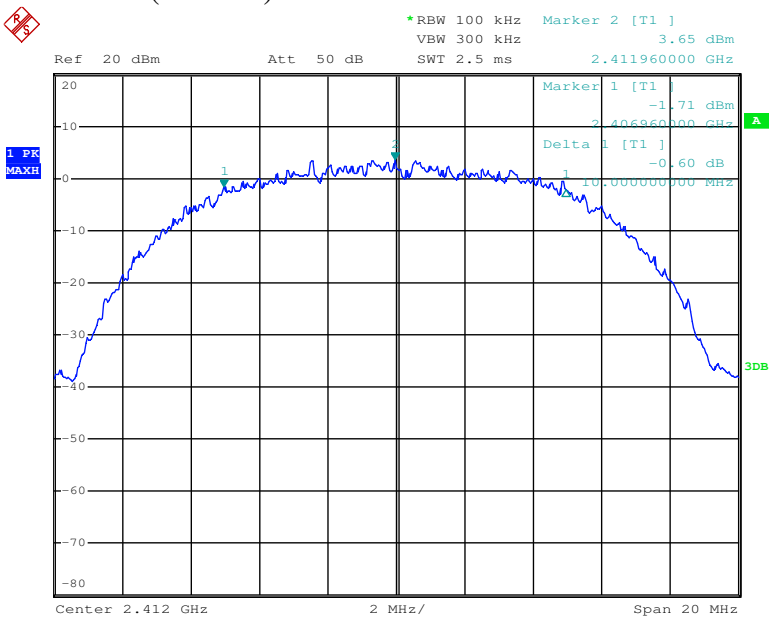
Since maximum peak output power of the transmitter is 4.13mW <10 mW.

Hence the EUT is excluded from SAR evaluation according to FCC KDB Publication 447498 D01 General RF Exposure Guidance v06.

7 List of Tables

6 dB Bandwidth Measurement

TX frequency: 2412MHz (802.11b)



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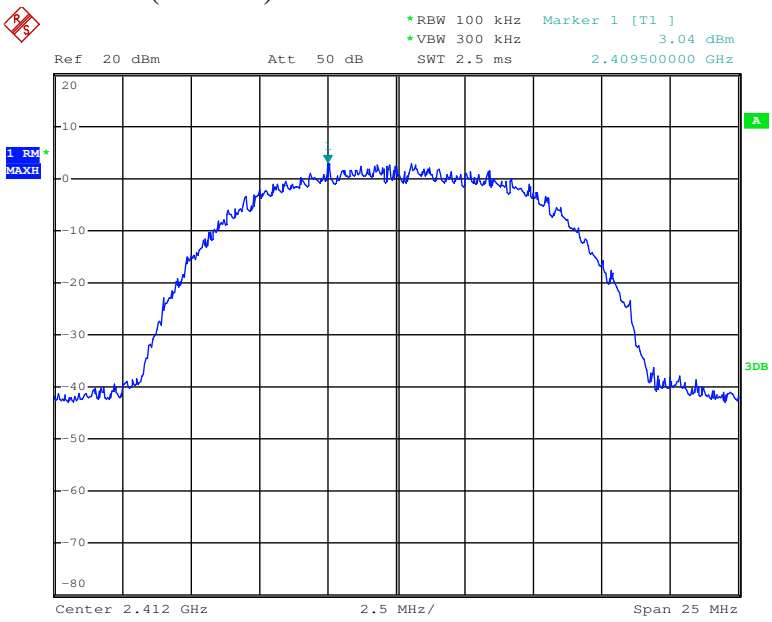
Power Spectral Density

TX frequency: 2417MHz (802.11b)



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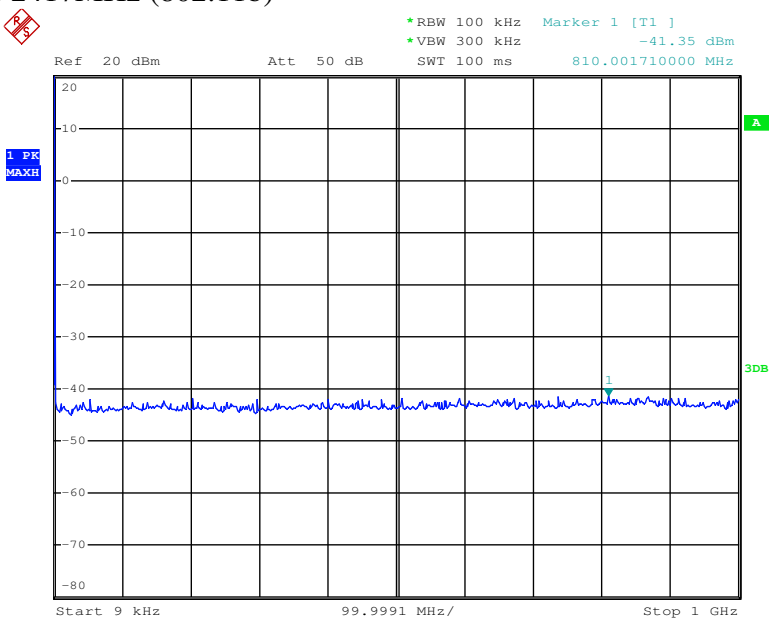
Spurious Conducted Emissions

TX frequency: 2417MHz (802.11b)



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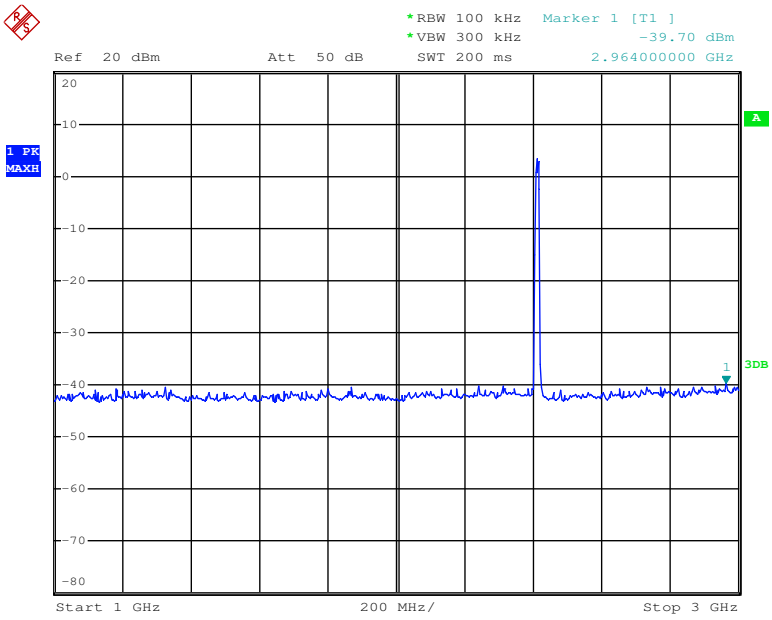

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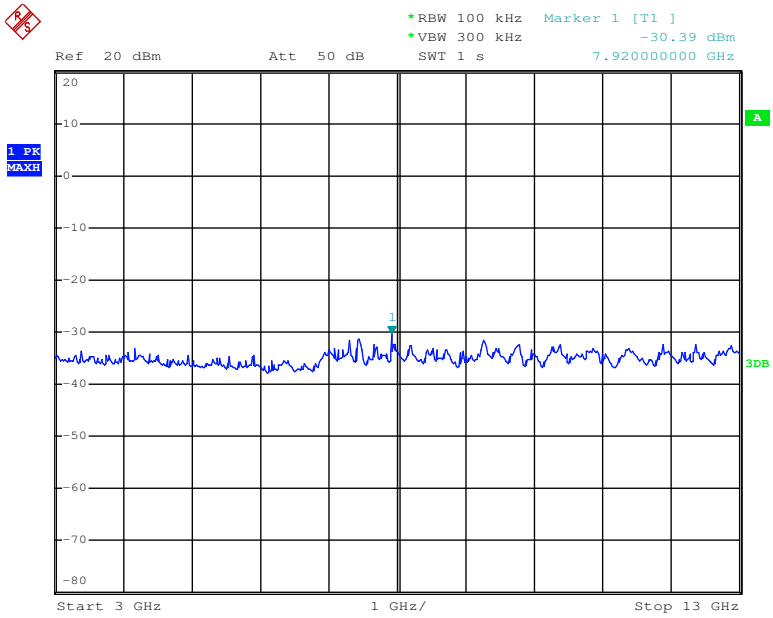

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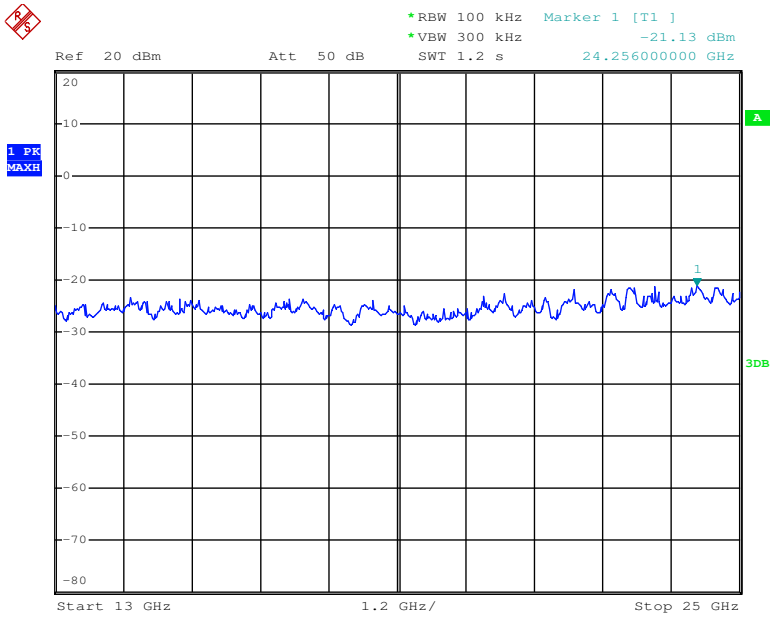

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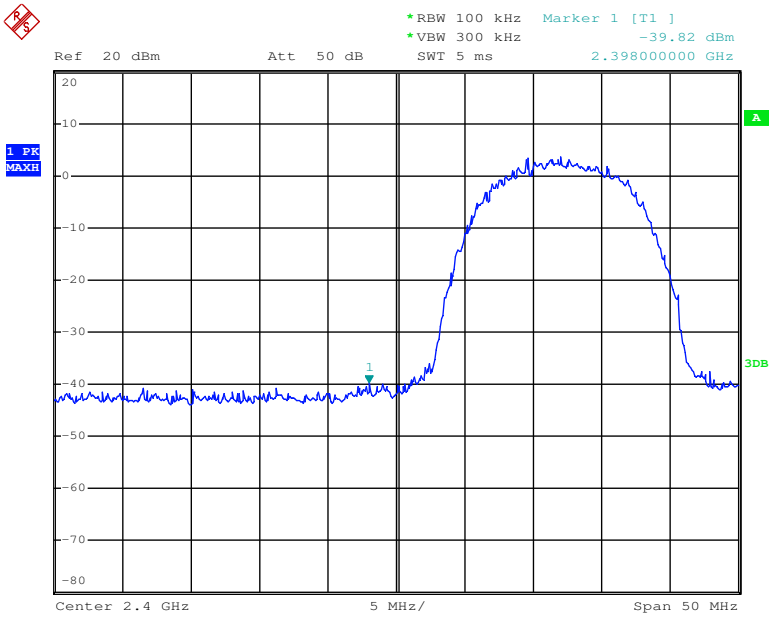

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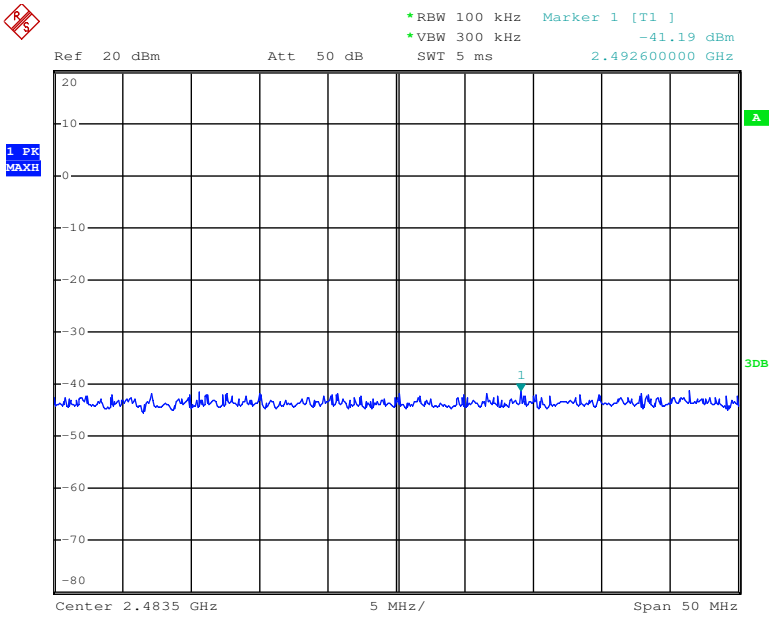

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