Measurement of RF Emissions from a GU4T Remote Control Transmitter

For	Genie Company One Door Drive Mount Hope, OH 44660
P.O. Number	4900037120
Date Tested	August 21, 2018 through October 22, 2018
Test Personnel	Mark E. Longinotti
Test Specification	FCC "Code of Federal Regulations" Title 47 Part15, Subpart C ISED RSS-GEN ISED RSS-210

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REVISION HISTORY

Revision	Date	Description
—	10/30/2018	Initial release

Measurement of RF Emissions from a Remote Control Transmitter, Model No. GU4T

1. INTRODUCTION

1.1. Scope of Tests

This report presents the results of the RF emissions measurements performed on a Genie Company Remote Control transmitter, Model No. GU4T, serial number None Assigned (hereinafter referred to as the Equipment Under Test (EUT)). The EUT was designed to transmit between 303MHz and 433.92MHz using an integral antenna. The EUT were manufactured and submitted for testing by Genie Company located in Mount Hope, OH.

See Elite Electronic Engineering Test Report ETR 1802542-02 for RF emissions measurements on the receiver portion of the EUT.

Per Genie Company personnel, the following model numbers are electrically identical to the GU4T:

- OU4T
- GU4TR
- GU4TB

1.2. Purpose

The test series was performed to determine if the EUT meets the conducted and radiated RF emission requirements of the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Sections 15.207 and 15.231 for Intentional Radiators. Testing was performed in accordance with ANSI C63.10-2013.

The test series was also performed to determine if the EUT meets the conducted RF emission requirements of the Innovation, Science, and Economic Development Canada Radio Standards Specification, RSS-Gen, Section 8.8 and the radiated RF emission requirements of the Innovation, Science, and Economic Development Canada Radio Standards Specification, RSS-210, Annex 1 for transmitters. Testing was performed in accordance with ANSI C63.10-2013.

1.3. Deviations, Additions and Exclusions

There were no deviations, additions to, or exclusions from the test specification during this test series.

1.4. EMC Laboratory Identification

This series of tests was performed by Elite Electronic Engineering Incorporated of Downers Grove, Illinois. The laboratory is accredited by The American Association for Laboratory Accreditation (A2LA). A2LA Certificate Number: 1786.01.

1.5. Laboratory Conditions

The temperature at the time of the test was 22°C and the relative humidity was 29%.

2. APPLICABLE DOCUMENTS

The following documents of the exact issue designated form part of this document to the extent specified herein:

- Federal Communications Commission "Code of Federal Regulations", Title 47, Part 15, Subpart C
- ANSI C63.4-2014, "American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz"

- ANSI C63-10-2013, “American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices”

- Innovation, Science, and Economic Development Canada Radio Standards Specification, RSS-Gen, “General Requirements for Compliance of Radio Apparatus”, Issue 5, April 2018

- Innovation, Science, and Economic Development Canada Radio Standards Specification, RSS-210, “License-exempt Radio Apparatus: Category I Equipment”, Issue 9, August 2016

3. EUT Setup and Operation

3.1. General Description

The EUT is a Genie Company, Remote Control, Model No. GU4T. A block diagram of the EUT setup is shown as Figure 1. A photograph of the EUT is shown as Figure 2.

3.1.1. Power Input

The EUT obtained 3VDC from a CR2032 coin cell battery.

3.1.2. Peripheral Equipment

No peripheral equipment was submitted with the EUT.

3.1.3. Signal Input/Output Leads

No interconnect cables were submitted with the EUT.

3.1.4. Grounding

The EUT was ungrounded during the tests.

3.2. Software

For all tests the EUT had the following firmware version loaded onto the device to provide correct load characteristics:

- LifestyleTX.CW for spurious emissions tests (unmodulated carrier)
- LifestyleTX.X for all other tests (modulated carrier)

3.3. Operational Mode

For all tests the EUT was placed on an 80cm high non-conductive stand when testing below 1GHz. Above 1GHz, the EUT was placed on a 150cm high non-conductive stand. The EUT was programmed to transmit separately in each of the following modes:

Mode	Frequency MHz	Manufacturer	Description	Duty Cycle	Field Strength Correction Factor (dB)
1	303	Guardian	Fixed Code	43.5%	-7.23
2	310	Sommer	Rolling Code	25.6%	-11.84
3	310	Stanley	Fixed Dip Switch	43.5%	-7.23
4	315	Chamberlain	Purple	43.5%	-7.23
5	315	Genie	IC1	25.2%	-11.97
6	315	Genie	IC2	24.2%	-12.32
7	315	Marantec	Fixed Code	29.64%	-10.56

8	318	Linear	Mega Code	17.00%	-15.39
9	372.5	Wayne Dalton	Rolling Code	25.4%	-11.90
10	372.5	Ryobi	Rolling Code	25.0%	-12.00
11	390	Chamberlain	Green	33.02%	-9.62
12	390	Chamberlain	Orange/Red	46.5%	-6.65
13	390	Chamberlain	Yellow	49.0%	-6.20
14	390	Chamberlain Legacy	9 position DIP switch	42.0%	-7.54
15	390	Genie	IC1	25.2%	-11.97
16	390	Genie	IC2	24.2%	-12.32
17	390	Genie Legacy	9 position DIP switch	50.0%	-6.00
18	390	Genie Legacy	12 position DIP switch	50.0%	-6.00
19	433.92	FAAC	Rolling Code	61.3%	-4.25
20	433.92	Nice	Rolling Code	27.25%	-11.29
21	303	Clone	Worst Case	100%	0.00
22	310	Clone	Worst Case	100%	0.00
23	315	Clone	Worst Case	100%	0.00
24	318	Clone	Worst Case	100%	0.00
25	372.5	Clone	Worst Case	100%	0.00
26	390	Clone	Worst Case	70.79%	-3.00
27	433.92	Clone	Worst Case	70.79%	-3.00

3.4. EUT Modifications

No modifications were required for compliance to the requirements.

4. Test Facility and Test Instrumentation

4.1. Shielded Enclosure

All tests were performed in a 32ft. x 20ft. x 18ft. hybrid ferrite-tile/anechoic absorber lined test chamber. With the exception of the floor, the reflective surfaces of the shielded chamber are lined with ferrite tiles on the walls and ceiling. Anechoic absorber material is installed over the ferrite tile. The floor of the chamber is used as the ground plane. The chamber complies with ANSI C63.4-2014 for site attenuation.

4.2. Test Instrumentation

The test instrumentation and auxiliary equipment used during the tests are listed in Table 9-1.

4.3. Calibration Traceability

Test equipment is maintained and calibrated on a regular basis with a calibration interval of not greater than two years. All calibrations are traceable to the International System of Units (SI).

4.4. Measurement Uncertainty

All measurements are an estimate of their true value. The measurement uncertainty characterizes, with a specified confidence level, the spread of values which may be possible for a given measurement system.

Values of Expanded Measurement Uncertainty (95% Confidence) are presented below:

Measurement Type	Expanded Measurement Uncertainty
Conducted disturbance (mains port) (150 kHz – 30 MHz)	2.7
Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1000 MHz)	4.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (1 GHz – 6 GHz)	3.1
Radiated disturbance (electric field strength on an open area test site or alternative test site) (6 GHz – 18 GHz)	3.2

5. TEST PROCEDURES

5.1. Powerline Conducted Emissions

5.1.1. Requirements

Since the EUT was powered by internal batteries and has no connections to AC power, no conducted emissions tests are required.

5.2. Periodic Operation Measurements

5.2.1. Requirements

Per 15.231(a)(1) and RSS-210 Annex A1.1, a manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released. Also, a transmitter activated automatically shall cease transmission within 5 seconds after activation.

5.2.2. Procedures

The spectrum analyzer was set up to display the time domain trace. The EUT was set to transmit normally. The spectrum analyzer was used to record the amount of time that the EUT remained active following activation.

5.2.3. Results

The plot of the periodic timing is shown on data pages 18 through 35. The data shows that the EUTs cease operation within the allotted time.

5.3. Duty Cycle Factor Measurements

5.3.1. Procedures

The duty cycle factor is used to convert peak detected readings to average readings. This factor is computed from the time domain trace of the pulse modulation signal. The following procedure was used to measure the duty cycle:

a) With the transmitter set up to transmit for maximum pulse density, the time domain trace is displayed on the spectrum analyzer.

b) The pulse width is measured and a plot of this measurement is recorded.

c) Next the number of pulses in the word period is measured and a plot is recorded.

d) Finally the length of the word period is measured and a third plot is recorded. If the word period exceeds 100 msec, the word period is limited to 100 msec.

e) The pulse width and number of pulses for the word period are used to compute the on-time. The duty cycle is then computed as the (on-time/ word period).

f) The duty cycle factor is computed from the duty cycle.

5.3.2. Results

Plots of the duty cycle factors used for each transmitter are shown on data pages 36 through 86. See section 3.3 of this document for a summary of the measured duty cycle factors.

5.4. Radiated Measurements

5.4.1. Requirements

The EUT must comply with the requirements of FCC "Code of Federal Regulations Title 47", Part 15, Subpart C, Section 15.205 et seq. and RSS-Gen Annex A, Table A1

Paragraph 15.231(b) and RSS-Gen Annex A, Table A1 has the following radiated emission limits:

Fundamental Frequency MHz	Field Intensity uV/m @ 3 meters	Field Strength Harmonics and Spurious @ 3 meters
260 to 470	3,750 to 12,500*	375 to 1,250*

* - Linear Interpolation

For 303MHz, the limit at the fundamental is 5541.7uV/m @ 3m and the limit on the harmonics is 554.2uV/m @ 3m.

For 310MHz, the limit at the fundamental is 5833.3uV/m @ 3m and the limit on the harmonics is 583.3uV/m @ 3m.

For 315MHz, the limit at the fundamental is 6041.7uV/m @ 3m and the limit on the harmonics is 604.2uV/m @ 3m.

For 318MHz, the limit at the fundamental is 6166.7uV/m @ 3m and the limit on the harmonics is 616.7uV/m @ 3m.

For 372.5MHz, the limit at the fundamental is 8437.5uV/m @ 3m and the limit on the harmonics is 843.8uV/m @ 3m.

For 390MHz, the limit at the fundamental is 9166.7uV/m @ 3m and the limit on the harmonics is 916.7uV/m @ 3m.

For 433.92MHz, the limit at the fundamental is 10996.7uV/m @ 3m and the limit on the harmonics is 1099.7uV/m @ 3m.

In addition, emissions appearing in the Restricted Bands of Operation listed in paragraph 15.205(a) shall not exceed the general requirements shown in paragraph 15.209.

5.4.2. Procedures

All tests were performed in a 32ft. x 20ft. x 18ft. hybrid ferrite-tile/anechoic absorber lined test chamber. The walls and ceiling of the shielded chamber are lined with ferrite tiles. Anechoic absorber material is installed over the ferrite tile. The floor of the chamber is used as the ground plane. The chamber complies with ANSI C63.4-2014 for site attenuation.

The shielded enclosure prevents emissions from other sources, such as radio and TV stations from interfering with the measurements. All powerlines and signal lines entering the enclosure pass through filters on the enclosure wall. The powerline filters prevent extraneous signals from entering the enclosure on these leads.

A preliminary radiated emissions test was performed to determine the emission characteristics of the EUT. For

the preliminary test, a broadband measuring antenna was positioned at a 3 meter distance from the EUT. The entire frequency range from 30MHz to the 10th harmonic of the transmitter was investigated using a peak detector function. The data was then processed by the computer to calculate equivalent field intensity.

The final open field emission tests were then manually performed over the frequency range of 30MHz to the 10th harmonic. Between 30MHz and 1000MHz, a bilog antenna was used as the pick-up device. A broadband double ridged waveguide antenna was used as the pick-up device for all frequencies above 1GHz. All significant broadband and narrowband signals were measured and recorded. The peak detected levels were converted to average levels using a duty cycle factor which was computed from the pulse train.

To ensure that maximum or worst case, emission levels were measured, the following steps were taken:

1) The EUT was rotated so that all of its sides were exposed to the receiving antenna.
2) Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured.
3) The measuring antenna was raised and lowered from 1 to 4 meters for each antenna polarization to maximize the readings.
4) For hand-held or body-worn devices, the EUT was rotated through three orthogonal axes to determine which orientation produces the highest emission relative to the limit.

5.4.3. Results

The preliminary plots and final radiated levels with the EUT transmitting in each of the modes listed in section 3.3 of this document are presented on data pages 87 through 216. The plots are presented for a reference only, and are not used to determine compliance. As can be seen from the data, all emissions measured from the EUT were within the specification limits.

Photographs of the test configuration which yielded the highest or worst case radiated emission levels are shown in Figures 3 and 4.

5.5. Occupied Bandwidth Measurements

5.5.1. Requirement

In accordance with paragraph 15.231(c) and RSS-Gen Annex A1.3, all emissions within 20dB of the peak amplitude level of the center frequency are required to be within a band less than 0.25% of the center frequency wide.

5.5.2. Procedures

The EUT was placed next to a near-field probe. The unit was programmed to transmit separately in each of the modes listed in section 3.3 of this document. The resolution bandwidth was set to 3 kHz and span was set to 4MHz. The frequency spectrum near the fundamental was plotted.

5.5.3. Results

The plot of the emissions near the fundamental frequency for each of the modes listed in section 3.3 of this document are presented on data pages 217 through 234. As can be seen from these data pages, each transmitter met the occupied bandwidth requirements. See below for 99% bandwidth measurements:

Mode	Frequency MHz	Manufacturer	Description	99% BW
1	303	Guardian	Fixed Code	135.8kHz
2	310	Sommer	Rolling Code	37.0kHz
3	310	Stanley	Fixed Dip Switch	157.8kHz
4	315	Chamberlain	Purple	227.8kHz
5	315	Genie	IC1	131.9kHz
6	315	Genie	IC2	131.9kHz
7	315	Marantec	Fixed Code	135.9kHz
8	318	Linear	Mega Code	311.7kHz
9	372.5	Wayne Dalton	Rolling Code	219.8kHz
10	372.5	Ryobi	Rolling Code	223.8kHz
11	390	Chamberlain	Green	295.7kHz
12	390	Chamberlain	Orange/Red	111.8kHz
13	390	Chamberlain	Yellow	255.7kHz
14	390	Chamberlain Legacy	9 position DIP switch	184.8kHz
15	390	Genie	IC1	151.8kHz
16	390	Genie	IC2	151.8kHz
17	390	Genie Legacy	9 position DIP switch	299.7kHz
18	390	Genie Legacy	12 position DIP switch	289.7kHz
19	433.92	FAAC	Rolling Code	144.9kHz
20	433.92	Nice	Rolling Code	134.9kHz

6. Other Test Conditions

6.1. Test Personnel and Witnesses

All tests were performed by qualified personnel from Elite Electronic Engineering Incorporated. The test series was witnessed by Genie Company personnel.

6.2. Disposition of the EUT

The EUT and all associated equipment were returned to Genie Company upon completion of the tests.

7. Conclusions

It was determined that Genie Company Remote Control transmitter, Model No. GU4T, did fully meet the conducted and radiated emission requirements of the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Section 15.205 et seq. for Intentional Radiators, when tested per ANSI C63.10-2013.

It was also determined that Genie Company Remote Control, Model No. GU4T, transmitter, did fully meet the conducted RF emission requirements of the Innovation, Science, and Economic Development Canada Radio Standards Specification, RSS-Gen, Section 8.8 and the radiated RF emission requirements of the Innovation, Science, and Economic Development Canada Radio Standards Specification, RSS-210, Annex 1 for transmitters, when tested per ANSI C63.10-2013.

8. CERTIFICATION

Elite Electronic Engineering Incorporated certifies that the information contained in this report was obtained under conditions which meet or exceed those specified in the test specifications.

The data presented in this test report pertains to the EUT at the test date as operated by Genie Company personnel. Any electrical or mechanical modification made to the EUT subsequent to the specified test date will serve to invalidate the data and void this certification.

This report must not be used to claim product certification, approval, or endorsement by A2LA, NIST or any agency of the Federal Government.

9. EQUIPMENT LIST

Table 9-1 Equipment List

Eq ID	Equipment Description	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Date	Due Date
APW11	PREAMPLIFIER	PMI	PE2-35-120-5R0-10-12-SFF	PL11685/1241	1GHZ-20GHZ	4/5/2018	4/5/2019
CDX8	COMPUTER	ELITE	WORKSTATION			N/A	
NTA3	BILOG ANTENNA	TESEQ	6112D	32853	25-1000MHz	10/3/2018	10/3/2019
NTA4	BILOG ANTENNA	TESEQ	6112D	46660	20-2000GHZ	9/5/2018	9/5/2019
NWQ0	DOUBLE RIDGED WAVEGUIDE ANTENNA	ETS LINDGREN	3117	66657	1GHZ-18GHZ	5/31/2018	5/31/2020
PHA0	MAGNETIC FIELD PROBE	ELECTRO-METRICS	EM-6882	134	22-230MHZ	NOTE 1	
RBG2	EMI ANALYZER	ROHDE & SCHWARZ	ESW44	101591	2HZ-44GHZ	2/23/2018	2/23/2019

I/O: Initial Only
N/A: Not Applicable
Note 1: For the purpose of this test, the equipment was calibrated over the specified frequency range, pulse rate, or modulation prior to the test or monitored by a calibrated instrument.

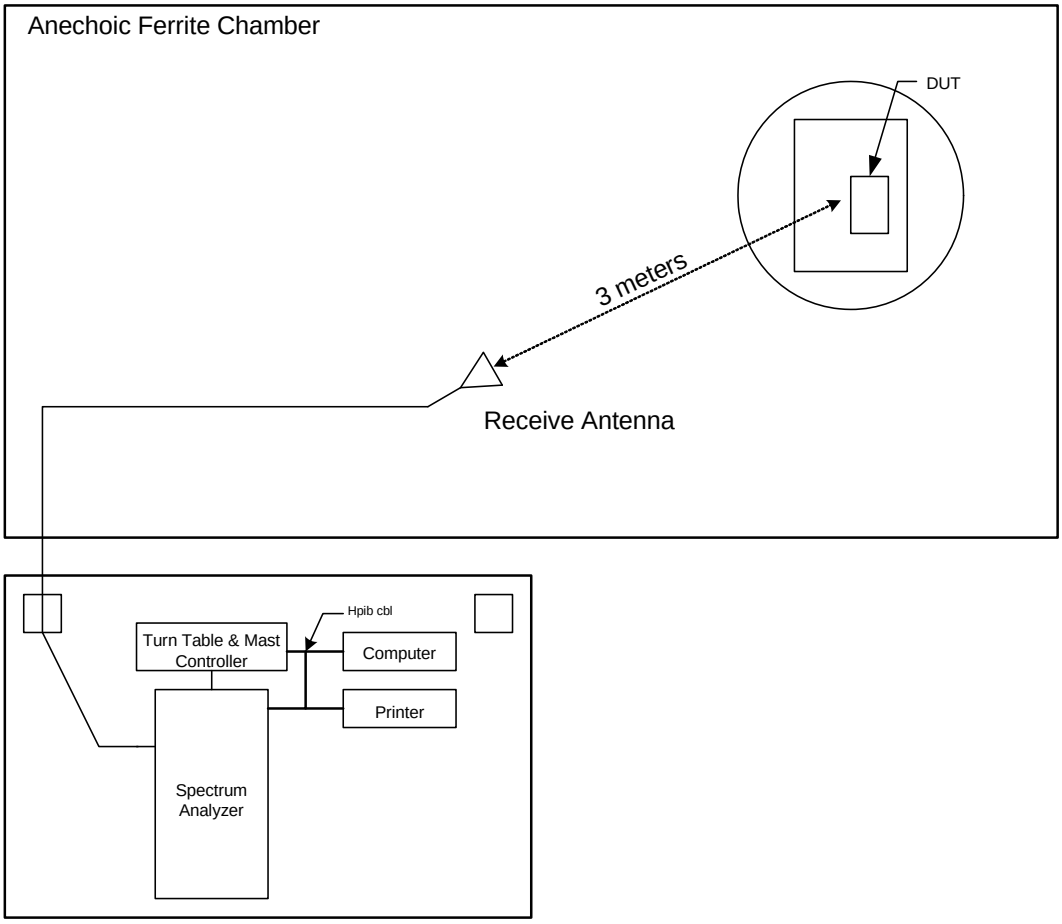
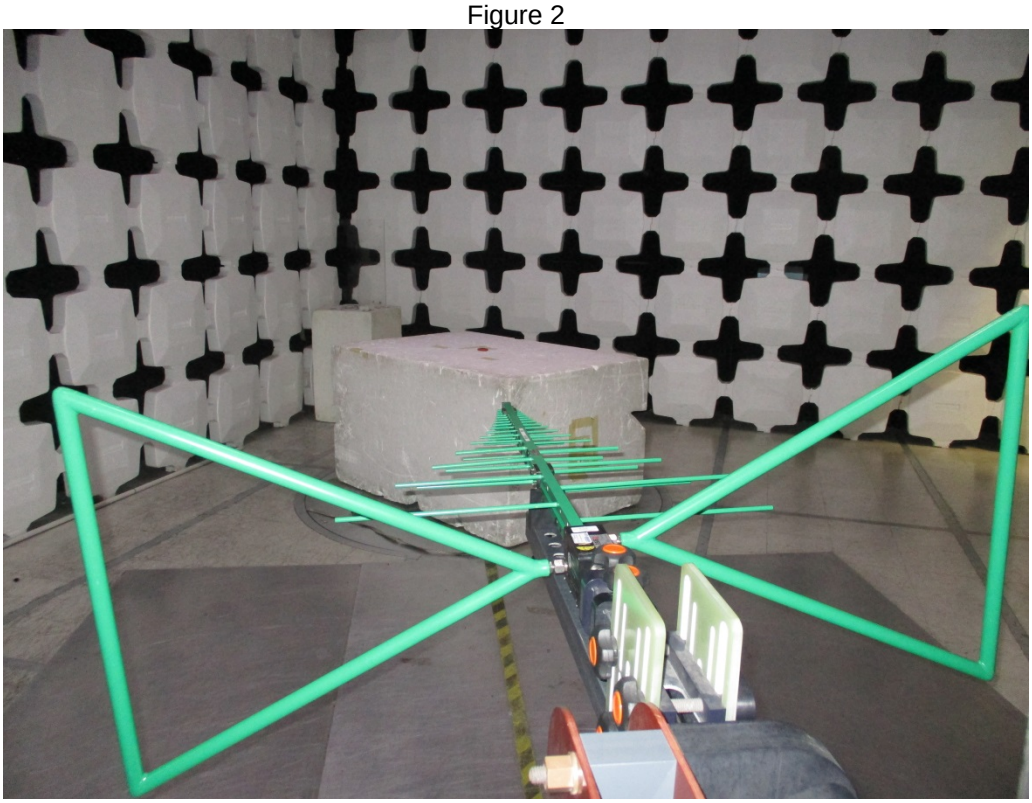


FIGURE 1 BLOCKDIAGRAM OF TEST SETUP

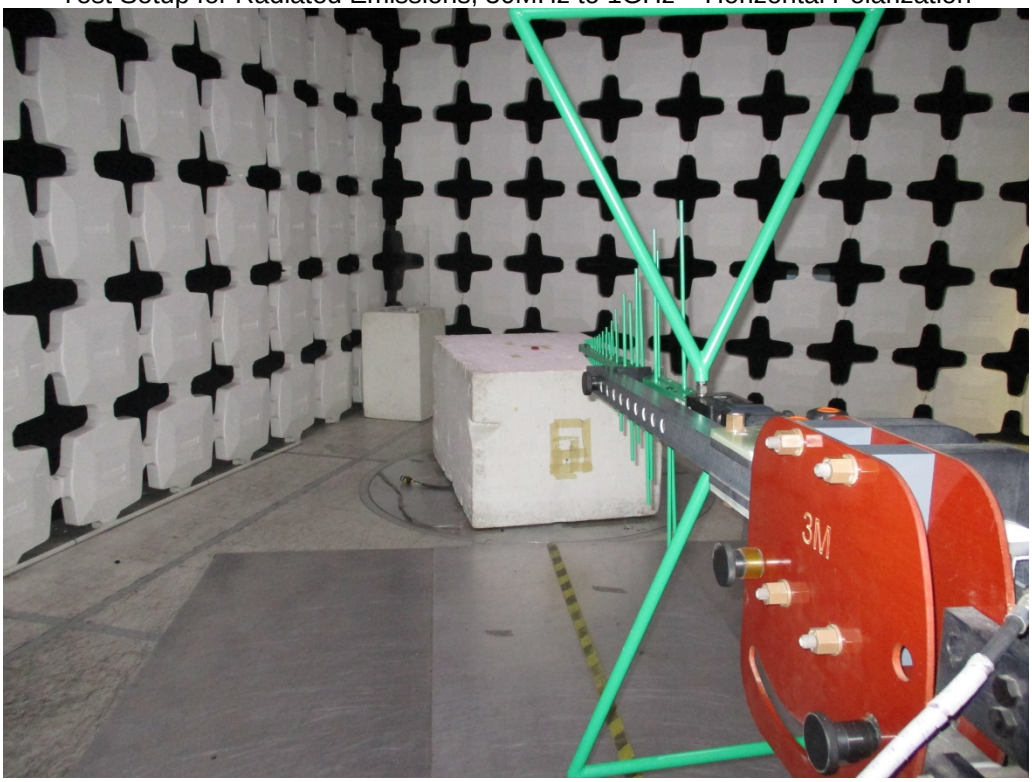
Figure 2

Photograph of the EUT

Figure 2

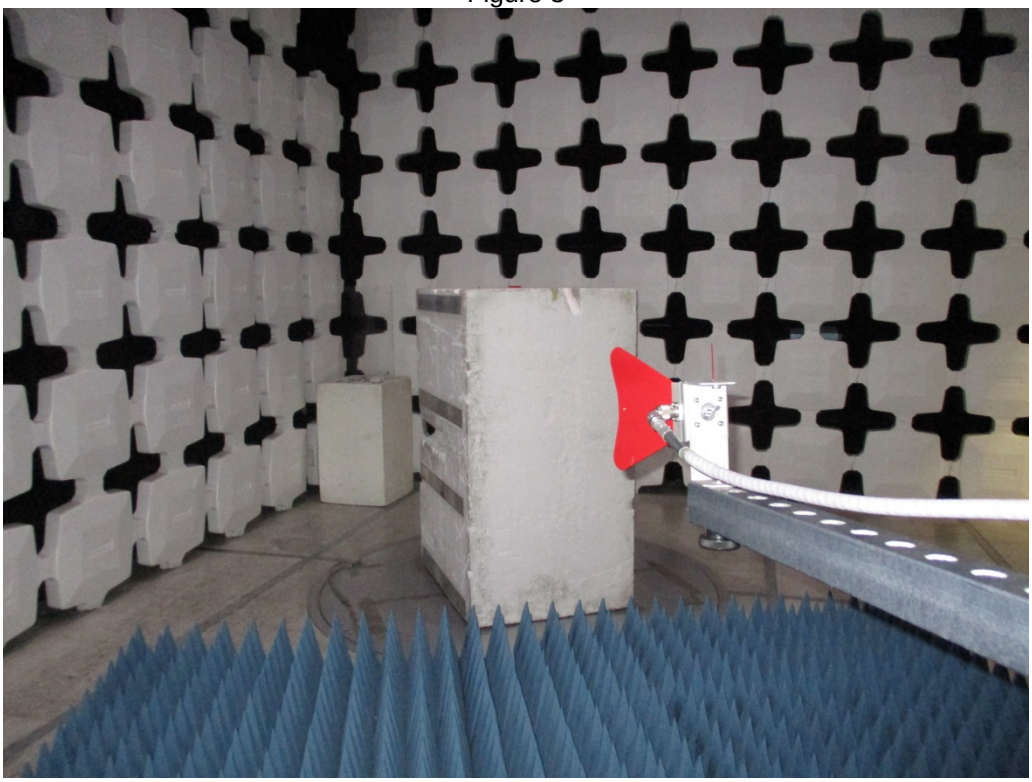


Test Setup for Radiated Emissions, 30MHz to 1GHz – Horizontal Polarization

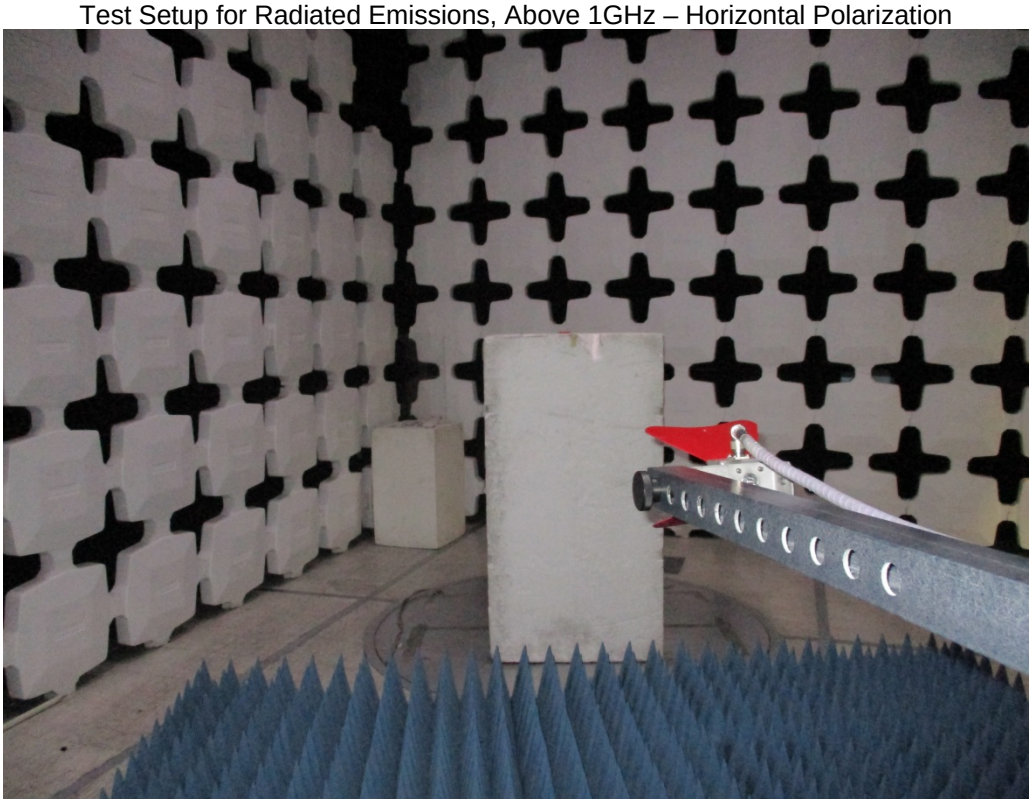


Test Setup for Radiated Emissions, 30MHz to 1GHz – Vertical Polarization

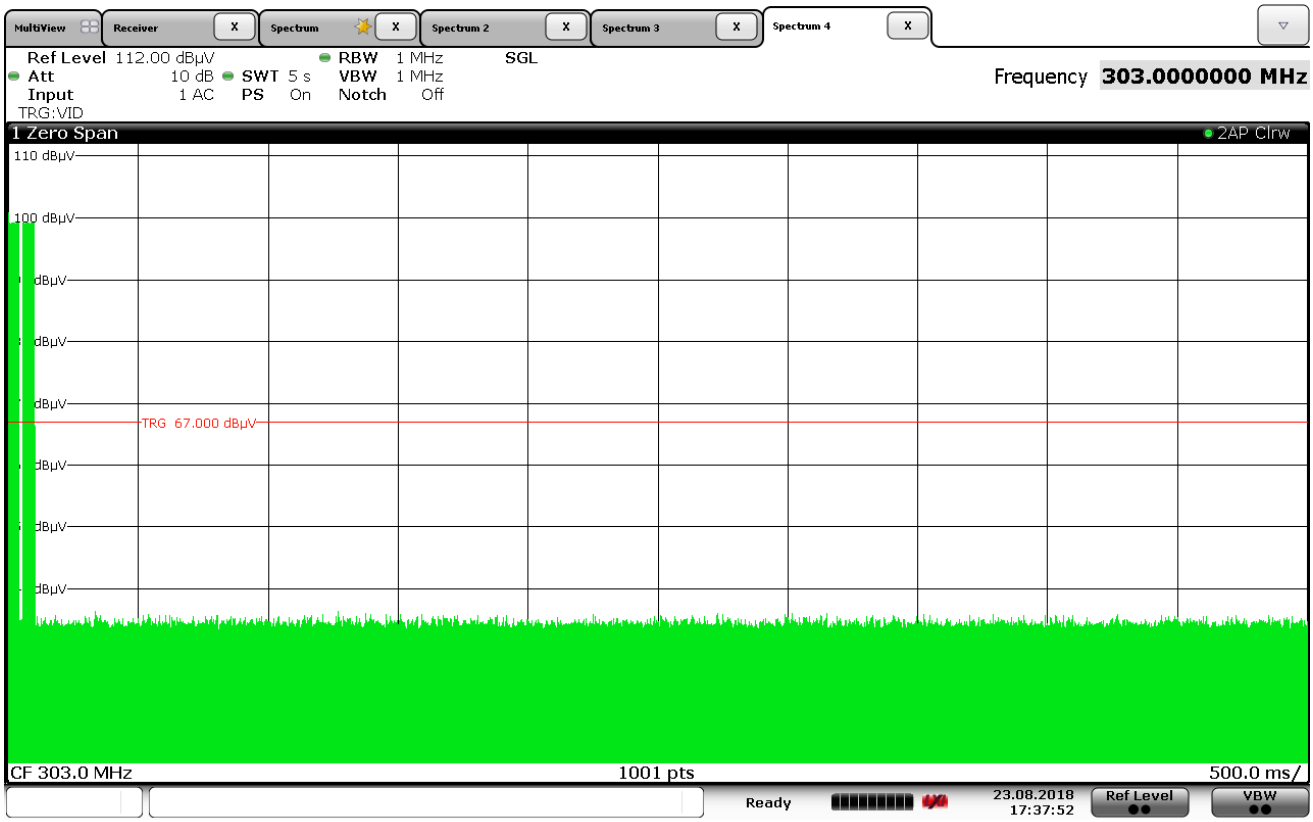
Figure 3



Test Setup for Radiated Emissions, Above 1GHz – Horizontal Polarization



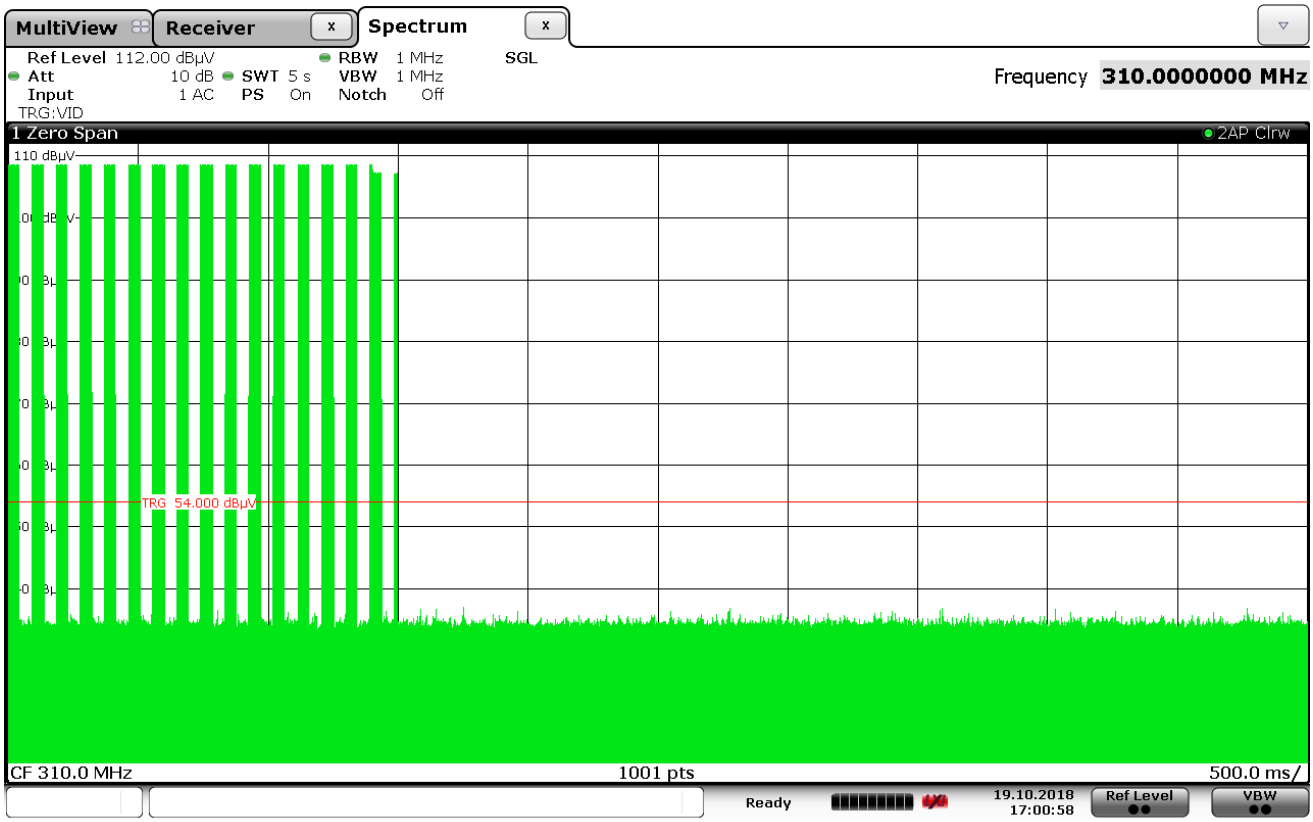
Test Setup for Radiated Emissions, Above 1GHz – Vertical Polarization



Date: 23.AUG.2018 17:37:52

FCC 15C 15.231(a)(1) / Periodic Operation

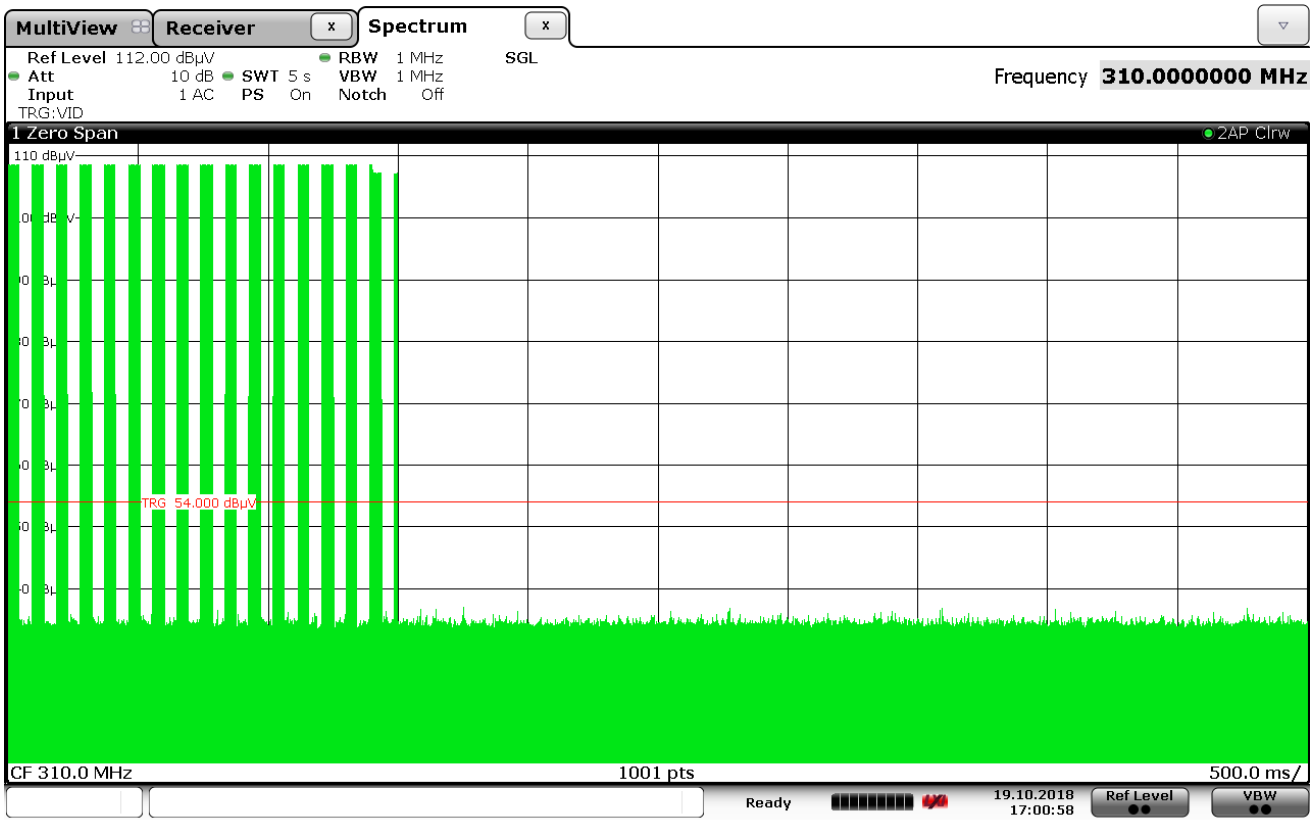
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : TX @ 303MHz
NOTES: : Guardian



Date: 19.OCT.2018 17:00:59

FCC 15C 15.231(a)(1) / Periodic Operation

MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : TX @ 310MHz
NOTES: : Sommer



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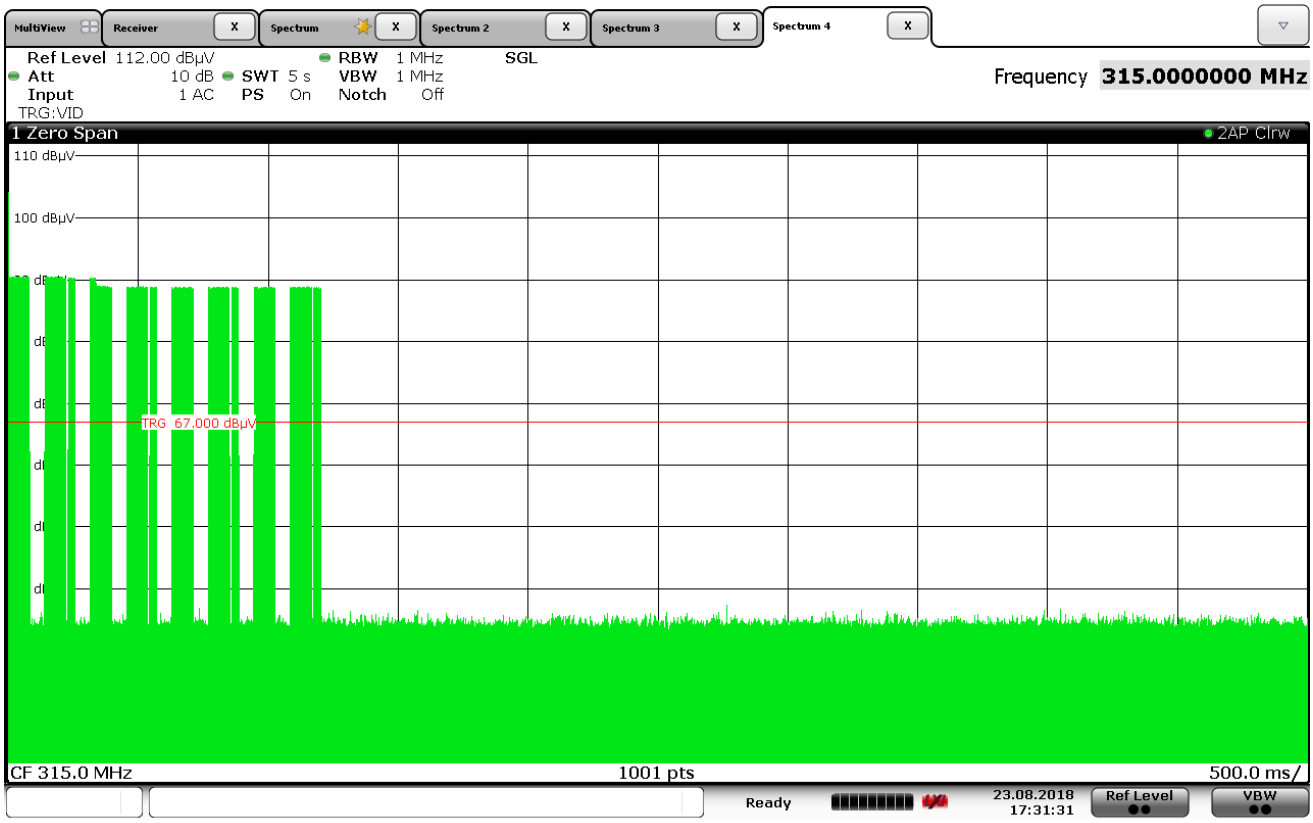
FCC 15C 15.231(a)(1) / Periodic Operation

MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : TX @ 310MHz
NOTES: : Stanley



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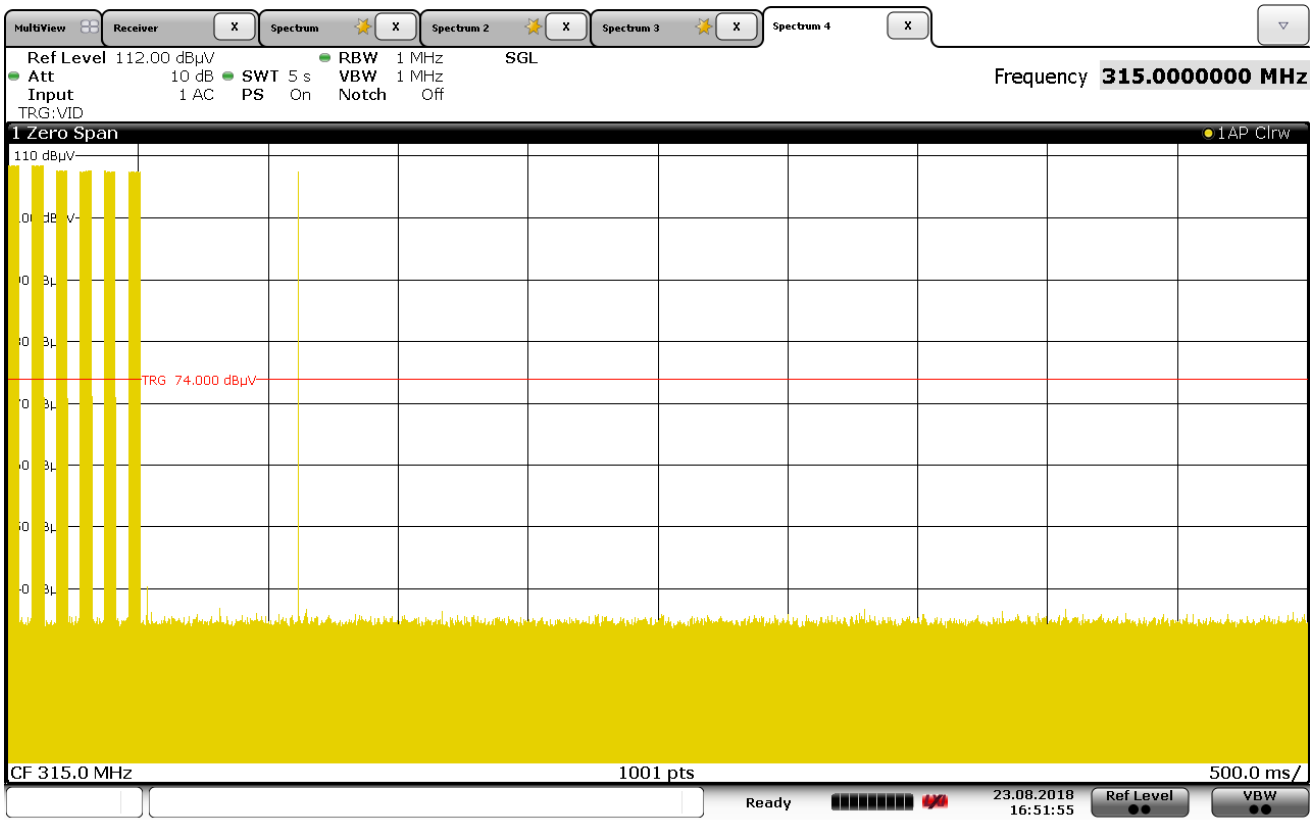
FCC 15C 15.231(a)(1) / Periodic Operation

MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : TX @ 315MHz
NOTES: : Chamberlain Purple



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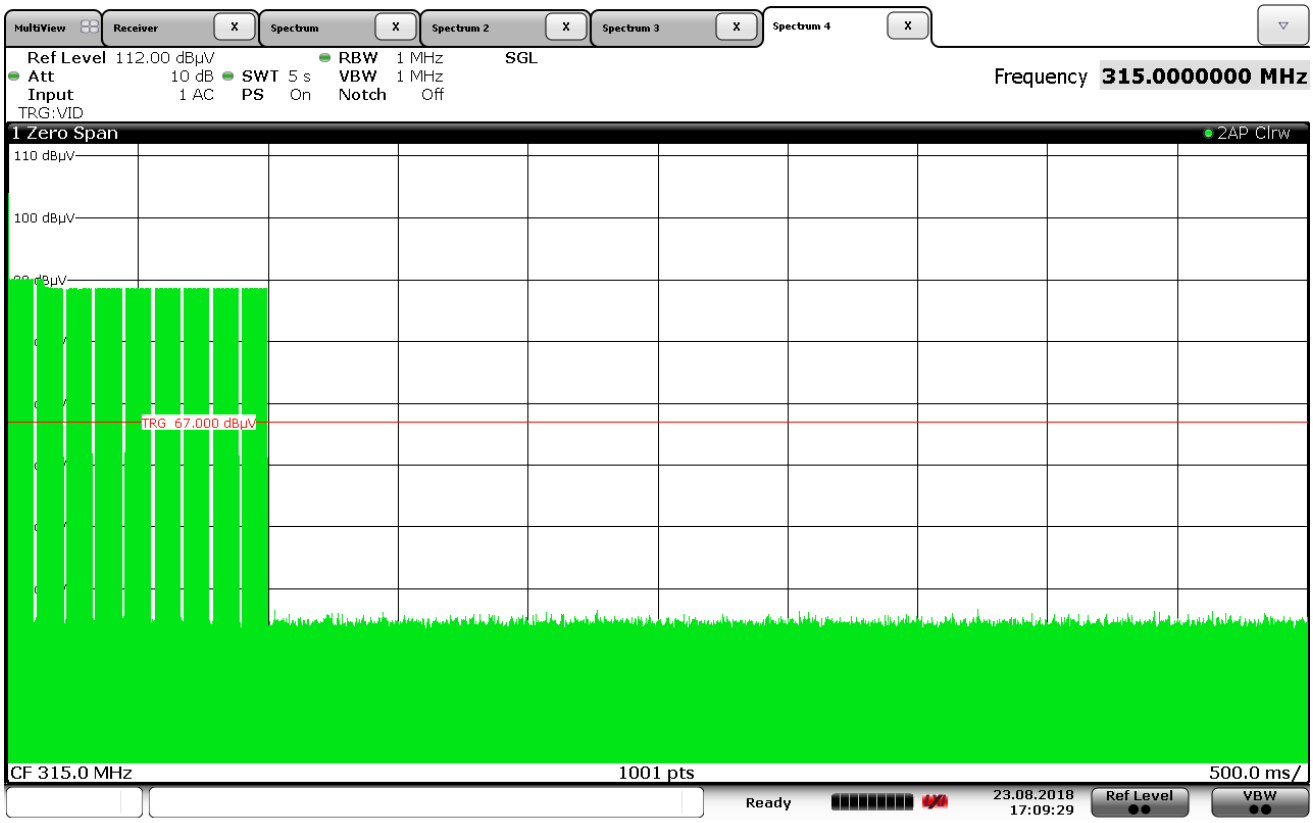
FCC 15C 15.231(a)(1) / Periodic Operation

MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : TX @ 315MHz
NOTES: : Genie IC1 and Genie IC2



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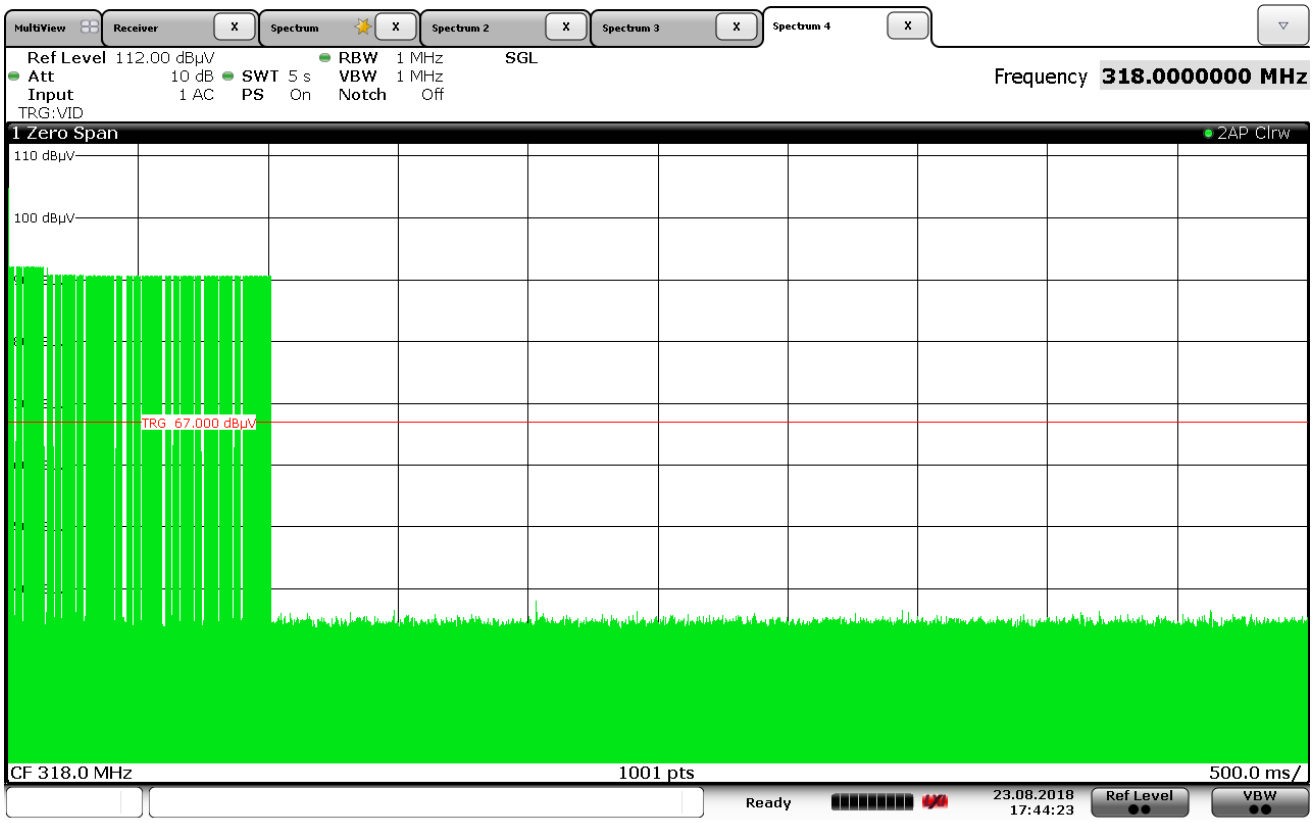
FCC 15C 15.231(a)(1) / Periodic Operation

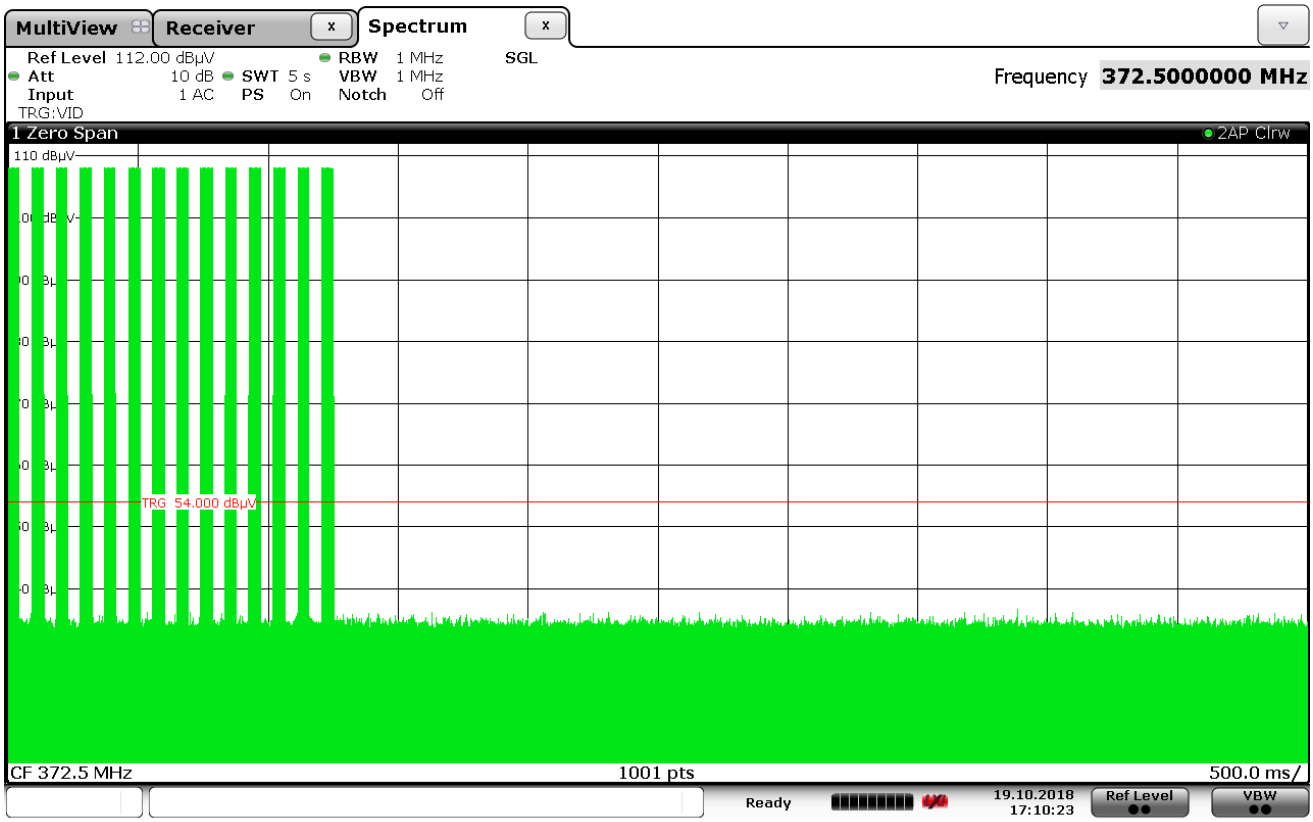
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : TX @ 315MHz
NOTES: : Marantec



Date: 23.AUG.2018 17:44:23

FCC 15C 15.231(a)(1) / Periodic Operation

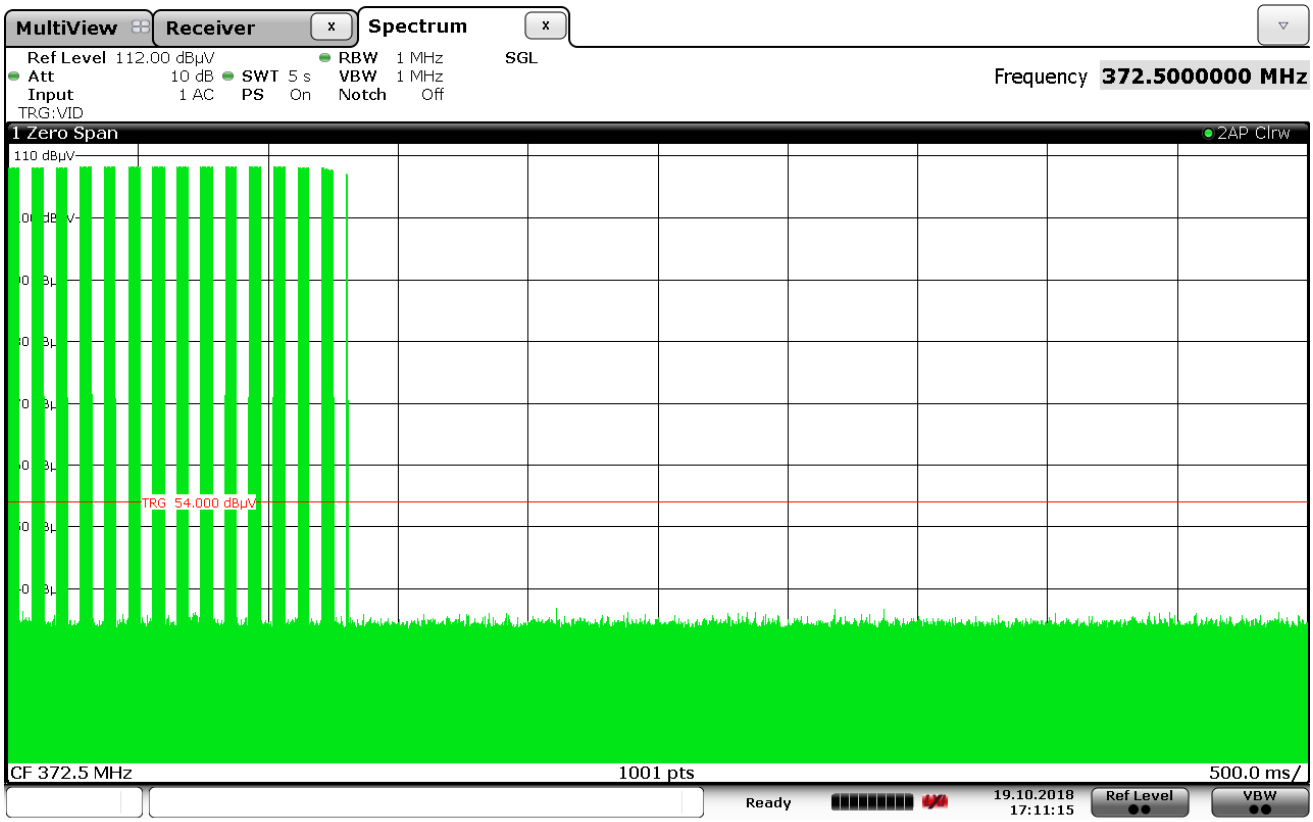
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : TX @ 318MHz
NOTES: : Linear



Date: 19.OCT.2018 17:10:23

FCC 15C 15.231(a)(1) / Periodic Operation

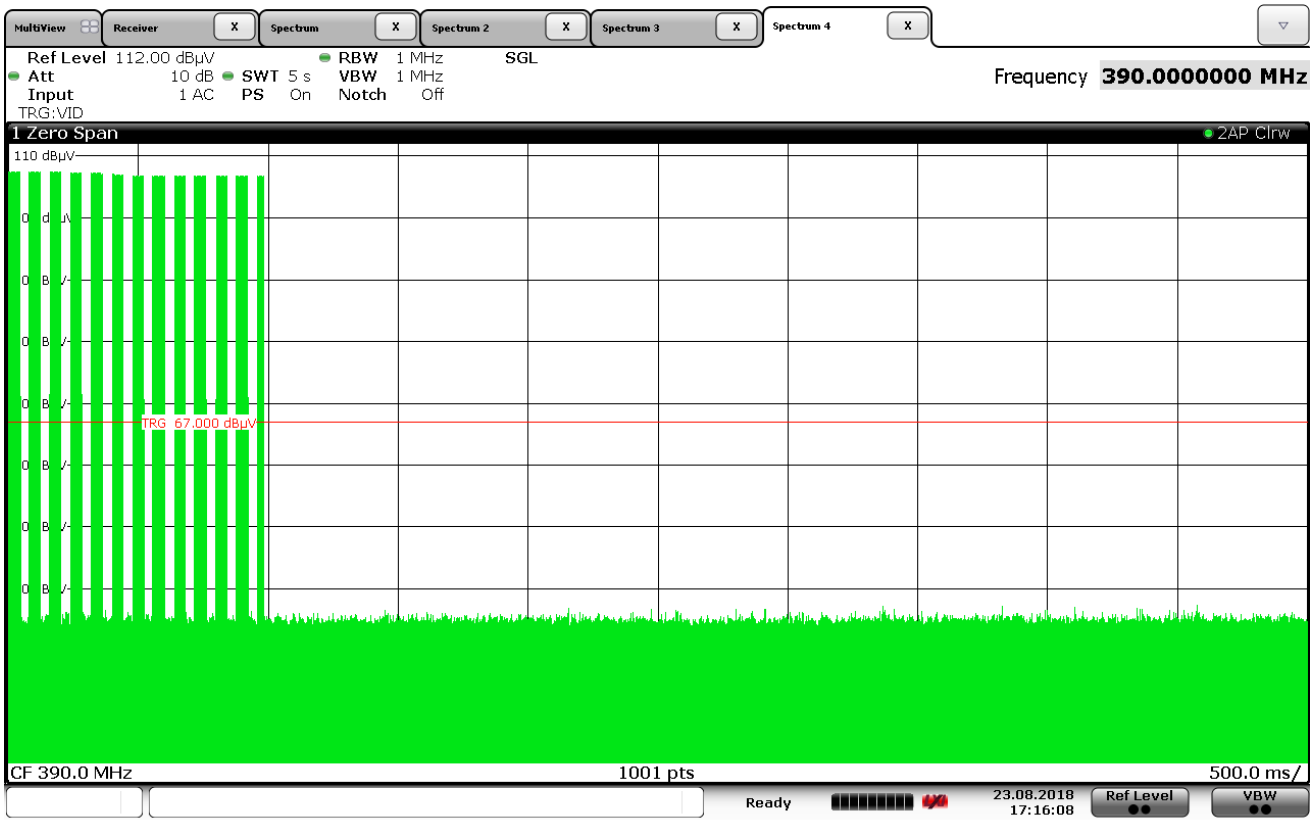
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : TX @ 372.5MHz
NOTES: : Wayne Dalton



Date: 19.OCT.2018 17:11:15

FCC 15C 15.231(a)(1) / Periodic Operation

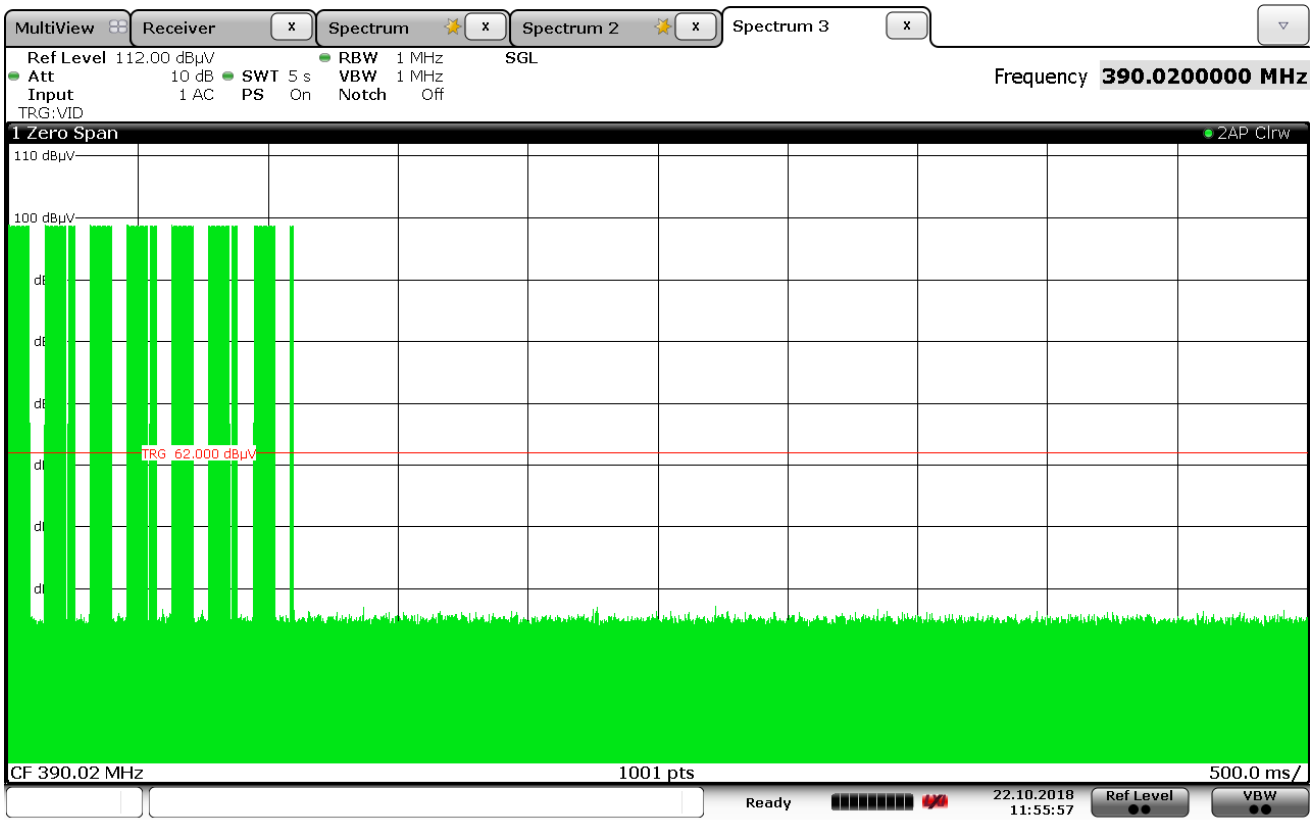
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : TX @ 372.5MHz
NOTES: : Ryobi



Date: 23.AUG.2018 17:16:08

FCC 15C 15.231(a)(1) / Periodic Operation

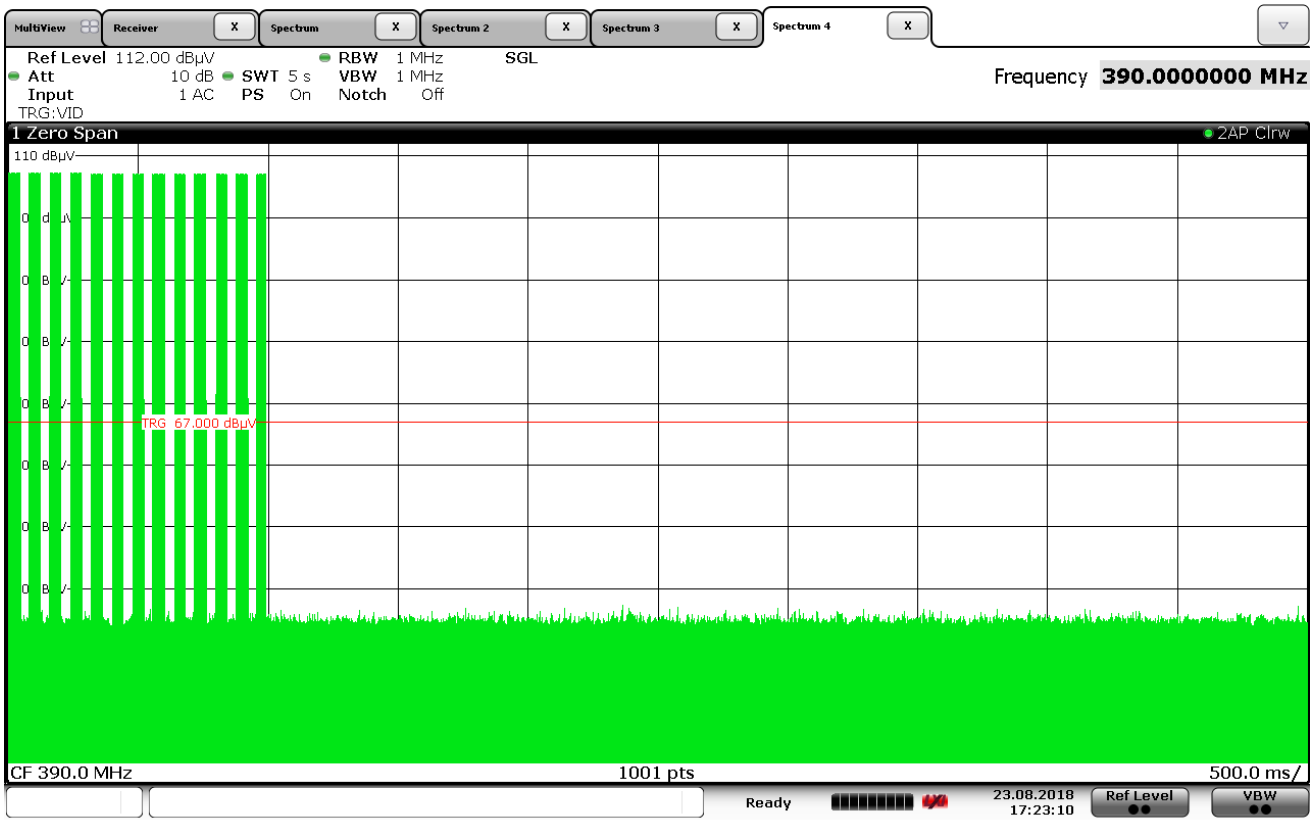
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : TX @ 390MHz
NOTES: : Chamberlain Green



Date: 22.OCT.2018 11:55:56

FCC 15C 15.231(a)(1) / Periodic Operation

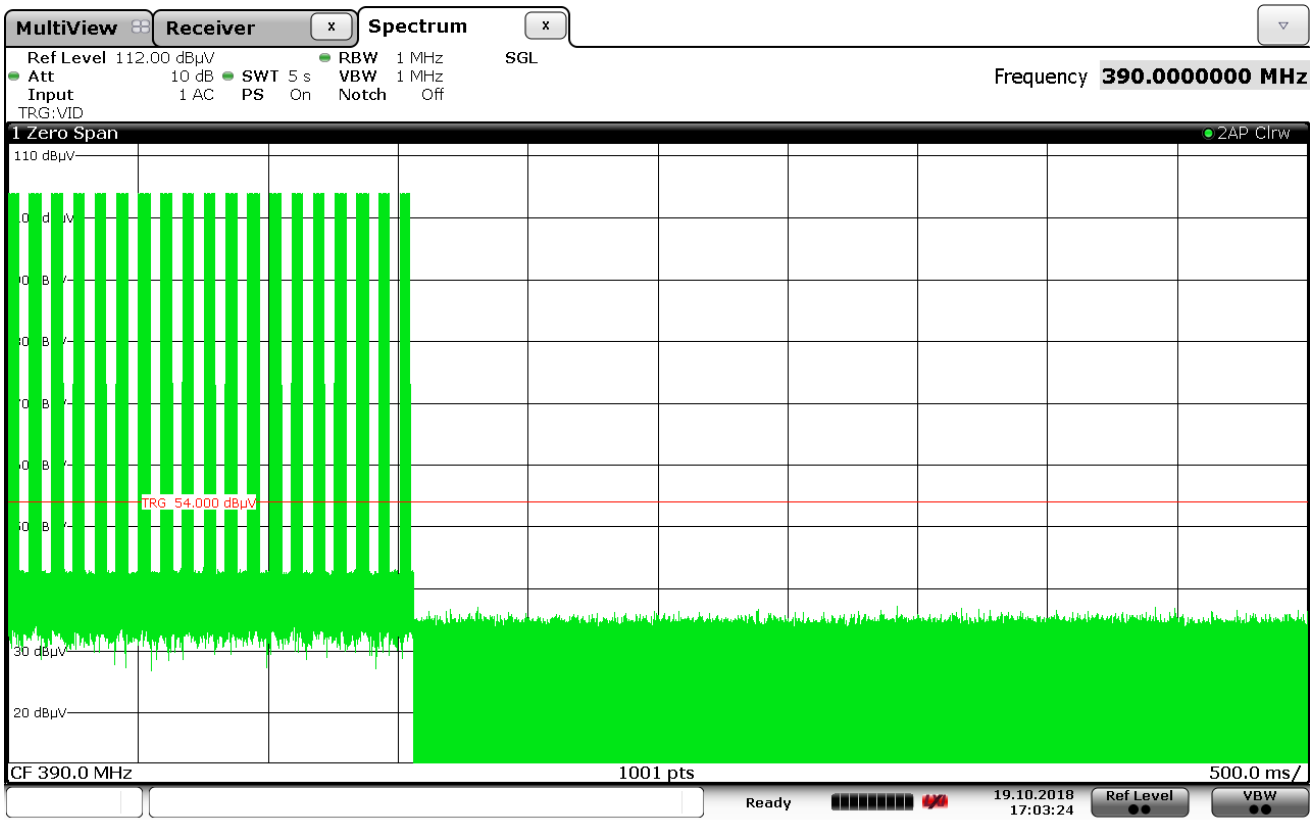
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : TX @ 390MHz
NOTES: : Chamberlain Orange/Red



Date: 23.AUG.2018 17:23:10

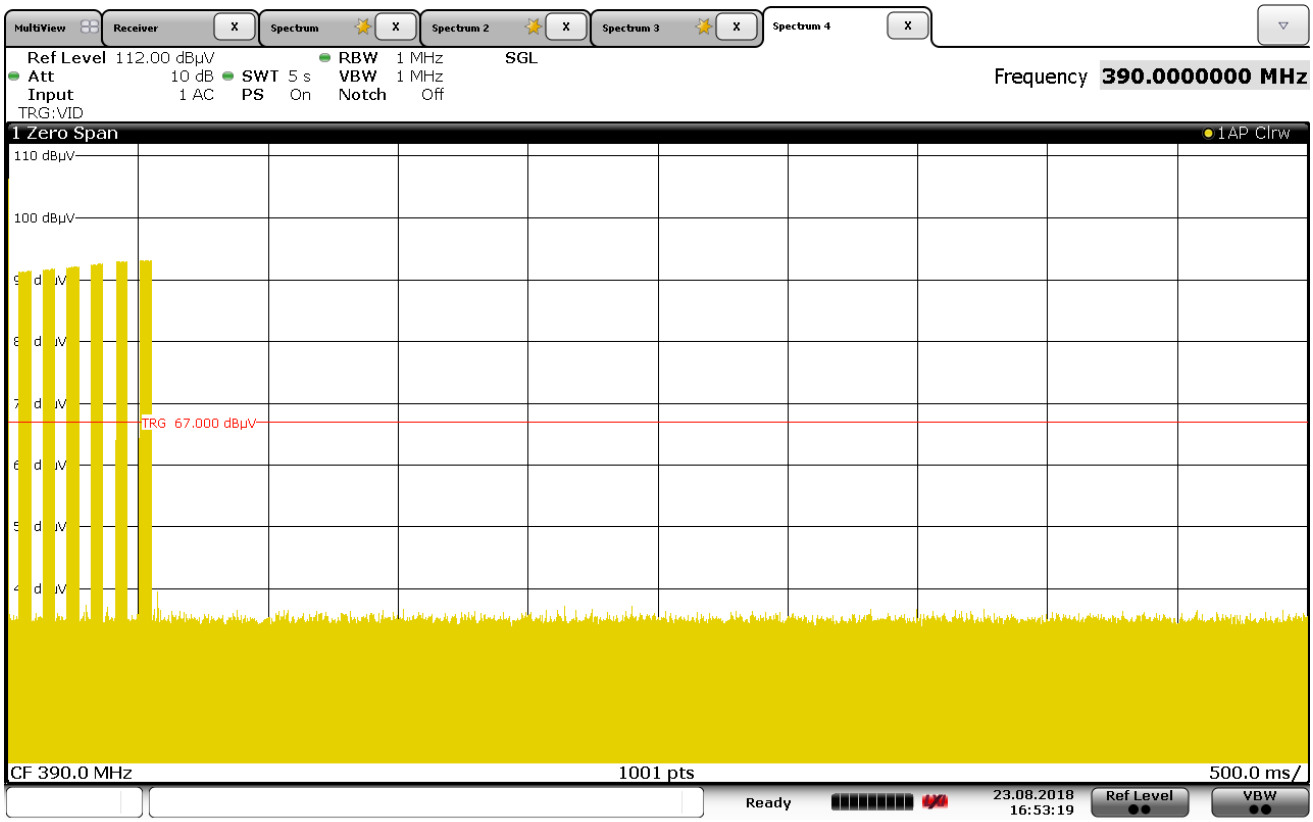
FCC 15C 15.231(a)(1) / Periodic Operation

MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : TX @ 390MHz
NOTES: : Chamberlain Yellow



FCC 15C 15.231(a)(1) / Periodic Operation

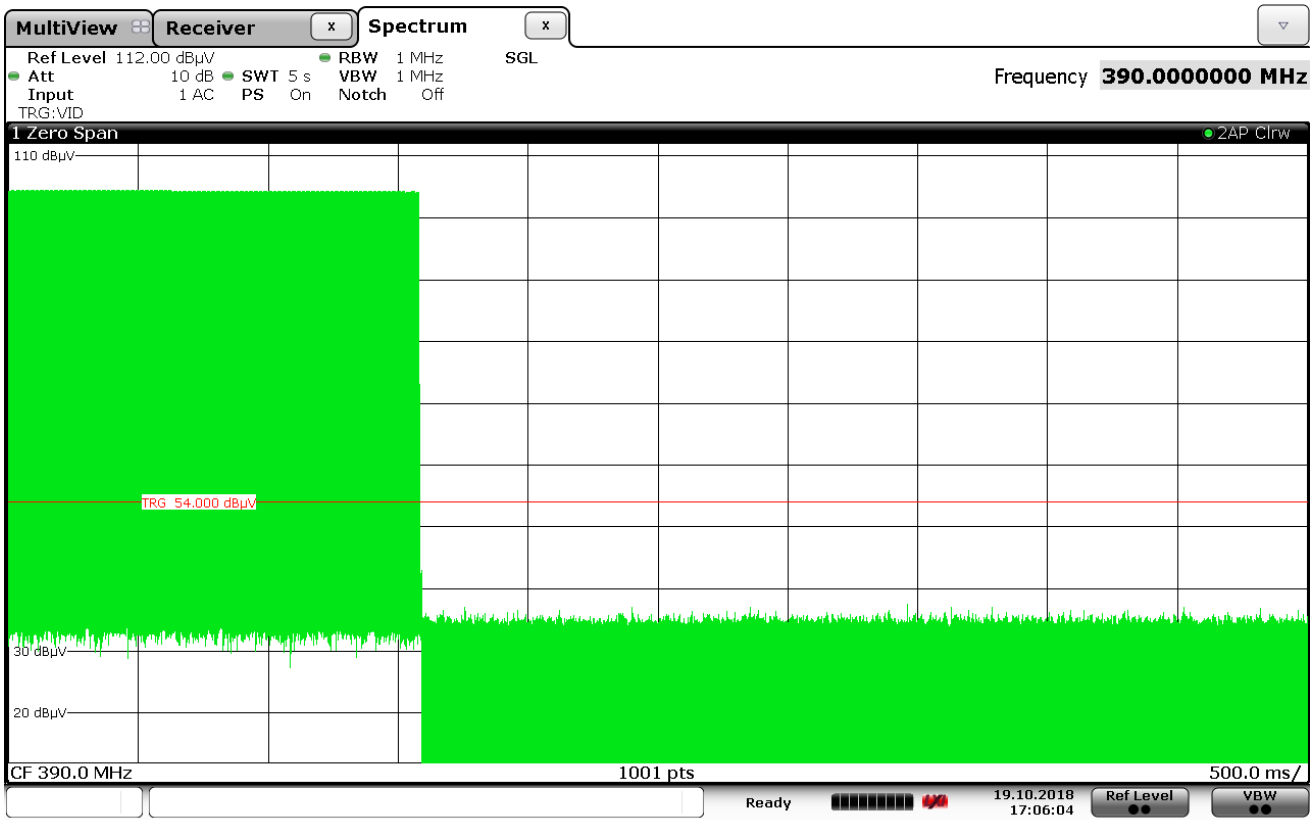
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : TX @ 390MHz
NOTES: : Chamberlain Legacy



Date: 23.AUG.2018 16:53:19

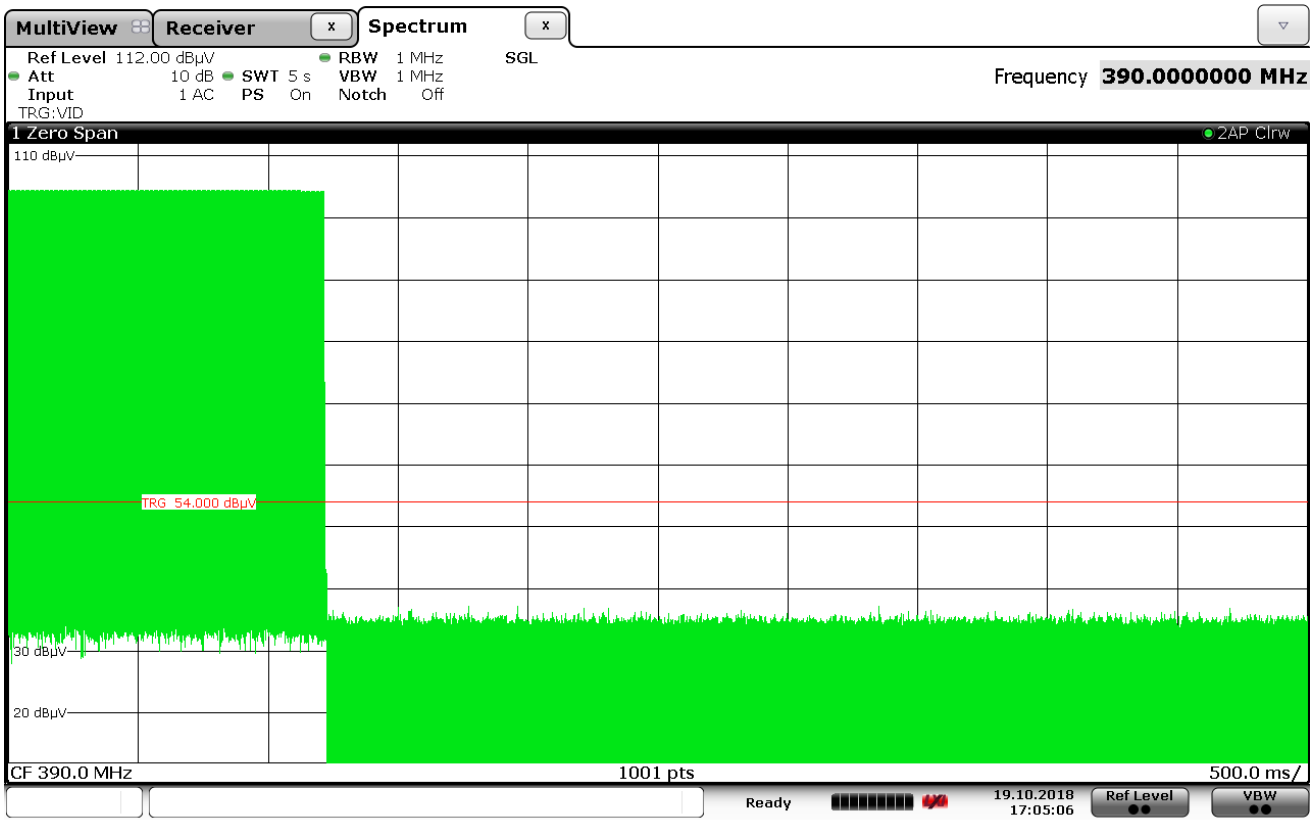
FCC 15C 15.231(a)(1) / Periodic Operation

MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : TX @ 390MHz
NOTES: : Genie IC1 and Genie IC2



FCC 15C 15.231(a)(1) / Periodic Operation

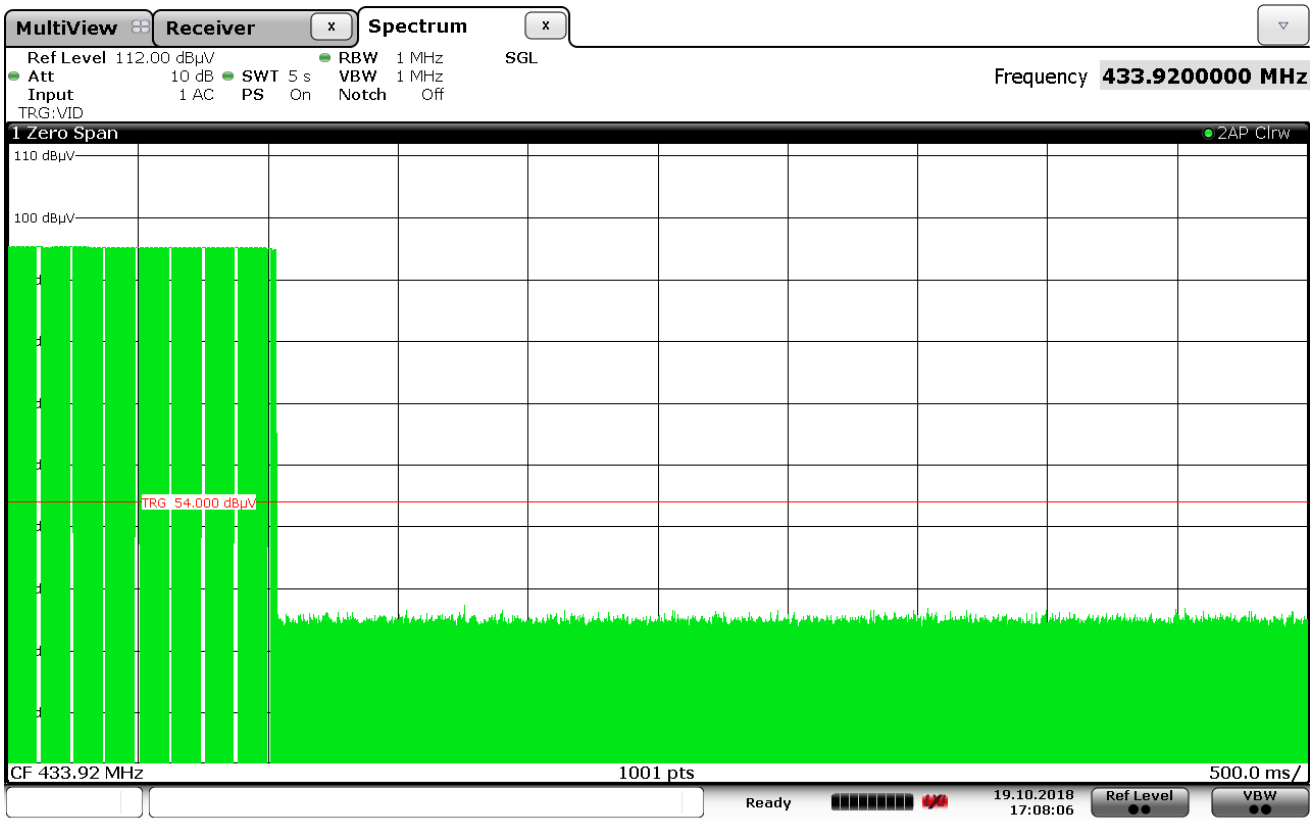
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : TX @ 390MHz
NOTES: : Genie Legacy 9 position DIP switch



Date: 19.OCT.2018 17:05:07

FCC 15C 15.231(a)(1) / Periodic Operation

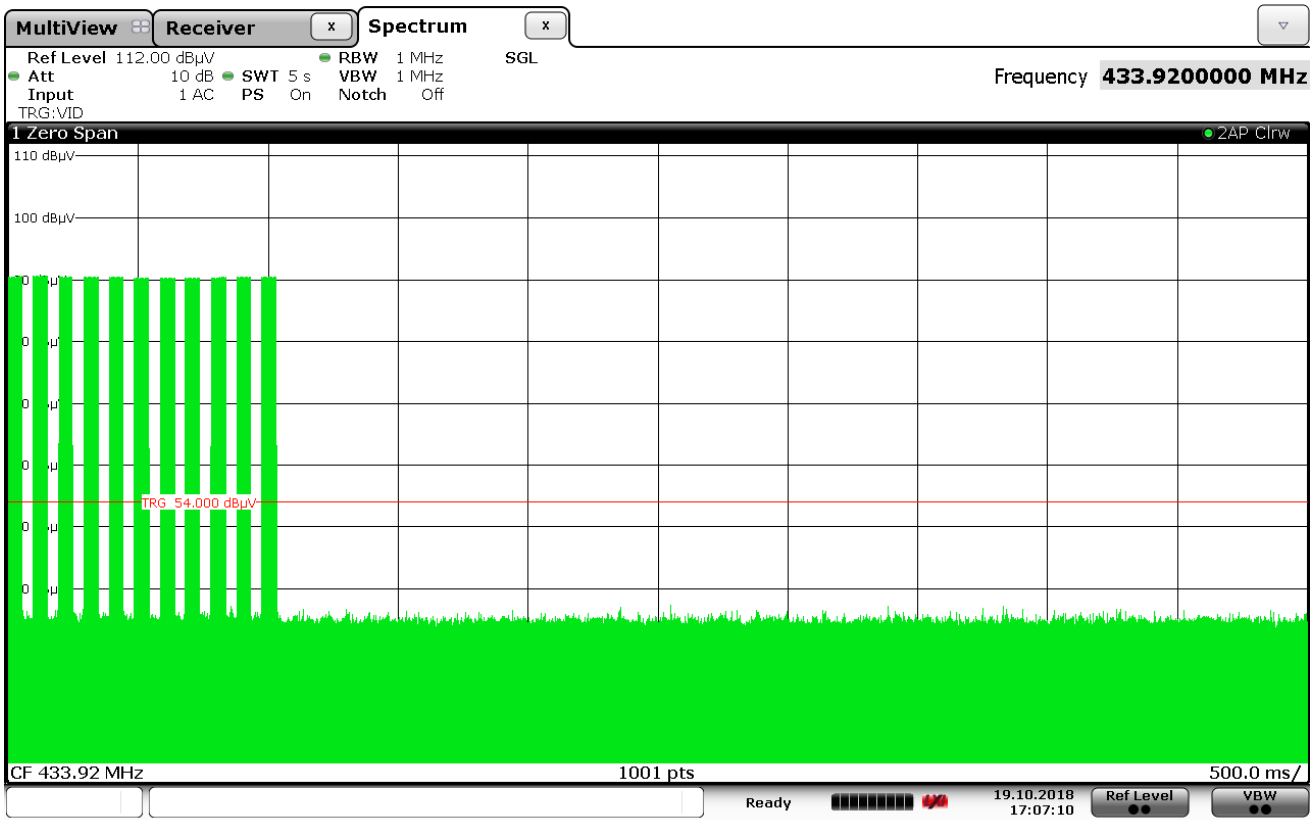
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : TX @ 390MHz
NOTES: : Genie Legacy 12 position DIP switch



Date: 19.OCT.2018 17:08:06

FCC 15C 15.231(a)(1) / Periodic Operation

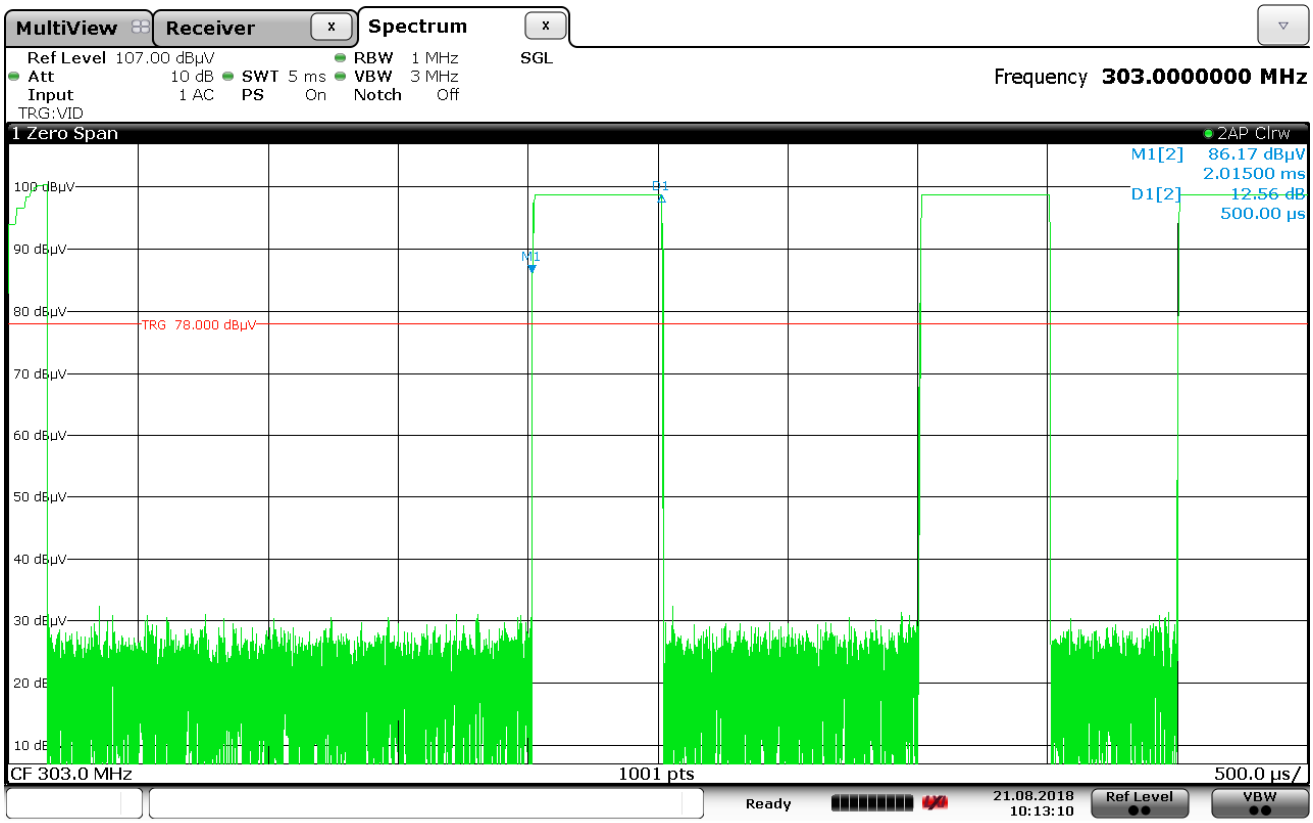
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : TX @ 433.92MHz
NOTES: : FAAC



Date: 19.OCT.2018 17:07:10

FCC 15C 15.231(a)(1) / Periodic Operation

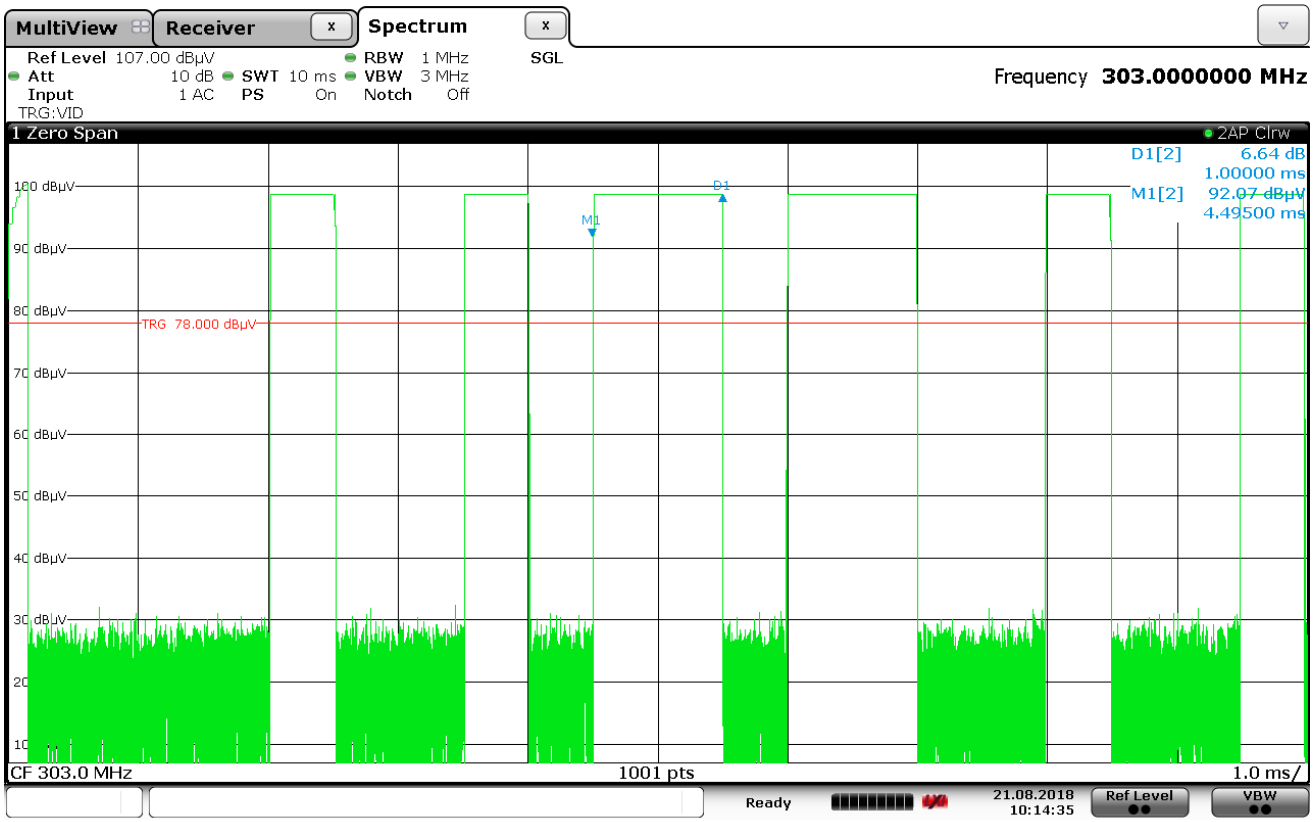
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : TX @ 433.92MHz
NOTES: : Nice



Date: 21.AUG.2018 10:13:10

FCC 15C 15.35 / Duty Cycle

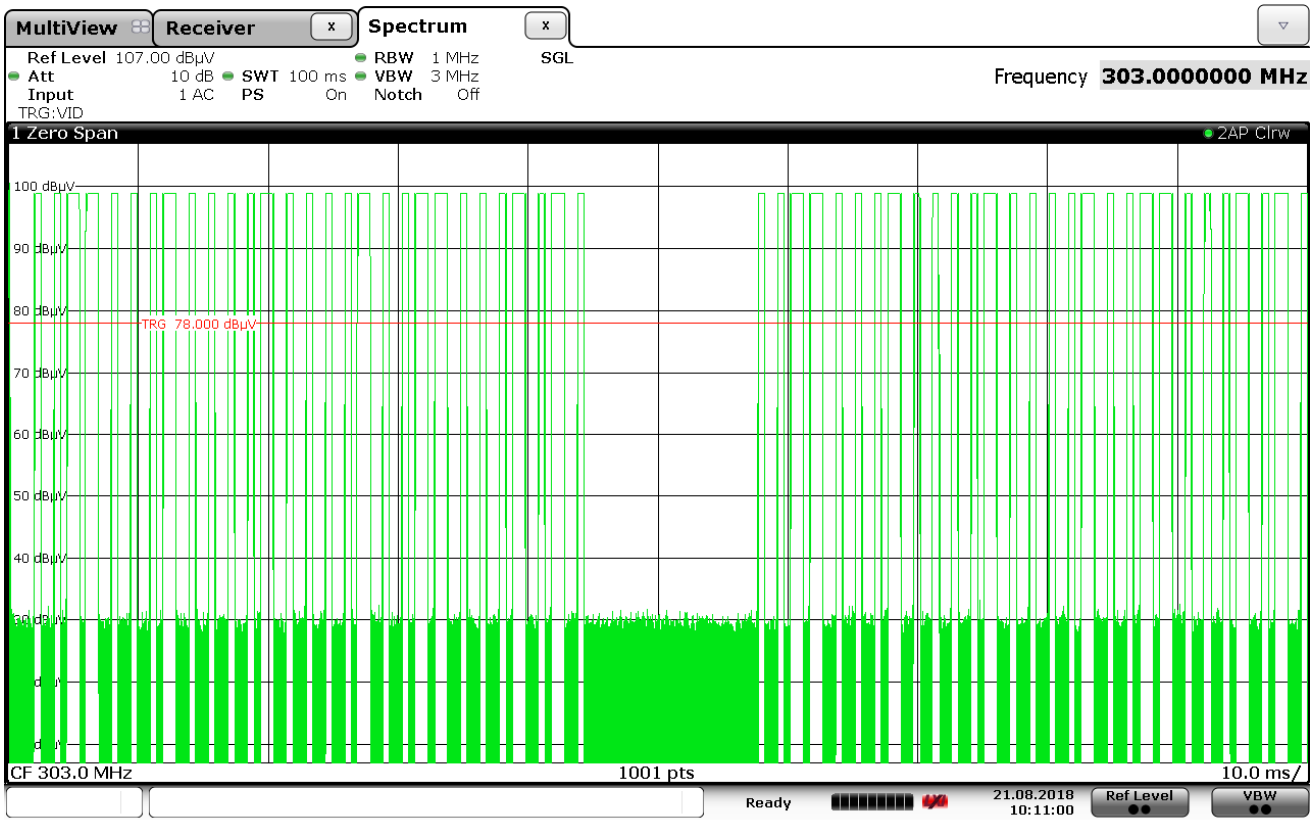
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : Tx @ 303MHz
NOTES : Guardian
NOTES : Narrow Pulse = 500usec



Date: 21.AUG.2018 10:14:35

FCC 15C 15.35 / Duty Cycle

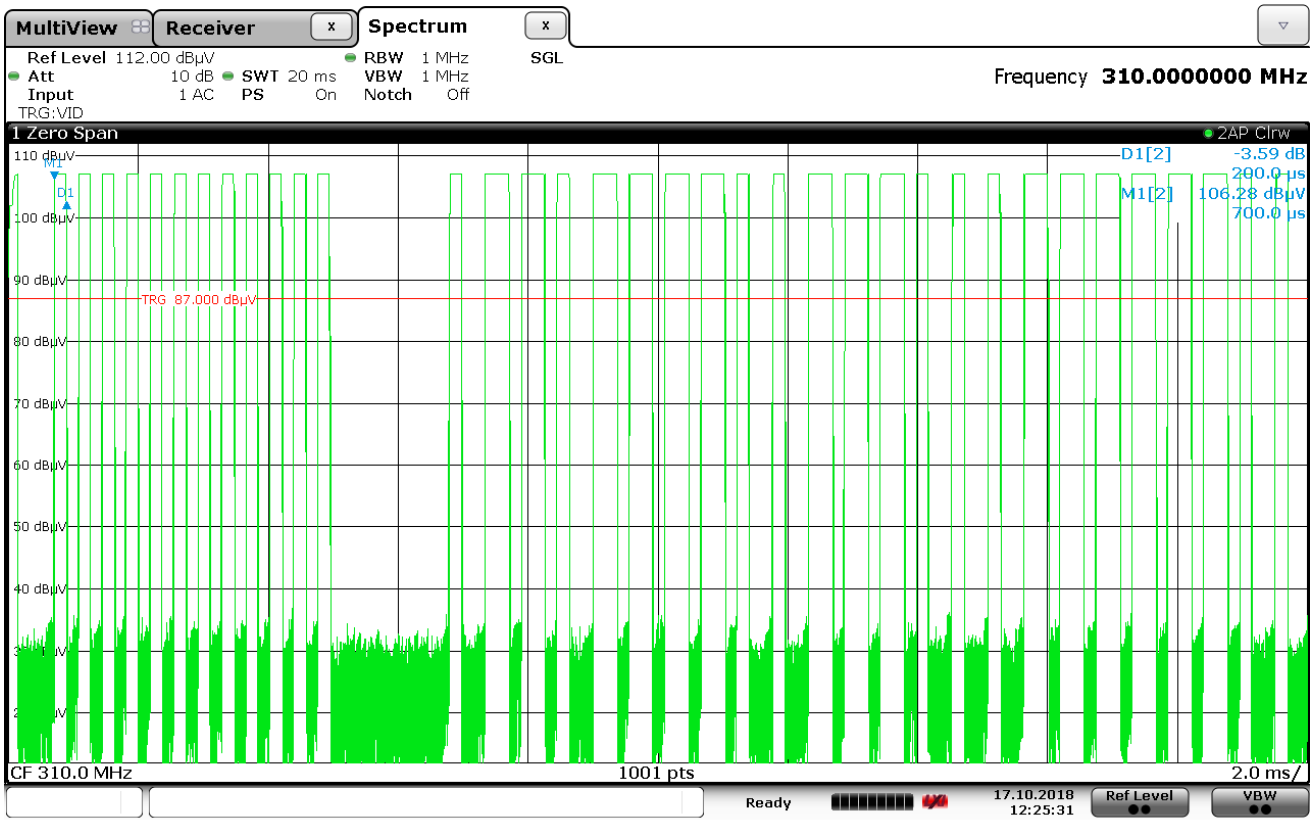
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : Tx @ 303MHz
NOTES : Guardian
NOTES : Wide Pulse = 1msec



Date: 21.AUG.2018 10:11:00

FCC 15C 15.35 / Duty Cycle

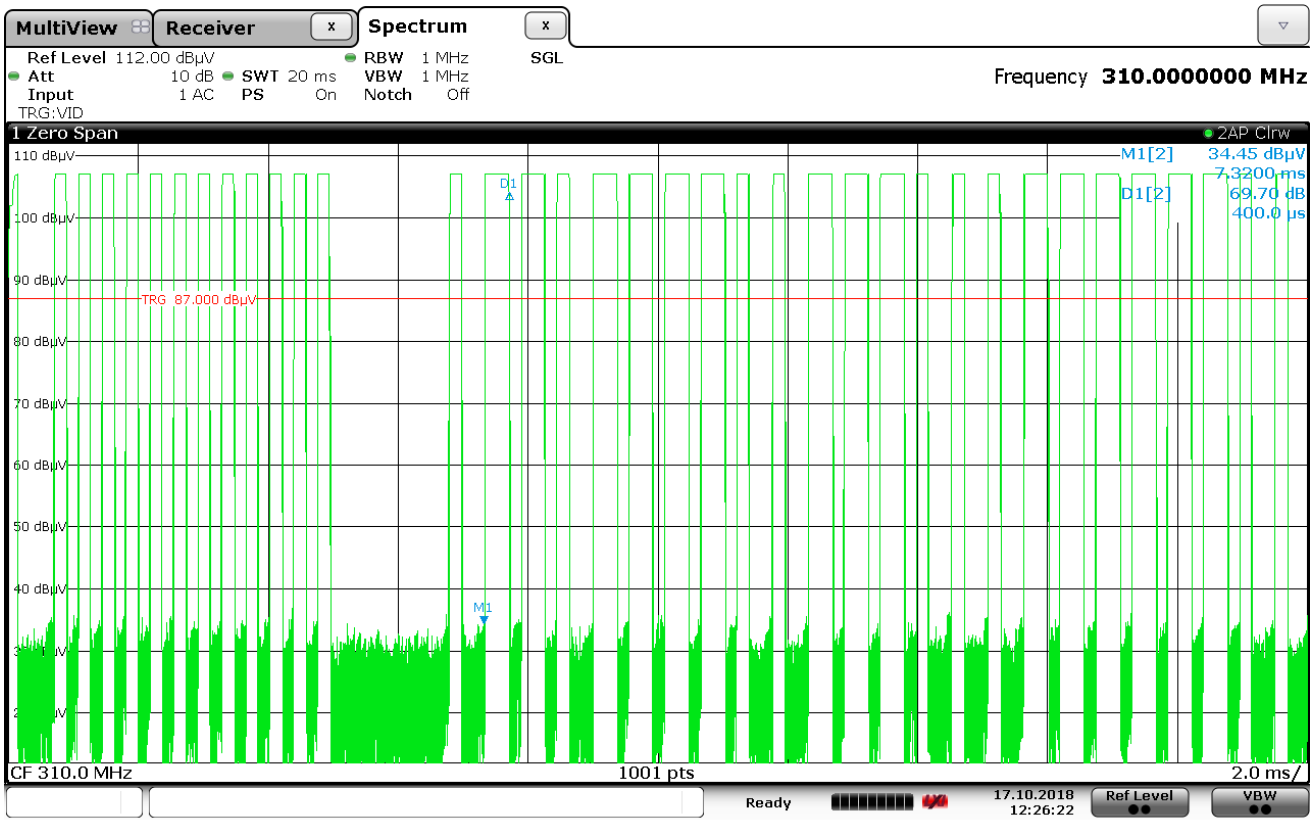
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : Tx @ 303MHz
NOTES : Guardian
NOTES : 100msec time
NOTES : Duty Cycle calculation was based on 50% short pulses and 50% long pulses or
: 29 short pulse and 29 long pulses = 29 x 500usec + 29 x 1 msec = 43.5msec
: Duty Cycle = 20 x log(43.5msec/100msec) = -7.23dB



Date: 17.OCT.2018 12:25:31

FCC 15C 15.35 / Duty Cycle

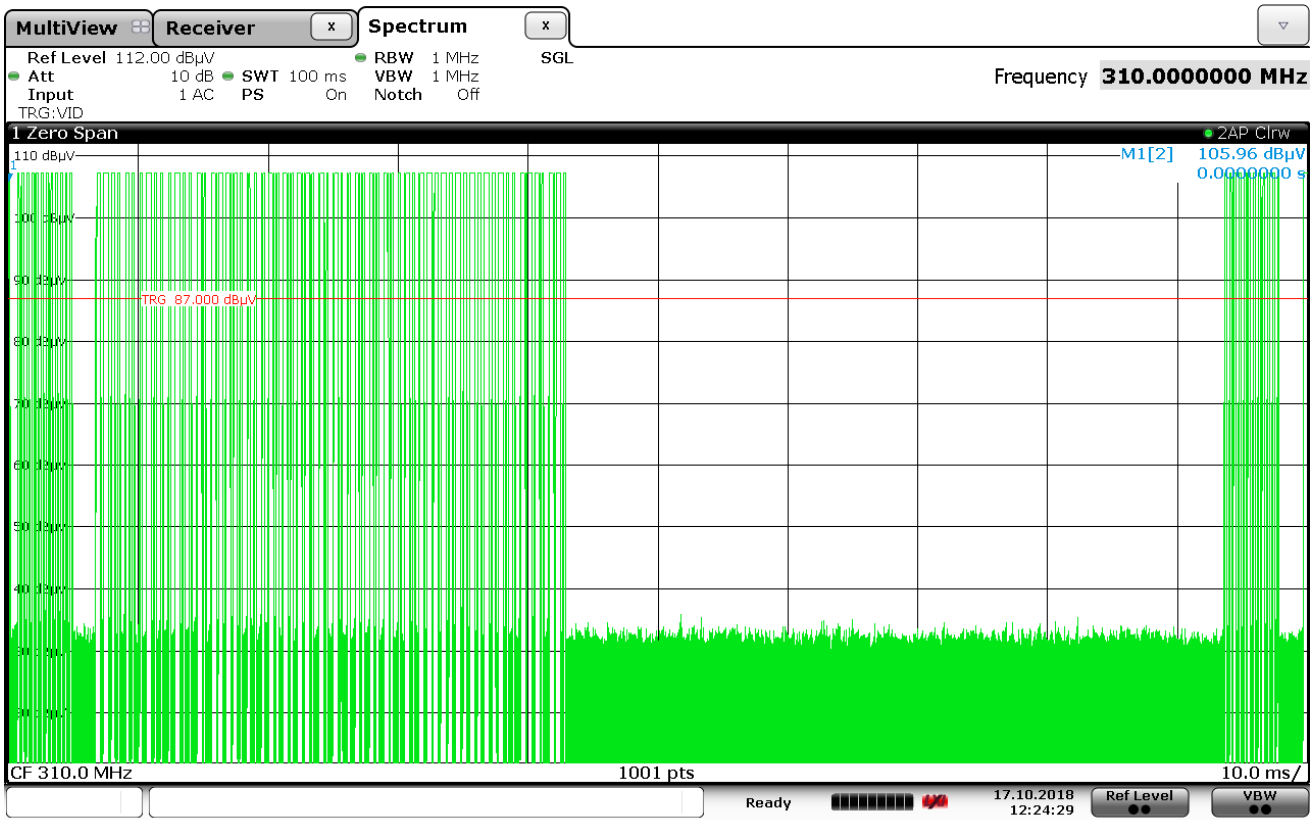
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : Tx @ 310MHz
NOTES : Sommer
NOTES : Narrow Pulse = 200usec



Date: 17.OCT.2018 12:26:23

FCC 15C 15.35 / Duty Cycle

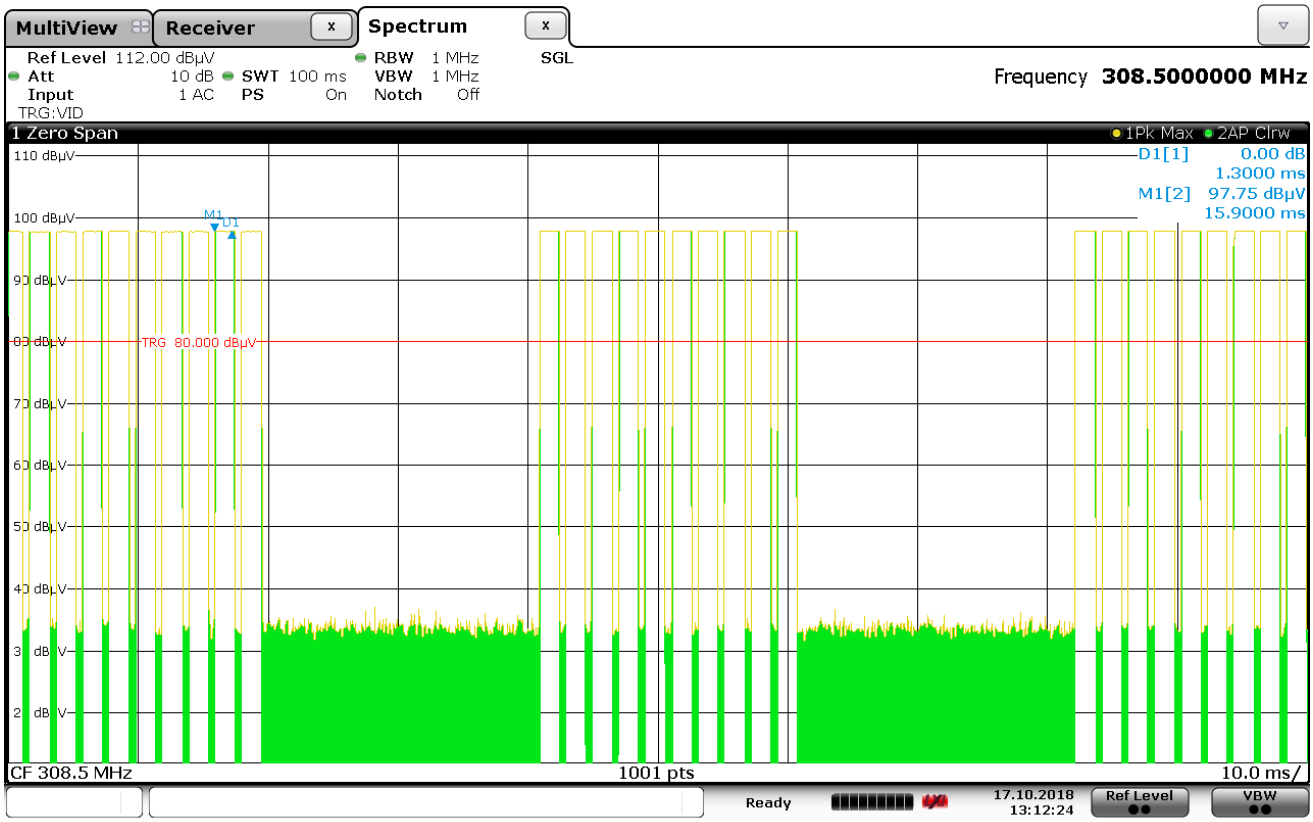
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : Tx @ 310MHz
NOTES : Sommer
NOTES : Wide Pulse = 400usec



Date: 17.OCT.2018 12:24:29

FCC 15C 15.35 / Duty Cycle

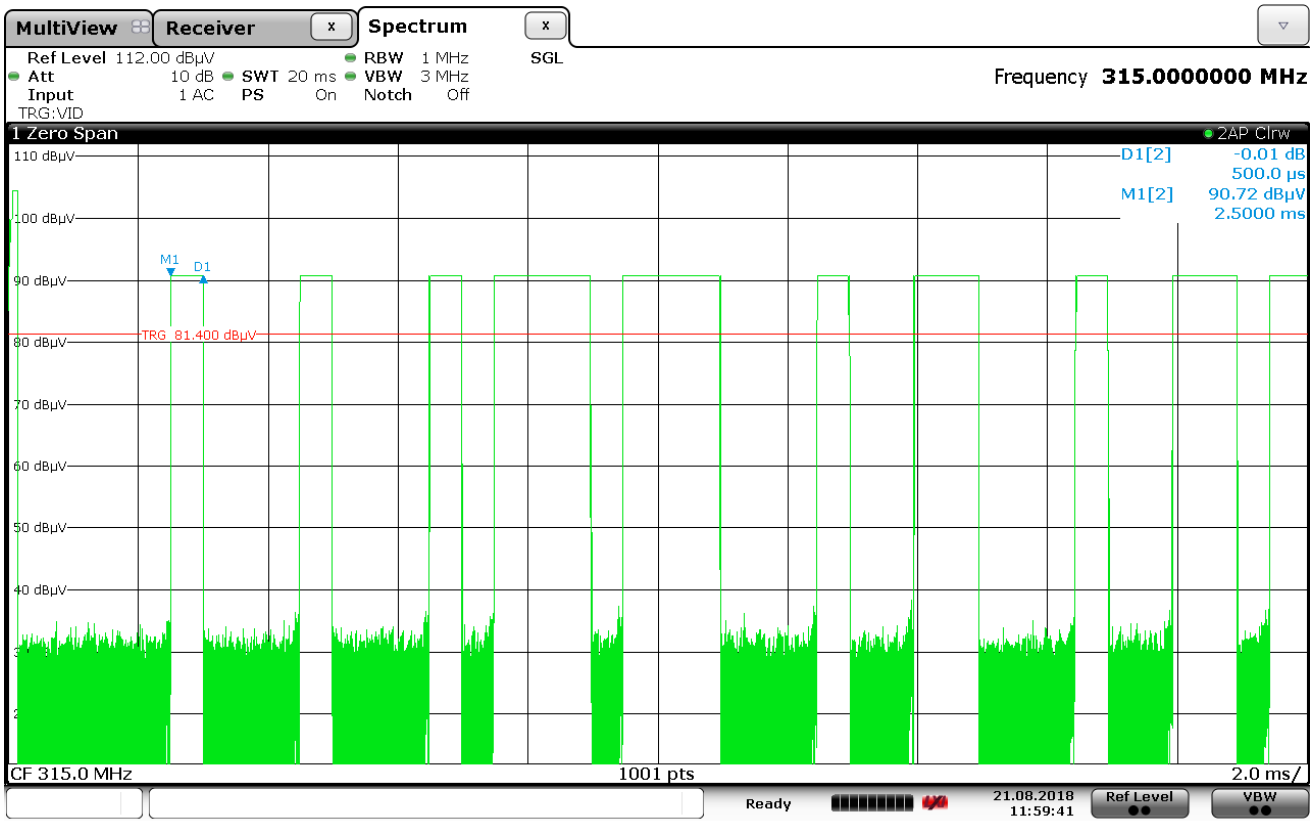
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : Tx @ 310MHz
NOTES : Sommer
NOTES : 100msec time
NOTES : Duty Cycle calculation was based on 54 short pulses and 37 long pulses
: or 54 x 200usec + 37 x 400 usec = 10.8usec + 14.8msec = 25.6msec
: Duty Cycle = 20 x log(25.6msec/100msec) = -11.84dB



Date: 17.OCT.2018 13:12:24

FCC 15C 15.35 / Duty Cycle

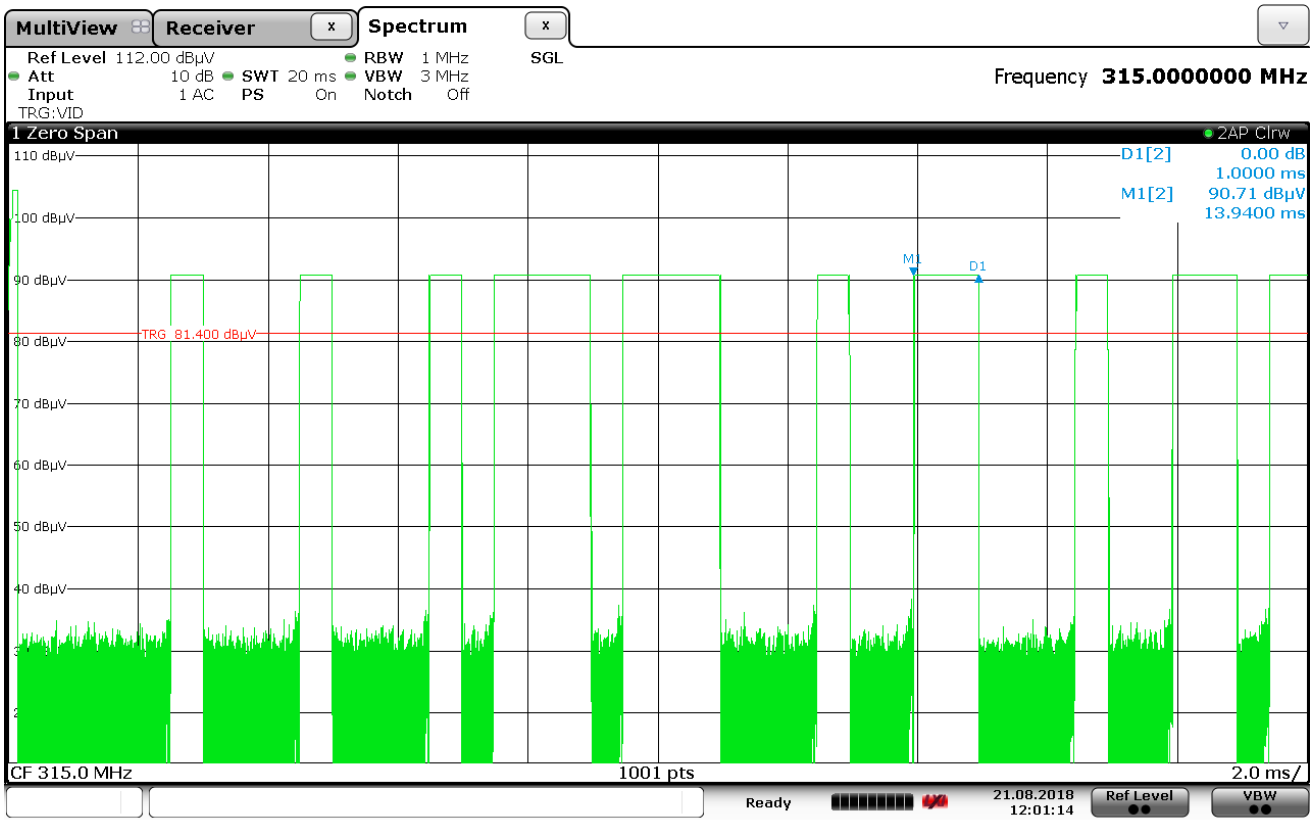
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : Tx @ 310MHz
NOTES : Stanley
NOTES : Fixed Pulse Width of 1.5msec
NOTES : Duty Cycle calculation was based on 29 fixed pulses or
: or 29 x 1.5msec = 43.5msec
: Duty Cycle = 20 x log(43.5msec/100msec) = -7.23dB



Date: 21.AUG.2018 11:59:41

FCC 15C 15.35 / Duty Cycle

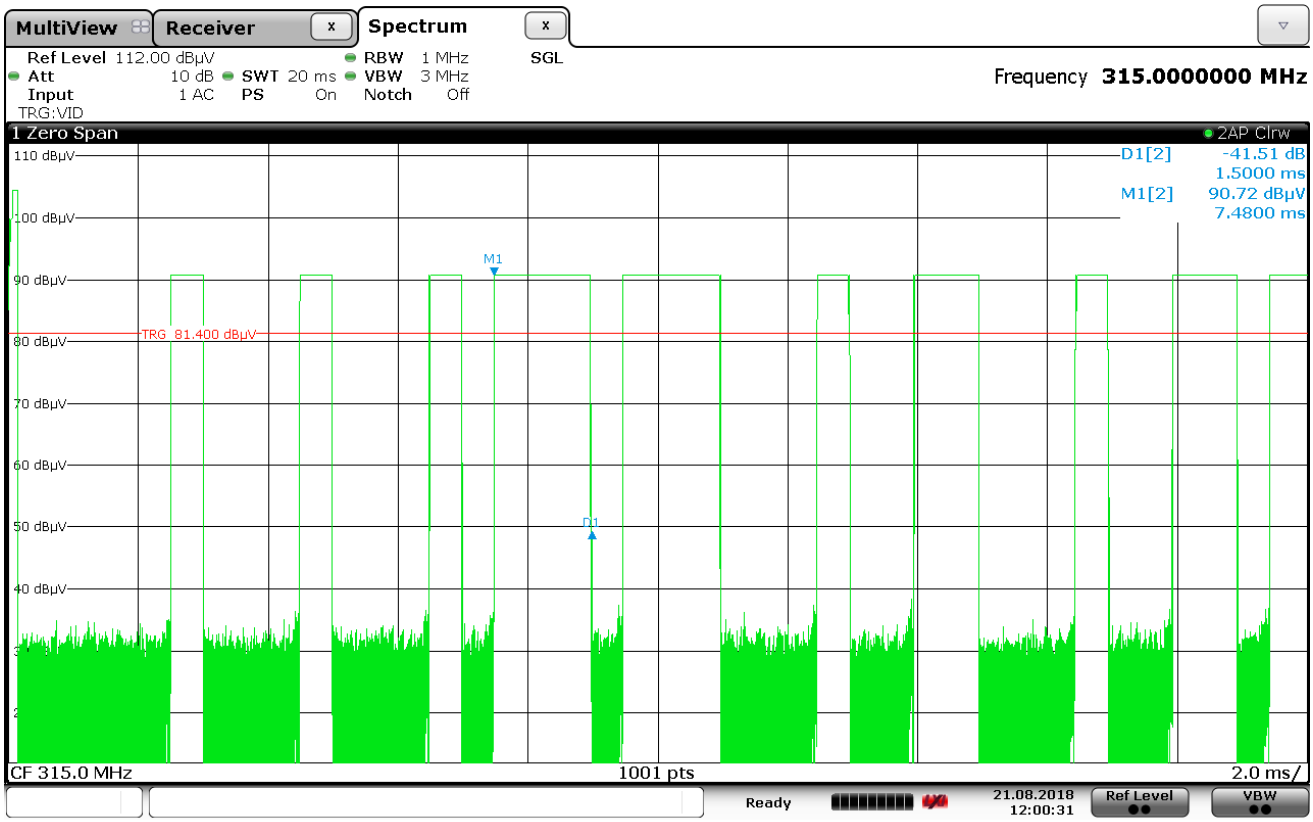
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : Tx @ 315MHz
NOTES : Chamberlain Purple
NOTES : Narrow Pulse = 500usec



Date: 21.AUG.2018 12:01:14

FCC 15C 15.35 / Duty Cycle

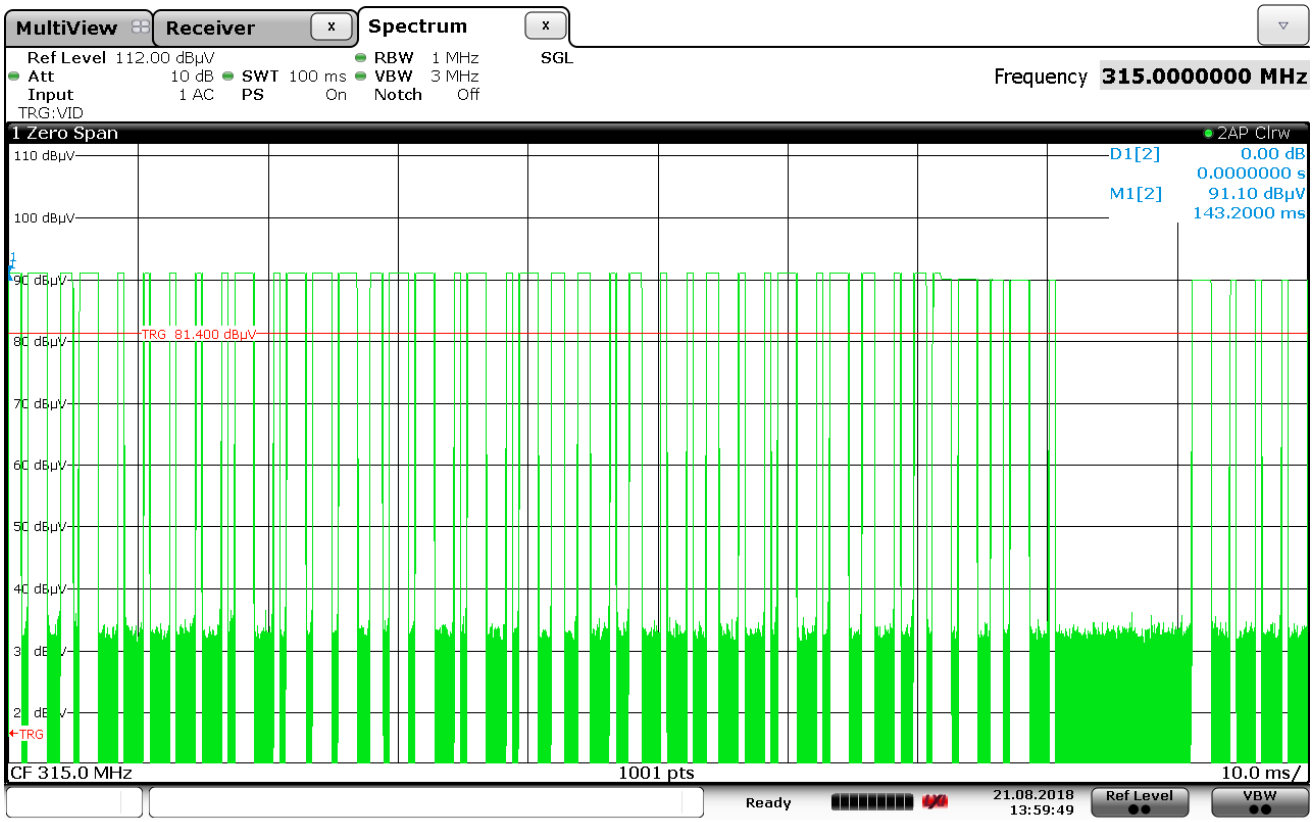
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : Tx @ 315MHz
NOTES : Chamberlain Purple
NOTES : Medium Pulse = 1.0msec



Date: 21.AUG.2018 12:00:31

FCC 15C 15.35 / Duty Cycle

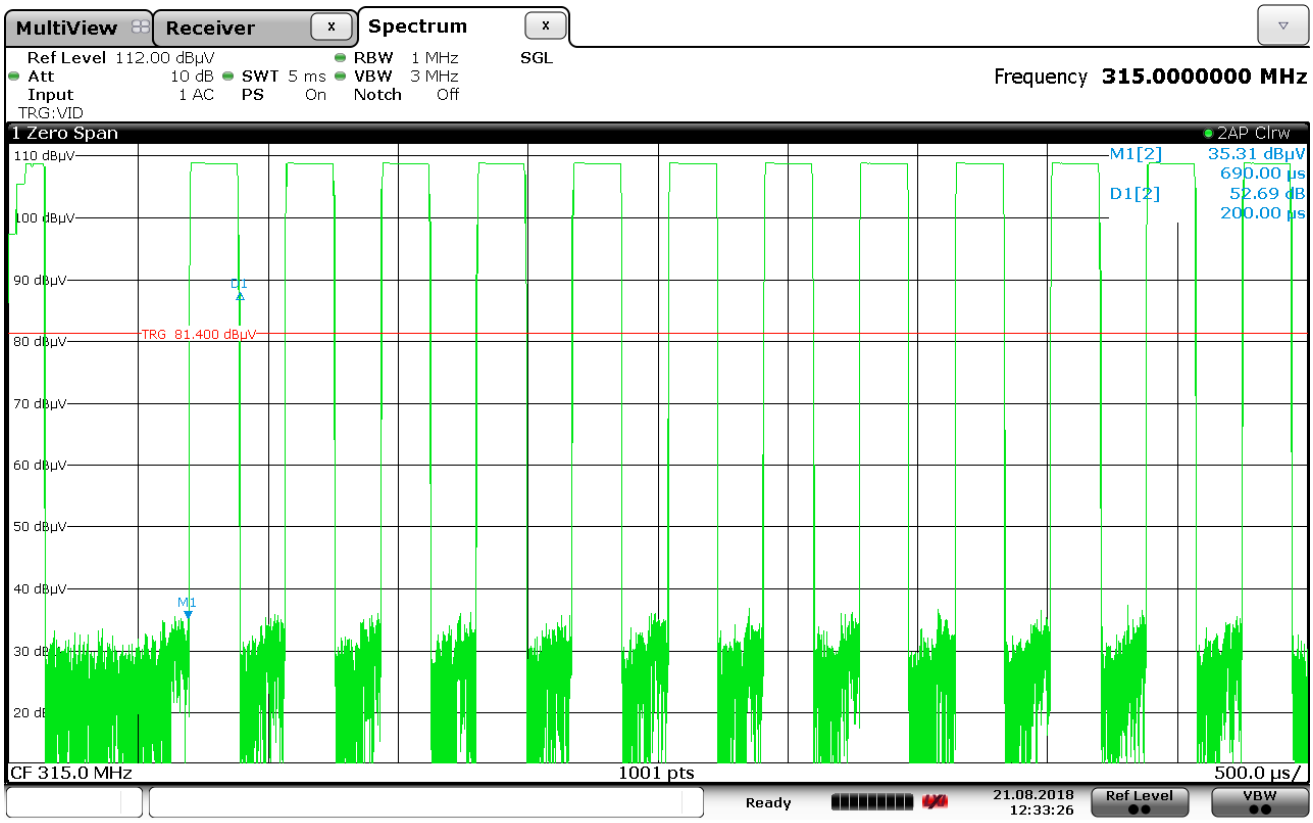
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : Tx @ 315MHz
NOTES : Chamberlain Purple
NOTES : Long Pulse = 1.5msec



Date: 21.AUG.2018 13:59:49

FCC 15C 15.35 / Duty Cycle

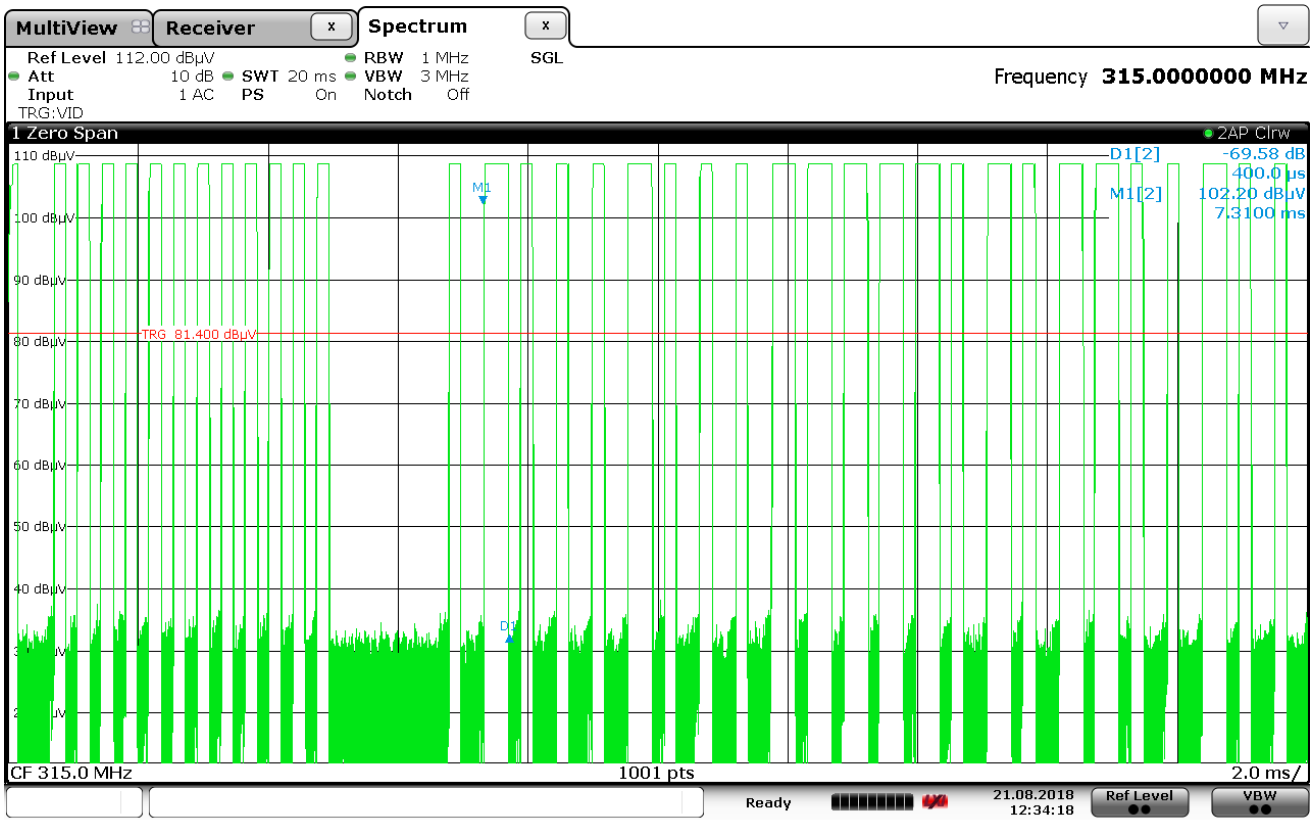
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : Tx @ 315MHz
NOTES : Chamberlain Purple
NOTES : 100msec time
NOTES : Duty Cycle calculation was based on 19 short pulses, 10 medium pulses, and 16
: long pulses
: or 19 x 500usec + 10 x 1 msec + 16 x 1.5 msec = 43.5msec
: Duty Cycle = 20 x log(43.5msec/100msec) = -7.23dB



Date: 21.AUG.2018 12:33:26

FCC 15C 15.35 / Duty Cycle

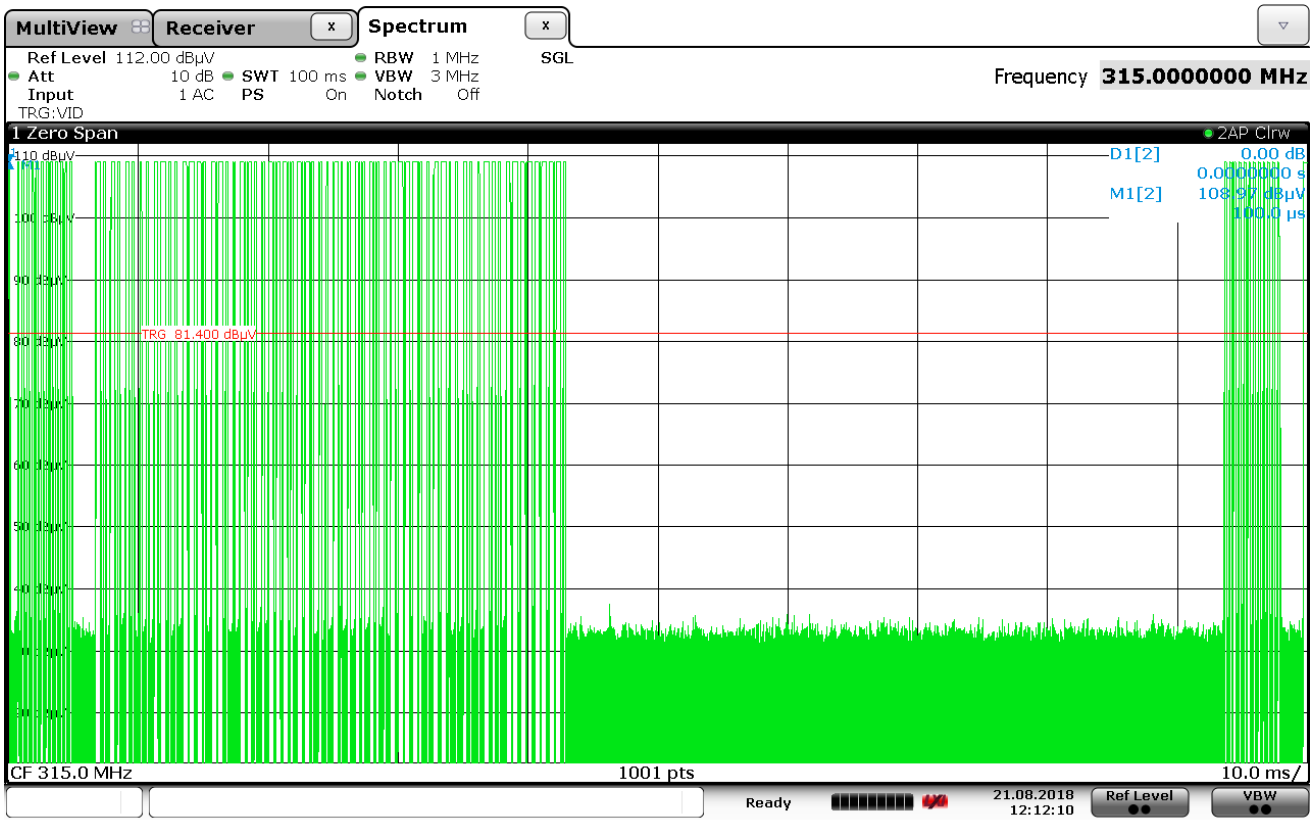
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : Tx @ 315MHz and 390MHz
NOTES : Genie IC1
NOTES : Short Pulse = 200usec



Date: 21.AUG.2018 12:34:18

FCC 15C 15.35 / Duty Cycle

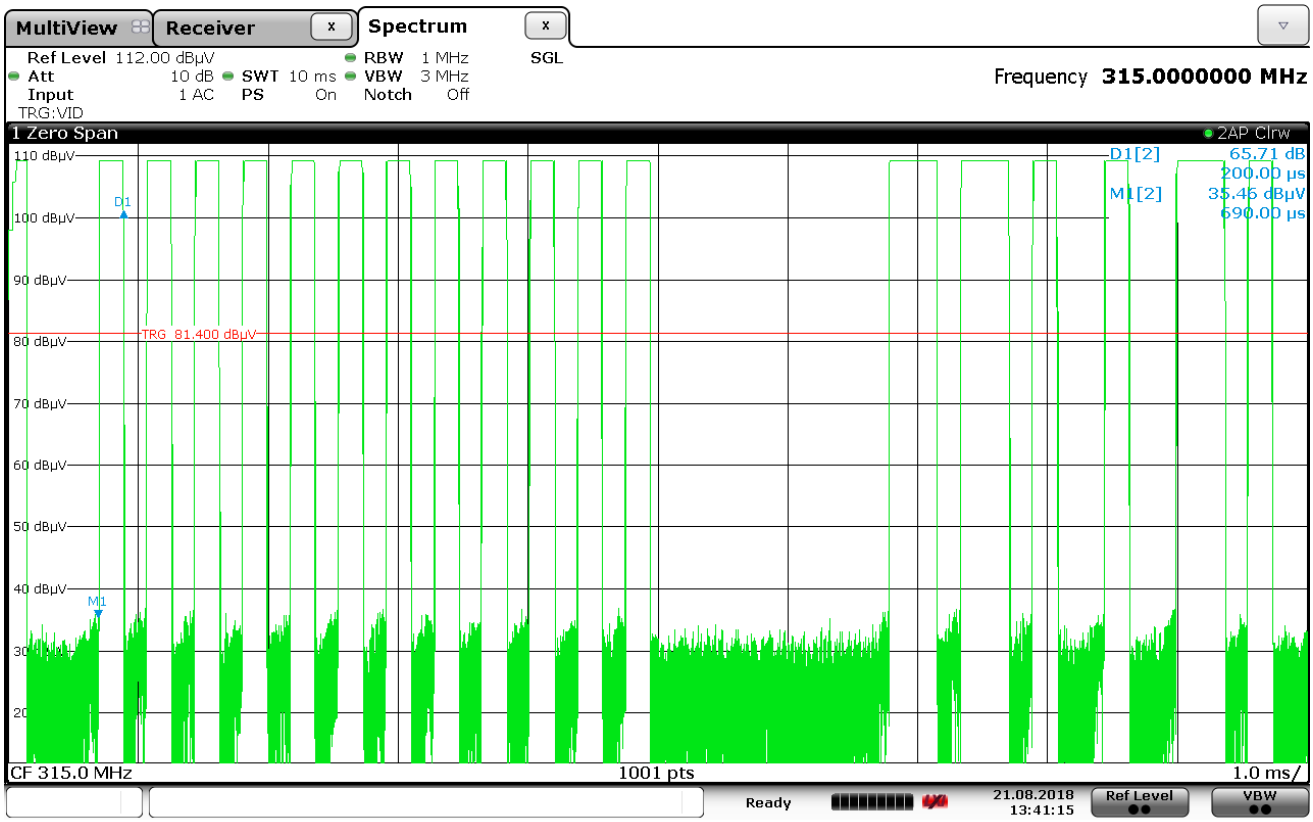
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : Tx @ 315MHz and 390MHz
NOTES : Genie IC1
NOTES : Long Pulse = 400usec



Date: 21.AUG.2018 12:12:10

FCC 15C 15.35 / Duty Cycle

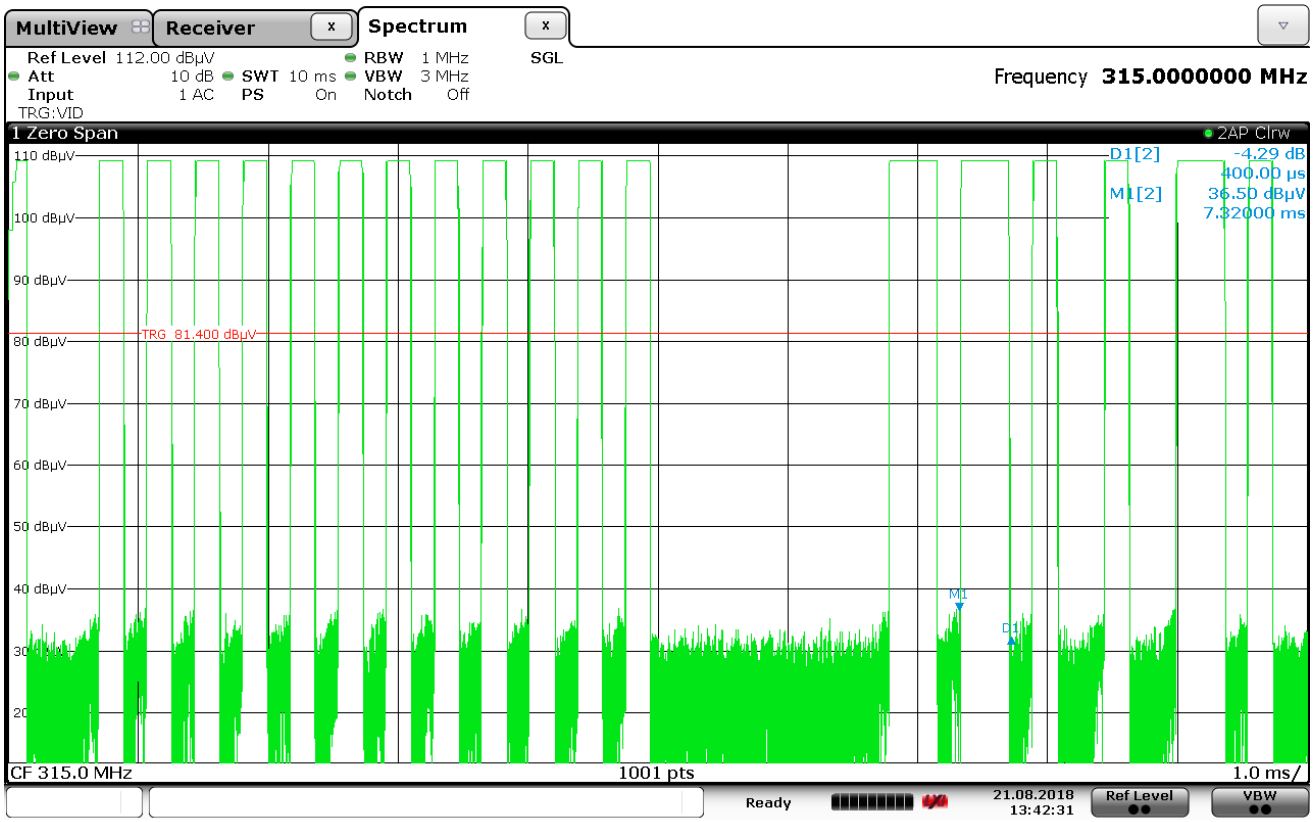
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : Tx @ 315MHz and 390MHz
NOTES : Genie IC1
NOTES : 100msec time
NOTES : Duty Cycle calculation was based on 56 short pulses and 35 long pulses
: or 56 x 200usec + 35 x 400 usec = 25.2msec
: Duty Cycle = 20 x log(25.2msec/100msec) = -11.97dB



Date: 21.AUG.2018 13:41:15

FCC 15C 15.35 / Duty Cycle

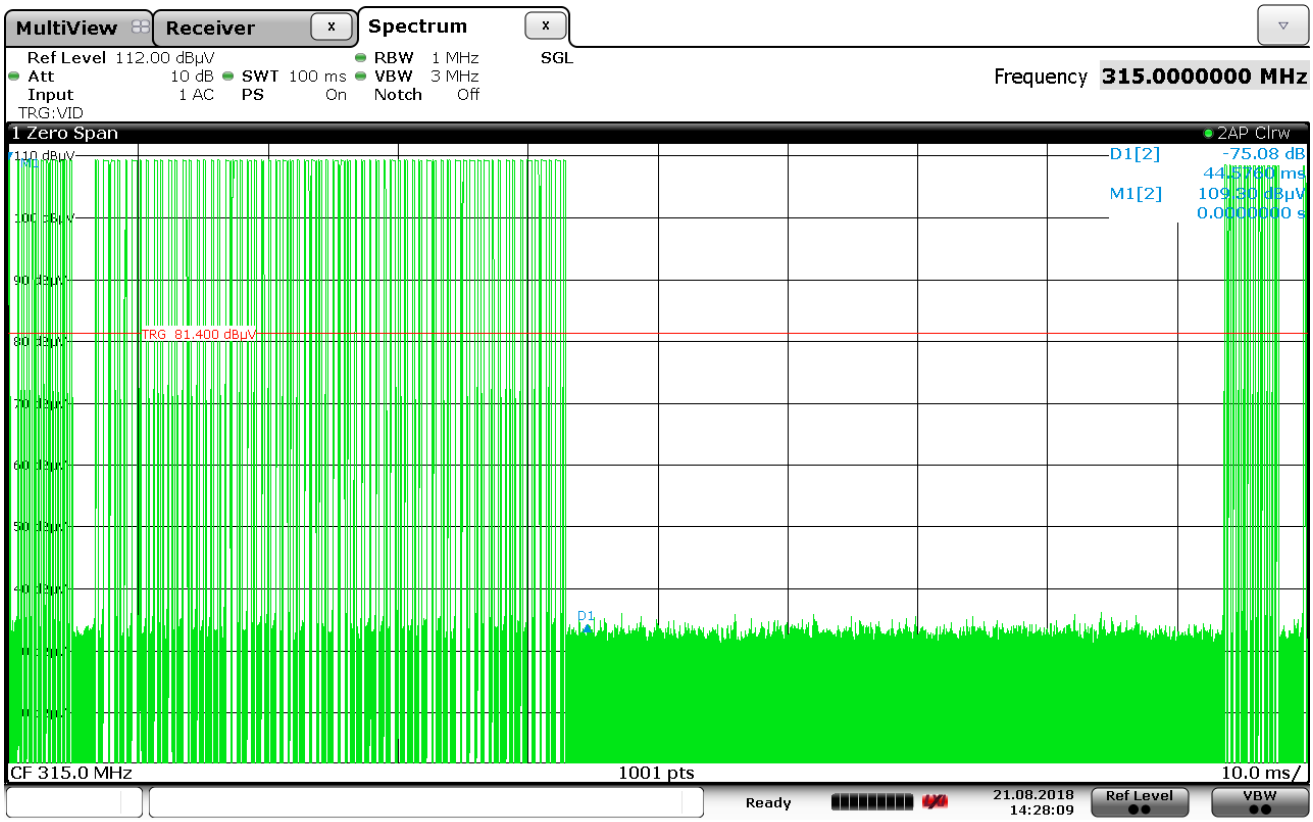
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : Tx @ 315MHz and 390MHz
NOTES : Genie IC2
NOTES : Short Pulse = 200usec



Date: 21.AUG.2018 13:42:31

FCC 15C 15.35 / Duty Cycle

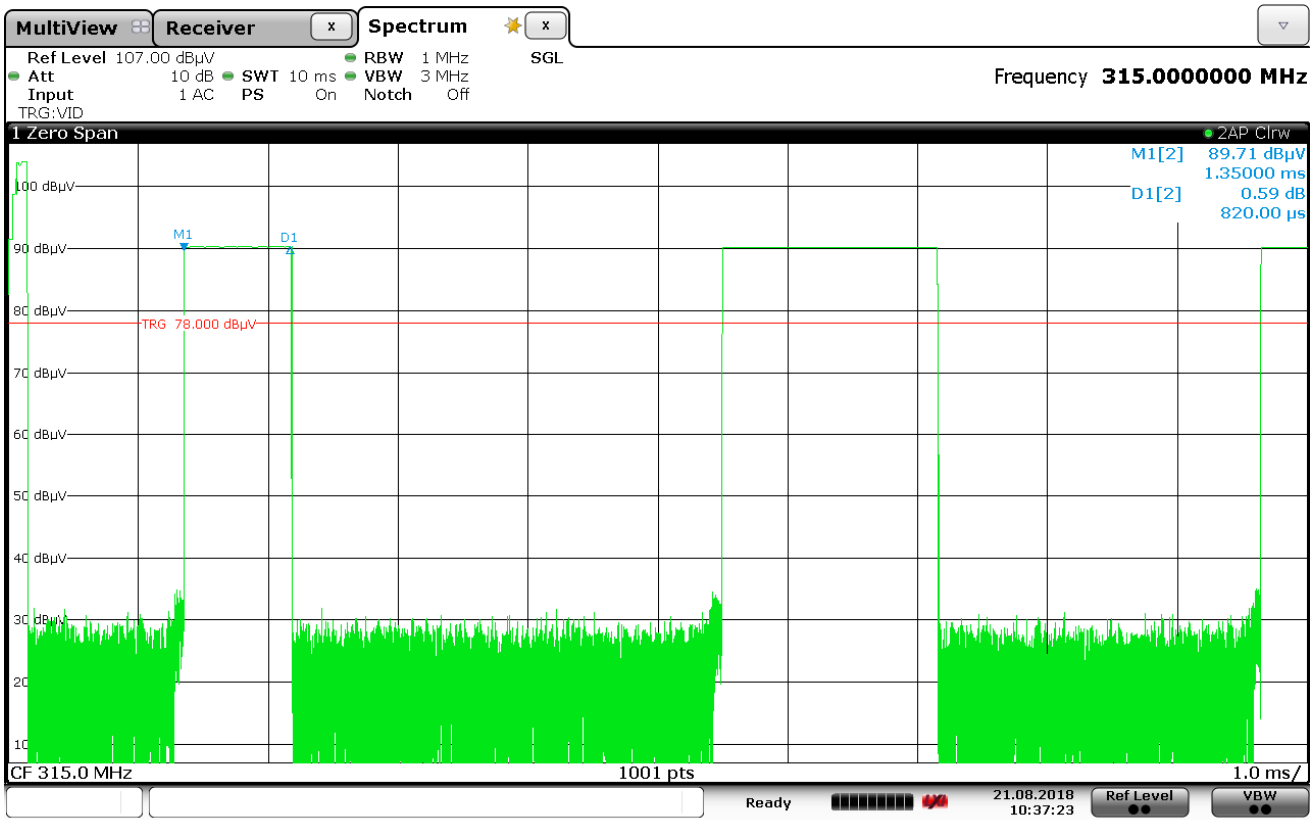
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : Tx @ 315MHz and 390MHz
NOTES : Genie IC2
NOTES : Long Pulse = 400usec



Date: 21.AUG.2018 14:28:09

FCC 15C 15.35 / Duty Cycle

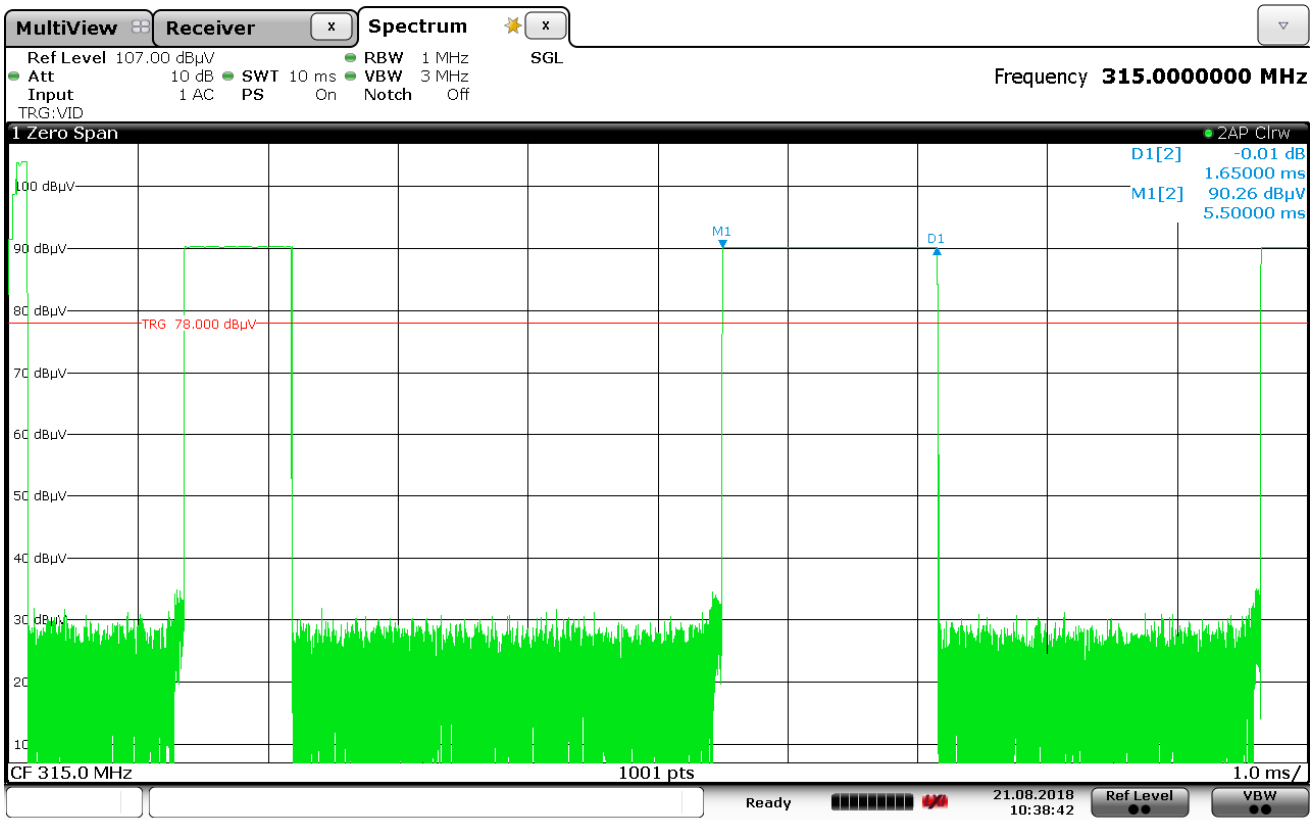
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : Tx @ 315MHz and 390MHz
NOTES : Genie IC2
NOTES : 100msec time
NOTES : Duty Cycle calculation was based on 61 short pulses and 30 long pulses
: or 61 x 200usec + 30 x 400 usec = 24.2msec
: Duty Cycle = 20 x log(24.2msec/100msec) = -12.32dB



Date: 21.AUG.2018 10:37:24

FCC 15C 15.35 / Duty Cycle

MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : Tx @ 315MHz
NOTES : Marantec
NOTES : Short Pulse = 820usec



Date: 21.AUG.2018 10:38:42

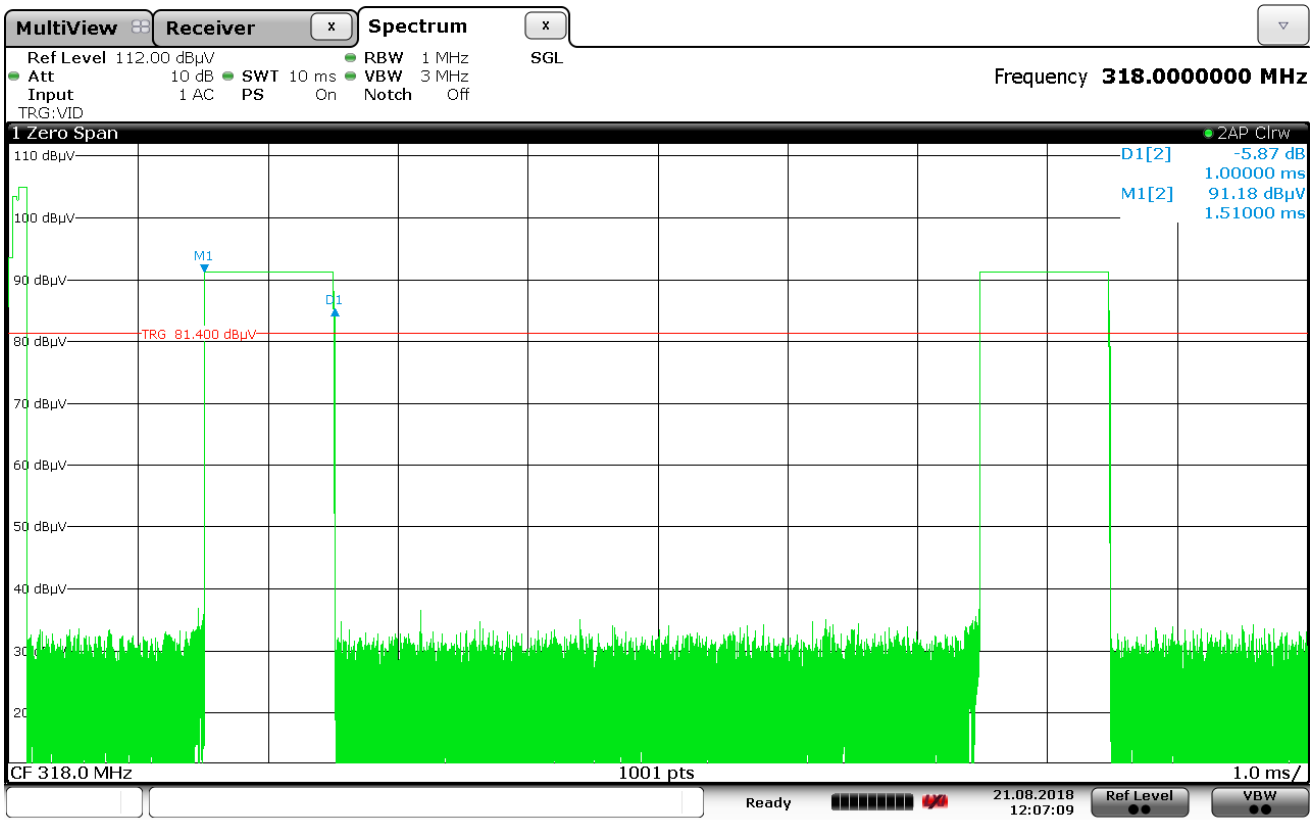
FCC 15C 15.35 / Duty Cycle

MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : Tx @ 315MHz
NOTES : Marantec
NOTES : Long Pulse = 1.65msec

Date: 21.AUG.2018 10:41:53

FCC 15C 15.35 / Duty Cycle

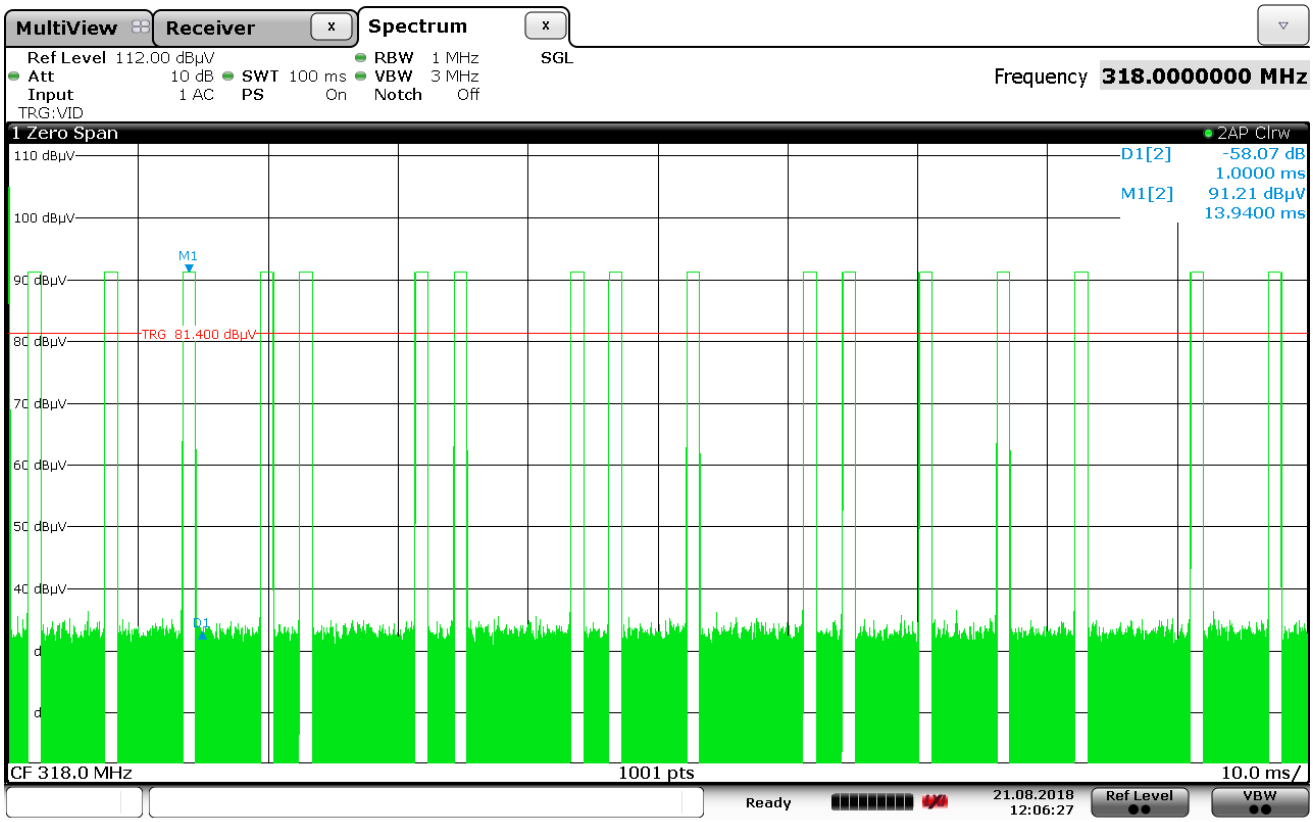
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : Tx @ 315MHz
NOTES : Marantec
NOTES : 100msec time
NOTES : Duty Cycle calculation was based on 14 short pulses and 10 long pulses
: or 14 x 820usec + 10 x 1.65msec = 27.98msec
: Duty Cycle = 20 x log(27.98msec/100msec) = -11.06dB



Date: 21.AUG.2018 12:07:09

FCC 15C 15.35 / Duty Cycle

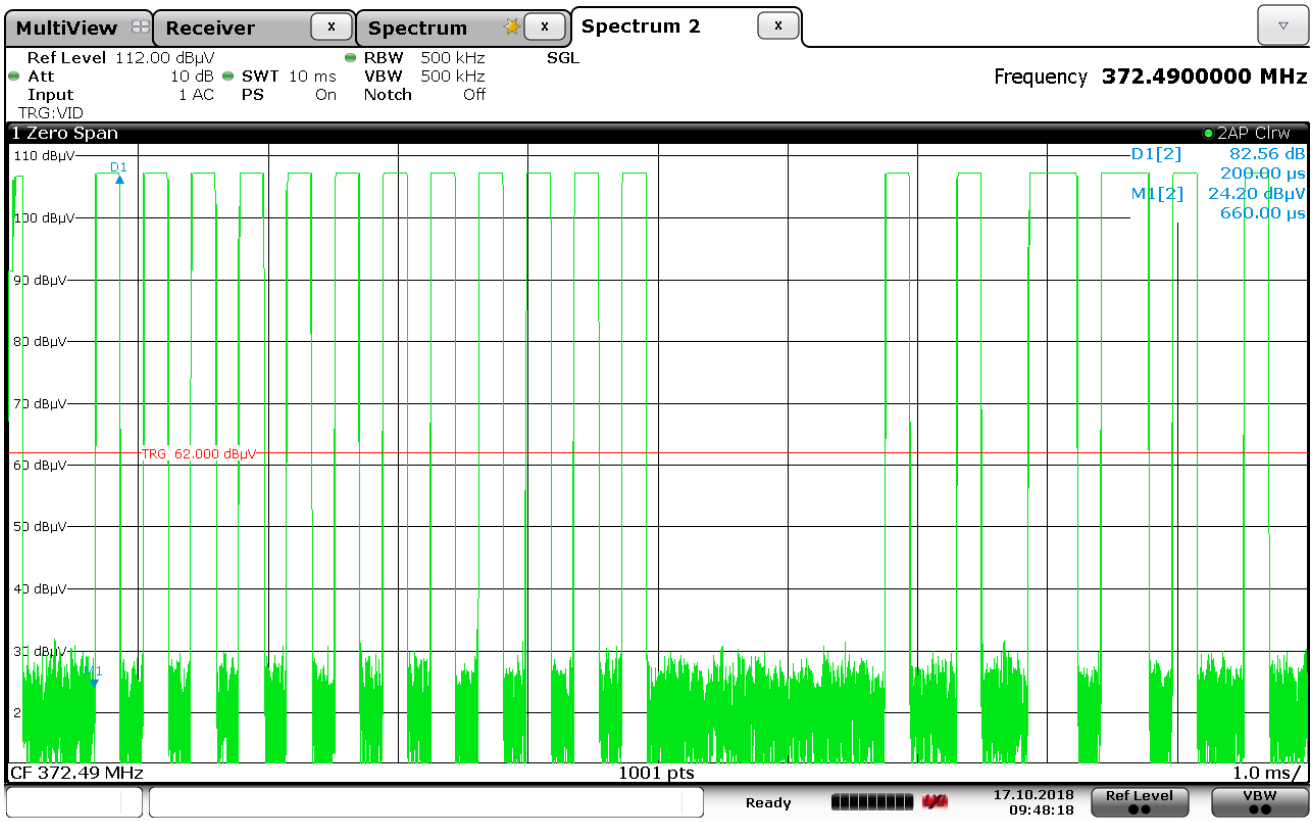
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : Tx @ 318MHz
NOTES : Linear
NOTES : Pulse = 1msec



Date: 21.AUG.2018 12:06:27

FCC 15C 15.35 / Duty Cycle

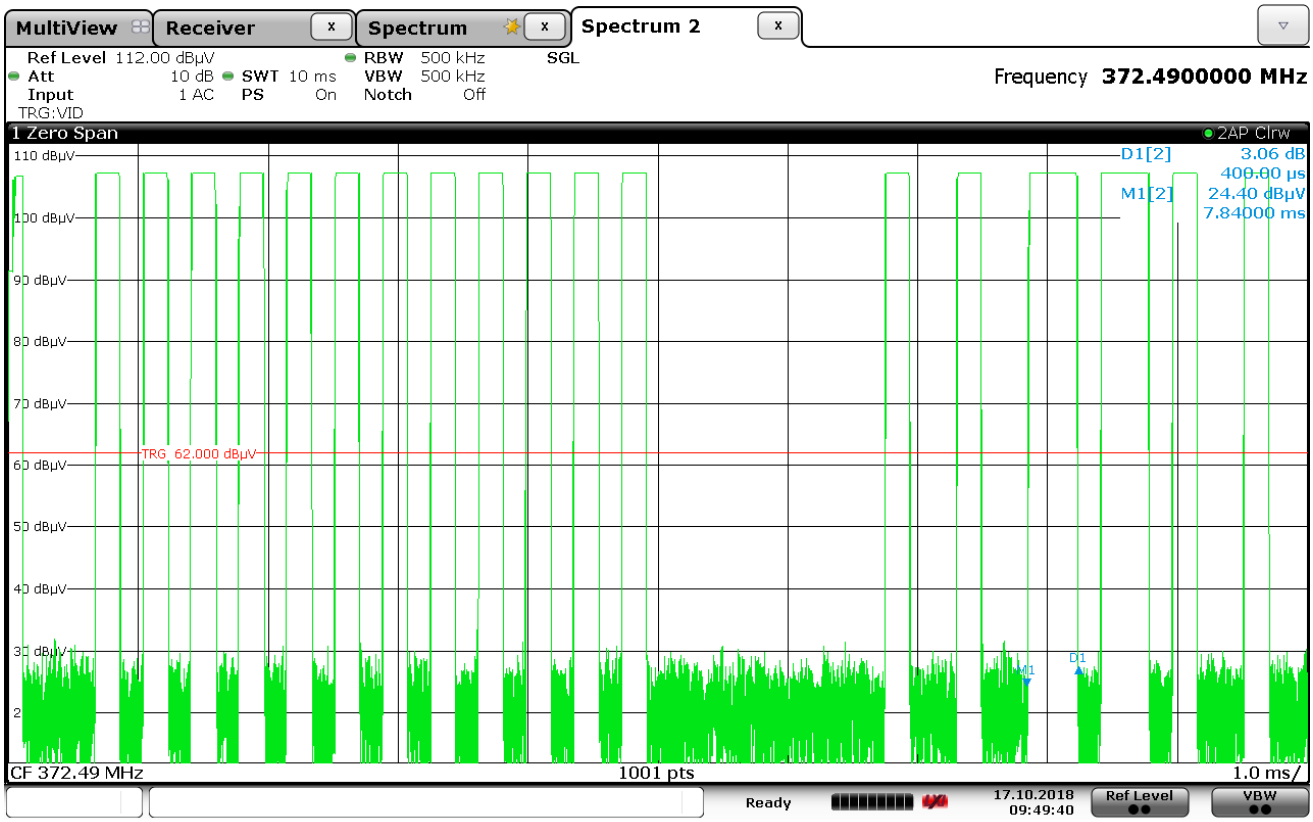
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : Tx @ 318MHz
NOTES : Linear
NOTES : 100msec time
NOTES : Duty Cycle calculation was based on 17 pulses
: or 17 x 1msec = 17.00msec
: Duty Cycle = 20 x log(17msec/100msec) = -15.39dB



Date: 17.OCT.2018 09:48:18

FCC 15C 15.35 / Duty Cycle

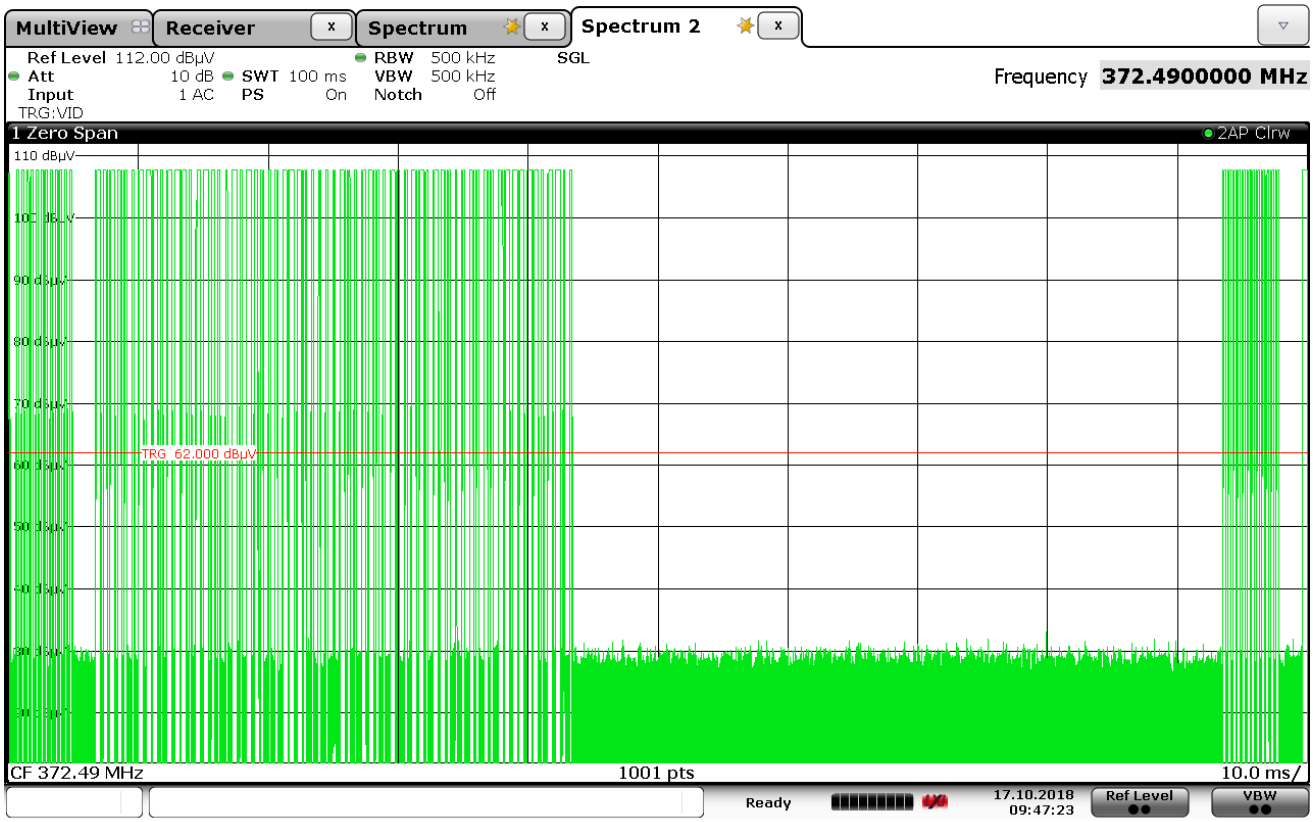
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : Tx @ 372.5MHz
NOTES : Wayne Dalton
NOTES : Short Pulse = 200usec



Date: 17.OCT.2018 09:49:40

FCC 15C 15.35 / Duty Cycle

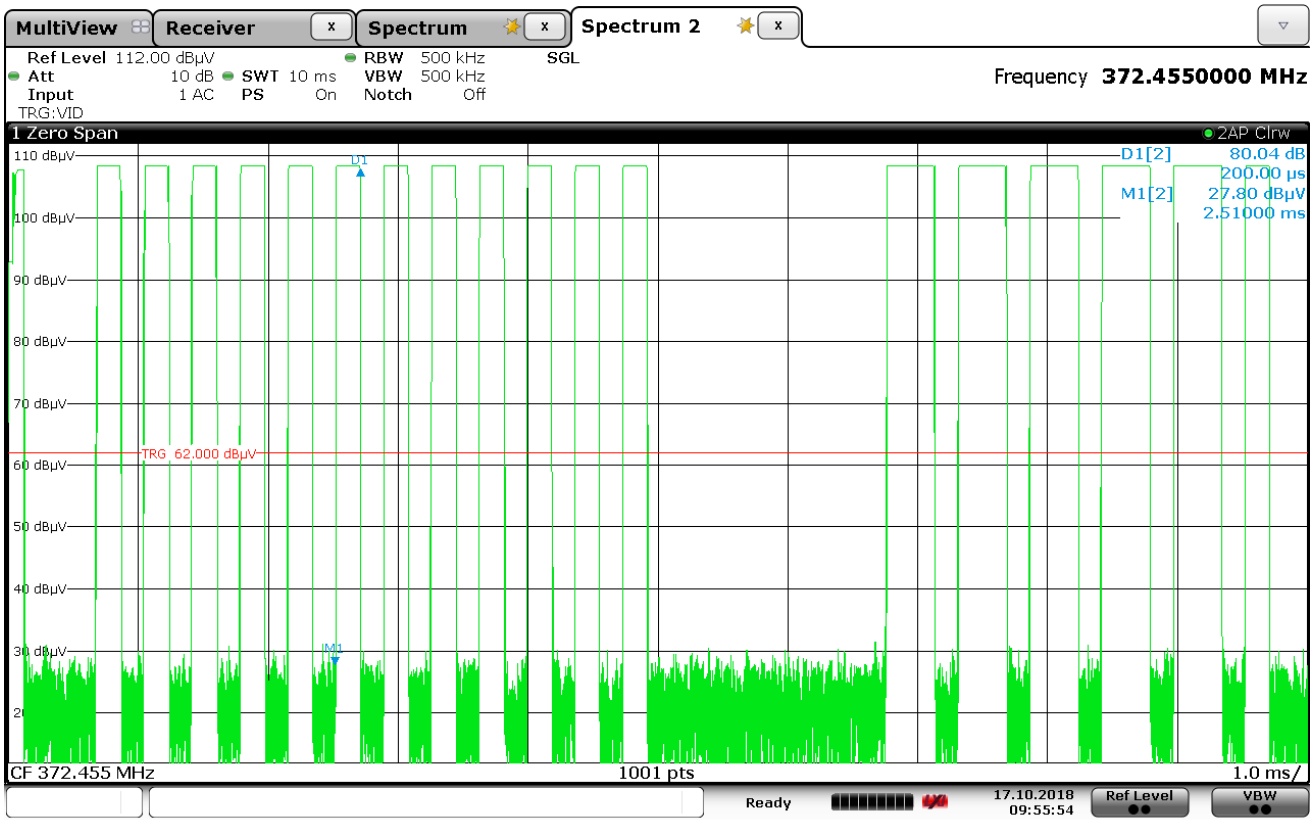
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : Tx @ 372.5MHz
NOTES : Wayne Dalton
NOTES : Long Pulse = 400usec



Date: 17.OCT.2018 09:47:23

FCC 15C 15.35 / Duty Cycle

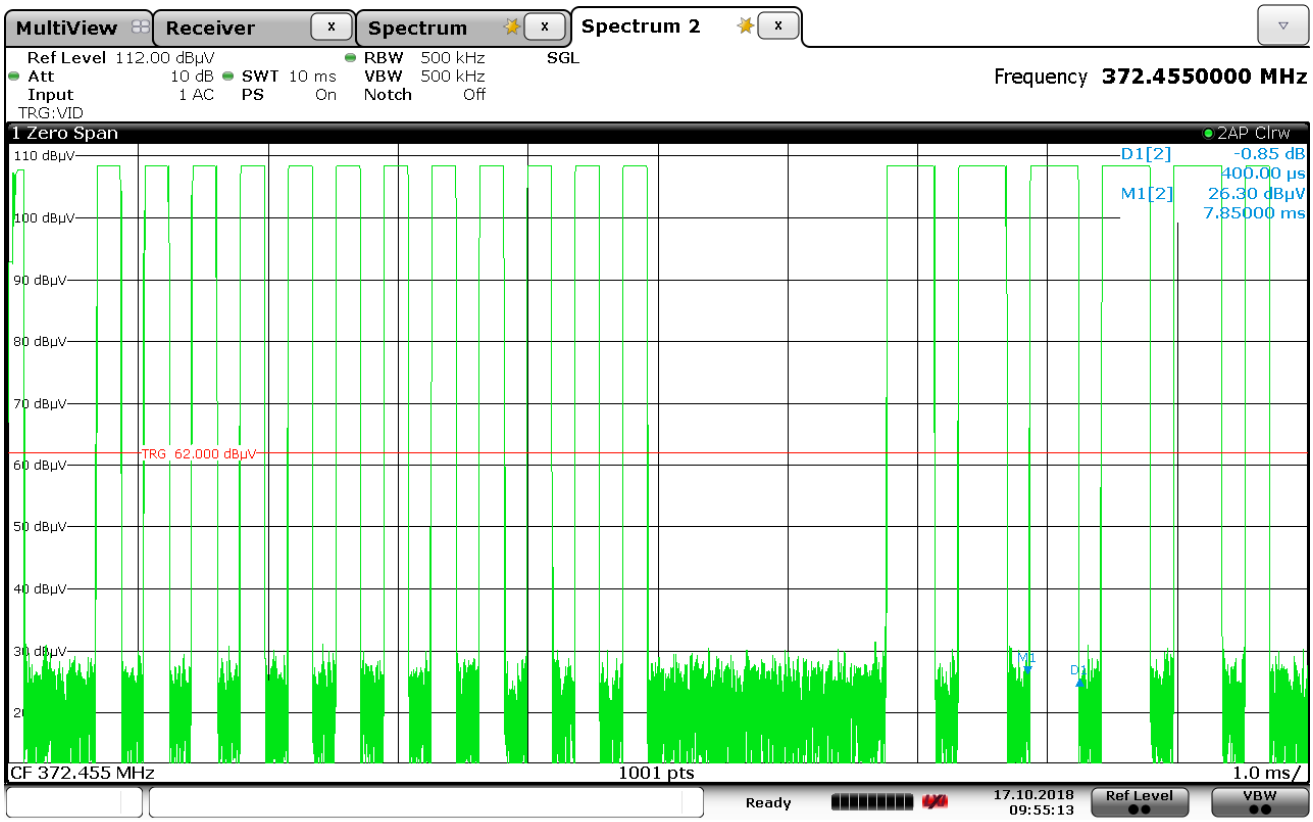
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : Tx @ 372.5MHz
NOTES : Wayne Dalton
NOTES : 100msec time
NOTES : Duty Cycle calculation was based on 57 short pulses and 35 long pulses
: or 57 x 200usec + 35 x 400usec = 25.4msec
: Duty Cycle = 20 x log(25.4msec/100msec) = -11.90dB



Date: 17.OCT.2018 09:55:53

FCC 15C 15.35 / Duty Cycle

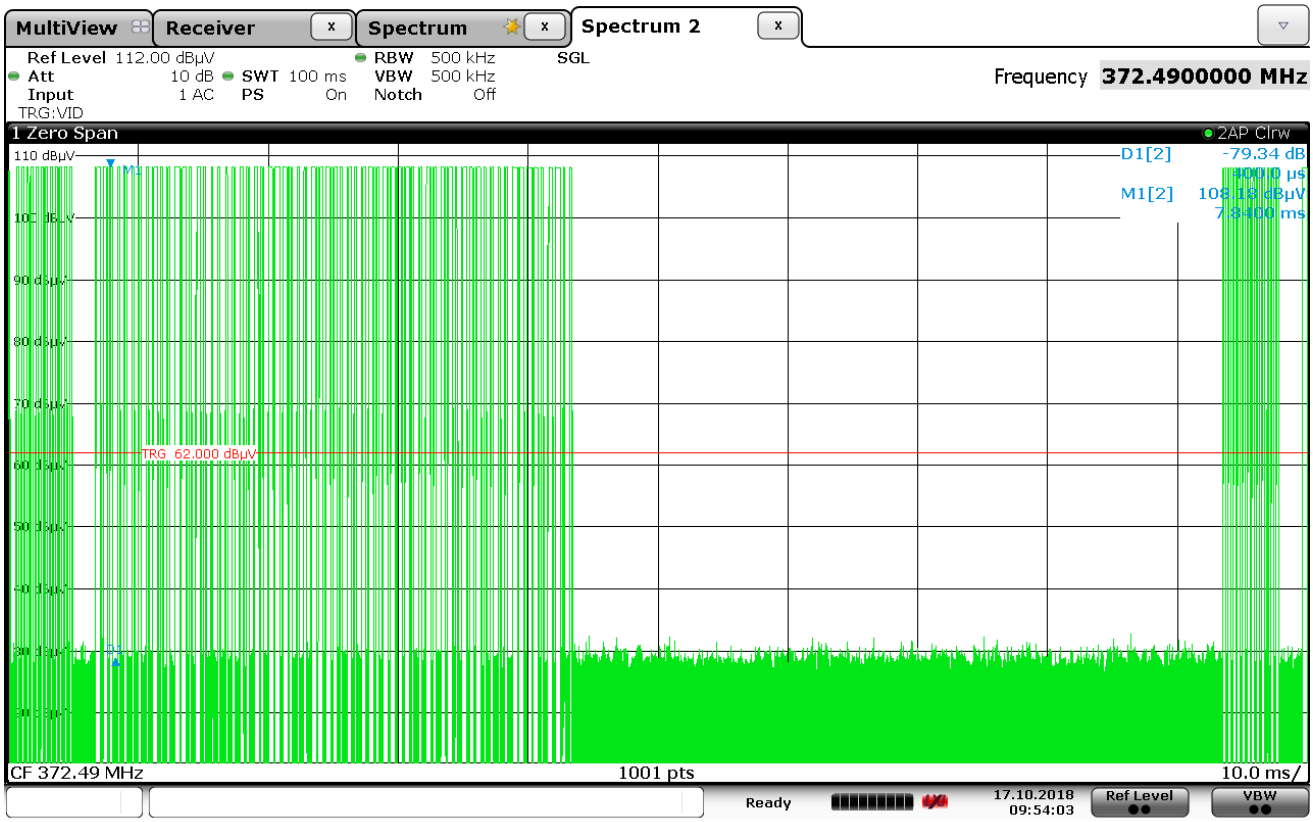
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : Tx @ 372.5MHz
NOTES : Ryobi
NOTES : Short Pulse = 200usec



Date: 17.OCT.2018 09:55:13

FCC 15C 15.35 / Duty Cycle

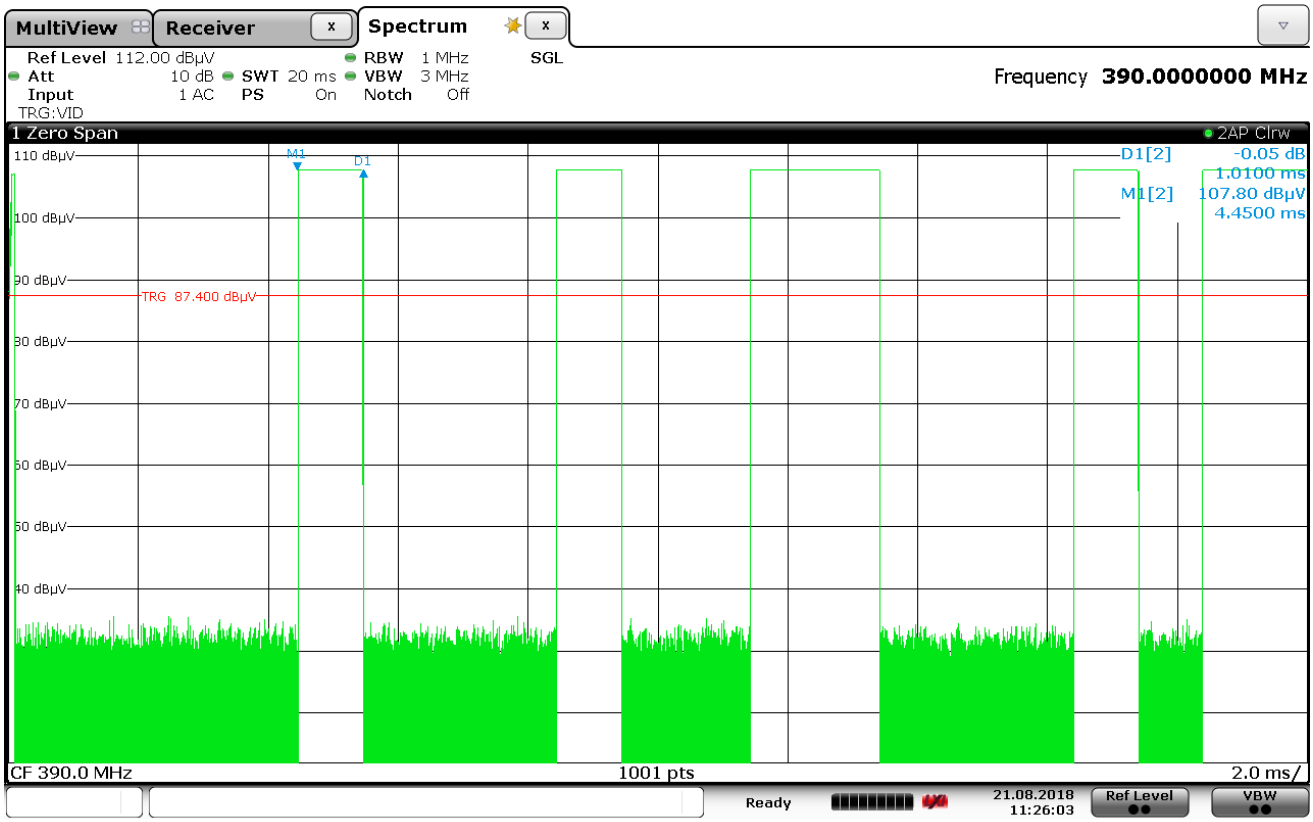
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : Tx @ 372.5MHz
NOTES : Ryobi
NOTES : Long Pulse = 400usec



Date: 17.OCT.2018 09:54:03

FCC 15C 15.35 / Duty Cycle

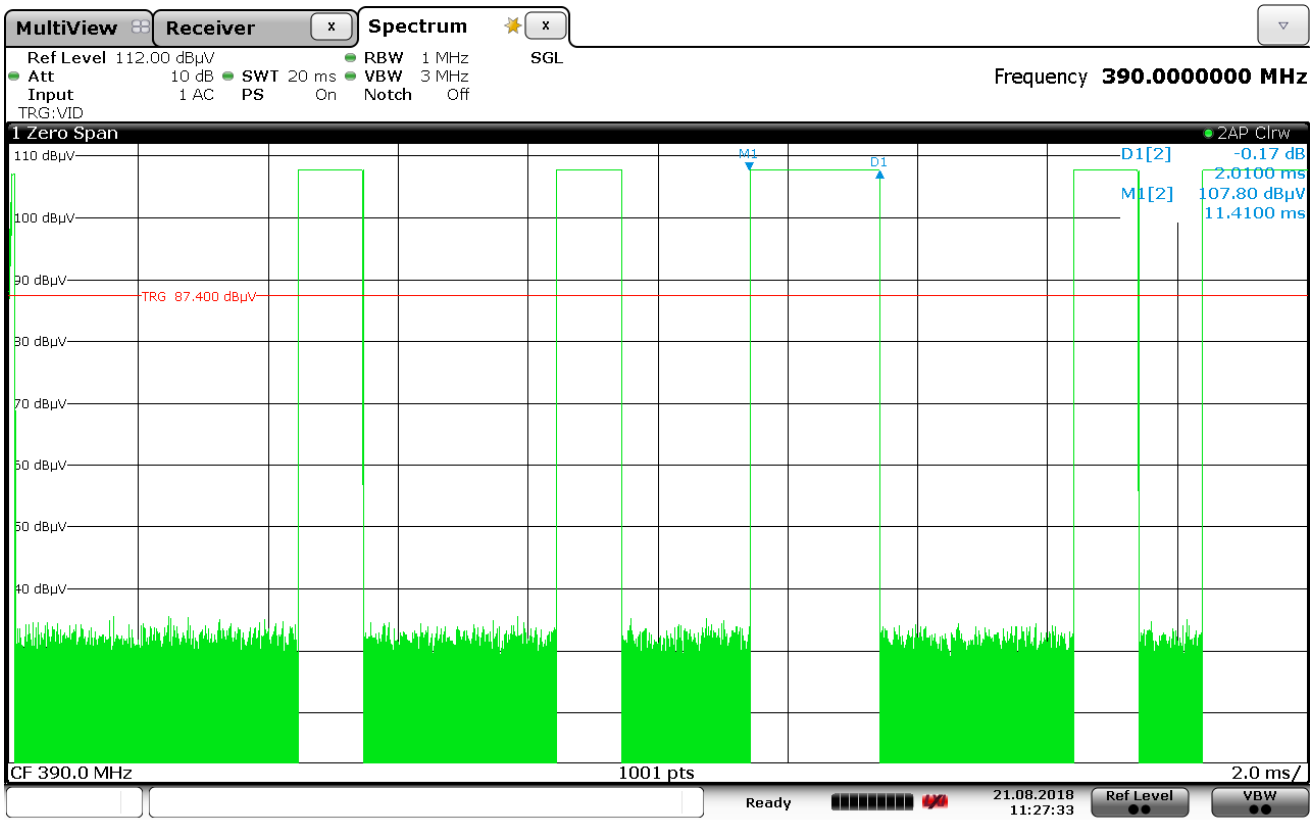
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : Tx @ 372.5MHz
NOTES : Ryobi
NOTES : 100msec time
NOTES : Duty Cycle calculation was based on 59 short pulses and 33 long pulses
: or 59 x 200usec + 33 x 400usec = 25.0msec
: Duty Cycle = 20 x log(25.0msec/100msec) = -12.00dB



Date: 21.AUG.2018 11:26:03

FCC 15C 15.35 / Duty Cycle

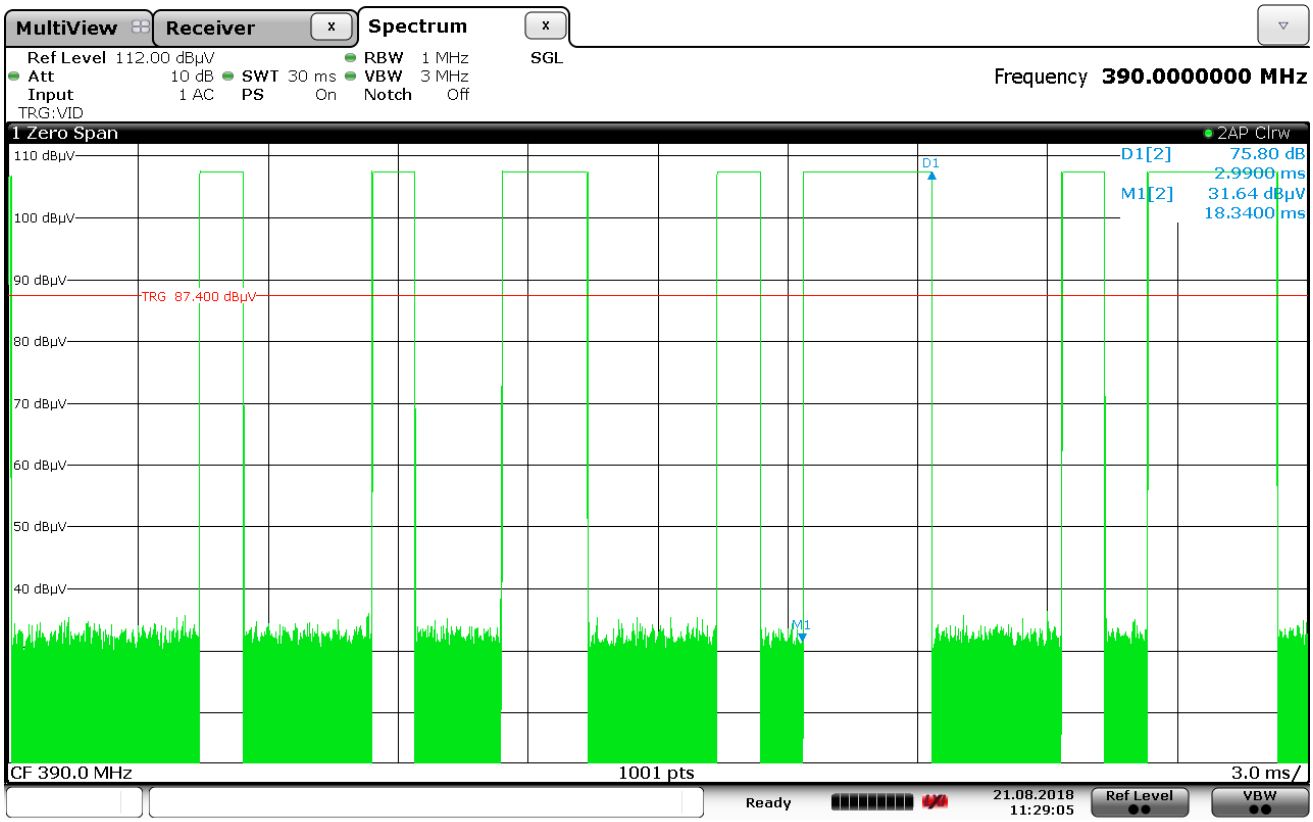
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : Tx @ 390MHz
NOTES : Chamberlain Green
NOTES : Short Pulse = 1.01msec



Date: 21.AUG.2018 11:27:34

FCC 15C 15.35 / Duty Cycle

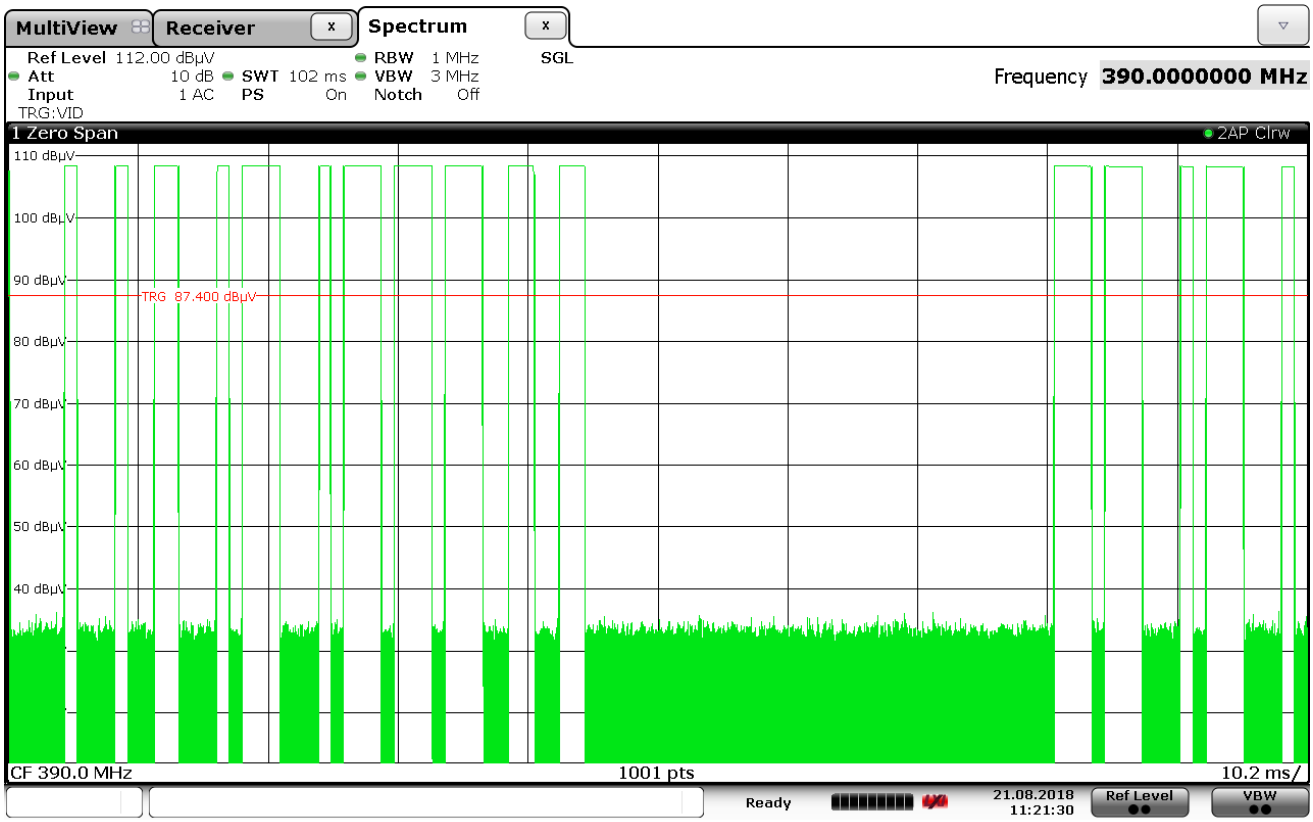
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : Tx @ 390MHz
NOTES : Chamberlain Green
NOTES : Medium Pulse = 2.01msec



Date: 21.AUG.2018 11:29:05

FCC 15C 15.35 / Duty Cycle

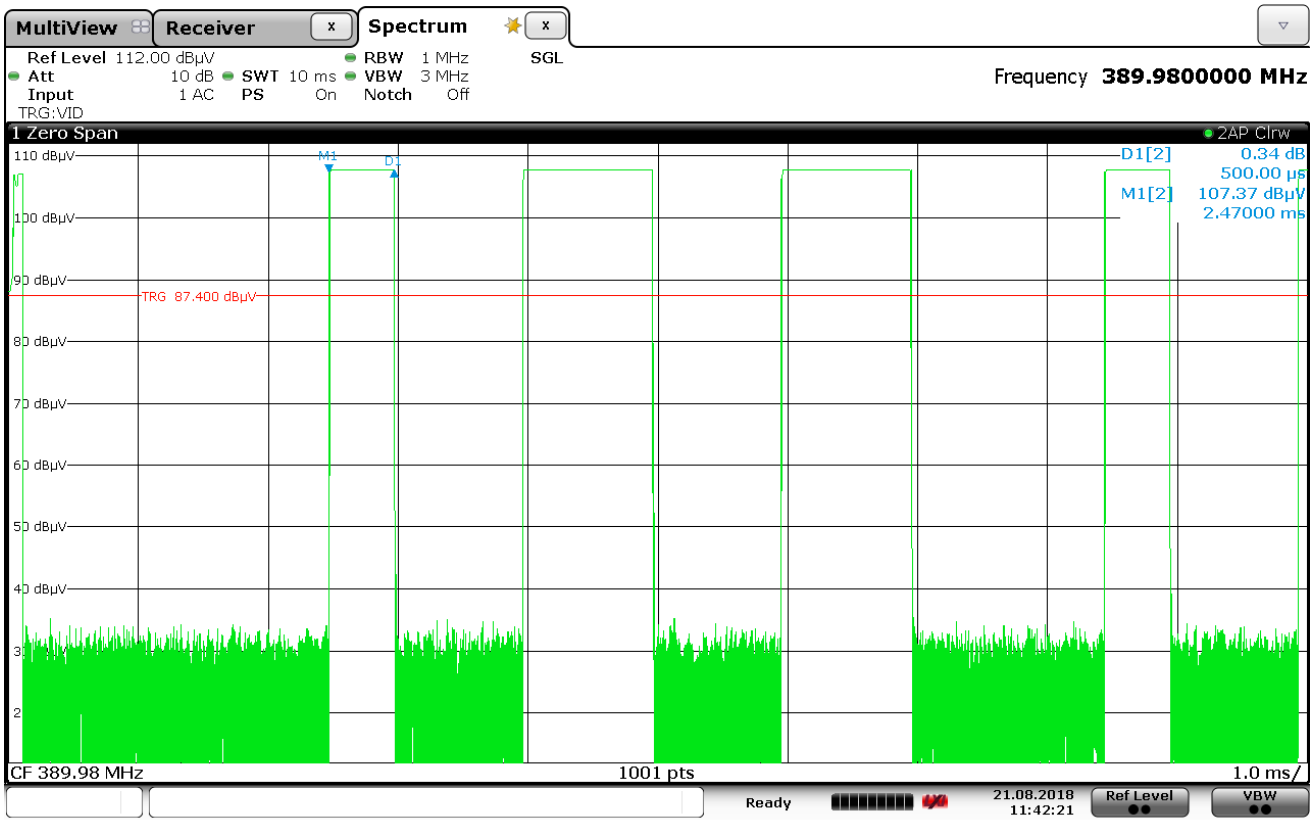
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : Tx @ 390MHz
NOTES : Chamberlain Green
NOTES : Long Pulse = 2.99msec



Date: 21.AUG.2018 11:21:30

FCC 15C 15.35 / Duty Cycle

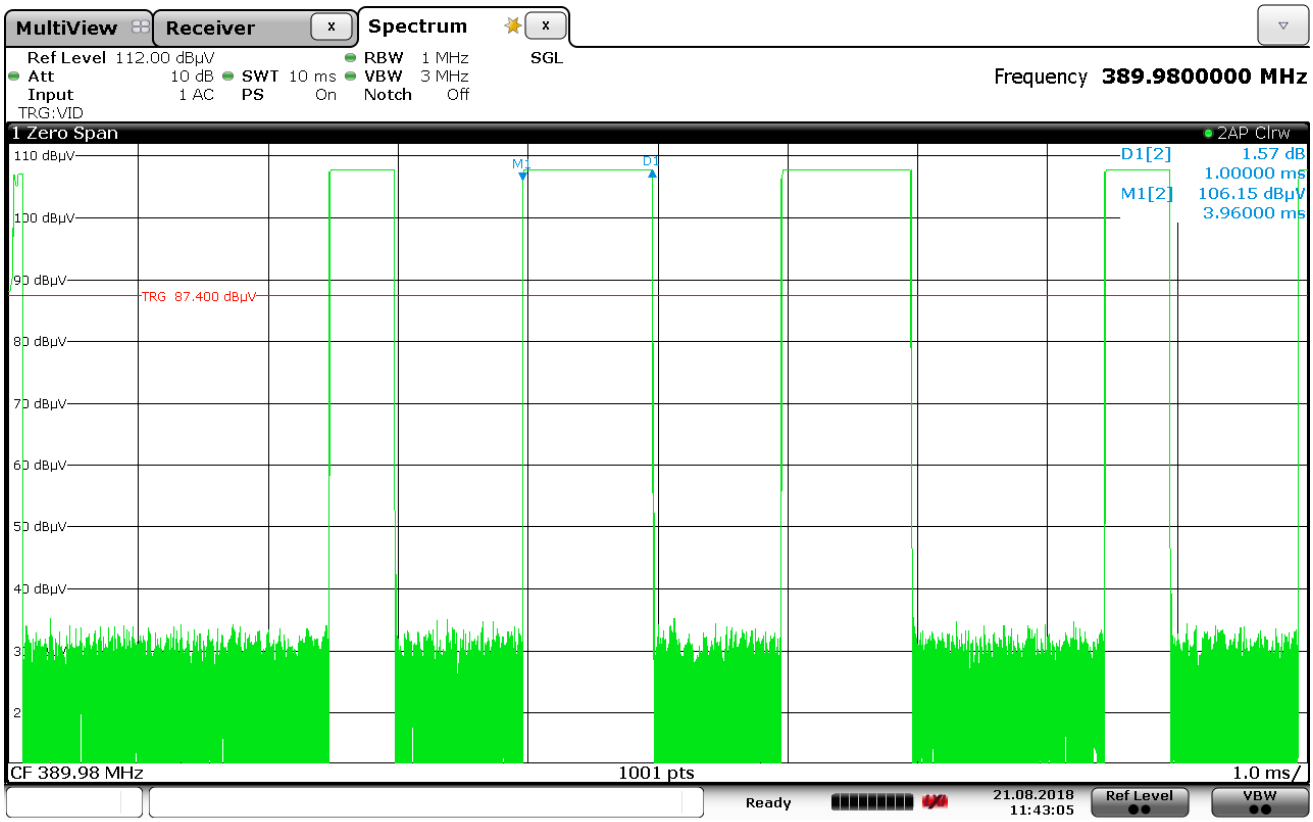
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : Tx @ 390MHz
NOTES : Chamberlain Green
NOTES : 100msec time
NOTES : Duty Cycle calculation was based on 6 short pulses, 3 medium pulses, and 7 long
: pulses
: or 6 x 1.01msec + 3 x 2.01msec + 7 x 2.99msec = 33.02msec
: Duty Cycle = 20 x log(33.02msec/100msec) = -9.62dB



Date: 21.AUG.2018 11:42:21

FCC 15C 15.35 / Duty Cycle

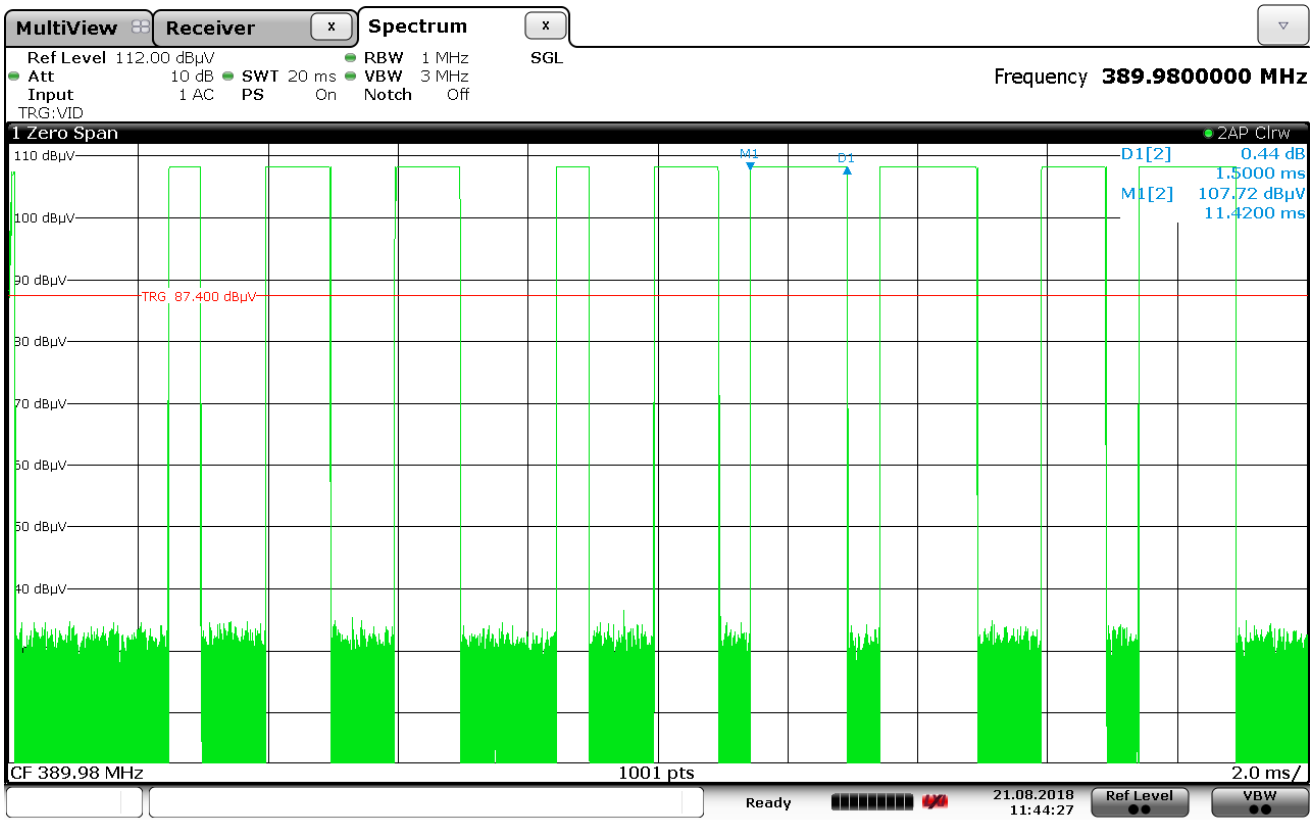
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : Tx @ 390MHz
NOTES : Chamberlain Orange/Red
NOTES : Short Pulse = 500usec



Date: 21.AUG.2018 11:43:05

FCC 15C 15.35 / Duty Cycle

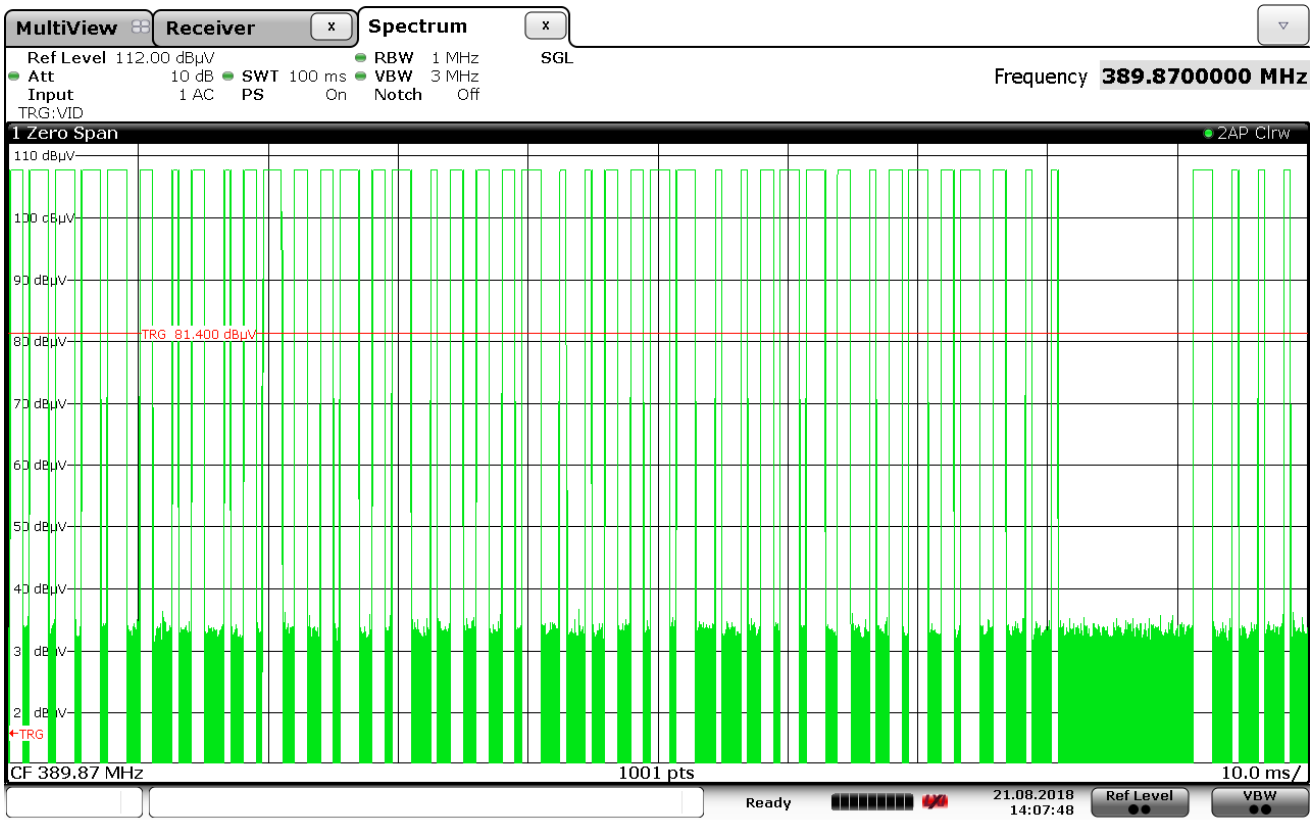
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : Tx @ 390MHz
NOTES : Chamberlain Orange/Red
NOTES : Medium Pulse = 1msec



Date: 21.AUG.2018 11:44:27

FCC 15C 15.35 / Duty Cycle

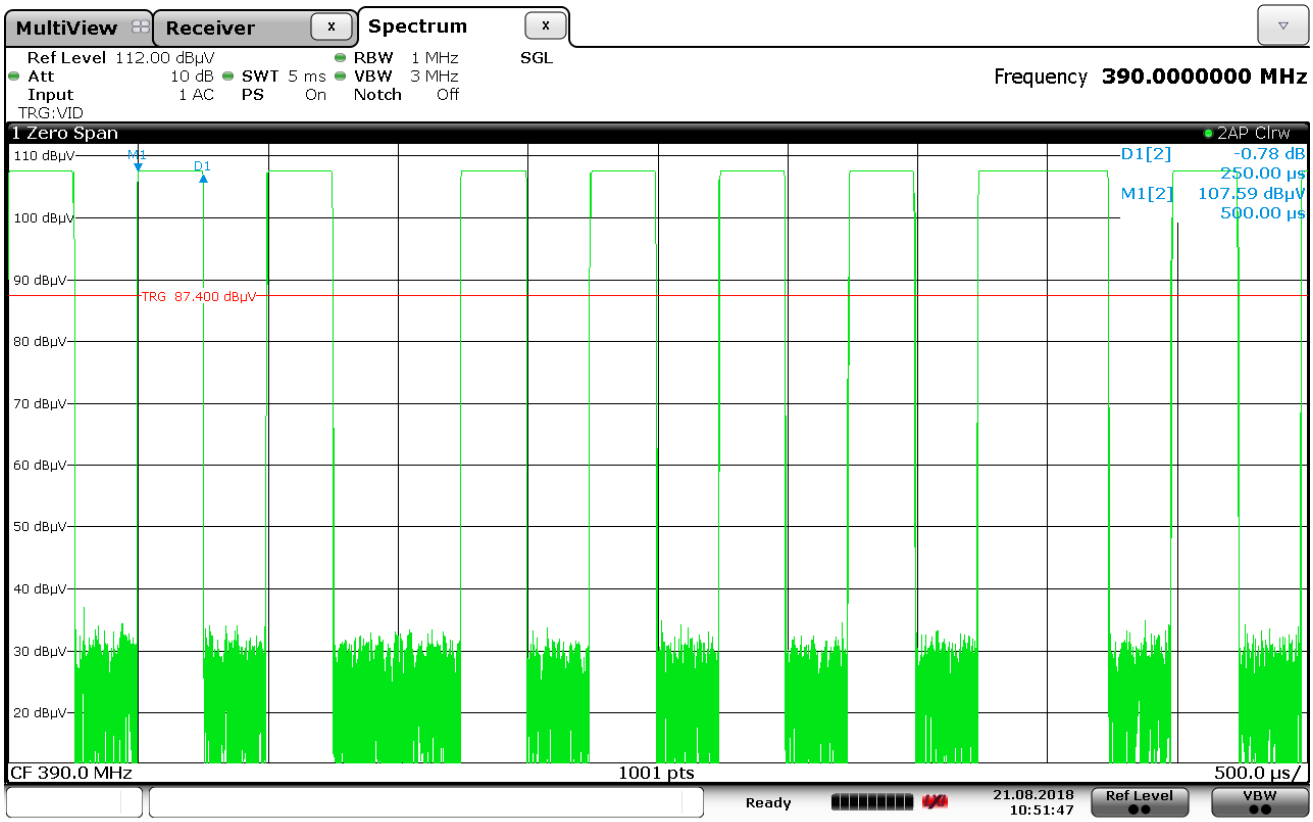
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : Tx @ 390MHz
NOTES : Chamberlain Orange/Red
NOTES : Medium Pulse = 1.5msec



Date: 21.AUG.2018 14:07:48

FCC 15C 15.35 / Duty Cycle

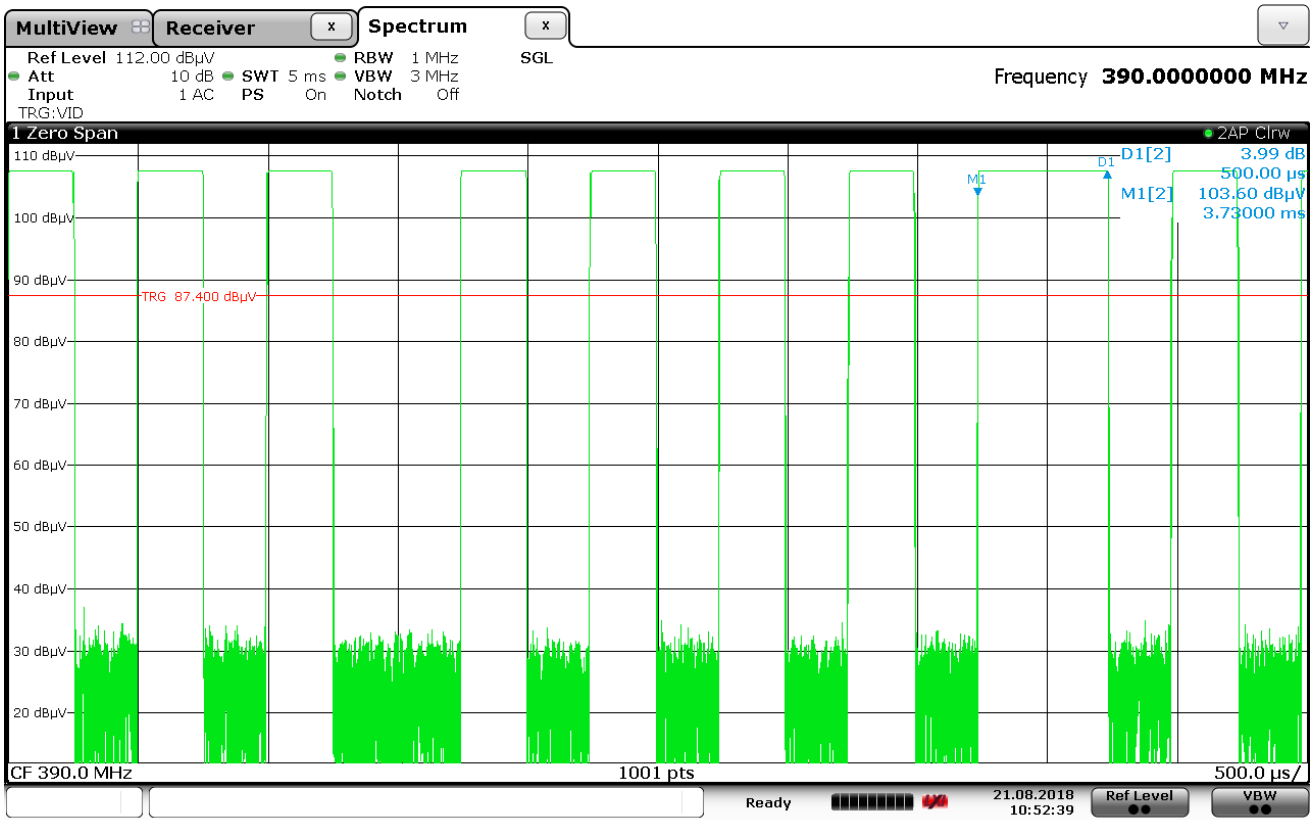
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : Tx @ 390MHz
NOTES : Chamberlain Orange/Red
NOTES : 100msec time
NOTES : Duty Cycle calculation was based on 13 short pulses, 16 medium pulses, and 16
: long pulses
: or 13 x 500usec + 16 x 1msec + 16 x 1.5msec = 46.5msec
: Duty Cycle = 20 x log(46.5msec/100msec) = -6.65dB



Date: 21.AUG.2018 10:51:48

FCC 15C 15.35 / Duty Cycle

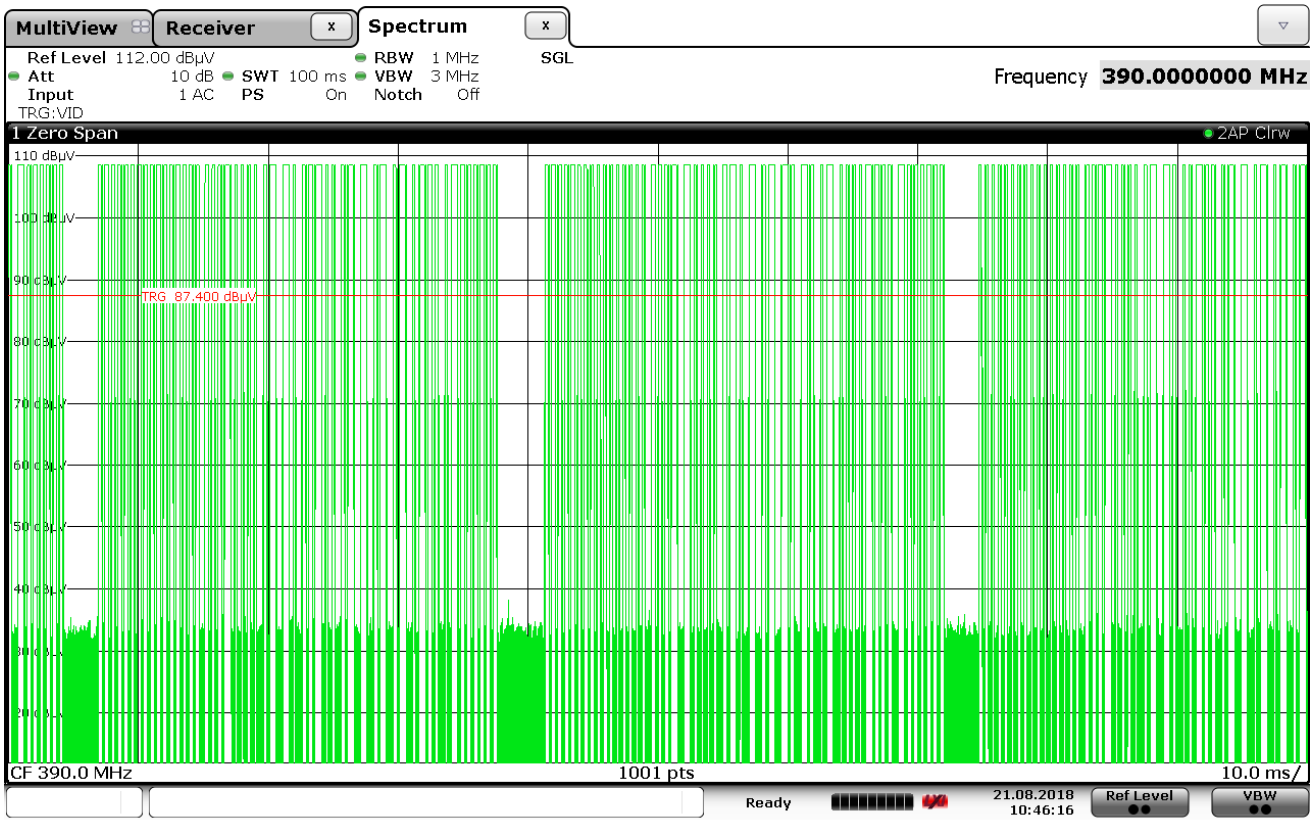
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : Tx @ 390MHz
NOTES : Chamberlain Yellow
NOTES : Short Pulse = 250usec



Date: 21.AUG.2018 10:52:40

FCC 15C 15.35 / Duty Cycle

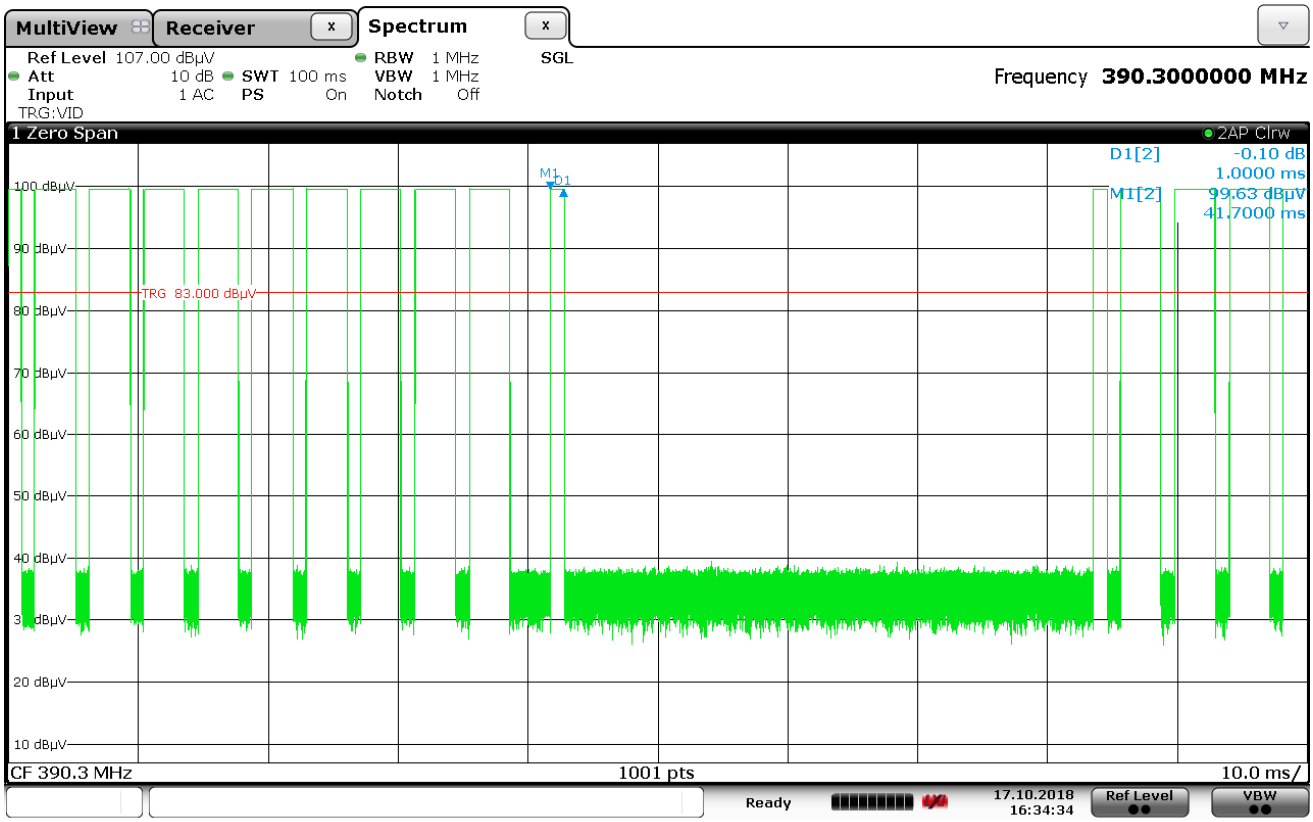
MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : Tx @ 390MHz
NOTES : Chamberlain Yellow
NOTES : Short Pulse = 500usec



Date: 21.AUG.2018 10:46:16

FCC 15C 15.35 / Duty Cycle

MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : Tx @ 390MHz
NOTES : Chamberlain Yellow
NOTES : 100msec time
NOTES : Duty Cycle calculation was based on 118 short pulses and 39 long pulses
: or 118 x 250usec + 39 x 500usec = 49msec
: Duty Cycle = 20 x log(49msec/100msec) = -6.20dB



Date: 17.OCT.2018 16:34:34

FCC 15C 15.35 / Duty Cycle

MANUFACTURER : Genie Company
MODEL NUMBER : GU4T
TEST MODE : Tx @ 390MHz
NOTES : Chamberlain Legacy
NOTES : Short Pulse = 1msec