TESTING LABORATORY
CERTIFICATE#4323.01

FCC PART 15.231

TEST REPORT

For

HANGZHOU HILAND TECHNOLOGY CO., LTD

4TH BUILDING, 2XIYUANWU ROAD, WESTLAKE, TECHNOLOGY GARDEN,
HANGZHOU, CHINA

FCC ID: 2AGCV-T35XX

Report Type:	Product Type:
Original Report	Transmitter

Test Engineer:	Max Min
Report Number:	RSHA181017001-00A
Report Date:	2018-12-11
Reviewed By:	Oscar Ye RF Leader
Prepared By:	Bay Area Compliance Laboratories Corp. (Kunshan) No.248 Chenghu Road, Kunshan, Jiangsu province, China Tel: +86-0512-86175000 Fax: +86-0512-88934268 www.baclcorp.com.cn

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant	HANGZHOU HILAND TECHNOLOGY CO., LTD
Tested Model	T3501
Series Model	T35XX, EG656, AT-4H
Product Type	Transmitter
Dimension	41 mm(L)* 56 mm(W)* 11.5 mm(H)
Power Supply	DC 3.0V from battery

Note: The difference between the tested model and series models was explained in the declaration letter.

**All measurement and test data in this report was gathered from production sample serial number: 20181017001. (Assigned by BACL, Kunshan). The EUT supplied by the applicant was received on 2018-10-17.*

Objective

This test report is prepared on behalf of *HANGZHOU HILAND TECHNOLOGY CO., LTD.* All the test measurements were performed according to the measurement procedure described in ANSI C63.10 - 2013.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, section 15.203, 15.205, 15.209, 15.35(c) and 15.231 rules.

Related Submittal(s)/Grant(s)

No related submittal/grant.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10 - 2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Kunshan). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

Item		Uncertainty
AC Power Lines Conducted Emissions		3.19 dB
RF conducted test with spectrum		0.9dB
Radiated emission	30MHz~1GHz	6.11dB
	1GHz~6GHz	4.45dB
	6GHz ~18GHz	5.23dB
Occupied Bandwidth		0.5kHz
Temperature		1.0℃
Humidity		6%

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Kunshan) to collect test data is located on the No.248 Chenghu Road, Kunshan, Jiangsu province, China.

Bay Area Compliance Laboratories Corp. (Kunshan) Lab is accredited to ISO/IEC 17025 by A2LA (Lab code: 4323.01) and the FCC designation No. CN1185 under the FCC KDB 974614 D01. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

SYSTEM TEST CONFIGURATION

Justification

Channel List:

Channel	Frequency (MHz)
1	433.92

The EUT has 4 buttons. All buttons triggered the same bandwidth, power level.

EUT Exercise Software

No software was used during the test. The EUT can transmit continuously through long pressing the buttons in engineering mode.

Equipment Modifications

No modification was made to the EUT.

Support Equipment List and Details

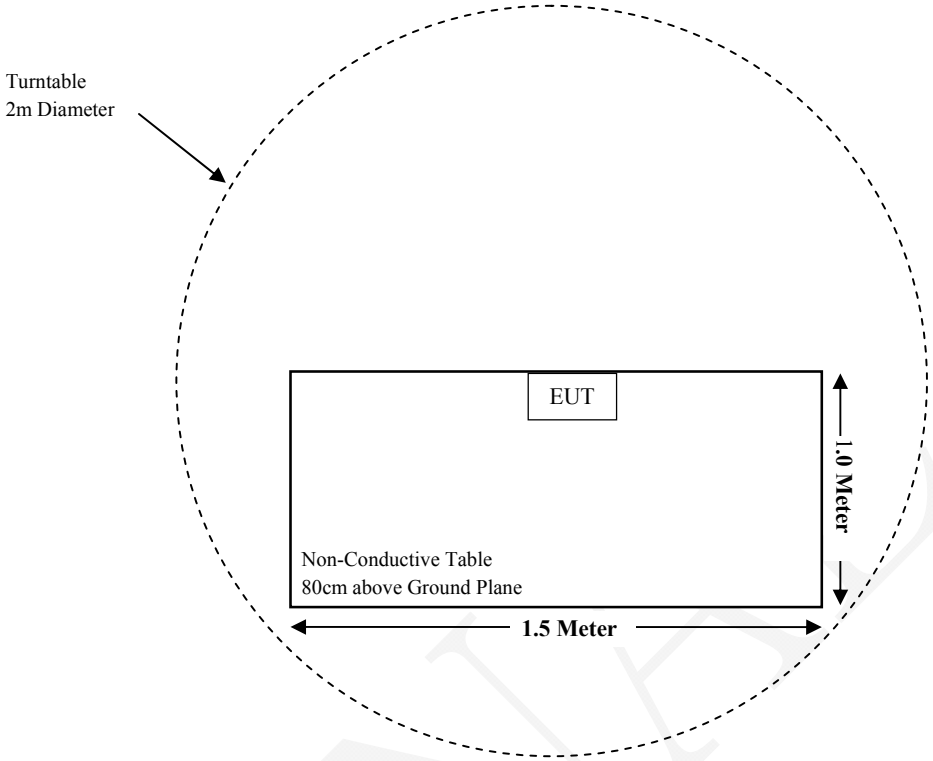
Manufacturer	Description	Model	Serial Number
/	/	/	/

External I/O Cable

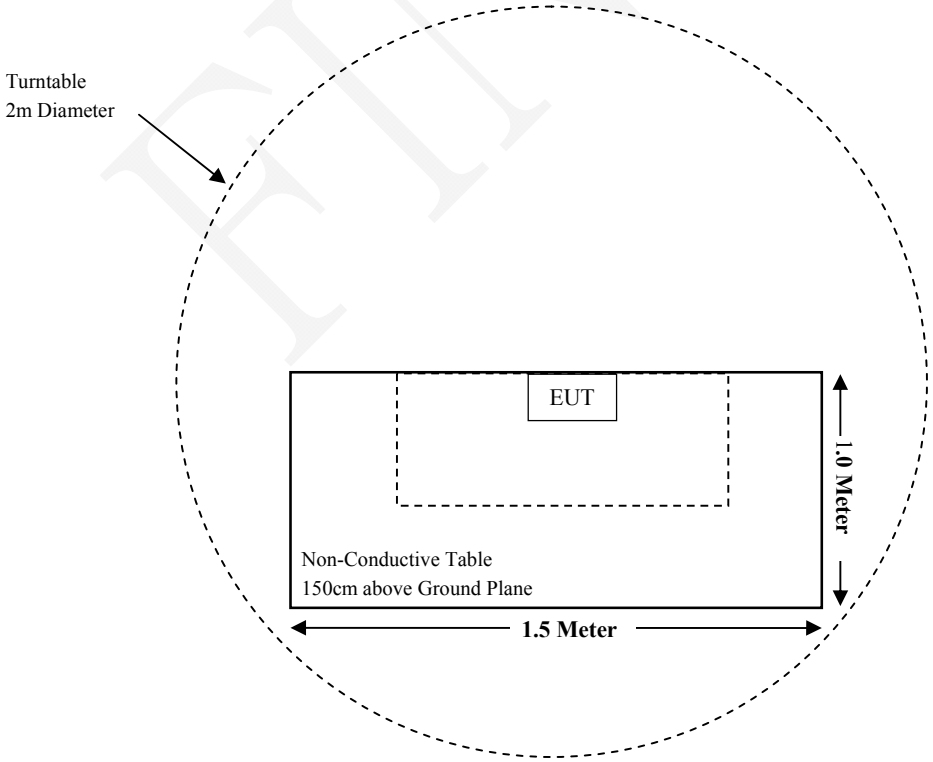
Cable Description	Length (m)	From Port	To
/	/	/	/

Block Diagram of Test Setup

For Radiated Emissions(Below 1GHz):



For Radiated Emissions(Above 1GHz):



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliance
§15.207(a)	Conducted Emissions	Not applicable (See Note)
§15.205, §15.209, §15.231(b)	Radiated Emissions	Compliance
§15.231 (a) (2)	Deactivation	Compliance
§15.231 (c)	20dB Emission Bandwidth	Compliance

Note: The EUT is powered by battery.

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test（Chamber 1#）					
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2017-11-12	2018-11-11
Sunol Sciences	Broadband Antenna	JB3	A090413-1	2016-12-26	2019-12-25
Sonoma Instrunent	Pre-amplifier	310N	171205	2018-08-15	2019-08-14
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
MICRO-COAX	Coaxial Cable	Cable-8	008	2018-08-15	2019-08-14
MICRO-COAX	Coaxial Cable	Cable-9	009	2018-08-15	2019-08-14
MICRO-COAX	Coaxial Cable	Cable-10	010	2018-08-15	2019-08-14
Radiated Emission Test（Chamber 2#）					
Rohde & Schwarz	EMI Test Receiver	ESU40	100207	2018-08-27	2019-08-26
Rohde & Schwarz	Signal Analyzer	FSV40	101116	2018-07-23	2019-07-22
ETS-LINDGREN	Horn Antenna	3115	6229	2016-01-11	2019-01-10
A.H.Systems, inc	Amplifier	2641-1	466	2018-09-11	2019-09-10
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
MICRO-COAX	Coaxial Cable	Cable-6	006	2018-08-15	2019-08-14
MICRO-COAX	Coaxial Cable	Cable-11	011	2018-08-15	2019-08-14
MICRO-COAX	Coaxial Cable	Cable-12	012	2018-08-15	2019-08-14
MICRO-COAX	Coaxial Cable	Cable-13	013	2018-08-15	2019-08-14

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

FCC§15.203 - ANTENNA REQUIREMENT

Applicable Standard

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

Antenna Connected Construction

The EUT has a PCB antenna which was permanently attached and the antenna gain is 0dBi; fulfill the requirement of this section. Please refer to EUT photos.

Result: Compliant.

FCC §15.205, §15.209, §15.231 (b) - RADIATED EMISSIONS

Applicable Standard

FCC §15.205, §15.209, §15.231 (b)

According to FCC §15.231(b), the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emission (microvolts/meter)
40.66-40.70	2250	225
70-130	1250	125
130-174	1250 to 3750 **	125 to 375 **
174-260	3750	375
260-470	3750 to 12500 **	375 to 1250**
Above 470	12500	1250

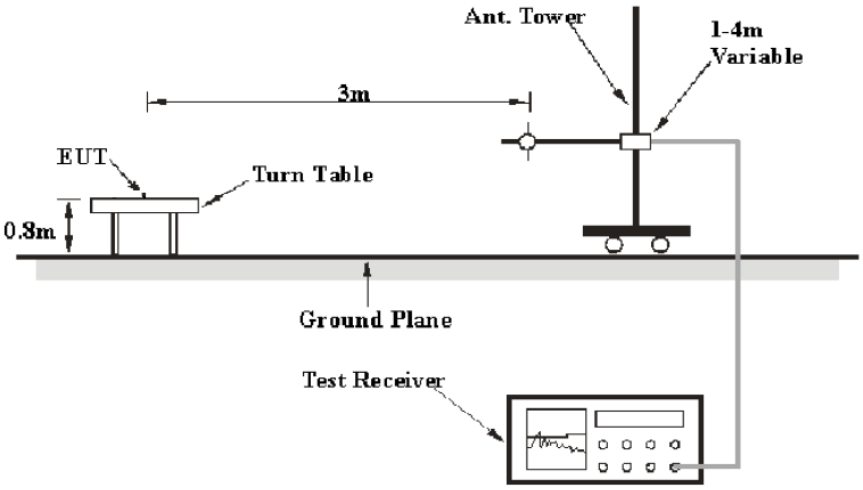
(1) The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at the band edges.

(2) Intentional radiators operating under the provisions of this section shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector. The specific method of measurement employed shall be specified in the application for equipment authorization. If average emission measurements are employed, the provisions in §15.35 for averaging pulsed emissions and for limiting peak emissions apply. Further, compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section.

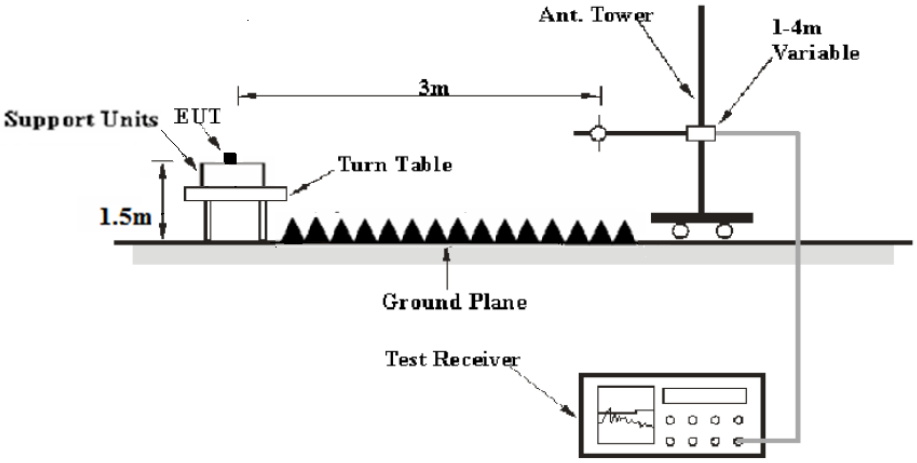
(3) The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in §15.209, whichever limit permits a higher field strength.

EUT Setup

Below 1GHz:



Above 1 GHz:



The radiated emission tests were performed in the 3 meters test site, using the setup accordance with the ANSI C63.10 - 2013. The specification used was the FCC 15 § 15.209, 15.205 and 15.231.

EMI Test Receiver Setup

The system was investigated from 30 MHz to 5 GHz.

During the radiated emission test, the EMI test Receiver was set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Detector
30 MHz – 1000 MHz	100 kHz	300 kHz	/	PK
1000MHz – 5000MHz	1MHz	3MHz	/	PK

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Corrected Amplitude (dBμV /m) = Meter Reading (dBμV) + Antenna Factor (dB/m) + Cable Loss (dB) - Amplifier Gain (dB)

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

Margin (dB) = Limit (dBμV/m) – Corrected Amplitude (dBμV /m)

Test Results Summary

According to the data in the following table, the EUT complied with the FCC §15.205, §15.209, §15.231 (b).

Test Data

Environmental Conditions

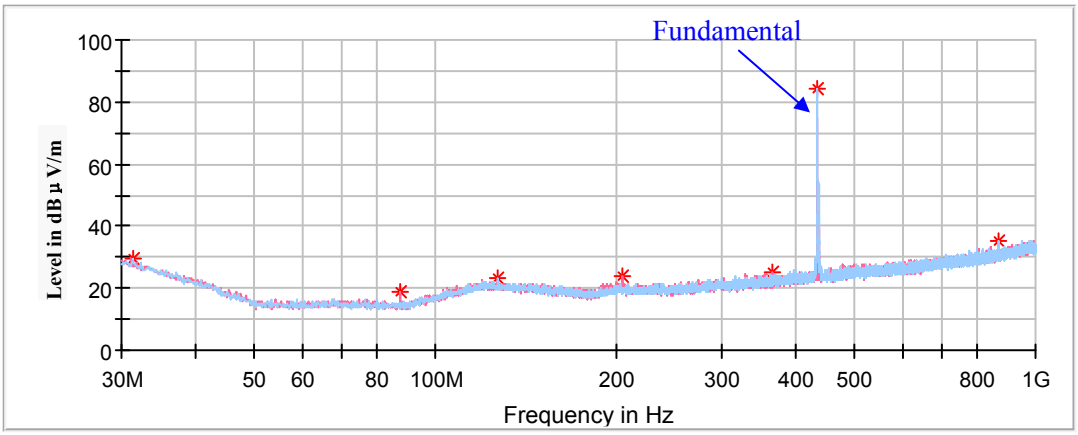
Temperature:	24.3 ℃-24.5℃
Relative Humidity:	51 %-52 %
ATM Pressure:	101.2 kPa -101.3 kPa

The testing was performed by Max Min from 2018-10-26 to2018-12-07.

Test mode: Transmitting

30MHz-1GHz

*(Pre-scan in the X,Y and Z axes of orientation, the worst case **X-axis of orientation** was recorded.)*



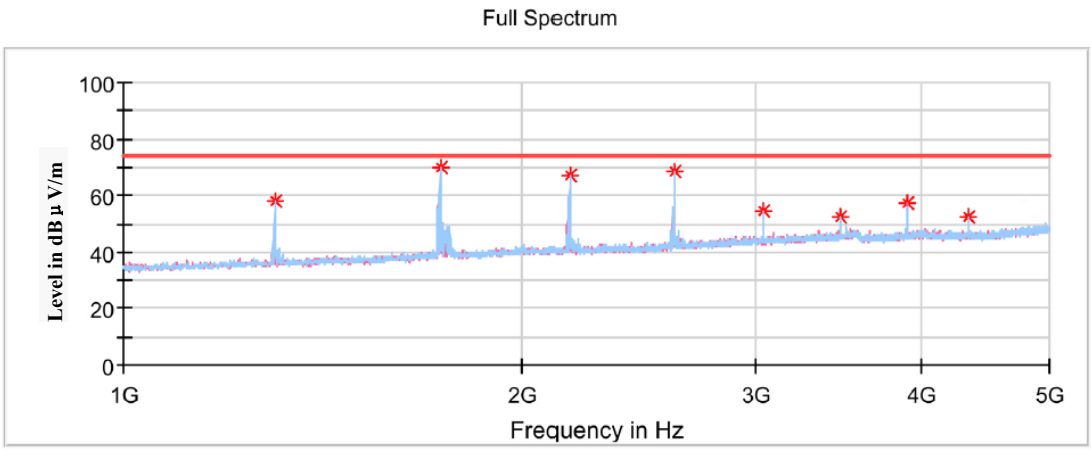
Frequency (MHz)	Corrected Amplitude MaxPeak (dBµV /m)	Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
		Height (cm)	Polar (H/V)				
31.33	29.70	200.0	H	222.0	-4.8	60.83	31.13
87.35	19.09	100.0	V	192.0	-17.6	60.83	41.74
127.36	23.03	100.0	H	294.0	-11.5	43.50	20.47
204.60	23.71	100.0	V	2.0	-12.3	60.83	37.12
364.53	25.36	200.0	V	283.0	-8.9	60.83	35.47
433.92	84.11	200.0	H	295.0	-7.7	100.83	16.72
867.84	35.52	200.0	H	105.0	-0.6	80.83	45.31

Field Strength of Average Emission

Frequency (MHz)	Peak Measurement@3m (dBµV/m)	Height (cm)	Polar (H/V)	Duty Cycle Corrected Factor (dB)	Corrected Ampitude (dBµV/m)	FCC Part 15.231(b)/205/209	
						Limit (dBµV/m)	Margin (dB)
433.92	84.11	200.0	H	-6.20	77.91	80.83	2.92
867.84	35.52	200.0	H	-6.20	29.32	60.83	31.51

1GHz-5 GHz

*(Pre-scan in the X,Y and Z axes of orientation, the worst case **X-axis of orientation** was recorded.)*



Frequency (MHz)	Corrected Amplitude MaxPeak (dBµV /m)	Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
		Height (cm)	Polar (H/V)				
1301.76	48.53	100.0	H	109.0	-8.70	74.00	25.47
1735.68	41.67	100.0	V	200.0	-6.70	80.83	39.16
2169.60	42.76	100.0	V	145.0	-5.30	80.83	38.07
2603.52	44.76	200.0	H	4.0	-3.80	80.83	36.07
3037.44	45.59	100.0	V	178.0	-1.60	80.83	35.24
3471.36	45.61	100.0	V	311.0	-0.84	80.83	35.22
3905.28	56.98	200.0	V	147.0	0.50	74.00	17.02
4339.20	47.73	100.0	V	259.0	1.24	74.00	26.27

Field Strength of Average Emission

Frequency (MHz)	Peak Measurement@3m (dBμV/m)	Height (cm)	Polar (H/V)	Duty Cycle Corrected Factor (dB)	Corrected Ampitude (dBμV/m)	FCC Part 15.231(b)/205/209	
						Limit (dBμV/m)	Margin (dB)
1301.76	48.53	100.0	H	-6.20	42.33	54.00	11.67
1735.68	41.67	100.0	V	-6.20	35.47	60.83	25.36
2169.60	42.76	100.0	V	-6.20	36.56	60.83	24.27
2603.52	44.76	200.0	H	-6.20	38.56	60.83	22.27
3037.44	45.59	100.0	V	-6.20	39.39	60.83	21.44
3471.36	45.61	100.0	V	-6.20	39.41	60.83	21.42
3905.28	56.98	200.0	V	-6.20	50.78	54.00	3.22
4339.20	47.73	100.0	V	-6.20	41.53	54.00	12.47

Note 1:

Corrected Factor (dB/m) = Antenna factor (RX) (dB/m) + Cable Loss (dB) – Amplifier Factor (dB)
Margin (dB) = Limit (dBμV/m) – Corrected Amplitude (dBμV /m)

Note 2:

Calculate average value based on duty cycle corrected factor:

T_p=100ms

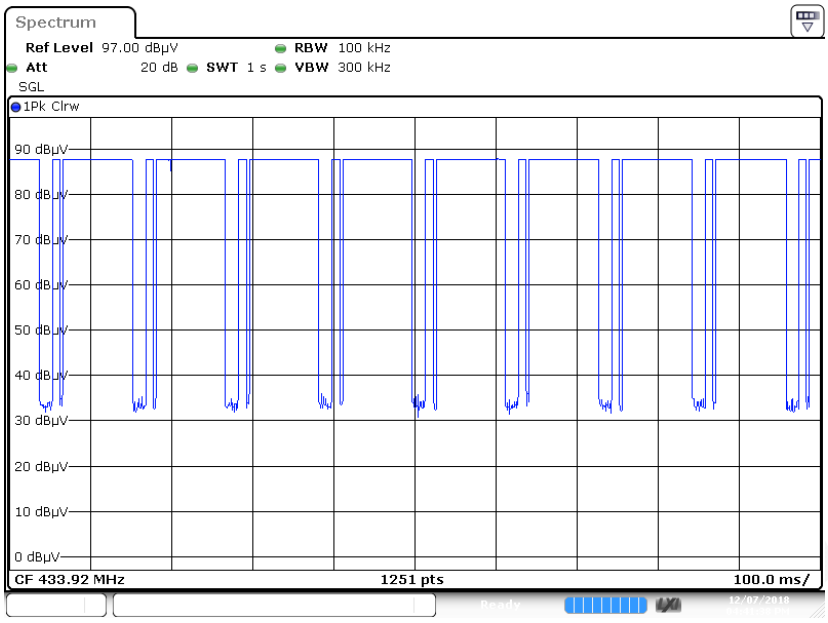
Button 1
T_{on}= Burst1*N1 + Burst2*N2 = 0.788ms*37+0.388ms*46 = 47.004ms
Button 2
T_{on}= Burst1*N1 + Burst2*N2 = 0.788ms*42+0.388ms*41 = 49.004ms
Button 3
T_{on}= Burst1*N1 + Burst2*N2 = 0.788ms*36+0.388ms*47 = 46.604ms
Button 4
T_{on}= Burst1*N1 + Burst2*N2 = 0.788ms*41+0.388ms*42 = 48.604ms

Duty Cycle Corrected Factor =20*log(T_{on}/T_p) = 20*log(49.004ms/100ms)= -6.20dB

Average value = Peak value + Duty Cycle Corrected Factor

Button 1

Duty Cycle



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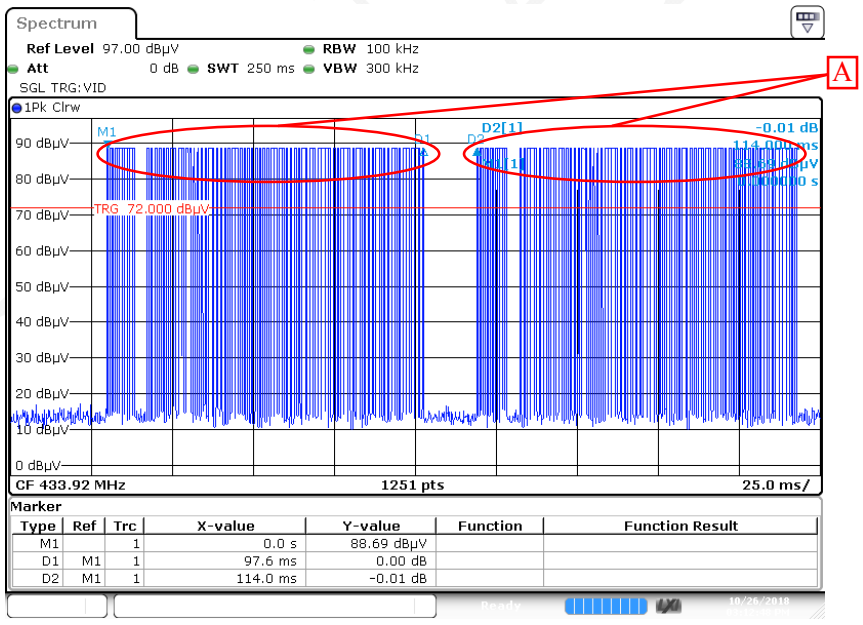
T_P=100.0ms



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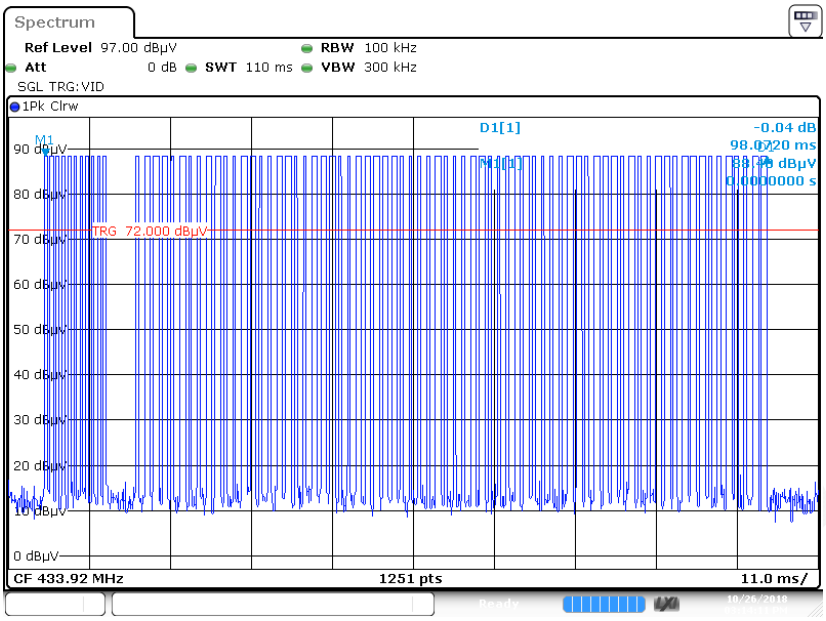
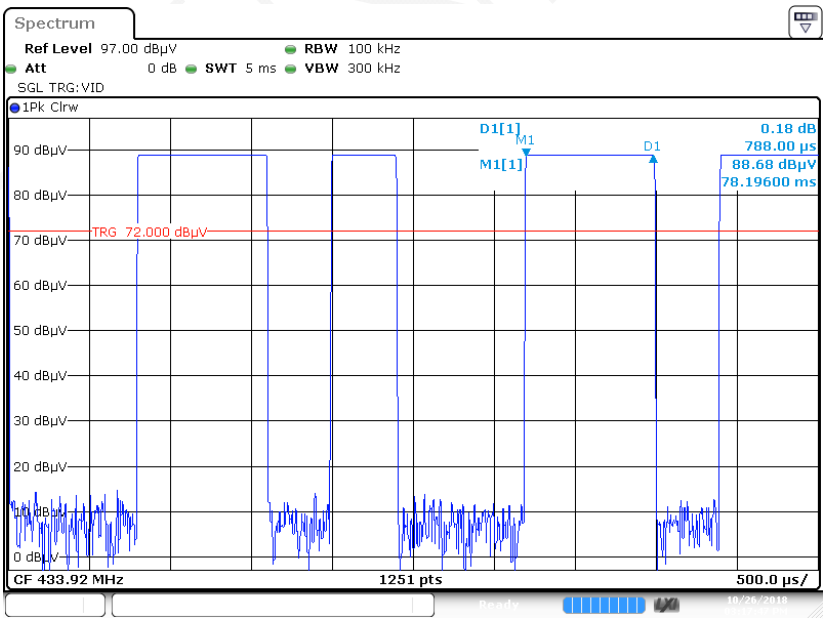
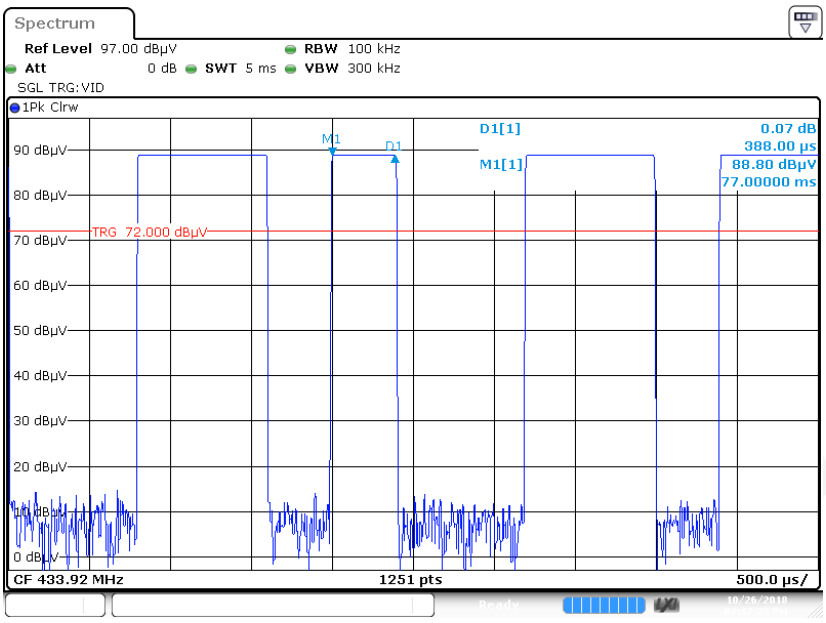
Zoom in A
N1=37, N2=46



Duty Cycle Burst 1
(Ton = 0.788ms)



Duty Cycle Burst 2
(Ton = 0.388ms)



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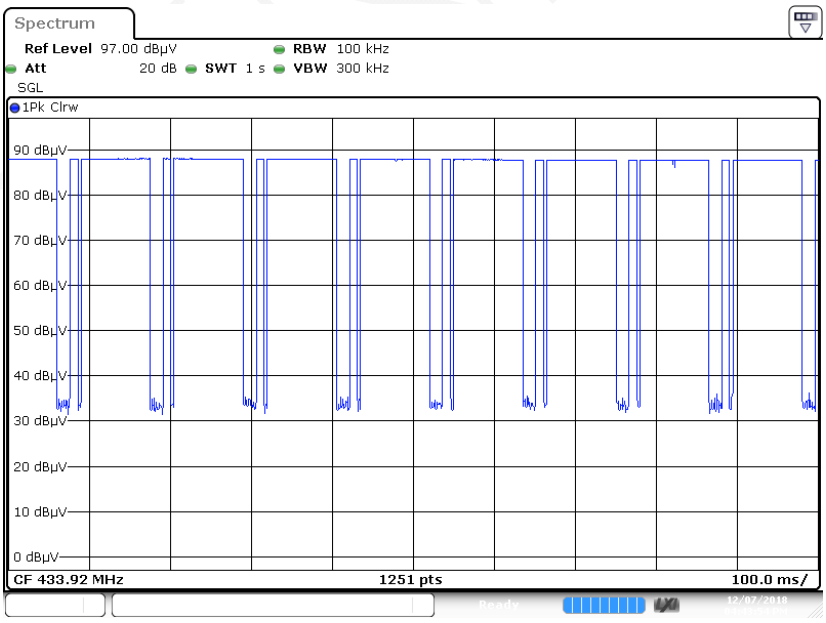
Button 2

Duty Cycle



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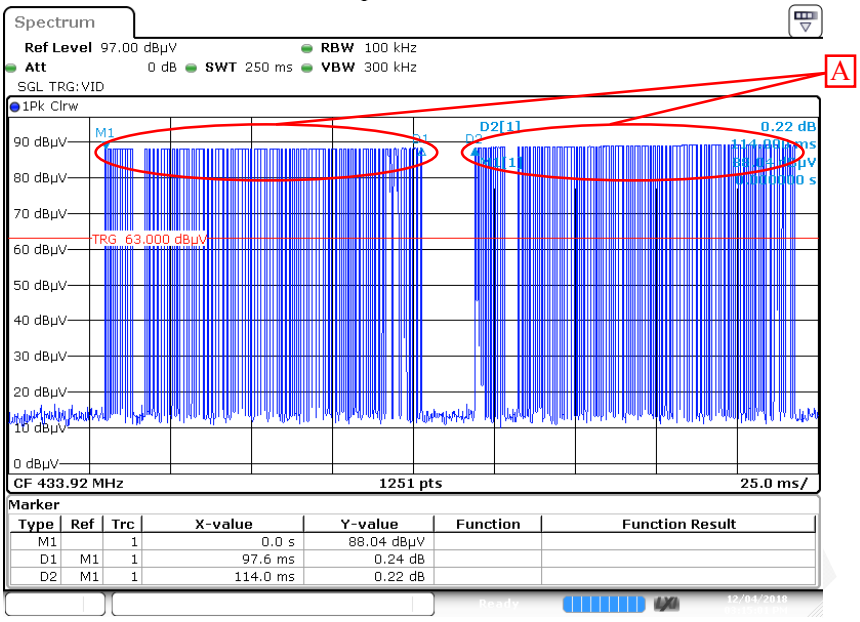
T_P=100.0ms



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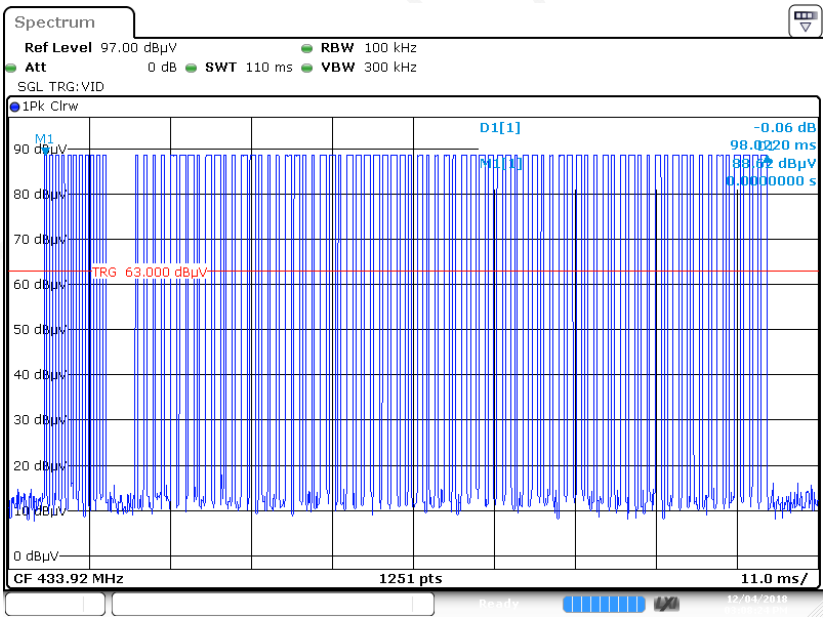
Zoom in A
N1=42, N2=41



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Duty Cycle Burst 1
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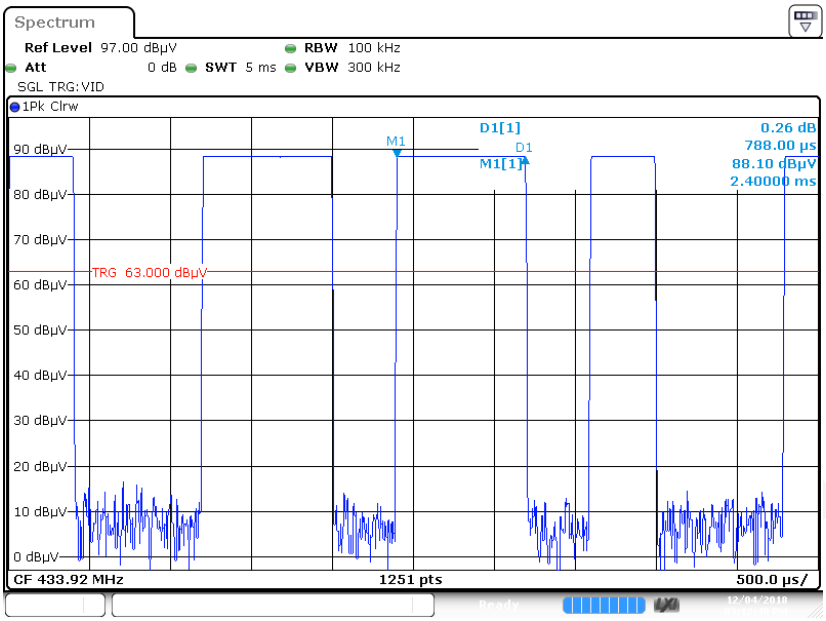

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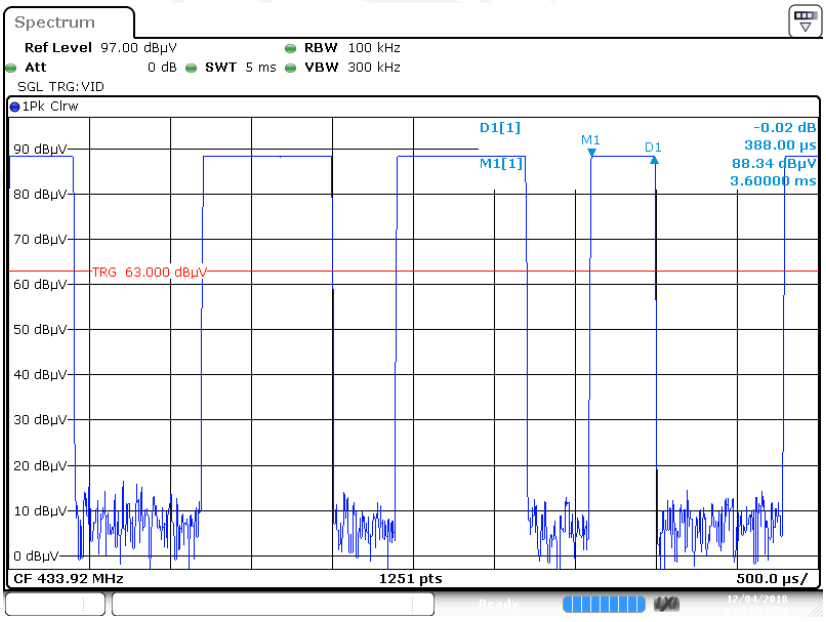
Duty Cycle Burst 2
(Ton = 0.388ms)



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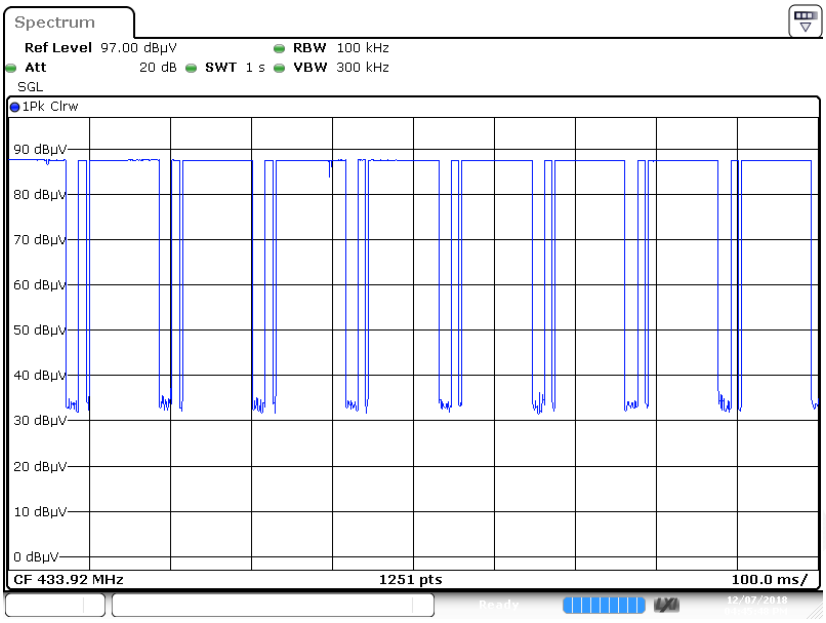
Button 3

Duty Cycle



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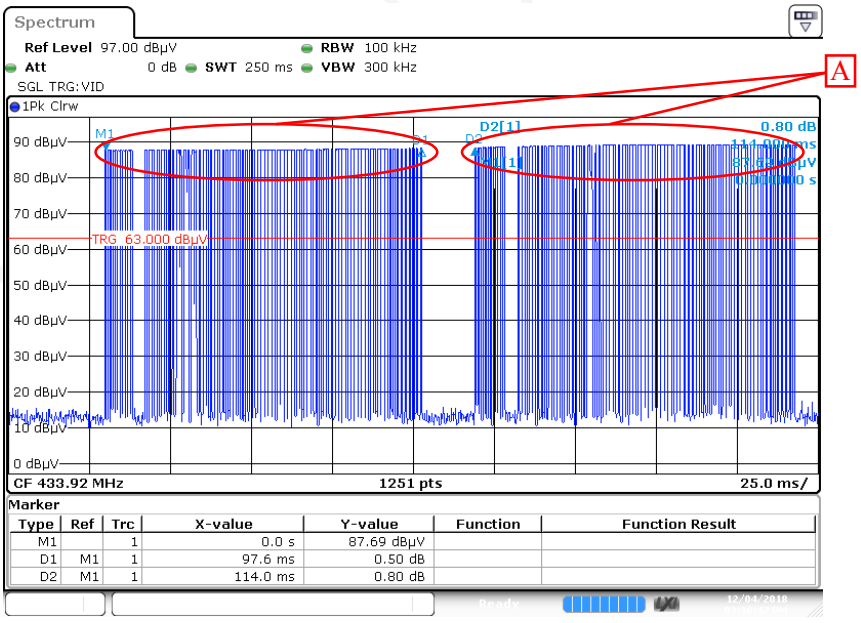
T_P=100.0ms



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Zoom in A
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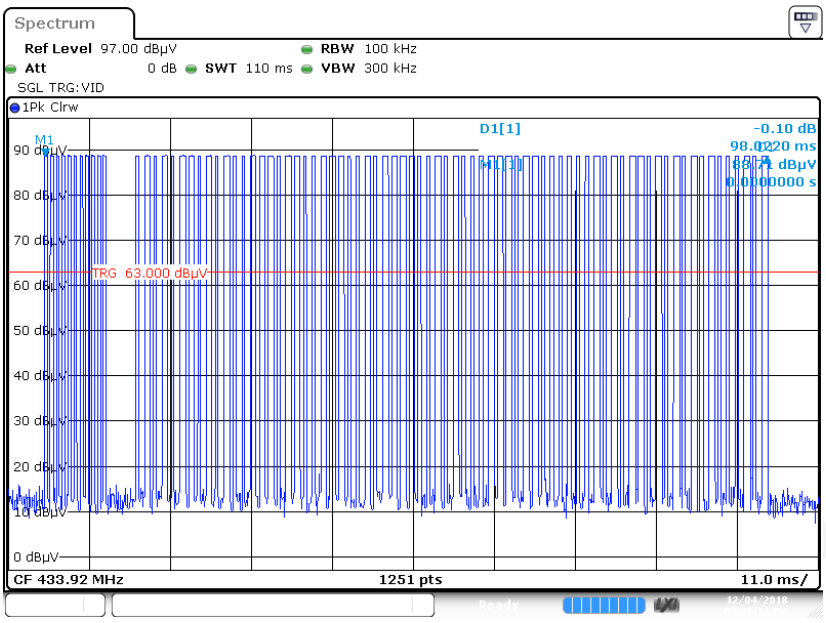

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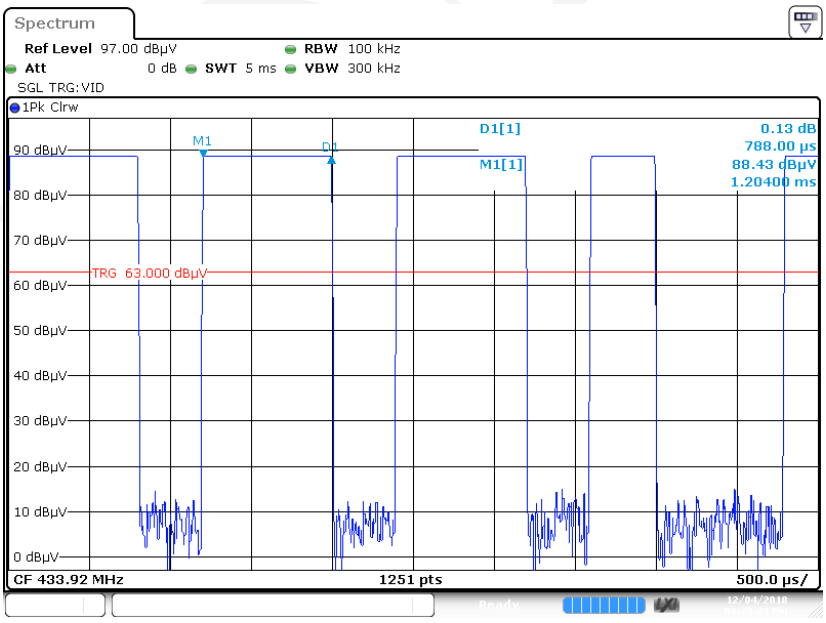
Duty Cycle Burst 1
(Ton = 0.788ms)



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Duty Cycle Burst 2
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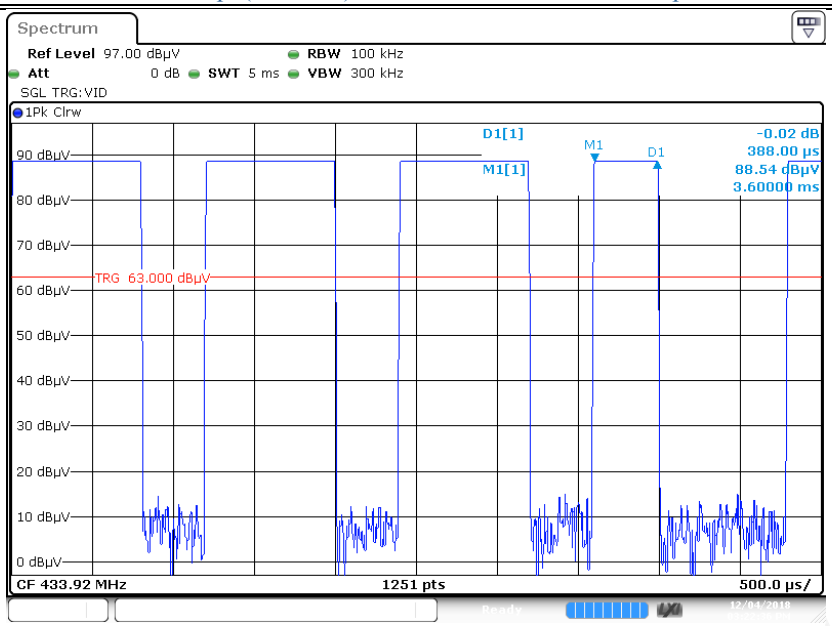

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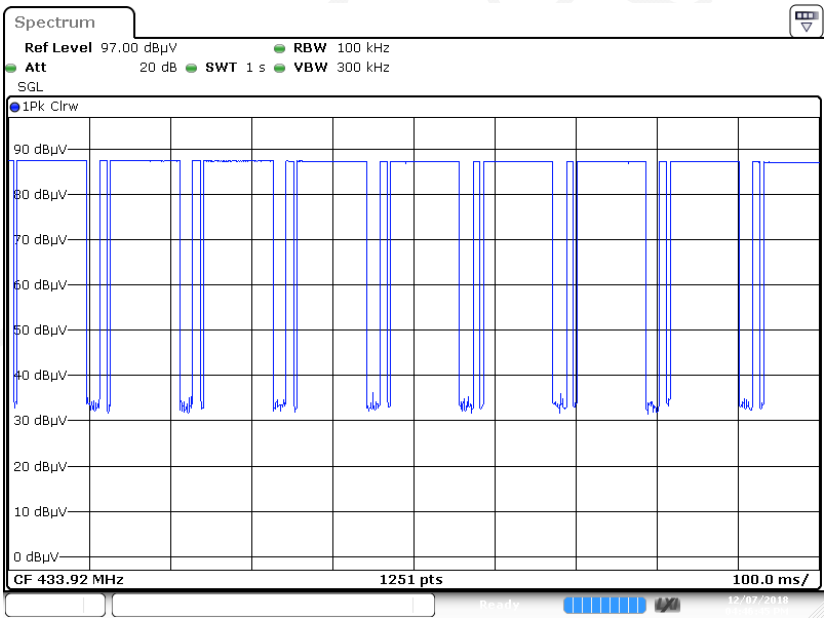
Button 4

Duty Cycle



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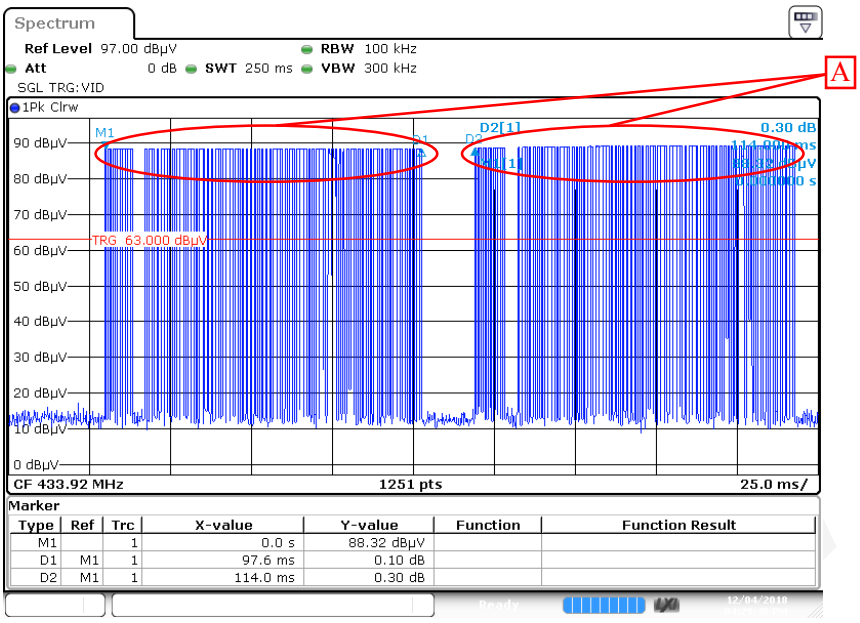
T_P=100.0ms



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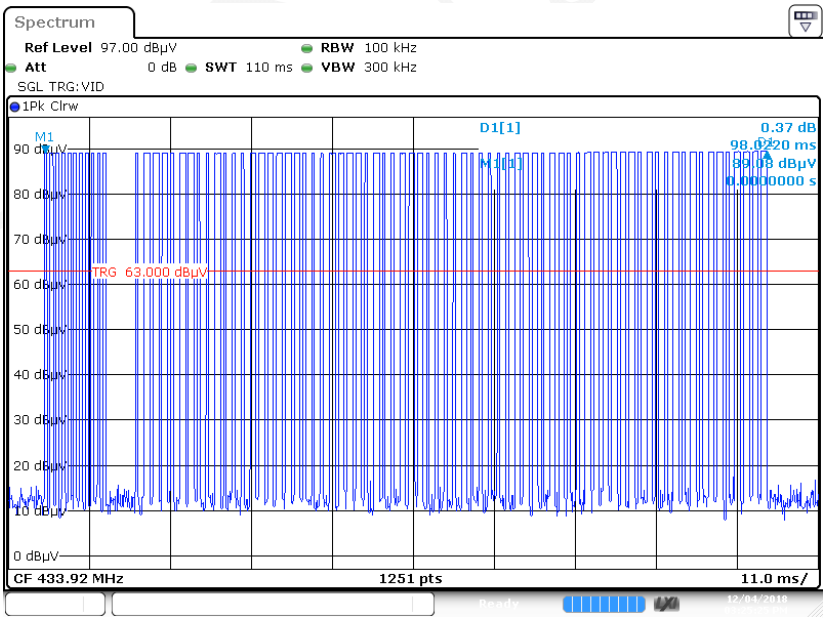

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Duty Cycle Burst 1
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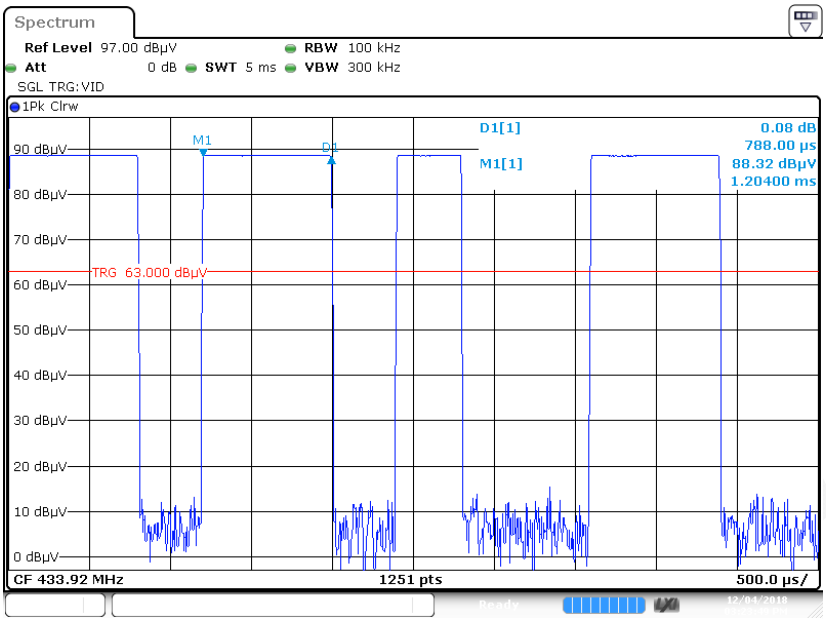

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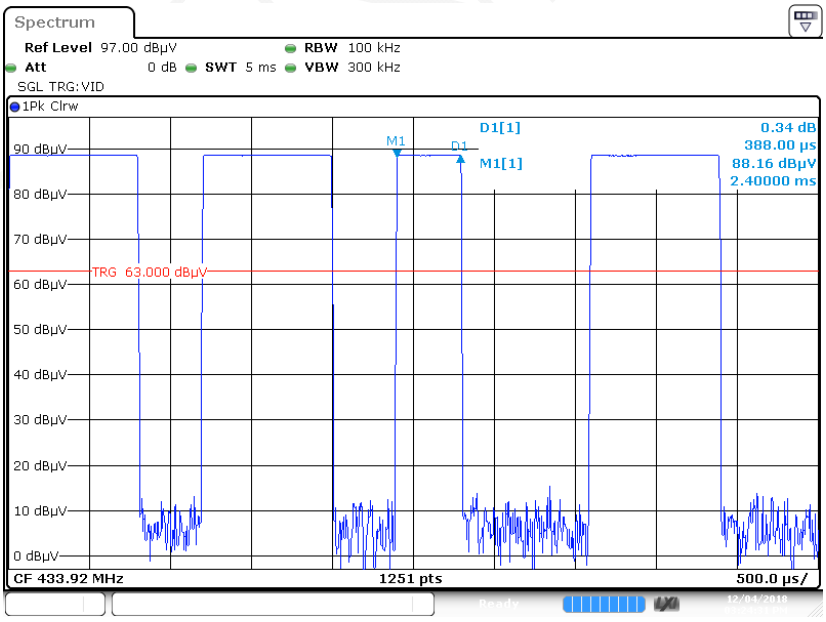
Duty Cycle Burst 2
(Ton = 0.388ms)



Date: 4.DEC.2018 15:24:31

FCC §15.231(a) (1 - DEACTIVATION TESTING

Applicable Standard

Per FCC §15.231(a) (1), A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

Test Procedure

1. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a spectrum analyzer, then turn on the EUT and make it operate in transmitting mode.
2. Set center frequency of spectrum analyzer=operating frequency.
3. Set the spectrum analyzer as RBW=100k VBW=300k Span=0Hz.
4. Repeat above procedures until all frequency measured was complete.

Test Data

Environmental Conditions

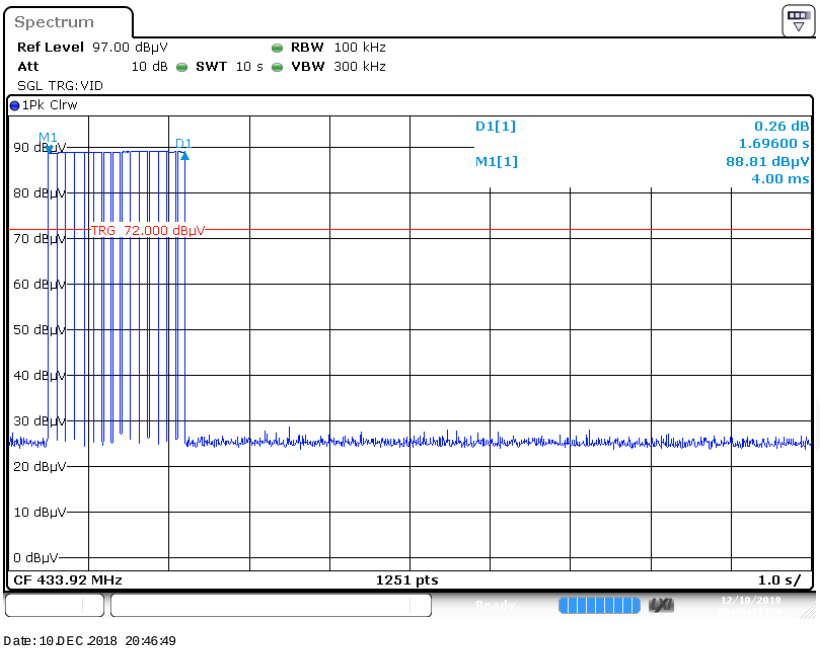
Temperature:	24.3 ℃
Relative Humidity:	53 %
ATM Pressure:	101.2 kPa

The testing was performed by Max Min on 2018-12-10.

Test mode: Transmitting

OOK Modulation

5s



FCC §15.231(c) - 20dB EMISSION BANDWIDTH TESTING

Applicable Standard

Per 15.231(c), The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. Bandwidth is determined at the points 20 dB down from the modulated carrier.

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

Test Data

Environmental Conditions

Temperature:	24.3 ℃
Relative Humidity:	51 %
ATM Pressure:	101.2 kPa

The testing was performed by Max Min on 2018-10-26.

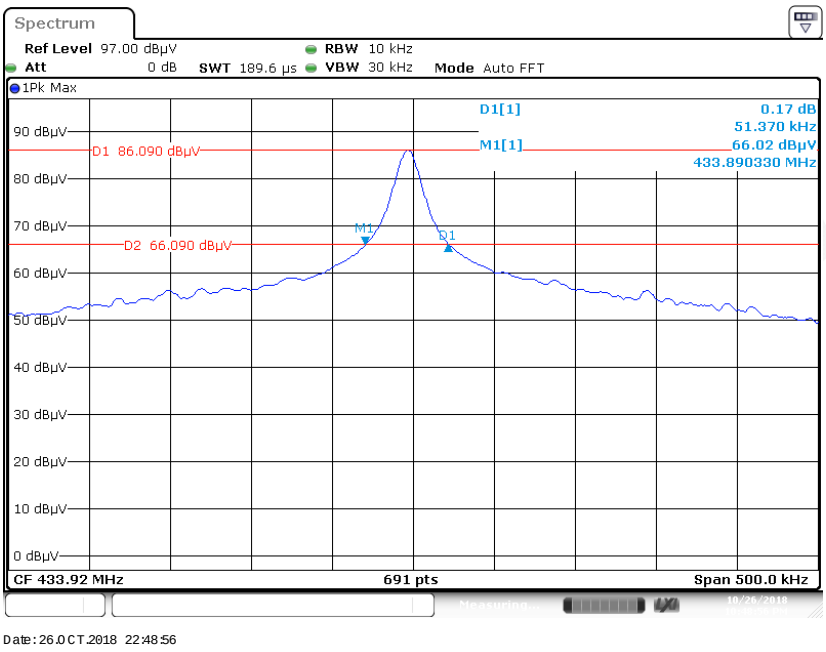
Test Mode: Transmitting

OOK Modulation:

Channel Frequency (MHz)	20dB Bandwidth (kHz)	Limit (kHz)	Result
433.92	51.37	1084.8	Pass

Note: Limit = 0.25% * Center Frequency = 0.25% * 433.92 MHz = 1084.8 kHz

20 dB Emission Bandwidth



******* END OF REPORT *******