FCC PART 15.231

TEST REPORT

For

Autel Intelligent Tech. Corp., Ltd.

6th - 10th Floor, Bldg. B1, Zhiyuan, Xueyuan Rd., Xili, Nanshan, Shenzhen, 518055, China

FCC ID: WQ8TPMSDF87

Report Type:	**Product Type:**
Original Report	MX-SENSOR

Report Number:	RSZ170519004-00
Report Date:	2017-09-29
Reviewed By:	Oscar Ye Engineer
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)

The *Autel Intelligent Tech. Corp., Ltd.'s* product, model number: *1 SENSOR (FCC ID: WQ8TPMSDF87)* (or the "EUT") in this report was a *MX-SENSOR,* which was measured approximately: 42.0 mm (L) x 28.0 mm (W) x 18.0 mm (H), rated input voltage: DC 3V battery.

**All measurement and test data in this report was gathered from production sample serial number: 1701060 (Assigned by BACL, Kunshan). The EUT supplied by the applicant was received on 2017-05-19.*

Objective

This test report is prepared on behalf of *Autel Intelligent Tech. Corp., 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(s).

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 with radiated emission is 5.91 dB for 30MHz-1GHz.and 4.92 dB for above 1GHz, 1.95dB for conducted measurement.

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) has been accredited to ISO/IEC 17025 by CNAS(Lab code: L9963). And accredited to ISO/IEC 17025 by A2LA(Lab code: 4323.01), the FCC Designation No. CN1185 under the KDB 974614 D01.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 815570. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

Bay Area Compliance Laboratories Corp. (Kunshan) was registered with ISED Canada under ISED Canada Registration Number 3062E.

SYSTEM TEST CONFIGURATION

Justification

The system was configured for testing by Professional scan tool which the model no.is MaxiTPMS TS508. The MaxiTPMS TS508 built-in a software can control the EUT transmit, Set the different type of cars can chose the radio transmitting frequency 315MHz or 433.92MHz, and also you can set the modulation type of the signal. In this method can keep the same RF parameter to the normal working.

Special Accessories

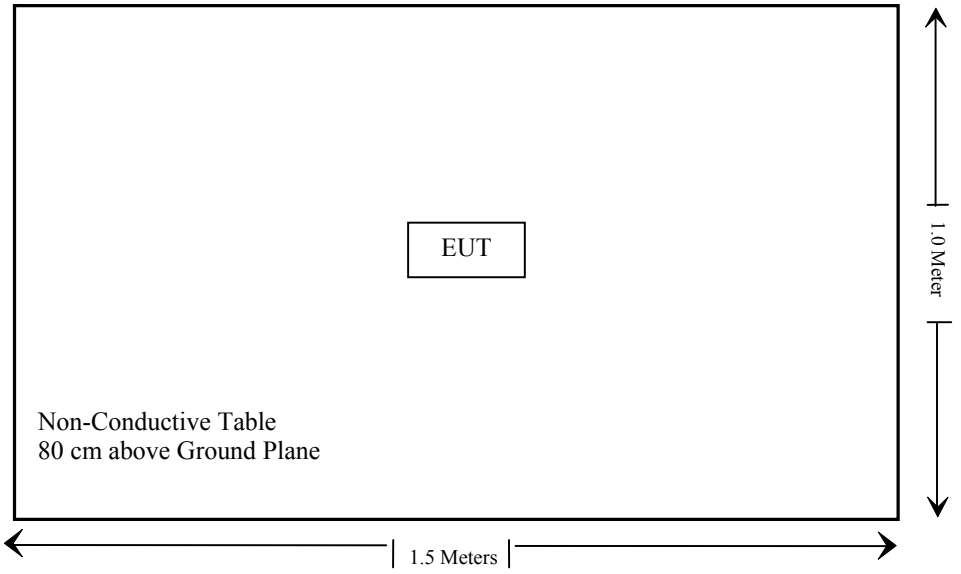
"Professional scan tool" special accessories was used.
Model No: MaxiTPMS TS508
Trade Mark: AUTEL
FCC ID: WQ82016-TS408

Equipment Modifications

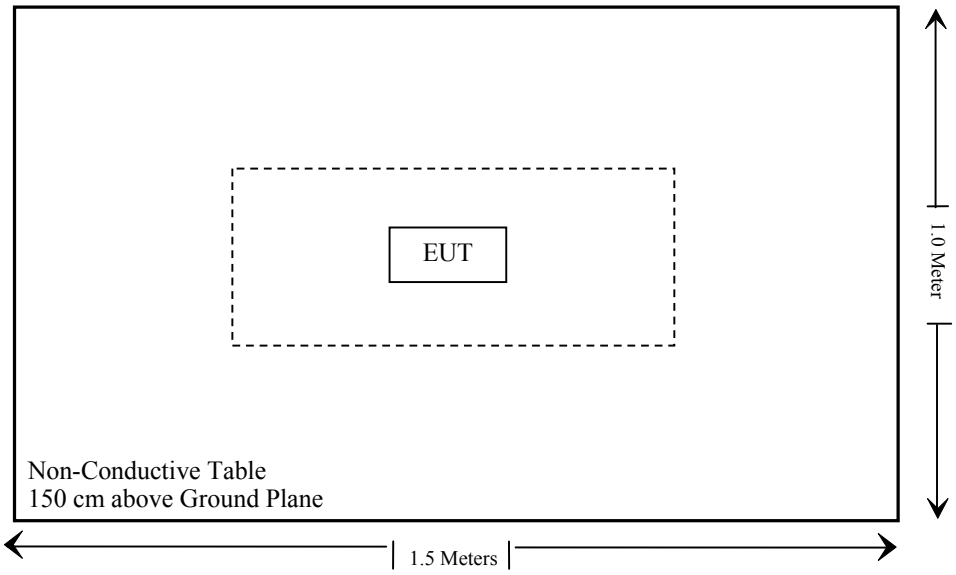
No modification was made to the EUT.

Block Diagram of Test Setup

Below 1GHz:



Above 1GHz:


EUT
1.0 Meter
Non-Conductive Table
150 cm above Ground Plane
1.5 Meters

SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliance
§15.207 (a)	Conducted Emissions	Not Applicable
§15.205, §15.209, §15.231(b)(e)	Radiated Emissions	Compliance
§15.231 (c)	20dB Emission Bandwidth	Compliance
§15.231 (a) (2)	Deactivation	Compliance
§15.231 (e)	Transmission Time, Silent period	Compliance

Not Applicable: The EUT is powered by battery only.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test					
Sonoma Instrunent	Amplifier	330	171377	2016-12-12	2017-12-12
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2016-11-25	2017-11-25
Sunol Sciences	Broadband Antenna	JB3	A090314-2	2016-01-09	2019-01-08
ETS	Horn Antenna	3115	9311-4159	2016-01-11	2019-01-10
Rohde & Schwarz	Signal Analyzer	FSIQ26	100048	2016-11-25	2017-11-25
Mini	Pre-amplifier	ZVA-183-S+	857001418	2016-09-16	2017-09-16
R&S	Auto test Software	EMC32	V 09.10.0	NCR	NCR
haojintech	Coaxial Cable	Cable-1	001	2016-09-08	2017-09-07
haojintech	Coaxial Cable	Cable-2	002	2016-09-08	2017-09-07
haojintech	Coaxial Cable	Cable-3	003	2016-09-08	2017-09-07
MICRO-COAX	Coaxial Cable	Cable-4	004	2016-11-18	2017-11-17
MICRO-COAX	Coaxial Cable	Cable-5	005	2016-11-18	2017-11-17
RF Conducted test					
WEINSCHEL	10dB Attenuator	5328	N/A	2016-06-18	2017-06-18
WEINSCHEL	10dB Attenuator	5328	N/A	2017-06-18	2018-06-18
Rohde & Schwarz	Signal Analyzer	FSIQ26	836131/009	2016-09-21	2017-09-21
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2016-11-25	2017-11-25

*** 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 Connector Construction

The EUT has an internal antenna arrangement which was permanently attached and the antenna gain is -1.5 dBi; fulfill the requirement of this section. Please refer to EUT photos.

Result: Compliant.

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

Applicable Standard

FCC §15.205, §15.209, §15.231 (b), §15.231 (e)

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 emissions ((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

*Linear interpolations.

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

According to §15.231 (e), intentional radiators may operate at a periodic rate exceeding that specified in paragraph (a) of this section and may be employed for any type of operation, including operation prohibited in paragraph (a) of this section, provided the intentional radiator complies with the provisions of paragraphs (b) through (d) of this section, except the field strength table in paragraph (b) of this section is replaced by the following:

Fundamental frequency (MHz)	Field Strength of Fundamental (Microvolts /meter)	Field Strength of spurious emissions (Microvolts /meter)
40.66-40.70	1000	100
70-130	500	50
130-174	500 to 1500**	50 to 150**
174-260	1500	150
260-470	1500 to 5000**	150 to 500**
Above 470	5000	500

**Linear interpolations.

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

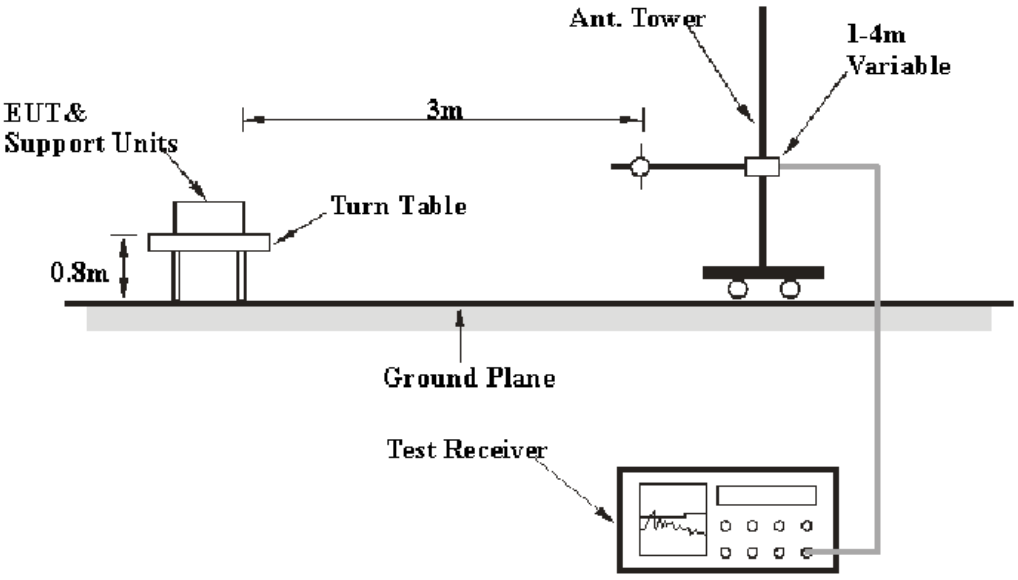
Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

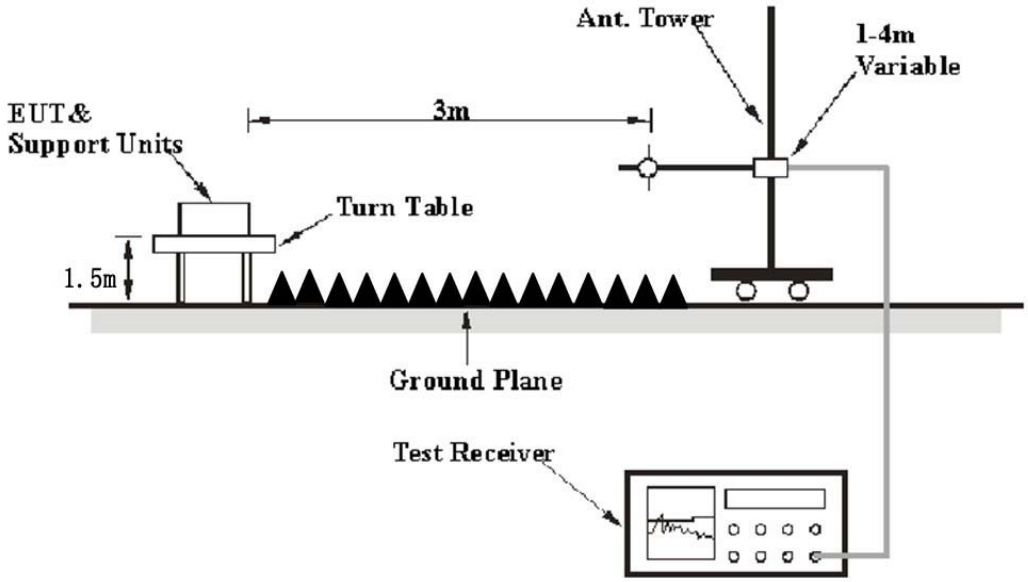
Based on CISPR 16-4-2:2011, the expended combined standard uncertainty of radiation emissions at Bay Area Compliance Laboratories Corp. (Kunshan) is 5.91 dB for 30MHz-1GHz.and 4.92 dB for above 1GHz, and it will not be taken into consideration for the test data recorded in the report.

EUT Setup

Below 1 GHz:



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 test receiver was set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Detector
30MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1 MHz	3 MHz	/	PK

Test Procedure

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

All final data was recorded in the Quasi-peak detection mode from 30MHz to 1GHz, Peak detection mode above 1 GHz.

Corrected Amplitude & Margin Calculation

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

Corrected Amplitude = Meter Reading + Antenna Loss + Cable Loss - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 5.8 dB means the emission is 5.8 dB below the limit. The equation for margin calculation is as follows:

Margin = Limit –Corrected Amplitude

Test Results Summary

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

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level complies with the limit if

$$L_m + U_{(Lm)} \leq L_{lim} + U_{cispr}$$

In BACL, $U_{(Lm)}$ is less than + U_{cispr}, if L_m is less than L_{lim}, it implies that the EUT complies with the limit.

Test Data

Environmental Conditions

Temperature:	24~26 ℃
Relative Humidity:	45~50 %
ATM Pressure:	100.0~101.0 kPa

The testing was performed by Layne Li from 2017-05-28 to 2017-06-03.

Test mode: Transmitting

433.92MHz:

30MHz-5GHz (ASK modulation):

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.231(b)/205/209		
	Reading (dBμV)	Detector (PK/QP/Ave.)		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)	Comment
433.92	93.11	PK	217	1.2	H	2.99	96.10	100.8	4.70	Fundamental
433.92	77.88	PK	263	2.0	V	2.99	80.87	100.8	19.93	Fundamental
867.84	42.28	PK	304	2.2	H	10.50	52.78	80.8	28.02	Harmonic
867.84	30.78	PK	304	2.2	V	10.50	41.28	80.8	39.52	Harmonic
1301.76	78.54	PK	53	1.8	H	-10.66	67.88	80.8	12.92	Harmonic
1301.76	72.95	PK	53	1.8	V	-10.66	62.29	80.8	18.51	Harmonic
1735.68	78.66	PK	87	1.1	H	-8.51	70.15	80.8	10.65	Harmonic
1735.68	74.99	PK	87	1.1	V	-8.51	66.48	80.8	14.32	Harmonic
2169.60	75.03	PK	177	1.6	H	-6.64	68.39	80.8	12.41	Harmonic
2169.60	71.38	PK	177	1.6	V	-6.64	64.74	80.8	16.06	Harmonic
2603.52	67.98	PK	10	1.2	H	-5.42	62.56	80.8	18.24	Harmonic
2603.52	64.92	PK	10	1.2	V	-5.42	59.50	80.8	21.3	Harmonic
3037.44	60.68	PK	149	2.1	H	-3.24	57.44	80.8	23.36	Harmonic
3037.44	61.64	PK	149	2.1	V	-3.24	58.40	80.8	22.4	Harmonic

Field Strength of Average Emission							
Frequency (MHz)	Peak Measurement @3m (dBμV/m)	Polar (H/V)	Duty Cycle Correction Factor (dB)	Corrected Ampitude (dBμV/m)	FCC Part 15.231(b)/205/209		
					Limit (dBμV/m)	Margin (dB)	Comment
433.92	96.10	H	-22.81	73.29	80.8	7.51	Fundamental
433.92	80.87	V	-22.81	58.06	80.8	22.74	Fundamental
867.84	52.78	H	-22.81	29.97	60.8	30.83	Harmonic
867.84	41.28	V	-22.81	18.47	60.8	42.33	Harmonic
1301.76	67.88	H	-22.81	45.07	60.8	15.73	Harmonic
1301.76	62.29	V	-22.81	39.48	60.8	21.32	Harmonic
1735.68	70.15	H	-22.81	47.34	60.8	13.46	Harmonic
1735.68	66.48	V	-22.81	43.67	60.8	17.13	Harmonic
2169.60	68.39	H	-22.81	45.58	60.8	15.22	Harmonic
2169.60	64.74	V	-22.81	41.93	60.8	18.87	Harmonic
2603.52	62.56	H	-22.81	39.75	60.8	21.05	Harmonic
2603.52	59.50	V	-22.81	36.69	60.8	24.11	Harmonic
3037.44	57.44	H	-22.81	34.63	60.8	26.17	Harmonic
3037.44	58.40	V	-22.81	35.59	60.8	25.21	Harmonic

Note 1:
Corrected Amplitude = Corrected Factor + Reading
Corrected Factor = Antenna factor (Rx) + cable loss – amplifier factor
Margin = Limit - Corr. Amplitude

Note 2:
Calculate Average value based on Duty Cycle correction factor:

Ton1 = 55*Pulses=55*0.082ms = 4.510ms

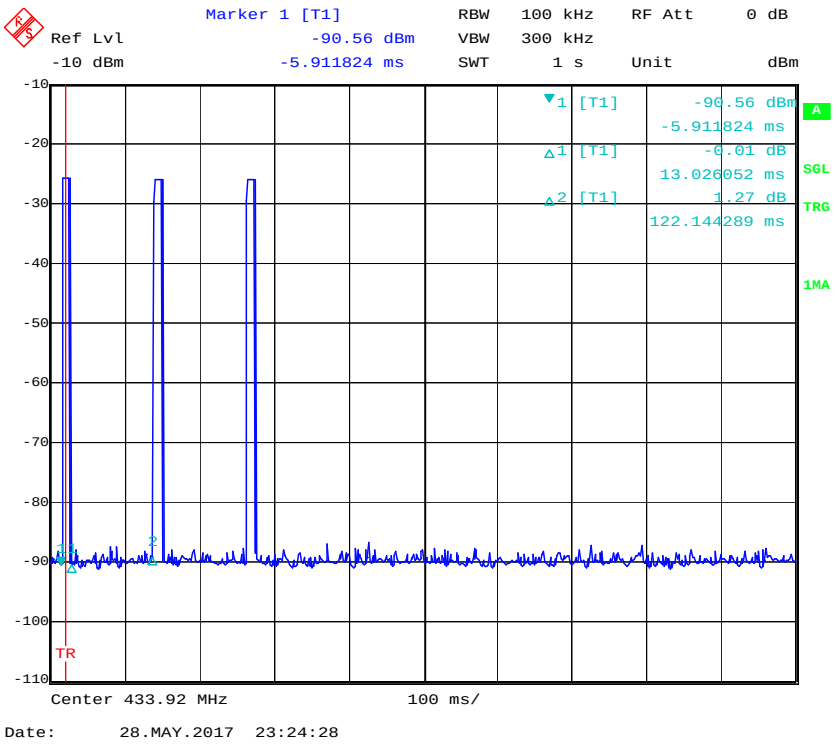
Ton2 = 22*Pulses=22*0.124ms =2.728 ms

Tp = 100 ms(122＞100)

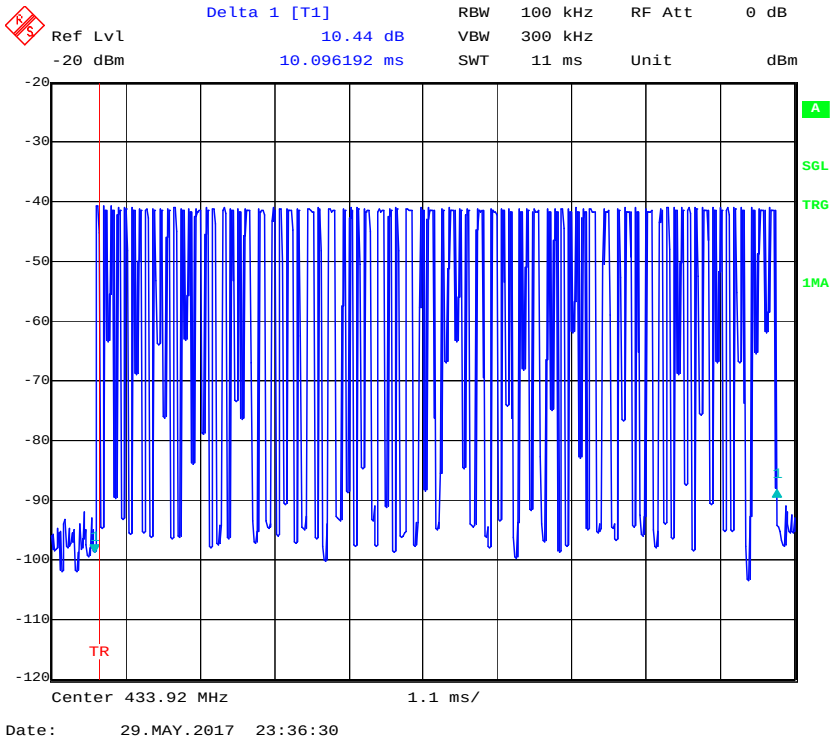
Duty cycle = (Ton1+ Ton2)/Tp = (4.510+2.728)/100 = 0.07238

Duty Cycle Corrected Factor = 20lg (Duty cycle) = 20lg0.07238 = -22.81
Average = Peak + Duty Cycle Corrected Factor

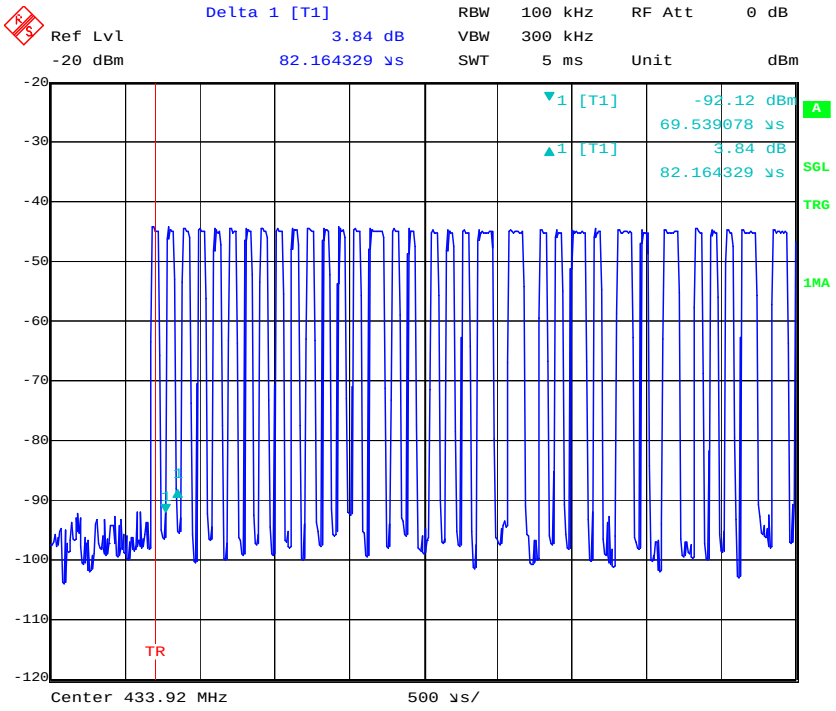
Duty Cycle



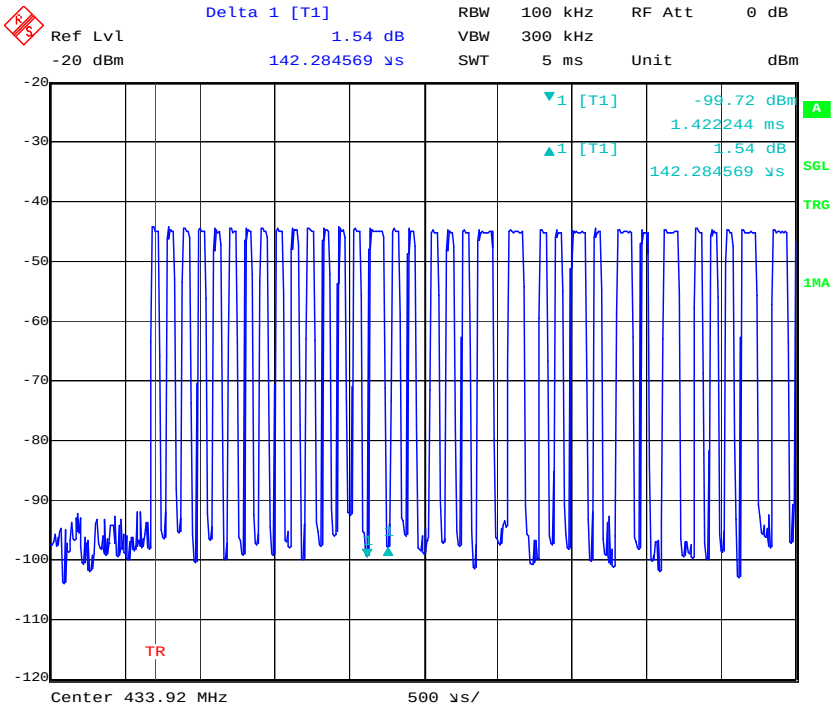
Duty Cycle



Ton1


Delta 1 [T1]
Ref Lvl
3.84 dB
-20 dBm
82.164329 µs
RBW 100 kHz
VBW 300 kHz
SWT 5 ms
RF Att 0 dB
Unit dBm
1 [T1] -92.12 dBm
69.539078 µs
1 [T1] 3.84 dB
82.164329 µs
A
SGL
TRG
1MA
TR
Center 433.92 MHz
500 µs/
Date: 29.MAY.2017 23:38:23

Ton2


Delta 1 [T1]
Ref Lvl
1.54 dB
-20 dBm
142.284569 µs
RBW 100 kHz
VBW 300 kHz
SWT 5 ms
RF Att 0 dB
Unit dBm
1 [T1] -99.72 dBm
1.422244 ms
1 [T1] 1.54 dB
142.284569 µs
A
SGL
TRG
1MA
TR
Center 433.92 MHz
500 µs/
Date: 29.MAY.2017 23:39:10

30MHz-5GHz (FSK modulation):

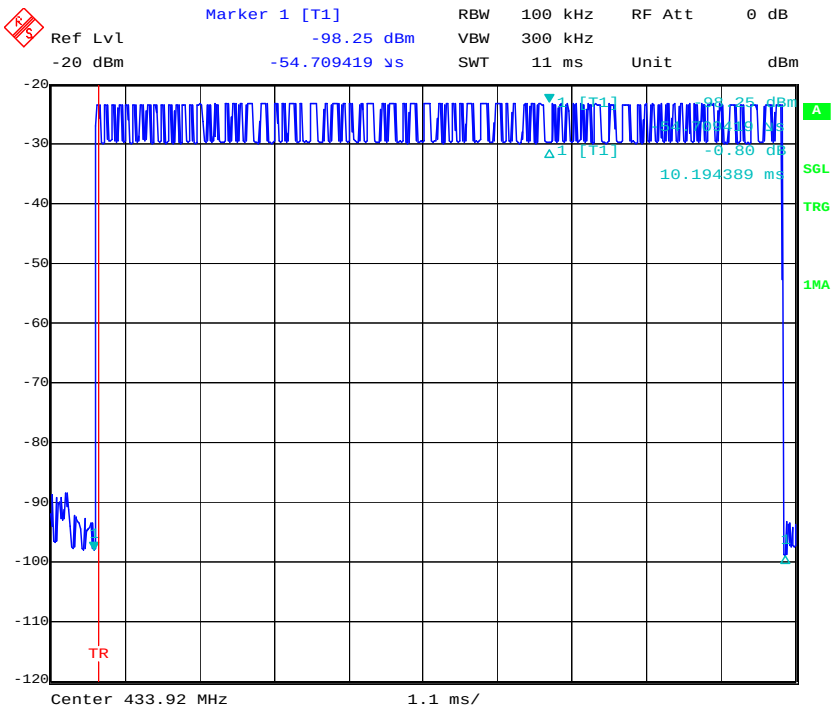
Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.231(e)/205/209		
	Reading (dBμV)	Detector (PK/QP/Ave.)		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)	Comment
433.92	87.98	PK	232	2.5	H	2.99	90.97	92.8	1.83	Fundamental
433.92	79.13	PK	4	2.3	V	2.99	82.12	92.8	10.68	Fundamental
867.84	39.73	PK	3	2.1	H	10.50	50.23	72.8	22.57	Harmonic
867.84	29.62	PK	3	2.1	V	10.50	40.12	72.8	32.68	Harmonic
1301.76	78.54	PK	53	1.8	H	-10.66	67.88	72.8	4.92	Harmonic
1301.76	72.95	PK	53	1.8	V	-10.66	62.29	72.8	10.51	Harmonic
1735.68	78.66	PK	87	1.1	H	-8.51	70.15	72.8	2.65	Harmonic
1735.68	74.99	PK	87	1.1	V	-8.51	66.48	72.8	6.32	Harmonic
2169.60	75.03	PK	177	1.6	H	-6.64	68.39	72.8	4.41	Harmonic
2169.60	71.38	PK	177	1.6	V	-6.64	64.74	72.8	8.06	Harmonic
2603.52	67.98	PK	10	1.2	H	-5.42	62.56	72.8	10.24	Harmonic
2603.52	64.92	PK	10	1.2	V	-5.42	59.50	72.8	13.3	Harmonic
3037.44	60.68	PK	149	2.1	H	-3.24	57.44	72.8	15.36	Harmonic
3037.44	61.64	PK	149	2.1	V	-3.24	58.40	72.8	14.4	Harmonic

Field Strength of Average Emission							
Frequency (MHz)	Peak Measurement @3m (dBμV/m)	Polar (H/V)	Duty Cycle Correction Factor (dB)	Corrected Ampitude (dBμV/m)	FCC Part 15.231(e)/205/209		
					Limit (dBμV/m)	Margin (dB)	Comment
433.92	90.97	H	-19.84	71.13	72.8	1.67	Fundamental
433.92	82.12	V	-19.84	62.28	72.8	10.52	Fundamental
867.84	50.23	H	-19.84	30.39	52.8	22.41	Harmonic
867.84	40.12	V	-19.84	20.28	52.8	32.52	Harmonic
1301.76	67.88	H	-19.84	48.04	52.8	4.76	Harmonic
1301.76	62.29	V	-19.84	42.45	52.8	10.35	Harmonic
1735.68	70.15	H	-19.84	50.31	52.8	2.49	Harmonic
1735.68	66.48	V	-19.84	46.64	52.8	6.16	Harmonic
2169.6	68.39	H	-19.84	48.55	52.8	4.25	Harmonic
2169.6	64.74	V	-19.84	44.9	52.8	7.9	Harmonic
3037.44	62.56	H	-19.84	42.72	52.8	10.08	Harmonic
3037.44	59.50	V	-19.84	39.66	52.8	13.14	Harmonic
3905.28	57.44	H	-19.84	37.6	52.8	15.2	Harmonic
3905.28	58.40	V	-19.84	38.56	52.8	14.24	Harmonic

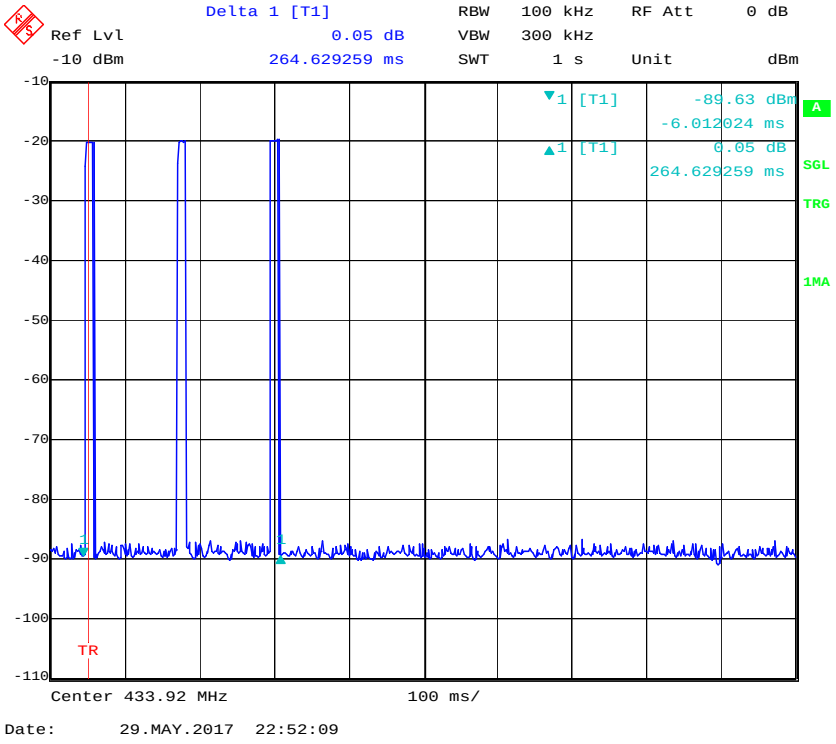
Note 1:
Corrected Amplitude = Corrected Factor + Reading
Corrected Factor = Antenna factor (Rx) + cable loss – amplifier factor
Margin = Limit + Corr. Amplitude

Note 2:
Calculate Average value based on Duty Cycle correction factor:
Duty cycle factor = 20*lg(Ton/Tp) = 20*lg(10.19/100) = -19.84
Average = Peak – Duty Cycle Corrected Factor

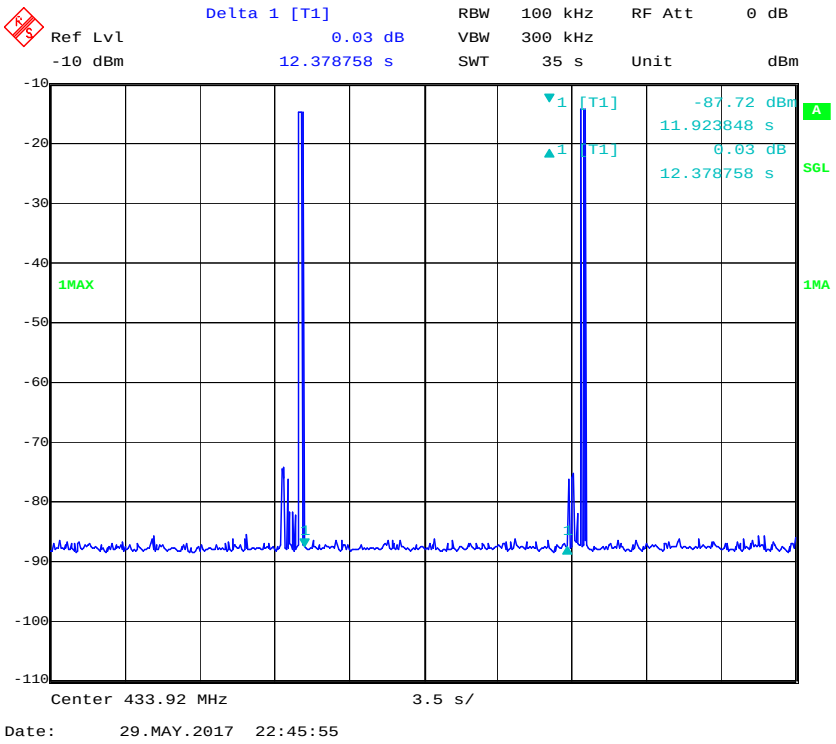
Duty Cycle 1



Duty Cycle 2



Duty Cycle 3


Delta 1 [T1]
RBW 100 kHz
RF Att 0 dB
Ref Lvl
0.03 dB
VBW 300 kHz
-10 dBm
12.378758 s
SWT 35 s
Unit dBm
1 [T1] -87.72 dBm
11.923848 s
1 [T1] 0.03 dB
12.378758 s
A
SGL
1MAX
1MA
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
Center 433.92 MHz
3.5 s/
Date: 29.MAY.2017 22:45:55

315MHz:

30MHz-5GHz (ASK modulation):

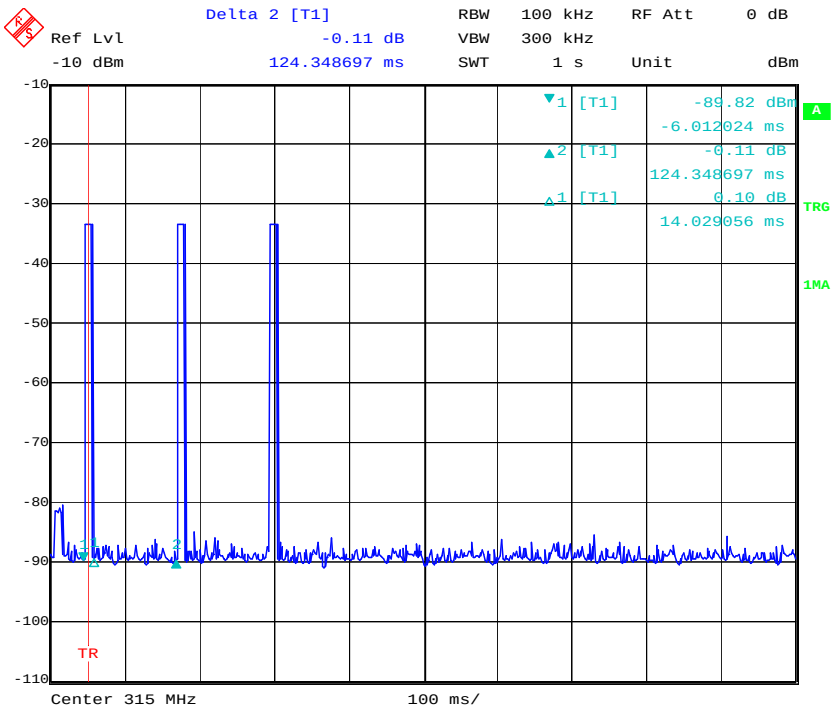
Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.231(b)/205/209		
	Reading (dBμV)	Detector (PK/QP/Ave.)		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)	Comment
315.00	89.18	PK	217	1.2	H	0.90	90.08	95.6	5.52	Fundamental
315.00	75.81	PK	263	2.0	V	0.90	76.71	95.6	18.89	Fundamental
630.00	50.27	PK	207	1.1	H	6.08	56.35	75.6	19.25	Harmonic
630.00	42.57	PK	267	1.6	V	6.08	48.65	75.6	26.95	Harmonic
945.00	24.62	PK	183	1.5	H	11.07	35.69	75.6	39.91	Harmonic
945.00	25.42	PK	21	1.7	V	11.07	36.49	75.6	39.11	Harmonic
1260.00	69.85	PK	355	1.4	H	-10.66	59.19	75.6	16.41	Harmonic
1260.00	61.86	PK	355	1.4	V	-10.66	51.20	75.6	24.4	Harmonic
1575.00	77.21	PK	49	2.0	H	-8.99	68.22	75.6	7.38	Harmonic
1575.00	65.9	PK	49	2.0	V	-8.99	56.91	75.6	18.69	Harmonic
1890.00	77.31	PK	325	2.0	H	-7.56	69.75	75.6	5.85	Harmonic
1890.00	69.74	PK	325	2.0	V	-7.56	62.18	75.6	13.42	Harmonic
2205.00	74.26	PK	179	1.5	H	-6.64	67.62	75.6	7.98	Harmonic
2205.00	65.51	PK	179	1.5	V	-6.64	58.87	75.6	16.73	Harmonic

Field Strength of Average Emission							
Frequency (MHz)	Peak Measurement @3m (dBμV/m)	Polar (H/V)	Duty Cycle Correction Factor (dB)	Corrected Ampitude (dBμV/m)	FCC Part 15.231(b)/205/209		
					Limit (dBμV/m)	Margin (dB)	Comment
315.00	90.08	H	-22.73	67.35	75.6	8.25	Fundamental
315.00	76.71	V	-22.73	53.98	75.6	21.62	Fundamental
630.00	56.35	H	-22.73	33.62	55.6	21.98	Harmonic
630.00	48.65	V	-22.73	25.92	55.6	29.68	Harmonic
945.00	35.69	H	-22.73	12.96	55.6	42.64	Harmonic
945.00	36.49	V	-22.73	13.76	55.6	41.84	Harmonic
1260.00	59.19	H	-22.73	36.46	55.6	19.14	Harmonic
1260.00	51.20	V	-22.73	28.47	55.6	27.13	Harmonic
1575.00	68.22	H	-22.73	45.49	55.6	10.11	Harmonic
1575.00	56.91	V	-22.73	34.18	55.6	21.42	Harmonic
1890.00	69.75	H	-22.73	47.02	55.6	8.58	Harmonic
1890.00	62.18	V	-22.73	39.45	55.6	16.15	Harmonic
2205.00	67.62	H	-22.73	44.89	55.6	10.71	Harmonic
2205.00	58.87	V	-22.73	36.14	55.6	19.46	Harmonic

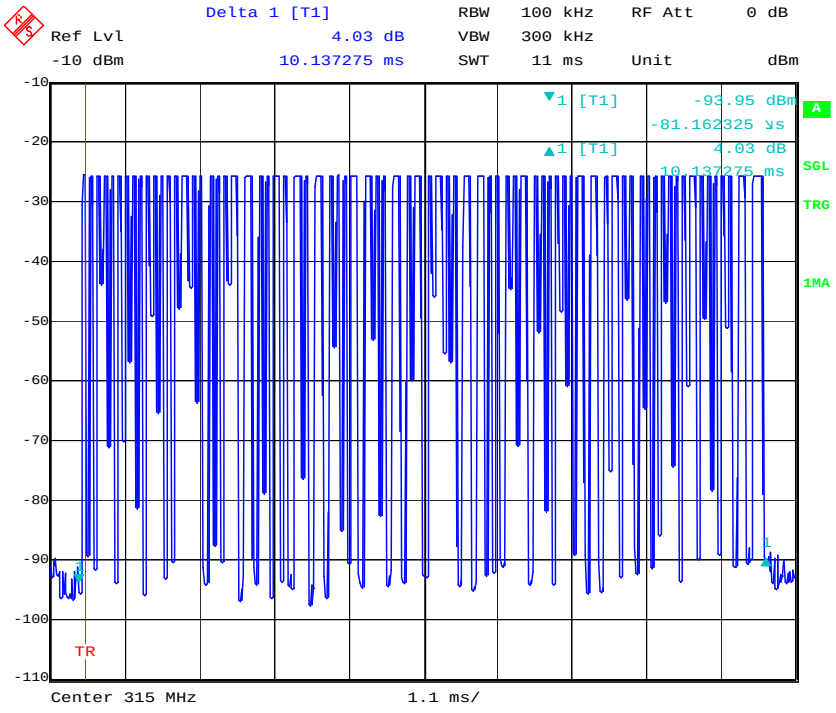
Note 1:
Corrected Amplitude = Corrected Factor + Reading
Corrected Factor = Antenna factor (Rx) + cable loss – amplifier factor
Margin = Limit - Corr. Amplitude

Note 2:
Calculate Average value based on Duty Cycle correction factor:
Ton1 = 57*Pulses=57*0.0802ms = 4.5731ms
Ton2 = 19*Pulses=19*0.1343ms =2.5517ms
Ton3 = 1*Pulses=1*0.1804ms = 0.1804ms
Tp = 100（124.3>100） ms
Duty cycle = (Ton1+ Ton2+ Ton3)/Tp = (4.5731+2.5517+0.1804)/100= 0.073052
Duty Cycle Corrected Factor = 20lg (Duty cycle) = 20lg0.073052 = -22.73
Average = Peak + Duty Cycle Corrected Factor

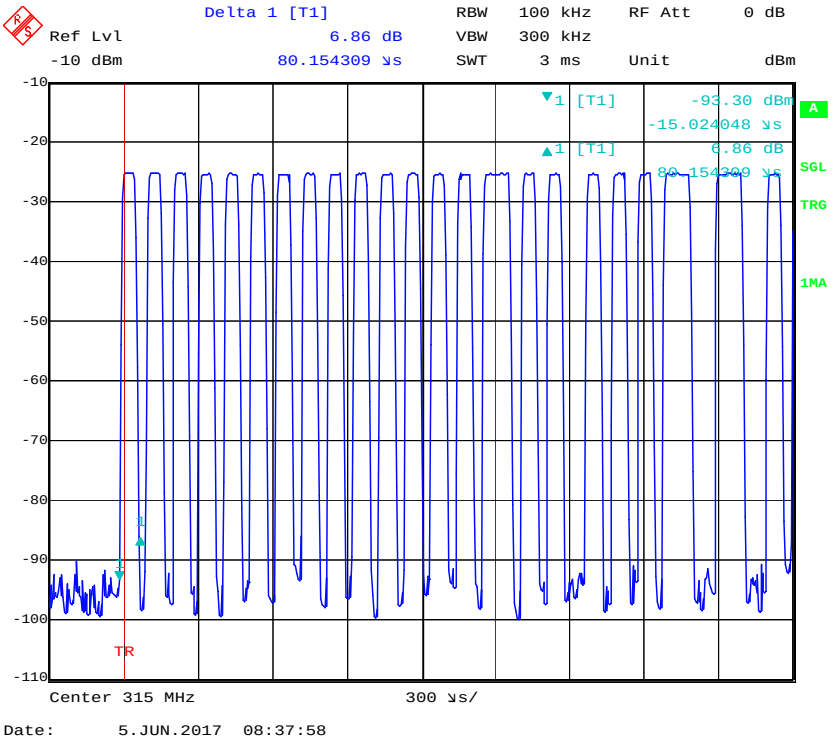
Duty Cycle



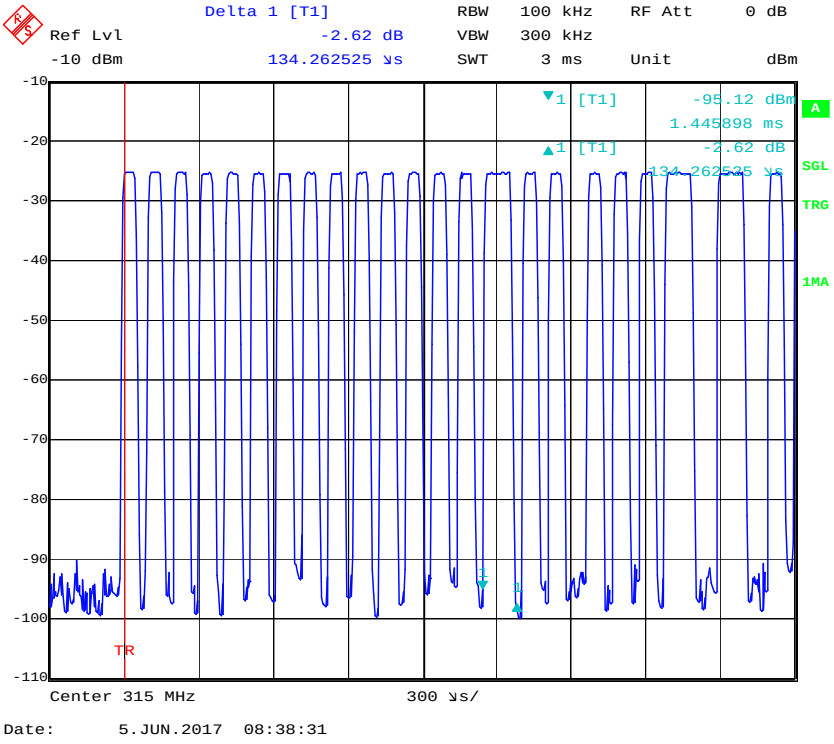
Duty Cycle



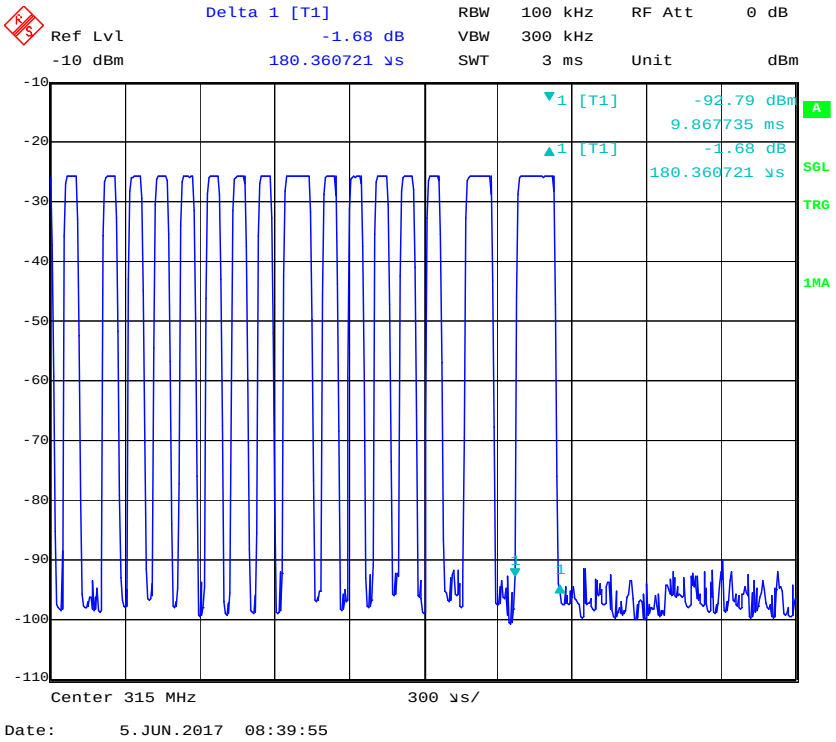
Ton1


Delta 1 [T1]
6.86 dB
80.154309 µs
Ref Lvl
-10 dBm
RBW 100 kHz
VBW 300 kHz
SWT 3 ms
RF Att 0 dB
Unit dBm
1 [T1] -93.30 dBm
-15.024048 µs
1 [T1] 6.86 dB
80.154309 µs
A
SGL
TRG
1MA
TR
Center 315 MHz
300 µs/
Date: 5.JUN.2017 08:37:58

Ton2


Delta 1 [T1]
-2.62 dB
134.262525 µs
Ref Lvl
-10 dBm
RBW 100 kHz
VBW 300 kHz
SWT 3 ms
RF Att 0 dB
Unit dBm
1 [T1] -95.12 dBm
1.445898 ms
1 [T1] -2.62 dB
134.262525 µs
A
SGL
TRG
1MA
TR
Center 315 MHz
300 µs/
Date: 5.JUN.2017 08:38:31

Ton3


Delta 1 [T1]
RBW 100 kHz
RF Att 0 dB
Ref Lvl
-1.68 dB
VBW 300 kHz
-10 dBm
180.360721 µs
SWT 3 ms
Unit dBm
1 [T1]
-92.79 dBm
9.867735 ms
1 [T1]
-1.68 dB
180.360721 µs
A
SGL
TRG
1MA
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
Center 315 MHz
300 µs/
Date: 5.JUN.2017 08:39:55

30MHz-5GHz (FSK modulation):

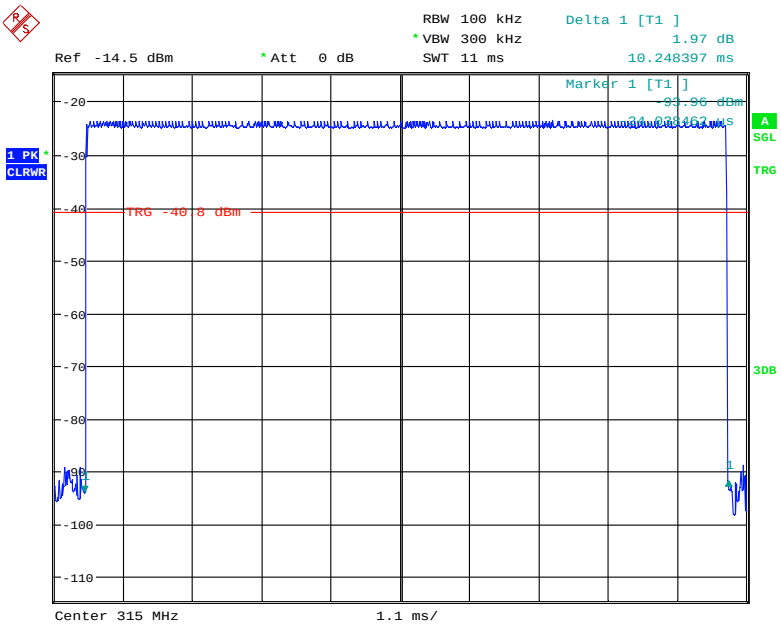
Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.231(e)/205/209		
	Reading (dBμV)	Detector (PK/QP/Ave.)		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)	Comment
315.00	85.08	PK	232	1.1	H	0.90	85.98	87.7	1.72	Fundamental
315.00	74.92	PK	4	1.1	V	0.90	75.82	87.7	11.88	Fundamental
630.00	46.96	PK	249	2.3	H	6.08	53.04	67.7	14.66	Harmonic
630.00	40.75	PK	203	2.4	V	6.08	46.83	67.7	20.87	Harmonic
945.00	24.49	PK	243	1.6	H	11.07	35.56	67.7	32.14	Harmonic
945.00	25.07	PK	279	1.3	V	11.07	36.14	67.7	31.56	Harmonic
1260.00	63.46	PK	195	1.7	H	-10.66	52.80	67.7	14.9	Harmonic
1260.00	58.75	PK	195	1.7	V	-10.66	48.09	67.7	19.61	Harmonic
1575.00	75.94	PK	105	2.4	H	-8.99	66.95	67.7	0.75	Harmonic
1575.00	70.84	PK	105	2.4	V	-8.99	61.85	67.7	5.85	Harmonic
1890.00	74.77	PK	262	1.7	H	-7.56	67.21	67.7	0.49	Harmonic
1890.00	67.97	PK	262	1.7	V	-7.56	60.41	67.7	7.29	Harmonic
2205.00	74.66	PK	356	1.5	H	-6.64	67.02	67.7	0.68	Harmonic
2205.00	68.95	PK	356	1.5	V	-6.64	62.31	67.7	5.39	Harmonic

Field Strength of Average Emission							
Frequency (MHz)	Peak Measurement @3m (dBμV/m)	Polar (H/V)	Duty Cycle Correction Factor (dB)	Corrected Ampitude (dBμV/m)	FCC Part 15.231(e)/205/209		
					Limit (dBμV/m)	Margin (dB)	Comment
315.00	85.98	H	-19.79	66.19	67.7	1.51	Fundamental
315.00	75.82	V	-19.79	56.03	67.7	11.67	Fundamental
630.00	53.04	H	-19.79	33.25	47.7	14.45	Harmonic
630.00	46.83	V	-19.79	27.04	47.7	20.66	Harmonic
945.00	35.56	H	-19.79	15.77	47.7	31.93	Harmonic
945.00	36.14	V	-19.79	16.35	47.7	31.35	Harmonic
1260.00	52.80	H	-19.79	33.01	47.7	14.69	Harmonic
1260.00	48.09	V	-19.79	28.3	47.7	19.4	Harmonic
1575.00	66.95	H	-19.79	47.16	47.7	0.54	Harmonic
1575.00	61.85	V	-19.79	42.06	47.7	5.64	Harmonic
1890.00	67.21	H	-19.79	47.42	47.7	0.28	Harmonic
1890.00	60.41	V	-19.79	40.62	47.7	7.08	Harmonic
2205.00	67.02	H	-19.79	47.23	47.7	0.47	Harmonic
2205.00	62.31	V	-19.79	42.52	47.7	5.18	Harmonic

Note 1:
Corrected Amplitude = Corrected Factor + Reading
Corrected Factor = Antenna factor (Rx) + cable loss – amplifier factor
Margin = Limit - Corr. Amplitude

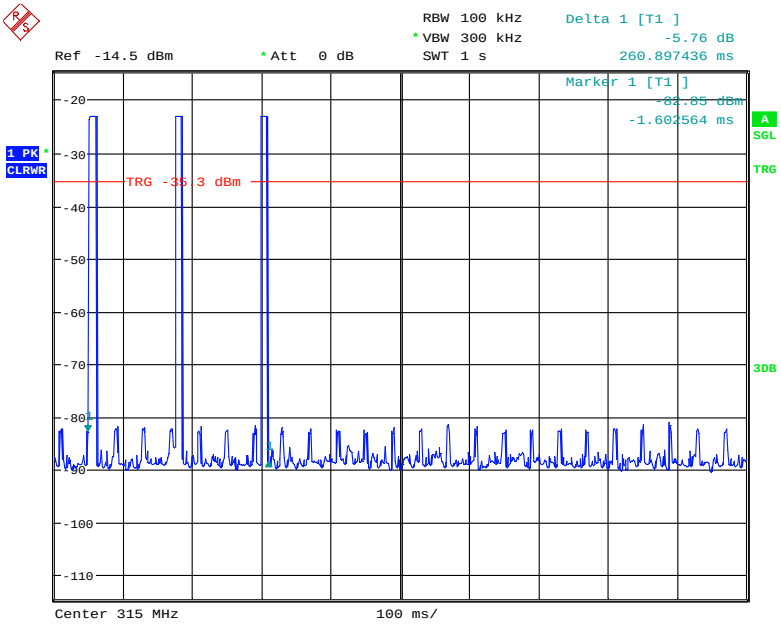
Note 2:
Calculate Average value based on Duty Cycle correction factor:
Duty cycle factor = 20*lg(Ton/Tp) = 20*lg(10.25/100) = -19.79
Average = Peak + Duty Cycle Corrected Factor

Duty Cycle 1



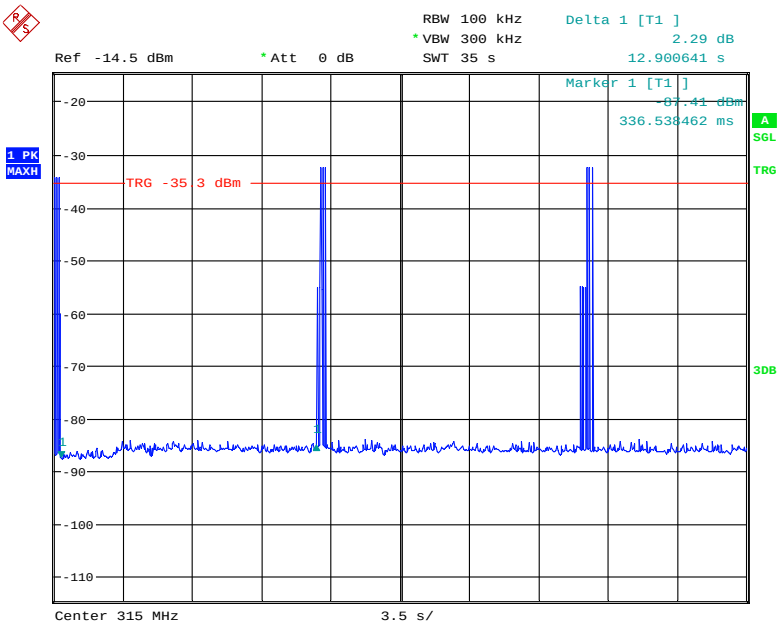
Date: 3.JUN.2017 16:44:01

Duty Cycle 2



Date: 3.JUN.2017 15:10:59

Duty Cycle 3



Date: 3.JUN.2017 14:56:40

FCC §15.231(a) (2) - DEACTIVATION TESTING

Applicable Standard

Per FCC §15.231(a) (2), a transmitter activated automatically shall cease transmission within 5 seconds after activation.

Test Procedure

1. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
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:	24~26 ℃
Relative Humidity:	45~48 %
ATM Pressure:	100.0~101.0 kPa

The testing was performed by Ada Yu from 2017-05-30 to 2017-06-03.

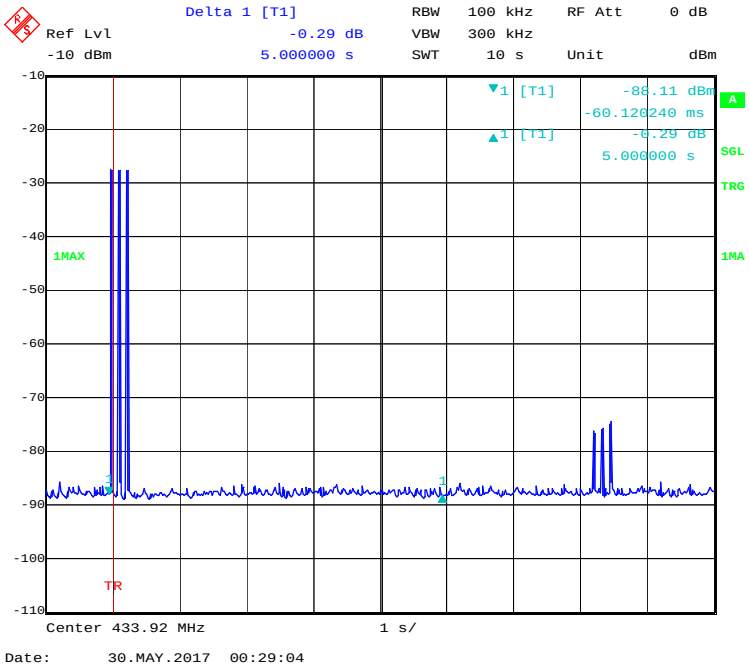
Test mode: Transmitting

Test Result: Compliant, please refer to following plot.

433.92MHz:

ASK modulation:

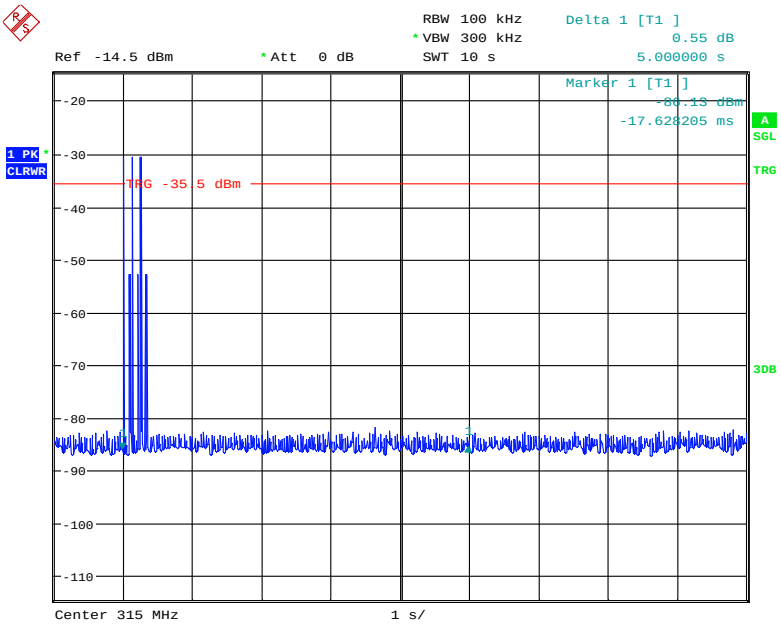
5 s



315MHz:

ASK modulation:

5 s



FCC §15.231(c) – 20 dB 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

With the EUT's antenna attached, the waveforzm was received by the test antenna which was connected to the spectrum analyzer, plot the 20 dB bandwidth.

Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	55 %
ATM Pressure:	101.0 kPa

The testing was performed by Ada Yu on 2017-09-04.

Test Mode: Transmitting

Please refer to following table and plot.

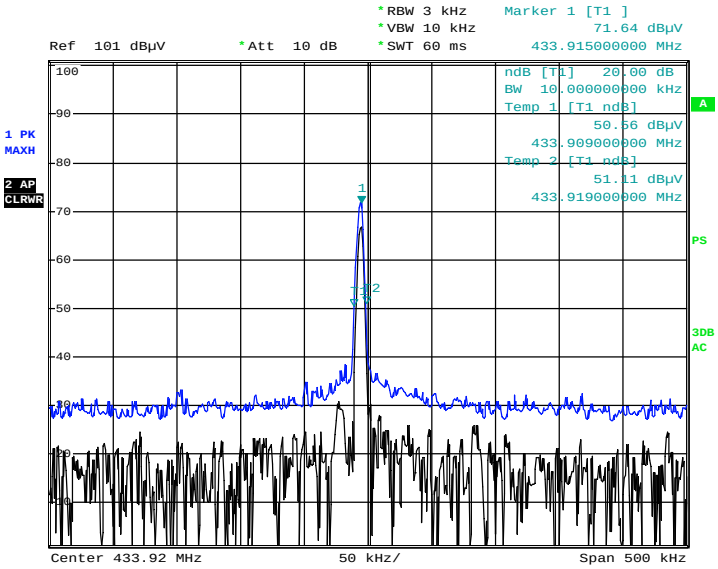
433.92MHz:

ASK modulation:

Channel Frequency (MHz)	20 dB Emission Bandwidth (kHz)	＜Limit (MHz)	Result
433.92	10	1.0848	Pass

Note: Limit = 0.25% * center frequency = 0.25% * 433.92 MHz = 1.0848 MHz
20dB bandwidth = 10 kHz <1.0848 MHz

20 dB Emission Bandwidth



EUT

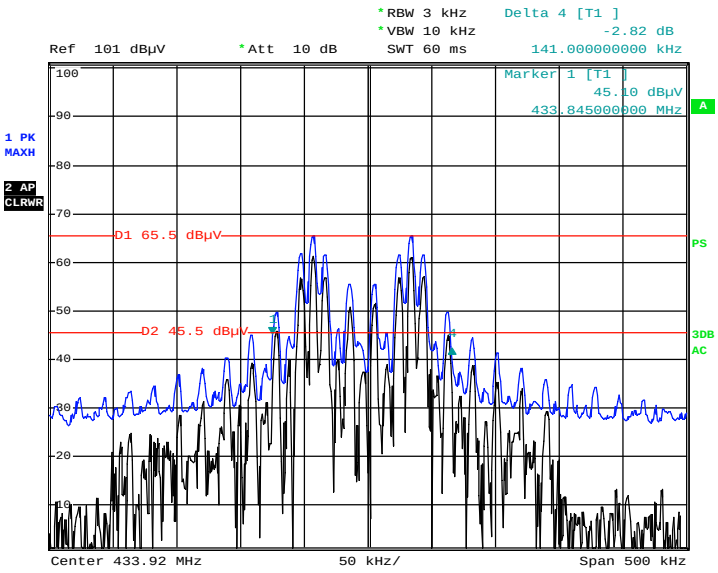
Date: 4.SEP.2017 19:10:48

FSK modulation:

Channel Frequency (MHz)	20 dB Emission Bandwidth (kHz)	＜Limit (MHz)	Result
433.92	141	1.0848	Pass

Note: Limit = 0.25% * center frequency = 0.25% * 433.92 MHz = 1.0848 MHz
20dB bandwidth = 141 kHz <1.0848 MHz

20 dB Emission Bandwidth



EUT

Date: 4.SEP.2017 19:34:21

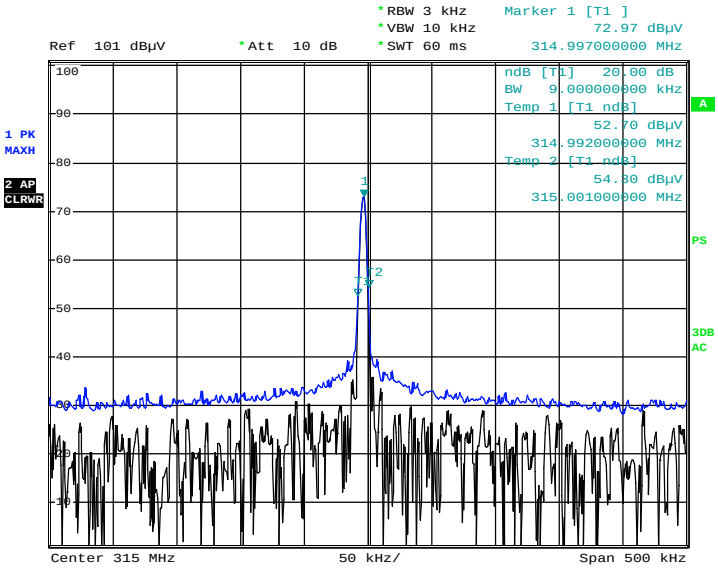
315MHz:

ASK modulation:

Channel Frequency (MHz)	20 dB Emission Bandwidth (kHz)	＜Limit (MHz)	Result
315	9	0.7875	Pass

Note: Limit = 0.25% * center frequency = 0.25% * 315 MHz = 0.7875 MHz
20dB bandwidth = 9 kHz < 0.7875 MHz

20 dB Emission Bandwidth



EUT

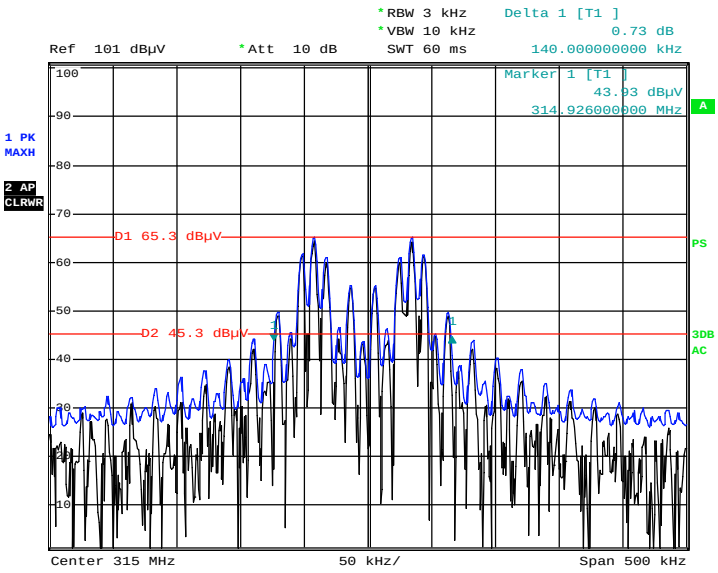
Date: 4.SEP.2017 18:55:42

FSK modulation:

Channel Frequency (MHz)	20 dB Emission Bandwidth (kHz)	＜Limit (MHz)	Result
433.92	140	0.7875	Pass

Note: Limit = 0.25% * center frequency = 0.25% * 315 MHz = 0.7875 MHz
20dB bandwidth = 140kHz < 0.7875 MHz

20 dB Emission Bandwidth



EUT

Date: 4.SEP.2017 19:29:09

FCC §15.231(e) – TRANSMISSION AND SILENT PERIOD TESTING

Applicable Standard

Per FCC §15.231(e), devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

Test Procedure

5. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
6. Set center frequency of spectrum analyzer=operating frequency.
7. Set the spectrum analyzer as RBW=100kHz, VBW=300kHz, Span=0Hz.
8. Repeat above procedures until all frequency measured was complete.

Test Data

Environmental Conditions

Temperature:	24~26 ℃
Relative Humidity:	45~48 %
ATM Pressure:	100.0~101.0 kPa

The testing was performed by Ada Yu from 2017-05-29 to 2017-06-04.

433.92MHz:

Test Mode: Transmitting

Deactivation

Transmission period (s)	Limit (s)	Result
0.265	< 1	Pass

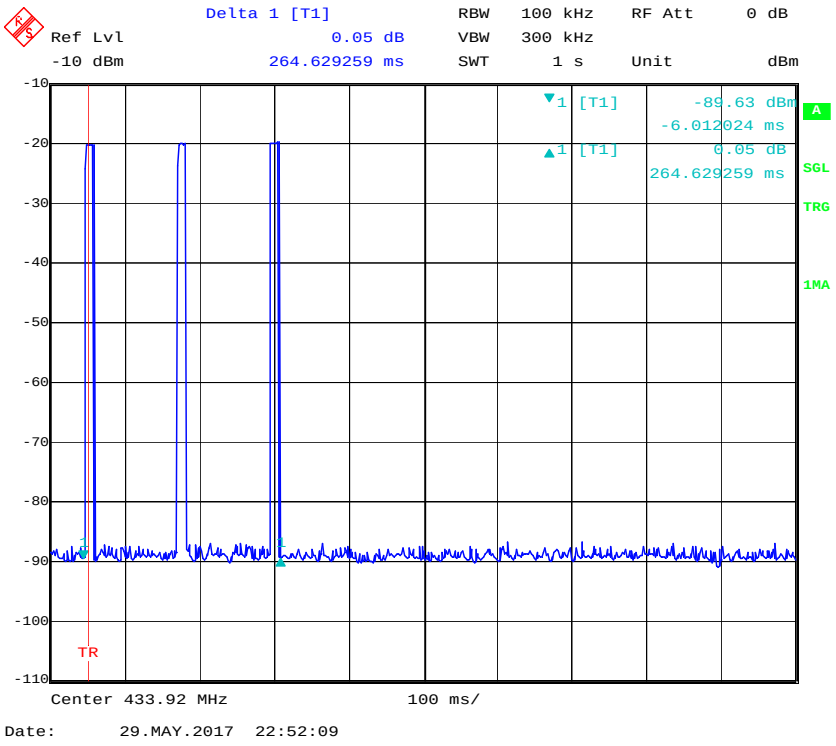
Silent period

Silent period (s)	Limit (s)	Result
12.38	> 10	Pass

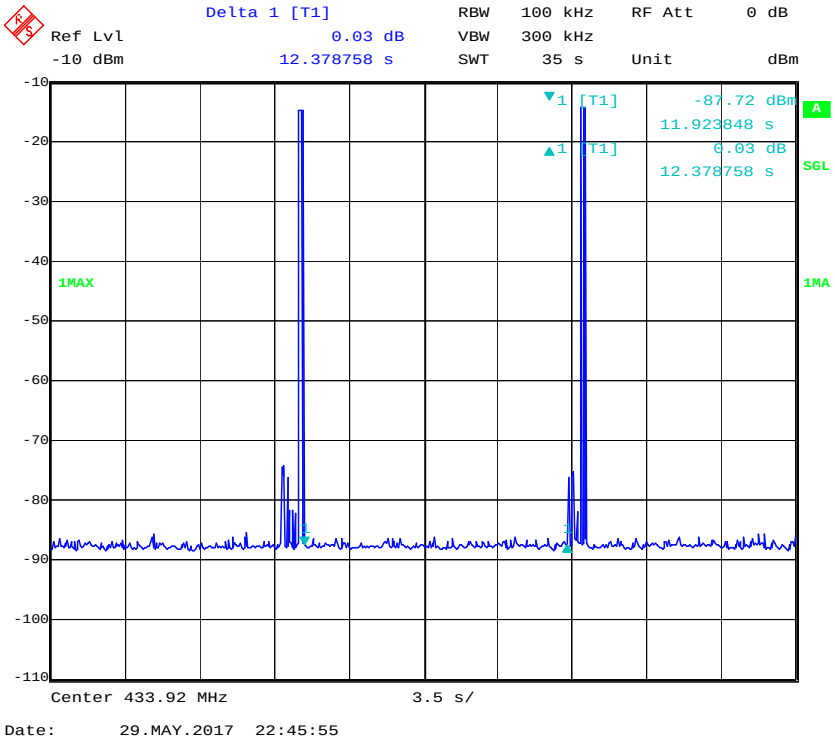
Note: The silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.
The duration time is 0.265s, 0.265×30 = 7.95s.

Test Result: Compliant, please refer to following plot

Transmission period



Silent period



315MHz:

Test Mode: Transmitting

Deactivation

Transmission period (s)	Limit (s)	Result
0.265	< 1	Pass

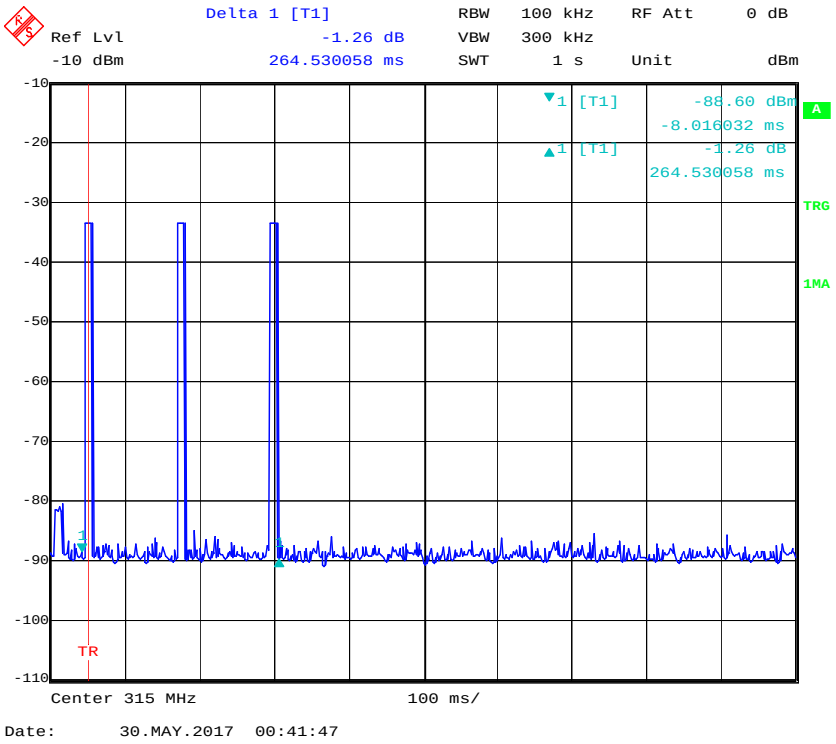
Silent period

Silent period (s)	Limit (s)	Result
12.914	> 10	Pass

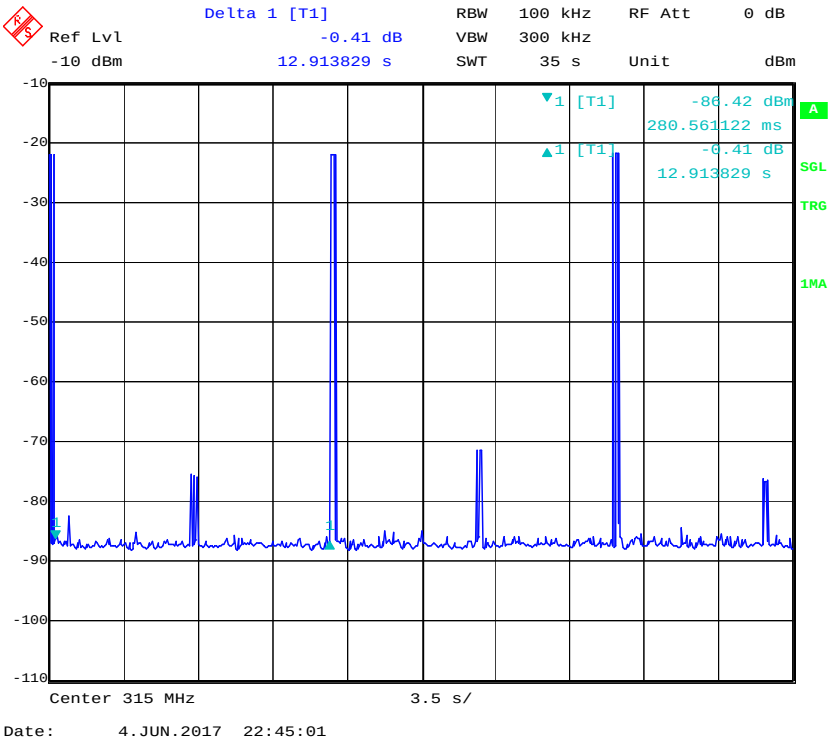
Note: The silent period between transmissions shall be at least 30 times the duration of the transmission but in no case 10 seconds.
The duration time is 0.265s, 0.265×30 = 7.95s.

Test Result: Compliant, please refer to following plot

Transmission period



Silent period



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