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Test Report for FCC

FCC ID : 2A6P8-POLLOCK-05TX

Report Number		ESTRFC2204-002		
Applicant	Company name	Pollock Lifts Ltd.		
	Address	Unit1, Sloefield Drive Carrickfergus, BT38 8GX, United Kingdom		
	Telephone	+44 (0)28 9336 8167		
Product	Product name	Radio Control Transmitter		
	Model No.	POLLOCK-05TX	Manufacturer	YOUNG ELECTRONICS CORP.
	Serial No.	NONE	Country of origin	KOREA
Test date	10-Mar-22 ~ 14-Mar-22		Date of issue	28-Apr-22
Testing location	140-16, Eongmalli-ro, Majang-myeon, Icheon-si, Gyeonggi-do, Rep. of Korea			
Standard	FCC PART 15 Subpart C(15.231), ANSI C 63.10(2013)			
MRA Registration number		KR0019		
Measurement facility registration number		659627		
Tested by	Senior Engineer H.G. Lee		(Signature)	
Reviewed by	Engineering Manager I.K. Hong		(Signature)	
Abbreviation	OK, Pass = Complied, Fail = Failed, N/A = not applicable			
<p>* Note</p> <ul style="list-style-type: none">- This test report is not permitted to copy partly without our permission- This test result is dependent on only equipment to be used- This test result based on a single evaluation of one sample of the above mentioned- This test report is not related to KOLAS accreditation				

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Appendix 1. Special diagram

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1. Laboratory Information

1.1 General

This EUT (Equipment Under Test) has been shown to be capable of compliance with the applicable technical standards and is tested in accordance with the measurement procedures as indicated in this report. ESTECH Lab attests to accuracy of test data. All measurement reported herein were performed by ESTECH Co., Ltd.

ESTECH Lab assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

1.2 Test Lab.

Corporation Name : ESTECH Co., Ltd.

Head Office : Suite 1015 World Meridian II, 123 Gasan Digital 2-ro, Geumcheon-gu,
Seoul 153-759, R. O. Korea

EMC/Telecom/Safety Test Lab : 140-16, Eongmali-ro, Majang-myeon, Icheon-si,
Gyeonggi-do, Rep. of Korea

1.3 Official Qualification(s)

KCC : Granted Accreditation from Ministry of Information & Communication for EMC, Safety
and Telecommunication

KOLAS : Accredited Lab By Korea Laboratory Accreditation Schema base on CENELEC

FCC : Filed Laboratory at Federal Communications Commission

VCCI : Granted Accreditation from Voluntary Control Council for Interference from ITE

2. Description of EUT

2.1 Summary of Equipment Under Test

Product : Radio Control Transmitter
 Model Number : POLLOCK-05TX
 Serial Number : NONE
 Manufacturer : YOUNG ELECTRONICS CORP.
 Country of origin : KOREA
 Operating Frequency : 433.88 MHz
 Antenna Type : PCB Patten Antenna
 Modulation Type : FSK
 Channel Spacing : 1

Power Rating : DC 9 V (Battery)

Receipt Date : 14-Feb-22

X-tal list(s) or
 Frequencies generated : The highest operating frequency is 433.88 MHz

2.2 General descriptions of EUT

Category	Name	Description
Credential	LCD screen	Provides UI for operation.
	Function button	Used for T & A key or changing a letter.
	Keypad	<ul style="list-style-type: none"> 0 ~ 9: Used for entering a number or letter. 2 <4, 6,> 8 : Used for moving to the desired item.
	OK button	Used for selecting and setting T&A Mode. If a job code is set, you can change the job code of the user by pressing this button long.
	ESC button	Used for opening the menu, moving to the previous screen or canceling input.
	Fingerprint authentication unit	Part to scan the fingerprint for entrance.
	RF card authentication unit	Part to scan the card for entrance.
	Speaker	Delivers sound.

3. Test Standards

Test Standard : FCC PART 15

This Standard sets out the regulations under which an intentional, unintentional, or incidental radiator may be operated without an individual license. It also contains the technical specifications, administrative requirements and other conditions relating to the marketing of Part 15 devices.

Test Method : ANSI C 63.10 (2013)

This standard sets forth uniform methods of measurement of radio-frequency (RF) signals and noise emitted from both unintentional and intentional emitters of RF energy in the frequency range 9 kHz to 40 GHz. Methods for the measurement of radiated and AC power-line conducted radio noise are covered and may be applied to any such equipment unless otherwise specified by individual equipment requirements. These methods cover measurement of certain devices that deliberately radiate energy, such as intentional emitters, but does not cover licensed transmitters. This standard is not intended for certification/approval of avionic equipment or for industrial, scientific, and medical (ISM) equipment. These methods apply to the measurement of individual units or systems comprised of multiple units.

Summary of Test Results

Applied Standard : 47 CFR Part 15, Subpart C				
Standard	Test Type	Result	Remark	Limit
15.203	Antenna Requirement	Pass	See Appendix 1	
15.207	AC Power Conducted Emission	N/A		
15.205	Restricted bands	Pass	Meet the requirement	
15.209	Radiated Emission	Pass	Meet the requirement	
15.231(c)	Occupied channel 20 dB bandwidth	Pass	Meet the requirement	
15.231(a)	Deactivation Testing & Frequency Tolerance	Pass	Meet the requirement	
15.231(a)(1)	Duty Cycle	Pass	Meet the requirement	

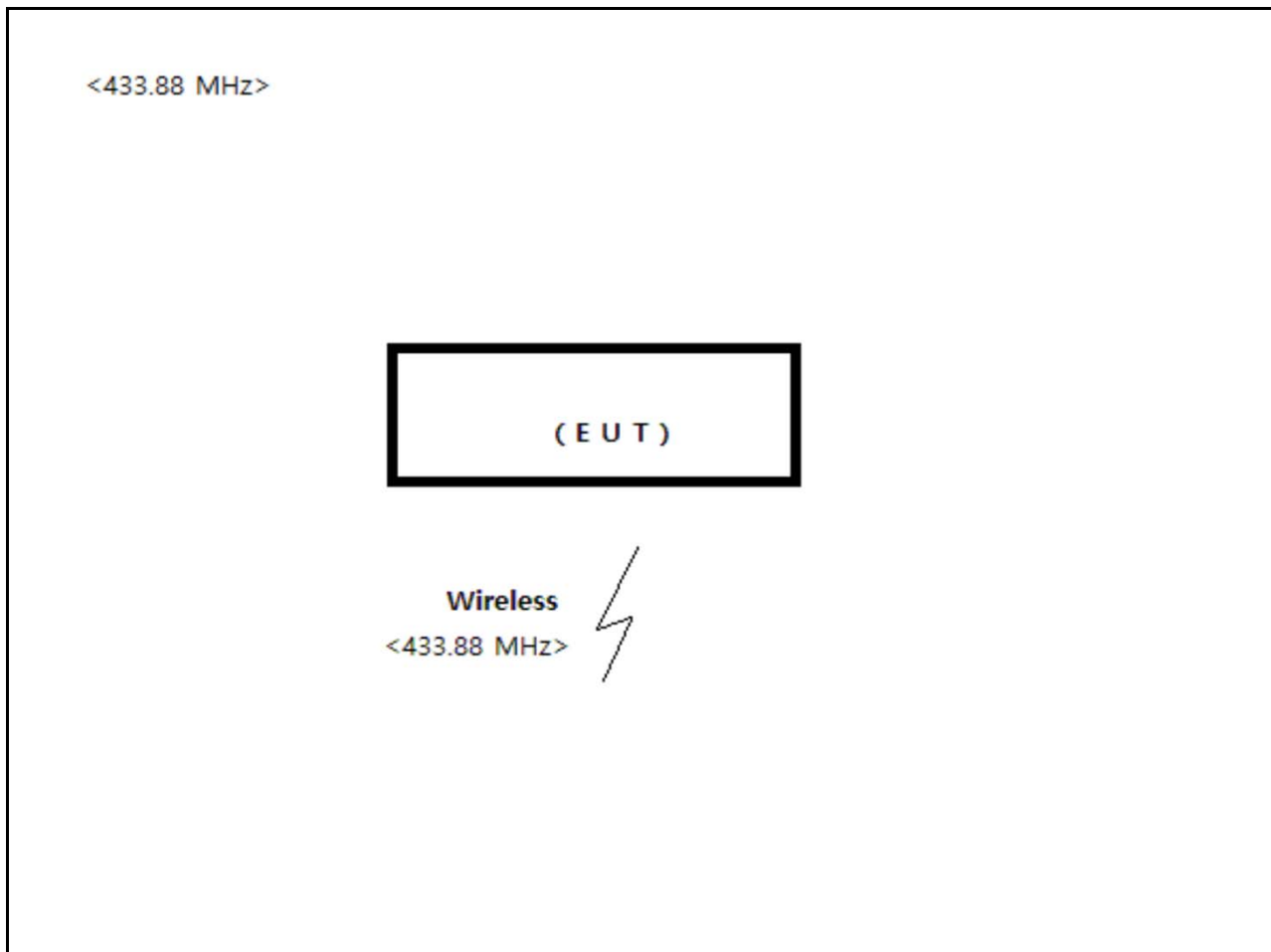
4. Measurement Condition

4.1 EUT Operation.

–The EUT was tested, under transmission

1. Normal communication with RF OUT Frequency(433.88 MHz).
2. DC 9 V (Battery)

4.2 Configuration and Peripherals



4.3 EUT and Support equipment

Equipment Name	Model Name	S/N	Manufacturer	Remark (FCC ID)
Radio Control Transmitter	POLLOCK-05TX	NONE	YOUNG ELECTRONICS CORP.	EUT

4.4 Cable Connecting

Start Equipment		End Equipment		Cable Standard		Remark
Name	I/O port	Name	I/O port	Length	Shielded	
Radio Control Transmitter	Power	-	-	-	-	

5. Measurement of radiated disturbance

Above 30 MHz Electric Field strength was measured in accordance with FCC PART 15.205, 15.209 . The test setup was made according to ANSI C 63.10 (2013) & KDB 558074 D01v05r02 Semi-anechoic chamber, which allows a 3 m distance measurement. The EUT was placed in the center of styrofoam. turntable. The height of this table was 0.8 m. The measurement was conducted with both horizontal and vertical antenna polarization. The turntable has fully rotated. For further description of the configuration refer to the picture of the test setup.

5.1 Radiated emission limits, general requirements

Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength(microvolt/meter)	Distance(meter)
0.009-0.490	2400/F(KHz)	300
0.490-1.705	24000/F(KHz)	30
1.705-30	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

* dBuV/m=20*log(uV/m) * Distance factor=40dB / decade(15.31(f))

5.2 Measurement equipments

Equipment Name	Type	Manufacturer	Serial No.	Next Calibration date
TEST Receiver	ESCi7	ROHDE & SCHWARZ	100916	19-Jul-22
Logbicon Antenna	VULB 9168	SCHWARZBECK	747	3-Feb-23
Turn Table	DT3000-2t	Innco System GmbH	N/A	-
Antenna Mast	MA4000-EP	Innco System GmbH	N/A	-
PREAMPLIFIER	8449B	AGILENT	3008A00581	20-Jul-22
Horn Antenna	BBHA9120D	SCHWARZBECK	752	22-Jul-22
Test Receiver	ESPI7	ROHDE & SCHWARZ	100393	29-Nov-22
Spectrum Analyzer	R3273	ADVANTEST	N/A	-
Turn Table	DT1500-S	Innco System GmbH	N/A	-
Antenna Mast	MA4000-EP	Innco System GmbH	CO2000/642 /28051111/L	-

5.3 Environmental Condition

Below 1 GHz -Test Place

Test Place : 10 m Semi-anechoic chamber
 Temperature (°C) : 21.1 °C
 Humidity (%) : 45.5 % R.H.

Above 1 GHz-Test Place

Test Place : 3 m Semi-anechoic chamber
 Temperature (°C) : 22.1 °C
 Humidity (%) : 44.4 % R.H.

5.4 Test data

Test Date : 10-Mar-22

Measurement Distance : 3 m

Frequency (MHz)	Reading (dB μ V)	Position (V/H)	Detector Type	Correction Factor		Result Value(Quasi-peak)		
				Ant Factor (dB)	Cable (dB)	Limit (dB μ V/m)	Result (dB μ V/m)	Margin (dB)
433.88	73.85	H	PK	16.66	3.34	100.82	93.85	6.97
433.88	53.52	H	AV	16.66	3.34	80.82	73.52	7.30
433.88	73.36	V	PK	16.66	3.34	100.82	93.36	7.46
433.88	53.19	V	AV	16.66	3.34	80.82	73.19	7.63
Remark	H : Horizontal, V : Vertical *Result Value = Reading + Antenna + Cable loss *Correction Factor = Ant Factor + Cable *The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection							

5.4-1 Test data(30 MHz ~ 1 000 MHz)

Test Date : 10-Mar-22

Measurement Distance : 3 m

Frequency (MHz)	Reading (dB μ V)	Position (V/H)	Height (m)	Correction Factor		Result Value(Quasi-peak)		
				Ant Factor (dB)	Cable (dB)	Limit (dB μ V/m)	Result (dB μ V/m)	Margin (dB)
46.60	2.06	H	2.0	13.42	1.01	40.00	16.48	23.52
73.30	5.28	H	1.8	11.84	1.30	40.00	18.42	21.58
96.70	5.66	H	1.8	7.84	1.49	43.50	14.99	28.51
157.50	2.01	H	1.8	12.93	1.90	43.50	16.85	26.65
867.70	28.29	H	1.0	22.95	4.88	60.82	56.12	4.70
34.70	3.90	V	1.0	12.06	0.83	40.00	16.78	23.22
72.50	5.26	V	1.0	11.83	1.29	40.00	18.39	21.61
98.50	9.57	V	1.0	7.88	1.50	43.50	18.95	24.55
108.80	7.05	V	1.0	9.48	1.58	43.50	18.11	25.39
867.70	29.37	V	1.5	22.95	4.88	60.82	57.20	3.62
Remark	H : Horizontal, V : Vertical *Result Value = Reading + Antenna + Cable loss *Correction Factor = Ant Factor + Cable *The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection							

5.4-2 Test Data

Test Date : 11-Mar-22

Measurement Distance : 3 m

Frequency (MHz)	Reading (dB μ V)	Position (V/H)	Height (m)	Correction Factor		Duty Cycle Correction (dB)	Result Value		
				Ant Factor (dB)	Cable (dB)		Limit (dB μ V/m)	Result (dB μ V/m)	Margin (dB)
PEAK(RBW:1 MHz VBW:3 MHz)									
1302.00	67.52	H	1.5	25.60	-30.94		74.00	62.18	11.82
1736.00	60.16	H	1.5	25.17	-30.31		80.83	55.02	25.81
2170.00	52.38	H	1.5	27.86	-29.94		80.83	50.30	30.53
2604.00	48.02	H	1.5	27.90	-29.72		80.83	46.21	34.62
3038.00	49.32	H	1.5	28.58	-29.56		80.83	48.34	32.49
3470.00	49.80	H	1.5	28.65	-28.72		80.83	49.73	31.10
PEAK(RBW:1 MHz VBW:3 MHz)									
1302.00	72.10	V	1.5	25.60	-30.94		74.00	66.76	7.24
1736.00	67.50	V	1.5	25.17	-30.31		80.83	62.36	18.47
2170.00	53.00	V	1.5	27.86	-29.94		80.83	50.92	29.91
3038.00	53.18	V	1.5	27.90	-29.72		80.83	51.37	29.46
3470.00	54.94	V	1.5	28.58	-29.56		80.83	53.96	26.87
3904.00	47.55	V	1.5	28.65	-28.72		80.83	47.48	33.35
Remark	<div>H : Horizontal, V : Vertical</div> <div>*The TX signal wasn't detected from 3th harmonics.</div> <div>*Result Value = Reading + Ant Factor + Cable loss - Amplifier Gain + Duty Cycle Correction Factor</div> <div>*Margin = Limit - Result</div> <div>*The resolution bandwidth and video bandwidth of spectrum analyzer is 1 MHz and 1 kHz for average detection at frequency above 1 GHz.</div> <div>FYI : Duty Cycle Correction Factor</div>								

6. Measurement of 20dB Bandwidth

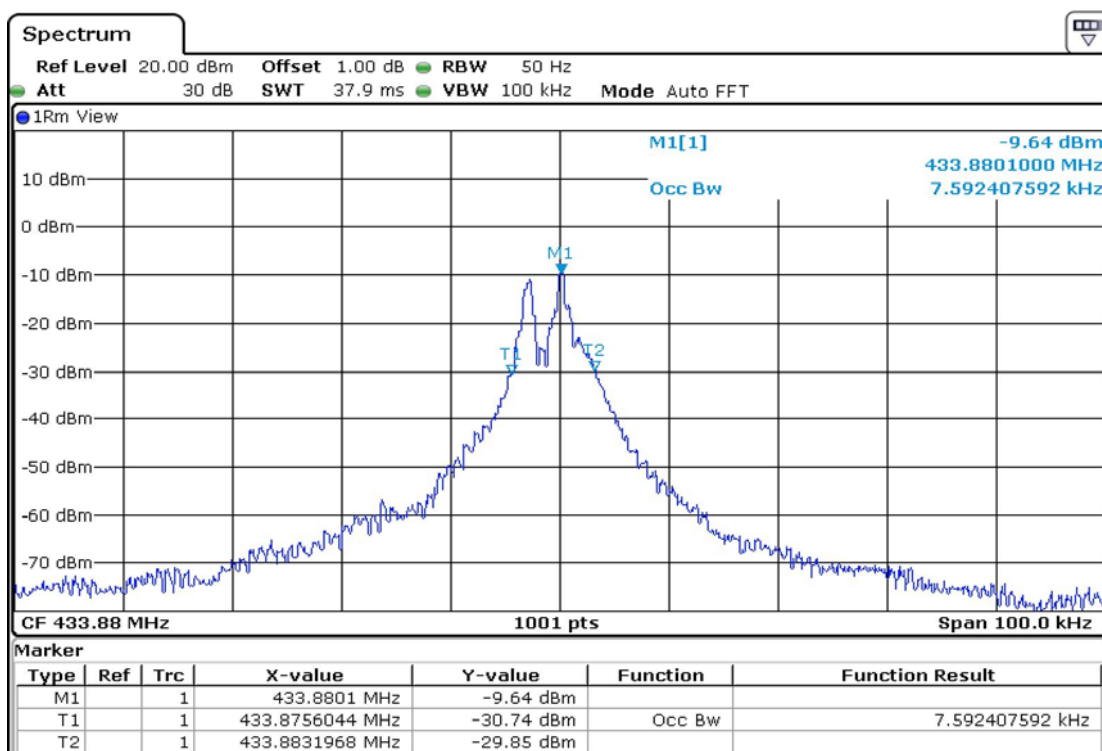
According to 15.231(c) The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

6.1 Limit

Frequency (MHz)	20dB Bandwidth (MHz)	Limit (MHz)
433.88	0.008	<1.0847

6.2 Test Result : PASS

6.3 Test Plot



7. Deactivation Testing

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

7.1 Test equipment List and details

Description	Manufacturer	Model	Serial Number	Due.Date
Spectrum Analyzer	ROHDE & SCHWARZ	FSV40	100939	28-Nov-23

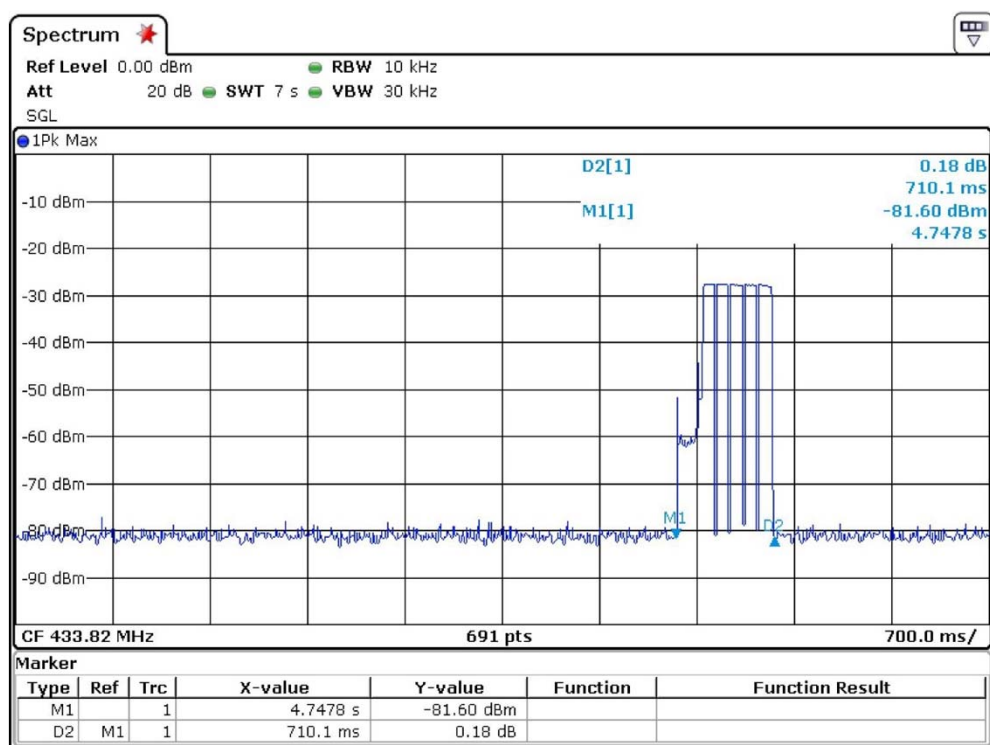
7.2 Test Procedure

With the EUT's antenna attached, the EUT's output signal was received by the test antenna, which was connected to the spectrum analyzer. Set the center frequency to 433.88 MHz, then set the spectrum analyzer to Zero span for the release time reading. During the testing, the switch was released then the EUT automatically deactivated.

7.3 Test Result

Frequency(MHz)	ontime (s)	limit	Result
433.88	0.710	<5 s	Pass

7.5 Test Plot



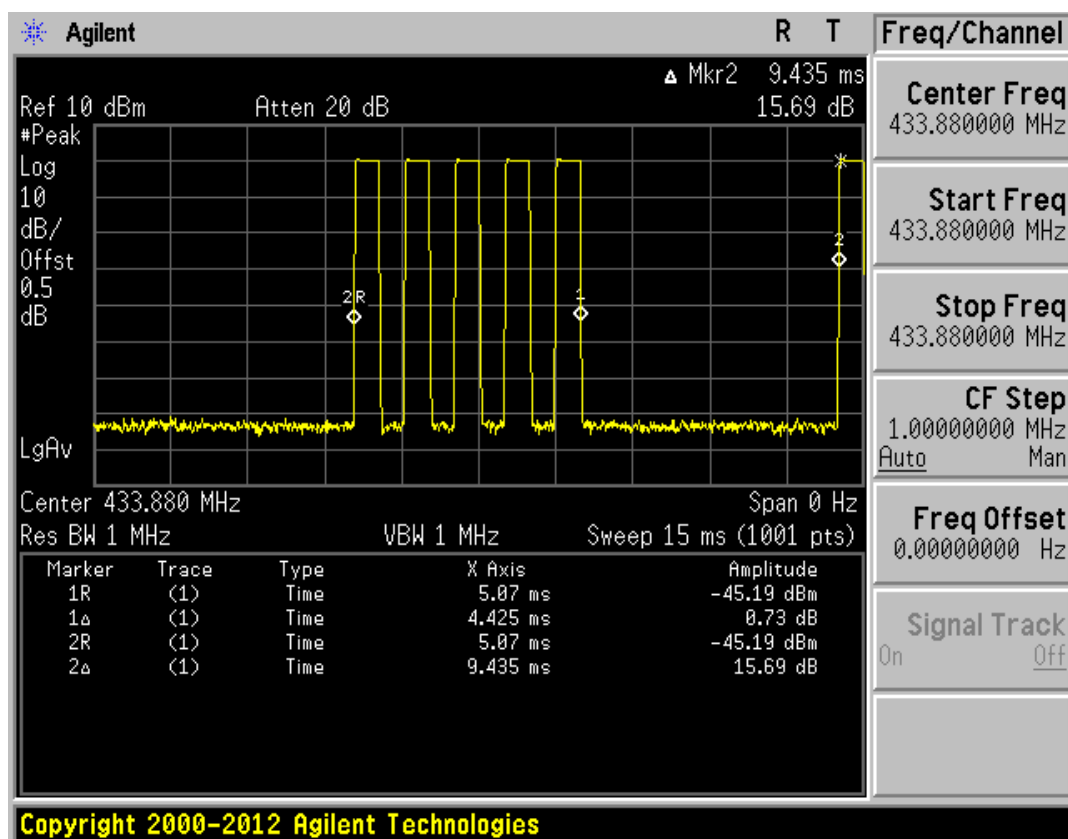
8. Duty Cycle

Set SPAN=0Hz
Set RBW=1 MHz
Set VBW=1 MHz
Set SWEET TIME=5 s

8.1 Test Result

Frequency	Duty cycle(%)	Ton (ms)	Ton + Toff (ms)	DCF=10*log(1/Duty) (dB)
433.88	46.800	4.425	9.435	3.298

8.2 Test Plot



9. Frequency Tolerance

9.1 Procedure

The frequency stability of the transmitter is measured by:

- a) Temperature: The temperature is varied from -20°C to $+50^{\circ}\text{C}$ using an environmental chamber.
- b) Primary Supply Voltage: The primary supply voltage is varied from 85 % to 115 % of the voltage normally at the input to the device or at the power supply terminals if cables are not normally supplied.

The frequency tolerance of the carrier shall be maintained within $\pm 0.01\%$ of the operating frequency.

9.2 Equipment lists

The following test equipments are used during test

Decription	Model	Serial Number	Cal. Due Data
Signal Analyzer	FSV40	100939	28-Nov-23
Temp./Humidity Chamber	SH-642	93014501	28-Nov-23

9.3 Frequency Tolerance Data

Operating Frequency :	<u>433,880,000 Hz</u>
Reference Voltage :	<u>9.00 Vd.c.</u>
Deviation Limit :	<u>± 0.01 %</u>

Voltage (%)	Power (Vdc)	Temperature (°C)	Frequency (Hz)	Deviation (%)
100	9.00	+20 °C(Ref)	433,880,018	0.000004
100		-20	433,860,026	-0.004604
100		-10	433,870,044	-0.002295
100		0	433,880,130	0.000030
100		10	433,881,956	0.000451
100		20	433,889,869	0.002275
100		30	433,889,819	0.002263
100		40	433,885,966	0.001375
100		50	433,880,398	0.000092
85	7.65	20	433,882,922	0.000673
115	10.35	20	433,881,276	0.000294

9.0 Photographs of EUT

[Front]



[Rear]



Appendix 1. Antenna Requirement

Regulation

According to §15.203, 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. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Result

–Complied

The transmitter has an integral PCB antenna.