

CTC Laboratories, Inc.

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•	TEST REPORT			
Report No. ·····:	CTC20220712E01			
FCC ID:	2A6YIC260			
Applicant:	Huizhou riboton Technology Co., L	td		
Address	4 / F, building a, Huate Industrial Park District, Huizhou City, Guangdong Pro	• • •		
Manufacturer	Huizhou riboton Technology Co., L	td		
Address:	4 / F, building a, Huate Industrial Park District, Huizhou City, Guangdong Pro			
Product Name·····:	tire pressure monitoring system			
Trade Mark······:	1			
Model/Type reference······:	C260			
Listed Model(s) ······	C200, C220, C230, C240, C242, C260, C262, C270, C280, C300, C310, C320, C330, C340, C350			
Standard:	FCC CFR Title 47 Part 15 Subpart C Section 15.231(e)			
Date of receipt of test sample:	May 9, 2022			
Date of testing	May 9, 2022 to May 19, 2022			
Date of issue	May 19, 2022			
Result:	PASS			
Compiled by:		$\supset \times$		
(Printed name+signature)	Zoe Xie	Zoe Xie Miller Ma		
Supervised by:		noillair AN a		
(Printed name+signature)	Miller Ma			
Approved by:		Johnas		
(Printed name+signature)	Totti Zhao	/or		
Testing Laboratory Name	CTC Laboratories, Inc.			
Address	1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Shenzhen, Guangdong, China			
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Any objections must be raised to CTC within 15 days since the date when the report is received. It will not be taken into consideration beyond this limit. The test report merely correspond to the test sample.



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1. TEST SUMMARY

1.1. Test Standards

The tests were performed according to following standards:

<u>FCC Rules Part 15.231(e)</u>: Periodic operation in the band 40.66–40.70 MHz and above 70MHz. <u>ANSI C63.10-2013</u>: American National Standard for Testing Unlicensed Wireless Devices.

1.2. Report version

Revised No.	Date of issue	Description
01	May 19, 2022	Original

1.3. Test Description

FCC Part 15 Subpart C 15.231(e)/ RSS-210 Issue 10					
Test Item	Standard Section				
rest item	FCC	Result	Engineer		
Antenna Requirement	15.203	Pass	Terry Su		
Conducted Emission	15.207	N/A	N/A		
Radiated Emissions	15.205&15.231(e)	Pass	Terry Su		
Field Strength of the Fundamental	15.231(e)	Pass	Terry Su		
20dB Bandwidth	15.231(c)	Pass	Terry Su		
Release Time	15.231(e)	Pass	Terry Su		

Note: "N/A" Not applicable.

The measurement uncertainty is not included in the test result.



1.4. Test Facility

Address of the test laboratory

CTC Laboratories, Inc.

Add: 1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Shenzhen, Guangdong, China

Laboratory accreditation

The test facility is recognized, certified, or accredited by the following organizations:

A2LA-Lab Cert. No.: 4340.01

CTC Laboratories, Inc. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in th e identified field of testing.

FCC (Registration No.: 951311, Designation Number CN1208)

CTC Laboratories, Inc. EMC Laboratory has been registered and fully described in a report filed with the (F CC) Federal Communications Commission. The acceptance letter from the FCC is maintained inour files. Registration 951311, Aug 26, 2017.

1.5. Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01" Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties equipment characteristics; Part 2" and is documented in the CTC Laboratories, Inc. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Below is the best measurement capability for CTC Laboratories, Inc.



Test Items	Measurement Uncertainty	Notes
Transmitter power conducted	0.42 dB	(1)
Transmitter power Radiated	2.14 dB	(1)
Conducted spurious emissions 9kHz~40GHz	1.60 dB	(1)
Radiated spurious emissions 9kHz~40GHz	2.20 dB	(1)
Conducted Emissions 9kHz~30MHz	3.20 dB	(1)
Radiated Emissions 30~1000MHz	4.70 dB	(1)
Radiated Emissions 1~18GHz	5.00 dB	(1)
Radiated Emissions 18~40GHz	5.54 dB	(1)
Occupied Bandwidth		(1)

Note (1): This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

1.6. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	25°C
Relative Humidity:	55 %
Air Pressure:	101kPa



2. GENERAL INFORMATION

2.1. Client Information

Applicant:	Huizhou riboton Technology Co., Ltd
Address:	4 / F, building a, Huate Industrial Park, Qiuchang Town, Huiyang District, Huizhou City, Guangdong Province
Manufacturer:	Huizhou riboton Technology Co., Ltd
Address:	4 / F, building a, Huate Industrial Park, Qiuchang Town, Huiyang District, Huizhou City, Guangdong Province

2.2. General Description of EUT

Product Name:	tire pressure monitoring system
Model/Type reference:	C260
Listed Model(s):	C200, C220, C230, C240, C242, C260, C262, C270, C280, C300, C310, C320, C330, C340, C350
Power supply:	DC 3V from battery
Hardware version:	N/A
Software version:	N/A
Serial Number:	01C02
RF parameter	
Modulation:	FSK
Operation frequency:	433.92MHz
Channel number:	1
Antenna type:	Integral Antenna
Antenna gain:	0dBi

2.3. EUT Operation state

The EUT has been tested under typical operating condition. The Applicant provides software to control the EUT for staying in continuous transmitting mode for testing.



2.4. Measurement Instruments List

3.	3. Tonscend JS0806-2 Test system				
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	Spectrum Analyzer	KEYSIGHT	N9020A	100231	Dec. 25, 2022
2	Spectrum Analyzer	Rohde & Schwarz	FUV40-N	101331	Mar. 15, 2023
3	MXG Vector Signal Generator	Agilent	N5182A	MY47420864	Dec. 25, 2022
4	Signal Generator	Agilent	E8257D	MY46521908	Dec. 25, 2022
5	Power Sensor	Agilent	U2021XA	MY5365004	Mar. 15, 2023
6	Power Sensor	Agilent	U2021XA	MY5365006	Mar. 15, 2023
7	High and low temperature box	ESPEC	MT3035	N/A	Mar. 24, 2023
8	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	102414	Dec. 25, 2022
9	300328 v2.2.2 test system	TONSCEND	v2.6	/	/

Radiated emission(3m chamber 2)

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated Until
1	Trilog-Broadband Antenna	Schwarzbeck	VULB 9168	9168-1013	Jan. 12, 2023
2	Horn Antenna	Schwarzbeck	BBHA 9120D	9120D-647	Dec. 24, 2022
3	Spectrum Analyzer	R&S	FSU26	100105	Dec. 25, 2022
4	Spectrum Analyzer	R&S	FSV40-N	101331	Mar. 15, 2023
5	Pre-Amplifier	SONOMA	310	186194	Dec. 25, 2022
6	Low Noise Pre-Amplifier	EMCI	EMC051835	980075	Dec. 25, 2022
7	Test Receiver	R&S	ESCI7	100967	Dec. 25, 2022

Radiated emission(3m chamber 3)

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated Until	
1	Trilog-Broadband Antenna	Schwarzbeck	VULB 9168	9168-759	Nov. 09, 2023	
2	Horn Antenna	Schwarzbeck	BBHA 9120D	9120D-647	Dec. 24, 2022	
3	Test Receiver	Keysight	N9038A	MY56400071	Dec. 25, 2022	
4	Broadband Premplifier	SCHWARZBECK	BBV9743B	259	Dec. 25, 2022	
5	Mirowave Broadband Amplifier	SCHWARZBECK	BBV9718C	111	Dec. 25, 2022	
6	Loop Antenna	ZHINAN	ZN30900A	/	Dec. 25, 2022	

Conducted Emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	LISN	R&S	ENV216	101112	Dec. 25, 2022
2	LISN	R&S	ENV216	101113	Dec. 25, 2022
3	EMI Test Receiver	R&S	ESCS30	100353	Dec. 25, 2022



Test software						
Item	Test Description	Manufacturer	Model No.	Version		
1	Radiated emission/ Conducted Emission	Farad	EZ-EMC	RA-03A1		

Note:1. The Cal. Interval was one year. 2. The cable loss has calculated in test result which connection between each test instruments.



4. TEST ITEM AND RESULTS

4.1. Conducted Emission

<u>Limit</u>

FCC CFR Title 47 Part 15 Subpart C Section 15.207:

	Limit (dBuV)				
Frequency range (MHz)	Quasi-peak	Average			
0.15-0.5	66 to 56*	56 to 46*			
0.5-5	56	46			
5-30	60	50			

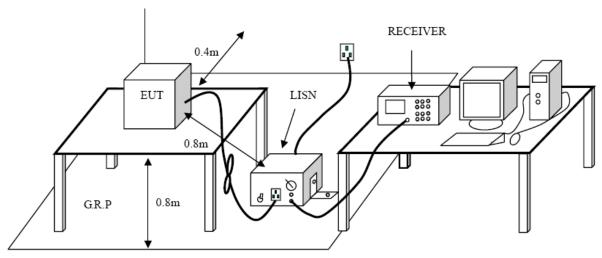
Notes:

(1) *Decreasing linearly with logarithm of the frequency.

(2) The lower limit shall apply at the transition frequencies.

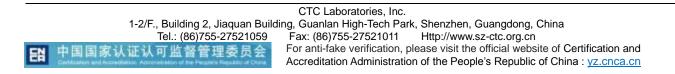
(3) The limit decrease in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

Test Configuration



Test Procedure

- 1. The EUT was setup according to ANSI C63.10:2013 requirements.
- 2. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface.
- 3. The EUT and simulators are connected to the main power through a line impedances stabilization network (LISN). The LISN provides a 50ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs)
- 4. Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.
- 5. The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.
- 6. Conducted Emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.
- 7. During the above scans, the emissions were maximized by cable manipulation.





Test Mode: Please refer to the clause 2.3.

Test Results

Not applicable.



4.2. Radiated Emission

<u>Limit</u>

FCC CFR Title 47 Part 15 Subpart C Section 15.231(e).

The field strength of emissions from intentional radiators operated **average value** under this section shall not exceed the following

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Unwanted emissions (millivolts/meter)
260 - 470 MHz	1500 to 5000(**)	150 to 500(**)

** linear interpolation with frequency, f, in MHz:

F is 433.92MHz

Field strength of fundamental: Limit at 3 meters = 16.6667(F)-2833.3333.

So the field strength of emission limits have been calculated in below table.

Fundamental Frequency (MHz)	Field Strength of Fundamental (microvolt/meter) at 3m
433.92MHz	92.87 (Peak)
433.92MHz	72.87 (Average)

Radiated Emission Limits (9 kHz~1000 MHz)

Frequency (MHz)	Field Strength (microvolt/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

Radiated Emission Limit (Above 1000MHz)

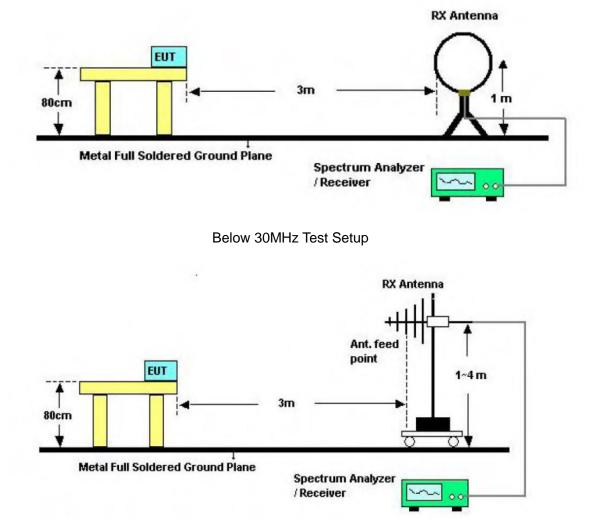
Frequency (MHz)	Distance Meters(at 3m)				
	Peak	Average			
Above 1000	74	54			

Note:

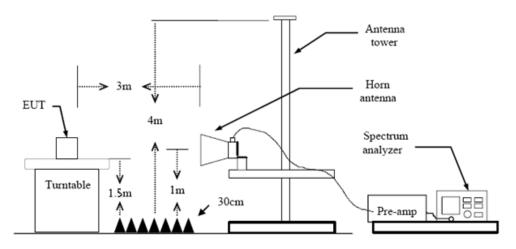
- (1) The tighter limit applies at the band edges.
- (2) Emission Level (dBuV/m)=20log Emission Level (uV/m).



Test Configuration







Above 1GHz Test Setup



- 1. The EUT was setup and tested according to ANSI C63.10:2013
- 2. The EUT is placed on a turn table which is 0.8 meter above ground for below 1 GHz, and 1.5 m for above 1 GHz. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
- 3. The EUT was set 3 meters from the receiving antenna, which was mounted on the top of a variable height antenna tower.
- 4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
- 5. Set to the maximum power setting and enable the EUT transmit continuously.
- 6. Use the following spectrum analyzer settings
 - (1) Span shall wide enough to fully capture the emission being measured;
 - (2) Below 1 GHz:

RBW=120 kHz, VBW=300 kHz, Sweep=auto, Detector function=peak, Trace=max hold;

If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

(3) From 1 GHz to 10th harmonic:

RBW=1MHz, VBW=3MHz Peak detector for Peak value.

RBW=1MHz, VBW=3MHz RMS detector for Average value.

Test Mode

Please refer to the clause 2.3.

Test Result

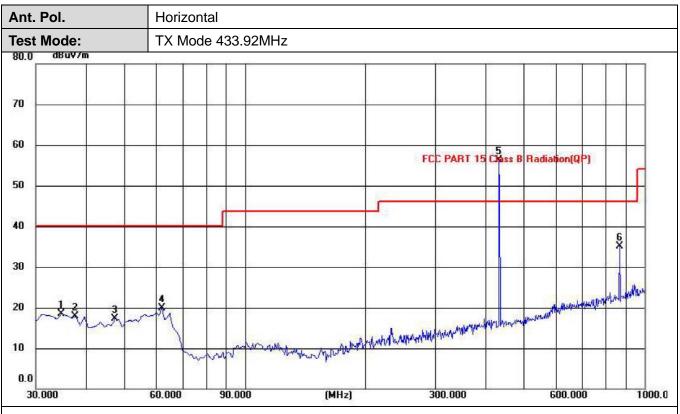
9 KHz~30 MHz

From 9 KHz to 30 MHz: Conclusion: PASS

Note: The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.



30MHz-1GHz



	Frequency	Reading	Duty	Factor	Level	Limit	Margin	
No.	(MHz)	(dBuV)	cycle Factor	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Det.
1	34.85	33	/	-14.56	18.44	40	-21.56	peak
2	37.76	34	/	-16.18	17.82	40	-22.18	peak
3	47.46	34.12	/	-16.8	17.32	40	-22.68	peak
4	62.01	34.23	/	-14.25	19.98	40	-20.02	peak
5	433.92	74.14	/	-17.81	56.33	92.87	-36.54	peak
/	433.92	/	-4.76	/	51.57	72.87	-21.30	AVG
6	867.84	47.62	/	-12.49	35.13	72.87	-37.74	peak
/	867.84	/	-4.76	/	30.67	52.87	-22.50	AVG

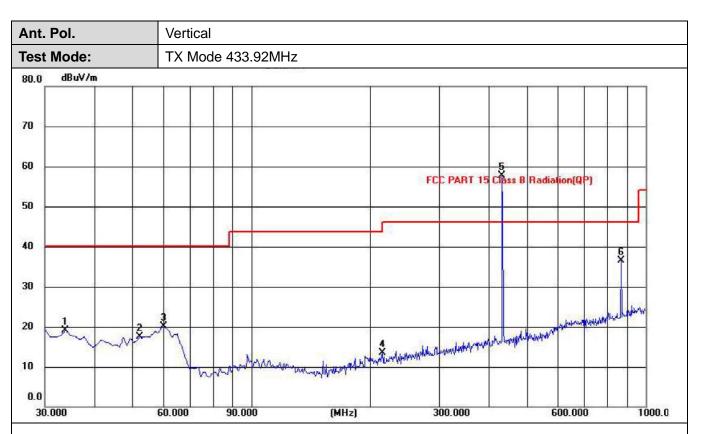
Remarks:

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor

2.Margin value = Level -Limit value

3.AVG=Peak+Duty Cycle Factor(-4.76)





Na	Frequency	Reading	Duty	Factor	Level	Limit	Margin	Det
No.	(MHz)	(dBuV)	cycle Factor	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Det.
1	33.88	33	/	-14.73	19.1	40	-20.9	peak
2	52.31	33.52	/	-16.04	17.48	40	-22.52	peak
3	60.07	33.5	/	-13.47	20.03	40	-19.97	peak
4	215.27	34.95	/	-21.51	13.44	43.5	-30.06	peak
5	433.92	75.51	/	-17.81	57.7	92.87	-35.17	peak
	433.92	/	-4.76	/	52.94	72.87	-19.93	AVG
6	867.84	48.95	/	-12.49	36.46	72.87	-36.41	peak
	867.84	/	-4.76	/	31.70	52.87	-21.17	AVG

Remarks:

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor

2.Margin value = Level -Limit value

3.AVG=Peak+Duty Cycle Factor(-4.76)



Frequency	Reading	Duty cycle Factor	Factor	Level	Limit	Margin	Det.	Polar H/V
(MHz)	(dBuV)	/	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)		
1301.76	45.18	/	-14.57	30.61	74	-43.39	peak	Н
1301.76	/	-4.76	/	25.85	54	-28.15	AVG	Н
1735.68	35.14	/	-13.27	21.87	74	-52.13	peak	Н
1735.68	/	-4.76	/	17.11	54	-36.89	AVG	Н
1301.76	45.05	/	-14.57	30.48	74	-43.52	peak	V
1301.76	/	-4.76	/	25.72	54	-28.28	AVG	V
1735.68	35.26	/	-13.27	21.99	74	-52.01	peak	V
1735.68	/	-4.76	/	17.23	54	-36.77	AVG	V

Remarks:

1. Correct (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor

2. Measure Level= Read Level+ Correct Factor

3. Margin = Measure Level-Limit

4. Testing is carried out with frequency rang 9kHz to the tenth harmonics, which above 4th Harmonics are

attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

5.AVG=Peak+Duty Cycle Factor(-4.76)



4.3. 20 dB Bandwidth

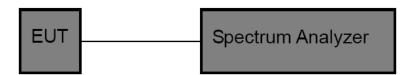
<u>Limit</u>

FCC CFR Title 47 Part 15 Subpart C Section 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.

433.92MHz*0.25%=1.085MHz

Test Configuration



Test Procedure

- 1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- 2. Spectrum Setting:
 - (1) Set RBW = 1% ~ 5% OCB.
 - (2) Set the video bandwidth (VBW) \ge 3 RBW.
 - (3) Detector = Peak.
 - (4) Trace mode = Max hold.
 - (5) Sweep = Auto couple.

Test Mode

Please refer to the clause 2.3.

Test Results



Channel Frequency(MHz)	20dB Bandwidth	n(kHz)	Limit (MHz))	Result
433.92	4.492		1.085		PASS
2 84 Marker 1 Marker 1 10 dB/div Log 49.5	433.93 MHz Conter FIGain:Low Trig: Fr Atten: Ref -29.50 dBm Market -29.50 dBm	Freq: 433.925000 MHz ee Run Avg Hold>10 0 dB		Trace/Detector Clear Writ Averag Max Ho	le
#Res BW	300 Hz #V	/BW 1 kHz	Sweep 527.2 ms	Min Ho	d
	bied Bandwidth 11.481 kHz	Total Power	-32.0 dBm	Detect	
	nit Freq Error 621 Hz andwidth 4.492 kHz	OBW Power x dB	99.00 % Au -20.00 dB	to <u>M</u> a	n L
MSG			STATUS		



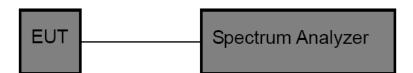
4.4. Release Time Measurement

<u>Limit</u>

FCC CFR Title 47 Part 15 Subpart C Section 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 Configuration



Test Procedure

- 1. The transmitter output was connected to the spectrum analyzer through an attenuator, the path loss was compensated to the results for each measurement.
- 2. Set to the maximum power setting and enable the EUT transmit continuously
- Use the following spectrum analyzer settings: Frequency=Center carrier frequency RBW=100KHz, VBW=300KHz, Span= 0, Detector function = peak
- 4. Measure and record the results in the test report.

Test Mode

Please refer to the clause 2.3.

Test Result



EN

Frequency (MHz)	Release Time	Limit	(s)	Result	
433.92	0.017		<1		Pass
	glient Spectrum Analyzer - Swept SA RL RF SOΩ AC CORREC Aarker 1 Δ 17.0000 mS PNO: Wide T IFGain:High 0 dE/dlv Ref -22.00 dBm	SENSE:INT Avg Typ rig: Free Run Atten: 0 dB	АЦСИАНТО 102:29:41 РМ Мау 19, 20 е: Log-Pwr телес р з а т туте рет Милин ΔMkr1 17.00 m -0.07 d	Select Marker	
	42.0 52.0			Delta Fixed⊳	
	72.0 72.0	<u>1Δ2</u> X2		Off	
	102 อาร์ปรับธุรณ์การแม้น่าสำรรมรู้สามไม่เป็นประการกระสมสมบรรษ 112	agadentanistikafunat kaninaana	nen Mahaminan provideranen fan geseran	Properties► More	
	Center 433.920000 MHz Les BW 100 kHz #VBW 30	0 kHz	Span 0 H Sweep 1.000 s (1001 pt status	z 1 of 2	

Frequency (MHz)	Silent period(s)	Limit (s)	Result
433.92	13.06	>10s >30* Release Time	Pass
Note: 30* Release Tim	e=0.51s		
	glient Spectrum Analyzer - Swept SA SENEEINT R.L BF S0.0 AC CORREC SENEEINT Aarker 1 Δ 13.0600 s PN0: Wide FG ain:High Trig: Free Run #Atten: 0 dB Avg Typ 0.0 dB/div Ref -20.00 dBm Image: Seneeine Construction of the Construction	Select Marker 1 Select Marker 1 Normal Delta Delta Fixed⊳ 1 1 2 0 Froperfies>	

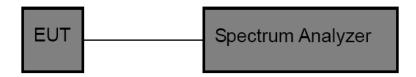


4.5. Duty Cycle

<u>Limit</u>

The duration of each transmission shall not be more than 1 second and the rest time between transfers shall be at least 30 times the duration of propagation, but in any case less than 10 seconds.

Test Configuration



Test Procedure

- 1. The transmitter output was connected to the spectrum analyzer through an attenuator, the path loss was compensated to the results for each measurement.
- 2. Set to the maximum power setting and enable the EUT transmit continuously
- 3. Use the following spectrum analyzer settings:

Frequency=Center carrier frequency RBW=1MHz, VBW>= RBW, Span= 0, Detector function = peak, Trace = single

4. Measure and record the results in the test report.

Test Mode

Please refer to the clause 2.3.

Test Result

Please refer the following pages:

Plot 1: Because the transmit period(50ms) of the EUT is not exceed 100ms, So 50ms was used for calculated, The pulses number total 1.

Plot 2: One pulse in a time period of 16.7ms.

Duty Cycle=ON/transmit period=16.7/ 50=33.4% Duty Cycle Factor=20 log(Duty Cycle)=-4.76



Plot 1

r Ri Mar		RF	50 Q		CORREC				SE:INT	Avg Type	ALIGNAUTO		24 PM May 18, 2 TRACE 1234	5.6	Marker
					PNO: W IFGain:I	fide 🖕 High	Trig: F #Atten						DET P N N P	JN N	Select Marker
0 dE	B/div	Ref	-20.00	dBm								ΔMkr1	50.00 i 0.06 (1
og :0.0															Norm
															Del
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4.6. Antenna requirement

Requirement

FCC CFR Title 47 Part 15 Subpart C Section 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 antenna that uses a unique coupling to the intentional radiator, 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.

FCC CFR Title 47 Part 15 Subpart C Section 15.247(c) (1)(i):

(i) Systems operating in the 2400~2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

Test Result

This product has an Integral antenna, fulfill the requirement of this section.