RADIO TEST REPORT
FCC ID: 2AXDW-PW1

Product:	Pudu Watch
Trade Mark:	Pudu
Model No.:	PW1
Family Model:	PW1-H4, PW1-H8, PW1-H9, PW1-H9K
Report No.:	S20110902302001
Issue Date:	05 Feb. 2021

Prepared for

SHENZHEN PUDU TECHNOLOGY CO., LTD.

Room 301, Wearnes Science and Technology Mansion, No.10, Kefa Road, Yuehai Street, Nanshan District , Shenzhen, Guangdong, China 518057

Prepared by

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1 TEST RESULT CERTIFICATION

Applicant's name ..... :	SHENZHEN PUDU TECHNOLOGY CO., LTD.
Address ..... :	Room 301, Wearnes Science and Technology Mansion, No.10, Kefa Road, Yuehai Street, Nanshan District , Shenzhen, Guangdong, China 518057
Manufacturer's Name ..... :	SHENZHEN PUDU TECHNOLOGY CO., LTD.
Address ..... :	Room 301, Wearnes Science and Technology Mansion, No.10, Kefa Road, Yuehai Street, Nanshan District , Shenzhen, Guangdong, China 518057
Product description	
Product name ..... :	Pudu Watch
Model and/or type reference ..... :	PW1
Family Model ..... :	PW1-H4, PW1-H8, PW1-H9, PW1-H9K

Measurement Procedure Used:

APPLICABLE STANDARDS	
STANDARD/ TEST PROCEDURE	TEST RESULT
FCC 47 CFR Part 2, Subpart J FCC 47 CFR Part 15, Subpart C ANSI C63.10-2013	Complied

This device described above has been tested by Shenzhen NTEK Testing Technology Co., Ltd., and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.
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The test results of this report relate only to the tested sample identified in this report.

Date of Test : 05 Jan. 2021 ~ 04 Feb. 2021

Testing Engineer : (Allen Liu)

Technical Manager : (Jason Chen)

Authorized Signatory : (Alex Li)

2 SUMMARY OF TEST RESULTS

FCC Part15 (15.247), Subpart C			
Standard Section	**Test Item**	**Verdict**	**Remark**
15.207	Conducted Emission	PASS	
15.209 (a) 15.205 (a)	Radiated Spurious Emission	PASS	
15.247(a)(1)	Hopping Channel Separation	PASS	
15.247(b)(1)	Peak Output Power	PASS	
15.247(a)(i)	Number of Hopping Frequency	PASS	
15.247(a)(i)	Dwell Time	PASS	
15.247(a)(1)	Bandwidth	PASS	
15.247 (d)	Band Edge Emission	PASS	
15.247 (d)	Spurious RF Conducted Emission	PASS	
15.203	Antenna Requirement	PASS	

Remark:
1. “N/A” denotes test is not applicable in this Test Report.
2. All test items were verified and recorded according to the standards and without any deviation during the test.

3 FACILITIES AND ACCREDITATIONS

3.1 FACILITIES

All measurement facilities used to collect the measurement data are located at
1/F, Building E, Fenda Science Park, Sanwei Community, Xixiang Street, Bao'an District, Shenzhen 518126 P.R. China.
The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.10 and CISPR Publication 22.

3.2 LABORATORY ACCREDITATIONS AND LISTINGS

Site Description		
CNAS-Lab.	:	The Certificate Registration Number is L5516.
IC-Registration		The Certificate Registration Number is 9270A. CAB identifier:CN0074
FCC- Accredited		Test Firm Registration Number: 463705. Designation Number: CN1184
A2LA-Lab.		The Certificate Registration Number is 4298.01 This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 General requirements for the competence of testing and calibration laboratories. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009).
Name of Firm	:	Shenzhen NTEK Testing Technology Co., Ltd.
Site Location	:	1/F, Building E, Fenda Science Park, Sanwei Community, Xixiang Street, Bao'an District, Shenzhen 518126 P.R. China.

3.3 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement y±U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95 %.

No.	Item	Uncertainty
1	Conducted Emission Test	±2.80dB
2	RF power, conducted	±0.16dB
3	Spurious emissions, conducted	±0.21dB
4	All emissions, radiated(30MHz~1GHz)	±2.64dB
5	All emissions, radiated(1GHz~6GHz)	±2.40dB
6	All emissions, radiated(＞6GHz)	±2.52dB
7	Temperature	±0.5°C
8	Humidity	±2%

4 GENERAL DESCRIPTION OF EUT

Product Feature and Specification	
Equipment	Pudu Watch
Trade Mark	Pudu
FCC ID	2AXDW-PW1
Model No.	PW1
Family Model	PW1-H4, PW1-H8, PW1-H9, PW1-H9K
Model Difference	All models are the same circuit and RF module, except the model name.
Operating Frequency	903 MHz~927MHz
Modulation	FSK
Number of Channels	61 Channels
Antenna Type	Spring antenna
Antenna Gain	-9.7dBi
Power supply	☒DC supply: DC 3.7V/300mAh from battery.
	☐Adapter supply:
HW Version	V4.0
SW Version	LoraWatchWithBoot_HEX_1207

Note: Based on the application, features, or specification exhibited in User's Manual, the EUT is considered as an ITE/Computing Device. More details of EUT technical specification, please refer to the User's Manual.

Revision History

Report No.	Version	Description	Issued Date
S20110902302001	Rev.01	Initial issue of report	05 Feb. 2021

5 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.
The Transmitter was operated in the normal operating mode. The TX frequency was fixed which was for the purpose of the measurements.

Test of channel included the lowest and middle and highest frequency to perform the test, then record on this report.

Data rate of the EUT:

System mode	Data rate(DR)	Configuration	Byte rate(bit/s)
FHSS	0	SF=7/BW=125KHz	3.5Kbps

Those data rates were used for all test. For FHSS: The data rate DR=0 is the worst case, all the test data except the Dwell Time just report the worst data rate data.

The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement –X, Y, and Z-plane. The X-plane results were found as the worst case and were shown in this report.
Carrier Frequency and Channel list:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	903	22	911.8	44	920.6
1	903.4	23	912.2	45	921
2	903.8	24	912.6	46	921.4
3	904.2	25	913	47	921.8
4	904.6	26	913.4	48	922.2
5	905	27	913.8	49	922.6
6	905.4	28	914.2	50	923
7	905.8	29	914.6	51	923.4
8	906.2	30	915	52	923.8
9	906.6	31	915.4	53	924.2
10	907	32	915.8	54	924.6
11	907.4	33	916.2	55	925
12	907.8	34	916.6	56	925.4
13	908.2	35	917	57	925.8
14	908.6	36	917.4	58	926.2
15	909	37	917.8	59	926.6
16	909.4	38	918.2	60	927
17	909.8	39	918.6		
18	910.2	40	919		
19	910.6	41	919.4		
20	911	42	919.8		
21	911.4	43	920.2		

The following summary table is showing all test modes to demonstrate in compliance with the standard.

For AC Conducted Emission	
Final Test Mode	Description
Mode 1	normal link mode

Note: AC power line Conducted Emission was tested under maximum output power.

For Radiated Test Cases	
Final Test Mode	Description
Mode 1	normal link mode
Mode 2	CH0(903MHz)
Mode 3	CH30(915MHz)
Mode 4	CH60(927MHz)

Note: For radiated test cases, the worst mode data rate 3.5Kbps was reported only, because this data rate has the highest RF output power at preliminary tests, and no other significantly frequencies found in conducted spurious emission.

For Conducted Test Cases	
Final Test Mode	Description
Mode 2	CH0(903MHz)
Mode 3	CH30(915MHz)
Mode 4	CH60(927MHz)
Mode 5	Hopping mode

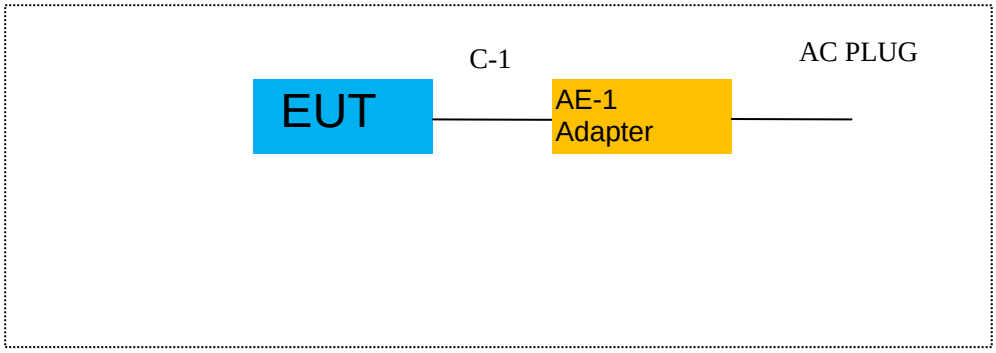
Note: The engineering test program was provided and the EUT was programmed to be in continuously transmitting mode.

1. AC power line Conducted Emission was tested under maximum output power.

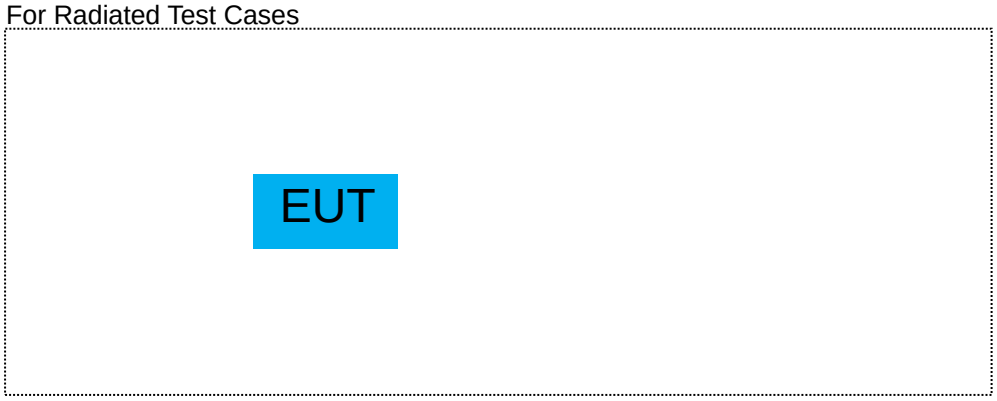
6 SETUP OF EQUIPMENT UNDER TEST

6.1 BLOCK DIAGRAM CONFIGURATION OF TEST SYSTEM

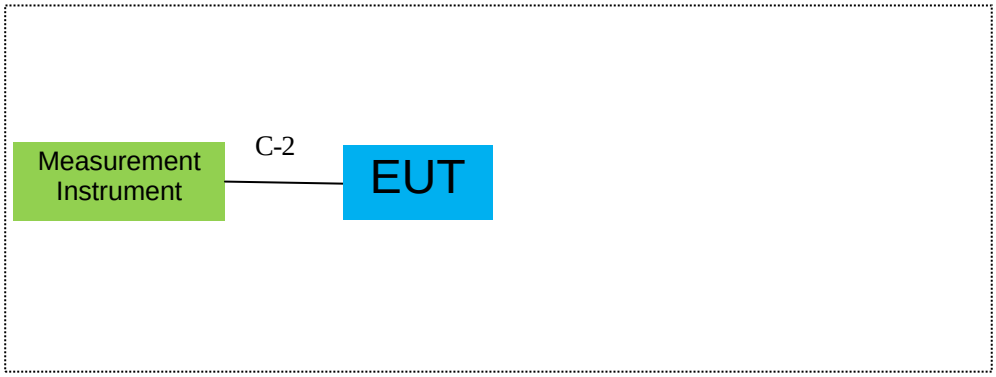
For AC Conducted Emission Mode



For Radiated Test Cases



For Conducted Test Cases



Note: 1. The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

6.2 SUPPORT EQUIPMENT

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
AE-1	Adapter	N/A	N/A	N/A	Peripherals

Item	Cable Type	Shielded Type	Ferrite Core	Length
C-1	USB Cable	NO	NO	1.2m
C-2	RF Cable	YES	NO	0.1m

Notes:

(1) The support equipment was authorized by Declaration of Confirmation.
(2) For detachable type I/O cable should be specified the length in cm in『Length』column.
(3) “YES” is means “shielded” “with core”; “NO” is means “unshielded” “without core”.

6.3 EQUIPMENTS LIST FOR ALL TEST ITEMS

Radiation& Conducted Test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Spectrum Analyzer	Aglient	E4407B	MY45108040	2020.05.11	2021.05.10	1 year
2	Spectrum Analyzer	Agilent	N9020A	MY49100060	2020.07.13	2021.07.12	1 year
3	Spectrum Analyzer	R&S	FSV40	101417	2020.08.07	2021.08.06	1 year
4	Test Receiver	R&S	ESPI7	101318	2020.05.11	2021.05.10	1 year
5	Bilog Antenna	TESEQ	CBL6111D	31216	2020.04.11	2021.04.10	1 year
6	50Ω Coaxial Switch	Anritsu	MP59B	6200983705	2020.05.11	2023.05.10	3 year
7	Horn Antenna	EM	EM-AH-10180	2011071402	2020.04.11	2021.04.10	1 year
8	Broadband Horn Antenna	SCHWARZBECK	BBHA 9170	803	2020.11.19	2021.11.18	1 year
9	Amplifier	EMC	EMC051835SE	980246	2020.07.13	2021.07.12	1 year
10	Active Loop Antenna	SCHWARZBECK	FMZB 1519 B	055	2020.11.19	2021.11.18	1 year
11	Power Meter	DARE	RPR3006W	15I00041SNO84	2020.07.13	2021.07.12	1 year
12	Test Cable (9KHz-30MHz)	N/A	R-01	N/A	2019.08.06	2022.08.05	3 year
13	Test Cable (30MHz-1GHz)	N/A	R-02	N/A	2020.07.13	2021.07.12	1 year
14	High Test Cable(1G-40GHz)	N/A	R-03	N/A	2019.06.28	2022.06.27	3 year
15	High Test Cable(1G-40GHz)	N/A	R-04	N/A	2020.04.11	2021.04.10	1 year
16	Filter	TRILTHIC	2400MHz	29	2020.05.11	2021.05.10	1 year
17	temporary antenna connector (Note)	NTS	R001	N/A	N/A	N/A	N/A

Note:

We will use the temporary antenna connector (soldered on the PCB board) When conducted test And this temporary antenna connector is listed within the instrument list

AC Conduction Test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Test Receiver	R&S	ESCI	101160	2020.05.11	2021.05.10	1 year
2	LISN	R&S	ENV216	101313	2020.04.11	2021.04.10	1 year
3	LISN	SCHWARZBECK	NNLK 8129	8129245	2020.05.11	2021.05.10	1 year
4	50Ω Coaxial Switch	ANRITSU CORP	MP59B	6200983704	2020.05.11	2023.05.10	3 year
5	Test Cable (9KHz-30MHz)	N/A	C01	N/A	2020.05.11	2023.05.10	3 year
6	Test Cable (9KHz-30MHz)	N/A	C02	N/A	2020.05.11	2023.05.10	3 year
7	Test Cable (9KHz-30MHz)	N/A	C03	N/A	2020.05.11	2021.05.10	3 year

Note: Each piece of equipment is scheduled for calibration once a year except the Aux Equipment & Test Cable which is scheduled for calibration every 2 or 3 years.

7 TEST REQUIREMENTS

7.1 CONDUCTED EMISSIONS TEST

7.1.1 Applicable Standard

According to FCC Part 15.207(a) and KDB 174176 D01 Line Conducted FAQ v01r01

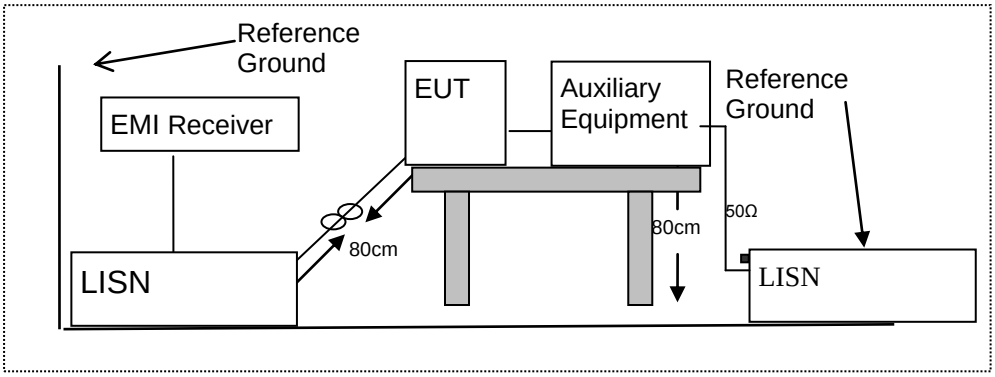
7.1.2 Conformance Limit

Frequency(MHz)	Conducted Emission Limit	
	Quasi-peak	Average
0.15-0.5	66-56*	56-46*
0.5-5.0	56	46
5.0-30.0	60	50
Note: 1. *Decreases with the logarithm of the frequency 2. The lower limit shall apply at the transition frequencies 3. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.		

7.1.3 Measuring Instruments

The Measuring equipment is listed in the section 6.3 of this test report.

7.1.4 Test Configuration



7.1.5 Test Procedure

According to the requirements in Section 13.1.4.1 of ANSI C63.10-2013 Conducted emissions the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-Peak and average detector mode.

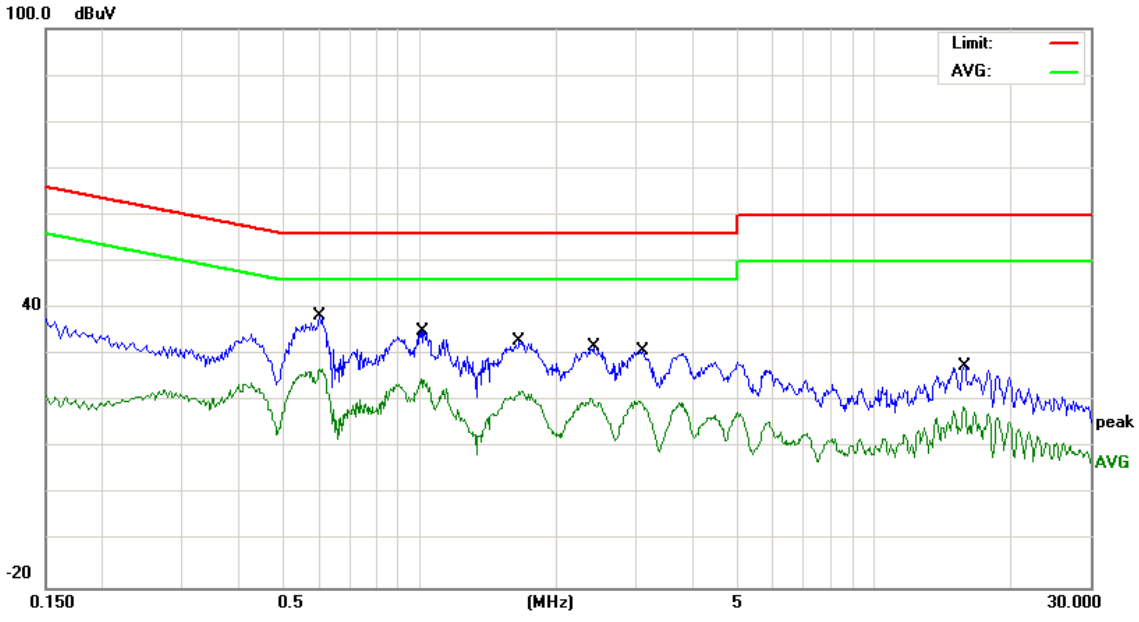
1. The EUT was placed 0.4 meter from the conducting wall of the shielding room.
2. The EUT was placed on a table which is 0.8m above ground plane.
3. Connect EUT to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
4. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40cm long.
5. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
6. LISN at least 80 cm from nearest part of EUT chassis.
7. The frequency range from 150KHz to 30MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth(IF bandwidth=9KHz) with Maximum Hold Mode
9. For the actual test configuration, please refer to the related Item –EUT Test Photos.

7.1.6 Test Results

EUT：	Pudu Watch	Model Name ：	PW1
Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	1010hPa	Phase :	L
Test Voltage ：	DC 5V from Adapter AC 120V/60Hz	Test Mode：	Mode 1

Frequency	Reading Level	Correct Factor	Measure-ment	Limits	Margin	Remark
(MHz)	(dBμV)	(dB)	(dBμV)	(dBμV)	(dB)	
0.6020	28.82	9.55	38.37	56.00	-17.63	QP
0.6020	17.43	9.55	26.98	46.00	-19.02	AVG
1.0180	25.57	9.56	35.13	56.00	-20.87	QP
1.0180	15.19	9.56	24.75	46.00	-21.25	AVG
1.6540	23.25	9.58	32.83	56.00	-23.17	QP
1.6540	12.78	9.58	22.36	46.00	-23.64	AVG
2.4100	22.31	9.58	31.89	56.00	-24.11	QP
2.4100	11.97	9.58	21.55	46.00	-24.45	AVG
3.0980	21.30	9.60	30.90	56.00	-25.10	QP
3.0980	10.59	9.60	20.19	46.00	-25.81	AVG
15.8380	17.86	9.80	27.66	60.00	-32.34	QP
15.8380	8.95	9.80	18.75	50.00	-31.25	AVG

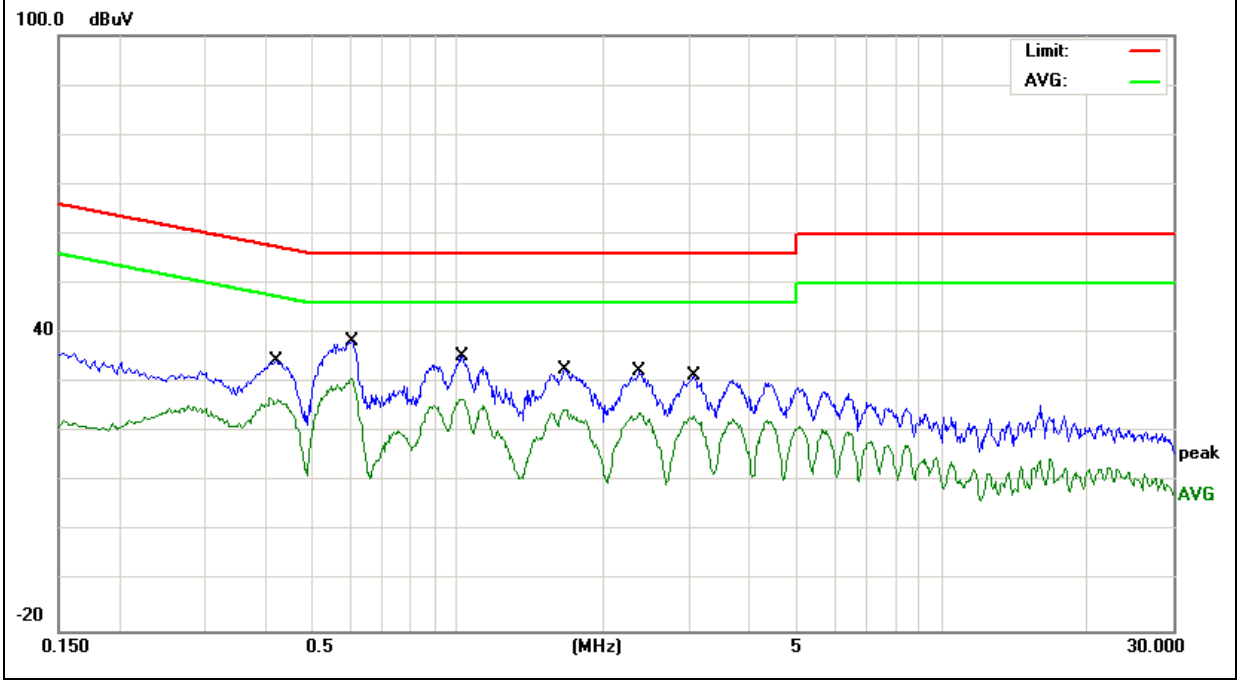
Remark: 1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.



EUT：	Pudu Watch	Model Name ：	PW1
Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	1010hPa	Phase :	N
Test Voltage ：	D DC 5V from Adapter AC 120V/60Hz	Test Mode：	Mode 1

Frequency	Reading Level	Correct Factor	Measure-ment	Limits	Margin	Remark
(MHz)	(dBμV)	(dB)	(dBμV)	(dBμV)	(dB)	
0.4220	24.84	9.54	34.38	57.41	-23.03	QP
0.4220	17.12	9.54	26.66	47.41	-20.75	AVG
0.6060	28.74	9.54	38.28	56.00	-17.72	QP
0.6060	21.31	9.54	30.85	46.00	-15.15	AVG
1.0220	25.90	9.55	35.45	56.00	-20.55	QP
1.0220	17.21	9.55	26.76	46.00	-19.24	AVG
1.6700	23.06	9.57	32.63	56.00	-23.37	QP
1.6700	15.08	9.57	24.65	46.00	-21.35	AVG
2.3780	22.63	9.57	32.20	56.00	-23.80	QP
2.3780	14.50	9.57	24.07	46.00	-21.93	AVG
3.0780	21.73	9.59	31.32	56.00	-24.68	QP
3.0780	12.89	9.59	22.48	46.00	-23.52	AVG

Remark: 1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.



7.2 RADIATED SPURIOUS EMISSION

7.2.1 Applicable Standard

According to FCC Part 15.247(d) and 15.209 and ANSI C63.10-2013

7.2.2 Conformance Limit

According to FCC Part 15.247(d): radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).
According to FCC Part15.205, Restricted bands

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(2)
13.36-13.41			

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Restricted Frequency(MHz)	Field Strength (μV/m)	Field Strength (dBμV/m)	Measurement Distance
0.009~0.490	2400/F(KHz)	20 log (uV/m)	300
0.490~1.705	24000/F(KHz)	20 log (uV/m)	30
1.705~30.0	30	29.5	30
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

Limits of Radiated Emission Measurement(Above 1000MHz)

Frequency(MHz)	Class B (dBuV/m) (at 3M)	
	PEAK	AVERAGE
Above 1000	74	54

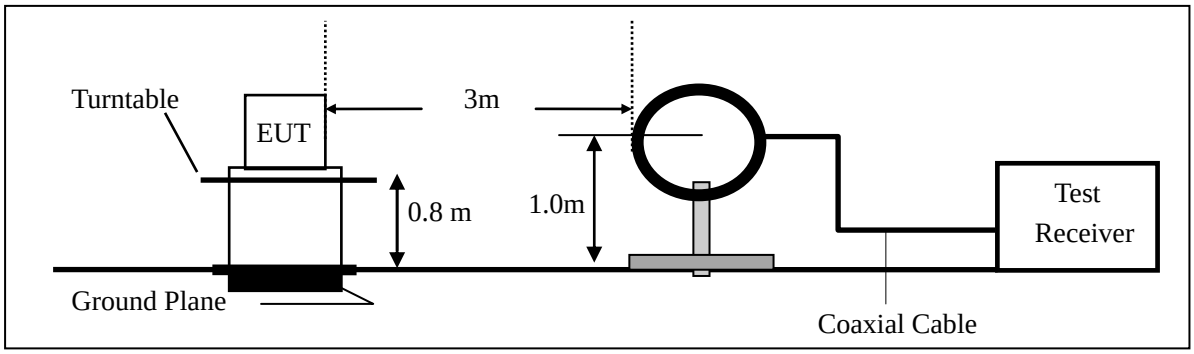
Remark :1. Emission level in dBuV/m=20 log (uV/m)
2. Measurement was performed at an antenna to the closed point of EUT distance of meters.
3. For Frequency 9kHz~30MHz:
Distance extrapolation factor =40log(Specific distance/ test distance)(dB);
Limit line=Specific limits(dBuV) + distance extrapolation factor.
For Frequency above 30MHz:
Distance extrapolation factor =20log(Specific distance/ test distance)(dB);
Limit line=Specific limits(dBuV) + distance extrapolation factor.

7.2.3 Measuring Instruments

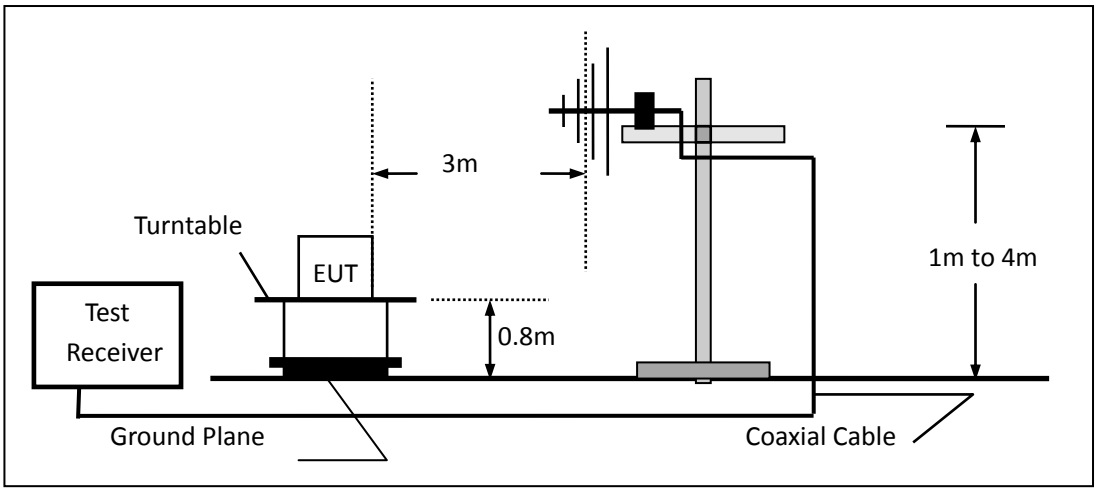
The Measuring equipment is listed in the section 6.3 of this test report.

7.2.4 Test Configuration

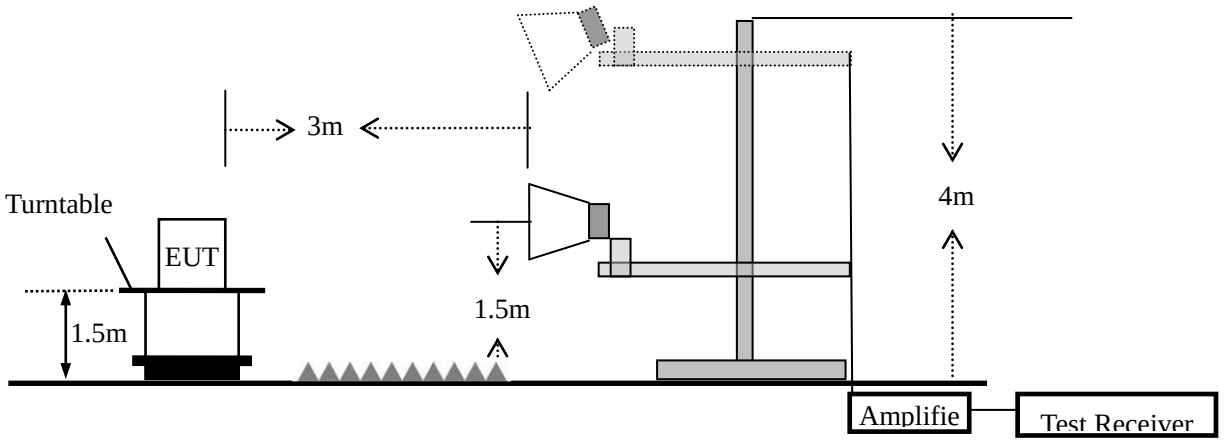
(a) For radiated emissions below 30MHz



(b) For radiated emissions from 30MHz to 1000MHz



(c) For radiated emissions above 1000MHz



7.2.5 Test Procedure

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4 dB according to the standards: ANSI C63.10-2013. The test distance is 3m.The setup is according to the requirements in Section 13.1.4.1 of ANSI C63.10-2013 and CAN/CSA-CEI/IEC CISPR 22.
This test is required for any spurious emission that falls in a Restricted Band, as defined in Section 15.205. It must be performed with the highest gain of each type of antenna proposed for use with the EUT.
Use the following spectrum analyzer settings:

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

a. The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
b. The EUT was placed on the top of a rotating table 0.8 m for below 1GHz and 1.5m for above 1GHz the ground at a 3 meter. The table was rotated 360 degrees to determine the position of the highest radiation.
c. The height of the equipment or of the substitution antenna shall be 0.8 m for below 1GHz and 1.5m for above 1GHz; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For the radiated emission test above 1GHz:
Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
e. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
f. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
g. For the actual test configuration, please refer to the related Item –EUT Test Photos.

Note:

Both horizontal and vertical antenna polarities were tested
and performed pretest to three orthogonal axis. The worst case emissions were reported

During the radiated emission test, the Spectrum Analyzer was set with the following configurations:

Frequency Band (MHz)	Function	Resolution bandwidth	Video Bandwidth
30 to 1000	QP	120 kHz	300 kHz
Above 1000	Peak	1 MHz	1 MHz
	Average	1 MHz	10 Hz

Note: for the frequency ranges below 30 MHz, a narrower RBW is used for these ranges but the measured value should add a RBW correction factor (RBWCF) where RBWCF [dB] =10*lg(100 [kHz]/narrower RBW [kHz]). , the narrower RBW is 1 kHz and RBWCF is 20 dB for the frequency 9 kHz to 150 kHz, and the narrower RBW is 10 kHz and RBWCF is 10 dB for the frequency 150 kHz to 30 MHz.

7.2.6 Test Results

■ Spurious Emission below 30MHz (9KHz to 30MHz)

EUT:	Pudu Watch	Model No.:	PW1
Temperature:	20 ℃	Relative Humidity:	48%
Test Mode:	Mode2/Mode3/Mode4	Test By:	Allen Liu

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
		PK	AV	PK	AV	PK	AV
--	--	--	--	--	--	--	--

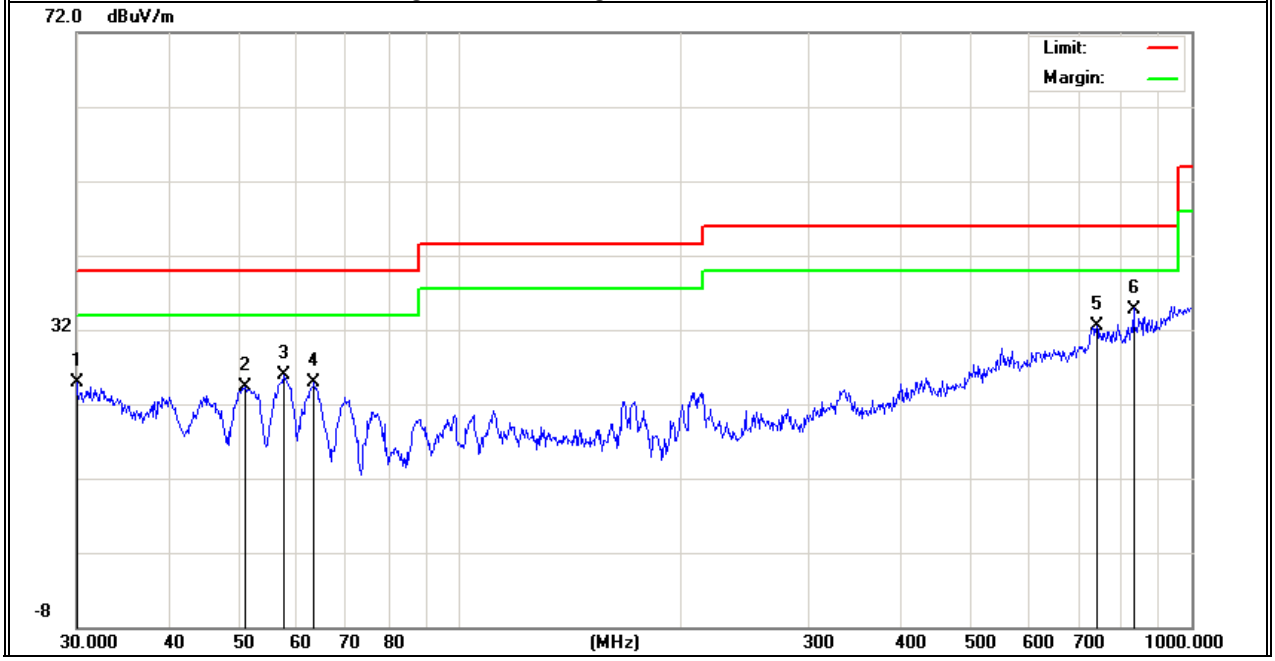
Note: the amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

■ Spurious Emission below 1GHz (30MHz to 1GHz)
All the modulation modes have been tested, and the worst result was report as below:

EUT：	Pudu Watch	Model Name ：	PW1
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010hPa	Test Mode：	Mode 1
Test Voltage ：	DC 3.7V		

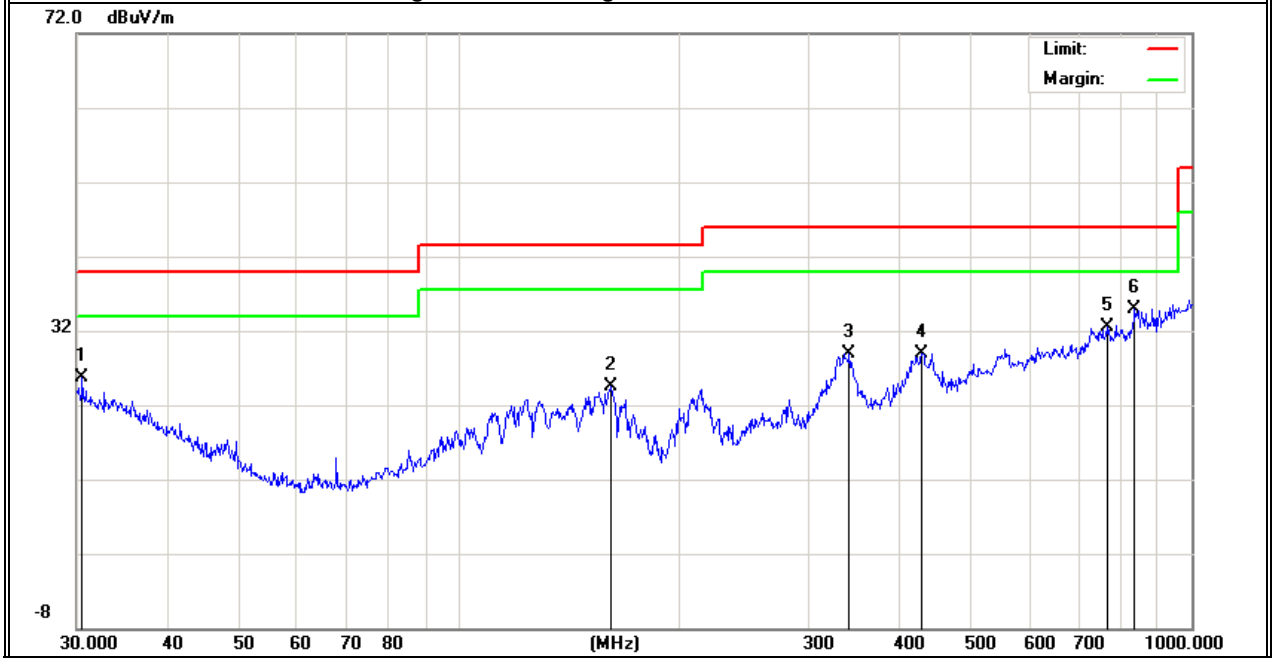
Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
V	30.0000	5.97	18.84	24.81	40.00	-15.19	QP
V	50.9420	15.83	8.44	24.27	40.00	-15.73	QP
V	57.5938	19.61	6.31	25.92	40.00	-14.08	QP
V	63.3132	18.67	6.15	24.82	40.00	-15.18	QP
V	742.2586	7.36	25.06	32.42	46.00	-13.58	QP
V	833.3170	8.99	25.81	34.80	46.00	-11.20	QP

Remark:
Emission Level = Meter Reading+ Factor, Margin= Emission Level - Limit



Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
H	30.5304	7.06	18.56	25.62	40.00	-14.38	QP
H	160.9088	13.75	10.75	24.50	43.50	-19.00	QP
H	340.7817	12.75	16.19	28.94	46.00	-17.06	QP
H	428.0192	10.55	18.28	28.83	46.00	-17.17	QP
H	766.0570	7.62	24.89	32.51	46.00	-13.49	QP
H	836.2441	9.05	25.95	35.00	46.00	-11.00	QP

Remark:
Emission Level = Meter Reading + Factor, Margin= Emission Level l - Limit



■ Spurious Emission Above 1GHz (1GHz to 25GHz)

EUT:	Pudu Watch	Model No.:	PW1
Temperature:	20 ℃	Relative Humidity:	48%
Test Mode:	Mode2/Mode3/Mode4	Test By:	Allen Liu

All the modulation modes have been tested, and the worst result was report as below:

Frequency	Read Level	Cable loss	Antenna Factor	Preamp Factor	Emission Level	Limits	Margin	Remark	Comment
(MHz)	(dBμV)	(dB)	dB/m	(dB)	(dBμV/m)	(dBμV/m)	(dB)		
Low Channel (903 MHz)--Above 1G									
1806	65.98	5.21	35.59	44.30	62.48	74.00	-11.52	Pk	Vertical
1806	43.64	5.21	35.59	44.30	40.14	54.00	-13.86	AV	Vertical
2709	62.90	6.48	36.27	44.60	61.05	74.00	-12.95	Pk	Vertical
2709	47.07	6.48	36.27	44.60	45.22	54.00	-8.78	AV	Vertical
1806	64.41	5.21	35.55	44.30	60.87	74.00	-13.13	Pk	Horizontal
1806	46.09	5.21	35.55	44.30	42.55	54.00	-11.45	AV	Horizontal
2709	65.91	6.48	36.27	44.52	64.14	74.00	-9.86	Pk	Horizontal
2709	50.30	6.48	36.27	44.52	48.53	54.00	-5.47	AV	Horizontal
Mid Channel (915MHz)--Above 1G									
1830	65.26	5.21	35.66	44.20	61.93	74.00	-12.07	Pk	Vertical
1830	45.04	5.21	35.66	44.20	41.71	54.00	-12.29	AV	Vertical
2745	63.36	7.10	36.50	44.43	62.53	74.00	-11.47	Pk	Vertical
2745	49.11	7.10	36.50	44.43	48.28	54.00	-5.72	AV	Vertical
1830	64.18	5.21	35.66	44.20	60.85	74.00	-13.15	Pk	Horizontal
1830	51.32	5.21	35.66	44.20	47.99	54.00	-6.01	AV	Horizontal
2745	63.17	7.10	36.50	44.43	62.34	74.00	-11.66	Pk	Horizontal
2745	45.20	7.10	36.50	44.43	44.37	54.00	-9.63	AV	Horizontal
High Channel (927 MHz)-- Above 1G									
1854	68.34	5.21	35.52	44.21	64.86	74.00	-9.14	Pk	Vertical
1854	46.54	5.21	35.52	44.21	43.06	54.00	-10.94	AV	Vertical
2781	64.82	7.10	36.53	44.60	63.85	74.00	-10.15	Pk	Vertical
2781	47.62	7.10	36.53	44.60	46.65	54.00	-7.35	AV	Vertical
1854	70.09	5.21	35.52	44.21	66.61	74.00	-7.39	Pk	Horizontal
1854	50.69	5.21	35.52	44.21	47.21	54.00	-6.79	AV	Horizontal
2781	63.99	7.10	36.53	44.60	63.02	74.00	-10.98	Pk	Horizontal
2781	47.44	7.10	36.53	44.60	46.47	54.00	-7.53	AV	Horizontal

Note:

(1) Emission Level= Antenna Factor + Cable Loss + Read Level - Preamp Factor

(2)All other emissions more than 20dB below the limit.

■ Spurious Emission in Restricted Band

EUT:	Pudu Watch	Model No.:	PW1
Temperature:	20 ℃	Relative Humidity:	48%
Test Mode:	Mode2/ Mode4	Test By:	Allen Liu

All the modulation modes have been tested, and the worst result was report as below:

Frequency	Reading Level	Cable Loss	Antenna Factor	Preamp Factor	Emission Level	Limits	Margin	Detector	Comment
(MHz)	(dBμV)	(dB)	dB/m	(dB)	(dBμV/m)	(dBμV/m)	(dB)	Type	
1240	61.3	4.04	29.57	44.70	50.21	74	-23.79	Pk	Vertical
1240	50.59	4.04	29.57	44.70	39.50	54	-14.50	AV	Vertical
1240	62.7	4.04	29.57	44.70	51.61	74	-22.39	Pk	Horizontal
1240	46.28	4.04	29.57	44.70	35.19	54	-18.81	AV	Horizontal

Note: (1) All other emissions more than 20dB below the limit.

7.3 NUMBER OF HOPPING CHANNEL

7.3.1 Applicable Standard

According to FCC Part 15.247(a)(1) (i)and ANSI C63.10-2013

7.3.2 Conformance Limit

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period.

7.3.3 Measuring Instruments

The Measuring equipment is listed in the section 6.3 of this test report.

7.3.4 Test Setup

Please refer to Section 6.1 of this test report.

7.3.5 Test Procedure

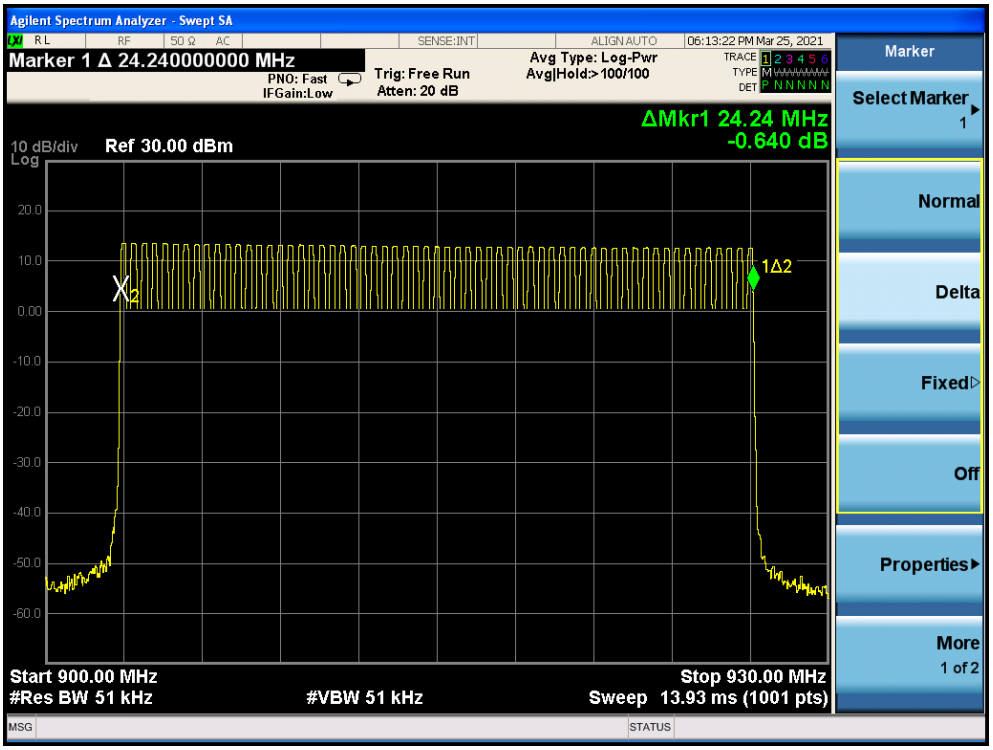
The testing follows ANSI C63.10-2013 clause 7.8.3
The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator.
The path loss was compensated to the results for each measurement.
Set to the maximum power setting and enable the EUT transmit continuously.
The EUT must have its hopping function enabled.
Use the following spectrum analyzer settings:
Span = the frequency band of operation
RBW : To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold

7.3.6 Test Results

EUT:	Pudu Watch	Model No.:	PW1
Temperature:	20 ℃	Relative Humidity:	48%
Test Mode:	Mode 5(1Mbps)	Test By:	Allen Liu

Number of Hopping (Channel):	61

Number of Hopping Channel Plot



7.4 HOPPING CHANNEL SEPARATION MEASUREMENT

7.4.1 Applicable Standard

According to FCC Part 15.247(a) (1) and ANSI C63.10-2013

7.4.2 Conformance Limit

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

7.4.3 Measuring Instruments

The Measuring equipment is listed in the section 6.3 of this test report.

7.4.4 Test Setup

Please refer to Section 6.1 of this test report.

7.4.5 Test Procedure

The testing follows ANSI C63.10-2013 clause 7.8.2
The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator.
The path loss was compensated to the results for each measurement.
Set to the maximum power setting and enable the EUT transmit continuously.
The EUT was operating in controlled its channel.
Use the following spectrum analyzer settings:
Span = Measurement Bandwidth or Channel Separation
RBW: Start with the RBW set to approximately 3% of the channel spacing; adjust as necessary to best identify the center of each individual channel.
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold

7.4.6 Test Results

EUT:	Pudu Watch	Model No.:	PW1
Temperature:	20 ℃	Relative Humidity:	48%
Test Mode:	Mode2/Mode3/Mode4	Test By:	Allen Liu

Modulation Mode	Channel Number	Channel Frequency (MHz)	Measured Channel Separation (kHz)	Limit (kHz)		Verdict
LoRa	00-01	903	401	> 139	20dB BW	PASS
	30-31	915	397	> 135.3	20dB BW	PASS
	59-60	927	398	> 136.5	20dB BW	PASS

Test Plot

Channel Separation plot on channel 00-01

Channel Separation plot on channel 30-31

Channel Separation plot on channel 59-60

7.5 AVERAGE TIME OF OCCUPANCY (DWELL TIME)

7.5.1 Applicable Standard

According to FCC Part 15.247(a)(1)(i)) and ANSI C63.10-2013

7.5.2 Conformance Limit

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

7.5.3 Measuring Instruments

The Measuring equipment is listed in the section 6.3 of this test report.

7.5.4 Test Setup

Please refer to Section 6.1 of this test report.

7.5.5 Test Procedure

The testing follows ANSI C63.10-2013 clause 7.8.4
The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator.
The path loss was compensated to the results for each measurement.
Set to the maximum power setting and enable the EUT transmit continuously.
The EUT must have its hopping function enabled.
Use the following spectrum analyzer settings:
Span = zero span, centered on a hopping channel
RBW ≥ 1MHz
VBW ≥ RBW
Sweep = as necessary to capture the entire dwell time per hopping channel
Detector function = peak
Trace = max hold
Measure the maximum time duration of one single pulse.
Set the EUT packet transmitting.
Measure the maximum time duration of one single pulse.

7.5.6 Test Results

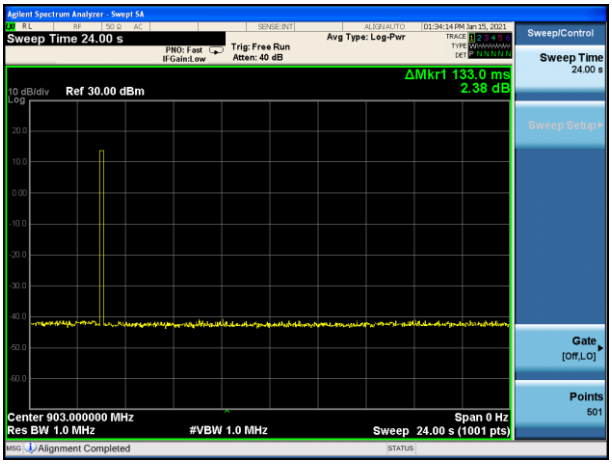
EUT:	Pudu Watch	Model No.:	PW1
Temperature:	20 ℃	Relative Humidity:	48%
Test Mode:	Mode2/Mode3/Mode4	Test By:	Allen Liu

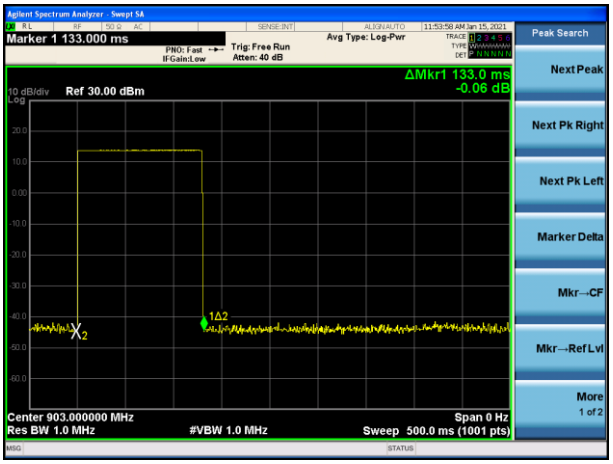
Data Rate (DR)	Center Frequency (MHz)	Transmit Time per Hop (ms)	The Number of Hop Within a limited time (N)	Dwell Time (s)	Limits (s)	Result
0	903	133	1	0.133	0.4	Pass
30	915	131	1	0.131	0.4	Pass
60	927	131.5	1	0.1315	0.4	Pass

Note:
1. Dwell Time(s) = Transmit Timeper Hop× N.

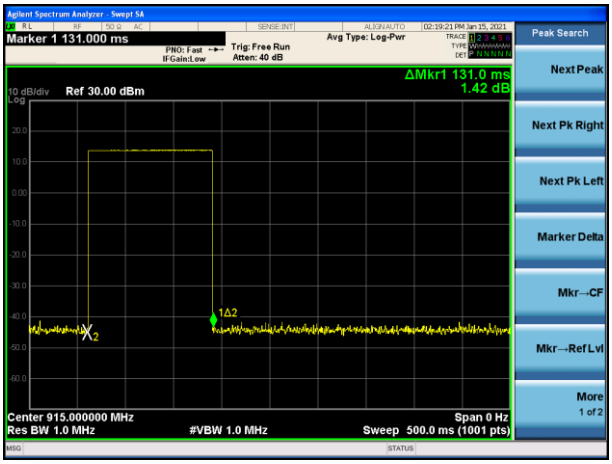
Test Plot

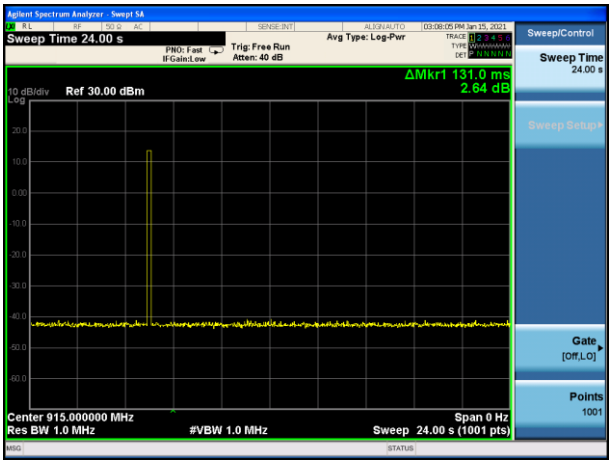
DR=0



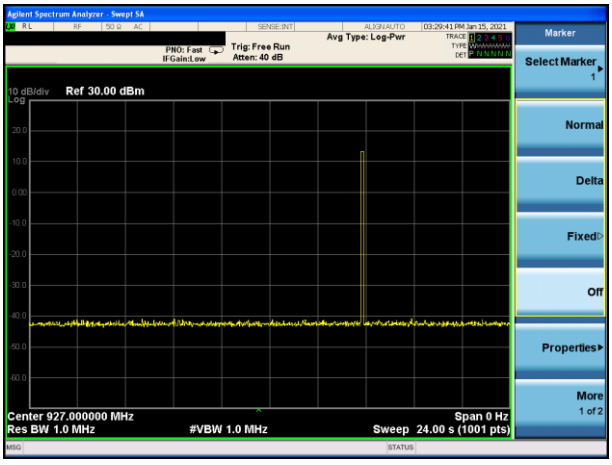


DR=30





DR=60



Pseudorandom Frequency Hopping Sequence
Each frequency used equally on the average by each transmitter.
The channel order is determined by the Channel mapping Table, system receivers have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies in synchronization with the transmitted signals

Pseudo-random sequence Table

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	903	32	915.8
1	903.4	33	916.2
2	903.8	34	916.6
3	904.2	35	917
4	904.6	36	917.4
5	905	37	917.8
6	905.4	38	918.2
7	905.8	39	918.6
8	906.2	40	919
9	906.6	41	919.4
10	907	42	919.8
11	907.4	43	920.2
12	907.8	44	920.6
13	908.2	45	921
14	908.6	46	921.4
15	909	47	921.8
16	909.4	48	922.2
17	909.8	49	922.6
18	910.2	50	923
19	910.6	51	923.4
20	911	52	923.8
21	911.4	53	924.2
22	911.8	54	924.6
23	912.2	55	925
24	912.6	56	925.4
25	913	57	925.8
26	913.4	58	926.2
27	913.8	59	926.6
28	914.2	60	927
29	914.6		
30	915		
31	915.4		

7.6 20DB BANDWIDTH TEST

7.6.1 Applicable Standard

According to FCC Part 15.247(a)(1) and ANSI C63.10-2013

7.6.2 Conformance Limit

No limit requirement.

7.6.3 Measuring Instruments

The Measuring equipment is listed in the section 6.3 of this test report.

7.6.4 Test Setup

Please refer to Section 6.1 of this test report.

7.6.5 Test Procedure

The testing follows ANSI C63.10-2013 clause 6.9.2
The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator.
The path loss was compensated to the results for each measurement.
Set to the maximum power setting and enable the EUT transmit continuously.
The EUT was operating in controlled its channel.
Use the following spectrum analyzer settings:
Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel
RBW ≥ 1% of the 20 dB bandwidth
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold

7.6.6 Test Results

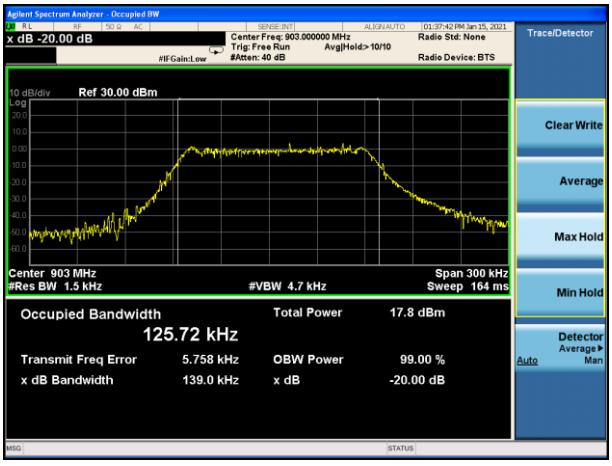
EUT:	Pudu Watch	Model No.:	PW1
Temperature:	20 ℃	Relative Humidity:	48%
Test Mode:	Mode2/Mode3/Mode4	Test By:	Allen Liu

Test Channel	Frequency (MHz)	Measured Bandwidth (KHz)	Limit (kHz)	Verdict
1Mbps				
0	903	139	N/A	PASS
30	915	135.3	N/A	PASS
60	927	136.5	N/A	PASS

Note: N/A (Not Applicable)

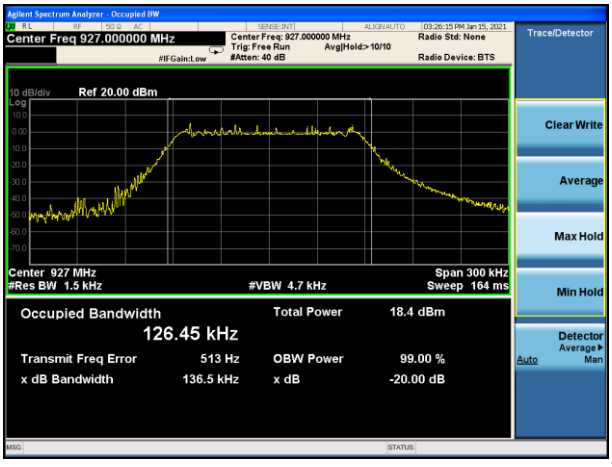
Test Plot

20dB Bandwidth plot on channel 0



20dB Bandwidth plot on channel 30

20dB Bandwidth plot on channel 60



7.7 PEAK OUTPUT POWER

7.7.1 Applicable Standard

According to FCC Part 15.247(b)(1) and ANSI C63.10-2013

7.7.2 Conformance Limit

For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.

7.7.3 Measuring Instruments

The Measuring equipment is listed in the section 6.3 of this test report.

7.7.4 Test Setup

Please refer to Section 6.1 of this test report.

7.7.5 Test Procedure

The testing follows ANSI C63.10-2013 clause 7.8.5.
The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator.
The path loss was compensated to the results for each measurement.
Set to the maximum power setting and enable the EUT transmit continuously.
The EUT was operating in controlled its channel.
Use the following spectrum analyzer settings:
Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel
RBW ≥ the 20 dB bandwidth of the emission being measured
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold

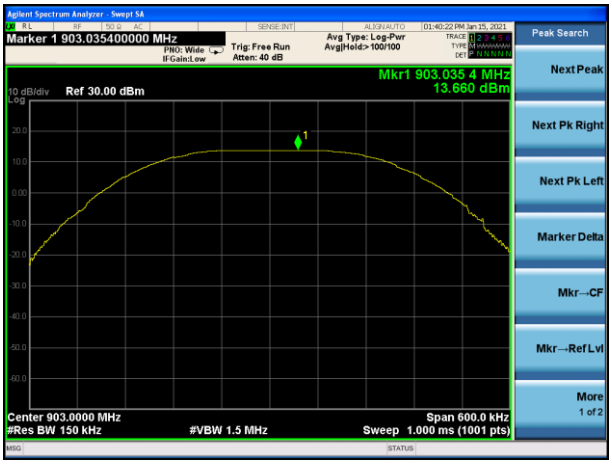
7.7.6 Test Results

EUT:	Pudu Watch	Model No.:	PW1
Temperature:	20 ℃	Relative Humidity:	48%
Test Mode:	Mode2/Mode3/Mode4	Test By:	Allen Liu

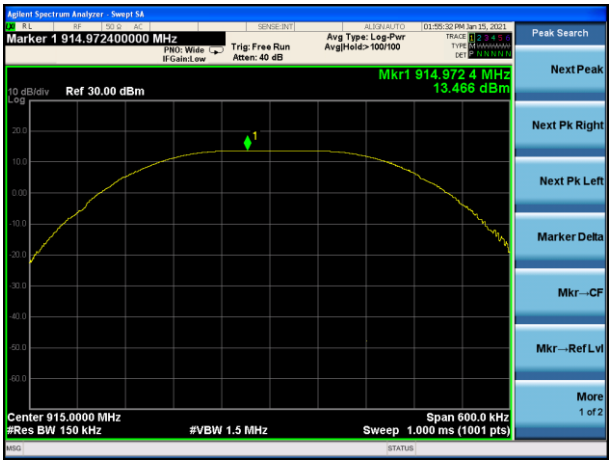
Test Channel	Frequency (MHz)	Power Setting	Peak Output Power (dBm)	LIMIT (dBm)	Verdict
3.5Kbps					
0	903	Default	13.66	30	PASS
30	915	Default	13.466	30	PASS
60	927	Default	13.332	30	PASS

Test Plot

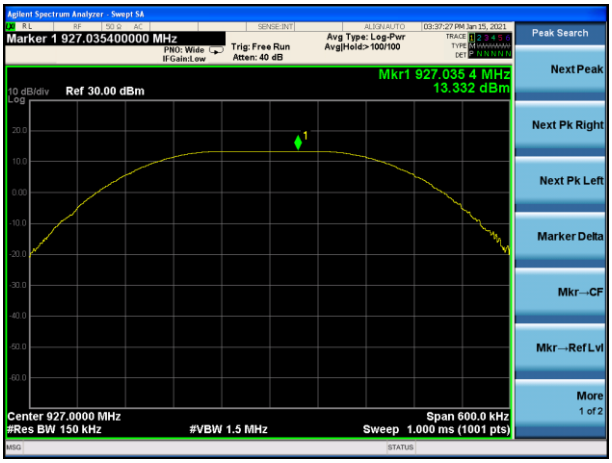
Peak output Power plot on channel 0



Peak output Power plot on channel 30



Peak output Power plot on channel 60



7.8 CONDUCTED BAND EDGE MEASUREMENT

7.8.1 Applicable Standard

According to FCC Part 15.247(d) and ANSI C63.10-2013

7.8.2 Conformance Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

7.8.3 Measuring Instruments

The Measuring equipment is listed in the section 6.3 of this test report.

7.8.4 Test Setup

Please refer to Section 6.1 of this test report.

7.8.5 Test Procedure

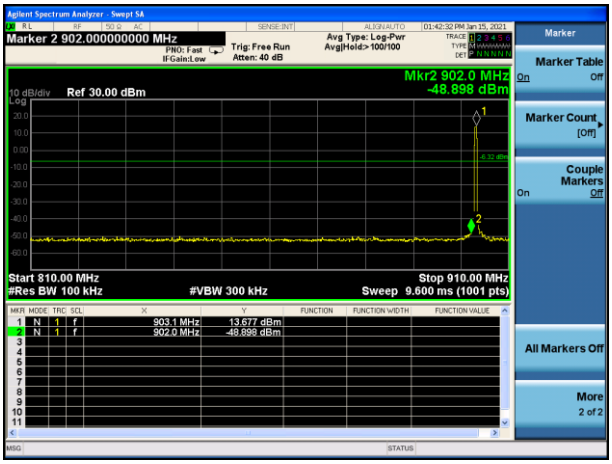
The testing follows ANSI C63.10-2013 clause 7.8.6.
The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator.
The path loss was compensated to the results for each measurement.
Set to the maximum power setting and enable the EUT transmit continuously.
The EUT must have its hopping function enabled.
Use the following spectrum analyzer settings:
Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel
RBW = 100KHz
VBW = 300KHz
Band edge emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100kHz RBW. The attenuation shall be 30 dB instead of 20 dB when RMS conducted output power procedure is used.
Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
Repeat above procedures until all measured frequencies were complete.

7.8.6 Test Results

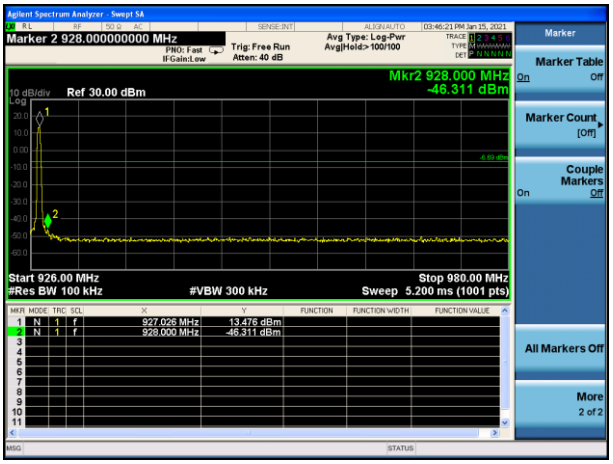
EUT:	Pudu Watch	Model No.:	PW1
Temperature:	20 ℃	Relative Humidity:	48%
Test Mode:	Mode2 /Mode4/ Mode 5	Test By:	Allen Liu

Test Plot For FHSS System

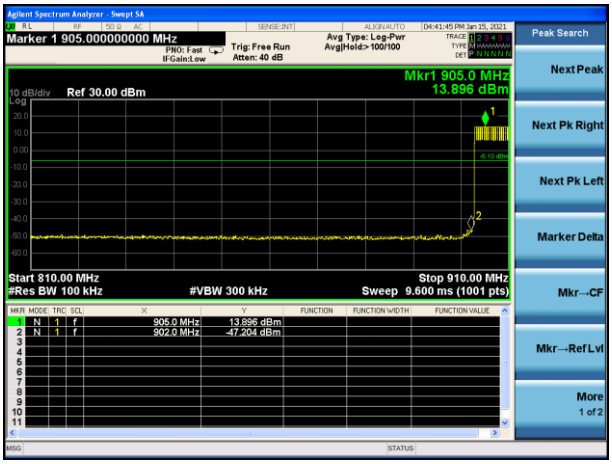
Band Edge-Low Channel



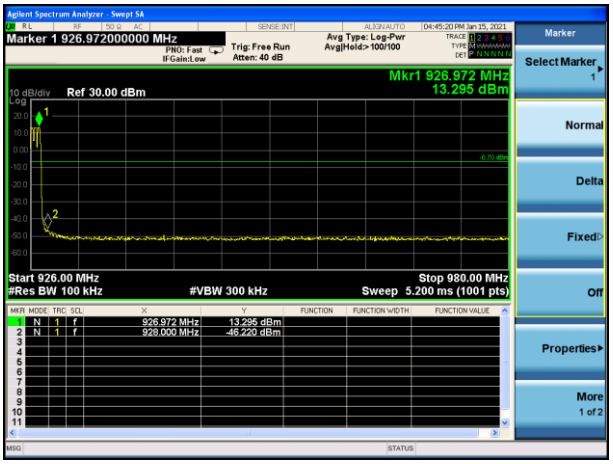
Band Edge-High Channel



Band Edge-Low Channel (Hopping Mode)



Band Edge-High Channel (Hopping Mode)



7.9 SPURIOUS RF CONDUCTED EMISSION

7.9.1 Applicable Standard

According to FCC Part 15.247(d) and ANSI C63.10-2013.

7.9.2 Conformance Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

7.9.3 Measuring Instruments

The Measuring equipment is listed in the section 6.3 of this test report.

7.9.4 Test Setup

Please refer to Section 6.1 of this test report.

7.9.5 Test Procedure

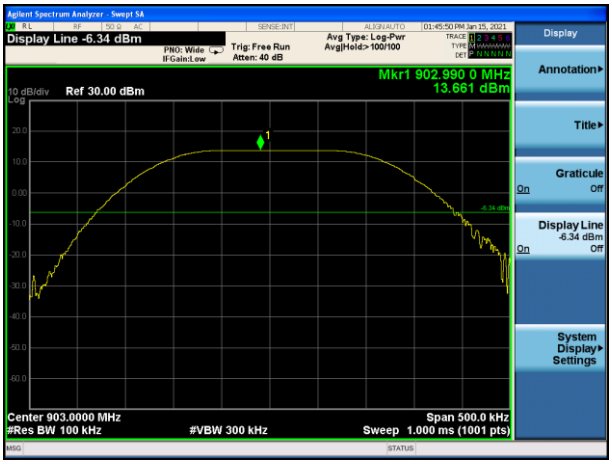
Establish an emission level by using the following procedure:
a) Set the center frequency and span to encompass frequency range to be measured.
b) Set the RBW = 100 kHz.
c) Set the VBW ≥ [3 × RBW].
d) Detector = peak.
e) Sweep time = auto couple.
f) Trace mode = max hold.
g) Allow trace to fully stabilize.
h) Use the peak marker function to determine the maximum amplitude level.
Then the limit shall be attenuated by at least 20 dB relative to the maximum amplitude level in 100 kHz.

7.9.6 Test Results

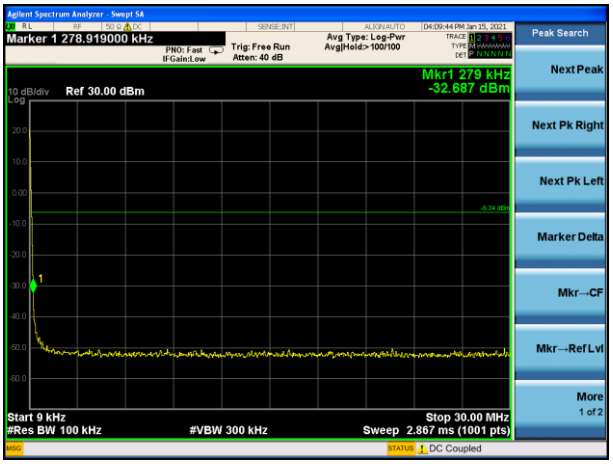
Remark: The measurement frequency range is from 9KHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions and bandege measurement data.

Test Plot For FHSS System

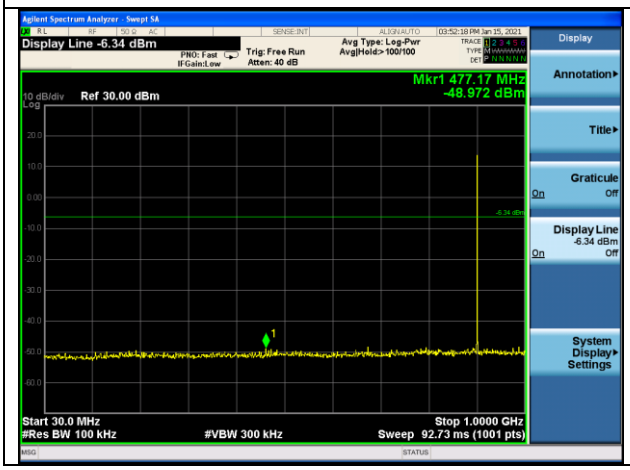
Channel 0



Channel 0

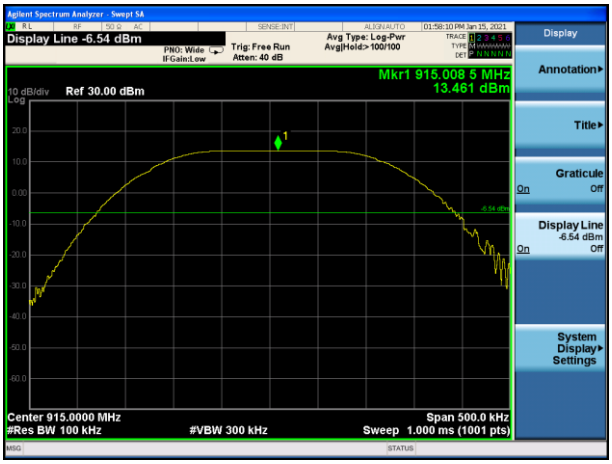
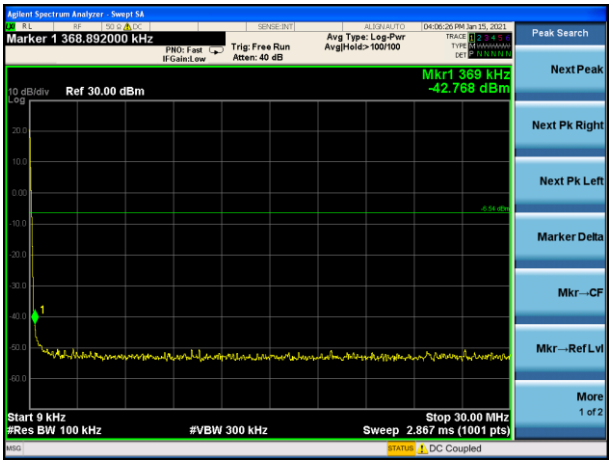
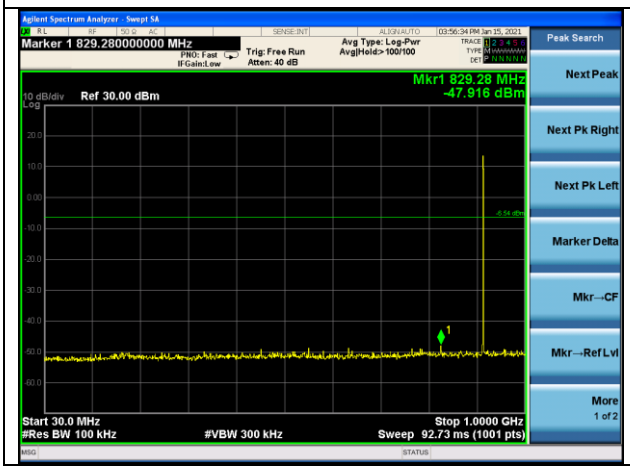


Channel 0



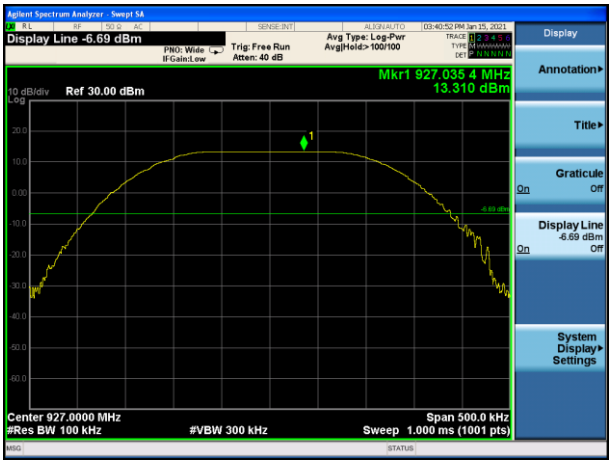
Channel 0

Test Plot For FHSS System

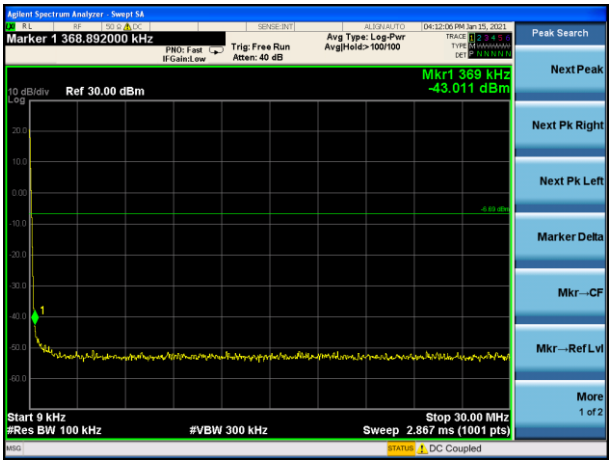
Channel 30	Channel 30
	
Channel 30	**Channel 30**
	

Test Plot

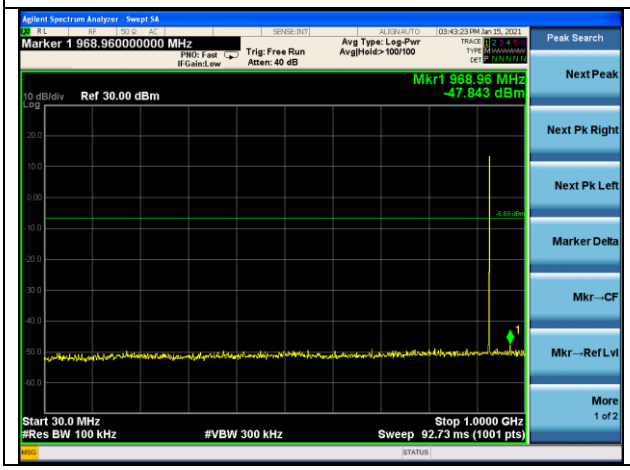
Channel 60



Channel 60



Channel 60



Channel 60

7.10 ANTENNA APPLICATION

7.10.1 Antenna Requirement

15.203 requirement: For intentional device, according to 15.203: an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible partyshall be used with the device.

7.10.2 Result

The EUT antenna is permanent attached Spring antenna (Gain: -9.7 dBm). It comply with the standard requirement.

END OF REPORT