

FCC CERTIFICATION TEST REPORT FOR

FCC ID:QT4-WS4392
IC:22090-WS4392

Report Reference No. : 16FAS10014 11
Date of issue : 2016-10-25
FCC 2.948 No : 923232
IC Registration Number : 110033A-1
Testing Laboratory : ATT Product Service Co., Ltd.
Address : No. 3, ChangLianShan Industrial Park, ChangAn Town,
DongGuan City, GuangDong, China.
Applicant's name..... : Well Shin Technology Co.,Ltd.
Address : No. 196, Xin Hu 3rd Road Nei Hu District Taipei City 114
Taiwan 523766 China.
Manufacturer : Same as applicant
Address : Same as applicant
Test specification:
Test item description..... : Portable SmartHub
Trade Mark..... : N/A
Model/Type reference : WS-439-2
Ratings..... : I/P: 100-240V,50/60Hz,0.2A
U/P: USB 5V/1A Max

Responsible Engineer :


Lake Hu

Approved by:

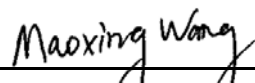

Maoxing Wang

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TEST REPORT DECLARE

Applicant	:	Well Shin Technology Co.,Ltd.
Address	:	No. 196, Xin Hu 3rd Road Nei Hu District Taipei City 114 Taiwan 523766 China.
Equipment under Test	:	Portable SmartHub
Model No	:	WS-439-2
Trade Mark	:	N/A
Manufacturer	:	Well Shin Technology Co.,Ltd.
Address	:	No. 196, Xin Hu 3rd Road Nei Hu District Taipei City 114 Taiwan 523766 China.

Test Standard Used: FCC Rules and Regulations Part 15 Subpart C: 2015

RSS-210 Issue 9 August 2016; RSS-GEN ISSUE 4 NOV 2014

Test procedure used: ANSI C63.10:2013

We Declare:

The equipment described above is tested by ATT Product Service Co., Ltd. and in the configuration tested the equipment complied with the standards specified above. The test results are contained in this test report and ATT Product Service Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests.

After test and evaluation, our opinion is that the equipment provided for test compliance with the requirement of the above FCC standards.

Report No:	16FAS10014 11		
Date of Test:	2016-10-11~2016-10-24	Date of Report:	2016-10-25

Note: This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of ATT Product Service Co., Ltd.

1. Summary of test Standards and results

The EUT have been tested according to the applicable standards as referenced below.

Description of Test Item	Standard	Results
Antenna requirement	FCC Part 15. 203 RSS-Gen:8.3	PASS
Conducted limits	FCC Part 15.207(a) RSS-Gen:8.8	PASS
Conditions for intentional radiators to comply with periodic pperation	FCC Part 15.231(b) RSS-210:A.1.1 a	PASS
Field strength emissions	FCC Part 15.231(b) RSS-210:A.1.2	PASS
Emission bandwidth	FCC Part 15.231(c) RSS-210:A.1.3	PASS

Note: (1) N/A" denotes test is not applicable in this Test Report

2. General test information

2.1 ACCREDITATIONS

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

USA	FCC	Registration Number :923232
Canada	INDUSTRY CANADA	Registration Number 11033A-1

2.2 Description of EUT

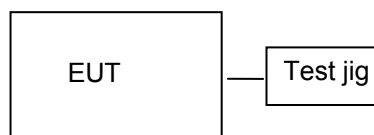
EUT* Name	:	Portable SmartHub
Model Number	:	WS-439-2
Trade Mark	:	N/A
EUT function description	:	Please reference user manual of this device
Power supply	:	AC 120V/60Hz
Operation frequency	:	433.3MHz
Modulation	:	ASK
Antenna Type	:	Copper wire Antenna,max PK gain: 0 dBi
Date of Receipt	:	2016-10-11
Sample Type	:	Sole production
HVIN	:	WS_RM08K_V3.5
FVIN	:	HLK_RM08M_V3.2

Note: EUT is the ab. of equipment under test.

2.3 Accessories of EUT

Description of Accessories	Manufacturer	Model number or Type	Other
Notebook	acer	Aspire E1-472G	FCC DoC

2.4 Block diagram of EUT configuration for test



2.5 Test environment conditions

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

Temperature range:	21-25°C
Humidity range:	40-75%
Pressure range:	86-106kPa

2.6 Measurement uncertainty

Test Item	Uncertainty
Uncertainty for Conduction emission test	2.44dB
Uncertainty for Radiation Emission test (150KHz-30MHz)	3.21dB
Uncertainty for Radiation Emission test (30MHz-1GHz)	3.14 dB (Polarize: V)
	3.16 dB (Polarize: H)
Uncertainty for Radiation Emission test (1GHz to 25GHz)	2.08dB(Polarize: V)
	2.56dB (Polarize: H)
Uncertainty for radio frequency	1×10 ⁻⁹
Uncertainty for conducted RF Power	0.65dB

Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

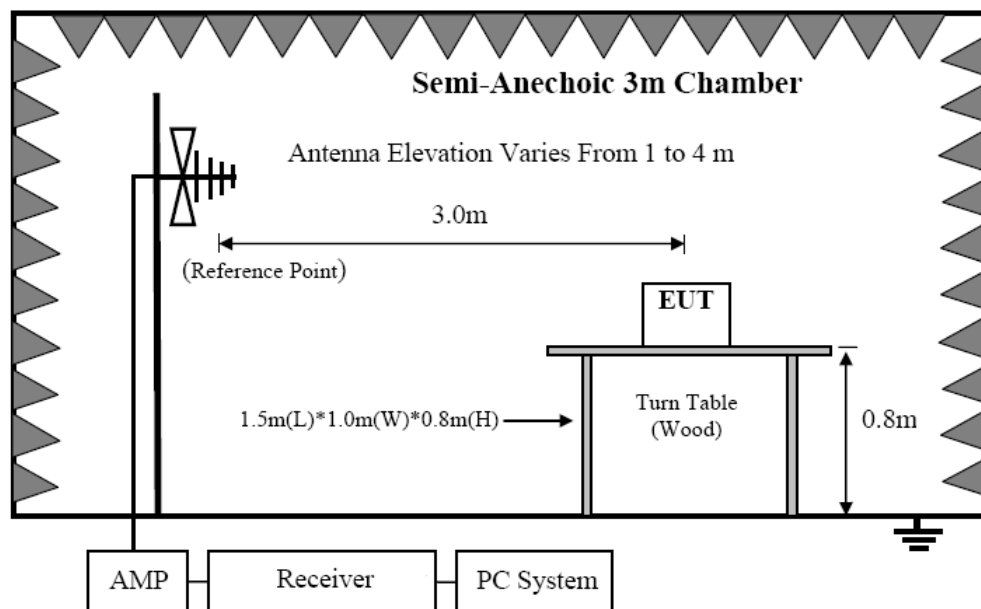
3. Radiated emission

3.1 Test equipment

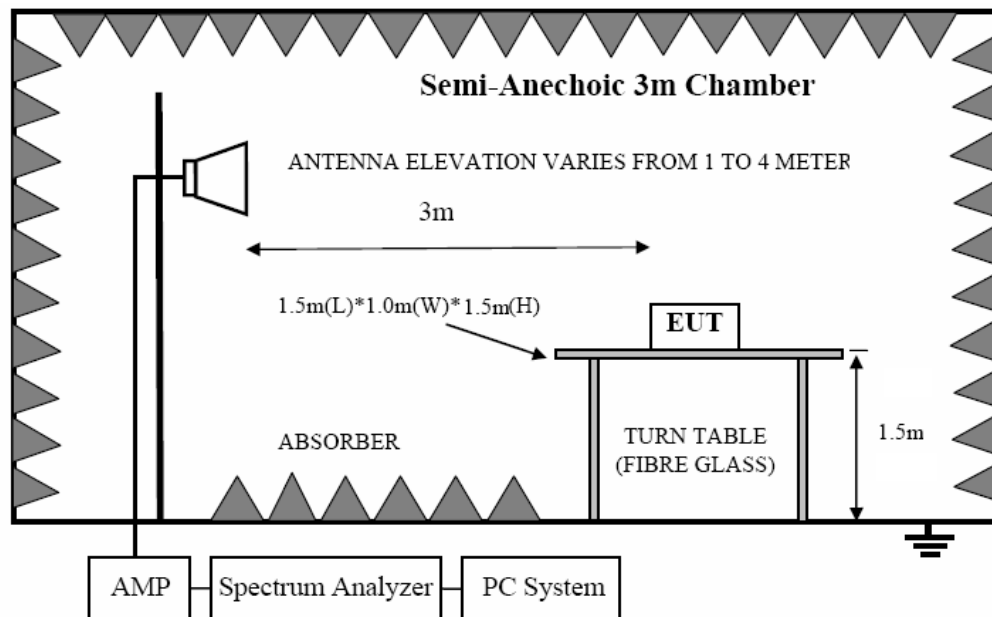
Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until	Calibrated Date
1	EMI Test Receiver	R&S	ESCI	101307	2016/12/19	2015/12/20
2	Spectrum analyzer	Agilent	E4407B	US40240708	2017/07/08	2016/07/09
3	Loop antenna	Chase	HLA6120	20129	2016/12/19	2015/12/20
4	Trilog Broadband Antenna	Schwarzbeck	VULB9163	9163-462	2016/12/19	2015/12/20
5	Double Ridged Horn Antenna	Schwarzbeck	BBHA9120D	9120D 1065	2016/12/19	2015/12/20
6	Pre-Amplifier	R&S	SCU-01	10049	2016/12/19	2015/12/20
7	Pre-amplifier	A.H.	PAM0-0118	360	2016/12/19	2015/12/20
8	RF Cable	R&S	R01	10403	2016/12/19	2015/12/20
9	RF Cable	R&S	R02	10512	2016/12/19	2015/12/20

3.2 Block diagram of test setup

In 3m Anechoic Chamber Test Setup Diagram for below 1GHz



In 3m Anechoic Chamber Test Setup Diagram for frequency above 1GHz



Note: For harmonic emissions test a appropriate high pass filter was inserted in the input port of AMP

3.3 Limits

In addition to the provisions of &15.205 and &15.209, the field strength of emissions from intentional radiators

FCC &15.209 Limit at 3m

Frequency	Distance	Field Strength	
MHz	Meter	$\mu\text{V/m}$	$\text{dB}\mu\text{V/m}$
0.009–0.490	300-3	$2400/F(\text{kHz})$	128.5-93.8
0.490–1.705	30-3	$24000/F(\text{kHz})$	93.8-62.9
1.705–30.0	30-3	30	62.9-40.0
30 to 88	3	100	40.0
88 to 216	3	150	43.5
216 to 960	3	200	46.0
Above 960	3	500	54.0

Frequency range GHz	Average limit $\text{dB}(\mu\text{V/m})$	Peak limit $\text{dB}(\mu\text{V/m})$
Above 1000	54	74

Operated under this section shall not exceed the following:

Fundamental frequency (MHz)	Field strength of fundamental		Field strength of spurious emissions	
	uV/m	dBuV/m	uV/m	dBuV/m
40.66-40.70	2250	67	225	47
70-130	1250	61.9	125	41.9
130-174	1250 to 3750	61.9-71.5	125 to 375	41.9 to 51.5
174-260	3750	71.5	375	51.5
260-470	3750 to 12500	71.5-81.94	375 to 1250	51.5 to 61.9
Above 470	12500	81.94	1250	61.9

* Linear interpolation with frequency, f, in MHz:

For 260-470 MHz: Field Strength ($\mu\text{V/m}$) = $(41.67 \times f) - 7083$

3.4 Test Procedure

- (1) EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber.
- (2) Test antenna was located 3m from the EUT on an adjustable mast.
- (3) Spectrum frequency from 30MHz to 4.5GHz (tenth harmonic of fundamental frequency) was swept Note: According FCC 15.33(a) the spectrum shall be investigated from the lowest radio frequency signal generated in the device. so radiated emissions were investigated start from 30MHz. Below pre-scan procedure was first performed in order to find prominent radiated emissions.
 - (a) Change work frequency or channel of device if practicable.
 - (b) Change modulation type of device if practicable.
 - (c) Change power supply range from 85% to 115% of the rated supply voltage.
 - (d) Adjust the EUT's antenna length and position is practicable.
 - (e) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produce highest emissions.
 - (f) Rotated EUT from 0 degree to 360 degree and varied test antenna height from 1m to 4m in both horizontal and vertical polarities.
- (4) When the relative maximum emissions were swept in step 4, holding the EUT's state, use the follow procedures to measure out the final emissions of device.
 - (a) Marked to the interested frequency point with appropriate span to see the whole signal wave.
 - (b) For emissions below 1GHz except fundamental, the Spectrum Analyzer's RBW is set at 120 KHz, VBW is set at 300 KHz, for emissions above 1GHz except fundamental, the Spectrum Analyzer's RBW is set at 1MHz, and VBW is set at 3MHz. For fundamental emission the Spectrum Analyzer's RBW is set at 200 KHz (above 20dB bandwidth of fundamental signal), and VBW is set at 300 KHz.
 - (c) At each measured frequency point, the maximum Peak levels were measured by rotated EUT and varied test antenna.
- (5) The duty cycle factor was use to calculate Average Level as below formula:

$$\text{Average level} = \text{PK Level} + \text{duty cycle factor}$$

3.5 Test Result

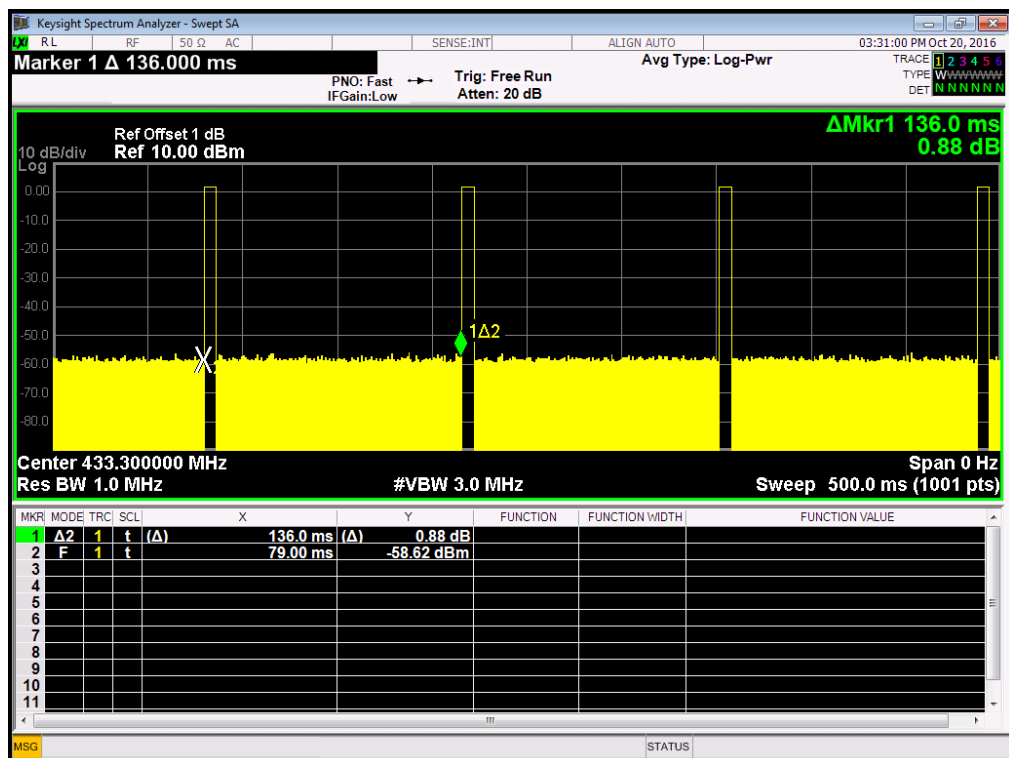
PASS. (See below detailed test result)

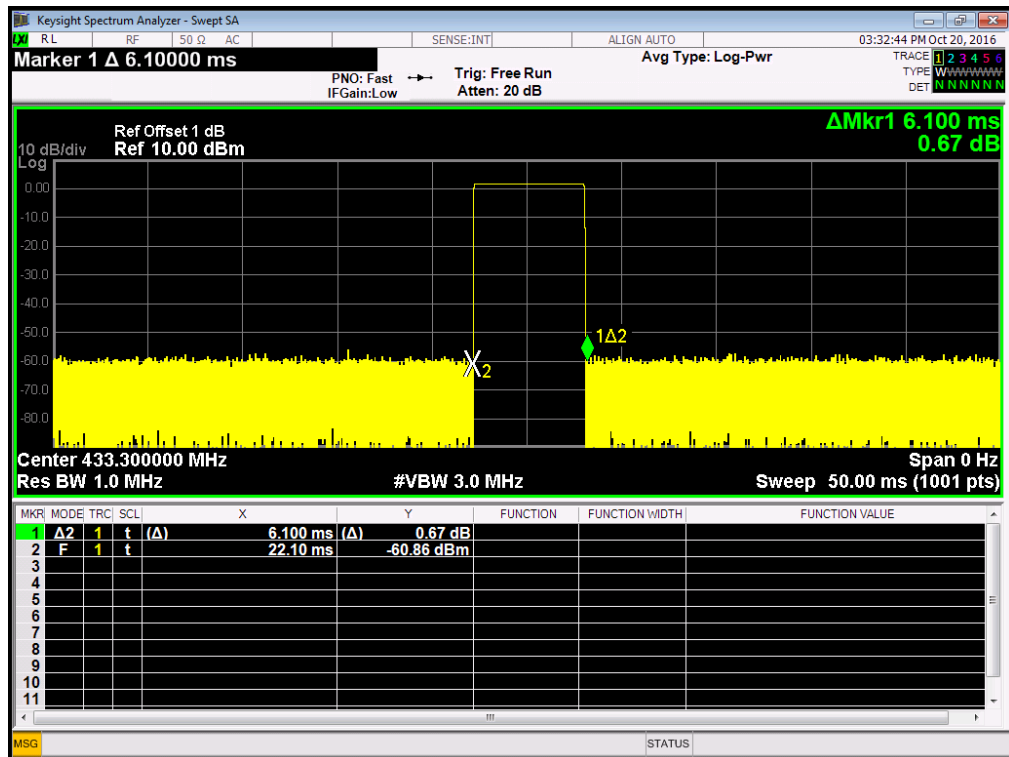
The frequency range from 30MHz to 4500MHz was investigated. When PK measured levels comply with average limit, then the average levels were deemed to comply with average limit. When PK measured levels exceed average limit, and, Duty cycle factor is used to calculate average level. Vertical and Horizontal mode all have been tested, Vertical mode is the worse case

$$\text{Duty cycle}(x) = (6.1\text{ms}/100\text{ms}) * 100\% = 6.1\%$$

$$\text{Duty cycle factor} = 20 \log(x) = -24.29\text{dB}$$

duty cycle:





Radiated Emission Test Result

Below 30M

EUT:	Portable SmartHub	Model No.:	WS-439-2
Temperature:	24℃	Relative Humidity:	55%
Distance:	3m	Test Power:	AC 120V/60Hz
Polarization:	/	Test Result:	Pass
Test Mode:	Keeping TX mode	Test By:	Lake

Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	P
--	--	--	--	P

Note:

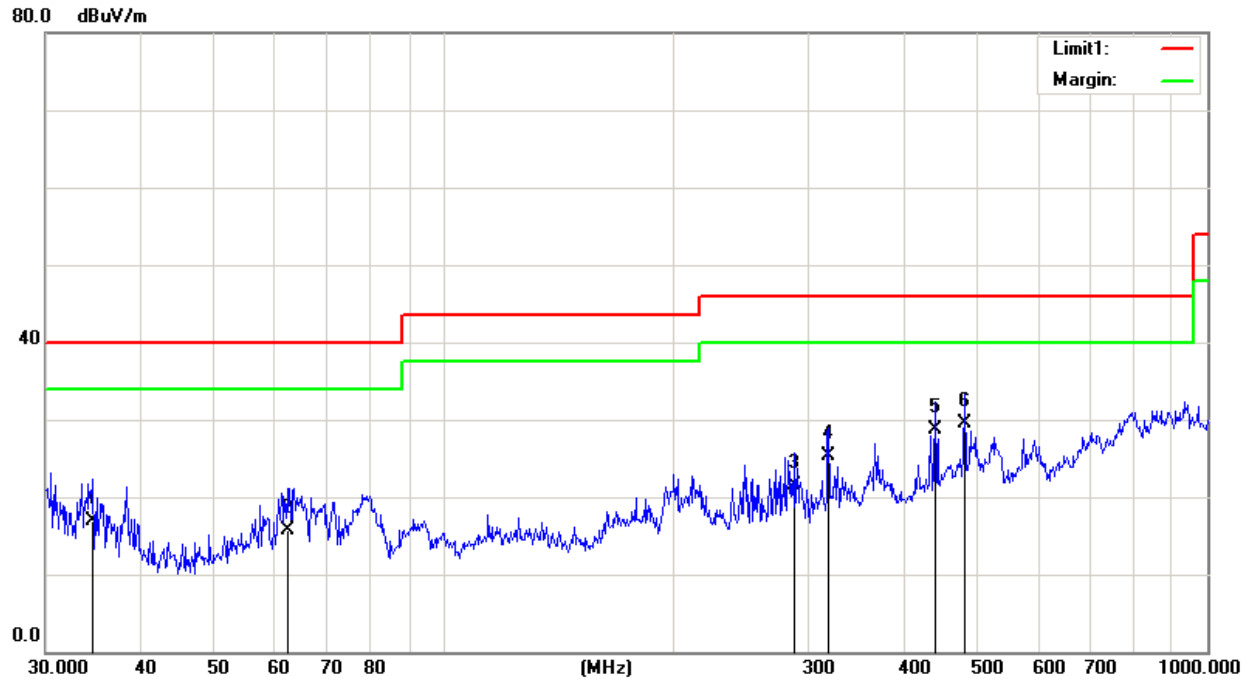
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor = $20 \log (\text{specific distance}/\text{test distance})(\text{dB})$;

Limit line = specific limits(dBuv) + distance extrapolation factor

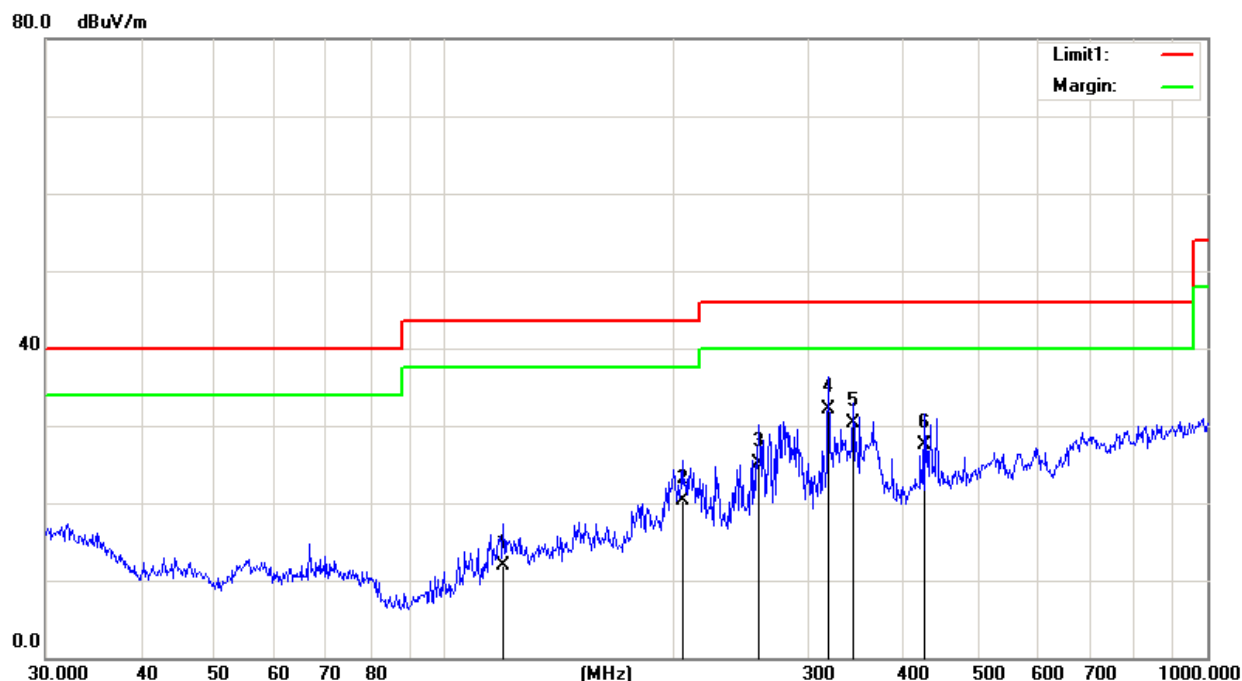
Between 30M – 1000 MHz

EUT:	Portable SmartHub	Model No.:	WS-439-2
Temperature:	24	Relative Humidity:	55%
Distance:	3m	Test Power:	AC 120V/60Hz
Polarization:	Vertical	Test Result:	Pass
Standard:	FCC PART 15 class C 3m	Test By:	Lake
Test Mode:	Keeping TX Mdoe		



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	34.6385	28.51	-11.66	16.85	40.00	-23.15	QP
2	62.2128	26.93	-11.24	15.69	40.00	-24.31	QP
3	287.9904	28.38	-6.79	21.59	46.00	-24.41	QP
4	318.8170	31.65	-6.31	25.34	46.00	-20.66	QP
5	440.1963	32.08	-3.42	28.66	46.00	-17.34	QP
6	480.5276	31.71	-2.22	29.49	46.00	-16.51	QP

EUT:	Portable SmartHub	Model No.:	WS-439-2
Temperature:	24	Relative Humidity:	55%
Distance:	3m	Test Power:	AC 120V/60Hz
Polarization:	Horizontal	Test Result:	Pass
Standard:	FCC PART 15 class C 3m	Test By:	Lake
Test Mode:	Keeping TX Mdoe		



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	119.4360	25.71	-13.82	11.89	43.50	-31.61	QP
2	204.9550	33.85	-13.51	20.34	43.50	-23.16	QP
3	258.3263	33.97	-8.90	25.07	46.00	-20.93	QP
4	318.8170	39.47	-7.31	32.16	46.00	-13.84	QP
5	343.1800	37.16	-6.81	30.35	46.00	-15.65	QP
6	425.0280	31.27	-3.86	27.41	46.00	-18.59	QP

Between 30M – 6000 MHz

Test Site : 3m Chamber

Test Date : 2016-10-15

EUT : Portable SmartHub

Power Supply : AC 120V/60Hz;

Condition : Temp:24.5'C,Humi:55%

Tested By : Lake

Model Number : WS-439-2

Test Mode : Keeping TX Mdoe

Antenna/Distance : 3m

Frequency	Receiver		Polar	FCC 15.231	
(MHz)	Reading (dBμV)	Detector (PK/AV)	(H/V)	Limit (dBμV/m)	Margin (dB)
433.3	98.05	PK	H	100.8	-2.75
433.3	73.76	AV	H	80.8	-7.04
433.3	95.30	PK	V	100.8	-5.50
433.3	71.01	AV	V	80.8	-9.79
866.6	58.87	PK	H	80.8	-21.93
866.6	34.58	AV	H	60.8	
866.6	54.63	PK	V	80.8	-26.17
866.6	30.34	AV	V	60.8	
1299.9	54.80	PK	H	74	-19.20
1299.9	30.51	AV	H	54	
1299.9	50.52	PK	V	74	-23.48
1299.9	26.23	AV	V	54	
1733.2	65.14	PK	H	74	-8.86
1733.2	40.85	AV	H	54	
1733.2	63.00	PK	V	74	-11.00
1733.2	38.71	AV	V	54	
2166.5	59.93	PK	H	74	-14.07
2166.5	35.64	AV	H	54	
2166.5	56.61	PK	V	74	-17.39
2166.5	32.32	AV	V	54	

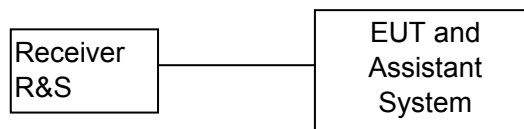
NOTE: AV=PK-24.29

4. transmitting time test

4.1 Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until	Calibrated Date
1	Spectrum analyzer	KEYSIGHT	N9010A	MY55150427	2017/05/05	2016/05/06
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2016/12/19	2015/12/20
3	RF Cable	Micable	C10-01-01-1	100309	2016/12/19	2015/12/20

4.2 Block diagram of test setup



4.3 Limits

A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

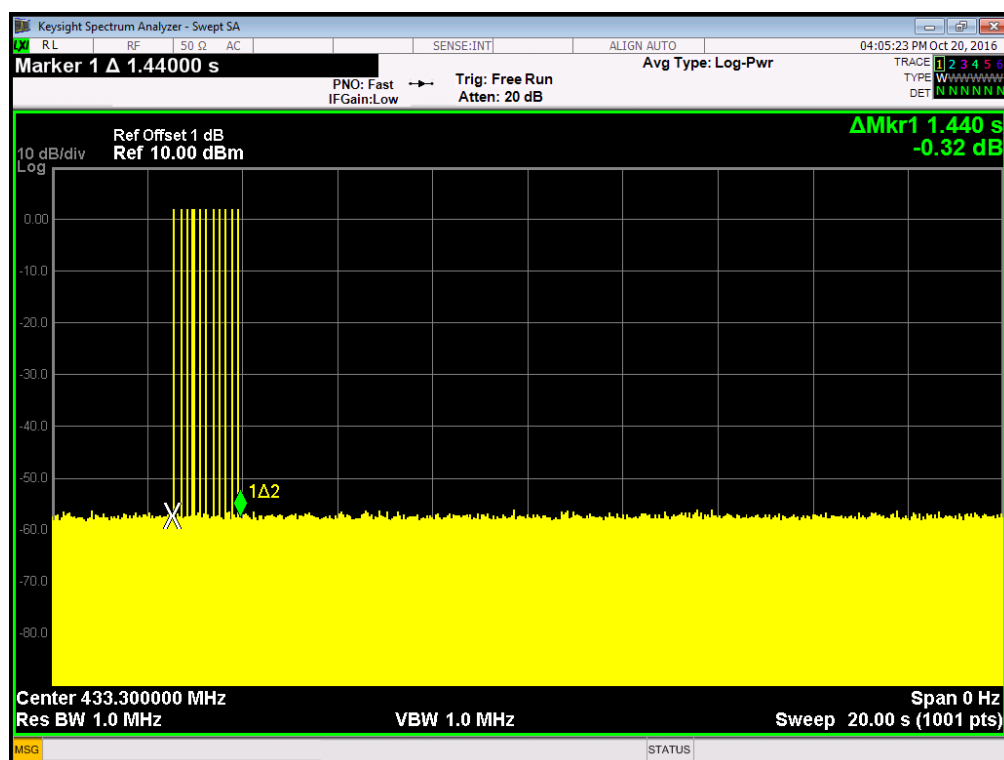
4.4 Test Procedure

- (1). The EUT's RF signal was coupled to spectrum analyzer by a antenna connected to spectrum analyzer..
- (2). Set the spectrum to zero span mode, and centered of EUT frequency.
- (3). Measure the EUT stop transmitting time.

4.5 Test Result

PASS. (See below detailed test result)

4.6 Original test data



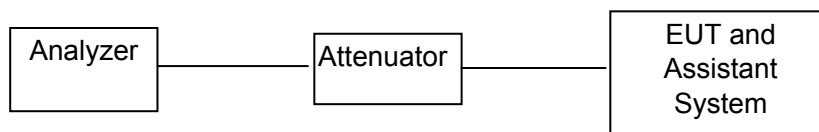
THE DURATION TIME	LIMIT	RESULT
1.44 s	<5s	PASS

5. 20dB bandwidth

5.1 Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until	Calibrated Date
1	Spectrum analyzer	KEYSIGHT	N9010A	MY55150427	2017/05/05	2016/05/06
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2016/12/19	2015/12/20
3	RF Cable	Micable	C10-01-01-1	100309	2016/12/19	2015/12/20

5.2 Block diagram of test setup



5.3 Limits

The bandwidth of the emission shall be no wider than 0.25% of the center frequency of devices operation above 70MHz and below 900MHz

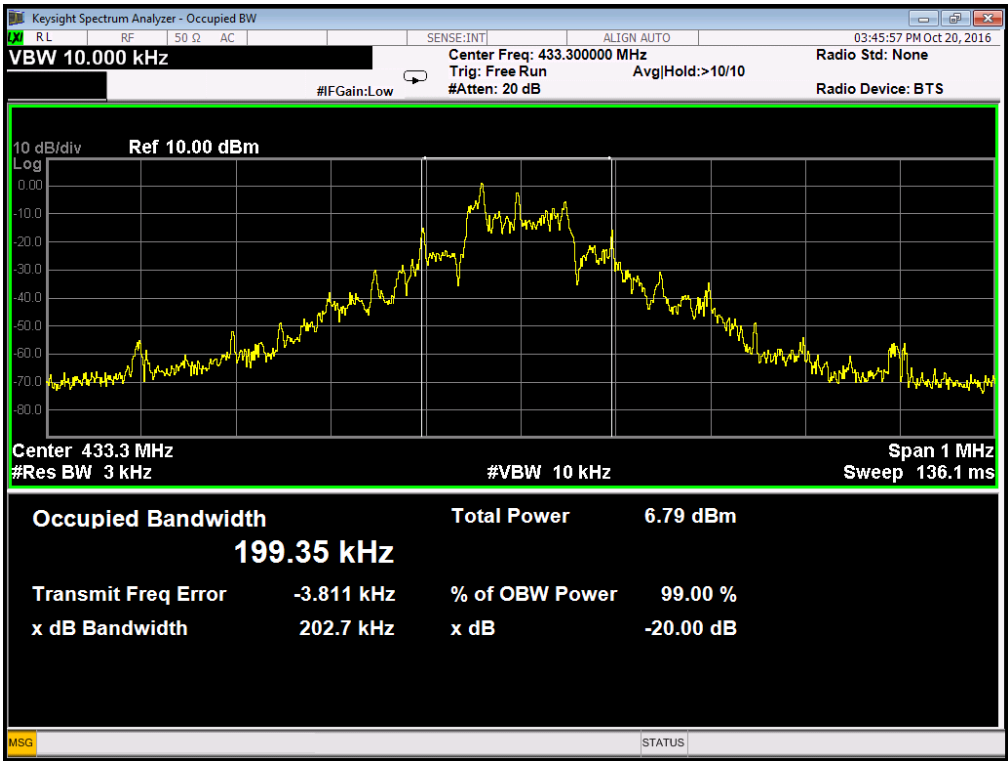
5.4 Test Procedure

1. The EUT's RF signal was coupled to spectrum analyzer by a antenna connected to spectrum analyzer.
2. The bandwidth of the fundamental frequency was measured by spectrum analyzer with RBW = 1% ~ 5% * OBW, VBW=3*RBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

5.5 Test Result

Frequency (MHz)	20 dB Bandwidth (kHz)	Limit(kHz): No wider than 0.25% of the center frequency	Conclusion
433.3	202.7	$433.3 \times 0.25\% = 1.08325\text{MHz}$	PASS

5.6 Original test data

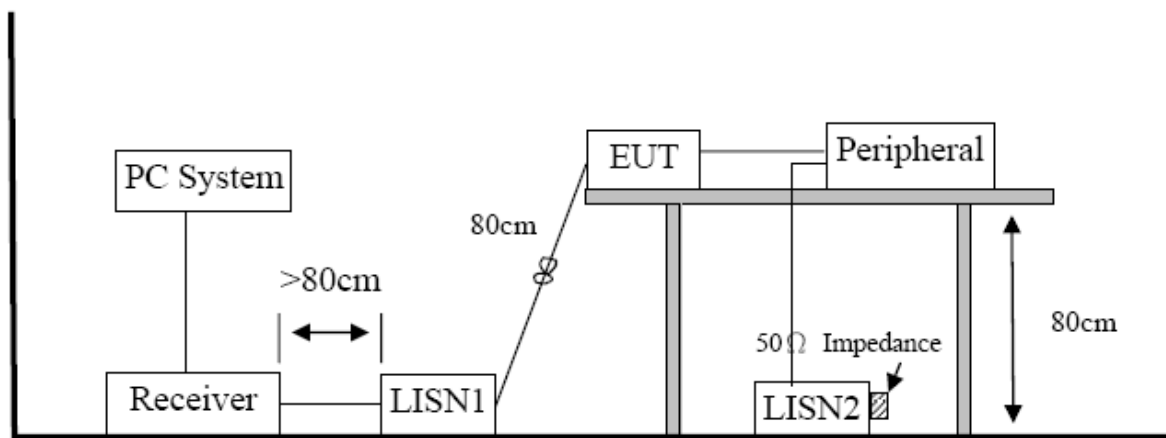


6. Power Line Conducted Emission

6.1. Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until	Calibrated Date
1	Test Receiver	R&S	ESCI	101308	2016/12/25	2015/12/26
2	LISN 1	AFJ	LS16	16011103219	2016/12/25	2015/12/26
3	LISN 2	R&S	ESH2-Z5	100309	2016/12/25	2015/12/26
4	Pulse Limiter	MTS-systemtechnik	MTS-IMP-136	261115-010-0024	2016/12/25	2015/12/26

6.2. Block diagram of test setup



6.3. Power Line Conducted Emission Limits(Class B)

Frequency	Quasi-Peak Level dB(μV)	Average Level dB(μV)
150kHz ~ 500kHz	66 ~ 56*	56 ~ 46*
500kHz ~ 5MHz	56	46
5MHz ~ 30MHz	60	50

Note 1: * Decreasing linearly with logarithm of frequency.

Note 2: The lower limit shall apply at the transition frequencies.

6.4. Test Procedure

The EUT and Support equipment, if needed, were put placed on a non-metallic table, 80cm above the ground plane.

Configuration EUT to simulate typical usage as described in clause 2.4 and test equipment as described in clause 10.2 of this report.

All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4.

All support equipment power received from a second LISN.

Emissions were measured on each current carrying line of the EUT using an EMI Test Receiver connected to the LISN powering the EUT.

The Receiver scanned from 150 kHz to 30MHz for emissions in each of the test modes.

During the above scans, the emissions were maximized by cable manipulation.

The test mode(s) described in clause 2.4 were scanned during the preliminary test.

After the preliminary scan, we found the test mode producing the highest emission level.

The EUT configuration and worse cable configuration of the above highest emission levels were recorded for reference of the final test.

EUT and support equipment were set up on the test bench as per the configuration with highest emission level in the preliminary test.

A scan was taken on both power lines, Neutral and Line, recording at least the six highest emissions.

Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit.

The test data of the worst-case condition(s) was recorded.

The bandwidth of test receiver is set at 9 KHz.

6.5. Test Result

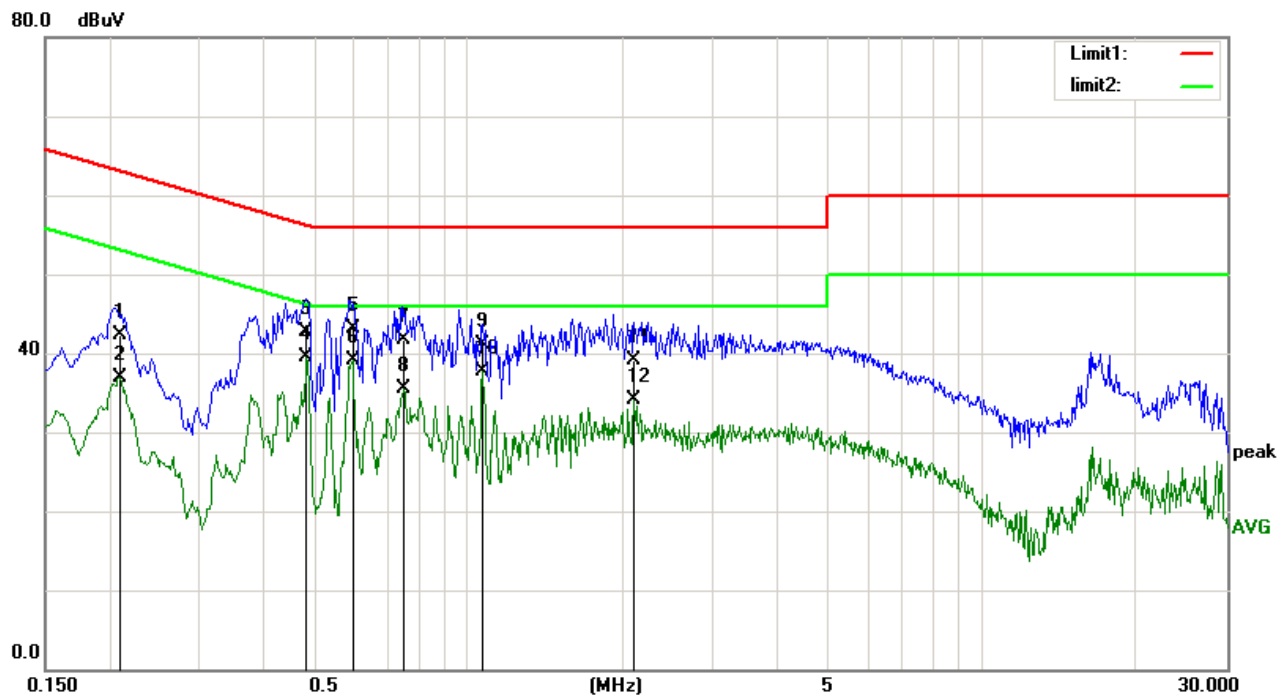
pass. (See below detailed test result)

Note1: All emissions not reported below are too low against the prescribed limits.

Note2: "-----" means average detection; "-----" mans peak detection

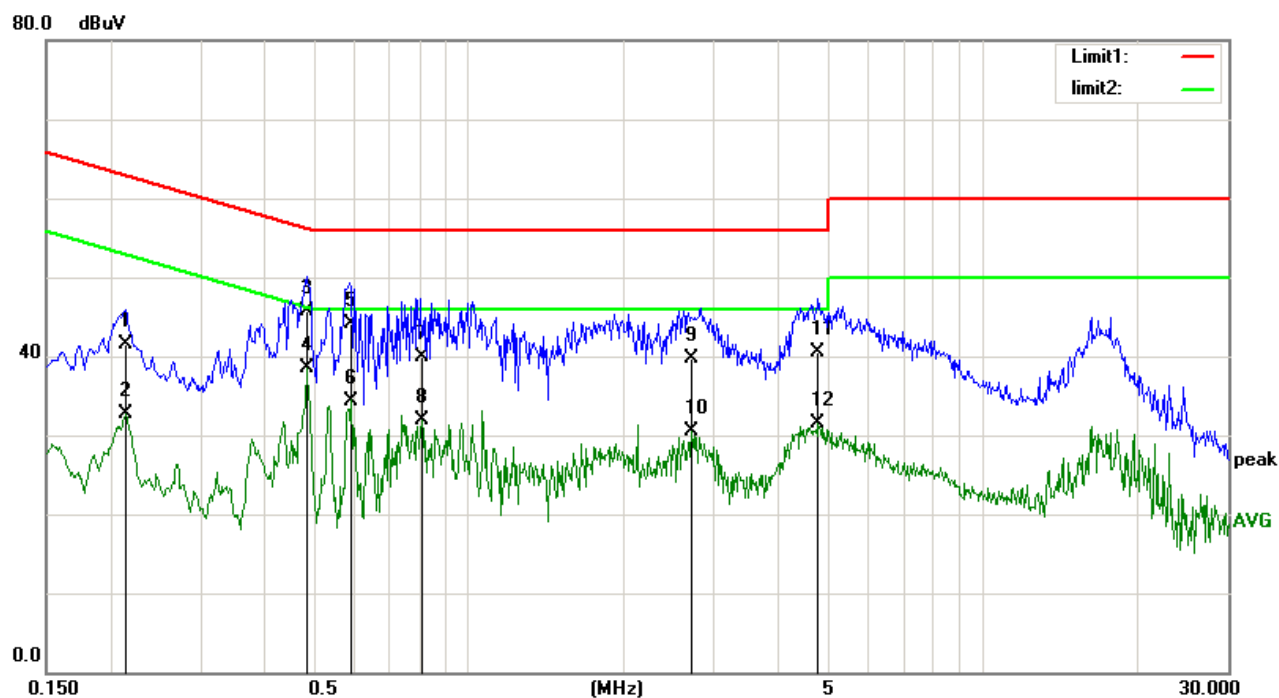
6.6 Test Result

EUT:	Portable SmartHub	Model No.:	WS-439-2
Temperature:	24°C	Relative Humidity:	55%
Probe:	L1	Test Power:	AC 120V/60Hz
Standard:	FCC PART 15 class B	Test Result:	Pass
Test Mode:	Tx	Test By:	Lake
Note:	Keeping TX Mdoe		



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.2099	31.27	11.06	42.33	63.21	-20.88	QP
2	0.2099	25.90	11.06	36.96	53.21	-16.25	AVG
3	0.4858	32.58	10.20	42.78	56.24	-13.46	QP
4	0.4858	29.25	10.20	39.45	46.24	-6.79	AVG
5	0.5947	33.01	10.15	43.16	56.00	-12.84	QP
6	0.5947	28.95	10.15	39.10	46.00	-6.90	AVG
7	0.7500	31.61	10.11	41.72	56.00	-14.28	QP
8	0.7500	25.35	10.11	35.46	46.00	-10.54	AVG
9	1.0660	30.98	10.10	41.08	56.00	-14.92	QP
10	1.0660	27.56	10.10	37.66	46.00	-8.34	AVG
11	2.1018	29.08	10.11	39.19	56.00	-16.81	QP
12	2.1018	23.91	10.11	34.02	46.00	-11.98	AVG

EUT:	Portable SmartHub	Model No.:	WS-439-2
Temperature:	24°C	Relative Humidity:	55%
Probe:	N	Test Power:	AC 120V/60Hz
Standard:	FCC PART 15 class B	Test Result:	Pass
Test Mode:	Tx	Test By:	Lake
Note:	Keeping TX Mdoe		



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.2139	30.56	11.03	41.59	63.05	-21.46	QP
2	0.2139	21.72	11.03	32.75	53.05	-20.30	AVG
3	0.4818	35.57	10.20	45.77	56.31	-10.54	QP
4	0.4818	28.34	10.20	38.54	46.31	-7.77	AVG
5	0.5898	33.90	10.15	44.05	56.00	-11.95	QP
6	0.5898	24.25	10.15	34.40	46.00	-11.60	AVG
7	0.8100	29.76	10.09	39.85	56.00	-16.15	QP
8	0.8100	21.82	10.09	31.91	46.00	-14.09	AVG
9	2.7099	29.59	10.13	39.72	56.00	-16.28	QP
10	2.7099	20.30	10.13	30.43	46.00	-15.57	AVG
11	4.7857	30.44	10.11	40.55	56.00	-15.45	QP
12	4.7857	21.30	10.11	31.41	46.00	-14.59	AVG

7. Antenna Requirements

7.1. Limit

For intentional device, according to FCC 47 CFR 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. And according to FCC 47 CFR, if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

7.2. Result

The antennas used for this product are built-out undetachable permanent attachment, the maximum peak gain of the transmit antenna is only 0dBi. Therefore the EUT is considered sufficient to comply with the provision.

END OF REPORT