

FCC - TEST REPORT Report Number 708881974832-00 Date of Issue: October 31, 2019 Model TYWE3SE Product Type TYWE3SE Wi-Fi and Bluetooth Module FCC ID : 2ANDL-TYWE3SE Applicant : Hangzhou Tuya Information Technology Co.,Ltd Address of Applicant Room701, Building3, More Center, No.87 GuDun Road, Hangzhou, Zhejiang China Manufacturer : Hangzhou Tuya Information Technology Co.,Ltd Address of Manufacturer : Room701,Building3,More Center,No.87 GuDun Road, Hangzhou, Zhejiang China Factory : Newtronics Hangzhou Co.,Ltd No.15, Jiu zhou Road, Jiang Gan Science& Technology Address of Factory Economic Park Hangzhou, Zhejiang China Test Result Positive □ Negative Total pages including Appendices 38

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2 Details about the Test Laboratory

Details about the Test Laboratory

Test Site 1

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch No.16 Lane, 1951 Du Hui Road, Shanghai 201108, P.R. China

Test Firm	820234
Registration	
Number:	
Telephone:	+86 21 6141 0123
Fax:	+86 21 6140 8600



3 Description of the Equipment under Test

Product:	TYWE3SE Wi-Fi and Bluetooth Module
Model no.:	TYWE3SE
FCC ID:	2ANDL-TYWE3SE
Options and accessories:	N/A
Rating:	3~3.6V DC
RF Transmission Frequency:	2402~2480MHz for Bluetooth For 2.4G Wi-Fi For 802.11b/g/n-HT20: 2412~2462 MHz For 802.11n-HT40: 2422~2452 MHz
No. of Operated Channel:	79 for Bluetooth 4.2 BR+EDR 40 for Bluetooth 4.2 BLE For 2.4GHz Wi-Fi
	Operation Frequency each of channel For 802.11b/g/n(H20)ChannelFrequencyChannelFrequencyChannelFrequency12412MHz42427MHz72442MHz102457MHz22417MHz52432MHz82447MHz112462MHz32422MHz62437MHz92452MHz
	Operation Frequency each of channel For 802.11n(H40) Channel Frequency Channel Frequency Channel Frequency Channel Frequency Channel Frequency Channel Frequency Channel Frequency 4 2427MHz 7 2442MHz 7 2442MHz 7 3 2422MHz 6 2437MHz 9 2452MHz 5
Modulation:	Bluetooth 4.2+EDR FHSS: GFSK, 8DPSK, π/4 DQPSK Bluetooth 4.2 BLE DHSS: QPSK For Wi-Fi: Direct Sequence Spread Spectrum (DSSS) for 802.11b Orthogonal Frequency Division Multiplexing(OFDM) for 802.11g/n
Data speed:	1. Bluetooth BR+EDR: 1Mbps, 2Mbps, 3Mbps 2. Bluetooth BLE: 1Mbps 3. 802.11b: 1, 2, 5.5, or 11 (Mbit/s) 802.11g: 6, 9, 12, 18, 24, 36, 48, or 54 (Mbit/s) 802.11n: HT20 & HT40 MCS0 to MCS7
Duty Cycle:	100%
Antenna Type:	PCB
EMC_SHA_F_R_02.05E	TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch 3-13, No.151, Heng Tong Road, Shanghai, 200070, P.R. China Phone: +86 21 61410123, Fax:+86 21 61408600Page 4 of 38 Rev. 171.00



Antenna Gain:

2.5dBi

Description of the EUT:

The Equipment Under Test (EUT) is a RF Module with Bluetooth and WI-Fl function. The EUT support Bluetooth 4.2 BR+EDR and support BLE function and Wi-Fi operated at 2.4GHz. Only 2.4G Bluetooth 4.2 BLE included in this report.



4 Summary of Test Standards

	Test Standards
FCC Part 15 Subpart C	PART 15 - RADIO FREQUENCY DEVICES
10-1-2014 Edition	Subpart C - Intentional Radiators

All the test methods were according to KDB 558074 D01 15.247 Meas Guidance v05r02 and ANSI C63.10 (2013).



5 Summary of Test Results

Technical Requirements									
FCC Part 15 Sub	part C		1						
Test Condition		Pages	Test		st Res				
		. agee	Site	Pass	Fail	N/A			
§15.207	Conducted emission AC power port	13	Site 1						
§15.247 (b) (1)	Conducted peak output power	16	Site 1						
§15.247(a)(1)	20dB Occupied Bandwidth					\square			
§15.247(a)(1)	Carrier frequency separation					\square			
§15.247(a)(1)(iii)	Number of hopping frequencies					\square			
§15.247(a)(1)(iii)	Dwell Time					\square			
§15.247(a)(2)	6dB Occupied Bandwidth	18	Site 1						
§15.247(e)	Power spectral density	20	Site 1						
§15.247(d)	Conducted Band Edge and Out-of- Band Emissions	22	Site 1						
§15.247(d) & §15.209	Spurious radiated emissions for transmitter	30	Site 1						
§15.203	Antenna requirement	See note	e 1						

Note 1: N/A=Not Applicable.

Note 2: The EUT uses a permanently integral antenna, which gain is 2.5dBi. In accordance to §15.203, It is considered sufficiently to comply with the provisions of this section.

15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, 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. 15.247(c) (1)(i) requirement: (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.

6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: 2ANDL-TYWE3SE, complies with Section 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C rules.

This report in only for Bluetooth BLE. The TX and RX range is 2402MHz-2480MHz.

SUMMARY:

All tests according to the regulations cited on page 5 were

- Performed
- □ Not Performed

The Equipment under Test

- - **Fulfills** the general approval requirements.
- □ **Does not** fulfill the general approval requirements.

Sample Received Date:

July 29, 2019

July 31, 2019

Testing Start Date:

Testing End Date: August 30, 2019

TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch

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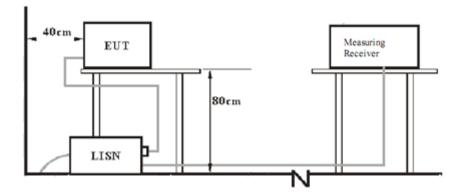
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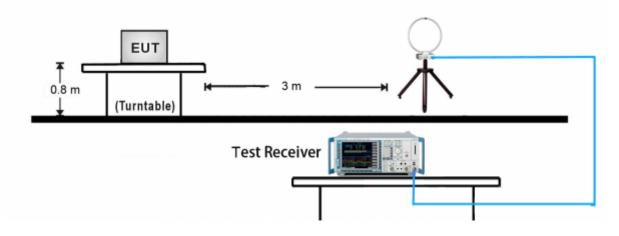
7 Test Setups

7.1 AC Power Line Conducted Emission test setups



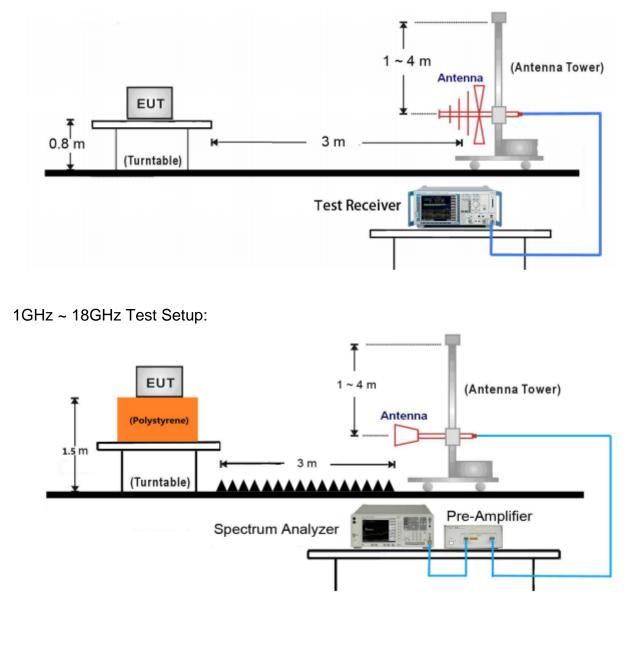
7.2 Radiated test setups

9kHz ~ 30MHz Test Setup:





30MHz ~ 1GHz Test Setup:

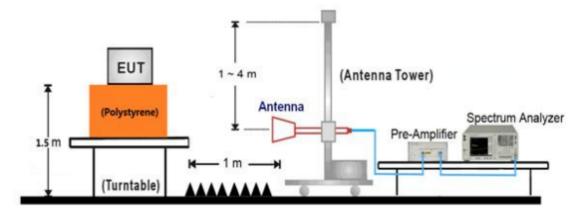


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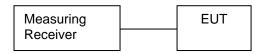
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18GHz ~ 25GHz Test Setup:



7.3 Conducted RF test setups





8 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.(SHIELD)	S/N(LENGTH)
Notebook	Lenove	X240	

Test software: SecureCRT, which used to control the EUT in continues transmitting mode

The system was configured to channel 0, 19, and 39 for the test.



9 Technical Requirement

9.1 Conducted Emission

Test Method

- 1. The EUT was placed on a table, which is 0.8m above ground plane
- 2. The power line of the EUT is connected to the AC mains through an Artificial Mains Network (A.M.N.).
- 3. Maximum procedure was performed to ensure EUT compliance
- 4. A EMI test receiver is used to test the emissions from both sides of AC line

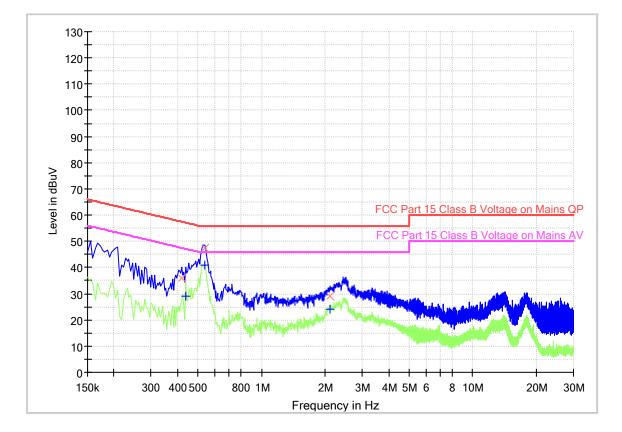
Limit

Frequency	QP Limit	AV Limit
MHz	dBµV	dBµV
0.150-0.500	66-56*	56-46*
0.500-5	56	46
5-30	60	50
Decreasing linearly wit	h logarithm of the f	requency



Conducted Emission

Product Type	:	TYWE3SE Wi-Fi and Bluetooth Module
M/N	:	TYWE3SE
Operating Condition	:	Mode 1: Tx powered by notebook
Test Specification	:	FCC_Part15.207
Comment	:	L-line, AC 120V/60Hz



Final_Result

Frequency (MHz)	Quasi Peak (dBuV)	CAverag e (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.420000	35.97		57.45	21.48	1000.0	9.000	L1	19.4
0.438000		29.02	47.10	18.08	1000.0	9.000	L1	19.4
0.537000		40.92	46.00	5.08	1000.0	9.000	L1	19.4
0.537000	47.35		56.00	8.65	1000.0	9.000	L1	19.4
2.103000		24.16	46.00	21.84	1000.0	9.000	L1	19.5
2.116500	28.93		56.00	27.07	1000.0	9.000	L1	19.5

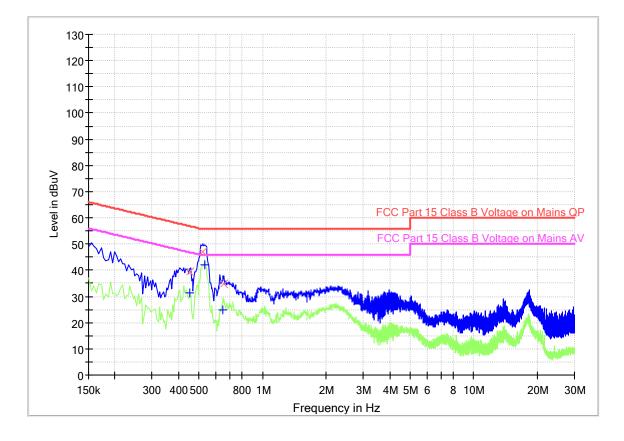
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Product Type M/N Operating Condition Test Specification Comment TYWE3SE Wi-Fi and Bluetooth Module TYWE3SE Mode 1: Tx powered by notebook FCC_Part15.207 N-line, AC 120V/60Hz



Final_Result

Frequency (MHz)	Quasi Peak (dBuV)	CAverag e (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.451500		31.32	46.85	15.53	1000.0	9.000	N	19.5
0.451500	39.21		56.85	17.64	1000.0	9.000	N	19.5
0.523500	47.16		56.00	8.84	1000.0	9.000	Ν	19.5
0.532500		42.23	46.00	3.77	1000.0	9.000	Ν	19.5
0.649500		24.71	46.00	21.29	1000.0	9.000	Ν	19.5
0.654000	34.86		56.00	21.14	1000.0	9.000	Ν	19.5



9.2 Conducted peak output power

Test Method

- Use the following spectrum analyzer settings: RBW > the 6 dB bandwidth of the emission being measured, VBW≥3RBW, Span≥3RBW Sweep = auto, Detector function = peak, Trace = max hold.
- 2. Add a correction factor to the display.
- 3. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power.

Limits

Frequency Range	Limit	Limit
MHz	W	dBm
2400-2483.5	≤1	≤30

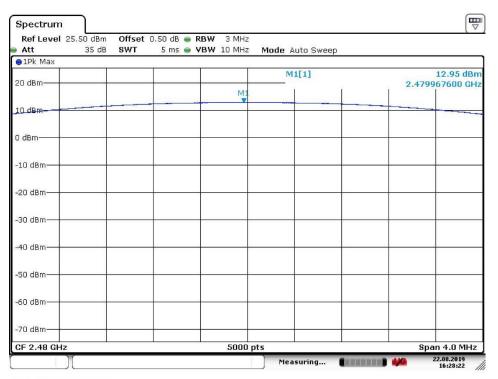
Test result as below table

Frequency MHz Low channel 2402MHz				Outpu	cted Pea ut Power IBm		Result		
Low cha	innel 24	402MH	z	1	2.74		Pas	s	
Middle ch	/liddle channel 2440MHz				3.09		Pas	s	
High channel 2480MHz			lz	1	2.95		Pas	S	
Spectrum								ſ	
Ref Level 2 Att	5.50 dBm 35 dB	Offset SWT	0.50 dB 👄 R 5 ms 👄 V	BW 3 MHz BW 10 MHz	Mode Auto S	Sweep			
●1Pk Max									
20 dBm			-		M1[1]		2.401	12.74 dB	
-				M1		_			
<u>10 dBm</u>									
0 dBm									
-10 dBm									
-20 dBm									
-30 dBm			×						
-40 dBm									
-50 dBm									
-60 dBm								_	
-70 dBm									
CF 2.402 GH	2		1	5000 p	ts		Sp	an 4.0 MH	
					Measurin	g ANNUN		22.08.2019 16:29:03	



Ref Level 25.50 dBm Att 35 dB	0.50 dB 🥌 RE 5 ms 👄 VE		Auto Sweep)		
●1Pk Max				m.		
20 dBm		N	11[1]		2.440	13.09 dBn 100400 GH
		M1				
10.dBm						
D dBm		<i>v</i>				
-10 dBm		 				
-20 dBm						
-30 dBm	5.					
-40 dBm		 6 0				
-50 dBm			*			
-60 dBm		v				
-70 dBm						

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9.3 6dB Occupied Bandwidth

Test Method

- 1. Use the following spectrum analyzer settings:
- RBW=100K, VBW≥3RBW, Sweep = auto, Detector function = peak, Trace = max hold
 Use the automatic bandwidth measurement capability of an instrument, may be employed using the X dB bandwidth mode with X set to 6 dB, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be ≥ 6 dB.
- 3. Allow the trace to stabilize, record the 6 dB Bandwidth value.

Limit

Limit [kHz]

≥500

Test result

Frequency MHz	6dB bandwidth kHz	Result
Top channel 2402MHz	647.2	Pass
Middle channel 2440MHz	648.8	Pass
Bottom channel 2480MHz	648.8	Pass

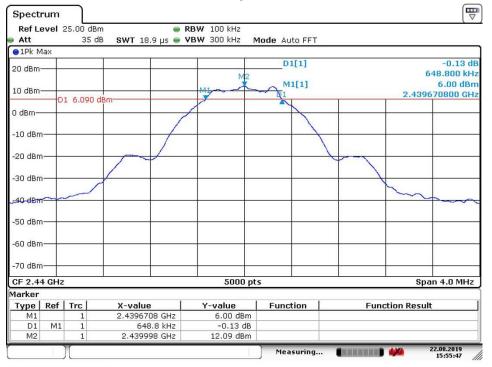
2402MHz

Att	evera	25.00 dB 35 c		● RBW 100 kHz ● VBW 300 kHz M	Mode Auto FFT		
●1Pk M	lax		- 000 1000 ps				
20 dBm	+			M2	D1[1]		-0.21 dl 647.200 kH
10 dBm		1 5.720	dBm	Mi	-~~~M1[1]		5.85 dBn 2.401672400 GH
0 dBm—		1 0020					
-10 dBn	-						
-20 dBn	-						
-30 dBn	-						
40-dBm		~					Jan
-50 dBm	-						
-60 dBn							
-70 dBn	-						
CF 2.4	02 GH	z	1	5000 pt	:5		Span 4.0 MHz
/larker							
Type	Ref		X-value	Y-value	Function	Functi	ion Result
M1		1	2.4016724 GH				
D1	M1	1	647.2 kHz 2.4019996 GHz				

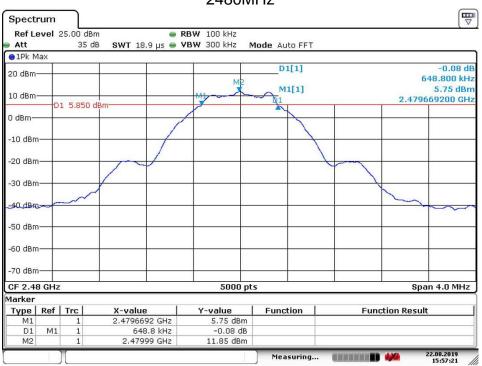
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2440MHz



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2480MHz

Date: 22.AUG.2019 15:57:22



9.4 Power spectral density

Test Method

This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance:

- Set analyzer center frequency to DTS channel center frequency. RBW=3kHz,VBW≥3RBW,Span=1.5 times DTS bandwidth, Detector=Peak, Sweep=auto, Trace= max hold.
- 2. Allow trace to fully stabilize, use the peak marker function to determine the maximum amplitude level within the RBW.
- 3. Repeat above procedures until other frequencies measured were completed.

Limit

Limit [dBm]

≤8

Test result

Frequency	density	Result		
MHz	dBm			
Top channel 2402MHz	-3.04	Pass		
Middle channel 2440MHz	-2.34	Pass		
Bottom channel 2480MHz	-2.73	Pass		
Spectrum		(
RefLevel 25.50 dBm Offset 0.50 dB ● RE ● Att 35 dB SWT 632.3 µs ● VE				
●1Pk Max				
20 dBm	M1[1]	-3.04 dl 2.401991900 d		
10 dBm				
0 dBm				
-10 dBm	manth of the second of the second of the	harperton		
120 dBm		warden warden warden		
-30 dBm				
-40 dBm				
-50 dBm				
-60 dBm				
-70 dBm				
CF 2.402 GHz	5000 pts	Span 1.0 Mi		
	Measuring	22.08.2019		

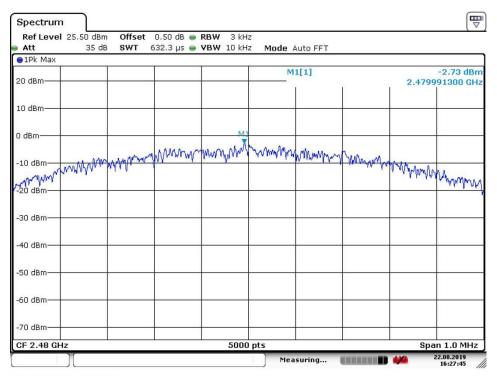
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Ref Level 25.50 dB Att 35 d		i0 dB 👄 RBW 3 .3 µs 👄 VBW 10	kHz kHz Mode Auto FFT		
⊜1Pk Max	1 1		<i>i</i>		
20 dBm			M1[1]	тт	-2.34 dBr 2.439991700 GH
10 dBm					
0 dBm			MI		
-10 dBm	Mermann	www.www.w	A wanter water	mannan	holen fie .
-20 dBm					1. 1. M.
30 dBm				-	
40 dBm					
-50 dBm					
60 dBm					
-70 dBm					

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9.5 Conducted Band Edge and Out-of-Band Emissions

Test Method

- 1. Establish a reference level by using the following procedure:
 - a. Set RBW=100 kHz. VBW≥3RBW. Detector =peak, Sweep time = auto couple, Trace mode = max hold.
 - b. Allow trace to fully stabilize, use the peak marker function to determine the maximum PSD level.
- 2. Use the maximum PSD level to establish the reference level.
 - a. Set the center frequency and span to encompass frequency range to be measured.
 - b. Use the peak marker function to determine the maximum amplitude level. Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements, report the three highest emissions relative to the limit.
- 3. Repeat above procedures until other frequencies measured were completed.

Limit

	Frequency MH	•	Limit (dBc)	
-	30-25	000	-20	
Test result:				
	Frequency	Limit		Result
_	MHz			
	Top channel 2402MHz	20dBc		Pass
	Middle channel 2440MHz	20dBc		Pass
	Bottom channel 2480MHz	20dBc		Pass

Spurious RF conducted emissions



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Spectrur	n									
	1 25.50 dBm	Offset	0.50 dB	👄 RB	W 100 kH	z				(*
Att	35 dB	SWT	9.7 ms	⊜ VB	W 300 kH	z Mode	Auto Sweep	1		,
●1Pk Max	T	1	Ť	1		м	1[1]			-42.50 dBm
20 dBm			-							00.470 MHz
10 dBm										
2 92										
0 dBm										
-10 dBm	D1 -7.560 d	Bm								
10 0.0111										
-20 dBm									ļ	
-30 dBm—			-							
-40 dBm								M		
-50 dBm	and h	1	in a sure		. In Low	بالدابير المراجعات	te Ala ana la	all Arrithter		and works along the state
-60 dBm			A LEADER						and an an internation	a statistic strength and a long
-00 0611-										
-70 dBm										
Start 30.0	MLIS				5000	ntc			C+	op 1.0 GHz
SLAFL 30.0	MIHZ				5000	pts			51	
	.2019 16:32:4	40				Mea	isuring		496	22.08.2019 16:32:39
Spectrur	n						suring		-	22.08.2019 16:32:39
Spectrur Ref Leve	n I 25.50 dBm	Offset			W 100 kH W 300 kH	z				16:32:39
Spectrur Ref Leve Att	n	Offset			W 100 kH W 300 kH	z	Auto Sweep			16:32:39
Spectrur Ref Leve Att 1Pk Max	n I 25.50 dBm	Offset				z z Mode				16:32:39 /// ▽ -40.31 dBm
Spectrur Ref Leve Att 1Pk Max	n I 25.50 dBm	Offset				z z Mode	Auto Sweep			16:32:39 ///
Spectrur Ref Leve Att 1Pk Max 20 dBm-	n I 25.50 dBm	Offset				z z Mode	Auto Sweep			16:32:39 /// ▽ -40.31 dBm
Spectrur Ref Leve Att 1Pk Max 20 dBm-	n I 25.50 dBm	Offset				z z Mode	Auto Sweep			16:32:39 /// ▽ -40.31 dBm
Spectrur Ref Leve Att 1Pk Max 20 dBm	n I 25.50 dBm	Offset				z z Mode	Auto Sweep			16:32:39 /// ▽ -40.31 dBm
Spectrur Ref Leve Att 1Pk Max 20 dBm	n 25.50 dBm 35 dE	Offset SWT				z z Mode	Auto Sweep			16:32:39 /// ▽ -40.31 dBm
Spectrur Ref Leve Att 1Pk Max 20 dBm 10 dBm 0 dBm	n I 25.50 dBm	Offset SWT				z z Mode	Auto Sweep			16:32:39 /// ▽ -40.31 dBm
Spectrur Ref Leve Att 1Pk Max 20 dBm	n 25.50 dBm 35 dE	Offset SWT				z z Mode	Auto Sweep			16:32:39 /// ▽ -40.31 dBm
Spectrur	n 25.50 dBm 35 dE	Offset SWT				z z Mode	Auto Sweep			16:32:39 /// ▽ -40.31 dBm
Spectrur Ref Leve Att 1Pk Max 20 dBm	n 25.50 dBm 35 dE	Offset SWT				z z Mode	Auto Sweep			16:32:39 /// ▽ -40.31 dBm
Spectrur Ref Leve Att 1Pk Max 20 dBm	n 25.50 dBm 35 dE	Offset SWT				z z Mode	Auto Sweep			16:32:39 /// ▽ -40.31 dBm
Spectrur Ref Leve Att 1Pk Max 20 dBm	n 25.50 dBm 35 dE	Offset SWT				z z Mode	Auto Sweep			16:32:39 /// ▽ -40.31 dBm
Spectrur Ref Leve Att 1Pk Max 20 dBm	n 25.50 dBm 35 dE	Offset SWT				z Mode . M	Auto Sweep			16:32:39 /// ▽ -40.31 dBm
Spectrur Ref Leve Att 1Pk Max 20 dBm	n 25.50 dBm 35 dE	BM	40 ms		W 300 kH	Z Mode	Auto Sweep		3.	-40.31 dBm 202800 GHz
Spectrur Ref Leve Att 1Pk Max 20 dBm	n 25.50 dBm 35 dE	BM	40 ms		W 300 kH	Z Mode	Auto Sweep		3.	16:32:39 /// ▽ -40.31 dBm
Spectrur Ref Leve Att 1Pk Max 20 dBm	n 25.50 dBm 35 dE	BM	40 ms		W 300 kH	Z Mode	Auto Sweep		3.	-40.31 dBm 202800 GHz
Spectrur Ref Leve Att ● 1Pk Max 20 dBm 10 dBm -10 dBm -20 dBm -20 dBm -30 dBm -30 dBm -50 dBm -50 dBm	n 25.50 dBm 35 dE	BM	40 ms		W 300 kH	Z Mode	Auto Sweep		3.	-40.31 dBm 202800 GHz
Spectrur Ref Leve Att 1Pk Max 20 dBm	n 25.50 dBm 35 dE	BM	40 ms		W 300 kH	Z Mode	Auto Sweep		3.	-40.31 dBm 202800 GHz
Spectrur Ref Leve Att 1Pk Max 20 dBm 10 dBm 0 dBm 10 dBm 20 dBm 20 dBm 30 dBm 30 dBm 50 dBm 50 dBm	n 35 dB 35 dE	BM	40 ms		W 300 kH	Z Mode	Auto Sweep		3.	-40.31 dBm 202800 GHz

Date: 22.AUG.2019 16:33:00

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Spectrum Ref Level 25.50 dBm Offset 0.50 dB 👄 RBW 100 kHz SWT 200 ms 💿 **VBW** 300 kHz Mode Auto Sweep Att 35 dB ⊖1Pk Max M1[1] 47.35 dBm 20 dBm 6.85400 GHz 10 dBm· 0 dBm--7.560 dB D1 -10 dBm -20 dBm -30 dBm 40 dBm M 50 abilities and Abilitie -60 dBm -70 dBm Start 5.0 GHz 5000 pts Stop 25.0 GHz 22.08.2019 16:33:30 Measuring...

Date: 22.AUG.2019 16:33:30

Spectrum	ı)															
Ref Level	25.5	0 dBm	Off	set	0.50 d	IB 👄	RBW	100 k	Hz								<u> </u>
Att		35 dB	SW	Т	227.5	JS 🔵	VBW	300 k	Hz	Mode	Auto FF	Т					
😑 1Pk Max									6								
20 dBm							-			M	1[1]	T		ĩ		39.17 00110	
10 dBm							-							+			-1
0 dBm	š						-							-			
-10 dBm	D1 -7	'.560 c	Bm				-										_
-20 dBm																	_
-30 dBm	6				-										1		
-40 dBm							-									- Marine	M
-50 dBm											1			_	- ANT		
-50 dBm	when the state	MAN MAN	Man Hand	-	Puttin por	Withthe	ANY MAR	MAMANAN	MANYA	without the	Working which a	remains in the	anthe better	her Hantle M			
-60 dBm			1		1												_
-70 dBm							-					_		_			
Start 2.3 G	Hz				•			5000) pts		•				Stop :	2.402 (GHz
										Mea	suring				2	22.08.201	

Date: 22.AUG.2019 16:35:05

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2440MHz



Date: 22.AUG.2019 16:37:25

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Spectrum Ref Level 25.50 dBm Offset 0.50 dB 👄 RBW 100 kHz SWT 40 ms 👄 **VBW** 300 kHz Mode Auto Sweep Att 35 dB 😑 1Pk Max M1[1] 40.89 dBm 20 dBm 3.253200 GHz 10 dBm-0 dBm-D1 -7.310 dBm -10 dBm--20 dBm -30 dBm M1 40 dBm -50 dBm Abert party of a sample of the sector Wall <u>ور ان</u> Hills, Augustalia Albert, April -60 dBm -70 dBm Start 1.0 GHz 5000 pts Stop 5.0 GHz 22.08.2019 16:37:40 Measuring...

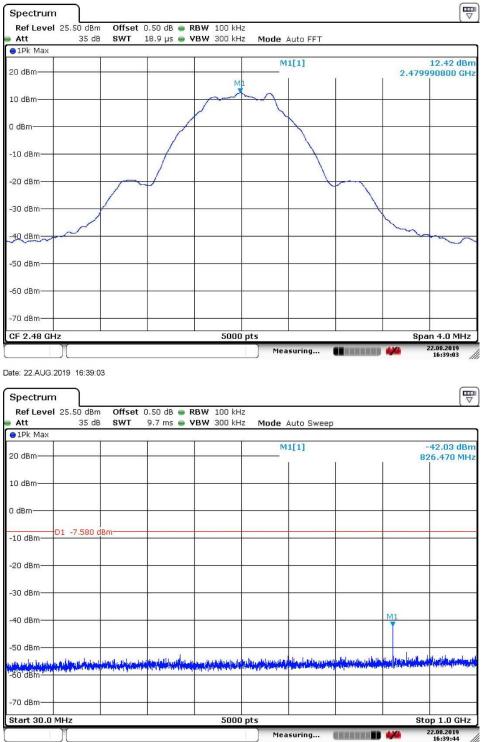
Date: 22.AUG.2019 16:37:41

	25.50 dBm		0.50 dB 🥌 🖪						
Att	35 dE	SWT	200 ms 画 🎙	'BW 300 kH	z Mode /	Auto Sweep			
∋1Pk Max	î	<u>.</u>	-						
20 dBm			-		M	1[1]	Ê.		-47.51 dBn .93400 GH:
10 dBm									
) dBm									
10 dBm—	D1 -7.310 (Bm							
20 dBm—									
-30 dBm									. 1/
40 dBm									
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60 dBm—	Manualadadadadadadadadadadadadadadadadadada	and the second second	and the second						Ale solve and the sole and
70 dBm—									
tart 5.0 (GHz		1	5000	pts		1	Stor	p 25.0 GHz

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2480MHz



Date: 22.AUG.2019 16:39:45

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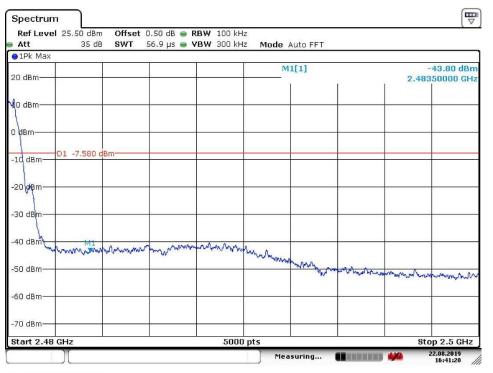


Spectrum Ref Level 25.50 dBm Offset 0.50 dB 👄 RBW 100 kHz SWT 40 ms 👄 **VBW** 300 kHz Mode Auto Sweep Att 35 dB 😑 1Pk Max M1[1] 41.54 dBm 20 dBm 3.306800 GHz 10 dBm-0 dBm--7.580 dBn D1 -10 dBm--20 dBm -30 dBm M1 40 dBm -50 dBm المالية وحدوا وحالية والمالية والمراجع والمالية undal lake WINH MUNIC J. Luss alle الاستيد فأر **FURNIN** -60 dBm -70 dBm Start 1.0 GHz 5000 pts Stop 5.0 GHz 22.08.2019 16:40:01 Measuring...

Date: 22.AUG.2019 16:40:02

Spectrum Ref Level	I 25.50 dBm	Offset	0.50 dB 👄 F	RBW 100 kH	7				[\(\neq \)
Att	35 dB		200 ms 🖷 🕚			Auto Sweep			
∋1Pk Max							°		
20 dBm					M	1[1]	ř		47.46 dBn 94600 GH:
10 dBm									
) dBm			-		<i>v</i>		-		
10 dBm	D1 -7.580 c	Bm					-		
-20 dBm			-						
-30 dBm									12
40 dBm	1		5						
50Leighter		1 10 10			والمعار والمتنا المالي	. le Mer Jahre 1944.			ust on detribut
60 dBm	n an the state of the second state of the seco		an hat in the international section of the in	And And		- Albert and a second			
70 dBm									
tart 5.0 G	Hz		1	5000	pts	1	1	Stop	25.0 GHz

Date: 22.AUG.2019 16:40:48



Date: 22.AUG.2019 16:41:20





9.6 Spurious radiated emissions for transmitter

Test Method

- 1. The EUT was place on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- 2. The EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
- 3. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- 4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- 5. Use the following spectrum analyzer settings According to C63.10:
- For Below 1GHz

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious RBW = 100 kHz to 120 kHz, VBW≥RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

For Peak unwanted emissions Above 1GHz:

Span = wide enough to capture the peak level of the in-band emission and all spurious RBW = 1MHz, VBW≥RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

Procedures for average unwanted emissions measurements above 1000 MHz

a) RBW = 1MHz.

b) VBW \geq [3 × RBW].

c) Detector = RMS (power averaging), if [span / (# of points in sweep)] \leq RBW / 2. Satisfying this condition can require increasing the number of points in the sweep or reducing the span. If the condition is not satisfied, then the detector mode shall be set to peak.

d) Averaging type = power (i.e., rms) (As an alternative, the detector and averaging type may be set for linear voltage averaging. Some instruments require linear display mode to use linear voltage averaging. Log or dB averaging shall not be used.)

e) Sweep time = auto.

f) Perform a trace average of at least 100 traces if the transmission is continuous. If the transmission is not continuous, then the number of traces shall be increased by a factor of 1 / D, where D is the duty cycle. For example, with 50% duty cycle, at least 200 traces shall be averaged. (If a specific emission is demonstrated to be continuous—i.e., 100% duty cycle—then rather than turning ON and OFF with the transmit cycle, at least 100 traces shall be averaged.)

g) If tests are performed with the EUT transmitting at a duty cycle less than 98%, then a correction factor shall be added to the measurement results prior to comparing with the emission limit, to compute the emission level that would have been measured had the test been performed at 100% duty cycle. The correction factor is computed as follows:
1) If power averaging (rms) mode was used in the preceding step e), then the correction



factor is [10 log (1 / D)], where D is the duty cycle. For example, if the transmit duty cycle was 50%, then 3 dB shall be added to the measured emission levels. 2) If linear voltage averaging mode was used in the preceding step e), then the correction factor is [20 log (1 / D)], where D is the duty cycle. For example, if the transmit duty cycle was 50%, then 6 dB shall be added to the measured emission levels. 3) If a specific emission is demonstrated to be continuous (100% duty cycle) rather than turning ON and OFF with the transmit cycle, then no duty cycle correction is required for that emission.

Limit

The radio emission outside the operating frequency band 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. Radiated emissions which fall in the restricted bands, as defined in section15.205, must comply with the radiated emission limits specified in section 15.209.

Frequer MHz	•	trength Mea /m	asured Distance Meters
0.009~0.	490 2400/F	^F (kHz)	300
0.490~1.	705 24000/	F (kHz)	30
1.705~3	30 3	0	30
Frequency	Field Strength	Field Strength	Detector
MHz	uV/m	dBµV/m	
30-88	100	40	QP
88-216	150	43.5	QP
216-960	200	46	QP
960-1000	500	54	QP
Above 1000	500	54	AV
Above 1000	5000	74	PK



Spurious radiated emissions for transmitter

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

Transmitting spurious emission test result as below:

BLE Mode 2402MHz Test Result

Frequency	Emission Level	Polarization	Limit	Detector	Margin	Result
MHz	dBuV/m		dBµV/m		dBuV/m	
2390	44.78	H	74	PK	29.22	Pass
4804	36.18	H	74	PK	37.82	Pass
2368.8	45.86	V	74	PK	28.14	Pass
4804	35.85	V	74	PK	38.15	Pass

BLE Mode 2440MHz Test Result

Frequency	Emission Level	Polarization	Limit	Detector	Margin	Result
MHz	dBuV/m		dBµV/m		dBuV/m	
4882	37.66	Н	74	PK	36.34	Pass
4882	36.06	V	74	PK	37.94	Pass

BLE Mode 2480MHz Test Result

Frequency	Emission Level	Polarization	Limit	Detector	Margin	Result
MHz	dBuV/m		dBµV/m		dBuV/m	
2487.8	57.91	Н	74	PK	16.09	Pass
2487.8	39.9	Н	54	AV	14.1	Pass
4960	36.76	Н	74	PK	37.24	Pass
2489.3	58.21	V	74	PK	15.79	Pass
2489.3	41.2	V	54	AV	12.8	Pass
4960	36.33	V	74	PK	37.67	Pass

Remark:

 (1) Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Pre-amplifier Below 1GHz: Corrector factor = Antenna Factor + Cable Loss Emission Level =Reading level +Correction Factor

(The Reading Level is recorded by software which is not shown in the sheet)



The worst case of Radiated Emission below 1GHz:

The worst case of readated Emission below ren	12.			
Site: 3 meter chamber	Time: 2019/08/21 - 17:21			
Limit: FCC_Part15.109_RE(3m)_ClassB	Engineer: Wenqiang LU			
Probe: VULB9168	Polarity: Horizontal			
EUT: TYWE3SE Wi-Fi and Bluetooth Module, Model no:	Power: Power by notebook			
TYWE3SE				
Note: There is the worst case within frequency range 30MHz~1GHz.				
· · · · · · · · · · · · · · · · · · ·				

80 70 60 FCC Part 15 Class_B Radiated Emission_QP_3m 50 Level in dBuV/m 40 30 20 10 0-30M 50 60 80 100M 200 300 400 500 800 1G Frequency in Hz

RE_VULB9168_pre_Cont_30-1000

Limit and Margin

Frequency	QuasiPeak	Meas.	Bandwidth	Height	Pol	Azimuth	Corr.	Margin -	Limit -
(MHz)	(dBuV/m)	Time	(kHz)	(cm)		(deg)	(dB)	QPK	QPK
		(ms)						(dB)	(dBuV/m)
143.880000	41.6	1000.0	120.000	150.1	N	2.0	15.2	1.9	43.5

Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

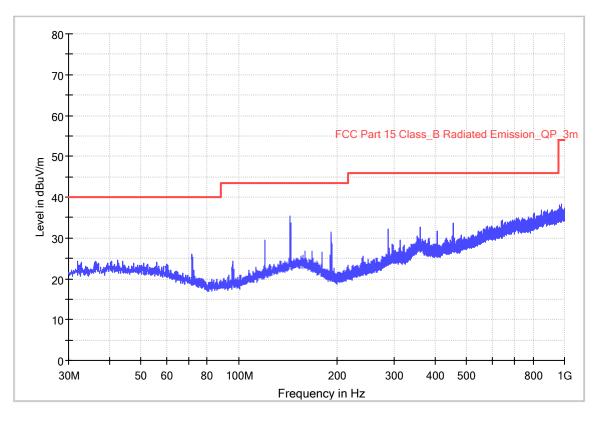
Note 2: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9kHz ~ 30MHz, 18GHz ~ 25GHz), therefore no data appear in the report.



The worst case of Radiated Emission below 1GHz:

Site: 3 meter chamber	Time: 2019/08/21 - 17:40			
Limit: FCC_Part15.109_RE(3m)_ClassB	Engineer: Wenqiang LU			
Probe: VULB9168	Polarity: Vertical			
EUT: TYWE3SE Wi-Fi and Bluetooth Module, Model no:	Power: Power by notebook			
TYWE3SE				
Note: There is the worst case within frequency range 30MHz~1GHz.				

RE_VULB9168_pre_Cont_30-1000



Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Note 2: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9kHz ~ 30MHz, 18GHz ~ 25GHz), therefore no data appear in the report.



10 Test Equipment List

	List of Test Instruments Test Site1					
	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DATE	CAL. DUE DATE
С	Signal Analyzer	Rohde & Schwarz	FSV40	101091	2019-8-5	2020-8-4
	EMI Test Receiver	Rohde & Schwarz	ESR3	101906	2019-8-5	2020-8-4
	Signal Analyzer	Rohde & Schwarz	FSV40	101091	2019-8-5	2020-8-4
	Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9168	961	2019-3-16	2022-3-15
	Horn Antenna	Rohde & Schwarz	HF907	102393	2018-6-11	2021-4-1
	Pre-amplifier	Rohde & Schwarz	SCU-18D	19006451	2019-8-5	2020-8-4
RE	Loop antenna	Rohde & Schwarz	HFH2-Z2	100443	2019-6-28	2020-6-27
	DOUBLE-RIDGED WAVEGUIDE HORN WITH PRE-AMPLIFIER (18 GHZ - 40 GHZ)	ETS-Lindgren	3116C-PA	002222727	2018-1-29	2021-1-28
	3m Semi-anechoic chamber	TDK	9X6X6		2018-5-11	2021-5-10
	EMI Test Receiver	Rohde & Schwarz	ESR3	101907	2019-8-5	2020-8-4
CE	LISN	Rohde & Schwarz	ENV216	101924	2019-8-5	2020-8-4
	Measurement Software Information					
Test Item	Test Item Software Manufacturer Version		sion			
RE	EMC 32	Rohde & Schwarz		V9.1	5.00	
CE	EMC 32	Rohde & Schwarz		V9.1	5.03	

C - Conducted RF testsConducted peak output power

- 6dB bandwidth and 99% Occupied Bandwidth
- Power spectral density*
- Spurious RF conducted emissions
- Band edge



11 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

Items	Extended Uncertainty		
Conducted Disturbance at Mains Terminals	150kHz to 30MHz, LISN, ±3.16dB		
Radiated Disturbance	30MHz to 1GHz, ±5.03dB (Horizontal) ±5.12dB (Vertical)		
	1GHz to 18GHz, ±5.49dB		
	18GHz to 25GHz, ±4.76dB		



12 Photographs of Test Set-ups

Refer to the < Test Setup photos >.



13 Photographs of EUT

Refer to the < External Photos > & < Internal Photos >.

THE END