

## **FCC/IC - TEST REPORT**

Report Number	:	68.950.18.0569	0.01	Date of Issue:	November 28, 2018
Model	:	KG9010			
Product Type	:	Wireless Keybo	ard		
Applicant	:	Shenzhen Loya	I Electronio	cs Co., Ltd	
Address	:	No.5 The First I	ndustrial A	rea of Shanmer	۱,
		Songgang, Bao	an, Shenzl	hen, China	
Manufacturer	:	Shenzhen Loya	I Electronio	cs Co., Ltd	
Address	:	No.5 The First I	ndustrial A	rea of Shanmer	۱,
		Songgang, Bao	an, Shenzl	hen, China	
Test Result	:	Positive	🗆 Negati	ve	
Total pages including Appendices	:	37			

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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. Shenzhen Branch Building 12 & 13, Zhiheng Wisdomland Business Park, Nantou Checkpoint Road 2, Nanshan District Shenzhen 518052 P.R. China
Telephone: Fax:	86 755 8828 6998 86 755 828 5299
FCC Registration	514049
IC Registration No.:	10320A -1



# **3** Description of the Equipment Under Test

Product:	Wireless Keyboard
Model no.:	KG9010
FCC ID:	2AAVD-G9010
IC:	23918-G9010
Options and accessories:	N/A
Rating:	3.0VDC, 100mA, powered by two AA size non-rechargeable battery
RF Transmission	2408MHz-2474MHz
No. of Operated Channel:	34
Modulation:	FSK,
Antenna Type:	Integrated antenna
Antenna Gain:	-0.61dBi
Description of the EUT:	The Equipment Under Test (EUT) is a Wireless Keyboard operated at 2.4GHz



# 4 Summary of Test Standards

Test Standards			
FCC Part 15 Subpart C	PART 15 - RADIO FREQUENCY DEVICES		
10-1-2017 Edition	Subpart C - Intentional Radiators		
RSS-Gen Issue 5	General Requirements for the Certification of Radio Apparatus		
April 2018			
RSS-247 Issue 2	Digital Transmission Systems (DTSS), Frequency Hopping Systems		
February 2017	(FHSS) and License-Exempt Local Area Network (LE-LAN) Devices		

All the test methods were according to KDB558074 D01 15.247 Meas Guidance v05 and ANSI C63.10 (2013).



## 5 Summary of Test Results

Technical Requirements					
FCC Part 15 Sub	part C/RSS-247 Is	sue 2/RSS-Gen Issue 5			
Test Condition			Pages	Test Result	Test Site
§15.207	RSS-GEN 8.8	Conducted emission AC power port		N/A	
§15.247(b)(1)	RSS-247 Clause 5.4(d)	Conducted peak output power	10	Pass	Site 1
§15.247(e)	RSS-247 Clause 5.2(b)	Power spectral density*		N/A	
§15.247(a)(2)	RSS-247 Clause 5.2(a)	6dB bandwidth		N/A	
§15.247(a)(1)	RSS-247 Clause 5.1(a) & RSS-Gen 6.7	20dB bandwidth and 99% Occupied Bandwidth	13	Pass	Site 1
§15.247(a)(1)	RSS-247 Clause 5.1(b)	Carrier frequency separation	17	Pass	Site 1
§15.247(a)(1)(iii)	RSS-247 Clause 5.1(d)	Number of hopping frequencies	19	Pass	Site 1
§15.247(a)(1)(iii)	RSS-247 Clause 5.1(d)	Dwell Time	21	Pass	Site 1
§15.247(d)	RSS-247 Clause 5.5	Spurious RF conducted emissions	23	Pass	Site 1
§15.247(d)	RSS-247 Clause 5.5	Band edge	29	Pass	Site 1
§15.247(d) & §15.209 &	RSS-247 Clause 5.5 & RSS-GEN 6.13	Spurious radiated emissions for transmitter and receiver	32	Pass	Site 1
§15.203	RSS-GEN 6.8	Antenna requirement	See note 2	Pass	

Note 1: N/A=Not Applicable.

Note 2: The EUT uses an Integrated antenna, which gain is -0.61dBi. In accordance to §15.203, it is considered sufficiently to comply with the provisions of this section.



## 6 General Remarks

#### Remarks

This submittal(s) (test report) is intended for FCC ID: 2AAVD-G9010, IC: 23918-G9010 complies with Section 15.209, 15.247 of the FCC Part 15, Subpart C, RSS-247 Issue 2 February 2017 and RSS-Gen Issue 5 April 2018 rules.

KG9010 is a Wireless Keyboard with 2.4G Radio function. The TX and RX range is 2408MHz-2474MHz.

Note: The report is for FSK only.

#### 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:	September 25, 2018
Testing Start Date:	September 25, 2018
Testing End Date:	October 20, 2018

Reviewed by:



Phoebe Hu EMC Section Manager Vincene zheng

Vincent Zheng EMC Project Engineer

Tested by:

Tree them

Tree Zhan EMC Test Engineer



## 7 Test Setups

7.1 Radiated test setups Below 1GHz



## Above 1GHz



## 7.2 Conducted RF test setups





## 8 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.	S/N

Test software: N/A

The system was configured to hopping mode and non-hopping mode.

Hopping mode: typical working mode (normal hopping status)

Non-hopping mode: The system was configured to operate at a signal channel transmitting. The test software allows the configuration and operation at the worst-case duty and the highest transmit power.



## 9 Technical Requirement

## 9.1 Conducted peak output power

#### **Test Method**

- Use the following spectrum analyzer settings: Span = approximately 5 times the 20dB bandwidth, centered on a hopping channel RBW > the 20dB bandwidth of the emission being measured, VBW≥RBW, 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

For e.i.r.p

Frequency Range	Limit	FCC Limit	IC Limit
MHz	W	dBm	dBm
2400-2483.5	≤1	≤30/1W	≤21/0.125W
Frequency Range	1	Limit	Limit
MHz		W	dBm
2400-2483.5		≤4W	≤36

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#### Conducted peak output power

FSK r	nodulation Test Re	sult				
	Conducted Peak	E.I.R.P				
Frequency	Output Power		Result			
MHz	dBm	dBm				
Low channel 2408MHz	-1.63	-2.24	Pass			
Middle channel 2440MHz	-2.69	-3.30	Pass			
High channel 2474MHz	-2.99	-3.60	Pass			



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#### Middle channel 2440MHz



Date: 10.SEP 2018 16:55:18

Att 40 dB SWT	1 ms 🖷 VBW 10 MH	iz Mode Auto Sweep	
1Pk View	Ť Ť	M1[1]	-2.99 dF
20 dBm		+ + +	2.4744520 G
10 dBm			
0 dBm		MI	
-10 dBHD HALAND have men			
20.080			
20 dbm			
30 dBm			
40 dBm			
50 dBm			
60 dBm			
CF 2.474 GHz	69	L pts	Span 8.0 Mł

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## 9.2 20 dB bandwidth and 99% Occupied Bandwidth

#### **Test Method**

- 1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- 2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
- 3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
- 4. Repeat above procedures until all frequencies measured were complete.

#### Limit

Limit [kHz]

N/A



#### 20 dB bandwidth and 99% Occupied Bandwidth



Bluetooth Mode FSK Modulation test result

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#### Middle channel 2440MHz

UU	e sasses the first first first first	VBW 300 kHz	Mode Auto FFT		
<u>aa</u>					
			M1[1]		-22.74 dBn 2.43858500 GH -2.70 dBr
				1	2.44049500 GH
			M2		
		$h \rightarrow$	$\sim$		
1 -22.699			~	- 23	
				-	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
		1001 pt:	s		Span 5.0 MHz
[ Tan ]	Muslus I		Counting 1	Front	law Daawik
1	2,438585 GHz	-22,74 dBm	Function	Funct	ion kesuit
1	2.440495 GHz	-2.70 dBm			
	1 -22.699	M1           1 -22.699 dBm           1 2.438585 GHz           1 2.438585 GHz           1 2.43959 MHz           1 2.4505 MHz	M1         Image: Constraint of the second seco	M1         M1(1)           M2         M2           M1         M2           M1         M2           M2         M2           M3         M2           M1         M2           M1         M2           M1         M2           M1         M2           M3         M2           M3         M2           M4         M2           M3         M2           M3         M2           M3         M2           M3         M2           M4         M2           M3         M2           M3         M2           M3         M2           M3         M2           M3         M2           M3         M3           M3         M3           M3         M3           M3         M3           M3         M3	M1[1]         M2[1]           M1         M2[1]           M2         M2           M1         M2           1         22.699 dSm           1         2.439585 GHz           -22.74 dBm           1         2.439585 GHz           -2.70 dBm           1         2.439585 GHz           -2.70 dBm

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#### High channel 2474MHz



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## 9.3 Carrier Frequency Separation

#### **Test Method**

- Use the following spectrum analyzer settings: Span = wide enough to capture the peaks of two adjacent channels, RBW ≥ 1% of the span, VBW) ≥RBW, Sweep = auto, Detector function = peak
- 2. By using the Max-Hold function record the separation of two adjacent channels.
- 3. Measure the frequency difference of these two adjacent channels by spectrum analyzer marker function.
- 4. Repeat above procedures until all frequencies measured were complete.

#### Limit

#### Limit kHz

≥25KHz or 2/3 of the 20 dB bandwidth which is greater

#### FSK Modulation Limit

Frequency	2/3 of 20 dB Bandwidth
MHz	kHz
2408	1753.33
2440	1723.33
2474	1700.00



#### **Carrier Frequency Separation**

Test result: The measurement was performed with the typical configuration (normal hopping status), here FSK modulation mode was used to show compliance.

#### FSK Modulation test result

Frequency MHz	Carrier Frequency Separation kHz	Result
2408		Pass
2440	1983	Pass
2474		Pass



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## 9.4 Number of hopping frequencies

#### **Test Method**

- Use the following spectrum analyzer settings: Span = wide enough to capture the peaks of two adjacent channels, RBW ≥ 1% of the span, VBW) ≥RBW, Sweep = auto, Detector function = peak
- 2. Set the spectrum analyzer on Max-Hold Mode, and then keep the EUT in hopping mode.
- 3. Record all the signals from each channel until each one has been recorded.
- 4. Repeat above procedures until all frequencies measured were complete.

#### Limit

Limit number ≥ 15



#### Number of hopping frequencies

Test result: The measurement was performed with the typical configuration (normal hopping status), and the total hopping channels is constant for the all modulation mode according with the Bluetooth Core Specification. Here FSK modulation mode was used to show compliance.

Number of nopping frequen	cies Result
34	Pass
Spectrum	<b>u</b>
Ref Level 30.00 dBm         Offset 1.00 dB ••         RBW 100 kHz           Att         40 dB         SWT         1 ms ••         VBW 300 kHz         Mg	ode Auto Sweep
1Pk View	
10 dBm	
0 dBm	
dBm-	
	, lat hu hu hu hu ha ha hu hu hu hu ha ha hu
10 dBm	d ann a a h a a a a a a a a a a a a a a a
o dam	
0 dBm	
i0 dBm-	
tart 2.4 GHz 691 pts	Stop 2.4835 GH

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## 9.5 Dwell Time

#### **Test Method**

- 1. Connect EUT antenna terminal to the spectrum analyzer with a low loss cable. Equipment mode: Spectrum analyzer
- 2. RBW: 1MHz; VBW: 1MHz; SPAN: Zero Span
- 3. Adjust the center frequency of spectrum analyzer on any frequency be measured.
- 4. Measure the Dwell Time by spectrum analyzer Marker function.
- 5. Repeat above procedures until all frequencies measured were complete.

#### Limit

The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.



#### **Dwell Time**

#### Dwell time

The maximum dwell time shall be 0.4 s.

The Dwell Time = Burst Width \* Total Hops. The detailed calculations are showed as follows: The duration for dwell time calculation: 0.4 [s] \* hopping number = 0.4 [s] \* 34 [ch] = 13.6 [s\*ch];

The burst width, which is directly measured, refers to the duration on one channel hop.

The maximum number of hopping channels in 13.6s for FSK=1600 / 6 /34 \*13.6=106.67

		T	est Result			
Modulation	Mada	Reading	Total Hono	Test Result	Limit	Pocult
	Mode	(ms)	Total Hops	(ms)	(ms)	Result
FSK		7.87	39	306.93	< 400	Pass

**FSK Modulation** 



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## 9.6 Spurious RF conducted emissions

#### **Test Method**

- Use the following spectrum analyzer settings: Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10<sup>th</sup> harmonic. Typically, several plots are required to cover this entire span. RBW = 100 kHz, VBW≥RBW, Sweep = auto, Detector function = peak, Trace = max hold
- 2. Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded.
- 3. The level displayed must comply with the limit specified in this Section. Submit these plots.
- 4. Repeat above procedures until all frequencies measured were complete.

#### Limit

Frequency Range MHz	Limit (dBc)
30-25000	-20

# SUD

## **Spurious RF conducted emissions**

#### FSK Modulation:

Att 30 dB SWT	18.9 µs • VBW 300 I	Hz Mode Auto FFT	
1Pk Max			
		M1[1]	-1.62 di 2.40850140 G
.0 dBm			
d d D m			MI
10 dBm			
20 dBm			
30 dBm			
40 dBm			
50 dBm			
60 dBm			
70 dBm-			
		1 ate	Snan 1 5 ML

Spectrum 
 Ref Level 11.00 dBm
 Offset
 1.00 dB
 RBW
 100 kHz

 Att
 20 dB
 SWT
 30.1 ms
 VBW
 300 kHz

 Count 10/10
 Image: Count 10/10
 Mode Auto Sweep -56.98 dBr 935.5460 MH M1[1] 0 dBr -10 dBm--20 dBm--30 dBm--40 dBm--50 dBm-MI -60 dBm--70 dBm----80 dBm-30001 pts Stop 1.0 GHz Start 30.0 MHz 1000 CONTRACTOR 640

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					M1[1]	- 944	-59.42 dB 4.7280 MH
I dBm		2				 	
10 dBm							
20 dBm-0	1 -22.790	dBm	:			 	
30 dBm						 	
40 dBm						 	
50 dBm		-		-		 	
60 dBm							M1
		12			Ť.	11.	

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					MI	[1]		-44.34 d 4.878550 (
) dBm			1					
dBm								
.0 dBm								
0 dBm-	D1 -22.790	dBm						
0 dem—	MI							
0 dem—		a dia 1		La ballate a	10 1 10 10 10 10 10 10 10 10 10 10 10 10	and the second states of the second	بالمرجع وسالله	and the strate of the State of
0 d'mant	docts little photo	Bullet	and a state of the loss	ana da Mada da M	Harry A. T. S. B.	The photose part	and warming with the	The disc shield all sur

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High channel 2474MHz

IPK Max		M	L[1]	2.4	-2.86 dB
10 dBm	 i	-			+
) dBm				MI	
10-dBm				$\square$	-
20 dBm					
30 dBm					
40 dBm					
50 dBm					-
60 dBm					
70 d9m					

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1Pk Max									
					M	1[1]		935	-58.04 dBn 5.6750 MH
) dBm									
10 dBm	_								
20 dBm	22.860 d	Bm							
30 dBm									
40 dBm					aa				-
50 dBm	_								
60 dBm									-
70 dBm	H. Maylor	wannanyka	I HISE MARINE	n an filme an	ور المعادين المعالية المعالية	وسنقاء الغريقان إنغا	Henrice Literta	alastaptadolor	and the second
30 dBm	New Yorking	autor applie	alliter formulater	te personale estimates for	ana fastinali paris	perela perioden	alman jakan palaju	htereseast states	and Age with the
Start 20.0 MU				3000	1 pts		1	Sto	DD 1.0 GHz

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Count 9/1	0	5 341	233 113	500 KH2	moue .	auto Sweep			
1Pk Max	[	T			м	1[1]		4.0	39.28 dB
.0 dBm									49100 G
) dBm			:						
10 dBm									
20 dBm—	D1 -22.860	dBm							
30 dBm									
40 dBm	MI								
50 c8m									
60 d8h	and the desidered	mar allow	and the short has the	والعربان والمقال والم	رطا (الداريسي وللمريخ ب	Allers, Arneddil	No also No II. (La sal A	a distanti ang sa	dia A Anala
- and a second	- Martin and South	a constant of the second second	and the second second	and the second				2020000	and all states
70 dBm									

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## 9.7 Band edge testing

#### **Test Method**

- 1 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, VBW ≥ RBW, Sweep = auto, Detector function = peak, Trace = max hold
- 2 Allow the trace to stabilize, use the peak and delta measurement to record the result.
- 3 The level displayed must comply with the limit specified in this Section. .
- 4 Repeat the test at the hopping off and hopping on mode, submit all the plots.

#### Limit:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the100 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 that the transmitter demonstrates compliance with the peak conducted power limits.

## FSK mode: Hopping off

Ret Lev	el 20.00 dBn	n Offset 1.00 dB	RBW 100 kHz		( Δ
Att	30 di	3 <b>SWT</b> 246.5 µs (	<b>VBW</b> 300 kHz	Mode Auto F	FT
Count 30	10/300				
TEK VIEV	,			M1[1]	-1.96 dBr
10 dBm-					2.408490 GH
to abili				M2[1]	-41.19 dBr
) dBm			-		2.400000 GH
10 dBm-	-				
20 dam-					l l l l l l l l l l l l l l l l l l l
20 0011	D1 -21.960	l dBm			
30 dBm-	_				M4
					. T.M21
40 dBm-	all to the				
	di di Alfredi di				
The line	a Martin Ma	1 <sup>10</sup> 1			
60 dBr	ad . d Mit 1	Upper and the set of the	Constitution of NUL	the sheets Milliam	JANA JANAH MATTA ANA ANA ANA ANA ANA ANA ANA ANA ANA
		a to other and recording of	Andrew and Alexander and	C. C. Son of Anna 1.	and and
70 dBm-					
	GHz		691 pts		Stop 2.41 GHz
Start 2.3					
Start 2.3 Iarker					
Start 2.3 Iarker Type   F	Ref Trc	X-value	Y-value	Function	Function Result
Start 2.3 larker Type F M1 M2	Ref Trc	X-value 2.40849 GHz 2.4 GHz	Y-value -1.96 dBm -41 19 dBm	Function	Function Result
Start 2.3 larker Type F M1 M2 M3	Ref Trc 1	X-value 2.40849 GHz 2.4 GHz 2.39 GHz	Y-value -1.96 dBm -41.19 dBm -50.34 dBm	Function	Function Result

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Spect	rum		044-th 1 00 db	- PPUL 100 Hile			
Att	ever :	20.00 aBri 30 dE	SWT 1.1 ms	<b>VBW</b> 300 kHz	Mode Auto Sv	weep	
1Pk Vi	900/3 ew	00					
					M1[1]		-2.88 di
10 dBm	-						2.474570 G
					M2[1]		-50.37 di
) dBM						10	2.483500 G
1.1							
10 <b>dS</b> m	-			-			
11							
20JdBn		1 -22,880	dBm				
d da	I I	1.1					
SU UBI							
0 dBm	11						
0 000	. n M	Mal					
50 dBm		N-Jon	M.	13			
		~ 1	Marine Marine	Nu .			
50 dBm	1-		MINIMUS GALVAN	- house where	Mary - and a strange take	Howard And And And And And And And And And An	- Heater and a second and a s
70 dBm	+-י						
start 2	.47 G	Hz	18 87	691 pts			Stop 2.55 G
larker							
Type	Ref	Trc	X-value	Y-value	Function	Fu	unction Result
M1		1	2.47457 GHz	-2.88 dBm			
M2		1	2.4835 GHz	-50.37 dBm			
MЗ		1	2.5 GHz	-53.48 dBm			
644		1	2.484493 GHz	-39.94 dBm			

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## FSK mode: Hopping on

Spect	rum		m Offcot 1.00	He - PPW 100	1/11-2			
Att	300/3	30 J	dB SWT 1.1 r	ns <b>e VBW</b> 300	kHz M	lode Auto S	weep	
1Pk Vi	ew					M1[1]		-2.93 dBr 2.470520 GH
i						M2[1]		-41.50 dBr 2 483500 GH
-10 dBn -20 dBn -30 dBn -40 dBn -50 dBn -60 dBn -70 dBn		1 -22.93		, 11-13 , 11-14 , 11-14 , 11-14				
Start 7	47.0	U7		6	01 ntc	10		Stop 2 55 CHz
larkor		112			91 pcs			300p 2.00 di 12
Type	Ref	Trc	X-value	Y-valu	e	Function	E E	unction Result
M1		1	2,47052 G	lz -2.93	dBm			
M2		1	2.4835 G	Hz -41.50	dBm			
MЗ		1	2.5 G	Hz -55.30	dBm			
M4		1	2.485536 G	Hz -41.14	dBm			

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Att	evel 2	20.00 dBn 30 dI	n Offset 1.00 dB 8 SWT 246.5 us	RBW 100 kHz VBW 300 kHz	Mode	Auto FFT			
1Pk M	эх	0.000			1.1040	indite i i i			
					M4	H[1]			35.36 dE
10 dBm	-		-					2.3	97500 G
					MI	[1]		0.4	-1.85 dE
0 dBm-	-			-			1	2.4	08490 G
-10 dBm									
20 dem			0255						
-20 UBII	D	1 -21.880	l dBm						
-30 dBm	-							1014	
								NT.	12 A
-40 dBm		1.1.1.1	1.1				1.1.1		
UN N		al la la la l					10 10	MELL'S V	ս կանություն
אין פון אין	41.5	nuu					1 NAM	HO AND .	
-60 dBm		0.0 - 0 -		al a constant	in ut	يبقير الظاملين	well they V"		
00 001			handradheramore	destanting reactions	alla Adard	to Annovatrillation of	n		
-70 dBm	-								
Start 2	.3 GH	z		691 pt	s			Stop	2.41 GH
1arker									
Type	Ref	Trc	X-value	Y-value	Funct	ion	Fund	tion Result	
M1		1	2.40849 GHz	-1.85 dBm					
M2		1	2.4 GHz	-36.79 dBm					
		1	2 30 GHz	-49 76 dBm					

Date: 11 SEP 2018 14:26:21

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## 9.8 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 Above 1GHz

Span = wide enough to capture the peak level of the in-band emission and all spurious RBW = 1MHz, VBW  $\geq$  RBW for peak measurement and VBW = 10Hz for average measurement, Sweep = auto, Detector function = peak, Trace = max hold.

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, VBW  $\geq$  RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

#### Note:

1: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 KHz for Quasi-peak detection (QP) at frequency below 1GHz.

2: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for peak detection (PK) at frequency above 1GHz.

3: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average ((duty cycle < 98%) for Average detection (AV) at frequency above 1GHz, then the measurement results was added to a correction factor (20log(1/duty cycle)).

4: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (duty cycle > 98%) for Average detection (AV) at frequency above 1GHz.



### 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 section 15.205, must comply with the radiated emission limits specified in section 15.209.

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:

FSK Modulation 2408MHz Test Result

Frequency	Frequency	Emission Level	Polarization	Limit	Detector	Margin	Correct factor	Result
Danu	MHz	dBuV/m		dBµV/m		dBuV/m	(dB)	
30-	726.33	28.61	Н	46	QP	17.39	-17.6	Pass
1000MHz	914.25	27.85	V	46	QP	18.15	-14.9	Pass
	4816.46*	52.77	Н	74	PK	21.23	-8.5	Pass
1000-	4815.65*	50.26	V	74	PK	23.74	-8.5	Pass
25000MHz	7224.08*	49.86	Н	74	PK	24.14	-7.6	Pass
	7224.72*	50.19	V	74	PK	23.81	-7.6	Pass

#### FSK Modulation 2440MHz Test Result

Frequency	Frequency	Emission Level	Polarization	Limit	Detector	Margin	Correct factor	Result
Dallu	MHz	dBuV/m		dBµV/m		dBuV/m	(dB)	
30-			Н	43.5	QP			Pass
1000MHz			Н	46	QP			Pass
	4880.65*	51.88	Н	74	PK	22.12	-8.5	Pass
1000-	4880.44*	49.75	V	74	PK	24.25	-8.5	Pass
25000MHz	7320.23*	50.24	Н	74	PK	23.76	-7.6	Pass
	7319.76*	48.73	V	74	PK	25.27	-7.6	Pass



Frequency	Frequency	Emission Level	Polarization	Limit	Detector	Margin	Correct factor	Result
Dallu	MHz	dBuV/m		dBµV/m		dBuV/m	(dB)	
30-			Н	43.5	QP			Pass
1000MHz			Н	46	QP			Pass
	4948.67*	52.84	Н	74	PK	21.16	-8.5	Pass
1000-	4947.36*	51.95	V	74	PK	22.05	-8.5	Pass
25000MHz	7421.89*	47.83	Н	74	PK	26.17	-7.6	Pass
	7422.31*	49.58	V	74	PK	24.42	-7.6	Pass

#### FSK Modulation 2474MHz Test Result

Remark:

- (1) "\*" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.
- (2) Data of measurement within this frequency range shown "--" in the table above means the reading of emissions are the noise floor or attenuated more than 10dB below the permissible limits or the field strength is too small to be measured.
- (3) Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Amplifier Gain Below 1GHz: Corrector factor = Antenna Factor + Cable Loss



# **10 Test Equipment List**

## **List of Test Instruments**

R	adiated Emission Test				
	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
	EMI Test Receiver	Rohde & Schwarz	ESR 26	101269	2019-7-6
	Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9163	707	2019-7-14
	Horn Antenna	Rohde & Schwarz	HF907	102294	2019-7-14
	Pre-amplifier	Rohde & Schwarz	SCU 18	102230	2019-7-6
	Signal Generator	Rohde & Schwarz	SMY01	839369/005	2019-7-6
	Attenuator	Agilent	8491A	MY39264334	2019-7-6
	3m Semi-anechoic chamber	TDK	9X6X6		2020-7-7
	Test software	Rohde & Schwarz	EMC32	Version 9.15.00	N/A

#### TS8997 Test System

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
Signal Generator	Rohde & Schwarz	SMB100A	108272	2019-7-6
Vector Signal Generator	Rohde & Schwarz	SMBV100A	262825	2019-7-6
Communication Synthetical Test Instrument	Rohde & Schwarz	CMW 270	101251	2019-5-31
Signal Analyzer	Rohde & Schwarz	FSV40	101030	2019-7-6
Vector Signal Generator	Rohde & Schwarz	SMU 200A	105324	2019-7-6
RF Switch Module	Rohde & Schwarz	OSP120/OSP-B157	101226/100851	2019-7-6
Power Splitter	Weinschel	1580	SC319	2019-7-5
10dB Attenuator	Weinschel	4M-10	43152	2019-7-6
10dB Attenuator	R&S	DNF	DNF-001	2019-7-6
10dB Attenuator	R&S	DNF	DNF-002	2019-7-6
10dB Attenuator	R&S	DNF	DNF-003	2019-7-6
10dB Attenuator	R&S	DNF	DNF-004	2019-7-6
Test software	Rohde & Schwarz	EMC32	Version 10.38.00	N/A
Test software	Tonscend	System for BT/WIFI	Version 2.6	N/A



## **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:

System Measurement Uncertainty						
Test Items	Extended Uncertainty					
Uncertainty for Radiated Emission in 3m chamber 30MHz-	Horizontal: 4.91dB;					
1000MHz	Vertical: 4.89dB;					
Uncertainty for Radiated Emission in 3m chamber 1000MHz-	Horizontal: 4.80dB;					
18000MHz	Vertical: 4.79dB;					
Uncertainty for Radiated Spurious Emission 18000MHz-	Horizontal: 5.05dB;					
40000MHz	Vertical: 5.04dB;					
Uncertainty for Conducted RF test with TS 8997	Power level test involved: 1.16dB Frequency test involved: 0.6×10 <sup>-7</sup>					