

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

OF

Applicant:	United Integrated Services Co., Ltd. 5F, No. 3, Lane 7, Baogao Rd., Xindian Dist., New Taipei City 23144, Taiwan
Product Name:	Wireless Panic Button
Brand Name:	UIS
Model No.:	WDI-220A, CPT-220, CNT-220
Model Difference:	Different internal component, function and colors
FCC ID:	XBTCPT-220
Report Number:	E2/2018/90011
FCC Rule Part:	§15.247, Cat: DTS
Issue Date:	Oct. 17, 2018
Date of Test:	Oct. 24, 2017 ~ Feb. 23, 2018 (Radiated)
Date of Test.	Sep. 04, 2018 ~ Oct. 09, 2018 (Conducted)
Date of EUT Received:	Oct. 24, 2017 (Radiated) & Sep. 04, 2018 (Conducted)
We hereby certify that:	

The above equipment was tested by SGS Taiwan Ltd. Electronics & Communication Laboratory The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10:2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits.

The test results of this report relate only to the tested sample identified in this report.

Aken Huang / Engineer

Tested By:

Approved By: _____CHUN; CHIZEH, CHIFN

Chun Chieh Chen / Asst. Supervisor





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Revision History

Report Number	Revision	Description	Effected Page	Issue Date	Revised By
E2/2018/90011	Rev.00	Initial creation of document	All	Oct. 17, 2018	Violetta Tang

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GENERAL INFORMATION 1

1.1 Product Description

General:

Product Name:	Wireless Panic Button	
Brand Name:	UIS	
Model No.:	VDI-220A, CPT-220, CNT-220	
Model Difference:	Different internal component, function and colors	
SW version:	N/A	
HW version:	N/A	
Power Supply:	3Vdc from CR123A battery	

Zigbee:

Frequency Range:	2405 – 2480MHz
Channel number:	16 channels
Modulation type:	O-QPSK
Transmit Power:	15.40dBm
Antenna Designation:	Chip Antenna, Gain: 2.41dBi



1.2 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.247

FCC KDB 558074 D01 DTS Meas. Guidance v05.

ANSI C63.10:2013

Note: All test items have been performed and record as per the above standards.

1.3 Test Facility

SGS Taiwan Ltd. Electronics & Communication Laboratory No.2, Keji 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)

(TAF code 0513)

FCC Registration and Designation number are: 735305 / TW0002

1.4 Special Accessories

There are no special accessories used while test was conducted.

1.5 Equipment Modifications

There was no modification incorporated into the EUT.

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SYSTEM TEST CONFIGURATION 2

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

An engineering test mode (software/firmware) that applicant provided was utilized to manipulate the EUT into transmit, selection of the test channel, and modulation scheme.

2.3 Test Procedure

2.3.1 Conducted Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plan. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz,. The CISPR Quasi-Peak and Average detector mode is employed according to §15.207 & RSS-Gen §8.8. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

2.3.2 Radiated Emissions

The EUT is a placed on as turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m above the reference ground plan. For emission measurements above 1 GHz, the table height shall be 1.5 m. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.

2.4 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuation factor between EUT conducted port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly EUT RF output level.

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2.5 Configuration of Tested System

Fig. 2-1 Conducted (Antenna Port) Emission Configuration

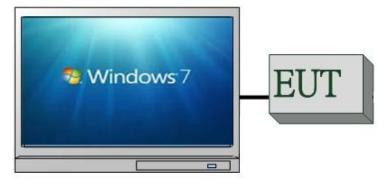


Fig 2-2 Radiated Emission Configuration



Table 2-1 Equipment Used in Tested System

ltem	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	Zigbee Test Software	N/A	N/A	N/A	N/A	N/A
2.	Notebook	Lenovo	L420	S0011721	N/A	Un-Shielded

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SUMMARY OF TEST RESULTS 3

FCC Rules	Description Of Test	Result
§15.207(a)	AC Power Line Conducted Emission	N/A
§15.247(b) (3)	Peak Output Power	Compliant
§15.247(a)(2)	6dB Emission Bandwidth	Compliant
§15.247(d)	Conducted Band Edge and Spurious Emission	Compliant
§15.247(d)	Radiated Band Edge and Spurious Emission	Compliant
§15.247(e)	Peak Power Density	Compliant
§15.203 §15.247(b)	Antenna Requirement	Compliant

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DESCRIPTION OF TEST MODES 4

4.1 Operated in 2400 ~ 2483.5MHz Band

16 channels are provided for Zigbee

	0		
CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
1	2405 MHz	9	2445 MHz
2	2410 MHz	10	2450 MHz
3	2415 MHz	11	2455 MHz
4	2420 MHz	12	2460 MHz
5	2425 MHz	13	2465 MHz
6	2430 MHz	14	2470 MHz
7	2435 MHz	15	2475 MHz
8	2440 MHz	16	2480 MHz

4.2 The Worst Test Modes and Channel Details

- 1. The EUT has been tested under operating condition.
- 2. Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

RADIATED EMISSION TEST:

MODE	AVAILABLE FREQUENCY (MHz)	TESTED FREQUENCY (MHz)	MODULATION	DATA RATE (Mbps)	
	RADIA	TED EMISSION TEST ((BELOW 1 GHz)		
Zigbee	2405 to 2480	2440	O-QPSK	1	
	RADIATED EMISSION TEST (ABOVE 1 GHz)				
Zigbee	2405 to 2480	2405, 2440, 2480	O-QPSK	1	
Note:					

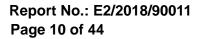
The field strength of radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for Zigbee Transmitter for channel Low, Mid and High, the worst case H position was reported.

ANTENNA PORT CONDUCTED MEASUREMENT:

	CONDUCTED TEST			
MODE	AVAILABLE FREQUENCY (MHz)	TESTED FREQUENCY (MHz)	MODULATION	DATA RATE (Mbps)
Zigbee	2405 to 2480	2405, 2440, 2480	O-QPSK	1

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MEASUREMENT UNCERTAINTY 5

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.586 dB
Peak Output Power	+/- 0.84 dB
6dB Bandwidth	+/- 51.33 Hz
100 KHz Bandwidth Of Frequency Band Edges	+/- 0.84 dB
Peak Power Density	+/- 1.3 dB
Temperature	+/- 0.65 °C
Humidity	+/- 4.6 %
DC / AC Power Source	DC= +/- 0.13%, AC= +/- 0.2%

Radiated Spurious Emission:

	9kHz – 30MHz: +/- 2.87 dB
	30MHz - 180MHz: +/- 3.37dB
Measurement uncertainty	180MHz -417MHz: +/- 3.19dB
(Polarization : Vertical)	0.417GHz-1GHz: +/- 3.19dB
	1GHz - 18GHz: +/- 4.04dB
	18GHz - 40GHz: +/- 4.04dB

	9kHz – 30MHz: +/- 2.87 dB
	30MHz - 167MHz: +/- 4.22dB
Measurement uncertainty	167MHz -500MHz: +/- 3.44dB
(Polarization : Horizontal)	0.5GHz-1GHz: +/- 3.39dB
	1GHz - 18GHz: +/- 4.08dB
	18GHz - 40GHz: +/- 4.08dB

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

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6 CONDUCTED EMISSION TEST

6.1 Standard Applicable:

Frequency range within 150kHz to 30MHz shall not exceed the Limit table as below.

Frequency range	Lin dB(nits uV)
MHz	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

Note

1. The lower limit shall apply at the transition frequencies

2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

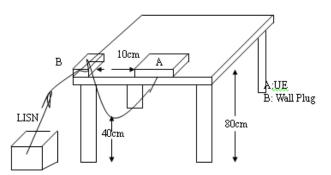
6.2 Measurement Equipment Used:

N/A, the device is powered by 3Vdc battery.

6.3 EUT Setup:

- 1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.10:2013.
- 2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
- 3. The LISN was connected with 120Vac/60Hz power source.

6.4 Test SET-UP (Block Diagram of Configuration)



6.5 Measurement Procedure:

- 1. The EUT was placed on a table which is 0.8m above ground plan.
- Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 3. Repeat above procedures until all phases of power being supplied by given UE are completed.

6.6 Measurement Result:

N/A, the device is powered by 3Vdc battery.

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7 PEAK OUTPUT POWER MEASUREMENT

7.1 Standard Applicable:

For systems using digital modulation in the 2400-2483.5 MHz bands, the limit for peak output power is 1Watt.

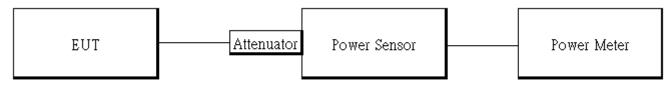
If the transmitting antenna of directional gain greater than 6dBi are used the peak output power form the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the Antenna exceeds 6dBi.

In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of Antenna exceeds 6dBi.

7.2 Measurement Equipment Used:

				<u>.</u>	
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.
TYPE		NUMBER	NUMBER	CAL.	
Power Meter	Anritsu	ML2496A	1326001	08/09/2018	08/02/2019
Power Sensor	Anritsu	MA2411B	1315048	08/09/2018	08/02/2019
Power Sensor	Anritsu	MA2411B	1315049	08/09/2018	08/02/2019
Attenuator	Marvelous	MVE2213-10	RF30	12/26/2017	12/25/2018
Notebook	Lenovo	L420	S0011721	N/A	N/A

7.3 Test Set-up:



7.4 Measurement Procedure:

- 1.Place the EUT on the table and set it in transmitting mode.
- 2.The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas Guidance & ANSI C63.10.
- 3.Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter.

Power Meter:

- It is used as the auxiliary test equipment to conduct the output power measurement.
- 4. Record the max. Reading as observed from Power Meter.
- 5.Repeat above procedures until all test default channel measured was complete.

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Formula:

Duty Cycle = Ton / (Ton+Toff)

Duty Factor:

	Duty Cycle (%)	Duty Factor (dB)	1/T (kHz)	VBW setting (kHz)
Zigbee	100.00	0.00	1.00	1.00

	trum Analyzer - Swept SA							#
Center Fr	req 2.4400000	00 GHz	1	SE:INT	LIGN AUTO	TRAC	M Oct 04, 2018	Frequency
10 dB/div	Ref Offset 10.5 d		Trig: Free #Atten: 30		 	De		Auto Tune
20.0 10.0								Center Freq 2.440000000 GHz
-10.0 -20.0 -30.0								Start Freq 2.440000000 GHz
-40.0 -50.0 -60.0								Stop Freq 2.440000000 GHz
Center 2.4 Res BW 8			/ 8.0 MHz	FUNC	Sweep 8	.000 ms (pan 0 Hz 1001 pts)	CF Step 8.000000 MHz <u>Auto</u> Man
1 2 3								Freq Offset 0 Hz
4 5 7 8 9 10 11								
MSG			111.		STATUS		+	

Duty Cycle Factor:10*log(1/(100/100))=0



7.5 Measurement Result:

Zigbee mode:

СН	Frequency (MHz)	Peak Power Output (dBm)	Required Limit
1	2405	12.21	1 Watt = 30 dBm
8	2440	15.40	1 Watt = 30 dBm
16	2480	6.80	1 Watt = 30 dBm
Zigbee	mode:		
СН	Frequency (MHz)	Max. Avg. Output include tune up tolerance Power (dBm)	Required Limit
1	2405	11.82	1 Watt = 30 dBm
8	2440	15.01	1 Watt = 30 dBm
16	2480	6.45	1 Watt = 30 dBm

*Note: Measured by power meter, cable loss as 10.45 dB that offsets on the power meter in Peak *Note: Measured by power meter, as cable loss+ Duty cycle factor that offsets on the power meter *Note: Max. Output include tune up tolerance Power is average power

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6DB BANDWIDTH MEASUREMENT 8

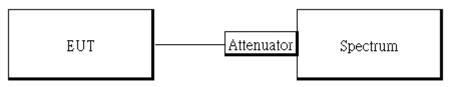
8.1 Standard Applicable

The minimum 6 dB bandwidth shall be at least 500 kHz.

8.2 Measurement Equipment Used

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	N9010A	MY51440113	06/20/2018	06/19/2019
Attenuator	Marvelous	MVE2213-10	RF30	12/26/2017	12/25/2018
DC Block	PASTERNACK	PE8210	RF29	12/26/2017	12/25/2018
Notebook	Lenovo	L420	S0011721	N/A	N/A

8.3 Test Set-up:



8.4 Measurement Procedure:

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance & ANSI C63.10.
- 3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 4. For 6dB Bandwidth:

Set the spectrum analyzer as RBW=100 kHz, VBW= 3*RBW, Span = 5MHz, Detector=Peak, Sweep=auto.

- 5. Mark the peak frequency and -6dB (upper and lower) frequency.
- 6. Repeat above procedures until all test default channel is completed.

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8.5 Measurement Result:

Zigbee mode

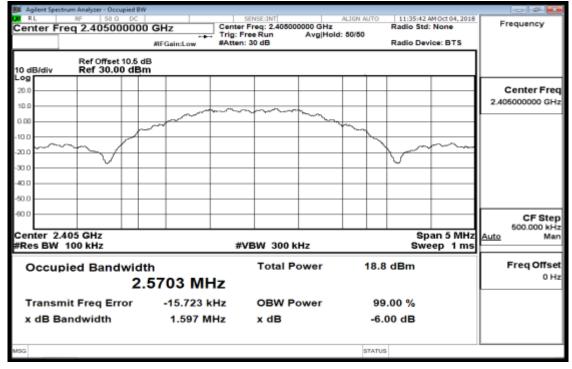
Frequency (MHz)	6dB BW (MHz)	BW (MHz)	Result
2405	1.597	> 0.5	PASS
2440	1.605	> 0.5	PASS
2480	1.604	> 0.5	PASS

Note: Refer to next page for plots.

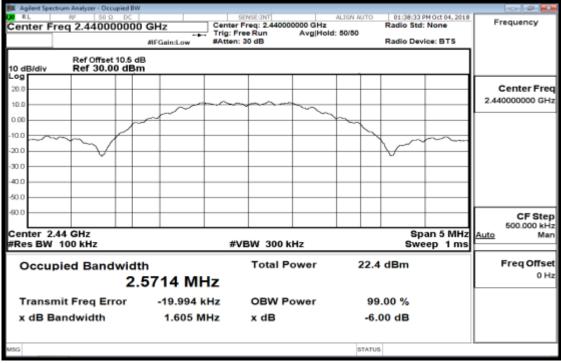
SGS Taiwan Ltd. No.134,WuKungRoad,NewTaipeiIndustrialPark,WukuDistrict,NewTaipeiCity,Taiwan24803/新北市五股區新北產業園區五工路 134號



6dB Band Width Test Data CH-Low



6dB Band Width Test Data CH-Mid

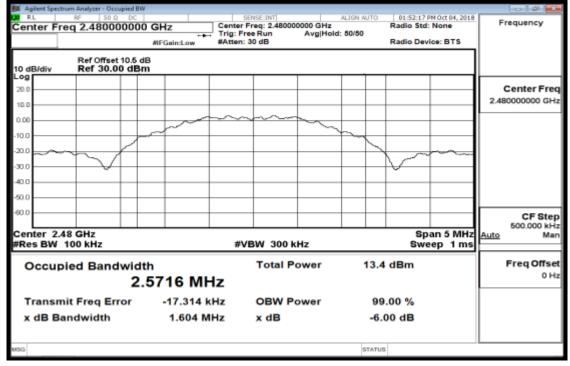


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6dB Band Width Test Data CH-High



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9 CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT

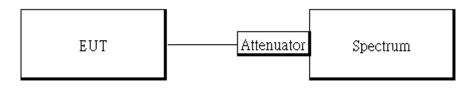
9.1 Standard Applicable

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. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a) & RSS-Gen §8.10, must also comply with the radiated emission limits specified in §15.209(a) & RSS-Gen §8.8.

9.2 Measurement Equipment Used:

EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.
TYPE		NUMBER	NUMBER	CAL.	
Spectrum Analyzer	Agilent	N9010A	MY51440113	06/20/2018	06/19/2019
Attenuator	Marvelous	MVE2213-10	RF30	12/26/2017	12/25/2018
DC Block	PASTERNACK	PE8210	RF29	12/26/2017	12/25/2018
Notebook	Lenovo	L420	S0011721	N/A	N/A

9.3 Test SET-UP:



9.4 Measurement Procedure

Reference Level of Emission Limit:

- 1. Set analyzer center frequency to DTS channel center frequency.
- 2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance & ANSI C63.10.
- 3. Set the span to 1.5 times the DTS channel bandwidth.
- 4. Set the RBW = 100kHz & VBW = 300 kHz.
- 5. Detector = peak.
- 6. Sweep time = auto couple.
- 7. Trace mode = max hold.
- 8. Allow trace to fully stabilize.
- 9. Use the peak marker function to determine the maximum amplitude level.

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Conducted Band Edge:

- 1. To connect Antenna Port of EUT to Spectrum.
- 2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance & ANSI C63.10.
- 3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 4. Set start to edge frequency, and stop frequency of spectrum analyzer so as to encompass the spectrum to be examined.
- 5. Set the spectrum analyzer as RBW=100 kHz, VBW=300 kHz, Detector = Peak, Sweep = auto
- 6. Mark the highest reading of the emission as the reference level measurement.
- 7. Marker on frequency, 2.3999GHz and 2.4836GHz, and examine shall 100 kHz immediately outside the authorized (2400~2483.5) be attenuated by 20dB at least relative to the maximum emission of power.
- 8. Repeat above procedures until all default test channel (low, middle, and high) was complete.

Conducted Spurious Emission:

- 1. To connect Antenna Port of EUT to Spectrum.
- 2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance & ANSI C63.10.
- 3. Set RBW = 100 kHz & VBW=300 kHz, Detector =Peak, Sweep = Auto
- 4. Allow trace to fully stabilize.
- 5. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.
- 6. Repeat above procedures until all default test channel measured were complete.

9.5 Measurement Result

Reference		
Frequency (MHz)	RF Power Density (dBm)	Reference Level of Limit = PSD - 20dB (dBm)
2405	8.50	-11.50
2440	11.715	-8.29
2480	3.22	-16.78

Reference Level of Limit

NOTE: cable loss as 10.45dB that offsets in the spectrum NOTE: Refer to next page for plots.

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Reference Level of Emission Limit (CH-Low)

Avg Type: Log-Pwr IB	1136154400004,2018 TRACE [12:3456 TRACE [12:3450 TRACE [12:
iB	04 718 0 GHz 8.50 dBm Center F
Mkr1 2.40	8.50 dBm Center F
	2.405000000
	Start F
	2.404250000
	Stop F
	2.405750000
	CF S 150.000
	Auto
	FreqOf
Stop	2.4057500 GHz
Hz	

Reference Level of Emission Limit (CH-Mid)

		_				trum Analyzer - Swept SA	
Frequency	01:49:15 PM Oct 04, 2018 TRACE 1 2 3 4 5 6 TYPE MWWWWW DET P NNNNN	Log-Pwr >100/100	Avg Typ	Trig: Free Run	GHz PNO: Wide	req 2.440000000	Center F
Auto Tune	440 235 5 GHz 11.715 dBm			Atten: 30 dB	IFGain:Low	Ref Offset 10.5 dB Ref 30.00 dBm	10 dB/div
Center Free 2.440000000 GH:			▲ ¹				20.0
Start Fred 2.439250000 GH					~~~		0.00
Stop Fre 2.440750000 GH							-10.0
CF Stej 150.000 kH Auto Ma							-30.0
Freq Offse 0 H						_	50.0
	Span 1.500 MHz					1400000 GHz	-60.0 Center 2.4
	000 ms (1001 pts)	Sweep 1.0		300 kHz	#VBW		#Res BW

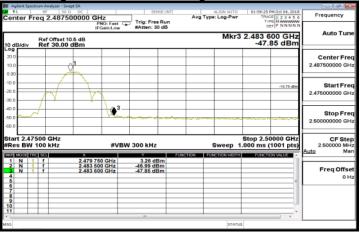
Reference Level of Emission Limit (CH-High)

	ctrum Analyzer - Swept SA								
Center F	req 2.48000000	0 GHz	Trig: Free F		Avg Type:	LIGN AUTO	01:52:31 P TRAC	N Oct 04, 2018 E 1 2 3 4 5 6 E M WWWWWW T P NNNNN	Frequency
10 dB/div	Ref Offset 10.5 dB Ref 30.00 dBm	PNO: Wide G	#Atten: 30	dB		Mkr1 2	.480 234		Auto Tune
20.0									Center Fred 2.480000000 GH:
0.00					<u> </u>				Start Fre 2.479250000 GH
-10.0									Stop Fre 2.480750000 GH
30.0									CF Ste 150.000 kH Auto Ma
50.0									Freq Offse 0 H
	792500 GHz					SI	op 2.4807	'500 GHz	
#Res BW	100 kHz	#VBW	/ 300 kHz		5	Sweep 1	.000 ms (1001 pts)	
49G						STATUS	5		

Band Edges Test Data CH-Low

Agilant Spectrum Analyzer - S				35	-ca- 🤪 🏭
enter Freq 2.360	000000 GHz	IENSE INT	Auton Auto Avg Type: Log-Pwr	02:12:05 PM Oct 04, 2018 TRACE 1 2 3 4 5 6	Frequency
	PNO: Fast ++ IFGain:Low	Trig: Free Run Atten: 30 dB	Avg Hold: 100/100	DET P NNNN	Auto Tun
Ref Offset 0 dB/div Ref 30.0			Mk	r3 2.390 0 GHz -51.630 dBm	Auto Tun
20.0					Center Free
0.0				×1	2.36000000 GH
0.00				findam	
20.0				Nh	Start Fre 2.310000000 GH
0.0				2 2	1.
0.0 0.0	permanent to prove a	anger and the spoke and the second	and the state of the second second	anno-under h	Stop Fre 2.410000000 GH
enter 2.36000 GHz Res BW 100 kHz		300 kHz	Sweep 1	Span 100.0 MHz 000 ms (1001 pts)	CF Ste
IN MORE THE SEL	×	Y	NETION FUNCTION MOTH		<u>Auto</u> Ma
1 N f 2 N f 3 N f 4	2 404 9 GHz 2 399 9 GHz 2 390 0 GHz	6.800 dBm -48.480 dBm -51.630 dBm			Freq Offse
5 6 7					
8 9 10					

Band Edges Test Data CH-High



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Spurious Emission Zigbee 1M LowCH01-2405

	ctrum Analyzer - Sv									
enter F	reg 1.5150	000000 GHz		1	SEIINT	Avg Typ	e: Log-Pwr	TRAC	M Oct 04, 2018	Frequency
0 dB/div	Ref Offset 1 Ref 30.00	IFGa 10.5 dB	: Fast 🖵	J Trig: Free #Atten: 30	dB		Mł	(r1 2.40	T P NNNNN	Auto Tun
20.0 10.0								1		Center Fre 1.515000000 GH
0.0									-11.50.dBo	Start Fre 30.000000 MH
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	515 GHz 100 kHz	×	#VBW	300 kHz	FUN		Sweep 9	.667 ms (CF Ste 297.000000 Mi Auto M
1 N 2 3 4 5 6	1 1	2.406 0	GHz	8.57 dB	m					Freq Offs 01
6 7 8 9 0										
<u> </u>									•	
a							STATU	s		

Spurious Emission_Zigbee_1M_HighCH01-2405

Magilent Spectrum Analyzer - Swept SA					- # -
Center Freg 14.7500000	00 GHz		e: Log-Pwr TR	AM Oct 04, 2018	Frequency
	PNO: Fast Trig: Fr IFGain:Low #Atten:		Mkr1 25.60	DET P NNNN	Auto Tune
10 dB/div Ref 30.00 dBm			-41	.45 dBm	
20.0					Center Freq
10.0					14.75000000 GHz
-10.0				-11.50 (890)	Start Freq
-20.0					3.000000000 GHz
-30.0				1	
50.0 million some				and the second second	Stop Freq 26,50000000 GHz
-60.0					26.50000000 GHz
Center 14.75 GHz #Res BW 100 kHz	#VBW 300 kH		Span Sweep 76.40 ms	23.50 GHz	CF Step 2.35000000 GHz
MKR MODE THE SEL	Y	FUNCTION FUI			Auto Man
2	5.607 0 GHz -41.45 0	1Bm			Freq Offset
3 4 5					0 Hz
6					
8 9 10					
10					
MSG			STATUS		

Spurious Emission_Zigbee_1M_LowCH08-2440

	ent Spectr		alyzer - Swep		_		_					#
Cent	er Fre	ed ,	50 S	0000 G	Hz		NSE:INT	Avg Ty	ALIGN AUTO pe: Log-Pwr	TRAC	M Oct 04, 2018	Frequency
10 dB	/div		Offset 10 ' 30.00 d	.5 dB	PNO: Fast Gain:Low	#Atten: 3	30 dB		м	kr1 2.438	7 GHz 2 dBm	Auto Tune
20.0 10.0										♦ ¹		Center Freq 1.515000000 GHz
-10.0 -20.0 -30.0											-0.20 dBm	Start Freq 30.000000 MHz
-40.0 -50.0 -60.0				a secondario de la	-			*****	en e	here		Stop Freq 3.000000000 GHz
#Res	er 1.5 BW 1	100	kHz	×	#VE	300 kHz	-	NCTION F	Sweep 9	9.667 ms (*		CF Step 297.000000 MH2 Auto Mar
	N 1				7 GHz	11.22 d						Freq Offset 0 Hz
•							'			-	•	
MSG									STATU	5		

Spurious Emission_Zigbee_1M_HighCH08-2440

Agilent Spectrum Analyzer - Swe					
K RL RF 50 G		SENSE:INT	ALIGN AUTO	01:50:22 PM Oct 04, 2018	Frequency
Center Freq 14.750	000000 GHz	Trig: Free Run	Avg Type: Log-Pwr	TRACE 1 2 3 4 5 6	riequency
	PNO: Fast	#Atten: 30 dB		DET P NNNN N	
	IFGain:Low	WAtten: 30 GB			Auto Tune
Ref Offset 10	0.6.40		Mk	r1 4.880 0 GHz	Autorune
10 dB/div Ref 30.00				-39.26 dBm	
Log	dBill				
20.0					Center Freq
10.0					14.750000000 GHz
0.00					
				-0.25 dBm	
-10.0					Start Freq
-20.0					3.000000000 GHz
					3.000000000 GHz
-30.0					
-40.0					
and the second	- warmen	موال مردور ، والم مياد الموال .	and a standard and a	بالإيداعيموسيولاة حليح مسرناقط	Stop Freq
-60.0					26.50000000 GHz
-60.0					20.0000000000000
Center 14.75 GHz				Span 23.50 GHz	CF Step
#Res BW 100 kHz	(C) (E) (A)	300 kHz	6	3.40 ms (1001 pts)	2.35000000 GHz
#Res BW 100 KHz	#VBW	300 KHZ	Sweep /	5.40 ms (1001 pts)	Auto Man
MODE THE SEL	×	Y FUNC	TION FUNCTION MOTH	FUNCTION VALUE	Mari
1 N 1 f	4.880 0 GHz	-39.26 dBm			
2 3					F 0//
3					Freq Offset
4					0 Hz
0 6					
5 6 7					
8					
8 9 10					
10					
11				*	
1 C				•	
MSG			STATUS		

Spurious Emission_Zigbee_1M_LowCH16-2480

	ctrum Analyzer - Sw									
Center F	req 1.5150	000000 GHz		Trig: Free	SE:INT	Avg Type	ALIGN AUTO	TRAC	M Oct 04, 2018	Frequency
10 dB/div	Ref Offset 1 Ref 30.00	IFGair	Fast 😱	#Atten: 30) dB		Mk	r1 2.480		Auto Tune
20.0 10.0								↓ ¹		Center Freq 1.515000000 GHz
10.0									-16.78 dDm	Start Free 30.000000 MH:
40.0 50.0 60.0	a.a.a.a.a.a.a.a.a.a.a.a.a.a.a.a.a.a.a.			ىلىلىكى بىلى مەلىرىمىلى مە				Jan		Stop Fre 3.000000000 GH
Res BW	515 GHz 100 kHz		#VBW	300 kHz			Sweep 9	.667 ms (CF Stej 297.000000 MH Auto Ma
1 N 2 3 4 5 6 6 7 7 8 9 9 10 11		× 2.480 3 G	Hz	2.79 dB			UCTION WIDTH	PUNCTR		Freq Offse 0 H
sa				al			STATUS			

Spurious Emission_Zigbee_1M_HighCH16-2480

	ectrum Analyzer - Swe					
Center F	RF 50 G	000000 GHz	SENSE:INT	ALIGN AUTO Avg Type: Log-Pwr	01:59:17 PM Oct 04, 2018 TRACE 1 2 3 4 5 6	Frequency
	104 11100	PNO: Fast G IFGain:Low	Trig: Free Run #Atten: 30 dB		DET P NNNNN	Auto Tune
10 dB/div	Ref Offset 1 Ref 30.00			Mkr	1 25.489 5 GHz -41.34 dBm	Auto Tune
20.0						Center Freq
0.00						
-10.0					-16.70 dDm	Start Freq 3.000000000 GHz
-30.0				والمروحين والمروحين والمروح والمروح	1- 1-	Stop Freg
-60.0	A.M. A. Marine	and the second	and the second			26.50000000 GHz
	4.75 GHz 100 kHz	#VB	W 300 kHz	Sweep 7	Span 23.50 GHz 6.40 ms (1001 pts)	CF Step 2.35000000 GHz Auto Man
MOT MODE T		× 25.489 5 GHz	-41.34 dBm	UNCTION FUNCTION WIDTH	FUNCTION VALUE	Man Man
2 3 4						Freq Offset 0 Hz
5 6 7 8						
8 9 10 11						
MSG				STATUS	•	

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台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488



10 RADIATED BANDEDGE AND SPURIOUS EMISSION MEASUREMENT

10.1 Standard Applicable

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. In addition, radiated emissions which fall in the restricted bands must also comply with the §15.209 & RSS-Gen §8.8, 8.9 limit as below.

And according to §15.33(a) (1) & RSS-Gen §6.13(a), for an intentional radiator operates below 10GHz, the frequency range of measurements: to the tenth harmonic of the highest fundamental frequency or to 40GHz, whichever is lower.

Frequency (MHz)	Field strength (microvolts/meter)	Distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Note:

- The lower limit shall apply at the transition frequencies. 1.
- 2. Emission level $(dB\mu V/m) = 20 \log Emission level (dB\mu V/m)$

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10.2Measurement Equipment Used

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESU 40	100363	04/18/2017	04/17/2018
Loop Antenna	ETS-Lindgren	6502	00143303	12/24/2016	12/23/2017
Broadband Antenna	TESEQ	CBL 6112D	35240	11/03/2017	11/02/2018
Horn Antenna	ETS-Lindgren	3117	00143272	12/16/2016	12/17/2017
Horn Antenna	Schwarzbeck	BBHA9170	185	08/01/2017	07/31/2018
Pre Amplifier	EMC Instru- ments	EMC330	980096	12/25/2016	12/24/2017
Pre Amplifier	EMC Instru- ments	EMC0011830	980199		12/24/2017
Pre Amplifier	R&S	SCU-18	10204		12/24/2017
Pre Amplifier	R&S	SCU-26	100780	12/25/2016	12/24/2017
Coaxial Cable	Huber+Suhner	RG 214/U	966Rx 9K-30M	12/25/2016	12/24/2017
Coaxial Cable	Huber+Suhner	RG 214/U SUCOFLEX 104	966Rx 30M-3G	12/25/2016	12/24/2017
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Rx 1G-18G	12/25/2016	12/24/2017
Coaxial Cable	Huber+Suhner	mini 141-12 SUCOFLEX 104	966Rx 18G-40G	12/25/2016	12/24/2017
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Tx 30M-18G	12/25/2016	12/24/2017
Coaxial Cable	Huber+Suhner	SUCOFLEX 102	966Tx 18G-40G	12/25/2016	12/24/2017
Attenuator	WOKEN	218FS-10	RF27	12/25/2016	12/24/2017
Site NSA	SGS	966 Chamber C	SAC-C	03/02/2017	03/01/2018
Site VSWR	SGS	966 Chamber C	SAC-C	03/02/2017	03/01/2018
DC Power Supply	HOLA	DP-3003	D7070035	05/04/2017	05/03/2018
Controller	MF	MF-7802	N/A	N.C.R.	N.C.R.
Antenna Master	MF	N/A	N/A	N.C.R.	N.C.R.
Turn Table	MF	N/A	N/A	N.C.R.	N.C.R.
Test Software	World-Pallas	Dr. E	V 3.0 Lite	N.C.R.	N.C.R.

NOTE: N.C.R refers to Not Calibrated Required.

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Remark: Please note that the duration to conduct the test took place in the mean time when the calibration for several equipments is due, and therefore extra tables of equipment calibration is constructed to indicate the calibration work is still maintained.

EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.
TYPE		NUMBER	NUMBER	CAL.	
Loop Antenna	ETS-Lindgren	6502	00143303	12/23/2017	12/22/2018
Horn Antenna	ETS-Lindgren	3117	00143272	12/15/2017	12/16/2018
Pre Amplifier	EMC Instruments	EMC330	980096	12/24/2017	12/23/2018
Pre Amplifier	EMC Instruments	EMC0011830	980199	12/24/2017	12/23/2018
Pre Amplifier	R&S	SCU-18	10204	12/24/2017	12/23/2018
Pre Amplifier	R&S	SCU-26	100780	12/24/2017	12/23/2018
Coaxial Cable	Huber+Suhner	RG 214/U	966Rx 9K-30M	12/24/2017	12/23/2018
Coaxial Cable	Huber+Suhner	RG 214/U SUCOFLEX 104	966Rx 30M-3G	12/24/2017	12/23/2018
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Rx 1G-18G	12/24/2017	12/23/2018
Coaxial Cable	Huber+Suhner	mini 141-12 SUCOFLEX 104	966Rx 18G-40G	12/24/2017	12/23/2018
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Tx 30M-18G	12/24/2017	12/23/2018
Coaxial Cable	Huber+Suhner	SUCOFLEX 102	966Tx 18G-40G	12/24/2017	12/23/2018
Attenuator	WOKEN	218FS-10	RF27	12/24/2017	12/23/2018

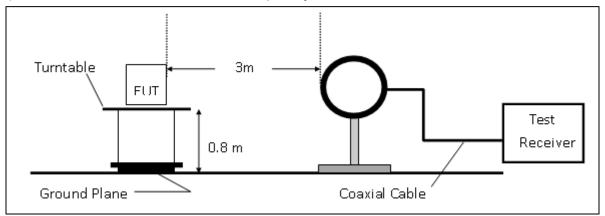
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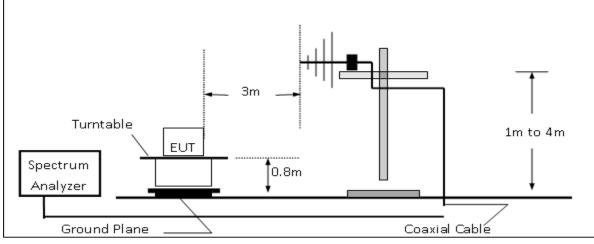


10.3Test SET-UP

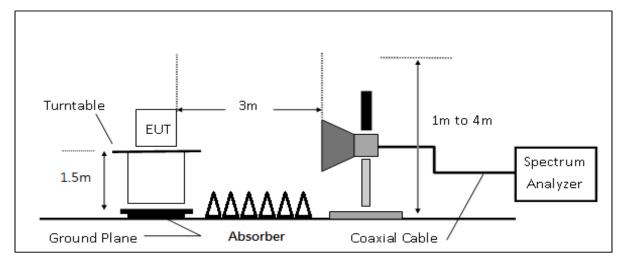
(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



(B) Radiated Emission Test Set-Up, Frequency form 30MHz to 1000MHz



(C) Radiated Emission Test Set-UP Frequency Over 1 GHz



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10.4Measurement Procedure

- 1. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance & ANSI C63.10.
- 2. The EUT was placed on a turn table with 0.8m for frequency< 1GHz and 1.5m for frequency> 1GHz above ground plan.
- 3. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
- 4. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
- 5. Set the spectrum analyzer as RBW=120 kHz and VBW=300 kHz for Peak Detector (PK) and Quasi-peak (QP) at frequency below 1 GHz.
- 6. Set the spectrum analyzer as RBW=1 MHz, VBW=3 MHz for Peak Detector at frequency above 1 GHz.
- Set the spectrum analyzer as RBW=1 MHz, VBW=10 Hz (Duty cycle > 98%) or VBW ≥ 1/T (Duty cycle < 98%) for Average Detector at frequency above 1 GHz.
- 8. When measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.
- 9. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 10. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. On spectrum, change spectrum mode in linear display mode, and reduce VBW = 10Hz if average reading is measured.
- 11. Repeat above procedures until all default test channel measured were complete.

10.5Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Where	0	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

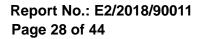
Actual FS(dB μ V/m) = SPA. Reading level(dB μ V) + Factor(dB)

Factor(dB) = Antenna Factor(dB μ V/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

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10.6 Test Results of Radiated Spurious Emissions form 9 kHz to 30 MHz

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit per 15.31(o) was not reported.

10.7Measurement Result:

Note: Refer to next page spectrum analyzer data chart and tabular data sheets.

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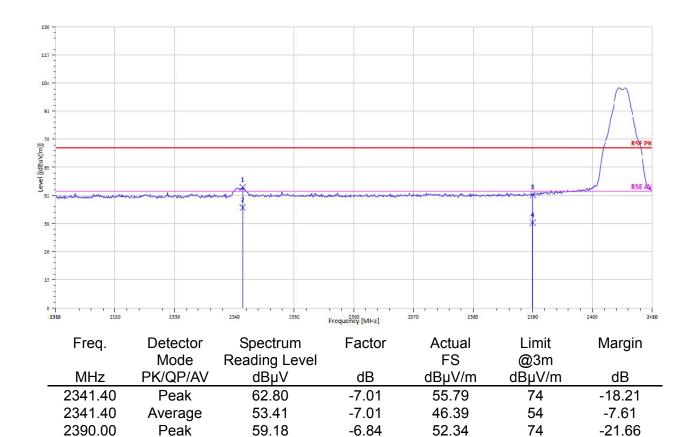
Radiated Band Edge Measurement Result:

Operation Mode :	Zigbee
Fundamental Frequency :	2405 MHz
Operation Band :	BE CH Low
EUT Pol. :	Н

2390.00

Average

Test Date : 2018/1/29 Temp. / Humi. : 23.7deg_C/62RH Test Engineer : Jerry Measurement Antenna Pol. : Vertical



-6.84

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46.25

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39.40

54

-14.60

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Fundar	ion Mode : nental Frequ ion Band : ol. :			Test Date : Temp. / Hum Test Engined Measureme	er:	2018/1/29 23.7deg_C/62RH Jerry I. : Horizontal	
130 							
104 91 78							REPK
Level [[dBuV/m]]	annon chan annound My	when the work -	1 	hele Marine Andrew Marine		mar marine and and a	RSE AV
30 26			- ×			*	
13 - D - 2310	0 2320	2330	2340 2350	Frequency [MHz]	2370 2380	2390	2400 2410
	Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
	MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
-	2341.70	Peak	60.45	-7.01	53.43	74	-20.57
	2341.70	Average	46.98	-7.01	39.96	54	-14.04

-6.84

-6.84

51.25

38.31

74

54

-22.75

-15.69

58.10

45.16

Peak

Average

2390.00

2390.00

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Fundan	on Mode : nental Freque on Band : ol. :	ency: 2480 N	BE CH High			Test Date : Temp. / Humi. : Test Engineer : Measurement Antenna Pol. :		
130								
Zevel [(dBuv/m)]			2 Conservationed	man	Access of the Analysia and the analysia and the	Magnation	RSE PK	
80								
2475	Freq. MHz	Detector Mode I PK/QP/AV	Spectrum Reading Level dBµV	Frequency [MHz] Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB	
	2483.50 2483.50	Peak Average	67.28 58.67	-6.38 -6.38	60.89 52.28	74 54	-13.11 -1.72	

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2483.50

Average

Operation Mode : Fundamental Frequency : Operation Band : EUT Pol. :	Zigbee 2480 MHz BE CH High H	Test Date : Temp. / Humi. : Test Engineer : Measurement Antenna Pol.	2018/1/29 23.7deg_C/62RH Jerry : Horizontal
133 117 104 91 76 104 76 104			RSE PK
			RSE AV
Mc <u>MHz PK/Q</u>	ector Spectrum Fac ode Reading Level QP/AV dBµV d	$\begin{array}{c cccc} & & & & & & & & & & & & & & & & & $	Margin dB -14.99

-6.38

49.73

54

-4.27

56.11

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Radiated Spurious Emission Measurement Result: For Frequency from 30MHz to 1000MHz

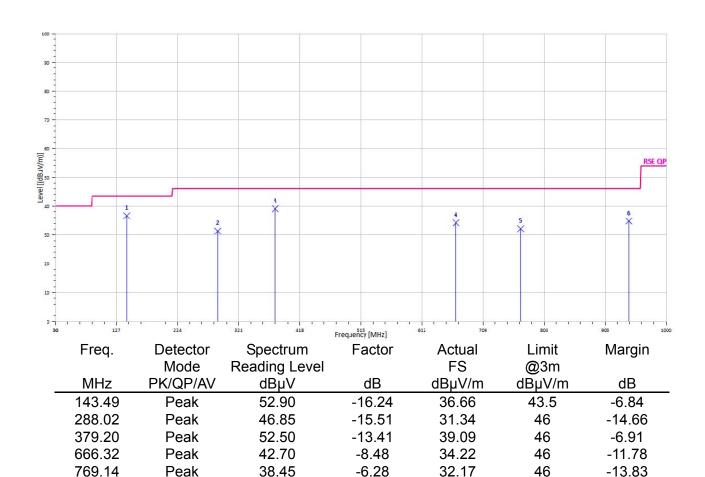
Operation Mode : Zigbee Fundamental Frequency: 2440 MHz **Operation Band :** EUT Pol. :

940.83

Peak

Tx CH Mid Н

Test Date : 2017/11/10 Temp. / Humi. : 23.7deg C/62RH Test Engineer : Jerry Measurement Antenna Pol. : Vertical



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39.38

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-4.56

34.81

46

-11.19

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2017/11/10



Ziabee

Operation Mode :

damental Freq ration Band : Pol. :	uency : 2440 Tx Cł H	MHz		Temp. / Hum Test Enginee Measuremer	23.7deg_C/ Jerry I. : Horizontal	
100 7						
90						
80						
70						
60						RSE QP
50						
40	2			4		
30		3 ×		×	5 *	5 X
20						
10						
D 1 1 1 1 1 1 30 127	224	321 41B	Frequency [MHz]	1 1 1 1 1 1 612 709	- I I I I I I I 805	905 1000
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
48.43	Peak	48.93	-17.17	31.76	40	-8.24
191.99	Peak	56.11	-18.71	37.40	43.5	-6.10
388.90	Peak	45.97	-13.13	32.85	46	-13.15
666.32	Peak	43.95	-8.48	35.47	46	-10.53
861.29	Peak	36.61	-6.14	30.47	46	-15.53
931.13	Peak	36.04	-4.69	31.35	46	-14.65

Test Date :

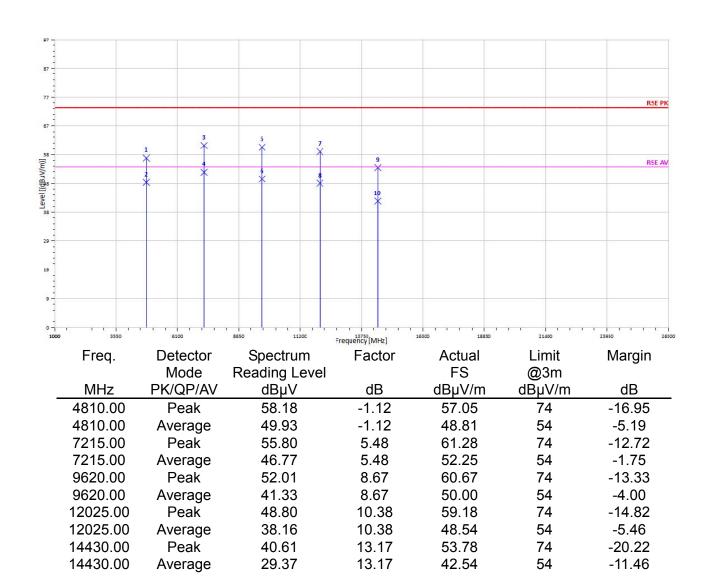


Radiated Spurious Emission Measurement Result:

For Frequency above 1GHz

Operation Mode : Zigbee Fundamental Frequency: 2405 MHz **Operation Band :** Tx CH Low EUT Pol. : Н

Test Date : 2018/1/29 Temp. / Humi. : 23.7deg C/62RH Test Engineer : Jerry Measurement Antenna Pol. : Vertical



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Fundan	on Mode : nental Frequ on Band : bl. :			Test Date : Temp. / Hum Test Enginee Measuremer	er:	2018/1/29 23.7deg_C/62 Jerry ol. : Horizontal	RH	
97 								
77							RSE PK	
58 [[[[[[]]			5 X 7 X	9 *			RSE AV	
ی Level [(dßu//m)] ی			* * *	10 ×				
29								
9								
0 -	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	6100	8650 1120C	Frequency [MHz]	16300 18850	21400	23950 26500	
	Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin	
		Mode	Reading Level		FS	@3m		
	MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	
	4810.00 4810.00	Peak	55.06 51.36	-1.12 -1.12	53.94 50.24	74 54	-20.06 -3.76	
	4810.00 7215.00	Average Peak	55.16	5.48	50.24 60.64	54 74	-3.76 -13.36	
	7215.00	Average	45.97	5.48	51.44	54	-2.56	
	9620.00	Peak	51.59	8.67	60.26	74	-13.74	
	9620.00	Average	40.77	8.67	49.43	54	-4.57	
	12025.00	Peak	46.32	10.38	56.70	74	-17.30	
	12025.00	Average	35.51	10.38	45.89	54	-8.11	
	14430.00	Peak	40.71	13.17	53.88	74	-20.12	
	14430.00	Average	29.36	13.17	42.53	54	-11.47	

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Fundar	ion Band :	Zigb uency:2440 Tx C H		Test Date : Temp. / Hum Test Enginee Measuremer		2018/1/29 23.7deg_C Jerry bl. : Vertical	:/62RH	
97 87								
77							RSE PK	
67			-					
58 -		$\stackrel{1}{\times}$ $\stackrel{3}{\times}$	5 * 7 *					
"(m/v		× t	* *	9 ×			RSE AV	
Level [(dBuV/m)]			*	10				
38 Lev								
1								
19								
•								
1000	3550	6100	8650 11200	Frequency [MHz]	16300 18850	21400	23950 26500	
	Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin	
	MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	
_	4880.00	Peak	61.12	-0.71	60.41	74	-13.59	
	4880.00	Average	53.36	-0.71	52.64	54	-1.36	
	7320.00	Peak	53.31	6.11	59.42	74	-14.58	
	7320.00	Average	44.01	6.11	50.12	54	-3.88	
	9760.00	Peak	54.93	8.52	63.46	74	-10.54	
	9760.00	Average	44.72	8.52	53.25	54	-0.75	
	12200.00	Peak	49.39	10.18	59.57	74	-14.43	
	12200.00	Average	38.72	10.18	48.90	54	-5.11	
	14640.00	Peak	40.30	13.40	53.70	74	-20.30	
	14640.00	Average	29.52	13.40	42.92	54	-11.08	

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Fundar	ion Band :	Zigb uency : 2440 Tx C H		Test Date : Temp. / Hum Test Enginee Measureme	er:	2018/1/29 23.7deg_ Jerry bl. : Horizonta	C/62RH	
97								
77 -							RSE PK	
67								
		1 3	5 ¥ 7					
58 [(m/			× ×	9 X			RSE AV	
s Level [(dBuV/m)]		Î X						
Level				¥				
29								
- 19 -								
1								
9-								
0	3550	6100	8650 11200	Frequency [MHz]	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	21400	23950 26500	
	Freq.	Detector	Spectrum	Frequency [MHz] Factor	Actual	Limit	Margin	
		Mode	Reading Level	, actor	FS	@3m	margin	
	MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	
_	4880.00	Peak	59.39	-0.71	58.67	74	-15.33	
	4880.00	Average	53.76	-0.71	53.05	54	-0.95	
	7320.00	Peak	52.90	6.11	59.01	74	-14.99	
	7320.00	Average	43.30	6.11	49.41	54	-4.59	
	9760.00	Peak	53.62	8.52	62.14	74	-11.86	
	9760.00	Average	43.25	8.52	51.78	54	-2.22	
	12200.00	Peak	47.37	10.18	57.55	74	-16.45	
	12200.00	Average	36.49	10.18	46.67	54	-7.33	
	14640.00	Peak	40.11	13.40	53.51	74	-20.49	
	14640.00	Average	29.14	13.40	42.54	54	-11.46	

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RSE AV



د Level [(dBuV/m)] الم

29

19

Operation Mode : Fundamental Frequency : Operation Band : EUT Pol. :	Zigbee 2480 MHz Tx CH High H	Test Date : Temp. / Humi. : Test Engineer : Measurement Antenna Pol. :			2018/1/29 23.7deg_C/62RH Jerry Vertical	
97 						
57					RSE PK	

1000	3550	6100	8650 11200	Frequency [MHz]	16300 18850	21400	23950 26500
	Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	-
	MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
_	4960.00	Peak	57.13	-0.66	56.47	74	-17.53
	4960.00	Average	53.07	-0.66	52.41	54	-1.59
	7440.00	Peak	46.10	6.19	52.29	74	-21.71
	7440.00	Average	34.22	6.19	40.40	54	-13.60

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peration Mode : Indamental Frequency : peration Band : JT Pol. :	Zigbee 2480 MHz Tx CH High H	Test Date : Temp. / Humi. : Test Engineer : Measurement Antenna Pol. :	2018/1/29 23.7deg_C/62RI Jerry Horizontal	
97				
87				
77			RSE PK	
67 -				
	3		RSE AV	
se (contraction of the second	×			
ق . 38 -	*			
29				
19				
9				
0	8650 1120C Frequency [MH			

				riequency [winz]				
	Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin	
		Mode	Reading Level		FS	@3m		
_	MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	
	4960.00	Peak	57.84	-0.66	57.18	74	-16.82	
	4960.00	Average	54.17	-0.66	53.51	54	-0.49	
	7440.00	Peak	44.28	6.19	50.46	74	-23.54	
	7440.00	Average	32.36	6.19	38.54	54	-15.46	



11 PEAK POWER SPECTRAL DENSITY

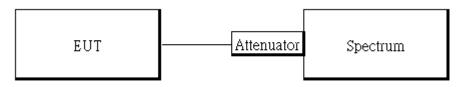
11.1 Standard Applicable:

The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

11.2Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	N9010A	MY51440113	06/20/2018	06/19/2019
Attenuator	Marvelous	MVE2213-10	RF30	12/26/2017	12/25/2018
DC Block	PASTERNACK	PE8210	RF29	12/26/2017	12/25/2018
Notebook	Lenovo	L420	S0011721	N/A	N/A

11.3Test Set-up:



11.4Measurement Procedure:

- 1. Set analyzer center frequency to DTS channel center frequency.
- 2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance & ANSI C63.10.
- 3. Set the span to 1.5 times the DTS channel bandwidth.
- 4. Set the RBW = 3 kHz. & the VBW = 10 kHz
- 5. For defining Restricted Band Edge Limit: Set the RBW = 100kHz & VBW = 300 kHz.
- 6. Detector = peak.
- 7. Sweep time = auto couple.
- 8. Trace mode = max hold.
- 9. Allow trace to fully stabilize.
- 10. Use the peak marker function to determine the maximum amplitude level.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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11.5Measurement Result:

Zigbee mode

Frequency (MHz)	RF Power Density (dBm)	Maximum Limit (dBm)	Result	
2405	-2.91	8	PASS	
2440	1.54	8	PASS	
2480	-8.25	8	PASS	

NOTE: cable loss as 10.45dB that offsets in the spectrum

Zigbee mode Power Spectral Density Test Plot (CH-Low)

	ctrum Analyzer - Swep									
Center F	req 2.40500	0000 GH	iz V:Wide 🕞		Run		ALIGN AUTO	TRAC	MOct 04, 2018 E 1 2 3 4 5 6 E M WWWWW	Frequency
10 dB/div	Ref Offset 10. Ref 30.00 d	5 dB	Sain:Low	#Atten: 3			Mkr1 2	.405 054	4 0 GHz 91 dBm	Auto Tune
20.0										Center Free 2.405000000 GH:
0.00					♦ ¹					Start Free 2.404250000 GH:
-10.0 -20.0		Pressed and a start	www.www.	- V	and when		hon my	V V	ny when the	Stop Free 2.405750000 GH:
-30.0				V				V		CF Step 150.000 kH: Auto Mar
-40.0										Freq Offse 0 Hi
-60.0										
#Res BW	42500 GHz 3.0 kHz		#VBW	10 kHz		1	Sweep 3		500 GHz 1001 pts)	
MSG							STATUS			

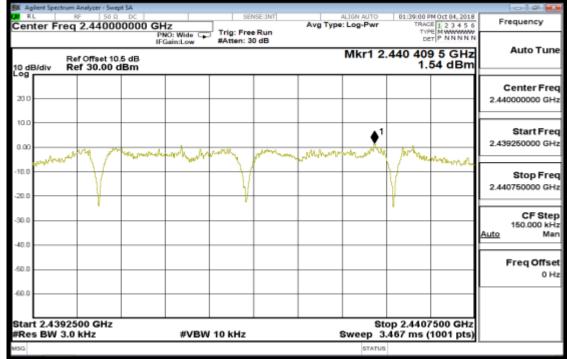
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Power Spectral Density Test Plot (CH-Mid)



Power Spectral Density Test Plot (CH-High)

	ent Spect	trum Analyzer - Swep	H SA								
Cent	er Fr	req 2.48000				Run		LIGN AUTO	TRAC	M Oct 04, 2018	Frequency
10 dB	Ref Offset 10.5 dB Mkr1 2.480 424 5 GHz 10 dB/div Ref 30.00 dBm										
20.0											Center Freq 2.480000000 GHz
10.0								1			Start Freq 2.479250000 GHz
-10.0 -20.0	har and	m /m	ant Construction	where the	*	man	en and a start of the	WWW	V manine su	war shally my place	Stop Freq 2.480750000 GHz
-30.0		<u> </u>			V				¥		CF Step 150.000 kHz <u>Auto</u> Man
-50.0 -											Freq Offset 0 Hz
		92500 GHz 3.0 kHz		#1/814/	10 kHz				op 2.4807	'500 GHz 1001 pts)	
#Kes		3.0 KHZ		#VBW	TO KHZ			SWeep 3.	,407 ms (1001 pts)	

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12 ANTENNA REQUIREMENT

12.1 Standard Applicable:

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

If the transmitting antenna is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi.

12.2Antenna Connected Construction:

The antenna is designed as permanently attached and no consideration of replacement. Please see EUT photo for details.

~ End of Report ~

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