

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

	OF
Applicant: Product Name:	ASKEY COMPUTER CORP. 10F, NO.119, JIANKANG RD., ZHONGHE DIST., NEW TAIPEI CITY 23585, TAIWAN, R.O.C. Wireless module
Brand Name:	Panasonic
Model No.:	WLU5540B-D81(RoHS)
Model Difference:	N/A
FCC ID:	H8N-WLU5540B
Report Number:	E2/2018/700334
FCC Rule Part:	§15.247, Cat: DTS
Issue Date:	Aug. 07, 2018
Date of Test:	Jul. 09, 2018~ Aug. 03, 2018
Date of EUT Re-	Jul. 09, 2018

ceived:

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.

Tested By:

Aken Huang / Engineer

Approved By:

Jim Chang / Manager





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Revision History

Report	Number	Revision	Description	Effected Page	Issue Date	Revised By
E2/201	8/70033	Rev.00	Initial creation of docu- ment	All	Apr. 07, 2018	Stefanie Yu / Clerk

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GENERAL INFORMATION 1

1.1 Product Description

General:

Product Name:	Wireless module
Brand Name:	Panasonic
Model No.:	WLU5540B-D81(RoHS)
Model Difference:	N/A
Hardware Version (Product):	REV5
Operation system:	Ubuntu 12.04.1
QA tool version:	v.63770
WLAN driver Version:	V 2.0.1
MTK BT Driver Version:	V6.1.17060901
Power Supply:	5Vdc from USB Port

Bluetooth Low Energy:

Bluetooth Version:	Bluetooth V4.2 LE Dual mode		
Channel number:	40 channels		
Modulation type:	GFSK		
Transmit Power:	9.19 dBm		
Frequency Range:	2402 – 2480MHz		
Antenna Designation:	Dipole Antenna, Antenna Gain: 2.4 dBi		

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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 District, Taoyuan City, Taiwan 333 (TAF code 0513)

FCC Registration Number and Designation number are: 735305 / TW 0002

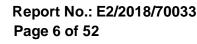
1.4 Special Accessories

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 30 MHz,. The CISPR Quasi-Peak and Average detector mode is employed according to §15.207. 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

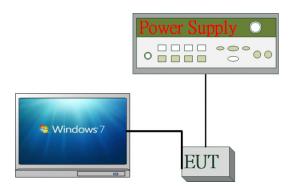


Fig 2-2 Radiated Emission



Fig 2-3 Conduction (AC Power Line) Radiated Emission



Table 2-1	Equipment	Used in	Tested System
-----------	-----------	---------	----------------------

ltem	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Ca- ble	Power Cord
1.	Bluetooth Test Software	N/A	N/A	N/A	N/A	N/A
2	Notebook	Lenovo	T420	S0012599	Shielded	Unshielded
3.	DC Power Supply	Agilent	E3640A	MY53130054	N/A	Unshielded

Table 2-2 Accessories Cable List

Cable Type	Core	Length	Shielding/Non-shielding
Ant cable	N/A	0.1m	Non-shielding
Ant cable	N/A	2m	Non-shielding

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SUMMARY OF TEST RESULTS 3

FCC Rules	Description Of Test	Result
§15.207(a)	AC Power Line Conducted Emission	Compliant
§15.247(b) (3)	Peak Output Power	Compliant
§15.247(a)(2)	6dB 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

40 channels are provided for Bluetooth LE

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
1	2402 MHz	15	2430 MHz	29	2458 MHz
2	2404 MHz	16	2432 MHz	30	2460 MHz
3	2406 MHz	17	2434 MHz	31	2462 MHz
4	2408 MHz	18	2436 MHz	32	2464 MHz
5	2410 MHz	19	2438 MHz	33	2466 MHz
6	2412 MHz	20	2440 MHz	34	2468 MHz
7	2414 MHz	21	2442 MHz	35	2470 MHz
8	2416MHz	22	2444 MHz	36	2472 MHz
9	2418 MHz	23	2446 MHz	37	2474 MHz
10	2420 MHz	24	2448 MHz	38	2476 MHz
11	2422 MHz	25	2450 MHz	39	2478 MHz
12	2424 MHz	26	2452 MHz	40	2480 MHz
13	2426 MHz	27	2454 MHz		
14	2428 MHz	28	2456 MHz		

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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:

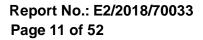
MODE	AVAILABLE FREQUENCY (MHz)	TESTED FREQUENCY (MHz)	MODULATION	DATA RATE (Mbps)			
RADIATED EMISSION TEST (BELOW 1 GHz)							
Bluetooth LE	2402 to 2480	2402, 2442, 2480	GFSK	1			
RADIATED EMISSION TEST (ABOVE 1 GHz)							
Bluetooth LE	2402 to 2480	2402, 2442, 2480	GFSK	1			
Note: The field strength of radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for Bluetooth LE 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)	
Bluetooth LE	2402 to 2480	2402, 2442, 2480	GFSK	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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CONDUCTED EMISSION TEST 6

6.1 Standard Applicable:

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

Frequency range		nits (μV)				
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:

Conducted Emission Test Site									
EQUIPMENT MFR		MODEL	SERIAL	LAST	CAL DUE.				
TYPE		NUMBER	NUMBER	CAL.					
EMI Test Receiver	R&S	ESCI 7	100950	12/24/2017	12/23/2018				
Coaxial Cables	N/A	N30N30-1042-150cm	N/A	08/30/2017	08/29/2018				
LISN	Schwarzbeck	NSLK 8127	8127-648	06/18/2018	06/17/2019				
Test Software	Farad	EZ-EMC	Ver. SGS-03A2	N.C.R.	N.C.R.				

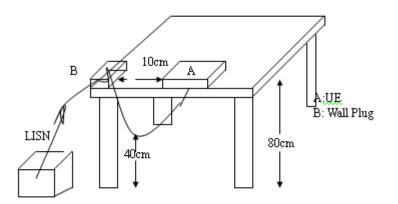
6.3 EUT Setup:

- 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.

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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.
- 2. 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:

Note: Refer to next page for measurement data and plots. Note2: The * reveals the worst-case results that closet to the limit.

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6

22.9340

15.84

20.10

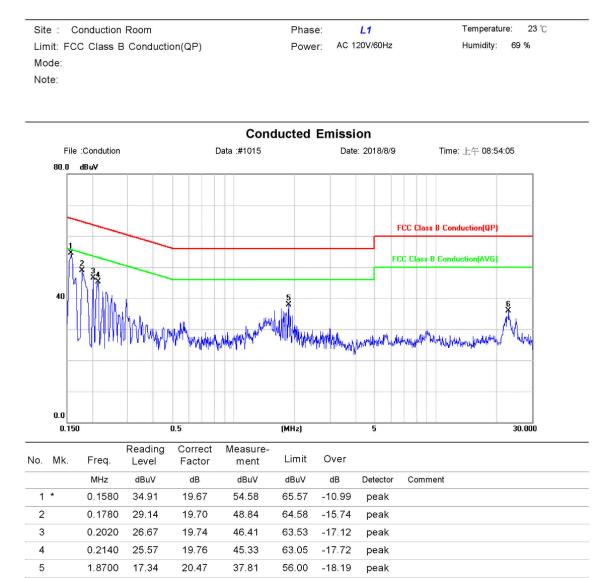
35.94

60.00

-24.06

peak

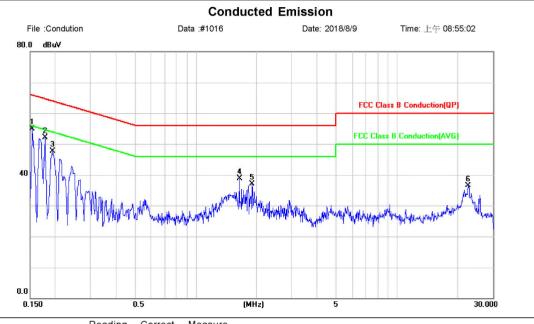
AC POWER LINE CONDUCTED EMISSION TEST DATA



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Temperature: 23 °C Site : Conduction Room Phase: Ν Limit: FCC Class B Conduction(QP) AC 120V/60Hz Humidity: 69 % Power: Mode: Note:



No.	Mk.	Freq.	Level	Factor	measure- ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.1540	35.17	19.65	54.82	65.78	-10.96	peak	
2		0.1780	32.40	19.69	52.09	64.58	-12.49	peak	
3		0.1940	27.97	19.71	47.68	63.86	-16.18	peak	
4		1.6500	18.60	20.29	38.89	56.00	-17.11	peak	
5		1.8980	16.61	20.47	37.08	56.00	-18.92	peak	
6		22.6260	16.29	20.12	36.41	60.00	-23.59	peak	

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PEAK OUTPUT POWER MEASUREMENT 7

7.1 Standard Applicable:

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

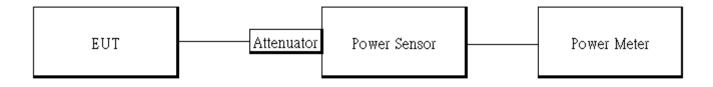
If the transmitting antenna of directional gain greater than 6dBi are used the peak output power form the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the Antenna exceeds 6dBi.

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:

Conducted Emission Test Site								
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.			
TYPE		NUMBER	NUMBER	CAL.				
Power Meter	Anritsu	ML2496A	1804001	2018/02/01	2019/01/31			
Power Sensor	Anritsu	MA2411B	1726104	2018/02/01	2019/01/31			
Power Sensor	Anritsu	MA2411B	1726107	2018/02/01	2019/01/31			
DC Power Supply	Agilent	E3640A	MY53130054	2017/09/04	2018/09/03			
Notebook	Lenovo	T420	S0012599	N/A	N/A			

7.3 Test Set-up:



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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.
- 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.

Formula:

Duty Cycle = Ton / (Ton+Toff)

Duty Factor:

	Duty Cycle (%)	Duty Factor (dB)	1/T (kHz)	VBW setting (kHz)
BLE	60.77	2.16	2.64	3.00

	ictrum Analyzer - 5											
enter Fi	req 2.4420	00000 G	Hz NO: Fast Gain:Low		Trig: Free Run #Atten: 30 dB		Type:	LIGN A		TRA	M Jul 26, 2018 CE 1 2 3 4 5 6 PE WWWWW ET P N N N N N	Frequency
0 dB/div	Ref Offset	1 dB							ΔΝ	/kr3 6 -1	324.0 μs 0.14 dB	Auto Tur
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6 7 8 9 0											<u> </u>	
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7.5 **Measurement Result:**

BLE mode:

СН	Frequency Peak Power Output (MHz) (dBm)		Required Limit
0	2402	9.01	1 Watt = 30 dBm
20	2442	9.19	1 Watt = 30 dBm
39	2480	8.32	1 Watt = 30 dBm

BLE mode:

СН	Frequency (MHz)	Max. Avg. Output include tune up tolerance Power (dBm)	Required Limit
0	2402	6.76	1 Watt = 30 dBm
20	2442	6.58	1 Watt = 30 dBm
39	2480	6.47	1 Watt = 30 dBm

*Note: Measured by power meter, cable loss as 1 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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8 6DB BANDWIDTH MEASUREMENT

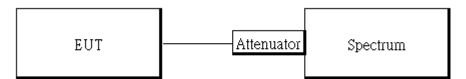
8.1 Standard Applicable

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

8.2 Measurement Equipment Used

Conducted Emission Test Site									
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.				
Spectrum Analyzer	Agilent	N9010A	MY51440113	2018/06/20	2019/06/19				
DC Power Supply	Agilent	E3640A	MY53130054	2017/09/04	2018/09/03				
DC Block	PASTERNACK	PE8210	RF29	2017/12/26	2018/12/25				
Notebook	Lenovo	T420	S0012599	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.
- 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. For 99% Bandwidth:

Set the spectrum analyzer as RBW=1%, VBW=3*RBW, Span = 2MHz, Detector=Sample, Sweep=auto.

- 7. Turn on the 99% bandwidth function, max reading.
- 8. Repeat above procedures until all test default channel is completed

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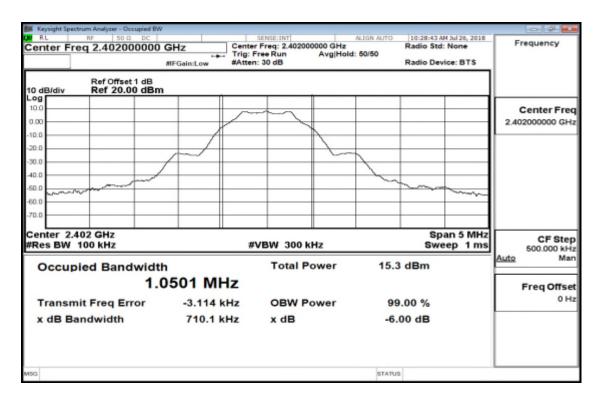


8.5 Measurement Result:

BLE mode			
Frequency (MHz)	6dB BW (MHz)	BW (MHz)	Result
2402	0.71	> 0.5	PASS
2442	0.709	> 0.5	PASS
2480	0.705	> 0.5	PASS

Note: Refer to next page for plots.

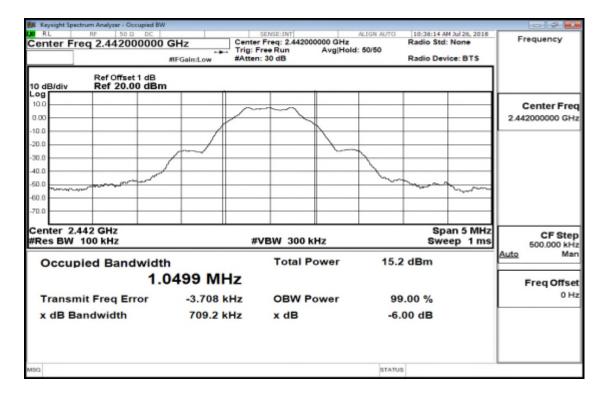
6dB Band Width Test Data CH-Low



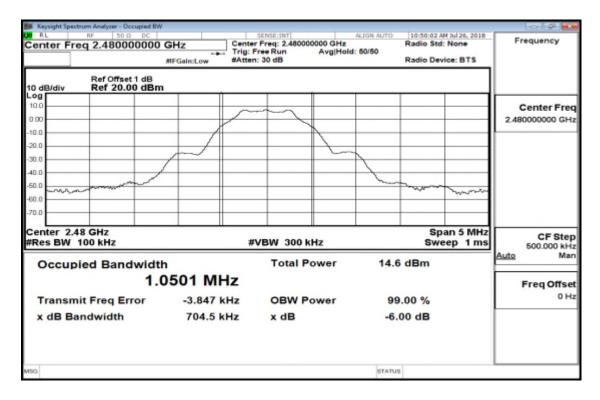
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6dB Band Width Test Data CH-Mid



6dB Band Width Test Data CH-High



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CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT 9

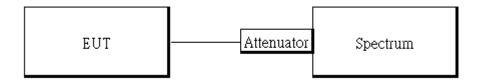
9.1 Standard Applicable

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), must also comply with the radiated emission limits specified in §15.209(a).

9.2 Measurement Equipment Used:

Conducted Emission Test Site											
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.						
Spectrum Analyzer	Agilent	N9010A	MY51440113	2018/06/20	2019/06/19						
DC Power Supply	Agilent	E3640A	MY53130054	2017/09/04	2018/09/03						
DC Block	PASTERNACK	PE8210	RF29	2017/12/26	2018/12/25						
Notebook	Lenovo	T420	S0012599	N/A	N/A						

9.3 Test SET-UP:



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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.
- Set the span to 1.5 times the DTS channel bandwidth.
- 4. Set the RBW = 100kHz & VBW = 300 kHz.
- 5. Detector = peak.
- 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.

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.
- 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.
- Marker on frequency, 2.3999GHz and 2.4836GHz, and examine shall 100 kHz immediately outside the authorized (2400~2483.5 MHz) 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.
- 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

Frequency (MHz)	RF Power Density (dBm)	Reference Level of Limit = PSD - 20dB (dBm)
2402	7.99	-12.01
2442	7.90	-12.10
2480	7.28	-12.72

Reference Level of Limit

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

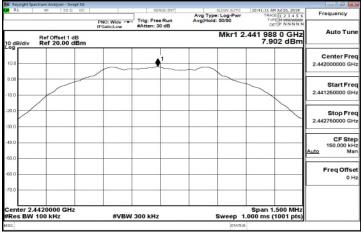
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Reference Level of Emission Limit (CH-Low)

	10:28:55 AM Jul 26, 2018		SENSE INT		Reference Analyzer - Swept SA			
Frequency	TRACE 1 2 3 4 5 6 TYPE MWWWWW DET P NNNNN	Aug Type: Log-Pwr	Trig: Free Run #Atten: 30 dB		req 2.4020000			
Auto Tun	Ref Offset 1 dB Mkr1 2.401 988 0 GHz dB/div Ref 20.00 dBm 7.99 dBm							
Center Fre 2.402000000 GH		~	1			10.0		
Start Fre 2.401250000 GF						0.00		
Stop Fre 2.402750000 GF						20.0		
CF Ste 150.000 ki Auto Ma						0.0		
Freq Offs 0 F						0.0		
						70.0		
	op 2.4027500 GHz 000 ms (1001 pts)	Sweep 1.	300 kHz	#VBV	12500 GHz 100 kHz	tart 2.40 Res BW		

Reference Level of Emission Limit (CH-Mid)



Reference Level of Emission Limit (CH-High)

Keysight Spectrum Analyzer - Swept SA				
RL 10 50 D DC	GHz	ALIGN AUTO 10:50: Avg Type: Log-Pwr	12 AM Jul 26, 2018 TRACE 1 2 3 4 5 6	Frequency
Ref Offset 1 dB	PNO: Wide Trig: Free Run IFGain:Low #Atten: 30 dB	Mkr1 2.479	988 0 GHz 7.28 dBm	Auto Tur
10.0 dB/div Ref 20.00 dBm	1		7.20 0.011	Center Fre 2.480000000 GH
0.00				Start Fre 2.479250000 GH
20.0				Stop Fre 2.480750000 GH
40.0				CF Ste 150.000 ki Auto M
60.0				Freq Offs 01
-70.0 Start 2.4792500 GHz #Res BW 100 kHz	#VBW 300 kHz	Stop 2.4 Sweep 1.000 n	807500 GHz	

Band Edges Test Data CH-Low

Keysight Spectrum Analyz					
RL IU	50 D DC PNO: Fast	Trig: Free Run	Avg Type: Log-Pwr	10:34:51 AM 3ul 26, 2018 TRACE 1 2 3 4 5 6 TYPE MWWWWW DET P N N N N N	Frequency
Ref Off	IFGein:Low	#Atten: 30 dB	Mk	r3 2.390 0 GHz -59.13 dBm	Auto Tun
dB/div Ref 20	.00 dBm			-55,13 UBM	Center Fre 2.360000000 GH
0					Start Fre 2.310000000 GH
1.0 1.0 11		enerit Anne are and all all all a	ayı - Luguri al ^a yı - Araş (y Araş (y. Arag	3 and the second	Stop Fre 2.410000000 GP
art 2.31000 GH es BW 100 kHz		300 kHz	Sweep 9	Stop 2.41000 GHz .600 ms (1001 pts)	CF Ste 10.000000 Mi <u>Auto</u> M
1 N 1 1 2 N 1 1 4 5 5 7	2.402 2 GHz 2.399 9 GHz 2.390 0 GHz	8.18 dBm -62.06 dBm -69.13 dBm			Freq Offs 01
8 9 0 1					

Band Edges Test Data CH-High

Avg Type: Log-Per Trig: Free Run BrGalarLow	Analyzer - Swept SA	
Bef Offset 1 dB Mkr3 2.483 600 GHz Auto Bildiv Ref 20.00 dBm -56.43 dBm Center 0 0 0 -56.43 dBm 2.4875000 0 0 0 -33 -56.43 dBm 2.4875000 1 0 0 -56.43 dBm -56.43 dBm 2.4875000 1 0 0 -56.43 dBm -56.43 dBm 2.4875000 1 0 0 0 -56.43 dBm 2.4875000 2.4875000 1 0 0 0 0 0 2.4875000 2.475000 2.4750000 2.500000<	1.00 00 00 0	Frequency
1	IFGair Offset 1 dB	z Auto Tur
Image: state		Center Fre 2.487500000 GH
Image: Star 2 2.4750000 Int 2.47500 GHz ess BW 100 kHz Stor 2.50000 GHz stor (100 Hz) Stor B BW 100 kHz Stor 2.50000 GHz stor (100 Hz) Image: BW 100 kHz Stor 2.50000 GHz stor (100 Hz)		
ato ato <td>[]]</td> <td>Start Fre 2.475000000 Gi</td>	[]]	Start Fre 2.475000000 Gi
es BW 100 kHz #VBW 300 kHz Sweep 2.400 ms (1001 pts) (Mode tited isou x Y Function Function and Function water A	and have	Stop Fre 2.50000000 Gi
MODE TRC SC. X Y FUNCTION WOTH FUNCTION WALKE		2.500000 M
N 1 f 2.483 500 GHz -55.66 dBm Freq	2.480 000 G 2.483 500 G	Freq Offs
		-

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Conducted Spurious Emission Measurement Result

CH-Low 30MHz - 3GHz

	D D DC	SENSE:INT	ALIGN AUTO	10:35:13 AM Jul 26, 2018	
RL IUF S	PNO: Fast		Avg Type: Log-Pwr	TRACE 1 2 3 4 5 6 TYPE NWWWW	Frequency
Ref Offse	IFGain:Low	#Atten: 30 dB	MH	r1 2.403 0 GHz 8.11 dBm	Auto Tun
3.0 00			-	1	Center Fre 1.515000000 GH
0.0				-12.01.dBn	Start Fre
0.0					30.000000 MH
0.0 0.0 0.0	and the second	and the second state of th	en ar	Norman	Stop Fre 3.000000000 GH
art 30 MHz Res BW 100 kHz	#VE	300 kHz	Sweep 2	Stop 3.000 GHz 83.9 ms (1001 pts)	
N 1 1	× 2.403 0 GHz	8.11 dBm	INCTION FUNCTION WOTH	FUNCTION VALUE	Auto Ma
2 3 4 5 6					Freq Offse 0 H
6					
1		++	1		

CH-Low 3GHz - 26.5GHz

						-			ctrum Analyzer		
Frequency	04 Jul 26, 2018 CE 1 2 3 4 5 6 PE MWWWW ET P NNNN	TRAC	LIGH AUTO	Avg Ty	ense:int		PNO: Fast	D DC	101	-	RI
Auto Tun	9 5 GHz 37 dBm	1 25.959	Mkr		30 dB	#Atten: 3	IFGain:Low		Ref Offse Ref 20.0	3/div	10 dE
Center Fre 14.750000000 GH	-12.01.dBm										10.0
Start Fre 3.000000000 GH											20.0 30.0 40.0
Stop Fre 26.50000000 GH		- Alexandra	*****	ملطيريني	-40-100	-	Janmon		and the second	m	50.0 50.0 70.0
CF Ste 2.350000000 Gr Auto Ma	26.50 GHz (1001 pts)	2.246 s (Sweep			W 300 kHz	#VB		100 kHz	t 3.00 s BW 1	Re
Freq Offse						-60.37 d	59 5 GHz	25.9		N 1	
						10				+	7 8 9 10 11
			STATUS								53

CH-Mid 30MHz – 3GHz

Keynight Spectrum Analyzer - Sv					
RL 10 50 0	PNO: Fest	Trig: Free Run	Aug Type: Log-Pwr	10:41:50 AM Jul 26, 2018 TRACE 1 2 3 4 5 6 TYPE MWWWW DET P N N N N N	Frequency
Ref Offset 1 dB/div Ref 20.00	IFGain:Low	#Atten: 30 dB	Mk	r1 2.441 6 GHz 7.48 dBm	Auto Tur
0.00				1 -12.10 dDn	Center Fre 1.515000000 GF
0.0					Start Fre 30.000000 Mi
0.0 0.0 0.0				A same to real second second	Stop Fre 3.000000000 Gi
art 30 MHz Res BW 100 kHz	#VBW	300 kHz		Stop 3.000 GHz 83.9 ms (1001 pts)	CF Ste 297.000000 Mi Auto M
REAL REAL REAL 1 1 1 1 2 - - - 3 - - - 4 - - - 5 - - - 6 - - -	2,441 6 GHz	7.48 dBm	FUNCTION FUNCTION WOTH	FUNCTION VALUE	Freq Offs 01
8 9 0 1					

CH-Mid 3GHz – 26.5GHz

									Amalyzer - Swe			
Frequency	10 AM Jul 26, 2018 TRACE 1 2 3 4 5 6	TRA	ALIGH AUTO		INSE:19			DC.	50 12	R	L	N R
Auto Tune	701 0 GHz 0.42 dBm	1 25.70	Mkr			#Atten: 3	NO: Fast Sain:Low	IF	Offset 1 of 20.00 of		B/div	10 d
Center Freq 14.750000000 GHz	.12 10 dBm									_	-	10.0 0.00
Start Freq 3.000000000 GHz	.12.10 dat											-10.0 -20.0 -30.0
Stop Freq 26.50000000 GHz	are to the	autor-palainet*	Wy gamma managa manana			-			the the second	يمليران	-	50.0 60.0
CF Step 2.350000000 GHz Auto Man	p 26.50 GHz s (1001 pts)	2.246 s	Sweep	2110/27/201	z	W 300 kHz	#VE		kHz	0 GH V 100	s Bl	Re
Freq Offset 0 Hz	401104199202 ×	FORCE		PONCTION	dBm	-50.42 d	0 GHz	25.701		1 f	N	12345
												6 7 8 9 10 11
		5	STATUS									450

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CH-High 30MHz – 3GHz

Frequency	10 AM Jul 26, 2018	11:07:1	ALIGN AUTO	INT	SENS		D DC	NF 50 0		RL
Frequency	TYPE NWWWWW DET P NNNN	-	Type: Log-Pwr	un	Trig: Free Atten: 30	PNO: Fast				
Auto Tun	480 3 GHz 6.73 dBm		Mk			Polani.Low	dB	Ref Offset 1 Ref 20.00	iv I	dB/d
Center Fre 1.515000000 GH		♦ ¹								
	-12.72 dile		_			+				0
Start Fre 30.000000 MH										0
Stop Fre 3.000000000 GH	and and the second sur-	-			21		we be meaning		-	0
CF Ste 297.000000 MH Auto Ma	p 3.000 GHz ns (1001 pts)		Sweep 2		300 kHz	#VBW :		iz D0 kHz	10 MH 3W 1	
Auto Ma	NCTION VALUE	FUN	FUNCTION WOTH		6.73 dB	0 3 GHz	2,480	500. 1	E TEC	N N
Freq Offse 0 H										
	· ·	-		-	**			-	1	1
		-	TATUS							

CH- High 3GHz – 26.5GHz

									Amalyzer - Sv	ctrum A	ght Spect	RL
Frequency	AM 3ul 26, 2018 ACE 1 2 3 4 5 6 YPE MWWWWW DET P N N N N N	TRAC	Log-Pwr	Avg Typ	Run		VO: Fast	DC DC	50 0	10	_	ĸĻ
Auto Tur	9 0 GHz .41 dBm	r1 9.90	Mk			#Atten: 3	sain:Low	IFI dB	Offset 1 f 20.00	Ref	div	dB/e
Center Fre 14.75000000 GH										-		9 00
Start Fre 3.000000000 GH	-12.72 dBn						1					1.0
Stop Fre 26.50000000 GF	and the second	^{مر} جلة (م. ع. المالا مليام	ويرابعه والمحاجب المحاجب المحاجب	*****	Persiana	and the particular	entertre			-	m	.0
CF Ste 2.350000000 GH Auto Ma	26.50 GHz (1001 pts)	2.246 s (Sweep			300 kHz	#VBV	*	kHz	100	3.00 (BW 1	les
Freq Offs	_					-48.41 di	0 GHz	9,909		f		N 2
							-				-	3
					-						-	

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10 RADIATED BANDEDGE AND SPURIOUS EMISSION MEASUREMENT

Standard Applicable 10.1

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 limit as below.

And according to §15.33(a) (1), 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:

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

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10.2 **Measurement Equipment Used**

		966 Chamber			
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Broadband Antenna	TESEQ	CBL 6112D	35243	2017/11/10	2018/11/09
Horn Antenna	Schwarzbeck	BBHA9120D	1187	2018/01/04	2019/01/03
Loop Antenna	ETS.LINDGREN	6502	148045	2017/09/26	2018/09/25
Horn Antenna	SCHWAZBECK	BBHA9170	184	2017/12/12	2018/12/11
EMI Test Receiver	R&S	ESU 40	100363	2018/04/11	2019/04/10
Pre-Amplifier	EMC Instru- ments	EMC330	980096	2017/12/26	2018/12/25
Pre-Amplifier	EMC Instru- ments	EMC0011830	980199	2017/12/26	2018/12/25
Pre-Amplifier	EMC Instru- ments	EMC184045B	980135	2017/10/27	2018/10/26
Coaxial Cable	Huber Suhner	SUCOFLEX 104	MY17388/4	2017/12/26	2018/12/25
Coaxial Cable	Huber Suhner	RG 214/U	W22.03	2017/12/26	2018/12/25

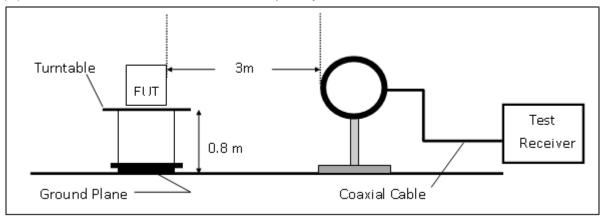
Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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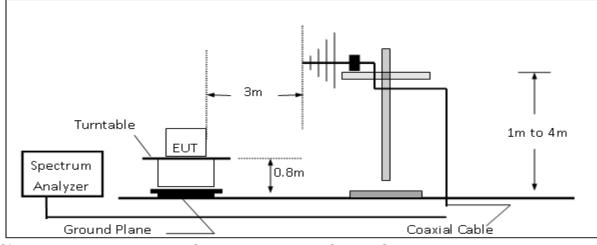


10.3 Test SET-UP

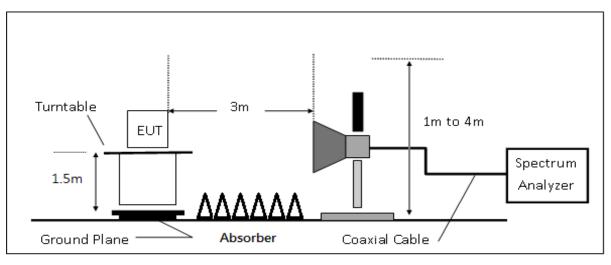
(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



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



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



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.



10.4 Measurement Procedure

- 1. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
- 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.
- 7. 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.

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Field Strength Calculation 10.5

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

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

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

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.

10.7 Measurement Result:

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

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.



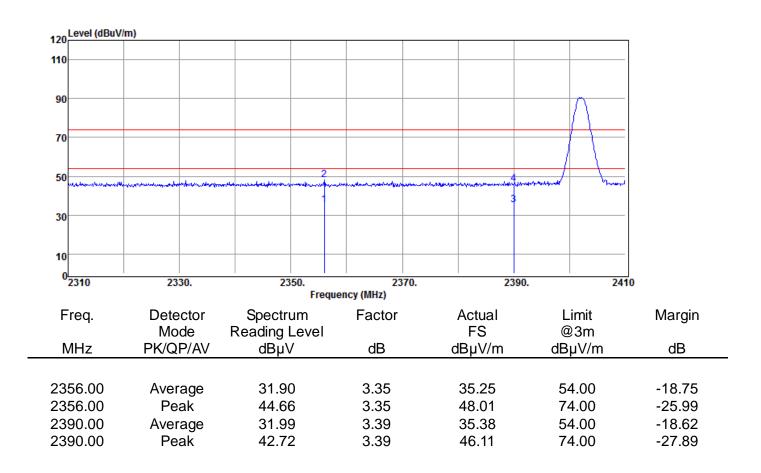
Radiated Band Edge Measurement Result

Operation Mode	
Test Mode	
EUT Pol	
Test Channel	

:BLE :BE CH LOW :H Plan :2402 MHz

Test Date Temp./Humi. Antenna Pol. Engineer

:2018-06-22 :23/61 :VERTICAL :Enzo



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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Operat Test Mo EUT Po Test Ch	ol	e	:BLE :BE CH LOW :H Plan :2402 MHz			:2018-06-22 :23/61 :HORIZONTAL :Enzo				
120 Le	evel (dBuV/m)									_
110										
90									Λ	
70									\vdash	
50	ertenne Angelen attende	unerson and a feature of	4.14.14.14.14.14.14.14.14.14.14.14.14.14	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	an a	ul-de-Manager	a da a a a a a a a a a a a a a a a a a	and and a second and	- Low	
30										
10										
0 <mark></mark> 23	310	2330.	2	350. Freque	23 ency (MHz)	70.	2:	390.	241	」 10
Fre	eq.			Spectrum			Actual		_imit	Margin
M	Hz	Mode Reading L PK/QP/AV dBµV			dB		FS dBµV/m		⊉3m ⊌µV/m	dB
	MHz PK/QP/AV 2390.00 Average 2390.00 Peak		Average 32.05		3.39 3.39		35.4454.0045.7974.00			-18.56 -28.21

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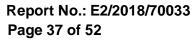


Operation Mo Test Mode EUT Pol Test Channel		:BLE :BE CH HI :H Plan :2480 MH		Test Date Temp./Humi. Antenna Pol. Engineer						
120 Level (dBuV	/m)									
110										
90										
70										
50 Harden and the second second					n an Annata an Annata An	unan ang makangkengang sa	and the second secon	adar dalamatan Mathematica		
30										
10										
0 <mark></mark> 2475	2480.	1 1	2485. Freque	24 ency (MHz)	90.	24	195.	250	0	
Freq.	Detecto		ectrum	Factor		Actual		imit	Margin	
MHz	Mode PK/QP/A		ling Level ∕BµV	dB	d	FS BµV/m		⊉3m βµV/m	dB	
2483.50 2483.50	2483.50 Average		age 39.49			43.45 52.09		4.00 4.00	-10.55 -21.91	

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Operation Mo Test Mode EUT Pol Test Channel		:H Pla	CH HIGH			:2018-06-22 :23/61 :HORIZONTAL :Enzo						
120 Level (dBuV	/m)											
110												
90		$\overline{\ }$										
70			2									
50 Marsadar			- Mar	an a	-			at and the second	alman day were they good			
30												
10												
0 2475	2480		24	185.	24	90.	24	195.	250	0		
					ncy (MHz)							
Freq.	Detect		Spectr		Factor		Actual		imit	Margin		
N411-	Mode		Reading Level		d٦		FS		2∂3m	٩D		
MHz	PK/QP/	/AV	dBh	v	dB	Ĺ	lBµV/m	UB	8µV/m	dB		
2483.50 2483.50	3.50 Average						3.96 3.96		48.71 59.13		4.00 4.00	-5.29 -14.87

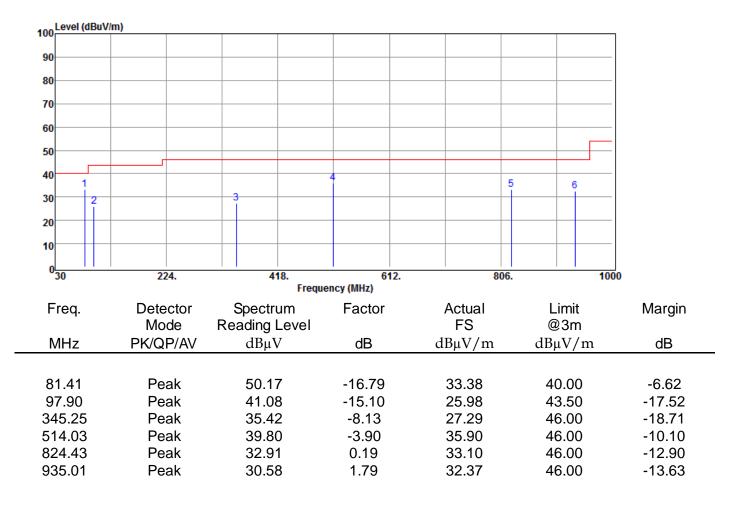




Radiated Spurious Emission Measurement Result

For Frequency form 30MHz to 1000MHz

Operation Mode	:BLE	Test Date	:2018-07-22
Test Mode	:TX CH LOW	Temp./Humi.	:23/61
EUT Pol	:H Plan	Antenna Pol.	:VERTICAL
Test Channel	:2402 MHz	Engineer	:Enzo



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Test Mo EUT Pol					Te Ai	st Date mp./F ntenna nginee	lumi a Pol				:2018-07-22 :23/61 :HORIZONTAL :Enzo		
100	el (dBuV/m	n)											
90													
80													
70													
60													
50		ſ											
40			2 3	1				4			5	6	
30				, 									
20													
10													
0		22	4.	4	18.	612	2.		806.			100	0
						ency (MHz)							
Fred] .	Dete		Spectr		Factor		Actua	I		mit		Margin
MH	7	Mo PK/QI		Reading dBµ		dB	ć	FS BµV/:	m	ي dBµ	3m V/r	n	dB
	<u> </u>			uDμ	v	uD		υμν/	111	uDμ	v / 1.		<u>ub</u>
83.3	5	Pea	ak	45.3	0	-16.70		28.60		40	00.		-11.40
231.7		Pea		48.6		-12.32		36.35			6.00		-9.65
298.6		Pea		39.9		-9.93		30.05			00.		-15.95
769.1		Pea		34.0		-0.96		33.07			00.		-12.93
935.9		Pea		30.2		1.81		32.09			00.		-13.91
995.´	10	Pea	aĸ	29.3	0	3.17		32.47		54	.00		-21.53

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Operation Mo Test Mode EUT Pol Test Channel	:T) H:	₋E K CH MID Plan 142 MHz		Test Date Temp./Humi. Antenna Pol. Engineer					
100 Level (dBuV/r	n)					7			
90									
80									
70									
60									
50									
40 2	4				6				
30 1 3									
20									
10									
0 <mark>1011</mark>	224.	418.	612.	806.	10] 00			
		-	ency (MHz)						
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin			
N 41 1-	Mode	Reading Level		FS	@3m				
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB			
38.73	Peak	36.54	-8.07	28.47	40.00	-11.53			
79.47	Peak	50.90	-16.93	33.97	40.00	-6.03			
96.93	Peak	43.92	-15.26	28.66	43.50	-14.84			
231.76	Peak	45.81	-12.32	33.49	46.00	-12.51			
729.37	Peak	39.41	-1.45	37.96	46.00	-8.04			
982.54	Peak	29.27	2.87	32.14	54.00	-21.86			

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Operation Mode Test Mode EUT Pol Test Channel	de	:BLE :TX CH :H Plan :2442 M			Test Date Temp./Hu Antenna Engineer	:2018-07-22 :23/61 :HORIZONTAL :Enzo	
100 Level (dBuV/n	n)						-
90							
80							
70							
60							
50							
40					5 6		
30	2	3	4				
20							
10							
0 <mark>1</mark> 30	224.		418. Frequ	612. ency (MHz)		806. 10	00
Freq.	Detect	tor S	Spectrum	Factor	Actual	Limit	Margin
·	Mode		ading Level		FS	@3m	-
MHz	PK/QP/	/AV	dBµV	dB	dBµV/n	n dBµV/m	dB
30.97	Peak		30.51	-4.16	26.35	40.00	-13.65
165.80 298.69	Peak Peak		40.94 39.92	-13.67 -9.93	27.27 29.99	43.50 46.00	-16.23 -16.01
298.69 366.59	Pear		39.92 37.12	-9.93 -7.32	29.99 29.80	46.00	-16.20
746.83	Peak		35.47	-1.38	34.09	46.00	-11.91
769.14	Peak		33.87	-0.96	32.91	46.00	-13.09

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Operation M Test Mode EUT Pol Test Channe	:	BLE TX CH HIGH H Plan 2480 MHz		Test Date Temp./Hum Antenna Po Engineer		:2018-07-22 :23/61 :VERTICAL :Enzo
100 Level (dBu)	V/m)					7
90						
80						
70						
60						
50						
40						
30 1 2	3	4		5	6	
20						
10						
0 <mark>30</mark>	224.	418.	612.	806	. 10	
50	224.		uency (MHz)	800	. 10	50
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode PK/QP/AV	Reading Level dBµV	dB	FS dBµV/m	@3m dBμV/m	dB
		ασμν	uВ	ασμνγπ	ασμ ν / Π	UD
38.73	Peak	37.88	-8.07	29.81	40.00	-10.19
96.93	Peak	44.15	-15.26	28.89	43.50	-14.61
172.59	Peak	38.77	-14.05	24.72	43.50	-18.78
298.69	Peak	34.45	-9.93	24.52	46.00	-21.48
769.14	Peak	33.39	-0.96	32.43	46.00	-13.57
974.78	Peak	30.21	2.68	32.89	54.00	-21.11

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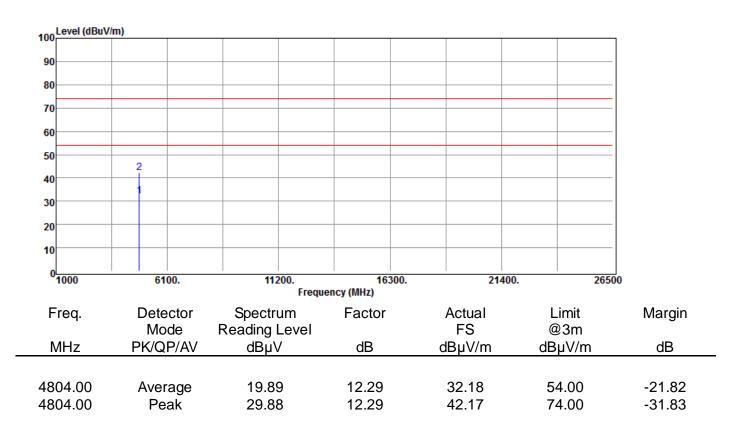


Operation Mode Test Mode EUT Pol Test Channel	נד: H:	LE K CH HIGH Plan 480 MHz		Test Date Temp./Humi. Antenna Pol. Engineer				
100 Level (dBuV/n	n)					1		
90								
80								
70								
60								
50								
40								
30	3	4 5		6	7			
20								
10								
0 <mark>30</mark>	224.	418.	<u>612.</u>	806.	100]		
		Freque	ency (MHz)					
Freq.	Detector	Spectrum	Factor	Actual FS	Limit @3m	Margin		
MHz	Mode PK/QP/AV	Reading Level dBμV	dB	го dBµV/m	dBµV/m	dB		
		•			. ,			
30.97	Peak	29.74	-4.16	25.58	40.00	-14.42		
38.73	Peak	31.69	-8.07	23.62	40.00	-16.38		
165.80	Peak	40.58	-13.67	26.91	43.50	-16.59		
345.25	Peak	38.00	-8.13	29.87	46.00	-16.13		
497.54	Peak	35.97	-4.26	31.71	46.00	-14.29		
769.14	Peak	33.17	-0.96	32.21	46.00	-13.79		
938.89	Peak	30.83	1.86	32.69	46.00	-13.31		



Radiated Spurious Emission Measurement Result

For Frequency above 1GHz									
Operation Mode	:BLE	Test Date	:2018-07-25						
Test Mode	:TX CH LOW	Temp./Humi.	:23/61						
EUT Pol	:H Plan	Antenna Pol.	:VERTICAL						
Test Channel	:2402 MHz	Engineer	:Enzo						



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Operation Test Mode EUT Pol Test Chan		:TX CH LOWTemp./Humi.:H PlanAntenna Pol.:2402 MHzEngineer					
100 Level (d	BuV/m)		1			-	
90						_	
80						_	
70						_	
60						_	
50	2					_	
40						_	
30						-	
20						-	
10						_	
0 <mark></mark>	6100.	11200. Frequ	16300 iency (MHz)). 214	00. 26	500	
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin	
MHz	Mode Reading Level MHz PK/QP/AV dBµV		dB	FS dBµV/m	@3m dBµV/m	dB	
4804.00	0	19.75	12.29	32.04	54.00	-21.96	
4804.00) Peak	30.37	12.29	42.66	74.00	-31.34	

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Test I EUT	ation Moo Mode Pol Channel	de	:H F	CH MID	Antenna Pol.					:2018-07-25 :23/61 :VERTICAL :Enzo	
100	Level (dBuV/n	n)									_
90											_
80											_
70											_
60											_
50											_
40		2									_
30											_
20											_
10											_
0	1000	6100).	112		163 ency (MHz)	800.	21	400.	265	500
F	req.	Detec		Spectru		Factor		Actual		Limit	Margin
<u> </u>	MHz	Mod PK/QP		Reading I dBµ∖		dB		FS dBµV/m		@3m 3µV/m	dB
	84.00 84.00	Avera Pea		19.97 29.7		12.63 12.63		32.60 42.34		54.00 74.00	-21.40 -31.66
				=							

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Test M EUT F Test C	Pol Channel		:BLE :TX CH MID :H Plan :2442 MHz		Test Date Temp./Humi. Antenna Pol. Engineer					:2018-07-25 :23/61 :HORIZONTAL :Enzo
100	Level (dBuV/n	n)						1	1	7
90-										_
80										_
70										-
60										_
50										-
40		2								_
30										-
20										-
10										-
0	1000	6100.	112		163 ncy (MHz)	00.	21	400.	265	500
F	req.	Detector			Factor		Actual		_imit	Margin
N	/Hz	Mode PK/QP/A	Reading l / dBµ∖		dB		FS dBµV/m		⊉3m 8µV/m	dB
488	84.00	Average	19.78	3	12.63		32.41	5	4.00	-21.59
488	84.00	Peak	29.97	7	12.63		42.60	7	4.00	-31.40

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Operation Mo Test Mode EUT Pol Test Channel	:T) :H :24	LE K CH HIGH Plan 480 MHz	Antenna Pol.				
100 Level (dBuV/	m)	1 1			1	_	
90						_	
80						_	
70						_	
60						_	
50						_	
40	2					_	
30						_	
20						-	
10						_	
0 <mark></mark>	6100.	11200. Freque	16300. ency (MHz)	21400	0. 26	500	
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin	
MHz	Mode PK/QP/AV	Reading Level dBµV	dB	FS dBµV/m	@3m dBµV/m	dB	
4960.00 4960.00	Average Peak	19.90 30.02	12.93 12.93	32.83 42.95	54.00 74.00	-21.17 -31.05	

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Test N EUT I		de	:H	LE X CH HIGH Plan 480 MHz		Test Date Temp./Humi. Antenna Pol. Engineer					:2018-07-25 :23/61 :HORIZONTAL :Enzo
100	Level (dBuV/	m)	,								_
90											_
80											_
70											-
60											-
50		2									-
40		1									-
30											-
20											-
10											-
0	1000	61	00.	11	200. Freque	163 ency (MHz)	300.	21	400.	265	500
F	req.		ector	Spectr		Factor		Actual		Limit	Margin
N	/IHz	Mode Reading Level PK/QP/AV dBµV		dB		FS dBµV/m		@3m BµV/m	dB		
	60.00 60.00	Aveı Pe	rage ak	20.0 30.2		12.93 12.93		32.96 43.13		54.00 74.00	-21.04 -30.87
-		-		-		-					



11 PEAK POWER SPECTRAL DENSITY

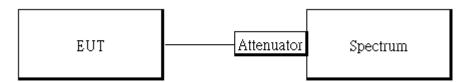
11.1 Standard Applicable:

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.

11.2 **Measurement Equipment Used:**

Conducted Emission Test Site						
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.	
Spectrum Analyzer	Agilent	N9010A	MY51440113	2018/06/20	2019/06/19	
DC Power Supply	Agilent	E3640A	MY53130054	2017/09/04	2018/09/03	
DC Block	PASTERNACK	PE8210	RF29	2017/12/26	2018/12/25	
Notebook	Lenovo	T420	S0012599	N/A	N/A	

11.3 Test Set-up:



11.4 Measurement 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.
- 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.

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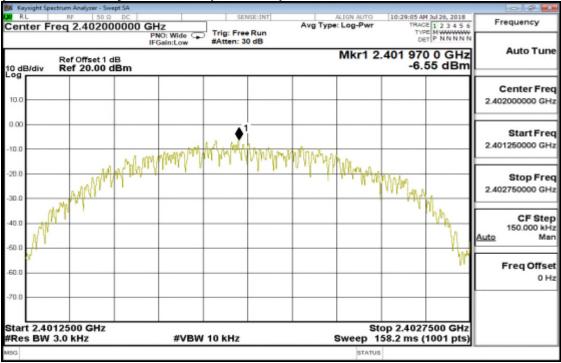


11.5 **Measurement Result:**

BLE mode			
Frequency (MHz)	RF Power Density (dBm)	Maximum Limit (dBm)	Result
2402	-6.55	8	PASS
2442	-6.60	8	PASS
2480	-7.24	8	PASS

NOTE: cable loss as 1dB that offsets in the spectrum

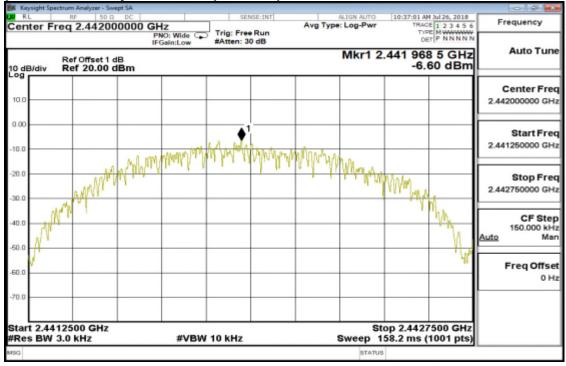
BLE mode Power Spectral Density Test Plot (CH-Low)



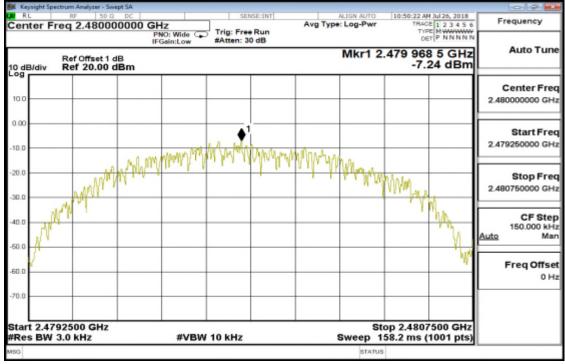
Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.



Power Spectral Density Test Plot (CH-Mid)



Power Spectral Density Test Plot (CH-High)



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12 ANTENNA REQUIREMENT

Standard Applicable: 12.1

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.

In case of point-to-point operation, the power shall be reduced by the one dB for every 3 dB that the directional gain of antenna exceeds 6dBi.

12.2 **Antenna 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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