

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C AND INDUSTRY CANADA RSS 247 REQUIREMENT

	OF				
Applicant:	Quanta Computer Inc.				
	No. 188, Wenhua 2nd Road, Guishan District, Taoyuan City				
	33377, Taiwan				
Product Name:	Clover Mini Enterprise/Clover Station Pro Terminal				
Brand Name:	clover				
Model No.:	C303, C503				
Model Difference:	C303 is a standalone POS terminal. C503 includes the				
	same POS terminal (C303) but comes with an included pe-				
	ripheral display (S503).				
FCC ID:	HFS-CX03U				
IC:	1787B-CX03U				
Report Number:	T190612W02-RP6				
FCC Rule Part:	§15.247, Cat: DTS				
IC Rule Part:	RSS-247 issue 2 Feb 2017				
Issue Date:	Jul. 12, 2019				
Date of Test:	Jun. 14, 2019 ~ Jul. 09, 2019				
Date of EUT Received:	Jun. 14, 2019				
Issued by	Compliance Certification Services Inc.Wugu Lab.				
	No.11, Wugong 6th Rd., Wugu Dist., New Taipei City 24891,				
	Taiwan. (R.O.C.)				
	service@ccsrf.com				

The test Result was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were given in ANSI C63.10: 2013 and compliance standards.

The test results of this report relate only to the tested sample (EUT) identified in this report. The test Report of full or partial shall not copy. Without written approval of Compliance Certification Services Inc. (Wugu Laboratory).

Tested By:

lone Hore

Hone Hsieh / Engineer

Approved By:

Kevin Tsai / Deputy Manager



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Revision History

Report Number	Revision	Description	Effected Page	Issue Date	Revised By
T190612W02-RP6	Rev.00	Initial creation of document	All	Jul. 12, 2019	Elle Chang

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GENERAL INFORMATION 1

1.1 Product Description

Product Name:	Clover Mini Enterprise/Clover Station Pro Terminal		
Brand Name:	clover		
Model No.:	C303, C50	03	
Model Difference:	C303 is a standalone POS terminal. C503 includes the same POS terminal (C303) but comes with an included peripheral display (S503)		
Product SW/HW version:	N/A / 4.01		
Radio SW/HW version:	N/A / N/A		
Test SW Version:	N/A		
RF power setting in TEST SW:	N/A		
Micro Hub:	Model No.	: H303, Supplier: clover	
	12V from Hub and Adapter		
Power Supply:	Battery: Model No.: YJ3B, Supplier: N/A		
	Adapter:	Model No.: FSP040-RHBN3, Supplier: FSP	

Bluetooth Low Energy:

Bluetooth Version:	Bluetooth V5.0 Dual Mode			
Channel number:	40 channels			
Modulation type:	GFSK			
Transmit Power:	2.09dBm (BLE 1M) 2.25dBm (BLE 2M)			
Frequency Range:	2402 – 2480MHz			
Antenna Designation:	 PIFA Antenna, 1. P/N: GD9320-15-001-R, Supplier: SAA, Antenna Gain: 0.08dBi (Main) 2. P/N: LA81FP017-1H, Supplier: Luxshare-ICT Antenna Gain: 2.1dBi (Main) 			

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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.

RSS-Gen. issue 5 Apr. 2018

RSS-247 issue 2 Feb. 2017

ANSI C63.10:2013

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

1.3 Test Facility

Compliance Certification Services Inc. Wugu Lab. No.11, Wugong 6th Rd., Wugu Dist., New Taipei City 24891, Taiwan. (R.O.C.) (TAF code 1309)

FCC Designation number: TW1309

Canada Registration Number: TW1309

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 Radiated Emission Configuration

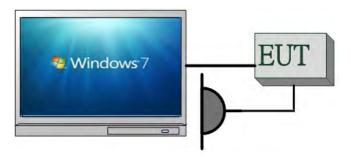


Fig. 2-2 Conducted Emission Configuration



Fig 2-3 Conduction (AC Power Line) Configuration

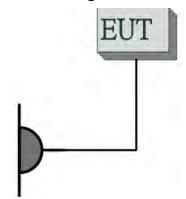


Table 2-1	Equipment	Used in	Tested	System
-----------	-----------	---------	--------	--------

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	L420	S0012467	Shielded	Unshielded

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SUMMARY OF TEST RESULTS 3

FCC Rules	C Rules IC Rules Description Of Test		Result
§15.207(a)	RSS-Gen §8.8	AC Power Line Conducted Emission	Compliant
§15.247(b) (3)	RSS-247 §5.4(4)	Peak Output Power	Compliant
§15.247(a)(2)	RSS-247 §5.2 (1) RSS-Gen §6.6	6dB & 99% Emission Bandwidth	Compliant
§15.247(d)	RSS-247 §5.5	Conducted Band Edge and Spurious Emission	Compliant
§15.247(d)	RSS-247 §5.5	Radiated Band Edge and Spurious Emission	Compliant
§15.247(e)	RSS-247 §5.2(2)	Peak Power Density	Compliant
§15.203 §15.247(b)	RSS- Gen §6.8	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

ITEM	FREQUENCY	ITEM	FREQUENCY	ITEM	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.

AC POWER LINE CONDUCTED EMISSION TEST:

Test Condition	AC Power line conducted emission for line and neutral			
Worst Case	Operation in normal mode			

RADIATED EMISSION TEST:

MODE	AVAILABLE FREQUENCY (MHz)	TESTED FREQUENCY (MHz)	MODULATION	DATA RATE (Mbps)
	RADIA	TED EMISSION TEST (BELOW 1 GHz)	
Bluetooth LE	2402 to 2480	2442	GFSK	1
Bluetooth LE	2402 to 2480	2442	GFSK	2
	RADIA	TED EMISSION TEST	(ABOVE 1 GHz)	-
Bluetooth LE	2402 to 2480	2402, 2442, 2480	GFSK	1
Bluetooth LE	2402 to 2480	2402, 2442, 2480	GFSK	2
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 E2 position was reported.

ANTENNA PORT CONDUCTED MEASUREMENT:

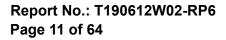
CONDUCTED TEST						
MODEAVAILABLE FREQUENCY (MHz)TESTED FREQUENCY (MHz)MODULATIONDATA RATE (Mbps)						
Bluetooth LE	2402 to 2480	2402, 2442, 2480	GFSK	1		
Bluetooth LE	2402 to 2480	2402, 2442, 2480	GFSK	2		

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MEASUREMENT UNCERTAINTY 5

PARAMETER	UNCERTAINTY
AC Powerline Conducted Emission	+/- 1.2575 dB
Peak Output Power	+/- 1.92 dB
6dB Bandwidth	+/- 61.248 Hz
100 kHz Bandwidth of Frequency Band Edges	+/- 1.92 dB
Peak Power Density	+/- 1.996 dB
3M Semi Anechoic Chamber / 30M~200M	+/- 4.12 dB
3M Semi Anechoic Chamber / 200M~1000M	+/- 4.68 dB
3M Semi Anechoic Chamber / 1G~8G	+/- 5.18 dB
3M Semi Anechoic Chamber / 8G~18G	+/- 5.47 dB
3M Semi Anechoic Chamber / 18G~26G	+/- 3.81 dB
3M Semi Anechoic Chamber / 26G~40G	+/- 3.87 dB

Note:

- 1. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
- 2. The conformity assessment statement in this report is based solely on the test results, measurement uncertainty is excluded.

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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	Limits dB(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 th							
2. The limit decreases linearly wit	h 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 TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.						
			NUNDER								
CABLE	EMCI	CFD300-NL	CERF	06/29/2018	06/28/2019						
EMI Test Receiver	/I Test Receiver R&S ESCI		100064	07/24/2018	07/23/2019						
LISN	SCHWARZBECK	NSLK 8127	8127-541	01/31/2019	01/30/2020						
LISN	SCHAFFNER NNB 41 03/10013 02/13/2019 02/12/2020										
Software	EZ-EMC(CCS-3A1-CE)										

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.

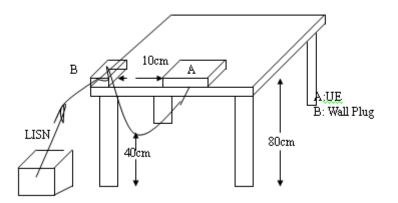
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6.4 Test SET-UP (Block Diagram of Configuration)



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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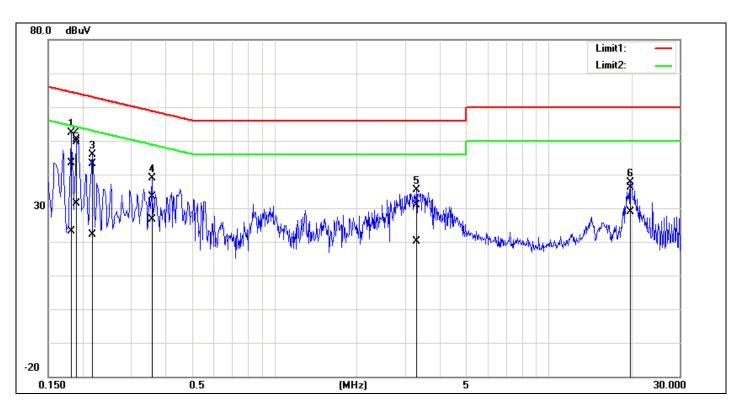
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AC POWER LINE CONDUCTED EMISSION TEST DATA

Description:	Operation	Date:	2019/6/21
Line:	L1	Temp.(℃)/Hum.(%):	26.9(℃)/67%
Test Voltage: Job No.:	AC 120V/60Hz T190612W02	Test By:	Henry



No.	Frequency	QuasiPeak	Average	Correction	QuasiPeak	Average	QuasiPeak	Average	QuasiPeak	Average	Remark
		reading	reading	factor	result	result	limit	limit	margin	margin	
	(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
1	0.1819	33.32	13.08	10.13	43.45	23.21	64.39	54.40	-20.94	-31.19	Pass
2*	0.1900	39.57	21.21	10.13	49.70	31.34	64.03	54.04	-14.33	-22.70	Pass
3	0.2180	33.06	11.91	10.13	43.19	22.04	62.89	52.89	-19.70	-30.85	Pass
4	0.3580	23.24	16.59	10.14	33.38	26.73	58.77	48.77	-25.39	-22.04	Pass
5	3.3020	20.69	9.81	10.22	30.91	20.03	56.00	46.00	-25.09	-25.97	Pass
6	19.9180	25.72	18.45	10.37	36.09	28.82	60.00	50.00	-23.91	-21.18	Pass

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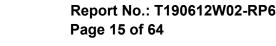
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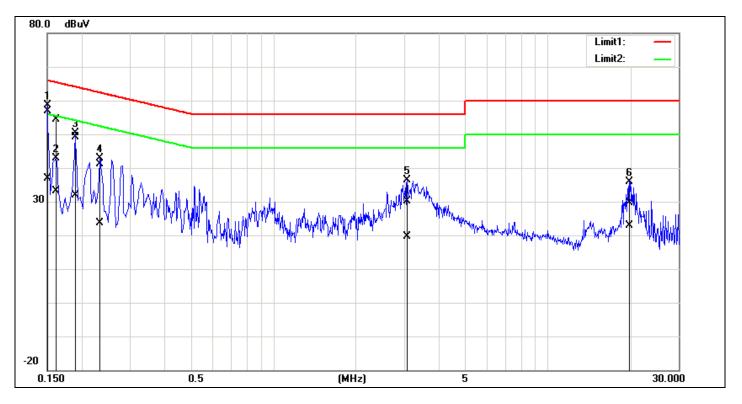
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Description:	Operation	Date:	2019/6/21
Line:	N	Temp.(℃)/Hum.(%):	26.9(°C)/67%
Test Voltage:	AC 120V/60Hz	Test By:	Henry
Job No.:	T190612W02		•



No.	Frequency	QuasiPeak reading	Average reading	Correction factor	QuasiPeak result	Average result	QuasiPeak limit	Average limit	QuasiPeak margin	Average margin	Remark
	(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
1*	0.1500	46.87	26.82	10.02	56.89	36.84	65.99	56.00	-9.10	-19.16	Pass
2	0.1620	44.27	23.03	10.02	54.29	33.05	65.36	55.36	-11.07	-22.31	Pass
3	0.1900	39.05	21.93	10.02	49.07	31.95	64.03	54.04	-14.96	-22.09	Pass
4	0.2340	31.20	13.69	10.02	41.22	23.71	62.30	52.31	-21.08	-28.60	Pass
5	3.0820	20.00	9.45	10.08	30.08	19.53	56.00	46.00	-25.92	-26.47	Pass
6	19.9100	19.28	12.68	10.27	29.55	22.95	60.00	50.00	-30.45	-27.05	Pass

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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.

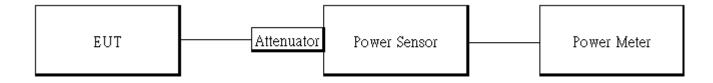
If the transmitting antenna of directional gain greater than 6dBi are used the peak output power form the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the Antenna exceeds 6dBi.

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:

	Conducted Emission Test Site										
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.						
TYPE		NUMBER	NUMBER	CAL.							
Power Meter	er Meter Anritsu ML2496A 132600				08/02/2019						
Power Sensor	Anritsu	Anritsu MA2411B 13		08/03/2018	08/02/2019						
Power Sensor	Anritsu	MA2411B 13150		08/03/2018	08/02/2019						
Attenuator Marvelous		MVE2213-10	RF80	02/26/2019	02/25/2020						
DC Block PASTERNACK		PE8210	RF256	02/26/2019	02/25/2020						
Spectrum Analyzer Agilent		N9010A	MY53400256	11/21/2018	11/20/2019						

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 & 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.

Formula:

Duty Cycle = Ton / (Ton+Toff)

Duty Factor:

Please refer to next page.

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(BLE 1M)

	Duty Cycle (%) Duty Factor (dB)	1/T (kHz)	VBW setting (kHz)				
BLE	62.40	2.05	2.56	3.00				
Duty Cycle_BLE_1M_MidCH20-2442								
Keysight Spectrum Analyzer - Swep R RF 50 Ω	DC		N AUTO 10:59:25 AM Jun 1					
Center Freq 2.44200	PNO: Fast +++ Trig	Avg Type: Lo : Free Run en: 30 dB	DG-Pwr TRACE 1 2 TYPE W₩ DET P N	3456 www				
Ref Offset 0.4 10 dB/div Ref 20.40 d	dB	en: 30 dB	ΔMkr3 625.0 -0.01	0 µs Auto Tune				
Log 10.4 0.400 -9.60	3Δ4			2.442000000 GH;				
-19.6				2.442000000 GH:				
-49.6	l herenal haven	i benned haveded	kypers/ Laher	Stop Fred 2.442000000 GHz				
Center 2.442000000 G Res BW 8 MHz	Hz #VBW 8.0 r		Span eep 5.000 ms (1001	pts) 8.000000 MHz Auto Mar				
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	420.0 μs 2. 625.0 μs (Δ) -	FUNCTION FUNCTION 0.06 dB 01 dBm 0.01 dB 01 dBm 01 dBm	DN WIDTH FUNCTION VALI	Freq Offset				
7 8 9 10 11								
۲ در	п	1	STATUS	4				

Duty Cycle Factor:10*log(1/(62.4/100))=2.05

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(BLE 2M):

	Duty Cycle (%)	Duty Factor (dB)	1/T (kHz)	VBW setting (kHz)
BLE 2M	33.01	4.81	4.85	5.00

Duty Cycle_BLE_2M_ MidCH20-2442

		Spect	trum /	Analyzer - Sw	ept SA											
	^{RL} nter	Fre	RF eq 2		DC 00000 GI			1	NSE:I		Avg '		LIGN AUTO	TRA	M Jun 19, 2019 CE 1 2 3 4 5 6	Frequency
	dB/div			Offset 11	IF .4 dB	'NO: Fas Gain:Lo		Trig: Fre Atten: 2		n			Z	Mkr3	^{pe} P NNNN 624.0 μs 1.58 dB	Auto Tune
Log 10. 0.0 -10.	0 0 0					1Δ2			34	4					-	Center Freq 2.442000000 GHz
-20. -30. -40.	o			hyperior				undon all			1 Ni	L d.J.d.	๛๚๛๛๛๛		Unit Maria	Start Freq 2.442000000 GHz
-50. -60. -70.	0	n i Ma		1 4741 474 .		APA. L Bood is		oor salisti koites			ייין איי	10 V U	ייש איז		10 arriver 10	Stop Freq 2.442000000 GHz
Re	s BW	8	MH	_		V	зw я	B.0 MHz					-	000 ms	Span 0 Hz (1001 pts)	CF Step 8.000000 MHz <u>Auto</u> Man
1 2 3 4 5 6 7 8 9 10 11				(Δ)	3	06.0 μs 58.0 μs 24.0 μs 58.0 μs		Y 0.26 1.94 d -1.58 1.94 d	Bm dB	FUNC		FUN				Freq Offset 0 Hz
MSG													STATUS			

Duty Cycle Factor:10*log(1/(33.01/100))=4.81

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7.5 Measurement Result:

(BLE 1M)

СН	Frequency (MHz)	Peak Power Output (dBm)	Required Limit
Low	2402	1.80	1 Watt = 30 dBm
Mid	2442	2.09	1 Watt = 30 dBm
High	2480	1.56	1 Watt = 30 dBm
СН	Frequency (MHz)	Max. Avg. Output include tune up tolerance Power (dBm)	Required Limit
Low	2402	1.62	1 Watt = 30 dBm
Mid	2442	1.88	1 Watt = 30 dBm
High	2480	1.33	1 Watt = 30 dBm

*Note: Measured by power meter, cable loss as 10.4 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

EIRP

СН	Frequency (MHz)	Max. Avg. Output include tune up tolerance Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	L	.imi	t
Low	2402	1.62	2.10	3.72	4W=	36	dBm
Mid	2442	1.88	2.10	3.98	4W=	36	dBm
High	2480	1.33	2.10	3.43	4W=	36	dBm

* Note: EIRP = Average Power + Gain

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(BLE 2M)

СН	Frequency (MHz)	Peak Power Output (dBm)	Required Limit
Low	2402	1.94	1 Watt = 30 dBm
Mid	2442	2.25	1 Watt = 30 dBm
High	2480	1.70	1 Watt = 30 dBm
		Max. Avg. Output include	
СН	Frequency (MHz)	tune up tolerance Power (dBm)	Required Limit
CH Low		•	Required Limit 1 Watt = 30 dBm
	(MHz)	(dBm)	-

*Note: Measured by power meter, cable loss as 10.4 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

EIRP

СН	Frequency (MHz)	Max. Avg. Output include tune up tolerance Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	L	.imi	t
Low	2402	1.49	2.10	3.59	4W=	36	dBm
Mid	2442	1.83	2.10	3.93	4W=	36	dBm
High	2480	1.32	2.10	3.42	4W=	36	dBm

* Note: EIRP = Average Power + Gain

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8 6DB & 99% BANDWIDTH MEASUREMENT

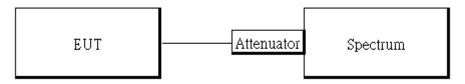
8.1 Standard Applicable

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.						
DC Block	PASTERNACK	PE8210	RF256	02/26/2019	02/25/2020						
Spectrum Analyzer	Agilent	N9010A	MY53400256	11/21/2018	11/20/2019						
Attenuator	Marvelous	MVE2213-10	RF80	02/26/2019	02/25/2020						

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. For 99% Bandwidth:

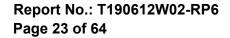
Set the spectrum analyzer as RBW=1%, VBW=3*RBW, Span = 2MHz, Detector=Sample, Sweep=auto.

- 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 1M mode

Frequency (MHz)	6dB BW (MHz)	BW (MHz)	Result
2402	0.684	> 0.5	PASS
2442	0.6848	> 0.5	PASS
2480	0.6849	> 0.5	PASS

BLE 1M mode

Frequency (MHz)	99%Bandwidth (MHz)
2402	1.0278
2442	1.0288
2480	1.0289

BLE 2M mode

Frequency	6dB BW	BW	Result	BLE 2M mode		
(MHz)	(MHz)	(MHz)	Result	Frequency (MHz)	99%Bandwidth (MHz)	
2402	1.144	> 0.5	PASS			
2402	1.144	× 0.0	17,00	2402	2.0349	
2442	1.16	> 0.5	PASS			
£112	1.10	- 0.0	17,000	2442	2.0322	
2480	1.162	> 0.5	PASS	2480	2.035	

Note: Refer to next page for plots.

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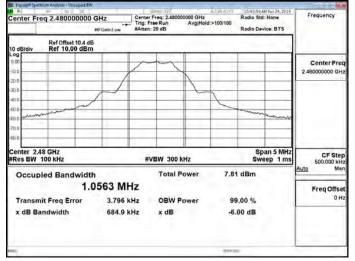
OBW 6dB_BLE_1M_LowCH00-2402

Kerupht Spectrum A	wayam - Occupied BW		and the second s	MIGH AUTO	8-24-47 AM Sun 24, 2019	-12 00
Center Freq 2	Frequency					
10 dB/div R	tef Offset 10.4 dB tef 10.00 dBm					10000
0.00			m l			Center Freq 2.402000000 GHz
-20.0			1			
-50.0 40.0					- manufactures	
Center 2,402 0 #Res BW 100			VBW 300 kHz		Span 5 MHz Sweep 1 ms	CF Step
Occupied Bandwidth Total 1.0556 MHz				8.33 d	Bm	Auto Man Freq Offset
Transmit F x dB Bandy		8.568 kHz 684.0 kHz	OBW Power x dB	99.00 -6.00	120	0 Hz
Minú				(SWM US-		·

OBW 6dB_BLE_1M_MidCH20-2442

ctrum Anulyon - Decupies BVr		- GMdr - 201		4339.4870	10:52:51	AM Nov 34, 2016			
	11	nter Freq: 2.4420 Ig: Free Run		1	Radio Ste	: None	Frequency		
Ref Offset 10.4 dB Ref 10.00 dBm					-				
		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~					Center Fre 2.442000000 GH		
			~	2					
442 GHz 100 kHz		#VBW 300	kHz	-			CF Ste 500.000 kH		
Occupied Bandwidth 1.0573 N				Total F	ower	8.50 dBm			Auto Mar Freq Offset
nit Freq Error			ower				01		
anawiau	004.8 KMZ	X dB		-0.	OU dB				
	Ref Officet 10.4 dB Ref 10.00 dBm H2 GHz 100 KHz Lied Bandwidth 1.0	Ref 00%set 10.4 dB Ref 10.00 dBm 442 GHz 100 kHz bied Bandwidth 1.0573 MHz bit Freq Error 5.578 kHz	Trig: Free Run ar Calendow Anten: 20 dB Ref 00.00 dBm 44 ten: 20 dB Ref 10.40 dB Ref 10.00 dBm 44 ten: 20 dB 44 ten: 20	eq 2.442000000 GHz FrGate 10.4 dB Ref 10,00 dBm H2 GHz 100 KHz 100 KHz 0 K	eq 2.442000000 GHz Fromer Free: 2.44500000 GHz Trg. Free Mark 20 6B Ref 10,00 dBm Ref 10,00 dBm 142 GHz 100 kHz #VEW 300 kHz 1.0573 MHz http://eq.Error 5.578 kHz OBW Power 94	eq 2.442000000 GHz recancion Relation Relation Rel 0.00 dBm Rel 10.00 dBm Rel 10.00 dBm recancion Rel 0.00 dBm Rel 0.00 dBm Rel 0.00 dBm recancion Rel 0.00 dBm Rel 0.00 dBm	eq 2.442000000 GHz arCaded um arCaded um register 20 dB Ref 10.00 dBm Ref 10.00 dBm HZ CHZ 100 kHz #VEW 300 kHz Sweep 1 ms Ned Bandwidth 1.0573 MHz htt Freq Error 5.578 kHz OBW Power 99.00 %		

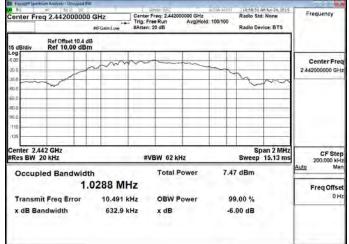
## OBW 6dB_BLE_1M_HighCH39-2480



## IC OBW 99%_BLE_1M_LowCH00-2402

eq 2.402000000	Trig.	Free Run Avg/Hold	a frankerro 10:11:23 AM Nor 24, 20 Radio Std: None : 100/100 Radio Device: BTS	Frequency				
				2.40200000 GH1				
102 GHz 20 KHz		#VBW 62 kHz	Span 2 M Sweep 15.13 r	Hz CF Ster ms 200,000 kH				
Occupied Bandwidth 1.0278 MH						Total Power	7.22 dBm	Auto Mar Freq Offsel
iit Freq Error andwidth	12.201 kHz 631.4 kHz	OBW Power x dB	99.00 % -6.00 dB	0 H2				
	Ref Offset 10.4 dE Ref 10.00 dEm Ref 10.00 dEm 102 GHz 20 KHz lied Bandwidtl 1.1 tit Freq Error	Ref 0.00 dbm Ref 10.00 dbm Ref	eq 2.40200000 GHz stGateLow Trg. Free Ron AvgMeld Ref 10,00 dbm Ref 10,00 dbm 102 GHz 20 KHz tied Bandwidth 1.0278 MHz tit Freq Error 12.201 kHz OBW Power	eq 2.402000000 GHz #Carled Jaw Ref 10,00 dBm Ref 10,00 dBm 102 FHz 20 KHz 20 KHz 10.278 MHz http: Freq Error 12.201 kHz 0BW Power 99.00 % Radio Stil: None Radio				

## IC OBW 99%_BLE_1M_MidCH20-2442



## IC OBW 99%_BLE_1M_HighCH39-2480



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## OBW 6dB_BLE_2M_LowCH00-2402

Report Spect	Dum Anulyon - D/copied PM		244-30	a.194400	11:00:15 AM Nor 24, 2015	
Center Fre	aq 2.402000000	Tri	nter Freq: 2.402000000 GF g: Free Run Avgin tten: 20 dB	fz fold: 100/100	Radio Std: None Radio Device: BTS	Frequency
10 dB/div	Ref Offset 10.4 dE Ref 10.00 dBm					
10.0				~		Center Fred 2.402000000 GH:
-30.0					m	
50.0 £0.0						
Center 2.4	00 CH2				Span 5 MHz	
#Res BW			#VBW 300 kHz		Sweep 1 ms	CF Step 500.000 kHz
Occup	ied Bandwidtl 2.0	n 0714 MHz	Total Power	8.5	8 dBm	Auto Man Freg Offsel
	it Freq Error Indwidth	15.154 kHz 1.144 MHz	OBW Power x dB		9.00 % .00 dB	0 Hz
ASK1				20003	50-	

## OBW 6dB_BLE_2M_MidCH20-2442

Reysell Spect	Dum Anulyaki - Décuping BW		-046-30		Sector 11:160	4.6M Nun 24, 2019	
Center Freq 2.442000000 GHz			nter Freq: 2.4420 g: Free Run ten: 20 dB		Radio 1	itd: None levice: BTS	Frequency
10 dB/div	Ref Offset 10.4 dB Ref 10.00 dBm						
100		h	~~~				Center Free 2.442000000 GHz
-30.0 -40.0					Y		
80 0 70 0 80 0							
Center 2.4 #Res BW			#VBW 300	kHz		Span 5 MHz weep 1 ms	CF Step 500,000 kHz
Occupied Bandwidth 2.0723 M		upled Bandwidth Total 2.0723 MHz		Power	8.88 dBm		Auto Man Freq Offset
	it Freq Error Indwidth	13.976 kHz 1.160 MHz	OBW F	ower	99.00 % -6.00 dB		0 H3

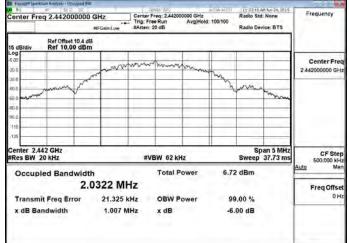
## OBW 6dB_BLE_2M_HighCH39-2480

BL	# 50 2 DE				AM Nun 24, 2019	Frequency	
Center Fre	eq 2.48000000	Trip	iter Freq: 2.480000000 GHz 1: Free Run AvgiHolo ten: 20 dB	1: 100/100	td: None evice: BTS		
10 dB/div	Ref Offset 10.4 de Ref 10.00 dBm					Center Freq 2.480000000 GHz CF Step	
-100 -100 -200 -300 -400							
60.0 70.0 60.0 Center 2.4					pan 5 MHz [		
#Res BW Occup	100 kHz ied Bandwidt		#VBW 300 kHz Total Power	8.26 dBm	veep 1 ms	500.000 kH Auto Mar	
	2.1 hit Freq Error andwidth	0746 MHz 10.081 kHz 1.162 MHz	OBW Power x dB	99,00 % -6.00 dB		Freq Offset 0 Hz	
ABK2-				orwitiko-		-	

## IC OBW 99%_BLE_2M_LowCH00-2402

Center Fi	reg 2.40200000	Trig:	er Freq: 2.402000000 GHz Free Run AvgiHo m: 20 dB	e 194 esto (d: 100/100	Radio Std		Frequency Center Freq 2.40200000 GHz
15 dB/div	Ref Offset 10.4 d Ref 10.00 dBr		-		-		
Log .5.00 .20.0		hanne	monson				
-35.0	month			my	m	monore	
165.0 mm	~ /	_			-	where	
-90.0		-	-	-		-	
95.0	_			-	-		
110			-				
125							
Center 2. #Res BW			VBW 62 kHz		Sweep	an 5 MHz 37.73 ms	CF Ste 500.000 kH
Occur	oied Bandwid	th	Total Power	6.4	7 dBm		Auto Ma
		0349 MHz					Freq Offse
Transr	nit Freq Error	23.044 kHz	OBW Power	99	9.00 %		он
x dB B	andwidth	887.2 kHz	x dB	-6	.00 dB		
ABIG-				cowity	0		-

## IC OBW 99%_BLE_2M_MidCH20-2442



## IC OBW 99%_BLE_2M_HighCH39-2480



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## 9 CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT

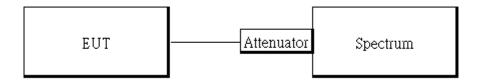
## 9.1 Standard Applicable

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:

	Conducted Emission Test Site							
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.			
DC Block	PASTERNACK	PE8210	RF256	02/26/2019	02/25/2020			
Spectrum Analyzer	Agilent	N9010A	MY53400256	11/21/2018	11/20/2019			
Attenuator	Marvelous	MVE2213-10	RF80	02/26/2019	02/25/2020			

## 9.3 Test SET-UP:



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## 9.4 Measurement Procedure

## **Reference Level of Emission Limit:**

- 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.
- 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 & 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.

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## **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.
- 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

## (BLE 1M)

### **Reference Level of Limit**

Frequency (MHz)	RF Power Density (dBm)	Reference Level of Limit = PSD - 20dB (dBm)
2402	1.49	-18.51
2442	1.65	-18.35
2480	0.96	-19.04

NOTE: cable loss as 10.4dB that offsets in the spectrum *NOTE: Refer to next page for plots.* 

### (BLE 2M)

### **Reference Level of Limit**

Frequency (MHz)	RF Power Density (dBm)	Reference Level of Limit = PSD - 20dB (dBm)
2402	1.40	-18.60
2442	1.61	-18.39
2480	1.00	-19.00

NOTE: cable loss as 10.4dB that offsets in the spectrum NOTE: Refer to next page for plots.

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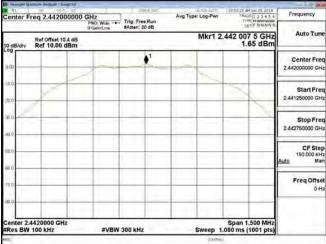
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## Reference Level_BLE_1M_LowCH00-2402

E Renald Garban Annual (Sought)	-				
Center Freq 2.40200000	0 GHz	Trig: Free Run	Avg Type: Log-Pwr	18:25:20 AP3 - 24, 2019 TRACE 1:2:3:4:5 = TVTE MUMANIN SET P NIMININ	Frequency
Ref Offset 10.4 dB	IF Gain Low	#Atten: 20 dB	Mkr1 2	.402 006 0 GHz 1.49 dBm	Auto Tune
00		¢'			Center Free
	2				
200				1	Start Free 2.401250000 GH
40.0				-	Stop Free 2.402750000 GH
500. 					CF Ste 150.000 kH Auto Ma
70.0					Freq Offse
0.05	-			-	
Center 2.4020000 GHz #Res BW 100 kHz	#VBW	300 kHz	Sweep 1	Span 1.500 MHz .000 ms (1001 pts)	
190			STIGLE		

## Reference Level_BLE_1M_MidCH20-2442



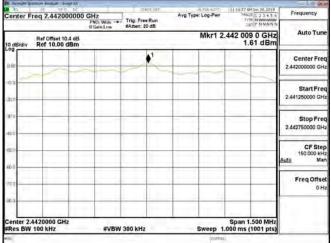
## Reference Level_BLE_1M_HighCH39-2480

a standar d	cour insue ris	1211					212 22
Center F	req 2.48000	P	Wide -++	Trig: Free Run	Avg Type: Log-Pwr	10144 35 APT 34 24 2019 THICS 1 2 3 4 5 5 TVTE NUMBER OF NUMBER	Frequency
10 dB/div	Ref Offset 10.4 dB				Mkr1 2	.480 004 5 GHz 0.96 dBm	Auto Tune
1.0g			_	1	my .		Center Free 2.480000000 GH;
(10.10) 	1						Start Fred 2.479250000 GH3
40.0							Stop Free 2.480750000 GHz
-900 							CF Step 150.000 kH Auto Mar
70 0							Freq Offse
	4800000 GH	z				Span 1.500 MHz	
#Res BW	100 kHz		#VBW 3	300 kHz		.000 ms (1001 pts)	
855					STORE	81	

## Reference Level_BLE_2M_LowCH00-2402

	11100 St. MI St. 24, 2019	A144/2	T other out		Alteria survey of	Receipt Get
Frequency	TYPE 1 2 3 4 5 8 TYPE NUMBER OF	Avg Type: Log-Pwr	Trig: Free Run #Atten: 20 dB	GHz PNO: Wide -+-	q 2.402000000	Center Fr
Auto Tun	402 006 0 GHz 1.40 dBm	Mkr1 2.	WAITER: 20 OD	In Cashi Low	Ref Offset 10.4 dB	10 dB/div
Center Fre 2.402000000 GH			*	-		D CO
Start Fre 2.401250000 GH						20.0
Stop Fre 2.402750000 GH						40.0
CF Ste 150.000 kH Auto Ma						907. 600
Freq Offse						70 0
	_					80.0
	Span 1.500 MHz 000 ms (1001 pts)	Sweep 1.	300 kHz	#VBW	20000 GHz 10 kHz	Center 2.4 #Res BW 1

## Reference Level_BLE_2M_MidCH20-2442



## Reference Level_BLE_2M_HighCH39-2480

Center Freq 2.48000000 0	SHz PND: Wide Trig: Free Run #Atten: 20 dB	Avg Type: Log-Pwr	11/17/38 49/34/24/2019 TRUCE 1 2 3 4 5 6 TVTE NUMMEN 28T P NNNNN	Frequency
Ref Offset 10.4 dB	PLANTLOW PHILET. 10 01	Mkr1 2.4	480 006 0 GHz 1.00 dBm	Auto Tune
000	-			Center Freq 2.480000000 GHz
20.0				Start Free 2.479250000 GH
305 400				Stop Free 2.480750000 GH:
50.0				CF Stej 150.000 kH Auto Mar
60 0) 70 0				Freq Offse 0 H
20.0				
Center 2.4800000 GHz #Res BW 100 kHz	#VBW 300 kHz	Sweep 1.0	Span 1.500 MHz 000 ms (1001 pts)	

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#### Report No.: T190612W02-RP6 Page 30 of 64

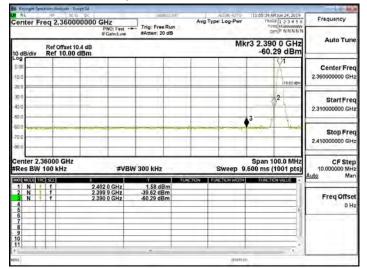
#### Band Edge_BLE_1M_LowCH00-2402

		anyote - Sou										~~~~~ (A)
Center I	Freq 2	.36000	00000 GI	Hz	1	estivati		Log-Pwr		TRACE	23456	Frequency
	-		P	NO: Fast	#Atten: 20			1		OFT	NNNNN	
10 dB/div		Offset 10 10.00 c			1			Mk			dBm	Auto Tun
0.00										1	71	Center Fre 2.360000000 GH
20.0	-	_		-	-	-	-	_	-	+	-10 51 dBm	1999 - Contra 1999
30 0 40 0 50 0	-								3	2		Start Fre 2.310000000 GH
60 0 70 0 80 0	-		-	-						1	here	Stop Fre 2.410000000 GH
Center 2 Res BV				#VBI	V 300 kHz			Sweep 9				CF Ste 10.000000 MH
1 N			×	0 GHz	1.60 dB		ACTON FUR	CTION WIDTH	ELD	ICTION N	WALKE -	Auto Ma
1 N 2 N 3 N 4 5	1		2.399	9 GHZ 9 GHZ 0 GHZ	-53.89 dBr -61.55 dBr	m						Freq Offse
6 7 8 9								_				
10						1		-		_	-	
101								STATIS				

### Band Edge_BLE_1M_HighCH39-2480

Keypiget Spectrum Relegant					~~~~
Center Freq 2.48	PNO: Fast	Trig: Free Run	Avg Type: Log-Pwr	10:49:19 AMJun 24, 2019 TRACE 1 2 3 4 5 6 Trill MWWWW Care P N NN N N	Frequency
Ref Offse		#Atten: 20 dB	Mkr3	2.483 600 GHz -60.94 dBm	Auto Tune
0.00				2	Center Fre 2.487500000 GH
-20.0				~18.04 dbm	Start Fre 2.475000000 GH
60.0 +	13				Stop Fre 2.500000000 GH
Center 2.48750 GH #Res BW 100 kHz	#VB	W 300 kHz		Span 25.00 MHz 400 ms (1001 pts)	CF Stej 2.500000 MH Auto Ma
1 N 1 1 2 N 1 f 3 N 1 f 4 5 6	2,480,000 GHz 2,483,500 GHz 2,483,600 GHz	1.16 dBm -60.53 dBm -60.94 dBm	NETION FUNCTION WEEK	ADMICTION WALKS	Freq Offse 0 H
6 7 8 9 10 11					
693			status		

#### Band Edge_BLE_2M_LowCH00-2402



#### Band Edge_BLE_2M_HighCH39-2480

						um Sangar - So		
Frequency	TRACE 1 2 3 4 5 6	Avg Type: Log-Pwr	Trig: Free Run	Hz PNO: Fast ->	500000 G	q 2.48750		Cen
Auto Tun	2.483 600 GHz -61.31 dBm	Mkr3 1	#Atten: 20 dB	FGaintow	10.4 dB	Ref Offset 10.4 dE		
Center Fre 2.487500000 GH	-19.00 albei				01			0.00
Start Fre 2.475000000 GH	_				-	A		10 0 10 0 10 0
Stop Fre 2.500000000 GH						-		
CF Ste 2.500000 MH Auto Ma	Span 25.00 MHz 00 ms (1001 pts)		300 kHz	#VBW	_		s BW 1	Re
Freq Offse 0 H	EDWCTION WATE	SN FUNCTION WISTH	1.18 dBm -60.39 dBm -61.31 dBm	00 GHz 00 GHz 00 GHz	2,480 0 2,483 5 2,483 6		N 1 N 1 N 1	1 2 3 4
								5 6 7 8 9 10
		STATUS						80

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### Spurious Emission _BLE_1M_LowCH00-2402

	trum Resigned - See						
Center Fr	eg 13 0150	00000 GHz	SERVICE	Avg Type: Log-Pwr	10:30:57 AMJun 24, 2019 TRACE 1 2 3 4 5 6	Frequency	
Center Freq 13.015000000 GHz PN0: Fast IFGainLow			#Atten: 20 dB		DET PNNNNN		
10 dB/div	Ref Offset 10. Ref 10.00 d			M	48.08 dBm	Auto Tun	
0.00	01			-		Center Fre	
-10.0	1				-10.51 00%	13.015000000 GH	
-30 0 -40 0 -50 0						Start Fre 30.000000 MH	
80 0 70 0 80 0	0	2 03				Stop Fre 26.000000000 GH	
Center 13. #Res BW		#VB	W 300 kHz	Sweep	Span 25.97 GHz 2.482 s (30001 pts)	CF Ste 2.597000000 GH	
	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	2.401 9 GHz	-0.41 dBm	UNCTION FUNCTION WOTH	FUNCTION WALLE	Auto Ma	
2 N 1 3 N 1 4 N 1	1	4.804 0 GHz 7.206 0 GHz 9.606 9 GHz	-60.22 dBm -61.61 dBm -48.08 dBm			Freq Offse 0 H	
6 7 8 9							
9 10 11			-				
* Color			-	STATU			

## Spurious Emission _BLE_1M_MidCH20-2442

and the set				-	۵	Reality and - Sources	pestrum 3	ypagent Se	1
Frequency	10:58:26 AMJun 24, 2019 TRACE 1 2 3 4 5 6	Avg Type: Log-Pwr	ENGELLAR	SEN			- UF		
	DET P NNNN	Avg type: Log-PWF True MWWWW ott P NNNN		Trig: Free #Atten: 20	Center Freq 13.015000000 GHz PNO: Fast IFGaintow			cen	
Auto Tune	25.053 0 GHz -50.28 dBm	Mkr4	. –			f 0ffset 10.4		Bidiv	10 di
Center Free						1	01	-	0.00
13.01800000 GH	-10 35 dBm			-				1	-20.0
Start Free		-	-				-	-	30 0
30.000000 MH	♦4	_					1	-	-40.0
Stop Free			-		08		-	-	60.0
26.000000000 GH					_			-	-70.0
CF Ster 2.597000000 GH	Span 25.97 GHz .482 s (30001 pts)	Sweep 2	z	W 300 kHz	#VB		3.02 C		
<u>Auto</u> Mar	FUNCTION WALKE	W FUNCTION WOTH		Ŷ	x	3	THE SOL		
Freq Offse			18m 18m	-1.95 dB -61.03 dB -61.87 dB -50.28 dB	2.441 7 GHz 4.884 0 GHz 7.326 0 GHz 25.053 0 GHz			N N N N	
	1						-		5
			_						8 9 10
								- 1	11
	1	STATUS							MHR3

### Spurious Emission _BLE_1M_HighCH39-2480

~~~ 1 (C. 10)			-				trum Sugar	ne Spece		
Frequency	50:06 AMJun 24, 2019 TRACE 1 2 3 4 5 6 TYTE MWWWW OFT P N N N N N	Avg Type: Log-Pwr		Trig: Free Run	Center Freq 13.015000000 GHz					
Auto Tune	9.919 4 GHz -49.67 dBm	Mkr		#Atten: 20 dB	IFGain:Low	et 10.4 dB		liv	dB/d	
Center Fre						-	01	-	-	0.0
	-19.04 dbm	-				-	-	_		-20.1
Start Fre 30.000000 MH	-						-	_	0	30 (
-	and the second				07	²	-	_		-60 (
Stop Fre 26.00000000 GH	-							-		-70
CF Ste 2.597000000 GH	oan 25.97 GHz 2 s (30001 pts)	Sweep 2.4		300 kHz	#VBW		.02 GHz 100 kHz			
<u>Auto</u> Ma	FUNCTION WALLS	UNCTION WOTH	FUNCTION	-0.20 dBm	2 479 8 GHz		150			1
Freq Offse				-61.14 dBm -61.96 dBm -61.96 dBm	4.960 0 GHz 7.440 0 GHz 9.919 4 GHz	4	1	1	NNN	23
									-	5678
		-								9 10 11
		STATUS								+

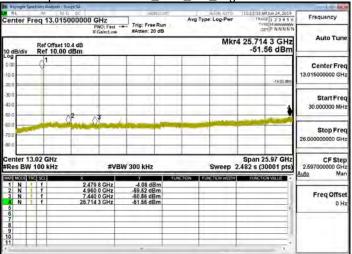
Spurious Emission _BLE_2M_LowCH00-2402

and the second				A	um Sangar - Smpt	t Spect	Corport
Frequency	11:00:25 AMJun 24, 2019	ALIGN AUTO	SENSELINT		HUF _ 50 fb _ 1	1	RL
Frequency	TRACE 1 2 3 4 5 6 TVIE MWWWWW DET P N N N N N	Avg Type: Log-Pwr	PNO: Fast Trig: Free Run		nter Freq 13.015000000 GHz PN0: Fast		nter
Auto Tun	r4 9.607 7 GHz	Mkr	1000 C		Ref Offset 10.4	-	-
	-46.56 dBm				Ref 10.00 dB		dB/di
Center Fre					d1		
13.015000000 GH		10 A			1		1.1
13.015000000 GF	-10.60 mpm						0
Ptart Era				-		_	0
Start Fre 30.000000 MH				♦ ⁴		_	0
-	and the second	and internet		03	07	-	0
Stop Fre 26.000000000 GH						1	
CF Ste 2.597000000 GH	Span 25.97 GHz 482 s (30001 pts)	Sween 2	300 kHz	#VRW	2 GHz 00 kHz		
Auto Ma			Y HUM	******		-	-
			-2.84 dBm	2.401 9 GHz	1	1	N
Freq Offse		_	-60.64 dBm	4,804 0 GHz	f	1	N
DH			-60.48 dBm -46.56 dBm	7 206 0 GHz 9.607 7 GHz	1	1	N
		-					-
		-					
							-
		-t - 1	-	1			-
		STATUE					

Spurious Emission _BLE_2M_MidCH20-2442

	sectrum Sample	o - Seept S	Δ								
R4.	IF O	30 0 D			SEN	SERIAK.	Avin Trin	e: Log-Pwr		M Jun 24, 2019	Frequency
Center Freq 13.015000000 GHz PNO: Fast *** IFGainLow					Trig: Free Run #Atten: 20 dB		e: Log-r wr	THE MUNICIPALITY PINNNN			
0 dB/div	Ref Offs Ref 10.				-			Mkr4		2 GHz 08 dBm	Auto Tune
0.00	01	-	1			_				-	Center Free
20.0										(10.29 april	13.015000000 GH:
30.0	-	-		_		-			_		Start Fred
40.0				-						4	30.000000 MH:
60.0	-	() ^r	01	Cold,	-	-	-			and the second division of the second divisio	Stop Free
70.0				_							26.00000000 GH:
	3.02 GHz 100 kHz			#VBV	V 300 kHz		-	Sweep 2.	Span 2 482 s (3	5.97 GHz 0001 pts)	CF Step 2.597000000 GH
	10 50		X	0.0	0.42 dB		NETION FU	CTION WIDTH	6000.00	IN WALLE	Auto Mar
2 N 3 N 4 N	1		2.441 7 4.884 0 7.326 0 25.979 2	GHz	-60.40 dB -60.04 dB -50.08 dB	m		_			Freq Offse
5 6 7 8 9							_	_			
8 9 10							-				
11	1.1			-				-			
199								STATIST.			

Spurious Emission _BLE_2M_HighCH39-2480



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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:

- 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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Measurement Equipment Used 10.2

966A Chamber							
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.		
Low Pass Filter	EWT	EWT-56-0019	RF46	02/26/2019	02/25/2020		
High Pass Filter	R&S	F13 HPF 3GHz	RF64	02/26/2019	02/25/2020		
Band Reject Filters	MICRO TRONICS	BRM 50702	120	02/26/2019	02/25/2020		
Bilog Antenna	Sunol Sciences	JB3	A030105	07/13/2018	07/12/2019		
Cable	HUBER SUHNER	SUCOFLEX 104PEA	25157	02/26/2019	02/25/2020		
Cable	HUBER SUHNER	SUCOFLEX 104PEA	20995	02/26/2019	02/25/2020		
Digital Thermo-Hygro Meter	WISEWIND	1206	D07	01/30/2019	01/29/2020		
double Ridged Guide Horn Antenna	ETC	MCTD 1209	DRH13M02003	08/20/2018	08/19/2019		
Loop Antenna	COM-POWER	AL-130	121051	03/22/2019	03/21/2020		
Horn Antenna	ETS LINDGREN	3116	00026370	12/26/2018	12/25/2019		
Pre-Amplifier	EMEC	EM330	060609	02/26/2019	02/25/2020		
Pre-Amplifier	HP	8449B	3008A00965	02/26/2019	02/25/2020		
PSA Series Spectrum Analyzer	Agilent	E4446A	MY46180323	05/29/2019	05/28/2020		
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R	N.C.R		
Controller	CCS	CC-C-1F	N/A	N.C.R	N.C.R		
Turn Table	CCS	CC-T-1F	N/A	N.C.R	N.C.R		
Software		e3 V6	.11-20180413				

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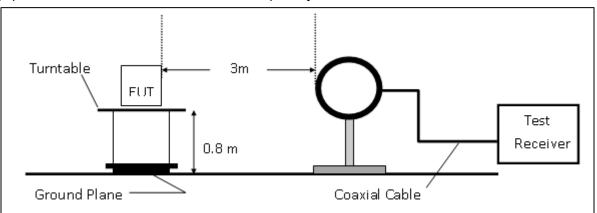
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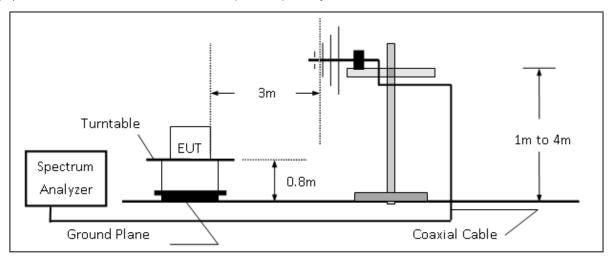


10.3 Test SET-UP

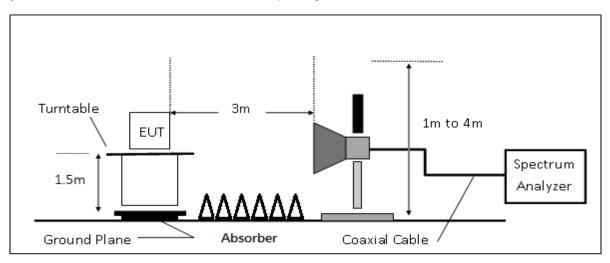
(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



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



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



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10.4 Measurement 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.

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10.5 Field 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	FS = Field Strength	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(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.

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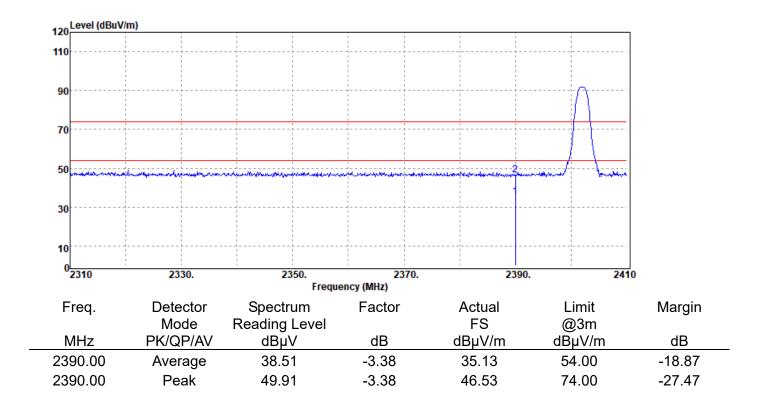


Report No.: T190612W02-RP6 Page 37 of 64

Radiated Band Edge Measurement Result

(BLE 1M)	
Report Number	:T190612W02
Operation Band	:BLE 1M
Frequency	:2402 MHz
Operation Mode	:BE CH Low
EUT Pol.	:E2 Plan

Test Date	:2019-06-27
Temp./Humi.	:19/51
Antenna Pol.	:VERTICAL
Engineer	:Kane



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Report Number Operation Band Frequency Operation Mode EUT Pol.	:T190612\ :BLE 1M :2402 MH; :BE CH Lo :E2 Plan	z		Test Date Temp./Hum Antenna Po Engineer		
120 Level (dBuV/m)			· · · · ·			
110					 	
90						
70						
50 million tonin	unaha yan yanaharuman	No	with a construction of the second second	man white man and a farmer	-	
30						
10						
⁰ 2310	2330.	2350. Freque	2370. ency (MHz)	2390.	2410)
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2390.00	Average	38.60	-3.38	35.22	54.00	-18.78
2390.00	Peak	50.56	-3.38	47.18	74.00	-26.82

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Report Number Operation Band Frequency Operation Mode EUT Pol.	:T190612W0 :BLE 1M :2480 MHz :BE CH High :E2 Plan			Test Date Temp./Humi. Antenna Pol. Engineer	:2019-06-27 :19/51 :VERTICAL :Kane	
120 Level (dBuV/m)	-					
110						
90						
70	·	 				
50		- White Harrison and Marine and Marine	and the second	and the man and the second	soundard and a short	
		1				
30						
10		1 1 1 1 1 1 1 1 1 1				
02475	2480.	2485. Freque	2490. ency (MHz)	2495.	2500	
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
		Reading Level		FS	@3m	
	PK/QP/AV	dBµV	dB		dBµV/m	dB
2483.50	Average	38.81	-2.83	35.98	54.00	-18.02
2483.50	Peak	51.61	-2.83	48.78	74.00	-25.22

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Report Numbe	r :T190612V	V02		Test Date	:2019-06-2	27
Operation Ban	d :BLE 1M			Temp./Hum	ni. :19/51	
Frequency	:2480 MHz	<u>.</u>		Antenna Po	ol. :HORIZON	NTAL
Operation Mod	le :BE CH Hig	gh		Engineer	:Kane	
EUT Pol.	:E2 Plan					
120 Level (dBuV/	(m)	ii	i i	i i	;	
110						
	\frown					
90						
70						
50		2 Martine Martine			and man and a start of the second start of the	
		1				
30						
10						
⁰ 2475	2480.	2485. Frequ	2490. ency (MHz)	2495.	250	D
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2483.50	Average	39.14	-2.83	36.31	54.00	-17.69
2483.50	Peak	54.60	-2.83	51.77	74.00	-22.23

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(BLE 2M)

Report Number :T190612W02 Test Date :2019-06-27 **Operation Band** :BLE 2M Temp./Humi. :19/51 Frequency :2402 MHz :VERTICAL Antenna Pol. **Operation Mode** :BE CH Low Engineer :Kane EUT Pol. :E2 Plan 120 Level (dBuV/m) 110 90 70 50 30 10 0 2310 2330. 2350. 2370. 2390. 2410 Frequency (MHz) Detector Spectrum Factor Limit Margin Freq. Actual Mode **Reading Level** FS @3m MHz PK/QP/AV dBµV dB dBµV/m dBµV/m dB 2390.00 -18.70 Average 38.68 -3.38 35.30 54.00 2390.00 74.00 -27.81 Peak 49.57 -3.38 46.19

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Report Number Operation Band Frequency Operation Mode EUT Pol.	:T190612V :BLE 2M :2402 MHz :BE CH Lo :E2 Plan	<u>.</u>		Test Date Temp./Hum Antenna Po Engineer		
120 Level (dBuV/m)						
110					1	
90						
70						
50 monumente		hangan din kanalaran kanan kanan kanan	ag shar, ha again fa a ha a ba	ahormadanin perinterangkan Kanadanan		
30						
10	 				 	
0 <mark></mark> 2310	2330.	2350. Freque	2370. ency (MHz)	2390.	2410	
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2390.00	Average	38.65	-3.38	35.27	54.00	-18.73
2390.00	Peak	49.86	-3.38	46.48	74.00	-27.52

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Report Number Operation Band Frequency Operation Mode EUT Pol.	:T190612W :BLE 2M :2480 MHz :BE CH Hig :E2 Plan				Test Date Temp./Hur Antenna P Engineer		
120 Level (dBuV/m)							
110							
90			 				
70			 				
50 the second second second	 	WW WWWWW	per the state of the		material and the second second	~\$~~\$~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	
30		1					
10							
0 2475	2480.	24	185. Freque	2490. ency (MHz)	2495.	2500	1
Freq.	Detector Mode	Spectr Reading	um	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµ'		dB	dBµV/m	dBµV/m	dB
2483.50	Average	38.8	6	-2.83	36.03	54.00	-17.97
2483.50	Peak	53.2	5	-2.83	50.42	74.00	-23.58

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Report Number Operation Band Frequency	:2480 MHz	<u>z</u>			Test Date Temp./Hun Antenna P	ol. :HORIZON	
Operation Mode EUT Pol.	:BE CH Hi :E2 Plan	gn			Engineer	:Kane	
120 Level (dBuV/m)						
110							
90							
70	/						
50 Jan Marchand	 		Martin Martin Martin	and the second second second second second second	have been the second of the second	duridas-number associatedas	
30							
10							
0 2475	2480.	i I	2485. Freque	2490. ncy (MHz)	2495.	2500)
Freq.	Detector Mode	•	ectrum ing Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV		BµV	dB	dBµV/m	dBµV/m	dB
2483.50	Average	4	1.35	-2.83	38.52	54.00	-15.48
2483.50	Peak	5	5.77	-2.83	52.94	74.00	-21.06

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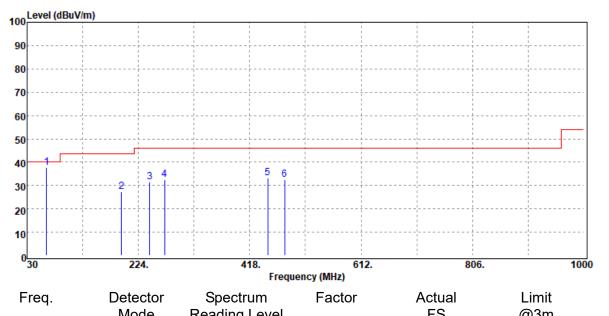
Report No.: T190612W02-RP6 Page 45 of 64



Radiated Spurious Emission Measurement Result For Frequency form 30MHz to 1000MHz

(BLE 1M)	
Report Number	:T190612W02
Operation Band	:BLE 1M
Frequency	:2442 MHz
Operation Mode	:Tx CH Mid
EUT Pol.	:E2 Plan

Test Date	:2019-06-28
Temp./Humi.	:19/51
Antenna Pol.	:VERTICAL
Engineer	:Kane



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
63.95	Peak	53.16	-15.28	37.88	40.00	-2.12
194.90	Peak	37.45	-10.06	27.39	43.50	-16.11
243.40	Peak	41.79	-10.28	31.51	46.00	-14.49
269.59	Peak	41.23	-8.58	32.65	46.00	-13.35
449.04	Peak	37.25	-3.88	33.37	46.00	-12.63
479.11	Peak	35.45	-2.98	32.47	46.00	-13.53

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Report Number Operation Band Frequency Operation Mode EUT Pol.	:T190612\ :BLE 1M :2442 MH: :Tx CH Mi :E2 Plan	Z		Test Date Temp./Hun Antenna Po Engineer		
100 Level (dBuV/m)						_
90						
80						
70						
60						
50						
40 1]	6		· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	
30	2	4 5				
20						
10						
0 <mark></mark> 30	224.	418. Free	612. quency (MHz)	806.	10	0
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
63.95	Peak	52.29	-15.28	37.01	40.00	-2.99
153.19	Peak	39.49	-10.09	29.40	43.50	-14.10
243.40	Peak	44.87	-10.28	34.59	46.00	-11.41
345.25	Peak	37.51	-7.12	30.39	46.00	-15.61
419.94	Peak	33.83	-4.62	29.21	46.00	-16.79
479.11	Peak	37.35	-2.98	34.37	46.00	-11.63

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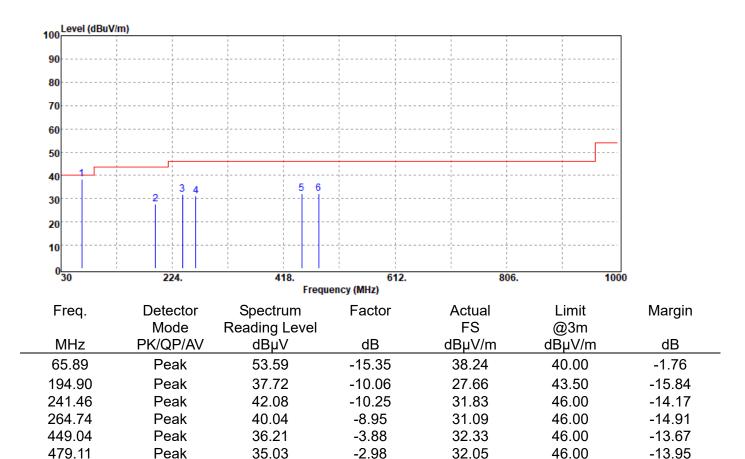
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(BLE 2M)

Report Number	:T190612W02
Operation Band	:BLE 2M
Frequency	:2442 MHz
Operation Mode	:Tx CH Mid
EUT Pol.	:E2 Plan

Test Date	:2019-06-28
Temp./Humi.	:19/51
Antenna Pol.	:VERTICAL
Engineer	:Kane



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Report Number Operation Band Frequency Operation Mode EUT Pol.	:T190612\ :BLE 2M :2442 MHz :Tx CH Mi :E2 Plan	z		Test Date Temp./Humi Antenna Po Engineer		
100 Level (dBuV/m))					_
90						
80						
70						
60		· · · · · · · · · · · · · · · · · · ·		i i i i i i		
50						
40 1		5		· · · · · · · · · · · · · · · · · · ·		
30	2	4	6			
20						
10						
0 <mark></mark> 30	224.	418.	612.	806.	100])0
_	.		quency (MHz)			
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
63.95	Peak	52.06	-15.28	36.78	40.00	-3.22
151.25	Peak	40.57	-9.90	30.67	43.50	-12.83
245.34	Peak	44.60	-10.28	34.32	46.00	-11.68
345.25	Peak	37.84	-7.12	30.72	46.00	-15.28
479.11	Peak	37.46	-2.98	34.48	46.00	-11.52
553.80	Peak	34.49	-2.29	32.20	46.00	-13.80

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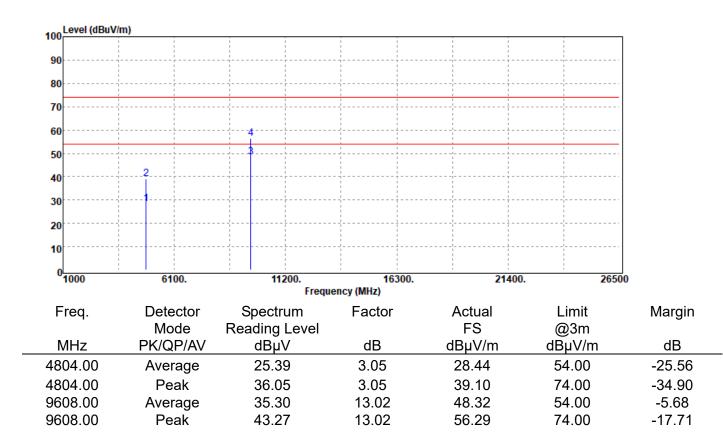
Report No.: T190612W02-RP6 Page 49 of 64



Radiated Spurious Emission Measurement Result For Frequency above 1GHz

(BLE 1M)
Report Number:T190612W02Operation Band:BLE 1MFrequency:2402 MHzOperation Mode:Tx CH LowEUT Pol.:E2 Plan

Test Date	:2019-06-27
Temp./Humi.	:19/51
Antenna Pol.	:VERTICAL
Engineer	:Kane



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Report Number Operation Band Frequency Operation Mode EUT Pol.	:T190612\ :BLE 1M :2402 MHz :Tx CH Lo :E2 Plan	Z		Test Date Temp./Hun Antenna Pe Engineer		
100 Level (dBuV/m)						
90						
80						
70	 					
60		4				
50		3				
40	2					
30						
20						
10						
0 ^L 1000	6100.	11200. Freque	16300. ncy (MHz)	21400.	2650	0
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode PK/QP/AV	Reading Level dBµV	dB	FS dBµV/m	@3m dBµV/m	dB
4804.00	Average	25.33	3.05	28.38	<u>υ</u> 54.00	-25.62
4804.00	Peak	34.81	3.05	37.86	74.00	-36.14
9608.00	Average	40.46	13.02	53.48	54.00	-0.52
9608.00	Peak	48.00	13.02	61.02	74.00	-12.98

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Report Number Operation Band Frequency Operation Mode EUT Pol.	:T190612V :BLE 1M :2442 MHz :Tx CH Mic :E2 Plan	<u>.</u>		Test Date Temp./Hur Antenna P Engineer		
100 Level (dBuV/m)	1			i	1	
90	 		 		 	
80						
70						
60		4				·
50		3			 	
40					 	·
30					· · · · · · · · · · · · · · · · · · ·	
20						
10						
0 <mark></mark>	6100.	11200. Freque	16300. ency (MHz)	21400	. 20	5500
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level	dB	FS dBul//m	@3m dBu\//m	dB
4884.00	PK/QP/AV	dBµV 25.63	3.41	<u>dBµV/m</u> 29.04	<u>dBµV/m</u> 54.00	-24.96
4884.00	Average Peak	25.65 33.99	3.41 3.41	29.04 37.40	54.00 74.00	-24.96
4884.00 9768.00	Average	32.83	3.41 12.71	45.54	74.00 54.00	-30.00 -8.46
9768.00	Peak	40.75	12.71	53.46	74.00	-20.54

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Report Number Operation Band Frequency Operation Mode EUT Pol.	:T190612V :BLE 1M :2442 MHz :Tx CH Mid :E2 Plan	Z		Test Date Temp./Hum Antenna Po Engineer		
100 Level (dBuV/m)						
90						
80			· · · · · · · · · · · · · · · · · · ·			
70			· · · · · · · · · · · · · · · · · · ·			
60		4	· · · · · · · · · · · · · · · · · · ·			
50		3				
40	2		· · · · · · · · · · · · · · · · · · ·			
30						
20						
10						
0						_
0 ^L 1000	6100.	11200. Freque	16300. ency (MHz)	21400.	2650)
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4884.00	Average	25.74	3.41	29.15	54.00	-24.85
4884.00	Peak	35.75	3.41	39.16	74.00	-34.84
9768.00 9768.00	Average Peak	36.57 44.14	12.71 12.71	49.28 56.85	54.00 74.00	-4.72 -17.15

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Report Number Operation Band Frequency Operation Mode EUT Pol.	:T190612\ :BLE 1M :2480 MHz :Tx CH Hig :E2 Plan	z		Test Date Temp./Hum Antenna Po Engineer		
100 Level (dBuV/m)						
90						
80						
70						
60						
50		4				
40	2					
30						
20						
10						
0 ^L 1000	6100.	11200. Freque	16300. ency (MHz)	21400.	26500)
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode PK/QP/AV	Reading Level	dB	FS dBµV/m	@3m dBµV/m	dB
4960.00	Average	dΒμV 25.42	4.06	<u>абру/ш</u> 29.48	54.00	<u>и</u> Б -24.52
4960.00	Peak	34.65	4.00	38.71	54.00 74.00	-24.52
9920.00	Average	33.57	13.22	46.79	54.00	-7.21
9920.00	Peak	41.75	13.22	54.97	74.00	-19.03

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Report Number Operation Band Frequency Operation Mode EUT Pol.	:T190612\ :BLE 1M :2480 MH: :Tx CH Hig :E2 Plan	z		Test Date Temp./Hum Antenna Po Engineer		
100 Level (dBuV/m)						
90						
80						
70						
60						
50						
40	2					
30						
20						
10	·					
0	6100.	11200.	16300.	21400.	2650	0
Frequency (MHz)						
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	Average	25.37	4.06	29.43	<u>54.00</u>	-24.57
4960.00	Peak	34.31	4.06	38.37	74.00	-35.63
9920.00	Average	36.83	13.22	50.05	54.00	-3.95
9920.00	Peak	44.53	13.22	57.75	74.00	-16.25

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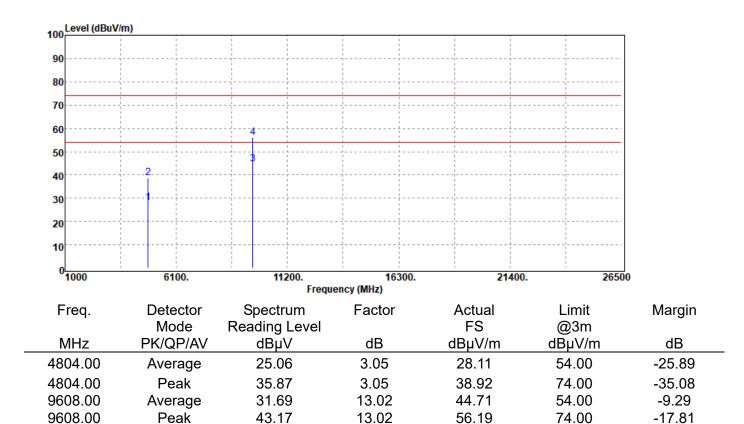
程智科技股份有限公司



(BLE 2M)

Report Number:T190612W02Operation Band:BLE 2MFrequency:2402 MHzOperation Mode:Tx CH LowEUT Pol.:E2 Plan

Test Date	:2019-06-27
Temp./Humi.	:19/51
Antenna Pol.	:VERTICAL
Engineer	:Kane



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Report Number Operation Band Frequency Operation Mode EUT Pol.	:T190612V :BLE 2M :2402 MHz :Tx CH Lo :E2 Plan	Z		Test Date Temp./Hun Antenna Po Engineer		
100 Level (dBuV/m)	i					
90						
80						
70						
60		4				
50						
40	2					
30						
20						
10						
0 ^L 1000	6100.	11200. Freque	16300. ency (MHz)	21400.	2650	0
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode PK/QP/AV	Reading Level	dB	FS dBuil//m	@3m dBu\//m	dB
4804.00		dΒμV 25.77	3.05	dBµV/m 28.82	dBµV/m 54.00	-25.18
4804.00	Average Peak	37.59	3.05	20.02 40.64	54.00 74.00	-25.16 -33.36
9608.00	Average	36.54	13.02	49.56	54.00	-4.44
9608.00	Peak	47.80	13.02	60.82	74.00	-13.18

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Report Number	:T190612\	N02		Test Date	:2019-06-2	27
Operation Band	:BLE 2M			Temp./Hum	ni. :19/51	
Frequency	:2442 MH	z		Antenna Po	DI. :VERTICA	L
Operation Mode	:Tx CH Mi	d		Engineer	:Kane	
EUT Pol.	:E2 Plan					
100 Level (dBuV/m)						
90						
80						
70						
60						
50		4				
40		3				
30						
20						
10						
0 <mark></mark> 1000	6100.	11200. Freque	16300. ency (MHz)	21400.	26500)
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode PK/QP/AV	Reading Level dBµV	dB	FS dBµV/m	@3m dBµV/m	dB
4884.00	Average	25.36	3.41	28.77	<u>54.00</u>	-25.23
4884.00	Peak	35.69	3.41	39.10	74.00	-34.90
9768.00	Average	28.23	12.71	40.94	54.00	-13.06
9768.00	Peak	40.18	12.71	52.89	74.00	-21.11

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Report Number Operation Band Frequency Operation Mode EUT Pol.	:T190612V :BLE 2M :2442 MHz :Tx CH Mic :E2 Plan	<u>z</u>		Test Date Temp./Hum Antenna Po Engineer		
100_Level (dBuV/m)						
90						
80						
70						
60						
50		4				
40	2	3				
30	-					
20						
10						
01000	6100.	11200. Freque	16300. ency (MHz)	21400.	2650	0
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4884.00	Average	25.71	3.41	29.12	54.00	-24.88
4884.00	Peak	36.48	3.41	39.89	74.00	-34.11
9768.00 9768.00	Average Peak	31.17 42.68	12.71 12.71	43.88 55.39	54.00 74.00	-10.12 -18.61

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Report Number Operation Band Frequency Operation Mode EUT Pol.	:BLE 2M :2480 MH :Tx CH Hi :E2 Plan	Z		Test Date Temp./Hu Antenna F Engineer		
100 Level (dBuV/n	n)					
90		1 1 1 1 1 1 1 1 1 1				
80						
70						
60						
50		4				
40		3				
30						
20						
10						
0 <mark>1000</mark>	6100.	11200.	16300	. 21400). 2 6500	0
		-	ency (MHz)			
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode PK/QP/AV	Reading Level dBµV	dB	FS dBull/m	@3m	dB
4960.00		25.68	4.06	dBµV/m 29.74	dBµV/m 54.00	-24.26
4960.00	Average Peak	25.00 34.51	4.06 4.06	29.74 38.57	54.00 74.00	-24.20 -35.43
9920.00	Average	29.87	4.00	43.09	54.00	-35.43
9920.00	Peak	40.62	13.22	53.84	74.00	-20.16

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Report Number Operation Band Frequency Operation Mode EUT Pol.	:T190612\ :BLE 2M :2480 MH; :Tx CH Hig :E2 Plan	Z		Test Date Temp./Hum Antenna Po Engineer		
100 Level (dBuV/m)		ii		; ;	i	
90						
80						
70						
60		4				
50						
40	.2					
30						
20						
10						
0						
0 <mark>1000</mark>	6100.	11200. Freque	16300. ency (MHz)	21400.	26500)
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level	JD	FS	@3m	٩D
	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4960.00	Average	25.84	4.06	29.90	54.00	-24.10
4960.00 9920.00	Peak	35.21 32.86	4.06 13.22	39.27 46.08	74.00 54.00	-34.73 -7.92
9920.00	Average Peak	44.16	13.22	40.08 57.38	54.00 74.00	-16.62

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11 EAK POWER SPECTRAL DENSITY

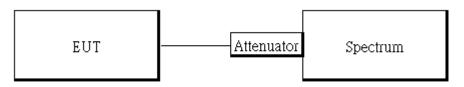
11.1 Standard Applicable:

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	MFR	MODEL	SERIAL	LAST	CAL DUE.	
TYPE		NUMBER	NUMBER	CAL.		
DC Block	PASTERNACK	PE8210	RF256	02/26/2019	02/25/2020	
Spectrum Analyzer	Agilent	N9010A	MY53400256	11/21/2018	11/20/2019	
Attenuator	Marvelous	MVE2213-10	RF80	02/26/2019	02/25/2020	

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 & ANSI C63.10.
- 3. Set the span to 1.5 times the DTS channel bandwidth.
- 4. Set the \overrightarrow{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 1M)

BLE 1M mode

Frequency (MHz)	RF Power Density (dBm)	Maximum Limit (dBm)	Result
2402	-13.09	8	PASS
2442	-12.90	8	PASS
2480	-13.56	8	PASS

NOTE: cable loss as 10.4dB that offsets in the spectrum

(BLE 2M)

BLE 2M mode

Frequency (MHz)	RF Power Density (dBm)	Maximum Limit (dBm)	Result
2402	-16.64	8	PASS
2442	-16.43	8	PASS
2480	-17.00	8	PASS

NOTE: cable loss as 10.4dB that offsets in the spectrum

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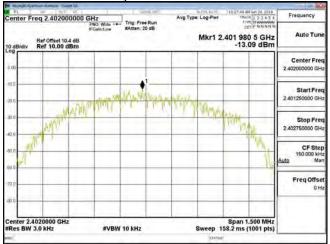
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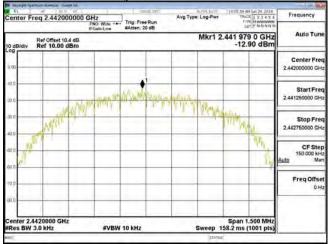
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Power Density_BLE_1M_LowCH00-2402



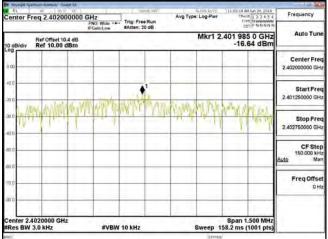
Power Density_BLE_1M_MidCH20-2442



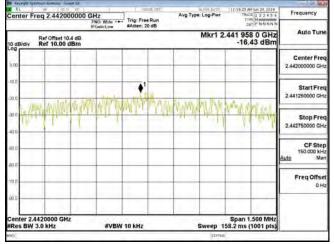
Power Density_BLE_1M_HighCH39-2480



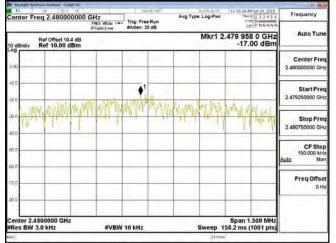
Power Density_BLE_2M_LowCH00-2402



Power Density_BLE_2M_MidCH20-2442



Power Density_BLE_2M_HighCH39-2480



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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.

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:

An embedded-in antenna design is used.

The antenna connector is designed with unique type RF connector and no consideration of replacement. Please see EUT photo and antenna spec. for details.

~ End of Report ~

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