

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

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

	OF
Applicant:	Trek Bicycle Corporation
	801 West Madison Street, Waterloo, WI 53594, USA
Product Name:	Transmitr MicroRemote
Brand Name:	Bontrager
Marketing Name:	Transmitr MicroRemote
Model No.:	563210
Model Difference:	N/A
Report Number:	E2/2019/70058
FCC ID:	2AHXD-563210
IC:	21334-563210
FCC Rule Part:	§15.247, Cat: DTS
IC Rule Part:	RSS-247 issue 2 Feb 2017
Issue Date:	Oct. 01, 2019
Date of Test:	Jul. 30, 2019 ~ Sep. 20, 2019
Date of EUT Received:	Jul. 30, 2019

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.

Alen la

Approved By:

Blue Yang / Asst. Manager



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Revision History				
Revision Description Issue Date Remark				
Rev.00	Original.	Oct. 01, 2019	Revised by: Susan Lin	

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GENERAL INFORMATION 1

1.1 Product Description

Product Name:	Transmitr MicroRemote		
Brand Name:	Bontrager		
Marketing Name:	Transmitr MicroRemote		
Model No.:	563210		
Model Difference:	N/A		
Product HW / SW Version:	0 / 1.0.0.0		
Radio HW / SW Version:	52 / 6.1.1		
	From Battery DC 3V		
Power Supply:	Battery: Supplier: CHARIOT TECHNOLOGY CORP. Model: CR1632 DC 3V		

Radio Technology:	Bluetooth Low Energy
Channel number:	40 channels
Modulation type:	GFSK
Transmit Power:	0.16 dBm
Frequency Range:	2402 – 2480MHz
Antenna Designation:	Chip Antenna, Peak Gain: -2.0dBi

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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

SGS Taiwan Ltd. Electronics & Communication Laboratory (TAF code 0513) FCC Designation number: TW0002 Canada Registration number: 4620E

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 a table which is 0.8 m above ground plane. 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. The two LISNs provide 50uH/50 ohm 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 **Conducted Test (RF)**

The active antenna port of the unlicensed wireless device is connected to the spectrum analyzer with attenuator to protect the instrumentation. If a second antenna port is available, it is tested at one operating frequency, with other port(s) appropriately terminated, to verify it has similar output characteristics as the fully tested port.

2.3.3 **Radiated Emissions**

The EUT is a placed on a turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m above the reference ground plane. 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.

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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



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	S0011721	Shielded	Unshielded

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SUMMARY OF TEST RESULTS 3

FCC Rules	IC Rules	Description Of Test	Result
§15.207(a)	RSS-Gen §8.8	AC Power Line Conducted Emission	N/A
§15.247(b) (3)	RSS-247 §5.4(4)	Peak Output Power	Compliant
§15.247(a)(2)	RSS-247 §5.1 (1) RSS-Gen §6.7	6dB & 99% Emission Bandwidth	Compliant
§15.247(d)	RSS-247 §5.5 RSS-Gen §8.10	Conducted Band Edge and Spurious Emission	Compliant
§15.247(d)	RSS-247 §5.5 RSS-Gen §8.9 RSS-Gen §8.10 RSS-Gen §6.13	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.

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 E2 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 Measurement Uncertainty		
	9kHz~30MHz: +-2.3dB	
	30MHz - 180MHz: +/- 3.37dB	
Polarization: Vertical	180MHz -417MHz: +/- 3.19dB	
Foldilzation. vertical	0.417GHz-1GHz: +/- 3.19dB	
	1GHz - 18GHz: +/- 4.04dB	
	18GHz - 40GHz: +/- 4.04dB	
	9kHz~30MHz: +-2.3dB	
	30MHz - 167MHz: +/- 4.22dB	
Polarization: Horizontal	167MHz -500MHz: +/- 3.44dB	
	0.5GHz-1GHz: +/- 3.39dB	
	1GHz - 18GHz: +/- 4.08dB	
	18GHz - 40GHz: +/- 4.08dB	

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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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 (uV)
MHz	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
Note		

1. The lower limit shall apply at the transition frequencies 2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

6.2 Measurement Equipment Used:

N/A

6.3 EUT Setup:

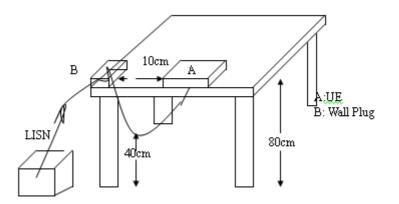
- 1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.10:2013.
- 2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
- 3. The LISN was connected with 120Vac/60Hz power source.

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6.4 Test SET-UP (Block Diagram of Configuration)

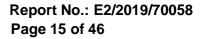


6.5 Measurement Procedure:

- 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:

N/A, Powered from DC 3V battery.





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.

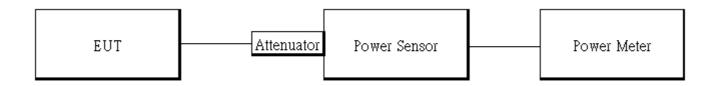
If the transmitting antenna of directional gain greater than 6dBi are used the peak output power form the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the Antenna exceeds 6dBi.

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:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Power Meter	Anritsu	ML2496A	1804002	03/26/2019	03/25/2020
Power Sensor	Anritsu	MA2411B	1726105	03/26/2019	03/25/2020
Power Sensor	Anritsu	MA2411B	1726106	03/26/2019	03/25/2020
Spectrum Analyzer	Agilent	N9010A	MY57120200	03/06/2019	03/05/2020
DC Block	PASTERNACK	PE8210	RF81	12/25/2018	12/24/2019

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.

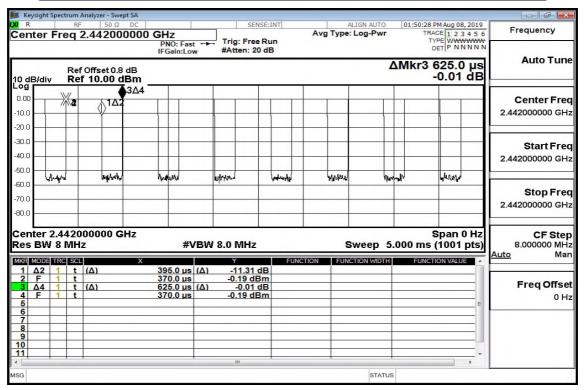
5. Repeat above procedures until all test default channel measured was complete.

Formula:

Duty Cycle = Ton / (Ton+Toff)

Duty Factor:

	Duty Cycle (%)	Duty Factor (dB)	1/T (kHz)	VBW setting (kHz)
BLE	63.20	1.99	2.53	3.00



Duty Cycle Factor:10*log(1/(63.2/100))=1.99

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7.5 Measurement Result:

BLE mode:

СН	Frequency Peak Power Output (MHz) (dBm)		Required Limit
Low	2402	0.13	1 Watt = 30 dBm
Mid	2442	0.16	1 Watt = 30 dBm
High	2480	0.14	1 Watt = 30 dBm
BLE mo	de:		
CH Frequency (MHz)		Max. Avg. Output include tune up tolerance Power (dBm)	Required Limit
Low	2402	0.02	1 Watt = 30 dBm
Mid	2442	0.06	1 Watt = 30 dBm
High	2480	0.03	1 Watt = 30 dBm

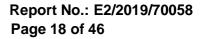
*Note: Measured by power meter, cable loss as 0.8 dB that offsets on the power meter in Peak *Note: Measured by power meter, as cable loss+ Duty cycle factor that offsets on the power meter *Note: Max. Output include tune up tolerance Power is average power

EIRP

СН	Frequency (MHz)	Max. Avg. Output include tune up tolerance Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)		Limit	
Low	2402	0.02	-2.00	-1.98	4W=	36	dBm
Mid	2442	0.06	-2.00	-1.94	4W=	36	dBm
High	2480	0.03	-2.00	-1.97	4W=	36	dBm

* Note: EIRP = Average Power + Gain

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8 6DB & 99% BANDWIDTH MEASUREMENT

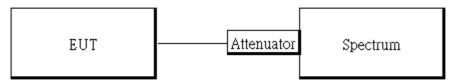
8.1 Standard Applicable

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

8.2 Measurement Equipment Used

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	N9010A	MY57120200	03/06/2019	03/05/2020
DC Block	PASTERNACK	PE8210	RF81	12/25/2018	12/24/2019

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 mode

Frequency	6dB BW	BW	Result	BLE mode	
(MHz)	ылл (MHz)	(MHz)	Result	Frequency (MHz)	99%Bandwidth (MHz)
2402	0.718	> 0.5	PASS		
2402	0.7 10	2 0.0	17,00	2402	1.0511
2442	0.724	> 0.5	PASS	2442	1 05 47
				2442	1.0547
2480	0.719	> 0.5	PASS	2480	1.0566

Note: Refer to next page for plots.

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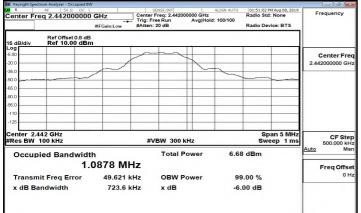
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OBW 6dB BLE 1M LowCH00-2402

R enter Fre	RF 50 Ω DC eq 2.402000000	Trig:	sense:INT er Freq: 2.402000000 GHz Free Run Avg Hold en: 20 dB	ALIGN AUTO 01:42:38 PM An Radio Std: No :>100/100 Radio Device	one Frequency
dB/div	Ref Offset 0.8 dB Ref 10.00 dBm				
00					Center Fre
1.0					2.402000000 GH
5.0			~		
1.0					
5.0					
1.0					
5.0					
10					
25					
enter 2.4 Res BW	02 GHz 100 kHz		#VBW 300 kHz		5 MHz CF Ste 5 1 ms 500,000 kH
Occup	upied Bandwidth		ied Bandwidth Total Power 6.5		Auto Ma
	1.0	0791 MHz			Freq Offs
Transm	it Freq Error	48.893 kHz	OBW Power	99.00 %	01
x dB Ba	andwidth	718.3 kHz	x dB	-6.00 dB	

OBW 6dB BLE 1M MidCH20-2442



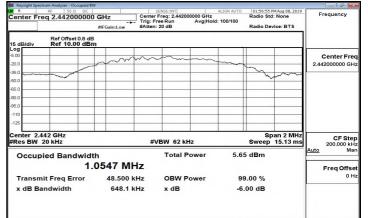
OBW 6dB_BLE_1M_HighCH39-2480

R RF 50 Ω DC Center Freq 2.480000000	Trig: I	SENSE:INT r Freq: 2.480000000 GHz Free Run Avg Hold: h: 20 dB	ALIGN AUTO 01:59:31 PM Aug 08, 2 Radio Std: None >100/100 Radio Device: BTS	Frequency
Ref Offset 0.8 dB 10 dB/div Ref 10.00 dBm				_
10.0				Center Free 2.480000000 GH
30.0		~		_
40.0				
50.0				
80.0				_
Center 2.48 GHz #Res BW 100 kHz	#	VBW 300 kHz	Span 5 M Sweep 1 r	ns 500.000 kH
Occupied Bandwidt	n	Total Power	6.58 dBm	Auto Mar
1.0	0892 MHz			Freq Offse
Transmit Freq Error	50.268 kHz	OBW Power	99.00 %	он
x dB Bandwidth	718.5 kHz	x dB	-6.00 dB	
sg			STATUS	

IC OBW 99%_BLE_1M_LowCH00-2402

R	RF 50 Ω DC			ENSE:INT	ALIGN AUTO		PM Aug 08, 2019		
enter Fr	req 2.402000000		Center F Trig: Fre #Atten:		00 GHz Avg Hold: 100/100	Radio Ste Radio De	d: None vice: BTS	Frequen	су
0 dB/div	Ref Offset 0.8 dB Ref 10.00 dBm								
og 1.00								Center	r Fre
0.0		. ~~	www	m	~~~~			2.40200000	00 GH
0.0		~			~~~~	m.			
0.0	mm					5	m		
0.0	~	_				~	,		
0.0	_	-					-		
0.0									
0.0									
enter 2. Res BW	.402 GHz 20 kHz		#V	BW 62 kHz		Si Sweep	oan 2 MHz 15.13 ms	CF 200.00	Ste
Occur	pied Bandwidth	1		Total Pov	ver 5.5	6 dBm		Auto	м
		0511 M	Hz					Freq	Offs
Transn	nit Freq Error	48.022	kHz	OBW Pov	ver 9	9.00 %			0
x dB B	andwidth	644.8	kHz	x dB	-6	6.00 dB			

IC OBW 99% BLE 1M MidCH20-2442



IC OBW 99%_BLE_1M_HighCH39-2480

X R Center Fr	eq 2.4800000	00 GHz Cent	sense:INT er Freq: 2.480000000 GHz Free Run Avg Hol en: 20 dB	ALIGN AUTO	Radio Std		Frequency
15 dB/div	Ref Offset 0.8 Ref 10.00 di						
-6.00			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~				Center Free
20.0					in .		2.480000000 GH
35.0	minor				- m	m	
50.0							
-65.0							
95.0							
-110							
-125	_			_			
Center 2.4 #Res BW		;	#VBW 62 kHz			an 2 MHz 15.13 ms	CF Stej 200.000 kH
Occup	ied Bandwig	dth	Total Power	5.54	dBm		<u>Auto</u> Ma
	1	.0566 MHz					Freq Offse
Transm	nit Freq Error	48.639 kHz	OBW Power	99	.00 %		он
x dB Ba	andwidth	646.3 kHz	x dB	-6.	00 dB	-	
ISG				STATU	5		

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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.

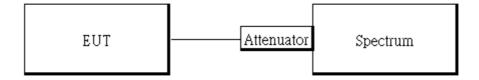
In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a) & RSS-Gen §8.10, must also comply with the radiated emission limits specified in §15.209(a) & RSS-Gen §8.9.

If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

9.2 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	N9010A	MY57120200	03/06/2019	03/05/2020
DC Block	PASTERNACK	PE8210	RF81	12/25/2018	12/24/2019

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.
- 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 & 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

Frequency (MHz)	RF Power Density (dBm)	Reference Level of Limit = PSD - 20dB (dBm)
2402	-0.36	-20.36
2442	-0.29	-20.29
2480	-0.38	-20.38

Reference Level of Limit

NOTE: cable loss as 0.8dB that offsets in the spectrum NOTE: Refer to next page for plots.

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Reference Level BLE 1M LowCH00-2402

Keysight Spectrum Analyzer - Swept SA R RF 50 Ω DC	SENSE:INT	ALIGN AUTO	01:43:11 PM Aug 08, 2019		
enter Freq 2.402000000 GHz	Ade Trig: Free Run	Avg Type: Log-Pwr	TRACE 1 2 3 4 5 6 TYPE M WWWWW DET P N N N N N	Frequency	
IFGain: Ref Offset 0.8 dB) dB/div Ref 10.00 dBm	Low #Atten: 20 dB	Mkr1 2	.402 049 5 GHz -0.36 dBm	Auto Tun	
00 00 00 00 00 00 00 00 00 00 00 00 00	•1			Center Fre 2.402000000 GB	
0.0				Start Fre 2.401250000 GF	
0.0				Stop Fre 2.402750000 Gi	
10				CF Ste 150.000 k Auto M	
1.0				Freq Offs 0	
enter 2.4020000 GHz Res BW 100 kHz	#VBW 300 kHz		Span 1.500 MHz .000 ms (1001 pts)		

Reference Level_BLE_1M_MidCH20-2442



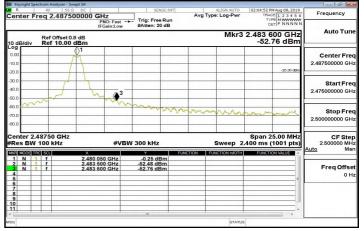
Reference Level_BLE_1M_HighCH39-2480

R RF 50 Ω DC	GHz	SENSE:INT]	ALIGN AUTO Avg Type: Log-Pwr	02:00:04 PM Aug 08, 2019 TRACE 1 2 3 4 5 6	Frequency
	PNO: Wido and Trig: F	ree Run 20 dB		DET P NNNN	Auto Tun
0 dB/div Ref Offset 0.8 dB			Mkr1 2	480 051 0 GHz -0.38 dBm	Auto Tui
0.00		•1			Center Fre 2.480000000 GH
0.0					Start Fre 2.479250000 GH
80.0					Stop Fre 2.480750000 GH
					CF Ste 150.000 ki Auto Mi
0.0					Freq Offs 0 F
enter 2.4800000 GHz				Span 1.500 MHz	
Res BW 100 kHz	#VBW 300 ki	Ηz	Sweep 1	.000 ms (1001 pts)	

Band Edge_BLE_1M_LowCH00-2402

R	ectrum Analyze	50 Ω DC		SENSE:INT		ALIGN AUTO	01:47:59 PM	Aug 08, 2010	- 0 e×
		0000000 GHz	Tele	: Free Run	Avg Type		TRACE	123456	Frequency
		PNO: IFGai		en: 20 dB				PNNNN	Auto Tun
10 dB/div	Ref Offs Ref 10.	et 0.8 dB .00 dBm				Mk	r3 2.390 -66.2	0 GHz 2 dBm	Auto Tur
0.00								\Diamond^1	Center Fre
10.0								0	2.360000000 GH
20.0	_	_			_			-20.36 dBm	
30.0		_							Start Fre
-40.0	-						0	2	2.310000000 GH
50.0	a .					-	3	h	
80.0 1000	MAN	www. William	want	mmm	m. Min	montant	month	- Acces	Stop Fre
-80.0									2.41000000 GH
Center 2.	36000 GI	Hz					Span 10	0.0 MHz	CF Ste
#Res BW	100 kHz		#VBW 300	kHz	5	weep 9	.600 ms (1		10.000000 Mi Auto Mi
MKR MODE T	RC SCL	× 2.402 1 0	Y N	25 dBm	UNCTION FUN	CTION WIDTH	FUNCTIO	N VALUE	Auto Mic
2 N	1	2.399 9 0	6Hz -49.	09 dBm 22 dBm					Freq Offs
4 5		2.350 0 0	-00.	22 0011					01
6 7									1
8				_					
			-						
10	-								

Band Edge_BLE_1M_HighCH39-2480



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Spurious Emission_BLE_1M_LowCH00-2402

					trum Analyzer - Swe	signt Spe
Frequency	01:48:41 PM Aug 08, 2019 TRACE 1 2 3 4 5 6 TYPE M WWWWWW	ALIGN AUTO Avg Type: Log-Pwr	SENSE:INT	000000 GHz		ter Fr
Auto Tur	DET P NNNNN		#Atten: 20 dB	PNO: Fast IFGain:Low		
Auto Tur	4 2.530 0 GHz -47.43 dBm	Mki			Ref Offset 0.8 Ref 10.00 c	3/div
Center Fre					0 ¹	
13.015000000 GH					Y	
	-20.36 dBm					
Start Fre						
30.000000 Mi				3	¥	
				I II.		
Stop Fr		- Second and a second second second	and the second second second	1 martine and a state of the	A second	
26.00000000 G						
CF Ste	Span 25.97 GHz		State of a		02 GHz	
2.597000000 G Auto M	482 s (30001 pts)	Sweep 2	300 kHz	#VBV	00 kHz	s BW
Auto III	FUNCTION VALUE	ION FUNCTION WIDTH	-2.22 dBm	2.401 9 GHz	SCL	
Freq Offs			-71.13 dBm -61.12 dBm	4.804 0 GHz 7.206 0 GHz	1	N 1
0			-47.43 dBm	2.530 0 GHz	1	N 1
						_
		CTATIC				

Spurious Emission_BLE_1M_MidCH20-2442

	trum Analyzer - Swept SA							
enter Fre	eq 13.015000	000 GHz	SENSE:1	Avg Ty	ALIGN AUTO pe: Log-Pwr	01:56:31 PM AL TRACE 1	23456	Frequency
0 dB/div	Ref Offset 0.8 dB Ref 10.00 dBm		#Atten: 20 dE		Mk	(r4 2.569 9 -47.76		Auto Tun
og 0.00 10.0							-20.29 dBm	Center Fre 13.015000000 GH
	4	3						Start Fre 30.000000 Mi
0.0	02						-	Stop Fre 26.00000000 GF
enter 13. Res BW 1	00 kHz	#VBI	W 300 kHz			Span 25.9 2.482 s (300	01 pts)	CF Ste 2.597000000 GI Auto M
Mode rsc 1 N 1 2 N 1 3 N 1 4 N 1 5 - - 6 - - 7 - -		x 2.442 6 GHz 4.884 0 GHz 7.326 0 GHz 2.569 9 GHz	-2.96 dBm -69.54 dBm -62.17 dBm -47.76 dBm	FUNCTION	UNCTION WIDTH	FUNCTION	E E	Freq Offs 01
8 9 10 11			m				<u> </u>	

Spurious Emission_BLE_1M_HighCH39-2480

B m	Trig: Free Run #Atten: 20 dB	ALIGH AUTO Avg Type: Log-Pwr Mk	02:05:34 PM Aug 08,2019 TRACE 1: 2:3 4:5 6 TYPE MWWWW DET P NNNN r4 2:351 7 GHz -48.41 dBm	Frequency Auto Tun
в	#Atten: 20 dB	Mk	r4 2.351 7 GHz	Auto Tun
			-20.38 dBm	Center Fre 13.015000000 GH
3				Start Fre 30.000000 MH
				Stop Fre 26.00000000 GH
#VBI	V 300 kHz	Sweep 2		CF Ste 2.597000000 GH Auto Ma
X 2.479 8 GHz 4.960 0 GHz 7.440 0 GHz 2.351 7 GHz	-2.20 dBm -63.88 dBm -67.98 dBm -48.41 dBm	FUNCTION WIDTH	FUNCTION VALUE	Freq Offs
	m			
	X 2.479 8 GHz 4.960 0 GHz 7.440 0 GHz	2.478 8.GHz 4.960 0.GHz 4.960 0.GHz 4.960 0.GHz 4.960 0.GHz 4.960 0.GHz 4.97 98 dBm 2.351 7.GHz 4.8 41 dBm	X 230.48 m FUNCTION FUNCTION 4980.0 CHz -2.20.48 m FUNCTION FUNCTION 4980.0 CHz -53.88.48 m - - 2.351.7 CHz -57.98.48 m - - 2.351.7 CHz -48.41 dBm - -	#VBW 300 kHz Sweep 2.482 s (30001 pts) 2 478 8 GHz - 2.20 dBm 4 980 0 GHz - 3.38 dBm 2.381 7 GHz - 48.41 dBm

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



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 RSS-Gen §8.10 Table 7.

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.

According to RSS-Gen §8.9 Table 5 & 6 Except where otherwise indicated in the applicable RSS, radiated emissions shall comply with the field strength limits shown in table 5 and table 6. Additionally, the level of any transmitter unwanted emission shall not exceed the level of the transmitter's fundamental emission

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**

EQUIPMENT TYPE	MFR	MODEL NUM- BER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Broadband Antenna	SCHWAZBECK	VULB 9168	9168-617	10/30/2018	10/29/2019
Horn Antenna	SCHWAZBECK	BBHA9170	184	12/27/2018	12/26/2019
Loop Antenna	ETS.LINDGREN	6502	143303	04/25/2019	04/24/2020
3m Site NSA	SGS	966 chamber D	N/A	07/12/2019	07/11/2020
Spectrum Analyzer	R&S	FSV-40	10058	01/02/2019	01/01/2020
Pre-Amplifier	EMC Instruments	EMC184045B	980135	12/25/2018	12/24/2019
Pre-Amplifier	EMC Instruments	EMC9135	980234	12/25/2018	12/24/2019
Pre-Amplifier	EMC Instruments	EMC12630SE	980271	12/25/2018	12/24/2019
Attenuator	Woken	WATT-218FS-10	RF25	12/25/2018	12/24/2019
Highpass Filter	Micro Tronics	BRM50701-01	G008	12/25/2018	12/24/2019
High Pass Filter	Micro-Tronics	G003	RF99	12/25/2018	12/24/2019
Notch Filter	Woken	EWT-54-0037	RF54	12/25/2018	12/24/2019
Notch Filter	Woken	EWT-54-0038	RF55	12/25/2018	12/24/2019
Band Rejection Filter	Micro-Tronics	G015	RF100	12/25/2018	12/24/2019
Band Rejection Filter	Micro-Tronics	G016	RF101	12/25/2018	12/24/2019
Band Rejection Filter	Micro-Tronics	G021	RF102	12/25/2018	12/24/2019
Lowpass Filter	Woken	EWT-56-0019	RF46	12/25/2018	12/24/2019
Coaxial Cable	Huber Suhner	SUCOFLEX 104	MY17388/4	12/25/2018	12/24/2019
Coaxial Cable	Huber Suhner	RG 214/U	W22.03	12/25/2018	12/24/2019
Coaxial Cable	Huber Suhner	SUCOFLEX 104	MY17413/4	12/25/2018	12/24/2019

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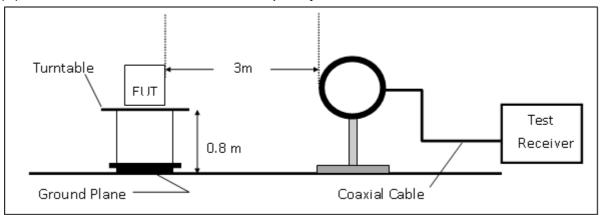
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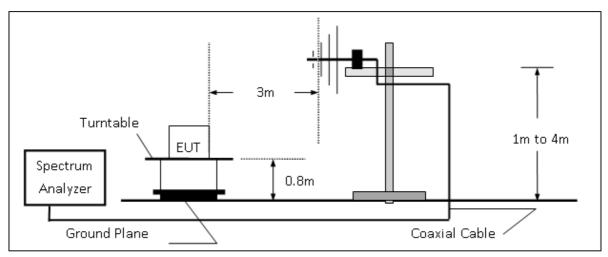


10.3 Test SET-UP

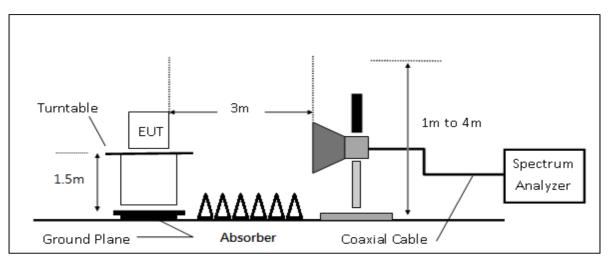
(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



(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.
- 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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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	
A attual	CC(dDu)//m) CDA Deeding lovel(d	

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.

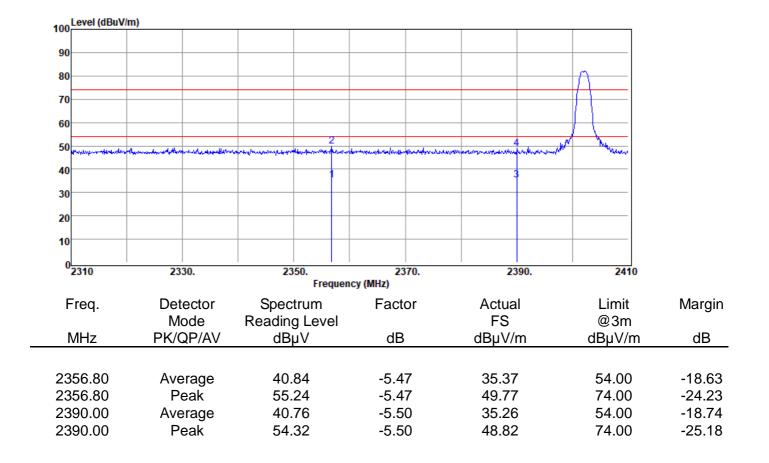
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Radiated Band Edge Measurement Result

Report Number	:E2/2019/70058	Test Date	:2019-08-30
Operation Mode	:BLE 1M	Temp./Humi.	:26.6/61
Test Channel	:2402 MHz	Antenna Pol.	:VERTICAL
Test Mode	:BE CH LOW	Engineer	:Pony
EUT Pol	:E2 Plan		



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Test Date



:E2/2019/70058

Report Number

	. 2/2013/1	0000			.2013-00-30	
Operation Mode	:BLE 1M			Temp./Humi.	:26.6/61	
Test Channel	:2402 MHz			Antenna Pol.	:HORIZONT/	۹L
Test Mode	:BE CH LC	W		Engineer	:Pony	
EUT Pol	:E2 Plan			-	·	
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80						
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60					+	
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_		Frequen				
Freq.	Detector Mode	Spectrum	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	Reading Level dBµV	dB	rs dBµV/m	dBµV/m	dB
		1		•	1	
2340.60	Average	40.87	-5.45	35.42	54.00	-18.58
2340.60	Peak	55.11	-5.45	49.66	74.00	-24.34
2390.00	Average	40.71	-5.50	35.21	54.00	-18.79
2390.00	Peak	54.88	-5.50	49.38	74.00	-24.62

Test Date



:E2/2019/70058

Report Number

•	(Number		_/2010/10	5000				1031 D		.2010.00	00
Opera	tion Mode	:BL	_E 1M					Temp.	/Humi.	:26.6/61	
Test C	hannel	:24	80 MHz					Anteni	na Pol.	:VERTICA	AL.
Test M	lode	:BE	Е СН НІС	ЭH				Engine	er	:Pony	
EUT F	Pol	:E2	2 Plan					-			
	Lough (dDu)//m)										
100	Level (dBuV/m)										
90											
80											
70											
60											
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	and a second state of the second states				alternation Mancheson and	(terristrations), in the states	Antonio Antonio Antonio A	en-stationer, alternationer, a	alaan Madda ahaa ahaa	har an an an Anna Anna Anna Anna Anna A	
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30											
20											
10											
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	2475	24	80.	24	85. Frequenc		90.	24	495.	2500	
F	req.	Det	ector	Spec	trum	Facto	or	Actua	al	Limit	Margin
	·	M	ode	Reading				FS		@3m	U
N	MHz	PK/C	QP/AV	dBj	JV	dB		dBµV/	m	dBµV/m	dB
	83.50		erage	40.		-4.8		35.97		54.00	-18.03
24	83.50	P	eak	57.	14	-4.8	9	52.25	ō	74.00	-21.75

Test Date



:E2/2019/70058

Report Number

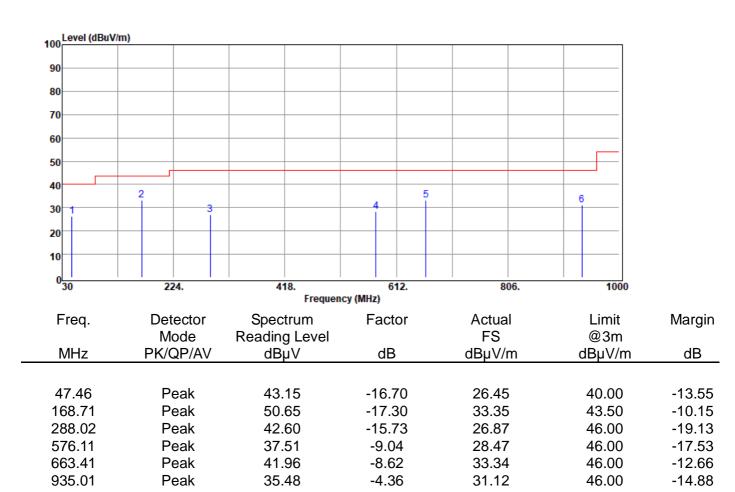
Operation Test Char Test Mo EUT Po	de) MHz CH HIG	iΗ				Temp., Antenr Engine	na Pol.	:26.6/61 :HORIZC :Pony	ONTAL
100 Lev	vel (dBuV/m)										
90											
80		\square									
70	/										
60			- ha								
50 ~~ *	town when the way			- Winds	water when when my		an a	and the second			
40				- 13							
30											
20											
10											
0 ^L 24	75	2480.			2485. Freque	24 ncy (MHz)	90.	24	495.	2500)
Fre	eq.	Detec	tor	Sp	ectrum	Fact	or	Actua	d	Limit	Margin
	•	Mod			ing Level			FS		@3m	-
M	Hz I	PK/QP	P/AV	C	lBμV	dB		dBµV/	m	dBµV/n	n dB
0.407	2 50	A	~~		0.70	4.0	0	25.00	,	E 4 00	40.47
2483 2483		Avera Pea			0.72 6.15	-4.8 -4.8		35.83 51.26		54.00 74.00	-18.17 -22.74
2483		Avera			0.84	-4.8		35.95		54.00	-18.05
2483		Pea	-		7.04	-4.8	9	52.15		74.00	-21.85



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

Report Number	:E2/2019/70058
Operation Mode	:BLE 1M
Test Channel	:2442 MHz
Test Mode	:TX CH MID
EUT Pol	:E2 Plan

Test Date	:2019-08-30
Temp./Humi.	:26.4/59
Antenna Pol.	:VERTICAL
Engineer	:Pony



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Test Date



:E2/2019/70058

Report Number

	,_0.0,,					
Operation Mode	:BLE 1M			Temp./Humi.	:26.4/59	
Test Channel	:2442 MHz			Antenna Pol.	:HORIZONT/	4L
Test Mode	:TX CH MI	D		Engineer	:Pony	
EUT Pol	:E2 Plan			C	-	
201101						
100 Level (dBuV/m)						
90						
80						
70						
60						
50						
40 1	2 3	5				
30			6			
20						
10						
030	224.	418. Eroguon	612. cy (MHz)	806.	1000	
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
rieq.	Mode	Reading Level	T actor	FS	@3m	margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
		•			·	
62.98	QP	53.11	-18.06	35.05	40.00	-4.95
167.74	Peak	50.32	-17.26	33.06	43.50	-10.44
239.52	Peak	53.95	-17.22	36.73	46.00	-9.27
288.02	Peak	55.42	-15.73	39.69	46.00	-6.31
331.67	Peak	52.21	-14.66	37.55	46.00	-8.45
666.32	Peak	40.45	-8.55	31.90	46.00	-14.10

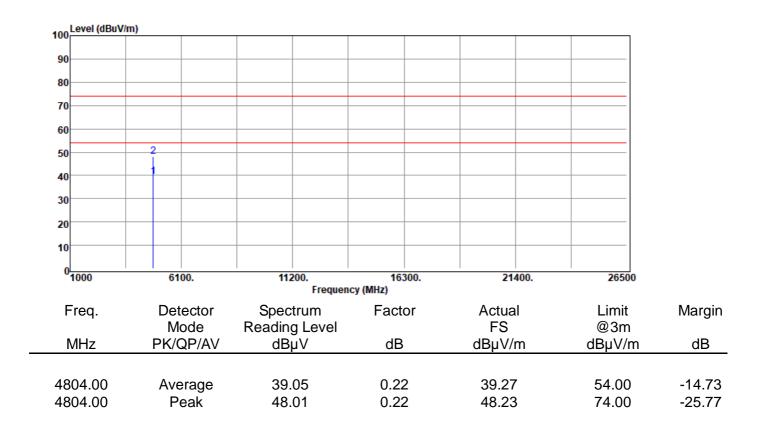
Report No.: E2/2019/70058 Page 37 of 46



Radiated Spurious Emission Measurement Result For Frequency above 1GHz

Report Number	:E2/2019/70058
Operation Mode	:BLE 1M
Test Channel	:2402 MHz
Test Mode	:TX CH LOW
EUT Pol	:E2 Plan

Test Date	:2019-08-30
Temp./Humi.	:26.5/60
Antenna Pol.	:VERTICAL
Engineer	:Pony



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Report Number	:E2/2019/7	0058		Test Date	:2019-08-30	
Operation Mode	:BLE 1M			Temp./Humi.	:26.5/60	
Test Channel	:2402 MHz	<u>:</u>		Antenna Pol.	:HORIZONT/	۹L
Test Mode	:TX CH LC	W		Engineer	:Pony	
EUT Pol	:E2 Plan					
100 Level (dBuV/m)						
90						
80						
70						
60						
50	2					
40						
30						
20						
10						
0 1000	6100.	11200. Frequen	16300. cy (MHz)	21400.	26500	
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
1001.00	•	00.40	0.00	00.40	54.00	45.00
4804.00 4804.00	Average Peak	38.18 46.25	0.22 0.22	38.40 46.47	54.00 74.00	-15.60 -27.53
100 1100	i oun	10.20	0.22	10.17	1 1.00	21.00

Test Date



:E2/2019/70058

Report Number

•	(Number		0000		Tool Duto	.2010 00 00	
Opera	ation Mode	:BLE 1M			Temp./Humi.	:26.5/60	
Test C	Channel	:2442 MH	Ζ		Antenna Pol.	:VERTICAL	
Test N	/lode	:TX CH M	D		Engineer	:Pony	
EUT F	Pol	:E2 Plan					
	Level (dBuV/m)						
100							
90							
80							
70							
60							
50		2					
40							
30							
20							
10							
0	1000	6100.	11200.	16300.	21400.	26500	
-	_		Frequenc				
ŀ	req.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
1	MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
			F	•	I	p	
48	84.00	Average	37.50	0.64	38.14	54.00	-15.86
48	84.00	Peak	47.27	0.64	47.91	74.00	-26.09

Test Date



:E2/2019/70058

Report Number

Кероі	Inumber	.LZ/2019/	10030		IESI Dale	.2019-00-30	
Opera	tion Mode	:BLE 1M			Temp./Humi.	:26.5/60	
Test C	hannel	:2442 MH	Z		Antenna Pol.	:HORIZONT/	۹L
Test M	lode	:TX CH M	ID		Engineer	:Pony	
EUT F	Pol	:E2 Plan			0	-	
100	Level (dBuV/m)						
90							
80							
70							
60							
50		2					
40							
30							
20							
10							
0	1000	6100.	11200.	16300.	21400.	26500	
			Frequen				
F	req.	Detector	Spectrum	Factor	Actual	Limit	Margin
Ν	ИНz	Mode PK/QP/AV	Reading Level dBµV	dB	FS dBµV/m	@3m dBµV/m	dB
	VII I∠						
48	84.00	Average	37.23	0.64	37.87	54.00	-16.13
	84.00	Peak	46.14	0.64	46.78	74.00	-27.22

Test Date



:E2/2019/70058

Report Number

Коро		.22/2013/	10000		Test Date	.2013-00-30	
Oper	ation Mode	:BLE 1M			Temp./Humi.	:26.5/60	
Test (Channel	:2480 MH	Z		Antenna Pol.	:VERTICAL	
Test I	Mode	:TX CH H	IGH		Engineer	:Pony	
EUT	Pol	:E2 Plan					
	Level (dBuV/m)						
10							
90	D						
8	0						
7(0						
6	0						
5	0	2					
40	D	1					
3	D						
2	0						
1							
	0L 1000	6100.	11200. Frequend	16300. cy (MHz)	21400.	26500	
	Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	5
	MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
			00 T 0		40.07	- 4 0 0	10.10
	960.00 960.00	Average Peak	39.72 46.50	1.15 1.15	40.87 47.65	54.00 74.00	-13.13 -26.35
43	900.00	reak	40.30	1.1 0	47.00	74.00	-20.33



Report Number	:E2/2019/7	0058		Test Date	:2019-08-30	
Operation Mode	:BLE 1M			Temp./Humi.	:26.5/60	
Test Channel	:2480 MHz			Antenna Pol.	:HORIZONT/	AL.
Test Mode	:TX CH HIG	GH		Engineer	:Pony	
EUT Pol	:E2 Plan					
100 Level (dBuV/m)						
90						
80						
70						
60						
50	1					
40						
30						
20						
10						
01000	6100.	11200.	16300.	21400.	26500	
Freq.	Detector	Frequen Spectrum	Factor	Actual	Limit	Margin
Fieq.	Mode	Reading Level	Factor	FS	@3m	warym
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
					- /	
4960.00 4960.00	Average Peak	38.79 45.79	1.15 1.15	39.94 46.94	54.00 74.00	-14.06 -27.06
4300.00	FEAN	43.73	1.15	40.34	74.00	-27.00



11 POWER SPECTRAL DENSITY

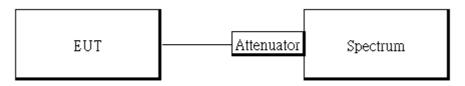
11.1 **Standard Applicable:**

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.

Measurement Equipment Used: 11.2

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	N9010A	MY57120200	03/06/2019	03/05/2020
DC Block	PASTERNACK	PE8210	RF81	12/25/2018	12/24/2019

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 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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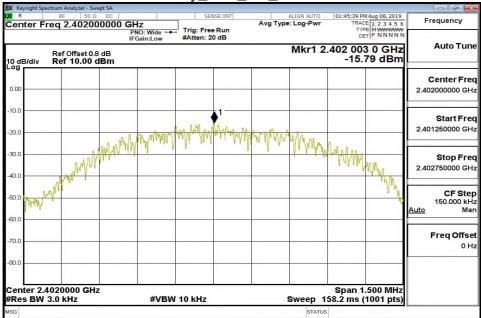


11.5 Measurement Result:

BLE mode

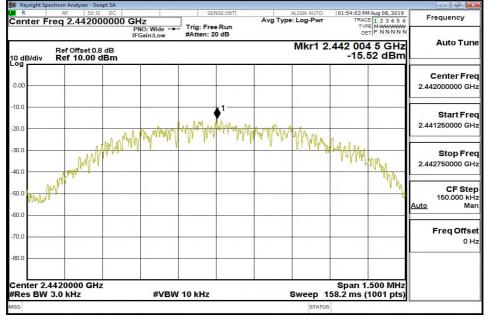
Frequency (MHz)	RF Power Density (dBm)	Maximum Limit (dBm)	Result
2402	-15.79	8	PASS
2442	-15.52	8	PASS
2480	-15.83	8	PASS

NOTE: cable loss as 0.8dB that offsets in the spectrum



Power Density_BLE_1M_LowCH00-2402

Power Density_BLE_ 1M_MidCH20-2442



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							ectrum Analyzer - Swe	
Frequency	02:02:32 PM Aug 08, 2019 TRACE 1 2 3 4 5 6	ALIGN AUTO	SE:INT AV	SEN	7		RF 50 Ω req 2.48000	R Renter F
Auto Tur	Mkr1 2.480 004 5 GHz -15.83 dBm			Trig: Free #Atten: 20	O: Wide ↔ Gain:Low	PN IFG dB	Ref Offset 0.8	
Center Fre 2.480000000 GH						Bm	Ref 10.00 d	og B/div
Start Fre 2.479250000 GH		ላሌ/ህብሔ እ.	A	han hard great	ስሌ ለለትምለስግ			0.0
Stop Fre 2.480750000 GH	and the many the	* II 94/1		,	-γ · γ	W.A. MY	waywhit	0.0 <u> </u>
CF Ste 150.000 kl Auto Mi							~~~~	
Freq Offs 0								
	Span 1.500 MHz 58.2 ms (1001 pts)	Sween 1		(10 kHz	#VBW		4800000 GHz 3.0 kHz	
		STATUS						sg

Power Density BLE 1M HighCH39-2480

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



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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