

Testing Laboratory 0659



# **FCC Radio Test Report**

FCC ID: VTV-RFBHN

Report No. : BTL-FCCP-2-2311T049
Equipment : Bluetooth module
Model Name : RF-BHS, RF-BHN

Brand Name : TSC

**Applicant**: TSC Auto ID Technology Co., Ltd.

Address : 9F., No. 95, Minquan Rd. Xindian Dist. New Taipei

Radio Function : Bluetooth Low Energy

FCC Rule Part(s) : FCC CFR Title 47, Part 15, Subpart C (15.247)

**Measurement**: ANSI C63.10-2013

Procedure(s)

**Date of Receipt** : 2023/11/21

**Date of Test** : 2023/12/1 ~ 2023/12/6

**Issued Date** : 2023/12/27

The above equipment has been tested and found in compliance with the requirement of the above standards by BTL Inc.

Prepared by

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#### Declaration

**BTL** represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with standards traceable to international standard(s) and/or national standard(s).

**BTL**'s reports apply only to the specific samples tested under conditions. It is manufacture's responsibility to ensure that additional production units of this model are manufactured with the identical electrical and mechanical components. **BTL** shall have no liability for any declarations, inferences or generalizations drawn by the client or others from **BTL** issued reports.

This report is the confidential property of the client. As a mutual protection to the clients, the public and ourselves, the test report shall not be reproduced, except in full, without our written approval.

**BTL**'s laboratory quality assurance procedures are in compliance with the **ISO/IEC 17025** requirements, and accredited by the conformity assessment authorities listed in this test report.

BTL is not responsible for the sampling stage, so the results only apply to the sample as received.

The information, data and test plan are provided by manufacturer which may affect the validity of results, so it is manufacturer's responsibility to ensure that the apparatus meets the essential requirements of applied standards and in all the possible configurations as representative of its intended use.

#### Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

Please note that the measurement uncertainty is provided for informational purpose only and are not use in determining the Pass/Fail results.

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# **REVISION HISTORY**

Report No.	Version	Description	Issued Date	Note
BTL-FCCP-2-2311T049	R00	Original Report.	2023/12/21	Invalid
BTL-FCCP-2-2311T049	R01	Revise Typo.	2023/12/27	Valid

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Test procedures according to the technical standards.

Standard(s) Section	Description	Test Result	Judgement	Remark
15.207	AC Power Line Conducted Emissions		N/A	Note (3)
15.205 15.209 15.247(d)	Radiated Emissions	APPENDIX A APPENDIX B APPENDIX C	Pass	
15.247(a)(2)	Bandwidth	APPENDIX D	Pass	
15.247(b)(3)	Output Power	APPENDIX E	Pass	
15.247(e)	Power Spectral Density	APPENDIX F	Pass	
15.247(d)	Antenna conducted Spurious Emission	APPENDIX G	Pass	
15.203	Antenna Requirement		Pass	

#### NOTE:

- "N/A" denotes test is not applicable in this Test Report.
   The report format version is TP.1.1.1.
   This is a DC input device.

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#### 1.1 TEST FACILITY

The test No. 68-1	location(s) used	to c	ollect the test da	ta in	Accreditation Numbers this report are: New Taipei City 2			
_ C	05		CB08		CB11	$\boxtimes$	SR10	SR11
	.n. 169, Sec. 2, I I: TW0659)	Dato	ong Rd., Xizhi Dis	st., N	ew Taipei City 22	1, Ta	wan	
` □ C	06 ´ [	$\times$	CB21		CB22			

#### 1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement  $\mathbf{y} \pm \mathbf{U}$ , where expanded uncertainty  $\mathbf{U}$  is based on a standard uncertainty multiplied by a coverage factor of  $\mathbf{k} = \mathbf{2}$ , providing a level of confidence of approximately  $\mathbf{95}$  %. The measurement instrumentation uncertainty considerations contained in CISPR 16-4-2. The BTL measurement uncertainty is less than the CISPR 16-4-2  $U_{cispr}$  requirement.

#### A. Radiated emissions test:

Test Site	Measurement Frequency Range	U (dB)
	0.03 GHz ~ 0.2 GHz	4.17
	0.2 GHz ~ 1 GHz	4.72
CB21	1 GHz ~ 6 GHz	5.21
CBZT	6 GHz ~ 18 GHz	5.51
	18 GHz ~ 26 GHz	3.69
	26 GHz ~ 40 GHz	4.23

# B. Conducted test:

d test .					
Test Item	U (dB)				
Occupied Bandwidth	0.5334				
Output power	0.3669				
Power Spectral Density	0.6591				
Conducted Spurious emissions	0.5416				
Conducted Band edges	0.5348				

### NOTE:

Unless specifically mentioned, the uncertainty of measurement has not been taken into account to declare the compliance or non-compliance to the specification.

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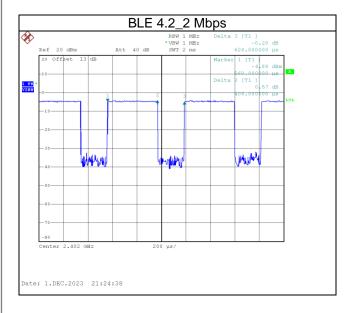
# 1.3 TEST ENVIRONMENT CONDITIONS

Test Item	Environment Condition	Test Voltage	Tested by
Radiated emissions below 1 GHz	Refer to data	DC 3.3V	Kevin Zhen
Radiated emissions above 1 GHz	Refer to data	DC 3.3V	Kevin Zhen
Bandwidth	20.9 °C, 70 %	DC 3.3V	Jerry Chuang
Output Power	20.9 °C, 70 %	DC 3.3V	Jerry Chuang
Power Spectral Density	20.9 °C, 70 %	DC 3.3V	Jerry Chuang
Antenna conducted Spurious Emission	20.9 °C, 70 %	DC 3.3V	Jerry Chuang

### 1.4 DUTY CYCLE

If duty cycle is  $\geq$  98 %, duty factor is not required. If duty cycle is < 98 %, duty factor shall be considered.

	Remark	Delta 1			Delta 2	On Time/Period	10 log(1/Duty Cycle)
Г	Mode	ON	Numbers	On Time (B)	Period (ON+OFF)	Duty Cycle	Duty Factor
	Mode	(ms)	(ON)	(ms)	(ms)	(%)	(dB)
	BLE (2 Mbps)	0.408	1	0.408	0.628	64.97%	1.87



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# 2 GENERAL INFORMATION

# 2.1 DESCRIPTION OF EUT

Equipment	Bluetooth module	
Model Name	RF-BHS, RF-BHN	
Brand Name	TSC	
Model Difference	Different model distribute to different area.	
Power Source	DC voltage supplied from host system.	
Power Rating	3.3Vdc	
Products Covered	N/A	
Operation Band	2400 MHz ~ 2483.5 MHz	
Operation Frequency	2402 MHz ~ 2480 MHz	
Modulation Technology	GFSK	
Transfer Rate	2 Mbps	
Output Power Max.	-4.90 dBm (0.0003 W)	
Test Software Version	ISRT_V:2.1.32.6337	
Test Model	RF-BHS	
Sample Status	Engineering Sample	
EUT Modification(s)	N/A	

### NOTE:

(1) The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.

# (2) Channel List:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	20	2442
01	2404	21	2444
02	2406	22	2446
03	2408	23	2448
04	2410	24	2450
05	2412	25	2452
06	2414	26	2454
07	2416	27	2456
08	2418	28	2458
09	2420	29	2460
10	2422	30	2462
11	2424	31	2464
12	2426	32	2466
13	2428	33	2468
14	2430	34	2470
15	2432	35	2472
16	2434	36	2474
17	2436	37	2476
18	2438	38	2478
19	2440	39	2480



(3) Table for Filed Antenna:

Ant.	Brand	Part Number	Туре	Frequency Range (MHz)	Gain (dBi)
1.	TSC	AT9520-B2R4HAAT/LF	Chip Antenna	2400-2500	3.0

(4) The above Antenna information are derived from the antenna data sheet provided by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.

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# 2.2 TEST MODES

Test Items	Test mode	Channel	Note
Transmitter Radiated Emissions (below 1GHz)	BLE 4.2 / 2 Mbps	19	-
Transmitter Radiated Emissions	BLE 4.2 / 2 Mbps	00/39	Bandedge
(above 1GHz)	BLE 4.2 / 2 Mbps	00/19/39	Harmonic
Transmitter Radiated Emissions (above 18GHz)	BLE 4.2 / 2 Mbps	19	-
Bandwidth	BLE 4.2 / 2 Mbps	00/19/39	-
Output Power	BLE 4.2 / 2 Mbps	00/19/39	-
Power Spectral Density	BLE 4.2 / 2 Mbps	00/19/39	-
Antenna conducted Spurious Emission	BLE 4.2 / 2 Mbps	00/19/39	-

#### NOTE:

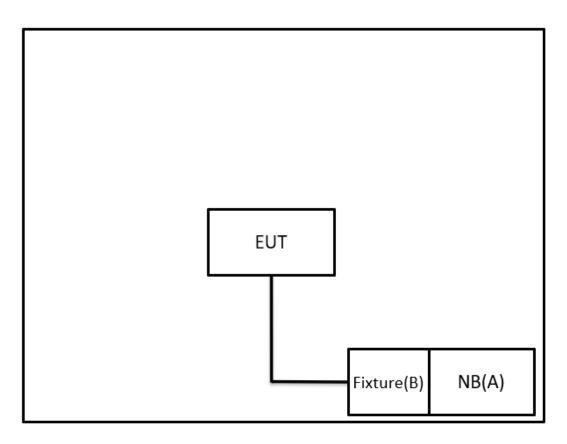
- For radiated emission band edge test, both Vertical and Horizontal are evaluated, but only the worst case (Horizontal) is recorded.
- (2) All X, Y and Z axes are evaluated, but only the worst case (X axis) is recorded.

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# 2.3 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Equipment letters and Cable numbers refer to item numbers described in the tables of clause 2.4.



#### 2.4 SUPPORT UNITS

Item	Equipment	Brand	Model No.	Series No.	Remarks
Α	NB	HP	TPN-I119	N/A	Furnished by test lab.
В	Fixture	N/A	CP2102	N/A	Furnished by test lab.

Item	Shielded	Ferrite Core	Length	Cable Type	Remarks
-	-	-	-	-	-

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#### 3 RADIATED EMISSIONS TEST

#### 3.1 LIMIT

In case the emission fall within the restricted band specified on 15.205, then the 15.209 limit in the table below has to be followed.

LIMITS OF RADIATED EMISSIONS MEASUREMENT (9 kHz to 1000 MHz)

Frequency	Field Strength	Measurement Distance
(MHz)	(microvolts/meter)	(meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
960~1000	500	3

LIMITS OF RADIATED EMISSIONS MEASUREMENT (Above 1000 MHz)

Frequency (MHz)	Radiated (dBu	Measurement Distance	
(IVITZ)	Peak	Average	(meters)
Above 1000	74	54	3

#### NOTE:

- (1) The limit for radiated test was performed according to FCC CFR Title 47, Part 15, Subpart C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).
- (4) The test result calculated as following:

Measurement Value = Reading Level + Correct Factor

Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain(if use)

Margin Level = Measurement Value - Limit Value

Calculation example:

Reading Level (dBµV)		Correct Factor (dB/m)		Measurement Value (dBµV/m)
41.91	+	-8.36	=	33.55

Measurement Value (dBµV/m)		Limit Value (dBµV/m)		Margin Level (dB)
33.55	-	43.50	=	-9.95

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RBW / VBW	1MHz / 3MHz for Peak,
(Emission in restricted band)	1MHz / 1/T for Average

Mode	VBW(Hz)
BLE (2M)	2700

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Spectrum Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9KHz~90KHz for PK/AVG detector
Start ~ Stop Frequency	90KHz~110KHz for QP detector
Start ~ Stop Frequency	110KHz~490KHz for PK/AVG detector
Start ~ Stop Frequency	490KHz~30MHz for QP detector
Start ~ Stop Frequency	30MHz~1000MHz for QP detector

#### 3.2 TEST PROCEDURE

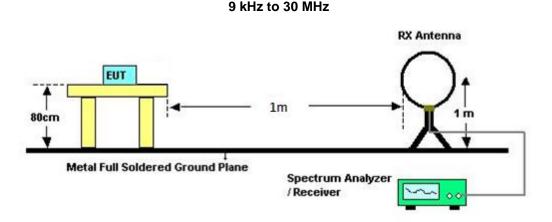
- a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation. (below 1GHz)
- b. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 1.5 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(above 1GHz)
- c. The height of the equipment or of the substitution antenna shall be 0.8 m or 1.5 m, the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights find the maximum reading (used Bore sight function).
- e. The receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1GHz.
- f. The initial step in collecting radiated emission data is a receiver peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- g. All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform. (below 1GHz)
- h. All readings are Peak Mode value unless otherwise stated AVG in column of Note. If the Peak Mode Measured value compliance with the Peak Limits and lower than AVG Limits, the EUT shall be deemed to meet both Peak & AVG Limits and then only Peak Mode was measured, but AVG Mode didn't perform.

  (above 1GHz)
- i. For the actual test configuration, please refer to the related Item EUT TEST PHOTO.

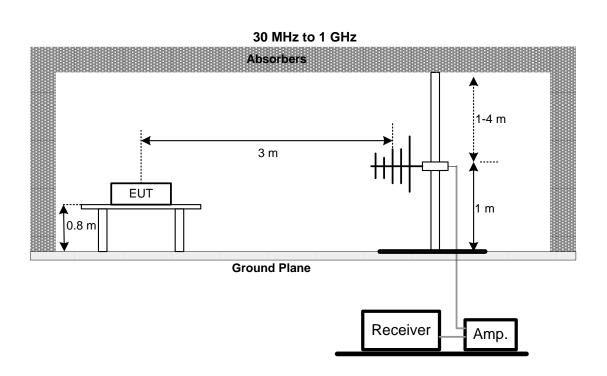
### 3.3 DEVIATION FROM TEST STANDARD

No deviation.

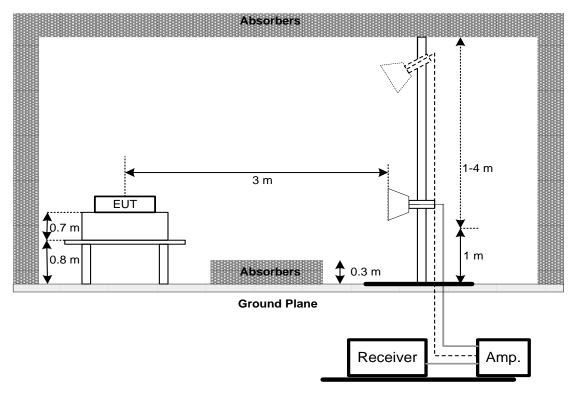
#### 3.4 TEST SETUP







# Above 1 GHz





# 3.5 EUT OPERATING CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

#### 3.6 TEST RESULT - 9kHz TO 30 MHz

Please refer to the APPENDIX A.

### 3.7 TEST RESULT - 30 MHZ TO 1 GHZ

Please refer to the APPENDIX B.

### 3.8 TEST RESULT - ABOVE 1 GHZ

Please refer to the APPENDIX C.

#### NOTE:

(1) No limit: This is fundamental signal, the judgment is not applicable. For fundamental signal judgment was referred to Peak output test.

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# 4 BANDWIDTH TEST

#### 4.1 APPLIED PROCEDURES / LIMIT

Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(a)(2)	Bandwidth	>= 500KHz	2400-2483.5	PASS
15.247 (a)(2)	Bandwidth	(6dB bandwidth)	2400-2463.3	FASS

#### 4.2 TEST PROCEDURE

- a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
- b. Spectrum Setting: RBW= 100KHz, VBW=300KHz, Sweep time = 2.5 ms.

#### 4.3 DEVIATION FROM STANDARD

No deviation.

# 4.4 TEST SETUP



#### 4.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 3.5 unless otherwise a special operating condition is specified in the follows during the testing.

#### 4.6 TEST RESULTS

Please refer to the APPENDIX D.

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#### 5 OUTPUT POWER TEST

#### 5.1 APPLIED PROCEDURES / LIMIT

Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(b)(3)	Maximum Output Power	1 watt or 30dBm	2400-2483.5	PASS

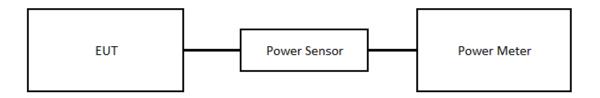
#### 5.2 TEST PROCEDURE

- a. The EUT was directly connected to the power meter and antenna output port as show in the block diagram below,
- b. The maximum peak conducted output power was performed in accordance with FCC KDB 558074 D01 15.247 Meas Guidance.

#### 5.3 DEVIATION FROM STANDARD

No deviation.

#### 5.4 TEST SETUP



#### 5.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 3.5 unless otherwise a special operating condition is specified in the follows during the testing.

### 5.6 TEST RESULTS

Please refer to the APPENDIX E.

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#### 6 POWER SPECTRAL DENSITY TEST

### 6.1 APPLIED PROCEDURES / LIMIT

Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(e)	Power Spectral Density	8 dBm (in any 3KHz)	2400-2483.5	PASS

#### 6.2 TEST PROCEDURE

- a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
- b. Spectrum Setting: RBW=3KHz, VBW=10 KHz, Sweep time = auto.

#### 6.3 DEVIATION FROM STANDARD

No deviation.

#### 6.4 TEST SETUP



### 6.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 3.5 unless otherwise a special operating condition is specified in the follows during the testing.

#### 6.6 TEST RESULTS

Please refer to the APPENDIX F.

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# 7 ANTENNA CONDUCTED SPURIOUS EMISSION

#### 7.1 APPLIED PROCEDURES / LIMIT

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

#### 7.2 TEST PROCEDURE

- a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
- b. Spectrum Setting: RBW= 100KHz, VBW=300KHz, Sweep time = 10 ms.

#### 7.3 DEVIATION FROM STANDARD

No deviation.

#### 7.4 TEST SETUP



#### 7.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 3.5 unless otherwise a special operating condition is specified in the follows during the testing.

#### 7.6 TEST RESULTS

Please refer to the APPENDIX G.

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# 8 LIST OF MEASURING EQUIPMENTS

			Radiated Emission	ons		
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	Preamplifier	EMCI	EMC330N	980850	2023/9/6	2024/9/5
2	Preamplifier	EMCI	EMC118A45SE	980819	2023/3/7	2024/3/6
3	Pre-Amplifier	EMCI	EMC184045SE	980907	2023/9/21	2024/9/20
4	Preamplifier	EMCI	EMC001340	980579	2023/9/6	2024/9/5
5	Test Cable	EMCI	EMC104-SM-100 0	180809	2023/7/10	2024/7/9
6	Test Cable	EMCI	EMC104-SM-SM- 3000	220322	2023/3/14	2024/3/13
7	Test Cable	EMCI	EMC104-SM-SM- 7000	220324	2023/3/14	2024/3/13
8	EXA Signal Analyzer	keysight	N9020B	MY57120120	2023/2/24	2024/2/23
9	Loop Ant	Electro-Metrics	EMCI-LPA600	291	2023/9/12	2024/9/11
10	Horn Antenna	RFSPIN	DRH18-E	211202A18EN	2023/5/12	2024/5/11
11	Horn Ant	Schwarzbeck	BBHA 9170D	1136	2023/5/12	2024/5/11
12	Log-bicon Antenna	Schwarzbeck	VULB9168	1369	2023/5/9	2024/5/8
13	6dB Attenuator	EMCI	EMCI-N-6-06	AT-06001	2023/5/9	2024/5/8
14	Test Cable	EMCI	EMC101G-KM-K M-3000	220329	2023/3/14	2024/3/13
15	Test Cable	EMCI	EMC102-KM-KM- 1000	220327	2023/3/14	2024/3/13
16	Measurement Software	EZ	EZ_EMC (Version NB-03A1-01)	N/A	N/A	N/A

			Bandwidth			
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	Spectrum Analyzer	R&S	FSP 40	100129	2023/3/27	2024/3/26

			Output Power	•		
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	Power Meter	Anritsu	ML2495A	1128008	2023/5/12	2024/5/11
2	Power Sensor	Anritsu	MA2411B	1126001	2023/5/12	2024/5/11

		F	ower Spectral De	nsity		
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	Spectrum Analyzer	R&S	FSP 40	100129	2023/3/27	2024/3/26

		Antenna	conducted Spurio	ous Emission		
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	Spectrum Analyzer	R&S	FSP 40	100129	2023/3/27	2024/3/26

Remark: "N/A" denotes no model name, no serial no. or no calibration specified.

All calibration period of equipment list is one year.



<ul> <li>9 EUT TEST PHOTO</li> <li>Please refer to document Appendix No.: TP-2311T049-FCCP-1 (APPENDIX-TEST PHOTOS).</li> <li>10 EUT PHOTOS</li> </ul>
10 EUT PHOTOS
Please refer to document Appendix No.: EP-2311T049-1 (APPENDIX-EUT PHOTOS).

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APPENDIX A	RADIATED EMISSIONS - 9 KHZ TO 30 MHZ

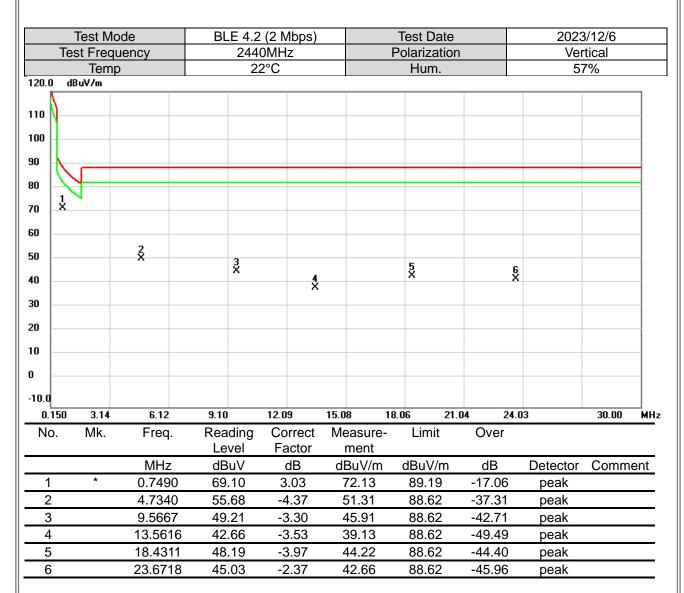
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	Test Mod	de	BLE 4.2	2 (2 Mbps)		Test Date		2023	3/12/6	
Te	st Freque	ency	244	·0MHz		Polarization		Ver	tical	
	Temp		2	2°C		Hum.		57	7%	
150.0 dl	BuV/m									_
140		_								
130										-
120										
110										
100										-
90 —		1 X								-
BO		×								-
70										$\perp$
60 <u> </u>										-
50										-
40										+
30										-
20.0										
0.009	0.02	0.04	0.05	0.07		09 0.11	0.12	1	0.15	MH
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over			
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comm	ent
1	*	0.0355	59.03	26.88	85.91	135.68	-49.77	peak		

- (1) Measurement Value = Reading Level + Correct Factor.(2) Margin Level = Measurement Value Limit Value.





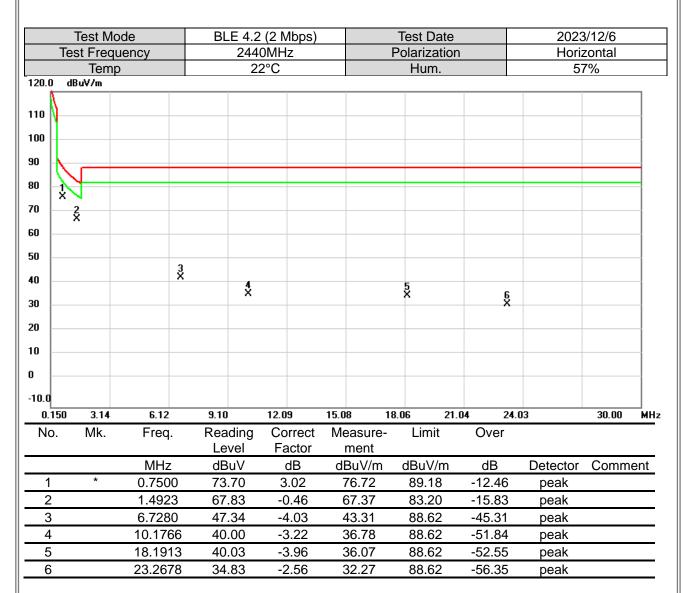
- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.



	Test Mod			2 (2 Mbps)		Test Date			3/12/6	
Tes	st Freque	ency		IOMHz		Polarization			zontal	
	Temp		2	2°C		Hum.		57	7%	
50.0 dE	BuV/m									_
140	_									
40	-									
30										$\dashv$
20					<u> </u>					_
										٦.
10										
00										$\dashv$
10										
		1 X								
:0										7
'o										$\dashv$
o										_
0										
ю										$\dashv$
:0										_
0.009	0.02	0.04	0.05	0.07	0.08 0.	09 0.11	0.12		0.15	
No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over		0.10	MI
INU.	IVIN.	rieq.	Level	Factor	ment	LIIIII	Ovei			
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comm	ent
1	*	0.0358	55.96	26.81	82.77	135.61	-52.84	peak	30	J

- (1) Measurement Value = Reading Level + Correct Factor.(2) Margin Level = Measurement Value Limit Value.





- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.



APPENDIX B	RADIATED EMISSIONS - 30 MHZ TO 1 GHZ

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	Test Mo				2 (2 Mbps)		Test Date			3/12/6	
Tes	t Frequ				40MHz		Polarization	1		tical	
	Temp	)			22°C		Hum.		57	7%	
	uV/m										
70											
60											
50											
40 —— 1 ×		2 3 X	. 5			6 8					
30		^	4 × ×								
20											
10 —— 0.0											
30.000	127.00	224.	.00	321.00	418.00	515.00	512.00 70	9.00 806	5.00	1000.00	мн
No.	Mk.	Fred	.	Reading Level	Correct Factor	Measure- ment	Limit	Over			
		MH	7	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comme	ent
1	*	37.53	37	44.00	-12.03	31.97	40.00	-8.03	QP		
2		168.12	280	42.39	-12.18	30.21	43.50	-13.29	QP		
3		191.99	900	47.00	-14.62	32.38	43.50	-11.12	peak		
4		239.97		41.75	-13.38	28.37	46.00	-17.63	peak		
5		256.01	00	42.23	-12.86	29.37	46.00	-16.63	peak		
6		532.91	27	37.27	-5.70	31.57	46.00	-14.43	peak		

- (1) Measurement Value = Reading Level + Correct Factor.
  (2) Margin Level = Measurement Value Limit Value.



	Test Mo	de	BLI	E 4.2	(2 Mbps)		Test Date	9	2023	3/12/6	
Te	est Frequ				0MHz		Polarizatio	n		zontal	
	Temp			2	2°C		Hum.		57	57%	
80.0	BuV/m										
70											
60											
50											
40 —	×	3X 2X X	6 ×								
30		×^									
20											
10											
0.0											
30.000	127.00	224.00	321.0	10	418.00	515.00	612.00 7	09.00 800	6.00	1000.00 MI	
No.	Mk.	Freq.	Read Lev		Correct Factor	Measure- ment	Limit	Over			
		MHz	dΒι	ı۷	dB	dBuV/m	dBuV/m	dB	Detector	Comment	
1		108.2467	50.		-15.32	35.46	43.50	-8.04	peak		
2		167.9663	43.	12	-12.18	30.94	43.50	-12.56	QP		
3		180.2530	46.3		-13.25	33.14	43.50	-10.36	QP		
4		192.0547			-14.62	35.63	43.50	-7.87	QP		
5	*	207.9950	52.		-15.21	37.34	43.50	-6.16	QP		
6		287.9877	50.	15	-11.51	38.64	46.00	-7.36	QP		

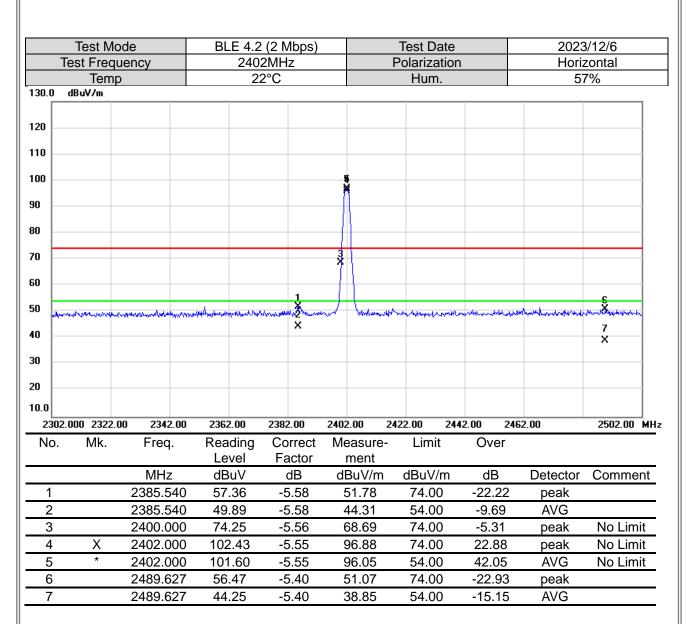
- (1) Measurement Value = Reading Level + Correct Factor.(2) Margin Level = Measurement Value Limit Value.



# APPENDIX C RADIATED EMISSIONS - ABOVE 1 GHZ

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- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.



	Test Mod	de	BIF 4	2 (2 Mbps)		Test Date		2023	3/12/6		
	st Freque			30MHz		Polarization	1	Horizontal			
	Temp		2	22°C		Hum.		57	7%		
130.0 di	BuV/m									7	
120											
120										1	
110										1	
100											
					Ä						
90										1	
80										-	
70										-	
60										1	
1											
50 😓				de la companya					A		
ماله مروع	genedadok faktor	magrafian was an in the act	water particular particular	odkonski sakon Marinda	may hampen	merimonia de la como d	Marinemaninghambur	quiposton/hok-aftiriosepanellique	Anastropologicos	4	
50 ½ 40 2 X	genedhadlatelphan	magical construction of the con-	wood production of the contraction of the contracti	orthogodinistra Meniodija	may Mayer	×	Andrew and a second	quantag/trkaftyrappaytys	Annapagaghalanag	ĸ	
ماله مروع	agara da selektrika da se	magrafission as now in 18 mes.	wykpodykacyka przeboców	ydhogden dop Mangali	maked when provide	5 -4-7-1-1/2-1-1-1/2-1-1-1-1-1-1-1-1-1-1-1-1-1	State of the state	qui pontrafich-aftir prografich	Anangrapakakana	4	
40 2 X 30	garachastat gidern	and water of the	woodlaghaardhool fergelinerry	odhogha shahlanshi	white was	5 444444444444444444444444444444444444	alparente antique de la constitue de la consti	green assert hat fifther was may hape	Anagrapababawa	A A	
40 2 X 30 20	gandriftet plase	magridus, may now my films.	orgit pringeneerfloot, forgethround	adhreada a dhearaidh	may when we	5 Quartina de la Carte de la C	alfricance and place from	og ag an artisty fra handfur grant hap	Samuel and all consists of the constraint of the	<b>M</b>	
40 2 X 30 20 10.0	00 2400.00		2440.00	2460.00		×		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	2580.00		
40 2 X 30 20 10.0		0 2420.00	2440.00	2460.00		×					
40 2 X 30 20 10.0 2380.00	00 2400.00				2480.00 25	X 500.00 252	20.00 254				
40 2 X 30 20 10.0 2380.00	00 2400.00	0 2420.00 Freq.	2440.00 Reading	2460.00 Correct	2480.00 29 Measure-	X 500.00 252	20.00 254			MHz	
40 2 X 30 20 10.0 2380.00	00 2400.00	0 2420.00 Freq. MHz 2381.760	2440.00 Reading Level dBuV 54.59	2460.00 Correct Factor dB -5.58	2480.00 29 Measure- ment dBuV/m 49.01	x 500.00 252 Limit dBuV/m 74.00	20.00 254 Over dB -24.99	Detector peak	2580.00	MHz	
40 2 X 30 20 10.0 2380.00 No.	00 2400.00 Mk.	0 2420.00 Freq. MHz 2381.760 2381.760	2440.00 Reading Level dBuV 54.59 43.71	2460.00 Correct Factor dB -5.58 -5.58	2480.00 29 Measurement dBuV/m 49.01 38.13	x 500.00 252 Limit dBuV/m 74.00 54.00	Over  dB -24.99 -15.87	Detector peak AVG	2580.00 Comme	MHz	
40 2 X 30 20 10.0 2380.0 No.	00 2400.00 Mk.	0 2420.00 Freq. MHz 2381.760 2381.760 2480.000	2440.00 Reading Level dBuV 54.59 43.71 100.69	2460.00 Correct Factor dB -5.58 -5.58 -5.41	2480.00 25 Measure- ment dBuV/m 49.01 38.13 95.28	500.00 252 Limit dBuV/m 74.00 54.00 74.00	20.00 254 Over dB -24.99 -15.87 21.28	Detector peak AVG peak	2580.00 Comme	MHz	
40 2 X 30 20 10.0 2380.00 No.	00 2400.00 Mk.	0 2420.00 Freq. MHz 2381.760 2381.760 2480.000 2480.000	2440.00 Reading Level dBuV 54.59 43.71 100.69 99.80	2460.00 Correct Factor dB -5.58 -5.58 -5.41 -5.41	2480.00 29 Measure- ment dBuV/m 49.01 38.13 95.28 94.39	X 500.00 252 Limit dBuV/m 74.00 54.00 74.00 54.00	20.00 254 Over dB -24.99 -15.87 21.28 40.39	Detector peak AVG peak AVG	2580.00 Comme	MHz	
40 2 X 30 20 10.0 2380.0 No.	00 2400.00 Mk.	0 2420.00 Freq. MHz 2381.760 2381.760 2480.000	2440.00 Reading Level dBuV 54.59 43.71 100.69	2460.00 Correct Factor dB -5.58 -5.58 -5.41	2480.00 25 Measure- ment dBuV/m 49.01 38.13 95.28	500.00 252 Limit dBuV/m 74.00 54.00 74.00	20.00 254 Over dB -24.99 -15.87 21.28	Detector peak AVG peak	2580.00 Comme	MHz	

- (1) Measurement Value = Reading Level + Correct Factor.(2) Margin Level = Measurement Value Limit Value.



	Test Mo					2 Mbps)				est Da	2023/12/6 Vertical			
	Test Frequ				4021				PC	olarizat	ion			
130.0	Temp	)			22°	<u> </u>				Hum.			5/	7%
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110														
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80														
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50														
			1 X											
40 <u> </u>			2											
30			×											
20														
10.0														
	0.000 2700.0	00 4400.	00	6100.00	7	800.00	9500	0.00	1120	00.00	12900.0	00 146	500.00	18000.00 MF
No.	Mk.	Mk. Freq.		Reading		Correct	Measure-			Limit	(	Over		
		MHz		Level dBuV		Factor dB		ment		dBuV/m		dB	Detector	Comment
1		4804.00	00	44.18		0.50	dBuV/m 44.68		(	74.00		29.32	peak	Comment
2	*	4804.00		32.62		0.50		33.12		54.00		20.88	AVG	

- (1) Measurement Value = Reading Level + Correct Factor.(2) Margin Level = Measurement Value Limit Value.



Test Mode					BLE 4.2 (2 Mbps)							Test Da	ate			2023/12/6			
	Test Fred	quen	су			240	2MH				F	Polariza	tion				zontal		
	Tem	np				2	2°C					Hum				5	7%		
130.0	dBuV/m																	_	
120																			
110																		_	
100																			
90																			
80																		_	
70																			
60																			
50				1 X															
40				2														-	
30				X														-	
20																		_	
10.0																			
	.000 2700	0.00	4400		6100		7800		9500			200.00			14600.0	00	18000	.00 MHz	
No.	Mk.		Freq.		Reading Level		Correct Factor		Measure- ment			Limit		Over					
			MHz		dBuV		dB		dBuV/r		n	dBuV/	//m dF		dB Detector		Comr	nent	
1			804.0			.16		50		14.66		74.00		-29.3		peak			
2	*	4	804.0	00	32	.58	0.	50	3	33.08		54.00	)	-20.92	2	AVG		_	

- (1) Measurement Value = Reading Level + Correct Factor.(2) Margin Level = Measurement Value Limit Value.



	Test			BLE 4.2 (2 Mbps)							Test Da				2023/12/6			
	Test Fr		ency				0MH	Z			Р	olariza					tical	
		emp				2:	2°C					Hum				57	7%	
130.0	dBuV/r	n																$\neg$
120 _																		4
110		-																-
100																		_
10																		
30 <u> </u>																		
o																		
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o				2 2														_
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20																		
0.0																		
	0.000 27				6100		7800		9500	).00	112	200.00		00.00	1460	0.00	18000.	00 MH
No.	MI	<.	Freq.		Reading Level		Correct Factor		Measure ment		e-	Limit	imit Over		er er			
			MHz		dBuV		dB		dBuV/m		n	dBuV/m		dB		Detector	Comm	ent
1			4880.0	00	44	.39	C	.73	4	15.12		74.00	)	-28.8	88	peak		
2	*		4880.0	00	33	.16	C	.73	- 3	33.89		54.00	)	-20.1	1	AVG		

- (1) Measurement Value = Reading Level + Correct Factor.(2) Margin Level = Measurement Value Limit Value.



		t Mo			BL		(2 M	ps)				Test D					3/12/6
	Test F		ency				0MHz				F	Polariza					zontal
100.0		emp				2:	2°C					Hum	۱.			57	7%
130.0	dBuV/	m															
120 _																	
110 📙																	
100																	
90																	
во																	
70																	
60 <u> </u>																	
50				1 ×													
40 <u> </u>				X 2													
30				×													
20																	
10.0																	
	).000 2		) 4400	0.00	6100		7800.0	)0	9500	0.00	11	200.00		00.00		00.00	18000.00 MI
No.	M	k.	Freq			ding vel	Cori			easur ment		Limi	t	Ove	er		
			MHz	<u>.</u>	dB	uV	dl	3	dl	3uV/ı	m	dBuV	/m	dB		Detector	Comment
1			4880.0	00	44	.21	0.7	73		14.94		74.0	0	-29.0	)6	peak	
2	,	*	4880.0	00	33	.71	0.7	73	3	34.44		54.0	0	-19.5	56	AVG	

- (1) Measurement Value = Reading Level + Correct Factor.(2) Margin Level = Measurement Value Limit Value.



		t Mo			BL	E 4.2						Test D					3/12/6
	Test F		ency				0MHz	<u>z</u>			F	Polariza					tical
100.0		emp				2:	2°C					Hum	١.			57	7%
130.0	dBuV/	m															
120																	
110 —																	
100																	
90																	
80																	
70 🗀																	
50 <u> </u>																	
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40 <u> </u>																	
30				2 X													
20																	
10.0																	
1000	.000 2	700.0	) 4400	.00	6100	0.00	7800	.00	9500	).00	11	200.00	129	00.00	1460	00.00	18000.00 MH
No.	M	lk.	Freq			ding vel		rrect ctor		easui ment		Limi	t	Ove	er		
			MHz			uV		ΙB		3uV/ı		dBuV	/m	dB		Detector	Comment
1			4960.0	00	43	.95	0.	.99		14.94		74.0	0	-29.0	06	peak	
2		*	4960.0	00	32	.96	0.	99	- 3	33.95	,	54.0	0	-20.0	)5	AVG	

- (1) Measurement Value = Reading Level + Correct Factor.(2) Margin Level = Measurement Value Limit Value.



	Test Mo		Bl		(2 Mbps)			Test Da			3/12/6
Т	Test Frequ				OMHz		F	Polariza			zontal
100.0	Temp	)		22	2°C			Hum.		5	7%
130.0	dBuV/m										
120											
110											
100											
90											
80											
70											
60											
50			1 X								
40											
30			2 X								
20											
10.0											
	.000 2700.0				7800.00	9500.00		200.00	12900.00	14600.00	18000.00 MHz
No.	Mk.	Freq.		iding vel	Correct Factor	Meası mer		Limit	Ove	er	
		MHz		BuV	dB	dBuV		dBuV/ı	m dE	B Detector	Comment
1		4960.00		.25	0.99	45.2		74.00			
2	*	4960.00	0 33	.07	0.99	34.0	6	54.00	-19.9		

- (1) Measurement Value = Reading Level + Correct Factor.(2) Margin Level = Measurement Value Limit Value.

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	Test Mod			2 (2 Mbps)		Test Da			3/12/6
T	est Freque	ency		0MHz		Polariza	tion		tical
	Temp		22	2°C		Hum.		5	7%
130.0	dBuV/m								
120									
110									
100 -									
10									
30									
o 🔚									
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50	-								
	X X								
10	2 X								
30	^								
20									
10									
0.0	0.000 20200.0	0 22400.00	24600.00	26800.00	29000.00	31200.00	33400.00 3	5600.00	40000.00 MH;
No.	Mk.	Freq.	Reading	Correct	Measure			3000.00	40000.00 1411
140.	IVIIX.	1 104.	Level	Factor	ment	,	OVCI		
		MHz	dBuV	dB	dBuV/m	n dBuV/ı	m dB	Detector	Comment
1		19520.00	55.96	-8.28	47.68	74.00	-26.32	peak	
2	*	19520.00	42.88	-8.28	34.60	54.00	-19.40	AVG	

- (1) Measurement Value = Reading Level + Correct Factor.
  (2) Margin Level = Measurement Value Limit Value.



	Test Mod			BL	E 4.2						Test Da					3/12/6	
	est Frequ	ency				0MH	Z			<u> </u>	olariza					zontal	
30.0	Temp dBuV/m				2.	2°C					Hum	•			5.	7%	
JU. U	aba+7iii																٦
20																	-
10																	
00																	
0																	1
0																	1
0																	1
0																	-
o	1 X																
	2 X																
0																	1
D  -																	1
0																	+
.0																	
18000	0.000 20200.0	00 2240	00.00	2460	00.00		00.00	2900	00.00	312	200.00		00.00		00.00	40000.00	MI
No.	Mk.	Freq	•	Rea Le	ding vel		rrect		easure ment	<del>)</del> -	Limit	t	Ove	er			
		MHz		dB	uV	(	dB	dl	3uV/n	1	dBuV/	m	dB	<b>,</b>	Detector	Comme	ent
1		19520.			.19		3.28		16.91		74.00		-27.0		peak		
2	*	19520.	.00	42	.98	-8	3.28	3	34.70		54.00	)	-19.3	30	AVG		

- (1) Measurement Value = Reading Level + Correct Factor.(2) Margin Level = Measurement Value Limit Value.



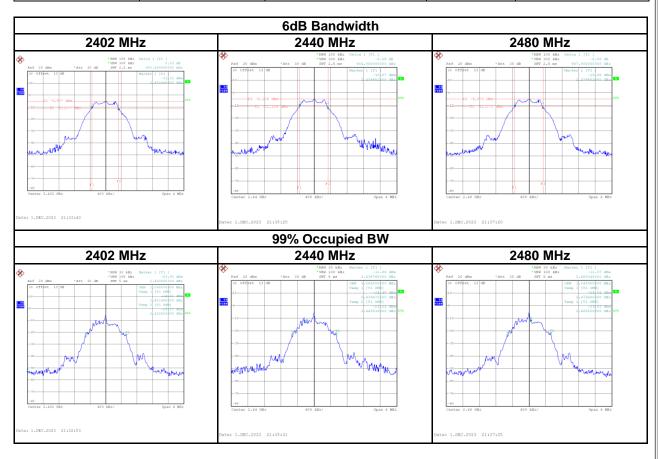
Report No.: BTL-FCCP-2-2311T049 APPENDIX D BANDWIDTH

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Test Mode: BLE 4.2\_2 Mbps

Frequency (MHz)	6dB Bandwidth (MHz)	99% Occupied BW (MHz)	Min. Limit (kHz)	Test Result
2402	0.68	1.04	500	Pass
2440	0.68	1.06	500	Pass
2480	0.69	1.05	500	Pass





		Report No.	BIL 1 001 2 23111043
	APPENDIX E	<b>OUTPUT POWER</b>	
Project No. 2211T040			

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Report No.: BTL-FCCP-2-2311T049

Test Mode :	BLE 4.2_2 Mbps	Tested Date	2023/12/1
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Frequency (MHz)	Conducted Power (dBm)	Conducted Power (W)	Max. Limit (dBm)	Max. Limit (W)	Test Result
2402	-4.90	0.0003	30.00	1.0000	Pass
2440	-4.91	0.0003	30.00	1.0000	Pass
2480	-4.90	0.0003	30.00	1.0000	Pass

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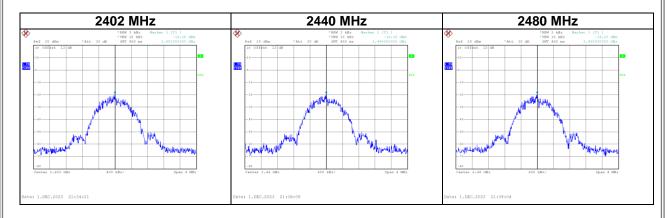
	11. CPOIL 140:: BTE 1 661 2 25111645
APPENDIX F	POWER SPECTRAL DENSITY TEST

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Test Mode : BLE 4.2\_2 Mbps

Frequency (MHz)	Power Density (dBm/3kHz)	Max. Limit (dBm/3kHz)	Test Result
2402	-19.25	8	Pass
2440	-19.16	8	Pass
2480	-19.20	8	Pass





APPENDIX G	ANTENNA CONDUCTED SPURIOUS EMISSION

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