

#### <2Mbps>





## 3.4 Conducted Band Edges and Spurious Emission Measurement

## 3.4.1 Limit of Conducted Band Edges and Spurious Emission

All harmonics/spurious must be at least 20 dB down from the highest emission level within the authorized band.

### 3.4.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

### 3.4.3 Test Procedure

- 1. The testing follows the ANSI C63.10 Section 11.11.3 Emission level measurement.
- 2. The RF output of EUT is connected to the spectrum analyzer by RF cable and attenuator. The path loss is compensated to the results for each measurement.
- 3. Set the maximum power setting and enable the EUT to transmit continuously.
- 4. Set RBW = 100 kHz, VBW = 300 kHz, Peak Detector. Unwanted Emissions measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.
- 5. Measure and record the results in the test report.
- 6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

## 3.4.4 Test Setup





## 3.4.5 Test Result of Conducted Band Edges Plots

### <1Mbps>

Low Band Edge Plot on Channel 00	High Band Edge Plot on Channel 39
Image: Spectrum     Image: Spectrum       Ref Level 20.00 B     Offset 23.90 dB = RBW 100 LHz       Att     20 dB SWT       9 TPk Max     Mode Sweep       10 dBm     41.00 LHz       -10 dBm     -1.00 dBm       -20 dBm     -1.00 LHz       -30 dBm     -1.00 LHz	Migh Band Edge Plot on Channel 39       Ref Level 20.00 dbm     Offset 23.90 db @ RBW 100 Ht/: *Att     To the
-60 dBm -70 dBm -70 dBm -70 dBm -70 dBm F1 Stort 2.375 GHz B001 pts Stop 2.405 GHz Date: 16 JUN 2022 13:38:39	-60 dBm

### <2Mbps>

Low Band Edge Plot on Channel 00					Ι		Hig	gh Ba	and E	dge F	Plot o	n Ch	annel	39						
Spectrur Ref Leve	n 1 20.00 dBr 20 d	n Offset 3 SWT	23.90 dB 👄 8 ms 👄	RBW 100 k VBW 300 k	Hz Hz <b>Mode</b>	Sweep					Spectrur Ref Leve	m al 20.00 dBn 20 dB	n Offset 3 SWT	23.90 dB 🖷 8 ms 🖷	RBW 100	Hz Hz Mode	Sweep			(III) ⊽
1Pk Max										ם ר	• 1Pk Max									
					м	1[1]		2.3	-30.28 dBr 9995880 GH	n z	10.10					M	11[1]	1	2.497	43.96 dBm 23660 GHz
0 dBm									wea		0 dBm	Judad								
-10 dBm									1		-10 dBm-	$\square$								
-20 dBm											-20 dBm									
-30 dBm	D1 -24.420	dBm						MI	M		-30 dBm	D1 -25.020	dBm							
-40 dBm	Antibian Distance	Lall average of	معالمينية	والمعرفة المعرفة والمعرفة	skullar as all at	المربع مروال الم	والمراجع والمراجع		1		-40 dBm—	-	wila	المالما ومناطر			الم المعادية الم	M1 Internet		
-90 88m	Address (1996)	A REAL PROPERTY.	AT A COLORAGE AND A COLORADO	and a suble	add each liter to be	And the second	aller a britance	ger.		"I II	-50 dBm			1	the second second	a to real a real of	11.11.11.11.11.11.11.11	and sharp a	and don't a	
-60 dBm											-60 dBm									
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								1		⅃║										
Start 2.37	5 GHz			8003	. pts			Sto	2.405 GHz	ᆀᆝ	Start 2.47	75 GHz			800	1 pts	<u> </u>		Stop	2.505 GHz
L						Measu	ing			// (							Measur	0.0 IIII		
Date: 16.JUN.	2022 13:49:5	5								C	Date: 16.JUN.	2022 13:43:1	7							



## 3.4.6 Test Result of Conducted Spurious Emission Plots

### <1Mbps>

	<b>Conducted Spurious Emission Plot on</b>					Conducted Spurious Emission Plot on						
	Bluetooth LE 1Mbps GFSK Channel 00						Bluetooth LE 1Mbps GFSK Channel 00					
Spectru		Offect 22.00 d	n - ppw 100 k	1 la			Spectrum	In Official 03 00 db a	DDW 100 kits			
Att	10 dB	3 SWT 29.7 m	s <b>= VBW</b> 300 k	Hz Mode Sweep			Att 10	dB SWT 230 ms •	VBW 300 kHz M	ode Sweep		
●1Pk View	v			M1[1]		4.60 dBm	●1Pk View			M1[1]		3.05 dBm
10 dBm				M2[1]	541	2.40420 GHz -52.56 dBm	10 dBm			M2[1]		2.3900 GHz -46.33 dBm
				1	I T	2.80140 GHz	M1			1 1	1	17.9070 GHz
U dBm							U dBm					
-10 dBm—	-						-10 dBm					
-20 dBm-							-20 dBm					
-	D1 -24.470	dBm					D1 -24.4	170 dBm				
-30 dBm							-00 dBm					
-40 dBm—							-+0 dBm			M2		
-50 dBm-						M2	-50 dBm		1.1.0.000	manuf	man.	Mouto the of mound
mon	men	unununun	Mumulman	menumblemetersheer	mulliner	www.www.but	monderson	we prove proposition	munior	с с.		
-60 dBm—							-60 dBm					
-70 dBm—							-70 dBm					
Start 30.	0 MHz		501	pts		Stop 3.0 GHz	Start 2.0 GHz		501 pts			Stop 25.0 GHz
	Con Blue	ducted \$ stooth Ll	Spuriou E 1Mbp	ıs Emissio s GFSK C	on Plot o hannel 1	n 19	Co Blu	nducted S <sub>l</sub> letooth LE	ourious E 1Mbps G	Emissio FSK CI	n Plot nannel	on 19
Spectru	Con Blue	ducted S tooth LI	Spuriou E 1Mbp	IS Emissio S GFSK C	on Plot o hannel 1	n 19 	Co Blu	nducted Spletooth LE	ourious E 1Mbps G	Emissio IFSK CI	n Plot nannel	on 19
Spectru Ref Lev	Con Blue	ducted stooth Ll	Spuriou E 1Mbp	IS Emissio S GFSK C	on Plot o hannel 1	n  9 (⊕	Co Blu Spectrum Ref Level 20.00	nducted Spletooth LE	1Mbps G	Emissio IFSK CI	n Plot nannel	on 19 ()
Spectru Ref Lev Att 9 1Pk View	Con Blue Blue	ducted \$	Spuriou E 1Mbp	IS Emissio S GFSK C Hz Mode Sweep	on Plot o hannel 1	en 19 ()	Co Blu Spectrum Ref Level 20.00 • Att 10	etooth LE	RBW 100 kHz VBW 300 kHz M	Emissio FSK Cl	n Plot nannel	on 19 ()
Spectru Ref Lev Att 1Pk View	Con Blue Blue 10 dB	ducted \$		IS EMISSIO S GFSK C H2 Mode Sweep M1[1]	on Plot o hannel 1	9 5.30 dBm 2.43980 GHz	Co Blu Spectrum Ref Level 20.00 ( att 10 1Pk View	Inducted Spectrum Interest 23.90 db spectrum IdB SWT 230 db spectrum spectrum 230 ms spectrum	RBW 100 kHz VBW 300 kHz M	Emissio FSK CI Inde Sweep	n Plot nannel	on 19 ♥ 3.49 dBm 2.4360 GHZ
Spectru Ref Lev Att 10 dBm-	Con Blue Blue 20.00 dBm 10 dB	ducted \$	Spuriou E 1Mbp	IS EMISSIO S GFSK Cl Hz Mode Sweep M1[1] M2[1]	n Plot o hannel 1	9 5.30 dBm 2.43980 CH2 ~51.05 dBm 2.03070 GH2	Co Blu Spectrum Ref Level 20.00 • Att 10 dBm M1	Inducted Spectrum Interest 23.90 db sectors and sector	RBW 100 kHz WBW 300 kHz M	Emissio FSK Cl Inde Sweep M1[1] 	n Plot o	0n 19 ♥ 3.49 dBm 2.4360 GHz -46.42 dBm 15.7950 GHz
Spectru Ref Lev Att 10 dBm- 0 dBm-	Con Blue Blue 10 dB v	offset 23.90 d swr 29.7 m	Spuriou E 1Mbp	IS EMISSIO S GFSK Cl Hz Mode Sweep M1[1] M2[1]	on Plot o hannel 1	5.30 dBm 2.43980 CHz -51.05 dBm 2.03070 CHz	Co Blu Spectrum Ref Level 20.00 0 • Att 10 dBm M1 0 dBm	Inducted Speed of the second s	Number Number   1Mbps G   * NBW 100 kHz   * VBW 300 kHz	Emissio FSK Cl Inde Sweep M1[1] 	n Plot o	on 19 ♥ 3.49 dBm 2.4360 GHz -46.42 dBm 15.7950 GHz
Spectru Ref Lev Att 10 dBm	Con Blue m 10 dB v	offset 23.90 d swr 29.7 m	Spuriou E 1Mbp B RBW 100 k s VBW 300 k	IS EMISSIO S GFSK Cl HZ Mode Sweep M1[1] M2[1]	on Plot o hannel 1	5.30 dBm 2.43980 GHz -51.05 dBm 2.03070 GHz	Co Blu Spectrum Reflevel 20.00 0 • Att 10 dBm M1 0 dBm	Inducted Speed of the second s	RBW 100 kHz	Emissio	n Plot d	on 19 ♥ 3.49 dBm 2.4360 GHz -46.42 dBm 15.7950 GHz
Spectru Ref Lev Att 1Pk View 10 dBm 0 dBm -10 dBm	Con Blue 20.00 dBm 10 dB	offset 23.90 d swr 29.7 m	Spuriou E 1Mbp B RBW 100 k S VBW 300 k	IS EMISSIO S GFSK Cl HZ Mode Sweep M1[1] M2[1]	on Plot o hannel 1	5.30 dBm 2.43980 GHz -51.05 dBm 2.03070 GHz	Co Blu Spectrum RefLevel 20.00 • Att 10 dBm -10 dBm -10 dBm	Inducted Speed of the second s	RBW 100 KHz   YBW 100 KHz	Emissio	n Plot d	on 19 (♥) 3.49 dBm 2.4360 GHz -46.42 dBm 15.7950 GHz -46.42 dBm
Spectru       Ref Lev       Att       ID dBm       0 dBm       -10 dBm       -20 dBm	Con Blue 10 dB 10 dB	ducted \$	Spuriou E 1Mbp B RBW 100 k s VBW 300 k	IS EMISSIO S GFSK Cl H2 Mode Sweep M1[1] M2[1]	on Plot o hannel 1	00 19 	Co Blu Spectrum RefLevel 20.00 • Att 10 • 12 View 10 dBm -10 dBm -20 dBm	Inducted Spectrum Inducted Spectrum IBm Offset 23.90 dB e BWT 230 ms e	RBW 100 KHz   YBW 300 KHz	Emissio	n Plot o	on 19 (♥) 3.49 dBm 2.4360 GHz -46.42 dBm 15.7950 GHz 
Spectru Ref Lev 10 dBm- 0 dBm- -10 dBm- -20 dBm- -20 dBm-	Con Blue 10 dB v v D1 -24.680	ducted \$	Spuriou E 1Mbp B RBW 100 k s VBW 300 k	HZ Mode Sweep	on Plot o hannel 1	9 ■ 5.30 dBm 2.43980 GHz -51.05 dBm 2.03070 GHz ■	Co Blu Spectrum Ref Level 20.00 0 • Att 10 • 112 View 10 dBm - 10 dBm - 20 dBm - 20 dBm - 20 dBm - 20 dBm	Inducted Spectrum Inducted Spectrum IBm Offset 23.90 dB + IBm 230 ms + IDm 1 IDm	RBW 100 KHz   YBW 300 KHz	Emissio	n Plot o	on 19 (♥) 3.49 dBm 2.4360 GHz -46.42 dBm 15.7950 GHz -46.42 dBm
Spectru Ref Lev Att 10 dBm	Con Blue m 10 dB v to dB v to dB v to dB v to dB v	ducted \$	Spuriou E 1Mbp B RBW 100 k S VBW 300 k	HZ Mode Sweep	on Plot o hannel 1	9 5.30 dBm 2.43980 GHz -51.05 dBm 2.0070 GHz	Co Blu Spectrum Ref Level 20.00 0 • Att 10 • 114 View 10 dBm -10 dBm -20 dBm -20 dBm -30 dBm	Inducted Spectrum Inducted Spectrum IBm Offset 23.90 dB + IBm 230 ms + 230 ms + 100 dB + 1	NUTIOUS E 1Mbps G NBW 100 KH2 N VBW 300 KH2 N I	Emissio	n Plot o	on 19 () 3.49 dBm 2.4360 GHz -46.42 dBm 15.7950 GHz
Spectru Ref Lev Att 10 dBm 0 dBm -10 dBm -20 dBm -30 dBm -30 dBm	Con Blue	ducted \$		HE EMISSIO S GFSK C Mode Sweep M1[1] M2[1]	n Plot o hannel 1	9 5.30 dBm 2.43980 GHz -51.05 dBm 2.03070 GHz	Co Blu Spectrum Ref Level 20.00 d • Att 10 • 114 View 10 dBm -10 dBm -20 dBm -20 dBm -30 dBm -0 dBm	Inducted Spectrum Inducted Spectrum IBm Offset 23.90 dB + IBm 230 ms	Holys G Holys G Holys G Holys G	Emissio	n Plot of annel	on 19 ♥ 3.49 dBm 2.4360 GHz -46.42 MBm 15.7950 GHz
Spectru       Ref Leve       Att       10 dBm       0 dBm       -10 dBm       -20 dBm       -30 dBm       -30 dBm	Con Blue 10 dB v	ducted \$	Spuriou E 1Mbp	HE EMISSIO	n Plot o hannel 1	n 19 5.30 dBm 2.43980 GHz -51.05 dBm 2.0070 GHz	Co Blu Spectrum Ref Level 20.00 0 • Att 10 • 11 View 10 dBm -10 dBm -20 dBm -20 dBm -30 dBm -30 dBm -30 dBm	Inducted Speed of the second s	PURIOUS E 1Mbps G REW 100 LH2 VBW 300 LH2 N 1 1 1 1 1 1 1 1 1 1 1 1 1	Emissio		on 19 ♥ 3.49 dBm 2.4360 dHz -46.42 dBm 15.7950 GHz -49.42 dBm 15.7950 GHz
Spectru       Ref Lew       Att       ID dBm       0 dBm       -10 dBm       -20 dBm       -30 dBm       -50 dBm       -50 dBm	Con Blue m 10 dB v 01 -24.680	ducted \$	Spuriou E 1Mbp	HE EMISSIO S GFSK C Mode Sweep M1[1] M2[1] M2[1] M2[1]	Mannel 1	n 9 5.30 dBm 2.49900 GHz -51.05 dBm 2.03070 GHz	Co Blu Spectrum Ref Level 20.00 • Att 10 • A	Inducted Spectral Spectrum Spe		Emissio		on 19 ♥ 3.49 dBm 2.4360 GHz -46.42 dBm 15.7950 GHz -46.42 dBm 15.7950 GHz
Spectru Ref Leve Att 10 dBm	Con Blue 10 dB v 01 -24.680	ducted \$	Spuriou E 1Mbp	IS EMISSIO S GFSK C	n Plot o hannel 1	n  9 	Co Blu Spectrum Ref Level 20.00 Att D dBm D dBm -10 dBm -20 dBm	Inducted Spectrum Intervention of the second secon	NUTIOUS E	Emissio		On 19 3.49 dBm 2.4360 GHz -46.42 dBm 15.7950 GHZ -46.7950 GHZ -47.42 dBm 15.7950 GHZ -47.42 dBm 15.79500 GHZ -47.42 dBm 15.79500 GHZ -47.42 dBm 15.79500 GHZ -47.42
Spectru Ref Leve Att 10 dBm 0 dBm -20 dBm -20 dBm -30 dBm -50 dBm -50 dBm -50 dBm -50 dBm -50 dBm	Con Blue 10 de v 01 -24.680	ducted \$	Spuriou E 1Mbp	IS EMISSIO S GFSK C	hannel 1	n  9 ∑.30 dBm 2.43990 GHz -51.05 dBz -51.05	Co Blu Spectrum Ref Level 20.00 d Att 10 PK View 10 dBm -10 dBm -20 dBm -20 dBm -20 dBm -30 dBm -50 dBm -50 dBm -70 dBm -70 dBm	Inducted Spectral Spectrum Spe	Rew 100 KH2 * Rew 100 KH2 * Wew 300 KH2 * Wew 300 KH2 * KH2	Emissio		On 19
Spectru Ref Leve Att 10 dBm 0 dBm -20 dBm -20 dBm -30 dBm -30 dBm -30 dBm -50 dBm -50 dBm -50 dBm Start 30	Con Blue 10 dB 10	ducted \$	Spuriou E 1Mbp	IS EMISSIO S GFSK C	hannel 1	5.30 dBm 2.43990 GHz -51.05 dBm 2.03070 GHz -4,-4,-4,-4,-4,-4,-4,-4,-4,-4,-4,-4,-4,-	Co Blu Spectrum Ref Level 20.00 d att 10 F/K View 10 dBm -10 dBm -20 dBm -20 dBm -20 dBm -30 dBm -50 dBm -50 dBm -50 dBm -70 dBm -70 dBm -70 dBm	Inducted Spectral Spectrum Spe	SILING SELECTION	Emissio		On 19 3.49 dBm 2.4360 GHz -46.42 dBm 15.7950 GHz -46.42 dBm 15.7950 GHz -46.42 dBm 15.7950 GHz -46.42 dBm 15.7950 GHz
Spectru Ref Leve Att 10 dBm 0 dBm -20 dBm -20 dBm -30 dBm -30 dBm -30 dBm -70 dBm Start 30.	Con Blue 10 dB 10 dB 10 dB 10 dB 10 dB 10 dB	ducted \$	Spuriou E 1Mbp	IS EMISSIO S GFSK C	en Plot o hannel 1	5.30 dBm 2.49900 GHz	Co Blu Spectrum Ref Level 20.00 d Att 10 FIX View 10 dBm -20 d	Inducted Spectrum Intervention of the second secon	BURIOUS E 1Mbps G BUBW 300 KH2 M WWW 300 KH2 M S01 Pts 501 pts	Emissio		On 19 3.49 dBm 2.4360 GHz -46.42 MB 15.7950 GHz -46.42 MB -46.42 MB









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## 3.5 Radiated Band Edges and Spurious Emission Measurement

## 3.5.1 Limit of Radiated Band Edges and Spurious Emission

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the output power of this device is measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the limits as below.

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		
Above 960	500	3		

### 3.5.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.



### 3.5.3 Test Procedures

- 1. The testing follows the ANSI C63.10 Section 11.12.1 Radiated emission measurements.
- 2. The EUT is arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
- 3. The EUT is placed on a turntable with 0.8 meter for frequency below 1 GHz and 1.5 meter for frequency above 1 GHz respectively above ground.
- 4. The EUT is set 3 meters away from the receiving antenna, which is mounted on the top of a variable height antenna tower.
- 5. Corrected Reading: Antenna Factor + Cable Loss + Read Level Preamp Factor = Level
- 6. Radiated testing below 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading. When there is no suspected emission found and the emission level is with at least 6 dB margin against QP limit line, the position is marked as "-".
- 7. Radiated testing above 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading for scanning all frequencies. When there is no suspected emission found and the harmonic emission level is with at least 6 dB margin against average limit line, the position is marked as "-".
- 8. Use the following spectrum analyzer settings:
  - (1) Span shall wide enough to fully capture the emission being measured;
  - (2) Set RBW = 100 kHz for f < 1 GHz; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold;
  - (3) Set RBW = 1 MHz, VBW = 3 MHz for  $f \ge 1$  GHz for peak measurement. For average measurement:
    - VBW = 10 Hz, when duty cycle is no less than 98 percent.
    - VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.



### 3.5.4 Test Setup

For radiated test below 30MHz







#### For radiated test above 18GHz



### 3.5.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

The low frequency, which starts from 9 kHz to 30 MHz, is pre-scanned and the result which is 20 dB lower than the limit line is not reported.

There is adequate comparison measurement of both open-field test site and alternative test site - semi-Anechoic chamber according to 414788 D01 Radiated Test Site v01r01, and the result comes out very similar.

## 3.5.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix C and D.

### 3.5.7 Duty Cycle

Please refer to Appendix E.

## 3.5.8 Test Result of Radiated Spurious Emission (30 MHz ~ 10th Harmonic)

Please refer to Appendix C and D.



## 3.6 AC Conducted Emission Measurement

### 3.6.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of omission (MHz)	Conducted limit (dBµV)			
riequency of emission (MHZ)	Quasi-peak	Average		
0.15-0.5	66 to 56*	56 to 46*		
0.5-5	56	46		
5-30	60	50		

\*Decreases with the logarithm of the frequency.

### 3.6.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

### 3.6.3 Test Procedures

- 1. The EUT is placed 0.4 meter away from the conducting wall of the shielding room, and is kept at least 80 centimeters from any other grounded conducting surface.
- 2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
- 3. All the support units are connecting to the other LISN.
- 4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
- 5. The FCC states that a 50 ohm, 50 microhenry LISN shall be used.
- 6. Both Line and Neutral shall be tested in order to find out the maximum conducted emission.
- 7. The frequency range from 150 kHz to 30 MHz is scanned.
- Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9 kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.



## 3.6.4 Test Setup



## 3.6.5 Test Result of AC Conducted Emission

Please refer to Appendix B.



## 3.7 Antenna Requirements

### 3.7.1 Standard Applicable

If directional gain of transmitting antennas is greater than 6 dBi, the power shall be reduced by the same level in dB comparing to gain minus 6 dBi. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the rule.

## 3.7.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

### 3.7.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.



#### List of Measuring Equipment 4

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Hygrometer	TECPEL	DTM-303A	TP201996	N/A	Nov. 16. 2021	Jun. 04, 2022 Jun. 16, 2022	Nov. 15. 2022	Conducted (TH05-HY)
Power Sensor	DARE	RPR3006W	16I00054SNO 12 (NO:113)	10MHz~6GHz	Dec. 16, 2021	Jun. 04, 2022 Jun. 16, 2022	Dec. 15, 2022	Conducted (TH05-HY)
Signal Analyzer	Rohde & Schwarz	FSV40	101566	10Hz~40GHz	Aug. 30, 2021	Jun. 04, 2022 Jun. 16, 2022	Aug. 29, 2022	Conducted (TH05-HY)
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Jun. 07, 2022	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102388	9kHz~3.6GHz	Dec. 01, 2021	Jun. 07, 2022	Nov. 30, 2022	Conduction (CO05-HY)
Hygrometer	Testo	608-H1	34913912	N/A	Nov. 17, 2021	Jun. 07, 2022	Nov. 16, 2022	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz~30MHz	Dec. 03, 2021	Jun. 07, 2022	Dec. 02, 2022	Conduction (CO05-HY)
Software	Rohde & Schwarz	EMC32	N/A	N/A	N/A	Jun. 07, 2022	N/A	Conduction (CO05-HY)
Pulse Limiter	SCHWARZBE CK	VTSD 9561-F N	00691	N/A	Jul. 28, 2021	Jun. 07, 2022	Jul. 27, 2022	Conduction (CO05-HY)
LISN Cable	MVE	RG-400	260260	N/A	Dec. 30, 2021	Jun. 07, 2022	Dec. 29, 2022	Conduction (CO05-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9kHz~30MHz	Sep. 07, 2021	May 30, 2022~ Jun. 22, 2022	Sep. 06, 2022	Radiation (03CH13-HY)
Bilog Antenna	TESEQ	CBL 6111D & 00800N1D01N -06	40103 & 07	30MHz~1GHz	Apr. 24, 2022	May 30, 2022~ Jun. 22, 2022	Apr. 23, 2023	Radiation (03CH13-HY)
Horn Antenna	SCHWARZBE CK	BBHA 9120 D	9120D-1241	1GHz~18GHz	Jul. 13, 2021	May 30, 2022~ Jun. 22, 2022	Jul. 12, 2022	Radiation (03CH13-HY)
SHF-EHF Horn Antenna	SCHWARZBE CK	BBHA 9170	00994	18GHz~40GHz	Nov. 04, 2021	May 30, 2022~ Jun. 22, 2022	Nov. 03, 2022	Radiation (03CH13-HY)
Amplifier	Sonoma- Instrument	310 N	187282	9kHz~1GHz	Dec. 15, 2021	May 30, 2022~ Jun. 22, 2022	Dec. 14, 2022	Radiation (03CH13-HY)
Preamplifier	MITEQ	AMF-7D- 00101800-30- 10P	1590074	1GHz~18GHz	May 17, 2022	May 30, 2022~ Jun. 22, 2022	May 16, 2023	Radiation (03CH13-HY)
Preamplifier	Keysight	83017A	MY53270147	1GHz~26.5GHz	Oct. 26, 2021	May 30, 2022~ Jun. 22, 2022	Oct. 25, 2022	Radiation (03CH13-HY)
Preamplifier	EMEC	EM18G40G	060715	18GHz~40GHz	Dec. 24, 2021	May 30, 2022~ Jun. 22, 2022	Dec. 23, 2022	Radiation (03CH13-HY)
Spectrum Analyzer	Keysight	N9010A	MY55370526	10Hz~44GHz	Mar. 18, 2022	May 30, 2022~ Jun. 22, 2022	Mar. 17, 2023	Radiation (03CH13-HY)
Hygrometer	TECPEL	DTM-303B	TP200889	N/A	Sep. 30, 2021	May 30, 2022~ Jun. 22, 2022	Sep. 29, 2022	Radiation (03CH13-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1m~4m	N/A	May 30, 2022~ Jun. 22, 2022	N/A	Radiation (03CH13-HY)
Turn Table	EMEC	TT2000	N/A	0~360 Degree	N/A	May 30, 2022~ Jun. 22, 2022	N/A	Radiation (03CH13-HY)
Software	Audix	E3 6.2009-8- 24	RK-000992	N/A	N/A	May 30, 2022~ Jun. 22, 2022	N/A	Radiation (03CH13-HY)



Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
RF Cable	HUBER + SUHNER	SUCOFLEX 126E	0030/126E	30MHz~18GHz	Feb. 09, 2022	May 30, 2022~ Jun. 22, 2022	Feb. 08, 2023	Radiation (03CH13-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	804793/4	30MHz~18GHz	Feb. 09, 2022	May 30, 2022~ Jun. 22, 2022	Feb. 08, 2023	Radiation (03CH13-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY24961/4	30MHz~18GHz	Feb. 09, 2022	May 30, 2022~ Jun. 22, 2022	Feb. 08, 2023	Radiation (03CH13-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	804011/2, 804012/2	18GHz~40GHz	Jan. 04, 2022	May 30, 2022~ Jun. 22, 2022	Jan. 03, 2023	Radiation (03CH13-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY9837/4PE	9kHz~30MHz	Mar. 10, 2022	May 30, 2022~ Jun. 22, 2022	Mar. 09, 2023	Radiation (03CH13-HY)
Filter	Wainwright	WLK4-1000- 1530-8000- 40SS	SN12	1.53GHz Low Pass Filter	Sep. 14, 2021	May 30, 2022~ Jun. 22, 2022	Sep. 13, 2022	Radiation (03CH13-HY)
Filter	Wainwright	WHKX8- 5872.5-6750- 18000-40ST	SN5	6.75GHz High Pass Filter	Mar. 10, 2022	May 30, 2022~ Jun. 22, 2022	Mar. 09, 2023	Radiation (03CH13-HY)
Filter	Wainwright	WHKX12- 2700-3000- 18000-60SS	SN2	3GHz High Pass Filter	Jul. 12, 2021	May 30, 2022~ Jun. 22, 2022	Jul. 11, 2022	Radiation (03CH13-HY)



# 5 Uncertainty of Evaluation

### Uncertainty of Conducted Emission Measurement (150 kHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence	24 40
of 95% (U = 2Uc(y))	3.1 dB

### Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence	6 0 dB
of 95% (U = 2Uc(y))	6.0 GB

### Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence	5 2 dP
of 95% (U = 2Uc(y))	5.2 UB

#### Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence	E 0 dP
of 95% (U = 2Uc(y))	5.9 UB

Report Number : FR1D2427-01B

## Appendix A. Test Result of Conducted Test Items

Test Engineer:	Benny Ku	Temperature:	21~25	°C
Test Date:	2022/6/4~2022/6/16	Relative Humidity:	51~54	%

<u>TEST RESULTS DATA</u> 6dB and 99% Occupied Bandwidth									
Mod.	6dB BW Limit (MHz)	Pass/Fail							
BLE	1Mbps	1	0	2402	1.043	0.672	0.50	Pass	
BLE	1Mbps	1	19	2440	1.051	0.720	0.50	Pass	
BLE	1Mbps	1	39	2480	1.041	0.726	0.50	Pass	

<u>TEST RESULTS DATA</u> <u>Average Power Table</u>												
	Mod. Data Rate NTX CH. Freq. Average Conducted (MHz) Power (dBm)						Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail	
	BLE	1Mbps	1	0	2402	6.00	30.00	5.20	11.20	36.00	Pass	l
	BLE	1Mbps	1	19	2440	6.40	30.00	5.20	11.60	36.00	Pass	l
	BLE	1Mbps	1	39	2480	6.00	30.00	5.20	11.20	36.00	Pass	ļ

Peak Power Density										
Mod.	Data Rate	Ntx	CH.	Freq. (MHz)	Peak PSD (dBm /100kHz)	Peak PSD (dBm /3kHz)	DG (dBi)	Peak PSD Limit (dBm /3kHz)	Pass/Fail	
BLE	1Mbps	1	0	2402	5.53	-9.75	5.20	8.00	Pass	
BLE	1Mbps	1	19	2440	5.32	-9.52	5.20	8.00	Pass	
BLE	1Mbps	1	39	2480	4.92	-9.90	5.20	8.00	Pass	

### Report Number : FR1D2427-01B

Test Engineer:	Benny Ku	Temperature:	21~25	°C
Test Date:	2022/6/4~2022/6/16	Relative Humidity:	51~54	%

	<u>TEST RESULTS DATA</u> 6dB and 99% Occupied Bandwidth										
M	lod.	Data Rate	NTX	CH.	Freq. (MHz)	99% Occupied BW (MHz)	6dB BW (MHz)	6dB BW Limit (MHz)	Pass/Fail		
В	3LE	2Mbps	1	0	2402	2.054	1.256	0.50	Pass		
В	3LE	2Mbps	1	19	2440	2.054	1.260	0.50	Pass		
В	3LE	2Mbps	1	39	2480	2.054	1.260	0.50	Pass		

<u>TEST RESULTS DATA</u> <u>Average Power Table</u>											
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail	
BLE	2Mbps	1	0	2402	6.50	30.00	5.20	11.70	36.00	Pass	
BLE	2Mbps	1	19	2440	6.80	30.00	5.20	12.00	36.00	Pass	
BLE	2Mbps	1	39	2480	6.30	30.00	5.20	11.50	36.00	Pass	

#### <u>TEST RESULTS DATA</u> <u>Peak Power Density</u>

Mod.	Data Rate	Ntx	CH.	Freq. (MHz)	Peak PSD (dBm /100kHz)	Peak PSD (dBm /3kHz)	DG (dBi)	Peak PSD Limit (dBm /3kHz)	Pass/Fail
BLE	2Mbps	1	0	2402	5.58	-13.90	5.20	8.00	Pass
BLE	2Mbps	1	19	2440	5.37	-13.31	5.20	8.00	Pass
BLE	2Mbps	1	39	2480	4.98	-13.85	5.20	8.00	Pass

Note: PSD (dBm/ 100kHz) is a reference level used for Conducted Band Edges and Conducted Spurious Emission 30dBc limit.



# Appendix B. AC Conducted Emission Test Results

Toot Engineer	Calvin Wang and Tam Las	Temperature :	<b>23~26</b> ℃
riest Engineer :	Carvin wang and form Lee	Relative Humidity :	45~55%

## **EUT Information**

Report NO : Test Mode : Test Voltage : Phase : 1D2427-01 Mode 1 120Vac/60Hz Line



FullSpectrum

## Final\_Result

Frequency	QuasiPeak	CAverage	Limit	Margin	Line	Filter	Corr.
(MHz)	(dBuV)	(dBuV)	(dBuV)	(dB)			(dB)
0.152250	41.47		65.88	24.41	L1	OFF	19.6
0.152250		28.50	55.88	27.38	L1	OFF	19.6
0.161250	40.85		65.40	24.55	L1	OFF	19.6
0.161250		26.79	55.40	28.61	L1	OFF	19.6
0.174750	40.34		64.73	24.39	L1	OFF	19.6
0.174750		26.34	54.73	28.39	L1	OFF	19.6
0.190500	37.34		64.02	26.68	L1	OFF	19.6
0.190500		25.59	54.02	28.43	L1	OFF	19.6
0.208500	37.16		63.27	26.11	L1	OFF	19.6
0.208500		25.23	53.27	28.04	L1	OFF	19.6
0.219750	35.67		62.83	27.16	L1	OFF	19.6
0.219750		25.24	52.83	27.59	L1	OFF	19.6
1.581000	24.65		56.00	31.35	L1	OFF	19.7
1.581000		23.30	46.00	22.70	L1	OFF	19.7
18.411000	37.34	-	60.00	22.66	L1	OFF	20.4
18.411000		31.70	50.00	18.30	L1	OFF	20.4

## **EUT Information**

Report NO : Test Mode : Test Voltage : Phase : 1D2427-01 Mode 1 120Vac/60Hz Neutral



#### FullSpectrum

## Final\_Result

Frequency	QuasiPeak	CAverage	Limit	Margin	Line	Filter	Corr.
(MHz)	(dBuV)	(dBuV)	(dBuV)	(dB)			(dB)
0.152250		28.72	55.88	27.16	Ν	OFF	19.6
0.152250	44.02		65.88	21.86	Ν	OFF	19.6
0.161250		27.32	55.40	28.08	Ν	OFF	19.6
0.161250	42.86		65.40	22.54	Ν	OFF	19.6
0.172500		26.53	54.84	28.31	Ν	OFF	19.6
0.172500	41.77		64.84	23.07	Ν	OFF	19.6
0.183750		25.79	54.31	28.52	Ν	OFF	19.6
0.183750	40.48		64.31	23.83	Ν	OFF	19.6
0.197250		25.81	53.73	27.92	Ν	OFF	19.6
0.197250	39.42		63.73	24.31	Ν	OFF	19.6
0.208500		25.39	53.27	27.88	Ν	OFF	19.6
0.208500	40.10		63.27	23.17	Ν	OFF	19.6
0.226500		25.08	52.58	27.50	Ν	OFF	19.6
0.226500	37.79		62.58	24.79	Ν	OFF	19.6
0.244500		25.53	51.94	26.41	Ν	OFF	19.6
0.244500	36.14		61.94	25.80	Ν	OFF	19.6
2.332500		23.74	46.00	22.26	Ν	OFF	19.7
2.332500	25.22		56.00	30.78	Ν	OFF	19.7
18.264750		31.87	50.00	18.13	Ν	OFF	20.4
18.264750	37.56		60.00	22.44	Ν	OFF	20.4



# Appendix C. Radiated Spurious Emission

Tost Engineer :	Pain Los and Jacky Hong	Temperature :	20~25°C
rest Engineer .	Rain Lee and Jacky Hong	Relative Humidity :	50~60%

<1Mbps>

#### 2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

BLE	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
					Line		Factor	Loss	Factor	Pos	Pos	Avg.	(110.0
		(IVIFIZ)	(авµv/m)	(ав)	( abµv/m )	(авµv)	( a B/m )	(ав)	(ав)	( cm )	(aeg)	(P/A)	(H/V)
		2362.5	55.55	-18.45	74	40.81	27.77	14.04	27.07	234	30	Р	Н
		2342.34	46.18	-7.82	54	31.38	27.86	14.02	27.08	234	30	Α	Н
	*	2402	101.08	-	-	86.37	27.7	14.07	27.06	234	30	Р	Н
	*	2402	100.22	-	-	85.51	27.7	14.07	27.06	234	30	А	Н
		2361.45	56.19	-17.81	74	41.44	27.78	14.04	27.07	100	82	Р	V
240210112		2314.515	46.28	-7.72	54	31.3	28.08	13.99	27.09	100	82	Α	V
	*	2402	101.66	-	-	86.95	27.7	14.07	27.06	100	82	Р	V
	*	2402	100.93	-	-	86.22	27.7	14.07	27.06	100	82	А	V
		2375.94	55.27	-18.73	74	40.54	27.75	14.05	27.07	365	33	Р	Н
		2311.54	46.01	-7.99	54	31	28.11	13.99	27.09	365	33	А	Н
	*	2440	101.39	-	-	86.71	27.62	14.11	27.05	365	33	Р	Н
	*	2440	100.76	-	-	86.08	27.62	14.11	27.05	365	33	А	Н
		2496.85	55.81	-18.19	74	40.99	27.69	14.16	27.03	365	33	Р	Н
BLE		2489.64	46.21	-7.79	54	31.41	27.68	14.15	27.03	365	33	А	Н
CH 19		2321.2	55.18	-18.82	74	40.24	28.03	14	27.09	122	113	Р	V
244010172		2327.78	45.99	-8.01	54	31.09	27.98	14.01	27.09	122	113	А	V
	*	2440	101.29	-	-	86.61	27.62	14.11	27.05	122	113	Р	V
	*	2440	100.73	-	-	86.05	27.62	14.11	27.05	122	113	А	V
		2486	54.96	-19.04	74	40.17	27.67	14.15	27.03	122	113	Р	V
		2486.35	46.26	-7.74	54	31.47	27.67	14.15	27.03	122	113	А	V



BLE	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
		(MHz)	(dBuV/m)	(dB)	Line ( dBuV/m )	Level (dBuV)	Factor	Loss (dB)	Factor (dB)	Pos (cm)	Pos (deg)	Avg. (P/A)	(H/V)
	*	2480	102.13	-	-	87.37	27.66	14.14	27.04	320	36	P	Н
	*	2480	101.61	-	-	86.85	27.66	14.14	27.04	320	36	А	Н
		2490.2	55.21	-18.79	74	40.41	27.68	14.15	27.03	320	36	Р	Н
BLE CH 39 2480MHz		2488.16	46.01	-7.99	54	31.21	27.68	14.15	27.03	320	36	А	Н
	*	2480	102.22	-	-	87.46	27.66	14.14	27.04	100	112	Р	V
	*	2480	100.06	-	-	85.3	27.66	14.14	27.04	100	112	А	V
		2495.36	55.3	-18.7	74	40.48	27.69	14.16	27.03	100	112	Р	V
		2490.56	46.14	-7.86	54	31.34	27.68	14.15	27.03	100	112	А	V
Remark	1. No 2. All	o other spurious I results are PA	s found. SS against F	Peak and	Average lim	it line.							



BLE Note Frequency	BLE (Harmonic @ 3m)														
DEE Note Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.				
(MHz)	(dBµV/m)	(dB)	Line ( dBµV/m )	Level ( dBµV )	Factor ( dB/m )	Loss (dB)	Factor (dB)	Pos ( cm )	Pos ( deg )	Avg. (P/A)	(H/V)				
4804	39.42	-34.58	74	58.56	31.41	6.79	57.34	-	-	Р	Н				
10860	48.64	-25.36	74	54.25	40.82	9.98	56.41	-	-	Р	Н				
10860	38.67	-15.33	54	44.28	40.82	9.98	56.41	-	-	А	Н				
14490	50.14	-23.86	74	53.32	41.86	11.77	56.81	-	-	Р	Н				
14490	40.09	-13.91	54	43.27	41.86	11.77	56.81	-	-	А	Н				
18000	55.93	-18.07	74	50.91	48.5	13.55	57.03	-	-	Р	Н				
BLE 18000	48.31	-5.69	54	43.29	48.5	13.55	57.03	-	-	А	Н				
CH 00 4804	38.93	-35.07	74	58.07	31.41	6.79	57.34	-	-	Р	V				
10860	49.51	-24.49	74	55.12	40.82	9.98	56.41	-	-	Р	V				
10860	38.49	-15.51	54	44.1	40.82	9.98	56.41	-	-	А	V				
14475	50.1	-23.9	74	53.38	41.8	11.76	56.84	-	-	Р	V				
14475	40.58	-13.42	54	43.86	41.8	11.76	56.84	-	-	А	V				
17985	56.24	-17.76	74	51.63	48.1	13.54	57.03	-	-	Р	V				
17985	47.92	-6.08	54	43.31	48.1	13.54	57.03	-	-	А	V				

#### 2.4GHz 2400~2483.5MHz



BLE	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
		(MHz)	(dBµV/m)	(dB)	Line (dBµV/m)	Level (dBµV)	Factor ( dB/m )	Loss (dB)	Factor (dB)	Pos ( cm )	Pos ( deg )	Avg. (P/A)	(H/V)
		4880	39.78	-34.22	74	58.74	31.44	6.82	57.22	-	-	Ρ	Н
		7320	43.68	-30.32	74	55.5	37.06	8.46	57.34	-	-	Ρ	Н
		10860	49.76	-24.24	74	55.37	40.82	9.98	56.41	-	-	Ρ	Н
		10860	38.28	-15.72	54	43.89	40.82	9.98	56.41	-	-	А	Н
		14490	50.13	-23.87	74	53.31	41.86	11.77	56.81	-	-	Ρ	Н
		14490	40.04	-13.96	54	43.22	41.86	11.77	56.81	-	-	А	Н
BLE		17985	56.79	-17.21	74	52.18	48.1	13.54	57.03	-	-	Ρ	Н
		17985	47.18	-6.82	54	42.57	48.1	13.54	57.03	-	-	А	Н
CH 19		4880	39.08	-34.92	74	58.04	31.44	6.82	57.22	-	-	Р	V
2440101112		7320	44.63	-29.37	74	56.45	37.06	8.46	57.34	-	-	Р	V
		10950	48.63	-25.37	74	54.21	40.8	10.03	56.41	-	-	Р	V
		10950	38.01	-15.99	54	43.59	40.8	10.03	56.41	-	-	А	V
		14490	50.68	-23.32	74	53.86	41.86	11.77	56.81	-	-	Р	V
		14490	40.1	-13.9	54	43.28	41.86	11.77	56.81	-	-	А	V
		18000	55.95	-18.05	74	50.93	48.5	13.55	57.03	-	-	Р	V
		18000	46.91	-7.09	54	41.89	48.5	13.55	57.03	-	-	А	V



BLE	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
					Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	(110.0
		(MHZ)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
		4960	40.58	-33.42	74	59.1	31.72	6.86	57.1	-	-	Р	Н
		7440	44.72	-29.28	74	56.69	37.02	8.53	57.52	-	-	Р	Н
		10710	49.02	-24.98	74	55	40.52	9.9	56.4	-	-	Ρ	Н
		10710	37.29	-16.71	54	43.27	40.52	9.9	56.4	-	-	А	Н
		14475	50.43	-23.57	74	53.71	41.8	11.76	56.84	-	-	Ρ	Н
		14475	40.38	-13.62	54	43.66	41.8	11.76	56.84	-	-	А	Н
		17970	56.29	-17.71	74	52.11	47.69	13.52	57.03	-	-	Ρ	Н
BLE		17970	46.93	-7.07	54	42.75	47.69	13.52	57.03	-	-	А	Н
CH 39 2480MHz		4960	40.18	-33.82	74	58.7	31.72	6.86	57.1	-	-	Ρ	V
		7440	44.28	-29.72	74	56.25	37.02	8.53	57.52	-	-	Ρ	V
		10845	49.71	-24.29	74	55.36	40.79	9.97	56.41	-	-	Ρ	V
		10845	38.36	-15.64	54	44.01	40.79	9.97	56.41	-	-	А	V
		14490	49.97	-24.03	74	53.15	41.86	11.77	56.81	-	-	Ρ	V
		14490	40.57	-13.43	54	43.75	41.86	11.77	56.81	-	-	А	V
		17955	56.18	-17.82	74	52.42	47.28	13.51	57.03	-	-	Ρ	V
		17955	46.77	-7.23	54	43.01	47.28	13.51	57.03	-	-	А	V
	1. No	o other spurious	s found.										
	2. All	results are PA	SS against F	Peak and	Average lim	it line.							
Remark	3. Th	e emission pos	ition marked	as "-" m	eans no sus	pected em	ission found	d with suff	ficient mar	gin agai	nst limit	line or	noise
	flo	or only.											

4. The emission level close to 18GHz is checked that the average emission level is noise floor only.



### Emission after 18GHz

BLE	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.	
					Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.		
		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	( dB/m )	( dB )	(dB)	( cm )	(deg)	(P/A)	(H/V)	
2.4GHz		21424	38.47	-35.53	74	56.45	37.95	-2.63	53.3	-	-	Р	н	
BLE														
SHF		20064 37.29 -36.71 74 56.29 37.58 -3.01 53.57 P V											V	
	1. N	No other spurious found.												
Domork	2. A	Il results are PA	SS against li	imit line.										
Reindik	3. T	he emission pos	ition marked	l as "-" m	eans no sus	pected em	ission found	d with suff	ficient mar	gin agai	nst limit	line or	noise	
	f	oor only.												

## 2.4GHz BLE (SHF)



BLE	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
					Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBµV/m)	( dB )	(dBµV/m)	(dBµV)	( dB/m )	( dB )	(dB)	( cm )	(deg)	(P/A)	(H/V)
		30	21.57	-18.43	40	28.66	24.53	0.72	32.34	-	-	Ρ	Н
		128.94	21.22	-22.28	43.5	34.91	17.46	1.15	32.3	-	-	Ρ	Н
		219.15	25.58	-20.42	46	41.32	15.11	1.4	32.25	-	-	Ρ	Н
		315.18	20.98	-25.02	46	31.91	19.6	1.63	32.16	-	-	Ρ	Н
		635.28	27.8	-18.2	46	31.39	26.4	2.24	32.23	-	-	Ρ	Н
2.4GHZ		896.21	34.45	-11.55	46	34.49	28.97	2.54	31.55	-	-	Ρ	Н
BLE - LF -		31.94	21.81	-18.19	40	29.69	23.75	0.73	32.36	-	-	Ρ	V
		113.42	21.6	-21.9	43.5	35.7	17.1	1.11	32.31	-	-	Ρ	V
		223.03	23.24	-22.76	46	38.68	15.4	1.41	32.25	-	-	Ρ	V
		433.52	24.04	-21.96	46	31.26	23.04	1.92	32.18	-	-	Ρ	V
		597.45	26.53	-19.47	46	31.05	25.59	2.16	32.27	-	-	Ρ	V
		898.15	36.94	-9.06	46	36.9	29.04	2.54	31.54	-	-	Ρ	V
	1. N	lo other spurious	s found.										
Remark	2. A	II results are PA	SS against li	mit line.									
	3. T	he emission pos	sition marked	as "-" m	eans no sus	pected em	ission foun	d and em	ission leve	el has at	least 60	IB mar	gin
	a	gainst limit or er	nission is no	se floor	only.								

## 2.4GHz BLE (LF)



### <2Mbps>

### 2.4GHz 2400~2483.5MHz

## BLE (Band Edge @ 3m)

BLE	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
			( dBu)//m )				Factor		Factor	Pos	Pos	Avg.	1111
		(WHZ)	(авµv/m)	(ав)	(авµv/m)	(α Βμν)	( ab/m )	(ав)	(ав)	( cm )	(aeg)	(P/A)	(H/V)
		2365.755	55.51	-18.49	74	40.77	27.77	14.04	27.07	292	137	P	Н
		2365.755	45.45	-8.55	54	30.71	27.77	14.04	27.07	292	137	Α	Н
	*	2402	102.37	-	-	87.66	27.7	14.07	27.06	292	137	Р	Н
BLE	*	2402	100.4	-	-	85.69	27.7	14.07	27.06	292	137	А	Н
2402MH7		2356.83	55.87	-18.13	74	41.13	27.79	14.03	27.08	100	66	Р	V
240210112		2313.57	45.4	-8.6	54	30.41	28.09	13.99	27.09	100	66	А	V
	*	2402	102.56	-	-	87.85	27.7	14.07	27.06	100	66	Р	V
	*	2402	97.87	-	-	83.16	27.7	14.07	27.06	100	66	А	V
		2340.24	56.24	-17.76	74	41.42	27.88	14.02	27.08	254	132	Р	Н
		2389.1	45.38	-8.62	54	30.67	27.72	14.06	27.07	254	132	А	Н
	*	2440	102.34	-	-	87.66	27.62	14.11	27.05	254	132	Р	Н
	*	2440	100.35	-	-	85.67	27.62	14.11	27.05	254	132	А	Н
51.5		2489.57	55.65	-18.35	74	40.85	27.68	14.15	27.03	254	132	Р	Н
BLE CH 40		2491.32	45.51	-8.49	54	30.71	27.68	14.15	27.03	254	132	А	Н
		2312.94	56.03	-17.97	74	41.03	28.1	13.99	27.09	100	122	Р	V
244010112		2312.1	45.42	-8.58	54	30.42	28.1	13.99	27.09	100	122	Α	V
	*	2440	101.37	-	-	86.69	27.62	14.11	27.05	100	122	Ρ	V
	*	2440	99.44	-	-	84.76	27.62	14.11	27.05	100	122	Α	V
		2496.43	55.73	-18.27	74	40.91	27.69	14.16	27.03	100	122	Р	V
		2492.16	45.36	-8.64	54	30.56	27.68	14.15	27.03	100	122	Α	V



BLE	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
		(MHz)	(dBµV/m)	(dB)	Line (dBµV/m)	Level (dBµV)	Factor ( dB/m )	Loss (dB)	Factor (dB)	Pos ( cm )	Pos ( deg )	Avg. (P/A)	(H/V)
	*	2480	101.63	-	-	86.87	27.66	14.14	27.04	348	134	Р	Н
	*	2480	99.7	-	-	84.94	27.66	14.14	27.04	348	134	А	Н
		2499.04	55.96	-18.04	74	41.13	27.7	14.16	27.03	348	134	Р	Н
BLE CH 39 2480MHz		2493.04	45.51	-8.49	54	30.7	27.69	14.15	27.03	348	134	А	Н
	*	2480	102.72	-	-	87.96	27.66	14.14	27.04	100	65	Р	V
	*	2480	100.76	-	-	86	27.66	14.14	27.04	100	65	А	V
		2488.08	55.53	-18.47	74	40.73	27.68	14.15	27.03	100	65	Р	V
		2483.56	45.51	-8.49	54	30.73	27.67	14.15	27.04	100	65	А	V
Remark	1. No 2. All	o other spurious I results are PA	s found. SS against F	Peak and	Average lim	it line.							·



BLE	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
		(MHz)	(dBµV/m)	(dB)	Line (dBµV/m)	Level (dBµV)	Factor ( dB/m )	Loss (dB)	Factor (dB)	Pos ( cm )	Pos ( deg )	Avg. (P/A)	(H/V)
		4804	40.05	-33.95	74	59.19	31.41	6.79	57.34	-	-	Ρ	Н
		10890	49.39	-24.61	74	54.93	40.88	9.99	56.41	-	-	Ρ	Н
		10890	38.05	-15.95	54	43.59	40.88	9.99	56.41	-	-	А	Н
		14475	49.7	-24.3	74	52.98	41.8	11.76	56.84	-	-	Ρ	Н
		14475	40.45	-13.55	54	43.73	41.8	11.76	56.84	-	-	А	Н
BLE		17985	56.61	-17.39	74	52	48.1	13.54	57.03	-	-	Ρ	Н
		17985	46.79	-7.21	54	42.18	48.1	13.54	57.03	-	-	А	Н
		4804	39.49	-34.51	74	58.63	31.41	6.79	57.34	-	-	Ρ	V
240211172		11025	48.43	-25.57	74	54.17	40.58	10.07	56.39	-	-	Ρ	V
		11025	38.04	-15.96	54	43.78	40.58	10.07	56.39	-	-	А	V
		14490	49.87	-24.13	74	53.05	41.86	11.77	56.81	-	-	Ρ	V
		14490	40.73	-13.27	54	43.91	41.86	11.77	56.81	-	-	А	V
		17985	56.38	-17.62	74	51.77	48.1	13.54	57.03	-	-	Ρ	V
		17985	46.77	-7.23	54	42.16	48.1	13.54	57.03	-	-	А	V

## 2.4GHz 2400~2483.5MHz BLE (Harmonic @ 3m)



BLE	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
		(MHz)	(dBµV/m)	(dB)	Line (dBµV/m)	Level (dBµV)	Factor (dB/m)	Loss (dB)	Factor (dB)	Pos ( cm )	Pos ( deg )	Avg. (P/A)	(H/V)
		4880	38.69	-35.31	74	57.65	31.44	6.82	57.22	-	-	Ρ	Н
		7320	44.23	-29.77	74	56.05	37.06	8.46	57.34	-	-	Ρ	Н
		10695	49.35	-24.65	74	55.37	40.49	9.89	56.4	-	-	Ρ	Н
		10695	37.79	-16.21	54	43.81	40.49	9.89	56.4	-	-	А	Н
		14490	49.93	-24.07	74	53.11	41.86	11.77	56.81	-	-	Ρ	Н
		14490	40.61	-13.39	54	43.79	41.86	11.77	56.81	-	-	А	Н
BLE		17985	56.43	-17.57	74	51.82	48.1	13.54	57.03	-	-	Ρ	Н
		17985	46.45	-7.55	54	41.84	48.1	13.54	57.03	-	-	А	Н
CH 19		4880	40.45	-33.55	74	59.41	31.44	6.82	57.22	-	-	Ρ	V
2440101112		7320	44.87	-29.13	74	56.69	37.06	8.46	57.34	-	-	Р	V
		10725	49.13	-24.87	74	55.08	40.55	9.9	56.4	-	-	Р	V
		10725	37.9	-16.1	54	43.85	40.55	9.9	56.4	-	-	А	V
		14490	49.97	-24.03	74	53.15	41.86	11.77	56.81	-	-	Р	V
		14490	39.74	-14.26	54	42.92	41.86	11.77	56.81	-	-	А	V
		17985	56.29	-17.71	74	51.68	48.1	13.54	57.03	-	-	Ρ	V
		17985	46.71	-7.29	54	42.1	48.1	13.54	57.03	-	-	А	V



BLE	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
		/ <b></b> .		/ <b></b> \	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHZ)	(dBµV/m)	(dB)	(dBµV/m)	(dBhA)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
		4960	41.15	-32.85	74	59.67	31.72	6.86	57.1	-	-	Р	Н
		7440	44.79	-29.21	74	56.76	37.02	8.53	57.52	-	-	Р	Н
		10950	48.82	-25.18	74	54.4	40.8	10.03	56.41	-	-	Р	Н
		10950	38	-16	54	43.58	40.8	10.03	56.41	-	-	Α	Н
		14475	49.58	-24.42	74	52.86	41.8	11.76	56.84	-	-	Р	Н
		14475	40.01	-13.99	54	43.29	41.8	11.76	56.84	-	-	А	Н
		18000	55.82	-18.18	74	50.8	48.5	13.55	57.03	-	-	Р	Н
BLE CH 39 2480MHz		18000	46.89	-7.11	54	41.87	48.5	13.55	57.03	-	-	А	Н
		4960	40.04	-33.96	74	58.56	31.72	6.86	57.1	-	-	Ρ	V
		7440	44.95	-29.05	74	56.92	37.02	8.53	57.52	-	-	Р	V
		10890	48.64	-25.36	74	54.18	40.88	9.99	56.41	-	-	Ρ	V
		10890	37.75	-16.25	54	43.29	40.88	9.99	56.41	-	-	А	V
		14490	50.18	-23.82	74	53.36	41.86	11.77	56.81	-	-	Р	V
		14490	39.59	-14.41	54	42.77	41.86	11.77	56.81	-	-	А	V
		18000	56.73	-17.27	74	51.71	48.5	13.55	57.03	-	-	Р	V
		18000	47.58	-6.42	54	42.56	48.5	13.55	57.03	-	-	А	V
	1. No	o other spurious	s found.										
	2. Al	l results are PA	SS against F	Peak and	Average lim	it line.							
Remark	3. Th	e emission pos	ition marked	as "-" m	eans no sus	pected em	ission found	d with suf	ficient mar	gin agai	nst limit	line or	noise
	flo	or only.											

4. The emission level close to 18GHz is checked that the average emission level is noise floor only.



### Note symbol

*	Fundamental Frequency which can be ignored. However, the level of any unwanted emissions shall not
	exceed the level of the fundamental frequency.
!	Test result is <b>over limit</b> line.
P/A	Peak or Average
H/V	Horizontal or Vertical



### A calculation example for radiated spurious emission is shown as below:

BLE	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBµV/m)	( dB )	(dBµV/m)	(dBµV)	( dB/m )	( dB )	( dB )	( cm )	(deg)	(P/A)	(H/V)
BLE		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	Р	н
CH 00													
2402MHz		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	Н

- 1. Path Loss(dB) = Cable loss(dB) + Filter loss(dB) + Attenuator loss(dB)
- 2. Level( $dB\mu V/m$ ) =

Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBµV) - Preamp Factor(dB)

3. Over Limit(dB) = Level(dB $\mu$ V/m) – Limit Line(dB $\mu$ V/m)

#### For Peak Limit @ 2390MHz:

- 1. Level(dB $\mu$ V/m)
- = Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBµV) Preamp Factor(dB)
- = 32.22(dB/m) + 4.58(dB) + 54.51(dBµV) 35.86 (dB)
- = 55.45 (dBµV/m)
- 2. Over Limit(dB)
- = Level(dB $\mu$ V/m) Limit Line(dB $\mu$ V/m)
- $= 55.45(dB\mu V/m) 74(dB\mu V/m)$
- = -18.55(dB)

### For Average Limit @ 2390MHz:

- 1. Level(dBµV/m)
- = Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBµV) Preamp Factor(dB)
- = 32.22(dB/m) + 4.58(dB) + 42.6(dBµV) 35.86 (dB)
- = 43.54 (dBµV/m)
- 2. Over Limit(dB)
- = Level(dB $\mu$ V/m) Limit Line(dB $\mu$ V/m)
- $= 43.54(dB\mu V/m) 54(dB\mu V/m)$
- = -10.46(dB)

#### Both peak and average measured complies with the limit line, so test result is "PASS".



# Appendix D. Radiated Spurious Emission Plots

Tost Engineer :	Rain Lee and Jacky Hong	Temperature :	20~25°C
Test Engineer .		Relative Humidity :	50~60%

## Note symbol

-L	Low channel location
-R	High channel location



### <1Mbps>

### 2.4GHz 2400~2483.5MHz

### BLE (Band Edge @ 3m)













BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m						
	BLE CH19 2440MHz - R						
	Horizontal	Fundamental					
Peak	100     100 <th 100<="" th="" th<=""><th>Left blank</th></th>	<th>Left blank</th>	Left blank				
Avg.	100 <th>Left blank</th>	Left blank					







BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m						
	BLE CH19 2440MHz - R						
	Vertical	Fundamental					
Peak	Inter-2020 00   Inter-2020 00	Left blank					
Avg.	101   202.02.00     100   101     100   100     100	Left blank					











### 2.4GHz 2400~2483.5MHz

## BLE (Harmonic @ 3m)













### Emission after 18GHz

## 2.4GHz BLE (SHF @ 1m)





### Emission below 1GHz



2.4GHz BLE (LF)



### <2Mbps>

#### 2.4GHz 2400~2483.5MHz

### BLE (Band Edge @ 3m)





















BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m						
	BLE CH19 2440MHz - R						
	Vertical	Fundamental					
Peak	Image: State of the state o	Left blank					
Avg.	100 100 100 100 100 100   100 100 100 100 100 100 100   100 100 100 100 100 100 100   100 100 100 100 100 100 100	Left blank					











### 2.4GHz 2400~2483.5MHz

## BLE (Harmonic @ 3m)









