

TEST RESULTS DATA
6dB and 99% Occupied Bandwidth

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	99% Occupied BW (MHz)	6dB BW (MHz)	6dB BW Limit (MHz)	Pass/Fail
LoRa 500kHz	SF8	1	1	902.5	0.537	0.637	0.50	Pass
LoRa 500kHz	SF8	1	16	914.5	0.541	0.637	0.50	Pass
LoRa 500kHz	SF8	1	31	926.5	0.543	0.637	0.50	Pass

TEST RESULTS DATA
Average Power Table

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
LoRa 500kHz	SF8	1	1	902.5	12.30	30.00	0.73	13.03	36.00	Pass
LoRa 500kHz	SF8	1	16	914.5	19.30	30.00	0.73	20.03	36.00	Pass
LoRa 500kHz	SF8	1	31	926.5	18.99	30.00	0.73	19.72	36.00	Pass

TEST RESULTS DATA
Average Power Density

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak PSD (dBm /100kHz)	Average PSD (dBm /3kHz)	DG (dBi)	Average PSD Limit (dBm /3kHz)	Pass/Fail
LoRa 500kHz	SF8	1	1	902.5	12.45	-6.68	0.73	8.00	Pass
LoRa 500kHz	SF8	1	16	914.5	19.40	0.15	0.73	8.00	Pass
LoRa 500kHz	SF8	1	31	926.5	18.96	-0.54	0.73	8.00	Pass

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

TEST RESULTS DATA
6dB and 99% Occupied Bandwidth

Mod.	Data Rate	Ntx	CH.	Freq. (MHz)	99% Occupied BW (MHz)	6dB BW (MHz)	6dB BW Limit (MHz)	Pass/Fail
LoRa 500kHz	SF9	1	1	902.5	0.545	0.641	0.50	Pass
LoRa 500kHz	SF9	1	16	914.5	0.543	0.641	0.50	Pass
LoRa 500kHz	SF9	1	31	926.5	0.545	0.643	0.50	Pass

TEST RESULTS DATA
Average Power Table

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
LoRa 500kHz	SF9	1	1	902.5	12.28	30.00	0.73	13.01	36.00	Pass
LoRa 500kHz	SF9	1	16	914.5	19.31	30.00	0.73	20.04	36.00	Pass
LoRa 500kHz	SF9	1	31	926.5	18.98	30.00	0.73	19.71	36.00	Pass

TEST RESULTS DATA
Average Power Density

Mod.	Data Rate	Ntx	CH.	Freq. (MHz)	Peak PSD (dBm /100kHz)	Average PSD (dBm /3kHz)	DG (dBi)	Average PSD Limit (dBm /3kHz)	Pass/Fail
LoRa 500kHz	SF9	1	1	902.5	12.38	-7.51	0.73	8.00	Pass
LoRa 500kHz	SF9	1	16	914.5	19.33	-0.29	0.73	8.00	Pass
LoRa 500kHz	SF9	1	31	926.5	19.00	-0.69	0.73	8.00	Pass

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

TEST RESULTS DATA
6dB and 99% Occupied Bandwidth

Mod.	Data Rate	Ntx	CH.	Freq. (MHz)	99% Occupied BW (MHz)	6dB BW (MHz)	6dB BW Limit (MHz)	Pass/Fail
LoRa 500kHz	SF10	1	1	902.5	0.545	0.645	0.50	Pass
LoRa 500kHz	SF10	1	16	914.5	0.543	0.645	0.50	Pass
LoRa 500kHz	SF10	1	31	926.5	0.545	0.647	0.50	Pass

TEST RESULTS DATA
Average Power Table

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
LoRa 500kHz	SF10	1	1	902.5	12.25	30.00	0.73	12.98	36.00	Pass
LoRa 500kHz	SF10	1	16	914.5	19.28	30.00	0.73	20.01	36.00	Pass
LoRa 500kHz	SF10	1	31	926.5	18.95	30.00	0.73	19.68	36.00	Pass

TEST RESULTS DATA
Average Power Density

Mod.	Data Rate	Ntx	CH.	Freq. (MHz)	Peak PSD (dBm /100kHz)	Average PSD (dBm /3kHz)	DG (dBi)	Average PSD Limit (dBm /3kHz)	Pass/Fail
LoRa 500kHz	SF10	1	1	902.5	12.40	-6.62	0.73	8.00	Pass
LoRa 500kHz	SF10	1	16	914.5	19.35	1.03	0.73	8.00	Pass
LoRa 500kHz	SF10	1	31	926.5	19.03	0.22	0.73	8.00	Pass

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

TEST RESULTS DATA
6dB and 99% Occupied Bandwidth

Mod.	Data Rate	Ntx	CH.	Freq. (MHz)	99% Occupied BW (MHz)	6dB BW (MHz)	6dB BW Limit (MHz)	Pass/Fail
LoRa 500kHz	SF11	1	1	902.5	0.543	0.645	0.50	Pass
LoRa 500kHz	SF11	1	16	914.5	0.545	0.645	0.50	Pass
LoRa 500kHz	SF11	1	31	926.5	0.543	0.647	0.50	Pass

TEST RESULTS DATA
Average Power Table

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
LoRa 500kHz	SF11	1	1	902.5	12.27	30.00	0.73	13.00	36.00	Pass
LoRa 500kHz	SF11	1	16	914.5	19.28	30.00	0.73	20.01	36.00	Pass
LoRa 500kHz	SF11	1	31	926.5	18.96	30.00	0.73	19.69	36.00	Pass

TEST RESULTS DATA
Average Power Density

Mod.	Data Rate	Ntx	CH.	Freq. (MHz)	Peak PSD (dBm /100kHz)	Average PSD (dBm /3kHz)	DG (dBi)	Average PSD Limit (dBm /3kHz)	Pass/Fail
LoRa 500kHz	SF11	1	1	902.5	12.42	-5.75	0.73	8.00	Pass
LoRa 500kHz	SF11	1	16	914.5	19.37	1.55	0.73	8.00	Pass
LoRa 500kHz	SF11	1	31	926.5	19.04	0.80	0.73	8.00	Pass

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



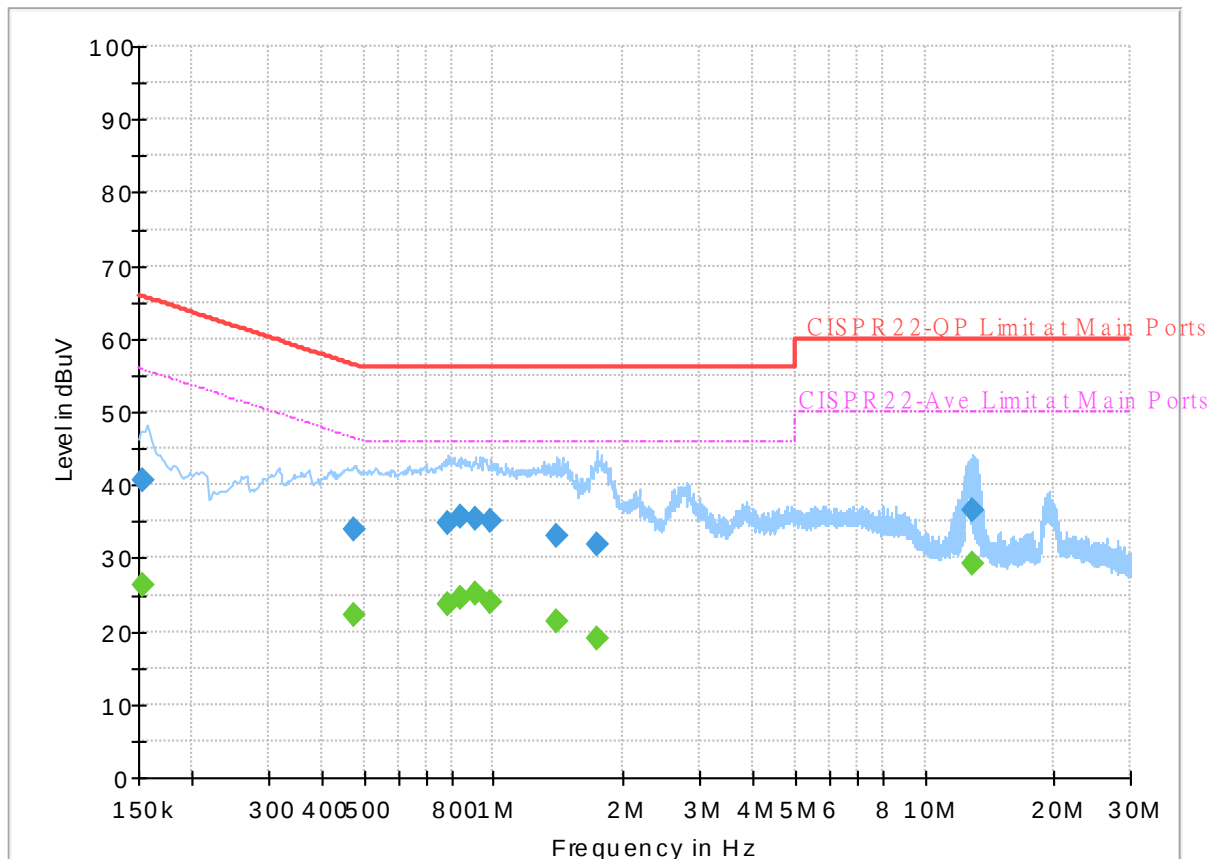
Appendix B. AC Conducted Emission Test Results

Test Engineer :	Louis Chung	Temperature :	23~26℃
		Relative Humidity :	45~55%

EUT Information

Report NO : 240817
Test Mode : Mode 1
Test Voltage : 120Vac/60Hz
Phase : Line

Full Spectrum



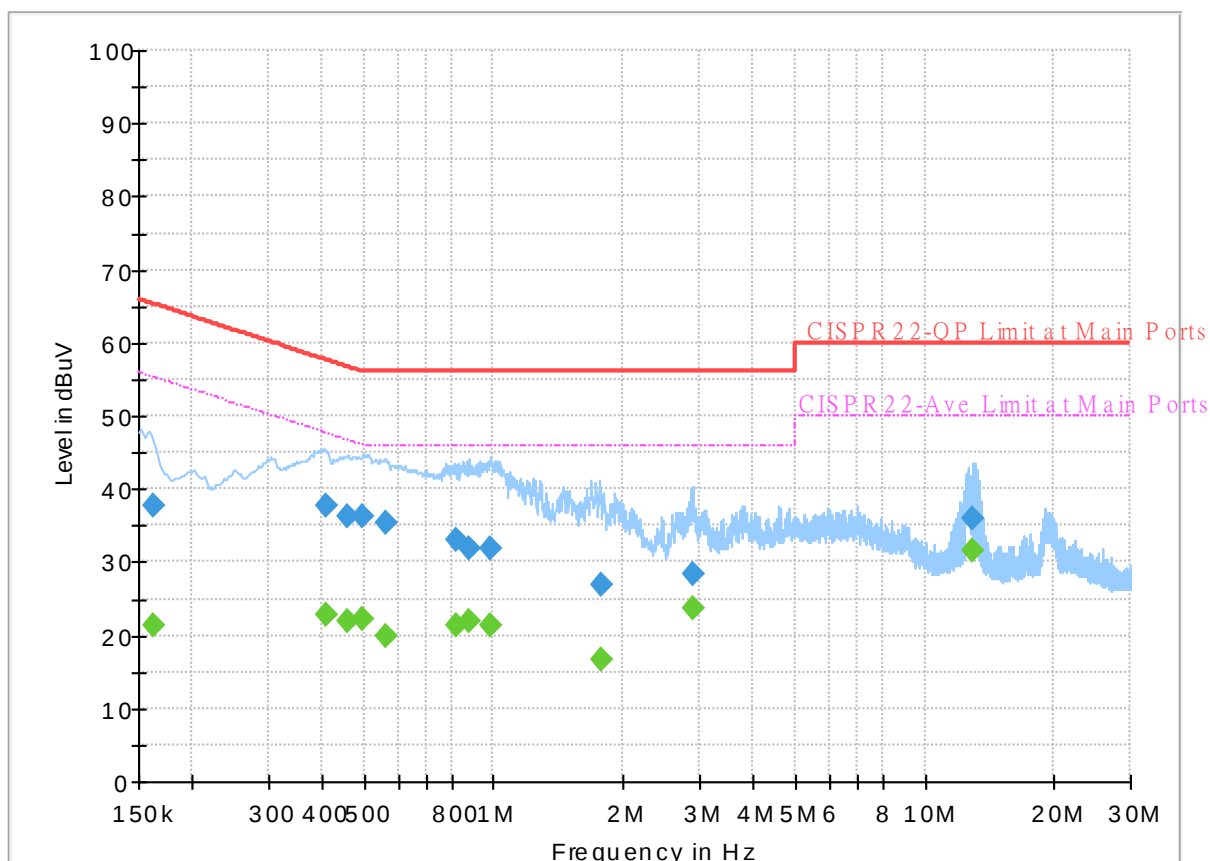
Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.152790	---	26.31	55.85	29.54	L1	OFF	19.7
0.152790	40.61	---	65.85	25.24	L1	OFF	19.7
0.474810	---	22.34	46.43	24.09	L1	OFF	19.7
0.474810	34.06	---	56.43	22.37	L1	OFF	19.7
0.784320	---	23.83	46.00	22.17	L1	OFF	19.7
0.784320	34.73	---	56.00	21.27	L1	OFF	19.7
0.841560	---	24.66	46.00	21.34	L1	OFF	19.7
0.841560	35.73	---	56.00	20.27	L1	OFF	19.7
0.904650	---	25.02	46.00	20.98	L1	OFF	19.7
0.904650	35.41	---	56.00	20.59	L1	OFF	19.7
0.978000	---	24.11	46.00	21.89	L1	OFF	19.7
0.978000	35.13	---	56.00	20.87	L1	OFF	19.7
1.402620	---	21.22	46.00	24.78	L1	OFF	19.7
1.402620	33.16	---	56.00	22.84	L1	OFF	19.7
1.743000	---	19.13	46.00	26.87	L1	OFF	19.7
1.743000	31.90	---	56.00	24.10	L1	OFF	19.7
12.853860	---	29.27	50.00	20.73	L1	OFF	19.9
12.853860	36.40	---	60.00	23.60	L1	OFF	19.9

EUT Information

Report NO : 240817
 Test Mode : Mode 1
 Test Voltage : 120Vac/60Hz
 Phase : Neutral

Full Spectrum



Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.162690	---	21.37	55.33	33.96	N	OFF	19.7
0.162690	37.72	---	65.33	27.61	N	OFF	19.7
0.408480	---	22.76	47.68	24.92	N	OFF	19.7
0.408480	37.62	---	57.68	20.06	N	OFF	19.7
0.456630	---	21.85	46.75	24.90	N	OFF	19.7
0.456630	36.37	---	56.75	20.38	N	OFF	19.7
0.495780	---	22.12	46.07	23.95	N	OFF	19.7
0.495780	36.27	---	56.07	19.80	N	OFF	19.7
0.561750	---	19.95	46.00	26.05	N	OFF	19.7
0.561750	35.34	---	56.00	20.66	N	OFF	19.7
0.816000	---	21.41	46.00	24.59	N	OFF	19.7
0.816000	32.97	---	56.00	23.03	N	OFF	19.7
0.877110	---	21.97	46.00	24.03	N	OFF	19.7
0.877110	32.00	---	56.00	24.00	N	OFF	19.7
0.980340	---	21.45	46.00	24.55	N	OFF	19.7
0.980340	31.75	---	56.00	24.25	N	OFF	19.7
1.770000	---	16.71	46.00	29.29	N	OFF	19.7
1.770000	27.05	---	56.00	28.95	N	OFF	19.7
2.902740	---	23.57	46.00	22.43	N	OFF	19.7

2.902740	28.48	---	56.00	27.52	N	OFF	19.7
12.968250	---	31.65	50.00	18.35	N	OFF	19.9
12.968250	35.89	---	60.00	24.11	N	OFF	19.9



Appendix C. Radiated Spurious Emission

Test Engineer :	Jack Cheng and Lance Chiang	Temperature :	22~26°C
		Relative Humidity :	59~66%

LoRa 902~928MHz

LoRa(500KHz)_SF5 (Harmonic @ 3m)

LoRa	Note	Frequency (MHz)	Level (dBμV/m)	Margin (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
LoRa (500KHz)_ SF5 Ch01 902.5MHz		2707.5	48.54	-25.46	74	46.41	28.17	7.49	33.53	-	-	P	H
		3610	39.27	-34.73	74	67.08	29.22	9.91	66.94	-	-	P	H
		4512.5	41.54	-32.46	74	67.45	30.65	10.74	67.3	-	-	P	H
		5415	38.49	-35.51	74	61.34	31.76	11.66	66.27	-	-	P	H
		8122.5	44.4	-29.6	74	59.56	36.76	14.46	66.38	-	-	P	H
		9025	46.96	-27.04	74	61.58	37.75	15.1	67.47	-	-	P	H
													H
		2707.5	48.67	-25.33	74	46.54	28.17	7.49	33.53	-	-	P	V
		3610	39.7	-34.3	74	67.51	29.22	9.91	66.94	-	-	P	V
		4512.5	40.04	-33.96	74	65.95	30.65	10.74	67.3	-	-	P	V
		5415	38.58	-35.42	74	61.43	31.76	11.66	66.27	-	-	P	V
		8122.5	45.16	-28.84	74	60.32	36.76	14.46	66.38	-	-	P	V
		9025	46.41	-27.59	74	61.03	37.75	15.1	67.47	-	-	P	V
													V



LoRa (500KHz)_ SF5 Ch16 914.5MHz		2743.5	48.81	-25.19	74	46.74	28.03	7.56	33.52	-	-	P	H
		3658	39.11	-34.89	74	66.83	29.32	9.94	66.98	-	-	P	H
		4572.5	40.45	-33.55	74	65.86	30.93	10.89	67.23	-	-	P	H
		7316	53.75	-20.25	74	69.81	36.36	13.53	65.95	238	300	P	H
		7316	47.37	-6.63	54	63.43	36.36	13.53	65.95	238	300	A	H
		8230.5	43.65	-30.35	74	59.14	36.54	14.48	66.51	-	-	P	H
		9145	46.61	-27.39	74	60.82	38.09	15.19	67.49	-	-	P	H
		2743.5	48.77	-25.23	74	46.7	28.03	7.56	33.52	-	-	P	V
		3658	38.61	-35.39	74	66.33	29.32	9.94	66.98	-	-	P	V
		4572.5	41.12	-32.88	74	66.53	30.93	10.89	67.23	-	-	P	V
		7316	54.28	-19.72	74	70.34	36.36	13.53	65.95	399	181	P	V
		7316	47.81	-6.19	54	63.87	36.36	13.53	65.95	399	181	A	V
		8230.5	47.39	-26.61	74	62.88	36.54	14.48	66.51	-	-	P	V
		9145	47.4	-26.6	74	61.61	38.09	15.19	67.49	-	-	P	V
LoRa (500KHz)_ SF5 Ch31 926.5MHz		2779.5	48.7	-25.3	74	46.58	28	7.62	33.5	-	-	P	H
		3706	40.59	-33.41	74	68.23	29.42	9.96	67.02	-	-	P	H
		4632.5	40.45	-33.55	74	65.43	31.23	10.95	67.16	-	-	P	H
		7412	52.88	-21.12	74	68.62	36.7	13.63	66.07	266	312	P	H
		7412	43.8	-10.2	54	59.54	36.7	13.63	66.07	266	312	A	H
		8338.5	44.82	-29.18	74	60.49	36.42	14.54	66.63			P	H
													H
		2779.5	48.91	-25.09	74	46.79	28	7.62	33.5	-	-	P	V
		3706	39.71	-34.29	74	67.35	29.42	9.96	67.02	-	-	P	V
		4632.5	39.65	-34.35	74	64.63	31.23	10.95	67.16	-	-	P	V
		7412	52.26	-21.74	74	68	36.7	13.63	66.07	100	286	P	V
		7412	44.33	-9.67	54	60.07	36.7	13.63	66.07	100	286	A	V
		8338.5	44.2	-29.8	74	59.87	36.42	14.54	66.63	-	-	P	V
													V
Remark		1. No other spurious found. 2. All results are PASS against Peak and Average limit line. 3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.											

Emission below 1GHz

LoRa(500KHz)_SF5

[illegible]

LoRa	Note	Frequency (MHz)	Level (dBμV/m)	Margin (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
LoRa(500KHz) SF5 Ch16 914.5MHz		31.94	30.66	-9.34	40	29.42	23.15	10.74	32.65	-	-	P	H
		146.4	33.14	-10.36	43.5	36.89	17.18	11.63	32.56	-	-	P	H
		267.65	39.67	-6.33	46	40.59	19.38	12.23	32.53	-	-	P	H
		457.77	39.73	-6.27	46	35.99	23.34	12.94	32.54	-	-	P	H
		523.73	38.33	-7.67	46	33.59	24.13	13.16	32.55	-	-	P	H
		562.53	39.34	-6.66	46	32.46	26.18	13.26	32.56	-	-	P	H
	*	914.5	111.05	-	-	99.2	29.27	14.16	31.58	209	98	P	H
													H
													H
													H
													H
													H
		38.73	30.24	-9.76	40	31.94	20.06	10.88	32.64	100	45	QP	V
		44.55	35.47	-4.53	40	40.2	16.95	10.95	32.63	100	58	QP	V
		144.46	33.63	-9.87	43.5	37.41	17.16	11.62	32.56	-	-	P	V
		264.74	34.8	-11.2	46	35.29	19.82	12.22	32.53	-	-	P	V
		456.8	38.64	-7.36	46	34.92	23.32	12.94	32.54	-	-	P	V
		474.26	39.19	-6.81	46	35.12	23.61	13	32.54	-	-	P	V
	*	914.5	107.34	-	-	95.49	29.27	14.16	31.58	133	212	P	V
													V
												V	
												V	
												V	
												V	
												V	
Remark	1. No other spurious found.												
	2. All results are PASS against limit line.												
	3. Non restricted band limit is radio frequency level down 30db and the result which was 20dB lower than the limit line was not reported.												
	4. The emission position marked as “-” means no suspected emission found and emission level has at least 6dB margin against limit or emission is noise floor only.												

[illegible]



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 over limit line.
P/A	P eak or A verage
H/V	H orizontal or V ertical



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 CH 00 2402MHz		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. Path Loss(dB) = Cable loss(dB) + Filter loss(dB) + Attenuator loss(dB)
2. Level(dBμV/m) =
Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
3. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

For Peak 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) + 54.51(dBμV) – 35.86 (dB)
= 55.45 (dBμV/m)
2. Over Limit(dB)
= Level(dBμV/m) – Limit Line(dBμV/m)
= 55.45(dBμV/m) – 74(dBμV/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(dBμV/m) – Limit Line(dBμV/m)
= 43.54(dBμV/m) – 54(dBμV/m)
= -10.46(dB)

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

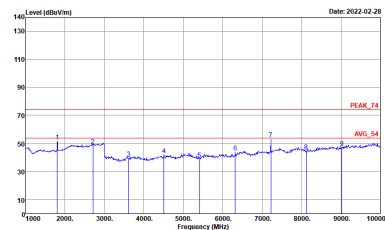
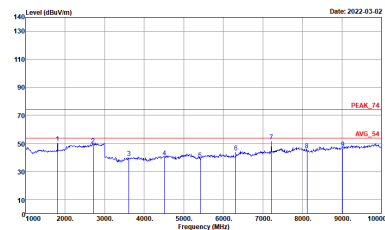


Appendix D. Radiated Spurious Emission Plots

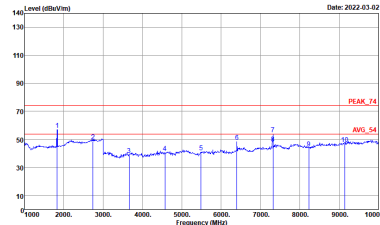
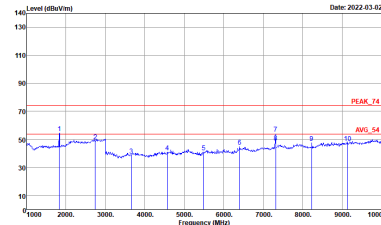
Test Engineer :	Jack Cheng and Lance Chiang	Temperature :	22~26°C
		Relative Humidity :	59~66%

902~928MHz

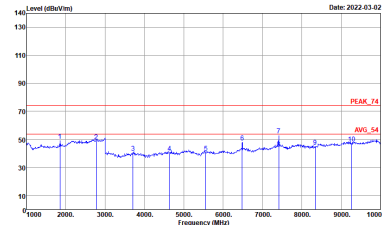
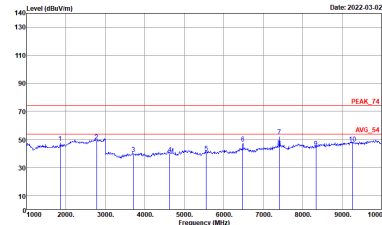
LoRa(500KHz)_SF5 (Harmonic @ 3m)

LoRa	902~928MHz Harmonic @ 3m	
	LoRa(500KHz)_SF5 Ch01 902.5MHz	
	Horizontal	Vertical
Peak Avg.	 Site : 03CH12-HY Condition : PEAK_74 3m HORN_91200_1328 HORIZONTAL	 Site : 03CH12-HY Condition : PEAK_74 3m HORN_91200_1328 VERTICAL

Remark: The unwanted signal of mark #1.6.7 in Horizontal plot and #1.6.7 in Vertical plot falls within the non-restricted band and meet the requirements of 15.247 (d).

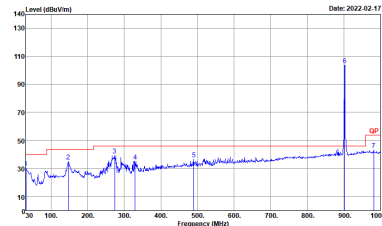
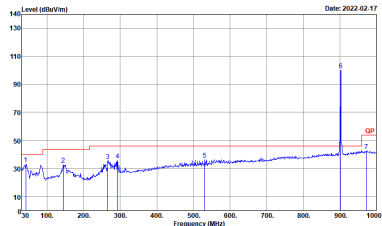
LoRa	902~928MHz Harmonic @ 3m	
	LoRa(500KHz)_SF5 Ch16 914.5MHz	
	Horizontal	Vertical
Peak Avg.	 Site : 03CH12-HY Condition : PEAK_74 3m HORN_91200_1328 HORIZONTAL	 Site : 03CH12-HY Condition : PEAK_74 3m HORN_91200_1328 VERTICAL

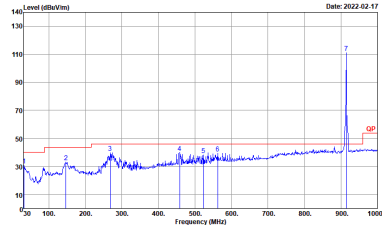
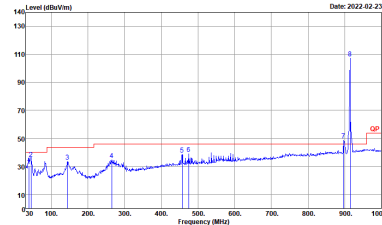
Remark: The unwanted signal of mark #1.5.6 in Horizontal plot and #1.5.6 in Vertical plot falls within the non-restricted band and meet the requirements of 15.247 (d).

LoRa	902~928MHz Harmonic @ 3m	
	LoRa(500KHz)_SF5 Ch31 926.5MHz	
	Horizontal	Vertical
Peak Avg.	 Site : 03CH12-HY Condition : PEAK_74 3m HORN_91200_1328 HORIZONTAL	 Site : 03CH12-HY Condition : PEAK_74 3m HORN_91200_1328 VERTICAL

Remark: The unwanted signal of mark #1.5.6.10 in Horizontal plot and #1.5.6.10 in Vertical plot falls within the non-restricted band and meet the requirements of 15.247 (d).

Emission below 1GHz
LoRa (500KHz)_SF5

LoRa	902~928MHz	
	LoRa(500KHz)_SF5 Ch01 902.5MHz LF	
	Horizontal	Vertical
QP / Peak	 Site : 03CH12-HY Condition : QP 3m BIL06_6111D_37059 HORIZONTAL	 Site : 03CH12-HY Condition : QP 3m BIL06_6111D_37059 VERTICAL

LoRa	902~928MHz	
	LoRa(500KHz)_SF5 Ch16 914.5MHz LF	
	Horizontal	Vertical
QP / Peak	 Site : 03CH12-HY Condition : QP 3m 81LO6_6111D_37059 HORIZONTAL	 Site : 03CH12-HY Condition : QP 3m 81LO6_6111D_37059 VERTICAL

Remark: The unwanted signal of mark #7 in Vertical plot falls within the non-restricted band and meet the requirements of 15.247 (d).



LoRa	902~928MHz	
	LoRa(500KHz)_SF5 Ch31 926.5MHz LF	
	Horizontal	Vertical
Peak Avg.	140 Level (dBm/Hz) Date: 2022-02-23 Site : 03CH12-HY Condition : QP 3m 81LO6_6111D_37059 HORIZONTAL	140 Level (dBm/Hz) Date: 2022-02-23 Site : 03CH12-HY Condition : QP 3m 81LO6_6111D_37059 VERTICAL



Appendix E. Duty Cycle Plots

Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
LoRa (500KHz)_SF5	92.50	10725	0.09	100Hz

