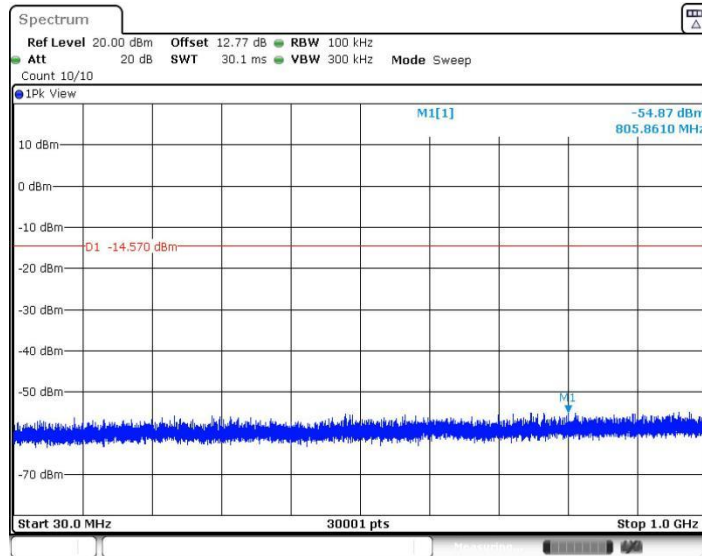
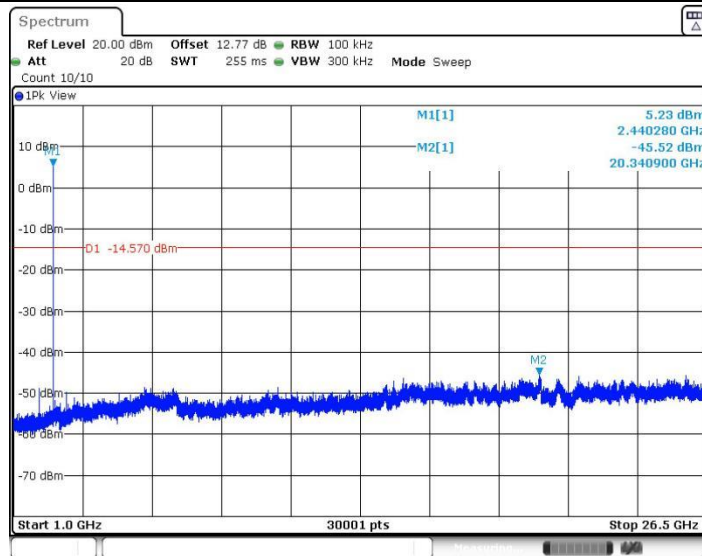




BLE_1M_Module 1 for Ant.9_2440_30~1000

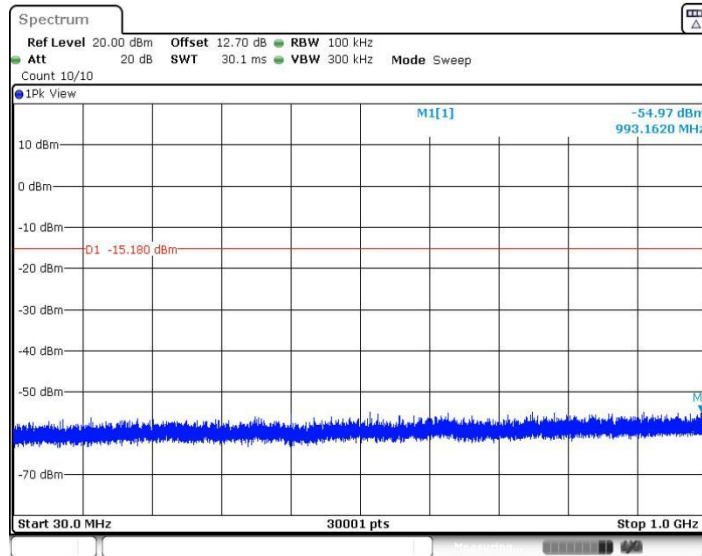


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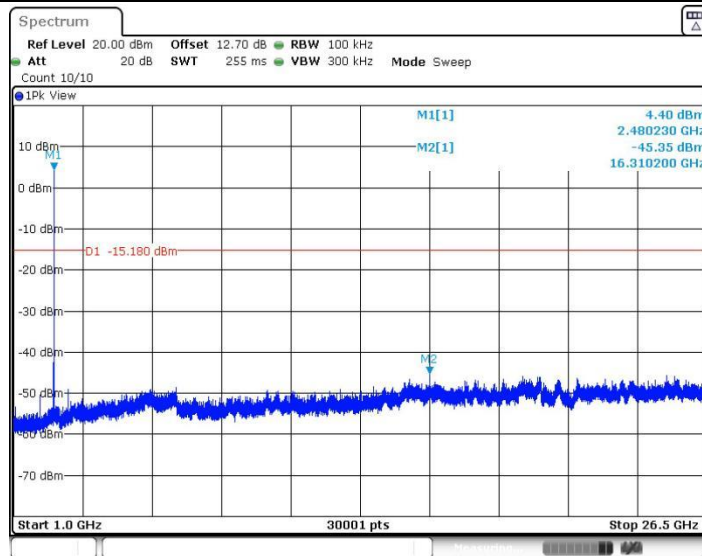




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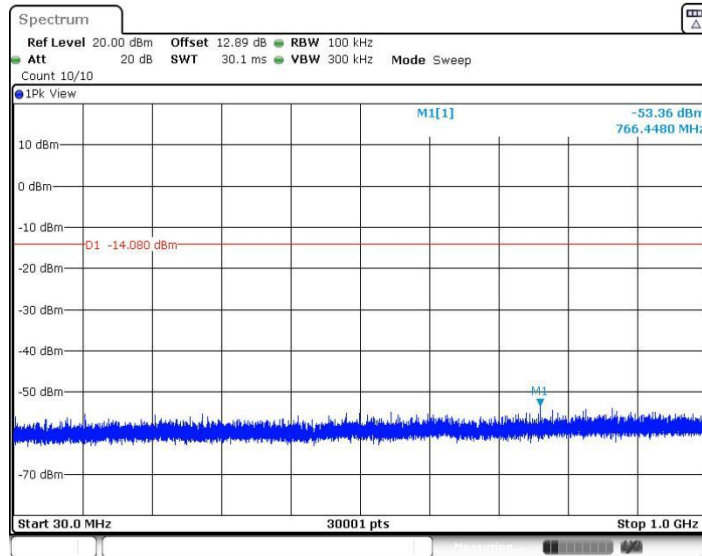


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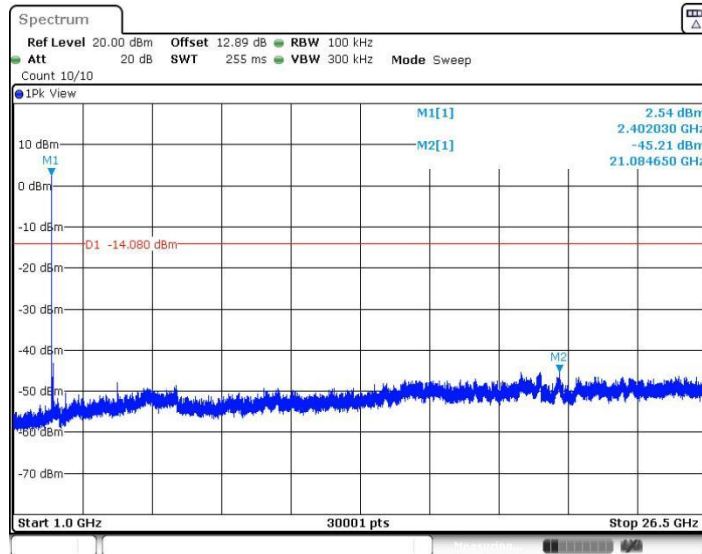




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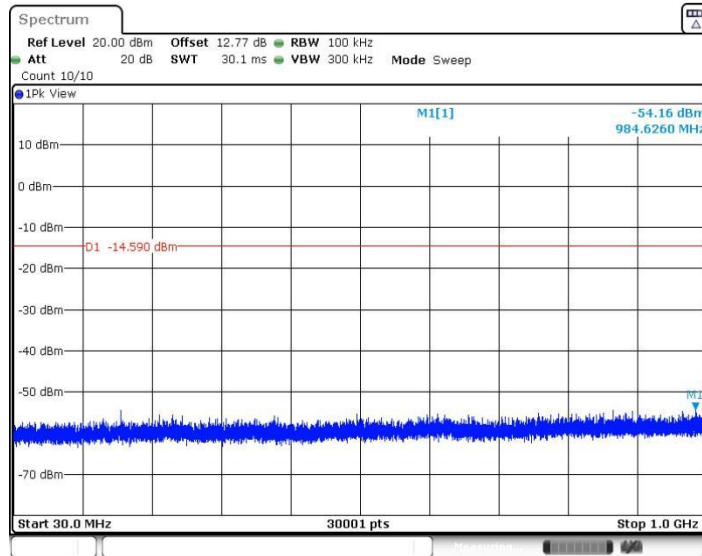


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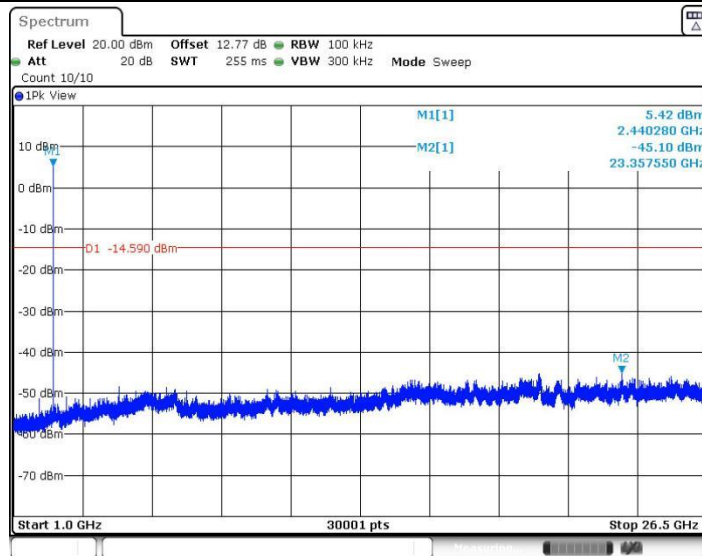




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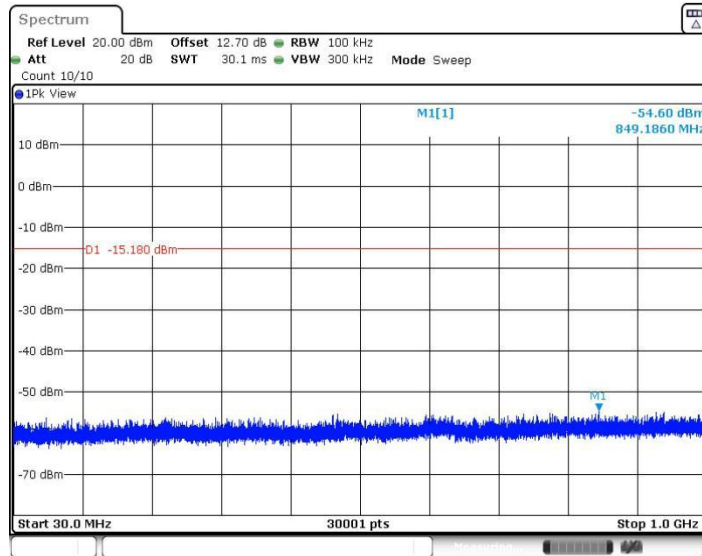


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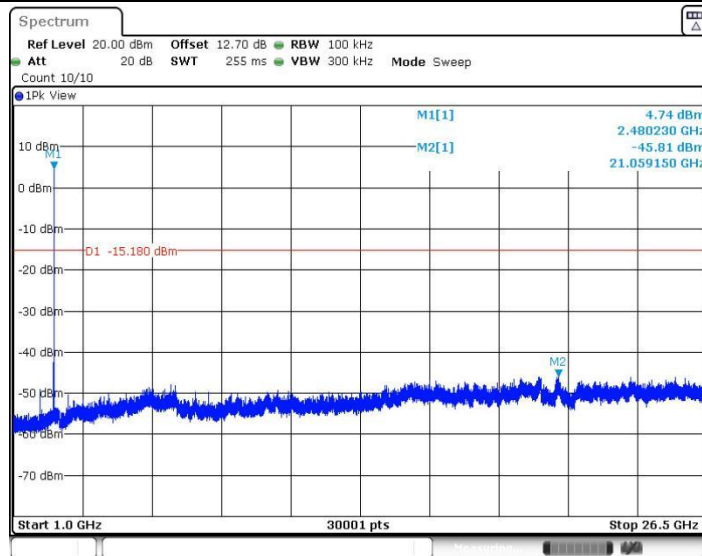




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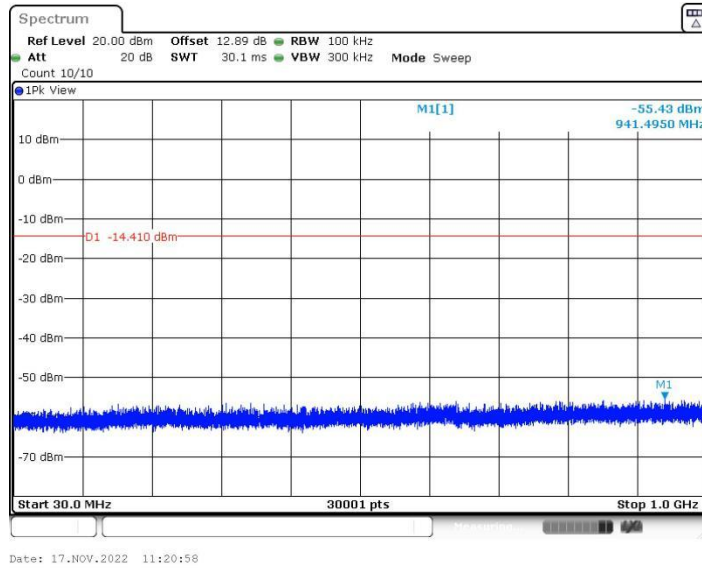


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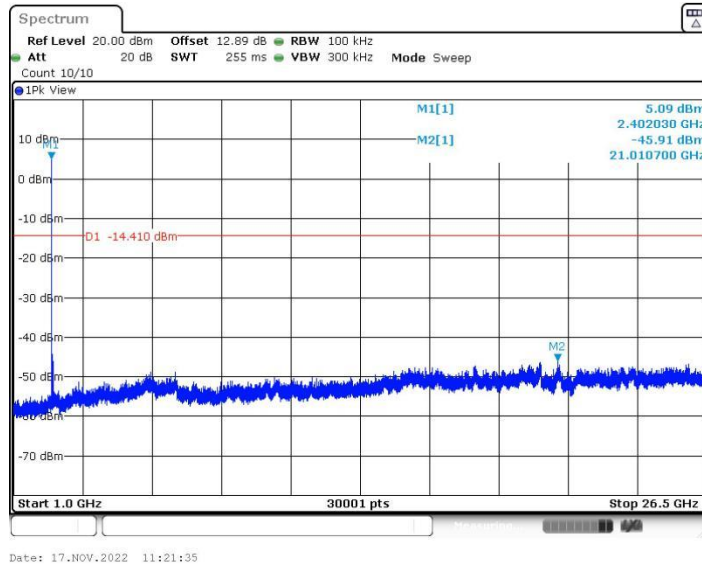




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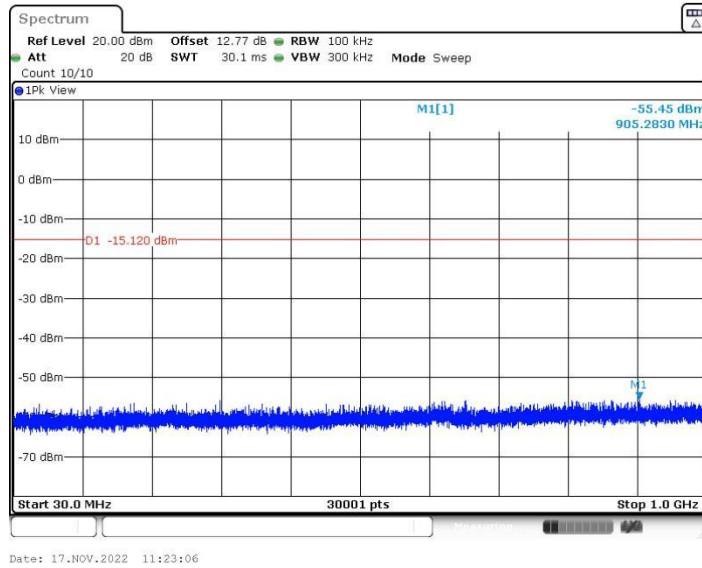


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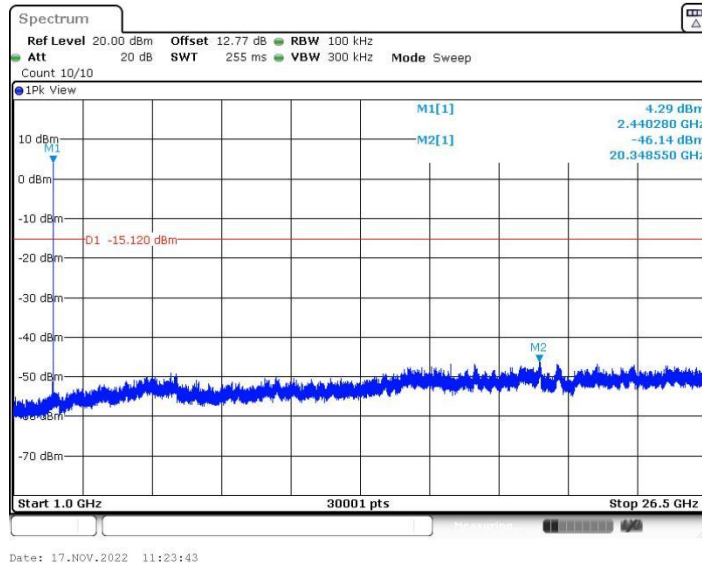




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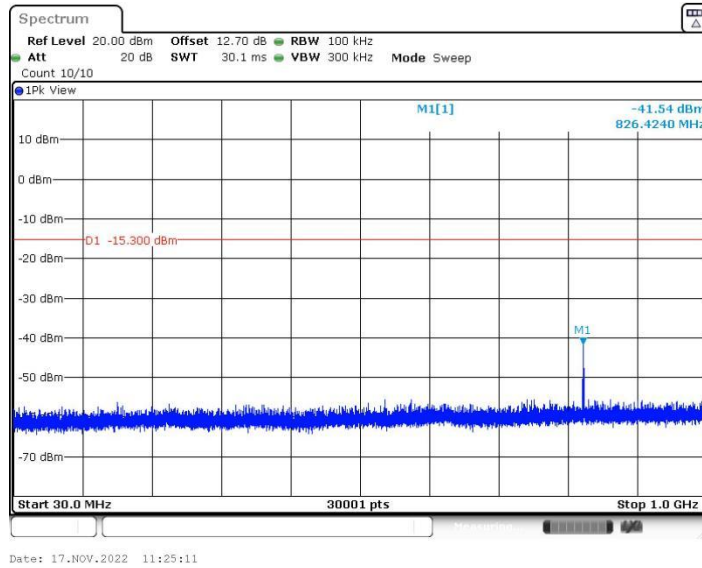


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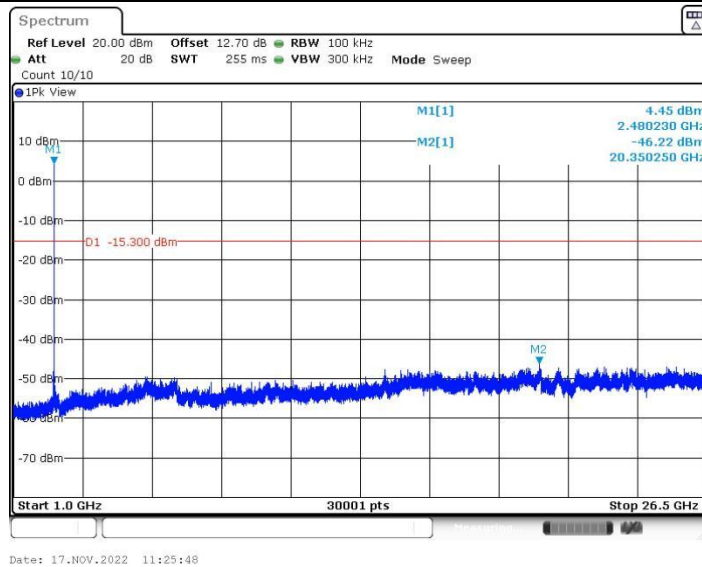




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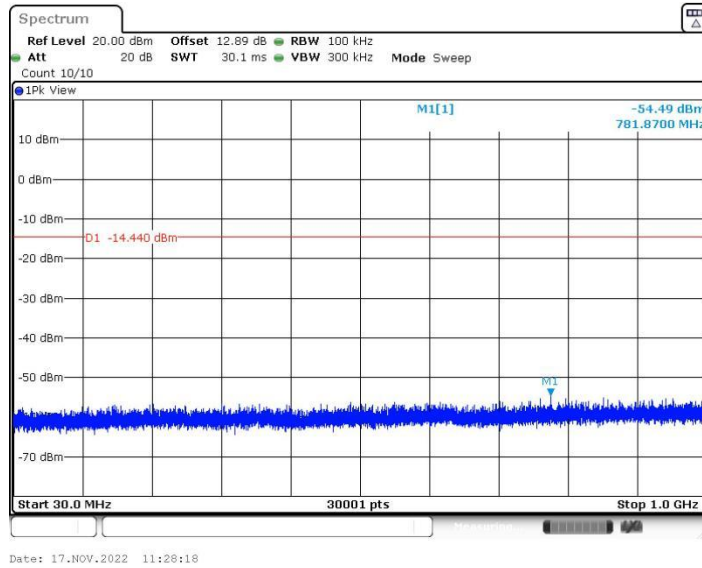


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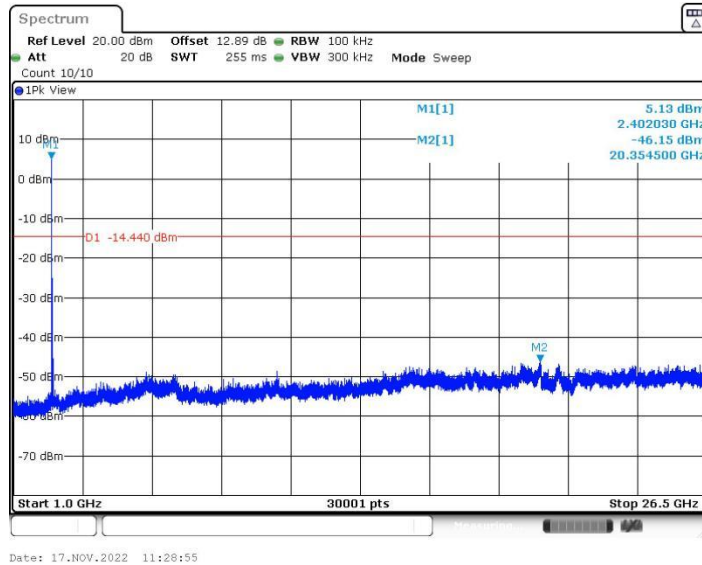




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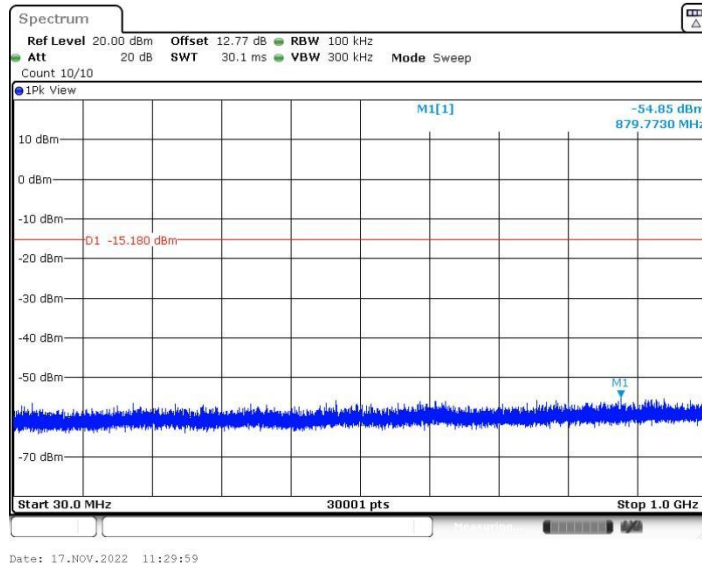


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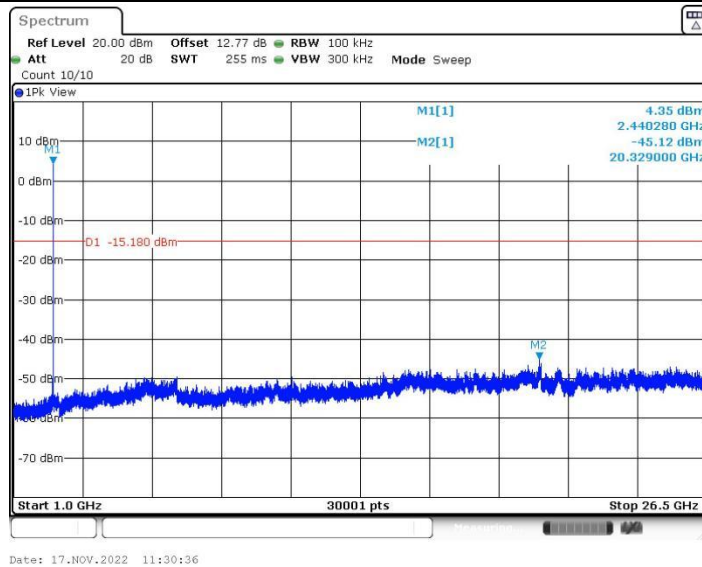




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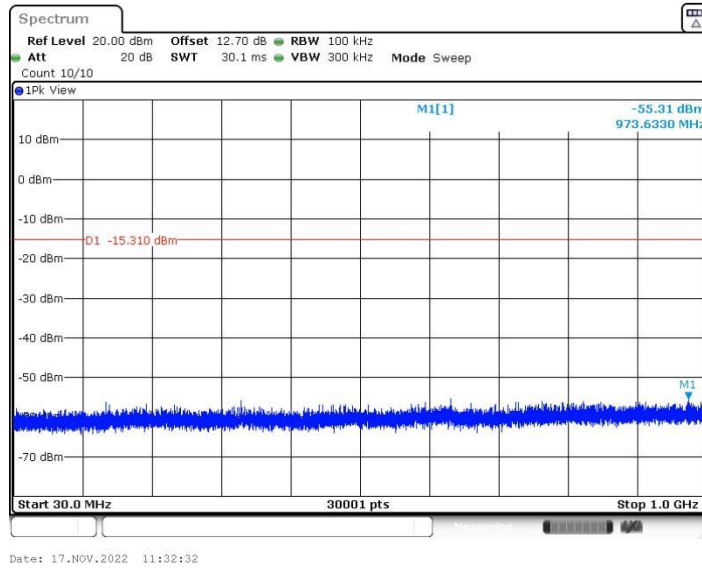


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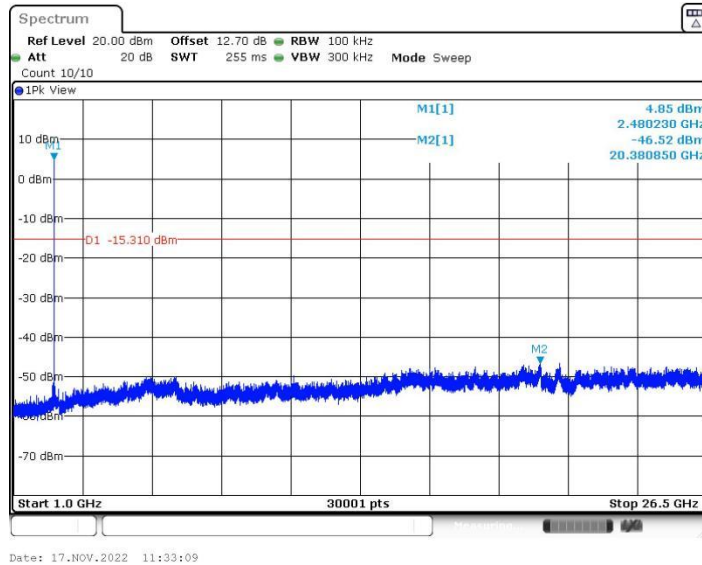




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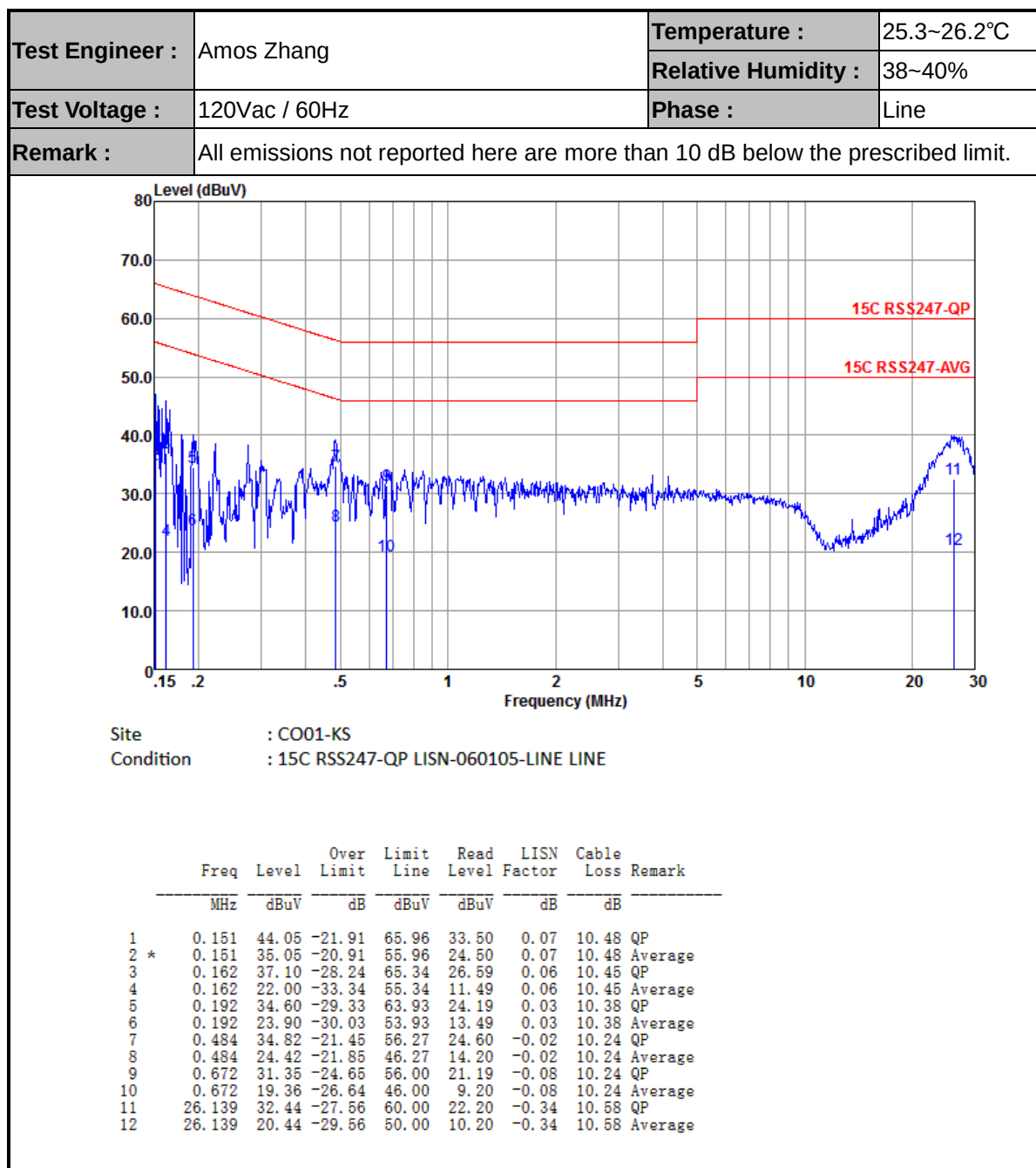


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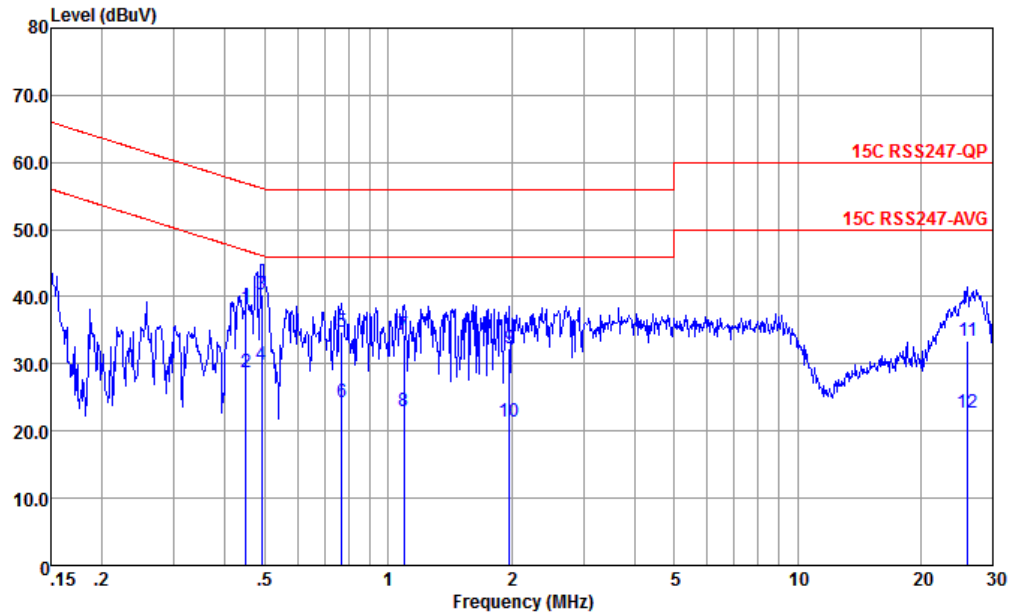


Appendix B. AC Conducted Emission Test Results





Test Engineer :	Amos Zhang	Temperature :	25.3~26.2°C
		Relative Humidity :	38~40%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Site : CO01-KS
Condition : 15C RSS247-QP LISN-060105-NEUTRAL NEUTRAL

	Freq	Level	Over	Limit	Read	LISN	Cable	Remark
	MHz	dBuV	Limit	Line	Level	Factor	Loss	
			dB	dBuV	dBuV	dB	dB	
1	0.449	38.38	-18.51	56.89	28.20	-0.07	10.25	QP
2	0.449	28.68	-18.21	46.89	18.50	-0.07	10.25	Average
3 *	0.491	40.36	-15.78	56.14	30.20	-0.08	10.24	QP
4	0.491	29.76	-16.38	46.14	19.60	-0.08	10.24	Average
5	0.771	34.74	-21.26	56.00	24.60	-0.10	10.24	QP
6	0.771	24.34	-21.66	46.00	14.20	-0.10	10.24	Average
7	1.094	34.32	-21.68	56.00	24.20	-0.11	10.23	QP
8	1.094	23.02	-22.98	46.00	12.90	-0.11	10.23	Average
9	1.980	32.31	-23.69	56.00	22.20	-0.12	10.23	QP
10	1.980	21.41	-24.59	46.00	11.30	-0.12	10.23	Average
11	26.001	33.43	-26.57	60.00	23.20	-0.35	10.58	QP
12	26.001	22.83	-27.17	50.00	12.60	-0.35	10.58	Average

Note:

1. Level(dBμV) = Read Level(dBμV) + LISN Factor(dB) + Cable Loss(dB)
2. Over Limit(dB) = Level(dBμV) – Limit Line(dBμV)



Appendix C. Radiated Spurious Emission

Only the worse cases are shown in the report.

< Module 1 for Ant.9 >

2.4GHz 2400~2483.5MHz

BLE—2Mbps (Band Edge @ 3m)

BLE	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (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)
BLE CH 00 2402MHz		2387.74	48.4	-25.6	74	45.41	32.4	7.1	36.51	100	127	P	H
		2388.52	39.5	-14.5	54	36.51	32.4	7.1	36.51	100	127	A	H
	*	2402	95.71	-	-	92.69	32.4	7.13	36.51	100	127	P	H
	*	2402	93.53	-	-	90.51	32.4	7.13	36.51	100	127	A	H
		2380.46	49.04	-24.96	74	46.18	32.31	7.1	36.55	100	77	P	V
		2324.95	39.76	-14.24	54	37.36	32.04	7.01	36.65	100	77	A	V
	*	2402	101.79	-	-	98.77	32.4	7.13	36.51	100	77	P	V
	*	2402	98.2	-	-	95.18	32.4	7.13	36.51	100	77	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz

BLE—2Mbps (Harmonic @ 3m)

BLE	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (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)
BLE CH 00 2402MHz		4800	46.34	-27.66	74	67.39	34	10.2	65.25	300	0	P	H
		4800	48.39	-25.61	74	69.44	34	10.2	65.25	100	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



< Module 2 for Ant.9 >

2.4GHz 2400~2483.5MHz

BLE—2Mbps (Band Edge @ 3m)

BLE	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (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)
BLE CH 39 2480MHz	*	2480	88.56	-	-	85.99	32.34	7.25	37.02	100	84	P	H
	*	2480	88.07	-	-	85.5	32.34	7.25	37.02	100	84	A	H
		2483.56	51.68	-22.32	74	49.11	32.34	7.25	37.02	100	84	P	H
		2483.5	39.39	-14.61	54	36.82	32.34	7.25	37.02	100	84	A	H
	*	2480	86.14	-	-	83.57	32.34	7.25	37.02	100	185	P	V
	*	2480	85.53	-	-	82.96	32.34	7.25	37.02	100	185	A	V
		2483.62	49.98	-24.02	74	47.41	32.34	7.25	37.02	100	185	P	V
		2483.98	39.05	-14.95	54	36.48	32.34	7.25	37.02	100	185	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz

BLE—2Mbps (Harmonic @ 3m)

BLE	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (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)
BLE CH 39 2480MHz		4965	40.18	-33.82	74	61.09	34	10.41	65.32	300	0	P	H
		7440	43.17	-30.83	74	61.73	35.79	12.79	67.14	300	0	P	H
		4965	40.15	-33.85	74	61.06	34	10.41	65.32	100	0	P	V
		7440	43.96	-30.04	74	62.52	35.79	12.79	67.14	100	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Emission below 1GHz for Ant. 9

2.4GHz BLE (LF)

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)
2.4GHz BLE LF		153.19	21.72	-21.78	43.5	36.31	16.36	1.87	32.82	-	-	P	H
		207.51	25.91	-17.59	43.5	40.68	15.87	2.19	32.83	-	-	P	H
		249.22	24.59	-21.41	46	36.59	18.36	2.41	32.77	-	-	P	H
		315.18	26.5	-19.5	46	36.99	19.66	2.7	32.85	-	-	P	H
		419.94	25.61	-20.39	46	33.38	22.02	3.13	32.92	-	-	P	H
		684.75	25.93	-20.07	46	29.74	25.23	4	33.04	-	-	P	H
		30	22.87	-17.13	40	30.61	24.57	0.71	33.02	-	-	P	V
		153.19	19.84	-23.66	43.5	34.43	16.36	1.87	32.82	-	-	P	V
		189.08	24.26	-19.24	43.5	39.38	15.63	2.09	32.84	-	-	P	V
		252.13	21.13	-24.87	46	33.01	18.46	2.43	32.77	-	-	P	V
		465.53	26.86	-19.14	46	33.72	22.86	3.3	33.02	-	-	P	V
		755.56	32.75	-13.25	46	35.45	25.88	4.2	32.78	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												



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)

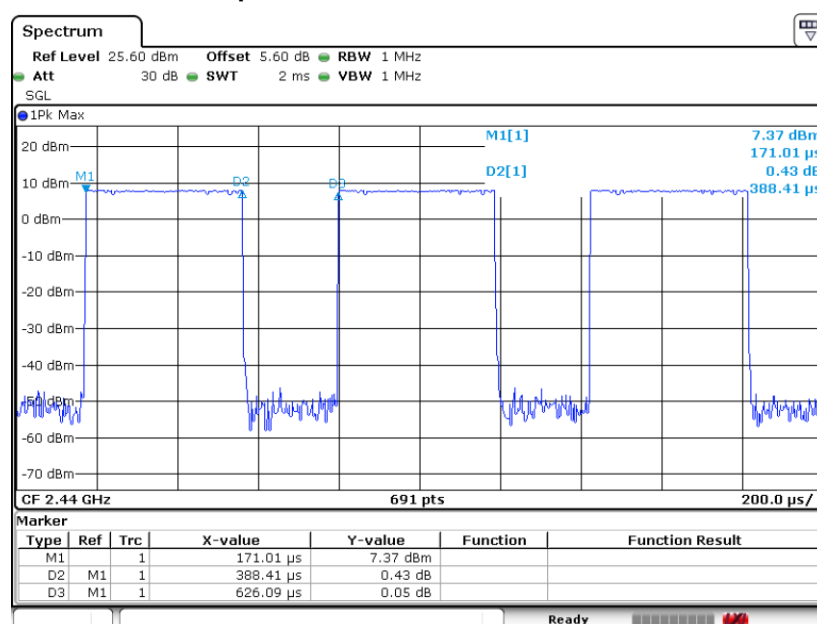
= 43.54(dBμV/m) – 54(dBμV/m)

= -10.46(dB)

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

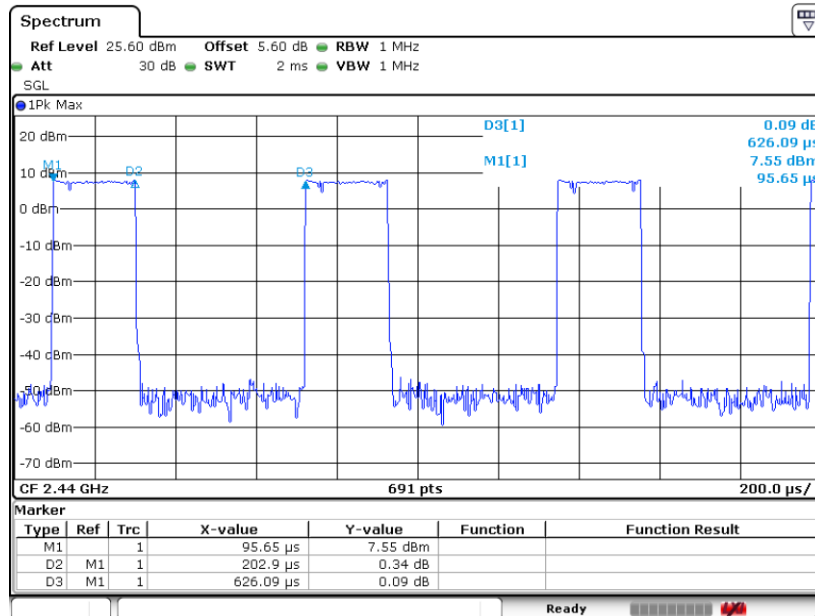
Appendix D. Duty Cycle Plots

Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
Bluetooth LE 1Mbps- Module 1 for Ant.9	62.04	0.388	2.575	2.7kHz
Bluetooth LE 2Mbps- Module 1 for Ant.9	32.41	0.203	4.929	5.1kHz
Bluetooth LE 1Mbps- Module 2 for Ant.9	48.26	0.601	1.663	1.8kHz
Bluetooth LE 2Mbps- Module 2 for Ant.9	49.77	0.312	3.209	3.3kHz

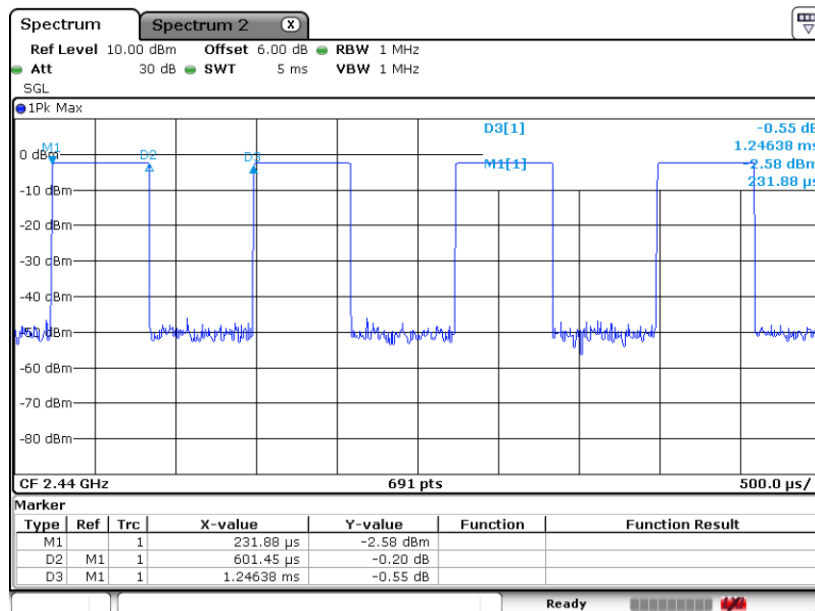
Bluetooth LE 1Mbps- Module 1 for Ant.9




Bluetooth LE 2Mbps- Module 1 for Ant.9



Bluetooth LE 1Mbps- Module 2 for Ant.9





Bluetooth LE 2Mbps- Module 2 for Ant.9

