



Appendix C. Radiated Spurious Emission

2.4GHz 2400~2483.5MHz

BT (Band Edge @ 3m)

BT	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.	
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)	
BT CH00 2402MHz		2388.26	49.81	-24.19	74	46.69	32.88	7.1	36.86	308	111	P	H	
	*	2388.26	25.05	-28.95	54	-	-	-	-	-	-	A	H	
		2402	102.46	-	-	99.31	32.88	7.13	36.86	308	111	P	H	
		2402	77.70	-	-	-	-	-	-	-	-	A	H	
		2382.54	50.5	-23.5	74	47.41	32.86	7.1	36.87	120	84	P	V	
	*	2382.54	25.74	-28.26	54	-	-	-	-	-	-	-	A	V
		2402	101.99	-	-	98.84	32.88	7.13	36.86	120	84	P	V	
		2402	77.23	-	-	-	-	-	-	-	-	-	A	V
BT CH 78 2480MHz		2483.8	59.03	-14.97	74	55.62	32.98	7.25	36.82	290	111	P	H	
	*	2483.8	34.27	-19.73	54	-	-	-	-	-	-	A	H	
		2480	101.31	-	-	97.9	32.98	7.25	36.82	290	111	P	H	
		2480	76.55	-	-	-	-	-	-	-	-	A	H	
		2483.56	58.47	-15.53	74	55.06	32.98	7.25	36.82	106	85	P	V	
	*	2483.56	33.71	-20.29	54	-	-	-	-	-	-	-	A	V
		2480	100.63	-	-	97.22	32.98	7.25	36.82	106	85	P	V	
		2480	75.87	-	-	-	-	-	-	-	-	-	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.													



**2.4GHz 2400~2483.5MHz
BT (Harmonic @ 3m)**

BT	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)
BT CH 00 2402MHz		4800	39.73	-34.27	74	60.71	34.19	10.2	65.37	300	0	P	H
		4800	40.72	-33.28	74	61.7	34.19	10.2	65.37	100	0	P	V
BT CH 39 2441MHz		4875	40.4	-33.6	74	61.3	34.23	10.29	65.42	300	0	P	H
		7320	41.86	-32.14	74	59.23	35.87	12.72	65.96	300	0	P	H
		4875	39.69	-34.31	74	60.59	34.23	10.29	65.42	100	0	P	V
		7320	43.3	-30.7	74	60.67	35.87	12.72	65.96	100	0	P	V
BT CH 78 2480MHz		4965	40.82	-33.18	74	61.6	34.28	10.41	65.47	300	0	P	H
		7440	42.91	-31.09	74	60.54	35.89	12.79	66.31	300	0	P	H
		4965	40.32	-33.68	74	61.1	34.28	10.41	65.47	100	0	P	V
		7440	45.17	-28.83	74	62.8	35.89	12.79	66.31	100	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Emission below 1GHz

2.4GHz BT (LF)

BT	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)
2.4GHz BT LF		30.97	20.71	-19.29	40	27.9	24.7	0.51	32.4	-	-	P	H
		109.54	14.67	-28.83	43.5	28.65	16.9	1.52	32.4	-	-	P	H
		178.41	19.14	-24.36	43.5	34.8	14.8	1.94	32.4	-	-	P	H
		213.33	20.47	-23.03	43.5	35.82	14.92	2.13	32.4	-	-	P	H
		350.1	20.08	-25.92	46	29.55	20.2	2.73	32.4	-	-	P	H
		556.71	24.46	-21.54	46	27.61	25.82	3.43	32.4	-	-	P	H
		30.97	30.27	-9.73	40	37.46	24.7	0.51	32.4	-	-	P	V
		56.19	25.06	-14.94	40	44.5	12.1	0.86	32.4	-	-	P	V
		135.73	19.06	-24.44	43.5	32.38	17.4	1.68	32.4	-	-	P	V
		183.26	18.58	-24.92	43.5	34.41	14.6	1.97	32.4	-	-	P	V



		250.19	18.29	-27.71	46	29.99	18.4	2.3	32.4	-	-	P	V
		856.44	28.7	-17.3	46	27.37	28.92	4.26	31.85	-	-	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	Peak or Average
H/V	Horizontal or Vertical



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

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

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

Note symbol

-L	Low channel location
-R	High channel location



2.4GHz 2400~2483.5MHz
BT (Band Edge @ 3m)

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Peak	<p>Site: 03CR05-ES Condition: FCC PART 15C In 2017 ON T0567 HORIZONTAL Project: R09 1000.000KHz VIEW 1000.000KHz SPT:Auto File: 0921210710-01 Plane: I IMEI: Full-directivity R47</p> <table border="1"> <thead> <tr> <th>IMEI</th> <th>Over</th> <th>Limit</th> <th>HeadAntenna</th> <th>Cable</th> <th>Preamp</th> <th>A/Pos</th> <th>T/Pos</th> <th>Remark</th> <th>Pol/Phas</th> </tr> <tr> <th>Freq</th> <th>Level</th> <th>Limit</th> <th>Line</th> <th>Level</th> <th>Factor</th> <th>Loss</th> <th>Factor</th> <th></th> <th></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>2382.26</td> <td>49.81</td> <td>-24.19</td> <td>74.00</td> <td>46.69</td> <td>32.88</td> <td>7.13</td> <td>36.86</td> <td>388</td> <td>111 Peak</td> <td>HORIZONTAL</td> </tr> </tbody> </table>	IMEI	Over	Limit	HeadAntenna	Cable	Preamp	A/Pos	T/Pos	Remark	Pol/Phas	Freq	Level	Limit	Line	Level	Factor	Loss	Factor			1	2382.26	49.81	-24.19	74.00	46.69	32.88	7.13	36.86	388	111 Peak	HORIZONTAL	<p>Site: 03CR05-ES Condition: FCC PART 15C In 2017 ON T0567 HORIZONTAL Project: R09 1000.000KHz VIEW 1000.000KHz SPT:Auto File: 0921210710-01 Plane: I IMEI: Full-directivity R47</p> <table border="1"> <thead> <tr> <th>IMEI</th> <th>Over</th> <th>Limit</th> <th>HeadAntenna</th> <th>Cable</th> <th>Preamp</th> <th>A/Pos</th> <th>T/Pos</th> <th>Remark</th> <th>Pol/Phas</th> </tr> <tr> <th>Freq</th> <th>Level</th> <th>Limit</th> <th>Line</th> <th>Level</th> <th>Factor</th> <th>Loss</th> <th>Factor</th> <th></th> <th></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>2402.00</td> <td>182.46</td> <td>28.46</td> <td>74.00</td> <td>99.33</td> <td>32.88</td> <td>7.13</td> <td>36.86</td> <td>388</td> <td>111 Peak</td> <td>HORIZONTAL</td> </tr> </tbody> </table>	IMEI	Over	Limit	HeadAntenna	Cable	Preamp	A/Pos	T/Pos	Remark	Pol/Phas	Freq	Level	Limit	Line	Level	Factor	Loss	Factor			1	2402.00	182.46	28.46	74.00	99.33	32.88	7.13	36.86	388	111 Peak	HORIZONTAL
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<p>Peak</p>	<p>No. 1098, Pengxi North Road, Kunshan Economic & Technical Development Zone, Jiangsu, China Tel: +86-512-57900158 Fax: +86-512-57900958 http://www.sporton.com.cn</p> <p>Site : 003095-05 Condition : FCC PART 15C 3m 3217 5W 75957 VERTICAL Project : FR210710-01 Mode : 2 Plane : T Polar : Full-directivity IMEI : 84T</p> <table border="1"> <thead> <tr> <th>Freq</th> <th>Level</th> <th>Over</th> <th>Limit</th> <th>ReadAntenna</th> <th>Cable</th> <th>Preamp</th> <th>A/Pos</th> <th>T/Pos</th> <th>Remark</th> <th>Pol/Phas</th> </tr> <tr> <th>MHz</th> <th>dBm/1m</th> <th>dB</th> <th>dBm/1m</th> <th>dBm</th> <th>dB/m</th> <th>dB</th> <th>dB</th> <th>cm</th> <th>deg</th> <th></th> </tr> </thead> <tbody> <tr> <td>1 * 2480.00</td> <td>100.63</td> <td>26.63</td> <td>74.00</td> <td>97.22</td> <td>32.98</td> <td>7.25</td> <td>36.82</td> <td>186</td> <td>85</td> <td>Peak VERTICAL</td> </tr> </tbody> </table>	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp	A/Pos	T/Pos	Remark	Pol/Phas	MHz	dBm/1m	dB	dBm/1m	dBm	dB/m	dB	dB	cm	deg		1 * 2480.00	100.63	26.63	74.00	97.22	32.98	7.25	36.82	186	85	Peak VERTICAL	<p>No. 1098, Pengxi North Road, Kunshan Economic & Technical Development Zone, Jiangsu, China Tel: +86-512-57900158 Fax: +86-512-57900958 http://www.sporton.com.cn</p> <p>Site : 003095-05 Condition : FCC PART 15C 3m 3217 5W 75957 VERTICAL Project : FR210710-01 Mode : 2 Plane : T Polar : Full-directivity IMEI : 84T</p> <table border="1"> <thead> <tr> <th>Freq</th> <th>Level</th> <th>Over</th> <th>Limit</th> <th>ReadAntenna</th> <th>Cable</th> <th>Preamp</th> <th>A/Pos</th> <th>T/Pos</th> <th>Remark</th> <th>Pol/Phas</th> </tr> <tr> <th>MHz</th> <th>dBm/1m</th> <th>dB</th> <th>dBm/1m</th> <th>dBm</th> <th>dB/m</th> <th>dB</th> <th>dB</th> <th>cm</th> <th>deg</th> <th></th> </tr> </thead> <tbody> <tr> <td>1 2483.56</td> <td>58.47</td> <td>-15.53</td> <td>74.00</td> <td>55.96</td> <td>32.98</td> <td>7.25</td> <td>36.82</td> <td>106</td> <td>85</td> <td>Peak VERTICAL</td> </tr> </tbody> </table>	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp	A/Pos	T/Pos	Remark	Pol/Phas	MHz	dBm/1m	dB	dBm/1m	dBm	dB/m	dB	dB	cm	deg		1 2483.56	58.47	-15.53	74.00	55.96	32.98	7.25	36.82	106	85	Peak VERTICAL
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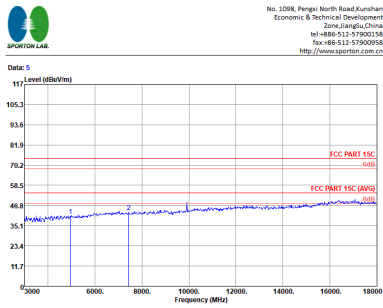
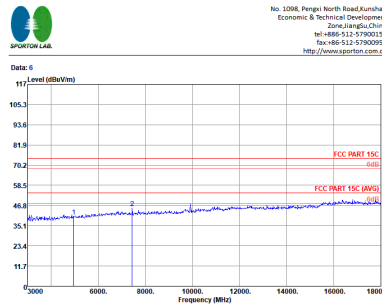
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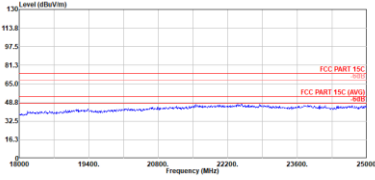
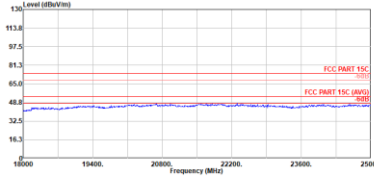
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Emission below 1GHz
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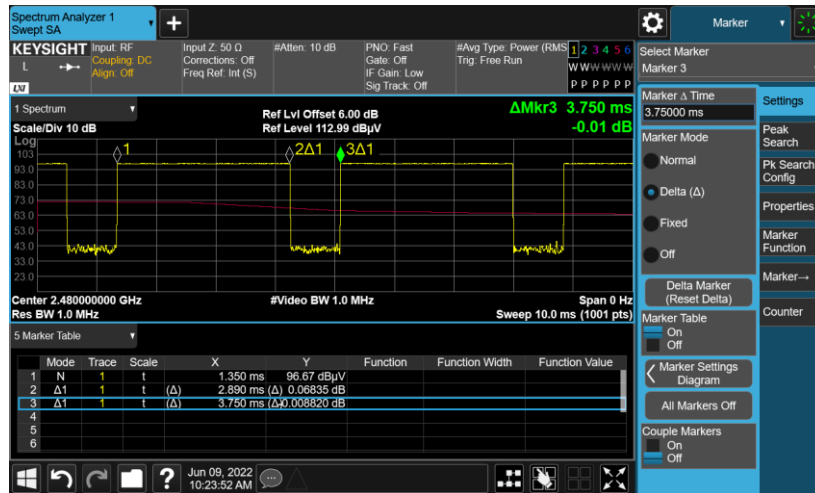
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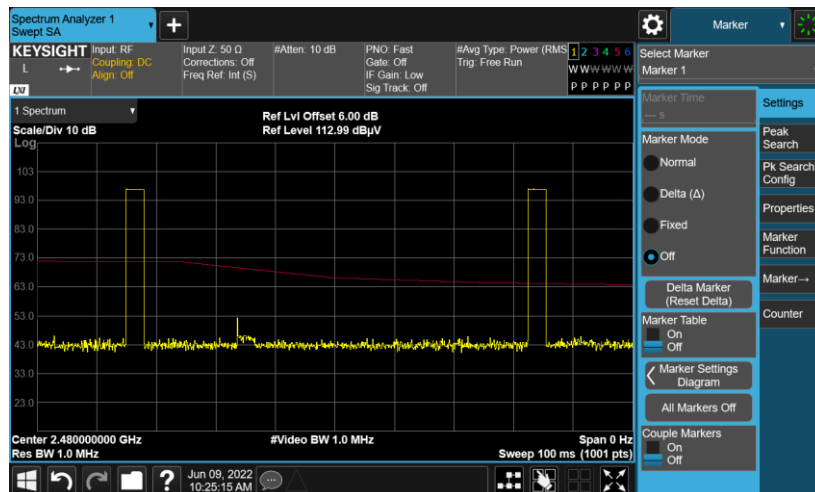
BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m from worse case	
ANT	BT CH78 2480MHz(18GHz-25GHz)	
1	Horizontal	Vertical
Peak		

Appendix E. Duty Cycle Plots

3DH5 on time (One Pulse) Plot on Channel 39



3DH5 on time (Count Pulses) Plot on Channel 39



Note:

1. Worst case Duty cycle = on time/100 milliseconds = $2 * 2.89 / 100 = 5.78 \%$
2. Worst case Duty cycle correction factor = $20 * \log(\text{Duty cycle}) = -24.76 \text{ dB}$
3. 3DH5 has the highest duty cycle worst case and is reported.