



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		2374.35	50.75	-23.25	74	47.69	32.86	7.07	36.87	344	68	P	H	
	*	2374.35	25.99	-28.01	54	-	-	-	-	-	-	A	H	
		2402	100.46	-	-	97.31	32.88	7.13	36.86	344	68	P	H	
		2402	75.70	-	-	-	-	-	-	-	-	A	H	
		2337.56	50.51	-23.49	74	47.58	32.81	7.01	36.89	108	104	P	V	
	*	2337.56	25.75	-28.25	54	-	-	-	-	-	-	-	A	V
		2402	101.14	-	-	97.99	32.88	7.13	36.86	108	104	P	V	
		2402	76.38	-	-	-	-	-	-	-	-	-	A	V
BT CH 78 2480MHz		2483.62	57.8	-16.2	74	54.39	32.98	7.25	36.82	152	100	P	H	
	*	2483.62	33.04	-20.96	54	-	-	-	-	-	-	A	H	
		2480	99.78	-	-	96.37	32.98	7.25	36.82	152	100	P	H	
		2480	75.02	-	-	-	-	-	-	-	-	A	H	
		2483.56	59.13	-14.87	74	55.72	32.98	7.25	36.82	286	74	P	V	
	*	2483.56	34.37	-19.63	54	-	-	-	-	-	-	A	V	
		2480	101.65	-	-	98.24	32.98	7.25	36.82	286	74	P	V	
		2480	76.89	-	-	-	-	-	-	-	-	-	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)

Table with 14 columns: 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). Rows include data for BT CH 00 (2402MHz) and BT CH 39 (2441MHz) and BT CH 78 (2480MHz). A Remark section at the bottom states: 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	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
2.4GHz BT LF		31.94	20.53	-19.47	40	29.21	23.2	0.52	32.4	-	-	P	H
		147.37	15.89	-27.61	43.5	29.34	17.2	1.75	32.4	-	-	P	H
		350.1	19.82	-26.18	46	29.29	20.2	2.73	32.4	-	-	P	H
		516.94	22.61	-23.39	46	27.86	23.84	3.31	32.4	-	-	P	H
		690.57	26.22	-19.78	46	28.4	26.38	3.84	32.4	-	-	P	H
		880.69	29.09	-16.91	46	27.36	29.06	4.32	31.65	-	-	P	H
		30.97	29.49	-10.51	40	36.68	24.7	0.51	32.4	-	-	P	V
		48.43	24.04	-15.96	40	40.69	15	0.75	32.4	-	-	P	V
		59.1	23.79	-16.21	40	43.59	11.7	0.9	32.4	-	-	P	V
		250.19	18.69	-27.31	46	30.39	18.4	2.3	32.4	-	-	P	V
		521.79	23.01	-22.99	46	28.19	23.9	3.32	32.4	-	-	P	V
		757.5	28.28	-17.72	46	28.39	28.15	4.01	32.27	-	-	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)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BT 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

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 Rule: QRS121012-01 Plane: I IMEI: Full-directivity #48</p> <table border="1"> <thead> <tr> <th>IMEI</th> <th>Over</th> <th>Level</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>Level</th> <th>Limit</th> <th>Line</th> <th>Level</th> <th>Factor</th> <th>Loss</th> <th>Factor</th> <th></th> <th></th> <th></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>2374.35</td> <td>58.75</td> <td>-23.25</td> <td>74.00</td> <td>47.69</td> <td>32.86</td> <td>7.87</td> <td>36.87</td> <td>344</td> <td>68 Peak</td> <td>HORIZONTAL</td> </tr> </tbody> </table>	IMEI	Over	Level	HeadAntenna	Cable	Preamp	A/Pos	T/Pos	Remark	Pol/Phas	Level	Limit	Line	Level	Factor	Loss	Factor				1	2374.35	58.75	-23.25	74.00	47.69	32.86	7.87	36.87	344	68 Peak	HORIZONTAL	<p>Site: 03CR05-ES Condition: FCC PART 15C In 2017 ON T0567 HORIZONTAL Project: R09 1000.000KHz VIEW 1000.000KHz SPT:Auto Rule: QRS121012-01 Plane: I IMEI: Full-directivity #48</p> <table border="1"> <thead> <tr> <th>IMEI</th> <th>Over</th> <th>Level</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>Level</th> <th>Limit</th> <th>Line</th> <th>Level</th> <th>Factor</th> <th>Loss</th> <th>Factor</th> <th></th> <th></th> <th></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>2402.00</td> <td>100.46</td> <td>26.46</td> <td>74.00</td> <td>97.33</td> <td>32.88</td> <td>7.13</td> <td>36.86</td> <td>344</td> <td>68 Peak</td> <td>HORIZONTAL</td> </tr> </tbody> </table>	IMEI	Over	Level	HeadAntenna	Cable	Preamp	A/Pos	T/Pos	Remark	Pol/Phas	Level	Limit	Line	Level	Factor	Loss	Factor				1	2402.00	100.46	26.46	74.00	97.33	32.88	7.13	36.86	344	68 Peak	HORIZONTAL
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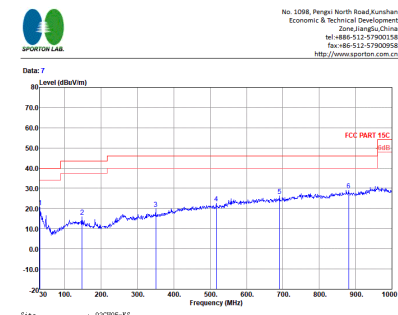
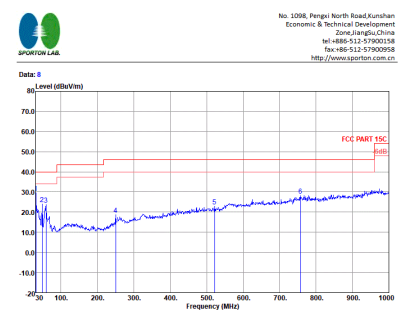
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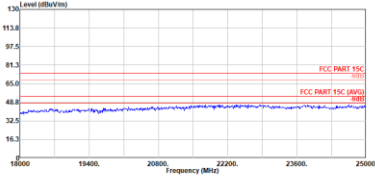
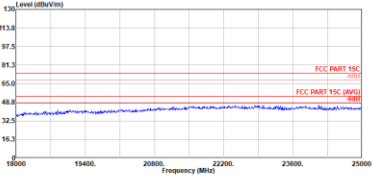
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Emission below 1GHz
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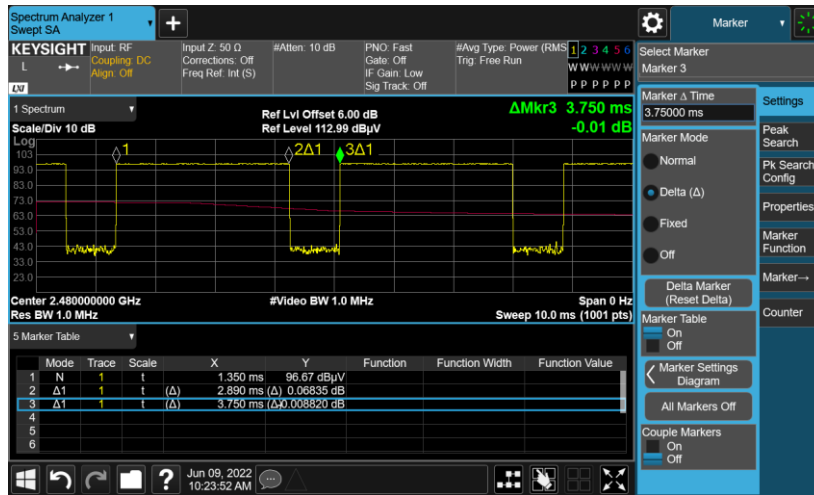
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2	147.17	15.89	-27.61	45.50	29.34	17.20	1.75	32.40	--- Peak HORIZONTAL																																																																																																																																																									
3	350.10	19.82	-16.18	40.00	29.29	20.20	2.73	32.40	--- Peak HORIZONTAL																																																																																																																																																									
4	516.94	22.63	-23.39	40.00	27.86	23.84	3.31	32.40	--- Peak HORIZONTAL																																																																																																																																																									
5	698.57	26.52	-19.76	40.00	28.40	26.36	3.68	32.40	--- Peak HORIZONTAL																																																																																																																																																									
6	880.69	29.89	-16.91	40.00	27.36	29.86	4.32	31.65	--- Peak HORIZONTAL																																																																																																																																																									
IMEI	Over Level	Line	HeadAntenna	Cable	Preamp	A/Pos	T/Pos	Remark	Pol/Phas																																																																																																																																																									
IMEI	Level	Limit	Level	Factor	Loss	Factor	dB	cm	deg																																																																																																																																																									
1	30.97	29.40	-10.51	40.00	36.68	24.70	0.51	32.40	--- Peak VERTICAL																																																																																																																																																									
2	48.43	24.84	-15.96	40.00	40.69	15.80	0.75	32.40	--- Peak VERTICAL																																																																																																																																																									
3	50.10	23.79	-16.31	40.00	43.59	11.70	0.90	32.40	--- Peak VERTICAL																																																																																																																																																									
4	250.19	18.69	-27.31	40.00	30.39	18.40	2.30	32.40	--- Peak VERTICAL																																																																																																																																																									
5	521.79	23.84	-23.99	40.00	20.19	23.00	3.32	32.40	--- Peak VERTICAL																																																																																																																																																									
6	797.50	28.28	-17.72	40.00	28.39	28.15	4.01	32.27	--- Peak VERTICAL																																																																																																																																																									



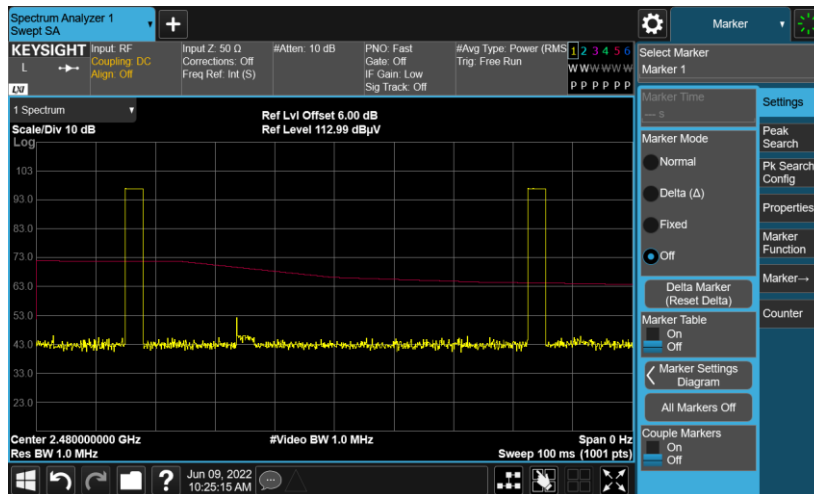
BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m from worse case	
ANT	BT CH78 2480MHz(18GHz-25GHz)	
1	Horizontal	Vertical
Peak		

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.