

APPENDIX E: MULTI-TX AND ANTENNA SAR CONSIDERATIONS

E.1 Introduction

The following procedures adopted from FCC KDB Publication 447498 D01v06 are applicable to devices with built-in unlicensed transmitters such as 802.11 and Bluetooth devices which may simultaneously transmit with the licensed transmitter.

E.2 Simultaneous Transmission Procedures

This device contains transmitters that may operate simultaneously. Therefore, simultaneous transmission analysis is required. Per FCC KDB Publication 447498 D01v06 and IEEE 1528-2013 Section 6.3.4.1.2, simultaneous transmission SAR test exclusion may be applied when the sum of the 1g SAR for all the simultaneous transmitting antennas in a specific physical test configuration is ≤ 1.6 W/kg. The different test positions in an exposure condition may be considered collectively to determine SAR test exclusion according to the sum of 1g or 10g SAR.

E.3 Body Simultaneous Transmission Analysis

Table E-1
Simultaneous Transmission Scenario of WLAN/BT

Configuration	2.4 GHz WLAN Ant 2 Max SAR (W/kg)	2.4 GHz WLAN Ant 2 at 12 dBm SAR (W/kg)	2.4 GHz WLAN Ant 2 Worst case SAR (W/kg)	2.4 GHz WLAN MIMO Max SAR (W/kg)	2.4 GHz WLAN MIMO at 15 dBm SAR (W/kg)	2.4 GHz WLAN MIMO Worst case SAR (W/kg)	5 GHz WLAN MIMO Max SAR (W/kg)	5 GHz WLAN MIMO at 11 dBm SAR (W/kg)	5 GHz WLAN MIMO Worst case SAR (W/kg)	6 GHz WLAN MIMO Max SAR (W/kg)	6 GHz WLAN MIMO at 11 dBm SAR (W/kg)	6 GHz WLAN MIMO Worst case SAR (W/kg)	2.4 GHz Bluetooth Ant 1 Max SAR (W/kg)	2.4 GHz Bluetooth Ant 1 at 8.5 dBm SAR (W/kg)	2.4 GHz Bluetooth Ant 1 Worst case SAR (W/kg)	2.4 GHz Bluetooth Ant 2 Max SAR (W/kg)	2.4 GHz Bluetooth Ant 2 at 10 dBm SAR (W/kg)	2.4 GHz Bluetooth Ant 2 Worst case SAR (W/kg)
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Back	0.139	0.614	0.614	0.073	0.783	0.783	0.128	0.806	0.806	0.024	0.729	0.729	0.031	0.091	0.091	0.099	0.343	0.343
Top	0.051	0.213	0.213	0.074	0.303	0.303	0.074	0.193	0.193	0.006	0.020	0.020	0.035	0.040	0.040	0.060	0.092	0.092
Right	0.005	-	0.005	0.256	0.531	0.531	0.472	0.665	0.665	0.201	0.156	0.201	0.177	0.106	0.177	0.012	-	0.012
Left	0.212	0.595	0.595	0.188	0.517	0.517	0.466	0.632	0.632	0.041	0.225	0.225	0.007	-	0.007	0.213	0.254	0.254

Configuration	2.4 GHz WLAN MIMO Worst case SAR (W/kg)	2.4 GHz Bluetooth Ant 1 Worst case + 2.4 GHz Bluetooth Ant 2 Worst case SAR (W/kg)	5 GHz WLAN MIMO Worst case SAR (W/kg)	6 GHz WLAN MIMO Worst case SAR (W/kg)	2.4 GHz Bluetooth Ant 1 Worst case + 2.4 GHz WLAN Ant 2 Worst case SAR (W/kg)	2.4 GHz Bluetooth Ant 1 Worst case + 5 GHz WLAN MIMO Worst case SAR (W/kg)	2.4 GHz Bluetooth Ant 1 Worst case + 6 GHz WLAN MIMO Worst case SAR (W/kg)	2.4 GHz Bluetooth Ant 2 Worst case + 5 GHz WLAN MIMO Worst case SAR (W/kg)	2.4 GHz Bluetooth Ant 2 Worst case + 6 GHz WLAN MIMO Worst case SAR (W/kg)	2.4 GHz Bluetooth Ant 1 Worst case + 2.4 GHz Bluetooth Ant 2 Worst case + 5 GHz WLAN MIMO Worst case SAR (W/kg)	2.4 GHz WLAN MIMO Worst case + 5 GHz WLAN MIMO Worst case SAR (W/kg)	2.4 GHz WLAN MIMO Worst case + 6 GHz WLAN MIMO Worst case SAR (W/kg)	2.4 GHz Bluetooth Ant 1 Worst case + 2.4 GHz WLAN Ant 2 Worst case + 5 GHz WLAN MIMO Worst case SAR (W/kg)	2.4 GHz Bluetooth Ant 1 Worst case + 2.4 GHz WLAN Ant 2 Worst case + 6 GHz WLAN MIMO Worst case SAR (W/kg)	WLAN/BT Worst-case Combination SAR (W/kg)
	6	15+18	9	12	15+3	15+9	15+12	18+9	18+12	15+18+9	15+18+12	6+9	6+12	15+3+9	15+3+12
Back	0.783	0.434	0.806	0.729	0.705	0.897	0.820	1.149	1.072	1.240	1.163	1.589	1.512	1.511	1.434
Top	0.303	0.132	0.193	0.020	0.253	0.233	0.060	0.285	0.112	0.325	0.152	0.496	0.323	0.446	0.273
Right	0.531	0.189	0.665	0.201	0.182	0.842	0.378	0.677	0.213	0.854	0.390	1.196	0.732	0.847	0.383
Left	0.517	0.261	0.632	0.225	0.602	0.639	0.232	0.886	0.479	0.893	0.486	1.149	0.742	1.234	0.827

Table E-2
Simultaneous Transmission Scenario of WLAN/BT for Laptop Mode

Configuration	2.4 GHz WLAN Ant 2 Max SAR (W/kg)	2.4 GHz WLAN Ant 2 Worst case SAR (W/kg)	2.4 GHz WLAN MIMO Max SAR (W/kg)	2.4 GHz WLAN MIMO Worst case SAR (W/kg)	5 GHz WLAN MIMO Max SAR (W/kg)	5 GHz WLAN MIMO Worst case SAR (W/kg)	6 GHz WLAN MIMO Max SAR (W/kg)	6 GHz WLAN MIMO Worst case SAR (W/kg)	2.4 GHz Bluetooth Ant 1 Max SAR (W/kg)	2.4 GHz Bluetooth Ant 1 Worst case SAR (W/kg)	2.4 GHz Bluetooth Ant 2 Max SAR (W/kg)	2.4 GHz Bluetooth Ant 2 Worst case SAR (W/kg)			
	1	3	4	6	7	9	10	12	13	15	16	18			
Bottom	0.105	0.105	0.101	0.101	0.567	0.567	0.369	0.369	0.000	0.000	0.514	0.514			
Configuration	2.4 GHz WLAN MIMO Worst case SAR (W/kg)	2.4 GHz Bluetooth Ant 1 Worst case + 2.4 GHz Bluetooth Ant 2 Worst case SAR (W/kg)	5 GHz WLAN MIMO Worst case SAR (W/kg)	6 GHz WLAN MIMO Worst case SAR (W/kg)	2.4 GHz Bluetooth Ant 1 Worst case + 2.4 GHz WLAN Ant 2 Worst case SAR (W/kg)	2.4 GHz Bluetooth Ant 1 Worst case + 5 GHz WLAN MIMO Worst case SAR (W/kg)	2.4 GHz Bluetooth Ant 1 Worst case + 6 GHz WLAN MIMO Worst case SAR (W/kg)	2.4 GHz Bluetooth Ant 2 Worst case + 5 GHz WLAN MIMO Worst case SAR (W/kg)	2.4 GHz Bluetooth Ant 2 Worst case + 6 GHz WLAN MIMO Worst case SAR (W/kg)	2.4 GHz Bluetooth Ant 1 Worst case + 2.4 GHz Bluetooth Ant 2 Worst case + 5 GHz WLAN MIMO Worst case SAR (W/kg)	2.4 GHz WLAN MIMO Worst case + 5 GHz WLAN MIMO Worst case SAR (W/kg)	2.4 GHz WLAN MIMO Worst case + 6 GHz WLAN MIMO Worst case SAR (W/kg)	2.4 GHz Bluetooth Ant 1 Worst case + 2.4 GHz WLAN Ant 2 Worst case + 5 GHz WLAN MIMO Worst case SAR (W/kg)	2.4 GHz Bluetooth Ant 1 Worst case + 2.4 GHz WLAN Ant 2 Worst case + 6 GHz WLAN MIMO Worst case SAR (W/kg)	WLAN/BT Worst-case Combination SAR (W/kg)
	6	15+18	9	12	15+3	15+9	15+12	18+9	18+12	15+18+9	15+18+12	6+9	6+12	15+3+9	15+3+12
Bottom	0.101	0.514	0.567	0.369	0.105	0.567	0.369	1.081	0.883	1.081	0.883	0.668	0.470	0.672	0.474

Notes:

- For all combinations where the sum of WLAN/BT is less than 1.6, there's no further analysis required for compliance demonstration.

FCC ID: A3LSMX910	SAR EVALUATION REPORT	Approved by: Technical Manager
DUT Type: Portable Computing Device		APPENDIX E: Page 1 of 2

E.4 Conclusion

The above numerical summed SAR results is sufficient to determine that simultaneous transmission cases will not exceed the SAR limit and therefore no measured volumetric simultaneous SAR summation is required per FCC KDB Publication 447498 D01v06 and IEEE 1528- 2013 Section 6.3.4.1.

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