

APPENDIX E: MULTI-TX AND ANTENNA SAR CONSIDERATIONS

E.1 Introduction

The following procedures adopted from FCC KDB Publication 447498 D04v01 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 D04v01 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 a 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.

Per FCC KDB Publication 941225 D06v02r01, the devices edges with antennas more than 2.5 cm from edge are not required to be evaluated for SAR (“-“).

Qualcomm Smart Transmit algorithm in WWAN directly adds the time-averaged RF exposure from 4G and time-averaged RF exposure from 5G NR. Smart Transmit algorithm controls the total RF exposure from both 4G and 5G NR to not exceed FCC limit. Therefore, simultaneous transmission compliance between 4G+5G operations is demonstrated in the Part 2 Report during algorithm validation.

FCC ID A3LSMS911JPN	SAR EVALUATION REPORT	Approved by: Technical Manager
DUT Type: Portable Handset		APPENDIX E: Page 1 of 5

E.1 Head Simultaneous Transmission Analysis

Table E-1
Simultaneous Transmission Scenarios of WLAN/BT (Held to Ear)

Configuration	2.4 GHz WLAN Ant 2 at 11 dBm SAR (W/kg)	2.4 GHz WLAN Ant 2 at 9 dBm SAR (W/kg)	2.4 GHz WLAN MIMO at 14 dBm SAR (W/kg)	2.4 GHz WLAN MIMO at 12 dBm SAR (W/kg)	5 GHz WLAN MIMO at 16 dBm SAR (W/kg)	5 GHz WLAN MIMO at 13 dBm SAR (W/kg)	5 GHz WLAN MIMO at 11 dBm SAR (W/kg)	6 GHz WLAN MIMO SAR (W/kg)	2.4 GHz Bluetooth Ant 1 at 10 dBm SAR (W/kg)	2.4 GHz Bluetooth Ant 2 at 10 dBm SAR (W/kg)
	1	2	3	4	5	6	7	8	9	10
Right Cheek	0.180	0.138	0.386	0.226	0.441	0.116	0.079	0.179	0.405	0.146
Right Tilt	0.023	0.017	0.208	0.120	0.332	0.081	0.079	0.057	0.300	0.019
Left Cheek	0.394	0.258	0.700	0.378	0.273	0.077	0.077	0.026	0.101	0.211
Left Tilt	0.100	0.057	0.103	0.047	0.264	0.056	0.053	0.024	0.101	0.034

Configuration	2.4 GHz Bluetooth Ant 1 at 10 dBm SAR (W/kg)	2.4 GHz Bluetooth Ant 2 at 10 dBm SAR (W/kg)	2.4 GHz WLAN MIMO at 14 dBm SAR (W/kg)	5 GHz WLAN MIMO at 16 dBm SAR (W/kg)	6 GHz WLAN MIMO SAR (W/kg)	2.4 GHz WLAN MIMO at 12 dBm + 5 GHz WLAN MIMO at 11 dBm SAR (W/kg)	2.4 GHz WLAN MIMO at 12 dBm + 6 GHz WLAN MIMO SAR (W/kg)	2.4 GHz Bluetooth Ant 1 at 10 dBm + 2.4 GHz WLAN Ant 2 at 11 dBm SAR (W/kg)	2.4 GHz Bluetooth Ant 1 at 10 dBm + 5 GHz WLAN MIMO at 16 dBm SAR (W/kg)	2.4 GHz Bluetooth Ant 2 at 10 dBm + 5 GHz WLAN MIMO at 16 dBm SAR (W/kg)	2.4 GHz Bluetooth Ant 1 at 10 dBm + 6 GHz WLAN MIMO SAR (W/kg)	2.4 GHz Bluetooth Ant 2 at 10 dBm + 6 GHz WLAN MIMO SAR (W/kg)	2.4 GHz Bluetooth Ant 1 at 10 dBm + 2.4 GHz WLAN Ant 2 at 9 dBm + 5 GHz WLAN MIMO at 11 dBm SAR (W/kg)	2.4 GHz Bluetooth Ant 1 at 10 dBm + 2.4 GHz WLAN Ant 2 at 9 dBm + 6 GHz WLAN MIMO SAR (W/kg)	WLAN/BT Worst-case Combination SAR (W/kg)
	9	10	3	5	8	4+7	4+8	9+1	9+5	10+5	9+8	10+8	9+2+7	9+2+8	
Right Cheek	0.405	0.146	0.386	0.441	0.179	0.305	0.405	0.585	0.846	0.587	0.584	0.325	0.622	0.722	0.846
Right Tilt	0.300	0.019	0.208	0.332	0.057	0.199	0.177	0.323	0.632	0.351	0.357	0.076	0.396	0.374	0.632
Left Cheek	0.101	0.211	0.700	0.273	0.026	0.455	0.404	0.495	0.374	0.484	0.127	0.237	0.436	0.385	0.700
Left Tilt	0.101	0.034	0.103	0.264	0.024	0.100	0.071	0.201	0.365	0.298	0.125	0.058	0.211	0.182	0.365

Configuration	2.4 GHz Bluetooth Ant 1 at 10 dBm SAR (W/kg)	2.4 GHz Bluetooth Ant 2 at 10 dBm SAR (W/kg)	2.4 GHz WLAN MIMO at 12 dBm SAR (W/kg)	5 GHz WLAN MIMO at 13 dBm SAR (W/kg)	6 GHz WLAN MIMO SAR (W/kg)	2.4 GHz WLAN MIMO at 12 dBm + 5 GHz WLAN MIMO at 11 dBm SAR (W/kg)	2.4 GHz WLAN MIMO at 12 dBm + 6 GHz WLAN MIMO SAR (W/kg)	2.4 GHz Bluetooth Ant 1 at 10 dBm + 2.4 GHz WLAN Ant 2 at 9 dBm SAR (W/kg)	2.4 GHz Bluetooth Ant 1 at 10 dBm + 5 GHz WLAN MIMO at 13 dBm SAR (W/kg)	2.4 GHz Bluetooth Ant 2 at 10 dBm + 5 GHz WLAN MIMO at 13 dBm SAR (W/kg)	2.4 GHz Bluetooth Ant 1 at 10 dBm + 6 GHz WLAN MIMO SAR (W/kg)	2.4 GHz Bluetooth Ant 2 at 10 dBm + 6 GHz WLAN MIMO SAR (W/kg)	2.4 GHz Bluetooth Ant 1 at 10 dBm + 2.4 GHz WLAN Ant 2 at 9 dBm + 5 GHz WLAN MIMO at 11 dBm SAR (W/kg)	2.4 GHz Bluetooth Ant 1 at 10 dBm + 2.4 GHz WLAN Ant 2 at 9 dBm + 6 GHz WLAN MIMO SAR (W/kg)	WLAN/BT Worst-case Combination with NR Active SAR (W/kg)
	9	10	4	6	8	4+7	4+8	9+2	9+6	10+6	9+8	10+8	9+2+7	9+2+8	
Right Cheek	0.405	0.146	0.226	0.116	0.179	0.305	0.405	0.543	0.521	0.262	0.584	0.325	0.622	0.722	0.722
Right Tilt	0.300	0.019	0.120	0.081	0.057	0.199	0.177	0.317	0.381	0.100	0.357	0.076	0.396	0.374	0.396
Left Cheek	0.101	0.211	0.378	0.077	0.026	0.455	0.404	0.359	0.178	0.288	0.127	0.237	0.436	0.385	0.455
Left Tilt	0.101	0.034	0.047	0.056	0.024	0.100	0.071	0.158	0.157	0.090	0.125	0.058	0.211	0.182	0.211

Table E-2
Simultaneous Transmission Scenario with WLAN/BT (Held to Ear)

Head SAR	Configuration	Non-NR Licensed SAR (W/kg)	NR licensed SAR (W/kg)	WLAN/BT Worst-case Combination SAR (W/kg)	WLAN/BT Worst-case Combination with NR Active SAR (W/kg)	Non-NR Licensed SAR + WLAN/BT SAR (W/kg)	NR licensed SAR + WLAN/BT with NR Active SAR (W/kg)
		1	2	3	4	1 + 3	2 + 4
	Right Cheek	0.354	0.872	0.846	0.722	1.200	1.594
	Right Tilt	0.197	0.886	0.632	0.396	0.829	1.282
	Left Cheek	0.354	0.421	0.700	0.455	1.054	0.876
	Left Tilt	0.183	0.509	0.365	0.211	0.548	0.720

FCC ID A3LSMS911JPN	SAR EVALUATION REPORT	Approved by: Technical Manager
DUT Type: Portable Handset		APPENDIX E: Page 2 of 5

E.2 Body-worn Simultaneous Transmission Analysis

Table E-3
Simultaneous Transmission Scenarios of WLAN/BT (Body-worn at 1.5 cm)

Configuration	2.4 GHz WLAN Ant 2 SAR (W/kg)	2.4 GHz WLAN Ant 2 at 12 dBm SAR (W/kg)	2.4 GHz WLAN MIMO SAR (W/kg)	2.4 GHz WLAN MIMO at 15 dBm SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	5 GHz WLAN MIMO at 16 dBm SAR (W/kg)	6 GHz WLAN MIMO SAR (W/kg)	2.4 GHz Bluetooth Ant 1 SAR (W/kg)	2.4 GHz Bluetooth Ant 2 SAR (W/kg)
	1	2	3	4	5	6	7	8	9
Back	0.061	0.020	0.341	0.054	0.291	0.059	0.056	0.030	0.025

Configuration	2.4 GHz Bluetooth Ant 1 SAR (W/kg)	2.4 GHz Bluetooth Ant 2 SAR (W/kg)	2.4 GHz WLAN MIMO SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	6 GHz WLAN MIMO SAR (W/kg)	2.4 GHz WLAN MIMO at 15 dBm + 5 GHz WLAN MIMO at 16 dBm SAR (W/kg)	2.4 GHz WLAN MIMO at 15 dBm + 6 GHz WLAN MIMO SAR (W/kg)	2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 SAR (W/kg)	2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO SAR (W/kg)	2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO SAR (W/kg)	2.4 GHz Bluetooth Ant 1 + 6 GHz WLAN MIMO SAR (W/kg)	2.4 GHz Bluetooth Ant 2 + 6 GHz WLAN MIMO SAR (W/kg)	2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 at 12 dBm + 5 GHz WLAN MIMO at 16 dBm SAR (W/kg)	2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 at 12 dBm + 6 GHz WLAN MIMO SAR (W/kg)	WLAN/BT Worst-case Combination SAR (W/kg)
	8	9	3	5	7	4+6	4+7	8+1	8+5	9+5	8+7	9+7	8+2+6	8+2+7	0.341
Back	0.030	0.025	0.341	0.291	0.056	0.113	0.110	0.091	0.321	0.316	0.086	0.081	0.109	0.106	0.341

Table E-4
Simultaneous Transmission Scenario with WLAN/BT (Body-worn at 1.5 cm)

Configuration	Licensed SAR (W/kg)	WLAN/BT Worst-case Combination SAR (W/kg)	Licensed + WLAN/BT SAR (W/kg)
Back	0.482	0.341	0.823

FCC ID A3LSMS911JPN	SAR EVALUATION REPORT	Approved by: Technical Manager
DUT Type: Portable Handset		APPENDIX E: Page 3 of 5

E.3 Hotspot Simultaneous Transmission Analysis

Table E-5
Simultaneous Transmission Scenarios of WLAN/BT (Hotspot at 1.0 cm)

Configuration	2.4 GHz WLAN Ant 2 SAR (W/kg)	2.4 GHz WLAN Ant 2 at 12 dBm SAR (W/kg)	2.4 GHz WLAN MIMO SAR (W/kg)	2.4 GHz WLAN MIMO at 15 dBm SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	5 GHz WLAN MIMO at 16 dBm SAR (W/kg)	2.4 GHz Bluetooth Ant 1 SAR (W/kg)	2.4 GHz Bluetooth Ant 2 SAR (W/kg)
	1	2	3	4	5	6	7	8
Back	0.123	0.044	0.515	0.096	0.251	0.060	0.066	0.050
Front	0.159	0.058	0.502	0.087	0.094	0.019	0.059	0.069
Top	0.012	0.004	0.173	0.070	0.153	0.036	0.060	0.002
Bottom	-	-	-	-	-	-	-	-
Right	0.066	0.024	0.150	0.034	0.063	0.010	-	0.025
Left	-	-	0.375	0.093	0.127	0.031	0.110	-

Configuration	2.4 GHz Bluetooth Ant 1 SAR (W/kg)	2.4 GHz Bluetooth Ant 2 SAR (W/kg)	2.4 GHz WLAN MIMO SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	2.4 GHz WLAN MIMO at 15 dBm + 5 GHz WLAN MIMO at 16 dBm SAR (W/kg)	2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 SAR (W/kg)	2.4 GHz Bluetooth Ant 1 + 5 GHz WLAN MIMO SAR (W/kg)	2.4 GHz Bluetooth Ant 2 + 5 GHz WLAN MIMO SAR (W/kg)	2.4 GHz Bluetooth Ant 1 + 2.4 GHz WLAN Ant 2 at 12 dBm + 5 GHz WLAN MIMO at 16 dBm SAR (W/kg)	WLAN/BT Worst-case Combination SAR (W/kg)
	7	8	3	5	4+6	7+1	7+5	8+5	7+2+6	
Back	0.066	0.050	0.515	0.251	0.156	0.189	0.317	0.301	0.170	0.515
Front	0.059	0.069	0.502	0.094	0.106	0.218	0.153	0.163	0.136	0.502
Top	0.060	0.002	0.173	0.153	0.106	0.072	0.213	0.155	0.100	0.213
Bottom	-	-	-	-	-	-	-	-	-	-
Right	-	0.025	0.150	0.063	0.044	0.066	0.063	0.088	0.034	0.150
Left	0.110	-	0.375	0.127	0.124	0.110	0.237	0.127	0.141	0.375

Table E-6
Simultaneous Transmission Scenarios with WLAN/BT (Hotspot at 1.0 cm)

Configuration	Licensed SAR (W/kg)	WLAN/BT Worst-case Combination SAR (W/kg)	Licensed + WLAN/BT SAR (W/kg)
Back	0.723	0.515	1.238
Front	0.530	0.502	1.032
Top	0.591	0.213	0.804
Bottom	1.091	-	1.091
Right	0.479	0.150	0.629
Left	0.452	0.375	0.827

FCC ID A3LSMS911JPN	SAR EVALUATION REPORT	Approved by: Technical Manager
DUT Type: Portable Handset		APPENDIX E: Page 4 of 5

E.4 Phablet Simultaneous Transmission Analysis

Per FCC KDB Publication 648474 D04 Handset SAR, Phablet SAR tests were not required if wireless router 1g SAR (scaled to the maximum output power, including tolerance) < 1.2 W/kg. Therefore, no further analysis beyond the tables included in this section was required to determine that possible simultaneous transmission scenarios would not exceed the SAR limit.

Table E-7
Simultaneous Transmission Scenarios of WLAN/BT

Configuration	5 GHz WLAN MIMO SAR (W/kg)	6 GHz WLAN MIMO SAR (W/kg)	WLAN/BT Worst-case Combination SAR (W/kg)
	1	2	
Back	1.298	0.148	1.298
Front	0.498	0.089	0.498
Top	0.430	0.048	0.430
Bottom	-	-	-
Right	0.154	0.003	0.154
Left	1.734	0.416	1.734

Table E-8

Simultaneous Transmission Scenarios with WLAN/BT

Phablet SAR	Configuration	Licensed SAR (W/kg)	NFC SAR (W/kg)	WLAN/BT Worst-case Combination SAR (W/kg)	Licensed + NFC + WLAN/BT SAR (W/kg)
		1	2	3	4
	Back	2.617	0.025	1.298	3.940
	Front	2.192	0.000	0.498	2.690
	Top	3.117	-	0.430	3.547
	Bottom	2.621	-	-	2.621
	Right	-	0.000	0.154	0.154
	Left	-	0.000	1.734	1.734

E.5 Simultaneous Transmission 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.

FCC ID A3LSMS911JPN	SAR EVALUATION REPORT	Approved by: Technical Manager
DUT Type: Portable Handset		APPENDIX E: Page 5 of 5