

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.

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 4.3.2 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. Alternatively, simultaneous transmission SAR test exclusion may be evaluated using Total Exposure Ratio (TER).

Note:

This device is enabled with the manufacturer's time-averaged method of Tx power control for connectivity radios (WiFi, Bluetooth, NB U-NII and 802.15.4). Co-located connectivity antennas with significant overlap of RF exposure hotspots are grouped into a single cluster. There are two pre-defined antenna clusters (AC): AC0 (Ant WF8) and AC1 (Ant WF7a, WF7b).

When operating in the same antenna cluster, the compliance under dynamic transmission condition, including all supported simultaneous transmission scenarios, should be assessed and demonstrated in the TAS Report during algorithm validation. This applies to multiple antennas in the same antenna cluster or different modes transmitting simultaneously in the same antenna cluster. For the evaluation of simultaneous transmission analysis in this report, the highest SAR value across all modes in the same antenna cluster was considered for summation and most conservative to determine simultaneous SAR test exclusions.

Note:

*The SAR distributions for at least one of the antennas are spatially separated from the other antennas per FCC KDB Publication 248227 Section 6.1 procedures. Therefore, simultaneous transmission was treated independently for this configuration. See section E.5 for more information about the Spatial Separation Analysis.

** When required, each transmitter is tested for simultaneous transmission in the configuration, channel, and operating mode that resulted in the highest SAR during the stand-alone evaluation. Per November 2019 TCB Workshop Notes, enlarged volumetric scans on co-located antenna pair were performed for all the modes/band for Antenna WF7a and WF8 to determine the aggregate distributions from the simultaneous transmission (volumetric) SAR evaluation.

FCC ID: BCGA3459	RF EXPOSURE REPORT	Approved by: Technical Manager
DUT Type: Tablet Device		APPENDIX E: Page 1 of 10

E.3 Exposure Ratios

Exposure ratio (ER) for different transmitters is calculated as following:

$$ER_{SAR,n} = \frac{SAR_n}{SAR_{limit,n}}, 10 \text{ MHz} < f_u \leq 6 \text{ GHz}$$

$$ER_{APD,n} = \frac{APD_v}{APD_{limit,v}}, 6 \text{ GHz} < f_t \leq 10 \text{ GHz}$$

Where:

- SAR_n is the SAR value for the n -th transmitter/test frequency
- $SAR_{limit,n}$ is the basic restriction limit that is applicable to the n -th transmitter/test frequency
- APD_v is the APD value for the v -th transmitter/test frequency
- $APD_{limit,v}$ is the basic restriction limit that is applicable to the v -th transmitter/test frequency

FCC ID: BCGA3459	RF EXPOSURE REPORT	Approved by: Technical Manager
DUT Type: Tablet Device		APPENDIX E: Page 2 of 10

E.4 Body SAR Simultaneous Transmission Analysis

Table E-1

Simultaneous Transmission Scenario with 2.4 GHz WIFI MIMO, 5 GHz WIFI MIMO and WPT

Simult Tx	Configuration	2.4 GHz WIFI Ant WF8 ER	5 GHz WIFI Ant WF8 ER	2.4 GHz WIFI Ant WF7b ER	5 GHz WIFI Ant WF7a ER	WPT ER	Σ ER
		1	2	3	4	5	1+2+3+4+5
Body SAR	Back	0.112	0.102	0.087	0.092	0.000	0.204
	Top	0.539	0.728	0.280	0.742	0.000	See Note 1
	Bottom	0.007	0.019	0.004	0.008	0.000	0.027
	Right	0.011	0.021	0.004	0.004	0.000	0.025
	Left	0.001	0.005	0.198	0.044	0.000	0.203

Table E-2

Simultaneous Transmission Scenario with 2.4 GHz WIFI, 5 GHz WIFI MIMO, 5 WIFI and WPT

Simult Tx	Configuration	2.4 GHz WIFI Ant WF7b + 5 GHz WIFI Ant WF8 + WPT ER	2.4 GHz WIFI Ant WF8 + 5 GHz WIFI Ant WF7a + WPT ER	5 GHz WIFI Ant WF7a + 5 GHz WIFI Ant WF8 + WPT ER
		1	2	3
Body SAR	Top	0.728*	0.781**	0.819**

Table E-3

Simultaneous Transmission Scenario with 2.4 GHz WIFI MIMO, 6 GHz WIFI MIMO and WPT

Simult Tx	Configuration	2.4 GHz WIFI Ant WF8 ER	6 GHz WIFI Ant WF8 ER	2.4 GHz WIFI Ant WF7b ER	6 GHz WIFI Ant WF7a ER	WPT ER	Σ ER
		1	2	3	4	5	1+2+3+4+5
Body SAR	Back	0.112	0.034	0.087	0.018	0.000	0.199
	Top	0.539	0.305	0.280	0.242	0.000	0.819
	Bottom	0.007	0.000	0.004	0.002	0.000	0.011
	Right	0.011	0.054	0.004	0.002	0.000	0.058
	Left	0.001	0.003	0.198	0.008	0.000	0.201

Table E-4

Simultaneous Transmission Scenario with 2.4 GHz Bluetooth TxBF, NB U-NII TxBF and WPT

Simult Tx	Configuration	2.4 GHz Bluetooth Ant WF8 ER	NB U-NII Ant WF8 ER	2.4 GHz Bluetooth Ant WF7b ER	NB U-NII Ant WF7a ER	WPT ER	Σ ER
		1	2	3	4	5	1+2+3+4+5
Body SAR	Back	0.126	0.065	0.079	0.106	0.000	0.232
	Top	0.394	0.740	0.231	0.746	0.000	See Note 1
	Bottom	0.012	0.031	0.000	0.000	0.000	0.031
	Right	0.013	0.011	0.004	0.000	0.000	0.017
	Left	0.000	0.000	0.203	0.022	0.000	0.203

Table E-5

Simultaneous Transmission Scenario with 2.4 GHz Bluetooth, NB U-NII TxBF and WPT

Simult Tx	Configuration	2.4 GHz Bluetooth Ant WF7b + NB U-NII Ant WF8 + WPT ER	2.4 GHz Bluetooth Ant WF8 + NB U-NII Ant WF7a + WPT ER	NB U-NII Ant WF7a + NB U-NII Ant WF8 + WPT ER
		1	2	3
Body SAR	Top	0.740*	0.775**	0.925**

FCC ID: BCGA3459	RF EXPOSURE REPORT	Approved by: Technical Manager
DUT Type: Tablet Device		APPENDIX E: Page 3 of 10

Table E-6

Simultaneous Transmission Scenario with 2.4 GHz WIFI MIMO, NB U-NII TxBF and WPT

Simult Tx	Configuration	2.4 GHz WIFI Ant WF8 ER	NB U-NII Ant WF8 ER	2.4 GHz WIFI Ant WF7b ER	NB U-NII Ant WF7a ER	WPT ER	Σ ER
		1	2	3	4	5	1+2+3+4+5
Body SAR	Back	0.112	0.065	0.087	0.106	0.000	0.218
	Top	0.539	0.740	0.280	0.746	0.000	See Note 1
	Bottom	0.007	0.031	0.004	0.000	0.000	0.035
	Right	0.011	0.011	0.004	0.000	0.000	0.015
	Left	0.001	0.000	0.198	0.022	0.000	0.199

Table E-7

Simultaneous Transmission Scenario with 2.4 GHz WIFI, NB U-NII TxBF and WPT

Simult Tx	Configuration	2.4 GHz WIFI Ant WF7b + NB U-NII Ant WF8 + WPT ER	2.4 GHz WIFI Ant WF8 + NB U-NII Ant WF7a + WPT ER	NB U-NII Ant WF7a + NB U-NII Ant WF8 + WPT ER
		1	2	3
Body SAR	Top	0.740*	0.794**	0.925**

Table E-8

Simultaneous Transmission Scenario with 5 GHz WIFI MIMO, 2.4 GHz Bluetooth TxBF and WPT

Simult Tx	Configuration	5 GHz WIFI Ant WF7a ER	2.4 GHz Bluetooth Ant WF7b ER	5 GHz WIFI Ant WF8 ER	2.4 GHz Bluetooth Ant WF8 ER	WPT ER	Σ ER
		1	2	3	4	5	1+2+3+4+5
Body SAR	Back	0.092	0.079	0.102	0.126	0.000	0.218
	Top	0.742	0.231	0.728	0.394	0.000	See Note 1
	Bottom	0.008	0.000	0.019	0.012	0.000	0.027
	Right	0.004	0.004	0.021	0.013	0.000	0.025
	Left	0.044	0.203	0.005	0.000	0.000	0.208

Table E-9

Simultaneous Transmission Scenario with 5 GHz WIFI MIMO, 2.4 GHz Bluetooth and WPT

Simult Tx	Configuration	2.4 GHz Bluetooth Ant WF7b + 5 GHz WIFI Ant WF8 + WPT ER	5 GHz WIFI Ant WF7a + 5 GHz WIFI Ant WF8 + WPT ER	5 GHz WIFI Ant WF7a + 2.4 GHz Bluetooth Ant WF8 + WPT ER
		1	2	3
Body SAR	Top	0.728*	0.819**	0.769**

Table E-10

Simultaneous Transmission Scenario with 6 GHz WIFI MIMO, 2.4 GHz Bluetooth TxBF and WPT

Simult Tx	Configuration	6 GHz WIFI Ant WF7a ER	2.4 GHz Bluetooth Ant WF7b ER	6 GHz WIFI Ant WF8 ER	2.4 GHz Bluetooth Ant WF8 ER	WPT ER	Σ ER
		1	2	3	4	5	1+2+3+4+5
Body SAR	Back	0.018	0.079	0.034	0.126	0.000	0.205
	Top	0.242	0.231	0.305	0.394	0.000	0.636
	Bottom	0.002	0.000	0.000	0.012	0.000	0.014
	Right	0.002	0.004	0.054	0.013	0.000	0.058
	Left	0.008	0.203	0.003	0.000	0.000	0.206

FCC ID: BCGA3459	RF EXPOSURE REPORT	Approved by: Technical Manager
DUT Type: Tablet Device		APPENDIX E: Page 4 of 10

Table E-11

Simultaneous Transmission Scenario with 2.4 GHz WIFI, 5 GHz WIFI MIMO, 2.4 GHz Bluetooth and WPT

Simult Tx	Configuration	2.4 GHz WIFI Ant WF8 ER	5 GHz WIFI Ant WF8 ER	5 GHz WIFI Ant WF7a ER	2.4 GHz Bluetooth Ant WF7b ER	WPT ER	Σ ER
		1	2	3	4	5	1+2+3+4+5
Body SAR	Back	0.112	0.102	0.092	0.079	0.000	0.204
	Top	0.539	0.728	0.742	0.231	0.000	See Note 1
	Bottom	0.007	0.019	0.008	0.000	0.000	0.027
	Right	0.011	0.021	0.004	0.004	0.000	0.025
	Left	0.001	0.005	0.044	0.203	0.000	0.208

Table E-12

Simultaneous Transmission Scenario with 2.4 GHz WIFI, 5 GHz WIFI MIMO, 2.4 GHz Bluetooth and WPT

Simult Tx	Configuration	2.4 GHz Bluetooth Ant WF7b + 5 GHz WIFI Ant WF8 + WPT ER	2.4 GHz WIFI Ant WF8 + 5 GHz WIFI Ant WF7a + WPT ER	5 GHz WIFI Ant WF8 + 5 GHz WIFI Ant WF7a + WPT ER
		1	2	3
Body SAR	Top	0.728*	0.781**	0.819**

Table E-13

Simultaneous Transmission Scenario with 2.4 GHz WIFI, 6 GHz WIFI MIMO, 2.4 GHz Bluetooth and WPT

Simult Tx	Configuration	2.4 GHz WIFI Ant WF8 ER	6 GHz WIFI Ant WF8 ER	6 GHz WIFI Ant WF7a ER	2.4 GHz Bluetooth Ant WF7b ER	WPT ER	Σ ER
		1	2	3	4	5	1+2+3+4+5
Body SAR	Back	0.112	0.034	0.018	0.079	0.000	0.191
	Top	0.539	0.305	0.242	0.231	0.000	0.781
	Bottom	0.007	0.000	0.002	0.000	0.000	0.009
	Right	0.011	0.054	0.002	0.004	0.000	0.058
	Left	0.001	0.003	0.008	0.203	0.000	0.206

Table E-14

Simultaneous Transmission Scenario with 2.4 GHz WIFI, 5 GHz WIFI MIMO, 2.4 GHz Bluetooth and WPT

Simult Tx	Configuration	2.4 GHz WIFI Ant WF7b ER	5 GHz WIFI Ant WF7a ER	5 GHz WIFI Ant WF8 ER	2.4 GHz Bluetooth Ant WF8 ER	WPT ER	Σ ER
		1	2	3	4	5	1+2+3+4+5
Body SAR	Back	0.087	0.092	0.102	0.126	0.000	0.218
	Top	0.280	0.742	0.728	0.394	0.000	See Note 1
	Bottom	0.004	0.008	0.019	0.012	0.000	0.027
	Right	0.004	0.004	0.021	0.013	0.000	0.025
	Left	0.198	0.044	0.005	0.000	0.000	0.203

Table E-15

Simultaneous Transmission Scenario with 2.4 GHz WIFI, 5 GHz WIFI MIMO, 2.4 Bluetooth and WPT

Simult Tx	Configuration	2.4 GHz WIFI Ant WF7b + 5 GHz WIFI Ant WF8 + WPT ER	5 GHz WIFI Ant WF7a + 5 GHz WIFI Ant WF8 + WPT ER	5 GHz WIFI Ant WF7a + 2.4 GHz Bluetooth Ant WF8 + WPT ER
		1	2	3
Body SAR	Top	0.728*	0.819**	0.769**

FCC ID: BCGA3459	RF EXPOSURE REPORT	Approved by: Technical Manager
DUT Type: Tablet Device		APPENDIX E: Page 5 of 10

Table E-16**Simultaneous Transmission Scenario with 2.4 GHz WIFI, 6 GHz WIFI MIMO, 2.4 GHz Bluetooth and WPT**

Simult Tx	Configuration	2.4 GHz WIFI Ant WF7b ER	6 GHz WIFI Ant WF7a ER	6 GHz WIFI Ant WF8 ER	2.4 GHz Bluetooth Ant WF8 ER	WPT ER	Σ ER
		1	2	3	4	5	1+2+3+4+5
Body SAR	Back	0.087	0.018	0.034	0.126	0.000	0.213
	Top	0.280	0.242	0.305	0.394	0.000	0.674
	Bottom	0.004	0.002	0.000	0.012	0.000	0.016
	Right	0.004	0.002	0.054	0.013	0.000	0.058
	Left	0.198	0.008	0.003	0.000	0.000	0.201

Table E-17**Simultaneous Transmission Scenario with 2.4 GHz WIFI, NB U-NII TxBF, 2.4 GHz Bluetooth and WPT**

Simult Tx	Configuration	2.4 GHz WIFI Ant WF8 ER	NB U-NII Ant WF8 ER	2.4 GHz Bluetooth Ant WF7b ER	NB U-NII Ant WF7a ER	WPT ER	Σ ER
		1	2	3	4	5	1+2+3+4+5
Body SAR	Back	0.112	0.065	0.079	0.106	0.000	0.218
	Top	0.539	0.740	0.231	0.746	0.000	See Note 1
	Bottom	0.007	0.031	0.000	0.000	0.000	0.031
	Right	0.011	0.011	0.004	0.000	0.000	0.015
	Left	0.001	0.000	0.203	0.022	0.000	0.204

Table E-18**Simultaneous Transmission Scenario with 2.4 GHz WIFI, 2.4 Bluetooth, NB U-NII TxBF and WPT**

Simult Tx	Configuration	2.4 GHz Bluetooth Ant WF7b + NB U-NII Ant WF8 + WPT ER	2.4 GHz WIFI Ant WF8 + NB U-NII Ant WF7a + WPT ER	NB U-NII Ant WF8 + NB U-NII Ant WF7a + WPT ER
		1	2	3
Body SAR	Top	0.740*	0.794**	0.925**

Table E-19**Simultaneous Transmission Scenario with 2.4 GHz WIFI, NB U-NII TxBF, 2.4 GHz Bluetooth and WPT**

Simult Tx	Configuration	2.4 GHz WIFI Ant WF7b ER	NB U-NII Ant WF7a ER	2.4 GHz Bluetooth Ant WF8 ER	NB U-NII Ant WF8 ER	WPT ER	Σ ER
		1	2	3	4	5	1+2+3+4+5
Body SAR	Back	0.087	0.106	0.126	0.065	0.000	0.232
	Top	0.280	0.746	0.394	0.740	0.000	See Note 1
	Bottom	0.004	0.000	0.012	0.031	0.000	0.035
	Right	0.004	0.000	0.013	0.011	0.000	0.017
	Left	0.198	0.022	0.000	0.000	0.000	0.198

Table E-20**Simultaneous Transmission Scenario with 2.4 GHz WIFI, 2.4 Bluetooth, NB U-NII TxBF and WPT**

Simult Tx	Configuration	2.4 GHz WIFI Ant WF7b + NB U-NII Ant WF8 + WPT ER	2.4 GHz Bluetooth Ant WF8 + NB U-NII Ant WF7a + WPT ER	NB U-NII Ant WF8 + NB U-NII Ant WF7a + WPT ER
		1	2	3
Body SAR	Top	0.740*	0.775**	0.925**

FCC ID: BCGA3459	RF EXPOSURE REPORT	Approved by: Technical Manager
DUT Type: Tablet Device		APPENDIX E: Page 6 of 10

Table E-21

Simultaneous Transmission Scenario with 2.4 GHz WIFI, 5 GHz WIFI MIMO, 802.15.4 and WPT

Simult Tx	Configuration	2.4 GHz WIFI Ant WF8 ER	5 GHz WIFI Ant WF8 ER	5 GHz WIFI Ant WF7a ER	802.15.4 Ant WF7b ER	WPT ER	Σ ER
		1	2	3	4	5	1+2+3+4+5
Body SAR	Back	0.112	0.102	0.092	0.063	0.000	0.204
	Top	0.539	0.728	0.742	0.225	0.000	See Note 1
	Bottom	0.007	0.019	0.008	0.004	0.000	0.027
	Right	0.011	0.021	0.004	0.004	0.000	0.025
	Left	0.001	0.005	0.044	0.139	0.000	0.144

Table E-22

Simultaneous Transmission Scenario with 2.4 GHz WIFI, 5 GHz WIFI MIMO, 802.15.4 and WPT

Simult Tx	Configuration	802.15.4 Ant WF7b + 5 GHz WIFI Ant WF8 + WPT ER	2.4 GHz WIFI Ant WF8 + 5 GHz WIFI Ant WF7a + WPT ER	5 GHz WIFI Ant WF7a + 5 GHz WIFI Ant WF8 + WPT ER
		1	2	3
Body SAR	Top	0.728*	0.781**	0.819**

Table E-23

Simultaneous Transmission Scenario with 2.4 GHz WIFI, 6 GHz WIFI MIMO, 802.15.4 and WPT

Simult Tx	Configuration	2.4 GHz WIFI Ant WF8 ER	6 GHz WIFI Ant WF8 ER	6 GHz WIFI Ant WF7a ER	802.15.4 Ant WF7b ER	WPT ER	Σ ER
		1	2	3	4	5	1+2+3+4+5
Body SAR	Back	0.112	0.034	0.018	0.063	0.000	0.175
	Top	0.539	0.305	0.242	0.225	0.000	0.781
	Bottom	0.007	0.000	0.002	0.004	0.000	0.011
	Right	0.011	0.054	0.002	0.004	0.000	0.058
	Left	0.001	0.003	0.008	0.139	0.000	0.142

Table E-24

Simultaneous Transmission Scenario with 2.4 GHz WIFI, 5 GHz WIFI MIMO, 802.15.4 and WPT

Simult Tx	Configuration	2.4 GHz WIFI Ant WF7b ER	5 GHz WIFI Ant WF7a ER	5 GHz WIFI Ant WF8 ER	802.15.4 Ant WF8 ER	WPT ER	Σ ER
		1	2	3	4	5	1+2+3+4+5
Body SAR	Back	0.087	0.092	0.102	0.092	0.000	0.194
	Top	0.280	0.742	0.728	0.361	0.000	See Note 1
	Bottom	0.004	0.008	0.019	0.004	0.000	0.027
	Right	0.004	0.004	0.021	0.011	0.000	0.025
	Left	0.198	0.044	0.005	0.000	0.000	0.203

Table E-25

Simultaneous Transmission Scenario with 2.4 GHz WIFI, 5 GHz WIFI MIMO, 802.15.4 and WPT

Simult Tx	Configuration	2.4 GHz WIFI Ant WF7b + 5 GHz WIFI Ant WF8 + WPT ER	5 GHz WIFI Ant WF7a + 5 GHz WIFI Ant WF8 + WPT ER	5 GHz WIFI Ant WF7a + 802.15.4 Ant WF8 + WPT ER
		1	2	3
Body SAR	Top	0.728*	0.819**	0.775*

FCC ID: BCGA3459	RF EXPOSURE REPORT	Approved by: Technical Manager
DUT Type: Tablet Device		APPENDIX E: Page 7 of 10

Table E-26

Simultaneous Transmission Scenario with 2.4 GHz WIFI, 6 GHz WIFI MIMO, 802.15.4 and WPT

Simult Tx	Configuration	2.4 GHz WIFI Ant WF7b ER	6 GHz WIFI Ant WF7a ER	6 GHz WIFI Ant WF8 ER	802.15.4 Ant WF8 ER	WPT ER	Σ ER
		1	2	3	4	5	1+2+3+4+5
Body SAR	Back	0.087	0.018	0.034	0.092	0.000	0.179
	Top	0.280	0.242	0.305	0.361	0.000	0.641
	Bottom	0.004	0.002	0.000	0.004	0.000	0.008
	Right	0.004	0.002	0.054	0.011	0.000	0.058
	Left	0.198	0.008	0.003	0.000	0.000	0.201

Table E-27

Simultaneous Transmission Scenario with 2.4 GHz WIFI, NB U-NII TxBF, 802.15.4 and WPT

Simult Tx	Configuration	2.4 GHz WIFI Ant WF8 ER	NB U-NII Ant WF8 ER	802.15.4 Ant WF7b ER	NB U-NII Ant WF7a ER	WPT ER	Σ ER
		1	2	3	4	5	1+2+3+4+5
Body SAR	Back	0.112	0.065	0.063	0.106	0.000	0.218
	Top	0.539	0.740	0.225	0.746	0.000	See Note 1
	Bottom	0.007	0.031	0.004	0.000	0.000	0.035
	Right	0.011	0.011	0.004	0.000	0.000	0.015
	Left	0.001	0.000	0.139	0.022	0.000	0.140

Table E-28

Simultaneous Transmission Scenario with 2.4 GHz WIFI, 802.15.4, NB U-NII TxBF and WPT

Simult Tx	Configuration	802.15.4 Ant WF7b + NB U-NII Ant WF8 + WPT ER	2.4 GHz WIFI Ant WF8 + NB U-NII Ant WF7a + WPT ER	NB U-NII Ant WF7a + NB U-NII Ant WF8 + WPT ER
		1	2	3
Body SAR	Top	0.740*	0.794**	0.925**

Table E-29

Simultaneous Transmission Scenario with 2.4 GHz WIFI, NB U-NII TxBF, 802.15.4 and WPT

Simult Tx	Configuration	2.4 GHz WIFI Ant WF7b ER	NB U-NII Ant WF7a ER	802.15.4 Ant WF8 ER	NB U-NII Ant WF8 ER	WPT ER	Σ ER
		1	2	3	4	5	1+2+3+4+5
Body SAR	Back	0.087	0.106	0.092	0.065	0.000	0.198
	Top	0.280	0.746	0.361	0.740	0.000	See Note 1
	Bottom	0.004	0.000	0.004	0.031	0.000	0.035
	Right	0.004	0.000	0.011	0.011	0.000	0.015
	Left	0.198	0.022	0.000	0.000	0.000	0.198

Table E-30

Simultaneous Transmission Scenario with 2.4 GHz WIFI, 802.15.4, NB U-NII TxBF and WPT

Simult Tx	Configuration	2.4 GHz WIFI Ant WF7b + NB U-NII Ant WF8 WPT	802.15.4 Ant WF8 + NB U-NII Ant WF7a + WPT ER	NB U-NII Ant WF7a + NB U-NII Ant WF8 + WPT ER
		1	2	3
Body SAR	Top	0.740*	0.769**	0.925**

FCC ID: BCGA3459	RF EXPOSURE REPORT	Approved by: Technical Manager
DUT Type: Tablet Device		APPENDIX E: Page 8 of 10

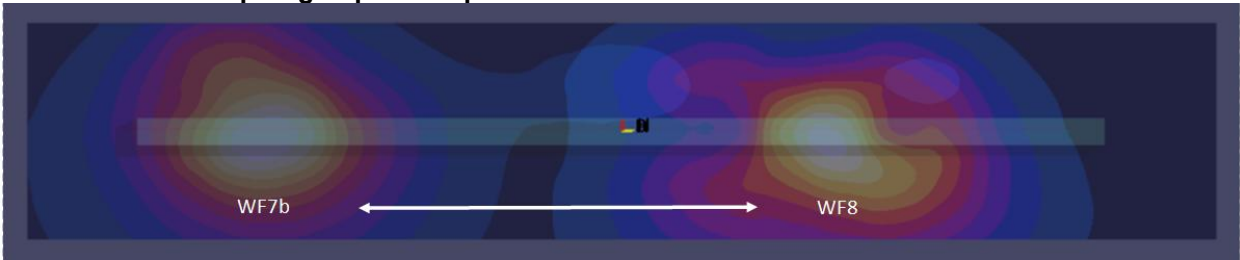
E.5 Spatial Separation Analysis

Per FCC KDB Publication 248227, antennas may be considered spatially separated when the aggregate SAR from multiple antennas at any location in the combined SAR distribution is either $\leq 1.2\text{ W/kg}$ where at least 90% of the SAR is attributed to a single SAR distribution or $\leq 0.4\text{ W/kg}$ where no more than one SAR distribution is contributing $> 0.1\text{ W/kg}$.

Spatial separation was determined by inspection of the area scan SAR distributions to confirm that at all locations, SAR was $< 1.2\text{ W/kg}$, where at least 90% of the SAR is attributed to a single SAR distribution. See below for illustrations of the spatial separated antennas considered.

E.5.1 Top Edge Spatial Separation Analysis

Figure E-1
Top Edge Spatial Separation for Antenna WF8 and Antenna WF7b



FCC ID: BCGA3459	RF EXPOSURE REPORT	Approved by: Technical Manager
DUT Type: Tablet Device		APPENDIX E: Page 9 of 10

E.6 Additional Simultaneous SAR Evaluation and Analysis for Antenna WF7a and WF8

When required, each transmitter is tested for simultaneous transmission in the configuration, channel, and operating mode that resulted in the highest SAR during the stand-alone evaluation. Per November 2019 TCB Workshop Notes, enlarged volumetric scans on co-located antenna pair were performed for all the modes/band for Antenna WF7a and WF8 to determine the aggregate distributions from the simultaneous transmission (volumetric) SAR evaluation.

Table E-31
Simultaneous Transmission SAR Analysis

Band / Mode	Bandwidth [MHz]	Service / Modulation	Ant.	Duty Cycle [%]	Power Drift [dB]	Frequency [MHz]	Channel #	Data Rate [Mbps]	Max Allowed Power [dBm]	Conducted Power [dBm]	Test Position	Spacing [mm]	Volumetric 1g SAR [W/kg]	Scaled Volumetric 1g SAR [W/kg]	Plot
2.4 GHz WIFI/ IEEE 802.11b	22	DSSS	WF8	98.02	0.12	2437.00	6	1	22.00	21.25	Top	5	0.683	0.837	A10
5 GHz WIFI/ IEEE 802.11n	40	OFDM	WF8	97.85	0.02	5795.00	159	13.5	19.75	18.52	Top	5	0.882	1.170	A11
5 GHz WIFI/ IEEE 802.11n	40	OFDM	WF7a	96.46	-0.01	5755.00	151	13.5	19.75	18.75	Top	5	0.891	1.190	A12
2.4 GHz Bluetooth LE	N/A	GFSK	WF8	84.81	-0.01	2402.00	0	1	21.00	19.69	Top	5	0.388	0.620	A13
802.15.4	N/A	CW	WF8	100.00	0.03	2405.00	11	0.25	21.00	19.42	Top	5	0.391	0.562	A14
NB U-NII 3	N/A	GFSK	WF8	76.55	0.06	5844.00	High	1	19.75	18.47	Top	5	0.642	1.180	A15
NB U-NII 3	N/A	GFSK	WF7a	76.55	-0.11	5844.00	High	1	19.75	18.85	Top	5	0.702	1.190	A16

Simultaneous Transmissio Bands/Modes		Scaled Multi-Band 1g SAR [W/kg]	Exposure Ratio (1g SAR)	Plot
5 GHz WIFI Ant WF7a	2.4 GHz WIFI Ant WF8	1.250	0.781	A17
5 GHz WIFI Ant WF7a	5 GHz WIFI Ant WF8	1.310	0.819	A18
5 GHz WIFI Ant WF7a	802.15.4 Ant WF8	1.240	0.775	A19
5 GHz WIFI Ant WF7a	2.4 GHz Bluetooth Ant WF8	1.230	0.769	A20
NB U-NII 3 Ant WF7a	2.4 GHz WIFI Ant WF8	1.270	0.794	A21
NB U-NII 3 Ant WF7a	802.15.4 Ant WF8	1.230	0.769	A22
NB U-NII 3 Ant WF7a	2.4 GHz Bluetooth Ant WF8	1.240	0.775	A23
NB U-NII 3 Ant WF7a	NB U-NII 3 Ant WF8	1.480	0.925	A24

1. All volumetric zoom scans were performed with cDASY6/DASY8 SAR system. cDASY6/DASY8 Post processing requires enlarged zoom scans to overlap but does not require measurement point resolutions within the volumes to be identical for interpolation and superposition.
2. Each antenna was evaluated independently using the channel/configuration that produced the highest measured SAR when the standalone SAR was tested.
3. SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D04v01. The simultaneous transmission SAR results of the individual transmitters were scaled using cDASY6/DASY8 Post processing.

E.7 Simultaneous Transmission Conclusion

The above numerical summed TER results for all the worst-case simultaneous transmission conditions were below the TER limit. Therefore, the above analysis 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 D04v01.

FCC ID: BCGA3459	RF EXPOSURE REPORT	Approved by: Technical Manager
DUT Type: Tablet Device		APPENDIX E: Page 10 of 10