

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.

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 (“-”).

This device is enabled with Qualcomm® Smart Transmit Gen2 with pre-defined antenna groups (AG0 and AG1). Simultaneous transmission analysis is performed per antenna groups. Below analysis demonstrates the mutually exclusive operation of AG0 and AG1, and the compliance between each antenna group with non-Smart Transmit Radios. For this model, WWAN/WLAN/BT/mmWave Radios are managed under Smart Transmit. Non-Smart Transmit Radios include NFC/UWB.

When operating in the same antenna group, the compliance under dynamic transmission condition, including all supported simultaneous transmission scenarios, should be assessed and demonstrated in the Part 2 Report during algorithm validation. Therefore, no further simultaneous analysis is needed within an antenna group.

E.3 Antenna Groups

The 2nd generation of Smart Transmit (GEN2) operates based on pre-defined antenna groups (AG). Sub6/mmW Module/WLAN/BT Tx antennas in the device are grouped based on spatial variation of RF exposure distributions, where the RF exposure of one AG is mutually exclusive from other AG. This is accomplished by demonstrating either of below conditions for all exposure scenarios:

- a) Sum of SAR of one antenna from each of the sub6 AGs and the RF exposure from radios outside Smart Transmit is less than regulatory limits. This condition must be demonstrated for all antenna combinations of sub6 AGs.

(or)

- b) Every antenna from each sub6 AG meets SPLSR criteria (Section 4.3.2(c) in FCC KDB 447498 D04) with every antenna from another sub6 AG. These criteria must be demonstrated for all antenna combinations for each pair of AGs.

This device supports two AGs: AG0 and AG1, with AG0 having 6 antennas (A, B, C, D, N, M) and AG1 having 7 antennas (E, F, I, H, J, N, M) for DSI=1 condition (N and M are shared antennas), otherwise AG0 has 5 antennas (A, B, C, D, N) and AG1 has 6 antennas (E, F, I, H, J, M). The conditions are verified through the following criteria:

- i) Sum of SAR: Demonstrate that the sum of *max.norm.exp.AG0* and *max.norm.exp.AG1* and the reported normalized SAR values from radios outside Smart Transmit (denoted as *reported.norm.exp.ER*) should be less than the regulatory limit for each supported DSI following the below procedure:

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1. Obtain the worst-case *adjusted SAR* for each antenna group, i.e., maximum *reported SAR* at $EFS P_{limit} + unc$ (or max of $\{P_{max} + unc, EFS P_{limit}\}$ when $EFS P_{limit} > P_{max}$) out of all supported technologies, frequency bands and antennas in AG0 and AG1, then normalized to the regulatory limit to get the maximum normalized SAR for each antenna group, denoted as *max.norm.exp.AG0* and *max.norm.exp.AG1*
2. For external radios outside of Smart Transmit (NFC/UWB): Obtain the worst-case RF exposure for each external radio normalized to regulatory limit to get the normalized SAR for each external radio, denoted as *reported.norm.exp.NFC* and *reported.norm.exp.UWB*
3. Demonstrate that the sum of these RF exposures meets: $\{max.norm.exp.AG0 + max.norm.exp.AG1 + normalized\ NFC\ SAR + normalized\ UWB\ SAR\} \leq 1$.
4. For DSI=0, there are shared antennas between the 2 antenna groups, demonstrate the following:
 - $max.norm.exp.without.AntN \& AntM.AG0 + max.norm.exp.without.AntN \& AntM.AG1 + normalized\ NFC\ SAR + normalized\ UWB\ SAR \leq 1$
 - $max.norm.exp.AntN + normalized\ NFC\ SAR + normalized\ UWB\ SAR \leq 1$
 - $max.norm.exp.AntM + normalized\ NFC\ SAR + normalized\ UWB\ SAR \leq 1$

ii) SPLSR or composite exposure distribution criteria: when TER sum of an antenna pair is over the limit for a DSI/exposure position, SPLSR or composite exposure distribution can be done to demonstrate simultaneous transmission compliance.

1. SPLSR analysis for sub6 antenna pairs: For each antenna, obtain the highest *adjusted SAR* at $EFS P_{limit} + unc$ (or max of $\{P_{max} + unc, EFS P_{limit}\}$ when $EFS P_{limit} > P_{max}$) out of all supported technologies for each frequency band. Using these values, demonstrate for a given DSI that every antenna from one AG meets SPLSR criteria with every antenna in another AG for all frequency bands. This criterion must be demonstrated for all antenna pair combinations irrespective of supported simultaneous transmission scenarios as given below for each DSI. As it can be seen, these include all combinations of antenna groups, antennas, and frequency bands.
 - If SPLSR criteria evaluation and analysis is needed to determine compliance for a certain DSI configuration, SPLSR is performed by taking the highest reported SAR for each of the supported technologies and bands per antenna, along with the peak SAR locations. Per Qualcomm guidance, only Y-axis coordinates are recorded in the analysis for calculation simplicity (assumes all 0mm of separation on the x-axis). Peak locations are documented in the Highest Report SAR and Hotspot Location Section below for each DSI configuration. For bottom AG0, Y_max coordinates represents the worst-case hotspot location that is closest to the top AG1. Similarly, for top AG1, Y_min coordinate represents the worst-case hotspot location that is closest to the bottom AG0
 - The following formula is used to calculate the SPLSR between AG0 and AG1 for each exposure configuration:

$$SPLSR = \frac{(Max\ SAR\ AG0 + Max\ SAR\ AG1)^{1.5}}{|Y_{max} - Y_{min}|}$$

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2. Composite exposure distributions for SAR-mmWave antenna pairs, or mmWave-mmWave antenna pairs: determine the composite exposure distributions for each antenna, normalized each composite distribution with the regulatory limit, then overlay/align these distributions in space relative to the device, and then sum them up in space to determine the aggregate distribution. Demonstrate the maximum normalized exposure out of all points in space on the aggregate distribution ≤ 1 .
 - For a given exposure condition, the composite exposure distribution for an antenna is determined by aligning the exposure distributions in space relative to the device and taking the maximum value of each point in space out of all supported radio configurations from all supported technologies/bands.
 - To determine composite SAR distribution for an antenna on a given DSI/exposure position:
 - a) Perform “Fast Volume Scan” in the mid channel using SPEAG DASY to obtain 1g/10g SAR distribution for each technology/band supported on the antenna.
 - b) Export the 1gSAR or 10gSAR distribution from the “Fast Volume Scan” and divide it by the maximum value in the distribution to obtain normalized 1gSAR or 10gSAR distribution for each technology/band.
 - c) Scale this normalized 1gSAR or 10gSAR distribution with the “adjusted SAR” value obtained from maximum *reported* SAR at EFS $P_{limit} + unc$ (or max of $\{P_{max} + unc, EFS P_{limit}\}$ when $EFS P_{limit} > P_{max}$) out of all supported technologies/bands for that antenna.
 - d) Determine composite SAR exposure distribution for the antenna given by maximum exposure distribution out of all supported technologies/bands at each point in space.
 - e) Determine normalized composite SAR distribution by dividing step d) result with the regulatory limit.
 - To determine composite PD distribution for an antenna on a given DSI/exposure position:
 - a) For all technologies/bands supported by the antenna, obtain the 4cm²PD distribution from validated simulated results.
 - b) Export the 4cm²PD distribution and divide it by the maximum value in the distribution to obtain the normalized 4cm²PD distribution.
 - c) Scaled this normalized 4cm²PD distribution with the “adjusted PD” value obtained from:
 - For dominant surface/position: PD exposure = $PD_design_target + unc$ when $input.power.limit \leq P_{max}$, otherwise PD exposure = PD_design_target
 - For non-dominant surfaces/positions: calculate exposure ratio of non-worst-case surface over worst-case surface from validated simulated results. Then multiply this exposure ratio with the PD exposure on the worst-case surface.
 - To obtain adjusted PD at test distance at 10mm, apply the (PD sim at 10mm/PD sim at 2mm) ratio to $PD_design_target + unc$
 - d) Determine composite PD distribution for the antenna given by the maximum exposure distribution out of all supported technologies/bands at each location in space.
 - e) Determine normalized composite PD distribution by dividing step d) result with the regulatory limit.

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- After determining normalized composite exposure distribution for each antenna of the pair, then align the composite distributions of both the antennas in space and perform the summation and determine the maximum of all locations in space. This maximum value must be ≤ 1 for the simultaneous transmission of the 2 antennas to be in compliance.

E.4 Power Density Theoretical Calculations

Table E-1
Worst Case PD Theoretical Exposure

PD Antennas - Theoretical Worst Case							
Antenna	AG	Bands	PD Design Target (W/m ²)	PD Uncertainty (dB)	Permanent Back off (dB)	PD Limit (W/m ²)	Theoretical Ratio to Limit
M	AG1	n258/n261/n260	6.31	1.4	0.1	10	0.851
N	AG0	n258	6.31	1.4	0.2	10	0.832
		n261	6.31	1.4	0.1	10	0.851
		n260	6.31	1.4	0.2	10	0.832
		Max	6.31	1.4	0.2	10	0.851

Table E-2
PD Theoretical Exposure per Position at 10mm

Antenna M						
Bands	Back	Front	Top	Bottom	Right	Left
n258/n261/n260	0.613	0.066	0.157	0.037	0.050	0.306
Antenna N						
Bands	Back	Front	Top	Bottom	Right	Left
n258	0.433	0.216	0.014	0.041	0.490	0.022
n261	0.237	0.229	0.011	0.017	0.595	0.013
n260	0.295	0.280	0.044	0.078	0.596	0.022
Max	0.433	0.280	0.044	0.078	0.596	0.022

Table E-3
PD Theoretical Exposure per Position at 2mm

Antenna M						
Bands	Back	Front	Top	Bottom	Right	Left
n258/n261/n260	0.851	0.164	0.231	0.045	0.067	0.598
Antenna N						
Bands	Back	Front	Top	Bottom	Right	Left
n258	0.825	0.443	0.017	0.053	0.832	0.027
n261	0.460	0.483	0.014	0.024	0.851	0.020
n260	0.511	0.531	0.079	0.098	0.832	0.037
Max	0.825	0.531	0.079	0.098	0.851	0.037

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E.5 Head (DSI = 1) SAR Antenna Group Analysis

Table E-4
DSI=1 Held-to-ear AG0 Highest Adjusted SAR

AG0 Ratio to Limit						
Head SAR	Configuration	A	B	C	D	Max
	Right Cheek	0.211	0.211	0.023	0.003	0.211
	Right Tilt	0.207	0.118	0.003	0.000	0.207
	Left Cheek	0.213	0.106	0.001	0.000	0.213
	Left Tilt	0.194	0.121	0.008	0.001	0.194

Table E-5
DSI=1 Held-to-ear AG1 Highest Adjusted SAR

AG1 Ratio to Limit							
Head SAR	Configuration	E	F	H	I	J	Max
	Right Cheek	0.644	0.784	0.556	0.506	0.401	0.784
	Right Tilt	0.551	0.781	0.411	0.057	0.159	0.781
	Left Cheek	0.746	0.424	0.366	0.636	0.366	0.746
	Left Tilt	0.726	0.545	0.365	0.076	0.098	0.726

Table E-6
DSI=1 Held-to-ear Shared AG Highest Adjusted SAR

Shared Ratio to Limit				
Head SAR	Configuration	N	M	Max
	Right Cheek	0.851	0.851	0.851
	Right Tilt	0.851	0.851	0.851
	Left Cheek	0.851	0.851	0.851
	Left Tilt	0.851	0.851	0.851

Table E-7
DSI=1 Held-to-ear AG Verification

Head SAR	Configuration	AG0 Ratio to Limit	AG1 Ratio to Limit	Shared Ratio to Limit	AG0 + AG1 Ratio to Limit	Shared Ratio to Limit
	Right Cheek	0.211	0.784	0.851	0.995	0.851
	Right Tilt	0.207	0.781	0.851	0.988	0.851
	Left Cheek	0.213	0.746	0.851	0.959	0.851
	Left Tilt	0.194	0.726	0.851	0.920	0.851

Notes:

1. For all combinations where the TER sum of AG0+AG1 is not greater than 1, there's no further analysis required for compliance demonstration.

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E.6 Body-worn (DSI = 0) SAR Antenna Group Analysis

Table E-8
DSI=0 Body-worn AG0 Highest Adjusted SAR

AG0 Ratio to Limit							
Bodyworn SAR	Configuration	A	B	C	D	N	Max
	Back	0.385	0.324	0.093	0.155	0.433	0.433

Table E-9
DSI=0 Body-worn AG1 Highest Adjusted SAR

AG1 Ratio to Limit								
Bodyworn SAR	Configuration	E	F	H	I	J	M	Max
	Back	0.564	0.291	0.564	0.148	0.367	0.613	0.613

Table E-10
DSI=0 Body-worn AG Verification

Bodyworn SAR	Configuration	AG0 Ratio to Limit	AG1 Ratio to Limit	AG0 + AG1 Ratio to Limit
	Back	0.433	0.613	See Table Below

Back					
AG0 Ratio to Limit		AG1 Ratio to Limit		AG0 + AG1 Ratio to Limit	SDOTER
Ant A	0.385	Ant E	0.564	0.949	N/A
Ant A	0.385	Ant F	0.291	0.676	N/A
Ant A	0.385	Ant H	0.564	0.949	N/A
Ant A	0.385	Ant I	0.148	0.533	N/A
Ant A	0.385	Ant J	0.367	0.752	N/A
Ant A	0.385	Ant M	0.613	0.998	N/A
Ant B	0.324	Ant E	0.564	0.888	N/A
Ant B	0.324	Ant F	0.291	0.615	N/A
Ant B	0.324	Ant H	0.564	0.888	N/A
Ant B	0.324	Ant I	0.148	0.472	N/A
Ant B	0.324	Ant J	0.367	0.691	N/A
Ant B	0.324	Ant M	0.613	0.937	N/A
Ant C	0.093	Ant E	0.564	0.657	N/A
Ant C	0.093	Ant F	0.291	0.384	N/A
Ant C	0.093	Ant H	0.564	0.657	N/A
Ant C	0.093	Ant I	0.148	0.241	N/A
Ant C	0.093	Ant J	0.367	0.460	N/A
Ant C	0.093	Ant M	0.613	0.706	N/A
Ant D	0.155	Ant E	0.564	0.719	N/A
Ant D	0.155	Ant F	0.291	0.446	N/A
Ant D	0.155	Ant H	0.564	0.719	N/A
Ant D	0.155	Ant I	0.148	0.303	N/A
Ant D	0.155	Ant J	0.367	0.522	N/A
Ant D	0.155	Ant M	0.613	0.768	N/A
Ant N	0.433	Ant E	0.564	0.997	N/A
Ant N	0.433	Ant F	0.291	0.724	N/A
Ant N	0.433	Ant H	0.564	0.997	N/A
Ant N	0.433	Ant I	0.148	0.581	N/A
Ant N	0.433	Ant J	0.367	0.800	N/A
Ant N	0.433	Ant M	0.613	See Note 1	0.619

Notes:

1. The aggregate of normalized composite exposure distribution for this antenna pair yields maximum total exposure at all locations in space ≤ 1 . Hence simultaneous transmission of this antenna pair is in compliance per Qualcomm Guidance 80-W2112-4. Please see the Spatial Distribution Overlay based Total Exposure Ratio (SDOTER) section.
2. For all combinations where the TER sum of AG0+AG1 is not greater than 1, there's no further analysis required for compliance demonstration.

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E.7 Hotspot (DSI = 0) SAR Antenna Group Analysis

Table E-11
DSI=0 Hotspot AG0 Highest Adjusted SAR

AG0 Ratio to Limit							
Hotspot SAR	Configuration	A	B	C	D	N	Max
	Back	0.385	0.324	0.093	0.155	0.433	0.433
	Front	0.383	0.296	0.061	0.008	0.280	0.383
	Top	-	-	-	-	0.044	0.044
	Bottom	0.785	0.372	0.026	0.036	0.078	0.785
	Right	0.311	0.345	0.153	-	0.596	0.596
	Left	0.238	-	-	0.009	0.022	0.238

Table E-12
DSI=0 Hotspot AG1 Highest Adjusted SAR

AG1 Ratio to Limit								
Hotspot SAR	Configuration	E	F	H	I	J	M	Max
	Back	0.486	0.291	0.384	0.148	0.367	0.613	0.613
	Front	0.521	0.314	0.191	0.117	0.191	0.066	0.521
	Top	0.566	0.568	0.239	-	0.110	0.157	0.568
	Bottom	-	-	-	-	-	0.037	0.037
	Right	0.399	-	0.063	-	0.063	0.050	0.399
	Left	0.508	0.088	0.531	0.060	0.489	0.306	0.531

Table E-13
DSI=0 Hotspot AG Verification

Hotspot SAR	Configuration	AG0 Ratio to Limit	AG1 Ratio to Limit	AG0 + AG1 Ratio to Limit
	Back	0.433	0.613	See Table Below
	Front	0.383	0.521	0.904
	Top	0.044	0.568	0.612
	Bottom	0.785	0.037	0.822
	Right	0.596	0.399	0.995
	Left	0.238	0.531	0.769

Back					
AG0 Ratio to Limit		AG1 Ratio to Limit		AG0 + AG1 Ratio to Limit	SDOTER
Ant A	0.385	Ant E	0.486	0.871	N/A
Ant A	0.385	Ant F	0.291	0.676	N/A
Ant A	0.385	Ant H	0.384	0.769	N/A
Ant A	0.385	Ant I	0.148	0.533	N/A
Ant A	0.385	Ant J	0.367	0.752	N/A
Ant A	0.385	Ant M	0.613	0.998	N/A
Ant B	0.324	Ant E	0.486	0.810	N/A
Ant B	0.324	Ant F	0.291	0.615	N/A
Ant B	0.324	Ant H	0.384	0.708	N/A
Ant B	0.324	Ant I	0.148	0.472	N/A
Ant B	0.324	Ant J	0.367	0.691	N/A
Ant B	0.324	Ant M	0.613	0.937	N/A
Ant C	0.093	Ant E	0.486	0.579	N/A
Ant C	0.093	Ant F	0.291	0.384	N/A
Ant C	0.093	Ant H	0.384	0.477	N/A
Ant C	0.093	Ant I	0.148	0.241	N/A
Ant C	0.093	Ant J	0.367	0.460	N/A
Ant C	0.093	Ant M	0.613	0.706	N/A
Ant D	0.155	Ant E	0.486	0.641	N/A
Ant D	0.155	Ant F	0.291	0.446	N/A
Ant D	0.155	Ant H	0.384	0.539	N/A
Ant D	0.155	Ant I	0.148	0.303	N/A
Ant D	0.155	Ant J	0.367	0.522	N/A
Ant D	0.155	Ant M	0.613	0.768	N/A
Ant N	0.433	Ant E	0.486	0.919	N/A
Ant N	0.433	Ant F	0.291	0.724	N/A
Ant N	0.433	Ant H	0.384	0.817	N/A
Ant N	0.433	Ant I	0.148	0.581	N/A
Ant N	0.433	Ant J	0.367	0.800	N/A
Ant N	0.433	Ant M	0.613	See Note 1	0.619

Notes:

1. The aggregate of normalized composite exposure distribution for this antenna pair yields maximum total exposure at all locations in space ≤ 1 . Hence simultaneous transmission of this antenna pair is in compliance per Qualcomm Guidance 80-W2112-4. Please see the Spatial Distribution Overlay based Total Exposure Ratio (SDOTER) section.
2. For all combinations where the TER sum of AG0+AG1 is not greater than 1, there's no further analysis required for compliance demonstration.

E.8 Phablet (DSI = 0) SAR Antenna Group 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-14
DSI=0 Phablet AG0 Highest Adjusted SAR

AG0 Ratio to Limit							
Phablet SAR	Configuration	A	B	C	D	N	Max
	Back	-	-	-	-	0.825	0.825
	Front	-	-	-	-	0.531	0.531
	Top	-	-	-	-	0.079	0.079
	Bottom	0.528	-	-	-	0.098	0.528
	Right	-	-	-	-	0.851	0.851
	Left	-	-	-	-	0.037	0.037

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Table E-15
DSI=0 Phablet AG1 Highest Adjusted SAR

AG1 Ratio to Limit								
Phablet SAR	Configuration	E	F	H	I	J	M	Max
	Back	0.509	-	0.509	-	0.172	0.851	0.851
	Front	0.278	-	0.260	-	0.461	0.164	0.461
	Top	0.141	-	0.120	-	0.065	0.231	0.231
	Bottom	-	-	-	-	-	0.045	0.045
	Right	0.063	-	0.063	-	0.014	0.067	0.067
	Left	0.467	-	0.607	-	0.166	0.598	0.607

Table E-16
Simultaneous Transmission Scenarios of NFC/UWB (Phablet)

Phablet SAR	Configuration	NFC Ratio to Limit	UWB Ratio to Limit
	Back	0.003	0.000
	Front	0.000	0.000
	Top	0.000	0.000
	Bottom	-	-
	Right	-	0.000
	Left	0.000	0.001

Table E-17
DSI=0 Phablet AG Verification

Phablet SAR	Configuration	AG0 Ratio to Limit	AG1 Ratio to Limit	NFC Ratio to Limit	UWB Ratio to Limit	AG0 + AG1 + NFC + UWB Ratio to Limit
	Back	0.825	0.851	0.003	0.000	See Table Below
	Front	0.531	0.461	0.000	0.000	0.992
	Top	0.079	0.231	0.000	0.000	0.310
	Bottom	0.528	0.045	-	-	0.573
	Right	0.851	0.067	-	0.000	0.918
	Left	0.037	0.607	0.000	0.001	0.645

Back								
AG0 Ratio to Limit		AG1 Ratio to Limit		AG0 + AG1 Ratio to Limit	SDOTER	UWB Ratio to Limit	NFC Ratio to Limit	TER
Ant A	-	Ant E	0.509	0.509	N/A	0.000	0.003	0.512
Ant A	-	Ant H	0.509	0.509	N/A	0.000	0.003	0.512
Ant A	-	Ant J	0.172	0.172	N/A	0.000	0.003	0.175
Ant A	-	Ant M	0.851	0.851	N/A	0.000	0.003	0.854
Ant B	-	Ant E	0.509	0.509	N/A	0.000	0.003	0.512
Ant B	-	Ant H	0.509	0.509	N/A	0.000	0.003	0.512
Ant B	-	Ant J	0.172	0.172	N/A	0.000	0.003	0.175
Ant B	-	Ant M	0.851	0.851	N/A	0.000	0.003	0.854
Ant C	-	Ant E	0.509	0.509	N/A	0.000	0.003	0.512
Ant C	-	Ant H	0.509	0.509	N/A	0.000	0.003	0.512
Ant C	-	Ant J	0.172	0.172	N/A	0.000	0.003	0.175
Ant C	-	Ant M	0.851	0.851	N/A	0.000	0.003	0.854
Ant D	-	Ant E	0.509	0.509	N/A	0.000	0.003	0.512
Ant D	-	Ant H	0.509	0.509	N/A	0.000	0.003	0.512
Ant D	-	Ant J	0.172	0.172	N/A	0.000	0.003	0.175
Ant D	-	Ant M	0.851	0.851	N/A	0.000	0.003	0.854
Ant N	0.825	Ant E	0.509	See Note 1	0.825	0.000	0.003	0.828
Ant N	0.825	Ant F	-	0.825	N/A	0.000	0.003	0.828
Ant N	0.825	Ant H	0.509	See Note 1	0.848	0.000	0.003	0.851
Ant N	0.825	Ant I	-	0.825	N/A	0.000	0.003	0.828
Ant N	0.825	Ant J	0.172	0.997	N/A	0.000	0.003	1.000
Ant N	0.825	Ant M	0.851	See Note 1	0.909	0.000	0.003	0.912

Notes:

1. The aggregate of normalized composite exposure distribution for this antenna pair yields maximum total exposure at all locations in space ≤ 1 . Hence simultaneous transmission of this antenna pair is in compliance per QualComm Guidance 80-W2112-4. Please see the Spatial Distribution Overlay based Total Exposure Ratio (SDOTER) section.
2. For all combinations where the TER sum of AG0+AG1 +UWB+NFC is not greater than 1, there's no further analysis required for compliance demonstration.

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E.9 Spatial Distribution Overlay based Total Exposure Ratio (SDOTER)

E.9.1 Back Side Body-worn and Hotspot

E.9.1.1 Verify intermediate data

Figure E-1
Side by side comparison of PD and SDOTER for Ant N

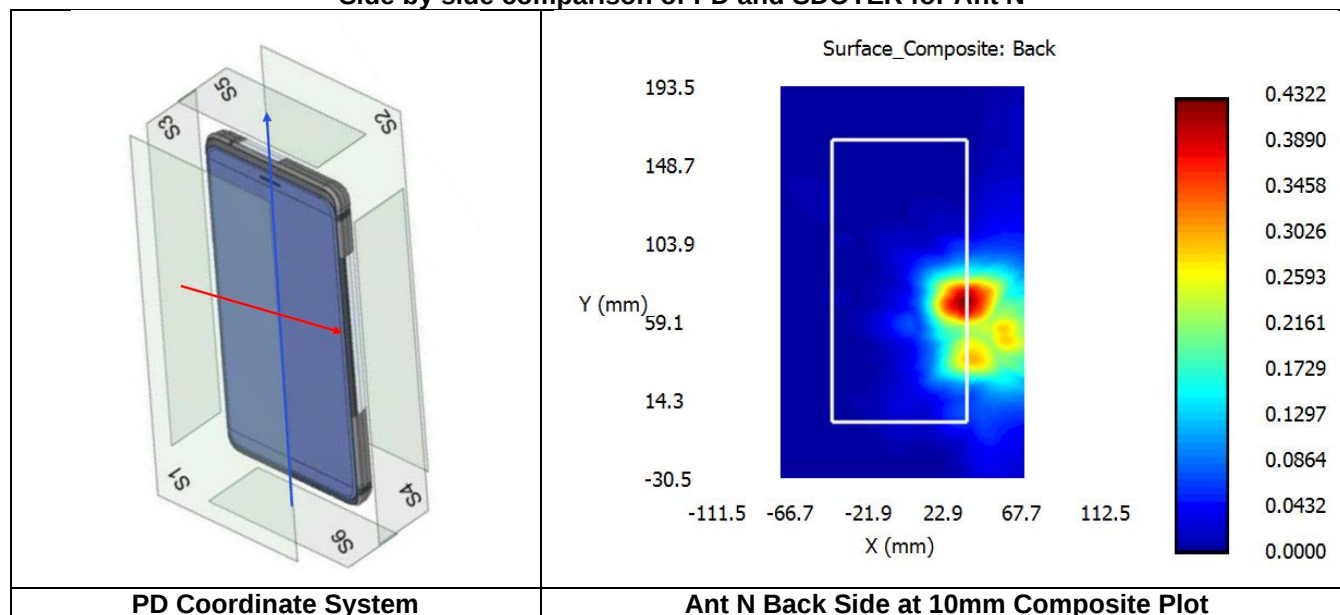
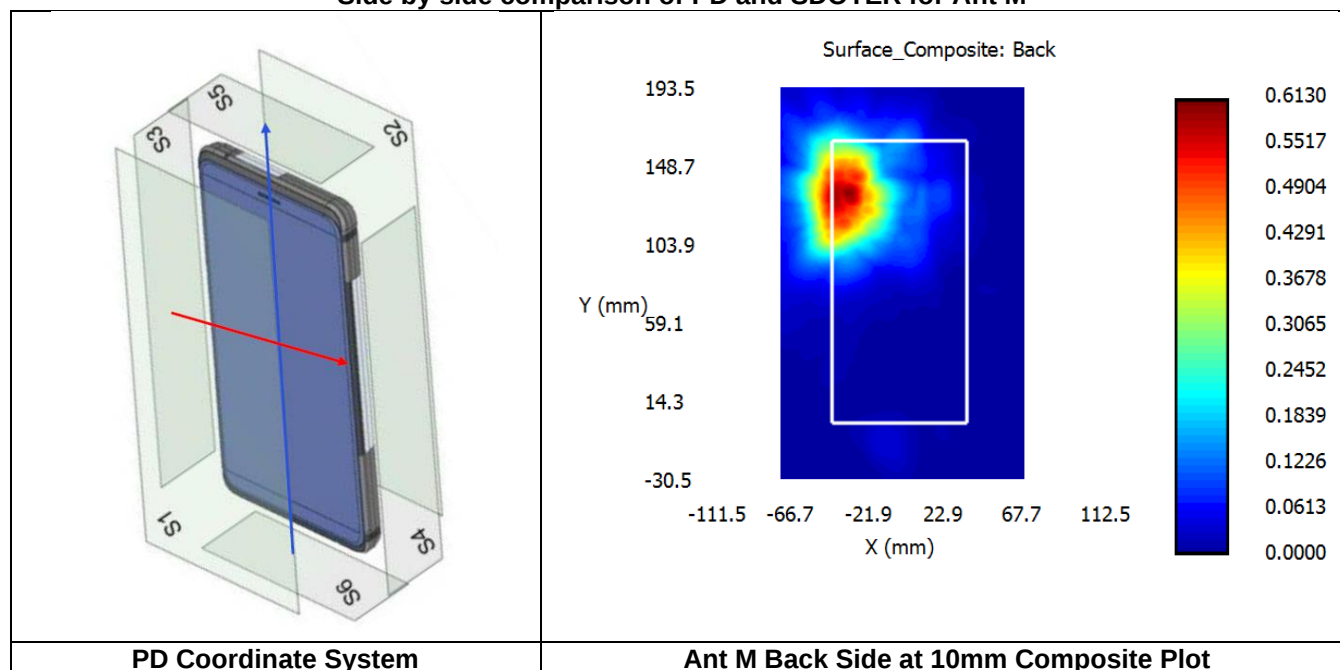


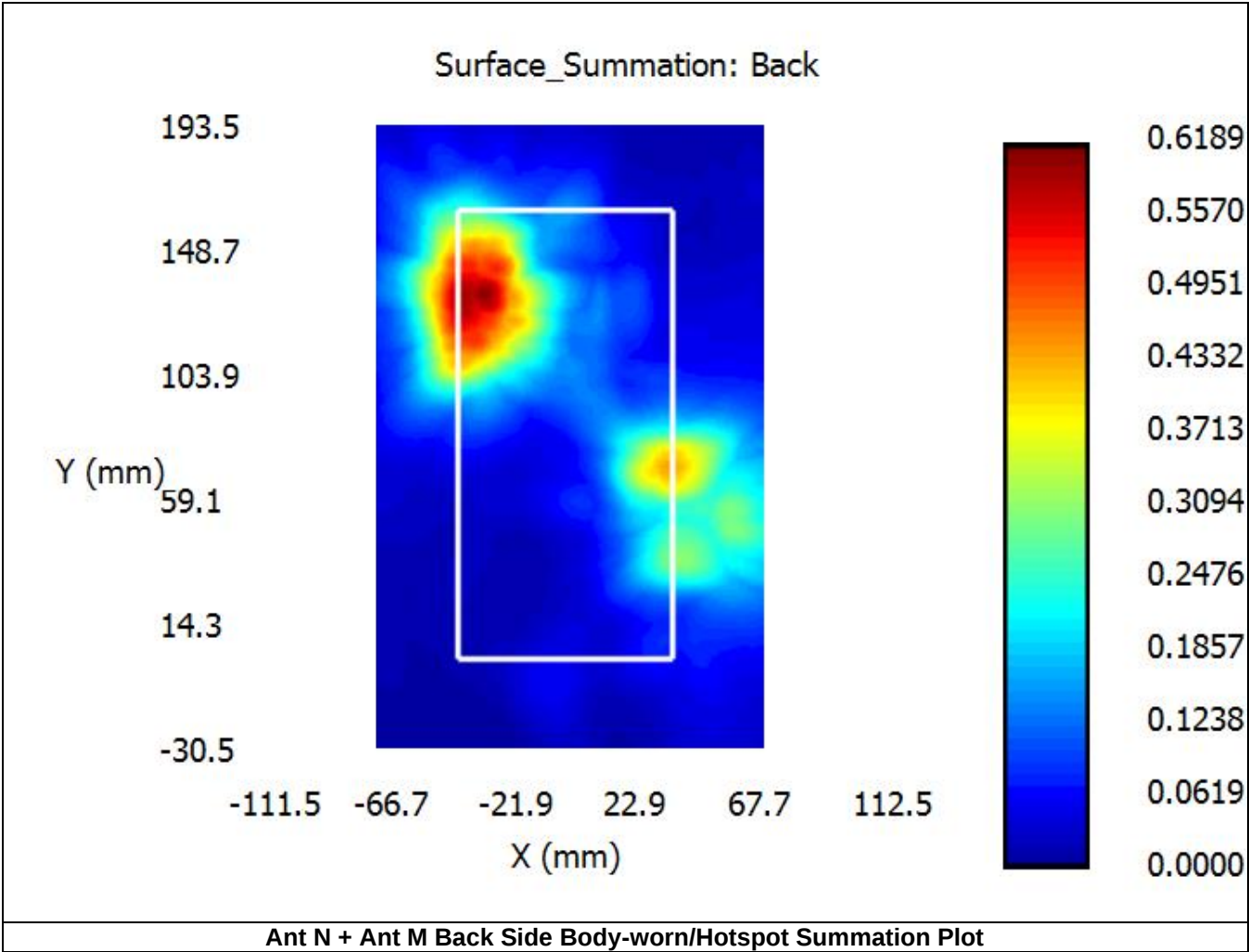
Figure E-2
Side by side comparison of PD and SDOTER for Ant M



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E.9.1.1 TER Summation Plots

Figure E-3
TER Summation Plot of Ant N & Ant M



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E.9.2 Back Side Phablet

E.9.2.1 Verify intermediate data

Figure E-4

Side by side comparison of PD and SDOTER for Ant N

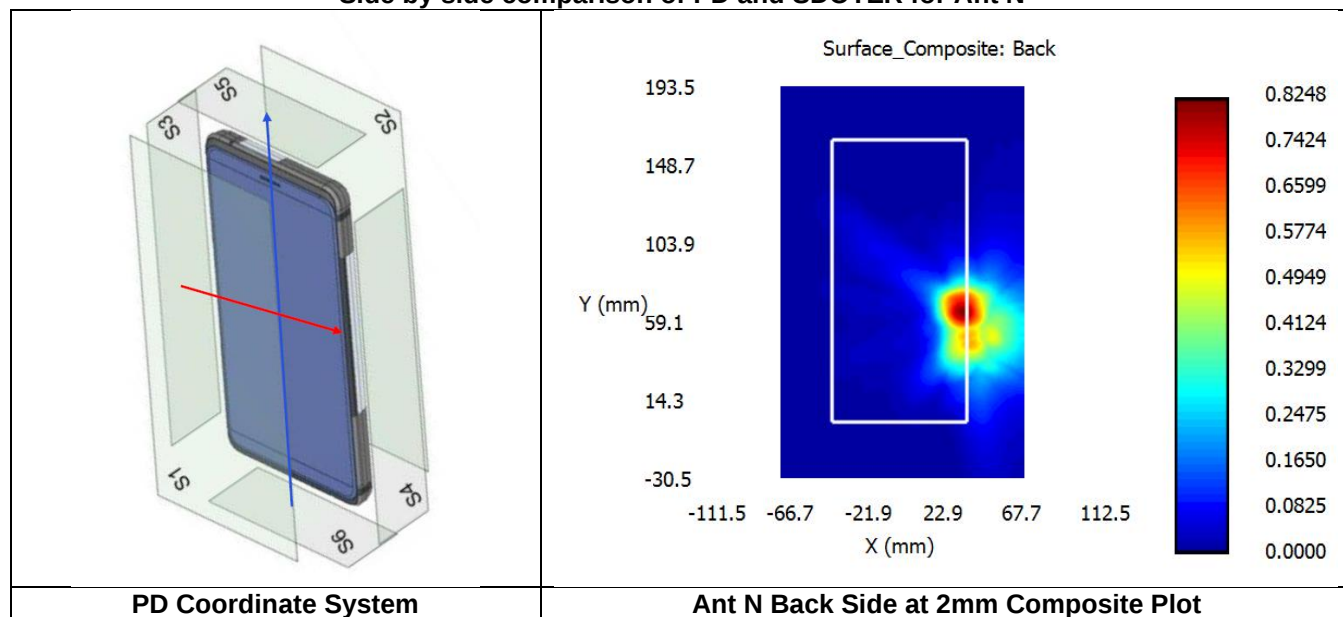
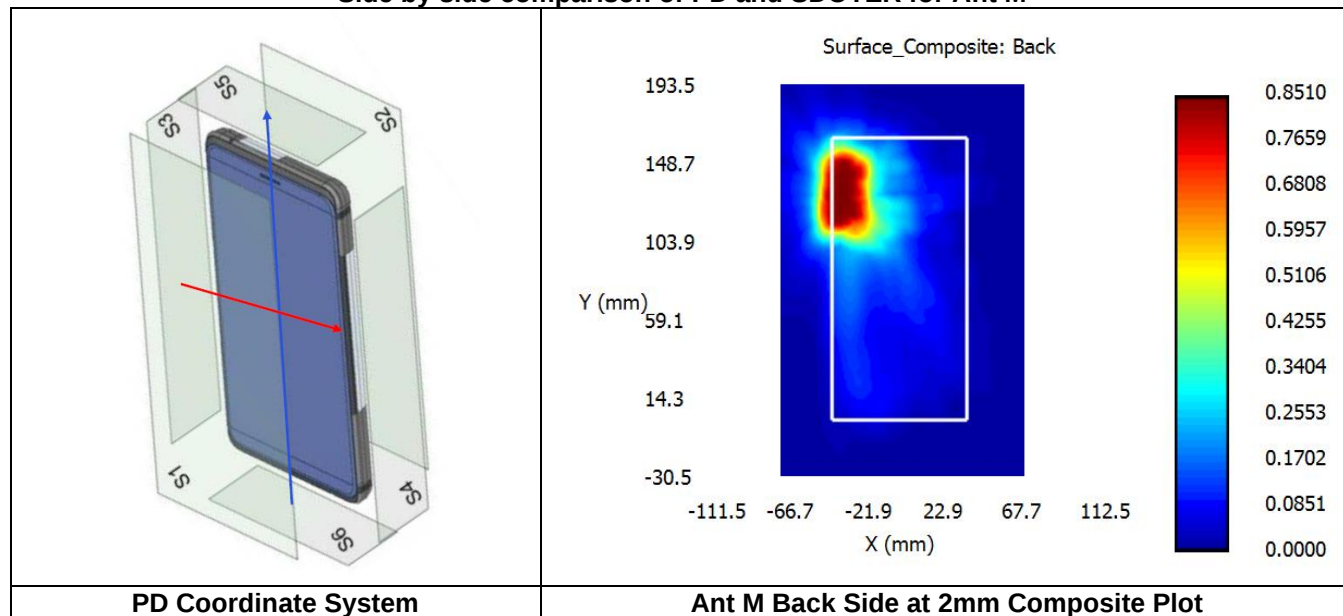


Figure E-5

Side by side comparison of PD and SDOTER for Ant M



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Figure E-6
Side by side comparison of DASY and SDOTER for Ant E

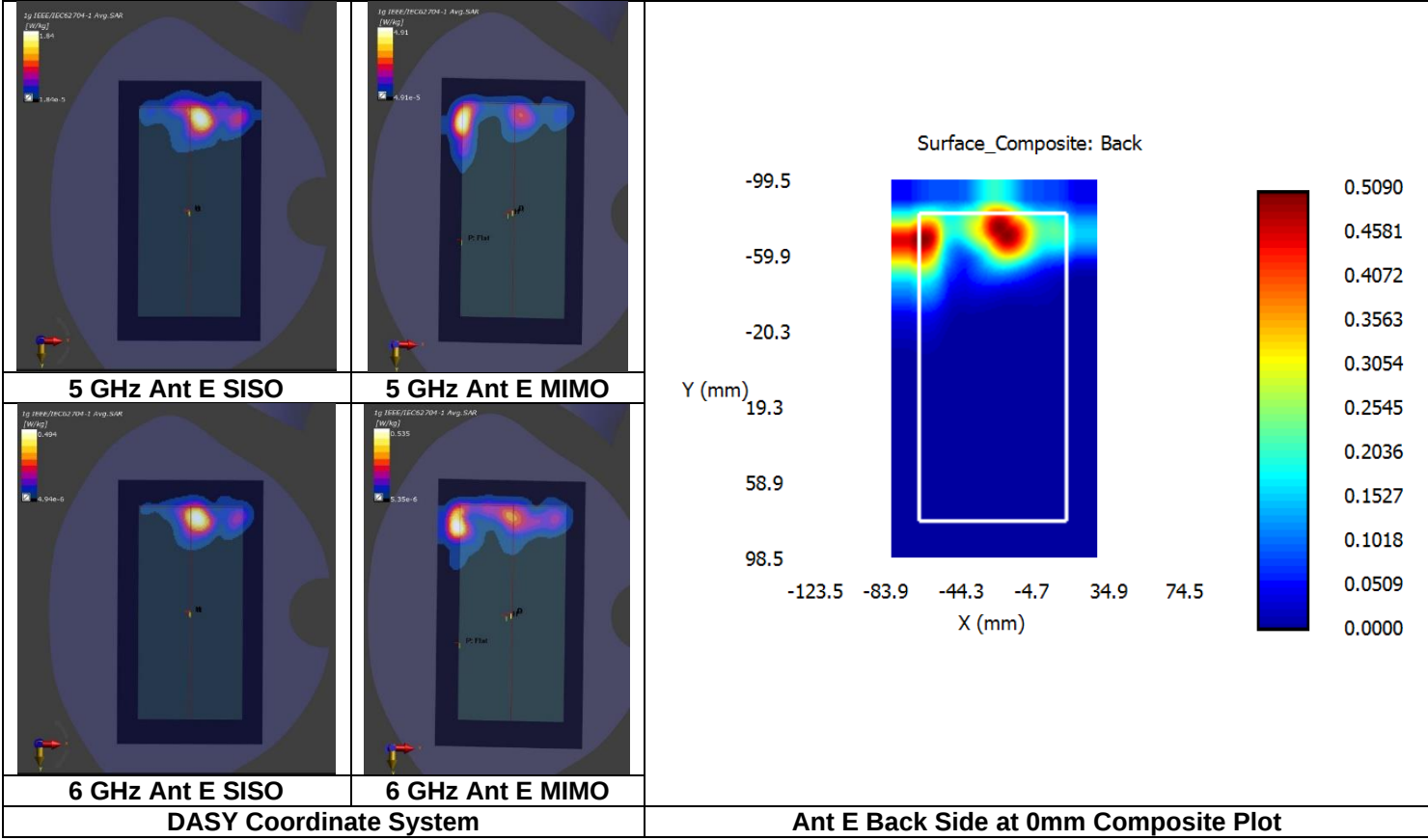
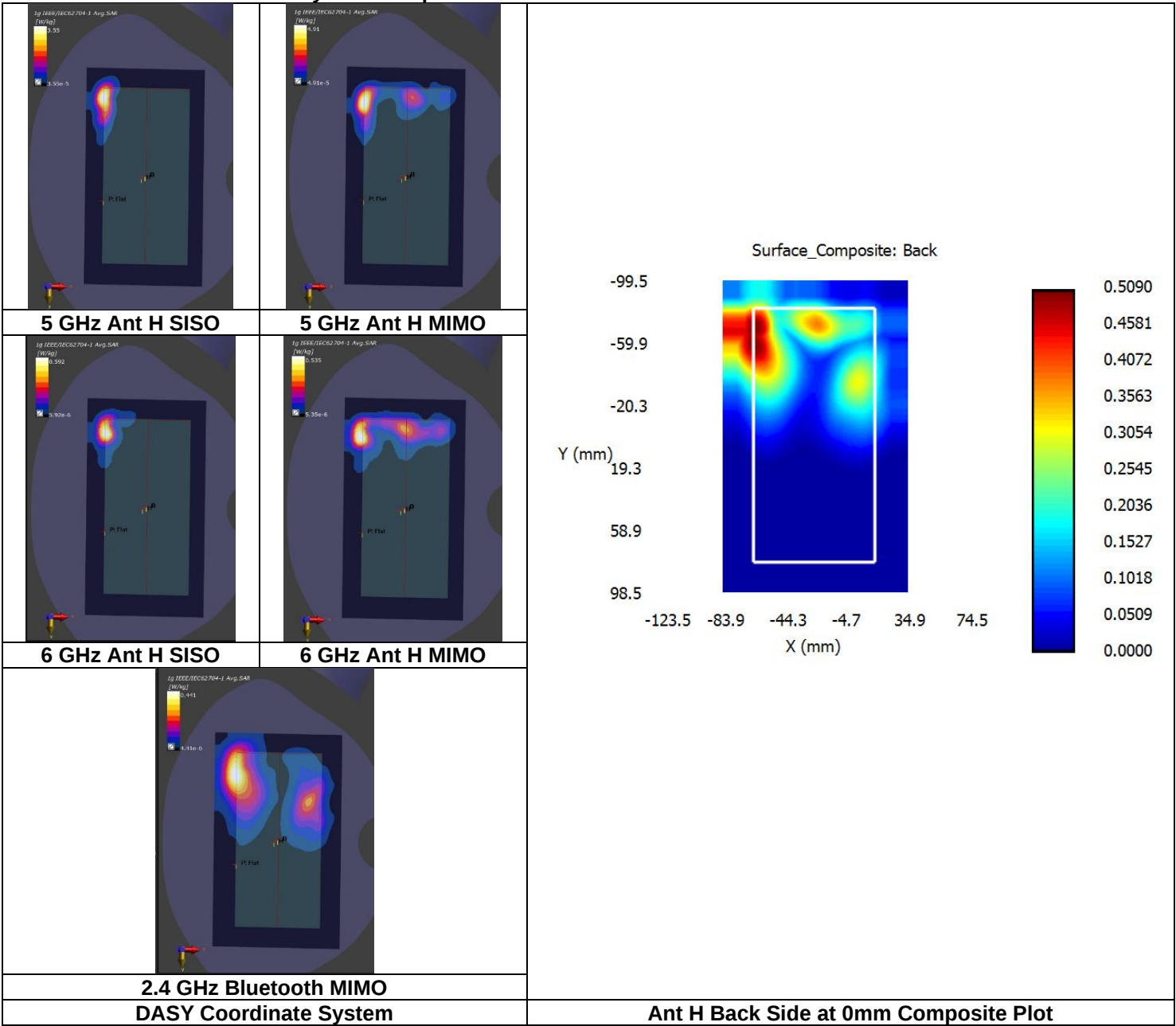
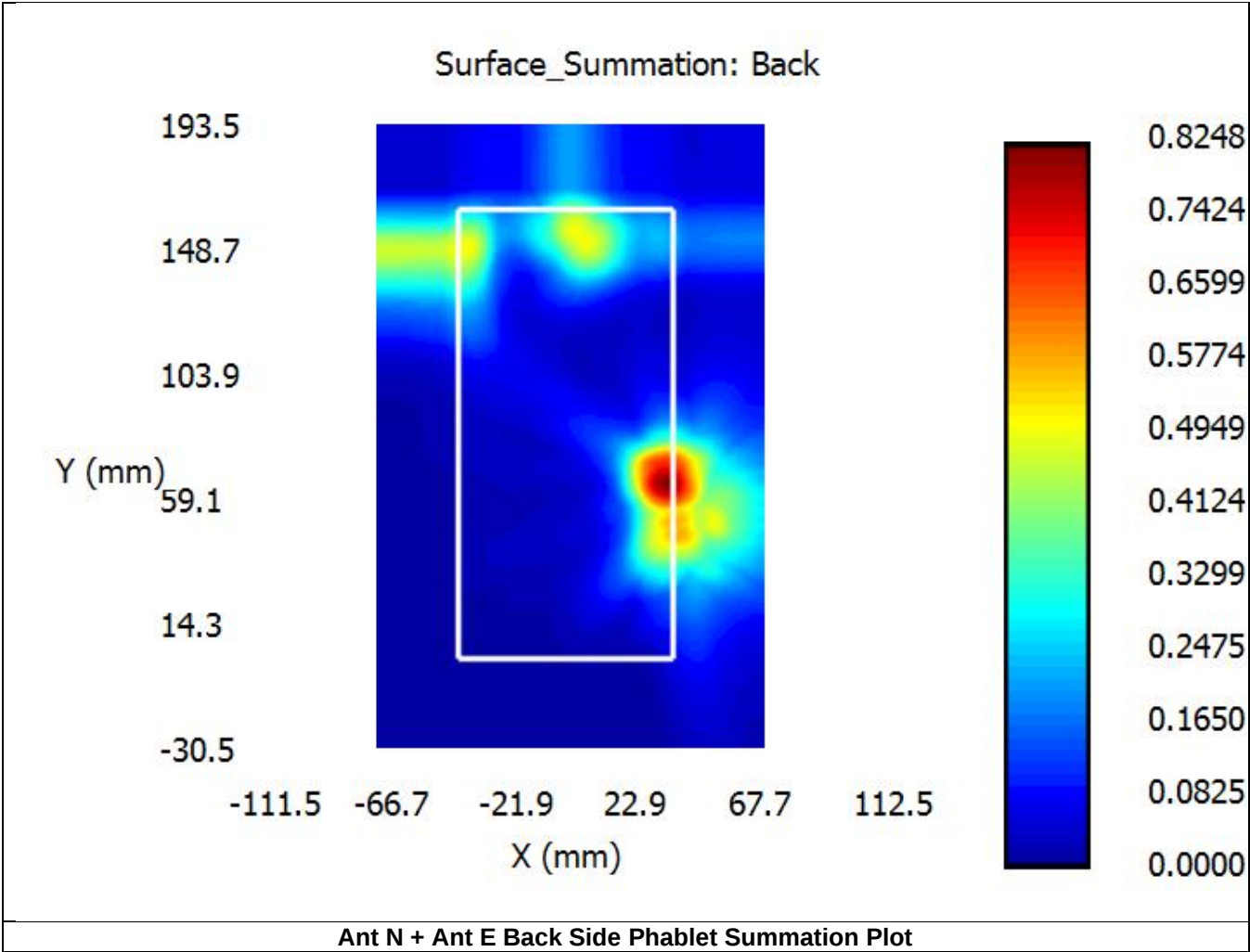


Figure E-7
Side by side comparison of DASY and SDOTER for Ant H



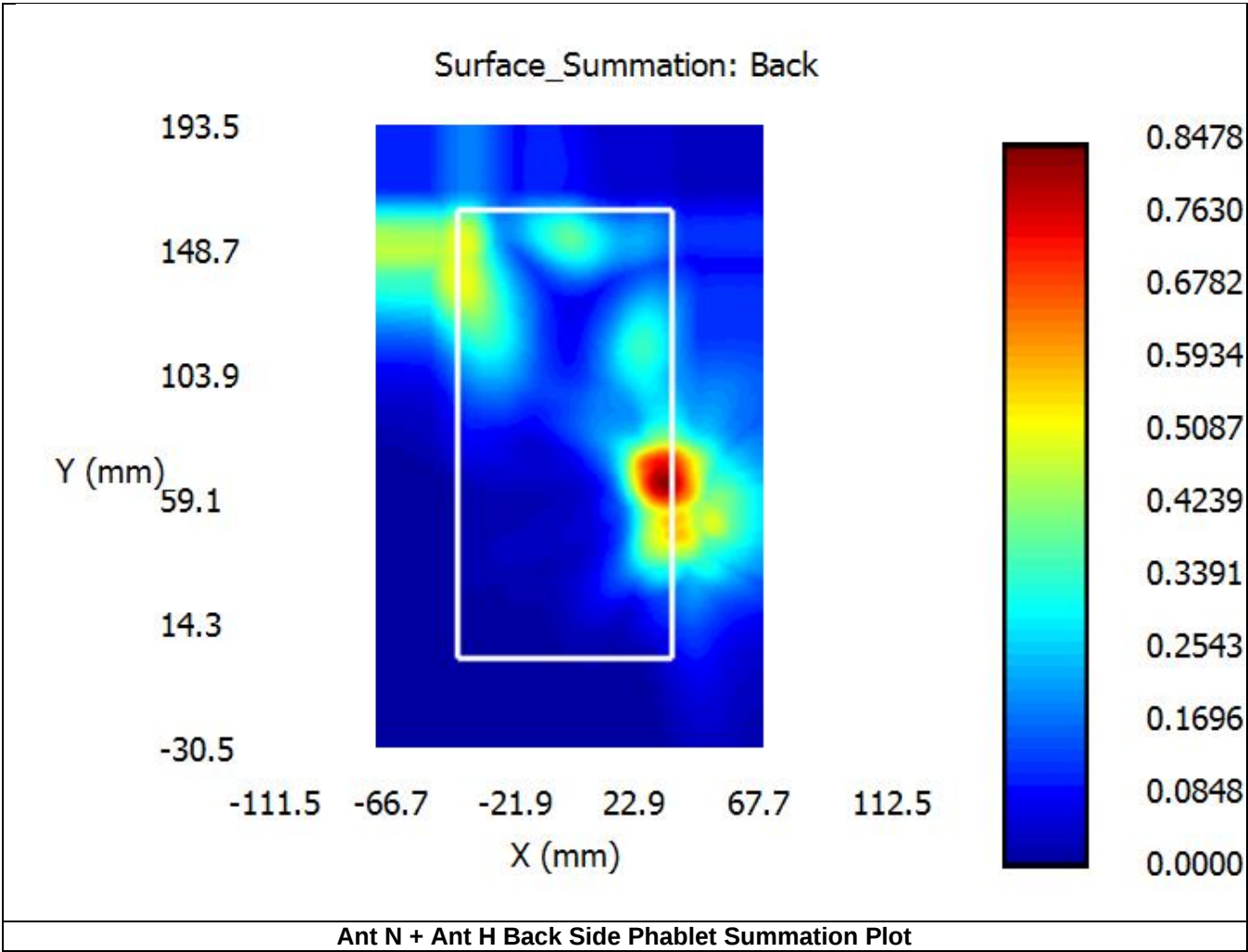
E.9.2.2 TER Summation Plots

Figure E-8
TER Summation Plot of Ant N & Ant E



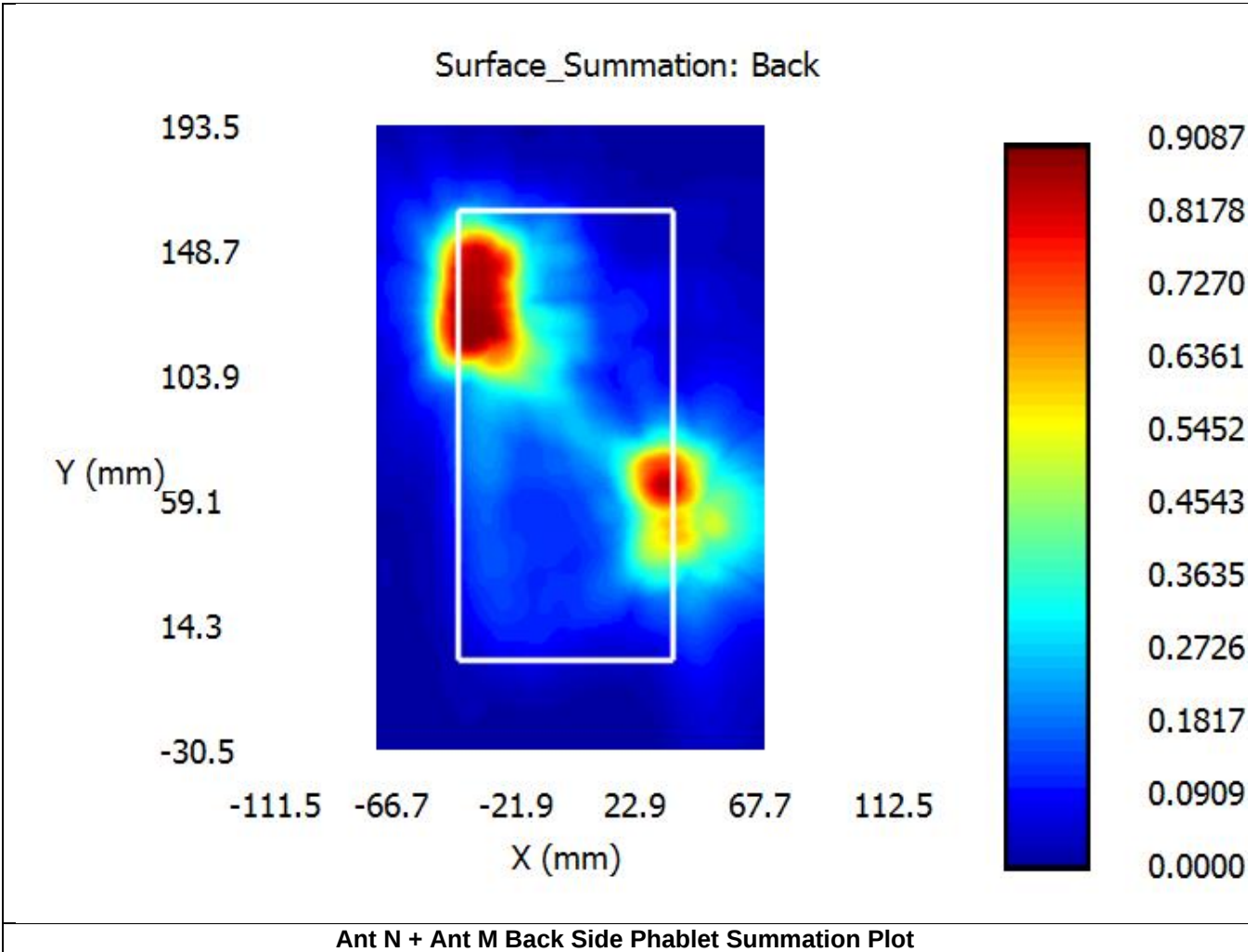
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Figure E-9
TER Summation Plot of Ant N & Ant H



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Figure E-10
TER Summation Plot of Ant N & Ant M



E.10 Conclusion

The above numerical summed SAR results and SPLSR/SDOTER for all the combinations of antenna groups are sufficient to show that AG0 is mutually exclusive from AG1 and 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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