3 Composition / Information on ingredients

The Item is composed of the following ingredients:

Water	50 – 73 %	
Non-ionic detergents	25 – 50 %	polyoxyethylenesorbitan monolaurate
NaCl	0 – 2 %	
Preservative	0.05 – 0.1%	Preventol-D7

Safety relevant ingredients:

CAS-No. 55965-84-9	< 0.1 %	aqueous preparation, containing 5-chloro-2-methyl-3(2H)-isothiazolone and 2-methyyl-3(2H)-isothiazolone
CAS-No. 9005-64-5	<50 %	polyoxyethylenesorbitan monolaurate

According to international guidelines, the product is not a dangerous mixture and therefore not required to be marked by symbols.

Figure D-4
Composition of 2.4 GHz Head Tissue Equivalent Matter

Note: 2.4 GHz head liquid recipes are proprietary SPEAG. Since the composition is approximate to the actual liquids utilized, the manufacturer tissue-equivalent liquid data sheets are provided below.

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Measurement Certificate / Material Test

Item Name	**Head Tissue Simulating Liquid (HBBL1900-3800V3)**
Product No.	SL AAH 196 AB (Batch: 170619-1)
Manufacturer	SPEAG

Measurement Method
TSL dielectric parameters measured using calibrated DAK probe.

Setup Validation
Validation results were within ± 2.5% towards the target values of Methanol.

Target Parameters
Target parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.

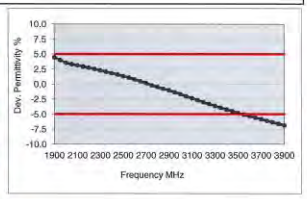
Test Condition

Ambient	Environment temperatur (22 ± 3)°C and humidity < 70%.
TSL Temperature	22°C
Test Date	20-Jun-17
Operator	CL

Additional Information

TSL Density	1.054 g/cm³
TSL Heat-capacity	3.389 kJ/(kg*K)

	Measured			Target		Diff.to Target [%]	
f [MHz]	e'	e''	sigma	eps	sigma	Δ-eps	Δ-sigma
1900	41.8	12.2	1.3	40.0	1.4	4.5	-8.2
1950	41.6	12.3	1.3	40.0	1.4	4.0	-4.8
2000	41.4	12.4	1.4	40.0	1.4	3.6	-1.3
2050	41.2	12.6	1.4	39.9	1.4	3.3	-0.9
2100	41.1	12.7	1.5	39.8	1.5	3.1	-0.6
2150	40.9	12.8	1.5	39.7	1.5	2.9	-0.2
2200	40.7	12.9	1.6	39.6	1.6	2.7	0.2
2250	40.6	13.0	1.6	39.6	1.6	2.5	0.5
2300	40.4	13.2	1.7	39.5	1.7	2.3	1.1
2350	40.2	13.3	1.7	39.4	1.7	2.1	1.5
2400	40.0	13.4	1.8	39.3	1.8	1.8	2.1
2450	39.8	13.5	1.8	39.2	1.8	1.6	2.6
2500	39.7	13.7	1.9	39.1	1.9	1.3	2.6
2550	39.5	13.7	2.0	39.1	1.9	1.1	2.2
2600	39.3	13.9	2.0	39.0	2.0	0.8	2.5
2650	39.1	14.0	2.1	38.9	2.0	0.5	2.6
2700	39.0	14.2	2.1	38.9	2.1	0.2	2.7
2750	38.7	14.3	2.2	38.8	2.1	-0.2	2.6
2800	38.6	14.4	2.2	38.8	2.2	-0.4	2.5
2850	38.4	14.5	2.3	38.7	2.2	-0.8	2.6
2900	38.2	14.6	2.3	38.6	2.3	-1.0	2.6
2950	38.1	14.7	2.4	38.6	2.3	-1.3	2.6
3000	37.9	14.8	2.5	38.5	2.4	-1.7	2.6
3050	37.7	14.8	2.5	38.4	2.5	-2.0	2.8
3100	37.5	14.9	2.6	38.4	2.5	-2.3	2.8
3150	37.3	15.0	2.6	38.3	2.6	-2.6	2.9
3200	37.1	15.1	2.7	38.3	2.6	-3.0	2.9
3250	37.0	15.1	2.7	38.2	2.7	-3.3	3.0
3300	36.8	15.2	2.8	38.2	2.7	-3.6	3.1
3350	36.6	15.3	2.8	38.1	2.8	-3.9	3.2
3400	36.4	15.3	2.9	38.0	2.8	-4.2	3.3
3450	36.3	15.4	3.0	38.0	2.9	-4.5	3.4
3500	36.1	15.5	3.0	37.9	2.9	-4.8	3.5
3550	36.0	15.5	3.1	37.9	3.0	-5.0	3.6
3600	35.8	15.6	3.1	37.8	3.0	-5.3	3.8
3650	35.7	15.7	3.2	37.8	3.1	-5.6	3.7
3700	35.5	15.7	3.2	37.7	3.1	-5.8	3.9
3750	35.4	15.8	3.3	37.6	3.2	-6.1	3.9
3800	35.2	15.9	3.4	37.6	3.2	-6.3	4.1
3850	35.1	15.9	3.4	37.5	3.3	-6.6	4.1



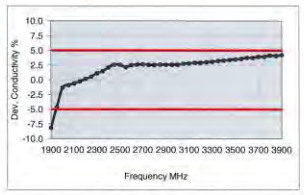


Figure D-5
2.4 GHz Head Tissue Equivalent Matter

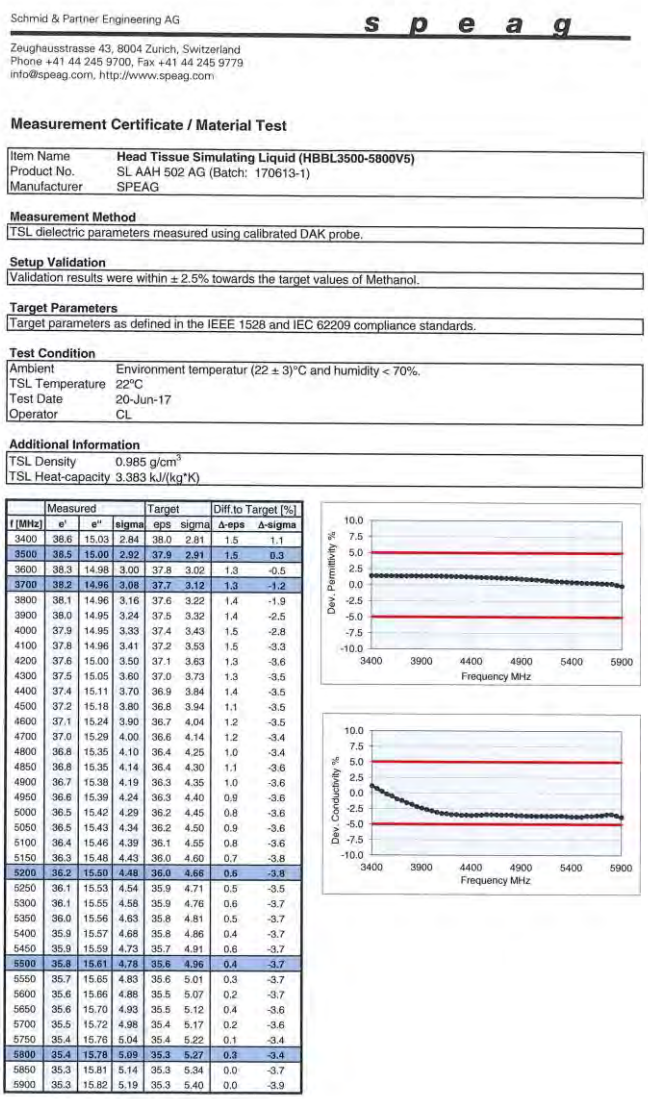
2 Composition / Information on ingredients

The Item is composed of the following ingredients:

Water	50 – 65%
Mineral oil	10 – 30%
Emulsifiers	8 – 25%
Sodium salt	0 – 1.5%

Figure D-6
Composition of 5 GHz Head Tissue Equivalent Matter

Note: 3.5 – 5 GHz head liquid recipes are proprietary SPEAG. Since the composition is approximate to the actual liquids utilized, the manufacturer tissue-equivalent liquid data sheets are provided below.



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Measurement Certificate / Material Test

Item Name	**Head Tissue Simulating Liquid (HBBL3500-5800V5)**
Product No.	SL AAH 502 AG (Batch: 170613-1)
Manufacturer	SPEAG

Measurement Method
TSL dielectric parameters measured using calibrated DAK probe.

Setup Validation
Validation results were within ± 2.5% towards the target values of Methanol.

Target Parameters
Target parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.

Test Condition

Ambient	Environment temperatur (22 ± 3)°C and humidity < 70%.
TSL Temperature	22°C
Test Date	20-Jun-17
Operator	CL

Additional Information

TSL Density	0.985 g/cm^3
TSL Heat-capacity	3.383 kJ/(kg*K)

	Measured			Target		Diff.to Target [%]	
f [MHz]	e'	e''	sigma	eps	sigma	Δ-eps	Δ-sigma
3400	38.6	15.03	2.84	38.0	2.81	1.5	1.1
3500	38.5	15.00	2.92	37.9	2.91	1.5	0.3
3600	38.3	14.98	3.00	37.8	3.02	1.3	-0.5
3700	38.2	14.96	3.08	37.7	3.12	1.3	-1.2
3800	38.1	14.96	3.16	37.6	3.22	1.4	-1.9
3900	38.0	14.95	3.24	37.5	3.32	1.4	-2.5
4000	37.9	14.95	3.33	37.4	3.43	1.5	-2.8
4100	37.8	14.96	3.41	37.2	3.53	1.5	-3.3
4200	37.6	15.00	3.50	37.1	3.63	1.3	-3.6
4300	37.5	15.05	3.60	37.0	3.73	1.3	-3.5
4400	37.4	15.11	3.70	36.9	3.84	1.4	-3.5
4500	37.2	15.18	3.80	36.8	3.94	1.1	-3.5
4600	37.1	15.24	3.90	36.7	4.04	1.2	-3.5
4700	37.0	15.29	4.00	36.6	4.14	1.2	-3.4
4800	36.8	15.35	4.10	36.4	4.25	1.0	-3.4
4850	36.8	15.35	4.14	36.4	4.30	1.1	-3.6
4900	36.7	15.38	4.19	36.3	4.35	1.0	-3.6
4950	36.6	15.39	4.24	36.3	4.40	0.9	-3.6
5000	36.5	15.42	4.29	36.2	4.45	0.8	-3.6
5050	36.5	15.43	4.34	36.2	4.50	0.9	-3.6
5100	36.4	15.46	4.39	36.1	4.55	0.8	-3.6
5150	36.3	15.48	4.43	36.0	4.60	0.7	-3.8
5200	36.2	15.50	4.48	36.0	4.66	0.6	-3.8
5250	36.1	15.53	4.54	35.9	4.71	0.5	-3.5
5300	36.1	15.55	4.58	35.9	4.76	0.6	-3.7
5350	36.0	15.56	4.63	35.8	4.81	0.5	-3.7
5400	35.9	15.57	4.68	35.8	4.86	0.4	-3.7
5450	35.9	15.59	4.73	35.7	4.91	0.6	-3.7
5500	35.8	15.61	4.78	35.6	4.96	0.4	-3.7
5550	35.7	15.65	4.83	35.6	5.01	0.3	-3.7
5600	35.6	15.66	4.88	35.5	5.07	0.2	-3.7
5650	35.6	15.70	4.93	35.5	5.12	0.4	-3.6
5700	35.5	15.72	4.98	35.4	5.17	0.2	-3.6
5750	35.4	15.76	5.04	35.4	5.22	0.1	-3.4
5800	35.4	15.78	5.09	35.3	5.27	0.3	-3.4
5850	35.3	15.81	5.14	35.3	5.34	0.0	-3.7
5900	35.3	15.82	5.19	35.3	5.40	0.0	-3.9

Figure D-7
5 GHz Head Tissue Equivalent Matter

3 Composition / Information on ingredients

The Item is composed of the following ingredients:

Water	60 – 80%
Esters, Emulsifiers, Inhibitors	20 – 40%
Sodium salt	0 – 1.5%

Figure D-8
Composition of 5 GHz Body Tissue Equivalent Matter

Note: 3.5 – 5 GHz Body liquid recipes are proprietary SPEAG. Since the composition is approximate to the actual liquids utilized, the manufacturer tissue-equivalent liquid data sheets are provided below.

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Measurement Certificate / Material Test

Item Name	**Body Tissue Simulating Liquid (MBBL3500-5800V5)**
Product No.	SL AAM 501 EA (Batch: 180423-2)
Manufacturer	SPEAG

Measurement Method
TSL dielectric parameters measured using calibrated DAK probe.

Setup Validation
Validation results were within ± 2.5% towards the target values of Methanol.

Target Parameters
Target parameters as defined in the KDB 865664 compliance standard.

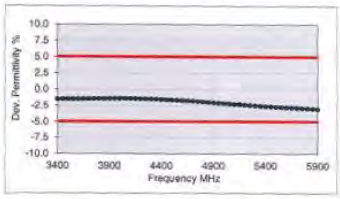
Test Condition

Ambient	Environment temperatur (22 ± 3)°C and humidity < 70%.
TSL Temperature	22°C
Test Date	25-Apr-18
Operator	WM

Additional Information

TSL Density	0.996 g/cm3
TSL Heat-capacity	3.765 kJ/(kg*K)

	Measured			Target		Diff.to Target [%]	
f [MHz]	e'	e''	sigma	eps	sigma	Δ-eps	Δ-sigma
3400	50.7	16.46	3.11	51.5	3.20	-1.5	-2.7
3500	50.5	16.50	3.21	51.3	3.31	-1.6	-3.1
3600	50.4	16.56	3.32	51.2	3.43	-1.5	-3.2
3700	50.3	16.63	3.42	51.1	3.55	-1.5	-3.6
3800	50.2	16.72	3.53	50.9	3.66	-1.4	-3.7
3900	50.1	16.81	3.65	50.8	3.78	-1.3	-3.5
4000	49.9	16.93	3.77	50.6	3.90	-1.5	-3.3
4100	49.8	17.05	3.89	50.5	4.01	-1.4	-3.1
4200	49.6	17.18	4.01	50.4	4.13	-1.5	-2.9
4300	49.5	17.32	4.14	50.2	4.25	-1.5	-2.5
4400	49.3	17.46	4.27	50.1	4.37	-1.6	-2.2
4500	49.2	17.59	4.40	50.0	4.48	-1.5	-1.8
4600	49.0	17.73	4.54	49.8	4.60	-1.7	-1.3
4700	48.8	17.86	4.67	49.7	4.72	-1.8	-1.0
4800	48.6	17.99	4.80	49.6	4.83	-1.9	-0.7
4850	48.5	18.05	4.87	49.5	4.89	-2.0	-0.4
4900	48.4	18.11	4.94	49.4	4.95	-2.1	-0.2
4950	48.3	18.17	5.00	49.4	5.01	-2.1	-0.1
5000	48.2	18.23	5.07	49.3	5.07	-2.2	0.1
5050	48.1	18.29	5.14	49.2	5.12	-2.3	0.3
5100	48.0	18.34	5.20	49.2	5.18	-2.3	0.3
5150	47.9	18.39	5.27	49.1	5.24	-2.4	0.6
5200	47.9	18.45	5.34	49.0	5.30	-2.3	0.8
5250	47.8	18.50	5.40	48.9	5.36	-2.3	0.8
5300	47.7	18.56	5.47	48.9	5.42	-2.4	1.0
5350	47.6	18.61	5.54	48.8	5.47	-2.5	1.2
5400	47.5	18.67	5.61	48.7	5.53	-2.5	1.4
5450	47.4	18.72	5.68	48.7	5.59	-2.6	1.6
5500	47.3	18.77	5.74	48.6	5.65	-2.7	1.6
5550	47.2	18.83	5.81	48.5	5.71	-2.8	1.8
5600	47.1	18.88	5.88	48.5	5.77	-2.8	2.0
5650	47.1	18.93	5.95	48.4	5.82	-2.7	2.1
5700	47.0	18.99	6.02	48.3	5.88	-2.8	2.3
5750	46.9	19.04	6.09	48.3	5.94	-2.8	2.5
5800	46.8	19.10	6.16	48.2	6.00	-2.9	2.7
5850	46.7	19.16	6.23	48.1	6.06	-3.0	2.8
5900	46.6	19.22	6.31	48.1	6.12	-3.0	3.2



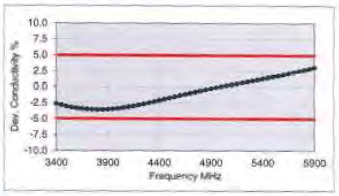


Figure D-9
5 GHz Body Tissue Equivalent Matter

APPENDIX E: SAR SYSTEM VALIDATION

Per FCC KDB Publication 865664 D02v01r02, SAR system validation status should be documented to confirm measurement accuracy. The SAR systems (including SAR probes, system components and software versions) used for this device were validated against its performance specifications prior to the SAR measurements. Reference dipoles were used with the required tissue- equivalent media for system validation, according to the procedures outlined in FCC KDB Publication 865664 D01v01r04 and IEEE 1528-2013. Since SAR probe calibrations are frequency dependent, each probe calibration point was validated at a frequency within the valid frequency range of the probe calibration point, using the system that normally operates with the probe for routine SAR measurements and according to the required tissue-equivalent media.

A tabulated summary of the system validation status including the validation date(s), measurement frequencies, SAR probes and tissue dielectric parameters has been included.

Table E-1
SAR System Validation Summary – 1g

SAR System	Freq. (MHz)	Date	Probe SN	Probe Cal Point		Cond. (σ)	Perm. (εr)	CW VALIDATION			MOD. VALIDATION		
								SENSITIVITY	PROBE LINEARITY	PROBE ISOTROPY	MOD. TYPE	DUTY FACTOR	PAR
M	750	11/2/2018	3287	750	Head	0.908	42.19	PASS	PASS	PASS	N/A	N/A	N/A
I	750	11/1/2018	7406	750	Head	0.898	42.449	PASS	PASS	PASS	N/A	N/A	N/A
M	835	11/5/2018	3287	835	Head	0.912	40.952	PASS	PASS	PASS	GMSK	PASS	N/A
M	1750	11/5/2018	3287	1750	Head	1.342	39.217	PASS	PASS	PASS	N/A	N/A	N/A
M	1900	11/5/2018	3287	1900	Head	1.43	39.014	PASS	PASS	PASS	GMSK	PASS	N/A
G	2450	8/7/2018	7410	2450	Head	1.865	39.618	PASS	PASS	PASS	OFDM/TDD	PASS	PASS
G	2600	8/8/2018	7410	2600	Head	2.04	39.033	PASS	PASS	PASS	TDD	PASS	N/A
H	5250	7/5/2018	7409	5250	Head	4.492	34.994	PASS	PASS	PASS	OFDM	N/A	PASS
H	5600	7/5/2018	7409	5600	Head	4.839	34.496	PASS	PASS	PASS	OFDM	N/A	PASS
H	5750	7/5/2018	7409	5750	Head	4.995	34.268	PASS	PASS	PASS	OFDM	N/A	PASS
D	750	8/15/2018	7357	750	Body	0.97	53.479	PASS	PASS	PASS	N/A	N/A	N/A
I	835	8/8/2018	7406	835	Body	0.98	53.497	PASS	PASS	PASS	GMSK	PASS	N/A
H	835	11/1/2018	7409	835	Body	0.955	53.843	PASS	PASS	PASS	GMSK	PASS	N/A
J	835	9/11/2018	3347	835	Body	0.984	54.197	PASS	PASS	PASS	GMSK	PASS	N/A
J	1750	9/5/2018	3347	1750	Body	1.454	53.515	PASS	PASS	PASS	N/A	N/A	N/A
E	1900	8/9/2018	3213	1900	Body	1.57	51.136	PASS	PASS	PASS	GMSK	PASS	N/A
E	1900	12/3/2018	3332	1900	Body	1.518	51.796	PASS	PASS	PASS	GMSK	PASS	N/A
J	2450	10/15/2018	3347	2450	Body	2.025	51.09	PASS	PASS	PASS	OFDM/TDD	PASS	PASS
K	2450	4/3/2018	3319	2450	Body	2.043	51.13	PASS	PASS	PASS	OFDM/TDD	PASS	PASS
I	2450	12/27/2018	7406	2450	Body	2.028	51.4	PASS	PASS	PASS	OFDM/TDD	PASS	PASS
K	2600	4/3/2018	3319	2600	Body	2.225	50.665	PASS	PASS	PASS	TDD	PASS	N/A
L	5250	10/29/2018	7308	5250	Body	5.511	48.77	PASS	PASS	PASS	OFDM	N/A	PASS
L	5600	10/29/2018	7308	5600	Body	5.994	48.2	PASS	PASS	PASS	OFDM	N/A	PASS
L	5750	10/29/2018	7308	5750	Body	6.219	47.96	PASS	PASS	PASS	OFDM	N/A	PASS
D	5750	6/11/2018	7357	5750	Body	6.214	47.275	PASS	PASS	PASS	OFDM	N/A	PASS

Table E-2
SAR System Validation Summary – 10g

SAR System	Freq. (MHz)	Date	Probe SN	Probe Cal Point		Cond. (σ)	Perm. (εr)	CW VALIDATION			MOD. VALIDATION		
								SENSITIVITY	PROBE LINEARITY	PROBE ISOTROPY	MOD. TYPE	DUTY FACTOR	PAR
J	1750	9/5/2018	3347	1750	Body	1.454	53.515	PASS	PASS	PASS	N/A	N/A	N/A
E	1900	8/9/2018	3213	1900	Body	1.57	51.136	PASS	PASS	PASS	GMSK	PASS	N/A
E	1900	12/3/2018	3332	1900	Body	1.518	51.796	PASS	PASS	PASS	GMSK	PASS	N/A
K	2450	4/3/2018	3319	2450	Body	2.043	51.13	PASS	PASS	PASS	OFDM/TDD	PASS	PASS
K	2600	4/3/2018	3319	2600	Body	2.225	50.665	PASS	PASS	PASS	TDD	PASS	N/A
L	5250	10/29/2018	7308	5250	Body	5.511	48.77	PASS	PASS	PASS	OFDM	N/A	PASS
L	5600	10/29/2018	7308	5600	Body	5.994	48.2	PASS	PASS	PASS	OFDM	N/A	PASS
L	5750	10/29/2018	7308	5750	Body	6.219	47.96	PASS	PASS	PASS	OFDM	N/A	PASS

NOTE: While the probes have been calibrated for both CW and modulated signals, all measurements were performed using communication systems calibrated for CW signals only. Modulations in the table above represent test configurations for which the measurement system has been validated per FCC KDB Publication 865664 D01v01r04 for scenarios when CW probe calibrations are used with other signal types. SAR systems were validated for modulated signals with a periodic duty cycle, such as GMSK, or with a high peak to average ratio (>5 dB), such as OFDM according to FCC KDB Publication 865664 D01v01r04.

APPENDIX G POWER REDUCTION VERIFICATION

Per the May 2017 TCBC Workshop Notes, demonstration of proper functioning of the power reduction mechanisms is required to support the corresponding SAR configurations. The verification process was divided into two parts: (1) evaluation of output power levels for individual or multiple triggering mechanisms and (2) evaluation of the triggering distances for proximity-based sensors.

G.1 Power Verification Procedure

The power verification was performed according to the following procedure:

1. A base station simulator was used to establish a conducted RF connection and the output power was monitored. The power measurements were confirmed to be within expected tolerances for all states before and after a power reduction mechanism was triggered.

2. Step 1 was repeated for all relevant modes and frequency bands for the mechanism being investigated.

3. Steps 1 and 2 were repeated for all individual power reduction mechanisms and combinations thereof. For the combination cases, one mechanism was switched to a 'triggered' state at a time; powers were confirmed to be within tolerances after each additional mechanism was activated.

G.2 Distance Verification Procedure

The distance verification procedure was performed according to the following procedure:

1. A base station simulator was used to establish an RF connection and to monitor the power levels. The device being tested was placed below the relevant section of the phantom with the relevant side or edge of the device facing toward the phantom.

2. The device was moved toward and away from the phantom to determine the distance at which the mechanism triggers and the output power is reduced, per KDB Publication 616217 D04v01r02 and FCC Guidance. Each applicable test position was evaluated. The distances were confirmed to be the same or larger (more conservative) than the minimum distances provided by the manufacturer.

3. Steps 1 and 2 were repeated for low, mid, and high bands, as appropriate (see note below Table G-2 for more details).

4. Steps 1 through 3 were repeated for all distance-based power reduction mechanisms.

G.3 Main Antenna Verification Summary

Table G-1
Power Measurement Verification for Main Antenna

Mechanism(s)		Mode/Band	Conducted Power (dBm)		
1st	2nd		Un-triggered (Max)	Mechanism #1 (Reduced)	Mechanism #2 (Reduced)
Hotspot On		GPRS 1900	26.81	24.86	
Hotspot On	Grip	GPRS 1900	26.79	24.78	24.77
Grip		GPRS 1900	26.74	24.7	
Grip	Hotspot On	GPRS 1900	26.72	24.69	24.66
Hotspot On		UMTS 1900	24.46	20.47	
Hotspot On	Grip	UMTS 1900	24.49	20.49	20.46
Grip		UMTS 1900	24.45	21.49	
Grip	Hotspot On	UMTS 1900	24.43	21.51	20.48
Hotspot On		LTE FDD Band 4	24.87	20.86	
Hotspot On	Grip	LTE FDD Band 4	24.84	20.68	20.87
Grip		LTE FDD Band 4	24.88	21.49	
Grip	Hotspot On	LTE FDD Band 4	24.91	21.47	20.81
Hotspot On		LTE FDD Band 2	24.66	20.46	
Hotspot On	Grip	LTE FDD Band 2	24.58	20.42	20.45
Grip		LTE FDD Band 2	24.47	21.45	
Grip	Hotspot On	LTE FDD Band 2	24.52	21.44	20.42
Hotspot On		LTE FDD Band 25	24.47	20.45	
Hotspot On	Grip	LTE FDD Band 25	24.51	20.47	20.43
Grip		LTE FDD Band 25	24.49	21.46	
Grip	Hotspot On	LTE FDD Band 25	24.56	21.48	20.42
Hotspot On		LTE TDD Band 41	23.96	21.96	
Hotspot On	Grip	LTE TDD Band 41	23.95	21.97	21.96
Grip		LTE TDD Band 41	23.94	21.94	
Grip	Hotspot On	LTE TDD Band 41	23.94	21.98	21.94

Table G-2
Distance Measurement Verification for Main Antenna

Mechanism(s)	Test Condition	Band	Distance Measurements (mm)		Minimum Distance per Manufacturer (mm)
			Moving Toward	Moving Away	
Grip	Phablet - Back Side	Mid	9	11	8
Grip	Phablet - Back Side	High	9	11	8
Grip	Phablet - Front Side	Mid	7	9	6
Grip	Phablet - Front Side	High	7	9	6
Grip	Phablet - Bottom Edge	Mid	10	13	10
Grip	Phablet - Bottom Edge	High	10	13	10

*Note: Mid band refers to: GSM1900, UMTS B2, LTE B2/4/25;
High band refers to: LTE B41

G.4 WIFI Verification Summary

Table G-3
Power Measurement Verification WIFI

Mechanism(s)	Mode/Band	Conducted Power (dBm)	
1st		Un-triggered (Max)	Mechanism #1 (Reduced)
Held-to-Ear	802.11b	18.84	15.53
Held-to-Ear	802.11g	16.46	15.07
Held-to-Ear	802.11n (2.4GHz)	16.32	14.97
Held-to-Ear	802.11a	15.11	11.53
Held-to-Ear	802.11n (5GHz, 20MHz BW)	15.2	11.54
Held-to-Ear	802.11ac (20MHz BW)	15.19	11.65
Held-to-Ear	802.11n (5GHz, 40MHz BW)	14.21	11.23
Held-to-Ear	802.11ac (40MHz BW)	14.4	11.54
Held-to-Ear	802.11ac (80MHz BW)	13.34	11.48

*Note: 802.11ax and MIMO WIFI modes were not evaluated due to equipment limitations.

APPENDIX H: DOWNLINK LTE CA RF CONDUCTED POWERS

1.1 LTE Downlink Only Carrier Aggregation Test Reduction Methodology

SAR test exclusion for LTE downlink Carrier Aggregation is determined by power measurements according to the number of component carriers (CCs) supported by the product implementation. Per April 2018 TCBC Workshop Notes, the following test reduction methodology was applied to determine the combinations required for conducted power measurements.

LTE DLCA Test Reduction Methodology:

- The supported combinations were arranged by the number of component carriers in columns.
- Any limitations on the PCC or SCC for each combination were identified alongside the combination (e.g. CA_2A-2A-4A-12A, but B12 can only be configured as a SCC).
- Power measurements were performed for "supersets" (LTE CA combinations with multiple components carriers) and any "subsets" (LTE CA combinations with fewer component carriers) that were not completely covered by the supersets.
- Only subsets that have the exact same components as a superset were excluded for measurement.
- When there were certain restrictions on component carriers that existed in the superset that were not applied for the subset, the subset configuration was additionally evaluated.
- Both inter-band and intra-band downlink carrier aggregation scenarios were considered.
- Downlink CA combinations for SISO and 4x4 Downlink MIMO operations were measured independently, per May 2017 TCBC Workshop notes.

Table 1 – Example of Exclusion Table for SISO Configurations

Index	2CC	Supported Channel Bandwidth [MHz]		Restriction	Completely Covered by Measurement Superset
		CC1	CC2		
2CC #1	CA_2C	5, 10, 15, 20	5, 10, 15, 20		3CC #4
2CC #2	CA_2A-5A	5, 10, 15, 20	5, 10		4CC #1
2CC #3	CA_2A-12A	5, 10, 15, 20	5, 10		3CC #3
2CC #4	CA_2A-13A	5, 10, 15, 20	10		3CC #9
2CC #5	CA_2A-17A	5, 10	5, 10		No
2CC #6	CA_2A-30A	5, 10, 15, 20	5, 10		3CC #14
2CC #8	CA_2A-66A (2)	5, 10, 15, 20	5, 10, 15, 20		3CC #1
2CC #9	CA_2A-71A	5, 10, 15, 20	5, 10, 15, 20		3CC #10
2CC #10	CA_4A-4A	5, 10, 15, 20	5, 10, 15, 20		3CC #6
2CC #11	CA_4A-5A (1)	5, 10, 15, 20	5, 10		3CC #1
2CC #12	CA_4A-12A (4)	5, 10, 15, 20	5, 10		3CC #8
2CC #13	CA_4A-13A	5, 10, 15, 20	10		3CC #9
2CC #14	CA_4A-17A	5, 10	5, 10	B17 SCC Only	No
2CC #15	CA_5B	5, 10	5, 10		3CC #1
2CC #16	CA_5A-25A	5, 10	5, 10, 15, 20		No
2CC #17	CA_7C	15, 20	15, 20		No
2CC #18	CA_7A-7A (1)	5, 10, 15, 20	5, 10, 15, 20		No
2CC #19	CA_7A-12A	5, 10, 15, 20	5, 10		3CC #12
2CC #20	CA_12B	5	5, 10		3CC #13
2CC #21	CA_12A-25A	5, 10	5, 10, 15, 20		No
2CC #22	CA_12A-30A	5, 10	5, 10		3CC #16
2CC #23	CA_41A-41A (1)	5, 10, 15, 20	5, 10, 15, 20		No

Index	3CC	Supported Channel Bandwidth [MHz]			Restriction	Completely Covered by Measurement Superset
		CC1	CC2	CC3		
3CC #1	CA_2A-2A-4A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		4CC #1
3CC #2	CA_2A-2A-5A	5, 10, 15, 20	5, 10, 15, 20	5, 10		4CC #1
3CC #3	CA_2A-2A-12A	5, 10, 15, 20	5, 10, 15, 20	5, 10		No
3CC #4	CA_2C-66A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		4CC #3
3CC #5	CA_2A-2A-71A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #6	CA_2A-4A-4A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #7	CA_2A-4A-5A	5, 10, 15, 20	5, 10, 15, 20	5, 10		4CC #1
3CC #8	CA_2A-4A-12A	5, 10, 15, 20	5, 10, 15, 20	5, 10		No
3CC #9	CA_2A-4A-13A	5, 10, 15, 20	5, 10, 15, 20	10		No
3CC #10	CA_2A-4A-71A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #11	CA_2A-5B	5, 10, 15, 20	5, 10	5, 10		4CC #1
3CC #12	CA_2A-7A-12A	5, 10, 15, 20	5, 10, 15, 20	5, 10		No
3CC #13	CA_2A-12B	5, 10, 15, 20	5	5, 10		No
3CC #14	CA_2A-12A-30A	5, 10, 15, 20	5, 10	5, 10		No
3CC #15	CA_4A-4A-5A	5, 10, 15, 20	5, 10, 15, 20	5, 10		No
3CC #16	CA_5B-30A	5, 10	5, 10	5, 10		3CC #1
3CC #17	CA_5B-66A	5, 10	5, 10	5, 10, 15, 20		3CC #1
3CC #18	CA_5A-30A-66A	5, 10	5, 10	5, 10, 15, 20		4CC #3
3CC #19	CA_12A-66C	5, 10	5, 10, 15, 20	5, 10, 15, 20		No
3CC #20	CA_30A-66A-66A	5, 10	5, 10, 15, 20	5, 10, 15, 20		3CC #9
3CC #21	CA_41D	10, 15, 20	10, 15, 20	10, 15, 20		No
3CC #22	CA_41A-41C	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #23	CA_66B	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #24	CA_66A-66C	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No

Index	4CC	Supported Channel Bandwidth [MHz]				Restriction	Completely Covered by Measurement Superset
		CC1	CC2	CC3	CC4		
4CC #1	CA_2A-4A-4A-5A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20	5, 10		No
4CC #2	CA_2A-2A-4A-12A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20	5, 10	B12 SCC Only	No
4CC #3	CA_2A-2A-5A-30A	5, 10, 15, 20	5, 10, 15, 20	5, 10	5, 10		No
4CC #4	CA_2A-2A-5A-66A	5, 10, 15, 20	5, 10, 15, 20	5, 10	5, 10, 15, 20		No
4CC #5	CA_2A-5B-30A	5, 10, 15, 20	5, 10	5, 10	5, 10		3CC #1
4CC #6	CA_2A-5B-66A	5, 10, 15, 20	5, 10	5, 10	5, 10, 15, 20		3CC #1
4CC #7	CA_5B-30A-66A	5, 10	5, 10	5, 10	5, 10		3CC #1
4CC #8	CA_5B-66A-66A	5, 10	5, 10	5, 10, 15, 20	5, 10, 15, 20		3CC #2
4CC #9	CA_5A-30A-66A-66A	5, 10	5, 10	5, 10, 15, 20	5, 10, 15, 20		No
4CC #10	CA_41E	15, 20	15, 20	15, 20	20		No

Index	SCC	Supported Channel Bandwidth [MHz]				Restriction	Completely Covered by Measurement Superset
		CC1	CC2	CC3	CC4		
SCC #1	CA_2A-5B-30A-66A	5, 10, 15, 20	5, 10	5, 10	5, 10, 15, 20		No
SCC #2	CA_2A-5B-66A-66A	5, 10, 15, 20	5, 10	5, 10	5, 10, 15, 20		No

Table 2 – Example of Exclusion Table for 4x4 Downlink MIMO Configurations

Index	2CC	Supported Channel Bandwidth [MHz]		Restriction	Completely Covered by Measurement Superset
		CC1	CC2		
2CC #M1	CA_[2C]	5, 10, 15, 20	5, 10, 15, 20		3CC #M6
2CC #M2	CA_[2A]-2A	5, 10, 15, 20	5, 10, 15, 20		3CC #M1
2CC #M3	CA_[2A]-[2A]	5, 10, 15, 20	5, 10, 15, 20		No
2CC #M4	CA_[2A]-4A (2)	5, 10, 15, 20	5, 10, 15, 20		3CC #M1
2CC #M5	CA_[2A]-[4A] (2)	5, 10, 15, 20	5, 10, 15, 20		No
2CC #M6	CA_[2A]-5A	5, 10, 15, 20	5, 10		4CC #M3
2CC #M7	CA_[2A]-12A (1)	5, 10, 15, 20	3, 5, 10		No
2CC #M8	CA_[2A]-13A	5, 10, 15, 20	10		3CC #M4
2CC #M9	CA_[2A]-17A	5, 10	5, 10		No
2CC #M10	CA_[2A]-29A (2)	5, 10, 15, 20	5, 10	B29 SCC Only	3CC #M12
2CC #M11	CA_[2A]-30A	5, 10, 15, 20	5, 10		3CC #M5
2CC #M12	CA_[2A]-66A (2)	5, 10, 15, 20	5, 10, 15, 20		4CC #M1
2CC #M13	CA_[2A-66A] (2)	5, 10, 15, 20	5, 10, 15, 20		4CC #M2
2CC #M14	CA_[2A]-[66A] (2)	5, 10, 15, 20	5, 10, 15, 20		No
2CC #M15	CA_[2A]-71A	5, 10, 15, 20	5, 10, 15, 20		3CC #M11
2CC #M16	CA_5A-[66A]	5, 10	5, 10, 15, 20		3CC #M16
2CC #M17	CA_12A-[66A] (4)	5, 10	5, 10, 15, 20		3CC #M17
2CC #M18	CA_13A-[66A]	5, 10	5, 10, 15, 20		3CC #M19
2CC #M19	CA_30A-[66A]	5, 10	5, 10, 15, 20		3CC #M20
2CC #M20	CA_[66B]	5, 10, 15	5, 10, 15		4CC #M4
2CC #M21	CA_[66C]	5, 10, 15, 20	5, 10, 15, 20		4CC #M6
2CC #M22	CA_[66A]-66A	5, 10, 15, 20	5, 10, 15, 20		3CC #M28
2CC #M23	CA_[66A]-[66A]	5, 10, 15, 20	5, 10, 15, 20		No

Index	3CC	Supported Channel Bandwidth [MHz]			Restriction	Completely Covered by Measurement Superset
		CC1	CC2	CC3		
3CC #M1	CA_[2A]-2A-4A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #M2	CA_[2A]-2A-5A	5, 10, 15, 20	5, 10, 15, 20	5, 10		No
3CC #M3	CA_[2A]-2A-12A	5, 10, 15, 20	5, 10, 15, 20	5, 10		No
3CC #M4	CA_[2A]-2A-13A	5, 10, 15, 20	5, 10, 15, 20	10		No
3CC #M5	CA_[2A]-2A-30A	5, 10, 15, 20	5, 10, 15, 20	5, 10		No
3CC #M6	CA_[2C]-66A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #M7	CA_2C-[66A]	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #M8	CA_[2C]-[66A]	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #M9	CA_[2A]-2A-66A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #M10	CA_2A-2A-[66A]	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #M11	CA_[2A]-2A-71A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #M12	CA_[2A]-4A-29A	5, 10, 15, 20	5, 10, 15, 20	5, 10	B29 SCC Only	No
3CC #M13	CA_[2A]-4A-71A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #M14	CA_[2A]-5B	5, 10, 15, 20	5, 10	5, 10		4CC #M1
3CC #M15	CA_[2A]-5A-66A	5, 10, 15, 20	5, 10	5, 10, 15, 20		No
3CC #M16	CA_2A-5A-[66A]	5, 10, 15, 20	5, 10	5, 10, 15, 20		No
3CC #M17	CA_2A-12A-[66A]	5, 10, 15, 20	5, 10	5, 10, 15, 20		No
3CC #M18	CA_[2A]-13A-66A	5, 10, 15, 20	5, 10	5, 10, 15, 20		No
3CC #M19	CA_2A-13A-[66A]	5, 10, 15, 20	5, 10	5, 10, 15, 20		No
3CC #M20	CA_2A-30A-[66A]	5, 10, 15, 20	5, 10	5, 10, 15, 20		No
3CC #M21	CA_[2A]-66B	5, 10, 15, 20	5, 10, 15	5, 10, 15		4CC #M3
3CC #M22	CA_2A-[66B]	5, 10, 15, 20	5, 10, 15	5, 10, 15		4CC #M4
3CC #M23	CA_[2A]-[66B]	5, 10, 15, 20	5, 10, 15	5, 10, 15		No
3CC #M24	CA_[2A]-66C	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		4CC #M5
3CC #M25	CA_2A-[66C]	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		4CC #M6
3CC #M26	CA_[2A]-[66C]	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #M27	CA_[2A]-66A-66A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #M28	CA_2A-[66A]-66A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No
3CC #M29	CA_[2A]-66A-71A	5, 10, 15, 20	5, 10, 15, 20	5, 10, 15, 20		No

Index	4CC	Supported Channel Bandwidth [MHz]				Restriction	Completely Covered by Measurement Superset
		CC1	CC2	CC3	CC4		
4CC #M1	CA_[2A]-5B-66A	5, 10, 15, 20	5, 10	5, 10	5, 10, 15, 20		No
4CC #M2	CA_2A-5B-[66A]	5, 10, 15, 20	5, 10	5, 10	5, 10, 15, 20		No
4CC #M3	CA_[2A]-5A-66B	5, 10, 15, 20	5, 10	5, 10, 15	5, 10, 15		No
4CC #M4	CA_2A-5A-[66B]	5, 10, 15, 20	5, 10	5, 10, 15	5, 10, 15		No
4CC #M5	CA_[2A]-5A-66C	5, 10, 15, 20	5, 10	5, 10, 15, 20	5, 10, 15, 20		No
4CC #M6	CA_2A-5A-[66C]	5, 10, 15, 20	5, 10	5, 10, 15, 20	5, 10, 15, 20		No

Note: [CC] indicates component carrier with 4x4 DL MIMO antenna configuration

1.2 LTE Downlink Only Carrier Aggregation Test Selection and Setup

SAR test exclusion for LTE downlink Carrier Aggregation is determined by power measurements according to the number component carriers (CCs) supported by the product implementation. For those configurations required by April 2018 TCBC Workshop Notes, conducted power measurements with LTE Carrier Aggregation (CA) (downlink only) active are made in accordance to KDB Publication 941225 D05Av01r02. The RRC connection is only handled by one cell, the primary component carrier (PCC) for downlink and uplink communications. After making a data connection to the PCC, the UE device adds secondary component carrier(s) (SCC) on the downlink only. All uplink communications and acknowledgements remain identical to specifications when downlink carrier aggregation is inactive on the PCC. Additional conducted output powers are measured with the downlink carrier aggregation active for the configuration with highest measured maximum conducted power with downlink carrier aggregation inactive measured among the channel bandwidth, modulation, and RB combinations in each frequency band.

Per FCC KDB Publication 941225 D05Av01r02, no SAR measurements are required for carrier aggregation configurations when the maximum average output power with downlink only carrier aggregation active is not more than 0.25 dB higher than the average output power with downlink only carrier aggregation inactive. All bands required for SAR testing per FCC KDB procedures were considered. Based on the measured maximum powers below, no additional SAR tests were required for DLCA SAR configurations.

General PCC and SCC configuration selection procedure

- PCC uplink channel, channel bandwidth, modulation and RB configurations were selected based on section C)3)b)ii) of KBD 941225 D05 V01r02. The downlink PCC channel was paired with the selected PCC uplink channel according to normal configurations without carrier aggregation.
- To maximize aggregated bandwidth, highest channel bandwidth available for that CA combination was selected for SCC. For inter-band CA, the SCC downlink channels were selected near the middle of their transmission bands. For contiguous intra-band CA, the downlink channel spacing between the component carriers was set to multiple of 300 kHz less than the nominal channel spacing defined in section 5.4.1A of 3GPP TS 36.521. For non-contiguous intra-band CA, the downlink channel spacing between the component carriers was set to be larger than the nominal channel spacing and provided maximum separation between the component carriers.
- All selected PCC and SCC(s) remained fully within the uplink/downlink transmission band of the respective component carrier.

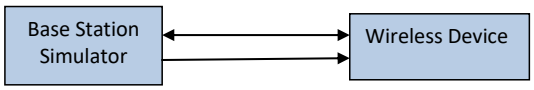


Figure 1
DL CA Power Measurement Setup

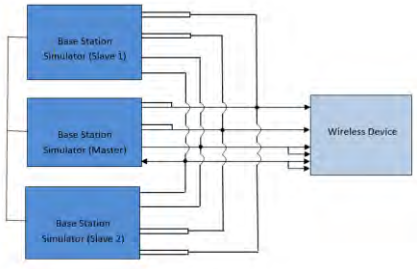


Figure 2
DL CA with DL 4x4 MIMO Power Measurement Setup

1.3 Downlink Carrier Aggregation RF Conducted Powers

1.3.1 LTE Band 41 as PCC

Table 1
Maximum Output Powers

	PCC									SCC 1				SCC 2				Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Channel	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_41A-41A (1)	LTE B41	5	39750	2506	QPSK	1	24	39750	2506	LTE B41	20	41490	2680	-	-	-	-	24.61	24.62
CA_41C (1)	LTE B41	5	39750	2506	QPSK	1	24	39750	2506	LTE B41	20	39867	2517.7	-	-	-	-	24.65	24.62
CA_41D	LTE B41	15	40185	2549.5	QPSK	1	0	40185	2549.5	LTE B41	20	40356	2566.6	LTE B41	20	40554	2586.4	24.67	24.57

1.4 DL CA with DL 4x4 MIMO RF Conduction Powers

This device supports downlink 4x4 MIMO operations for some LTE bands. Uplink transmission is limited to a single output stream. When carrier aggregation was applicable, the general test selection and setup procedures described in Section 1.2 were applied.

Per May 2017 TCB Workshop Notes, SAR for 4x4 DL MIMO was not needed since the maximum average output power in 4x4 DL MIMO mode was not more than 0.25 dB higher than the maximum output power with 4x4 DL MIMO inactive. Additionally, SAR for 4x4 MIMO Downlink Carrier Aggregation was not needed since the maximum average output power in 4x4 MIMO Downlink Carrier Aggregation mode was not more than 0.25 dB higher than the maximum output power with 4x4 MIMO Downlink and downlink carrier aggregation inactive.

1.4.1 LTE 4x4 MIMO DL Standalone Powers

Table 2
Maximum Output Powers

LTE Band	Bandwidth [MHz]	Channel	Frequency [MHz]	Modulation	RB Size	RB Offset	4x4 DL MIMO Tx. Power [dBm]	Single Antenna Tx. Power [dBm]
41	5	39750	2506	QPSK	1	24	24.65	24.62

1.4.2 LTE Band 41 as PCC

Table 3
Maximum Output Powers

	PCC										SCC 1					SCC 2					Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Ch.	PCC (UL) Freq. [MHz]	Mod.	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	DL Ant. Config.	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_[41A]-41A (1)	LTE B41	5	39750	2506	QPSK	1	24	39750	2506	4x4	LTE B41	20	41490	2680	2x2	-	-	-	-	-	24.64	24.62
CA_[41A]-41A (1)	LTE B41	5	39750	2506	QPSK	1	24	39750	2506	2x2	LTE B41	20	41490	2680	4x4	-	-	-	-	-	24.62	24.62
CA_[41A]-[41A] (1)	LTE B41	5	39750	2506	QPSK	1	24	39750	2506	4x4	LTE B41	20	41490	2680	4x4	-	-	-	-	-	24.66	24.62
CA_[41C] (1)	LTE B41	5	39750	2506	QPSK	1	24	39750	2506	4x4	LTE B41	20	39867	2517.7	4x4	-	-	-	-	-	24.70	24.62
CA_[41D]	LTE B41	15	40185	2549.5	QPSK	1	0	40185	2549.5	4x4	LTE B41	20	40356	2566.6	4x4	LTE B41	20	40554	2586.4	4x4	24.69	24.57

1.5 Downlink Carrier Aggregation with CA_41C Uplink Carrier Aggregation enabled

This device supports uplink carrier aggregation (ULCA) with additional Carrier Aggregation configurations active in the downlink. Power measurements were performed with ULCA active and additional CA configurations active in the downlink for the configuration per Fall 2017 TCB Workshop Notes.

Per FCC Guidance, additional SAR measurements for these configurations were not required since their maximum output power was not more than 0.25 dB higher than the maximum output power for with only ULCA active.

1.5.1 DL Carrier Aggregation RF Conducted Powers

Table 4
Maximum Output Powers

	PCC							SCC1							SCC2				Power	
Combination	PCC Band	PCC Bandwidth [MHz]	PCC (UL/DL) Channel	PCC (UL/DL) Frequency [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	SCC Band	SCC Bandwidth [MHz]	SCC (UL/DL) Channel	SCC (UL/DL) Frequency [MHz]	Modulation	SCC UL# RB	SCC UL RB Offset	SCC Band	SCC Bandwidth [MHz]	SCC DL Channel	SCC DL Frequency [MHz]	ULCA Tx. Power with add'l CA config. active in DL (dBm)	ULCA Tx Power (dBm)
CA_41D	LTE B41	20	40185	2549.5	QPSK	1	0	LTE B41	20	39987	2529.7	QPSK	1	99	LTE B41	20	40383	2569.3	24.28	24.19

1.5.2 DL Carrier Aggregation with DL 4x4 MIMO RF Conducted Powers

Note: 4x4 DL MIMO is only operating in the downlink. Uplink transmission is limited to a single output stream for each component carrier of ULCA.

Table 5
Maximum Output Powers

	PCC								SCC1								Power	
Combination	PCC Band	PCC Bandwidth [MHz]	PCC (UL/DL) Channel	PCC (UL/DL) Frequency [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	DL Ant. Config.	SCC Band	SCC Bandwidth [MHz]	SCC (UL/DL) Channel	SCC (UL/DL) Frequency [MHz]	Modulation	SCC UL# RB	SCC UL RB Offset	DL Ant. Config.	ULCA Tx. Power with add'l CA config. active in DL (dBm)	ULCA Tx Power (dBm)
CA_[41C] (1)	LTE B41	20	40185	2549.5	QPSK	1	0	4x4	LTE B41	20	39987	2529.7	QPSK	1	99	4x4	24.34	24.19

APPENDIX I: IEEE 802.11AX RU SAR EXCLUSION

1.1 IEEE 802.11ax RU SAR Exclusion

To make the most efficient use of the additional available subcarriers (data tones), IEEE 802.11ax can utilize Orthogonal Frequency-Division Multiple Access (OFDMA) which divides the existing 802.11 channels into smaller subchannels called Resource Units (RUs). Possible RU sizes are: 26T, 52T, 106T, 242T, 484T and 996T.

Per FCC Guidance, 802.11ax was considered a higher order 802.11 mode when compared to a/b/g/n/ac to apply KDB Publication 248227 D01v02r02 for OFDM mode selection. Therefore, SAR tests were not required for 802.11ax based on the maximum allowed output powers of OFDM modes and the reported SAR values. Per FCC Guidance, maximum conducted powers were performed for each RU size to demonstrate that the output powers would not be higher than the other OFDM 802.11 modes.

1.2 IEEE 802.11ax RU Target Powers

1.2.1 Maximum 802.11ax RU WLAN Output Power

		SISO (ANT1/2) /in dBm				MIMO (ALL) /in dBm			
Tones		2.4G	5G/20Mhz	5G/40Mhz	5G/80Mhz	2.4G	5G/20Mhz	5G/40Mhz	5G/80Mhz
		Ch & RU index							
26T	Maximum	14 ch 12: 13, ch 13: 1	11	11	11	14 ch 12: 13, ch 13: 1	11	11	11
	Nominal	13 ch 12: 12, ch 13: 0	10	10	10	13 ch 12: 12, ch 13: 0	10	10	10
52T	Maximum	15 ch 12: 13.5, ch 13: 2.5	13	12	11	15 ch 12: 13.5, ch 13: 2.5	13	12	11
	Nominal	14 ch 12: 12.5, ch 13: 1.5	12	11	10	14 ch 12: 12.5, ch 13: 1.5	12	11	10
106T	Maximum	16 ch 12: 15, ch 13: 4.5	15	13	12	16 ch 12: 15, ch 13: 4.5	15	13	12
	Nominal	15 ch 12: 14, ch 13: 3.5	14	12	11	15 ch 12: 14, ch 13: 3.5	14	12	11
242T	Maximum	17 ch 1: 16, ch 11: 15 ch 12: 15 ch 13: 12	16	14	13	17 ch 1: 16, ch 11: 15 ch 12: 15 ch 13: 12	16	14	13
	Nominal	16 ch 1: 15, ch 11: 14 ch 12: 14 ch 13: 11	15	13	12	16 ch 1: 15, ch 11: 14 ch 12: 14 ch 13: 11	15	13	12
484T	Maximum			14	13			14	13
	Nominal			13	12			13	12
996T	Maximum				13				13
	Nominal				12				12

1.2.2 Reduced 802.11ax RU WLAN Output Power

		SISO (ANT1/2) /in dBm				MIMO (ALL) /in dBm			
Tones		2.4G	5G/20Mhz	5G/40Mhz	5G/80Mhz	2.4G	5G/20Mhz	5G/40Mhz	5G/80Mhz
		Ch & RU index							
26T	Maximum	14 ch 12: 13, ch 13: 1	11	11	11	14 ch 12: 13, ch 13: 1	11	11	11
	Nominal	13 ch 12: 12, ch 13: 0	10	10	10	13 ch 12: 12, ch 13: 0	10	10	10
52T	Maximum	15 ch 12: 13.5, ch 13: 2.5	13	12	11	15 ch 12: 13.5, ch 13: 2.5	13	12	11
	Nominal	14 ch 12: 12.5, ch 13: 1.5	12	11	10	14 ch 12: 12.5, ch 13: 1.5	12	11	10
106T	Maximum	16 ch 12: 15, ch 13: 4.5	14	13	12	16 ch 12: 15, ch 13: 4.5	15	13	12
	Nominal	15 ch 12: 14, ch 13: 3.5	13	12	11	15 ch 12: 14, ch 13: 3.5	14	12	11
242T	Maximum	17 ch 1: 16, ch 11: 15 ch 12: 15 ch 13: 12	14	14	13	17 ch 1: 16, ch 11: 15 ch 12: 15 ch 13: 12	16	14	13
	Nominal	16 ch 1: 15, ch 11: 14 ch 12: 14 ch 13: 11	13	13	12	16 ch 1: 15, ch 11: 14 ch 12: 14 ch 13: 11	15	13	12
484T	Maximum			14	13			14	13
	Nominal			13	12			13	12
996T	Maximum				13				13
	Nominal				12				12

1.2.3 Maximum 802.11ax RU WLAN Output Power During Conditions with Simultaneous 2.4 GHz WLAN and 5 GHz WLAN

		SISO (ANT1/2) /in dBm				MIMO (ALL) /in dBm			
Tones		**2.4G**	**5G/20Mhz**	**5G/40Mhz**	**5G/80Mhz**	**2.4G**	**5G/20Mhz**	**5G/40Mhz**	**5G/80Mhz**
		Ch & RU index							
26T	Maximum	14 ch 12: 13, ch 13: 1	11	11	11	14 ch 12: 13, ch 13: 1	11	11	11
	Nominal	13 ch 12: 12, ch 13: 0	10	10	10	13 ch 12: 12, ch 13: 0	10	10	10
52T	Maximum	15 ch 12: 13.5, ch 13: 2.5	13	12	11	15 ch 12: 13.5, ch 13: 2.5	13	12	11
	Nominal	14 ch 12: 12.5, ch 13: 1.5	12	11	10	14 ch 12: 12.5, ch 13: 1.5	12	11	10
106T	Maximum	16 ch 12: 15, ch 13: 4.5	14	13	12	16 ch 12: 15, ch 13: 4.5	15	13	12
	Nominal	15 ch 12: 14, ch 13: 3.5	13	12	11	15 ch 12: 14, ch 13: 3.5	14	12	11
242T	Maximum	17 ch 1: 16, ch 11: 15 ch 12: 15 ch 13: 12	14	14	13	17 ch 1: 16, ch 11: 15 ch 12: 15 ch 13: 12	16	14	13
	Nominal	16 ch 1: 15, ch 11: 14 ch 12: 14 ch 13: 11	13	13	12	16 ch 1: 15, ch 11: 14 ch 12: 14 ch 13: 11	15	13	12
484T	Maximum			14	13			14	13
	Nominal			13	12			13	12
996T	Maximum				13				13
	Nominal				12				12

1.2.4 Reduced 802.11ax RU WLAN Output Power During Conditions with Simultaneous 2.4 GHz WLAN and 5 GHz WLAN

		SISO (ANT1/2) /in dBm				MIMO (ALL) /in dBm			
Tones		**2.4G**	**5G/20Mhz**	**5G/40Mhz**	**5G/80Mhz**	**2.4G**	**5G/20Mhz**	**5G/40Mhz**	**5G/80Mhz**
		Ch & RU index							
26T	Maximum	14 ch 12: 13, ch 13: 1	11	11	11	14 ch 12: 13, ch 13: 1	11	11	11
	Nominal	13 ch 12: 12, ch 13: 0	10	10	10	13 ch 12: 12, ch 13: 0	10	10	10
52T	Maximum	14 ch 12: 13.5, ch 13: 2.5	13	12	11	15 ch 12: 13.5, ch 13: 2.5	13	12	11
	Nominal	13 ch 12: 12.5, ch 13: 1.5	12	11	10	14 ch 12: 12.5, ch 13: 1.5	12	11	10
106T	Maximum	14 ch 13: 4.5	14	13	12	16 ch 12: 15, ch 13: 4.5	15	13	12
	Nominal	13 ch 13: 3.5	13	12	11	15 ch 12: 14, ch 13: 3.5	14	12	11
242T	Maximum	14 ch 13: 12	14	14	13	17 ch 1: 16, ch 11: 15 ch 12: 15 ch 13: 12	16	14	13
	Nominal	13 ch 13: 11	13	13	12	16 ch 1: 15, ch 11: 14 ch 12: 14 ch 13: 11	15	13	12
484T	Maximum			14	13			14	13
	Nominal			13	12			13	12
996T	Maximum				13				13
	Nominal				12				12

1.3 IEEE 802.11ax Measured Powers

Table 1
Maximum 2.4 GHz 802.11ax RU Output Power – Ant 1

RU Index	Tones	Ch. 1	Ch. 2	Ch. 6	Ch. 10	Ch. 11
		Average	Average	Average	Average	Average
0	26	13.7		13.63		13.35
4	26	13.67		13.58		13.69
8	26	13.45		13.49		13.79
37	52	14.84		14.63		14.88
38	52	14.43		14.69		14.65
40	52	14.92		14.55		14.52
53	106	15.32		15.79		15.59
54	106	15.7		15.54		15.41
61	242	15.41	16.65	16.51	16.78	14.79

Table 2
Maximum 2.4 GHz 802.11ax RU Output Power – Ant 2

RU Index	Tones	Ch. 1	Ch. 2	Ch. 6	Ch. 10	Ch. 11
		Average	Average	Average	Average	Average
0	26	13.53		13.87		13.71
4	26	13.63		13.82		13.89
8	26	13.98		13.73		13.87
37	52	14.56		14.58		14.59
38	52	14.6		14.86		14.82
40	52	14.72		14.79		14.65
53	106	15.84		15.92		15.79
54	106	15.46		15.37		15.57
61	242	15.69	16.73	16.74	16.73	14.73

Table 3
Maximum 5 GHz 802.11ax RU Output Power – Ant 1

5GHz - 20MHz													
RU Index	Tones	UNII 1			UNII 2A			UNII 2C			UNII 3		
		Ch. 36	Ch. 40	Ch. 48	Ch. 52	Ch. 56	Ch. 64	Ch. 100	Ch. 120	Ch. 144	Ch. 149	Ch. 157	U3 - Ch. 165
		Average	Average	Average	Average	Average	Average	Average	Average	Average	Average	Average	Average
0	26	10.87	10.85	10.85	10.52	10.70	10.88	10.53	10.81	10.94	10.48	10.83	10.70
4	26	10.75	10.76	10.77	10.98	10.46	10.74	10.83	10.64	10.76	10.69	10.96	10.79
8	26	10.64	10.64	10.77	10.93	10.58	10.55	10.69	10.54	10.59	10.87	10.50	10.84
37	52	12.91	12.89	12.96	12.64	12.73	12.94	12.56	12.91	12.85	12.86	12.75	12.62
38	52	12.60	12.58	12.63	12.84	12.95	12.69	12.61	12.95	12.97	12.87	12.50	12.94
40	52	12.71	12.70	12.77	12.86	12.58	12.61	12.66	12.90	12.87	12.70	12.54	12.74
53	106	14.98	14.44	14.50	14.70	14.70	14.88	14.97	14.65	14.64	14.85	14.88	14.74
54	106	14.73	14.77	14.75	14.73	14.91	14.42	14.51	14.64	14.70	14.72	14.99	14.81
61	242	15.55	15.59	15.61	15.72	15.82	15.93	15.81	15.42	15.40	15.64	15.73	15.66

5GHz - 40MHz										
RU Index	Tones	UNII 1		UNII 2A		UNII 2C			UNII 3	
		Ch. 38	Ch. 46	Ch. 54	Ch. 62	Ch. 102	Ch. 118	Ch. 142	Ch. 151	Ch. 159
		Average	Average	Average	Average	Average	Average	Average	Average	Average
0	26	10.66	10.67	10.95	10.67	10.72	10.81	10.97	10.52	10.94
8	26	10.65	10.67	10.77	10.92	10.86	10.84	10.63	10.70	10.68
17	26	10.57	10.63	10.83	10.85	10.99	10.85	10.55	10.70	10.76
37	52	11.47	11.59	11.93	11.96	11.73	11.87	11.97	11.68	11.61
40	52	11.70	11.75	11.91	11.66	11.94	11.93	11.63	11.67	11.63
44	52	11.67	11.89	11.54	11.60	11.64	11.51	11.69	11.85	11.45
53	106	12.68	12.73	12.96	12.70	12.93	12.56	12.78	12.88	12.49
54	106	12.58	12.60	12.93	12.45	12.67	12.73	12.44	12.61	12.59
56	106	12.90	12.99	12.74	12.68	12.74	12.69	12.84	12.97	12.67
61	242	13.66	13.68	13.91	13.47	13.65	13.83	13.93	13.97	13.87
62	242	13.52	13.67	13.96	13.41	13.88	13.81	13.89	13.77	13.97
65	484	13.61	13.89	13.60	13.74	13.45	13.56	13.61	13.74	13.68

5GHz - 80MHz							
RU Index	Tones	UNII 1	UNII 2A	UNII 2C			UNII 3
		Ch. 42	Ch. 58	Ch. 106	Ch. 122	Ch. 138	Ch. 155
		Average	Average	Average	Average	Average	Average
0	26	10.83	10.48	10.68	10.72	10.84	10.90
17	26	10.71	10.92	10.85	10.80	10.87	10.63
36	26	10.79	10.90	10.83	10.88	10.96	10.60
37	52	10.63	10.69	10.84	10.85	10.51	10.49
44	52	10.64	10.95	10.85	10.70	10.84	10.65
52	52	10.88	10.54	10.92	10.99	10.50	10.80
53	106	11.78	11.97	11.90	11.94	11.58	11.62
56	106	11.65	11.98	11.88	11.89	11.89	11.72
60	106	11.99	11.67	11.59	11.51	11.77	11.91
61	242	12.67	12.73	12.68	12.61	12.77	12.82
62	242	12.43	12.49	12.95	12.96	12.97	12.68
64	242	12.59	12.85	12.80	12.78	12.84	12.44
65	484	12.80	12.92	12.93	12.91	12.93	12.75
66	484	12.91	12.94	12.55	12.62	12.77	12.74
67	996	12.95	12.56	12.86	12.98	12.94	12.64

Table 4
Maximum 5 GHz 802.11ax RU Output Power – Ant 2

5GHz - 20MHz													
RU Index	Tones	UNII 1			UNII 2A			UNII 2C			UNII 3		
		Ch. 36	Ch. 40	Ch. 48	Ch. 52	Ch. 56	Ch. 64	Ch. 100	Ch. 120	Ch. 144	Ch. 149	Ch. 157	U3 - Ch. 165
		Average	Average	Average	Average	Average	Average	Average	Average	Average	Average	Average	Average
0	26	10.48	10.44	10.53	10.87	10.86	10.99	10.68	10.86	10.60	10.73	10.50	10.70
4	26	10.82	10.78	10.84	10.54	10.69	10.69	10.90	10.97	10.77	10.79	10.72	10.63
8	26	10.75	10.70	10.71	10.95	10.98	10.61	10.64	10.68	10.48	10.49	10.66	10.60
37	52	12.43	12.50	12.44	12.71	12.76	12.85	12.68	12.92	12.56	12.63	12.78	12.85
38	52	12.65	12.54	12.71	12.98	12.44	12.53	12.86	12.61	12.75	12.68	12.95	12.44
40	52	12.61	12.61	12.61	12.80	12.92	12.53	12.60	12.80	12.49	12.73	12.57	12.61
53	106	14.41	14.41	14.86	14.67	14.77	14.83	14.58	14.91	14.59	14.90	14.74	14.70
54	106	14.57	14.54	14.47	14.91	14.91	14.49	14.62	14.86	14.57	14.67	14.57	14.64
61	242	15.49	15.51	15.94	15.74	15.86	15.91	15.58	15.83	15.95	15.81	15.71	15.72

5GHz - 40MHz										
RU Index	Tones	UNII 1		UNII 2A		UNII 2C			UNII 3	
		Ch. 38	Ch. 46	Ch. 54	Ch. 62	Ch. 102	Ch. 118	Ch. 142	Ch. 151	Ch. 159
		Average	Average	Average	Average	Average	Average	Average	Average	Average
0	26	10.53	10.93	10.73	10.79	10.64	10.66	10.56	10.62	10.70
9	26	10.89	10.83	10.77	10.77	10.95	10.96	10.66	10.65	10.94
17	26	10.74	10.71	10.85	10.82	10.88	10.61	10.40	10.51	10.49
37	52	11.71	11.66	11.44	11.51	11.90	11.89	11.83	11.80	11.56
40	52	11.91	11.83	11.41	11.52	11.72	11.63	11.44	11.50	11.56
44	52	11.81	11.87	11.96	11.52	11.50	11.89	11.64	11.54	11.80
53	106	12.86	12.87	12.62	12.67	12.53	12.57	12.43	12.79	12.78
55	106	12.75	12.79	12.61	12.69	12.87	12.78	12.44	12.91	12.70
56	106	12.88	12.93	12.68	12.69	12.65	12.45	12.88	12.71	12.58
61	242	13.82	13.80	13.77	13.92	13.77	13.76	13.56	13.95	13.87
62	242	13.63	13.74	13.74	13.81	13.92	13.83	13.50	13.91	13.91
65	484	13.83	13.42	13.84	13.71	13.60	13.58	13.55	13.72	13.86

5GHz - 80MHz							
RU Index	Tones	UNII 1	UNII 2A	UNII 2C			UNII 3
		Ch. 42	Ch. 58	Ch. 106	Ch. 122	Ch. 138	Ch. 155
		Average	Average	Average	Average	Average	Average
0	26	10.92	10.51	10.64	10.65	10.63	10.57
18	26	10.75	10.91	10.80	10.70	10.56	10.99
36	26	10.99	10.75	10.59	10.55	10.56	10.43
37	52	10.64	10.70	10.69	10.77	10.81	10.95
44	52	10.63	10.86	10.66	10.52	10.92	10.75
52	52	10.68	10.91	10.71	10.62	10.78	10.54
53	106	11.83	11.51	11.92	11.99	11.91	11.73
56	106	11.57	11.79	11.64	11.61	11.97	11.71
60	106	11.79	11.52	11.97	11.86	11.52	11.68
61	242	12.58	12.75	12.54	12.62	12.54	12.76
63	242	12.80	12.51	12.50	12.47	12.77	12.50
64	242	12.96	12.70	12.71	12.59	12.78	12.46
65	484	12.87	12.58	12.94	12.96	12.84	12.56
66	484	12.87	12.62	12.54	12.34	12.79	12.53
67	996	12.66	12.62	12.87	12.83	12.62	12.88