#### 2 Composition / Information on ingredients

I he Item is composed of	the following ingredients:
H <sub>2</sub> O	Water, 35 – 58%
Sucrose	Sugar, white, refined, 40 – 60%
NaCl	Sodium Chloride, 0 – 6%
Hydroxyethyl-cellulose	Medium Viscosity (CAS# 9004-62-0), <0.3%
Preventol-D7	Preservative: aqueous preparation, (CAS# 55965-84-9), containing
	5-chloro-2-methyl-3(2H)-isothiazolone and 2-methyyl-3(2H)-isothiazolone,
	0.1 – 0.7%
	Relevant for safety; Refer to the respective Safety Data Sheet*.

### Figure D-1 Composition of 750 MHz Head and Body Tissue Equivalent Matter

**Note:** 750MHz 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.

∠eugnau Phone + info@sp	usstras: 41 44 : eag.com	se 43, 8 245 97 m, http	8004 Z 00, Fax ://www	urich, s x +41 4 w.speag	Switzer 14 245 g.com	rland 9779											
Meas	urem	ent C	ertif	icate	/ Ma	terial	Test										
Item Na	ame	I	Body	Tissu	e Sim	ulating	Liquid (I	MSL75	0V2)								
Produc	t No.			M 075	5 AA (E	Batch:	170608-1	)									
Wartura	loturer		SP LA	a													
Measu	remen	t Meth	nod														
TSL die	electric	paran	neters	meas	ured u	using ca	alibrated D	DAK pro	obe.								
Cotun	Valida	tion															
Validat	ion res	sults w	ere wi	thin ±	2.5% t	towards	the targe	et value	s of Met	hanol.							_
Target	Parar	neters			41 17		00 and IF	0.000	0.000-	lanac	atopd	ardo					
Target	param	eters a	as def	ined in	the lt	EEE 15	28 and IE	0 6220	la comb	lance	stanua	arus.					_
Test C	onditi	on															
Ambier	nt		Envir	onmen	t temp	peratur	(22 ± 3)°C	and h	umidity ·	< 70%.							
TSL Te	empera	ature	22°C														
TSL Te Test D	empera ate	ature	22°C 20-Ju	n-17													
TSL Te Test D Operat	empera ate tor	ature	22°C 20-Ju CL	n-17													
TSL Te Test D Operat	empera ate tor	ature	22°C 20-Ju CL	n-17													
Additie	empera ate tor onal Ir ensity	ature	22°C 20-Ju CL ation 1.212	n-17	1												
Addition TSL D Operat	empera ate tor onal Ir ensity eat-ca	nformative	22°C 20-Ju CL ation 1.212 3.006	n-17 g/cm <sup>3</sup> kJ/(kg	g*K)												
Addition TSL D Operat	empera ate or onal Ir ensity eat-cap	nforma pacity	22°C 20-Ju CL ation 1.212 3.006	n-17 g/cm <sup>3</sup> kJ/(kg	j*K)	0.000											
Addition TSL D Operat	empera ate for onal Ir ensity eat-ca Measu	nforma pacity	22°C 20-Ju CL 1.212 3.006	n-17 g/cm <sup>3</sup> kJ/(kc	g*K)	Diff.to 1	farget [%]		10.0								
TSL Test D Operation Addition TSL D TSL H	empera ate for onal Ir ensity eat-ca Measu e' 57.3	nforma pacity red e" 25.02	22°C 20-Ju CL 1.212 3.006 sigma 0.84	g/cm <sup>3</sup> kJ/(kc Target 56.1	sigma	Diff.to 1 ∆-eps 2.2	Target [%] Δ-sigma -12.2	× %	10.0								
TSL Test D Operat Additi TSL D TSL H	empera ate lor onal Ir ensity eat-ca Measu e' 57.3 57.1	nforma pacity rred 25.02 24.67	22°C 20-Ju CL 1.212 3.006 sigma 0.84 0.86	n-17 g/cm <sup>3</sup> kJ/(kg Target eps 56.1 56.0	sigma 0.95 0.95	Diff.to 1 <u>∆-eps</u> 2.2 1.9	Target [%] Δ-sigma -12.2 -10.1	ttivity %	10.0								
TSL Test D Operation TSL D TSL H f(MHz) 600 625 650	empera ate for ensity eat-ca Measu e' 57.3 57.1 56.8	nforma pacity red 25.02 24.67 24.32	22°C 20-Ju CL 1.212 3.006 sigma 0.84 0.86 0.88	n-17 g/cm <sup>3</sup> kJ/(kc Target 56.1 56.0 55.9	sigma 0.95 0.95 0.96	Diff.to 1 Δ-eps 2.2 1.9 1.6	Target [%] Δ-sigma -12.2 -10.1 -8.0	armittivity %	10.0 7.5 5.0 2.5 0.0								
TSL Test D Operation TSL D TSL H f [MHz] 600 625 650 675	empera ate tor onal Ir ensity eat-ca Measu e' 57.3 57.1 56.8 56.6	nforma pacity red e" 25.02 24.67 24.32 24.02	22°C 20-Ju CL 1.212 3.006 0.84 0.86 0.88 0.90	n-17 g/cm <sup>3</sup> kJ/(kg Target eps 56.1 56.0 55.9 55.8	sigma 0.95 0.96 0.96	Diff.to 1 Δ-eps 2.2 1.9 1.6 1.3	Farget [%] Δ-sigma -12.2 -10.1 -8.0 -5.8	v. Permittivity %	10.0 7.5 5.0 2.5 0.0 -2.5								
TSL To Test D Operation TSL D TSL H f [MHz] 600 625 650 675 700	empera ate tor onal Ir ensity eat-ca 57.3 57.1 56.8 56.6 56.3	nforma pacity red 25.02 24.67 24.22 24.02 23.71	22°C 20-Ju CL 1.212 3.006 sigma 0.84 0.86 0.88 0.90 0.92	n-17 g/cm <sup>3</sup> kJ/(kg 56.1 56.0 55.9 55.8 55.7	sigma 0.95 0.96 0.96 0.96	Diff.to 7 <b>Δ-eps</b> 2.2 1.9 1.6 1.3 1.1	Target [%] Δ-sigma -12.2 -10.1 -8.0 -5.8 -3.8 -3.8	Dev. Permittivity %	10.0 7.5 5.0 2.5 0.0 -2.5 -5.0 -7.5								•
TSL Test D Operat TSL D TSL D TSL H ([MHz] 600 625 650 675 700 725	empera ate tor ensity eat-ca <b>Measu</b> e' 57.3 57.1 56.8 56.6 56.3 56.1 56.3	nforma pacity red 25.02 24.67 24.32 24.02 23.71 23.74 23.29	22°C 20-Ju CL 1.212 3.006 0.84 0.86 0.88 0.90 0.92 0.95 0.97	n-17 g/cm <sup>3</sup> kJ/(kg 56.1 56.0 55.9 55.8 55.7 55.8	sigma 0.95 0.95 0.96 0.96 0.96 0.96	Diff.to 1 <b>∆-eps</b> 2.2 1.9 1.6 1.3 1.1 0.8 0.6	Target [%]           Δ-sigma           -12.2           -10.1           -8.0           -5.8           -3.8           -1.5.8           -3.8           -1.5.7	Dev. Permittivity %	10.0 7.5 5.0 2.5 0.0 -2.5 -5.0 -7.5 -10.0								
TSL Test D Operat TSL D TSL D TSL H (MHz) 600 625 650 675 700 725 750 725	empera ate lor ensity eat-ca for 57.3 57.1 56.8 56.6 56.3 56.1 55.9 55.9	nforma pacity rred 25.02 24.67 24.32 24.32 24.32 23.24 23.24 23.24 23.04	22°C 20-Ju CL 1.212 3.006 sigma 0.84 0.86 0.88 0.90 0.92 0.95 0.97 0.99	n-17 g/cm <sup>3</sup> kJ/(kg 56.1 56.0 55.9 55.8 55.7 55.6 55.5	sigma 0.95 0.95 0.96 0.96 0.96 0.96 0.96 0.96	Diff.to 1	Γarget [%]           Δ-sigma           -12.2           -10.1           -8.0           -5.8           -3.8           -1.5           0.7           2.9	Dev. Permittivity %	10.0 7.5 5.0 2.5 -0.0 -2.5 -5.0 -7.5 -10.0 600	650	700	750	800	850	900	950	•
TSL Test D Operation Additii TSL D TSL H f [MHz] 600 625 650 675 700 725 750 775 800	empera ate lor onal Ir ensity eat-ca for 57.3 57.1 56.8 56.6 56.3 56.1 55.9 55.6	nforma pacity red 25.02 24.67 24.32 24.02 23.71 23.25 23.04 23.25 23.04 22.82	22°C 20-Ju CL 1.212 3.006 sigma 0.84 0.86 0.88 0.90 0.92 0.95 0.97 0.99 1.02	n-17 g/cm <sup>3</sup> kJ/(kg 56.1 56.0 55.9 55.8 55.7 55.6 <b>55.5</b> 55.4 55.3	sigma 0.95 0.96 0.96 0.96 0.96 0.96 0.96 0.97 0.97	Diff.to 1	Target [%] <u>∧-sigma</u> -12.2 -10.1 -8.0 -5.8 -1.5 0.7 2.9 5.0	Dev. Permittivity %	10.0 7.5 5.0 2.5 -0.0 -2.5 -0.0 -7.5 -10.0 600	650	700	750 Freq	800 Juency I	850 MHz	900	950	1
TSL Test D Operation Additii TSL D TSL H f [MHz] 600 625 650 675 700 725 750 775 800 825	empera ate lor onal Ir ensity eat-ca 57.3 57.1 56.8 56.6 56.3 56.1 55.9 55.6 55.4 55.2	nforma pacity red 25.02 24.67 24.32 24.02 23.71 23.25 23.04 23.25 23.04 22.65	22°C 20-Ju cL ation 1.212 3.006 sigma 0.84 0.86 0.88 0.90 0.92 0.95 0.97 0.99 1.02 1.04	n-17 g/cm <sup>3</sup> kJ/(kg 56.1 56.0 55.9 55.8 55.7 55.6 <b>55.5</b> 55.4 55.3 55.2	sigma 0.95 0.95 0.96 0.96 0.96 0.96 0.96 0.96 0.97 0.97	Diff.to 1 Δ-eps 2.2 1.9 1.6 1.3 1.1 0.8 0.6 0.3 0.1 -0.1	arget [%] <b>A-sigma</b> -12.2           -10.1           -8.0           -5.8           -1.5 <b>0.7</b> 2.9           5.0           6.3	Dev. Permittivity %	10.0 7.5 5.0 2.5 -2.5 -5.0 -7.5 -10.0 600	650	700	750 Freq	800 yuuency l	850 MHz	900	950	-
I'SL Te           Test D           Operati           Addition           TSL D           TSL D           TSL D           TSL D           TSL D           1           (IMHz)           600           625           650           675           700           725           700           8025           838	Measure         6           57.3         56.8         56.3         56.6         56.3         55.4         55.6         55.6         55.4         55.5         55.5         55.1         55.1         55.1         55.1         55.1         55.1         55.2         55.1         55.2         55.1         55.1         55.2         55.2         55.1         55	nforma pacity red 25.02 24.67 24.32 24.32 24.32 24.32 24.32 24.32 24.32 24.32 24.32 24.32 24.32 23.34 22.32 22.35 22.55	22°C 20-Ju cL ation 1.212 3.0006 sigma 0.84 0.86 0.90 0.92 0.92 0.92 0.92 0.92 0.92 0.92 0.92 1.02 1.02 1.02 1.02 0.99 1.02 1.02 0.99 1.02 1.0	n-17 g/cm <sup>3</sup> kJ/(kg 56.1 56.0 55.8 55.7 55.6 55.5 55.5 55.3 55.2 55.2	sigma 0.95 0.95 0.96 0.96 0.96 0.96 0.96 0.96 0.97 0.97 0.97 0.97 0.98	Diff.to 1 <b>Δ-eps</b> 2.2 1.9 1.6 1.3 1.1 0.8 <b>0.6</b> 0.3 0.1 -0.1 -0.3	arsget [%] <b>A-sigma</b> -12.2           -10.1           -8.0           -5.8           -3.8           -1.5           0.7           2.9           5.0           6.3           6.9	Dev. Permittivity %	10.0 7.5 5.0 2.5 0.0 -2.5 -5.0 -7.5 -10.0 600	650	700	750 Freq	800 Nuuency I	850 MHz	900	950	1
TSL Test D Operation TSL D TSL D TSL H 1(MHz) 600 625 650 675 700 725 700 775 800 825 838 850	mpera ate tor onal Ir ensity eat-ca e' 57.3 57.1 56.8 56.6 56.6 56.6 55.4 55.4 55.4 55.1 54.9	nforma pacity red 25.02 24.67 24.32 24.32 24.32 24.32 24.32 24.32 23.34 23.34 23.34 23.34 23.34 23.34 22.85 22.56 22.56 22.57	22°C 20-Ju CL 31.000 1.212 3.000 0.84 0.84 0.86 0.90 0.92 0.95 0.97 0.99 1.02 1.04 1.05 1.06	n-17 g/cm <sup>3</sup> kJ/(kg eps 56.1 55.8 55.4 55.4 55.4 55.2 55.2 55.2 55.2	sigma 0.95 0.95 0.96 0.96 0.96 0.96 0.96 0.96 0.97 0.97 0.97 0.98 0.99	Diff.to 1 <b>∆-eps</b> 2.2 1.9 1.6 1.3 1.1 0.8 <b>0.6</b> 0.3 0.1 -0.1 -0.3 -0.4	arsiget [%] <b>A-sigma</b> -12.2           -10.1           -8.0           -5.8           -3.8           -1.5 <b>0.7</b> 2.9           5.0           6.9           7.5	Dev. Permittvity %	10.0 7.5 5.0 2.5 -5.0 -2.5 -5.0 -7.5 -10.0 600	650	700	750 Freq	800 Iuuency I	850 MHz	900	950	11
TSL Te Test D Operat Additi TSL D TSL D TSL H 600 625 650 675 700 725 700 725 800 825 838 835 835 835	empera ate lor onal Ir ensity eat-cal fr.a 57.3 57.1 56.8 56.6 56.3 56.1 55.9 55.6 55.4 55.2 55.1 55.1 55.9 54.9 54.9	nforma pacity red 25.02 24.67 24.32 24.02 24.32 24.02 23.48 23.48 23.25 23.44 22.82 22.82 22.82 22.82 22.82 22.84 22.84	22°C 20-Ju 20-Ju CL 31.006 sigma 0.84 0.84 0.86 0.90 0.92 0.95 0.97 0.99 1.02 1.04 1.05 1.06 1.09	n-17 g/cm <sup>3</sup> kJ/(kg eps 56.1 55.8 55.4 55.4 55.2 55.4 55.2 55.2 55.2 55.2	sigma 0.95 0.96 0.96 0.96 0.96 0.96 0.97 0.97 0.97 0.97 0.98 0.99 1.02	Diff.to 1 A-eps 2.2 1.9 1.6 1.3 1.1 0.8 0.6 0.3 0.1 -0.1 -0.3 -0.4 -0.7	Target [%] <b>Δ-sigma</b> -12.2           -10.1           -8.0           -5.8           -3.8           -1.5 <b>0.7</b> 2.9           5.0           6.3           6.9           7.5           6.7	b % Dev. Permittvity %	10.0 7.5 5.0 2.5 -5.0 -2.5 -7.5 -10.0 600	650	700	750 Freq	800 800	850 MHz	900	950	11
ITSL T7 Test D Operat Additi TSL D TSL H (MHz) 600 625 650 650 650 650 650 650 650 657 700 725 750 825 838 850 825 838	empera ate lor onal Ir ensity eat-cal e' e' 57.3 57.1 56.8 56.6 56.3 56.1 55.6 55.4 55.2 55.1 55.2 55.2 55.9 54.9 54.9 54.9	nforma pacity red 25.02 24.67 24.32 24.02 23.71 23.48 23.25 23.04 22.82 22.56 22.55 22.57 22.34 22.24 22.25	22°C 20-Ju 20-Ju CL 31-00-0 sigma 0.84 0.84 0.84 0.86 0.90 0.92 0.95 0.97 0.99 1.02 1.04 1.05 1.06 1.09 1.11	n-17 g/cm <sup>3</sup> kJ/(kg 56.1 56.6 55.8 55.7 55.6 55.4 55.2 55.2 55.2 55.2 55.2 55.2 55.2	sigma 0.95 0.96 0.96 0.96 0.96 0.96 0.97 0.97 0.97 0.97 0.98 0.98 0.98 0.98 0.98 1.02	Diff.to 1 <b>A-eps</b> 2.2 1.9 1.6 1.3 1.1 0.8 0.6 0.3 0.1 -0.1 -0.3 0.1 -0.4 -0.7 -0.9 -0.4	Farget [%] <b>A-sigma</b> -12.2           -10.1           -8.0           -5.8           -3.8           -1.5           -1.5           0.7           2.9           5.0           6.3           6.9           7.5           6.7           5.9           0.0	tavity % Dev. Permittvity %	10.0 7.5 5.0 2.5 0.0 -2.5 -10.0 600	650	700	750 Freq	800 Receiption	850 MHz	900	950	11
17SL 7T Test D Operat TSL D TSL H 1(MHz) 600 625 625 625 625 625 625 625 625 625 725 775 800 775 838 845 838 845 845 845 845 845 845 845 845 845 84	mpera ate ior onal Ir ensity eat-ca et 57.3 57.1 56.8 56.6 56.6 56.3 56.1 55.9 55.4 55.2 55.4 55.2 55.4 55.2 55.4 55.4	nformat pacity red 25.02 24.62 24.62 24.62 23.71 23.48 23.25 22.56 22.40 23.25 22.56 22.47 22.34 22.24 22.34 22.24 22.34 23.34 24.34 23.34 24.344 24.344 24.344 24.344 24.3444 24.34444 24.34444444444	22°CC 20-JU 20-JU CL ation 1.212 3.006 sigma 0.84 0.86 0.88 0.90 0.92 0.95 0.97 0.99 1.02 1.04 1.06 1.09 1.11 1.14	n-17 g/cm <sup>3</sup> kJ/(kg eps 55.8 55.7 55.6 55.4 55.3 55.2 55.2 55.2 55.2 55.2 55.2 55.2	sigma 0.95 0.95 0.96 0.96 0.96 0.96 0.96 0.96 0.97 0.98 0.98 0.99 1.02 1.05 1.06	Diff.to 1 <b>Δ-eps</b> 2.2 1.9 1.6 1.3 1.1 0.8 <b>0.6</b> 0.3 0.1 -0.1 -0.3 -0.4 -0.9 -1.3 -0.4 -0.9 -1.9	Farget [%] <b>A-sigma</b> -12.2           -10.1           -8.0           -5.8           -1.5 <b>0.7</b> 5.0           6.9           7.5           6.9           7.5           6.9           7.9           6.9           7.9           7.9	nductivity % Dev. Permittivity %	10.0 7.5 5.0 2.5 -0.0 -2.5 -10.0 600 10.0 7.5 5.0 2.5 0.0	650	700	750 Freq	800 800	850 MHz	900	950	11
17SL Tr Test D Operativ TSL D TSL H 1000 625 650 675 700 775 800 825 838 838 838 838 839 839 950 925 950 925	mpera ate tor onal lr ensity eat-ca 57.3 57.1 56.8 56.6 56.6 56.6 56.3 56.1 55.9 55.4 55.2 55.4 55.4	nforma pacity red 25.02 24.67 24.32 24.62 23.71 23.48 23.25 22.65 22.65 22.47 22.82 22.82 22.82 22.82 22.82 22.84 22.82 22.84 22.82 22.84 22.84 22.84 22.82 22.84 23.84 24.84	22°CC 20-JU 20-JU CL ation 1.212 3.006 sigma 0.84 0.86 0.88 0.90 0.92 0.95 0.97 0.99 1.02 1.04 1.06 1.09 1.11 1.14 1.16	g/cm <sup>3</sup> kJ/(kg eps 56.1 55.9 55.8 55.7 55.6 55.5 55.4 55.2 55.2 55.2 55.2 55.2 55.2	sigma 0.95 0.95 0.96 0.96 0.96 0.96 0.96 0.97 0.97 0.97 0.97 0.98 0.99 0.99 0.97 1.02 1.02 1.02 1.05	Diff.to 1 <b>Δ-eps</b> 2.2 1.9 1.6 1.3 1.1 0.8 <b>0.6</b> 0.3 0.1 -0.3 -0.4 -0.7 -0.9 -1.3 -1.6 -1.9 -1.9 -1.3 -1.9 -1.1 -0.8 -0.4 -0.5 -0.4 -0.5 -0.4 -0.4 -0.4 -0.5 -0.4 -0.4 -0.5 -0.4 -0.5 -0.4 -0.5 -0.4 -0.5 -0.4 -0.5 -0.4 -0.5 -0.4 -0.5 -0.4 -0.5	arget [%]           A-sigma           -12.2           -10.1           -8.0           -5.8           -3.8           -1.5           0.7           2.9           5.0           6.3           6.7           5.9           6.7           5.9           6.7           5.9           6.9           7.9           9.1	Conductivity % Dev. Permittivity %	10.0 7.5 2.5 0.0 2.5 5.0 2.5 5.0 2.5 10.0 600	650	700	750 Freq	800 B00	850 MHz	900	950	11

Figure D-2 750MHz Body Tissue Equivalent Matter

	FCC ID: ZNFL423DL		SAR EVALUATION REPORT	🕒 LG	Approved by: Quality Manager
	Test Dates:	DUT Type:			APPENDIX D:
	12/03/18 - 12/26/18	Portable Handset			Page 2 of 6
20	19 PCTEST Engineering Laboratory, Inc	:.			REV 21.2 M 12/05/2018

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Schmid & Partner Engineering AG	S	p	е	а	g	
Zeughausstrasse 43, 8004 Zurich, Switzerland						

Phone +41 44 245 9700, Fax +41 44 245 9779 info@speag.com, http://www.speag.com

#### Measurement Certificate / Material Test

	au fissue Sinulating Liquid (HSL/50VZ)
Product No. SL	AAH 075 AA (Batch: 170612-4)
Manufacturer SPE	PEAG

Measurement Method TSL dielectric parameters measured using calibrated DAK probe.

Setup Validation Validation results were within  $\pm 2.5\%$  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 1.284 g/cm<sup>3</sup> TSL Heat-capacity 2.701 kJ/(kg\*K)

1.4.1.1	Measu	ured		Targe	t	Diff.to T	arget [%]		
f [MHz]	e'	e"	sigma	eps	sigma	∆-eps	∆-sigma		0
600	45.6	22.97	0.77	42.7	0.88	6.7	-13.1	~	7
625	45.2	22.73	0.79	42.6	0.88	6.2	-10.6	tivit	0
650	44.9	22.49	0.81	42.5	0.89	5.6	-8.2	Ē	0
675	44.5	22.27	0.84	42.3	0.89	5.1	-5.8	å.	-2
700	44.2	22.05	0.86	42.2	0.89	4.6	-3.5	00	-5
725	43.8	21.88	0.88	42.1	0.89	4.2	-1.0	<b>–</b>	7
750	43.5	21.72	0.91	41.9	0.89	3.8	1.4	-1	0
775	43.2	21.55	0.93	41.8	0.90	3.4	3.7		
800	42.9	21.38	0.95	41.7	0.90	2.9	6.0		_
825	42.6	21.24	0.97	41.6	0.91	2.4	7.5		
838	42.5	21.17	0.99	41.5	0.91	2.2	8.2		-
850	42.3	21.09	1.00	41.5	0.92	2.0	8.9		10
875	42.0	20.98	1.02	41.5	0.94	1.2	8.3	8	7
900	41.7	20.87	1.05	41.5	0.97	0.5	7.7	₩.	5
925	41.5	20.76	1.07	41.5	0.98	0.0	8.7	Inct	2
950	41.2	20.64	1.09	41.4	0.99	-0.6	9.7	puo	
975	40.9	20.55	1.11	41.4	1.00	-1.1	10.9	0.7	-5
1000	40.6	20.46	1.14	41.3	1.01	-1.7	12.1	6	-7



Figure D-3 750MHz Head Tissue Equivalent Matter

	FCC ID: ZNFL423DL		SAR EVALUATION REPORT	LG	Approved by: Quality Manager
	Test Dates:	DUT Type:			APPENDIX D:
	12/03/18 - 12/26/18	Portable Handset			Page 3 of 6
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3 Composition / Info	ormation on in	gredients
The Item is composed of t	he following ingre	dients:
Water	50 - 73 %	
Non-ionic detergents	25 - 50 %	polyoxyethylenesorbitan monolaurate
NaCl	0 - 2%	
Preservative	0.05 - 0.1%	Preventol-D7
Safety relevant ingredients	5:	
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 marked by symbols.	guidelines, the pr	oduct is not a dangerous mixture and therefore not required to be

## 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.

maylauszas 43, 804 Zurch, Switzerland,	Schmid	i & Part	tner Er	gineer	ing AG						s	р	6	9	а		g	1			
Resurrent Certificate / Material Test           Image: Simulating Liquid (HBBL 1900-3800V3)           roduct No.         SL Heat Tissue Simulating Liquid (HBBL 1900-3800V3)           Image: Signal All 196 AB (Batch: 170819-1)           Image: Signal All 186 AB (Batch: 170819-1)           Imaget: Signal All 186 AB (Batch: 170819-1)     <	Zeugha Phone nfo@sp	+41 44 peag.co	ise 43, 245 9 om, htt	8004 700, Fa p://ww	Zurich, ax +41 w.spe	Switz 44 249 ag.com	erland 5 9779 n														
Head Tissue Simulating Liquid (HBL 1900-3860V3)           SL AAH 196 AB (Bath: 170619-1)           anufacturer           SL Galence for parameters measured using calibrated DAK probe.           etup Validation           alidation results were within ± 2.5% towards the target values of Methanol.           arget Parameters           Billent           Environment temperatur (22 ± 3)*C and humidity < 70%.           SL Hentity         1.054 gfcm <sup>3</sup> SL Hentity         1.054 gfcm <sup>3</sup> SL Hat 12 12 14 400 14 4 45 - 4.1           100 4118 12 12 13 400 14 4 45 - 4.1           101 41.1 12 13 28 13 18 98 18 23 0.9           200 40.4 13 12 13 98 4 17 2.2 1 15           201 41.1 12 13 28 13 18 18 18 2.2 1           201 40.2 133 17 98.4 17 2.2 1 15           202 40.2 133 17 98.4 17 2.2 1 15           203 40.2 13 18 98 2 18 12 2.2 0.8 2.6           204 40.2 13 38 2 18 92 2 18 2 2 0.8 2.6	Meas	urem	nent	Certi	ficat	e / Ma	aterial	Test													
Sel-delectic parameters measured using calibrated DAK probe.           arget parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.           arget parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.           arget parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.           arget parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.           arget parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.           aster the temperature (22 ± 3)°C and humidity < 70%.           St. Heat-capacity 3.389 ku/(kg °K)           defined in the IEEE 1528 and IEC 62209 compliance standards.           aster text standards.           aster text standards.           defined in the IEEE 1528 and IEC 62209 compliance standards.           aster text standardstastandardstastandardstandardstandardstandardstandardstandardstan	ltern N Produc Manufa	ame ct No. acturer	r	Head SL A SPE/	Tissi AH 19 AG	ue Sin 6 AB (	nulating (Batch:	Liquid (I 170619-1	HBBL1 )	900-	3800\	/3)									
Sc. disection:         parameters         parameters           arget Parameters         arget Parameters         arget Parameters           arget Parameters         as defined in the IEEE 1528 and IEC 62209 compliance standards.           eet Condition         Environment temperatur (22 ± 3)°C and humidity < 70%.	Measu	iremer	nt Mel	hod		e ure d	ualaa a	Theotod P	Alf or	ch c											
etup Values of Methanol.           arget parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.           arget parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.           est Condition           mile to the IEEE 1528 and IEC 62209 compliance standards.           est Date           20-Jun-17           perature C           difficit Target [%].           Measure of the temperature (22 ± 3)°C and humidity < 70%.           St. Heat-capacity 3.389 ku/(kg/K)           Measure of temperature (22 ± 14 400 14 4 5 4 -44.5           Measure of temperature (21 12 13 400 14 4 5 4 -44.5           1000 41.8 122 13 14 400 14 4 5 4 -44.5           add to 12 12 13 13 30 1 14 39 13 13 -24           11 5 290 402           11 5 290 402           200 40.7 12 15 298 11 0 2 2.0 0.5 2.6           10 300 14.2 21 8 18 302 18 18 2.21           10 300 14.2 2 3 8.1 2 3 30.2 0.0 5 2.6           200 40.2 12 3 17 30.5 1.0 2 2.0 0.5 2.6           200 40.6 13.0 18 30.3 1.0 30.3 1.0 2.6           200 50 5 1.0 2 2.0 0.5 2.6           200 50 5 1.0 2 2.0 0.5 2.6           200		electric	o para	meter	5 mea	sureu	using c	anorated L	JAK pl	000.			-	-		-	_	_	-		
arget Parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.           est C           est Compliance standards.           SI. Temperature         22°C           C           difficit Colspan="2">C           difficit Colspan="2">C           difficit Colspan="2">C           difficit Colspan="2">C           difficit Colspan="2">difficit Colspan="2">C           difficit Colspan="2">C           difficit Colspan="2">difficit Colspan="2">C           difficit Colspan="2">difficit Colspan="2">difficit Colspan="2">difficit Colspan="2"           St. Heat-copacel?         3.38 k. kl/kg.*K)           Messure         Toget Adv         difficit Colspan="2"           Toget Adv         difficit Colspan="2"         difficit Colspan="2"           Toget Adv         difficit Colspan="2"         difficit Colspan="2"           Toget Adv          difficit Colspan="2"            Toget Adv          difficit Colspan="2"            Toget Adv <th co<="" td=""><td>Setup Validat</td><td>Validation res</td><td>ation sults v</td><td>vere w</td><td>ithin ±</td><td>2.5%</td><td>towards</td><td>s the targe</td><td>et value</td><td>es of I</td><td>Metha</td><td>nol.</td><td>_</td><td>_</td><td></td><td></td><td></td><td></td><td></td><td>_</td></th>	<td>Setup Validat</td> <td>Validation res</td> <td>ation sults v</td> <td>vere w</td> <td>ithin ±</td> <td>2.5%</td> <td>towards</td> <td>s the targe</td> <td>et value</td> <td>es of I</td> <td>Metha</td> <td>nol.</td> <td>_</td> <td>_</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>_</td>	Setup Validat	Validation res	ation sults v	vere w	ithin ±	2.5%	towards	s the targe	et value	es of I	Metha	nol.	_	_						_
est Condition         mixing compliance standards.         est Condition         Condition         St. Hearscape: Condition         Offso Target [5:1]         Measure: Target of the total standards.         Image: Standards of the total standards.         Offso Target [5:1]         Measure: Target of the total standards.         Target of the total standards.         Offso Target [5:1]         Measure: Target of the total standards.         Measure: Target of the total standards.         Target of the total standards.         Target of the total standards.         Measure: Target of the total standards.         Target of total standards.         Ta	Target	t Parar	meter	s																	
est Condition         Environment temperatur (22 ± 3)*C and humidity < 70%.         SL Heat-Capacity       3.80 kJ/(kg */s)         ddlitional Information         SL Heat-Capacity       3.80 kJ/(kg */s)         ddlitional information         10.64 g/bm³         SL Heat-Capacity       3.80 kJ/(kg */s)         Massored       Marget       DMIA       ST Heat-Capacity       3.80 kJ/(kg */s)         Massored       Imaget       DMIA       A signa         000 41.2       1.1       4.0       1.4       4.6       4.6       4.2         CL       100         100 41.2       1.1       3.0       1.4       4.6<	Target	param	neters	as de	fined i	n the l	EEE 15	28 and IE	C 6220	09 co	mpliar	nce star	ndaro	ls.		_			_		
Automatic     Second State       St. Temperature     200       St. Temperature     200       St. Temperature     200       St. Density     1.054 g/cm <sup>3</sup> St. Heat-capacity 3.389 kJ/kgrk1       St. Heat-capacity 3.389 kJ/kgrk1       St. Heat-capacity 3.389 kJ/kgrk1       St. Density     1.054 g/cm <sup>3</sup> St. Heat-capacity 3.389 kJ/kgrk1       St. Density     1.054 g/cm <sup>3</sup> St. Heat-capacity 3.389 kJ/kgrk1       St. Density     1.054 g/cm <sup>3</sup> St. Heat-capacity 3.389 kJ/kgrk1       St. Density     1.054 g/cm <sup>3</sup> St. Heat-capacity 3.389 kJ/kgrk1       St. Density 5.389 kJ/kgrk1       St. Density 5.389 kJ/kgrk1       St. Density 5.389 kJ/kgrk1       St. Density 5.380 kJ/kgrk1       St. Density 5.390 kJ/kgrk1 <td>Test C</td> <td>onditi</td> <td>ion</td> <td>Envir</td> <td>onme</td> <td>nt tem</td> <td>peratur</td> <td>(22 + 3)*0</td> <td>andb</td> <td>umid</td> <td>ity &lt; 7</td> <td>0%</td> <td></td> <td></td> <td></td> <td>_</td> <td></td> <td></td> <td>_</td> <td></td>	Test C	onditi	ion	Envir	onme	nt tem	peratur	(22 + 3)*0	andb	umid	ity < 7	0%				_			_		
Best Late       20-JUIN-17         periator       CL         dditonal Information       1.054 g/cm <sup>3</sup> SL Density       3.08 g/cm <sup>3</sup> SL Density       3.09 g/cm <sup>3</sup> Via       4.00 g/cm <sup>3</sup> Via       4.00 g/cm <sup>3</sup> Via       4.1 g/c         Via       4.00 g/cm <sup>3</sup> Via       1.1 g/c       1.1 g/c         Via       1.1 g/c       1.1 g/c       2.1 g/c         Via       1.1 g/c       1.1 g/c       2.1 g/c       1.1 g/c         Via       1.1 g/c       1.1 g/c       1.1 g/c       1.1 g/c       1.1 g/c         Via       1.1 g/c       1.1 g/c       1.1 g/c       1.1 g/c       1.1 g/c       1.1 g/c         Via       1.1 g/c       1.1 g/c       1.1 g/c       1.1 g/c       1.1 g/c       1.1 g/c         Via       1.1 g/c       1	TSL T	empera	ature	22°C	or met	in tern	peratur	(ec ± 0)"C	/ anu fi	- Carried	ny < 1	v 70.									
dditional Information         SL Density       1.054 g cmr <sup>3</sup> Station       1.054 g cmr <sup>3</sup> 1000       1.81       122       1.3       400       1.4       4.6       4.6         1000       1.81       1.22       1.3       400       1.4       4.6       4.6         1000       1.41       1.22       1.5       3.0       1.4       3.5       0.6         1100       4.11       1.22       1.8       3.0       1.5       3.1       0.6         1100       4.11       1.3       3.0       1.6       2.7       0.2       0.2         2201       4.0       1.4       3.0       1.8       1.8       2.1       1.5         2000       4.0       1.3       3.0       1.8       1.8       2.1       1.5         2000       3.0       3.1       3.0       3.8       1.8       2.5       1.5         2000       3.0       3.0	Test D Operat	tor		20-Ju CL	in-17																
SL Density 1 0.64 g/cm <sup>3</sup> SL Heat-capacity 3.089 kJ(kg <sup>-K</sup> ) Measured Target Diff.o Target [%] Measured Target Diff.o Target [%] 106 41.6 12.2 1.3 40.0 1.4 4.5 0.42 109 41.6 12.2 1.3 40.0 1.4 4.5 0.42 100 41.6 12.2 1.3 40.0 1.4 4.5 0.42 100 41.6 12.2 1.5 0.8 1.5 3.1 0.6 1.2 200 41.6 12.2 1.5 0.8 1.5 2.7 0.2 200 40.7 12.5 1.8 0.8 1.6 2.7 0.2 200 40.7 12.5 1.8 0.8 1.6 2.7 0.2 200 40.7 12.5 1.8 0.8 1.6 2.7 0.2 200 40.6 1.3 1.6 0.9 1.8 1.6 2.5 0.5 100 2100 2000 2000 2700 2000 3100 3300 3500 3700 3900 100 2100 2000 2000 2700 2000 3100 3300 3500 3700 3900 100 2100 2000 2500 2700 2000 3100 3300 3500 3700 3900 Frequency MHz 100 7.5 1.0 0.0 1.4 2.2 0.8 2.2 0.8 2.5 200 0.8 1.4 2.2 0.8 2.5 0.5 2.5 0.0 0.7 1.4 6.2 0.8 2.5 0.5 2.6 0.0 7.5 1.4 2.8 0.5 2.4 0.1 2.26 2.6 0.0 7.5 1.4 2.8 0.5 2.4 0.5 2.6 2.6 0.0 7.5 1.4 2.8 0.5 2.4 0.5 2.6 2.6 0.0 7.7 1.5 1.2 7 0.8 2.5 0.2 0.8 2.6 0.0 3.7 1 4.8 2.5 0.2 0.2 0.8 2.7 1.4 2.5 0.8 2.2 0.3 2.8 2.8 1.4 2.2 0.8 2.2 7 0.3 0.0 2.8 1.4 2.2 0.8 2.5 0.2 0.8 2.8 1.4 2.2 0.8 2.5 0.2 0.8 2.8 1.4 2.2 0.8 2.5 0.2 0.8 2.8 1.4 4.2 2.8 0.5 2.4 0.2 2.6 2.8 3.1 14.5 2.8 0.3 0.2 0.9 4.5 3.4 3.0 0.35 15.4 2.8 0.2 0.9 4.5 3.4 3.0 0.35 15.4 3.0 0.0 2.8 4.2 3.3 2.8 0.0 0.8 15.5 3.0 1.7 9.0 4.5 0.3 3.9 0.35 15.5 3.3 17.9 0.3 0.50 3.5 3.9 0.35 15.5 3.3 17.9 0.3 0.50 3.5 3.9 0.35 15.5 3.4 0.7 0.3 0.50 3.5 3.9 0.5 15.5 3.4 0.7 0.3 0.50 3.5 3.9 0.5 15.5 3.4 0.7 0.3	Additi	onal Ir	nform	ation																	
<ul> <li>Other intervention of the second se</li></ul>	TSL D	ensity	nacit	1.054	g/cm	3														_	
Utters         * <td>ISLH</td> <td>Measu</td> <td>red</td> <td>3.385</td> <td>Targe</td> <td><u>g-к)</u> (</td> <td>Diff.to T</td> <td>arget [%]</td> <td></td> <td>_</td> <td>_</td> <td></td> <td>_</td> <td>_</td> <td>_</td> <td>-</td> <td>-</td> <td>-</td> <td>_</td> <td></td>	ISLH	Measu	red	3.385	Targe	<u>g-к)</u> (	Diff.to T	arget [%]		_	_		_	_	_	-	-	-	_		
1980       16       17       11       400       14       400       14       400       14       400       14       400       14       400       14       400       14       400       14       30       16       100       110       111       121       111	[MHz]	e' 41.8	e"	sigma	eps 40.0	sigma	Δ-eps 4.5	∆-sigma		10.0		2215			2						
2000       41.4       1.4       40.0       1.4       3.6       -1.3         2000       41.2       1.4       40.0       1.4       3.6       -1.3         2000       41.1       1.2       1.4       3.9       4.3       -3.0         2000       41.1       1.2       1.5       3.9       7.5       2.8       -0.6         2010       41.1       1.2       1.5       3.9       7.5       2.8       -0.6         2020       40.6       1.3       1.5       3.9       1.5       2.8       -0.6         2020       40.6       1.52       1.5       2.8       -0.6       -0.7.5       -1.0         2020       40.6       1.3       1.8       3.8       1.8	1950	41.6	12.3	1.3	40.0	1.4	4.0	-4.6	1 Å	5.0	-										
<ul> <li>a 2.5</li> <li>b 2.5</li> <li>c 2.5</li> <lic< td=""><td>2000</td><td>41.4</td><td>12.4</td><td>1.4</td><td>40.0</td><td>1.4</td><td>3.6</td><td>-1.3</td><td>1 E</td><td>2.5</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></lic<></ul>	2000	41.4	12.4	1.4	40.0	1.4	3.6	-1.3	1 E	2.5											
110         100         12         15         29         -0.2           00         11         15         16         16         2.7         -0.2           00         13         16         16         16         2.7         0.2           00         13         16         16         2.7         0.2         0.2           00         13         17         95         1.7         2.8         1.1         1.5         0.6         1.3         0.7         2.8         1.1         1.5         0.6         1.3         0.6         1.3         0.6         1.3         0.6         1.5         0.6         0.6         1.3         1.8	2100	41.1	12.0	1.5	39.8	1.5	3.1	-0.6	s. Pe	-2.5				-	-	-					
<ul> <li>Value 1, Value 1,</li></ul>	2150	40.9	12.8	1.5	39.7	1.5	2.9	-0.2	ă	-5.0						-		-	-		
2000         404         132         17         945         17         23         11           2000         402         133         13         945         17         2.1         11           2000         402         133         13         945         17         2.1         13           2000         400         133         13         943         1.8         1.8         2.1           2000         200         137         13         933         1.8         1.8         2.1           2000         203         137         12         931         1.9         1.3         2.6           2000         303         137         12         941         1.9         1.3         2.6           2000         303         144         2.1         389         2.0         0.8         2.6           2000         326         144         2.2         388         2.1         0.2         2.6           2000         326         144         2.3         386         2.4         -1.7         2.6           2000         327         14.3         2.5         38.4         2.6         3.0         2.8 <td>2200</td> <td>40.7</td> <td>12.9</td> <td>1.6</td> <td>39.6</td> <td>1.6</td> <td>2.5</td> <td>0.2</td> <td></td> <td>-7.5</td> <td></td>	2200	40.7	12.9	1.6	39.6	1.6	2.5	0.2		-7.5											
View         View <th< td=""><td>2300</td><td>40.4</td><td>13.2</td><td>1.7</td><td>39.5</td><td>1.7</td><td>2.3</td><td>1.1</td><td>1</td><td>1</td><td>900 21</td><td>00 2300</td><td>2500</td><td>2700 2</td><td>2900 31</td><td>100 3</td><td>300 3</td><td>3500</td><td>370</td><td>0 390</td></th<>	2300	40.4	13.2	1.7	39.5	1.7	2.3	1.1	1	1	900 21	00 2300	2500	2700 2	2900 31	100 3	300 3	3500	370	0 390	
2260         280         153         15         52         18         16         26           2500         367         157         15         19         19         13         26           2500         365         157         15         951         19         13         26           2500         303         133         20         20         0.6         25           2500         301         12         21         19         1.1         22           2500         301         142         21         385         21         02         27           300         144         22         385         22         0.8         28         20         0.8         144         23         385         24         0.2         0.7           2500         30.1         144         23         385         2.4         -1.0         2.6         0.7         1.5         2.6         -0.0         2.8         -1.0         2.6         0.7         1.4         2.6         3.0         2.9         2.8         -1.0         1.00         2.00         2.5         -1.0         1.00         1.00         1.00         1.00	2350 2400	40.2	13.3	1.7	39.4 39.3	1.7	2.1	1.5					Free	quency	/ MHz						
200       327       13.2       10.9       11.9       13.       2.6         200       32.5       32.5       32.5       32.5       32.5       32.5       32.5         200       32.8       12.0       20.0       19.1       11.1       2.6       2.6         200       32.5 <td>2450</td> <td>39.8</td> <td>13.5</td> <td>1.8</td> <td>39.2</td> <td>1.8</td> <td>1.6</td> <td>2.6</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>-</td> <td></td> <td>-</td> <td>-</td> <td></td>	2450	39.8	13.5	1.8	39.2	1.8	1.6	2.6								-		-	-		
2030     2030     132     22     20     132     132     23     132     23     132     23     132     23     132     23     132     23     132     23     132     23     132     23     132     23     132     23     132     23     132     23     132     23     132     23     132     133     132     133     132     133     132     133     132     133     132     133     132     133     133     132     133     133     132     133     133     133     133     133     133     133     133     133     133<	2500	39.7	13.7	1.9	39.1	1.9	1.3	2.6					_		_	_		_	_	_	
2800     281     14.0     21     38.9     2.0     0.5     2.6       2700     30.0     4.2     21     38.9     2.0     0.5     2.6       2700     30.0     4.2     21     38.9     2.1     0.2     2.6       2800     36.1     4.14     22     38.8     2.1     0.2     2.6       2800     36.4     4.45     2.3     38.6     2.3     -1.0     2.6       2800     36.1     4.7     2.4     38.6     2.3     -1.0     2.6       2800     36.1     4.7     2.4     38.6     2.3     -1.0     2.6       2800     37.1     4.8     2.5     3.2     2.8     2.9       3110     37.3     1.4     2.6     3.0     2.9       3200     37.1     1.6     2.8     3.0     3.0       3300     36.6     1.5     2.8     3.0     2.8       3400     36.4     1.5     2.9     4.8     3.5       3500     36.7     1.5     3.1     3.79     3.4     3.6       3500     36.8     1.6     3.1     3.79     3.4     3.5       3500     36.7     1.5     3.3	2600	39.5	13.7	2.0	39.0	2.0	0.8	2.2	1	10.0		201									
2700         300         14.2         21         38.9         2.1         0.2         2.7           307         14.4         22         38.9         2.1         0.2         2.6           2800         36.6         14.4         22         38.8         2.2         0.4         2.6           2800         36.6         14.4         22         38.8         2.2         0.4         2.6           2800         36.4         14.4         22         38.8         2.2         0.4         2.6           2800         36.4         14.4         22         38.8         2.2         0.4         2.6           2800         36.1         14.2         23         38.5         2.1         3.2         0.6         0.6         0.7         14.8         2.5         3.2         3.1         3.2         0.6         0.0         1900 2100 2300 2500 2700 2900 3100 3300 3500 3700 3900         1900 3300 3500 3700 3500         1900 2100 2300 2500 2700 2900 3100 3300 3500 3700 3900         1900 2100 2300 2500 2700 2900 3100 3300 3500 3700 3900           3000         306         15.2         28         3.2         3.4         3.4         3.4         3.4         3.4         3.4         3.4         3.4	2650	39.1	14.0	2.1	38.9	2.0	0.5	2.6	18	7.5		817									
388         144         22         388         22         -0.4         25           280         384         144         22         387         22         -0.4         25           280         384         144         22         387         22         -0.4         25           280         384         144         22         387         22         -0.4         25           280         384         144         23         385         21         -0.1         25           280         381         147         24         386         23         -1.1         2.6           3900         377         148         25         384         25         -2.0         2.8           3100         37.5         162         28         382         2.6         -2.6         2.9           3200         37.6         151         27         38.2         -3.0         -3.2           3300         366         153         28         31.2         2.6         -3.2         -3.2           3400         355         155         3.1         37.9         3.0         -5.3         3.8           3500 <td>2700</td> <td>39.0</td> <td>14.2</td> <td>2.1</td> <td>38.9</td> <td>2.1</td> <td>0.2</td> <td>2.7</td> <td>ctivity</td> <td>2.5</td> <td></td> <td>-</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>***</td> <td>***</td> <td></td>	2700	39.0	14.2	2.1	38.9	2.1	0.2	2.7	ctivity	2.5		-						***	***		
2880         384         14.5         2.3         38.7         2.2         -0.8         2.6           200         382         14.6         2.3         38.7         2.3         -1.0         2.6           2000         38.2         14.2         2.3         3.6         2.6         -1.7         2.6           2000         37.9         1.4         2.5         3.8         2.5         -1.7         2.6           3000         37.7         1.4         2.5         3.8         2.5         -2.5         -2.6           3100         37.5         1.6         2.6         3.8         2.5         -2.3         2.8           3100         37.5         1.5         2.6         3.8         2.6         -0.2         2.8           3100         37.6         1.5         2.7         3.8         -0.0         2.9           3200         37.6         1.5         2.8         3.1         2.7         -3.3         0.0           3000         36.8         1.52         2.8         3.1         2.8         3.2         3.4         3.4           3000         36.8         1.52         2.8         3.1         2.8	2800	38.6	14.4	22	38.8	2.2	-0.4	2.5	onduo	0.0	~	-									
Intervent         Intervent <t< td=""><td>2850</td><td>38.4</td><td>14.5</td><td>2.3</td><td>38.7</td><td>2.2</td><td>-0.8</td><td>2.6</td><td>N.O</td><td>-2.5</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>	2850	38.4	14.5	2.3	38.7	2.2	-0.8	2.6	N.O	-2.5	1										
3000         379         14.8         25         34.5         2.4         -1.7         2.6           3000         377         14.8         2.5         34.2         5.2         -2.0         2.6           3100         375         14.8         2.5         34.2         5.2         -2.0         2.8           3100         375         14.0         2.5         34.2         5.4         -2.7         -2.0         2.8           3100         37.5         16.0         2.5         34.2         5.4         -2.9         2.8         -2.9           3000         37.1         16.2         2.8         3.2         -3.0         2.9           3000         36.8         15.2         2.8         2.9         -3.1         -3.0           3000         36.8         15.2         2.8         2.9         -4.5         3.4           3000         36.8         15.3         2.8         3.0         -5.0         3.6           3000         36.1         15.7         3.0         3.6         -5.0         3.6           3000         36.1         15.7         3.0         3.6         3.7         3.1         -5.6         3	2900	38.2	14.6	2.3	38.6	2.3	-1.3	2.6	8	-7.5	1										
Store         J.T.         H.B.         Z.D.         H.B.         Z.D.         Z.B.         H.D.         L.D.         L.D. <thl.d.< th="">         L.D.         L.D.         <th< td=""><td>3000</td><td>37.9</td><td>14.8</td><td>2.5</td><td>38.5</td><td>2.4</td><td>-1.7</td><td>2.6</td><td></td><td>-10.0</td><td>900 21</td><td>00 2300</td><td>2500</td><td>2700 5</td><td>2900 31</td><td>100 5</td><td>300 -</td><td>3500</td><td>370</td><td>0.39</td></th<></thl.d.<>	3000	37.9	14.8	2.5	38.5	2.4	-1.7	2.6		-10.0	900 21	00 2300	2500	2700 5	2900 31	100 5	300 -	3500	370	0.39	
1100         124         150         125         126         126         127         183.0         127         183.0         127         183.0         127         183.0         127         183.0         127         183.0         127         183.0         127         183.0         127         183.0         127         183.0         127         183.0         127         183.0         127         183.0         127         133.0         127         133.0         127         133.0         127         133.0         127         133.0         127         133.0         127         333.0         230.0         230.0         230.0         230.0         230.0         230.0         330.0         330.0         330.0         330.0         330.0         330.0         330.0         330.0         330.0         330.0         330.0         330.0         330.0         330.0         330.0         330.0         340.0         350.0         360.	3050 3100	37.7	14.8	2.5	38.4	2.5	-2.0	2.8			5-30 E II								oru	08	
200         37.1         16.1         127         88.2         26         -0.0         2.9           370         16.1         127         88.2         2.7         -3.3         3.0           300         36.8         15.2         2.8         38.2         2.7         -3.3         3.0           300         36.8         15.2         2.8         38.2         2.7         -3.4         3.1           300         36.8         15.2         2.8         3.0         2.8         -3.9         3.2           300         36.8         15.2         2.8         3.0         2.8         -4.2         3.3           300         36.8         15.3         30         30.9         -4.5         3.4           300         36.8         15.6         3.1         17.9         3.6         -5.0         -5.0           300         30.7         3.1         -5.6         3.7         -7.7         3.8         -7.7           300         55.7         5.7         3.2         3.7         3.1         -5.6         3.7           370         56.4         5.7         3.2         3.7         3.1         -5.6         3.7	3150	37.3	15.0	2.6	38.3	2.6	-2.6	2.9					Fr	equen	cy MHz						
start         a <td>3200</td> <td>37.1</td> <td>15.1</td> <td>2.7</td> <td>38.3</td> <td>2.6</td> <td>-3.0</td> <td>2.9</td> <td></td>	3200	37.1	15.1	2.7	38.3	2.6	-3.0	2.9													
3300         364         15.3         2.8         36.1         2.8         3.2           3400         364         15.2         28         36.2         3.2           3400         364         15.2         28         36.2         3.4           3500         36.1         15.5         3.1         27.9         2.9         4.5         3.4           3500         360         15.5         3.1         37.9         2.9         4.5         3.4           3500         360         15.5         3.1         37.9         3.0         -5.0         3.6           3600         36.7         15.5         3.1         37.9         3.0         -5.0         3.6           3600         36.7         15.5         3.1         37.9         3.0         -5.0         3.6           3600         36.7         15.2         3.7         3.1         -5.6         3.7           3700         36.5         15.7         3.2         37.8         3.9           3800         32.7         1.4         -5.8         3.9           3800         32.7         3.4         3.6         3.4           380         35.4	3300	36.8	15.2	2.8	38.2	2.7	-3.6	3.1													
3400         364         15.2         12.9         36.0         2.6         4.2         3.3           3400         36.8         15.3         36.9         36.0         16.3         36.0 </td <td>3350</td> <td>36.6</td> <td>15.3</td> <td>2.8</td> <td>38.1</td> <td>2.8</td> <td>-3.9</td> <td>3.2</td> <td></td>	3350	36.6	15.3	2.8	38.1	2.8	-3.9	3.2													
1         1	3400	36.4	15.3	2.9	38.0	2.8	-4.2	3.3													
350         360         15.5         31         37.9         3.0         -5.0         3.6           3600         55.6         15.0         3.1         37.9         3.0         -5.3         3.8           3600         36.7         15.7         3.2         37.8         3.1         -5.6         3.7           3700         36.5         15.7         3.2         37.8         3.1         -5.6         3.7           3700         36.5         15.7         3.2         37.7         3.1         -5.6         3.7           3700         36.4         15.3         3.7         3.1         -5.6         3.9           3800         35.2         15.9         3.4         37.6         3.2         -6.1         3.9           3800         35.1         15.9         3.4         37.6         3.2         -6.1         3.9	3500	36.1	15.5	3.0	37.9	2.9	-4.8	3.5	1												
swort         iso         iso </td <td>3550</td> <td>36.0</td> <td>15.5</td> <td>3.1</td> <td>37.9</td> <td>3.0</td> <td>-5.0</td> <td>3.6</td> <td>1</td> <td></td>	3550	36.0	15.5	3.1	37.9	3.0	-5.0	3.6	1												
3700         36.5         15.7         3.2         37.7         3.1         -5.8         3.9           3700         36.4         15.8         3.3         37.6         3.2         -6.1         3.9           3800         35.2         15.9         3.4         37.6         3.2         -6.1         3.9           3800         35.0         15.9         3.4         37.6         3.2         -6.1         3.9	3600	35.8	15.6	3.1	37.8	3.0	-5.8	3.8 3.7													
3750         36.4         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           3805         35.1         15.9         3.4         37.5         3.3         -6.6         4.1	3700	35.5	15.7	3.2	37.7	3.1	-5.8	3.9	1												
3850 35.1 15.9 3.4 37.5 3.3 -6.6 4.1	3750	35.4	15.8	3.3	37.6	3.2	-6.1	3.9													
	3850	35.2	15.9	3.4	37.6	3.2	-6.6	4.1													

Figure D-5 2.4 GHz Head Tissue Equivalent Matter

	FCC ID: ZNFL423DL		SAR EVALUATION REPORT	🕑 LG	Approved by:
	Test Dates:	DUT Type:			APPENDIX D:
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### 2 Composition / Information on ingredients

The Item is composed of the following ingredients:Water50 - 65%Mineral oil10 - 30%Emulsifiers8 - 25%Sodium salt0 - 1.5%

#### Figure D-6

## Composition of 5 GHz Head Tissue Equivalent Matter

**Note:** 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.

Schmi	d & Par	tner Er	nginee	ring AG	3					S	p	е	а	q	
Zeugh Phone info@s	ausstra +41 44 peag.c	sse 43 1 245 9 om, htt	, 8004 700, F p://wv	Zurich ax +41 vw.spe	, Switz 44 24 ag.com	terland 5 9779 n									
Meas	suren	nent	Certi	ficat	e/M	ateria	l Test								
Item N Produ	lame		Head	I Tiss	ue Sir	nulatin	g Liquid (	(HBB	L3500-	5800	V5)				
Manut	acture	r	SPE	AG AG	12 AG	(batch:	170613-	"							
Measu	ureme	nt Met	hod												
TSL d	ielectri	c para	meter	s mea	sured	using c	alibrated	DAK	probe.						
Setup	Valid	ation		(a). (	0.50										
Valida	tion re	SUITS V	vere w	nthin ±	: 2.5%	toward	s the targ	et va	lues of I	Metha	inol.				
Targe Targe	t Para t paran	meters	s as de	fined i	n the	IEEE 15	528 and IF	-C 62	209.00	molia	nce stan	lards			
Toet (	ondit	ion								- aprila	100 5101	1000.			
Ambie	nt	511	Envir	onme	nt tem	peratur	(22 ± 3)°	C and	d humid	ity < 7	70%.				
TSL T Test D	emper ate	ature	22°C 20-Ji	un-17											
Opera	tor		CL												
Additi	onal l	nform	ation												
TSL D	ensity	and the	0.985	5 g/cm	3										
ISL H	eat-ca	pacity	3.383	s ĸJ/(k	g*K)										
	Measu	red		Targe	t	Diff.to 1	farget [%]		10.0						
3400	38.6	e. 15.03	2.84	38.0	2.81	1.5	Δ-sigma 1.1		\$ 7.5						
3500	38.5	15.00	2.92	37.9	2.91	1.5	0.3		5.0 2.5						
3700	38.2	14.96	3.00	37.8	3.12	1.3	-1.2		0.0 Per	*****		*******	******	******	
3800	38.1	14.96	3.16	37.6	3.22	1.4	-1.9		à -2.5						
4000	37.9	14.95	3.33	37.4	3.43	1.5	-2.8		-7.5						
4100 4200	37.8 37.6	14.96 15.00	3.41 3.50	37.2	3.53 3.63	1.5	-3.3 -3.6		-10.0 34	\$00	3900	4400	4900	5400	5900
4300	37.5	15.05	3.60	37.0	3.73	1.3	-3.5					Frequ	ency MHz		
4400	37.4	15.11	3.80	36.9	3.84	1.4	-3.5								
4600	37.1	15.24	3.90	36.7	4.04	1.2	-3.5		10.0		_				
4800	36.8	15.35	4.10	36.4	4.25	1.0	-3.4		7.5						
4850 4900	36.8 36.7	15.35 15.38	4.14	36.4	4.30	1.1	-3.6 -3.6		AU 2.5						
4950	36.6	15.39	4.24	36.3	4.40	0.9	-3.6		0.0	~	-				
5000 5050	36.5	15.42 15.43	4.29	36.2	4.45	0.8	-3.6 -3.6		8 ≥ -5.0	-		********	********		
5100	36.4	15.46	4.39	36.1	4.55	0.8	-3.6		∆ -7.5 -10.0						
5200	36.3	15.50	4.48	36.0	4.66	0.6	-3.8		34	400	3900	4400 Freque	4900 ency MHz	5400	5900
5250 5300	36.1 36.1	15.53	4.54	35.9	4.71	0.5	-3.5	1				. requ	andy mind.		
5350	36.0	15.56	4.63	35.8	4.81	0.5	-3.7								
5400 5450	35.9 35.9	15.57 15.59	4.68	35.8 35.7	4.86 4.91	0.4	-3.7 -3.7								
5500	35.8	15.61	4.78	35.6	4.96	0.4	-3.7								
5600 5600	35.7	15.65	4.83	35.6	5.01 5.07	0.3	-3.7								
5650 5700	35.6	15.70	4.93	35.5	5.12	0.4	-3.6								
5750	35.4	15.76	5.04	35.4	5.22	0.2	-3.4								
_		the second se													
5800 5850	35.4	15.78	5.09	35.3	5.27	0.3	-3.4								

Figure D-7 5 GHz Head Tissue Equivalent Matter

	FCC ID: ZNFL423DL		SAR EVALUATION REPORT	🕒 LG	Approved by: Quality Manager
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#### 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:** 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.

Series 10	hmid & Partner Engineering AG						5	5	p	e	а	a			
Zeugha Phone info@s	+41 44 peag.c	sse 43, 1 245 9 om, htt	, 8004 700, F p://ww	Zurich ax +41 rw.spe	Switz 44 24 ag.con	erland 5 9779 1									
Meas	uren	nent	Certi	ficat	e / Ma	ateria	l Test								
ltern N Produc Manuf	arne ct No. acture	r	Body SL A SPE	/ Tiss AM 50 AG	ue Sin 1 EA	nulatin (Batch:	g Liquid (1 180423-2	MBBL )	.3500-6	5800	V5)				
Measu	ireme	nt Met	hod												
ISL 0	electri	c para	meter	s mea	sured	using c	alibrated [	AK p	robe.						
Setup Validat	Validation re-	ation sults w	ere w	ithin ±	2.5%	toward	s <u>the</u> targe	t valu	es of N	letha	inol.				
Target	Para	meter	5												
Target	paran	neters	as de	fined i	n the H	CDB 86	5664 com	oliance	e stand	lard.					
Test C	ondit	ion	_												
Ambier	nt emper	ature	Envir 22°C	onmer	nt temp	peratur	(22 ± 3)°C	and	numidit	y < 7	0%.				
Test D	ate	ature	25-A	or-18											
Operat	or		WM			_									
Additi	onal li	nform	ation												
TSL D	ensity	nacitu	0.996	g/cm	3										
I SE H	car-ca	pacity	3.700	KJ/(K	g K)										
	Measu	ired		Targe	t	Diff.to T	Farget [%]		10.0						
[MHz]	e'		0.000												
3400	50.7	16.46	3 11	61.5	3 20	-40ps	∆-sigma	38	7.5						
3400 3500	50.7 50.5	16.46 16.50	3.11 3.21	51.5 51.3	3.20 3.31	-1.5 -1.6	<u>Δ-sigma</u> -2.7 -3.1	NIN %	7.5 -						
3400 3500 3600	50.7 50.5 50.4	16.46 16.50 16.56	3.11 3.21 3.32	605 51.5 51.3 51.2	3.20 3.31 3.43	-1.5 -1.6 -1.5	Δ-sigma -2.7 -3.1 -3.2	armittivity %	7.5						
3400 3500 3600 3700 3800	50.7 50.5 50.4 50.3 50.2	16.46 16.50 16.56 16.63 16.72	3.11 3.21 3.32 3.42 3.53	61.5 51.3 51.2 51.1 50.9	3.20 3.31 3.43 3.55 3.66	-1.5 -1.6 -1.5 -1.5 -1.5 -1.4	Δ-sigma -2.7 -3.1 -3.2 -3.6 -3.7	w. Permittivity %	7.5 - 5.0 - 2.5 - 0.0 2.5 -						
3400 3500 3600 3700 3800 3900	50.7 50.5 50.4 50.3 50.2 50.1	16.46 16.50 16.56 16.63 16.72 16.81	3.11 3.21 3.32 3.42 3.53 3.65	eps 51.5 51.3 51.2 51.1 50.9 50.8	3.20 3.31 3.43 3.55 3.66 3.78	-1.5 -1.5 -1.5 -1.5 -1.4 -1.3	<u>A-sigma</u> -2.7 -3.1 -3.2 -3.6 -3.7 -3.5	Dev. Permittivity %	7.5 5.0 2.5 - 0.0 - 2.5 - - 2.5 - - 5.0						
3400 3500 3600 3700 3800 3900 4000 4100	50.7 50.5 50.4 50.3 50.2 50.1 49.9 49.8	16.46 16.50 16.56 16.63 16.72 16.81 16.93 17.05	3.11 3.21 3.32 3.42 3.53 3.65 3.77 2.90	eps 51.5 51.2 51.2 51.2 50.9 50.8 50.6 50.6	3.20 3.31 3.43 3.55 3.66 3.78 3.90 4.01	-1.5 -1.6 -1.5 -1.5 -1.4 -1.4 -1.3 -1.5 -1.4	<u>A-sigma</u> -2.7 -3.1 -3.2 -3.6 -3.7 -3.5 -3.3 -3.3 -3.3	Dev. Permitivity %	7.5 5.0 2.5 0.0 -2.5 -5.0 -7.5						
3400 3500 3600 3700 3800 3900 4000 4100 4200	50.7 50.5 50.4 50.2 50.2 50.1 49.9 49.8 49.6	16.46 16.50 16.56 16.63 16.72 16.81 16.93 17.05 17.18	3.11 3.21 3.32 3.42 3.53 3.65 3.77 3.89 4.01	eps 51.5 51.3 51.2 51.2 50.9 50.8 50.6 50.5 50.5 50.4	3.20 3.31 3.43 3.55 3.66 3.78 3.90 4.01 4.13	-1.5 -1.5 -1.5 -1.5 -1.4 -1.3 -1.5 -1.4 -1.5 -1.4 -1.5	▲-sigma -2.7 -3.1 -3.2 -3.6 -3.7 -3.5 -3.3 -3.3 -3.1 -2.9	Dev. Permittivity %	7.5 5.0 2.5 -0.0 -2.5 -5.0 -7.5 -10.0 -340	20	3900	4400	4900	5400	5900
3400 3500 3600 3800 3800 4000 4100 4200 4300	50.7 50.5 50.4 50.2 50.2 50.1 49.9 49.8 49.6 49.5	16.46 16.50 16.56 16.63 16.72 16.81 16.93 17.05 17.18 17.32	3.11 3.21 3.32 3.42 3.53 3.65 3.77 3.89 4.01 4.14	eps 51.5 51.3 51.2 51.1 50.9 50.8 50.6 50.5 50.4 50.2	3.20 3.31 3.43 3.55 3.66 3.78 3.90 4.01 4.13 4.25	1.5 1.5 1.5 1.5 1.5 1.5 1.4 1.5 1.4 1.5 1.5 1.5	▲-sigma -2.7 -3.1 -3.2 -3.6 -3.7 -3.5 -3.3 -3.1 -2.9 -2.5	Dev. Permitivity %	7.5 5.0 2.5 -0.0 -2.5 -5.0 -7.5 -10.0 340	20	3900	4400 Frequ	4900 ency MHz	5400	5900
3400 3500 3600 3800 3900 4000 4100 4200 4300 4400 4500	50.7 50.5 50.4 50.2 50.1 49.9 49.8 49.6 49.5 49.3 49.2	16.46 16.50 16.56 16.63 16.72 16.81 16.93 17.05 17.18 17.32 17.46	3.11 3.21 3.32 3.42 3.53 3.65 3.77 3.89 4.01 4.14 4.27 4.40	eps 51.5 51.3 51.2 51.1 50.9 50.8 50.6 50.5 50.4 50.2 50.1 50.0	3.20 3.31 3.43 3.55 3.66 3.78 3.90 4.01 4.13 4.25 4.37 4.48	1.5 1.5 1.5 1.5 1.5 1.5 1.4 1.5 1.4 1.5 1.5 1.4 1.5 1.5 1.6 1.5	▲-sigma -2.7 -3.1 -3.2 -3.6 -3.7 -3.5 -3.3 -3.1 -2.9 -2.5 -2.2 -1.9	Dev. Permittivity %	7.5 5.0 2.5 -2.5 -5.0 -7.5 -10.0 340	00	3900	4400 Frequ	4900 ency MHz	5400	5900
3400 3500 3600 3800 3900 4000 4100 4200 4300 4400 4400 4500 4600	50.7 50.5 50.4 50.3 50.2 50.1 49.9 49.8 49.6 49.5 49.3 49.2 49.0	16.46 16.50 16.56 16.62 16.72 16.81 16.93 17.05 17.18 17.32 17.46 17.59 17.73	3.11 3.21 3.32 3.42 3.53 3.65 3.77 3.89 4.01 4.14 4.27 4.40 4.54	eps 51.5 51.3 51.2 51.2 51.2 51.2 50.9 50.8 50.6 50.5 50.4 50.2 50.1 50.0 49.8	3.20 3.31 3.43 3.55 3.66 3.78 3.90 4.01 4.13 4.25 4.37 4.48 4.60	1.5 1.5 1.5 1.5 1.5 1.4 1.5 1.5 1.4 1.5 1.5 1.5 1.6 1.5 1.5 1.7	▲-sigma -2.7 -3.1 -3.2 -3.6 -3.7 -3.5 -3.3 -3.1 -2.9 -2.5 -2.5 -2.2 -1.8 -1.3	Dev. Permittvity %	7.5 5.0 2.5 -0.0 -2.5 -5.0 -7.5 -10.0 340	00	3900	4400 Frequ	4900 ancy MHz	5400	5900
3400 3500 3600 3800 3900 4000 4100 4200 4300 4400 4500 4600 4700	50.7 50.5 50.4 50.2 50.1 49.9 49.8 49.6 49.5 49.3 49.2 49.0 48.8	16.46 16.50 16.56 16.63 16.72 16.81 16.93 17.05 17.18 17.32 17.46 17.59 17.73 17.86	3.11 3.21 3.32 3.42 3.53 3.65 3.77 3.89 4.01 4.14 4.27 4.40 4.54 4.67	eps 51.5 51.3 51.2 51.2 51.1 50.9 50.8 50.6 50.5 50.4 50.2 50.1 50.0 49.8 49.7	3.20 3.31 3.43 3.55 3.66 3.78 3.90 4.01 4.13 4.25 4.37 4.48 4.60 4.72	1.5 1.5 1.5 1.5 1.4 1.5 1.4 1.5 1.4 1.5 1.5 1.6 1.5 1.6 1.5 1.7 1.8	▲-sigma -2.7 -3.1 -3.2 -3.6 -3.7 -3.5 -3.3 -3.1 -2.9 -2.5 -2.2 -1.8 -1.3 -1.0	Permittvity %	7.5 5.0 2.5 -2.5 -5.0 -7.5 -10.0 340 10.0 7.5	00	3900	4400 Frequ	4900 ancy MHz	5400	5900
3400 3500 3600 3800 3900 4000 4100 4200 4300 4400 4500 4600 4700 4850	50.7 50.5 50.4 50.2 50.1 49.9 49.8 49.6 49.5 49.3 49.2 49.0 48.8 48.6 48.5	16.46 16.50 16.56 16.62 16.72 16.81 16.93 17.05 17.18 17.32 17.46 17.59 17.73 17.86 17.99 17.73	3.11 3.21 3.32 3.42 3.53 3.65 3.77 3.89 4.01 4.14 4.27 4.40 4.54 4.67 4.80 4.87	eps 51.5 51.3 51.2 51.1 50.9 50.8 50.6 50.5 50.4 50.5 50.4 50.2 50.1 50.0 49.8 49.7 49.6	3.20 3.31 3.43 3.55 3.66 3.78 3.90 4.01 4.13 4.25 4.37 4.48 4.60 4.72 4.83 4.60	1.5 1.5 1.5 1.5 1.5 1.4 1.5 1.4 1.5 1.4 1.5 1.5 1.4 1.5 1.5 1.6 1.5 1.5 1.6 1.5 1.7 1.8 1.5 1.7 1.8 1.5	▲eigma -2.7 -3.1 -3.2 -3.6 -3.7 -3.5 -3.3 -3.1 -2.9 -2.5 -2.2 -1.8 -1.3 -1.0 -0.7 -0.4	alvity % Dev. Permittvity %	7.5 - 5.0 - 2.5 - -5.0 - -7.5 - -10.0 - 340 7.5 - 5.0 - 2.5 -	00	3900	4400 Frequ	4900 ency MHz	5400	5900
3400 3500 3600 3800 3900 4000 4100 4200 4300 4400 4500 4600 4600 4850 4850 4850	50.7 50.5 50.4 50.2 50.1 49.9 49.8 49.6 49.5 49.3 49.2 49.0 48.8 48.6 48.5 48.4	16.46 16.50 16.50 16.62 16.72 16.81 16.93 17.05 17.18 17.32 17.46 17.59 17.73 17.86 17.99 18.05 18.11	3.11 3.21 3.32 3.42 3.53 3.65 3.77 3.89 4.01 4.14 4.27 4.40 4.54 4.67 4.80 4.87 4.94	eps 51.5 51.3 51.2 50.9 50.8 50.6 50.5 50.4 50.2 50.1 50.0 49.8 49.7 49.6 49.5 49.4	3.20 3.31 3.43 3.66 3.66 3.78 3.90 4.01 4.13 4.25 4.37 4.48 4.60 4.72 4.83 4.89 4.95	1.5 1.5 1.5 1.5 1.5 1.4 1.5 1.4 1.5 1.4 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5	▲eigma -2.7 -3.1 -3.2 -3.6 -3.7 -3.5 -3.3 -3.1 -2.9 -2.5 -2.2 -1.8 -1.3 -1.0 -0.7 -0.4 -0.2	nductivity % Dev. Permittivity %	7.5 - 5.0 - 2.5 - -2.5 - -7.5 - -7.5 - -7.5 - -10.0 - 7.5 - 5.0 - 2.5 - 0.0 -	20	3900	4400 Frequ	4900 ency MHz	5400	5900
3400 3500 3600 3900 4000 4100 4200 4300 4400 4500 4600 4600 4850 4850 4850 4850	50.7 50.5 50.4 50.2 50.1 49.9 49.8 49.6 49.5 49.3 49.2 49.0 48.8 48.6 48.5 48.4 48.5	16.46 16.50 16.56 16.62 16.72 16.81 16.93 17.05 17.18 17.32 17.46 17.59 17.73 17.86 17.99 18.05 18.11 18.17	3.11 3.21 3.22 3.42 3.53 3.65 3.77 3.89 4.01 4.14 4.27 4.40 4.54 4.67 4.80 4.87 4.94 5.00	eps 51.5 51.3 51.2 51.1 50.9 50.8 50.6 50.5 50.4 50.2 50.4 50.2 50.4 50.2 50.4 49.4 49.5 49.4 49.4	3.20 3.31 3.43 3.55 3.66 3.78 3.90 4.01 4.13 4.25 4.37 4.48 4.60 4.72 4.83 4.89 4.95 5.01	-1.5 -1.5 -1.5 -1.5 -1.5 -1.4 -1.5 -1.4 -1.5 -1.4 -1.5 -1.6 -1.5 -1.6 -1.5 -1.6 -1.5 -1.6 -1.5 -1.4 -1.5 -1.5 -1.5 -1.5 -1.5 -1.5 -1.5 -1.5	A-sigma -2.7 -3.1 -3.2 -3.6 -3.7 -3.5 -3.3 -3.1 -2.9 -2.5 -2.2 -1.8 -1.3 -1.0 -0.7 -0.4 -0.2 -0.1	Conductivity % Dev. Permittivity %	7.5 5.0 2.5 -0.0 -2.5 -5.0 -7.5 -10.0 7.5 -10.0 2.5 -0.0 -0.0 -0.0 -0.0 -0.0 -0.0 -0.0 -0	00	3900	4400 Frequ	4900 ency MHz	5400	5900
3400 3500 3600 3800 3900 4000 4100 4200 4300 4400 4500 4600 4600 4600 4850 4850 4850 4900 5050	50.7 50.8 50.4 50.2 50.2 50.1 49.9 49.8 49.6 49.5 49.3 49.2 49.0 48.8 48.6 48.5 48.4 48.5 48.4 48.2 48.2 48.4 48.5	16.46 16.50 16.56 16.62 16.72 16.81 16.93 17.05 17.18 17.32 17.46 17.59 17.73 17.86 17.99 18.05 18.11 18.17 18.23 18.23	3.11 3.21 3.221 3.32 3.53 3.65 3.77 3.89 4.01 4.14 4.27 4.40 4.54 4.67 4.80 4.87 4.94 5.00 5.07 5.07	eps           51.5           51.2           51.2           51.2           50.9           50.8           50.6           50.5           50.4           50.2           50.1           50.0           49.6           49.7           49.8           49.4           49.4           49.4	sigma 3.20 3.31 3.43 3.55 3.66 3.78 3.90 4.01 4.13 4.25 4.37 4.48 4.60 4.72 4.83 4.60 4.72 4.83 4.60 5.01 5.01	2-405 -1.5 -1.5 -1.5 -1.4 -1.4 -1.5 -1.4 -1.5 -1.4 -1.5 -1.5 -1.5 -1.5 -1.6 -1.5 -1.5 -1.5 -1.7 -1.8 -1.5 -1.5 -1.5 -1.5 -1.5 -1.5 -1.5 -1.5	▲sigma -2.7 -3.1 -3.2 -3.6 -3.7 -3.5 -3.3 -3.7 -3.5 -3.3 -3.7 -3.5 -3.3 -3.1 -2.9 -2.5 -2.9 -2.5 -2.2 -1.8 -1.3 -1.0 -0.7 -0.7 -0.4 -0.7 -0.4 -0.7 -0.4 -0.7 -0.4 -0.1 -0.4 -0.4 -0.4 -0.4 -0.4 -0.4 -0.4 -0.4	Dev. Conductivity % Dev. Permittivity %	7.5 5.0 2.5 -0.0 -2.5 -5.0 -7.5 -10.0 7.5 - 5.0 -7.5 - 5.0 -2.5 - 0.0 -2.5 - 5.0 -7.5 -7.5 -7.5 -7.5 -7.5 -7.5 -7.5 -7.5	20	3900	4400 Frequ	4900 ency MHz	5400	5900
3400 3500 3600 3700 3800 4000 4100 4200 4400 4400 4500 4500 4500 4850 4900 4950 5000 5100	50.7 50.8 50.4 50.3 50.2 50.1 49.9 49.8 49.6 49.5 49.3 49.2 49.0 48.8 48.6 48.5 48.4 48.5 48.4 48.2 48.1 48.1	16.46 16.50 16.50 16.62 16.81 16.93 17.05 17.18 17.32 17.46 17.59 17.73 17.86 17.99 18.05 18.11 18.29 18.29 18.34	3.111 3.21 3.32 3.42 3.53 3.65 3.77 3.89 4.01 4.14 4.27 4.40 4.54 4.67 4.80 4.87 4.94 5.00 5.07 5.14 5.20	eps           51.5           51.2           51.3           50.9           50.6           50.5           50.4           50.2           50.1           50.2           50.4           49.5           49.4           49.4           49.4           49.2	3,20 3,31 3,43 3,43 3,43 3,43 3,43 3,45 3,43 3,40 4,11 4,25 4,37 4,48 4,60 4,72 4,48 4,48 4,49 5,01 5,01 5,01 5,12 5,18	2-405 -1.5 -1.5 -1.5 -1.4 -1.4 -1.5 -1.4 -1.5 -1.4 -1.5 -1.6 -1.5 -1.6 -1.5 -1.6 -1.5 -1.6 -1.5 -1.6 -1.5 -1.4 -1.5 -1.6 -1.5 -1.4 -1.5 -1.4 -1.5 -1.4 -1.5 -1.6 -1.5 -1.6 -1.5 -1.6 -1.5 -1.6 -1.5 -1.6 -1.5 -1.6 -1.5 -1.6 -1.5 -1.6 -1.5 -1.6 -1.5 -1.6 -1.5 -1.6 -1.5 -1.8 -1.5 -1.8 -1.9 -2.0 -2.0 -2.0 -2.0 -2.0 -2.0 -2.0 -2.0	Areigma -2.7 -3.1 -3.2 -3.6 -3.7 -3.5 -3.3 -3.7 -3.5 -3.3 -3.1 -2.9 -2.5 -2.2 -1.8 -1.3 -1.0 -0.7 -0.4 -0.7 -0.4 -0.7 -0.4 -0.2 -0.1 0.3 0.3	Dev. Conductivity % Dev. Permittivity %	7.5 5.0 2.5 -0.0 -2.5 -5.0 -7.5 -10.0 7.5 -5.0 -2.5 0.0 -2.5 -5.0 -2.5 -5.0 -7.5 -5.0 -7.5 -10.0	00	3900	4400 Frequ	4900 ency MHz	5400	5900
3400 3500 3600 3700 3900 4000 4100 4200 4400 4500 4500 4500 4500 4850 4900 5050 5000 5050 5150	50.7 50.8 50.4 50.3 50.2 50.1 49.9 49.8 49.6 49.5 49.3 49.2 49.0 48.8 48.6 48.5 48.4 48.5 48.4 48.5 48.4 48.3	16.46 16.50 16.56 16.62 16.72 16.81 17.05 17.18 17.32 17.46 17.59 18.05 18.11 18.27 18.29 18.34 18.29	3.111 3.21 3.32 3.42 3.53 3.65 3.77 3.89 4.01 4.54 4.44 4.44 4.44 4.44 4.44 4.44 4.4	eps           51.5           51.2           51.2           51.2           50.9           50.8           50.6           50.5           50.4           50.2           50.4           50.4           50.5           50.4           49.5           49.4           49.4           49.2           49.2           49.1	sigma 3.20 3.31 3.43 3.43 3.43 3.43 3.45 3.46 4.01 4.13 4.25 4.48 4.99 4.95 5.01 5.07 5.12 5.18 5.24	2-005 -1.5 -1.6 -1.5 -1.4 -1.5 -1.4 -1.5 -1.4 -1.5 -1.6 -1.5 -1.6 -1.5 -1.6 -1.5 -1.6 -1.5 -1.7 -1.8 -1.5 -1.4 -1.5 -1.6 -1.5 -1.4 -1.5 -1.6 -1.5 -1.4 -1.5 -1.6 -1.5 -1.2 -1.5 -1.6 -1.5 -1.2 -1.5 -1.2 -1.5 -1.6 -1.5 -1.2 -1.2 -1.2 -1.2 -1.2 -1.2 -1.2 -1.2	▲ reigna -2.7 -3.1 -3.2 -3.6 -3.7 -3.5 -3.3 -3.1 -2.9 -2.5 -2.2 -1.8 -1.3 -1.0 -0.7 -0.4 -0.2 -0.1 0.1 0.3 0.6 -0.3 0.6 -0.5	Dev. Conductivity % Dev. Permittivity %	7.5 - 5.0 - 2.5	00	3900	4400 Freque 4400 Freque	4900 ancy MHz 4900	5400	5900
3400 3500 3600 3900 4000 4100 4200 4400 4400 4400 4400 44	50.7 50.5 50.4 50.3 50.2 50.1 49.8 49.6 49.5 49.3 49.2 49.2 49.2 48.4 48.6 48.5 48.4 48.5 48.4 48.2 48.4 48.2 48.1 48.2 47.9 47.9	16.46 16.50 16.56 16.63 16.72 16.81 17.05 17.18 17.32 17.46 17.59 18.05 18.11 18.17 18.23 18.29 18.34 18.39 18.45	3.111 3.321 3.32 3.42 3.53 3.65 3.77 3.89 4.01 4.14 4.27 4.40 4.54 4.67 4.40 4.54 4.67 4.80 5.00 5.07 5.14 5.20 5.27 5.34	eps           51.5           51.2           51.2           51.2           50.9           50.8           50.6           50.5           50.4           50.5           50.4           50.5           50.4           50.5           50.4           49.5           49.7           49.8           49.4           49.3           49.4           49.2           49.1           49.2           48.9           48.9	sigma 3.20 3.31 3.35 3.66 3.78 3.90 4.01 4.13 4.25 4.37 4.48 4.60 4.02 4.83 4.89 5.07 5.12 5.07 5.12 5.18 5.24 5.36	aug         aug           1-5         -1.5           -1.5         -1.5           -1.5         -1.4           -1.5         -1.4           -1.5         -1.4           -1.5         -1.6           -1.5         -1.7           -1.8         -1.9           -2.1         -2.2           -2.3         -2.4           -2.4         -2.3	Areigma -2.7 -3.1 -3.2 -3.6 -3.7 -3.5 -3.3 -3.1 -2.9 -2.5 -2.2 -1.3 -1.0 -0.7 -0.4 -0.2 -0.1 0.1 0.3 0.6 0.8 0.8	Dev. Conductivity % Dev. Permittivity %	10.0 2.5 0.0 2.5 0.0 2.5 0.0 -2.5 -10.0 -7.5 -10.0 -7.5 -10.0 -2.5 -10.0 -2.5 -10.0 -2.5 -10.0 -2.5 -10.0 -2.5 -10.0 -2.5 -10.0 -2.5 -10.0 -2.5 -10.0 -2.5 -10.0 -7.5 -7.5 -10.0 -7.5 -7.5 -10.0 -7.5 -7.5 -10.0 -7.5	00	3900	4400 Freque 4400 Freque	4900 ancy MHz 4900 ency MHz	5400	5900
3400 3500 3600 3900 3900 4000 4000 4100 4200 4400 4400 4400 4400 4400 4400 4400 4500 4400 5000 5000 5150 5200 5250 5250	50.7 50.5 50.4 50.3 50.2 50.1 49.9 49.8 49.6 49.5 49.5 49.5 49.5 49.5 48.4 48.5 48.4 48.5 48.4 48.3 48.2 48.1 48.3 48.2 48.1 48.3 48.2 48.1 48.3 48.2 48.1 48.3 48.2 48.1 48.3 48.2 48.1 48.3 48.2 48.1 48.3 48.2 48.1 48.3 48.2 48.1 48.2 48.1 48.2 48.1 48.2 48.2 48.1 48.2 48.2 48.2 48.2 48.2 48.2 48.2 48.2	16.46 16.50 16.56 16.62 16.72 16.81 16.93 17.05 17.18 17.32 17.46 17.32 17.46 17.59 17.46 17.59 17.46 17.59 18.05 18.29 18.34 18.29 18.34 18.39 18.56	3.111 3.211 3.221 3.221 3.42 3.53 3.65 3.77 3.89 4.01 4.14 4.27 4.40 4.54 4.54 4.54 5.07 5.14 5.20 5.27 5.34	eps           51.5           51.3           51.2           51.1           50.9           50.8           50.5           50.4           50.2           50.1           50.2           50.1           50.2           50.1           50.2           50.1           50.2           50.1           50.2           50.1           50.2           50.1           50.4           49.7           49.8           49.2           49.2           49.2           49.2           49.2           48.9           48.9           48.9           48.9           48.9           48.9           48.9           48.9           48.9           48.9           50.5           50.5           50.6           50.7           50.8           50.9           50.9           50.9           50.9     <	sigma 3.20 3.31 3.35 3.66 3.78 3.90 4.01 4.13 4.25 4.37 4.48 4.60 4.72 4.83 4.60 4.72 4.83 5.01 5.07 5.12 5.18 5.24 5.36 5.36	1.5         1.5           1.5         1.5           1.5         1.5           1.7         1.3           1.5         1.4           1.5         1.5           1.6         1.5           1.6         1.5           1.6         1.5           1.6         1.7           1.8         1.9           2.0         2.1           2.2         2.3           2.4         2.3           2.4         2.4	A-sigma -2.7 -3.1 -3.2 -3.6 -3.7 -3.5 -3.3 -3.1 -3.7 -3.5 -3.3 -3.1 -2.9 -2.5 -2.2 -2.5 -2.2 -1.8 -1.3 -1.0 -0.7 -0.1 0.3 0.3 0.3 0.6 0.8 0.8 1.0	Dev. Conductivity % Dev. Permittivity %	10.0 7.5 5.0 2.5 0.0 -2.5 -0.0 -2.5 -10.0 -7.5 -10.0 -7.5 -0.0 -7.5 -10.0 -2.5 -10.0 -2.5 -10.0 -2.5 -10.0 -2.5 -10.0 -2.5 -10.0 -2.5 -10.0 -2.5 -10.0 -2.5 -10.0 -7.5 -7.5 -10.0 -7.5 -7.5 -10.0 -7.5	00	3900	4400 Freque 4400 Freque	4900 ency MHz 4900 ency MHz	5400	5900
3400 3500 3600 3700 3900 3900 4000 4000 4400 4400 4400 4400 4400 4400 4400 4400 4500 4400 5000 5000 5150 5250 5350 5350	50.7 50.5 50.4 50.2 50.2 50.1 49.9 49.6 49.6 49.5 49.3 49.2 49.0 48.8 48.4 48.5 48.4 48.5 48.4 48.3 48.2 48.4 48.3 48.2 47.9 47.9 47.6	16.46 16.50 16.56 16.72 16.72 16.71 16.81 16.93 17.05 17.18 17.32 17.46 17.59 17.46 17.59 17.46 17.59 18.05 18.11 18.17 18.23 18.29 18.34 18.29 18.34 18.50 18.56 18.56	3.111 3.21 3.221 3.22 3.42 3.53 3.65 3.65 3.69 4.01 4.14 4.27 4.40 4.54 4.67 4.94 5.07 5.14 5.20 5.21 5.40 5.47 5.54	eps           51.5           51.3           51.2           51.1           50.9           50.6           50.5           50.4           50.2           50.1           50.04           49.6           49.7           49.8           49.4           49.4           49.2           49.2           49.2           48.9           48.9           48.9           48.9           48.9           48.9           48.9           48.9           48.9           48.9           48.9           48.9           48.9           48.9           48.9           48.8	sigma 3.20 3.31 3.43 3.65 3.66 3.90 4.01 4.13 4.25 4.48 4.60 4.72 4.48 4.60 4.72 4.48 4.95 5.01 5.01 5.01 5.02 5.12 5.12 5.12 5.12 5.12 5.12 5.12 5.1	1.5         1.5           1.5         1.5           1.5         1.5           1.7         1.3           1.5         1.4           1.5         1.5           1.6         1.5           1.6         1.5           1.6         1.7           1.8         1.9           2.0         2.1           2.2         2.3           2.4         2.3           2.4         2.5	A-sigma 2.7 -3.1 -3.2 -3.6 -3.3 -3.1 -3.3 -3.3 -3.3 -3.3 -3.3 -2.5 -2.2 -2.5 -2.2 -2.5 -2.2 -2.5 -2.2 -1.8 -1.3 -1.0 -0.7 -0.4 -0.1 0.3 0.3 0.3 0.3 0.6 0.8 1.2 -0.8 1.2 -0.1 -0.1 -0.1 -0.1 -0.2 -0.1 -0.2 -0.1 -0.2 -0.1 -0.2 -0.1 -0.2 -0.1 -0.2 -0.1 -0.2 -0.1 -0.2 -0.1 -0.2 -0.1 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2	Dev. Conductivity % Dev. Permittivity %	10.0 7.5 5.0 2.5 -5.0 -7.5 -10.0 10.0 7.5 -7.5 -5.0 -7.5 -5.0 -2.5 -7.5 -5.0 -2.5 -3.40 -2.5 -5.0 -2.5 -5.0 -7.5 -2.5 -7.5 -2.5 -7.5 -2.5 -7.5 -2.5 -7.5 -2.5 -2.5 -2.5 -2.5 -2.5 -2.5 -2.5 -2.5 -7.5 -2.5 -2.5 -2.5 -2.5 -2.5 -2.5 -2.5 -7.5 -2	00	3900	4400 Frequ 4400 Frequ	4900 ancy MHz 4900 ency MHz	5400	5900
3400 3500 3600 3700 3900 4000 4000 4200 4300 4400 4400 4400 4400 4400 4400 4400 4850 4850 4850 4850 5050 5150 5150 5220 5350 5350 5400 5450	50.7 50.5 50.4 50.3 50.2 50.1 49.9 49.8 49.6 49.5 49.3 49.2 49.3 49.2 49.4 49.5 48.8 48.6 48.5 48.4 48.3 48.2 48.4 48.3 48.2 48.4 48.4 48.4 48.4 48.4 48.4 47.9 47.9 47.6 47.6 47.6 47.4	16.46 16.50 16.56 16.62 16.62 16.81 16.93 17.05 17.18 17.32 17.46 17.73 17.86 17.73 17.86 17.73 17.86 18.05 18.34 18.39 18.56 18.50 18.56 18.56 18.59 18.56 18.59 18	3,111 3,21 3,32 3,42 3,53 3,65 3,77 3,89 4,01 4,14 4,54 4,67 4,40 4,54 4,67 4,80 4,80 4,87 4,80 5,07 5,14 5,20 5,27 5,34 5,40 5,47 5,54 5,67 5,54 5,67 5,77 5,67 5,777 5,77	eps           51.5           51.3           51.2           51.1           50.9           50.6           50.5           50.4           50.2           50.1           50.2           50.4           50.2           50.4           50.5           50.4           50.5           49.7           49.8           49.4           49.2           49.2           49.2           49.3           48.9           48.9           48.9           48.8           48.7           48.8           48.7           48.8           48.7	sigma 3.20 3.31 3.43 3.65 3.66 3.90 4.01 4.13 4.25 5.07 5.12 5.18 5.24 5.36 5.36 5.42 5.42 5.42 5.47 5.52		A-sigma -2.7 -3.1 -3.2 -3.6 -3.7 -3.5 -3.3 -3.1 -2.9 -2.5 -2.2 -1.8 -1.0 -0.7 -0.4 -0.2 -0.1 0.1 0.1 0.1 0.3 0.8 0.8 1.0 -0.8 1.2 -1.2 -1.2 -1.2 -1.2 -1.2 -1.2 -1.2	Dev. Conductivity % Dev. Permittivity %	10.0 7.5 5.0 2.5 -5.0 -7.5 -10.0 10.0 7.5 -7.5 -0.0 -7.5 -0.0 -2.5 -0.0 -7.5 -0.0 -2.5 -0.0 -7.5 -0.0 -7.5 -2.5 -7.5 -2.5 -7.5 -2.5 -7.5 -2.5 -2.5 -7.5 -2.5 -2.5 -2.5 -2.5 -2.5 -7.5 -2.	20	3900	4400 Frequ 4400 Frequ	4900 ency MHz 4900 ency MHz	5400	5900
3400 3500 3600 3700 3900 4000 4000 4200 4300 4400 4400 4400 4400 4400 4400 4400 4500 4400 4500 4850 4950 5050 5150 5350	50.7 50.5 50.4 50.2 50.2 50.1 49.9 49.6 49.5 49.5 49.5 49.3 49.2 49.4 48.6 48.5 48.5 48.2 48.2 48.2 47.9 47.9 47.6 47.5 47.4 47.3	16.46 16.50 16.56 16.62 16.62 16.81 16.93 17.05 17.18 17.32 17.46 17.73 17.86 17.73 17.86 18.50 18.50 18.54 18.50 18.56 18.57 18.56 18.56 18.57 18.56 18.56 18.56 18.57 18.56 18.56 18.56 18.57 18.56 18.56 18.57 18.56 18.56 18.56 18.57 18.56 18.57 18.56 18.56 18.56 18.56 18.57 18.57 18.56 18.56 18.56 18.57 18.57 18.57 18.57 18.57 18.57 18.57 18.57 18.57 18.57 18.57 18.57 18.57 18.77 17	3,111 3,21 3,32 3,42 3,53 3,65 3,77 3,89 4,01 4,12 4,40 4,54 4,67 4,40 4,54 4,67 4,80 4,87 4,80 5,07 5,14 5,20 5,27 5,34 5,40 5,40 5,47 5,54 5,68 5,74	eps           51.5           51.3           51.2           51.1           50.9           50.6           50.5           50.4           50.2           50.1           50.2           50.4           50.2           50.4           50.2           50.4           50.2           49.7           49.8           49.2           49.2           49.2           49.2           49.3           48.8           48.7           48.8           48.7           48.6	sigma 3.20 3.21 3.43 3.55 3.66 3.90 4.01 4.13 4.25 4.37 4.48 4.43 4.43 4.43 4.43 4.43 4.43 4.43	15           15           15           15           15           15           15           15           15           14           13           15           14           15           15           14           15           15           14           15           15           15           14           15           15           14           15           15           16           17           18           221           223           24           23           24           25           25           25           26           26           27	A-sigma -2.7 -3.1 -3.2 -3.5 -3.5 -3.3 -3.7 -3.5 -3.3 -3.1 -2.9 -2.2 -1.3 -1.0 -2.5 -2.2 -1.3 -1.0 -0.7 -0.4 -0.7 -0.4 -0.7 -0.4 -0.7 -0.5 -0.3 -0.3 -0.3 -0.3 -0.3 -0.3 -0.3 -0.5 -0.3 -0.5 -0.5 -0.5 -0.5 -0.5 -0.5 -0.5 -0.5	Dev. Conductivity %. Dev. Permittivity %	10.0 2.5 5.0 -2.5 -5.0 -2.5 -10.0 -2.5 -5.0 -2.5 -2	20	3900	4400 Frequ	4900 ancy MHz 4900 ency MHz	5400	5900
3400 3500 3800 3800 3900 4000 4100 4000 4200 4200 4400 4500 4800 4800 4800 4800 4800 5000 5100 5150 5150 5250 5350 5400 5550	50.7 50.5 50.4 50.2 50.1 49.9 49.8 49.6 49.5 49.0 48.8 48.6 48.5 48.0 48.2 48.2 48.2 48.2 48.2 48.2 47.9 47.9 47.8 47.5 47.4 47.5 47.4 47.3	16.46 16.50 16.56 16.52 16.83 16.72 16.81 17.05 17.18 17.32 17.46 17.59 17.73 17.86 17.59 18.05 18.17 18.23 18.29 18.39 18.39 18.39 18.56 18.67 18.67 18.67 18.67 18.67 18.67 18.67 18.67 18.67 18.67 18.67 18.67 18.67 18.67 18.69 18.59 18.77 19	3,111 3,21 3,32 3,42 3,53 3,53 3,53 3,55 3,57 3,89 4,14 4,27 4,40 4,54 4,54 4,54 4,54 4,54 5,00 5,07 5,14 5,20 5,27 5,34 5,61 5,65 5,66 5,67 5,54 5,61 5,66 5,77 5,74 5,61 5,74 5,61 5,74	eps           51.5           51.2           51.7           50.9           50.8           50.6           50.5           50.4           50.2           50.1           50.2           50.1           50.2           50.1           50.2           50.1           50.2           50.1           49.6           49.7           49.8           49.4           49.2           49.1           48.9           48.8           48.7           48.8           48.7           48.8           48.7           48.6           48.7           48.8           48.7           48.6           48.5	signa 3.20 3.21 3.43 3.55 3.66 3.90 4.01 4.13 4.25 4.37 4.48 4.43 4.43 4.43 4.43 4.43 4.40 4.72 4.83 4.60 4.72 4.83 5.51 5.52 5.30 5.32 5.32 5.42 5.42 5.42 5.42 5.42 5.42 5.42 5.4	args           115           115           115           115           114           113           114           113           114           115           114           115           114           115           114           115           114           115           114           115           114           115           114           115           114           115           114           115           114           115           114           115           114           115           114           115           114           115           114           115           114           114           115           114           114           115           114           114           115           114	A-sigma 2-7 3.1 3.2 3.6 3.7 3.5 3.3 3.1 2.9 -2.5 -2.2 -1.3 -1.0 -0.4 -0.2 -0.1 0.1 0.3 0.3 0.6 0.6 0.6 0.6 0.6 1.0 1.2 1.2 1.6 1.6 1.6 1.8	Dev. Conductivity %. Dev. Permittivity %	10.0 2.5 -2.5 -5.0 -2.5 -5.0 -2.5 -10.0 -2.5 -10.0 -2.5 -10.0 -2.5 -5.0 -2.5 -5.0 -2.5 -5.0 -2.5 -5.0 -340 -2.5 -5.0 -7.5 -5.0 -7.5 -5.0 -7.5 -5.0 -7.5 -5.0 -7.5 -5.0 -7.5 -5.0 -7.5 -5.0 -7.5 -5.0 -7.5	00	3900	4400 Frequ 4400 Frequ	4900 All MHz 4900 All MHz	5400	5900
3400 3500 3600 3700 3800 3900 4000 4000 4000 4200 4200 4200 4200 4200 4300 4200 4500 4500 4500 5000 5150 5250 5450 5450 5450 5450	50.7 50.5 50.4 50.2 50.1 49.9 49.8 49.6 49.5 49.4 49.4 49.4 49.4 49.4 49.5 48.8 48.6 48.5 48.4 48.6 48.5 48.4 48.6 48.5 48.4 48.6 48.5 48.4 48.6 48.5 48.4 47.9 47.9 47.8 47.5 47.4 47.2 47.4 47.2 47.4 47.2 47.4 47.2 47.4 47.2 47.4 47.2 47.4 47.2 47.4 47.2 47.4 47.5 47.4 47.4 47.5 47.4 47.5 47.4 47.5 47.4 47.5 47.4 47.5 47.4 47.5 47.4 47.5 47.4 47.5 47.4 47.5 47.4 47.5 47.4 47.5 47.4 47.5 47.4 47.5 47.4 47.5 47.4 47.5 47.5 47.4 47.5	16.46 16.50 16.56 16.52 16.81 16.93 17.05 17.18 17.35 17.46 17.59 17.76 17.79 18.05 18.17 18.29 18.39 18.39 18.39 18.56 18.61 18.67 18.61 18.67 18.77 18.83 18.84 18.85 18	3,111 3,21 3,32 3,42 3,53 3,53 3,53 3,55 3,55 3,57 4,14 4,27 4,40 4,54 4,54 4,54 4,54 4,54 5,20 5,27 5,34 5,66 5,67 5,54 5,66 5,67 5,54 5,66 5,77 5,74 5,66 5,77 5,54 5,66 5,77 5,74 5,66 5,77 5,74 5,66 5,77 5,74 5,66 5,77 5,74 5,66 5,77 5,74 5,66 5,77 5,74 5,66 5,77 5,74 5,66 5,77 5,74 5,66 5,77 5,74 5,66 5,77 5,74 5,74 5,76 5,77 5,74 5,76 5,77 5,74 5,76 5,77 5,74 5,76 5,77 5,74 5,76 5,77 5,74 5,76 5,77 5,74 5,76 5,77 5,74 5,76 5,77 5,74 5,76 5,77 5,74 5,77 5,74 5,77 5,74 5,77 5,74 5,77 5,74 5,77 5,74 5,77 5,74 5,77 5,74 5,77 5,74 5,77 5,74 5,77 5,74 5,77 5,74 5,77 5,74 5,77 5,74 5,77 5,74 5,77 5,74 5,77 5,74 5,74 5,77 5,74 5,77 5,74	tpp           51.5           51.2           51.7           50.8           50.8           50.6           50.6           50.2           50.1           50.2           50.1           50.2           50.1           50.2           50.1           50.2           50.1           50.2           50.1           50.2           50.1           50.2           50.1           50.2           50.1           50.2           50.1           50.2           50.1           50.2           50.1           50.2           50.4           49.4           49.2           49.4           49.2           48.8           48.7           48.8           48.6           48.5           48.5           48.5	3,20 3,20 3,21 3,43 3,56 3,66 3,78 3,90 4,13 4,25 4,37 4,48 4,48 4,48 4,48 4,48 4,48 4,48 4,48 4,95 5,07 5,12 5,12 5,12 5,12 5,54 5,52 5	1-15           1-15           1-15           1-15           1-15           1-15           1-15           1-15           1-15           1-15           1-15           1-15           1-15           1-15           1-15           1-16           1-15           1-16           1-15           1-16           1-15           1-16           1-16           1-17           1-18           1-19           2-1           2-1           2-1           2-2           2-3           2-24           2-23           2-24           2-25           2-26           2-27           2-28           2-28           2-28           2-28           2-28           2-28           2-28           2-28	A-tegma -2.7 -3.1 -3.2 -3.5 -3.5 -3.3 -3.5 -3.3 -3.5 -3.3 -3.1 -2.9 -2.5 -2.2 -2.5 -2.2 -1.8 -1.3 -1.0 -0.7 -0.4 -0.1 0.3 0.3 0.6 0.8 1.0 -0.3 0.3 0.6 0.8 1.0 -1.2 1.4 -1.6 1.6 -1.6 -1.6 -1.6 -1.6 -1.6 -1.6	Dev. Conductivity % Dev. Permittivity %	10.0 7.5 5.0 -2.5 -2.5 -3.0 -2.5 -10.0 -2.5 -10.0 -2.5 -10.0 -2.5 -10.0 -2.5 -3.0 -2.5 -10.0 -2.5 -3.0 -2.5 -3.0 -2.5 -3.0 -2.5 -3.0 -2.5 -3.0 -2.5 -3.0 -2.5 -3.0 -2.5 -3.0 -2.5 -3.0 -2.5 -3.0 -2.5 -3.0 -3.0 -2.5 -3.0 -3.	00	3900	4400 Freque	4000 MHz 4000 Altra	5400	5900
3400 3500 3700 3800 3900 4000 4100 4200 4400 4400 4400 4400 44	50.7 50.5 50.4 50.2 50.1 49.9 49.6 49.6 49.5 49.4 49.6 49.5 49.2 49.2 49.2 49.2 49.2 49.2 48.8 48.6 48.5 48.4 48.5 48.4 48.5 48.4 48.5 48.4 47.9 47.9 47.5 47.4 47.2 47.1 47.2 47.1 47.2 47.1 47.2	16.46 16.50 16.52 16.72 16.81 16.72 16.81 17.05 17.18 17.32 17.46 17.32 17.46 17.99 17.73 17.73 17.86 17.99 18.05 18.11 18.17 18.23 18.34 18.34 18.35 18.55 18.65 18.65 18.65 18.67 18.72 18.72 18.73 18.88 18.88 18.92 18.88 18.92 18.88 18.92 18.88 18.92 18.88 18.92 18.88 18.92 18	3,111 3,21 3,32 3,42 3,42 3,42 3,53 3,65 3,77 3,80 4,14 4,40 4,40 4,40 4,40 4,40 4,40 4,40 4,40 4,40 4,40 4,40 4,40 4,40 5,07 5,14 5,27 5,54	teps           51.5           51.3           51.5           50.9           50.8           50.6           50.6           50.6           50.7           50.8           50.6           50.6           50.6           50.7           49.6           49.7           49.5           49.4           49.2           49.2           49.2           48.9           48.9           48.9           48.8           48.7           48.7           48.7           48.7           48.7           48.7           48.7           48.7           48.7           48.5           48.5           48.5           48.5           48.5	3,200 3,201 3,231 3,453 3,566 3,768 3,566 3,788 3,900 4,011 4,133 4,255 4,377 4,488 4,488 4,489 4,955 5,077 5,122 5,188 5,507 5,528 5,656 5,771 5,878 5,	1-15           1-15	A-sigma -2.7 -3.1 -3.2 -3.5 -3.3 -3.5 -3.3 -3.7 -3.5 -3.3 -3.7 -3.5 -3.3 -3.7 -3.5 -3.3 -3.7 -2.5 -2.2 -1.8 -1.3 -1.0 -0.7 -0.4 -0.7 -0.4 -0.7 -0.4 -0.7 -0.4 -0.7 -0.4 -0.7 -0.5 -0.3 -0.5 -0.3 -0.5 -0.3 -0.5 -0.5 -0.5 -0.5 -0.5 -0.5 -0.5 -0.5	Dev. Conductivity % Dev. Permitikny %	10.0 7.5 5.0 -2.5 -2.5 -3.0 -2.5 -3.0 -2.5 -3.0 -2.5 -3.0 -2.5 -3.0 -2.5 -3.0 -2.5 -3.0 -2.5 -3.0 -2.5 -3.0 -2.5 -3.0 -2.5 -3.0 -2.5 -3.0 -2.5 -3.0 -2.5 -3.0 -2.5 -3.0 -3.0 -2.5 -3.0 -3.0 -2.5 -3.0 -3.0 -2.5 -3.0 -3.0 -2.5 -3.0 -3.0 -2.5 -3.0 -3.0 -2.5 -3.0 -3.0 -2.5 -3.0 -3.0 -2.5 -3.0 -3.0 -3.5 -3.0 -3.5 -3.0 -3.5 -3.0 -3.5 	00	3900	4400 Frequ 4400 Frequ	4900 Algono MHz 4900 Algono MHz	5400	5900
3400 3500 3600 3700 3800 3900 4000 4100 4200 4400 4400 4400 4400 4400 4400 4400 4400 4400 4400 4400 5000 5150 5100 5150 5300 5400 5450 5400 5450 5550 5650 5700 5650 5700	50.7           50.5           50.4           50.3           50.2           50.4           49.9           49.8           49.6           49.2           49.3           49.4           48.5           48.8           48.8           48.8           48.8           48.8           48.8           48.8           47.9           47.7           47.8           47.7           47.5           47.4           47.2           47.1           47.1           47.1           47.1           47.1           47.1	16.46 16.50 16.52 16.72 16.81 17.05 17.18 17.05 17.18 17.32 17.74 17.73 17.74 17.74 17.74 17.74 17.74 17.74 17.74 17.74 17.74 17.74 17.74 17.74 18.17 18.23 18.29 18.45 18.54 19.54 19.55 19	3,111 3,21 3,32 3,42 3,42 3,42 3,53 3,65 3,77 3,80 4,14 4,40 4,40 4,40 4,40 4,40 4,40 4,40 4,40 4,40 4,40 4,40 4,40 5,07 5,14 5,27 5,54 5,40 5,40 5,40 5,41 5,88 5,56 6,02 6,09	teps           51.5           51.3           51.5           50.9           50.8           50.6           50.5           50.4           50.2           50.3           50.4           50.5           50.4           50.5           50.4           50.5           50.4           49.5           49.4           49.3           49.4           49.2           49.1           48.9           48.9           48.9           48.9           48.7           48.7           48.8           48.7           48.8           48.4           48.3           48.4           48.3           48.4           48.3           48.4           48.3	3.20 3.20 3.21 3.43 3.55 3.66 3.78 3.90 4.01 4.13 4.25 4.48 4.60 4.07 4.48 4.83 4.95 5.07 5.18 5.24 5.30 5.59 5.59 5.59 5.59 5.57 5.57 5.58 5.57 5.58 5.59 5.67 5.77 5.82 5.67 5.82 5.67 5.88 5.67 5.88 5.67 5.78 5.67 5.88 5.67 5.78 5.67 5.78 5.67 5.78 5.67 5.78 5.69 4.67 5.94 5.97 5.97 5.97 5.97 5.97 5.98 5.94 5.94 5.94 5.97 5.97 5.98 5.94 5.94 5.94 5.94 5.97 5.97 5.98 5.94 5.94 5.94 5.94 5.97 5.97 5.98 5.94 5.94 5.94 5.94 5.97 5.97 5.98 5.94	1-15           2-1           2-2           2-3           2-23           2-23           2-23           2-24           2-25           2-26           2-27           2-28           2-27           2-28           2-28 <td>A-sigma 2-7 -3.1 -3.2 -3.5 -3.5 -3.3 -3.7 -3.5 -3.3 -3.1 -2.9 -2.2 -1.3 -1.0 -2.2 -1.3 -1.0 -0.7 -0.4 -0.7 -0.4 -0.7 -0.4 -0.7 -0.4 -0.7 -0.5 -0.3 -0.3 -0.3 -0.3 -0.3 -0.3 -0.3 -0.5 -0.3 -0.5 -0.5 -0.5 -0.5 -0.5 -0.5 -0.5 -0.5</td> <td>Dev. Conductivity % Dev. Permittivity %</td> <td>10.0 7.5 5.0 -2.5 -2.5 -10.0 -2.5 -10.0 -2.5 -10.0 -2.5 -10.0 -2.5 -10.0 -2.5 -10.0 -2.5 -2.5 -2.5 -2.5 -2.5 -2.5 -2.5 -2.5 -10.0 -2.5 -2.5 -10.0 -2.5 -2.5 -10.0 -2.5 -2.5 -10.0 -2.5</td> <td>00</td> <td>3900</td> <td>4400 Frequi</td> <td>4900 4800 4800 4800 MHz</td> <td>5400</td> <td>5900</td>	A-sigma 2-7 -3.1 -3.2 -3.5 -3.5 -3.3 -3.7 -3.5 -3.3 -3.1 -2.9 -2.2 -1.3 -1.0 -2.2 -1.3 -1.0 -0.7 -0.4 -0.7 -0.4 -0.7 -0.4 -0.7 -0.4 -0.7 -0.5 -0.3 -0.3 -0.3 -0.3 -0.3 -0.3 -0.3 -0.5 -0.3 -0.5 -0.5 -0.5 -0.5 -0.5 -0.5 -0.5 -0.5	Dev. Conductivity % Dev. Permittivity %	10.0 7.5 5.0 -2.5 -2.5 -10.0 -2.5 -10.0 -2.5 -10.0 -2.5 -10.0 -2.5 -10.0 -2.5 -10.0 -2.5 -2.5 -2.5 -2.5 -2.5 -2.5 -2.5 -2.5 -10.0 -2.5 -2.5 -10.0 -2.5 -2.5 -10.0 -2.5 -2.5 -10.0 -2.5	00	3900	4400 Frequi	4900 4800 4800 4800 MHz	5400	5900
3400 3500 3700 3800 3900 4000 4100 4200 4400 4400 4400 4400 44	50.7           50.5           50.4           50.2           50.1           50.2           50.1           49.9           49.8           49.6           49.3           49.4           49.5           449.5           48.8           48.8           48.8           48.8           48.8           48.8           48.8           48.8           47.9           47.9           47.8           47.7           47.6           47.7           47.6           47.7           47.7           47.7           47.8           47.1           47.1           47.1           47.1           47.1           47.1           47.9           46.9           46.9           47.9           46.9           47.1           47.1           47.1	16.46 16.50 16.56 16.62 16.72 16.81 17.02 17.18 17.32 17.46 17.32 17.46 17.32 17.46 17.73 17.88 18.05 18.11 18.29 18.39 18.56 18.56 18.51 18.59 18.59 18.54 18.59 18.54 18.59 18.54 18.59 18.54 18.59 18.54 18.59 18.54 18.59 18.54 18.59 18.54 18.59 18.55 18	3,111 3,21 3,32 3,32 3,42 3,53 3,45 3,45 3,45 3,45 3,45 3,45 3,45 3,45 4,41 4,57 4,40 4,57 4,40 4,57 4,40 5,07 5,14 5,20 5,27 5,540 5,27 5,540 5,27 5,540 5,27 5,540 5,27 5,540 5,27 5,540 5,27 5,540 5,27 5,540 5,27 5,540 5,27 5,540 5,27 5,540 5,27 5,540 5,277 5,540 5,277 5,540 5,277 5,540 5,477 5,540 5,507 5,540 5,	teps           51.5           51.3           51.5           50.4           50.5           50.4           50.5           50.4           50.5           50.4           50.5           50.4           50.5           50.4           50.5           50.4           49.4           49.5           49.4           49.4           49.2           49.4           48.9           48.9           48.8           48.7           48.6           48.5           48.4           48.3           48.4           48.3           48.4           48.3           48.3           48.4           48.3           48.3           48.4           48.3           48.3           48.3           48.4           48.3           48.3	3.20 3.21 3.23 3.55 3.66 3.78 3.90 4.13 4.25 4.48 4.80 4.95 5.12 5.18 5.24 4.83 5.07 5.12 5.18 5.24 5.30 5.42 5.42 5.42 5.47 5.59 5.59 5.59 5.59 5.59 5.59 5.59 5.67 5.77 5.82 5.82 5.84 5.94	1-15           -1-5           -1-5           -1-5           -1-7           -1-5           -1-6           -1-7           -1-8           -1-7           -1-8           -2-1           -2-2           -2-3           -2-4           -2-5           -2-6           -2-7           -2-8	A-sigma -2.7 -3.1 -3.2 -3.6 -3.7 -3.5 -3.3 -3.7 -3.5 -3.3 -3.1 -2.9 -2.2 -1.8 -1.3 -1.0 -0.4 -0.2 -0.1 -0.4 -0.2 -0.1 0.3 0.3 0.6 0.8 0.8 0.6 0.8 0.8 1.0 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1.2	Dev. Conductivity % Dev. Permittivity %	10.0 7.5 5.0 -2.5 -2.5 -10.0 -2.5 -10.0 -2.5 -10.0 -2.5 -7.5 -10.0 -2.5 -7.5 -10.0 -2.5 -7.5 -10.0 -2.5 -7	00	3900	4400 Frequ 4400 Frequ	4900 4900 4900 4900 4900	5400	5900

Figure D-9 5 GHz Body Tissue Equivalent Matter

	FCC ID: ZNFL423DL	CAPCTEST	SAR EVALUATION REPORT		Approved by:		
					Quality Manager		
	Test Dates:	DUT Type:			APPENDIX D:		
	12/03/18 - 12/26/18	Portable Handset			Page 6 of 6		
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					12/05/2018		

# 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.

SAR						COND.	PERM.	C	W VALIDATION	1	MOD. VALIDATION		
SYSTEM #	FREQ. [MHz]	DATE	PROBE SN	PROBE C	AL. POINT	(σ)	(ɛr)	SENSITIVITY	PROBE LINEARITY	PROBE ISOTROPY	MOD. TYPE	DUTY FACTOR	PAR
М	750	11/2/2018	3287	750	Head	0.908	42.190	PASS	PASS	PASS	N/A	N/A	N/A
G	835	8/9/2018	7410	835	Head	0.889	40.915	PASS	PASS	PASS	GMSK	PASS	N/A
М	1750	11/5/2018	3287	1750	Head	1.342	39.217	PASS	PASS	PASS	N/A	N/A	N/A
М	1900	11/5/2018	3287	1900	Head	1.430	39.014	PASS	PASS	PASS	GMSK	PASS	N/A
Н	1900	7/16/2018	7409	1900	Head	1.425	40.935	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
1	2450	12/24/2018	7406	2450	Head	1.797	38.399	PASS	PASS	PASS	OFDM/TDD	PASS	PASS
н	5250	7/5/2018	7409	5250	Head	4.492	34.994	PASS	PASS	PASS	OFDM	N/A	PASS
н	5600	7/5/2018	7409	5600	Head	4.839	34.496	PASS	PASS	PASS	OFDM	N/A	PASS
н	5750	7/5/2018	7409	5750	Head	4.995	34.288	PASS	PASS	PASS	OFDM	N/A	PASS
1	750	7/19/2018	7406	750	Body	0.969	53.451	PASS	PASS	PASS	N/A	N/A	N/A
L	750	11/6/2018	7308	750	Body	0.962	53.923	PASS	PASS	PASS	N/A	N/A	N/A
1	835	8/8/2018	7406	835	Body	0.980	53.497	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
D	1750	8/15/2018	7357	1750	Body	1.475	51.784	PASS	PASS	PASS	N/A	N/A	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	51.130	PASS	PASS	PASS	OFDM/TDD	PASS	PASS
L	5250	10/29/2018	7308	5250	Body	5.511	48.770	PASS	PASS	PASS	OFDM	N/A	PASS
L	5600	10/29/2018	7308	5600	Body	5.994	48.200	PASS	PASS	PASS	OFDM	N/A	PASS
L	5750	10/29/2018	7308	5750	Body	6.219	47.960	PASS	PASS	PASS	OFDM	N/A	PASS

Table E-1 SAR System Validation Summary – 1g

Table E-2 SAR System Validation Summary – 10g

SAR						COND. PERM. CW VALIDATION				MOD. VALIDATION			
SYSTEM	FREQ. [MHz]	DATE	PROBE SN	PROBE C	AL. POINT	(7)	(cr)		PROBE	PROBE	MOD.		
#						(0)	(13)	SENSITIVIT	LINEARITY	ISOTROPY	TYPE	DUTTFACTOR	PAR
D	1750	8/15/2018	7357	1750	Body	1.475	51.784	PASS	PASS	PASS	N/A	N/A	N/A
E	1900	12/3/2018	3332	1900	Body	1.518	51.796	PASS	PASS	PASS	GMSK	PASS	N/A
L	5250	10/29/2018	7308	5250	Body	5.511	48.770	PASS	PASS	PASS	OFDM	N/A	PASS
L	5600	10/29/2018	7308	5600	Body	5.994	48.200	PASS	PASS	PASS	OFDM	N/A	PASS
L	5750	10/29/2018	7308	5750	Body	6.219	47.960	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.

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# **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.

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#### **Main Antenna Verification Summary** G.3

Machanism(s)	Mode/Band	Conducted Power (dBm)							
wiechanism(s)	WOUE/ Ballu	Un-triggered	Mechanism #1						
		(Max)	(Reduced)						
Grip	UMTS 1750	24.62	23.23						
Grip	UMTS 1900	24.28	23.04						
Grip	PCS CDMA	24.16	22.89						
Grip	LTE FDD Band 4	24.31	23.01						
Grip	LTE FDD Band 66	24.38	23.12						
Grip	LTE FDD Band 2	24.09	22.84						

Table G-1 Power Measurement Verification for Main Antenna

Table G-2 Distance Measurement Verification for Main Antenna

Mechanism(s)	Test Condition	Band	Distance Meas	urements (mm)	Minimum Distance per
	Test condition	Dallu	Moving Toward	Moving Away	Manufacturer (mm)
Grip	Body - Back Side	Mid	3	5	3
Grip	Body - Front Side	Mid	5	7	5
Grip	Body - Bottom Edge	Mid	5	7	5

\*Note: Mid band refers to: PCS CDMA (BC1), UMTS B2/4, LTE B2/4/66

# G.4 WIFI Verification Summary

Table G-3 **Power Measurement Verification WIFI** 

Machanism(s)	Mada (Band	Conducted Power (dBm)			
wechanism(s)	wode/Band	Un-triggered	Mechanism #1		
		(Max)	(Reduced)		
Held-to-Ear	802.11b	21.26	16.08		
Held-to-Ear	802.11g	20.87	16.24		
Held-to-Ear	802.11n (2.4GHz)	20.11	15.96		
Held-to-Ear	802.11a	18.97	12.29		
Held-to-Ear	802.11n (5GHz, 20MHz BW)	15.53	12.51		
Held-to-Ear	802.11ac (20MHz BW)	15.29	12.62		
Held-to-Ear	802.11n (5GHz, 40MHz BW)	14.48	12.28		
Held-to-Ear	802.11ac (40MHz BW)	14.73	11.23		

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# APPENDIX H: DOWNLINK LTE CA RF CONDUCTED POWERS

# 1.1 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 inactive 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

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# 1.2 Downlink Carrier Aggregation RF Conducted Powers

# 1.2.1 LTE Band 71 as PCC

	Maximum Output Powers														
	PCC SCC														
Combination         PCC Band         PCC (UL)         PCC (UL)									SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)	
CA_2A-71A	LTE B71	10	133297	680.5	QPSK	1	49	68761	634.5	LTE B2	20	900	1960	25.17	25.17
CA_4A-71A	LTE B71	10	133297	680.5	QPSK	1	49	68761	634.5	LTE B4	20	2175	2132.5	25.13	25.17
CA 664-71A	LTE B71	10	133297	680.5	OPSK	1	49	68761	634.5	I TE B66	20	66786	21/15	25.18	25.17

Tabla 1

# 1.2.2 LTE Band 12 as PCC

Table 2 Maximum Output Powers

					PCC						SCC			Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Channel	PCC (UL) Freq. [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_2A-12A	LTE B12	3	23165	714.5	QPSK	1	0	5165	744.5	LTE B2	20	900	1960	25.18	25.14
CA_4A-12A	LTE B12	3	23165	714.5	QPSK	1	0	5165	744.5	LTE B4	20	2175	2132.5	25.12	25.14
CA_12A-66A	LTE B12	3	23165	714.5	QPSK	1	0	5165	744.5	LTE B66	20	66786	2145	25.08	25.14

# 1.2.3 LTE Band 5 as PCC

Table 3Maximum Output Powers

					PCC			•			SCC			Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Channel	PCC (UL) Freq. [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_2A-5A	LTE B5	10	20525	836.5	QPSK	1	25	2525	881.5	LTE B2	20	900	1960	25.13	25.10
CA_4A-5A	LTE B5	10	20525	836.5	QPSK	1	25	2525	881.5	LTE B4	20	2175	2132.5	25.06	25.10

# 1.2.4 LTE Band 4 as PCC

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Table 4 **Maximum Output Powers** SCO LTE Single PCC (DL) SCC (DL) PCC (UL) PCC UL PCC (DL) SCC (DL) LTE Tx.Power with DL CA PCC BW PCC (UL) PCC UL# SCC BW Carrier Tx Combination PCC Band Modulatio Freq. [MHz] SCC Band Freq. [MHz] Enabled (dBm) [MHz] Freq. [MHz] RB Offset [MHz] Channel Ch. Ch. RB Power (dBm) CA 4A-4A LTE B4 20 20050 1720 QPSK 1 50 2050 2120 LTE B4 20 2300 2145 24.67 24.70 LTE B2 CA 2A-4A LTE B4 20 20050 1720 QPSK 1 50 2050 2120 20 900 1960 24.66 24.70 CA\_4A-5A LTE B4 20 1720 QPSK 50 2050 LTE B5 881.5 24.63 20050 2120 10 2525 1 24.70 CA\_4A-12A CA\_4A-71A LTE B4 LTE B4 20050 20050 1720 1720 QPSK QPSK 50 50 2050 2050 2120 2120 LTE B12 LTE B71 5095 68761 737.5 634.5 24.67 24.68 20 20 10 24.70 1 24.70 1 20

Table 5Reduced Output Powers

					PCC						SCC			Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Channel	PCC (UL) Freq. [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_4A-4A	LTE B4	20	20050	1720	QPSK	50	25	2050	2120	LTE B4	20	2300	2145	23.48	23.50
CA_2A-4A	LTE B4	20	20050	1720	QPSK	50	25	2050	2120	LTE B2	20	900	1960	23.42	23.50
CA_4A-5A	LTE B4	20	20050	1720	QPSK	50	25	2050	2120	LTE B5	10	2525	881.5	23.45	23.50
CA_4A-12A	LTE B4	20	20050	1720	QPSK	50	25	2050	2120	LTE B12	10	5095	737.5	23.46	23.50
CA_4A-71A	LTE B4	20	20050	1720	QPSK	50	25	2050	2120	LTE B71	20	68761	634.5	23.45	23.50

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# 1.2.5 LTE Band 66 as PCC

					PCC						SCC			Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Channel	PCC (UL) Freq. [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_66A-66A	LTE B66	20	132072	1720	QPSK	1	50	66536	2120	LTE B66	20	67236	2190	24.61	24.70
CA_66B	LTE B66	5	132647	1777.5	QPSK	1	0	67111	2177.5	LTE B66	15	67018	2168.2	24.67	24.70
CA_66C	LTE B66	20	132072	1720	QPSK	1	50	66536	2120	LTE B66	20	66734	2139.8	24.69	24.70
CA_2A-66A	LTE B66	20	132072	1720	QPSK	1	50	66536	2120	LTE B2	20	900	1960	24.69	24.70
CA_12A-66A	LTE B66	20	132072	1720	QPSK	1	50	66536	2120	LTE B12	10	5095	737.5	24.49	24.70
CA 66A-71A	LTE B66	20	132072	1720	OPSK	1	50	66536	2120	LTE B71	20	68761	634.5	24.60	24.70

Table 6 Maximum Output Powers

Table 7Reduced Output Powers

					PCC						SCC			Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Channel	PCC (UL) Freq. [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_66A-66A	LTE B66	20	132072	1720	QPSK	50	25	66536	2120	LTE B66	20	67236	2190	23.44	23.50
CA_66B	LTE B66	15	132047	1717.5	QPSK	1	36	66511	2117.5	LTE B66	5	66604	2126.8	23.49	23.50
CA_66C	LTE B66	20	132072	1720	QPSK	50	25	66536	2120	LTE B66	20	66734	2139.8	23.44	23.50
CA_2A-66A	LTE B66	20	132072	1720	QPSK	50	25	66536	2120	LTE B2	20	900	1960	23.38	23.50
CA_12A-66A	LTE B66	20	132072	1720	QPSK	50	25	66536	2120	LTE B12	10	5095	737.5	23.40	23.50
CA_66A-71A	LTE B66	20	132072	1720	QPSK	50	25	66536	2120	LTE B71	20	68761	634.5	23.47	23.50

# 1.2.6 LTE Band 2 as PCC

Table 8 Maximum Output Powers

					PCC						SCC			Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Channel	PCC (UL) Freq. [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_2A-2A	LTE B2	15	18900	1880	QPSK	1	0	900	1960	LTE B2	20	700	1940	24.38	24.35
CA_2A-4A	LTE B2	15	18900	1880	QPSK	1	0	900	1960	LTE B4	20	2175	2132.5	24.40	24.35
CA_2A-5A	LTE B2	15	18900	1880	QPSK	1	0	900	1960	LTE B5	10	2525	881.5	24.35	24.35
CA_2A-12A	LTE B2	15	18900	1880	QPSK	1	0	900	1960	LTE B12	10	5095	737.5	24.31	24.35
CA_2A-66A	LTE B2	15	18900	1880	QPSK	1	0	900	1960	LTE B66	20	66786	2145	24.30	24.35
CA_2A-71A	LTE B2	15	18900	1880	QPSK	1	0	900	1960	LTE B71	20	68761	634.5	24.28	24.35
CA_2C	LTE B2	15	18900	1880	QPSK	1	0	900	1960	LTE B2	20	729	1942.9	24.39	24.35

Table 9 Reduced Output Powers

					PCC						SCC			Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Channel	PCC (UL) Freq. [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	PCC (DL) Ch.	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Ch.	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_2A-2A	LTE B2	20	18900	1880	QPSK	50	0	900	1960	LTE B2	20	700	1940	23.10	23.20
CA_2A-4A	LTE B2	20	18900	1880	QPSK	50	0	900	1960	LTE B4	20	2175	2132.5	23.13	23.20
CA_2A-5A	LTE B2	20	18900	1880	QPSK	50	0	900	1960	LTE B5	10	2525	881.5	23.20	23.20
CA_2A-12A	LTE B2	20	18900	1880	QPSK	50	0	900	1960	LTE B12	10	5095	737.5	23.09	23.20
CA_2A-66A	LTE B2	20	18900	1880	QPSK	50	0	900	1960	LTE B66	20	66786	2145	23.18	23.20
CA_2A-71A	LTE B2	20	18900	1880	QPSK	50	0	900	1960	LTE B71	20	68761	634.5	23.13	23.20
CA 2C	LTE B2	20	18900	1880	QPSK	50	0	900	1960	LTE B2	20	702	1940.2	23.18	23.20

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