



Original Test Report S/N **45461435 R2.0**

Test Report Date: **18 July 2018**

Project Number: **1404**

SAR Test Report Addendum

Applicant:



Garmin International Inc.
1200 East 151 St.
Olathe, KS, 66062
USA

FCC ID:

IPH-03298

Product Model Number / HVIN

A03298

ISED Registration Number

1792A-03298

Product Name / PMN

A03298

In Accordance With:

FCC 47 CFR §2.1093

Radiofrequency Radiation Exposure Evaluation: Portable Devices

IC RSS-102 Issue 5

Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)



Test Lab Certificate: 2470.01



**Industry
Canada**

IC Registration 3874A-1



FCC Registration: 714830

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1.0 SCOPE OF EVALUATION

It is understood that the test procedures on April 10 2018; report reference 45461435 R1.0, varied from the procedure stated in IEEE 1528 2013 6.6.1.2.

In order to revalidate the reported results from April 10th 2018, the A03298 was retested to the worst case with an active TSL of the same temperature. The results were then compared to the previous worst case test previously reported.

Although the previous fluid dielectric procedure was not done in accordance to IEEE 1528 2018 6.6.1.2; it is demonstrated, that the results from the July 18 2018 retest are comparable.

Reference section 3.0 for details.

**This is an addendum to Test Report S/N 45461435 R2.0.
Not intended to be a standalone report.**

2.0 DETAILS OF SAR EVALUATION

2.0 Day Log

DAY LOG					Fluid Dielectric	SPC	Test
Date	Ambient Temp °C	Fluid Temp °C	Humidity	TSL			
18 July 2018	25	22.6	25%	2450B	X	X	
18 July 2018	25	23.1	25%	2450B			X

3.0 SAR MEASUREMENT SUMMARY

Table 3.0: Measured Results

Measured SAR Results (1g) - BODY(FCC/ISED)														
Date	Plot ID #	DUT Model	Test Type	Test Freq.	Modulation	Accessories				DUT Spacing		Meas. Cond. Power	Measured SAR	
				(MHz)		Antenna ID	Battery ID	Body ID	Audio ID	DUT (mm)	Antenna (mm)		1g	
						(dBm)	(W/kg)							
BODY SAR														
18 July 2018	B9-2	A03298	Body/Touch - Left	2457	DSSS-1Mbps	Default	P3 - NiMH Pack	B2	n/a	0	0	13.51	0.914	
SAR Limit							Spatial Peak					RF Exposure Category		
FCC 47 CFR 2.1093				Health Canada Safety Code 6			Body		1g Average		1.6 W/kg		General Population	

Table 3.1: Reported Results

Measured SAR Results (1g) - BODY(FCC/ISED)														
Date	Plot ID #	DUT Model	Test Type	Test Freq.	Modulation	Accessories				DUT Spacing		Meas. Cond. Power	Measured SAR	
				(MHz)		Antenna ID	Battery ID	Body ID	Audio ID	DUT (mm)	Antenna (mm)		(dBm)	1g
			(W/kg)											
BODY SAR														
09 Apr 2018	B1*	A03298	Body/Touch - Back	2417	DSSS-1Mbps	Default	P1 - Lithium	n/a	n/a	0	0	14.45	0.199	
09 Apr 2018	B2	A03298	Body/Touch - Back	2417	DSSS-1Mbps	Default	P1 - Lithium	B1	n/a	0	35	14.45	0.047	
09 Apr 2018	B3	A03298	Body/Touch - Back	2417	DSSS-1Mbps	Default	P1 - Lithium	B2	n/a	0	20	14.45	0.044	
09 Apr 2018	B4	A03298	Body/Touch - Front	2417	DSSS-1Mbps	Default	P1 - Lithium	B2	n/a	0	0	14.45	0.219	
09 Apr 2018	B5	A03298	Body/Touch - Left	2417	DSSS-1Mbps	Default	P1 - Lithium	B2	n/a	0	0	14.45	0.730	
09 Apr 2018	B6	A03298	Body/Touch - Left	2437	DSSS-1Mbps	Default	P1 - Lithium	B2	n/a	0	0	13.41	0.738	
09 Apr 2018	B7*	A03298	Body/Touch - Left	2457	DSSS-1Mbps	Default	P1 - Lithium	B2	n/a	0	0	13.59	0.793	
10 Apr 2018	B8	A03298	Body/Touch - Left	2457	DSSS-1Mbps	Default	P2 - NiMH	B2	n/a	0	0	13.50	0.817	
10 Apr 2018	B9	A03298	Body/Touch - Left	2457	DSSS-1Mbps	Default	P3 - NiMH Pack	B2	n/a	0	0	13.51	0.948	
10 Apr 2018	B10	A03298	Body/Touch - Left	2457	DSSS-1Mbps	Default	P4 - Alkaline	B2	n/a	0	0	13.44	0.773	
SAR Limit						Spatial Peak				RF Exposure Category				
FCC 47 CFR 2.1093				Health Canada Safety Code 6			Body		1g Average		2.0 W/kg		General Population	

*Per KDB 248227 When reported SAR is ≤ 0.8 W/kg, no further SAR testing is required for 802.11b DSS in that exposure configuration.

*Per KDB 248227 When output power is reduced for channel 1 and 11 to meet restricted band requirements the highest output channels closest to each of these channels should be tested.

In accordance to IEEE 1528 2013 6.6.1.2.

The liquid parameters were measured within 24 hours before the start of a handset test series and not more than one week before any SAR measurement. Further to this the handset test series was completed in less than 48 hrs.

The A03298 was retested to the worst case with an active TSL of the same temperature. The measured result Table 3.0 was then compared to the previous worst case reported result in Table 3.1.

When compared, it was found the measured to reported SAR deviated by < 0.2dB and slightly less than originally reported. The measured SAR level did not exceed 0.948 W/kg using the active TSL.

I attest that the data reported herein is true and accurate within the tolerance of the Measurement Instrument Uncertainty; that all tests and measurements were performed in accordance with accepted practices or procedures; and that all tests and measurements were performed by me or by trained personnel under my direct supervision. The results of this investigation are based solely on the test sample(s) provided by the client which were not adjusted, modified or altered in any manner whatsoever, except as required to carry out specific tests or measurements. This test report has been completed in accordance with ISO/IEC 17025.



Trevor Whillock
Test Lab Engineer
Celltech Labs Inc.

18 July 2018

Date

4.0 MEASUREMENT PLOTS OF MAXIMUM MEASURED SAR

Plot B9-2

Date/Time: 7/18/2018 4:02:50 PM

Test Laboratory: Celltech Labs

Garmin-2450B July 18 2018-2

DUT: Garmin A03298; Type: Sample; Serial: IMEI Number

Communication System: UID 10012 - CAB, IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps); Communication System Band: WLAN 2.4GHz (2412.0 - 2484.0 MHz); Frequency: 2457 MHz; Communication System PAR: 1.87 dB; PMF: 1.04833

Medium: TSL_2450B[18JL18]

Medium parameters used (interpolated): $f = 2457$ MHz; $\sigma = 1.964$ S/m; $\epsilon_r = 52.04$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC/ANSI C63.19-2011)

DASY Configuration:

- Probe: EX3DV4 - SN3600; ConvF(6.54, 6.54, 6.54); Calibrated: 4/25/2018, ConvF(6.54, 6.54, 6.54); Calibrated: 4/25/2018, ConvF(6.54, 6.54, 6.54); Calibrated: 4/25/2018;
O Modulation Compensation: PMR for UID 10012 - CAB, Calibrated: 4/25/2018
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection), $z = -1.5, 31.0, 151.0$
- Electronics: DAE4 Sn353; Calibrated: 4/20/2018
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 Ax;
- DASY52 52.10.1(1476);

Frequency: 2457 MHz

2450B/B9-2 A03298, 2457MHz Body-Touch Left Side, WIFI, Bat P3 NiMH Pack 1.2V 2000mAH, Ant T1, Body Accessory B2 2 2/Area Scan (9x18x1): Measurement grid: dx=12mm, dy=12mm

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 1.15 W/kg

2450B/B9-2 A03298, 2457MHz Body-Touch Left Side, WIFI, Bat P3 NiMH Pack 1.2V 2000mAH, Ant T1, Body Accessory B2 2 2/Zoom Scan

(7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 3.699 V/m

Peak SAR (extrapolated) = 2.28 W/kg

SAR(1 g) = 0.914 W/kg; SAR(10 g) = 0.346 W/kg

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 1.07 W/kg

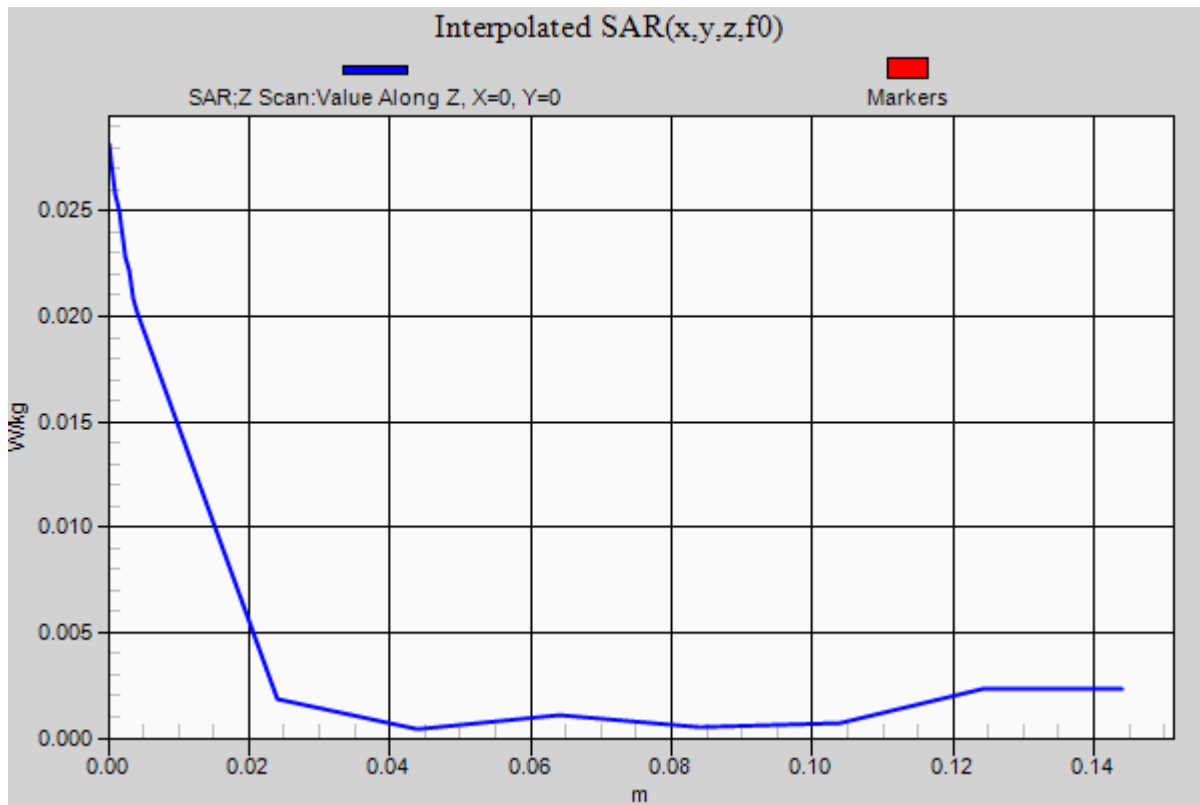
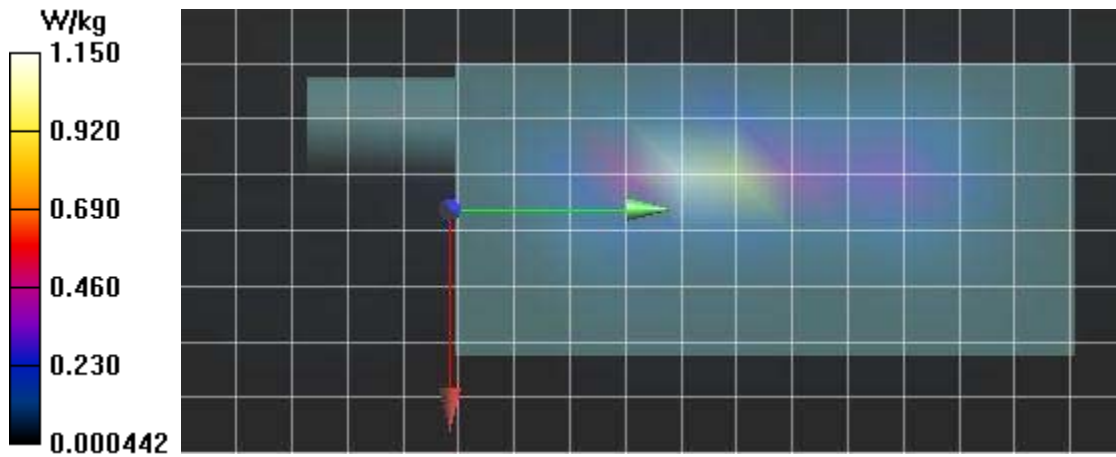
2450B/B9-2 A03298, 2457MHz Body-Touch Left Side, WIFI, Bat P3 NiMH Pack 1.2V 2000mAH, Ant T1, Body Accessory B2 2 2/Z Scan (1x1x19):

Measurement grid: dx=20mm, dy=20mm, dz=20mm

Info: Interpolated medium parameters used for SAR evaluation.

Penetration depth = n/a (n/a, 8.281) [mm]

Maximum value of SAR (interpolated) = 0.0281 W/kg



5.0 SYSTEM VERIFICATION PLOTS

Date/Time: 7/18/2018 12:05:01 PM, Date/Time: 7/18/2018 12:09:31 PM

Test Laboratory: Celltech Labs

SPC-2450B Jul 18 2018

DUT: Dipole 2450 MHz D2450V2; Type: D2450V2; Serial: D2450V2 - SN:825

Communication System: UID 0, CW (0); Communication System Band: FullSpan (0.0 - 6000.0 MHz); Frequency: 2450 MHz; Communication System PAR: 0 dB; PMF: 1

Medium: TSL_2450B[18JL18]

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.95$ S/m; $\epsilon_r = 51.9$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY Configuration:

- Probe: EX3DV4 - SN3600; ConvF(6.54, 6.54, 6.54); Calibrated: 4/25/2018, ConvF(6.54, 6.54, 6.54); Calibrated: 4/25/2018, ConvF(6.54, 6.54, 6.54); Calibrated: 4/25/2018;
 - Modulation Compensation:
- Sensor-Surface: 4mm (Mechanical Surface Detection), $z = -1.5, 31.0, 151.0$
- Electronics: DAE4 Sn353; Calibrated: 4/20/2018
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 Ax;
- DASY52 52.10.1(1476);

Frequency: 2450 MHz

SPC/SPC 2450B Input=250mw, Target=12.8W/kg/Area Scan (5x9x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 15.3 W/kg

SPC/SPC 2450B Input=250mw, Target=12.8W/kg/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 88.91 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 27.1 W/kg

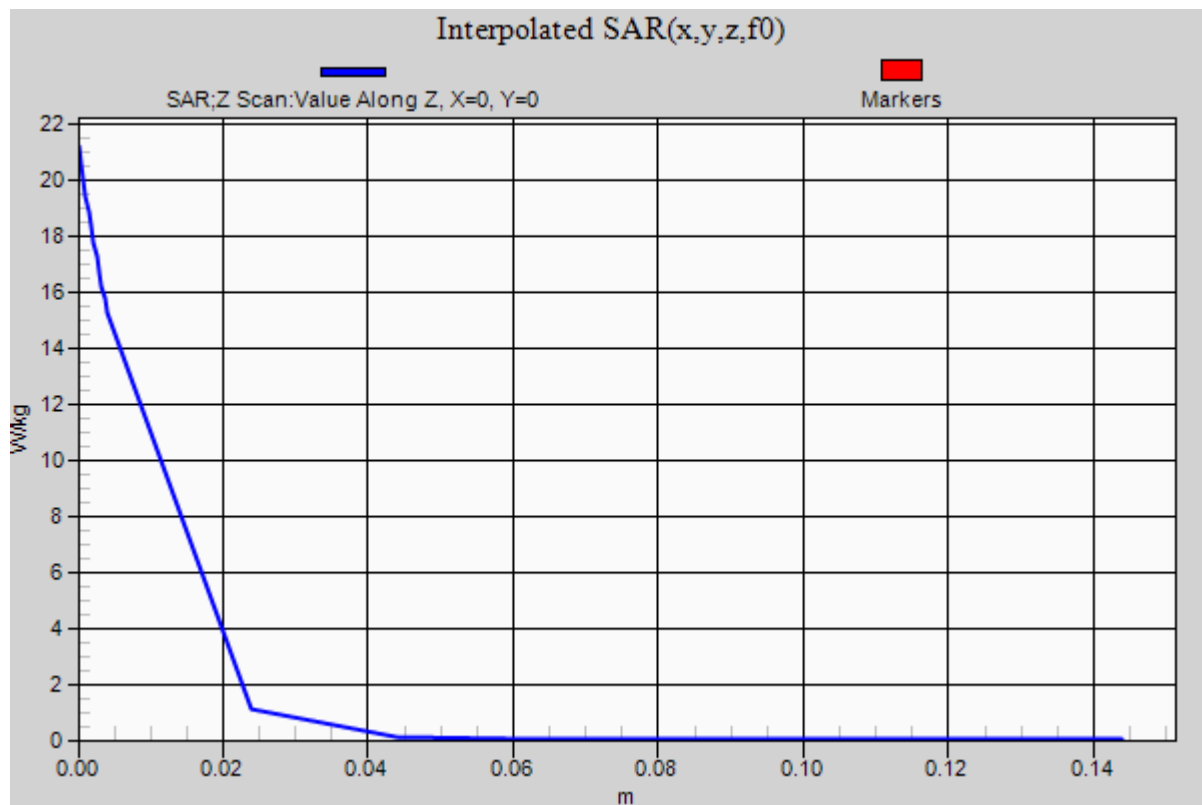
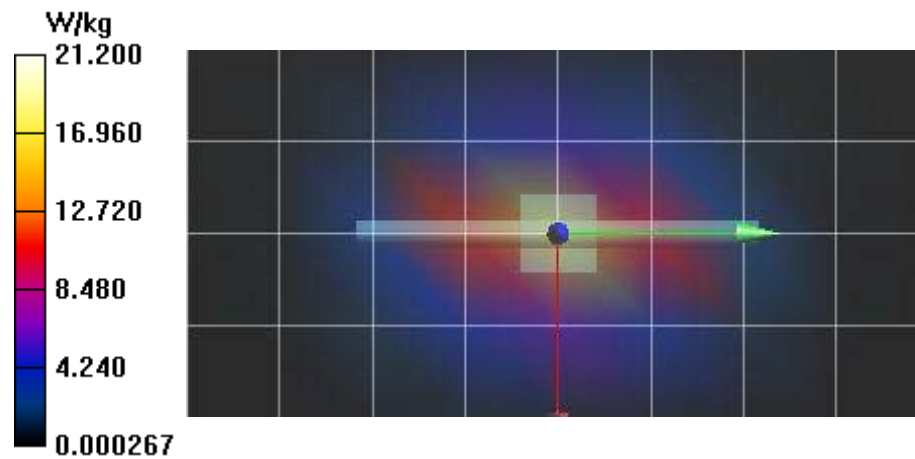
SAR(1 g) = 13.3 W/kg; SAR(10 g) = 6.11 W/kg

Maximum value of SAR (measured) = 15.0 W/kg

SPC/SPC 2450B Input=250mw, Target=12.8W/kg/Z Scan (1x1x19): Measurement grid: dx=20mm, dy=20mm, dz=20mm

Penetration depth = n/a (n/a, 7.674) [mm]

Maximum value of SAR (interpolated) = 21.2 W/kg



6.0 SYSTEM VERIFICATION TEST RESULTS

Table 6.0 System Verification Results 2450MHz BODY TSL

System Verification Test Results					
Date		Frequency (MHz)	Validation Source		
			P/N	S/N	
18 Jul 2018		2450	D2450V2	825	
Fluid Type	Fluid Temp °C	Ambient Temp °C	Ambient Humidity (%)	Forward Power (mW)	Source Spacing (mm)
Body	22.6	25	25%	250	10
Fluid Parameters					
Permittivity			Conductivity		
Measured	Target	Deviation	Measured	Target	Deviation
51.90	52.70	-1.52%	1.95	1.95	0.00%
Measured SAR					
1 gram			10 gram		
Measured	Target	Deviation	Measured	Target	Deviation
13.30	13.00	2.31%	6.11	6.05	0.99%
Measured SAR Normalized to 1.0W					
1 gram			10 gram		
Normalized	Target	Deviation	Normalized	Target	Deviation
53.20	50.70	4.93%	24.44	23.80	2.69%
Prior to the SAR evaluations, system checks were performed on the planar section of the phantom and a SPEAG validation dipole in accordance with the procedures described in IEEE 1528-2013, FCC KDB 846224 and IEC 62209-1. The dielectric parameters of the simulated tissue mixture were measured prior to the system performance check using a Dielectric Probe Kit and a Network Analyzer. The forward power was applied to the dipole and the system was verified to a tolerance of +10% from the system manufacturer's dipole calibration target SAR value. The forward power applied was same forward power applied by the calibration lab during the calibration of this validation source.					

7.0 FLUID DIELECTRIC PARAMETERS

Table 7.0 Fluid Dielectric Parameters 2450MHz BODY TSL

Aprel Laboratory
Test Result for UIM Dielectric Parameter
Wed 18/Jul/2018 11:23:33
Freq Frequency(GHz)
FCC_eHFCC Bulletin 65 Supplement C (June 2001) Limits for Head Epsilon
FCC_sHFCC Bulletin 65 Supplement C (June 2001) Limits for Head Sigma
FCC_eBFCC Limits for Body Epsilon
FCC_sBFCC Limits for Body Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM

Freq	FCC_eB	FCC_sB	Test_e	Test_s
2.3500	52.83	1.85	52.15	1.82
2.3600	52.82	1.86	52.21	1.83
2.3700	52.81	1.87	52.29	1.84
2.3800	52.79	1.88	52.19	1.84
2.3900	52.78	1.89	51.89	1.85
2.4000	52.77	1.90	51.90	1.87
2.4100	52.75	1.91	52.11	1.90
2.4200	52.74	1.92	51.95	1.89
2.4300	52.73	1.93	52.03	1.92
2.4400	52.71	1.94	51.82	1.90
2.4500	52.70	1.95	51.90	1.95
2.4600	52.69	1.96	52.10	1.97
2.4700	52.67	1.98	51.81	1.99
2.4800	52.66	1.99	51.89	1.99
2.4900	52.65	2.01	51.84	2.02
2.5000	52.64	2.02	51.73	2.05
2.5100	52.62	2.04	51.69	2.05
2.5200	52.61	2.05	51.75	2.05
2.5300	52.60	2.06	51.67	2.06
2.5400	52.59	2.08	51.57	2.08
2.5500	52.57	2.09	51.63	2.12

FLUID DIELECTRIC PARAMETERS

Date:	18 Jul 2018	Fluid Temp:	22.6	Frequency:	2450MHz	Tissue:	Body
Freq (MHz)		Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
2350.0000		52.1500	1.8200	52.8300	1.85	-1.29%	-1.62%
2360.0000		52.2100	1.8300	52.8200	1.86	-1.15%	-1.61%
2370.0000		52.2900	1.8400	52.8100	1.87	-0.98%	-1.60%
2380.0000		52.1900	1.8400	52.7900	1.88	-1.14%	-2.13%
2390.0000		51.8900	1.8500	52.7800	1.89	-1.69%	-2.12%
2400.0000		51.9000	1.8700	52.7700	1.90	-1.65%	-1.58%
2410.0000		52.1100	1.9000	52.7500	1.91	-1.21%	-0.52%
2417.0000		51.9980	1.8930	52.7430	1.92	-1.41%	-1.25%
2420.0000		51.9500	1.8900	52.7400	1.92	-1.50%	-1.56%
2430.0000		52.0300	1.9200	52.7300	1.93	-1.33%	-0.52%
2437.0000		51.8830	1.9060	52.7160	1.94	-1.58%	-1.60%
2440.0000		51.8200	1.9000	52.7100	1.94	-1.69%	-2.06%
2450.0000		51.9000	1.9500	52.7000	1.95	-1.52%	0.00%
2457.0000	*	52.0400	1.9640	52.6930	1.96	-1.24%	0.36%
2460.0000		52.1000	1.9700	52.6900	1.96	-1.12%	0.51%
2470.0000		51.8100	1.9900	52.6700	1.98	-1.63%	0.51%
2480.0000		51.8900	1.9900	52.6600	1.99	-1.46%	0.00%
2490.0000		51.8400	2.0200	52.6500	2.01	-1.54%	0.50%
2500.0000		51.7300	2.0500	52.6400	2.02	-1.73%	1.49%
2510.0000		51.6900	2.0500	52.6200	2.04	-1.77%	0.49%
2520.0000		51.7500	2.0500	52.6100	2.05	-1.63%	0.00%
2530.0000		51.6700	2.0600	52.6000	2.06	-1.77%	0.00%
2540.0000		51.5700	2.0800	52.5900	2.08	-1.94%	0.00%
2550.0000		51.6300	2.1200	52.5700	2.09	-1.79%	1.44%

*Channel Frequency Tested