Celltech
Testing and Engineering Services Lab

Test Report Serial Number:	45461401 R1.0
Test Report Date:	21 September 2017
Project Number:	1380

SAR Test Report - New Filing

Applicant:

HARRIS

Harris Corporation
221 Jefferson Ridge Parkway
Lynchburg, VA, 24501
USA

Maximum Reported 1g SAR			
FCC	HEAD:	2.10	W/kg
	BODY:	3.89	
ISEDC	HEAD:	2.19	
	BODY:	4.06	
General Pop. Limit:		8.00	

FCC ID: **OWDTR-0152-E**

IC Registration Number: **3636B-0152**

Product Model Number / HVIN: **See Section 2.0**

Product Name / PMN: **XL-185P C1D1**

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)

Approved By:

Ben Hewson, President
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ilac-MRA ACCREDITED

Test Lab Certificate: 2470.01

Industry Canada

IC Registration 3874A-1

FCC Registration: 714830

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1.0 DOCUMENT CONTROL

Samples Tested By:	**Trevor Whillock**
Report Prepared By:	**Art Voss**
Report Reviewed By:	**Ben Hewson**

Report Issue Number	Description	Section	By	Report Issue Date
R1.0	Initial Release		Art Voss	21 September 2017

2.0 CLIENT AND DEVICE INFORMATION

Client Information		
Applicant Name	**Harris Corporation**	
Applicant Address	221 Jefferson Ridge Parkway	
	Lynchburg, VA, 24501	
	USA	
DUT Information		
Device Identifier(s):	**FCC ID:**	**OWDTR-0152-E**
	IC:	**3636B-0152**
Type of Equipment:	Licensed Non-Broadcast Transmitter Held to Face (TNF) FCC Part 90	
	Land Mobile Radio Transmitter/Receiver (27.41-960MHz) RSS-119	
	Digital Transmission System (DTS) FCC Part 15, RSS 247	
	Unlicensed National Information Infrastructure (NII) FCC Part 15	
	Spread Spectrum Transmitter (DSS) FCC Part 15	
Device Model(s) / HVIN:	XS-PFSUM-C1D1	
	XS-PFSUY-C1D1	
Device Marketing Name / PMN:	XL-185P C1D1	
Test Sample Serial No.:	A-40191000001	
Transmit Frequency Range:	UHF: 378-522MHz	
	WLAN: 2412-2462MHz, 5180-5825MHz	
	BT/BLE: 2402-2480MHz	
Number of Channels:	Programmable	
Manuf. Max. Rated Output Power:	UHF: 5W / BT: 50mW / BLE: 7mW WLAN 2.4G: 230mW / WLAN 5G: 15 mW	
Modulation:	LMR: FM	
Duty Cycle:	50% PTT Duty Cycle	
DUT Power Source:	7.2 VDC Li-Ion 3100mAh Rechargeable Battery - C1D1	
Deviation(s) from standard/procedure:	None	
Modification of DUT:	None	

3.0 SCOPE OF EVALUATION/DATA REUSE

The XL-185P C1D1, FCC ID: OWDTR-0152-E, ISEDC ID: 3636B-0152 is a single-band, Push-To-Talk (PTT) Licensed Mobile Radio (LMR) transceiver intended for Occupational Use. It incorporates WiFi and BlueTooth transmitters. The XL-185P is identical in RF circuitry to the XL-200P C1D1 Rebanded, FCC ID: OWDTR-0144-E, ISEDC ID: 3636B-0144 multi-band radio with the exception that it has been modified by removing components to make it a single band radio.It includes the addition of a new battery, P/N 14034-4045-01, which has been designed to meet C1D1 Safety Standards. A metal shield is included and is placed between the battery pack and the DUT .

In this document, the following DUT references are made:

The XL-185P C1D1, FCC ID: OWDTR-0152-E, ISEDC ID: 3636B-0152 is referenced as XL-185P

The XL-200P C1D1 Rebanded, FCC ID: OWDTR-0144-E, ISEDC ID: 3636B-0144 is referenced as XL-200P

The Test Plan developed for this evaluation leverages SAR test data from previous evaluations of the XL-200P, per FCC KDB 484598 and is based on test channels, configurations and accessories which produced the highest (*worst case*) SAR. The previous *worst case* configurations of the XL-200P were re-evaluated during the course of this investigation to establish a base-line for comparison of test data from the XL-185P. The basis for the *worst case* configurations of the XL-185P are as follows:

3.1 Previous XL-200P Test Data

Worst Case Test Data from XL-200P							
Model:	XL-200P						
FCC ID:	OWDTR-0144-E						
Variant:	System Radio						
Date Evaluated:	June 2017						
Reference Report:	45461392 R2.1						
Frequency	**Configuration**	**Antenna**	**Accessory 1**	**Accessory 1**	**SAR (50% PTT)**	**Band**	**Spot Check**
406	Head	14035-4420-01	n/a	n/a	2.07	LMR	Y
406	Body	14035-4420-01	B1	A1	3.94		Y
Frequency	**Configuration**	**Antenna****	**Accessory 1**	**Accessory 1**	**SAR (100%)**	**Band**	**Spot Check**
2437	Body	14035-4440-01	B1	A1	0.006	Wifi	Y
5260*	Body	14035-4440-01	B1	A1	0.031		
2480	Body	14035-4440-01	B1	A1	0.006	BT	Y

*The highest *reported* SAR from this evaluation in the WiFi and BT bands was on the system Variant of the XL-200P in the Body Configuration.As a result spot checks in these bands will be done in the Body configuration.

**The WiFi and BT transmitters do not share the same antenna as the LMR antennas. It has been demostrated on evaluations of similar variants that the LMR antennas have no impact on the WiFi or BT SAR.

Note: The highest *reported* SAR in the 5GHz WiFi band occurred at 5260MHz which is not supported by this device. SAR was measured on supported channels in the 5GHz during this evaluation. The highest *reported* SAR from all variants from all previous evaluations in the WiFi and BlueTooth bands will be used for the purposes of simultaneous transmission.

Note: The four single band C1D1 variants of the XL-185P, FCC IDs: OWDTR-0151-E, -0152-E, -0153-E and -0154-E, ISED IDs: 3636B-0151, -1052, -0153, -0154, were all evaluate at the same time. They are identical in all aspects, including RF circuitry, PCB layout and form factor with the exception of component population options to operate in different LMR bands. The WiFi and BlueTooth circuitry, PCB and antenna layouts are identical on all variants. Measurements performed in the WiFi and BlueTooth bands were performed on the LX-185P Non-Rebanded variant, FCC ID OWDTR-0151-E, ISED ID: 3636B-0151, and are valid for the other three variants evaluated.

4.0 NORMATIVE REFERENCES

Normative References*	
ANSI / ISO 17025:2005	General Requirements for competence of testing and calibration laboratories
FCC CFR Title 47 Part 2	Code of Federal Regulations
Title 47:	Telecommunication
Part 2.1093:	Radiofrequency Radiation Exposure Evaluation: Portable Devices
Health Canada	
Safety Code 6 (2015)	Limits of Human Exposure to Radiofrequency Electromagnetic Energy in the Frequency Range from 3kHz to 300GHz
Industry Canada Spectrum Management & Telecommunications Policy	
RSS-102 Issue 5:	Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)
IEEE International Committee on Electromagnetic Safety	
IEEE 1528-2013:	IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
IEC International Standard	
IEC 62209-2 2010	Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Part 2
FCC KDB	
KDB 865664 D01v01r04	SAR Measurement Requirements for 100MHz to 6GHz
FCC KDB	
KDB 447498 D01v06	Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies
FCC KDB	
KDB 643646 D01v01r03	SAR Test Reduction Considerations for Occupational PTT Radios

* When the issue number or issue date is omitted, the latest version is assumed.

5.0 STATEMENT OF COMPLIANCE

This measurement report demonstrates that samples of the product model(s) were evaluated for Specific Absorption Rate (SAR) on the date(s) shown, in accordance with the Measurement Procedures cited and were found to comply with the Standard(s) Applied based on the Exposure Limits of the Use Group indicated for which the product is intended to be used.

Applicant:	Model / HVIN:	
Harris Corporation	XL-185P C1D1	
Standard(s) Applied:	**Measurement Procedure(s):**	
FCC 47 CFR §2.1093 Health Canada's Safety Code 6	FCC KDB 865664, FCC KDB 447498, FCC KDB 643646 Industry Canada RSS-102 Issue 5 IEEE Standard 1528-2013, IEC 62209-2	
Reason For Issue:	**Use Group:**	**Limits Applied:**
[X] New Certification	[ ] General Population / Uncontrolled	[ ] 1.6W/kg - 1g Volume
[ ] Class I Permissive Change		[X] 8.0W/kg - 1g Volume
[ ] Class II Permissive Change	[X] Occupational / Controlled	[ ] 4.0W/kg - 10g Volume
Reason for Change:		**Date(s) Evaluated:**
Original Filing		6 Sep 2017 - 7 Sep 2017

The results of this investigation are based solely on the test sample(s) provided by the applicant which was not adjusted, modified or altered in any manner whatsoever except as required to carry out specific tests or measurements. A description of the device, operating configuration, detailed summary of the test results, methodologies and procedures used during this evaluation, the equipment used and the various provisions of the rules are included in this test report.

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.

Art Voss, P.Eng.
Technical Manager
Celltech Labs Inc.

21 September 2017
Date

6.0 RF CONDUCTED POWER MEASUREMENT

Table 6.0 Conducted Power Measurements UHF

Measured Conduced Power					
Frequency (MHz)	Measured Power (dBm)	Rated Power (dBm)	Rated Power (W)	Delta (dBm)	SAR Test Channel (Y/N)
378.0000	37.85	37.00	5.00	0.85	Y
406.0000	37.84	37.00	5.00	0.84	Y
418.0000	37.81	37.00	5.00	0.81	N
430.0000	37.81	37.00	5.00	0.81	N
450.0000	37.80	37.00	5.00	0.80	N
454.0000	37.82	37.00	5.00	0.82	N
456.0000	37.83	37.00	5.00	0.83	N
459.0250	37.81	37.00	5.00	0.81	N
459.9750	37.80	37.00	5.00	0.80	N
470.0000	37.81	37.00	5.00	0.81	N
512.0000	37.79	37.00	5.00	0.79	N
522.0000	37.80	37.00	5.00	0.80	N

Notes:

The Conducted Power of the DUT was measured at the antenna port, with a fully charged battery and transmitting at 100% duty cycle.

7.0 NUMBER OF TEST CHANNELS (N_C)

This device is identical to the XL-200P , FCC ID: OWDTR-0144-E, ISEDC ID: 3636B-0144 multi band radio with the exception that it has been modified by removing components to make it a single band radio.. The number of channels and channel frequencies tested are based on *worst case* configurations from previous test data from the original filing of this device. Reference **Section 3.0 Scope of Evaluation.**

8.0 ACCESSORIES EVALUATED

Table 8.0 Manufacturer's Accessory List

Change History			
Change ID	Date	Change Type	Description of Change
1	15 June 2017	Initial	Initial Filing

Manufacturer's Accessory List							
Test Report ID Number	Manufacturer's Part Number	Description	Change ID(1)	UDC Group(2)	Type II Group(3)	SAR(4) Evaluated	SAR(5) Tested
Antenna							
T4	14035-4000-01	Full Spectrum Whip Antenna	1			Y	Y
T5	14035-4420-01	Wideband Whip, UHF, 7/800 MHz	5			Y	Y
T6	14035-4440-01	1/2 Wave Whip Antenna, 7/800 MHz	4			Y	Y
T7	14035-4440-02	1/4 Wave Stub Antenna, 7/800 MHz	4			Y	Y
Battery							
P3	14035-4045-01	Li-Ion Battery 7.2VDC, 3100mAh C1D1	1			Y	Y

Manufacturer's Accessory List							
Test Report ID Number	Manufacturer's Part Number	Description	Change ID(1)	UDC Group(2)	Type II Group(3)	SAR(4) Evaluated	SAR(5) Tested
Audio Accessory							
A1	12082-0600-01	Standard Speaker Microphone	1	7A	PB	Y	Y
A2	12082-0600-02	Storm Speaker Microphone	1	7A	PB	Y	Y
A28	12082-0600-03	Storm Speaker Microphone, 18"	6	7A	PB	Y	Y
A16	12082-0650-13	Headset, Heavy Duty, BTH, w/PTT, XG-100P	3	7A	IL	Y	Y
A17	12082-0650-14	Headset, Heavy Duty, OTH, w/PTT, XG-100P	3	7A	IL	Y	-
A26	LS103239V1	Earphone, Lapel MIC, 2.5mm	3	n/a	n/a	Y	Y
A27	LS103239V2	Earphone, Lapel MIC, 2.5mm, Right Angle	4	n/a	n/a	Y	-
A29	12082-0600-04	Storm Speaker Microphone 25.6"	1	7A	PB	Y	Y
A30	12082-0600-05	Storm Speaker Microphone, 30"	6	7A	PB	Y	Y

Manufacturer's Accessory List							
Test Report ID Number	Manufacturer's Part Number	Description	Change ID(1)	UDC Group(2)	Type II Group(3)	SAR(4) Evaluated	SAR(5) Tested
Body-Worn Accessory							
B1	12082-1290-01	Metal Belt Clip	1			Y	Y
B2	12082-3230-01	D-Swivel (Used w/ 14002-0218-01 and KRY 1011609/1)	1			Y	Y
B3	14002-0218-01	Premium Belt Loop	1			Y	Y
	12082-1398-01	Side Connector Cover	3			Y	Y
B15	KRY 1011609/1	Leather Belt Loop	1			Y	Y

(1) From Table 6.0 - Indicates which change the item was introduced or tested. A "**" in this column indicates these accessories were evaluated on similar product and are deemed compliant.

(2) UDC Group: 9 = 9 Pin, 7A = 7 Pin, 7B = 7 Pin Modified

(3) Type II Group: PB = Palm Button, IL = In-Line Pushbutton, PT = Pigtail Pushbutton, RB = Ring Pushbutton, BB = Body Button, BT = BlueTooth

(4) Accessories are categorized into groups of similar design and construction. Samples of individual groups are SAR Tested and the SAR results apply to ALL members of the Accessory Group. A "Y" in this column indicates the accessory is deemed acceptable.

(5) Accessories and/or Accessory Group members SAR Tested.

9.0 SAR MEASUREMENT SUMMARY

Table 9.0: Measured Results – BODY

Measured SAR Results (1g) - BODY Configuration (FCC/ISEDC)															
Date	Plot ID	DUT		Test Frequency (*MHz*)	Modulation	Accessories				DUT Spacing		Conducted Power (*dBm*)	Measured SAR (10g)		SAR Drift (*dB*)
		M/N	Type			Antenna ID	Battery ID	Body ID	Audio ID	DUT (*mm*)	Antenna (*mm*)		100% DC (*W/kg*)	50% DC (*W/kg*)	
UHF BODY															
06 Sep 2017	B1*	XL-200P C1D1	0144-E	406	CW	4045-01	4420-01	B1	A1	0	30	37.48	6.890	3.445	-0.265
06 Sep 2017	B2*	XL-200P C1D1	0146-E	406	CW	4045-01	4000-01	B1	A1	0	22	37.52	7.820	3.910	-0.156
06 Sep 2017	B3	XL-185P C1D1	0152-E	406	CW	4045-01	4000-01	B1	A1	0	22	37.84	7.010	3.505	-0.146
06 Sep 2017	B4	XL-185P C1D1	0152-E	406	CW	4045-01	4420-01	B1	A1	0	22	37.84	7.670	3.835	-0.195
06 Sep 2017	B5	XL-185P C1D1	0152-E	378	CW	4045-01	4420-01	B1	A1	0	30	37.85	6.380	3.190	-0.266
2.4GHz WiFi BODY															
13 Sep 2017	B6	XL-185P C1D1	0151-E	2412	CW	4045-01	4440-01	B1	A1	0	30	24	0.000	n/a	(a)
13 Sep 2017	B7	XL-185P C1D1	0151-E	2437	CW	4045-01	4440-01	B1	A1	0	30	24	0.001	n/a	(a)
13 Sep 2017	B8	XL-185P C1D1	0151-E	2462	CW	4045-01	4440-01	B1	A1	0	30	24	0.000	n/a	(a)
2.4GHz BT BODY															
12 Sep 2017	B9*	XL-200P C1D1	0144-E	2480	CW	4045-01	4440-01	B1	A1	0	30	17	0.000	n/a	(a)
12 Sep 2017	B10*	XL-200P C1D1	0146-E	2480	CW	4045-01	4440-01	B1	A1	0	30	17	0.000	n/a	(a)
12 Sep 2017	B11	XL-185P C1D1	0152-E	2480	CW	4045-01	4440-01	B1	A1	0	30	17	0.000	n/a	(a)
5GHz BT BODY															
14 Sep 2017	B12*	XL-200P C1D1	0144-E	5180	CW	4045-01	4440-01	B1	A1	0	30	12	0.001	n/a	(a)
14 Sep 2017	B13*	XL-200P C1D1	0146-E	5180	CW	4045-01	4440-01	B1	A1	0	30	12	0.001	n/a	(a)
14 Sep 2017	B14	XL-185P C1D1	0152-E	5180	CW	4045-01	4440-01	B1	A1	0	30	12	0.001	n/a	(a)
14 Sep 2017	B15	XL-185P C1D1	0151-E	5240	CW	4045-01	4440-01	B1	A1	0	30	12	0.000	n/a	(a)
SAR Limit							Spatial Peak			Head/Body		RF Exposure Category			

Table 9.1: Measured Results - FACE

Measured SAR Results (1g) - FACE Configuration (FCC/ISEDC)															
Date	Plot ID	DUT		Test Frequency (*MHz*)	Modulation	Accessories				DUT Spacing		Conducted Power (*dBm*)	Measured SAR (10g)		SAR Drift (*dB*)
		M/N	Type			Antenna ID	Battery ID	Body ID	Audio ID	DUT (*mm*)	Antenna (*mm*)		100% DC (*W/kg*)	50% DC (*W/kg*)	
UHF FACE															
07 Sep 2017	F1*	XL-200P C1D1	0144-E	406	CW	4045-01	4420-01	n/a	n/a	25	55	37.84	3.710	1.855	-0.371
07 Sep 2017	F2*	XL-200P C1D1	0146-E	406	CW	4045-01	4420-01	n/a	n/a	25	55	37.84	3.770	1.885	-0.260
07 Sep 2017	F3	XL-185P C1D1	0152-E	406	CW	4045-01	4000-01	n/a	n/a	25	52	37.84	4.100	2.050	-0.181
07 Sep 2017	F4	XL-185P C1D1	0152-E	406	CW	4045-01	4420-01	n/a	n/a	25	55	37.84	4.000	2.000	-0.173
07 Sep 2017	F5	XL-185P C1D1	0152-E	378	CW	4045-01	4000-01	n/a	n/a	25	52	37.85	3.400	1.700	-0.124
SAR Limit							**Spatial Peak**			**Head/Body**		**RF Exposure Category**			
FCC 47 CFR 2.1093				**Health Canada Safety Code 6**			**1 Gram Average**			**8.0 W/kg**		**Occupational/User Aware**			

* Baseline Measurements

(a) The BlueTooth and WiFi antennas are located on the side of the DUT. Due to the location of the BlueTooth and WiFi antennas, the minimum phantom separation distance in the BODY or FACE configurations that could be achieved is greater than 30mm. The measured SAR values approximated noise floor measurements resulting in inconsistent power drift measurements and are omitted in this table.

Note: The WiFi and BlueTooth channels evaluated on the XL-185P produced *worst case* SAR in the BODY Configurations.

Note: This device does not support BlueTooth (voice) activated transmission devices therefore 50% PTT is applied.

10.0 ANALYSIS OF SIMULTANEOUS TRANSMISSION

Simultaneous Transmission Analysis

Introduction

The XL-185P incorporates integrated WiFi and BlueTooth transmitters capable of simultaneously transmitting, in any combination, with the LMR transmitter. As per FCC KDB 447498, simultaneous transmission analysis is required for devices capable of simultaneous transmission. The WiFi and BT 1g SAR are subject to General Population limits of 1.6W/kg. The LMR 1g SAR is subject to Occupational of 8.0W/kg. To determine compliance when different SAR limits are applied to the different transmit modes, the Sum-of-the-Ratios of the SAR to the respective SAR limit is applied. When the Sum-of-the-Ratios is ≤ 1.0, simultaneous SAR test exclusion may be applied.

SAR for each transmission band, transmission mode and/or equipment class was evaluated with Body-Worn and Audio Accessories in the BODY and HEAD configurations. Only the Maximum maximum *reported* SAR for each is used in the Sum-of-the-Ratios calculation and the worst case of all possible combinations is considered.

Table 10.0 List of Possible Transmitters

List of Possible Transmitters				
Type	Class	Frequency Range		Rated Output Power (dBm)
		Lower (MHz)	Upper (MHz)	
LMR UHF	TNF	378.0	522.0	37.0
BlueTooth	DSS	2402.0	2480.0	17.0
BLE	DTS	2402.0	2480.0	8.5
WiFi 2.4	DTS	2412.0	2462.0	24.0
WiFi 5	NII	5150.0	5850.0	12.0

Table 10.1 List of Possible Transmitters Combinations

Simultaneous Transmitter Combinations					
Configuration Number	Transmitter				
	LMR	BlueTooth	BLE	WiFi 2.4	WiFi 5
1	X	X			
2	X		X		
3	X			X	
4	X				X

Indicates this configuration is not supported

Note: The WiFi and BlueTooth transmitters share the same antenna and cannot simultaneously transmit.

Table 10.2 Analysis of Sum-of-the-Ratios

Analysis of Sum-of-the-Ratios For All Transmitters and Configurations														
Configuration Number	Configuration	Transmitter Type											Sum of Ratios	Sum of SARs
		LMR Band		BlueTooth		BLE		WiFi 2.4		WiFi 5				
		stand-alone SAR (W/kg)	Ratio to Limit	*stand-alone* SAR (W/kg)	Ratio to Limit	*stand-alone* SAR (W/kg)	Ratio to Limit	*stand-alone* SAR (W/kg)	Ratio to Limit	*stand-alone* SAR (W/kg)	Ratio to Limit			
		SAR Limit = 8.0W/kg (Occupational)		*SAR Limit = 1.6W/kg (General Population)*										*(W/kg)*
1	HEAD	2.050	0.256	0.006	0.004								0.260	2.056
2		2.050	0.256			0.048	0.030						0.286	**2.098**
3		2.050	0.256					0.005	0.003				0.259	2.055
4		2.050	0.256							0.031	0.019		0.276	2.081
1	BODY	3.835	0.479	0.006	0.004								0.483	3.841
2		3.835	0.479			0.048	0.030						0.509	**3.883**
3		3.835	0.479					0.005	0.003				0.483	3.840
4		3.835	0.479							0.031	0.019		0.499	3.866

Indicates this combination is not supported

Test Exclusion of the BlueTooth Low Energy (BLE) transmitter is evaluated using Max Power = 8.4dBm (7mW), Separation Distance = 30mm*, Transmit Frequency = 2.480GHz.

Per KDB 447498 D01v06 [4.3.1(a)], SAR Test Exclusion is given by:

[(Max Power, mW) / (Separation Distance, mm)] * [√f, GHz] ≤ 3.0 for 1g SAR
[(7)/(30)] * [(√2.480)] = 0.362 ≤ 3.0

Therefore the BlueTooth transmitter meets the SAR Test Exclusion criteria.

For reference only, per KDB 447498 D01v06 [4.3.2(b)], the estimated BlueTooth SAR is given by:

[(Max Power, mW) / (Separation Distance, mm)] * [(√f, GHz) / (x)], where x = 7.5 for 1g SAR
[(7)/(30)] * [(√2.480) / (7.5)] = 0.048W/kg

From Table 10.2, the Sum-of-the-Ratios for any given simultaneous transmission combination, when applied to their respective SAR limit, does not exceed 1.0. No further analysis is required.

Note: The WiFi and BlueTooth SAR values shown in this table are the highest *worst case* SAR values from all configurations and transmission modes from all variants of the XL-185P series of radios. They are applied in this table to illustrate the most conservative ratio.

* Due to the location of the BlueTooth and WiFi antennas, the minimum phantom separation distance in the BODY or FACE configurations that could be achieved is greater than 30mm.

11.0 SCALING OF MAXIMUM MEASURE SAR

Table 11.0 SAR Scaling

Scaling of Maximum Measured SAR (1)							
Plot ID	Configuration	Freq (MHz)	Measured Fluid Deviation Permittivity	Measured Fluid Deviation Conductivity	Measured Conducted Power (dBm)	Measured Drift (dB)	Measured SAR (1g) (W/kg)
F3	Face	406	3.53%	-3.22%	37.8	-0.181	2.050
B4	Body	406	-4.30%	-2.80%	37.8	-0.195	3.835

Step 1 — Fluid Sensitivity Adjustment

Plot ID	Scale Factor (%)		Measured SAR (W/kg)		Step 1 Adjusted SAR (1g) (W/kg)
F3	1.000%	x	2.050	=	2.050
B4	1.000%	x	3.835	=	3.835

Step 2 — Manufacturer's Tune-Up Tolerance

Plot ID	Measured Conducted Power (dBm)	Rated Power (dBm)	Delta (dB)		Step 1 Adjusted SAR (W/kg)		Step 2 Adjusted SAR (1g) (W/kg)
F3	37.8	37.0	0.8	+	2.050	=	2.050
B4	37.8	37.0	0.8	+	3.835	=	3.835

Step 3 — Simultaneous Transmission - Bluetooth and/or WiFi

Plot ID	Rated Output Power (Pmax) (mW)	Freq (MHz)	Separation Distance (mm)	Estimated SAR (W/kg)		Step 2 Adjusted SAR (W/kg)		Step 3 Adjusted SAR (1g) (W/kg)
F3				0.05	+	2.050	=	2.100
B4				0.05	+	3.835	=	3.885

Step 4 — Drift Adjustment

Plot ID	Measured Drift (dB)		Step 3 Adjusted SAR (W/kg)		Step 4 Adjusted SAR (1g) (W/kg)
F3	-0.181	+	2.100	=	2.190
B4	-0.195	+	3.885	=	4.060

Step 5 — Reported SAR

Plot ID	FCC From Steps 1 through 3 1g SAR (W/kg)	IC From Steps 1 through 4 1g SAR (W/kg)
F3	2.10	2.19
B4	3.89	4.06

NOTES to Table 10.0
(1) Scaling of the Maximum Measured SAR is based on the highest, 100% duty cycle, Face, Body and/or Head SAR measured of ALL test channels, configurations and accessories used during THIS evaluation. The Measured Fluid Deviation parameters apply only to deviation of the tissue equivalent fluids used at the frequencies which produced the highest measured SAR. The Measured Conducted Power applies to the Conducted Power measured at the frequencies producing the highest Face and Body SAR. The Measured Drift is the SAR drift associated with that specific SAR measurement. The Reported SAR is the accumulation of all SAR Adjustments from the applicable Steps 1 through 4. The Plot ID is for indentification of the SAR Measurement Plots in Annex A of this report. NOTE: Some of the scaling factors in Steps 1 through 4 may not apply and are identified by light gray text.
Step 1
Per IEC-62209-1 and FCC KDB 865664. Scaling required only when Measured Fluid Deviation is greater than 5%. If the Measured Fluid Deviation is greater than 5%, Table 10.1 will be shown and will indicate the SAR scaling factor in percent (%). SAR is MULTIPLIED by this scaling factor only when the scaling factor is positive (+).
Step 2
Per KDB 447498. Scaling required only when the difference (Delta) between the Measured Conducted Power and the Manufacturer's Rated Conducted Power is (-) Negative. The absolute value of Delta is ADDED to the SAR.
Step 3
Per KDB 447498 4.3.2. The SAR, either measured or calculated, of ANY and ALL simultaneous transmitters must be added together and includes all contributors.
Step 4
Per IEC 62209-1. Scaling required only when Measured Drift is (-) Negative. The absolute value of Measured Drift is added to Reported or Simultaneous Reported SAR.
Step 5
The Reported SAR is the Maximum Final Adjusted Cumulative SAR from the applicable Steps 1 through 4 and are reported on Page 1 of this report.

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. 21 September 2017 Date

12.0 SAR EXPOSURE LIMITS

Table 12.0 Exposure Limits

SAR RF EXPOSURE LIMITS			
FCC 47 CFR§2.1093	Health Canada Safety Code 6	General Population / Uncontrolled Exposure(4)	Occupational / Controlled Exposure(5)
Spatial Average(1) (averaged over the whole body)		0.08 W/kg	0.4 W/kg
Spatial Peak(2) (Head and Trunk averaged over any 1 g of tissue)		1.6 W/kg	**8.0 W/kg**
Spatial Peak(3) (Hands/Wrists/Feet/Ankles averaged over 10 g)		4.0 W/kg	20.0 W/kg
(1) The Spatial Average value of the SAR averaged over the whole body.			
(2) The Spatial Peak value of the SAR averaged over any 1 gram of tissue, defined as a tissue volume in the shape of a cube and over the appropriate averaging time.			
(3) The Spatial Peak value of the SAR averaged over any 10 grams of tissue, defined as a tissue volume in the shape of a cube and over the appropriate averaging time.			
(4) Uncontrolled environments are defined as locations where there is potential exposure to individuals who have no knowledge or control of their potential exposure.			
(5) Controlled environments are defined as locations where there is potential exposure to individuals who have knowledge of their potential exposure and can exercise control over their exposure.			

13.0 DETAILS OF SAR EVALUATION

13.1 Day Log

Date	Ambient Temp °C	Fluid Temp °C	Humidity	TSL	Fluid Param	SPC	DUT Test
5 Sep 2017	27	19.8	26%	450B	X		
6 Sep 2017	26	22.6	32%	450B		X	X
7 Sep 2017	25	21.0	30%	450H	X	X	X

13.2 DUT Setup and Configuration

DUT Setup and Configuration

Overview

The XL-185P is identical in electronic circuitry to the XL-200P with the exception that it had been designed to be a Single Band Radio.

The number of test channels and test configurations performed on this device were based on the antenna and accessory combinations which produced the highest, or worst case, SAR from previous SAR evaluations of the XL-200P, FCC ID: OWDTR-0144-E, ISEDC ID: 3636B-0144. Section 3.0 identifies those test channels and each channel was tested in the BODY and FACE configuration.

Sample measurements of the original XL-200P in the worst case configurations were made and compared to previous measurement data taken from the same XL-200P in the same configurations from the original filing and used to establish a base-line. Measurements from the XL-185P in the same configurations were compared to the base-line measurements and were found to be within 5% of the base-line. From this, justification is made for the determination of test channels, configurations and accessory combinations.

The XL-185P was evaluated at the maximum conducted output power level, preset by the manufacturer, with a fully charged battery in unmodulated continuous transmit operation (Continuous Wave mode at 100% duty cycle) with the transmit key continuously depressed. For a Push-To-Talk (PTT) device with a manually operated transmit pushbutton, a 50% duty cycle compensation for the *reported SAR* was used, as per FCC KDB 447498 (6.1). This was applied only to the LMR bands.

The test procedures outlined in FCC KDB 643646 "SAR Test Reduction Considerations for Occupational PTT Radios" as well as FCC KDB 865664, ISEDC RSS-102 and IEEE 1528 were used throughout the evaluation of this device in the LMR bands.

13.3 DUT Positioning

DUT Positioning
Positioning
The DUT Positioner was securely fastened to the Phantom Platform. Registration marks were placed on the DUT and the Positioner to ensure consistent positioning of the DUT for each test evaluation.
FACE Configuration
The DUT was securely clamped into the device holder with the surface of the DUT normally held to the user's face facing the phantom. The device holder was adjusted to ensure that the horizontal axis of the DUT was parallel to the bottom of the phantom. A 25mm spacer block was used to set the separation distance between the DUT and the phantom to 25mm. When applicable and unless by design, the antenna of the DUT was prevented from sagging away from the phantom. The spacer block was removed before testing.
BODY Configuration
Body-Worn and Audio Accessories were affixed to the DUT in the manner in which they are intended to be used. The DUT, with its accessories, were securely clamped into the device holder with the surface of the DUT normally in contact with the body in direct contact with the bottom of the phantom, or 0mm separation from the DUT's accessory to the phantom. Body-Worn Accessory straps, linkages, etc. were positioned in a fashion resembling that for which they were intended to be used. Audio Accessory cables, etc., were positioned in a fashion resembling that for which they were intended to be used.
HEAD Configuration
This device is not intended to be held to the ear and was not tested in the HEAD configuration.

13.4 General Procedures and Report

General Procedures and Reporting
General Procedures
The fluid dielectric parameters of the Active Tissue Simulating Liquid (TSL) were measured as described in this Section, recorded and entered into the DASY Measurement Server. Active meaning the TSL used during the SAR evaluation of the DUT. The temperature of the Active TSL was measured and recorded prior to performing a System Performance Check (SPC). An SPC was performed with the Active TSL prior to the start of the test series. The temperature of the Active TSL was measured throughout the day and the Active TSL temperature was maintained to $\pm$ 0.5°C. The Active TSL temperature was maintained to within ±1.0°C throughout the test series. TSL analysis and SPC were repeated when the Active TSL use exceeded 84 hours. An Area Scan exceeding the length and width of the DUT projection was performed and the locations of all maximas within 2dB of the Peak SAR recorded. A Zoom Scan centered over the Peak SAR location(s) was performed and the 1g and 10g SAR values recorded. The resolutions of the Area Scan and Zoom Scan are described in the Scan Resolution table(s) in this Section. A Power Reference Measurement was taken at the phantom reference point immediately prior to the Area Scan. A Power Drift measurement was taken at the phantom reference point immediately following the Zoom Scan to determine the power drift. A Z-Scan from the *Maximum Distance to Phantom Surface* to the fluid surface was performed following the power drift measurement.
Reporting
The 1g SAR, 10g SAR and power drift measurements are recorded in the SAR Measurement Summary tables in the SAR Measurement Summary Section of this report. The SAR values shown in the 100% DC (Duty Cycle) column are the SAR values reported by the SAR Measurement Server with the DUT operating at 100% transmit duty cycle. The SAR values in the 50% DC column have been scaled by 50% for 50% Push-To-Talk duty cycle compensation. These tables also include other information such as transmit channel and frequency, modulation, accessories tested and DUT-phantom separation distance. In the Scaling of Maximum Measured SAR Section of this report, the highest measured SAR in the BODY and FACE configurations, within the entire scope of this assessment, are, when applicable, scaled for Fluid Sensitivity, Manufacturer's Tune-Up Tolerance, Simultaneous Transmission and Drift. With the exception of Duty Cycle correction/compensation, SAR values are ONLY scaled up, not down. The final results of this scaling is the *reported SAR* which appears on the Cover Page of this report.

13.5 Fluid Dielectric and Systems Performance Check

Fluid Dielectric and Systems Performance Check
Fluid Dielectric Measurement Procedure
The fluid dielectric parameters of the Tissue Simulating Liquid (TSL) are measured using the Open-Ended Coax Method connected to an Agilent 8753ET Network Analyzer connected to a measurement server running Aprel Dielectric Property Measurement System. A frequency range of ± 100MHz for frequencies > 300MHz and ± 50MHz for frequencies ≤ 300MHz with frequency step size of 10MHz is used. The center frequency is centered around the SAR measurement probe's calibration point for that TSL frequency range. A calibration of the setup is performed using a short-open-deionized water (at 23°C in a 300ml beaker) method. A sample of the TSL is placed in a 300ml beaker and the open-ended coax is submerged approximately 8mm below the fluid surface in the approximate center of the beaker. A check of the setup is made to ensure no air is trapped under the open-ended coax. The sample of TSL is measured and compared to the FCC OET Bulletin 65 Supplement C targets for HEAD or BODY for the entire fluid measurement range. Fluid adjustment are made if the dielectric parameters are > 5% in range that the DUT is to be tested. If the adjustments fail to bring the parameters to ≤ 5% but are < 10%, the SAR Fluid Sensitivity as per IEC 62201-1 and FCC KDB 865664 are applied to the highest measured SAR. A TSL with dielectric parameters > 10% in the DUT test frequency range are not used.
Systems Performance Check
The fluid dielectric parameters of the Active TSL are entered into the DASY Measurement Server at each of the 10MHz step size intervals. Active meaning the TSL used during the SAR evaluation of the DUT. The DASY Measurement System will automatically interpolate the dielectric parameters for DUT test frequencies that fall between the 10MHz step intervals. A Systems Performance Check (SPC) is performed in accordance with IEEE 1528 "System Check" and FCC KDB 865664 "System Verification". A validation source, dipole or Confined Loop Antenna (CLA), is placed under the geometric center of the phantom and separated from the phantom in accordance to the validation source's Calibration Certificate data. A CW signal set to the frequency of the validate source's and SAR measurement probe's calibration frequency with a forward power set to the validation source's Calibration Certificate data power setting is applied to the validation source. An Area Scan is centered over the projection of the validation source's feed point and an Area Scan is taken. A Zoom Scan centered over the Peak SAR measurement of the Area Scan and the 1g and 10g SAR is measured. The measured 1g and 10g SAR is compared to the 1g and 10g SAR measurements from the validation source's Calibration Certificate. When required, the measured SAR is normalized to 1.0W and compared to the normalized SAR indicated on the validation source's Calibration Certificate. The SPC is considered valid when the measured and normalized SAR is ≤ 10% of the measured and normalize SAR of the validation source's Calibration Certificate. The fluid dielectric parameters of the Active TSL and SPC are repeated when the Active TSL has been in use for greater than 84 hours or if the Active TSL temperature has exceed ± 1°C of the initial fluid analysis.

13.6 Scan Resolution 100MHz to 2GHz

Scan Resolution 100MHz to 2GHz	
Maximum distance from the closest measurement point to phantom surface: (Geometric Center of Probe Center)	**4 ± 1 mm**
Maximum probe angle normal to phantom surface. (Flat Section ELI Phantom)	**5° ± 1°**
Area Scan Spatial Resolution ΔX, ΔY	**15 mm**
Zoom Scan Spatial Resolution ΔX, ΔY	**7.5 mm**
Zoom Scan Spatial Resolution ΔZ (Uniform Grid)	**5 mm**
Zoom Scan Volume X, Y, Z	**30 mm**
Phantom	**ELI**
Fluid Depth	**150 ± 5 mm**
An Area Scan with an area extending beyond the device was used to locate the candidate maximas within 2dB of the global maxima.	
A Zoom Scan centered over the peak SAR location(s) determined by the Area Scan was used to determine the 1-gram and 10-gram peak spatial-average SAR	

13.7 Scan Resolution 2GHz to 3GHz

Scan Resolution 2GHz to 3GHz	
Maximum distance from the closest measurement point to phantom surface: (Geometric Center of Probe Center)	**4 ± 1 mm**
Maximum probe angle normal to phantom surface. (Flat Section ELI Phantom)	**5° ± 1°**
Area Scan Spatial Resolution ΔX, ΔY	**12 mm**
Zoom Scan Spatial Resolution ΔX, ΔY	**5 mm**
Zoom Scan Spatial Resolution ΔZ (Uniform Grid)	**5 mm**
Zoom Scan Volume X, Y, Z	**30 mm**
Phantom	**ELI**
Fluid Depth	**150 ± 5 mm**
An Area Scan with an area extending beyond the device was used to locate the candidate maximas within 2dB of the global maxima.	
A Zoom Scan centered over the peak SAR location(s) determined by the Area Scan was used to determine the 1-gram and 10-gram peak spatial-average SAR	

13.8 Scan Resolution 5GHz to 6GHz

Scan Resolution 5GHz to 6GHz	
Maximum distance from the closest measurement point to phantom surface: (Geometric Center of Probe Center)	**4 ± 1 mm**
Maximum probe angle normal to phantom surface. (Flat Section ELI Phantom)	**5° ± 1°**
Area Scan Spatial Resolution ΔX, ΔY	**10 mm**
Zoom Scan Spatial Resolution ΔX, ΔY	**4 mm**
Zoom Scan Spatial Resolution ΔZ (Uniform Grid)	**2 mm**
Zoom Scan Volume X, Y, Z	**22 mm**
Phantom	**ELI**
Fluid Depth	**100 ± 5 mm**
An Area Scan with an area extending beyond the device was used to locate the candidate maximas within 2dB of the global maxima.	
A Zoom Scan centered over the peak SAR location(s) determined by the Area Scan was used to determine the 1-gram and 10-gram peak spatial-average SAR	

14.0 MEASUREMENT UNCERTAINTIES

Table 14.0 Measurement Uncertainty

UNCERTAINTY BUDGET FOR DEVICE EVALUATION (IEEE 1528-2013 Table 9)									
Uncertainty Component	**IEEE 1528 Section**	**Uncertainty Value ±%**	**Probability Distribution**	**Divisor**	**ci 1g**	**ci 10g**	**Uncertainty Value ±% (1g)**	**Uncertainty Value ±% (10g)**	**V_i or V_{eff}**
Measurement System									
Probe Calibration*	E.2.1	6.6	Normal	1	1	1	6.60	6.60	∞
Axial Isotropy*	E.2.2	4.7	Rectangular	1.732050808	0.7	0.7	1.9	1.9	∞
Hemispherical Isotropy*	E.2.2	9.6	Rectangular	1.732050808	0.7	0.7	3.9	3.9	∞
Boundary Effect*	E.2.3	8.3	Rectangular	1.732050808	1	1	4.8	4.8	∞
Linearity*	E.2.4	4.7	Rectangular	1.732050808	1	1	2.7	2.7	∞
System Detection Limits*	E.2.4	1.0	Rectangular	1.732050808	1	1	0.6	0.6	∞
Modulation Response	E.2.5	4.0	Rectangular	1.732050808	1	1	2.3	2.3	∞
Readout Electronics*	E.2.6	1.0	Normal	1	1	1	1.0	1.0	∞
Response Time*	E.2.7	0.8	Rectangular	1.732050808	1	1	0.5	0.5	∞
Integration Time*	E.2.8	1.4	Rectangular	1.732050808	1	1	0.8	0.8	∞
RF Ambient Conditions - Noise	E.6.1	0.0	Rectangular	1.732050808	1	1	0.0	0.0	∞
RF Ambient Conditions - Reflection	E.6.1	0.0	Rectangular	1.732050808	1	1	0.0	0.0	∞
Probe Positioner Mechanical Tolerance*	E.6.2	0.4	Rectangular	1.732050808	1	1	0.2	0.2	∞
Probe Positioning wrt Phantom Shell*	E.6.3	2.9	Rectangular	1.732050808	1	1	1.7	1.7	∞
Extrapolation, interpolation & integration algorithms for max. SAR evaluation*	E.5	3.9	Rectangular	1.732050808	1	1	2.3	2.3	∞
Test Sample Related									
Test Sample Positioning	E.4.2	0.3	Normal	1	1	1	0.3	0.3	5
Device Holder Uncertainty*	E.4.1	3.6	Normal	1	1	1	3.6	3.6	∞
SAR Drift Measurement**	E.2.9	0.0	Rectangular	1.732050808	1	1	0.0	0.0	∞
SAR Scaling***	E.6.5	2.0	Rectangular	1.732050808	1	1	1.2	1.2	∞
Phantom and Tissue Parameters									
Phantom Uncertainty*	E.3.1	4.0	Rectangular	1.732050808	1	1	2.3	2.3	∞
SAR Correction Uncertainty	E.3.2	1.2	Normal	1	1	0.84	1.2	1.0	∞
Liquid Conductivity (measurement)	E.3.3	6.8	Normal	1	0.78	0.71	5.3	4.8	10
Liquid Permittivity (measurement)	E.3.3	5.3	Normal	1	0.23	0.26	1.2	1.4	10
Liquid Conductivity (Temperature)	E.3.2	0.1	Rectangular	1.732050808	0.78	0.71	0.1	0.0	∞
Liquid Permittivity Temperature)	E.3.2	0.0	Rectangular	1.732050808	0.23	0.26	0.0	0.0	∞
Effective Degrees of Freedom(1)								**V_{eff} =**	**873.2**
Combined Standard Uncertainty			**RSS**				**12.59**	**12.40**	
Expanded Uncertainty (95% Confidence Interval)			**k=2**				**25.18**	**24.80**	
Measurement Uncertainty Table in accordance with IEEE Standard 1528-2003									

(1) The Effective Degrees of Freedom is > 30 therefore a coverage factor of k=2 represents an approximate confidence level of 95%.

* Provided by SPEAG

Table 14.1 Calculation of Degrees of Freedom

Table 13.1

Calculation of the Degrees and Effective Degrees of Freedom	
$v_i = n - 1$	$v_{eff} = \frac{u_c^4}{\frac{m}{\sum_{i=1} \frac{c_i^4 u_i^4}{v_i}}}$

15.0 FLUID DIELECTRIC PARAMETERS

Table 15.0 Fluid Dielectric Parameters 450MHz BODY TSL

****
Aprel Laboratory
Test Result for UIM Dielectric Parameter
Tue 05/Sep/2017 15:35:38
Freq Frequency(GHz)
FCC_eH FCC Bulletin 65 Supplement C (June 2001) Limits for Head Epsilon
FCC_sH FCC Bulletin 65 Supplement C (June 2001) Limits for Head Sigma
FCC_eB FCC Limits for Body Epsilon
FCC_sB FCC Limits for Body Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM
****

Freq	FCC_eB	FCC_sB	Test_e	Test_s
0.3500	57.70	0.93	55.68	0.88
0.3600	57.60	0.93	55.37	0.89
0.3700	57.50	0.93	56.06	0.87
0.3800	57.40	0.93	55.35	0.89
0.3900	57.30	0.93	54.46	0.90
0.4000	57.20	0.93	55.08	0.91
0.4100	57.10	0.93	54.42	0.90
0.4200	57.00	0.94	55.16	0.91
0.4300	56.90	0.94	54.76	0.92
0.4400	56.80	0.94	53.71	0.93
0.4500	56.70	0.94	53.76	0.94
0.4600	56.66	0.94	53.64	0.95
0.4700	56.62	0.94	53.77	0.95
0.4800	56.58	0.94	53.43	0.98
0.4900	56.54	0.94	53.38	0.96
0.5000	56.51	0.94	53.42	0.97
0.5100	56.47	0.94	53.20	0.98
0.5200	56.43	0.95	53.29	0.99
0.5300	56.39	0.95	53.49	0.99
0.5400	56.35	0.95	52.52	1.01
0.5500	56.31	0.95	52.59	1.02

FLUID DIELECTRIC PARAMETERS

Date:	5 Sep 2017	Fluid Temp:	19.8	Frequency:	450MHz	Tissue:	Body
Freq (MHz)		Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
350.0000		55.6800	0.8800	57.7000	0.93	-3.50%	-5.38%
360.0000		55.3700	0.8900	57.6000	0.93	-3.87%	-4.30%
370.0000		56.0600	0.8700	57.5000	0.93	-2.50%	-6.45%
378.0000	*	55.4920	0.8860	57.4200	0.93	-3.36%	-4.73%
380.0000		55.3500	0.8900	57.4000	0.93	-3.57%	-4.30%
390.0000		54.4600	0.9000	57.3000	0.93	-4.96%	-3.23%
400.0000		55.0800	0.9100	57.2000	0.93	-3.71%	-2.15%
406.0000	*	54.6840	0.9040	57.1400	0.93	-4.30%	-2.80%
410.0000		54.4200	0.9000	57.1000	0.93	-4.69%	-3.23%
420.0000		55.1600	0.9100	57.0000	0.94	-3.23%	-3.19%
430.0000		54.7600	0.9200	56.9000	0.94	-3.76%	-2.13%
440.0000		53.7100	0.9300	56.8000	0.94	-5.44%	-1.06%
450.0000		53.7600	0.9400	56.7000	0.94	-5.19%	0.00%
460.0000		53.6400	0.9500	56.6600	0.94	-5.33%	1.06%
470.0000		53.7700	0.9500	56.6200	0.94	-5.03%	1.06%
480.0000		53.4300	0.9800	56.5800	0.94	-5.57%	4.26%
490.0000		53.3800	0.9600	56.5400	0.94	-5.59%	2.13%
500.0000		53.4200	0.9700	56.5100	0.94	-5.47%	3.19%
510.0000		53.2000	0.9800	56.4700	0.94	-5.79%	4.26%
520.0000		53.2900	0.9900	56.4300	0.95	-5.56%	4.21%
530.0000		53.4900	0.9900	56.3900	0.95	-5.14%	4.21%
540.0000		52.5200	1.0100	56.3500	0.95	-6.80%	6.32%
550.0000		52.5900	1.0200	56.3100	0.95	-6.61%	7.37%

*Channel Frequency Tested

Table 15.1 Fluid Dielectric Parameters 450MHz HEAD TSL

****
Aprel Laboratory
Test Result for UIM Dielectric Parameter
Thu 07/Sep/2017 09:27:51
Freq Frequency(GHz)
FCC_eH FCC OET 65 Supplement C (June 2001) Limits for Head Epsilon
FCC_sH FCC OET 65 Supplement C (June 2001) Limits for Head Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM
****

Freq	FCC_eH	FCC_sH	Test_e	Test_s
0.3500	44.70	0.87	47.22	0.80
0.3600	44.58	0.87	47.04	0.80
0.3700	44.46	0.87	46.87	0.80
0.3800	44.34	0.87	46.52	0.81
0.3900	44.22	0.87	46.82	0.82
0.4000	44.10	0.87	45.76	0.83
0.4100	43.98	0.87	45.46	0.85
0.4200	43.86	0.87	45.83	0.84
0.4300	43.74	0.87	45.23	0.86
0.4400	43.62	0.87	44.76	0.88
0.4500	43.50	0.87	44.56	0.89
0.4600	43.45	0.87	44.81	0.89
0.4700	43.40	0.87	44.92	0.89
0.4800	43.34	0.87	43.75	0.90
0.4900	43.29	0.87	43.77	0.90
0.5000	43.24	0.87	43.63	0.91
0.5100	43.19	0.87	43.59	0.92
0.5200	43.14	0.88	43.05	0.93
0.5300	43.08	0.88	42.73	0.94
0.5400	43.03	0.88	42.49	0.93
0.5500	42.98	0.88	42.29	0.96

FLUID DIELECTRIC PARAMETERS

Date:	7 Sep 2017	Fluid Temp:	21	Frequency:	450MHz	Tissue:	Head
Freq (MHz)		Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
350.0000		47.2200	0.8000	44.7000	0.87	5.64%	-8.05%
360.0000		47.0400	0.8000	44.5800	0.87	5.52%	-8.05%
370.0000		46.8700	0.8000	44.4600	0.87	5.42%	-8.05%
378.0000	*	46.5900	0.8080	44.3640	0.87	5.02%	-7.13%
380.0000		46.5200	0.8100	44.3400	0.87	4.92%	-6.90%
390.0000		46.8200	0.8200	44.2200	0.87	5.88%	-5.75%
400.0000		45.7600	0.8300	44.1000	0.87	3.76%	-4.60%
406.0000	*	45.5800	0.8420	44.0280	0.87	3.53%	-3.22%
410.0000		45.4600	0.8500	43.9800	0.87	3.37%	-2.30%
420.0000		45.8300	0.8400	43.8600	0.87	4.49%	-3.45%
430.0000		45.2300	0.8600	43.7400	0.87	3.41%	-1.15%
440.0000		44.7600	0.8800	43.6200	0.87	2.61%	1.15%
450.0000		44.5600	0.8900	43.5000	0.87	2.44%	2.30%
460.0000		44.8100	0.8900	43.4500	0.87	3.13%	2.30%
470.0000		44.9200	0.8900	43.4000	0.87	3.50%	2.30%
480.0000		43.7500	0.9000	43.3400	0.87	0.95%	3.45%
490.0000		43.7700	0.9000	43.2900	0.87	1.11%	3.45%
500.0000		43.6300	0.9100	43.2400	0.87	0.90%	4.60%
510.0000		43.5900	0.9200	43.1900	0.87	0.93%	5.75%
520.0000		43.0500	0.9300	43.1400	0.88	-0.21%	5.68%
530.0000		42.7300	0.9400	43.0800	0.88	-0.81%	6.82%
540.0000		42.4900	0.9300	43.0300	0.88	-1.25%	5.68%
550.0000		42.2900	0.9600	42.9800	0.88	-1.61%	9.09%

*Channel Frequency Tested

Table 15.6 Fluid Dielectric Parameters 2450MHz BODY TSL

****
Aprel Laboratory
Test Result for UIM Dielectric Parameter
Mon 11/Sep/2017 13:44:13
Freq Frequency(GHz)
FCC_eH FCC Bulletin 65 Supplement C (June 2001) Limits for Head Epsilon
FCC_sH FCC Bulletin 65 Supplement C (June 2001) Limits for Head Sigma
FCC_eB FCC Limits for Body Epsilon
FCC_sB FCC 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	49.94	1.82
2.3600	52.82	1.86	50.13	1.86
2.3700	52.81	1.87	50.00	1.84
2.3800	52.79	1.88	49.83	1.86
2.3900	52.78	1.89	49.70	1.88
2.4000	52.77	1.90	49.82	1.89
2.4100	52.75	1.91	49.69	1.90
2.4200	52.74	1.92	49.59	1.92
2.4300	52.73	1.93	49.71	1.92
2.4400	52.71	1.94	49.34	1.98
2.4500	52.70	1.95	49.50	1.97
2.4600	52.69	1.96	49.47	2.00
2.4700	52.67	1.98	49.48	2.00
2.4800	52.66	1.99	49.54	1.98
2.4900	52.65	2.01	49.39	2.02
2.5000	52.64	2.02	49.25	2.04
2.5100	52.62	2.04	49.29	2.04
2.5200	52.61	2.05	49.35	2.07
2.5300	52.60	2.06	49.29	2.09
2.5400	52.59	2.08	49.31	2.10
2.5500	52.57	2.09	49.28	2.11

FLUID DIELECTRIC PARAMETERS

Date:	11 Sep 2017	Fluid Temp:	23.1	Frequency:	2450MHz	Tissue:	Body

Freq (MHz)		Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
2350.0000		49.9400	1.8200	52.8300	1.85	-5.47%	-1.62%
2360.0000		50.1300	1.8600	52.8200	1.86	-5.09%	0.00%
2370.0000		50.0000	1.8400	52.8100	1.87	-5.32%	-1.60%
2380.0000		49.8300	1.8600	52.7900	1.88	-5.61%	-1.06%
2390.0000		49.7000	1.8800	52.7800	1.89	-5.84%	-0.53%
2400.0000		49.8200	1.8900	52.7700	1.90	-5.59%	-0.53%
2410.0000		49.6900	1.9000	52.7500	1.91	-5.80%	-0.52%
2420.0000		49.5900	1.9200	52.7400	1.92	-5.97%	0.00%
2430.0000		49.7100	1.9200	52.7300	1.93	-5.73%	-0.52%
2440.0000		49.3400	1.9800	52.7100	1.94	-6.39%	2.06%
2450.0000		49.5000	1.9700	52.7000	1.95	-6.07%	1.03%
2460.0000		49.4700	2.0000	52.6900	1.96	-6.11%	2.04%
2470.0000		49.4800	2.0000	52.6700	1.98	-6.06%	1.01%
2480.0000		49.5400	1.9800	52.6600	1.99	-5.92%	-0.50%
2490.0000		49.3900	2.0200	52.6500	2.01	-6.19%	0.50%
2500.0000		49.2500	2.0400	52.6400	2.02	-6.44%	0.99%
2510.0000		49.2900	2.0400	52.6200	2.04	-6.33%	0.00%
2520.0000		49.3500	2.0700	52.6100	2.05	-6.20%	0.98%
2530.0000		49.2900	2.0900	52.6000	2.06	-6.29%	1.46%
2540.0000		49.3100	2.1000	52.5900	2.08	-6.24%	0.96%
2550.0000		49.2800	2.1100	52.5700	2.09	-6.26%	0.96%

*Channel Frequency Tested

Table 15.7 Fluid Dielectric Parameters 5250MHz BODY TSL

Aprel Laboratory

Test Result for UIM Dielectric Parameter
Wed 13/Sep/2017 14:13:43
Freq Frequency(GHz)
FCC_eH FCC Bulletin 65 Supplement C (June 2001) Limits for Head Epsilon
FCC_sH FCC Bulletin 65 Supplement C (June 2001) Limits for Head Sigma
FCC_eB FCC Limits for Body Epsilon
FCC_sB FCC Limits for Body Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM
****

Freq	FCC_eB	FCC_sB	Test_e	Test_s
5.1500	49.08	5.24	48.11	5.64
5.1600	49.07	5.25	48.59	5.66
5.1700	49.06	5.26	48.33	5.72
5.1800	49.04	5.28	48.41	5.66
5.1900	49.03	5.29	48.14	5.73
5.2000	49.01	5.30	48.38	5.70
5.2100	49.00	5.31	48.03	5.72
5.2200	48.99	5.32	48.17	5.71
5.2300	48.97	5.33	48.41	5.71
5.2400	48.96	5.35	48.09	5.81
5.2500	48.95	5.36	48.06	5.73
5.2600	48.93	5.37	48.01	5.85
5.2700	48.92	5.38	48.16	5.85
5.2800	48.91	5.39	47.95	5.86
5.2900	48.89	5.40	48.01	5.92
5.3000	48.88	5.42	47.92	5.82
5.3100	48.87	5.43	47.91	5.94
5.3200	48.85	5.44	47.71	5.93
5.3300	48.84	5.45	47.66	5.91
5.3400	48.82	5.46	47.71	5.96
5.3500	48.81	5.47	47.95	5.94

FLUID DIELECTRIC PARAMETERS

Date:	13 Sep 2017	Fluid Temp:	23	Frequency:	5250MHz	Tissue:	Body
Freq (MHz)		Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
5150.0000		48.1100	5.6400	49.0800	5.24	-1.98%	7.63%
5160.0000		48.5900	5.6600	49.0700	5.25	-0.98%	7.81%
5170.0000		48.3300	5.7200	49.0600	5.26	-1.49%	8.75%
5180.0000		48.4100	5.6600	49.0400	5.28	-1.28%	7.20%
5190.0000		48.1400	5.7300	49.0300	5.29	-1.82%	8.32%
5200.0000		48.3800	5.7000	49.0100	5.30	-1.29%	7.55%
5210.0000		48.0300	5.7200	49.0000	5.31	-1.98%	7.72%
5220.0000		48.1700	5.7100	48.9900	5.32	-1.67%	7.33%
5230.0000		48.4100	5.7100	48.9700	5.33	-1.14%	7.13%
5240.0000		48.0900	5.8100	48.9600	5.35	-1.78%	8.60%
5250.0000		48.0600	5.7300	48.9500	5.36	-1.82%	6.90%
5260.0000		48.0100	5.8500	48.9300	5.37	-1.88%	8.94%
5270.0000		48.1600	5.8500	48.9200	5.38	-1.55%	8.74%
5280.0000		47.9500	5.8600	48.9100	5.39	-1.96%	8.72%
5290.0000		48.0100	5.9200	48.8900	5.40	-1.80%	9.63%
5300.0000		47.9200	5.8200	48.8800	5.42	-1.96%	7.38%
5310.0000		47.9100	5.9400	48.8700	5.43	-1.96%	9.39%
5320.0000		47.7100	5.9300	48.8500	5.44	-2.33%	9.01%
5330.0000		47.6600	5.9100	48.8400	5.45	-2.42%	8.44%
5340.0000		47.7100	5.9600	48.8200	5.46	-2.27%	9.16%
5350.0000		47.9500	5.9400	48.8100	5.47	-1.76%	8.59%

*Channel Frequency Tested

16.0 SYSTEM VERIFICATION TEST RESULTS

Table 16.0 System Verification Results 450MHz BODY TSL

System Verification Test Results					
Date		Frequency (MHz)	Validation Source		
			P/N		S/N
06 Sep 2017		450	D450V3		1068
Fluid Type	Fluid Temp °C	Ambient Temp °C	Ambient Humidity (%)	Forward Power (mW)	Source Spacing (mm)
Body	22.6	26	32%	250	15
Fluid Parameters					
Permittivity			Conductivity		
Measured	Target	Deviation	Measured	Target	Deviation
53.76	56.70	-5.19%	0.94	0.94	0.00%
Measured SAR					
1 gram			10 gram		
Measured	Target	Deviation	Measured	Target	Deviation
1.04	1.12	-7.14%	0.69	0.74	-6.22%
Measured SAR Normalized to 1.0W					
1 gram			10 gram		
Normalized	Target	Deviation	Normalized	Target	Deviation
4.16	4.42	-5.88%	2.78	2.92	-4.79%

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.

Table 16.1 System Verification Results 450MHz HEAD TSL

System Verification Test Results					
Date		Frequency (MHz)	Validation Source		
			P/N		S/N
07 Sep 2017		450	D450V3		1068
Fluid Type	Fluid Temp °C	Ambient Temp °C	Ambient Humidity (%)	Forward Power (mW)	Source Spacing (mm)
Head	21.0	25	30%	250	15
Fluid Parameters					
Permittivity			Conductivity		
Measured	Target	Deviation	Measured	Target	Deviation
44.56	43.50	2.44%	0.89	0.87	2.30%
Measured SAR					
1 gram			10 gram		
Measured	Target	Deviation	Measured	Target	Deviation
1.06	1.16	-8.62%	0.72	0.78	-7.82%
Measured SAR Normalized to 1.0W					
1 gram			10 gram		
Normalized	Target	Deviation	Normalized	Target	Deviation
4.24	4.49	-5.57%	2.88	3.02	-4.64%

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.

Table 16.2 System Verification Results 2450MHz BODY TSL

System Verification Test Results					
Date		Frequency (MHz)	Validation Source		
			P/N		S/N
12 Sep 2017		2450	D2450V2		825
Fluid Type	Fluid Temp °C	Ambient Temp °C	Ambient Humidity (%)	Forward Power (mW)	Source Spacing (mm)
Body	23.3	27	33%	250	10
Fluid Parameters					
Permittivity			Conductivity		
Measured	Target	Deviation	Measured	Target	Deviation
49.50	52.70	-6.07%	1.97	1.95	1.03%
Measured SAR					
1 gram			10 gram		
Measured	Target	Deviation	Measured	Target	Deviation
12.40	13.00	-4.62%	5.64	6.05	-6.78%
Measured SAR Normalized to 1.0W					
1 gram			10 gram		
Normalized	Target	Deviation	Normalized	Target	Deviation
49.60	50.70	-2.17%	22.56	23.80	-5.21%

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.

Table 16.3 System Verification Results 5250MHz BODY TSL

System Verification Test Results					
Date		Frequency (MHz)	Validation Source		
			P/N		S/N
13 Sep 2017		5250	D5GHzV2		1031
Fluid Type	Fluid Temp °C	Ambient Temp °C	Ambient Humidity (%)	Forward Power (mW)	Source Spacing (mm)
Body	23.0	28	32%	100	10
Fluid Parameters					
Permittivity			Conductivity		
Measured	Target	Deviation	Measured	Target	Deviation
48.06	48.95	-1.82%	5.73	5.36	6.90%
Measured SAR					
1 gram			10 gram		
Measured	Target	Deviation	Measured	Target	Deviation
7.10	7.26	-2.20%	1.96	2.04	-3.92%
Measured SAR Normalized to 1.0W					
1 gram			10 gram		
Normalized	Target	Deviation	Normalized	Target	Deviation
71.00	72.20	-1.66%	19.60	20.30	-3.45%

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.

17.0 MEASUREMENT SYSTEM SPECIFICATIONS

Table 17.0 Measurement System Specifications

Measurement System Specification	
Specifications	
Positioner	Stäubli Unimation Corp. Robot Model: RX60L
Repeatability	0.02 mm
No. of axis	6
Data Acquisition Electronic (DAE) System	
Cell Controller	
Processor	AMD Athlon XP 2400+
Clock Speed	2.0 GHz
Operating System	Windows XP Professional
Data Converter	
Features	Signal Amplifier, multiplexer, A/D converter, and control logic
Software	Measurement Software: DASY
	Postprocessing Software: SEMCAD, V1.8 Build 186
Connecting Lines	Optical downlink for data and status info., Optical uplink for commands and clock
DASY Measurement Server	
Function	Real-time data evaluation for field measurements and surface detection
Hardware	PC/104 166MHz Pentium CPU; 32 MB chipdisk; 64 MB RAM
Connections	COM1, COM2, DAE, Robot, Ethernet, Service Interface
E-Field Probe	
Model	EX3DV4
Serial No.	3600
Construction	Triangular core fiber optic detection system
Frequency	10 MHz to 6 GHz
Linearity	±0.2 dB (30 MHz to 3 GHz)
Phantom	
Type	SAM
Shell Material	Fiberglass
Thickness	2mm +/- .2mm
Volume	> 30 Liter

Measurement System Specification

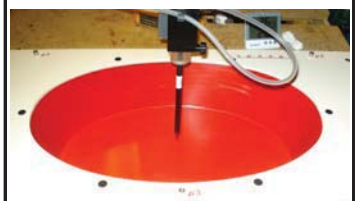
Probe Specification

Construction:	Symmetrical design with triangular core; Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, glycol)
Calibration:	In air from 10 MHz to 2.5 GHz In head simulating tissue at frequencies of 900 MHz and 1.8 GHz (accuracy ± 8%)
Frequency:	10 MHz to > 6 GHz; Linearity: ± 0.2 dB (30 MHz to 3 GHz)
Directivity:	± 0.2 dB in head tissue (rotation around probe axis) ± 0.4 dB in head tissue (rotation normal to probe axis)
Dynamic Range:	5 μW/g to > 100 mW/g; Linearity: ± 0.2 dB
Surface Detect:	± 0.2 mm repeatability in air and clear liquids over diffuse reflecting surfaces
Dimensions:	Overall length: 330 mm; Tip length: 16 mm; Body diameter: 12 mm; Tip diameter: 6.8 mm Distance from probe tip to dipole centers: 2.7 mm
Application:	General dosimetry up to 3 GHz; Compliance tests of mobile phone

EX3DV4 E-Field Probe

Phantom Specification

The SAM V5.0 phantom is an elliptical planar fiberglass shell phantom with a shell thickness of 2.0mm +/- .2mm at the planar area. This phantom conforms to OET Bulletin 65, Supplement C, IEEE 1528-2013, IEC 62209-1 and IEC 62209-2.



ELI Phantom

Device Positioner Specification

The DASY device positioner has two scales for device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear openings). The plane between the ear openings and the mouth tip has a rotation angle of 65^{O}. The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections.

Device Positioner

18.0 TEST EQUIPMENT LIST

Table 18.0 Equipment List and Calibration

Test Equipment List				
DESCRIPTION	ASSET NO.	SERIAL NO.	DATE CALIBRATED	CALIBRATION INTERVAL
Schmid & Partner DASY System	-	-	-	-
-DASY Measurement Server	158	1078	CNR	CNR
-Robot	46	599396-01	CNR	CNR
-DAE4	19	353	24-Apr-17	Annual
-EX3DV4 E-Field Probe	213	3600	27-Apr-17	Annual
-CLA150 Validation Source	251	4007	27-Apr-17	Triennial
-D835V2 Validation Dipole	217	4D075	23-Apr-15	Triennial
-D450V3 Validation Dipole	221	1068	21-Apr-15	Triennial
-D2450V2 Validation Dipole	25	825	23-Apr-15	Triennial
-D5GHzV2 Validation Dipole	126	1031	20-Apr-15	Triennial
ELI Phantom	247	-	CNR	CNR
HP 85070C Dielectric Probe Kit	33	none	CNR	CNR
Gigatronics 8652A Power Meter	110	1835801	29-Feb-16	Triennial
Gigatronics 80701A Power Sensor	248	1833687	29-Feb-16	Triennial
HP 8753ET Network Analyzer	134	US39170292	22-Oct-14	Triennial
Generator	6	100104	29-May-17	Triennial
Amplifier	106	26235	CNR	CNR

CNR = Calibration Not Required

19.0 FLUID COMPOSITION

Table 19.0 Fluid Composition 450MHz HEAD TSL

450			450MHz Head	
Tissue Simulating Liquid (TSL) Composition				
Component by Percent Weight				
Water	Sugar	Salt(1)	HEC(2)	Bacteriacide(3)
38.56	56.32	3.95	0.98	0.19

(1) Non-Iodinized
(2) **H**ydroxy**E**thyl-**C**ellulose: Sigma-Aldrich P/N 54290-500g
(3) Dow Chemical Dowicil 75 Antimicrobial Perservative

Table 19.1 Fluid Composition 450MHz BODY TSL

450			450MHz Body	
Tissue Simulating Liquid (TSL) Composition				
Component by Percent Weight				
Water	Sugar	Salt(1)	HEC(2)	Bacteriacide(3)
52.0	45.65	1.75	0.5	0.1

(1) Non-Iodinized
(2) **H**ydroxy**E**thyl-**C**ellulose: Sigma-Aldrich P/N 54290-500g
(3) Dow Chemical Dowicil 75 Antimicrobial Perservative

Table 19.2 Fluid Composition 2450MHz BODY TSL

2450			2450MHz Body	
Tissue Simulating Liquid (TSL) Composition				
Component by Percent Weight				
Water	Glycol	Salt(1)	HEC(2)	Bacteriacide(3)
69.98	30.0	0.02	0.0	0.0

(1) Non-Iodinized
(2) **H**ydroxy**E**thyl-**C**ellulose: Sigma-Aldrich P/N 54290-500g
(3) Dow Chemical Dowicil 75 Antimicrobial Perservative

Table 19.3 Fluid Composition 5250MHz BODY TSL

This is a proprietary composition by SPEAG.

