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SAR Test Report

Report Number: M170217F

Test Sample:	Lone Worker Personal Safety Monitoring Transmitter HMN: G7C
FCC ID:	XPY1CGM5NNN
IC:	8595A-1CGM5NNN
Tested for:	Blackline Safety Corp.
Date of Issue:	6th June 2017

Table 1

Table of Revisions				
Report Number	Revision Number	Description	Pages affected	Date
M170217F	1	Original	N/A	20th March 2017
M170217F	2	RSS 102 rev. added	5 and 12	4th April 2017
M170217F	3	KDB versions updated, Conducted power re-measured and tune-up table updated, Liquid parameters table added,	4, 5 to 10, 19 to 27	11th May 2017
M170217F	4	Statement of liquid parameters changed. Paragraph 5.3 Liquid parameters screenshots added.	12 22 to 34	22th May 2017
M170217F	5	Model no updated Liquid limits corrected	1 21 and 23	30th May 2017
M170217F	6	Model no updated 850 MHz UMTS Band SAR value corrected	1 4	6th June 2017

CONTENTS

SAR TEST REPORT
Report Number: M170217F
FCC ID: XPY1CGM5NNN IC: 8595A-1CGM5NNN

1.0 GENERAL INFORMATION

Test Sample:	Lone Worker Personal Safety Monitoring Transmiter
Device Category:	Portable Transmitter
Test Device:	Pre-Production Unit
Model:	HMN: G7C
IMEI:	35752007009007701
Software Version No.:	3.300 A12 LGC
Hardware Version No.:	5
FCC ID:	XPY1CGM5NNN
IC:	8595A-1CGM5NNN
RF exposure Category:	General Population/Uncontrolled
Manufacturer:	Blackline Safety Corp.

FCC KDB Procedures:

1. 447498 D01 General RF Exposure Guidance v06
   941225 D01 3G SAR Procedures v03r01
   865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
   865664 D02 RF Exposure Reporting v01r02

Test Standard/s:

2. Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands) RSS-102, Issue 5, March 2015
3. **EN 62209-2:2010**
   Human exposure to radio frequency fields from hand-held and bodymounted wireless communication devices. Human models, instrumentation, and procedures.
   Part 2: Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)
4. **IEEE 1528: 2013**
   Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head Due to Wireless Communications Devices: Measurement Techniques.

Statement Of Compliance: The Blackline Safety Lone Worker WWAN Transmitter HMN: G7C complied with the FCC General public/uncontrolled RF exposure limits of 1.6mW/g per requirements of 47CFR2.1093(d). It also complied with ISED RSS-102 requirements.

Highest Reported SAR: 850 MHz GSM Band - 1.189 mW/g; 1900 MHz GSM Band – 0.515/g
850 MHz UMTS Band - 1.105 mW/g; 1900 MHz UMTS Band - 1.194 mW/g

Test Dates: 8th to 16th March 2017

Test Officer:

Peter Jakubiec

Authorised Signature:

Chris Zombolas
Technical Director

SAR TEST REPORT
Lone Worker Personal Safety Monitoring Transmiter
Model: HMN: G7C
Report Number: M170217F

2.0 INTRODUCTION

Testing was performed on the Blackline Safety Personal Safety Monitoring Transmiter, Model: HMN: G7C . It will be referred to as the DUT throughout this report.

Table 2

Applicable Head Configurations	: In Front of the Face (10mm Spacing)
Applicable Body Configurations	: Belt Clip

3.0 TEST SAMPLE TECHNICAL INFORMATION (INFORMATION SUPPLIED BY THE CLIENT)

3.1 WWAN Details

Wireless Module: WWAN (GSM/UMTS)
Model Number: SARA-U201
Manufacturer: u-blox AG
Modulation Type: TDMA for GSM/GPRS
QPSK and QAM for UMTS
GSM Frequency Bands: 850/1900
UMTS Frequency Bands: 850/1900
Antenna type: Internal Flex
Antenna Manufacturer: Blackline
Antenna Part Number: 101958
Output Power: 33 (+1.5, -2) dBm in 850 MHz GSM
30 (+1.5, -2) dBm in 1900 MHz GSM
24 (+1.5, -3) dBm in UMTS bands

Test Signal, Frequency and Output Power

The DUT was provided by Blackline Safety Australia Pty Ltd. It was put into operation using a Rohde & Schwarz Radio Communication Tester CMU200. The channels utilised in the measurements were the traffic channels shown in the table below. The power level was set to Class 4 for 850 MHz and Class 1 for 1900 MHz GSM bands, class 3 for 850, and 1900 MHz UMTS bands.

Channels and Output power:

Table 3

Channel and Mode	Frequency MHz	Average Output Power dBm
GPRS Mode		
Channels 128, 190 and 251	824.2, 836.6 and 848.8	33 (+1.5, -2)
Channels 512, 661 and 810	1850.2, 1880 and1909.8	30 (+1.5, -2)
EGPRS Mode		
Channels 128, 190 and 251	824.2, 836.6 and 848.8	27 (+1.5, -2)
Channels 512, 661 and 810	1850.2, 1880 and1909.8	26 (+1.5, -2)
UMTS Mode		
Channels 4132, 4183 and 4233	826.4, 836.6 and 846.6	24 (+1.5, -3)
Channels 9262, 9400 and 9538	1852.4, 1880 and 1907.6	24 (+1.5, -3)

Test sample Accessories

3.3.1 Battery Types

One type of Narada Lithium Poly battery is used to power the DUT.

Standard Battery

Model	NLP503759H1
V/mAh	3.7V/1100mAh

4.0 TEST SIGNAL, FREQUENCY AND OUTPUT POWER

For the SAR measurements the DUT was operating at full transmit power. The fixed frequency channels used in the testing are shown in Table Below.

The frequency span of the GSM, and UMTS bands was more than 10MHz consequently; the SAR levels of the test sample were measured for lowest, centre and highest channels in the applicable modes. There were no wires or other connections to the DUT during the SAR measurements.
At the beginning of the SAR tests, the conducted power of the DUT was measured after temporary modification of antenna connector inside the DUT's TX RX compartment. Measurements were performed with a calibrated Power Meter. The results of this measurement are listed in tables below. Burst Average power was used to calculate the Frame Average power (100% Duty Cycle) which determines the worst case Multislot Class.

Table: Frequency and Conducted Power Results

Table 4

Coding Scheme	GPRS Multislot Class	RF Channel	Measured Power Burst Average (dBm)	Calculated Power Frame Average (100% Duty Cycle) (dBm)
N/A	N/A (Voice)	128	**32.97**	23.78
N/A	N/A (Voice)	190	32.53	23.34
N/A	N/A (Voice)	251	32.55	23.36
Coding Scheme	**GPRS Multislot Class**	**RF Channel**	**Measured Power Burst Average (dBm)**	**Calculated Power Frame Average (100% Duty Cycle) (dBm)**
CS1	8	128	**32.63**	23.44
CS1	8	190	32.57	23.38
CS1	8	251	32.59	23.40
CS1	10	128	N/A	N/A
CS1	10	190	N/A	N/A
CS1	10	251	N/A	N/A
CS1	11	128	N/A	N/A
CS1	11	190	N/A	N/A
CS1	11	251	N/A	N/A
CS1	12	128	N/A	N/A
CS1	12	190	N/A	N/A
CS1	12	251	N/A	N/A

Table 5

Coding Scheme	EGPRS Multislot Class	RF Channel	Measured Power Burst Average (dBm)	Calculated Power Frame Average (100% Duty Cycle) (dBm)
MCS5	8	128	27.23	18.04
MCS5	8	190	27.22	18.03
MCS5	8	251	27.21	18.02
MCS5	10	128	N/A	N/A
MCS5	10	190	N/A	N/A
MCS5	10	251	N/A	N/A
MCS5	11	128	N/A	N/A
MCS5	11	190	N/A	N/A
MCS5	11	251	N/A	N/A
MCS5	12	128	N/A	N/A
MCS5	12	190	N/A	N/A
MCS5	12	251	N/A	N/A

*DUT has no GPRS/EGPRS Multislot Class 10, 11 and 12 capabilities

Table 6

Coding Scheme	GPRS Multislot Class	RF Channel	Measured Power Burst Average (dBm)	Calculated Power Frame Average (100% Duty Cycle) (dBm)
N/A	N/A (Voice)	512	29.57	20.38
N/A	N/A (Voice)	661	29.73	20.54
N/A	N/A (Voice)	810	**29.83**	20.64
Coding Scheme	**GPRS Multislot Class**	**RF Channel**	**Measured Power Burst Average (dBm)**	**Calculated Power Frame Average (100% Duty Cycle) (dBm)**
CS1	8	512	29.55	20.36
CS1	8	661	29.71	20.52
CS1	8	810	**29.85**	20.66
CS1	10	512	N/A	N/A
CS1	10	661	N/A	N/A
CS1	10	810	N/A	N/A
CS1	11	512	N/A	N/A
CS1	11	661	N/A	N/A
CS1	11	810	N/A	N/A
CS1	12	512	N/A	N/A
CS1	12	661	N/A	N/A
CS1	12	810	N/A	N/A

Table 7

Coding Scheme	EGPRS Multislot Class	RF Channel	Measured Power Burst Average (dBm)	Calculated Power Frame Average (100% Duty Cycle) (dBm)
MCS5	8	512	25.93	16.74
MCS5	8	661	25.99	16.80
MCS5	8	810	26.18	16.99
MCS5	10	512	N/A	N/A
MCS5	10	661	N/A	N/A
MCS5	10	810	N/A	N/A
MCS5	11	512	N/A	N/A
MCS5	11	661	N/A	N/A
MCS5	11	810	N/A	N/A
MCS5	12	512	N/A	N/A
MCS5	12	661	N/A	N/A
MCS5	12	810	N/A	N/A

*DUT has no GPRS/EGPRS Multislot Class 10, 11 and 12 capabilities

Conducted Power Measurement UMTS 850 MHz

Configuration:
12.2 kbps RMC
Test Loop Mode 1
βc = 8, βd = 15 (3GPP default)
TPC (Transmit Power Control) = All 1s

Table 8

Channel No.	βc	βd	Result (dBm)
4132	8	15	**24.63**
4183	8	15	24.57
4233	8	15	24.39

Conducted Power Measurement UMTS + HSDPA 850 MHz

Configuration:
Device HSDPA Category 6 (Downlink 3.6 Mbps and Uplink 384 kbps)
H-Set = 1
QPSK in H-Set (1)
CQI Fidback Cycle = 4ms; CQI Repetition Rate = 2ms

Table 9

Sub Test No.	βc	βd	ΔAKN	ΔNAKN	ΔCQI	Result (dBm)			MPR (dB)
						4132	4183	4233	
1	2	15	8	8	8	24.57	24.54	24.36	0.0
2	12	15	8	8	8	24.26	24.27	24.08	0.0
3	15	8	8	8	8	23.97	23.97	23.3	0.5
4	15	4	8	8	8	23.85	23.71	23.58	0.5

Conducted Power Measurement UMTS + HSDPA + HSUPA 850 MHz

Configuration:
Device HSUPA Release 6 (5.7 Mbps)
RMC 12.2 kbps + HSPA 34.108 with loop mode 1
HS-DPCCH, E-DPCCH, E-DPDCH Enabled
DPCH Channel Code {βd (SF)} = 64
Power Control – TPC algorithm 2
3GPP default HS-DPCCH power offset parameters Δ_{AKN} = 5; Δ_{NAKN} = 5; Δ_{CQI} = 2
E-TFCI table index = 0
E-DCH minimum set E-TFCI = 9
PLnon-max = 0.84
Maximum Channelisation Code {βed (SF) and βed (codes)} – Subtests 1,2,4,5 = SF4; Subtest 3 = 2xSF4
Initial Serving Grant Value = Off
Δ HARQ =0
Number of Ref.E-TFCIs – Subtests 1,2,4,5 = 5; Subtest 3 = 2
Set1 Patern Type = Closed Loop

Table 10

Sub Test	βc	βd	Δ AKN	Δ NAKN	Δ CQI	Δ E-DPCCH	βed (SF)	βed (codes)	AG Index	Result (dBm)			MPR (dB)
										4132	4183	4233	
1	10	15	8	8	8	6	4	1	20	23.79	23.65	23.53	0.0
2	6	15	8	8	8	8	4	1	12	21.74	21.72	21.57	2.0
3	15	9	8	8	8	8	4	2	15	22.77	22.73	22.55	1.0
4	2	15	8	8	8	5	4	1	17	21.75	21.89	21.81	2.0
5	15	15	8	8	8	7	4	1	21	23.79	23.74	23.58	0.0

HSPA+: Since the modem is only capable of Cat 6 UL 5.76 Mb/s, the uplink Category and release is same as HSUPA, i.e., CAT 6 Rel 6

Conducted Power Measurement UMTS 1900 MHz
Configuration:
12.2 kbps RMC
Test Loop Mode 1
βc = 8, βd = 15 (3GPP default)
TPC (Transmit Power Control) = All 1s

Table 11

Channel No.	βc	βd	Result (dBm)
9262	8	15	24.35
9400	8	15	24.61
9538	8	15	**24.77**

Conducted Power Measurement UMTS + HSDPA 1900 MHz

Configuration:
Device HSDPA Category 6 (Downlink 3.6 Mbps and Uplink 384 kbps)
H-Set = 1
QPSK in H-Set (1)
CQI Fidback Cycle = 4ms; CQI Repetition Rate = 2ms
3GPP default HS-DPCCH power offset parameters Δ_{AKN} = 5; Δ_{NAKN} = 5; Δ_{CQI} = 2

Table 12

Sub Test No.	βc	βd	ΔAKN	ΔNAKN	ΔCQI	Result (dBm)			MPR (dB)
						9262	9400	9538	
1	2	15	8	8	8	24.27	24.51	24.58	0.0
2	12	15	8	8	8	23.99	24.17	24.45	0.0
3	15	8	8	8	8	23.75	24.06	24.02	0.5
4	15	4	8	8	8	23.65	23.84	23.86	0.5

Conducted Power Measurement UMTS + HSDPA + HSUPA 1900 MHz

Configuration:
Device HSUPA Release 6 (5.7 Mbps)
RMC 12.2 kbps + HSPA 34.108 with loop mode 1
HS-DPCCH, E-DPCCH, E-DPDCH Enabled
DPCH Channel Code {βd (SF)} = 64
Power Control – TPC algorithm 2
3GPP default HS-DPCCH power offset parameters Δ_{AKN} = 5; Δ_{NAKN} = 5; Δ_{CQI} = 2
E-TFCI table index = 0
E-DCH minimum set E-TFCI = 9
PLnon-max = 0.84
Maximum Channelisation Code {βed (SF) and βed (codes)} – Subtests 1,2,4,5 = SF4; Subtest 3 = 2xSF4
Initial Serving Grant Value = Off
Δ HARQ =0
Number of Ref.E-TFCIs – Subtests 1,2,4,5 = 5; Subtest 3 = 2
Set1 Patern Type = Closed Loop

Table 13

Sub Test	βc	βd	Δ AKN	Δ NAKN	Δ CQI	Δ E-DPCCH	βed (SF)	βed (codes)	AG Index	Result (dBm)			MPR (dB)
										9262	9400	9538	
1	10	15	8	8	8	6	4	1	20	23.53	23.79	23.83	0.0
2	6	15	8	8	8	8	4	1	12	21.21	21.75	21.73	2.0
3	15	9	8	8	8	8	4	2	15	22.17	22.73	22.78	1.0
4	2	15	8	8	8	5	4	1	17	21.63	21.27	21.30	2.0
5	15	15	8	8	8	7	4	1	21	23.53	24.31	23.82	0.0

HSPA+: Since the modem is only capable of Cat 6 UL 5.76 Mb/s, the uplink Category and release is same as HSUPA, i.e., CAT 6 Rel 6

4.1 Battery Status

The DUT battery was fully charged prior to commencement of measurement. The battery condition was monitored by measuring the RF field at a defined position inside the phantom before the commencement of each test and again after the completion of the test. It was not possible to perform conducted power measurements at the output of the DUT, at the beginning and end of each scan due to lack of a suitable antenna port. The uncertainty associated with the power drift was less than 5% and was assessed in the uncertainty budget.

5.0 DETAILS OF TEST LABORATORY

5.1 Location

EMC Technologies Pty Ltd
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5.2 Accreditations

EMC Technologies Pty. Ltd. is accredited by the National Association of Testing Authorities, Australia (NATA).
NATA Accredited Laboratory Number: 5292
Last assessed in February 2017, next scheduled assessment in June 2017

EMC Technologies Pty Ltd is NATA accredited for the following standards:

Table 14

AS/NZS 2772.2 2016:	Radiofrequency Fields. **Part 2:** Principles and methods of measurement and computation - 3kHz to 300 GHz.
ACMA:	Radiocommunications (Electromagnetic Radiation — Human Exposure) Standard 2014
EN 50360: 2001	Product standard to demonstrate the compliance of Mobile phones with the basic restrictions related to human exposure to electromagnetic fields (300 MHz – 3 GHz)
EN 62209-1:2006	Human Exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models instrumentation and procedures. **Part 1:** Procedure to determine the specific absorption rate (SAR) for hand-held devices used in close proximity to the ear (300 MHz to 3 GHz)
EN 62209-2:2010	Human Exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models instrumentation and procedures **Part 2:** Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz
IEEE 1528: 2013	Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head Due to Wireless Communications Devices: Measurement Techniques.
FCC Knowledge Database:	KDB measurement procedures publications
RSS-102:	Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands), Issue 5, March 2015

Refer to NATA website www.nata.asn.au for the full scope of accreditation.

5.3 Environmental Factors

The measurements were performed in a shielded room with no background RF signals. The temperature in the laboratory was controlled to within 21±1°C, the humidity was in the range 43% to 57%. The liquid parameters are measured daily prior to the commencement of each test. Tissue dielectric liquid parameters were measured within 24 hours before the start of testing. Tests were performed to check that reflections within the environment did not influence the SAR measurements. The noise floor of the DASY5 SAR measurement system using the SN1380 probe was less than 5μV in both air and liquid mediums.

6.0 CALIBRATION AND VERIFICATION PROCEDURES AND DATA

6.1 System Verification

6.1.1 Deviation from reference validation values

The following table lists the results of the System Verification. The forward power into the reference dipole for SAR System Verification was adjusted to 250 mW.

The reference SAR values are derived using a reference dipoles and flat section of the phantom suitable for the frequencies listed below. These reference SAR values are obtained from the IEEE Std 1528-2013 and are normalized to 1W.

The SPEAG calibration reference SAR value is the SAR validation result obtained in a specific dielectric liquid using the validation dipole during calibration. The measured one-gram SAR should be within 10% of the expected target reference values shown in table below.

Table 15

Frequency and Date	Measured SAR 1g (mW/g)	Measured SAR 1g (Normalized to 1W)	SPEAG Calibration reference SAR Value 1g (mW/g)	Deviation From SPEAG Reference 1g (%)	IEEE Std 1528 reference SAR value 1g (mW/g)	Deviation From IEEE 1g (%)	Last Validation Date
1950MHz 8th March 17	10.2	40.80	40.3	1.24	40.5	0.74	20-Jun-16
1950MHz 9th March 17	10.4	41.60	40.3	3.23	40.5	2.72	20-Jun-16
900MHz 10th March 17	2.6	10.40	10.6	-1.89	10.8	-3.70	17-Jun-16
900MHz 14th March 17	2.93	11.72	10.7	9.53	N/A	N/A	17-Jun-16
900MHz 15th March 17	2.89	11.56	10.7	8.04	N/A	N/A	17-Jun-16
1950MHz 16th March 17	9.93	39.72	38.2	3.98	N/A	N/A	20-Jun-16

NOTE: All reference validation values are referenced to 1W input power.

6.1.2 Liquid Temperature and Humidity

The humidity and dielectric/ambient temperatures were recorded during the assessment of the tissue material dielectric parameters. The difference between the ambient temperature of the liquid during the dielectric measurement and the temperature during tests was less than |2|°C.

Table: Temperature and Humidity recorded for each day

Table 16

Date	Ambient Temperature (°C)	Liquid Temperature (°C)	Humidity (%)
8th March 17	20.4	19.9	57
9th March 17	20.4	19.9	53
10th March 17	19.9	19.7	54
14th March 17	20.2	19.8	51
15th March 17	20.5	20.1	53
16th March 17	20.6	20.3	43

7.0 SAR MEASUREMENT PROCEDURE USING DASY5

The SAR evaluation was performed with the SPEAG DASY5 system. A summary of the procedure follows:

a) A measurement of the SAR value at a fixed location is used as a reference value for assessing the power drop of the DUT. The SAR at this point is measured at the start of the test, and then again at the end of the test.

b) The SAR distribution at the exposed flat section of the flat phantom is measured at a distance of 4.0 mm from the inner surface of the shell. The area covers the entire dimension of the DUT and the horizontal grid spacing is 15 mm x 15 mm. The actual largest Area Scan has dimensions of 105 mm x 180 mm surrounding the test device. Based on this data, the area of the maximum absorption is determined by Spline interpolation.

c) Around this point, a volume of 32 mm x 32 mm x 30 mm is assessed by measuring 5 x 5 x 7 points. On the basis of this data set, the spatial peak SAR value is evaluated with the following procedure:

(i) The data at the surface are extrapolated, since the centre of the dipoles is 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 4 mm. The extrapolation is based on a least square algorithm. A polynomial of the fourth order is calculated through the points in z-axes. This polynomial is then used to evaluate the points between the surface and the probe tip.

d)

(i) The maximum interpolated value is searched with a straightforward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1 g and 10 g) are computed using the 3D-Spline interpolation algorithm. The 3D-Spline is composed of three one-dimensional splines with the “Not a knot”- condition (in x, y and z-direction). The volume is integrated with the trapezoidal – algorithm. One thousand points (10 x 10 x 10) are interpolated to calculate the averages.

(ii) All neighbouring volumes are evaluated until no neighbouring volume with a higher average value is found.

(iv) The SAR value at the same location as in Step (a) is again measured to evaluate the actual power drift.

8.0 MEASUREMENT UNCERTAINTY

The uncertainty analysis is based on the template listed in the IEEE Std 1528-2013 for both Handset SAR tests and System Verification uncertainty. The measurement uncertainty of a specific device is evaluated independently and the total uncertainty for both evaluations (95% confidence level) must be less than 30%.

Table 17: Uncertainty Budget for DASY5 Version 52 (Build 1258) – DUT SAR

Error Description	Uncert. Value	Prob. Dist.	Div.	C_i (1g)	C_i (10g)	1g u_i	10g u_i	v_i
Measurement System								
Probe Calibration	6	N	1.00	1	1	6.00	6.00	∞
Axial Isotropy	4.7	R	1.73	0.7	0.7	1.90	1.90	∞
Hemispherical Isotropy	9.6	R	1.73	0.7	0.7	3.88	3.88	∞
Boundary Effects	1	R	1.73	1	1	0.58	0.58	∞
Linearity	4.7	R	1.73	1	1	2.71	2.71	∞
System Detection Limits	1	R	1.73	1	1	0.58	0.58	∞
Modulation response	2.4	R	1.73	1	1	1.39	1.39	∞
Readout Electronics	0.3	N	1.00	1	1	0.30	0.30	∞
Response Time	0.8	R	1.73	1	1	0.46	0.46	∞
Integration Time	2.6	R	1.73	1	1	1.50	1.50	∞
RF Ambient Noise	3	R	1.73	1	1	1.73	1.73	∞
RF Ambient Reflections	3	R	1.73	1	1	1.73	1.73	∞
Probe Positioner	0.4	R	1.73	1	1	0.23	0.23	∞
Probe Positioning	2.9	R	1.73	1	1	1.67	1.67	∞
Post Processing	2	R	1.73	1	1	1.15	1.15	∞
Test Sample Related								
Power Scaling	0	R	1.73	1	1	0.00	0.00	∞
Test Sample Positioning	2.9	N	1.00	1	1	2.90	2.90	145
Device Holder Uncertainty	3.6	N	1.00	1	1	3.60	3.60	5
Output Power Variation – SAR Drift Measurement	4.28	R	1.73	1	1	2.47	2.47	∞
Phantom and Setup								
Phantom Uncertainty	7.6	R	1.73	1	1	4.39	4.39	∞
Liquid Conductivity – Deviation from target values	5	R	1.73	0.64	0.43	1.85	1.24	∞
Liquid Permittivity – Deviation from target values	5	R	1.73	0.6	0.49	1.73	1.41	∞
Liquid Conductivity – Measurement uncertainty	2.5	N	1.00	0.64	0.71	1.60	1.78	∞
Liquid Permittivity – Measurement uncertainty	2.5	N	1.00	0.6	0.26	1.50	0.65	∞
Temp.unc. - Conductivity	3.4	R	1.73	0.78	0.71	0.77	0.70	∞
Temp. unc. - Permittivity	0.4	R	1.73	0.23	0.26	0.04	0.05	∞
Combined standard Uncertainty (u_c)						11.66	11.48	
Expanded Uncertainty (95% CONFIDENCE LEVEL)			k= 2			23.32	22.95	

Estimated total measurement uncertainty for the DASY5 measurement system was ±11.66%. The expanded uncertainty (K = 2) was assessed to be ±23.32% based on 95% confidence level. The uncertainty is not added to the measurement result.

Table 18: **Uncertainty Budget IEC 62209-2 (RSS-102) for DASY5 Version 52 (Build 1258) – DUT SAR**

Error Description	Uncert. Value	Prob. Dist.	Div.	C_i (1g)	C_i (10g)	1g u_i	10g u_i	v_i
Measurement System								
Probe Calibration	6	N	1.00	1	1	6.00	6.00	∞
Axial Isotropy	4.7	R	1.73	0.7	0.7	1.90	1.90	∞
Hemispherical Isotropy	9.6	R	1.73	0.7	0.7	3.88	3.88	∞
Boundary Effects	1	R	1.73	1	1	0.58	0.58	∞
Linearity	4.7	R	1.73	1	1	2.71	2.71	∞
System Detection Limits	1	R	1.73	1	1	0.58	0.58	∞
Modulation response	2.4	R	1.73	1	1	1.39	1.39	∞
Readout Electronics	0.3	N	1.00	1	1	0.30	0.30	∞
Response Time	0.8	R	1.73	1	1	0.46	0.46	∞
Integration Time	2.6	R	1.73	1	1	1.50	1.50	∞
RF Ambient Noise	3	R	1.73	1	1	1.73	1.73	∞
RF Ambient Reflections	3	R	1.73	1	1	1.73	1.73	∞
Probe Positioner	0.4	R	1.73	1	1	0.23	0.23	∞
Probe Positioning	2.9	R	1.73	1	1	1.67	1.67	∞
Post Processing	2	R	1.73	1	1	1.15	1.15	∞
Test Sample Related								
Power Scaling	0	R	1.73	1	1	0.00	0.00	∞
Test Sample Positioning	2.9	N	1.00	1	1	2.90	2.90	145
Device Holder Uncertainty	3.6	N	1.00	1	1	3.60	3.60	∞
Output Power Variation – SAR Drift Measurement	4.28	R	1.73	1	1	2.47	2.47	∞
Phantom and Setup								
Phantom Uncertainty	7.6	R	1.73	1	1	4.39	4.39	∞
Liquid Conductivity – Deviation from target values	5	R	1.73	0.64	0.43	1.85	1.24	∞
Liquid Permittivity – Deviation from target values	5	R	1.73	0.6	0.49	1.73	1.41	∞
Liquid Conductivity – Measurement uncertainty	2.5	N	1.00	0.64	0.43	1.60	1.08	∞
Liquid Permittivity – Measurement uncertainty	2.5	N	1.00	0.6	0.49	1.50	1.23	∞
Temp.unc. - Conductivity	3.4	R	1.73	0.78	0.71	1.53	1.39	∞
Temp. unc. - Permittivity	0.4	R	1.73	0.23	0.26	0.05	0.06	∞
Combined standard Uncertainty (u_c)						11.73	11.50	
Expanded Uncertainty (95% CONFIDENCE LEVEL)			k=	2		23.47	23.00	

Estimated total measurement uncertainty for the DASY5 measurement system was ±11.73%. The expanded uncertainty (K = 2) was assessed to be ±23.47% based on 95% confidence level. The uncertainty is not added to the measurement result.

Table 19: Uncertainty Budget for DASY5 Version 52 (Build 1258) – System Verification

Error Description	Uncert. Value	Prob. Dist.	Div.	C_i (1g)	C_i (10g)	1g u_i	10g u_i	v_i
Measurement System								
Probe Calibration	6	N	1.00	1	1	6.00	6.00	∞
Axial Isotropy	4.7	R	1.73	1	1	2.71	2.71	∞
Hemispherical Isotropy	9.6	R	1.73	0	0	0.00	0.00	∞
Boundary Effects	1	R	1.73	1	1	0.58	0.58	∞
Linearity	4.7	R	1.73	1	1	2.71	2.71	∞
System Detection Limits	1	R	1.73	1	1	0.58	0.58	∞
Modulation response	0	R	1.73	1	1	0.00	0.00	∞
Readout Electronics	0.3	N	1.00	1	1	0.30	0.30	∞
Response Time	0	R	1.73	1	1	0.00	0.00	∞
Integration Time	0	R	1.73	1	1	0.00	0.00	∞
RF Ambient Noise	1	R	1.73	1	1	0.58	0.58	∞
RF Ambient Reflections	1	R	1.73	1	1	0.58	0.58	∞
Probe Positioner	0.8	R	1.73	1	1	0.46	0.46	∞
Probe Positioning	6.7	R	1.73	1	1	3.87	3.87	∞
Post Processing	2	R	1.73	1	1	1.15	1.15	∞
Dipole Related								
Deviation of exp. dipole	5.5	R	1.73	1	1	3.18	3.18	##
Dipole Axis to Liquid Dist.	2	R	1.73	1	1	1.15	1.15	##
Input power & SAR drift	3.40	R	1.73	1	1	1.96	1.96	∞
Phantom and Setup								
Phantom Uncertainty	4	R	1.73	1	1	2.31	2.31	∞
Liquid Conductivity – Deviation from target values	5	R	1.73	0.64	0.43	1.85	1.24	∞
Liquid Permittivity – Deviation from target values	5	R	1.73	0.6	0.49	1.73	1.41	∞
Liquid Conductivity – Measurement uncertainty	2.5	N	1.00	0.78	0.71	1.95	1.78	∞
Liquid Permittivity – Measurement uncertainty	2.5	N	1.00	0.26	0.26	0.65	0.65	∞
Temp.unc. - Conductivity	3.4	R	1.73	0.78	0.71	0.77	0.70	∞
Temp. unc. - Permittivity	0.4	R	1.73	0.23	0.26	0.04	0.05	∞
Combined standard Uncertainty (u_c)						10.02	9.84	
Expanded Uncertainty (95% CONFIDENCE LEVEL)			k= 2			20.05	19.68	

Estimated total measurement uncertainty for the DASY5 measurement system was ±10.2%. The expanded uncertainty (K = 2) was assessed to be ±20.5% based on 95% confidence level. The uncertainty is not added to the System Verification measurement result.

9.0 EQUIPMENT LIST AND CALIBRATION DETAILS

Table 20: SPEAG DASY5 Version 52 (Build 1258)

Equipment Type	Manufacturer	Model Number	Serial Number	Calibration Due	Used For this Test?
Robot - Six Axes	Staubli	RX90BL	N/A	Not applicable	✓
Robot Remote Control	SPEAG	CS7MB	RX90B	Not applicable	✓
SAM Phantom	SPEAG	N/A	1260	Not applicable	
SAM Phantom	SPEAG	N/A	1060	Not applicable	
Flat Phantom	AndreT	10.1	P 10.1	Not Applicable	
Flat Phantom	AndreT	9.1	P 9.1	Not Applicable	
Flat Phantom	SPEAG	ELI 4.0	1101	Not Applicable	✓
Data Acquisition Electronics	SPEAG	DAE3 V1	359	07-June-2017	
Data Acquisition Electronics	SPEAG	DAE3 V1	442	06-Dec-2017	✓
Probe E-Field - Dummy	SPEAG	DP1	N/A	Not applicable	
Probe E-Field	SPEAG	ET3DV6	1380	08-Dec-2017	✓
Probe E-Field	SPEAG	ET3DV6	1377	15-June-2017	
Probe E-Field	SPEAG	ES3DV6	3029	Not Used	
Probe E-Field	SPEAG	EX3DV4	3956	15-June-2016	
Probe E-Field	SPEAG	EX3DV4	7358	09-Dec-2017	
Validation Source 150 MHz	SPEAG	CLA150	4003	06-Dec-2019	
Antenna Dipole 300 MHz	SPEAG	D300V3	1012	09-Dec-2018	
Antenna Dipole 450 MHz	SPEAG	D450V3	1074	09-Dec-2018	
Antenna Dipole 600 MHz	SPEAG	D600V3	1008	16-Oct-2018	
Antenna Dipole 750 MHz	SPEAG	D750V2	1051	08-Dec-2019	
Antenna Dipole 900 MHz	SPEAG	D900V2	047	09-Dec-2017	✓
Antenna Dipole 1640 MHz	SPEAG	D1640V2	314	05-Dec-2017	
Antenna Dipole 1800 MHz	SPEAG	D1800V2	242	05-Dec-2017	
Antenna Dipole 1950 MHz	SPEAG	D1950V3	1113	09-Dec-2018	✓
Antenna Dipole 2300 MHz	SPEAG	D2300V2	1032	10-Dec-2018	
Antenna Dipole 2450 MHz	SPEAG	D2450V2	724	10-Dec-2018	
Antenna Dipole 2600 MHz	SPEAG	D2600V2	1044	09-Dec-2019	
Antenna Dipole 3500 MHz	SPEAG	D3500V2	1002	13-July-2013	
Antenna Dipole 5600 MHz	SPEAG	D5GHzV2	1008	02-Dec-2019	
RF Amplifier	EIN	603L	N/A	*In test	
RF Amplifier	Mini-Circuits	ZHL-42	N/A	*In test	✓
RF Amplifier	Mini-Circuits	ZVE-8G	N/A	*In test	
Synthesized signal generator	Hewlett Packard	86630A	3250A00328	*In test	✓
RF Power Meter	Hewlett Packard	437B	3125012786	*In test	✓
RF Power Sensor 0.01 - 18 GHz	Hewlett Packard	8481H	1545A01634	18-Oct-2017	✓
RF Power Meter	Rohde & Schwarz	NRP	101415	16-Oct-2016	
RF Power Sensor	Rohde & Schwarz	NRP - Z81	100174	19-Oct-2017	
RF Power Meter Dual	Hewlett Packard	435A	1733A05847	*In test	✓
RF Power Sensor	Hewlett Packard	8482A	2349A10114	*In test	✓
Network Analyser	Hewlett Packard	8714B	GB3510035	15-Nov-2017	
Network Analyser	Hewlett Packard	8753ES	JP39240130	03-Dec-2016	
Network Analyser	Hewlett Packard	8753D	3410A04122	04-Feb-2017	✓
Dual Directional Coupler	Hewlett Packard	778D	1144 04700	*In test	
Dual Directional Coupler	NARDA	3022	75453	*In test	✓
Thermometer	Digitech	QM7217	T-103	31-Aug-2017	
Thermometer	Digitech	QM7217	T-104	15-Jan-2017	✓
Radio Communication Test Set	Rohde & Schwarz	CMU200	101573	Not Applicable	✓
Radio Communication Test Set	Anritsu	MT8820A	6200240559	Not Applicable	
Radio Communication Test Set	Agilent	PXT E6621A	MY51100168	Not Applicable	

* Calibrated during the test for the relevant parameters.

10.0 SAR TEST METHOD

10.1 Description of the Test Positions (Face Frontal and Belt Clip)

SAR measurements were performed in the “Face Frontal” and “Belt Clip” positions. Both the “Face Frontal” and “Belt Clip” positions were measured in the flat section of the SPEAG ELI 4.0 phantom.
See Appendix A for photos of test positions.

10.1.1 “Face Frontal Position”

The SAR evaluation was performed in the flat section of the SPEAG phantom. The device was placed 10mm from the phantom, this position is equivalent to the device placed in front of the nose, as per manufacturer’s specifications. The supporting hand was not used.

10.1.2 “Belt Clip” Position

The device was tested in the (2.00 mm) flat section of the SPEAG phantom for the “Belt Clip” position. A belt clip maintained a distance of approximately 11 mm between the back of the device and the flat phantom. The Transceiver was placed at the flat section of the phantom and suspended until the Belt Clip touched the phantom. The belt clip was made of metal.

10.2 List of All Test Cases (Antenna In/Out, Test Frequencies, User Modes)

The DUT has a fixed antenna. Depending on the measured SAR level up to three test channels with the test sample operating at maximum power were recorded. The following table represents the matrix used to determine what testing was required. All relevant provisions of KDB 447498 and KDB 941225 are applied for SAR measurements of the host system. SAR measurement for the HSDPA and HSUPA modes were not conducted because SAR results in WWAN bands are lower than 1.2 mW/g (75% of the SAR limit).

Table: Testing configurations

Table 22

Phantom Configuration	Device Mode WWAN Band Name	Test Configurations		
		Channel (Low)	Channel (Middle)	Channel (High)
Face Frontal/ Belt Clip	GSM 850 MHz	x	x	x
	GSM 1900 MHz	x	x	x
	WCDMA 850 MHz	x	x	x
	WCDMA 1900 MHz	x	x	x

Legend

X	Testing Required in this configuration
	Testing required in this configuration only if SAR of middle channel is more than 3dB below the SAR limit or it is the worst case.
X	Additional SAR measurement for the HSDPA and HSUPA modes

11.0 SAR MEASUREMENT RESULTS

The SAR values averaged over 1g tissue masses were determined for the sample DUT for all test configurations listed in section 10.2.

11.1 SAR Results

There are two modes of operation which include UMTS and GSM transmission. Table below displays the SAR results.

Table: SAR MEASUREMENT RESULTS – 850MHz UMTS

Table 23

Test Position and Date of test	Plot No.	Test Mode	Test Ch.	Test Freq. (MHz)	SAR (1g) mW/g	Drift (dB)	∈r (target 41.5 ±5% 39.4 to 43.6)	σ (target 0.90 ±5% 0.86 to 0.95)	Tune –Up SAR (W/kg)
Face Frontal 10mm Spacing Standard Cartridge 10-03-17	1.	WCDMA - UMTS	4132	826.4	0.623	-0.02	42.68	0.90	**1.105**
Face Frontal 10mm Spacing Standard Cartridge 10-03-17	2.	WCDMA - UMTS	4183	836.6	0.609	-0.02	42.58	0.91	1.093
Face Frontal 10mm Spacing Standard Cartridge 10-03-17	3.	WCDMA - UMTS	4233	846.6	0.588	0	42.43	0.92	1.095
Face Frontal 10mm Spacing Standard Cartridge Variability 10-03-17	4.	WCDMA - UMTS	4183	836.6	0.593	0.04	42.58	0.91	1.064
Face Frontal 10mm Spacing H2S Cartridge 10-03-17	5.	WCDMA - UMTS	4132	826.4	0.255	0.12	42.68	0.90	0.452
Face Frontal 10mm Spacing H2S Cartridge 10-03-17	6.	WCDMA - UMTS	4183	836.6	0.23	0.01	42.58	0.91	0.413
Face Frontal 10mm Spacing H2S Cartridge 10-03-17	7.	WCDMA - UMTS	4233	846.6	0.22	-0.05	42.43	0.92	0.410
Face Frontal 10mm Spacing O2 CO H2S LEL Cartridge 10-03-17	8.	WCDMA - UMTS	4132	826.4	0.146	-0.19	42.68	0.90	0.259
Face Frontal 10mm Spacing O2 CO H2S LEL Cartridge 10-03-17	9.	WCDMA - UMTS	4183	836.6	0.155	-0.09	42.58	0.91	0.278
Face Frontal 10mm Spacing O2 CO H2S LEL Cartridge 10-03-17	10.	WCDMA - UMTS	4233	846.6	0.171	-0.06	42.43	0.92	0.318
Test Position	**Plot No.**	**Test Mode**	**Test Ch.**	**Test Freq. (MHz)**	**SAR (1g) mW/g**	**Drift (dB)**	**∈r (target 41.5 ±5% 39.4 to 43.6)**	**σ (target 0.97 ±5% 0.92 to 1.02)**	-
System Check 10-03-17	11.	CW	1	900	2.6	-0.12	41.83	0.97	-

NOTE: The measurement uncertainty of 23.32% was not added to the result.

Table: Liquid Parameters 850MHz

Table 24

Date	Freq. (MHz)	∈r (target 41.5 ±5% 39.4 to 43.6)	σ (target 0.90 ±5% 0.86 to 0.95)
10-March-2017	826.4	42.68	0.90
10-March-2017	836.6	42.58	0.91
10-March-2017	846.6	42.43	0.92
10-March-2017	900	41.83	0.97

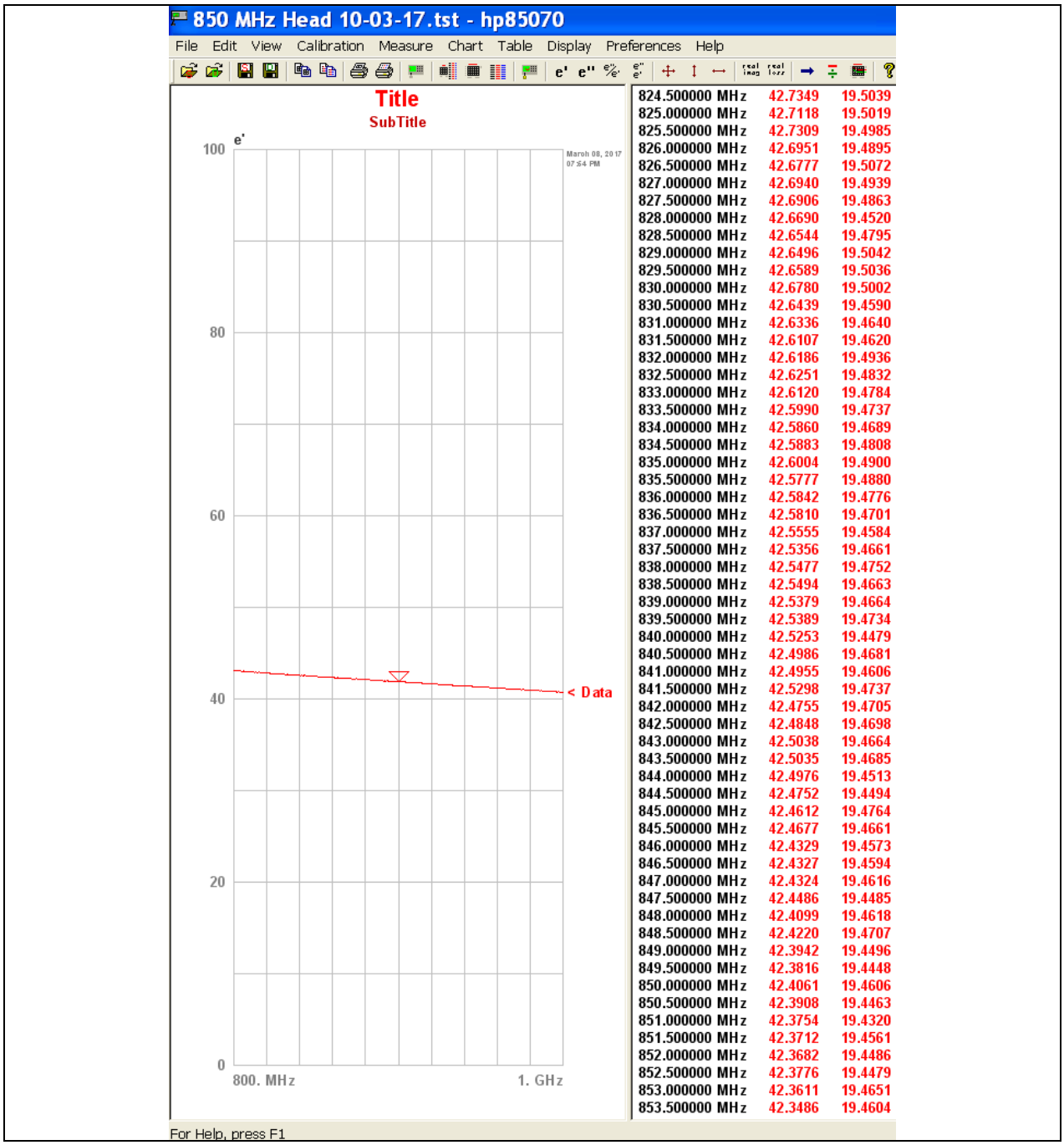

Table: SAR MEASUREMENT RESULTS – 850MHz UMTS

Table 25

Test Position and Date of test	Plot No.	Test Mode	Test Ch.	Test Freq. (MHz)	SAR (1g) mW/g	Drift (dB)	∈r (target 55.2 ±5% 52.4 to 58.0)	σ (target 0.97 ±5% 0.92 to 1.02)	Tune –Up SAR (W/kg)
Body Worn Belt Clip Standard Cartridge 15-03-17	12.	WCDMA - UMTS	4132	826.4	0.329	-0.1	54.58	0.98	0.584
Body Worn Belt Clip Standard Cartridge 15-03-17	13.	WCDMA - UMTS	4183	836.6	0.387	-0.01	54.47	0.99	0.695
Body Worn Belt Clip Standard Cartridge 15-03-17	14.	WCDMA - UMTS	4233	846.6	0.452	0.01	54.37	1.00	0.842
Body Worn Belt Clip Standard Cartridge variability 15-03-17	15.	WCDMA - UMTS	4233	846.6	0.476	-0.02	54.37	1.00	**0.886**
Body Worn Belt Clip H2S Cartridge 15-03-17	16.	WCDMA - UMTS	4132	826.4	0.273	-0.09	54.58	0.98	0.484
Body Worn Belt Clip H2S Cartridge 15-03-17	17.	WCDMA - UMTS	4183	836.6	0.267	0.07	54.47	0.99	0.479
Body Worn Belt Clip H2S Cartridge 15-03-17	18.	WCDMA - UMTS	4233	846.6	0.255	0.12	54.37	1.00	0.475
Body Worn Belt Clip O2 CO H2S LEL Cartridge 15-03-17	19.	WCDMA - UMTS	4132	826.4	0.062 2	-0.04	54.58	0.98	0.110
Body Worn Belt Clip O2 CO H2S LEL Cartridge 15-03-17	20.	WCDMA - UMTS	4183	836.6	0.060 2	0.11	54.47	0.99	0.108
Body Worn Belt Clip O2 CO H2S LEL Cartridge 15-03-17	21.	WCDMA - UMTS	4233	846.6	0.068 2	-0.02	54.37	1.00	0.127
Test Position	**Plot No.**	**Test Mode**	**Test Ch.**	**Test Freq. (MHz)**	**SAR (1g) mW/g**	**Drift (dB)**	**∈r (target 55.0 ±5% 52.3 to 578)**	**σ (target 1.05 ±5% 1.00 to 1.10)**	
System Check 15-03-17	22.	CW	1	900	2.89	-0.06	53.86	1.05	-

NOTE: The measurement uncertainty of 23.32% was not added to the result.

Table: Liquid Parameters 850MHz

Table 26

Date	Freq. (MHz)	∈r (target 55.2 ±5% 52.4 to 58.0)	σ (target 0.97 ±5% 0.92 to 1.02)
15-March-2017	826.4	54.58	0.98
15-March-2017	836.6	54.47	0.99
15-March-2017	846.6	54.37	1.00
15-March-2017	900	53.86	1.05

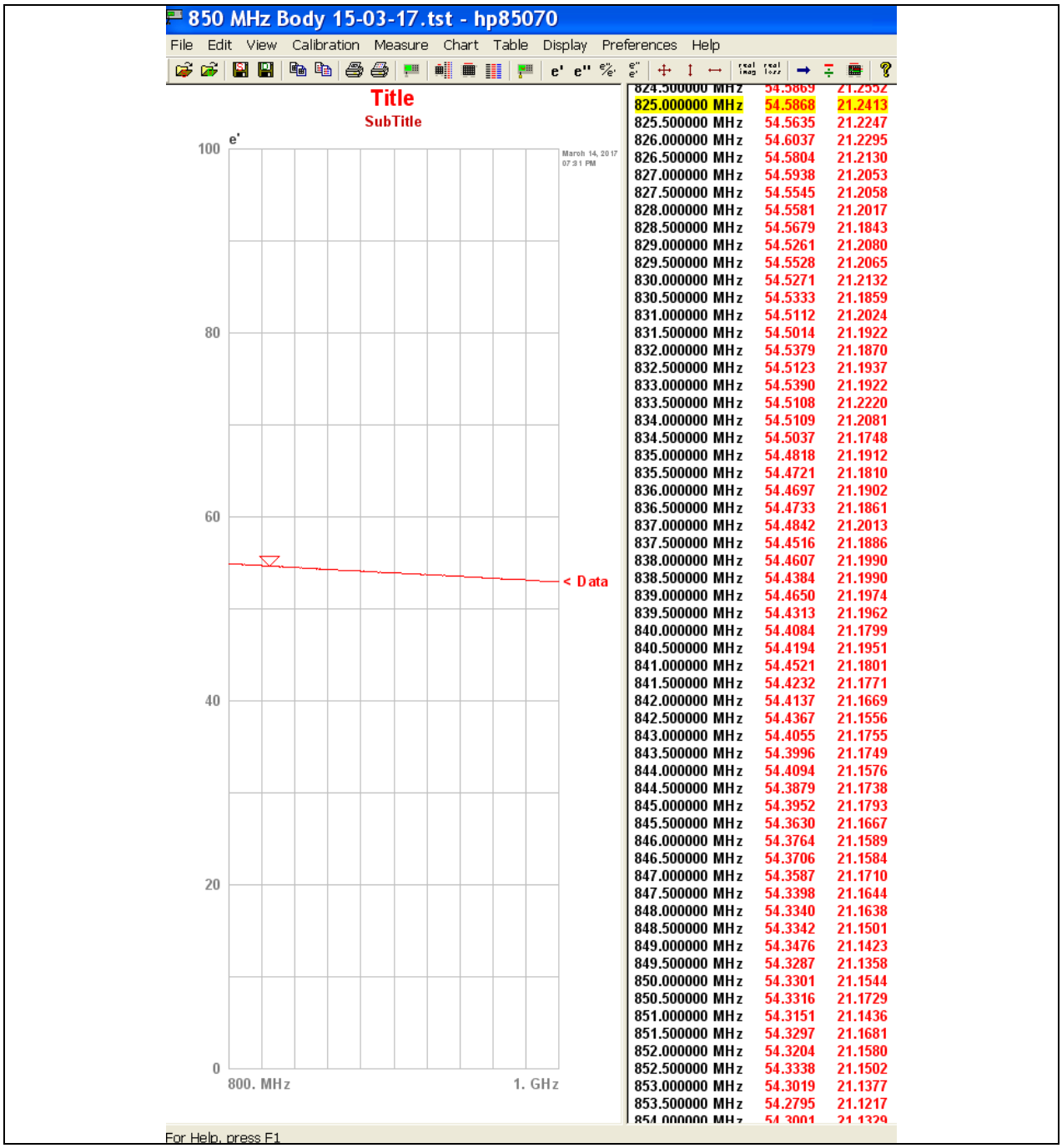

Table: SAR MEASUREMENT RESULTS – 850MHz GSM

Table 27

Test Position and Date of test	Plot No.	Test Mode	Test Ch.	Test Freq. (MHz)	SAR (1g) mW/g	Drift (dB)	∈r (target 41.5 ±5% 39.4 to 43.6)	σ (target 0.90 ±5% 0.86 to 0.95)	Tune –Up SAR (W/kg)
Face Frontal 10mm Spacing Standard Cartridge GPRS Class 8 14-03-17	23.	Generic GSM	128	824.2	0.655	0.04	42.88	0.89	1.100
Face Frontal 10mm Spacing Standard Cartridge GPRS Class 8 14-03-17	24.	Generic GSM	190	836.6	0.636	-0.06	42.73	0.91	1.168
Face Frontal 10mm Spacing Standard Cartridge GPRS Class 8 14-03-17	25.	Generic GSM	251	848.6	0.619	0.05	42.57	0.92	1.139
Face Frontal 10mm Spacing Standard Cartridge GPRS Class 8 Variability 14-03-17	26.	Generic GSM	128	824.2	0.708	-0.07	42.88	0.89	**1.189**
Face Frontal 10mm Spacing H2S Cartridge GPRS Class 8 14-03-17	27.	Generic GSM	128	824.2	0.306	-0.01	42.88	0.89	0.514
Face Frontal 10mm Spacing H2S Cartridge GPRS Class 8 14-03-17	28.	Generic GSM	190	836.6	0.278	-0.02	42.73	0.91	0.511
Face Frontal 10mm Spacing H2S Cartridge GPRS Class 8 14-03-17	29.	Generic GSM	251	848.6	0.263	-0.08	42.57	0.92	0.484
Face Frontal 10mm Spacing O2 CO H2S LEL Cartridge GPRS Class 8 14-03-17	30.	Generic GSM	128	824.2	0.225	-0.02	42.88	0.89	0.378
Face Frontal 10mm Spacing O2 CO H2S LEL Cartridge GPRS Class 8 14-03-17	31.	Generic GSM	190	836.6	0.254	0.02	42.73	0.91	0.466
Face Frontal 10mm Spacing O2 CO H2S LEL Cartridge GPRS Class 8 14-03-17	32.	Generic GSM	251	848.6	0.274	-0.04	42.57	0.92	0.504
Test Position	**Plot No.**	**Test Mode**	**Test Ch.**	**Test Freq. (MHz)**	**SAR (1g) mW/g**	**Drift (dB)**	**∈r (target 41.5 ±5% 39.4 to 43.6)**	**σ (target 0.97 ±5% 0.92 to 1.02)**	-
System Check 14-03-17	33.	CW	1	900	2.73	0	41.96	0.97	-

NOTE: The measurement uncertainty of 23.32% was not added to the result.

Table: Liquid Parameters 850MHz

Table 28

Date	Freq. (MHz)	∈r (target 53.3 ±5% 50.6 to 56.0)	σ (target 1.52 ±5% 1.44 to 1.60)
14-March-2017	824.2	42.88	0.89
14-March-2017	836.6	42.73	0.91
14-March-2017	848.6	42.57	0.92
14-March-2017	900	41.96	0.97

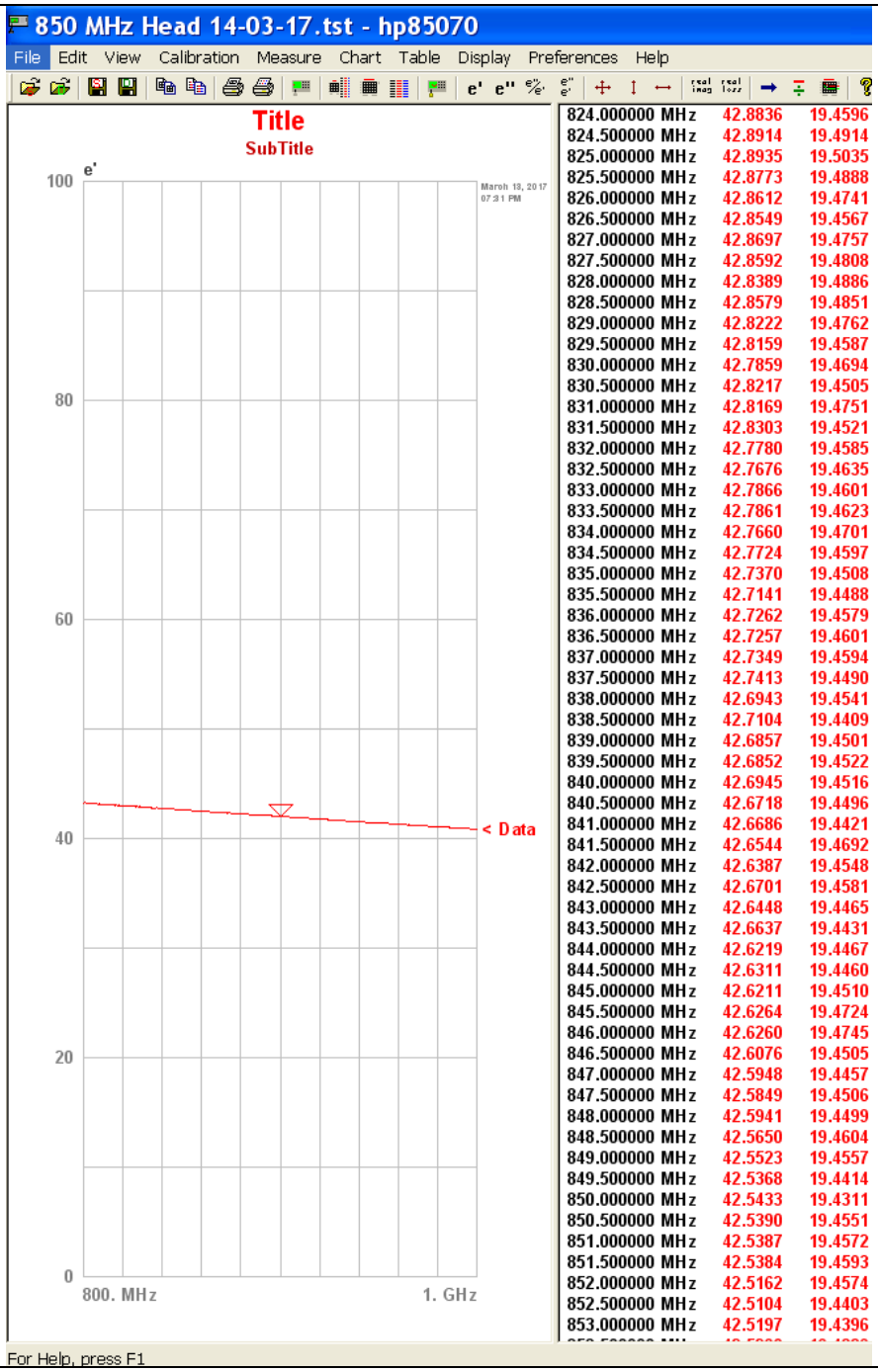

Table: SAR MEASUREMENT RESULTS – 850MHz GPRS

Table 29

Test Position and Date of test	Plot No.	Test Mode	Test Ch.	Test Freq. (MHz)	SAR (1g) mW/g	Drift (dB)	∈r (target 55.2 ±5% 52.4 to 58.0)	σ (target 0.97 ±5% 0.92 to 1.02)	Tune –Up SAR (W/kg)
Body Worn Belt Clip Standard Cartridge GPRS Class 8 14-03-17	34.	GPRS Class 08	128	824.2	0.271	0.02	54.23	0.97	0.490
Body Worn Belt Clip Standard Cartridge GPRS Class 8 14-03-17	35.	GPRS Class 08	190	836.6	0.336	0.02	54.12	0.99	0.613
Body Worn Belt Clip Standard Cartridge GPRS Class 8 14-03-17	36.	GPRS Class 08	521	848.6	0.394	0.02	53.97	1.00	**0.722**
Body Worn Belt Clip H2S Cartridge GPRS Class 8 14-03-17	37.	GPRS Class 08	128	824.2	0.301	0.02	54.23	0.97	0.544
Body Worn Belt Clip H2S Cartridge GPRS Class 8 14-03-17	38.	GPRS Class 08	190	836.6	0.303	0.02	54.12	0.99	0.553
Body Worn Belt Clip H2S Cartridge GPRS Class 8 14-03-17	39.	GPRS Class 08	521	848.6	0.281	0	53.97	1.00	0.515
Body Worn Belt Clip O2 CO H2S LEL Cartridge GPRS Class 8 14-03-17	40.	GPRS Class 08	128	824.2	0.082	0.03	54.23	0.97	0.148
Body Worn Belt Clip O2 CO H2S LEL Cartridge GPRS Class 8 14-03-17	41.	GPRS Class 08	190	836.6	0.0832	-0.02	54.12	0.99	0.152
Body Worn Belt Clip O2 CO H2S LEL Cartridge GPRS Class 8 14-03-17	42.	GPRS Class 08	521	848.6	0.0789	0.02	53.97	1.00	0.145
Test Position	**Plot No.**	**Test Mode**	**Test Ch.**	**Test Freq. (MHz)**	**SAR (1g) mW/g**	**Drift (dB)**	**∈r (target 55.0 ±5% 52.3 to 578)**	**σ (target 1.05 ±5% 1.00 to 1.10)**	
System Check 14-03-17	43.	CW	1	900	2.93	-0.12	53.49	1.05	-

NOTE: The measurement uncertainty of 23.32% was not added to the result.

Table: Liquid Parameters 850MHz

Table 30

Date	Freq. (MHz)	∈r (target 53.3 ±5% 50.6 to 56.0)	σ (target 1.52 ±5% 1.44 to 1.60)
14-March-2017	824.2	54.23	0.97
14-March-2017	836.6	54.12	0.99
14-March-2017	848.6	53.97	1.00
14-March-2017	900	40.29	1.47

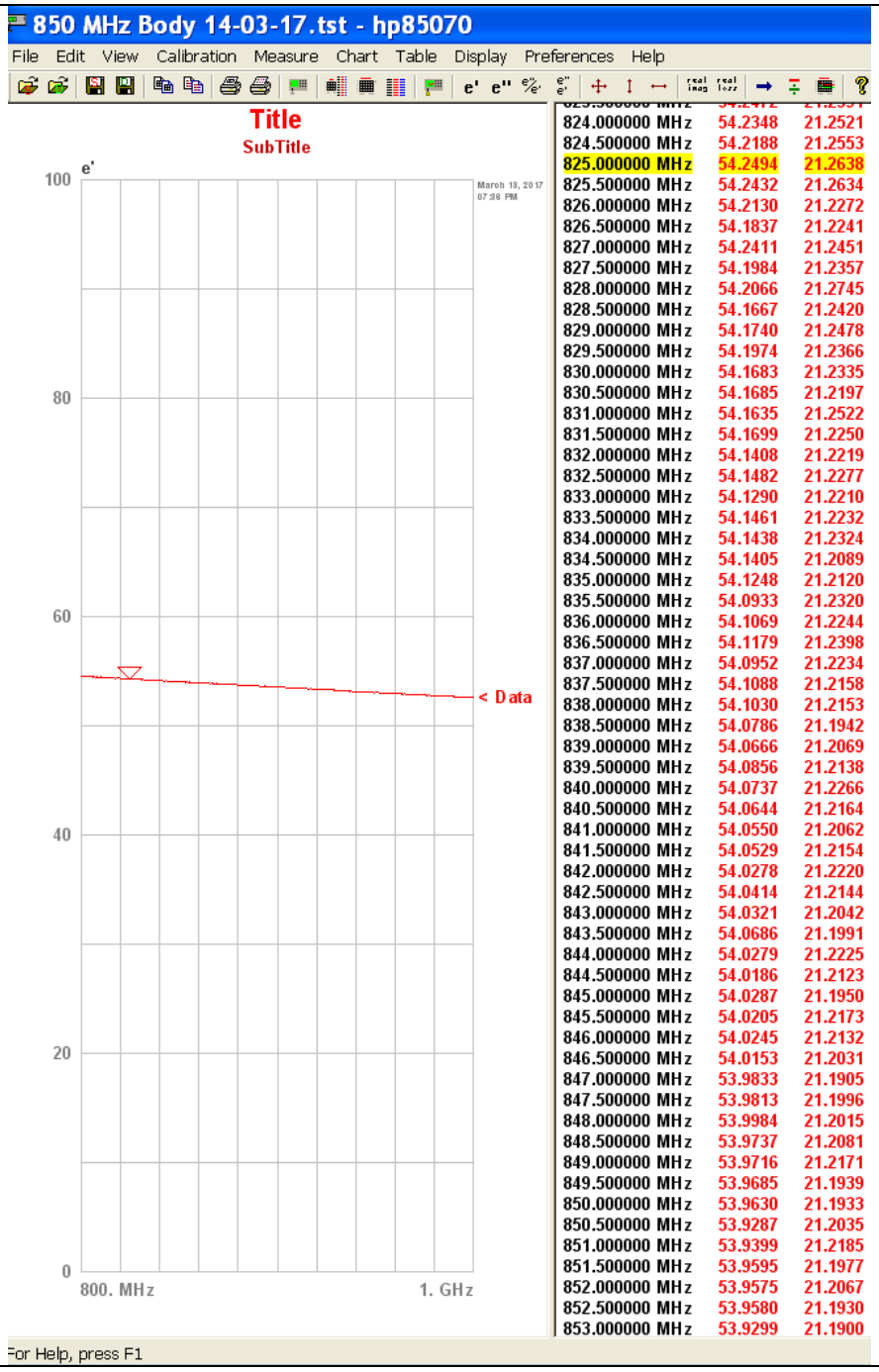

Table: SAR MEASUREMENT RESULTS – 1900MHz UMTS

Table 31

Test Position and Date of test	Plot No.	Test Mode	Test Ch.	Test Freq. (MHz)	SAR (1g) mW/g	Drift (dB)	∈r (target 40.0 ±5% 38.0 to 42.0)	σ (target 1.40 ±5% 1.33 to 1.47)	Tune –Up SAR (W/kg)
Face Frontal 10mm Spacing Standard Cartridge 09-03-17	44.	WCDMA - UMTS	9262	1852	0.531	-0.04	40.63	1.42	0.883
Face Frontal 10mm Spacing Standard Cartridge 09-03-17	45.	WCDMA - UMTS	9400	1880	0.596	0.01	40.51	1.44	0.936
Face Frontal 10mm Spacing Standard Cartridge 09-03-17	46.	WCDMA - UMTS	9538	1908	0.691	-0.02	40.42	1.45	1.043
Face Frontal 10mm Spacing H2S Cartridge 09-03-17	47.	WCDMA - UMTS	9262	1852	0.512	0.05	40.63	1.42	0.852
Face Frontal 10mm Spacing H2S Cartridge 09-03-17	48.	WCDMA - UMTS	9400	1880	0.565	0.11	40.51	1.44	0.887
Face Frontal 10mm Spacing H2S Cartridge 09-03-17	49.	WCDMA - UMTS	9538	1908	0.761	-0.06	40.42	1.45	1.149
Face Frontal 10mm Spacing H2S Cartridge Variability 09-03-17	50.	WCDMA - UMTS	9538	1908	0.791	-0.09	40.42	1.45	**1.194**
Face Frontal 10mm Spacing O2 CO H2S LEL Cartridge 09-03-17	51.	WCDMA - UMTS	9262	1852	0.617	-0.01	40.63	1.42	1.026
Face Frontal 10mm Spacing O2 CO H2S LEL Cartridge 09-03-17	52.	WCDMA - UMTS	9400	1880	0.655	-0.02	40.51	1.44	1.029
Face Frontal 10mm Spacing O2 CO H2S LEL Cartridge 09-03-17	53.	WCDMA - UMTS	9538	1908	0.746	-0.08	40.42	1.45	1.127
System Check 09-03-17	54.	CW (0)	1	1950	10.4	-0.04	40.29	1.47	-

NOTE: The measurement uncertainty of 23.32% was not added to the result.

Table: Liquid Parameters 1900MHz

Table 32

Date	Freq. (MHz)	∈r (target 53.3 ±5% 50.6 to 56.0)	σ (target 1.52 ±5% 1.44 to 1.60)
9-March-2017	1852	40.63	1.42
9-March-2017	1880	40.51	1.44
9-March-2017	1908	40.42	1.45
9-March-2017	1950	40.29	1.47

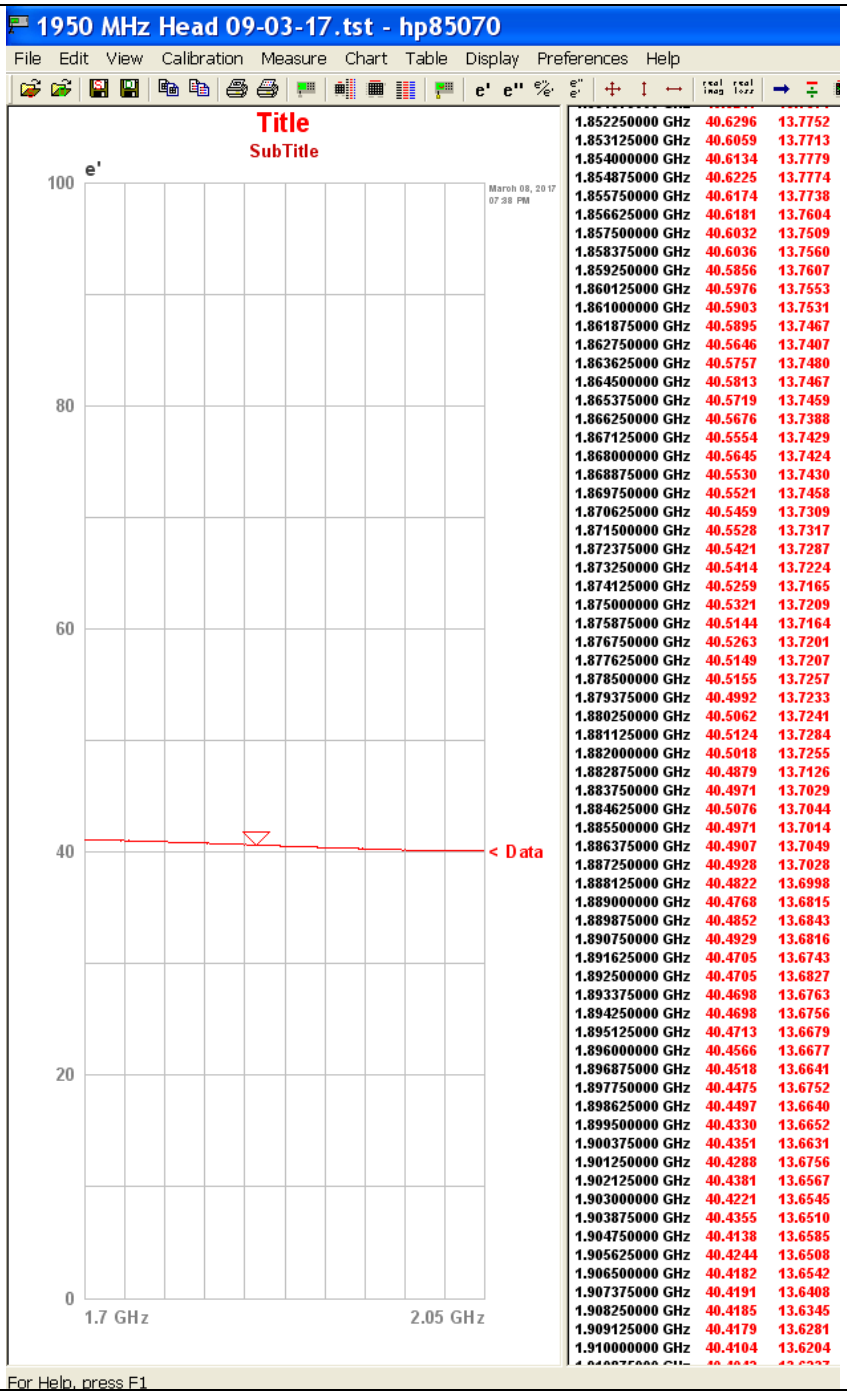

Table: SAR MEASUREMENT RESULTS – 1900MHz UMTS

Table 33

Test Position and Date of test	Plot No.	Test Mode	Test Ch.	Test Freq. (MHz)	SAR (1g) mW/g	Drift (dB)	∈r (target 53.3 ±5% 50.6 to 56.0)	σ (target 1.52 ±5% 1.44 to 1.60)	Tune –Up SAR (W/kg)
Body Worn Belt Clip Standard Cartridge 16-03-17	55.	WCDMA - UMTS	9262	1852	0.108	-0.06	52.36	1.52	0.180
Body Worn Belt Clip Standard Cartridge 16-03-17	56.	WCDMA - UMTS	9400	1880	0.124	0.14	52.25	1.54	0.195
Body Worn Belt Clip Standard Cartridge 16-03-17	57.	WCDMA - UMTS	9538	1908	0.138	-0.03	52.14	1.55	0.217
Body Worn Belt Clip H2S Cartridge 16-03-17	58.	WCDMA - UMTS	9262	1852	0.178	0.08	52.36	1.52	0.296
Body Worn Belt Clip H2S Cartridge 16-03-17	59.	WCDMA - UMTS	9400	1880	0.211	-0.02	52.25	1.54	**0.331**
Body Worn Belt Clip H2S Cartridge 16-03-17	60.	WCDMA - UMTS	9538	1908	0.21	-0.08	52.14	1.55	0.330
Body Worn Belt Clip O2 CO H2S LEL Cartridge 16-03-17	61.	WCDMA - UMTS	9262	1852	0.151	-0.04	52.36	1.52	0.251
Body Worn Belt Clip O2 CO H2S LEL Cartridge 16-03-17	62.	WCDMA - UMTS	9400	1880	0.171	0	52.25	1.54	0.269
Body Worn Belt Clip O2 CO H2S LEL Cartridge 16-03-17	63.	WCDMA - UMTS	9538	1908	0.184	-0.01	52.14	1.55	0.289
System Check 16-03-17	64.	CW (0)	1	1950	9.93	-0.02	52	1.57	-

NOTE: The measurement uncertainty of 23.32% was not added to the result.

Table: Liquid Parameters 1900MHz

Table 34

Date	Freq. (MHz)	∈r (target 53.3 ±5% 50.6 to 56.0)	σ (target 1.52 ±5% 1.44 to 1.60)
16-March-2017	1852	52.36	1.52
16-March-2017	1880	52.25	1.54
16-March-2017	1908	52.14	1.55
16-March-2017	1950	52	1.57

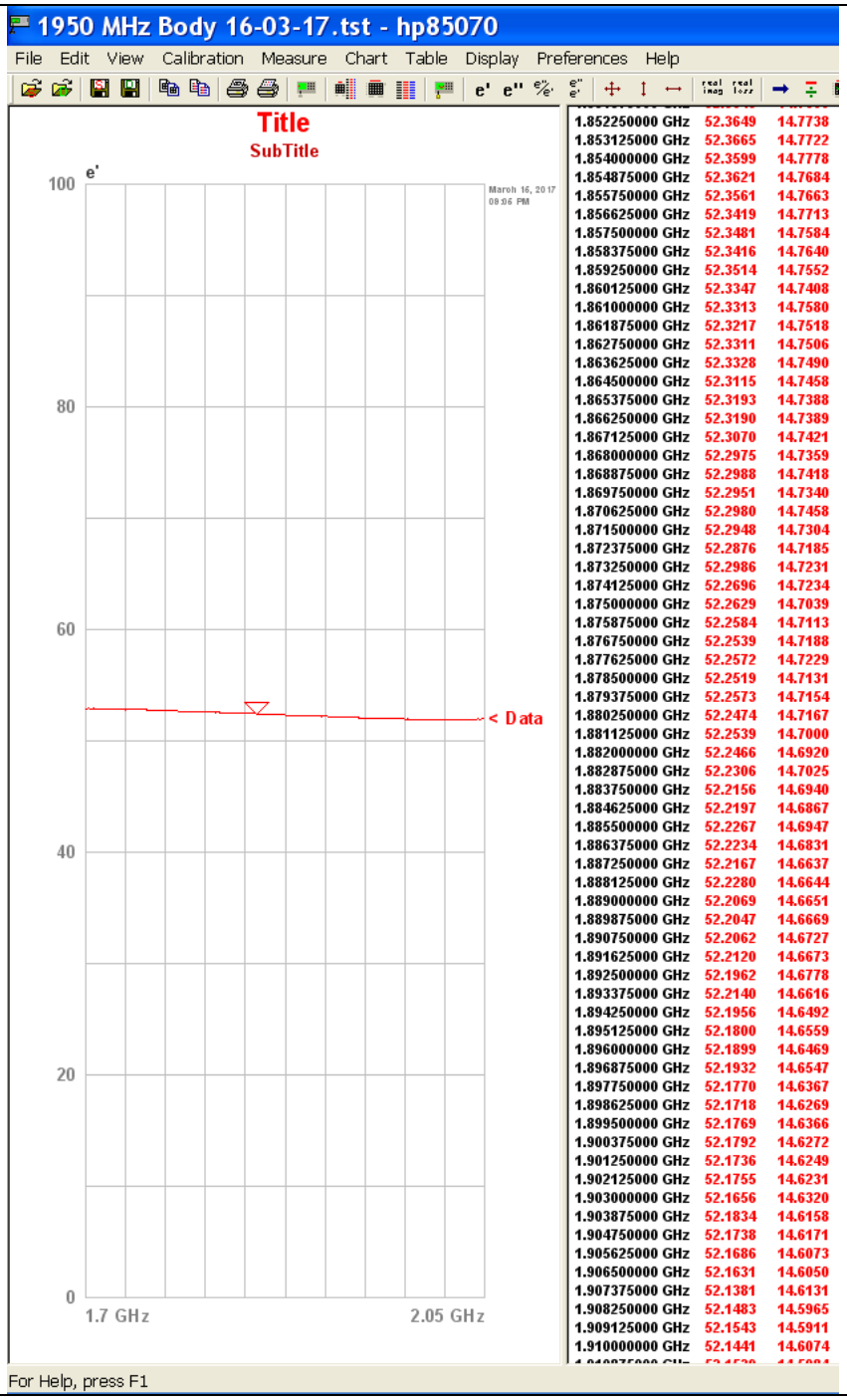

Table: SAR MEASUREMENT RESULTS – 1900MHz GSM

Table 35

Test Position and Date of test	Plot No.	Test Mode	Test Ch.	Test Freq. (MHz)	SAR (1g) mW/g	Drift (dB)	∈r (target 40.0 ±5% 38.0 to 42.0)	σ (target 1.40 ±5% 1.33 to 1.47)	Tune –Up SAR (W/kg)
Face Frontal 10mm Spacing Standard Cartridge GPRS Class 8 08-03-17	65.	Generic GSM	512	1850	0.273	-0.02	39.84	1.41	0.438
Face Frontal 10mm Spacing Standard Cartridge GPRS Class 8 08-03-17	66.	Generic GSM	661	1880	0.313	0.03	39.75	1.43	0.481
Face Frontal 10mm Spacing Standard Cartridge GPRS Class 8 08-03-17	67.	Generic GSM	810	1910	0.341	0.01	39.67	1.45	**0.515**
Face Frontal 10mm Spacing H2S Cartridge GPRS Class 8 08-03-17	68.	Generic GSM	512	1850	0.265	0.01	39.84	1.41	0.425
Face Frontal 10mm Spacing H2S Cartridge GPRS Class 8 08-03-17	69.	Generic GSM	661	1880	0.299	-0.01	39.75	1.43	0.460
Face Frontal 10mm Spacing H2S Cartridge GPRS Class 8 08-03-17	70.	Generic GSM	810	1910	0.319	-0.04	39.67	1.45	0.482
Face Frontal 10mm Spacing O2 CO H2S LEL Cartridge GPRS Class 8 08-03-17	71.	Generic GSM	512	1850	0.272	-0.02	39.84	1.41	0.436
Face Frontal 10mm Spacing O2 CO H2S LEL Cartridge GPRS Class 8 08-03-17	72.	Generic GSM	661	1880	0.313	-0.01	39.75	1.43	0.481
Face Frontal 10mm Spacing O2 CO H2S LEL Cartridge GPRS Class 8 08-03-17	73.	Generic GSM	810	1910	0.337	-0.07	39.67	1.45	0.509
System Check 08-03-17	74.	CW	1	1950	10.2	0	39.56	1.46	-

NOTE: The measurement uncertainty of 23.32% was not added to the result.

Table: Liquid Parameters 1900MHz

Table 36

Date	Freq. (MHz)	∈r (target 40.0 ±5% 38.0 to 42.0)	σ (target 1.40 ±5% 1.33 to 1.47)
8-March-2017	1850	39.84	1.41
8-March-2017	1880	39.75	1.43
8-March-2017	1910	39.67	1.45
8-March-2017	1950	39.56	1.46

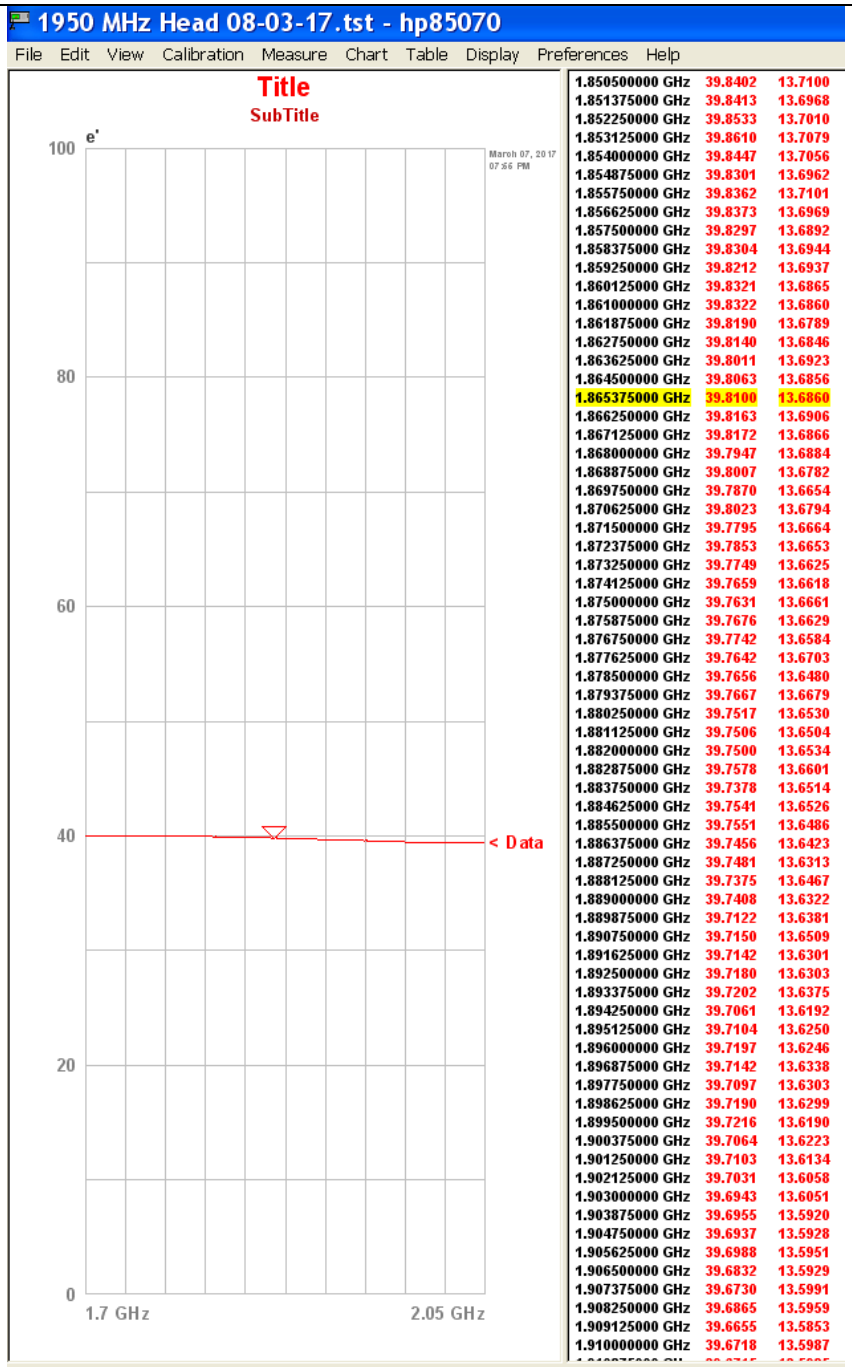

Table: SAR MEASUREMENT RESULTS – 1900MHz GPRS

Table 37

Test Position and Date of test	Plot No.	Test Mode	Test Ch.	Test Freq. (MHz)	SAR (1g) mW/g	Drift (dB)	∈r (target 53.3 ±5% 50.6 to 56.0)	σ (target 1.52 ±5% 1.44 to 1.60)	Tune –Up SAR (W/kg)
Body Worn Belt Clip Standard Cartridge GPRS Class 8 16-03-17	75.	GPRS Class 08	512	1850	0.066	-0.06	52.36	1.52	0.106
Body Worn Belt Clip Standard Cartridge GPRS Class 8 16-03-17	76.	GPRS Class 08	661	1880	0.073	-0.03	52.25	1.54	0.113
Body Worn Belt Clip Standard Cartridge GPRS Class 8 16-03-17	77.	GPRS Class 08	810	1910	0.075	-0.03	52.14	1.55	0.114
Body Worn Belt Clip H2S Cartridge GPRS Class 8 16-03-17	78.	GPRS Class 08	512	1850	0.066	-0.06	52.36	1.52	0.106
Body Worn Belt Clip H2S Cartridge GPRS Class 8 16-03-17	79.	GPRS Class 08	661	1880	0.081	-0.06	52.25	1.54	0.126
Body Worn Belt Clip H2S Cartridge GPRS Class 8 16-03-17	80.	GPRS Class 08	810	1910	0.087	0	52.14	1.55	0.132
Body Worn Belt Clip O2 CO H2S LEL Cartridge GPRS Class 8 16-03-17	81.	GPRS Class 08	512	1850	0.080	-0.04	52.36	1.52	0.129
Body Worn Belt Clip O2 CO H2S LEL Cartridge GPRS Class 8 16-03-17	82.	GPRS Class 08	661	1880	0.099	-0.03	52.25	1.54	0.153
Body Worn Belt Clip O2 CO H2S LEL Cartridge GPRS Class 8 16-03-17	83.	GPRS Class 08	810	1910	0.105	-0.01	52.14	1.55	**0.159**

NOTE: The measurement uncertainty of 23.32% was not added to the result.

12.0 COMPLIANCE STATEMENT

The Blackline Safety Lone Worker Personal Safety Monitoring Transmiter, Model: HMN: G7C was found to comply with the FCC and RSS-102 SAR requirements.

The highest SAR level measured was 0.791 mW/g for a 1g cube. The manufacturer's tune up power is stated to be 25.5 dBm. Scaling the SAR result, the maximum SAR value is **1.194 mW/g.** This value was measured at 1908 MHz (channel 9538) in the "Face Frontal with 10mm Spacing" position with H2S Cartridge in UMTS transmission mode. This was below the limit of 1.6 mW/g for uncontrolled exposure, but was within the band of measurement uncertainty around the limit.

The SAR test Variability checks were conducted and the repeated results are included in the SAR results tables.