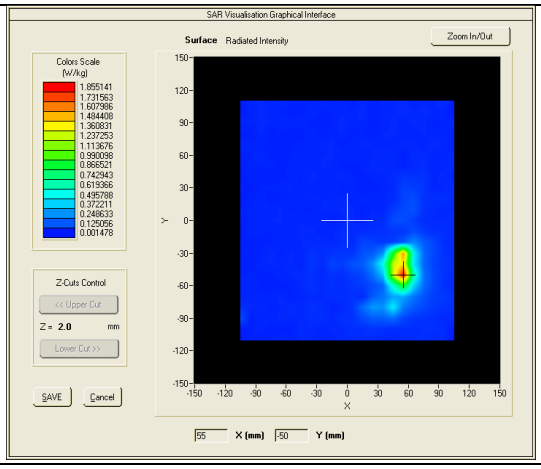
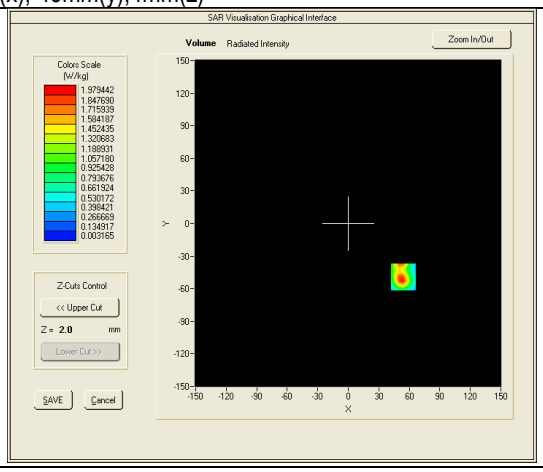
Test specification:	Q520_Bottom Touch_5580_A mode			
Environ Conditions:	Temp(oC):	21	Result:	Pass
	Humidity(%):	46		
	Atmospheric(mPa):	1005		
Mains Power:	7.2VDC Battery			
Test Date:	12/10/2014			
Tested by:	Ricky Wang			
Remarks:	N/A			

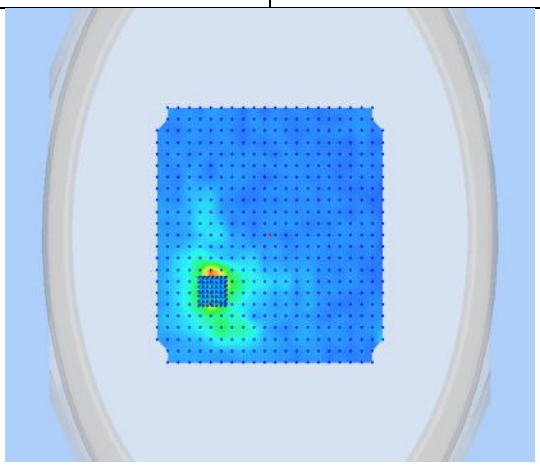
Frequency (MHz)	5580.000000
Relative permittivity (real part)	48.67
Conductivity (S/m)	5.98
Transmission Duty Factor	1.0
Probe SN	1714_EPG213
Conversion Factor (dB)	16.15
Area Scan Resolution	4 mm
Zoom Scan Resolution	dx=4mm, dy=4mm, dz=2mm
Zoom Scan Size	24x24x24 mm
Measurement Drifts (%)	2.48
Highest Extrapolated SAR (W/Kg)	2.3400
SAR 1g (W/Kg)	0.7478
Peak SAR Location	54mm(x),-49mm(y),4mm(z)



SURFACE SAR



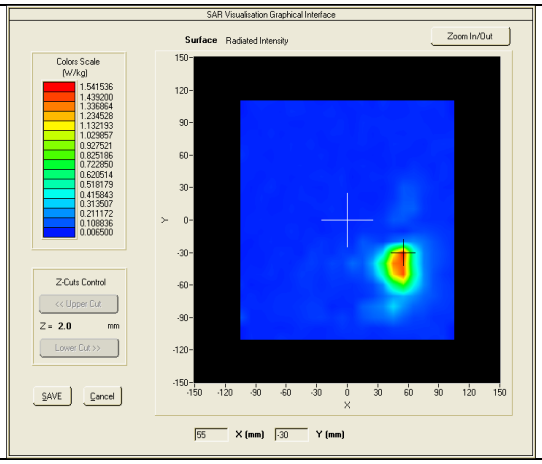
VOLUME SAR



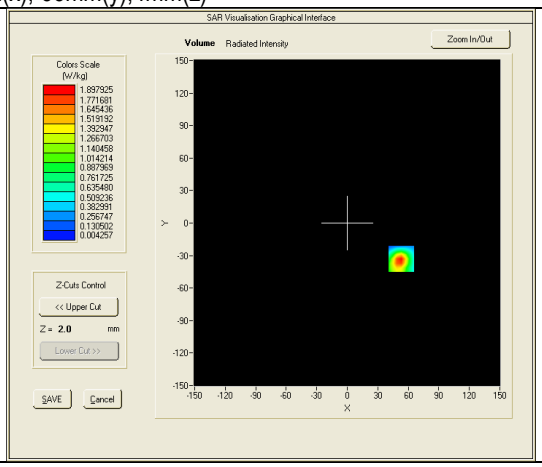
3D View Plot

Test specification:	Q510_Bottom Touch_5680_A mode			
Environ Conditions:	Temp(oC):	21	Result:	Pass
	Humidity(%):	46		
	Atmospheric(mPa):	1005		
Mains Power:	7.2VDC Battery			
Test Date:	12/10/2014			
Tested by:	Ricky Wang			
Remarks:	N/A			

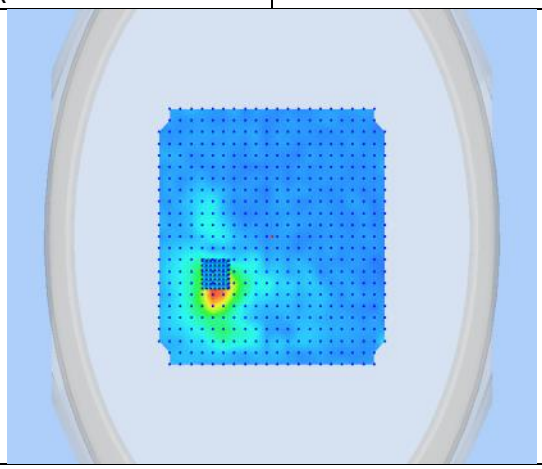
Frequency (MHz)	5680.000000
Relative permittivity (real part)	47.51
Conductivity (S/m)	6.08
Transmission Duty Factor	1.0
Probe SN	1714_EPG213
Conversion Factor (dB)	16.15
Area Scan Resolution	4 mm
Zoom Scan Resolution	dx=4mm, dy=4mm, dz=2mm
Zoom Scan Size	24x24x24 mm
Measurement Drifts (%)	-2.73
Highest Extrapolated SAR (W/Kg)	2.2142
SAR 1g (W/Kg)	0.6893
Peak SAR Location	53mm(x),-33mm(y),4mm(z)



SURFACE SAR



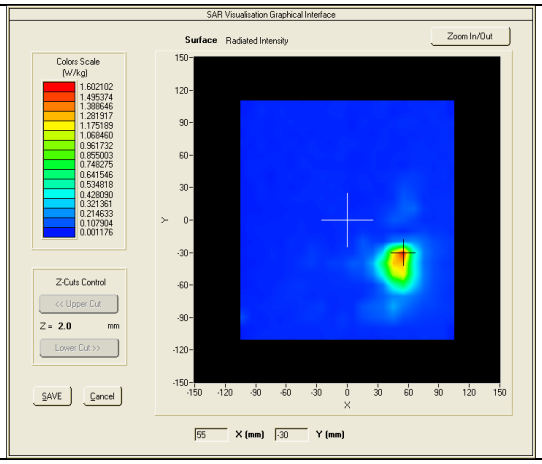
VOLUME SAR



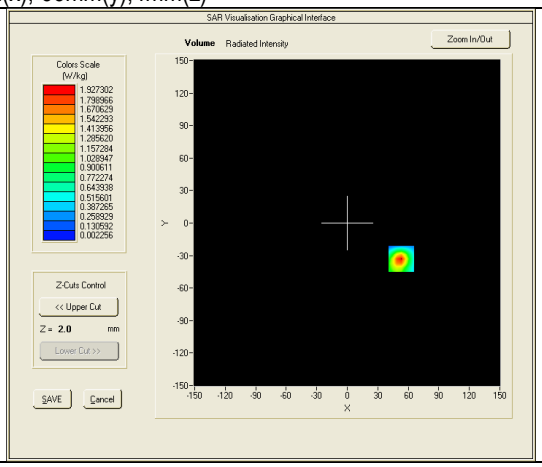
3D View Plot

Test specification:	Q520_Bottom Touch_5745_A mode			
Environ Conditions:	Temp(oC):	21	Result:	Pass
	Humidity(%):	46		
	Atmospheric(mPa):	1005		
Mains Power:	7.2VDC Battery			
Test Date:	12/10/2014			
Tested by:	Ricky Wang			
Remarks:	N/A			

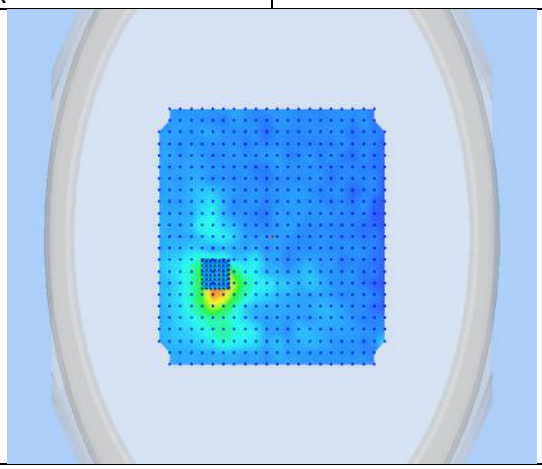
Frequency (MHz)	5745.000000
Relative permittivity (real part)	47.13
Conductivity (S/m)	6.16
Transmission Duty Factor	1.0
Probe SN	1714_EPG213
Conversion Factor (dB)	16.15
Area Scan Resolution	4 mm
Zoom Scan Resolution	dx=4mm, dy=4mm, dz=2mm
Zoom Scan Size	24x24x24 mm
Measurement Drifts (%)	-0.52
Highest Extrapolated SAR (W/Kg)	2.2249
SAR 1g (W/Kg)	0.6799
Peak SAR Location	53mm(x),-33mm(y),4mm(z)



SURFACE SAR



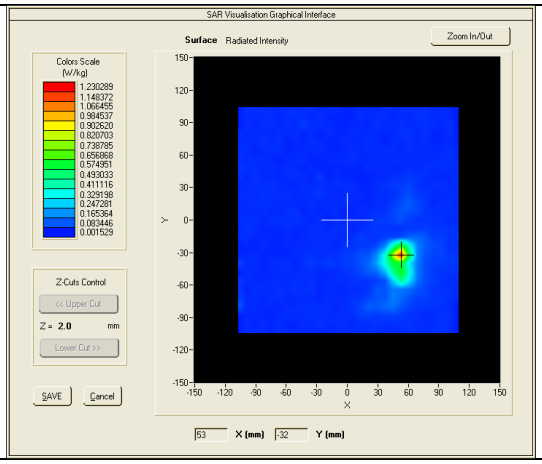
VOLUME SAR



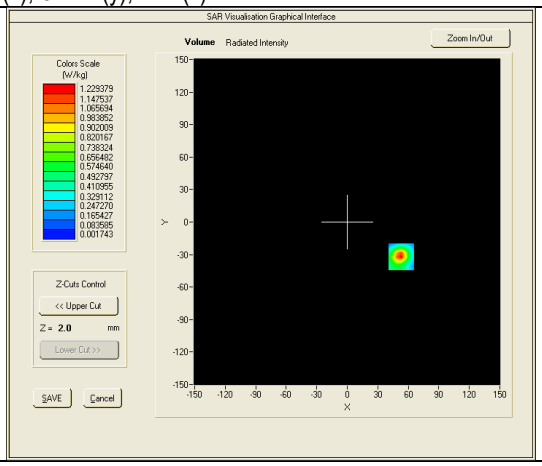
3D View Plot

Test specification:	Q520_Bottom Touch_5785_A mode			
Environ Conditions:	Temp(oC):	21	Result:	Pass
	Humidity(%):	46		
	Atmospheric(mPa):	1005		
Mains Power:	7.2VDC Battery			
Test Date:	12/10/2014			
Tested by:	Ricky Wang			
Remarks:	N/A			

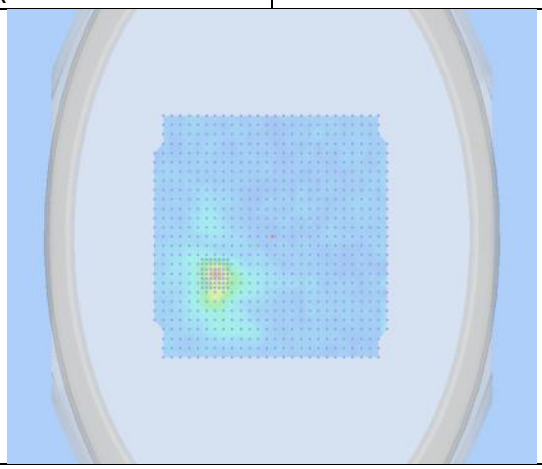
Frequency (MHz)	5785.000000
Relative permittivity (real part)	47.04
Conductivity (S/m)	6.22
Transmission Duty Factor	1.0
Probe SN	1714_EPG213
Conversion Factor (dB)	16.15
Area Scan Resolution	4 mm
Zoom Scan Resolution	dx=4mm, dy=4mm, dz=2mm
Zoom Scan Size	24x24x24 mm
Measurement Drifts (%)	-0.98
Highest Extrapolated SAR (W/Kg)	2.1178
SAR 1g (W/Kg)	0.6247
Peak SAR Location	53mm(x),-32mm(y),4mm(z)



SURFACE SAR



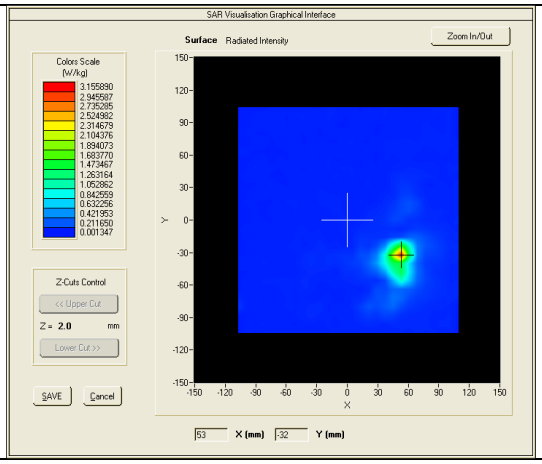
VOLUME SAR



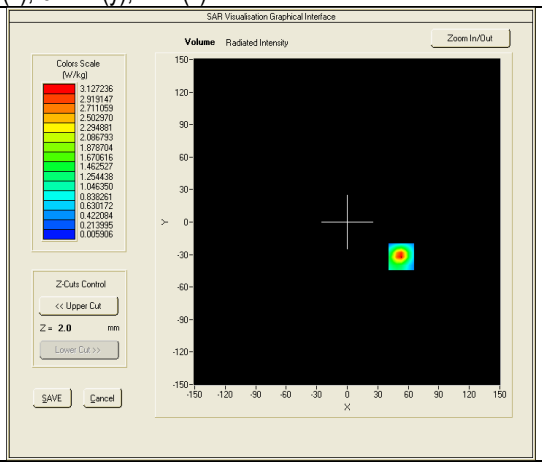
3D View Plot

Test specification:	Q520_Bottom Touch_5825_A mode			
Environ Conditions:	Temp(oC):	21	Result:	Pass
	Humidity(%):	46		
	Atmospheric(mPa):	1005		
Mains Power:	7.2VDC Battery			
Test Date:	12/10/2014			
Tested by:	Ricky Wang			
Remarks:	N/A			

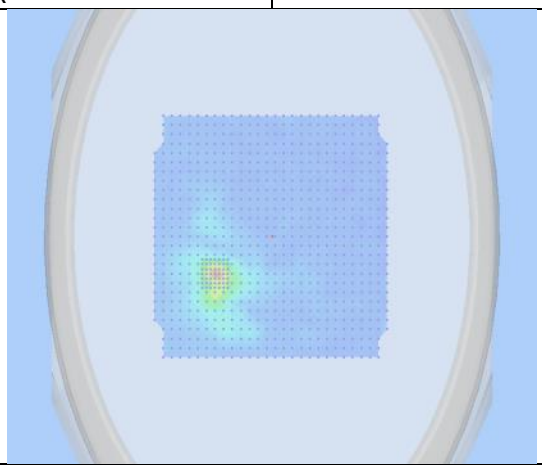
Frequency (MHz)	5825.000000
Relative permittivity (real part)	48.00
Conductivity (S/m)	6.24
Transmission Duty Factor	1.0
Probe SN	1714_EPG213
Conversion Factor (dB)	16.15
Area Scan Resolution	4 mm
Zoom Scan Resolution	dx=4mm, dy=4mm, dz=2mm
Zoom Scan Size	24x24x24 mm
Measurement Drifts (%)	2.35
Highest Extrapolated SAR (W/Kg)	2.4087
SAR 1g (W/Kg)	0.7744
Peak SAR Location	53mm(x),-32mm(y),4mm(z)



SURFACE SAR



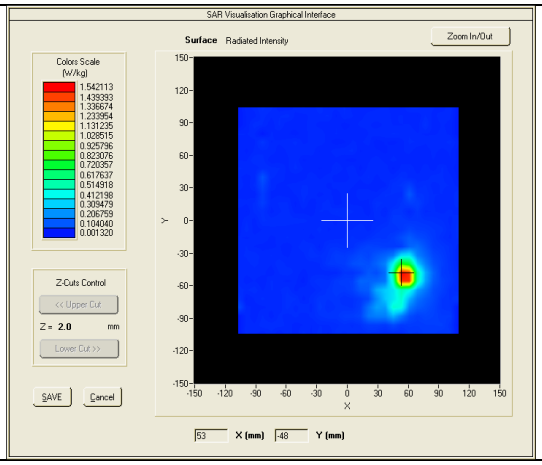
VOLUME SAR



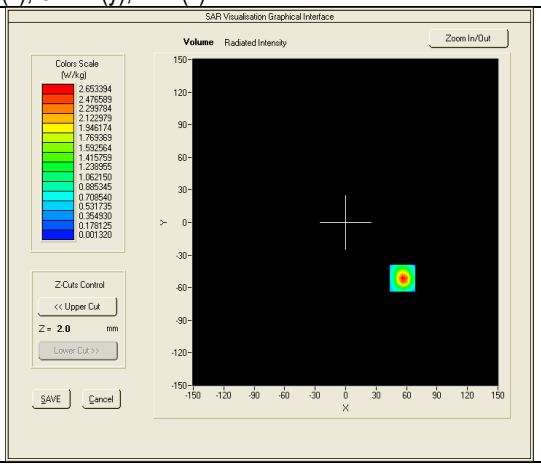
3D View Plot

Test specification:	ZQ520_Bottom Touch_5190_HT40 mode			
Environ Conditions:	Temp(oC):	21	Result:	Pass
	Humidity(%):	46		
	Atmospheric(mPa):	1005		
Mains Power:	7.2VDC Battery			
Test Date:	12/10/2014			
Tested by:	Ricky Wang			
Remarks:	N/A			

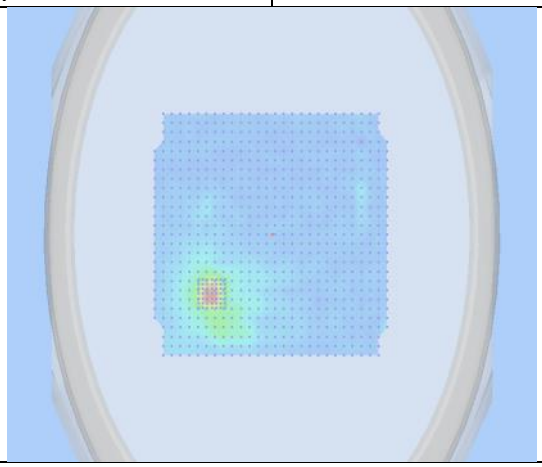
Frequency (MHz)	5190.000000
Relative permittivity (real part)	50.07
Conductivity (S/m)	5.46
Transmission Duty Factor	1.0
Probe SN	1714_EPG213
Conversion Factor (dB)	16.15
Area Scan Resolution	4 mm
Zoom Scan Resolution	dx=4mm, dy=4mm, dz=2mm
Zoom Scan Size	24x24x24 mm
Measurement Drifts (%)	1.260
Highest Extrapolated SAR (W/Kg)	2.3581
SAR 1g (W/Kg)	0.6954
Peak SAR Location	56mm(x),-51mm(y),4mm(z)



SURFACE SAR



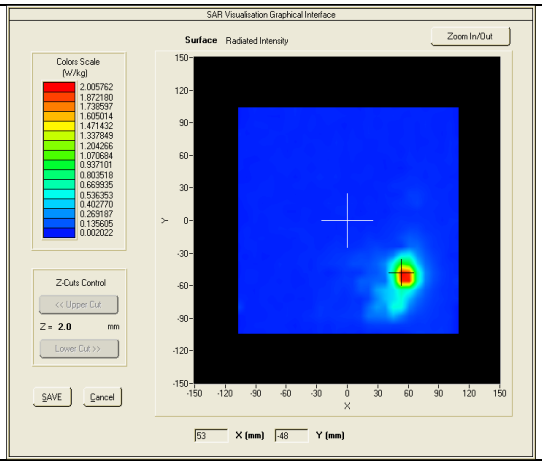
VOLUME SAR



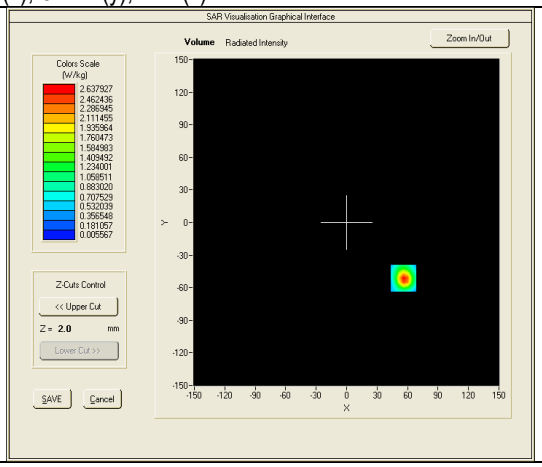
3D View Plot

Test specification:	ZQ520_Bottom Touch_5230_HT40 mode			
Environ Conditions:	Temp(oC):	21	Result:	Pass
	Humidity(%):	46		
	Atmospheric(mPa):	1005		
Mains Power:	7.2VDC Battery			
Test Date:	12/10/2014			
Tested by:	Ricky Wang			
Remarks:	N/A			

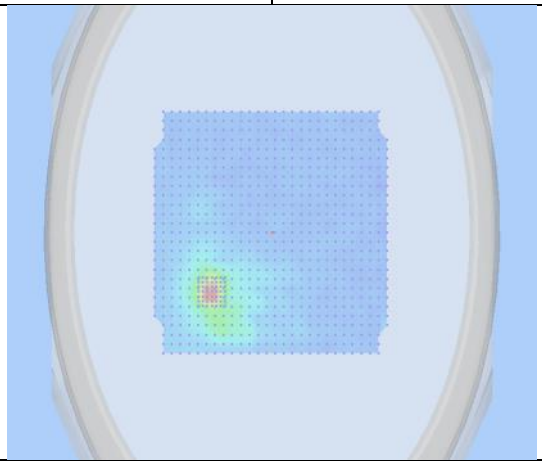
Frequency (MHz)	5230.000000
Relative permittivity (real part)	50.02
Conductivity (S/m)	5.54
Transmission Duty Factor	1.0
Probe SN	1714_EPG213
Conversion Factor (dB)	16.15
Area Scan Resolution	4 mm
Zoom Scan Resolution	dx=4mm, dy=4mm, dz=2mm
Zoom Scan Size	24x24x24 mm
Measurement Drifts (%)	0.650
Highest Extrapolated SAR (W/Kg)	2.3468
SAR 1g (W/Kg)	0.6956
Peak SAR Location	56mm(x),-51mm(y),4mm(z)



SURFACE SAR



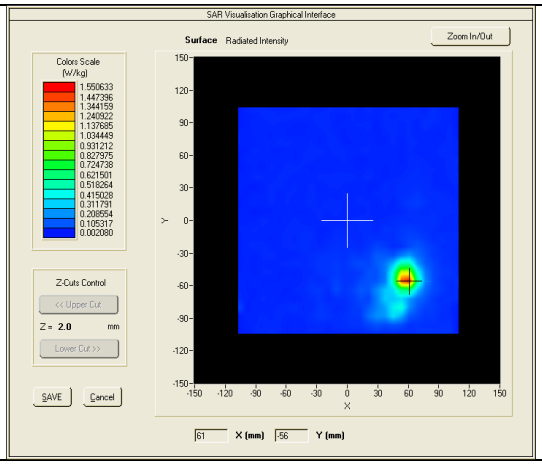
VOLUME SAR



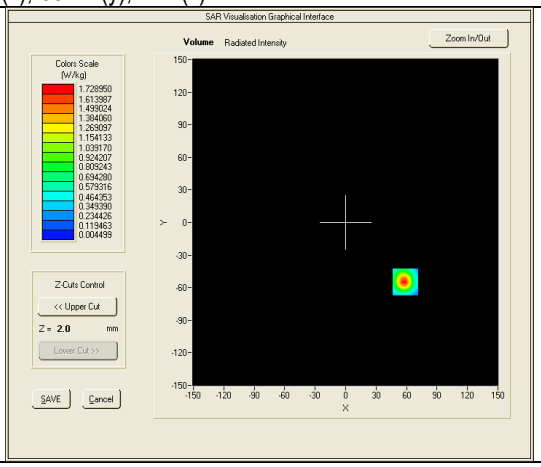
3D View Plot

Test specification:	ZQ520_Bottom Touch_5270_HT40 mode			
Environ Conditions:	Temp(oC):	21	Result:	Pass
	Humidity(%):	46		
	Atmospheric(mPa):	1005		
Mains Power:	7.2VDC Battery			
Test Date:	12/10/2014			
Tested by:	Ricky Wang			
Remarks:	N/A			

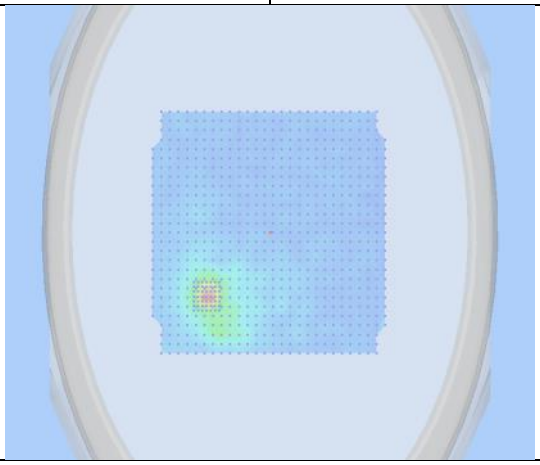
Frequency (MHz)	5270.000000
Relative permittivity (real part)	50.00
Conductivity (S/m)	5.58
Transmission Duty Factor	1.0
Probe SN	1714_EPG213
Conversion Factor (dB)	16.15
Area Scan Resolution	4 mm
Zoom Scan Resolution	dx=4mm, dy=4mm, dz=2mm
Zoom Scan Size	24x24x24 mm
Measurement Drifts (%)	3.940
Highest Extrapolated SAR (W/Kg)	1.8552
SAR 1g (W/Kg)	0.4142
Peak SAR Location	59mm(x),-55mm(y),4mm(z)



SURFACE SAR



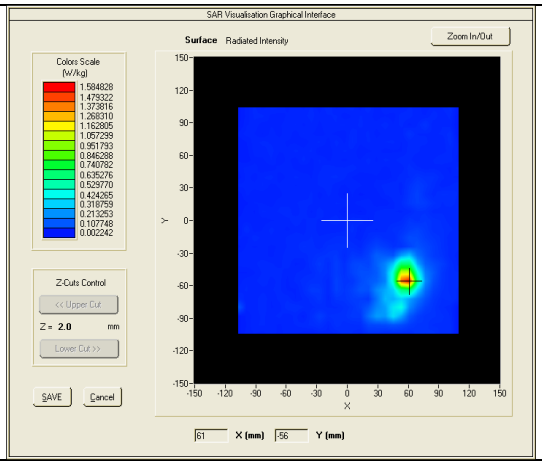
VOLUME SAR



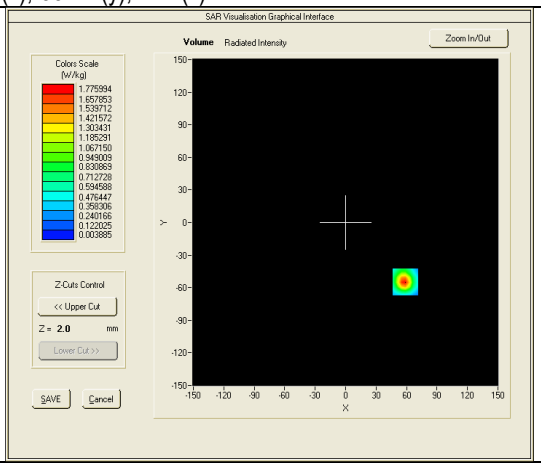
3D View Plot

Test specification:	ZQ520_Bottom Touch_5310_HT40 mode			
Environ Conditions:	Temp(oC):	21	Result:	Pass
	Humidity(%):	46		
	Atmospheric(mPa):	1005		
Mains Power:	7.2VDC Battery			
Test Date:	12/10/2014			
Tested by:	Ricky Wang			
Remarks:	N/A			

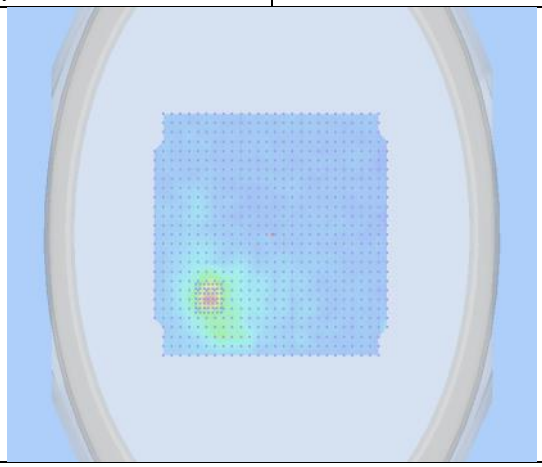
Frequency (MHz)	5310.000000
Relative permittivity (real part)	49.94
Conductivity (S/m)	5.67
Transmission Duty Factor	1.0
Probe SN	1714_EPG213
Conversion Factor (dB)	16.15
Area Scan Resolution	4 mm
Zoom Scan Resolution	dx=4mm, dy=4mm, dz=2mm
Zoom Scan Size	24x24x24 mm
Measurement Drifts (%)	2.100
Highest Extrapolated SAR (W/Kg)	1.9490
SAR 1g (W/Kg)	0.4349
Peak SAR Location	59mm(x),-55mm(y),4mm(z)



SURFACE SAR



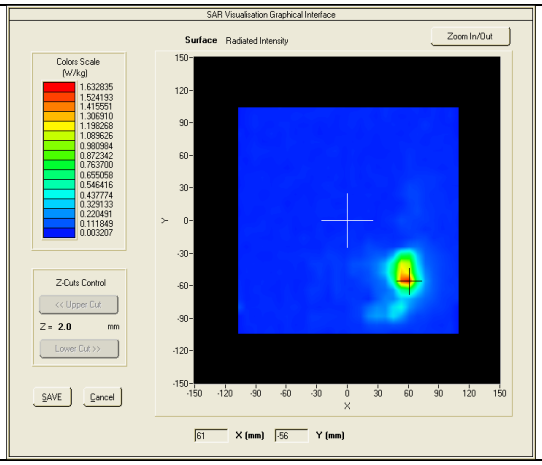
VOLUME SAR



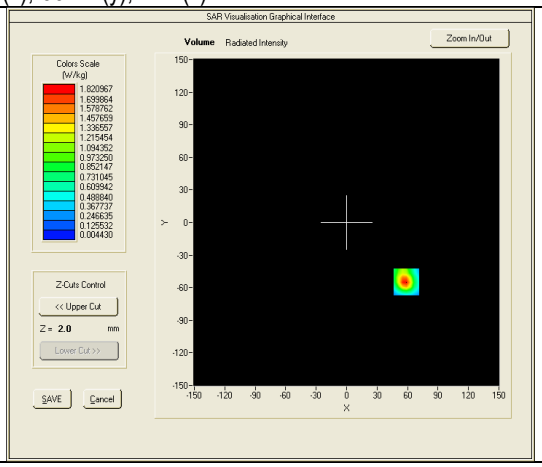
3D View Plot

Test specification:	ZQ520_Bottom Touch_5510_HT40 mode			
Environ Conditions:	Temp(oC):	21	Result:	Pass
	Humidity(%):	46		
	Atmospheric(mPa):	1005		
Mains Power:	7.2VDC Battery			
Test Date:	12/10/2014			
Tested by:	Ricky Wang			
Remarks:	N/A			

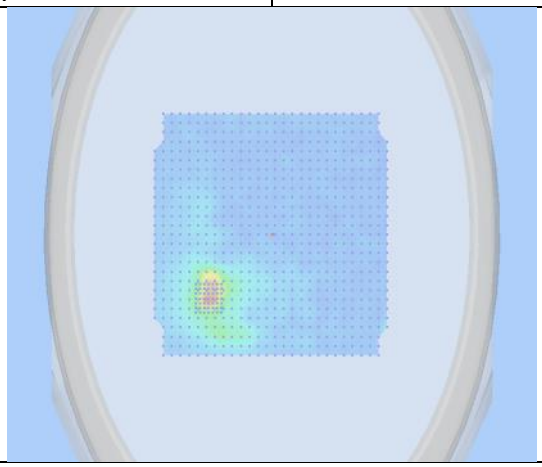
Frequency (MHz)	5510.000000
Relative permittivity (real part)	48.91
Conductivity (S/m)	5.89
Transmission Duty Factor	1.0
Probe SN	1714_EPG213
Conversion Factor (dB)	16.15
Area Scan Resolution	4 mm
Zoom Scan Resolution	dx=4mm, dy=4mm, dz=2mm
Zoom Scan Size	24x24x24 mm
Measurement Drifts (%)	2.510
Highest Extrapolated SAR (W/Kg)	2.0601
SAR 1g (W/Kg)	0.4726
Peak SAR Location	59mm(x),-55mm(y),4mm(z)



SURFACE SAR



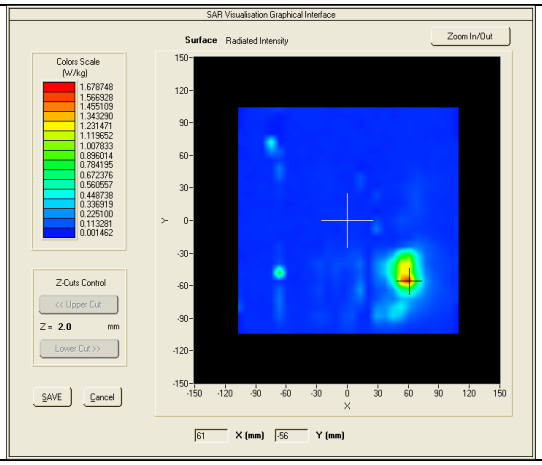
VOLUME SAR



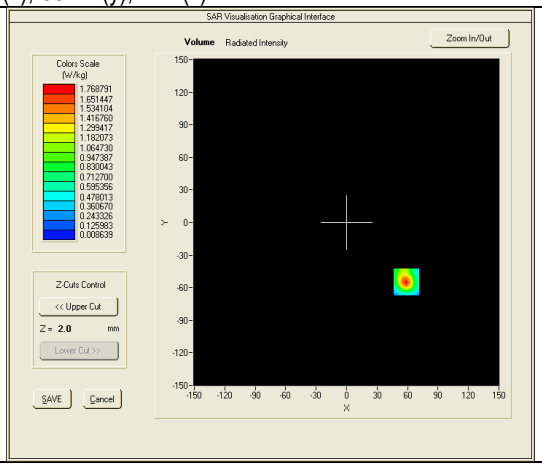
3D View Plot

Test specification:	ZQ520_Bottom Touch_5550_HT40 mode			
Environ Conditions:	Temp(oC):	21	Result:	Pass
	Humidity(%):	46		
	Atmospheric(mPa):	1005		
Mains Power:	7.2VDC Battery			
Test Date:	12/10/2014			
Tested by:	Ricky Wang			
Remarks:	N/A			

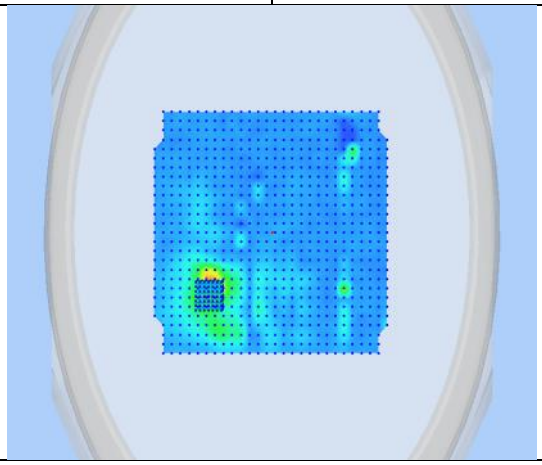
Frequency (MHz)	5550.000000
Relative permittivity (real part)	48.67
Conductivity (S/m)	5.98
Transmission Duty Factor	1.0
Probe SN	1714_EPG213
Conversion Factor (dB)	16.15
Area Scan Resolution	4 mm
Zoom Scan Resolution	dx=4mm, dy=4mm, dz=2mm
Zoom Scan Size	24x24x24 mm
Measurement Drifts (%)	1.440
Highest Extrapolated SAR (W/Kg)	1.9313
SAR 1g (W/Kg)	0.4269
Peak SAR Location	59mm(x),-55mm(y),4mm(z)



SURFACE SAR



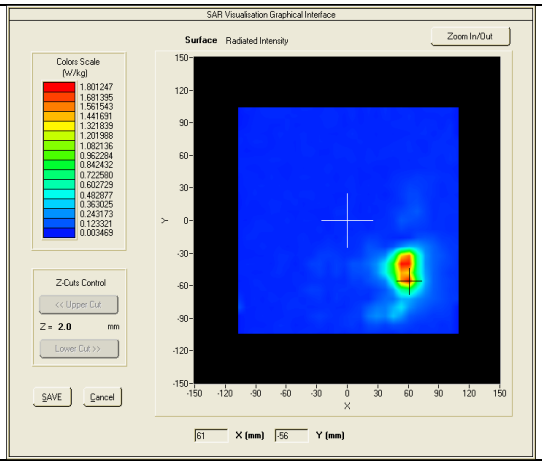
VOLUME SAR



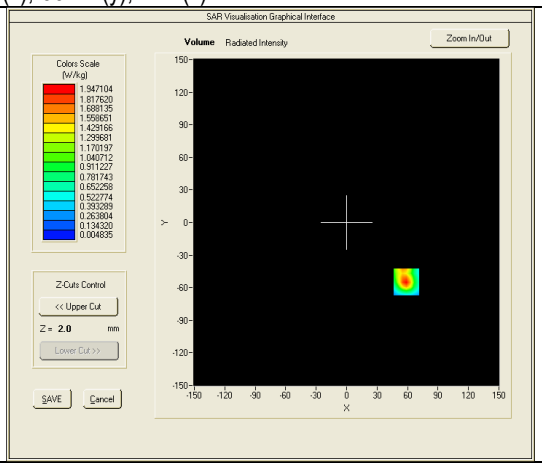
3D View Plot

Test specification:	ZQ520_Bottom Touch_5670_HT40 mode			
Environ Conditions:	Temp(oC):	21	Result:	Pass
	Humidity(%):	46		
	Atmospheric(mPa):	1005		
Mains Power:	7.2VDC Battery			
Test Date:	12/10/2014			
Tested by:	Ricky Wang			
Remarks:	N/A			

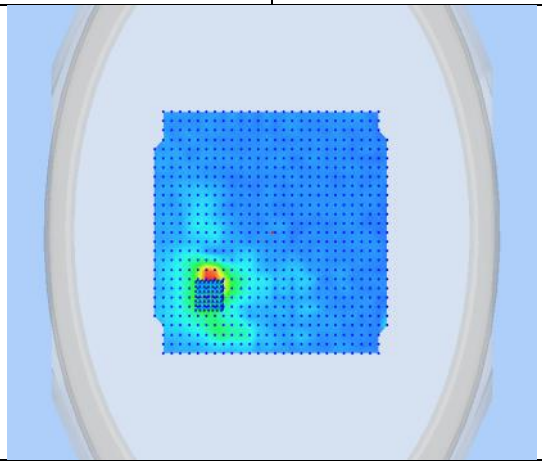
Frequency (MHz)	5670.000000
Relative permittivity (real part)	47.51
Conductivity (S/m)	6.08
Transmission Duty Factor	1.0
Probe SN	1714_EPG213
Conversion Factor (dB)	16.15
Area Scan Resolution	4 mm
Zoom Scan Resolution	dx=4mm, dy=4mm, dz=2mm
Zoom Scan Size	24x24x24 mm
Measurement Drifts (%)	2.230
Highest Extrapolated SAR (W/Kg)	2.2436
SAR 1g (W/Kg)	0.5216
Peak SAR Location	59mm(x),-55mm(y),4mm(z)



SURFACE SAR



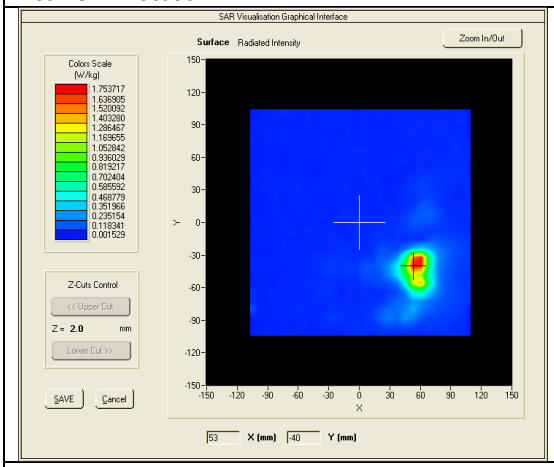
VOLUME SAR



3D View Plot

Test specification:	ZQ520_Bottom Touch_5755_HT40 mode			
Environ Conditions:	Temp(oC):	21	Result:	Pass
	Humidity(%):	46		
	Atmospheric(mPa):	1005		
Mains Power:	7.2VDC Battery			
Test Date:	12/10/2014			
Tested by:	Ricky Wang			
Remarks:	N/A			

Frequency (MHz)	5755.000000
Relative permittivity (real part)	47.13
Conductivity (S/m)	6.16
Transmission Duty Factor	1.0
Probe SN	1714_EPG213
Conversion Factor (dB)	16.15
Area Scan Resolution	4 mm
Zoom Scan Resolution	dx=4mm, dy=4mm, dz=2mm
Zoom Scan Size	24x24x24 mm
Measurement Drifts (%)	1.950
Highest Extrapolated SAR (W/Kg)	2.8369
SAR 1g (W/Kg)	0.6604
Peak SAR Location	57mm(x),-37mm(y),4mm(z)



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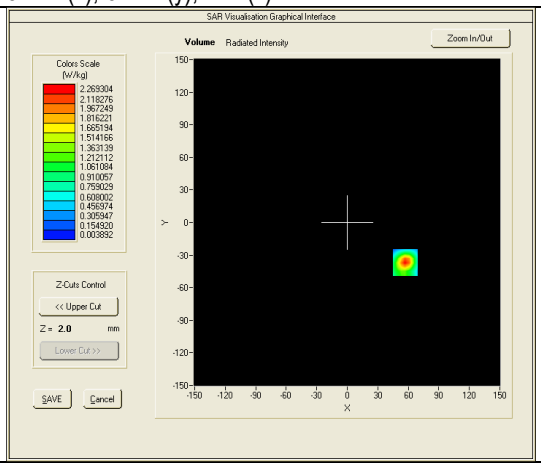
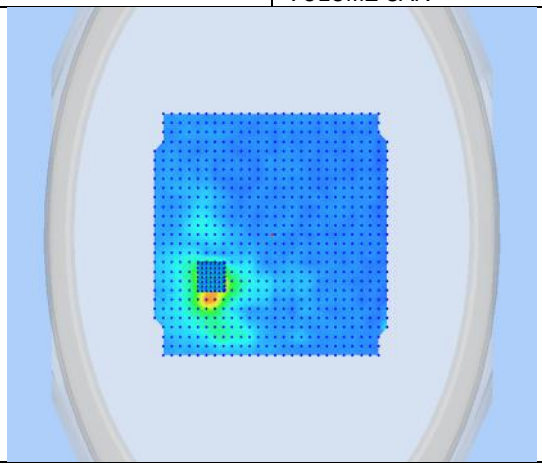


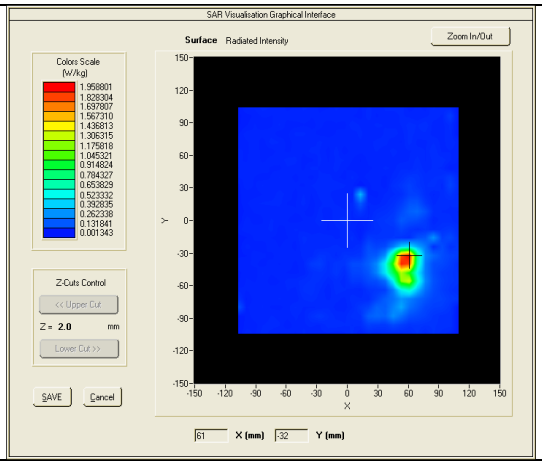
VOLUME SAR



3D View Plot

Test specification:	ZQ520_Bottom Touch_5795_HT40 mode			
Environ Conditions:	Temp(oC):	21	Result:	Pass
	Humidity(%):	46		
	Atmospheric(mPa):	1005		
Mains Power:	7.2VDC Battery			
Test Date:	12/10/2014			
Tested by:	Ricky Wang			
Remarks:	N/A			

Frequency (MHz)	5795.000000
Relative permittivity (real part)	47.04
Conductivity (S/m)	6.22
Transmission Duty Factor	1.0
Probe SN	1714_EPG213
Conversion Factor (dB)	16.15
Area Scan Resolution	4 mm
Zoom Scan Resolution	dx=4mm, dy=4mm, dz=2mm
Zoom Scan Size	24x24x24 mm
Measurement Drifts (%)	2.130
Highest Extrapolated SAR (W/Kg)	2.2489
SAR 1g (W/Kg)	0.7162
Peak SAR Location	58mm(x),-35mm(y),4mm(z)



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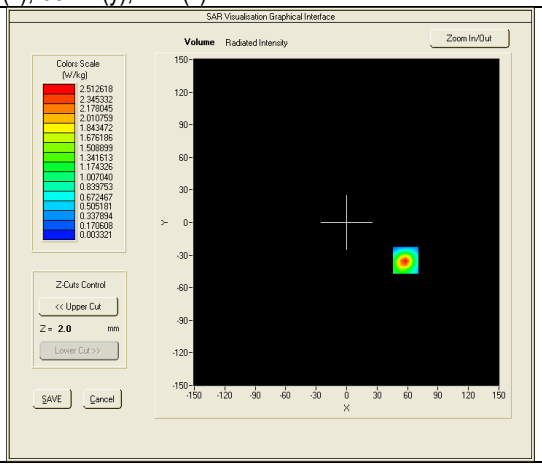
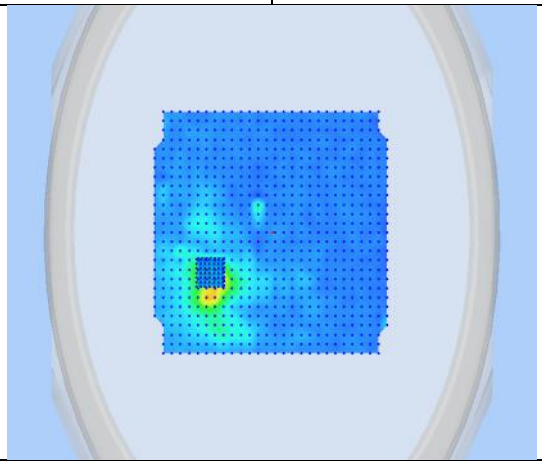


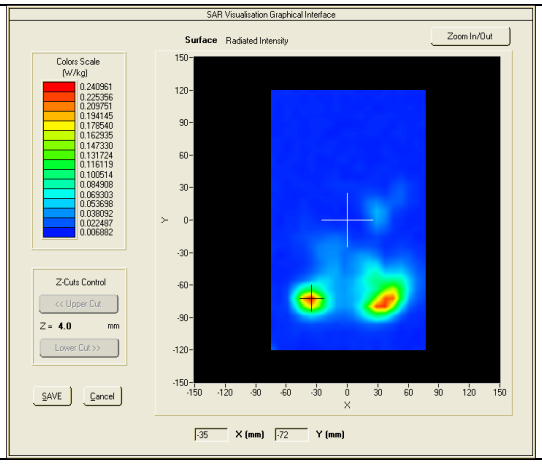
VOLUME SAR



3D View Plot

Test specification:	Q510_Bottom Touch_2437_B mode			
Environ Conditions:	Temp(oC):	21	Result:	Pass
	Humidity(%):	46		
	Atmospheric(mPa):	1005		
Mains Power:	7.2VDC Battery			
Test Date:	12/08/2014			
Tested by:	Ricky Wang			
Remarks:	N/A			

Frequency (MHz)	2437.000000
Relative permittivity (real part)	51.48
Conductivity (S/m)	1.94
Transmission Duty Factor	1.0
Probe SN	1714_EPG213
Conversion Factor (dB)	21.96
Area Scan Resolution	8 mm
Zoom Scan Resolution	dx=8mm, dy=8mm, dz=5mm
Zoom Scan Size	32x32x34 mm
Measurement Drifts (%)	-0.38
Highest Extrapolated SAR (W/Kg)	0.4524
SAR 1g (W/Kg)	0.2500
Peak SAR Location	-36mm(x),-73mm(y),4mm(z)



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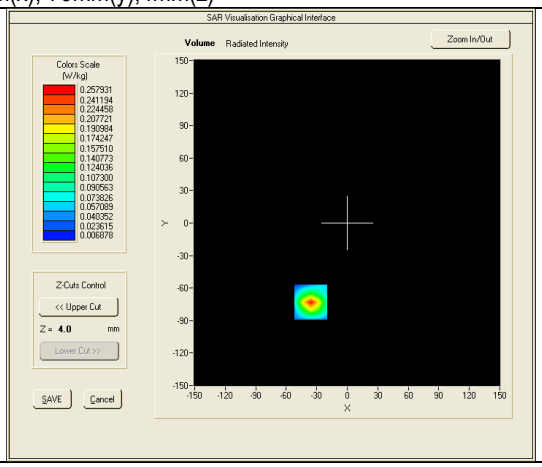
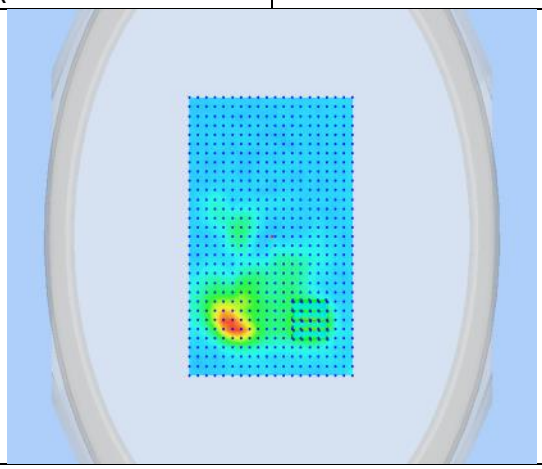


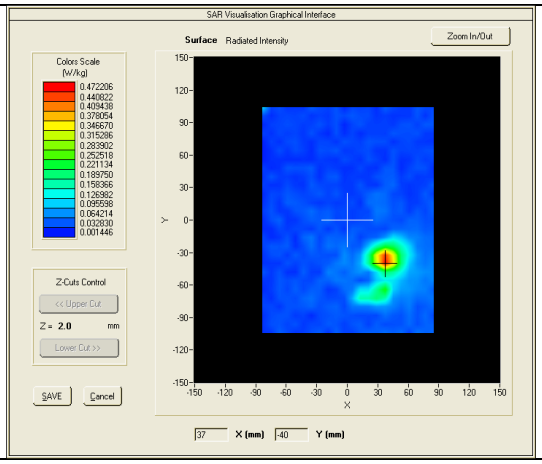
VOLUME SAR



3D View Plot

Test specification:	Q510_Bottom Touch_5825_A mode			
Environ Conditions:	Temp(oC):	21	Result:	Pass
	Humidity(%):	46		
	Atmospheric(mPa):	1005		
Mains Power:	7.2VDC Battery			
Test Date:	12/10/2014			
Tested by:	Ricky Wang			
Remarks:	N/A			

Frequency (MHz)	5520.000000
Relative permittivity (real part)	48.00
Conductivity (S/m)	6.24
Transmission Duty Factor	1.0
Probe SN	1714_EPG213
Conversion Factor (dB)	16.15
Area Scan Resolution	4 mm
Zoom Scan Resolution	dx=4mm, dy=4mm, dz=2mm
Zoom Scan Size	24x24x24 mm
Measurement Drifts (%)	3.57
Highest Extrapolated SAR (W/Kg)	0.8170
SAR 1g (W/Kg)	0.2855
Peak SAR Location	37mm(x),-38mm(y),4mm(z)



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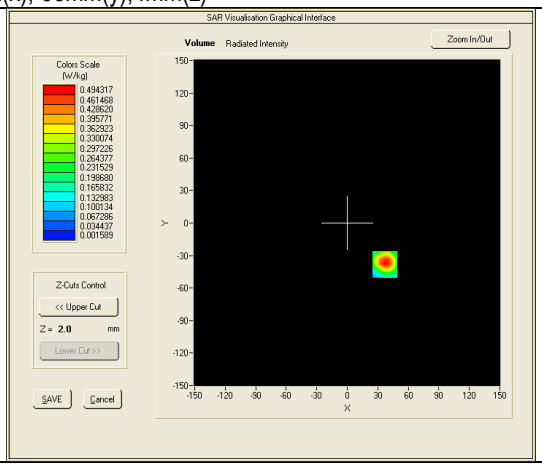
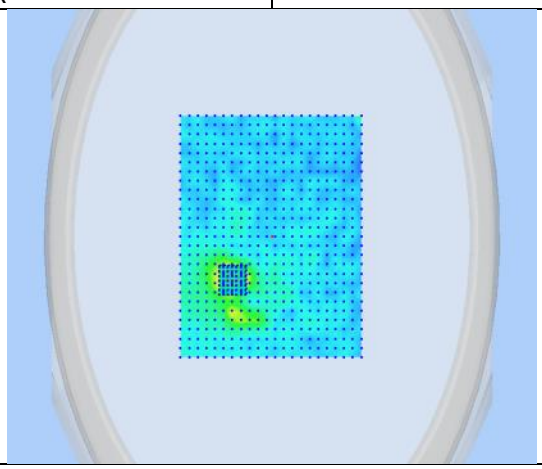


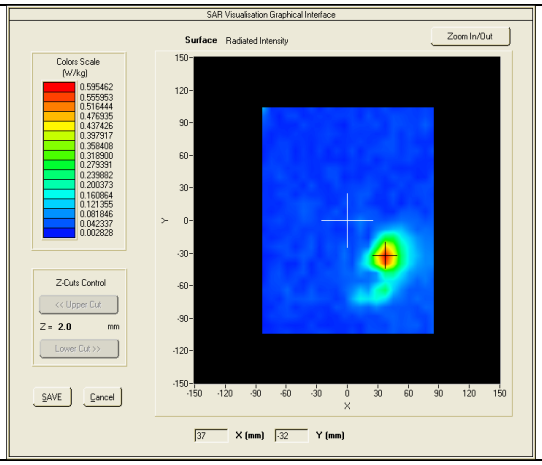
VOLUME SAR



3D View Plot

Test specification:	ZQ510_Bottom Touch_5230_HT40 mode			
Environ Conditions:	Temp(oC):	21	Result:	Pass
	Humidity(%):	46		
	Atmospheric(mPa):	1005		
Mains Power:	7.2VDC Battery			
Test Date:	12/10/2014			
Tested by:	Ricky Wang			
Remarks:	N/A			

Frequency (MHz)	5230.000000
Relative permittivity (real part)	47.04
Conductivity (S/m)	6.22
Transmission Duty Factor	1.0
Probe SN	1714_EPG213
Conversion Factor (dB)	16.15
Area Scan Resolution	4 mm
Zoom Scan Resolution	dx=4mm, dy=4mm, dz=2mm
Zoom Scan Size	24x24x24 mm
Measurement Drifts (%)	1.770
Highest Extrapolated SAR (W/Kg)	0.9874
SAR 1g (W/Kg)	0.2394
Peak SAR Location	37mm(x),-33mm(y),4mm(z)



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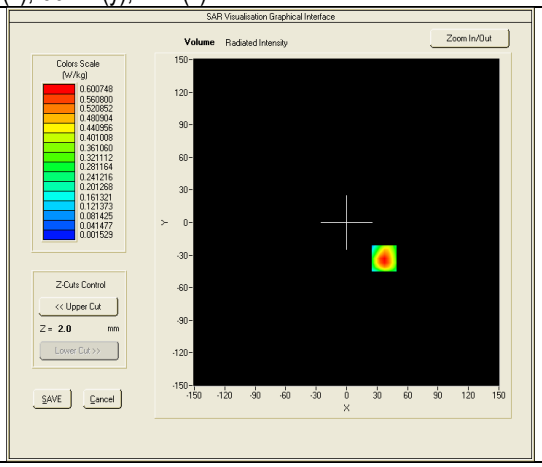
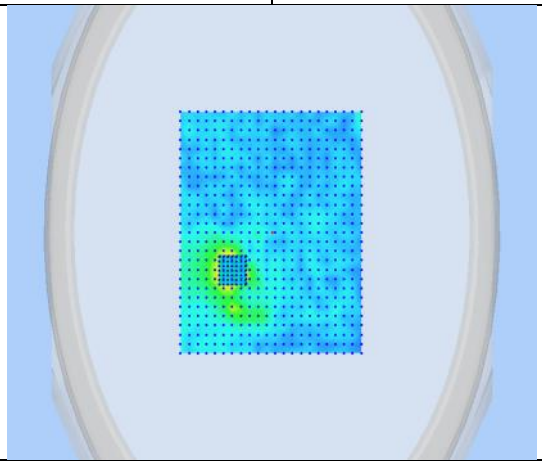


VOLUME SAR



3D View Plot

Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Cycle	Cal Due	In use
SAR						
P C	PV 3.06GHz	375052-AA1	N/A	N/A	N/A	☑
Signal Generator	8665B-008	3744A01304	5/17/2014	1 Year	05/17/2015	☑
Multi-meter	Multi-meter 2000	1259033	08/13/2014	1 Year	08/13/2015	☐
S-Parameter Network Analyzer	8753ES	US38161019	05/11/2014	1 Year	05/11/2015	☑
Power Meter	437B	3038A03648	04/25/2014	1 Year	04/25/2015	☑
E-field PROBE	EPG213	SN17/14 EPG213	08/27/2014	1 Year	08/27/2015	☐
DIPOLE 900	DIPOLE 900MHz	SN 31/10 DIPD134	08/14/2014	1 Year	08/14/2015	☐
DIPOLE 1800	DIPOLE 2450MHz	SN 31/10 DIPF135	08/14/2014	1 Year	08/14/2015	☐
DIPOLE 2450	DIPOLE 2450MHz	SN 31/10 DIPI137	08/14/2014	1 Year	08/14/2015	☑
DIPOLE 2450	DIPOLE 2450MHz	SN 31/10 DIPJ138	08/14/2014	1 Year	08/14/2015	☑
WaveGuide 5/6 GHz	Wave Guide 5/6GHz	SN 31/10 DIPWGA13	06/13/2014	1 Year	06/13/2015	☑
COMOSAR Open Coaxial Probe	OCP36	SN 31/10 OCP36	06/13/2014	1 Year	06/13/2015	☑
Communication Antenna	ANTA30	SN 31/10 ANTA30	N/A	N/A	N/A	☐
Laptop POSITIONING DEVICE	LSH63	SN 31/10 LSH13	N/A	N/A	N/A	☑
Mobile Phone POSITIONING DEVICE	MSH63	SN 31/10 MSH63	N/A	N/A	N/A	☑
DUMMY PROBE	None	SN 31/10	N/A	N/A	N/A	☐
SAM PHANTOM	SAM77	SN 31/10 SAM77	N/A	N/A	N/A	☐
Elliptic Phantom	ELLI17	SN 31-10 ELLI17	N/A	N/A	N/A	☑
PHANTOM TABLE	N/A	N/A	N/A	N/A	N/A	☑
6 AXIS ROBOT	KR5	949319	N/A	N/A	N/A	☑
Medium Power Solid State Amplifier (0.8~4.2GHz)	S41-25	M629-0408	N/A	N/A	N/A	☑

Annex B. Probe Calibration report

SATIMO
The microwave vision company

COMOSAR E-Field Probe Calibration Report

Ref : ACR.239.1.14.SATU.A

SIEMIC TESTING AND CERTIFICATION SERVICES
775 MONTAGUE EXPRESSWAY
MILPITAS, CA 95035, USA
SATIMO COMOSAR DOSIMETRIC E-FIELD PROBE
SERIAL NO.: SN 17/14 EPG213

Calibrated at SATIMO US
2105 Barrett Park Dr. - Kennesaw, GA 30144

ilac-MRA A2LA ACCREDITED

08/27/2014

Summary:

This document presents the method and results from an accredited COMOSAR Dosimetric E-Field Probe calibration performed in SATIMO USA using the CALISAR / CALIBAIR test bench, for use with a SATIMO COMOSAR system only. All calibration results are traceable to national metrology institutions.

SATIMO

COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.239.1.14.SATU.A

	Name	Function	Date	Signature
Prepared by :	Jérôme LUC	Product Manager	8/27/2014	
Checked by :	Jérôme LUC	Product Manager	8/27/2014	
Approved by :	Kim RUTKOWSKI	Quality Manager	8/27/2014	

	Customer Name
Distribution :	SIEMIC Testing and Certification Services

Issue	Date	Modifications
A	8/27/2014	Initial release

TABLE OF CONTENTS

1 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR DOSIMETRIC E FIELD PROBE
Manufacturer	Satimo
Model	SSE2
Serial Number	SN 17/14 EPG213
Product Condition (new / used)	New
Frequency Range of Probe	0.7 GHz-6GHz
Resistance of Three Dipoles at Connector	Dipole 1: R1=0.212 MΩ Dipole 2: R2=0.240 MΩ Dipole 3: R3=0.205 MΩ

A yearly calibration interval is recommended.

2 PRODUCT DESCRIPTION

2.1 GENERAL INFORMATION

Satimo's COMOSAR E field Probes are built in accordance to the IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards.

Figure 1 – *Satimo COMOSAR Dosimetric E field Dipole*

Probe Length	330 mm
Length of Individual Dipoles	2 mm
Maximum external diameter	8 mm
Probe Tip External Diameter	2.5 mm
Distance between dipoles / probe extremity	1 mm

3 MEASUREMENT METHOD

The IEEE 1528, OET 65 Bulletin C, CENELEC EN50361 and CEI/IEC 62209 standards provide recommended practices for the probe calibrations, including the performance characteristics of interest and methods by which to assess their affect. All calibrations / measurements performed meet the fore mentioned standards.

3.1 LINEARITY

The evaluation of the linearity was done in free space using the waveguide, performing a power sweep to cover the SAR range 0.01W/kg to 100W/kg.

3.2 SENSITIVITY

The sensitivity factors of the three dipoles were determined using a two step calibration method (air and tissue simulating liquid) using waveguides as outlined in the standards.

3.3 LOWER DETECTION LIMIT

The lower detection limit was assessed using the same measurement set up as used for the linearity measurement. The required lower detection limit is 10 mW/kg.

3.4 ISOTROPY

The axial isotropy was evaluated by exposing the probe to a reference wave from a standard dipole with the dipole mounted under the flat phantom in the test configuration suggested for system validations and checks. The probe was rotated along its main axis from 0 - 360 degrees in 15 degree steps. The hemispherical isotropy is determined by inserting the probe in a thin plastic box filled with tissue-equivalent liquid, with the plastic box illuminated with the fields from a half wave dipole. The dipole is rotated about its axis (0°–180°) in 15° increments. At each step the probe is rotated about its axis (0°–360°).

3.5 BOUNDARY EFFECT

The boundary effect is defined as the deviation between the SAR measured data and the expected exponential decay in the liquid when the probe is oriented normal to the interface. To evaluate this effect, the liquid filled flat phantom is exposed to fields from either a reference dipole or waveguide. With the probe normal to the phantom surface, the peak spatial average SAR is measured and compared to the analytical value at the surface.

4 MEASUREMENT UNCERTAINTY

The guidelines outlined in the IEEE 1528, OET 65 Bulletin C, CENELEC EN50361 and CEI/IEC 62209 standards were followed to generate the measurement uncertainty associated with an E-field probe calibration using the waveguide technique. All uncertainties listed below represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2, traceable to the Internationally Accepted Guides to Measurement Uncertainty.

Uncertainty analysis of the probe calibration in waveguide

ERROR SOURCES	Uncertainty value (%)	Probability Distribution	Divisor	ci	Standard Uncertainty (%)
Incident or forward power	3.00%	Rectangular	$\sqrt{3}$	1	1.732%
Reflected power	3.00%	Rectangular	$\sqrt{3}$	1	1.732%
Liquid conductivity	5.00%	Rectangular	$\sqrt{3}$	1	2.887%
Liquid permittivity	4.00%	Rectangular	$\sqrt{3}$	1	2.309%
Field homogeneity	3.00%	Rectangular	$\sqrt{3}$	1	1.732%
Field probe positioning	5.00%	Rectangular	$\sqrt{3}$	1	2.887%
Field probe linearity	3.00%	Rectangular	$\sqrt{3}$	1	1.732%

Combined standard uncertainty					5.831%
Expanded uncertainty 95 % confidence level k = 2					12.0%

5 CALIBRATION MEASUREMENT RESULTS

Calibration Parameters	
Liquid Temperature	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

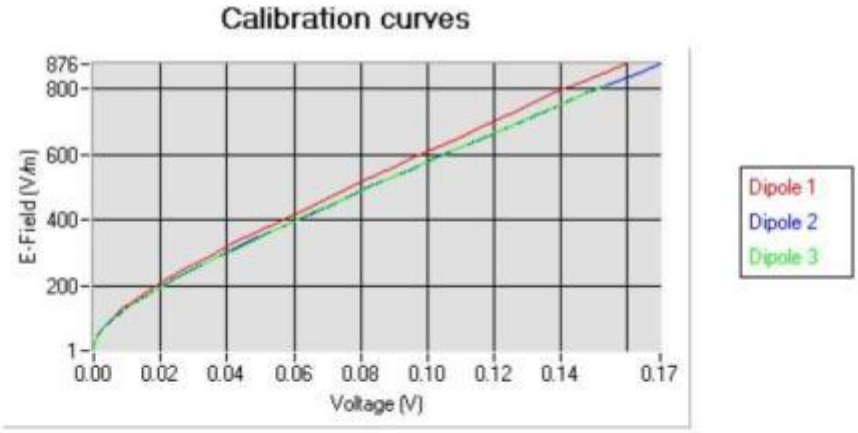
5.1 SENSITIVITY IN AIR

Normx dipole 1 (μV/(V/m)²)	Normy dipole 2 (μV/(V/m)²)	Normz dipole 3 (μV/(V/m)²)
0.57	0.63	0.54

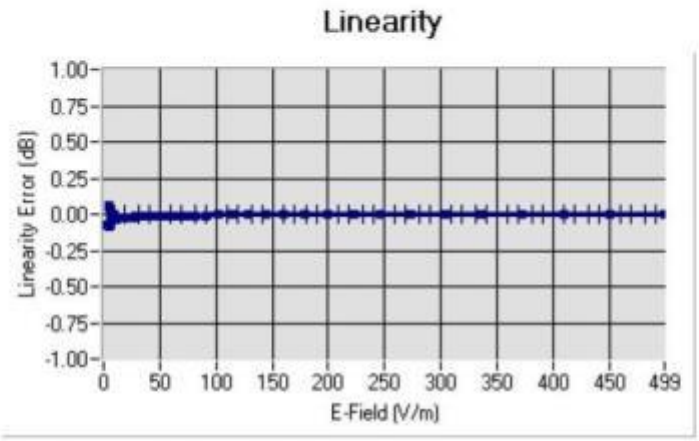
DCP dipole 1 (mV)	DCP dipole 2 (mV)	DCP dipole 3 (mV)
91	91	90

Calibration curves ei=f(V) (i=1,2,3) allow to obtain H-field value using the formula:

$$E = \sqrt{E_1^2 + E_2^2 + E_3^2}$$



5.2 LINEARITY



Linearity: +/-1.95% (+/-0.09dB)

5.3 SENSITIVITY IN LIQUID

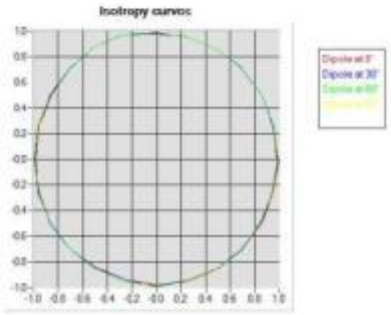
Liquid	Frequency (MHz +/- 100MHz)	Permittivity	Epsilon (S/m)	ConvF
HL850	835	42.81	0.89	19.81
BL850	835	53.46	0.96	20.38
HL900	900	42.47	0.96	19.61
BL900	900	56.69	1.08	20.35
HL1800	1800	41.31	1.38	19.93
BL1800	1800	53.27	1.51	20.70
HL1900	1900	41.09	1.42	22.46
BL1900	1900	54.20	1.54	23.18
HL2000	2000	39.72	1.43	21.18
BL2000	2000	53.91	1.53	21.62
HL2450	2450	39.05	1.77	21.35
BL2450	2450	52.97	1.93	21.96
HL3500	3500	38.53	3.03	21.26
BL3500	3500	50.39	3.43	21.72
HL5200	5200	36.62	4.93	15.63
BL5200	5200	50.69	4.98	16.15
HL5400	5400	35.95	5.18	17.86
BL5400	5400	48.45	5.82	18.36
HL5600	5600	36.08	5.60	17.02
BL5600	5600	50.57	6.37	17.41
HL5800	5800	34.73	5.74	15.22
BL5800	5800	48.19	6.45	15.72

LOWER DETECTION LIMIT: 7mW/kg

5.4 ISOTROPY

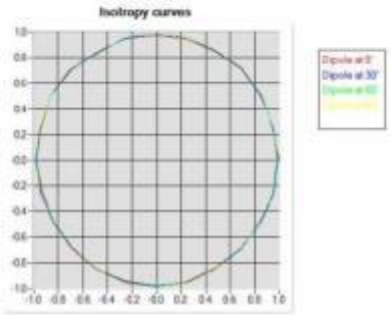
HL900 MHz

- Axial isotropy: 0.04 dB
- Hemispherical isotropy: 0.06 dB



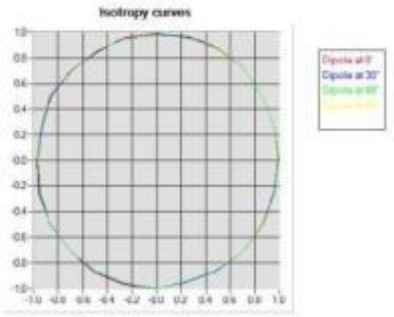
HL1800 MHz

- Axial isotropy: 0.05 dB
- Hemispherical isotropy: 0.06 dB



HL5400 MHz

- Axial isotropy: 0.06 dB
- Hemispherical isotropy: 0.09 dB



6 LIST OF EQUIPMENT

Equipment Summary Sheet				
Equipment Description	**Manufacturer / Model**	**Identification No.**	**Current Calibration Date**	**Next Calibration Date**
Flat Phantom	Satimo	SN-20/09-SAM71	Validated. No cal required.	Validated. No cal required.
COMOSAR Test Bench	Version 3	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rhode & Schwarz ZVA	SN100132	02/2013	02/2016
Reference Probe	Satimo	EP 94 SN 37/08	10/2013	10/2014
Multimeter	Keithley 2000	1188656	12/2013	12/2016
Signal Generator	Agilent E4438C	MY49070581	12/2013	12/2016
Amplifier	Aethercomm	SN 046	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	HP E4418A	US38261498	12/2013	12/2016
Power Sensor	HP ECP-E26A	US37181460	12/2013	12/2016
Directional Coupler	Narda 4216-20	01386	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Waveguide	Mega Industries	069Y7-158-13-712	Validated. No cal required.	Validated. No cal required.
Waveguide Transition	Mega Industries	069Y7-158-13-701	Validated. No cal required.	Validated. No cal required.
Waveguide Termination	Mega Industries	069Y7-158-13-701	Validated. No cal required.	Validated. No cal required.
Temperature / Humidity Sensor	Control Company	11-661-9	8/2012	8/2015

Annex C. Dipoles Calibration report

SATIMO
The microwave vision company

SAR Reference Dipole Calibration Report

Ref : ACR.227.6.14.SATU.A

SIEMIC TESTING AND CERTIFICATION SERVICES
775 MONTAGUE EXPRESSWAY
MILPITAS, CA 95035, USA
SATIMO COMOSAR REFERENCE DIPOLE
FREQUENCY: 2450 MHZ
SERIAL NO.: SN 31/10 DIPJ138

Calibrated at SATIMO US
2105 Barrett Park Dr. - Kennesaw, GA 30144

ilac-MRA
A2LA ACCREDITED

08/14/2014

Summary:

This document presents the method and results from an accredited SAR reference dipole calibration performed in SATIMO USA using the COMOSAR test bench. All calibration results are traceable to national metrology institutions.

SATIMO

SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.227.6.14.SATU.A

	Name	*Function*	*Date*	*Signature*
Prepared by :	Jérôme LUC	Product Manager	8/15/2014	
Checked by :	Jérôme LUC	Product Manager	8/15/2014	
Approved by :	Kim RUTKOWSKI	Quality Manager	8/15/2014	

	Customer Name
Distribution :	SIEMIC Testing and Certification Services

Issue	*Date*	*Modifications*
A	8/15/2014	Initial release

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1 INTRODUCTION

This document contains a summary of the requirements set forth by the IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards for reference dipoles used for SAR measurement system validations and the measurements that were performed to verify that the product complies with the fore mentioned standards.

2 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR 2450 MHz REFERENCE DIPOLE
Manufacturer	Satimo
Model	SID2450
Serial Number	SN 31/10 DIPJ138
Product Condition (new / used)	Used

A yearly calibration interval is recommended.

3 PRODUCT DESCRIPTION

3.1 GENERAL INFORMATION

Satimo's COMOSAR Validation Dipoles are built in accordance to the IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards. The product is designed for use with the COMOSAR test bench only.

Figure 1 – *Satimo COMOSAR Validation Dipole*

4 MEASUREMENT METHOD

The IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards provide requirements for reference dipoles used for system validation measurements. The following measurements were performed to verify that the product complies with the fore mentioned standards.

4.1 RETURN LOSS REQUIREMENTS

The dipole used for SAR system validation measurements and checks must have a return loss of -20 dB or better. The return loss measurement shall be performed against a liquid filled flat phantom, with the phantom constucted as outlined in the fore mentioned standards.

4.2 MECHANICAL REQUIREMENTS

The IEEE Std. 1528 and CEI/IEC 62209 standards specify the mechanical components and dimensions of the validation dipoles, with the dimensions frequency and phantom shell thickness dependent. The COMOSAR test bench employs a 2 mm phantom shell thickness therefore the dipoles sold for use with the COMOSAR test bench comply with the requirements set forth for a 2 mm phantom shell thickness.

5 MEASUREMENT UNCERTAINTY

All uncertainties listed below represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2, traceable to the Internationally Accepted Guides to Measurement Uncertainty.

5.1 RETURN LOSS

The following uncertainties apply to the return loss measurement:

Frequency band	Expanded Uncertainty on Return Loss
400-6000MHz	0.1 dB

5.2 DIMENSION MEASUREMENT

The following uncertainties apply to the dimension measurements:

Length (mm)	Expanded Uncertainty on Length
3 - 300	0.05 mm

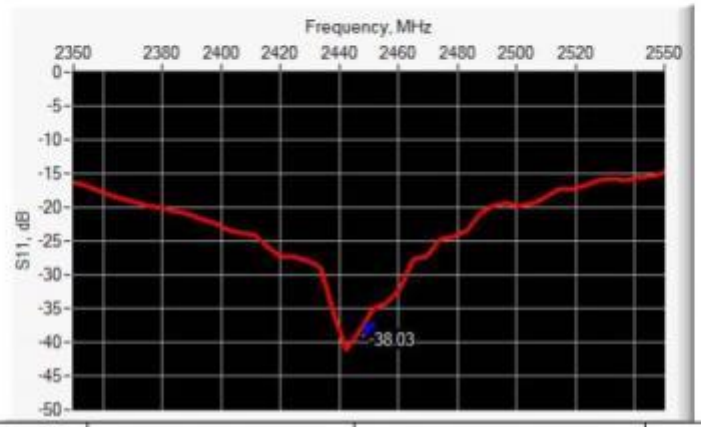
5.3 VALIDATION MEASUREMENT

The guidelines outlined in the IEEE 1528, OET 65 Bulletin C, CENELEC EN50361 and CEI/IEC 62209 standards were followed to generate the measurement uncertainty for validation measurements.

Scan Volume	Expanded Uncertainty
1 g	20.3 %
10 g	20.1 %

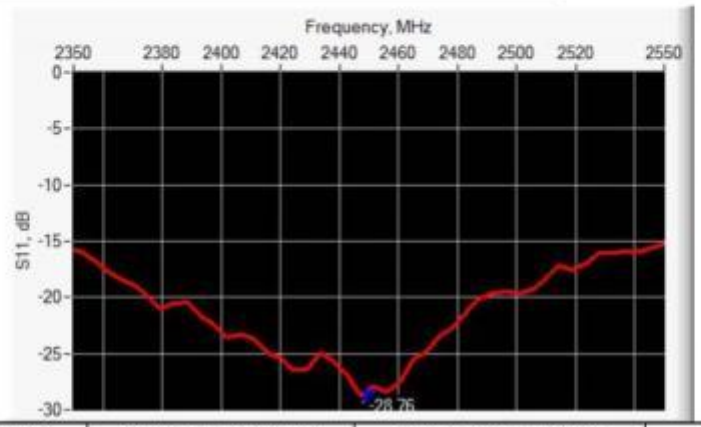
6 CALIBRATION MEASUREMENT RESULTS

6.1 RETURN LOSS AND IMPEDANCE IN HEAD LIQUID



Frequency (MHz)	Return Loss (dB)	Requirement (dB)	Impedance
2450	-38.03	-20	49.5 Ω - 1.2 jΩ

6.2 RETURN LOSS AND IMPEDANCE IN BODY LIQUID



Frequency (MHz)	Return Loss (dB)	Requirement (dB)	Impedance
2450	-28.76	-20	53.2 Ω - 1.9 jΩ

6.3 MECHANICAL DIMENSIONS

Frequency MHz	L mm		h mm		d mm	
	required	measured	required	measured	required	measured
300	420.0 ±1 %.		250.0 ±1 %.		6.35 ±1 %.	
450	290.0 ±1 %.		166.7 ±1 %.		6.35 ±1 %.	
750	176.0 ±1 %.		100.0 ±1 %.		6.35 ±1 %.	
835	161.0 ±1 %.		89.8 ±1 %.		3.6 ±1 %.	

900	149.0 ±1 %.		83.3 ±1 %.		3.6 ±1 %.	
1450	89.1 ±1 %.		51.7 ±1 %.		3.6 ±1 %.	
1500	80.5 ±1 %.		50.0 ±1 %.		3.6 ±1 %.	
1640	79.0 ±1 %.		45.7 ±1 %.		3.6 ±1 %.	
1750	75.2 ±1 %.		42.9 ±1 %.		3.6 ±1 %.	
1800	72.0 ±1 %.		41.7 ±1 %.		3.6 ±1 %.	
1900	68.0 ±1 %.		39.5 ±1 %.		3.6 ±1 %.	
1950	66.3 ±1 %.		38.5 ±1 %.		3.6 ±1 %.	
2000	64.5 ±1 %.		37.5 ±1 %.		3.6 ±1 %.	
2100	61.0 ±1 %.		35.7 ±1 %.		3.6 ±1 %.	
2300	55.5 ±1 %.		32.6 ±1 %.		3.6 ±1 %.	
2450	51.5 ±1 %.	PASS	30.4 ±1 %.	PASS	3.6 ±1 %.	PASS
2600	48.5 ±1 %.		28.8 ±1 %.		3.6 ±1 %.	
3000	41.5 ±1 %.		25.0 ±1 %.		3.6 ±1 %.	
3500	37.0±1 %.		26.4 ±1 %.		3.6 ±1 %.	
3700	34.7±1 %.		26.4 ±1 %.		3.6 ±1 %.	

7 VALIDATION MEASUREMENT

The IEEE Std. 1528, OET 65 Bulletin C and CEI/IEC 62209 standards state that the system validation measurements must be performed using a reference dipole meeting the fore mentioned return loss and mechanical dimension requirements. The validation measurement must be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards. Per the standards, the dipole shall be positioned below the bottom of the phantom, with the dipole length centered and parallel to the longest dimension of the flat phantom, with the top surface of the dipole at the described distance from the bottom surface of the phantom.

7.1 HEAD LIQUID MEASUREMENT

Frequency MHz	Relative permittivity (ε,')		Conductivity (σ) S/m	
	required	measured	required	measured
300	45.3 ±5 %		0.87 ±5 %	
450	43.5 ±5 %		0.87 ±5 %	
750	41.9 ±5 %		0.89 ±5 %	
835	41.5 ±5 %		0.90 ±5 %	
900	41.5 ±5 %		0.97 ±5 %	
1450	40.5 ±5 %		1.20 ±5 %	
1500	40.4 ±5 %		1.23 ±5 %	
1640	40.2 ±5 %		1.31 ±5 %	
1750	40.1 ±5 %		1.37 ±5 %	
1800	40.0 ±5 %		1.40 ±5 %	
1900	40.0 ±5 %		1.40 ±5 %	
1950	40.0 ±5 %		1.40 ±5 %	
2000	40.0 ±5 %		1.40 ±5 %	

2100	39.8 ±5 %		1.49 ±5 %	
2300	39.5 ±5 %		1.67 ±5 %	
2450	39.2 ±5 %	PASS	1.80 ±5 %	PASS
2600	39.0 ±5 %		1.96 ±5 %	
3000	38.5 ±5 %		2.40 ±5 %	
3500	37.9 ±5 %		2.91 ±5 %	

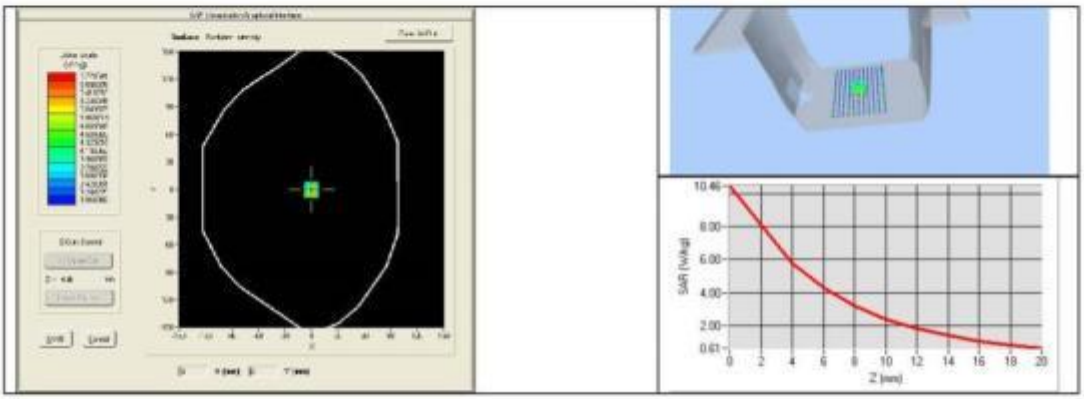
7.2 SAR MEASUREMENT RESULT WITH HEAD LIQUID

The IEEE Std. 1528 and CEI/IEC 62209 standards state that the system validation measurements should produce the SAR values shown below (for phantom thickness of 2 mm), within the uncertainty for the system validation. All SAR values are normalized to 1 W forward power. In bracket, the measured SAR is given with the used input power.

Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Head Liquid Values: eps' : 39.0 sigma : 1.77
Distance between dipole center and liquid	10.0 mm
Area scan resolution	dx=8mm/dy=8mm
Zoon Scan Resolution	dx=8mm/dy=8m/dz=5mm
Frequency	2450 MHz
Input power	20 dBm
Liquid Temperature	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

Frequency MHz	1 g SAR (W/kg/W)		10 g SAR (W/kg/W)	
	required	measured	required	measured
300	2.85		1.94	
450	4.58		3.06	
750	8.49		5.55	
835	9.56		6.22	
900	10.9		6.99	
1450	29		16	
1500	30.5		16.8	
1640	34.2		18.4	
1750	36.4		19.3	
1800	38.4		20.1	
1900	39.7		20.5	
1950	40.5		20.9	
2000	41.1		21.1	
2100	43.6		21.9	
2300	48.7		23.3	

2450	52.4	54.49 (5.45)	24	24.23 (2.42)
2600	55.3		24.6	
3000	63.8		25.7	
3500	67.1		25	



7.3 BODY LIQUID MEASUREMENT

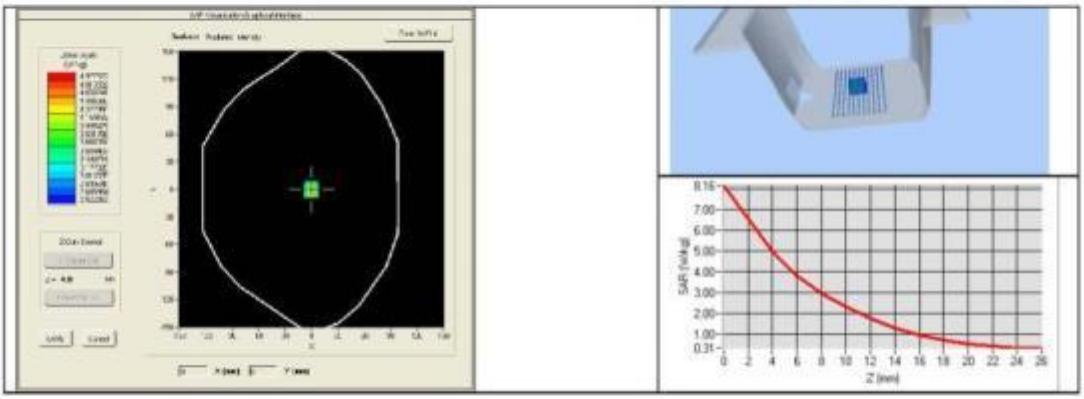
Frequency MHz	Relative permittivity (ε,')		Conductivity (σ) S/m	
	required	measured	required	measured
150	61.9 ±5 %		0.80 ±5 %	
300	58.2 ±5 %		0.92 ±5 %	
450	56.7 ±5 %		0.94 ±5 %	
750	55.5 ±5 %		0.96 ±5 %	
835	55.2 ±5 %		0.97 ±5 %	
900	55.0 ±5 %		1.05 ±5 %	
915	55.0 ±5 %		1.06 ±5 %	
1450	54.0 ±5 %		1.30 ±5 %	
1610	53.8 ±5 %		1.40 ±5 %	
1800	53.3 ±5 %		1.52 ±5 %	
1900	53.3 ±5 %		1.52 ±5 %	
2000	53.3 ±5 %		1.52 ±5 %	
2100	53.2 ±5 %		1.62 ±5 %	
2450	52.7 ±5 %	PASS	1.95 ±5 %	PASS
2600	52.5 ±5 %		2.16 ±5 %	
3000	52.0 ±5 %		2.73 ±5 %	
3500	51.3 ±5 %		3.31 ±5 %	
5200	49.0 ±10 %		5.30 ±10 %	
5300	48.9 ±10 %		5.42 ±10 %	
5400	48.7 ±10 %		5.53 ±10 %	

5500	48.6 ±10 %		5.65 ±10 %	
5600	48.5 ±10 %		5.77 ±10 %	
5800	48.2 ±10 %		6.00 ±10 %	

7.4 SAR MEASUREMENT RESULT WITH BODY LIQUID

Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Body Liquid Values: eps' : 53.0 sigma : 1.93
Distance between dipole center and liquid	10.0 mm
Area scan resolution	dx=8mm/dy=8mm
Zoon Scan Resolution	dx=8mm/dy=8m/dz=5mm
Frequency	2450 MHz
Input power	20 dBm
Liquid Temperature	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

Frequency MHz	1 g SAR (W/kg/W)	10 g SAR (W/kg/W)
	measured	measured
2450	52.31 (5.23)	24.09 (2.41)



8 LIST OF EQUIPMENT

Equipment Summary Sheet				
Equipment Description	**Manufacturer / Model**	**Identification No.**	**Current Calibration Date**	**Next Calibration Date**
SAM Phantom	Satimo	SN-20/09-SAM71	Validated. No cal required.	Validated. No cal required.
COMOSAR Test Bench	Version 3	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rhode & Schwarz ZVA	SN100132	02/2013	02/2016
Calipers	Carrera	CALIPER-01	12/2013	12/2016
Reference Probe	Satimo	EPG122 SN 18/11	10/2013	10/2014
Multimeter	Keithley 2000	1188656	12/2013	12/2016
Signal Generator	Agilent E4438C	MY49070581	12/2013	12/2016
Amplifier	Aethercomm	SN 046	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	HP E4418A	US38261498	12/2013	12/2016
Power Sensor	HP ECP-E26A	US37181460	12/2013	12/2016
Directional Coupler	Narda 4216-20	01386	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Temperature and Humidity Sensor	Control Company	11-661-9	8/2012	8/2015

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SAR Reference Waveguide Calibration Report

Ref : ACR.227.8.14.SATU.A

SIEMIC TESTING AND CERTIFICATION SERVICES

775 MONTAGUE EXPRESSWAY
MILPITAS, CA 95035, USA

SATIMO COMOSAR REFERENCE WAVEGUIDE

FREQUENCY: 5000-6000 MHZ
SERIAL NO.: SN 31/10 WGA13

Calibrated at SATIMO US
2105 Barrett Park Dr. - Kennesaw, GA 30144

ilac-MRA
A2LA ACCREDITED

08/14/2014

Summary:

This document presents the method and results from an accredited SAR reference waveguide calibration performed in SATIMO USA using the COMOSAR test bench. All calibration results are traceable to national metrology institutions.

SATIMO

SAR REFERENCE WAVEGUIDE CALIBRATION REPORT Ref: ACR.227.8.14.SATU.A

	Name	Function	Date	Signature
Prepared by :	Jérôme LUC	Product Manager	8/15/2014	
Checked by :	Jérôme LUC	Product Manager	8/15/2014	
Approved by :	Kim RUTKOWSKI	Quality Manager	8/15/2014	

	Customer Name
Distribution :	SIEMIC Testing and Certification Services

Issue	Date	Modifications
A	8/15/2014	Initial release

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1 INTRODUCTION

This document contains a summary of the requirements set forth by the IEEE 1528 and CEI/IEC 62209 standards for reference waveguides used for SAR measurement system validations and the measurements that were performed to verify that the product complies with the fore mentioned standards.

2 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR 5000-6000 MHz REFERENCE WAVEGUIDE
Manufacturer	Satimo
Model	SWG5500
Serial Number	SN 31/10 WGA13
Product Condition (new / used)	Used

A yearly calibration interval is recommended.

3 PRODUCT DESCRIPTION

3.1 GENERAL INFORMATION

Satimo's COMOSAR Validation Waveguides are built in accordance to the IEEE 1528 and CEI/IEC 62209 standards.

4 MEASUREMENT METHOD

The IEEE 1528 and CEI/IEC 62209 standards provide requirements for reference waveguides used for system validation measurements. The following measurements were performed to verify that the product complies with the fore mentioned standards.

4.1 RETURN LOSS REQUIREMENTS

The waveguide used for SAR system validation measurements and checks must have a return loss of -8 dB or better. The return loss measurement shall be performed with matching layer placed in the open end of the waveguide, with the waveguide and matching layer in direct contact with the phantom shell as outlined in the fore mentioned standards.

4.2 MECHANICAL REQUIREMENTS

The IEEE 1528 and CEI/IEC 62209 standards specify the mechanical dimensions of the validation waveguide, the specified dimensions are as shown in Section 6.2. Figure 1 shows how the dimensions relate to the physical construction of the waveguide.

5 MEASUREMENT UNCERTAINTY

All uncertainties listed below represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2, traceable to the Internationally Accepted Guides to Measurement Uncertainty.

5.1 RETURN LOSS

The following uncertainties apply to the return loss measurement:

Frequency band	Expanded Uncertainty on Return Loss
400-6000MHz	0.1 dB

5.2 DIMENSION MEASUREMENT

The following uncertainties apply to the dimension measurements:

Length (mm)	Expanded Uncertainty on Length
3 - 300	0.05 mm

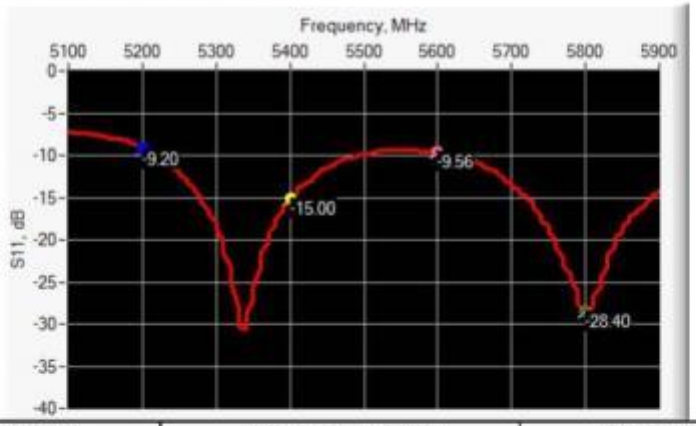
5.3 VALIDATION MEASUREMENT

The guidelines outlined in the IEEE 1528 and CEI/IEC 62209 standards were followed to generate the measurement uncertainty for validation measurements.

Scan Volume	Expanded Uncertainty
1 g	20.3 %
10 g	20.1 %

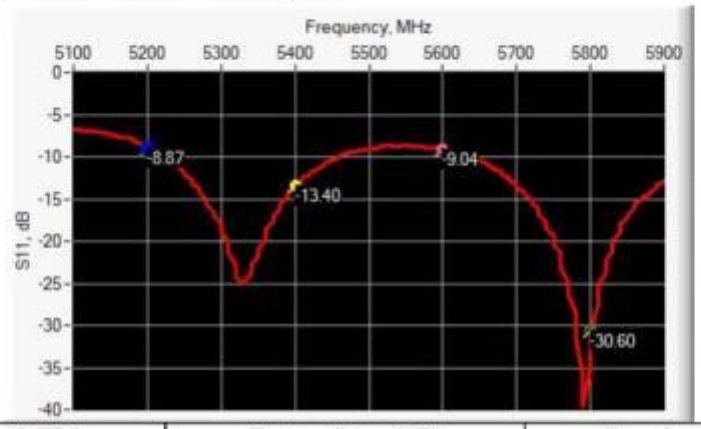
6 CALIBRATION MEASUREMENT RESULTS

6.1 RETURN LOSS IN HEAD LIQUID



Frequency (MHz)	Return Loss (dB)	Requirement (dB)
5200-5800	< -9.20	-8

6.2 RETURN LOSS IN BODY LIQUID



Frequency (MHz)	Return Loss (dB)	Requirement (dB)
5200-5800	< -8.87	-8

6.3 MECHANICAL DIMENSIONS

Frequency (MHz)	L (mm)		W (mm)		L_f (mm)		W_f (mm)		T (mm)	
	Required	Measured	Required	Measured	Required	Measured	Required	Measured	Required	Measured
5200	40.39 ± 0.13	PASS	20.19 ± 0.13	PASS	81.03 ± 0.13	PASS	61.98 ± 0.13	PASS	5.3*	PASS
5800	40.39 ± 0.13	PASS	20.19 ± 0.13	PASS	81.03 ± 0.13	PASS	61.98 ± 0.13	PASS	4.3*	PASS

* The tolerance for the matching layer is included in the return loss measurement.

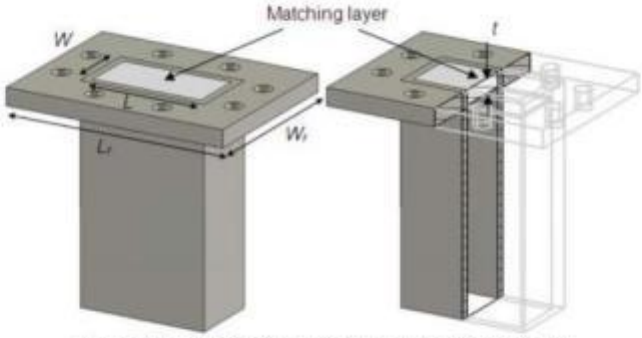


Figure 1: Validation Waveguide Dimensions

7 VALIDATION MEASUREMENT

The IEEE Std. 1528 and CEI/IEC 62209 standards state that the system validation measurements must be performed using a reference waveguide meeting the fore mentioned return loss and mechanical dimension requirements. The validation measurement must be performed with the matching layer placed in the open end of the waveguide, with the waveguide and matching layer in direct contact with the phantom shell.

7.1 HEAD LIQUID MEASUREMENT

Frequency MHz	Relative permittivity (ε,')		Conductivity (σ) S/m	
	required	measured	required	measured
5000	36.2 ±10 %		4.45 ±10 %	
5100	36.1 ±10 %		4.56 ±10 %	
5200	36.0 ±10 %	PASS	4.66 ±10 %	PASS
5300	35.9 ±10 %		4.76 ±10 %	
5400	35.8 ±10 %	PASS	4.86 ±10 %	PASS
5500	35.6 ±10 %		4.97 ±10 %	
5600	35.5 ±10 %	PASS	5.07 ±10 %	PASS
5700	35.4 ±10 %		5.17 ±10 %	
5800	35.3 ±10 %	PASS	5.27 ±10 %	PASS
5900	35.2 ±10 %		5.38 ±10 %	
6000	35.1 ±10 %		5.48 ±10 %	

7.2 SAR MEASUREMENT RESULT WITH HEAD LIQUID

At those frequencies, the target SAR value can not be generic. Hereunder is the target SAR value defined by Satimo, within the uncertainty for the system validation. All SAR values are normalized to 1 W net power. In bracket, the measured SAR is given with the used input power.

Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Head Liquid Values 5200 MHz: eps' :36.62 sigma : 4.93 Head Liquid Values 5400 MHz: eps' :35.95 sigma : 5.18 Head Liquid Values 5600 MHz: eps' :36.08 sigma : 5.60 Head Liquid Values 5800 MHz: eps' :34.73 sigma : 5.74
Distance between dipole waveguide and liquid	0 mm
Area scan resolution	dx=8mm/dy=8mm
Zoon Scan Resolution	dx=4mm/dy=4m/dz=2mm
Frequency	5200 MHz 5400 MHz 5600 MHz 5800 MHz
Input power	20 dBm
Liquid Temperature	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

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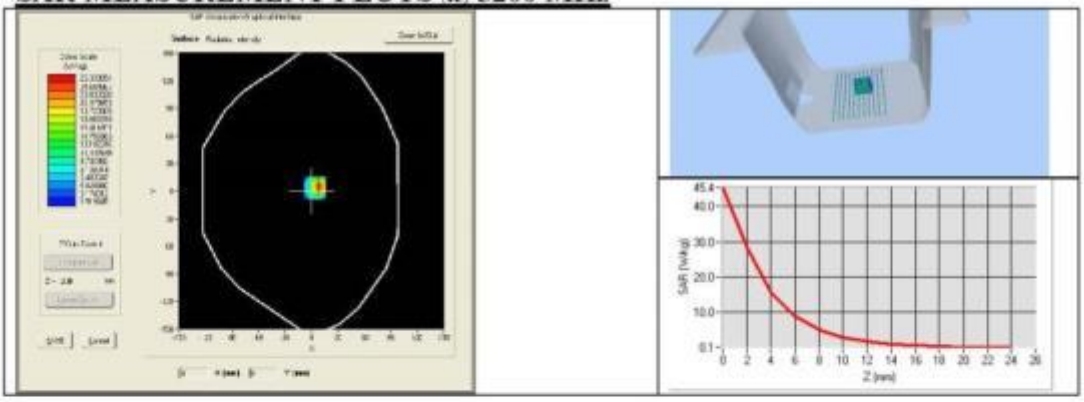
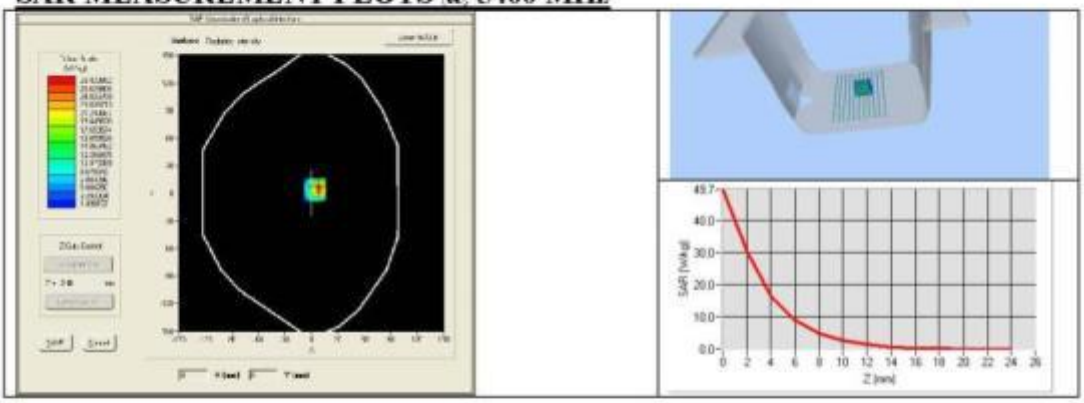
SAR REFERENCE WAVEGUIDE CALIBRATION REPORT Ref: ACR.227.8.14.SATU.A

Frequency (MHz)	1 g SAR (W/kg)		10 g SAR (W/kg)	
	required	measured	required	measured
5200	159.00	161.23 (16.12)	56.90	56.05 (5.60)
5400	166.40	171.11 (17.11)	58.43	58.88 (5.89)
5600	173.80	177.31 (17.73)	59.97	60.11 (6.01)
5800	181.20	183.88 (18.39)	61.50	62.01 (6.20)

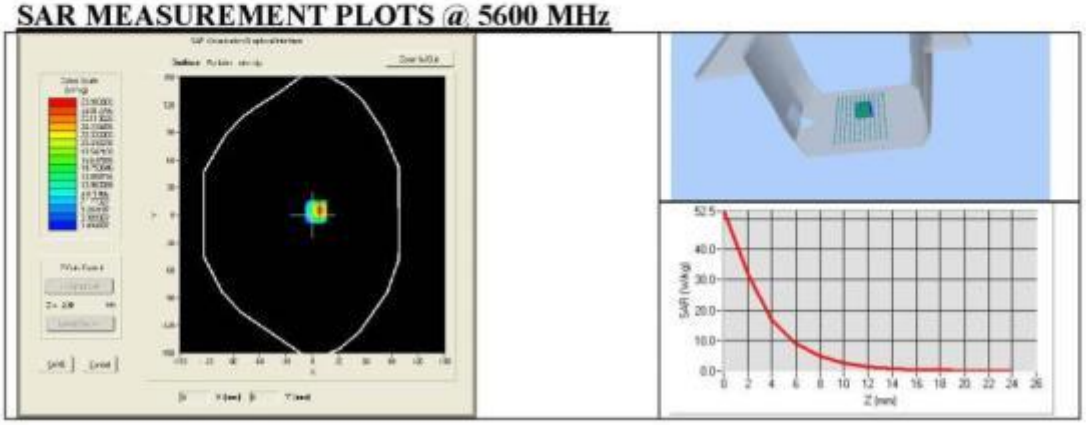
SAR MEASUREMENT PLOTS @ 5200 MHz



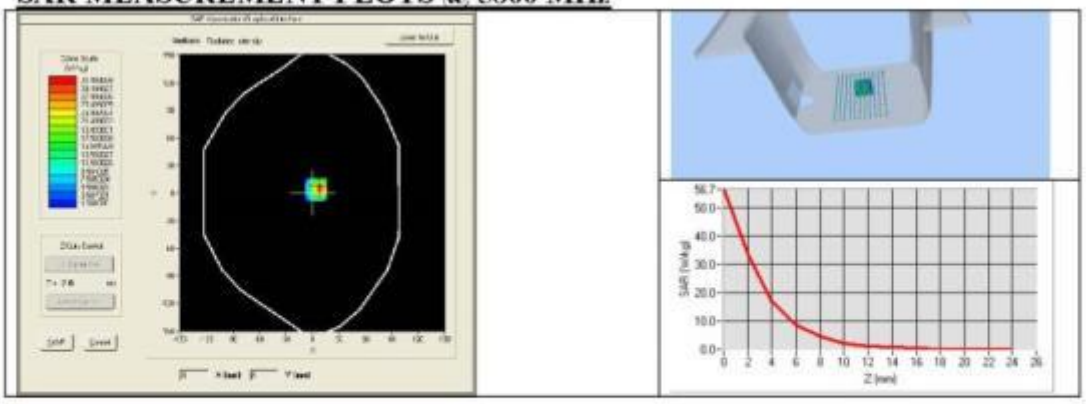
SAR MEASUREMENT PLOTS @ 5400 MHz



SAR MEASUREMENT PLOTS @ 5600 MHz



SAR MEASUREMENT PLOTS @ 5800 MHz



7.3 BODY LIQUID MEASUREMENT

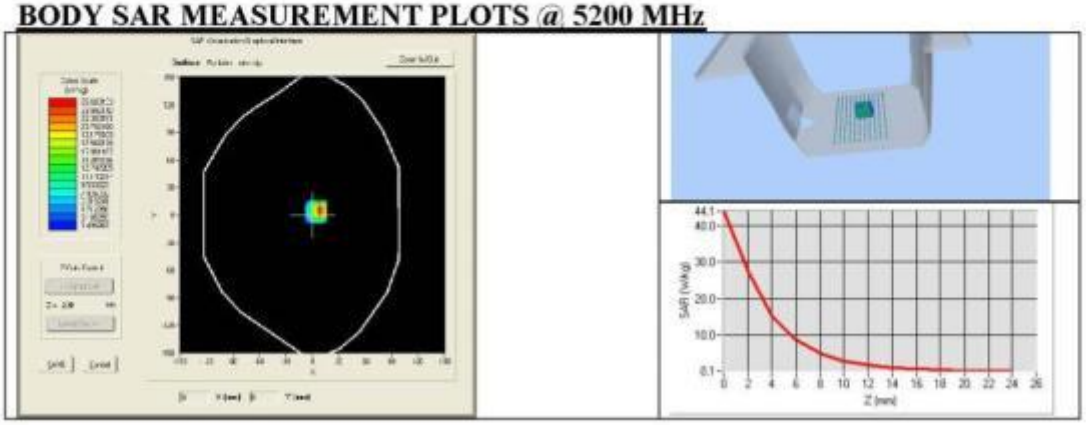
Frequency MHz	Relative permittivity (ε,')		Conductivity (σ) S/m	
	required	measured	required	measured
5200	49.0 ±10 %	PASS	5.30 ±10 %	PASS
5300	48.9 ±10 %		5.42 ±10 %	
5400	48.7 ±10 %	PASS	5.53 ±10 %	PASS
5500	48.6 ±10 %		5.65 ±10 %	
5600	48.5 ±10 %	PASS	5.77 ±10 %	PASS
5800	48.2 ±10 %	PASS	6.00 ±10 %	PASS

7.4 SAR MEASUREMENT RESULT WITH BODY LIQUID

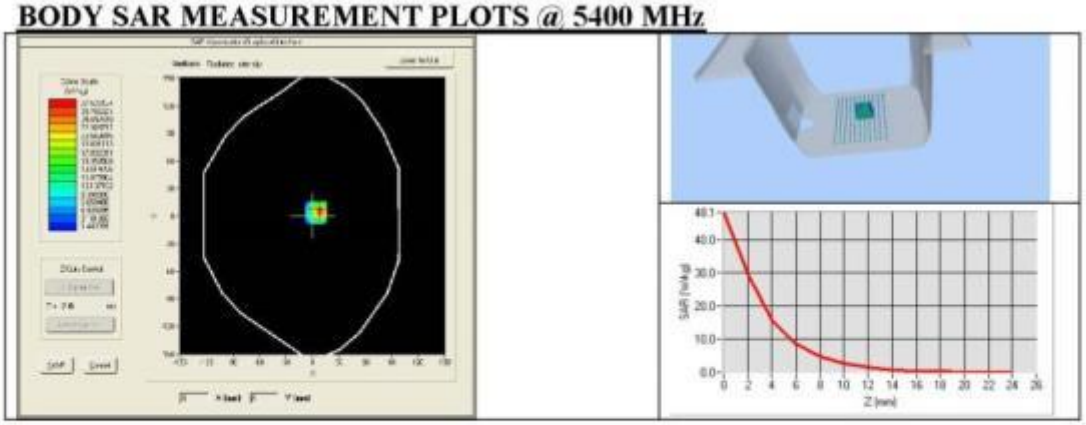
Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Body Liquid Values 5200 MHz: eps' :50.69 sigma : 4.98 Body Liquid Values 5400 MHz: eps' :48.45 sigma : 5.82 Body Liquid Values 5600 MHz: eps' :50.57 sigma : 6.37 Body Liquid Values 5800 MHz: eps' :48.19 sigma : 6.45
Distance between dipole waveguide and liquid	0 mm
Area scan resolution	dx=8mm/dy=8mm
Zoon Scan Resolution	dx=4mm/dy=4m/dz=2mm
Frequency	5200 MHz 5400 MHz 5600 MHz 5800 MHz
Input power	20 dBm
Liquid Temperature	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

Frequency (MHz)	1 g SAR (W/kg)	10 g SAR (W/kg)
	measured	measured
5200	156.53 (15.65)	54.57 (5.46)
5400	165.62 (16.56)	56.91 (5.69)
5600	172.12 (17.21)	58.28 (5.83)
5800	178.28 (17.83)	60.06 (6.01)

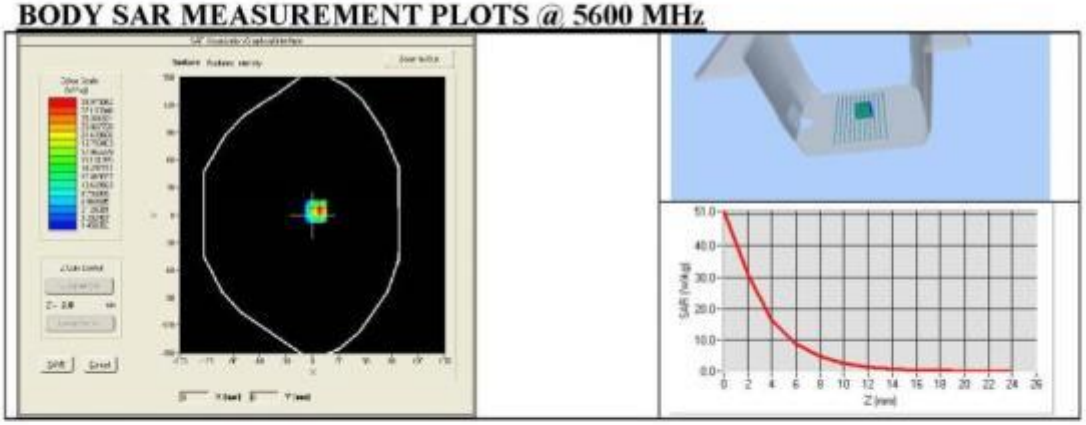
BODY SAR MEASUREMENT PLOTS @ 5200 MHz



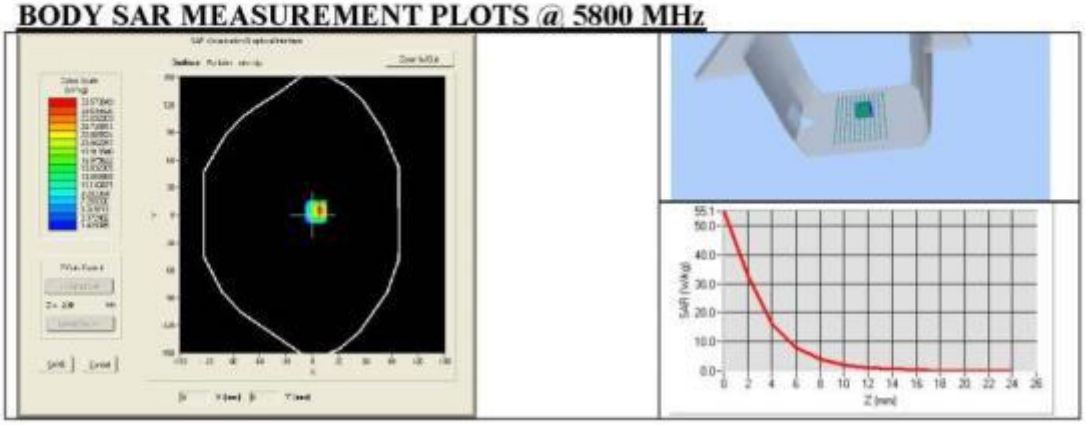
BODY SAR MEASUREMENT PLOTS @ 5400 MHz



BODY SAR MEASUREMENT PLOTS @ 5600 MHz



BODY SAR MEASUREMENT PLOTS @ 5800 MHz



8 LIST OF EQUIPMENT

Equipment Summary Sheet				
Equipment Description	**Manufacturer / Model**	**Identification No.**	**Current Calibration Date**	**Next Calibration Date**
Flat Phantom	Satimo	SN-20/09-SAM71	Validated. No cal required.	Validated. No cal required.
COMOSAR Test Bench	Version 3	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rhode & Schwarz ZVA	SN100132	02/2013	02/2016
Calipers	Carrera	CALIPER-01	12/2013	12/2016
Reference Probe	Satimo	EPG122 SN 18/11	10/2013	10/2014
Multimeter	Keithley 2000	1188656	12/2013	12/2016
Signal Generator	Agilent E4438C	MY49070581	12/2013	12/2016
Amplifier	Aethercomm	SN 046	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	HP E4418A	US38261498	12/2013	12/2016
Power Sensor	HP ECP-E26A	US37181460	12/2013	12/2016
Directional Coupler	Narda 4216-20	01386	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Temperature and Humidity Sensor	Control Company	11-661-9	8/2012	8/2015

Annex D. USER MANUAL, BLOCK & CIRCUIT DIAGRAM

Please see attachment

Annex E. SIEMIC Accreditation

Accreditations	Document	Scope / Remark
ISO 17025 (A2LA)		Please see the documents for the detailed scope
ISO Guide 65 (A2LA)		Please see the documents for the detailed scope
TCB Designation		A1, A2, A3, A4, B1, B2, B3, B4, C
FCC DoC Accreditation		FCC Declaration of Conformity Accreditation
FCC Site Registration		3 meter site
FCC Site Registration		10 meter site
IC Site Registration		3 meter site
IC Site Registration		10 meter site
EU NB		**Radio & Telecommunications Terminal Equipment:** EN45001 – EN ISO/IEC 17025
		Electromagnetic Compatibility: EN45001 – EN ISO/IEC 17025
Singapore iDA CB(Certification Body)		Phase I, Phase II
Vietnam MIC CAB Accreditation		Please see the document for the detailed scope
HongKong OFCA		**(Phase II)** OFCA Foreign Certification Body for Radio and Telecom
		(Phase I) Conformity Assessment Body for Radio and Telecom
Industry Canada CAB		**Radio:** Scope A – All Radio Standard Specification in Category I
		Telecom: CS-03 Part I, II, V, VI, VII, VIII

Japan Recognized Certification Body Designation		**Radio** : A1. Terminal equipment for purpose of calling **Telecom** : B1. Specified radio equipment specified in Article 38-2, Paragraph 1, Item 1 of the Radio Law
Korea CAB Accreditation		**EMI:** KCC Notice 2008-39, RRL Notice 2008-3: CA Procedures for EMI KN22: Test Method for EMI**EMS:** KCC Notice 2008-38, RRL Notice 2008-4: CA Procedures for EMS KN24, KN61000-4-2, -4-3, -4-4, -4-5, -4-6, -4-8, -4-11: Test Method for EMS
		Radio: RRL Notice 2008-26, RRL Notice 2008-2, RRL Notice 2008-10, RRL Notice 2007-49, RRL Notice 2007-20, RRL Notice 2007-21, RRL Notice 2007-80, RRL Notice 2004-68
		Telecom: President Notice 20664, RRL Notice 2007-30, RRL Notice 2008-7 with attachments 1, 3, 5, 6; President Notice 20664, RRL Notice 2008-7 with attachment 4
Taiwan NCC CAB Recognition		LP0002, PSTN01, ADSL01, ID0002, IS6100, CNS14336, PLMN07, PLMN01, PLMN08
Taiwan BSMI CAB Recognition		CNS 13438
Japan VCCI		R-3083: Radiation 3 meter site C-3421: Main Ports Conducted Interference Measurement T-1597: Telecommunication Ports Conducted Interference Measuremet
Australia CAB Regocnition		**EMC:** AS/NZS CISPR 11, AS/NZS CISPR 14.1, AS/NZS CISPR22, AS/NZS 61000.6.3, AS/NZS 61000.6.4
		Radiocommunications: AS/NZS 4281, AS/NZS 4268, AS/NZS 4280.1, AS/NZS 4280.2, AS/NZS 4295, AS/NZS 4582, AS/NZS 4583, AS/NZS 4769.1, AS/NZS 4769.2, AS/NZS 4770, AS/NZS 4771
		Telecommunications: AS/ACIF S002:05, AS/ACIF S003:06, AS/ACIF S004:06 AS/ACIF S006:01, AS/ACIF S016:01, AS/ACIF S031:01, AS/ACIF S038:01, AS/ACIF S040:01, AS/ACIF S041:05, AS/ACIF S043.2:06, AS/ACIF S60950.1
Australia NATA Recognition		AS/ACIF S002, AS/ACIF S003, AS/ACIF S004, AS/ACIF S006, AS/ACIF S016,AS/ACIF S031, AS/ACIF S038, AS/ACIF S040, AS/ACIF S041, AS/ACIF S043.2