

## 7.1 HEAD LIQUID MEASUREMENT

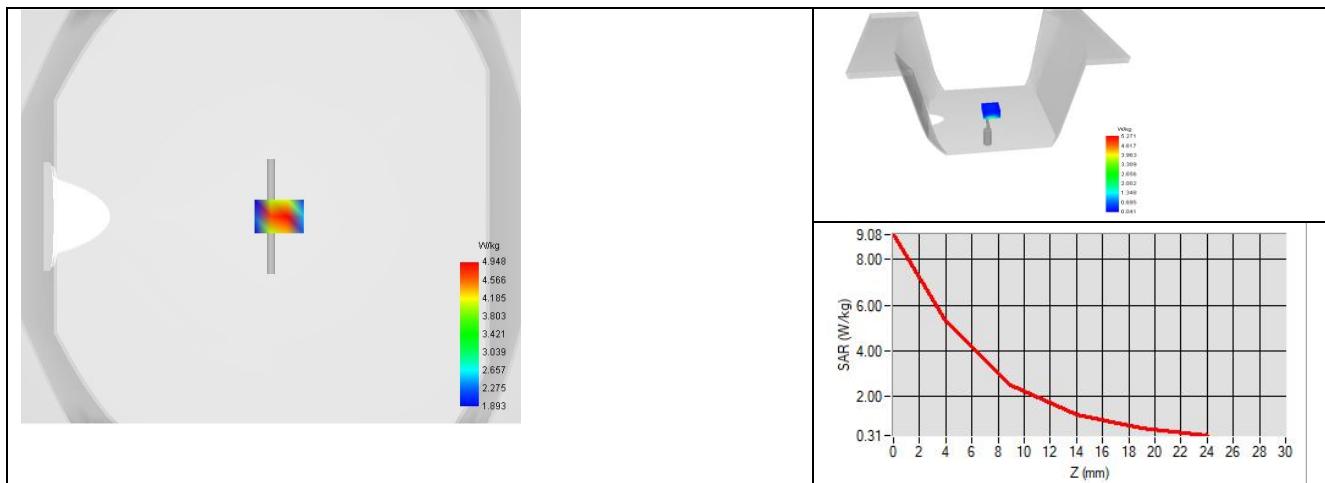
Frequency MHz	Relative permittivity ( $\epsilon_r'$ )		Conductivity ( $\sigma$ ) S/m	
	required	measured	required	measured
300	45.3 $\pm$ 10 %		0.87 $\pm$ 10 %	
450	43.5 $\pm$ 10 %		0.87 $\pm$ 10 %	
750	41.9 $\pm$ 10 %		0.89 $\pm$ 10 %	
835	41.5 $\pm$ 10 %		0.90 $\pm$ 10 %	
900	41.5 $\pm$ 10 %		0.97 $\pm$ 10 %	
1450	40.5 $\pm$ 10 %		1.20 $\pm$ 10 %	
1500	40.4 $\pm$ 10 %		1.23 $\pm$ 10 %	
1640	40.2 $\pm$ 10 %		1.31 $\pm$ 10 %	
1750	40.1 $\pm$ 10 %		1.37 $\pm$ 10 %	
1800	40.0 $\pm$ 10 %		1.40 $\pm$ 10 %	
1900	40.0 $\pm$ 10 %		1.40 $\pm$ 10 %	
1950	40.0 $\pm$ 10 %		1.40 $\pm$ 10 %	
2000	40.0 $\pm$ 10 %		1.40 $\pm$ 10 %	
2100	39.8 $\pm$ 10 %		1.49 $\pm$ 10 %	
2300	39.5 $\pm$ 10 %	37.0	1.67 $\pm$ 10 %	1.83
2450	39.2 $\pm$ 10 %		1.80 $\pm$ 10 %	
2600	39.0 $\pm$ 10 %		1.96 $\pm$ 10 %	
3000	38.5 $\pm$ 10 %		2.40 $\pm$ 10 %	
3300	38.2 $\pm$ 10 %		2.71 $\pm$ 10 %	
3500	37.9 $\pm$ 10 %		2.91 $\pm$ 10 %	
3700	37.7 $\pm$ 10 %		3.12 $\pm$ 10 %	
3900	37.5 $\pm$ 10 %		3.32 $\pm$ 10 %	
4200	37.1 $\pm$ 10 %		3.63 $\pm$ 10 %	
4600	36.7 $\pm$ 10 %		4.04 $\pm$ 10 %	
4900	36.3 $\pm$ 10 %		4.35 $\pm$ 10 %	

## 7.2 SAR MEASUREMENT RESULT WITH HEAD LIQUID

The IEC/IEEE 62209-1528 and FCC KDB865664 D01 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 V5
Phantom	SN 13/09 SAM68
Probe	SN 41/18 EPGO333
Liquid	Head Liquid Values: $\epsilon''$ : 37.0 sigma : 1.83
Distance between dipole center and liquid	10.0 mm
Area scan resolution	$dx=8mm/dy=8mm$
Zoon Scan Resolution	$dx=5mm/dy=5mm/dz=5mm$
Frequency	2300 MHz
Input power	20 dBm
Liquid Temperature	20 +/- 1 °C
Lab Temperature	20 +/- 1 °C
Lab Humidity	30-70 %

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	50.35 (5.03)	23.3	22.84 (2.28)
2450	52.4		24	
2600	55.3		24.6	
3000	63.8		25.7	
3300	-		-	
3500	67.1		25	
3700	67.4		24.2	
3900	-		-	
4200	-		-	
4600	-		-	
4900	-		-	



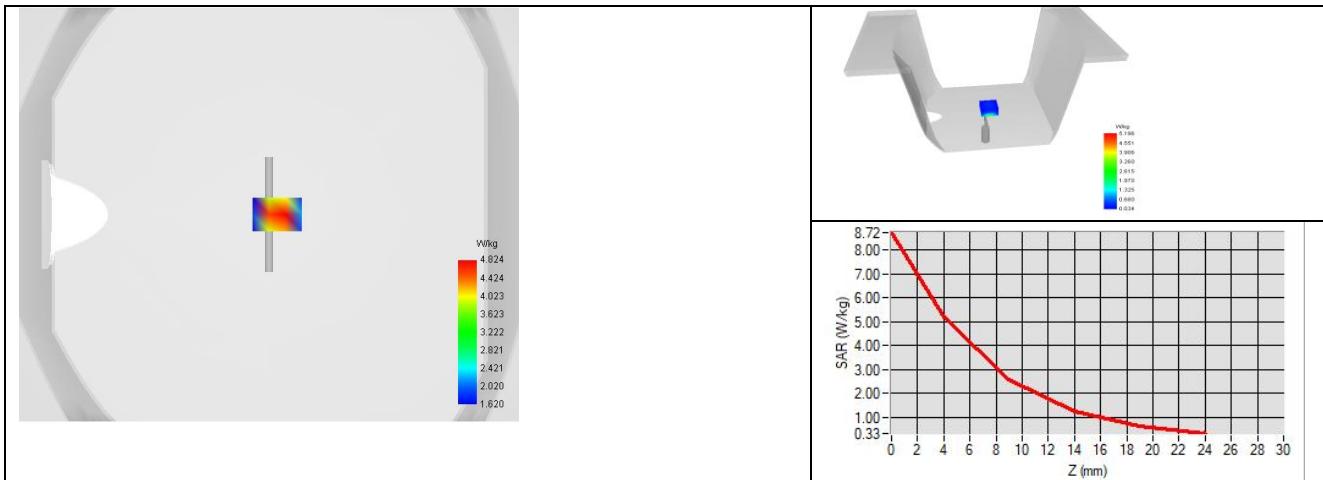
### 7.3 BODY LIQUID MEASUREMENT

Frequency MHz	Relative permittivity ( $\epsilon_r'$ )		Conductivity ( $\sigma$ ) S/m	
	required	measured	required	measured
150	61.9 $\pm$ 10 %		0.80 $\pm$ 10 %	
300	58.2 $\pm$ 10 %		0.92 $\pm$ 10 %	
450	56.7 $\pm$ 10 %		0.94 $\pm$ 10 %	
750	55.5 $\pm$ 10 %		0.96 $\pm$ 10 %	
835	55.2 $\pm$ 10 %		0.97 $\pm$ 10 %	
900	55.0 $\pm$ 10 %		1.05 $\pm$ 10 %	
915	55.0 $\pm$ 10 %		1.06 $\pm$ 10 %	
1450	54.0 $\pm$ 10 %		1.30 $\pm$ 10 %	
1610	53.8 $\pm$ 10 %		1.40 $\pm$ 10 %	
1800	53.3 $\pm$ 10 %		1.52 $\pm$ 10 %	
1900	53.3 $\pm$ 10 %		1.52 $\pm$ 10 %	
2000	53.3 $\pm$ 10 %		1.52 $\pm$ 10 %	
2100	53.2 $\pm$ 10 %		1.62 $\pm$ 10 %	
2300	52.9 $\pm$ 10 %	54.3	1.81 $\pm$ 10 %	1.96
2450	52.7 $\pm$ 10 %		1.95 $\pm$ 10 %	
2600	52.5 $\pm$ 10 %		2.16 $\pm$ 10 %	
3000	52.0 $\pm$ 10 %		2.73 $\pm$ 10 %	
3300	51.6 $\pm$ 10 %		3.08 $\pm$ 10 %	
3500	51.3 $\pm$ 10 %		3.31 $\pm$ 10 %	
3700	51.0 $\pm$ 10 %		3.55 $\pm$ 10 %	
3900	50.8 $\pm$ 10 %		3.78 $\pm$ 10 %	
4200	50.4 $\pm$ 10 %		4.13 $\pm$ 10 %	
4600	49.8 $\pm$ 10 %		4.60 $\pm$ 10 %	
4900	49.4 $\pm$ 10 %		4.95 $\pm$ 10 %	
5200	49.0 $\pm$ 10 %		5.30 $\pm$ 10 %	
5300	48.9 $\pm$ 10 %		5.42 $\pm$ 10 %	
5400	48.7 $\pm$ 10 %		5.53 $\pm$ 10 %	
5500	48.6 $\pm$ 10 %		5.65 $\pm$ 10 %	
5600	48.5 $\pm$ 10 %		5.77 $\pm$ 10 %	
5800	48.2 $\pm$ 10 %		6.00 $\pm$ 10 %	

#### 7.4 SAR MEASUREMENT RESULT WITH BODY LIQUID

Software	OPENSAR V5
Phantom	SN 13/09 SAM68
Probe	SN 41/18 EPGO333
Liquid	Body Liquid Values: $\epsilon_r'$ : 54.3 sigma : 1.96
Distance between dipole center and liquid	10.0 mm
Area scan resolution	$dx=8\text{mm}/dy=8\text{mm}$
Zoon Scan Resolution	$dx=5\text{mm}/dy=5\text{mm}/dz=5\text{mm}$
Frequency	2300 MHz
Input power	20 dBm
Liquid Temperature	20 +/- 1 °C
Lab Temperature	20 +/- 1 °C
Lab Humidity	30-70 %

Frequency MHz	1 g SAR (W/kg/W)	10 g SAR (W/kg/W)
	measured	measured
2300	49.56 (4.96)	22.29 (2.23)



## 8 LIST OF EQUIPMENT

Equipment Summary Sheet				
Equipment Description	Manufacturer / Model	Identification No.	Current Calibration Date	Next Calibration Date
SAM Phantom	MVG	SN 13/09 SAM68	Validated. No cal required.	Validated. No cal required.
COMOSAR Test Bench	Version 3	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rohde & Schwarz ZVM	100203	08/2021	08/2024
Network Analyzer	Agilent 8753ES	MY40003210	10/2021	10/2024
Network Analyzer – Calibration kit	Rohde & Schwarz ZV-Z235	101223	05/2021	05/2024
Network Analyzer – Calibration kit	HP 85033D	3423A08186	06/2021	06/2027
Calipers	Mitutoyo	SN 0009732	10/2021	10/2024
Reference Probe	MVG	SN 41/18 EPGO333	10/2021	10/2024
Multimeter	Keithley 2000	1160271	02/2021	02/2024
Signal Generator	Rohde & Schwarz SMB	106589	04/2021	04/2024
Amplifier	MVG	MODU-023-C-0002	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	NI-USB 5680	170100013	06/2021	06/2024
Power Meter	Rohde & Schwarz NRVD	832839-056	11/2021	11/2024
Directional Coupler	Krytar 158020	131467	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Temperature / Humidity Sensor	Testo 184 H1	44225320	06/2021	06/2024



## SAR Reference Dipole Calibration Report

Ref : ACR.49.11.22.BES.A

**BTF TESTING LAB (SHENZHEN) CO., LTD.**  
**F101,201 AND 301, BUILDING 1, BLOCK 2, TANTOU**  
**INDUSTRIAL PARK, TANTOU COMMUNITY**  
**SONGGANG STREET, BAO'AN DISTRICT, SHENZHEN,**  
**CHINA**

### **MVG COMOSAR REFERENCE DIPOLE**

**FREQUENCY: 2450 MHZ**

**SERIAL NO.: SN 07/22 DIP2G450-662**

**Calibrated at MVG**

**Z.I. de la pointe du diable**

**Technopôle Brest Iroise – 295 avenue Alexis de Rochon**  
**29280 PLOUZANE - FRANCE**

**Calibration date: 02/06/2023**



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#### *Summary:*

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

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<i>Issue</i>	<i>Name</i>	<i>Date</i>	<i>Modifications</i>
A	Jérôme Luc	2/6/2023	Initial release

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## 1 INTRODUCTION

This document contains a summary of the requirements set forth by the IEC/IEEE 62209-1528 and FCC KDB865664 D01 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	MVG
Model	SID2450
Serial Number	SN 07/22 DIP2G450-662
Product Condition (new / used)	New

## 3 PRODUCT DESCRIPTION

### 3.1 GENERAL INFORMATION

MVG's COMOSAR Validation Dipoles are built in accordance to the IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards. The product is designed for use with the COMOSAR test bench only.



**Figure 1 – MVG COMOSAR Validation Dipole**