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Report On

Specific Absorption Rate Testing of the
Inmarsat Solutions B.V., IsatPhone 2 (Model 2.1)

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REPORT ON

Specific Absorption Rate Testing of the
Inmarsat Solutions B.V., IsatPhone 2 (Model 2.1)

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September 2020

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DATED

04 September 2020

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SECTION 1

REPORT SUMMARY

Specific Absorption Rate Testing of the
Inmarsat Solutions B.V., IsatPhone 2 (Model 2.1)

1.1 REPORT MODIFICATION RECORD

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

Issue	Description of Change	Date of Issue
1	First Issue	04 September 2020

1.2 INTRODUCTION

The information contained in this report is intended to show verification of the Specific Absorption Rate Testing of the Inmarsat Solutions B.V., IsatPhone 2 (Model 2.1) to the requirements of KDB 447498 D01 v06 General RF Exposure Guidance.

Objective	To perform Specific Absorption Rate Testing to determine the Equipment Under Test's (EUT's) compliance with the requirements specified of KDB 447498 D01 v06 General RF Exposure Guidance, for the series of tests carried out.
Applicant	Inmarsat Global Ltd
Manufacturer	Inmarsat Solutions B.V.
Manufacturing Description	Handheld satellite phone for the Inmarsat GMR2+ Satellite Network System
Model Number	IsatPhone 2 (Model 2.1)
Serial Number	1
Number of Samples Tested	1
Hardware Version	HW 2800
Software Version	Isat2.1-V01.00.11
Battery Cell Manufacturer	Varta
Battery Model Number	56426 702 097
Test Specification/Issue/Date	KDB 447498 D01 v06 General RF Exposure Guidance
Order Number	146810
Start of Test	01-July-2020
Finish of Test	01-July-2020
Related Document(s)	FCC 47CFR 2.1093: 2015 KDB 865664 – D01 v01r04 KDB 648474 – D01 v01r03 KDB 447498 – v06 IEEE 1528 – 2013 RSS-102 Issue 5
Name of Engineer	Stephen Dodd

1.3 BRIEF SUMMARY OF RESULTS

The measurements shown in this report were made in accordance with the procedures specified KDB 447498 D01 v06 General RF Exposure Guidance.

The maximum 1g volume averaged stand-alone SAR found during this Assessment

Max 1 g SAR (W/kg) Body	0.55 (Measured)	0.67 (Scaled)
The maximum 1g volume averaged SAR level measured for all the tests performed did not exceed the limits for General Population/Uncontrolled Exposure (W/kg) Partial Body of 1.6 W/kg which is the relevant limit for testing according to the KDB 447498 D01 v06 General RF Exposure Guidance.		

1.4 TEST RESULTS SUMMARY

1.4.1 System Performance / Validation Check Results

Prior to formal testing being performed a System Check was performed in accordance with KDB 865664 and the results were compared against published data in Standard IEEE 1528-2013. The following results were obtained: -

System performance / Validation results

Date	Frequency (MHz)	Fluid Type	Measured Max 1g SAR (W/kg) *	Max 1g SAR (W/kg) Target	Percentage Drift on Reference
01/07/2020	1640	HBBL	31.92	34.20	-6.65

*Normalised to a forward power of 1W

1.4.2 Results Summary Tables

1640 MHz - Specific Absorption Rate (Maximum SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	SAR Scan Type	Scan Figure Number
Front Face 0mm Separation Distance (Antenna base 12mm Separation Distance - Antenna tip 32mm Separation Distance)	0	1626.68	33.15	34.00	0.55	**0.67**	Full	6
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g) KDB 447498 D01 - Testing of other required channels within the operation mode of a frequency band is not required when the reported 1g SAR for mid-band or highest output power channel is: ≤ 0.8W/kg when the transmission band is ≤ 100MHz ≤ 0.6W/kg when the transmission band is between 100MHz and 200MHz ≤ 0.4W/kg when the transmission band is ≥ 200MHz								

1.4.3 Standalone SAR Test Exclusion Considerations (KDB 447498 D01)

The 1g SAR Test exclusion thresholds for 100 MHz to 6 GHz *test separation distances* ≤ 50 mm are determined by:

[(*max power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)] [√f (GHz)]* ≤ 3.0, where

- f (GHz) is the RF channel transmit frequency in GHz.
- Power and distance are rounded to the nearest mW and mm before calculation.
- The result is rounded to one decimal place for comparison.
- When the maximum test separation distance is < 5 mm, a distance of 5 mm is applied.

Band	Frequency (MHz)	Power (dBm)	Power (mW)	Test Position	Distance (mm)	Threshold	Test Exclusion
1640 MHz	1626.68	34.00	2511.9	Head	5	640.7	No
1640 MHz	1643.68	34.00	2511.9	Head	5	644.1	No
1640 MHz	1660.47	34.00	2511.9	Head	5	647.4	No

1.4.4 Technical Description

The equipment under test (EUT) was an Inmarsat Solutions B.V. IsatPhone 2 (Model 2.1) Handheld satellite phone for the Inmarsat GMR2+ Satellite Network System. A full technical description can be found in the manufacturer's documentation.

1.4.5 Test Configuration and Modes of Operation

The testing was performed with an integral battery supplied by Inmarsat Solutions B.V. and manufactured by Varta.

For each scan, the device was configured into a continuous transmission test mode using control software provided by Inmarsat Solutions B.V..

The EUT operates in the 1626.675 to 1660.475 MHz frequency band (Sub Band 1) at a peak operating power of 34 dBm and 1668.675 to 1674.825 MHz (Sub Band 2) at a peak operating power of 31.5 dBm.

The EUT has a rotational antenna which is stowed in a docked position when not in use with three other possible operation positions at 135°, 180°, and 225°. (Figure 1)

For head SAR assessment, testing was performed with the device in the declared normal position of operation for the 1626.675 – 1660.475 MHz frequency band at maximum power. The device was placed against an Elliptical phantom. (An explanation can be found in section 1.4.6)

The Elliptical Flat Phantom dimensions are 600 mm major axis and 400 mm minor axis with a shell thickness of 2.00 mm. The phantom was filled to a minimum depth of 150 mm with the appropriate broad band simulant liquid. The dielectric properties were in accordance with the requirements specified in KDB 865665

Included in this report are descriptions of the test method; the equipment used and an analysis of the test uncertainties applicable and diagrams indicating the locations of maximum SAR for each test position along with photographs indicating the positioning of the handset against the phantom as appropriate.

1.4.6 Deviations from Standard

SAR measurements were initially made with the EUT positioned against the SAM phantom The maxima of the SAR distributions were found to be outside the achieveable measurement boundary of the SAR system for all test positions. Therefore the SAR System was unable to obtain enough measurement points for an accurate SAR evaluation. This was reported in Document 75935241 Report 10 Issue 3 using variant Isatphone2w. The only differences between the models are changes of LNA (with similar performance as previous) and earpiece.

Testing was completed using the following method. The EUT was positioned against the SAM phantom in all of the required test positions for each of the three antenna positions. For each position the distance from the tip of the antenna to the shell of the phantom and the distance from the base of the antenna to the shell of the phantom were measured. The smallest distance from the antenna tip to the phantom shell was 60 mm. The smallest distance from the antenna base to the phantom shell was 14 mm. All distances are tabulated in the table below.

Test Position	Antenna Position	Separation Distance Antenna Tip to SAM Phantom Shell (mm)	Separation Distance Antenna Base to SAM Phantom Shell (mm)
LH Cheek	1	104	17
LH Cheek	2	103	28
LH Cheek	3	96	26
LH Tilted	1	90	25
LH Tilted	2	80	22
LH Tilted	3	78	17
RH Cheek	1	75	18
RH Cheek	2	102	25
RH Cheek	3	120	37
RH Tilted	1	60	14
RH Tilted	2	76	16
RH Tilted	3	113	28

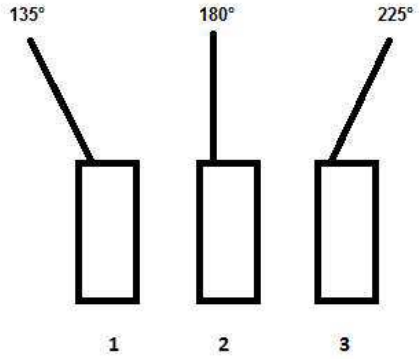

Figure 1: Antenna Positions

The EUT was placed against the Eliptical Flat Phantom with a 0 mm separation distance. This resulted in a separation distance of 32 mm from the tip of the antenna and 12 mm from the base of the antenna to the Elliptical Flat Phantom. The seperation distances for both the tip and base of the antenna from the Eliptical Flat Phantom were less than the measured seperation distances for all of the positions against the SAM phantom. The resulting SAR evaluation shows higher SAR values due the closer proximity of the EUT antenna to the Elipitcal Flat Phantom, whilst demonstrating compliance.

The EUT was placed against the Eliptical Flat Phantom with an antenna position of 180°. Other antenna positions were not tested as rotating the antenna would maintain the same separation distance and the resulting change in SAR levels would be negligible.