



RF EXPOSURE EVALUATION

Maximum Permissible Exposure (MPE)

Applicant Name:

Centum Research & Technology S.L.
Fonte das Abelleiras S/N
Edificio Citexvi
36310 Vigo (Spain)

Date of Testing:

08/27/2024

Test Report Issue Date:

10/14/2024

Test Site/Location:

Element Lab. Columbia, MD, USA

Test Report Serial No.:

1M2407310061-05.2A93U

FCC ID:

2A93U-55041-402

APPLICANT:

Centum Research & Technology S.L.

Application Type:

Certification

EUT Type:

Geolocation System

FCC Classifications:

PCS Licensed Transmitter (PCB)

FCC Rule Part:

FCC Part 1 (§1.1310) and Part 2 (§2.1091)

Test Procedure(s):

KDB 447498 D01

Permissive Change:

Adding additional bands of operation

Original Grant Date:

03/02/2023

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in FCC KDB 447498 D01. Test results reported herein relate only to the item(s) tested.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.



RJ Ortanez
Executive Vice President



CERT #2041.01

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1.0 RF EXPOSURE EVALUATION – MAXIMUM PERMISSIBLE EXPOSURE (MPE)

1.1 Introduction

This document is prepared to show compliance with the RF Exposure requirements as required in §1.1310 of the FCC Rules and Regulations and RSS-102 of Industry Canada.

The limit for Maximum Permissible Exposure (MPE), specified in FCC §1.1310, is listed in Table 1-1. According to FCC §1.1310 and RSS-102: the criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b).

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Average Time (Minutes)
(A) Limits For Occupational / Control Exposures (f = frequency)				
30-300	61.4	0.163	1.0	6
300-1500	...	...	f/300	6
1500-100,000	...	...	5.0	6
(B) Limits For General Population / Uncontrolled Exposure (f = frequency)				
30-300	27.5	0.073	0.2	30
300-1500	...	...	f/1500	30
1500-100,000	...	...	1.0	30

Table 1-1. Limits for Maximum Permissible Exposure (MPE)

1.2 EUT Description

The Equipment Under Test (EUT) is the **Centum Geolocation System FCC ID: 2A93U-55041-402**. EUT was set up to operate as shown below with a 12 VDC power source with current limitation of 10A. Server equipment was used to control the RF functions of the EUT.

The EUT additionally supports operation in the following LTE Bands as part of this permissive change filing:

GSM850 (869 – 894MHz)
 GSM1900 (1930 – 1990MHz)
 UMTS B2 (1930 - 1990MHz)
 UMTS B12 (729 - 746 MHz)
 UMTS B13 (746 - 756 MHz)
 UMTS B26 (859 - 894 MHz)
 UMTS B66 (2110 - 2180 MHz)

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1.3 Procedure

The procedure used to determine the RF power density was based upon a calculation for determining compliance with the MPE requirements.

The power generated by each transmitter used in this product was initially measured by a power meter or spectrum analyzer and the powers were recorded. Through use of the Friis transmission formula and knowledge of the maximum antenna gain to be used, the power density level is calculated at a distance of 20cm.

Friis Transmission Formula

Friis transmission formula: $P_d = (P_{out} * G) / (4\pi r^2)$

Where,

P_d = Power Density (mW/cm²)

π = 3.1416

P_{out} = output power to antenna (mW)

r = distance between observation point and center of the radiator (cm)

G = gain of antenna in linear scale

Calculated MPE

The power density limit for General Population/Uncontrolled Exposure at each frequency is determined based on the information in Table 1-1.

There is no co-location between the electric fields of any two transmitters therefore following power densities are calculated for each individual transmitter by frequency at 20cm spacing:

Frequency	869 MHz		
Limit	0.579 mW/cm ²		
Distance (cm), R =	20 cm		
Power (dBm), P =	23 dBm	199.53 mW	
TX Ant Gain (dBi), G =	0.82 dBi		
Power Density (S) =	0.048 mW/cm ²	(at 20cm)	
Minimum Distance =	5.8 cm		

Table 1-2. Calculated MPE Data for GSM850

Frequency:	1930 MHz		
Limit:	1.000 mW/cm ²		
Distance (cm), R =	20 cm		
Power (dBm), P =	23 dBm	199.53 mW	
TX Ant Gain (dBi), G =	1.52 dBi		
Power Density (S) =	0.056 mW/cm ²	(at 20cm)	
Minimum Distance =	4.7 cm		

Table 1-3. Calculated MPE Data for GSM1900

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Frequency	1930 MHz		
Limit	1.000 mW/cm ²		
Distance (cm), R =	20 cm		
Power (dBm), P =	22 dBm	158.49 mW	
TX Ant Gain (dB), G =	1.52 dBi		
Power Density (S) =	0.045 mW/cm ²	(at 20cm)	
Minimum Distance =	4.2 cm		

Table 1-4. Calculated MPE Data for UMTS B2

Frequency	729 MHz		
Limit	0.486 mW/cm ²		
Distance (cm), R =	20 cm		
Power (dBm), P =	23 dBm	199.53 mW	
TX Ant Gain (dB), G =	0.62 dBi		
Power Density (S) =	0.046 mW/cm ²	(at 20cm)	
Minimum Distance =	6.1 cm		

Table 1-5. Calculated MPE Data for UMTS B12

Frequency	746 MHz		
Limit	0.497 mW/cm ²		
Distance (cm), R =	20 cm		
Power (dBm), P =	23 dBm	199.53 mW	
TX Ant Gain (dB), G =	0.62 dBi		
Power Density (S) =	0.046 mW/cm ²	(at 20cm)	
Minimum Distance =	6.1 cm		

Table 1-6. Calculated MPE Data for UMTS B13

Frequency	859 MHz		
Limit	0.573 mW/cm ²		
Distance (cm), R =	20 cm		
Power (dBm), P =	22 dBm	158.49 mW	
TX Ant Gain (dB), G =	0.82 dBi		
Power Density (S) =	0.038 mW/cm ²	(at 20cm)	
Minimum Distance =	5.2 cm		

Table 1-7. Calculated MPE Data for LTE B26

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Frequency	2110 MHz		
Limit	1.000 mW/cm ²		
Distance (cm), R =	20 cm		
Power (dBm), P =	21 dBm	125.89 mW	
TX Ant Gain (dB), G =	2.8 dBi		
Power Density (S) =	0.048 mW/cm ²	(at 20cm)	
Minimum Distance =	4.4 cm		

Table 1-8. Calculated MPE Data for UMTS B66

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2.0 CONCLUSION

The device meets the mobile RF exposure limit at a 20cm separation distance as specified in §2.1091 of the FCC Rules and Regulations. An appropriate RF exposure compliance statement will be placed in the user's manual.

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