

Maximum permissible exposure (MPE)

1.1

For test instruments and accessories used see section 6 Part **CPC 2**.

1.1.1 Description of the test location

Test location: Shielded room S5

1.1.2 Applicable standard

According to FCC Part 15, Section 15.247(i):

Systems operating under the provisions of this section shall be operated in a manner that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines.

The test methods used comply with ANSI/IEEE C95.1, "IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz".

This test report shows the compliance with the limits for Maximum Permissible Exposure (MPE) specified in FCC Part 1, Section 1.1310 and the criteria to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in FCC Part 1, Section 1.1307(b).

1.1.3 Description of Measurement

The maximum total power input to the antenna has been measured conducted as described in clause 5.3 of this document. Through the Friis transmission formula, the known maximum gain of the antenna and the maximum power, the MPE can be calculated in a defined distance away from the product.

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

where

P_d = power density (mW/cm²)

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

G = gain of antenna (linear scale)

r = distance between antenna and observation point (cm)

ATTACHMENT B to File No.: T38208-00-00HU**1.1.4 Test result**

- a.) Power setting 30.0 dBm
= Antenna gain: < 6.0 dBi

Type	Order-No.	Shortened designation
MiRa FCC	52010083	Mid Range Antenna FCC, 902-928 MHz, 100° circular (2.5 dBic)
S-MiRa ETSI/FCC	52010172	Short-Mid Range Antenna ETSI/FCC, 865-928 MHz, 100° circular (-10.0 dBic)
U-LoRa ETSI/FCC	52010092	Ultra Low Range Antenna ETSI/FCC, 865-928 MHz (-30.0 dBi)
LoRa FCC	52010085	Low Range Antenna FCC, 902-928 MHz (-15.0 dBi)
SMSH-30-30-KRAI-Slave	52010197	Smart Shelf Antenna, 865-928 MHz (-7.0 dBic)

To show the compliance with the standard the antenna gain from the **MiRa FCC (2.5 dBic, Order No. 52010083)** was used for calculation.

Channel No.	Frequency	Max power output to antenna		Antenna gain	Power density	Limit of power density
	(MHz)	(dBm)	(mW)	(dBi)	(mW/cm ²)	(mW/cm ²)
1	902.75	29.74	941.890	2.5	0.3332	0.602
26	914.75	29.82	959.401	2.5	0.3394	0.610
50	927.25	29.41	872.971	2.5	0.3088	0.618

According to FCC Rules 47CFR 2.1093(b) the EUT is not a portable device.
The EUT is designed to be used that radiating structures are more than 20 cm outside of the body of the user. ($r = 20$ cm).

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- b.) Power setting 25.5 dBm
= Antenna gain: > 6.0 dBi

Type	Order-No.	Shortened designation
WiRa 30° FCC	52010087	Wide Range-Antenna FCC, 902-928 MHz, 30° circular (10.5 dBi)
WiRa 70° FCC	52010079	Wide Range Antenna FCC, 902-928 MHz, 70° circular (8.3 dBi)
WiRa-70°-KRAI-FCC	52010194	Wide Range KRAI Antenna FCC, 902-928 MHz (7.5 dBi)

To show the compliance with the standard the antenna gain from the **WiRa 30° FCC (10.5 dBi, Order No. 52010087)** was used for calculation.

Channel No.	Frequency (MHz)	Max power output to antenna (dBm) (mW)		Antenna gain (dBi)	Power density (mW/cm ²)	Limit of power density (mW/cm ²)
1	902.75	25.18	329.610	10.5	0.5844	0.602
26	914.75	25.35	342.768	10.5	0.6078	0.610
50	927.25	24.90	309.030	10.5	0.5479	0.618

According to FCC Rules 47CFR 2.1093(b) the EUT is not a portable device.

The EUT is designed to be used that radiating structures are more than 20 cm outside of the body of the user. ($r = 20$ cm).

Limits for maximum permissible exposure (MPE):

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (minutes)
(B) Limits for General Population / Uncontrolled Exposure				
0.3 – 3.0	614	1.63	100	30
3.0 – 30	824/f	2.19/f	180/ f ²	30
30 - 300	27.5	0.073	0.2	30
300-1500	---	---	f/1500	30
1500-100000	---	---	1.0	30

f = Frequency (MHz)

Note: The manufacturer shall state in the manual the minimum cable length for each antenna. Additionally this shall be stated on the label of the EuT.

The requirements are **FULFILLED**.

Remarks:
