

Test report No:
NIE: 69260RAN.002A1

Assessment report RF EXPOSURE REPORT ACCORDING TO FCC 47 CFR Part 2.1091

(*) Identification of item under evaluation	TRX module
(*) Trademark	MIPOT
(*) Model and /or type reference	32001505BUS
(*) Derived model not tested	32001506BUS
(*) Other identification of the product	HW version: 2 SW version: FW01000002 FCC ID: 2AGJP-MIP IC: 28566-MIP
(*) Features	LoRaWAN US915
(*) Manufacturer	MIPOT S.p.A. Via Corona 5, 34071 Cormons (GO) - ITALY
Test method requested, standard	FCC 47 CFR Part 2.1091 Radiofrequency radiation exposure evaluation: mobile devices.
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Miguel Lacave Antennas Lab Manager
Date of issue	2023-10-03
Report template No	FAN36_01 (*) "Data provided by the client"

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Competences and guarantees

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Data provided by the client

The following data has been provided by the client:

1. Information relating to the description of the sample ("Identification of the item under evaluation", "Trademark", "Model and/or type reference", "Derived model not tested", "Other identification of the product", "Features", "Manufacturer" and "General description of the device").
2. Request for evaluation under mobile exposure conditions.
3. Derived models not tested. These models have been declared by the supplier of the sample as being the same as the model under test.



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DECLARATION OF IDENTITY TO TYPE

We,

MIPOT S.p.A

Of:

**Via Corona, 5
34071 Cormons (Gorizia)
ITALY**

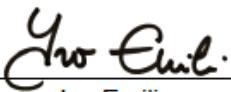
Declare under our sole responsibility that the product **32001506BUS** should be considered a derived model of **32001505BUS**.

32001506BUS deviates from the **32001505BUS** model in the following respects:

- Customized data labeling;
- Customized instruction manual;
- Secure Element chip (U4) mounted and positioned away from the RF line;

The manufacturer certifies that the changes have no impact neither on EMC performance or Safety aspects.

Cormons, 5th August 2021


Ivo Emili
CEO



Società soggetta all'attività di direzione e coordinamento
da parte della KB1909 Società per azioni - Detinuta al 100%
codice fiscale e numero di iscrizione al Registro Imprese di Gorizia 00004860315

DEKRA Testing and Certification S.A.U. declines any responsibility with respect to the information provided by the client and that may affect the validity of results.

Identification of the client

Company name: MIPOT S.p.A.

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Document history

Report number	Date	Description
69260RAN.002	2023-05-24	First release
69260RAN.002A1	2023-10-03	Second release: FCC ID has been changed on the cover by customer request. This modification test report cancels and replaces the test report 69260RAN.002

Appendix A: FCC RF Exposure assessment result

General description of the equipment under evaluation

The equipment under evaluation consists of a LoRaWAN transceiver (US915 frequency plan).

As the equipment under evaluation is a module, a conservative evaluation distance of 20 cm has been used to perform the assessment.

As stated into DEKRA Testing and Certification, S.A.U. test report num. 69260RRF.002, the maximum measured output power levels for each supported technology are:

Technology / Mode	Band	Frequency (MHz)	Maximum Conducted Output Power (dBm)
LoRa	ISM (USA)	902 - 928	18.70

Table 1: Equipment specifications

Maximum Antenna Gain determination for RF Exposure compliance

Summary of maximum antenna gain values:

Maximum antenna gain for mobile operation to comply with MPE and EIRP limits (see Appendix B) shall not exceed the following values:

Technology / Mode	Band	Frequency (MHz)	Max Gain to comply with RF Exp Limits (dBi)	Max Gain to comply with EIRP Limits (dBi)	Maximum allowed Gain (worst case) (dBi)
LoRa	ISM (USA)	902 - 928	16.10	17.30	16.10

Table 2: Maximum Antenna Gain values summary

Maximum Gain to meet FCC Radiofrequency radiation exposure limits:

Technology / Mode	Band	Frequency (MHz)	Distance (cm)	FCC General Population Limit (mW/cm ²)	Maximum Gain to comply with RF Exposure Limits (dBi)
LoRa	ISM (USA)	902 - 928	20.00	0.60	16.10

Table 3: Maximum Antenna Gain values based on FCC MPE limits

Maximum Gain to meet FCC EIRP limits

Technology / Mode	Band	Frequency (MHz)	Maximum Output power (dBm)	EIRP Limits (dBm)	Maximum Gain to meet EIRP Limits (dBi)
LoRa	ISM (USA)	902 - 928	18.70	36.00	17.30

Table 4: Maximum Antenna Gain values based on FCC EIRP limits

Appendix B: FCC RF Exposure information

FCC RF Exposure evaluation

Devices operating in standalone mobile device exposure conditions may contain a single transmitter or multiple transmitters that do not transmit simultaneously. A minimum test separation distance ≥ 20 cm is required between the antenna and radiating structures of the device and nearby persons to apply mobile device exposure limits. The distance must be at least 20 cm and fully supported by the operating and installation configurations of the transmitter and its antenna(s), according to the source-based time-averaged maximum power requirements of § 2.1091(d)(2). In cases where cable losses or other attenuations are applied to determine compliance, the most conservative operating configurations and exposure conditions must be evaluated. The minimum test separation distance required for a device to comply with mobile device exposure conditions must be clearly identified in the installation and operating instructions, for all installation and exposure conditions, to enable users and installers to comply with RF exposure requirements. For mobile devices that have the potential to operate in portable device exposure conditions, similar to the configurations described in § 2.1091(d)(4), a KDB inquiry is required to determine the SAR test requirements for demonstrating compliance.

When a device qualifies for the categorical exclusion provision of § 2.1091(c), the minimum test separation distance may be estimated, when applicable, by simple calculations according to plane-wave equivalent conditions, to ensure the transmitter and its antenna(s) can operate in manners that meet or exceed the estimated distance. The source-based time-averaged maximum radiated power, according to the maximum antenna gain, must be applied to calculate the field strength and power density required to establish the minimum test separation distance. When the estimated test separation distance becomes overly conservative and does not support compliance, MPE measurement or computational modeling may be used to determine the required minimum separation distance.

According to §1.1310 Radiofrequency radiation exposure limits, paragraph (e), the limits for Maximum Permissible Exposure (MPE) to radiofrequency electromagnetic fields are:

TABLE 1—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)
(A) Limits for Occupational/Controlled Exposure				
0.3–3.0	614	1.63	* 100	6
3.0–30	1842/f	4.89/f	* 900/f ²	6
30–300	61.4	0.163	1.0	6
300–1,500 .....	.....	.....	f/300	6
1,500–100,000 .....	.....	.....	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	* 100	30
1.34–30	824/f	2.19/f	* 180/f ²	30
30–300	27.5	0.073	0.2	30
300–1,500 .....	.....	.....	f/1500	30
1,500–100,000 .....	.....	.....	1.0	30

f = frequency in MHz * = Plane-wave equivalent power density

FCC MPE Evaluation

Each supported transmission technology will be evaluated to determine if it is in compliance with limits for Maximum Permissible Exposure (MPE) to radiofrequency electromagnetic fields.

In order to perform the assessment, the following equations have been used for the calculations; these equations are accurate in the far-field of an antenna and will over-predict power density in the near field, where they could be used for making a "worst-case" or conservative prediction:

$$\text{Power density: } S[mW / cm^2] = \frac{P_{\max} [mW]}{4\pi R[cm]^2}$$

$$\text{Maximum gain to meet the MPE limit: } G_{\max} [dBi] = (10 * \log[S[mW / cm^2] * 4\pi R[cm]^2]) - P_{\max} [dBm]$$

S = power density

P_{\max} = power input to the antenna

R = distance to the center of radiation of the antenna (evaluation distance)

G_{\max} = power gain of the antenna in the direction of interest relative to an isotropic radiator

FCC ISM bands limits

Maximum FCC conducted output limits are stated into FCC 47 CFR §15.247 (b) (4) standard. The limit depends on the antenna value as follows, for antenna gains with 6dBi:

Standard	Band (MHz)	Conducted output limit (W)	Maximum EIRP (dBm)
FCC 47 CFR §15.247 (b)	2400-2483.5	1.0	36.0
FCC 47 CFR §15.247 (b)	902-928	1.0	36.0

For antenna gains exceeding 6dBi, the conducted output power from the intentional radiator shall be reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

Maximum FCC EIRP limits for 5GHz bands are stated into FCC 47 CFR §15.407 standard. The limit depends on the antenna value as follows, for antenna gains with 6dBi:

Standard	Band (MHz)	Conducted output limit (W)	Maximum EIRP (dBm)
FCC 47 CFR §15.407	5150-5250	0.25	30.0
	5250-5725	0.25	30.0
	5725-5850	1.0	36.0

For antenna gains exceeding 6dBi, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.