

Test report No:
NIE: 77842RAN.002A4

Assessment report

RF EXPOSURE REPORT ACCORDING TO FCC 47 CFR Part 2.1091; FCC 47 CFR Part 1.1307 FCC 47 CFR Part 1.1310

(*) Identification of item under evaluation	Telematic Control Unit with GNSS, Wifi, UWB, BT classic, BLE, 4G LTE CAT
(*) Trademark	IDNEO
(*) Model and /or type reference	EBOX
(*) Other identification of the product	IMEI TAC : Not provided FCC ID : 2BGE31EBOX0524 IC ID : 32504-1EBOX0624 HW version : 419100346 SW Version : 414100493
(*) Features	GNSS, Wifi, UWB, BT classic, BLE, 4G LTE CAT 4
(*) Manufacturer	IDNEO TECHNOLOGIES, S.A.U Carrer Rec de Dalt, 3, 08100 Mollet del Vallès, Barcelona (SPAIN)
Test method requested, standard	FCC 47 CFR Part 2.1091 Radiofrequency radiation exposure evaluation: mobile devices. FCC 47 CFR Part 1.1307: Actions that may have a significant environmental effect, for which Environmental Assessments (EAs) must be prepared. FCC 47 CFR Part 1.1310: Radiofrequency radiation exposure limits.
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Manuel García Antennas Lab Technical Responsible
Date of issue	2025-02-25
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Index

Competences and guarantees3

General conditions3

Data provided by the client.....3

Identification of the client.....3

Document history3

Appendix A: FCC RF Exposure assessment result5

 General description of the device under evaluation6

 Evaluation Results.....9

Appendix B: FCC RF Exposure information11

 RF Exposure determination of exemption.....12

 RF Exposure evaluation14

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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", "General description of the device", "Other identification of the product").
2. Maximum output power, maximum antenna gains and use distance information.
3. The device under evaluation consists of a telematic control unit.

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

IDNEO TECHNOLOGIES, S.A.U

Carrer Rec de Dalt, 3, 08100 Mollet del Vallès, Barcelona (SPAIN)

Document history

Report number	Date	Description
77842RAN.002	2024-09-13	First release
77842RAN.002A1	2025-02-07	Second release. UWB maximum output power and antenna peak gain updated and LTE Band 17 replaces LTE Band 38. This test report cancels and replaces test report 77842RAN.002.
77842RAN.002A2	2025-02-20	Third release. Cellular, BT, BTLE, WiFi 2,4GHz and WiFi 5GHz antenna peak gain updated. This test report cancels and replaces test report 77842RAN.002A1.
77842RAN.002A3	2025-02-24	Fourth release. Corrected typos and tables updated with the correct values. This test reports cancels and replaces test report 77842RAN.002A2.
77842RAN.002A4	2025-02-25	Fifth release. Maximum output power of Bluetooth, BLE and WiFi have been updated. This test report cancels and replaces test report 77842RAN.002A3.

Appendix A: FCC RF Exposure assessment result

General description of the device under evaluation

Table 1 shows information used for the RF Evaluation, considering the following declared specifications for the device:

Description and technologies: the device under evaluation consists of a telematic control unit with the following features: GNSS, Wifi, UWB, BT classic, BLE, 4G LTE CAT 4. For RF Exposure evaluation, only transmission technologies: Wifi, UWB, BT classic, BLE, 4G LTE CAT 4 are considered.

Evaluation Distance: according to the manufacturer, during its normal use, the separation distance between the radiating structures of the device and nearby users will be greater than 20 cm. In order to perform the assessment a conservative evaluation distance of 20 cm has been used.

Maximum output power:

- Values corresponding to maximum output power have been declared by the device manufacturer (maximum output power values stated in modules manufacturer's datasheets.
- Values corresponding to the Bluetooth, BTLE and WiFi maximum output power of the AF20 module have been declared in the FCC Grant for the module with FCC ID XMR202303AF20.
- Values corresponding to the BTLE maximum output power of the ANNAB1 module have been declared in the FCC Grant for the module with FCC ID XPYANNAB1.

Antennas: the device supports several antennas for the Wifi, UWB, BT classic, BLE, 4G LTE CAT 4 transmitting technologies:

- "Ebox AG35-NA LTE main" antenna for cellular transmissions.
- "Ebox AF20 NA WIFI/BT", for 2.4 GHz and/or 5GHz transmissions.
- "Ebox AF20 NA WIFI/BT" and "Ebox NA BLE ANNA" antennas for Bluetooth transmissions.
- "Ebox NA UWB" antenna for UWB transmissions.
- Values corresponding to antenna gain have been declared by the device manufacturer (maximum peak gain stated in antenna manufacturer's datasheet).

The following table shows the information provided above:

Technology / Mode	Operating Band	Frequency under evaluation (MHz)	Transmitting configuration	Maximum Conducted Output Power (Incl. Tune-Up) (dBm)	Duty Cycle (%)	Time Averaged Conducted Power (dBm)	“AG35-NA LTE main” peak gain (dBi)	“AF20 NA WIFI/BT” peak gain (dBi)	“NA BLE ANNA” peak gain (dBi)	“NA UWB” peak gain (dBi)	Maximum Averaged E.R.P (dBm)	Maximum Averaged E.R.P (mW)	Maximum Averaged E.I.R.P (dBm)	Maximum Averaged E.I.R.P (mW)
GSM	850	824 - 849	SISO	35.00	12.50	25.97	1.20	-	-	-	25.02	317.62	27.17	521.09
GPRS 1TX	850	824 - 849	SISO	35.00	12.50	25.97	1.20	-	-	-	25.02	317.62	27.17	521.09
GPRS 2TX	850	824 - 849	SISO	35.00	25.00	28.98	1.20	-	-	-	28.03	635.24	30.18	1042.17
GPRS 3TX	850	824 - 849	SISO	33.20	37.50	28.94	1.20	-	-	-	27.99	629.55	30.14	1032.84
GPRS 4TX	850	824 - 849	SISO	32.00	50.00	28.99	1.20	-	-	-	28.04	636.75	30.19	1044.65
EGPRS 1TX	850	824 - 849	SISO	30.00	12.50	20.97	1.20	-	-	-	20.02	100.44	22.17	164.78
EGPRS 2TX	850	824 - 849	SISO	30.00	25.00	23.98	1.20	-	-	-	23.03	200.88	25.18	329.56
EGPRS 3TX	850	824 - 849	SISO	28.20	37.50	23.94	1.20	-	-	-	22.99	199.08	25.14	326.61
EGPRS 4TX	850	824 - 849	SISO	27.00	50.00	23.99	1.20	-	-	-	23.04	201.36	25.19	330.35
GSM	1900	1850 - 1910	SISO	32.00	12.50	22.97	1.90	-	-	-	22.72	187.03	24.87	306.84
GPRS 1TX	1900	1850 - 1910	SISO	32.00	12.50	22.97	1.90	-	-	-	22.72	187.03	24.87	306.84
GPRS 2TX	1900	1850 - 1910	SISO	32.00	25.00	25.98	1.90	-	-	-	25.73	374.06	27.88	613.68
GPRS 3TX	1900	1850 - 1910	SISO	30.20	37.50	25.94	1.90	-	-	-	25.69	370.71	27.84	608.18
GPRS 4TX	1900	1850 - 1910	SISO	29.00	50.00	25.99	1.90	-	-	-	25.74	374.95	27.89	615.13
EGPRS 1TX	1900	1850 - 1910	SISO	29.00	12.50	19.97	1.90	-	-	-	19.72	93.74	21.87	153.78
EGPRS 2TX	1900	1850 - 1910	SISO	29.00	25.00	22.98	1.90	-	-	-	22.73	187.47	24.88	307.57
EGPRS 3TX	1900	1850 - 1910	SISO	27.20	37.50	22.94	1.90	-	-	-	22.69	185.79	24.84	304.81
EGPRS 4TX	1900	1850 - 1910	SISO	26.00	50.00	22.99	1.90	-	-	-	22.74	187.92	24.89	308.30
UMTS	II	1850 - 1910	SISO	25.00	100.00	25.00	1.90	-	-	-	24.75	298.54	26.90	489.78
UMTS	IV	1710 - 1755	SISO	25.00	100.00	25.00	1.30	-	-	-	24.15	260.02	26.30	426.58
UMTS	V	824 - 849	SISO	25.00	100.00	25.00	1.20	-	-	-	24.05	254.10	26.20	416.87
LTE	2	1850 - 1910	SISO	25.00	100.00	25.00	1.90	-	-	-	24.75	298.54	26.90	489.78
LTE	4	1710 - 1755	SISO	25.00	100.00	25.00	1.30	-	-	-	24.15	260.02	26.30	426.58
LTE	5	824 - 849	SISO	25.00	100.00	25.00	1.20	-	-	-	24.05	254.10	26.20	416.87

Technology / Mode	Operating Band	Frequency under evaluation (MHz)	Transmitting configuration	Maximum Conducted Output Power (Incl. Tune-Up) (dBm)	Duty Cycle (%)	Time Averaged Conducted Power (dBm)	“AG35-NA LTE main” peak gain (dBi)	“AF20 NA WIFI/BT” peak gain (dBi)	“NA BLE ANNA” peak gain (dBi)	“NA UWB” peak gain (dBi)	Maximum Averaged E.R.P (dBm)	Maximum Averaged E.R.P (mW)	Maximum Averaged E.I.R.P (dBm)	Maximum Averaged E.I.R.P (mW)
LTE	7	2500 - 2570	SISO	25.00	100.00	25.00	3.00	-	-	-	25.85	384.59	28.00	630.96
LTE	12	699 - 716	SISO	25.00	100.00	25.00	0.00	-	-	-	22.85	192.75	25.00	316.23
LTE	13	777 - 787	SISO	25.00	100.00	25.00	0.00	-	-	-	22.85	192.75	25.00	316.23
LTE	17	704 - 716	SISO	25.00	100.00	25.00	-0.60	-	-	-	22.25	167.88	24.40	275.42
802.11b/g/n	2.4 GHz	2412 - 2462	SISO	17.64	100.00	17.64	-	3.00	-	-	18.49	70.63	20.64	115.88
802.11a/n/ac	U-NII-1	5180 - 5240	SISO	11.77	100.00	11.77	-	4.50	-	-	14.12	25.82	16.27	42.36
802.11a/n/ac	U-NII-2A	5260 - 5320	SISO	11.47	100.00	11.47	-	4.50	-	-	13.82	24.10	15.97	39.54
802.11a/n/ac	U-NII-2C	5500 - 5700	SISO	11.77	100.00	11.77	-	4.50	-	-	14.12	25.82	16.27	42.36
802.11a/n/ac	U-NII-3	5745 - 5825	SISO	11.77	100.00	11.77	-	4.50	-	-	14.12	25.82	16.27	42.36
Bluetooth	2.4 GHz	2402 - 2480	SISO	6.99	100.00	6.99	-	3.10	-	-	7.94	6.22	10.09	10.21
BTLE	2.4 GHz	2402 - 2480	SISO	3.01	100.00	3.01	-	3.10	-	-	3.96	2.49	6.11	4.08
BTLE	2.4 GHz	2402 - 2480	SISO	3.01	100.00	3.01	-	-	0.50	-	1.36	1.37	3.51	2.24
UWB	7987.2	7987.2	SISO	-34.32	100.00	-34.32	-	-	-	5.80	-30.67	0.00	-28.52	0.00

Table 1: Equipment specifications

Evaluation Results

RF Exposure Exemption evaluation:

Technology / Mode	Operating Band	Frequency under evaluation (MHz)	Transmitting configuration	Distance (cm)	Time Averaged Conducted Power (mW)	Maximum Averaged E.R.P (mW)	§1.1307(b)(3).i.(C) Exposure Limit (mW)	§ 1.1307(b)(3).i.(B) Exposure Limit (mW)	Verdict for exemption § 1.1307(b)(3).i
GSM/GPRS	850	824 - 849	SISO	20.00	792.45	N/A	N/A	1680.96	Pass
GSM/GPRS	1900	1850 - 1910	SISO	20.00	N/A	374.95	768.00	N/A	Pass
UMTS	II	1850 - 1910	SISO	20.00	N/A	298.54	768.00	N/A	Pass
UMTS	IV	1710 - 1755	SISO	20.00	N/A	260.02	768.00	N/A	Pass
UMTS	V	824 - 849	SISO	20.00	N/A	254.10	421.89	N/A	Pass
LTE	2	1850 - 1910	SISO	20.00	N/A	298.54	768.00	N/A	Pass
LTE	4	1710 - 1755	SISO	20.00	N/A	260.02	768.00	N/A	Pass
LTE	5	824 - 849	SISO	20.00	N/A	254.10	421.89	N/A	Pass
LTE	7	2500 - 2570	SISO	20.00	N/A	384.59	768.00	N/A	Pass
LTE	12	699 - 716	SISO	20.00	N/A	192.75	357.89	N/A	Pass
LTE	13	777 - 787	SISO	20.00	N/A	192.75	397.82	N/A	Pass
LTE	17	704 - 716	SISO	20.00	N/A	167.88	360.45	N/A	Pass
802.11b/g/n	2.4 GHz	2412 - 2462	SISO	20.00	N/A	70.63	768.00	N/A	Pass
802.11a/n/ac	U-NII-1	5180 - 5240	SISO	20.00	N/A	25.82	768.00	N/A	Pass
802.11a/n/ac	U-NII-2A	5260 - 5320	SISO	20.00	N/A	24.10	768.00	N/A	Pass
802.11a/n/ac	U-NII-2C	5500 - 5700	SISO	20.00	N/A	25.82	768.00	N/A	Pass
802.11a/n/ac	U-NII-3	5745 - 5825	SISO	20.00	N/A	25.82	768.00	N/A	Pass
Bluetooth	2.4 GHz	2402 - 2480	SISO	20.00	N/A	6.22	768.00	N/A	Pass
BTLE	2.4 GHz	2402 - 2480	SISO	20.00	N/A	2.49	768.00	N/A	Pass
BTLE	2.4 GHz	2402 - 2480	SISO	20.00	N/A	1.37	768.00	N/A	Pass
UWB	7987.2	7987.2	SISO	20.00	N/A	0.00086	768.00	N/A	Pass

Table 2: FCC Exemption Evaluation Results

The computed value(s) are below the exemption limit(s), so these modes meet the requirements stated in FCC 47 CFR Part 1.1307.

Simultaneous transmission assessment:

Simultaneous technologies and modes	Result ($\sum$ of Pout/Pmax ratios)	Verdict ($\sum \leq 1$)
GPRS 4TX 850 + 802.11b/g/n 2.4 GHz + 802.11a/n/ac U-NII-1 + Bluetooth 2.4 GHz + BTLE 2.4 GHz + BTLE 2.4 GHz + UWB 7987.2	0.52	Pass

Table 3: Simultaneous Transmission assessment

Appendix B: FCC RF Exposure information

RF Exposure determination of exemption

According to FCC 47 CFR §1.1307 (b)(3) Determination of exemption:

(i) For single RF sources (i.e., any single fixed RF source, mobile device, or portable device, as defined in paragraph (b)(2), a single RF source is exempt if:

(A) The available maximum time-averaged power is no more than 1 mW, regardless of separation distance. This exemption may not be used in conjunction with other exemption criteria other than those in paragraph (b)(3)(ii)(A) of this section. Medical implant devices may only use this exemption and that in paragraph (b)(3)(ii)(A);

(B) Or the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold P_{th} (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive). P_{th} is given by:

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

Where

$$x = -\log_{10} \left(\frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

d = the separation distance (cm);

(C) Or using Table 1 and the minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. For the exemption in Table 1 to apply, R must be at least $\lambda/2\pi$, where λ is the free-space operating wavelength in meters. If the ERP of a single RF source is not easily obtained, then the available maximum time-averaged power may be used in lieu of ERP if the physical dimensions of the radiating structure(s) do not exceed the electrical length of $\lambda/4$ or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).

TABLE 1 TO §1.1307(b)(3)(i)(C)—SINGLE RF SOURCES SUBJECT TO ROUTINE ENVIRONMENTAL EVALUATION

RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	1,920 R^2 .
1.34-30	3,450 R^2/f^2 .
30-300	3.83 R^2 .
300-1,500	0.0128 R^2f .
1,500-100,000	19.2 R^2 .

(ii) For multiple RF sources: Multiple RF sources are exempt if:

(A) The available maximum time-averaged power of each source is no more than 1 mW and there is a separation distance of two centimeters between any portion of a radiating structure operating and the nearest portion of any other radiating structure in the same device, except if the sum of multiple sources is less than 1 mW during the time-averaging period, in which case they may be treated as a single source (separation is not required). This exemption may not be used in conjunction with other exemption criteria other than those in paragraph (b)(3)(i)(A) of this section. Medical implant devices may only use this exemption and that in paragraph (b)(3)(i)(A).

(B) in the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation.

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure\ Limit_k} \leq 1$$

Where:

a = number of fixed, mobile, or portable RF sources claiming exemption using paragraph (b)(3)(i)(B) of this section for P_{th}, including existing exempt transmitters and those being added.

b = number of fixed, mobile, or portable RF sources claiming exemption using paragraph (b)(3)(i)(C) of this section for Threshold ERP, including existing exempt transmitters and those being added.

c = number of existing fixed, mobile, or portable RF sources with known evaluation for the specified minimum distance including existing evaluated transmitters.

P_i = the available maximum time-averaged power or the ERP, whichever is greater, for fixed, mobile, or portable RF source i at a distance between 0.5 cm and 40 cm (inclusive).

P_{th,i} = the exemption threshold power (P_{th}) according to paragraph (b)(3)(i)(B) of this section for fixed, mobile, or portable RF source i.

ERP_j = the ERP of fixed, mobile, or portable RF source j.

ERP_{th,j} = exemption threshold ERP for fixed, mobile, or portable RF source j, at a distance of at least λ/2π according to the applicable formula of paragraph (b)(3)(i)(C) of this section.

Evaluated_k = the maximum reported SAR or MPE of fixed, mobile, or portable RF source k either in the device or at the transmitter site from an existing evaluation at the location of exposure.

Exposure Limit_k = either the general population/uncontrolled maximum permissible exposure (MPE) or specific absorption rate (SAR) limit for each fixed, mobile, or portable RF source k, as applicable from §1.1310 of this chapter.

The available maximum time-averaged power or effective radiated power (ERP), can be calculated using the following formula to assess compliance with the Exemption Limits:

$$P_{E.I.R.P.} = P_T + G_T - L_C$$

Where:

P_T = transmitter time-averaged output power (including Duty Cycle and tune-up tolerance, if applicable)

G_T = gain of the transmitting antenna

L_C = signal attenuation in the connecting cable between the transmitter and the antenna if applicable

$$P_{E.R.P.} = P_{E.I.R.P.} - 2.15 \text{ dB}$$

RF Exposure evaluation

Limits for Maximum Permissible Exposure (MPE) for RF sources are defined in FCC 47 CFR “§1.1310 Radiation Exposure limits, paragraph (e)”:

TABLE 1 TO §1.1310(E)(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)
(i) 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
(ii) 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.

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:

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

Where:

S = power density

$P_{E.I.R.P.}$ = Equivalent isotropically radiated power

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

$$P_{E.I.R.P.} = P_T + G_T - L_C$$

Where:

P_T = transmitter time-averaged output power (including Duty Cycle and tune-up tolerance, if applicable)

G_T = gain of the transmitting antenna

L_C = signal attenuation in the connecting cable between the transmitter and the antenna if applicable