

Test report No:
NIE: 54008RAN.001

Assessment report

RF EXPOSURE REPORT ACCORDING TO FCC 47 CFR Part 2.1091 ISED RSS-102 Issue 5:2015

Identification of item tested	RF Transceiver / Mast-Mounted Base Station
Trademark	PowerTrunk
Model and /or type reference	MBS Unit –1
Other identification of the product	D148101PT FCC ID: WT7PTMBS450B IC: 8624A-PTMBS450B
Features	TETRA and TI D-LMR
Manufacturer	TELTRONIC, S.A.U. Polígono Malpica, Calle C/F-Oeste (50016). Zaragoza (SPAIN)
Test method requested, standard	FCC 47 CFR Part 2.1091 Radiofrequency radiation exposure evaluation: mobile devices. ISED RSS-102 Issue 5 (2015-03) – Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)
Summary	IN COMPLIANCE
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Identification of the client

TELTRONIC, S.A.U.

Polígono Malpica, Calle C/F-Oeste (50016).

Zaragoza (SPAIN)

General description of the device under evaluation

The MBS Unit is a TETRA and TI D-LMR single-carrier module (digital RF transceiver) that has been designed for indoor or outdoor installation in different locations such as walls, towers or masts. Up to two MBS Units can be interconnected to deploy a full-featured Mast-mounted Base Station (MBS). It can be either DC or AC power-supplied. The MBS Unit -1 operates and provides an RF output power of 10 W in the frequency bands 425-430 MHz and 450-470 MHz. However, only the latter falls under the scope of this assessment report.

The device is intended to be used only for occupational use, persons will be exposed as a consequence of their employment, and will be fully aware of, and can exercise control over, their exposure. It is not intended for use by members of the general public. During its normal use the separation distance between the antenna and the user will be greater than 200 cm.

Regulation Body	Modulation	Band (MHz)	RF output power (dBm)	Max. antenna gain (dBi)	Maximum Radiated power (E.I.R.P.) (dBm)	Maximum Radiated power (E.I.R.P.) (mW)
FCC	TETRA, TI D-LMR	450-470	40.00±1	15.0	56.00	398107.2
ISED	TETRA	450-470	40.00±1	15.0	56.00	398107.2

Table 1: Maximum radiated output power

Assessment summary

Radiofrequency radiation exposure limits			
FCC 47 CFR § 2.1091 & ISED RSS-102 Issue 5 (2015-03)			
Regulation Body	Modulation	Band (MHz)	VERDICT (Pass/Fail)
FCC	TETRA, TI D-LMR	450.0–470.0	Pass
ISED	TETRA	450.0–470.0	Pass

Table 2: Assessment summary

Appendix A: FCC RF Exposure

FCC RF Exposure evaluation for mobile devices

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 Results

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:

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

$$\text{Minimum compliance distance: } R_{\min}[cm] = \sqrt{\frac{P_{E.I.R.P.}[mW]}{4\pi S[mW/cm^2]}}$$

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)

$R_{\min}$ = distance to the center of radiation of the antenna

TETRA and TI D-LMR / 450-470 MHz Band

Maximum output power (dBm):	41.00
Maximum output power (mW):	12589.00
Maximum antenna gain (dBi):	15.00
Maximum antenna gain (numerical):	31.62
Worst Case Frequency (MHz):	450.00
Maximum EIRP (dBm):	56.00
Maximum EIRP (mW):	398107.20
Minimum use distance (cm):	200.00

Power density at minimum use distance:

Power density (mW/cm ²):	0.79
Occupational/Controlled Exposure - Power density limit (mW/cm ²):	1.50
Verdict for Occupational/Controlled Exposure:	PASS

The power density level for TETRA and TI D-LMR transmission modes is below the Occupational/Controlled Exposure power density limit.

Minimum compliance distance for this technology:

Minimum compliance distance for Occupational/Controlled Exposure (cm):	145.33
Minimum use distance (cm):	200.00
Verdict for Occupational/Controlled Exposure:	PASS

The minimum use distance is greater than the Occupational/Controlled Exposure minimum compliance distance.

Appendix B: ISED RF Exposure

ISED RF Exposure evaluation for mobile devices

According to RSS-102 Issue 5, Paragraph “4. Exposure Limits”, Industry of Canada has adopted the RF field strength limits established in Health Canada’s RF exposure guideline, Safety code 6. The limits for Controlled Environment are:

Table 6: RF Field Strength Limits for Controlled Use Devices (Controlled Environment)

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m ²)	Reference Period (minutes)
0.003-10 ²³	170	180	-	Instantaneous*
0.1-10	-	1.6/ f	-	6**
1.29-10	193/ $f^{0.5}$	-	-	6**
10-20	61.4	0.163	10	6
20-48	129.8/ $f^{0.25}$	0.3444/ $f^{0.25}$	44.72/ $f^{0.5}$	6
48-100	49.33	0.1309	6.455	6
100-6000	15.60 $f^{0.25}$	0.04138 $f^{0.25}$	0.6455 $f^{0.5}$	6
6000-15000	137	0.364	50	6
15000-150000	137	0.364	50	616000/ $f^{1.2}$
150000-300000	0.354 $f^{0.5}$	9.40 x 10 ⁻⁴ $f^{0.5}$	3.33 x 10 ⁻⁴ f	616000/ $f^{1.2}$
Note: f is frequency in MHz. *Based on nerve stimulation (NS). ** Based on specific absorption rate (SAR).				

ISED MPE Evaluation Results

Each supported transmission technology will be evaluated to determine if it is in compliance with RSS-102 Issue 5, RF Field Strength Limits for Controlled Used Devices (Controlled Environment).

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:

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

$$\text{Minimum compliance distance: } R_{\min}[m] = \sqrt{\frac{P_{E.I.R.P.}[W]}{4\pi S[W / m^2]}}$$

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)

$R_{\min}$ = distance to the center of radiation of the antenna

TETRA 450-470 MHz Band

Maximum output power (dBm):	41.00
Maximum output power (W):	12.59
Maximum antenna gain (dBi):	15.00
Maximum antenna gain (numerical):	31.62
Worst Case Frequency (MHz):	450.00
Maximum EIRP (dBm):	56.00
Maximum EIRP (W):	398.11
Minimum use distance (m):	2.00

Power density at minimum use distance:

Power density (W/m ²):	7.92
Controlled Environment - Power density limit (W/m ²):	13.69
Verdict for Controlled Environment exposure:	PASS

The power density level for TETRA transmission mode is below the Controlled Environment power density limit.

Minimum compliance distance for this technology:

Minimum compliance distance for Controlled Environment (m):	1.52
Minimum use distance (m):	2.00
Verdict for Controlled Environment exposure:	PASS

The minimum use distance is greater than the Controlled Environment minimum compliance distance.