

Test report No:
NIE: 58611RAN.002

Assessment report

RF EXPOSURE REPORT ACCORDING TO

FCC 47 CFR Part 2.1091
ISED RSS-102 Issue 5:2015
IEEE Std C95.3™ -2002 (R2008)

Identification of item tested	Companion module
Trademark	Telit
Model and /or type reference	WE866C3-P
Other identification of the product	FCC ID: RI7WE866C3 IC ID: 5131A-WE866C3 HW version: CS1929a-A SW Version: Host SW V_25.20.000-B010
Features	BT BR/EDR/LE 4.2 + Wifi a/b/g/n/ac (wave 1=> Max BW= 80 MHz)
Manufacturer	TELIT AUTOMOTIVE SOLUTIONS Esplanade Anton Philips 14460 Colombelles, France
Test method requested, standard	IEEE Std C95.3™ -2002 (R2008). IEEE Recommended Practice for Measurements and Computations of Radio Frequency Electromagnetic Fields With Respect to Human Exposure to Such Fields, 100 kHz–300 GHz 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
Approved by (name / position & signature)	Miguel Lacave Antennas Lab Manager
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Competences and guarantees

In order to assure the traceability to other national and international laboratories, DEKRA has a calibration and maintenance program for its measurement equipment.

DEKRA guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at DEKRA at the time of performance of the test.

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The results presented in this Assessment Report apply only to the particular item under test established in this document.

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Data provided by the client

The device under evaluation consist of a companion module, supporting Wi-Fi 802.11 a/b/g/n/ac (wave 1) and BT (BR/EDR/LE(4.2)). It supports single RF antenna port for both technologies Wifi and BT. SDIO and HCI I/F, respectively for Wi-Fi and BT control. Module is controlled via a host Telit module, LE920A4 or LE910C1

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

Identification of the client

TELIT AUTOMOTIVE SOLUTIONS

Esplanade Anton Philips 14460 Colombelles, France

Document history

Report number	Date	Description
58611RAN.002	2019-05-03	First release

General description of the device under evaluation

The device under evaluation consist of a companion module, supporting Wi-Fi 802.11 a/b/g/n/ac (wave 1) and BT (BR/EDR/LE(4.2)). It supports single RF antenna port for both technologies Wifi and BT. SDIO and HCI I/F, respectively for Wi-Fi and BT control. Module is controlled via a host Telit module, LE920A4 or LE910C1.

According to the manufacturer, during its normal use, the separation distance between the device and the body of nearby users will be greater than 20 cm. In order to perform the assessment a conservative separation distance of 20 cm has been used.

The equipment specifications declared by the manufacturer for each supported technology and band are:

Band (MHz)	Technology*	Band	Maximum RF output power (incl. tune-up) (dBm)	Max. Antenna gain (dBi)	Maximum E.I.R.P. (dBm)
2412-2480	Wi-Fi 802.11b/g/n	ISM	18.0	+2.5	20.5
5170-5725	Wi-Fi 802.11a/n/ac	U-NII	16.5	+4.5	21.0
2402-2480	Bluetooth BR/RDR/LE	ISM	3.9	+2.5	6.4

Table 1: Equipment specifications

*Note: Only the maximum output power mode has been taken into account as a worst case mode for technologies with different transmission modes that use the same module and antenna at the same transmission frequency range.

Assessment summary

Radiofrequency radiation exposure limits				
FCC 47 CFR § 2.1091 & ISED RSS-102 Issue 5 (2015-03)				
Assessment	Band (MHz)	Technology	Band	VERDICT (Pass/Fail)
1	2450	Wi-Fi	ISM	Pass
2	5000	Wi-Fi	U-NII	Pass
3	2450	Bluetooth	ISM	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

Assessment 1 – Wi-Fi 2.45 GHz Band

Maximum output power (dBm):	18.0
Maximum antenna Gain (dBi):	2.5
Minimum use distance (cm):	20.0
Worst Case Frequency (MHz):	2412.0
Maximum EIRP (dBm):	20.5
Maximum EIRP (mW):	112.2
General population - Power density limit (mW/cm ²):	1.0

Power density at minimum use distance:

Power density (mW/cm ²):	0.22
General population - Power density limit (mW/cm ²):	1.0
Verdict for general population:	PASS

The power density level for this transmission mode is below general population exposure power density limit.

Assessment 2 – Wi-Fi 5 GHz Band

Maximum output power (dBm):	16.5
Maximum antenna Gain (dBi):	4.5
Minimum use distance (cm):	20.0
Worst Case Frequency (MHz):	5170.0
Maximum EIRP (dBm):	21.0
Maximum EIRP (mW):	125.89
General population - Power density limit (mW/cm ²):	1.0

Power density at minimum use distance:

Power density (mW/cm ²):	0.025
General population - Power density limit (mW/cm ²):	1.0
Verdict for general population:	PASS

The power density level for this transmission mode is below general population exposure power density limit.

Assessment 3 – Bluetooth 2.45 GHz Band

Maximum output power (dBm):	3.9
Maximum antenna Gain (dBi):	2.5
Minimum use distance (cm):	20.0
Worst Case Frequency (MHz):	2402.0
Maximum EIRP (dBm):	6.4
Maximum EIRP (mW):	4.37
General population - Power density limit (mW/cm ²):	1.0

Power density at minimum use distance:

Power density (mW/cm ²):	0.00087
General population - Power density limit (mW/cm ²):	1.0
Verdict for general population:	PASS

The power density level for this transmission mode is below general population exposure power density limit.

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:

**Table 4: RF Field Strength Limits for Devices Used by the General Public
(Uncontrolled 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 ²¹	83	90	-	Instantaneous*
0.1-10	-	0.73/ f	-	6**
1.1-10	87/ $f^{0.5}$	-	-	6**
10-20	27.46	0.0728	2	6
20-48	58.07/ $f^{0.25}$	0.1540/ $f^{0.25}$	8.944/ $f^{0.5}$	6
48-300	22.06	0.05852	1.291	6
300-6000	3.142 $f^{0.3417}$	0.008335 $f^{0.3417}$	0.02619 $f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	616000/ $f^{1.2}$
150000-300000	0.158 $f^{0.5}$	4.21 x 10 ⁻⁴ $f^{0.5}$	6.67 x 10 ⁻⁵ f	616000/ $f^{1.2}$
Note: f is frequency in MHz. *Based on nerve stimulation (NS). ** Based on specific absorption rate (SAR).				

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 devices used by the General Public.

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

Assessment 1 – Wi-Fi 2.45 GHz Band

Maximum output power (dBm):	18.0
Maximum antenna gain (dBi):	2.5
Minimum use distance (m):	0.2
Worst Case Frequency (MHz):	2412.0
Maximum EIRP (dBm):	20.5
Maximum EIRP (W):	0.11
General public - Power density limit (W/m ²):	5.366

Power density at minimum use distance:

Power density (W/m ²):	0.223
General public - Power density limit (W/m ²):	5.366
Verdict for general public:	PASS

The power density level for this transmission mode is below general public power density limit.

Assessment 2 – Wi-Fi 5 GHz Band

Maximum output power (dBm):	16.5
Maximum antenna gain (dBi):	4.5
Minimum use distance (m):	0.2
Worst Case Frequency (MHz):	5170.0
Maximum EIRP (dBm):	21.0
Maximum EIRP (W):	0.13
General public - Power density limit (W/m ²):	9.035

Power density at minimum use distance:

Power density (W/m ²):	0.250
General public - Power density limit (W/m ²):	9.035
Verdict for general public:	PASS

The power density level for this transmission mode is below general public power density limit.

Assessment 3 – Bluetooth 2.45 GHz Band

Maximum output power (dBm):	3.9
Maximum antenna gain (dBi):	2.5
Minimum use distance (m):	0.2
Worst Case Frequency (MHz):	2402.0
Maximum EIRP (dBm):	6.4
Maximum EIRP (W):	0.004
General public - Power density limit (W/m ²):	5.35

Power density at minimum use distance:

Power density (W/m ²):	0.009
General public - Power density limit (W/m ²):	5.35
Verdict for general public:	PASS

The power density level for this transmission mode is below general public power density limit.