

Test report No:
NIE: 63199RAN.001

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

(*) Identification of item under evaluation	FiberGateway
(*) Trademark	Altice, Altice Labs
(*) Model and /or type reference	Fullu equipped model: GR140DG Sub-equipped variant models: GRxy0DG (x - 0 or 1 FXS ports / y - 0, 1, 2, 3 or 4 - Eth ports)
(*) Other identification of the product	HW version: PCB1496 SW version: 1.4.x FCC ID: 2ACJF-FGW-GR140DG
(*) Features	4 Ethernet, 1 FXS, 1 USB and Dual Band Wi-Fi 802.11bgnax / anacax
(*) Applicant	Altice Labs Rua Eng. José Ferreira Pinto Basto, 3810-106 Aveiro Portugal
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	2020-12-09
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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 tested", "Trademark", "Model and/or type reference tested", "General description of the device").
2. Maximum antenna gain and use distance information.

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

Altice Labs
Rua Eng. Ferreira Pinto Basto, 3810-106 Aveiro
Portugal

Document history

Report number	Date	Description
63199RAN.001	2020-12-09	First release

Appendix A: FCC RF Exposure assessment result

General description of the device under evaluation

The device under evaluation consists of a dual band Wi-Fi 6 mesh extender device.

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 20cm. In order to perform the assessment a conservative evaluation distance of 20 cm has been used.

The equipment specifications for each supported technology are shown in Table 1. Values corresponding to antenna gain have been declared by the manufacturer. Values corresponding to output power have been measured and stated into DEKRA Testing and Certification, Co., Ltd. test report num. 2070864R-E3032110114 and 2070864R-E3032110123

Technology / Mode	Band	Frequency (MHz)	Maximum Conducted Output Power (dBm)	Antenna peak gain (dBi)	Maximum E.I.R.P. (dBm)	Maximum E.I.R.P. (mW)
802.11b - Ant 0	2.4 GHz	2412 - 2484	28.30	1.30	29.60	912.01
802.11b - Ant 1	2.4 GHz	2412 - 2484	28.06	1.10	29.16	824.14
802.11b - Ant 2	2.4 GHz	2412 - 2484	27.88	1.70	29.58	907.82
802.11b - Ant 3	2.4 GHz	2412 - 2484	28.19	1.50	29.69	931.11
802.11g/n/ax - Ant 0	2.4 GHz	2412 - 2484	24.25	1.30	25.55	358.92
802.11g/n/ax - Ant 1	2.4 GHz	2412 - 2484	23.18	1.10	24.28	267.92
802.11g/n/ax - Ant 2	2.4 GHz	2412 - 2484	22.90	1.70	24.60	288.40
802.11g/n/ax - Ant 3	2.4 GHz	2412 - 2484	24.00	1.50	25.50	354.81
802.11a/an/ac/ax - Ant 0	5.2 GHz	5180 - 5240	21.22	4.50	25.72	373.25
802.11a/an/ac/ax - Ant 1	5.2 GHz	5180 - 5240	21.51	4.10	25.61	363.92
802.11a/an/ac/ax - Ant 2	5.2 GHz	5180 - 5240	21.47	4.70	26.17	414.00
802.11a/an/ac/ax - Ant 3	5.2 GHz	5180 - 5240	22.42	4.40	26.82	480.84

Table 1: Equipment specifications

*5.2 GHz band corresponds to U-NII Low band

RF Exposure Assessment result and verdict

Limits for Maximum Permissible Exposure (MPE) to comply with FCC 47 CFR § 2.1091 are defined in “§1.1310 Radiation Exposure limits, paragraph (e)”:

Technology / Mode	Band	Frequency (MHz)	Distance (cm)	Power density (mW/cm2)	FCC General Population Limit (mW/cm2)	Verdict
802.11b - Ant 0	2.4 GHz	2412 - 2484	20.00	0.18	1.00	Pass
802.11b - Ant 1	2.4 GHz	2412 - 2484	20.00	0.16	1.00	Pass
802.11b - Ant 2	2.4 GHz	2412 - 2484	20.00	0.18	1.00	Pass
802.11b - Ant 3	2.4 GHz	2412 - 2484	20.00	0.19	1.00	Pass
802.11g/n/ax - Ant 0	2.4 GHz	2412 - 2484	20.00	0.07	1.00	Pass
802.11g/n/ax - Ant 1	2.4 GHz	2412 - 2484	20.00	0.05	1.00	Pass
802.11g/n/ax - Ant 2	2.4 GHz	2412 - 2484	20.00	0.06	1.00	Pass
802.11g/n/ax - Ant 3	2.4 GHz	2412 - 2484	20.00	0.07	1.00	Pass
802.11a/an/ac/ax - Ant 0	5.2 GHz	5180 - 5240	20.00	0.07	1.00	Pass
802.11a/an/ac/ax - Ant 1	5.2 GHz	5180 - 5240	20.00	0.07	1.00	Pass
802.11a/an/ac/ax - Ant 2	5.2 GHz	5180 - 5240	20.00	0.08	1.00	Pass
802.11a/an/ac/ax - Ant 3	5.2 GHz	5180 - 5240	20.00	0.10	1.00	Pass

Table 2: Assessment result and verdict

Simultaneous transmission assessment:

The device supports MIMO 4x4 for 802.11g/n/ax modes (2.4GHz), MIMO 4x4 for 802.11a/an/ac/ax modes (5.2GHz) and SISO only for 802.11b mode.

The following simultaneous transmission evaluation results correspond to the worst cases scenarios:

Simultaneous technologies and modes	Result	Limit	Verdict
Ant 0 + Ant 1 + Ant 2 + Ant 3 (802.11g/n/ax 2.4GHz) + Ant 0 + Ant 1 + Ant 2 + Ant 3 (802.11a/an/ac/ax 5.2GHz)	0.58	1	Pass
Ant 0 (802.11b 2.4GHz) + Ant 0 + Ant 1 + Ant 2 + Ant 3 (802.11a/an/ac/ax 5.2GHz)	0.51	1	Pass

Table 3: Simultaneous Transmission assessment

Appendix B: FCC RF Exposure information

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

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:

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

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 output power (including tune-up tolerance)

G_T = gain of the transmitting antenna

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

Multiple frequencies assessment

When multiple sources are introduced into an environment, it becomes necessary to address the sources interdependently, since each source will contribute some percentage of the maximum exposure towards the total exposure at a fixed location. The sum of the ratios of the exposure from each source to the corresponding maximum exposure for the frequency of each source must be evaluated.

The exposure complies with the maximum permissible exposure if the sum of the ratios is less than unity:

$$\sum_{i=1}^n \frac{S_i}{L_{i\text{m}}}$$

Where

S_i is the applicable contribution of each source (e.g. power flux density).

$L_{i\text{m}}$ is the limit for the applicable contribution of each source (e.g. MPE power flux density basic restriction).