

ISED CABid: ES1909

Test report No:
NIE: 67442RAN.003

Assessment report

RF EXPOSURE REPORT ACCORDING TO FCC 47 CFR Part 2.1091

(*) Identification of item under evaluation	Communications device
(*) Trademark	Ring LLC
(*) Model and /or type reference	5AT3T3
(*) Other identification of the product	FCC ID: 2AEUPBHAXN001 IC ID: 20271-BHAXN001
(*) Features	--
(*) Manufacturer	Ring LLC 1523 26 th Street, Santa Monica, CA 90404, USA
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  2021.08.26 13:43:11 +02'00'
Date of issue	2021-08-26
Report template No	FAN36_02 (*) "Data provided by the client"

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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", "Other identification of the product", "Features", "Manufacturer" and "General description of the device").
2. Maximum output power, 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

Company name: Ring LLC

Postal Address: 1523 26th Street, Santa Monica, CA 90404, USA

Telephone: (800) 656-1918

Document history

Report number	Date	Description
67442RAN.003	2021-08-26	First release

Appendix A: FCC RF Exposure assessment result

General description of the device under evaluation

The device under evaluation consists of a wireless access point supporting Wi-Fi 6, Cellular, Z-Wave, ZigBee, Bluetooth LE, and FSK-FHSS.

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 27 cm. In order to perform the assessment a conservative evaluation distance of 27 cm has been used.

The equipment specifications for each supported technology are shown in Table 1. Values corresponding to LTE output power have been declared by the manufacturer. Values corresponding to the other radios output power have been measured and stated into DEKRA Testing and Certification, S.A.U. test reports num. 67442RRF.001, 67442RRF.002, 67442RRF.003, 67442RRF.004, 67442RRF.005, 67442RRF.006, 67442RRF.007 and 67442RRF.010.

Technology / Mode	Band	Frequency (MHz)	Maximum Conducted Output Power RMS Burst (Incl. Tune-Up) (dBm)	Antenna peak gain (dBi)	Maximum E.I.R.P. (dBm)	Maximum E.I.R.P. (mW)
LTE	2	1850 - 1910	24.00	2.70	26.70	467.74
LTE	4	1710 - 1755	24.07	2.20	26.27	423.64
LTE	5	824 - 849	23.96	1.80	25.76	376.70
LTE	12	699 - 716	23.91	2.00	25.91	389.94
LTE	13	777 - 787	23.78	2.20	25.98	396.28
LTE	25	1850 - 1915	24.00	2.70	26.70	467.74
LTE	26	814 - 849	24.12	1.80	25.92	390.84
Wi-Fi 802.11b/g/n/ax SISO - Ant1	2.4 GHz	2412 - 2484	24.00	4.60	28.60	724.44
Wi-Fi 802.11b/g/n/ax SISO - Ant1	2.4 GHz	2412 - 2484	25.40	3.80	29.20	831.76
Wi-Fi 802.11b/g/n/ax MIMO - Ant1+2	2.4 GHz	2412 - 2484	28.50	7.20	35.70	3715.35
Wi-Fi 802.11a/n/ac/ax SISO - Ant1	U-NII Low	5150 - 5250	25.30	3.50	28.80	758.58
	U-NII Up	5725 - 5850	22.90	5.20	28.10	645.65
Wi-Fi 802.11a/n/ac/ax SISO - Ant2	U-NII Low	5150 - 5250	25.80	2.80	28.60	724.44
	U-NII Up	5725 - 5850	23.50	4.90	28.40	691.83
Wi-Fi 802.11a/n/ac/ax MIMO - Ant1+2	U-NII Low	5150 - 5250	29.40	6.20	35.60	3630.78
	U-NII Up	5725 - 5850	19.70	8.20	27.90	616.60

Technology / Mode	Band	Frequency (MHz)	Maximum Conducted Output Power RMS Burst (Incl. Tune-Up) (dBm)	Antenna peak gain (dBi)	Maximum E.I.R.P. (dBm)	Maximum E.I.R.P. (mW)
Bluetooth LE (2)	2.4 GHz	2400 - 2483.5	14.80	3.70	18.50	70.79
Bluetooth LE (1)	2.4 GHz	2400 - 2483.5	0.30	3.70	4.00	2.51
FSK FHSS	ISM	902 - 928	20.43	4.10	24.53	283.79
Z-Wave Long Range	ISM	912 - 928	17.54	1.90	19.44	87.90
Zigbee	ISM	2405 - 2480	14.80	3.70	18.50	70.79

Table 1: Equipment specifications

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/cm ²)	FCC General Population Limit (mW/cm ²)	Verdict
LTE	2	1850 - 1910	27.00	0.05	1.00	Pass
LTE	4	1710 - 1755	27.00	0.05	1.00	Pass
LTE	5	824 - 849	27.00	0.04	0.55	Pass
LTE	12	699 - 716	27.00	0.04	0.47	Pass
LTE	13	777 - 787	27.00	0.04	0.52	Pass
LTE	25	1850 - 1915	27.00	0.05	1.00	Pass
LTE	26	814 - 849	27.00	0.04	0.54	Pass
Wi-Fi 802.11b/g/n/ax SISO - Ant1	2.4 GHz	2412 - 2484	27.00	0.08	1.00	Pass
Wi-Fi 802.11b/g/n/ax SISO - Ant1	2.4 GHz	2412 - 2484	27.00	0.09	1.00	Pass
Wi-Fi 802.11b/g/n/ax MIMO - Ant1+2	2.4 GHz	2412 - 2484	27.00	0.41	1.00	Pass
Wi-Fi 802.11a/n/ac/ax SISO - Ant1	U-NII Low	5150 - 5250	27.00	0.08	1.00	Pass
	U-NII Up	5725 - 5850	27.00	0.07	1.00	Pass
Wi-Fi 802.11a/n/ac/ax SISO - Ant2	U-NII Low	5150 - 5250	27.00	0.08	1.00	Pass
	U-NII Up	5725 - 5850	27.00	0.08	1.00	Pass
Wi-Fi 802.11a/n/ac/ax MIMO - Ant1+2	U-NII Low	5150 - 5250	27.00	0.40	1.00	Pass
	U-NII Up	5725 - 5850	27.00	0.07	1.00	Pass
Bluetooth LE (2)	2.4 GHz	2400 - 2483.5	27.00	0.01	1.00	Pass
Bluetooth LE (1)	2.4 GHz	2400 - 2483.5	27.00	0.0003	1.00	Pass
FSK FHSS	ISM	902 - 928	27.00	0.03	0.60	Pass
Z-Wave Long Range	ISM	912 - 928	27.00	0.01	0.61	Pass
Zigbee	ISM	2405 - 2480	27.00	0.01	1.00	Pass

Table 2: Assessment result and verdict

Simultaneous transmission assessment:

Simultaneous technologies and modes	Result	Limit	Verdict
LTE 12 + Wi-Fi 802.11a/n/ac/ax MIMO - Ant1+2 U-NII Low + Bluetooth LE (1) 2.4 GHz + Z-Wave Long Range	0.50	1	Pass
LTE 12 + Wi-Fi 802.11b/g/n/ax MIMO - Ant1+2 2.4 GHz + Wi-Fi 802.11a/n/ac/ax MIMO - Ant1+2 U-NII Low + FSK FHSS+ Z-Wave Long Range	0.96	1	Pass
LTE 12 + Wi-Fi 802.11a/n/ac/ax MIMO - Ant1+2 U-NII Low + Bluetooth LE (2) 2.4 GHz + FSK FHSS+ Z-Wave Long Range	0.56	1	Pass
LTE 12 + Wi-Fi 802.11a/n/ac/ax MIMO - Ant1+2 U-NII Low + FSK FHSS+ Z-Wave Long Range + Zigbee	0.56	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:

$$\sum_{i=1}^n \frac{S_i}{Lim_i}$$

Where

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

Lim_i is the limit for the applicable contribution of each source (e.g. MPE power flux density basic restriction).