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Wireless Connectivity
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SAR Test exclusion documentation according to FCC KDB 44798, RSS-102 and EN 62479 2617011025000

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Certification numbers and labeling requirements	
FCC ID	R7T1701102
IC number	5136A-1701102
HVIN (Hardware Version Identification Number)	1701102
PMN (Product Marketing Name)	1701102
FVIN (Firmware Version Identification Number)	-
HMN (Host Marketing Name)	-

Information how the EIRP was derived is demonstrated in the test reports attached in this filing.

EUT technologies

Technologies:	Max. power: (AVG) ¹	Max. gain:	Min. pathloss:
Bluetooth LE	Declared 15 dBm Measured: +15 dBm peak	Measured: -7.4 dBi	0 dB (if applicable)
WIFI	Declared 28 dBm Measured: +27.7 dBm peak	Measured: -8.0 dBi	0 dB (if applicable)

Both, Bluetooth® LE as well as Wi-Fi, can run simultaneously.

Bluetooth® LE test results see Test Report Reference 1-4723_22-02-06

WIFI test results see Test Report Reference 1-4723_22-02-07

¹As no average power was measured this SAR consideration bases on peak values. Knowing the transmitter on times, the average power could be calculated and the SAR consideration could be relaxed.

FCC: SAR test exclusion according to KDB447498 General RF Exposure Guidance v06

Equation from chapter 4.3.1 Standalone SAR test exclusion considerations:

a) For 100 MHz to 6 GHz and test separation distances ≤ 50 mm, it must hold that

$$\frac{P_{(\text{mW})}}{d_{(\text{mm})}} \times \sqrt{f_{(\text{GHz})}} \leq 3.0$$

for 1-g SAR and

$$\frac{P_{(\text{mW})}}{d_{(\text{mm})}} \times \sqrt{f_{(\text{GHz})}} \leq 7.5$$

for 10-g extremity SAR, where

- $f_{(\text{GHz})}$ is the RF channel transmit frequency in GHz
- $P_{(\text{mW})}$ is the power which is rounded to the nearest mW before calculation
- $d_{(\text{mm})}$ is distance which is rounded to the nearest mm before calculation

b) For a frequency between 1500 MHz and 6 GHz and test separation distances > 50 mm, the 1-g and 10-g SAR test exclusion, thresholds are determined by the following

$$P_{50\text{mm}} + (d - 50) \times 10[\text{mW}]$$

where $P_{50\text{mm}}$ is the power in mW allowed at 50 mm distance and d is the separation distance.

The table below gives the calculated maximal power that could be used for source based time averaged conducted or radiated power, adjusted for tune up tolerance. If this is at or below the calculated value the DUT is exempted from SAR evaluation.

f [MHz]	d _{separation} [mm]	Threshold 1-g	Powerlimit [mW]	P max-declared [mW]	Exclusion
Bluetooth LE, a) is applied					
2450	20	3	38	31.6	yes
WIFI, b) is applied					
2450	110	3	696	631	yes

Explanation to SAR calculation

Please find the distance value d in KDB447498. For frequency f equals 2.44 GHz, the distance of d equals 110 mm can be used here, allowing a power limit of 696 mW.

ISED: SAR test exclusion according to RSS-102 Issue 5

Section 2.5.1 Table 1 / Section 2.5.2

The table below gives the calculated maximal power that could be used for source based time averaged conducted or radiated power, adjusted for tune up tolerance. If this is at or below the calculated value the DUT is exempted from SAR evaluation.

f [MHz]	d _{separation} [mm]	Tissue volume	Powerlimit [mW]	P max-declared [mW]	Exclusion
Bluetooth LE using section 2.5.1					
2450	25	1 g	52	31.6	yes
WIFI using section 2.5.2 as the power is higher than 309 mW					
2450	200	1 g	2705.3	631	yes

Explanation to RSS-102 Issue 5 Section 2.5.1

See table in RSS-102 Issue 5 Section 2.5.1 to check what distance is suitable for the declared power.

Explanation to RSS-102 Issue 5 Section 2.5.2

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than

$$1.31 \times 10^{-2} \times f^{0.6834} [W]$$

(adjusted for tune-up tolerance) where f is in MHz

Using f as 2440 MHz, the power limit calculates as 2.7053 W.

RED: MPE calculation according to EN 62311

General

Assessment of the compliance of low power electronic and electrical equipment with the basic restrictions related to human exposure to electromagnetic fields (10 MHz to 300 GHz).

MPE Calculations

The following equation is generally accurate in the far field of an antenna but will over predict power density in the near field, where it could be used for making a "worst case" prediction.

$$S = \frac{PG}{4\pi R^2}$$

or

$$S = \frac{EIRP}{4\pi R^2}$$

Where

S is the power density (in appropriate units, e.g. mW/cm²)

P is the power input to the antenna (in appropriate units e.g. mW)

G is the power gain of the antenna in the direction of interest relative to the isotropic radiator

R is the distance to the center of radiation of the antenna (appropriate units e.g. cm)

$EIRP$ is the equivalent isotropically radiated power

Reference level for general public exposure according to Council Recommendation 1999/519/EEC of 12 July 1999.

Frequency Range	Equivalent Plane Wave Power Density (Seq) [W/m ²]
0 - 1 Hz	-
1 - 8 Hz	-
8 - 25 Hz	-
0.025 - 0.8 kHz	-
0.8 - 3 kHz	-
3 - 150 kHz	-
0.15 - 1 MHz	-
1 - 10 MHz	-
10 - 400 MHz	2
400 - 2000 MHz	f / 200
2 - 300 GHz	10

SAR exclusion**Bluetooth LE****Result based on measurements Test report no. 1-4723_22-02-02**

Operating Frequency [GHz]	Measured Max. ERP [dBm]	Measured EIRP [mW]	S @ 20 cm [W/m ²]	Limit [W/m ²]
2.402	4.5	2.8	0.011	10
2.440	3.4	2.2	0.008	10
2.480	1.5	1.4	0.006	10

Operating Frequency [GHz]	Measured Max. ERP [dBm]	Measured EIRP [mW]	S @ 1 cm [W/m ²]	Limit [W/m ²]
2.402	4.5	2.8	4.5	10
2.440	3.4	2.2	3.5	10
2.480	1.5	1.4	2.2	10

WIFI**Result based on measurements Test report no. 1-4723_22-02-03**

Operating Frequency [GHz]	Measured Max. ERP [dBm]	Measured EIRP [mW]	S @ 20 cm [W/m ²]	Limit [W/m ²]
2.412	9.9	9.8	0.039	10
2.442	11.9	15.5	0.062	10
2.472	11.0	12.6	0.05	10

Operating Frequency [GHz]	Measured Max. ERP [dBm]	Measured EIRP [mW]	S @ 2 cm [W/m ²]	Limit [W/m ²]
2.412	9.9	9.8	3.9	10
2.442	11.9	15.5	6.17	10
2.472	11.0	12.6	5.01	10