



# Maximum Permissible Exposure Evaluation

**FCC ID: 2AVE6TBS1A****IC: 25970-TBS1A**

## 1. Client Information

<b>Applicant</b>	:	Tractive GmbH
<b>Address</b>	:	Poststrasse 4, 4061 Pasching, AUSTRIA
<b>Manufacturer</b>	:	Tractive GmbH
<b>Address</b>	:	Poststrasse 4, 4061 Pasching, AUSTRIA

## 2. General Description of EUT

<b>EUT Name</b>	:	Tractive Base Station	
<b>HVIN/Models No.</b>	:	TBS1A	
<b>Model Different</b>	:	----	
<b>Product Description</b>	:	Operation Frequency:	802.11b/g/n(HT20): 2412MHz~2462MHz 802.11n(HT40): 2422MHz-2452MHz
	:	Antenna Gain:	2.32dBi Dipole Antenna
<b>Power Rating</b>	:	Input: DC 5V(USB-C)	
<b>Software Version</b>	:	v1.1.1	
<b>Hardware Version</b>	:	v1.1	
<b>Connecting I/O Port(S)</b>	:	Please refer to the User's Manual	
<b>Remark</b>	:	the evaluation report used the EUT(HC-C-202312-0150-01-01-2#).	



## Method of Measurement for FCC

### 1. EUT Operation Condition:

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

### 2. Exposure Evaluation:

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S=(PG)/4\pi R^2$$

Where

**S**: power density

**P**: power input to the antenna

**G**: power gain of the antenna in the direction of interest relative to an isotropic radiator.

**R**: distance to the center of radiation of the antenna

### 3. Simultaneous transmission MPE Considerations

According to KDB447498: All transmitters and antennas in the host must be either evaluated for MPE compliance, by measurement or computational modeling, or qualify for the standalone MPE test exclusion in section 7.1. Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modeled or measured field strengths or power density, is  $\leq 1.0$ .

This means that:

$$\sum \text{ of MPE ratios } \leq 1.0$$





#### 4. Test Result:

2.4G WiFi Worst Maximum MPE Result								
Mode	N <sub>TX</sub>	Freq. (MHz)	Conducted Power(max) (dBm)	Turn-up Power (dB)	Max tune up power (dBm) [P]	ANT Gain (dBi) [G]	Distance (cm) [R]	Power Density (mW/ cm <sup>2</sup> ) [S]
802.11b	1	2412	14.95	14±1	15	2.32	20	0.01073
		2437	15.09	15±1	16	2.32	20	0.01351
		2462	14.89	14±1	15	2.32	20	0.01073
802.11g	1	2412	14.25	14±1	15	2.32	20	0.01073
		2437	14.58	14±1	15	2.32	20	0.01073
		2462	14.29	14±1	15	2.32	20	0.01073
802.11n (HT20)	1	2412	13.29	13±1	14	2.32	20	0.00853
		2437	13.60	13±1	14	2.32	20	0.00853
		2462	13.26	13±1	14	2.32	20	0.00853
802.11n (HT40)	1	2422	12.65	12±1	13	2.32	20	0.00677
		2437	13.10	13±1	14	2.32	20	0.00853
		2452	12.89	12±1	13	2.32	20	0.00677
Note: N <sub>TX</sub> = Number of Transmit Antennas RF Output power specifies that Maximum Conducted Peak Output Power.								





## 5. Conclusion:

As specified in Table 1B of 47 CFR 1.1310- Limits for Maximum Permissible Exposure (MPE),

### Limits for General Population/ Uncontrolled Exposure

Frequency Range (MHz)	Power density (mW/ cm <sup>2</sup> )
300-1,500	F/1500
1,500-100,000	1.0

For 2.4G WIFI: 2412~2462MHz

MPE limit S: 1mW/ cm<sup>2</sup>

The worst MPE is calculated as ***0.01351mW/cm<sup>2</sup> < limit 1mW/cm<sup>2</sup>***. So, RF exposure limit warning or SAR test are not required. The EUT will only be used with a separation of 20cm or greater between the antenna and nearby persons and can therefore be considered a mobile transmitter per 47 CFR2.1091 (b).

The RF Exposure Information page from the manual is included here for reference.

For a more detailed features description, please refer to the RF Test Report.

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure of mobile device.





## Method of Measurement for IC

### 1. Applicable Standard

[Radio Standards Specification 102](#), Radio Frequency (RF) Exposure Compliance of Radio Communication Apparatus (All Frequency Bands), sets out the requirements and measurement techniques used to evaluate radio frequency (RF) exposure compliance of radio communication apparatus designed to be used within the vicinity of the human body.

[ANSI C95.1-1999](#): IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

[FCC KDB publication 447498 D01 General RF Exposure Guidance v06](#): Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.

### 2. Evaluation Method and Limit

According to RSS-102 §4 Table 4, RF Filed 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 <sup>2</sup> )	Reference Period (minutes)
0.003-10 <sup>21</sup>	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 <sup>-4</sup> $f^{0.5}$	6.67 x 10 <sup>-5</sup> $f$	616000/ $f^{1.2}$

Note:  $f$  is frequency in MHz.  
 \*Based on nerve stimulation (NS).  
 \*\* Based on specific absorption rate (SAR).

Frequency Band	$f$ (MHz)	Limit of Power Density (W/m <sup>2</sup> )
2.4G WLAN	2412	5.37

Note: Limit=0.02619  $f^{0.6834}$  (where  $f$  is in MHz).  
 The  $f$  in the limit is the frequency of the lowest Channel.





### 3. Calculation Formula

Prediction of power density at the distance of the applicable MPE limit:

**$S = PG/4\pi R^2$**  = Power density (in appropriate units, e.g W/m<sup>2</sup>)

**P** = power input to antenna (in appropriate units, e.g W)

**G** = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain.

**R** = distance to the center of radiation of the antenna (in appropriate units, e.g m)

#### Simultaneous transmission MPE Considerations

According to KDB447498: All transmitters and antennas in the host must be either evaluated for MPE compliance, by measurement or computational modeling, or qualify for the standalone MPE test exclusion in section 7.1. Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modeled or measured field strengths or power density, is  $\leq 1.0$ .

This means that:

$\sum$  of MPE ratios  $\leq 1.0$





#### 4. Standalone MPE Evaluation:

2.4G WIFI Worst Maximum MPE Result									
Mode	N <sub>TX</sub>	Freq. (MHz)	Conducted Power(max) (dBm)	Turn-up Power (dB)	Max tune up power (dBm) [P]	ANT Gain (dBi) [G]	Distance (m) [R]	Power Density (W/m <sup>2</sup> ) [S]	Limit of Power Density (W/m <sup>2</sup> ) [S]
802.11b	1	2412	14.95	14±1	15	2.32	0.2	0.1073	5.37
		2437	15.09	15±1	16	2.32	0.2	0.1351	5.37
		2462	14.89	14±1	15	2.32	0.2	0.1073	5.37
802.11g	1	2412	14.25	14±1	15	2.32	0.2	0.1073	5.37
		2437	14.58	14±1	15	2.32	0.2	0.1073	5.37
		2462	14.29	14±1	15	2.32	0.2	0.1073	5.37
802.11n (HT20)	1	2412	13.29	13±1	14	2.32	0.2	0.0853	5.37
		2437	13.60	13±1	14	2.32	0.2	0.0853	5.37
		2462	13.26	13±1	14	2.32	0.2	0.0853	5.37
802.11n (HT40)	1	2422	12.65	12±1	13	2.32	0.2	0.0677	5.37
		2437	13.10	13±1	14	2.32	0.2	0.0853	5.37
		2462	12.89	12±1	13	2.32	0.2	0.0677	5.37
Note: N <sub>TX</sub> = Number of Transmit Antennas RF Output power specifies that Maximum Conducted Peak Output Power.									

#### 5. Conclusion:

For 2.4G WIFI: 2412MHz~2462MHz

The worst MPE is calculated as **0.1351W/m<sup>2</sup>**. So, RF exposure limit warning or SAR test are not required. The EUT will only be used with a separation of 20cm or greater between the antenna and nearby persons and can therefore be considered a mobile transmitter per 47 CFR2.1091 (b).

The RF Exposure Information page from the manual is included here for reference. For a more detailed features description, please refer to the RF Test Report.

-----END OF THE REPORT-----

