NIGHTWATCH®
Equine Distress & Wellness Monitor

September 5, 2017

FCC ID: 2AJZLNW1000

Dear Sir or Madam,

We hereby attest that the NIGHTWATCH® device's WLAN and Cellular transmitter, while not on its charger, qualifies for an exemption of the FCC's SAR testing requirements due to its low duty cycle. The NIGHTWATCH® device firmware controls the transmission time to guarantee the reported duty cycle time.

The NIGHTWATCH® **WLAN transmitter** attempts to upload device status and/or sensor data information. The maximum payload is 1 KB and considering a 10% overhead will yield a maximum payload of ~1.1 KB. The NIGHTWATCH® WLAN transmitter attempts to send payloads to remote server(s) at a maximum rate of once per 10 seconds. Considering a 1 Mbps upload link, the maximum transmitter on-time is ~0.01 seconds. A minimum of 1 Mbps uplink link is controlled via minimum RSSI value. The minimum acceptable RSSI value and packet upload frequency is controlled by the NIGHTWATCH® device firmware.

- 0.01 seconds on-time
- 9.99 seconds off-time
- Duty Cycle = 0.001 = 0.1%

Applying a 1.5x safety factor on the duty cycle above (0.1%) results in a duty cycle of **0.15%**. Calculations provided in Appendix 1, use a duty cycle factor of **0.0015** for SAR exclusion testing.

The NIGHTWATCH® **3G Cellular transmitter** attempts to upload device status and/or sensor data information. The maximum payload is 1 KB and considering a 10% overhead will yield a maximum payload of ~1.1 KB. The NIGHTWATCH® WLAN transmitter attempts to send payloads to remote server(s) at a maximum rate of once per 10 seconds. Considering a worst case 384 Kbps upload link, the maximum transmitter on-time is ~0.03 seconds. A minimum of 384 Kbps uplink link is controlled via minimum RSSI value. The minimum acceptable RSSI value and packet upload frequency is controlled by the NIGHTWATCH device firmware.

- 0.03 seconds on-time
- 9.97 seconds off-time
- Duty Cycle = 0.003 = 0.3%

Applying a 1.5x safety factor on the duty cycle above (0.3%) results in a duty cycle of **0.45%**. Calculations provided in Appendix 2, use a duty cycle factor of **0.0045** for SAR exclusion testing.

The NIGHTWATCH® **UWB transmitter** qualifies for an exemption of the FCC's SAR testing requirements due to its very low power transmission. The peak emission data from TUV SUD America test report: CG72118338-0617A Rev 1.0 reports a peak EIRP of -33.44 dBm at 6.059 GHz. SAR test exemption calculations have been provided in Appendix C of this letter for requirements stated by FCC Rule Parts §§ 1.1310 and 2.1093. While the SAR exemption methodology/calculation contained in KDB 447498 D01 is applicable for frequencies up to 6 GHz only, we are providing this calculation due to the frequency (6.059 GHz) being only slightly higher than 6GHz and for illustration purposes, in respect to the exemption threshold contained in KDB 447498 D01v05 clause 4.3.1.

The Cellular and WLAN modules do not transmit at the same time. The following Appendices provide the SAR exemption calculations (at 5mm).

Sincerely,

Jeffrey R. Schab
Founder & CEO

Appendix 1 – WLAN Radio

SAR Exemption Calculations:

Power levels reported are taken from Sporton International Inc. test report: FA4O0971.

Antenna gain taken as maximum gain from manufacturer datasheet (ANT016008LCD2442MA1) for frequencies reported as 2.4 GHz ISM band. We attest that there exists no amplification between the WLAN module and WLAN chip antenna and calculations are based on an additional path loss of 0dB.

Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Duty Cycle Factor	Source Based Time-Averaged Power (mW)	Source-Based Time-Averaged EIRP (mW)
2412.0	2.3	17.5	19.8	0.0015	0.0843	**0.143**

Using the source based time averaging duty cycle of 0.15%, the device does not require SAR testing as demonstrated by the following SAR exemption calculation based on FCC KDB 447398 D01 Section 4.3.1.

The 1-g head or body and 10-g extremity SAR evaluation for general population exposure conditions are not required if the *SAR Test Exclusion Threshold* condition(s) are met as defined KDB 447498 D01. According to *FCC KDB 447398*, for 100 MHz to 6 GHz and test separation distance ≤ 50 mm; the SAR test exclusion result must be ≤ 3.0 and ≤ 7.5 for 1-g SAR and 10-g extremity SAR respectively. The SAR test exclusion thresholds may be determined in respect to the exemption threshold contained in KDB 447498 D01v05 clause 4.3.1: -

$$SAR\ Test\ Exclusion = \frac{P_{MAX}}{d_{MIN}} \times \sqrt{f_{(GHz)}}$$

P_{MAX} (mW) – Maximum power of channel, including tune-up tolerances
d_{MIN} (mm) – Minimum test separation distance, mm (≤ 50 mm)
$f_{(GHz)}$ (GHz) – RF channel transmit frequency in GHz [100MHz, 6GHz]
* *Power and distance are rounded to the nearest mW and mm before calculation*
* *The result is rounded to one decimal place for comparison*

A test separation distance of 5 mm has been applied to the SAR test exclusion calculation.

P_{MAX} = 0.143 mW
$f_{(GHz)}$ = 2.412
d_{MIN} = 5 mm

[(0.143 *mW*) / (5 *mm*)] [√2.412 *GHz*] ≤ 3.0

Test Exclusion = 0.044
Limit Exemption = 3.0

Using the source based time averaging duty cycle of 0.15%; the NIGHTWATCH® device WLAN transmitter, when off the charger, does not exceed the test limit exemption and therefore a routine SAR evaluation is not required.

Appendix 2 – Cellular Radio

SAR Exemption Calculations

Power levels reported are taken from CETECOM™ test report: 6-0608-14-1-4b.

Antenna gain taken as maximum gain from manufacturer datasheet (SRFC025-100) for frequencies reported for ranges 824 – 960 MHz and 1710 – 1900 MHz. We attest that there exists no amplification between the WLAN module and WLAN chip antenna and calculations are based on an additional path loss of 0dB.

Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Duty Cycle Factor	Source Based Time-Averaged Power (mW)	Source-Based Time-Averaged EIRP (mW)
826.4	4.07	24	28.07	0.0045	1.13	**2.89**
1907.6	5.44	24	29.44	0.0045	1.13	**3.96**

Using the source based time averaging duty cycle of 0.45%, the device does not require SAR testing as demonstrated by the following SAR exemption calculation based on FCC KDB 447398 D01 Section 4.3.1.

The 1-g head or body and 10-g extremity SAR evaluation for general population exposure conditions are not required if the *SAR Test Exclusion Threshold* condition(s) are met as defined KDB 447498 D01. According to *FCC KDB 447398*, for 100 MHz to 6 GHz and test separation distance ≤ 50 mm; the SAR test exclusion result must be ≤ 3.0 and ≤ 7.5 for 1-g SAR and 10-g extremity SAR respectively. The SAR test exclusion thresholds may be determined in respect to the exemption threshold contained in KDB 447498 D01v05 clause 4.3.1: -

$$SAR\ Test\ Exclusion = \frac{P_{MAX}}{d_{MIN}} \times \sqrt{f_{(GHz)}}$$

P_{MAX} (mW) – Maximum power of channel, including tune-up tolerances
d_{MIN} (mm) – Minimum test separation distance, mm (≤ 50 mm)
$f_{(GHz)}$ (GHz) – RF channel transmit frequency in GHz [100MHz, 6GHz]
* *Power and distance are rounded to the nearest mW and mm before calculation*
** The result is rounded to one decimal place for comparison*

A test separation distance of 5 mm has been applied to the SAR test exclusion calculation.

P_{MAX} = 3.96 mW
$f_{(GHz)}$ = 1.9076
d_{MIN} = 5 mm

[(4 *mW*) / (5 *mm*)] [√1.9076 *GHz*] ≤ 3.0

Test Exclusion = 1.1
Limit Exemption = 3.0

Using the source based time averaging duty cycle of 0.45%; the NIGHTWATCH® 3G Cellular transmitter, when off the charger, does not exceed the test limit exemption and therefore a routine SAR evaluation is not required.

Appendix 3 – UWB Radio

SAR Test Exclusion Calculations:

Portable devices as defined in § 2.1093 operating under Part 15 are subject to radio frequency radiation exposure requirements as specified in § 1.1307(b), with appropriate exposure limits in §§ 1.1310 or 2.1093. Although the SAR exemption calculation in KDB 447498 D01 is applicable for frequencies up to 6 GHz only, we are providing this calculation as our frequency is only slightly higher and for illustration purposes.

A. Test Notes

The 1-g head or body and 10-g extremity SAR evaluation for general population exposure conditions are not required if the *SAR Test Exclusion Threshold* condition(s) are met as defined KDB 447498 D01. According to *FCC KDB 447398*, for 100 MHz to 6 GHz and test separation distance ≤ 50 mm; the SAR test exclusion result must be ≤ 3.0 and ≤ 7.5 for 1-g SAR and 10-g extremity SAR respectively. The SAR test exclusion thresholds may be determined in respect to the exemption threshold contained in KDB 447498 D01v05 clause 4.3.1: -

$$SAR\ Test\ Exclusion = \frac{P_{MAX}}{d_{MIN}} \times \sqrt{f_{(GHz)}}$$

P_{MAX} (mW) – Maximum power of channel, including tune-up tolerances
d_{MIN} (mm) – Minimum test separation distance, mm (≤ 50 mm)
$f_{(GHz)}$ (GHz) – RF channel transmit frequency in GHz [100MHz, 6GHz]

B. Results

Power levels reported are taken from TUV SUD America test report: CG72118338-0617A Rev 1.0, which has been uploaded in the filing. A test separation distance of 5 mm has been applied to the SAR test exclusion calculation.

Maximum power = 0.00045mW (-33.44 dBm Peak EIRP)

P_{MAX} = 0.00045mW
$f_{(GHz)}$ = 6.059 GHz
d_{MIN} = 5mm

[(0.00045 *mW*) / (5 *mm*)] [√6.059 *GHz*] ≤ 3.0

Test Exclusion = 0.00022
Limit Exemption = 3.00

The NIGHTWATCH® device UWB transmitter does not exceed the test limit exemption and therefore a routine SAR evaluation is not required.