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Tenovi Co. MPE REPORT

SCOPE OF WORK

MPE CALCULATION
ON THE TENOVI GATEWAY

REPORT NUMBER

104630548LEX-009b

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MPE TEST REPORT

Report Number: 104630548LEX-009b
Project Number: G104630548

Report Issue Date: 8/4/2021

Product Name: Tenovi Gateway

Standards: FCC Part 1.1310 Limits for Maximum
Permissible Exposure (MPE)

RSS-102 Issue 5 RF Field Strength Limits for
Devices Used by the General Public

Tested by:
Intertek Testing Services NA, Inc.
731 Enterprise Drive
Lexington, KY 40510
USA

Client:
Tenovi Co.
18023 Sky Park Cir STE H2
Irvine, CA, 92614
USA

Report prepared by



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1 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 4.0. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the product tested **complies** with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested. Intertek does not make any claims of compliance for samples or variants which were not tested.

2 Test Summary

| Section | Test full name | Result |
|---------|--|--------|
| 10 | FCC Part 1.1310 Limits for Maximum Permissible Exposure (MPE) (Limits for General Population / Uncontrolled Exposure) | Pass |
| | RSS-102 Issue 5 RF Field Strength Limits (For Devices Used by the General Public) | Pass |



3 Client Information

This product was tested at the request of the following:

| Client Information | |
|------------------------------|---|
| Client Name: | Tenovis Co. |
| Address: | 18023 Sky Park Cir STE H2 Irvine, CA, 92614 USA |
| Contact: | Nizan Friedman |
| Telephone: | (800) 593-5468 |
| Email: | nfriedman@flintrehab.com |
| Manufacturer Information | |
| Manufacturer Name: | Tenovis Co. |
| Manufacturer Address: | 18023 Sky Park Cir STE H2 Irvine, CA, 92614 USA |



4 Description of Equipment under Test and Variant Models

| Equipment Under Test | |
|---|---|
| Product Name | Tenovis Gateway |
| Model Number | Tenovis Gateway |
| Serial Number | 860016040136579 |
| Transmission Type | Bluetooth Low Energy, LTE CATM1 / NB-IoT |
| Frequency Range | 2402 – 2480MHz (Bluetooth Low Energy) LTE Band 2 (1850 – 1910MHz) LTE Band 4 (1710 – 1755MHz) LTE Band 12 (699 – 716MHz) LTE Band 13 (777 – 787MHz) LTE Band 25 (1850 – 1915MHz) LTE Band 26 (814 – 849MHz) |
| Antenna Type | Bluetooth Low Energy: $\frac{1}{4}$ wave monopole (PCB trace) LTE: 2.6dBi (698 – 960MHz) LTE: 4.4dBi (1710 – 2200MHz) |
| Receive Date | 3/29/2021 |
| Test Start Date | 3/30/2021 |
| Test End Date | 5/27/2021 |
| Device Received Condition | Good |
| Test Sample Type | Production |
| Rated Voltage | 120VAC / 60Hz |
| Description of Equipment Under Test (provided by client) | |
| The Tenovis Gateway is a gateway device for home health devices that is capable of Bluetooth Low Energy transmission. It also has an integrated approved LTE CATM1 / NB-IoT module (SIMCom SIM7080G, FCCID: 2AJYU-8C0002) | |

4.1 Variant Models:

There were no variant models covered by this evaluation.

5 Antenna Gains:

The peak antenna gain as provided by Tenovis Co. was 2.79dBi. This value was used in the MPE calculations which follow.

6 Output Power:

The peak output power measured was 4.13dBm. This value was used in the MPE calculations which follow. Additionally the RF exposure exhibit from the approved SIMCom module was used for the maximum power from the LTE module.



7 FCC Limits

§ 1.1310: The criteria listed in table 1 shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

Part 1.1310 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 Exposures | | | | |
| 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 |
| 300–1500 | | | f/300 | 6 |
| 1500–100,000 | | | 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 |
| 300–1500 | | | f/1500 | 30 |
| 1500–100,000 | | | 1.0 | 30 |

f = frequency in MHz

* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.



8 RSS-102 Issue 5 Exposure Limits:

Table 4: RF Field 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 ²) | Reference Period (minutes) |
|------------------------|--------------------------|-----------------------------------|-----------------------------------|----------------------------|
| 0.003-10 ²¹ | 83 | 90 | - | Instantaneous* |
| 0.1-10 | - | 0.73/ $f^{0.5}$ | - | 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 ⁻⁴ $f^{0.5}$ | 6.67 x 10 ⁻⁵ f | 616000/ $f^{1.2}$ |

Note: f is frequency in MHz.

* Based on nerve stimulation (NS).

** Based on specific absorption rate (SAR).



9 Test Procedure

An MPE evaluation was performed in order to show that the device was compliant with the general population exposure limits from FCC §2.1091 and RSS-102 Issue 5. The maximum power density was calculated for each transmitter band at a separation distance of 20cm using the maximum declared output power including tune up tolerance.

For each transmitter the maximum RF exposure at a 20 cm distance using the formula:

$$\text{Conducted Power}_{mW} = 10^{\frac{\text{Conducted Power}(dBm)}{10}}$$
$$\text{Power Density} = \frac{\text{Conducted Power}_{mW} \times \text{Ant.Gain}}{4\pi \times (20_{cm})^2}$$

For transmitters that could operate simultaneously, the MPE to limit ratio for each was calculated and then summed. If the sum of the MPE to limit ratios was less than 1, that specific combination of transmitters was deemed to comply.



10 Results:

The calculated maximum power density at 20cm distance was equal to or less than the required limits for general population exposure for FCC Part 1.1310, RSS-102 Issue 5, and IEC62311: 2019.

Additionally the BLE radio could transmit simultaneously with any one LTE transmit mode. The sum of the MPE / Limit ratios for BLE and the worst case LTE mode are less than 1

FCC MPE Data

| Duty Cycle | | 100 (%) | | Duty Cycle | Antenna Gain | MPE Value (mW/cm^2) | MPE Limit (mW/cm^2) | Margin to Limit (mW/cm^2) | MPE / Limit Ratio (for Co-Location) |
|------------------|-----------------|---|--|-----------------------------------|--------------|---------------------|---------------------|---------------------------|-------------------------------------|
| Separation Dist. | | 20 (cm) | | | | | | | |
| Operating Mode | Frequency (MHz) | Declared Max Cond. Power (Inc. Tolerance) (dBm) | | Adjusted Cond. Output Power (dBm) | Antenna Gain | MPE Value (mW/cm^2) | MPE Limit (mW/cm^2) | Margin to Limit (mW/cm^2) | MPE / Limit Ratio (for Co-Location) |
| BLE | 2402 | 4.13 | | 4.13 | 2.79 | 0.0010 | 1.0000 | 0.9990 | 0.0010 |
| LTE Band 2 | 1850 | 24 | | 24 | 4.4 | 0.1376 | 1.0000 | 0.8624 | 0.1376 |
| LTE Band 4 | 1710 | 24 | | 24 | 4.4 | 0.1376 | 1.0000 | 0.8624 | 0.1376 |
| LTE Band 12 | 824 | 24 | | 24 | 2.6 | 0.0909 | 0.5493 | 0.4584 | 0.1655 |
| LTE Band 13 | 699 | 24 | | 24 | 2.6 | 0.0909 | 0.4660 | 0.3751 | 0.1951 |
| LTE Band 25 | 777 | 24 | | 24 | 2.6 | 0.0909 | 0.5180 | 0.4271 | 0.1755 |
| LTE Band 26 | 663 | 25 | | 25 | 2.6 | 0.1145 | 0.4420 | 0.3275 | 0.2590 |

Sum of worst case limit / MPE ratios = 0.001 + 0.1755 = 0.1765

RSS-102 Issue 5 MPE Data

| Duty Cycle | | 100 (%) | | Duty Cycle | Antenna Gain | MPE Value (W/m^2) | MPE Limit (W/m^2) | Margin to Limit (W/m^2) | MPE / Limit Ratio (for Co-Location) |
|------------------|-----------------|---|--|-----------------------------------|--------------|-------------------|-------------------|-------------------------|-------------------------------------|
| Separation Dist. | | 20 (cm) | | | | | | | |
| Operating Mode | Frequency (MHz) | Declared Max Cond. Power (Inc. Tolerance) (dBm) | | Adjusted Cond. Output Power (dBm) | Antenna Gain | MPE Value (W/m^2) | MPE Limit (W/m^2) | Margin to Limit (W/m^2) | MPE / Limit Ratio (for Co-Location) |
| BLE | 2402 | 4.13 | | 4.13 | 2.79 | 0.0098 | 5.3508 | 5.3410 | 0.0018 |
| LTE Band 2 | 1850 | 24 | | 24 | 4.4 | 1.3764 | 4.4763 | 3.1000 | 0.3075 |
| LTE Band 4 | 1710 | 24 | | 24 | 4.4 | 1.3764 | 4.2419 | 2.8656 | 0.3245 |
| LTE Band 12 | 824 | 24 | | 24 | 2.6 | 0.9093 | 2.5756 | 1.6663 | 0.3531 |
| LTE Band 13 | 699 | 24 | | 24 | 2.6 | 0.9093 | 2.3017 | 1.3924 | 0.3951 |
| LTE Band 25 | 777 | 24 | | 24 | 2.6 | 0.9093 | 2.4743 | 1.5649 | 0.6338 |
| LTE Band 26 | 663 | 25 | | 25 | 2.6 | 1.1448 | 2.2200 | 1.0752 | 0.5157 |

Sum of worst case limit / MPE ratios = 0.0018 + 0.6338 = 0.6356



11 Revision History

| Revision Level | Date | Report Number | Prepared By | Reviewed By | Notes |
|----------------|----------|-------------------|-------------|-------------|----------------|
| 0 | 8/4/2021 | 104630548LEX-009b | BCT | BZ | Original Issue |
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