

RF Safety of Trilliant's SecureMesh™ Wireless Smart Meters

Summary

- Many of the devices we use in our everyday lives generate radio emissions, including televisions, microwave ovens, cellular phones, cordless phones, baby monitors, Bluetooth headsets, laptop computers, and other commonplace devices. All of these devices, including wireless Smart Meters, are subject to US and Canadian government regulations to ensure their safety for the general public.
- Extensive radio safety studies have been performed by the American National Standards Institute (ANSI), the Electric Power Research Institute (EPRI), the Institute of Electrical and Electronics Engineers (IEEE), the National Council on Radiation Protection and Measurements (NCRP), the United States Food and Drug Administration (FDA), the United States Occupational Safety and Health Administration (OSHA), the United States Federal Communications Commission (FCC), and the World Health Organization (WHO). Based on these various studies, FCC regulations specify radio output levels that are deemed safe for everyday exposure with no negative health or safety impacts.
- All of Trilliant's SecureMesh Smart Meters and associated SecureMesh products are certified by the FCC in the United States and Industry Canada in Canada, ensuring compliance with appropriate safety levels.
- **Even if a person were to stand next to a SecureMesh wireless Smart Meter for a prolonged period of time, the resulting radio exposure would be *hundreds of times lower* than the maximum levels allowed by safety standards, where those maximum levels ensure no adverse health impacts. With most Smart Meters installed in relatively out-of-the-way places and only active for minutes during each day, the typical radio exposure is minimal.**

Background

All SecureMesh Neighborhood Area Network (NAN) devices, including SecureMesh Smart Meters, operate as radios in the 2.4 GHz band, the same frequency band as used by cordless phones, Wi-Fi devices, Bluetooth hands-free headsets, and even microwave ovens.

In the same way that television or AM or FM radio signals are transmitted, a SecureMesh device generates radio waves that are emitted by an antenna with a certain power level. The resulting radio waves propagate through the air until an object intercepts a portion of the electromagnetic field. As the waves are emitted from the transmitter, the conveyed power diminishes rapidly with distance, so that a given surface area will intercept less transmitted power the farther away it is from the transmitter. Any walls, barriers, or obstacles between the transmitter and the reception point further reduce the received power. Most of the transmitted power is not meaningfully used, but, similar to the way a television set or radio receiver can capture the transmitted signals and present video or audio, if another SecureMesh device is within range, it can process the received signal to recover the desired information. Because the transmit power levels used by SecureMesh devices (and other devices in the 2.4 GHz band) are much lower than those used by television or commercial radio transmissions, however, signals in the 2.4 GHz band are allowed to be transmitted without requiring a special license as long as the transmitting devices comply with national regulations.

Compliance with Regulations

Within the 2.4 GHz band, all SecureMesh NAN radios have been tested by an accredited laboratory to meet Federal Communications Commission (FCC) Part 15.247 and Industry Canada RSS-210 regulations for unlicensed operation at their respective transmit power levels and antenna gains. Similarly, all SecureMesh NAN radios have been tested by an accredited laboratory to meet FCC and Industry Canada regulations for out-of-band emissions (i.e., radio emissions outside the 2.4 GHz unlicensed band) as a Class B digital device, where those limits have been set to provide protection against interference to other radio communications in a residential environment.

The limits established by the FCC and Industry Canada for unlicensed operation in the 2.4 GHz band are hundreds of times less than the limits for maximum permissible exposure as set in the FCC's Office of Engineering and Technology (OET) Bulletin 65 ("Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields"). As explained in the FCC's OET Bulletin 56 ("Questions and Answers about Biological Effects and Potential Hazards of Radiofrequency Electromagnetic Fields"), these guidelines reflect the best available research and have been developed conservatively. More information can be found on the FCC's website, at <http://www.fcc.gov/oet/rfsafety/>.

Characteristics of SecureMesh NAN Radio Transmissions

The SecureMesh NAN radios operate in the 2.4 GHz band with a transmit power of 1 Watt (30 dBm), the allowed maximum for unlicensed operation. By comparison, the transmission power of a GSM cellphone handset can be up to 2 Watts (33 dBm) in the 850 or 900 MHz band, while older analog cellphone handsets transmitted at up to 3.6 Watts (35.6 dBm) in the United States.

The FCC's limit for maximum permissible exposure in the 2.4 GHz band is 1.0 mW/cm² (as cited in OET Bulletin 65). This value reflects the maximum power density (power per unit area) as seen at a given distance from the transmitter – as long as the power density is less than this value, then exposure is permitted under FCC regulations for an indefinite period of time and is considered to be safe.

At a distance of ~3 feet (1 meter) away from a SecureMesh NAN radio (and assuming that there are no intervening obstacles), the power density from the SecureMesh radio is 0.032 mW/cm², more than 30 times less than the FCC's limit; at a distance of ~10 feet (3 meters), the power density is 0.0035 mW/cm², more than 280 times less than the limit. Given the typical locations of SecureMesh NAN radios -- mounted on poles at least 18-20 feet above ground or inside electric meters installed on the sides of buildings – most people will rarely ever be this close to a SecureMesh radio.

Finally, it is worth noting that SecureMesh NAN radios are not transmitting continuously. On the contrary, SecureMesh NAN radios observe a maximum transmit duty cycle of 10%. In other words, over a period of 1 second, the SecureMesh radios do not transmit for more than ~100 ms (or, equivalently, over a period of 1 hour, the SecureMesh radios are not transmitting for more than ~6 minutes). In practice, the actual transmit duty cycle of a typical SecureMesh NAN device is much less than 10% -- most deployed SecureMesh NAN devices typically transmit in bursts of a fraction of a second that total to only several minutes of actual activity each day.

Conclusion

As discussed above, even when one is relatively close to a SecureMesh NAN device, the radio waves emitted by it are many orders of magnitude less than the FCC's (and Industry Canada's) limit for maximum permissible exposure. At the same time, a SecureMesh NAN device is only rarely transmitting, further limiting one's possible exposure to radio emissions. Extensive testing of Trilliant's radios and rigorous regulation and certification by both US and Canadian government bodies ensures that no-one will be exposed to unsafe radio transmissions from a Trilliant SecureMesh device.

Moreover, the electromagnetic fields emitted by SecureMesh devices are insignificant compared to the levels to which we are normally exposed in our daily lives because of our use of cellphones and Wi-Fi devices. For example, in the United States, microwave ovens operating in the 2.4 GHz band are allowed by the FDA to "leak" as much as 5 mW/cm² at a distance of 5 cm from the oven. As a result, cooking popcorn in the kitchen is much more likely to lead to high exposure to electromagnetic waves than the presence of nearby SecureMesh devices.

References

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