

The Essential Role of Licensed Spectrum for Patient Monitoring

Patient monitoring via medical telemetry plays a profoundly important role in the care of patients with cardiac risk factors. Studies demonstrate that monitored patient populations have significantly better outcomes than those that are unmonitored. This is true even in severe cases of cardiac arrest, where patient monitoring more than doubles the chances of survival.¹ Today, the growing sophistication of medical telemetry is enabling these systems to not only alert staff during a cardiac event, but also detect trends that can warn clinicians well in advance of trouble. Through increasingly sophisticated software analytics, patient monitoring is rapidly expanding its ability to save lives.

No matter how sophisticated patient monitoring becomes, the most important element will always be the link between the patient and the broader medical telemetry network. At most hospitals across the United States, this link is wireless. Wireless patient monitoring simplifies network deployment, while offering the advantage of allowing ambulatory patients to be continuously monitored. Yet, for all its benefits, use of wireless technology can introduce risk by passing critical real-time cardiac data through a medium that is subject to interference and disruption.

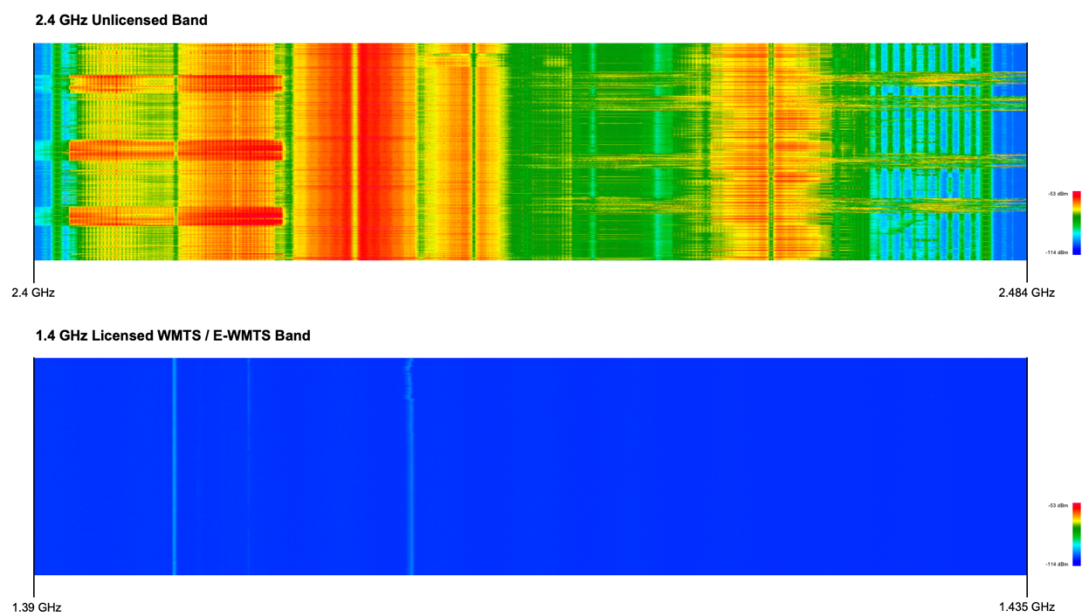
Wireless patient monitoring networks make use of selected portions of the radio-frequency (RF) spectrum, and the most common RF spectrum band used globally is at 2.4 GHz. The 2.4 GHz band has long been attractive for medical applications due to the broad availability of components and the ease of unlicensed operations. However, it is becoming an increasingly difficult place to guarantee reliable patient connectivity. Whereas the 2.4 GHz band was once limited to niche industrial and medical applications, it has now become crowded with countless consumer device emissions, including Wi-Fi and Bluetooth. It is not uncommon for a person to walk around with a number of devices (e.g. smartphones, laptops, Bluetooth headphones, etc.) that splatter interference atop the same channels used by patient monitoring networks.

To ensure that patient monitoring will have long-term protection from interference, the FCC established the Wireless Medical Telemetry Service (WMTS). WMTS provides a licensed refuge for patient monitoring in the RF spectrum, which cannot be violated by unlicensed non-medical services. The most compelling WMTS allocation is at 1.4 GHz, and it allows sensitive medical telemetry networks to be designed with long-term assurance of interference free operation. This is why the FDA has encouraged device manufacturers to move patient monitoring systems out of unlicensed bands and into licensed and protected WMTS allocations.² In 2022, with several thousand 1.4 GHz WMTS deployments, this service has proven itself as a safe and effective means of monitoring the cardiac and respiratory functions of critical care patients.

With WMTS enabling a new generation of reliable patient monitoring, the final challenge exists in limited network capacity. While licensed 1.4 GHz WMTS is free from interference concerns, it is only a fraction the size of the unlicensed 2.4 GHz band that it replaces, and this has been a limiting factor in the growth of new and advanced monitoring functions. To combat this, the FCC has recently authorized a private spectrum holder, TerreStar, to offer Enhanced WMTS (E-

WMTS) on commercial licensed spectrum that it controls in the adjacent 1.4 GHz band. The E-WMTS service, which is already compatible with many existing hospital networks, will more than double the capacity of current WMTS systems. Plans are in place to enable E-WMTS in more than 2,000 healthcare facilities by the end of this year, with thousands of additional hospitals coming online just as fast as device manufacturers can adapt their networks.

Decades of wireless patient monitoring experience have shown that licensed and protected spectrum is the safest option for critical care networks. With the introduction of expanded licensed resources like E-WMTS, patient monitoring systems will enjoy both long-term interference protection and the expanded channel capacity required for new clinical features.



Unlicensed 2.4 GHz Band vs. Licensed Patient Monitoring Spectrum at 1.4 GHz – Unlicensed medical networks enjoy no protection from the rapidly growing threat of RF interference. The chaos of the uncontrolled 2.4 GHz band stands in dramatic contrast to the clean and protected licensed WMTS / E-WMTS resource at 1.4 GHz (Survey taken on the campus of Massachusetts General Hospital – Boston, MA).

Notes:

¹See https://www.researchgate.net/publication/50939241_In-hospital_cardiac_arrest_Impact_of_monitoring_and_witnessed_event_on_patient_survival_and_neurologic_status_at_hospital_discharge

²See <https://www.fda.gov/medical-devices/wireless-medical-devices/wireless-medical-telemetry-systems#regs>