

Wireless Communications for Medical Devices



Without doubt, the presence of wireless communications within healthcare is escalating. Today, radio technology is being used with confidence in a range of critical applications, from ambulatory patient monitoring to surgical tools. Wireless is indeed a rising technology star within this demanding sector.

Yet, it's far from trivial to develop high-integrity wireless systems for medical applications. Methods to ensure communication integrity, resilience to interference, latency, and security must be addressed to produce a robust solution. Furthermore, knowledge of the medical design process and regulatory approvals is essential.

As one of the world's leading design consultancies, Cambridge Consultants combines the skills of its two largest businesses; Medical Devices and Wireless, to provide one of the most advanced 'wireless medical' design teams in operation today. With this rare combined expertise, Cambridge Consultants offers a faster and lower risk route to a regulatory-compliant and cost-effective wireless solution.

Extensive Wireless Background

The Cambridge Consultants wireless team comprises around 100 engineers, experienced in the wide range of wireless systems available today. As well as considerable design experience in the 'standards-based' radio systems such as Bluetooth®, WiFi, DECT, ZigBee®, UWB, GSM, UMTS and NFC, the team also develops custom radio solutions on request. With this breadth of knowledge, Cambridge Consultants provides an independent perspective; recommending the optimum solution for a particular application.

With a strong background in high-performance 'professional radio' design, the team is well versed in the latest advances in high integrity radio technology to ensure reliable communication. Further, having detailed understanding across this range of technologies, the team can confidently predict and simulate how solutions will co-exist with other wireless systems and unwanted interferers. Examples of our market leading technology developments include:

- The world's lowest-power radio for implantable devices ('SubQore')
- The world's first high-spec ambulatory monitor in the WMTS band
- Research into the use of high data-rate wireless systems for transmission of high quality medical video images
- Leading-edge work in emerging wireless standards (such as Bluetooth®, WiFi ZigBee® and NFC) applied to the medical sector

Project Example – Ambulatory Monitor

Cambridge Consultants was engaged to develop the radio subsystem for a next generation ambulatory patient monitoring system. This state-of-the-art monitor had to operate in the dedicated WMTS medical frequency band with very high link integrity and achieve more than two days operation per battery change.



Using our tailored medical product design process, Cambridge Consultants developed the radio subsystem for patient worn devices and the infrastructure access points.

To reduce development risk and time, we used our DECT radio IP by modifying the frequency band to the WMTS band, used digital signal processing (DSP) to enhance the spectral mask for the medical band, and modified the frame structure to increase user density.

To achieve the challenging ultra-power consumption requirements we also employed advanced power management techniques. Cambridge Consultants supported its client successfully through the regulatory cycle, enabling them to be first to market in this product class.

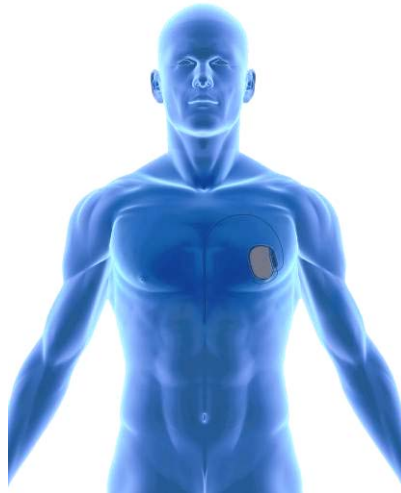
Project Example – ‘SubQore’ Implantable Radio

Building on the previous development of a range of ultra-low power radios, Cambridge Consultants developed the ‘SubQore’ architecture. The solution represents the very latest advances in ultra-low power radio for use within the body. SubQore has been designed to be implemented as a custom BiCMOS integrated circuit, optimised for the target application.

It is suitable for devices using the Medical Implant Communications Service (MICS) frequency band, which is now emerging as a global standard.

SubQore achieves a compelling balance between unit cost and performance. It is targeted at a single-package solution, with minimum external components. Whilst being extremely cost effective, the radio is nevertheless

capable of performance consistent with high integrity medical applications. The architecture is scalable, offering an excellent trade-off between power and data-rate in its most basic implementation, with an upgrade path to achieve higher data rates in an enhanced form.



SubQore provides an extremely competitive base upon which customers can commission their own custom IC for applications including implantable pacemakers, defibrillators, remote telemonitors, orthopaedic devices, pump controllers, nerve stimulators and swallowable imaging and diagnostic systems.

Project Example – Vena Wireless Health Device Platform

A trend exists within the medical sector to develop new services that can be delivered outside the hospital environment. The Continua Health Alliance has developed standards that ensure interoperability between Continua Certified™ products, which communicate from the patient to the remote service.

Vena is the first reference design platform for the development of

Continua Certified™ health devices. It implements the full version one device connectivity standards defined by the Continua Health Alliance. Vena offers wireless connectivity via the Bluetooth Health Device Profile, and wired connectivity via the USB Personal Health Device Class.

Vena is a complete single-chip platform with the capability to drive a display, sensor, and user interface. This single-chip approach creates a new cost point for connected health devices, with a module cost of just \$10 or less in appropriate volumes.

Vena can be used to add connectivity to both sensor devices, and device managers providing a reference design for creating low cost Continua Certified™ products.



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