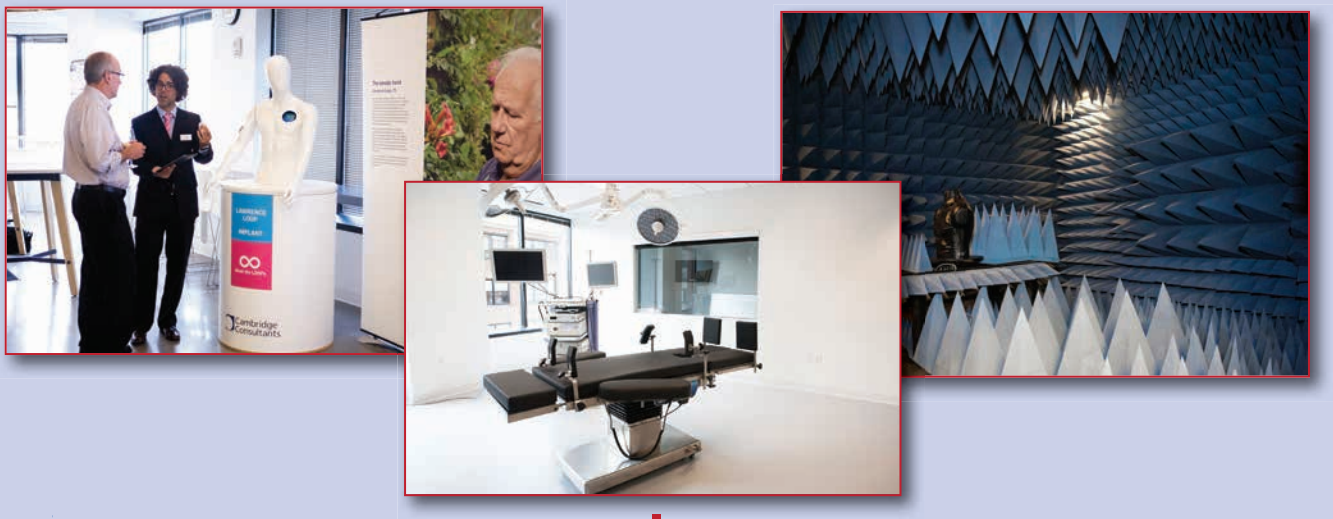
FABS and LABS

An Out of Body Experience at Cambridge Consultants



Cambridge Consultants delivers cutting edge product development engineering and technology consulting to its clients. They are one of the largest independent wireless development teams, with more than 120 experts working in areas such as ultra-low-power short-range wireless connectivity and global satellite communication, with locations in Boston, Mass. and Cambridge, UK.

The company has a track record of creating world-firsts for their clients. During its 55-year history, the company has helped develop technology ranging from the world's first wireless implanted pacing system, to the ground-to-air radio system that controls the majority of air traffic across the globe. A recent example is the completion of initial trials of the first fully digital radio transmitter that can be an enabler for the Internet of Things (IoT) and 5G technology. Their first trial of the technology created 14 simultaneous cellular base station signals. They also developed the first single-chip Bluetooth radio that led to the spinout of the global short-range wireless and audiovisual company CSR.

MWJ recently visited Cambridge Consultant's new downtown Boston facility. The facility has impressive labs and testing capabilities that mainly focus on medical device development, including an anechoic chamber, fully equipped operating room and various phantom bodies and test vehicles to mimic the body. Dr. Arun Venkatasubramanian designs antennas for medical applications and took us on a lab tour. He explained how many previous medical devices have been difficult to work with at the standard 401 to 406 MHz medical band, due to highly regulated power levels and other restrictions. The cost to customize a wireless connection can also be extremely high. However, with the commercialization of low energy Bluetooth, the cost of 2.4 GHz connections has become very inexpensive and convenient to use with smartphones and tablets. Allowing doctors to control implanted medical devices with smartphones or tablets is becoming a common request with application development and wide availability of devices.

Implantable devices found in wireless body area networks for healthcare applications such as disease prevention, diagnosis and therapy rely on antennas to transmit reliable information from inside the human body to an external receiver. In many applications, traditional antenna designs would not allow the low energy Bluetooth signal to make it out of the body. Due to the EM interaction between the implanted antenna and human tissue, wireless devices experience high energy consumption during transmission (as much as 99 percent of the radiated energy can be lost inside the body), irregularly distributed signals and possible failure to meet the minimum range requirements. Recently, Dr. Venkatasubramanian designed a dual band (MICS and ISM) antenna that was optimized in a small planar structure that is 40 x 45 mm in size with no passive components. The low Q nature of the compound field antenna desensitizes the antenna from the impact of being implanted within the body, eliminating the need for retuning the antenna to account for different body dimensions.

The designs are tested and evaluated in their anechoic chamber and other labs using phantoms to represent various parts of the body. They use standard phantoms and their own custom setups to evaluate their designs. The operating room also helps them work with doctors to step through the entire operation of implanting and communicating with the device so that the methods can be exactly replicated step-by-step. This ensures proper simulation, modeling and testing to make sure the device operates under real life conditions.

Cambridge Consultants is tackling some of the most challenging wireless projects in our industry within the walls of their state-of-the-art testing facilities. Their ongoing work on getting device signals out of the body to create a reliable wireless link is enabling significant advances in the medical field.