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Secure and Reliable Wireless Communications for Geological Repositories and Nuclear Facilities

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There is an important need to develop new generation robust RF communication systems to support wireless communications and instrumentation control in geological repositories and nuclear facilities, such as nuclear power plants. Often these facilities have large metallic structures with electro-magnetic (EM) transients from plant equipment. The ambient EMI/RFI harsh environment is responsible for degrading radio link bandwidth. Current communication systems often employ physical cables that are not only expensive to install, but deteriorate over time and are vulnerable to failures. Furthermore, conventional high-power narrowband walkie-talkies sometimes upset other electronics. On the other hand, high-quality reliable wireless communications between operators and automated control systems are critical in these facilities, as wireless sensors become more and more prevalent in these operations. In an effort to develop novel wireless communications systems, Dirac Solutions Inc. (DSI) in collaboration with Lawrence Livermore National Laboratory (LLNL), has developed high-quality ultra-wideband (UWB) hand-held communications systems that have proven to have excellent performance in ships and tunnels. The short pulse UWB RF technology, with bandwidths of many hundreds of MHz's, are non-interfering due to low average power. Furthermore, the UWB link has been shown to be highly reliable in the presence of other interfering signals.

The DSI UWB communications systems can be adapted for applications in tunnels and nuclear power facilities for voice, data, and instrumentation control. In this paper we show examples of voice communication in ships with UWB walkie-talkies. We have developed novel modulation and demodulation techniques for short pulse UWB communications. The design is a low-power one and in a compact form. The communication units can be produced inexpensively in large quantities. A major application of these units might be their use by IAEA inspectors and facility operators.

Country or International Organization

United States of America

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