

FY23 Updates: Dirac Solutions Inc. (DSI) is known for its expertise in developing wireless systems for hostile environments where conventional wireless technologies face significant challenges. Having obtained Phase III funding from the National Nuclear Security Administration (NNSA) Office of International Safeguards (DE-SC0006260), DSI was able to extend the battery-free RF sensor communications technology highlighted in this success story to meet specific dry cask monitoring needs for international safeguards. After these demonstrations, ***DSI expanded beyond nuclear safeguards applications by adapting the design for use in remote long-range wireless sensor monitoring systems, completely free from battery constraints; for example, soil condition monitoring in agricultural irrigation applications.*** This technology not only met the original NNSA objectives but also paved the way for solutions to promote environmental conservation and sustainable growth.

Advancing their research in communications for harsh environments, DSI also used FY21 Phase II DOE SBIR/STTR funding from the Office of Nuclear Energy (DE-SC0020840) to extend the technology to provide secure wireless multi-media data communications, Acousto-RF Thru-wall Communications (ARTcom). ARTcom is the first wireless multi-media communications system with bi-directional, *real-time* video and data transmission capability to be equipped with two-factor authentication. ***In 2022, DSI demonstrated seamless, secure video transmission through 5-ft of reinforced nuclear concrete for the International Atomic Energy Agency (IAEA) – a feat that had never been done before!***

This FY22 demonstration attracted additional funding from the NNSA Office of International Safeguards to address IAEA's need for through-the-wall secure *real-time* video transmissions. The ARTcom system has the potential to revolutionize day-to-day operations in both nuclear reactor operations and safeguards applications. ***Using this system, current and future nuclear reactors can benefit from low-cost, secure wireless sensor/video data transmission through nuclear concrete walls to provide an attractive alternative to manually intensive, risky tasks required of inspectors and reactor operators.*** Seamless, secure wireless links can now be used to remotely monitor, in *real-time*, operations through 5-ft of nuclear reinforced concrete walls, increasing not only inspector safety but also that of surrounding communities.

DSI is well-situated to enter commercial markets and is securing strategic partnerships to mass manufacture its ARTcom systems for government applications and specialized commercial markets.