

NQR Scanner Detects Explosives In Shoes At Airport Security Checkpoints

U.S. Naval Research Laboratory



Taking your shoes off at airport security checkpoints slows down the entire departure process and can be aggravating. Technology originally developed at the U.S. Naval Research Laboratory in Washington, D.C. is being refined to allow for the detection of explosives hidden in shoes as people walk through a scanner, without having to remove them.

The detection of explosives by nuclear quadrupole resonance (NQR) technology was invented in late 1980s by U.S. Navy researchers Michael Buess, Allan Garroway, and Joel Miller. About \$100,000 in funding was provided by the Federal Aviation Administration Technology Center in 1989 to explore explosive detection technology for baggage. The technology was disclosed in 1991.

“ Explosives generally contain nitrogen, whose common isotope N has specific electronic properties that can be detected with highly sensitive equipment.

Components include a radio frequency power source, a coil to generate a magnetic excitation field, and a detector circuit that is programmed to recognize the specific nitrogen response. The NQR technology can also discern between different kinds of nitrogenrich compounds commonly used in explosives.

In 1995 the NQR technology was licensed to Quantum Magnetics, which was acquired in 2005 by GE Security. The company is continuing to develop and refine the technology for shoe scanning and other airport applications. The military is interested in using the device for detecting hidden explosives such as landmines. There are also nondestructive applications as well, such as analysis of stress and strain in mechanical parts.

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