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Portable MRI Named in Top 10 Breakthroughs

A portable MRI device developed at the U.S. Los Alamos National Laboratory has been acclaimed as one of the Top 10 Breakthroughs of the Year by Physics World. Portable MRI, also known as Battlefield MRI (bMRI), uses ultra-low-field magnetic resonance imaging to create images of injured soft tissues, such as the brain.

"Hospital-based MRI devices are big and expensive," said Michelle Espy, the bMRI project leader (pictured) explained that hospital-based MRI devices are large, expensive and require considerable infrastructure, including large quantities of liquid nitrogen and helium and a lot of energy. The advantage of bMRI is that is is much lighter, less expensive and has low power requirements, and so can be used in hard-to-reach places like the battlefield and remote hospitals in poor countries."

Espy said that their team has been in touch with doctors who routinely work in developing countries and report that MRI would be extremely valuable in treating paediatric encephalopathy and other serious diseases in children.

Espy and her team set out to see if images of sufficient quality could be made with ultra-low-magnetic fields, similar in strength to the Earth's magnetic field. To achieve images at such low fields they use exquisitely sensitive detectors called Superconducting Quantum Interference Devices, or SQUIDs.

SQUIDs are among the most sensitive magnetic field detectors available, so interference with the signal is the primary stumbling block. "SQUIDs are so sensitive they'll respond to a truck driving by outside or a radio signal 50 miles away," said Al Urbaitis, a bMRI engineer. The team's first generation bMRI had to be built in a large metal housing in order to shield it from interference.

By the end of the project the Los Alamos team was also working in the open environment without the large metal housing using a lightweight series of wire coils that surround the bMRI system to compensate the Earth's magnetic field. In the future, the field compensation system will also function similar to noise-cancelling headphones to eradicate invading magnetic field signals on-the-fly.

The bMRI team is hopeful that with additional development through external follow-on funding, bMRI systems could become relatively easy and inexpensive to deploy."

Source and image credit: Los Alamos National Laboratory

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