



Total freedom in coil positioning and handling with the AIR Technology Suite

At RSNA 2016, GE Healthcare introduced an evolution in MR coil technology: The AIR Technology Suite. AIR Technology Coils were developed to address several clinical needs: clinical coverage with high SNR, optimized geometries for maximum use of parallel imaging, an adaptive design that fits 99.9% of patients and ultra-lightweight for patient comfort.



See how AIR Technology works at:
tiny.cc/spa174



Learn more about the SIGNA™ Premier and AIR Technology at:
tiny.cc/spa173

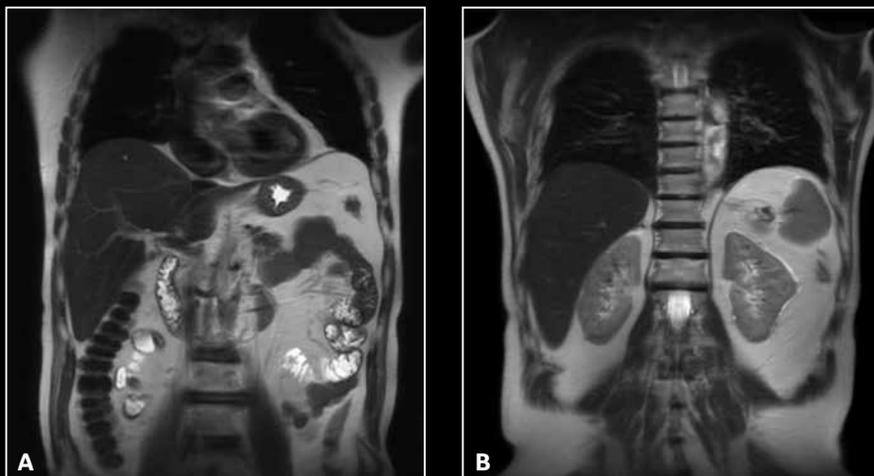


Figure 1. The AIR Technology Coil allows for extended coverage in z-direction as demonstrated in this Coronal T2 SSFSE breath-hold exam.

GE Healthcare scientists developed several new underlying technologies in the new coil design. A multiple resonator conductor arrangement replaces lumped components and circuit boards with an exceptionally durable and flexible loop, named the INCA conductor. AIR Technology also incorporates proprietary E-Mode electronics designed to reduce component volume by more than 60%, decrease coupling flex conductor geometries by 30% and deliver 95% more transparency for MR-based attenuation correction. The E-Mode electronics also help lessen current noise, boost linearity and improve tolerance to varying coil loading conditions. The combination of these technologies makes AIR Technology Coils well suited to work in low- to high-density coil applications.

The goal is total freedom in coil positioning and handling with a $\geq 60\%$ lighter weight and 80% more flexible design opportunities.

The University of Wisconsin-Madison recently evaluated the AIR Technology Suite on the SIGNA™ Premier 3.0T system using volunteers in a clinical study which was reviewed and monitored by an Institutional Review Board (IRB). Tammy Heydle, RT(R) (MR), Senior MR Technologist, and Shawn Pulver, RT(R)(MR), Objective MR Technologist, performed a series of scans on the prostate, female pelvis, musculoskeletal, abdomen, ENT (ear, nose and throat), neck, spine and vasculature. They used the Posterior AIR Technology Coil and Anterior AIR Technology Coil for all applications.

In addition, Heydle and Pulver also used the AIR Technology Coils simultaneously with conventional coil technology—Head Neck Unit (HNU). When the HNU was combined with the AIR Technology Coil it enabled whole-body imaging without repositioning or re-landmarking the patient. All scanning was performed using existing UW-Madison MR protocols.

“The signal on the images acquired with the AIR Technology Coil appeared greater than the images obtained with the conventional Abdominal Body Array coil. The AIR Technology Coils are also lighter and more flexible so they conform to the body habitus.”

Tammy Heydle

She explains that with traditional coils, the Anterior Abdominal Array does not conform to the patient and needs to be fastened to the table to prevent coil movement. However, with the AIR Technology Coil conforming and molding to a patient's unique body and size, the issue of coil movement was minimized.

Pulver adds that the material of the coil also makes a difference—it is smoother and more sleek so it is easier to slide the patient into the bore of the magnet. He was also impressed that he could obtain a signal beyond where the AIR Technology Coil is positioned

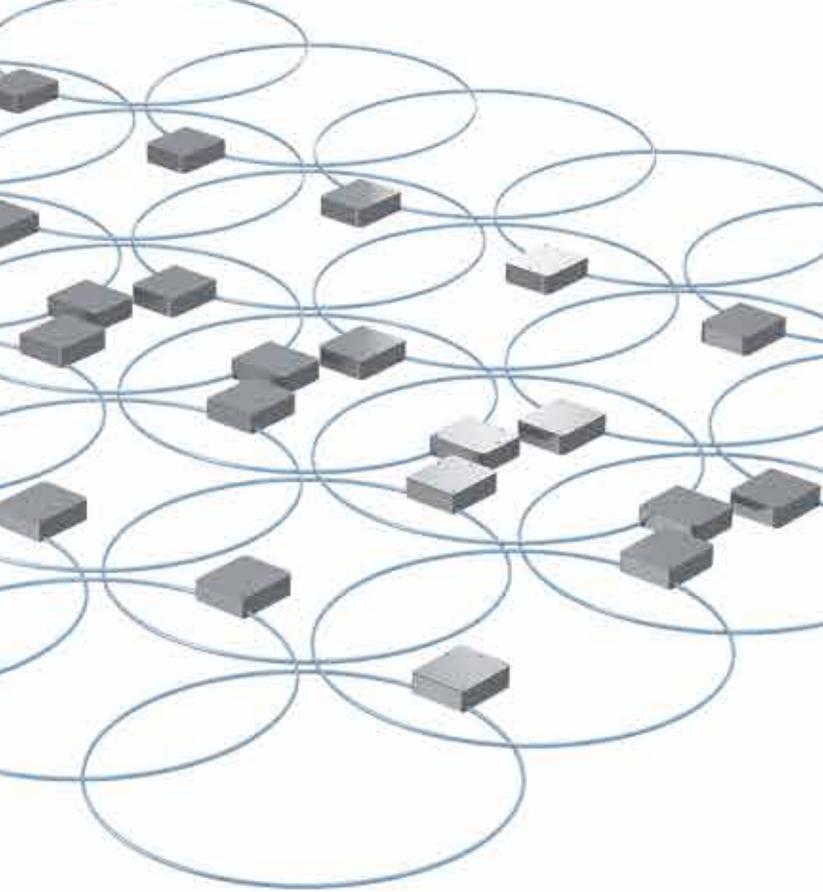


Figure 2. Coronal brachial plexus with Cube STIR and HyperCube acquired with 1.2 mm isotropic resolution.

on the patient. An indentation and gray colored area helps indicate coil coverage, enabling a streamlined coil set up. A thinner coil, thanks to the reduction in component volume, also translates to more available room in the magnet bore to scan very large patients.

The design of the coils may also lead to higher SNR. The Abdominal Array Coil provides superb SNR and acceleration performance while the Posterior Array Coil improves SNR in the spine and deeper anatomical structures in the body.

“The way the coil elements are combined and situated as many smaller coils appears to enhance SNR,” Heydle says. She didn’t conduct comparison QA testing, but when compared to a traditional Abdominal Body Array Coil she could qualitatively see a boost in SNR.

The AIR Technology Coil also performed well with parallel imaging. Pulver and Heydle used HyperSense, an acceleration technique that enables faster imaging without the penalties commonly found with conventional parallel imaging. HyperCube for 3D isotropic imaging and MAGiC DWI (synthetic diffusion) were also utilized.

“Using HyperSense with parallel imaging enables a decrease in scan times without affecting image quality,” Heydle says. “With HyperSense, we can obtain higher resolution imaging or faster scan times for better patient throughput.” MAGiC DWI allows the tech to acquire additional b-values without an addition to exam time when compared to acquiring separate scans for each b-value.”

Using the AIR Technology Coil in a brachial plexus study, Heydle and Pulver acquired Sagittal T1 BRAVO and Sagittal T1 Cube images that were then reformatted into other imaging planes.

“The AIR Technology Coil is a vast improvement over the conventional, hard-shell coils that cover the patient’s face,” Heydle says. “It also conforms to the neck providing better comfort.”

Pulver adds, “Since the AIR Technology Coil is lighter, there is less weight on the arms, so the patient doesn’t feel all that pressure on their shoulders when we image them with their arms above their head.”

Another advantage of the AIR Technology Suite in brachial plexus exams is the ability to overlap elements. Pulver used the HNU and the AIR Technology Coil simultaneously.

“We had great signal penetration all the way through with no artifacts or any issues due to the overlap.”

Shawn Pulver

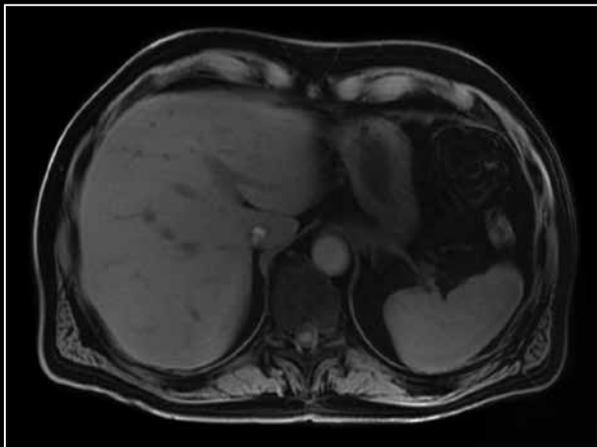


Figure 3. Axial LAVA Flex.



Figure 4. High resolution Sagittal T2 PROPELLER Multi-Blade of the female pelvis.

With some coils, an overlap can lead to signal loss or image degradation. He also notes that one nice feature of the SIGNA Premier is the system will alert the technologist if there is too much overlap so they can adjust the coil placement.

Heydle believes the AIR Technology Coils will also help with claustrophobic patients. “The lighter coil will feel more like a blanket, so the patient won’t feel as weighed down,” she says. Plus, the ability to scan feet first on the SIGNA Premier may further lessen claustrophobia.

While the IRB at UW-Madison was only for adult volunteer scanning, Pulver sees an opportunity to use the AIR Technology Coils on pediatric patients.

“You don’t want too much pressure on the patient if they are sedated, so the AIR Technology Coil could be very nice for pediatric imaging.”

In addition to pediatrics, Pulver also sees an opportunity to use the lightweight, flexible AIR Technology Coils for extremity imaging. Both Pulver and Heydle are excited to use the AIR Technology Suite once they are fully implemented at UW-Madison.

Heydle adds, “The AIR Technology Coils are very versatile, which opens up almost endless possibilities for using them.” **S**

