Excellent breast imaging with MultiTransmit, SmartExam at FAHC

Hirslanden Clinic performs MR image guided prostate biopsy

32-channel coil boosts 3.0T neuro imaging at Kennedy Krieger

Cardiac MR is fast and easy with complete Elite Cardiac Solution

Pediatric SENSE Head/Spine coil simplifies infant studies

Educational: MultiTransmit solves 3.0T challenges at the source
“MultiTransmit helps us to achieve a high level of image quality and image uniformity in all of our patients, which in turn makes image interpretation easier.”

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Philips MRI displays clinical and operational excellence at RSNA 2009

Philips reinforces leadership role in 3.0T technology and advanced clinical solutions

At RSNA 2009, Philips exhibits a strong portfolio of MR products that enhance clinical capabilities and simplify imaging workflow.

**Achieva 3.0T TX fully equipped for breast imaging, biopsy**
The Achieva 3.0T TX scanner with MultiTransmit technology has demonstrated to be a successful product in clinical practice at many sites. MultiTransmit addresses dielectric shading at the source delivering improved image consistency and signal uniformity. The Achieva 3.0T TX can be combined with the MammoTrak patient support for superb, consistent high quality breast imaging and biopsy with efficient workflow and patient friendliness. MultiTransmit now also offers benefits for imaging applications in the brain.

**Elite Clinical Solution for prostate**
The Elite Prostate Clinical Solution brings together a full range of imaging and spectroscopy capabilities, coil combinations, data analysis and biopsy planning software and a new MR compatible biopsy device for targeted MR image guided biopsies.

**Further enhancements in Elite Clinical Solutions**
The 32-channel SENSE Head coil offers enhanced 3.0T brain imaging as well as fMRI, DTI and spectroscopic imaging. Increased signal-to-noise ratio and multidirectional parallel imaging enable improved imaging quality and high SENSE acceleration factors. MultiTransmit parallel RF transmission in combination with this coil provides an outstanding combination for excellent image quality and fast scanning.

The Cardiac Explorer and Vessel Explorer packages for automated, task-guided analysis of CMR and MRA data strengthen the Elite Cardiac and Elite Vascular Clinical Solutions.
Dear friends,

Sometimes, forces or ideas that appear to be in opposition actually work together to bring better solutions for you and your patients. This issue of FieldStrength will portray how great clinical solutions and quality can still be economically responsible and sustainable.

Achieva 3.0T TX, the MRI scanner that adjusts to each patient through MultiTransmit technology, continues to demonstrate clinical excellence with shorter scan times. The article on breast imaging at Fletcher Allen shows this again. Being the first to market with this true MultiTransmit system, Philips has taken another lead in MRI knowledge.

Our Pediatric MRI experience brings more effective outcomes (quality and economic) by recognizing these patients’ unique needs. This issue offers two articles building the awareness and understanding that Pediatric MRI may require different approaches than adult imaging.

Philips is recognized as a leader in Sustainability. The Achieva 1.5T SE has earned the Philips’ Green Flagship designation for its PowerSave operating mode, smaller footprint in the equipment room and lower operating cost. Philips also offers FieldStrength readers an opportunity to be more environmentally friendly by changing to an electronic-only subscription, see page 13.

We look forward to sharing these and more developments in Clinical and Operational Excellence at the RSNA 2009.

Conrad H. Smits
Chief Executive Officer Magnetic Resonance Imaging
Philips Healthcare

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**Five successful years confirm efficacy of Panorama HFO**

Already five years ago Philips was the first vendor to introduce a high field open system. Since then Panorama HFO has established its reputation of combining high field image quality with patient comfort offered by its wide open design. Last October a successful international symposium on high field open MRI was held in Berlin, attracting more than 80 participants from more than 10 countries. The symposium covered the wide open clinical versatility of the system – from breast imaging and biopsy to dynamic scanning of joints, from fetal imaging to interventional therapy. Participants also had a chance to experience hands-on how easy interventional MRI procedures could be. Panorama highlights at RSNA are new 8-channel coils for body and breast imaging.

**More innovation proofpoints**

The Philips booth also highlights SmartExam one-click reproducible scanning for brain, spine, breast, shoulder, knee and the “rampable” Achieva XR, the MR system that is easily upgraded from 1.5T to 3.0T without a magnet swap. Also featured is Achieva 1.5T SE, providing the best gradients in its class, and PowerSave, which smartly reduces energy consumption.

For more information visit www.philips.com/RSNA

**Investigational MR-HIFU system showcased**

MR imaging is an optimal modality for guiding and monitoring High Intensity Focused Ultrasound (HIFU) ablation procedures because of its excellent soft tissue contrast, 3D imaging capabilities and its ability to non-invasively measure temperature. Philips is showing its MR-HIFU system, a tabletop design with an integrated transducer and 5D positioning system is currently under clinical investigation.
Excellent breast imaging at FAHC with MultiTransmit and SmartExam

MultiTransmit and SmartExam Breast address workflow and image quality challenges in 3.0T breast imaging at Fletcher Allen Health Care

The high spatial resolution enabled by 3.0T is a clear benefit in breast imaging, but obtaining uniform fat saturation can be more challenging at this field strength. MultiTransmit and SmartExam Breast innovations in the new Achieva 3.0T TX are designed to neutralize inhomogeneities – resulting in higher image quality and consistent fat saturation – and make scan planning much easier and faster. Fletcher Allen’s Dr. Sally Herschorn and her colleagues have been evaluating both solutions in an Achieva 3.0T X-series system and recently on their Achieva 3.0T TX.

Fletcher Allen clinicians employ MRI mostly when examining high-risk patients and patients with a new diagnosis. MRI also is used in occasional problem-solving cases, such as evaluating for disease recurrence at a lumpectomy site and resolving one-view mammographic densities. Frontline diagnostic modalities include digital mammography and ultrasound – 30,000 studies per year and 4,000 studies per year, respectively.

Transfer to 3.0T made impact, but challenges remained

Fletcher Allen shifted its breast studies from an old 1.5T system to the Achieva 3.0T in October 2005, enabling clinicians to obtain bilateral axial images with much higher SNR and resolution. Dr. Herschorn and her colleagues have been using an advanced ExamCard consisting of a T1-weighted non-fat saturated sequence, a T2-weighted sequence with SPAIR fat saturation, followed by a dynamic fat saturated THRIVE series. A high resolution THRIVE is positioned between the second and third dynamic series.

In the beginning, results were inconsistent, Dr. Herschorn observes. “In some patients, we obtained excellent images, while in others there was poor or inhomogeneous fat saturation and every degree in between.”
This variability was due to a wide range of patient factors, and to a lesser extent, technologist skill and experience, Dr. Herschorn notes. At 3.0T, inhomogeneities of the main magnetic field ($B_0$) are likely to occur in patients with large breasts, asymmetric breasts, extensive breast folding and those who have had prior surgery and have one or two implants. If these inhomogeneities are not compensated for — either by manual or automatic shimming or by repositioning the patient — the result will be poor fat suppression and image quality.

Manual placement of shim boxes can be fairly tricky and time-consuming, though, she says. Patients undergoing MRI are anxious about a new cancer or about their risk for cancer to begin with. It is critical for technologists to be confident that the sequences they program will work right the first time. Technologist frustration and insecurity are easily transmitted to patients, making them more anxious. Therefore, it is vital that technologists work quickly and expertly.

“SmartExam Breast has eliminated delays in implementing fat saturation, resulting in better workflow and increased patient comfort.”

SmartExam Breast improves workflow and image quality

“Workflow without SmartExam Breast was not ideal,” Dr. Herschorn observes. “It was time-consuming to plan the volume shim box and check the offset frequencies needed. This required trial-and-error. Often manual central frequency determination was also needed to improve fat suppression quality. And even after these steps, outcomes were inconsistent. SmartExam Breast completely eliminates this problem and has made achieving acceptable fat saturation a non-issue.”

Manual placement of shim boxes can be fairly tricky and time-consuming, though, she says. Patients undergoing MRI are anxious about a new cancer or about their risk for cancer to begin with. It is critical for technologists to be confident that the sequences they program will work right the first time. Technologist frustration and insecurity are easily transmitted to patients, making them more anxious. Therefore, it is vital that technologists work quickly and expertly.

SmartExam Breast is the newest SmartExam application. It provides intelligent assistance in planning, scanning and processing. It automatically detects the breasts and chest wall to efficiently plan the scan. Perhaps more importantly, it automatically optimizes localized shimming. The automatic image-based higher order shim results in better image quality and better fat suppression. With SmartExam Breast, workflow is tremendously simplified. And the result is excellent, reproducible image quality.

“With MultiTransmit, we are seeing a significant uniformity improvement in the non-fat saturated images.”
According to Supervisor of MRI, Gretchen White, one of every two 3.0T breast MRI examinations present shimming challenges. “There are so few women whose breasts are exactly alike,” White observes. “Even a little asymmetry can cause problems, particularly in achieving good fat saturation at 3.0T, so manual shimming was a monumental task. With SmartExam Breast, it was as if someone had sprinkled magic dust on our magnet. Shimming was automated and homogeneity was optimized for every patient. SmartExam Breast is absolutely wonderful.”

“SmartExam Breast has made technologists feel confident that they can get a good image on the first try. Patients can easily sense stress or confidence in their technologist and feel more comfortable in their exam when the technologist is confident. This leads to less patient motion and better quality exams – not to mention happier referring physicians,” says Dr. Herschorn.

In 2008, Dr. Herschorn’s team used SmartExam Breast in 3.0T breast MRI exams on nearly 400 patients (1-2 patients per day). Previously, in difficult cases, the manual shimming step would add an average of 15 minutes or more to each breast MRI examination, which takes 30 minutes under optimal conditions. In especially difficult cases, as the length of time it took to obtain decent fat saturation increased, technologist and patient anxiety increased. The longer it took, the worse fat saturation would get. Often, these cases resulted in images of unacceptable quality. “SmartExam Breast has eliminated delays in implementing fat saturation, resulting in better workflow and increased patient comfort,” Dr. Herschorn says.

**Patient-adaptive MultiTransmit achieves consistent image uniformity at 3.0T**

The dielectric effect causes RF field (B1) non-uniformity and is exacerbated at 3.0T due to a larger RF wavelength at this field.
Field Strength

The result is non-uniform signal – or shading – in the image, which can obscure anatomy and pathology. MultiTransmit solves this problem by adding an extra RF transmit source to provide simultaneous parallel RF transmission. The dielectric effect and shading are nullified, resulting in enhanced signal uniformity and consistency.

Dr. Herschorn and FAHC-based Philips clinical scientist Trevor Andrews, PhD, have used MultiTransmit on about 20 women so far. They currently are beginning a project to assess the impact of both MultiTransmit and SmartExam Breast on image quality.

“We are seeing a significant uniformity improvement in the non-fat saturated images,” she reports. “Not all patients present these shading issues, but for the ones who do, the signal uniformity is enhanced through MultiTransmit. Fat saturation also is more uniform, which enables improved visualization of the axilla. This is particularly important in patients with cancer.”

Dr. Herschorn says with 3.0T imaging, there often is a right breast/left breast shading difference. “However,” she continues, “MultiTransmit will automatically adapt the RF signal to each patient’s unique anatomy. The result in every case so far has been neutralized shading. This is where the true benefit of MultiTransmit lies: it helps us achieve a high level of image quality and image uniformity in all of our patients, which in turn makes image interpretation easier.”

Achieva 3.0T TX: premium breast imaging system

With its high spatial resolution enabled by the 3.0T field strength and its powerful tools for enhanced workflow and consistently optimized image uniformity, Achieva 3.0T TX with the Elite Breast Clinical Solution seems destined to become the option of choice for breast MRI imaging.

“We have only just started breast imaging on Achieva 3.0T TX,” Dr. Herschorn says. “But the nice thing is that SmartExam Breast solves B0 inhomogeneities and MultiTransmit solves RF shading, so you’re able to address both issues, enabling us to fully leverage the benefits of 3.0T breast imaging.”
The Hirslanden Clinic (Zurich, Switzerland) is using the Philips Elite Prostate Clinical Solution for faster, more controlled prostate biopsy procedures. With a new biopsy device and DynaCAD for Prostate, MR image guided prostate biopsies are vastly simplified.

The most common method for prostate biopsy involves a transrectal procedure with tactile finger guidance performed by a urologist or an ultrasound-guided process. Clinicians at the Hirslanden Clinic are using their Achieva 3.0T with the Elite Prostate solution to perform MR image guided biopsy in the prostate.

“With MR’s excellent soft tissue contrast, we can clearly visualize where lesions are, and we can see how to angle and position the biopsy needle. That’s the big advantage of MR image guided biopsy,” says Beat Porcellini, MD, radiologist at Hirslanden Clinic.

He emphasizes that also ultrasound-guided biopsy is not comparable to the MR image guided method. “A large number of lesions cannot be detected by ultrasound and it may be difficult to reach the entire organ, whereas it is easy to make biopsies of every region using MR image guided biopsy.”

**MR image guided biopsies help discover more lesions**

About 50% to 70% of the time a patient’s first blind biopsy is negative, says Dr. Porcellini. “Maybe you can reduce that by taking more biopsy samples, but with ‘blind’ biopsies the problem remains that even with many samples, a lesion can be missed if none of the needles passes through it.”

They have thus far performed MR image guided prostate biopsy on 19 patients referred by urologists who wanted a second, MR image guided biopsy after blind biopsy with negative results. “Out of these first 19 patients, seven have had positive MR image guided biopsy results,” says Dr. Porcellini. “In other words, seven patients had a...”
66-year-old male with PSA rising from 5.1 to 7.2 in two years. Previous TRUS biopsies in 2007 and 2008 were negative. T2-weighted image shows a suspicious focus of 10 x 6 mm in the right side lobe. It has restricted diffusion. The dynamic contrast series and spectroscopy do not show any distinct abnormality. No invasion of capsule, no enlarged lymph nodes or mets. After MR image guided biopsy the lesion was found to be adenocarcinoma Gleason 3 + 4 = 7. The SENSE Cardiac coil and the endorectal coil were used in dual-coil mode for the exam, a flexible coil was used for the biopsy images.

MR image guided biopsy of adenocarcinoma

67-year-old male with PSA 33. Six months ago PSA was 27 and TRUS biopsy was negative. MR results show a suspicious focal lesion of 25 x 30 mm in the right middle lobe with strong restriction of diffusion. Spectroscopy shows an elevated cholin peak and slightly reduced citrate in the lesion. The dynamic contrast series is unremarkable. No invasion of capsule, no lymph nodes and/or mets. MR image guided biopsy helped to identify adenocarcinoma Gleason 3 + 4 = 7.
When a patient presents for MR image guided biopsy, first dual-coil MR scanning can be performed to visualize suspicious lesions in the prostate. Imaging techniques include high resolution T2-weighted imaging, diffusion weighted imaging, dynamic T1 studies and spectroscopy. DynaCAD for Prostate offers streamlined image analysis and biopsy guidance. For biopsy, the MR-compatible biopsy device DynaTRIM is placed on the MR patient support, imaging is performed with flexible surface coils. Planning of the biopsy trajectory is an integrated part of the solution, that can be displayed at the scanner’s console.

**Urologists and radiologists work together for patient outcomes**

“In Switzerland’s fee-for-service healthcare program urologists and radiologists earn more doing ten biopsies instead of two biopsies,” says Dr. Porcellini. “But clinicians are beginning to understand that the way to a more efficient process and better diagnosis is with well-targeted MR image guided biopsy. Our outlook is to bring more patients to both urologists and radiologists by offering this method to their patients.”

Hirslanden Clinic urologists are convinced of the need for MR image guided prostate biopsy. “But we also want to propagate and offer this method to other urologists in Zurich,” Dr. Porcellini says. “I think the fact that we are getting more patients will be a factor in these referrals; urologists will profit, and consequently we as radiologists also. And, of course, the patients benefit the most. MR image guided biopsy helps us detect more prostate lesions at an earlier stage.”

Dr. Porcellini hopes to expand the prostate program soon, bringing in a larger group of urologists and staff.
FieldStrength now offers electronic-only subscriptions in an effort to be more environmentally friendly. When a new FieldStrength issue is available, subscribers receive an email alert with an overview of the issue’s contents and links to the articles online. We encourage existing readers to switch to an email subscription, and new readers to register for an email subscription.

Philips’ commitment to sustainability
Philips Healthcare is dedicated to being a world-class sustainable development company by conducting our business in an environmentally and socially responsible manner.

Reducing our carbon footprint – Achieva 1.5T SE
Since 1994, Philips has been increasing the energy efficiency of its products along with other environmental improvements in manufacturing since 1984. We seek new solutions for responsible energy practices, and focus on the energy efficiency of our products and production processes. Our continued focus on sustainability has resulted in the PowerSave feature for our MRI systems. The Achieva 1.5T Green Product line reduces energy consumption by 28%. Green products score at least 10% lower on environmental impact on one of the Green focal areas, measured during the entire life cycle of the product. So, Philips MRI systems now help hospitals to reduce their carbon footprint.

Please consider the environment before printing any document.

Most popular NetForum contributions in third quarter of 2009

1. Web Seminar: Clinical experience with MultiTransmit technology at 3.0T – University of Bonn
2. ExamCard: 1.5T Non-CE renal/mesenteric MRA – Scottsdale Healthcare
3. Application Tip: Optimization of fat suppression in the head and neck area
4. Application Tip: Tips for cardiac black blood imaging
5. ExamCard: 1.5T Brain spectroscopy – Soroka University Medical Center
32-channel coil boosts 3.0T neuro imaging at Kennedy Krieger

Kennedy Krieger Institute sees significantly better fMRI, DTI, spectroscopic imaging with the 32-channel SENSE Head coil

The F.M. Kirby Research Center for Functional Brain Imaging at the Kennedy Krieger Institute (Baltimore, Maryland, USA) is a general resource center for neuro imaging. It provides 3.0T and 7.0T imaging for Kennedy Krieger, for Johns Hopkins University School of Medicine and for the University of Maryland.

The Center recently began using the 32-channel SENSE Head coil in its neuro studies on the Achieva 3.0T X-series. Because the 32-channel coil provides increased SNR, clinicians can either scan faster or get higher spatial resolution or temporal resolution, depending on the particular study.

Peter van Zijl, PhD, is the Director of the F.M. Kirby Research Center at Kennedy Krieger and Professor of Radiology at the Johns Hopkins University School of Medicine. He explains how the coil benefits studies done at the Institute.

**High SENSE factors become practical**

“With the 8-channel coil we wouldn’t do parallel imaging in multiple directions because noise was much bigger,” says Dr. van Zijl. “The 32-channel coil now enables using SENSE in multiple directions and with higher SENSE acceleration factors. This is particularly an advantage for 3D acquisition techniques.”

Dr. van Zijl emphasizes that the high SENSE acceleration factors achieved with the coil do not compromise image quality. “For anatomical imaging, we have applied SENSE acceleration factors of 6, and the images are still beautiful. So, for instance, we can easily do a 3D FFE at 0.7 x 0.7 x 0.7 mm in about 4 minutes, which is much better than the 1 x 1 x 1 mm in about 6 minutes that we used to do with the 8-channel coil.”

“In spectroscopy, we have gone as high as a SENSE acceleration factor of 9. The quality of these spectroscopic images is still better than with the 8-channel coil using lower acceleration factors, because...
there is less lipid contamination. These are the most impressive spectroscopic images that I have seen in my whole life,” he says, “and I have seen a lot of them.”

“This coil’s design enables very good quality images over the whole of the brain, even without the front section. I have not seen that in any other coil,” says Dr. van Zijl.

**Significantly faster spectroscopy promotes clinical acceptance**

Peter B. Barker, D.Phil., Professor, Department of Radiology at Johns Hopkins University School of Medicine, is working on several neuroimaging projects at the Institute. These include using MR Spectroscopy Imaging (MRSI) to assess rare metabolic diseases in children, such as leukodystrophies and Rett syndrome.

“There are two main advantages to this 32-channel coil,” says Dr. Barker. “Improved SNR and improved SENSE reconstruction performance. These are critical for demanding experiments such as multi-voxel spectroscopy. The coil is also very comfortable for the patient.”

With the conventional 8-channel coil, Dr. Barker did not use SENSE factors higher than 2 or 3 for 2D-MRSI, because of low SNR and artifacts becoming more apparent. “With the new 32-channel coil, we routinely do a SENSE factor of 6 for MRSI,” he says. “This reduces a conventional 30-minute MRSI scan to just five minutes. Recently, we acquired some 3-minute 2D-MRSI scans with a SENSE factor of 9. The data were surprisingly good for such a short scan time.”

**SENSE-MRSI of high-grade tumor**

The left frontoparietal lesion shows very characteristic spectra of a high grade glioma, with a high Cho signal and a decrease in NAA. Note that the lesion shows FLAIR/T2 hyperintensity in a region which closely matches the NAA reduction. Individual spectra are shown from the normal right side (blue) and the abnormal region (red). Achieva 3.0T with 32-channel SENSE Head coil.
Parallel imaging has improved DTI

Susumu Mori, PhD, Professor at Johns Hopkins University School of Medicine, is a world leader in using DTI to characterize human white matter anatomy, and its abnormalities in conditions such as multiple sclerosis, stroke, brain tumors and cerebral palsy.

“While DTI is an extremely powerful method to delineate white matter anatomy, it’s easily affected by patient motion,” says Prof. Mori. “To minimize this motion effect, it is essential to use a rapid imaging technique such as single-shot echo-planar imaging (EPI). DTI, therefore, inherits many issues related to single-shot EPI, such as low spatial resolution and image distortion.”

In the past 10 years, DTI has been drastically improved by the introduction of SENSE parallel imaging. SENSE enables shorter echo times for high SNR, less distortion, and higher spatial resolution.

New coil enables higher resolution and less distortion in DTI

“SENSE was literally a ‘dream’ technology for DTI,” says Prof. Mori. “However, there is a limitation in increasing the SENSE factor. Depending on the coil geometry, a SENSE factor higher than 2 often leads to artifacts. With the 32-channel SENSE Head coil, however, we can now push the boundary in DTI. First, the new coil allows a higher SENSE factor; a SENSE factor of 3 produces clean, artifact-free images. Second, it provides higher SNR, which leads to shorter scanning time and/or higher image resolution.”

“In the past, we spent at least 9 minutes for DTI with 2.5 mm resolution, but now the scanning time is reduced to about 4.5 minutes with 2.2 mm resolution,” says Prof. Mori. “This time reduction is the key for DTI scans to be accepted as a routine clinical scan, where time efficiency is so crucial.”

Higher SENSE factor reduces distortion

Images with different SENSE factors. The red outline from the SENSE 3 image is superimposed on the SENSE 2 image, highlighting the improvements near the temporal lobes. This clearly shows that distortion is significantly reduced with the higher SENSE factor.

High SENSE factors enable high resolution DTI

The 32-channel SENSE Head coil enables high resolution DTI, which was not possible several years ago. These DTI images with 1.9 mm isotropic resolution, 66 slices were obtained in 5:21 min. scan time.

“With the 32-channel SENSE Head coil, we can now push the boundary in DTI.”
High resolution improves BOLD-fMRI

This right-hand finger-tap block-design experiment demonstrates better localization of the activation and higher t-values (arrows) when resolution is increased from 3 x 3 x 3 mm to 2 x 2 x 2 mm using the 32-channel head coil.

The applications of MRSI might be expanded as clinicians become aware of its feasibility. “Widespread adoption of clinical applications has been hampered by a lack of commercially available optimized pulse sequences and analysis tools,” says Dr. Barker. “Philips now provides an outstanding package for both single and multi-voxel spectroscopy.”

Faster scans, smaller voxels particularly important in pediatric fMRI

In Kennedy Krieger’s functional MRI (fMRI) studies, the new 32-channel head coil far outperforms the previous coil. “In standard fMRI the new coil works very well,” says Dr. van Zijl. “The SNR is much better, and we can go to higher spatial resolution.”

James J. Pekar, PhD, is Research Scientist at Kennedy Krieger and Associate Professor in the Russel H. Morgan Department of Radiology and Radiological Science at Johns Hopkins University School of Medicine. In his fMRI work, Dr. Pekar often works with children who have ADHD, autism, dyslexia and other brain-related disorders.

“If we had done the same fMRI acquisition with the 8-channel coil, we would have seen nothing.”

High resolution DTI allows detailed fiber-tracking

The small pixel size in combination with high SENSE factor allows detailed visualization of complex anatomy in the mid-brain region. Five fiber bundles are shown: cortico-spinal tract (cst, blue), medial lemniscus (ml, green), superior-, medial-, and inferior-cerebellar peduncles (scp, pink; mcp, red; icp, orange).
Coil yields beautiful results in APT research on brain tumors

Dr. van Zijl explains that the coil benefits other studies as well. “One of our colleagues, Dr. Jinyuan Zhou, has a project to look at the content of small proteins and peptides in brain tumors using Amide Proton Transfer imaging, or APT imaging. With the 32-channel head coil, the images from the increased baseline protein and peptide content are very beautiful.” APT imaging is a variant of a method called Chemical Exchange Saturation Transfer (CEST) imaging developed for research purposes by Drs. Zhou and van Zijl at Kennedy Krieger and Johns Hopkins.

There are special challenges in working with children. Investigators design child-friendly paradigms with stimuli and tasks that are age appropriate. Faster scan times are of great importance in children, who often cannot stay still for long periods of time. The higher SENSE factors also produce smaller voxels for better localization.

“We’re currently optimizing fMRI acquisitions using the new 32-channel coil,” says Dr. Pekar. “Previously, our default fMRI exam used 3 mm isotropic resolution. Our initial scans with the new coil show better results using 2 mm isotropic voxels.”

“The new coil provides higher temporal SNR with 3 mm isotropic voxels,” he says, “But the 2 mm isotropic voxels show higher t-values in a block-design activation paradigm, which is due to reduced partial volume effects when using smaller voxels.”

Increasing to more than 32 coil elements will add less benefit

“Adding even more coil elements will not have a similar impact as moving from 8 to 32,” says Dr. van Zijl. “There’s a point of diminishing gain per added coil element as this follows an exponential curve. Changing from 1 to 8 will give more than a doubling in SNR, increasing from 8 to 16 may provide 50% more, and from 16 to 32 probably another 10%. Even if you would go from 32 to 64, you would probably gain only 10% in SNR. So, I think 32 channels is about right.”

“The 32-channel coil interfaces seamlessly with our 3.0T system and is very comfortable for the patient.”

References
Cardiac MR is fast and easy with complete Elite Cardiac Solution

32-channel cardiac coil and new Cardiac Explorer software smooth out the CMR process at St. Luke’s Episcopal Hospital (SLEH) and German Heart Institute Berlin

Philips’ Elite Cardiac Clinical Solution now includes the 32-channel SENSE Torso/Cardiac coil for 1.5T and 3.0T systems, and Cardiac Explorer and Vessel Explorer software for automated, task-guided analysis of CMR data. These make Cardiac Magnetic Resonance (CMR) fast and easy, which clinicians have indicated as an essential need for the growth of CMR.

The SENSE Torso/Cardiac coil is designed to allow greater coverage of anatomy and improved signal-to-noise ratio. The increased SENSE acceleration factors help to either improve image spatial resolution, or reduce breath holding duration during cardiac studies.

Cardiac Explorer integrates image viewing and analysis, with viewing formats selected from a predefined list linked to the ExamCard. Many analyses can be completed in less than 20 minutes, thanks to a high degree of automation. Cardiac Explorer and Vessel Explorer are available as optional packages on the Extended MR WorkSpace (EWS) workstation.

32-channel coil boosts cardiac studies at SLEH

St. Luke’s Episcopal Hospital, home of the Texas Heart® Institute is a tertiary referral center performing about 80 to 100 cardiovascular MR exams in an average month. Benjamin Cheong, MD, cardiologist at St. Luke’s, routinely uses the SENSE Torso/Cardiac coil for cardiovascular MR.

“All of our cardiovascular studies, ranging from functional assessment to aortic studies, benefit from the 32-channel coil,” he says. “With the increase in imaging speed, the staff can complete an image sequence and finish the examination much more quickly than before. That helps our throughput, and our patients obviously appreciate a faster examination and less time in the scanner.”

Multiple breath holds are often unnecessary with the 32-channel coil, explains Dr. Cheong. “Cardiac MR has already established itself as the gold standard for functional and morphological assessment of the left and right ventricles with the traditional multislice cine imaging that covers both ventricles in 10 to 12 slices. But with the new 32-channel cardiac coil, knowing that we can increase the
68-year-old male with prior myocardial infarction and congestive cardiac failure presented for pre-operative surgical planning. Echocardiography demonstrated left ventricular aneurysm. Cardiac MR was performed with 32-channel SENSE Torso/Cardiac coil, SENSE factor 2, voxels 1.8 x 1.8 x 8 mm, breath hold 6 sec. Cine SSFP of the left ventricular outflow tract and mid short-axis demonstrate left ventricular aneurysmal dilation present in the proximal half of the inferolateral wall (left, arrowhead) extending into the inferior wall (right, arrowhead). LV = left ventricle; RA = right atrium; Ao = aorta; RV = right ventricle.

“I had never seen such quality images coming from a 1.5T scanner.”

The higher spatial and temporal resolution of the images is impressive. One of the applications where MR really shines is in the assessment of the arrhythmogenic right ventricular dysplasia/cardiomyopathy (ARVD/C),” says Dr. Cheong. “The right ventricle (RV) is a thin wall structure of about 3-4 mm in thickness. The 32-channel coil allows us to achieve a higher spatial resolution in order to image the RV free wall, without a prolonged breath hold. That is of paramount importance in the assessment of fatty infiltration and fibrous replacement of the right ventricle in patients suspected to have ARVD/C. Our image quality, and therefore our diagnostic capability, is much higher.”

St. Luke’s senior physicist, Raja Muthupillai, PhD, recently completed a study using the 32-channel coil to achieve very high temporal resolution (3-6 ms) in a cine sequence for evaluation of the left ventricular diastolic function. As certain diastolic indices, such as isovolumic relaxation time, are about 70-80 ms in normal individuals, this high temporal resolution is essential to help distinguish between normal and abnormal heart function.

“For cardiac imaging, MR is a modality that is accurate, well established, non-invasive, and does not expose the patient to radiation,” says Dr. Cheong. “And using the 32-channel coil gives us a huge advantage.”

Coil enables improved speed and resolution
With the traditional 5-channel cardiac coil, typically a SENSE factor of 2-3 is used. Higher acceleration factors may result in decreased signal-to-noise ratio or image artifacts. The high number of coil elements in the 32-channel coil enables use of higher SENSE acceleration factors and multidimensional parallel imaging accelerations.

Dr. Cheong says in the past, using the 5-channel cardiac coil with parallel imaging, a coronary whole-heart MRA typically required an imaging time of 8 to 12 minutes, even with reasonable respiratory gating efficiency. “However, I was the first to try out the 32-channel coil,” says Dr. Cheong. “The whole-heart coronary MRA of myself was acquired in only four minutes, with a gating efficiency close to 70% and an isotropic resolution of 1 x 1 x 1 mm. I had never seen such quality images coming from a 1.5T scanner. All major epicardial coronary arteries were well visualized.”

58-year-old male with congestive cardiac failure of unknown etiology. CMR with SENSE Torso/Cardiac coil, SENSE factor 2, voxels 1.8 x 1.8 x 8 mm, breath hold 6 sec. Cine SSFP of the two-chamber view shows increased trabeculation confined to the left ventricular apex (arrowhead) consistent with left ventricular non-compaction.

“I had never seen such quality images coming from a 1.5T scanner.”

“The higher spatial and temporal resolution of the images is impressive. One of the applications where MR really shines is in the assessment of the arrhythmogenic right ventricular dysplasia/cardiomyopathy (ARVD/C),” says Dr. Cheong. “The right ventricle (RV) is a thin wall structure of about 3-4 mm in thickness. The 32-channel coil allows us to achieve a higher spatial resolution in order to image the RV free wall, without a prolonged breath hold. That is of paramount importance in the assessment of fatty infiltration and fibrous replacement of the right ventricle in patients suspected to have ARVD/C. Our image quality, and therefore our diagnostic capability, is much higher.”

St. Luke’s senior physicist, Raja Muthupillai, PhD, recently completed a study using the 32-channel coil to achieve very high temporal resolution (3-6 ms) in a cine sequence for evaluation of the left ventricular diastolic function. As certain diastolic indices, such as isovolumic relaxation time, are about 70-80 ms in normal individuals, this high temporal resolution is essential to help distinguish between normal and abnormal heart function.

“For cardiac imaging, MR is a modality that is accurate, well established, non-invasive, and does not expose the patient to radiation,” says Dr. Cheong. “And using the 32-channel coil gives us a huge advantage.”
“With the increase in imaging speed, the staff can finish the examination much more quickly than before.”

Cardiologist Ingo Paetsch, MD, Director of the CMR imaging department at the German Heart Institute (Berlin, Germany) has been involved in Cardiac MR for more than 10 years. He uses both Achieva 1.5T and 3.0T for cardiac MR. In the past months, he has been one of the first to use the Cardiac Explorer and Vessel Explorer packages.

Cardiac Explorer software facilitates rapid viewing of cardiac CMR images. “It’s particularly useful in stress CMR imaging when looking for myocardial ischemic reactions in the presence of coronary artery stenoses,” Dr Paetsch says. “For both cine imaging and non-cine dynamic functional imaging in stress CMR Cardiac Explorer is extremely helpful. Side-by-side viewing of rest and multiple stress scans for comparative purposes – which is the hallmark of pharmacological stress CMR testing – is easily accomplished.”

In the Institute’s recently developed combined stress CMR protocol using a single stressor agent2,3, multiple cine views are acquired at each step of the protocol. “With just two mouse clicks Cardiac Explorer displays multiple views at different stress levels together with the non-cine dynamic images.”

“Cardiac Explorer mimics a physician’s line of thought,” says Dr. Paetsch. “Incoming images are automatically placed in predefined viewports and can be reviewed almost immediately thus avoiding the tedious job of manual sorting. The side-by-side comparison of multiple cine views assists the cardiologist not only to rapidly establish a diagnosis but also helps to continuously monitor wall motion changes during the scan procedure, which is important as early recognition of wall motion abnormalities leads to termination of the test. Cardiac Explorer represents the cardiologist’s “best friend” during the stress CMR examination.”

More time saving is seen in the Cardiac Explorer module for left ventricular functional analysis. Automatic endo- and epicardial contour detection routinely enables measurement of LV volumes and mass using the disk summation method (Simpson’s rule) in each patient in less than 30 seconds.
Dobutamine stress study

Synchronized display of multiple cine short axis views of a dobutamine CMR stress study. From left to right: increasing levels of graded dobutamine dosage. From top to bottom: basal, equatorial and apical short axis orientation. Missing wall thickening of the inferolateral segment in all three short axis views under maximum dobutamine stress can easily be recognized to assist in diagnosis.

Targeted RCA reconstruction

Vessel Explorer used for reconstruction of a 3D whole-heart coronary MR angiography. Targeted reconstruction of the right coronary artery (RCA) is exemplified using maximum intensity projection, multiplanar curved reformating and corresponding cross-sectional view of RCA lumen.

“With just two mouse clicks Cardiac Explorer displays multiple views at different stress levels together with the non-cine dynamic images.”

Vessel Explorer helps evaluate coronary arteries

Vessel Explorer not only facilitates 3D reconstruction of large thoracic or mid-sized peripheral arteries, but also of the coronary arteries with 2 to 4 mm luminal diameter range. “The benefits of Vessel Explorer are enormous,” says Dr. Paetsch. “Interactive and simultaneous display of 3D volume rendering, MIPs and MPRs ensures easier anatomical identification of complex vessel anatomy and speeds up path identification for additional reconstructions highlighting a specific pathology. Several vessel parameters are simultaneously provided...”
Cardiac Explorer mimics a physician’s line of thought.

FieldStrength 23

Vessel Explorer is used for reconstruction of a 3D left atrial and pulmonary venous MR angiogram. Assessment of ostial area and luminal diameter of pulmonary veins assists electrophysiological procedure planning (top). Simultaneous display of surface rendering improves anatomical orientation and can directly be used for ostial area and luminal diameter measurements (bottom).

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(luminal diameter, percentage of stenosis, vessel length, ostial area, etc). A single click on a vessel displays its cross-section view, and curved planar reformats can be obtained with just a few more clicks.

In CMR and electrophysiological interventions, Vessel Explorer permits fast review of 3D angiographic datasets before and during interventions.

Packages speed processing, reporting and enhance reproducibility

“Cardiac Explorer and Vessel Explorer increase our reproducibility and make results less user-dependent,” Dr. Paetsch says. “Especially with ExamCards, you need to ‘teach’ Cardiac Explorer only once to sort and display images. Despite the increased speed and ease of use, both flexibility and customizability are very well preserved in these two packages.”

“More than 20 CMR studies are conducted every day at the Institute, and our policy is to finish the report immediately after the examination with the patient taking it directly back to the referring physician. A CMR study delivers a huge amount of images for every patient, consisting of multiple cine views as well as dynamic images and scar images,” explains Dr. Paetsch. “We are extremely happy with Cardiac Explorer to free our mind of tedious image sorting and other manual processing before actually reviewing the case – which is a physician’s true task.”
Pediatric SENSE Head/Spine coil simplifies infant studies

Dedicated, lightweight, integrated coil enables one-step examinations with high SNR in Karolinska University Hospital, Stockholm.

When applying “adult” coils for infants, the large coil elements and their distance from the patient can yield suboptimal SNR. In head/spine examinations in infants, another problem has been the risk of waking sleeping patients when swapping head and spine coils. At Astrid Lindgren Children’s Hospital, radiographers led by Bo Ehnmark, have evaluated Philips’ Pediatric SENSE Head/Spine coil for 12 patients. The coil’s small elements, integrated design and light weight have provided an excellent solution.

Astrid Lindgren Children’s Hospital, part of Karolinska University Hospital (Stockholm, Sweden), developed an innovative way to scan their youngest patients, children ranging in age from hours-old to 12 weeks old. The “Feed-and-Sleep” protocol entails bringing infant patients in 30 minutes before their examination, feeding them and then allowing the babies to fall asleep. Because the children are brought in overdue for a nap anyway, it is more likely that the patients will sleep motionlessly (with ear protection) for at least the 30 minutes it takes to scan them.

For Achieva 1.5T brain studies in this patient group, the Children’s Hospital has commonly used the 8-channel SENSE Head coil or the SENSE Spine coil.

“For brain-only studies we have used the SENSE Head coil,” Ehnmark says. “It’s a good coil with ample space on the inside for headsets, but its size also is a disadvantage. It’s too big for infants, so we don’t obtain optimal SNR because the coil elements are too far away from the head.”

In addition, if clinicians wanted to investigate the spine as well, technologists risked waking the sleeping baby when swapping the head coil for the SENSE Spine coil, and SNR was not optimal. “Swapping coils is too clumsy,” Ehnmark observes. “And the SNR in the spine has not been sufficient in two- to three-kilogram babies.”

Sequential infant head/spine studies became easier when Astrid Lindgren’s Children’s Hospital acquired the 16-channel SENSE NeuroVascular coil about a year ago. When integrated with the SENSE Spine coil, clinicians could look at the brain, possible
problems in the upper cervical spine (e.g. Chiari malformation) and lower cervical spine (e.g. tethered cord), all the way to the lumbar spine and pelvis, without changing coils. Still, signal issues persist when using the adult-designed spine coil for infants.

“Babies-only” Pediatric SENSE Head/Spine coil performs well in test
Astrid Lindgren Children’s Hospital evaluated the Pediatric SENSE Head/Spine coil on Philips’ Try & Buy program, using the coil in 12 examinations over an eight-week period. The typical weight range of the patients was 4.5 to 6.5 lbs. (2-3 kilograms). Ehnmark believes one of their patients, a 17.6 lb. (8 kilograms) 10-month-old represents the maximum feasible size for the coil. The Children’s Hospital’s first case for the pediatric SENSE Head/Spine coil was at the opposite end of the spectrum, a 6-hour old infant (see images).

“We received the coil around lunchtime and by one o’clock it was on the table ready to scan this 6-hour old baby with suspected hydrocephalus.”

For the Feed-and-Sleep patients who require an examination of head and spine, the pediatric SENSE Head/Spine coil seems tailor-made, he adds. “With Feed-and-Sleep, we have a 30-minute window to perform the examination. It’s usually not more, because of the increasing chance that the baby will wake up from his nap and start to cry and move. Then it’s all over;” Ehnmark explains. “With our traditional solution, the lower SNR required more signal averages, which could increase the scan time past 30 minutes. Sometimes we got lucky and the baby stayed asleep, but most times we had to end the study because the infant woke up.”

Clear visualization of congenital anomalies
Ehnmark has found that the Pediatric SENSE Head/Spine coil has provided excellent visualization of a tethered spinal cord, a neurological disorder caused by tissue attachments that limit spinal cord movement. The resultant stretching of the spinal cord as the baby grows interferes with nerve function. “In infant spine imaging, you need high resolution, which has been very tricky with a standard spine coil,” he says.
“But with the dedicated pediatric coil, we can see this clearly in babies.” Among the 12 patients that Astrid Lindgren’s Children’s Hospital scanned using the pediatric coil, several had brain tumors, which Ehnmark reports were visualized at least as well as they had been with the NeuroVascular coil. The design of the Pediatric SENSE Head/Spine coil, however, enabled better accommodation of the tubing and wires of ancillary monitoring equipment.

From the start, he was surprised that technologists could use the department’s existing ExamCards with the pediatric coil. “We obtained very good results,” he says. “In the long run, with more experience with this coil, I think we could still optimize the protocols and get even better images, but I was amazed that we acquired such good images with the standard sequences.”

A special feature of Achieva systems that contributes to these results is the ability to adjust the FOV while maintaining the same voxel size.

“That means we can use the same ExamCard whether the baby is two kilograms or five kilograms,” Ehnmark observes. “With an older system or with other vendor’s machines, when changing the FOV, you also have to manually adapt the voxel size, increasing it for larger patients and decreasing if for smaller patients. We don’t need to do that – our Achieva is a very pediatric-friendly system.”

Astrid Lindgren Children’s Hospital neuroradiologist, Chen Wang, MD, PhD, also reports favorable first impressions of the pediatric

Follow-up MRI exam of a 14-month-old male patient who was treated for a metastatic lesion in the brain. This was the first use of the pediatric SENSE Head/Spine coil with the patient under general anesthesia. Note that there is ample space in the coil for anesthesia equipment. The high quality images clearly show the lesion and surrounding brain anatomy.
In a two-week-old infant was referred for MRI investigation of a skin lesion in the midline of the lower back. Such a lesion can be suspicious of a meningomyelocele. Often covered by skin, a meningomyelocele can result in a tethered cord, a neurological disorder caused by tissue attachments that limit spinal cord movement. The resultant stretching of the spinal cord as the baby grows interferes with nerve function. In children, symptoms may include lesions and hairy patches, in addition to leg weakness, lower back pain, incontinence and loss of bowel control. If the disorder is not addressed, symptoms will progress. The patient was examined using the Feed-and-Sleep protocol, which requires a rapid study not exceeding 30 minutes (to ensure a reasonable likelihood that the patient will remain asleep). The images confirmed the question of dermal sinus with intraspinal extension and tethered cord.

SENSE Head/Spine coil. “Our preliminary test results are very promising, with high quality images that to our eyes are superior, or at least equal to, the images obtained with a standard coil,” he says. “Controlled comparative studies may be needed before we make firm conclusions, but we definitely are looking forward to further evaluations of this RF coil.”

Lightweight coil makes technologists’ lives easier The size and weight of the pediatric SENSE Head/Spine coil makes it very easy to use, according to Ehnmark. “The pediatric coil seems to weigh almost nothing,” he says. “Some of the other coils are noticeably heavier.”

The Pediatric SENSE Head/Spine coil comes with a special mattress that enables precise positioning of the coil centered on the patient table. The mattress’s thickness brings it flush to the part of the coil on which the patient lays, allowing technologists to wrap the baby in a blanket outside the coil and gently pull him into position inside the coil.

Coil fulfills a real need Scanning these infant patients is a growing application at the medical center, Ehnmark reports. “We’re seeing a big increase in demand for studies of these congenital problems, for which the pediatricians can appreciate the importance of MRI,” he says. “And, unfortunately, we also are seeing more emergency cases. We will put the Pediatric SENSE Head/Spine coil to good use.”

Chen Wang, MD, PhD

“In infant spine imaging, you need high resolution, which has been very tricky with a standard spine coil. But with the dedicated pediatric coil, we can see this clearly in babies.”
Achieva XR offers Dritter Orden Hospital easy conversion to 3.0T

Munich center enjoys 3.0T gradient power in its rampable 1.5T MRI system

Dritter Orden Hospital (DOH) had operated its Intera 1.5T system for just six years before officials decided that MRI technological development since 2002 offered an opportunity to upgrade imaging capabilities. In selecting the rampable Achieva XR, Dritter Orden Hospital not only improved its 1.5T scanning, but also prepared for an easy upgrade to 3.0T when new construction is complete in 2013.

Although DOH could not accommodate a 3.0T system immediately — due to the configuration and location of its current 1.5T scan room — hospital administrators and radiology department clinicians were well aware of 3.0T’s potential and were eager to get their “foot in the door,” says Prof. Hermann Helberger, MD, Head of the Department of Radiology and Nuclear Medicine at DOH, a 574-bed teaching hospital in Munich, Germany.

“Acquiring the Achieva XR system would accomplish two goals at once,” he observes. “First, we would obtain improvements in 1.5T image quality, patient comfort and diagnostic capabilities, and second, we could wait until future hospital renovations made it possible to build a scan room suitable for 3.0T — at which point we could quickly ramp up.”

When Philips representatives explained that the ramp up to 3.0T would require just four days of downtime, Prof. Helberger admits to some initial skepticism.

“At first, this sounded a bit mystical,” he recalls. “Then, I spoke with some technicians and others at Philips who gave me additional technical explanations, and I became quite optimistic that it was feasible.”

The ramp-up involves bringing the 1.5T field to 0T, replacing the RF subsystem, integrating a new RF coil, ramping up to 3.0T and shimming and calibrating the system.

Dritter Orden Hospital experiences 1.5T scanning with 3.0T gradients

The Achieva XR became operational on September 29, 2008. It provided the hospital with new possibilities that come with the latest software release and technology. By virtue of the Achieva XR system’s X-series magnet technology and dual-mode 80 mT/m X-series gradients, 1.5T imaging performance in several areas has increased at DOH, Prof. Helberger reports.

In DWI, for example, better spatial resolution and anatomical coding of functional information has resulted in easier study implementation and better visualization. Also, clinicians now can perform DWI scans in the sagittal plane, offering enhanced resolution in neuro imaging. “For instance, we are achieving better depiction of spots in the cerebral myelon in patients with multiple sclerosis — within just one session,” he says.

High gradient power has enhanced peripheral vessel analysis, specifically in estimation of stenoses, Prof. Helberger notes. With the Achieva XR, in combination with the 16-channel SENSE XL Torso coil, Dritter Orden clinicians have been able to reduce the number of additional catheter angiographies that need to be performed to determine therapeutic alternatives.

The Achieva XR has helped improve imaging of pathology in the female pelvis and enhanced diagnostic confidence for staging prostate and rectal tumor, including local lymph nodes.

“We are achieving better visualization of spots in the cerebral myelon in patients with multiple sclerosis.”

Prof. Hermann Helberger, MD
In patients with rectal cancer, it is essential to differentiate stage T2 from stage T3, the latter involving invasion of surrounding fatty tissue,” he says. “T2 patients normally are resected immediately, while T3 patients undergo neoadjuvant radio-chemotherapy.”

Better spatial resolution in breast MRI has yielded 1 mm reconstructions, Prof. Helmberger adds. In addition, higher spatial resolution has benefitted MRA and imaging of the joints and the cerebrum.

The Achieva XR system’s more robust gradients also have enabled DOH to scan faster, with a 20% increase in patients per day from 10-15 patients to 12-18 patients during normal daily scanning hours.

Finally, fat suppression has been exceptional, Prof. Helmberger says, “which is not unusual, since that is one of the stars in the entire Philips MRI portfolio.”

**An investment in the future**

Prof. Helmberger regards Achieva XR as the ideal solution for medical centers that are strictly limited to a single MRI system, but which also desire the flexibility to evolve to higher level scanning.

“Achieva XR is simply the best 1.5T you can get now, because it is a sort of 1.5T-3.0T 'hybrid' with its 3.0T gradient system,” he says. “But it's also an investment in the future – leaving the door open for 3.0T when you're ready.”
More patients and high clinical versatility

Panorama HFO accommodates broader patient group and provides exceptional results at two different sites

The Panorama HFO provides a spacious 160 cm-wide patient aperture to ensure a comfortable, relaxing MRI experience for anxious, elderly, obese or claustrophobic patients. At Cuero Community Hospital (Cuero, Texas, USA), Solstice MRI Center at the Florida Neurological Center (Ocala, Florida, USA) and Wadi El-Neel Hospital (Cairo, Egypt) clinicians appreciate the Panorama for its exceptional image quality.

Hospital serves community with high quality MR scans

Cuero Community Hospital went clinical with a Panorama HFO in June 2009. Since then, patient volume has grown from about 10 patients a week to nearly 35 per week, with imaging needs that range from spine to extremities to angiography.

Brian Olsovsky, RT, CT, Director of Radiology at the hospital, says, “Within two weeks I brought on a consulting technologist just to keep up. We’ll be extending our hours soon, to accommodate 40 to 50 patients per week.”

Repeat scans are a thing of the past

When Cuero Hospital began its search for an open MR system, the project was met with skepticism. “Open MRI units have gotten a bad reputation in the past because of their weak signal, but Philips has introduced a great product with the Panorama HFO.”

“Our patients have good quality images for the next level of care if they need it,” says Olsovsky. “There is no need to repeat these scans. If they were done here, they don’t need to be done again because of quality issues. The images will not be any better than these, regardless of the vendor.”

The hospital’s radiologists say that in many cases the quality of Panorama images exceeds that of their 1.5T systems. Additionally, Olsovsky says they appreciate the Panorama’s ability to center the patient directly under the isocenter of the magnet.

“Our overall experience with Philips and the Panorama has been a solid 10. I am amazed how many people are calling the hospital and asking about it.”
Ambient Experience calms patients
The hospital uses Ambient Experience to enhance the MR experience with sounds and lights of the patient’s choice. The Ambient Experience suite was offered to Cuero Hospital as a turnkey installation. “It puts patients in charge of their MR environment,” Olsovsky explains. “Patients can bring their own CDs or MP3 players, and that’s very comforting. I have scanned many patients who have never had an MRI comfortably, who go into this MR system and fall asleep because of Ambient Experience.”

“Our overall experience with Philips and the Panorama has been a solid 10,” he adds. “I am amazed how many people are calling the hospital and asking about it. They’ve been going to larger cities for high quality imaging, and now they can stay right here. It really is an excellent system.”

Solstice MRI Center, a part of the Florida Neurological Center, began imaging patients on a Panorama HFO in August 2008.

Lance Kim, MD, says he had been frustrated with open MR systems. “I realized that the gold standard for MRI is the resolution from a closed MRI; however, many patients cannot tolerate the closed tube. As a result, they were getting a low field open MRI scan, which, in my opinion, is totally unacceptable. The image quality was so poor that the surgeons simply did not have enough information for clinical decision-making.”

MRI center making patients more comfortable, one scan at a time

Solstice MRI Center
Post contrast T2-weighted
Post contrast FLAIR

Acute subdural hematoma

In a 64-year-old male violent involuntary movement due to severe REM behavior sleep disorder resulted in acute subdural hematoma. The FLAIR image shows a high signal fluid collection overlying the left parietal and frontal lobes consistent with acute subdural hematoma.

Then Dr. Kim attended an RSNA meeting and saw a long line of people at the Philips booth. “When I saw the Panorama HFO, there was an instant attraction. It had an incredibly beautiful design and a huge patient space.” When Dr. Kim met with the Philips sales rep and saw actual MR images from the Panorama, his decision was made.

Dr. Kim’s experience with the Panorama has been exceptional. “It’s just as I expected. The image quality is superb, and the whole community has accepted it with open arms; surgeons, specialists, and especially patients.”

**Panorama puts patient comfort first**
He says the main advantage of the Panorama is that it minimizes his patients’ discomfort. “We have many larger patients who could not have an MRI scan, because they just did not fit in the scanner, or were beyond the weight limitation of the scanner. We can care for those patients now.”

Solstice MRI also has the Ambient Experience suite. “We have patients with profound claustrophobia, where even an open MR system isn’t enough to offset it. I’m able to image many of those patients because of Ambient Experience.”

Florida patients have responded accordingly, he says. “We have not yet changed our marketing, and yet the word has spread like wildfire. We’re enjoying referrals from three surrounding counties.”

Dr. Kim feels that the Panorama serves the true purpose of what an MR scan is all about. “It meets the needs of the physician without compromising the comfort of the patient.”

“**The word has spread like wildfire. We’re enjoying referrals from three surrounding counties.**”
**Advanced techniques enable broad use of Cairo Panorama HFO**

“The Panorama enables excellent image quality and a short scan time; it's ideal for all kinds of patients, and covers modern advanced MRI procedures including diffusion, perfusion and fiber tracking.”

Prof. Hassan El-Kiki, Head of MR Unit, Wadi El-Neel Hospital
Professor of Radiodiagnosis, Cairo University, Egypt.

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<th>Fiber tracking in spine</th>
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<td>MR images show a focal cervical cord area of malacia. Fiber tracking demonstrates fiber interruption in that area. Performed on Panorama HFO in Wadi El-Neel Hospital, Cairo.</td>
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<th>Fetal Chiari malformation</th>
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<td>Fetal MR images acquired at 37 weeks of pregnancy show Chiari malformation. Performed on Panorama HFO in Wadi El-Neel Hospital, Cairo.</td>
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Versailles clinic lightens up its MRI room

Ambient Lighting creates a calming and relaxing atmosphere in Panorama HFO examination room

Philips Healthcare has installed the first Ambient Lighting MR suite in the Clinique Medicale de la Porte Verte, Versailles, France. This private clinic, which is located west of Paris, focuses on elderly patients and delivers acute care, re-education, and aftercare services.

To maintain its prestigious reputation, the clinic decided to buy a Panorama HFO MRI system. In addition, the clinic installed the Ambient Lighting solution to further enhance the patient-friendly experience offered by the wide open Panorama HFO.

In close cooperation with the clinic, Philips had directed preparatory discussions and provided architectural recommendations for the room. A local contractor smoothly installed the Ambient Lighting MR solution in just two days.

The clinic’s staff reports that patients are enjoying the more relaxing atmosphere of the Philips Panorama MRI system with Ambient Lighting.

**Ambient Lighting increases patient comfort**

Under standard examination room lighting, patients may feel vulnerable, exposed and anxious. Installation of Ambient Lighting MR along the perimeter of the room, creates a more soothing and relaxing atmosphere. Walls are washed by warm inviting hues of red, green, yellow and blue, calming patients and providing a source of positive distraction. Furthermore, patients can actively participate in the creation of their personal scanning experience by choosing their favorite wall color before the procedure. Empowering patients in this way can greatly increase the patient’s comfort, thereby resulting in an enhanced experience for patients and staff.

**Putting people first**

Ambient Lighting is an excellent example of what makes Philips Healthcare products so special. By focusing on the needs of patients and staff, and combining human insight and clinical and technical expertise, Philips Healthcare creates innovations that put people first in the entire care cycle.

From left to right: Mrs. Spender, Mr. Bechet, Mr. François, Mr. Denis, Dr. Terjan, Mr. Reibell.
MultiTransmit solves 3.0T body imaging challenges at the source

MultiTransmit RF technology enhances image quality by nullifying dielectric shading and speeds up scanning by reducing local SAR. Patient-adaptive MultiTransmit is available on Philips’ Achieva 3.0T TX, the first 3.0T system with parallel RF transmission.

Higher field strength paradox
3.0T has rapidly become the preferred field strength for neuro and musculoskeletal MRI because of the higher SNR, spatial resolution and scan speed it offers. However, anyone involved in body and body-related imaging on a 3.0T system has seen the impact of the stronger dielectric effects that may sometimes cause darkened, shaded areas in MR images.

MultiTransmit cancels out dielectric effect as soon as it appears

The dielectric effect is non-uniform RF distribution – also called B1 inhomogeneity – caused by changes of the RF wave due to the tissue’s properties. The effect is more pronounced at 3.0T than at lower field strengths, as the RF wavelength at 3.0T (about 25 cm), approaches the size of the body. Depending on the size, shape and tissue characteristics of each individual patient, it can result in standing waves.

In the Achieva 3.0T X-series, RF-SMART technology reduces SAR and dielectric problems, avoiding the need to use cumbersome dielectric pads. However, only MultiTransmit is able to nullify the dielectric effect before the fact, as it addresses dielectric shading at the source.

Conventional imaging using one RF transmission source may create a non-uniform image due to a standing wave. With MultiTransmit, parallel RF sources are tuned so that a standing wave generated by one source is countered by the second source, resulting in images with uniform signal and contrast.

In an enabling technology for growing MRI applications
Philips’ MultiTransmit RF technology now addresses these obstacles at their origins. With Achieva 3.0T TX system’s MultiTransmit technology, dielectric shading and local SAR challenges have been effectively addressed, for consistent results and enhanced diagnostic confidence. The way is now clear for exceptional 3.0T breast, abdomen, pelvis, spine and heart studies.
MultiTransmit automatically adjusts to each patient’s unique anatomy

MultiTransmit creates uniform images by adapting the RF transmission to a patient’s size, shape and relative amounts of fat and water. The system automatically optimizes the power, amplitude, phase and waveform of each RF source to tailor the RF transmission to the patient’s anatomy. Optimizing RF using parallel RF transmit is also called RF shimming or B1 shimming. Using two completely independent RF sources greatly increases the “degrees of freedom” that the MRI system can use for B1 shimming.

Particularly in torso imaging, elimination or significant lessening of dielectric shading with MultiTransmit’s patient-adaptive RF technology has resulted in enhanced signal and contrast uniformity and consistent results, patient after patient.

Conventional single transmit 3T uses only one single RF source, sometimes resulting in dielectric shading, depending on the size, shape and tissue characteristics of the patient. MultiTransmit with multiple RF sources enables adaption to each patient’s unique anatomy resulting in uniform images.

Consistent image uniformity for enhanced diagnostic confidence

Conventional 3T image sometimes shows dark areas and brighter spots, but MultiTransmit images consistently provide enhanced uniformity of signal and contrast, patient after patient.
MultiTransmit reduces local SAR, lifting scan speed limit

With completely independent RF sources, MultiTransmit can also make local SAR distribution more uniform and avoids local high SAR areas, when RF transmit is automatically tailored for each patient. With MultiTransmit hardware (the full chain from RF source via RF transmission to RF reception), it has become possible to optimize RF management, thus better accommodating speed increases in all RF intensive applications.

In this way MultiTransmit RF technology has helped clinicians to reduce 3.0T scan times by up to 40%. Alternatively, this gain in speed may be traded for higher resolution at the same scan time.

Conventional single transmit

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MultiTransmit

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Color coding indicates SAR levels in a patient’s body (red is high, blue is low). MultiTransmit helps to make the local SAR distribution more uniform and the lowering of localized high SAR enables faster scanning.

Up to 40% faster scanning

MultiTransmit avoids areas of high local SAR, so that up to 40% faster imaging can be achieved. A standard spine examination decreases from 15:07 min. to 9:43 min. with MultiTransmit.

<table>
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<tr>
<th>Conventional</th>
<th>2:52 min.</th>
<th>MultiTransmit</th>
<th>Higher resolution, 2:50 min.</th>
</tr>
</thead>
</table>

Higher resolution in same scan time

The gain in scan speed by preventing high local SAR can be traded to obtain higher spatial resolution in the same scan time.
Optimizing pediatric brain imaging

Pediatric brain MRI is a challenging specialty that requires users to adapt to continually shifting imaging requirements, such as patient size (0.5 to 300 Kg), age, anatomical maturation, pathology, condition, widely varying level of consciousness/cooperation.

Young brains are undergoing myelination, the formation of the myelin sheath around a nerve fiber. Therefore, images of pediatric brains, especially of children under three-years-old, are markedly different from adult brain images. After three years, signal characteristics are similar to those in adult brains, but in smaller anatomy. In children of eight years or older, adult methods are acceptable, as head size does no longer increase appreciably with age.

With the basic strategies described here, high quality pediatric neuro MRI exams are readily achievable. And simple, the way they should be.

Tip 1: Reset the preset for spatial resolution

Preset procedures are designed for healthy, cooperative adult volunteers and therefore usually are inadequate for imaging children.

Because the structures of interest are smaller, use the 20%-30% rule of thumb for spatial resolution: reducing voxel sizes by 20%-30% will sufficiently scale adult presets for pediatric patients to optimize spatial resolution.

Tip 2: Adjust contrast parameters for optimal T2W imaging

Users who are new to pediatric MRI, often are challenged by the spectrum of tissue signal characteristics and patient physical sizes encountered among children. For example, unmyelinated white matter in infants is hyperintense on T2-weighted images. This finding is normal at this stage of development.

Optimizing imaging of infants requires adjustment of contrast and resolution parameters. Increasing TR (4000-5000 ms minimum) for T2-weighted scans typically improves contrast, and this alone often is sufficient.

In addition, an increased TE can help exploit the minimal available contrast in infants. As the inherent SNR of T2-weighted TSE is quite high, these adjustments are easily made without adverse effects to overall image quality.
Tip 3: Overcoming T1-weighted imaging challenges with SE

T1-weighted imaging in infants presents challenges related to the myelination process. Don’t expect to see good T1 contrast in infants – regardless of field strength – as there is not enough white matter in this stage. However, T1-weighted images still can reveal hypoxic ischemic changes well before abnormalities become visible in T2-weighted images. Hypoxic injury results in T1 signal changes in the basal ganglia first, followed by the cerebral hemispheres in more severe injuries.

Among T1 imaging methods, spin echo (SE) is still the gold standard. In infants, SE images tend to be somewhat noisy, but this is normal, especially in neonates, whose brains have ample water but minimal myelin. By the age of three, SE T1 contrast approximates that of adults.

Controlling flow artifacts in SE

Flow artifacts in the posterior fossa have plagued post-contrast T1 SE ever since contrast agents were introduced. Hyperintense, contrast-enhanced blood flowing through the transverse sinuses causes bright ghosting artifacts in the cerebellum. While this is seen in all patients, it can be more severe in pediatric patients due to their higher heart rates.

Do NOT add a parallel REST slab to the scan. REST not only is ineffective at suppressing contrast-enhanced flowing blood, but it also reduces T1 contrast through the increased TR needed and through Magnetization Transfer Contrast (MTC) effects. Using a REST slab also may lead to increased motion artifacts due to longer overall scan time.

The only way to reduce flow artifacts in post-contrast T1 SE scans is to use shortest TE combined with a flow compensation gradient.

Use of T1 TSE is not recommended as inherent MTC effects reduce T1 contrast, and the pediatric patient’s inherently low T1 contrast makes it a poor choice.
Tip 4: Setting up a robust 3D T1-TFE scan

3D T1 TFE can be a good alternative in terms of resolution, high SNR, and excellent T1 contrast. Additionally, the multiplanar reformatting feature is excellent.

At 3.0T, it offers the best compromise between scan time and image contrast. It provides better T1 contrast than SE, TSE, or T1 FFE, and it’s faster than IR-TSE methods.

Watch TE and pre-pulse delay when modifying 3D T1 TFE, as these can significantly affect the outcome of brain scans.

At 1.5T, fat and water are out of phase every 2.3 ms, while at 3.0T this happens every 1.15 ms. For that reason, with “shortest” TE, little modification may already result in a shortest TE that is out of phase, especially at 3.0T. Setting TE to “in-phase” will avoid this problem.

Similarly, a user-defined pre-pulse delay of 800-1000 ms will guarantee dark CSF and enhanced gray matter/white matter differentiation. Leaving a pre-pulse delay set to “shortest” can have dramatic consequences. Turning on SENSE (factor 2), for example, will halve the shortest pre-pulse delay and CSF will no longer be nulled.

Locking in these two values allows users to freely modify the sequence without negatively impacting image contrast.

Tip 5: Use optimum inversion delay in FLAIR imaging

FLAIR imaging can be challenging in pediatric cases due to the lower SNR of inversion recovery techniques. However, because the FLAIR sequence provides so much useful information, accepting a longer scan time can be worthwhile. As usual in MRI, users need to balance scan time, SNR, and resolution.

Left image is a FLAIR adjusted for maximum SNR. The right image is a FLAIR adjusted to high spatial resolution at the expense of SNR. The middle image represents a good compromise.
When optimizing FLAIR for pediatric patients, the optimum inversion delay depends on the selected TR. As TR increases, also the optimum value for the inversion delay will increase. When a user-defined TR value is between the preset procedures values (6000 and 11000), use the inversion delays of the preset procedures as a guideline for setting the optimum inversion delay.

The high heart rates of small children lead to more flow artifacts compared to adults. Note that the number of packages affects flow artifacts in FLAIR. Dividing FLAIR scans into more packages reduces flow sensitivity. It costs more scan time, but reduces the potential for misinterpretation of images.

### Tip 6: Frequency offset test scans aid fat suppression

Fat suppression techniques are very important in pediatrics, for instance when imaging optic nerves in a neurofibromatosis case, or the goal is to find the extent of a lymphangioma.

Pediatric patients are smaller than adults, but conditions such as hydrocephalus, or implants, dental braces or shunts can make fat suppression difficult.

Fortunately, there are some superb tools on Philips MRI systems to optimize fat suppression, for instance volume shim. Also extremely useful are the frequency offset test scans in the “Orbits” folder. These very fast (~ 9 sec), low resolution scans help to fine tune fat suppression. Just a 36-second investment helps to find the optimum value for the most homogeneous fat suppression in particular patient. Note that the optimum value will change from one patient to the next.

A typical frequency offset test is shown on the right. In this example, the most homogeneous fat suppression occurs with a frequency offset of 80 Hz. This value can be plugged into all fat suppressed scans performed on this patient to achieve the best results.

Although running a frequency offset test is an extra step, it is worth it considering how much time could be wasted if a five-minute high resolution scan would have to be repeated because of poor results.

Note the dramatic improvement between the image acquired with a default orbit protocol and the image obtained with the exact same protocol, after determining the best frequency offset via the test scans.
### 3.0T

**AMIGENICS/NIC 3.0T courses**

- **Las Vegas, Nevada, USA**
  - **Info:** Colleen Perone, cperone@niclv.com, Tel. (+1) 702-214-9741

**Visiting Physician Fellowship Programs**
Combination of didactic lectures and interactive MRI case reading with experienced 3.0T MR radiologists.

**Radiology Technologist Practicum**
Hands-on experience and technical insights.

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### Breast MRI

**Advanced Breast MRI Workshop**
Cleveland, Ohio, USA
- **Date:** t.b.d.
- Two-day course for radiologists, technologists. Participants have basic knowledge of MRI, breast imaging. The course combines lectures and the clinical practice of breast MR. Note that class size for this course is limited.
  - **Info:** vicki.milligan@philips.com

**The Chicago International Breast Course**
Chicago, USA
- **Date:** Sep. 30 - Oct. 3
  - **Info:** [http://www.radiology.northwestern.edu](http://www.radiology.northwestern.edu)

**Soc. of Breast Imaging course**
Dallas, Texas
- **Date:** January 16-17
  - **Info:** [www.sbi-online.org](http://www.sbi-online.org)

### Cardiac MR

**Cardiac MR courses at CMR Academy**

**German Heart Institute, Berlin**
- All courses are for cardiologists and radiologists. Some parts will be offered in separate groups.
  - **Info:** [www.cmr-academy.com](http://www.cmr-academy.com), info@cmr-academy.com, Tel. +49-30-4502 6280

**Complete course**
- **Dates:** Feb. 8 - Mar. 19; Oct. 25 - Dec. 3
  - Intensive course including hands-on training at the German Heart Institute, and reading and partially quantifying over 250 cases

**Compact course**
- **Dates:** February 8-12; October 25-29
  - CMR diagnostics in theory and practice, including performing examinations and case interpretation.

**CVMRI Practicum: New Techniques and Better Outcomes**
St. Luke’s Episcopal Hospital, Houston, Texas
- **Date:** February 22-25; October 18-21
  - On principles and practical applications of Cardiac MRI.
  - **Info:** trose@sleh.com, Tel. +1-832-355-4201, Fax: +1-832-355-4741

**International Cardiac MR course**
Leeds, England
- **Date:** June 15-19, Oct. 18-22
  - Deals with theoretical principles and practical applications of Cardiac MRI. Daily practical scanning and post-processing sessions in small groups.
  - **Info:** [www.leedscmr.org/cardiac_course](http://www.leedscmr.org/cardiac_course), Mgreen@leedscmr.org, Tel. +44-113-3922735

**Cardiovascular MR training courses and fellowships**
St. Louis, Mo., USA
- **Date:** Spring 2010
  - Lecture format (2.5 days) or lecture plus hands-on (4 days). Also offered are hands-on technologist training courses and three-month fellowships.
  - **Info:** [ctrain.wustl.edu](http://ctrain.wustl.edu), cme@wustl.edu, Tel. +1-314-454-7459

### MR Spectroscopy

**MR Spectroscopy course (1.5T and 3.0T)**
Zurich, Switzerland
- **Date:** t.b.d.
  - Theory sessions and daily practical scanning and post-processing sessions in small groups.
  - **Info:** [www.biomed.ee.ethz.ch/education/education-centre](http://www.biomed.ee.ethz.ch/education/education-centre), dmeier@ethz.ch

**Advanced MR Spectroscopy**
Cleveland, Ohio, USA
- **Dates:** t.b.d.
  - MR engineers, research technologists, physicians, and physicists of Philips MR sites, interested in MR spectroscopy. Participants require basic MR scanning experience. Note that class size for this course is limited.
  - **Info:** vicki.milligan@philips.com
**General MR**

**Essential Guide to Philips in MRI**
Different locations, UK  
**Dates:** October 12-15  
Specifically designed for Philips users, past, present and future. It is designed to provide a modular approach to accommodate all levels of knowledge  
**Info:** lorna.smith@philips.com

**MRI self-directed visiting fellowship**
ProScan Education Foundation  
Cincinnati, Ohio, USA  
**Date:** continuously throughout the year.  
**Info:** http://www.proscan.com/fw/main/Visiting_Fellowships-448.html, mrieducation@proscan.com  
Tel. 1-866-MRI-EDUC

**Philips UK MR User Group Meeting**
Oxford, England  
**Date:** January 12  
Lectures from radiologists, radiographers and Philips on current topics and new developments. Aimed at radiographers using Philips MR.  
**Info:** lorna.smith@philips.com

**North American off-site training courses**

**Dates:** upon request  
**Info:** lori.hawkins@philips.com  
Tel. 1+440-483-2260  
Fax: +1-440-483-7946

**MR Basics**
Cleveland, Ohio, USA  
Designed for the novice technologists with little or no previous MR experience. Lectures cover the basic concepts and theory of MRI. This program is entirely didactic and theory based.

**MR Essentials for Achieva, Intera and Panorama HFO users**
Cleveland, Ohio, USA  
This comprehensive course for technologists covers all basic scanning and system functionality. Lectures cover MRI safety, scan parameters, and pulse sequences.

**MR Advanced for Achieva, Intera and Panorama HFO users**
Cleveland, Ohio, USA  
Didactic and hands-on course covering advanced applications including advanced scan parameters, pulse sequences, advanced Neuro, Ortho, Body and Breast imaging techniques.

**Extended MR WorkSpace for Achieva, Intera and Panorama HFO users**
Cleveland, Ohio, USA  
Didactic and hands-on course covering basic system maintenance, EWS functionality, and all MR analysis packages with lectures in Cardiac imaging, fMRI and Diffusion Tensor imaging and Fiber Tracking.

**Cardiac Imaging for Achieva, Intera and Panorama HFO users**
Cleveland, Ohio, USA  
Didactic and hand-on course covering all cardiac views, heart valves, Q-flow, coronary arteries and the postprocessing packages on the EWS.

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**Events calendar 2010**

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<thead>
<tr>
<th>Date</th>
<th>Event</th>
<th>Location</th>
<th>More information</th>
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<tbody>
<tr>
<td>Nov. 29 - Dec. 4</td>
<td>Radiological Society of North America – RSNA</td>
<td>Chicago, IL, USA</td>
<td><a href="http://www.rsna.org">www.rsna.org</a></td>
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<tr>
<td>January 14-17</td>
<td>American Society of Neuroimaging – ASN</td>
<td>San Francisco, CA, USA</td>
<td><a href="http://www.asnweb.org">www.asnweb.org</a></td>
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<tr>
<td>January 25-28</td>
<td>Arab Health</td>
<td>Dubai, UAE</td>
<td><a href="http://www.arabhealthonline.com">www.arabhealthonline.com</a></td>
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<td>January 21-24</td>
<td>Society for Cardiovascular Magnetic Resonance – SCMR</td>
<td>Phoenix, AZ, USA</td>
<td><a href="http://www.scmr.org">www.scmr.org</a></td>
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<tr>
<td>February 11-13</td>
<td>Joint Interventional Meeting</td>
<td>Rome, Italy</td>
<td><a href="http://www.jim-vascular.com">www.jim-vascular.com</a></td>
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<tr>
<td>February 18-21</td>
<td>American Society of Spine Radiology – ASSR</td>
<td>Las Vegas, NV, USA</td>
<td><a href="http://thesrr.org">thesrr.org</a></td>
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<tr>
<td>March 3-6</td>
<td>Advances in Breast Imaging and Intervention</td>
<td>Las Vegas, NV, USA</td>
<td><a href="http://radiologycme.stanford.edu/dest">radiologycme.stanford.edu/dest</a></td>
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<tr>
<td>March 4-8</td>
<td>European Congress of Radiology – ECR</td>
<td>Vienna, Austria</td>
<td><a href="http://www.myesc.org">www.myesc.org</a></td>
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<tr>
<td>March 14-16</td>
<td>American College of Cardiology – ACC</td>
<td>Atlanta, GA, USA</td>
<td><a href="http://acc10.acc.org">acc10.acc.org</a></td>
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<tr>
<td>April 8-10</td>
<td>German Cardiac Society – DGK</td>
<td>Mannheim, Germany</td>
<td><a href="http://ft2010.dkg.org">ft2010.dkg.org</a></td>
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<tr>
<td>April 10-13</td>
<td>Charing Cross Symposium</td>
<td>London, UK</td>
<td><a href="http://www.cxsymposium.com">www.cxsymposium.com</a></td>
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<tr>
<td>April 10-13</td>
<td>American Academy of Neurology – AAN</td>
<td>Toronto, Canada</td>
<td><a href="http://www.aan.com">www.aan.com</a></td>
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<tr>
<td>April 13-17</td>
<td>Society for Pediatric Radiology – SPR</td>
<td>Boston, MA, USA</td>
<td><a href="http://www.pedrad.org">www.pedrad.org</a></td>
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<tr>
<td>April 23-25</td>
<td>Cardiac MRI &amp; CT - Clinical Update 2010</td>
<td>Cannes, France</td>
<td><a href="http://cannes2010.medconvent.at">cannes2010.medconvent.at</a></td>
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<tr>
<td>May 1-5</td>
<td>American Association of Neurological Surgeons – AANS</td>
<td>Philadelphia, PA, USA</td>
<td><a href="http://www.aans.org">www.aans.org</a></td>
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<tr>
<td>May 12-15</td>
<td>American Society of Neuroradiology</td>
<td>Boston, MA, USA</td>
<td><a href="http://www.asnr.org">www.asnr.org</a></td>
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<td></td>
<td>Paris Course on Revascularization – EuroPCR</td>
<td>Paris, France</td>
<td><a href="http://www.europcr.com">www.europcr.com</a></td>
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</table>
What inspired our MultiTransmit innovation in 3T?
No two patients are alike.

The Achieva 3.0T TX automatically adjusts to each patient’s unique anatomy. Its MultiTransmit parallel RF transmission technology tailors the RF signals to provide consistent high image quality and reduced scan times – across a broad range of clinical applications. Make diagnoses based on information that is fast, robust and reliable. It just makes clinical and economic sense. To learn more, please visit us at www.philips.com/AchievaTX.

*Because our innovations are inspired by you.