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# High Performance Gradients Drive Future MR Applications

## The Signa® MR750 Gradient System

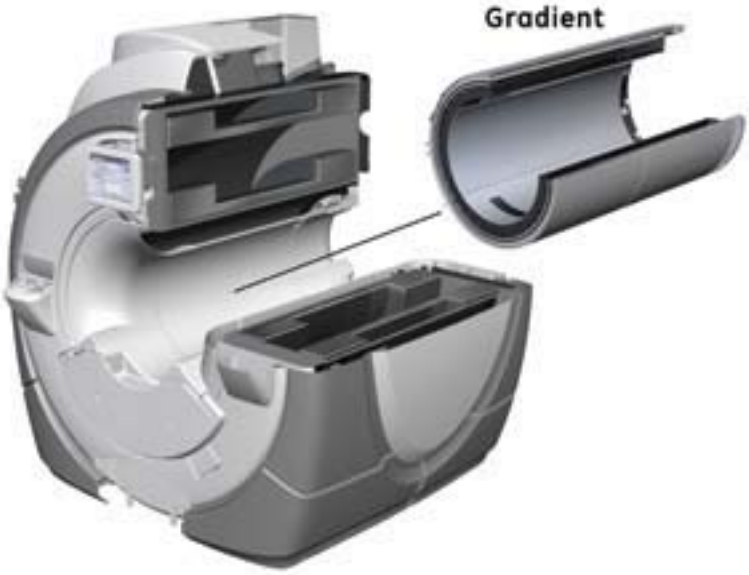
*By Bryan J. Mock, PhD, 3.0T MR Product Manager*
*and Jason A. Polzin, PhD, MR Chief Engineer, GE Healthcare*

As MR applications continue to evolve, higher performance levels are required of the MR gradient subsystem. Advanced applications such as fMRI, high-angular resolution diffusion tensor imaging, spiral, in/out of phase breath-held abdominal examinations at 3.0T and spectroscopy rely heavily on the MR gradients to produce consistent and reliable high quality data. Equally important is the ability of the gradient to manage thermal challenges, gradient induced noise and peripheral nerve stimulation limits (dB/dt).

At the heart of the Signa MR750 system is a newly designed whole-body gradient coil – the eXtreme Gradient Resonance Module (XRM) – and high-power amplifier – the eXtreme Gradient Driver (XGD). Together, the XRM/XGD deliver a 50 mT/m gradient field on each axis (X, Y, & Z) simultaneously to maximize gradient amplitude and slew rate at of 200 T/m/s, yielding a zero to full-scale rise time of 250μ sec. This also minimizes coil inductance to provide the proper current density for peak performance level. The result is a gradient subsystem that serves today's demanding clinical applications while providing an uncompromised platform for the development of future applications.

To accommodate for the variation in AC/DC resistance, the Signa MR750's XRM gradient coil utilizes a unique water-cooled thermal-electrical cooling circuit that is five times more efficient for extracting heat from the system. Similarly, the Signa MR750's XGD incorporates digitally controlled feedback, switching-optimized power generation devices and direct-cold plate heat transfer technology to manage the thermal load within the amplifier. As a consequence, the thermal management approach maximizes system performance by 60 percent and improves subsystem reliability by a factor of 10.

Enhanced gradient performance does not translate into increased acoustic noise on the Signa MR750. The system architecture along with GE's Quiet Technology 2.0 minimize the mechanical interactions within the magnet that generate acoustic noise. The effect is up to 50 percent reduction (six to eight dB) in acoustic noise levels.




Improved gradient subsystem linearity can impact the rate at which the magnetic field is switched (dB/dt) due to peripheral nerve stimulation limits. To address this issue, the Signa MR750 incorporates an automated gradient pulse sequence optimization algorithm that minimizes the number of overlapping gradient ramps. This approach enables a slew-rate that stays within peripheral nerve stimulation limits to achieve shorter TEs and TRs.

Overall, the Signa MR750's gradient efficacy is achieved by a design that takes the gradient coil and driver into account as a single subsystem to deliver the performance researchers desire. ■

**For the complete white paper, please visit www.gehealthcare.com/signapulse.**