An 8-Channel Body Array Coil for Abdominal Parallel Imaging at 3.0T

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INTRODUCTION Abdominal imaging, due to patient's breathing and breath-hold requirements, benefits significantly from the use of parallel imaging (PI) techniques such as SENSE [1]. In particular, the PI approach becomes a very powerful tool when combined with a PI optimized coil and a higher B_0 system (i.e., > 1.5T) that produces more SNR, and, in return, this SNR increase may be exchanged for reducing T_s while maintaining clinically usable image quality. To serve this purpose, we have developed an 8-channel body array coil for parallel imaging at 3T.

METHOD The coil consists of anterior and posterior sectors as shown in Fig. 1. Each sector has 4 rectangular loops, and each loop (32cm by 11cm) is tuned at 127.73MHz. The loop positions have been determined by minimizing g-factors. As a result, this coil is a "non-overlap" design, as has been reported in [2]. The mutual inductance was minimized by using a "mutual-inductance" cancellation PCB between the adjacent loops. The anterior and posterior sectors are covered with soft/flexible materials to provide comfort to patients (Fig. 2). To address patient's claustrophobia, a patient goes into a bore with feet-first. To satisfy this application, the system cables have been made longer (i.e., approximately 1.5m). In so doing, we paid careful attention to the design of the cables from the standpoint of cable stability (i.e., "cold") and positions of baluns (Fig. 1). If the baluns are positioned at high E-field regions, heating may occur, which is a serious safety concern at 3.0T. Thus, the transmitter body coil (GE Signa EXCITE 3T) was examined with an E-field probe (dipole antenna) to identify where to position the baluns.

EXPERIMENTS & RESULTS Using the developed coil, various images have been obtained. Shown in Fig. 3 are a coronal image with 2D FGRE and an image of ovaries with fat suppression (FSE). For these 2 images, the PI technique was not applied. They both exhibit excellent anatomical image quality at 3.0T. Taking the advantage of 3.0T SNR and the PI technique with R=2, shown in Fig. 4 is a high-resolution axial image obtained with 512 x 512 data points collected in 30s. The image quality is excellent.

CONCLUSION We have developed an 8-channel body array coil for abdominal parallel imaging at 3.0T and demonstrated its superior performance in various clinical applications. 3.0T MRI whole-body systems together with optimized array coils for different anatomies are truly becoming high-end routine clinical scanners.

REFERENCES [1] K. P. Pruessmann, et al., MRM, 42, pp. 952-962, (1999).
[2] M. Weiger, et al., MRM, 45, pp. 495-504, (2001).

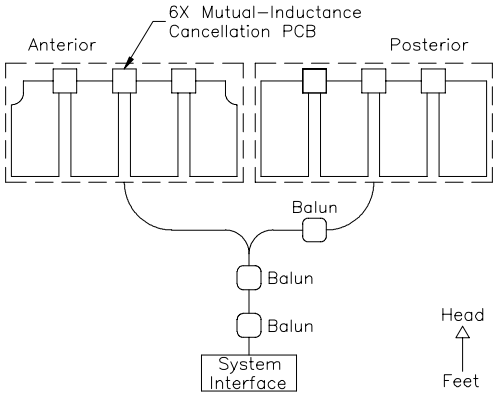

Fig. 1 Schematic representation of the 8-channel body array coil

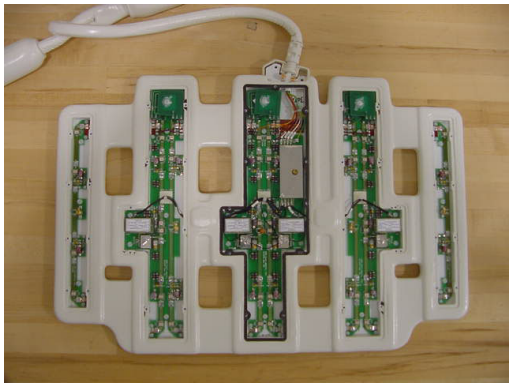

Fig. 2 Flexible-material (anterior sector)

Fig. 3 Left: 2D FGRE (liver; T_s = 23s; breath hold [yes]); Right: FSE-XL (ovaries with fat suppression; T_s = 2:48; breath hold [yes])

Fig. 4 Axial FGRE w/ R=2 (T_s = 30s; breath hold [yes])