**The Twisted coil: A New Strip Array Coil Topology for 3D SENSE**

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**Abstract:** In this work, a new planar strip array coil topology is presented. It allows one to use SENSE in two phase-encoding directions and hence significantly decreases the scan time for a 3D image without increasing the number of receiver channels.

**Method:** Multi-channel coils are aimed at reducing g-factor for parallel imaging. While development has proceeded with larger arrays of smaller coils, this work is focused on improving the spatial encoding efficiency from a limited number of coils. A straight cylindrical strip array” coil cannot accelerate in z (Fig. 1). However, by twisting the striplines (Fig. 2), we rotate the coil sensitivity profile in the xy-plane as we move along z, such that the aliased data for a given coil element do not overlap in z upon acceleration (Fig. 3).

**Computer simulation:** Simulations have shown that for an acceleration factor of 4 or higher, the g-factor map for an accelerated 3D image is better if we accelerate in 2 directions (y and z) compared to only y. We compare on Fig. 4 and 5 an accelerated image and the associated g-factor map obtained with a straight coil with those obtained with a twisted coil for an acceleration factor of 8. One can see that it is advantageous to be able to accelerate along y and z since the g-factor mean is really less important for the twisted coil than for the straight coil. The g-factor for the twisted coil is very high at the center of the xy-plane because the coils share the same information.

**Discussion:** The initial results obtained with the twisted coil demonstrate increased acceleration and better SNR for 3D acquisitions without the need to add additional receiver coil channels. It is worth noting that this study assumes that the striplines length are small compared to the wavelength since it has been done for a small coil at 3T. That means that the magnetic field amplitude does not vary along z. However it should be less than 360 degrees so that the coil profiles along z do not share the same information.

**References:**