# Dual-Coverage T/R Phased Array Coil for Knee Imaging at 1.5T Tesla

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**Synopsis**

A T/R phased array coil for knee imaging at 1.5 Tesla was constructed and tested. The coil uses a quadrature birdcage coil to transmit and an array of six dual-coverage surface coils to receive signal. Each coil in the array is critically coupled to its neighboring coils to minimize the interaction. The dual-coverage coil has two working modes: The full mode that has S/I coverage of 16cm for normal knee imaging and the zoom mode with S/I coverage of 10cm for high-resolution knee imaging.

**Introduction**

The SNR advantage of using an array of small RF coils to image large volume is well known (1), usually, SNR increases with the reduction of coil size. For knee imaging, the typical S/I coverage of a knee coil is about 16cm, however, when imaging using smaller FOV (e.g. 10cm) at same resolution, signal-to-noise will decrease. The dual-coverage knee coil offers a zoom mode that has S/I coverage of 10cm, in addition to the full coverage mode, so that smaller FOV knee imaging can be performed without loss of SNR.

**Method**

Fig. 1 shows the structure of the dual-coverage phased array knee coil, a 12 rung quadrature birdcage coil is used to generate uniform transmit B1 field, and the MRI signal is received through an array of six individual lattice-shaped coil elements, the width of the coil element is 12cm, and the lengths of outer and inner loops are 16cm and 10cm. The outer and inner loops can be activated separately using DC bias current to create two different image modes, when the outer loop is activated, the coil can be used for normal knee imaging with typical FOV of 16cm, and the inner loop can be used for small FOV, high resolution imaging with FOV of about 10cm. The adjacent loop element are overlapped to minimize coupling, and the coil element are further isolated with each other using low input impedance preamplifiers. The inner diameter of the coil is 22cm.

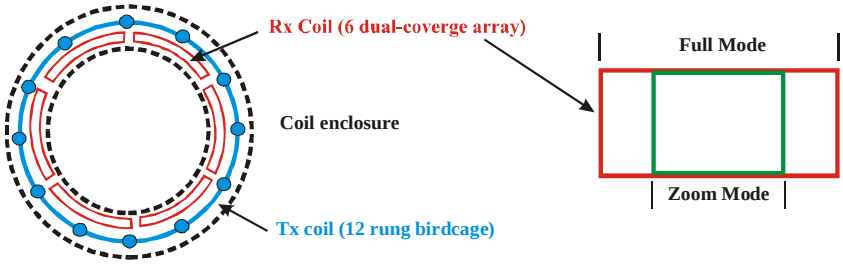
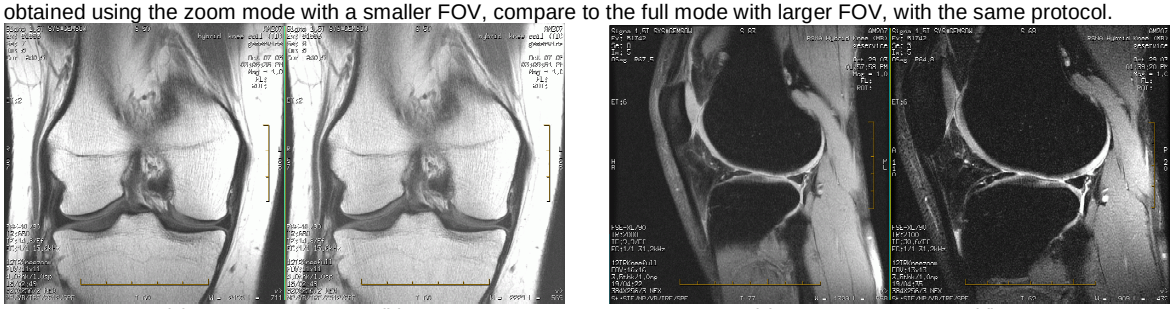



Fig.1 Concept of T/R dual-coverage phased array knee coil

**Results**

The dual-coverage phased array knee coil was used on a General Electric Excite 1.5 Tesla system, Fig.2 (a) and (b) show the comparison of coronal images in a human subject with full mode (a) and zoom mode (b) of the coil, with the same FOV and image protocol, and Fig. 2 (c) and (d) show the sagittal images using full mode with larger FOV (c) and zoom mode with smaller FOV (d), using the same image protocol. Higher signal-to-noise ratio was observed with the zoom mode of the coil using same imaging protocol and FOV, compare to the full mode, and similar image quality was obtained using the zoom mode with a smaller FOV, compare to the full mode with larger FOV, with the same protocol.



(a) (b) (c) (d)

Fig.2 Clinical results of dual-coverage knee coil

**Conclusion**

A dual-coverage T/R phased array knee coil was constructed and evaluated on a 1.5 Tesla MR system, initial results suggest some benefit on the image quality for small FOV knee imaging using the zoom mode of the coil.

**References**

(1) P.B. Roemer, W.A. Edelsten, C.E. Hayes, S.P. Souza and O.M. Mueller, “The NMR Array”, Magnetic Resonance in Medicine 16, 192-225 (1990)