

A Novel Four-Channel Phased Array Coil With A Special Shield For Cardiac Functional Imaging

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INTRODUCTION

MRI is playing an increasingly important role in the evaluation of cardiovascular disease. How to improve the signal-to-noise ratio (SNR) of cardiac imaging is one of the important issues for cardiovascular research[1-2]. Usually transmit/receive arrays are used in the 1.5T, 3T and 7T MRI for decreasing RF inhomogeneities and increasing SNR. Strengthening the effect of transmitting radio frequency(RF) can improve SNR under the ruled specific absorption rate(SAR). In this work, a novel shield circuit is proposed to strengthen transmitting magnetic field(B1) and we have got much higher SNR with our new coil.

METHODS

The proposed phased array coil is composed of two parts as shown in Fig. 1. One is the phased array circuits with low noise amplifiers. The other is the proposed shield circuit. The proposed shield circuit in upside is made with one-fourth wave length copper tapes . Bottom layer is made of foam material. The shield size is enough big to cover phased array coil. The proposed shield circuit is lied at between body coil and phased array coil. Using the proposed shield circuit, we can improve B1 homogeneity and strength when RF waves are transmitted from body coil. Because the metal is placed in inductor, inductance will be improved. So transmitted magnetic field strength will become much stronger. In our proposed shield circuit, we utilized one-fourth wave length copper tapes to strengthen the effective rate of transmitter.

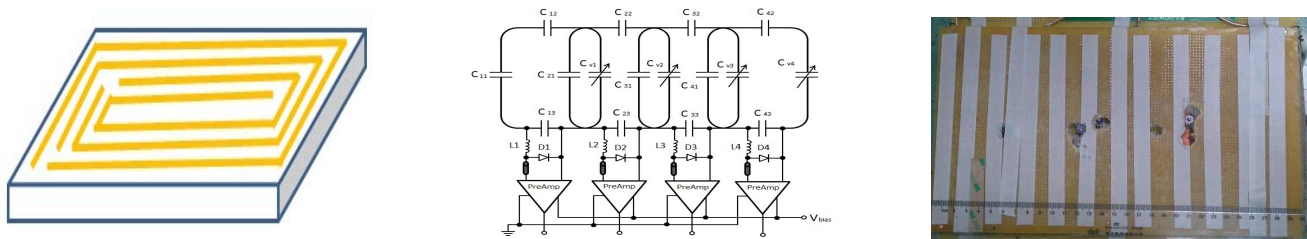


Figure1 The proposed shield(left), circuits(middle) and the combined 4-channel phased array coil(right).

RESULTS AND DISCUSSION

Using our proposed coil, we can achieve much higher SNR and quality of cardiac imaging in 3T system. The SNR of this work is about 1.5 times than commercial coils under the same conditions such as size, channels, phantom and pulse sequence etc in Fig.2 . Right pictures in Fig.2 and Fig.3, respectively are from this work. Using True-FISP pulse sequence, cardiac functional imaging for human was evaluated in Fig.3. The experiment result also confirms higher SNR and image quality same as phantom test. In the future work, we will optimize our coil design and adopt acceleration technique to get much higher SNR and calculate its g-factor.

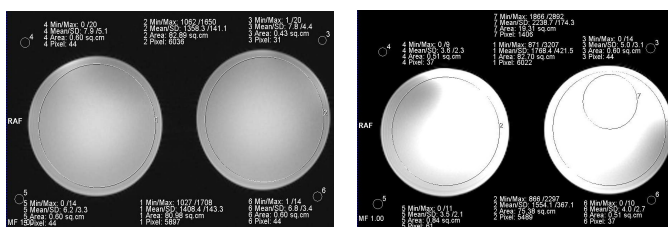


Figure2 Phantom test results

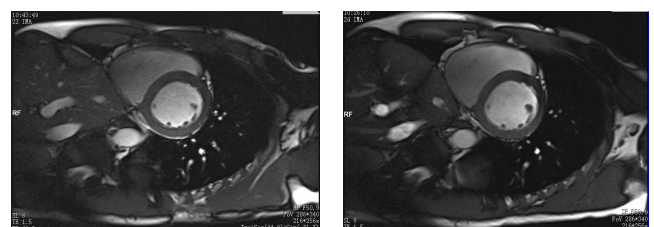


Figure3 Human test results

CONCLUSION

A novel 4-channel phased array coil for cardiac functional imaging was developed and evaluated with a special shield circuit. Using our proposed special shield circuit, high quality pictures of phantom and human are achieved. Comparing with the same kind of commercial coils, our proposed phased array coils have 1.5 times SNR than commercial coils.

REFERENCES

1. Scott B King et al. Proc. ISMRM 2012, P.2647.
2. C. J. Snyder et al. Proc. ISMRM 2011, P.165.