300 MHz RF coils for MR studies of *Macaca mulatta* brain at 7 Tesla

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Introduction

MR techniques in monkeys complement uniquely brain research in humans and the large body of systems neuroscience work in animals [1,2]. Critical factor for any spatiotemporally resolved MR experiment is the construction and optimization of form- and aim-specific rf coils. Therefore, besides general purpose homogeneous coils with minimum size, we designed and built a variety of rf coils, customized for a *vertical* ultra high field 7 Tesla system develop for vision research in the alert, trained macaque.

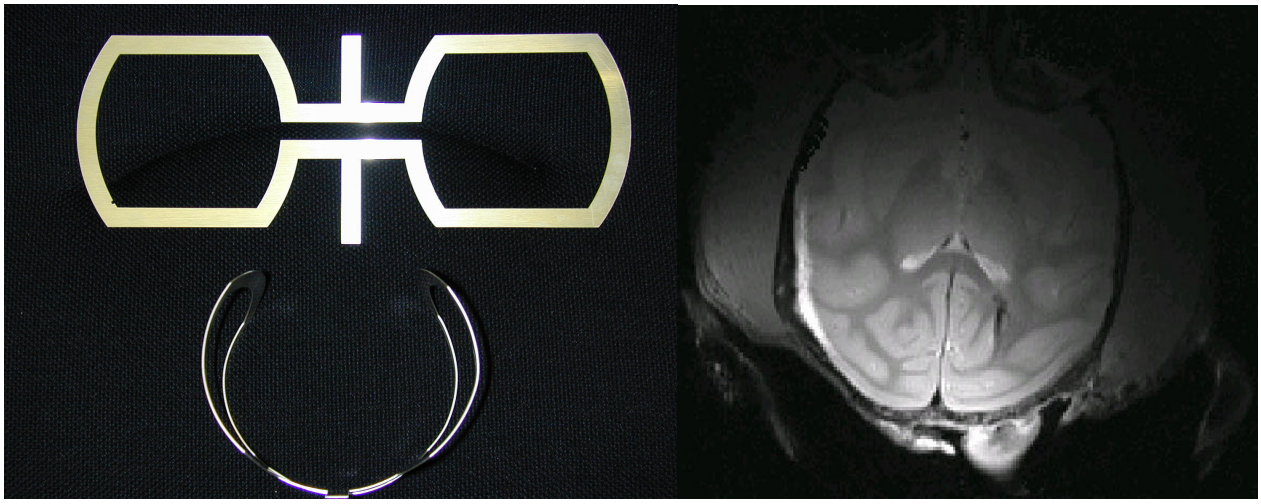
Methods

A prototype primate chair was designed and built for the vertical 7-Tesla/60-cm BRUKER Biospin system. The 300 MHz coils, which are further developments of 200 MHz probes shown previously [3,4], were built using custom-cast epoxy- or acrylic formers and silver stripes or silver rods with inserted ceramic capacitors ea. respectively. We built a variety of surface coils, quadrature surface coils, saddle coils and surface coil assemblies for hetero-nuclear studies. Decoupling was achieved by geometry and the use of pin-diodes, forward-biased with 120 mA or, negatively biased with -30V using a standard device from Bruker.

Results

MRI experiments were performed with spin echo, FLASH, and inversion-recovery sequences. In the figure, a CAD-milled silver stripe substrate is shown, used to construct a tight-fit saddle coil for anatomical studies. The substrate is machined, bent around a cylindrical epoxy former (bent structure at lower left), and later cut in segments for insertion of ceramic capacitors. The T2 image of the visual cortex on the right was obtained with a 80-mm surface coil (0.5 x 0.5 x 2 mm, TE 12.7 ms, TR 5 s, FOV 12.8 cm).

For the monkey head, dielectric resonances were not yet found to be prominent at 300MHz. Customizing of rf probes was found to be a necessity and exhibit a s/n gain of 3-35 as compared to large standard coils. The sensitivity obtained in the first MR images as acquired with the customized coils promises the ultra-high resolution required for detailed neuroscience questions.



References

1.2.3. Logothetis NK et al. [1999] *Nature Neurosci.(2)(6):555-62,* [2001] *Nature (412)150-157,* [2002] *J.Neurosci.Meth, in press.* 4. Merkle H et al. [1999] *MAGMA 8 Suppl.1,532.*

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