RF coils for high resolution imaging of the human visual cortex at ultra-high fields

Propositions of the thesis

RF coils for high resolution imaging of the human visual cortex at ultra-high fields

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1. Anatomical, functional and quantitative MR imaging methods at ultra-high fields have become essential tools for studying and understanding the functional and structural organization in the human cortex.
2. A densely populated, small diameter, conformal phased array coil will show increased SNR gains (over a volume coil), through a combination of a tight-fitting former and small coil loops.
3. Electromagnetic simulations are indispensable for RF coil development.
4. Cable traps are an underrated component in the RF chain.
5. Ultra-high resolution (<60µm) images can be acquired on a wide-bore, 9.4T system by using parallel-transmit (pTx) methods in conjunction with optimized receiver arrays on large, ex-vivo samples that would otherwise not fit in a pre-clinical, animal scanner.
6. A combination of homogeneous transmit excitations and superior receive signal SNR can help acquire 100µm isotropic GRE T_2* weighted data over the entire post mortem human brain sample, allowing clear definition and contrast of anatomical structures in the deep brain nuclei and especially in the cortical grey matter.
7. The ability to rotate the sample container on top of a coil surface and tilting the coil surface, thereby providing 2 full degrees of rotational freedom, enables advanced phase contrast and quantitative susceptibility imaging while also allowing diffusion imaging with up to √3 more diffusion gradient amplitudes and hence up to 3 times higher b-values.
8. Dipole elements will generally outperform traditional loops when imaging deep-lying anatomical structures.
9. The electric things have their life too. Paltry as those lives are. – *Rick Deckard, Do Androids Dream of Electric Sheep?*
10. The future is already here — it's just not very evenly distributed. – *William F. Gibson*