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Tue-Mo-Po2.06-01 [32]: Several Key Issues in 14 Tesla Whole body MRI Magnet development

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Understanding the human brain in neuro scale is one of the main scientific challenges in the future. The sub-micron Magnetic Resonance Imaging (MRI) is significant to the structural and functional research of the human brain. The important way to improve the resolution of MRI scanner is increasing the magnetic field B_0 , as it is well known that the signal to noise ratio (SNR) is proportional to B_0 : $SNR \propto \gamma^{5/2} B_0^{3/2}$. In the early 2000s, the French Alternative Energies and Atomic Energy Commission (CEA) launched a great program to conceive and build a 'human brain explorer', the first human MRI scanner operating at 11.7 T, the prospective resolution of this MRI scanner is 100 μm . now the magnet system of this MRI scanner is under test. After 11.7 T, the next challenge will be 14 T. Which can be anticipated that the ultra-high field (UHF) magnet system of 14 T MRI will be a great challenge of superconducting techniques, due to its such high field and large size of aperture. In 2017s, Chinese government launched a program to develop the key technologies in 14 MRI magnet system. In the past year, several key issues have been set up and the corresponding R&D programs have been made, which will be discussed in this article.

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