Research Progress in 2022 on Low-field Portable MRI

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Magnetic Resonance Imaging (MRI) offers the best soft tissue contrast without ionizing radiation. However, it is trapped in the radiology department in a hospital or a research institute because of the siting requirements (in terms of space, floor loading, and location with minimum external interferences) and high cost (upfront on and maintenance). Recently, low-field MRI is revisited with the intention to simplify the hardware to reduce the size of an MRI system for portability since [1]-[4]. It has been a fast-growing area since 2015.

In 2022, there are intensive research work on different aspects of low-field portable MRI. Magnet design is a major part because the size of the magnet directly decides the size of an MRI scanner. In [5], a high-performance inward-outward (IO) ring based permanent magnet design (shown in Fig. 1 (a)) was proposed for head imager. It has a high magnetic field strength of 110 mT, a monotonic field pattern, and a light weight (126kg). Different from the well-known Halbach array [3-4], IO-ring array has the field pointing in the longitudinal direction, which leads to a number of advantages such as no compromised coil sensitivity for surface coil/coil array and easy pre-polarization. For designs of RF coils, asymmetric tapered solenoid designs (shown in Fig. 1(b)) for a Halbach-based head MRI where the B1 field sensitivity is considerably increased without compromising too much field homogeneity [6]. Besides, noise suppression using AI is shown to be effective [7]. Besides the mentioned above, in this talk, other research progress in 2022 on low-field portable MRI will be reviewed and discussed in detail.

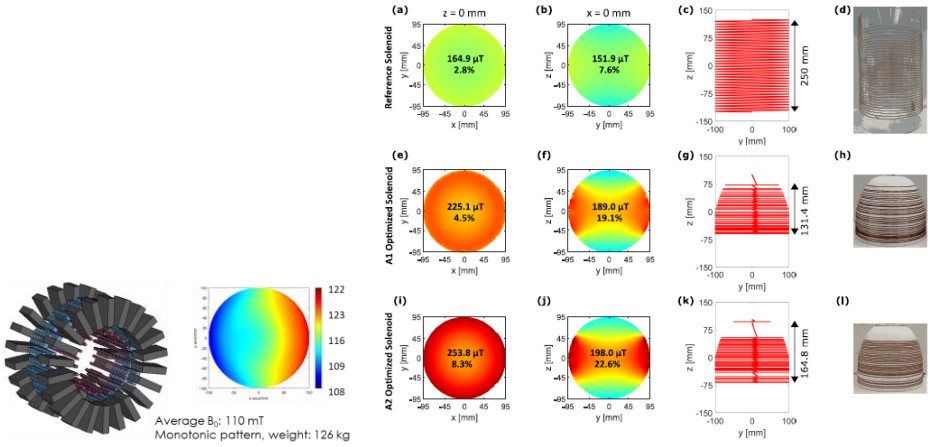

Figure 1. (a) High-performance IO-ring based permanent magnet design for head imager [5], (b) asymmetric tapered solenoid designs for a Halbach-based head MRI

References

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