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Abstract

A hyperthermia insert for a preclinical MPI scanner incorporating auxiliary devices

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Additive manufacturing is a useful method for rapid prototyping in applications where subtractive manufacturing methods are improbable to use or generate a lot of effort. Such an application is combining magnetic fluid hyperthermia (MFH) and magnetic particle imaging (MPI) into a theranostic platform, due to restrictions on installation space and functional design. When extending forementioned MFH-MPI theranostic platform with the capability to incorporate auxiliary devices, the restrictions on space are even more demanding. However, allowing the installation of additional devices opens the pathway for new medical scenarios, e. g, integration of an ultrasound transducer for simultaneous ultrasound diagnostics [1], fiber-guided laser applications for ablation therapy [2] or special purpose coils for higher resolution in MPI imaging [3].

The recently developed system provides MFH capability based on a self-compensating winding technique [4], like the one presented by Wei et. al. [5]. However, the current system provides installation space, as well as space for cabling of an additional the auxiliary device. Considering the already restricted space for the MFH device, additional space restrictions lead to challenges in construction, which can be resolved using additive manufacturing.

The authors present the design, as well as the manufacturing process using a stereolithographic additive manufacturing technique, to realize an MFH-MPI theranostic platform capable of incorporating auxiliary devices.

Author's statement

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