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A Review Paper on Solving MRI-Related Issues through Additive Manufacturing

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Abstract: *This study uses cutting-edge materials and additive manufacturing (3D printing) to improve MRI technology. High-performance gradient coils are produced automatically by a 3D printing system and software, allowing for high-resolution imaging (50 µm) in a matter of seconds. A new multi-layer Litz wire addresses overheating in high-frequency applications such as cardiac imaging by reducing resistive losses by 80%. By using thin conductive layers, additive manufacturing also increases the MRI coils' flexibility and cooling. A 3D-printed tungsten collimator reduces eddy currents for SPECT/MRI integration, improving compatibility. MRI artifacts are reduced by 10% with lightweight titanium implants, namely those with a honeycomb cranioplasty design. Furthermore, ultra-short echo time (UTE) MRI provides a safe substitute for medical 3D printing by producing radiation-free 3D medical models with small deviations (<1.5 mm). These developments highlight the revolutionary potential of additive manufacturing in medical imaging by improving MRI efficiency, accuracy, and patient safety.*

Keywords: MRI, Litz wire, Additive manufacturing, RF coils

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