Philipp Amrein

MRI hardware engineer | Creator and maintainer of CoilGen

pamrein11@mgh.harvard.edu | coilgen.org | github.com/Philipp-MR

MRI hardware engineer focused on RF and gradient coil design, electromagnetic modeling, and mathematical optimization of winding patterns. Creator and maintainer of CoilGen, connecting target magnetic fields and support geometry with computational coil layout and evaluation.

PROFESSIONAL EXPERIENCE AND EDUCATION

Martinos Center | Current work

MRI hardware work at the Athinoula A. Martinos Center for Biomedical Imaging with Jason Stockmann.

Neoscan | DYNAMIC 14 T MRI project

Main coil designer for Neoscan's DYNAMIC 14 T MRI project in the Netherlands; responsible for designing the coil layouts.

University of Freiburg | Doctoral research

Gradient coil design with Maxim Zaitsev and Sebastian Littin. Developed CoilGen during this work, integrating stream-function optimization, contour processing, interconnection and coil evaluation. Read doctoral thesis at University of Freiburg.

University of Freiburg | Master's research

Master's thesis on RF coil design with Jan-Bernd Hövener in Freiburg.

University of Freiburg | Physics studies

Studied physics, establishing the basis for subsequent RF and gradient coil research.

SELECTED PROJECT CONTRIBUTIONS

CoilGen | Magnetic coil layout generation

Developed the design pipeline from triangulated support meshes and target fields to optimized surface currents, contour topology, connected winding paths, and field and electrical evaluation. Research includes generated cylindrical and biplanar geometries and reproducible parameter studies.

CoilGen2 | Python implementation and scientific workbench

Current development combines a class-based Python API and Qt/VTK interface with intrinsic mesh topology, constrained optimization, routing, conductor export, and field, electrical and geometry diagnostics. Numerical examples support engineering review; they are not fabrication-qualified hardware.

TECHNICAL EXPERTISE

RF and gradient coils; electromagnetic field modeling; constrained optimization and regularization; stream functions and mesh geometry; winding topology and routing; MATLAB and Python; reproducible numerical studies.

SELECTED PUBLICATION

Amrein P, Jia F, Zaitsev M, Littin S. **CoilGen: Open-source MR coil layout generator.** Magnetic Resonance in Medicine. 2022;88(3):1465-1479. doi:10.1002/mrm.29294.

Career sequence supplied by Philipp Amrein; dates omitted where not provided.