Modeling and Evaluation of EML Rail Cooling Methods though Finite Elemental Analysis

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ABSTRACT

Future naval tactical Electromagnetic Launchers (i.e. Railguns) will need to be capable of repeatedly firing six to twelve rounds per minute. Due to the 1 – 6 MA of current flowing through the rails, an intense active cooling system must be implemented in order thermally manage the gun. To accurately account for the necessary amount of heat to be removed, a 3D Electromagnetic-Thermal-Dynamic model in Comsol was created to solve for the thermal loading. Integrating this software with MatLab, various models, including an axial FP-OHP, spray/forced convection, cooling channel, and control model were tested for a repeatedly fired gun system. Finally, a 2D structural optimization within Comsol and MatLab was created to evaluate the feasibility and optimization of an axial FP-OHP design.