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A testbed for an augmented railgun to be powered by superconducting coils

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A very important topic in the field of electromagnetic accelerators of the railgun-type is the realization of an appropriate power supply. So far, three different ways of storing energy for railguns have been explored: electric fields, magnetic fields and kinetic energy corresponding to capacitors, storage coils and fly wheels respectively. The project to be presented here and funded by the French DGA consists in building a railgun which is powered by superconducting magnetic energy storage (SMES).

Augmented electromagnetic railguns are offering interesting options in comparison to simple classical railguns. For instance, if the same action integral is applied to the armature, an augmented railgun allows for obtaining higher kinetic energies. In the context of the project described here, the augmented railgun allows for an elegant setup as the augmented coils are made from superconducting materials and are therefore used as energy storage.

The paper describes the current phase of the project from the launcher point of view. This phase is characterized by developments taking place in different laboratories. The SMES is developed jointly by the company Sigmaphi (Vannes) and the Néel institute (Grenoble) and is assembled in Grenoble, whereas the augmented railgun is built and studied at the French-German institute of Saint-Louis (ISL). Therefore, the ISL has to develop a testbed which allows the operation of the augmented railgun under similar conditions as in the SMES circuit. Only during the last phase of the project, the joint operation of both devices will be studied in Grenoble.

The project does not yet aim at competing with currently available high power launchers. The stored energy is about 30 kJ and the goal for the velocity of the launch is 100 m/s. The aim is about exploring the technical potential of a combination of superconductivity and electromagnetic launch.

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