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Thermomagnetic mechanism for self-cooling cables LUCA DE' MEDICI, European Synchrotron Radiation Facility — A solid-state mechanism for cooling high-current cables is proposed based on the Ettingshausen effect, i.e., the transverse-thermoelectric cooling generated in magnetic fields. The intense current running in the cable generates a strong magnetic field around it that can be exploited by a small current running in a coating layer made out of a strong thermomagnetic material to induce a temperature difference between the cable core and the environment. Both analytical calculations and realistic numerical simulations for the steady state of bismuth coatings in typical magnetic fields are presented. The latter yield temperature drops $\simeq$60 K and >100 K for a single- and double-layer coating, respectively. These encouraging results should stimulate the search for better thermomagnetic materials in view of applications such as self-cooled superconducting cables working at room temperature.

Luca de' Medici
European Synchrotron Radiation Facility

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