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Permanent Magnet Dipoles For the ESRF Upgrade

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The new magnet lattice of the European Synchrotron Radiation Facility (ESRF) will include 128 Permanent Magnet (PM) dipoles presently under in-house construction. It requires about 6 tons of high coercivity Sm₂C₀₁₇ permanent magnet material subdivided into 12,300 blocks. The choice of the permanent magnet technology is motivated by an energy-saving context, the compactness of the magnet lattice and also a long experience acquired in this area with Insertion Devices at the ESRF. Each dipole has a length of 1.784 m and is segmented into five modules with different field strengths in order to achieve a longitudinal field gradient as it contributes to the reduction of the horizontal emittance of the stored electron beam. From the concept to the serial production, the project involves several interesting topics such as detailed numerical simulations, a passive method for the temperature stabilization of the magnet, a full methodology for the modules and dipoles assembly and dedicated magnetic measurement methods as well. Critical subjects, such as long term stability of the PM dipoles, are discussed. A review of the project will be presented.

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