

Magnets for the ESRF Diffraction Limited Light Source Project

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Abstract — A major upgrade of the European Synchrotron Radiation Facility (ESRF) is planned for the coming years. A new storage ring will be built in place of the present one, aiming to decrease the horizontal emittance and to improve the brilliance and coherence of the X-ray beams. The lattice of the new ESRF storage ring relies on magnets with demanding specifications: dipoles with longitudinal gradients (fields ranging from 0.17 T up to 0.67 T along 1.85 m), strong quadrupoles (up to 90 T/m) with large vertical gaps, combined function dipole-quadrupoles with high gradients (0.57 T and 37 T/m), and strong sextupoles and octupoles. The design of these magnets is based on innovative solutions; in particular, the longitudinal gradient dipoles are permanent magnets and the combined dipole-quadrupoles are single-sided devices with a large vertical aperture on one side. The high gradient quadrupoles rely on a more conventional design, except that these magnets have been optimized at a saturated working point. Significant effort has been put into the power consumption of all of the magnets. The design of the magnets is now well advanced and prototypes of dipoles with longitudinal gradients and high gradient quadrupoles have been built. The procurement of the magnets has started.

Keywords (Index Terms) — Accelerator magnets, magnet design, multipoles, permanent magnets, combined magnets, dipole-quadrupoles, magnetic measurements.