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## New Tunable High Gradient Permanent Magnet Quadrupole for Plasma Wake Field Acceleration at SPARC\_LAB

*Wednesday, September 18, 2019 7:00 PM (1 hour)*

Applications such as colliders and plasma wake field acceleration require high gradient quadrupoles, in the range of 400-500 T/m and with a bore of few millimeters in diameter.

The design of a tunable high gradient permanent magnet quadrupole, based on the QUAPEVA design developed for the SOLEIL synchrotron, is presented. The quadrupole has a fixed part made of a Halbach quadrupole surrounded by four permanent magnet cylinders with a radial orientation of the magnetic momentum. The gradient is regulated by rotating the cylinders, reaching a tunability greater than the 25%. The main improvements with respect to the SOLEIL configuration are the gradient increasing from 200 T/m to more than 500 T/m, and a near vanishing of undesirable skew quadrupole components.

The quadrupole has been designed for the COMB plasma wake field experiment for the SPARC\_LAB test-facility at INFN-LNF, one of the candidates to host the EuPRAXIA project. The present layout foresees two triplets where the focusing strength tuning is performed by moving two quadrupoles of each triplet along the beam axis. The new quadrupoles have bigger gradient and less multipolar content than actual ones, moreover a tuning system that does not need any shift of the magnet.

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