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A New Concept for Variable-Period Undulators

The May 2003 issue of the Journal of Synchrotron Radiation has as its cover story an article by Gopal Shenoy (XFD), John Lewellen (ASD), Deming Shu (XFD), and Nikolai Vinokurov (XFD/Budker Institute of Nuclear Physics) on a new concept for variable-period undulators.

Permanent-magnet undulators have served well in the production of bright x-ray beams. However, their fixed magnetic period limits their broad application; primarily their tunability. A novel concept for undulators with the capability to vary the length of the magnetic period for the production of synchrotron radiation from both medium- and high-energy sources is proposed in the article.

This concept is based on staggered arrays of poles placed in a magnetic solenoid. The potential impact of such a "variable-period undulator" on synchrotron science is very broad due its wide energy tunability and delivery of highly brilliant radiation without the burden of handling a high power load on the first optics. This development could also contribute to future linac-based sources such as energy recovery linacs and free-electron lasers.

See: "Variable-period undulators as synchrotron sources," G. K. Shenoy, J. W. Lewellen, D. Shu, and N. A. Vinokurov, J. Synch. Rad. 10, 205-213 (May 2003).

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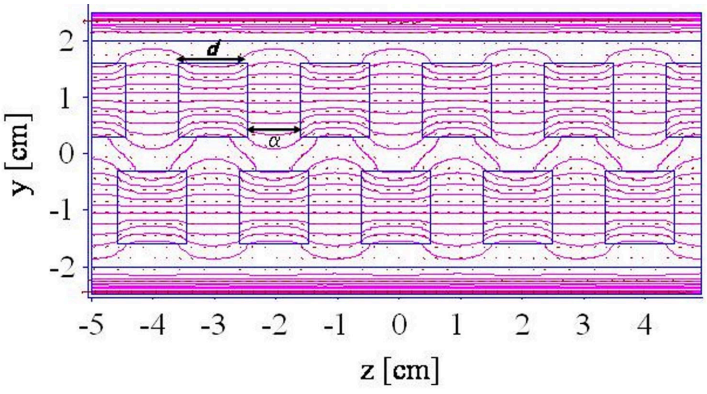
Above: *The JSR cover illustration shows a three-dimensional schematic of the driving mechanism for a variable-period undulator placed outside a straight-section vacuum chamber. A section of the magnetic solenoid is also shown.*



Right: *Diagram of the basic concept for a variable-period undulator. The spaces with width α permit period variation along the z-axis, and the blocks of high-permeability material have a fixed width d. The periodic transverse undulator field is derived by the staggered arrays from the longitudinal field produced by a normal conducting or a superconducting solenoid.*