Superconducting Undulator Technology

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Why Superconducting Undulators

Superconducting Undulators (SCUs) are the natural continuation in the evolution of insertion devices. The use of permanent magnets has been pushed to the limit by installing the arrays directly in the beam UHV to reduce the gap (In-Vacuum Undulators IVU) and even further by cooling them down to cryogenic temperatures to increase the remanence field (Cryogenic Permanent Magnet Undulators CPMU). In order to further increase the magnetic field of these devices, a jump in technology is required; hence the implementation of superconductivity. Development programs both in the US and in Europe have shown that SCUs generate stronger field on axis than comparable permanent magnet based devices and that the use of superconductivity does not compromise the operation of synchrotron storage rings or FELs. For period lengths above 13 mm, SCUs made out of NbTi show a significant improvement in field on axis compared to CPMUs; furthermore a large portion of the superconducting technology potential, Nb₃Sn and HTS, has yet to be exploited.