

IX Seminar on Software for Nuclear, Subnuclear and Applied Physics.
Technology Transfer Workshop



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High Brightness beams production for advanced accelerator applications

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Light sources based on high gain free electron lasers or future high energy linear colliders require the production, acceleration and transport up to the interaction point of low emittance, high charge density electron bunches. Many effects contribute in general to the degradation of the final beam quality, including chromatic effects, wake fields, emission of coherent radiation, accelerator misalignments. Space charge effects and mismatch with the focusing and accelerating devices typically contribute to emittance degradation of high charge density beams, hence the control of beam transport and acceleration is the leading edge for high quality beam production. In this lecture we introduce from basic principles the main concepts of beam focusing and transport in modern accelerators using the beam envelope equation as a convenient mathematical tool. Matching conditions suitable to preserve the beam quality are derived from the model for significant beam dynamics regimes. An extension of the model to the plasma accelerator case is also introduced.

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