CST'S COMMERCIAL BEAM-PHYSICS CODES

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Abstract

During the past decades Particle Accelerators have grown to higher and higher complexity and cost, so that a careful analysis and understanding of the machines' behaviour becomes more and more important. CST offers userfriendly numerical simulation tools for the accurate analysis of electromagnetic fields in combination with charged particles, including basic thermal analysis. The CST STUDIO SUITE code family is the direct successor of the code MAFIA, combining the numerical accuracy of the Finite Integration Theory and Perfect Boundary Approximation within an intuitive, easy-to-use CAD environment. Automatic Parameter Sweeping and Optimization are available to achieve and control the design goals. In this paper various solver modules of CST PARTICLE STUDIO, CST EM STUDIO and CST MICROWAVE STUDIO will be presented along accelerator-relevant examples, such as:

- Cavity design using eigenmode solver including calculation of losses, Q-factors, shunt impedance and thermal analysis.
- Coupler Design, including external Q-factor
- Wakefield Simulation, including resistive wall effects, also realized for beams slower than speed of light
- dispersion diagram for the analysis of periodic structures
- design of guns, including beam emittance studies
- study of secondary emission processes and dark current effects in accelerating structures.

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