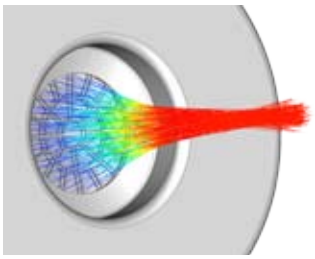
CST STUDIO SUITE™
CHARGED PARTICLE SIMULATION

CST PARTICLE STUDIO™ (CST PS) is a specialist tool for the fast and accurate 3D analysis of charged particle dynamics in 3D electromagnetic fields. As a member of CST STUDIO SUITE™, CST PS is fully integrated in CST DESIGN ENVIRONMENT™, taking advantage of the standard raising user interface as well as the solver technology of our multi-purpose electromagnetic modules CST MICROWAVE STUDIO® and CST EM STUDIO™. CST PS is based on the knowledge, research and development that went into the algorithms used in the MAFIA-4 simulation package.

CST PARTICLE STUDIO™ features 3 different modules:

- GUN (particle tracking and DC gun simulation including space charge)
- PIC (self-consistent transient particle-in-cell simulation)
- WAK (wakefield simulation)

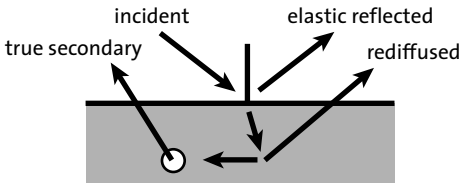
GUN - DESIGN OF ELECTRON GUNS



Gridded gun analysis

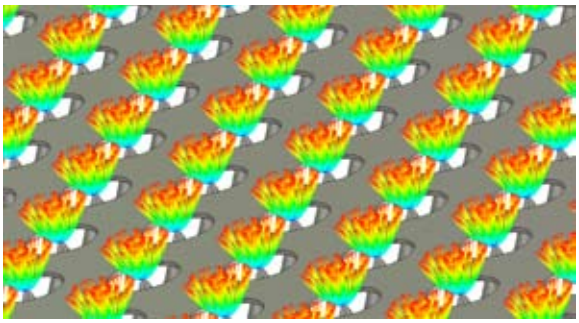
EMISSION MODELS

- Fixed
- Space charge limited
- Thermionic
- Field emission
- Secondary emission

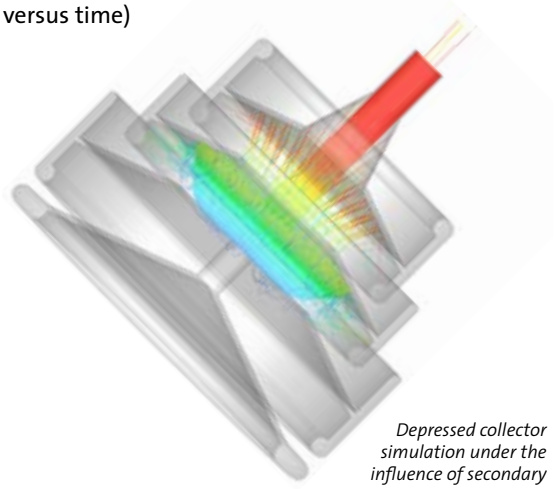


SECONDARY EMISSION MODEL

- Furman model (incl. elastic reflected, rediffused and true secondary particles)
- Analysis of absorbed power and current
- Multipaction (observation of increase in particles versus time)



Particle trajectory on top of a Spindt type field emitter array



Depressed collector simulation under the influence of secondary electron emission

GENERAL FEATURES OF CST PARTICLE STUDIO™

- Integrated in CST DESIGN ENVIRONMENT™
  - Intuitive parametric 3D modelling
  - 64bit support
  - VBA compatible macro language
  - Powerful user-definable postprocessing
- PERFECT BOUNDARY APPROXIMATION (PBA)®
- Intuitive magnet design (solenoid / permanent magnet)
- Particle monitoring and emittance calculation

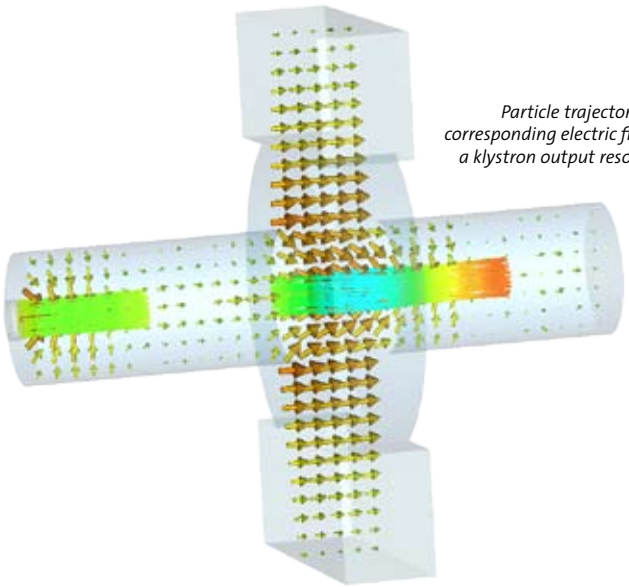
(cont.)

CST

CHANGING THE STANDARDS

PIC – DESIGN OF MICROWAVE TUBES

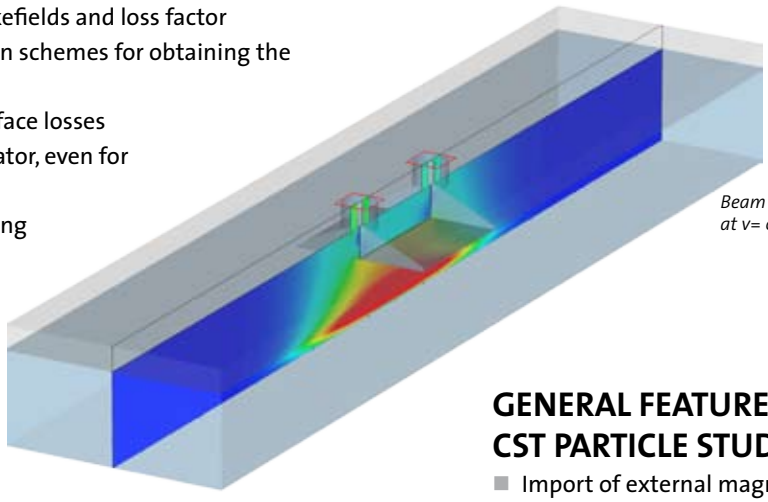
- DC emission
- Emission of Gaussian bunch series
- GUN/PIC interface for realistic beam input created by an electron gun
- Support of all CST MWS time domain solver features including:
  - dispersive materials
  - lossy metals
  - discrete ports
  - waveguide ports
- Direct output signal monitoring
- Grid and metallic foil models



Particle trajectory and corresponding electric field of a klystron output resonator

WAK – WAKEFIELDS, IMPEDANCE AND LOSS FACTOR

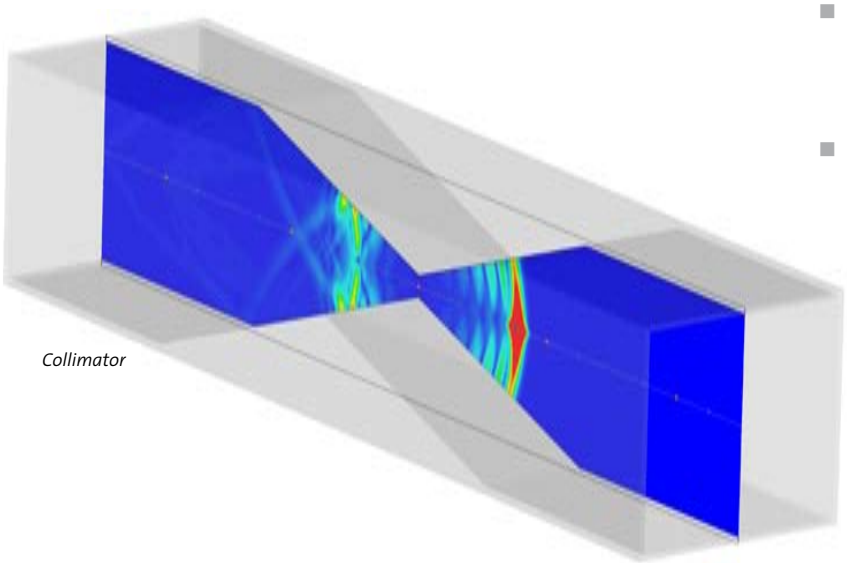
- Automatic calculation of wakefields and loss factor
- Direct and indirect integration schemes for obtaining the wakefield
- Resistive wake: considers surface losses
- Special beam boundary operator, even for non-relativistic beams (v < c)
- direct output signal monitoring



Beam position monitor at v= 0.75c

GENERAL FEATURES OF CST PARTICLE STUDIO™ (CONT.)

- Import of external magnetic fields
- Eigenmode solver for accurate cavity analysis
  - Shunt impedance, R/Q, transit time factor
  - Periodic boundaries and mode dispersion diagrams
- Co-simulation with thermal solver



Collimator

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