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

TRK – PARTICLE TRACKING AND ELECTRON GUN DESIGN

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)

Depressed collector simulation under the influence of secondary electron emission
PIC – DESIGN OF MICROWAVE TUBES

- DC emission
- Emission of Gaussian bunch series
- Explosive emission
- GUN/PIC interface for realistic beam input created by an electron gun
- User defined particle source via ASCII interface
- 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 (including energy dependency)
- Multipacting stopping criterion

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
- Wakefield postprocessor for user-defined sampling

GENERAL FEATURES OF CST PARTICLE STUDIO

- Integrated in the CST design environment
- Intuitive parametric 3D modelling
- 64bit support
- VBA compatible macro language
- Powerful user-definable postprocessing
- PERIODIC SOLUTION OPERATOR (PSO®)
- Intuitive magnet design (solenoid / permanent magnet)
- Magnetic field solver
- Particle monitoring and emittance calculation
- 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