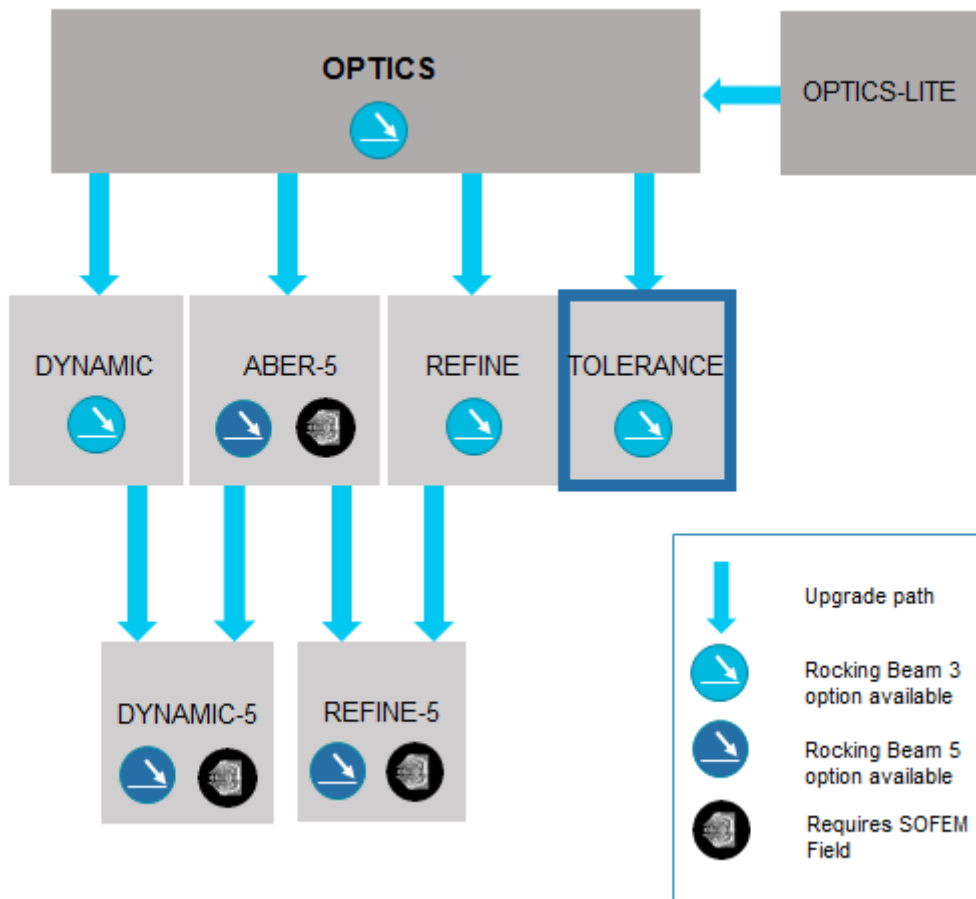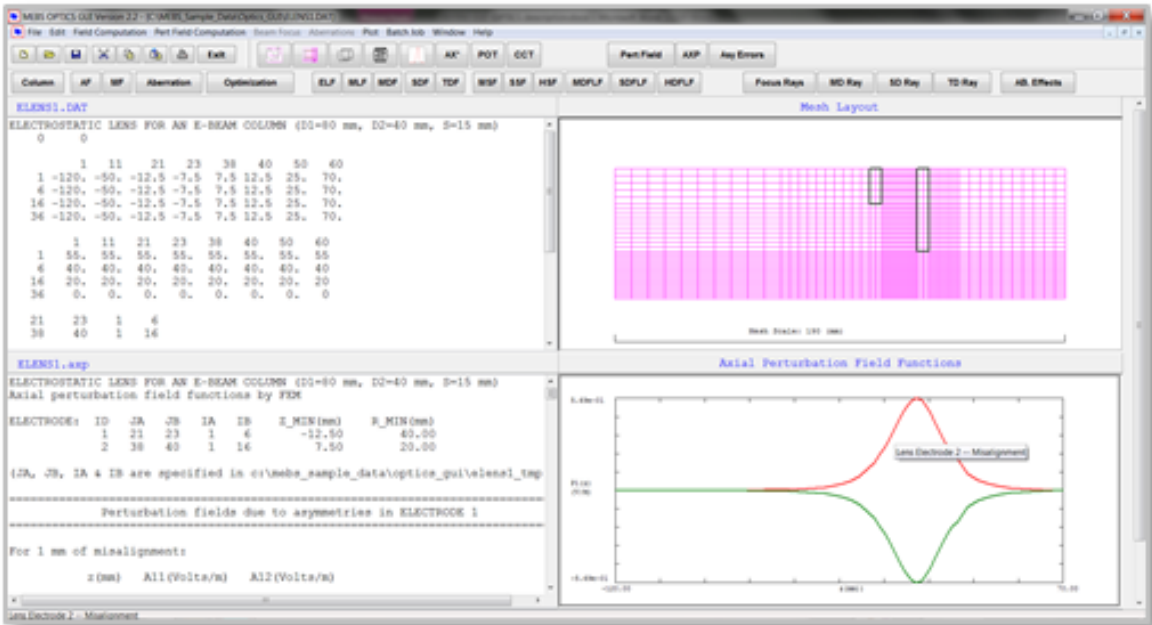# TOLERANCE
## Column tolerancing

Overview

Real columns suffer from asymmetry errors caused by small mechanical imperfections during construction and alignment. Using the TOLERANCE software the user can compute the perturbation fields and aberrations due to tilts, misalignments and ellipticities in the electrodes, to ensure that the system will perform in accordance with its design specifications

Electrostatic lens simulation, with the computed axial perturbation field functions displayed numerically and graphically in the lower part of the screen

TOLERANCE handles the effects of misalignments and tilts of complete lenses and deflectors, relative to the optical axis of the column. The software also computes the effects of axial and radial misalignments, tilts and ellipticities of any individual polepiece, coil winding or electrode of any lens or deflector in the column. In the case of deflectors, the software also handles the effects of azimuthal misalignments of individual coil windings or electrodes.

TOLERANCE can also handle static deflectors and stigmators. The static deflectors are used to correct the first-order image shifts due to misalignment and tilt of lens electrodes or polepieces; and the static stigmators are used to correct the astigmatism due to ellipticity of lens electrodes or polepieces. In this case, the static deflection and stigmation field functions are computed, using the field computation functions of the core OPTICS package plus the optional DYNAMIC module, respectively. The software computes the additional aberrations due to the static deflectors and stigmators. It also calculates the required signals for correcting the first-order image shifts and beam tilts due to the specified misalignments and tilts of the lens polepieces and electrodes, and the astigmatism due to the specified ellipticities of the lens polepieces and electrodes.
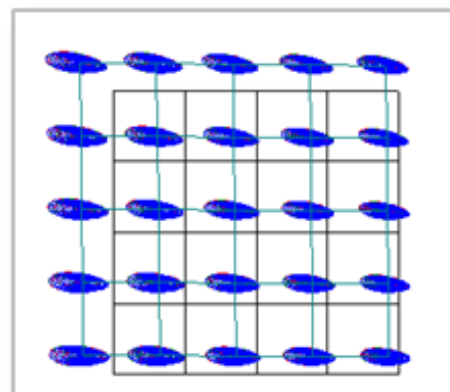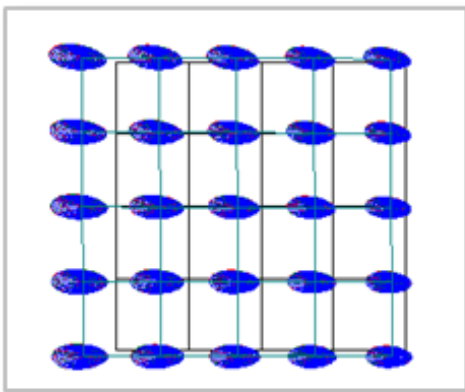
Aberration spot diagram without and with the asymmetry aberrations included