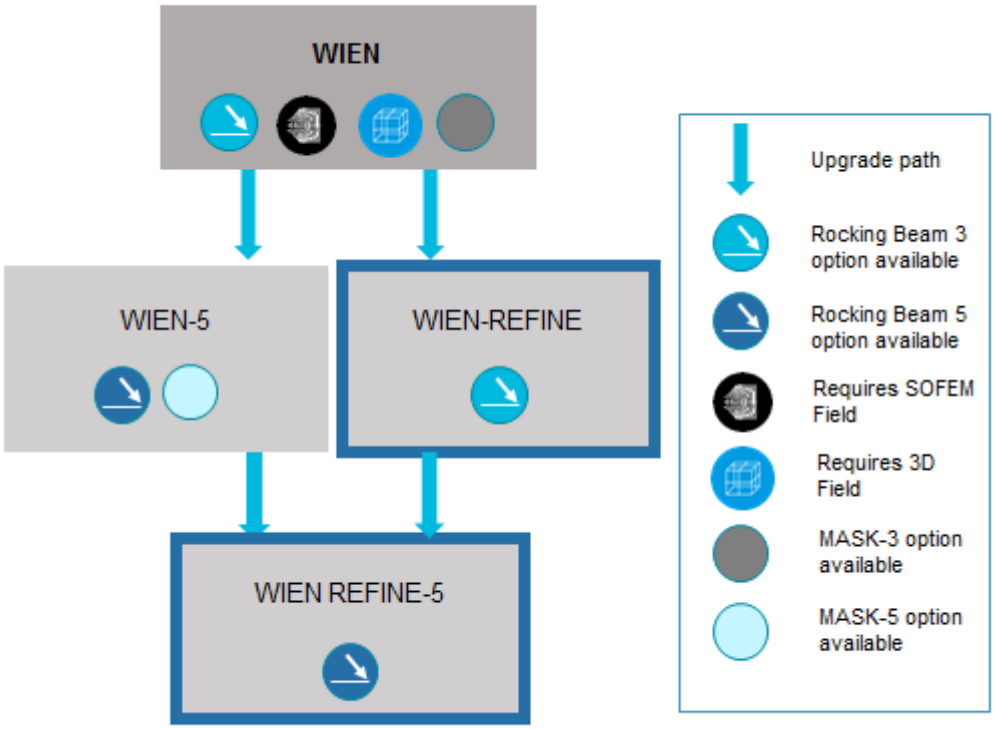
WIEN REFINE & WIEN REFINE-5

Upgrade for optimisation of aberrations



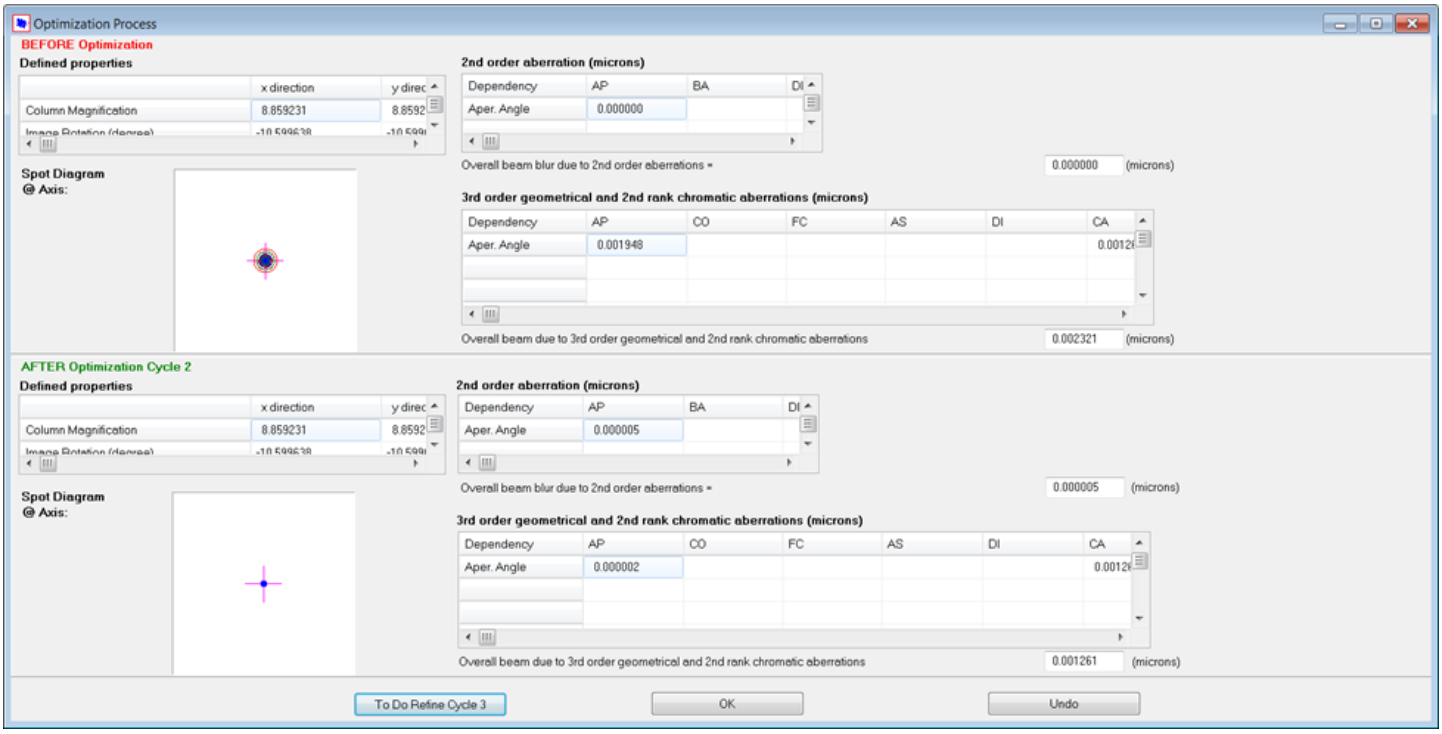
Overview

The WIEN-REFINE module takes the initial design of the column, and interactively refines it to optimise the performance. A electron beam column contains many design parameters that can be varied and there are numerous aberrations which each depend on the variable parameters. WIEN-REFINE allows the user to choose which design parameter to vary and which aberration to target. The program then runs several optimisation cycles and generally yields designs with better properties than those obtained through trial and error.

The WIEN-REFINE-5 module extends the functionality of WIEN-REFINE to allow optimisation of the aberrations up to 5^{th} – order terms.

After defining the imaging conditions data, optical element settings and parameter values and the focus constraints for the autofocus scheme, as in WIEN or WIEN-5, the weighting factors can be specified for the optimisation scheme. Use of additional optical elements can reduce the aberrations introduced in the original system. In addition, if we have a deflection system to scan or rock the beam, the deflection aberrations will, in general, scale with deflection field strength: we call these aberrations the dynamic deflection aberrations. We can use additional optical elements whose strength varies with deflection field strength to correct some aberrations introduced by the deflection system: we call these additional optical elements the dynamic correction elements.

Common dynamic correction elements include a round lens to correct for normal deflection field curvature, a quadrupole element to correct for normal deflection astigmatism.



WIEN-REFINE-5 Optimisation Control Screen

Both WIEN-5 and WIEN-REFINE-5 can handle round lenses and multipole lenses that can be used to compensate the dynamic deflection aberrations. In addition, the optimisation function in WIEN-REFINE-5 can be used to compute the required settings (strength and/or rotation angle) for the dynamic correction elements to compensate the deflection aberrations.

In the software, the dynamic correction elements are not energised during the autofocus procedure, but they are switched on when the beam is in focus and the deflection system is energised. The settings of the dynamic correction elements are then optimised to reduce or eliminate the chosen set of deflection aberrations.