Corrector auto-tuning developments

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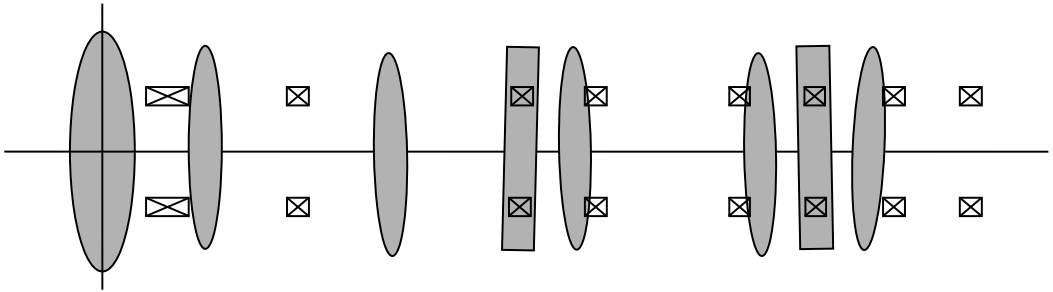
Aberration correction

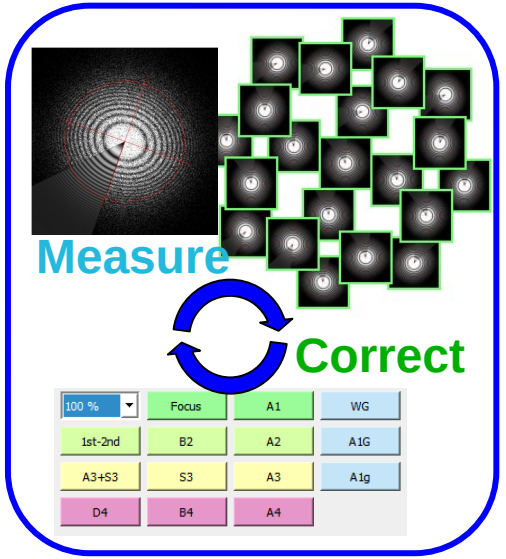
Factory corrector adjustment



real system

- Correction of mechanical mis-alignments and imperfections of magnetic materials
- One-time factory adjustment
- No change over time

Daily corrector tuning

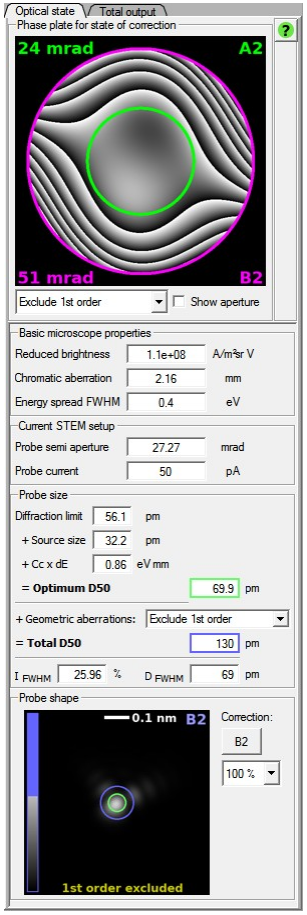


- Fine-tuning against hysteresis of magnetic elements and thermal drift

Goal: automate the procedure

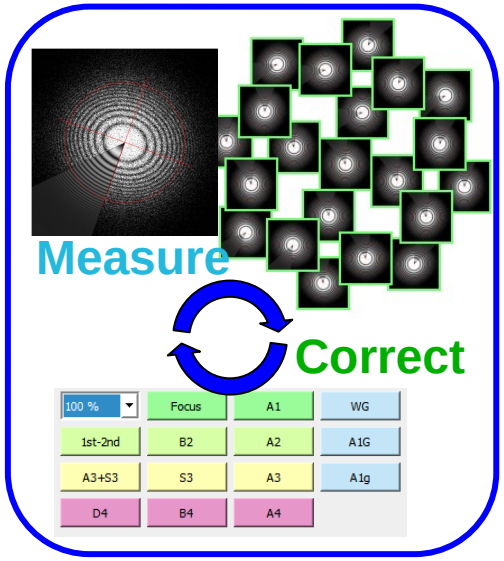
Tuning towards experimental requirements

STEM: probe shape



Desired optical state

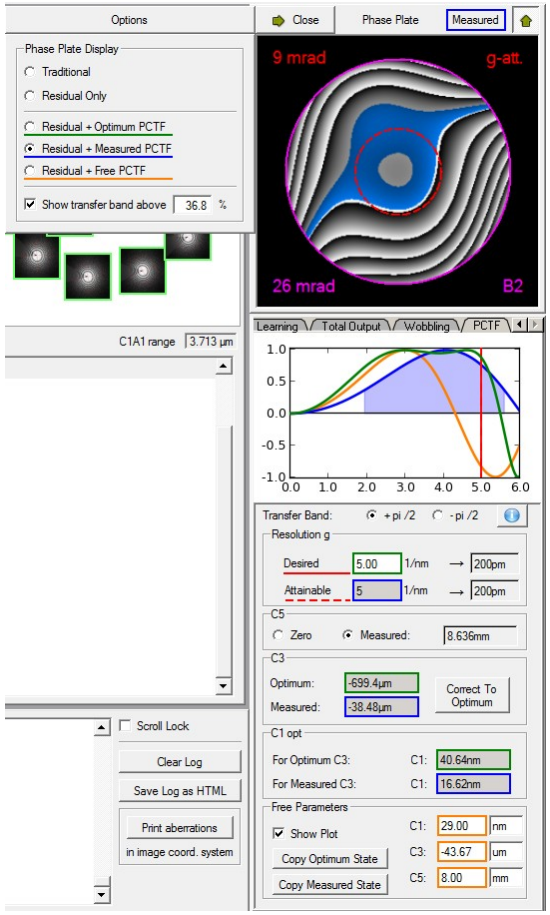
- STEM: “zero” aberrations, all aberrations sufficiently small
- TEM: ≠ zero aberrations, PCTF shaped with round aberrations, other aberrations sufficiently small



Automatic

Good enough for desired experiment?

TEM: PCTF



Auto-tuning developments

Desired optical state

- STEM: “zero” aberrations, all aberrations sufficiently small
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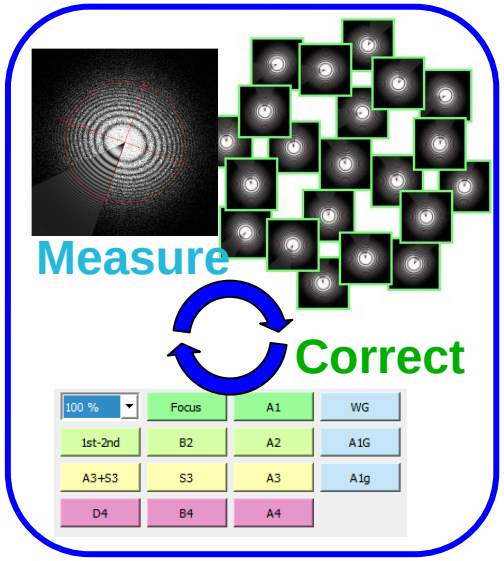
Measurement settings

- *magnification*
- *fraction and binning, defocus*
- *outer tilt angle, tableau type*
- *fit parameters*
- *...*



Automatic

Error recognition

- *wrong magnification*
- *inadequate illumination*
- *bad image quality (Thon rings / deconvolution)*

Correction criteria

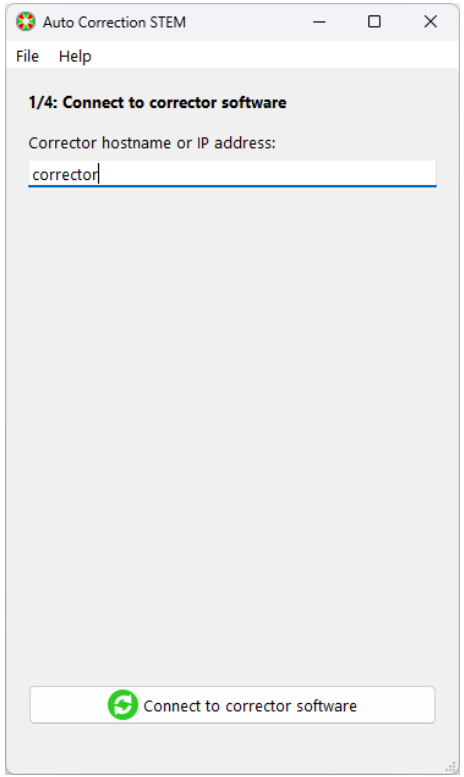
- *list of aberrations*
- *confidence of measurement*
- *compensation schemes (different orders of same multiplicity)*

Stop criteria

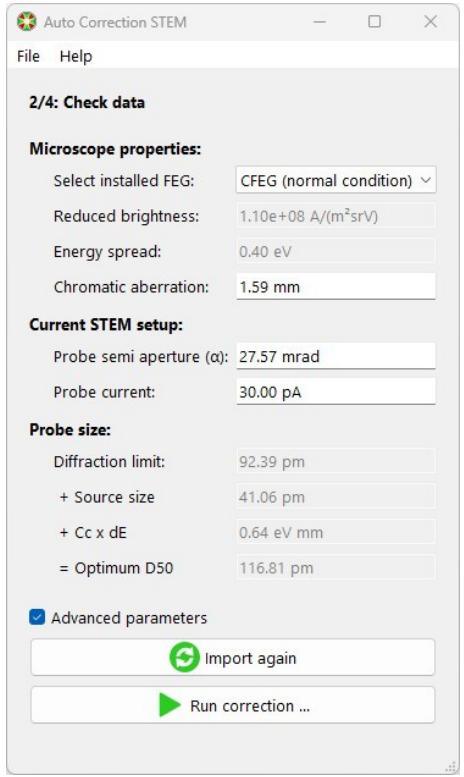
- *desired optical state achieved*
- *further correction not meaningful*
- *confidence of measurement*
- *measurement failed*

STEM auto-correction

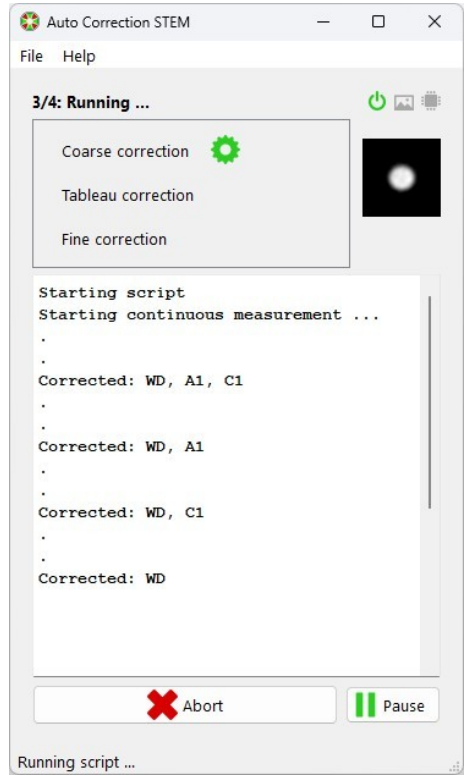
1/4 Connect to corrector software



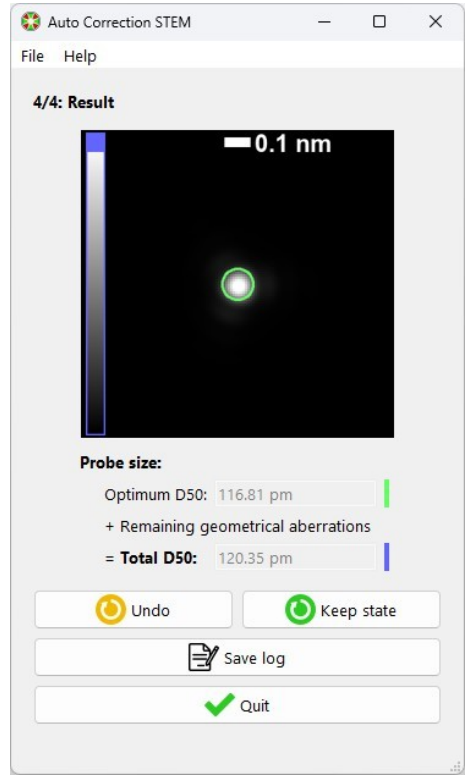
2/4 Check data:
Microscope configuration and STEM setup



3/4 Running:
Auto-correction in progress



4/4 Result:
Probe simulation with attainable probe size



TEM auto-correction

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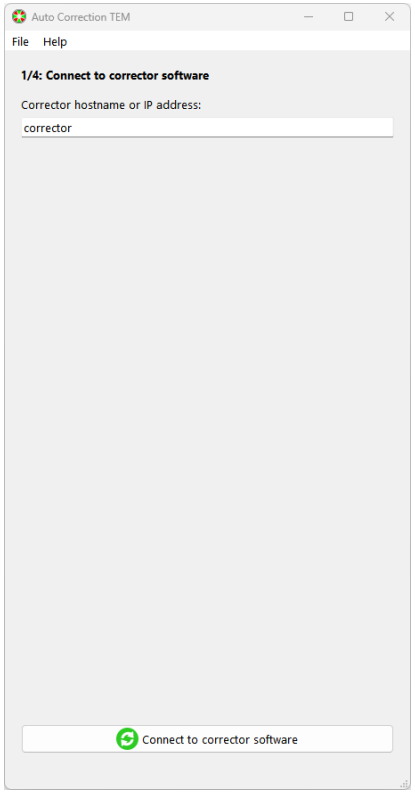
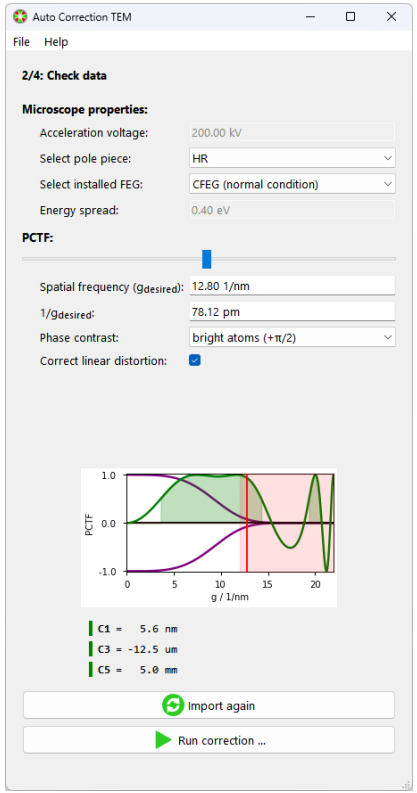
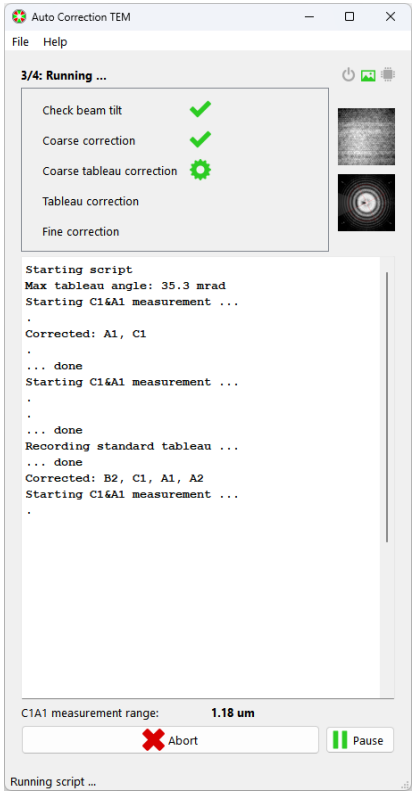
1/4 Connect to corrector software



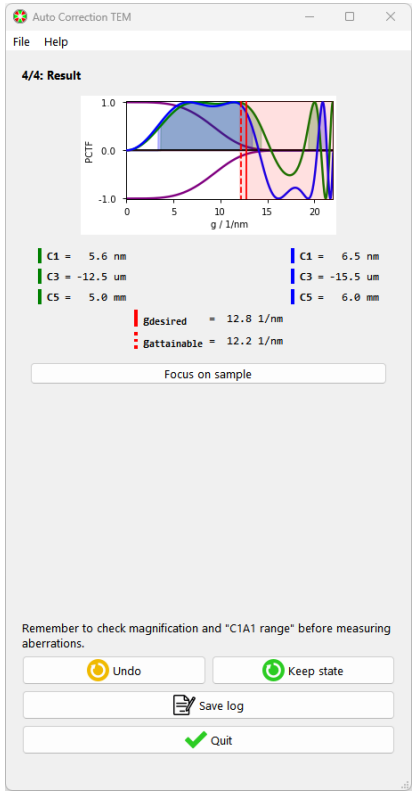
2/4 Check data:
Microscope configuration and PCTF requirements



3/4 Running:
Auto-correction in progress



4/4 Result:
Final PCTF with attainable resolution



Availability

	ThermoFisher	JEOL
CEOS	TEM: Auto-CETCOR STEM: Auto-SCORR	TEM: Auto-CETCOR+ Auto-ATCOR STEM: Auto-ASCOR Auto-LASCOR
TEM manufacturer	Sherpa Opti-STEM(+) *(using the corrector's Exported elements)*	COSMO *(using RPC)*