

Lattice parameter measurements from CBED patterns

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INTRODUCTION

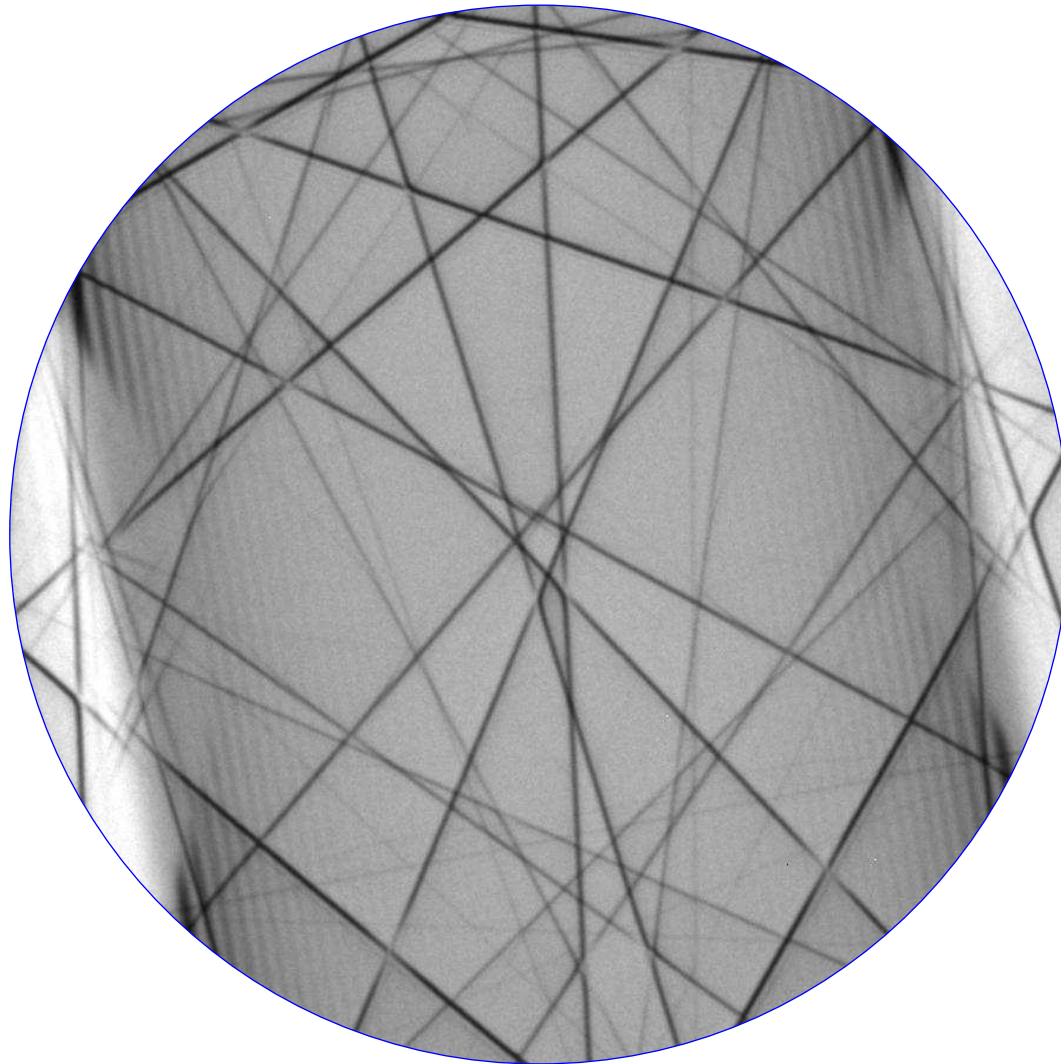
The aim of this lab session is to measure as accurately as possible the lattice parameters from a zone axis bright field CBED pattern.

The positions of the HOLZ lines visible on this pattern are compared with those simulated from kinematical calculations

Three steps are involved:

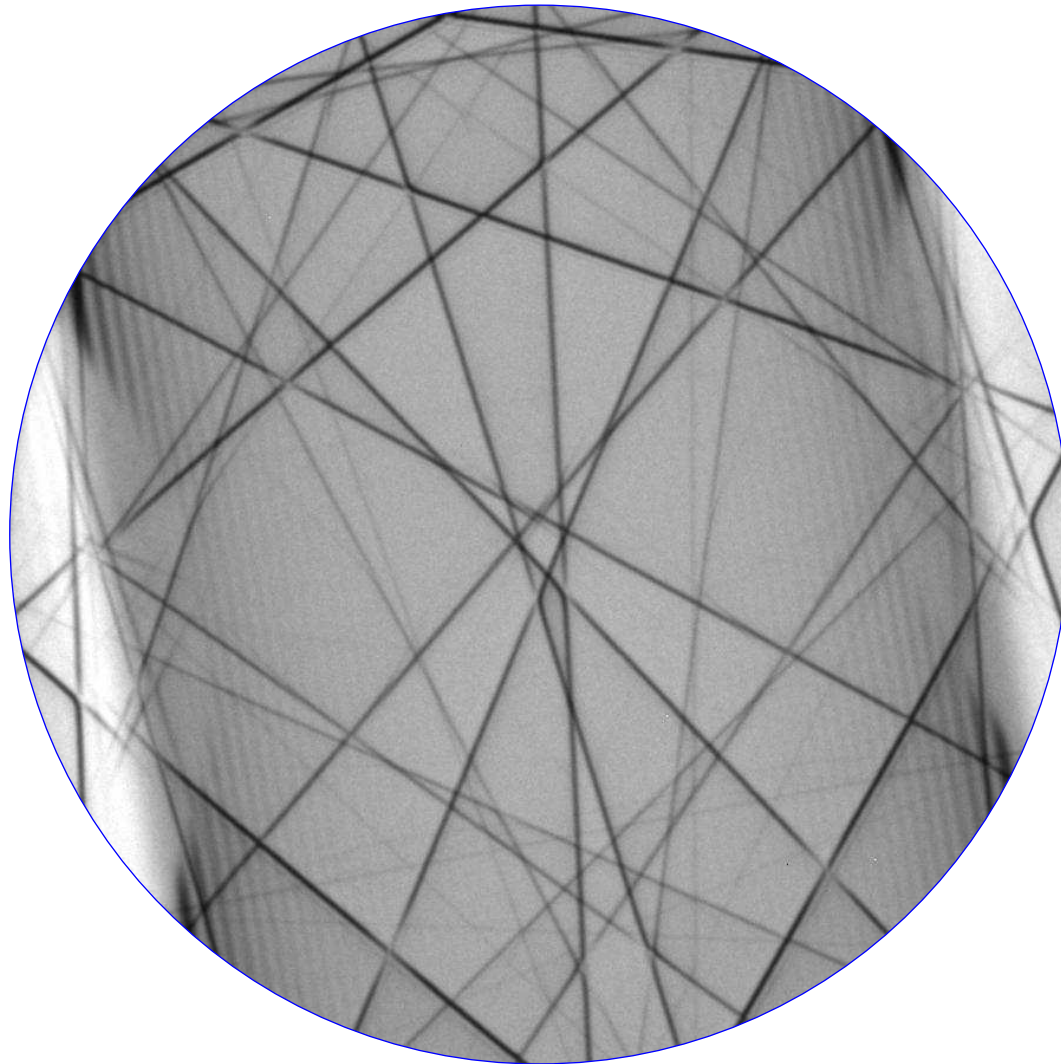
- 1 - Calibration of the voltage from a pure silicon specimen
- 2 - Identification of the lattice parameter of a GaAs specimen
- 3 - Discussion about the accuracy taking into account the dynamical effects

1 - Calibration of the voltage from a pure silicon specimen



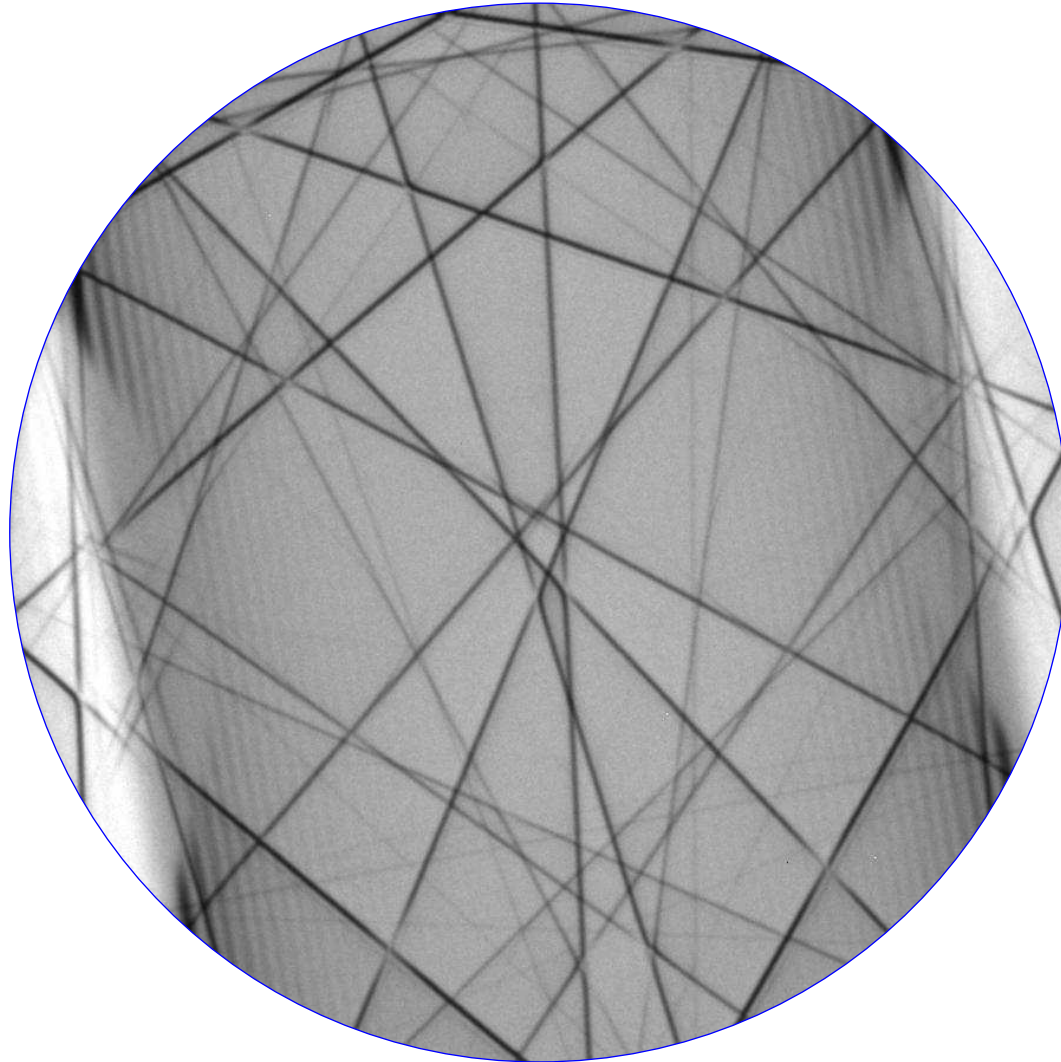
Bright-field disk of a filtered CBED pattern from a pure Silicon specimen
($a = 5.4307$ Angstroms).
<230> zone axis. Pattern made on a Tecnai microscope at 200 kV.

1 - Calibration of the voltage from a pure silicon specimen



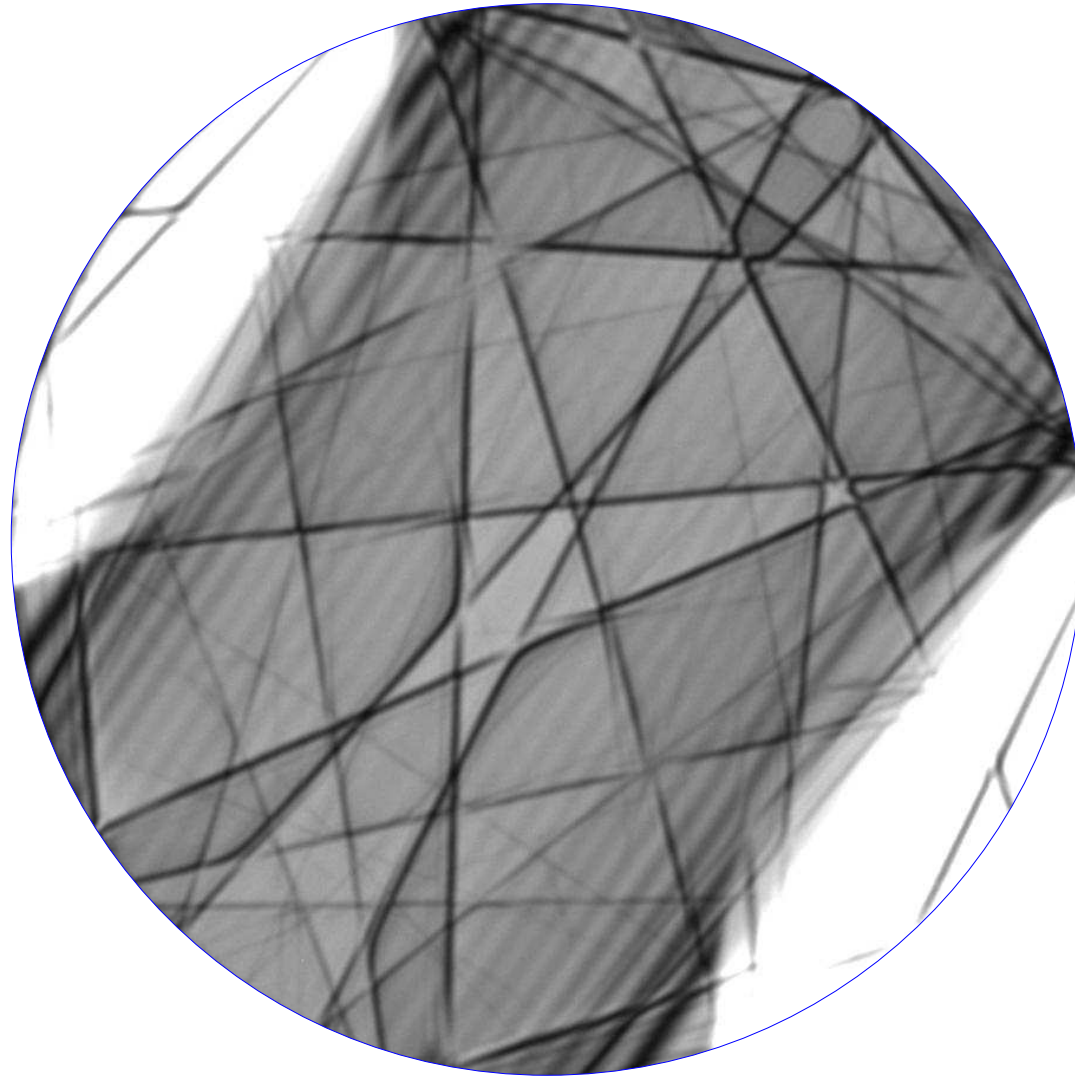
Simulate this diffraction pattern with the software "Electron Diffraction"
The parameters to adjust are: the crystal orientation, the beam convergence, the camera length,
the limits for the interplanar distances and the diffracted intensities

1 - Calibration of the voltage from a pure silicon specimen



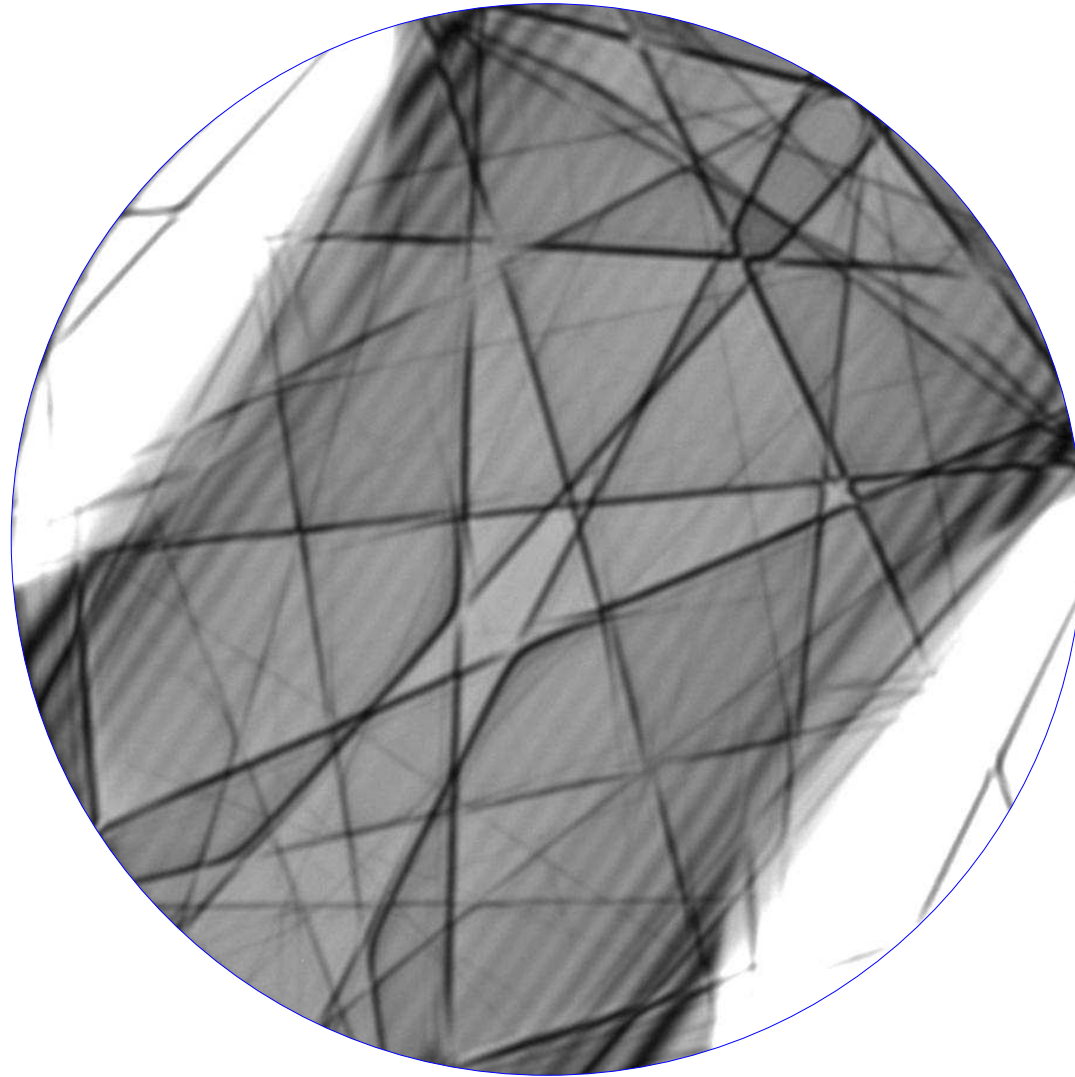
Locate a few typical intersections of HOLZ lines (intersection of two or three lines, typical triangles...)
Compare these typical intersections with the ones simulated by changing the voltage
Determine as accurately as possible the high voltage. What is the accuracy?

2 - Identification of the lattice parameter of a GaAs specimen



Bright-field disk of a filtered CBED pattern from a GaAs specimen $\langle 230 \rangle$ zone axis. Pattern made on a Tecnai microscope at 200 kV.

2 - Identification of the lattice parameter of a GaAs specimen



Measure accurately the lattice parameter
knowing that $5.6 \text{ Angstroms} < a_{\text{GaAs}} < 5.7 \text{ Angstroms}$



PATTERN TYPE

ELECTRON DIFFRACTION PATTERNS

STEREOGRAMS

STRUCTURE



Click in this area to draw the pattern

STRUCTURE

Structure :

a = Å b = Å c = Å

$\alpha =$ ° $\beta =$ ° $\gamma =$ °

OPTIONS

Si Demo

SPECIMEN

Orientation

[u	v	w]
	<input type="text" value="0"/>	<input type="text" value="2"/>	<input type="text" value="3"/>	

Thickness = Å

MICROSCOPE

Voltage = Volts

Beam convergence =

Camera length = mm

DISPLAY



PATTERN

Magnification = x

Rotation =

Minimal Intensity =

Minimal dhkl = Å

PATTERN INSCRIPTIONS

Inscriptions :

Reflections :

Comments :

Gap = mm

COMPUTER SCREEN

Screen Magnification Coefficient :

ToolTip Help

Contextual Help

This FRAME is used to SELECT the structure among the proposed structures and to MODIFY the lattice parameters.

You can create new structures or modify a structure by using the command Create or Modify in the menu Structure of the Setup Form.

