Brightness ?

$A\ mm^{-2} Sr^{-1}$

$C\ s^{-1}$

unit of charge

$e^-$ : $1.6 \times 10^{-19} C$

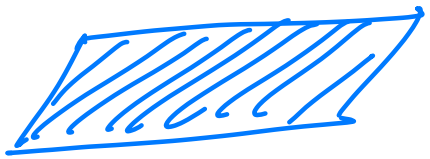
Suppose current of 1 $\mu A$

$\# e^-\ s^{-1}$ : $\frac{10^{-6}}{1.6 \times 10^{-19}} \sim 5 \cdot 10^{12}\ e^-/s$

$\sim 2$

EPFL

## Source size



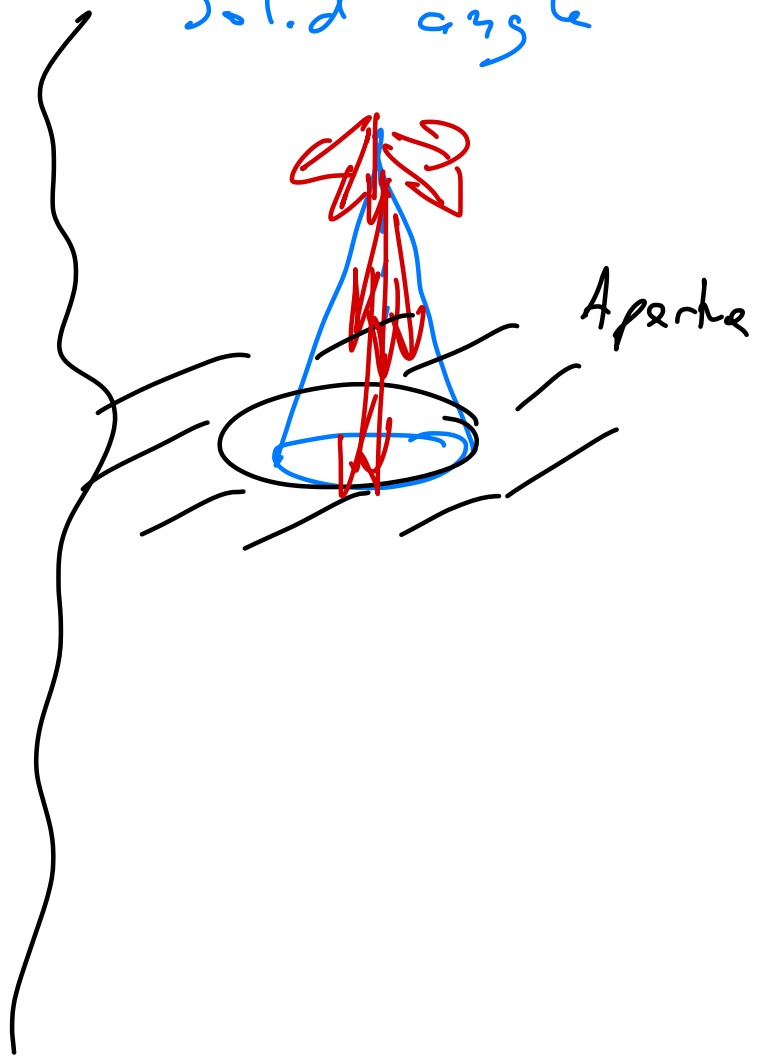
large area

Same current

↑

low brightness

## Solid angle

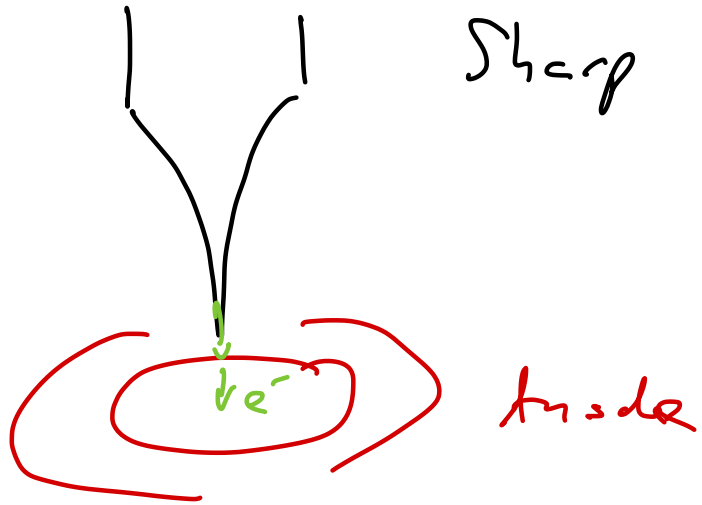



tiny area.

↑

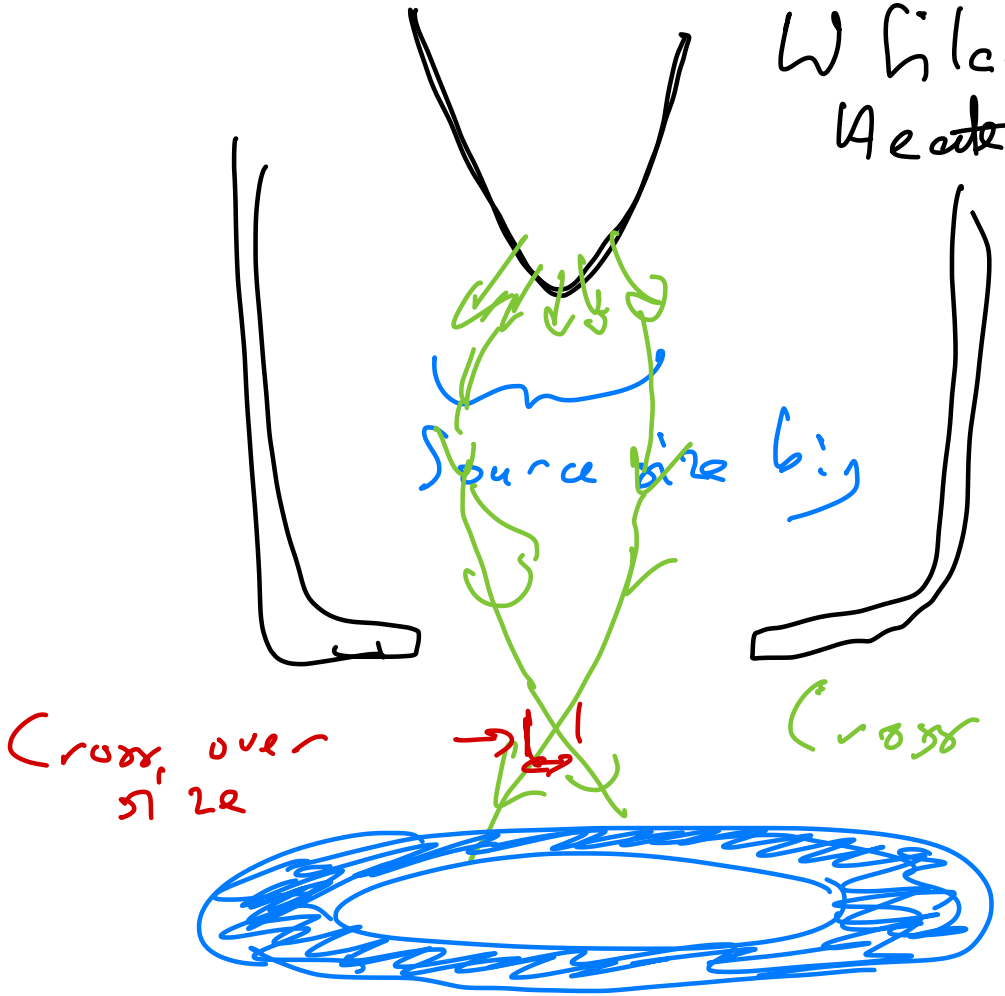
high brightness

Highest brightness cold FEG




Small tip
Forwards e⁻
beam
⇒ High brightness
$A\,mm^{-2}\,Sr^{-1}$

# Thermionic W filament



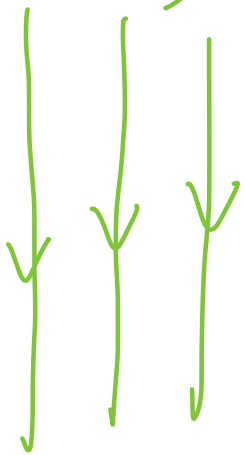

Wehnelt - apply negative potential

(Anode)

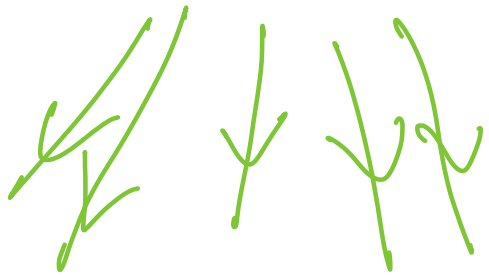
Anode - +ve bias

Cross over

Parallel rays

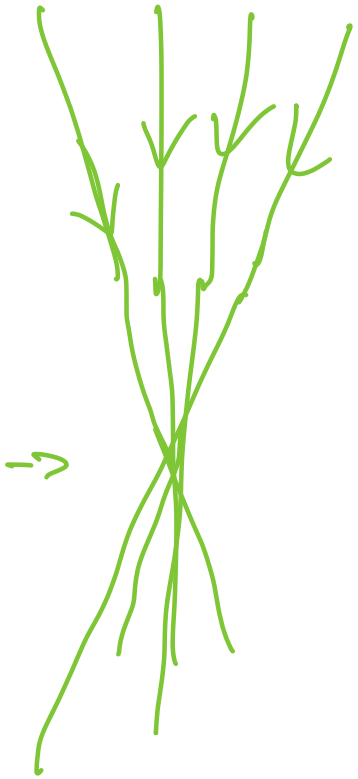


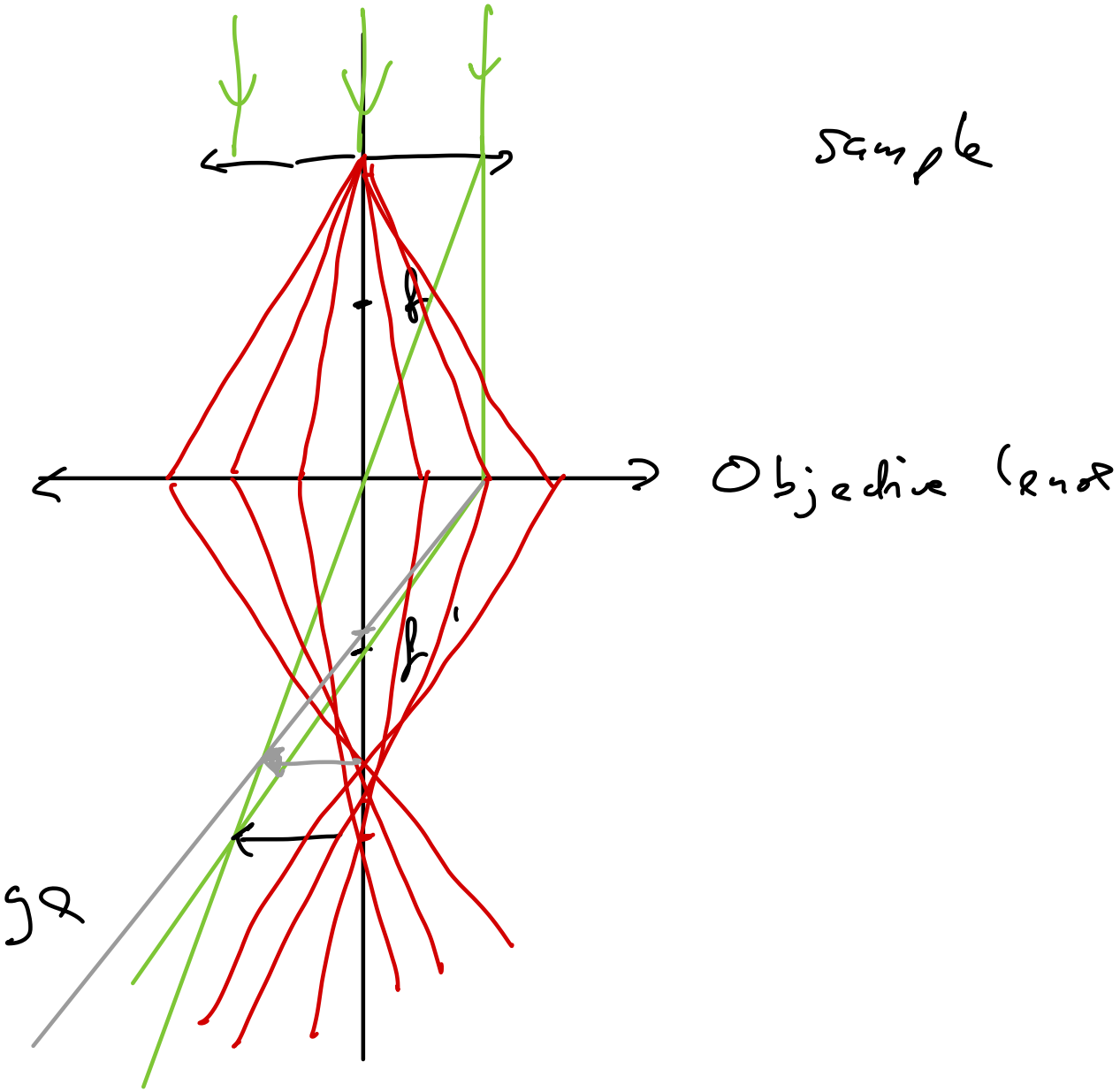
Divergent rays



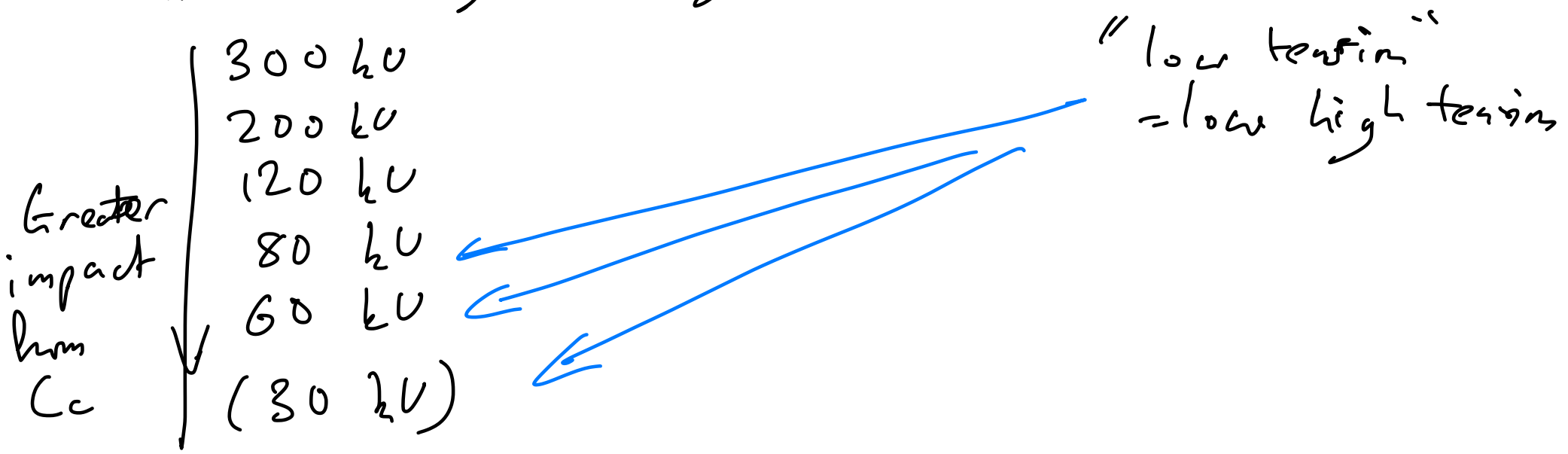
Convergent rays

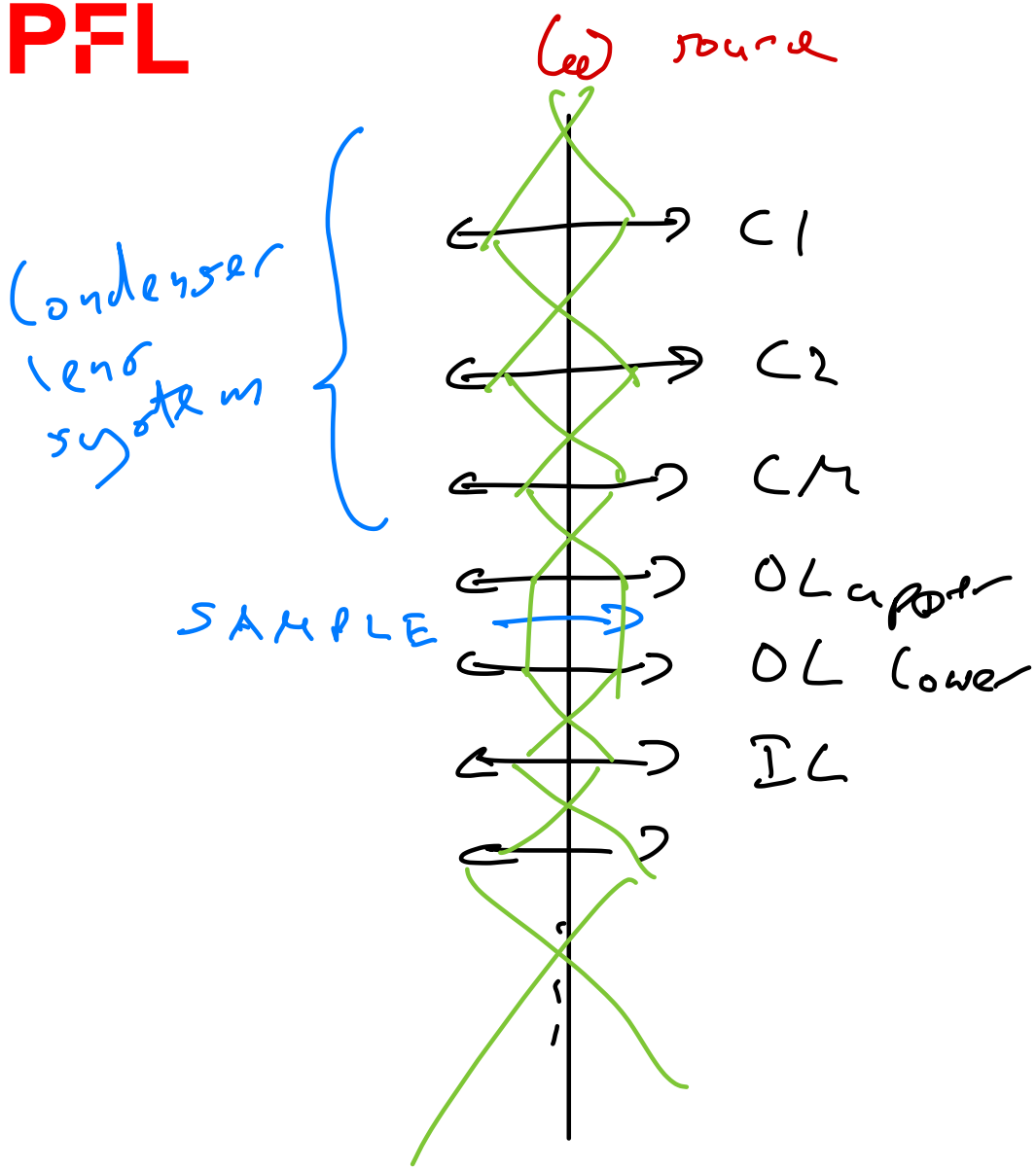
Cross over →

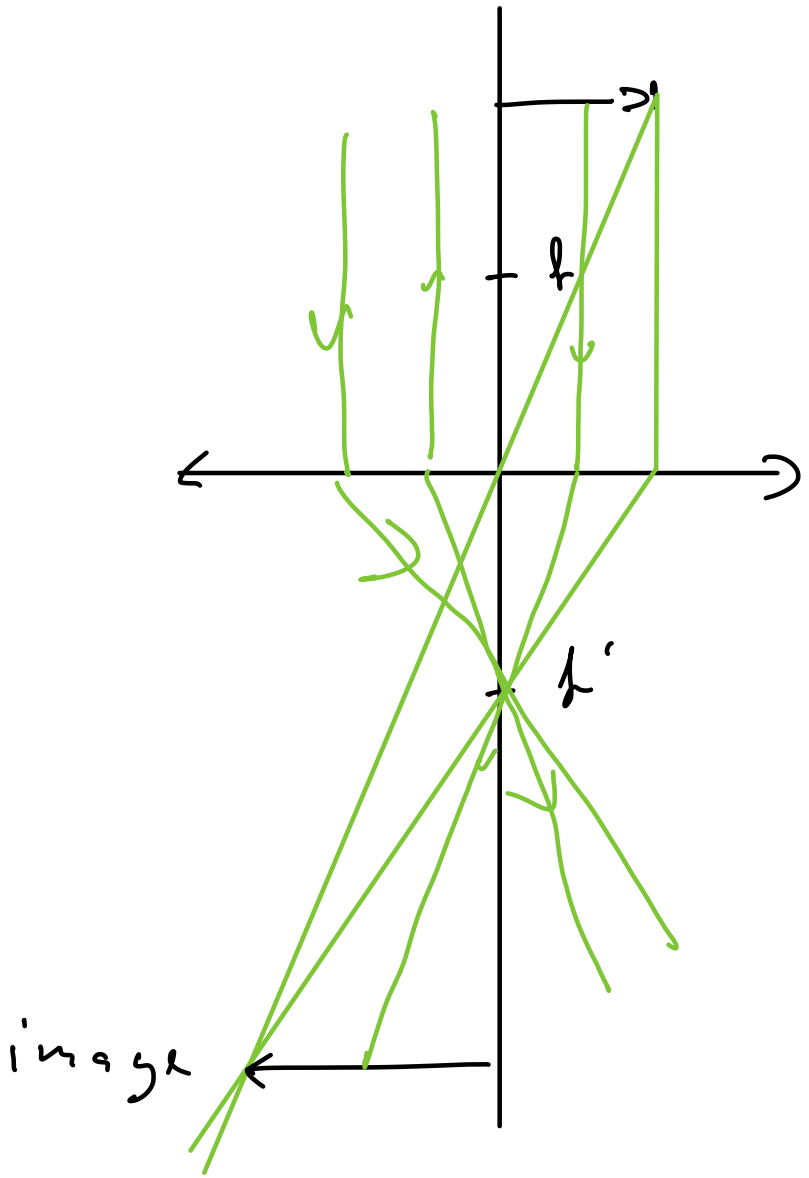


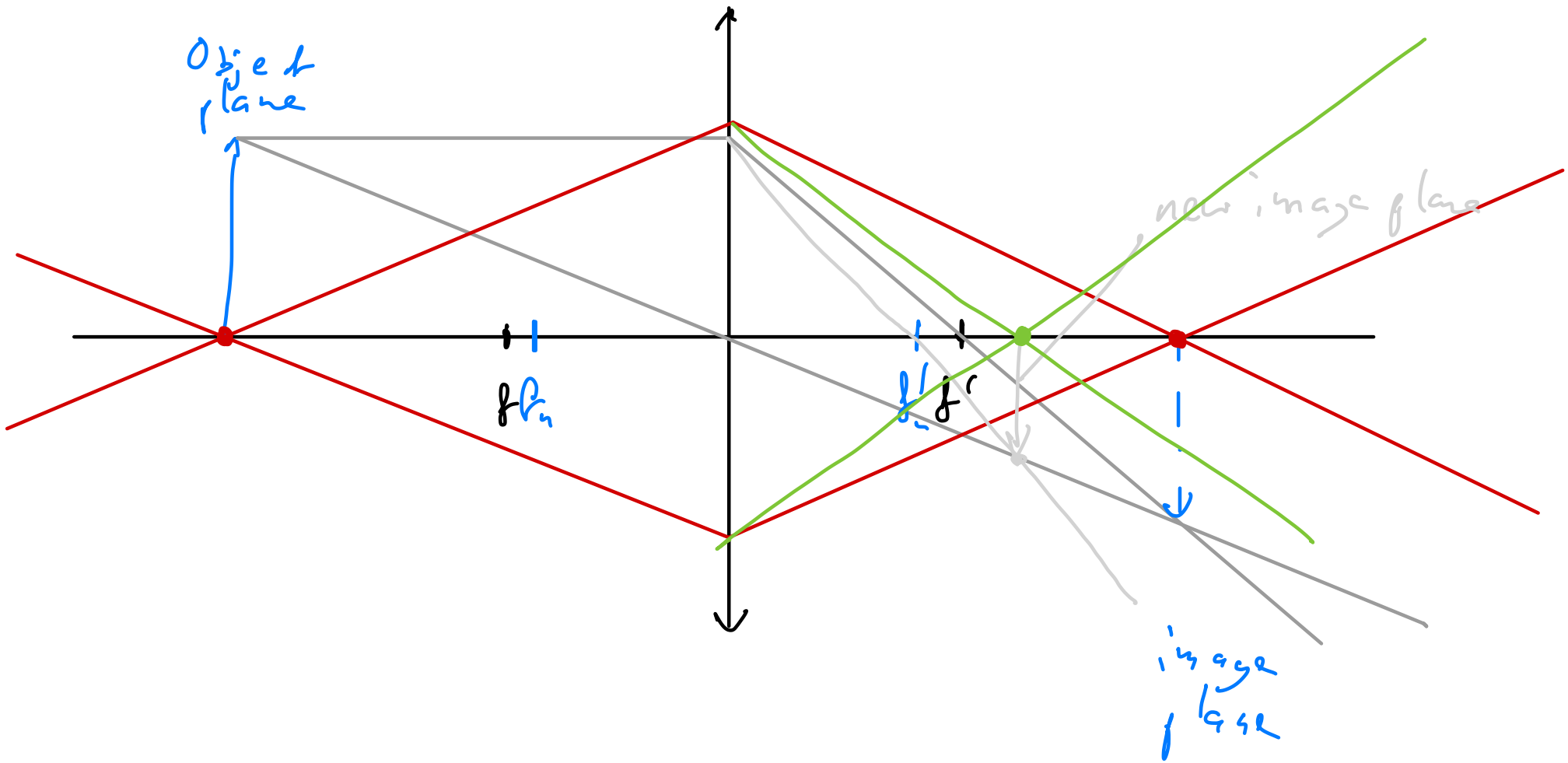

sample
f
Objective lens
f'
TEM
image

Accel. voltage = High tension




(e) source
condenser lens system
C1
C2
CN
SAMPLE
OL upper
OL Lower
IL


f
f'
image


Object plane
new image plane
image plane

Origin, Tador: $C_S = 1.2$ mm

Titan – $C_S$ correction: $C_S \approx 2-20$ µm

Contrast