Notes for exercise sheet 3

Send questions and corrections to: tweber@frm2.tum.de

1 Simple phonon modes

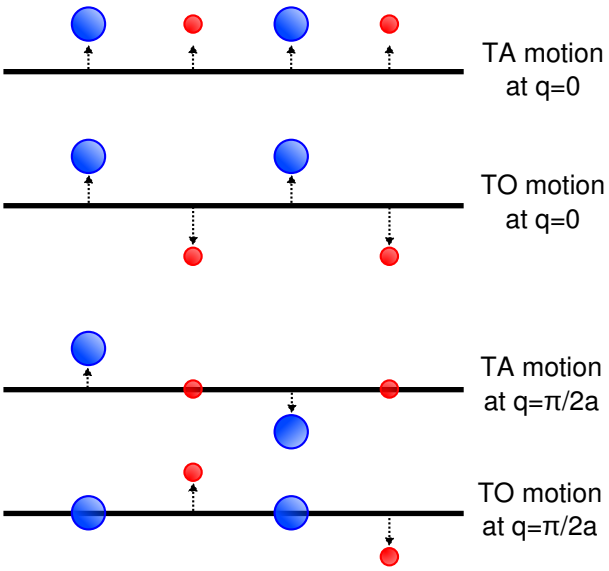

Figure 1: Transverse phonon motions in a two-atomic chain.

2 Scattering planes for fcc and bcc lattices

Shown are the scattering planes, symmetry points and scan positions for phonons in an fcc and a bcc crystal.

fcc

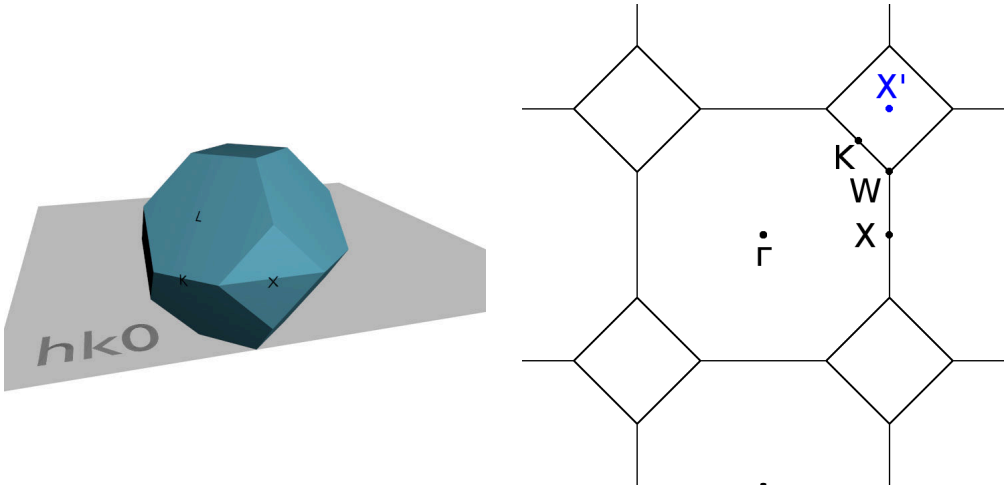

Figure 2: fcc Brillouin zone and (hk0) plane

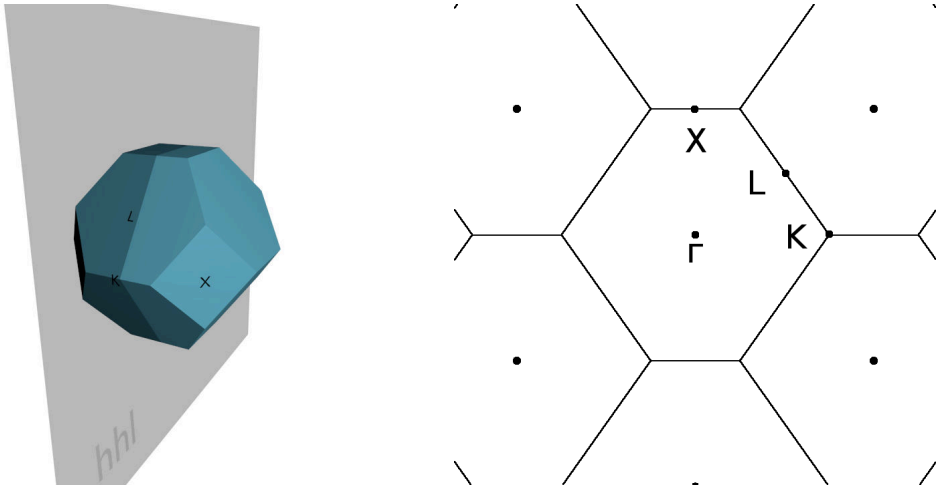

Figure 3: fcc Brillouin zone and (hhl) plane

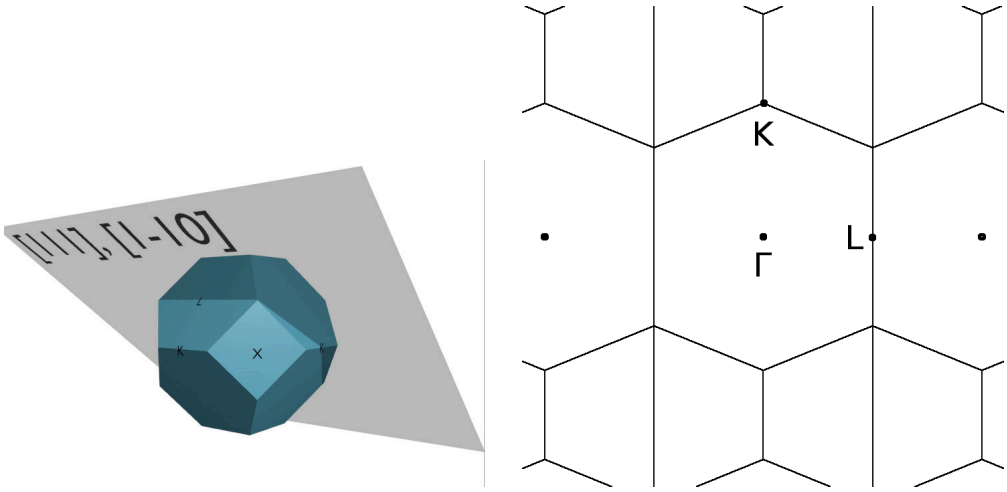

Figure 4: fcc Brillouin zone and [111], [1-10] plane

bcc

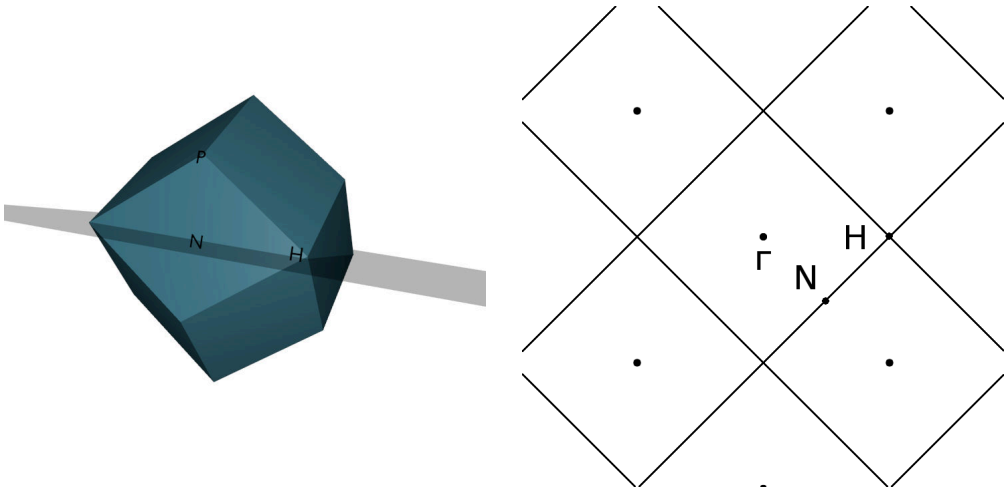

Figure 5: bcc Brillouin zone and (hk0) plane

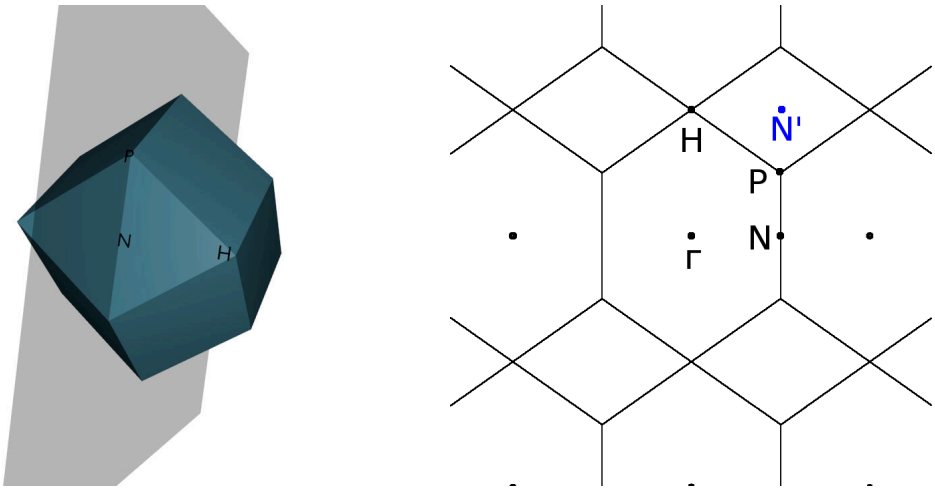

Figure 6: bcc Brillouin zone and (hhl) plane

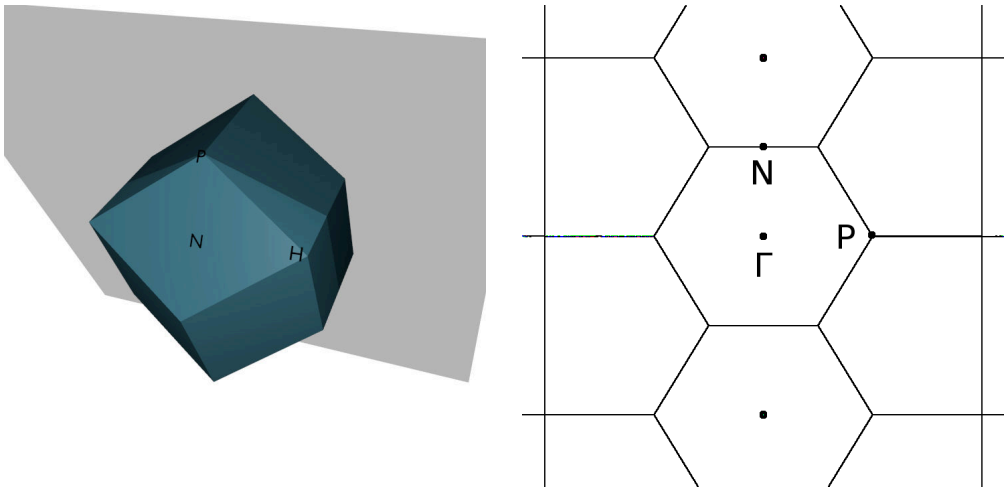

Figure 7: bcc Brillouin zone and [111], [1-10] plane

3 Two fcc Brillouin zones

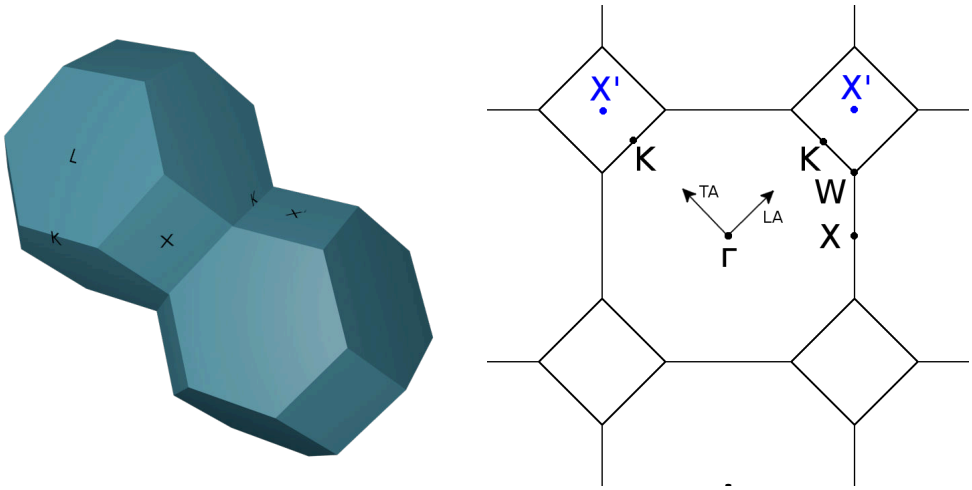

Figure 8: Continuing along a $\Gamma \to K$ path crosses the X' position of the adjacent BZ.

Scanning transversely or longitudinally from Γ in the K direction and crossing the K point will end in the X' point of the adjacent Brillouin zone with the q vectors from Γ' in X' direction perpendicular to both the longitudinal and transversal $\Gamma \to K$ q vectors. I.e. for symmetry reasons all three dispersion branches have to meet in a single point at the Brillouin zone boundary.