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# Physics with neutrons 2

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Exercise sheet 1

To be discussed 2017-05-02, room C.3203

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## EXERCISE 1.1

1. With which part of matter do neutrons and photons interact, respectively? What are the differences between light and neutron scattering?
2. What gives rise to coherent / incoherent scattering? Which information can be extracted from each of them?
3. Recall the most important facts about the structure factor  $|S|^2$  and the form factor  $|F|^2$ .

## EXERCISE 1.2

Verify the diffraction patterns of Fig. 1. The atomic positions of NaH and NaD in the fcc unit cell are defined by

$$\mathbf{b}_{Na} = a(0, 0, 0), a(1/2, 1/2, 0), a(1/2, 0, 1/2), a(0, 1/2, 1/2)$$

$$\mathbf{b}_{H/D} = a(1/2, 0, 0), a(0, 1/2, 0), a(0, 0, 1/2), a(1/2, 1/2, 1/2)$$

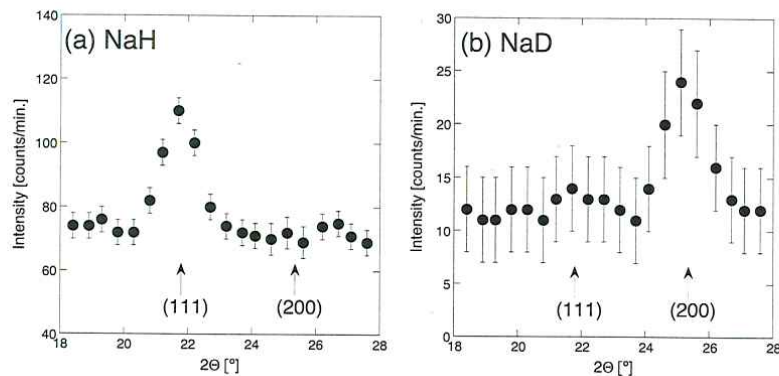


Figure 1: Neutron diffraction patterns obtained for NaH and NaD at room temperature (Shull *et al.*, 1948)