2.2 First Remarks

Before we discuss in detail the consequences of the four axioms, we will start with some remarks in order to get a better understanding of what will follow:

1. It is important to notice that we use the phrase **state function** and not **wave function**, since the wave function is only a special representation of a state in space.

2. All measurable quantities are extensive, i.e. having twice the number of particles will lead to an expectation value which is also twice as large. This is the reason why quantum mechanical operators must be linear.

3. Measuring means to find a sharp value. Thus the system must decide itself, which state it will represent. All measurable quantities are real and correspond to Eigenvalues. Thus all Eigenvalues must be real and the corresponding operators must be Hermitian.

4. The fraction of an ensemble is a real number. Eigenvectors of Hermitian operators are in general not real, but the value $\langle\psi|\psi\rangle$ is.

Historical remark: In the beginning of quantum mechanics only the physical meaning of the Eigenvalues was known. The importance of the Eigenfunctions as the representation of the state has been recognized several years later.