QSIT 2009 - Questions 3

12. Oktober 2009

1. **Bloch Sphere and Pauli operators**

   see Problem Sheet 2 - Question 2.

2. **Spin 1/2 particle in transverse magnetic field**

   A spin-1/2 particle is placed in a magetic field pointing in the z-direction with magnitude B_z. At time t_0 an additional field B_x is applied in the x-direction. Calculate the expected excited state population as a function of time and draw a diagram thereof. Assume that $B_x \gg B_z$ and that the particle is initially in its ground state. What changes, if the additional magnetic field points in the y-direction instead?

   (Hint: The population is calculated by squaring the coefficient in front of the corresponding basis-vector.)