

Exercise Class 3

Exercise 1

Consider an operator \hat{O} with truth table:

Input state $ \psi_{in}\rangle$	Output state $ \psi_{out}\rangle$
$ 0\rangle$	$ -\rangle$
$ 1\rangle$	$ +\rangle$

Calculate the angles ϕ, θ, λ to implement \hat{O} with two rotations around \vec{z} and one rotation around \vec{y} .

Exercise 2

Consider an electron subject to a magnetic field $B = 2 T$ directed along \vec{z} . Determine the position of the energy levels $|0\rangle, |1\rangle$, the Larmor frequency ω_L and the time t_1 for which the magnetic field must be applied to operate a gate \hat{S} .

Exercise 3

Consider an electron subject to a static magnetic field $B_0 = 1 T$ along \vec{z} and an oscillating magnetic field $B_1 = 1 mT$ along \vec{x} . Calculate the frequency of the magnetic field B_1 and draw the pulse schedule to operate the gate $\hat{O} = \hat{H} \cdot \hat{X}$.