

## Exercise Sheet 02

Out: 2021-03-01

Due: 2021-03-08

## 1 Bomb tester

<b>Knowlets:</b>	Bomb	ProblemID: BombLower
<b>Time:</b>		
<b>Difficulty:</b>		

In the lecture, we have described the bomb tester (see also Section 3 in the lecture notes). To test whether there is a bomb, we send a photon through the *upper* input path of the bomb tester (called  $|up\rangle$  in the lecture notes). Assume instead that, with the same setup, we send the photon through the *lower* path. What happens? (Compute the probabilities for “bomb explodes”, “photon in upper path”, “photon in lower path” in the cases of “bomb” and “no bomb”.)

## 2 Working with quantum states (ctd.)

(a)	<b>Knowlets:</b>	ComplMeas	ProblemID: ComplMeas
	<b>Time:</b>		
	<b>Difficulty:</b>		

For each of the *valid* quantum states from Homework 1, Problem ?? (??), answer the following: You perform a measurement in basis  $\begin{pmatrix} \frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} \end{pmatrix}, \begin{pmatrix} \frac{1}{\sqrt{2}} \\ -\frac{1}{\sqrt{2}} \end{pmatrix}$  (we call the corresponding outcomes “+” and “−”). What is the probability of answer +, what is the probability of answer −? What is the state after the measurement in each of those cases?