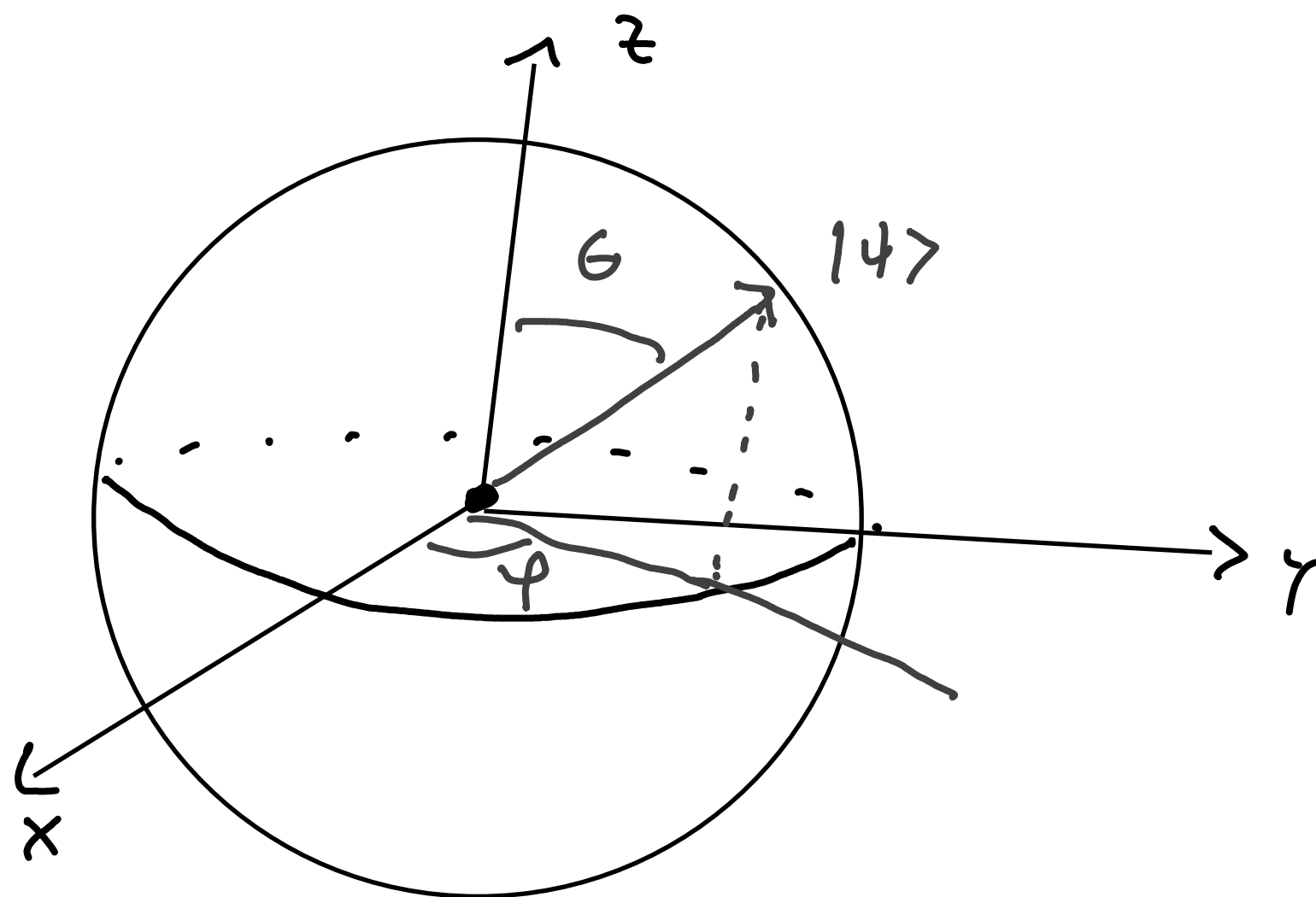# 2. Principes quantiques

Calcul quantique

2. Principes quantiques

Sphère de Bloch: $|\psi\rangle = \cos\left(\frac{\theta}{2}\right)|0\rangle + e^{i\varphi}\sin\left(\frac{\theta}{2}\right)|1\rangle$

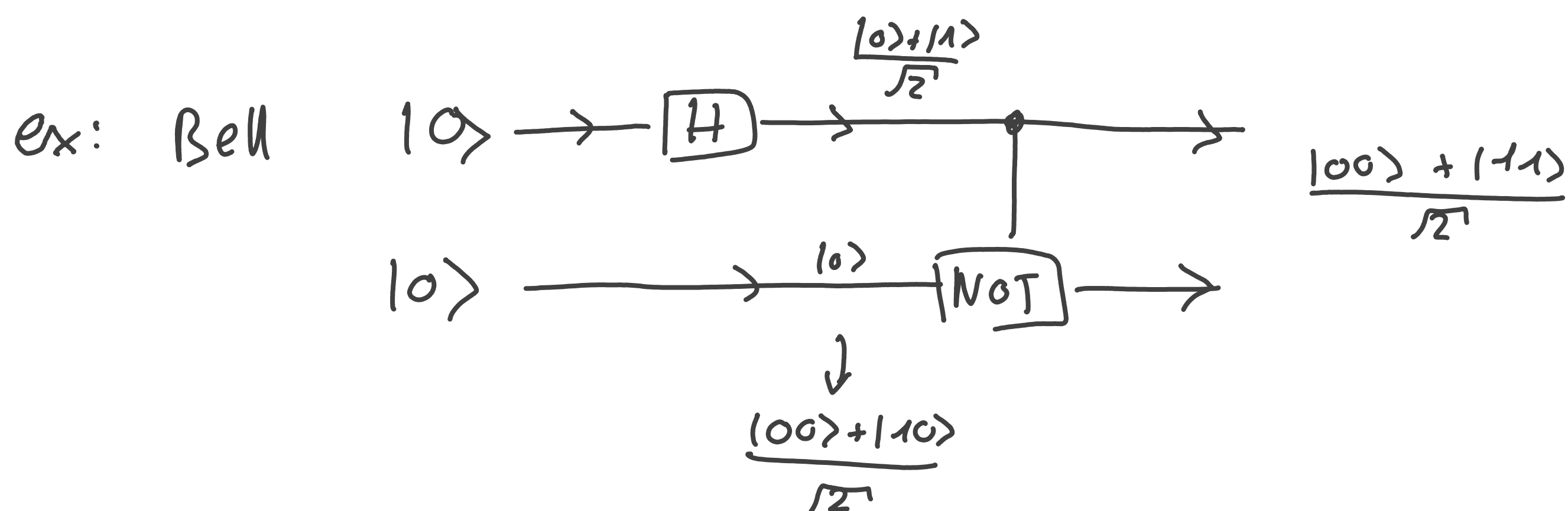

Matrice unitaire: $UU^\dagger = U^\dagger U = \mathbb{1}$, $U^\dagger = U^{T,*}$

ex: $\alpha|0\rangle + \beta|1\rangle \longrightarrow \alpha|1\rangle + \beta|0\rangle$ existe si $\exists U$

$|\psi\rangle$ $U|\psi\rangle$

$U(\alpha|0\rangle + \beta|1\rangle) = \alpha|1\rangle + \beta|0\rangle \Rightarrow \begin{cases} U|0\rangle = |1\rangle \\ U|1\rangle = |0\rangle \end{cases}$

$\Rightarrow U = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix} = NOT$

$\alpha|0\rangle + \beta|1\rangle \rightarrow \boxed{NOT} \rightarrow \alpha|1\rangle + \beta|0\rangle$

ex: Bell $|0\rangle \rightarrow \boxed{H} \rightarrow \frac{|0\rangle + |1\rangle}{\sqrt{2}} \rightarrow \bullet \rightarrow \frac{|00\rangle + |11\rangle}{\sqrt{2}}$

$|0\rangle \longrightarrow \frac{|0\rangle}{} \boxed{NOT} \rightarrow$

$\downarrow$

$\frac{|00\rangle + |10\rangle}{\sqrt{2}}$

$\Rightarrow U = (NOT_{1\to2}(H \otimes \mathbb{1})$