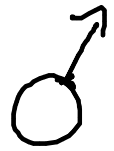
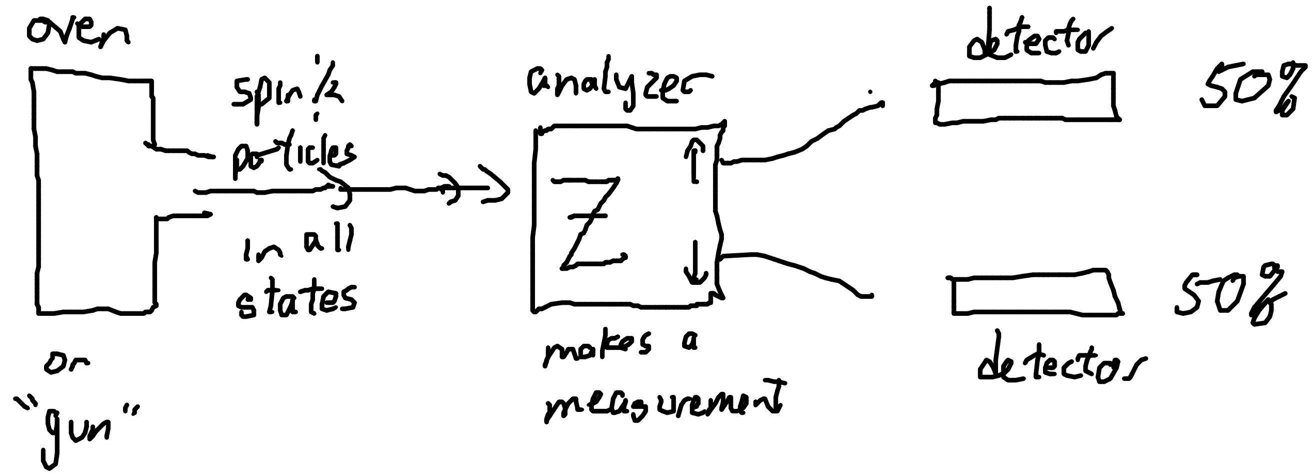
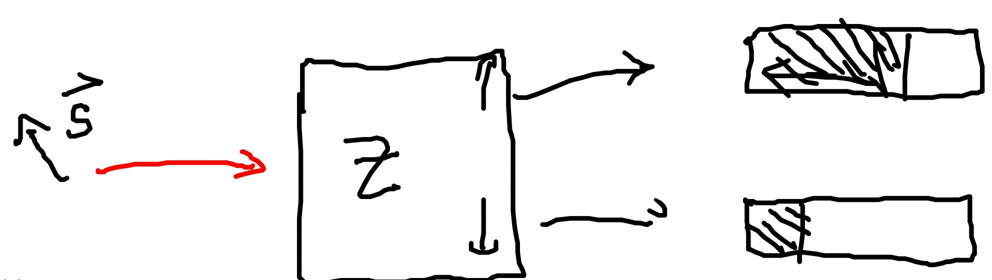


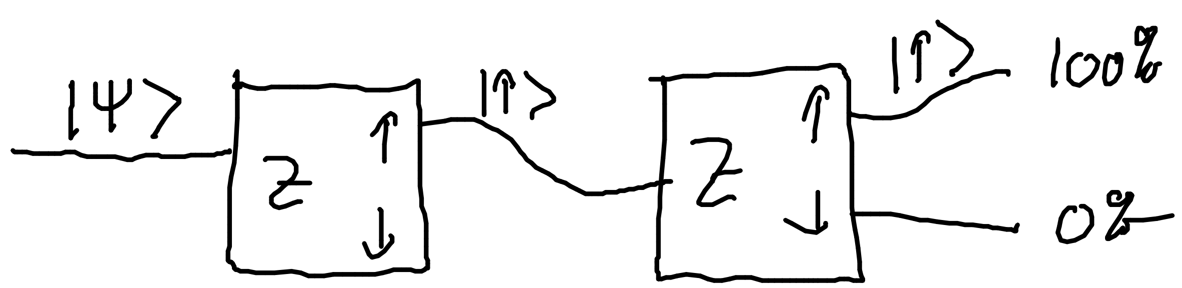
$\vec{S}$ $\qquad S_z = \pm \frac{\hbar}{2}$

$$|\vec{S}| = \sqrt{3}\,\frac{\hbar}{2}$$





will come out as ↑ most of the time.

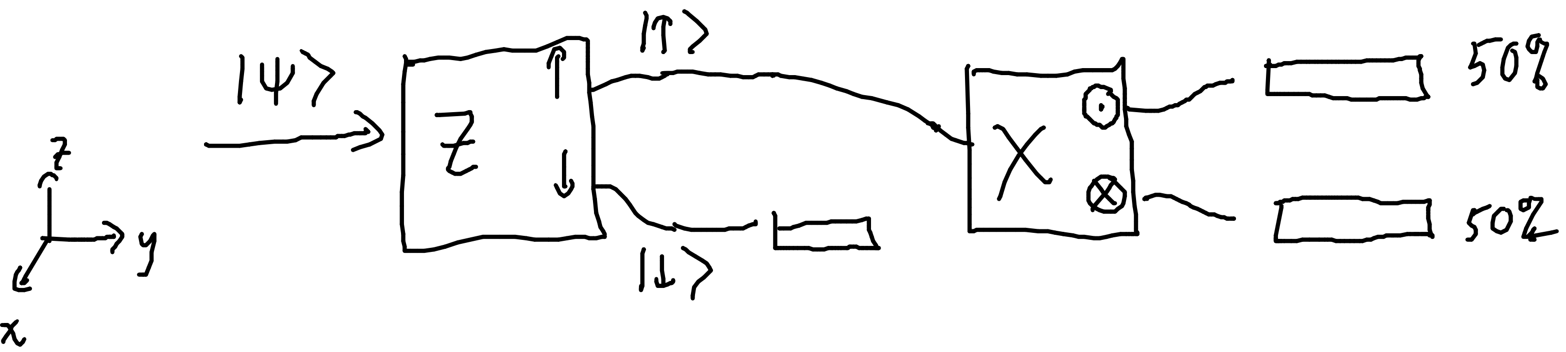


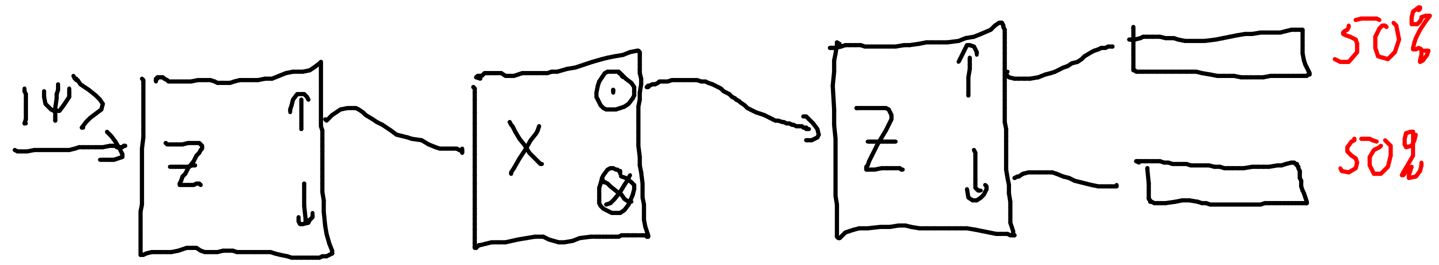
Quantum measurement changes the quantum state.

"ket" $\quad |\psi\rangle \quad$ a generic quantum state

$|\uparrow\rangle \quad$ a specific quantum state "spin-up"

(or $|+_z\rangle$ or $|S_z = +\frac{\hbar}{2}\rangle$ or whatever)





A) 50% & 50%

B) 100% & 0%

No memory of first Z measurement,
no "hidden variable" telling particle
what to do when Z-measured,

(cf "Bell's inequalities")

— —

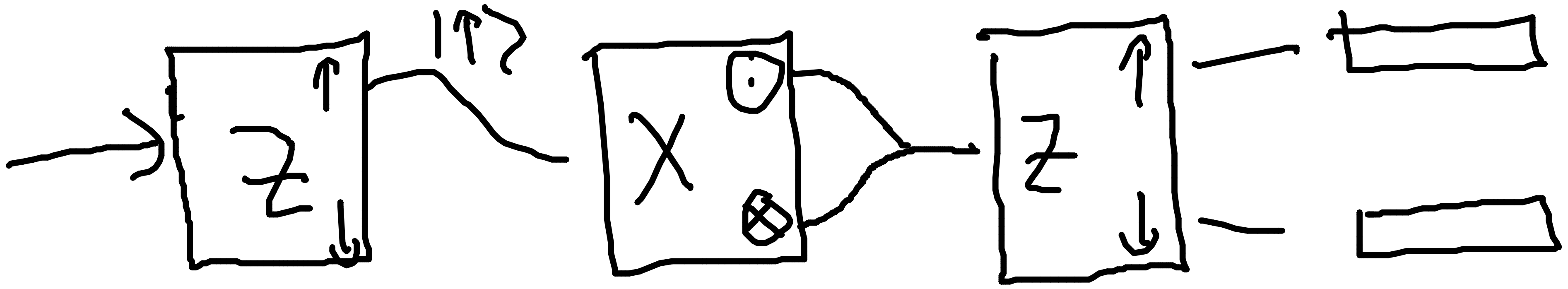
There are no particles that will always register
$|\uparrow\rangle$ & $|\odot\rangle$ 100% of the time

Z & X are "observables" (more precisely μ_z & μ_x)

they are "incompatible observables"

We can't determine what $\vec{S}$ or $\vec{\mu}$ are,

SO much information at quantum level
that is inaccessible to measurement,
or possibly unknowable?



If I block $\otimes$, 50%-50%

If I block $\odot$, 50%-50%

With both X channels open, 100% $\uparrow$!

~~The~~ Each particle leaves X as a superposition of $|\odot\rangle$ & $|\otimes\rangle$

It is as if X measurement didn't happen.

UNLESS you try to determine which channel on X the particle left.

$\therefore$ destructive interference at the $\downarrow$ channel of the last analyzer.