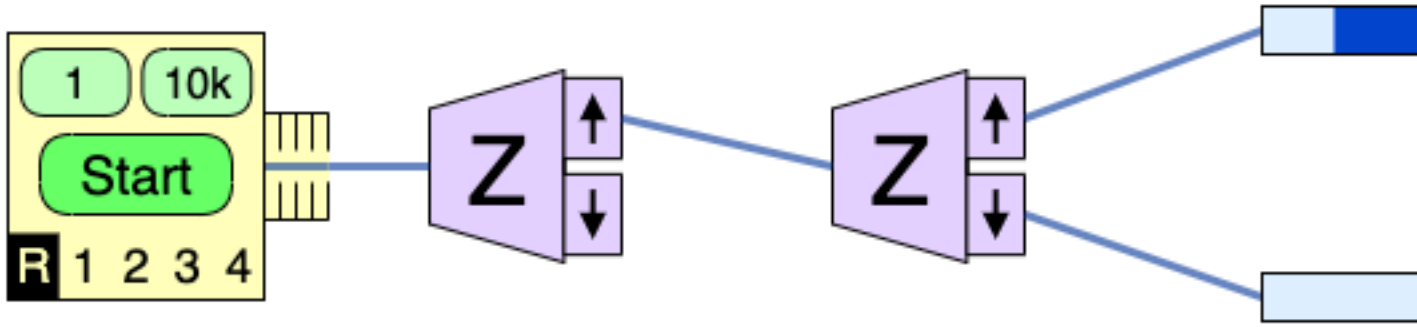
Set up three analyzers in a row, with the 1st and 3rd analyzer oriented in the same direction but the 2nd analyzer in a different direction.

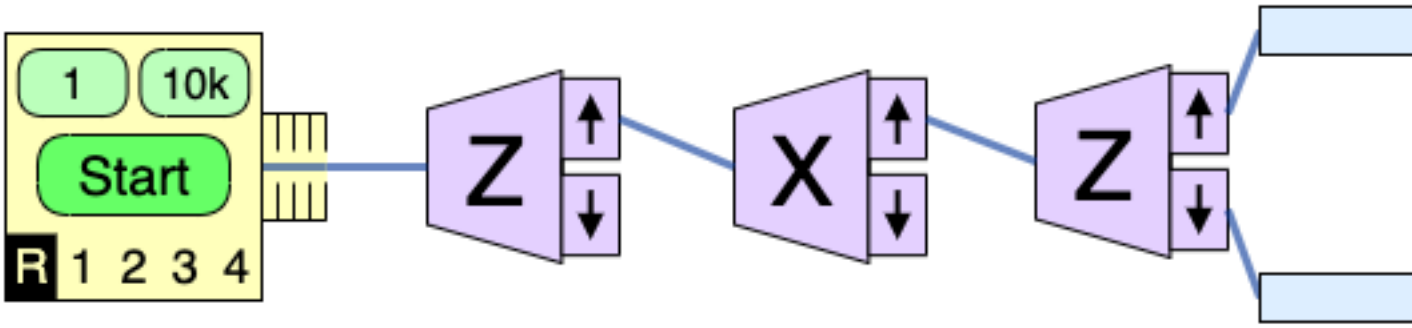
What happens when you send particles through this experiment?

Solution When I set up 3 analyzers in a row, stuff gets weird!

We saw that if I prepare a state by making a measurement of a spin component, then I definitely know the value of that spin component when I make a subsequent measurement:



However, if I put a 3rd analyzer in the middle, the result changes!



Something weird is happening. The 2nd analyzer changes the state of the particle! We know that all the particles leaving the 1st analyzer have $S_z = +\frac{\hbar}{2}$, but a particle leaving the 3nd analyzer has a 50% chance of ending up in the top counter. Somehow, the 2nd analyzer *changed* the state. The Copenhagen interpretation of quantum mechanics calls this change a **collapse** and we'll talk about how to mathematically model this using projection operators later.

This experiment is also known as a quantum eraser: the measurement at the 2nd analyzer **erases** the information about the S_z component of spin. The quantum eraser works because S_z and S_x are **incompatible observables**. You can't know both components of spins with certainty at the same time!