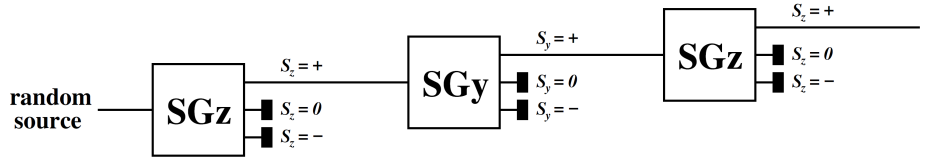
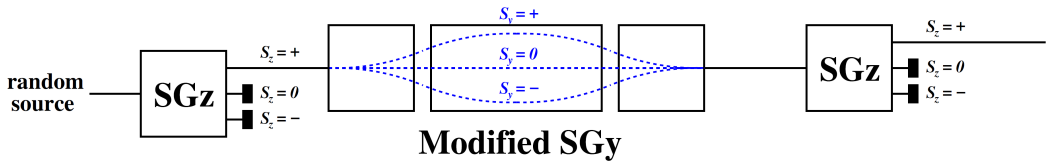
Optional problem: Spin-1 particle in a SG loop In class we found the eigenstates of $\hat{S}_y$ for a spin-1 particle to be:

$$
\begin{aligned}
|y_{+1}\rangle &= \frac{1}{2}\Big(|1,1\rangle + i\sqrt{2}|1,0\rangle - |1,-1\rangle\Big) \\
|y_{0}\,\rangle &= \frac{1}{\sqrt{2}}\left(|1,1\rangle + |1,-1\rangle\right) \\
|y_{-1}\rangle &= \frac{1}{2}\Big(|1,1\rangle - i\sqrt{2}|1,0\rangle - |1,-1\rangle\Big)
\end{aligned}
$$

(a) Spin-1 particles with random spin orientation are sent through the following sequence of Stern-Gerlach setups. What fraction of particles from the initial random source make it all the way through?



(b) Now we replace the second apparatus by a Modified SGy device which splits the beams according to S_y but then recombines them in such a way that no information is retained about which path was taken. What fraction of initial source particles now get through?



(c) Now imagine that we modify the modified SGy in (b) to block the $S_y = -1$ path so that particles can only get through on the $S_y = 0$ and $S_y = 1$ paths. What fraction of particles from the initial source get through in this case? [We haven't done a problem exactly like this before, so think about possible strategies and pick the one you feel more comfortable with.]