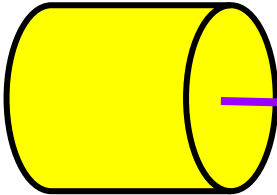


Photon emitter



Path of a single photon



$\frac{1}{2}$

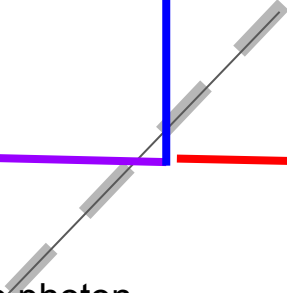


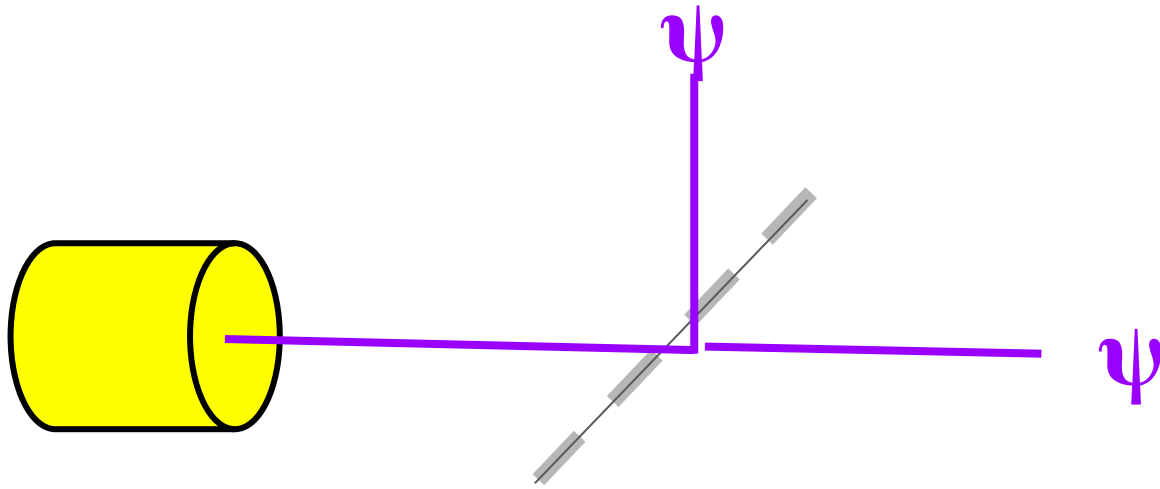
$\frac{1}{2}$



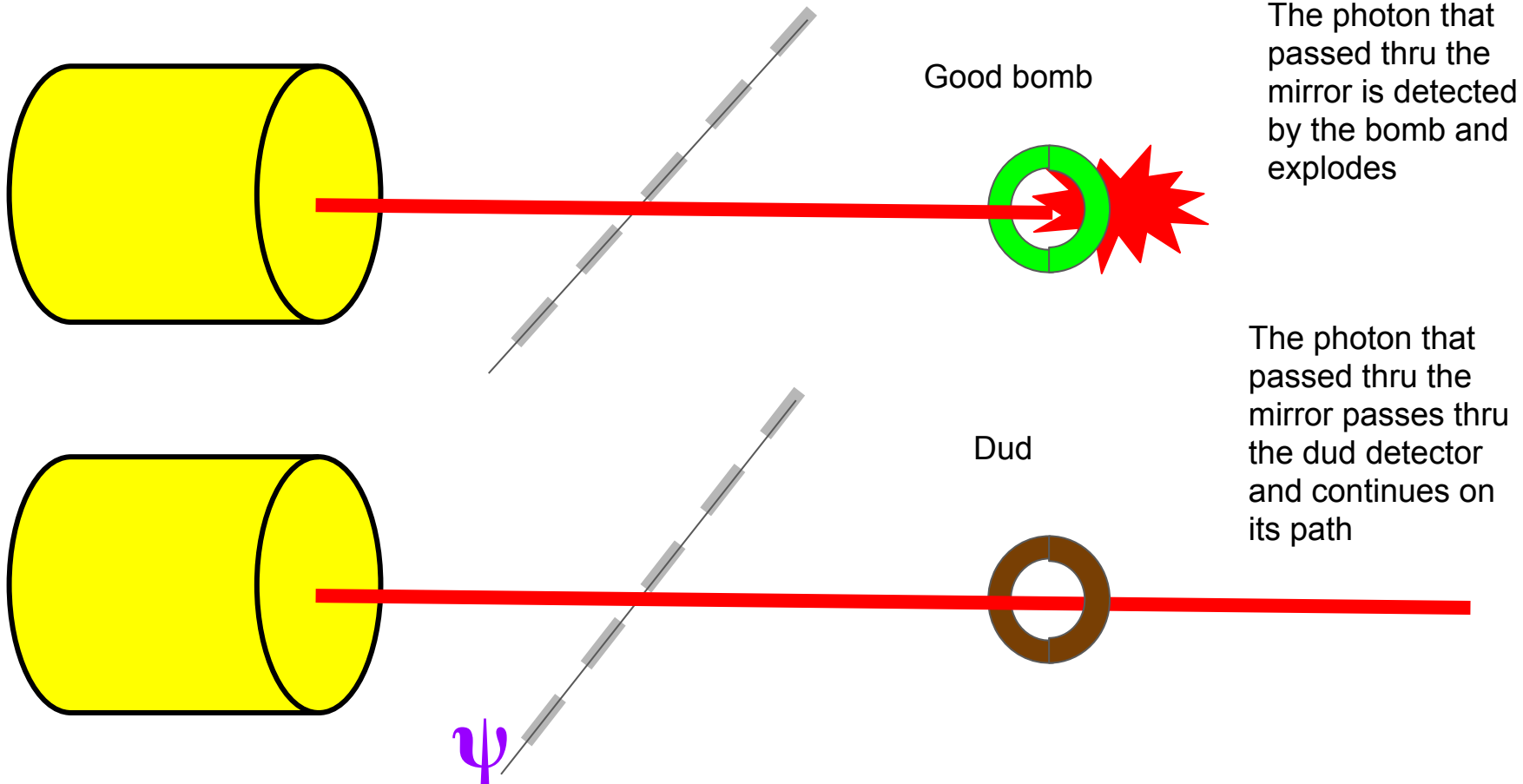
Half silvered mirror

There is a 50-50 chance the photon will be reflected or pass through the mirror

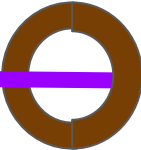
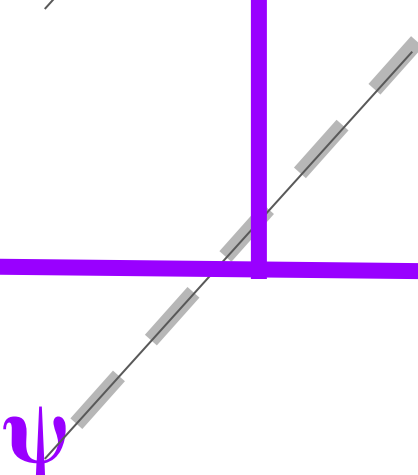
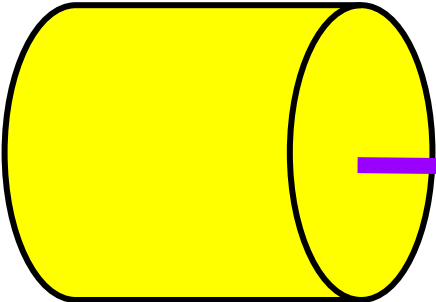
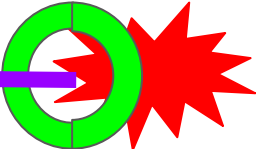
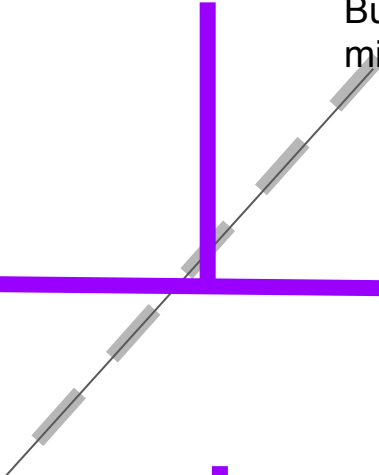
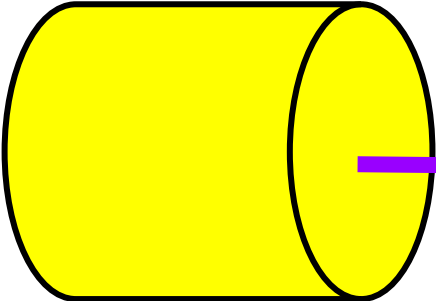


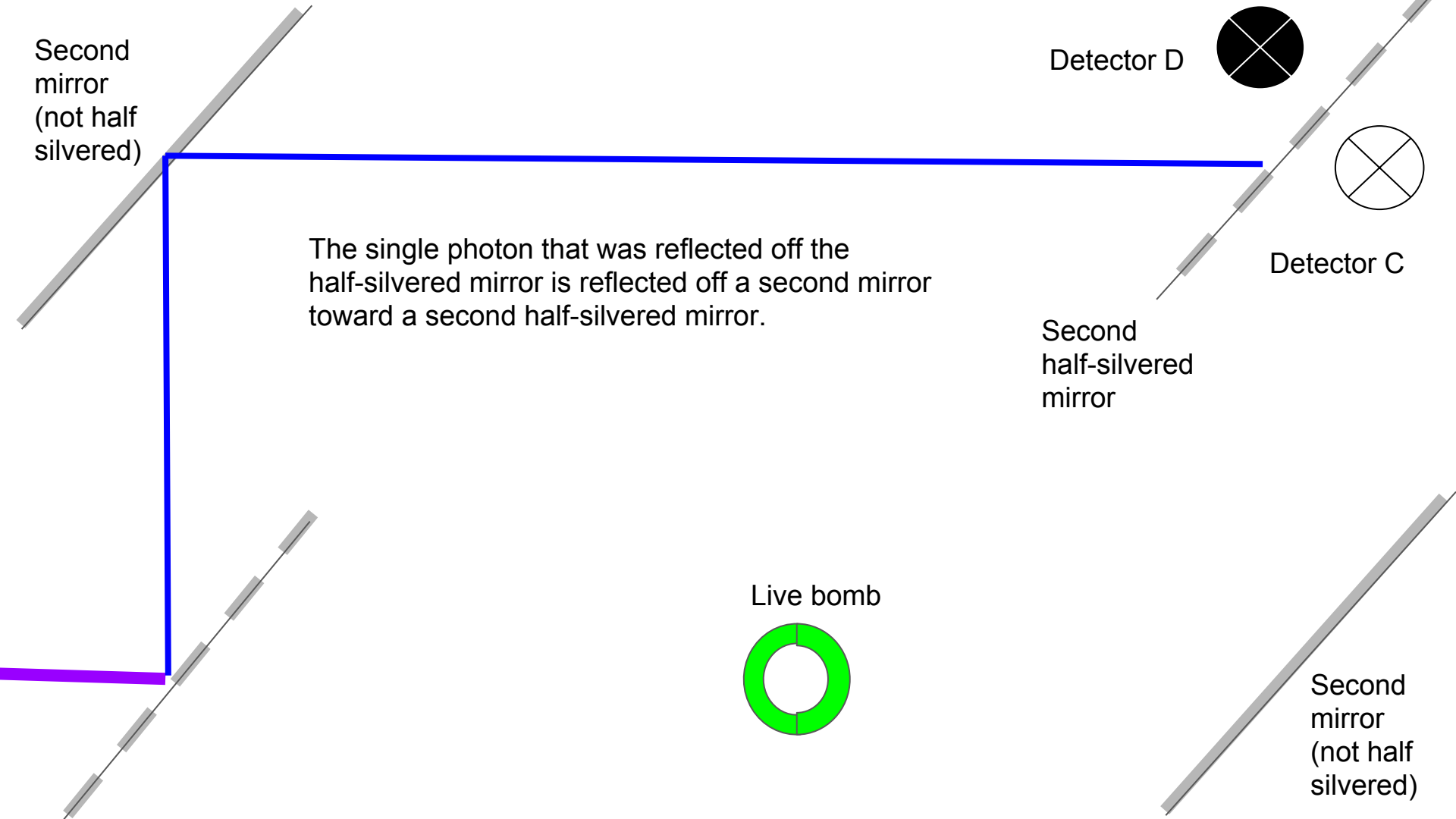


In reality, the photon does both. When it reaches the mirror, it enters a quantum superposition and remains so until observed.



But of course the photon also was deflected by the mirror in either case/

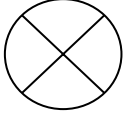




Second mirror (not half silvered)

The single photon that was reflected off the half-silvered mirror is reflected off a second mirror toward a second half-silvered mirror.

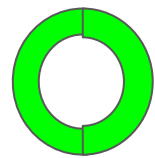
Detector D



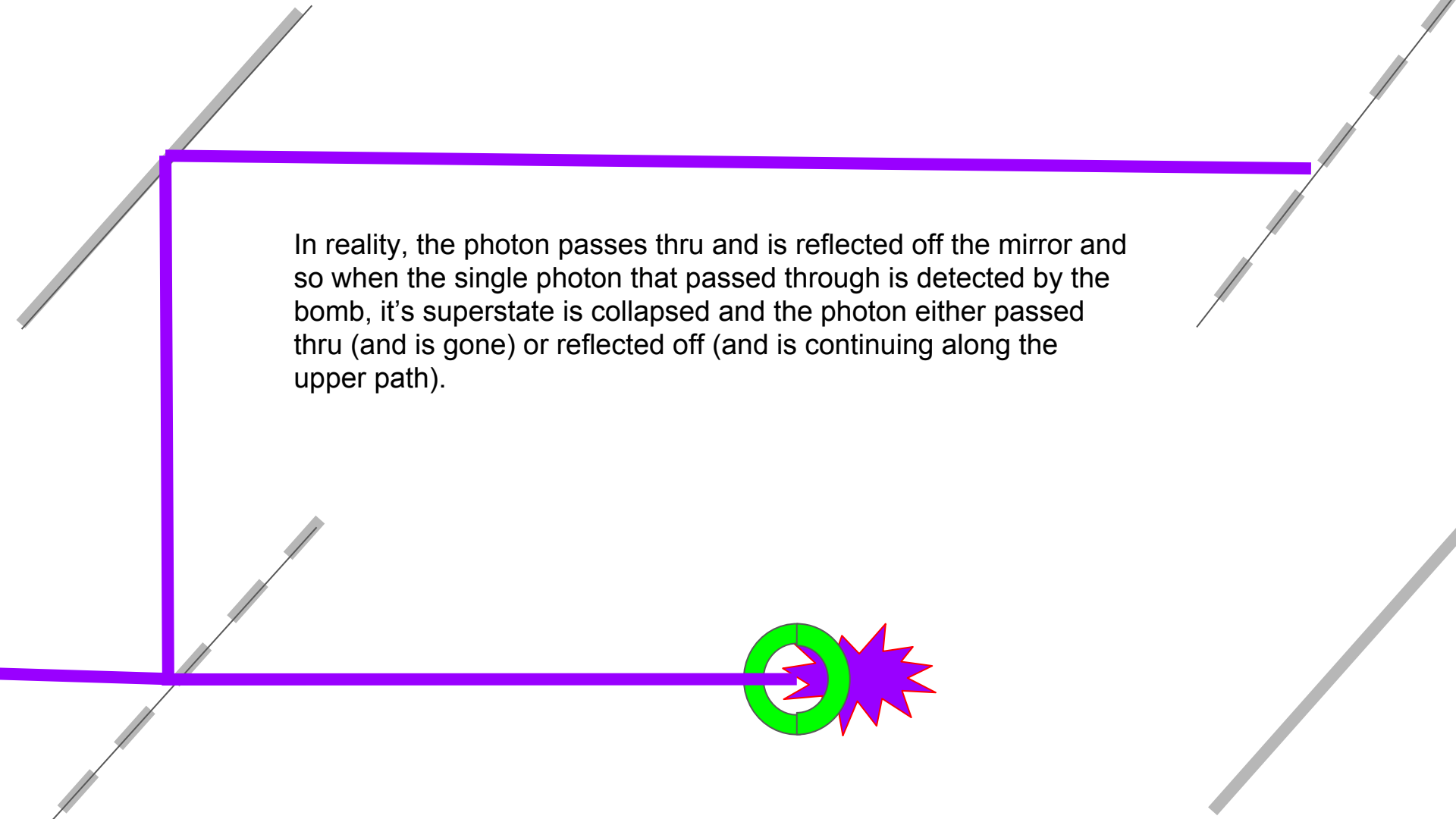
Detector C

Second half-silvered mirror

Live bomb

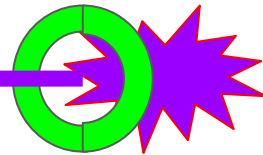


Second mirror (not half silvered)

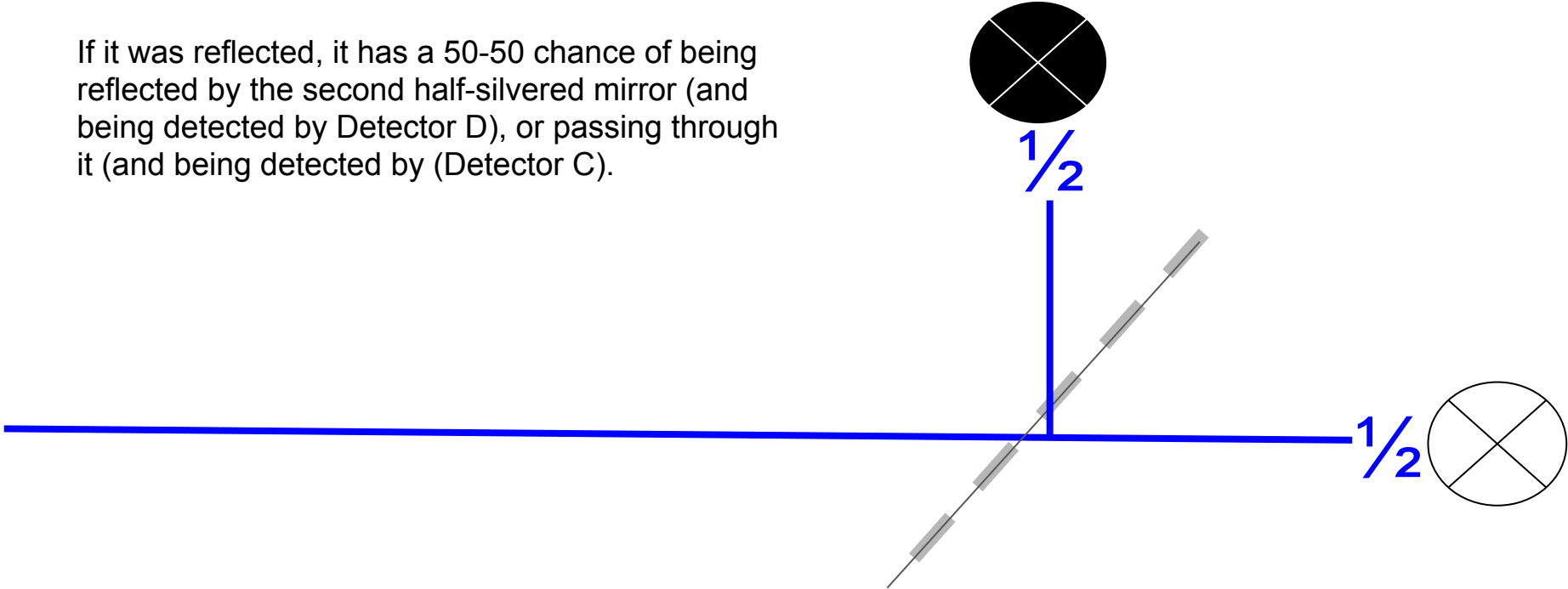


In reality, the photon passes thru and is reflected off the mirror and so when the single photon that passed through is detected by the bomb, it's superstate is collapsed and the photon either passed thru (and is gone) or reflected off (and is continuing along the upper path).

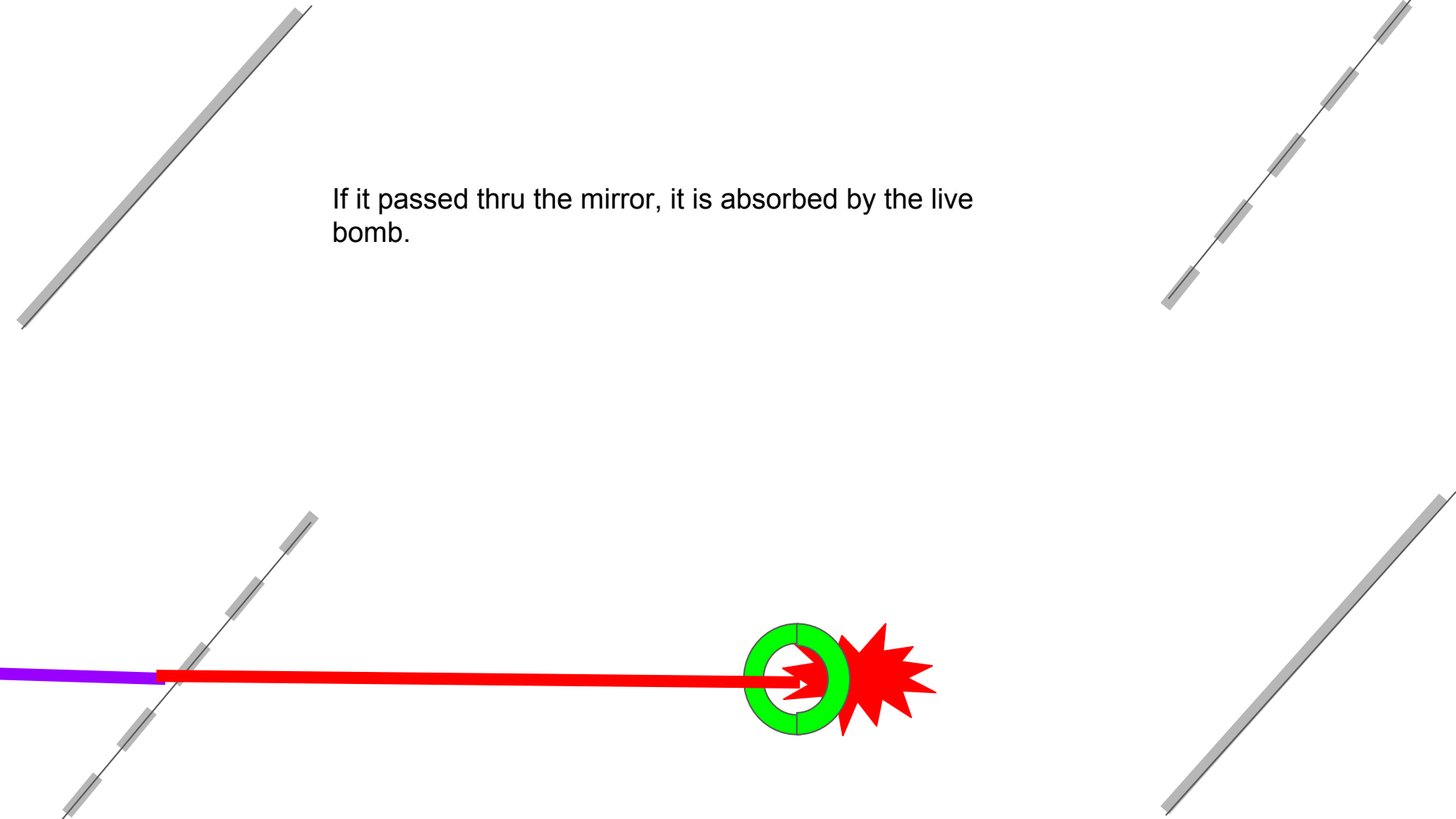
The diagram illustrates a Mach-Zehnder interferometer. A purple line represents the path of a photon. It starts from the left, hits a diagonal mirror, and is split into two paths: an upper path and a lower path. The upper path is a horizontal line that reflects off a top mirror. The lower path is a horizontal line that passes through a green circular detector (the bomb). A purple starburst indicates the photon's interaction with the bomb. The paths recombine at a bottom mirror and exit to the right. The text explains that in reality, the photon's superstate is collapsed by the bomb, resulting in either the photon passing through (and being gone) or being reflected off (and continuing along the upper path).



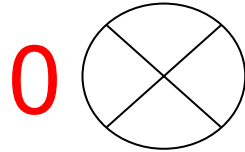
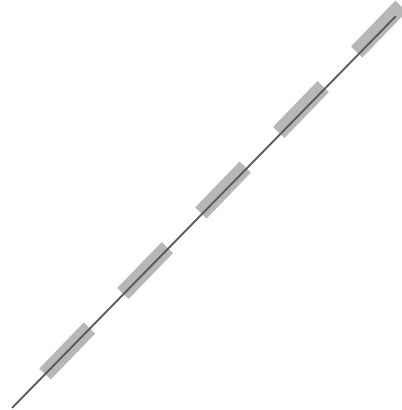
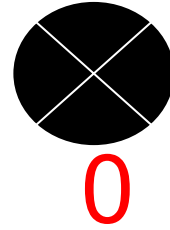
If it was reflected, it has a 50-50 chance of being reflected by the second half-silvered mirror (and being detected by Detector D), or passing through it (and being detected by (Detector C).

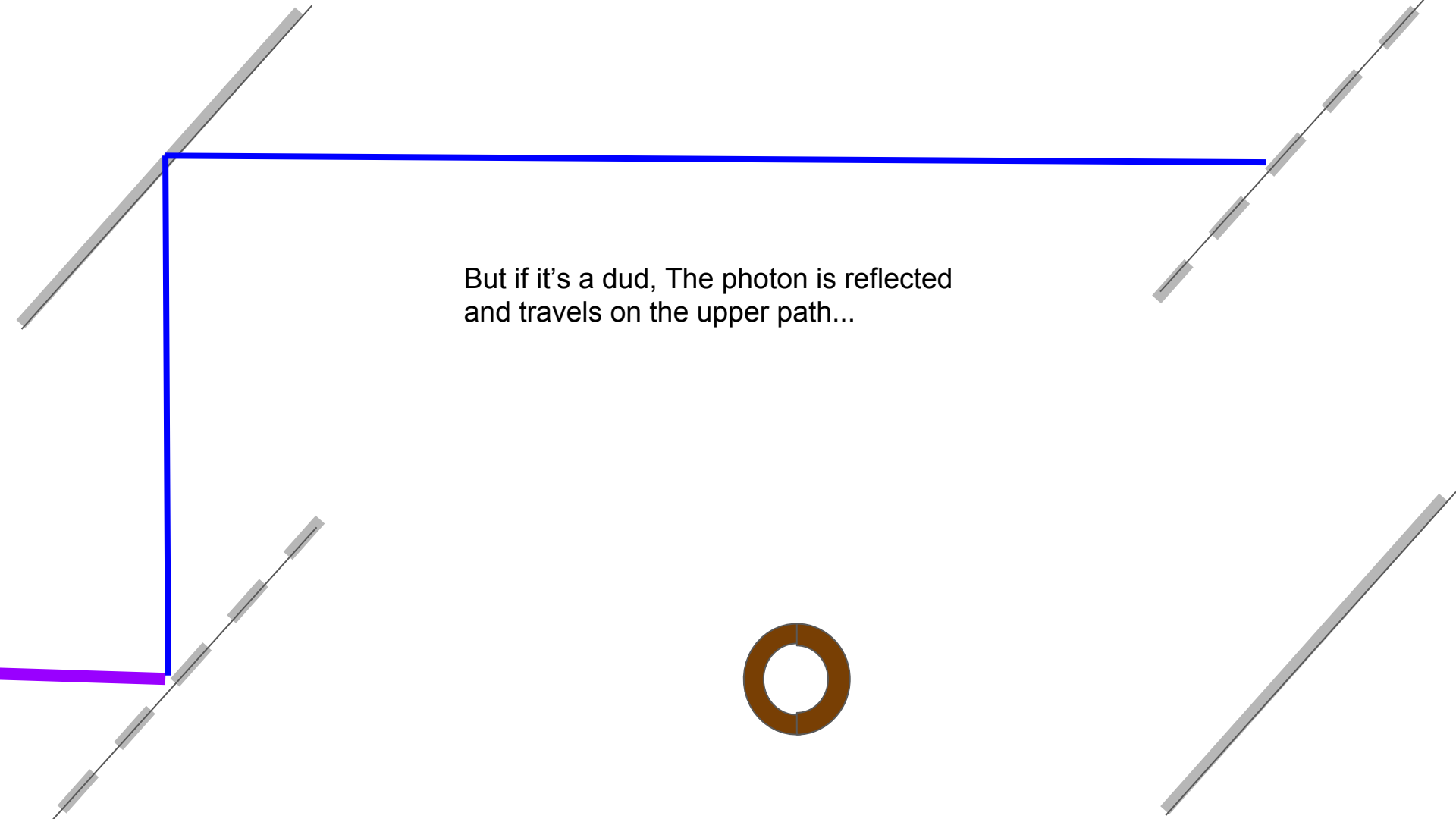


If it passed thru the mirror, it is absorbed by the live bomb.



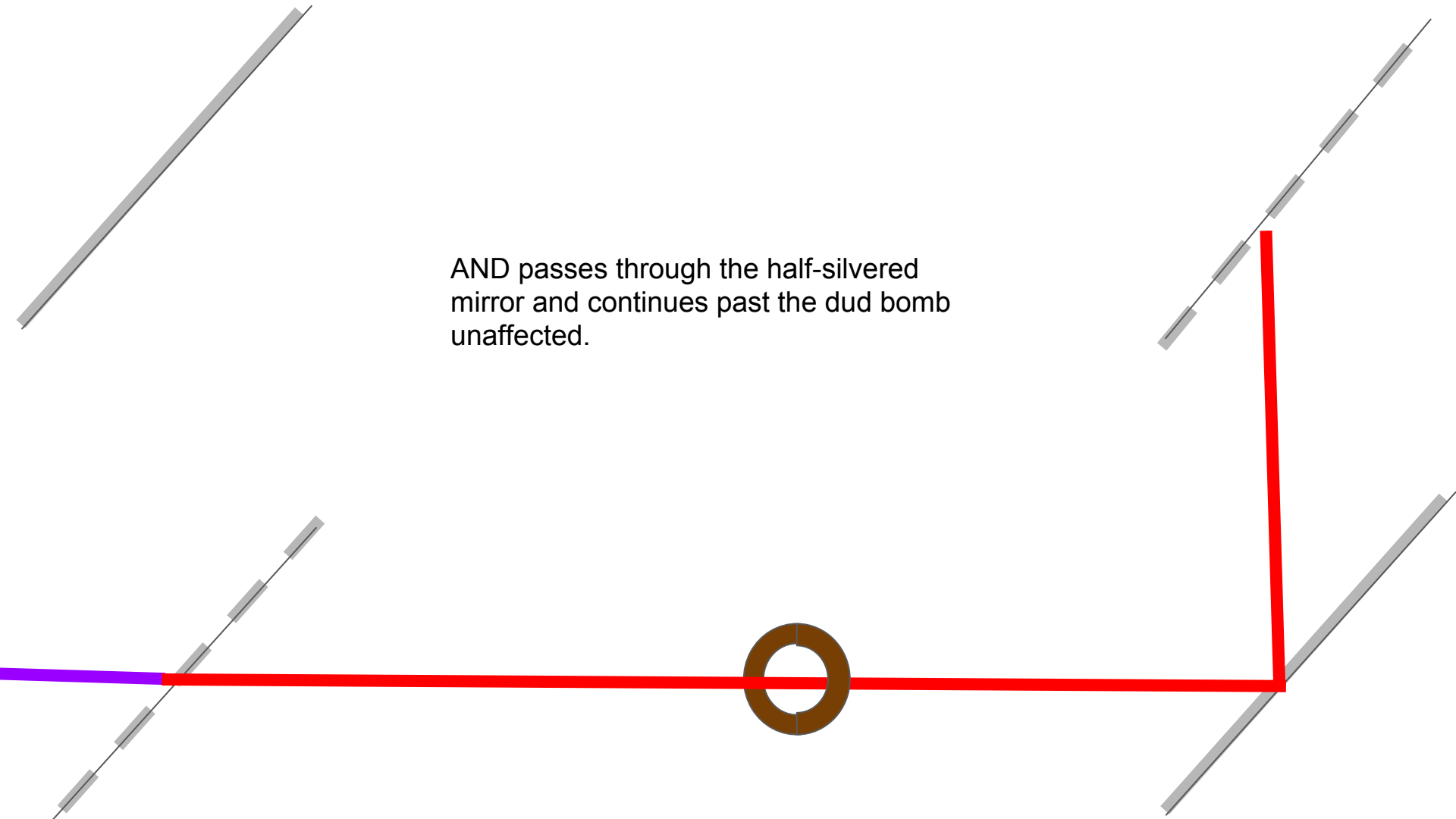
It will not be detected by either D or C,
but it will explode, so that's that...

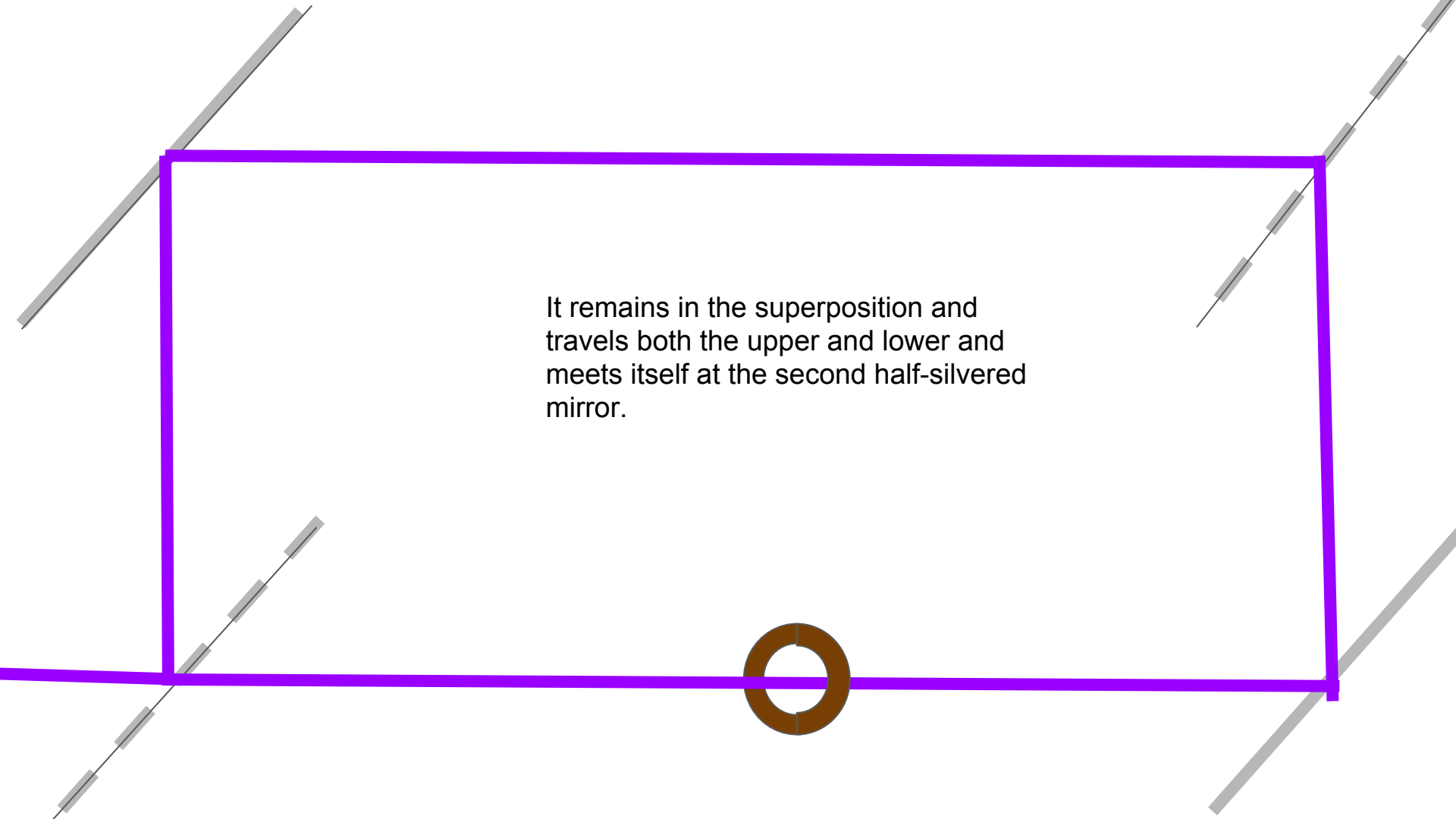




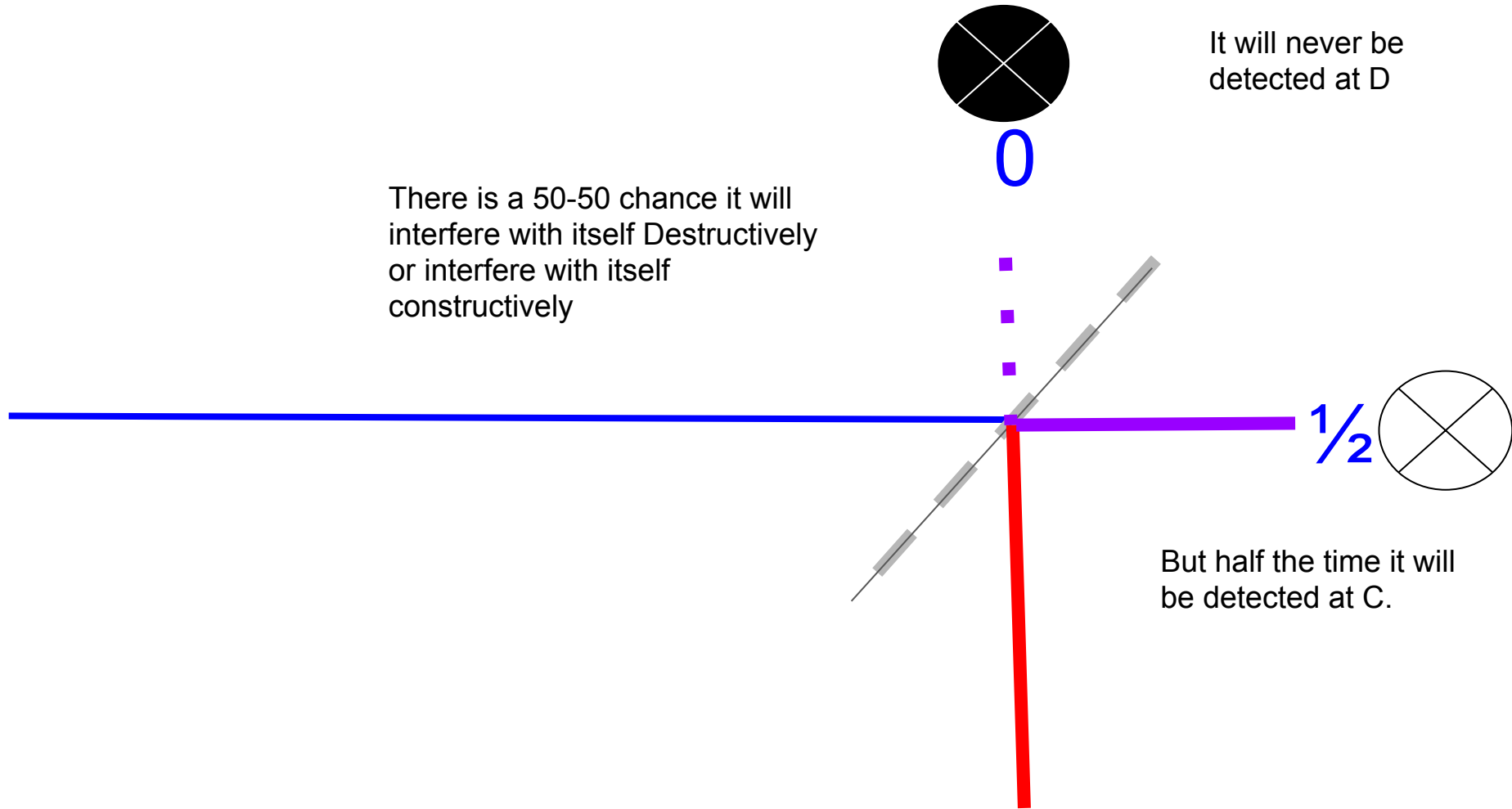
But if it's a dud, The photon is reflected and travels on the upper path...

AND passes through the half-silvered mirror and continues past the dud bomb unaffected.

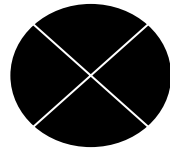


The diagram shows a Mach-Zehnder interferometer. A horizontal purple line enters from the left and passes through a half-silvered mirror (represented by a brown ring) in the center. The line then splits into two paths: one vertical path going up and one vertical path going down. These two paths meet at a second half-silvered mirror on the right. From this second mirror, a single horizontal purple line exits to the right. The entire setup is enclosed in a purple rectangular frame. Four diagonal grey lines, representing mirrors, are positioned at the corners of the frame. In the center of the frame, there is a text box with black text.

It remains in the superposition and travels both the upper and lower and meets itself at the second half-silvered mirror.



There is a 50-50 chance it will interfere with itself Destructively or interfere with itself constructively

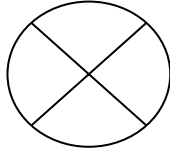


It will never be detected at D

0

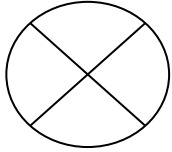


$1/2$



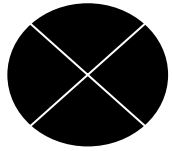
But half the time it will be detected at C.

If the photon is detected at:



Detector C

Bomb is a **dud** or **live** and unexploded.
(25%) retest it.



Detector D

The bomb is live and unexploded.
(25%) success.

No detection

The bomb is **exploded**. (50%) (ahem)

If you get a detection at C or no detection, you repeat the test until it explodes or you get a detection at D. Eventually, you will be left with bombs that only give C or no detection no matter how many times you test them. These are almost certainly the duds.