What happens when you try to chop a photon in half?

A photon is a single particle of light, and under normal circumstances, it can't be divided. But a photon is also *not* a particle, in the sense that it does not have a specific location. Instead, it is an extended object.

So if a photon is only partway through the process of reflecting from a perfect mirror and you yank the mirror away, what happens? The answer, from a trio of Norwegian physicists, turns out (arxiv.org link) to be more complex than I expected.

A photon divided?

Let's first talk briefly about dividing and combining photons. If this were a common experience in our lives, then shining a single color of light through a piece of glass or reflecting it from a surface might cause photons to divide or combine. This would lead to an amazing array of colors: Our universe would be the most fantastic and legal LSD trip you could imagine. But this doesn't generally happen, hence LSD.

What does happen is that photons can divide and combine under the right circumstances—essentially, the medium through which the light travels has to change in response to the light. This can lead to a rainbow of colors from a single color source.

Technically, we would say that the light interactions we see around us are linear, and the combination/division of photons is a nonlinear process. Typically, to overcome that nonlinearity, you need either a very sensitive medium or a very high-intensity light source, like a laser.

The sudden removal of the mirror while a photon is reflecting is not nonlinear in the way that I would normally think about it. But if you give it more than a moment’s thought, it’s clearly a nonlinear event. This line of thinking is obscured by how we think about single photons at mirrors, though, as I will illustrate below.

https://arstechnica.com/science/2026/07/what-happens-when-you-try-to-chop-a-photon-in-half/