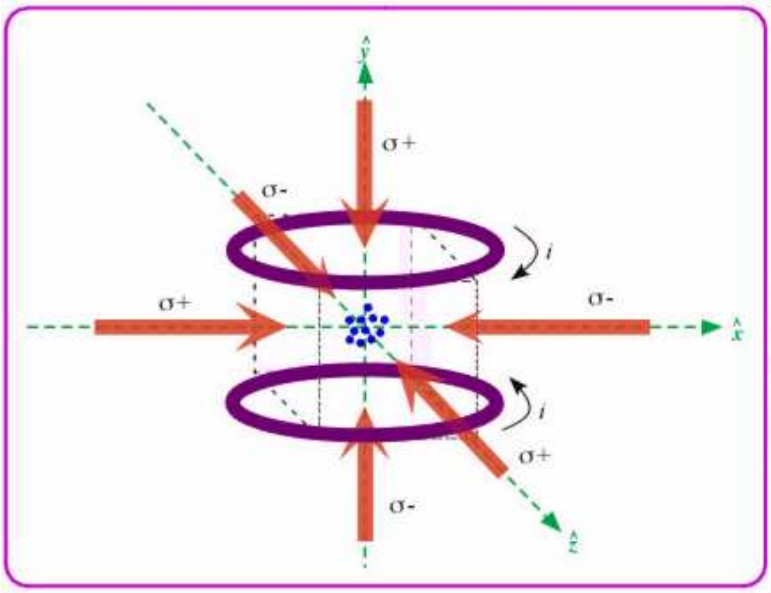
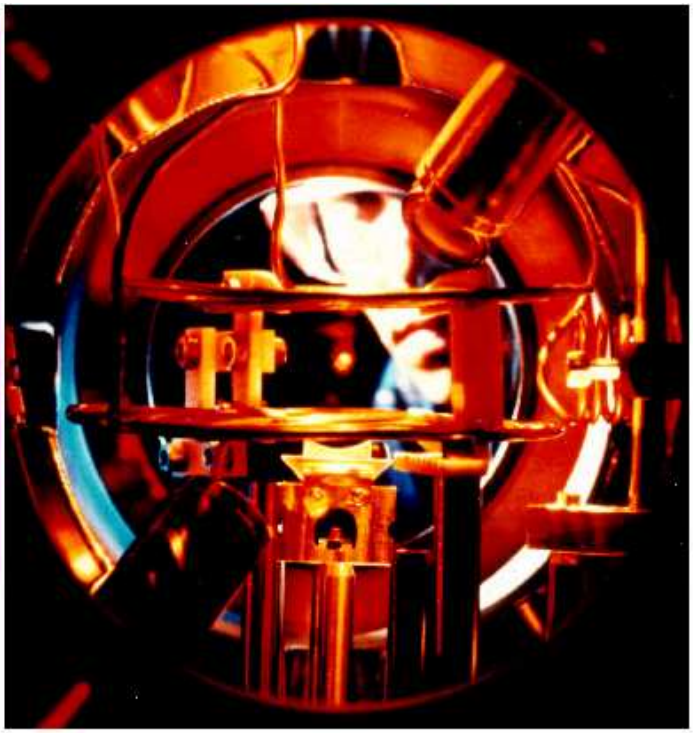
Even more Cooling :

To go below the Doppler limit you use a MOT (Magneto-Optic Trap)





A MOT with its beam configuration to the left and an actual experimental device, trapping a yellow bunch of sodium atoms.

The MOT uses light pressure as well as an inhomogeneous magnetic field. This field is needed to overcome the problem of the Optical Earnshaw Theorem which states, that it is impossible to construct a stabile trap using the light field alone. It is an equivalent to Gauss theorem over a closed volume that tells you that "what goes in must come out". The MOT is explained in a separate box. The MOT is a robust trap for neutral atoms and is often used for feeding other experiments with cooled samples.

Evaporative cooling can be used for temperatures down to 1nK (Na).
The technique can simply be described as letting the hottest atoms escape from the potential trap, by lowering the wall for a while and then restoring it, thus only keeping the coldest atoms. This is the way to BEC, first achieved in 1995.