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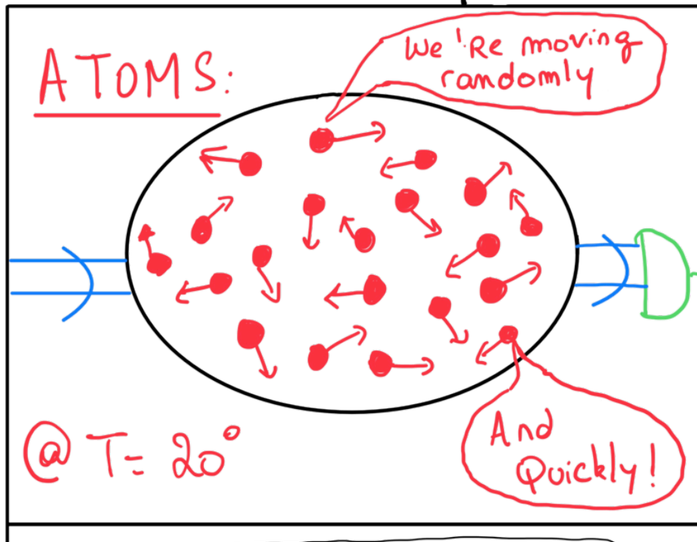
How can we resolve internal properties of atoms?

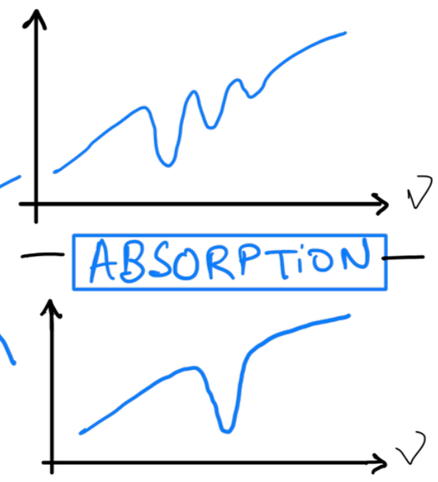
ATOMS:



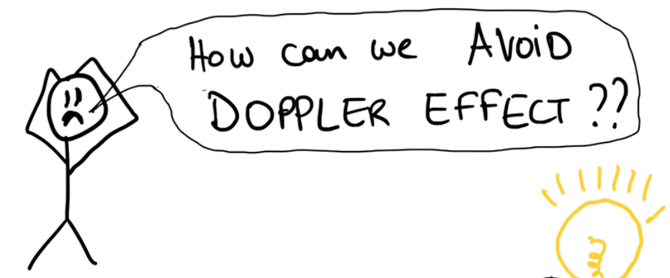
EXCEPTATION:

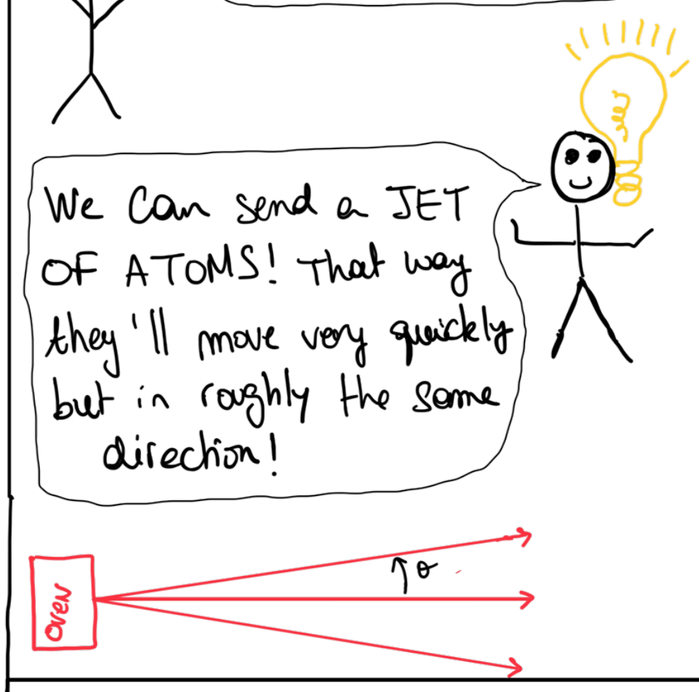
VS

REALITY:



The internal structure of atoms cannot be resolved at room temperature because they are subject to Doppler effect and this blurs the data that can be recovered





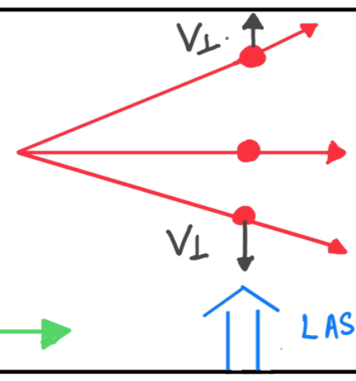
Mmh... They'll be still too fast and still be subject to Doppler effect if a laser is shone on them. They will see a different laser frequency...

Well, you're RIGHT, BUT YOU'RE ACTUALLY WRONG

ATOMS ⟵ LASER

Yes, if you send a laser like that, They'll be subject to Doppler effect

BUT LOOK

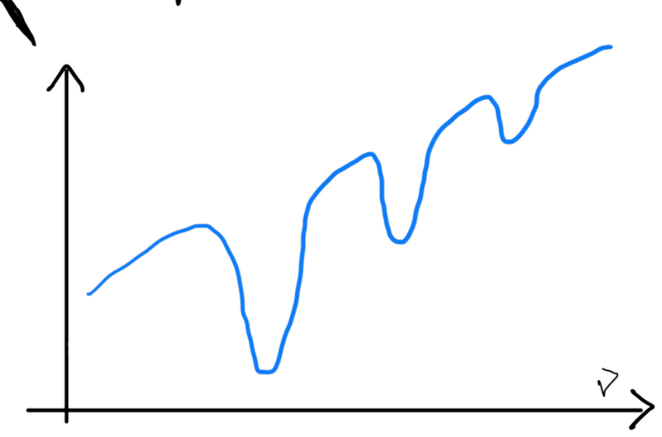


By sending a laser PERPENDICULARLY to the atoms, you'll be playing with the TRANSVERSE VELOCITIES! which are 100 times slower than longitudinale velocities

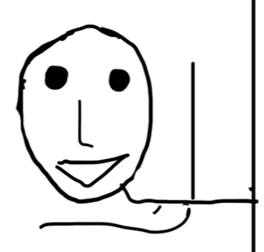
oh! OK! I'll give it a try, Let me 2 minutes!

A FEW MOMENT LATER...

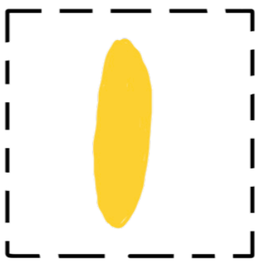
It works! I can see 3 picks in the absorption spectrum!



And that's not all! You can even find out WHICH LASER FREQUENCIES ATOM EMITS LIGHT AT!

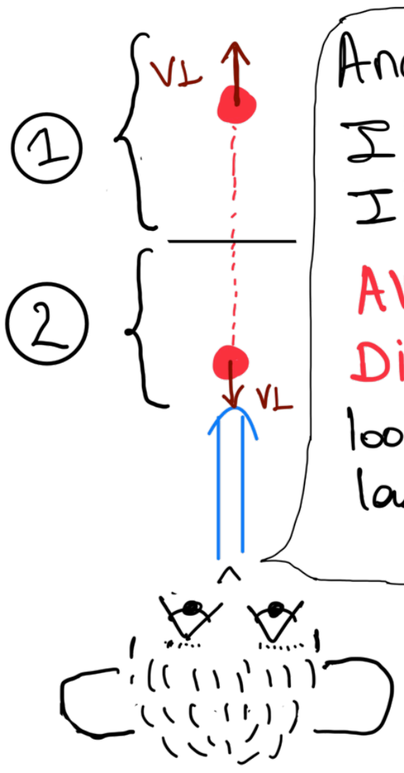


⟶ With a camera you can see a signal. This is light shine by atoms for a given laser frequency.

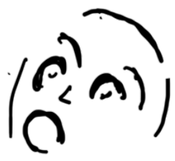


The SIGNAL MOVES UPWARDS if I DECREASE the LASER FREQUENCY (1)

And MOVES DOWNWARDS if I INCREASE the LASER FREQUENCY (2)



And that let me know which atoms I'm looking at. In situation ① I'm looking atoms that are FURTHEST AWAY from the laser moving in the SAME DIRECTION as it. In situation ② I'm looking at the atoms CLOSEST from the laser, moving in the OPPOSITE DIRECTION



Really not stupid...

So, by using a jet of atoms and sending the laser perpendicular to it, we can limit the Doppler effect to find out the internal properties of the atoms and know precisely which atoms we're looking at!