

Midterm

- Friday, March 17, 2010
- Test will cover all material seen to this point.
- 1 hour.

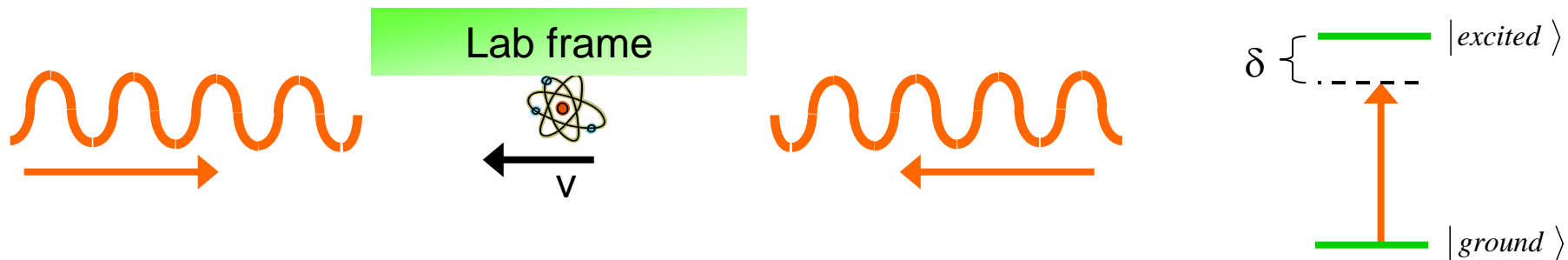
Basic topics:

- 1st and 2nd order coherence.
- 2-level atom.
- Dressed atom theory.
- AC Stark dipole force and traps
- Bloch Sphere.
- Spontaneous emission.
- Density matrix and wavefunction Monte Carlo.
- Selection rules for M1 and E1 transitions.

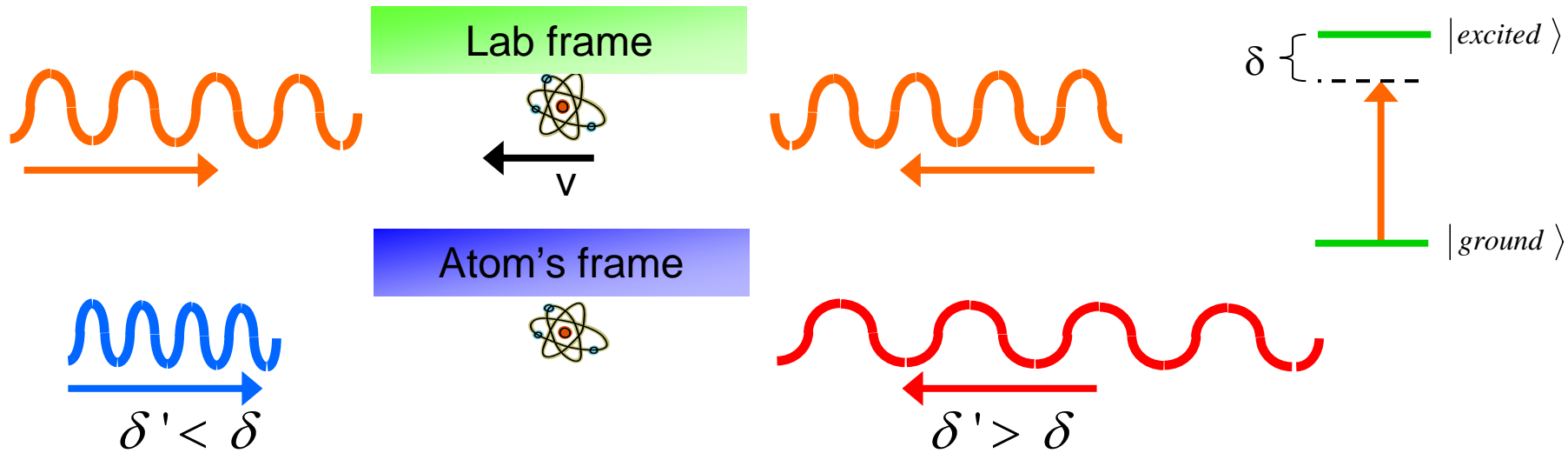
Laser Cooling

1. Doppler Cooling – optical molasses.
2. Doppler temperature.
3. Magneto-optical trap.

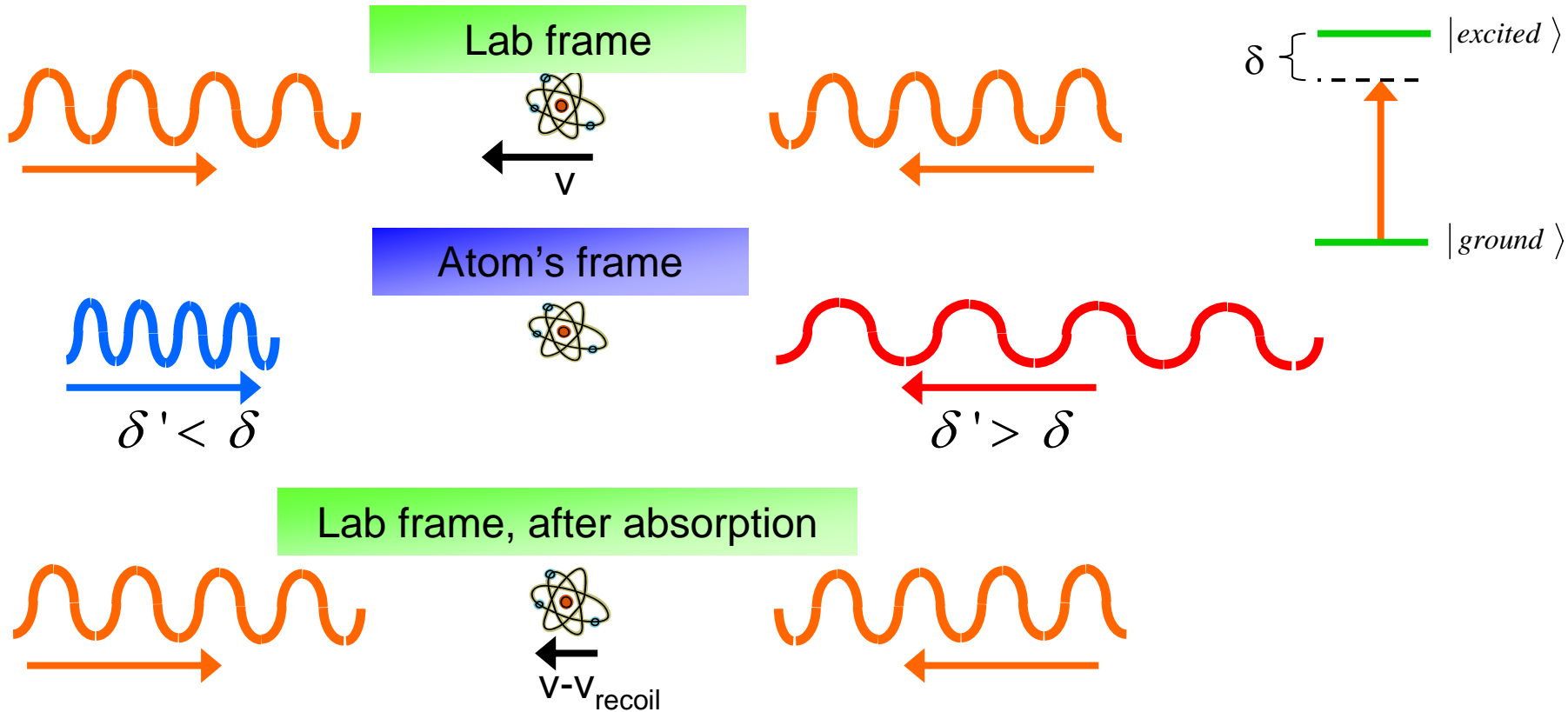
Doppler Cooling: How can a laser cool?



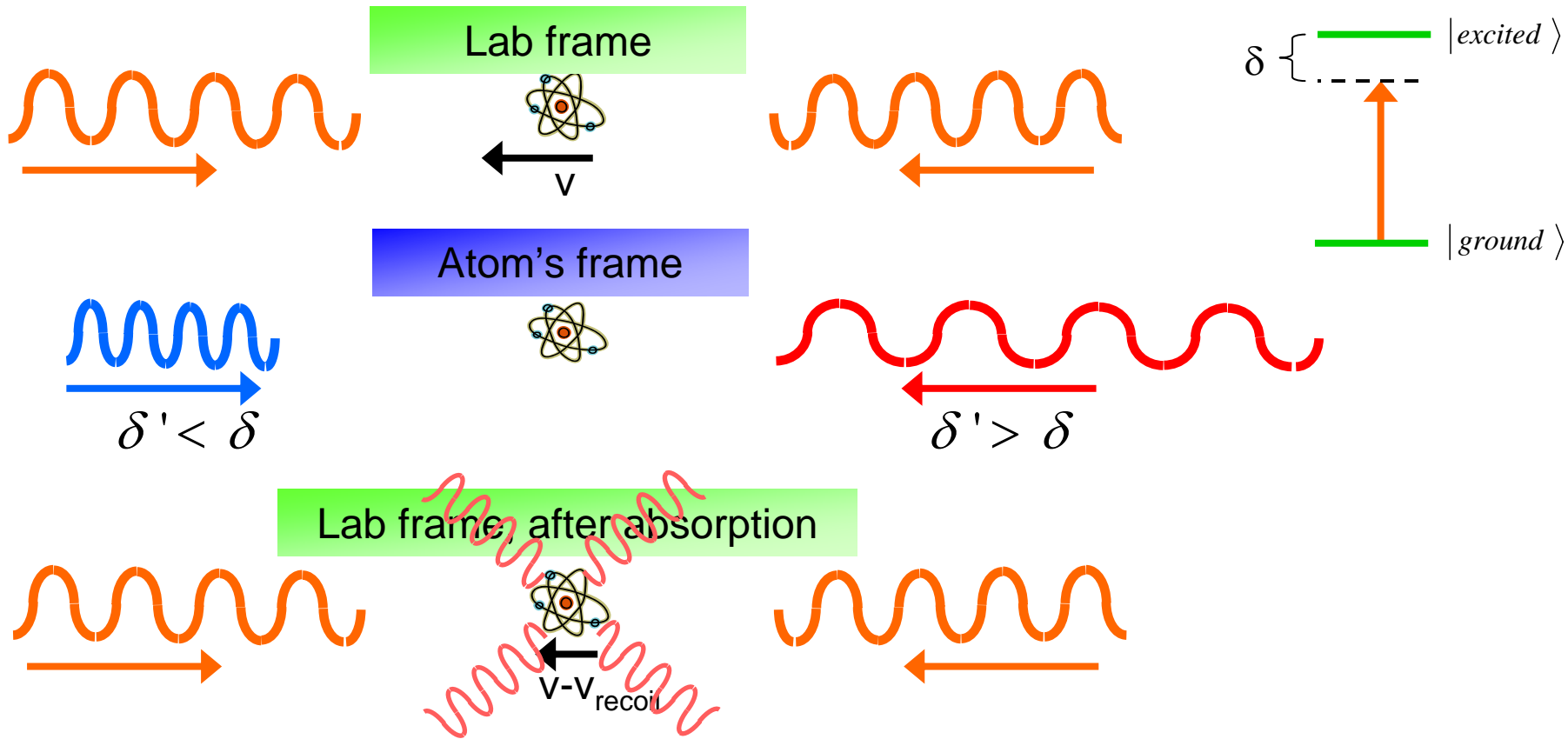
Doppler Cooling: How can a laser cool?



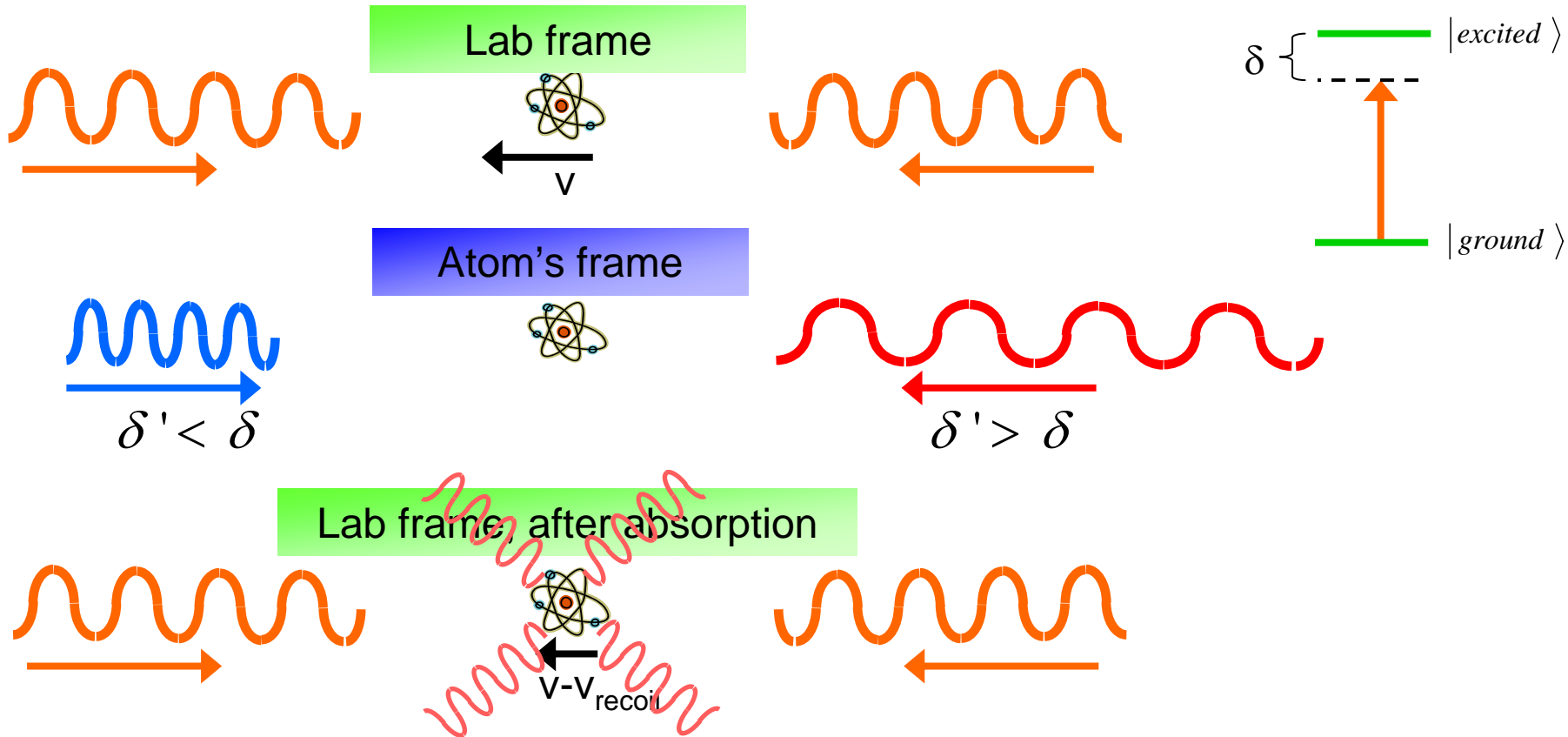
Doppler Cooling: How can a laser cool?



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Doppler Cooling: How can a laser cool?



- Absorb a photon \rightarrow atom gets $\hbar\vec{k}$ momentum kick.
- Repeat process at 10^7 kicks/s \rightarrow large deceleration.
- Emitted photons are radiated symmetrically \rightarrow do not affect motion on average

Doppler Cooling: How can a laser cool?

