FLUX MEASUREMENT AND LASER BUILDING

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If…all scientific knowledge were to be destroyed, and only one sentence passed on to the next generation of creatures, what statement would contain the most information in the fewest words? I believe it is the atomic hypothesis, that all things are made of atoms…in that one sentence you will see an enormous amount of information about the world, if just a little imagination and thinking are applied.

Richard P. Feynman
Laser Cooling

Stationary Atom:
Energy mismatch means photon is not absorbed and atom receives no momentum kick.

Moving Atom:
Small backwards momentum kick to atom.
Photon absorbed in energy transition.

When the atom is moving, the Doppler shifted transition energy corresponds with that of the photon.

http://sciencewise.anu.edu.au/articles/qed
Optical Molasses
Magneto-Optical Trap
http://www.bpc.edu/mathscience/chemistry/history_of_the_periodic_table.html
Rb-85

http://commons.wikimedia.org/wiki/File:Electron_shell_037_rubidum.png
Probe Beam

Reference Beam

Pusher Beam

amplified by 100,000
Compensation Coil
Flux of Atoms
Primary MOT
Secondary Atom Trap
Signal vs. Frequency for Reference Cell

F' = 2
F' = 3
F' = 4

Found the Signal!
Averaged Signal vs. Frequency with Pusher Beam

Graph showing averaged signal (V) vs. frequency (MHz) with a prominent peak at 0 MHz.
Pusher Beam

Compensation Coil

Flux of Atoms
Averaged Signal vs. Laser Frequency

No Pusher

Pusher

Signal: 0.0176 V
-> 0.029 %

Signal: 0.0048 V
-> 0.008 %
Signal vs. Frequency With Various Applied B-fields
Line Strength vs. Applied B-field

Laser Frequency (MHz)

Applied B-field (Gauss)
Probe Beam

Reference Beam

Pusher Beam

amplified by 100,000
~$10,000

~$1,000
THANKS
QUESTIONS?