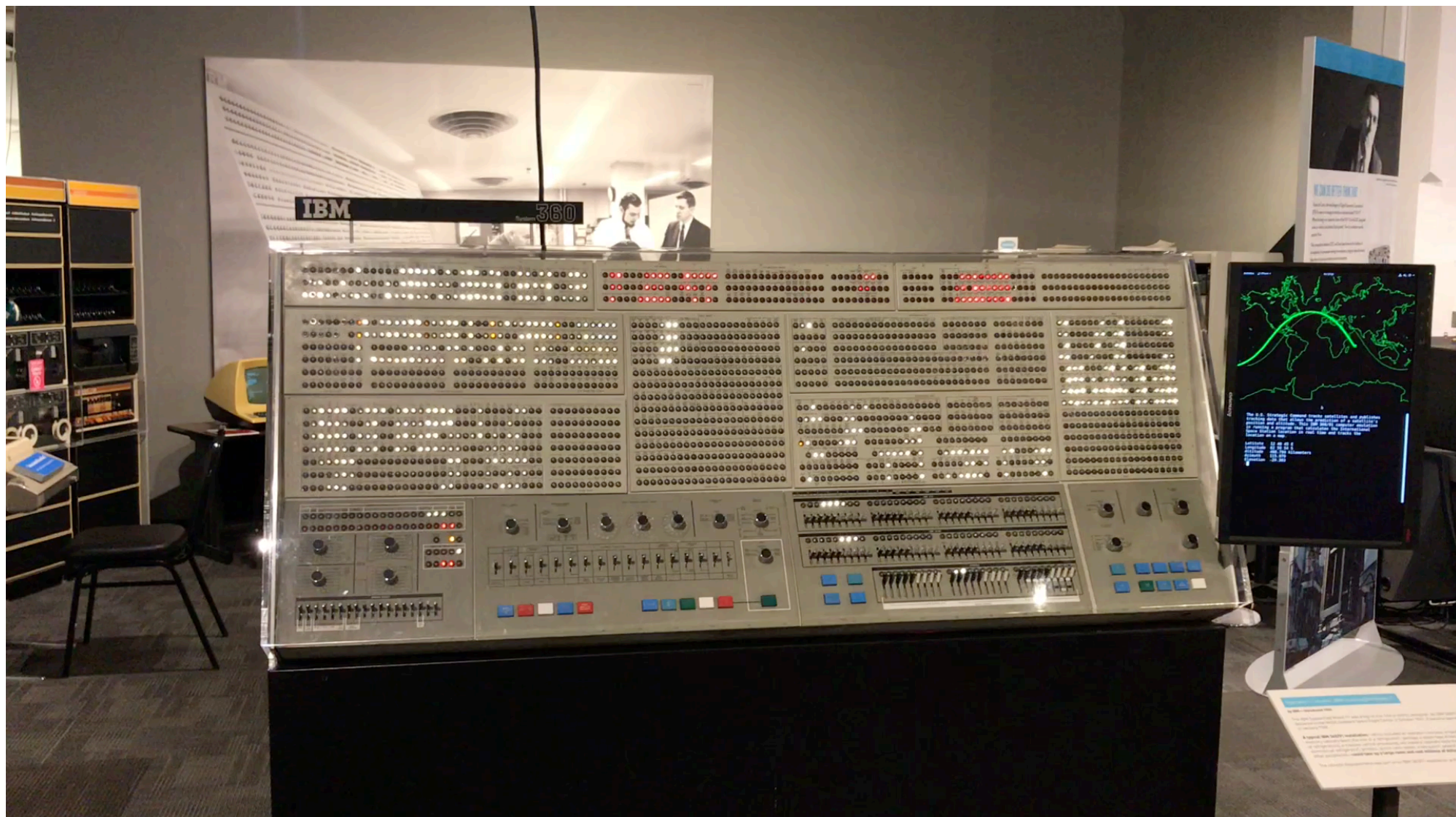


More Midterm Review

Reminder!

- Visit to the Living Computer Museum for this week's homework
- Normally \$20
- **Free Thursday 5-8 pm**



Topics (thanks Citlalli, Claire, Lauren)

- How waves add upon each other
- UTC & atomic time
- Optical clock & optical comb
- How to measure distance with light
- Doppler shift of light
- Natural sources and the telescopes to see them



Interfering waves (demo)



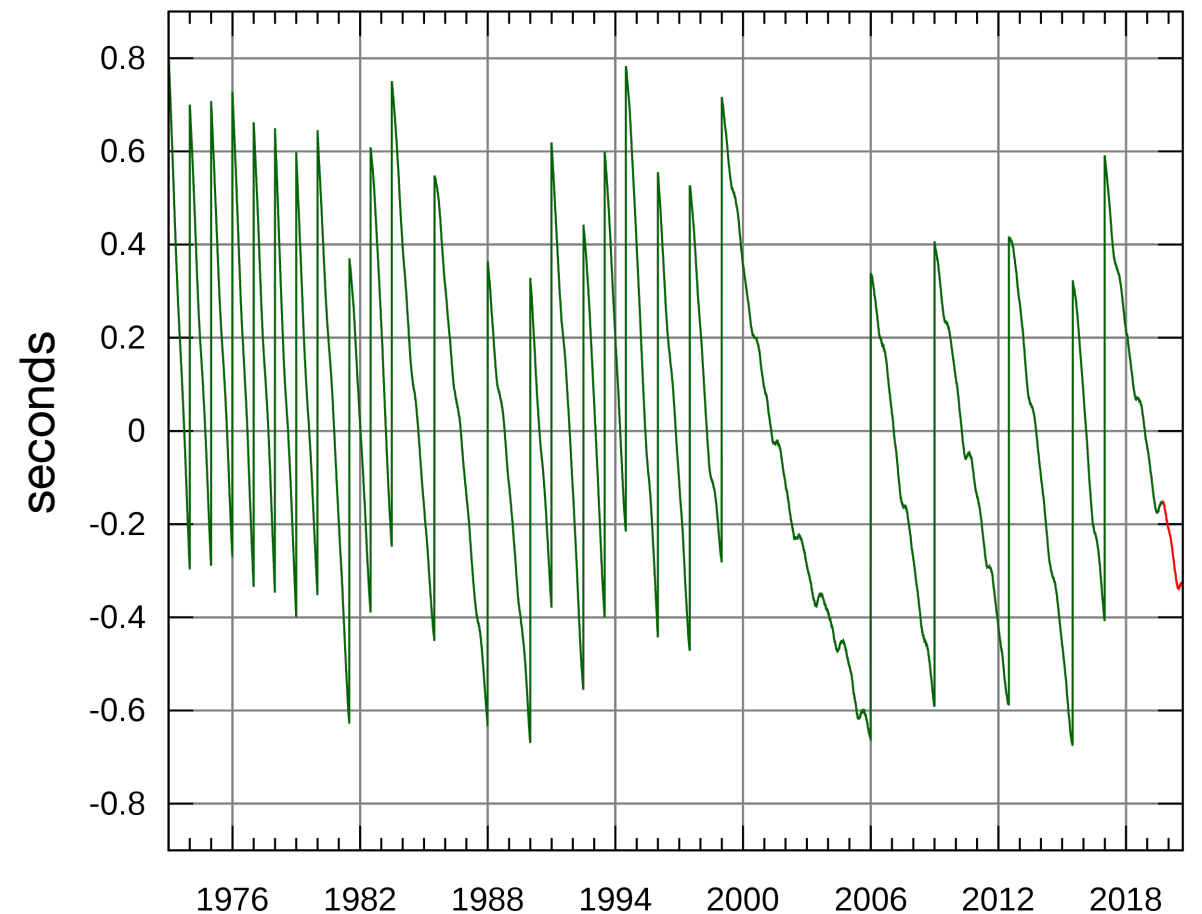


Topics

- ~~How waves add upon each other~~
- UTC & atomic time
- Optical clock & optical comb
- How to measure distance with light
- Doppler shift of light
- Natural sources and the telescopes to see them

What time is it?

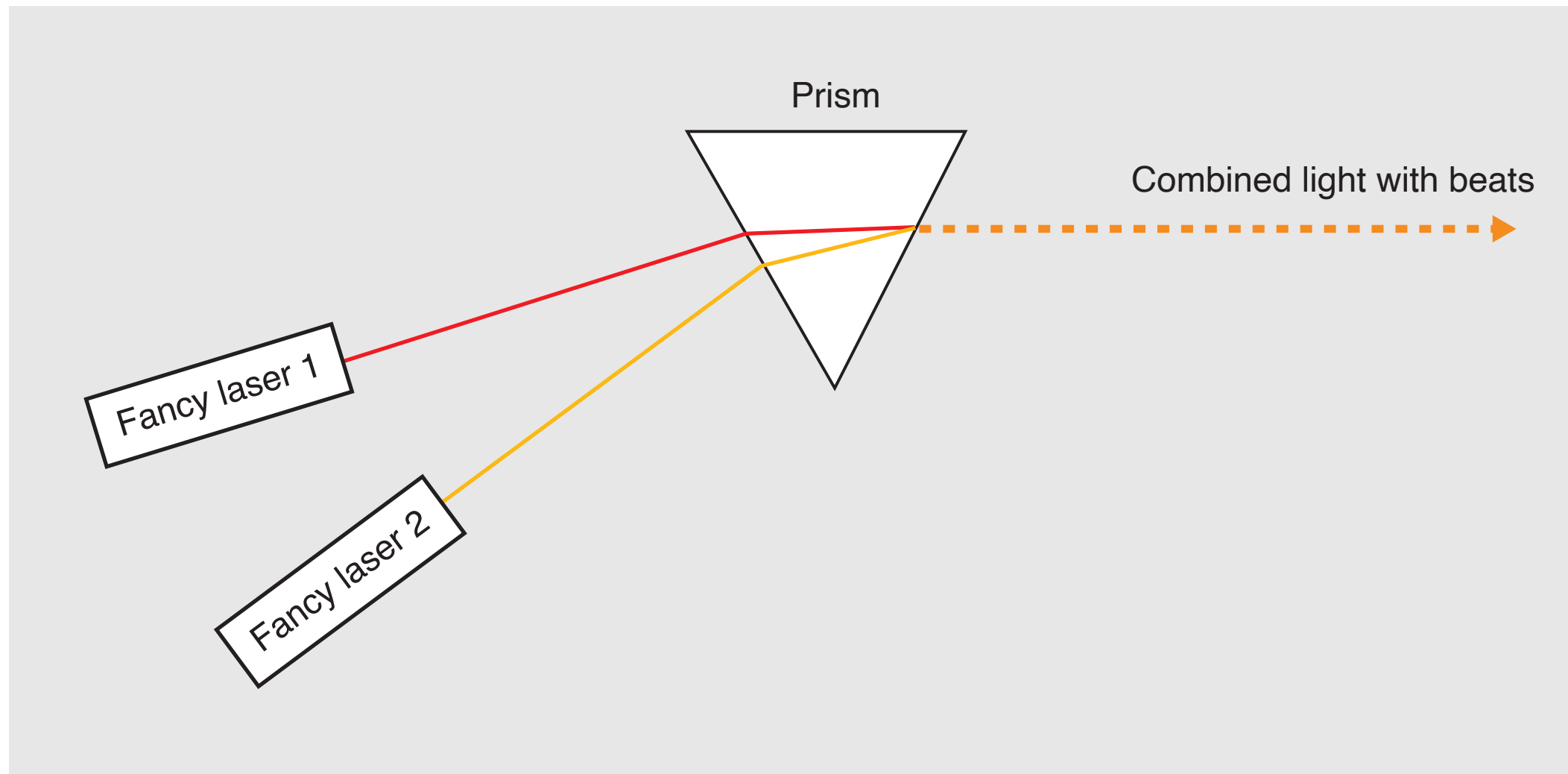
- International Atomic Time (TAI)
- Universal Time (UT1)
- UTC (Coordinated Universal Time)



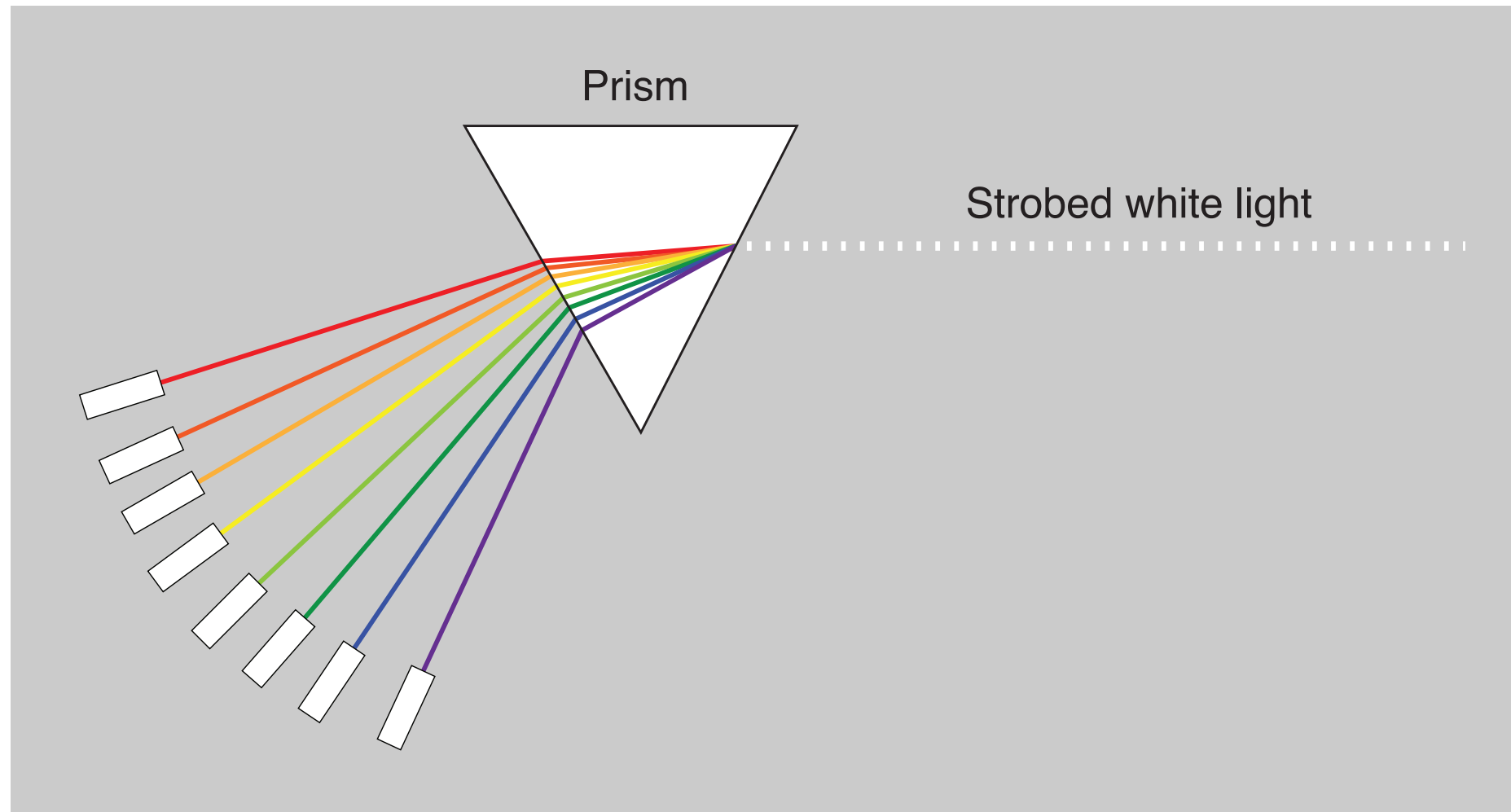
Topics

- ~~How waves add upon each other~~
- ~~UTC & atomic time~~
- Optical clock & optical comb
- How to measure distance with light
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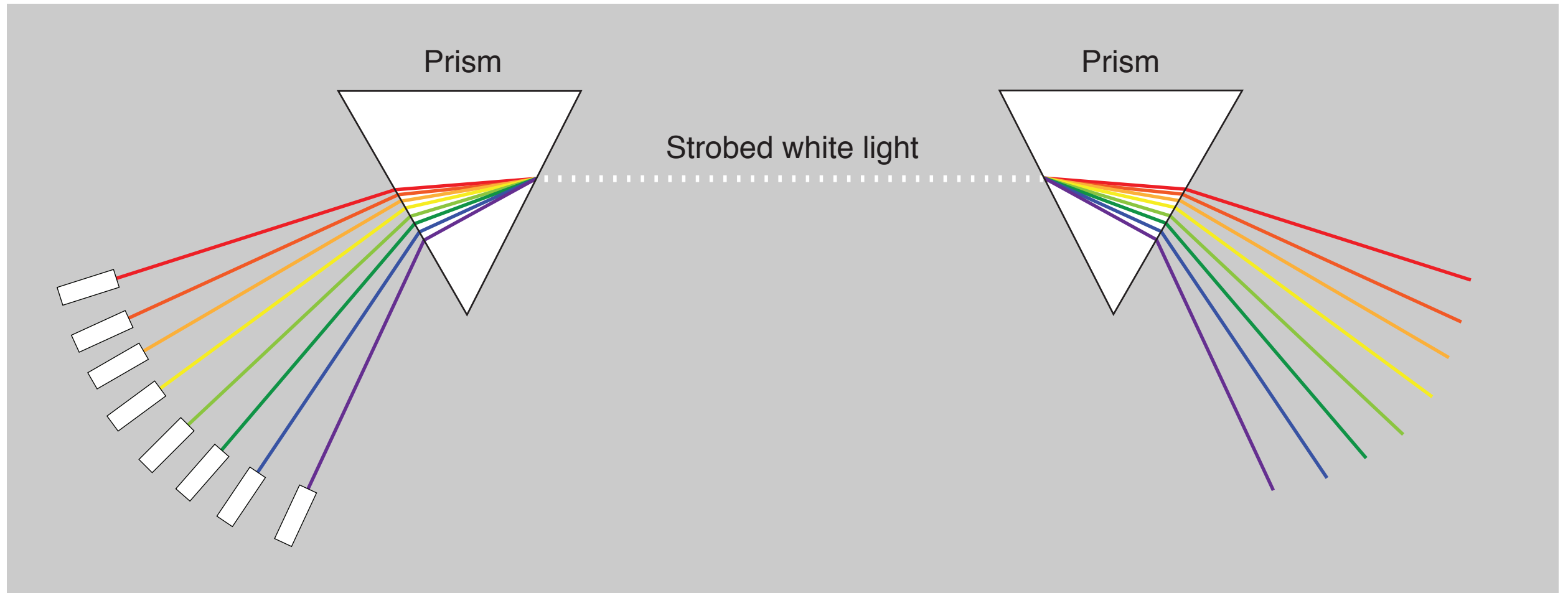
Two lasers



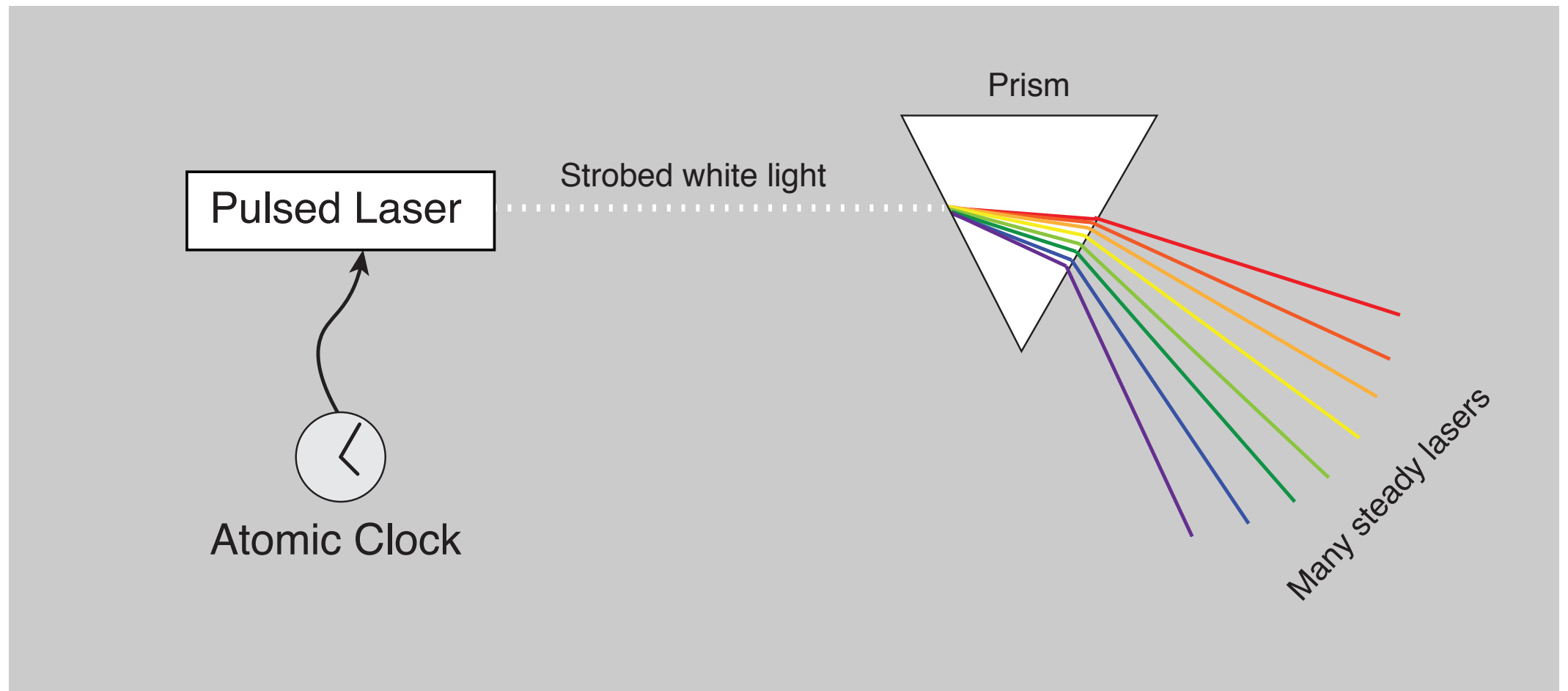
Many fancy lasers!



Many fancy lasers

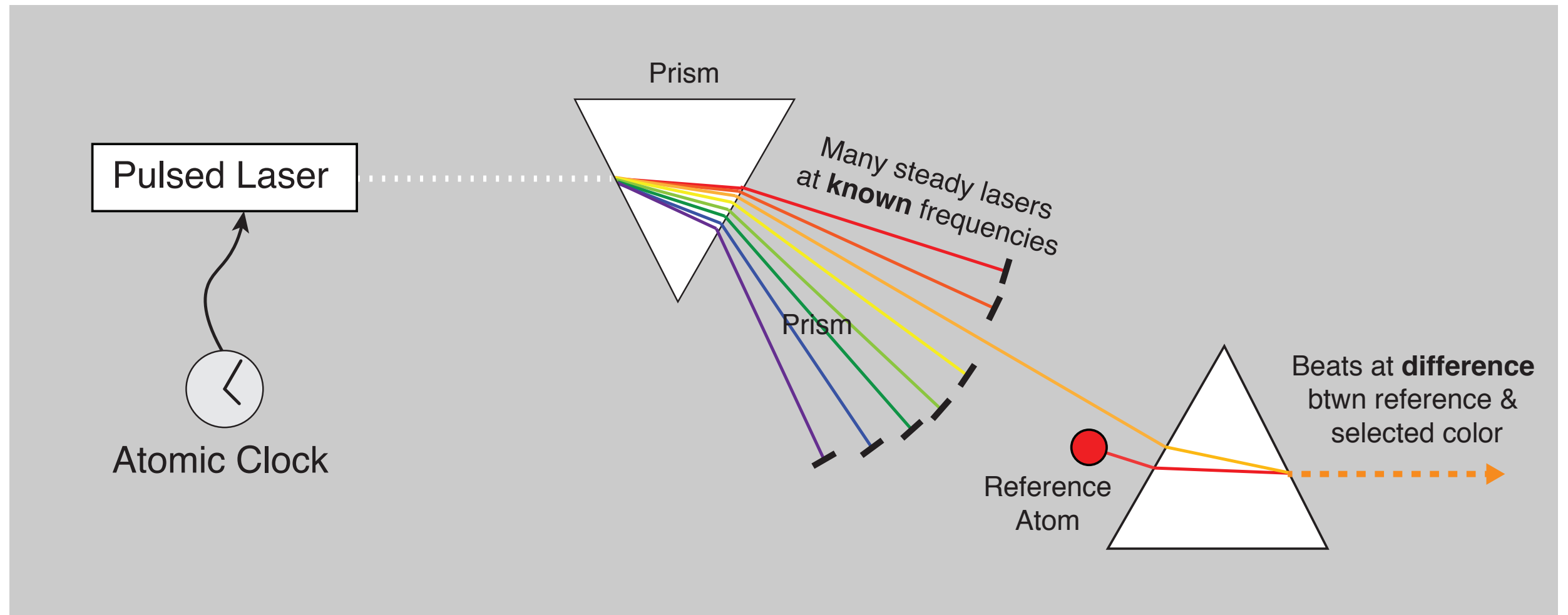


Pulsed laser



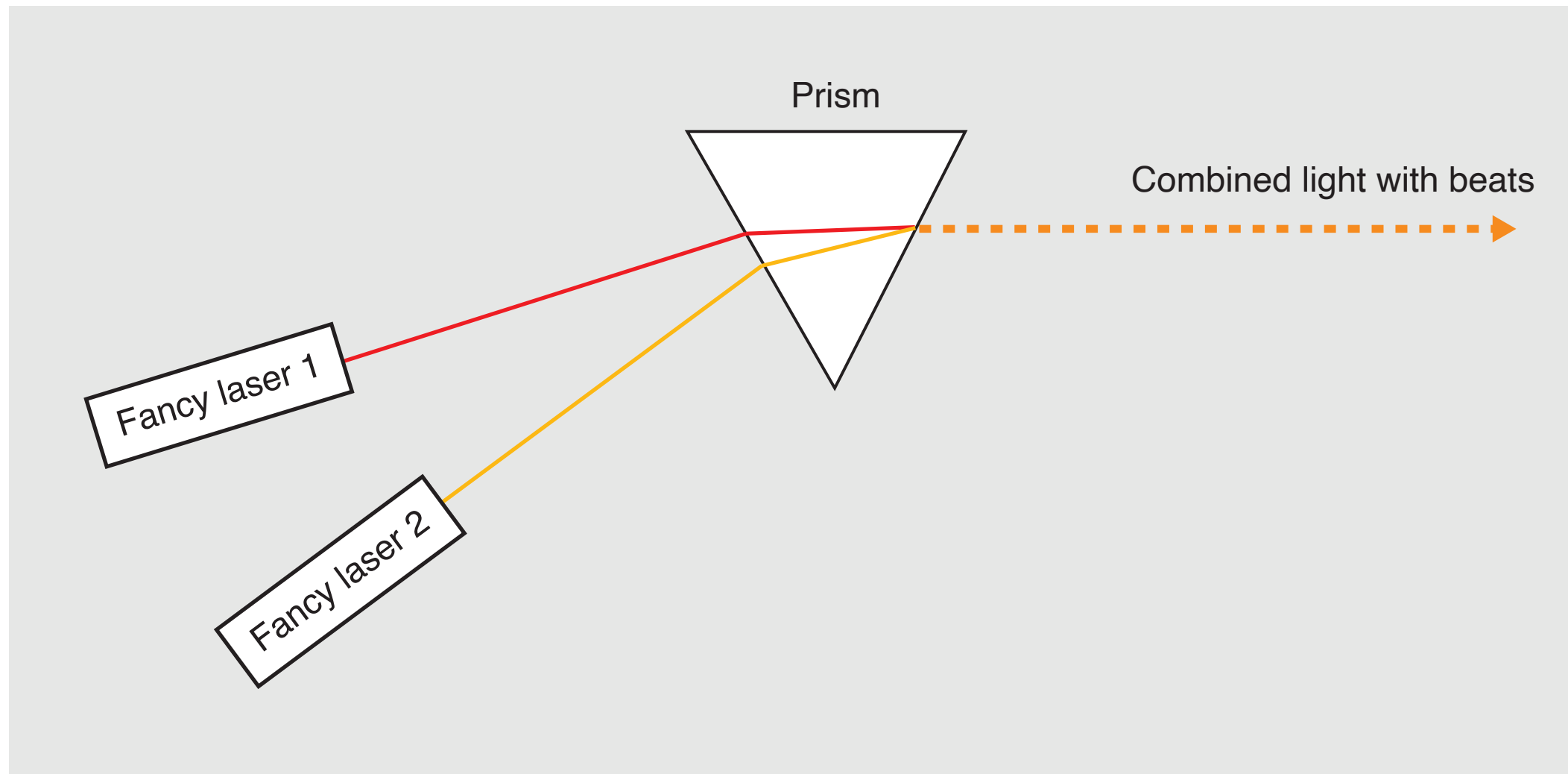
Optical comb used as 'optical gearing'

Optical clock



Use beats to correct the atomic clock!

Two lasers (demo)



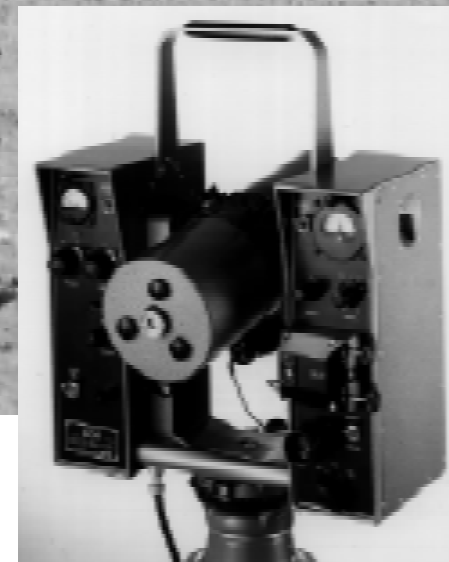
Topics

- ~~How waves add upon each other~~
- ~~UTC & atomic time~~
- ~~Optical clock & optical comb~~
- How to measure distance with light
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Geodimeter model 6 (1964)

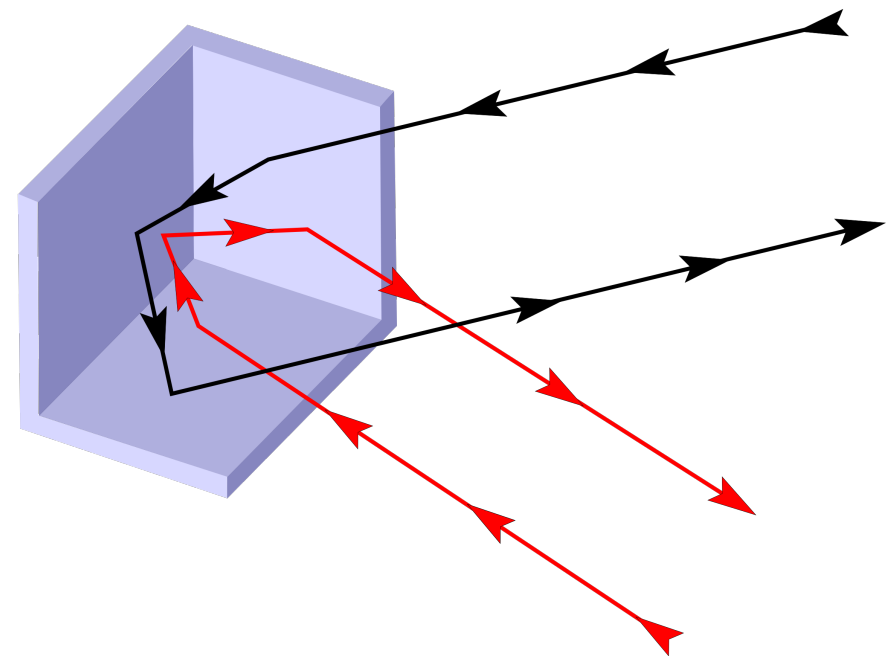


*Geodimeter Model 6 in front of the Pyramids in Giza.
A control measurement of the 4700-year old Cheops pyramid
showed that the north side measured 231.434 m and the east side
231.379 m - a difference of only 5.5 cm from a perfect square!*



How it works

- Chops light very fast (30 meter pulses)
- Bounced off a corner reflector
- Calculate how much extra length is needed to match with outgoing pulse
- Run at a different frequency



Topics

- ~~How waves add upon each other~~
- ~~UTC & atomic time~~
- ~~Optical clock & optical comb~~
- ~~How to measure distance with light~~
- Doppler shift of light
- Natural sources and the telescopes to see them

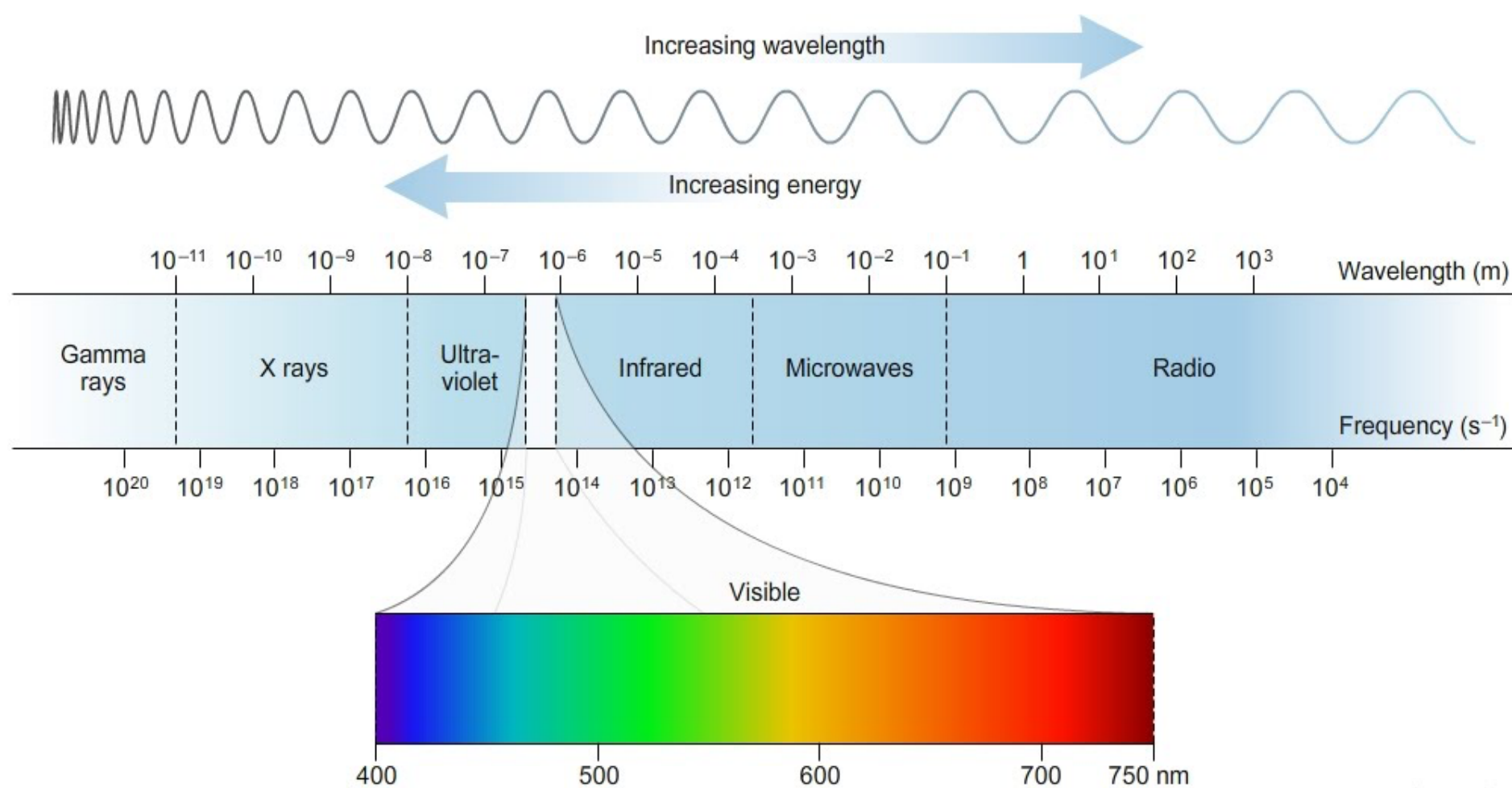
Doppler shift of light

- Speed of light is ***always*** constant
- The color is not
 - red if moving away
 - blue if moving towards

Topics

- ~~How waves add upon each other~~
- ~~UTC & atomic time~~
- ~~Optical clock & optical comb~~
- ~~How to measure distance with light~~
- ~~Doppler shift of light~~
- Natural sources and the telescopes to see them

Natural Light Sources



Topics

- How waves add upon each other
- UTC & atomic time
- Optical clock & optical comb
- How to measure distance with light
- Doppler shift of light
- Natural sources and the telescopes to see them

Note sheet

- One page, double sided
- Must be yours
- Main purpose is to remind you of what you already know

Studying

- Understanding is key
- Dates, trivial facts are less important (rough dates fair game)
- Use the topic guide