NPRE 421 — 9/26

*NOTE: "hour" exam #1 = TUES MARCH 2nd

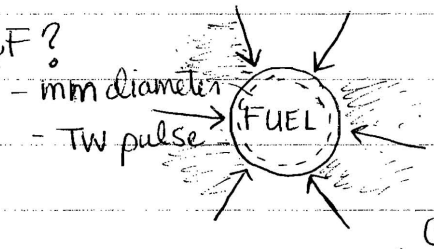
•assignments:
- finish reading chapt. 1 Energy from IF & start chapt. 2 of book

TODAY

→① Introduction to Inertial Confinement Fusion (ICF)

→② View of how ICF fits into global future energy

① What is ICF?



- 3-D compression
- symmetrically
- rocket action (ablate surface) compress & heat the "inner" fuel by $10-10^3$ x

$PV = nRT$

- $\rho \rightarrow 10^{22} \times 10^3 \rightarrow 10^{25}$ $\frac{atoms}{cm^3}$ (~solid state)
- Temp goes up $T \rightarrow RT \rightarrow 10-20$ keV

→ Drivers
~~Laser~~ fusion

λ ~ blue light

1 Nd-glass → 1.2 μm —(frequency tripling)→ blue

→ Drivers: + Lasers
+ Heavy ions (accelerator)
+ Light ions } "pulsed power generators"
+ X-Rays }

Inertial Fusion Energy (IFE)

$E_{out} > E_{in}$: $n\tau \sim 10^{14}$ $cm^{-3} \cdot sec$ (Lawson Criterion)

10^{25} × $\sim 10^{-11}$ sec

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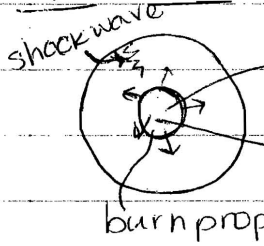
$T \sim 25$ KeV

- driver pulse $< 10^{-11}$ sec
  - Inertia holds target together
- ICF: 1 or 2 MJ out

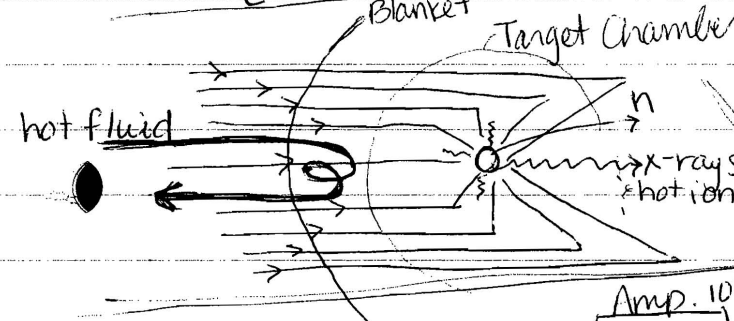


$D + T \rightarrow n + \alpha$ (3.5 MeV)

heats the fuel

$\frac{E_{out}}{E_{in}} = Gain$

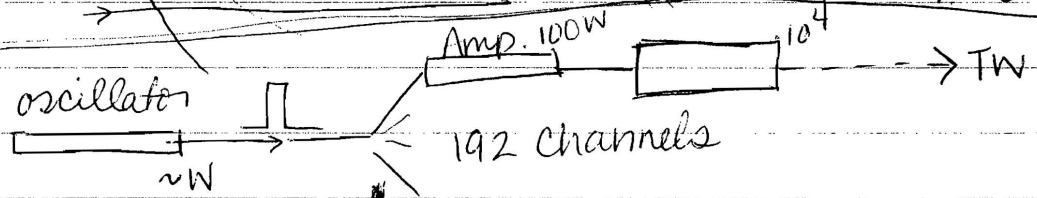
"fast ignition"



192 beams are needed

$\Delta t < 10^{-12}$ sec

Direction $> 10^{-2}$ μm



① $n + {}^6Li \rightarrow {}^4He + {}^3T$ ② $n + {}^7Li \rightarrow {}^4He + 3T + n'$

- required neutron energy: $E \gtrsim 7$ MeV