Cherenkov (and tof?)

My current understanding

Freon

- Present assumption; use Freon at 10 atm.. But if I understand correctly, Freon will liquefy above 5atm at ambient temperature
- The same (or worse..) for similar heavy gases that could replace Freon
- ➔ stay with standard 3-bar Cerenkov, no need to build 10-bar ones.

NIST National Institute of Standards and Technology | MATERIAL MEASUREMENT LABORATORY | Standard Reference Data Program | Data Gateway | Chemistry WebBook

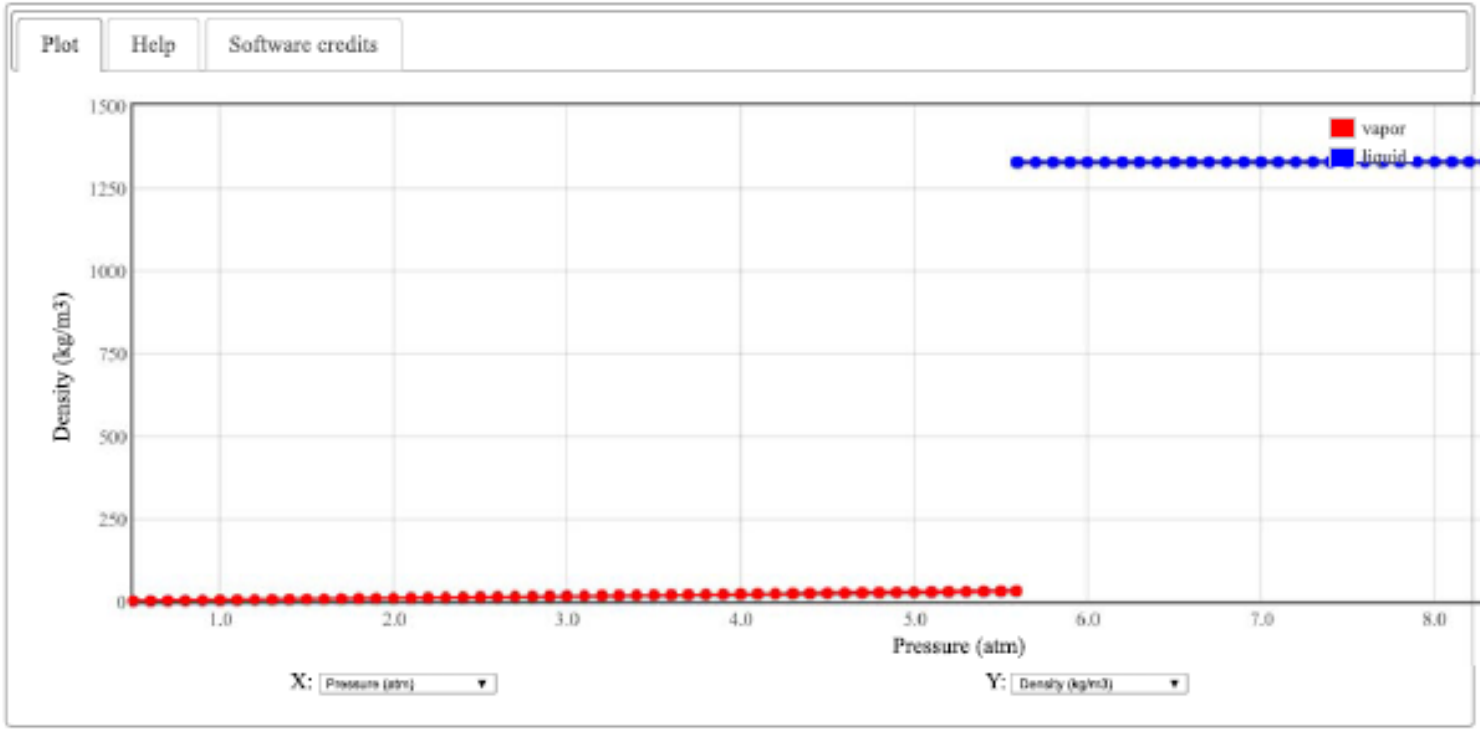
Isothermal Properties for Dichlorodifluoromethane (R12)

- Fluid Data
- Auxiliary Data
- References
- Additional Information
- Important Information About This Data
- Notes
- **Other Data Available:**
  - View data in HTML table.
  - Download data as a tab-delimited text file.
  - Main NIST Chemistry WebBook page for this species.
  - Recommended citation for data from this page.
  - Fluid data for other species

From NIST:
Isothermal density vs pressure
For Freon at 20°Celsius
Red is gas
Blue is liquid

Fluid Data

Isothermal Data for T = 20.000 C



PID

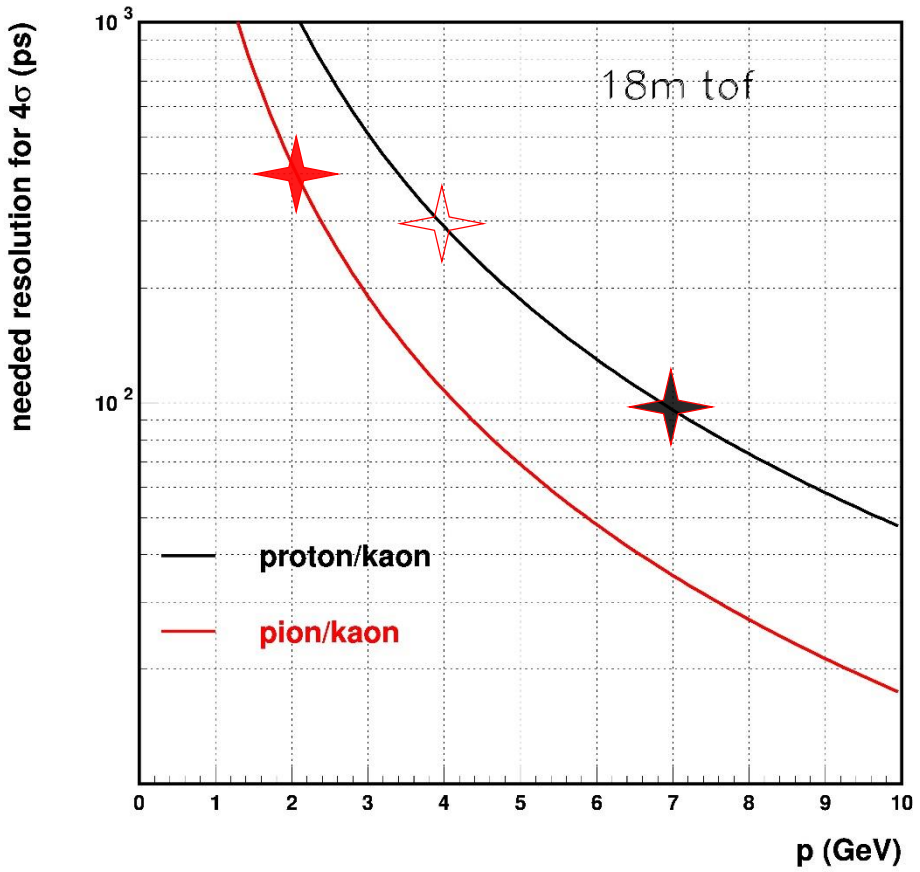
- Two handles: Cerenkov and ToF
- From Yannis: Cerenkov, used as threshold counter, Freon:.
- With 3bar gas pressure, can identify $\pi > 2$ GeV, $K > 7$ GeV
- ~~With 10 bar $\pi > 1$ GeV, $K > 4$ GeV~~

Therefore:

- Pions can be identified with a single Cerenkov down to 2 GeV. Use 3 bar to minimize material budget at low p
- Kaons will need additional Cerenkov, starting from 7 GeV
- TOF is needed for :
  - pion/kaon below 2 GeV
  - Proton/kaon below 7

TOF -2

Needed Tof resolution to get 4 σ discrimination, assuming 18m path



- TOF is needed for :
  - pion/kaon below 2 GeV
  - Proton/kaon below 7 GeV
- pion/kaon below 2 GeV : need 400 ps resolution
- Proton/kaon below ~~4 GeV : 300 ps~~
  7GeV : 100 ps

Summary

- For electron beam: NO Cerenkov. Possibly also no TOF
- For p< 2 GeV: NO Cerenkov. TOF needed.
- For 2< p < 7 GeV : Only ONE Cerenkov, pressure <= 3bar + TOF needed
- For p> 7 GeV: two cerenkovs, one at low pressure (< 1 bar), the other <=3 bars, no TOF, not needed

- ToF resolution better than 100 ps if path is at least 18 m → ok for the FNAL devices
- Would be interesting to have fully plug-and-play devices.

backup

Isothermal Properties for Carbon dioxide

Fluid Data

Isothermal Data for T = 20.000 C