ver 1.0
02062024

pfRHIC Gas System Design

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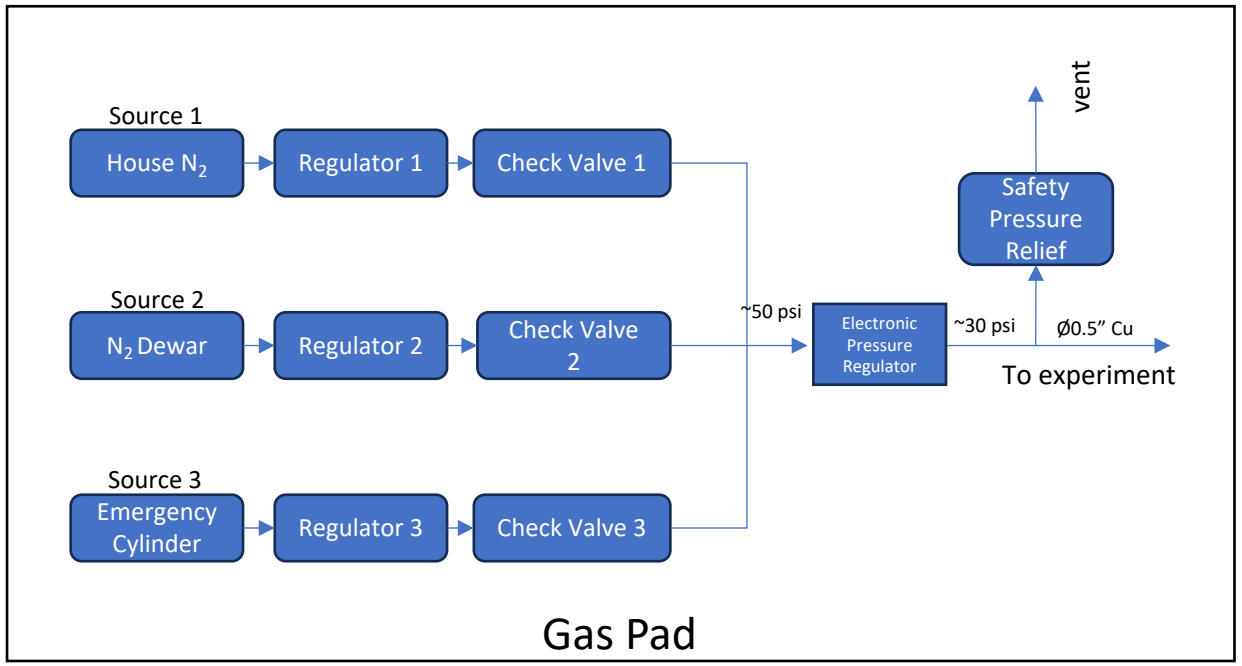
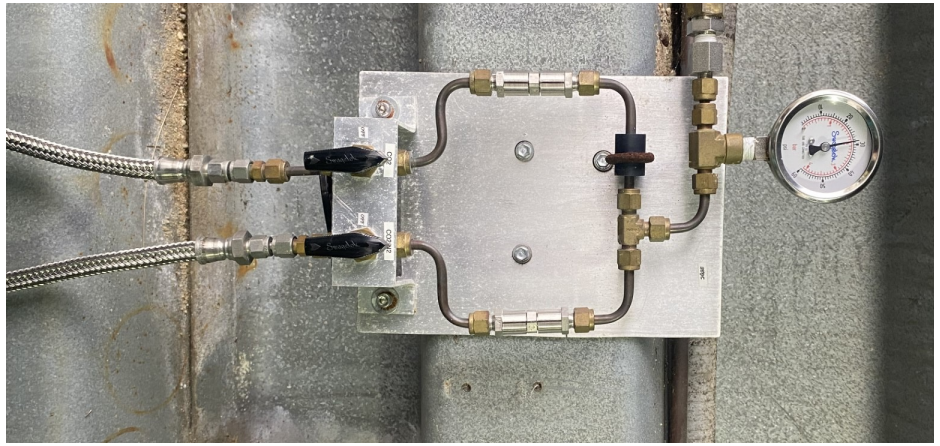
N_2 Supply

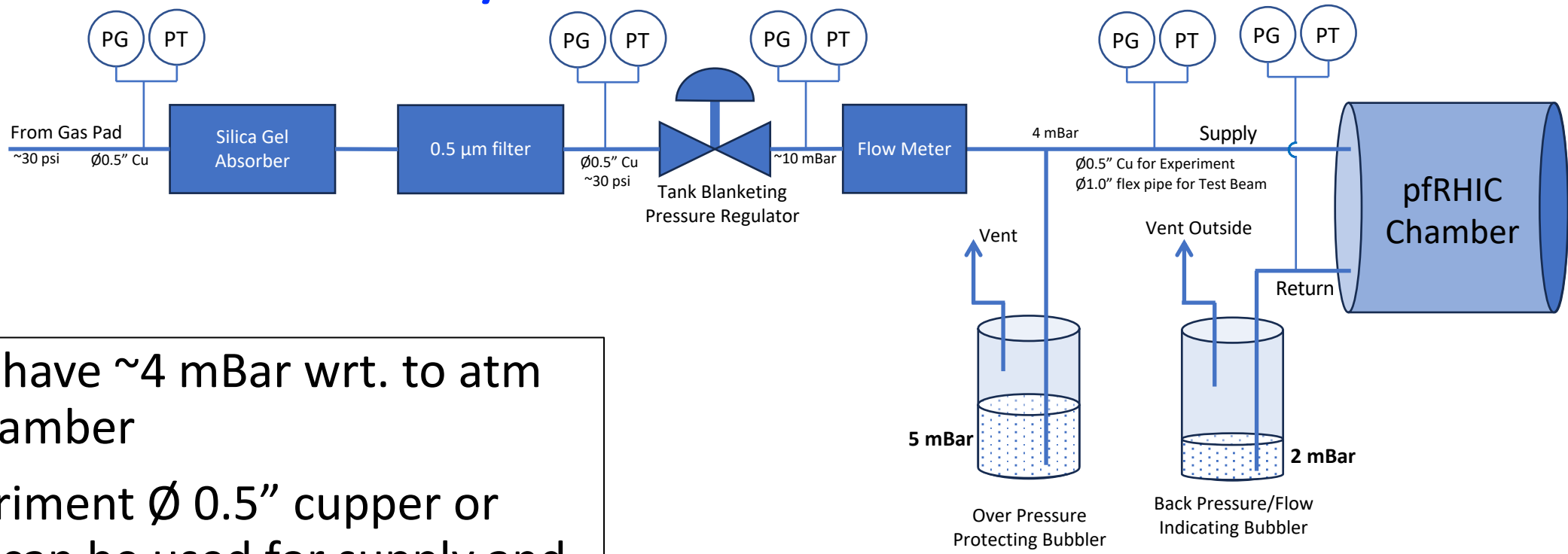




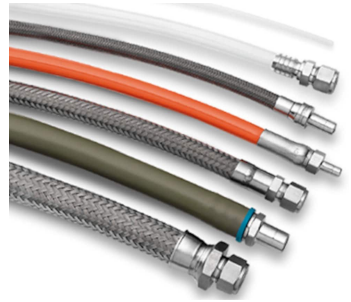
- Volume of pfRHICH (542 mm X *R* 643 mm)
  = 0.704 m^3 (25 cu.ft, 186 US. Gal)
- Flow rate:
  - During purge
    - Beam testing 'say' 3 volume exchange in 3 hours
      - 12 liters/min
    - Before run start 'say' 1 volume exchange in a day
  - After purge
    - 'Say' one volume exchange in 6 hours
- What grade N_2 needed?
  - House N_2:
  - N_2 Dewar:
  - N_2 Cylinder:
- Supply system will have
  - Primary
    - In house
      or
    - N_2 Dewar
  - Emergency cylinder
    - Will be triggered to supply N_2 in the event of loss of primary
  - Regulators and Check Valves(CV) will be tuned in order to select which source supplies the gas

Pressure Control & Safety

PG: Pressure gauge
PT: Pressure Transmitter

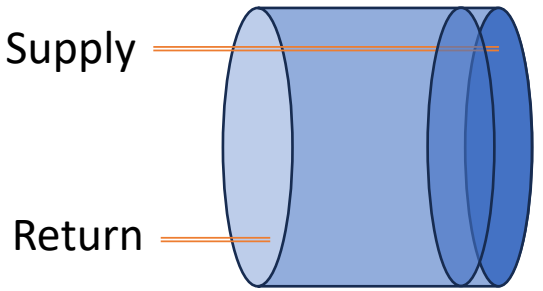


- Expecting to have ~4 mBar wrt. to atm inside the chamber
- For the experiment Ø 0.5" cupper or plastic pipes can be used for supply and return
- For the test beam Ø 1.0" flexible hoses can be used for supply and return
- Tank Blanketing Pressure regulators(TBPR) to reduce high(psi) pressure to low pressure (mBar)

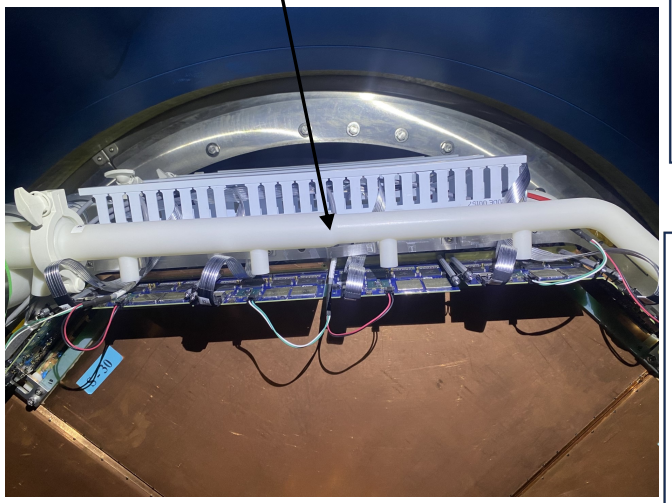


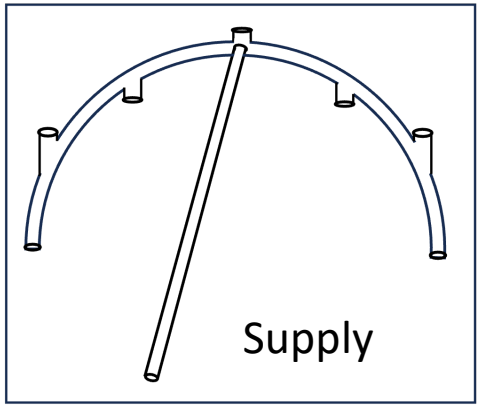
Distribution of N2 inside the chamber

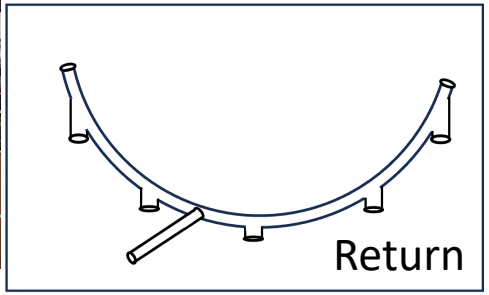
- N_2 tent to rise in pfRHIC chamber
  - N_2 supply on the top
  - Return from the bottom
- For quick purge & to avoid localized air trap, N_2 can be released multiple locations inside the chamber
  - What is the material?
  - Can be 3D printed (radiation hardness)
- Supply and return connection to chamber
  - Will be larger as possible inlet & outlet to avoid back pressure & to maximize the flow rate
  - Compression x NPT connection Ø 1.0”



STAR sTGC air cooling manifold, in the forward direction







Swagelok SS-1610-1-16BT

Some Comments

- Need to find a part number for
  - Electronic pressure regulator (50 psi -> 30 psi)
  - Flowmeter, which has very low impedance
  - High capacity bubblers or need to build one
  - Rest are identified
- For test beam TBPR is not needed, can manage with a flow meter and the setup can be simple