

Some thoughts about Gas Dump

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Intro

- Water dump requires challenging window design (20 cm)
- Using long gas dump – simpler window (8cm)
- lower activation per unit volume
- suitable for $\gamma\gamma$

Layout

- Long gas core ~10cm thick, 1-2 km
- Surrounding material (Fe) to take most of energy deposit
- Layer of water
- Air + shielding (sand)

Issues to be considered

- Layout optimization
- Radiation protection
- Gas stability
- Maintenance
- Cost
-

Layout optimiation

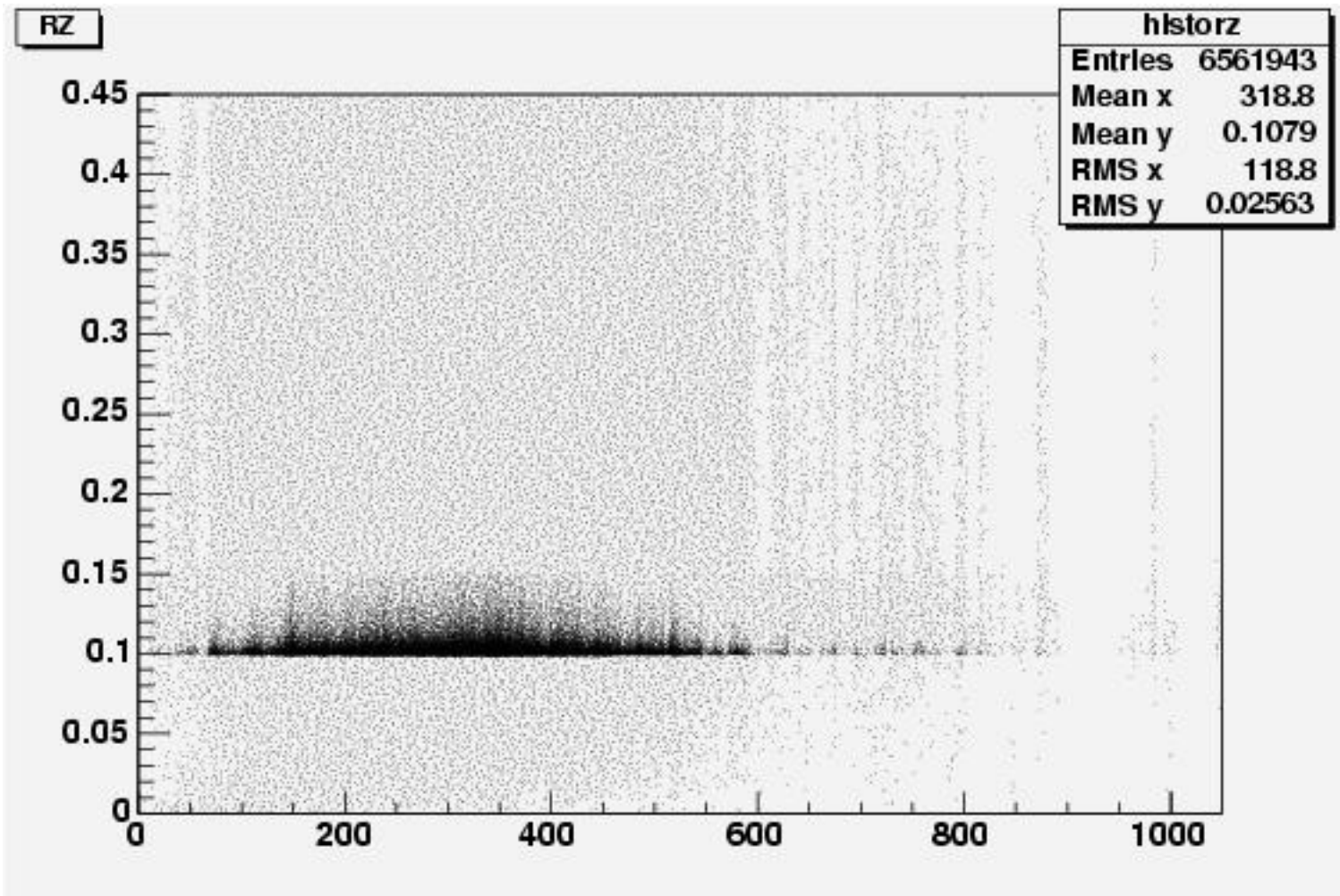
- Distribute energy deposit
- Uniform heating
- Uniform dose
- Possibly reduce the Fe thickness

Sectioned gas

- Create pressure profile by sectioning the gas
- Energy deposit from the EM shower should be uniformly distributed

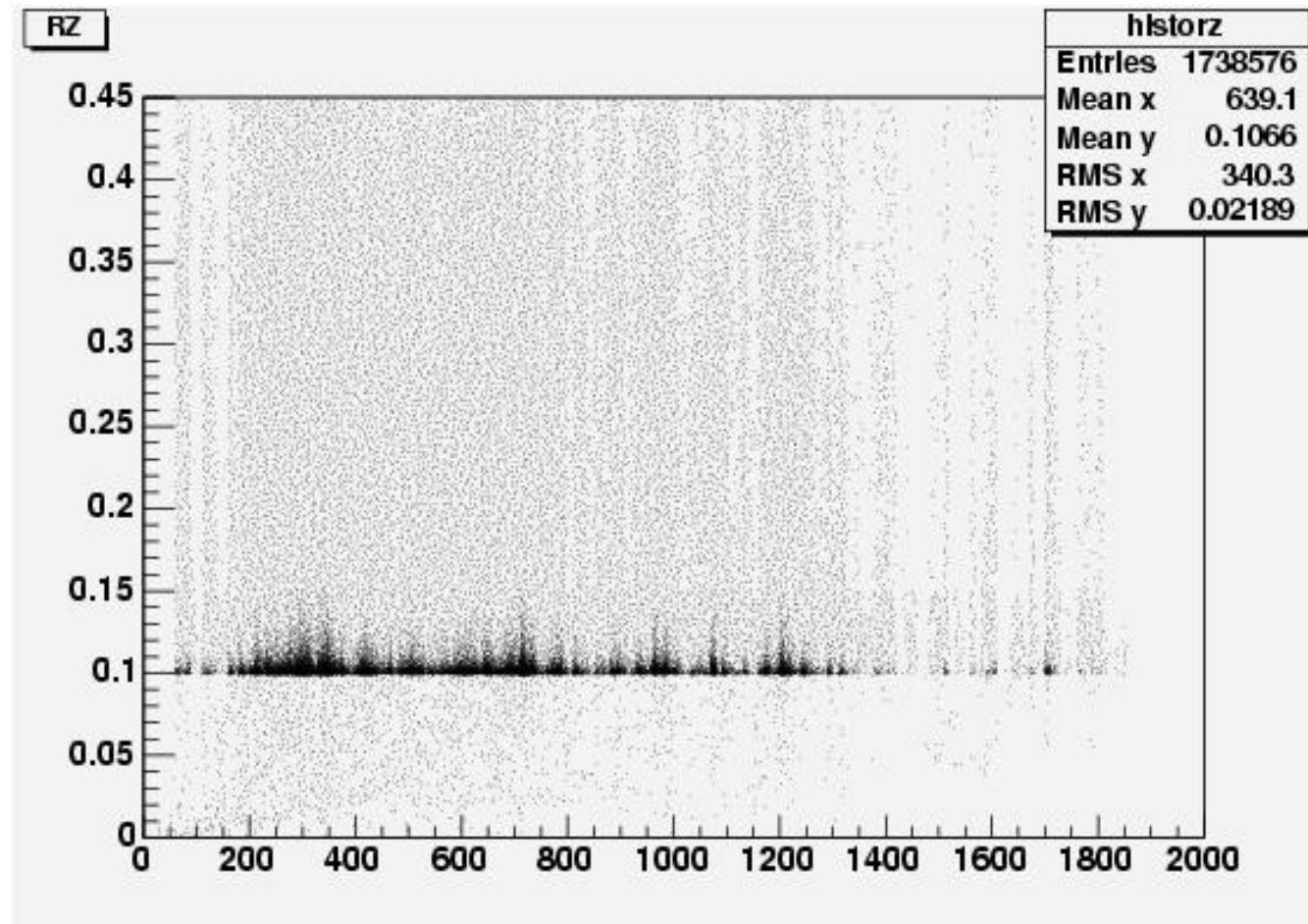
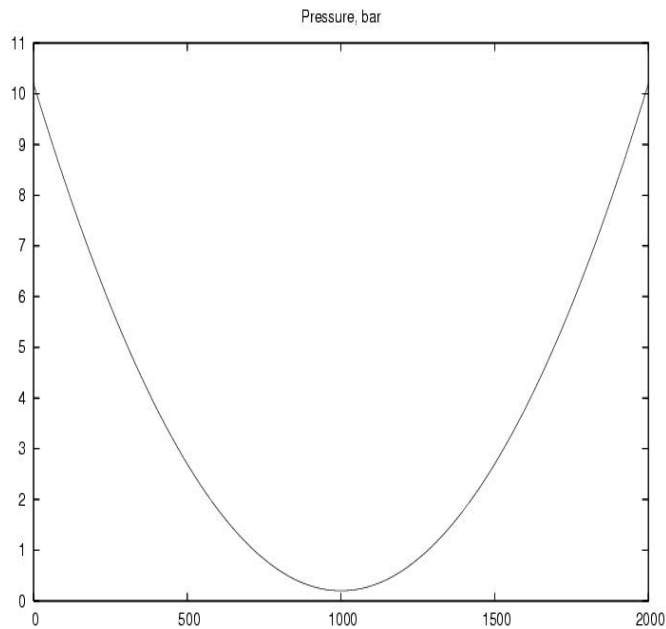
Case 1

Ar 1.5 bar, energy deposit from 250 GeV e-



Case 2

Ar, energy deposit from 250 GeV e-



Problems

- material for walls between sections
- Limits for section pressure
- Limit for number of sections
- Should survive for many years or be easily replacable

Choice of gas

- Noble gas (Ar,Xe) – isotope production
- Air – longer tunnel
- ???

Gas heating

- Gas heating by e beam
- Longitudinal pressure profile instability
- Pressure in sections
- Ionization Effects
- ???

Radiation Protection

- Mainly Fe activation
- Neutrons at surface (needs several m shielding)
- muons (probably not important)
- Doing Geant4 + MCNP calculations

Maintenance

- Gas Leakage
- Gas disposal
- Activated air
- Element replacement procedure
- ???

Cost

- Tunnel cost – estimated too high
- Maintenance cost ???

Other options

- Gas + water
- Gas + solid (long since solid should take ~100 kW)
- Scheme where window less critical

Development plans?

- Layout optimisation
- Dosimetry calculations
- Gas dynamics studies (+experts)
- Radiation management (+experts)
- Window and wall material (+experts)
- Test facilities?

Summary

- Gas dump looks like a reasonable idea
- Some optimization should be done
- Hybrid design may be required
- Material studies + gas dynamics studies required
- Test facility?