

# BigBite Gas Cherenkov Update

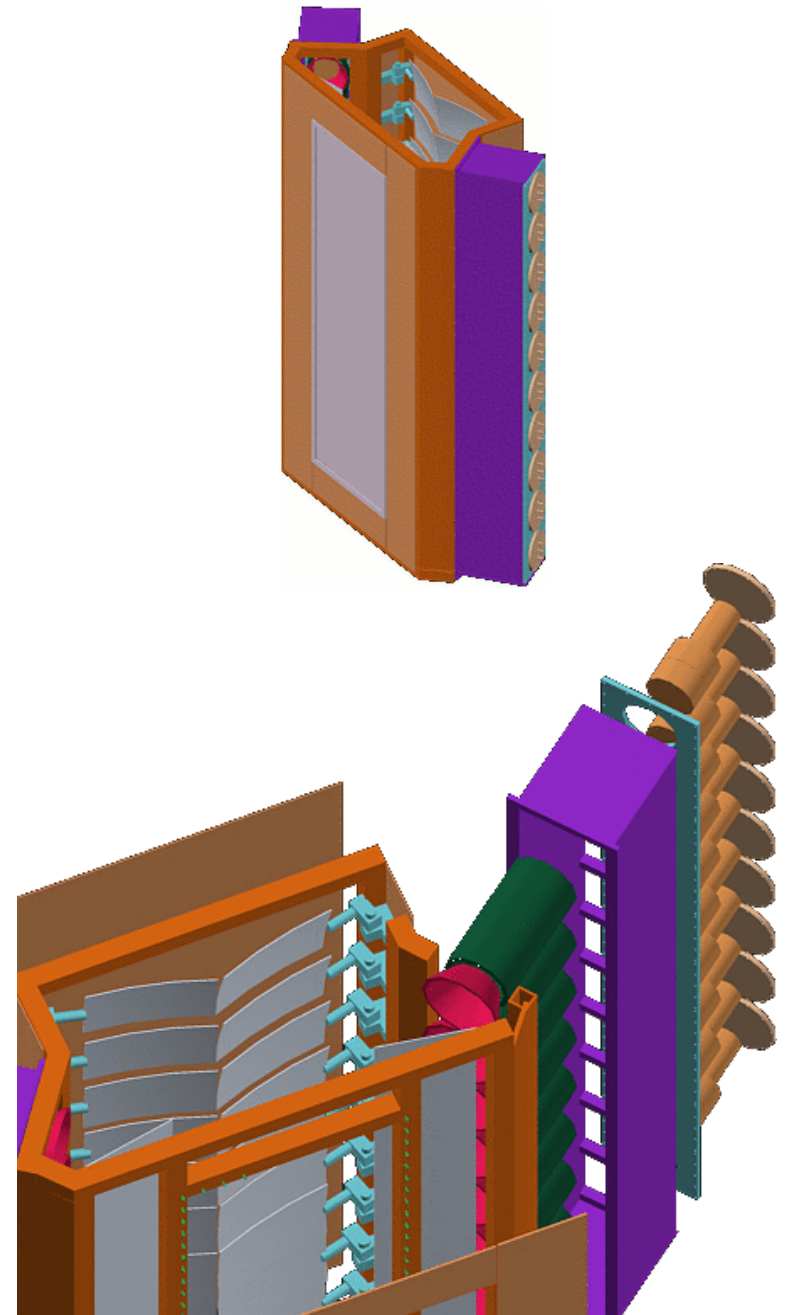
July 21, 2008

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(& Doug Higinbotham)

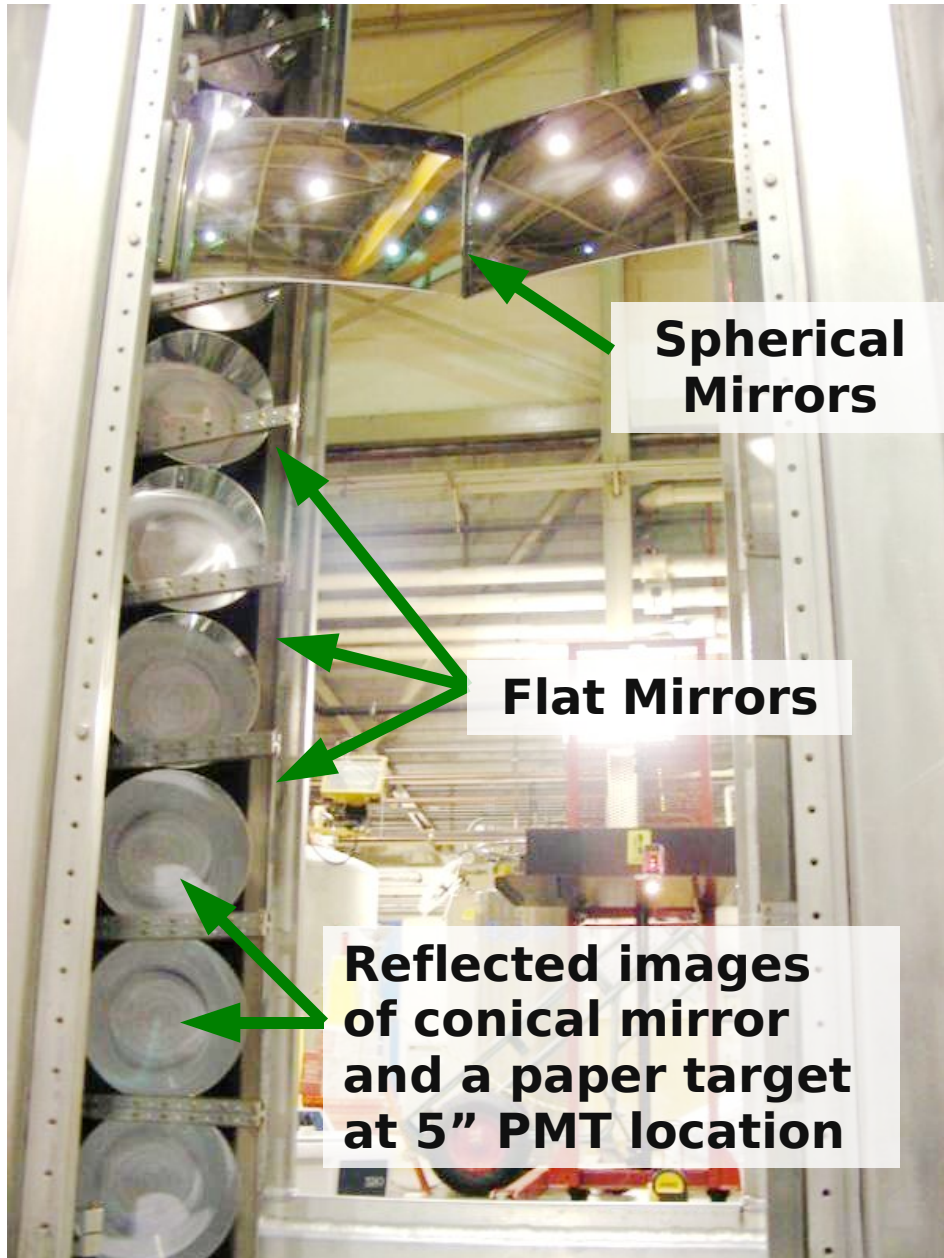
- **I apologize for being out of town for this meeting – I booked my trip before the meeting date was set and could not rebook.**
- **Many thanks to Doug for presenting for me. If you have questions please do not hesitate to contact me after I return on July 26.**

# BigBite Gas Cherenkov

- **New heavy gas Cherenkov for BB electron stack**
  - 200cm x 60cm x 60cm
  - 20 PMTs
  - 2 columns of 10 focusing mirrors
  - sandwiched between wire chambers
- **Cherenkov was assembled in May 2008**
  - no major assembly issues
  - patched a few pinhole leaks along weld joints and tank is now gas tight
  - rough estimate of gas consumption  $\sim 1 \text{ ft}^3/\text{day}$  (within initial projections)
- **Installed in Electron stack in time for parasitic tests during E08-007 (May—June)**
  - tank filled with production gas ( $\text{C}_4\text{F}_8\text{O}$ ) on May 29
  - $\text{C}_4\text{F}_8\text{O}$  is 'drop in' replacement for  $\text{C}_4\text{F}_{10}$  (but is  $<1/3$  the cost)
- **More on the test in a moment, but first a pretty picture.**



# BB Cerenkov During Assembly (viewed from rear)





# Cherenkov Test Run

- **We were *not* able to identify a Cherenkov signal coincident with an electron passing through the BigBite stack.**
  - **electron was tagged using recoil elastic proton in HRS coincident with a signal in the BigBite calorimeter during the June part the Gep run.**
- **Many approaches were tried online, we are confident that it was not a DAQ issue (ADC gate timing, trigger timing, cabling error, etc).**
- ***It is our expectation and top priority to understand and rectify the problem in time for Transversity.***

# Cherenkov Test Run

- **What's left?**
  - **Optics / Mirror alignment**
    - Re-re-re-checked optics configuration using two independent sets of raytrace code. Everything is consistent – **looks good**.
  - **BigBite stack and target locations were different in the optics model vs. the Gep configuration**
    - Remeasured BB stack location after Gep and cross checked with the software geometry – **looks good**.
  - **$C_4F_8O$  was contaminated (or was not actually  $C_4F_8O$ )**
    - Arranged with Hall B group to test UV transmission and photo-electron yield in a controlled testbed (1<sup>st</sup> test completed July 17 – results?)
  - **Mirrors horrifically inefficient in the UV while appearing fine under visual (optic wavelenth) inspection**
    - each mirror has reflectivity curve supplied by the company after coating showing >90% at 250nm for all mirrors
    - it seems very unlikely that mirrors could be the problem

# Cherenkov Test Run

- **What are we doing:**
  - **C<sub>4</sub>F<sub>8</sub>O** transmission and p.e. yield being tested right now.
    - **If this looks good we will place order for 3 more bottles (we till have a ½ full bottle on-site from the Gep test).**
  - **The same Hall B testbed could be adapted to explicitly measure the mirror reflectivity in the UV if necessary.**
  - **Cosmics testing underway in Hall A now**
    - **Cherenkov has been pulled from the stack to simplify our work.**
    - **Tank still filled with C<sub>4</sub>F<sub>8</sub>O from Gep run, will flush and fill with CO<sub>2</sub> next week and continue cosmics tests.**
  - **Tank will be opened in 2—4 weeks from now**
    - **will install the final spherical mirror (replacement arrived two weeks ago)**
    - **will confirm mirror alignment, align to Transversity/ $d_2^n$  config**
      - **possible (but very unlikely) that mirrors shifted position during the transportation and installation of the BigBite stack.**
  - **13X molecular filters will be added (as in original plan) as additional hedge against residual contaminants in gas**