Update on SoLID Cherenkov Detectors

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SIDIS Cherenkov Detectors

The pion Cherenkov

No significant design changes: C_4F_8O + 30 spherical mirrors (one piece per sector) + straight cones + field resistant maPMTs in 3 by 3 arrays

→ Mirrors: Carbon Fiber Reinforced Polymer (CFRP), sent request for quote to Composite Mirror Applications (CMA)

→ Cones: switched to straight cones with no significant impact on the collection efficiency (cheaper than Winston cones)

The electron Cherenkov

No significant design changes, 2 options for photon detectors: GEMs+CsI or maPMTs

→ GEMs+CsI: CF_4 + 30 large spherical mirrors (one piece per sector)

- Mirrors: CFRP not an option (absorbs and retains water); actively searching for a manufacturer that could cut large glass mirrors; coating could be done by Tom Hemmick (SBU) or maybe CMA

→ maPMT: CO_2 + 30 CFRP spherical mirrors (in 2 pieces of different curvature per sector) + cones + field resistant maPMTs in 2 by 2 arrays

PVDIS Electron Cherenkov Detector

Option 1

→ GEMs+CsI: common detector with SIDIS

Option 2

→ maPMT: C_4F_8O + 30 spherical mirrors (2 pieces of different curvature per sector) + cones + field resistant maPMTs in 3 by 3 arrays

- gas at sub-atmospheric pressure to push the pion threshold from 2.7 GeV to 3 GeV

Miscellaneous

→Phase 1 of hardware tests completed: background test of GEM+CsI and of maPMT & 5" PMT during the g_2^p commissioning run in December 2011; data analysis underway

Thanks to Brad Sawatzky for his help and guidance with the PMT test

→Phase 2: signal test of GEM + CsI coming up in Spring 2012

Backup

Mirror Coating with Big Mac

Slide from Tom Hemmick

- Big Mac (8’ diameter, 6’ tall) can likely make excellent LARGE mirrors.
- BNL can likely verify quality.
- SIGNIFICANT money savings for SoLID possible.
- Need to make contact Lipski → CERN

CFRP Mirrors: CMA

→ Composite Mirror Applications: based in Tucson, Az

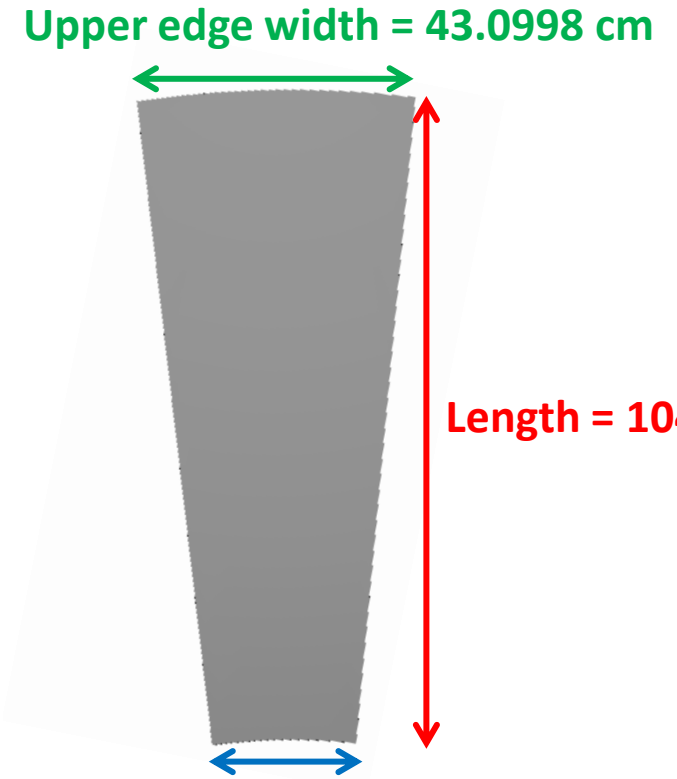
CMA was involved in producing mirrors for:

- SOS, Hall C JLab
- Hermes RICH, DESY
- LHCb RICH 1, CERN
- Alpha Magnetic Spectrometer AMS-02 on board the ISS
- ALICE (demo mirrors), CERN

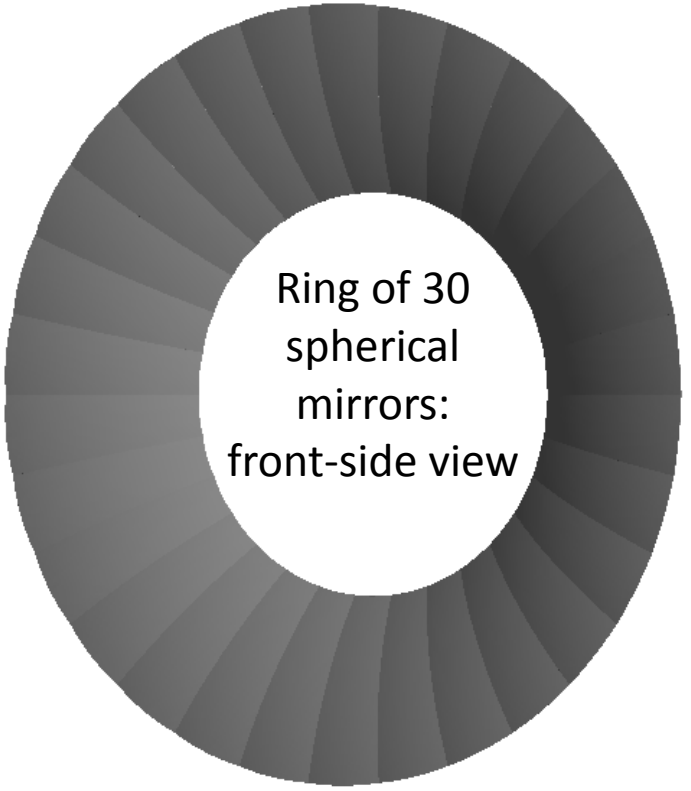
Capability of applying optical coating (Al + MgF_2,…) on large-size mirrors: 72” by 144” coating chamber

CFRP advantages: radiation hard, fluorocarbon compatibility, non-magnetic, light-weight, good rigidity, relatively cheap compared to other materials that would offer similar advantages, no safety implications

SIDIS Pion Cherenkov Mirrors: Example



1 spherical mirror: front view



1 spherical mirror: side view