SoLID Collaboration Meeting

Heavy gas Cerenkov

May 25th, 2015

Mehdi Meziane, Gary Swift

Duke University

C_4F_8O (OctaFluoroTetraHydroFuran)

Properties:

– 9.19 g/L @ 21°C (10 time heavier than air)

– boiling point: -5°C, vapor pressure 1.7 atm @ 21°C

– Stable, non explosive and non-reactive (only with alkali halide metals)

The BTeV RICH collaboration tested the gas in contact with a variety of plastics, epoxies, metals and other materials : 9.3 year equivalent with no noticeable change in gas or material properties *(M. Artuso et al. , Nucl. Instr. and Meth. A, 558 (2006), p. 373-387)*

– ability to transport oils: avoid direct contact with organic materials

– Ozone friendly

– Have a high global warming potential (long lifetime) -> need to be contained in a re-circulating system

– Scarcity: contacting vendors, get price for reproduction

Assembly, Testing and Commissioning Plan

Fabrication and Prototyping (1R&D year + 1year):

– Windows (@ Duke) first component to be prototyped (shell design depends on the test results of the window)

– Tank fabrication (@ Duke) second item to be prototyped

– Mirror blanks (CMA), ~9 months lead time + coating (Stony Brook)

– Shielding Cones (Amuneal), perform magnetic field tests

– Gas system (@ JLab)

– Manpower: 1 engineer, 1 postdoc, 1/2 Technician

– Garth Huber submitted a funding proposal to the Canadian Foundation for Innovation to build and test the prototype.

Assembly, Testing and Commissioning Plan

Assembly and Testing (2 years):

- Assemble tank, windows
- Test mirrors
- Install PMT array and test the shielding cones
- Leak check
- Install/align mirrors, simulate expected results
- Manpower: 1 engineer, 1 postdoc, 1/2 Technician, 2 graduate students

Assembly, Testing and Commissioning Plan

Commissioning (1-2 months):

- Install electronics, HV
- Gain matching
- Alignment of all the elements
- Internal and external complete survey
- Beam Commissioning (clean particle samples from known reactions to test PID efficiency, rate studies)

Cost Estimate Updated

ITEM	COST (k$) / FTE-Year
Prototype tank	50 / 2.5
Full Tank	300 / 4.5
Mirrors	490
Cones	131
PMTs (H12700)	1232
Gas System	85 / 0.5
Gas	154
Total	$2,442 / 7.5

- 16 H12700 PMTs have been bought with Duke Funds for the Prototype
- $247k savings.