Specialized APEX hardware update

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Specialized APEX hardware: Septa magnet

Septa works well for $\Delta p/p << 1$. In HRS $\Delta p/p$ is of 0.09
Required field integral is 0.44 Tesla-m per 1 GeV/c
APEX is approved to run with 1.1, 2.2, 3.3, and 4.4 GeV beam energies, which requires 0.55, 1.1, 1.65, and 2.2 GeV in HRS

The concept was used in two previous septa magnets and well understood
Specialized APEX hardware: Septa magnet

Field vs. distance from the beam, in the septa middle plane

5 deg. trajectory passes here

beam at x = 0

trajectories to HRS from 4 to 6 deg.
Magnet view and correctors
Magnet top view and vacuum connections

SciFi
Specialized APEX detector: SciFi detector

Traditional sieve pattern

Spectrometer optics

Target

Sieve

Tracker

VDCs

Calibrated optics is good to 0.1 mrad!
Specialized APEX detector: SciFi detector

Active “sieve slit”: a Sci Fiber detector with 1 mm fibers with 1/4” pitch connected via a bundle of 1.5 mm clear fibers to a 64-channel PMT.
Readout via 1877S TDC; 1-3 MHz rate per fiber; off-line time window of < 5 ns

Positively charged particle optics needs the SciFi
Specialized APEX detector: SciFi detector

Active “sieve slit”: a Sci Fiber detector with 1 mm fibers with 1/4” pitch connected via a bundle of 1.5 mm clear fibers to a 64-channel PMT.

Readout via 1877S TDC; 1-3 MHz rate per fiber; off-line time window of < 5 ns

The front-end is made with the low threshold A/D card from MWDC.

Tested in September – a significant rate of hits in the DAQ is due to crosstalk signals: capacitive coupling between adjacent electronic channels. It limits the range of PMT HV and efficiency.
Specialized APEX detector: SciFi detector

Active “sieve slit”: a Sci Fiber detector with 1 mm fibers with 1/4” pitch connected via a bundle of 1.5 mm clear fibers to a 64-channel PMT.

Readout via costly VME fADC250: 4 ns ticks; allow up to 20 MHz rate per fiber; off-line time window of ~ 5 ns, integration window just 12 ns
Specialized APEX detector: SciFi detector

The front-end is a fast NIM amplifier.

Preliminary tested in November – works!
Require more studies with additional analysis scripts.
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<th>crosstalk in pixel #8</th>
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