Upgraded Detector of the BigBite spectrometer

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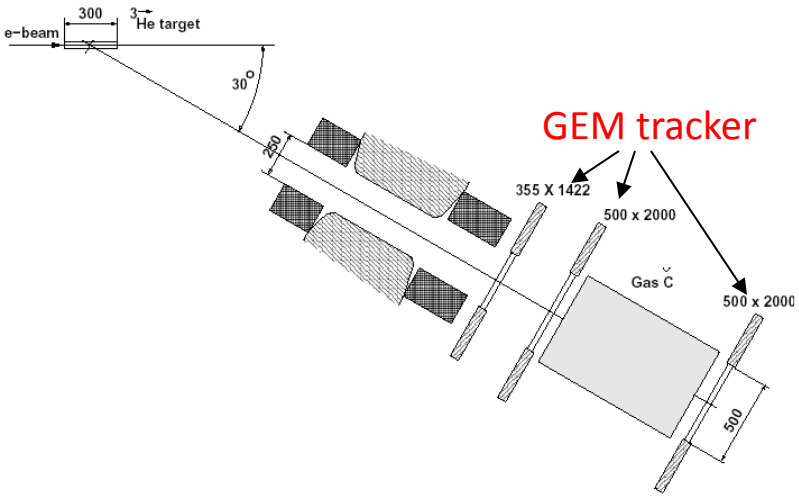
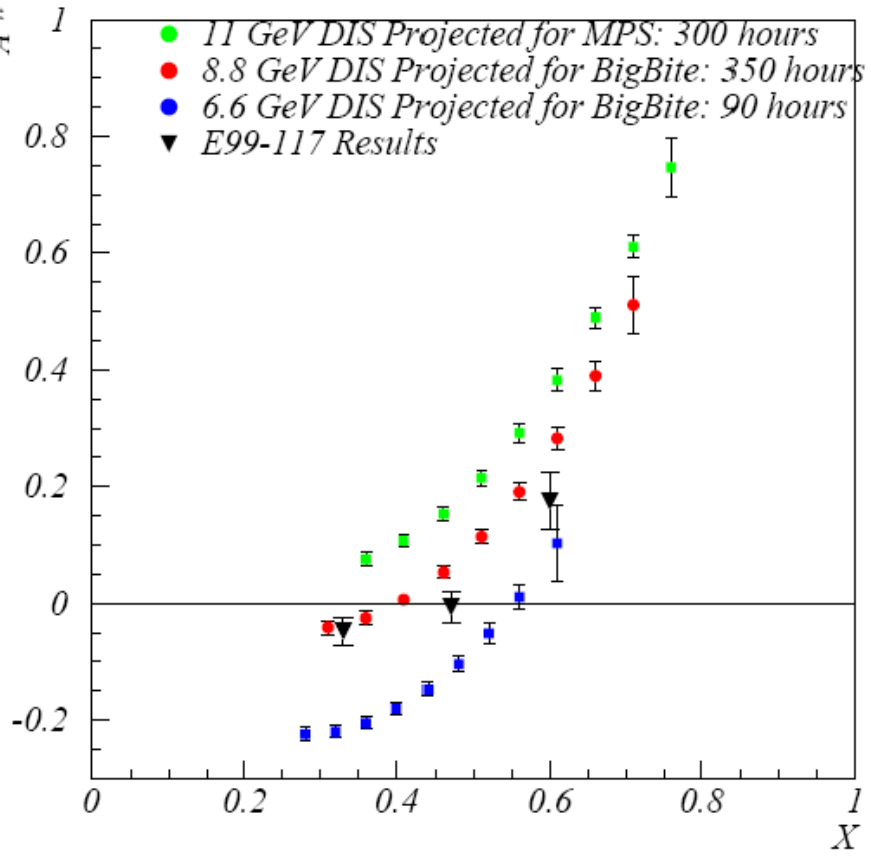
Polarized DIS with BB

$$^3\vec{H}e(\vec{e},e')X$$



GEM tracker



very good accuracy, x up to 0.75
first test of Q^2 dependence

1. NIKHEF's detector package (L ~ < 10^{32}):
- two planes of MWPCs with multiplexed readout
- aerogel counter (10 PMTs) for proton/electron ID
- two scintillator paddles for the trigger

2. a) UVa MRI initial plan: two planes of MWPC with PICOs readout and two-layer 16 paddle scintillator trigger (GU)

b) UVa MRI final plan: three planes of MWDC (nanometric AD borrowed from FNAL) + CAEN TDCs(Hall A); Collaboration with ITEP: two-layer lead-glass calorimeter; Hall A: 13-paddle timing hodoscope; Hall A: improved the AD cards for these MWDCs.

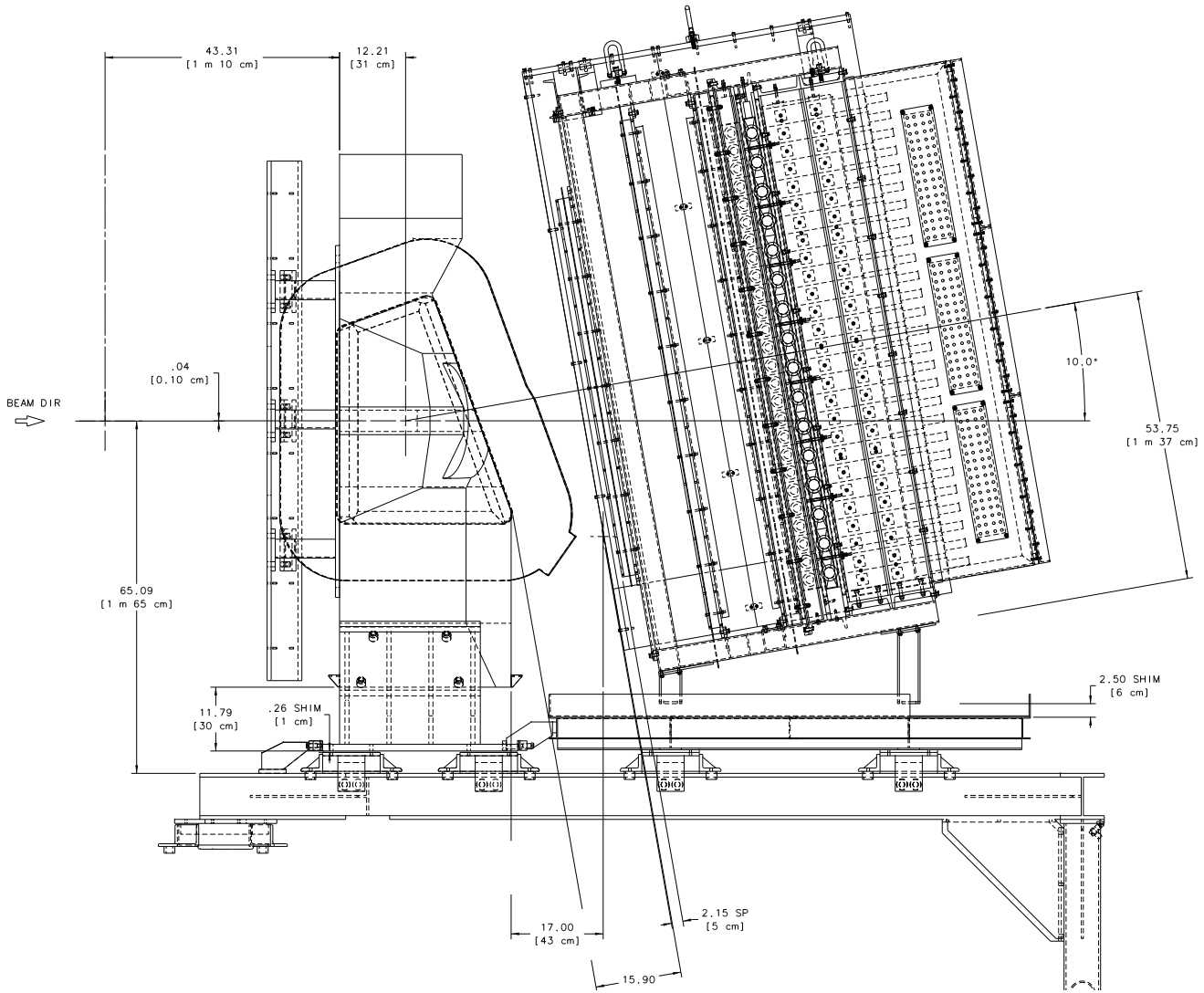
Limits in MWDC due to the rate ~ 10-20 MHz /plane (GEn)
and the wire current (aging at 1 C/cm)
in Timing Hodoscope ~ 200 kHz/paddle (GEn)

2. a) UVa MRI initial plan: two planes of MWPC with PICOs readout and two-layer 16 paddle scintillator trigger (GU)

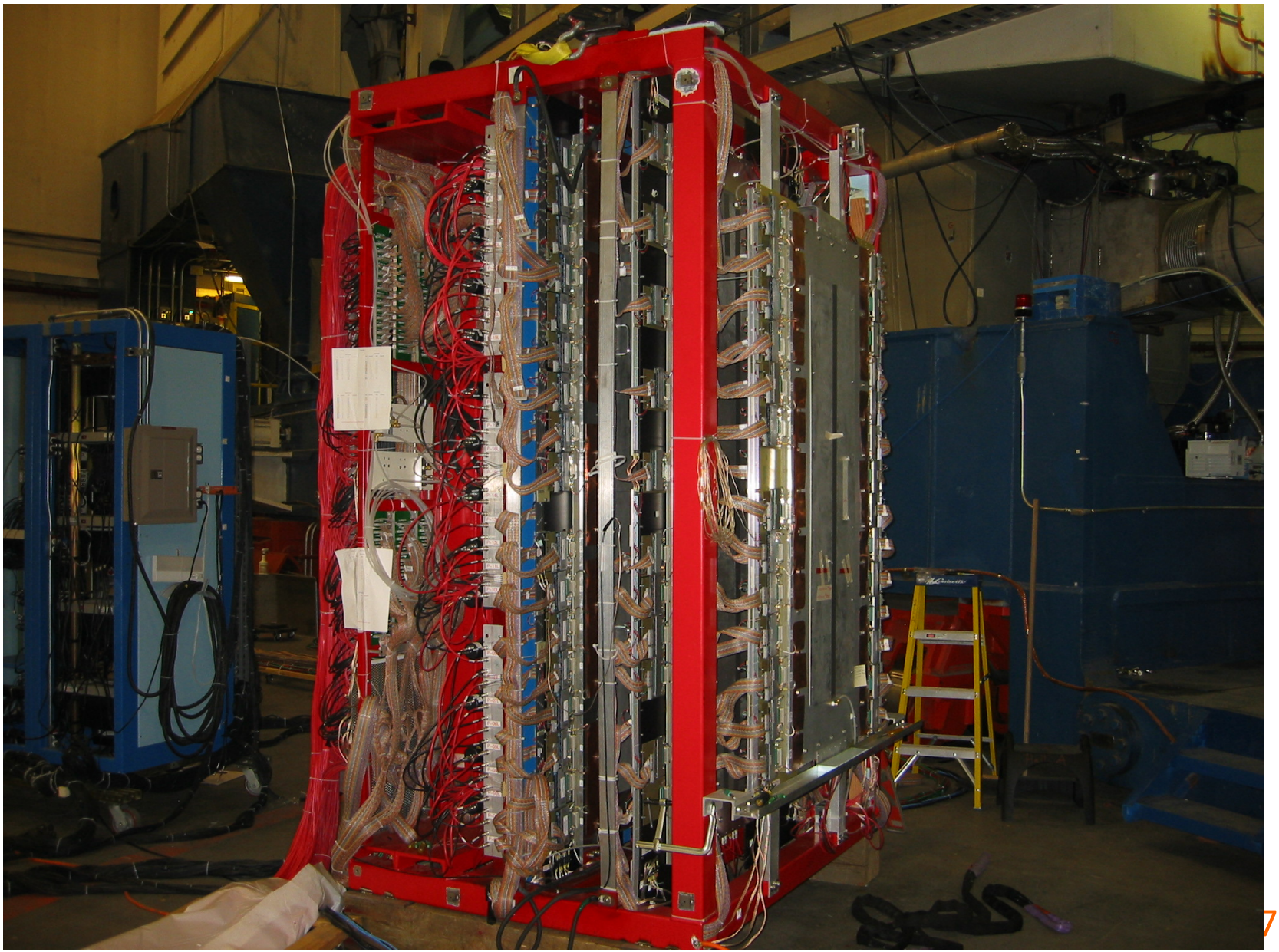
b) UVa MRI final plan: three planes of MWDC (nanometric AD borrowed from FNAL) + CAEN TDCs(Hall A); Collaboration with ITEP: two-layer lead-glass calorimeter; Hall A: 13-paddle timing hodoscope; Hall A: improved the AD cards for these MWDCs.

3. INFN: front GEM chambers 40x150 cm^2 (three/four planes);
Collaboration: Gas Cherenkov counter;
SBS GEM chamber from GEP(5) polarimeter (UVa) 50x200 cm^2
Two-layer lead-glass calorimeter (as above)
Highly segmented timing hodoscope (GU)

BigBite detectors

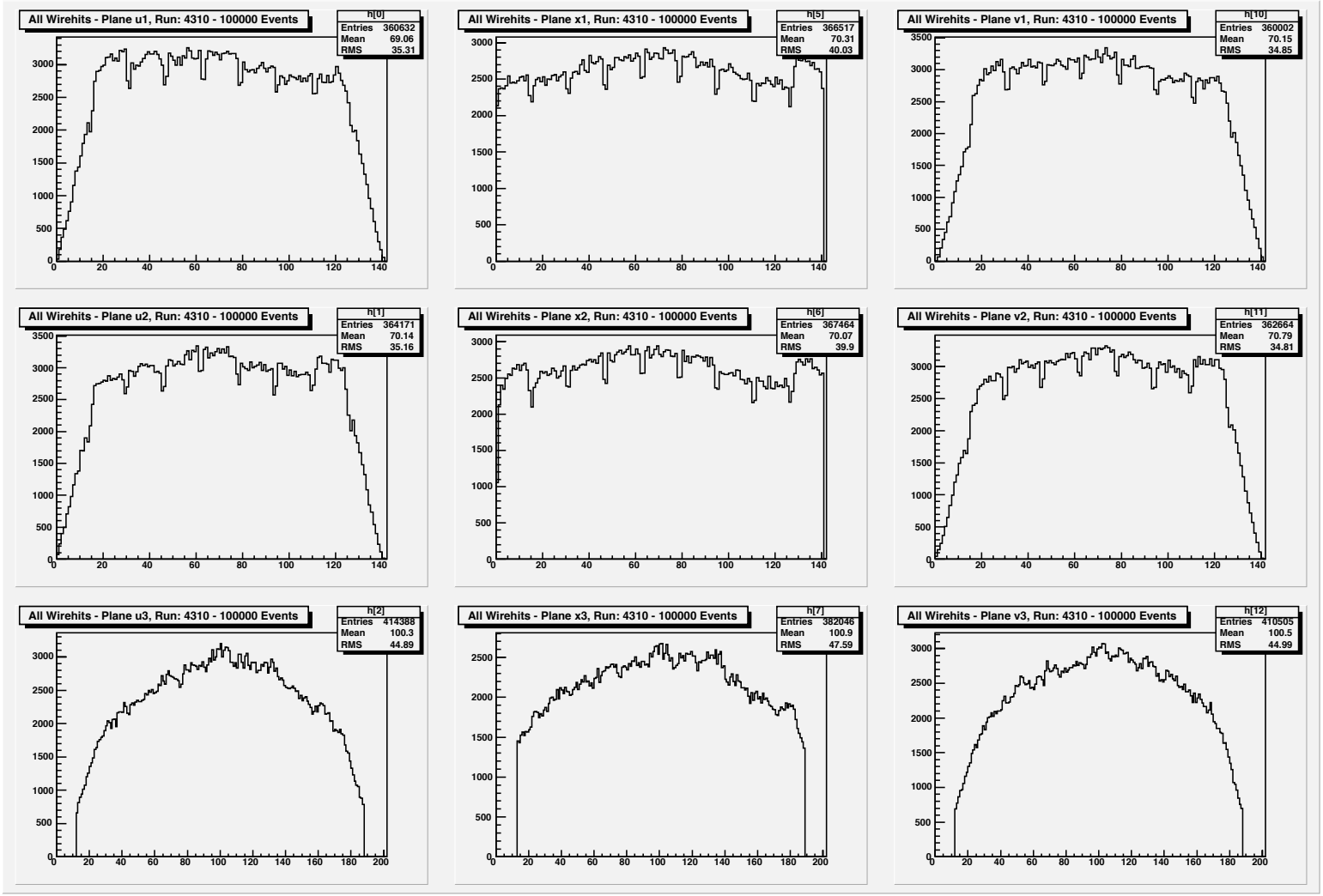


BigBite detectors



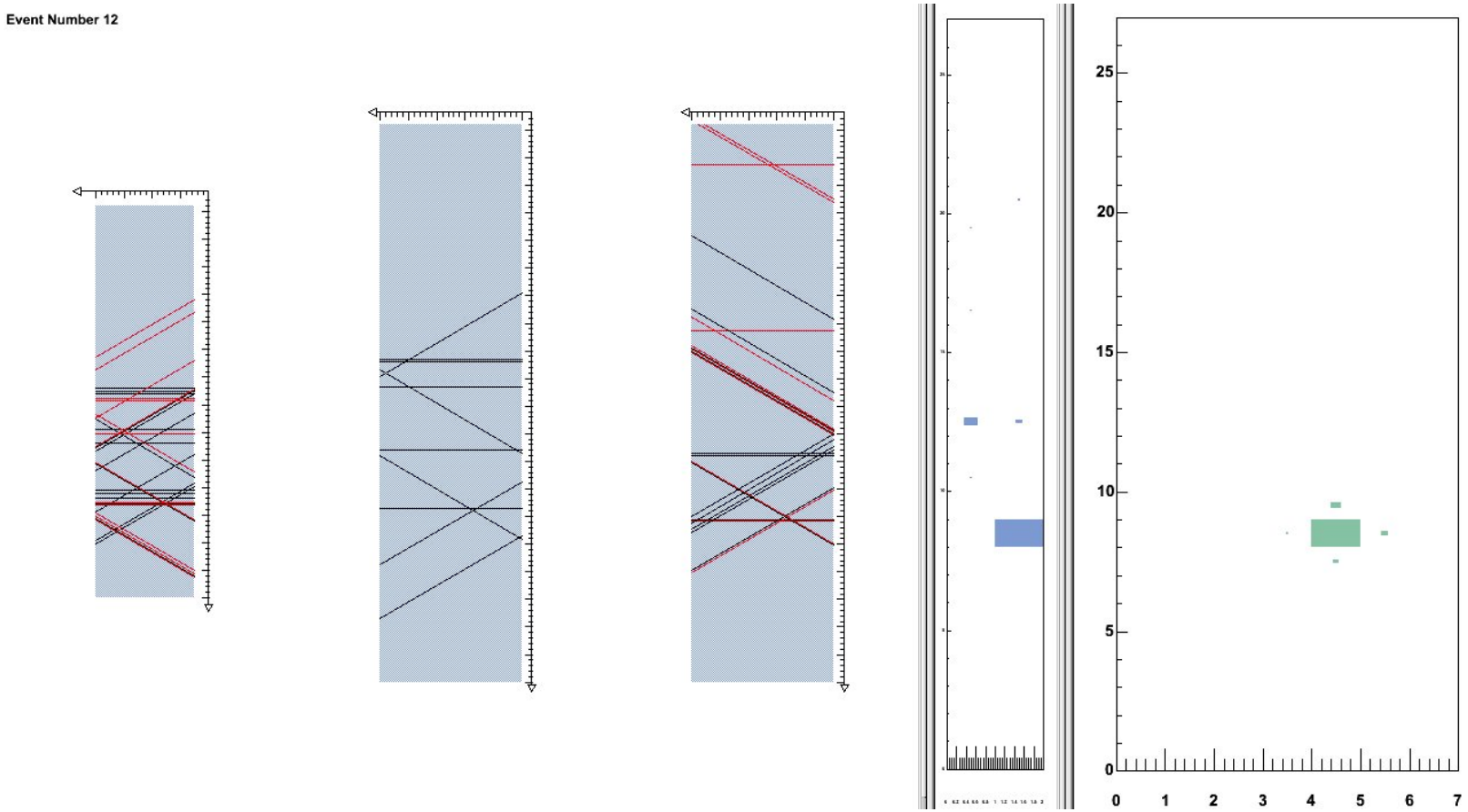
BigBite detectors

Wire hit maps for the nine wire planes



BigBite detectors

Event display: timing gate ~ 300 ns in MWDC



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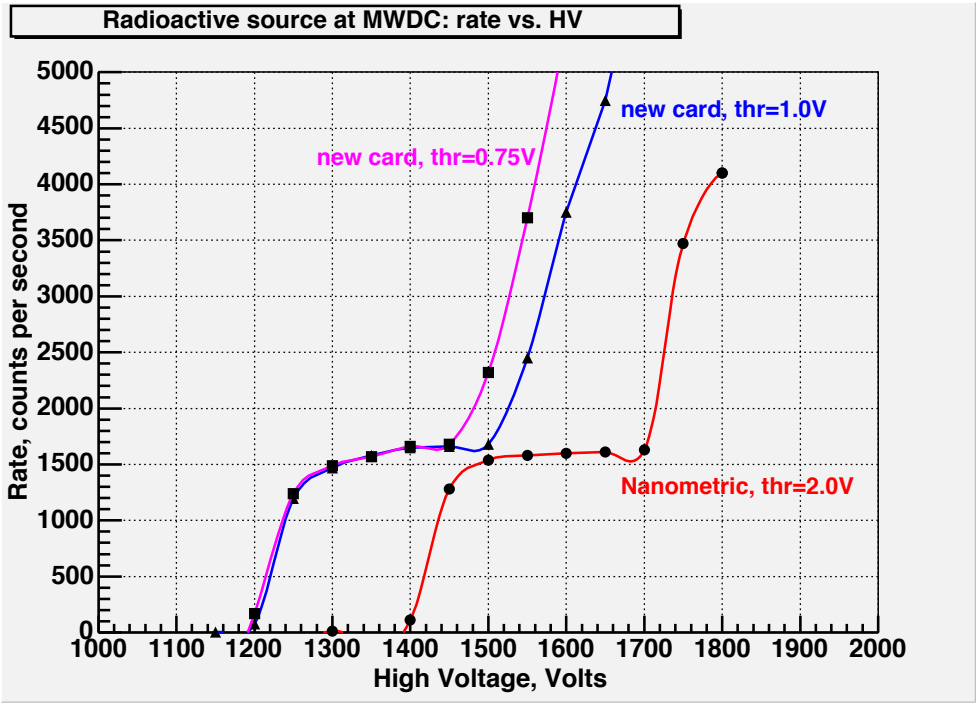
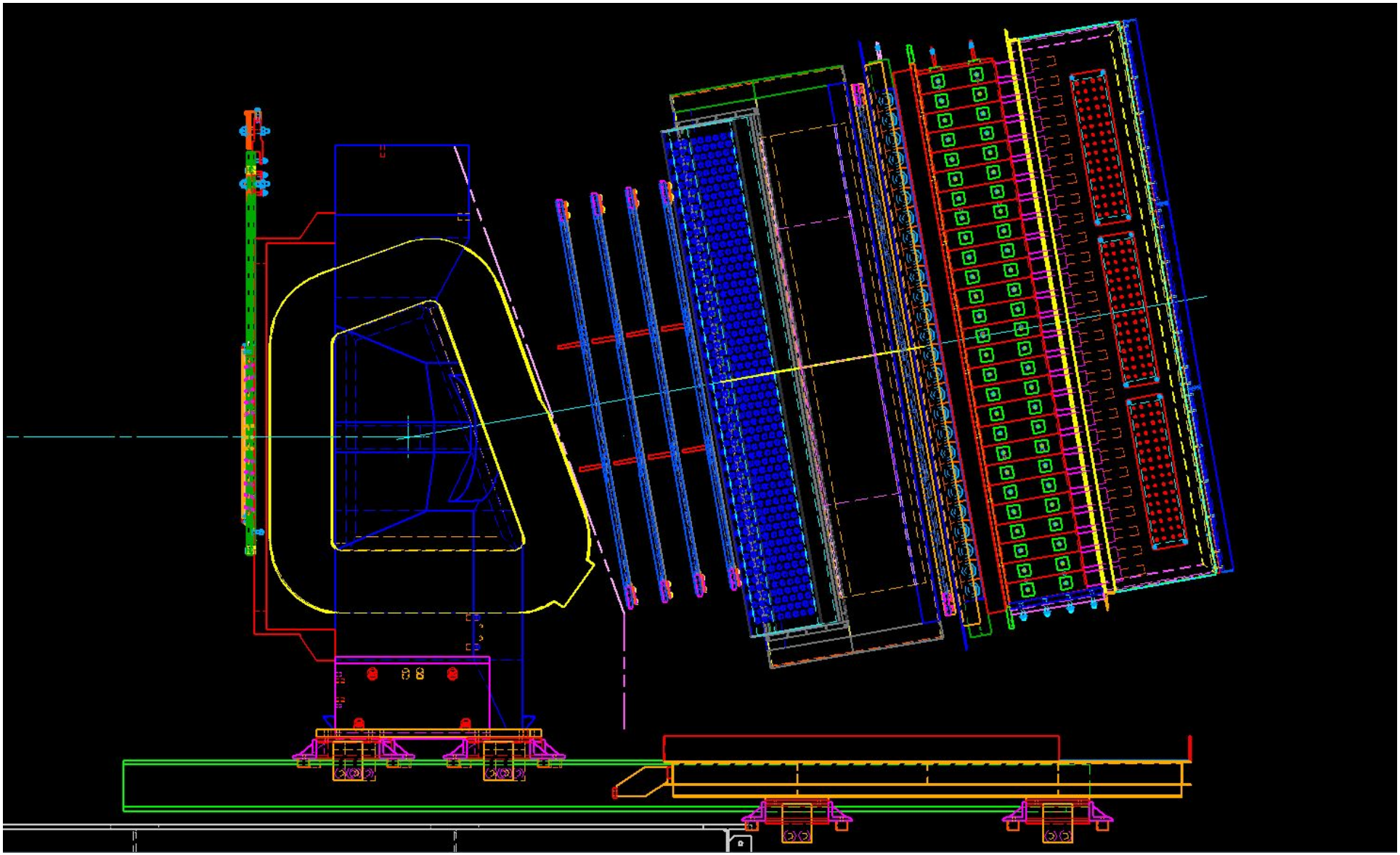
Important grounding connection!

BigBite detectors

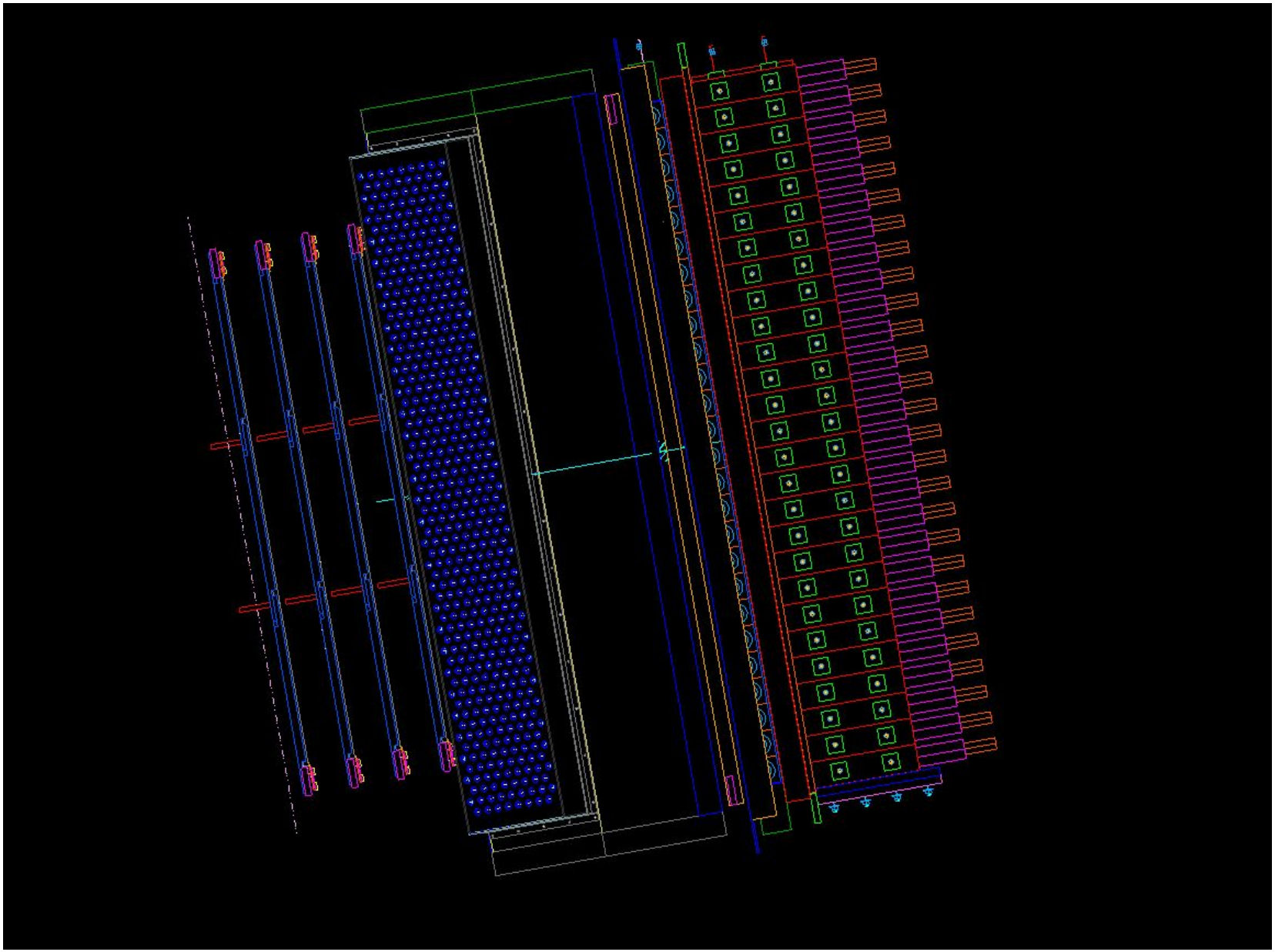


During GEn rate per plane was of 20 MHz and beam current of 8 μA limited by the wire chamber operation considerations.

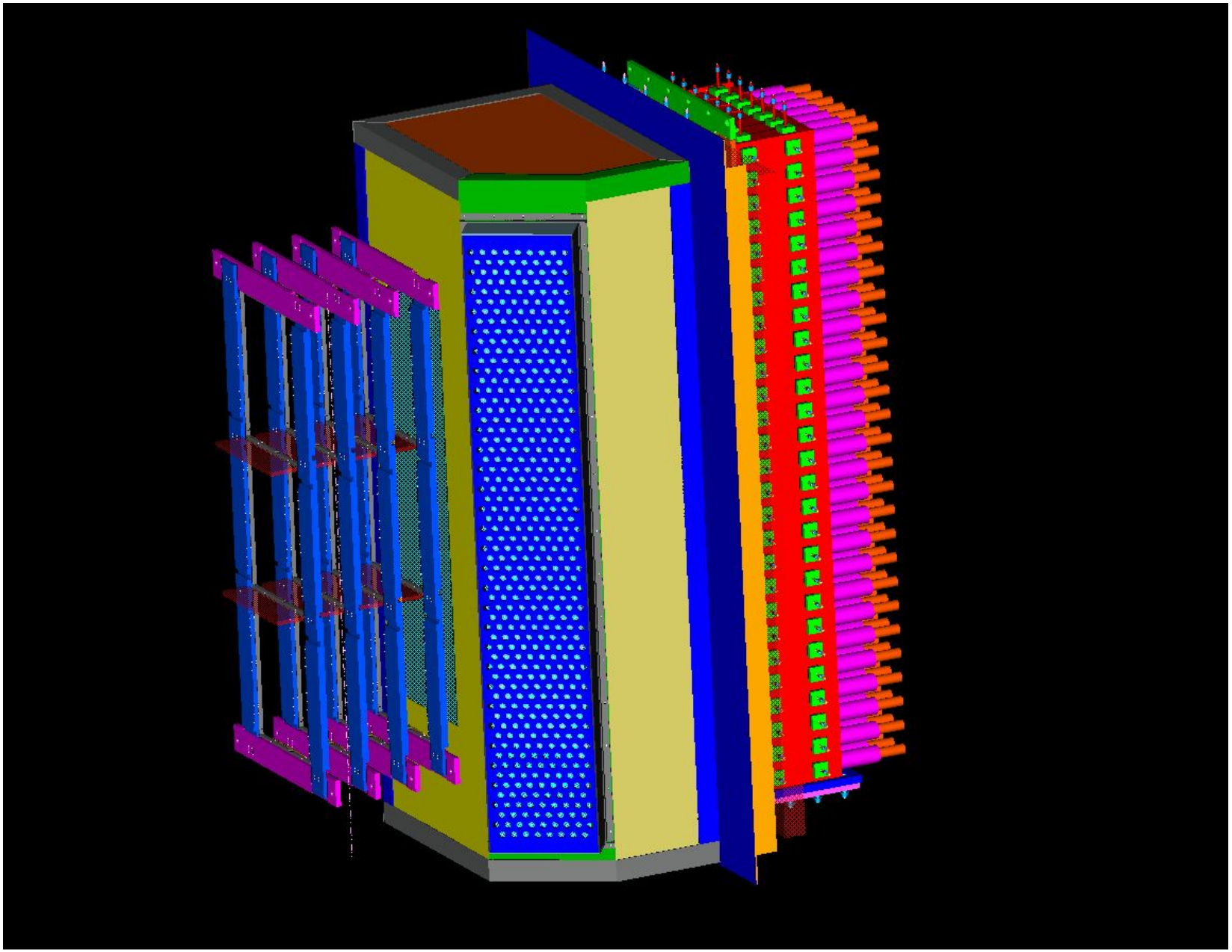
BigBite detectors



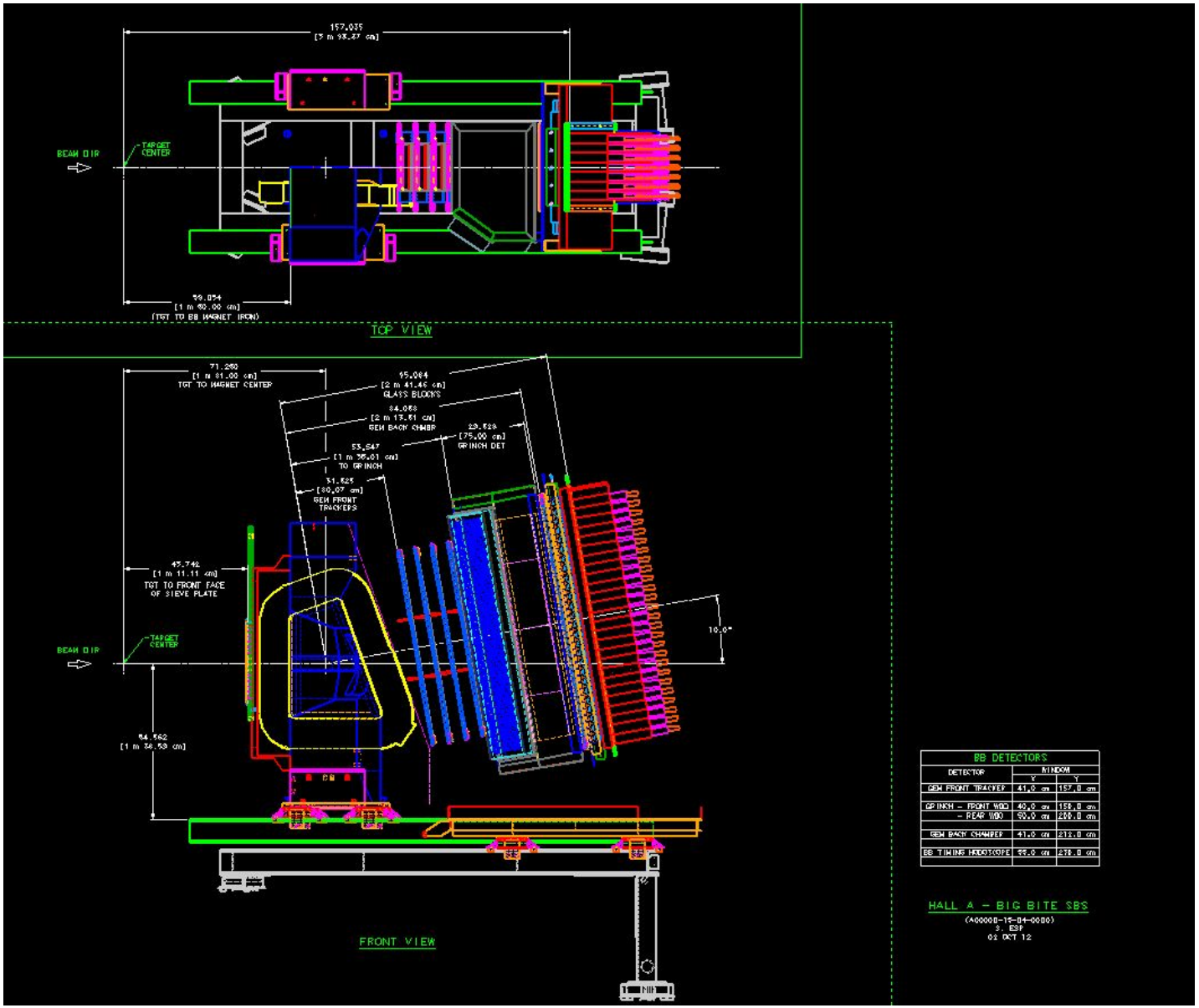
BigBite detectors



BigBite detectors



BigBite detectors

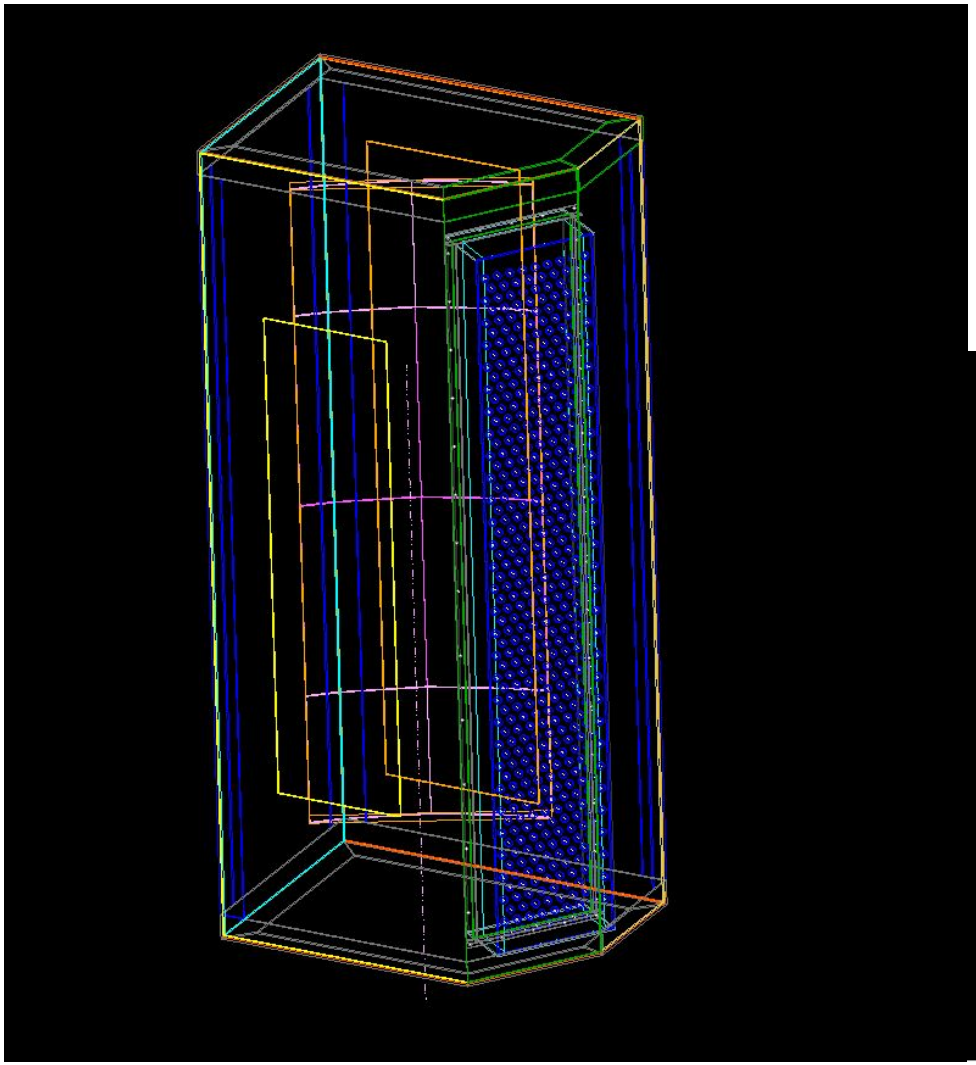


Solid Angle

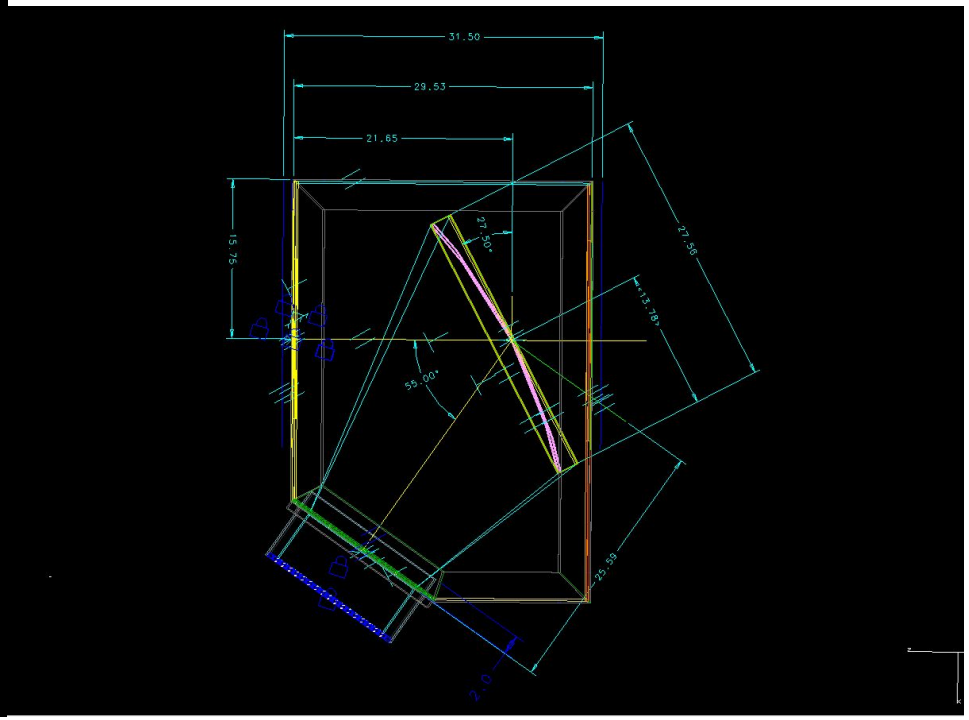
Distance from
the target to
the last GEM plane
is 394 cm:

$50 \times 200 / 394^2 = 64$ msr

BigBite detectors

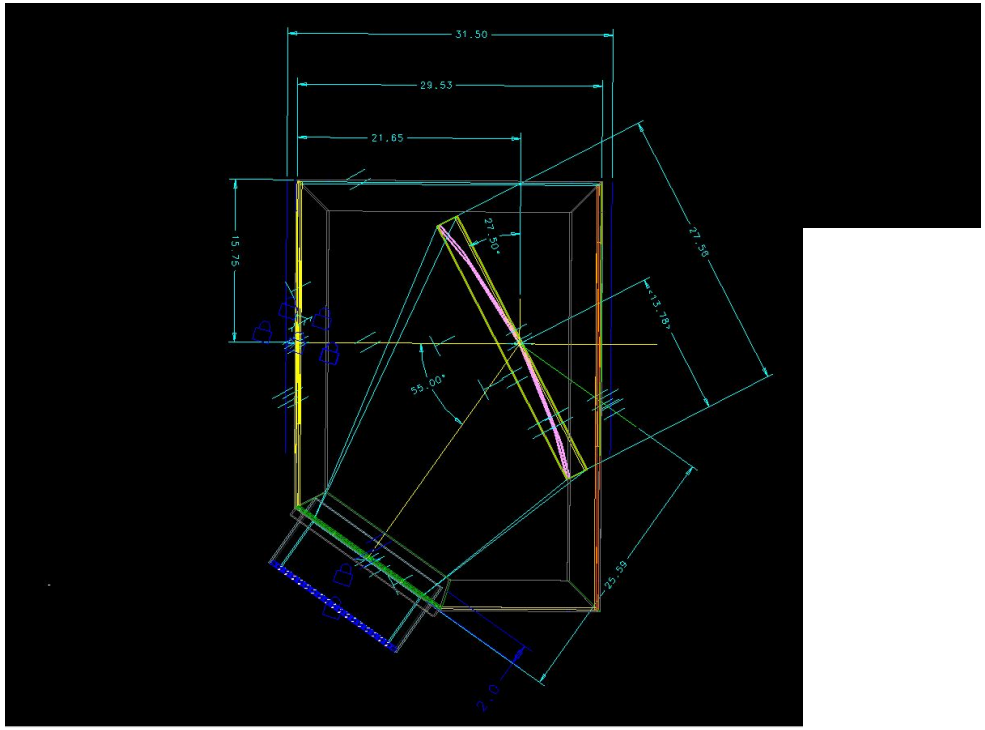


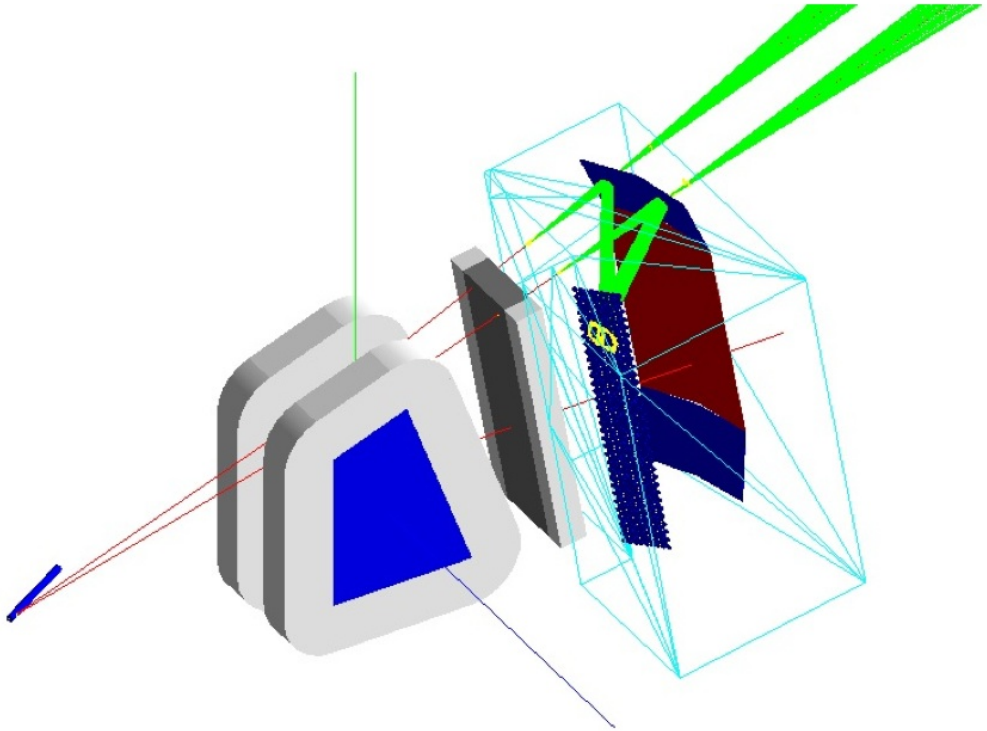
Gas Cherenkov counter



BigBite detectors

Cherenkov counter: optics, PMT array, electron and pion detection





BigBite detectors

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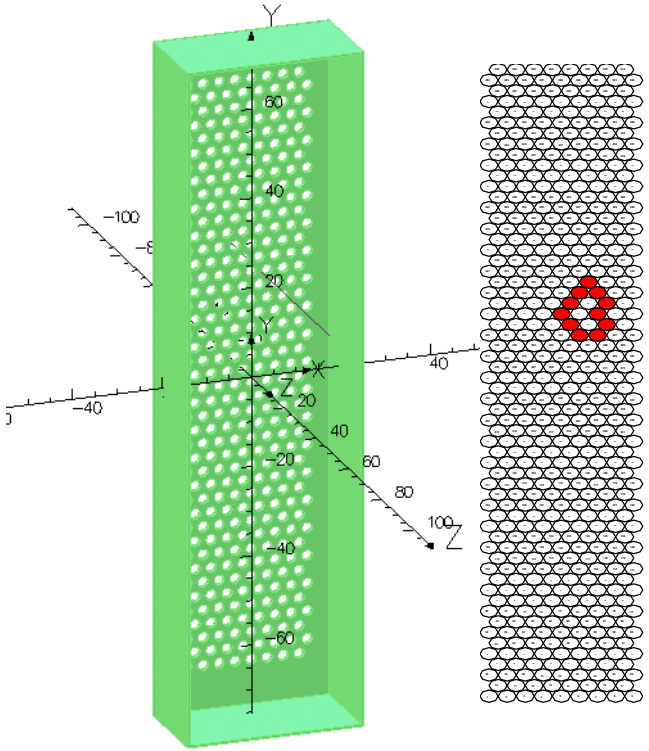

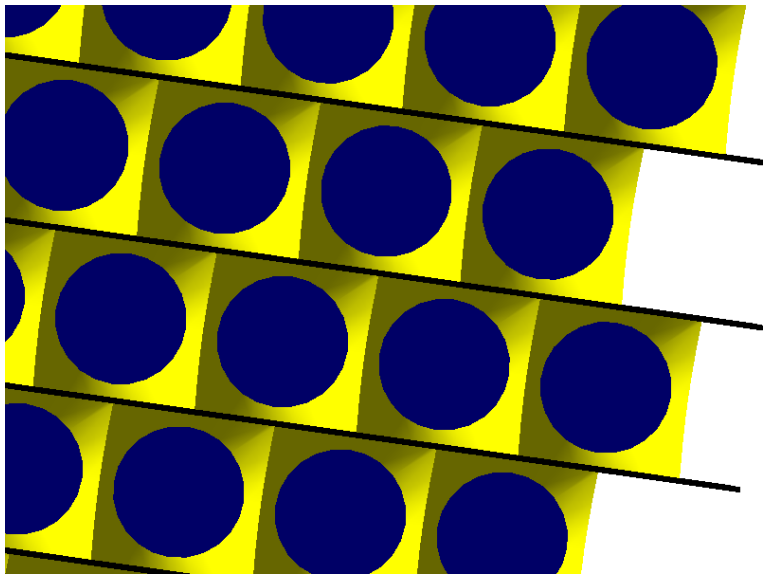

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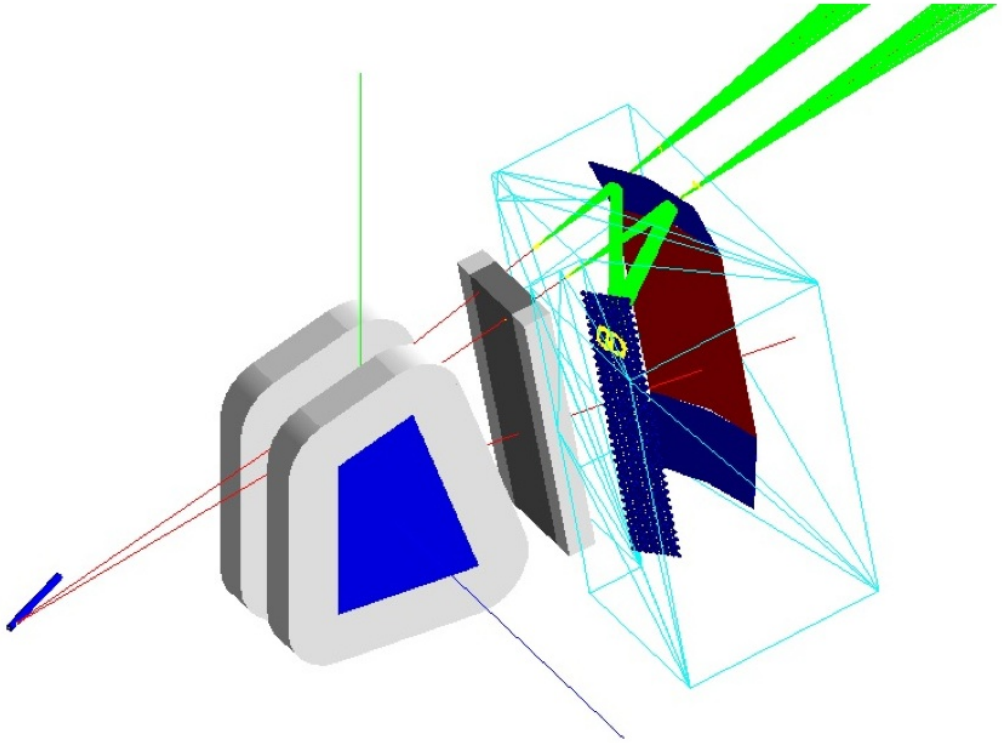

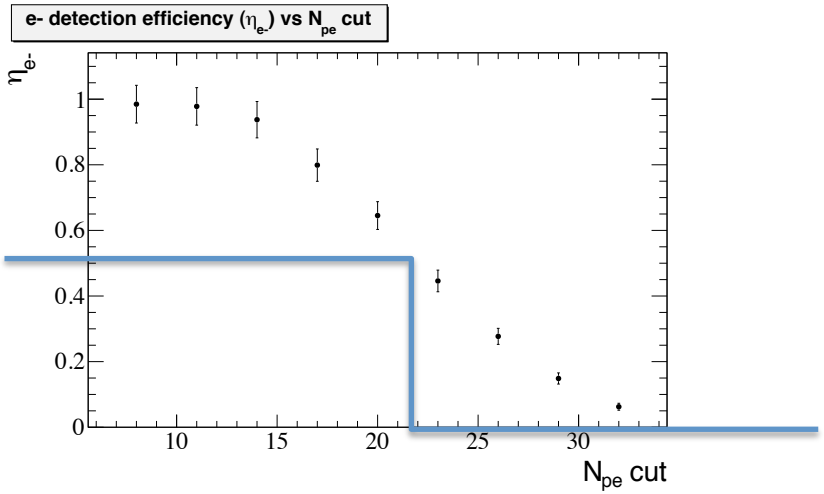

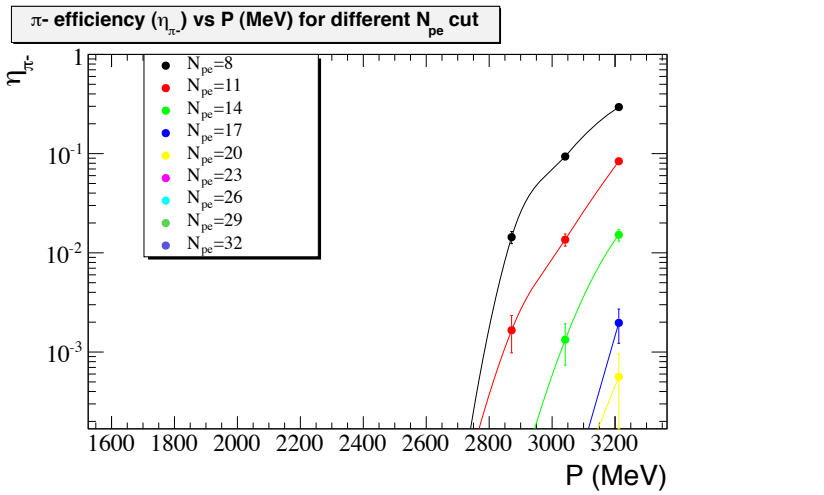

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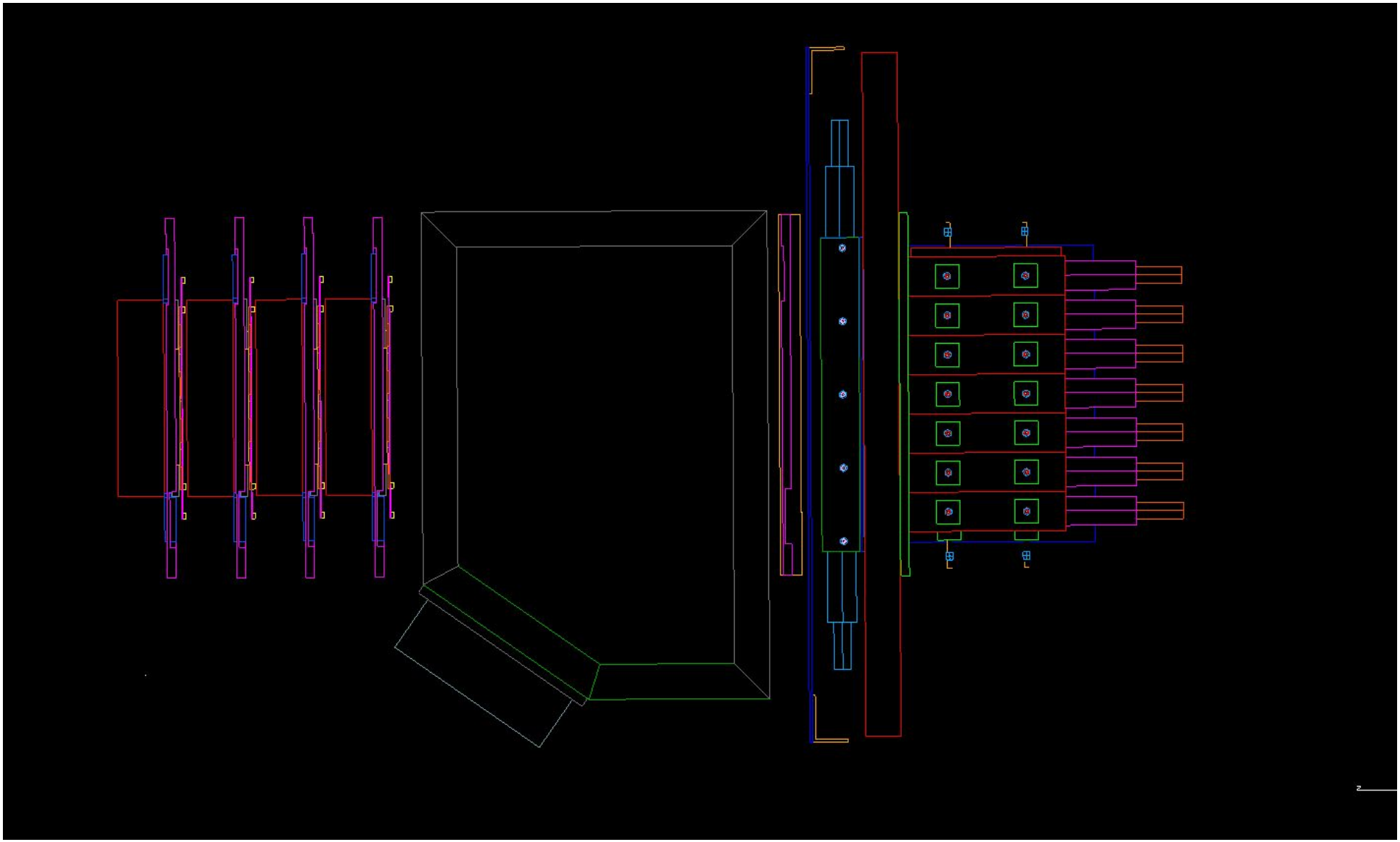

BigBite detectors

Collaboration behind these efforts:
GEM chambers: INFN & UVa
Gas Cherenkov: W&M/NCAT/JLab
Timing hodoscope: GU/CalST/
Design and DAQ: JLab

Time line:
It is driven by the collaboration schedule and preparation for the experiments.
If everything works well, a new detector could be ready by 2015.