

# Reaction Plane Detector Safety Review

All data sheets can be found at:

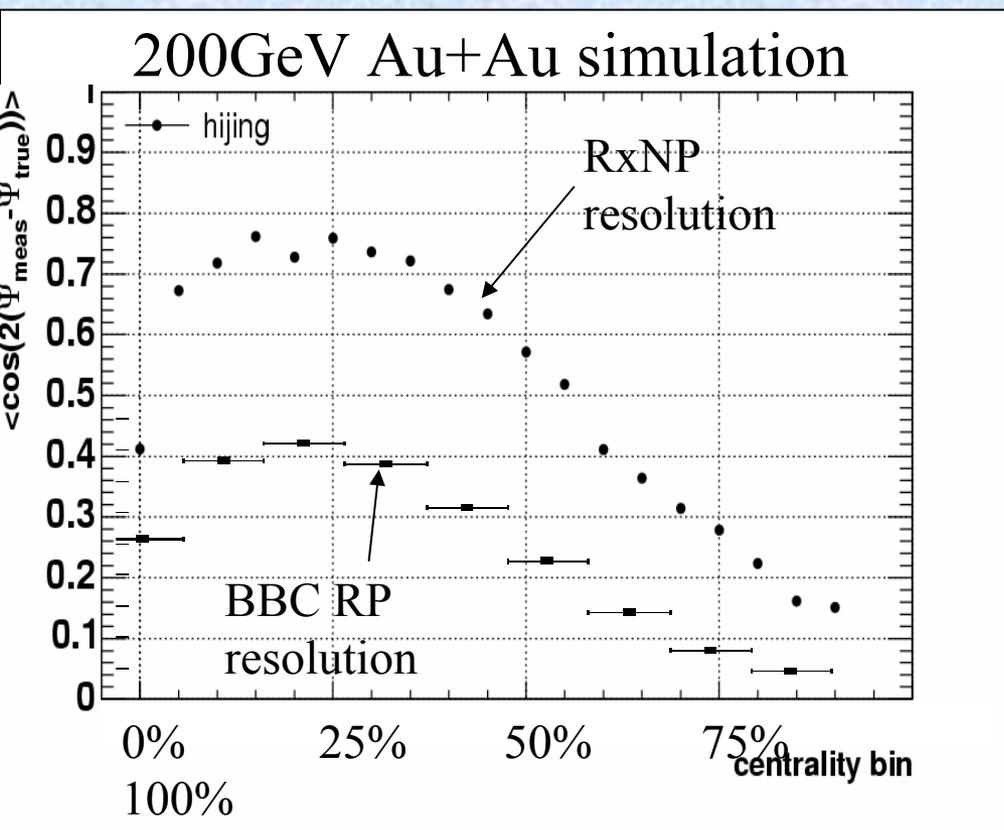
[https://www.phenix.bnl.gov/WWW/publish/bickleya/060622\\_RxnPSafety/](https://www.phenix.bnl.gov/WWW/publish/bickleya/060622_RxnPSafety/)

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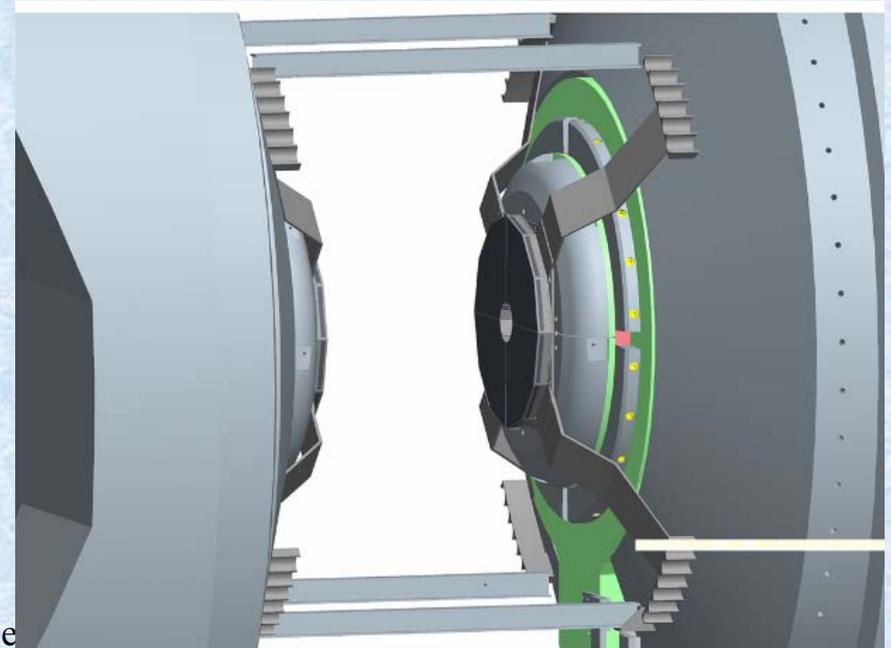
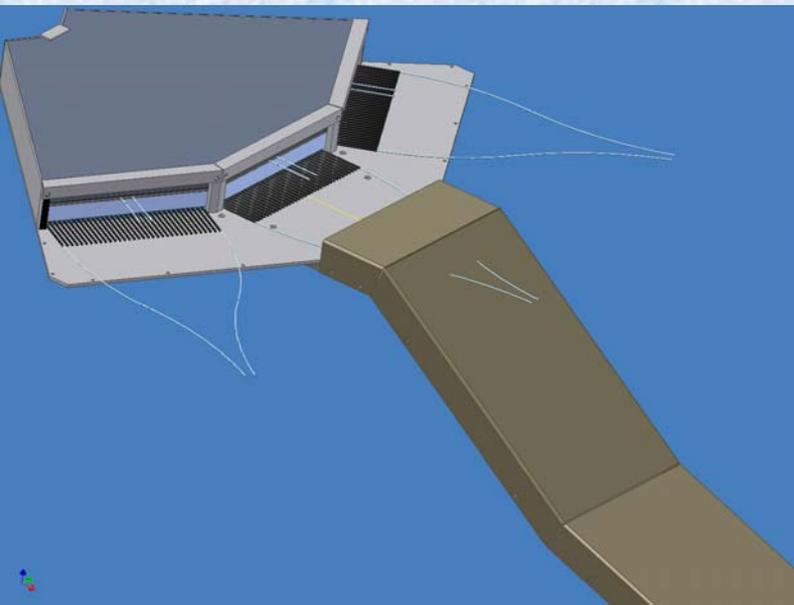
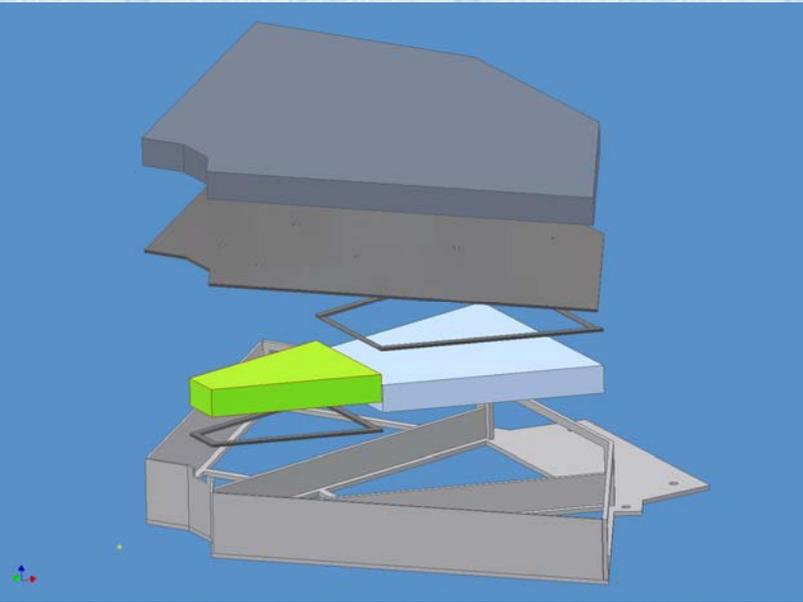
# Physics Overview



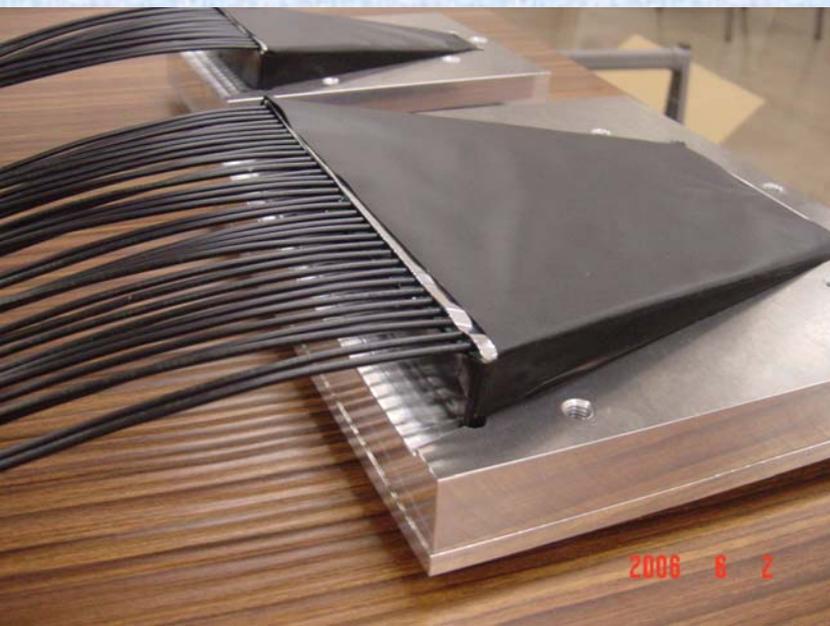
- Detector will be used to measure particle yield distributions versus reaction plane that are currently inaccessible with sufficient statistical resolution
  - J/Psi
  - Single electrons from heavy quark decay
  - Neutral pions at high  $p_T$
  - direct photons at intermediate  $p_T$
  - Jet shape modification
- RxnP has an improved reaction plane resolution of a x2 above the current BBC capabilities
- Corresponds to an effective statistical improvement of x3
- Covers rapidity region  $1.0 < y < 2.8$
- 2 divisions in  $\eta$  allows study of jet auto-correlation effects

# Detector Design

- Detector divided into quadrants
- Each quadrant contains:
  - 3 inner & 3 outer scintillators
    - Fibers embedded at 0.5cm intervals
    - Fibers exit quadrant tray at outer radius
  - 1 painted Pb converter
  - 6 mesh dynode pmt's
  - 1 LED fiber run to each pmt for calibrations



# Scintillator



- Scintillator:
  - EJ-200 (Eljent Technology)
  - Equivalent to BC-408
  - 2cm thick
  - Inner scintillator
    - $R = 6.5 \rightarrow 18.0\text{cm}$
  - Outer scintillator
    - $R = 18.0 \rightarrow 33.0\text{cm}$
  - Light tight wrapping:
    - Al mylar
    - Black plastic sheeting
    - RTV silicone gum KE45
    - Scotch Super 33+ 054007-06132 Vinyl Electrical Tape (3M)

# Prism & Fibers



- Prism:
  - Material = Acryl
  - Dimensions
    - 3inch diameter cylinder
    - cut at 45 degrees from the PMT window
    - height is ~5cm.
- Fibers:
  - BCF91A & Y11
  - Cladding
    - -F- E56036 IWASE AH6 CSA PVC 105C VW-1
    - max temperature 110deg
    - inner radius 1.2mm
    - thickness 0.62mm
  - Shrink Tube
- Epoxy
- Optical Grease, BC-630 will be used to attach the prism to the pmt

# Converter



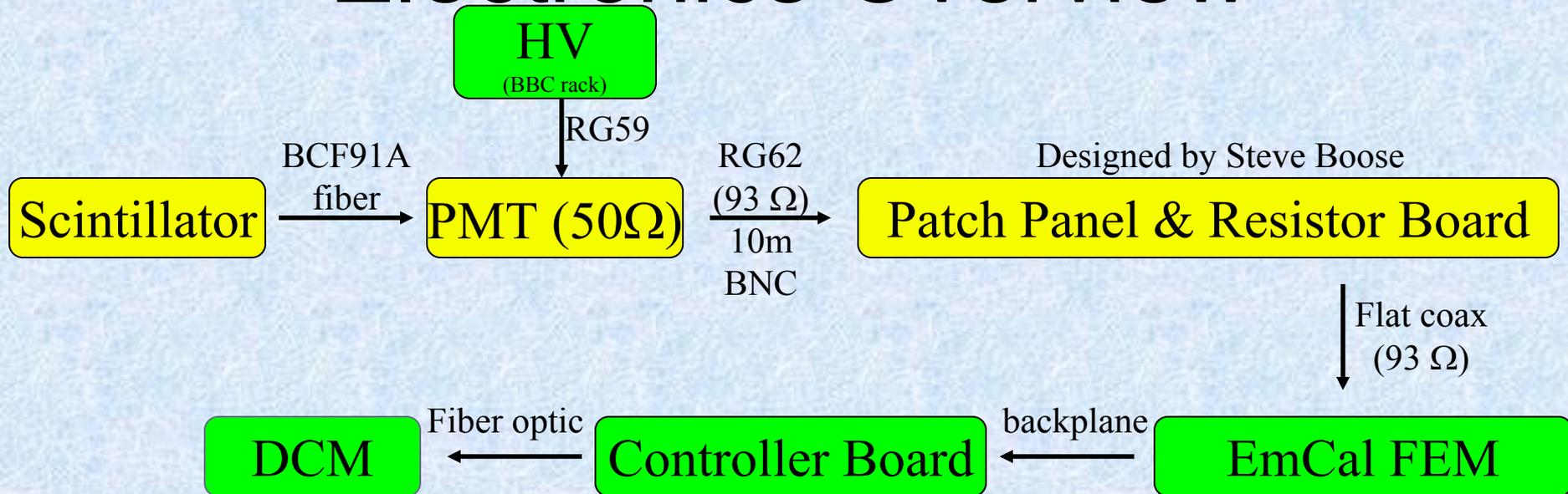
- 2 in thick Pb-Sb composite
  - 98%Pb, 2%Sb
- Will be painted to prevent oxidation
  - SP coat SPSY-3 heat resistant paint
  - Paint will be applied in Japan before shipping to BNL
  - Composition already reviewed by CAD
- Designed to be removable

# PMT's



- Will use a fine mesh pmt which is capable of operating in the magnetic field environment of the PHENIX central region
  - Hamamatsu - R5543 assembly (same as R5542 with UV window)
  - HV cable - (AWG24?)
  - Signal cable - RG174/U
  - Base diagram

# Electronics Overview



- New components:

- Patch panel resistor board

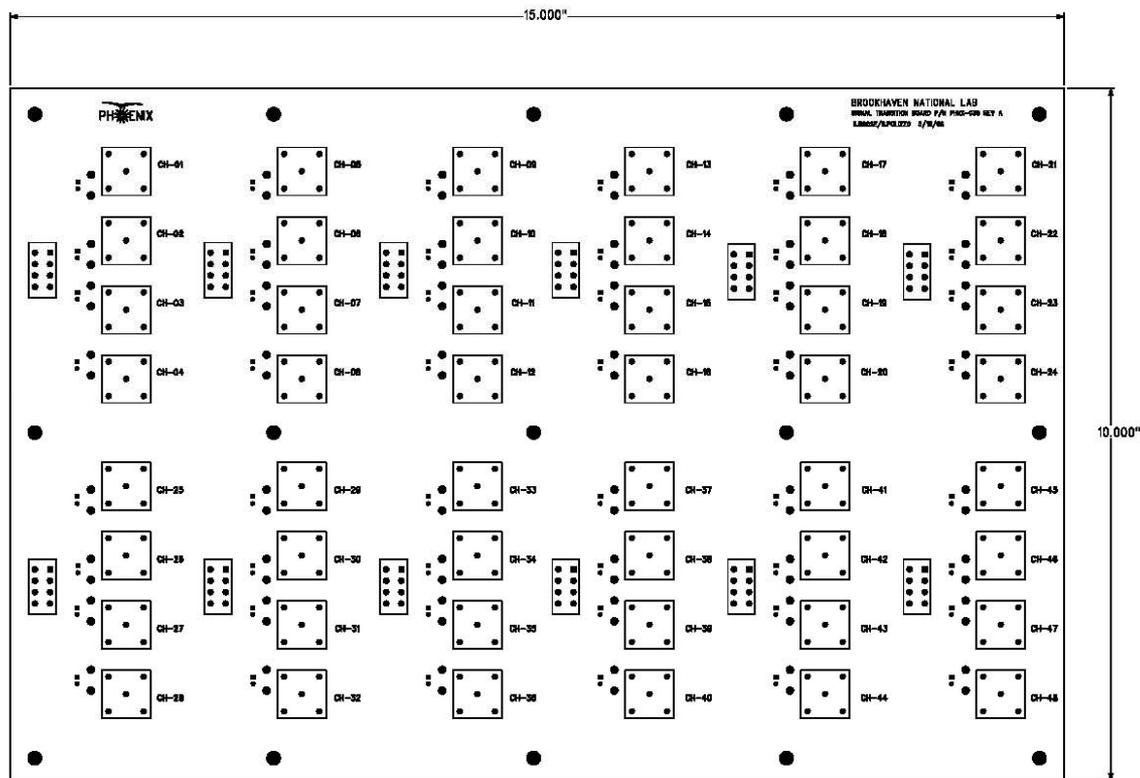
- PHENIX standard components:

- BBC HV rack
- RG59 & RG62
- EmCal FEM
- Flat coaxial cable
- Controller Board
- DCM

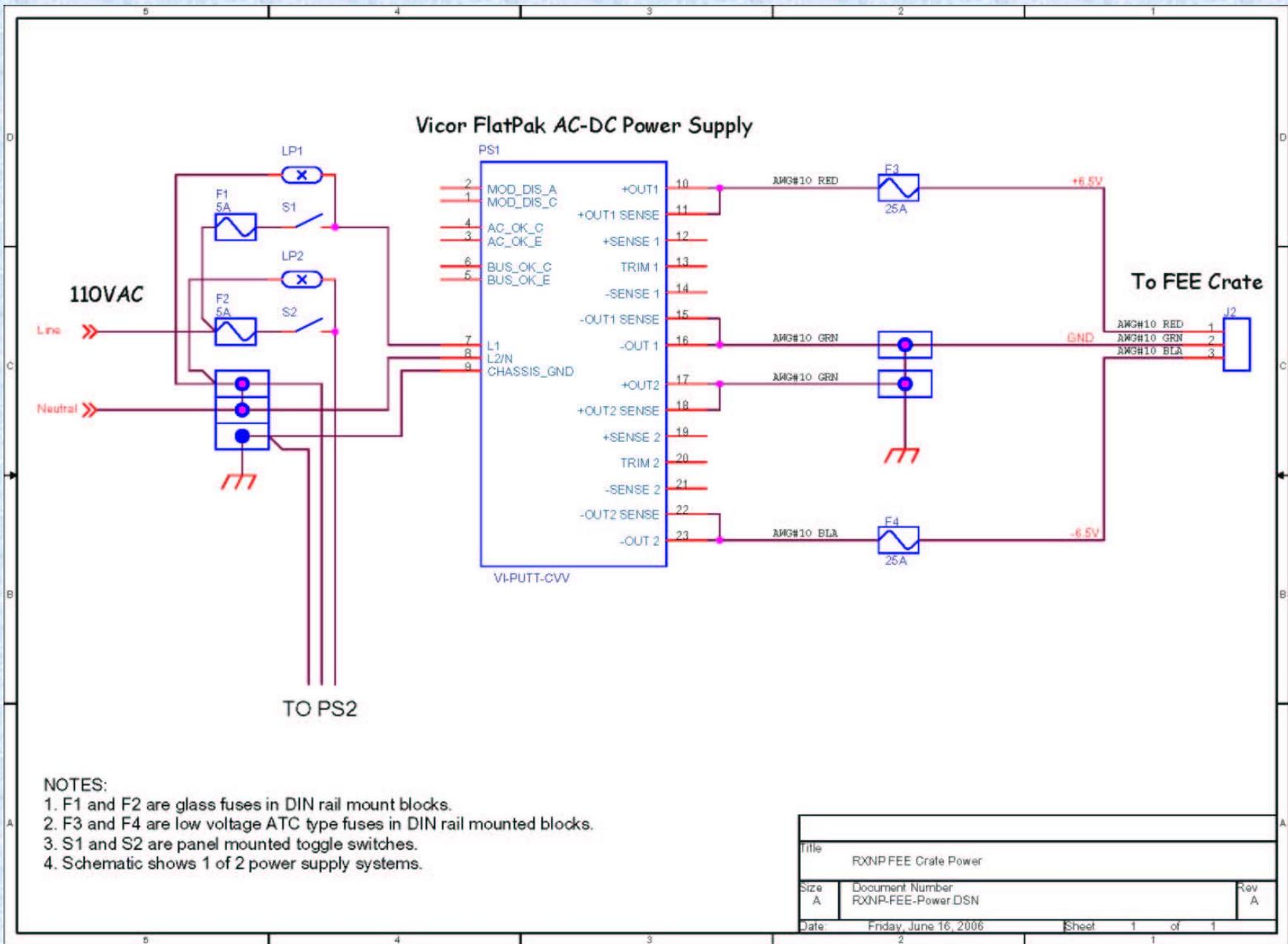
# Patch Panel & Resistor Board

- The designed discharge time of the FEM is too long to achieve a DAQ rate  $> 1\text{kHz}$
- To compensate for this we will connect a termination resistor to the input end of the FEM to modify the timing constant
- Studies suggest a  $40\text{k}\Omega$  resistor is sufficient
- Board will be designed as a patch panel with termination resistor by Steve Boose

# RXNP Patch Panel by Steve Boose

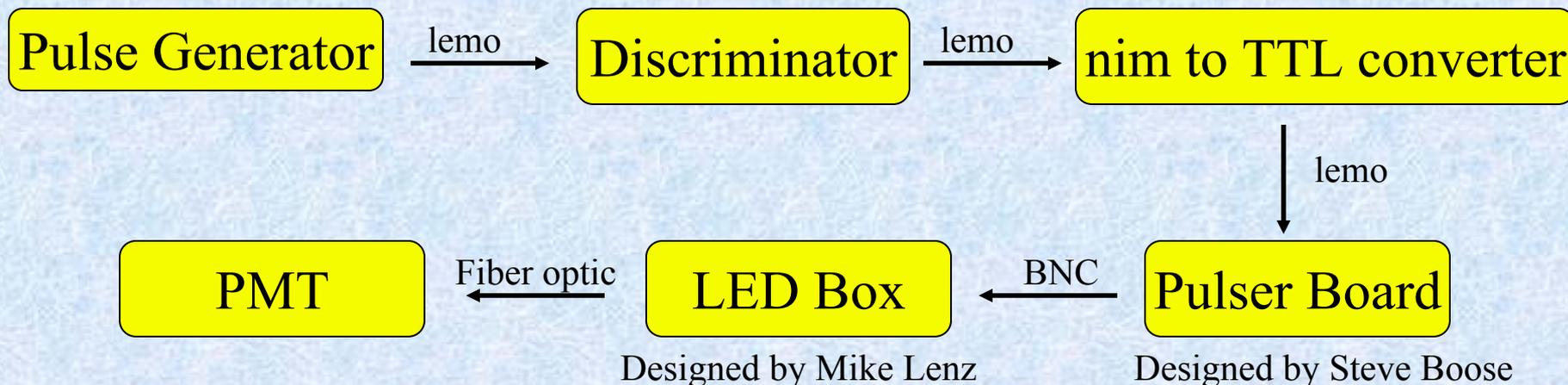


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# LED Calibration System

(still under design)



- LED fibers will run directly to pmt's to provide a known calibration signal to the tubes
- LED box is the only component not already in use in PHENIX