

# STAR Forward Trigger Array

**Purpose:** provides triggering for STAR for pp collisions  
& relative luminosity measurement for spin physics.

## Outline

- Overview of detector components
- Implementation for RHIC run 2
- Electronics implementation for RHIC run 2

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BNL Safety Review

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# Detector Components

- **Detector**

- o Plastic scintillator hexagons + wave-length shifting fiber light collection
- o Fiber-glass channel mechanical support off STAR magnet poletip

- **Photomultiplier tube (PMT) box**

- o Light-tight aluminum box (on east & west poletip 12:00 mounting brackets.)
- o 16 PMT assemblies (UCLA) contained in each box. Each assembly...
  - Electron Tubes Ltd. 9124B PMT
  - resistive voltage divider base ( $R_{\text{tot}} = 1.3 \text{ M}\Omega$ )
  - three part magnetic shield
    - ❑ soft iron shield tube (5cm OD, 3.5 cm ID, 17.8 cm length)
    - ❑ inner  $\mu$  metal tube (3.9 cm OD, 3.7 cm ID, 15.9 cm length)
    - ❑  $\mu$  metal wrap around PMT

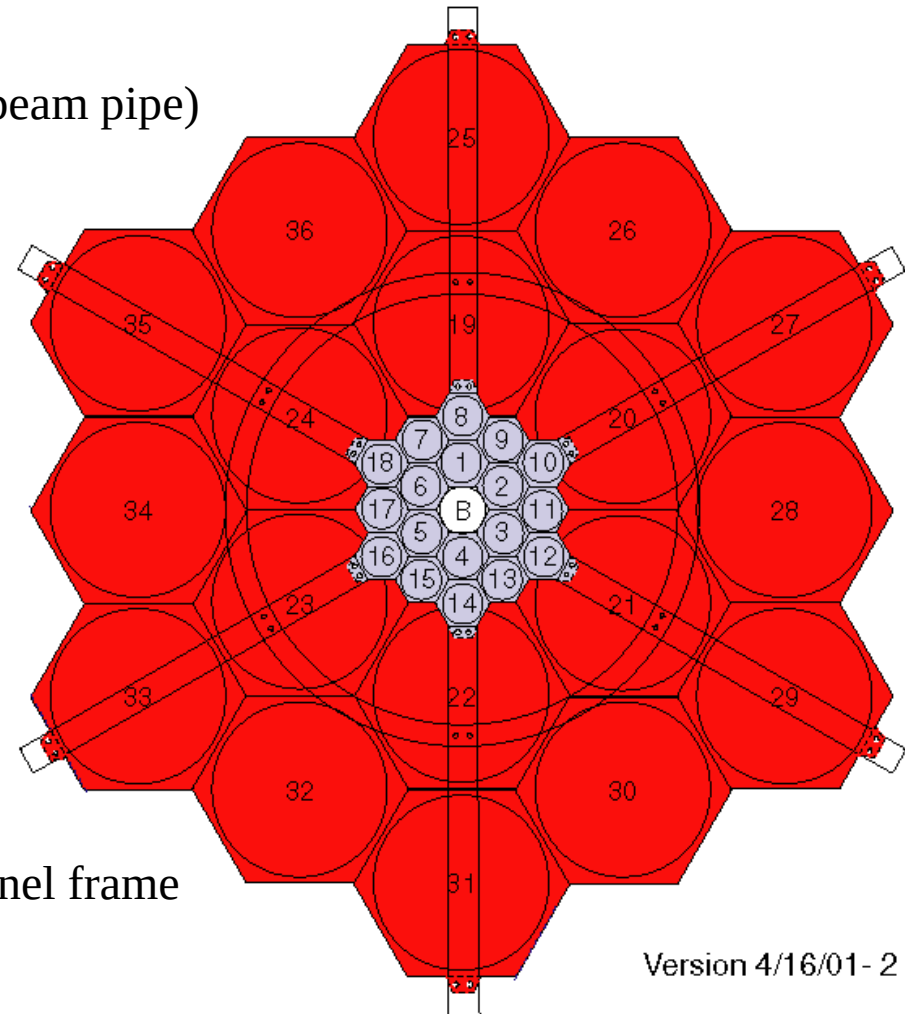
- **Readout electronics**

- o Commercial HV power supply + CAMAC monitoring & trigger electronics.
- o Gigalink interface to STAR trigger and scaler system.

# Scintillator Annuli

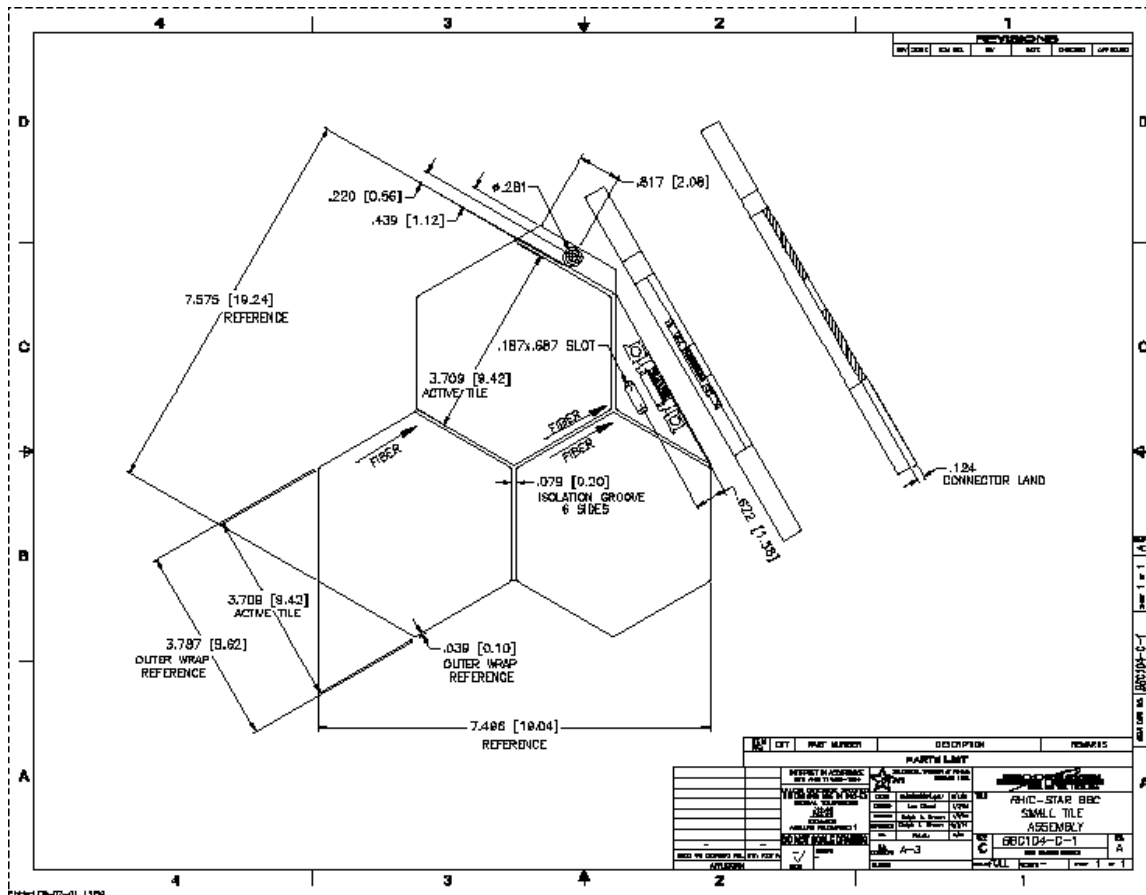
- All scintillator is 1cm thick SCSN81 (Kuraray)
- Inner annulus
  - o 9.6 cm ID (1 cm clearance around beam pipe)
  - o 48 cm OD
  - o total weight 11 pounds
  - o 18 total pixels
- Outer annulus
  - o 38 cm ID
  - o 193 cm OD
  - o total weight 44 pounds
  - o 18 total pixels
- Annuli are supported by fiber-glass channel frame

STAR Beam-Beam Counter Design 1  
Front View



Version 4/16/01 - 2

# Scintillator Megatiles



- Annulus comprises 6 megatile triplets.
- Small hexagon triplets have single attachment points to fiber glass support frame (triplet weight is ~2 lbs.).
- Large hexagon triplets have two attachment points to fiber glass support frame (triplet weight is ~7.5 lbs).
- Each scintillator tile has 4 0.83mm diameter x 32cm (135cm) long wave-length shifting fibers for light collection.
- Light from a triplet is transported using 0.9mm diameter x 350cm long clear optical fibers contained in PVC tube.

• two hexagonal scintillator annuli

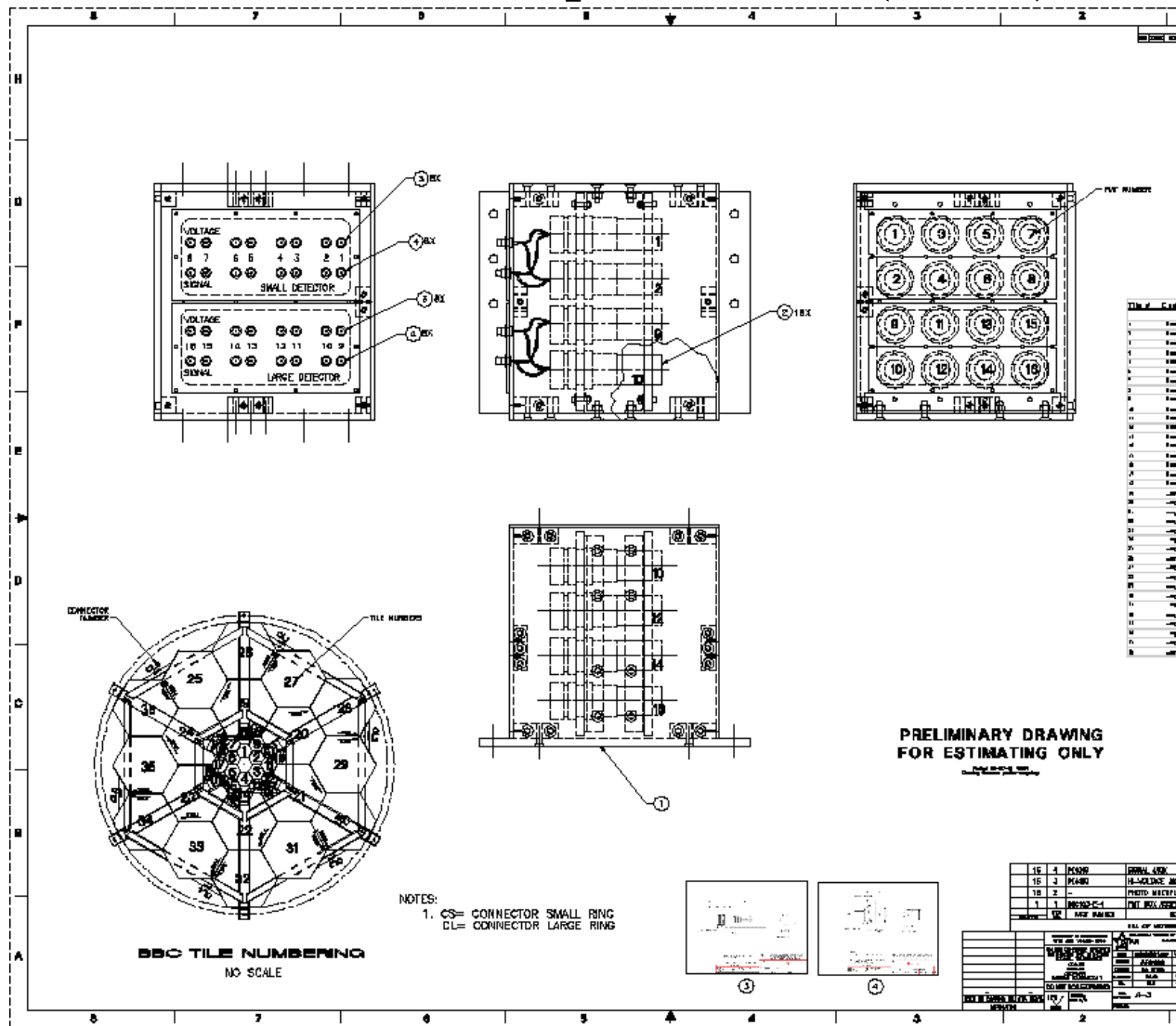
• fiber-glass channel support frame

• assembly mounted outside STAR magnet

• 6'' distance off poletip

- two hexagonal scintillator annuli
- fiber-glass channel support frame
- assembly mounted outside STAR magnet
- 6'' distance off poletip

# Photomultiplier Tube (PMT) Box and Cabling



- 16 PMT assemblies per box.
- PMT assemblies are electrically isolated from light-tight PMT box.
- SHV and BNC connectors are mounted on insulating signal panels (Nema Grade LE)
- Grounding of PMT assemblies is through cable ground shields to electronics rack.
- Cables are all CL2 fire rated. There are 17x 70' long cable pairs (red-insulator HV + RG-58 signal) run to east and west poletips from 2<sup>nd</sup> floor north platform.

# RHIC Run 2 Implementation

- Complete small hexagon annuli on east and west poletips
- Two large hexagon megatile triplets on east and west poletips
- PMT boxes mounted on 12:00 poletip attachment bracket
- Commercial electronics used for HV and readout, rack-mounted on 2<sup>nd</sup> floor north platform of STAR.

o LeCroy 4032, 32-channel HV power supply + NIM bin + CAMAC crate

o Passive current splitter + 200nsec delay chips

o 2x LeCroy 4413, discriminators

o 2x LeCroy 4518, programmable delay

o 4x LeCroy 4508, programmable lookup unit (PLU)

o 4x LeCroy 4300, fast-encoding readout ADC (FERA)

o 2x LeCroy 4303, time-to-FERA converter

