

# **E12-17-004 GEn Update SBS Collaboration Meeting August 5–6, 2019**

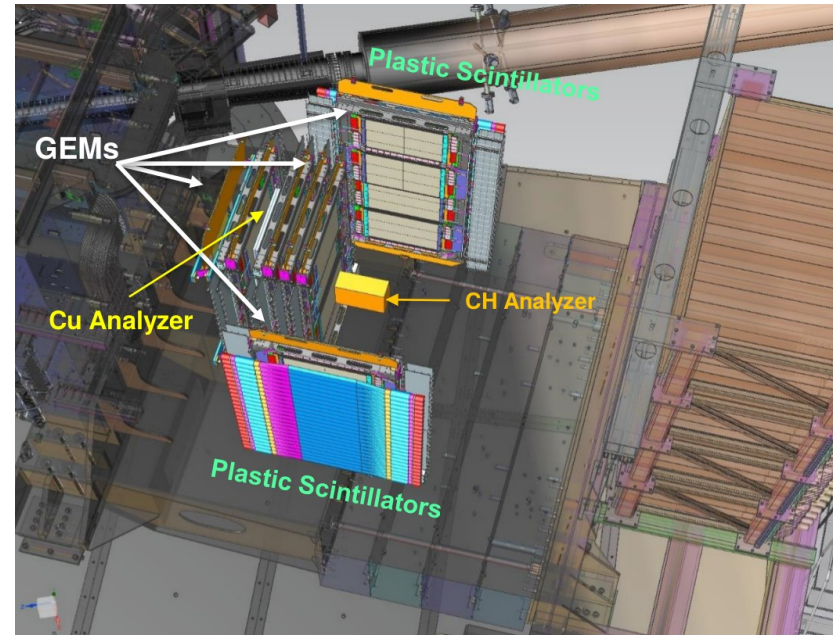
## **Recoil Polarimeter Detector Update**

[E12-17-004 Wiki Page](#)

Brad Sawatzky

# Addl. Hardware for GEn / E12-17-004

- Active Analyzer (PR)
  - segmented plastic scint. array
  - np recoil vertex identification
- Recoil proton detectors (PR)
  - 2 packages total:
    - » One on SBS Left
    - » One on SBS Right
  - Each package contains
    - » 1x Hodoscope array
      - timing, coarse location
    - » 2x UVa GEM planes
      - proton tracking
- Inline GEMs (PR + ChEx)
  - 2x INFN + 6x UVa GEMs
  - charged particle veto
  - large angle proton tracking (PR)
- Copper Analyzer (ChEx)



# GEn Detector/Hardware Summary

Count	Item	Description
2	Hodoscope arrays	24+24 scint bars from (Old) BB Hadron stack 2 PMTs/bar 96 HV, signal channels)
12	GEM planes	8 in-line with SBS detector stack 2 in front of 'left' hodoscope array (proton pol.) 2 in front of 'right' hodoscope array (proton pol.)
1	Active analyzer	'Glasgow' active analyzer (4x8 segmented scintillator array; in-hand)
1	Copper analyzer	To Be Purchased (JLab Engineering Goup)

# Required Electronics/Cabling (non-GEM)

Count	Item	Status
6+2	F250 FADC	Draw from 'NPS/LAD' inventory + Hall C (*)
1	C1190 TDC	In hand (1+spare: Hall C + Glasgow)
1	VXS crate + CPU + TI + SD	In hand (1+spare: Hall C + Glasgow)
6+2	CAMAC Discrim.	In hand (w/ spares)
	CAMAC crate	In hand
96+32 ch	HV supply	In hand (96 neg; + 32 pos)
10+	Ribbon cables	In hand
128	Passive splitter (chan)	In hand
128	SHV cables (~100')	(78 in-hand; 50 to find) in Phys Storage (**)
128	Signal cables (~100')	In hand in Phys Storage

- (\*) F250 FADCs are essentially 'in-hand' (6 'Hall C' spares + existing Phys Div units cover us)
- (\*\*) Glasgow also pledged to support SHV and signal cable requirements, as needed

# Personnel / Task List / Timeline Summary

Item	People	Completion Target
Hodoscope Checkout	<u>Sawatzky</u> , Kohl, Tireman	Summer/Fall 2019
Hodoscope ready for installation	<u>Sawatzky</u> , Kohl, Tireman	Complete: Spring 2020 (need new hodo. stands)
Collect DAQ electronics, hardware, cabling	<u>Sawatzky</u>	Staging: Summer 2019 Complete: Summer 2020
Active Analyzer checkout	<u>Sawatzky</u> , Hamilton, Tireman?	Fall 2019
GEM production testing	<u>Gnanvo</u> , Liyanage, <u>Kohl</u> , Rathnayake, Gautam	See Kondo's talk for details
RP GEM installation	<u>Gnanvo</u> , Liyanage, et al., Kohl, et al.	
ChEx GEM installation	<u>Gnanvo</u> , Liyanage, et al., <u>Kohl</u> , et al.	

See also  
Robin's talk (Engineering) & Kondo's talk (GEMs)

# Readout/FE Hardware Locations

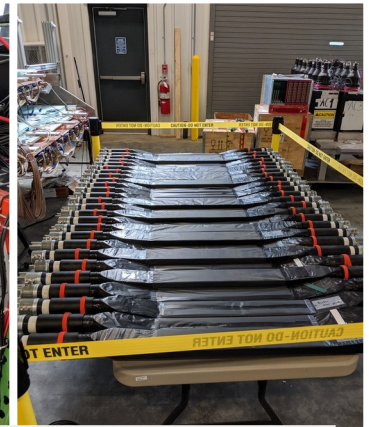
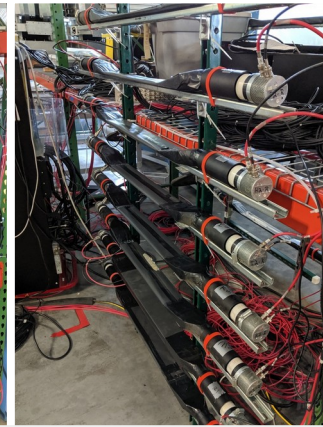
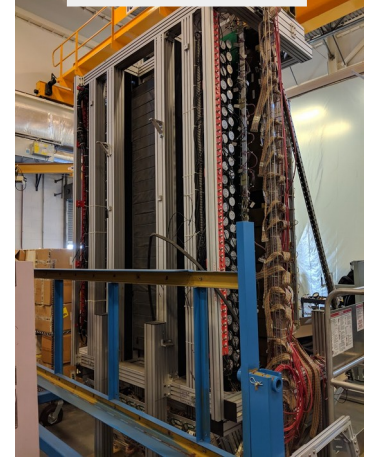
Count	Item	Status
4	GEM crates	GEM FE crates are located in shielded region next to SBS carriage (See R. Wines' talk)
1	VME/VXS crate	In DAQ weldment 6+2 FADCs, 1 CAEN 1190 TDC
1	CAMAC crate	Run RG-58 → DAQ weldment 6+2 Slots for Discriminators + 2 slot Controller (if not already present)
	Additional Racks	In hand (Phys. St; Hall C area), if needed



# Hodoscope Status and Timeline

- BigBite (old) Hadron stack bars
  - » 24 'dE' 500x86x3 mm<sup>3</sup>
  - » 24 'E' 500x86x30 mm<sup>3</sup>
  - Each stack:
    - » 50cm wide x 200cm
- Todo List:
  - Verification and gain match (underway)
  - Move cables to ESB and label (locate remaining HV cables)
  - Repair broken glue joints & Study B-shielding vs SBS fringe field
    - » Fall 2019
  - Restack when stands are ready
    - » Spring 2020
  - Final checkout w/ cosmics
    - » Spring/Summer 2020
- Summer progress (Carly Wever, Tanner Hawk)
  - Bars unstacked → ESB
  - Signal + HV cables located
  - DAQ built and running
  - All bars triaged
    - » Good bars being gain matched now

Before: TEDF



Bars in ESB work area w/ DAQ

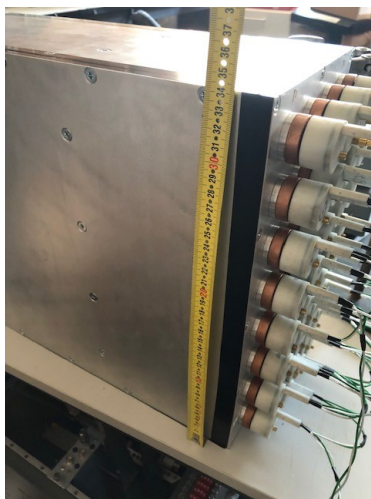
# Fringe Field Evaluation/Mitigation at PMTs

- SBS Magnet fringe fields may be significant at hodoscope and Active Analyzer PMTs
  - Existing BB hodoscopes have magnetic shields
    - » Need to evaluate sufficiency
- Bogdan has provided TOSCA model with rear field clamp to bound fields at these detectors
  - Rear field clamp only in place for GEn program (no impact on GMn)
- Evaluation and Mitigation Plans
  - Responsibility / Timeline
    - » Brad Sawatzky
    - » Answer by Fall 2019
  - Test B-shielding in TEDF
    - » Will verify PMT shielding is sufficient using B-field test apparatus in TEDF



# Active Analyzer Status and Timeline

- Assembled and ready in Glasgow now
  - Often referred to as
    - » “Glasgow Analyzer”
  - 4 x 8 array of scint bars w/ PMTs
    - » 4cm x 4cm x 25cm each
    - » Assembly weighs ~ 30 kg
- Todo List (Hamilton, Sawatzky)
  - Ship to JLab
    - » Arrive summer/fall 2019
  - Verify operation after arrival
    - » Fall 2019, Spring 2020



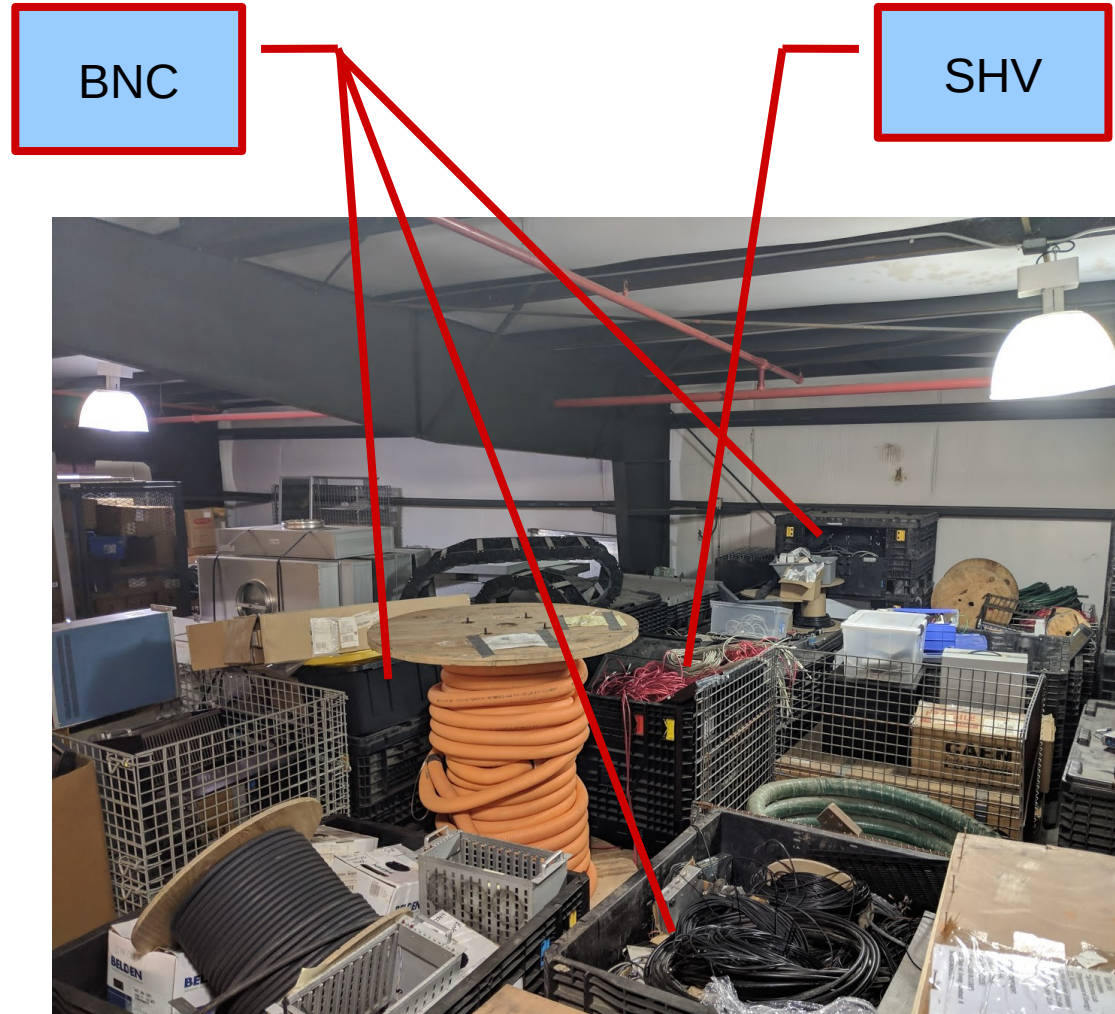
# DAQ / Readout Status and Timeline

- Hodoscopes, Active Analyzer are simple PMT detectors (non-GEM)
  - Signals split and fed to
    - » CAEN 1190 (TDC)
    - » F250 FADCs (Energy)
  - One additional VXS crate with ROC added to SBS DAQ
  - Majority of hardware and cabling is already “in-hand”
- NO 'special' trigger required
  - Primary trigger is “GMn” BB electron trigger + HCAL analog sum trigger
- GEM DAQ Hardware and Readout
  - See Kondo's Talk

## Backup / Misc. Slides

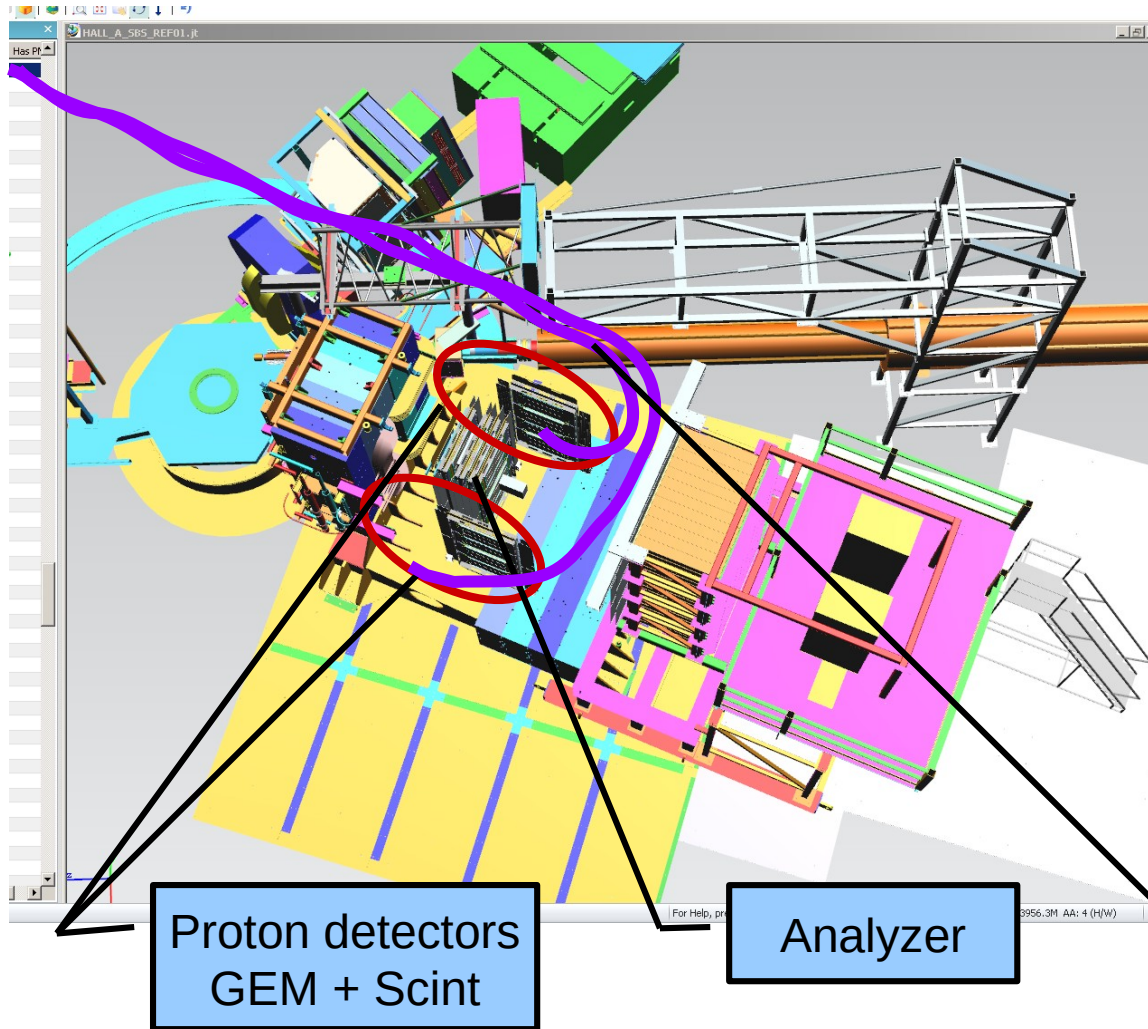
# Cables and Testbed/DAQ

- Testbed in ESB being used for cosmics tests now
- Cables in Hall C boxes in Physics Storage
  - ~100' from detector → DAQ weldment (run under/ near pivot)
  - Needs sorting and labeling!
    - » Summer/Fall 2019
- Glasgow offered support cables from their inventory/ funds if needed





# Floor Layout



- Notes:
  - PR “side detectors” designed for rapid removal with crane
- Hodoscope and Analyzer cables will run under pivot to the DAQ weldment
- GEM cables run to FE crates inside SBS carriage shielded by yoke (See Robin W. talk)