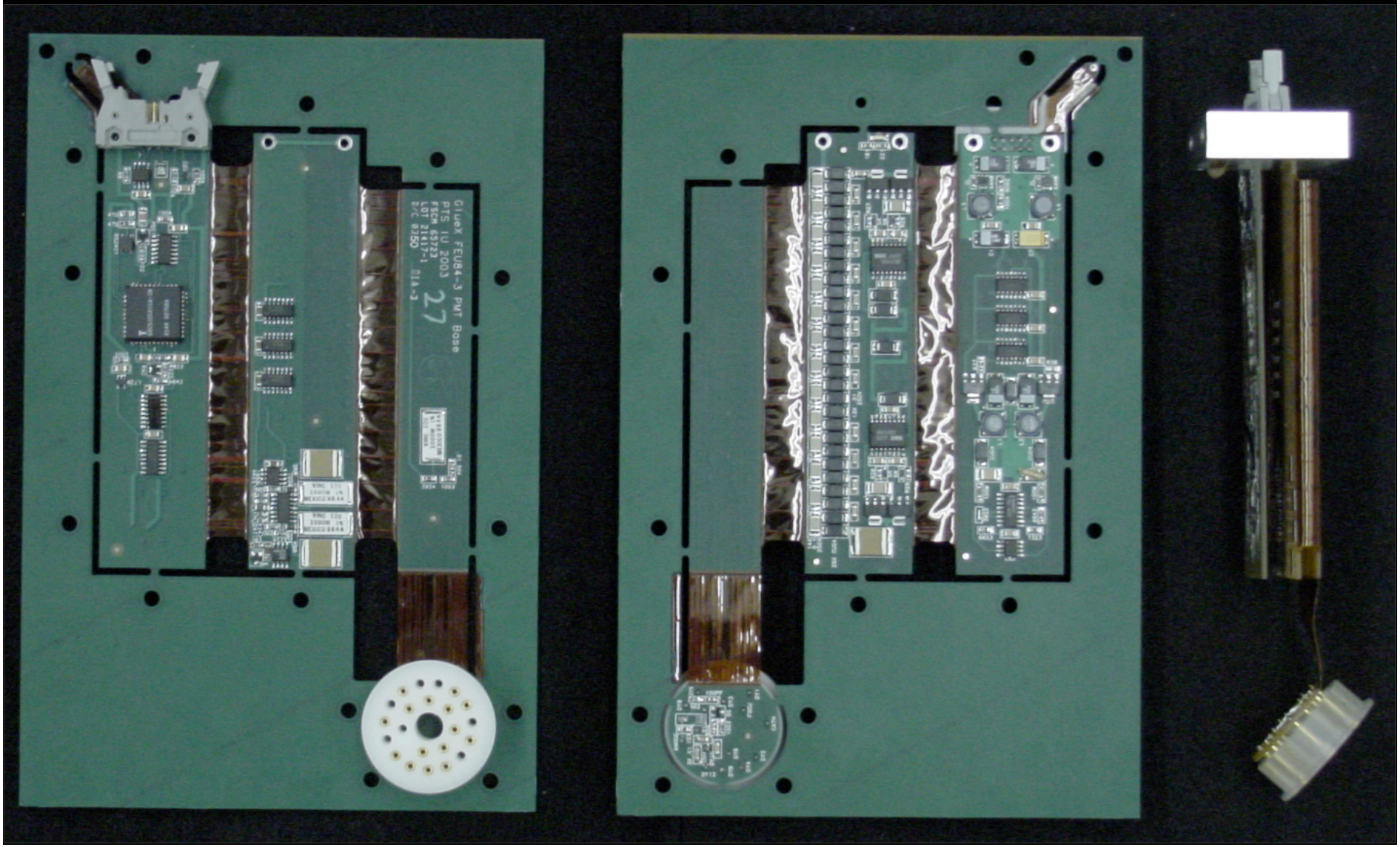
GlueX electronics status

Collaboration Meeting

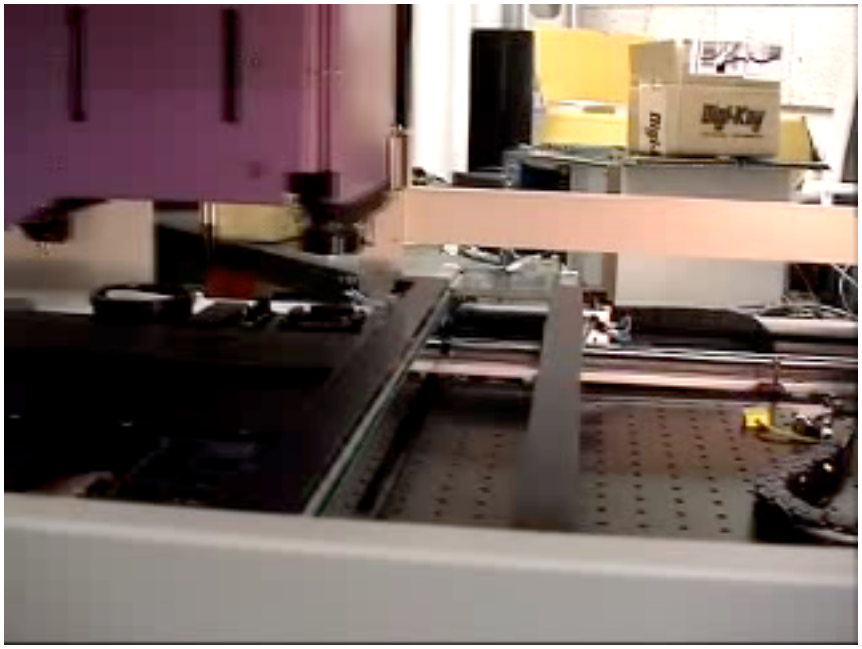
September, 2004

Paul Smith

Cockcroft-Walton PMT base



Robotic Selective Assembly



Electronics Review

Andy Lankford (UC Irvine) and Glenn Young (ORNL)

at the GlueX Electronics Review - July 23 2003

Selected Review Conclusions:

- It is important to insure that the requirements on the electronics derive from the physics.
- The lack of full definition of detector designs may soon limit progress on electronics design.

Summary of GlueX Detector Subsystems
Prepared for the GlueX Electronics Review
July 24, 2003

Detector type	Photon tagger	Vertex tracker	Straw tubes	Forward Drifts	Cerenkov	TOF	Barrel calorimeter	Forward calorimeter	Backward veto
Signal Source	PMT	VLPC	Straw tube	anode (A) cathode (C)	PMT	PMT	PMT (P) ? HPD (H) ? MCP (M) ?	PMT	PMT
Channel count	250	2000	3400	2900 (A) 5800 (C)	40	320	600	2500	20
FADC	yes	no	yes (log)	no (A) yes (C)	yes	yes	yes	yes	yes
TDC	yes	yes	no	yes (A) no (C)	yes	yes	yes	no	yes
Typical charge	~ 1 nC	~ 1 pC	~ 40 fC	~ 20 fC (A) ~ 4 fC (C)	~ 10 pC	~ 1 nC	~ 1 nC (P) ~1 pC (H) ~1 nC (M)	~ 1 nC	~ 1 nC
Energy resolution	Given by segment	N/A	20%	N/A (A) 20% (C)	N/A but 10 p.e.	N/A	5%/√E	5%/√E	5%/√E
Time resolution	~ 100 ps	~ 1 ns	~ 1 ns	~ 1 ns	~ few ns	~ 80 ps	~ 200 ps with averaging	~ 1 ns	~ 1 ns
Dynamic range factor	5	5	50	200	10	10	1000	1000	100
Packaging constraints & issues	none	cryogenics	Preamps at upstream end and cabling inside BCAL	Preamps within barrel and B-field and cabling	Shielding of PMT's	Shielding of PMT's	Operation in B-field and choice of PMT,HPD or MCP	none	none
Known solutions for electronics	Used by CLAS	D0 at FNAL & look at VLPC alternatives	Look at existing straw tube solutions	standard	LASS CLAS	Prototypes tested at IHEP	KLOE	This detector used in BNL E852	standard
Institutional responsible	Glasgow Catholic U U Conn	FIU ODU	CMU	Ohio JLab	IHEP	IU IHEP	Regina	IU	FSU

Selected Review Conclusions:

- The manpower resources shown during the review will be inadequate for developing an electronics system of the scope required by GlueX.

Vertex Tracking:	Deleted
Calorimeter FADCs:	IU
Tracking FADCs:	JLab
TDCs:	JLab
CF discriminators:	Alberta
Drift Chamber Amps:	Alberta
Level 1 Trigger:	CNU
Clock Distribution:	JLab
Power / Grounding:	Jlab
Meantimer:	???
Tagger:	???
Active Collimator??:	???
Calibration:	???
Pipeline issues:	???

ORNL?

Selected Review Conclusions:

- The decision to standardize all detector readout on a single TDC module design and a single Flash ADC module design is good, and will help simplify the overall electronics system design in a constructive way and conserve valuable engineering resources.

Probably need 2 types of FADC:

Calorimeters need energy sum for L1 trigger.
FCAL needs 250 MSPS for timing.
Tracking needs 10 - 12 bits; can be slower.

2 types of TDC?:

F1 certainly adequate for Drifts, Tagger, Start, BCAL.

25 ps HPTDC needed for TOF?:

Need physics justification.
Need engineering manpower.
CAEN module has no provision for user supplied clock.

Selected Review Conclusions:

- Rudiments of a plan for management of the electronics system exist, although the plan needs further development. The Committee suggests creating a single organization covering front-end electronics of all detector subsystems, trigger, data acquisition, and online software.
- The electronics organization should be put in place during the development of the CDR, and the electronics management plan included in that document .

Electronics subsystems developed at various institutions need to work together in final system.

- Communication between electronics groups needs improvement.
  - ✓Representatives need to participate in GlueX phone conferences.
  - ✓Minutes of local meetings need to be available.
  - ✓Electronics email listserv / web forum?
  - ✓Web availability of design documentation.
  - ✓Electronics workshops.

- Internal reviewing process needs to be developed.

- Milestones and interoperability tests need to be established.