GlueX electronics

Paul Smith

Collaboration Meeting
April 28, 2006

GlueX-doc-619:

14 April, 2006
P. Smith, scribe

Minutes of GlueX electronics meeting in Bloomington, Indiana; April 6 & 7, 2006

Participants:

At IU: Dave Rust, Mike McCracken, Simon Taylor, Paul Smith, Jim Pinfold, Scott Teige, Curtis Meyer, Matt Shepherd, Alex Dzierba, Chris Cuevas, Ryan Mitchell, Eric Scott

Videoconferenced from JLab: David Lawrence, Elliott Wolin, Ed Jastrzembski, Elton Smith, Dave Abbott, Dave Doughty

Videoconferenced from UConn: Richard Jones   Videoconfereced from UPenn: Mitch Newcomer

By phone from UTenn: Steve Berridge   By phone from Alberta: George Lolos, Zisis Papandreou,
                                                                                    Mauricio Barbi

- JLab updates
- FCal timing
- CDC updates
- FDC updates
- Preamps
- Tracking fADC

- Manpower
- DIRC
- Beamline
- SiPM/BCal
- Beam Tests
- Livetime

Dave Rust's report: GlueX-doc-618

GlueX-doc-412

Summary of GlueX Detector Subsystems **26 April 2006   P. Smith**

Detector	Photon tagger	Pair polarimeter	Pair spectrometer	Upstream Photon veto	Start counter	Central drift	Forward drifts	DIRC	Time-of-flight	Barrel calorimeter	Forward calorimeter
Type	Scintillator	Si microstrip	Scintillator	Scintillator	Scintillator	Straw tube	Planar chamber	Quartz	Scintillator	Sci fibers	Lead glass
Channel count	144 fixed 120 movable	2048	32	112	40	3240	2,856 anode 11,424 cathode	2000 TDC 32 FADC	168	1920 inner 960 outer	2500
Signal source	fixed - PMT movable - SiPM	Silicon microstrip	PMT	PMT	PMT	Straw tube	anode wires cathode strips	Multi-anode PMT	PMT	SiPM	PMT
Physics signal	100 pe	22000 e	100 pe	100 pe	100 pe	338 e	94 e	8 pe	500 pe	250 pe/GeV	250 pe/GeV.
Energy resolution	0.1% (segmentation)	N/A	N/A	$10\%/\sqrt{E}$	N/A	15%	15%	N/A.	N/A	$2\% + 5\%/\sqrt{E}$	$3.6\% + 7.3\%/\sqrt{E}$
Single channel time resolution	100 ps	10 ns	1 ns	1 ns	350 ps	2 ns	2 ns	200 ps	140 ps	$150 + 50/\sqrt{E}$ ps	400 ps
Gain in detector	10^6	1	10^6	10^6	10^6	2×10^4	10^5	10^6	10^6	8×10^5	8×10^5
Typical charge	16 pC	3.5 fC	16 pC	16 pC	16 pC	1 pC	1.5 pC anodes 0.3 pC cathodes	1 pC	80 pC	32 pC/GeV	32 pC/GeV
Signal range	5	10	10	100	10	3 pC max 100 fC min	anodes: 0.3 pC → 3 pC cathodes: 10 fC → 1 pC	10	10	160 pC max 1.6 pC min 0.16 pC lsb	160 pC max 1.6 pC min 0.16 pC lsb
Preamp gain	no	10^4	no	no	no	250	250	40	no	no	no
Maximum single channel rate	5 MHz	1 MHz	1 MHz	1 MHz	10 MHz	600 KHz	140 KHz	250 KHz	6 MHz	1.4 MHz	2 MHz
Discrimination	constant fraction	no	no	no	constant fraction	no	no	yes	constant fraction	yes	no
Scaler	yes	no	no	no	yes	no	no	no	no	no	no
FADC	8 bits 250 Msps	buffered latch special low rate runs only	8 bits 250 Msps	8 bits 250 Msps	8 bits 250 Msps	12 bits 100 Msps	12 bits 100 Msps	8 bits 250 Msps	8 bits 250 Msps	8 bits 250 Msps 0.5 V fs	8 bits 250 Msps 0.5 V fs
TDC	62 ps		no	no	62 ps	no	no	125 ps	62 ps	62 ps	no
Level 1 trigger	yes (low rate runs)	no	special low rate runs	no	track count	no	no	no	track count	energy sum	energy sum

Summary of GlueX detector cables, modules, crates, & racks   26 April 2006   P. Smith

Detector	Module Type	Channels	Cables	Modules	Crates	Racks
Photon Tagger	6U, 16 channel, 8 bit, 250 Msps FADC	264	264 RG58	17	3 64X	2
	6U, 32 channel, 62 ps TDC	264	17 x 16 pair	9		
	6U, 32 channel scaler	264	17 x 16 pair	9		
	High voltage	144	144 RG59	12	1 HV	
	8 channel CFD	264	264 RG58	33	2 VME	
Pair Polarimeter	6U, 64 channel buffered latch	2048	128 x 16 pair	32	2 VME	1
Pair Spectrometer	6U, 16 channel, 8 bit, 250 Msps FADC	32	32 RG58	2		
Upstream Photon Veto	6U, 16 channel, 8 bit, 250 Msps FADC	112	112 RG58	7	1 64X	
	High voltage	112	112 RG59	10		
Start Counter	6U, 16 channel, 8 bit, 250 Msps FADC	40	40 RG58	3	1 HV	1
	6U, 32 channel, 62 ps TDC	40	3 x 16 pair	2		
	High voltage	40	40 RG59	4		
	8 channel CFD	40	40 RG58	5	1 VME	
Central Drift	6U, 64 channel, 12 bit, 100 Msps FADC	3240	220 x 16 pair	55	3 64X	2
	High voltage	60	60 RG59	5	1 HV	
	Gas					1
Forward Drift anodes	High voltage	300	300 RG59	25	2 HV	1
	6U, 64 channel, 12 bit, 100 Msps FADC	2856	192 x 16 pair	48	12 64X	4
Forward Drift cathodes	6U, 64 channel, 12 bit, 100 Msps FADC	11,424	720 x 16 pair	180		
	Gas					1
DIRC	8 channel CFD	2000	2000 RG58	250	16 VME	7
	6U, 16 channel, 8 bit, 250 Msps FADC	32	32 RG58	2	2 64X	
	6U, 64 channel, 125 ps TDC	2000	125 x 16 pair	32		
	High voltage	32	32 RG59	3	1 HV	
Time of Flight	8 channel CFD	168	168 RG58	21	2 VME	2
	6U, 32 channel, 62 ps TDC	168	11 x 16 pair	6	1 64X	
	6U, 16 channel, 8 bit, 250 Msps FADC	168	168 RG58	11		
	High voltage	168	168 RG59	14	1 HV	
Barrel Calorimeter	6U, 16 channel, 8 bit, 250 Msps FADC with energy sum	2880	2880 RG58	180	12 VXS	8
	8 channel CFD	960	960 RG58	120	8 VME	
	6U, 32 channel, 62 ps TDC	960	60 x 16 pair	30	2 64X	
Forward Calorimeter	6U, 16 channel, 8 bit, 250 Msps FADC with energy sum	2500	2500 RG58	157	10 VXS	4
	Cockcroft Walton control, misc				1 VME	
Level 1 Trigger					2 VXS	1
Totals:					24 VXS 24 64X 32 VME 7 HV	35

GlueX Electronics Status and Plan
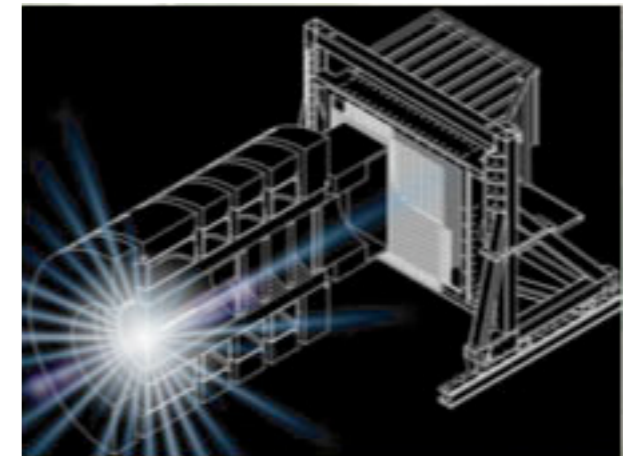
GlueX Electronics Group

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GlueX Design Report V5

Abstract

This note summarizes the current state of the GlueX electronics systems, and describes the R&D required to fully specify the design. Institutional responsibilities are noted, and manpower needs are addressed.

Manpower needs:

1. Design Engineer ⎱
2. Senior Tech ⎰ Chris Cuevas
   GlueX-doc-614

3. Mechanical Designer

   ▸ Electronics & Cabling   Extraction!

   ▸ Preamps & Cooling

4. Slow Controls Design/Integration

Concerns:

- JLab Manpower

- Procurements

  ➡ Struck FADCs

  ➡ Alberta preamp contract

    ✴ U Penn student support

- Chamber tests

  ➡ FDC & CDC anode timing & dE/dx

  ➡ fADC sampling rate

- Beam tests:

  ✓ Fall 2006

  ➡ Summer 2007

    ✴ JLab FADC, TDC, clock, trigger