

# Summary of Hall D Detector Systems

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F.J. Barbosa JLAB – HallD Detector Summary.doc

Detector	Photon Tagger	Pair Polarimeter	Pair Spectrometer	Upstream Photon Veto	Start Counter	Central Drift	Forward Drifts	DIRC	Time-of-Flight	Barrel Calorimeter	Forward Calorimeter
<b>Type</b>	Scintillator	Si microstrip	Scintillator	Scintillator	Scintillator	Straw Tube	Planar Chamber	Quartz	Scintillator	Sci Fibers	Lead Glass
<b>Channel Count</b>	144 fixed 120 movable	2048	32	112	40	3350	2304 anode 9216 cathode	2000 TDC 32 FADC	168	1920 inner 960 outer	2500
<b>Signal Source</b>	Fixed – PMT Movable - SiPM	Si	PMT	PMT	PMT	-Anode wires (dE/dx)	Anode wires Cathode wires (dE/dx)	Multi-anode PMT	PMT	SiPM	PMT
<b>Physics Signal</b>	100 pe	22000 e	100 e	100 e	100 e	338 e	94 e	8 pe	500 pe	250 pe/GeV	250 pe/GeV
<b>Energy Resolution</b>	0.1% (segmentation)	N/A	N/A	10%/√E	N/A	15%	15%	N/A	N/A	2% + 5%/√E	3.6% + 7.3%/√E
<b>Single Channel Time Resolution</b>	100 ps	10 nS	1 nS	1 nS	350 pS	2 nS	2 nS	200 pS	140 pS	150 + 50/√E pS	400 pS
<b>Gain in Detector</b>	10 <sup>6</sup>	1	10 <sup>6</sup>	10 <sup>6</sup>	10 <sup>6</sup>	2 x 10 <sup>4</sup>	10 <sup>5</sup>	10 <sup>6</sup>	10 <sup>6</sup>	8 x 10 <sup>5</sup>	8 x 10 <sup>5</sup>
<b>Typical Charge</b>	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
<b>Signal Range</b>	5	10	10	100	10	3 pC max 100 fC min	Anodes: 300 fC → 3 pC Cathodes: 10 fC → 1pC	10	10	160 pC max 1.6 pC min 0.16 pC LSB	160 pC max 1.6 pC min 0.16 pC LSB
<b>Preamp Gain</b>	no	10 <sup>4</sup>	no	no	no	2 mV/fC	Anodes: 2 mV/fC Cathodes: 10 mV/fC	40	no	no	no
<b>Maximum Single Channel Rate</b>	5MHz	1 MHz	1 MHz	1 MHz	10 MHz	600 KHz	140 KHz	250 KHz	6 MHz	1.4 MHz	2 MHz
<b>Discrimination</b>	Constant Fraction	no	no	no	Constant fraction	no	Anodes: yes Cathodes: no	yes	Constant fraction	yes	no
<b>Scaler</b>	yes	no	no	no	yes	no	no	no	no	no	no
<b>FADC</b>	8 bits 250 MSPS	Buffered latch	8 bits 250 MSPS	8 bits 250 MSPS	8 bits 250 MSPS	12 bits 100 MSPS 1V diff FS	12 bits 100 MSPS cathodes	8 bits 250 MSPS	8 bits 250 MSPS	8 bits 250 MSPS 0.5V FS	8 bits 250 MSPS 0.5V FS
<b>TDC</b>	62 pS	Special low rate runs only	no	no	62 pS	no	125 pS anodes	125 pS	62 pS	62 pS	no
<b>Level 1 Trigger</b>	Yes (low rate runs)	no	Special low rate runs	no	Track count	no	no	no	Track count	Energy sum	Energy sum