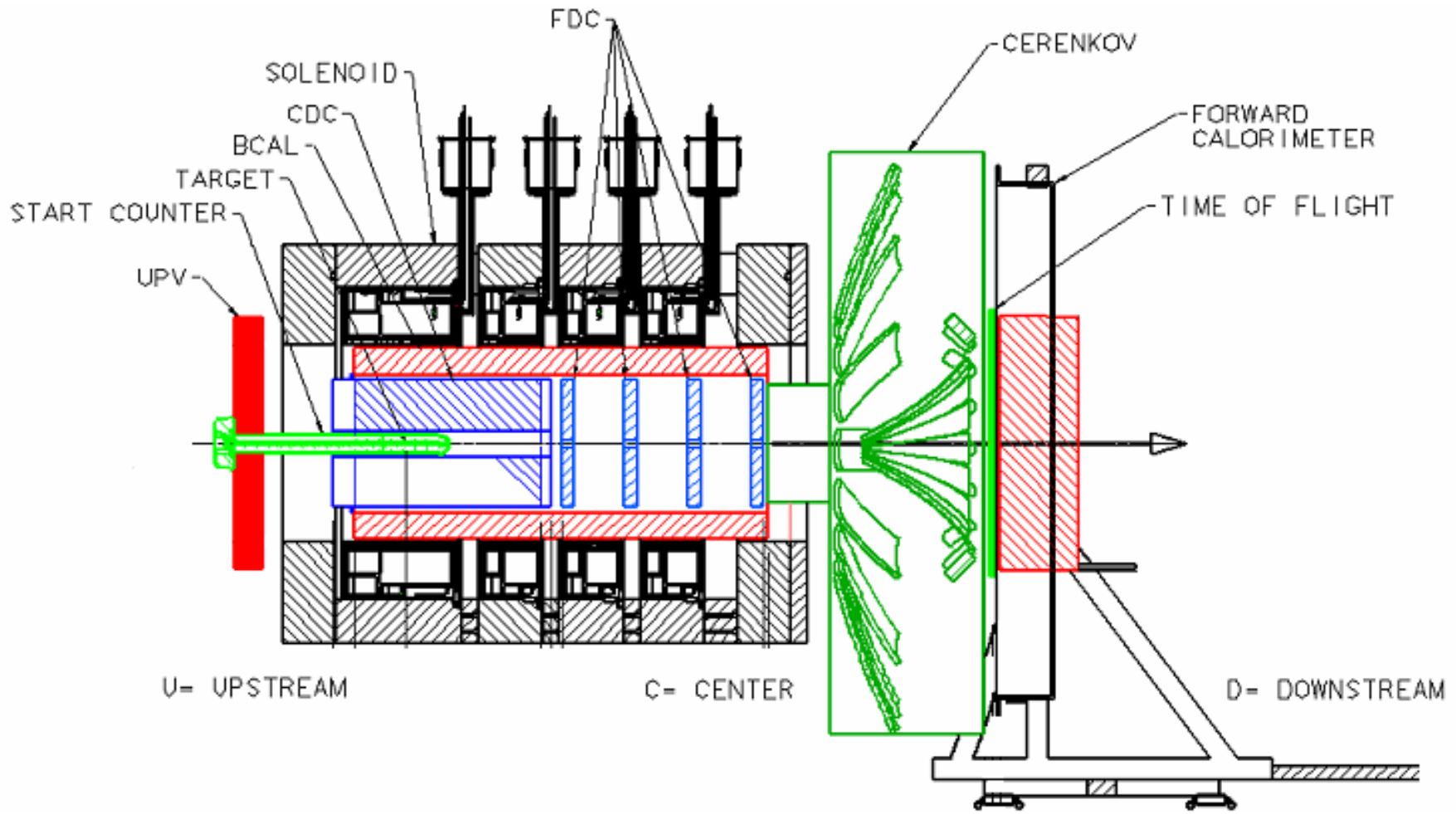
Summary of Hall D Detector Systems 27 March 2007

Detector →	Photon Tagger	Pair Spectrometer	Upstream Photon Veto	Start Counter	Central Drift (CDC)	Forward Drifts (FDC)	Cerenkov (CKOV)	Time-of-Flight (TOF)	Barrel Calorimeter (BCAL)	Forward Calorimeter (FCAL)
Type	Scintillator	Scintillator	Scintillator	Scintillator	Straw Tube	Planar Chamber	C_4F_{10}	Scintillator	Sci Fibers	Lead Glass
Channel Count	144 fixed 120 movable	32	224	40	3200	2304 anodes 9216 cathodes	16	168	1920 inner 1152 outer	2800
Signal Source	Fixed – PMT Movable - SiPM	PMT	PMT	PMT	Anode wires (dE/dx)	Anode wires Cathode wires	PMT	PMT	SiPM	PMT
Physics Signal	100 pe	100 pe	100 pe	100 pe	225 e	94 e	5 pe	500 pe	250 pe/GeV	250 pe/GeV
Energy Resolution	0.1% (segment)	N/A	10%/√E	N/A	15%	15%	N/A	N/A	2% + 5%/√E	3.6% + 7.3%√E
Single Channel Time Resolution	100 ps	100 ps	1 ns	350 ps	2 ns	1 ns anodes 5 ns cathodes	2 ns	140 ps	150 + 50/√E ps	400 ps
Gain in Detector	10^6	10^6	10^6	10^6	2×10^4	4×10^4	10^7	10^6	8×10^5	8×10^5
Typical Charge	16 pC	16 pC	16 pC	16 pC	1 pC	1.5 pC anodes 0.3 pC cathodes	0.5 pC	80 pC	32 pC/GeV	32 pC/GeV
Dynamic Range	10	10	100	10	100 fC → 3 pC	Anodes: 300 fC → 3 pC Cathodes: 10 fC → 1pC	5	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	no	no	no	2 mV/fC	Anodes: 2 mV/fC Cathodes: 10 mV/fC	no	no	no	no
Maximum Single Channel Rate	5 MHz	lz	1 MHz	10 MHz	3 kHz – 100 kHz	Anodes: < 280 kHz Cathodes: < 600 kHz	250 kHz	6 MHz	1.4 MHz	2 MHz
Discrimination	Constant Fraction	y	no	Constant fraction	no	Anodes: yes Cathodes: no	Constant fraction	Constant fraction	yes	no
Scaler	yes	yes	no	yes	no	no	no	no	no	no
FADC	10 bits 250 MSPS	10 bits 250 MSPS	10 bits 250 MSPS	10 bits 250 MSPS	12 bits 100 MSPS 1V diff FS	12 bits 100 MSPS cathodes	10 bits 250 MSPS	10 bits 250 MSPS	10 bits 250 MSPS 0.5V FS	10 bits 250 MSPS 0.5V FS
TDC	60 ps	60 ps	no	60 ps	no	115 ps anodes	no	60 ps	60 ps	no
Level 1 Trigger	Yes (low rate runs)	Special low rate runs	no	Track count	no	no	no	Track count	Energy sum	Energy sum

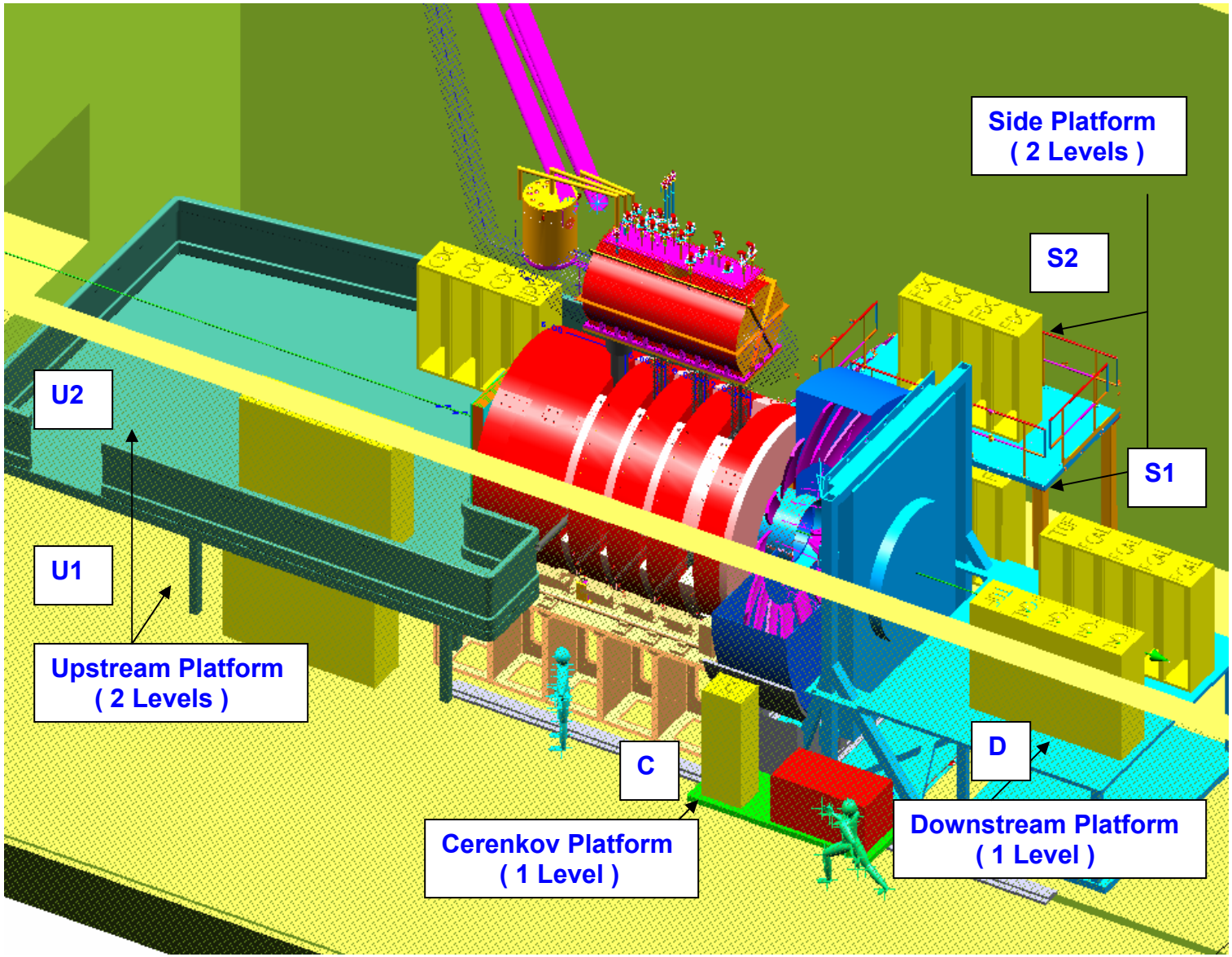
Summary of Hall D Detector Systems - Electronics

Detector →	Photon Tagger	Pair Spectrometer	Upstream Photon Veto (UPV)	Start Counter (ST)	Central Drift (CDC)	Forward Drifts (FDC)	Cerenkov (CKOV)	Time-of-Flight (TOF)	Barrel Calorimeter (BCAL)	Forward Calorimeter (FCAL)	TOTAL
eX ASIC *Channel, ASD 0.25 µm CMOS*	no	no	no	no	400	1440	no	no	no	no	**1840**
FADC-100 *72 Ch, VME64x 12-bit, 100 MSPS*	no	no	no	no	45	128	no	no	no	no	**173**
FADC-250 *16 Ch, VME64x-VXS 10-bit, 250 MSPS*	17	2	14	3	no	no	1	11	192	175	**415**
F1TDC *ECL Input, 32 Ch, VME64x 60 ps*	9	1	no	2	no	no	no	6	96	no	**114**
F1TDC_DC *LVDS Input, Cal, 64 Ch, VME64x 115 ps*	no	no	no	no	no	36	no	no	no	no	**36**
CFD *ECL Output, 16 Ch, VME64x*	17	2	no	3	no	no	1	11	192	no	**226**
SIS3800 Scaler *ECL Input, 32 Ch, VME64x*	9	1	no	2	no	no	no	no	no	no	**12**
VME64x Crate	1 + 15/20	4/20→	14/20	7/20	3	9	2/20	17/20	15	no	**33**
VXS Crate	1 + 1/16→	2/16→	no	3/16	no	no	no	11/16	12	10 + 15/16	**26**
Racks	1	no	no	1	1	4	1	1	9	3	**21**
HV - A1932AP *48 Ch. +3 kV, 500 µA*	no	no	no	no	1	1	no	no	no	no	**2**
HV - A1932AN *48 Ch. -3 kV, 500 µA*	no	no	no	no	no	1	no	no	no	no	**1**
HV – A1733BN *12 Ch. -3 kV, 3 mA*	12	2 + 8/12	9 + 4/12	3 + 4/12	no	no	1 + 4/12	14	no	233 + 4/12	**250**
HV Mainframe *SY1527*	12/16→	3/16→	9/16→	4/16→	2/16→	4/16	2/16→	14/16	no	14 + 10/16	**20**
HV Racks	no	no	no	no	no	1	no	1	no	5	**7**
LV-DC *3 - 5 V, 70 A*	no	no	no	no	1	4	no	no	no	no	**5**
LV-SiPM-AMP *+/- 5 V, 100 A*	yes	no	no	no	no	no	no	no	yes	no	**1**
LV-SiPM-BIAS *0 - 30 V, 1 A*	yes	no	no	no	no	no	no	no	yes	no	**1**
LV Racks	→	no	no	no	1	3	no	no	1	no	**5**

Locations of the Hall D Detectors – Profile View

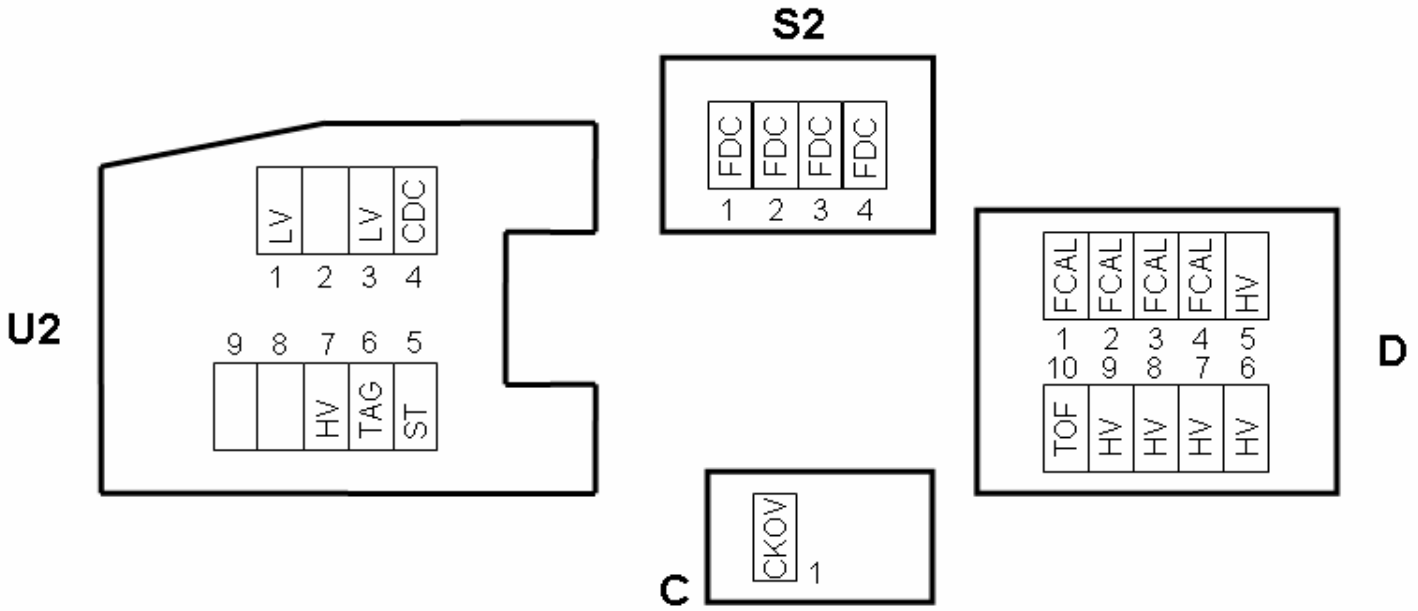


The Hall D Experimental Area in Perspective

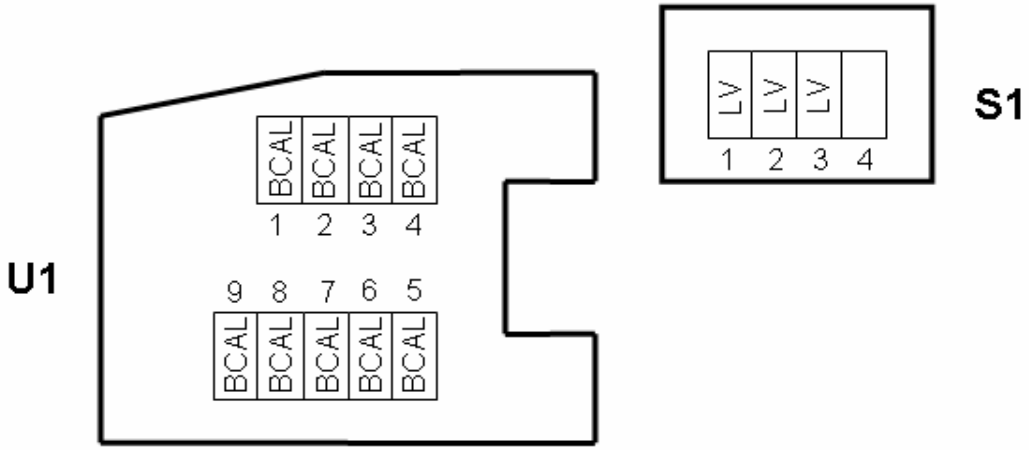


The Hall D Electronics' Racks Layout

Platform Level



Floor Level



Location Legend:

U1-1-1 → Platform/Level - Rack # - Crate #

U1

Location	Detector	Crate Type	System	# of Modules	Detector Element
U1-1-1	BCAL	VXS	fADC-250	16	
U1-1-2	BCAL	VXS	fADC-250	16	
U1-1-3	BCAL	VXS	fADC-250	16	
U1-2-1	BCAL	VXS	fADC-250	16	
U1-2-2	BCAL	VXS	fADC-250	16	
U1-2-3	BCAL	VXS	fADC-250	16	
U1-3-1	BCAL	VXS	fADC-250	16	
U1-3-2	BCAL	VXS	fADC-250	16	
U1-3-3	BCAL	VXS	fADC-250	16	
U1-4-1	BCAL	VXS	fADC-250	16	
U1-4-2	BCAL	VXS	fADC-250	16	
U1-4-3	BCAL	VXS	fADC-250	16	
U1-5-1	BCAL	VME-64x	fADC-250	20	
U1-5-2	BCAL	VME-64x	fADC-250	20	
U1-5-3	BCAL	VME-64x	fADC-250	20	
U1-6-1	BCAL	VME-64x	fADC-250	20	
U1-6-2	BCAL	VME-64x	fADC-250	20	
U1-6-3	BCAL	VME-64x	fADC-250	20	
U1-7-1	BCAL	VME-64x	fADC-250	20	
U1-7-2	BCAL	VME-64x	fADC-250	20	
U1-7-3	BCAL	VME-64x	fADC-250	20	
U1-8-1	BCAL	VME-64x	fADC-250	20	
U1-8-2	BCAL	VME-64x	fADC-250	20	
U1-8-3	BCAL	VME-64x	fADC-250	20	
U1-9-1	BCAL	VME-64x	fADC-250	20	
U1-9-2	BCAL	VME-64x	fADC-250	20	
U1-9-3	BCAL	VME-64x	fADC-250	20	

U2

Location	Detector	Crate Type	System	# of Modules	Detector Element
U2-1-1	BCAL/TAG	LV	SiPM		
U2-1-2	BACL/TAG	LV	SiPM		
U2-1-3	BCAL/TAG	LV	SiPM		
U2-2-1					
U2-2-2					
U2-2-3					
U2-3-1	CDC	FUSE	ASIC		
U2-3-2					
U2-3-3	CDC	LV	ASIC		
U2-4-1	CDC	VME-64x	fADC-100	15	
U2-4-2	CDC	VME-64x	fADC-100	15	
U2-4-3	CDC	VME-64x	fADC-100	15	
U2-5-1	TAG, PS,UPV,ST	VXS	fADC-250	6	
U2-5-2	PS,UPV,ST	VME-64x	F1TDC CFD SCALER	3 5 3	
U2-5-3	PS,UPV,ST	VME-64x	fADC-250	14	
U2-6-1	TAG	VXS	fADC-250	16	
U2-6-2	TAG	VME-64x	F1TDC SCALER	9 9	
U2-6-3	TAG	VME-64x	CFD	17	
U2-7-1	TAG,PS	HV	SY1527	15	
U2-7-2	UPV,ST	HV	SY1527	13	
U2-7-3	CDC,FDC	HV	SY1527	6	
U2-8-1					
U2-8-2					
U2-8-3					
U2-9-1					
U2-9-2					
U2-9-3					

S1

Location	Detector	Crate Type	System	# of Modules	Detector Element
S1-1-1	FDC	LV	ASIC		
S1-1-2	FDC	LV	ASIC		
S1-1-3	FDC	LV	ASIC		
S1-2-1	FDC	LV	ASIC		
S1-2-2					
S1-2-3	FDC	FUSE	ASIC		
S1-3-1	FDC	FUSE	ASIC		
S1-3-2	FDC	FUSE	ASIC		
S1-3-3	FDC	FUSE	ASIC		
S1-4-1					
S1-4-2					
S1-4-3					

S2

Location	Detector	Crate Type	System	# of Modules	Detector Element
S2-1-1	FDC	VME-64x	fADC-100	20	
S2-1-2	FDC	VME-64x	fADC-100	20	
S2-1-3	FDC	VME-64x	fADC-100	20	
S2-2-1	FDC	VME-64x	fADC-100	20	
S2-2-2	FDC	VME-64x	fADC-100	20	
S2-2-3	FDC	VME-64x	fADC-100	20	
S2-3-1	FDC	VME-64x	fADC-100	8	
S2-3-2					
S2-3-3					
S2-4-1	FDC	VME-64x	F1TDC	20	
S2-4-2	FDC	VME-64x	F1TDC	16	
S2-4-3					

C

Location	Detector	Crate Type	System	# of Modules	Detector Element
C-1-1	CKOV	VME-64x	fADC-250 CFD	1 1	
C-1-2					
C-1-3	CKOV	HV	SY1527	2	

D

Location	Detector	Crate Type	System	# of Modules	Detector Element
D-1-1	FCAL	VXS	fADC-250	16	
D-1-2	FCAL	VXS	fADC-250	16	
D-1-3	FCAL	VXS	fADC-250	16	
D-2-1	FCAL	VXS	fADC-250	16	
D-2-2	FCAL	VXS	fADC-250	16	
D-2-3	FCAL	VXS	fADC-250	16	
D-3-1	FCAL	VXS	fADC-250	16	
D-3-2	FCAL	VXS	fADC-250	16	
D-3-3	FCAL	VXS	fADC-250	16	
D-4-1	FCAL	VXS	fADC-250	16	
D-4-2	FCAL	VXS	fADC-250	15	
D-4-3	FCAL	HV	SY1527	16	
D-5-1	FCAL	HV	SY1527	16	
D-5-2	FCAL	HV	SY1527	16	
D-5-3	FCAL	HV	SY1527	16	
D-6-1	FCAL	HV	SY1527	16	
D-6-2	FCAL	HV	SY1527	16	
D-6-3	FCAL	HV	SY1527	16	
D-7-1	FCAL	HV	SY1527	16	
D-7-2	FCAL	HV	SY1527	16	
D-7-3	FCAL	HV	SY1527	16	
D-8-1	FCAL	HV	SY1527	16	
D-8-2	FCAL	HV	SY1527	16	
D-8-3	FCAL	HV	SY1527	16	
D-9-1	FCAL	HV	SY1527	16	
D-9-2	FCAL	HV	SY1527	10	
D-9-3	TOF	HV	SY1527	14	
D-10-1	TOF	VXS	fADC-250	11	
D-10-2	TOF	VME-64x	F1TDC CFD	6 11	
D-10-3					