

WBS 4.6

Dectectors

EA# by looking @
following Pgs.

FTE (K\$/y)	\$150	Total M\$	Item M\$	Construction			M\$ Purchasing	Basis
WBS	Description	FTE	Years					
2	Gamma Ray Detectors	\$24.8						LBNL-4360, pp 4
2.1	class 2 (TRACKING)		\$24.8	8	4		\$20.0	
3	Recoil Separators	\$9.8						LBNL-4360, pp 4
3.1	Low Energy		\$3.6	2	2		\$3.0	
3.2	High Energy		\$4.1	2	2		\$3.5	
3.3	Gas Filled Separator		\$2.1	2	2		\$1.5	
4	Magnetic Spectrographs	\$3.6						LBNL-4360, pp 4
4.1	Conventional		\$3.6	2	2		\$3.0	
4.2	Large Acceptance		\$0.0					
5	Particle Detectors	\$1.9						LBNL-4360, pp 4
5.1	light charge particle - CsI		\$0.4	1	1		\$0.3	
5.2	light charged particle- Si		\$0.8	1	2		\$0.5	
5.3	neutron		\$0.7	1	1		\$0.5	
6	Non Accelerated Beams	\$12.7						LBNL-4360, pp 4
6.1	laser atom trap		\$2.9	4	3		\$1.1	
6.2	ion trap		\$4.3	10	2		\$1.3	
6.3	nuclear orientation		\$0.9	2	1.5		\$0.5	
6.4	beta-NMR		\$1.0	3	1.5		\$0.4	
6.5	decay spectroscopy		\$2.5	5	2		\$1.0	
6.6	electron-beam ion trap		\$1.1	2	2		\$0.5	
7	Special Targets	\$1.8						LBNL-4360, pp 4
7.1	gas		\$0.7	1	1		\$0.5	
7.2	radioactive targets		\$1.1	2	2		\$0.5	
	Total	\$54.5						

450

990

990

225

825

935

250

2500

75

10

Gamma-Ray Detector System

- Ge detectors (40) \$12000k
- Processing electronics \$3160k
- Data acquisition \$2200k
- LN2 filling system \$200k
- Mechanical system/
Annealing stations \$260k
- Digital design 3.0 my
- Installation/calibration 1.5 my
- Total (w design, w/o cont.) \$18.1M



Low-Energy Recoil Separator

- Magnets (dipoles, quads) \$350k
- Electric dipoles \$250k
- Power supplies \$240k
- Vacuum vessels \$290k
- Mechanical supports \$40k
- Vacuum equipment \$270k
- Focal plane detectors \$60k
- Controls/electronics \$280k
- Shielding/interlocks \$60k

- Engineering 3.0 my
- Design 3.6 my
- Installation 0.8 my

- Total (w design, w/o cont.) \$1.93M



High-Energy Recoil Separator

- Magnets (dipoles, quads) \$500k
- Electric dipoles \$330k
- Power supplies \$260k
- Vacuum vessels \$290k
- RF resonator \$300k
- Mechanical supports \$120k
- Vacuum equipment \$380k
- Focal plane detectors \$90k
- Controls/electronics \$200k
- Shielding/interlocks \$60k

- Engineering 3.0 my
- Design 3.6 my
- Installation 0.8 my

- Total (w design, w/o cont.) \$2.62M



Gas-Filled Magnet

- Magnets \$540k
- Power supplies \$180k
- Vacuum/gas control \$300k
- Support structure \$50k
- Focal plane detectors \$100k
- Target/control systems \$50k

- Design 1.5 my
- Installation 0.5 my

- Total (w design, w/o cont.) \$1.28M



High-Resolution Spectrograph

- Magnets (dipoles, quads) \$1200k
- Power supplies \$260k
- Carriage/Vacuum chamber \$510k
- Vacuum equipment \$190k
- detector/electronics \$200k
- Engineering 3.0 my
- Design 2.5 my
- Field mapping/Installation 1.0 my
- Total (w design, w/o cont.) \$2.48M



Silicon Particle Detector Systems

- Detector costs \$460k
- Readout chips costs \$55k
- Hardware for assembly \$530k
- Electronics/DAQ/cables \$325k
- Mechanical assembly \$50k
- Development of readout chips 5.0 my

Associated Detectors

- CsI upgrade \$250k
- Neutron detectors \$170k
- Electronics \$340k
- Total (w/o cont.) \$2.18M



Stopped Beam Area

• Laser farm	\$900k
• Magneto-optical trap	\$550k
• Ion-trap beam handler	\$590k
• Mass spectrometer	\$880k
• Dilution refrigerator	\$450k
• NMR equipment	\$50k
• Absorption spectrometer	\$550k
• EBIT trap	\$450k
• detectors/electronics	\$410k
• Spectroscopy systems	\$60k
• Mechanical systems	\$290k
• Installation	3.0 my
• Total (w design,w/o cont.)	\$5.5M



Gas Target

- Roots blowers \$90k
- Vacuum pumps \$95k
- Vacuum gauges \$40k
- Control system \$15k
- Mechanical systems \$35k
- Recovery system \$25k

- Design 0.5 my
- Installation 0.5 my

- Total (w design, w/o cont.) \$361k



Radioactive Target System

- Radiochemical laboratory \$500k
- Total (w/o cont.) \$500k

