

Task Item	FTE-Year				Labor & Materials Cost (burdened)						Proportion under experiment-specific R&D	Proportion under generic R&D (hardware and operation)	Base Cost (no student labor)	Previous column, using student labor to replace some tech labor	Previous column, with Building Constr removed	Previous column, with experiment-specific R&D Items removed	Previous column, with generic R&D Items removed
	Eng	Design /Drafting	Tech	Student (zero cost)	All Labor (burdened)	Labor with no Students (paid Techs) (burdened)	Estimated Materials Cost	M&S w/ 17% MSA									
Infrastructure					\$0.00	0	\$350,000.00	\$409,500.00				\$409,500.00	\$409,500.00	\$0.00	\$0.00	\$0.00	
Shield Block Building					\$0.00	\$0.00	\$350,000.00	\$409,500.00				\$409,500	\$409,500	\$0	\$0.00	\$0.00	
Cryostat & Cryogenics	3.35	1.00	4.75	0.00	\$1,485,000.00	\$1,485,000.00		\$4,160,100.00				\$5,627,700.00	\$5,627,700.00	\$5,627,700.00	\$5,420,093.75	\$4,103,653.13	
Vessel					\$0.00	\$0.00	\$2,000,000.00	\$2,136,000.00	0.00	0.25		\$2,136,000	\$2,136,000	\$2,136,000	\$2,136,000.00	\$1,602,000.00	
Cryostat Vessel Design	0.5	0.75			\$207,250.00	\$207,250.00		\$0.00	0.00	0.25		\$196,887.50	\$196,887.50	\$196,887.50	\$196,887.50	\$147,665.63	
Vessel Insulation Design	0.5	0.25	0		\$140,750.00	\$140,750.00		\$0.00	0.50	1.00		\$133,712.50	\$133,712.50	\$133,712.50	\$66,856.25	\$0.00	
Vessel Insulation Assembly	0.1		0.25		\$54,750.00	\$54,750.00	\$70,000.00	\$81,900.00	0.00	0.75		\$136,650.00	\$136,650.00	\$136,650.00	\$136,650.00	\$34,162.50	
LAr Cryo & Purification System Design	1		0.5		\$281,500.00	\$281,500.00		\$0.00	0.50	1.00		\$281,500.00	\$281,500.00	\$281,500.00	\$140,750.00	\$0.00	
LAr Cryo & Purification System Assembly	0.25		2	0	\$319,750.00	\$319,750.00	\$350,000.00	\$409,500.00	0.00	0.50		\$729,250.00	\$729,250.00	\$729,250.00	\$729,250.00	\$364,625.00	
Cryo Controls Design	0.5				\$107,500.00	\$107,500.00		\$0.00	0.00	0.00		\$107,500.00	\$107,500.00	\$107,500.00	\$107,500.00	\$107,500.00	
Cryo Controls Assembly			0.5		\$66,500.00	\$66,500.00	\$150,000.00	\$175,500.00	0.00	0.00		\$242,000.00	\$242,000.00	\$242,000.00	\$242,000.00	\$242,000.00	
LAr Cryo system feed-throughs					\$0.00	\$0.00	\$50,000.00	\$58,500.00	0.00	0.00		\$58,500.00	\$58,500.00	\$58,500.00	\$58,500.00	\$58,500.00	
Cryo Vacuum system					\$0.00	\$0.00	\$130,000.00	\$152,100.00	0.00	0.00		\$152,100.00	\$152,100.00	\$152,100.00	\$152,100.00	\$152,100.00	
LN2 system design	0.5				\$107,500.00	\$107,500.00	\$130,000.00	\$152,100.00	0.00	0.00		\$259,600.00	\$259,600.00	\$259,600.00	\$259,600.00	\$259,600.00	
LN2 System parts					\$0.00	\$0.00	\$400,000.00	\$468,000.00	0.00	0.00		\$468,000.00	\$468,000.00	\$468,000.00	\$468,000.00	\$468,000.00	
LN2 Cryo pumps					\$0.00	\$0.00	\$100,000.00	\$117,000.00	0.00	0.50		\$117,000.00	\$117,000.00	\$117,000.00	\$117,000.00	\$58,500.00	
LN2 Dewar					\$0.00	\$0.00	\$350,000.00	\$409,500.00	0.00	0.00		\$409,500.00	\$409,500.00	\$409,500.00	\$409,500.00	\$409,500.00	
LN2 system fabrication & parts assembly			1.5		\$199,500.00	\$199,500.00		\$0.00	0.00	0.00		\$199,500.00	\$199,500.00	\$199,500.00	\$199,500.00	\$199,500.00	
Detector Feed-throughs	1.25	0.00	0.00	0.00	\$268,750.00	\$268,750.00		\$140,400.00				\$280,590.00	\$280,590.00	\$280,590.00	\$227,390.00	\$56,847.50	
TPC Signal FT	0.5				\$107,500.00	\$107,500.00	\$90,000.00	\$105,300.00	0.25	0.75		\$212,800.00	\$212,800.00	\$212,800.00	\$159,600.00	\$39,900.00	
TPC High Voltage FT	0.25				\$53,750.00	\$53,750.00	\$12,000.00	\$14,040.00	0.00	0.75		\$67,790.00	\$67,790.00	\$67,790.00	\$67,790.00	\$16,947.50	
Photomultiplier Signal FT	0.25				\$53,750.00	\$53,750.00	\$10,000.00	\$11,700.00	0.00	0.75		\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	
Photomultiplier High Voltage FT	0.25				\$53,750.00	\$53,750.00	\$8,000.00	\$9,360.00	0.00	0.75		\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	
Detector Design & Fabrication - TPC & Photodetector	2.47	0.10	1.15	1.25	\$697,300.00	\$863,550.00		\$518,310.00				\$1,110,510.00	\$977,510.00	\$977,510.00	\$909,805.00	\$385,630.00	
TPC Electric Field Simulation/Design	0.2				\$43,000.00	\$43,000.00		\$0.00	0.00	1.00		\$21,500.00	\$21,500.00	\$21,500.00	\$21,500.00	\$0.00	
TPC Mechanical Design	1.5				\$322,500.00	\$322,500.00		\$0.00	0.00	1.00		\$322,500.00	\$322,500.00	\$322,500.00	\$322,500.00	\$0.00	

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	Eng	Design /Drafting	Tech	Student (zero cost)	All Labor (burdened)	Labor with no Students (paid Techs) (burdened)	Estimated Materials Cost	M&S w/ 17% MSA									
TPC Signal Plane Design	0.5				\$107,500.00	\$107,500.00		\$0.00	0.50	1.00	\$96,750.00	\$96,750.00	\$96,750.00	\$48,375.00	\$0.00		
TPC signal plane wire					\$0.00	\$0.00	\$60,000.00	\$70,200.00	0.00	0.00	\$70,200.00	\$70,200.00	\$70,200.00	\$70,200.00	\$70,200.00		
Wire Termination					\$0.00	\$0.00	\$3,000.00	\$3,510.00	0.00	0.00	\$3,510.00	\$3,510.00	\$3,510.00	\$3,510.00	\$3,510.00		
TPC plane winding machine	0.02	0.1			\$17,600.00	\$17,600.00	\$18,000.00	\$21,060.00	0.50	1.00	\$38,660.00	\$38,660.00	\$38,660.00	\$19,330.00	\$0.00		
Wire tension measuring device					\$0.00	\$0.00	\$5,000.00	\$5,850.00	0.00	0.00	\$5,850.00	\$5,850.00	\$5,850.00	\$5,850.00	\$5,850.00		
wire holders					\$0.00	\$0.00	\$0.00	\$0.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00		
Wire holder storage							\$10,000.00	\$11,700.00	0.00	0.00	\$11,700.00	\$11,700.00	\$11,700.00	\$11,700.00	\$11,700.00		
Wire winding			0.5	1	\$66,500.00	\$199,500.00	\$10,000.00	\$11,700.00	0.00	0.30	\$211,200.00	\$78,200.00	\$78,200.00	\$78,200.00	\$54,740.00		
Top ground plane fabrication			0.2		\$26,600.00	\$26,600.00	\$6,000.00	\$7,020.00	0.00	0.50	\$33,620.00	\$33,620.00	\$33,620.00	\$33,620.00	\$16,810.00		
Wire frames fabrication					\$0.00	\$0.00	\$50,000.00	\$58,500.00	0.00	0.50	\$58,500.00	\$58,500.00	\$58,500.00	\$58,500.00	\$29,250.00		
Cathode Plane fabrication			0.2		\$26,600.00	\$26,600.00	\$15,000.00	\$17,550.00	0.00	0.50	\$44,150.00	\$44,150.00	\$44,150.00	\$44,150.00	\$22,075.00		
Field cage tubing			0.2		\$26,600.00	\$26,600.00	\$50,000.00	\$58,500.00	0.00	0.00	\$85,100.00	\$85,100.00	\$85,100.00	\$85,100.00	\$85,100.00		
Field cage support			0.05		\$6,650.00	\$6,650.00	\$30,000.00	\$35,100.00	0.00	0.50	\$41,750.00	\$41,750.00	\$41,750.00	\$41,750.00	\$20,875.00		
Field cage voltage divider					\$0.00	\$0.00	\$6,000.00	\$7,020.00	0.00	0.00	\$7,020.00	\$7,020.00	\$7,020.00	\$7,020.00	\$7,020.00		
TPC Support attachments					\$0.00	\$0.00	\$50,000.00	\$58,500.00	0.00	0.00	\$58,500.00	\$58,500.00	\$58,500.00	\$58,500.00	\$58,500.00		
Photomultiplier detectors					\$0.00	\$0.00	\$80,000.00	\$93,600.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00		
PM assembly and testing				0.25	\$0.00	\$33,250.00		\$0.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00		
PM Support attachments	0.25				\$53,750.00	\$53,750.00	\$50,000.00	\$58,500.00	0.00	0.50	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00		
Electronics, PS, DAQ, Monitoring	4.56	0.00	1.99	3.05	\$1,245,070.00	\$1,650,720.00		\$1,706,445.00			\$3,188,807.50	\$2,783,157.50	\$2,783,157.50	\$2,783,157.50	\$2,233,516.88		
Pre-Amp Motherboard Design & Fabrication	0.75			0	\$161,250.00	\$161,250.00	\$50,000.00	\$58,500.00	0.00	0.75	\$166,537.50	\$166,537.50	\$166,537.50	\$166,537.50	\$41,634.38		
Pre-Amp Motherboard Testing	0.02			0.4	\$4,300.00	\$57,500.00	\$0.00	\$0.00	0.00	0.00	\$57,500.00	\$4,300.00	\$4,300.00	\$4,300.00	\$4,300.00		
Pre-amp board design & fabrication	0.4		0	0	\$86,000.00	\$86,000.00	\$275,000.00	\$321,750.00	0.00	0.75	\$399,150.00	\$399,150.00	\$399,150.00	\$399,150.00	\$99,787.50		
Pre-amp board tesing	0.02		0.125	0.125	\$20,925.00	\$37,550.00	\$0.00	\$0.00	0.00	0.00	\$37,550.00	\$20,925.00	\$20,925.00	\$20,925.00	\$20,925.00		
Twisted pair cables	0.05			0.2	\$10,750.00	\$37,350.00	\$30,500.00	\$35,685.00	0.00	0.00	\$73,035.00	\$46,435.00	\$46,435.00	\$46,435.00	\$46,435.00		
FT Amplifier board design & fabrication	0.25				\$53,750.00	\$53,750.00	\$75,000.00	\$87,750.00	0.00	1.00	\$125,375.00	\$125,375.00	\$125,375.00	\$125,375.00	\$0.00		
FT Amp board testing	0.02		0.125	0.125	\$20,925.00	\$37,550.00	\$0.00	\$0.00	0.00	0.00	\$37,550.00	\$20,925.00	\$20,925.00	\$20,925.00	\$20,925.00		
Shielded Twisted pair cables	0.05			0.2	\$10,750.00	\$37,350.00	\$46,000.00	\$53,820.00	0.00	0.00	\$91,170.00	\$64,570.00	\$64,570.00	\$64,570.00	\$64,570.00		

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	Eng	Design/Drafting	Tech	Student (zero cost)	All Labor (burdened)	Labor with no Students (paid Techs) (burdened)	Estimated Materials Cost	M&S w/ 17% MSA									
TPC Calibration cables					\$0.00	\$0.00	\$12,000.00	\$14,040.00	0.00	0.00	\$14,040.00	\$14,040.00	\$14,040.00	\$14,040.00	\$14,040.00		
Pre-amp power cables					\$0.00	\$0.00		\$0.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00		
Electronics LVPS purchase & testing			0.25		\$33,250.00	\$33,250.00	\$40,000.00	\$46,800.00	0.00	0.00	\$80,050.00	\$80,050.00	\$80,050.00	\$80,050.00	\$80,050.00		
TPC High Voltage PS					\$0.00	\$0.00	\$40,000.00	\$46,800.00	0.00	0.00	\$46,800.00	\$46,800.00	\$46,800.00	\$46,800.00	\$46,800.00		
TPC High Voltage cable, fabrication & testing			0.25		\$33,250.00	\$33,250.00	\$10,000.00	\$11,700.00	0.00	0.00	\$44,950.00	\$44,950.00	\$44,950.00	\$44,950.00	\$44,950.00		
PM digitizer & readout					\$0.00	\$0.00	\$10,000.00	\$11,700.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00		
PM readout cables			0.12		\$15,960.00	\$15,960.00	\$20,000.00	\$23,400.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00		
PM High Voltage PS					\$0.00	\$0.00	\$0.00	\$0.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00		
PM High Voltage Cables			0.12		\$15,960.00	\$15,960.00	\$20,000.00	\$23,400.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00		
DAQ system	1.5		0.5	1.00	\$389,000.00	\$522,000.00	\$710,000.00	\$830,700.00	0.00	0.00	\$1,352,700.00	\$1,219,700.00	\$1,219,700.00	\$1,219,700.00	\$1,219,700.00		
Detector Monitoring system	0.5		0.25	1.00	\$140,750.00	\$273,750.00	\$50,000.00	\$58,500.00	0.00	0.00	\$332,250.00	\$199,250.00	\$199,250.00	\$199,250.00	\$199,250.00		
Racks and cabling	1		0.25		\$248,250.00	\$248,250.00	\$70,000.00	\$81,900.00	0.00	0.00	\$330,150.00	\$330,150.00	\$330,150.00	\$330,150.00	\$330,150.00		
Installation & Integration	0.25	0.00	5.35	1.90	\$765,300.00	\$1,018,000.00		\$0.00			\$1,018,000.00	\$765,300.00	\$765,300.00	\$765,300.00	\$519,250.00		
Detector Installation			0.75	0.3	\$99,750.00	\$139,650.00		\$0.00	0.00	0.50	\$139,650.00	\$99,750.00	\$99,750.00	\$99,750.00	\$49,875.00		
Cryo Vessel Installation setup			0.2		\$26,600.00	\$26,600.00		\$0.00	0.00	0.50	\$26,600.00	\$26,600.00	\$26,600.00	\$26,600.00	\$13,300.00		
Cryo Vessel Insulation installation			0.75		\$99,750.00	\$99,750.00		\$0.00	0.00	0.50	\$99,750.00	\$99,750.00	\$99,750.00	\$99,750.00	\$49,875.00		
LN2 Cryo system installation			1.25		\$166,250.00	\$166,250.00		\$0.00	0.00	0.00	\$166,250.00	\$166,250.00	\$166,250.00	\$166,250.00	\$166,250.00		
LAr system installation			2		\$266,000.00	\$266,000.00		\$0.00	0.00	0.50	\$266,000.00	\$266,000.00	\$266,000.00	\$266,000.00	\$133,000.00		
Cabling, Racks & readout support			0.2	0.8	\$26,600.00	\$133,000.00		\$0.00	0.00	0.00	\$133,000.00	\$26,600.00	\$26,600.00	\$26,600.00	\$26,600.00		
Electronics Installation			0.20	0.80	\$26,600.00	\$133,000.00		\$0.00	0.00	0.00	\$133,000.00	\$26,600.00	\$26,600.00	\$26,600.00	\$26,600.00		
Installation oversight	0.25				\$53,750.00	\$53,750.00		\$0.00	0.00	0.00	\$53,750.00	\$53,750.00	\$53,750.00	\$53,750.00	\$53,750.00		

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	Eng	Design/Drafting	Tech	Student (zero cost)	All Labor (burdened)	Labor with no Students (paid Techs) (burdened)	Estimated Materials Cost	M&S w/ 17% MSA							
	Sums of Labor & Materials	11.88	1.10	13.24	6.20	\$5,109,852.50	\$4,318,502.50								
Base (burdened) Cost totals										\$11,635,107.50	\$10,843,757.50	\$10,434,257.50	\$10,105,746.25	\$7,298,897.50	
Base + FY09 to FY11 Escalation										\$13,277,984.68	\$12,374,896.06	\$11,907,574.66	\$11,532,677.62	\$8,329,501.83	
Base with FY09-FY11 escalation and 30% contingency										\$16,768,516.93	\$15,628,023.31	\$15,037,851.91	\$14,564,401.50	\$10,519,171.08	
Base with FY09-FY11 escalation and a contingency formula - 30% applied to 2/3 of costs, 50% applied to 1/3 of costs										\$19,647,454.87	\$18,311,153.22	\$17,619,657.00	\$17,064,921.27	\$12,325,176.99	