

Appendix A Cost Estimations

A.1 Summary of SoLID overall cost estimation

The cost estimation for each subsystem is listed in Figures A.1 and 149. The costs are assumed to be spread in four years. The 5th column is the sum of the 4 years. Fifth column is the contributions from other sources, including the anticipated contributions from China for the GEM and MRPC detectors and contributions from other groups, and the last column is the amount to be requested from DOE (as an MIE). For each major item, there are 7 rows: the first row is the total for this item, the next two row split it into labor and procurement. Then the labor part is listed as FTEs and divided further into the Jlab FTEs, other contributed FTEs and the University FTEs (which are the FTEs subcontracted to the University groups). Net total is the sum of all the direct cost, including both procurement and labor. JLab overhead is listed, including the overhead for both procurement and JLab FTEs.

The total request to DOE is \$47.7M. The total cost for SoLID, including contributions of \$11.4M from other sources, is estimated to be \$59.1M. (Note: The total contribution from other sources is expected to be higher, given that the \$11.4M estimate has a lower cost basis for FTE and no overhead included.)

SoLID Cost Estimate
Costs are in FY14\$K

FY14 \$k (Direct)	Yr 1	Yr 2	Yr 3	Yr 4	Total	Contribute	Request
Ecal	1,278.1	3,278.1	1,473.1	565.1	6,594.3	400.0	6,194.3
Labor \$	273.1	273.1	273.1	273.1	1,092.3	400.0	692.3
Proc \$	1,005.0	3,005.0	1,200.0	292.0	5,502.0	-	5,502.0
FTEs	4.0	4.0	4.0	4.0	16.0	4.0	12.0
Jlab	1.5	1.5	1.5	1.5	6.0	-	6.0
Other	1.0	1.0	1.0	1.0	4.0	4.0	-
University	1.5	1.5	1.5	1.5	6.0	-	6.0
e Cherenkov	504.3	1,176.3	822.7	142.7	2,645.9	148.7	2,497.2
Labor \$	184.3	136.3	122.7	122.7	565.9	148.7	417.2
Proc \$	320.0	1,040.0	700.0	20.0	2,080.0	-	2,080.0
FTEs	3.0	3.0	2.0	2.0	10.0	1.5	8.5
Jlab	1.2	1.2	0.8	0.8	4.0	-	4.0
Other	0.5	0.5	0.3	0.3	1.5	1.5	-
University	1.3	1.3	0.9	0.9	4.5	-	4.5
h Cherenkov	952.9	952.9	952.9	325.9	3,184.5	150.0	3,034.5
Labor \$	152.9	152.9	152.9	152.9	611.5	150.0	461.5
Proc \$	800.0	800.0	800.0	173.0	2,573.0	-	2,573.0
FTEs	2.0	2.0	2.0	2.0	8.0	1.5	6.5
Jlab	1.0	1.0	1.0	1.0	4.0	-	4.0
Other	0.4	0.4	0.4	0.4	1.5	1.5	-
University	0.6	0.6	0.6	0.6	2.5	-	2.5
GEM-US	113.7	183.7	250.0	171.3	718.6	-	718.6
Labor \$	83.7	83.7	150.0	141.3	458.6	-	458.6
Proc \$	30.0	100.0	100.0	30.0	260.0	-	260.0
FTEs	0.9	0.9	1.4	1.4	4.5	-	4.5
Jlab	0.7	0.7	1.3	1.2	4.0	-	4.0
Other	-	-	-	-	-	-	-
University	0.1	0.1	0.1	0.1	0.5	-	0.5
GEM-China	1,737.5	1,737.5	1,137.5	832.5	5,445.0	5,445.0	-
Labor \$	637.5	637.5	537.5	537.5	2,350.0	2,350.0	-
Proc \$	1,100.0	1,100.0	600.0	295.0	3,095.0	3,095.0	-
FTEs	6.4	6.4	5.4	5.4	23.5	23.5	-
Jlab	-	-	-	-	-	-	-
Other	6.4	6.4	5.4	5.4	23.5	23.5	-
University	-	-	-	-	-	-	-
MRPC-US	265.4	325.4	215.4	155.4	961.5	-	961.5
Labor \$	115.4	115.4	115.4	115.4	461.5	-	461.5
Proc \$	150.0	210.0	100.0	40.0	500.0	-	500.0
FTEs	1.1	1.1	1.1	1.1	4.5	-	4.5
Jlab	1.0	1.0	1.0	1.0	4.0	-	4.0
Other	-	-	-	-	-	-	-
University	0.1	0.1	0.1	0.1	0.5	-	0.5
MRPC-China	687.5	587.5	377.5	187.5	1,840.0	1,840.0	-
Labor \$	187.5	187.5	187.5	187.5	750.0	750.0	-
Proc \$	500.0	400.0	190.0	-	1,090.0	1,090.0	-

Figure 148: Estimation of SoLID Overall Cost, page 1

FY14 \$k (Direct)	Yr 1	Yr 2	Yr 3	Yr 4	Total	Contribute	Request
FTEs	1.9	1.9	1.9	1.9	7.5	7.5	-
Jlab	-	-	-	-	-	-	-
Other	1.9	1.9	1.9	1.9	7.5	7.5	-
University	-	-	-	-	-	-	-
DAQ / Electronics	1,146.3	1,056.3	915.3	952.3	4,070.2	238.0	3,832.2
Labor \$	446.3	456.3	452.3	452.3	1,807.2	238.0	1,569.2
Proc \$	700.0	600.0	463.0	500.0	2,263.0	-	2,263.0
FTEs	3.9	4.0	4.0	4.0	16.0	2.4	13.6
Jlab	3.4	3.4	3.4	3.4	13.6	-	13.6
Other	0.5	0.6	0.6	0.6	2.4	2.4	-
University	-	-	-	-	-	-	-
Magnet	2,232.7	2,354.7	950.0	411.5	5,948.9	-	5,948.9
Labor \$	507.7	507.7	300.0	311.5	1,626.9	-	1,626.9
Proc \$	1,725.0	1,847.0	650.0	100.0	4,322.0	-	4,322.0
FTEs	4.4	4.4	2.6	2.7	14.1	-	14.1
Jlab	4.4	4.4	2.6	2.7	14.1	-	14.1
Other	-	-	-	-	-	-	-
University	-	-	-	-	-	-	-
Support	465.4	2,014.2	1,457.7	967.7	4,904.9	-	4,904.9
Labor \$	415.4	669.2	807.7	807.7	2,699.9	-	2,699.9
Proc \$	50.0	1,345.0	650.0	160.0	2,205.0	-	2,205.0
FTEs	3.6	5.8	7.0	7.0	23.4	-	23.4
Jlab	3.6	5.8	7.0	7.0	23.4	-	23.4
Other	-	-	-	-	-	-	-
University	-	-	-	-	-	-	-
Software	165.4	165.4	165.4	165.4	661.5	200.4	461.1
Labor \$	165.4	165.4	165.4	165.4	661.5	200.4	461.1
Proc \$	-	-	-	-	-	-	-
FTEs	1.5	1.5	1.5	1.5	6.0	2.0	4.0
Jlab	1.0	1.0	1.0	1.0	4.0	-	4.0
Other	0.5	0.5	0.5	0.5	2.0	2.0	-
University	-	-	-	-	-	-	-
Oversight	173.1	173.1	173.1	173.1	692.3	-	692.3
Labor \$	173.1	173.1	173.1	173.1	692.3	-	692.3
Proc \$	-	-	-	-	-	-	-
FTEs	1.5	1.5	1.5	1.5	6.0	-	6.0
Jlab	1.5	1.5	1.5	1.5	6.0	-	6.0
Other	-	-	-	-	-	-	-
University	-	-	-	-	-	-	-
Net Total \$k	9,722	14,005	8,890	5,050	37,668	8,422	29,245
FTEs	34.2	36.4	34.4	34.4	139.4	42.4	97.0
Jlab FTEs	19.3	21.5	21.1	21.1	83.1	-	83.1
Overhead	1,626	1,933	1,924	1,732	7,215	-	7,215
Subtotal w/ Overhead	11,348	15,938	10,815	6,782	44,883	8,422	36,461
Contingency @ 35%	3,583	5,185	3,435	2,023	14,226	2,948	11,278
Grand Total	14,931	21,124	14,249	8,805	59,109	11,370	47,739

Figure 149: Estimation of SoLID Overall Cost, page 2

A.2 Estimation of Cost Request for Subsystems

A.2.1 Cost of Electromagnetic Calorimeters

Table 19: EM Calorimeter (SH/PS/SPD) Request Cost Breakdown

	Year-1	Year-2	Year-3	Year-4	Sum	Contrib	Request
Shower Modules	315	1870	655	132	2972		2972
PreShower Modules	80	180	100	30	390		390
SPD Modules	30	30	5		65		65
WLS Fiber	80	100	39		219		219
Clear Fiber	150	250	126		526		526
Fiber Connectors	100	175	86		361		361
Shower PMTs	100	200	104	50	454		454
PS MAPMTs	80	120	34	30	264		264
SPD MAPMTs	30	30	6		66		66
Assembling and Testing	30	30	35	40	135		135
FTE	4	4	4	4	16	4	12
Shipping	10	20	10	10	50		50
Total-EC-cost	1005	3005	1200	292	5502		5502
Total-EC-FTE	4	4	4	4	16	4	12

A.2.2 Cost of the Light-Gas Čerenkov Counters

Table 20: Light Gas Cherenkov Request Cost Breakdown

	Year-1	Year-2	Year-3	Year-4	Sum	Contrib	Request
Engineering Design FTE	1	1	0.5	0.5	3	0.5	2.5
Physics Oversight FTE	1	1	0.5	0.5	3	0.5	2.5
Technical Work FTE	1	1	1	1	4	0.5	3.5
H8500C-03 PMTs	126	122.5	700		948.5		948.5
Mu-metal Shields	6	37.5			43.5		43.5
Aluminized Cones	25	125			150		152
Mirror Blanks	58	290			348		348
Mirror Coating	35	165			200		200
Gas System	50				50		50
Tank	20	300			320		320
Transport				20	20		20
Total-LG	320	1040	700	20	2080		2080
Total-LG FTE	3	3	2	2	10	1.5	8.5

A.2.3 Cost of Heavy-Gas Čerenkov Detectors

Table 21: Heavy Gas Cherenkov Request Cost Breakdown

	Year-1	Year-2	Year-3	Year-4	Sum	Contrib	Request
Design, Assembly	2	2	2	2	8	1.5	6.5
Full Tank		300			300		300
Mirror		290			290		290
Cone		116			116		116
PMTs	800	94	734		1628		1628
Gas System			66	19	85		85
Gas				154	154		154
Total-HG	800	800	800	173	2573		2573
Total-HG FTE	2	2	2	2	8	1.5	6.5

A.2.4 Cost of GEM detectors

Table 22: GEM Cost Breakdown

	Year-1	Year-2	Year-3	Year-4	Sum	Contrib	Request
GEM-China	1100	1100	600	295	3095	3095	0
GEM-China FTE	6	6	5	5	22	22	
Design and Prototyping FTE	0.5	0.5	0.5	0.5	2	0.5	1.5
Hosting Chinese Collaborators	10				10		10
Installation /tesing	20	100	100	30	250		250
Installation /testing FTE			0.5	0.5	1		1
DAQ FTE	0.25	0.25	0.25	0.25	1	0.5	0.5
Management FTE	0.5	0.5	0.5	0.5	2	0.5	1.5
Total-GEM	1130	1200	700	325	3355	3095	260
Total-GEM FTE	7.5	7.5	6.5	6.5	28	23.5	4.5

The other source contributions include the anticipated funding from Chinese groups.

A.2.5 Cost of MRPC

Table 23: MRPC Cost Breakdown

	Year-1	Year-2	Year-3	Year-4	Sum	Contrib	Request
MRPC-China	500	400	190		1090	1090	0
MRPC-China FTE	1.5	1.5	1.5	1.5	6	6	0
Read-out Electronics	110	190	70		370		370
Gas System	20				20		20
Testing and Installation	20	20	30	40	110		110
FTE	1.5	1.5	1.5	1.5	6	1.5	4.5
Total-MRPC	650	610	290	40	1590	1090	500
Total-MRPC FTE	3	3	3	3	12	7.5	4.5

The other source contributions include the anticipated funding from Chinese groups.

A.2.6 Cost of DAQ Electronics and High Voltage Power Supplies

Table 24: DAQ Cost Breakdown

	Year-1	Year-2	Year-3	Year-4	Sum		Contrib	Request
DAQ Electronics	700	600	400	200	1900		0	3075
HV power supply			63	300	363		0	363
DAQ FTE	3.6	4	4	4	16		2.4	13.6
Total-DAQ	700	600	463	500	2263		0	2263
Total-DAQ FTE	3.6	4	4	4	16		2.4	13.6

A.2.7 Cost of Magnet Modification and Refurbishing

Table 25: Magnet Cost Breakdown

	Year-1	Year-2	Year-3	Year-4	Sum	Contrib	Request
Yoke	360				360		360
FTE	0.3	0.3	0.2		0.6		0.6
Upstream Endcap	335	342			677		677
FTE	0.5	0.5	0.2		0.8		0.3
Downstream endcap	450	425			875		875
FTE	0.7	0.5	0.2		1.4		1.4
Nose Extension	330	330			660		660
FTE	0.3	0.3	0.1		0.7		0.7
Downstream coil collar	250	250			500		500
FTE	0.8	0.6	0.1		1.5		1.5
Magnet support, alignment		100	250		350		350
FTE	1	0.4	0.4	0.2	2		2
Control		100	200	100	400		400
FTE	0.5	0.5	1	1	3		3
Cryogenic		300	200		500		500
FTE	0.3	0.3	0.4	0.5	1.5		1.5
Magnet Testing					100		100
FTE		1		1	2		2
Total- magnet	1725	1847	650	100	4322		4322
Total-FTE	4.4	4.4	2.6	2.7	14.1		14.1

A.2.8 Cost of Detector Support, Hall Infrastructure Upgrade and Installation

Table 26: Engineering, Detector Support Structure, Hall Infrastructure Upgrade and Installation

	Year-1	Year-2	Year-3	Year-4	Sum	Contrib	Request
Detector Engineer FTE	2	2.5	2.5	0.5	7.5		7.5
Detector Support		250	250		500		500
FEC Support		125			125		125
FTE	0.1	0.1			0.2		0.2
LAEC Supp.		80			80		80
FTE	0.1	0.1			0.2		0.2
Baffle		300			300		300
FTE	0.1	0.1			0.2		0.2
Baffle Supp.		220			220		220
FTE	0.1	0.1			0.2		0.2
Access		170			170		170
FTE		0.1	0.1		0.2		0.2
Power		100	100		200		200
FTE	0.1	0.1	0.1		0.3		0.3
Beamline/ Chambers			200	60	260		260
FTE			0.2	0.2	0.4		0.4
Ramp		50			50		50
FTE		0.1			0.1		0.1
Hall	50	50	50		150		150
FTE	0.5	0.5	0.5		1.5		2
Layout FTE	0.1	0.1	0.1	0.1	0.4		0.4
Assembly and Installation			50	100	150		150
FTE	0.5	2	5.5	6.2	14.2		14.2
Total-Structure	50	1225	650	160	2205		2205
FTE	3.6	5.8	7.0	7	23.4		23.4