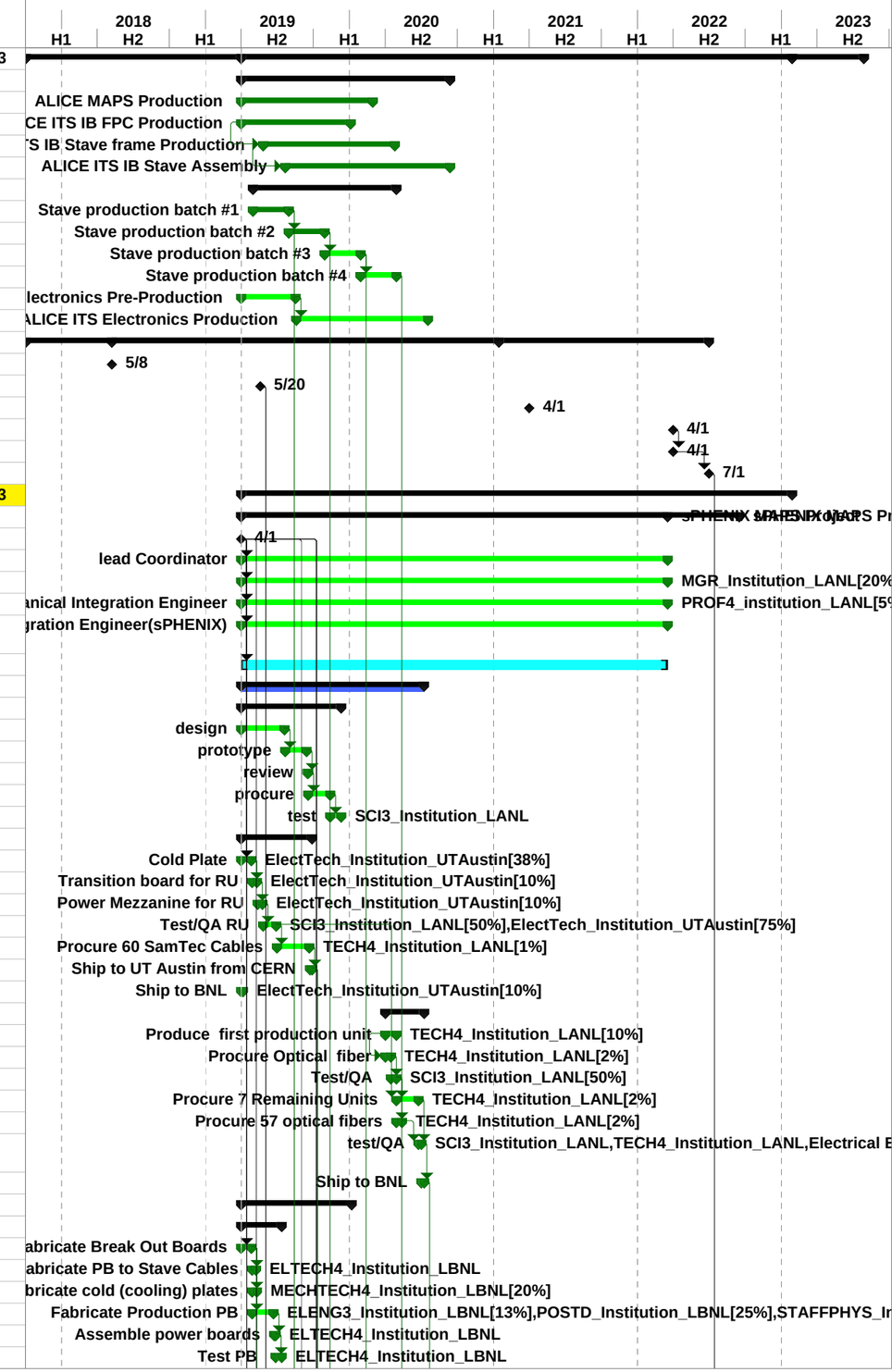
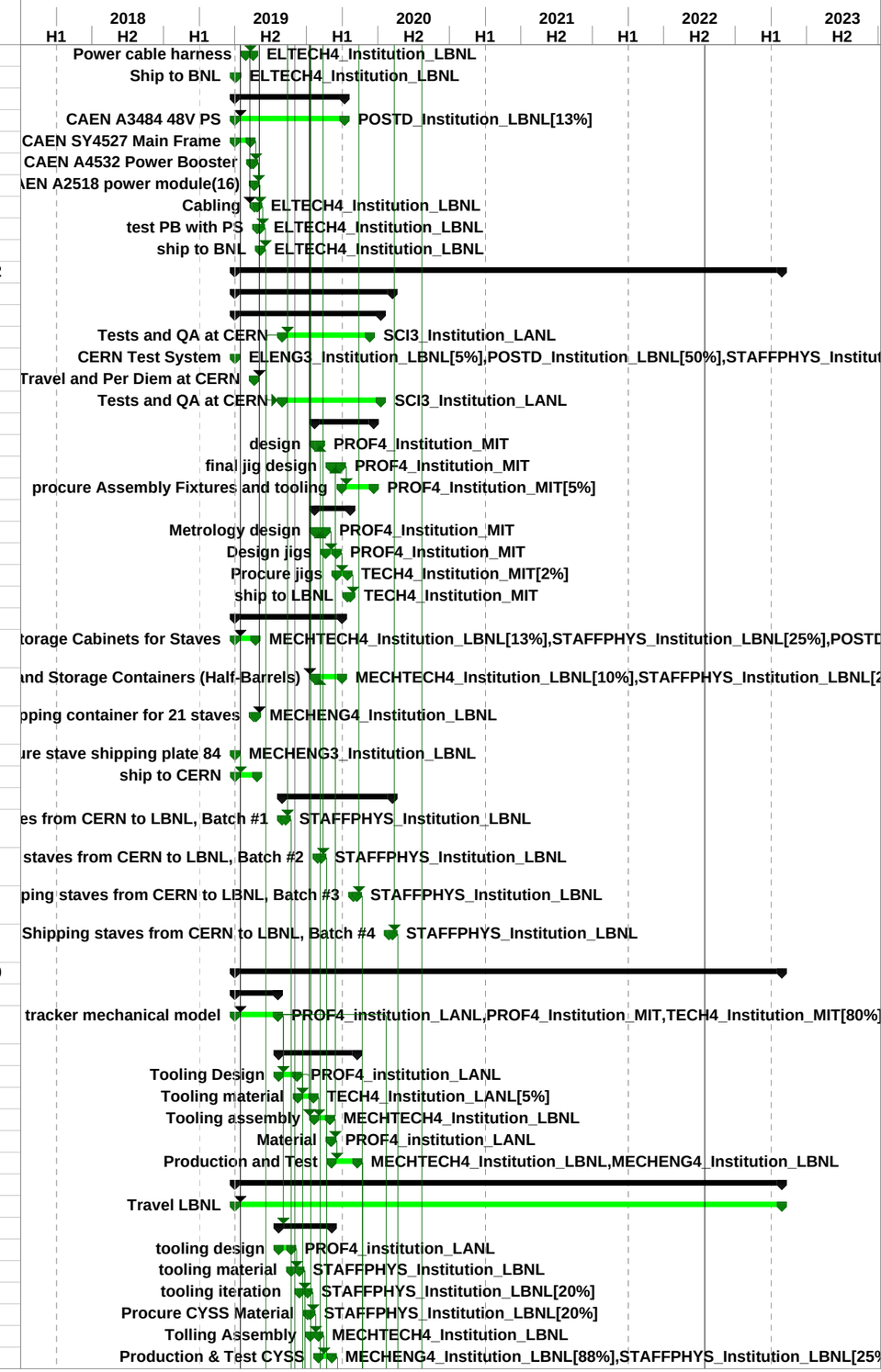
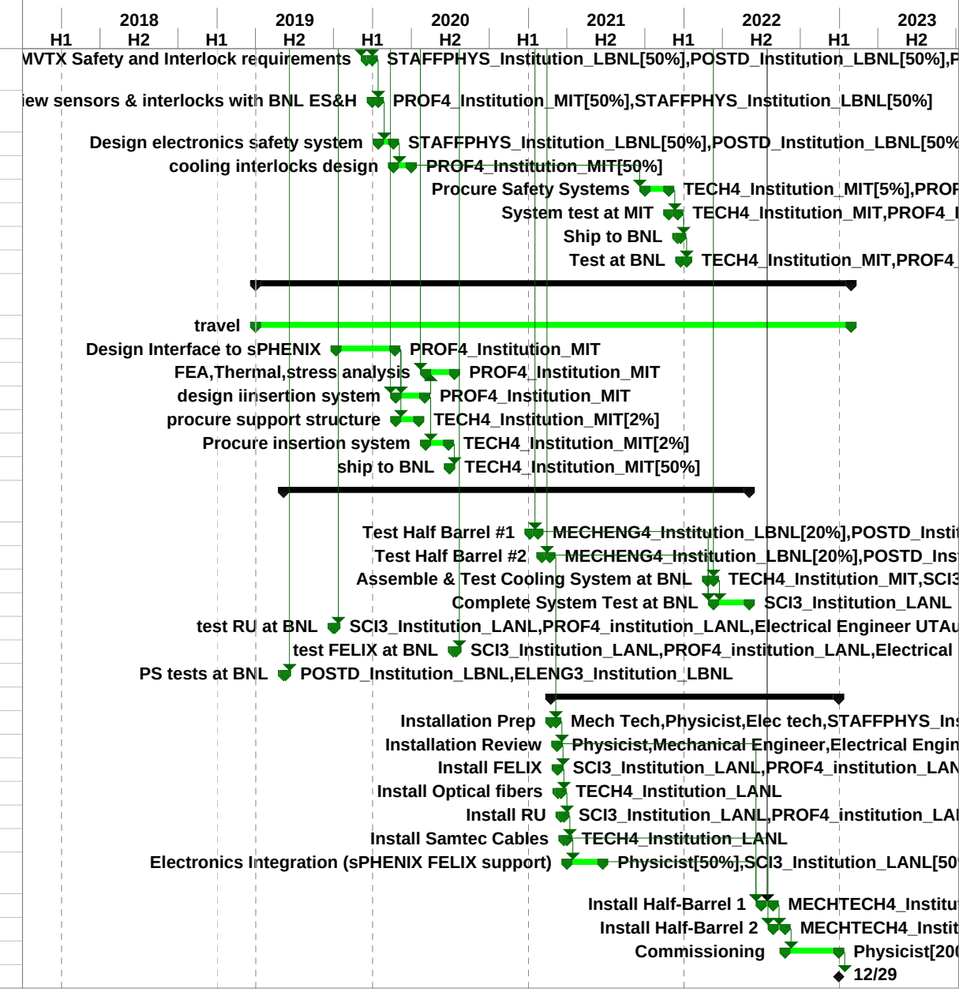
ID	WBS	Task Name	Duration	Start	Finish	Fixed Cost	Calculated Fixed Cost	Resource Names	Resource Costs	Cost	Institu	Mat con	Total Con	Over	cost+conting
1	3	MVTX Inner Barrel	1130 days	Mon 4/1/19	Fri 7/28/23	$0	$1,206,230		$2,492,894	$3,699,124				0	$4,909,463
2	3.0	ALICE ITS Key Tasks	380 days	Mon 4/1/19	Fri 9/11/20	$0	$0		$0	$0		0		0	$0
3	3.0.1	ALICE MAPS Production	240 days	Mon 4/1/19	Fri 2/28/20	$0	$0		$0	$0		0	0	0	$0
4	3.0.2	ALICE ITS IB FPC Production	200 days	Mon 4/1/19	Fri 1/3/20	$0	$0		$0	$0		0	0	0	$0
5	3.0.3	ALICE ITS IB Stave frame Production	240 days	Mon 5/27/19	Fri 4/24/20	$0	$0		$0	$0		0	0	0	$0
6	3.0.4	ALICE ITS IB Stave Assembly	300 days	Mon 7/22/19	Fri 9/11/20	$0	$0		$0	$0		0	0	0	$0
7	3.0.5	MVTX stave production at CERN	260 days	Wed 5/1/19	Tue 4/28/20	$0	$0		$0	$0	CERN			0	$0
8	3.0.5.1	Stave production batch #1	13 wks	Wed 5/1/19	Tue 7/30/19	$0	$0		$0	$0		0	0	0	$0
9	3.0.5.2	Stave production batch #2	13 wks	Wed 7/31/19	Tue 10/29/19	$0	$0		$0	$0		0	0	0	$0
10	3.0.5.3	Stave production batch #3	13 wks	Wed 10/30/19	Tue 1/28/20	$0	$0		$0	$0		0	0	0	$0
11	3.0.5.4	Stave production batch #4	13 wks	Wed 1/29/20	Tue 4/28/20	$0	$0		$0	$0		0	0	0	$0
12	3.0.6	ALICE ITS Electronics Pre-Production	100 days	Mon 4/1/19	Fri 8/16/19	$0	$0		$0	$0		0	0	0	$0
13	3.0.7	ALICE ITS Electronics Production	240 days	Mon 8/19/19	Fri 7/17/20	$0	$0		$0	$0		0	0	0	$0
14	3.1	sPHENIX Milestones	849 days	Mon 10/2/17	Wed 1/13/21	$0	$0		$0	$0				0	$0
15	3.1.1	sPHENIX CD-1 Review	0 days	Tue 5/8/18	Tue 5/8/18	$0	$0		$0	$0		0	0	0	$0
16	3.1.2	sPHENIX Construction starts PD2/3	0 days	Mon 5/20/19	Mon 5/20/19	$0	$0		$0	$0		0	0	0	$0
17	3.1.3	sPHENIX Installation Starts	0 days	Thu 4/1/21	Thu 4/1/21	$0	$0		$0	$0		0	0	0	$0
18	3.1.4	INTT Ready for Installation	0 days	Fri 4/1/22	Fri 4/1/22	$0	$0		$0	$0		0	0	0	$0
19	3.1.5	MVTX Ready for Installation	0 days	Fri 4/1/22	Fri 4/1/22	$0	$0		$0	$0		0	0	0	$0
20	3.1.6	sPHENIX Installed and Ready for Beam	0 days	Fri 7/1/22	Fri 7/1/22	$0	$0		$0	$0		0	0	0	$0
21	3.2	MVTX Project	1000 days	Mon 4/1/19	Fri 1/27/23	$0	$1,206,230		$2,492,894	$3,699,124				0	$4,909,463
22	3.2.1	MVTX Project Management	904 days	Mon 4/1/19	Thu 9/15/22	$0	$50,000		$493,050	$543,050	LANL			0	$641,660
23	3.2.1.1	Milestone Start MVTX	0 days	Mon 4/1/19	Mon 4/1/19	$0	$0		$0	$0		0	0	0	$0
24	3.2.1.2	lead Coordinator	774 days	Mon 4/1/19	Thu 3/17/22	$0	$0		$0	$0		.2	.2	0	$0
25	3.2.1.3	Project Manager	774 days	Mon 4/1/19	Thu 3/17/22	$0	$0	MGR_Ins	$394,478	$394,478		.2	.2	0	$473,374
26	3.2.1.4	Mechanical Integration Engineer	774 days	Mon 4/1/19	Thu 3/17/22	$0	$0	PROF4_i	$98,572	$98,572		.2	.2	0	$118,286
27	3.2.1.5	Electronics Integration Engineer(sPHENIX)	774 days	Mon 4/1/19	Thu 3/17/22	$0	$0		$0	$0		.2	.2	0	$0
28	3.2.1.6	Travel	774 days	Mon 4/1/19	Thu 3/17/22	$50,000	$50,000		$0	$50,000		0	0	0	$50,000
29	3.2.2	Electronics	332 days	Mon 4/1/19	Tue 7/7/20	$0	$298,544		$102,337	$400,881	LANL			0	$492,286
30	3.2.2.1	Stave Extension Cable	182 days	Mon 4/1/19	Tue 12/10/19	$0	$0		$0	$0	LANL			0	$0
31	3.2.2.1.1	design	4 mons	Mon 4/1/19	Fri 7/19/19	$0	$0		$0	$0		.35	.35	0	$0
32	3.2.2.1.2	prototype	2 mons	Mon 7/22/19	Fri 9/13/19	$0	$0		$0	$0		.35	.35	0	$0
33	3.2.2.1.3	review	2 days	Mon 9/16/19	Tue 9/17/19	$0	$0		$0	$0		.35	.35	0	$0
34	3.2.2.1.4	procure	2 mons	Wed 9/18/19	Tue 11/12/19	$0	$0		$0	$0		.30	.30	0.09	$0
35	3.2.2.1.5	test	20 days	Wed 11/13/19	Tue 12/10/19	$0	$0	SCI3_Ins	$0	$0		.35	.35	0.09	$0
36	3.2.2.2	RU	130 days	Mon 4/1/19	Fri 9/27/19	$0	$66,005		$21,694	$87,699				0	$116,167
37	3.2.2.2.1	Cold Plate	4 wks	Mon 4/1/19	Fri 4/26/19	$12,104	$12,104	ElectTec	$5,472	$17,576		.35	.35	0.09	$23,728
38	3.2.2.2.2	Transition board for RU	2 wks	Mon 4/29/19	Fri 5/10/19	$8,716	$8,716	ElectTec	$720	$9,436		.2	.2	0	$11,323
39	3.2.2.2.3	Power Mezzanine for RU	2 wks	Mon 5/13/19	Fri 5/24/19	$4,685	$4,685	ElectTec	$720	$5,405		.2	.2	0	$6,486
40	3.2.2.2.4	Test/QA RU	1.25 mo...	Mon 5/27/19	Fri 6/28/19	$7,500	$7,500	SCI3_Ins	$13,500	$21,000		.35	.35	0.09	$28,350
41	3.2.2.2.5	Procure 60 SamTec Cables	60 days	Mon 7/1/19	Fri 9/20/19	$30,000	$30,000	TECH4_I	$922	$30,922	LANL	.35	.35	0.09	$41,745
42	3.2.2.2.6	Ship to UT Austin from CERN	1 wk	Mon 9/23/19	Fri 9/27/19	$2,000	$2,000		$0	$2,000		.35	.35	0.09	$2,700
43	3.2.2.2.7	Ship to BNL	5 days	Mon 4/1/19	Fri 4/5/19	$1,000	$1,000	ElectTec	$360	$1,360		.35	.35	0	$1,836
44	3.2.2.3	FELIX	70.33 da...	Wed 4/1/20	Wed 7/8/20	$0	$76,400		$20,275	$96,675				0	$116,310
45	3.2.2.3.1	Produce first production unit	4 wks	Wed 4/1/20	Tue 4/28/20	$8,000	$8,000	TECH4_I	$3,152	$11,152		.2	.2	0.12	$13,382
46	3.2.2.3.2	Procure Optical fiber	2 wks	Wed 4/1/20	Tue 4/14/20	$50	$50	TECH4_I	$315	$365		.2	.2	0.09	$438
47	3.2.2.3.3	Test/QA	2 wks	Wed 4/15/20	Tue 4/28/20	$0	$0	SCI3_Ins	$0	$0		.2	.2	0.09	$0
48	3.2.2.3.4	Procure 7 Remaining Units	8 wks	Wed 4/29/20	Tue 6/23/20	$56,000	$56,000	TECH4_I	$1,261	$57,261	LANL	.2	.2	0.09	$68,713
49	3.2.2.3.5	Procure 57 optical fibers	2 wks	Wed 4/29/20	Tue 5/12/20	$2,850	$2,850	TECH4_I	$315	$3,165		.2	.2	0.12	$3,798
50	3.2.2.3.6	test/QA	5.33 days	Wed 6/24/20	Wed 7/1/20	$7,500	$7,500	SCI3_Ins Engineer	$15,232	$22,732		.2	.2	0.09	$27,278
51	3.2.2.3.7	Ship to BNL	1 wk	Wed 7/1/20	Wed 7/8/20	$2,000	$2,000		$0	$2,000		.35	.35	0.12	$2,700
52	3.2.2.4	MAPS Power System	200.77 d...	Mon 4/1/19	Mon 1/6/20	$0	$156,139		$60,368	$216,507	LBNL			0	$259,808
53	3.2.2.4.1	Power Boards	75 days	Mon 4/1/19	Fri 7/12/19	$0	$79,020		$49,672	$128,692	LBNL			0	$154,431
54	3.2.2.4.1.1	Fabricate Break Out Boards	20 days	Mon 4/1/19	Fri 4/26/19	$6,600	$6,600		$0	$6,600		.2	.2	0.09	$7,920
55	3.2.2.4.1.2	Fabricate PB to Stave Cables	60 hrs	Mon 4/29/19	Wed 5/8/19	$8,000	$8,000	ELTECH4	$7,080	$15,080		.2	.2	0.09	$18,096
56	3.2.2.4.1.3	Fabricate cold (cooling) plates	2 wks	Mon 4/29/19	Fri 5/10/19	$3,420	$3,420	MECHTE	$2,112	$5,532		.2	.2	0	$6,638
57	3.2.2.4.1.4	Fabricate Production PB	40 days	Mon 4/29/19	Fri 6/21/19	$60,000	$60,000	ELENG3_	$8,620	$68,620		.2	.2	0.09	$82,345
58	3.2.2.4.1.5	Assemble power boards	30 hrs	Mon 6/24/19	Thu 6/27/19	$0	$0	ELTECH4	$3,540	$3,540		.2	.2	0	$4,248
59	3.2.2.4.1.6	Test PB	90 hrs	Thu 6/27/19	Fri 7/12/19	$0	$0	ELTECH4	$10,620	$10,620		.2	.2	0	$12,744



ID	WBS	Task Name	Duration	Start	Finish	Fixed Cost	Calculated Fixed Cost	Resource Names	Resource Costs	Cost	Institu	Mat con	Tota Con	Ove	cost+conting
60	3.2.2.4.1.7	Power cable harness	15 days	Mon 4/29/19	Fri 5/17/19	$0	$0	ELTECH4	$14,160	$14,160		.2	.2	0	$16,992
61	3.2.2.4.1.8	Ship to BNL	30 hrs	Mon 4/1/19	Thu 4/4/19	$1,000	$1,000	ELTECH4	$3,540	$4,540		.2	.2	0	$5,448
62	3.2.2.4.2	Power Supplies	200.77 d...	Mon 4/1/19	Mon 1/6/20	$0	$77,119		$10,696	$87,815				0	$105,377
63	3.2.2.4.2.1	CAEN A3484 48V PS	200.77 d...	Mon 4/1/19	Mon 1/6/20	$8,607	$8,607	POSTD_I	$0	$8,607		.2	.2	0.09	$10,328
64	3.2.2.4.2.2	CAEN SY4527 Main Frame	30 days	Mon 4/1/19	Fri 5/10/19	$11,620	$11,620		$0	$11,620		.2	.2	0.09	$13,944
65	3.2.2.4.2.3	CAEN A4532 Power Booster	1 wk	Mon 5/13/19	Fri 5/17/19	$1,216	$1,216		$0	$1,216		.2	.2	0.09	$1,459
66	3.2.2.4.2.4	CAEN A2518 power module(16)	1.33 days	Mon 5/20/19	Tue 5/21/19	$43,676	$43,676		$0	$43,676		.2	.2	0.09	$52,411
67	3.2.2.4.2.5	Cabling	1 wk	Tue 5/21/19	Tue 5/28/19	$10,000	$10,000	ELTECH4	$4,720	$14,720		.2	.2	0	$17,664
68	3.2.2.4.2.6	test PB with PS	1 wk	Tue 5/28/19	Tue 6/4/19	$0	$0	ELTECH4	$4,720	$4,720		.2	.2	0	$5,664
69	3.2.2.4.2.7	ship to BNL	1.33 days	Tue 6/4/19	Wed 6/5/19	$2,000	$2,000	ELTECH4	$1,256	$3,256		.2	.2	0.09	$3,907
70	3.2.3	Mechanics and Detector Assembly	1000 days	Mon 4/1/19	Fri 1/27/23	$0	$523,486		$1,260,914	$1,784,400	LBNL			0	$2,430,522
71	3.2.3.1	Staves	289 days	Mon 4/1/19	Thu 5/7/20	$0	$146,852		$124,034	$270,886				0	$365,131
72	3.2.3.1.1	Production	267 days	Mon 4/1/19	Tue 4/7/20	$0	$57,360		$72	$57,432				0	$77,534
73	3.2.3.1.1.1	Tests and QA at CERN	160 days	Wed 7/31/19	Tue 3/10/20	$0	$0	SCI3_Ins	$0	$0	LANL	.35	.35	0.09	$0
74	3.2.3.1.1.2	CERN Test System	1 day	Mon 4/1/19	Mon 4/1/19	$7,360	$7,360	ELENG3_	$72	$7,432	LANL	.35	.35	0.09	$10,034
75	3.2.3.1.1.3	Travel and Per Diem at CERN	1 day	Mon 5/20/19	Mon 5/20/19	$50,000	$50,000		$0	$50,000	LANL	.35	.35	0.09	$67,500
76	3.2.3.1.1.4	Tests and QA at CERN	180 days	Wed 7/31/19	Tue 4/7/20	$0	$0	SCI3_Ins	$0	$0	LANL	.35	.35	0.09	$0
77	3.2.3.1.2	Stave Assembly Tooling	109 days	Tue 10/22/19	Fri 3/20/20	$0	$25,000		$44,352	$69,352	MIT			0	$93,625
78	3.2.3.1.2.1	design	2 wks	Tue 10/22/19	Mon 11/4/19	$0	$0	PROF4_I	$13,440	$13,440		.35	.35	0.09	$18,144
79	3.2.3.1.2.2	final jig design	20 days	Mon 12/2/19	Fri 12/27/19	$0	$0	PROF4_I	$26,880	$26,880		.35	.35	0.09	$36,288
80	3.2.3.1.2.3	procure Assembly Fixtures and tooli	60 days	Mon 12/30/19	Fri 3/20/20	$25,000	$25,000	PROF4_I	$4,032	$29,032		.35	.35	0.09	$39,193
81	3.2.3.1.3	Metrology	65 days	Tue 10/22/19	Mon 1/20/20	$0	$7,000		$58,007	$65,007	MIT			0	$87,759
82	3.2.3.1.3.1	Metrology design	1 mon	Tue 10/22/19	Mon 11/18/19	$0	$0	PROF4_I	$26,880	$26,880		.35	.35	0.09	$36,288
83	3.2.3.1.3.2	Design jigs	20 days	Tue 11/19/19	Mon 12/16/19	$0	$0	PROF4_I	$26,880	$26,880		.35	.35	0.09	$36,288
84	3.2.3.1.3.3	Procure jigs	4 wks	Tue 12/17/19	Mon 1/13/20	$5,000	$5,000	TECH4_I	$315	$5,315		.35	.35	0.09	$7,175
85	3.2.3.1.3.4	ship to LBNL	1 wk	Tue 1/14/20	Mon 1/20/20	$2,000	$2,000	TECH4_I	$3,932	$5,932		.35	.35	0.09	$8,008
86	3.2.3.1.4	Shipping and Storage Containers	196 days	Mon 4/1/19	Mon 12/30/19	$0	$33,492		$21,603	$55,095	LBNL			0	$73,814
87	3.2.3.1.4.1	Design&Fabricate Storage Cabinets for Staves	39 days	Mon 4/1/19	Thu 5/23/19	$6,992	$6,992	MECHTE	$5,355	$12,347		.35	.35	0.09	$16,668
88	3.2.3.1.4.2	Design&Fabricate Shipping and Storage Containers (Half-Barrels)	50 days	Tue 10/22/19	Mon 12/30/19	$11,500	$11,500	MECHTE	$5,480	$16,980		.35	.35	0.09	$22,923
89	3.2.3.1.4.3	Design shipping container for 21 staves	1 wk	Mon 5/20/19	Fri 5/24/19	$0	$0	MECHEN	$9,480	$9,480		.35	.35	0.09	$12,798
90	3.2.3.1.4.4	procure stave shipping plate 84	1 day	Mon 4/1/19	Mon 4/1/19	$10,000	$10,000	MECHEN	$1,288	$11,288		.3	.3	0	$14,674
91	3.2.3.1.4.5	ship to CERN	2 mons	Tue 4/2/19	Mon 5/27/19	$5,000	$5,000		$0	$5,000		.35	.35	0.09	$6,750
92	3.2.3.1.5	Shipping staves to LBNL	202 days	Wed 7/31/19	Thu 5/7/20	$0	$24,000		$0	$24,000	LBNL			0	$32,400
93	3.2.3.1.5.1	Shipping staves from CERN to LBNL, Batch #1	7 days	Wed 7/31/19	Thu 8/8/19	$6,000	$6,000	STAFFPH	$0	$6,000		.35	.35	0	$8,100
94	3.2.3.1.5.2	Shipping staves from CERN to LBNL, Batch #2	7 days	Wed 10/30/19	Thu 11/7/19	$6,000	$6,000	STAFFPH	$0	$6,000		.35	.35	0	$8,100
95	3.2.3.1.5.3	Shipping staves from CERN to LBNL, Batch #3	7 days	Wed 1/29/20	Thu 2/6/20	$6,000	$6,000	STAFFPH	$0	$6,000		.35	.35	0	$8,100
96	3.2.3.1.5.4	Shipping staves from CERN to LBNL, Batch #4	7 days	Wed 4/29/20	Thu 5/7/20	$6,000	$6,000	STAFFPH	$0	$6,000		.35	.35	0	$8,100
97	3.2.3.2	Carbon Structures	1000 days	Mon 4/1/19	Fri 1/27/23	$0	$347,820		$943,104	$1,290,924	LBNL			0	$1,762,080
98	3.2.3.2.1	Mechanics Detector Design	80 days	Mon 4/1/19	Fri 7/19/19	$0	$0		$348,723	$348,723	LANL			0	$470,776
99	3.2.3.2.1.1	Develop MAPS inner tracker mechanical model	4 mons	Mon 4/1/19	Fri 7/19/19	$0	$0	PROF4_i	$348,723	$348,723		.35	.35	0.09	$470,776
100	3.2.3.2.2	End Wheels	145 days	Mon 7/22/19	Fri 2/7/20	$0	$75,940		$273,227	$349,167				0	$506,292
101	3.2.3.2.2.1	Tooling Design	1.75 mo...	Mon 7/22/19	Fri 9/6/19	$0	$0	PROF4_i	$85,534	$85,534		.45	.45	0.09	$124,025
102	3.2.3.2.2.2	Tooling material	30 days	Mon 9/9/19	Fri 10/18/19	$60,000	$60,000	TECH4_I	$2,333	$62,333		.45	.45	0.09	$90,382
103	3.2.3.2.2.3	Tooling assembly	30 days	Mon 10/21/19	Fri 11/29/19	$0	$0	MECHTE	$32,880	$32,880	LBNL	.45	.45	0	$47,676
104	3.2.3.2.2.4	Material	2 days	Mon 12/2/19	Tue 12/3/19	$15,940	$15,940	PROF4_i	$5,024	$20,964		.45	.45	0.09	$30,398
105	3.2.3.2.2.5	Production and Test	48 days	Wed 12/4/19	Fri 2/7/20	$0	$0	MECHTE	$147,456	$147,456	LBNL	.45	.45	0.09	$213,811
106	3.2.3.2.3	Mechanics Fabrication	1000 days	Mon 4/1/19	Fri 1/27/23	$0	$261,880		$267,298	$529,178				0	$714,770
107	3.2.3.2.3.1	Travel LBNL	1000 days	Mon 4/1/19	Fri 1/27/23	$70,000	$70,000		$0	$70,000		.35	.35	0.09	$94,500
108	3.2.3.2.3.2	CYSS Cylindrical Structure	98 days	Mon 7/22/19	Wed 12/4/19	$0	$75,940		$139,971	$215,911	LBNL			0	$313,072
109	3.2.3.2.3.2.1	tooling design	1.2 mons	Mon 7/22/19	Thu 8/22/19	$0	$0	PROF4_i	$58,652	$58,652		.45	.45	0.09	$85,046
110	3.2.3.2.3.2.2	tooling material	15 days	Fri 8/23/19	Thu 9/12/19	$30,000	$30,000	STAFFPH	$0	$30,000		.45	.45	0.09	$43,500
111	3.2.3.2.3.2.3	tooling iteration	15 days	Fri 9/13/19	Thu 10/3/19	$30,000	$30,000	STAFFPH	$0	$30,000		.45	.45	0	$43,500
112	3.2.3.2.3.2.4	Procure CYSS Material	5 days	Fri 10/4/19	Thu 10/10/19	$15,940	$15,940	STAFFPH	$0	$15,940	LBNL	.45	.45	0.09	$23,113
113	3.2.3.2.3.2.5	Tolling Assembly	15 days	Fri 10/11/19	Thu 10/31/19	$0	$0	MECHTE	$16,440	$16,440		.45	.45	0	$23,838
114	3.2.3.2.3.2.6	Production & Test CYSS	24 days	Fri 11/1/19	Wed 12/4/19	$0	$0	MECHEN	$64,879	$64,879	LBNL	.45	.45	0.09	$94,075



ID	WBS	Task Name	Duration	Start	Finish	Fixed Cost	Calculated Fixed Cost	Resource Names	Resource Costs	Cost	Institu	Mat con	Tota Con	Ove	cost+conting
115	3.2.3.2.3.2.7	Milestone: Complete CYSS	0 days	Wed 12/4/19	Wed 12/4/19	$0	$0		$0	$0	LBNL	0	0	0	$0
116	3.2.3.2.3.3	Service Barrel (SB)	80 days	Fri 9/13/19	Thu 1/2/20	$0	$115,940		$127,327	$243,267	LBNL			0	$307,199
117	3.2.3.2.3.3.1	Review SB Design-Fabrication Compatibility	40 days	Fri 9/13/19	Thu 11/7/19	$0	$0	MECHEN	$12,493	$12,493		.30	.30	0.09	$16,241
118	3.2.3.2.3.3.2	Hold SB Review (PRR)	15 days	Fri 9/13/19	Thu 10/3/19	$0	$0	MECHEN	$12,230	$12,230		.30	.30	0.09	$15,900
119	3.2.3.2.3.3.3	Tooling	20 days	Fri 10/4/19	Thu 10/31/19	$40,000	$40,000	MECHTE	$50,480	$90,480		.2	.2	0	$108,576
120	3.2.3.2.3.3.4	Procure SB Material	5 days	Fri 11/1/19	Thu 11/7/19	$75,940	$75,940	STAFFPH	$0	$75,940	LBNL	.30	.30	0.09	$98,722
121	3.2.3.2.3.3.5	Production & Test SB	21 days	Thu 12/5/19	Thu 1/2/20	$0	$0	MECHEN	$52,123	$52,123	LBNL	.30	.30	0.09	$67,760
122	3.2.3.2.3.3.6	Milestone: Complete SB	0 days	Thu 1/2/20	Thu 1/2/20	$0	$0		$0	$0	LBNL	0	0	0	$0
123	3.2.3.2.4	MVTX Final Design Review	12 days	Fri 10/4/19	Mon 10/21/19	$0	$10,000		$53,856	$63,856				0	$70,242
124	3.2.3.2.4.1	MVTX Design Review	2 days	Fri 10/4/19	Mon 10/7/19	$10,000	$10,000	MECHEN	$8,976	$18,976	ALL	.1	.1	0.09	$20,874
125	3.2.3.2.4.2	Incorporate review comments	9 days	Tue 10/8/19	Fri 10/18/19	$0	$0	MECHEN	$40,392	$40,392	ALL	.10	.10	0.09	$44,431
126	3.2.3.2.4.3	Complete Final Design	1 day	Mon 10/21/19	Mon 10/21/19	$0	$0	MECHEN	$4,488	$4,488	ALL	.10	.10	0.09	$4,937
127	3.2.3.3	Barrel Assembly	386 days	Fri 8/9/19	Fri 1/29/21	$0	$28,814		$193,777	$222,591				0	$303,311
128	3.2.3.3.1	Assembly and Testing	386 days	Fri 8/9/19	Fri 1/29/21	$0	$28,814		$193,777	$222,591				0	$303,311
129	3.2.3.3.1.1	Receive 1st batch Staves from CERN	1 day	Fri 8/9/19	Fri 8/9/19	$0	$0		$0	$0	LBNL	0	0	0	$0
130	3.2.3.3.1.2	Test and Rework 1st batch Staves	12 days	Mon 8/12/19	Tue 8/27/19	$0	$0	ELENG3_	$5,240	$5,240	LBNL	.30	.30	0.09	$6,812
131	3.2.3.3.1.3	Receive 2nd batch Staves from CER	1 day	Fri 11/8/19	Fri 11/8/19	$0	$0		$0	$0		.3	.3	0	$0
132	3.2.3.3.1.4	Test and Rework 2nd batch Staves	12 days	Mon 11/11/19	Tue 11/26/19	$0	$0		$0	$0		.3	.3	0	$0
133	3.2.3.3.1.5	Receive 3rd batch Staves from CERN	1 day	Fri 2/7/20	Fri 2/7/20	$0	$0		$0	$0		.3	.3	0	$0
134	3.2.3.3.1.6	Test and Rework 3rd batch Staves	12 days	Mon 2/10/20	Tue 2/25/20	$0	$0		$0	$0		.3	.3	0	$0
135	3.2.3.3.1.7	Receive 4th batch Staves from CERN	1 day	Fri 5/8/20	Fri 5/8/20	$0	$0		$0	$0		.3	.3	0	$0
136	3.2.3.3.1.8	Test and Rework 4th batch Staves	12 days	Mon 5/11/20	Tue 5/26/20	$0	$0		$0	$0		.3	.3	0	$0
137	3.2.3.3.1.9	Layer Assembly and Test	140 days	Mon 2/10/20	Fri 8/21/20	$0	$5,336		$68,670	$74,006	LBNL			0	$101,329
138	3.2.3.3.1.9.1	Test Installation of Staves onto Layer End-Wheels	20 days	Mon 2/10/20	Fri 3/6/20	$0	$0	MECHEN	$7,056	$7,056	LBNL	.35	.35	0.09	$9,526
139	3.2.3.3.1.9.2	Hold Half-Detector Assembly Review (PRR)	5 days	Mon 3/9/20	Fri 3/13/20	$0	$0	MECHEN	$2,672	$2,672	LBNL	.20	.20	0.09	$3,206
140	3.2.3.3.1.9.3	Install Staves Onto Layer End-Wheels To Form Layers	70 days	Mon 3/16/20	Fri 6/19/20	$2,760	$2,760	MECHEN	$33,656	$36,416	LBNL	.40	.40	0.09	$50,982
141	3.2.3.3.1.9.4	Test and Rework Layers After Assembly	30 days	Mon 6/22/20	Fri 7/31/20	$2,576	$2,576	ELENG3_	$14,278	$16,854	LBNL	.35	.35	0.09	$22,752
142	3.2.3.3.1.9.5	Perform Half-Detector Metrology On Layers	15 days	Mon 8/3/20	Fri 8/21/20	$0	$0	CMMTEC	$11,009	$11,009	LBNL	.35	.35	0.09	$14,862
143	3.2.3.3.1.9.6	Milestone: Complete Layers	0 days	Fri 8/21/20	Fri 8/21/20	$0	$0		$0	$0	LBNL	0	0	0.09	$0
144	3.2.3.3.1.10	Half Barrel #1 Assembly and Test	95 days	Mon 8/24/20	Fri 1/1/21	$0	$11,739		$59,660	$71,399	LBNL			0	$97,208
145	3.2.3.3.1.10.1	Assemble Layers and CYSS Into Half-Detector	20 days	Mon 8/24/20	Fri 9/18/20	$2,760	$2,760	ELENG3_	$13,624	$16,384	LBNL	.40	.40	0.09	$22,938
146	3.2.3.3.1.10.2	Test and Rework Half-Detector	30 days	Mon 9/21/20	Fri 10/30/20	$2,576	$2,576	ELENG3_	$18,995	$21,571	LBNL	.35	.35	0.09	$29,121
147	3.2.3.3.1.10.3	Perform Half-Detector Metrology On Final Assembly	10 days	Mon 11/2/20	Fri 11/13/20	$0	$0	CMMTEC	$8,120	$8,120	LBNL	.35	.35	0.09	$10,962
148	3.2.3.3.1.10.4	Validation Of Final Assembly	20 days	Mon 11/16/20	Fri 12/11/20	$2,576	$2,576	ELENG3_	$13,976	$16,552	LBNL	.35	.35	0.09	$22,345
149	3.2.3.3.1.10.5	Pack/Ship Final Assemblies To BN	15 days	Mon 12/14/20	Fri 1/1/21	$3,827	$3,827	MECHEN	$4,945	$8,772	LBNL	.35	.35	0.09	$11,843
150	3.2.3.3.1.11	Half Barrel #2 Assembly and Test	95 days	Mon 9/21/20	Fri 1/29/21	$0	$11,739		$60,206	$71,945	LBNL			0	$97,962
151	3.2.3.3.1.11.1	Assemble Layers and CYSS Into Half-Detector	20 days	Mon 9/21/20	Fri 10/16/20	$2,760	$2,760	ELENG3_	$13,965	$16,725	LBNL	.40	.40	0.09	$23,415
152	3.2.3.3.1.11.2	Test and Rework Half-Detector	30 days	Mon 10/19/20	Fri 11/27/20	$2,576	$2,576	ELENG3_	$19,200	$21,776	LBNL	.35	.35	0.09	$29,398
153	3.2.3.3.1.11.3	Perform Half-Detector Metrology On Final Assembly	10 days	Mon 11/30/20	Fri 12/11/20	$0	$0	CMMTEC	$8,120	$8,120	LBNL	.35	.35	0.09	$10,962
154	3.2.3.3.1.11.4	Validation Of Final Assembly	20 days	Mon 12/14/20	Fri 1/8/21	$2,576	$2,576	ELENG3_	$13,976	$16,552	LBNL	.35	.35	0.09	$22,345
155	3.2.3.3.1.11.5	Pack/Ship Final Assemblies To BN	15 days	Mon 1/11/21	Fri 1/29/21	$3,827	$3,827	MECHEN	$4,945	$8,772	LBNL	.35	.35	0.09	$11,843
156	3.2.3.3.1.11.6	Milestone: Complete Barrel (RR)	0 days	Fri 1/29/21	Fri 1/29/21	$0	$0		$0	$0	LBNL	0	0	0	$0
157	3.2.4	Integration and Infrastructure	1000 days	Mon 4/1/19	Fri 1/27/23	$0	$334,200		$636,593	$970,793				0	$1,344,995
158	3.2.4.1	Clean Tent/Room	100 days	Mon 4/1/19	Fri 8/16/19	$50,000	$50,000		$0	$50,000		.35	.35	0.09	$67,500
159	3.2.4.2	Cooling System	1000 days	Mon 4/1/19	Fri 1/27/23	$0	$87,000		$42,239	$129,239	MIT			0	$174,472
160	3.2.4.2.1	travel	1000 days	Mon 4/1/19	Fri 1/27/23	$25,000	$25,000		$0	$25,000		.35	.35	0.12	$33,750
161	3.2.4.2.2	Design (modify ALICE)	1 mon	Tue 10/22/19	Mon 11/18/19	$0	$0	PROF4_I	$21,304	$21,304		.35	.35	0.12	$28,760
162	3.2.4.2.3	Mock up Testing	3 wks	Tue 11/19/19	Mon 12/9/19	$20,000	$20,000	TECH4_I	$12,551	$32,551		.35	.35	0.12	$43,944
163	3.2.4.2.4	Final Design of Cooling System	5 days	Tue 12/10/19	Mon 12/16/19	$0	$0	PROF4_I	$6,720	$6,720		.35	.35	0.12	$9,072
164	3.2.4.2.5	Procure Cooling Plant	100 days	Fri 10/1/21	Thu 2/17/22	$40,000	$40,000	SCI3_Ins	$1,664	$41,664	MIT	.35	.35	0.12	$56,246
165	3.2.4.2.6	Ship to BNL	1 wk	Fri 2/18/22	Thu 2/24/22	$2,000	$2,000		$0	$2,000		.35	.35	0.12	$2,700
166	3.2.4.3	Safety Systems	724 days	Mon 4/1/19	Thu 1/6/22	$0	$35,200		$98,795	$133,995	MIT			0	$179,550
167	3.2.4.3.1	travel	700 days	Mon 4/1/19	Fri 12/3/21	$25,000	$25,000		$0	$25,000		.35	.35	0.12	$33,750

ID	WBS	Task Name	Duration	Start	Finish	Fixed Cost	Calculated Fixed Cost	Resource Names	Resource Costs	Cost	Institu	Mat con	Tota Con	Ove	cost+conting
168	3.2.4.3.2	Define MVTX Safety and Interlock requirements	2 wks	Tue 12/17/19	Mon 12/30/19	$0	$0	STAFFPH	$6,720	$6,720	LBNL	.35	.35	0.09	$9,072
169	3.2.4.3.3	review sensors & interlocks with BNL ES&H	10 days	Tue 12/31/19	Mon 1/13/20	$0	$0	PROF4_I	$6,720	$6,720	LBNL	.15	.15	0.09	$7,728
170	3.2.4.3.4	Design electronics safety system	5.14 wks	Tue 1/14/20	Tue 2/18/20	$0	$0	STAFFPH	$13,824	$13,824	MIT	.35	.35	0.09	$18,662
171	3.2.4.3.5	cooling interlocks design	30 days	Tue 2/18/20	Tue 3/31/20	$0	$0	PROF4_I	$20,160	$20,160	MIT	.35	.35	0.12	$27,216
172	3.2.4.3.6	Procure Safety Systems	8 wks	Fri 10/1/21	Thu 11/25/21	$10,000	$10,000	TECH4_I	$9,069	$19,069	MIT	.35	.35	0.12	$25,743
173	3.2.4.3.7	System test at MIT	3 wks	Fri 11/26/21	Thu 12/16/21	$0	$0	TECH4_I	$19,742	$19,742		.35	.35	0.12	$26,652
174	3.2.4.3.8	Ship to BNL	1 wk	Fri 12/17/21	Thu 12/23/21	$200	$200		$0	$200		.35	.35	0.12	$270
175	3.2.4.3.9	Test at BNL	2 wks	Fri 12/24/21	Thu 1/6/22	$0	$0	TECH4_I	$22,560	$22,560		.35	.35	0.12	$30,456
176	3.2.4.4	Stave Support Frame & MVTX Interface to sPHENIX	1000 days	Mon 4/1/19	Fri 1/27/23	$0	$162,000		$270,255	$432,255	LANL			0	$640,053
177	3.2.4.4.1	travel	1000 days	Mon 4/1/19	Fri 1/27/23	$20,000	$20,000		$0	$20,000		.1	.1	0.09	$22,000
178	3.2.4.4.2	Design Interface to sPHENIX	100 days	Mon 10/7/19	Fri 2/21/20	$0	$0	PROF4_I	$134,400	$134,400	MIT	.50	.50	0.09	$201,600
179	3.2.4.4.3	FEA,Thermal,stress analysis	50 days	Mon 5/4/20	Fri 7/10/20	$0	$0	PROF4_I	$67,200	$67,200	MIT	.50	.50	0.09	$100,800
180	3.2.4.4.4	design iinsertion system	10 wks	Mon 2/24/20	Fri 5/1/20	$0	$0	PROF4_I	$67,200	$67,200		.50	.50	0.09	$100,800
181	3.2.4.4.5	procure support structure	8 wks	Mon 2/24/20	Fri 4/17/20	$100,000	$100,000	TECH4_I	$629	$100,629		.50	.50	0.09	$150,944
182	3.2.4.4.6	Procure insertion system	8 wks	Mon 5/4/20	Fri 6/26/20	$40,000	$40,000	TECH4_I	$629	$40,629		.50	.50	0.09	$60,944
183	3.2.4.4.7	ship to BNL	0.1 wks	Mon 6/29/20	Mon 6/29/20	$2,000	$2,000	TECH4_I	$197	$2,197		.35	.35	0.09	$2,965
184	3.2.4.5	Half detector Assembly Readout and Cooling Test at BNL	781.34 days	Wed 6/5/19	Thu 6/2/22	$0	$0		$56,496	$56,496				0	$76,269
185	3.2.4.5.1	Test Half Barrel #1	15 days	Mon 1/4/21	Fri 1/22/21	$0	$0	MECHEN	$6,144	$6,144	LBNL	.35	.35	0.09	$8,294
186	3.2.4.5.2	Test Half Barrel #2	15 days	Mon 2/1/21	Fri 2/19/21	$0	$0	MECHEN	$6,144	$6,144	LBNL	.35	.35	0.09	$8,294
187	3.2.4.5.3	Assemble & Test Cooling System at BI	10 days	Fri 2/25/22	Thu 3/10/22	$0	$0	TECH4_I	$15,440	$15,440	MIT	.35	.35	0.12	$20,844
188	3.2.4.5.4	Complete System Test at BNL	3 mons	Fri 3/11/22	Thu 6/2/22	$0	$0	SCI3_Ins	$0	$0		0	0	0.09	$0
189	3.2.4.5.5	test RU at BNL	0.8 wks	Mon 9/30/19	Thu 10/3/19	$0	$0	SCI3_Ins	$12,540	$12,540	LANL	.35	.35	0.09	$16,929
190	3.2.4.5.6	test FELIX at BNL	0.8 wks	Wed 7/8/20	Tue 7/14/20	$0	$0	SCI3_Ins	$12,608	$12,608	LANL	.35	.35	0.09	$17,021
191	3.2.4.5.7	PS tests at BNL	0.5 wks	Wed 6/5/19	Mon 6/10/19	$0	$0	POSTD_I	$3,620	$3,620	LBNL	.35	.35	0.09	$4,887
192	3.2.4.6	Installation and Commissioning	484 days	Mon 2/22/21	Thu 12/29/22	$0	$0		$168,808	$168,808				0	$207,151
193	3.2.4.6.1	Installation Prep	10 days	Mon 2/22/21	Fri 3/5/21	$0	$0	Mech Tec	$15,520	$15,520	ALL	.35	.35	0.09	$20,952
194	3.2.4.6.2	Installation Review	1 day	Mon 3/8/21	Mon 3/8/21	$0	$0	Physicist	$2,320	$2,320	ALL	.10	.10	0.09	$2,552
195	3.2.4.6.3	Install FELIX	2 days	Tue 3/9/21	Wed 3/10/21	$0	$0	SCI3_Ins	$5,168	$5,168		.35	.35	0.09	$6,977
196	3.2.4.6.4	Install Optical fibers	1 wk	Thu 3/11/21	Wed 3/17/21	$0	$0	TECH4_I	$8,120	$8,120		.35	.35	0.09	$10,962
197	3.2.4.6.5	Install RU	1 wk	Thu 3/18/21	Wed 3/24/21	$0	$0	SCI3_Ins	$19,320	$19,320		.35	.35	0.09	$26,082
198	3.2.4.6.6	Install Samtec Cables	1 wk	Thu 3/25/21	Wed 3/31/21	$0	$0	TECH4_I	$8,120	$8,120		.35	.35	0.09	$10,962
199	3.2.4.6.7	Electronics Integration (sPHENIX FELIX support)	3 mons	Thu 4/1/21	Wed 6/23/21	$0	$0	Physicist	$0	$0		.3	.3	0	$0
200	3.2.4.6.8	Install Half-Barrel 1	1 mon	Fri 7/1/22	Thu 7/28/22	$0	$0	MECHTE	$26,320	$26,320		.35	.35	0.09	$35,532
201	3.2.4.6.9	Install Half-Barrel 2	1 mon	Fri 7/29/22	Thu 8/25/22	$0	$0	MECHTE	$26,320	$26,320		.35	.35	0.09	$35,532
202	3.2.4.6.10	Commissioning	90 days	Fri 8/26/22	Thu 12/29/22	$0	$0	Physicist	$57,600	$57,600		0	0	0.09	$57,600
203	3.2.5	Ready for beam	0 days	Thu 12/29/22	Thu 12/29/22	$0	$0		$0	$0		0	0	0	$0