

ID	WBS	Task Name	Duration	Start	Finish	Cost Center	Fixed Cost	Cost	Activi	Cost per Unit	Resource Cost	Total Cost + Contingency												
1		1 MAPS Inner Barrel	1217 days	Mon 10/3/16	Tue 6/1/21		\$0.00	\$4,895,314.00		\$0.00	\$2,321,204.00	\$0.00		Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	2017	2018	
2	1.1	MAPS Inner Barrel Starts	0 days	Sat 10/1/16	Sat 10/1/16		\$0.00	\$0.00		\$0.00	\$0.00	\$0.00		10/1										
3	1.2	MAPS Inner Barrel Ends	0 days	Tue 6/1/21	Tue 6/1/21		\$0.00	\$0.00		\$0.00	\$0.00	\$0.00												
4	1.3	Milestones & Key Tasks	0 days	Mon 10/3/16	Mon 10/3/16		\$0.00	\$0.00		\$0.00	\$0.00	\$0.00		10/3										
5	1.3.1	ALICE ITS Key Tasks	0 days	Mon 1/2/17	Mon 1/2/17		\$0.00	\$0.00		\$0.00	\$0.00	\$0.00			1/2									
6	1.3.1.1	ALICE MAPS Production (7/17)	240 days?	Mon 8/1/16	Fri 6/30/17		\$0.00	\$0.00		\$0.00	\$0.00	\$0.00												
7	1.3.1.2	ALICE ITS IB FPC Production (9/17)	90 days	Mon 5/1/17	Fri 9/1/17		\$0.00	\$0.00		\$0.00	\$0.00	\$0.00												
8	1.3.1.3	ALICE ITS IB Stave Production (1/18)	1 day?	Tue 1/2/18	Tue 1/2/18		\$0.00	\$0.00		\$0.00	\$0.00	\$0.00												
9	1.3.1.4	ALICE ITS IB Stave Assembly (3/18)	262 days	Mon 1/2/17	Tue 1/2/18		\$0.00	\$0.00	ITS c	\$0.00	\$0.00	\$0.00												
10	1.3.1.5	ALICE ITS Electronics Pre-Production (7/17)	100 days	Wed 2/22/17	Tue 7/11/17		\$0.00	\$0.00	ITS E	\$0.00	\$0.00	\$0.00												
11	1.3.1.6	ALICE ITS Electronics Production (6/18)	240 days	Thu 7/13/17	Wed 6/13/18		\$0.00	\$0.00	ITS E	\$0.00	\$0.00	\$0.00												
12	1.3.2	sPHENIX Milestones	1195 days	Tue 11/1/16	Tue 6/1/21		\$0.00	\$0.00		\$0.00	\$0.00	\$0.00												
13	1.3.2.1	sPHENIX Technical Design CD-0	0 days	Tue 11/1/16	Tue 11/1/16		\$0.00	\$0.00	CD-0	\$0.00	\$0.00	\$0.00												
14	1.3.2.2	sPHENIX Technical Design (CD-1/CD-3a)	0 days	Wed 11/1/17	Wed 11/1/17		\$0.00	\$0.00	CD-1	\$0.00	\$0.00	\$0.00												
15	1.3.2.3	sPHENIX Technical Dewsgin (CD-2)	0 days	Mon 7/2/18	Mon 7/2/18		\$0.00	\$0.00	CD-2	\$0.00	\$0.00	\$0.00												
16	1.3.2.4	sPHENIX Start Construction (CD-3b)	0 days	Wed 8/1/18	Wed 8/1/18		\$0.00	\$0.00	CD-3	\$0.00	\$0.00	\$0.00												
17	1.3.2.5	sPHENIX Installed and Ready for Beam	0 days	Tue 6/1/21	Tue 6/1/21		\$0.00	\$0.00	ready	\$0.00	\$0.00	\$0.00												
18	1.3.3	LDRD Milestones & Critical Tasks	781 days	Mon 10/3/16	Mon 9/30/19		\$0.00	\$0.00		\$0.00	\$0.00	\$0.00												
19	1.3.3.1	LDRD Start and End	781 days	Mon 10/3/16	Mon 9/30/19		\$0.00	\$0.00		\$0.00	\$0.00	\$0.00												
20	1.3.3.8	Complete MoU LANL-ALICE	0 days	Fri 12/9/16	Fri 12/9/16		\$0.00	\$0.00		\$0.00	\$0.00	\$0.00												
21	1.3.3.3	Setup ALICE Readout Test Stands	0 days	Fri 2/17/17	Fri 2/17/17		\$0.00	\$0.00		\$0.00	\$0.00	\$0.00												
22	1.3.3.4	Complete final sPHENIX Readout Design Review	0 days	Wed 7/26/17	Wed 7/26/17		\$0.00	\$0.00		\$0.00	\$0.00	\$0.00												
23	1.3.3.5	Complete Final MAPS Detector Design (CD-1)	0 days	Thu 11/16/17	Thu 11/16/17		\$0.00	\$0.00		\$0.00	\$0.00	\$0.00												
24	1.3.3.6	sPHENIX Test Beam	21 days	Fri 2/1/19	Fri 3/1/19	LDRD	\$0.00	\$0.00		\$0.00	\$0.00	\$0.00												
25	1.3.3.7	MAPS Final Design (CD-2/CD-3)?	0 days	Mon 10/3/16	Mon 10/3/16		\$0.00	\$0.00		\$0.00	\$0.00	\$0.00												
26	1.4	LANL LDRD	781 days	Mon 10/3/16	Mon 9/30/19	LDRD	\$0.00	\$1,601,852.00	LANL	\$0.00	\$1,325,452.00	\$0.00												
27	1.4.1	MOU btw LANL and ALICE for R&D	50 days	Mon 10/3/16	Fri 12/9/16	LDRD	\$0.00	\$18,400.00		\$0.00	\$18,400.00	\$57,960.00												
28	1.4.2	Obtain Designs from ALICE	1 day	Mon 10/3/16	Mon 10/3/16		\$0.00	\$2,760.00		\$0.00	\$2,760.00	\$0.00												
29	1.4.2.1	Obtain Test Stand Design from CERN	1 day	Mon 10/3/16	Mon 10/3/16	LDRD	\$0.00	\$920.00		\$0.00	\$920.00	\$2,898.00												
30	1.4.2.2	Obtain ALICE Readout Unit Design	1 day	Mon 10/3/16	Mon 10/3/16	LDRD	\$0.00	\$920.00		\$0.00	\$920.00	\$2,898.00												
31	1.4.2.3	obtain ALICE CAD model	1 day	Mon 10/3/16	Mon 10/3/16	LDRD	\$0.00	\$920.00	ALICE	\$0.00	\$920.00	\$2,898.00												
32	1.4.3	Setup Alice Readout Test Stand	100 days	Mon 10/3/16	Fri 2/17/17	LDRD	\$0.00	\$52,856.00		\$0.00	\$17,856.00	\$0.00												
33	1.4.3.1	Procure 2 Test Stands	90 days	Mon 10/3/16	Fri 2/3/17	LDRD	\$30,000.00	\$34,656.00		\$15,000.00	\$4,656.00	\$67,166.40												
34	1.4.3.2	Setup Test Stands	10 days	Mon 2/6/17	Fri 2/17/17	LDRD	\$5,000.00	\$18,200.00		\$0.00	\$13,200.00	\$50,330.00												
35	1.4.4	Procure R&D ALICE Staves	180 days	Mon 12/12/16	Fri 8/18/17	LDRD	\$0.00	\$205,360.00		\$0.00	\$123,360.00	\$0.00												
36	1.4.4.1	Procure and Produce 4 Staves	60 days	Mon 12/12/16	Fri 3/3/17	LDRD	\$55,000.00	\$170,200.00		\$13,750.00	\$115,200.00	\$459,130.00												
37	1.4.4.2	Test Staves	5 days	Mon 2/27/17	Fri 3/3/17	LDRD	\$0.00	\$8,160.00		\$0.00	\$8,160.00	\$25,704.00												
38	1.4.4.3	Travel and Per Diem Support	180 days	Mon 12/12/16	Fri 8/18/17	LDRD	\$27,000.00	\$27,000.00		\$0.00	\$0.00	\$47,250.00												
39	1.4.5	Procure ALICE Electronics & Cabels	116 days	Mon 10/3/16	Mon 3/13/17	LDRD	\$0.00	\$85,248.00		\$0.00	\$30,848.00	\$0.00												
40	1.4.5.1	ALICE Readout Electronics Boards	65 days	Tue 12/13/16	Mon 3/13/17		\$0.00	\$34,520.00		\$0.00	\$19,520.00	\$0.00												
41	1.4.5.1.1	Readout Units (RDOs)	65 days	Tue 12/13/16	Mon 3/13/17		\$0.00	\$17,640.00		\$0.00	\$12,640.00	\$0.00												
42	4.5.1.1.1	Procure 4 RDOs	60 days	Tue 12/13/16	Mon 3/6/17	LDRD	\$5,000.00	\$8,600.00		\$1,250.00	\$3,600.00	\$20,090.00												
43	4.5.1.1.2	Test RDOs	10 days	Tue 2/28/17	Mon 3/13/17	LDRD	\$0.00	\$9,040.00		\$0.00	\$9,040.00	\$28,476.00												
44	1.4.5.1.2	Common Readout Units (CRUs)	65 days	Tue 12/13/16	Mon 3/13/17		\$0.00	\$16,880.00		\$0.00	\$6,880.00	\$0.00												
45	4.5.1.2.1	Procure 2 CRUs	60 days	Tue 12/13/16	Mon 3/6/17	LDRD	\$10,000.00	\$11,440.00		\$5,000.00	\$1,440.00	\$22,036.00												
46	4.5.1.2.2	Test CRUs	5 days	Tue 3/7/17	Mon 3/13/17	LDRD	\$0.00	\$5,440.00		\$0.00	\$5,440.00	\$17,136.00												
47	1.4.5.2	SamTec Cables	11 days	Mon 10/3/16	Mon 10/17/16		\$0.00	\$3,200.00		\$0.00	\$1,200.00	\$0.00												
48	1.4.5.2.1	Procure 7 SamTec Cables	10 days	Mon 10/3/16	Fri 10/14/16	LDRD	\$2,000.00	\$2,600.00		\$285.00	\$600.00	\$5,390.00												
49	1.4.5.2.2	Test Cables	1 day	Mon 10/17/16	Mon 10/17/16	LDRD	\$0.00	\$600.00		\$0.00	\$600.00	\$1,890.00												
50	1.4.5.3	Optical Cables	11 days	Tue 10/4/16	Tue 10/18/16		\$0.00	\$1,000.00		\$0.00	\$600.00	\$0.00												
51	1.4.5.3.1	Procure 4 Optical Cables	10 days	Tue 10/4/16	Mon 10/17/16	LDRD	\$400.00	\$640.00		\$100.00	\$240.00	\$1,456.00												
52	1.4.5.3.2	Test Optical Cables	1 day	Tue 10/18/16	Tue 10/18/16	LDRD	\$0.00	\$360.00		\$0.00	\$360.00	\$1,134.00												
53	1.4.5.4	Procure Ancillaries	64 days	Tue 10/4/16	Fri 12/30/16	LDRD	\$0.00	\$46,528.00		\$0.00	\$9,528.00	\$0.00												

ID	WBS	Task Name	Duration	Start	Finish	Cost Center	Fixed Cost	Cost	Activi	Cost per Unit	Resource Cost	Total Cost + Contingency	Qtr 4	2017					2018		
														Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	
158	.5.5.2.2.7	Procure Cooling Plant	100 days	Wed 8/1/18	Tue 12/18/18		\$40,000.00	\$41,552.00		\$0.00	\$1,552.00	\$74,888.80									
159	.5.5.2.2.8	Procure Assembly Fixtures & Jigs	60 days	Thu 8/2/18	Wed 10/24/18		\$100,000.00	\$100,931.20		\$0.00	\$931.20	\$177,933.28									
160	.5.5.2.2.9	Procure End Wheels	100 days	Fri 8/3/18	Thu 12/20/18		\$34,000.00	\$35,552.00		\$0.00	\$1,552.00	\$64,388.80									
161	.5.5.2.2.10	Procure Cylindrical Structural Shells	100 days	Mon 8/6/18	Fri 12/21/18		\$11,000.00	\$12,552.00		\$0.00	\$1,552.00	\$24,138.80									
162	.5.5.2.2.11	Procure Detector Half Barrels	100 days	Tue 8/7/18	Mon 12/24/18		\$13,000.00	\$14,552.00		\$0.00	\$1,552.00	\$27,638.80									
163	.5.5.2.2.12	Procure Service Half Barrels	100 days	Wed 8/8/18	Tue 12/25/18		\$120,000.00	\$121,552.00		\$0.00	\$1,552.00	\$214,888.80									
164	.5.5.2.2.13	Procure Detector and Service Half Barrels	100 days	Thu 8/9/18	Wed 12/26/18		\$21,000.00	\$22,552.00		\$0.00	\$1,552.00	\$41,638.80									
165	.5.5.2.2.14	Procure Two Half Support Structures	100 days	Fri 8/10/18	Thu 12/27/18		\$50,000.00	\$51,552.00		\$0.00	\$1,552.00	\$92,388.80									
166	1.5.5.3	Assembly and Testing at BNL	400 days	Wed 12/19/18	Tue 6/30/20		\$0.00	\$206,544.00		\$0.00	\$206,544.00	\$0.00									
167	1.5.5.3.1	Test Production FEMS, e-Links, CRU, LV, optical links	60 days	Tue 12/25/18	Mon 3/18/19		\$0.00	\$13,968.00		\$0.00	\$13,968.00	\$43,999.20									
168	1.5.5.3.2	Assemble & Test Cooling System	20 days	Wed 12/19/18	Tue 1/15/19		\$0.00	\$7,760.00		\$0.00	\$7,760.00	\$24,444.00									
169	1.5.5.3.3	Stave Reciept Inspection	10 days	Wed 4/10/19	Tue 4/23/19		\$0.00	\$3,880.00		\$0.00	\$3,880.00	\$12,222.00									
170	1.5.5.3.4	Individual Stave Readout Test	70 days	Wed 4/24/19	Tue 7/30/19		\$0.00	\$10,864.00		\$0.00	\$10,864.00	\$34,221.60									
171	1.5.5.3.5	Metrology on Stave Assemblies	70 days	Wed 7/31/19	Tue 11/5/19		\$0.00	\$41,720.00		\$0.00	\$41,720.00	\$131,418.00									
172	1.5.5.3.6	Assemble full Ladders into Half support	100 days	Wed 11/6/19	Tue 3/24/20		\$0.00	\$24,832.00		\$0.00	\$24,832.00	\$78,220.80									
173	1.5.5.3.7	Metrology on Final Assembly	10 days	Wed 3/25/20	Tue 4/7/20		\$0.00	\$10,400.00		\$0.00	\$10,400.00	\$32,760.00									
174	1.5.5.3.8	Half detector Assembly Readout and Cooling Test	60 days	Wed 4/8/20	Tue 6/30/20		\$0.00	\$93,120.00		\$0.00	\$93,120.00	\$293,328.00									
175	1.5.6	Installation	131 days	Wed 7/1/20	Wed 12/30/20		\$0.00	\$250,400.00		\$0.00	\$250,400.00	\$0.00									
176	1.5.6.1	Installation Prep	10 days	Wed 7/1/20	Tue 7/14/20		\$0.00	\$15,520.00		\$0.00	\$15,520.00	\$48,888.00									
177	1.5.6.2	Installation Review	1 day	Wed 7/15/20	Wed 7/15/20		\$0.00	\$2,080.00		\$0.00	\$2,080.00	\$6,552.00									
178	1.5.6.3	Installation	60 days	Thu 7/16/20	Wed 10/7/20		\$0.00	\$186,240.00		\$0.00	\$186,240.00	\$586,656.00									
179	1.5.6.4	Commissioning	60 days	Thu 10/8/20	Wed 12/30/20		\$0.00	\$46,560.00		\$0.00	\$46,560.00	\$146,664.00									
180	1.5.7	Ready for beam	0 days	Wed 12/30/20	Wed 12/30/20		\$0.00	\$0.00		\$0.00	\$0.00	\$0.00									

ID	WBS	Task Name	Duration	Start	Finish	18		2019				2020				2021			
						Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4
54	1.4.5.4.1	Procure LV,HV,etc	60 days	Tue 10/4/16	Mon 12/26/16														
55	1.4.5.4.2	Procure Racks	60 days	Thu 10/6/16	Wed 12/28/16														
56	1.4.5.4.3	Procure Chiller	60 days	Mon 10/10/16	Fri 12/30/16														
57	1.4.6	sPHENIX Readout Electronics Integration	270 days	Tue 10/4/16	Mon 10/16/17														
58	1.4.6.1	Initial sPHENIX Readout Design (sCRU, modified from ALICE)	40 days	Tue 10/4/16	Mon 11/28/16														
59	1.4.6.2	Prototype sCRU	60 days	Tue 11/29/16	Mon 2/20/17	neer[10%],LDRD Physicist[20%]													
60	1.4.6.3	sCRU test-I	5 days	Tue 2/21/17	Mon 2/27/17	%],LDRD Electronics Tech[20%],LDRD Physicist[20%]													
61	1.4.6.4	Revised sCRU Design	20 days	Tue 2/28/17	Mon 3/27/17														
62	1.4.6.5	Prototype sCRU-II	60 days	Tue 3/28/17	Mon 6/19/17	PostDoc[20%]													
63	1.4.6.6	sCRU test-II	5 days	Tue 6/20/17	Mon 6/26/17	DRD Electronics Tech[20%],LDRD PostDoc[50%]													
64	1.4.6.7	Final sPHENIX Readout Design (CD-1)	10 days	Mon 6/26/17	Mon 7/10/17														
65	1.4.6.8	Procure 4 sCRUs	60 days	Tue 7/11/17	Mon 10/2/17	h[5%]													
66	1.4.6.9	Final sCRU Test	10 days	Tue 10/3/17	Mon 10/16/17	ngineer[30%],LDRD Physicist[20%],LDRD PostDoc[30%],LDRD Electronics Tech[20%]													
67	1.4.7	sPHENIX DAQ System Integration	70 days	Tue 11/29/16	Mon 3/6/17														
68	1.4.7.1	Slow Control Design	60 days	Tue 11/29/16	Mon 2/20/17	20%],LDRD Electronics Engineer[20%]													
69	1.4.7.2	Trigger Interface Design	60 days	Tue 12/6/16	Mon 2/27/17	RD Physicist[10%]													
70	1.4.7.3	DAQ Interface Design	60 days	Tue 12/13/16	Mon 3/6/17														
71	1.4.8	Electronics Final Design Review	12 days	Tue 7/11/17	Wed 7/26/17														
72	1.4.8.1	Electronics Design Review	1 day	Tue 7/11/17	Tue 7/11/17	Physicist													
73	1.4.8.2	Incorporate Review Comments	10 days	Wed 7/12/17	Tue 7/25/17	ctronics Engineer[30%]													
74	1.4.8.3	Complete Final Electronics Design	1 day	Wed 7/26/17	Wed 7/26/17														
75	1.4.9	Mechanical Support and Cooling	160 days	Tue 10/4/16	Mon 5/15/17														
76	1.4.9.1	Specifications	60 days	Tue 10/4/16	Mon 12/26/16														
77	1.4.9.1.1	Review & Simulate Heat Load	40 days	Tue 10/4/16	Mon 11/28/16	stDoc[20%]													
78	1.4.9.1.2	review mechanical tolerances/distortions	10 days	Tue 11/29/16	Mon 12/12/16														
79	1.4.9.1.3	review disassembly/repair options	10 days	Tue 12/13/16	Mon 12/26/16														
80	1.4.9.2	Prototype Stave Frame Design	20 days	Tue 12/27/16	Mon 1/23/17	DRD Mechanical Tech [30%]													
81	1.4.9.3	Safety Systems	60 days	Tue 2/21/17	Mon 5/15/17														
82	1.4.9.3.1	review sensors & interlocks	20 days	Tue 2/21/17	Mon 3/20/17														
83	1.4.9.3.2	electrical interlock design	20 days	Tue 3/21/17	Mon 4/17/17														
84	1.4.9.3.3	cooling interlocks design	20 days	Tue 4/18/17	Mon 5/15/17														
85	1.4.9.4	Cooling System	20 days	Tue 1/24/17	Mon 2/20/17														
86	1.4.9.4.1	Prototype Design (modify ALICE)	10 days	Tue 1/24/17	Mon 2/6/17														
87	1.4.9.4.2	Mock up Testing	10 days	Tue 2/7/17	Mon 2/20/17	DRD PostDoc[50%]													
88	1.4.9.5	Stave Assembly Tooling	60 days	Tue 2/7/17	Mon 5/1/17														
89	1.4.9.5.1	Jig Design (modify ALICE)	10 days	Tue 2/7/17	Mon 2/20/17	%]													
90	1.4.9.5.2	Prototype Jigs	30 days	Tue 2/21/17	Mon 4/3/17	%]													
91	1.4.9.5.3	Final Jigs Design and Production	20 days	Tue 4/4/17	Mon 5/1/17	chnical Tech [30%]													
92	1.4.10	Mechanical Coneptual Design Review	12 days	Tue 5/23/17	Wed 6/7/17														
93	1.4.10.1	Mechanics Design Review	1 day	Tue 5/23/17	Tue 5/23/17	cist													
94	1.4.10.2	Incorporate Review Comments	10 days	Wed 5/24/17	Tue 6/6/17	Physicist[50%]													
95	1.4.10.3	Complete Mechanical Conceptual Design (for CD-1)	1 day	Wed 6/7/17	Wed 6/7/17														
96	1.4.11	MAPS Inner Barrel Review (CD-1)	12 days	Wed 11/1/17	Thu 11/16/17														
97	1.4.11.1	Final Design Review	1 day	Wed 11/1/17	Wed 11/1/17	Engineer,LDRD Mechanical Engineer ,LDRD Physicist													
98	1.4.11.2	Incorporate Review Comments	10 days	Thu 11/2/17	Wed 11/15/17	s Engineer[50%],LDRD Mechanical Engineer [50%],LDRD Physicist[50%]													
99	1.4.11.3	Complete Final CD-1 MAPS Design	1 day	Thu 11/16/17	Thu 11/16/17														
100	1.4.12	Prototype Assembly and Test	50 days	Tue 3/14/17	Mon 5/22/17														
101	1.4.12.1	Assemble prototype	30 days	Tue 3/14/17	Mon 4/24/17	al Tech [20%],LDRD Physicist[10%],LDRD PostDoc[20%]													
102	1.4.12.2	Prototype Full System Test	20 days	Tue 4/25/17	Mon 5/22/17	RD PostDoc[30%],LDRD Electronics Engineer[10%],LDRD Mechanical Engineer [10%]													
103	1.4.13	Software Development	300 days	Tue 10/4/16	Mon 11/27/17														
104	1.4.13.1	Online Monitoring and Contorls	100 days	Tue 10/4/16	Mon 2/20/17	50%]													
105	1.4.13.2	Offline Software and Analysis	200 days	Tue 2/21/17	Mon 11/27/17	[30%],LDRD Physicist[10%],Physicist[50%]													
106	1.4.14	Detector Optimizaation and Physics Simulations (CD-1)	300 days	Mon 10/3/16	Fri 11/24/17	[50%],LDRD PostDoc[50%]													



