MVTX Proposal Status and Plan

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1/26/2018 sPHENIX General Meeting

- Proposal submission plan
- Funding path

MVTX Proposal Status & Plan

- Received extensive and very good comments and suggestions from the collaboration, thanks!
 - MVTX group has been updating the proposal since 1/16/2018.
 - Plan is to complete the full proposal by early next week.
 - Address the comments received from the collaboration
 - Final edit, Jan 26 ~ Jan 30
 - Send it to ALD ~Jan 31, 2018
- Propose to submit a modified version of this proposal (remove most of the cost & schedule discussions) to arXiv for record and future reference
 - Collaboration review of modified proposal, ~March?
 - Submission: ~March/April 2018?
- Comments & responses summary doc:

https://docs.google.com/document/d/1CruOsS4g4U2VWMVbF8F2IkDP2H2WSqjR 818_OIhVynI/edit#heading=h.s87340nqkunh

• MVTX full proposal link:

https://www.overleaf.com/10919417bwssgrhhgryc#/41088600/

MVTX Funding News

Email from Gunther and Dave to collaboration on 1/21/2018,

Dear Colleagues,

Last weekend the project and co-spokespeople were notified by the ALD Berndt Mueller about a recent communication from the DOE office of nuclear science in response to the MVTX preproposal submitted last year. We met with the ALD last Wednesday, and discussed what we learned with the MVTX management team on Thursday and Friday. A summary can be found in a presentation prepared for Friday's biweekly MVTX meeting:

https://indico.bnl.gov/conferenceDisplay.py?confld=4114

The message from DOE is that while they "appreciate the compelling science this instrument could enable and why it is considered very important to the sPHENIX experiment by the collaboration" they unfortunately "do not foresee at this time that we would be able to identify new DOE funding for the purpose of implementing the MVTX". DOE "very much appreciate and encourage efforts to secure" international contributions to sPHENIX to implement elements of the detector that can not be funded with the RHIC budget constraints.

Please see the presentation for further details and first thoughts on how to proceed.

As before, we remain fully committed to building a detector that delivers the full sPHENIX physics program. While the DOE budget developments narrow our path to achieving this goal, there are other options available, in particular in regards to non-US sPHENIX institutions able and willing to contribute to the MVTX project. We will have further discussions involving project and BNL management in the near future. We will also have a brainstorming session at next week's general meeting, and are planning to call an EC meeting for further discussion.

Best,

Gunther and Dave

Active follow up discussions on alternative funding path and project planning

- MVTX project weekly meeting 1/23/2018, Maria, Bob, Grazyna and Ming
 - Discussed inputs from Berndt:
 - Berndt has requested to have the proposal by the end of January;
 - Even if no additional funds expected from DOE at this time, DOE would allow us to proceed with the construction of the MVTX if financially feasible as the scientific case is compelling
 - Actively seek non-DOE contributions
 - Agreed to complete MVTX full proposal as planned, and send it to ALD by 1/31.
 - Try to have all comments/updates implemented by Monday
 - MVTX group actively working with sPHENIX and BNL management to develop "Plan-B"
- A meeting to discuss possible foreign contributions and "Plan-B", 1/25/2018, Gunther, Dave, Nu and Ming
 - Foreign contributions, direct and indirect ones to generate cash for MVTX
 - Chinese consortium on EMcal contribution, CCNU to work on stave production and assembly etc.
 - CCNU can provide "free" student/technician/engineer labors and lab space, and cover travels but hard to pay for materials
 - Possible savings from sPHENIX baseline contingency, HCal steel procurement etc.
 - Further exploring cost reduction options for MVTX
 - Physics priority in 2016 de-scoping exercise, the collaboration determined keeping MVTX physics in the program is more important than to recover other de-scoped subsystems.

MVTX Major Cost Items

WBS	Task Name	Cost (K)	Cost with Contingency+ Passthru (K)
1.5.3.1.1	Produce 84 staves	\$966	\$1337
1.5.2.2	Readout Units(RDO)	\$480	\$664
1.5.5.3.2.3.2	CYSS Cylindical Structure	\$319	\$424
1.5.5.3.2.3.3	COSS Conical Half Shell	\$329	\$438
1.5.4.3	Safety Systems	\$139	\$191
1.5.4.4	Stave Support+ Global Interface	\$308	\$465

Table 6: Major Cost Items

Major Items	Cost w/ 35%Cont. (\$M)	Schedule
Staves (WBS 1.5.3.1)	1.3	8/2018-5/2019
Readout & Controls (WBS 1.5.2)	1.3	1/2019-6/2019
Mechanics & Detector Assembly (WBS 1.5.3)	1.8	2019-2022, TBO
Integration (WBS 1.5.4)	1.0	2021-2022, TBO
Project Management	1.0	8/2018-1/2023

Time Sensitive Items: ~1.5M

• Stave production @CERN: 1.3M (w/ 35% contin.)

- 0.97M(quote from ALICE, \$11.5K/stave x84)
- Cost & technical risk reduction
- Two-step in procurement?
 - 48+20%, in FY18/19 (700K)
 - Rest comes later (300K)
- Readout Unit: 0.66M

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- 0.48M (best estimate, paid for RUv1.0, 58RUs)
- Cost reduction (~50%) through ALICE mass production
- Saving from sPHENIX contingency? Non-DOE contribution?
- MVTX has a large schedule contingency: > 1 year
 - New funds could come in later ... Foreign, non-DOE/US and DOE



sPHENIX MVTX Cost Profile

Figure 42: MVTX Funding Profile.

Major Items	Cost (\$M)	Schedule
Staves (WBS 1.5.3.1)	1.3	8/2018-5/2019
Readout & Controls (WBS 1.5.2)	1.3	1/2019-6/2019
Mechanics & Detector Assembly (WBS 1.5.3) CCN	U? 1.8	2019-2022, TBO
Integration (WBS 1.5.4)	1.0	2021-2022, TBO
Project Management	1.0	8/2018-1/2023

Labor Cost Profile in the Current Proposal

- Physicists and students/postdocs are not costed
- Engineers & Technicians are costed in the project
 - Could some covered by institution's base program?
 - More "in kind" contribution to reduce project management cost (Engineers & Physicists)





11/	29	/2017			NUM IN STREET		_M&S	Labo			13 (DM - 31 (
125	+	4.5	MVTY Broject	1129 days	Mon 9/2/49	Thu 12/20/22 \$0	C 047 240	1 990 411	\$202,200	C 2C4 244	\$C 522 449
126		1.5.1	MVTX Project Management	774 days	Mon 10/1/18	Thu 9/16/21 \$0	\$322.842	\$399,158	\$722.000 LANL	\$957,200	\$981,130
127		1.5.1.1	Milestone Start MVTX	0 days	Mon 10/1/18	Mon 10/1/18 \$0	\$0	\$0	\$0	0 0 \$0	50
128		1.5.1.2	lead Coordinator	774 days	Mon 10/1/18	Thu 9/16/21 \$272.842	\$272.842	\$0	\$272.842	.35.35\$368.337	\$377.545
129		1.5.1.3	Project Manager	774 days	Mon 10/1/18	Thu 9/16/21 \$0	\$0	\$311,214	\$311,214	35.35\$420.138	\$430.642
130		1.5.1.4	Mechanical Integration	774 days	Mon 10/1/18	Thu 9/16/21 \$0	\$0	\$43,972	\$43,972	.35.35\$59,362	\$60,846
	-		Engineer	-		-	-				
131	4	1.5.1.5	Electronics Integration Engineer	774 days	Mon 10/1/18	Thu 9/16/21 \$0	\$0	\$43,972	\$43,972	.35.35\$59,362	\$60,846
132	*	1.5.1.6	Travel	342 days	Mon 10/1/18	Tue 1/21/20 \$50,000	\$50,000	\$0	\$50,000	0 0 \$50,000	\$51,250
133	4	1.5.2	Electronics	492 days	Mon 10/1/18	Tue 8/18/20 \$0	\$771,030	\$171,950	\$942,980 LANL	\$1,269,971	\$1,301,720
134	4	1.5.2.1	Stave Extension Cable	122 days	Wed 9/4/19	Thu 2/20/20 \$0	\$24,400	\$24,370	\$48,770 LANL	\$65,840	\$67,486
135	4	1.5.2.1.1	design	1 mon	Wed 9/4/19	Tue 10/1/19 \$0	\$O	\$22,097	\$22,097	.35.35\$29,831	\$30,577
136	4	1.5.2.1.2	prototype	2 mons	Wed 10/2/19	Tue 11/26/19 \$10,000	\$10,000	\$0	\$10,000	.35.35\$13,500	\$13,838
137	4	1.5.2.1.3	review	2 days	Wed 11/27/19	Thu 11/28/19 \$0	\$0	\$2,273	\$2,273	.35.35\$3,068	\$3,145
138	-4	1.5.2.1.4	procure	2 mons	Fri 11/29/19	Thu 1/23/20 \$14,400	\$14,400	\$0	\$14,400	.35.35\$19,440	\$19,926
139	4	1.5.2.1.5	test	20 days	Fri 1/24/20	Thu 2/20/20 \$0	\$0	\$0	\$0	.35.35\$0	\$0
140	4	1.5.2.2	RU	373 days	Fri 3/15/19	Tue 8/18/20 \$0	\$425,030	554,653	\$479,683	\$647,572	\$663,761
141	4	1.5.2.2.1	Produce RU first production unit	4 wks	Fri 3/15/19	Thu 4/11/19 \$10,000	910,000	\$2,546	\$12,546	.35.35\$16,937	\$17,360
142	4	1.5.2.2.2	Procure SamTec Cable	4 wks	Fri 3/15/19	Thu 4/11/19 \$230	\$230	\$1,273	\$1,503	.35.35\$2,029	\$2,080
143	-	1.5.2.2.3	Test/QA RU	2 wks	Fri 4/12/19	Thu 4/25/19 \$0	\$0	\$3,600	\$3,600	.35.35\$4,860	\$4,982
144	4	1.5.2.2.4	Procure 57Readout /RU Units	250 days	Wed 9/4/19	Tue 8/18/20 \$399,000	\$399,000	\$3,271	\$402,271 LANL	.35.35\$543,066	\$556,642
145	4	1.5.2.2.5	Procure 60 SamTec Cabl	60 days	Fri 4/26/19	Thu 7/18/19 \$13,800	\$13,800	\$764	\$14,564 LANL	.35.35\$19,661	\$20,153
146	4	1.5.2.2.6	Test/QA	60 days	Fri 7/19/19	Thu 10/10/19 \$0	\$0	\$43,200	\$43,200	.35.35\$58,320	\$59,778
147	-4	1.5.2.2.7	Ship to BNL	1 wk	Fri 10/11/19	Thu 10/17/19 \$2,000	\$2,000	\$0	\$2,000	.35.35\$2,700	\$2,768
148	-4	1.5.2.3	FELIX/CRU	176 days	Fri 3/15/19	Fri 11/15/19 \$0	\$100,400	14,579	\$114,979	\$155,221	\$159,102
149	- 4	1.5.2.3.1	Produce first production (4 wks	Fri 3/15/19	Thu 4/11/19 \$15,000	\$15,800	2,546	\$17,546	.35.35\$23,687	\$24,279
150	4	1.5.2.3.2	Procure Optical fiber	2 wks	Fri 3/15/19	Thu 3/28/19 \$50	\$50	\$255	\$305	.35.35\$411	\$421
151	4	1.5.2.3.3	Test/QA	2 wks	Fri 3/29/19	Thu 4/11/19 \$0	\$O	\$0	\$0	.35.35\$0	\$0
152	4	1.5.2.3.4	Procure 7 Remaining Unit	8 wks	Wed 9/4/19	Tue 10/29/19 \$80,500	\$80,500	\$1,034	\$81,534 LANL	.35.35\$110,071	\$112,823
153	4	1.5.2.3.5	Procure 57 optical fibers	2 wks	Fri 4/12/19	Thu 4/25/19 \$2,850	\$2,850	\$255	\$3,105	.35.35\$4,191	\$4,296
154	4	1.5.2.3.6	test/QA	8 days	Wed 10/30/19	Fri 11/8/19 \$0	\$0	\$10,490	\$10,490	.35.35\$14,161	\$14,515
155	4	1.5.2.3.7	Ship to BNL	1 wk	Mon 11/11/19	Fri 11/15/19 \$2,000	\$2,000	\$0	\$2,000	.35.35\$2,700	\$2,768
156	4	1.5.2.4	MAPS Power System	225 days	Mon 10/1/18	Fri 8/9/19 \$0	\$221,200	78,349	\$299,549 LBNL	\$401,339	\$411,372
157	4	1.5.2.4.1	Power Boards	175 days	Mon 10/1/18	Fri 5/31/19 \$ 0	\$115,500	\$68,349	\$182,249 LBNL	\$242,983	\$249,058
158	4	1.5.2.4.1.1	Review ALICE PB Desi	30 days	Mon 10/1/18	Fri 11/9/18 \$0	\$0	\$17,726	\$17,726	.30.30\$23,044	\$23,620
159	-4	1.5.2.4.1.2	Fabricate PB Prototype	40 days	Mon 11/12/18	Fri 1/4/19 \$5,750	\$5,750	\$11,112	\$16,862	.35.35\$22,763	\$23,332
160	-4	1.5.2.4.1.3	Procure Power Distribu	20 days	Mon 1/7/19	Fri 2/1/19 \$1,000	\$1,000	\$0	\$1,000	.35.35\$1,350	\$1,384
161	-4	1.5.2.4.1.4	Test PB Prototype and Distribution	20 days	Mon 2/4/19	Fri 3/1/19\$1,150	\$1,150	\$10,947	\$12,097	.25.25\$15,121	\$15,499
162	4	1.5.2.4.1.5	Design Production PB	20 days	Mon 3/4/19	Fri 3/29/19 \$2,000	\$2,000	\$17,777	\$19,777	.35.35\$26,699	\$27,367
163	-4	1.5.2.4.1.6	Hold Power system Review	5 days	Mon 4/1/19	Fri 4/5/19 \$0	\$0	\$2,732	\$2,732	0 0 \$2,732	\$2,801
164	-4	1.5.2.4.1.7	Fabricate Break Out Boards	20 days	Mon 4/8/19	Fri 5/3/19 \$15,000	\$15,000	\$0	\$15,000	.35.35\$20,250	\$20,756

Wed 11/29/17

MVTX-Barrel-112917

	ID	Tasl Mod	WBS	Task Name	Duration	Start	Finish F	ixed Cost	Calculated Fixed Cost	Resource Costs	Cost	Institut	MaTorcost+continge colCo	elTotal cost with passthrough
_	165	-	1.5.2.4.1.8	Fabricate PB to Stave	20 days	Mon 4/8/19	Fri 5/3/19 \$	5.000	\$5,000	<u>006.</u>	\$5,000		.35.35\$6,750	\$6,919
				Cables	-					-				
	166	-	1.5.2.4.1.9	Fabricate Production Pl	40 days	Mon 4/8/19	Fri 5/31/19\$	84,000	\$84,000	\$8,055	\$92,055		.35.35\$124,274	\$127,381
L	167	-4	1.5.2.4.2	Power Supplies	90 days	Mon 4/8/19	Fri 8/9/19 \$	0	\$107,300	\$10,000	\$117,300		\$158,355	\$162,314
	168	4	1.5.2.4.2.1	Procure and Integrate Power	90 days	Mon 4/8/19	Fri 8/9/19 \$	94,800	\$94,800	\$3,688	\$98,488		.35.35\$132,959	\$136,283
	169	-	1.5.2.4.2.2	Procure and terminate PS-to-Pb	30 days	Mon 4/8/19	Fri 5/17/19\$	10,500	\$10,500	\$1,647	\$12,147		.35.35\$16,398	\$16,808
	170	+	1.5.2.4.2.3	test PB with power supplies	1 wk	Mon 5/20/19	Fri 5/24/19\$	0	\$0	\$4,116	\$4,116		.35.35\$5,557	\$5,696
-	171	-4	1.5.2.4.2.4	Document	1.33 days	Mon 5/27/19	Tue 5/28/19\$	0	\$0	\$549	\$549		.35.35\$741	\$760
-	1/2	-4	1.5.2.4.2.5 1.5.3	Mechanics and Detector	1 wk 617 days	Mon 9/3/18	Tue 6/4/19 \$	2,000 0	\$2,000 \$1,479,177	\$0 \$886,552	\$2,000 \$2,365,729	LBNL	.35.35\$2,700 \$3,146,717	\$2,768 \$3,225,384
-	174	╘╌┼╴	1524	Assembly	277 dave	Mon 9/2/19	Tuo 2/11/20 \$	0	¢1 100 052	\$125 292	\$1 224 145		\$1 665 095	\$1 706 722
-	175	C +	15211	Broduction	100 days	Mon 9/3/18	Eri 5/40/49	0	\$1,100,002	¢125,255	\$1,234,145		\$1,005,055	\$1,700,723
- F	176		153111	Produce 84 Inner	1 day	Mon 9/3/18	Mon 9/3/18 \$	966 000	\$966,000	300	\$966,000	LANI	35 35\$1 304 100	\$1,336,703
		-+	1.0.0.1.1.1	Staves at CERN	1 day	Morresorre	mon oron ro o	.000,000	\$000,000		\$000,000	Erate		\$1,000,700
T	177	4	1.5.3.1.1.2	Tests and QA at CERN	180 days	Mon 9/3/18	Fri 5/10/19 \$	0	\$0	\$0	\$0	LANL	.35.35\$0	\$0
F	178	-4	1.5.3.1.1.3	CERN Test System	1 day	Tue 9/4/18	Tue 9/4/18 \$	7,360	\$7,360	\$66	\$7,426	LANL	.35.35\$10,025	\$10,276
	179	4	1.5.3.1.1.4	Travel and Per Diem at CERN	1 day	Mon 9/3/18	Mon 9/3/18\$	50,000	\$50,000	\$0	\$50,000	LANL	.35.35\$67,500	\$69,188
L	180	-4	1.5.3.1.1.5	Ship to LBNL and custo	1 day	Tue 9/4/18	Tue 9/4/18\$	10,000	\$10,000	\$0	\$10,000	LANL	.25.25\$12,500	\$12,813
L	181	-	1.5.3.1.2	Stave Assembly Tooling	115 days	Wed 9/4/19	Tue 2/11/20 \$	0	\$45,000	\$61,329	\$106,329		\$143,544	\$147,132
	182	-	1.5.3.1.2.1	design	1 mon	Wed 9/4/19	Tue 10/1/19\$	0	\$0	\$34,072	\$34,072	LBNL	.35.35\$45,997	\$47,147
	183	4	1.5.3.1.2.2	prototype	30 days	Wed 10/2/19	Tue 11/12/19\$	20,000	\$20,000	\$15,616	\$35,616	LBNL	.35.35\$48,081	\$49,283
	184	-4	1.5.3.1.2.3	final jig design	5 days	Wed 11/13/19	Tue 11/19/19\$	0	\$0	\$8,518	\$8,518	LBNL	.35.35\$11,499	\$11,787
	185	-4	1.5.3.1.2.4	procure Assembly Fixtures and tooling	60 days	Wed 11/20/19	Tue 2/11/20 \$	25,000	\$25,000	\$3,123	\$28,123	LBNL	.35.35\$37,966	\$38,915
L	186	-	1.5.3.1.3	Metrology	65 days	Wed 9/4/19	Tue 12/3/19 \$	0	\$7,000	\$45,350	\$52,350	LANL	\$70,672	\$72,439
L	187	4	1.5.3.1.3.1	Metrology design	1 mon	Wed 9/4/19	Tue 10/1/19\$	0	\$0	\$22,097	\$22,097		.35.35\$29,831	\$30,577
	188	-	1.5.3.1.3.2	Design jigs	20 days	Wed 10/2/19	Tue 10/29/19\$	0	\$0	\$22,728	\$22,728		.35.35\$30,683	\$31,450
-	189	-4	1.5.3.1.3.3	Procure jigs	4 wks	Wed 10/30/19	Tue 11/26/19\$	5,000	\$5,000	\$525	\$5,525		.35.35\$7,458	\$7,645
ŀ	190	4	1.5.3.1.3.4 1.5.3.1.4	Ship to LBNL Shipping and Storage	1 wk 312 days	Mon 9/3/18	Tue 12/3/19\$	2,000 0	\$2,000 \$23,492	\$0 \$18,548	\$2,000 \$42,040	LBNL	\$56,754	\$2,768 \$58,173
ŀ	192	4	1.5.3.1.4.1	Design&Fabricate	39 days	Wed 9/4/19	Mon 10/28/19\$	6,992	\$6,992	\$5,183	\$12,175		.35.35\$16,436	\$16,847
-	193	-4	1.5.3.1.4.2	Design&Fabricate Shipping and Storage Containers	50 days	Wed 9/4/19	Tue 11/12/19\$	11,500	\$11,500	\$5,131	\$16,631		.35.35\$22,452	\$23,013
	194	-	1.5.3.1.4.3	Design shipping container for 84 stayes	1 wk	Mon 9/3/18	Fri 9/7/18 \$	0	\$0	\$8,234	\$8,234		.35.35\$11,116	\$11,394
	195		1.5.3.1.4.4	ship to CERN	2 mons	Mon 9/10/18	Fri 11/2/18 \$	5 000	\$5.000	su .	\$5,000		35 35\$6 750	\$6,919
	196	4	1.5.3.2	Carbon Structures	432 days	Mon 10/1/18	Tue 5/26/20 \$	0	\$341,511	\$574,320	\$915,831	LBNL	\$1,188,560	\$1,218,274
	197	-4	1.5.3.2.1	Mechanics Detector	80 days	Mon 10/1/18	Fn 1/18/19 \$	0	÷.	400,200	\$88,256	LANL	\$119,146	\$122,124
-	198	-4	1.5.3.2.1.1	Design Develop MAPS inner	4 mons	Mon 10/1/18	Fri 1/18/19\$	0	\$0	\$88,256	\$88,256		.35.35\$119,146	\$122,124
⊢	100		15222	tracker mechanical	262 dave	Mon 1/24/49	Tue 1/24/20 #	0	\$45.000	\$20.664	\$65.664		\$25.262	\$97 497
ŀ	200		152224	Design	202 UdyS	Mon 1/21/19	Ed 2/0/10 P	0	\$40,000 \$0	\$18 540	\$18,540		200,000	\$22.050
ŀ	200	+	153222	Prototype	30 days	Mon 2/11/19	Fri 3/22/10 9	10 000	\$10,000	\$1,040	\$10,048		30 30\$15 482	\$15,869
ŀ	201	-	153222	Review	2 days	Mon 3/25/10	Tue 3/28/10 9	0	\$0,000	\$2,206	\$2 208		30 30\$2 888	\$2.940
ŀ	202		153224	Procure and wheels	2 days	Wed 0/4/10	Tue 1/21/20 9	35.000	\$35,000	\$0	\$2,200	LBNI	31 30\$45 500	\$46,639
ŀ	204		15323	Mechanics Fabrication	432 days	Mon 10/1/18	Tue 5/26/20 \$	0	\$286,511	\$431,719	\$718 230		\$936.002	\$959,402
ŀ	205	-	152221	Travel L BNI	50 days	Mon 10/1/19	Fri 12/7/19 S	70.000	670.000	en	\$70.000		26 25504 500	\$06.962
	206	-4	1.5.3.2.3.2	CYSS Cylindrical Structure	242 days	Mon 1/21/19	Tue 12/24/19\$	0	\$102,871	\$216,316	\$319,187	LBNL	\$413,747	\$424,090
6/1	207	4	1.5.3.2.3.2.1	Review CYSS Design-Fabrication Compatibility	40 days	Mon 1/21/19	Fri 3/15/19\$	0	\$0	\$10,567	\$10,567		.30.30\$13,737	\$14,081
F	208	-	1.5.3.2.3.2.2	modify design	1 mon	Mon 3/18/19	Fri 4/12/19 \$	0	\$0	\$22,064	\$22,064		.30.30\$28,683	\$29,400

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	ID	Tas Mod	WBS	Task Name	Duration	Start	Finish	Fixed Cost	Calculated Fixed Cost	Costs	Cost	Institut	MaTo	o'cost+continge o	#Total cost with passthrough
-	209	-4	1.5.3.2.3.2.3	Review CYSS	15 days	Mon 4/15/19	Fri 5/3/19	\$0	\$0	\$11,969	\$11,969		20.2	\$14,363	\$14,722
_	210		1522224	Design-Fabrication	E dava	Mar ElBIIO	E-2 5/10/10	64E 840	E1E 840	e0.	E1E 840	DNI	26.2		600.040
-	210	+	1.0.3.2.3.2.4	Production & Test C)	o days	Wod 0/4/19	Tue 12/24/10	\$10,040 \$97.021	\$10,040	ο 0 0 0 0 0 0 0 0 0 0 0 0 0	\$10,040		31.31	\$20,332	\$20,840
-	212		1532326	Milestone: Complete	0 days	Tue 12/24/19	Tue 12/24/19	\$07,231	\$07,231	\$0	\$230,847	BNI	0 0	\$0	\$0
_		+		CYSS									_	· ·	••
_	213	-4	1.5.3.2.3.3	COSS Conical Half Sh	277 days	Mon 5/6/19	Tue 5/26/20	\$0	\$113,640	\$215,403	\$329,043	LBNL		\$427,756	\$438,449
	214	-	1.5.3.2.3.3.1	Review COSS Design-Fabrication Compatibility	40 days	Mon 5/6/19	Fn 6/28/19	\$0	\$0	\$10,903	\$10,903		.30.30	(\$14,174	\$14,528
	215	-4	1.5.3.2.3.3.2	modify design	1 mon	Mon 7/1/19	Fri 7/26/19	\$0	\$0	\$22,064	\$22,064		.30.3/	\$28,683	\$29,400
_	216	-	1.5.3.2.3.3.3	Hold COSS Review (15 days	Mon 7/29/19	Fri 8/16/19	\$0	\$0	\$10,691	\$10,691		.30.30	C\$13,899	\$14,246
-	21/	-4	1.5.3.2.3.3.4	Procure COSS Mater	5 days	Mon 8/19/19	Fn 8/23/19	\$15,640	\$15,640	\$U \$171.744	\$15,640		31.3	\$20,332 \$250,889	\$20,840
_	219	4	1.5.3.2.3.3.6	Milestone: Complete COSS	0 days	Tue 5/26/20	Tue 5/26/20	\$0 \$0	\$0 \$0	\$0	\$208,744 \$0	LBNL	0 0	\$0	\$0
_	220	4	1.5.3.2.4	MVTX Final Design Review	12 days	Mon 8/19/19	Tue 9/3/19	\$0	\$10,000	\$33,682	\$43,682			\$48,050	\$49,251
_	221	-4	1.5.3.2.4.1	MVTX Design Review	2 days	Mon 8/19/19	Tue 8/20/19	\$10,000	\$10,000	\$5,614	\$15,614	ALL	.1 .1	\$17,175	\$17,604
_	222	4	1.5.3.2.4.2	Incorporate review comments	9 days	Wed 8/21/19	Mon 9/2/19	\$0	\$0	\$25,261	\$25,261	ALL	.10.10	0\$27,787	\$28,482
F	223	-	1.5.3.2.4.3	Complete Final Design	202 days	Tue 9/3/19	Tue 4/42/24	\$0 ¢0	\$20.044	\$10C 020	\$2.807	ALL	.10.10	\$292.064	\$3,105
	224	*	15331	Assembly and Testing	392 days	FI 7/12/19	Tue 1/12/21	\$0 \$0	\$20,014	\$100,333	\$215,755		+	\$233,061	\$300,388
_	226	-	1.5.3.3.1.1	Receive 84 Staves from CERN	0 days	Fri 7/12/19	Fri 7/12/19	\$0	\$0	\$0	\$0	LBNL	D O	\$0	\$0
	227	-4	1.5.3.3.1.2	Test and Rework Stave	50 days	Mon 7/15/19	Fri 9/20/19	\$0	\$0	\$19,573	\$19,573	LBNL	.30.3	\$25,444	\$26,081
_	228	+	1.5.3.3.1.3	Layer Assembly and Test	140 days	Wed 1/22/20	Tue 8/4/20	\$0	\$5,336	\$61,207	\$66,543	LBNL		\$91,123	\$93,401
_	229	4	1.5.3.3.1.3.1	Test Installation of Staves onto Layer End-Wheels	20 days	Wed 1/22/20	Tue 2/18/20	\$0	\$0	\$6,497	\$6,497	LBNL	.38.3	5\$8,770	\$8,990
_	230	4	1.5.3.3.1.3.2	Hold Half-Detector Assembly Review	5 days	Wed 2/19/20	Tue 2/25/20	\$0	\$0	\$2,332	\$2,332		.20.20	0\$2,799	\$2,869
_	231	-	1.0.3.3.1.3.3	Layer End-Wheels To Form Layers	70 days	wed 2/20/20	Tue 0/2/20	\$2,700	\$2,700	\$30,031	\$32,781	LONL	.40.41	u ə 40,908	\$47,000
_	232	4	1.5.3.3.1.3.4	Test and Rework Layers After	30 days	Wed 6/3/20	Tue 7/14/20	\$2,576	\$2,576	\$12,753	\$15,329	LBNL	.35.3	5\$20,694	\$21,212
_	233	+	1.5.3.3.1.3.5	Perform Half-Detector	15 days	Wed 7/15/20	Tue 8/4/20	\$0	\$0	\$9,594	\$9,594	LBNL	.35.3	5\$12,952	\$13,276
_	234	+	1.5.3.3.1.3.6	Milestone: Complete Layers	0 days	Tue 8/4/20	Tue 8/4/20	\$0	\$0	\$0	\$0	LBNL	50	\$0	\$0
	235	-4	1.5.3.3.1.4	Half Barrel #1 Assembly and Test	95 days	Wed 8/5/20	Tue 12/15/20	\$0	\$11,739	\$52,867	\$64,606	LBNL		\$87,960	\$90,159
_	236	4	1.5.3.3.1.4.1	Assemble Layers and CYSS Into	20 days	Wed 8/5/20	Tue 9/1/20	\$2,760	\$2,760	\$12,079	\$14,839	LBNL	.40.40	0\$20,774	\$21,294
_	237	-	1.5.3.3.1.4.2	Test and Rework Half-Detector	30 days	Wed 9/2/20	Tue 10/13/20	\$2,576	\$2,576	\$16,561	\$19,137	LBNL	.35.3	5\$25,834	\$26,480
	238	*	1.5.3.3.1.4.3	Perform Half-Detector Metrology On Final	10 days	Wed 10/14/20	Tue 10/27/20	\$0	\$0	\$7,048	\$7,048	LBNL	.35.3	5\$9,515	\$9,753
	239	4	1.5.3.3.1.4.4	Validation Of Final Assembly	20 days	Wed 10/28/20	Tue 11/24/20	\$2,576	\$2,576	\$12,707	\$15,283	LBNL	.35.3	5\$20,632	\$21,148
_	240	4	1.5.3.3.1.4.5	Pack/Ship Final Assemblies To BNL	15 days	Wed 11/25/20	Tue 12/15/20	\$3,827	\$3,827	\$4,472	\$8,299	LBNL	.35.3	5\$11,204	\$11,484
	241	-	1.5.3.3.1.5	Half Barrel #2 Assembly and Test	95 days	Wed 9/2/20	Tue 1/12/21	\$0	\$11,739	\$53,292	\$65,031	LBNL		\$88,534	\$90,748
_	242	4	1.5.3.3.1.5.1	Assemble Layers and CYSS Into	20 days	Wed 9/2/20	Tue 9/29/20	\$2,760	\$2,760	\$12,079	\$14,839	LBNL	.40.40	0\$20,774	\$21,294
1/2 <i>6/-</i>	243	4	1.5.3.3.1.5.2	Test and Rework Half-Detector	30 days	Wed 9/30/20	Tue 11/10/20	\$2,576	\$2,576	\$16,986	\$19,562	LBNL	.35.3	5\$26,409	\$27,069
1/20/.	244	4	1.5.3.3.1.5.3	Perform Half-Detector Metrology On Final	10 days	Wed 11/11/20	Tue 11/24/20	\$0	\$0	\$7,048	\$7,048	LBNL	.35.3	5\$9,515	\$9,753

ID	Tas	WBS	Task Name	Duration	Start	Finish	Fixed Cost	Calculated	Resource	Cost I	nstitut	MaTo cost+conting	erTotal cost
	Mod							Fixed Cost	Costs			colCo	with
								M&S					passthrough
								Mas					
									aha				
									Lapo				
245	-4	1.5.3.3.1.5.4	Validation Of Final	20 days	Wed 11/25/20	Tue 12/22/20	\$2,576	\$2,576	\$12,707	\$15,2831	BNL	.35.35\$20,632	\$21,148
			Assembly	-									
246	4	1.5.3.3.1.5.5	Pack/Ship Final	15 days	Wed 12/23/20	Tue 1/12/21	\$3,827	\$3,827	\$4,472	\$8,2991	LBNL	.35.35\$11,204	\$11,484
			Assemblies To BNL										
247	4	1.5.3.3.1.5.6	Milestone: Complete	0 days	Tue 1/12/21	Tue 1/12/21	\$0	\$0	\$0	\$01	LBNL	0 0 \$0	\$0
240			Barrel (RR)			-	40		A 100 750	4700.050		4000.404	
248	-4	1.5.4	Integration and Infrastructur	1109 days	Mon 10/1/18	Thu 12/29/22	\$0	\$274,200	\$432,752	\$706,952		\$990,424	\$1,015,184
249	+	1.0.4.1	Clean Tent/Room	Too days	Mon 10/1/18	Fn 2/15/19	300,000	400,000		\$90,000		.30.3000,000	\$09,188
250	4	1.5.4.2	Cooling System	700 days	Mon 10/1/18	Fri 6/4/21	\$0	\$87,000	\$18,431	\$105,431	TIM	\$142,332	\$145,890
251	4	1.5.4.2.1	travel	700 days	Mon 10/1/18	Fri 6/4/21	\$25,000	\$25,000	\$0	\$25,000		.35.35\$33,750	\$34,594
252	4	1.5.4.2.2	Design (modify ALICE)	1 wk	Wed 9/4/19	Tue 9/10/19	\$0	\$0	\$6,520	\$6,520		.35.35\$8,802	\$9,022
253	4	1.5.4.2.3	Mock up Testing	1 wk	Wed 9/11/19	Tue 9/17/19	\$20,000	\$20,000	\$3,820	\$23,820		.35.35\$32,157	\$32,961
254	4	1.5.4.2.4	Final Design of Cooling	5 days	Wed 9/18/19	Tue 9/24/19	\$0	\$0	\$6,520	\$6,520		.35.35\$8,802	\$9,022
			System										
255	4	1.5.4.2.5	Procure Cooling Plant	100 days	Wed 9/25/19	Tue 2/11/20	\$40,000	\$40,000	\$1,571	\$41,571	MIT	.35.35\$56,121	\$57,524
256	-4	1.5.4.2.6	Ship to BNL	1 wk	Wed 2/12/20	Tue 2/18/20	\$2,000	\$2,000	\$0	\$2,000		.35.35\$2,700	\$2,768
257	-	1.5.4.3	Safety Systems	700 days	Mon 10/1/18	Fri 6/4/21	\$0	\$35,200	\$104,093	\$139,293	TIM	\$186,702	\$191,369
258		1.5.4.3.1	travel	700 days	Mon 10/1/18	Fri 6/4/21	\$25,000	\$25,000	\$0	\$25,000		.35.35\$33,750	\$34,594
259		1.5.4.3.2	Define MVTX Safety and	2 wks	Wed 9/25/19	Tue 10/8/19	\$0	\$0	\$6.640	\$6,6401	BNL	35.35\$8.964	\$9,188
			Interlock requirements				-	ľ					
260	4	1.5.4.3.3	review sensors &	10 days	Wed 10/9/19	Tue 10/22/19	\$0	\$0	\$6,720	\$6,7201	BNL	.15.15\$7,728	\$7,921
			interlocks with BNL	-									
261	-4.	1.5.4.3.4	Design electronics safety	4 wks	Wed 10/23/19	Tue 11/19/19	\$0	\$0	\$22,057	\$22,0571	LBNL	.35.35\$29,777	\$30,521
			system										
262	-	1.5.4.3.5	cooling interlocks design	30 days	Wed 11/20/19	Tue 12/31/19	\$0	\$0	\$20,160	\$20,160		.35.35\$27,216	\$27,896
263	4	1.5.4.3.6	Procure Safety Systems	8 wks	Wed 1/1/20	Tue 2/25/20	\$10,000	\$10,000	\$8,562	\$18,562		.35.35\$25,058	\$25,685
264	4	1.5.4.3.7	Test	3 wks	Wed 2/26/20	Tue 3/17/20	\$0	\$0	\$18,650	\$18,650		.35.35\$25,178	\$25,808
265	-4	1.5.4.3.8	Ship to BNL	1 wk	Wed 3/18/20	Tue 3/24/20	\$200	\$200	\$0	\$200		.35.35\$270	\$277
266		1.5.4.3.9	Test at BNL	2 wks	Wed 3/25/20	Tue 4/7/20	\$0	\$0	\$21,304	\$21,304		.35.35\$28,760	\$29,479
267	.	1.5.4.4	Stave Support Frame	300 days	Wed 9/4/19	Tue 10/27/20	\$0	\$102,000	\$206,279	\$308,279	LANL	\$454,080	\$465,432
			&Global Interface to	-									
268	4	1.5.4.4.1	travel	300 days	Wed 9/4/19	Tue 10/27/20	\$20,000	\$20,000	\$0	\$20,000		.1 .1 \$22,000	\$22,550
269		1.5.4.4.2	Design Interface to sPHE	100 days	Wed 9/4/19	Tue 1/21/20	\$0	\$0	\$113,009	\$113,009		.50.50\$169,514	\$173,752
270		1.5.4.4.3	FEA, Thermal, stress analy	30 days	Wed 4/1/20	Tue 5/12/20	\$0	\$0	\$34,092	\$34,092		.50.50\$51,138	\$52,417
271		1.5.4.4.4	design interface to rail	10 wks	Wed 1/22/20	Tue 3/31/20	\$0	\$0	\$56,820	\$56,820		50 50\$85,230	\$87,361
	-		system					*-		*****			
272	-4	1.5.4.4.5	procure support structure	8 wks	Wed 1/22/20	Tue 3/17/20	\$40,000	\$40,000	\$1,049	\$41,049		.50.50\$61,573	\$63,113
273		1.5.4.4.6	Procure rail interface	8 wks	Wed 4/1/20	Tue 5/26/20	\$40.000	\$40,000	\$1.049	\$41,049		50.50\$61.573	\$63,113
274		1.5.4.4.7	ship to BNL	0.1 wks	Wed 5/27/20	Wed 5/27/20	\$2,000	\$2,000	\$260	\$2,260		35.35\$3.051	\$3,128
275	-+	1545	Half detector Assembly	435 67 days	Tue 6/4/19	Tue 2/2/21	\$0	\$0	\$26 348	\$26.348		\$35 570	\$36.459
2.00	-		Readout and Cooling	400.01 0033	Tue or arto	100 2/2/21	•••	••				400,010	
			Test at BNL										
276		1.5.4.5.1	Test Half Barrel #1	15 days	Wed 12/16/20	Tue 1/5/21	\$0	\$0	\$5.310	\$5,3101	BNL	35,35\$7,169	\$7.348
277	-	15452	Test Half Barrel #2	15 days	Wed 1/13/21	Tue 2/2/21	\$0	\$0	\$5.310	\$5,310	BNI	35 35\$7 169	\$7.349
278	-	15452	Assemble & Test	20 days	Wed 2/19/20	Tue 3/17/20	\$0	\$0	\$15,728	\$15 729	MIT	35 35\$21 233	\$21 764
210	+	1.0.4.0.0	Cooling System at BNL	20 days	11eu 2/18/20	Tue artrizu	4 0		¢10,720	\$10,7201			021,104
279		1.5.4.5.4	test RU at BNL	2 wks	Fri 10/18/19	Thu 10/31/19	\$0	\$0	\$0	\$01	ANL	35 35\$0	\$0
280	-	15455	test FELIX at BNI	2 w/c	Mon 11/18/10	Eri 11/20/10	\$0	50	\$0	\$01		36 3550	50
200	<u>-</u> *-	15458	PS tests at PNI	2 wks	Tue 8/4/10	Tue 8/11/10	90 80	00	\$0 \$0	501	DNI	26 2500	00
201	- 4	1.0.4.0.0	F3 tests at BNL	407 1	Tue 0/4/18	The 0/11/18	ф0	\$0	\$U	\$77.000	LDINL	.30.30.00	QU
202	-+	1.5.4.6	Installation and	497 days	wed 2/3/21	Thu 12/29/22	\$U	\$U	\$11,600	\$77,600		\$104,240	\$106,846
202	_	15481	Installation Prop	10 days	Wed 2/2/21	Tue 2/18/21	\$0	50	\$15.520	\$15.520	AL 1	26 26\$20 052	\$21.478
203	+	1.0.4.0.1	Installation Prep	TU days	Wed 2/3/21	Tue 2/10/21	40 60	90 80	\$10,020	a 10,020/		10.30920,802	921,470 80.045
284	÷	1.5.4.6.2	Installation Review	1 day	wea 2/1//21	wea 2/1//21	фU	φU	\$2,080	\$2,0807	ALL	.10.10\$2,288	a2,345
285	-4	1.5.4.6.3	Install FELIX	2 days	Thu 2/18/21	Fri 2/19/21	\$0	\$0	\$2,341	\$2,341		.35.35\$3,160	\$3,239
286	-4	1.5.4.6.4	Install Optical fibers	1 wk	Mon 2/22/21	Fn 2/26/21	20	\$0	\$6,752	\$6,752		.35.35\$9,115	\$9,343
287	-4	1.5.4.6.5	Install RU	2 days	Mon 3/1/21	Tue 3/2/21	\$0	\$0	\$2,341	\$2,341		.35.35\$3,160	\$3,239
288	4	1.5.4.6.6	Install Samtec Cables	2 days	Wed 3/3/21	Thu 3/4/21	\$0	\$0	\$2,701	\$2,701		.35.35\$3,646	\$3,737
289	4	1.5.4.6.7	Install Half-Barrel 1	1 mon	Fri 7/1/22	Thu 7/28/22	\$0	\$0	\$22,933	\$22,933		.35.35\$30,959	\$31,733
290	4	1.5.4.6.8	Install Half-Barrel 2	1 mon	Fri 7/29/22	Thu 8/25/22	\$0	\$0	\$22,933	\$22,933		.35.35\$30,959	\$31,733
291	-4	1.5.4.6.9	Commissioning	90 days	Fri 8/26/22	Thu 12/29/22	\$0	\$0	\$0	\$0		0 0 \$0	\$0
202		155	Ready for beam	o dave	Thu 12/20/22	Thu 12/20/22	\$0	\$0	\$0	\$0		0 0 80	\$0

Detector Assembly @LBNL/CCNU?



Possible Path Forward

- follow up on the discussions from today's meeting

• Plan-B1

- sPHENIX savings from contingency
- Foreign contributions
 - direct (such as CCNU on stave production/assembly)
 - indirect (such as EMCal) to generate cash saving from sPHENIX baseline

• Plan-B2

- NSF funding through Universities .. \$4M cap
- sPHENIX savings from contingency
- Reduce the total cost of MVTX is critical
 - Carbon structures
 - Readout electronics
 - Labor cost more "in kind" contributions