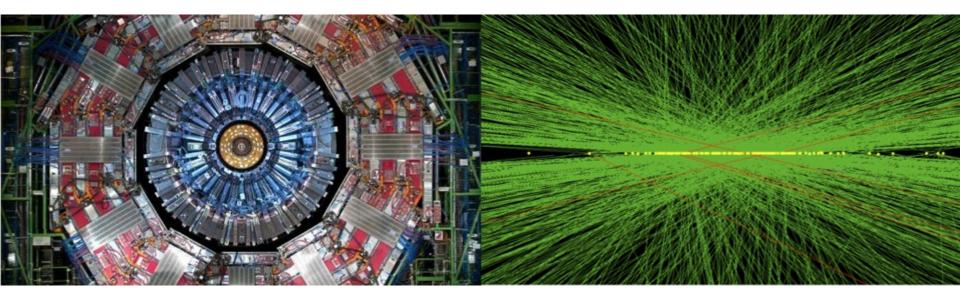


US-MTD: FNAL Group Meeting

Frank Chlebana

Apr 7, 2021





We have planned the work assuming we will use specific FNAL / SMU resources in order to estimate the budget and schedule

Need to remain flexible and have the ability to react to a rapidly changing environment COVID impact on availability of SMU interns Availability of FNAL ASIC resources due to delays for other projects

In order to mitigate these risks we will outsource some work that was originally planned for FNAL to one of our partners

Will use the P6 schedule to monitor progress during monthly statusing

Work make be completed by different resources that was used to estimate the budget

We expect that the schedule (and milestones) will remain the same Cost estimate should also be accurate *Moving work using higher costed resources may require additional lower costed resources*



The updated schedule based on BCR103 has not yet been approved... This will happen following a project cost and schedule review (Apr 29)

In order to get the money flowing... we can use the schedule to get a cost estimate for the FNAL SOW and have a second SOW / Change Order for the remaining funds once the schedule has been approved...



BCR Implementation

Bill has implemented the ETL BCR We provided feedback (Ted and Frank) on the ETROC (looks ok...) Frank Golf and Artur are reviewing the ETL-Assembly section *Expect to provide feedback this week...*

Using Oct 1, 2020 as the change date Activities prior to Oct 1, 2020 are not included Applying changes to the "statused" schedule some activities are shifted

The CD-2 plan does have work prior to Oct 1, 2020 that was not in the CD-1 plan Most changes occur after 16-Mar-20 "ETL – T5 -Start post TDR design" *ETROC1 testing, COVID related costs, and emulator development*

Can add a supplemental cost activity on Oct 1, 2020 to capture additional cost prior to Oct 1, 2020... Could also treat as a cost variance and reset costs once we baseline...



Cost and Schedule Workshop

We are planning to have a "schedule workshop" on Apr 29 from 8-11am FNAL time with a slot for spillover discussions from 2:30 - 3:30 if needed

The goal of the workshop is to review the BTL and ETL schedules together with the project office and verify that it is ready for the director's review

We will also be asked to look for ways to reduce costs

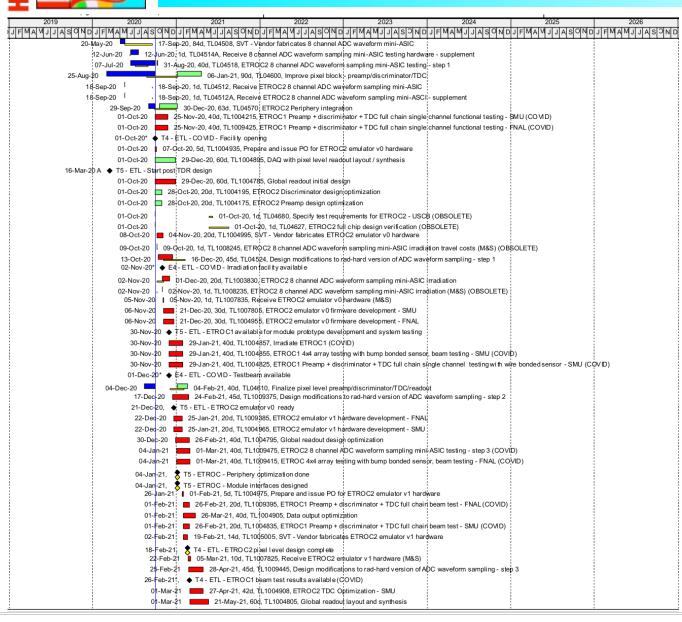
In preparation for the workshop we will need to review the updated schedule that has the changes from BCR-102/103 and work with Bill to reconcile any problems.

- schedule technical details (hot spots, pred/succ, code assignments...)
- resource allocation (no overloading, uncosted labor)

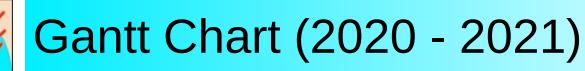
CAMs will be asked to walk through the schedule and discuss the plan and cost estimate

- general work plan and activity logic
- cost rollup
- critical path evaluation
- determination of float to CMS need by dates
- connections to external constraints and across WBS areas
- milestone alignment with international CMS

Gantt Chart (2020 - 2021)



US-MTD Management Meeting 4/7/21



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03-May-21 28-Jun-21, 40x TL1005725, System testing development with emulative - FNAL 24-May-21 03-Lay-21, 60x TL1004856, Global relation design simulation / verification 22-Jun-21 03-Lay-21, 50x TL04680, Specify test requirements for ETROC2. FNAL 04-Jug-21 113-Sap-21, 55x TL04680, Specify test requirements for ETROC2. FNAL 04-Jug-21 115-Sap-21, 30x TL040885, ETROC2 final integration / testing verification - SMU 04-Jug-21 115-Sap-21, 30x TL040885, ETROC2 final integration / testing verification - SMU 04-Jug-21 119-Jug-21, 10x TL04700, Develop testing software for ETROC2 - JSCB (DBSOLETE) 13-Jug-21 19-Jug-21, 10x TL0470, Develop testing software for ETROC2 - JSCB (DBSOLETE) 13-Jug-21 19-Jug-21, 10x TL0470, Purchase Testing Hardware for ETROC2 - SMU (DBSOLETE) 19-Jug-21 19-Jug-21, 10x TL0470, Purchase Testing Hardware for ETROC2 - SMU (DBSOLETE) 19-Jug-21 19-Jug-21, 10x TL0470, Purchase Testing Hardware for ETROC2 - SMU (DBSOLETE) 19-Jug-21, 0 15-ETL - ETROC2 testing software integration testing farmware for ETROC2 - INAL 03-Sap-21, 0 15-ETL - ETROC2 testing software integration with periphery done 15-Sap-21, 0 15-ETL - ETROC2 public integration with periphery done 15-Sap-21, 0 15-ETL - ETROC2 public integration with periphery done 15-Sap-21, 0 15-			-				
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25-Jun;21 13-Sep 21, 56, TL04620, ETROC2 Inal integration with periphery and verification 22-Jul;21 15-Sep 21, 30d, TL00885, ETROC2 Inal global integration / design verification - SMU (4-Aug-21 15-Sep 21, 30d, TL00885, ETROC2 Inal global integration / design verification - FNAL (9-Aug-21 19-Aug-21, 1d, TL04700, Develop texting firmware for ETROC2 - JSC8 (DSSOLETE) (9-Aug-21 19-Aug-21, 1d, TL04700, Develop texting firmware for ETROC2 - SMU (DSSOLETE) (9-Aug-21 19-Aug-21, 1d, TL0470, Develop texting firmware for ETROC2 - SMU (DSSOLETE) (9-Aug-21 19-Aug-21, 1d, TL0470, Develop texting firmware for ETROC2 - SMU (DSSOLETE) (9-Aug-21 19-Aug-21, 1d, TL0470, Develop texting firmware for ETROC2 - SMU (DSSOLETE) (9-Aug-21 01-Sep 21, 1dd, TL0470, Purchasis Testing hardware for ETROC2 - SMU (DSSOLETE) (9-Aug-21 01-Sep 21, 1dd, TL0470, Purchasis resting hardware for ETROC2 - FNAL (9-Sep 21) 01-Nov-21, 421, TL04470, Purchasis resting hardware for ETROC2 - FNAL (9-Sep 21) 01-Nov-21, 421, TL04470, Purchasis resting hardware for ETROC2 - FNAL (9-Sep 21) 01-Nov-21, 421, TL04470, Purchasis resting hardware for ETROC2 - FNAL (9-Sep 21) 01-Nov-21, 421, TL0440, Prepare PO for ETROC2 production (9-Sep 21) 01-Nov-21, 421, TL0440, Prepare PO for ETROC2 - FNAL (15-Sep 21) <t< td=""><td></td><td>24-May-21 03-Aug-2</td><td>1, 50d, TL1004885, Global re</td><td>adout design simulation / ve</td><td>rification</td><td></td><td></td></t<>		24-May-21 03-Aug-2	1, 50d, TL1004885, Global re	adout design simulation / ve	rification		
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04-Aug-21 ■ 15-Sep-21, 30d, TL 1008885, ETRO22 final global integration / design verification - SMU 04-Aug-21 ■ 15-Sep-21, 30d, TL 1008885, ETRO22 final global integration / design verification - FNAL 19-Aug-21 ■ 19-Aug-21, 11, TL04710, Develop tegling software for ETRO22 - USCB (OBSOLETE) 19-Aug-21 ■ 19-Aug-21, 11, TL04710, Develop tegling software for ETRO22 - SMU (OBSOLETE) 19-Aug-21 ■ 19-Aug-21, 10, TL04730, Develop tegling software for ETRO22 - SMU (OBSOLETE) 19-Aug-21 ■ 01-Sep-21, 10d, TL04740, Purchase Testing hardware for ETRO22 19-Aug-21 ■ 01-Sep-21, 10d, TL04740, Purchase Testing hardware 19-Aug-21 ■ 01-Sep-21, 10d, TL04760, Purchase Testing hortware for ETRO22 19-Aug-21 ■ 01-Sep-21, 10d, TL04760, Purchase Testing hortware for ETRO22 19-Aug-21 ■ 01-Sep-21, 10d, TL04760, Purchase Testing hortware for ETRO22 19-Aug-21 ■ 01-Sep-21, 10d, TL04760, Purchase Testing hortware for ETRO22 19-Aug-21 ● 15-ETL - ETRO 2: pixel integration with peri phery done 13-Sep-21, ● T5 - ETL - ETRO 2: pixel integration with peri phery done 15-Sep-21, ● T5 - ETL - ETRO 2: pixel integration done 15-Sep-21, ● T6 - ETRO 2: pixel integration done 15-Sep-21, ● T6 - ETRO 2: pixel integration done 15-Sep-21, ● T6 - ETRO 2: pixel integration done 15-Sep-21, ●							
9-Aug-21 19-Aug-21, 1d, TL04700, Develop testing software for ETROC2 - USCB (OBSOLETE) 19-Aug-21 19-Aug-21, 1d, TL04700, Develop testing firmware for ETROC2 - USCB (OBSOLETE) 19-Aug-21 19-Aug-21, 1d, TL04700, Develop testing software for ETROC2 - USCB (OBSOLETE) 19-Aug-21 19-Aug-21, 1d, TL04700, Develop testing firmware for ETROC2 - SMU (OBSOLETE) 19-Aug-21 01-Sep-21, 10d, TL04700, Purchase Testing Hardware for ETROC2 19-Aug-21 01-Sep-21, 10d, TL04700, Purchase Testing Hardware for ETROC2 19-Aug-21 01-Sep-21, 10d, TL04700, Purchase Testing Hardware for ETROC2 19-Aug-21 01-Sep-21, 10d, TL04700, Purchase Testing Hardware for ETROC2 - FNAL 07-Sep-21* 01-Nov-21, 42d, TL1040475, Develop testing firmware for ETROC2 - FNAL 07-Sep-21 01-Nov-21, 42d, TL1040475, Develop testing firmware for ETROC2 - FNAL 07-Sep-21 05-Sep-21, 10d, TL04700, Purchase TEROC2 production 15-Sep-21, • T5 - ETL - ETROC2 pixel integration with peri phery done 15-Sep-21, • T6 - ETROC2 pixel integration of the path subin 16-Sep-21 05-Sch-21, 14d, TL04600, Prepare PO for ETROC2 production 16-Sep-21 15-Dec-21, 63d, TL04735, Develop test-board for ETROC2 06-Onc+21 15-Dec-24, 63d, TL04750, Cormission test-stand for ETROC2 16-Dec-21 16-De							
i9-Aug-21 i 19-Aug-21, 1d, TL04710, Develop testing firmware for ETROC2 - SMU (OBSOLETE) i9-Aug-21 i9-Aug-21, 1d, TL04730, Develop testing firmware for ETROC2 - SMU (OBSOLETE) i9-Aug-21 01-Sep-21, 1d, TL04730, Develop testing firmware for ETROC2 - SMU (OBSOLETE) i9-Aug-21 01-Sep-21, 1d, TL04730, Develop testing firmware for ETROC2 - SMU (OBSOLETE) i9-Aug-21 01-Sep-21, 1d, TL04730, Purchase Testing Hardware for ETROC2 - SML 02-Sep-21 01-Nov-21, 42d, TL100475, Develop testing firmware for ETROC2 - FNAL 07-Sep-21, T5 - ETL - ETROC2 pisol insign inrware for ETROC2 - FNAL 07-Sep-21, T5 - ETL - ETROC2 global integration with periphery done 15-Sep-21, T5 - ETL - ETROC2 global integration of the periphery done 15-Sep-21, T5 - ETL - ETROC2 production 16-Sep-21, T5 - ETL - ETROC2 production 16-Sep-21, T5 - ETL - ETROC2 production 16-Sep-21, T6 - ETL - ETROC2 production 16-Sep-21, T0 - Eth-22, 14, TL04660, SVT - Vendor fabricates ETROC2 20-Jan-22, Z, Jat,		04-Aug-21 📕 15-Se	p-21, 30d, TL1008885, ETRO	C2 final global integration /	design verification - FNAL		
i9-Aug-21 i 19-Aug-21, 1d, TL04710, Develop testing firmware for ETROC2 - SMU (OBSOLETE) i9-Aug-21 i9-Aug-21, 1d, TL04730, Develop testing software for ETROC2 - SMU (OBSOLETE) i9-Aug-21 i0-Sep-21, 1d, TL04730, Develop testing software for ETROC2 - SMU (OBSOLETE) i9-Aug-21 i0-Sep-21, 1d, TL04730, Develop testing software for ETROC2 - SMU (OBSOLETE) i9-Aug-21 i0-Sep-21, 1d, TL04730, Purchase Testing Hardware for ETROC2 - SMU (OBSOLETE) i9-Aug-21 i0-Sep-21, 1d, TL04730, Develop testing firmware for ETROC2 - FNAL i9-Aug-21 i0-Sep-21, i0d, TL04740, Purchase Testing Hardware for ETROC2 - FNAL i9-Aug-21 i5-ETL - ETROC2 producing firmware for ETROC2 - FNAL i9-Aug-21, into the software indication testing and firmware for ETROC2 - FNAL i0-Sep-21, into the software indication testing and firmware for ETROC2 - FNAL i1-Sep-21, into the software indication testing and formware for ETROC2 - FNAL i1-Sep-21, into the software ready indication testing and form i1-Sep-21, into the software indication testing and formware for ETROC2 - FNAL i0-Sep-21, into the software indication testing and form and the software indication testing and form i0-Sep-21, into the software ready into test indicates ETROC2 i0-Sep-21, into the software ready into test indicates ETROC2 - FNAL i0-Sep-21, into the software ready into test inding into test indin		19-Aug-21 — 19-Aug-	21, 1d, TL04700, Develop tes	ting software for ETROC2 -	USCB (OBSOLETE)		
19-Aug-21 19-Aug-21 19-Aug-21 01-Sep-21, 10d, TL04740, Purchase Testing Hardware for ETROC2 19-Aug-21 01-Sep-21, 10d, TL04760, Purchase irradiation testing hardware 19-Aug-21 01-Sep-21, 10d, TL04760, Purchase irradiation testing hardware 19-Aug-21 01-Sep-21, 10d, TL04760, Purchase irradiation testing hardware 19-Aug-21 19-Aug-21 19-Aug-21 01-Sep-21, 0d, TL04760, Purchase irradiation testing hardware 19-Aug-21 10-Sep-21, 0d, TL04760, Purchase irradiation testing hardware 02-Sep-21 01-Nov-21, 42d, TL1004475, Develop testing firmware for ETROC2 - FNAL 07-Sep-21, 0d, TL = ETRO C2 submission 13-Sep-21, T15 - ETL - ETRO C2 global integration with periphery done 15-Sep-21, 0d, TL = ETRO C2 global integration with periphery done 15-Sep-21, T15 - ETL - ETRO C2 global integration with periphery done 15-Sep-21, 0d, TL04640, Prepare PO for ETROC2 production 16-Sep-21 05-Cet-21, 14d, TL04640, Suse PO for ETROC2 production 16-Sep-21 05-Cet-21, 14d, TL04640, Suse PO for ETROC2 production 07-Oct-21 05-Cet-21, 14d, TL04640, Suse PO for ETROC2 production 07-Oct-21 05-Cet-21, 14d, TL04660, SWT - Vendor fabricates ETROC2 16-Sep-21, 0 10-Feb-22, 1d, TL04670, Receive ETROC2 16-Dec-21 = 20-Jan-22, 2, 2, 2, 1d, TL0470, Receive ETROC2 14-Feb-22 <td></td> <td></td> <td></td> <td></td> <td>1</td> <td></td> <td></td>					1		
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13-Sep-21, T5 - ETL - ETROC2 pixel integration with periphery done 15-Sep-21, T5 - ETL - ETROC2 global integration done 15-Sep-21, T4 - ETL - ETROC2 global integration done 16-Sep-21 05-Cct-21, 14d, TL04640, Prepare PO for ETROC2 production 16-Sep-21 05-Cct-21, 14d, TL04640, Prepare PO for ETROC2 production 16-Sep-21 06-Cct-21, 14d, TL04660, Issue PD for ETROC2 production 07-Oct-21 10-Eb-22, 63d, TL04735, Develop test-board for ETROC2 16-Dec-21 06-Cct-21, 1d, TL04670, Receive DF for ETROC2 16-Dec-21 TD-Feb-22, 1d, TL04670, Receive ETROC2 T1-Feb-22, 1d, TL04670, Receive ETROC2 T1+Feb-22, 1d, TL04670, Inspect and sort ETROC2 - FNAL T4-Feb-22, 1d, TL04670, Irradiate ETROC2 (OBSOLETE) T5-Feb-22, 2d, TL04680, Irradiate ETROC2 (OBSOLETE) T6-Feb-22, 1d, TL04810, Irradiate ETROC2 (OBSOLETE) T6-Feb-22, 1d, TL04810, Irradiate ETROC2 (OBSOLETE) T6-Feb-22, 1d, TL04810, Irradiate ETROC2 (OBSOLETE) 							
15-Sep-21, ◆ T5 - ETL - ETRO C2gl obal integration done 15-Sep-21, ◆ T4 - ETL - ETRO C2 ready for submission 16-Sep-21 ● 05-Cet-21, 1.4, TL04640, Prepare PO for ETROC2 production 16-Sep-21 ● 05-Cet-21, 1.4, TL04640, Prepare PO for ETROC2 production 16-Sep-21 ● 05-Cet-21, 1.4, TL04650, Issue PD for ETROC2 production 07-Oct-21 ● 05-Cet-21, 1.4, TL04650, SVT - Vendor fabricates ETROC2 16-Dec-21 ● 05-Cet-21, 1.04750, Commission test-stand for ETROC2 16-Dec-21 ● 05-Cet-21, 1.104750, Commission test-stand for ETROC2 16-Dec-21 ● 15-Eb-22, 1.4, TL04670, Receive ETROC2 16-Dec-21 ● 16-Feb-22, 1.4, TL04670, Receive ETROC2 14-Feb-22 1.14-Feb-22, 1.4, TL04670, Inspect and sort ETROC2 (OBSOLETE) 15-Feb-22 1.5-Feb-22, 1.4, TL04680, Irradiate ETROC2 (OBSOLETE) 15-Feb-22 1.5-Feb-22, 1.4, TL04810, Irradiate ETROC2 (OBSOLETE) 16-Feb-22 1.6-Feb-22, 1.4, TL04810, Irradiate ETROC2 (OBSOLETE)							
15-Sep-21 ◆ T4 - ETL - ETRO C2 ready for subtrission 16-Sep-21 ● 05-Oct-21, 14d, TL04640, Prepare PO for ETROC2 production 16-Sep-21 ● 05-Oct-21, 13d, TL04735, Develop test-board for ETROC2 06-Oct-21, 1 ● 06-Oct-21, 14d, TL04660, Staue PD for ETROC2 production 07-Oct-21 ● 06-Oct-21, 14d, TL04660, Strue PD for ETROC2 production 07-Oct-21 ● 06-Oct-21, 14d, TL04660, Strue PD for ETROC2 production 07-Oct-21 ● 06-Oct-21, 14d, TL04660, Strue PD for ETROC2 production 07-Oct-21 ● 06-Oct-21, 14d, TL04660, Strue PD for ETROC2 production 07-Oct-21 ● 06-Oct-21, 14d, TL04660, Strue PD for ETROC2 production 07-Oct-21 ● 06-Oct-21, 14d, TL04670, Receive ETROC2 20-Jan-22, ● ● T5 - ETL - ETRO C2 testing hardware ready 11-Feb-22 11-Feb-22, 14, TL04670, Receive ETROC2 14-Feb-22 14-Feb-22, 14, TL04670, Inspect and sort ETROC2 - FNAL 14-Feb-22 14-Feb-22, 14, TL04770, Inspect and sort ETROC2 - FNAL 14-Feb-22 15-Feb-22, 24, 14, TL0470, Inspect and sort ETROC2 (OBSOLETE) 15-Feb-22 16-Feb-22, 14, TL04800, Irradiate ETROC2 (OBSOLETE) 16-Feb-22 16-Feb-22, 14, TL04800, Irradiate ETROC2 (OBSOLETE)							
16: Sep-21 05-Oct-21, 14d, TL04640, Prepare PO for ETROC2 production 16: Sep-21 15-Dec-21, 63d, TL04735, Develop test board for ETROC2 06-Oct-21 10-Oct-21, 10, TL04650, Issue PD for ETROC2 production 07-Oct-21 10-Feb-22, 8dd, TL04650, SVT - Vendor fabricates ETROC2 16-Dec-21 20-Jan-22, 20, 11, TL04500, Cormission test-stand for ETROC2 11-Feb-22, 1 11-Feb-22, 14, TL04670, Receive ETROC2 11-Feb-22, 1 11-Feb-22, 14, TL04670, Receive ETROC2 14-Feb-22 14-Feb-22, 14, TL04670, Inspect and sort ETROC2 - FNAL 14-Feb-22 15-Feb-22, 14, TL04670, Inspect and sort ETROC2 (OBSOLETE) 15-Feb-22 15-Feb-22, 14, TL04680, Irradiate ETROC2 (OBSOLETE) 16-Feb-22 16-Feb-22, 14, TL04680, Irradiate ETROC2 (OBSOLETE)		i i i i					
16-Sep-21 15-Dec-21, 63d, TL04735, Develop test-board for ETROC2 06-Oct-21 10-Oct-21, 1d, TL04650, Issue PD for ETROC2 production 07-Oct-21 10-Feb-22, 84d, TL04650, SVT - Vendor fabricates ETROC2 16-Dec-21 10-Feb-22, 84d, TL04650, SVT - Vendor fabricates ETROC2 20-Jan-22, 0 15-ETL-ETROC2 testing hardware ready 11-Feb-22, 1 11-Feb-22, 1d, TL04670, Receive ETROC2 14-Feb-22 14-Feb-22, 1d, TL04670, Inspect and sort ETROC2 (OBSOLETE) 15-Feb-22, 1d, TL04600, Irradiate ETROC2 (OBSOLETE) 16-Feb-22 16-Feb-22, 1d, TL04610, Irradiate ETROC2 (OBSOLETE)		· · ·			ņ		
06-Oct-21 ↓ 06-Oct-21, 1d, TL04650, Issue PD for ETROC2 production 07-Oct-21 ↓ 10-Feb-22, 84d, TL04650, SVT - Vendor fabricates ETROC2 16-Dec-21 ↓ 10-Feb-22, 41d, TL04750, Commission test-stand for ETROC2 20-Jan-22, 15-ETL = TROC2 testing hardware ready 11-Feb-22 ↓ 15-Feb-22, 1d, TL047670, Receive ETROC2 14-Feb-22 ↓ 18-Feb-22, 5d, TL1004670, Receive ETROC2 (OBSOLETE) 15-Feb-22 ↓ 16-Feb-22, 1d, TL04800, Irradiate ETROC2 (OBSOLETE) 16-Feb-22 ↓ 16-Feb-22, 1d, TL04800, Irradiate ETROC2 (OBSOLETE) 16-Feb-22 ↓ 16-Feb-22, 1d, TL04810, Test Irradiate ETROC2 (OBSOLETE)					i de la companya de l		
07-Oct-21 10-Feb-22, 84d, TL04660, SVT - Vendor fabricates ETROC2 16-Dec-21 20-Jan-22, 21d, TL04750, Commission test-stand for ETROC2 20-Jan-22, o T5 - ETL - ETRO C2 testing hardware ready 11-Feb-22 11-Feb-22, dt, TL04670, Receive ETROC2 14-Feb-22 11-Feb-22, dt, TL04670, Receive ETROC2 - FNAL 14-Feb-22 14-Feb-22, dt, TL04670, Inspect and sort ETROC2 (OBSOLETE) 15-Feb-22 15-Feb-22, dt, TL04800, Irradiate ETROC2 (OBSOLETE) 15-Feb-22 16-Feb-22, dt, TL04800, Irradiate ETROC2 (OBSOLETE)							
16-Dec-21 → 20-Jan-22, 21d, TL04750, Commission test-stand for ETROC2 20-Jan-22, ◇ T5 - ETL - ETRO C2 testing hardware ready 11-Feb-22, ↓ 11-Feb-22, 1d, TL04670, Receive ETROC2 14-Feb-22, ↓ 14-Feb-22, 5d, TL1004606, Inspect and sort ETROC2 - FNAL 14-Feb-22, ↓ 14-Feb-22, 1d, TL04770, Inspect and sort ETROC2 (OBSOLETE) 15-Feb-22, ↓ 15-Feb-22, 1d, TL04800, Irradiate ETROC2 (OBSOLETE) 16-Feb-22, ↓ 16-Feb-22, 1d, TL04800, Irradiate ETROC2 (OBSOLETE) 16-Feb-22, ↓ 16-Feb-22, 1d, TL04800, Irradiate ETROC2 (OBSOLETE)					ETROC2		
11-Feb-22 I 11-Feb-22, 1d, TL04670, Receive ETROC2 14-Feb-22 I 15-Feb-22, 3d, TL1004605, Inspect and sort ETROC2 - FNAL 14-Feb-22 I 14-Feb-22, 1d, TL04770, Inspect and sort ETROC2 (OBSOLETE) 15-Feb-22 I 15-Feb-22, 1d, TL04800, Irradiate ETROC2 (OBSOLETE) 15-Feb-22 I 15-Feb-22, 1d, TL04810, Irradiate ETROC2 (OBSOLETE) 16-Feb-22 I 16-Feb-22, 1d, TL04810, Test Irradiate ETROC2 (OBSOLETE)			_				
11-Feb-22 I 11-Feb-22, 1d, TL04670, Receive ETROC2 14-Feb-22 I 15-Feb-22, 3d, TL1004605, Inspect and sort ETROC2 - FNAL 14-Feb-22 I 14-Feb-22, 1d, TL04770, Inspect and sort ETROC2 (OBSOLETE) 15-Feb-22 I 15-Feb-22, 1d, TL04800, Irradiate ETROC2 (OBSOLETE) 15-Feb-22 I 15-Feb-22, 1d, TL04810, Irradiate ETROC2 (OBSOLETE) 16-Feb-22 I 16-Feb-22, 1d, TL04810, Test Irradiate ETROC2 (OBSOLETE)		20-Jan-22, 🔥	T5 - ETL - ETRO C2test	ng hardware ready			
14-Feb-22 I 14-Feb-22, 1d, TL04770, Inspect and sort ETROC2 (OBSOLETE) 15-Feb-22 I 15-Feb-22, 1d, TL04800, Irradiate ETROC2 (OBSOLETE) 16-Feb-22 I 16-Feb-22, 1d, TL04810, Test Irradiate ETROC2 (OBSOLETE)		11-Feb-22					
15-Feb-22 — 15-Feb-22, 1d, TL04800, Irradiate ETROC2 (OBSOLETE) 16-Feb-22 — 16-Feb-22, 1d, TL04810, Test Irradiate ETROC2 (OBSOLETE)		14-Feb-2	2 18-Feb-22, 5d, TL1004	605, Inspect and sort ETRO	C2 - FNAL		
16-Feb-22 🛏 16-Feb-22, 1d, TL04810, Test Irradiate ETROC2 (OBSOLETE)		14-Feb-22 •	14-Feb-22, 1d, TL0477	0, Inspect and sort ETROC2	(OBSOLETE)		
		15-Feb-22	15-Feb-22, 1d, TL0480	0, Irradiate ETROC2 (OBSC	LETE)		
16-Feb-22 🛏 16-Feb-22, 1d, TL04815, Perform functional tests of irradiated waveform sampling ETROC2 (OBSOLETE)							
	<u> </u>	16-Feb-2	2 🛏 16-Feb-22, 1d, TL04	1815, Perform functional test	ts of irradiated waveform san	pling ETROC2 (OBSOLETE	i)

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Budget from P6

Activity ID	FY2020, FQ4	FY2021, FQ1	FY2021, FQ2	FY2021, FQ3	FY2021, FQ4	FY2022, FQ1
WBS: 402W-DEV-6.8.4.2.1 ETL - Frontend ASICs General		\$7,742.66	\$1,054.54			\$7,897.49
Responsible Institution: FN Fermi National Accelerator Laboratory		\$7,742.66	\$1,054.54			\$7,897.49
Resource ID: FN_MS_PASS_FY19		\$2,218.16	\$1,054.54			\$2,262.49
Resource ID: FN_MS_STND_FY19		\$5,524.50				\$5,635.00
WBS: 402W-DEV-6.8.4.2.3 ETL - Frontend ASICs v2 development	\$93,712.99	\$414,780.37	\$385,235.79	\$598,030.96	\$ \$440,467.80	\$87,934.60
Responsible Institution: FN Fermi National Accelerator Laboratory	\$76,831.06	\$357,582.63	\$328,720.74	\$539,370.79	\$419,494.42	\$87,934.60
Resource ID: c_FN_MS_STND_FY19		/				
Resource ID: c_FNd_ASIC_DESIGN_EN		,				
Resource ID: c_FNd_ELTN_DESIGN_EN		/				
Resource ID: CMS-HL_FN_SM_P_PHYS_GRAD_STUD		,	\$2,375.06			
Resource ID: FN_MS_STND_FY19	\$23,900.40	\$3,314.70	\$2,209.80		\$45,300.90	J
Resource ID: FN_MS_TRVL_FY19		\$5,966.46				
Resource ID: FN_U_PT_EXP_PHYST		,				
Resource ID: FN_U_PT_EXP_RA		/				
Resource ID: FNd_ASIC_DESIGN_EN	\$52,930.66	\$312,869.28	\$157,773.33	\$444,884.96	\$ \$341,604.52	2 \$1,978.39
Resource ID: FNd_ELTN_DESIGN_EN		\$35,432.19	\$166,362.55	\$94,485.83	\$32,588.99	\$85,956.21
Resource ID: FNn_ENGNRING_PHYST		,				
Responsible Institution: SM Southern Methodist University	\$16,881.93	\$ \$57,197.74	\$56,515.05	\$58,660.16	\$20,973.38	٤
Resource ID: CMS-HL_FN_SM_P_ENG_GRAD_STUD	\$16,881.93	\$ \$34,669.78	\$33,148.90	\$13,036.09	1	
Resource ID: CMS-HL_FN_SM_P_PHYS_ASIC_DES		\$5,546.31	\$16,597.24	\$45,624.08	\$20,973.38	٤
Resource ID: CMS-HL_FN_SM_P_PHYS_GRAD_STUD		\$16,981.65	\$6,768.91			
Responsible Institution: UCSB University of California - Santa Barbara		/				
Resource ID: CMS-HL_AVE_U_SCIENTIST		1				
		,				
Labor		\$405,499.21	\$383,025.99	\$598,030.96	6 \$395,166.89	9 \$87,934.60
M&S		\$17,023.82	\$3,264.34	\$0.00	0 \$45,300.90	0 \$7,897.49
Total Labor		\$405,499.21	\$1,464,158.44			
Total M&S		\$17,023.82	\$56,462.73			



Activities from P6

Activity ID	Activity Name	FY2020, FQ3				FY2021, FQ3		FY2022, FQ1
Responsible Institution: SM Southern Methodist	University	\$41,326.40	\$16,881.93	\$57,197.74	\$56,515.05	\$58,660.16	\$20,973.38	
Resource ID: CMS-HL_FN_SM_P_ENG_GRAD_ST	UD	\$32,459.30	\$16,881.93	\$34,669.78	\$33,148.90	\$13,036.09		
TL04502	ETROC2 8 channel ADC waveform sampling design							
TL04513	ETROC2 8 channel ADC waveform sampling testing specification							
TL04522	ETROC2 8 channel ADC waveform sampling rad-hard version design	\$13,911.13						
TL04504	ETROC2 8 channel ADC waveform sampling improvements							
TL04506	Submit ETROC2 8 channel ADC waveform sampling mini-ASIC							
TL04515	ETROC2 8 channel ADC waveform sampling testing platform development	\$18,548.17						
TL04627	ETROC2 full chip design verification (OBSOLETE)							
TL04518	ETROC2 8 channel ADC waveform sampling mini-ASIC testing - step 1		\$16,881.93					
TL1003830	ETROC2 8 channel ADC waveform sampling mini-ASIC irradiation			\$4,966.13				
TL04524	Design modifications to rad-hard version of ADC waveform sampling - step 1			\$26,227.36				
TL1009375	Design modifications to rad-hard version of ADC waveform sampling - step 2			\$3,476.29	\$16,077.84			
TL1009475	ETROC2 8 channel ADC waveform sampling mini-ASIC testing - step 3 (COVID)				\$6,207.66			
TL1009445	Design modifications to rad-hard version of ADC waveform sampling - step 3				\$10,863.41	\$8,690.72		
TL04528	Integration of 8 channel rad-hard ADC waveform sampling into ETROC2 - SMU					\$4,345.36		
TL04815	Perform functional tests of irradiated waveform sampling ETROC2 (OBSOLETE)							
TL04785	Perform initial functionality test of ETROC2 waveform sampling - SMU							
Resource ID: CMS-HL_FN_SM_P_PHYS_ASIC_DE	s			\$5,546.31	\$16,597.24	\$45,624.08	\$20,973.38	
TL1004935	Prepare and issue PO for ETROC2 emulator v0 hardware			\$1,167.64				
TL1007805	ETROC2 emulator v0 firmware development - SMU			\$2,919.11				
TL1004965	ETROC2 emulator v1 hardware development - SMU			\$1,459.56	\$4,378.67			
TL1007815	ETROC2 emulator v1 firmware development - SMU				\$2,627.20	\$291.91		
TL1004908	ETROC2 TDC Optimization - SMU				\$9,591.37	\$7,923.30		
TL1007865	ETROC2 emulator v2 firmware development - SMU					\$2,919.11		
TL1007875	System testing development with emulator - SMU					\$5,838.22		
TL1007785	Pixel level integration (preamp + discriminator + TDC + DAQ readout) - SMU					\$10,747.64	\$2,388.36	
TL1007795	ETROC2 initial global integration / design verification - SMU					\$17,903.89	\$5,449.01	
TL1008895	ETROC2 final global integration / design verification - SMU						\$13,136.00	
Resource ID: CMS-HL_EN_SM_P_PHYS_GRAD_S	TUD	\$8,867.10		\$16,981.65	\$6,768.91			
TL04585	Develop ASIC periphery common design blocks - SMU	\$8,867.10						
TL1004215	ETROC1 Preamp + discriminator + TDC full chain single channel functional testing - SMU (COVID)			\$4,750.11				
TL04590	Pixel level readout							
TL1007805	ETROC2 emulator v0 firmware development - SMU			\$4,750.11				
TL1004857	Irradiate ETROC1 (COVID)			\$2,493.81	\$2,256.30			
TL1004855	ETROC1 4x4 array testing with bump bonded sensor, beam testing - SMU (COVID)			\$2,493.81	\$2,256.30		Delayed ac	tivities got shifted
TL1004825	ETROC1 Preamp + discriminator + TDC full chain single channel testing with wire bonded sensor - §	•		\$2,493.81	\$2,256.30	ir	nto ČY21	-
TL1007815	ETROC2 emulator v1 firmware development - SMU					T		
TL1007865	ETROC2 emulator v2 firmware development - SMU							
TL1007795	ETROC2 initial global integration / design verification - SMU							
TL04720	Develop testing software for ETROC2 - SMU (OBSOLETE)							
TL04730	Develop testing firmware for ETROC2 - SMU (OBSOLETE)							
TL1008895	ETROC2 final global integration / design verification - SMU							
TL04770	Inspect and sort ETROC2 (OBSOLETE)							
TL04800	Irradiate ETROC2 (OBSOLETE)							
TL04810	Test Irradiate ETROC2 (OBSOLETE)							
TL04820	Evaluate results of irradiated ETROC2 (OBSOLETE)						vork reass	igned to FNAL
TL04780	Perform initial functionality test of ETROC2 - SMU							
TL1008915	ETROC2 initial SEU testing (irradiation) - SMU							
TL1008905	ETROC2 initial TID testing (irradiation) - SMU							
TL1009345	Perform final functionality test of ETROC2 - SMU							
TL1009025	ETROC2 initial system testing - SMU							
TL1008935	ETROC2 final system testing - SMU							
TL1009255	ETROC2 final SEU testing (irradiation) - SMU							
TL1009235	ETROC2 final TID testing (irradiation) - SMU							
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Milestones (ETROC2)

	<u>.</u>	· ·	.,	26lul-22	402W-DEV-6.8.4.2.3 ETL -	Frontend AS	ICs v2 development
•	T5 - ETL - Start on-project ETRC	C2work		1 20 001 22			
	28-Jan-20 A, 🗙 T	4 - ETL - E TRO C	2 clock di stri buti on architect ur	e chosen			
	02-Mar-20 A, ♦	T5 - ETROC0 be	am test results available				
	26-Feb-20 A, 🔶	T4 - ETL - ETR 01-Oct-20* ◆ 1	OC2 submit 8 channel ADC wa T4 - ETL - COVID - Facility ope	weform sampling mini-ASIC ening			
	16-Mar-20 A 🖪	T5 - ETL - Start	post TDR design	-			
		30-Nov-20	♦ T5 - ETL - ETROC1 availa	ble for module prototype devel	opment and system testing		
		21-Dec-20	, 🔶 T5 - ETL - ETRO C2 emu	latorv0 ready			
		04-Jan-2'	1, 🗴 T5 - ETROC - Peripher	optimization done			
ETR	C available for ETL		1, 🗴 T5 - ETROC - Module ii				
	le development	18-Fe	b-21 🗙 T4 - ETL - ETRO C2	pixel level design complete			
mout			b-21 , 🍝 T4 - ETL - ETROC1	,	OVID)		
		02	2-Apr-21, 🔶 T5 - ETL - ETRO	C2 emulator v1 ready			
		28-Apr	r-21. 🖕 🔶 T5 - ETL - ETF	OC2 - 8 channel rad-hard ADC	waveform sampling design	done	
				kend software/firmware availal		mulator	
			30-Apr-21, 🔶 T5 - ETL - Bac		-		External components
			30-Apr-21,				needed for system
			30-Apr-21,				testing with the emulator
			30-Apr-21,		n testing with emulator		emulator
			30-Apr-21, ◆ T5 - ETL - ETF				
		24-J	· · ·	ETROC2 - 8 channel rad-hard			ne
				TL - ETROC2 Testing software - ETL - E FE.3 - ETROC2 sub		LETE)	
	Key US / Internationa		13-Sep-21, 🔥 🔶 T5-	ETL - ETROC2 pixel integratio	n with periphery done		
	milestones		15-Sep-21, 🔶 T5-	ETL - ETRO C2 gl obal integra	ondone		
			15-Sep-21, 🔥 🕈 T4-	ETL - ETROC2 ready for subr	nission		
			20-Jan-22, 🖕	T5 - ETL - ETRO C2 test	ng hardware ready		
			18-Mar-2		available for module prototy	pe developm	nent and system testing
			13-M	ay-22,	C2 testing results ready ETROC2 chiplevel testing	done	
			26-	Jul-22, 💊 🔹 🕈 T5 - ETL -	E TRO C2 done		



Milestones (ETROC3)

		▼ 12-Aug-24, 402W-DEV-6.8.4.2.4 ETL - Frontend ASICs v3 development
21-Mar-22 💊		ETRO C3 devel opment CMS - ETL- ETL EDR
		 T4 - ETL - Preproduction ETRO C3 ready for submission CMS - ETL - E FE.4 - ETRO C3 submission (preproduction)
ETROC available f module developme		 T5 - ETL - Preproduction ETROC3 available for module preproduction prototyping - Batch 0 28-Jun-23, ◆ T4 - ETL - Backend available for system testing with ETROC3 28-Jun-23, ◆ T4 - ETL - Service hybrid available for system testing with ETROC3 28-Jun-23, ◆ T4 - ETL - Preproduction module with ETROC3 ready for system testing
External c needed fo testing wit emulator		28-Jun-23, ◆ T4 - ETL - Preproduction ETROC3 chip level testing results ready I-Aug-23, ◆ T4 - ETL - Preproduction ETROC3 testing results available 07-Sep-23*, ◆ CMS - ETL - E FE.5 - ETROC3 ready for production 25-Sep-23, ◆ T5 - ETL - Frontend ETROC3 development done 25-Sep-23, ◆ T4 - ETL - ETROC3 production readiness review done 24-Oct-23, ◆ T4 - ETL - Production ETROC3 ready for submission 03-Jan-24, ◆ T4 - ETL - ETROCQC testing procedures ready
1	S / International	05-Apr-24, ◆ T4 - ETL - ETROCOC testing procedures ready 05-Apr-24, ◆ CMS - ETL - E FE \$ - ETROC3 ready for module production 25-Apr-24, ◆ T4 - ETL - ETROC3 batch 1 available for module production 12-Aug-24, ◆ T4 - ETL - ETROC Production Complete
milest	ones	