

CTF Down: Impact on CM Production

What-If Schedule Discussion



Outline

- Background UIM
- Overview
- Mitigations for LCLS-II
- Schedule Analysis
- Summary

- New cold box from Linde containing turbines currently resides in the CTF building.
- Preparations for piping work are on-going now.



Utilities Infrastructure Modernization (UIM) (1/2)

- The current cryogenic, power distribution, cooling water, and communication utility system gaps at TJNAF jeopardize its capability to provide the unique competencies to deliver its mission and customer focus within the DOE laboratory system. This infrastructure is essential to operation of TJNAF.
- This project includes replacement and upgrading of the accelerator site electrical distribution feeders, replacement of cooling towers serving accelerator operations, providing additional cooling and uninterruptable power for the computer center, upgrading of the cryogenics test facility to support cryomodule development and testing, and improving site communications infrastructure. This project will extend the life of existing utilities infrastructure and provide additional capacity to meet the Lab's science mission. The design will emphasize more open, collaborative, and flexible environments to respond to future mission needs.

https://www.jlab.org/fm/construction/UIM/

Utilities Infrastructure Modernization (UIM) (2/2)

- Managed as a project with a series of critical decision dates
- LCLS-II production overlaps with UIM
 - Last JLab CM shipment is DEC 2018

The Schedule

Milestone Description	Date
CD-0: Approve Mission Need	9/18/2009 (actual)
CD-1: Approve Alternative Selection and Cost Range	10/14/2010 (actual)
CD-2/3A: Approve Performance Baseline and Start of Construction - Phase A	August 2014
CD-3B: Approve Start of Construction - Phase B	October 2014
CD-3C: Approve Start of Construction - Phase C	June 2015
CD-4: Approve Project Completion	December 2018

Overview

- CTF Down begins 17-Feb:
 - 3.5 Months for equipment installation
 - 2 Months for commissioning and restart
- Impacts all SRF programs at JLab without mitigations
- LCLS-II Impacts
 - Cavity qualification
 - Production ramp-up
 - CM acceptance testing

Impacts and Mitigations (1/2)

- Cavity Qualification
 - Plan to qualify cavities for CM03 and CM04 before down in VTA
 - Need cavities for CM05, CM06 and possibly CM07 qualified elsewhere to bridge gap
 - Assume re-test in qualification rate
 - Assume TD material from RI to avoid customs issues
 - Mitigation Plan to have RI/DESY qualify cavities at a rate of 4 6 cavities per month starting February 2016
 - Received quotation from RI for four batches of tests at DESY
 - Mitigation Prepare dewar 5 for testing up to four cavities per cycle during CTF down
 - Creates additional capacity in order to catch up with qualification activities
 - Consider having cavities tested at FNAL
 - Discussing options with FNAL STL need to take into account rerinse rate and R&D priorities at FNAL

Impacts and Mitigations (2/2)

- Production Ramp-Up
 - Lack of cavities would create gap in production
 - Mitigation test qualified cavities for CM03 and CM04 at JLab in advance of CM05 deliveries from RI/DESY
 - Retains smooth labor profile to avoid standing army costs by loading up CM assembly work stations
- CM Acceptance Testing
 - 3.5 + 2 month down creates delay in start of pCM re-testing, CM02, CM03...
 - Mitigation shorten testing cycle on last 10 CMs by 25% to achieve 0 days of float
 - Consider performing shipping test with FNAL pCM
 - Consider not testing some portion of CMs if testing proceeds successfully

Schedule Analysis

- Snapshot of cavity deliveries
 - Forecast is several months <u>ahead of baseline</u>
 - What-if falls behind forecast but <u>still ahead of baseline</u>
 - No gaps in string assembly start 26 d float
- Snapshot of CM acceptance testing
 - Forecast is several months <u>ahead of baseline</u>
 - What-if falls behind forecast but <u>still ahead of baseline</u>
 - Gap in CM testing due to 3.5 month down
 - Revised testing duration 0 d float
- CM Assembly Labor Profile
 - Unchanged at the 10% level (65 FTEs)
 - Have budget to add 4 6 techs for CM assembly

Cavity Schedule Analysis

CMTF Down What-if Cavity String Assemblies							1:
	Start	Finish	BL Project Finish	Variance - BL1 Finish Date	Total Float	FFFFF	FY2017 FY2018
CM02 Cavity String Assembly	19-Sep-16 A	07-Dec-16	22-Nov-16	0.00	43.00		Conduct Cryomodule CM02 Cavity String Assemt
CM03 Cavity String Assembly	08-Dec-16	20-Jan-17	01-Mar-17	0.00	43.00		Conduct Cryomodule CM03 Cavity String A
CM04 Cavity String Assembly	09-Feb-17	15-Mar-17	05-Apr-17	0.00	30.00		Conduct Cryomodule CM04 Cavity String
CM05 Cavity String Assembly	16-Mar-17	19-Apr-17	10-May-17	0.00	30.00		Conduct Cryomodule CM05 Cavity Str
CM06 Cavity String Assembly	20-Apr-17	24-May-17	15-Jun-17	0.00	30.00		Conduct Cryomodule CM06 Cavity :
CM07 Cavity String Assembly	25-May-17	22-Jun-17	14-Jul-17	0.00	30.00		🚣 Conduct Cryomodule CM07 Caγity
CM08 Cavity String Assembly	29-Jun-17	27-Jul-17	11-Aug-17	-4.00	26.00		Conduct Cryomodule CM08 Cav
CM09 Cavity String Assembly	28-Jul-17	24-Aug-17	11-Sep-17	-4.00	26.00		Conduct Cryomodule CM09 C
CM10 Cavity String Assembly	25-Aug-17	22-Sep-17	09-Oct-17	-4.00	26.00		Conduct Cryomodule CM10
CM11 Cavity String Assembly	25-Sep-17	20-Oct-17	06-Nov-17	-4.00	26.00		Conduct Cryomodule CM1
CM12 Cavity String Assembly	23-Oct-17	17-Nov-17	06-Dec-17	-4.00	26.00		
CM13 Cavity String Assembly	20-Nov-17	19-Dec-17	11-Jan-18	-4.00	26.00		Conduct Cryomodule
CM14 Cavity String Assembly	20-Dec-17	25-Jan-18	09-Feb-18	-4.00	26.00		Conduct Cryomodu
CM15 Cavity String Assembly	26-Jan-18	22-Feb-18	09-Mar-18	-4.00	26.00		Conduct Cryomo
CM16 Cavity String Assembly	23-Feb-18	22-Mar-18	06-Apr-18	-4.00	26.00		🖳 Conduct Cryom
CM17 Cavity String Assembly	23-Mar-18	19-Apr-18	04-May-18	-4.00	26.00		🛂 Conduct Ctyc
CM18 Cavity String Assembly	20-Apr-18	17-May-18	04-Jun-18	-4.00	26.00		Conduct Cı

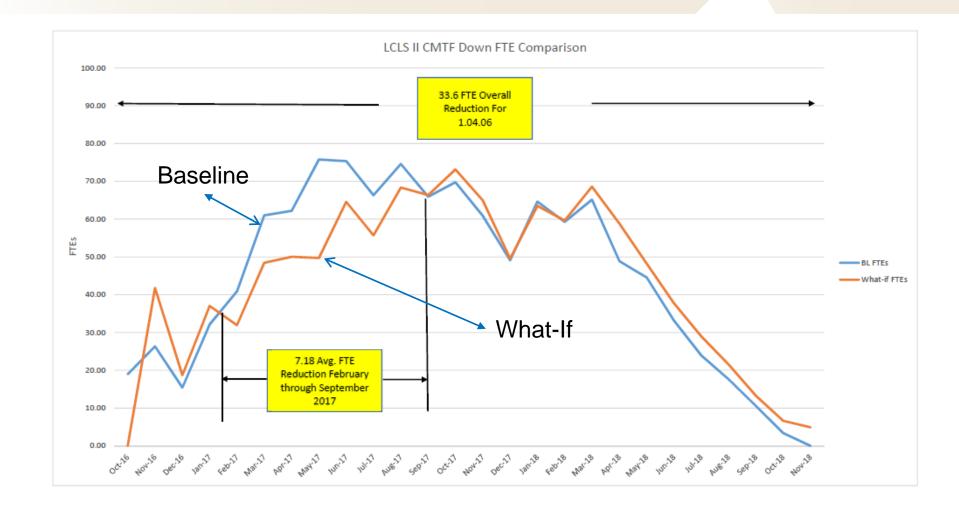
<u>Legend</u>
Baseline (Red)
Forecast (Blue)
What-If (Green)

CM Acceptance Testing Schedule Analysis

CMT	F Down What-if						13-Dec-16 1
Activity Name	Start	Finish	BL Project Finish	Variance - BL1 Finish	Total Float	FY2017 FY2018	FY20:
Cryomodule CM07 Cold Mass II Assembly	24-Jul-17	18-Aug-17	11-Sep-17	0.00	59.00	<u> </u>	
Cryomodule CM07 Vacuum Vessel	21-Aug-17	18-Sep-17	09-Oct-17	0.00	59.00		
Cryomodule CM07 Final Assembly	19-Sep-17	16-Oct-17	06-Nov-17	0.00	64.00		
	18-Aug-17	25-Sep-18	26-Sep-18	-10.00	6.00		₩ :
	18-Aug-17	22-Sep-17	01-May-17	-65.00	0.00		*******
Cryomodule CM02 Test	18-Aug-17	22-Sep-17	01-May-17	-65.00	0.00		
	25-Sep-17	20-Oct-17	28-Jul-17	-60.00	0.00		
Cryomodule CM03 Test	25-Sep-17	20-Oct-17	28-Jul-17	-60.00	0.00		
•	23-Oct-17	17-Nov-17	25-Aug-17	-60.00	0.00		
Cryomodule CM04 Test	23-Oct-17	17-Nov-17	25-Aug-17	-60.00	0.00	┼┼┤╎┼┤╎┼┼╎┼┼╎┼┼┼┼┼┼ ╻ ┤┼ ┊	********
	20-Nov-17	19-Dec-17	02-Oct-17	-60.00	0.00		
Cryomodule CM05 Test	20-Nov-17	19-Dec-17	02-Oct-17	-60.00	0.00		
•	20-Dec-17	25-Jan-18	06-Nov-17	-60.00	0.00	· · · · · · · · · · · · · · · · · · ·	
Cryomodule CM06 Test	20-Dec-17	25-Jan-18	06-Nov-17	-60.00	0.00		
•	26-Jan-18	22-Feb-18	06-Dec-17	-60.00	0.00	††:\:\:\ 	+++++++
Cryomodule CM07 Test	26-Jan-18	22-Feb-18	06-Dec-17	-60.00	0.00		
•	23-Feb-18	15-Mar-18	11-Jan-18	-55.00	0.00	₩.	
Cryomodule CM08 Test	23-Feb-18	15-Mar-18	11-Jan-18	-55.00	0.00		
	16-Mar-18	05-Apr-18	09-Feb-18	-50.00	0.00	· · · · · · · · · · · · · · · · · · ·	
Cryomodule CM09 Test	16-Mar-18	05-Apr-18	09-Feb-18	-50.00	0.00	╅╌┇╌┇╌┇╌┇╌┇╌┇╌┇╌┇╌┇╌┇╌┇╌┇╌┇╌┇╌┇╌┇╌┇ <mark>╌╬</mark> ╾╏╌	+++++++
	06-Apr-18	26-Apr-18	09-Mar-18	-45.00	0.00	!!!!! !!!!!!!!	
Cryomodule CM10 Test	06-Apr-18	26-Apr-18	09-Mar-18	-45.00	0.00	=	
•	27-Apr-18	17-May-18	06-Apr-18	-40.00	0.00		
Cryomodule CM11 Test	27-Apr-18	17-May-18	06-Apr-18	-40.00	0.00		
•	18-May-18	08-Jun-18	04-May-18	-35.00	0.00	*******	v††††††††
Cryomodule CM12 Test	18-May-18	08-Jun-18	04-May-18	-35.00	0.00		·
	11-Jun-18	29-Jun-18	04-Jun-18	-30.00	0.00	!!!!! !!!!	₩
Cryomodule CM13 Test	11-Jun-18	29-Jun-18	04-Jun-18	-30.00	0.00		• ! ! ! ! ! ! ! !
	02-Jul-18	23-Jul-18	02-Jul-18	-25.00	0.00	11111 11111 1111 1111	₩
Cryomodule CM14 Test	02-Jul-18	23-Jul-18	02-Jul-18	-25.00	0.00		
•	24-Jul-18	13-Aug-18	31-Jul-18	-20.00	0.00		₩
Cryomodule CM15 Test	24-Jul-18	13-Aug-18	31-Jul-18	-20.00	0.00		.
	14-Aug-18	04-Sep-18	28-Aug-18	-15.00	0.00		₩
Cryomodule CM16 Test	14-Aug-18	04-Sep-18	28-Aug-18	-15.00	0.00		
	05-Sep-18	25-Sep-18	26-Sep-18	-10.00	6.00		₩
Cryomodule CM17 Test	05-Sep-18	25-Sep-18	26-Sep-18	-10.00	6.00		

Legend
Baseline
(Red)
Forecast
(Blue)
What-If
(Green)

Labor Profile Schedule Analysis



Summary

- CTF Down begins 17-Feb:
 - 3.5 Months for equipment installation
 - 2 Months for commissioning and restart
- Impacts all SRF programs at JLab without mitigations
 - Actively working to mitigate schedule impacts
- LCLS-II Impacts
 - Cavity qualification retain 26 d float with RI/DESY testing of up to 24 cavities
 - Production ramp-up avoiding standing army with proposed solution
 - CM acceptance testing what if shows 0 d float, reduced testing protocols

Back-Up Slides