Working Group Report

Cryogenic System

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Outline

- Cryogenic Systems WG Scope
- Modifications to the cryogenic section of the ICD
- Issues that need to be addressed within RD&D program
- Proposed timeline
- Provisional distribution of responsibility
- Issues that need resolution
- Summary

Cryogenic Systems WG Scope

- Cryogenic Plant
- Cryogenic Distribution System
- Ancillary Systems

Modification to the ICD

- The cryogenic portion of the ICD-2 was discussed. It was found to have sufficient content for the ICD level document
- No modifications were identified or proposed

Issues that need to be addressed within the RD&D program

1. Cryogenic Distribution and Segmentation
2. Capital and Operational Cost Optimization
3. Heat Load Analysis

ISSUE 1:
Cryogenic Distribution and Segmentation

- Study existing cryomodules thermal cycling experience
- Process development – 2K h/x, steady state, transient, fault, maintenance, and commissioning scenarios
- Tunnel distribution components capacities and location definition
- Components over pressure protection study
- Define cryogenic string size limits and segments
- Liquid helium level control strategy development
- Development of tunnel ODH mitigation strategy
- Integrated CM safety analysis
- Study low pressure bayonet performance

ISSUE 2:
Capital and Operational Cost Optimization

- Cavity operating temperature optimization
- Shields operating parameters optimization
- Cryogenic Plant Cycle
- System lifecycle cost optimization
  - 5 K Shield retention
- Effective utilization of existing Fermilab cryogenic assets

ISSUE 3:
Heat Load Analysis

- Investigate static and dynamic loads for all components and sub systems including issues of operating temperature for high temp shield
- Define overcapacity and uncertainty factors
- Fault scenarios heat flux study

Sequence and timeline

1. Distribution and Segmentation – 2010
2. Cost Optimization – 2012
3. Heat Load Analysis – 2012

Responsibilities through CD-1

- The following distribution of responsibilities is proposed for the Cryogenics portion of RD&D:

	Lead	(Contributor)
Cryogenic Distribution and Segmentation –	SLAC	(FNAL)
Capital and Operational Cost Optimization –	TJNAF	(FNAL)
Heat Load Analysis –	FNAL	

Issues that need resolution

- Refine cryogenic system lifecycle and reliability requirements
- SRF accelerating components requirements specification
  - Operating temperatures and pressures tolerances
  - MAWPs
  - Cooldown/warm-up constraints
  - Thermal cycling limits
  - Relieving and fault scenarios
  - Interface definition
- Commissioning scenarios
- Refine future upgrade scenarios

Summary

- ICD is technically feasible
- CM and Cryo System RD&D should be linked in a closer way
- RD&D plan fine tunes system design (normal and fault) parameters
- Collaboration is essential for the success of the RD&D plan implementation
- Thanks to all participants and collaborators for their contribution