

Superconducting Linac (SCL) Systems

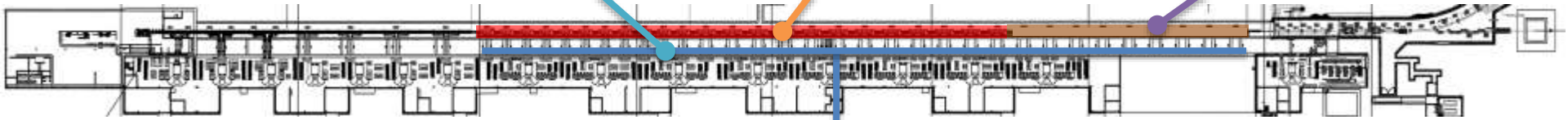
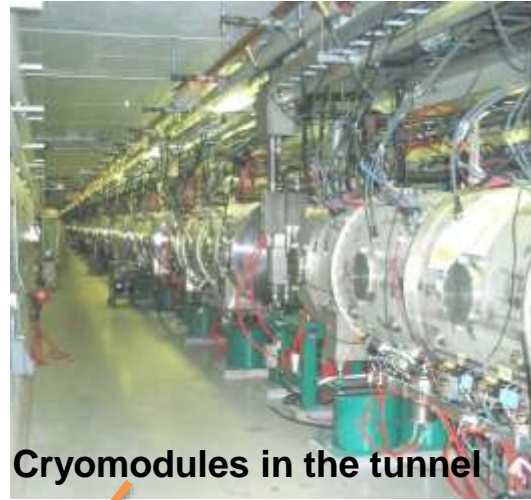
Presented at the
Accelerator Advisory Committee
Review

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Scope of Work (I)



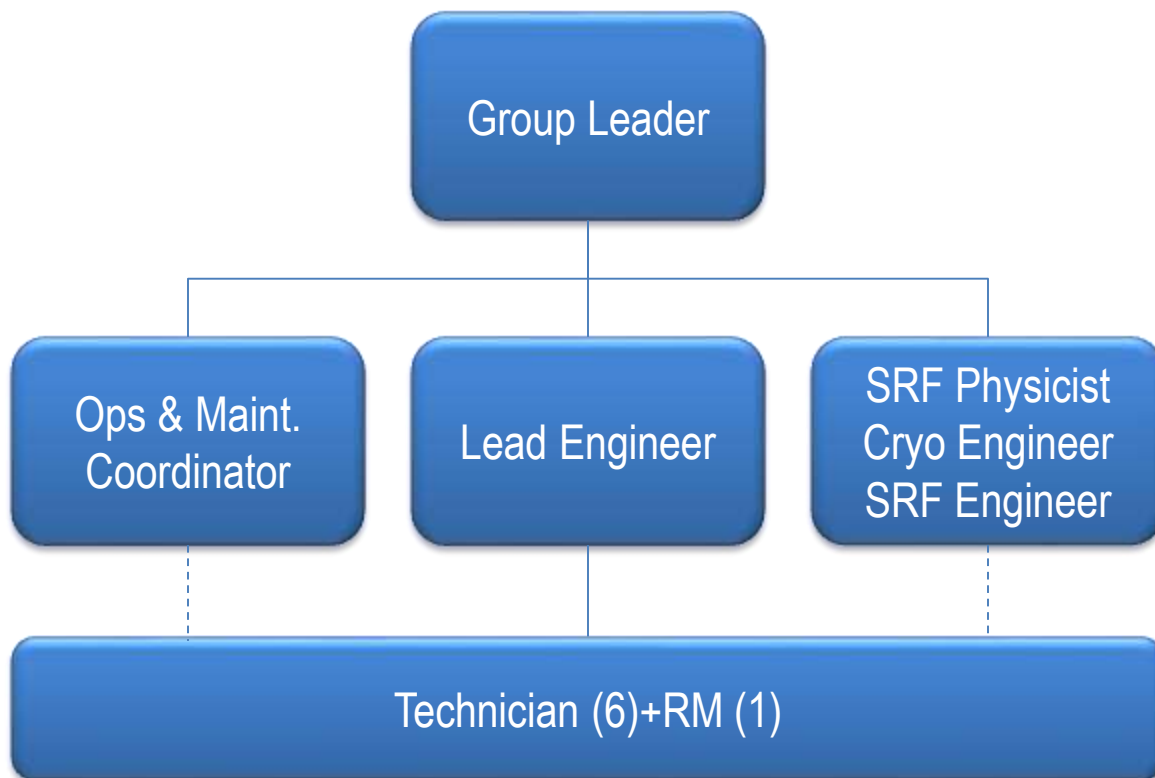
MOS DRIVE
 TRANSPORT DRIVE
 2 K COLD BOX
 LN2
 GHe storage
 R&D
 CM rework
 Control room
 CTF
 CM development
 HPR
 VTA
 LHe dewar
 2 K Cold Box
 4 K Cold Box
 Warm Compressor

Scope of Work (II)

- Operation and maintenance of SCL Systems
 - Cryomodules: 11 medium beta, 12 high beta
 - Central Helium Liquefier (CHL): 2.8 kW at 2K
 - CHL control room: 1.5 shifts/day to cover CHL operation
 - Transfer lines: about 550 linear meters
- Cryomodule development and cryomodule rework/repair
 - High beta spare cryomodule: commissioned in March 2012, in-service since Aug. 2012
 - Medium beta spare cryomodule: design under progress, ready for long-lead item procurements
 - Repair/rework in the RFTF: 0-2 cryomodules/year
- R&D for SCL system performance improvement and for STS
 - In-situ cleaning process, SRF cavity, fundamental power coupler, etc.
- SRF facilities
 - Existing: Clean room, high pressure rinse/ultra pure water system, test cave, RF system for test cave, ultrasonic cleaning, cavity tuning bench, cryomodule assembly/repair area
 - Under development: Vertical test area, Horizontal test apparatus, Cryogenic test facility, Barrel polishing system, R&D vacuum furnace
 - Future plans: Chemistry system, full size vacuum furnace

Group organization

- FY13 Budget (Labor: \$3.09M, material: \$1.96M)
 - Materials: spares 0.44, recurring ops 0.34, cryogenes 0.43, CM repairs 0.48, others (contractor, facility improv./cleaning, M&S, travel, etc) 0.27



Position Type	number
Management	2
Engineer	3
Physicist	1
Technician	6
Research mechanic	1
Post-doc	(1)

- Weekly planning for resource management

Spare/maintenance

- Spares
 - In-line spares (ex. Warm compressor)
 - Ready to install for emergency (ex. Spare cryomodule, dummy pipes, warm section)
 - Critical spares are identified and maintained
 - Other spares are managed by system expert
- Maintenance planning
 - Preventative maintenance for CHL automatically triggered by SNS maintenance management system
 - Shut down planning starts 2 months in advance
 - Maintenance & operation coordinator position
 - Follow the SNS standard for work control
 - Predictive/proactive maintenance

Issues and Vulnerability

- Issues (performance degradation over the long term)
 - CHL: contamination → efficiency/capacity down
 - Could result in long shut down: non-gaseous contamination in 4 K heat exchanger
 - Full time monitoring of impurities of helium (O₂, N₂, water, Oil)
 - SCL: SRF cavity performance degradation by gas/particulate contaminants (ex. Errant beam)
 - Processing, thermal cycle, repairs
 - Strict procedures/instructions followed and careful operation as a whole
 - Communication/consulting between subject matter expert and operation group at abnormal condition or precursors
 - Adjustment of machine proactively
- Key vulnerabilities (single point failure)
 - Carbon bed failure: 6 months
 - 2K cold compressor failure: 6-12 months
 - Transfer line failure: 6-18 months
 - Gas management failure: 3 months
 - Oil contamination in 4K cold box: 4 weeks- 3months
 - Cryomodule: 3 weeks

Backup Material

Critical Spares

- SCL
 - Spare high beta cryomodule
 - Spare valves and actuators
 - Spare mechanical tuners
 - Four spare couplers for each beta
 - Part kit at least for one CM rework
 - Spare dummy pipes
 - Spare warm section (under procurement)
 - Spare medium beta cryomodule (under design)
 - Spare local pumping cart

Critical Spares

- CHL

- Warm compressors:

- in-line spare compressors in 1st and 2nd stages
 - One spare for each 1st and 2nd stage motor in storage
 - Two or three oil pumps/motors for each 1st and 2nd stage in storage
 - At least three shaft seals in storage

- 4K cold box

- One spare turbine for each stage (5 stage)

- 2K cold box

- One spare cold compressor/motor for each stage (4 stage)
 - Two spare VDFs for each stage
 - Spare card for mag bearing cabinets at least one each

- Gas management

- Full set of valves