A November, 2008, update for the ILC cryogenics work package list

TA-1.4 Cryogenics

Technical Area Group 1.4, Cryogenics, has 7 (merged from17) work packages listed in Table A.1.

Table A.1: Cryogenics Work Packages

ID	title	description	who (tentatively)
1.4.1.	Heat loads	The heat load to the entire cryogenics system is investigated under static and dynamic conditions. Static, dynamic, and distribution system loads are considered, including tolerances and uncertainties. Overall uncertainty factors and cryoplant sizes are re-evaluated.	Peterson (FNAL), Ohuchi (KEK), Pierini (INFN), Petersen* (DESY)
1.4.2.	Cryogenic process design, cryoplant design, and surface impact	The cryogenics plant engineering is to be carried out in cooperation with industry and in close communication with CF&S technical area engineers to optimize interface with the CFS system. The location and distribution of surface equipment such as large compressors and associated utilities are optimized for minimal local impact, reliability /maintainability and cost. The integrated cycle design is evaluated. Temperature and pressure levels in cryomodules, particularly in the thermal shields, should be evaluated in the context of the full process through the cryoplants.	Klebaner (FNAL), Peterson (FNAL), Arenius (JLAB), Ganni (JLAB), Tavian* (CERN)
1.4.3.	Venting, pressure limits, and piping and vessel standards	The peak pressure in the cryogenics system in various modes of pre-cooling, steady state operation, and emergencies such as vacuum failure and helium rupture into the vacuum should be assessed, along with venting design. Cryogenics system and components need to meet industrial high-pressure gas regulation standards, which includes regional code compliance for hardware manufactured in other regions.	Peterson (FNAL), Nakai (KEK), Hosoyama (KEK), Petersen* (DESY)
1.4.4.	Tunnel cryogenic system design and integration with Main Linac	Design of the cryogenic system arrangement and components within the Main Linac tunnel includes cryogenic distribution design, segmentation, load-sharing, and maintenance scenarios, special 4K to 2K heat exchanger design, and liquid helium level control. Trade-off studies that compare cryomodule complexity and cost for cryogenic system loads.	(on hold, no effort foreseen)
1.4.5.	Oxygen deficiency hazard	Safety plan against oxygen deficiency hazard (ODH) in tunnel and surface building is investigated.	(on hold, no effort foreseen)

1.4.6	Cryogenics outside of the main linacs (e+/-sources, damping ring, RTML, BDS)	Cryogenics for e+, e- source linac, undulators, DR, BDS, RTML, and associated distribution and special objects, as unique and separate from Main Linac. The cryogenic engineering should be similar to that of the main linac system, with a smaller scale. These systems must be properly integrated into the ML cryogenics system.	(on hold, no effort foreseen)
1.4.7	Cold vacuum systems	The vacuum systems for thermal insulation in all cryogenics systems in ML, e+/- sources, BDS, RTML are designed in close cooperation with cryogenics system design. The vacuum system for beam pipe is designed as separate system, in this work package.	(on hold, no effort foreseen)

* CERN and DESY effort involves primarily just provision of information from their work on XFEL and LHC.

Here is the old work list for reference, showing the source of modifications.

Table A.1: Cryogenics Work Packages

ID	title	description
1.4.1.	Heat loads	The heat load to the entire cryogenics system is investigated under static and dynamic conditions. Static, dynamic, distribution system loads are considered, including tolerances and uncertainties.
1.4.2.	Cryoplant design and surface impact	The cryogenics plant engineering is to be carried out in cooperation with industry and in close communication with CF&S technical area engineers to optimize interface with the CFS system. The location and distribution of surface equipments such as large compressors and associated utilities are optimized in balance of reliability /maintainability and cost.
1.4.3.	Tunnel cryogenic system design and integration with Main Linac	The cryogen distribution box capacity, location, and distribution in the tunnel, are designed and optimized in balance of the performance/redundancy and cost. The long-term and stable operation is a critical requirement. Studies of segmentation, load-sharing, and maintenance scenario are to be made to keep the system redundancy in balance of the global cost. The liquid helium level in the cavity and He vessel is an important design parameter to ensure safe and reliable operational condition. The static and dynamic operational conditions are studied and a level control operation is designed and optimized by using heaters. Trade-off studies that compare cryomodule complexity and cost for cryogenic system loads. Designs are needed for a new heat exchanger for 4K to 2K heat transfer to pumped vapor, pre-cool liquid supply
1.4.4.	Venting, pressure limits, and vessel and piping standards	The high pressure gas design needs to fit to any regional codes and constraints. The peak pressure in the cryogenics system in various modes of pre-cooling, steady state operation, emergency modes such as SRF cavity quenches and vacuum failure modes should be carefully studied including the inspection pressure to be required. The cryogenics system design needs to be consistently designed and standardized according to the industrial high-pressure gas regulation to be met. .Regional code, compliance, hardware transfer
1.4.5.	~~Surface impact~~ Combine with 1.4.2	~~The location and distribution of surface equipments such as large compressors and associated utilities are optimized in balance of reliability /maintainability and cost.~~
1.4.6.	Oxygen deficiency hazard	Safety plan against oxygen deficiency hazard (ODH) in tunnel and surface building is investigated.
1.4.7.	~~Cryobox design~~ Combine with 1.4.3	~~The cryogen distribution box capacity, location, and distribution in the tunnel, are designed and optimized in balance of the performance/redundancy and cost.~~
1.4.8.	~~Liquid control~~ Combine with 1.4.3	~~The liquid helium level in the cavity and He vessel is an important design parameter to ensure safe and reliable operational condition. The static and dynamic operational conditions are studied and a level control operation is designed and optimized by using heaters.~~
1.4.9.	~~Optimization of cryogenics~~ Combine with 1.4.3	~~Trade-off studies that compare cryomodule complexity and cost for cryogenic system loads~~

1.4.10.	~~2K heat exchanger~~ Combine with 1.4.3	~~4K to 2K heat transfer to pumped vapor,~~ ~~pre-cool liquid supply~~
1.4.11.	~~Standards~~ Combine with 1.4.4	~~The cryogenics system design needs to be consistently designed and standardized according to the industrial high-pressure gas regulation to be met. .Regional code, compliance, hardware transfer~~
1.4.12.	e+/- sources cryo.	Cryogenics for e+, e- source linac, undulators, DR, BDS, RTML, and associated distribution and special objects, as unique and separate from Main Linac. The cryogenic engineering should be similar to that of the main linac system, with a smaller scale. These systems must be properly integrated into the ML cryogenics system.
1.4.13.	Damping ring cryo.	
1.4.14.	BDS cryo.	
1.4.15.	RTML cryo.	
1.4.16.	Main Linac Vacuum.	The vacuum systems for thermal insulation in all cryogenics system in ML, e+/- sources, BDS, RTML are designed in close cooperation with cryogenics system design. The vacuum system for beam pipe is designed as separate system, in this work package.
1.4.17.	RTML vacuum.	