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Interface parameters, constraints, preferences, responsibilities, as well as questions and possible solutions. DRAFT.

Speed of push-pull operation and responsibility.

Hardware design should allow the moving operation and reconnections to be performed in few days, say less than a week.
Responsibility for operation – ILC machine group.

Alignment parameters.

Assume that after the push-pull operation the detector elements can be placed within ±1mm from ideal position. Final adjustment of FD and Tracker will have to be done with main magnetic field on to do away with various displacement of detector parts under magnetic stresses.
FD has its own alignment system of the ?mm range that can be used for finer alignment without beam or with beam. Before starting the beam, the FD apertures and Vertex apertures need to be aligned better than to ??mm.
The beam-based measurement of FD position and application of its alignment system will bring it to ideal position within ???microns.
Tracker location is measured with respect to the Vertex to 1micron. Also the different parts of the tracker need to be measured (verified) w.r.to each other at 1micron level.
Tracker to calorimeter position needs to be measured with 1mm accuracy.
Responsibility for alignment FD – ILC machine group.
Responsibility for alignment and on-line survey of subdetectors – Collaboration.

Stability parameters. (I assume all these numbers are between any two 5Hz pulses?)

The needed stability of the Final Doublet is about 100-200nm, which is rms relative displacement of two FDs between any two 5Hz pulses.
Assume that it implies that the needed stability of detector surfaced on which the FD rests, is about 50-100nm.
Assume that this implies that the needed stability of the collider hall floor is about 25-50nm.
The needed stability of the BDS quadrupoles in the in-tunnel beamline is 20-30nm (??). Assume that it implies the BDS tunnel floor stability about 10-15nm.

Assembly of detector.

Assembly is done on surface, in a dedicated building, and only final assembly is done in the collider hall underground, using a light crane for example around 20 ton capacity.
A reasonable limit for the maximum mass to be handled from the surface seems to be around 2000 tons, but this may be adjusted to the needs of detectors.
From cost and logistic consideration the gantry crane must be stationary when handling heavy loads, however, with no load, the gantry crane can be slid over one or the other shaft to service one detector or the other, as needed.

The gantry crane being stationary when handling heavy loads, then one shaft cover is needed as handling ancillary. This shaft cover can also be slid to service one shaft or the other, as needed.

Segmentation of detector.

Segmentation of detector is a choice of detector collaboration, provided that it does not contradict the assembly scenario and other requirements, in particular the capacity of the underground crane.

The question whether the detector door is split vertically or not, seems to have most interference with machine design. For this latter, the preferences as they seen now are the following. Split vertically – makes vacuum chamber easier, but require extending support for FD, and may limit cryogenic line connection options; large magnetic forces complicates design of the end caps. Door not split – complicated vacuum chamber, more tight requirements on the external size of the FD, require sliding support of FD from the door.

Surface buildings

The choice of surface assembly for the detectors and the sharing of gantry crane and shaft cover imposes the disposition of the main assembly halls.

The other ancillary buildings are disposed at best around the main assembly halls.

Underground hall

It seems reasonable to have a main service area on the side of the by pass, and a smaller service area, at the opposite side for the other detector. Size will depend of which services have really to be there. These two service caverns will be served by ≠9m shafts comprising lift, stairs, services and sufficient space to lower loads to the service caverns. This will render the main shafts nearly empty, apart from main ventilation ducts.

The trench needed by a possible push pull platform and cable chains should stay inside the space naturally provided by the bottom invert.

It may be needed on one side for each detector to enlarge the hall to allow extracting Tracker or TPC in the garage position, especially if the doors are not split.

Radiation and shielding.

Detector should either be self-shielded or need to assume responsibility for additional local fixed or movable shielding (walls) to provide area accessible for people near the second detector when the other one is running with beam. The radiation criteria to be satisfied are for normal operation and for accident case. In the normal operation, the dose anywhere near non-operational second detector should be less than 0.05mrem/hour. In the accident case the dose should be less than 25rem/h for maximum credible beam (simultaneous loss of both e+ and e- beams near IP, at maximum beam power), and the integrated dose less than 100mrem per accident.

(The outcome of these requirements is understood to be the need for packman shielding of the IR beamlines, and additional shielding of detector and a shielding wall for non-self shielding detector.)

Vacuum requirements.

To limit beam gas interaction, the vacuum should be less than 1nTorr within 200m of the IP, 10nTorr from 200m to 800m from the IP, and 50nTorr more than 800m from the IP. The need and position of pumps near IP must be assessed.

Magnetic field outside of detector.

Field outside of detector body should be smaller than 50Gauss.
(Why so stringent? it may cost a lot in return iron)

Opening of detector on the beamline.

Hardware design should allow opening or closing to be performed in half-a-day.
At least 2m of opening should be provided.
The corresponding detector collaboration is responsible for the operation.

Cryogenic system for the FD.

Should provide 2K helium.
Assume that the push-pull schedule require the cryo lines to be always connected to the FD and heat exchanger.
System should allow for 100W??? total heat load for the 2K FD and cryo lines.
The cryo lines are not restricted to be only in a plane, as soon as they contain just a single phase, and two phase system is present only in heat exchangers.

Support of forward instrumentation.

The masks or other IR hardware and instrumentation should not be supported from the final doublet, if the total mass recalculated to the IR FD edge exceeds 10kg.

Calibration of detector.

After routine push pull operation or other routine switch of the magnetic field is performed with data tracks, at nominal or other energy. This operation is the detector collaboration choice and responsibility and its time is not counted as push-pull operation.

Splitting of beamline.

Beamline is split into the part which moves together with detector and the one which stay fixed in the tunnel. The splitting is preferred in a drift between QD0 and QF1, which then require to have two independent cryostats for the FD.

When p-p ends, with what?

Power, services, water, air for detector and IR beamlines?
Need for He, quantity?
T stability

Procedures to be done in garage position and on beamline.

Questions:

GLD talk shows that prefer to split beamline after QF1, instead of between QD0 and QF1. Spell out the arguments for one way or another.