| CHANGE REVIEW PANEL REPORT ON ILC-CR-0015: KAMABOKO-SHAPED POSITRON BDS TUNNEL | EDMS No: **D*1xxxxxx** |
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## Summary of the CRP Review

Change Request ILC-CR-0015 "Kamaboko-shaped positron BDS tunnel" (EDMS ID D*1154075) was submitted to the TCMB on 24.3.2017.

The TCMB formed a Change Review Panel with these members:

- Benno List, DESY (chair)
- John Osborne, CERN
- Masakazu Yoshioka, KEK

The CRP held a phone meeting on 12.6.2017.

The CRP findings and recommendations are as follows:

Overall, the CRP agrees that the change request is reasonable.

The CR contains three distinct proposals:

- To change the tunnel layout from a two-tunnel configuration with separate machine and service tunnels, to a Kamaboko shaped single tunnel with shield wall, and extend the service tunnel up to the experimental hall.
- To relocate the electron source upstream.
- To change the cryogenic supply scheme for the electron source's 5GeV booster such that the booster is connected to the Main Linac helium supply rather than the experimental hall.

In the following, first general comments are made, then these topics are discussed separately.

## 1. General

**Request**: We would like to see drawings of better quality of the tunnel cross sections (Fig 2, 5) and top views (Figs 1, 3, 4), i.e., drawings with higher resolution and more detail.

**Finding**: We find the estimate of the cost impact of the CR to be sufficient to judge the CR; we consider the CR to be essentially cost neutral.

## 2. Change of the tunnel cross section to a Kamaboko shape

**Finding**: We find it reasonable to assume that the BDS tunnel access requirements will be similar to the Main Linac case, i.e., that no access will be necessary to the service tunnel during beam operation.

**Finding**: We find that the in the region of the electron source 5GeV booster , the shielding requirements are the same as in the Main Linac (i.e., shielding is required from neutron radiation due to dark current emissions during RF testing with cold accelerator modules), and that therefore the same 1.5m shield wall thickness is required.

**Finding**: We consider it a strength of the proposed Kamaboko tunnel shape that in regions where no SC cavities will be installed the shield wall thickness may be reduced from the assumed 1.5m, which would save some costs.

**Finding**: We considers the fact that the CR introduces a service way along the whole accelerator tunnel with a connection to the experimental hall an improvement to safety, as it opens a second, protected escape route.

**Finding**: We find that the CR significantly eases the installation of the 66kV power cables that need to be laid in the tunnel.

**Recommendation**: We recommend to further study the arrangement of beamlines in those tunnel sections where three beamlines are mounted side by side, with respect to accessibility for installation and maintenance.

**Recommendation**: We recommend to further study the layout of the branch-off region, where the LTR tunnel connects to the BDS tunnel, to understand how the service tunnel crosses the LTR tunnel.

**Recommendation**: We recommend to further study access requirements for specialized devices such as laser wires and the electron source components in the region under consideration.

**Recommendation**: We recommend to make a more detailed design of the dump regions (pressurized 18MW main dump, 400kW tune-up dump) to better understand the access requirements and safety (radiation, escape) impact.

## 3. Relocation of the Electron Source

**Finding**: We find that the reason given for the electron source relocation (avoidance of high radiation region around collimators) is plausible.

**Finding**: We find that the cost increase incurred by the change is acceptable, provided

the cryogenic supply scheme is adapted.

## 4. Change of the 5GeV Booster Cryogenic Supply Scheme

**Finding**: We find that the electron source relocation and the change of the cryogenic supply need to be done together.

**Finding**: The change of the cryogenic supply scheme is reasonable if, and only if, the electron source is moved upstream.

**Recommendation**: We recommend providing an updated cryogenic layout of the Main Linac as part of the implementation of this CR, which takes the increased cryogenic load into account.

**Recommendation**: We recommend providing a more detailed layout of the cryogenic supply, e.g. specifying the temperature of the supplied helium and determine the cryogenic losses and costs incurred by the supply line.

## 5. Final recommendation:

We recommend to accept the Change Request in its entirety.

Benno List, 13.6.2017, for the CRP