March 2021

Towards the realization of the ILC – The International Development Team IDT

The Year 2020 has brought significant progress to the project of the International Linear Collider (ILC) in Japan. The evaluation of the Japanese Science Council has put the Japanese Government into position to adopt the project at governmental level. Further the Government of the United States has declared publicly that it wishes to see the project being realized in Japan. The recent Update of the European Strategy of Particle Physics (EPPSU) has put a high energy electron-positron collider (Higgs Factory) as top priority and declared a timely realization of the ILC to be compatible with this strategy. This statement reflects the fact that the International Linear Collider (ILC) is the most advanced project among the current proposals.

In this context, the International Committee for Future Accelerators (ICFA) has mandated an *International Development Team (IDT)* to prepare a "pre-laboratory" (Pre-lab) for the ILC. The Pre-lab will coordinate the necessary R&D before the construction of the ILC accelerator and the experiments. The Pre-lab is foreseen to start during 2022 for a duration of four years.
The figures below give an impression of the accelerator site and accelerator complex of the ILC and of the ILD Detector, a concept for a detector to record the final state of the e+e- collisions.

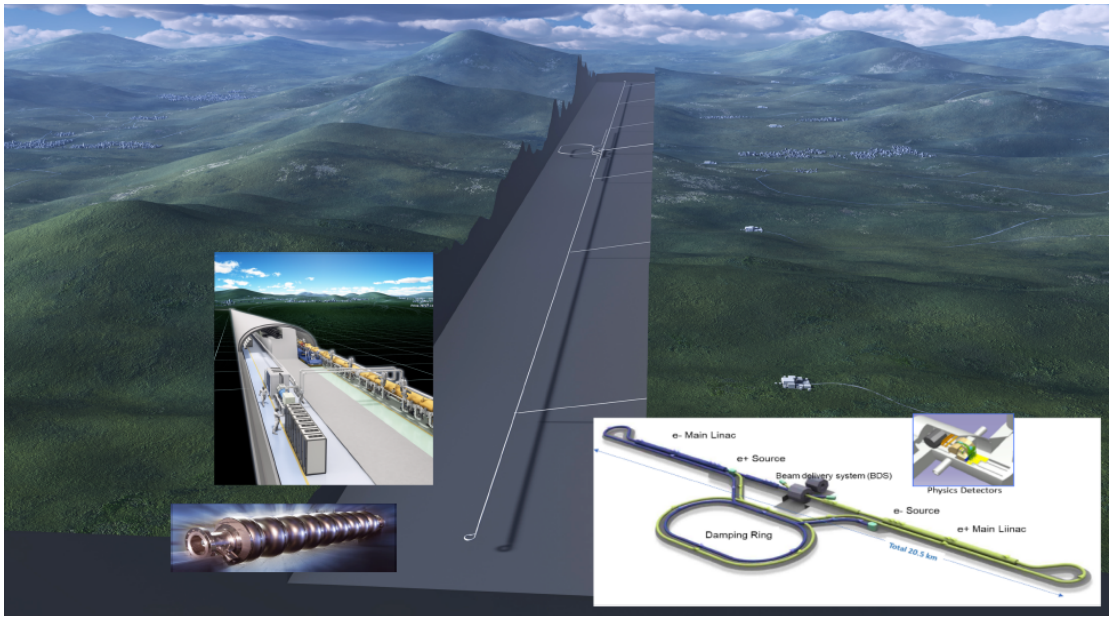

Figure 1: The background shows an artistic view on the approximately 30km long ILC Accelerator embedded in the landscape of the foreseen site in Kitakami (Northern Japan). From top left to lower right are images of the accelerator tunnel, a structure for particle acceleration and a schematic view of the accelerator complex.

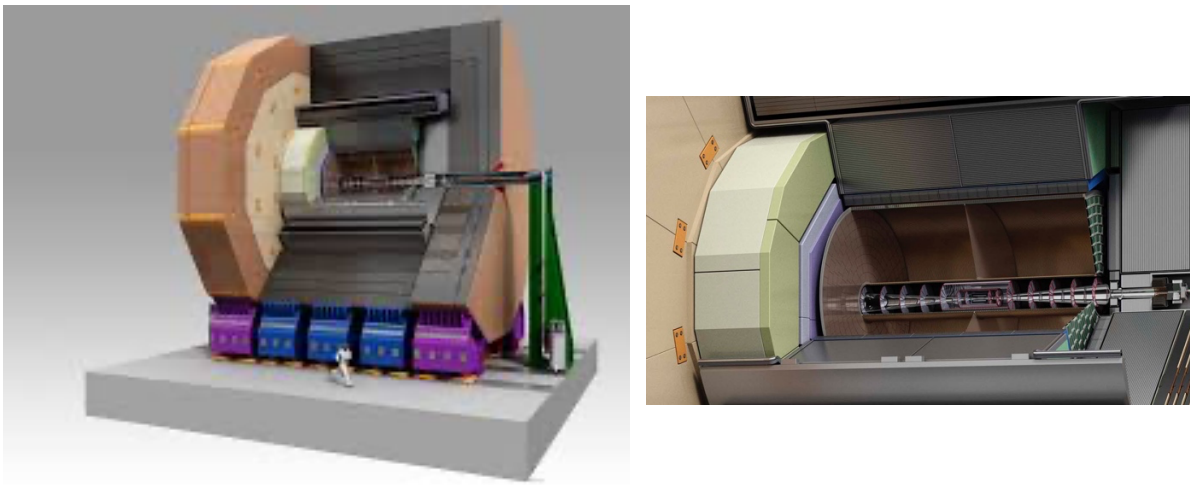

Figure 2: Left : 3D View of the ILD Detector. Right: Zoom into the central part showing the vertex region, the central tracking chamber and the electromagnetic (violet) and hadronic (green) calorimeters.

The IDT is chaired by Prof. Tatsuya Nakada and is subdivided into three working groups: WG1 (Management), WG2 (Accelerator), WG3 (Physics and Detectors). IJCLab is represented in WG2 by Angeles Faus-Golfe and in WG3 by Roman Pöschl.

The WG2 conducts the accelerator and facility work, the main objective of this WG is the definition of the Technical Preparation plan that will define all the activities necessary during the ILC Pre-lab phase to prepare for the construction phase of the ILC. The plan supposes that most of the preparation tasks will involve international collaboration based on Memoranda of Understanding (MoUs) between laboratories and institutions.

The WG2 includes 3 main domains: the Main Linac (ML) and Super Conducting RF (SRF), the electron and positron sources, the Damping Rings (DR), the Beam Delivery System (BDS) and the Dumps. For each of these domains a technical readiness evaluation and an Engineering Design Report (EDR) documentation with cost estimate for ILC construction will be carried out. The French laboratories: IRFU-CEA, LAPP Annecy and IJClab participate actively in the SRF and BDS areas. In WG2 Angeles is in charge of the readiness of nanobeam technology, in particular the Final Focus System and the related experimental test facilities: ATF3.

These activities are aligned with the high-priority future initiatives of the EPPSU and in synergy with IJClab activities for the FCCee.

WG3 is more diverse than WG2. It federates physics studies and software, detector R&D and technology as well as the interface of the experiments with the machine.

In the coming years a variety of ideas will have to be condensed into an exciting research program at the ILC Laboratory. IJCLab is in a position to make major contributions to this working group. Examples are the ongoing R&D on a highly granular electromagnetic calorimeter, detector integration and physics studies on Higgs and heavy quark production including possible interpretations.

All the work is carried out in close collaboration with groups of other French Institutes (IN2P3-IPHC, IN2P3-IP2I, IN2P3-LLR, IN2P3-LPNHE, IN2P3-OMEGA, IN2P3 -LPSC and Irfu-CEA) and international partners in the collaborations CALICE and ILD and physics working groups.

Within WG3 Roman convenes the subgroup “Interface with the Machine”. There are several aspects to this task. The first is to ensure a smooth interplay between the accelerator and the detectors right at the

collision point. There are ideas to use the ILC beams also outside the main collision point for physics experiments. The collection of these ideas and their integration with the accelerator is also part of the mandate. A further important aspect of the working group is the preparation of the call for Expressions of Interest for experiments at the ILC. An important milestone will be a workshop on experiments at the ILC currently planned for October 2021 in Japan.

The participation of IJCLab in these working groups will allow us to identify and quantify how the outstanding technical and scientific potential of our lab can be optimally exploited such that IJCLab can assume a leadership role in this worldwide project.