

## **Input to RANDALF proposal:**

### Task 2.2 Tracking technologies and industrialisation

This task will address a combination of gaseous and silicon-based tracking techniques. Today, most of the R&D for TPC readout at linear (ILC/CLIC) or circular lepton colliders (CepC) concentrates on micro-pattern gaseous detectors (MPGDs). Major readout structures – GEM, Micromegas and InGrid - that are being developed in Europe rely on expertise and elements designed by the research groups in Japan and other regions. As the MPGD technology became more mature, several industrial companies are currently producing prototypes for the ILC. The goal of this task is to establish a reliable technology production process for high-transparency gating GEMs, resistive Micromegas, and advanced InGrid devices by European and Japanese manufacturers. Development of finely segmented and thin silicon micro-strip detectors for the inner forward region is closely linked with vertex detectors studies in task 2.1, including development of ladders equipped with realistic services, powering and alignment. In addition European researchers will support the launch of a Japan-based effort on silicon strip detector development and thus improve the connection to Japanese semi-conductor industry.

**Deliverables:** Production of gating GEM in Japan and testing these devices in Europe with regards to the ion absorption. In addition a module for cooling tests will be produced, where TPG based cooling will be done in Japan and the 2PCO<sub>2</sub> cooling unit as well as the electronics is available at Europe.

### Task 3.2 Tracking detector integration and beam tests

The Large Prototype (LP) at DESY has been built as a proof-of-principle set-up for an advanced TPC within the EUDET project. It was assembled with important contributions from Japanese institutions and allows comparison of different readout structures (GEM, Micromegas, “InGrid”) under identical conditions and to address integration issues. This task will consist of several integration efforts to improve TPC module designs for all technologies and to address important endplate engineering aspects, such as: material budget, cooling, alignment, power-pulsing, realistic gas mixtures for the operation. This will also allow seamless participation of Japanese groups in European test-beam efforts. In addition, high-transparency gating GEMs produced in Japan shall be included into LP modules at DESY. Distortions in TPC will be studied using the laser facility available at KEK. Sub-tasks are devoted to the tests of the TPC infrastructure based on the low-power sALTRO-16 ASICs developed in Europe and to studies of CO<sub>2</sub> micro-channel ASICs cooling in Japan. The beam test of silicon tracking systems are linked to studies in Task 3.1, in particular common tests of the vertex detector and silicon-strip devices for different technologies, detector geometries and material separating the two detector parts.

**Deliverables:** Design of modules with gating GEM produced in Japan, and different gas amplification stages and readout electronics produced in Europe. The module(s) shall be tested in test beam campaigns at DESY.