**Expression of Interest**

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| Title of the proposed project | A prototype of an ultra-light drift chamber with new materials for the next generation of lepton colliders |
| Short description of the project | Ultra-light, high granularity drift chambers represent an ideal solution for a general purpose tracking detector at the next generation of lepton colliders, particularly for the precise reconstruction of low momentum tracks, as in flavor physics and in high multiplicity event topologies at higher energies. Furthermore, the recently proposed Cluster Counting/Timing technique, which consists in measuring the arrival times on the sense wires of each individual ionization cluster generated in a drift cell, offers the possibility of greatly improving both the momentum resolution and the particle identification capabilities of this kind of gas sampling detectors (separation powers of better than a factor two with respect to the traditional method of dE/dx have been demonstratred experimentally).The drift chambers proposed for the IDEA detectors at the future lepton colliders FCC-ee at CERN and CEPC in China and for the Super tau/charm Factory at BINP, Novosibirsk, Russia, exploit the peculiarities of such a tracking system.In this context, high polar angle coverage, i.e. long wires, and high granularities, i.e. closely spaced wires, contrast secure limits on drift cell electrostatic stability, requiring larger mechanical tensions to the wires and, as a consequence, larger yield strengths, (therefore denser materials and larger diameter wires), with the drawback of increasing both the multiple scattering contribution to the momentum measurement and the applied load on the chamber endplates.New solutions involving light polymeric fibers or Carbon monofilaments, coated with easy to solder low Z metals, like tin, zinc, copper or their common alloys, as opposed to the usual high Z silver or gold coatings, represent a breakthrough in technology and must be operatively tested. Alternative proposals, contemplating direct soldering of Carbon monofilaments on PCB by means of newly developed solder alloys may also represent an intriguing solution needing large scale verification .We propose to build a full length (at least 4 m long, approximately the length of the IDEA detector) drift chamber prototype to test the electrostatic stability against the drift cell size and the mechanical wire tension applied to these new types of wires. In addition, new concetps on mechanical design of the end plates for adjustable compensation of the wire tension by means of spokes, made of composite materials, and stays, made of polymeric fibers, may lead to solutions allowing for a strong reduction of the total radiation length in front of the endplate electromagnetic calorimeter. |
| Main partners | INFN (Bari, LE), Politecnico di Bari, Università del Salento, Politecnico di Torino, Budker Institute for Nuclear Physics (BINP), Novosibirsk, Russia, EngiSoft SpA |
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