**Expression of Interest**

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| Title of the proposed project | New materials for ultra-light drift chambers  |
| Short description of the project | Ultra-light, high granularity drift chambers, making use of low-mass gas mixtures and of new materials, both for wires and for mechanical supports, represent the 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. In this context, the larger drift chamber granularities and, therefore, the higher densities in the number of wires, conflicting both with the electrostatic stability of the drift cells, which requires higher mechanical tensions, and with the multiple Coulomb scattering contribution to the momentum measurement, due to the wire materials, claim for new developments to replace the heavy metals constituting the wires. New solutions involving polymeric fibers or Carbon monofilaments, coated with easy to solder light metals, like tin, zinc, copper or their common alloys, as opposed to the usual silver or gold coatings, will represent a breakthrough in technology and must be pursued with feasibility studies.Moreover, the adoption of new composite materials for the drift chamber gas containment and for the electrostatic and radiofrequency shielding of the active chamber volume, suitably shaped to minimize stresses and deformations, will contribute to further decreasing the material budget of the overall tracking system placed in front of the remaining sub-detectors. As an example, composite materials made of graphene loaded polymers and carbon fibers, besides increasing the tortuosity of the gas molecules in diffusing through them, thus making the gas vessel less permeable, thanks to their electrical conductivity, will act also as an excellent electrical and radiofrequency shield, with the great advantage of avoiding the need of using metallic layers for the same purposes. Equivalently, conductive polymeric matrices, like PEDOT:PSS, with the addition of graphite based conductive fillers, will produce analogous results. Needless to say, these studies have paramount relevance for many other applications, from aeronautical, to space missions, to homeland security. |
| Main partners | INFN (Bari, LE), Politecnico Bari, Università del Salento, Budker Institute for Nuclear Physics (BINP), Novosibirsk, Russia |
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