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The EXO-200 detector

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EXO-200 is a prototype detector for the Enriched Xenon Observatory (EXO) searching for double beta decay ($\beta\beta$) of xenon 136. It employs 200 kg of enriched liquid xenon (enriched to 80% in the isotope Xe-136, already in hand for the project). The xenon, in liquid phase (LXe) is also used as active medium contained in an all-Teflon, cylindrical, time projection chamber (TPC). Currently under construction at Stanford, its functionality will be tested prior to being housed underground at WIPP, New Mexico. EXO-200 will serve as a prototype for the 1-10 ton scale EXO experiment. It will allow researching low radioactivity building materials, optimizing the performance and operation of a large-scale xenon detector, and studying some of its crucial parameters, such as energy resolution. On the other hand, once completed, it will also be the largest running double-beta decay experiment. It will not employ the Ba-136 ion tagging technique being developed for EXO. EXO-200 is designed to have very competitive sensitivity for the neutrino-less ($0\nu\beta\beta$) process. It also aims at measuring the lifetime of the standard, although not yet observed, $\beta\beta$ decay of Xe-136 accompanied by neutrinos ($2\nu\beta\beta$). Both the ionization signal and the scintillation light produced by ionizing events in the xenon will be recorded. Such complementary information is proven to significantly improve the energy resolution of xenon detectors, a crucial requirement in order to separate the $0\nu\beta\beta$ and $2\nu\beta\beta$ processes. The TPC displays an electric field parallel to the cylinder axis with a central cathode and two sets of orthogonal wires at each end for 3D position reconstruction of the events. 700 large area avalanche photodiodes collect the scintillation light. A double-walled, vacuum-insulated copper cryostat filled with fluorocarbon fluid surrounds the xenon, providing a significant buffer for external gamma radiation as well as the necessary cryogenics.