Enriched Xenon Observatory (EXO) Project Planners Meet

Dr. Giorgio Gratta, associate professor of physics at Stanford University, discusses plans with CBFO and WTS managers to install a prototype neutrino observatory in the WIPP underground. Back row: John Lee, WTS General Manager; Dennis Hofer, WTS National TRU Programs. Front row: Dr. Giorgio Gratta; Roger Nelson, CBFO Chief Scientist; George Basabilvazo, CBFO Assistant Manager, Office of Development and Research.

Dr. Giorgio Gratta isn't the first scientist to dream of capturing and measuring the subatomic neutrino, but he and Stanford University colleagues are convinced they have built a "better mousetrap," a neutrino detector that uses enriched ^{136}Xenon. Dr. Gratta made a preliminary visit to WIPP last week to plan for the installation of a prototype observatory in the former core storage alcove area early next summer.

WIPP offers researchers an ideal setting for experiments that require low levels of naturally occurring radiation. Shielded from the sun's cosmic rays by 2,150 feet of earth, the WIPP repository provides an extremely low background environment for studies such as Dr. Gratta's Enriched Xenon Observatory (EXO).

The only way to detect a neutrino is to observe its indirect interaction with

matter. For example, we know that the wind is blowing by watching the turning blades of a windmill. Thus, we can detect a neutrino by observing the tracks of light it generates when it interacts with ^{136} Xenon. The neutrino (Italian for "little neutral one") has no electric charge and a theorized mass of nearly zero.

Dr. Gratta's team will investigate neutrino-less double-beta decay, a rare nuclear process that occurs when a disintegrating nucleus emits two electrons. For more information see www.wipp.ws/science/DBDecay/DBDecay.htm.

Experimental equipment will consist of five modules assembled as "clean rooms" at Stanford to prevent dust contamination. The modules will be shipped to WIPP and placed underground in the southeast corner of the former core storage alcove. EXO collaborators expect to be ready to construct a large-scale detector about a year after the modules are installed and operated at WIPP.

Phase 1 of the EXO experiment will test the prototype detector, followed by Phase 2 - construction of a large-scale detector. Researchers plan to conduct neutrino studies in the scaled-up laboratory for up to ten years.

Interestingly, laboratories that formed part of the former Soviet Union's military complex will provide the large quantities of enriched Xenon needed for the experiment. A bargain at $6 per gram, more than a ton of the isotopically enriched gas will be required in the initial EXO test phase.

Asked why determining the mass of a neutrino is so important to scientists, the Italian-born physicist enthusiastically compared the discovery to pouring a concrete foundation before building a house, "We need this fundamental knowledge to build more things on top."