Professor Takaaki Kajita donates two types of photomultiplier tubes to the Nobel Museum

December 6, 2015 — 2015 Nobel Laureate Professor Takaaki Kajita, Director of the University of Tokyo Institute for Cosmic Ray Research, has donated two types of photomultiplier tubes to the Nobel Museum in Stockholm as artifacts related to his research.

A photomultiplier tube is a type of photosensor used in the Super-Kamiokande experiment at the Kamioka Observatory in central Japan. Professor Kajita has donated one sensor each from the Super-Kamiokande inner and outer detectors to the museum.

The Super-Kamiokande detector is filled with 50,000 tons of purified water and is divided into an inner detector, which holds 32,000 tons, and a two meter-wide outer detector that contains the remainder (Figure 1). The wall of the inner detector is lined with around 11,000 photomultiplier tubes, each with a 20 inch (50 cm) diameter (Figure 2), that detect Cherenkov light originating from reactions between neutrinos and water in the inner detector. The 20-inch photomultiplier tube was first developed in 1981 by Hamamatsu Photonics K.K. in collaboration with the University of Tokyo and KEK for the Kamiokande detector. The photomultiplier tubes used in the Super-Kamiokande detector are the result of continuous improvements to this original model. In 2014 the 20-inch photomultiplier tube was recognized with an IEEE milestone award. IEEE Milestones in Electrical Engineering and Computing honor significant technical achievements in electrical, electronics, informatics and communications fields.

The outer detector is fitted with 1,885 photomultiplier tubes that are 8 inches (20 cm) in diameter (Figure 3). These photomultiplier tubes detect Cherenkov light originating from cosmic ray muons, a type of elementary particle that is generated by the same cosmic ray interactions that produce neutrinos. Since the outer detector is only two meters thick, each 8-inch photomultiplier tube is attached to an acrylic wavelength shifting plate that is 60 cm square and 1.3 cm thick. This plate transforms the Cherenkov light produced by charged particles into a wavelength that is more easily detected by the photomultiplier tubes, ensuring that each tube is able to capture as much light as possible.

The 8-inch photomultiplier tube is currently displayed at the Nobel Museum without the wavelength shifting plate due to limitations of exhibition space.

Professor Masatoshi Koshiba, Distinguished Professor of the University of Tokyo and recipient of the 2002 Nobel Prize in Physics, similarly donated a 20-inch photomultiplier tube from

the Kamiokande detector to the Nobel Museum in 2002.

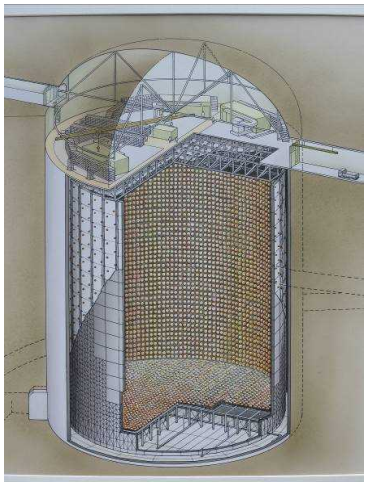

Figure 1. The inner and outer detectors of Super-Kamiokande.

Figure 2. A 20-inch photomultiplier tube of the type installed in the Super-Kamiokande inner detector. (Photo courtesy of Hamamatsu Photonics K.K.)

Figure 3. An 8-inch photomultiplier tube of the type installed in the Super-Kamiokande outer detector with its wavelength conversion plate.

*High resolution images can be downloaded from the link below
http://bit.ly/1N39XCQ

Links
Super-Kamiokande website
http://www-sk.icrr.u-tokyo.ac.jp/sk/index-e.html

Photomultiplier tubes
http://www-sk.icrr.u-tokyo.ac.jp/sk/detector/index-e.html

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