Contribution ID : **153** Type : **Oral Presentation**

Addition of Active Background Suppression for an International Monitoring System Gamma Detector

Thursday, 29 September 2016 14:40 (0:20)

Content

The International Monitoring System of the Comprehensive Nuclear Test Ban Treaty Organization includes a network of 80 field stations and 16 laboratories dedicated to the detection and analysis of airborne particulates to detect possible nuclear events that could indicate a violation of the Treaty. PNNL has operated a certified laboratory, USL16, since December 2007 with two commercial gamma spectroscopy systems (RL16-001 and RL16-002) and the recent addition of two very low-background gamma detectors housed in a new shallow underground laboratory (RL16-003 and RL16-004). Development of the two very low-background gamma systems, which utilize active background suppression, prompted application of the same technology to the above ground RL16-001 and RL16-002 detectors. The active background suppression or cosmic veto for each of the above ground systems consists of a single 76.2 cm by 76.2 cm plastic scintillator panel made of polyvinyl toluene (PVT) obtained from Eljen Technology (US). The cosmic veto panels are 5.08 cm thick and lay horizontally on an aluminum-framed radon enclosure that surrounds the commercial counting cave. The hinged-lid enclosure was modified to securely hold the 36 kg panel in place and protect the two photomultiplier tubes. The panel resides approximately 30 cm above the HPGe detector. As the majority of the cosmic muon flux is perpendicular to the earth's surface the single horizontal panel over the cave and HPGe detectors was expected to be the most cost effective background reduction. Two methods will be evaluated for generating the veto gating signal. In the first, the output from the two PMTs is combined and the signal input to a Canberra 2005 preamplifier with the preamplifier output feeding the Energy In on a Canberra Lynx DSP. The Lynx ICR output serves as the Gate-In to the Canberra Lynx which controls the HPGe detector. The second method involves sending the PMT output signals to a constant fraction discriminator (Ortec CF8000) which provides an input to an Ortec 416A gate and delay generator to produce the Gate-In signal for the HPGe Lynx. Based on previous experience, the methods should provide comparable performance though the second method, while requiring more NIM modules, is less costly. Overall a background reduction of between 30-45% over the 40 – 2500 keV energy range is anticipated with the single veto panel. This should provide a significant improvement on minimum detectable activity (MDA) for each system.

About the Presenter

Mike Cantaloub is scientist working Pacific Northwest National Laboratory (PNNL) in the area gamma spectroscopy and advanced spectroscopic methods for radionuclide measurement in environmental samples.

Primary author(s) : Mr. CANTALOUB, Michael (PNNL)

Co-author(s) : Dr. BURNETT, Jon (PNNL); Dr. GREENWOOD, Larry (PNNL); Mr. CAMERON, Ian (PNNL)

Presenter(s) : Mr. CANTALOUB, Michael (PNNL)

Session Classification : Special Session: Monitoring Networks

Track Classification : Special Topic: Monitoring Networks