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The resurgence of the 8Pi spectrometer

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Gamma ray spectroscopy in the Nuclear Science Laboratory (NSL) at Simon Fraser University (SFU) is used for nuclear structure studies, neutron activation analysis, and environmental radioactivity monitoring. All non-environmental sources are produced using the in-house Thermo Fisher Scientific P-385 Neutron Generator (NG), which allows for a diverse experimental program. The current detection system is the Germanium detector for Elemental Analysis and Radioactivity Studies (GEARS), and consists of a single high purity germanium (HPGe) detector which is housed in a lead box for passive shielding. Sensitivity is limited especially at low energies due to background radiation and Compton scattering. In order to take full advantage of the NG, improved detection capabilities are required. This can be achieved through the use of Compton suppression and time coincidence measurements which will allow for the possibility of gamma-gamma, beta-gamma, and alpha-gamma measurements that will help distinguish between events of interest, and background radiation or events caused by contaminant induced reactions. However a multi-detector system is required to take advantage of this method. For this purpose, the 8-Pi spectrometer, recently acquired by SFU from the ISAC-1 facility at TRIUMF, is being rebuilt to its original design, consisting of 20 HPGe Compton Suppressed Spectrometers (CSS). The 8Pi consists of 4Pi coverage from an inner layer of Bismuth Germanium Oxide (BGO), as well as 4Pi coverage from an outer later of CSS's. Operation of the 8-Pi requires a 352 channel data acquisition (DAQ) system which is under development, based on the TIG-10 and VF-48 digitizers. A subset of six of the 8Pi CSS's have been arranged in a cubic array as a testing ground for the 8Pi CSS layer. The development and application of the cubic array will be presented and discussed.

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