Correlating reactor core power with radiation detector noise outside of primary shielding

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Abstract:

It is of significant importance to monitor the changes of power within a nuclear reactor whether it is used for medical, commercial, or research use. With the onset of generation four reactors comes changes in the reactor environment from its generation three predecessors; creating inherent difficulties with placing in-core reactor monitoring equipment. Based on the need of placing monitoring equipment outside the core, an investigation is undergoing to correlate reactor core power with noise in radiation detection devices placed outside the primary shielding. To investigate this, an experiment was conducted at a TRIGA research reactor to measure noise in organic scintillators, inorganic scintillators, and gas-filled radiation detectors by correlating changes in noise with changes in power outside the primary shield. Based on this experiment it was found changes in noise on detector count rate plots can be seen with changes in reactor power at various power levels from one watt up to nine-hundred watts.