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Sytematics related to Neutron Counting in PSI nEDM

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The Paul Scherrer Institute Neutron Electric Dipole Moment (PSI nEDM) experiment is a room temperature experiment using the Ramsey technique for separation of oscillating fields. In an experiment which relies on neutron counts heavily, it is vital to understand the backgrounds completely. The greater fear of not understanding the backgrounds thoroughly is that, variations in the background neutron counts might mimic a false nEDM. Thereby understanding the limit on sensitivity to nEDM that arises from varying backgrounds is a vital systematic effect. A stringent, well understood, number on the limit on sensitivity of nEDM from varying backgrounds must be arrived at. Given that the experiment is slated to run in excess of 365 days, understanding the neutron counting systematic also involves understanding the neutron detector and its response as a function of time. Furthermore we analyze the potential ramification of applying cuts on the detector signal and the $\gamma - n$ event discrimination. We will present the study on variations of background neutron counts along with detector response and data cuts applied, in order to arrive at the limit of sensitivity of nEDM to neutron count systematics. We shall then compare the neutron count systematic effects with how the statistical neutron count uncertainty contribution, to the value of experimental nEDM sensitivity, scales with time.

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