



The Friday Thing

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Neutrino Mass and X-Ray Physics

The large effort to measure neutrino masses has a positive effect on developing spectroscopical methods. Broad ranges of experiments have delivered some limits on neutrino masses. The various limits will be presented in a brief manner. Limits for muon and electron neutrino masses are derived in some cases where the experiment yielded negative mass squares for both the electron and muon neutrino masses. This implies there are underlying difficulties and unknown physical quantities in the applied spectroscopical methods. The relation of these quantities to physics, and the difficulties exposed in the spectroscopical methods will be discussed. New efforts to improve the muon neutrino masses are under way, where the x-rays of muonic and pionic molecules are measured. Large, focusing diffraction spectrometers have been constructed. The problem of x-ray spectrometer response functions and x-ray energy calibration will be presented. We have worked on improving the performance of x-ray spectroscopical methods with the aim of measuring the outer bremsstrahlung spectra of tritium decay. Obviously analytical methods and x-ray physics will also benefit from such an improvement. We have considered two spectroscopical methods, as viable approaches. One is to use solid state detectors, like Si(Li) or HpGe. We have improved the understanding of the response function and the resolution of such detectors. Additionally the pile up recognition is now better by almost an order of magnitude than earlier available. Another method that we are experimenting with is called PAX spectrometry (photoelectron spectroscopy for the analysis of x-rays). We have reached 1 eV resolution for x-rays at 18.6 keV.

However, it is our opinion, that the presently available energy and efficiency calibration approaches of x-ray and electron spectrometers are not sufficient for either the level of accuracy of the experimental resolution or the demand to determine the neutrino mass limits. Some new initiatives in which we are involved will be mentioned.

Date: Friday, March 16, 2001

Place: MacNaughton 222

Time: 12:30 p.m.

Cookies will be served. Don't forget to bring your lunch.