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Relic Neutrino Detection with PTOLEMY

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The Universe became transparent to neutrino's approximately 1 second after the Big Bang. These neutrino's are omnipresent with a density of around 300 cm^{-3}. However, they have never been observed since they have cooled down to a temperature of 1.9K, corresponding to an energy of just several 100 μeV. Within the PTOLEMY collaboration we are investigating techniques to observe these neutrino's through their capture on tritium and its subsequent two-body beta decay.

The ultimate goal of PTOLEMY is to construct a target of 100g of tritium lightly bound to a solid state substrate and measuring the endpoint of the decay spectrum with an extreme precision. The electron energy resolution should be of the order of 50meV in order to be able to observe the monochromatic electrons induced by neutrino capture from the three-body decay spectrum of the ordinary decays.
To make the experiment even more challenging, we need to suppress the extreme background from the ordinary tritium decays (around 10^{15} Bq/g tritium) to 100Hz around the endpoint of the spectrum in order not to saturate the cryogenic calorimetry system. We propose a technique to suppress the background by means of a **ExB** drift filter with an appropriate gradient in the **B** field.

To date, our method is the only viable proposal to detect relic neutrinos. If we succeed this would be the 4^{th} piece of direct evidence for the Big Bang.

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