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# Reception of modulated neutrino day-night effect signal by neutrino detectors

The regeneration effect of solar neutrinos in the Earth leading to the so-called day-night effect strongly depends on the neutrino energy, the time of day, and the season. Classical neutrino experiments, such as Super Kamiokande, typically observe this effect cumulatively, i.e., virtually integrate it over the year. We discuss various day-night effects that could become potentially observable if time-weighted data processing is applied to neutrino events. The procedure is similar to reception of radio-frequency modulated signals and 'demodulation' of the neutrino signal, for example, is able to reveal interesting signatures in the high-energy tail of the electron recoil energy spectrum.

## Summary

Our research focuses on the analytical estimation and subsequent numerical simulation of a time-resolved observation of the solar neutrino day-night effect. The regeneration factor in the Earth depends on the solar elevation in a highly oscillatory way, the latter on the time of day and the season, so that an experiment observing nighttime solar neutrinos virtually measures an expectation value (with some variance) of a rapidly-oscillating function over the observation time window. Usually making the window smaller reduces the signal-to-noise ratio, however, as we show in [arXiv.org/1509.08073], such a logic applies only to the cumulative, non-oscillating component of the signal. The signal in question, however, also contains a peculiar, time-localized contribution, mathematically corresponding to a stationary point of an oscillatory function, that can be drawn out of noise by restriction of the observation time window. Such 'time-resolved' observations lead to a number of effects at the level of the resulting recoil electron spectrum, whose isolation could, e.g., help to precisely measure the neutrino mass-squared difference.

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