



Contribution ID: 67

Type: Poster

MANTRA: Measuring anti-neutron energy with the TOP counter of Belle II

Monday, September 15, 2025 3:50 PM (1 hour)

The MANTRA project is an inter-university effort to develop an algorithm to measure anti-neutron momentum using existing detectors installed in the BESIII and Belle II experiments. Both experiments are equipped with CsI electromagnetic calorimeters: these provide a loose measurement of the anti-neutron energy, which is heavily affected by shower containment. This can be mitigated by using the timing information of a high resolution particle identification detector installed in front of the calorimeter.

Such is the case for the Time of Flight system at BESIII and the Time of Propagation (TOP) counter at Belle II.

This talk will focus on the latter; the TOP allows precise measurement of the time of propagation of the Cherenkov photons emitted and trapped within a fused silica bar by incoming charged particles. This timing is function of the Cherenkov angle and the time of flight the incoming particle, allowing for a measurement of its velocity.

A Cherenkov signal, however, can also be induced by neutral particles annihilating in or nearby the TOP radiator. This talk will outline a technique for anti-neutron detection using the timing information of the Belle II TOP counter. We will show how the TOP can both function as a target for anti-neutrons allowing for a measurement of their time of flight, and provide precise timing for hadronic showers originating inside the calorimeter.

We will show the timing signature left by the anti-neutron, as a function of their energy and their annihilation position, and how this information correlates with calorimetric measurements.

This study therefore paves the way towards precise measurement of the anti-neutrons produced in e^+e^- collisions, and provides useful information on the backgrounds due to neutral hadron interactions in the TOP counter.

Authors: Dr DAS, Sanjeeda (University of Torino and INFN Torino); Dr DE LA MOTTE, Shanette (INFN Torino); SPATARO, Stefano (University of Torino(UNITO)); TAMPONI, Umberto (INFN Torino)

Presenter: Dr DE LA MOTTE, Shanette (INFN Torino)

Session Classification: Poster Session

Track Classification: R&D on Cherenkov light imaging systems for future experiments