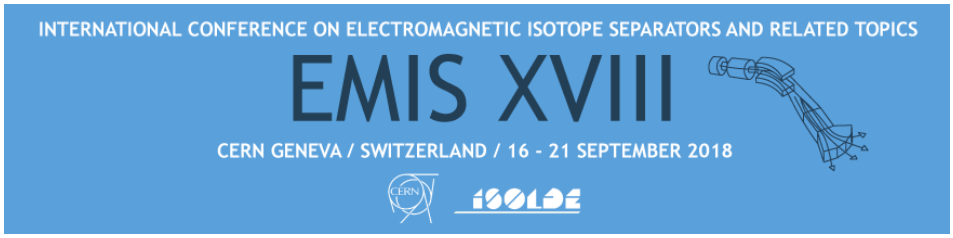

Contribution ID: **142** Type: **Poster**

New Central module for the Modular Total Absorption Spectrometer

Monday 17 September 2018 18:08 (1 minute)

The Modular Total Absorption Spectrometer (MTAS) has been used in Oak Ridge since 2012. It consists of 18 NaI(Tl) hexagonal modules. Each of the 18 modules is 21" long and 6.93" wide (side-to-side). There is also one central module of the same length and cross section, but with a 2.5" hole drilled through. The crystals are arranged in a honeycomb like structure. Radioactive samples, to be measured, are placed between two 1mm thick silicon detectors in the geometrical center of the detector. The total active NaI(Tl) mass is approximately one ton, making MTAS the largest and most efficient detector of this type currently in use [1].

Apart from its large efficiency the main advantage of the MTAS is its modularity, which allows accounting not only the summed gamma energy signals (standard total absorption data evaluation [2,3]), but also the study the intensities of the individual gamma rays to confirm decay schema assumptions made. Most of the individual gamma ray analysis is based on the signals from all, but central detector. Unfortunately, this functionality is only efficient for higher energy gamma transitions. The low energy gamma rays are efficiently absorbed in the central detector and do not reach other modules. Due to the almost 4π geometry of the central module, energy deposited by multiple gammas in the cascade are summed up, creating TAS like spectrum.

In order to overcome this feature of MTAS a new central detector has been designed. The new module will be optically segmented into 6 independent pieces to allow for more efficient analysis of low energy gammas. This presentation will discus the simulated impact of the new module on the efficiency of the detector as well as on the data analysis. If available, real performance data from the completed new central module will also be presented.

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Session Classification: Poster Session 1

Track Classification: Instrumentation for radioactive ion beam experiments