

Characterization of Gamma-Ray Detectors with Tagged Photons

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To my family

```
while [not good]
do
    better
done
```


Abstract

Photon detectors are used for various kinds of experiments in the field of nuclear physics. The response function of photon detectors on gamma rays is complex and needs to be considered during the analysis of experimental data. This thesis experimentally investigates such response functions for different detector types in a large energy range (2 - 20 MeV).

The experiments described in this thesis were performed at the NEPTUN photon tagging facility, which provides a mono energetic photon source with tunable energy and intensity. As these were the first experiments to be performed at NEPTUN, within this study extensive development and commissioning of the setup also with respect to future campaigns were accomplished. The setup is shown to be well suited for the systematic study of detector response functions, while measurements of nuclear reactions need further improvements.

Zusammenfassung

Photonendetektoren finden in zahlreichen Experimenten in der Kernphysik Anwendung. Die Antwortfunktion von Photonendetektoren beim Nachweis von Gammastrahlung ist komplex und muss bei der Auswertung experimenteller Daten berücksichtigt werden.

Im Rahmen dieser Arbeit wurden solche Antwortfunktionen für verschiedene Detektortypen in einem großen Energiebereich (2 - 20 MeV) experimentell untersucht.

Die Experimente, die in dieser Arbeit behandelt werden, wurden am Niederenergiephotonentagger NEPTUN durchgeführt, der eine monoenergetische Photonenquelle darstellt, bei der Energie und Intensität über einen weiten Bereich stufenlos einstellbar sind. Bei den Experimenten handelt es sich um die erste Messkampagne an NEPTUN. Dies machte umfangreiche Entwicklungen nötig, die im Rahmen dieser Arbeit mit Hinblick auch auf zukünftige Experimente durchgeführt wurden.

Der Messplatz zeigt sich als hervorragend geeignet zur systematischen Untersuchung von Detektor-Antwortfunktionen. Die notwendigen Erweiterungen, um auch Kernreaktionen zu untersuchen, werden aufgeführt.

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