Compton cameras localize γ-ray sources in 3D space by observing evidence of Compton scattering with detectors sensitive to ionizing radiation. This thesis proposes a software system for operating a novel Compton camera device comprised of Timepix3 detectors and Katherine readouts.

To communicate with readouts using UDP-based protocol, a dedicated hardware library was developed. The presented software can successfully control the acquisition of multiple Timepix3 detectors and simultaneously process their measurements in a real-time setting. To recognize instances of Compton scattering among observed interactions, a chain of algorithms is applied with explicit consideration for a possibly high volume of measured information. Unlike alternate approaches, the presented work uses a recently published charge drift time model to improve its spatial resolution. In order to achieve localization of γ-ray sources, the software performs conical back projection into a discretized cuboid volume.

Results of randomized evaluation with simulated data indicate that the presented implementation is correct and constitutes a viable method of γ-ray source localization in 3D space. Experimental verification with a prototype model is in progress.