We experimentally investigate near-field gamma-ray imaging using a Si/CdTe Compton camera based on Timepix3 pixel detectors. The camera consists of a 0.5-mm-thick Si scatterer and a 1.0-mm-thick CdTe absorber, both with a pixel pitch of 55 μm. We apply spatial and temporal clustering to the measured pixel hits, select coincident events between the Si and CdTe detectors, and reconstruct gamma-ray images using simple backprojection.

To evaluate source localization and field-of-view characteristics, we performed measurements using 356-keV gamma rays from a Ba-133 point source at various positions, including off-axis locations. Initial reconstruction results showed that the reconstructed peak positions shifted in accordance with changes in the actual source position.

To investigate the capability of distinguishing multiple gamma-ray sources, we performed measurements using three radioactive sources: Ba-133, Cs-137, and Co-57. We also investigate how background events, including partial energy deposition and scattering in surrounding materials, affect energy selection and image reconstruction.

In addition to these experimental studies, we are developing image reconstruction methods suited to near-field geometries, aiming to achieve quantitative reconstruction of gamma-ray source distributions while accounting for source-distance dependence. This presentation will discuss the experimental imaging performance of the Timepix3-based Compton camera, including source localization, off-axis imaging, and challenges in multiple-source reconstruction.