

## Positron emission tomography imaging harnessing polarization correlations

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Conventional Positron Emission Tomography (PET) imaging is based on measurement of energy and coincidence time of back-to-back photons from positron annihilation. The annihilation quanta possess yet another correlation - the orthogonality of their initial polarizations. We developed a demonstrator based on single-layer Compton polarimeters to study the potential of this additional information to enhance PET. We present the imaging tests done with two Ge-68 rod sources of 45 MBq each, and with NEMA NU-4 phantom with a Ga-68 solution of 400 MBq initial activity. To assess the performance we compare the images reconstructed using polarization-correlated Compton events with single-pixel gamma identification, as a reference. We observed the spatial resolutions of from  $4.3 \pm 0.3$  mm to  $6.3 \pm 0.3$  mm, in the former case, and  $2.5 \pm 0.3$  mm in the latter. We also show that ~10% sensitivity increase can be obtained by combining all events.

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