Photon phase space distributions (xPSD) are specified as input to Monte Carlo or Convolution/Superposition dose calculation methods. The xPSD of a linear accelerator can be expressed as the energy-angular distribution of photons as a function of spatial location on a plane perpendicular to the central axis. Measurements of the incident photon energy spectrum at a specific spatial location using Compton scattering have been reported, but few direct measurements of the angular distribution in the xPSD have been forthcoming. We are investigating experimental methods to study xPSD of linear accelerators and we have developed a numerical method to reconstruct the *angular distribution* in the xPSD from measurements of the pulse height distributions for different solid angles of the incident photons. In this study, simulated data for different field shapes were generated from a given source distribution to simulate the experimental conditions. The generated data were analyzed using the wavelet transform with biorthogonal wavelets as basis functions to provide data wavelets of the given source. For source distributions consisting of single wavelets, the same procedure was used to provide data wavelets of source wavelets. Singular value decomposition was used to determine the linear combination of source wavelets to reproduce the data wavelets of the given source. The linear combination of source wavelets was then synthesized to form the reconstructed source distribution. Comparison of the reconstructed source distribution with the given source distribution will be presented.

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