Optimizing parameters of the POCLUST algorithm for muon tomography. W. BITTNER, D. MITRA, and M. HOHLMANN. Department of Physics and Space Sciences and Department of Computer Science, Florida Institute of Technology, 150 West University Blvd, Melbourne, FL 32901. Using a GEM (Gas Electron Multiplier) muon tomography station, we have been imaging materials with different atomic numbers Z in various target scenarios. The overall goal is to reliably image high-Z material and discriminate it from surrounding shielding material in the context of creating a passive detection method for shielded sensitive nuclear material, *e.g.*, enriched uranium, in cargo. Previously we were using the simple POCA (Point of Closest Approach) reconstruction method for muon scattering, along with voxelization of the reconstructed muon deflection angles within the volume as the main imaging method. The more advanced POCLUST algorithm clusters POCA scattering points using a density based approach. It should be capable of discerning closely placed objects and of providing a better quantitative analysis than a simple POCA analysis. Using custom visualization tools written in C++, OpenGL, and running on Linux, we present results of POCLUST parameter optimization algorithms for data from a Monte Carlo simulation as well as for data recorded with our muon tomography station.