

ABSTRACT

Z-axis laser alignment in CT scanning is crucial for accurate slice positioning, as misalignment can affect diagnostic quality and clinical accuracy. This study aims to determine the accuracy of Z-laser positioning in CT scanners using a Siemens phantom with two methods: edge marker and ramp. CT images were acquired with seven slice thickness variations (0.6–5 mm) and ten phantom displacements (0–9 mm). Image analysis was performed using IndoQCT software, both manually and automatically, through image segmentation, edge marker detection, and ramp projection. The results demonstrated a strong linear relationship between Z-laser deviations and phantom displacements, with correlation coefficients of $r = 0.996–0.999$ (edge marker) and $r = 0.971–0.998$ (ramp). The edge marker method was found to be more sensitive and stable in detecting small deviations, whereas the ramp method tended to slightly underestimate but remained valid as a supporting reference. IndoQCT provided a fast, objective, and accurate evaluation, supporting quality assurance of Z-laser alignment in CT to enhance clinical safety and reliability.

Keywords: Z-axis laser alignment, CT Quality Assurance, Siemens QA phantom, Edge Marker, Ramp