

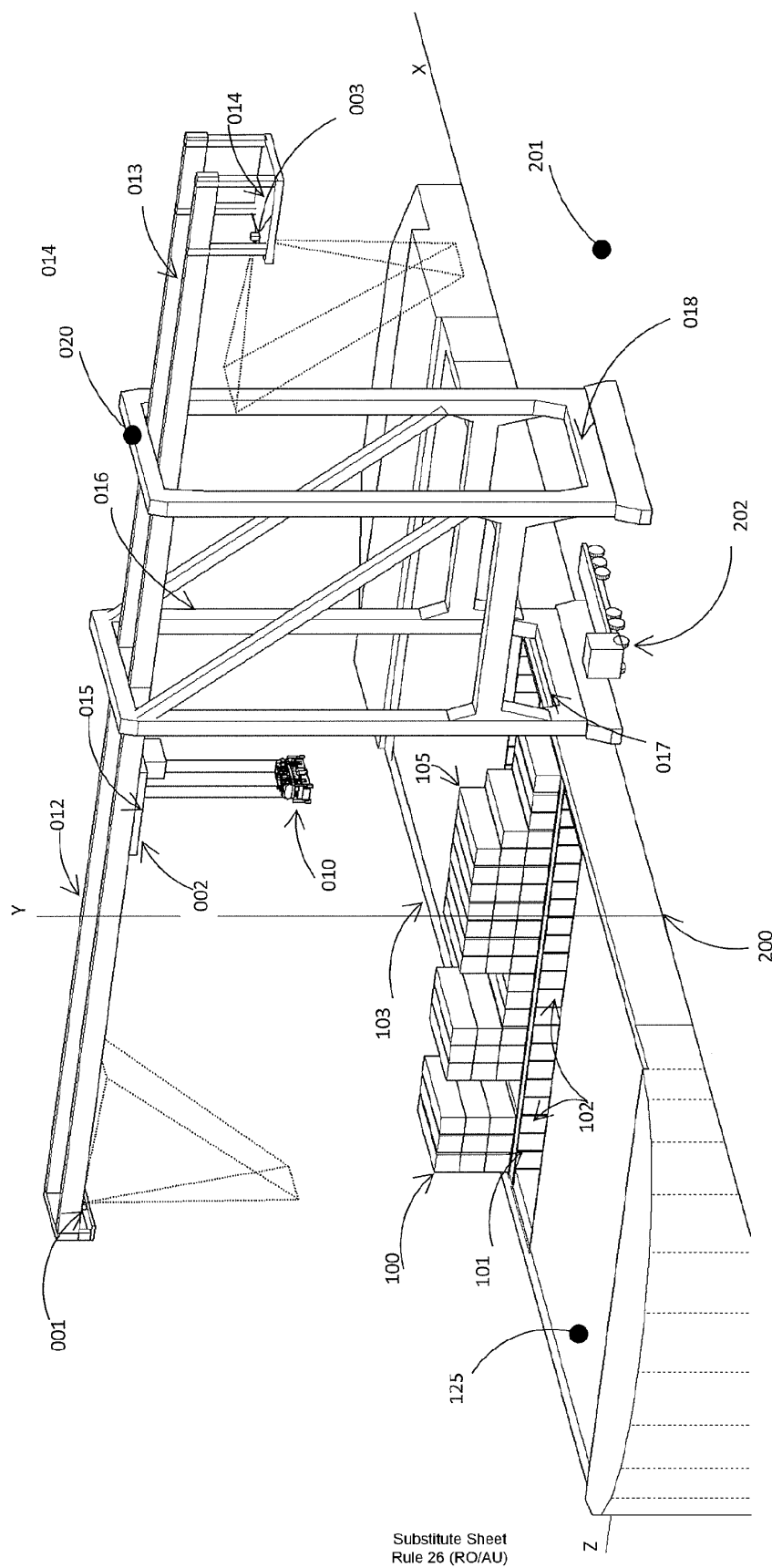


Figure 1: Apparatus preferred embodiment view 1

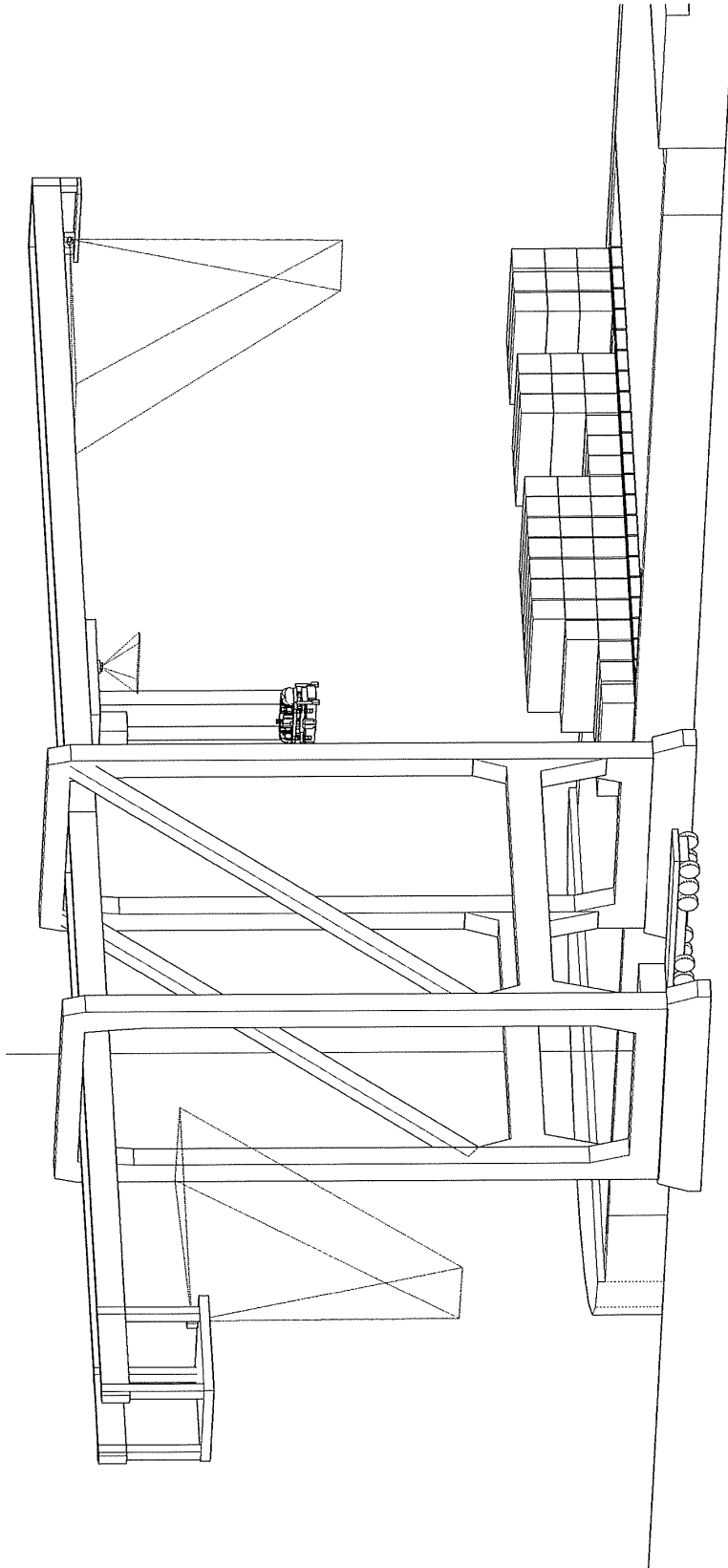


Figure 2: Apparatus preferred embodiment view 2

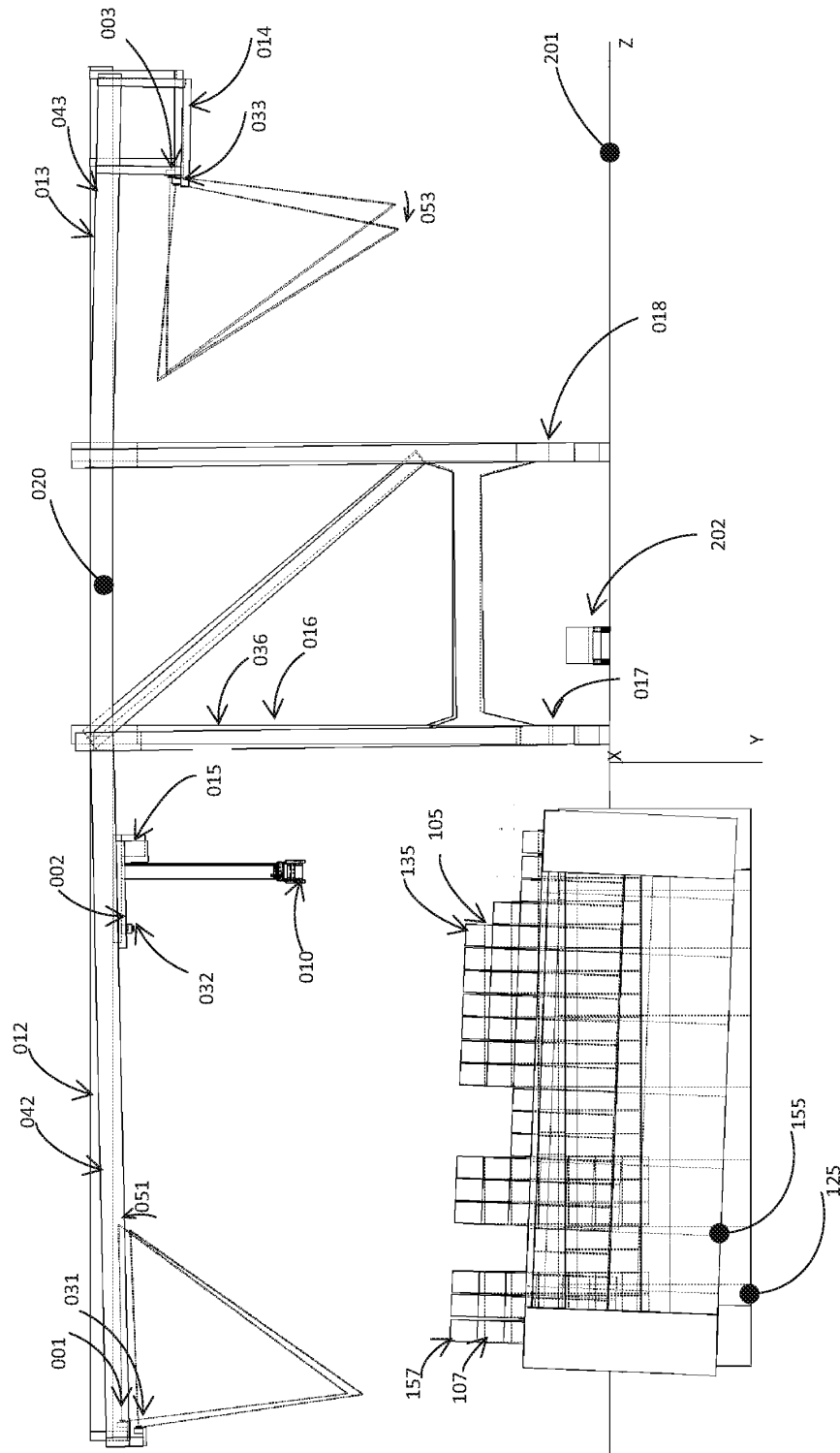


Figure 3: Ship motion and crane flex capture

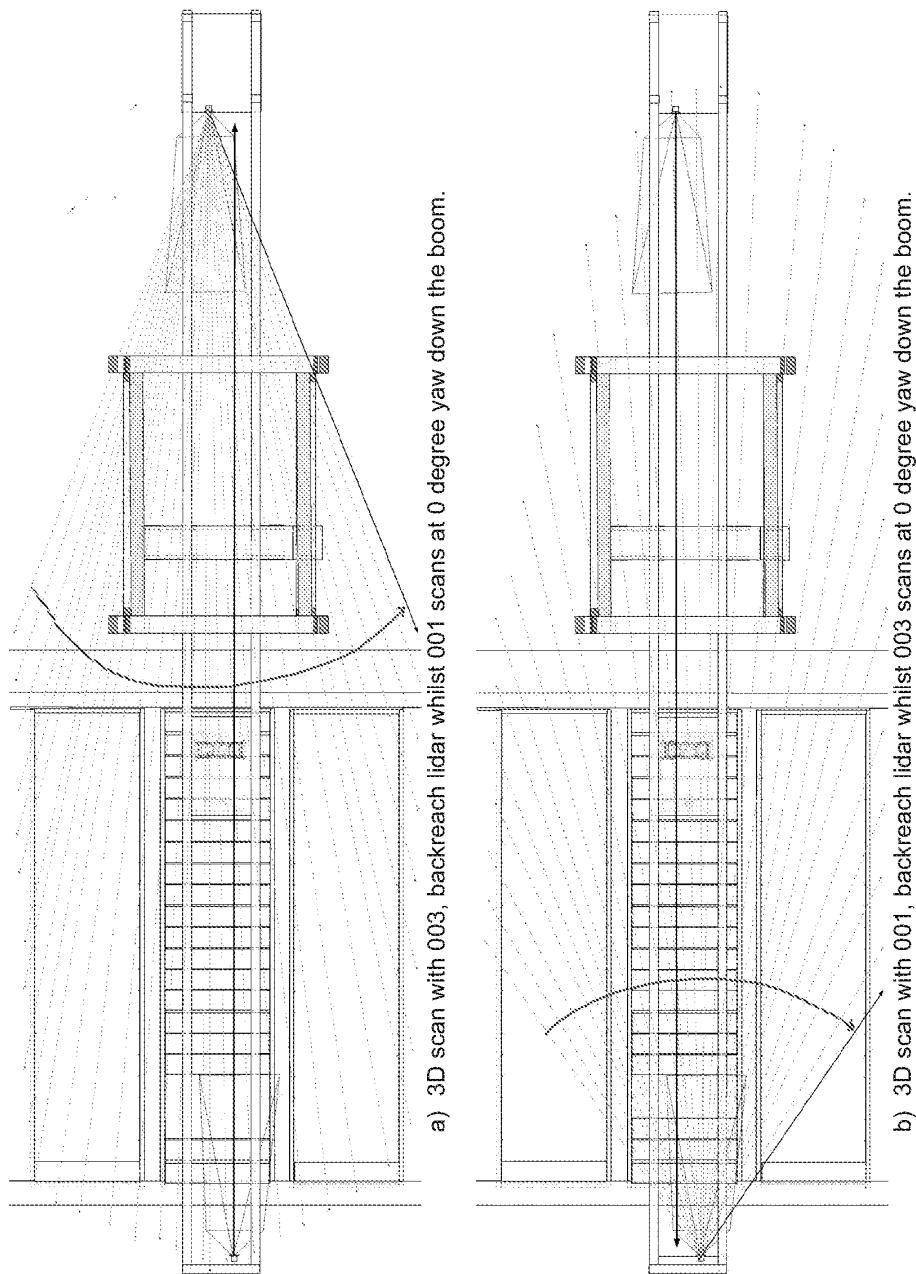
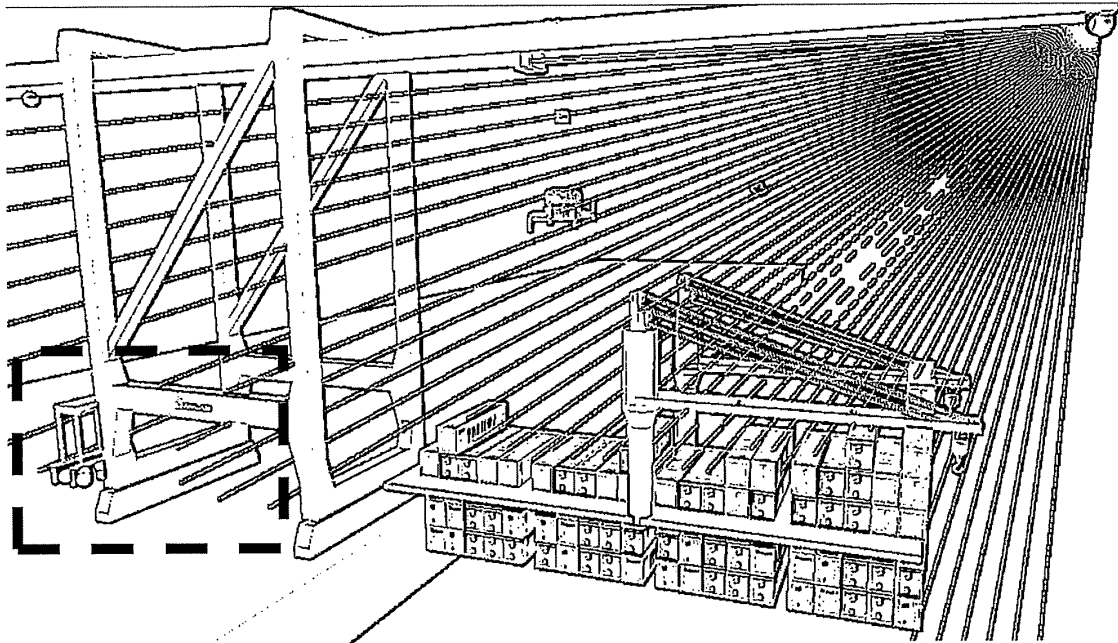


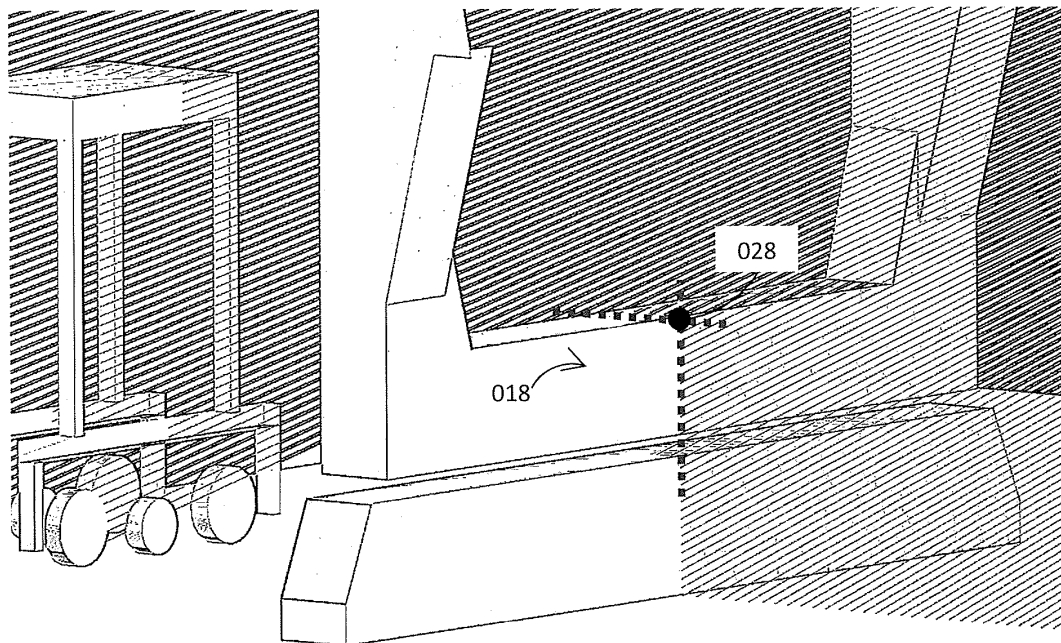
Figure 4: 2-Stage 3D scanning with dynamic lidar pair Crane and Ship tracking with stationary laser



Figure 5: Ship 3D scan



a) 001 2D vertical scanning of ship and crane structure at 0 degree yaw position.



b) Inset: Sill beam 028 edge, being the intersection of two lines on the vertical and horizontal portions of the sill beam structure.

Figure 6: Sill beam measurements and edge tracking by 001 during 003 3D sweep.

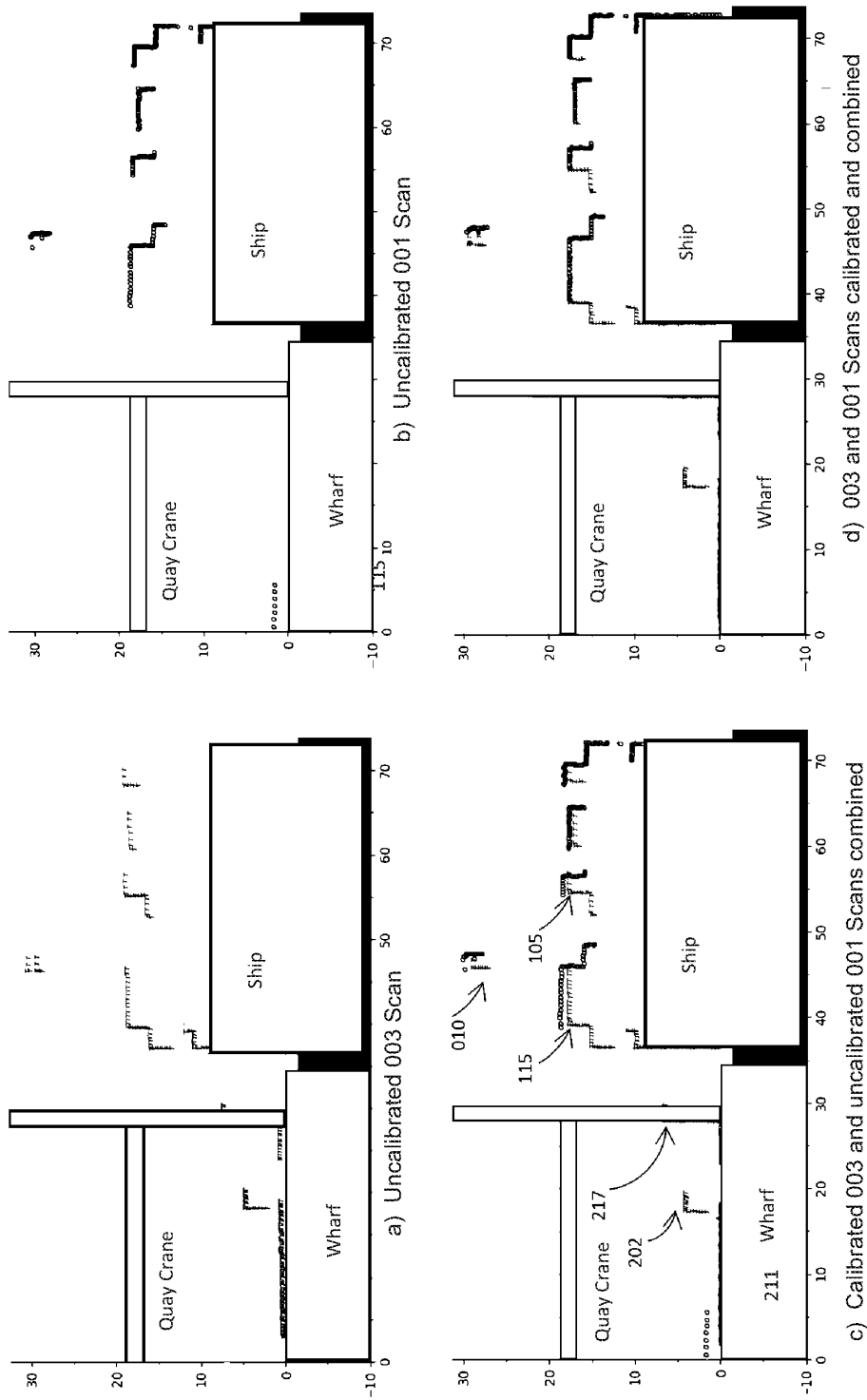


Figure 7: Illustration of uncalibrated measurements (1 degree error), and combination following dynamic calibration

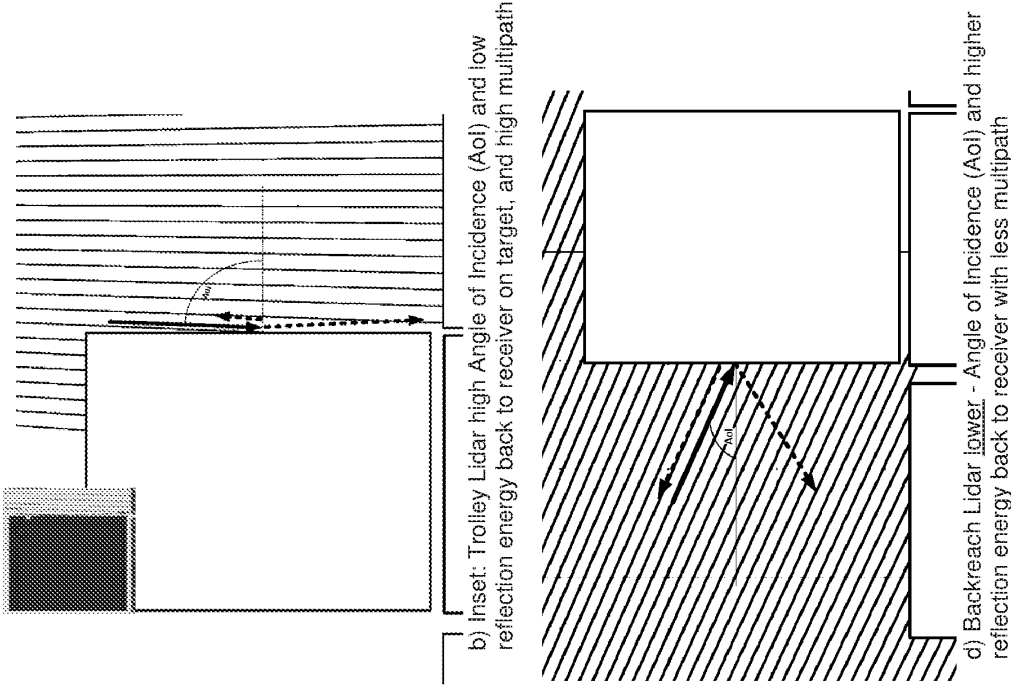


FIGURE 8: Illustration of backreach Lidar higher reflection energy and lower multipath energy compared to trolley mounted lidar.