

Purpose: Daily use of cone-beam computed tomography (CBCT) for patient position verification can lead to a substantial dose to a large volume of normal tissue outside of the planned target volume. The purpose of this work is to quantify this dose for the two kilovoltage CBCT systems currently available on medical linear accelerators, namely the X-ray Volumetric Imager (XVI[®], Elekta Oncology Systems) and the On-Board Imager (OBI[®], Varian Medical Systems). **Method and Materials:** An adult male anthropomorphic phantom was constructed from three tissue equivalent materials representing lung, bone, and soft tissue. To perform dose measurements within the phantom, a new fiber optic coupled (FOC) dosimeter was also developed and characterized. A total of three clinically relevant scan sites were investigated for each machine: head and neck, chest, and pelvis. For each scan site, the dose to a total of 25 organs was measured based on recommendations by the International Commission on Radiological Protection (ICRP) Publication 103 for the evaluation of effective dose. **Results:** The dose to organs inside the CBCT scan volume was found to be as high as 30 mGy. Due to the large field-of-view (FOV) of CBCT and associated radiation scatter, a substantial dose to organs outside of the scan volume was also observed and in some cases this dose was nearly 50% of the dose to organs inside of the scan volume. **Conclusions:** Results indicate that daily CBCT imaging in a high fraction therapy regimen can result in a substantial dose to organs well outside the planned target volume and should be taken into consideration during the treatment planning and delivery process.