Abstract:
The Acuros® XB dose calculation algorithm by Varian and the Monte Carlo algorithm XVMC by Brainlab were compared with each other and with the well-established AAA algorithm, which is also from Varian. First, square fields to two different artificial phantoms were applied: (1) a "slab phantom" with a 3 cm water layer, followed by a 2 cm bone layer, a 7 cm lung layer, and another 18 cm water layer and (2) a "lung phantom" with water surrounding an eccentric lung block. For the slab phantom, depth-dose curves along central beam axis were compared. The lung phantom was used to compare profiles at depths of 6 and 14 cm. As clinical cases, the CTs of three different patients were used. The original AAA plans with all three algorithms using open fields were recalculated. There were only minor differences between Acuros and XVMC in all artificial phantom depth doses and profiles; however, this was different for AAA, which had deviations of up to 13% in depth dose and a few percent for profiles in the lung phantom. These deviations did not translate into the clinical cases, where the dose-volume histograms of all algorithms were close to each other for open fields. Only within artificial phantoms with clearly separated layers of simulated tissue does AAA show differences at layer boundaries compared to XVMC or Acuros. In real patient CTs, these differences in the dose-volume histogram of the planning target volume were not observed.