Three-dimensional compensators provide corrections for missing tissue and/or tissue inhomogeneities encountered by photon beam. The compensator shape depends on missing tissue thickness, beam energy, field size, prescription depth, and internal inhomogeneities. This relationship is complex and results in a uniform dose only along one (compensated) plane. Above and below this plane the dose is overcompensated and undercompensated respectively. When multiple beams are used, the effect of overcompensation from one beam may be reduced by undercompensation from another beam leading to improved dose distribution throughout the entire target volume. This hypothesis was evaluated using a phantom with a complex surface shape. The phantom thickness varied from 8cm to 20cm. Tissue inhomogeneity was modeled by replacing acrylic material with a cavity filled with either cork or air. The cavity cross sectional dimensions were 5.5 x 8 cm². The phantom accommodated film and ionization chamber measurements. Co60, 6, 10 and 18MV photons were investigated. For a single 6MV beam, the measured dose distribution in the compensation plane was uniform to within 3%. Dose distributions in planes located ±4cm laterally varied 9% and 18% for homogeneous and heterogeneous phantoms respectively. When parallel-opposed 6MV compensated beams were used, the effect of over and undercompensation disappeared in all planes. Similar results were obtained with other energies. Calculations and experimental data were in agreement within 1.5%. Experimental results were verified for a lung patient using two pairs of parallel-opposed (AP/PA and oblique) beams and a significant improvement in dose uniformity was observed.