New applications of portal imaging devices aim at measuring the dose delivered to the patient during a treatment session.
In all such applications it is crucial to measure portal dose as exactly as possible. In addition, to compare portal dose obtained with an electronic portal imaging device with predicted dose in a water phantom, the dose deposition in both the portal image detector and water has to be studied.
In this work a Monte Carlo study was performed to simulate dose deposition in the detector (liquid filled ionisation chamber, Varian PortalVision) and in water. An accurate model of the detector's various materials was implemented in the Monte Carlo code. We simulated the absorbed dose of monoenergetic pencil beams in the energy range from 0.3 to 18 MeV and calculated the ratio of absorbed doses in water to the absorbed dose in the detector (correction factors). In order to investigate the effects of polyenergetic beams we also calculated correction factors for different beam qualities.
The correction factor was strongly dependent on the incident energy of the photons. For the monoenergetic photon beams it increased up to a value of 2. For different
beam qualities of a 6 MV beam the correction factors were between 1.04 and 1.07.
Consequently, the results of relative dose measurements will be dependent on the measuring device. In conclusion, a simple calibration of the detector response on water
dose is not sufficient for exact dosimetry and has to be corrected.