PEREGRINE is a 3-D Monte Carlo radiation transport system designed to provide the most accurate dose calculations for radiation therapy treatment planning. PEREGRINE combines Monte Carlo-based modeling of the accelerator beam delivery system, Monte Carlo simulation of treatment-specific beam modifiers, and Monte Carlo transport in the patient to provide a robust and accurate representation of the radiation source, the beam modifiers, and heterogeneities in patients. To validate the PEREGRINE dose calculation system, we have developed a comprehensive set of tests comparing PEREGRINE calculations to high-quality dosimetric measurements made with standard 6 and 18 MV clinical beams. These tests stress the physics algorithms for a full range of clinically relevant materials, densities, and beam energies for open, blocked, wedged, and compensated fields incident on a simple water phantom and water-equivalent phantoms with a variety of surface and sub-surface heterogeneities. Measurements were made with several types of detectors, including cylindrical and thin-window ionization chambers, photon diodes, and radiochromic film, chosen for the specific dose-distribution characteristics being studied. We report that PEREGRINE accurately models the absolute dose per monitor unit for a comprehensive set of clinically relevant cases.

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