

The ability to accurately convert CT scan numbers into appropriate beam transport factors (i.e. photon attenuation coefficients, electron stopping powers and scattering powers) is needed to generate correct absorbed dose distributions in radiation treatment planning. However, there exists no standard protocol for CT number conversion in radiotherapy. Consequently, different conversion methods reported in the literature or recommended by the treatment planning computer vendor will lead to different, and sometimes incorrect dose determinations. For example, if one uses a teflon insert in a linearity phantom to represent the electron density of bone, the electron scattering power could be overestimated by as much as 45 per cent. The conversion method presented here is based on recognizing that three independent factors must be considered to generate tables which are: 1. An objective determination of CT linearity must be done. 2. An estimate of CT energy should be determined in the presence of beam hardening. 3. A subjective decision, not determined by any phantom measurements, must be made to assign the type of tissue represented by various CT numbers (i.e. lung, fat, muscle, bone, etc.) The CT linearity was established using a quality assurance phantom. The energy was determined by scanning polyethylene, water, and methyl sulfoxide samples, and the tissue type assignments were made by evaluating CT number histograms from several scans. Physical density, electron density (megavoltage photon attenuation), electron stopping powers, electron scattering powers, and DRR coefficients were calculated from linear attenuation coefficients computed from the CT linearity and the atomic composition of the tissues.