scattered into adjacent tissue from slices being scanned, as well as radiation scattered beyond the ends of the scan. The $CTDI_{100}$ is measured with a 100-mm-long ionization chamber and two different phantoms: a 16-cm diameter phantom to represent the head, and a 32-cm diameter phantom to represent the trunk. When designing shielding for rooms where CT scanning will be performed, only secondary radiation is considered, since the primary X-ray beam is attenuated to a very low level and essentially stopped by the detector assembly and by the gantry. The scattered radiation at 1 m per rotation is given by

$$K_{\mathrm{sec}}^{1} = \kappa \frac{L}{p} \cdot \mathrm{CTDI}_{100}, \tag{10.27}$$

where κ = X-ray scatter fraction per cm, and has the following experimentally determined values:

$$\kappa_{\mathrm{head}} = 9 \times 10^{-5}\,\mathrm{cm}^{-1} \tag{10.28a}$$

$$\kappa_{\mathrm{body}} = 3 \times 10^{-4}\,\mathrm{cm}^{-1} \tag{10.28b}$$

$$L = \text{ length of the scan, cm}$$

$$p = \text{pitch} = \frac{\text{horizontal movement of the patient/gantry rotation}}{\text{beam width}}.$$

The value of the $CTDI_{100}$ for any specific scanner depends on the X-ray high voltage and on the exposure in mA-seconds (mA-s). Values of the $CTDI_{100}$ vary from one model scanner to another, and are measured and supplied by the manufacturer of the scanner. If we normalize the $CTDI_{100}$ to per mA-s and we call it $nCTDI_{100}$, then we obtain

$$K_{\mathrm{sec}}^{1} = \kappa \frac{L}{p} \cdot {}_{n}\mathrm{CTDI}_{100} \cdot \mathrm{mAs} \tag{10.29}$$