COMPONENT-BASED SUPERPOSITION CALCULATIONS: DEPENDENCE ON NUMBER OF COMPONENTS

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The kernels used in superposition dose calculation algorithms must be allowed to vary spatially in order to account for spectral changes such as beam hardening with depth. This can be modeled by generating polyenergetic kernels at various depths and interpolating. Alternatively, kernels may be generated separately for several monoenergetic components and superimposed, allowing the spectrum to change continuously with depth. This "components" method directly accounts for spectral changes with depth and provides better fits to measured data than the “polyenergetic” method. However, the calculation time is multiplied by the number of energy bins in the initial energy spectrum. We have investigated component-based calculations using various numbers of energy bins. Calculations were made for a 6 MV beam using a single point-source model encompassing kernel tilting and gaussian penumbra blurring. Calculations using as few as three or four energy bins are shown to be a good approximation to the full 14-component model, potentially decreasing the calculation time by as much as a factor of five.
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