The EGS4 based Monte Carlo program package BEAM enables the user to generate the phase-space information of an electron beam of a real accelerator at the surface of a phantom. This is the most desirable input for the simulation of dosimetry problems that require high accuracy such as the calculation of the replacement correction factor P_{repl} for plane-parallel ionization chambers in electron dosimetry.
In a separate contribution we demonstrate the improvements in the calculation of P_{repl} originating from the consideration of the full electron spectrum in the air cavity, of the resulting average stopping power ratio, of the small geometric chamber structures, and from applying an improved Monte-Carlo-code (EGS4 / PRESTA-II) capable of handling small scoring regions.
Incorporating these aspects and using BEAM-generated phase-space files for an individual accelerator we calculated P_{repl} for various electron energies. It is assumed that this determination of P_{repl} is most accurate, which was also confirmed by measurement.
However the simulation of an individual accelerator is laborious and the handling of the large phase-space files requires a high storage capacity for every single electron beam energy.
We therefore investigated the resulting loss in accuracy when the complete phase-space input is replaced with an energy spectrum represented by discrete points or even a monoenergetic one.
As result we found that the application of the full phase space information is necessary for the determination of P_{repl} since an accuracy of better than 1% is required over the full energy range.