Abstract
In January 2011 the Helmholtz-Zentrum Berlin started the design of the Berlin Energy Recovery Linac Project BERLinPro as a demonstrator of ERL science and technology [1,2]. The maximum energy is 50 MeV, the maximum current is 100 mA (cw), low energy parts of the machine (injector, beam dump line) are operated at about 6 MeV. Due to the high beam power of 5 MW in the ring, 600 kW in the beam dump, the accelerator will be built subterraneously [3]. For the beam dump surface one has to consider a heating up at this low energy of 6 MeV due to the comparatively small penetration depth of the radiation. To contribute to the construction of the beam dump we used the simulation code FLUKA [4, 5] to calculate not only the dose, but also the energy deposition into the material varying about different beam parameters (beam size, angle, divergence). These data are combined with an ANSYS calculation to find the appropriate temperature profile. So we optimized the design and the necessary beam parameters successfully.

Machine-layout and parameters

Challenge: Low penetration depth at 6 MeV, but high power leads to heating of the beam dump surface.

Energy distribution (FLUKA simulation)

Temperature profile (ANSYS calculation)

Conclusions and Outlook

- With a combination of FLUKA with ANSYS we achieve an appropriate temperature profile of the BERLinPro beam dump (also applicable for the design of other accelerator components).
- A further decrease of the max. temperature (to about 150°C) is planned.
- The high beam power can be handled in a safe way and the detailed design is in progress.