EGS4 PRESTAII Monte-Carlo simulations of photon and electron transport in two different source-blood vessel geometries used for endovascular irradiation to prevent restenosis after percutaneous transluminal coronary angioplasty (PTCA) were performed to calculate the 3-D dose distributions surrounding each source type.

On one hand a beta emitting ^{32}P stent was modeled as a combination of eight helicoidal cylinders consisting of elementary voxels of a cylindrical grid. Electrons are set in motion on the surface of these cylinders for which the material was set to nickel to take into account the attenuation in the stent material. On the other hand the geometry of a photon emitting ^{192}Ir HDR Mallinckrod source was simulated accurately. For reasons of symmetry, cylindrical rings surrounding the HDR source were used to calculate the dose to the tissues. To check our calculations, the obtained results were used to calculate dose kernel functions, which were compared to other published results.

Results for the case of the ^{32}P stent show that it is very important to take into account the stent material (attenuation) and that the effective geometry of the stent results in 'hot spots' at short distances from the stent. Given the same dose at the reference radial distance of 2 mm the doses to the media and intima (tissues responsible for the restenosis) were calculated for different thickness' of the plaques. The calculations indicate a stronger dose gradient for the ^{32}P stent, resulting in a relatively low dose in the media and the adventitia.