Recent Validation Results for Fano Cavity

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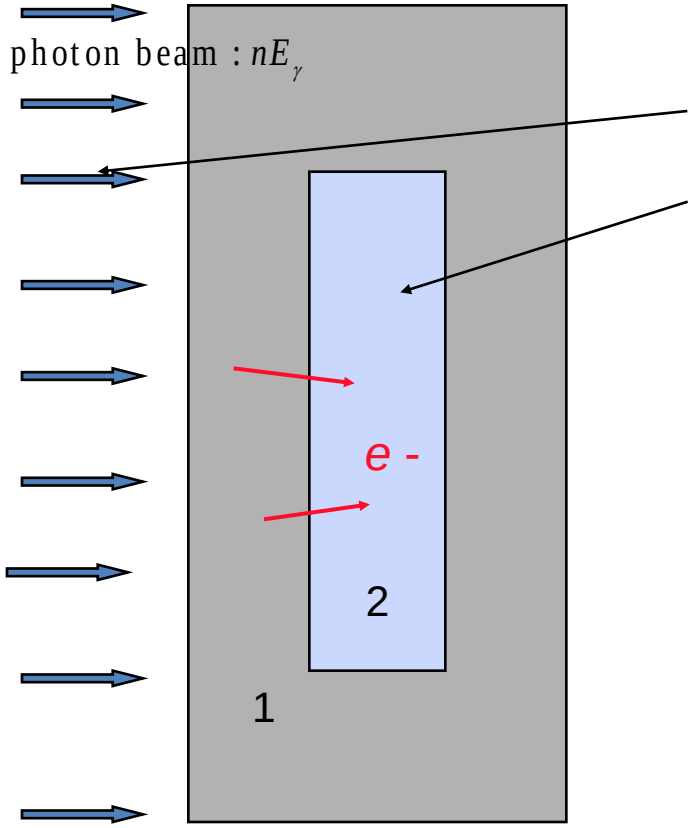
Fano Cavity Test

Materials 1 and 2 : same A, but different density ρ1 and ρ2

$$\Rightarrow \left(\frac{1}{\rho}\frac{dE}{dx}\right)_1 = \left(\frac{1}{\rho}\frac{dE}{dx}\right)_2$$



beam energy fluence : $\Phi = \frac{nE_\gamma}{S_1}$

dose in material 2 : D

energy transfert coefficient : $\mu_{tr}(E_\gamma) = \sigma_{tot}(E_\gamma)\frac{\langle T \rangle}{E_\gamma}$

$\langle T \rangle$ is the mean kinetic energy of emited e^-

Under *charged particle equilibrium* condition :

$$\frac{D}{\Phi(E_\gamma)} = \left(\frac{\mu_{tr}(E_\gamma)}{\rho}\right)_1 = \text{const}$$

i.e. independent of the tracking parameters of the simulation

9.3-ref-05

Fano cavity test case

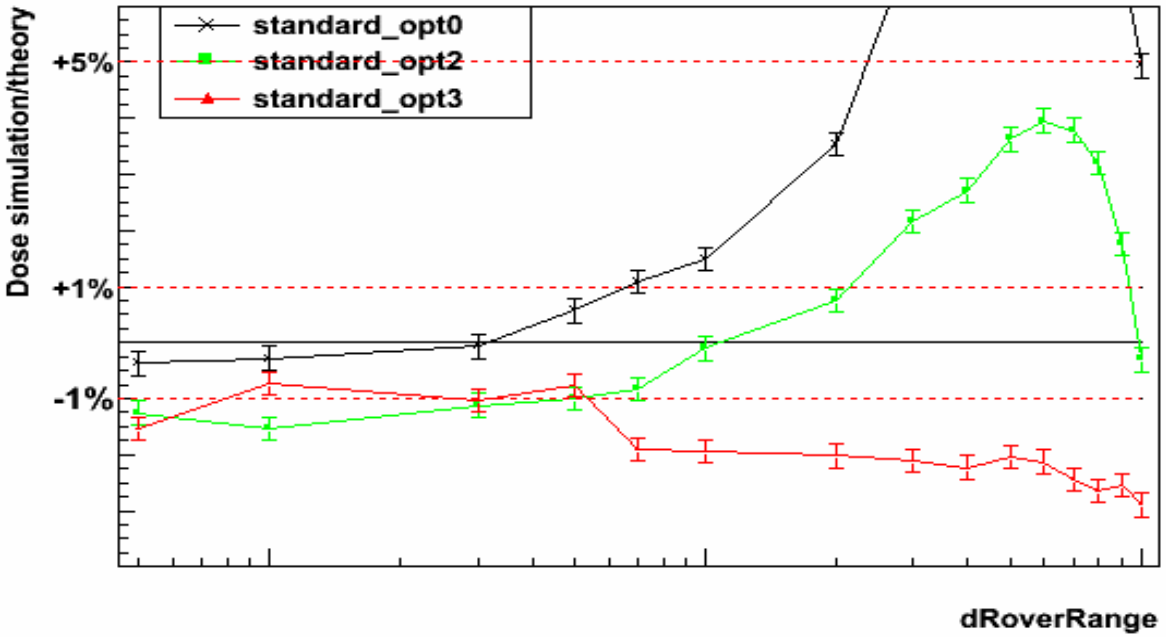
Ratio between simulated and therical dose deposited by a 1.25 MeV photon beam crossing an ionization chamber

Geant4 release : 09-03-ref-05

Basic test (no fluct, no msc):

standard_opt0 : 0.9983 +/- 0.0002 for dRoverRange = 0.004
standard_opt2 : 0.9983 +/- 0.0002 for dRoverRange = 0.004
standard_opt3 : 1.0007 +/- 0.0002 for dRoverRange = 0.004

Full test (fluct & msc):



9.3-ref-05

Fano cavity test case

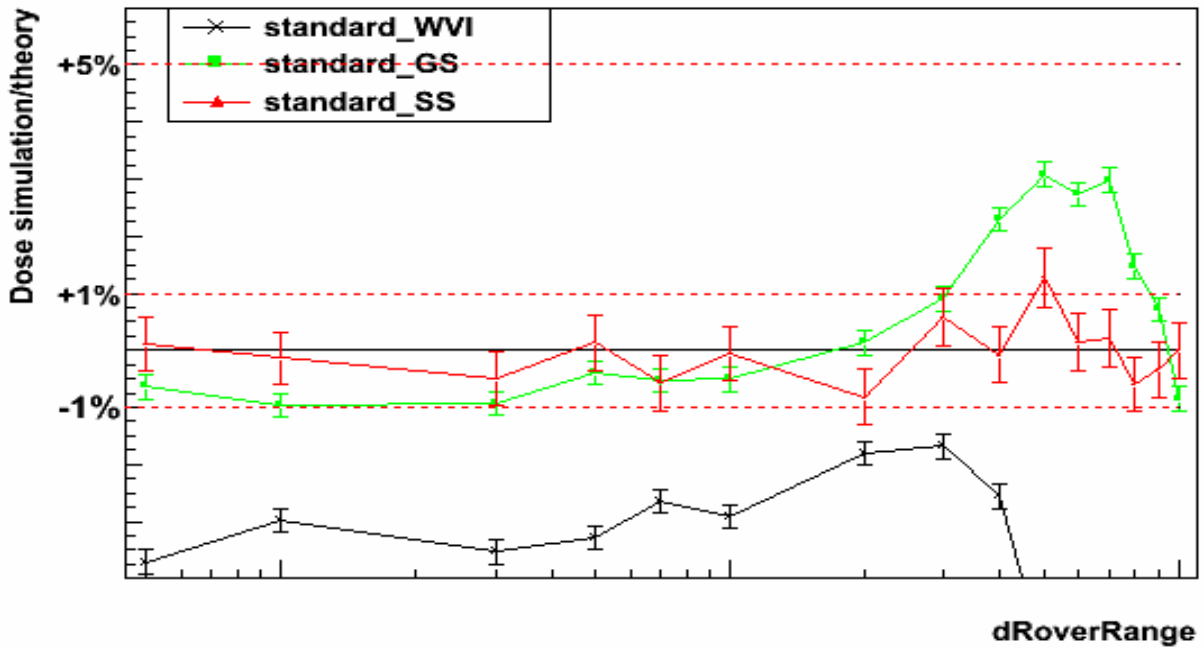
Ratio between simulated and therical dose deposited by a 1.25 MeV photon beam crossing an ionization chamber

Geant4 release : 09-03-ref-05

Basic test (no fluct, no msc):

standard_WVI : 1.0019 +/- 0.0003 for dRoverRange = 0.004
standard_GS : 0.9983 +/- 0.0002 for dRoverRange = 0.004

Full test (fluct & msc):



9.3-ref-05

Fano cavity test case - computation time

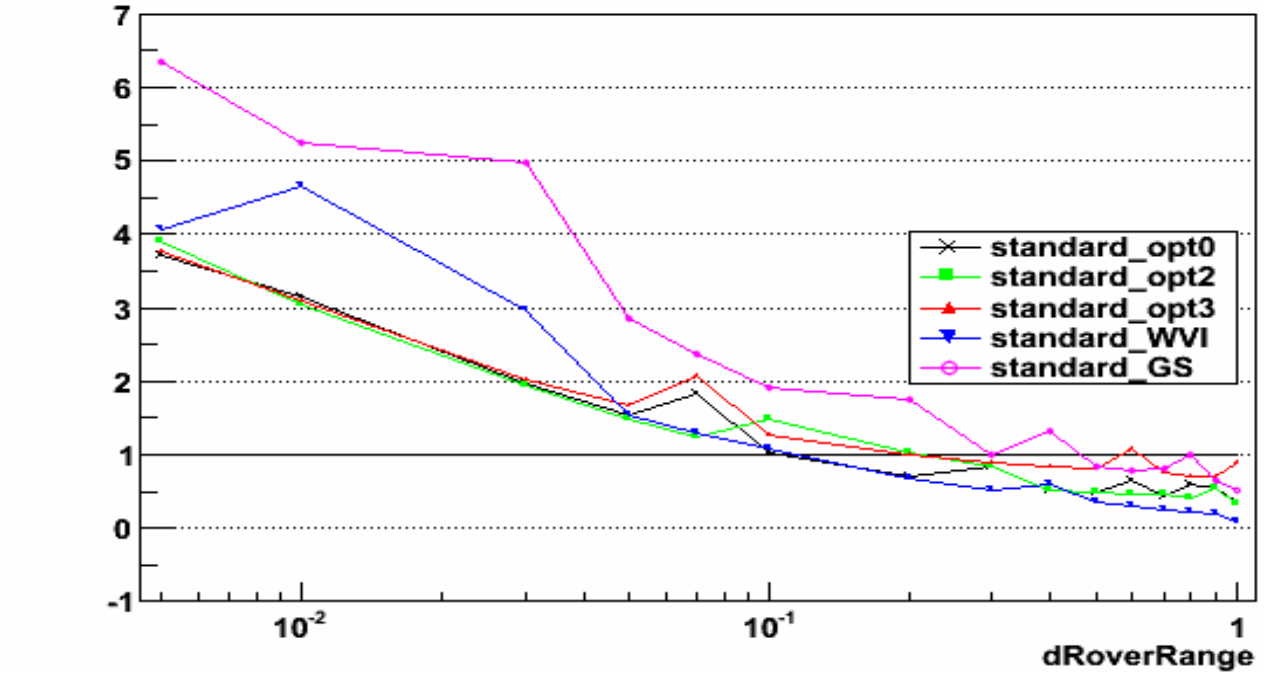
Ratio between simulated and theorical dose deposited by a 1.25 MeV photon beam crossing an ionization chamber

Time per event normalized to standard_opt3 (dR/Range=0.2)

Geant4 release : 09-03-ref-05

CPU for standard_SS model (dR/Range=0.2) : 10.3

Full test (fluct & msc):



9.3-ref-07

Fano cavity test case

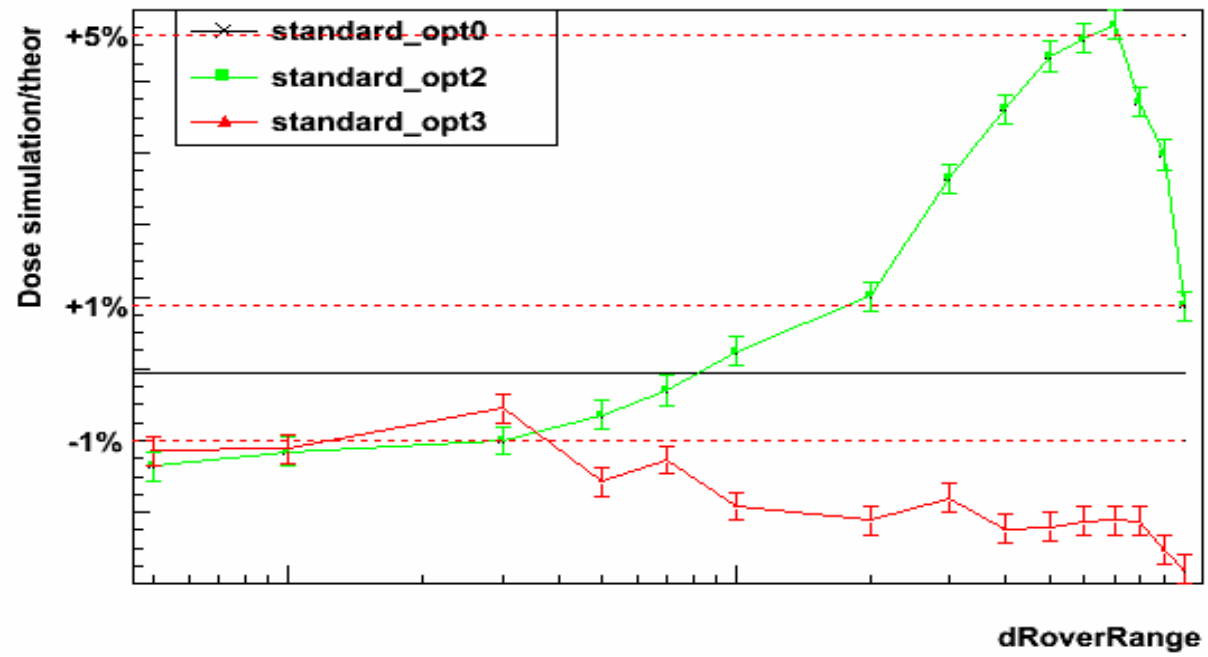
Ratio between simulated and theorical dose deposited by a 1.25 MeV photon beam crossing an ionization chamber

Geant4 release : 09-03-ref-07

Basic test (no fluct, no msc):

standard_opt0 : 0.9983 +/- 0.0002 for dRoverRange = 0.004
standard_opt2 : 0.9983 +/- 0.0002 for dRoverRange = 0.004
standard_opt3 : 1.0007 +/- 0.0002 for dRoverRange = 0.004

Full test (fluct & msc):



9.3-ref-07

Fano cavity test case

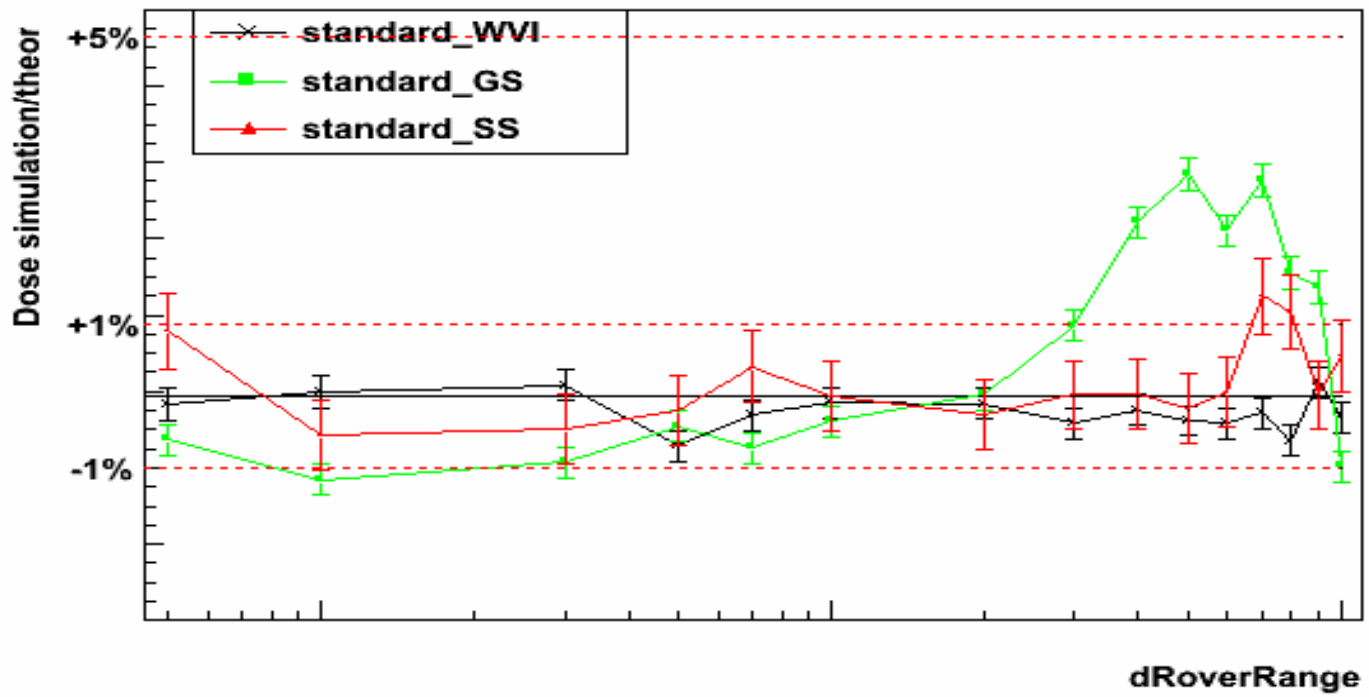
Ratio between simulated and theorical dose deposited by a 1.25 MeV photon beam crossing an ionization chamber

Geant4 release : 09-03-ref-07

Basic test (no fluct, no msc):

standard_WVI : 1.0036 +/- 0.0003 for dRoverRange = 0.004
standard_GS : 0.9983 +/- 0.0002 for dRoverRange = 0.004

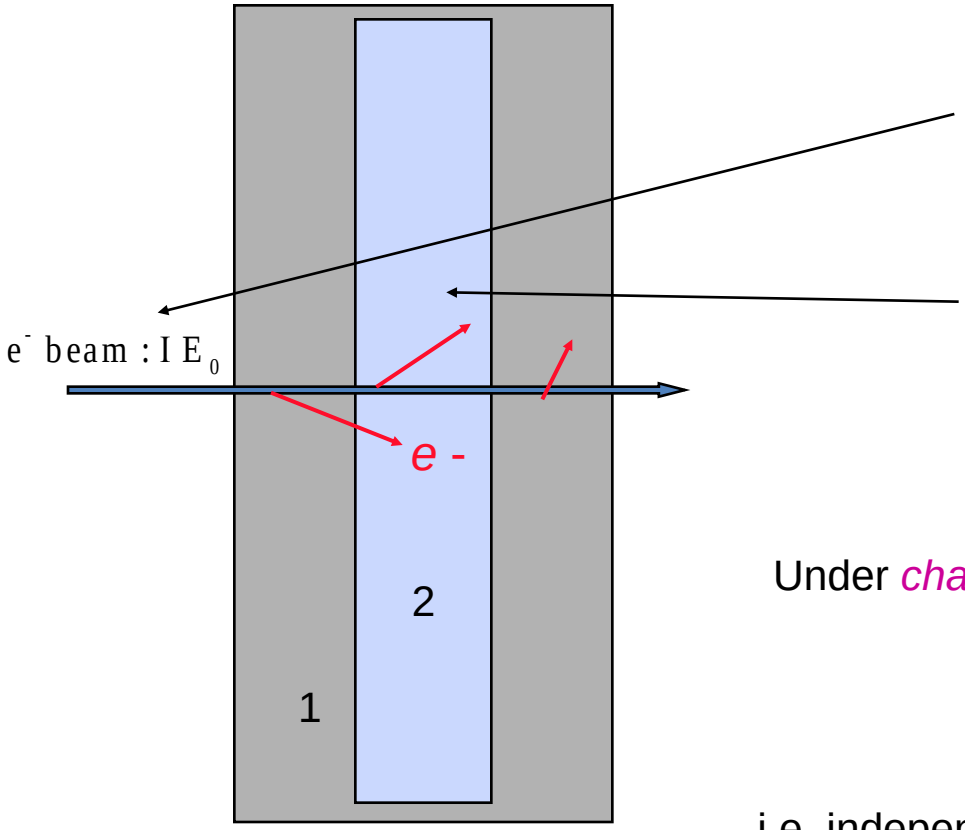
Full test (fluct & msc):



Fano Cavity 2

Materials 1 and 2 : same A, but different density ρ1 and ρ2

$$\Rightarrow \left(\frac{1}{\rho}\frac{dE}{dx}\right)_1 = \left(\frac{1}{\rho}\frac{dE}{dx}\right)_2$$



$$\text{lineic density } I = \frac{n_1}{m_1} = \frac{n_2}{m_2}$$

$$\text{beam energy fluence} : \Phi = IE_0$$

$$\text{dose in material 2} : D$$

Under *charged particle equilibrium* condition :

$$\frac{D}{\Phi(E_0)} = 1$$

i.e. independent of the tracking parameters of the simulation

9.3-ref-05

Fano2 cavity test case

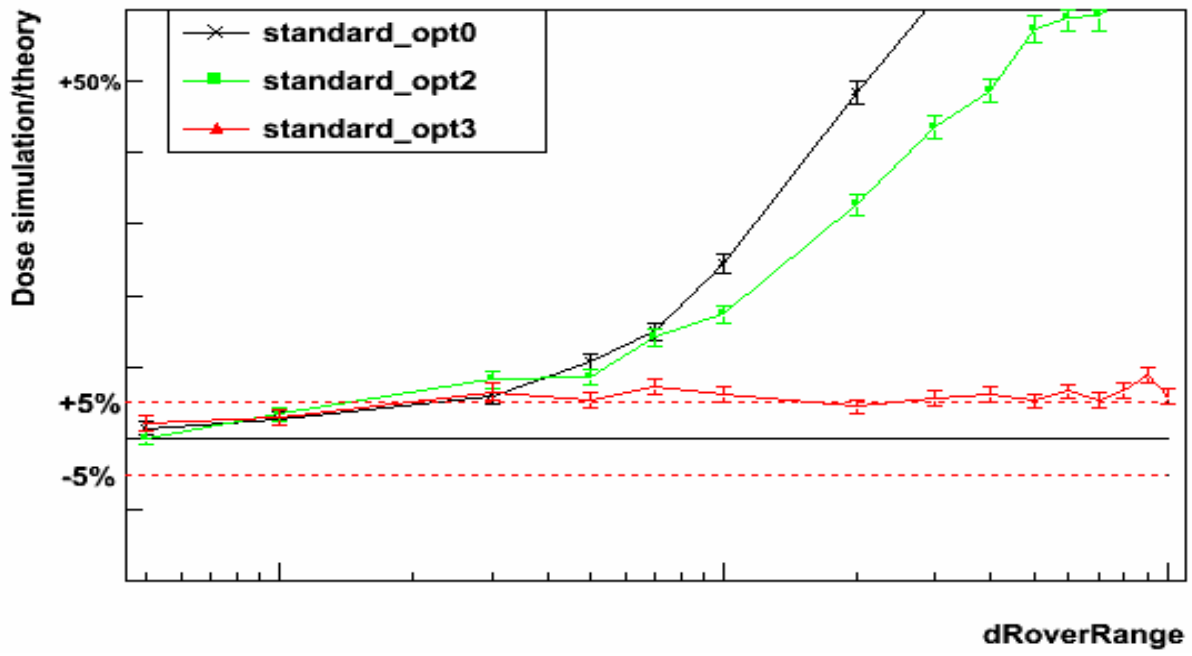
Ratio between simulated and theorical dose deposited by a 1.00 MeV electron beam crossing an infinite radius chamber

Geant4 release : 09-03-ref-05

Basic test (no fluct, no msc):

standard_opt0 : 1.0025 +/- 0.0009 for dRoverRange = 0.004
standard_opt2 : 1.0025 +/- 0.0009 for dRoverRange = 0.004
standard_opt3 : 1.0008 +/- 0.0009 for dRoverRange = 0.004

Full test (fluct & msc):



9.3-ref-05

Fano2 cavity test case

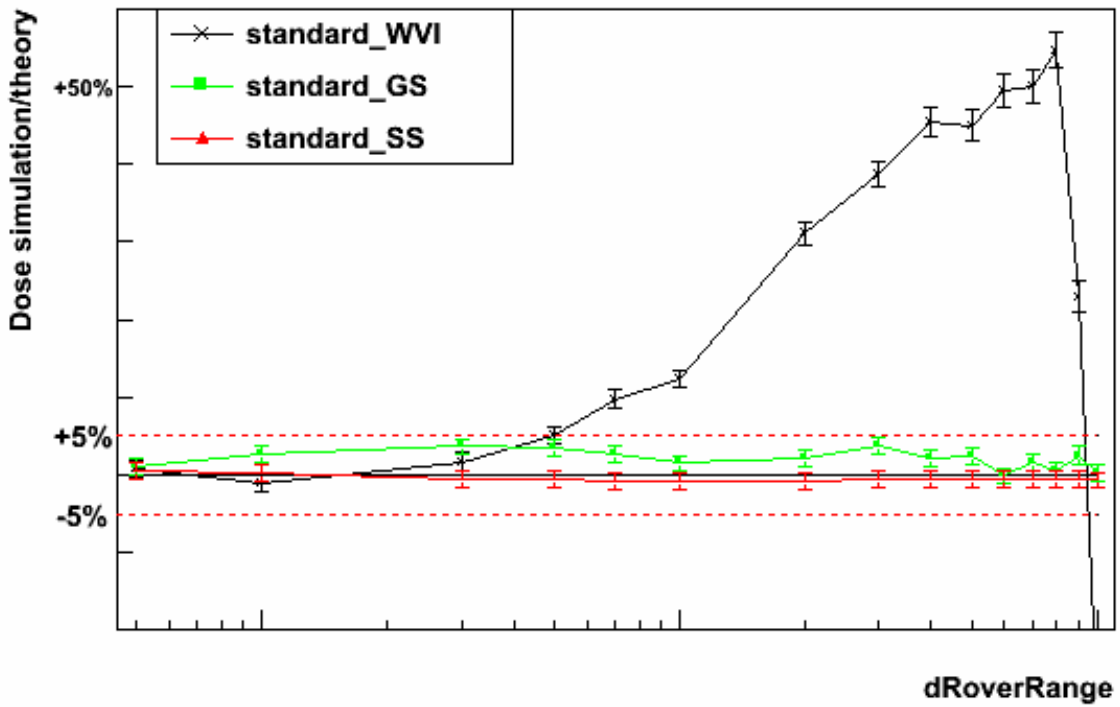
Ratio between simulated and theorical dose deposited by a 1.00 MeV electron beam crossing an infinite radius chamber

Geant4 release : 09-03-ref-05

Basic test (no fluct, no msc):

standard_WVI : 1.0033 +/- 0.0008 for dRoverRange = 0.004
standard_GS : 1.0008 +/- 0.0009 for dRoverRange = 0.004

Full test (fluct & msc):



9.3-ref-07

Fano2 cavity test case

Ratio between simulated and theorical dose deposited by a 1.00 MeV electron beam crossing an infinite radius chamber

Geant4 release : 09-03-ref-07

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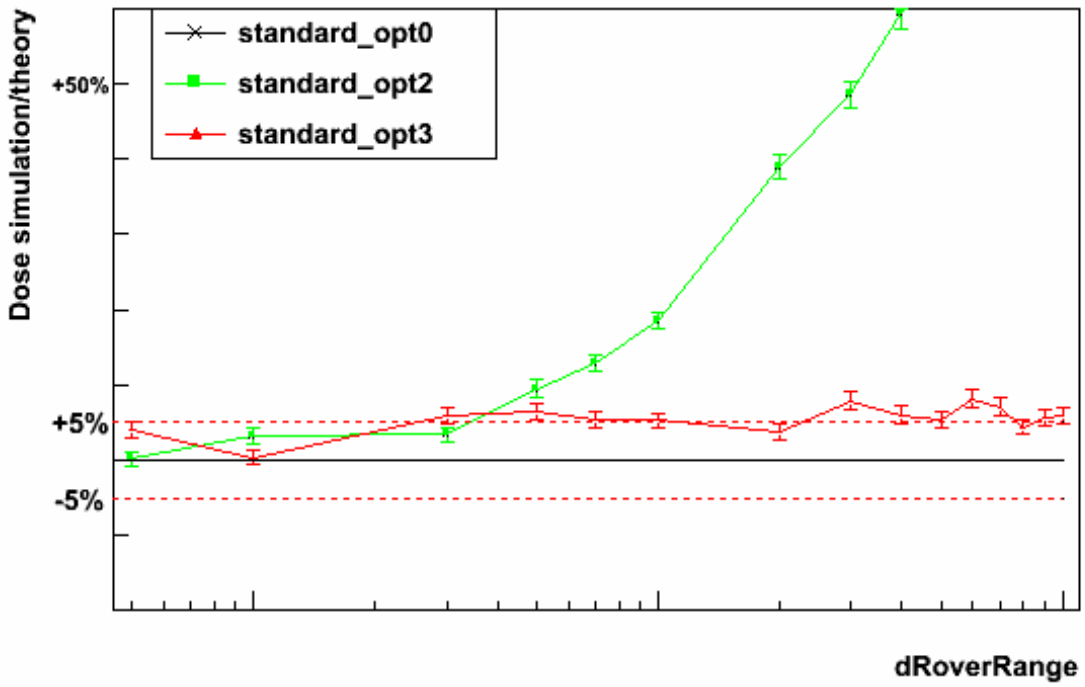
standard_opt0 : 1.0025 +/- 0.0009 for dRoverRange = 0.004
standard_opt2 : 1.0025 +/- 0.0009 for dRoverRange = 0.004
standard_opt3 : 1.0008 +/- 0.0009 for dRoverRange = 0.004

Full test (fluct & msc):



9.3-ref-07

Fano2 cavity test case

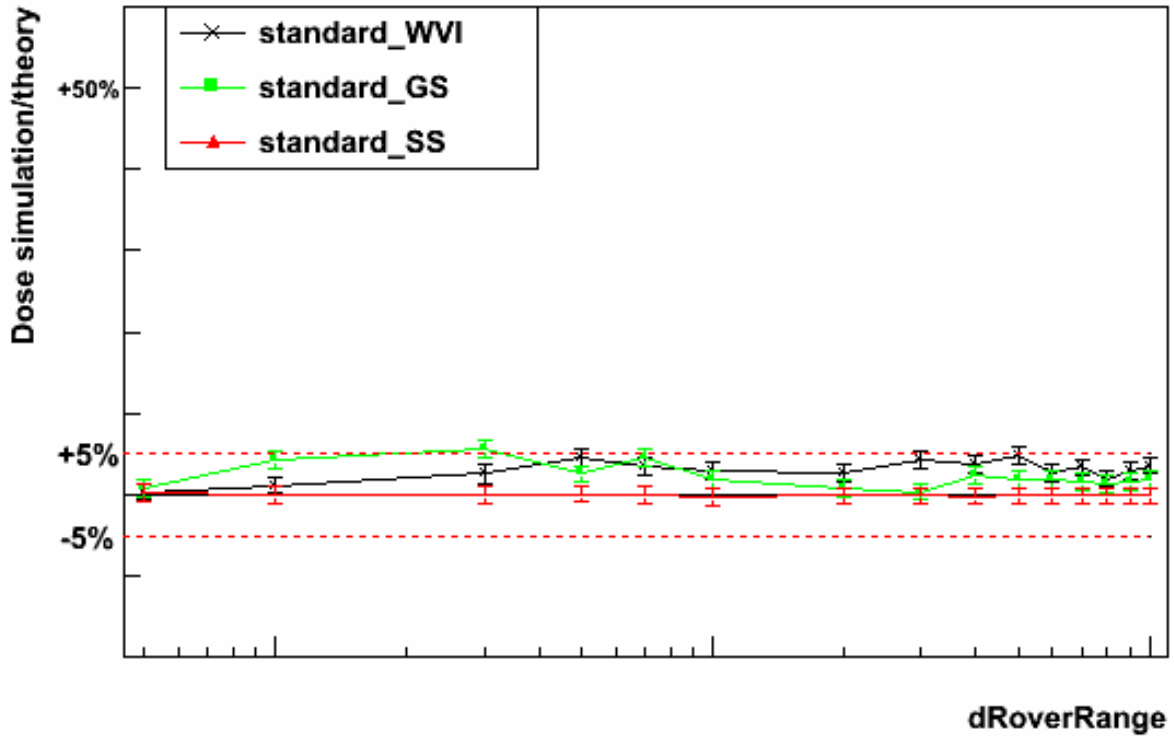
Ratio between simulated and theorical dose deposited by a 1.00 MeV electron beam crossing an infinite radius chamber

Geant4 release : 09-03-ref-07

Basic test (no fluct, no msc):

standard_WVI : 1.0034 +/- 0.0016 for dRoverRange = 0.004
standard_GS : 1.0008 +/- 0.0009 for dRoverRange = 0.004

Full test (fluct & msc):



Back-up

Single and Multiple Scattering in g4 9.1