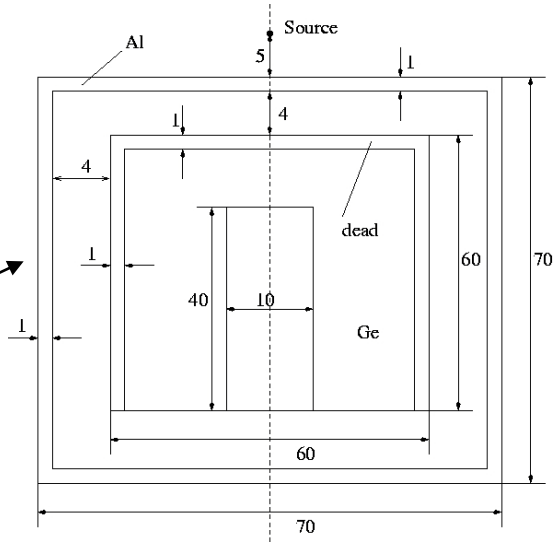
2A: New EM verifications

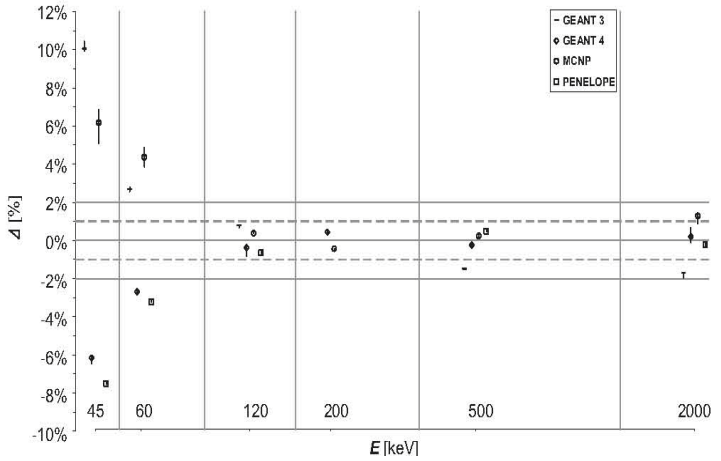
- L.Pandola “New test67 test results”
- D.Sawkey “Toward automatic validation of electron multiple scattering”
- M.Maire “New validation results”
- V.Ivanchenko “Validation results from ELSHIELD project”

- Various EM benchmark results and methods were discussed

L.Pandola "New test67 test results"

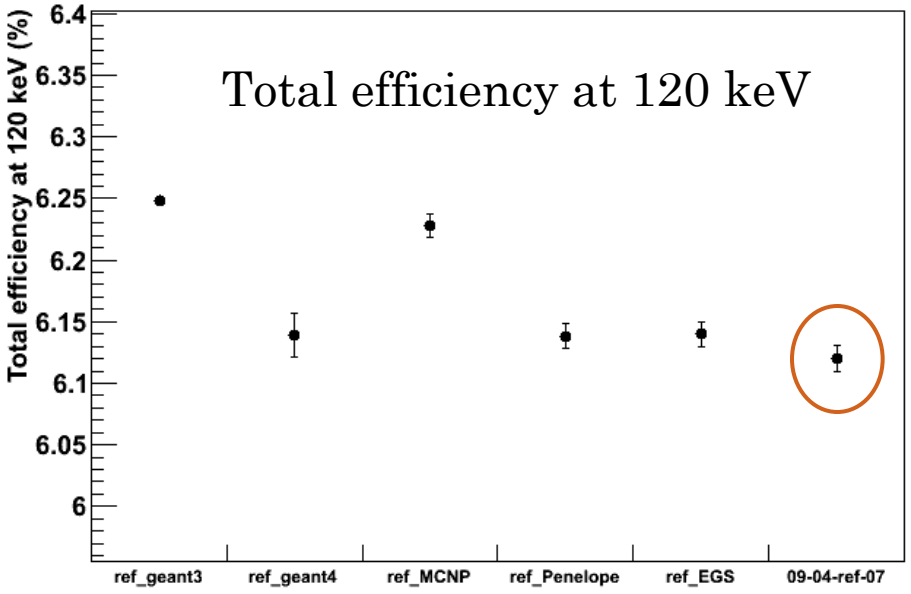
- In 2007 a **"comparison exercise"** has been performed within the **γ-ray spectrometry** community
- Goal: compare detection efficiencies predicted by different MC codes for a given (simplified) geometry of interest
  - each participant submitted the results calculated with his/her favourite MC code
  - participants used Geant4, Geant3, PENELOPE, MCNP, EGS et al.
- Appl. Rad. Isotopes **66** (2008) 764
  - found differences **up to 10%** at very low energy. Typically < few %
- Use this setup as a benchmark for the existing and new EM models in Geant4 → **`test67`**

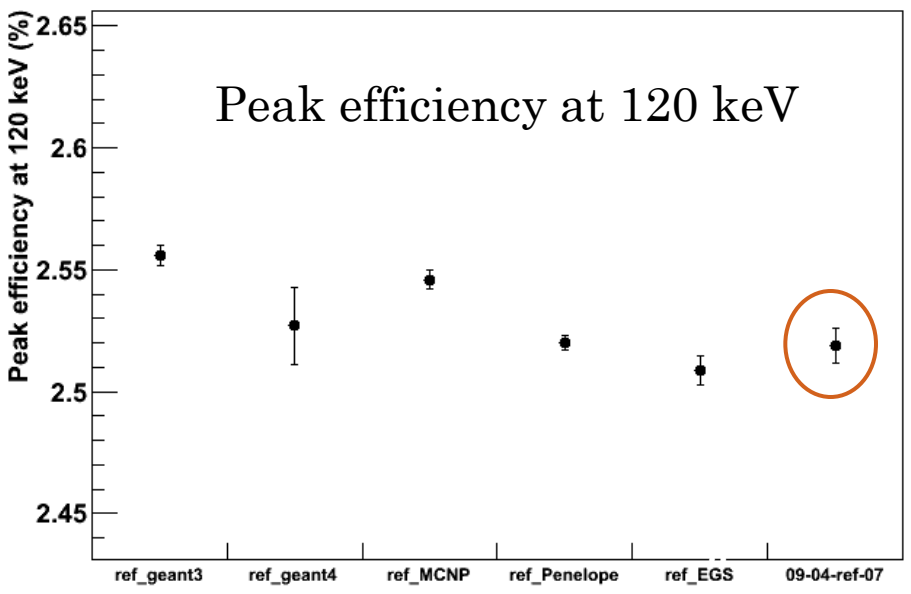




Comparison with other codes or between Geant4 versions

- Results from Geant4-sim can be compared also with reference values obtained with **other codes** in the intercomparison exercise
  - error bars in the reference values are the spread of results provided by participants who used the same code
- Good agreement with EGS, Geant4, Penelope
- We agree to run this benchmark regularly





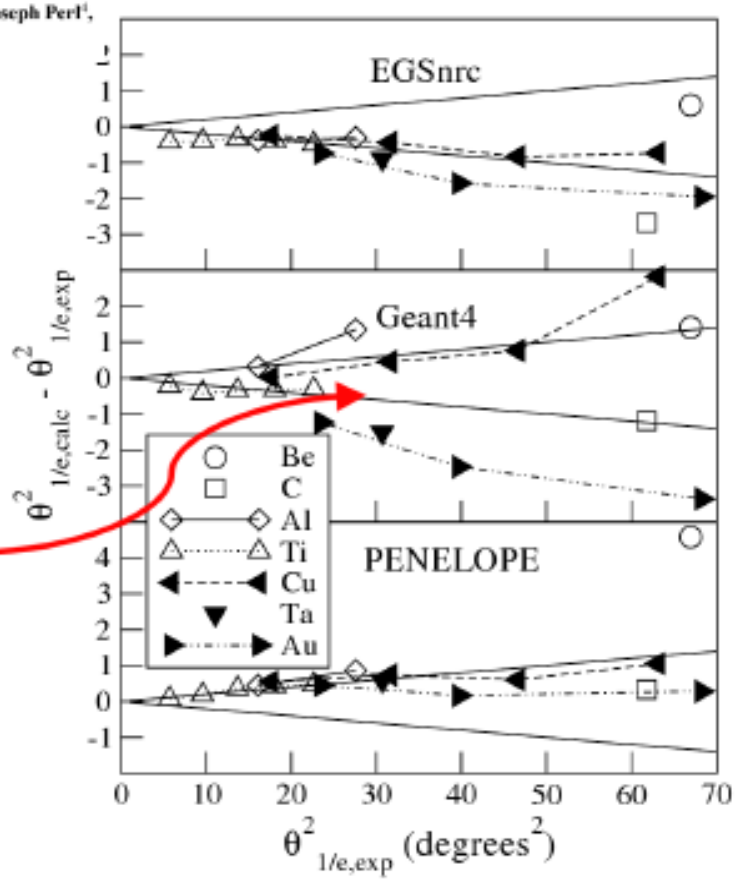
D.Sawkey "Toward automatic validation of electron multiple scattering"

The accuracy of EGSnrc, Geant4 and PENELOPE Monte Carlo systems for the simulation of electron scatter in external beam radiotherapy

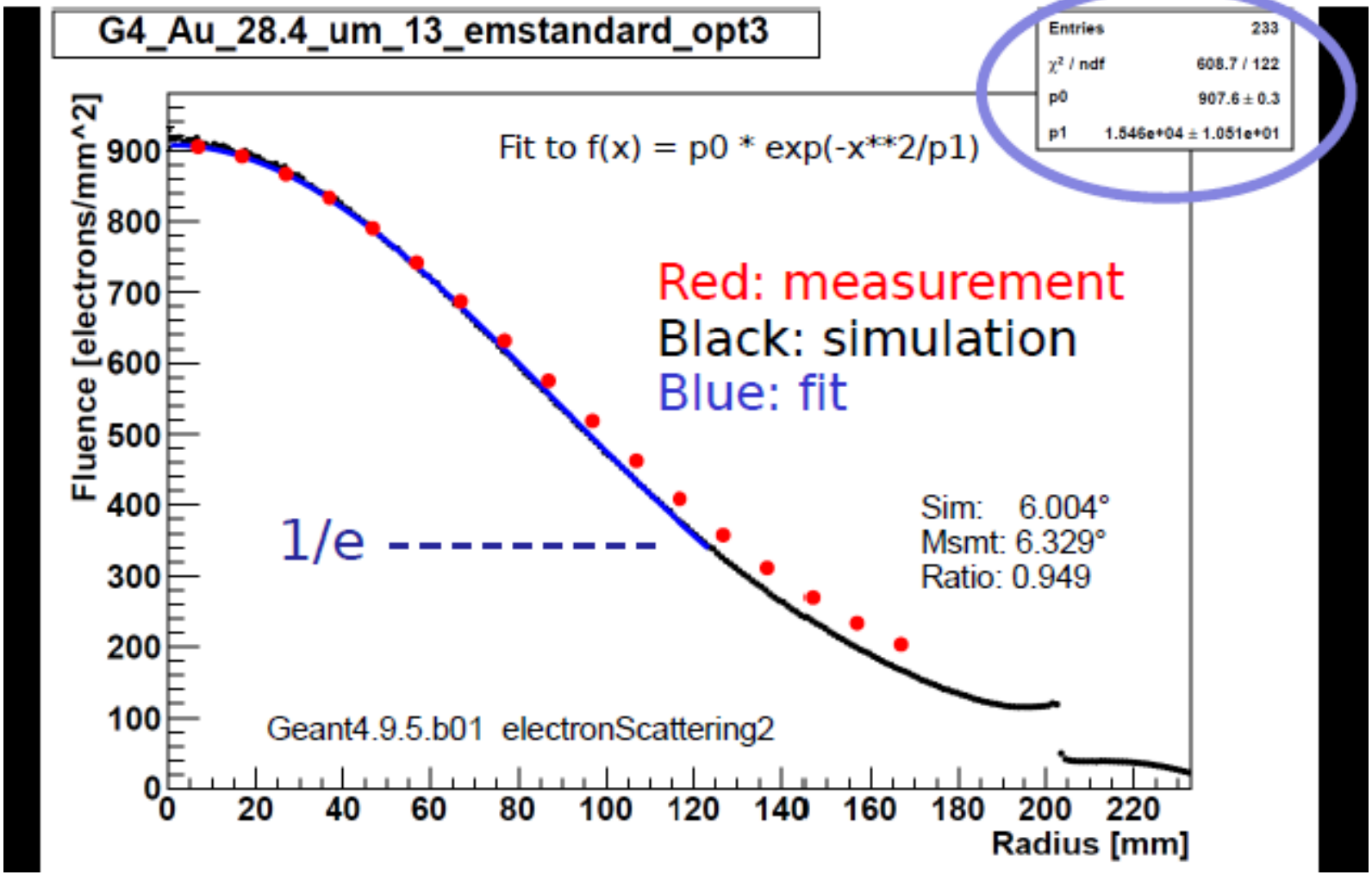
Bruce A Faddegon[1], Iwan Kawrakow[2], Yuri Kubyshin[3,6], Joseph Perl[4], Josep Sempau[3] and Laszlo Urban[5]

2009
Geant4.9.2 + Δ
Option 0

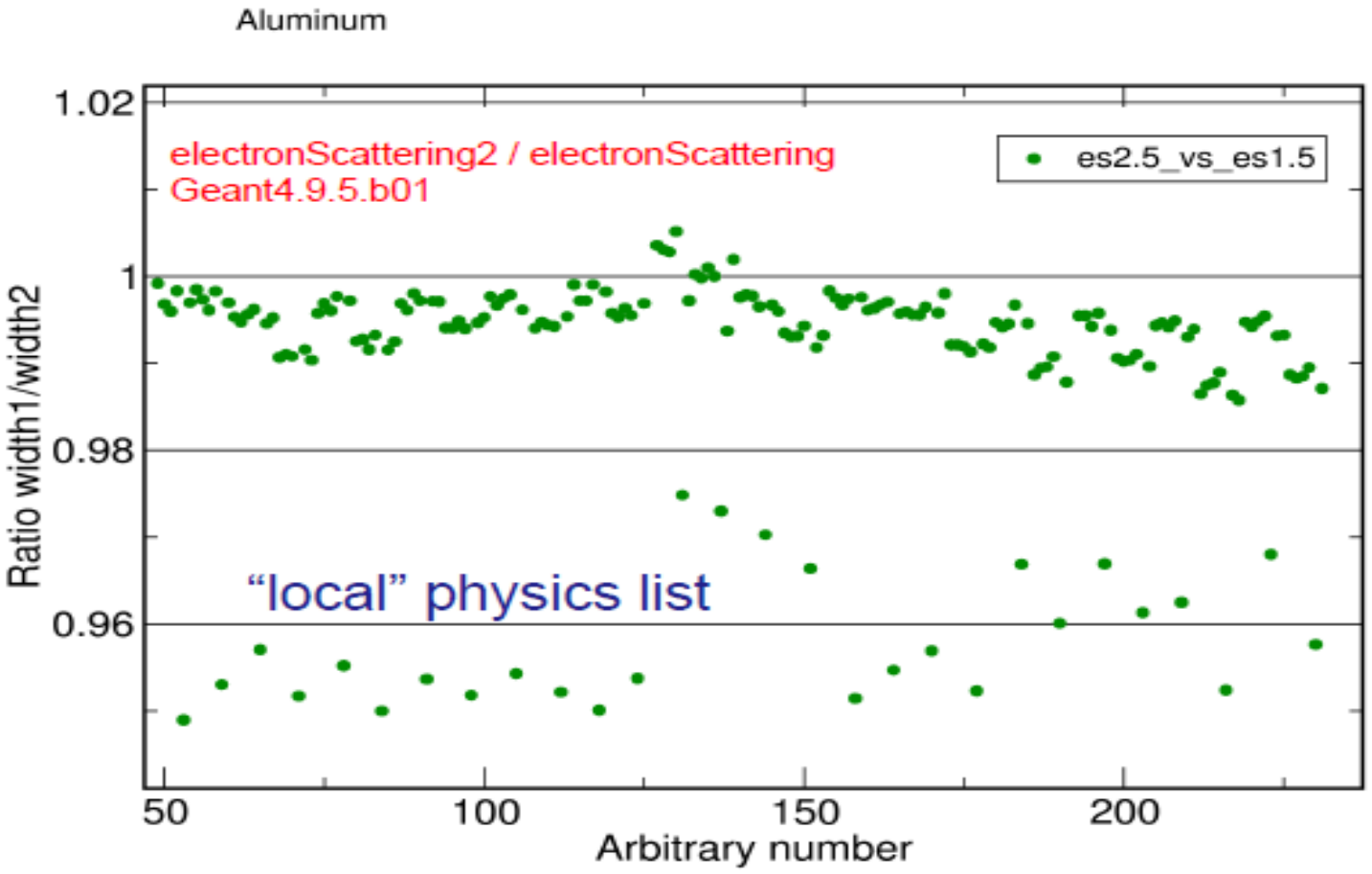
Lines are 1% difference



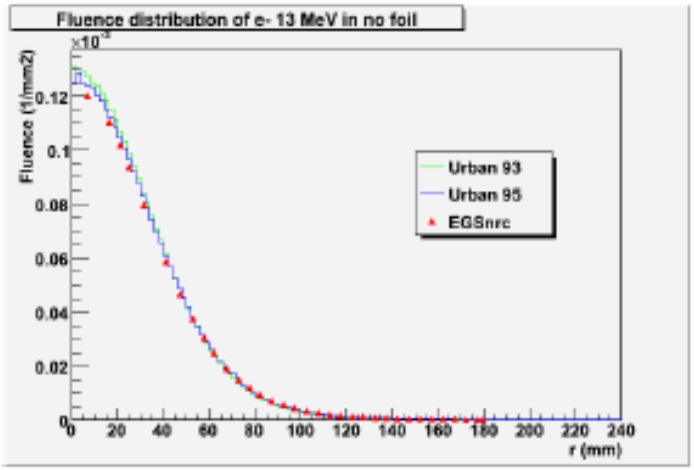
A SOFTWARE HAS BEEN DEVELOPED TO PROVIDE FAST AND DETAILED ANALYSIS OF THE BENCHMARK RESULTS

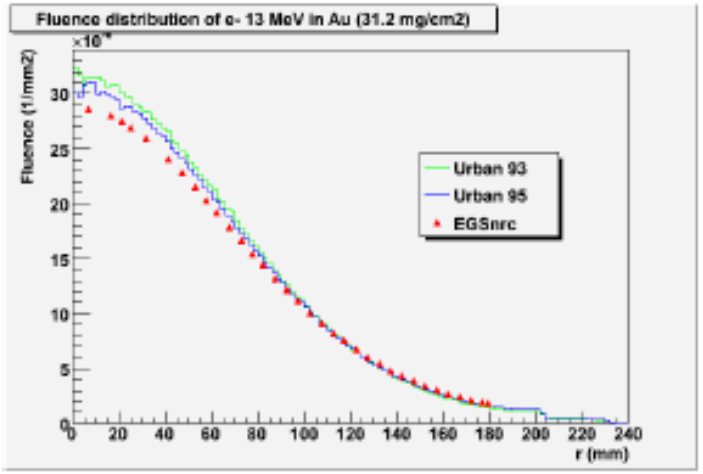


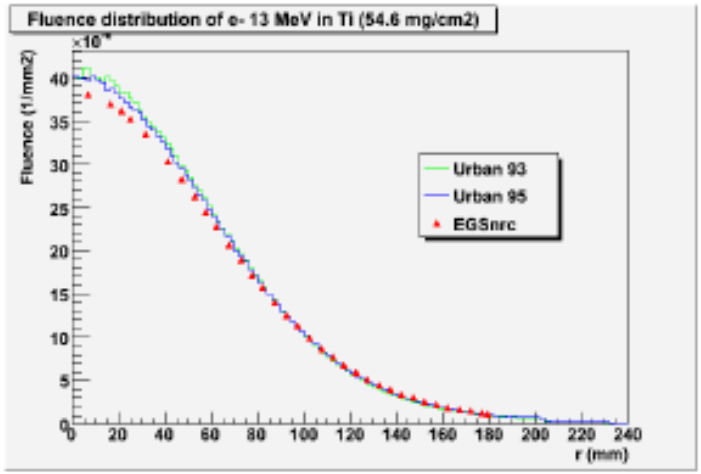
Number of variants of runs is huge: material/thickness/energy/Physics Lists

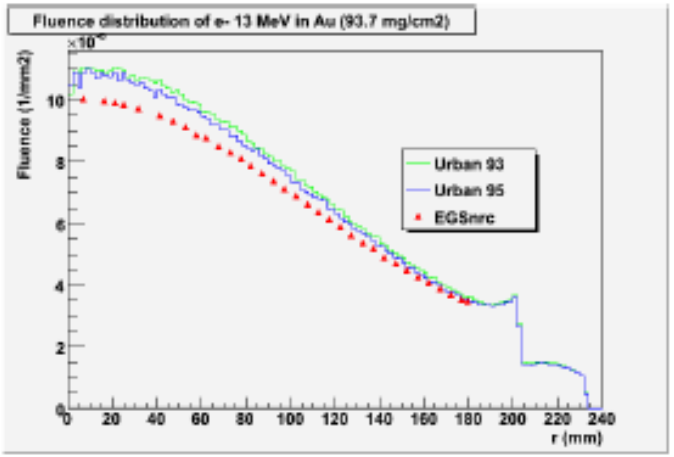


M.Maire "New validation results" Continue discussion on electron scattering benchmark: Geant4/EGSnrc

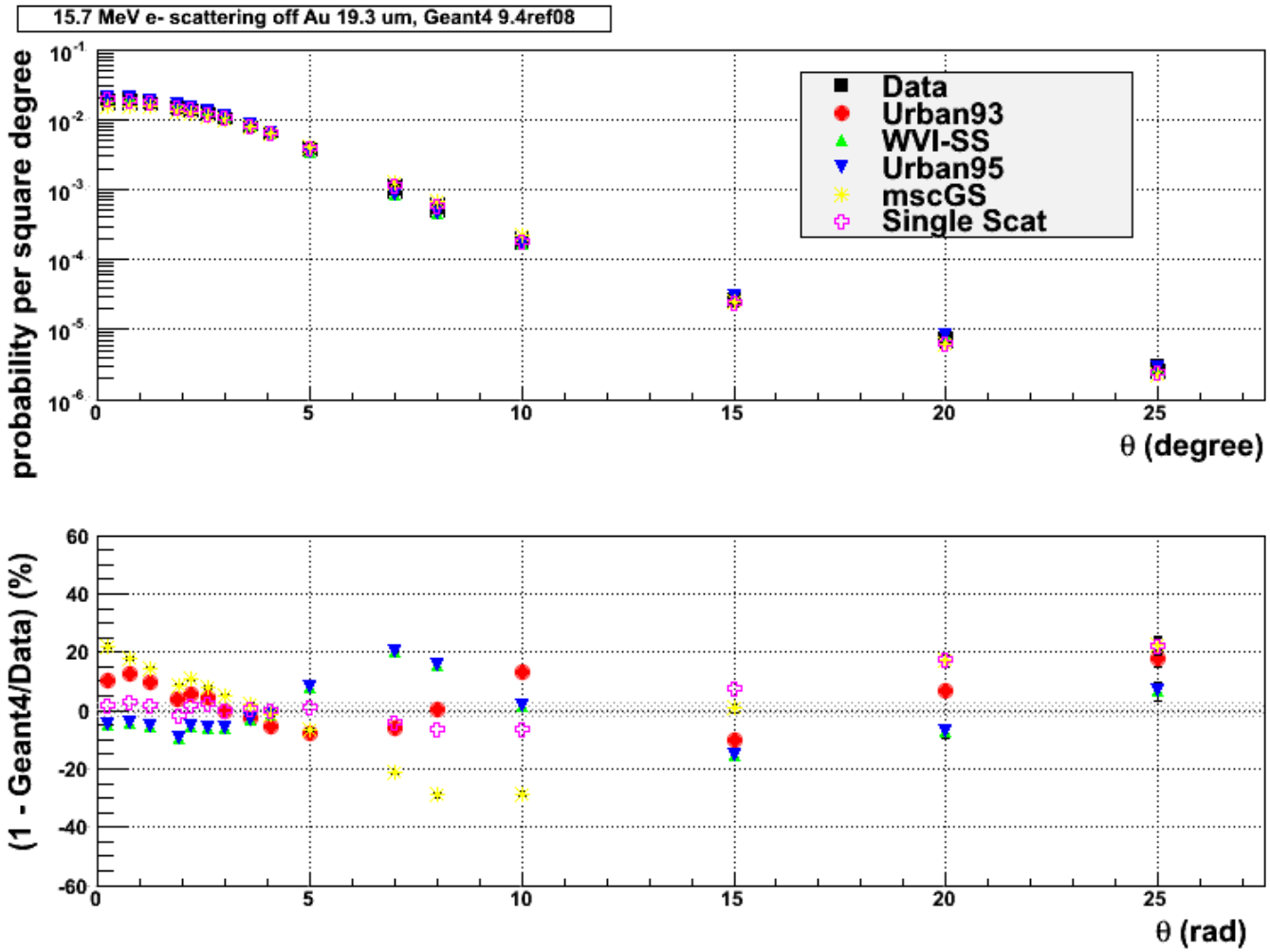








V.Ivanchenko "Validation results from ELSHIELD project"



List of ELSHIELD validation benchmarks versus experimental data

Benchmark	Type	Energy/angle	Material	Test
Electron scattering	new	15.6 MeV $0 – 25^0$	Au	data
Electron scattering	Existing, update in progress	13, 20 MeV $0 – 12^0$	Be, C, Al, Ti, Cu, Au, Ta	Data, EGSnrc, Penelope
Dose profile	Existing	0.5 – 1 MeV	Al, Mo, Ta, TaAl, AlAuAl	Data
Backscattering	new	0.1 – 1 MeV $0 – 75^0$	Be, C, Al, Ti, Cu, Mo, Au, Ta, U	Data
Bremsstrahlung	new	1, 2.8, 15 MeV $0 – 60^0$	Al, Cu, W	Data, EGSnrc, Penelope
Dose kernel	Existing	10, 15, 100 keV 1 MeV	Water	EGSnrc

Energy interval of interest for the project 1 keV – 20 MeV

In summary: a discussion on validation for the release 9.5 was carried out and a plan was established