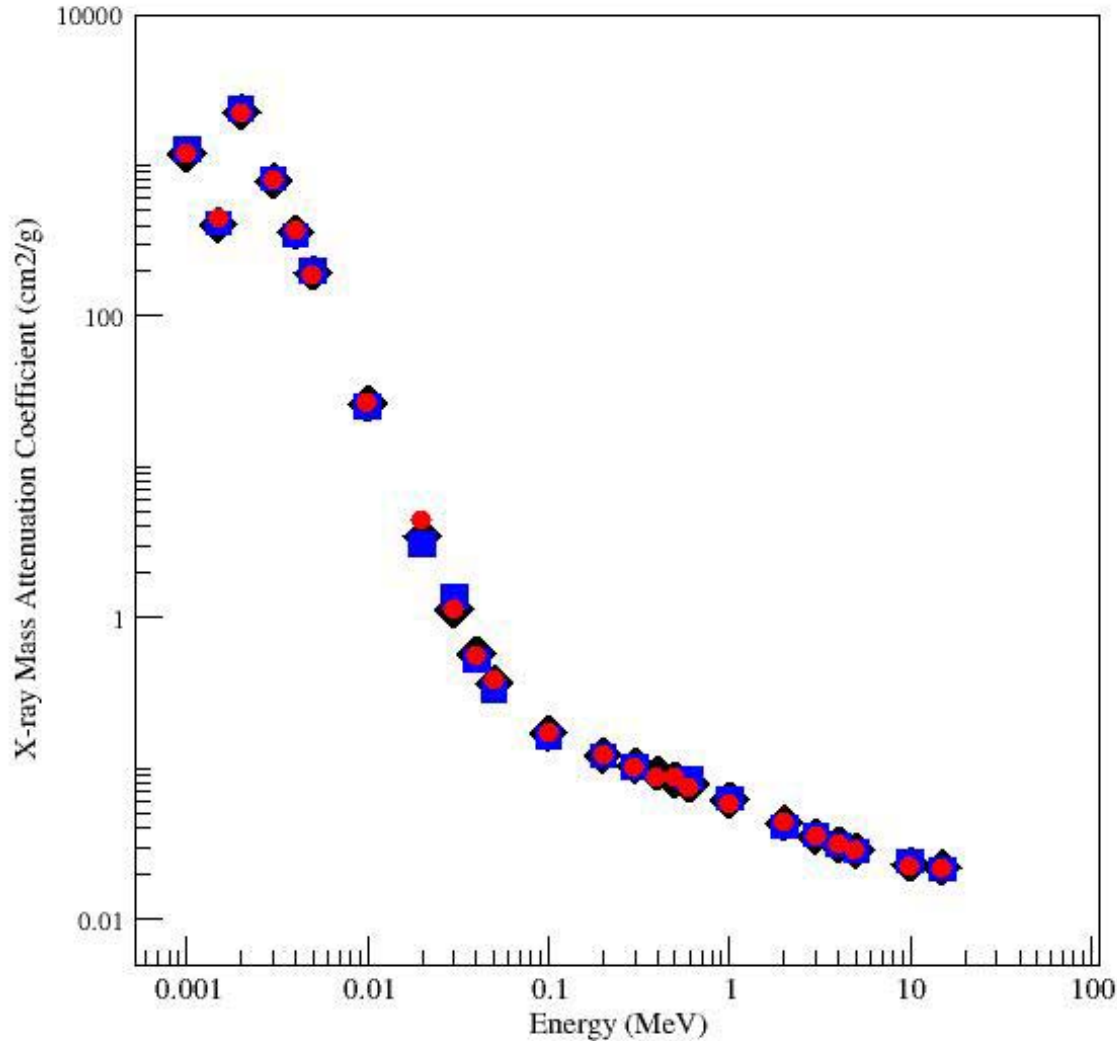


# PHOTONS - ATTENUATION

# X-ray Attenuation Coefficient - Al

X-ray - Attenuation Coefficient - Aluminium

(Geant4-05-02)



$$\chi^2_{N-L}=13.1 - \nu=20 - p=0.87$$

$$\chi^2_{N-S}=23.2 - \nu=15 - p=0.08$$

◆ NIST-XCOM

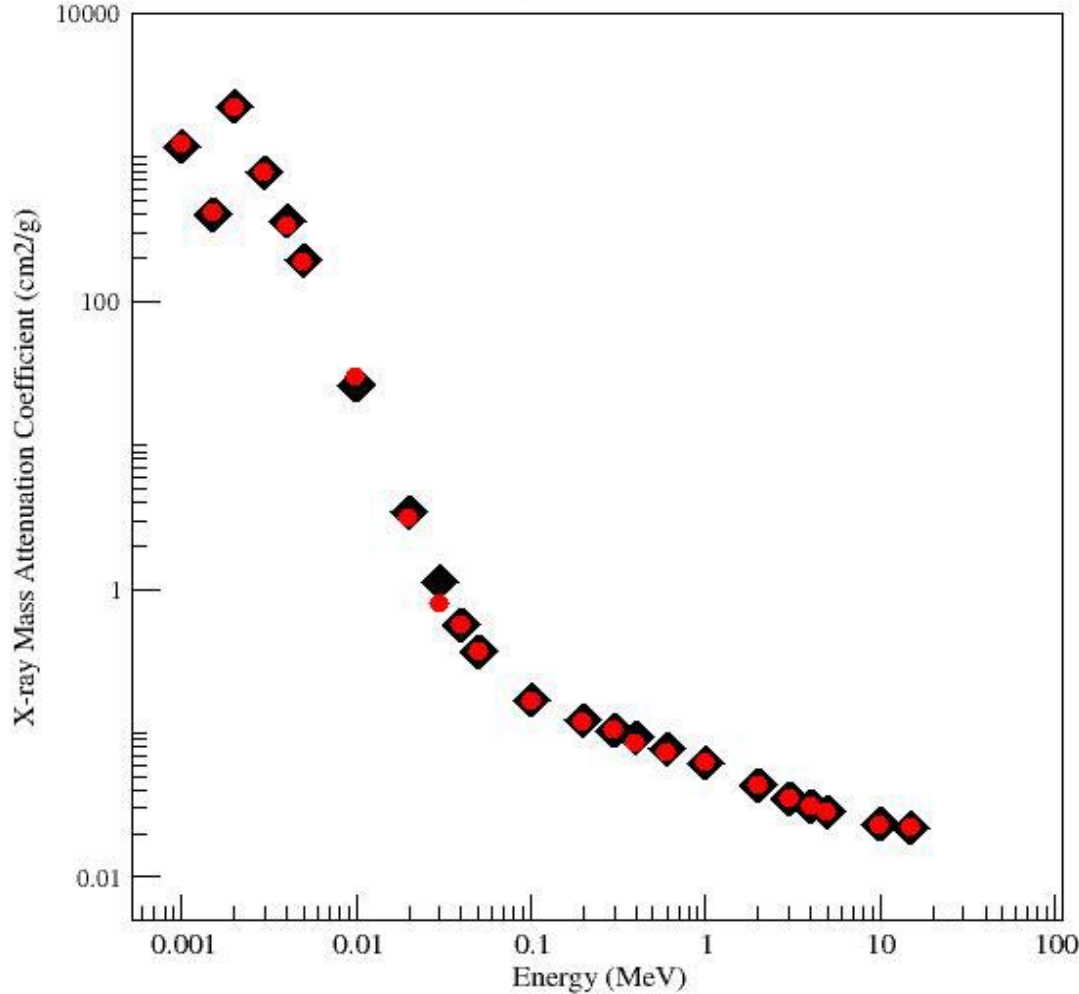
■ G4 Standard

● G4 LowE

# X-ray Attenuation Coefficient - Al

X-ray - Attenuation Coefficient - Aluminium

(Geant4-05-02)



NIST-XCOM



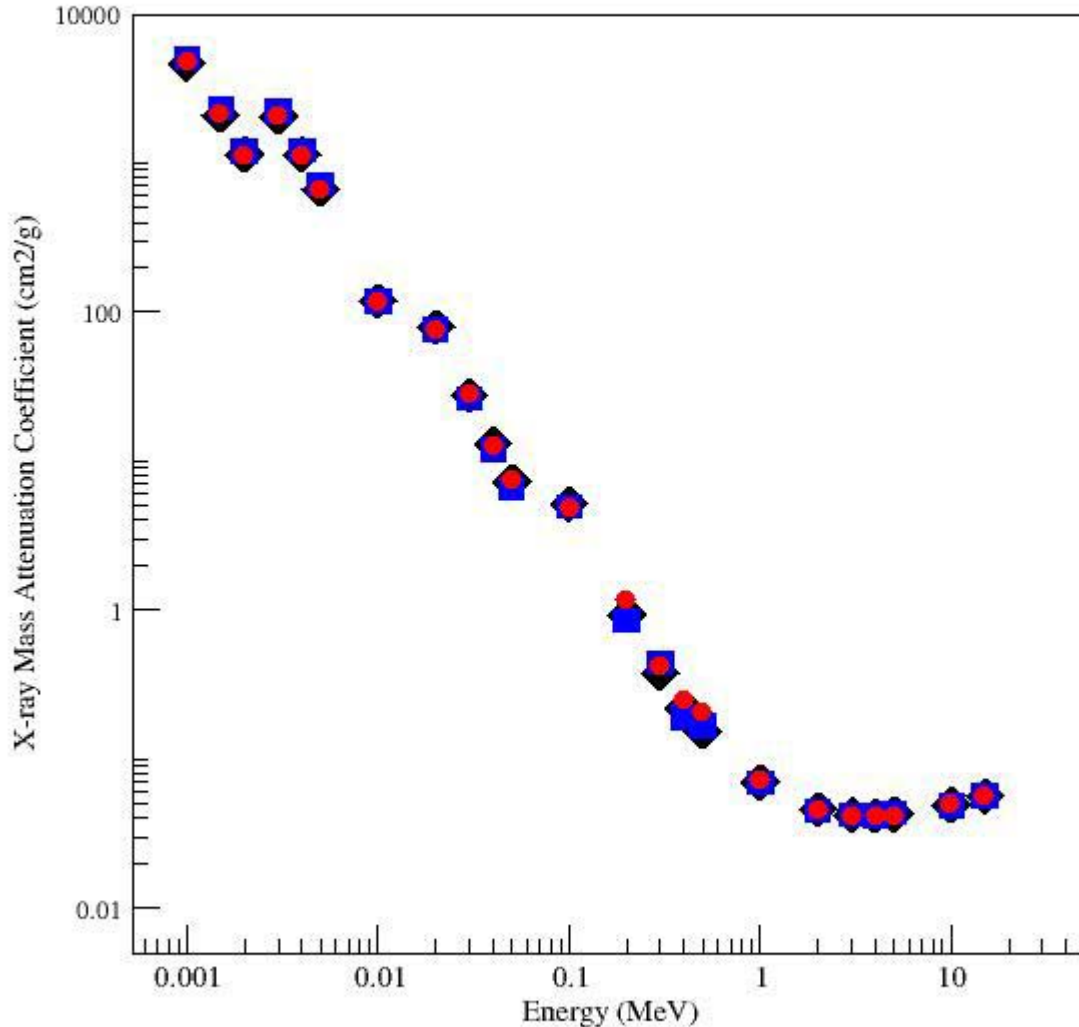
G4 LowE Penelope

$$\chi^2_{N-P} = 15.9 - \nu = 19 - p = 0.66$$

# X-ray Attenuation Coefficient - Au

X-ray - Attenuation Coefficient - Gold

(Geant4-05-02)



$$\chi^2_{N-L} = 28.0 - \nu = 21 - p = 0.14$$

$$\chi^2_{N-S} = 20.1 - \nu = 19 - p = 0.39$$

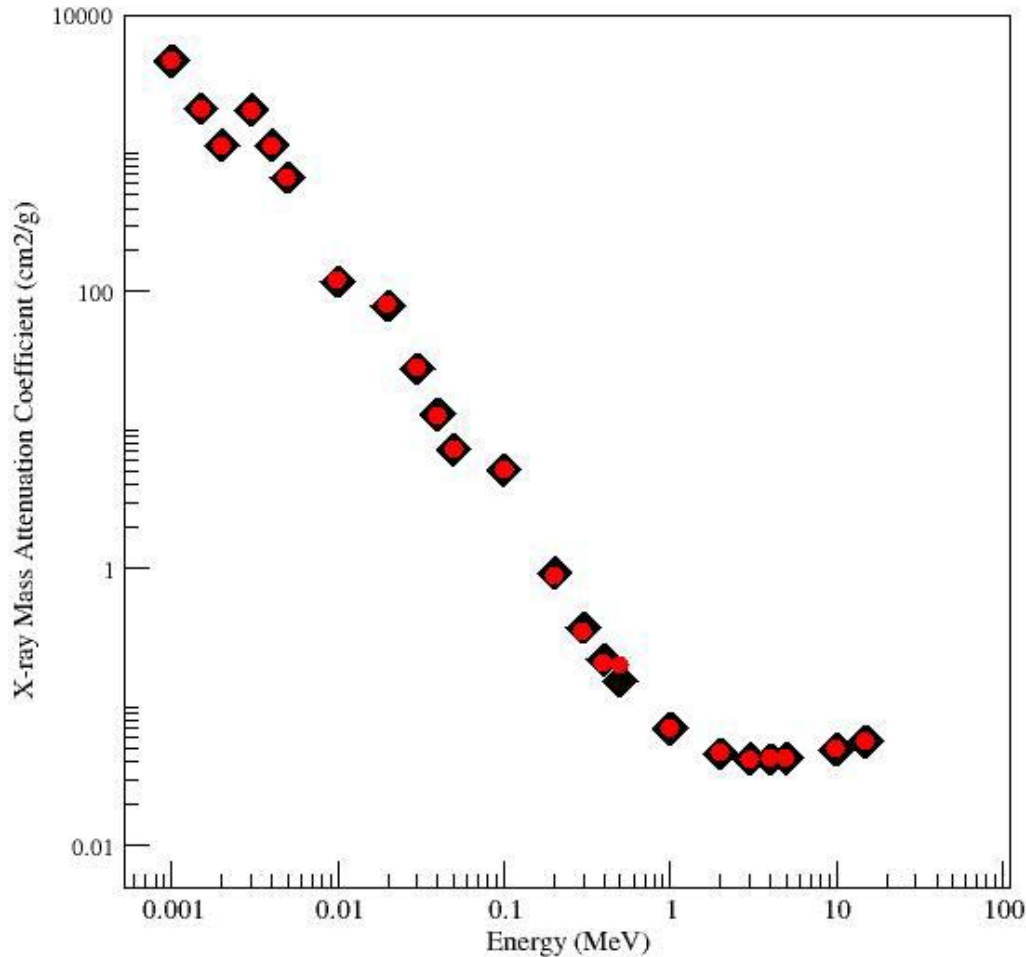
◆ NIST-XCOM

■ G4 Standard

● G4 LowE

# X-ray Attenuation Coefficient - Au

X-ray - Attenuation Coefficient - Gold  
(Geant4-05-02)



- ◆ NIST-XCOM
- G4 LowE Penelope

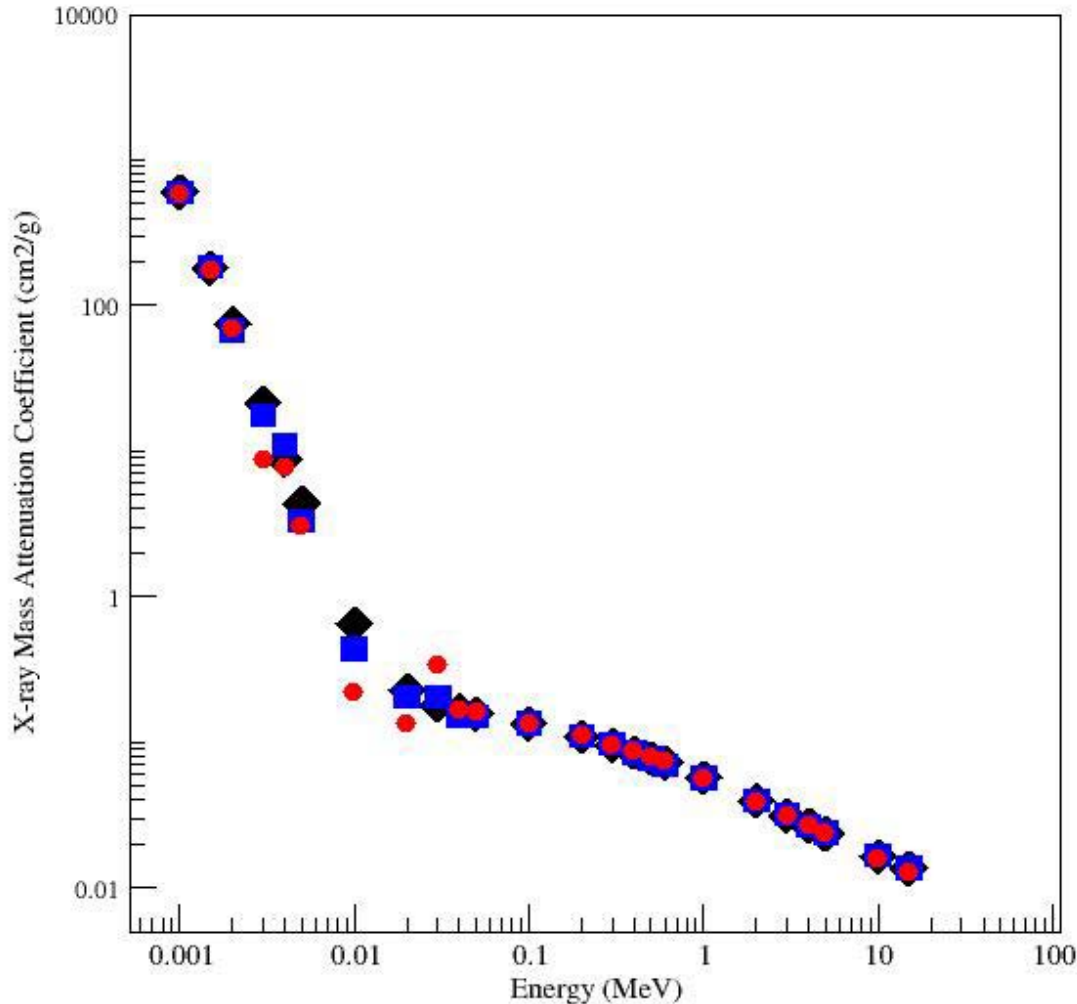
$$\chi^2_{N-P} = 21.3 - \nu = 22 - p = 0.50$$

# X-ray Attenuation Coefficient - Be

X-ray - Attenuation Coefficient - Beryllium  
(Geant4-05-02)

$$\chi^2_{N-L}=19.9 - \nu=20 - p=0.47$$

$$\chi^2_{N-S}=23.4 - \nu=21 - p=0.33$$



◆ NIST-XCOM

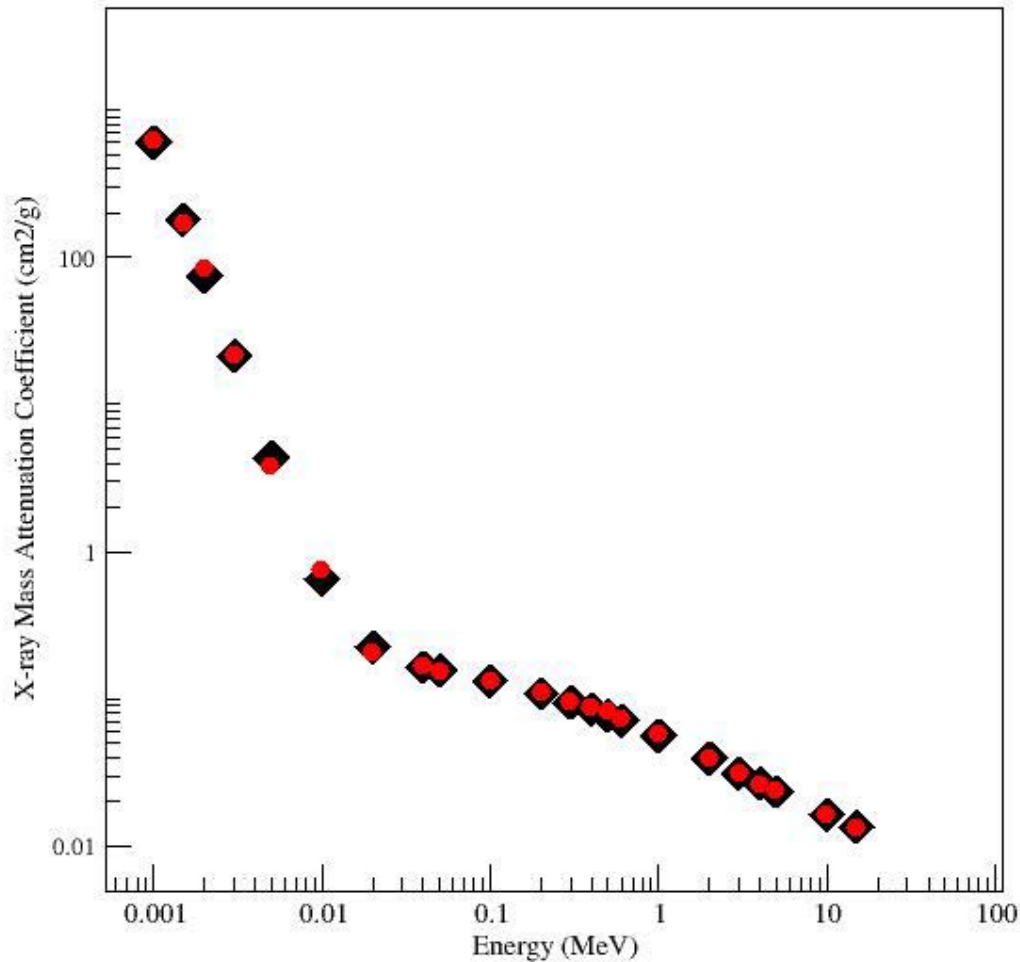
■ G4 Standard

● G4 LowE

# X-ray Attenuation Coefficient - Be

X-ray - Attenuation Coefficient - Beryllium

(Geant4-05-02)



NIST-XCOM



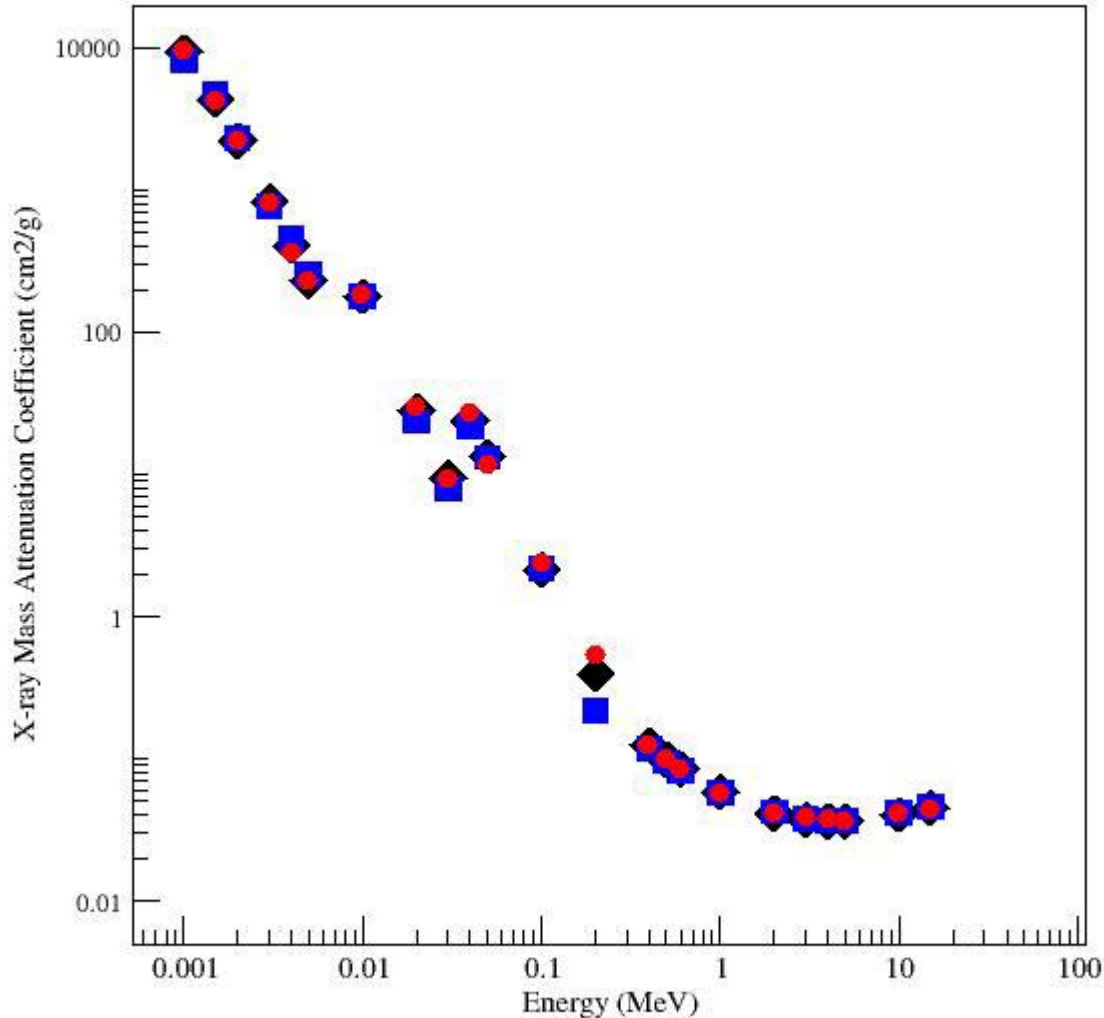
G4 LowE Penelope

$$\chi^2_{N-P}=29.9 - \nu=22 - p=0.12$$

# X-ray Attenuation Coefficient - Cs

X-ray - Attenuation Coefficient - Cesium

(Geant4-05-02)



$$\chi^2_{\text{N-L}} = 33.2 - \nu = 23 - p = 0.08$$

$$\chi^2_{\text{N-S}} = 25.3 - \nu = 19 - p = 0.15$$

◆ NIST-XCOM

■ G4 Standard

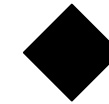
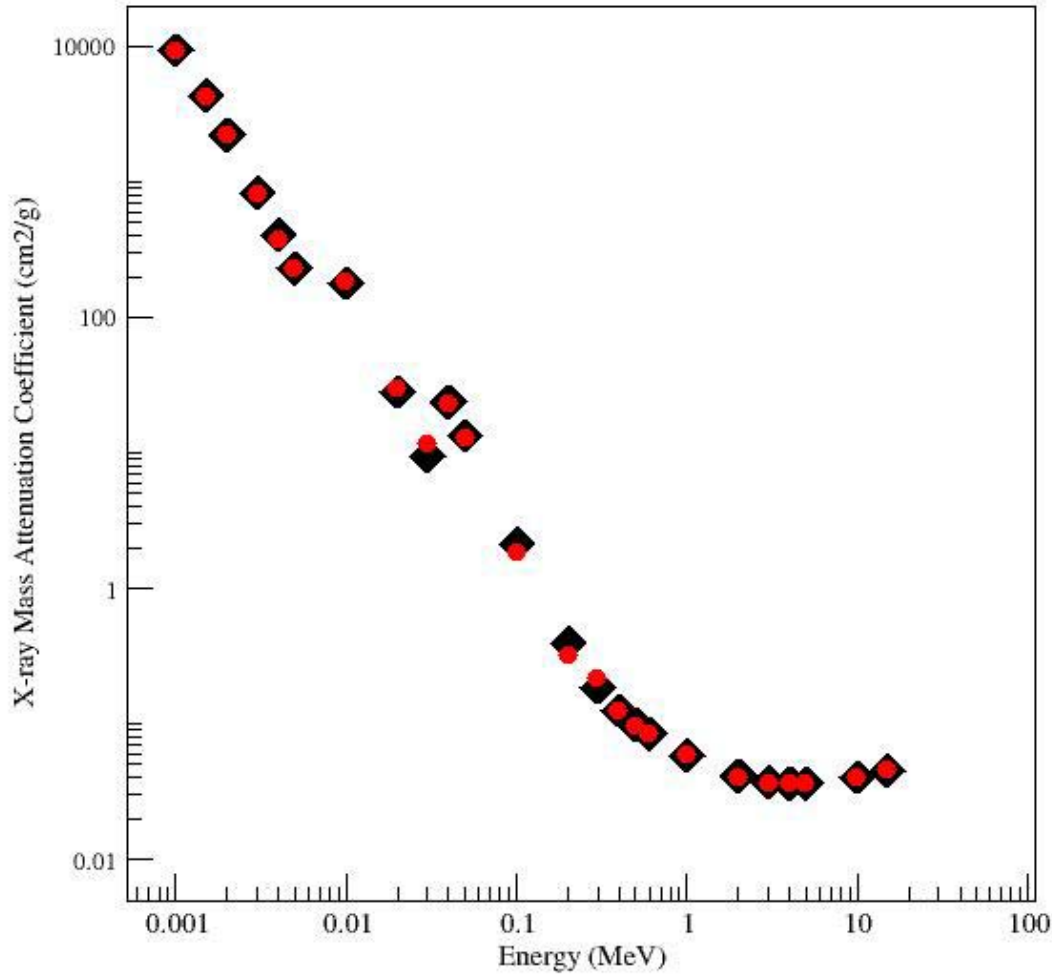
● G4 LowE



# X-ray Attenuation Coefficient - Cs

X-ray - Attenuation Coefficient - Cesium

(Geant4-05-02)



NIST-XCOM



G4 LowE Penelope

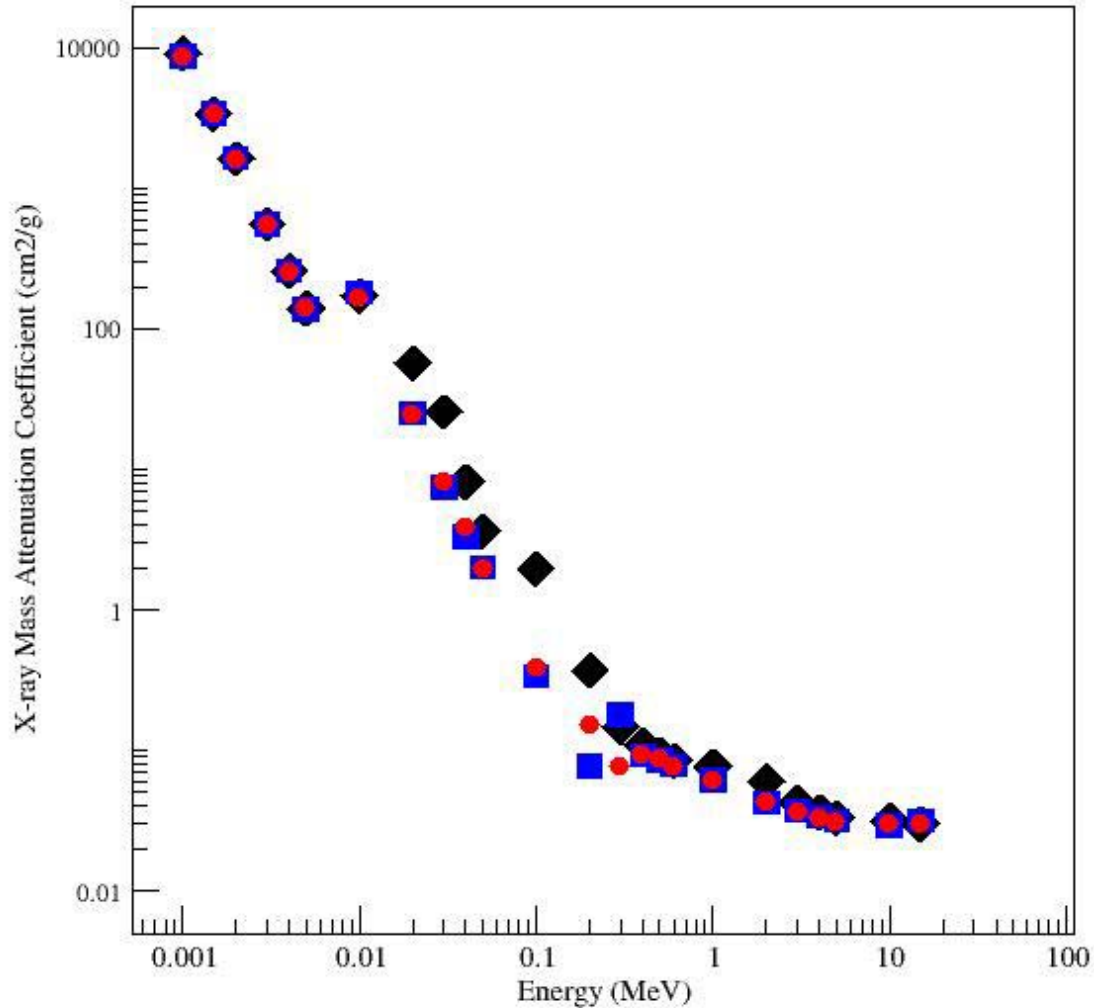
$$\chi^2_{N-P}=24.9 - \nu=23 - p=0.35$$

# X-ray Attenuation Coefficient - Fe

X-ray - Attenuation Coefficient - Iron  
(Geant4-05-02)

$$\chi^2_{N-L} = 10.9 - \nu = 9 - p = 0.27$$

$$\chi^2_{N-S} = 9.9 - \nu = 9 - p = 0.36$$



◆ NIST-XCOM

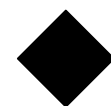
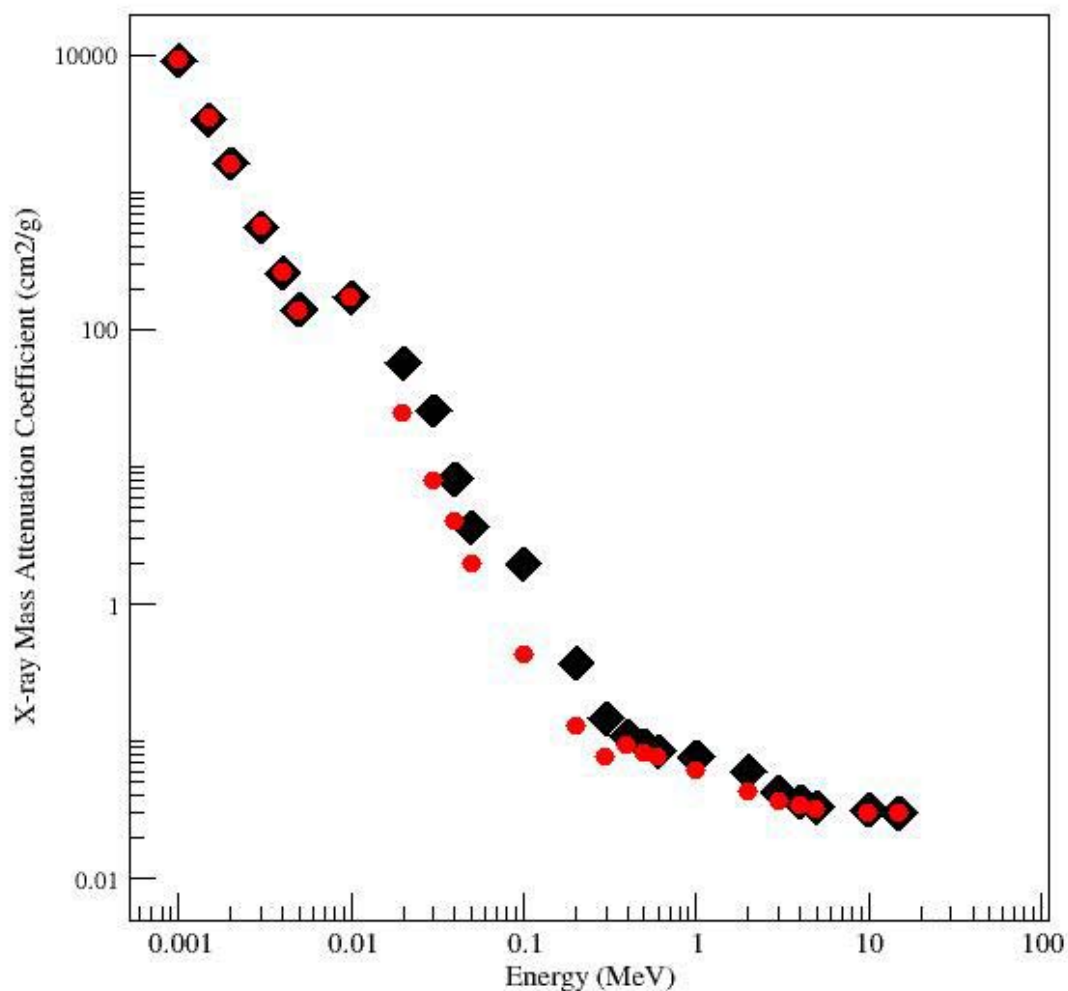
■ G4 Standard

● G4 LowE

# X-ray Attenuation Coefficient - Fe

X-ray - Attenuation Coefficient - Iron

(Geant4-05-02)



NIST-XCOM



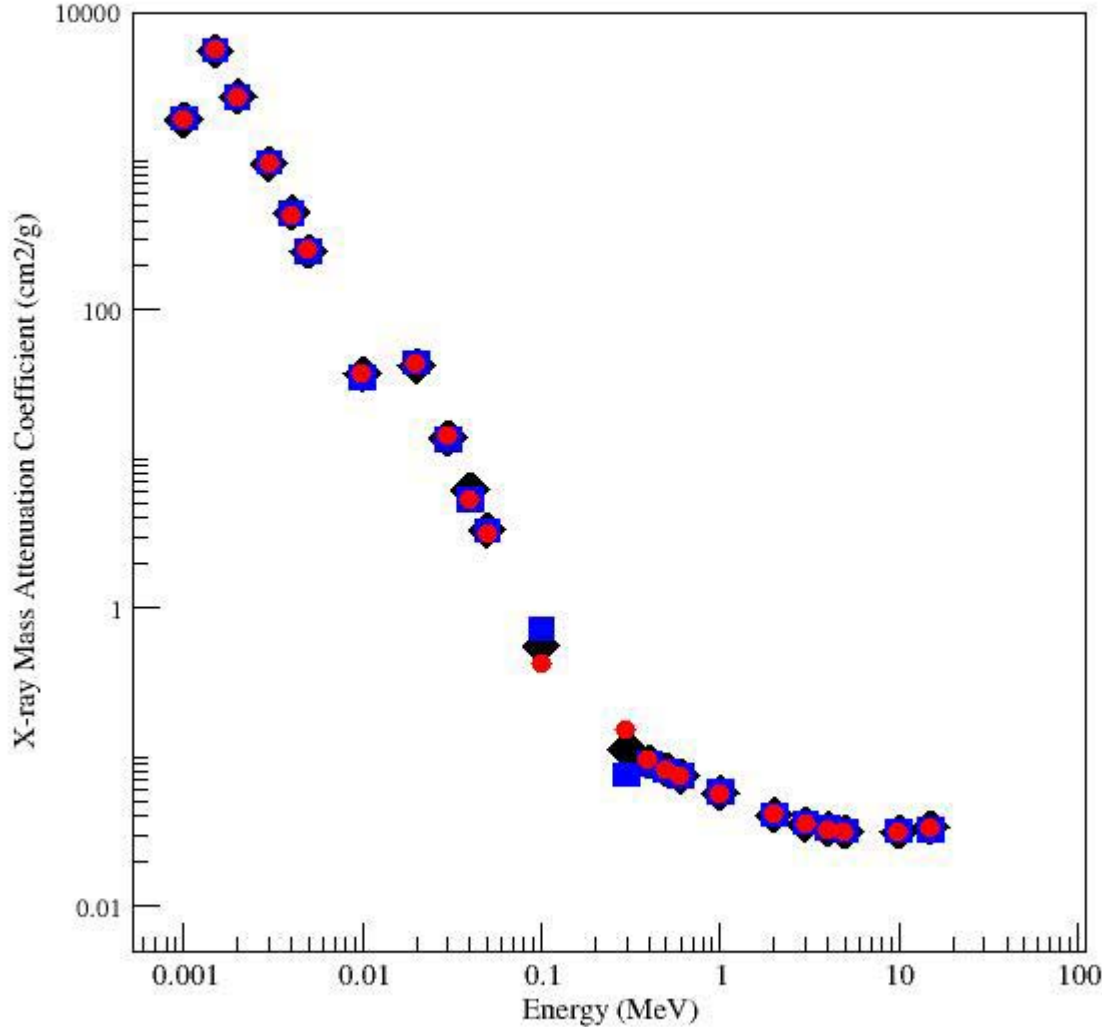
G4 LowE Penelope

$$\chi^2_{N-P} = 9.4 - \nu = 8 - p = 0.31$$

# X-ray Attenuation Coefficient - Ge

X-ray - Attenuation Coefficient - Germanium

(Geant4-05-02)



$$\chi^2_{N-L}=26.3 - \nu=23 - p=0.29$$

$$\chi^2_{N-S}=27.9 - \nu=23 - p=0.22$$

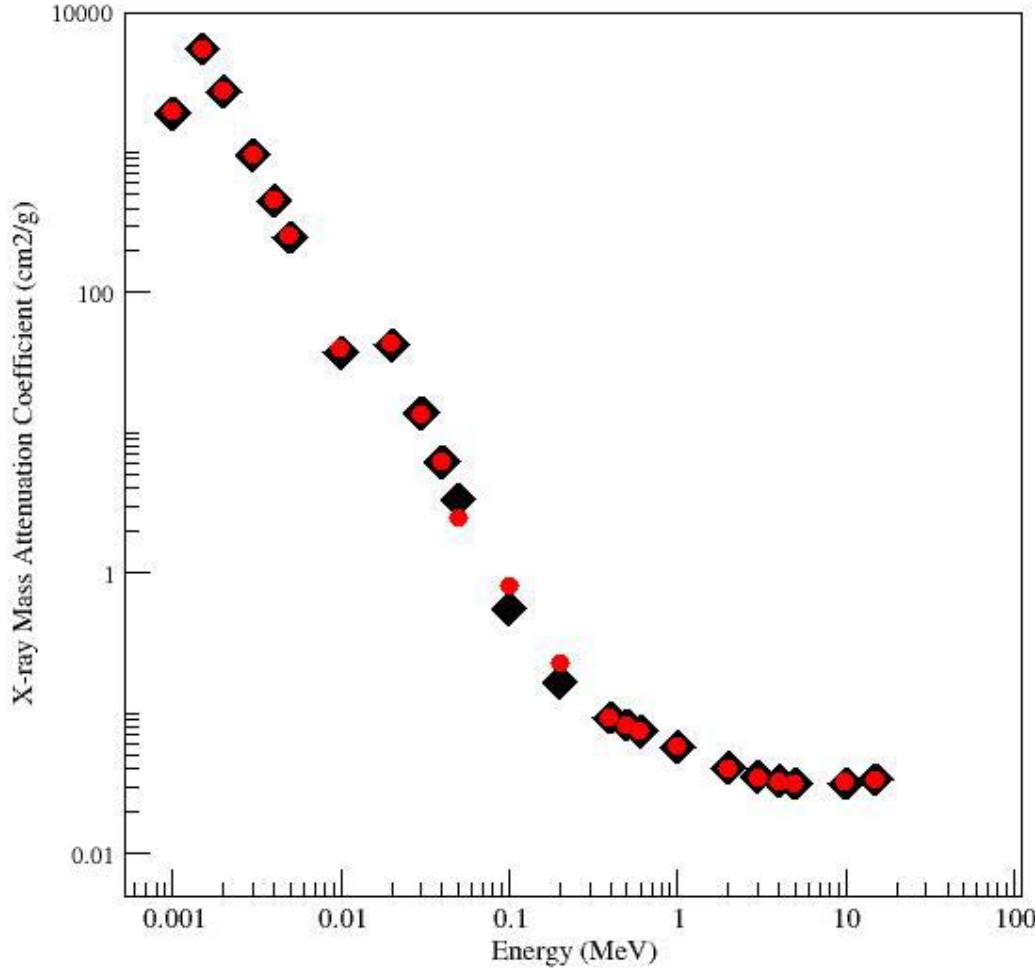
◆ NIST-XCOM

■ G4 Standard

● G4 LowE

# X-ray Attenuation Coefficient - Ge

X-ray - Attenuation Coefficient - Germanium  
(Geant4-05-02)



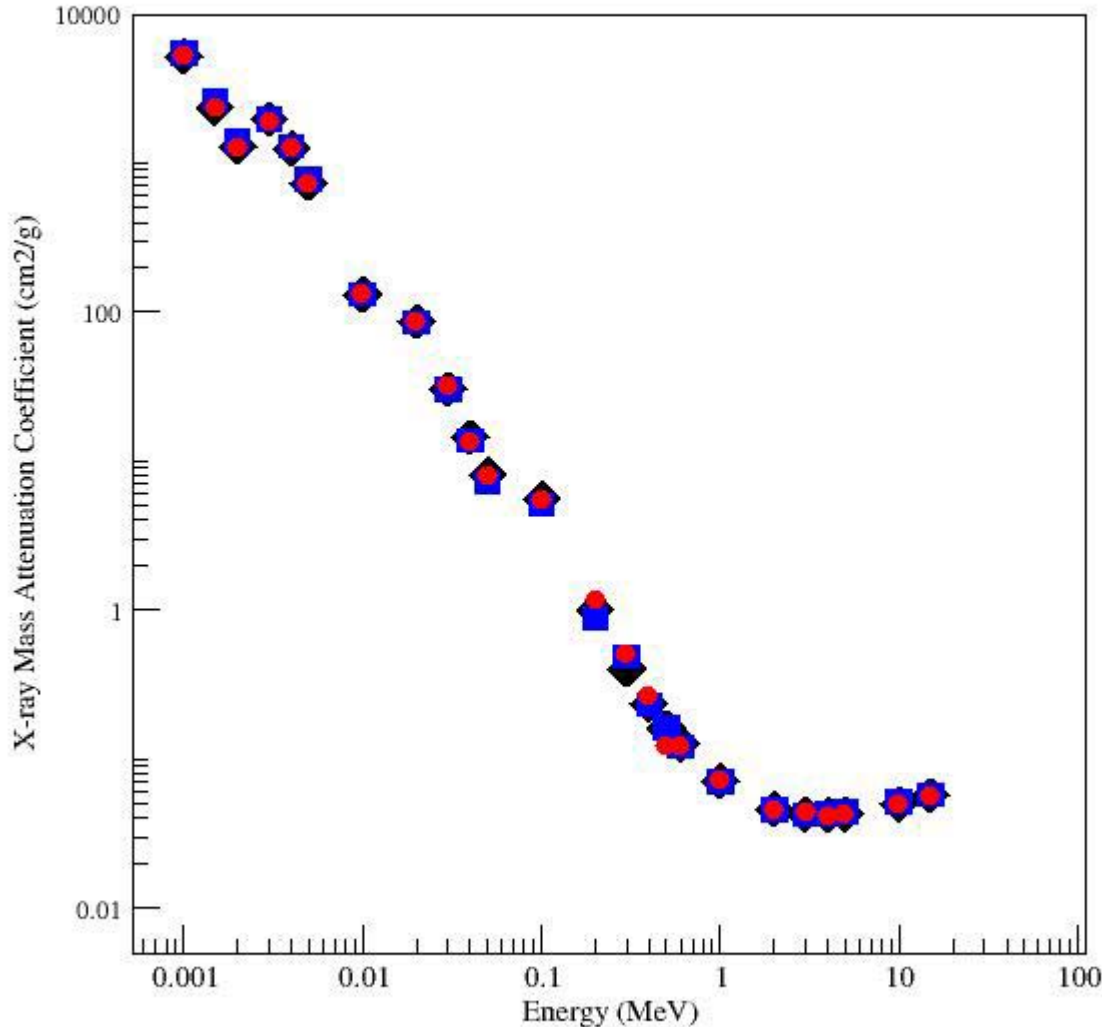
- ◆ NIST-XCOM
- G4 LowE Penelope

$$\chi^2_{N-P} = 10.1 - \nu = 21 - p = 0.98$$

# X-ray Attenuation Coefficient - Pb

X-ray - Attenuation Coefficient - Lead

(Geant4-05-02)



$$\chi^2_{\text{N-L}} = 35.2 - \nu = 23 - p = 0.05$$

$$\chi^2_{\text{N-S}} = 31.3 - \nu = 22 - p = 0.09$$

◆ NIST-XCOM

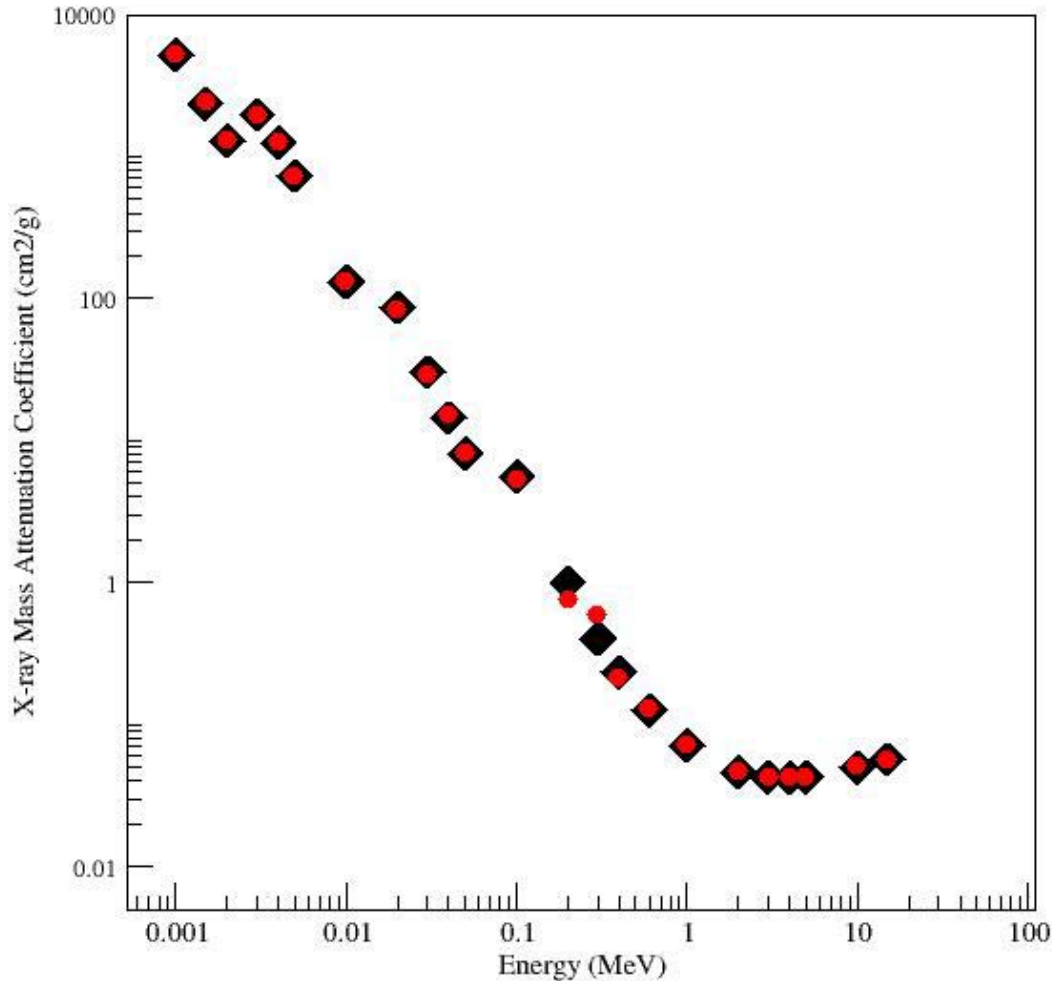
■ G4 Standard

● G4 LowE

# X-ray Attenuation Coefficient - Pb

X-ray - Attenuation Coefficient - Lead

(Geant4-05-02)



NIST-XCOM



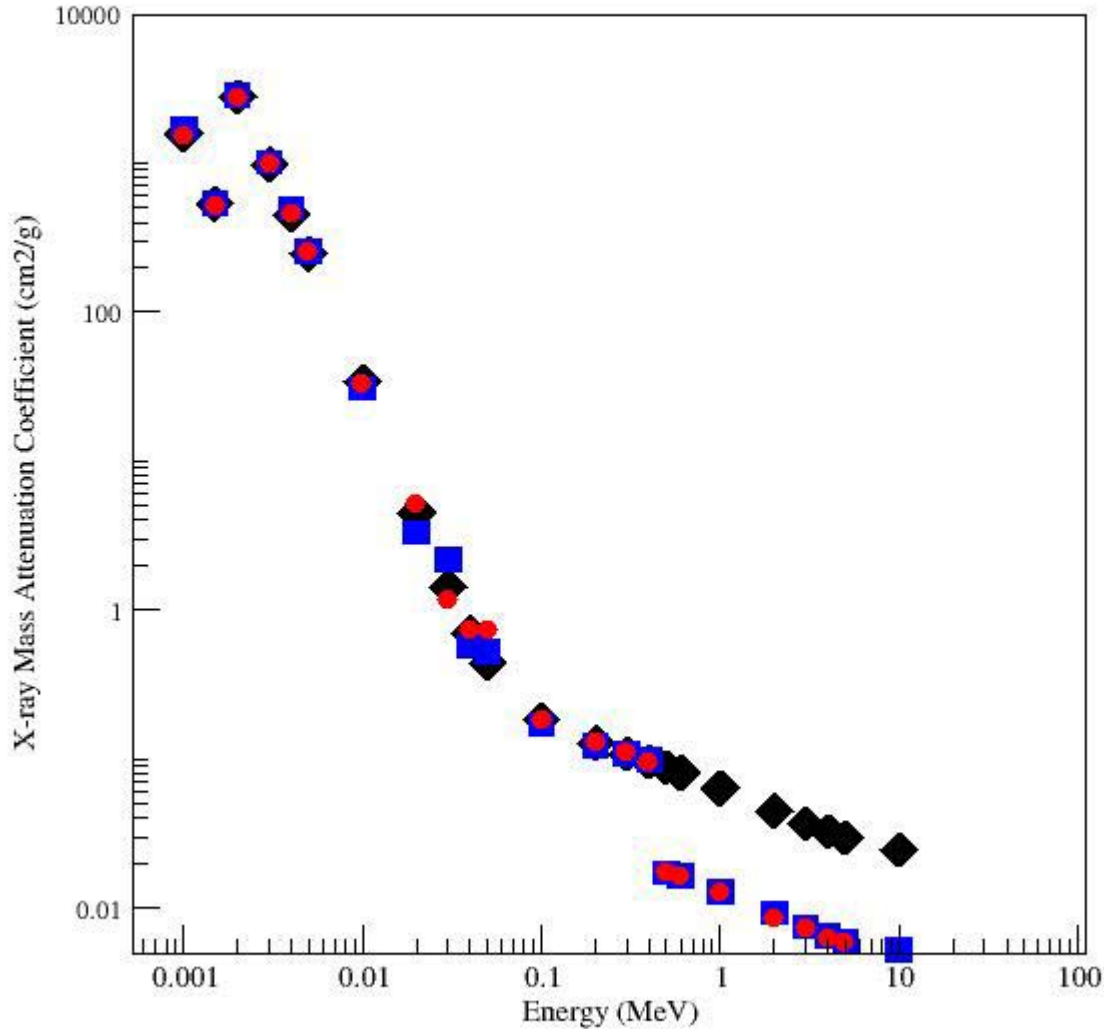
G4 LowE Penelope

$$\chi^2_{N-P} = 4.4 - \nu = 20 - p = 0.99$$

# X-ray Attenuation Coefficient - Si

X-ray - Attenuation Coefficient - Silicon

(Geant4-05-02)



$$\chi^2_{N-L} = 3.3 - \nu = 11 - p = 0.99$$

$$\chi^2_{N-S} = 12.3 - \nu = 10 - p = 0.26$$

◆ NIST-XCOM

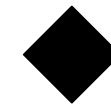
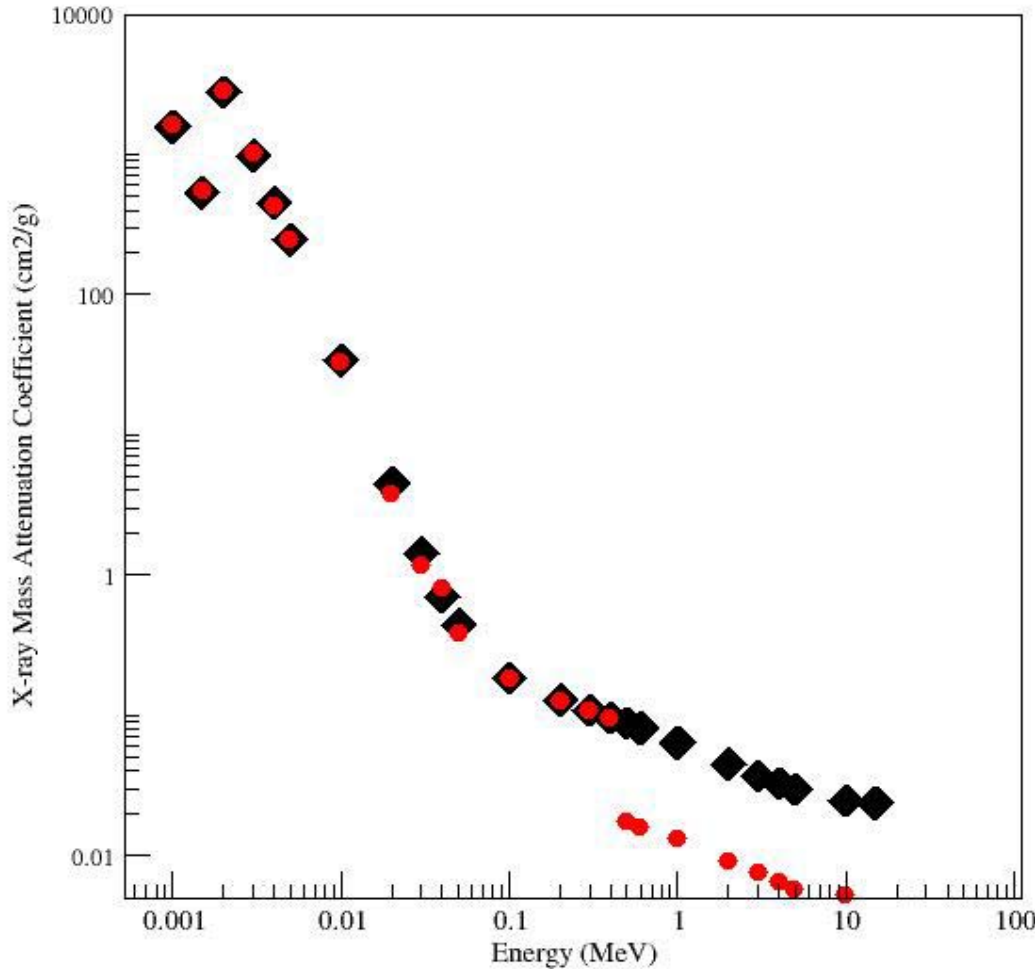
■ G4 Standard

● G4 LowE



# X-ray Attenuation Coefficient - Si

X-ray - Attenuation Coefficient - Silicon  
(Geant4-05-02)



NIST-XCOM



G4 LowE Penelope

$$\chi^2_{N-P} = 8.2 - \nu = 12 - p = 0.77$$

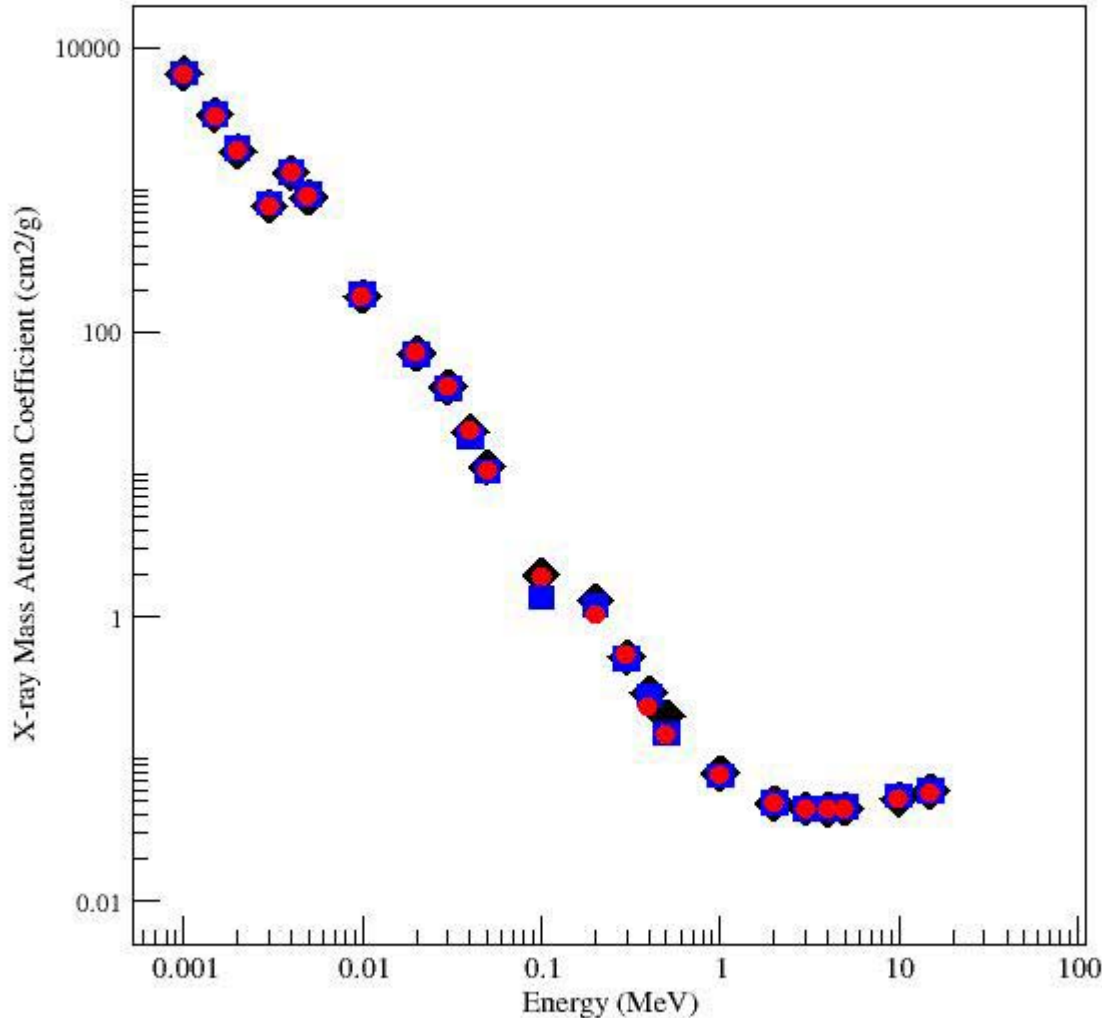
# X-ray Attenuation Coefficient - U

X-ray - Attenuation Coefficient - Uranium

(Geant4-05-02)

$$\chi^2_{N-L} = 6.6 - \nu = 20 - p = 0.99$$

$$\chi^2_{N-S} = 14.7 - \nu = 20 - p = 0.80$$



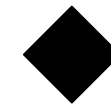
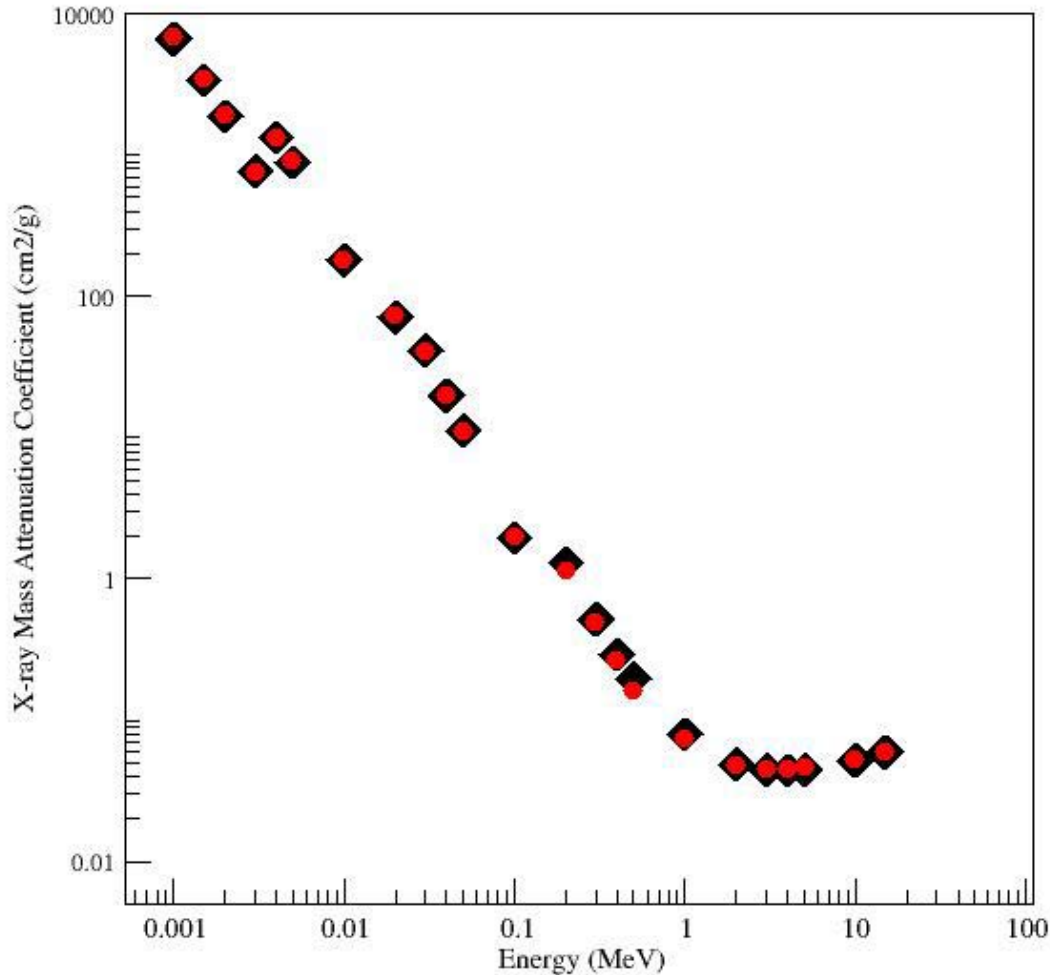
◆ NIST-XCOM

■ G4 Standard

● G4 LowE

# X-ray Attenuation Coefficient - U

X-ray - Attenuation Coefficient - Uranium  
(Geant4-05-02)



NIST-XCOM



G4 LowE Penelope

$$\chi^2_{N-P}=19.3 - \nu=22 - p=0.63$$

# PHOTONS – CROSS SECTIONS

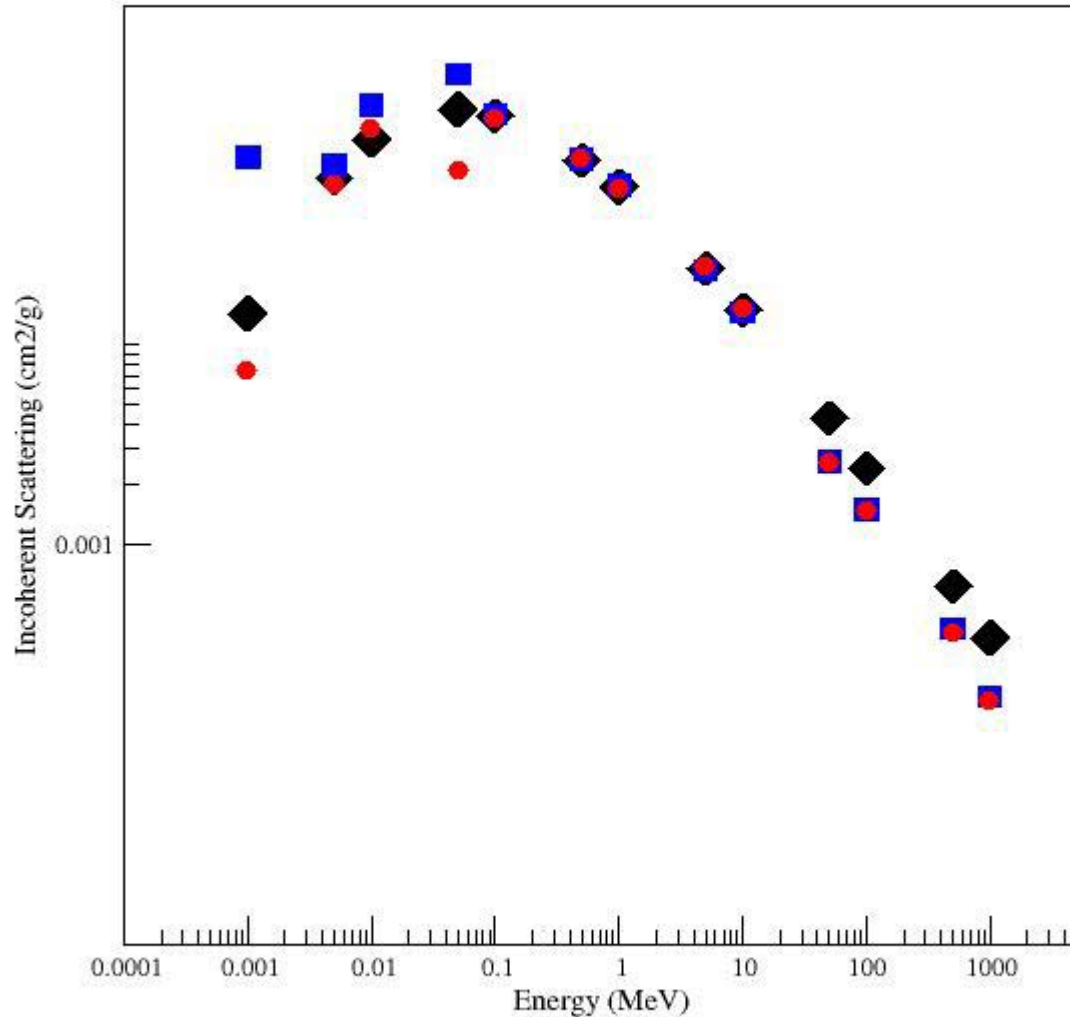
# Incoherent Scattering - Al

Photons - Incoherent Scattering - Aluminium

(Geant4-05-02)

$$\chi^2_{N-L} = 12.9 - \nu=8 - p=0.12$$

$$\chi^2_{N-S} = 8.7 - \nu=6 - p=0.19$$



◆ NIST-XCOM

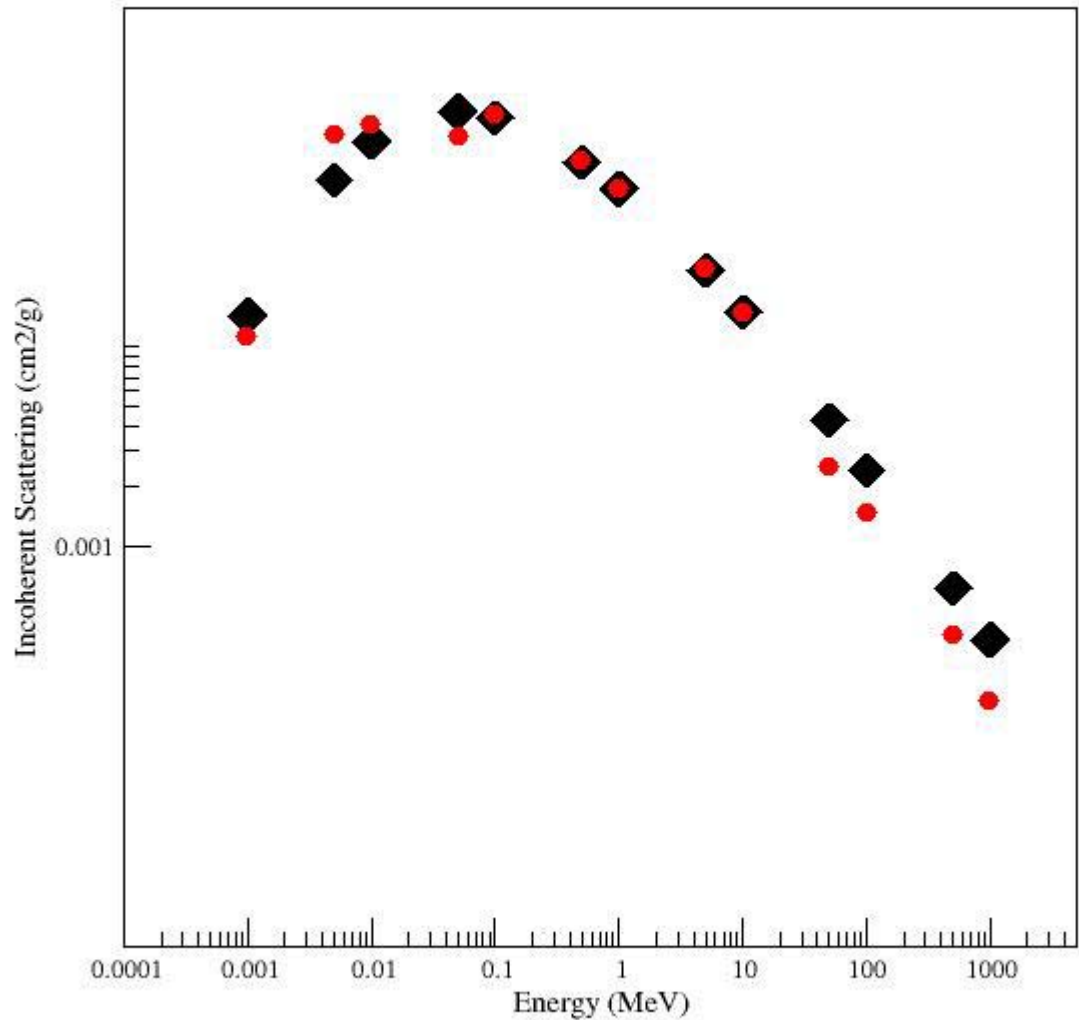
■ G4 Standard

● G4 LowE

# Incoherent Scattering - Al

Photons - Incoherent Scattering - Aluminium

(Geant4-05-02)



- ◆ NIST-XCOM
- G4 LowE Penelope

$$\chi^2_{N-P} = 2.5 - \nu = 6 - p = 0.87$$

# Incoherent Scattering - Au

I dati sono stati scritti male nel file xml

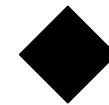
◆ NIST-XCOM

■ G4 Standard

● G4 LowE

# Incoherent Scattering - Au

I dati sono stati scritti male nel file xml



NIST-XCOM



G4 LowE Penelope



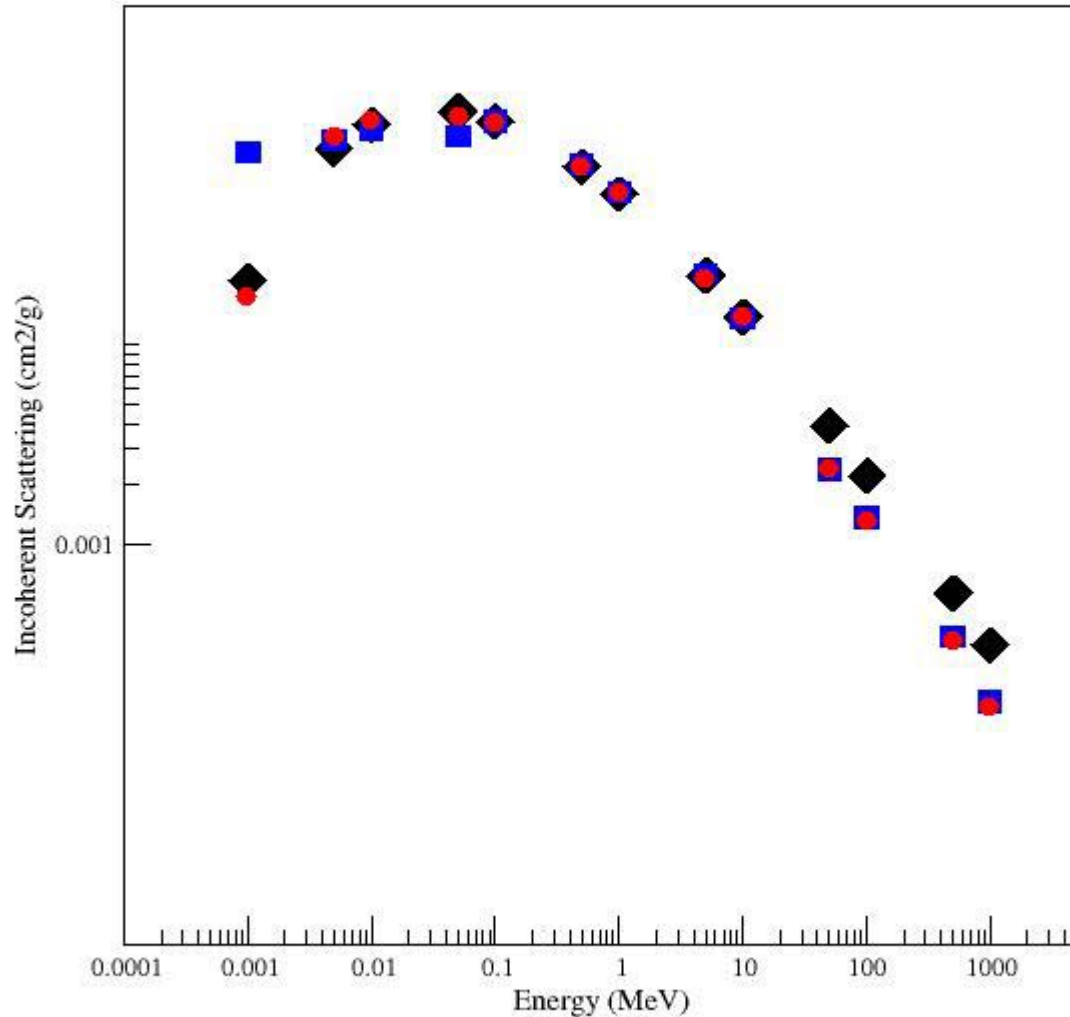
# Incoherent Scattering - Be

Photons - Incoherent Scattering - Beryllium

(Geant4-05-02)

$$\chi^2_{N-L}=9.0 - \nu=7 - p=0.25$$

$$\chi^2_{N-S}=5.1 - \nu=6 - p=0.53$$



◆ NIST-XCOM

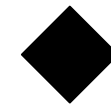
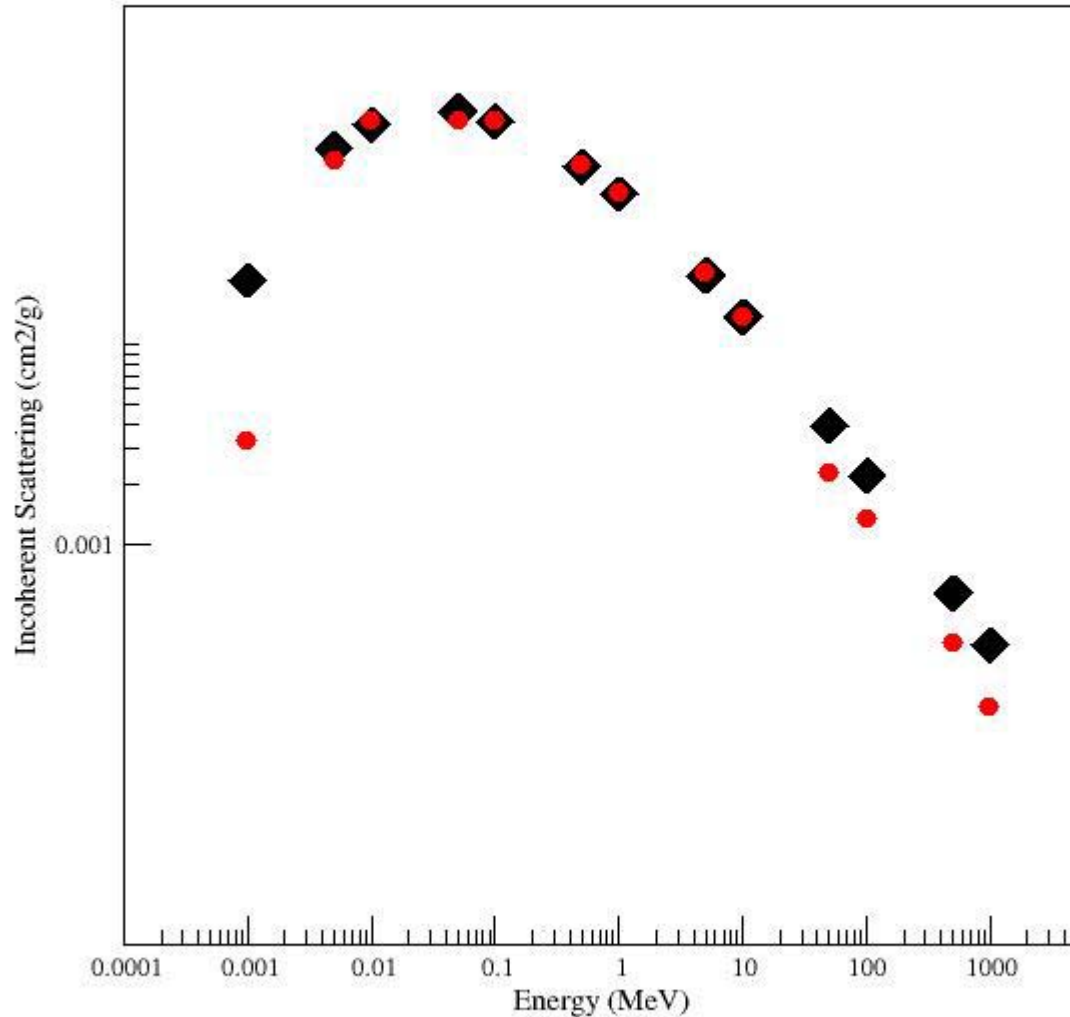
■ G4 Standard

● G4 LowE

# Incoherent Scattering - Be

Photons - Incoherent Scattering - Beryllium

(Geant4-05-02)



NIST-XCOM



G4 LowE Penelope

$$\chi^2_{N-P}=9.0 - \nu=7 - p=0.25$$

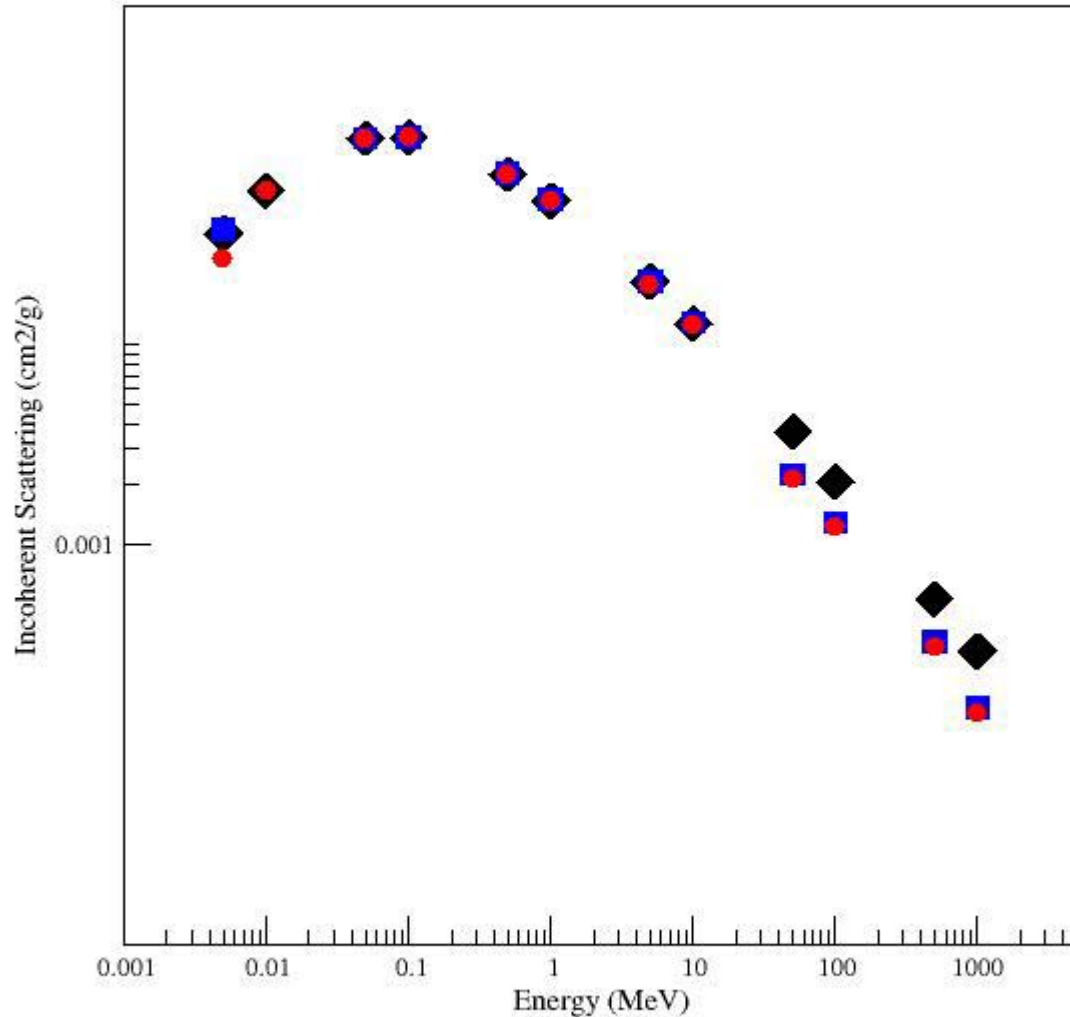
# Incoherent Scattering - Cs

Photons - Incoherent Scattering - Cesium

(Geant4-05-02)

$$\chi^2_{N-L}=4.6 - \nu=8 - p=0.80$$

$$\chi^2_{N-S}=1.8 - \nu=8 - p=0.99$$



◆ NIST-XCOM

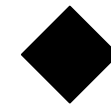
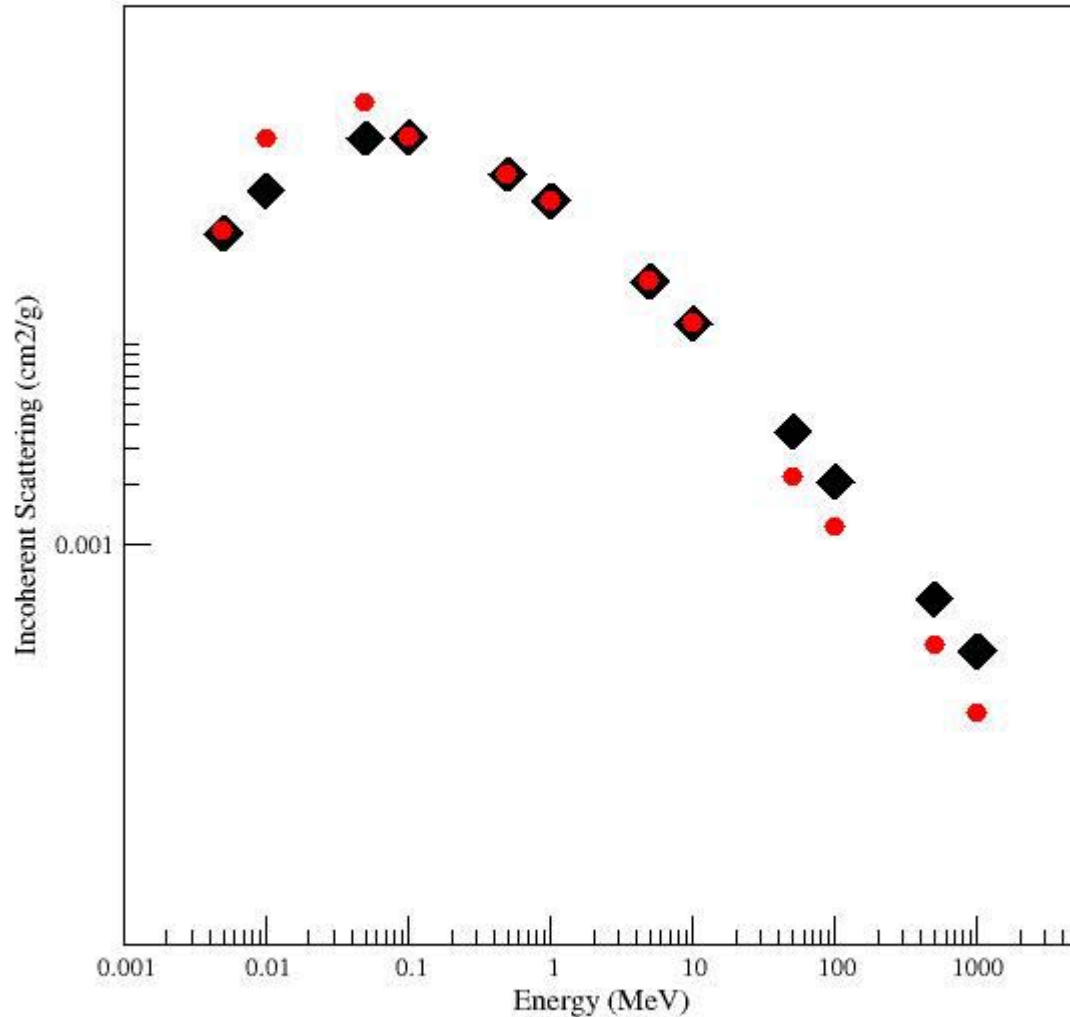
■ G4 Standard

● G4 LowE

# Incoherent Scattering - Cs

Photons - Incoherent Scattering - Cesium

(Geant4-05-02)



NIST-XCOM



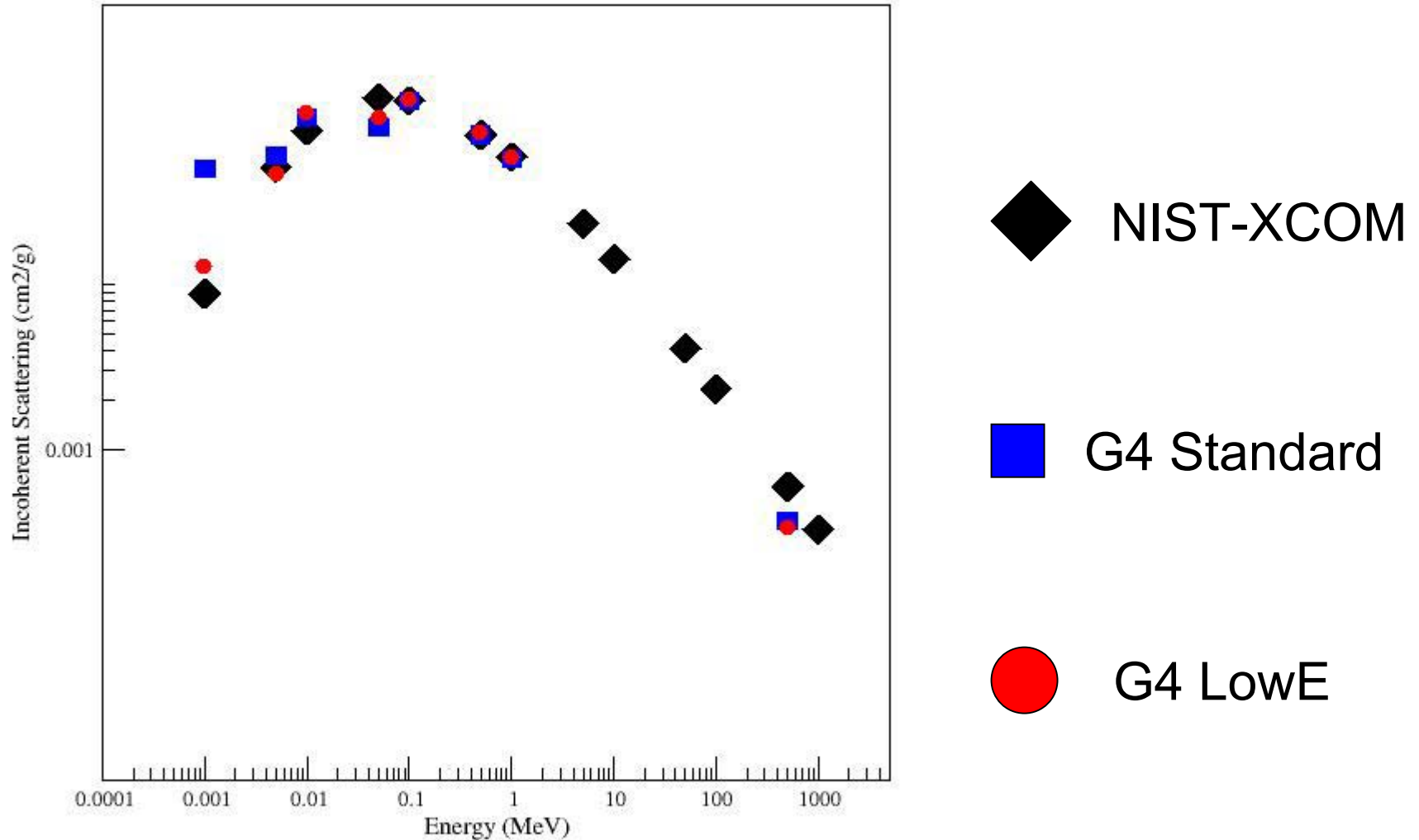
G4 LowE Penelope

$$\chi^2_{N-P} = 4.6 - \nu = 8 - p = 0.80$$

# Incoherent Scattering - Fe

Photons - Incoherent Scattering - Iron

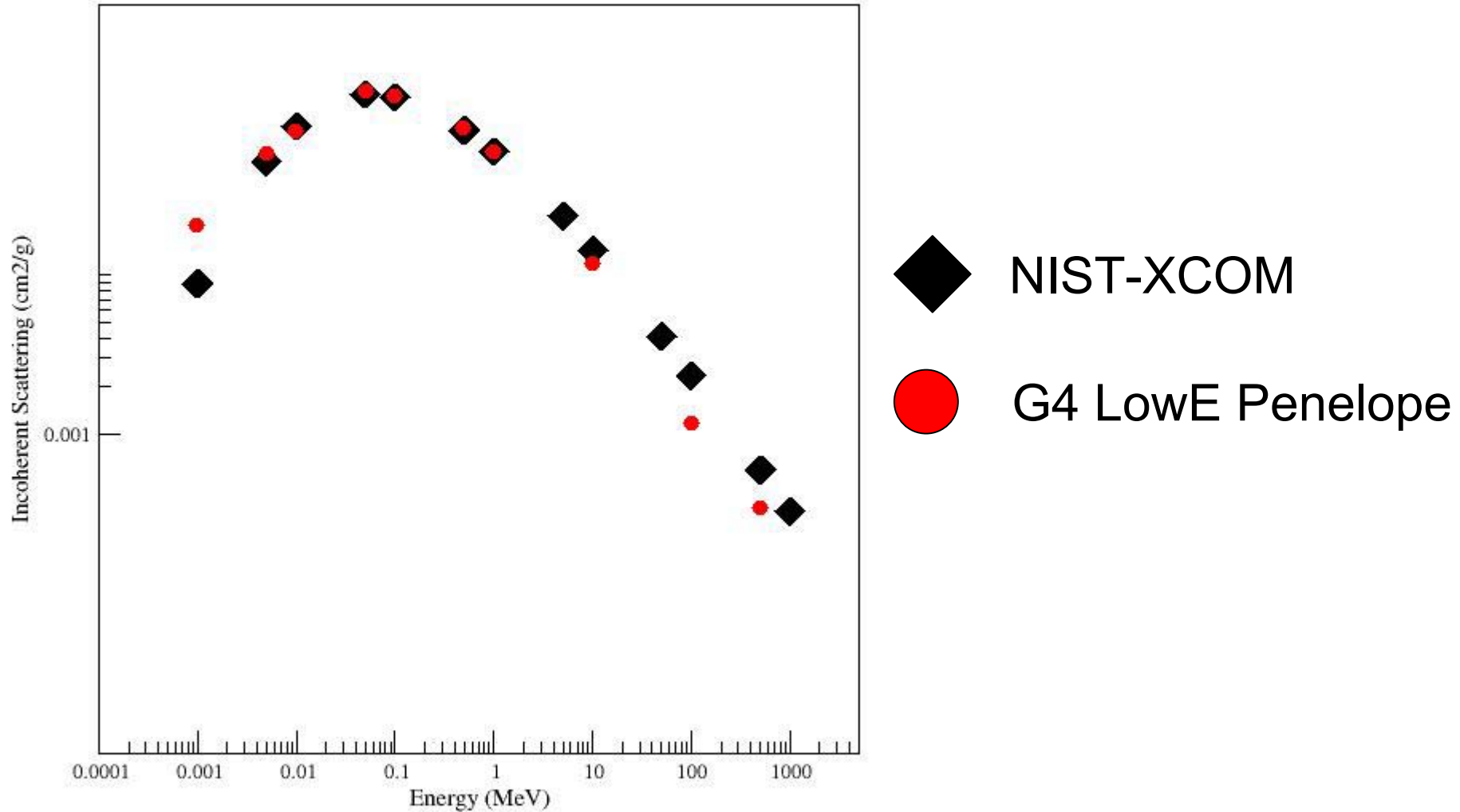
(Geant4-05-02)



# Incoherent Scattering - Fe

Photons - Incoherent Scattering - Iron

(Geant4-05-02)



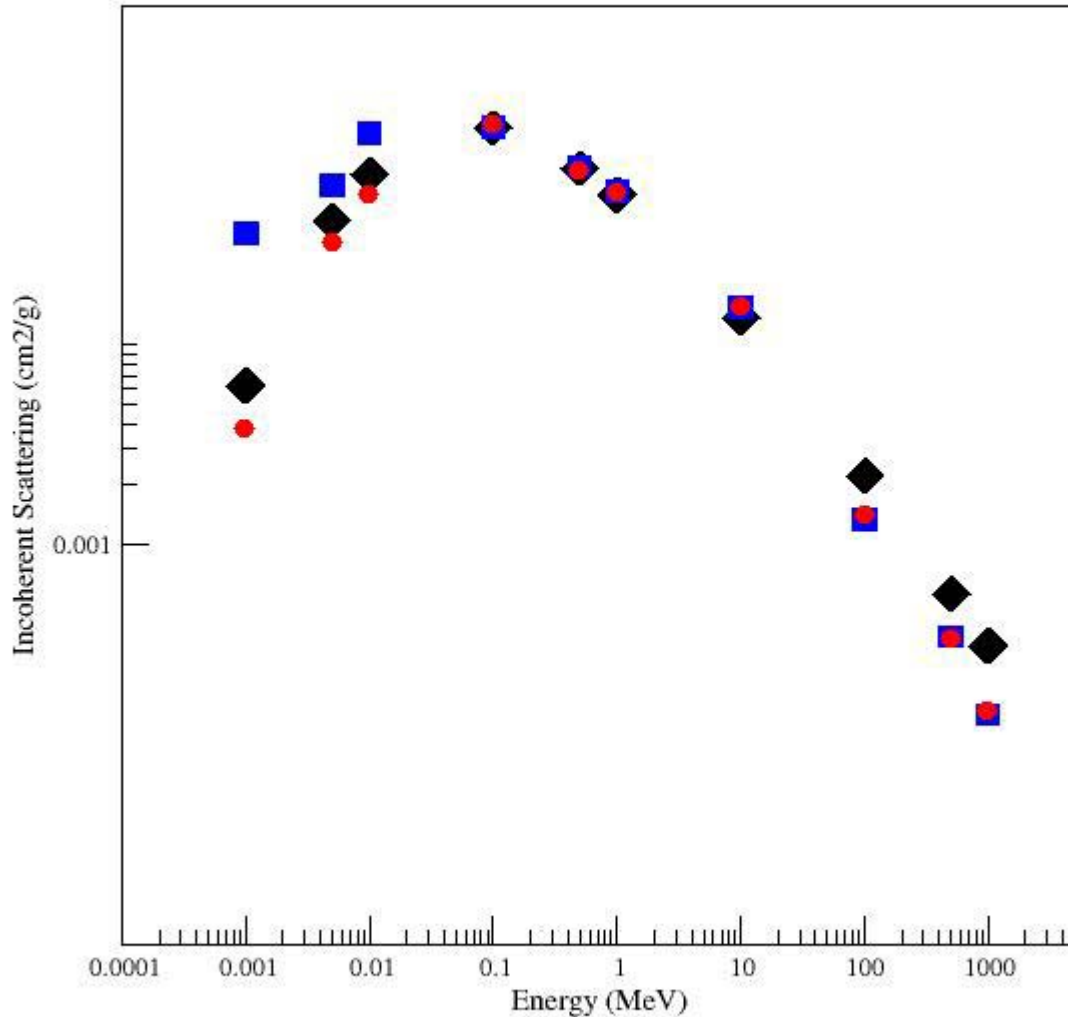
# Incoherent Scattering - Ge

Photons - Incoherent Scattering - Germanium

(Geant4-05-02)

$$\chi^2_{N-L}=5.7 - \nu=4 - p=0.23$$

$$\chi^2_{N-S}=5.0 - \nu=4 - p=0.29$$



◆ NIST-XCOM

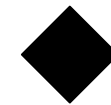
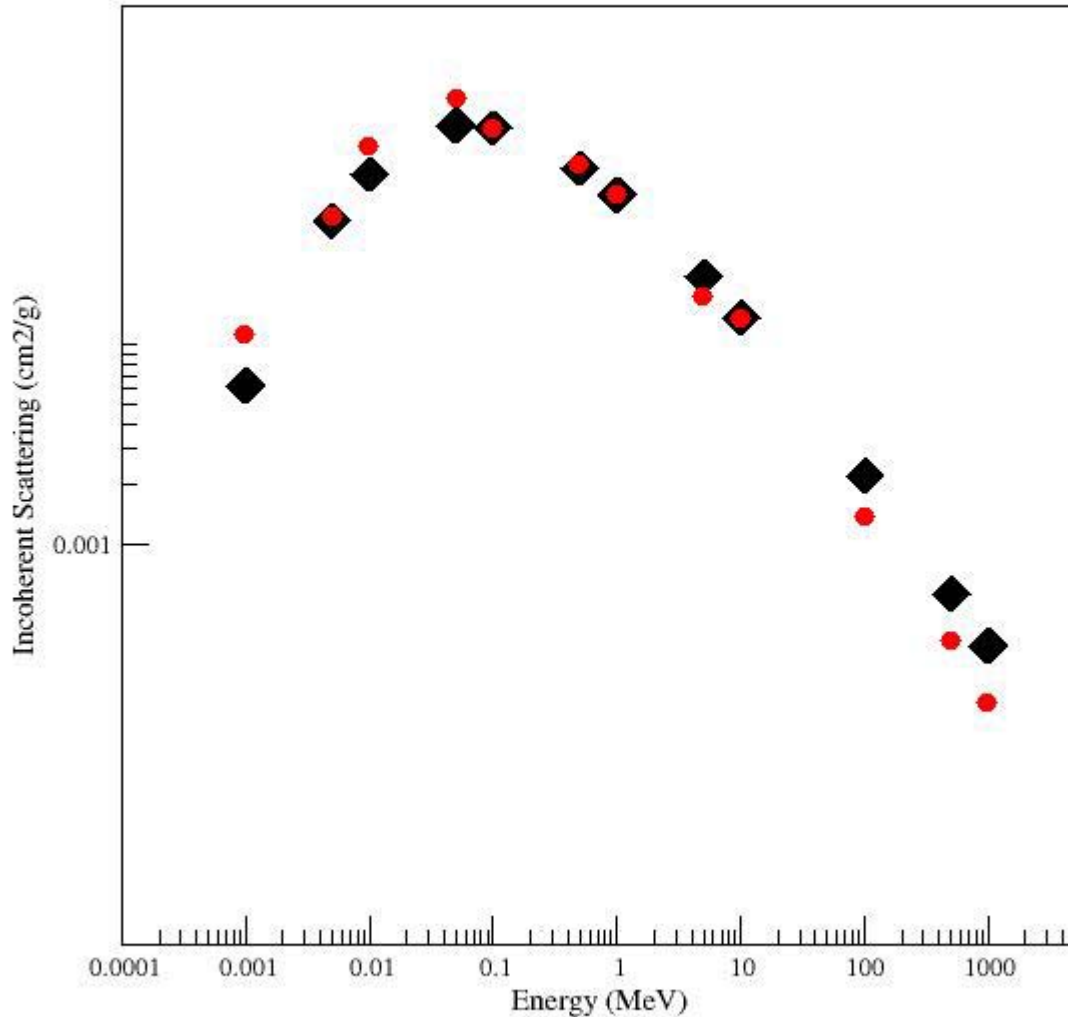
■ G4 Standard

● G4 LowE

# Incoherent Scattering - Ge

Photons - Incoherent Scattering - Germanium

(Geant4-05-02)



NIST-XCOM



G4 LowE Penelope

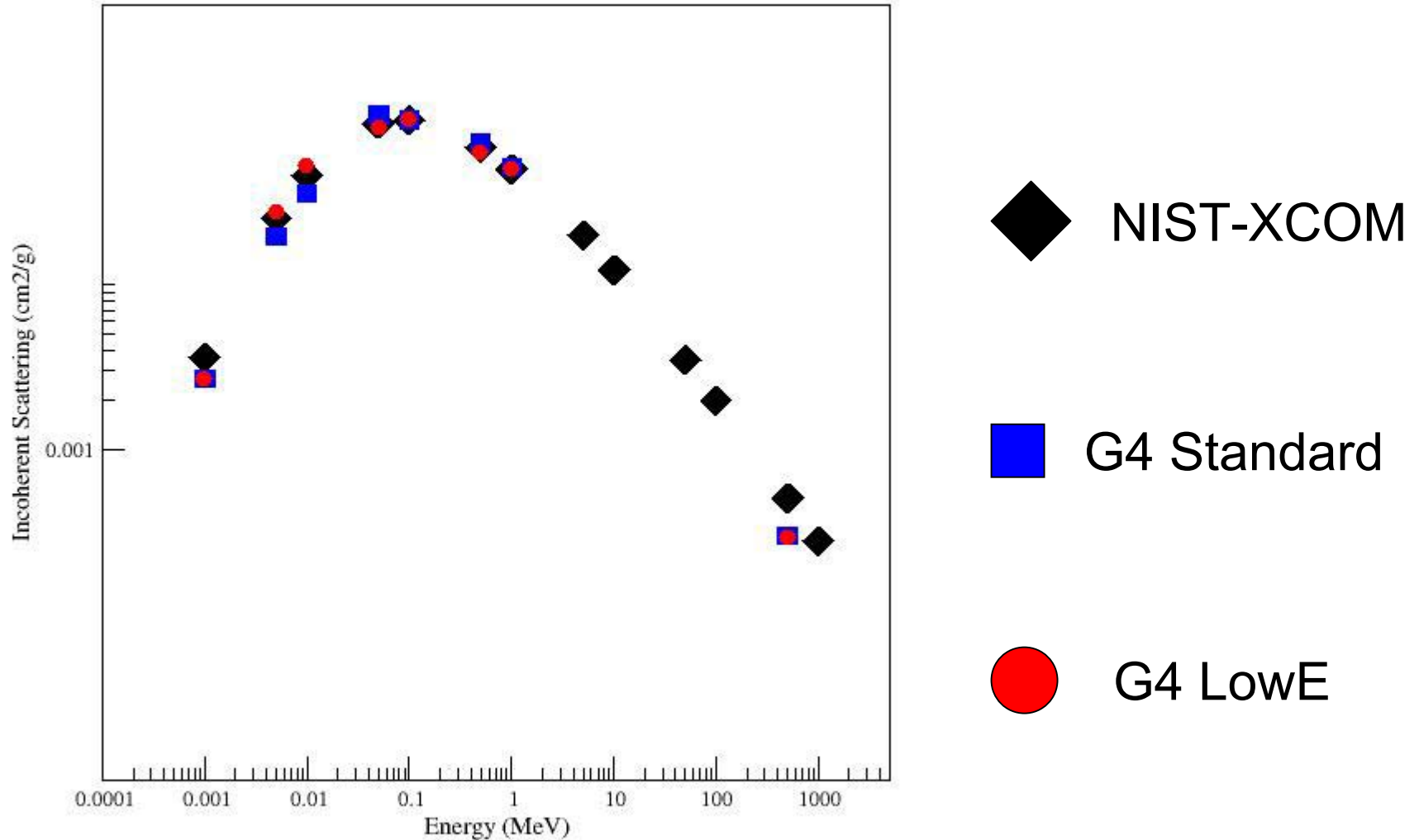
$$\chi^2_{N-P} = 5.9 - \nu = 5 - p = 0.32$$



# Incoherent Scattering - Pb

Photons - Incoherent Scattering - Lead

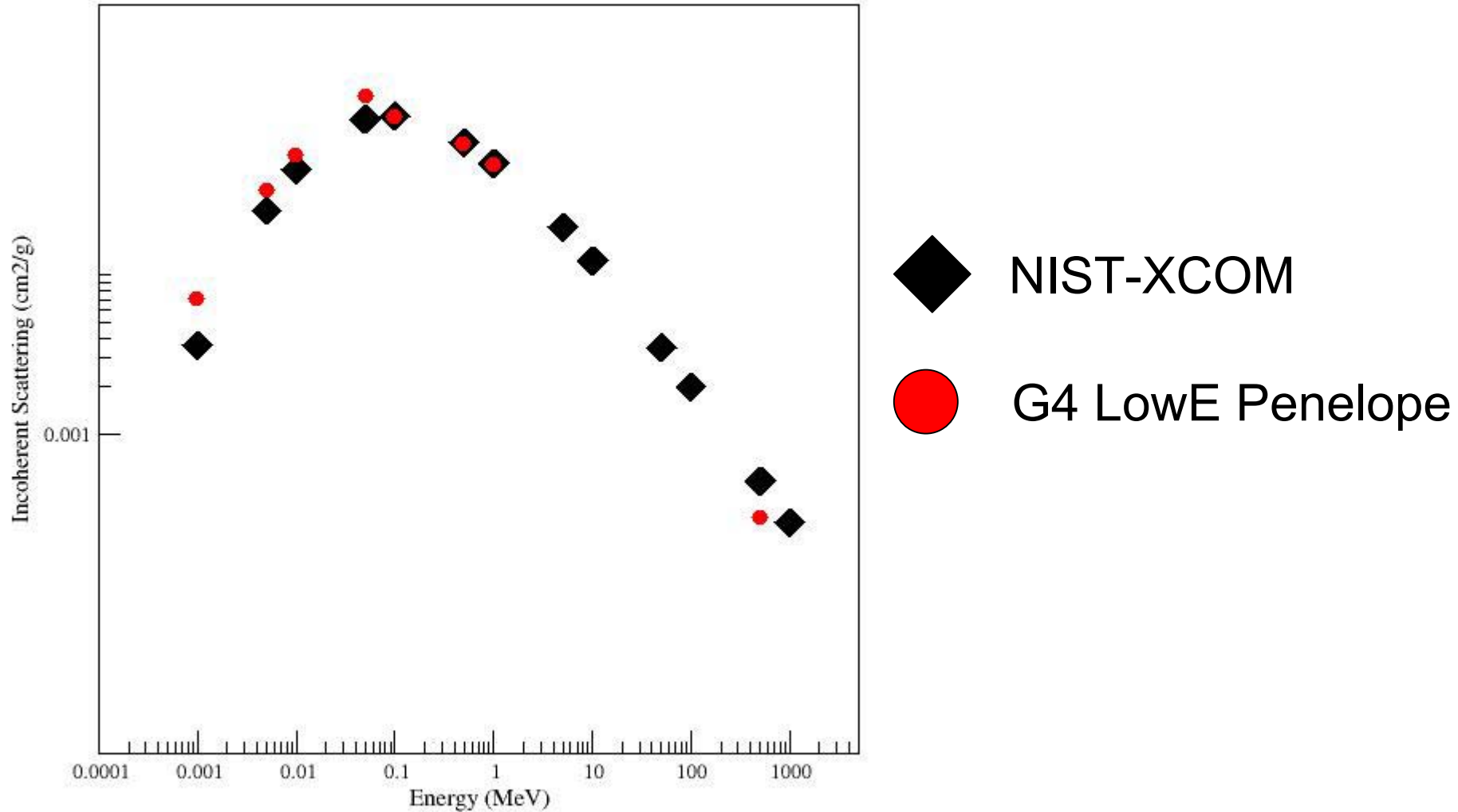
(Geant4-05-02)



# Incoherent Scattering - Pb

Photons - Incoherent Scattering - Lead

(Geant4-05-02)



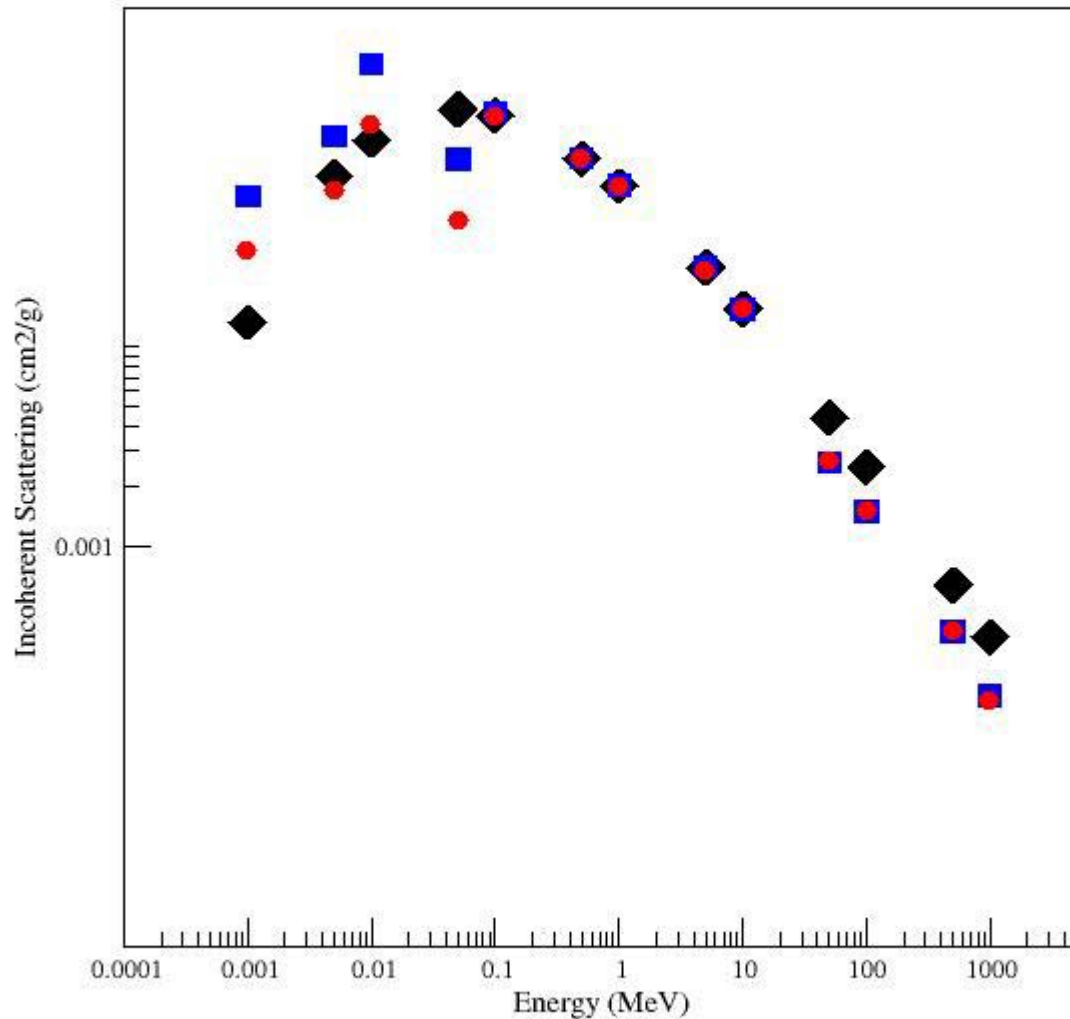
# Incoherent Scattering - Si

Photons - Incoherent Scattering - Silicon

(Geant4-05-02)

$$\chi^2_{N-L}=11.7 - \nu=6 - p=0.07$$

$$\chi^2_{N-S}=6.0 - \nu=6 - p=0.42$$



◆ NIST-XCOM

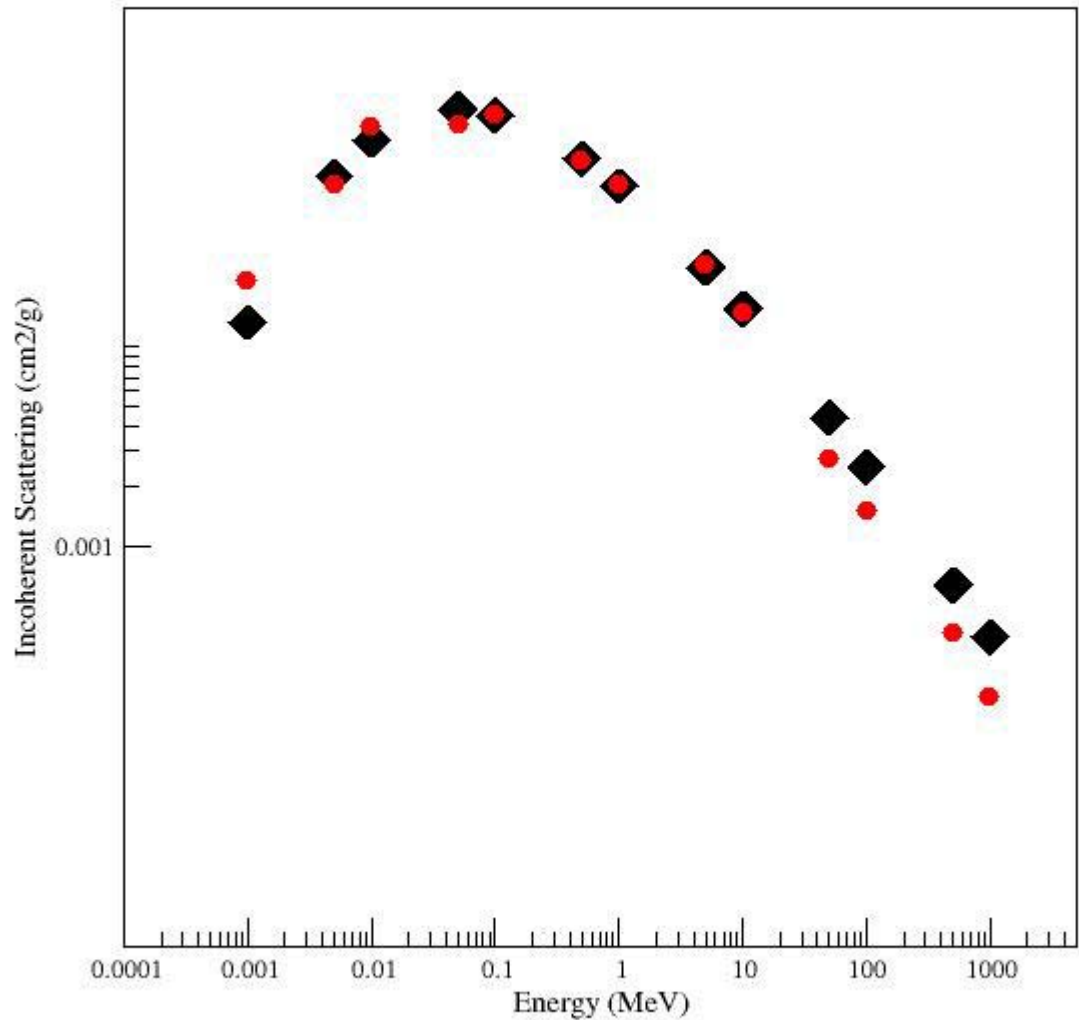
■ G4 Standard

● G4 LowE

# Incoherent Scattering - Si

Photons - Incoherent Scattering - Silicon

(Geant4-05-02)



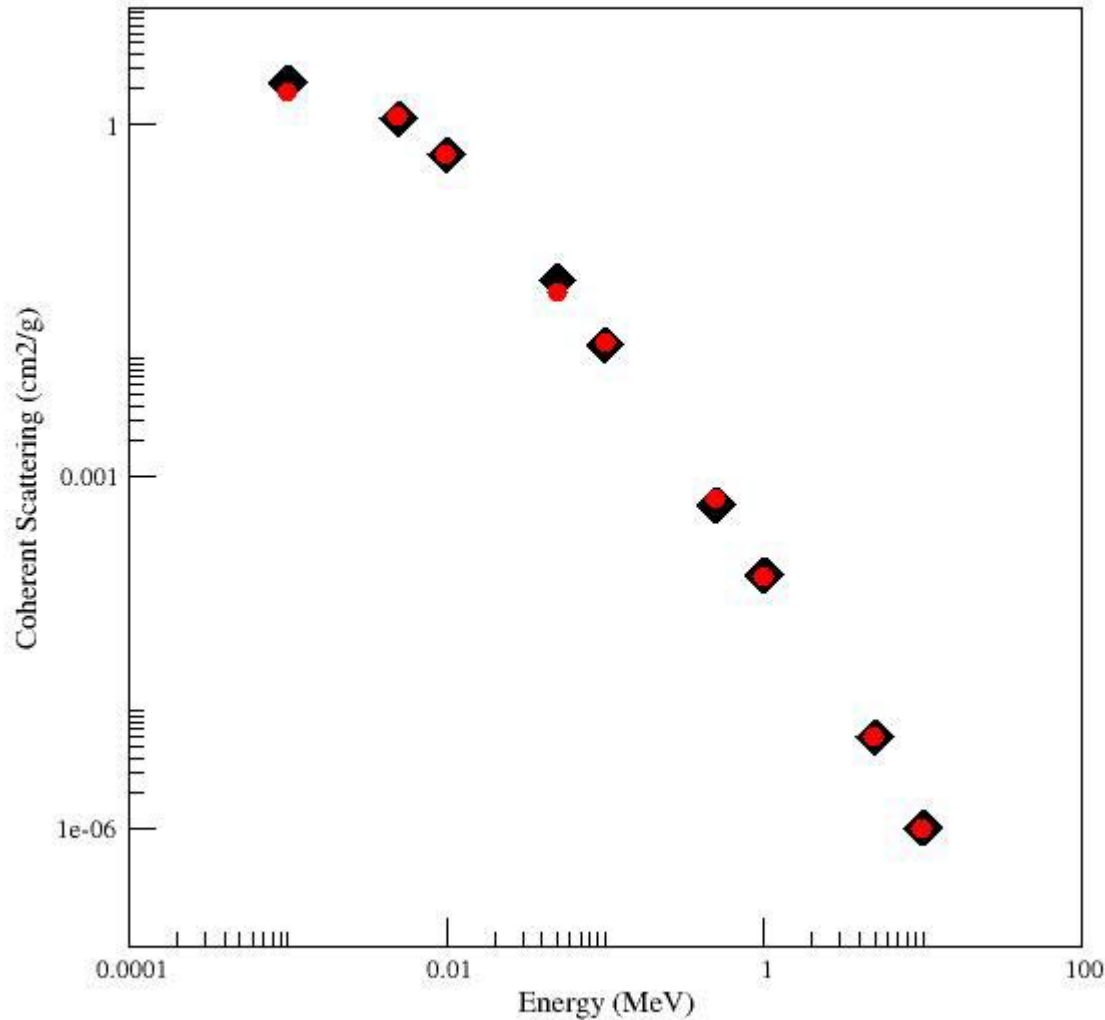
- ◆ NIST-XCOM
- G4 LowE Penelope

$$\chi^2_{N-P} = 12.4 - \nu = 8 - p = 0.13$$

# Coherent Scattering - Al

Photons - Coherent Scattering - Aluminium

(Geant4-05-02)



$$\chi^2_{N-L} = 13.6 - \nu = 11 - p = 0.26$$

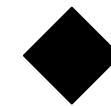
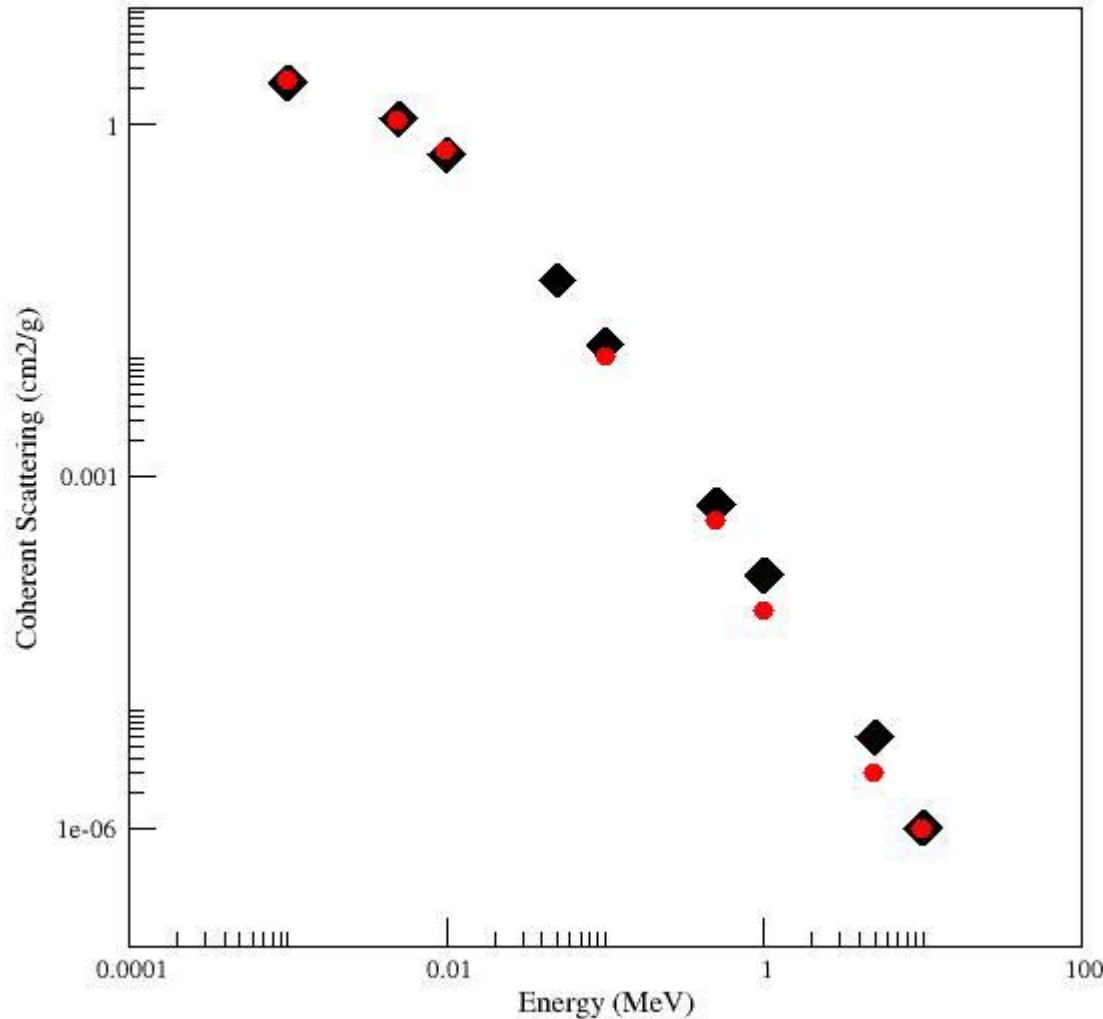
◆ NIST-XCOM

● G4 LowE

# Coherent Scattering - Al

Photons - Coherent Scattering - Aluminium

(Geant4-05-02)



NIST-XCOM



G4 LowE Penelope

$$\chi^2_{N-P}=7.2 - \nu=8 - p=0.52$$

# Coherent Scattering - Au

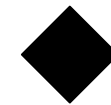
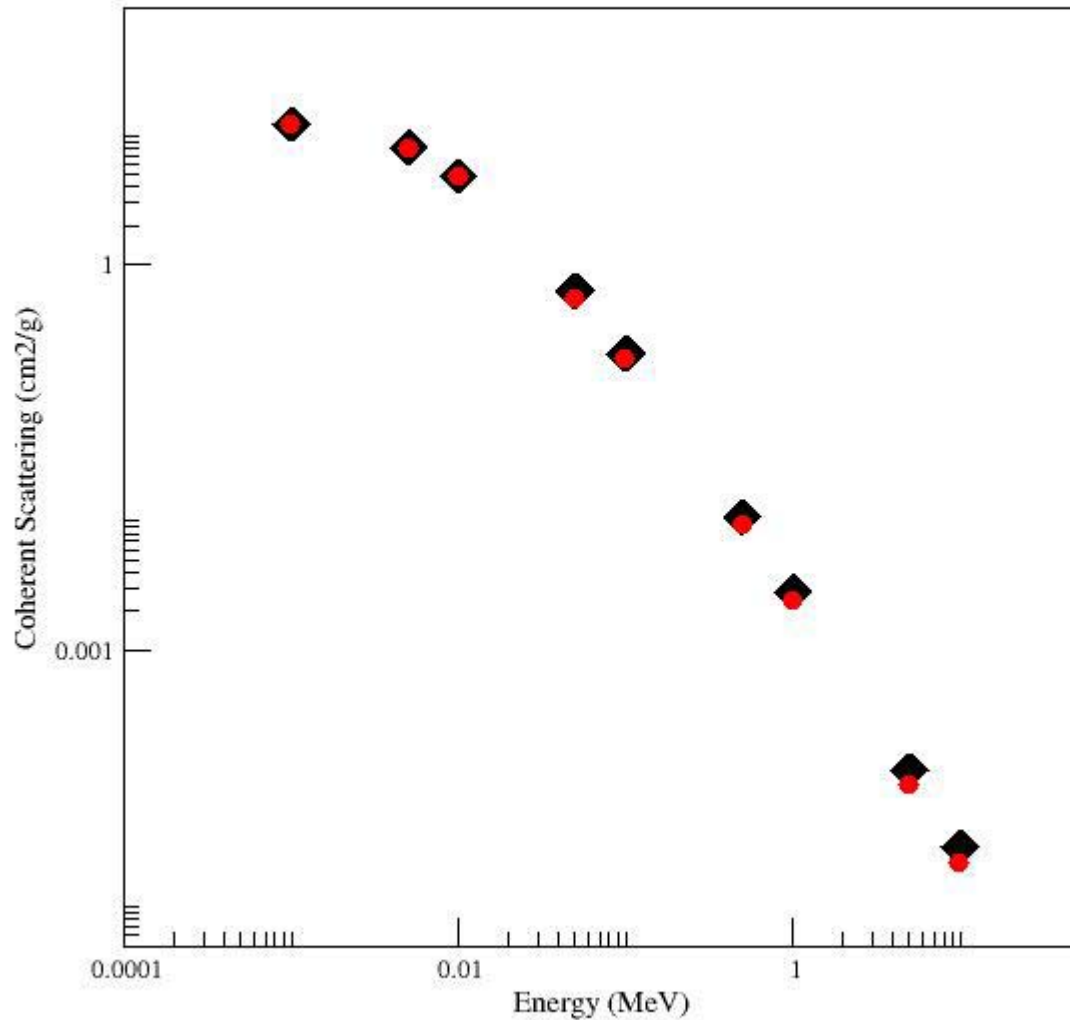
◆ NIST-XCOM

● G4 LowE

# Coherent Scattering - Au

Photons - Coherent Scattering - Gold

(Geant4-05-02)



NIST-XCOM



G4 LowE Penelope

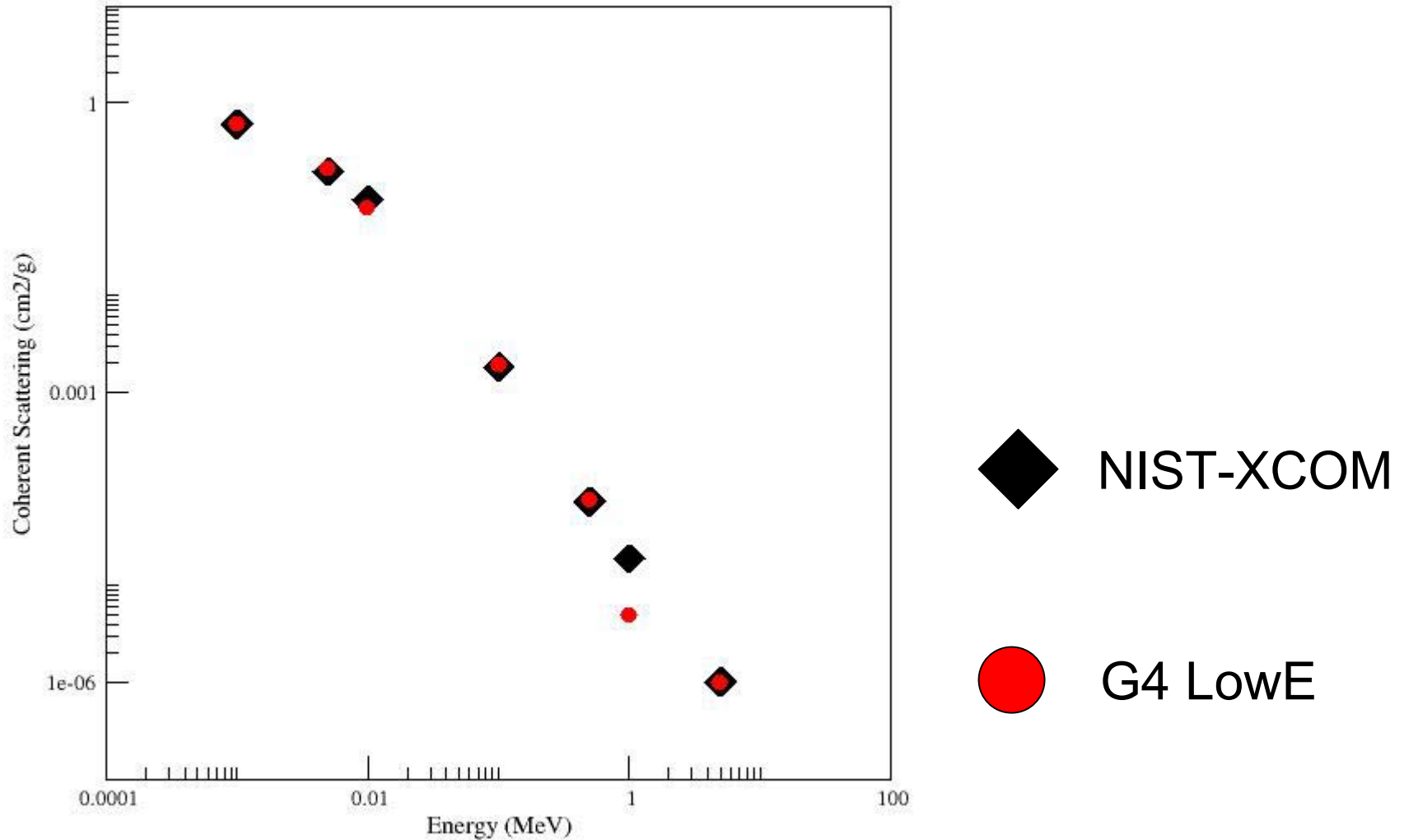
$$\chi^2_{N-P}=3.4 - \nu=3 - p=0.33$$



# Coherent Scattering - Be

Photons - Coherent Scattering - Beryllium

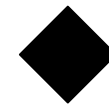
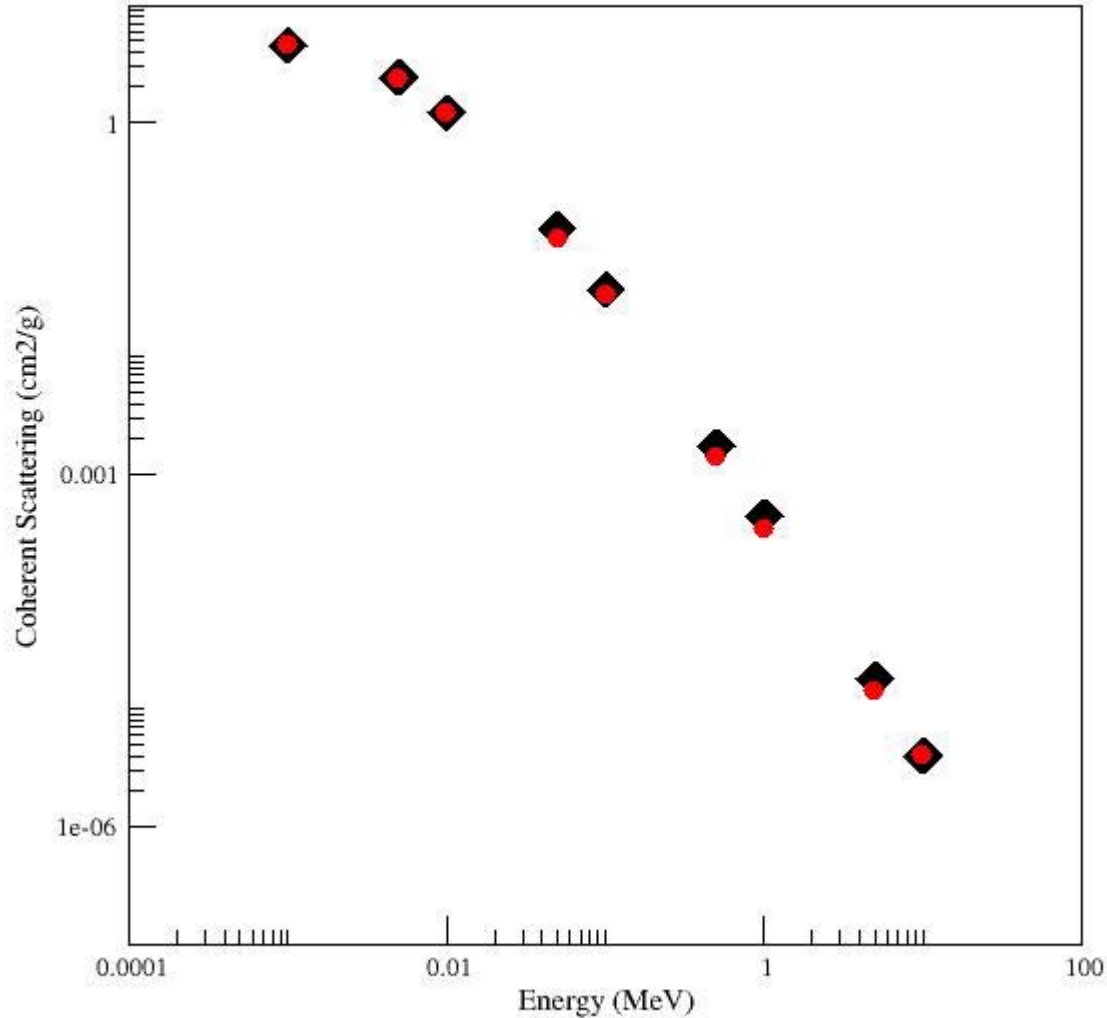
(Geant4-05-02)



# Coherent Scattering - Be

Photons - Coherent Scattering - Iron

(Geant4-05-02)



NIST-XCOM

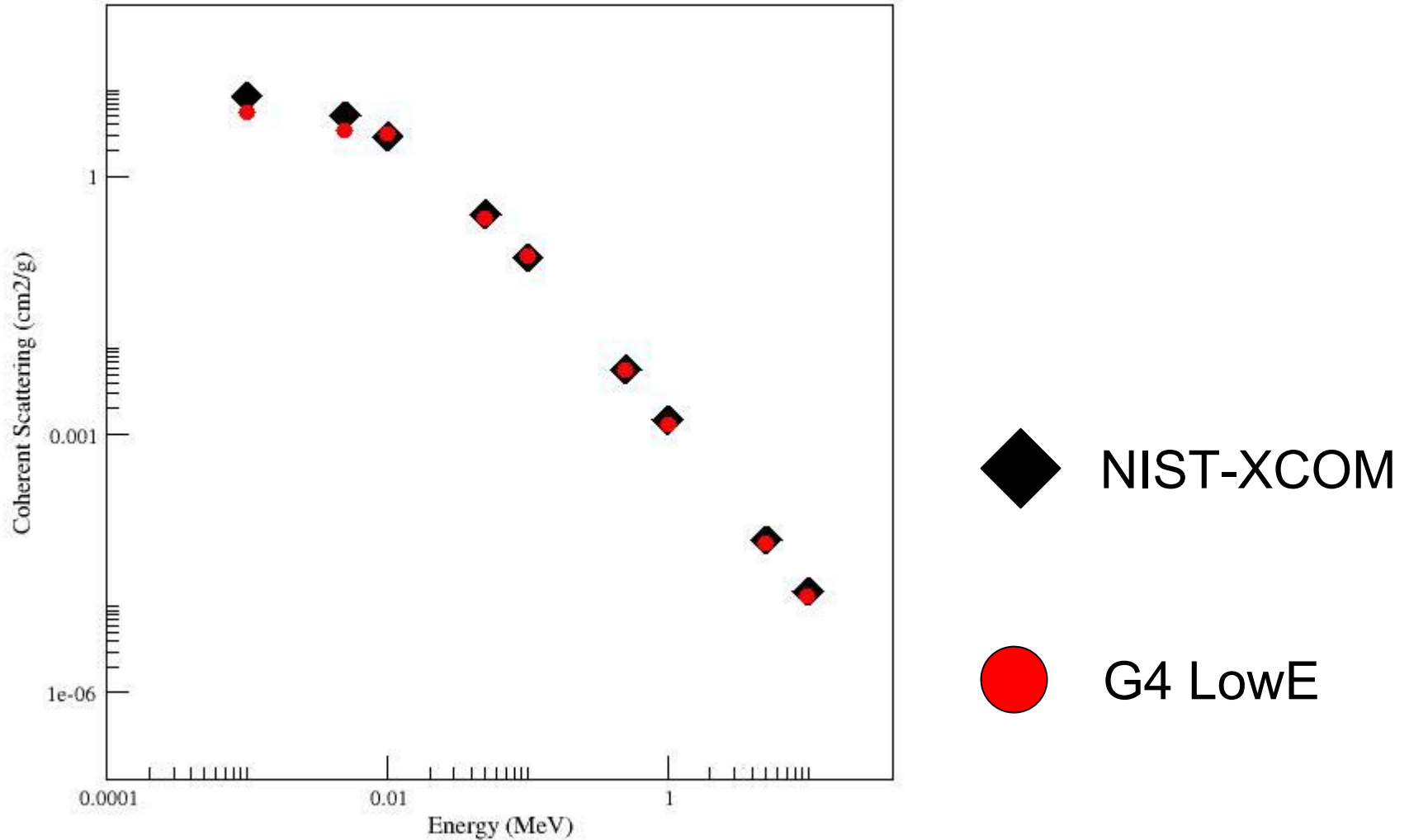


G4 LowE Penelope

# Coherent Scattering - Cs

Photons - Coherent Scattering - Cesium

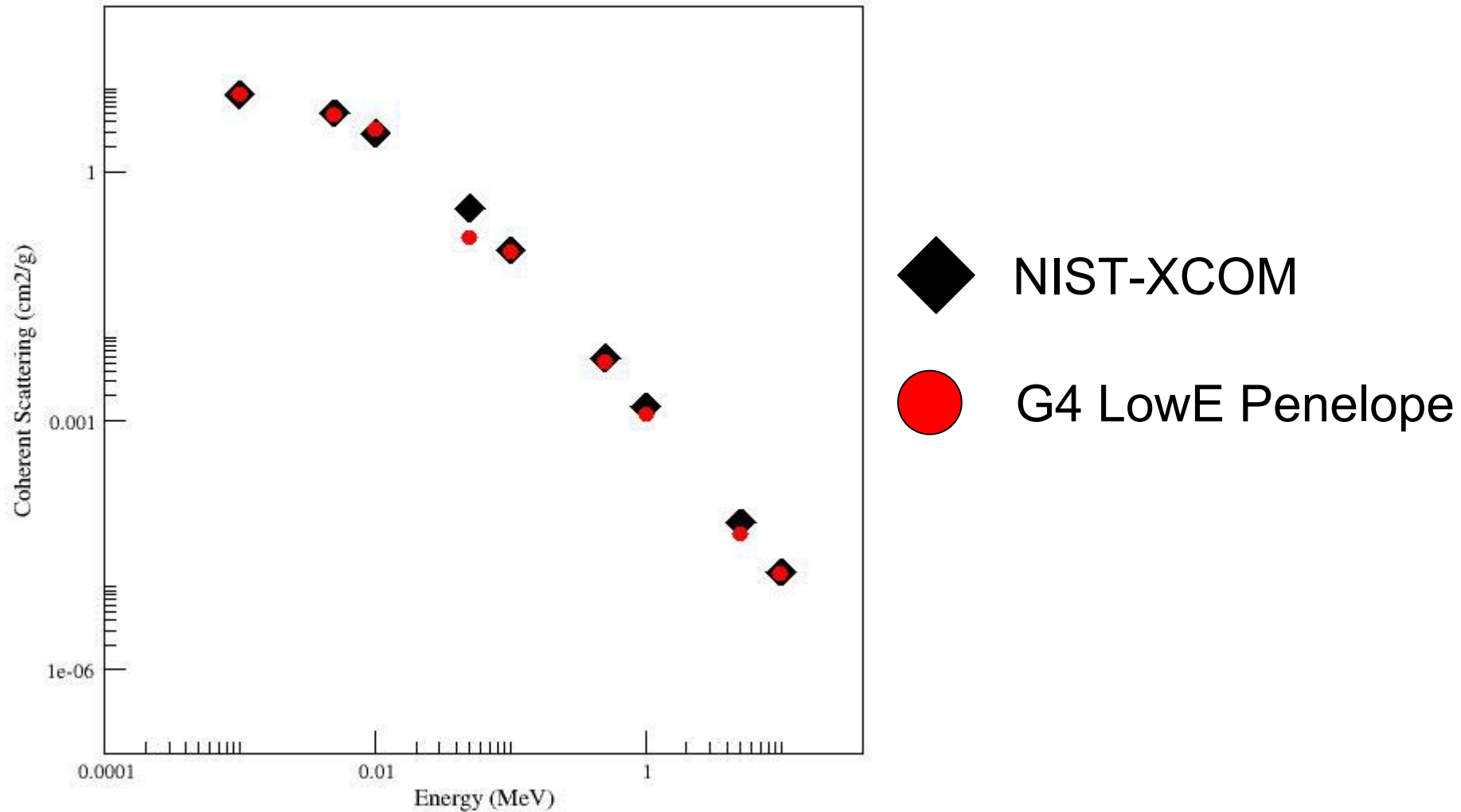
(Geant4-05-02)



# Coherent Scattering - Cs

Photons - Coherent Scattering - Cesium

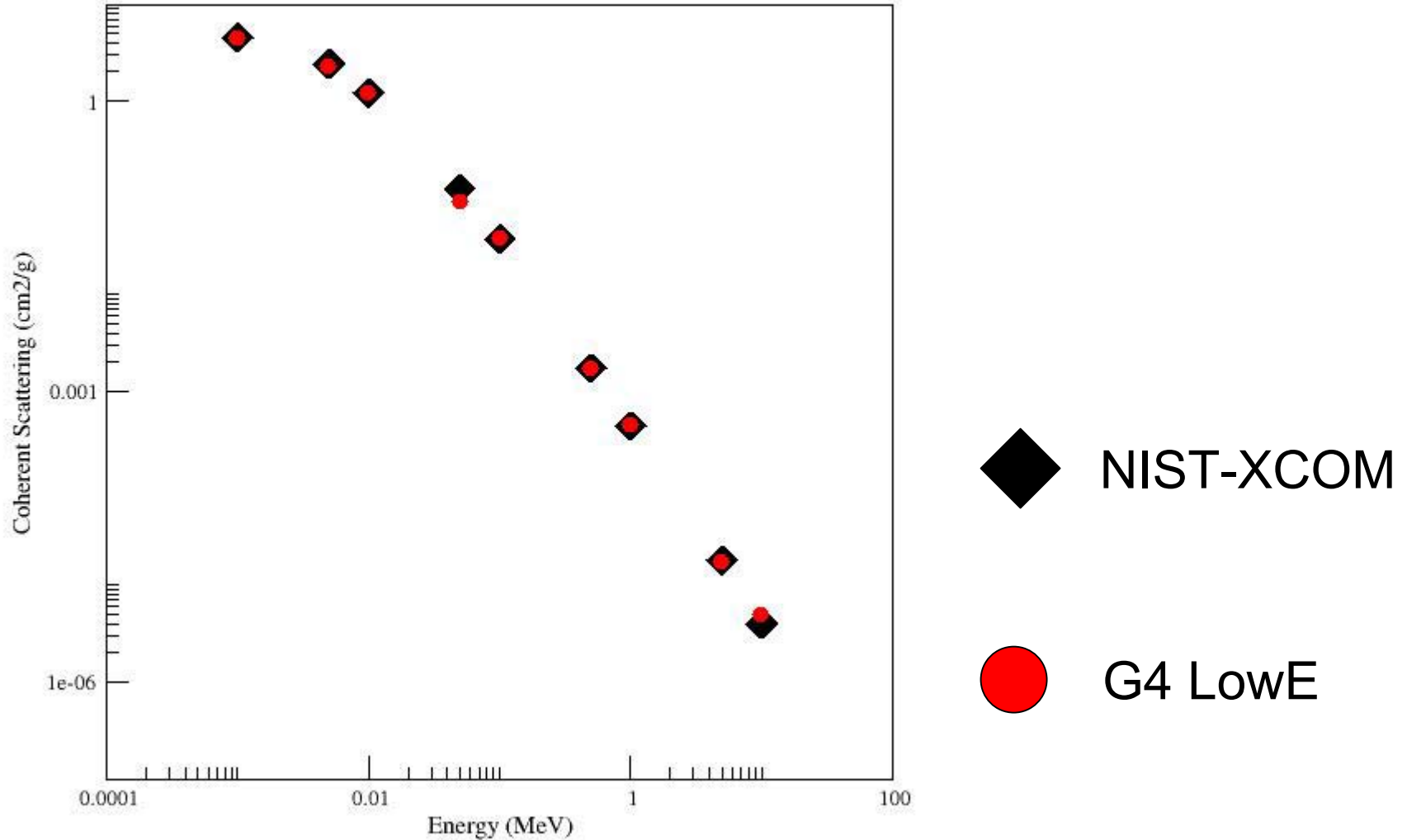
(Geant4-05-02)



# Coherent Scattering - Fe

Photons - Coherent Scattering - Iron

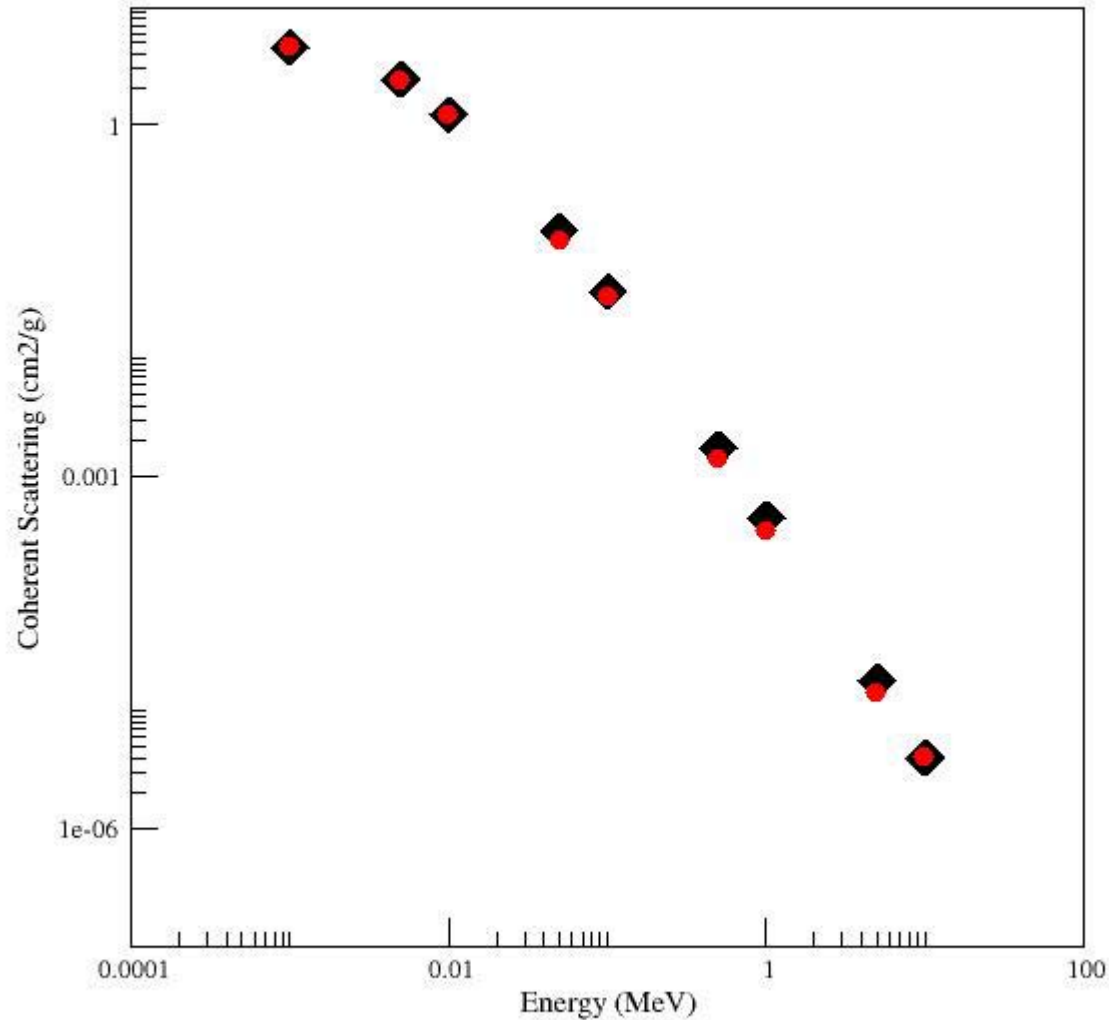
(Geant4-05-02)



# Coherent Scattering - Fe

Photons - Coherent Scattering - Iron

(Geant4-05-02)



NIST-XCOM

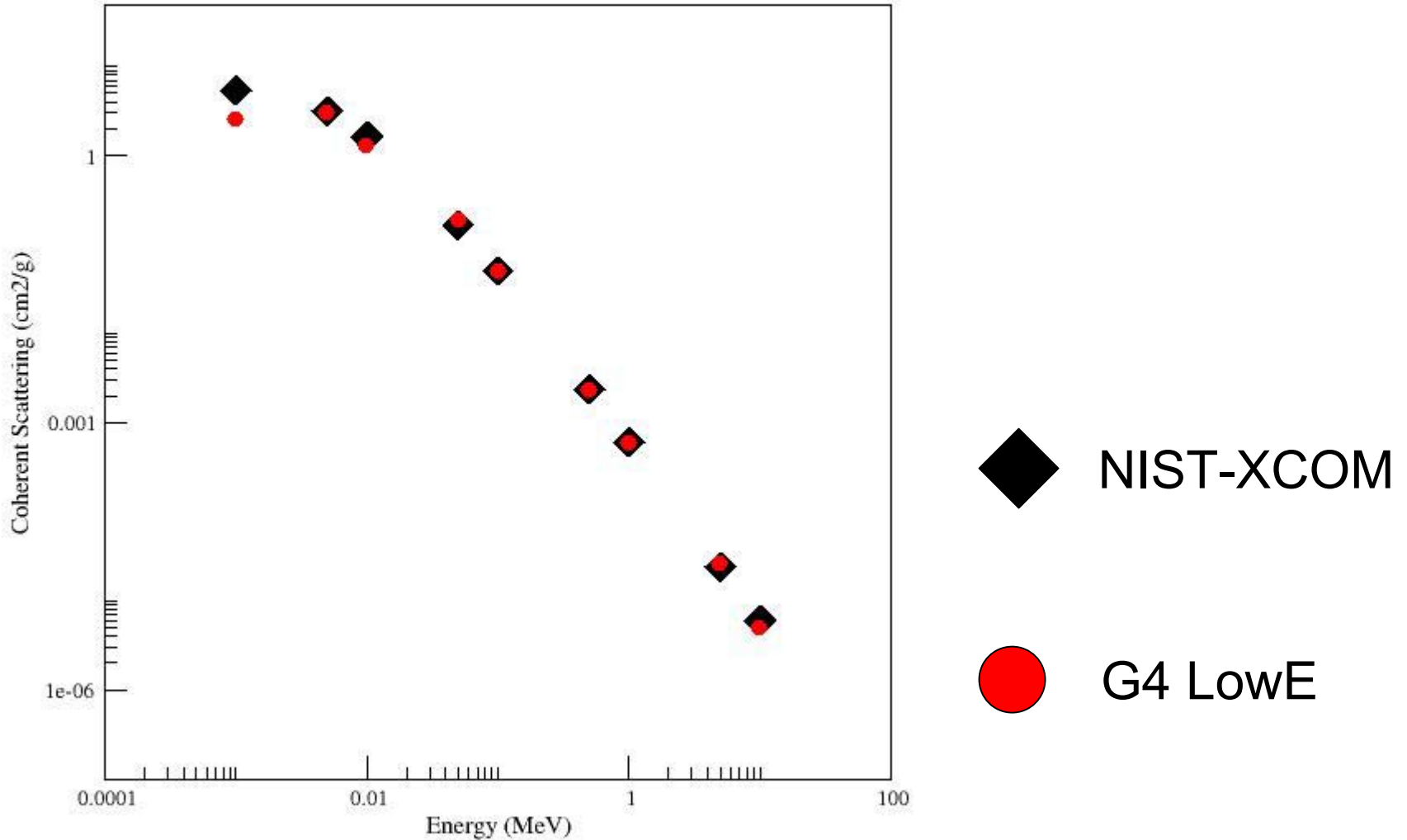


G4 LowE Penelope

# Coherent Scattering - Ge

Photons - Coherent Scattering - Germanium

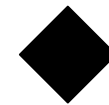
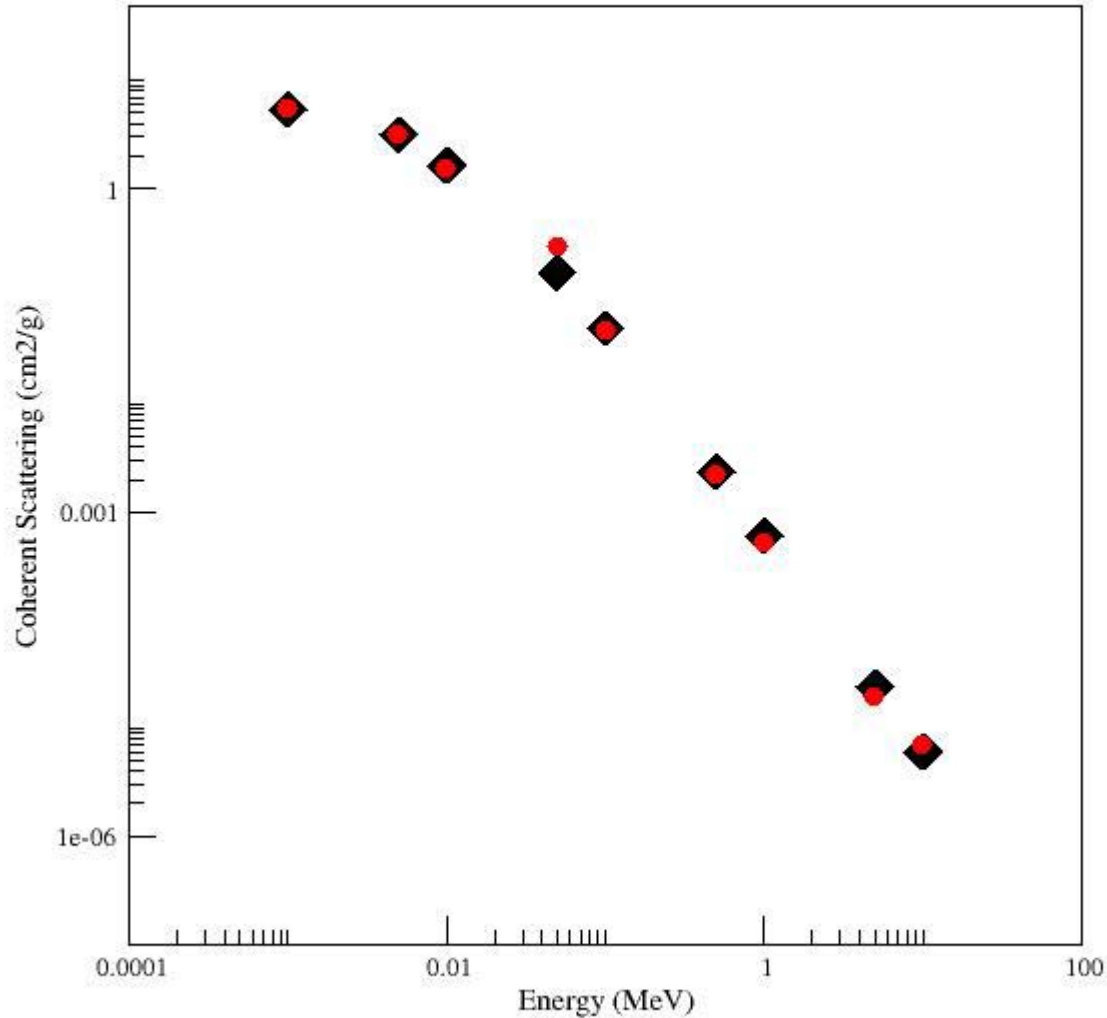
(Geant4-05-02)



# Coherent Scattering - Ge

Photons - Coherent Scattering - Germanium

(Geant4-05-02)



NIST-XCOM



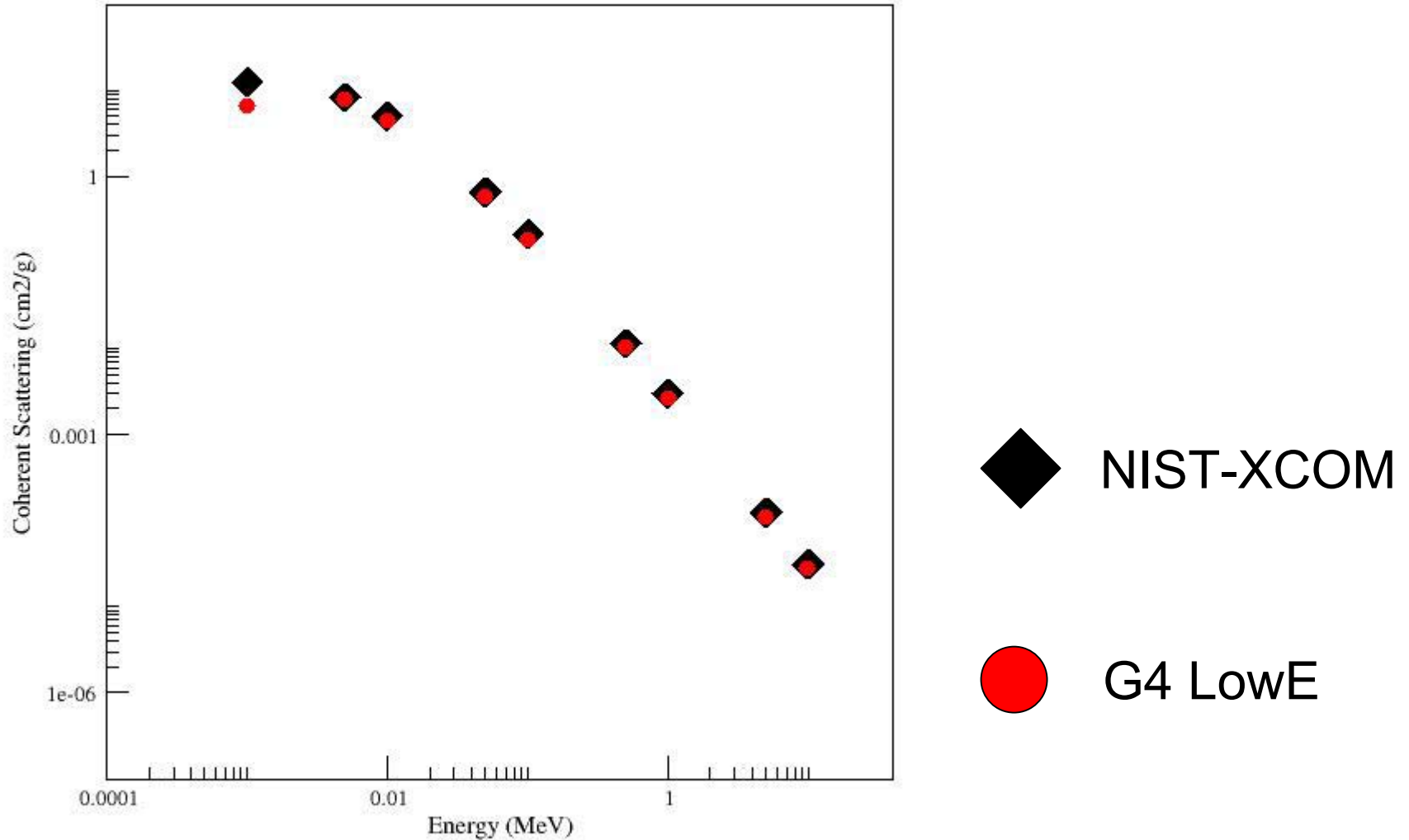
G4 LowE Penelope



# Coherent Scattering - Pb

Photons - Coherent Scattering - Lead

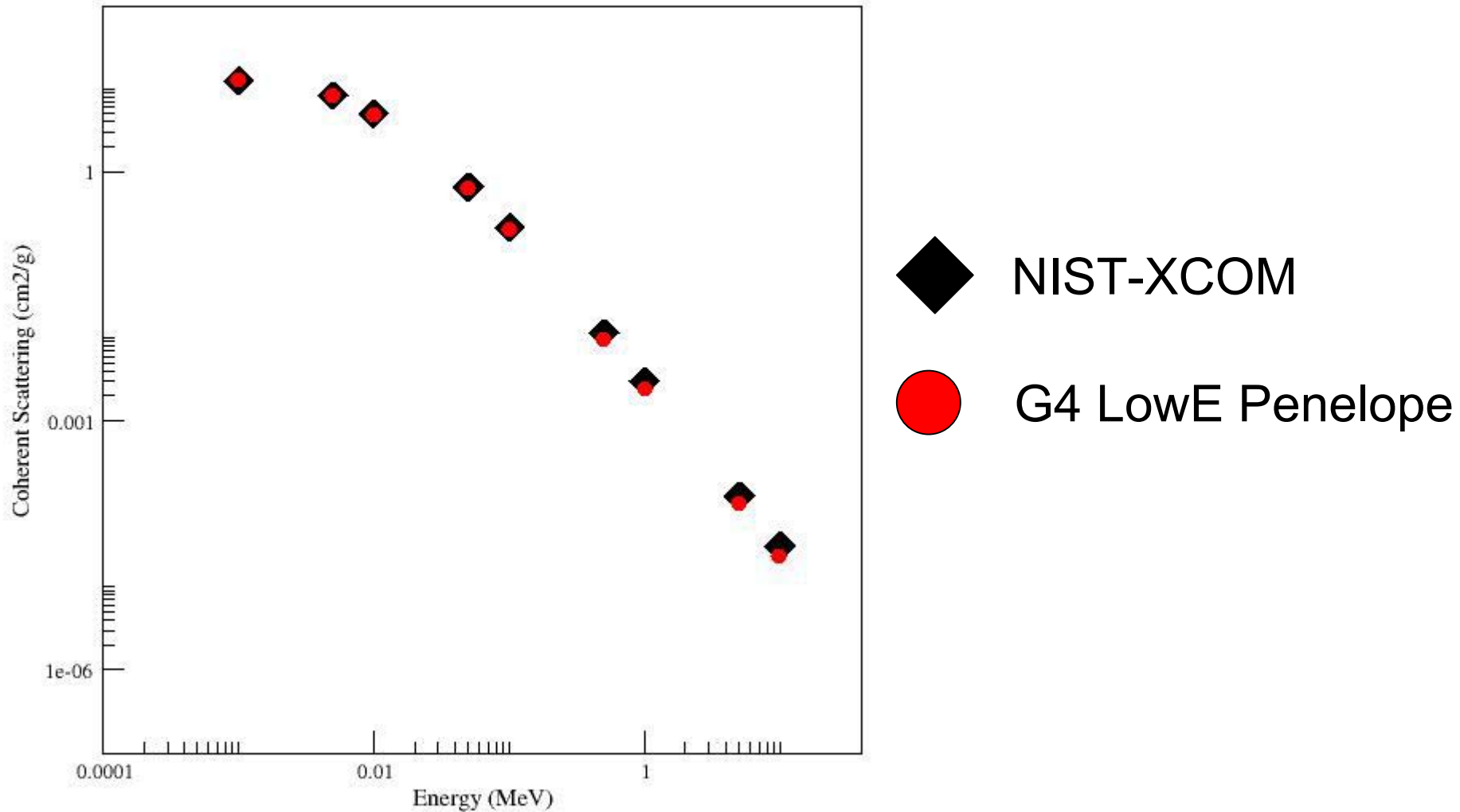
(Geant4-05-02)



# Coherent Scattering - Pb

Photons - Coherent Scattering - Lead

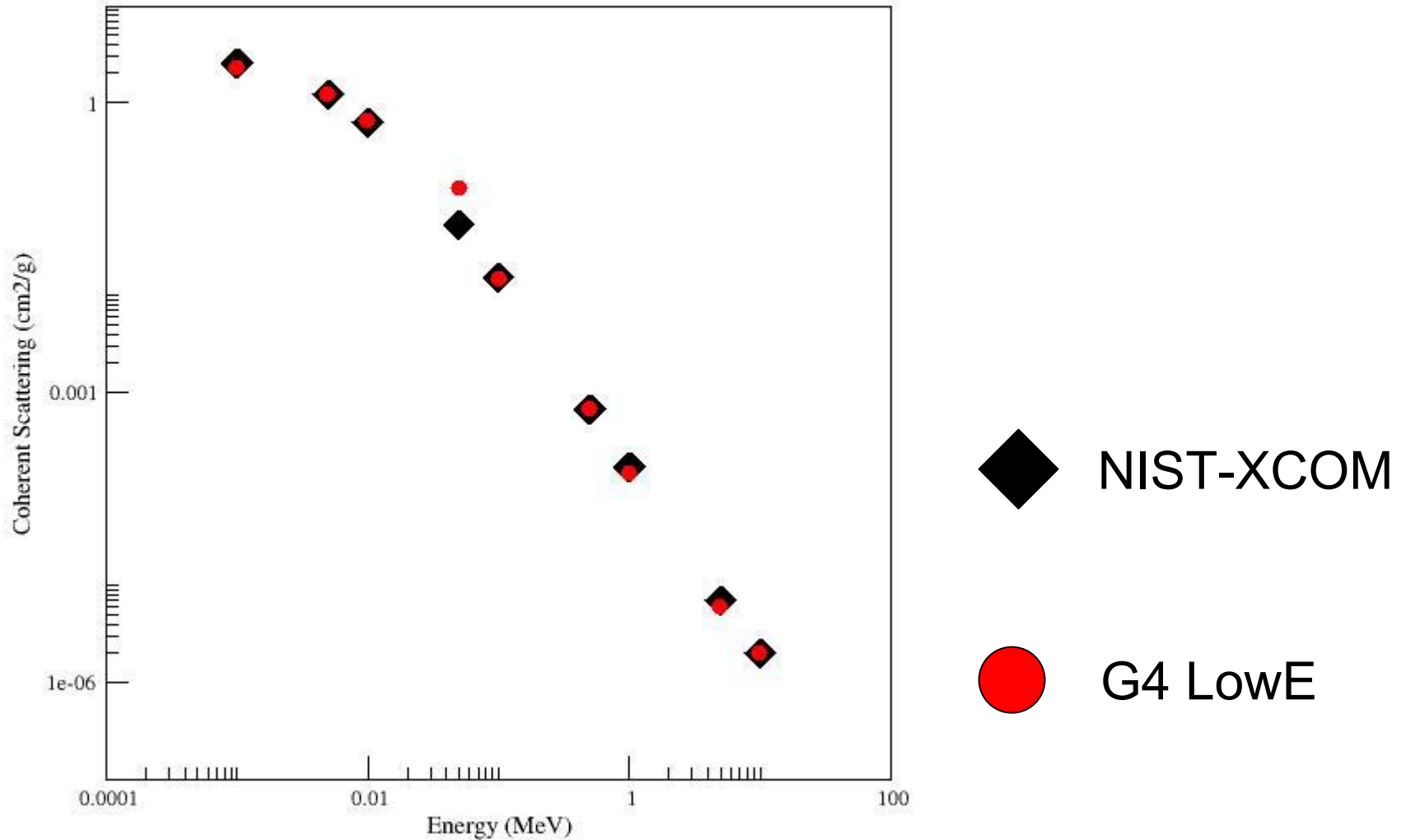
(Geant4-05-02)



# Coherent Scattering - Si

Photons - Coherent Scattering - Silicon

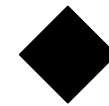
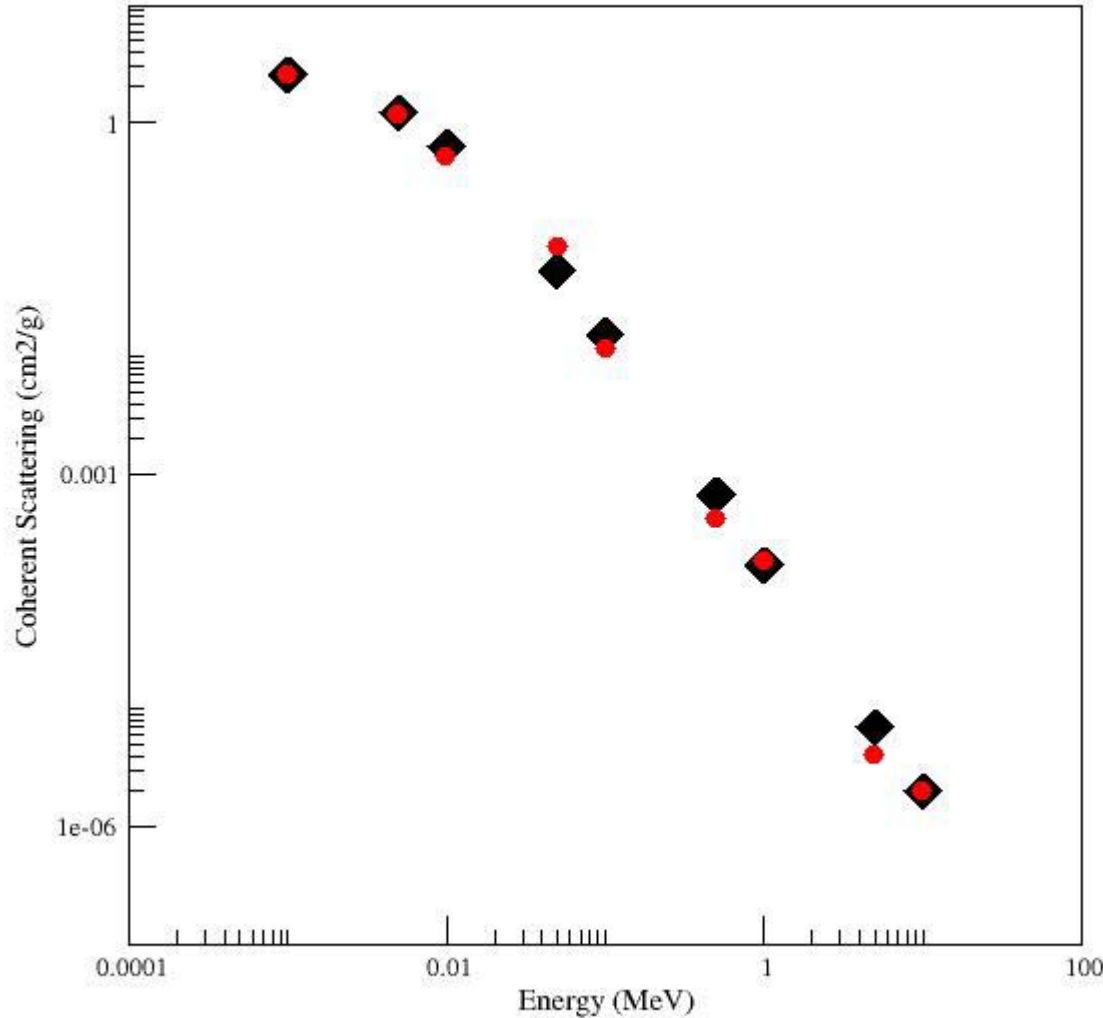
(Geant4-05-02)



# Coherent Scattering - Si

Photons - Coherent Scattering - Silicon

(Geant4-05-02)



NIST-XCOM

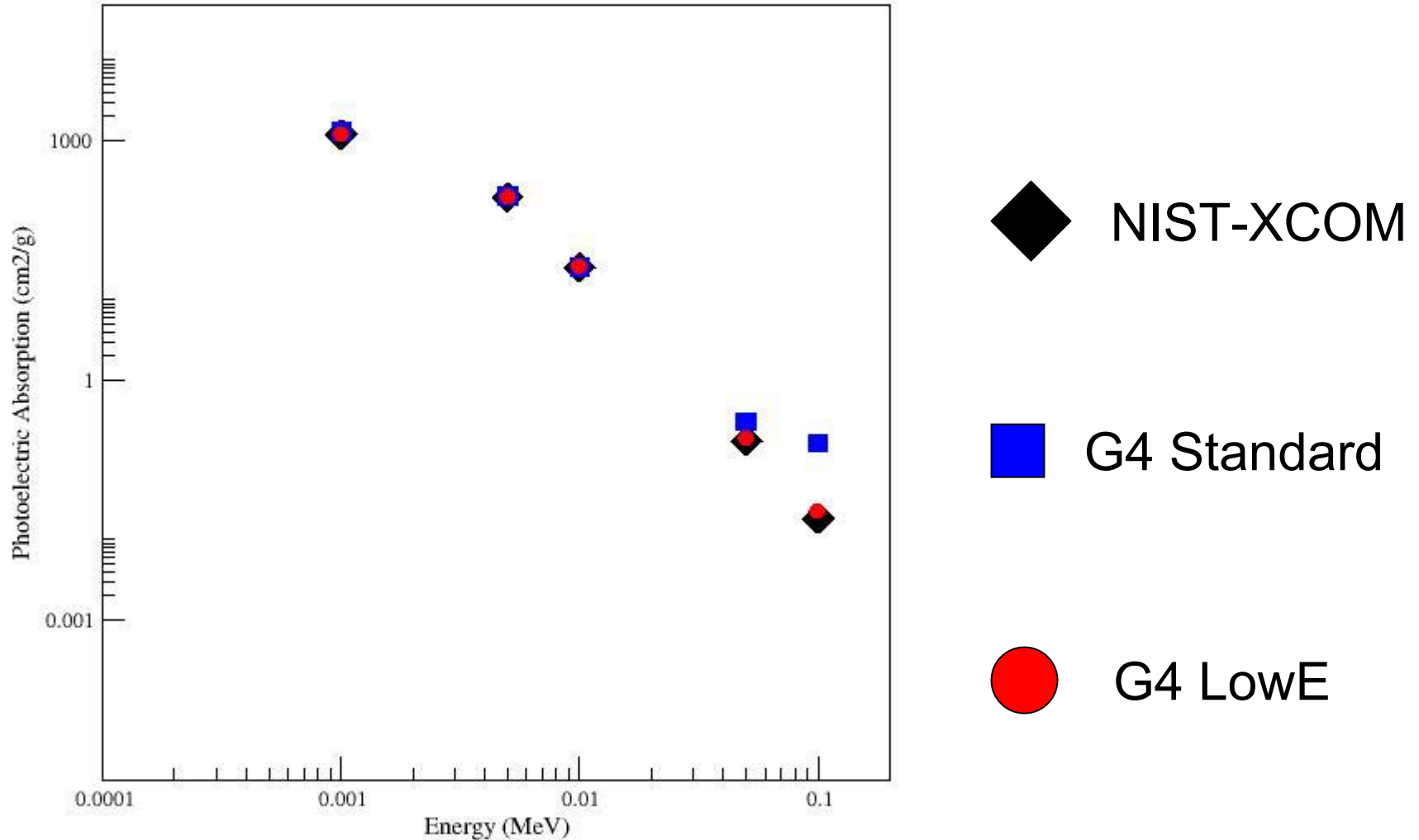


G4 LowE Penelope

# Photoelectric Absorption - Al

Photons - Photoelectric Absorption - Aluminium

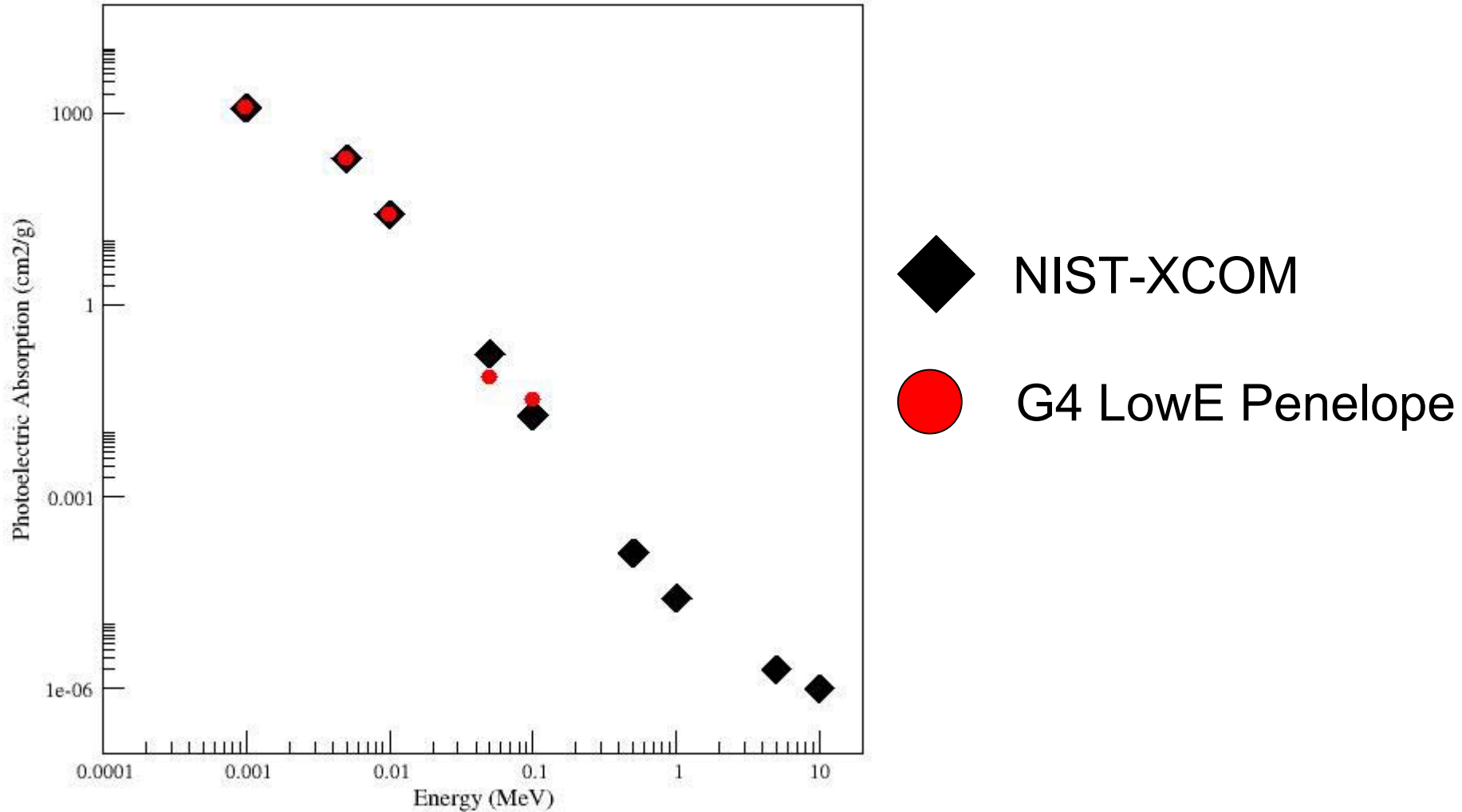
(Geant4-05-02)



# Photoelectric Absorption - Al

Photons - Photoelectric Absorption - Aluminium

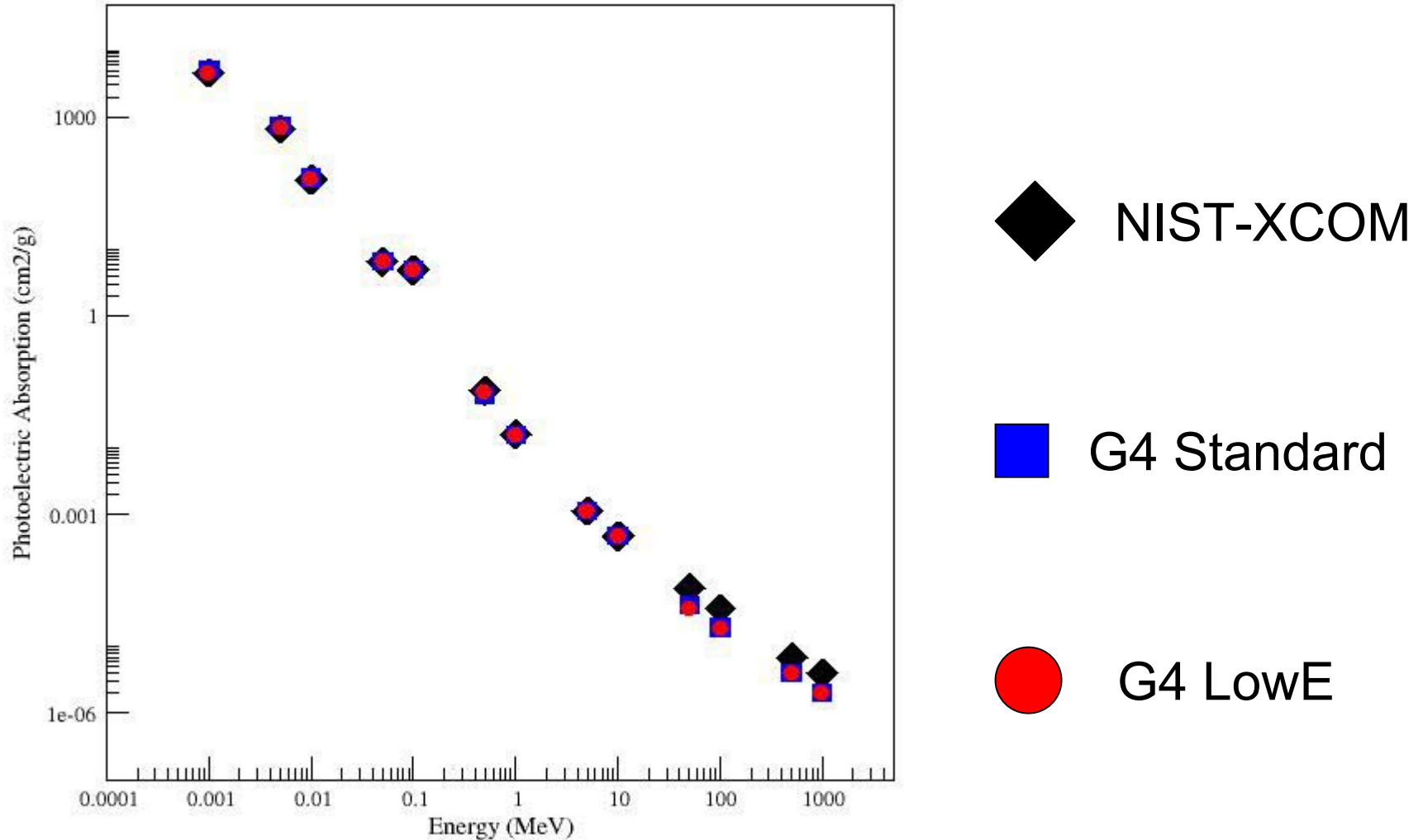
(Geant4-05-02)



# Photoelectric Absorption - Au

Photons - Photoelectric Absorption - Gold

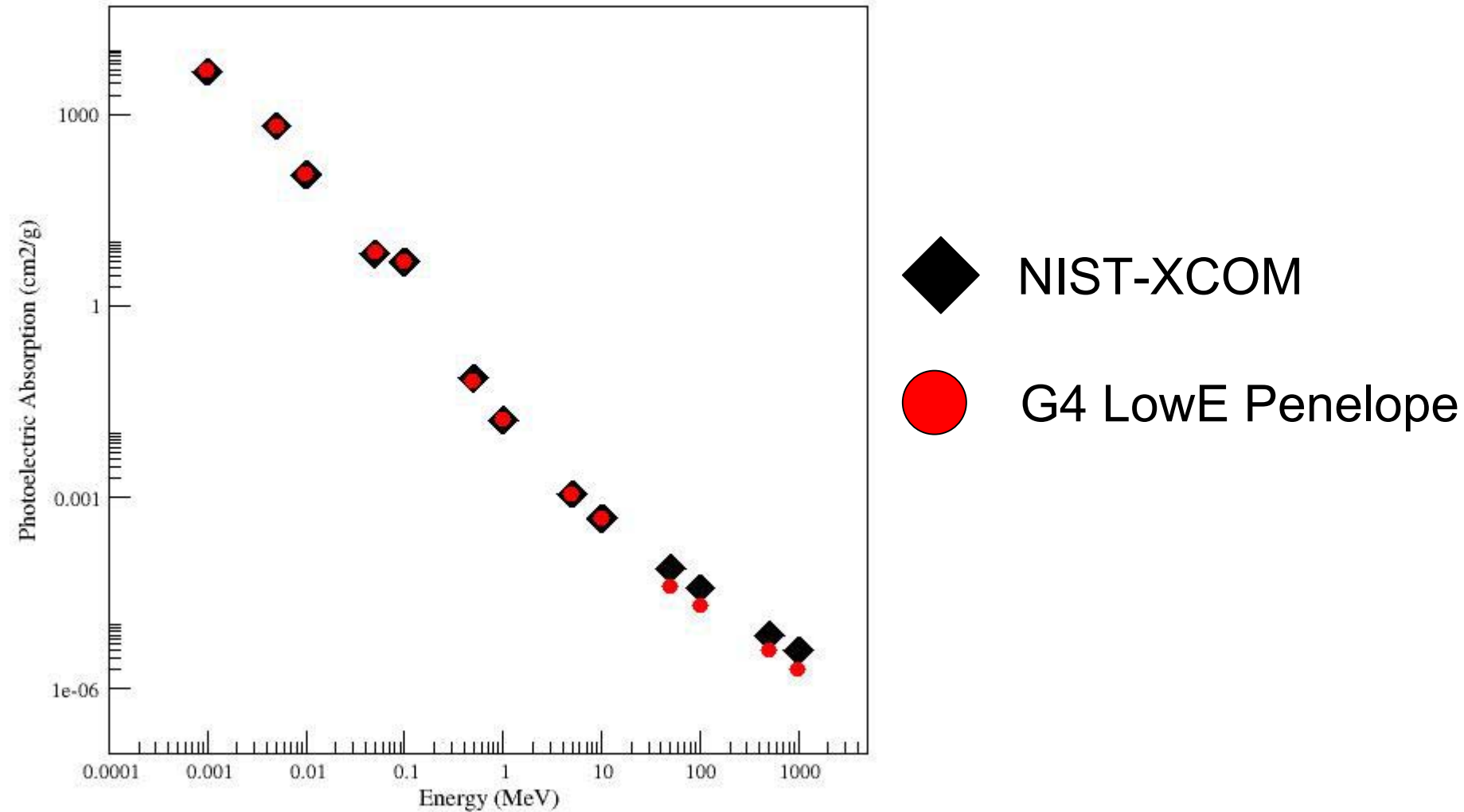
(Geant4-05-02)



# Photoelectric Absorption - Au

Photons - Photoelectric Absorption - Gold

(Geant4-05-02)

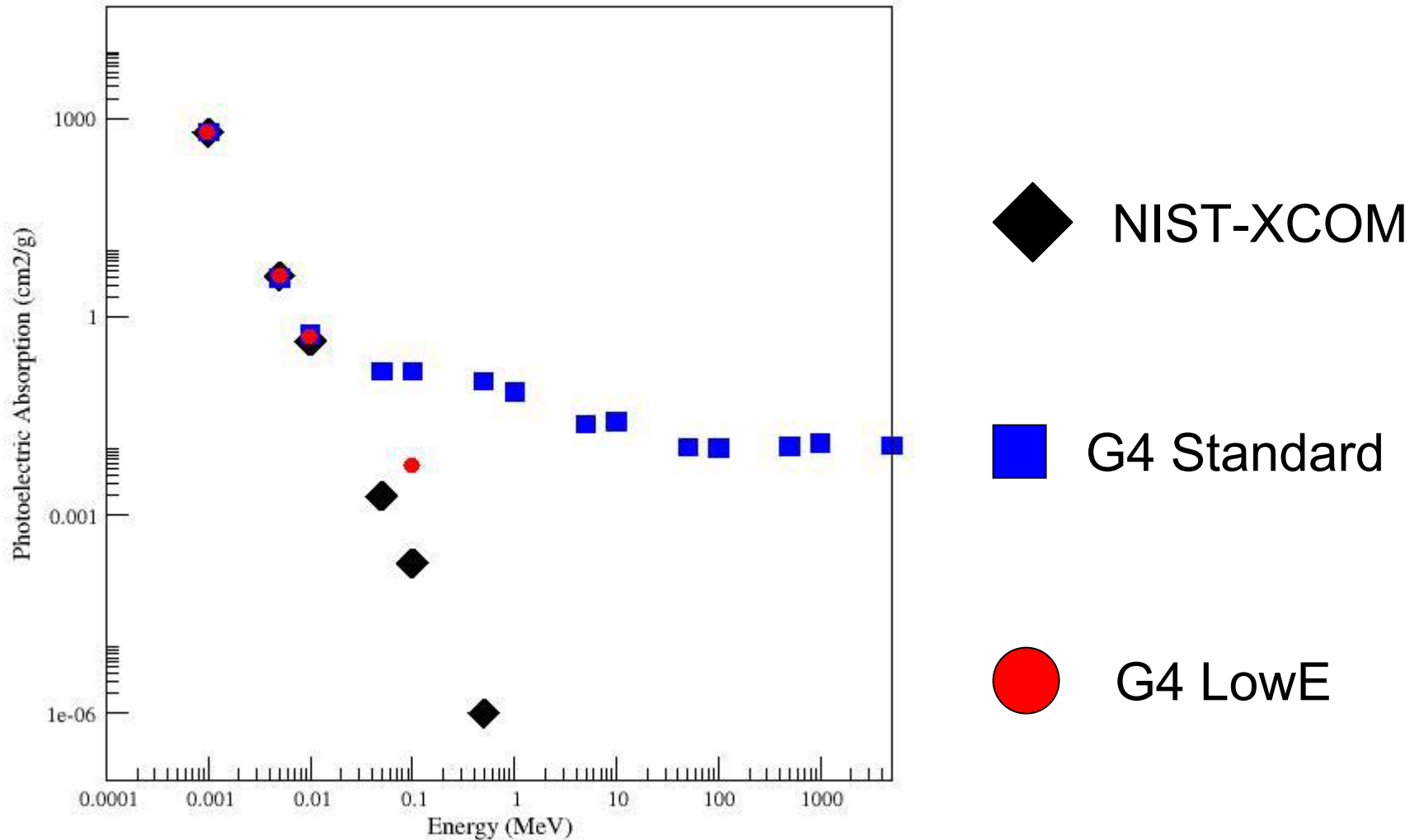




# Photoelectric Absorption - Be

Photons - Photoelectric Absorption - Beryllium

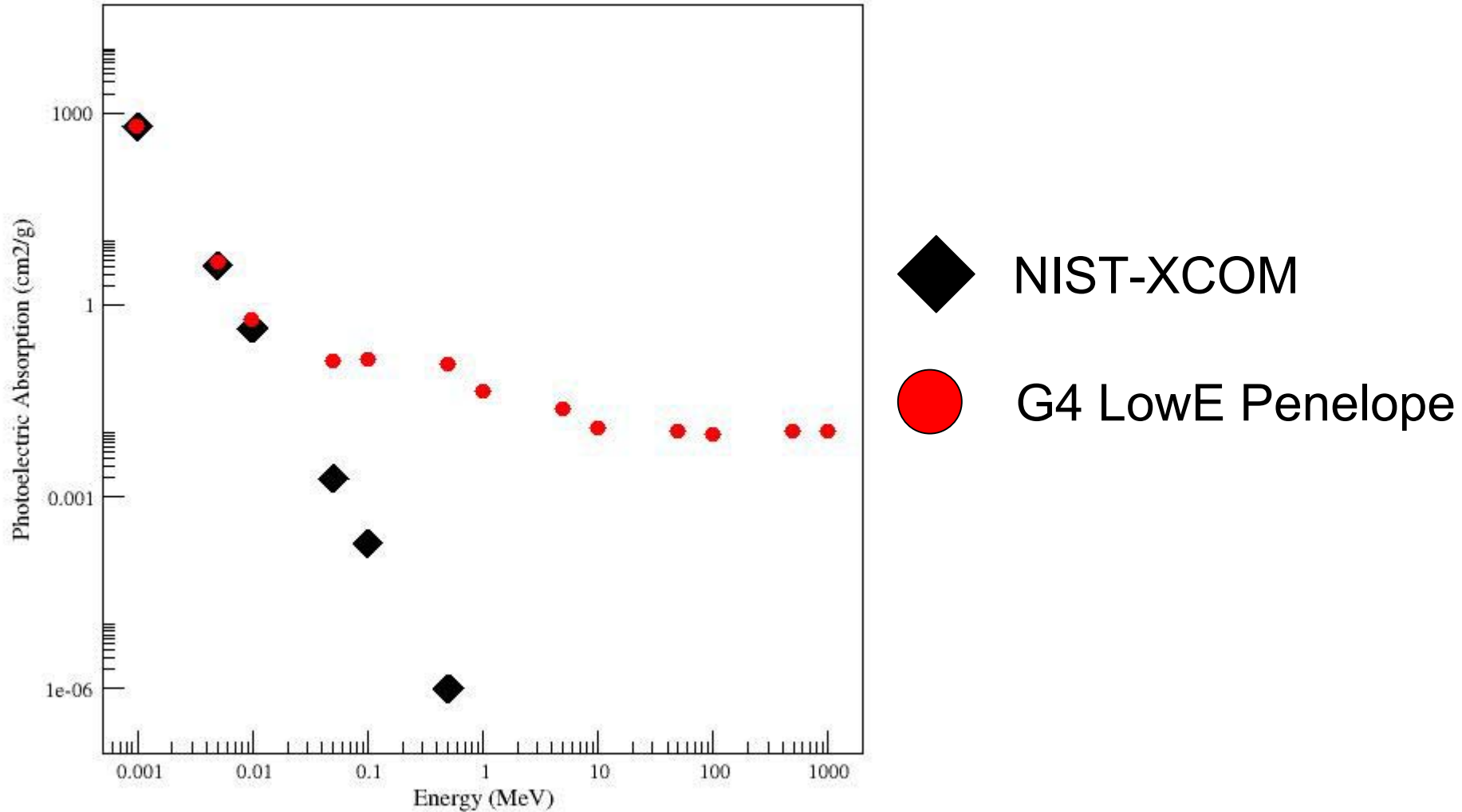
(Geant4-05-02)



# Photoelectric Absorption - Be

Photons - Photoelectric Absorption - Beryllium

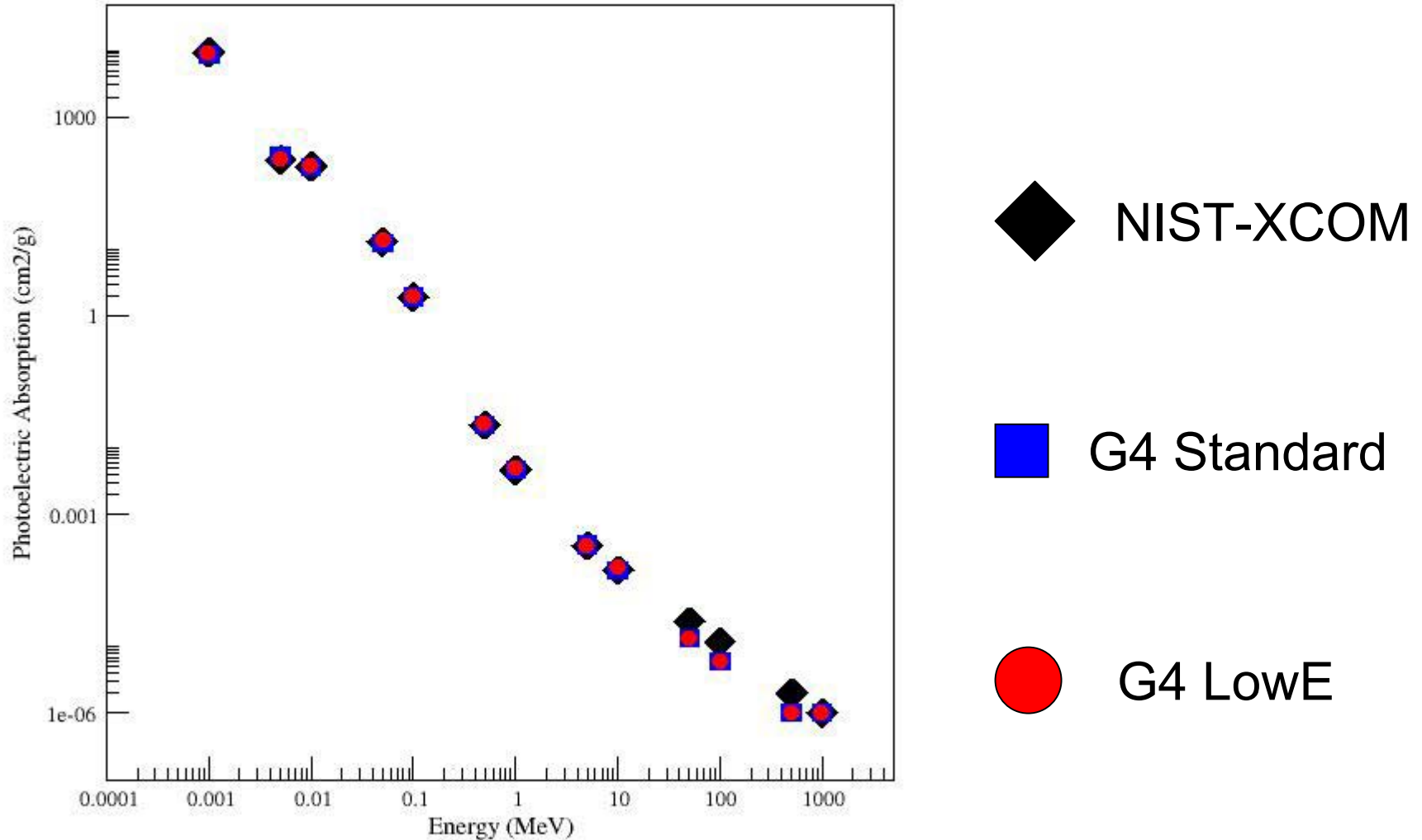
(Geant4-05-02)



# Photoelectric Absorption - Cs

Photons - Photoelectric Absorption - Cesium

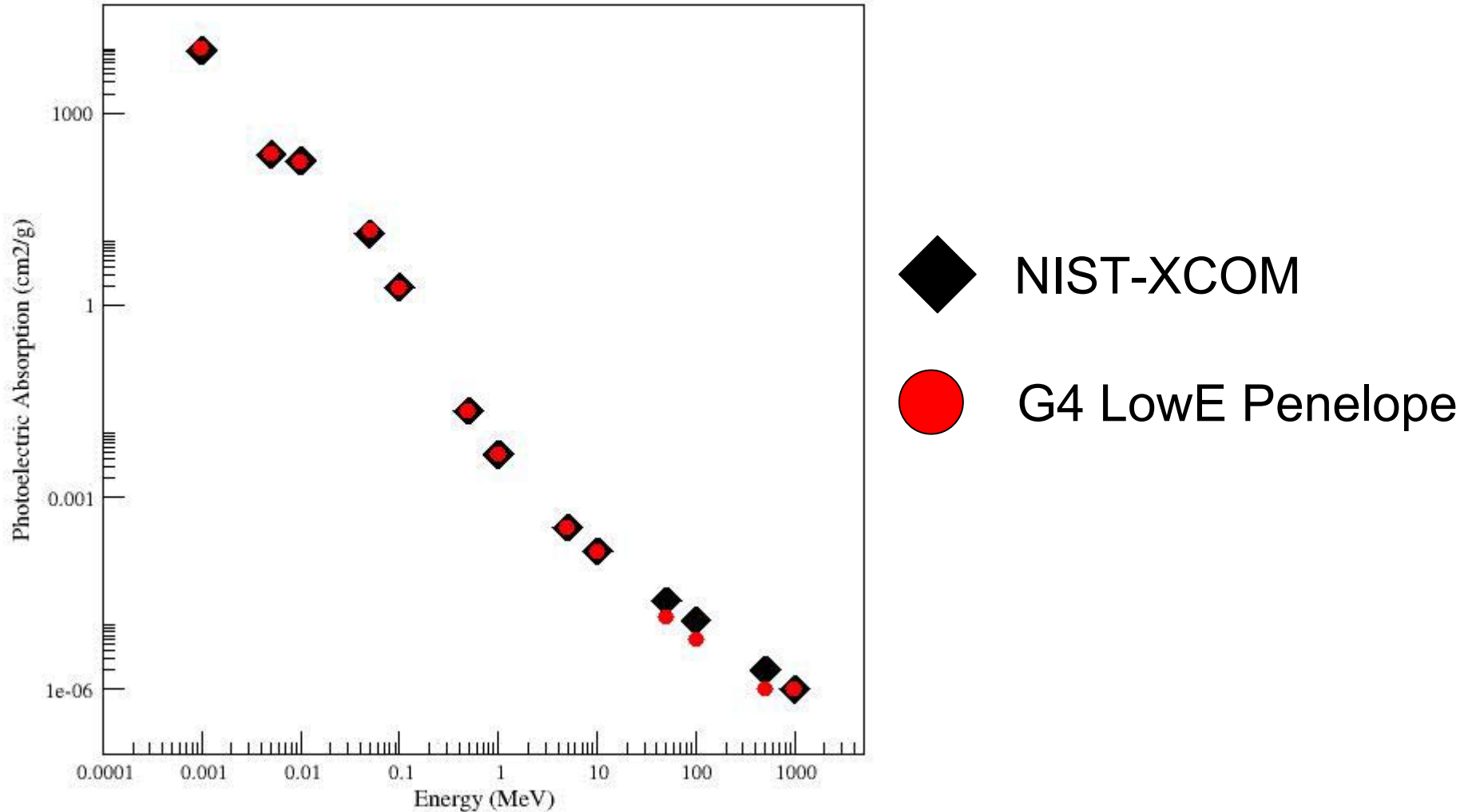
(Geant4-05-02)



# Photoelectric Absorption - Cs

Photons - Photoelectric Absorption - Cesium

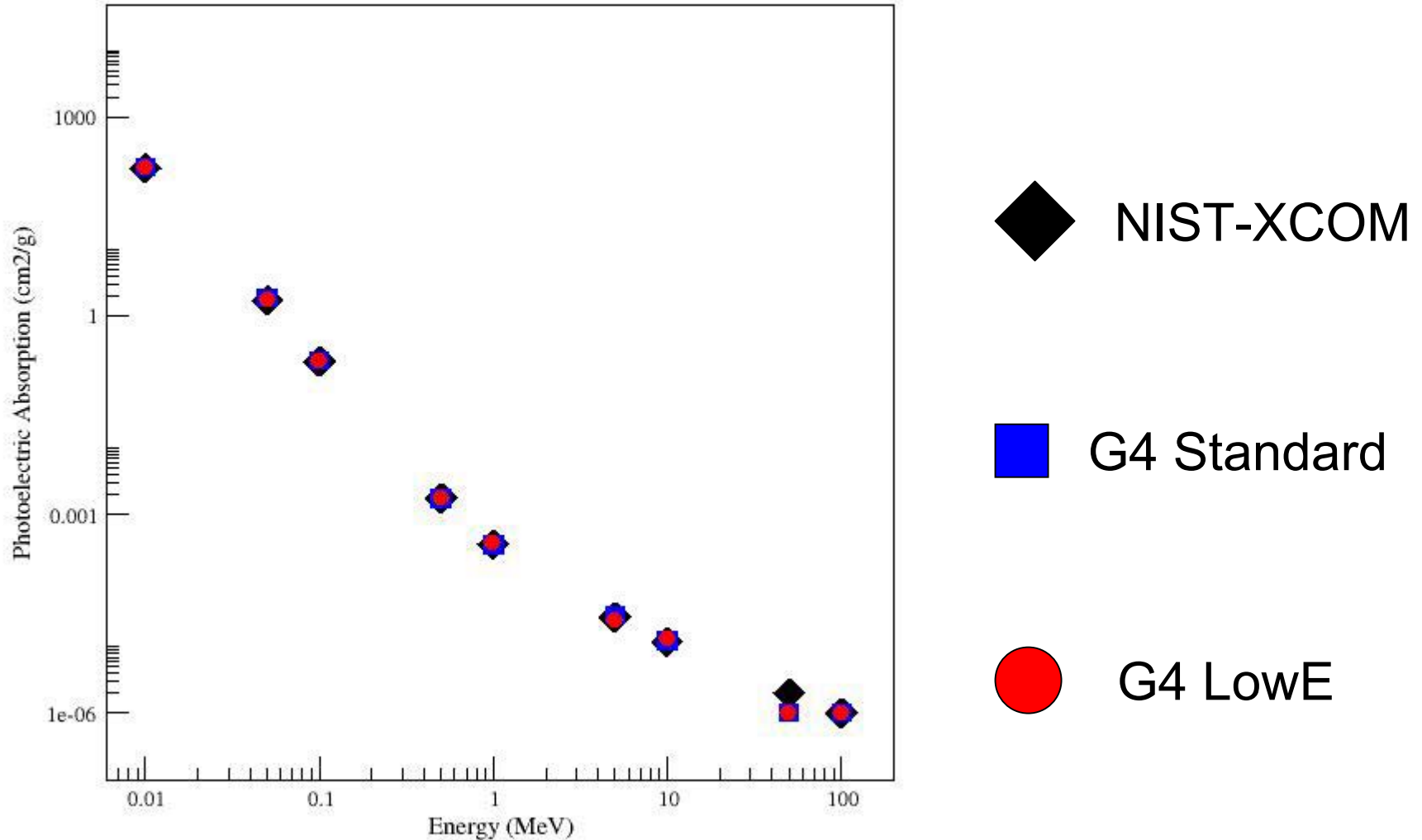
(Geant4-05-02)



# Photoelectric Absorption - Fe

Photons - Photoelectric Absorption - Iron

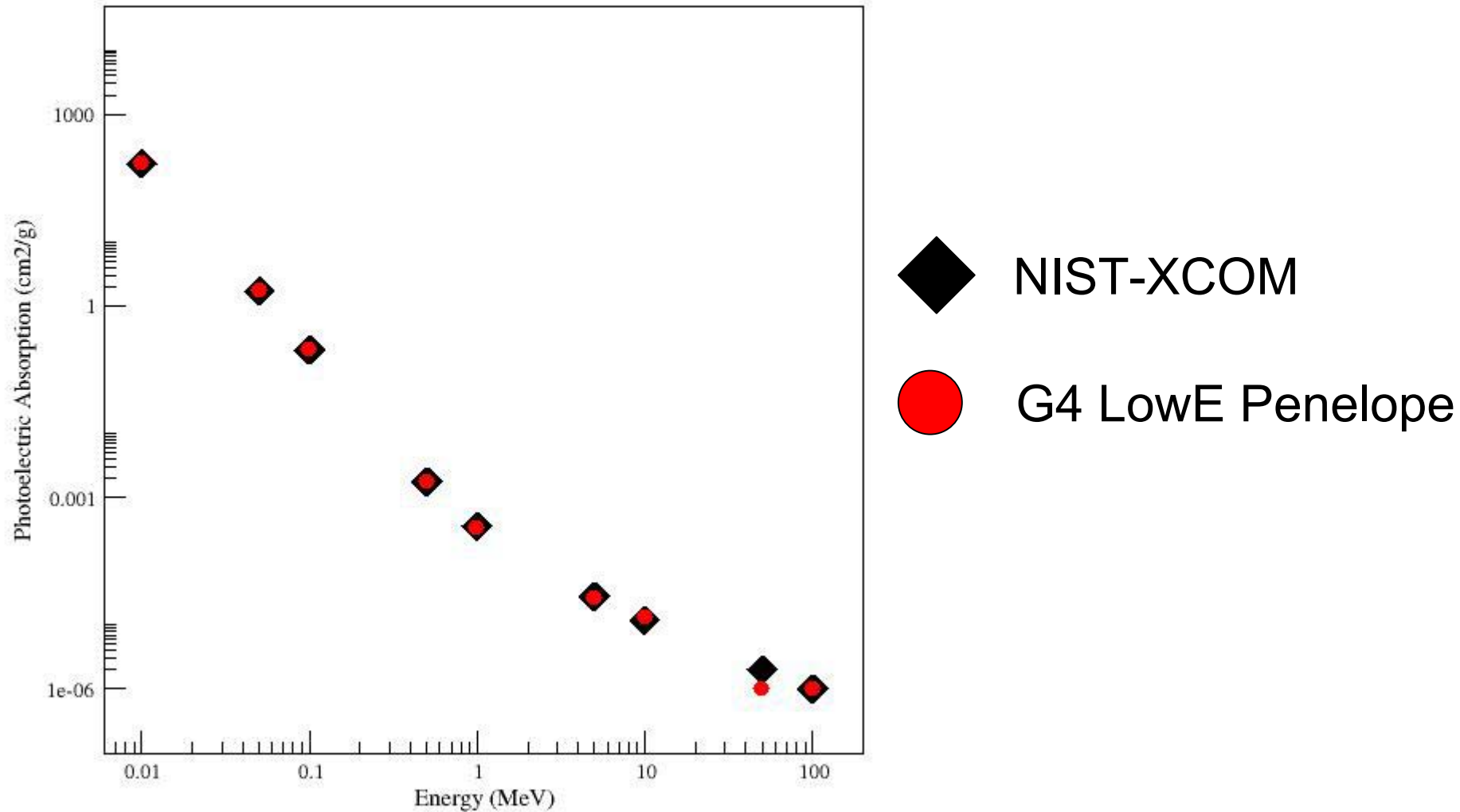
(Geant4-05-02)



# Photoelectric Absorption - Fe

Photons - Photoelectric Absorption - Iron

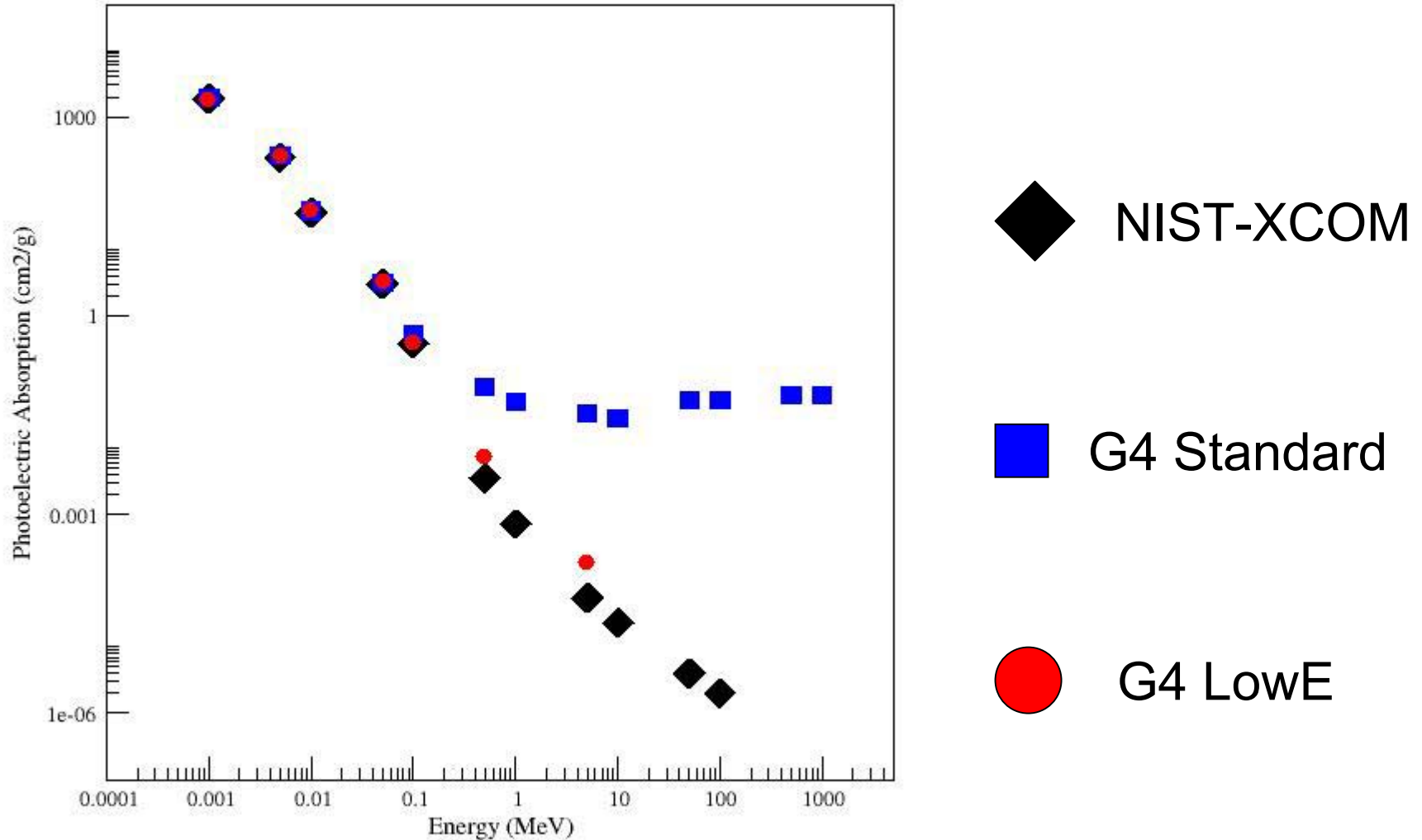
(Geant4-05-02)



# Photoelectric Absorption - Ge

Photons - Photoelectric Absorption - Germanium

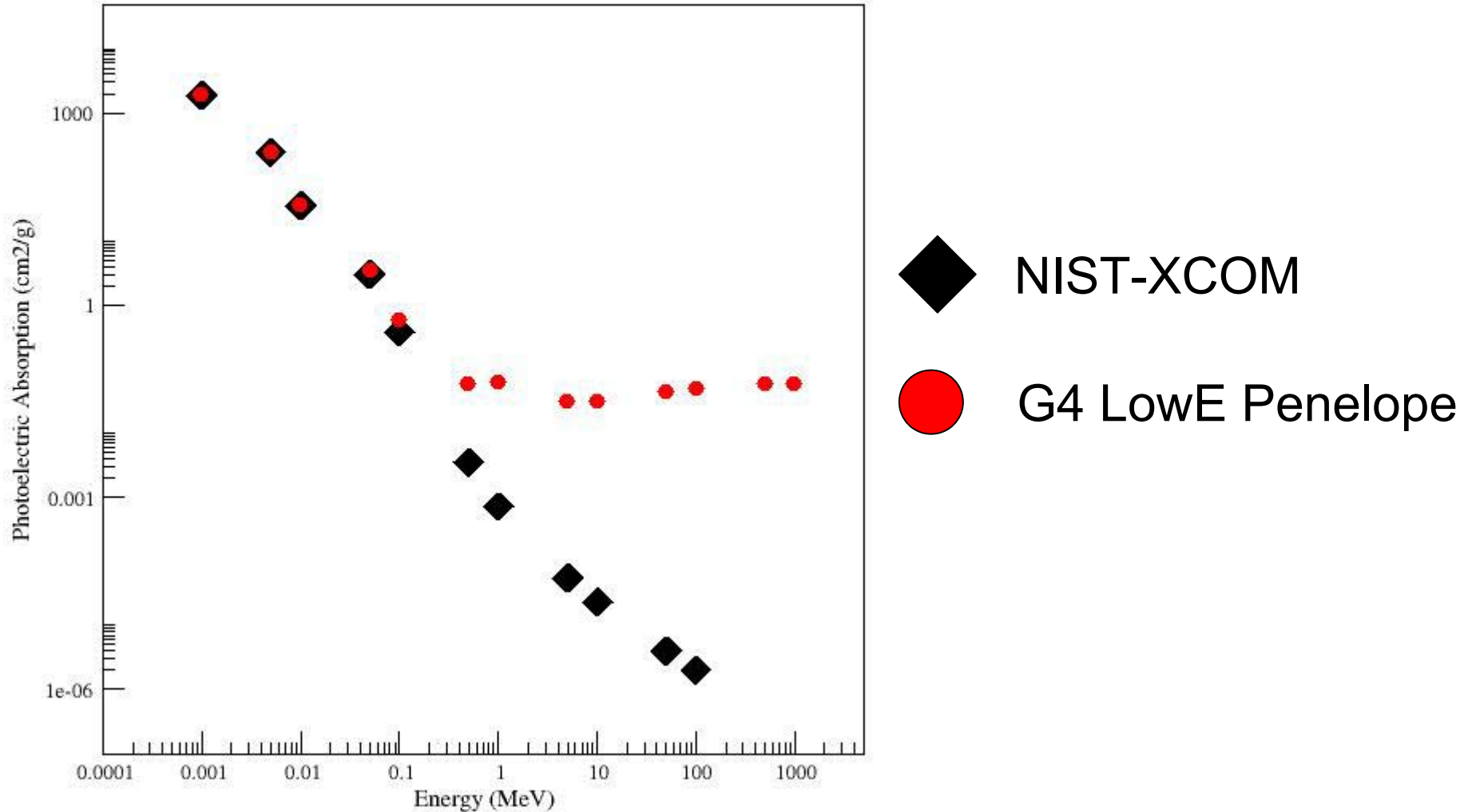
(Geant4-05-02)



# Photoelectric Absorption - Ge

Photons - Photoelectric Absorption - Germanium

(Geant4-05-02)

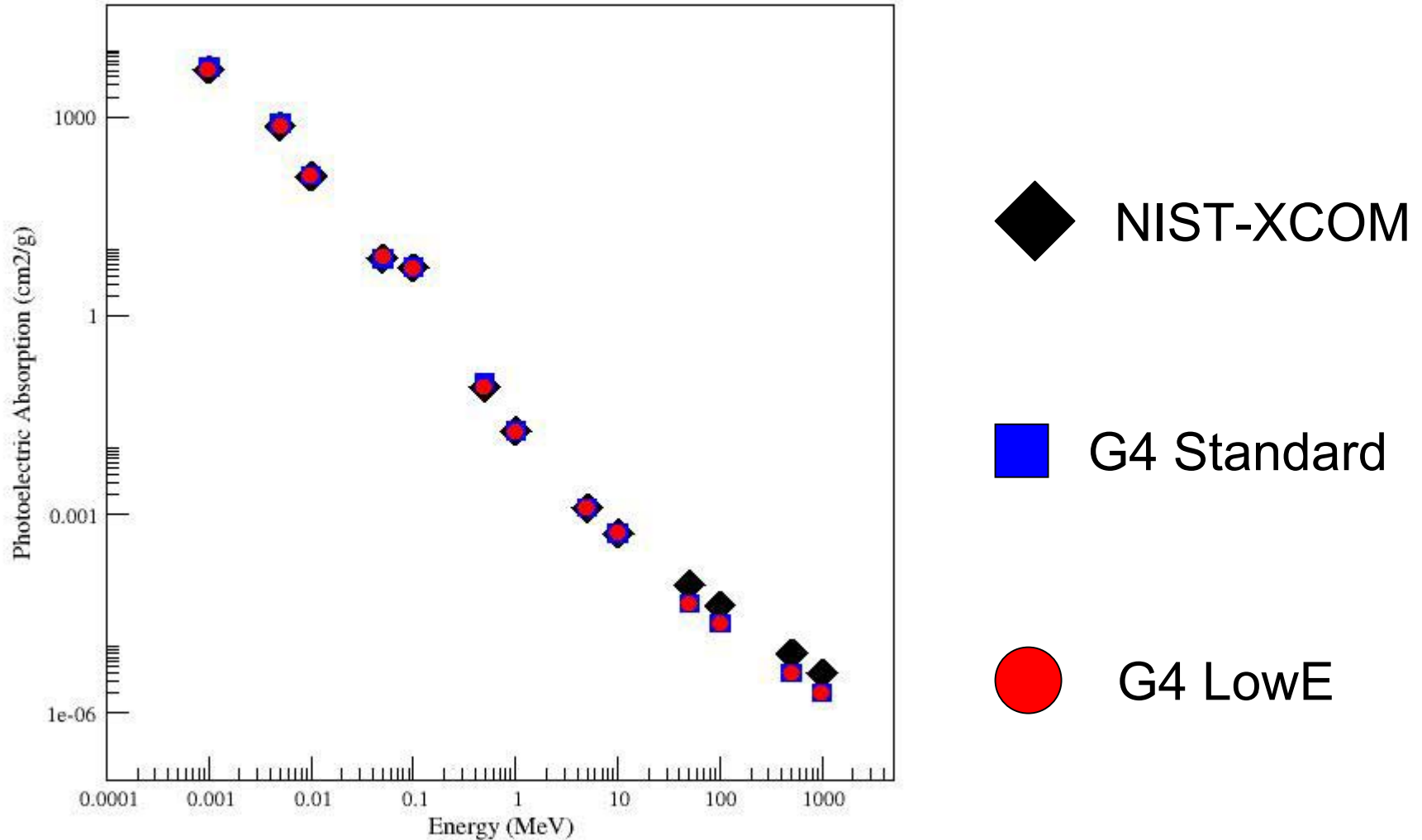




# Photoelectric Absorption - Pb

Photons - Photoelectric Absorption - Lead

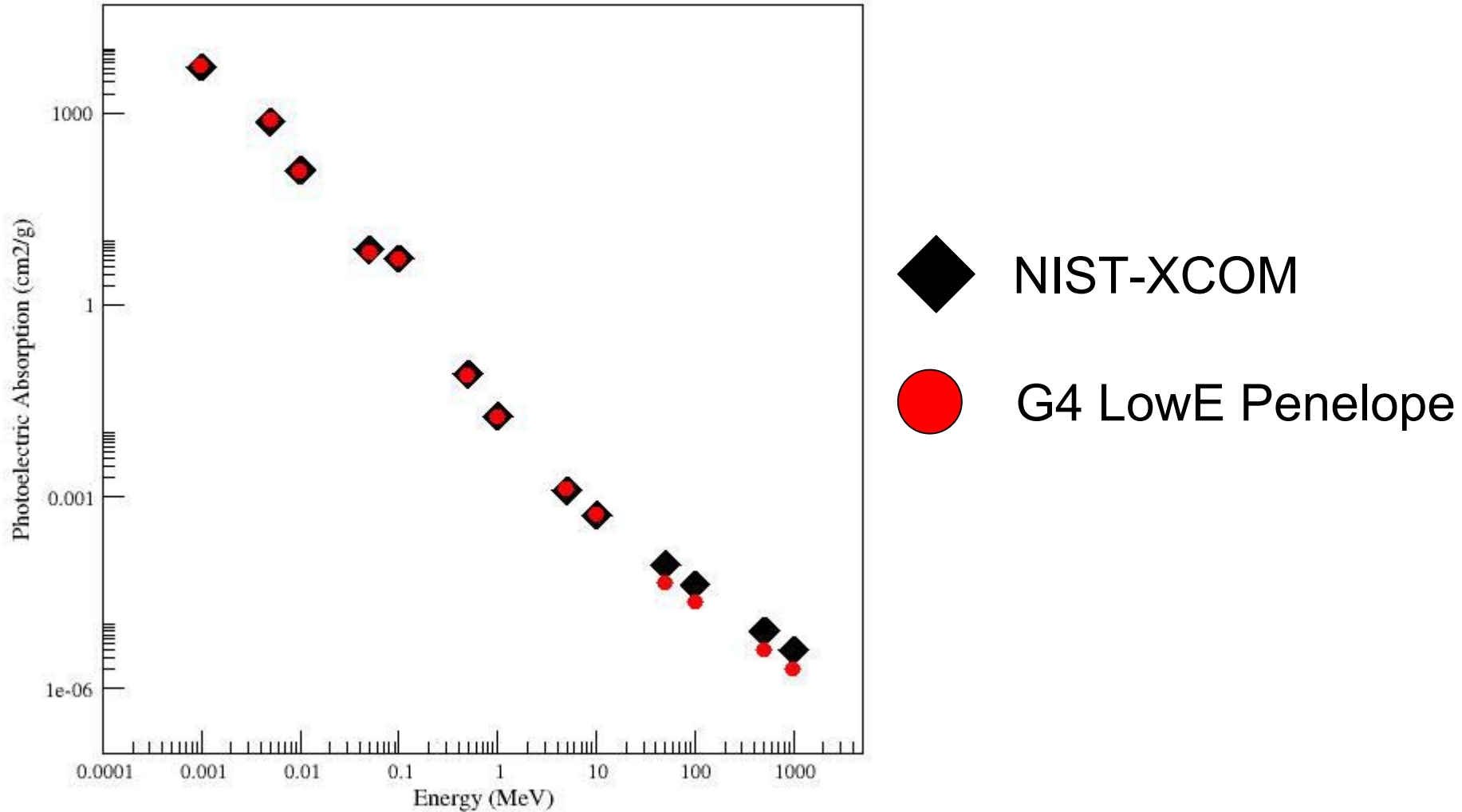
(Geant4-05-02)



# Photoelectric Absorption - Pb

Photons - Photoelectric Absorption - Lead

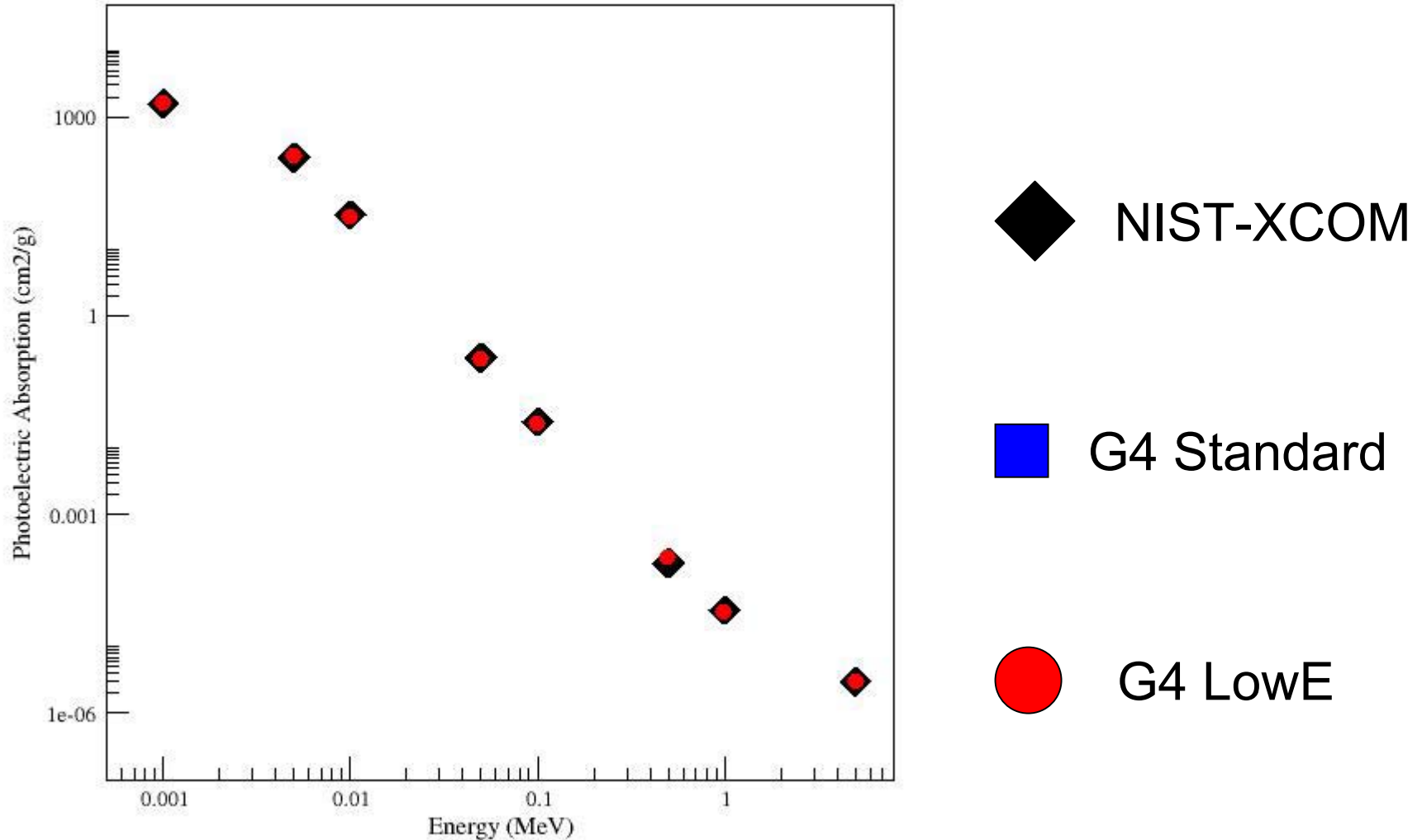
(Geant4-05-02)



# Photoelectric Absorption - Si

Photons - Photoelectric Absorption - Silicon

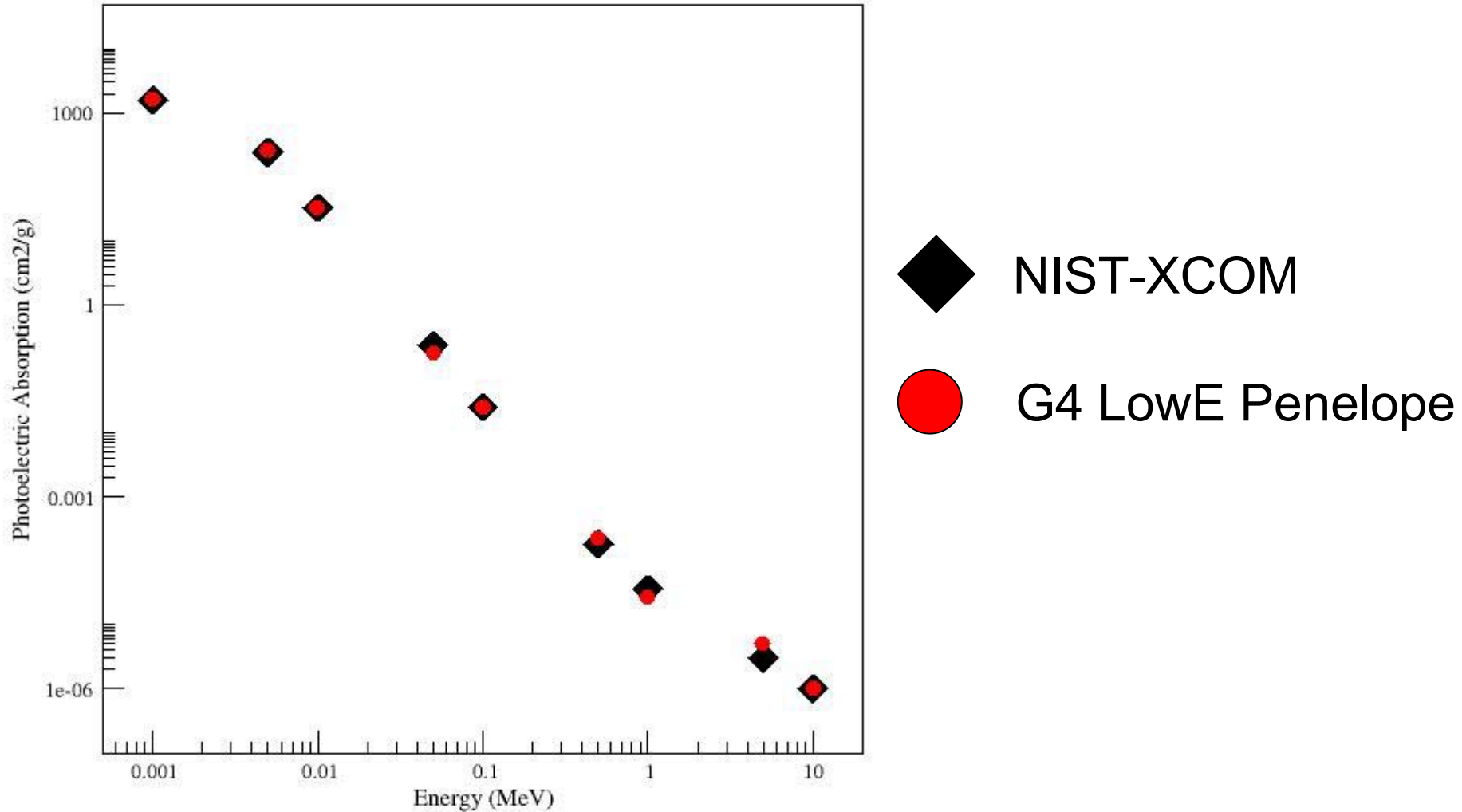
(Geant4-05-02)



# Photoelectric Absorption - Si

Photons - Photoelectric Absorption - Silicon

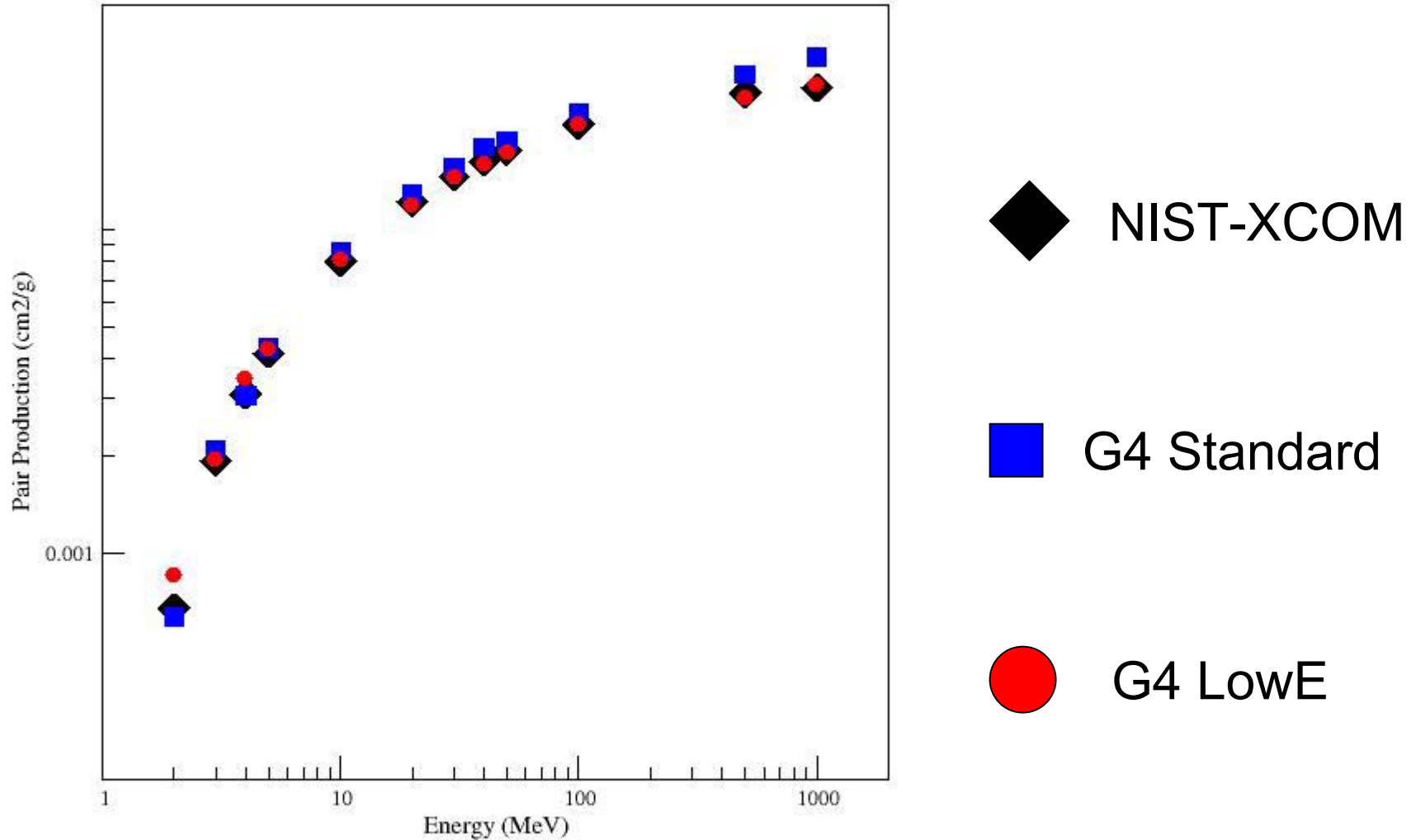
(Geant4-05-02)



# Pair Production - Al

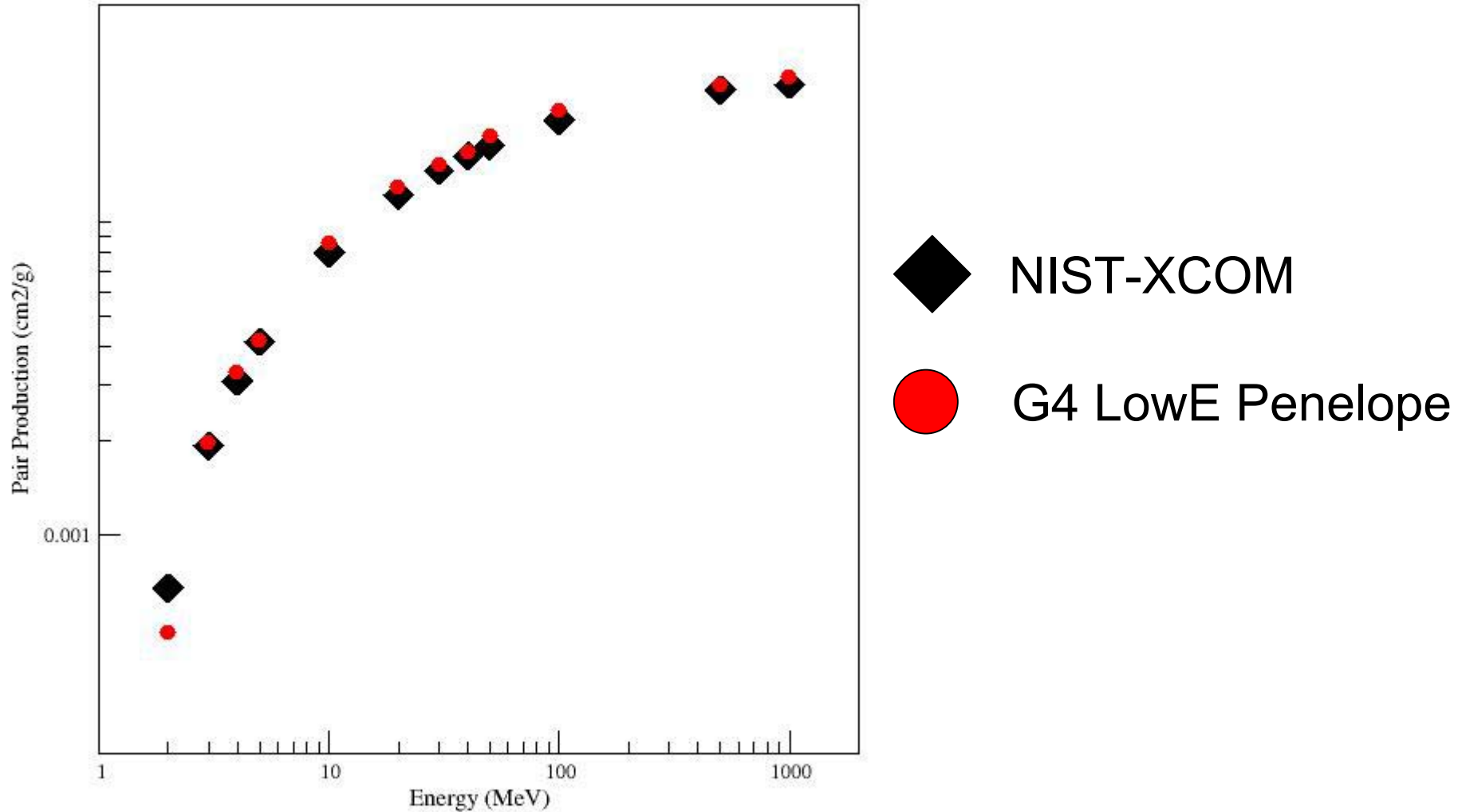
Photons - Pair Production - Aluminium

(Geant4-05-02)



# Pair Production - Al

Photons - Pair Production - Aluminium  
(Geant4-05-02)



# Pair Production - Au

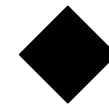
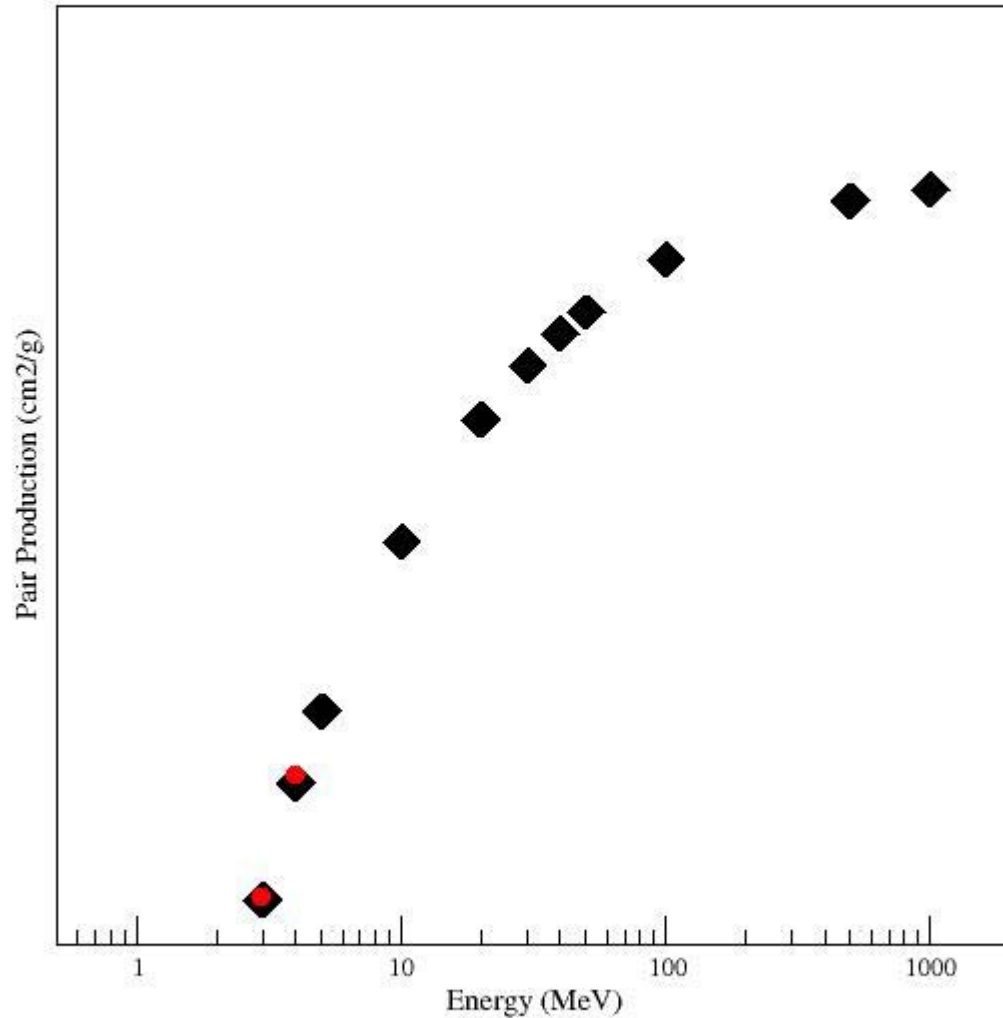
◆ NIST-XCOM

■ G4 Standard

● G4 LowE

# Pair Production - Au

Photons - Pair Production -Gold  
(Geant4-05-02)



NIST-XCOM



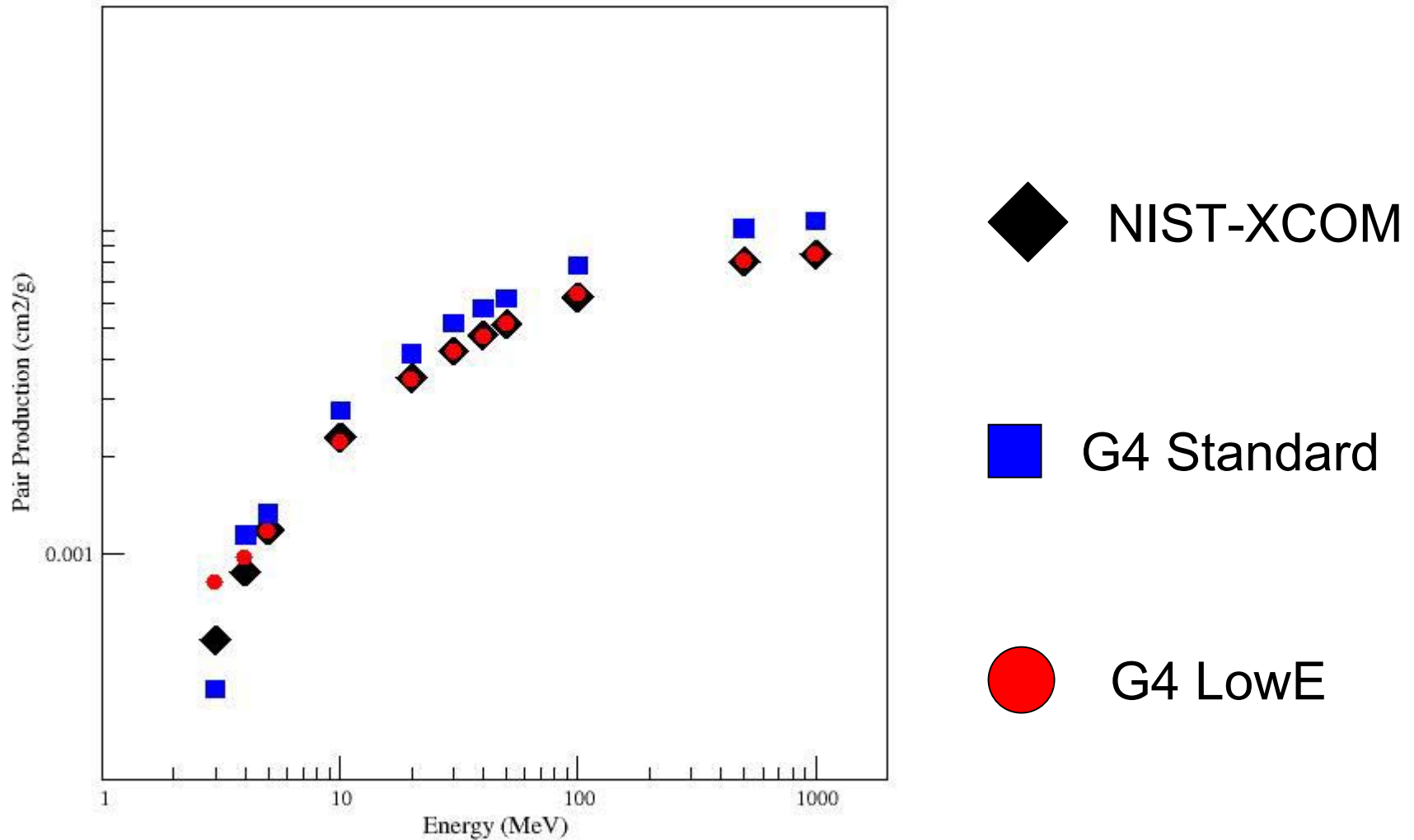
G4 LowE Penelope



# Pair Production - Be

Photons - Pair Production - Beryllium

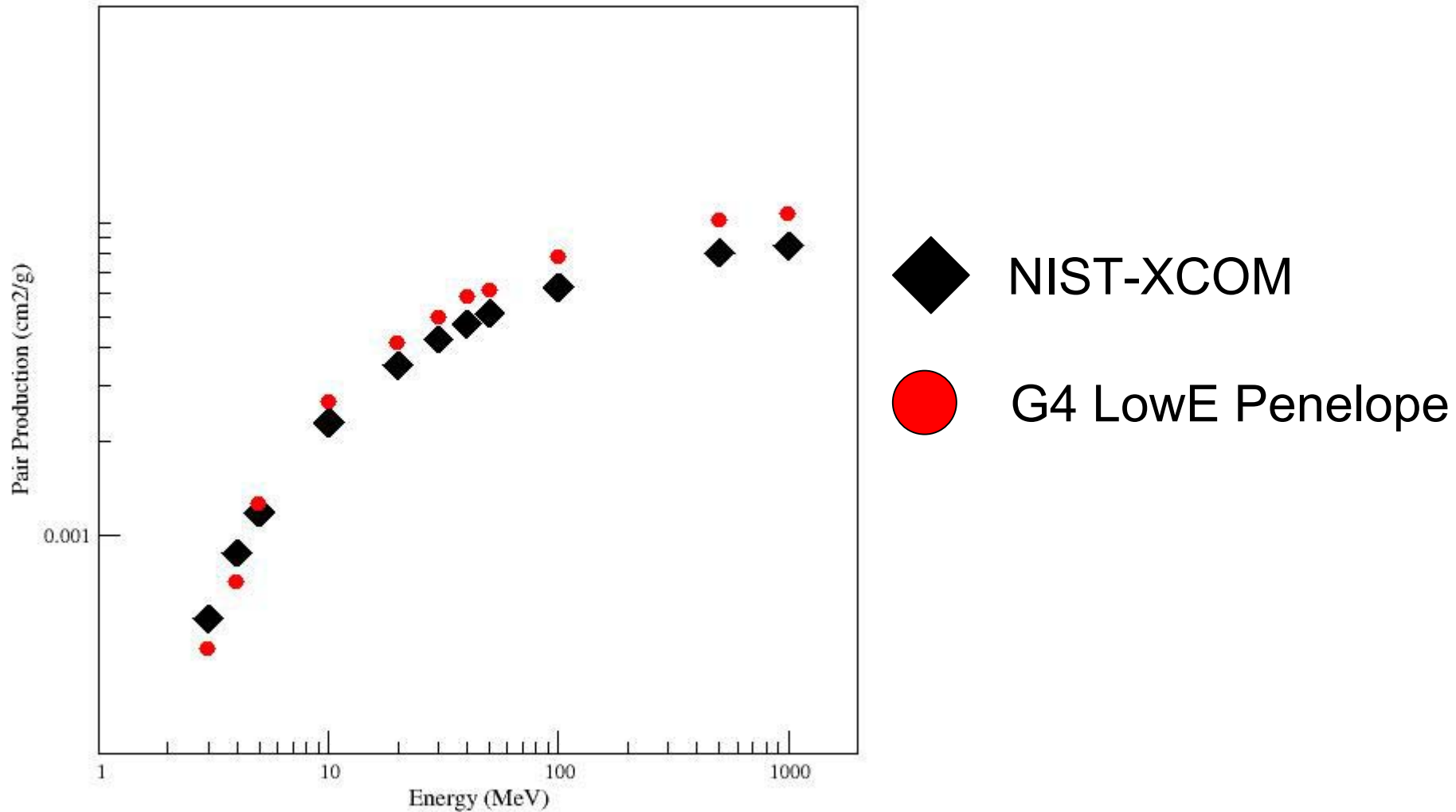
(Geant4-05-02)



# Pair Production - Be

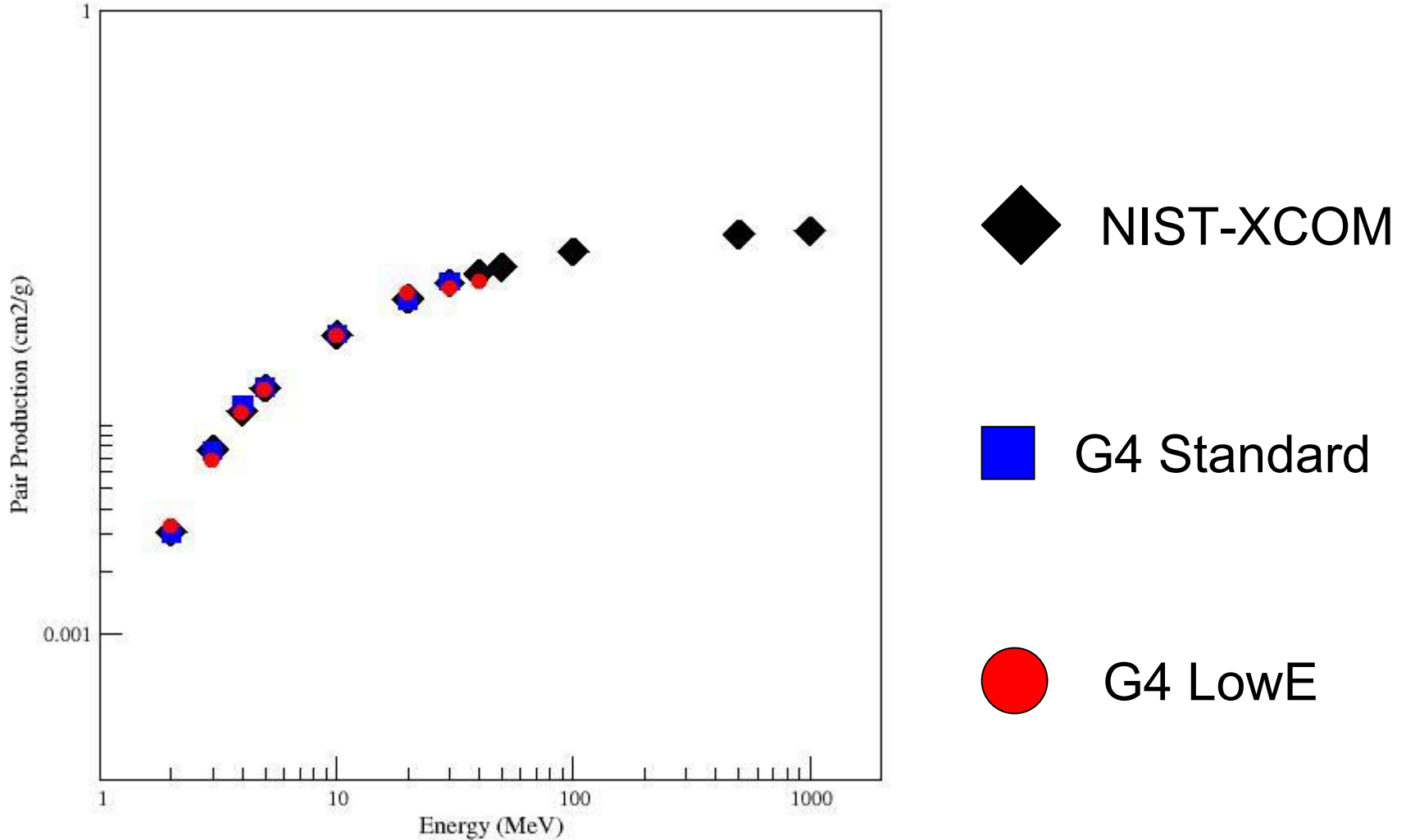
Photons - Pair Production - Beryllium

(Geant4-05-02)



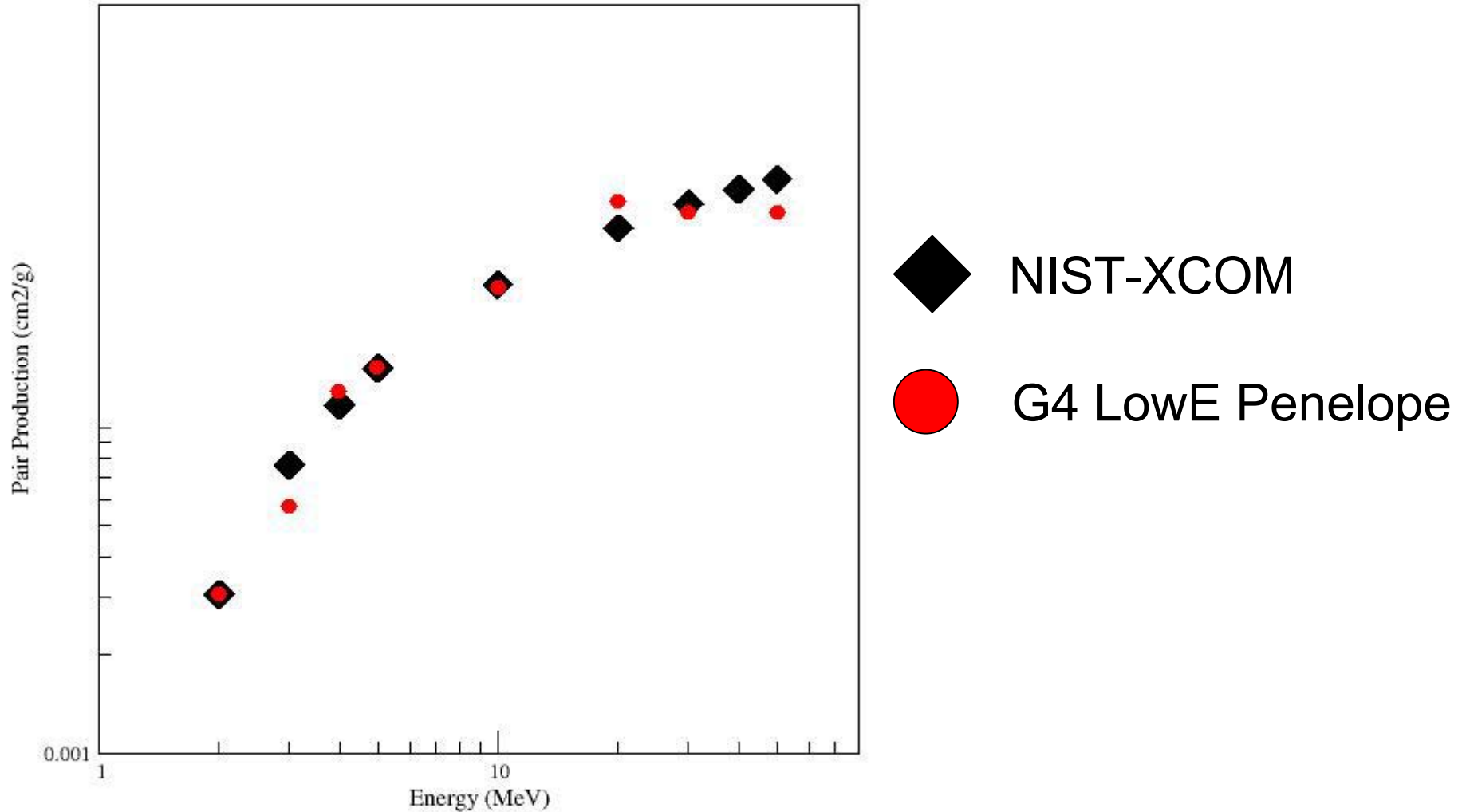
# Pair Production - Cs

Photons - Pair Production - Cesium  
(Geant4-05-02)



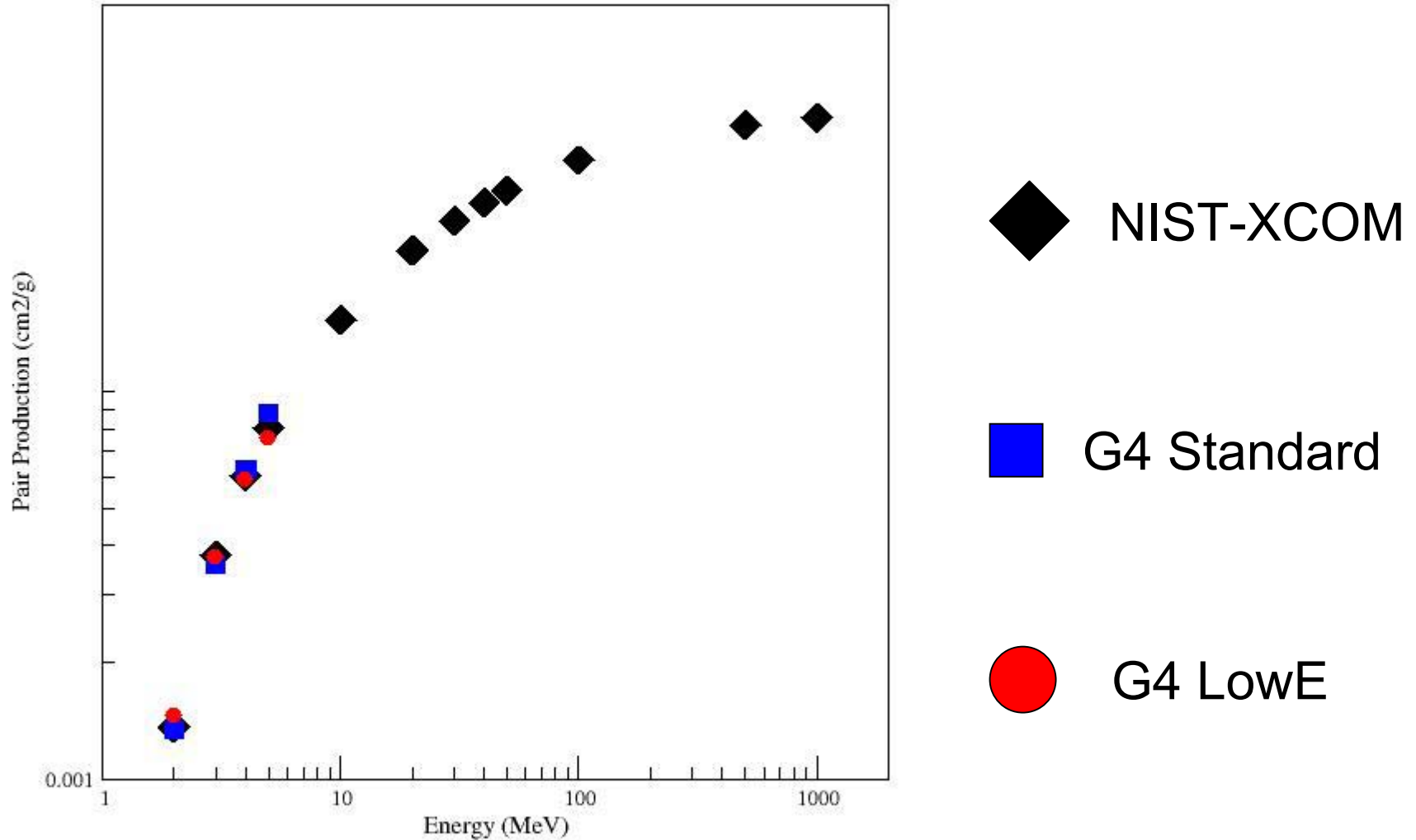
# Pair Production - Cs

Photons - Pair Production - Cesium  
(Geant4-05-02)



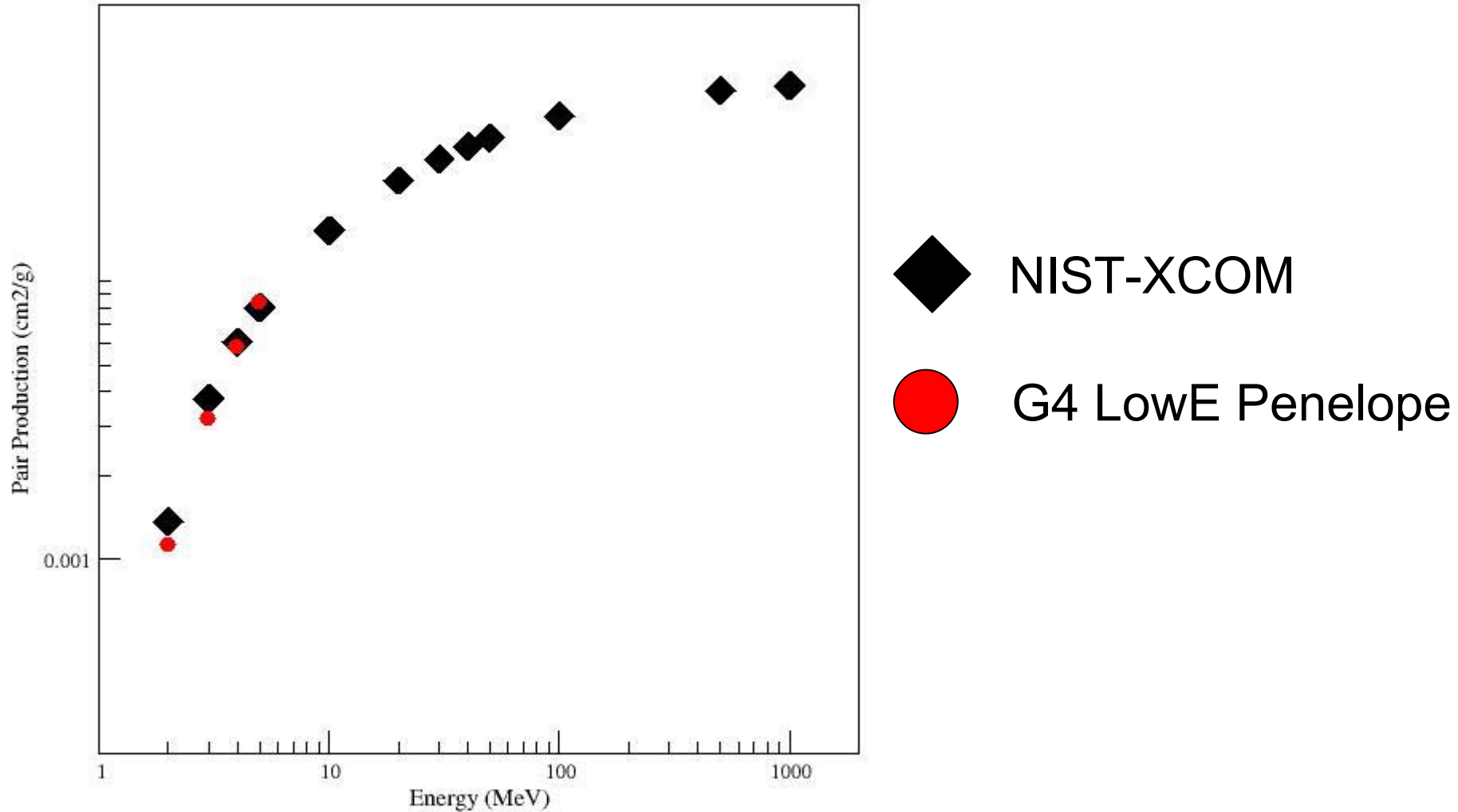
# Pair Production - Fe

Photons - Pair Production -Iron  
(Geant4-05-02)



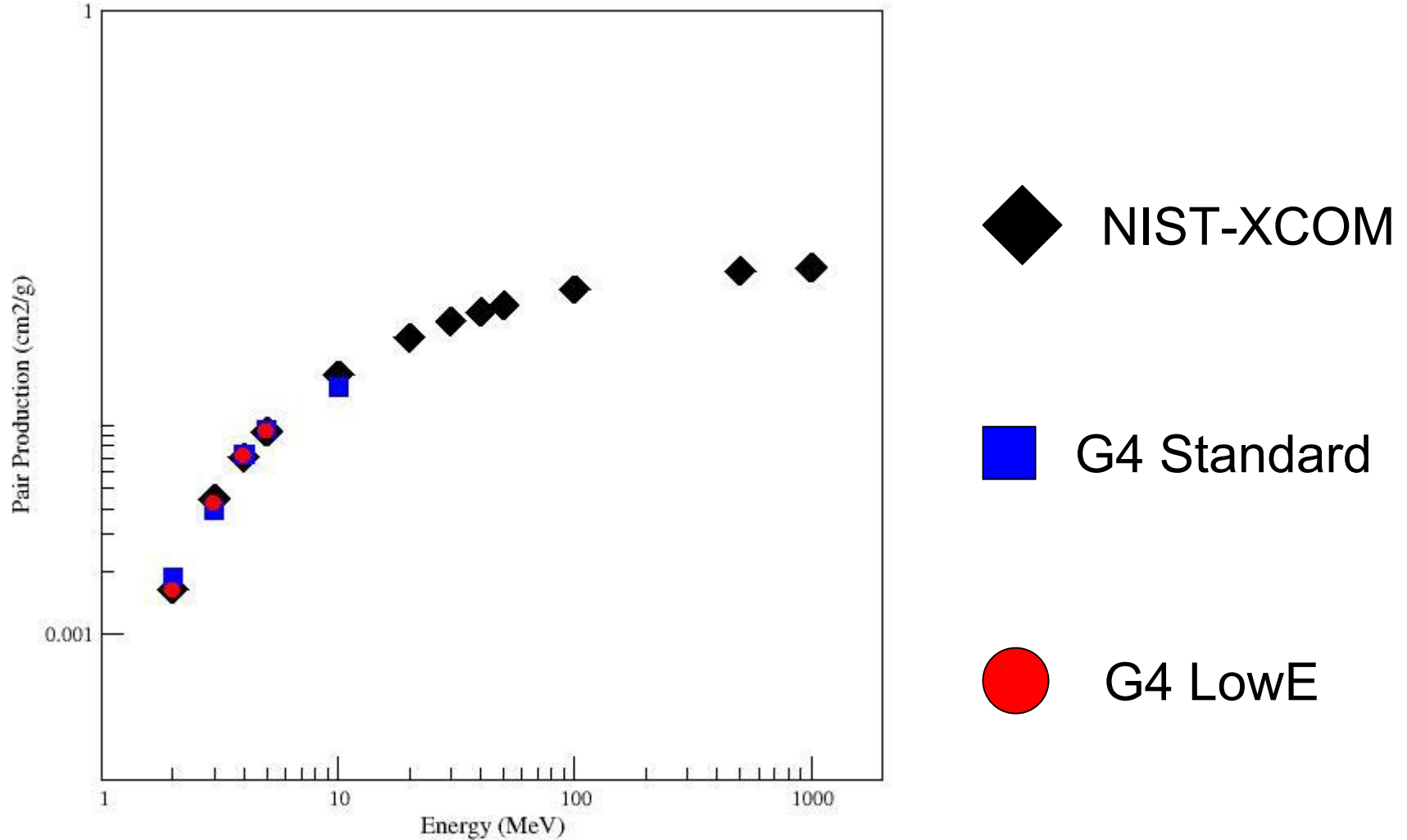
# Pair Production - Fe

Photons - Pair Production -Iron  
(Geant4-05-02)



# Pair Production - Ge

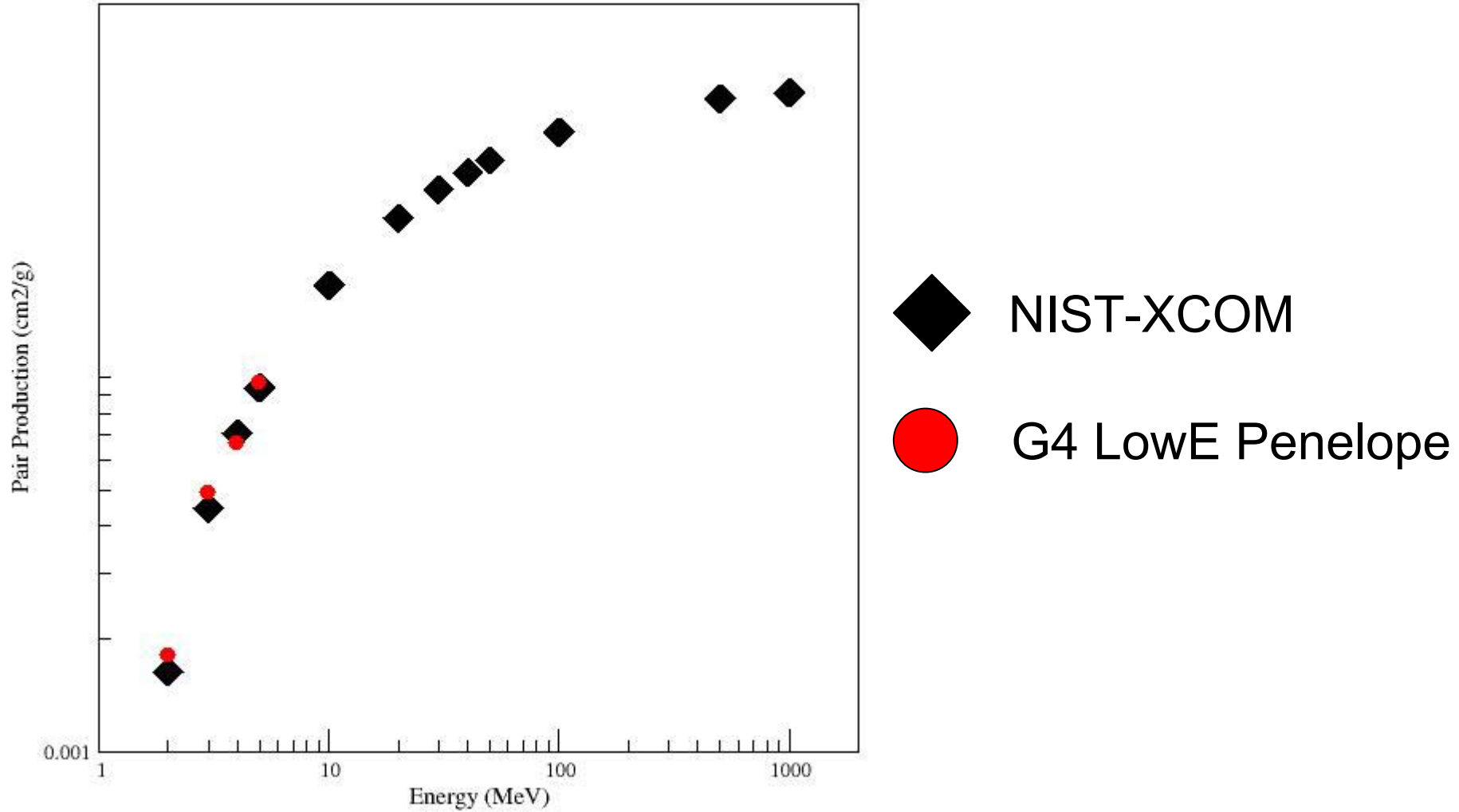
Photons - Pair Production - Germanium  
(Geant4-05-02)



# Pair Production - Ge

Photons - Pair Production - Germanium

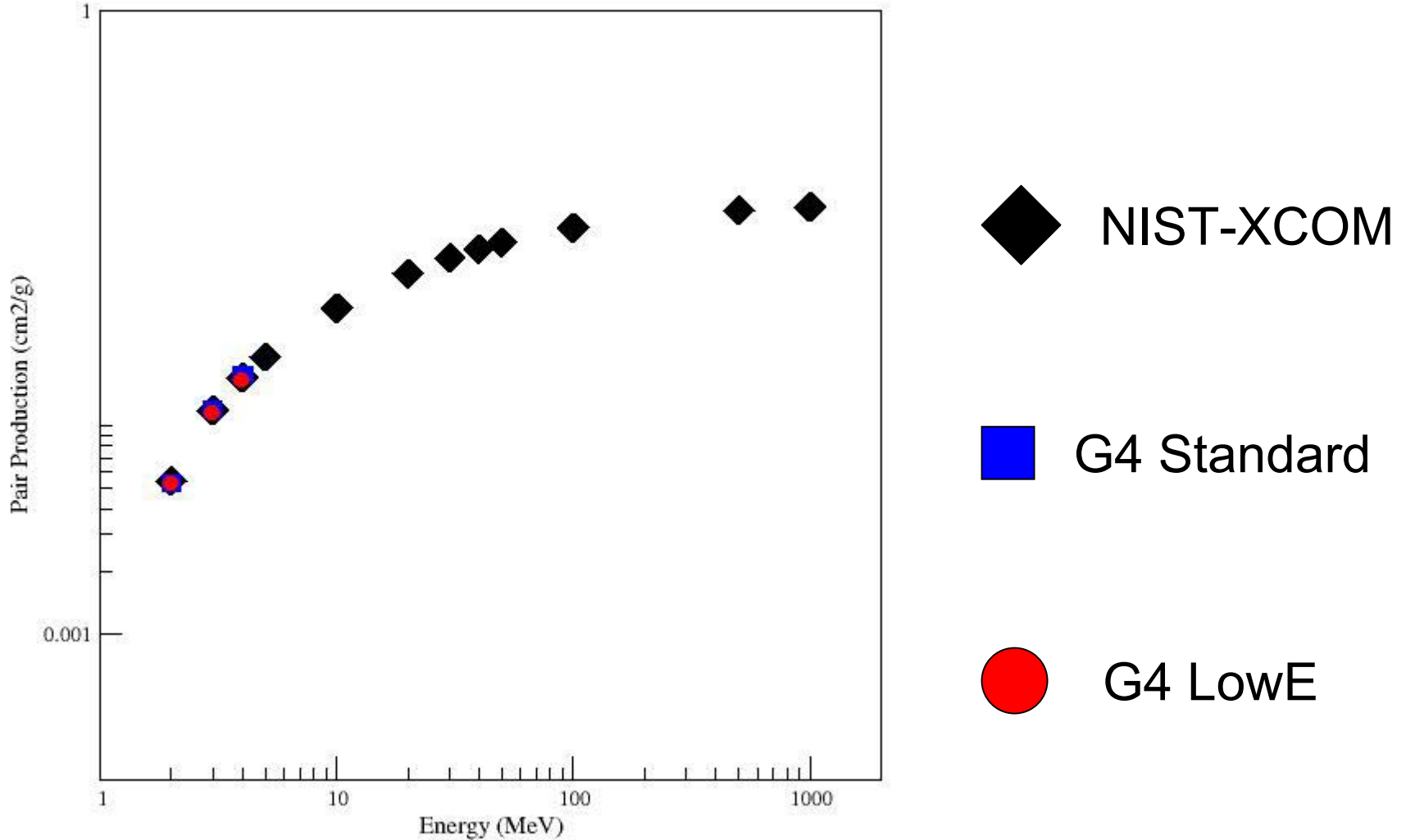
(Geant4-05-02)





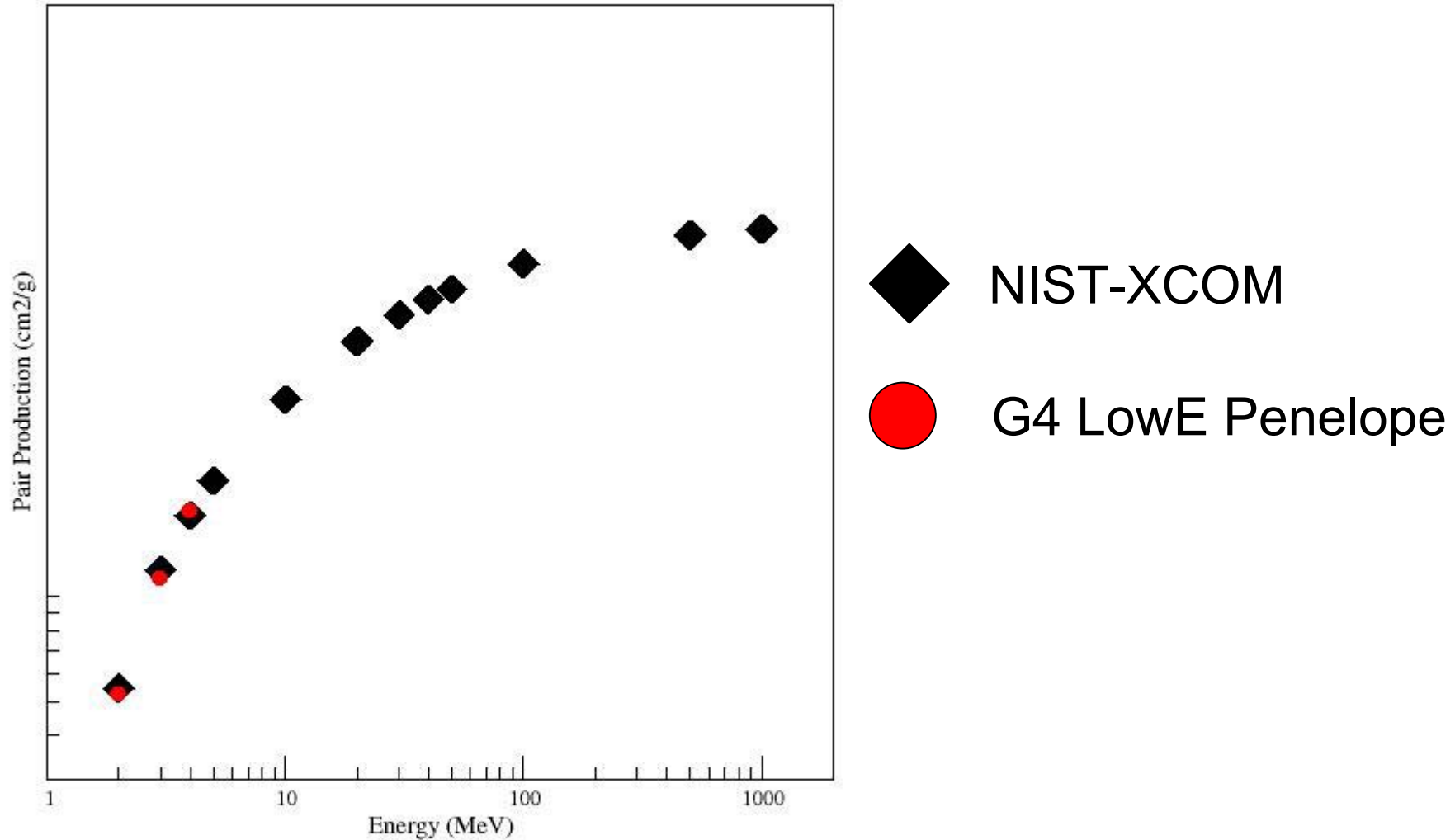
# Pair Production - Pb

Photons - Pair Production -Lead  
(Geant4-05-02)



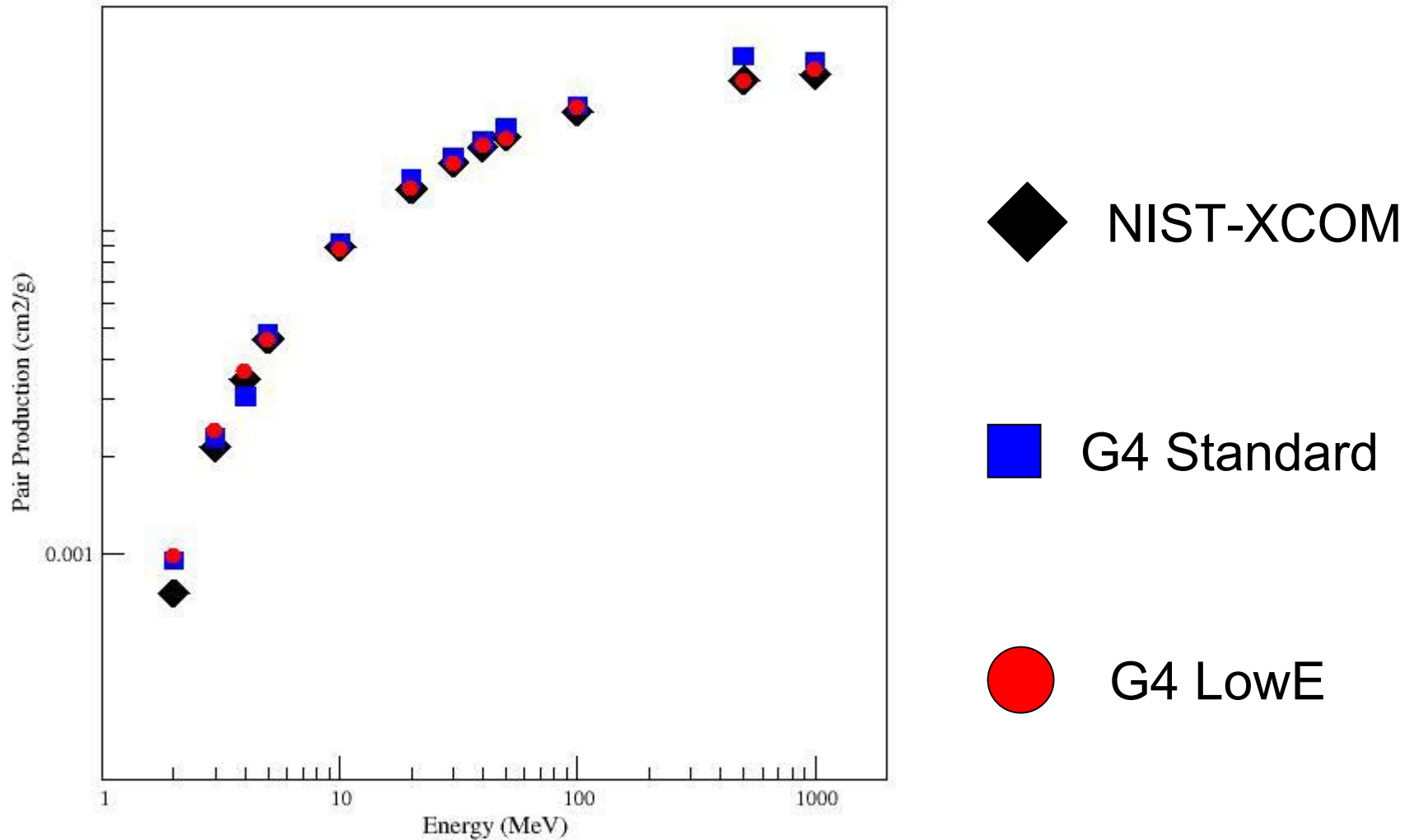
# Pair Production – Pb

Photons - Pair Production -Lead  
(Geant4-05-02)



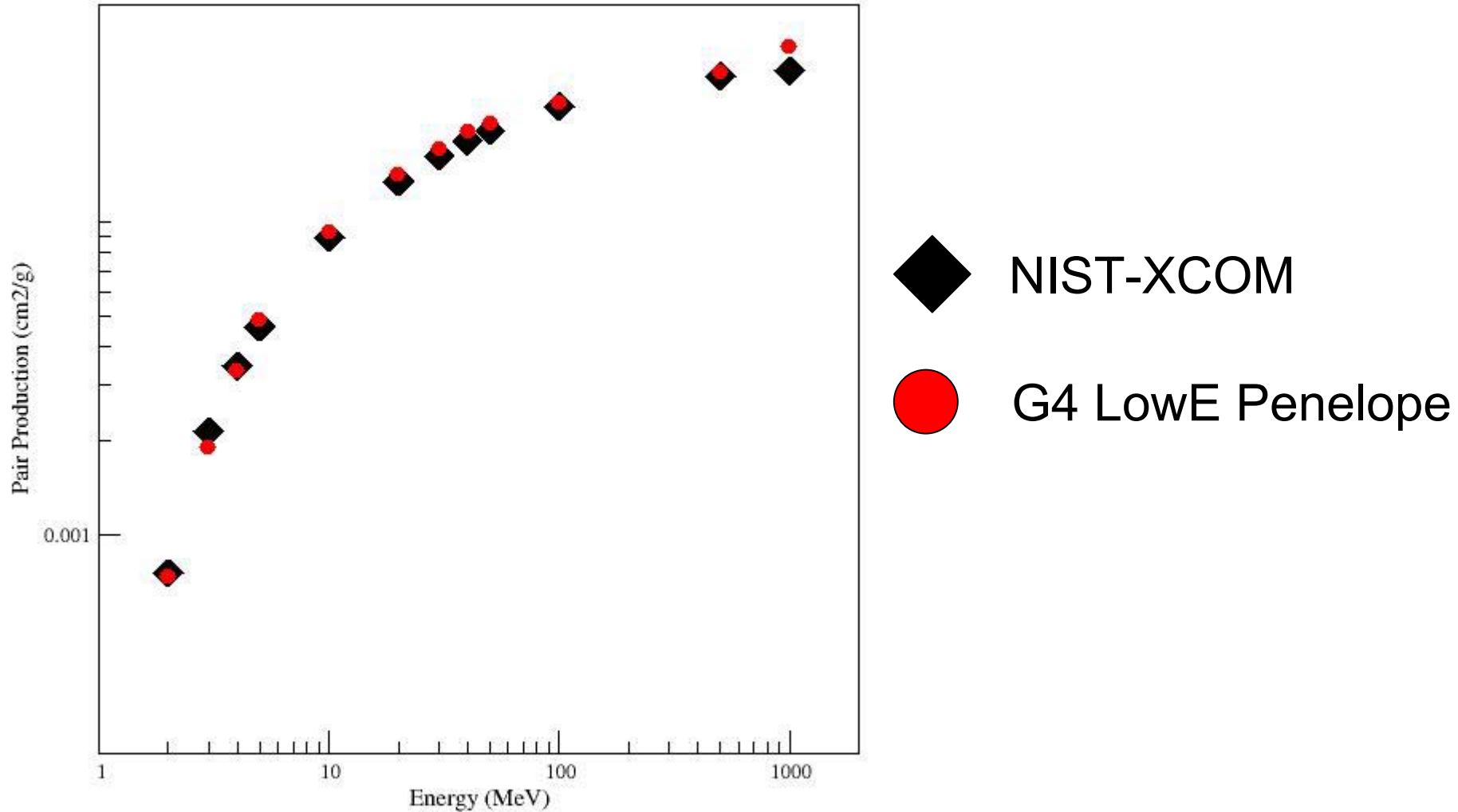
# Pair Production - Si

Photons - Pair Production - Silicon  
(Geant4-05-02)



# Pair Production – Si

Photons - Pair Production - Silicon  
(Geant4-05-02)

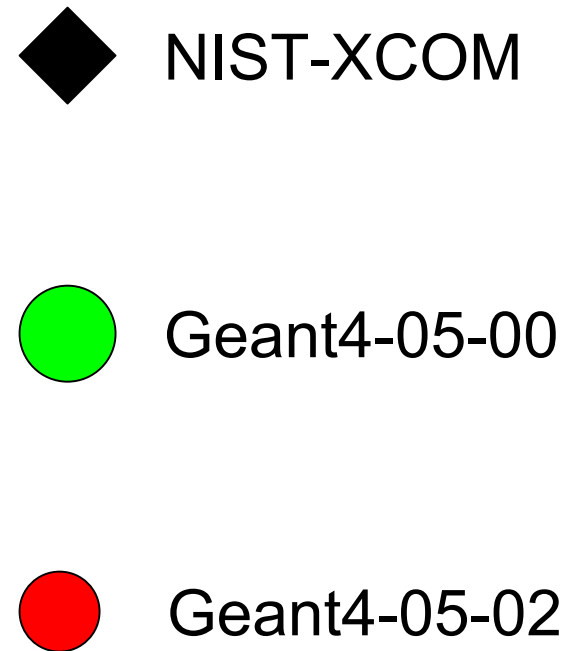
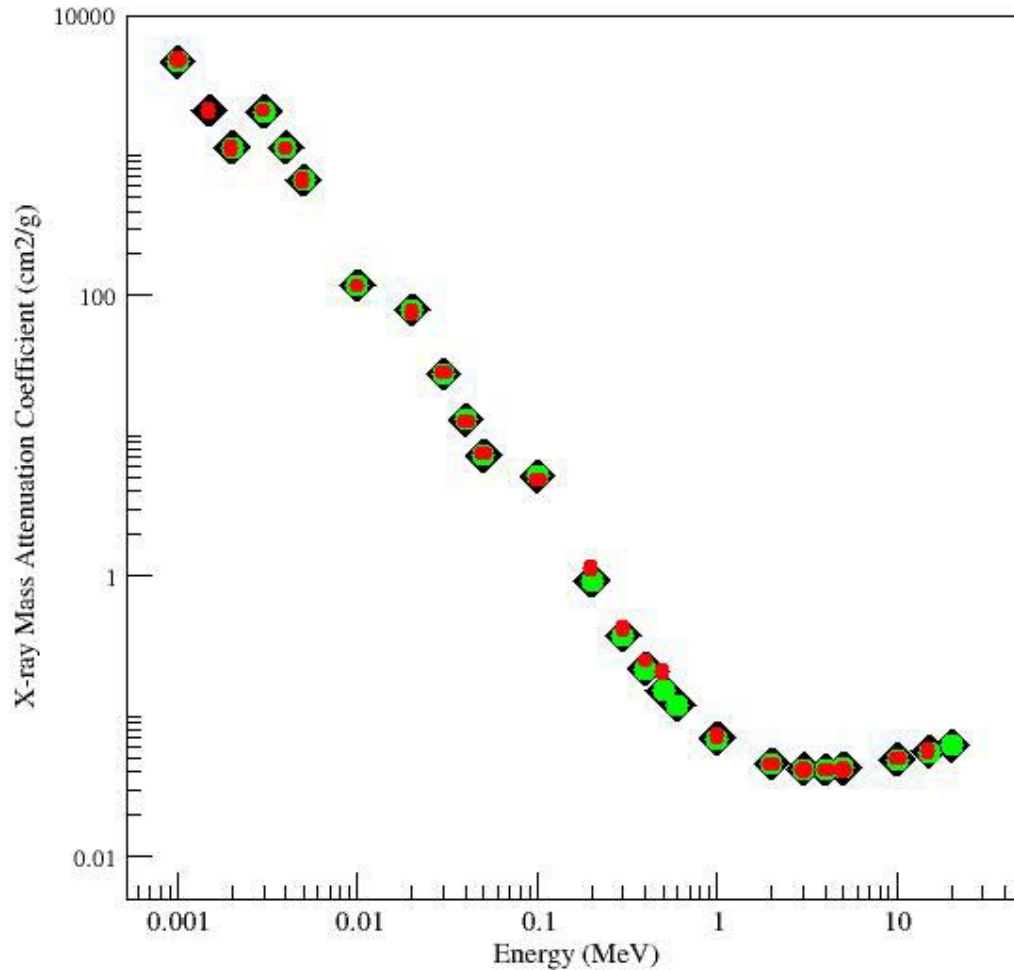


# REGRESSION TESTING

# Attenuation Coefficient – Au –G4LowE

X-ray - Attenuation Coefficient - Gold

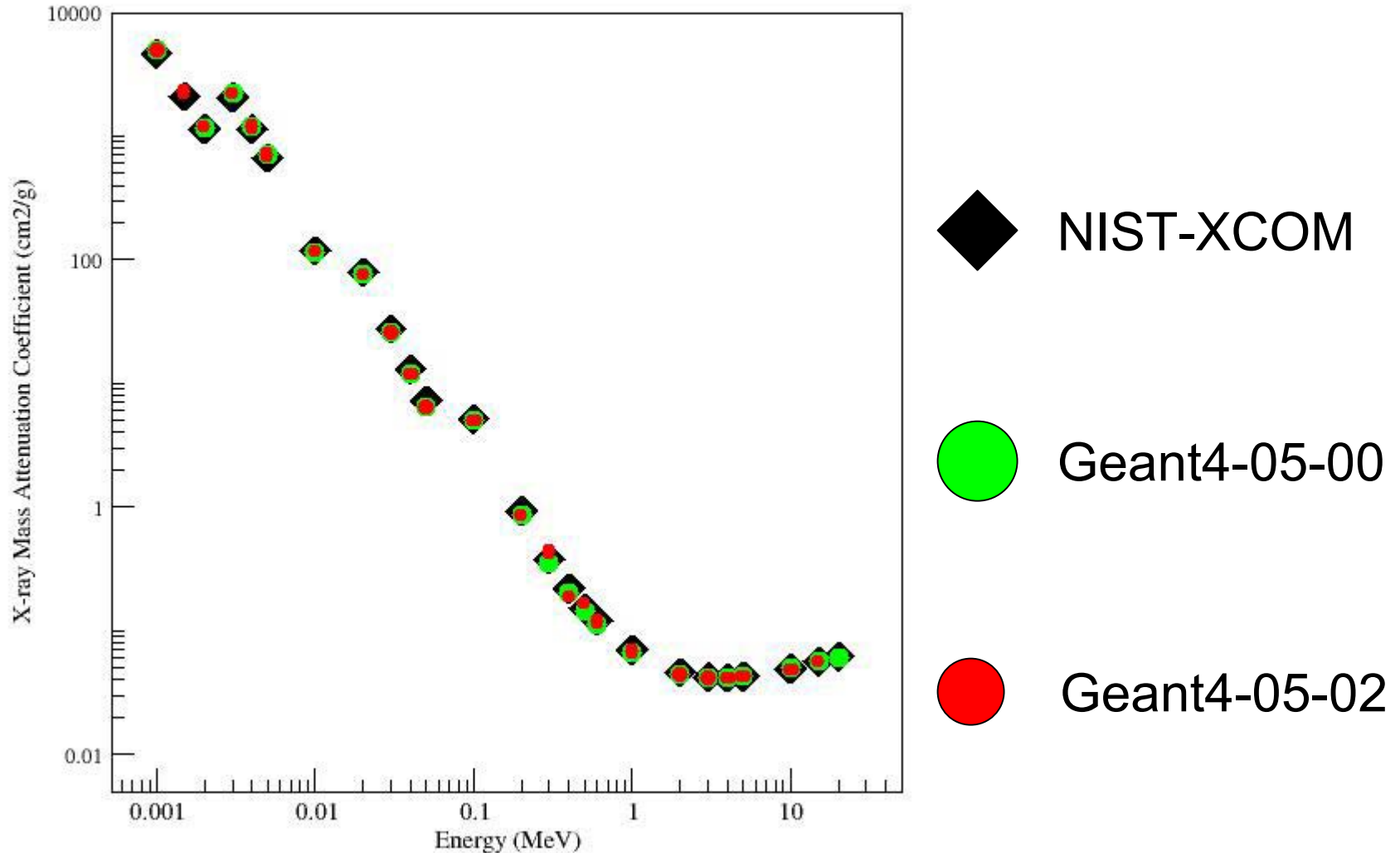
Regression Testing - G4LowE



# Attenuation Coefficient – Au G4Standard

X-ray - Attenuation Coefficient - Gold

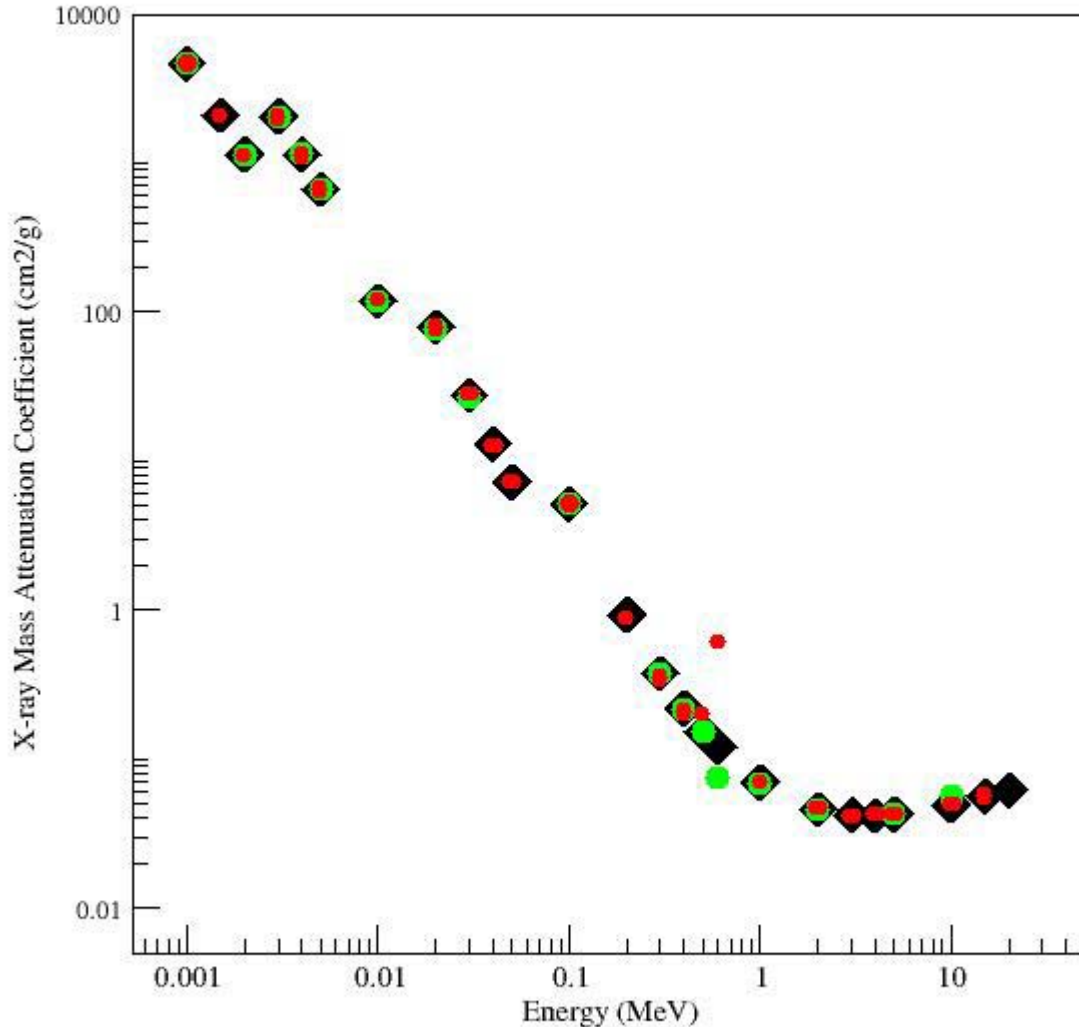
Regression Testing - G4Standard



# Attenuation Coefficient – Au –G4Penelope

X-ray - Attenuation Coefficient - Gold

Regression Testing - G4 Penelope Processes



- ◆ NIST-XCOM
- Geant4-05-00
- Geant4-05-02