

# GEANT4 MicroElec new example 2023

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# SEY calculations main features

## - stack of 6 layers

user defined thicknesses and materials with messenger and macro commands

```

/testem/det/setMat G4_Cu      #-----
/testem/det/setSize 500 nm   Energy loop
/testem/det/setWidth 500 nm #-----

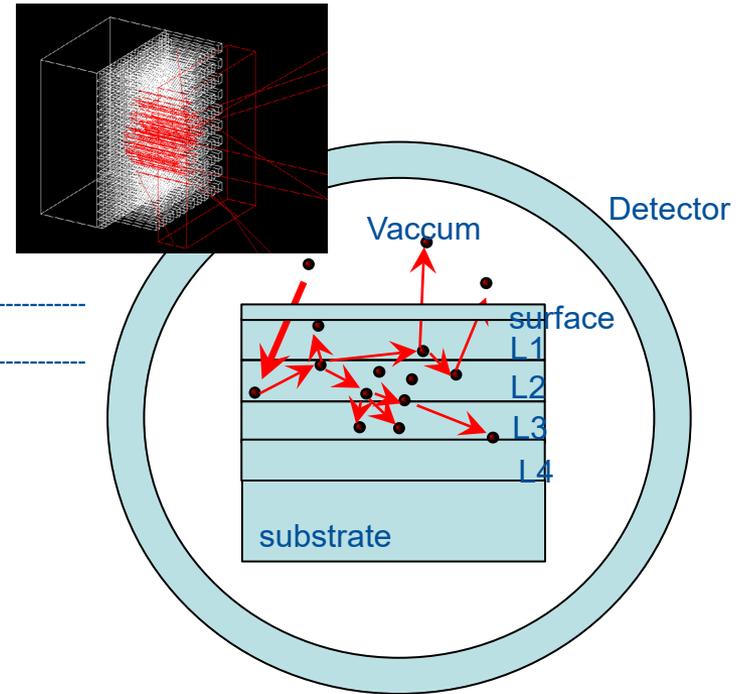
#Layer4 (Red)
/testem/det/setMatLayer4 G4_Cu /control/loop loop_ekin.mac Ekin 25 50 25
/testem/det/setSizeLayer4 4 nm /control/loop loop_ekin.mac Ekin 100 800 100
#Layer3 (Red)                /control/loop loop_ekin.mac Ekin 1000 3000 1000
/testem/det/setMatLayer3 G4_Cu
/testem/det/setSizeLayer3 4 nm
#Layer2 (Red)                /gps/ene/mono {Ekin} eV
/testem/det/setMatLayer2 G4_Cu /run/beamOn 3000
/testem/det/setSizeLayer2 2 nm
#Layer1 (Red)
/testem/det/setMatLayer1 G4_Cu
/testem/det/setSizeLayer1 5 nm
#Surface (Red)
/testem/det/setMatSurf G4_Al
/testem/det/setSizeLayer1 5 nm

/testem/det/update
    
```

## - Spherical detector with an automatically adapted ray

4 counters : primaries  
 secondaries  
 electrons with  $E > 50$  eV  
 total

Output data : CSV file generated with G4VAnalysisManager



```

#class tools::wcsv::ntuple
#title Sec. Ele. Emission
#separator 44
#vector_separator 59
#column double Initial energy (eV)
#column double TEEY
#column double SEEY
#column double BEEY
#column double EEY>50eV
25,0.665333,0.111667,0.553667,0
50,1.041,0.396333,0.644667,0.181667
100,1.634,1.00767,0.626333,0.205333
200,2.428,1.928,0.5,0.218333
300,2.82767,2.404,0.423667,0.240333
400,3.02067,2.67267,0.348,0.236333
500,2.97367,2.662,0.311667,0.230667
600,2.99867,2.71267,0.286,0.238333
700,2.89067,2.63433,0.256333,0.23
800,2.64967,2.40133,0.248333,0.241667
1000,2.462,2.23267,0.229333,0.228333
2000,1.531,1.333,0.198,0.232667
3000,1.15533,0.952333,0.203,0.234333
    
```

# SEY calculations tests

- **Multi threading mode**
- **New version of microelec enables the calculations in 17 materials**
  - Be, C, Al, Si, Ti, Fe, Ni, Cu, Ge, Ag, Au, W
  - Kapton, SiO<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub>, TiN, BN
- **Tested with GEANT4.11.1**
- **Tests performed on both Windows and Linux machines**
  - SEY compared to experimental data
  - Segmentation fault when Deleting RunManager (only in Linux) : must be fixed before the release

# Microelec Physics

## future improvements

- Creation of a new process to replace G4MicroelecCapture
  - withdrawing inheritance from G4ElectronCapture
- Elastic scattering energy losses neglected
  - Low energy recoils production must be enabled
  - electron beam damage processes
- e-[eV, 10 keV] may be re-extended up to 100 keV for some applications
- heavy ions [ $\sim 100$  eV, 10 MeV] ??
- Extending material database to new materials