e^- stopping power in gas

Jean Jacquemier, Michel Maire

LAPP (Annecy)

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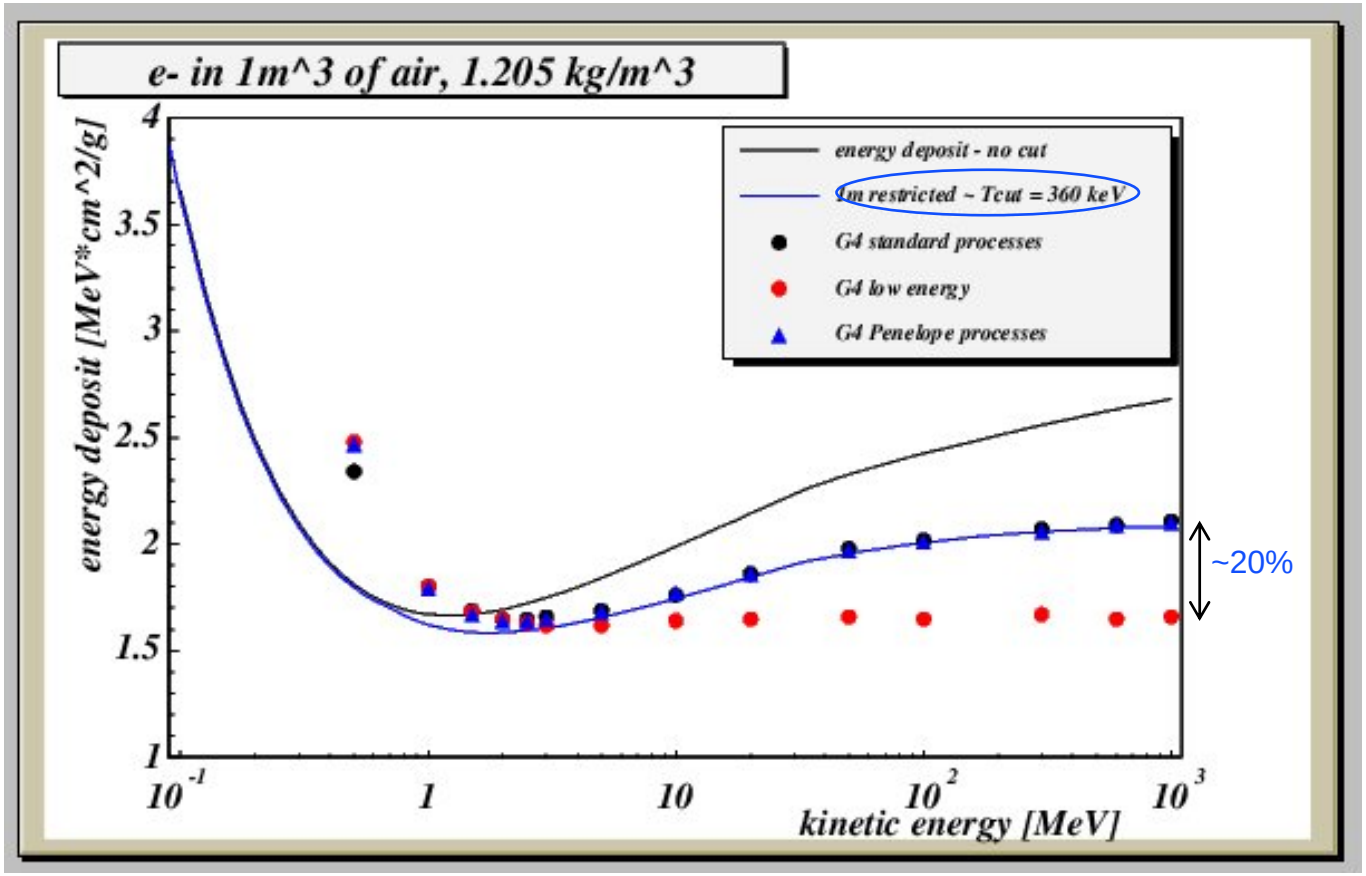
restricted dE/dx in air



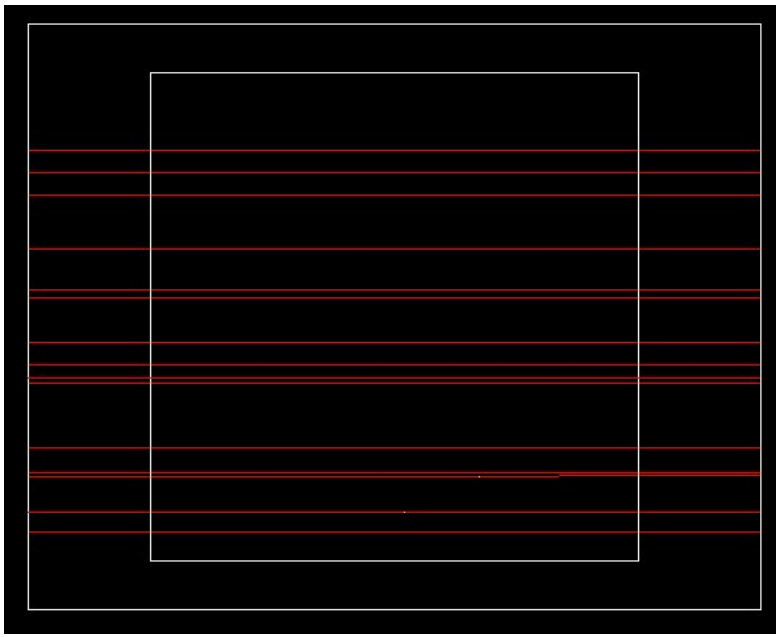
From Martina Bohacova (September 2005)

Does it happen only in case of gases, or more general ?

With TestEm5, we computed it for liquid and gas :

	density	thickness	cut ~ 80 keV
water liquid	1 g/cm^3	2 mm	100 um
water vapor	1 mg/cm^3	1 m	10 cm

e^- stopping power in gas



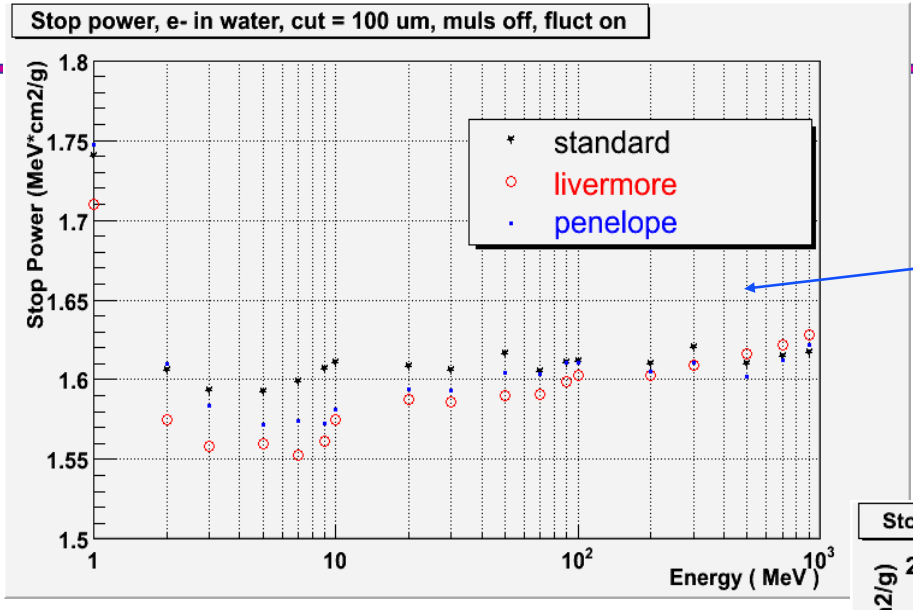
```
# macro file for TestEm5.cc
#
# to control dE/dx calculation
#
/control/verbose 2
/run/verbose 2
#
/testem/det/setAbsMat WaterSteam
/testem/det/setAbsThick 1 m
/testem/det/setAbsYZ    1 m
#
###/testem/phys/addPhysics standard
/testem/phys/addPhysics livermore
###/testem/phys/addPhysics penelope
#
/testem/phys/setCuts 10 cm
#
/run/initialize
#
/process/inactivate msc
#
/testem/gun/setDefault
/gun/particle e-
/gun/energy 100 MeV
#
/testem/stack/killSecondaries 2
#
/run/beamOn 2000
```

~ 80 keV

to take into account only continuous energy loss

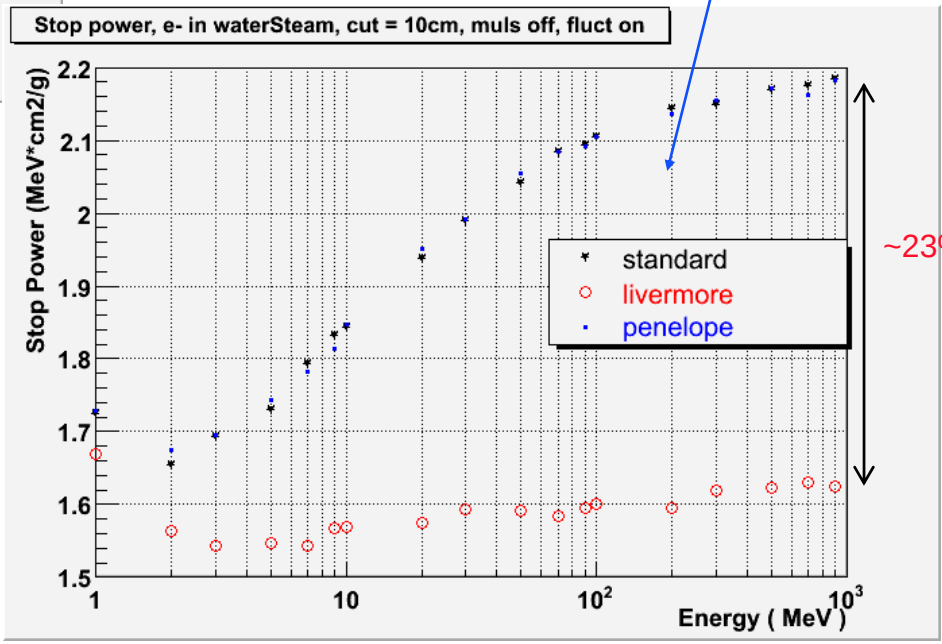
```
========================= run summary ======================

The run was 2000 e- of 100 MeV through 1 m   of WaterSteam (density: 1 mg/cm3)

Total energy deposit in absorber per event = 160.8 keV +- 620.4 eV
-----> Mean dE/dx = 0.001608 MeV/cm    (1.608 MeV*cm2/g)

From formulas :
  restricted dEdx = 0.001617 MeV/cm    (1.617 MeV*cm2/g)

 User=0.03s Real=1.32s Sys=1.28s
```

restricted dE/dx



liquid

vapor



from nist → e^- 100 MeV in water,

full collision stopping power :

liquid : 2.202 MeV cm^2/g

vapor : 2.726 MeV cm^2/g

~23%

conclusion

- In the Livermore data base, the restricted stopping power of electron in gases is off by ~20%