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# Simulation of 2D Silicon MESFET using GNU/Archimedes

J.M.Sellier[1]

Dipartimento di Matematica e Informatica, Universita' di Catania, Italy,
sellier@dmi.unict.it,
www.gnu.org/software/archimedes

**Summary.** GNU/Archimedes is the GNU Free Software for the design and simulation of Semiconductor devices. Here we show, briefly, how it is possible to simulate a 2D Silicon MESFET just typing a very simple script describing the MESFET. All the relevant scattering phenomena are taken into account in order to obtain a realistic simulation of the Electron-Dynamics. You can find the GNU/Archimedes package at the following web site:
www.gnu.org/software/archimedes

## 1.1 Introduction

Using GNU/Archimedes is very simple. Indeed, in order to describe a semiconductor device, one only needs to type a brief script in which the description of the device is reported in a simple scripting language. We report, in the following, a brief script usefull for the simulation of a 2D Silicon MESFET.

```
# Silicon MESFET test-1
# created on 22 sep.2004, J.M.Sellier
# modified on 21 oct.2004, J.M.Sellier

MATERIAL SILICON
TRANSPORT ELECTRONS

FINALTIME 6.0e-12
TIMESTEP 0.0015e-12

XLENGTH 0.6e-6
YLENGTH 0.2e-6

XSPATIALSTEP 120
YSPATIALSTEP 40
```

```
# Definition of the doping concentration
# =====================================
DONORDENSITY    0.       0.         0.6e-6    0.2e-6    1.e23
DONORDENSITY    0.       0.15e-6    0.1e-6    0.2e-6    3.e23
DONORDENSITY    0.5e-6   0.15e-6    0.6e-6    0.2e-6    3.e23
ACCEPTORDENSITY 0.       0.         0.6e-6    0.2e-6    1.e20

# Definition of the various contacts
# ==================================
CONTACT DOWN  0.0    0.6e-6 INSULATOR 0.0
CONTACT LEFT  0.0    0.2e-6 INSULATOR 0.0
CONTACT RIGHT 0.0    0.2e-6 INSULATOR 0.0
CONTACT UP    0.1e-6 0.2e-6 INSULATOR 0.0
CONTACT UP    0.4e-6 0.5e-6 INSULATOR 0.0
CONTACT UP    0.0    0.1e-6 OHMIC     0.0 3.e23
CONTACT UP    0.2e-6 0.4e-6 SCHOTTKY -1.3
CONTACT UP    0.5e-6 0.6e-6 OHMIC     1.0 3.e23

NOQUANTUMEFFECTS
MAXIMINI
# SAVEEACHSTEP

LATTICETEMPERATURE 300.

STATISTICALWEIGHT 1000
MEDIA 500

OUTPUTFORMAT GNUPLOT

# end of MESFET test-1
```

## 1.2 GNU/Archimedes Simulation Results

We report, in the following, some pictures which show the results obtainable with GNU/Archimedes.

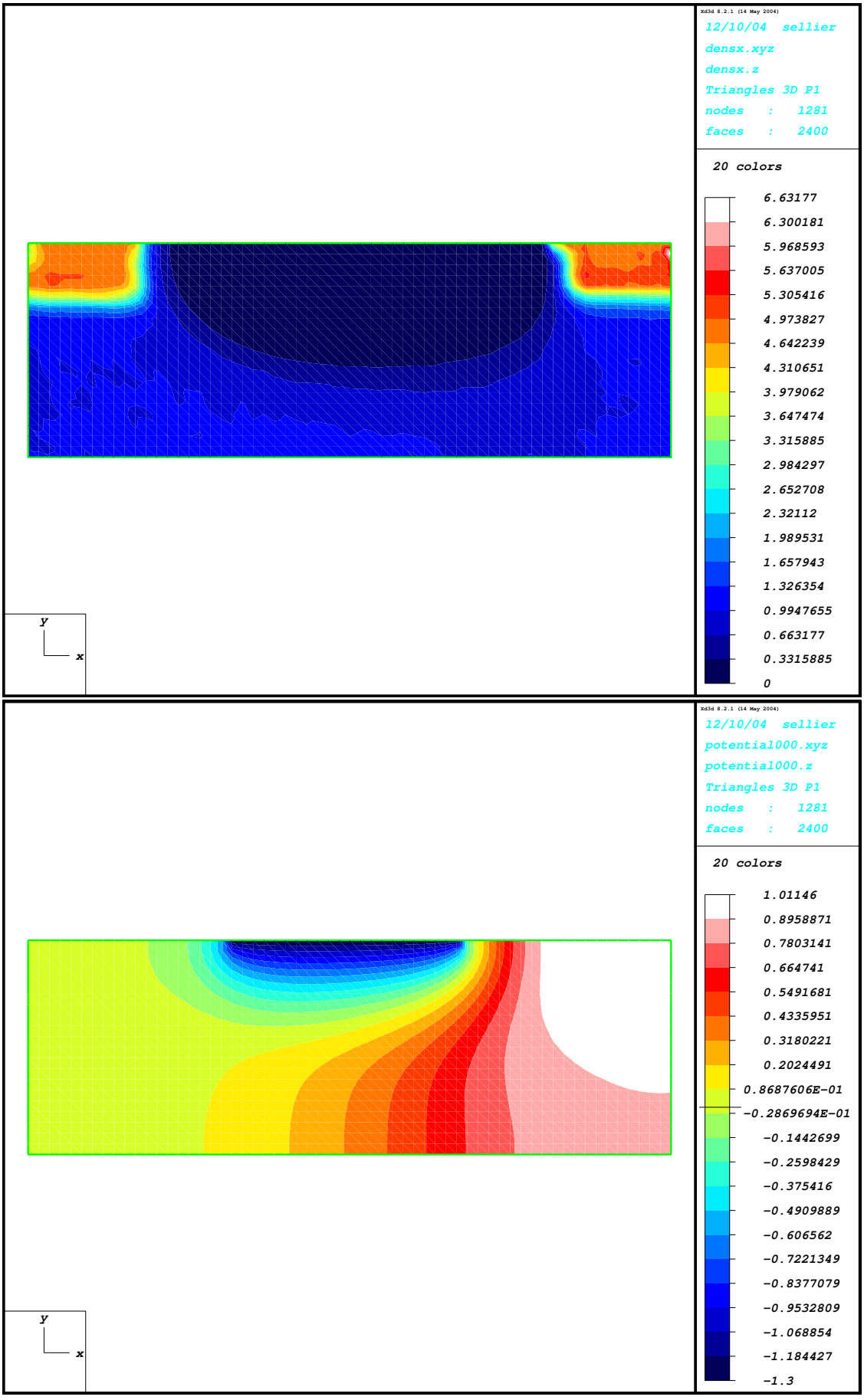
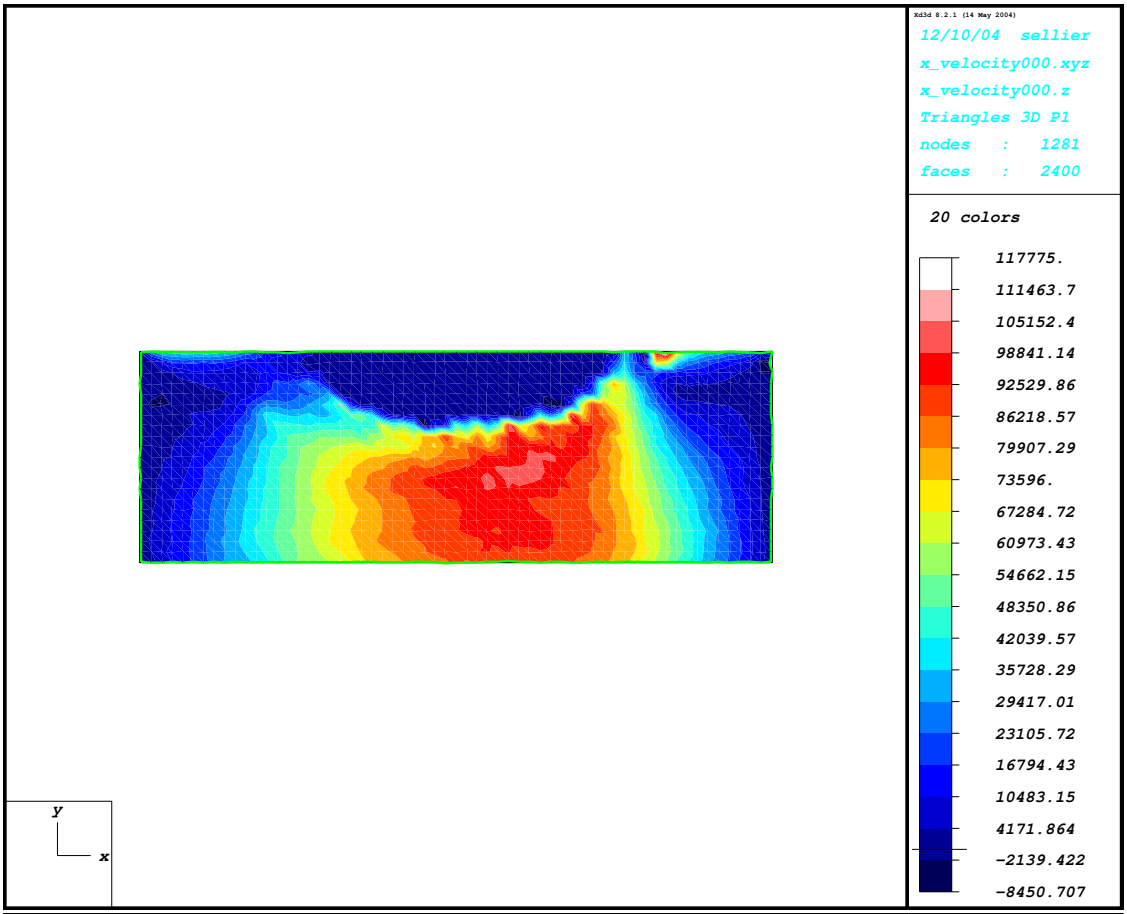



**Fig. 1.1.** Plot of the MESFET density and potential obtained by GNU/Archimedes.



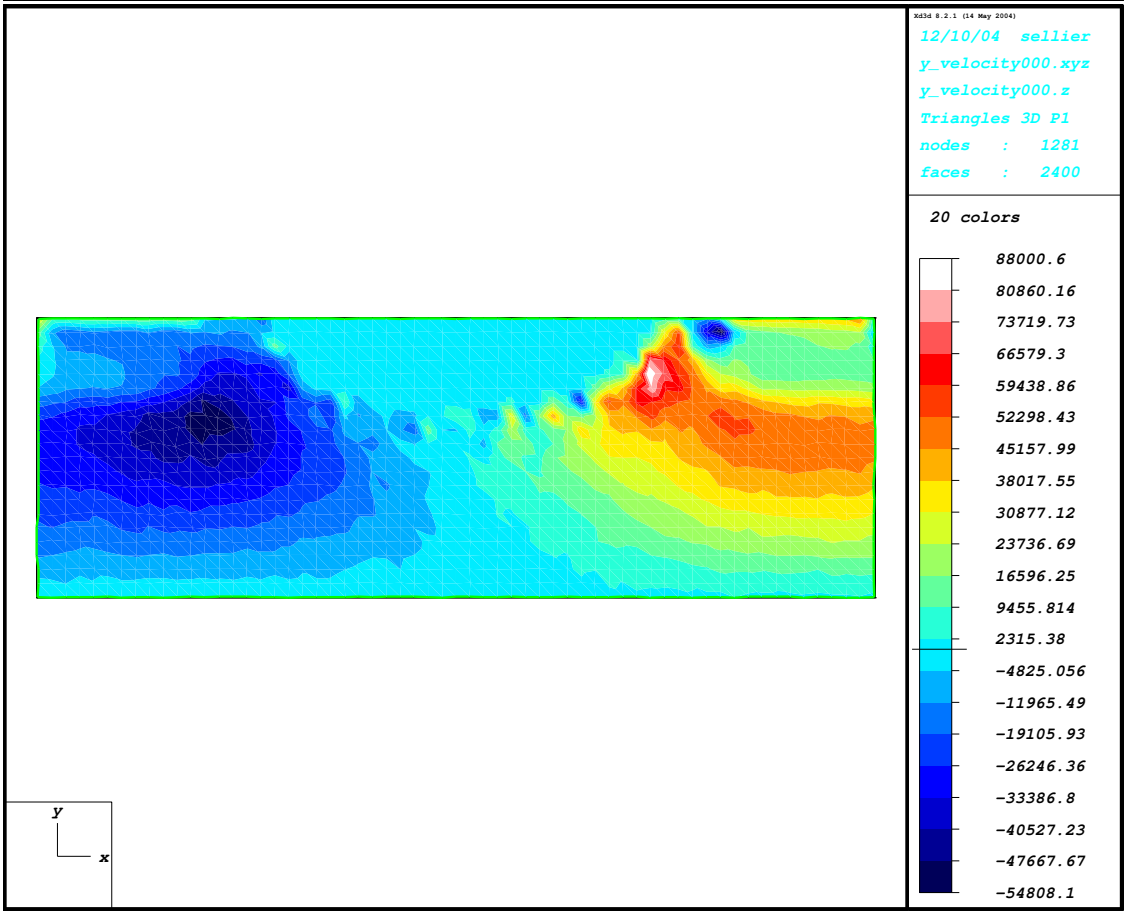




**Fig. 1.2.** Plot of the MESFET x and y-component of velocity obtained by GNU/Archimedes.

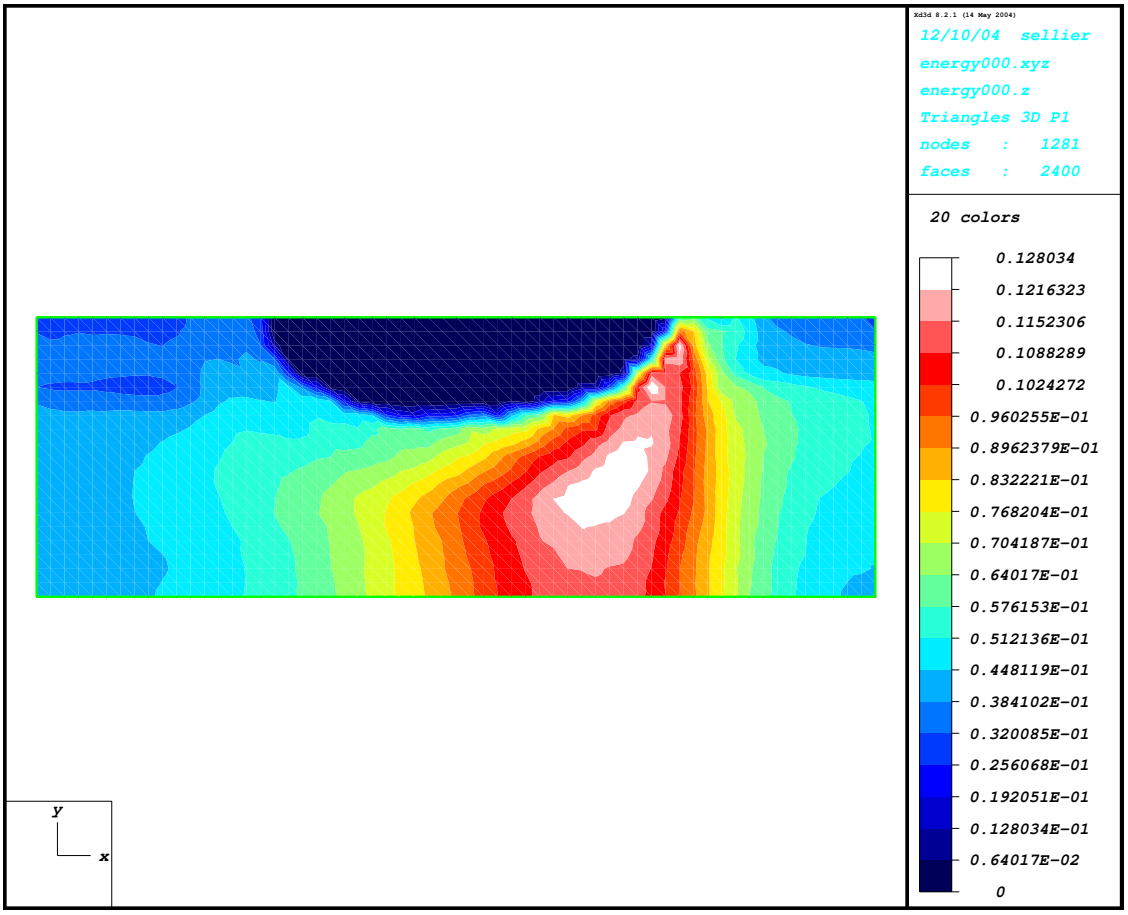



**Fig. 1.3.** Plot of the MESFET electron energy obtained by GNU/Archimedes.