Homework #12

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Introduction

We calculated the electron density with nonlinear Poisson equation and self-consistent solution. And compare those two values with 6 different condition.

    (1) For 600 nm long version

        100 nm: Highly doped (5×10^{17} cm^{-3})

        400 nm: Lowly doped (2×10^{15} cm^{-3})

        100 nm: Highly doped (5×10^{17} cm^{-3})

With delta x variations, 0.5 nm, 1 nm, and 10 nm

    (2) For 120 nm short version

        40 nm: Highly doped (5×10^{19} cm^{-3})

        40 nm: Lowly doped (2×10^{17} cm^{-3})

        40 nm: Highly doped (5×10^{19} cm^{-3})

With delta x variations, 0.2 nm, 1 nm, and 5 nm

Result

  I plotted the result solved with self-consistent method with red line and nonlinear poisson with blue line.
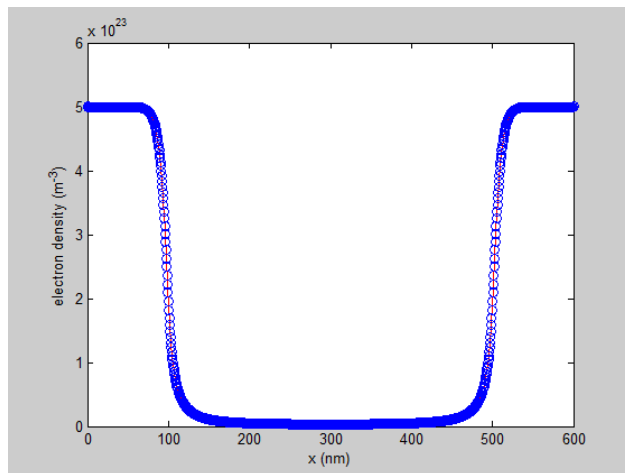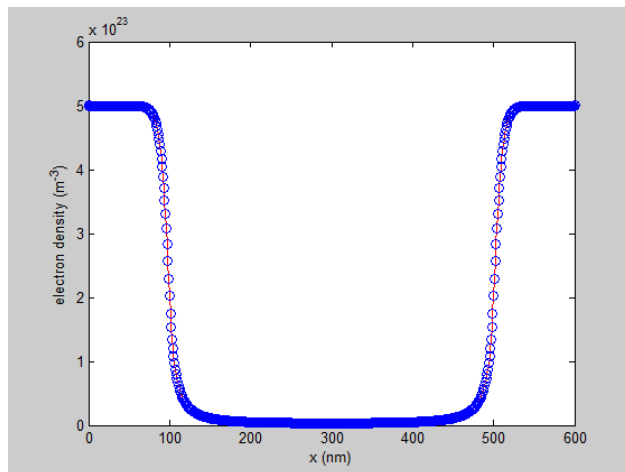
Fig. 1. 600 nm long with 0.5 nm spacing

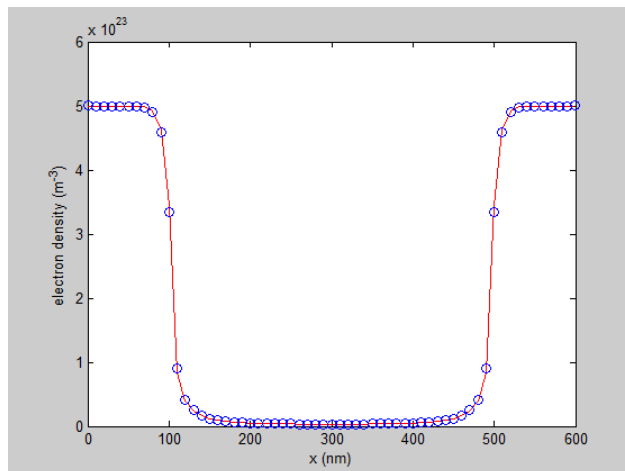Fig. 2. 600 nm long with 1 nm spacing

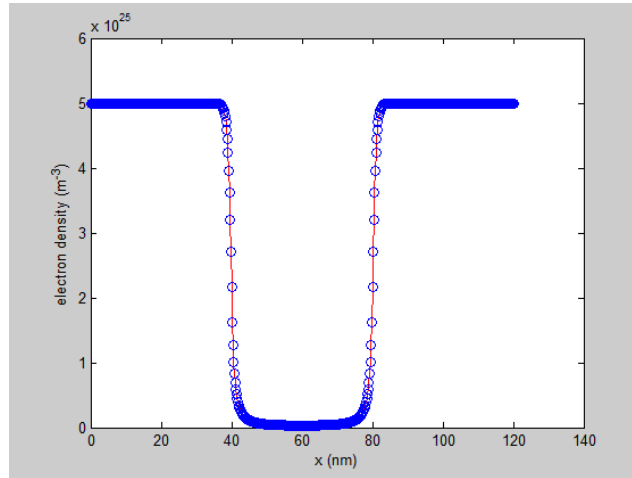Fig. 3. 600 nm long with 10 nm spacing
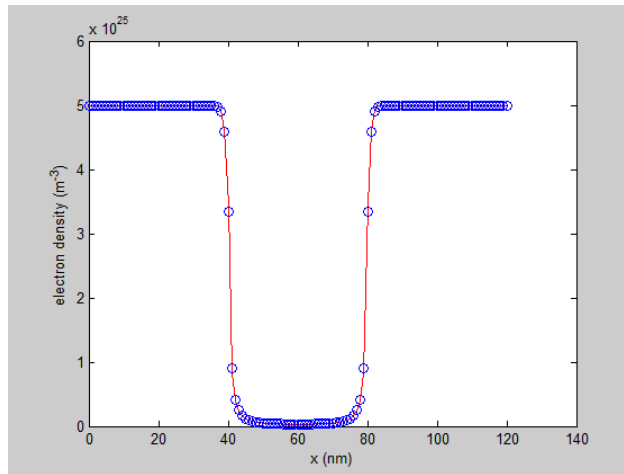

Fig. 4. 120 nm short with 0.2 nm spacing

Fig. 5. 120 nm short with 1 nm spacing

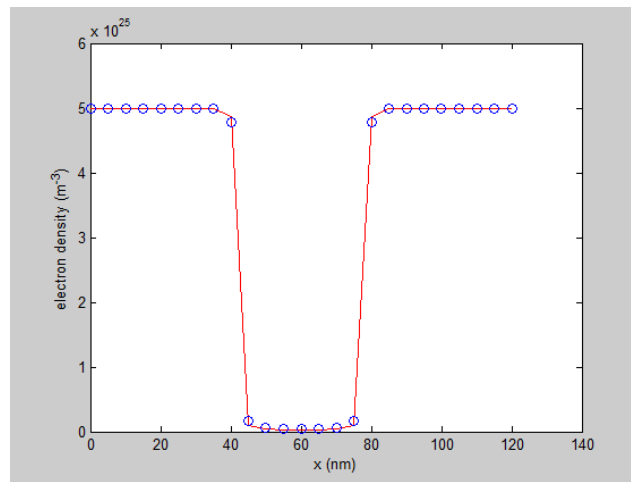We find that as spacing goes large, which means that resolution decrease, difference between two solver increase.

Fig. 6. 120 nm short with 5 nm spacing