

ELEC 4700

Assignment 3

Monte-Carlo/Finite Difference Method

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Question 1

Using the Finite Difference Method

a)

Question 1a) Electric field is: 500000 V/m

Figure 1: E

b)

Question 1b) Force on each electron: 8.01×10^{-14} N

Figure 2: F

c)

Question 1c) Acceleration on each electron due to E-field: $3.381973336041227 \times 10^{17}$ m/s²

Figure 3: Acceleration

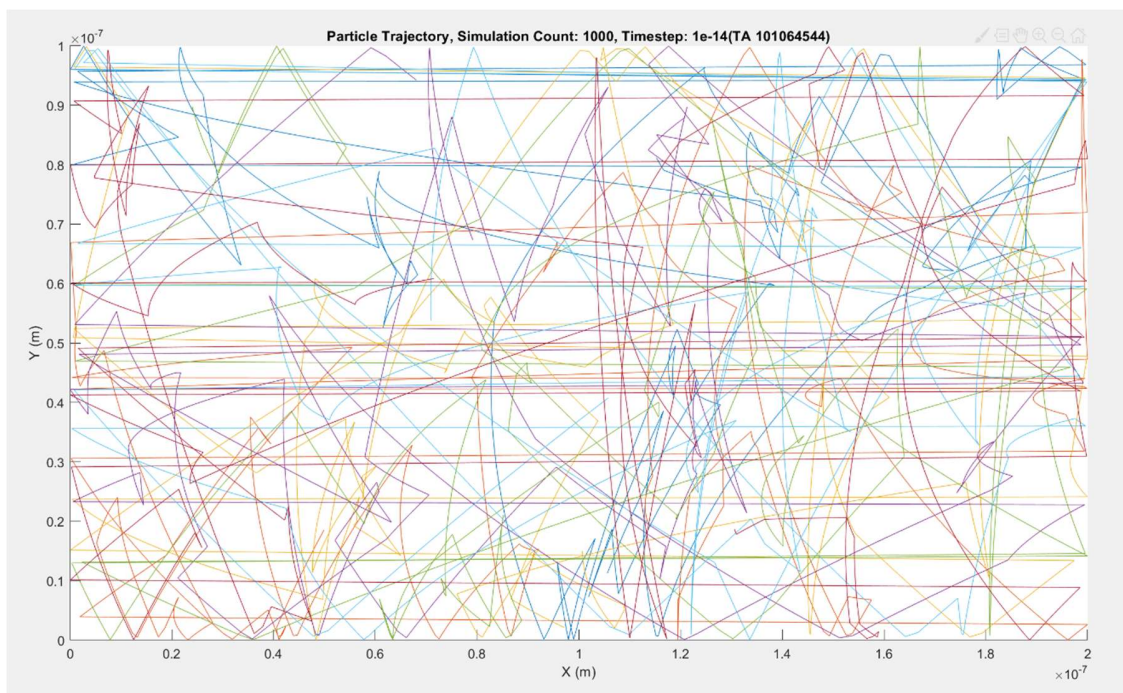


Figure 4: 2-D plot of particle trajectories

d)

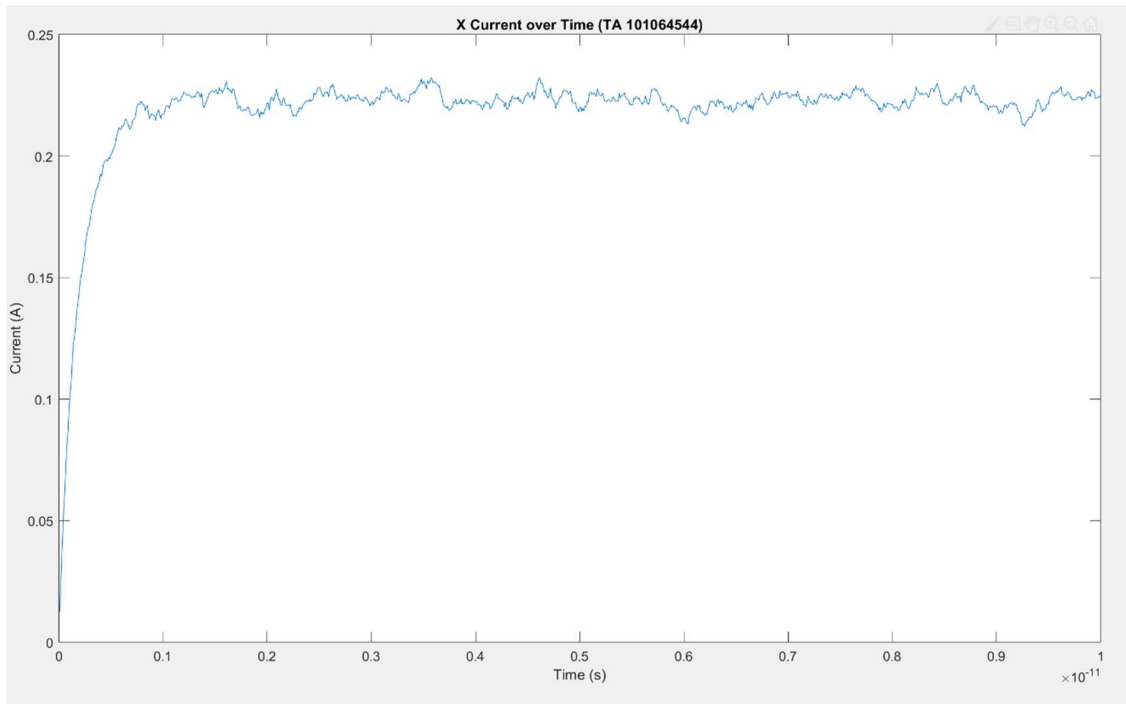


Figure 5: Current Plot

e)

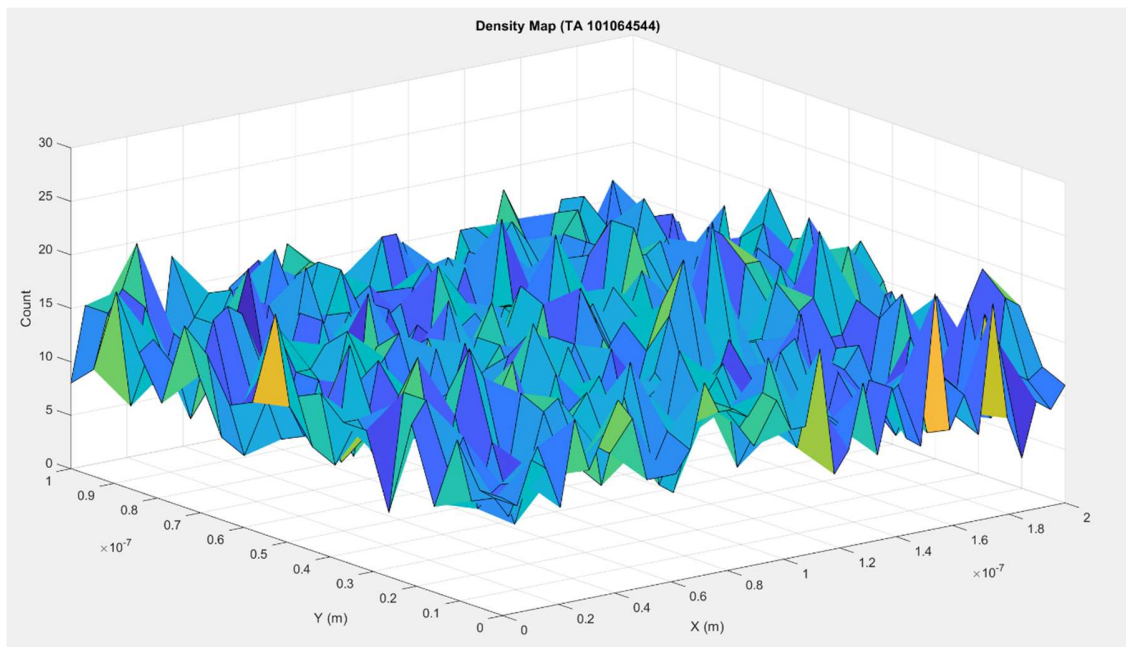


Figure 6: Density plot

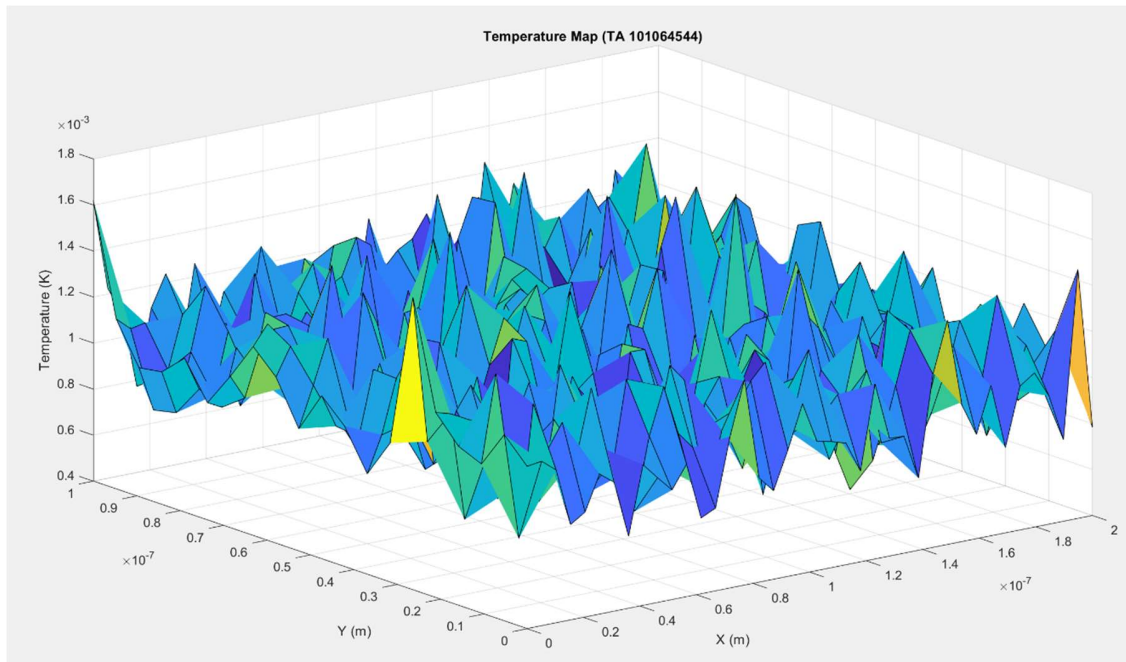


Figure 7: Temperature plot

Question 2

a)

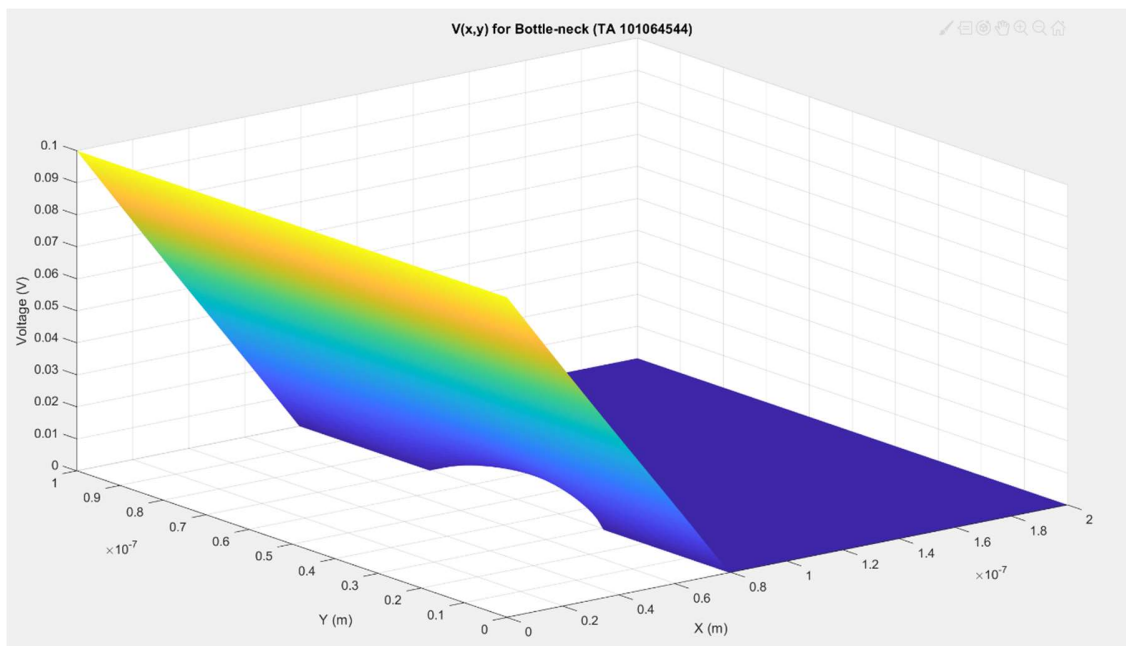


Figure 8: Surface plot of $V(x,y)$

b)

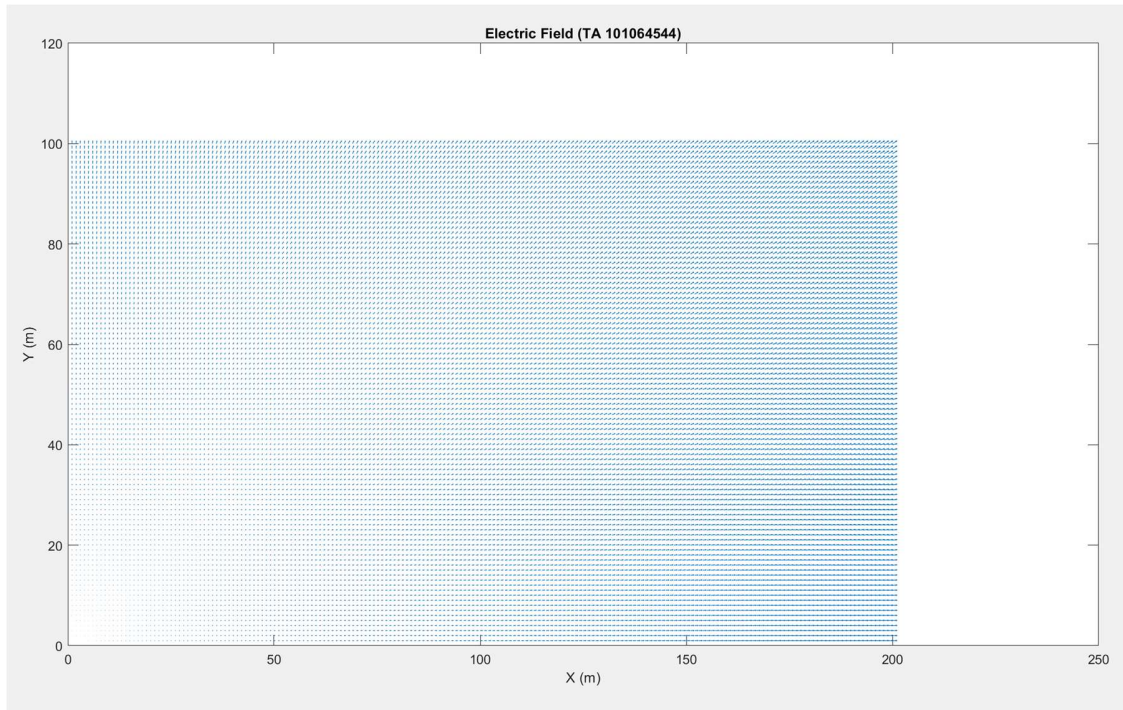


Figure 9: 2-D electric field vector plot

c)

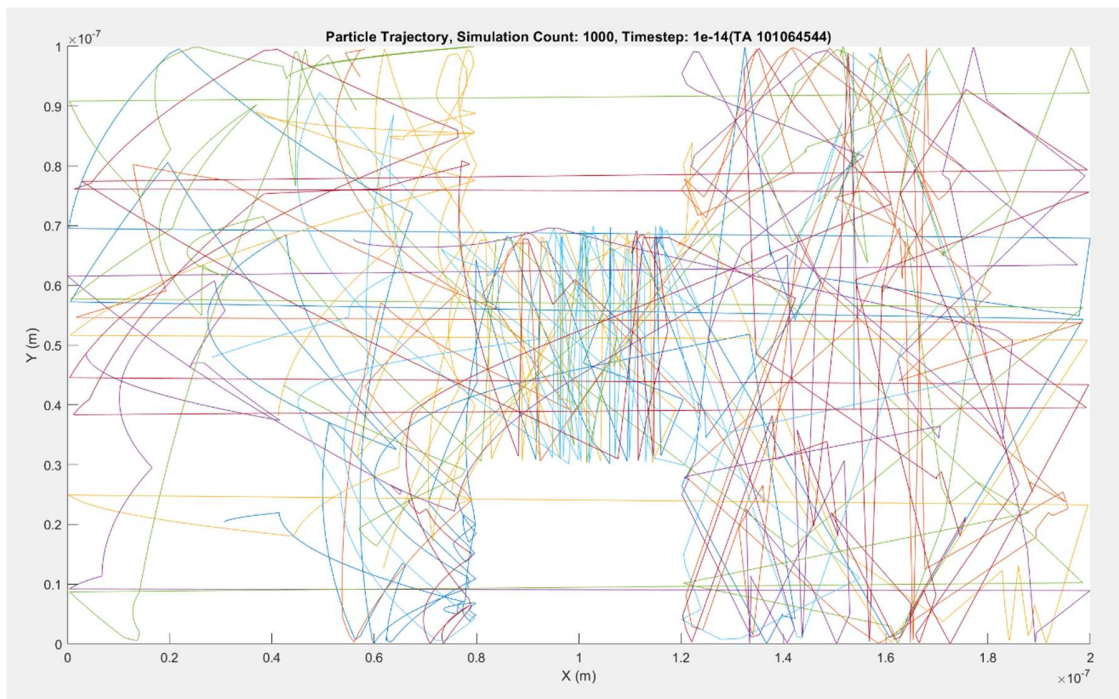


Figure 10: 2-D plot of particle trajectories

Question 3

a)

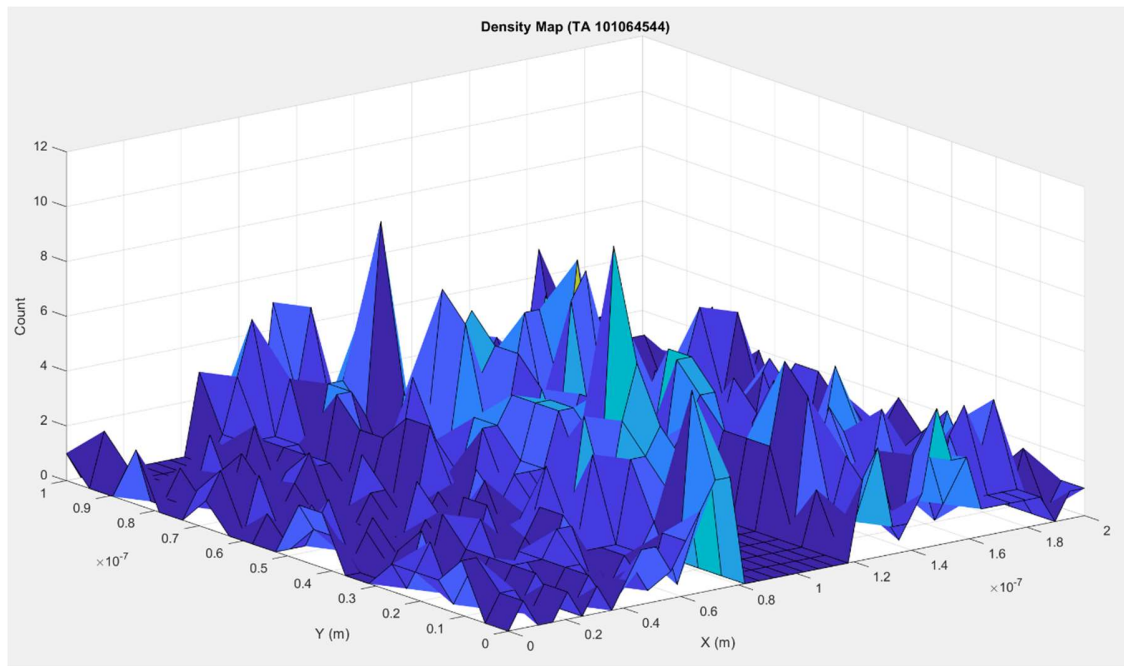


Figure 11: Density plot

b)

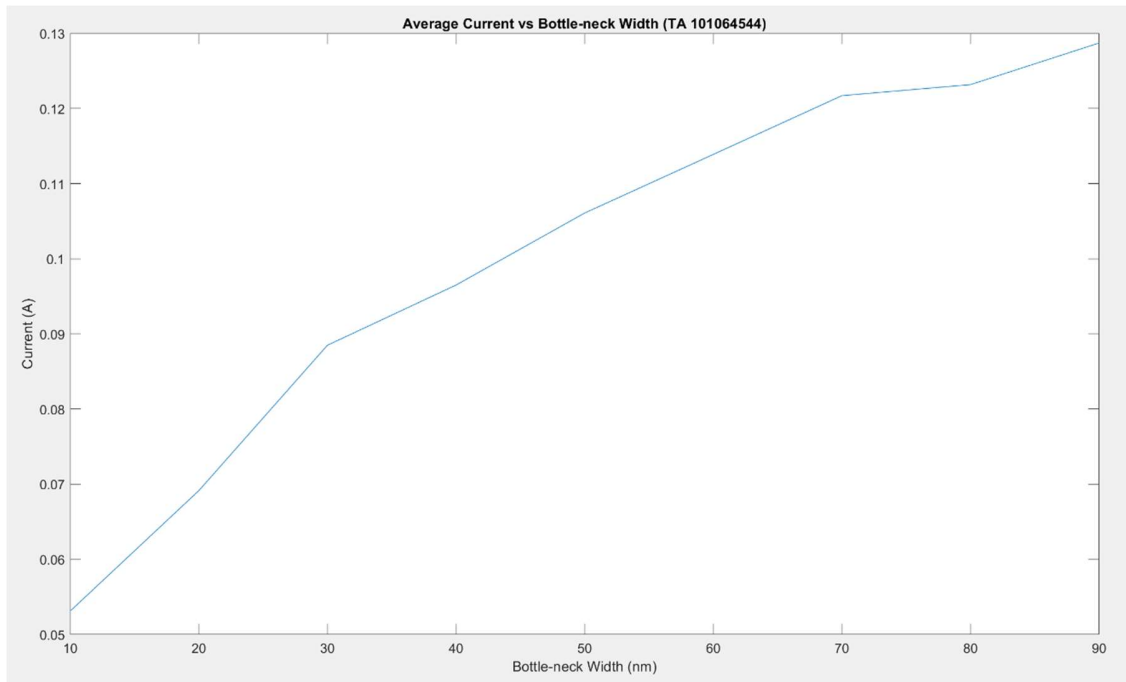


Figure 12: Plot of current vs bottleneck

c)

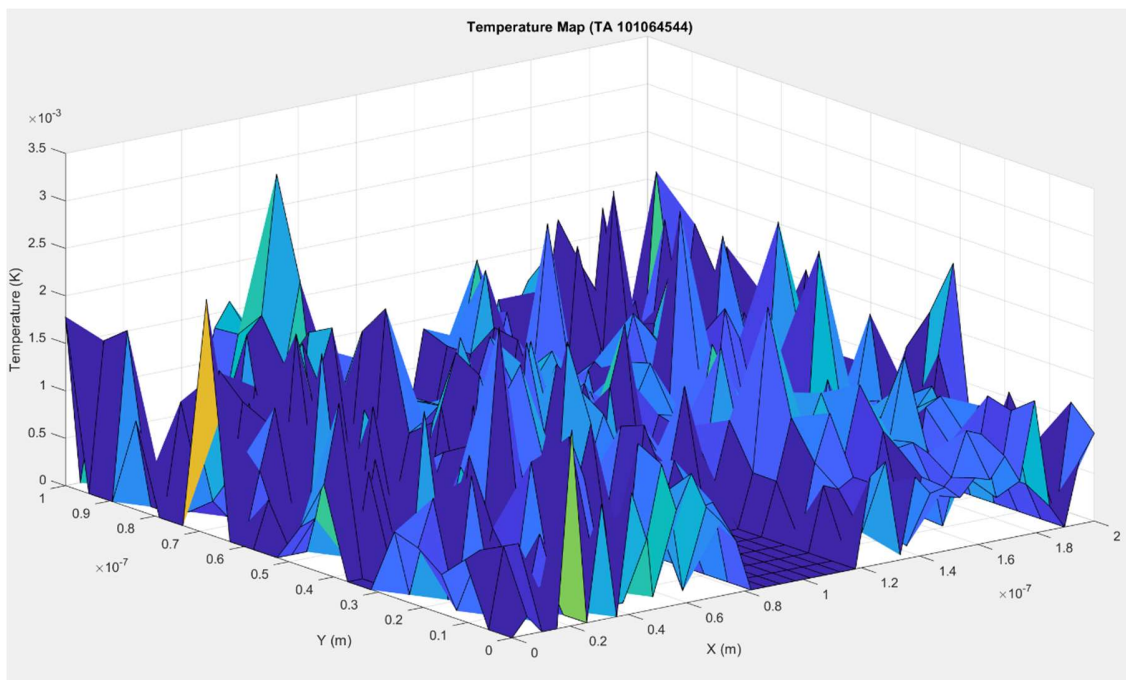


Figure 13: Temperature Plot