Toy Model #3

The equations that define the simple Toy Model are described in Equations 1 and 2.

$$\frac{d\Phi}{dt} = -\beta V \qquad = L_{\Phi} \tag{1}$$

$$\frac{d\mathrm{V}}{dt} = \beta\Phi \qquad = L_{\mathrm{V}} \tag{2}$$

Then with diffusion added Equations 1 and 2 become 3 and 4 as follows;

$$\frac{d\Phi}{dt} = \mathrm{D}\frac{\mathrm{d}^2\Phi}{\mathrm{dx}^2} + L_{\Phi} \tag{3}$$

$$\frac{d\mathrm{V}}{dt} = \mathrm{D}\frac{\mathrm{d}^2 V}{\mathrm{dx}^2} + L_{\mathrm{V}} \tag{4}$$

Results 1a

Initial simulation results with and without diffusion are shown in Figure 1 and 2 respectively with a beta described by Figure 3.

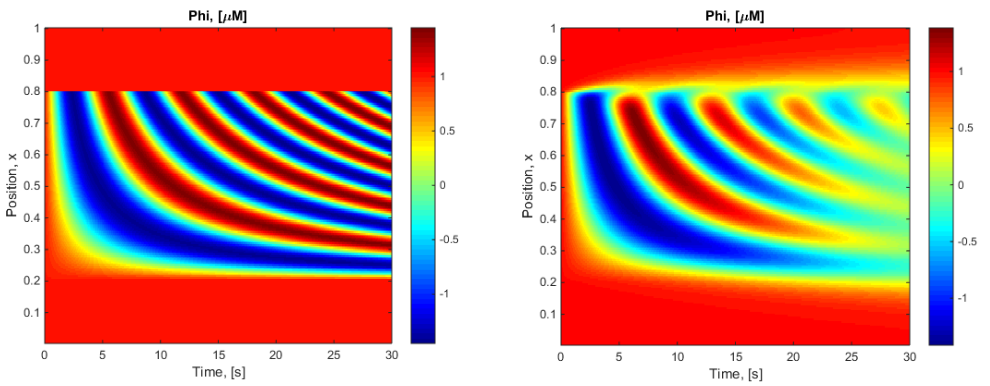

Figure 1 and 2: Phi over time and space for Zero diffusion (Eq. 1&2) and D=100e-6 (Eq. 3 & 4) with Beta described by Figure 3.

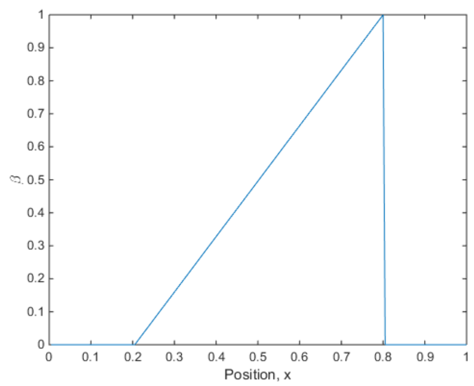

Figure 3: Initial Beta choice

Results 1b

The results in section 1a were recomputed over 100s in time with the same Beta described by Figure 3.

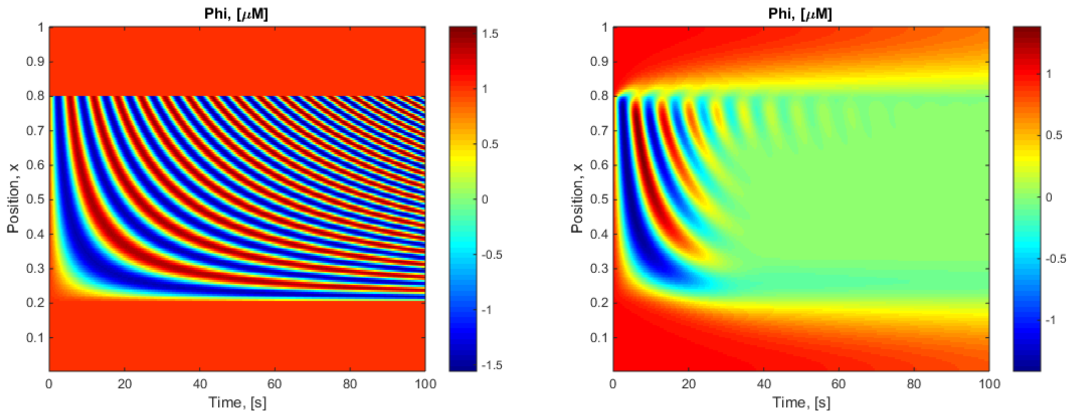

Figure 4 and 5: Phi over time and space for Zero diffusion (Eq. 1&2) and D=100e-6 (Eq. 3 & 4) with Beta described by Figure 6.

Results 2

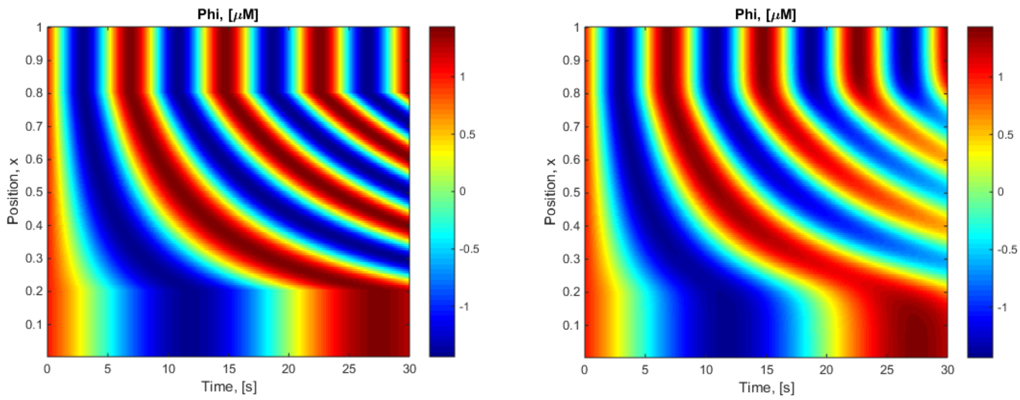

Figure 6 and 7: Phi over time and space for Zero diffusion (Eq. 1&2) and D=100e-6 (Eq. 3 & 4) with Beta described by Figure 6.

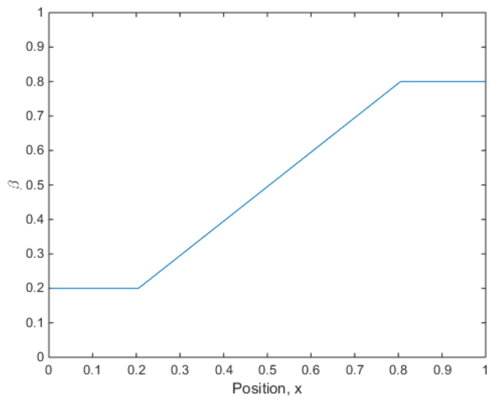

Figure 7: Secondary Beta choice

Results 3

The simulation to produce the results in Section 1 have been rerun with varying Diffusion coefficients, D.

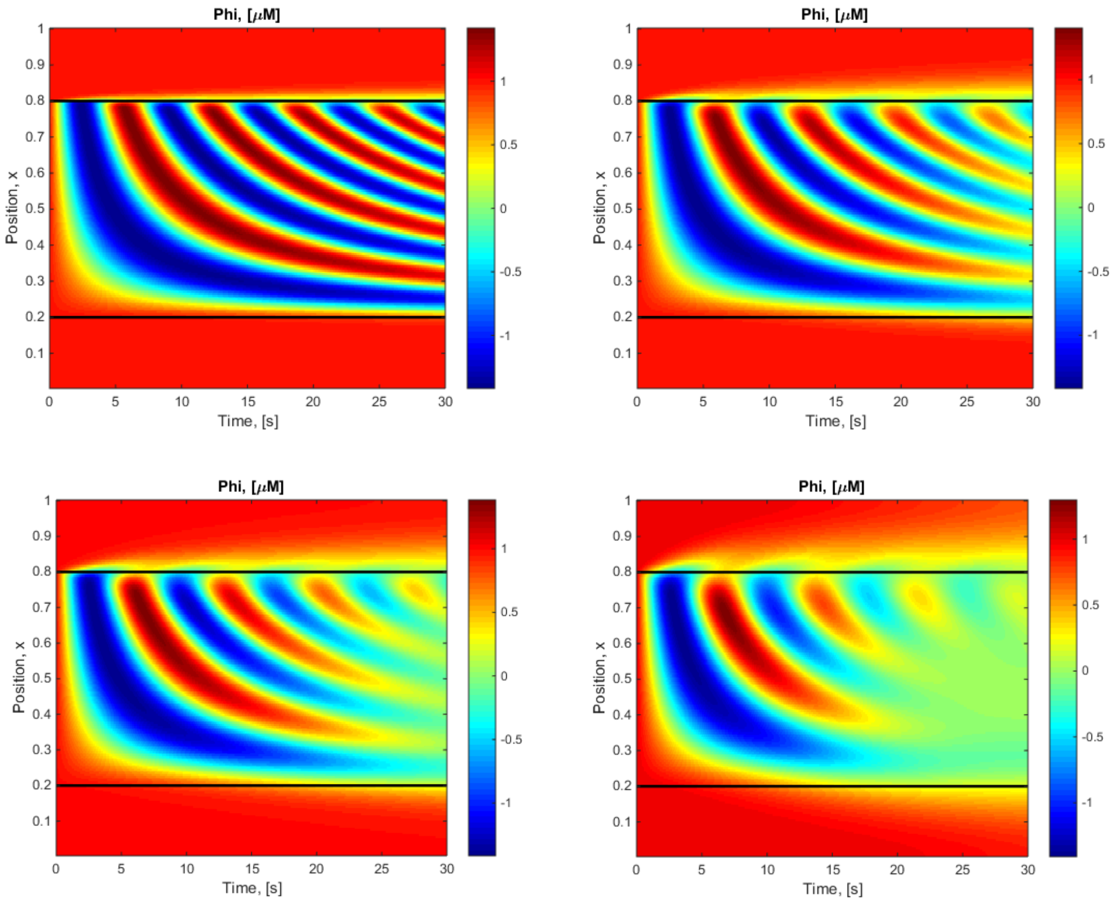

Figure 8 to 11: Phi over time and space D={10e-6 (TL) , 50e-6 (TR) , 100e-6 (BL) , 300e-6 (BR) } (Eq. 3 & 4) with Beta described by Figure 3.

Results 4

For this results a combination of Equation 3 and 2 have been used; Diffusion only Phi.

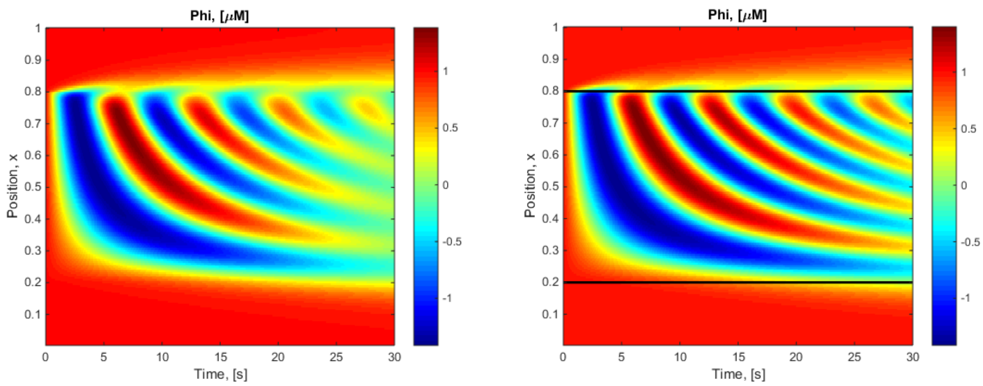

Figure 12 and 13: Figure 2 repeated for side by side view (Eq. 3 & 4) and Phi over time and space D=100e-6 (Eq. 3 & 2) with Beta described by Figure 3.