**Equations Used**

M-Current:

E\_M=-100

g\_M=1.5 (can vary for different frequency of slow oscillations)

Q\_s=3.209

I\_app\_py= 1.8

alpha\_M\_py=Q\_s\*(0.0001)\*(v\_py+30)/(1-np.exp(-1\*(v\_py+30)/9))

beta\_M\_py = -1\*Q\_s\*(0.0001)\*(v\_py+30)/(1-np.exp((v\_py+30)/9))

Mdot\_py = alpha\_M\_py\*(1-M\_py)-beta\_M\_py\*M\_py

I\_M\_py=g\_M\*M\_py\*(v\_py-E\_M)

ATP-Current:

ATP\_scale=1

J\_ATP= 2\*ATP\_scale #production rate of ATP (linked to metabolism)

ATP\_max= 1.5 # ?

K\_m= 6\*(10\*\*(-8)) # govern the NA-ATP pump dynamics

F= 2\*3\*.000168\*1.8 #8.8\*(10\*\*(-5)) # help govern the NA-ATP pump dynamics

z = 1/(1+6\*ATP)

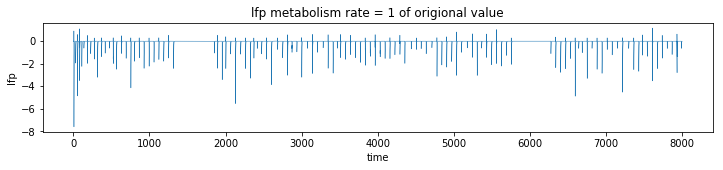
Nadot = 2\*3\*((0.000168)\*1.8\*np.abs(I\_Na\_py)-(3\*(0.00000006)\*ATP\*Na\*Na\*Na))#F\*np.abs(I\_Na\_py)-3\*K\_m\*(Na\*\*3)\*ATP

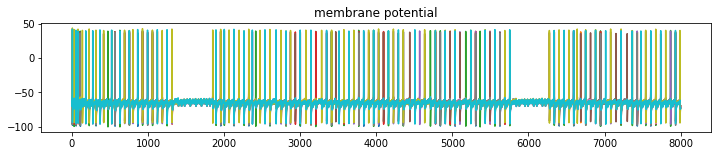
ATPdot = 2\*5\*((J\_ATP\*0.0004)\*(2.00-ATP)-(2\*(0.00000006)\*ATP\*Na\*Na\*Na))#J\_ATP\*(ATP\_max - ATP) - K\_m\*(Na\*\*3)\*ATP

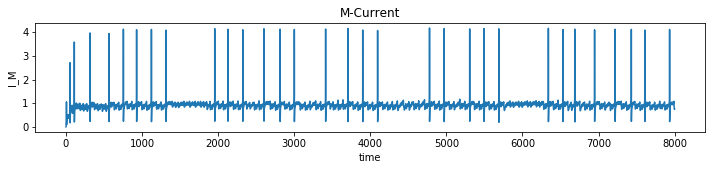
I\_K\_ATP = g\_K\_ATP\*z\*(v\_py-E\_K\_py)

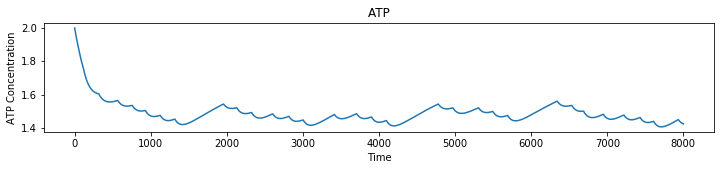
**Results**

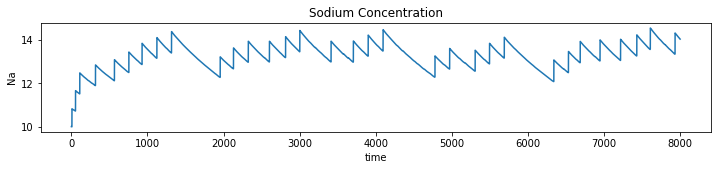
G\_M=1.3



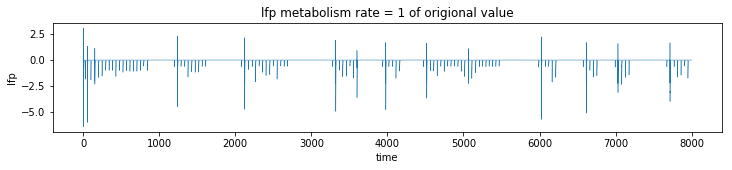


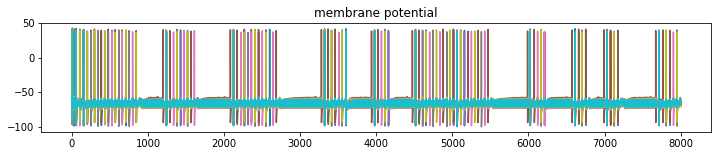


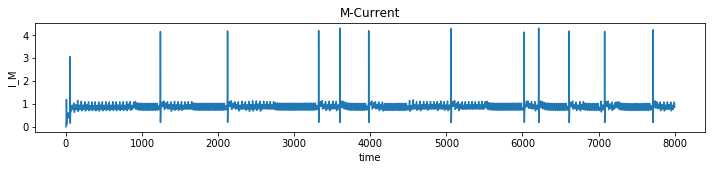


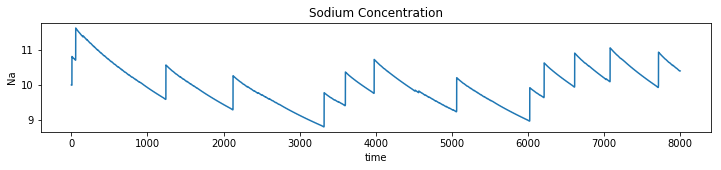
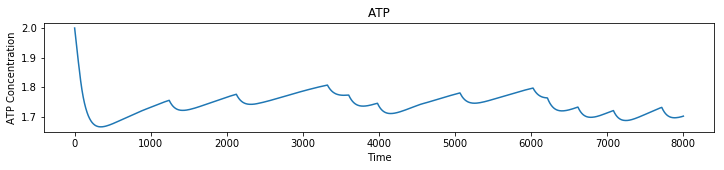


G\_M=1.5

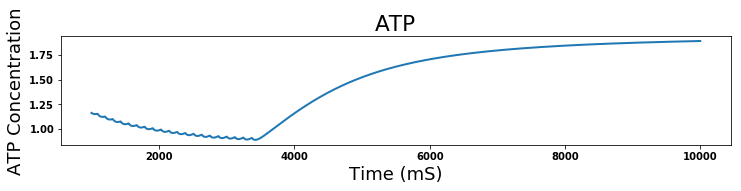
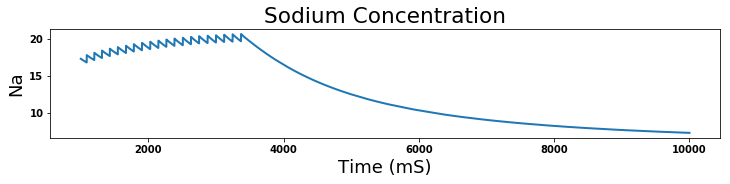
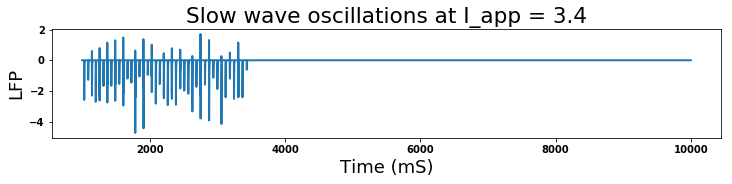


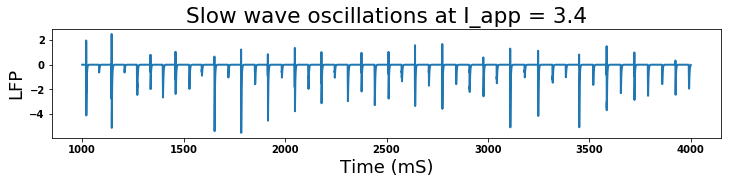






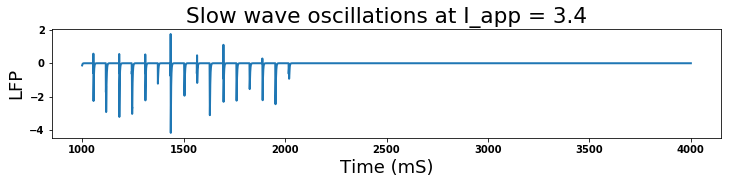
Gaba = 20 I\_app = 3.8

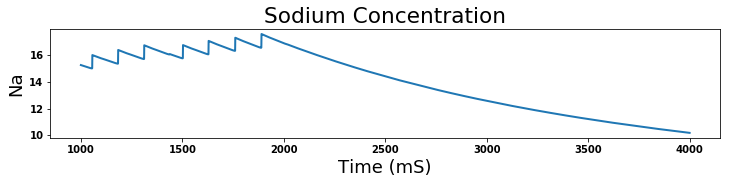


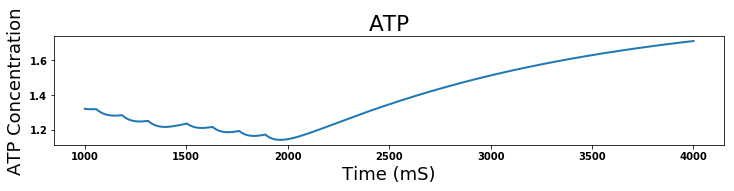


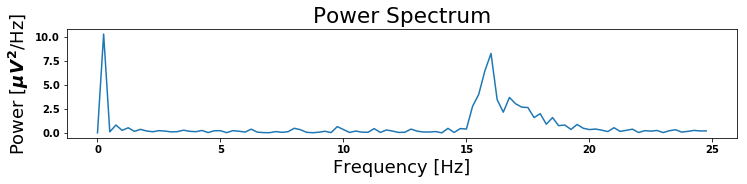
I

I\_app = 3.56

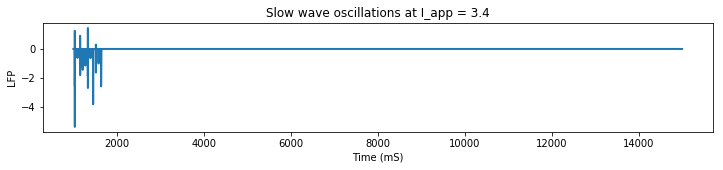


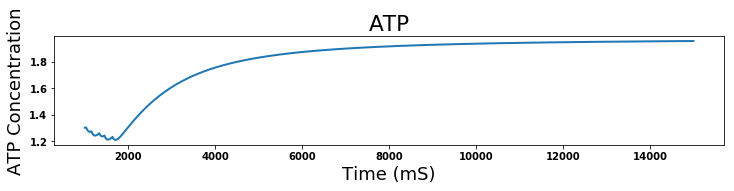


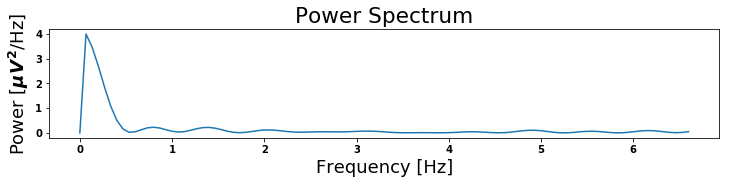




I\_app= 3.56 15 seconds



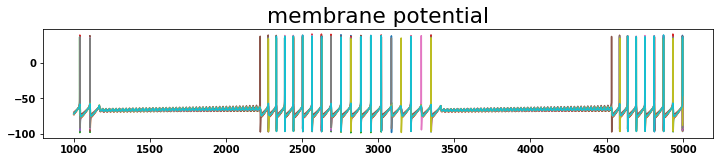
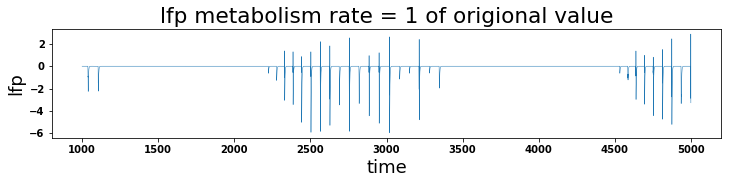


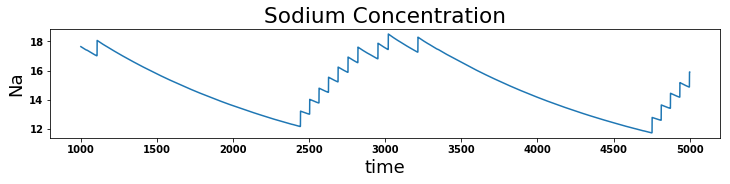


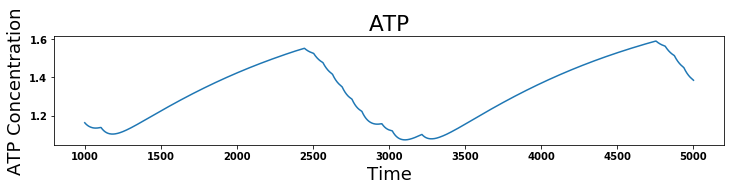
NO M-CURRENT !!

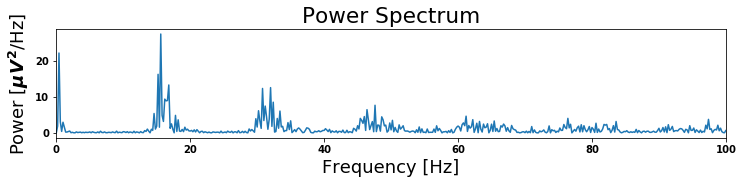
I\_APP = 2.7

GABA = 20

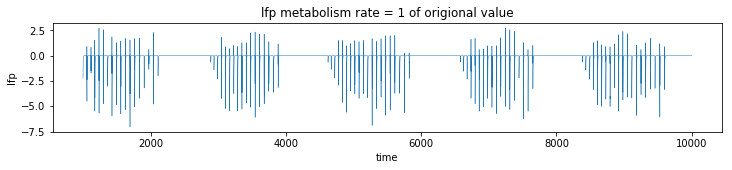


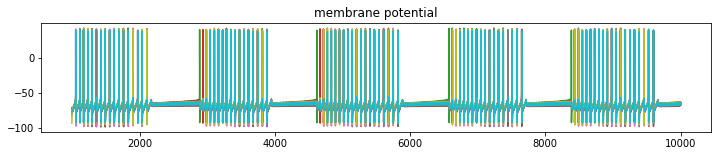


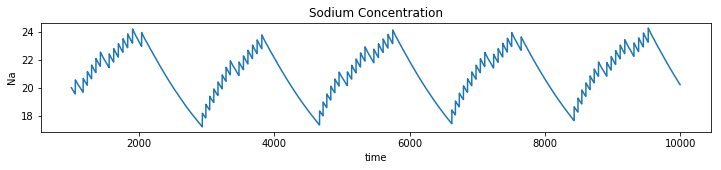


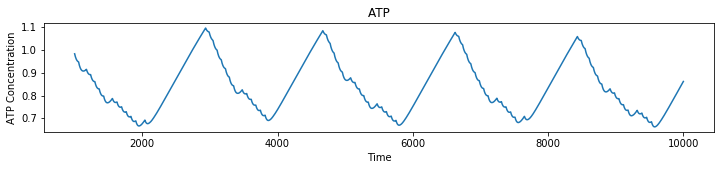


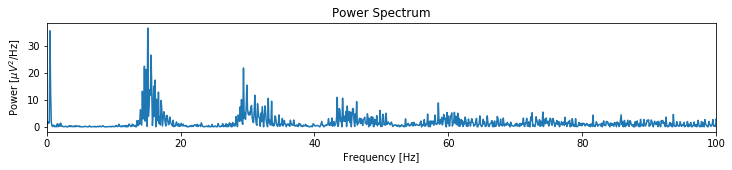
I\_app = 2.8











-try reducing FS\_Iapp so they only spike with pyramidal

- could do multi-scale model of anesthesia

- can start with Jake’s data of coupling oscillations

-propofol alpha, ketamine gamma

-alpha coordinated, delta not?