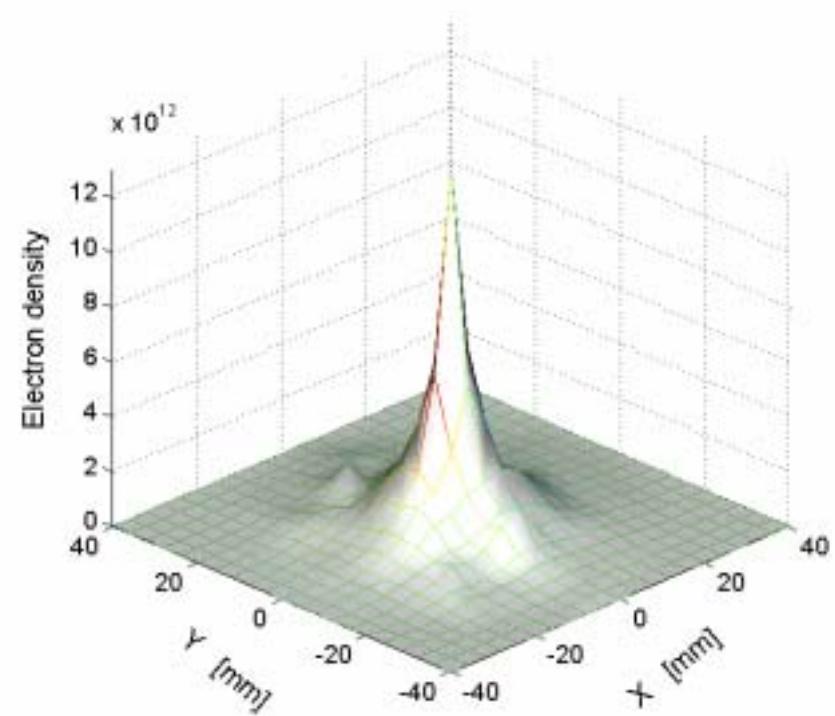
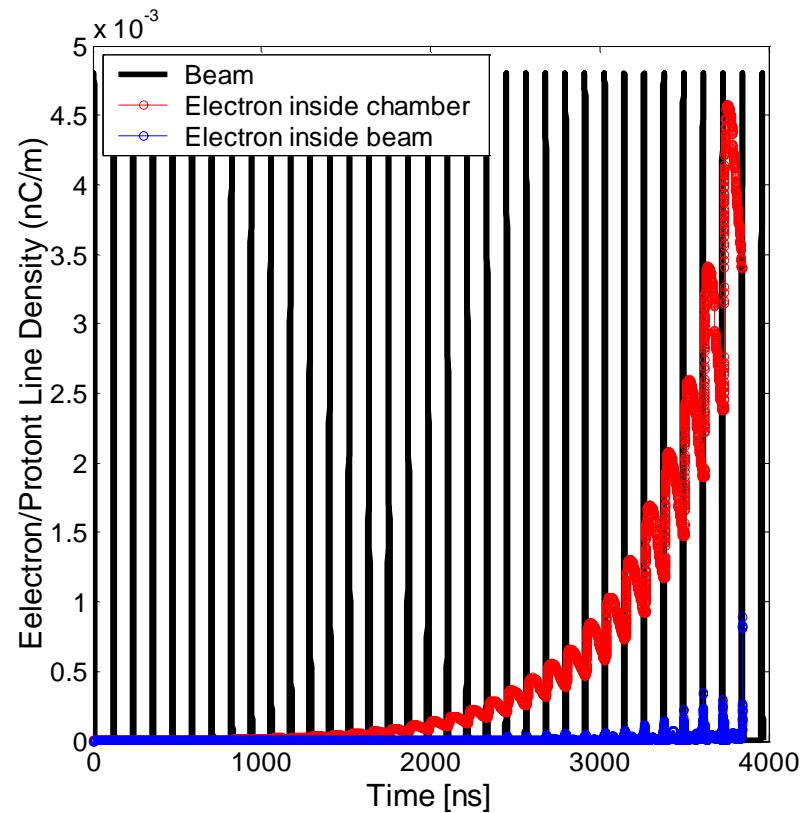


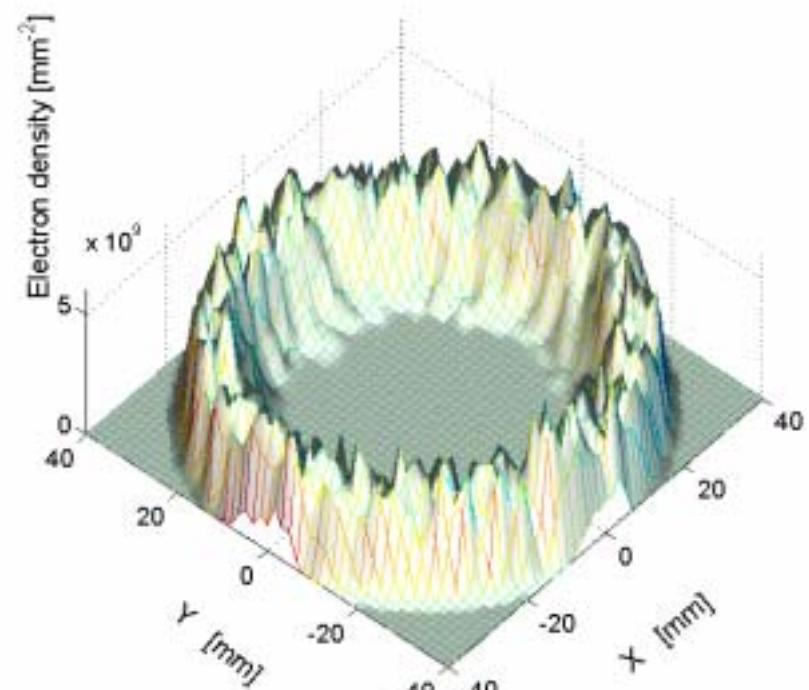
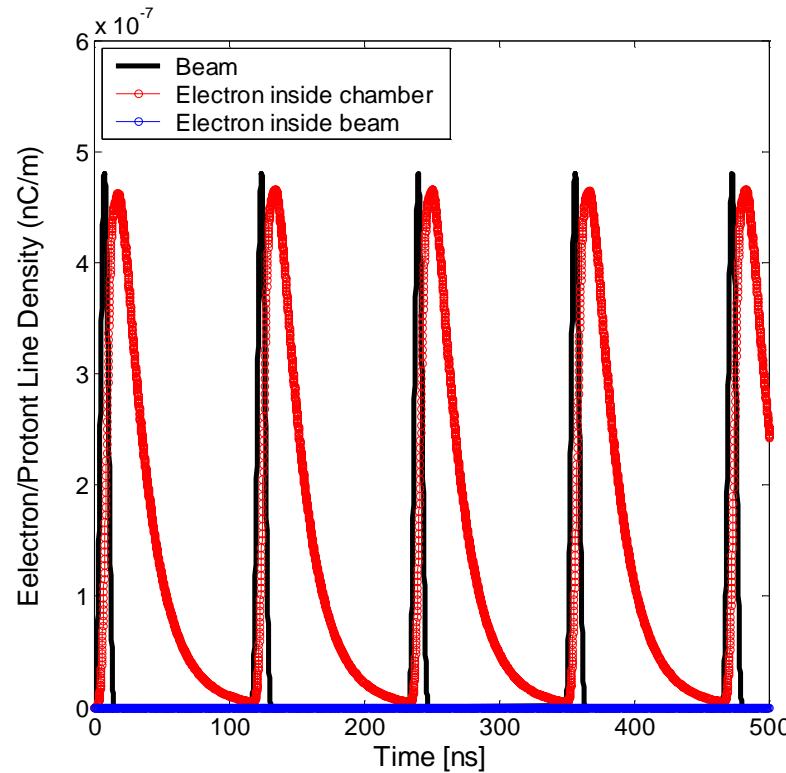
# RHIC, drift region, ploss=1e-6, 110 bunch



## RHIC beam, Uniform $B=20G$

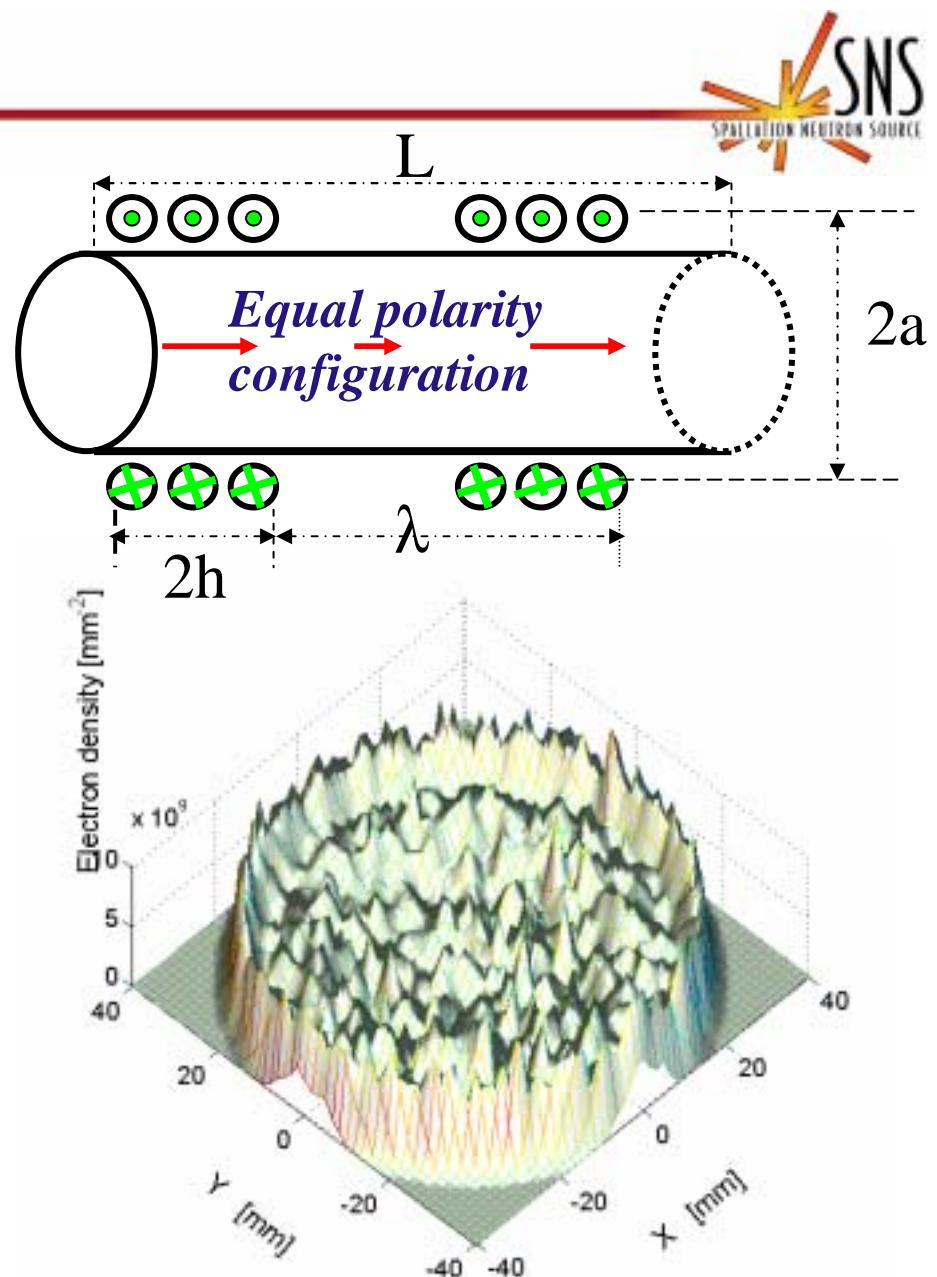
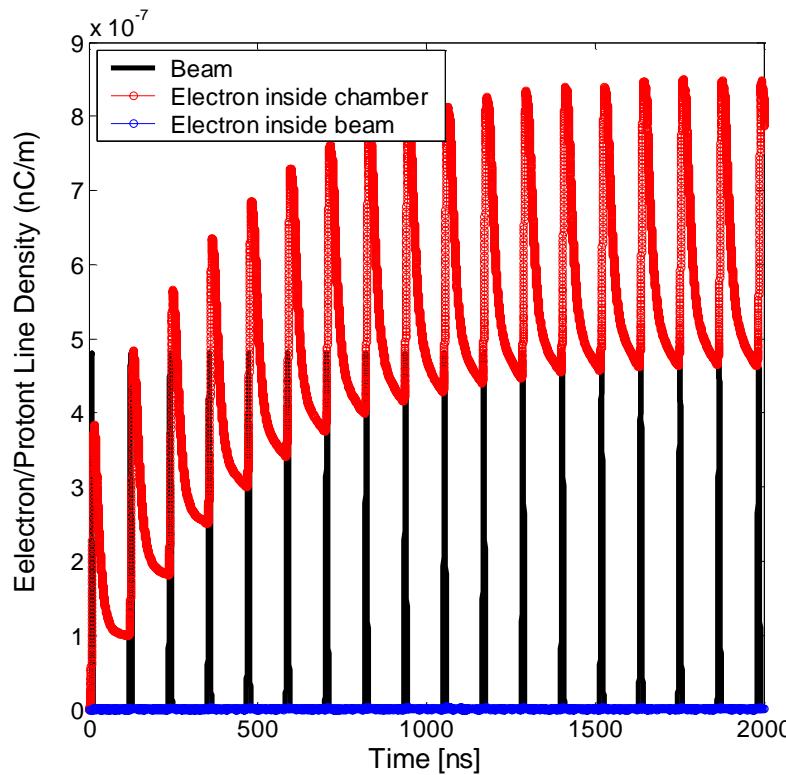


20G B field can reduce e-cloud with factor more than 1000. There is no e-cloud in chamber center



## Opposite polarity field

Equal polarity is better

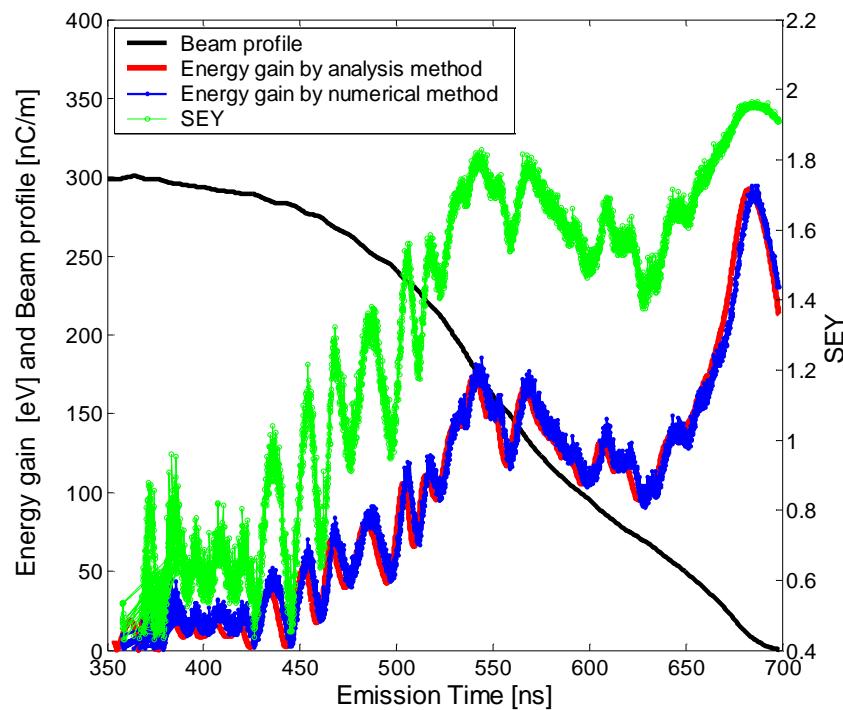


# ENERGY Gain & Beam Profile Factor

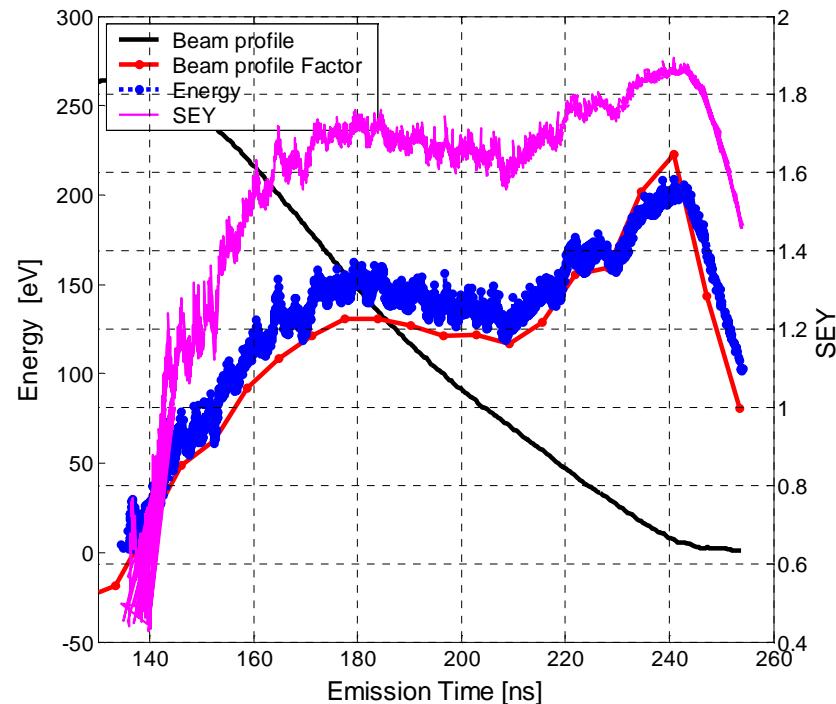


## Beam Profile Factor

$$Factor_{profile} = -\frac{\partial \lambda}{\partial z} \frac{1}{\sqrt{\lambda}}$$



SNS Beam

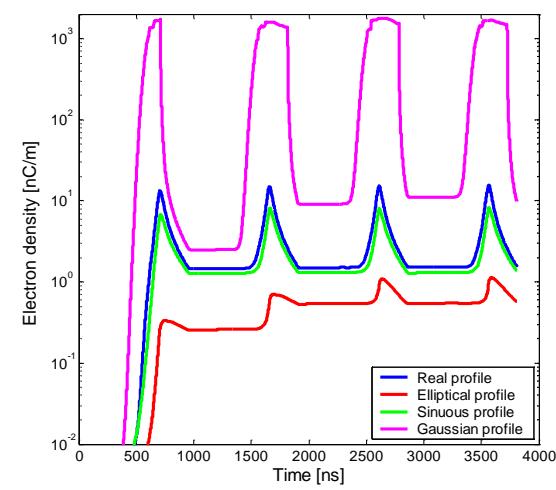
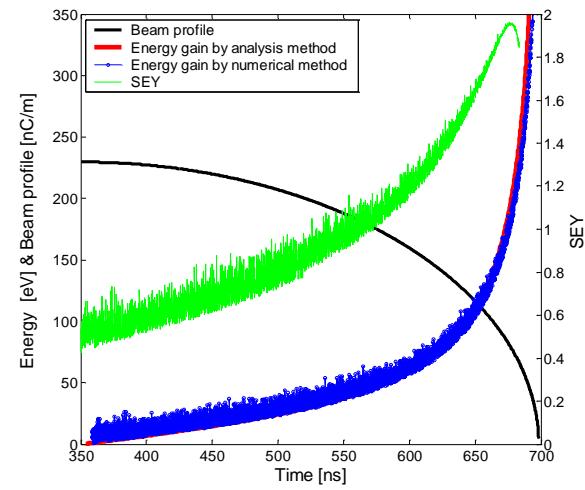
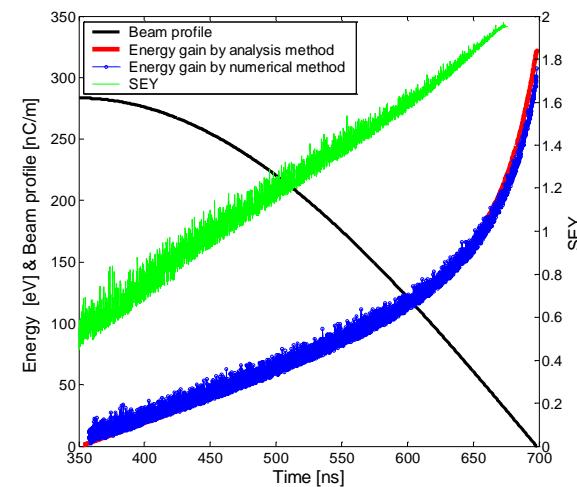
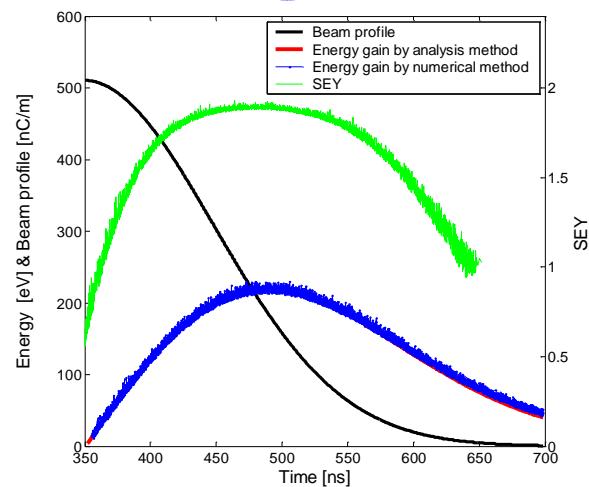


PSR Beam

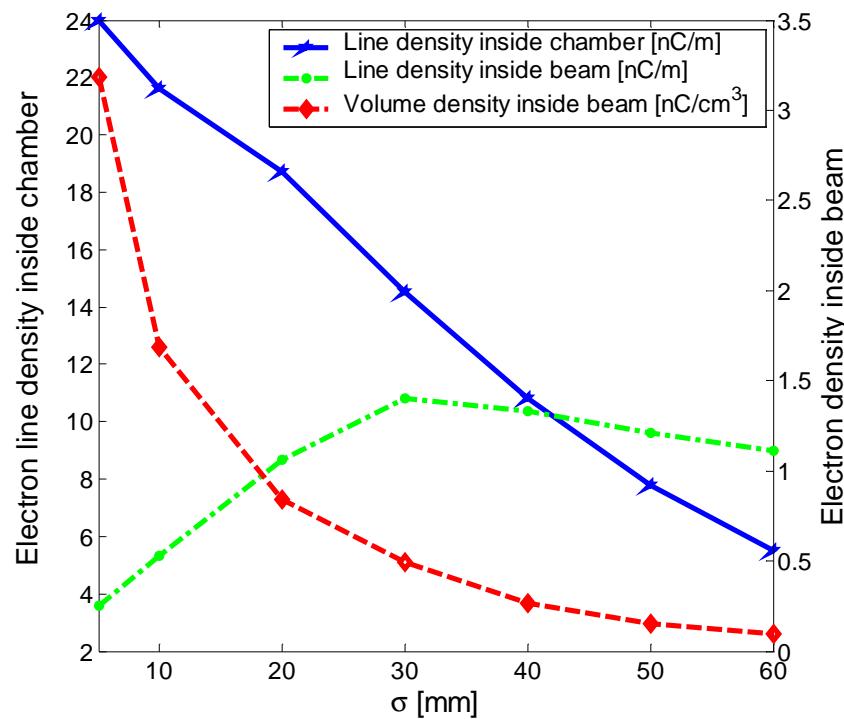
# Important Factors Related to Electron multipacting(1)



## Longitudinal Beam Profile



## Important Factors Related to Electron multipacting(2)



**electron line density inside chamber**

$$\lambda_{chamber} [nC / m] = 25.2186 - 0.3425\sigma [mm]$$

**electron volume density inside beam**

$$\rho_{cen} [nC / cm^3] = 4.72e^{-0.088\sigma [mm]}$$

## Transverse Beam Size

## Important Factors Related to Electron multipacting(3)— Bunch population

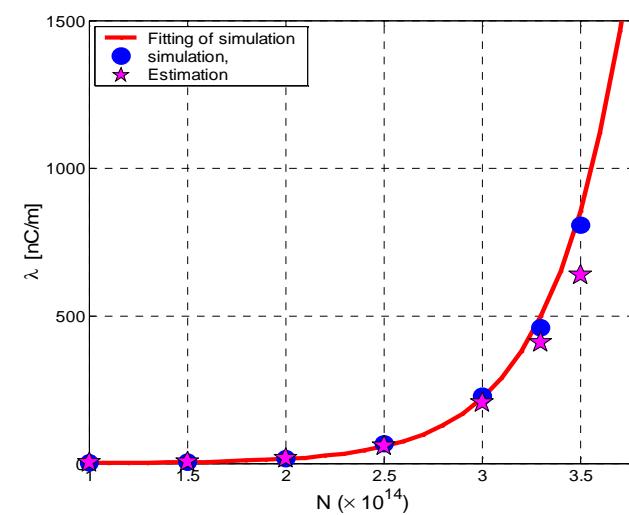
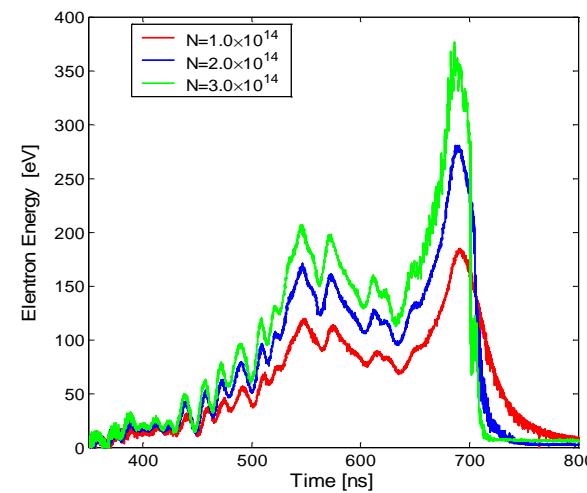
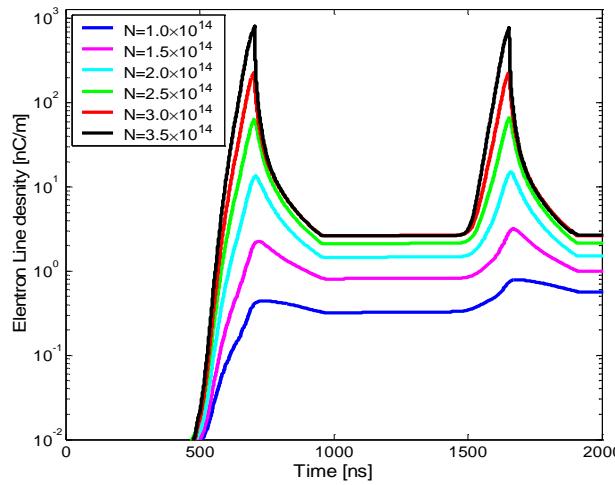


$$Factor_{profile} = -\frac{\partial \lambda}{\partial z} \frac{1}{\sqrt{\lambda}} \quad \Delta E \propto \sqrt{N}$$

Scaling Law:

$$\lambda[nC/m] = e^{(N \times 1.0^{-14} - 1) \times 2.7}$$

*Electron density exponentially grows with bunch population !!*

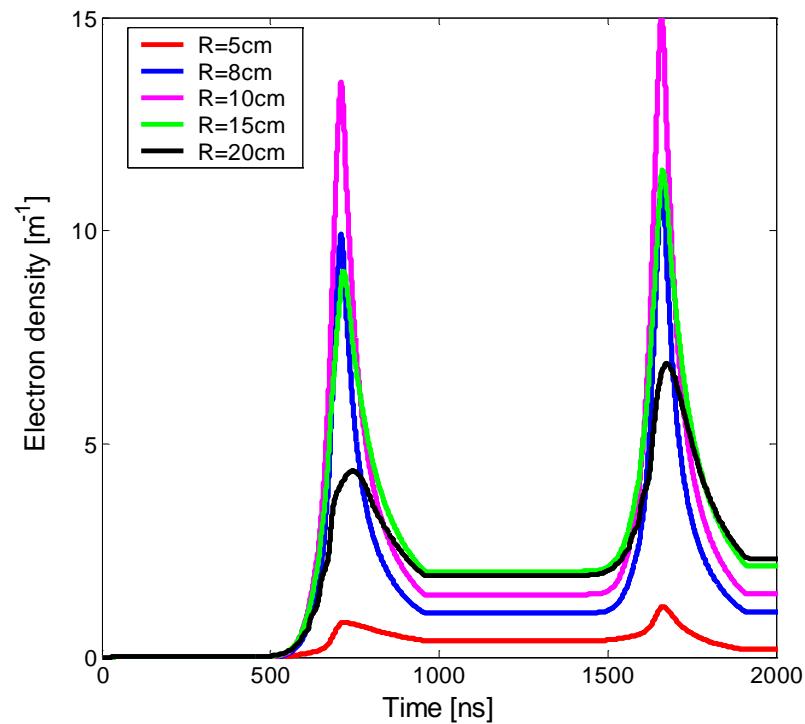
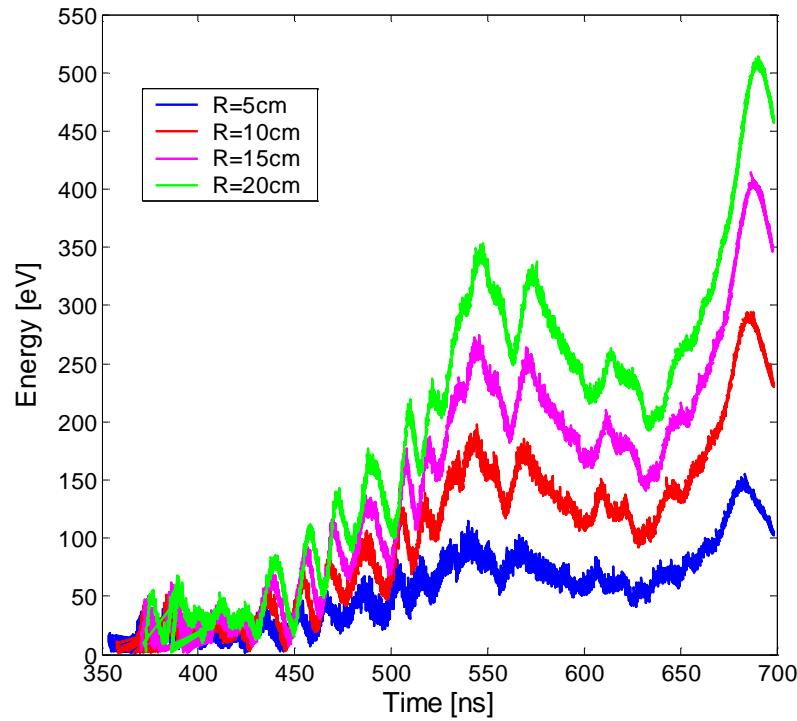


# **Important Factors Related to Electron multipacting(4)- Chamber size R**

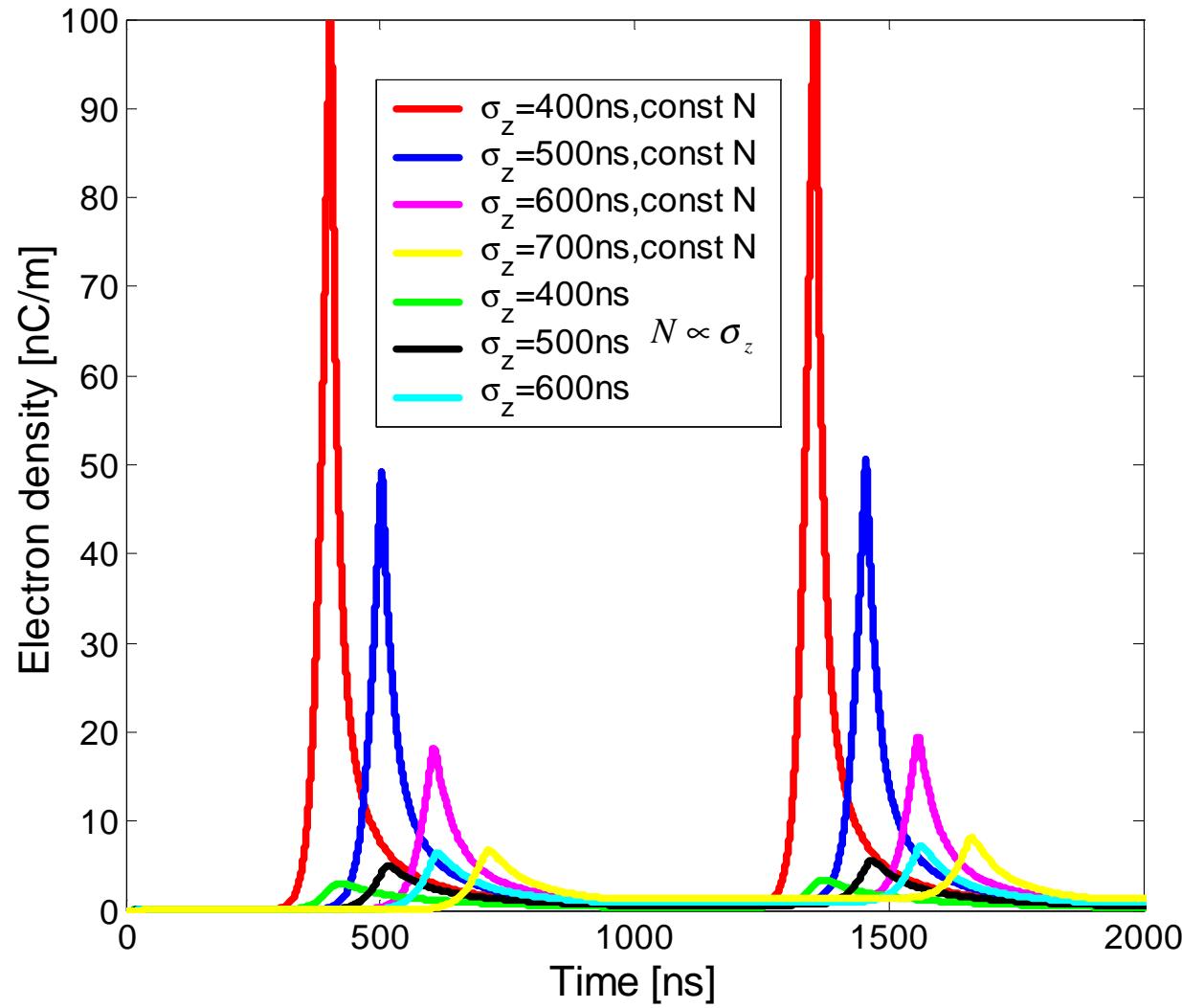


$$\Delta E \approx kR$$

**Median R is the worst!**



# **Important Factors Related to Electron multipacting(5)- Bunch length**



Sinuous beam profile