



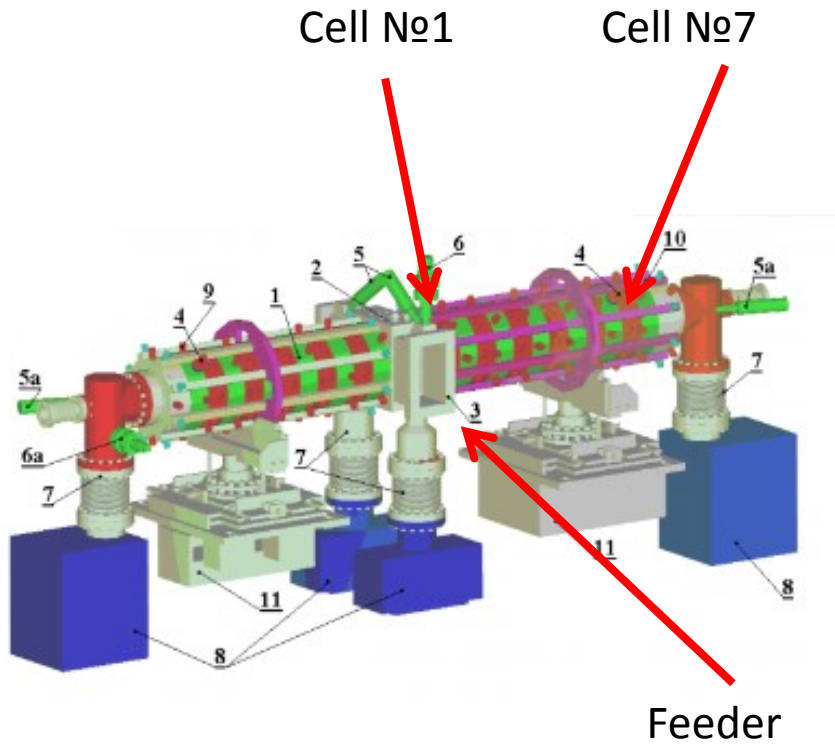
# Estimation of multipacting possibility in PITZ CDS booster

I. Rybakov, V. Paramonov

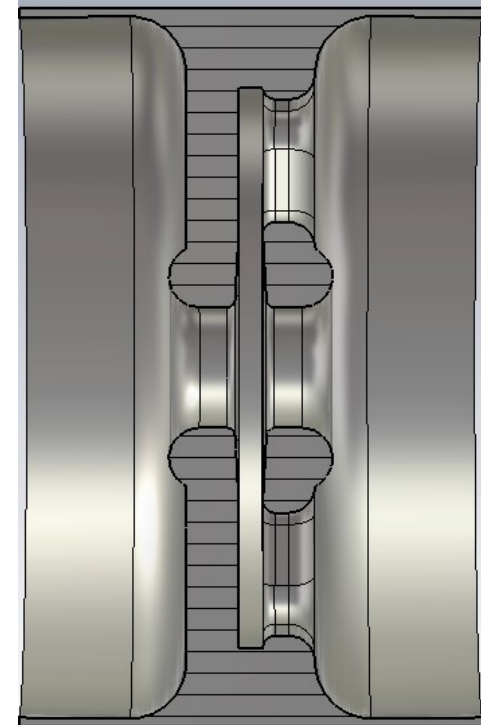
Zeuthen 2016



# The CDS booster structure



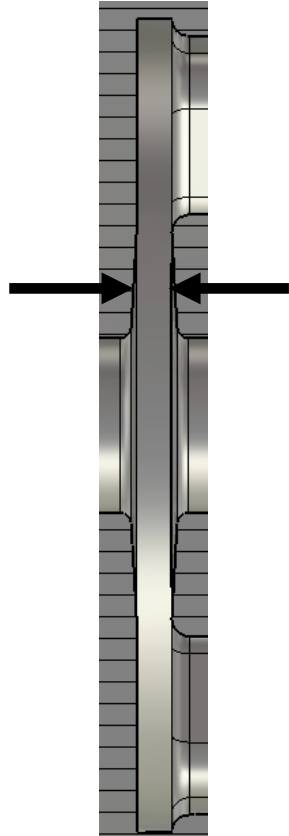
Overall view



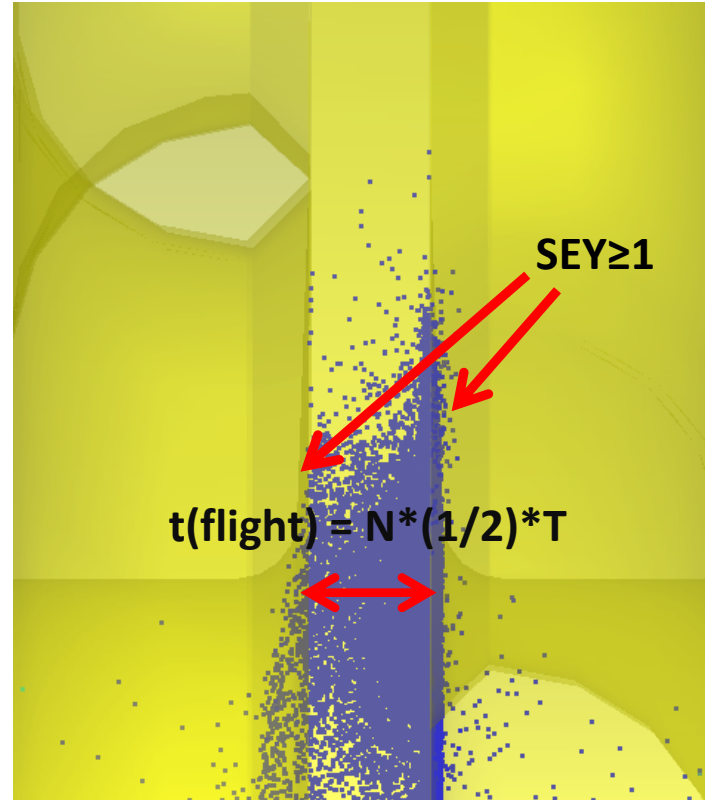
Single cavity (period)



# Dangerous zone



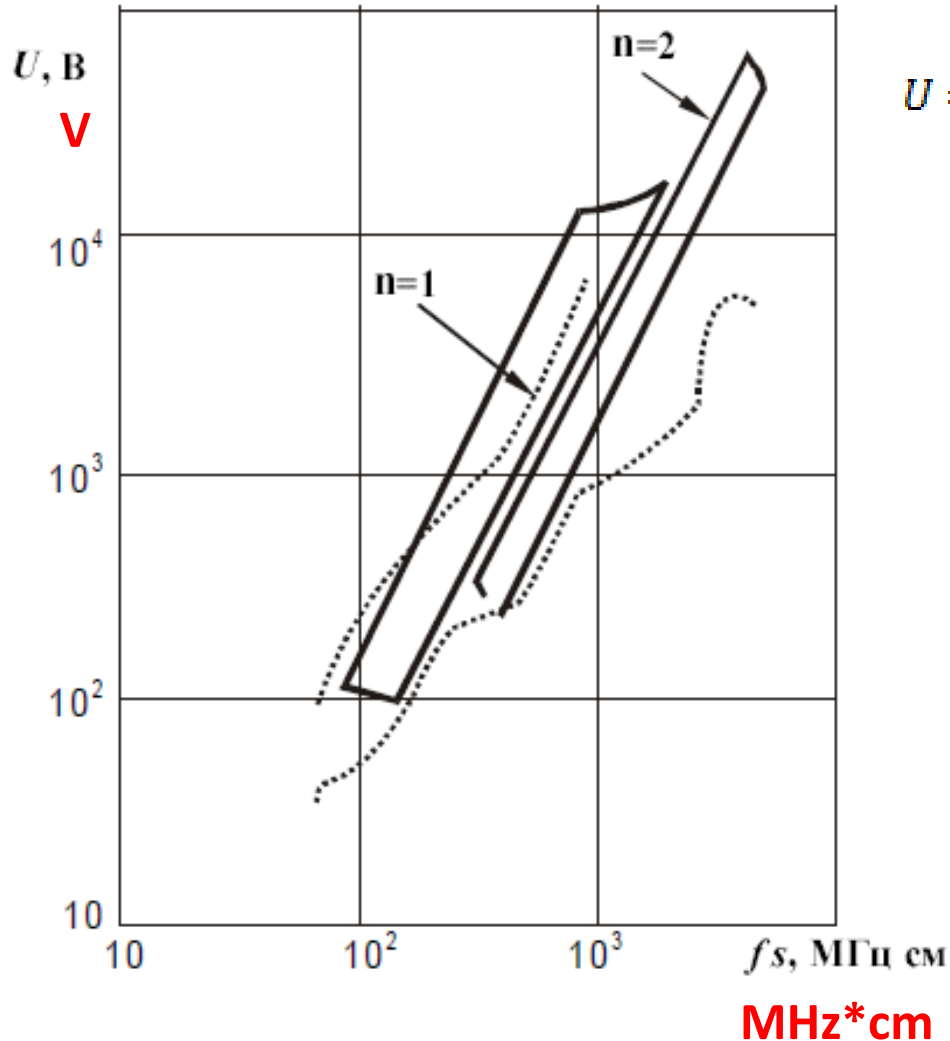
The gap "flat capacitor"



Electron avalanche



# Analytical estimation



$$U = 4\pi^2 (fs)^2 \frac{m}{e} \left( \frac{1 + K_v}{1 - K_v} \pi n \cos\psi + 2 \sin\psi \right)^{-1}$$



**1.1 – 2 kV discharge voltage**



**6-12 MV/m accelerating  
voltage levels**



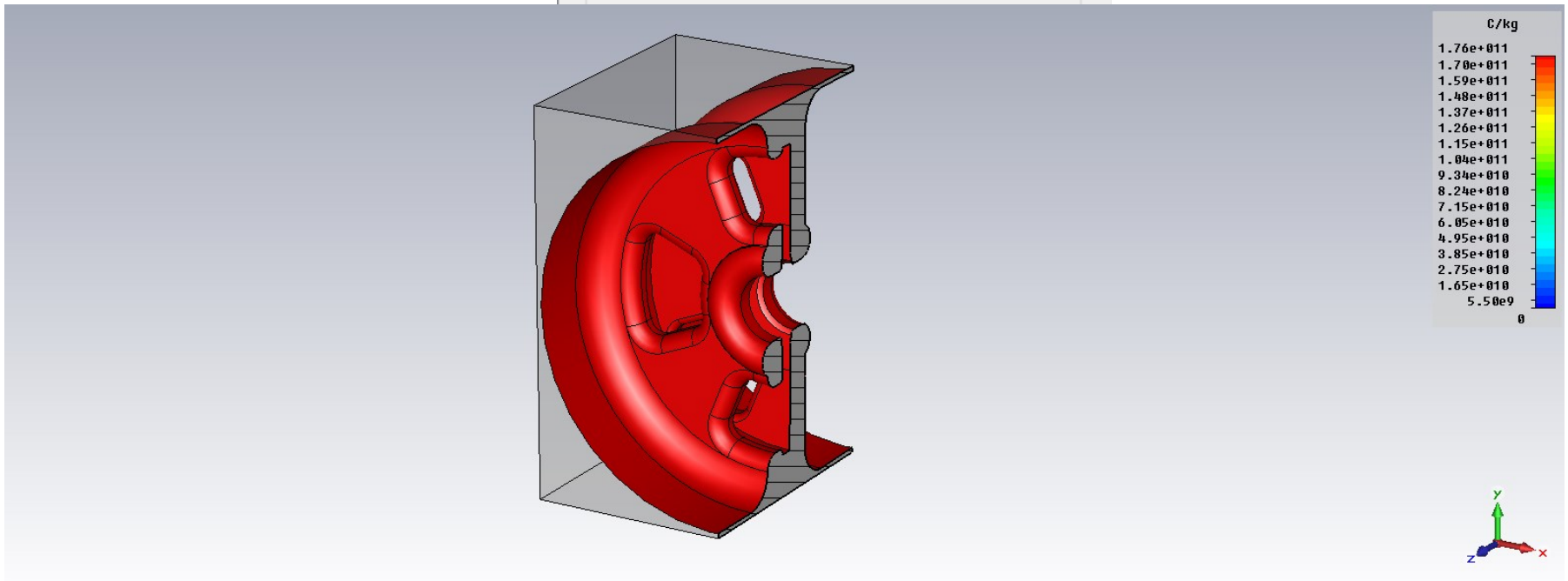
# Numerical simulations - preparation



Kinetic settings

Kinetic type: Energy

Kinetic value: 10 eV



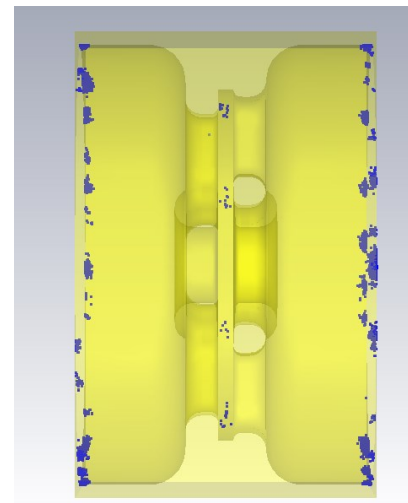
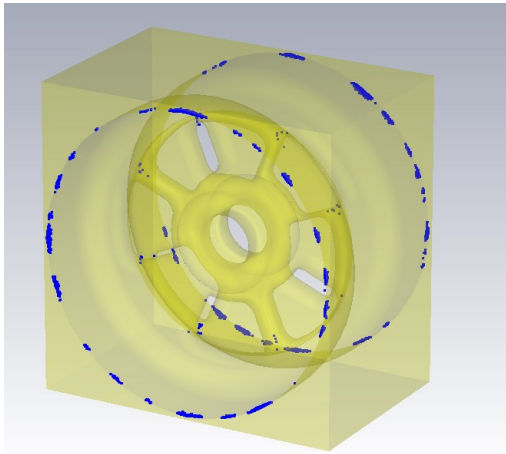
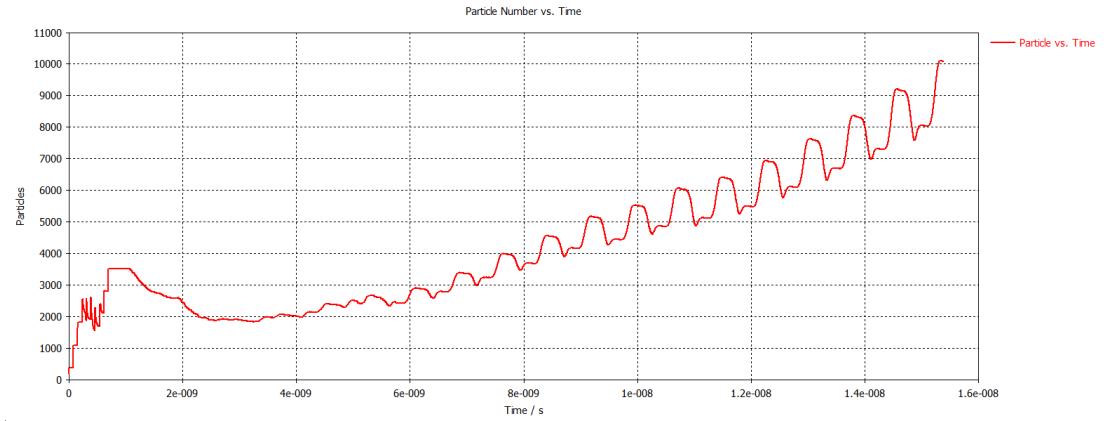
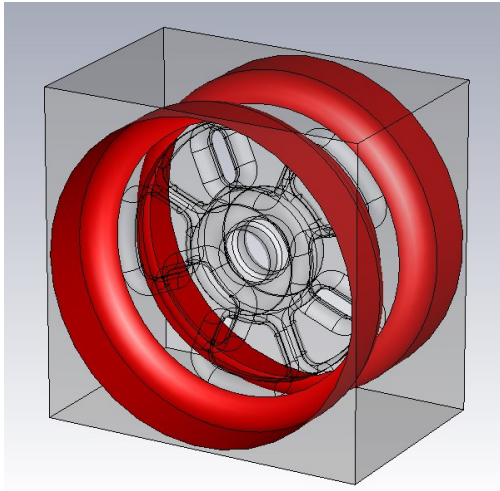
Offset: 0.0

Bunch distances: T\*1e-1

OK Cancel Help

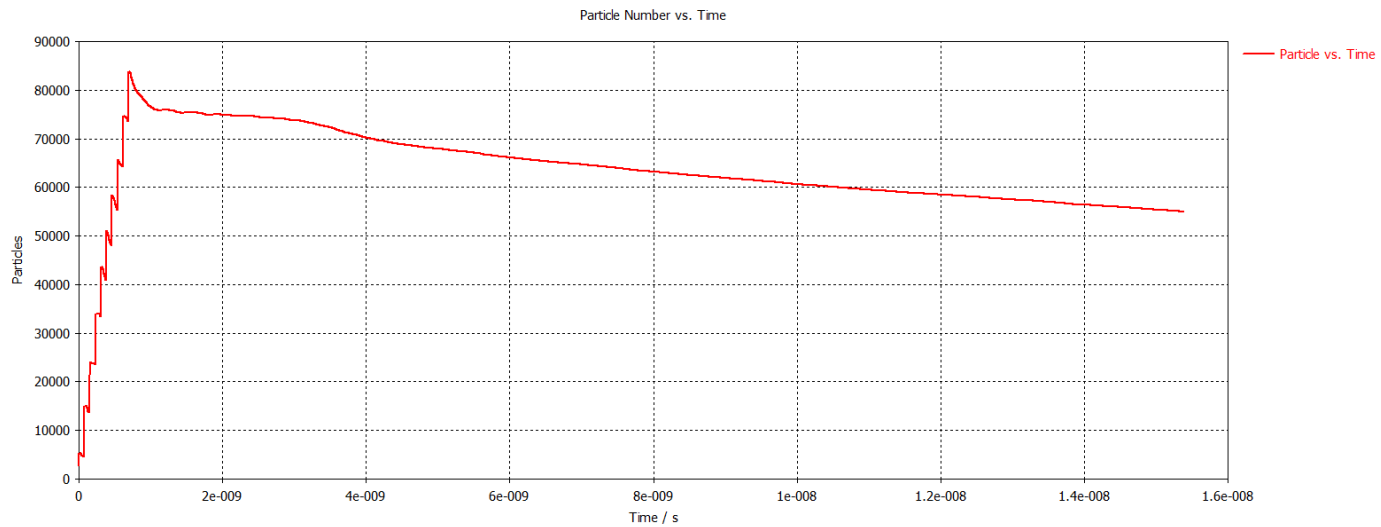
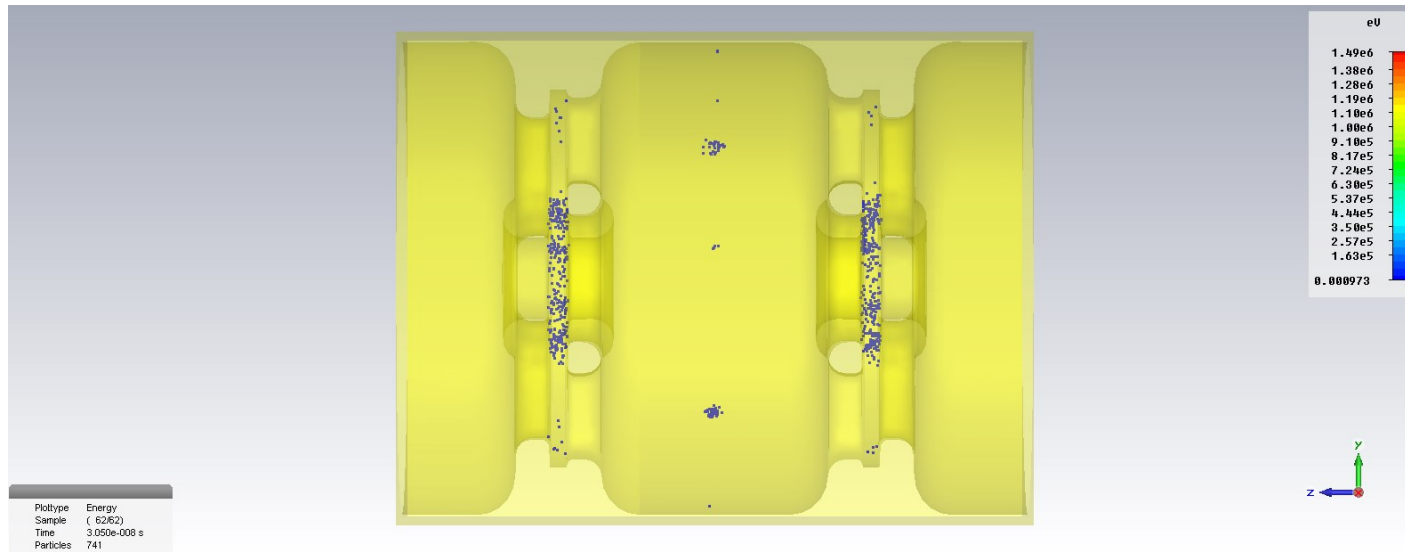


# Numerical simulations - testing





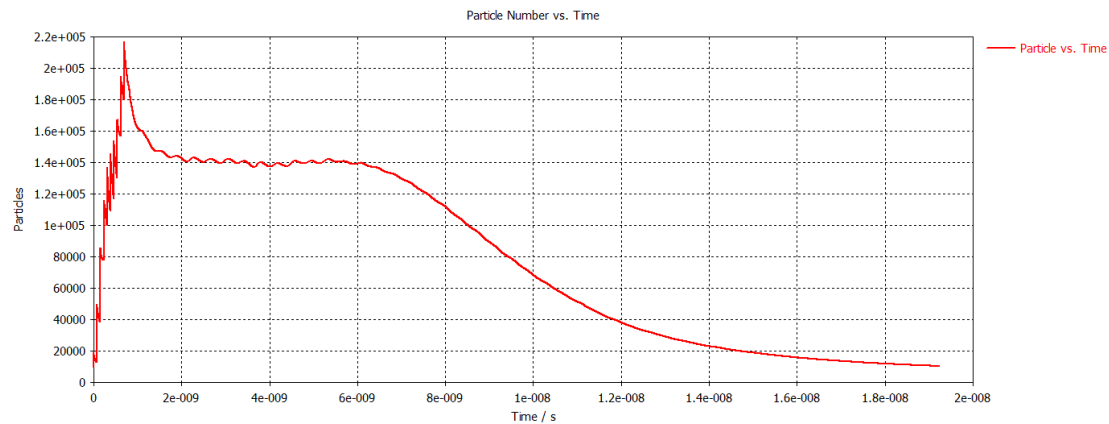
# Numerical simulations - testing



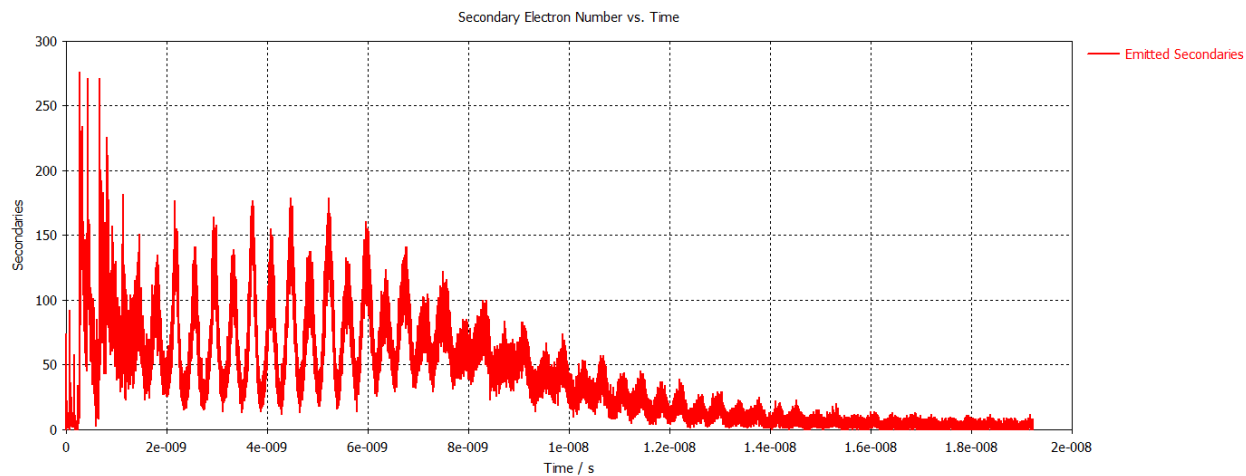


# Numerical simulations – coupled experiment

## Results for 9 MV/m, cell №4



### Particles number vs Time



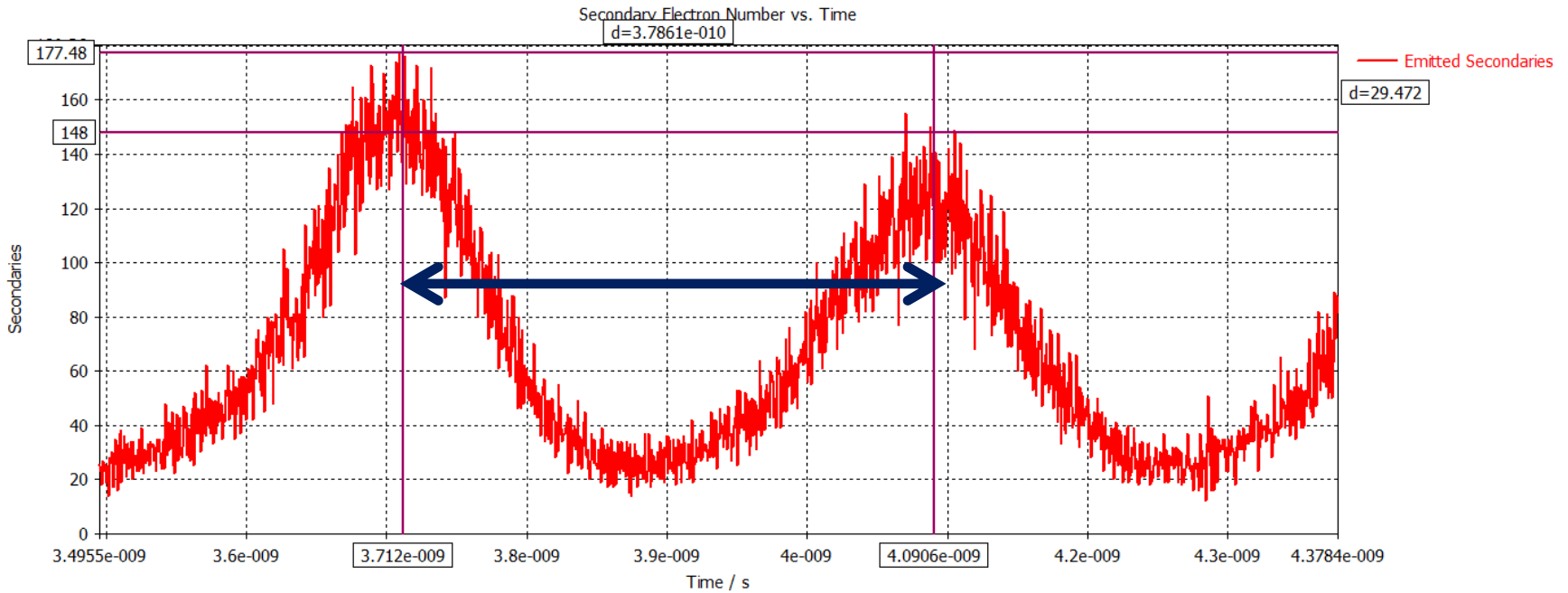
### Number of secondary electrons





# Numerical simulations – coupled experiment

## Results for 9 MV/m, cell №4

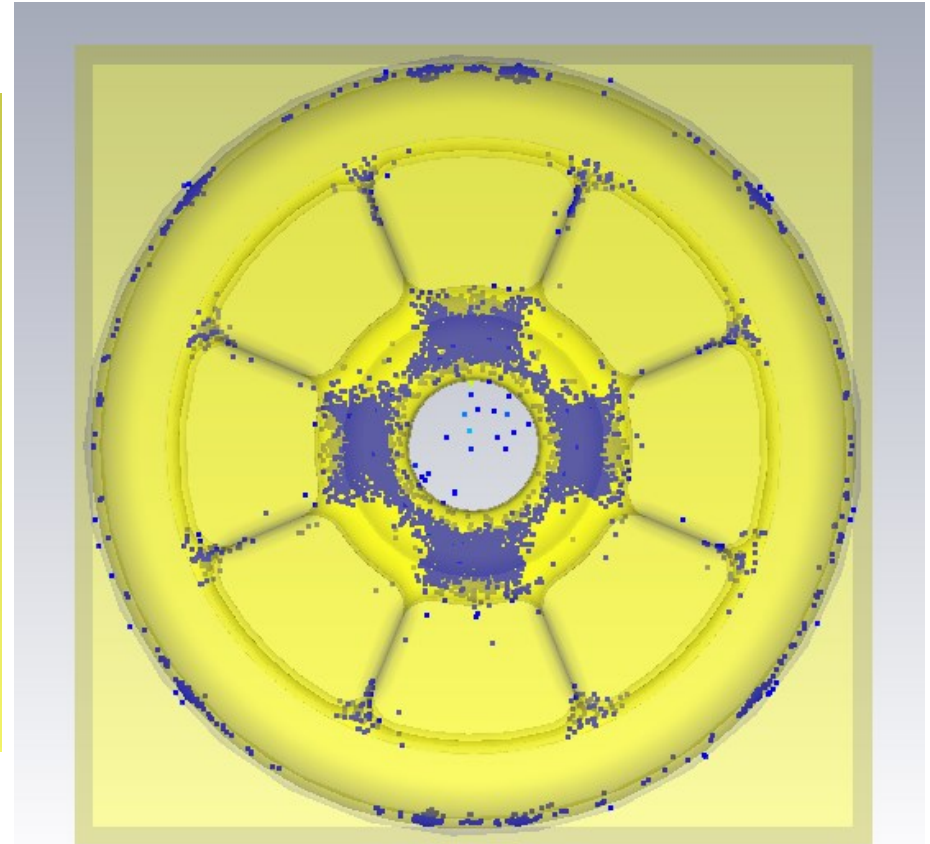
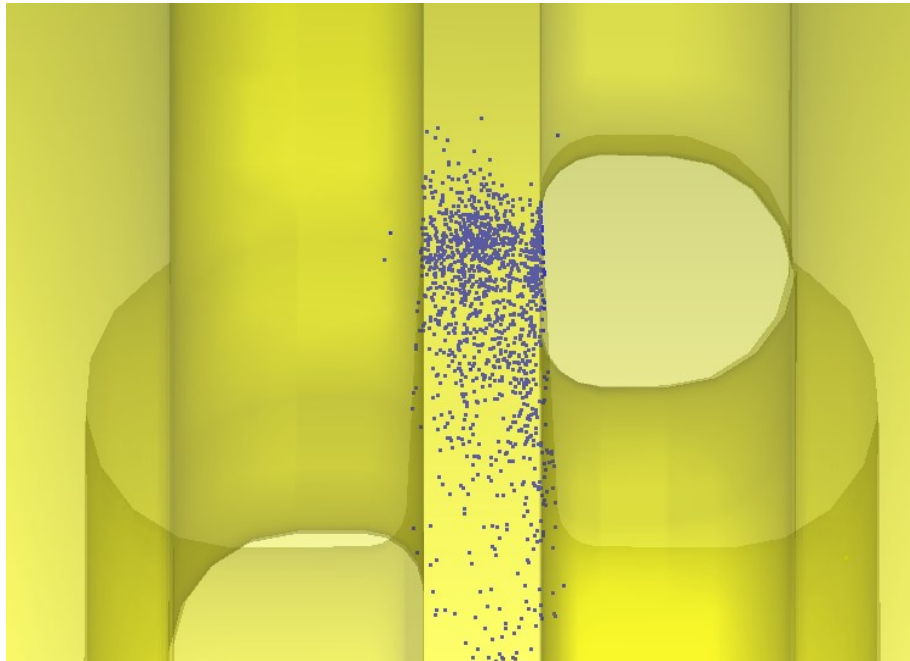


$$\frac{1}{2} T$$



# Numerical simulations – coupled experiment

## Results for 9 MV/m, cell №4



**Electrons positioning**

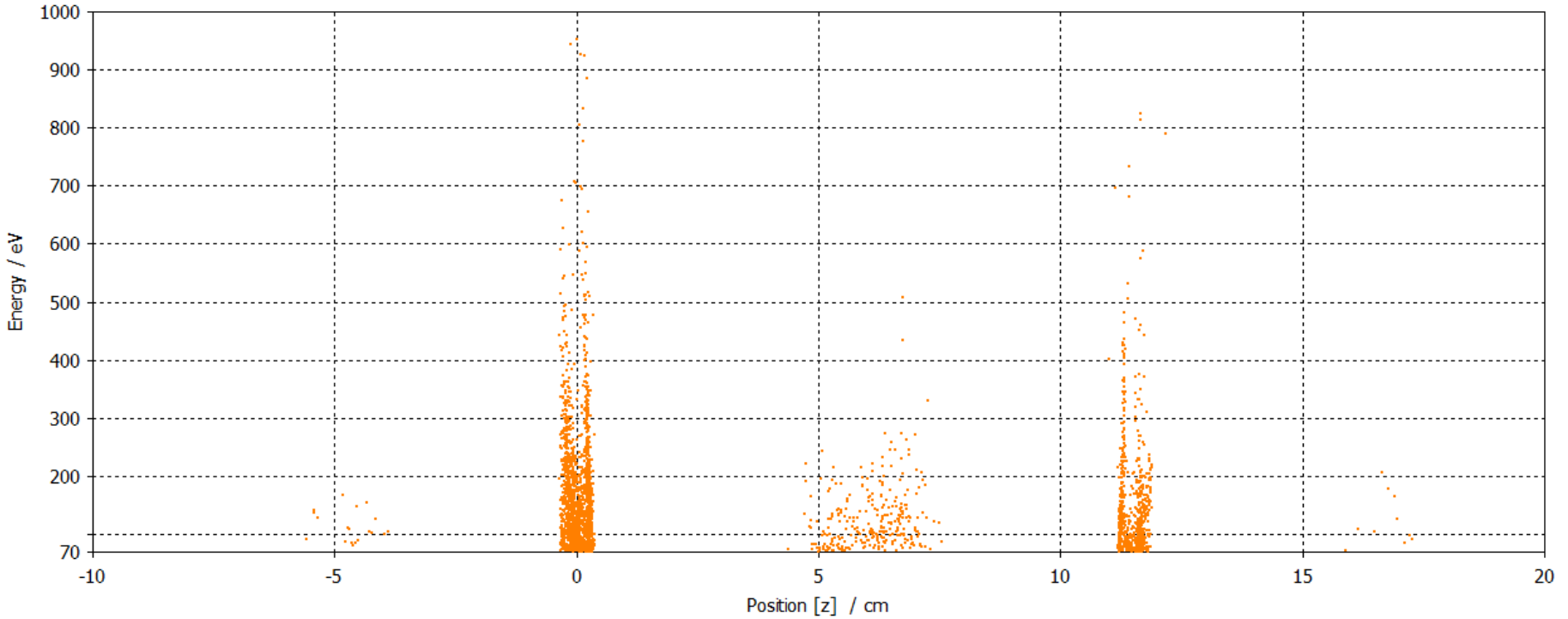


# Numerical simulations – coupled experiment

## Results for 9 MV/m, cell №4



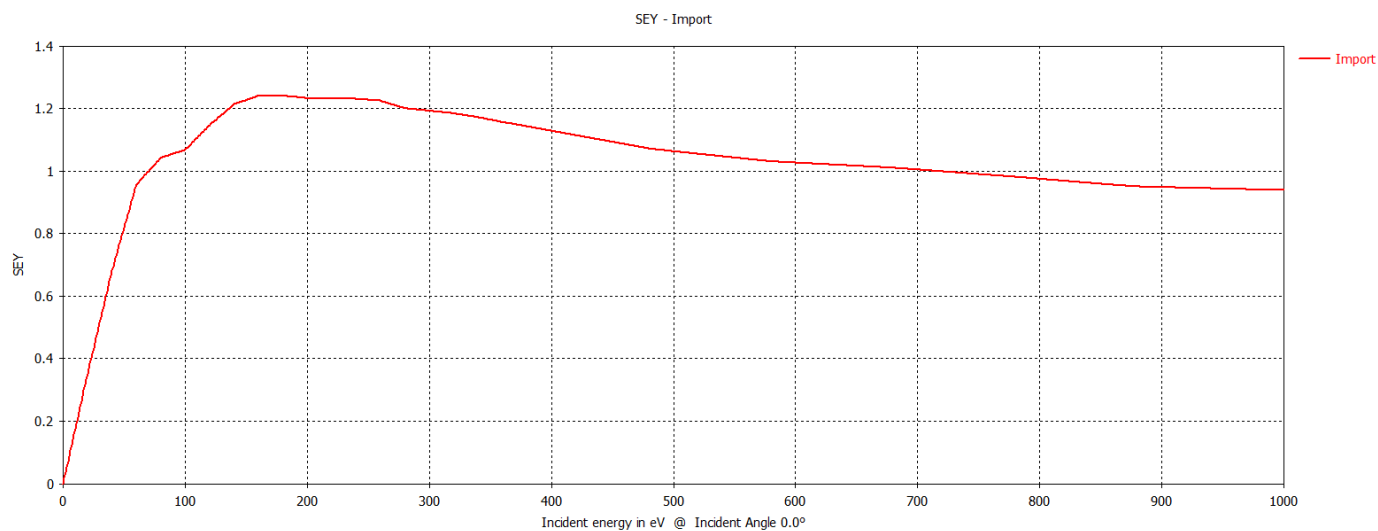
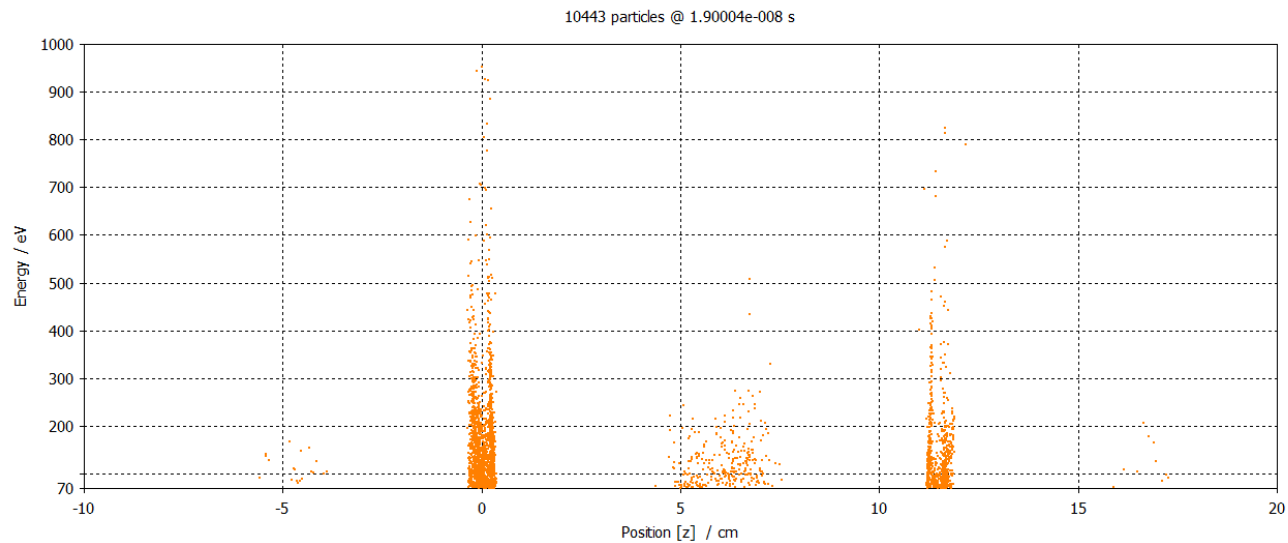
10443 particles @ 1.90004e-008 s





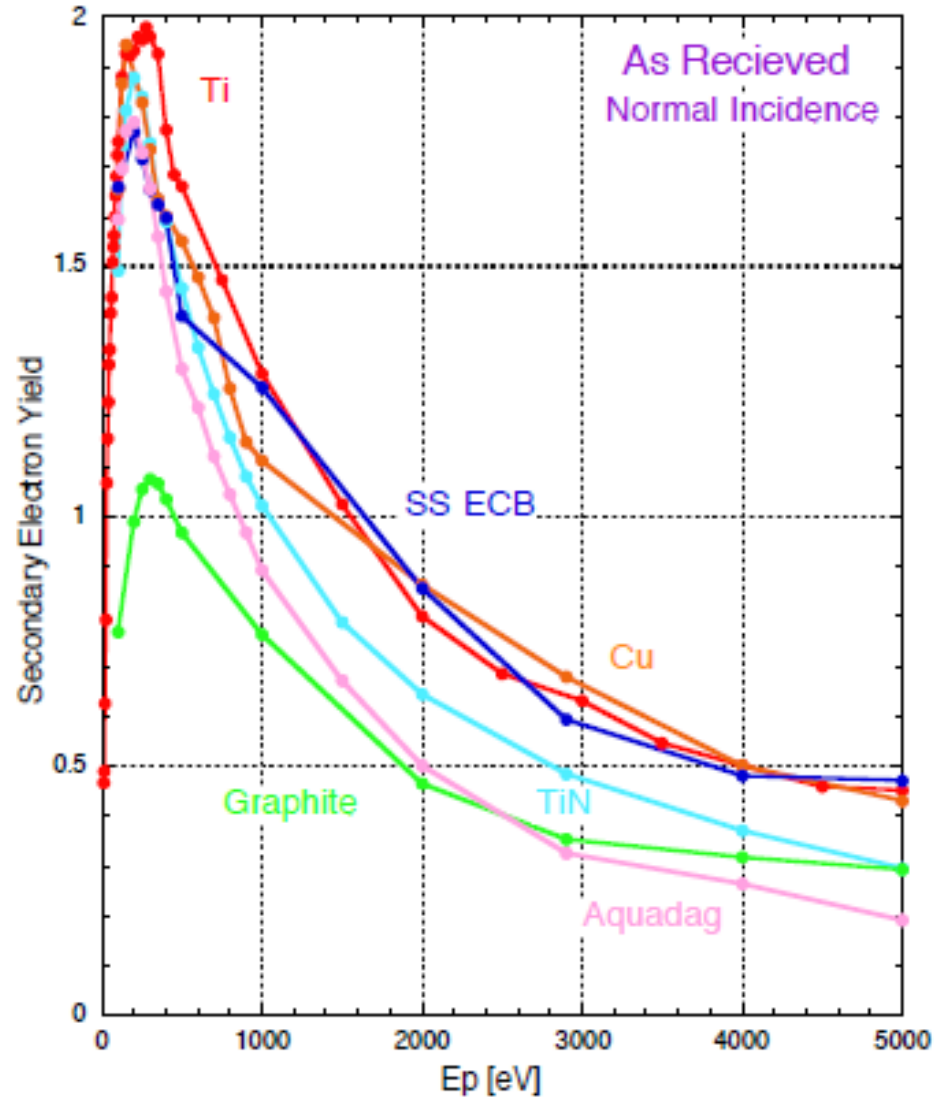
# Numerical simulations – coupled experiment

## Results for 9 MV/m, cell №4



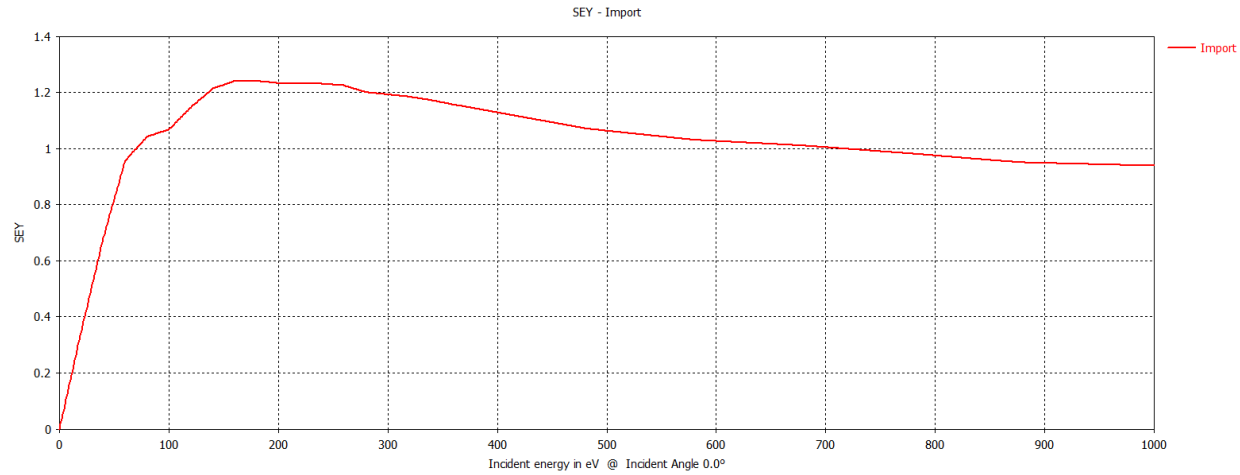
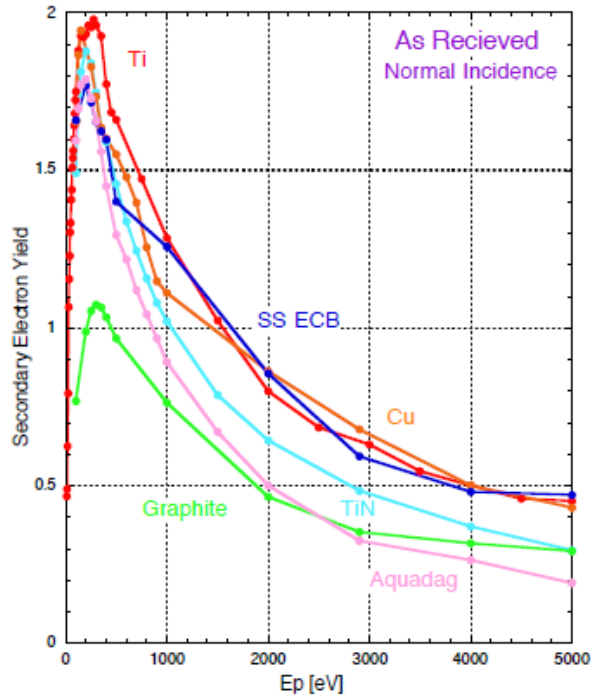


# SEY for the thin carbon film





# SEY for the thin carbon film





## Conclusion



1. The analytical estimation shows multipacting possibility at accelerating field rates 6 - 12 MV/m.
2. The numerical simulation indicates a MP-danger tendency at predicted field levels. A discharge can appear in the case of higher SEY.
3. A thin carbon film cannot provide the SEY enough for multipacting evolution.



Thanks you for attention!