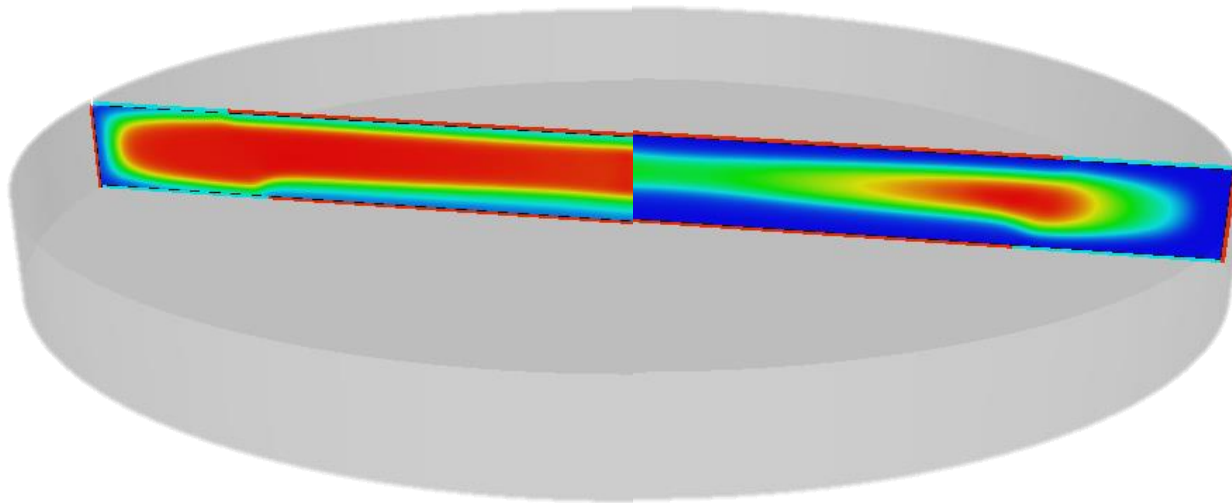


— CASE EXAMPLE —

# Dual Frequency CCP

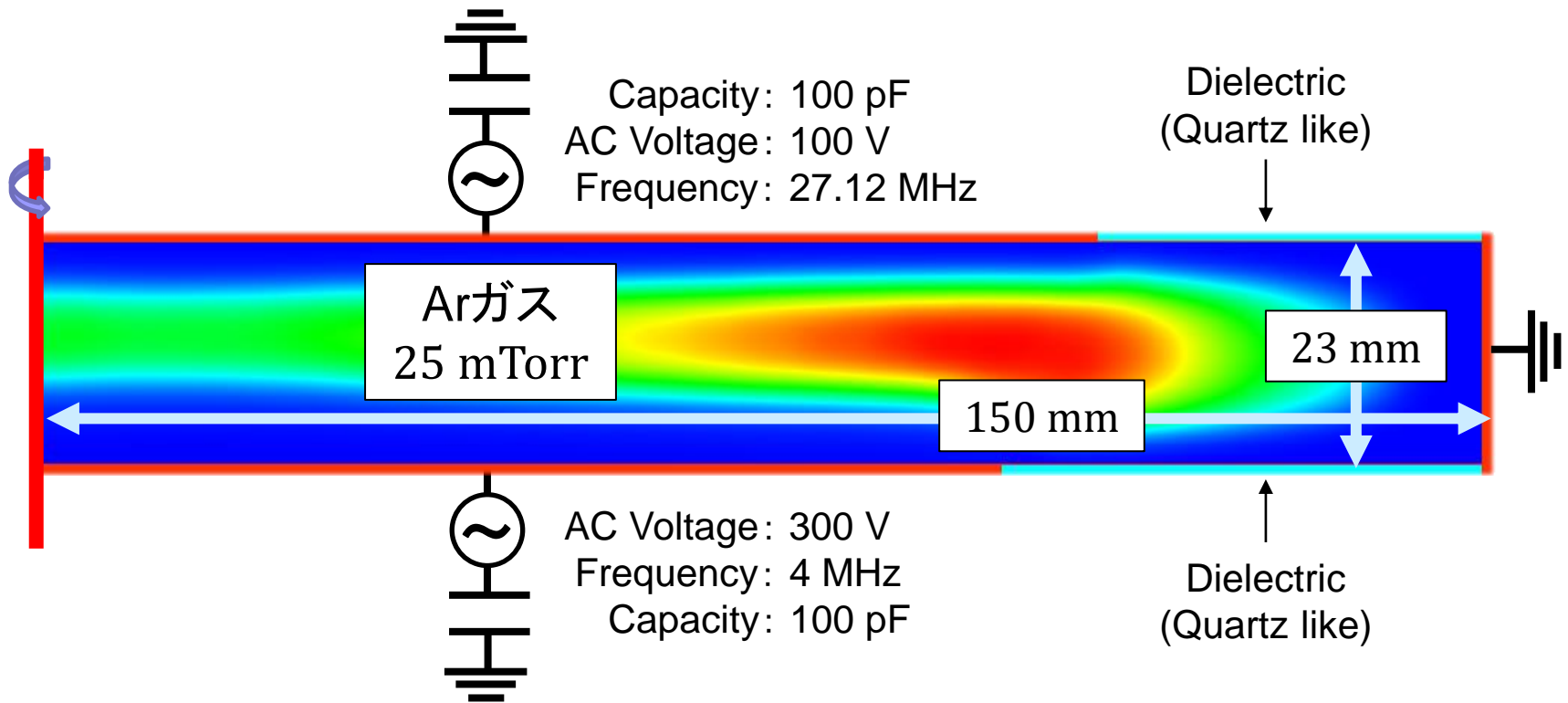
---



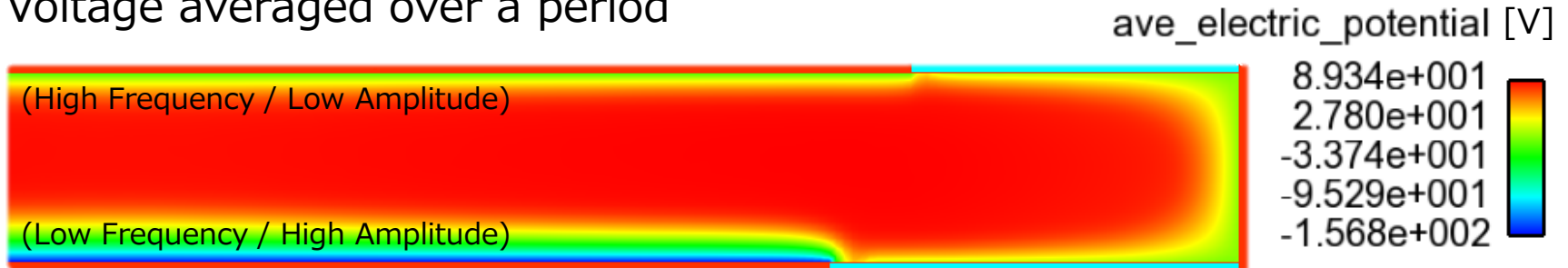
Computational Region

Axi-symmetric model

\* Superposed frequency case also can be analyzed by Particle-PLUS.

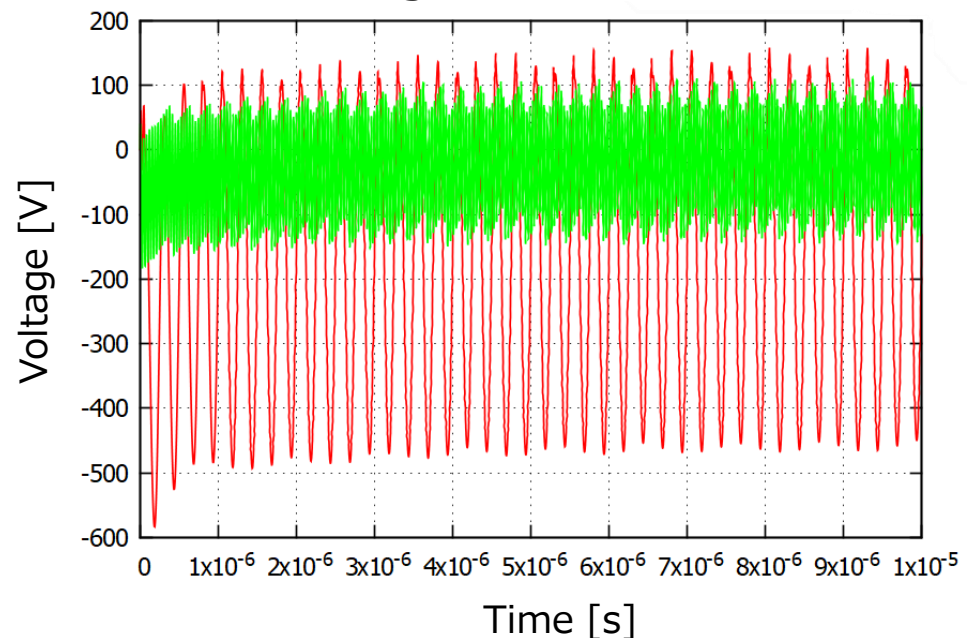


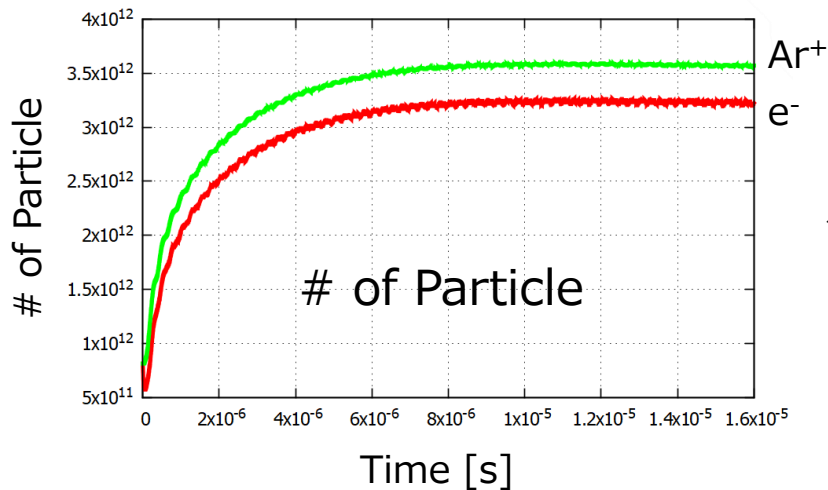
Voltage averaged over a period



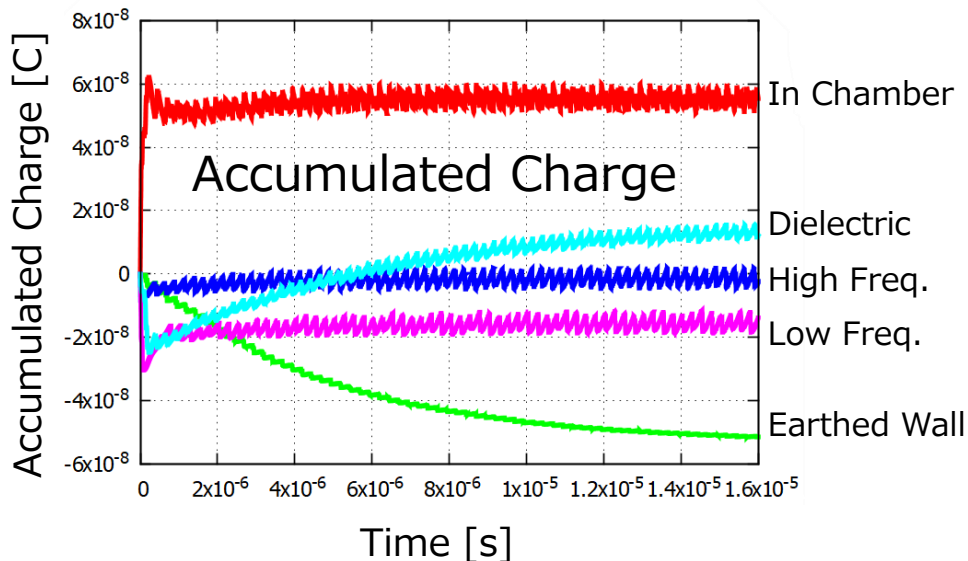
- ✓ Ion is left in plasma region since electron velocity is larger than ion's one. Therefore voltage in plasma is slightly positive.
- ✓ Voltage on substrate has minus component of DC because of **self-bias**.

Voltage on substrate





- ✓ Particle in chamber become a steady state on about  $1 \times 10^{-5}$  seconds, then generation and annihilation rate of particles are balanced.



# Density

Electron Density  
averaged over a period

(High Frequency / Low Amplitude)

(Low Frequency / High Amplitude)

[/m<sup>3</sup>]  
ave\_density\_ele

6.244e+015

4.683e+015

3.122e+015

1.561e+015

0.000e+000



Ar Ion Density  
averaged over a period

(High Frequency / Low Amplitude)

(Low Frequency / High Amplitude)

[/m<sup>3</sup>]  
ave\_density\_Ar\_p

6.261e+015

4.696e+015

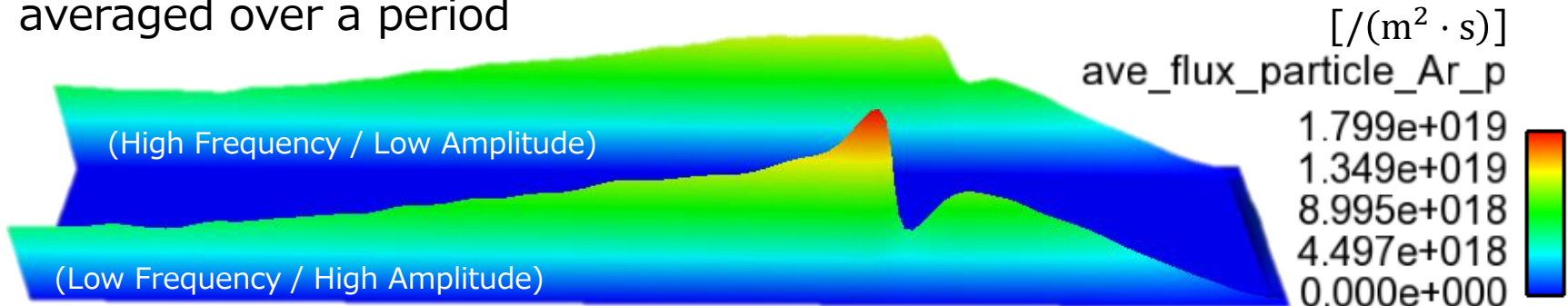
3.130e+015

1.565e+015

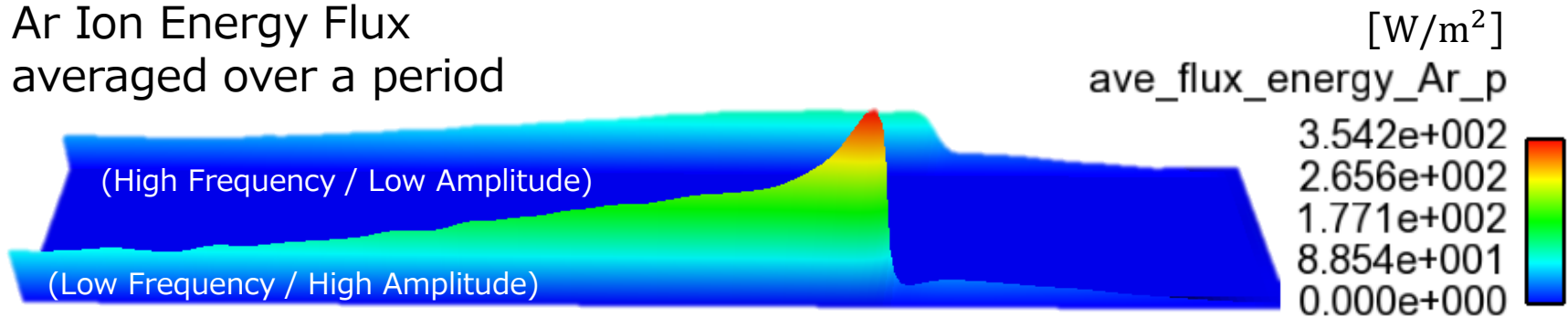
0.000e+000



Ar Ion Particle Flux  
averaged over a period



Ar Ion Energy Flux  
averaged over a period



- ✓ Particle-PLUS can analyze phenomenon of sputtering by using these fluxes.