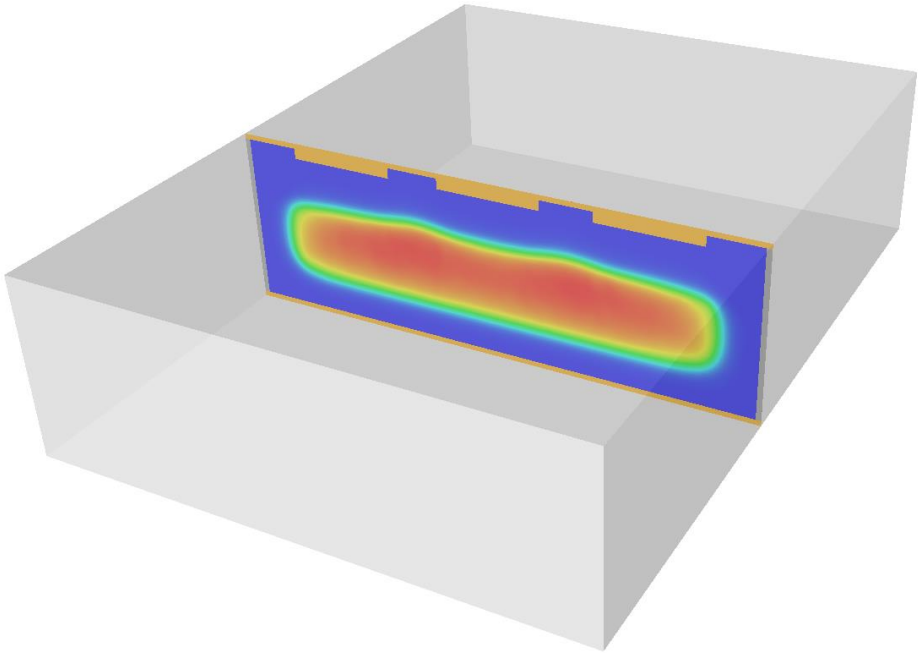
Apr. 2021

— CASE EXAMPLE —

DLC Coating by Plasma CVD

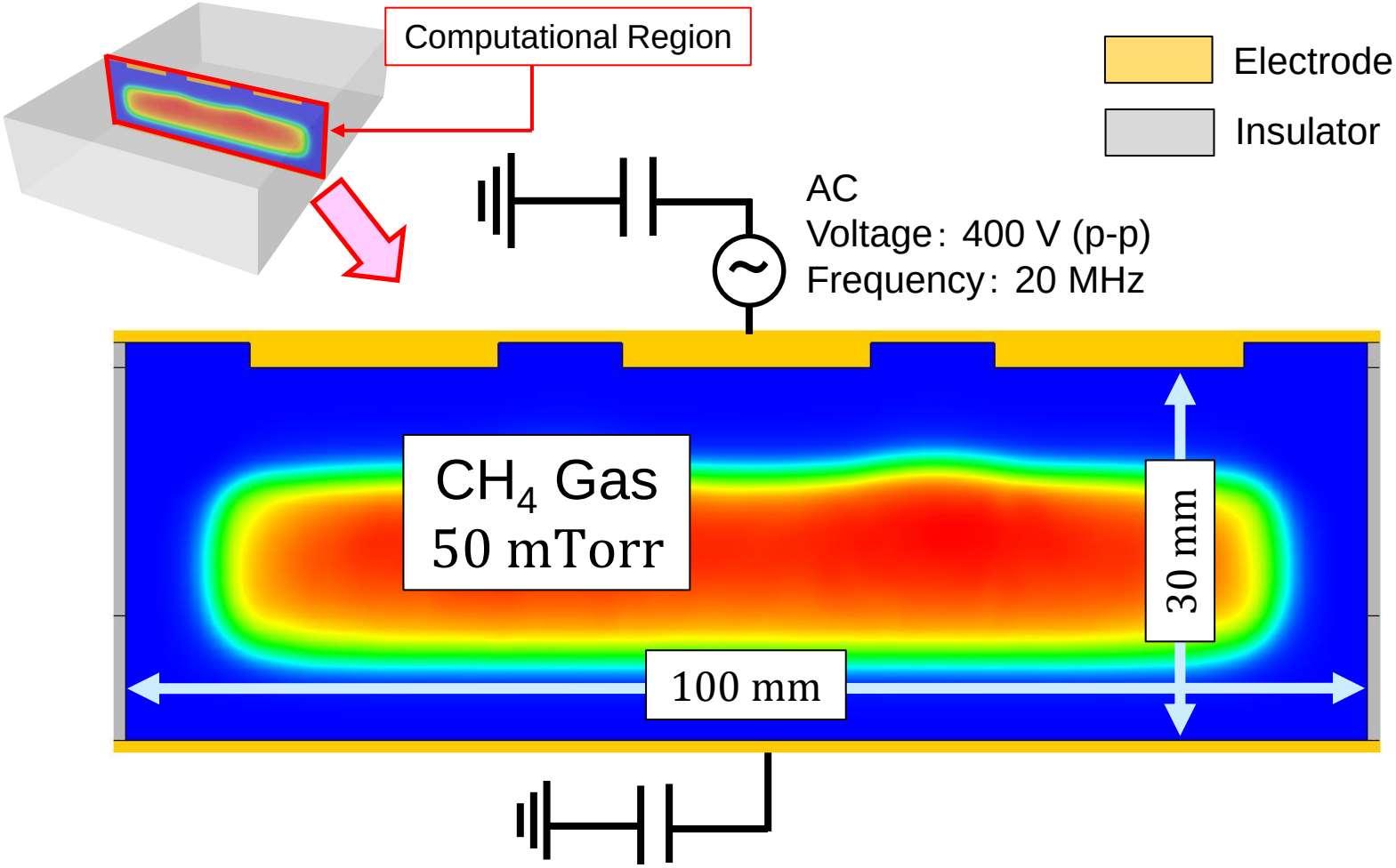


WAVE FRONT

Model

Coating by CH_4 Plasma

2D model



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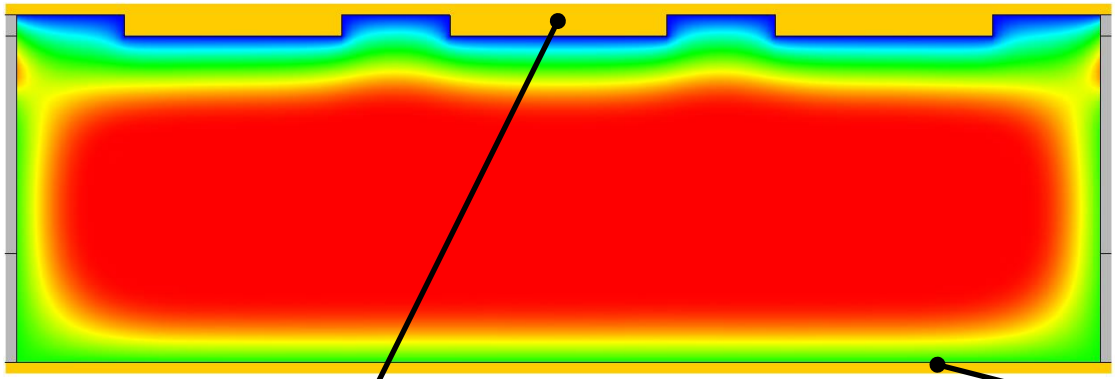
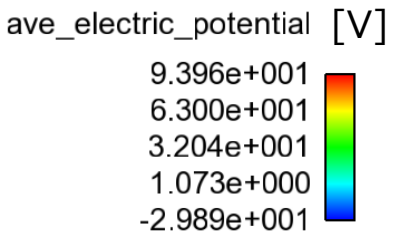
Voltage & Self-Bias

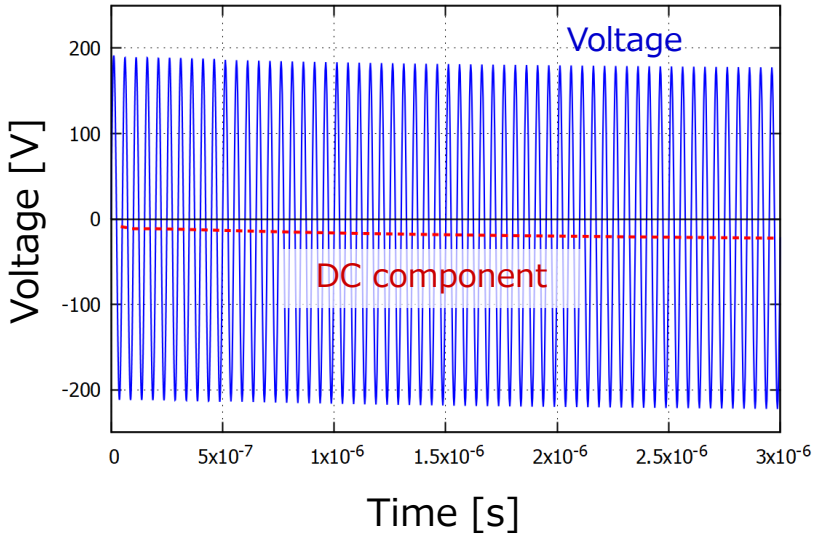
Voltage (avg.)



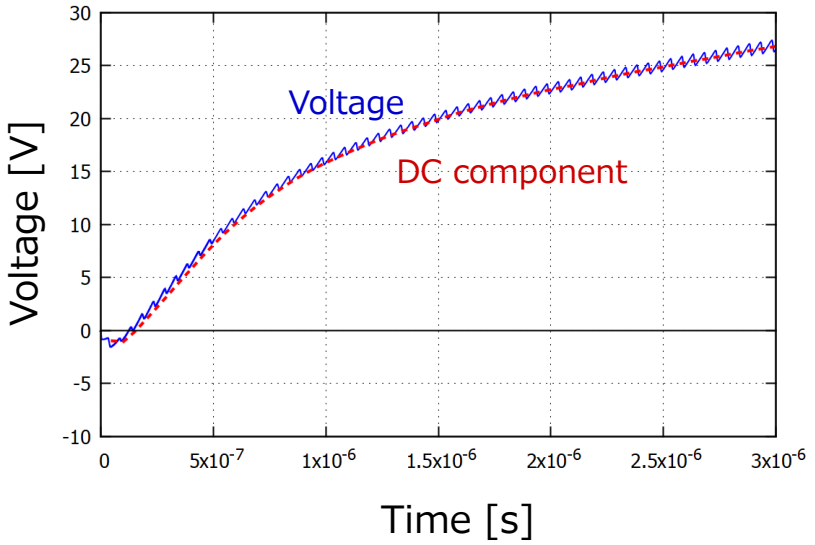


Time Dependence of Voltage

Upper Electrode



Lower Electrode



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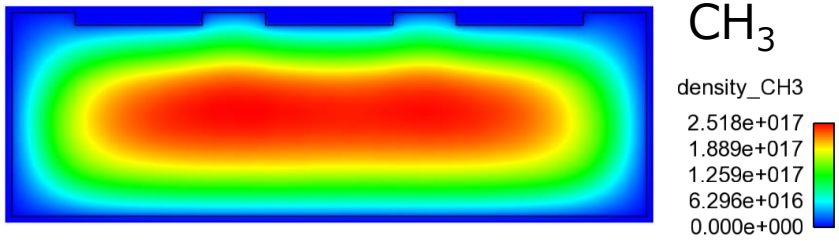
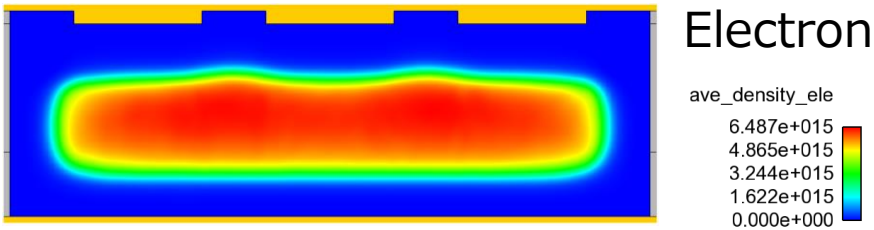
Particle Density

The unit is $[/m^3]$. In addition to them, CH_4 as a background and ions, excited species and radicals as reaction products are considered.

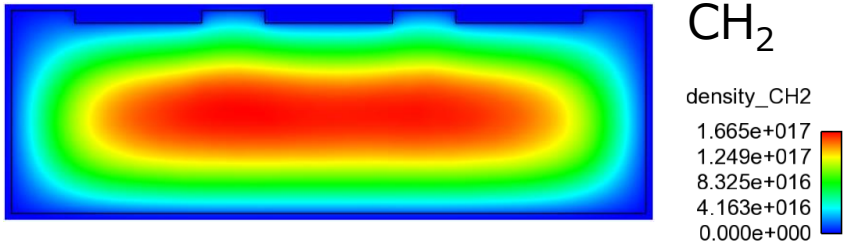
CH_3



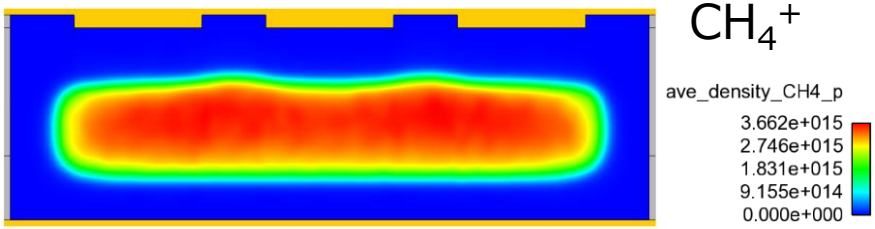
Electron



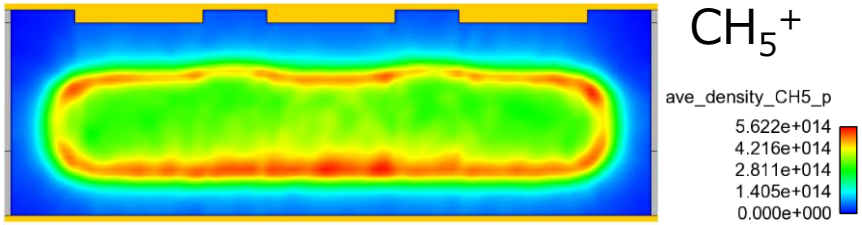
CH_2



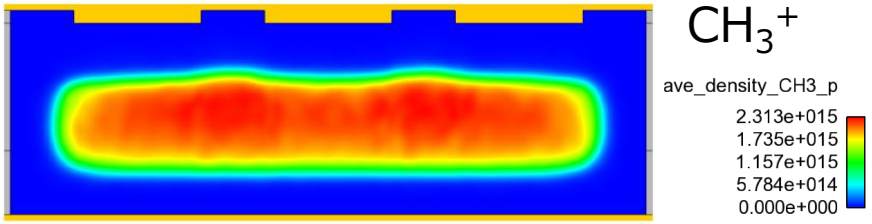
CH_4^+



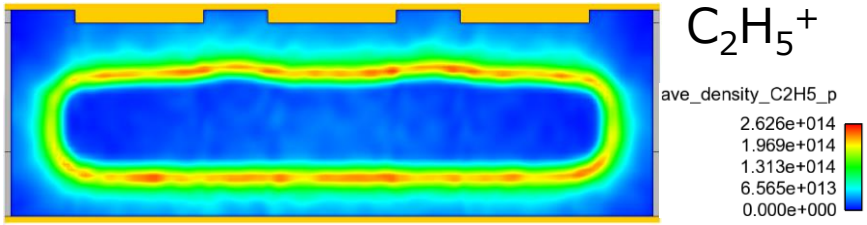
CH_5^+



CH_3^+



$C_2H_5^+$



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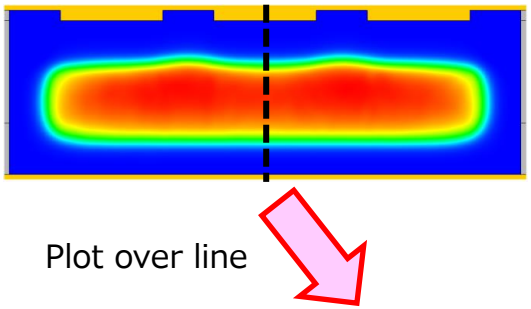
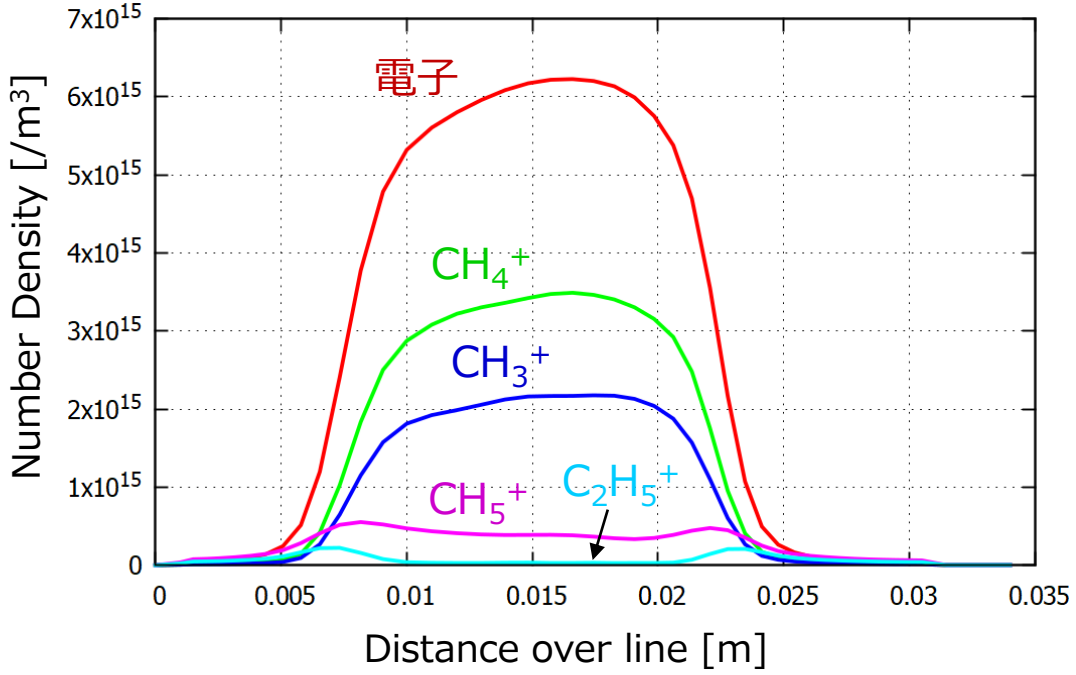
Side Reaction & Distribution



Main generation process of CH_5^+ and $C_2H_5^+$

- $e + CH_4 \rightarrow e + e + CH_4^+$
- $e + CH_4 \rightarrow e + e + CH_3^+ + H$
- $CH_4^+ + CH_4 \rightarrow CH_5^+ + CH_3$
- $CH_3^+ + CH_4 \rightarrow C_2H_5^+ + H_2$

Number Density Distribution of Electron and ions (avg.)



By-products such as CH_5^+ and $C_2H_5^+$ are peaked around main products such as CH_4^+ and CH_3^+.

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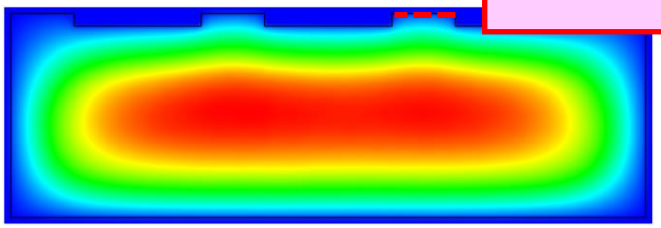
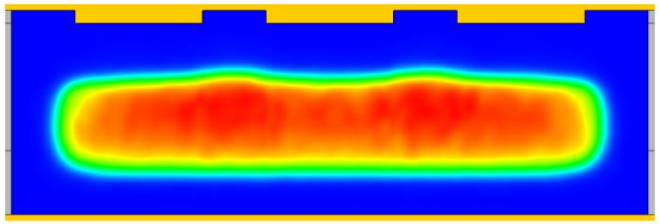
Flux on Groove

CH_3 Density



density_CH3 [/m³]
2.518e+017
1.889e+017
1.259e+017
6.296e+016
0.000e+000

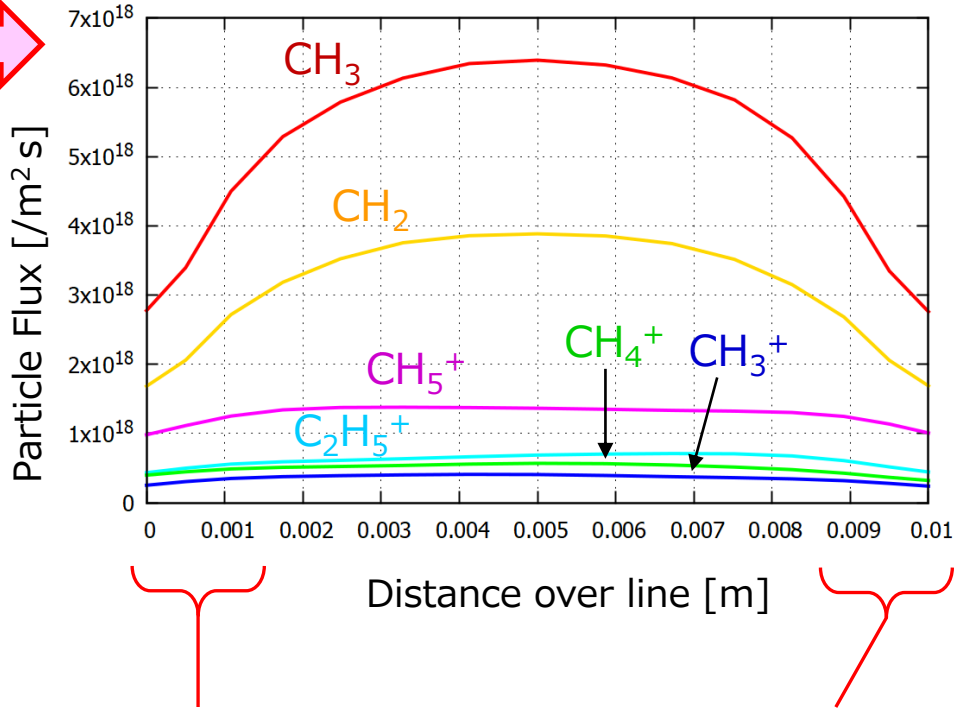
CH_3^+ Density



ave_density_CH3_p [/m³]
2.313e+015
1.735e+015
1.157e+015
5.784e+014
0.000e+000

Plot over line

Surface Flux of Ions and Radicals (avg.)



- ✓ Ions have relatively low flux on retracted position due to higher directivity of them than neutral radicals.

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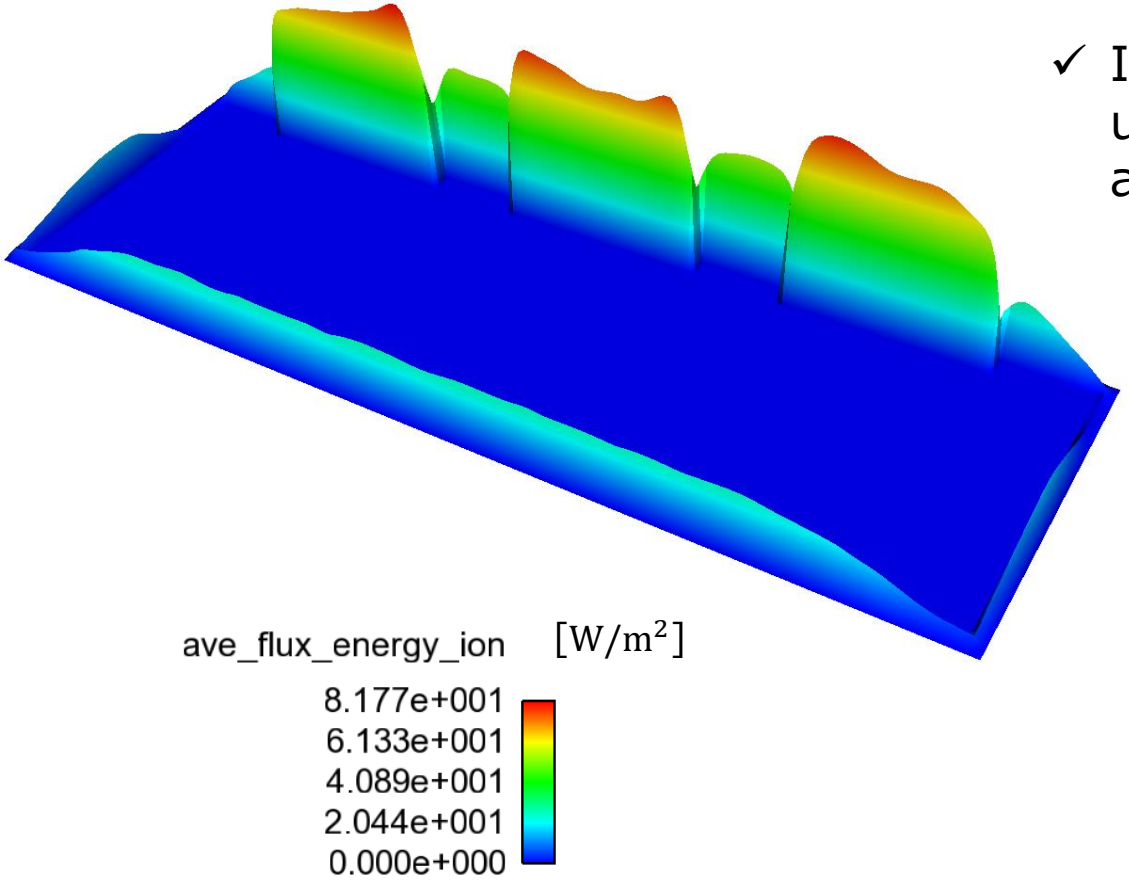
Ion Energy Flux on Surface

Ion Energy Flux on surface (avg.)



- ✓ Ion energy flux, which is useful to estimate an ion assist, is also evaluated.

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