Electric Field Calculation in GITR

Sheath Model (from GITR)

Magnitude of E Field :

$$E(u) = \frac{\Phi_S * e^{-\frac{u}{2\lambda_d}}}{2\lambda_d} + \frac{\Phi_{MPS} * e^{-\frac{u}{R_D}}}{R_D} \qquad \Phi_S = 3T_e$$

(From Tim's presentation)

u : distance-to-boundary
lambda : Debye Length

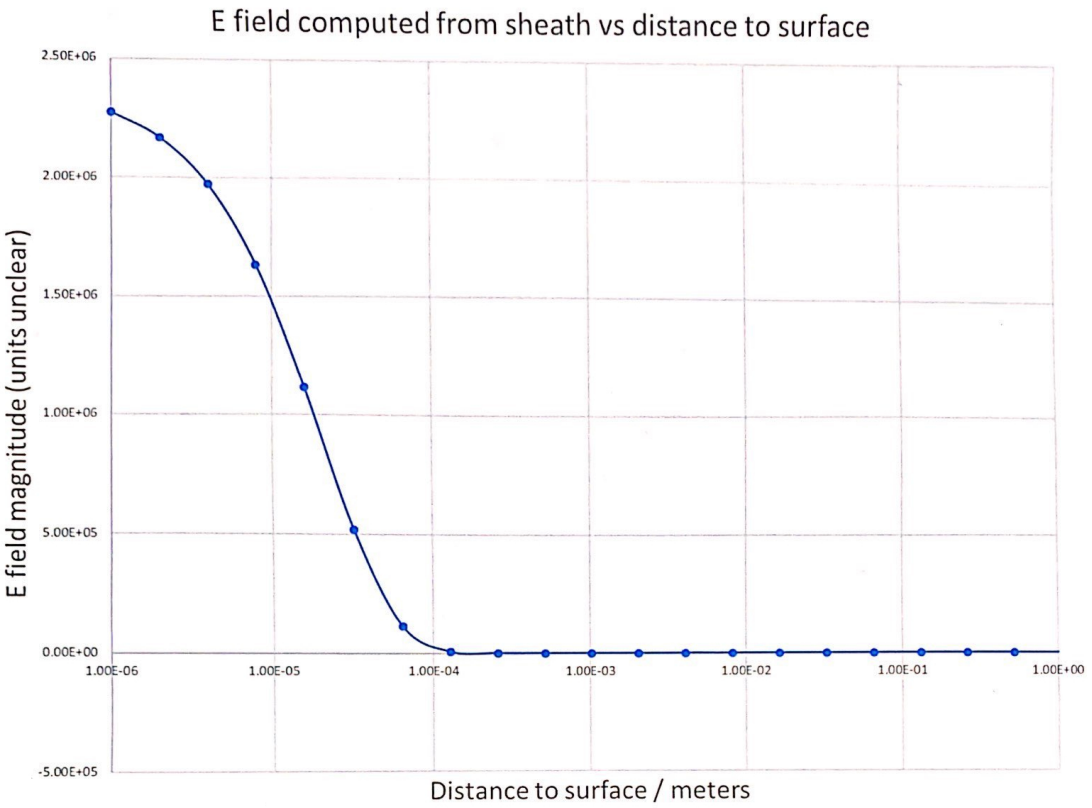


Figure 1

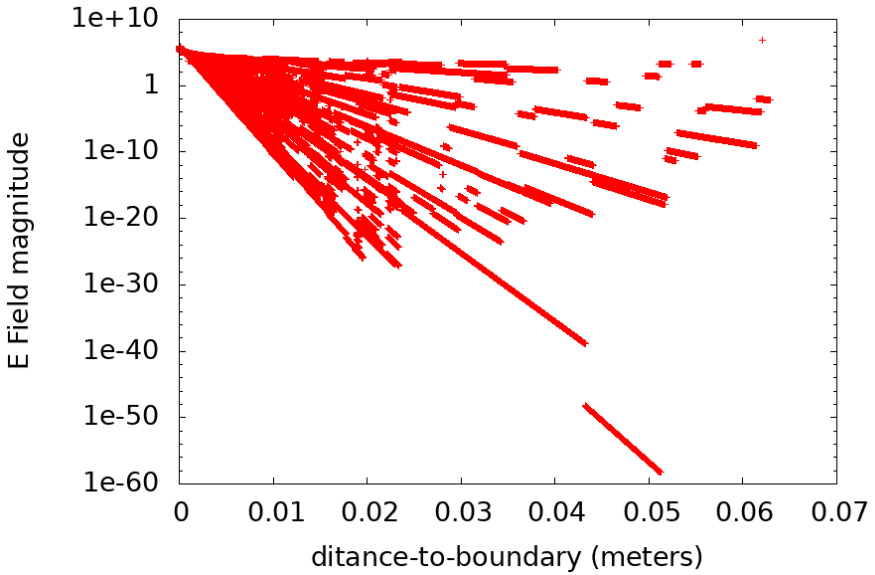
Model from:
https://github.com/SCOREC/GITR/blob/gopan-gpu/src/EfieldInterp.cpp#L17

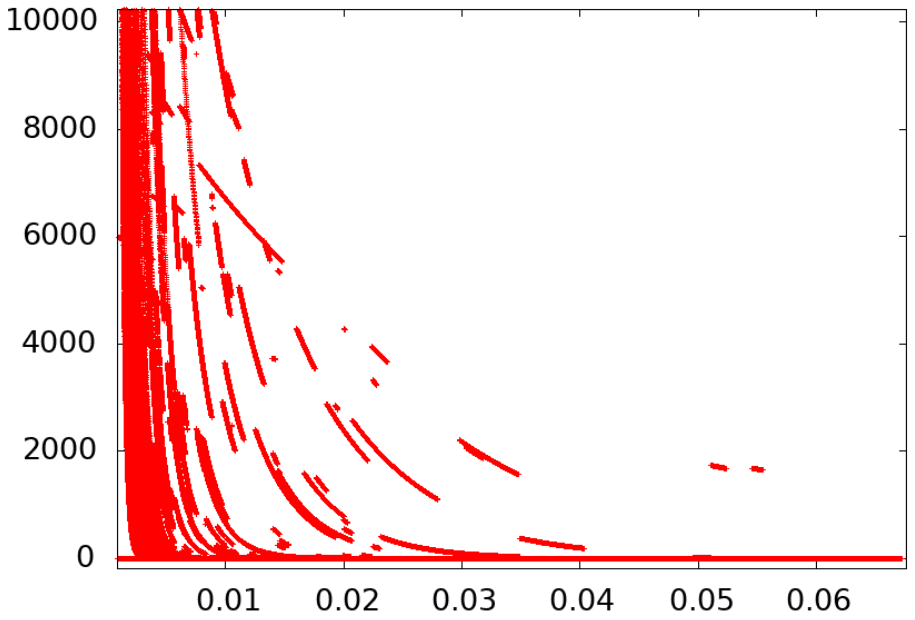
Electric Field vs Distance-to-boundary in GITR

Plot shows printed values of E Field magnitude vs distance at particle positions within plasma (from GITR code)

Compared to Figure 1, non-zero E Field values for extended distances.

E Field **1650** for **5.5 cm**.
Is this valid ?





X : distance-to-boundary in **meters**
Y : E Field magnitude

Left: log scale

Figure 2

Calculations in GITR code

Debye Length calculated using electron density and electron temperature at the boundary :
https://github.com/SCOREC/GITR/blob/gopan-gpu/include/boundaryInit.h#L112

Child-Langmuir Distance calculated using Debye Length and potential at boundary, for biased boundary :
https://github.com/SCOREC/GITR/blob/gopan-gpu/include/boundaryInit.h#L125

Electric field magnitude calculated using **distance-to-boundary**, Child-Langmuir Distance, and potential, for biased boundary:
https://github.com/SCOREC/GITR/blob/gopan-gpu/include/boris.h#L660

For non-biased boundary surface, E Field is calculated using **distance-to-boundary**, and Debye Length:
https://github.com/SCOREC/GITR/blob/gopan-gpu/include/boris.h#L673