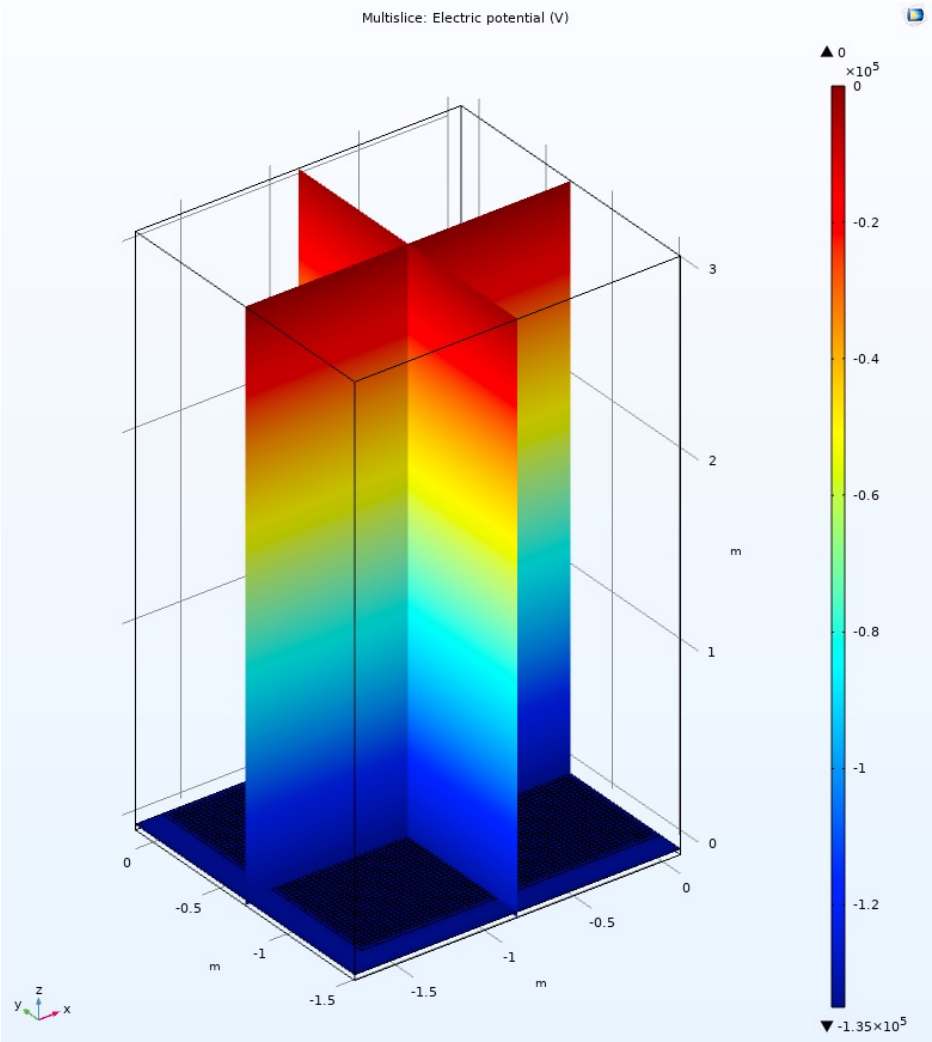
Spacer influence at cathode / FC interface

Yoann Kermaïdic, Fabien Cavalier

HV consortium

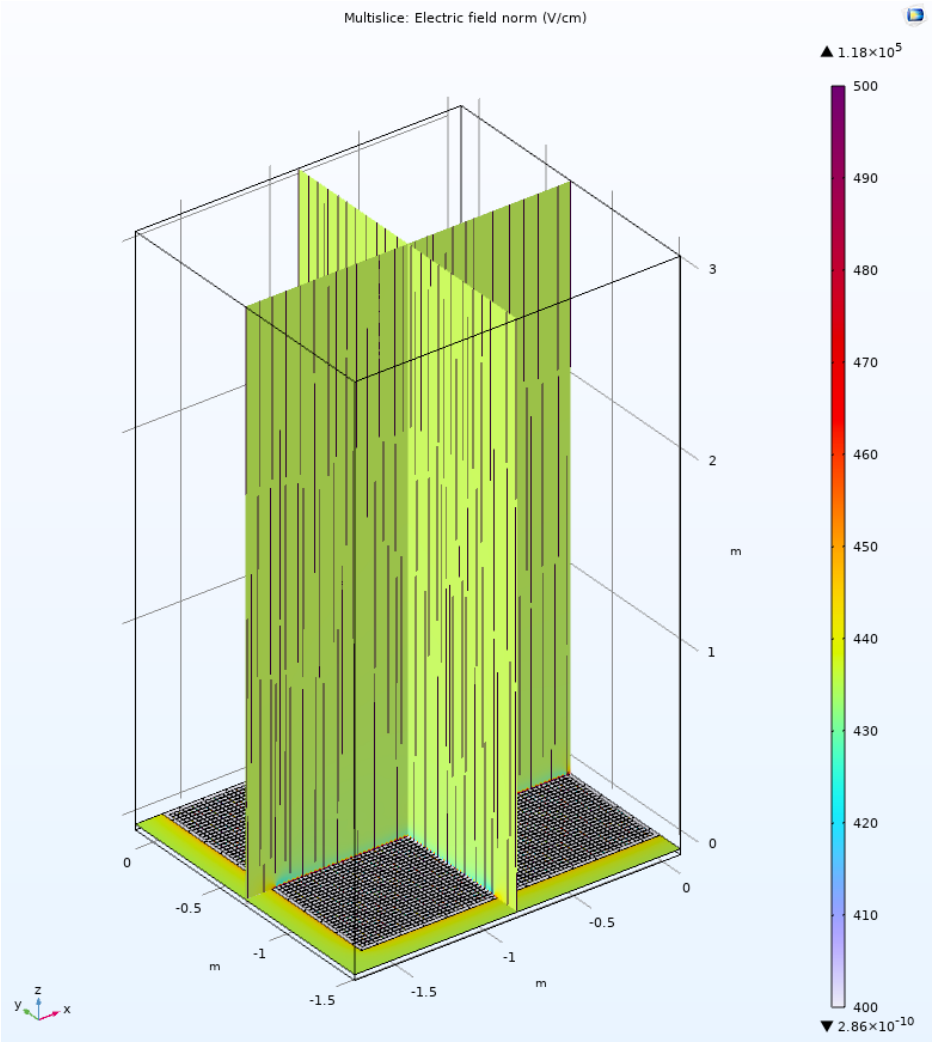
March 07, 2023

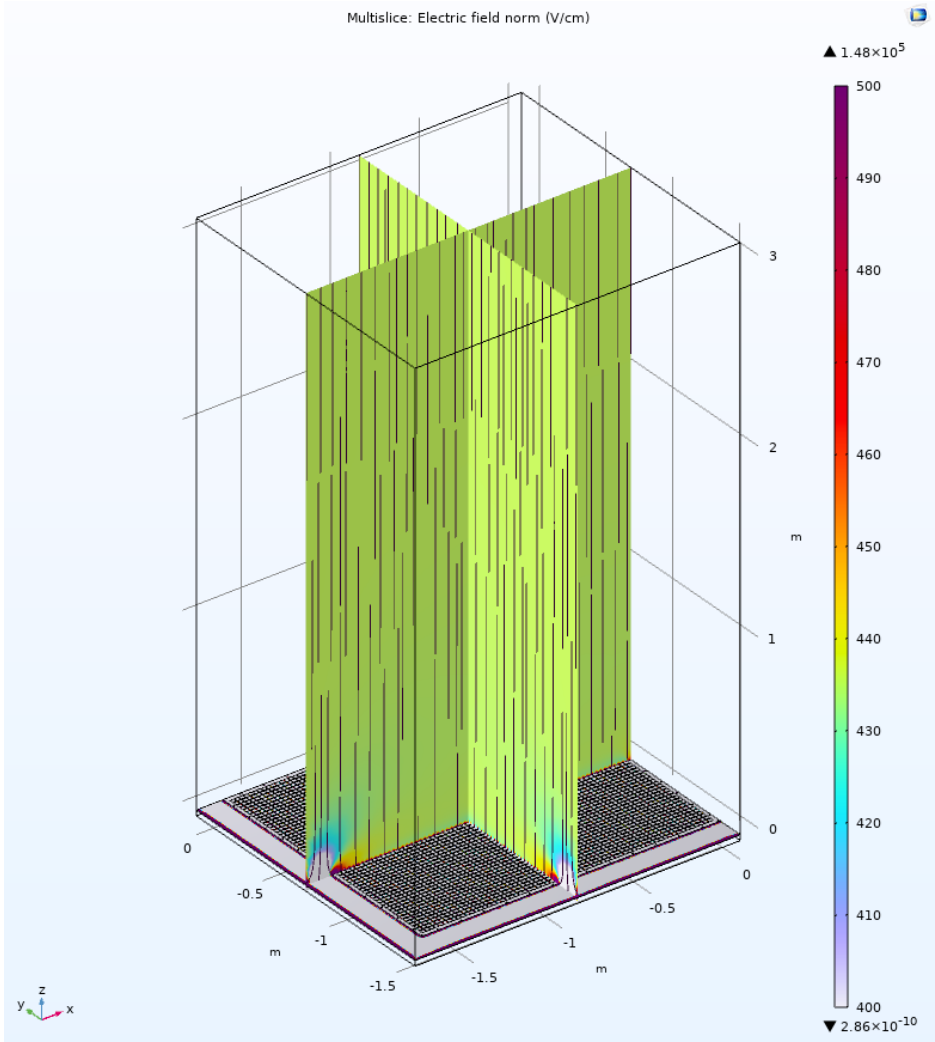
COMSOL configuration



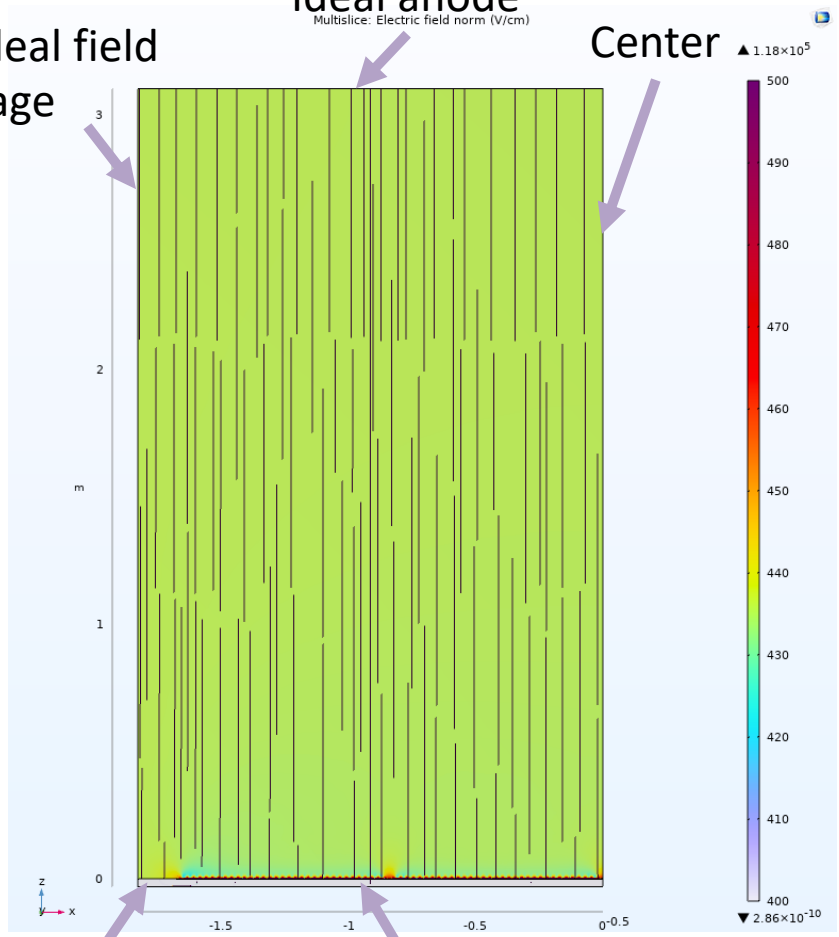
- Simulate 1/8th of a cathode (using symmetries)
- 3 m height (HV = -135 kV)
- Calculations with/without spacer between cathode and FC (15 cm gap)

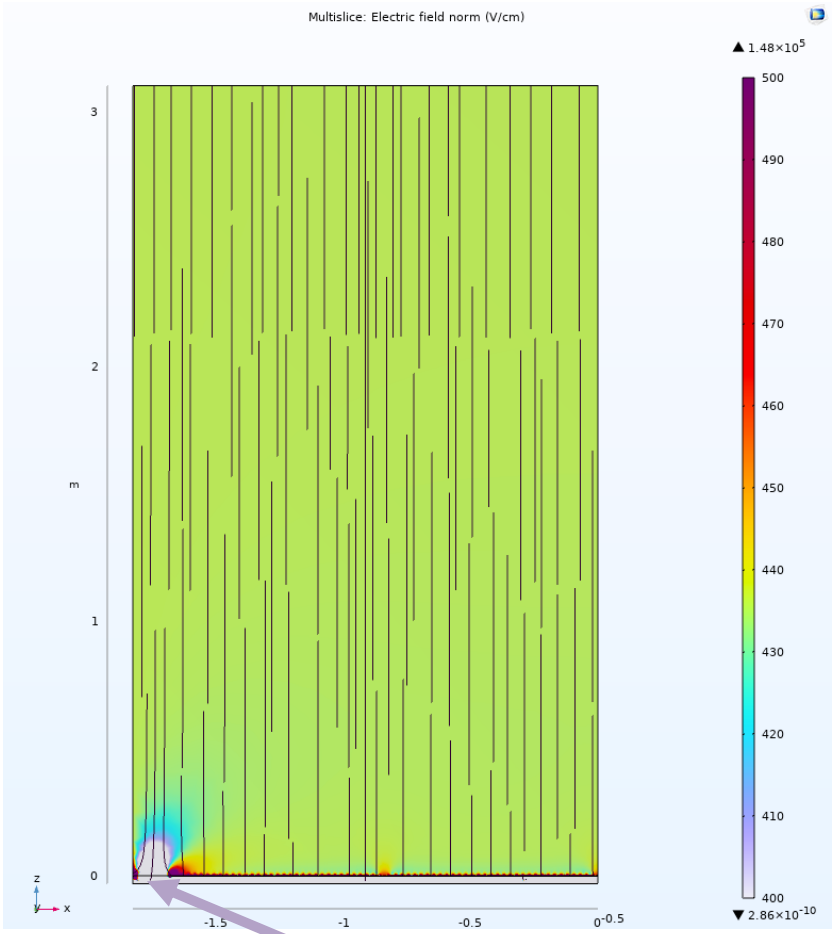
3D E-field rendering





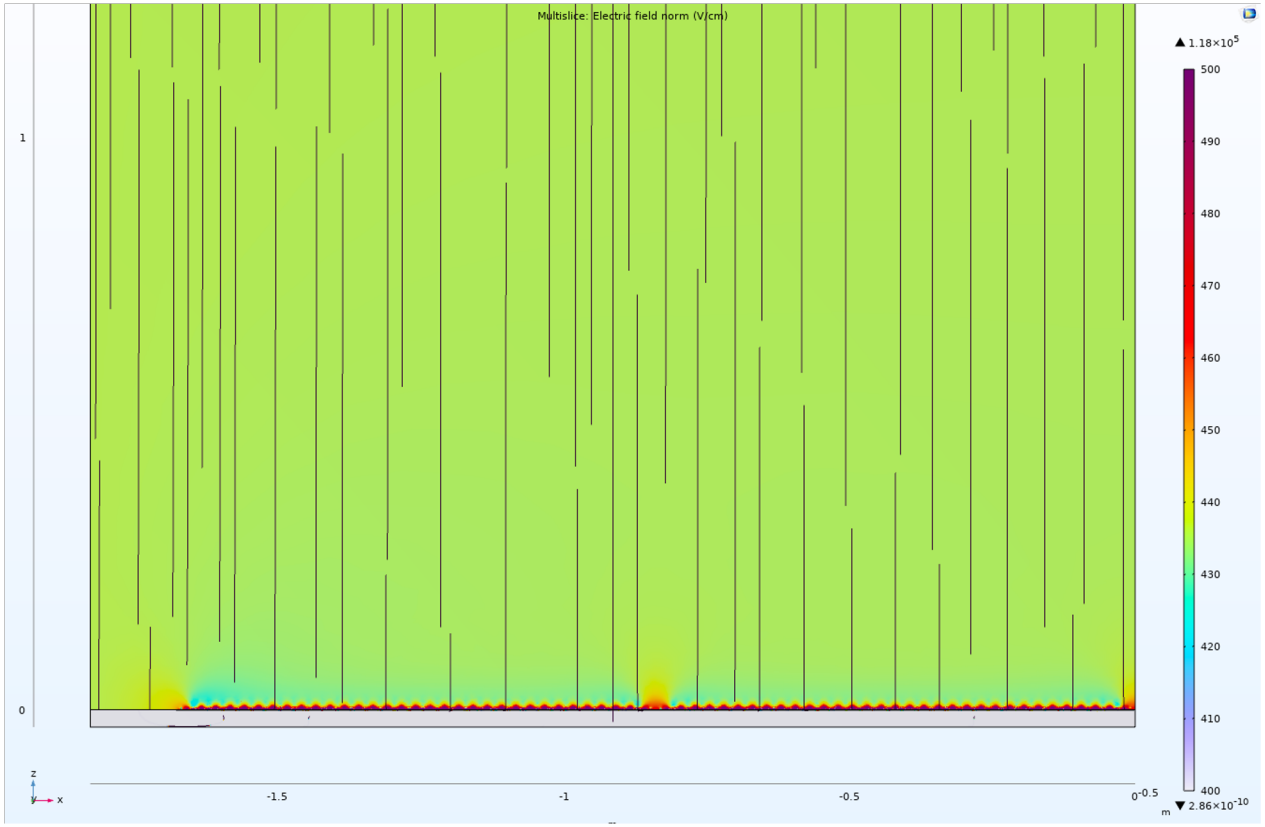
Geometry with spacer





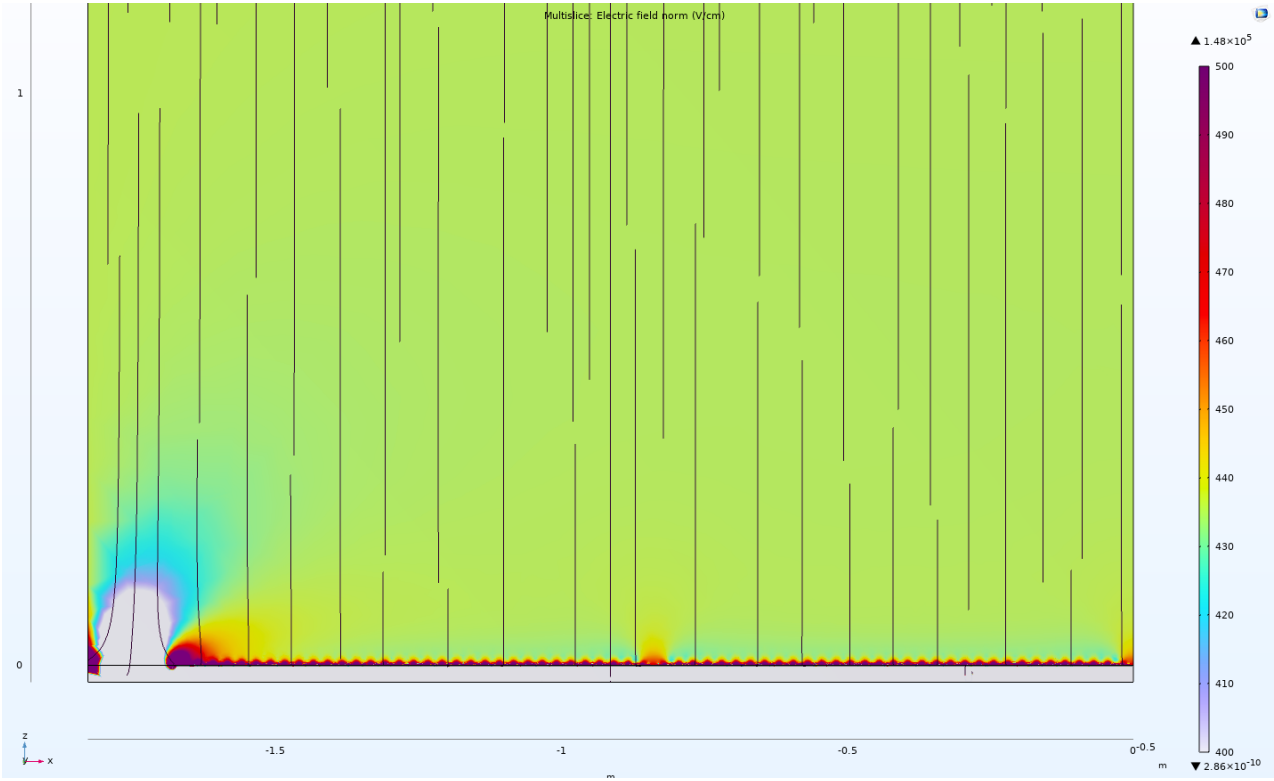
Zoom of the E-field

With spacer



Zoom of the E-field

No spacer

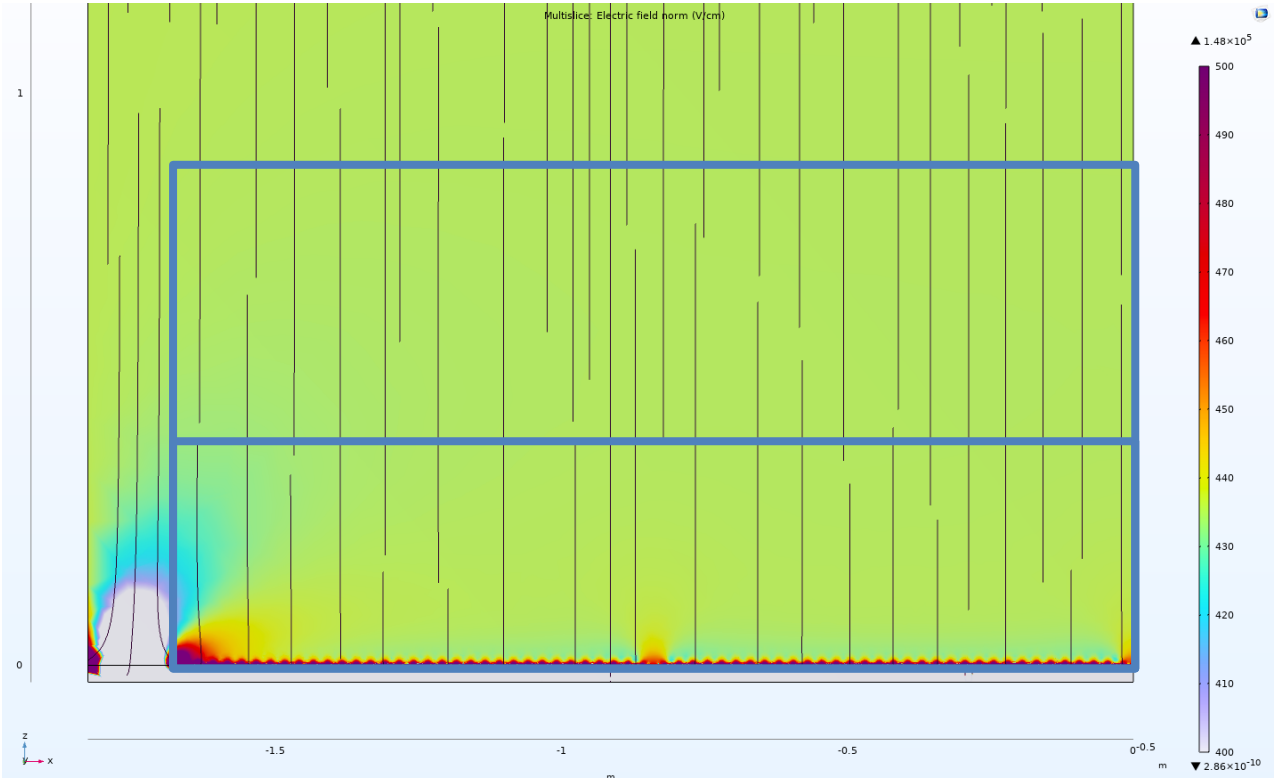


Zoom of the E-field

- Look at the field homogeneity at various height above the cathode

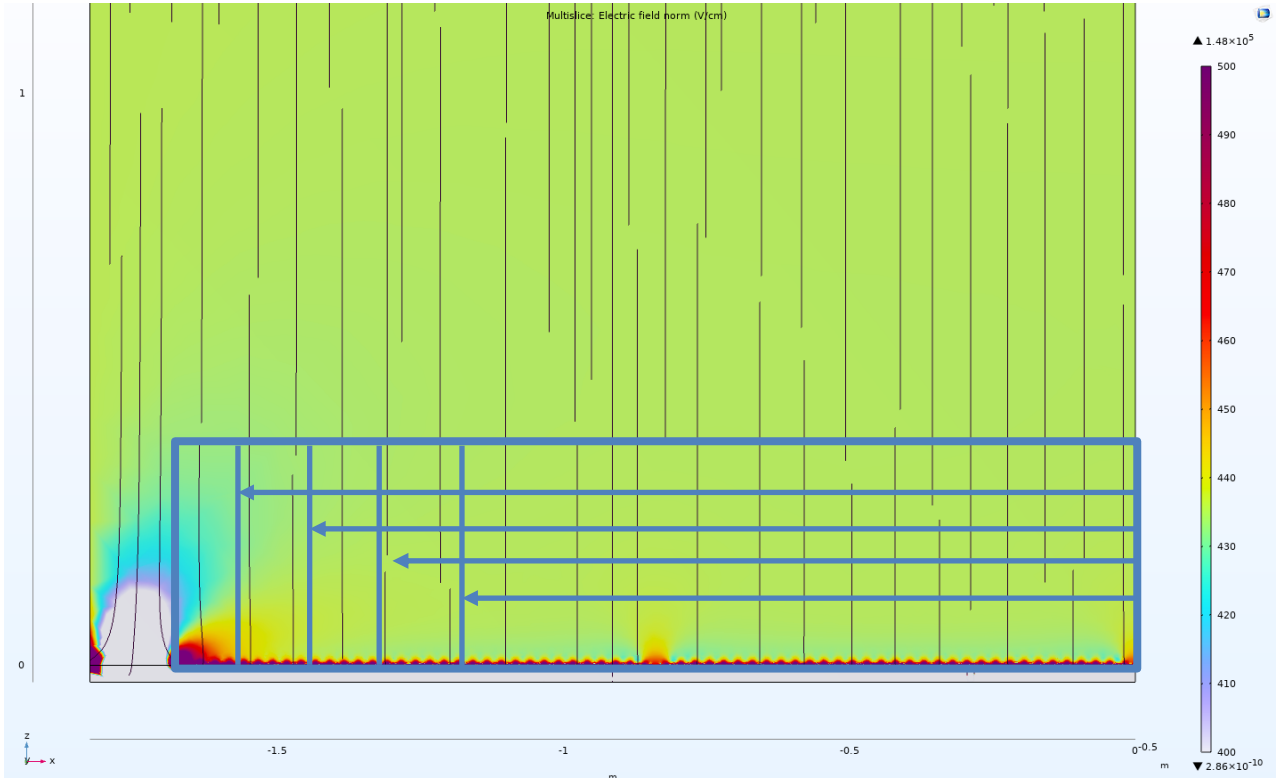
90 cm

30 cm



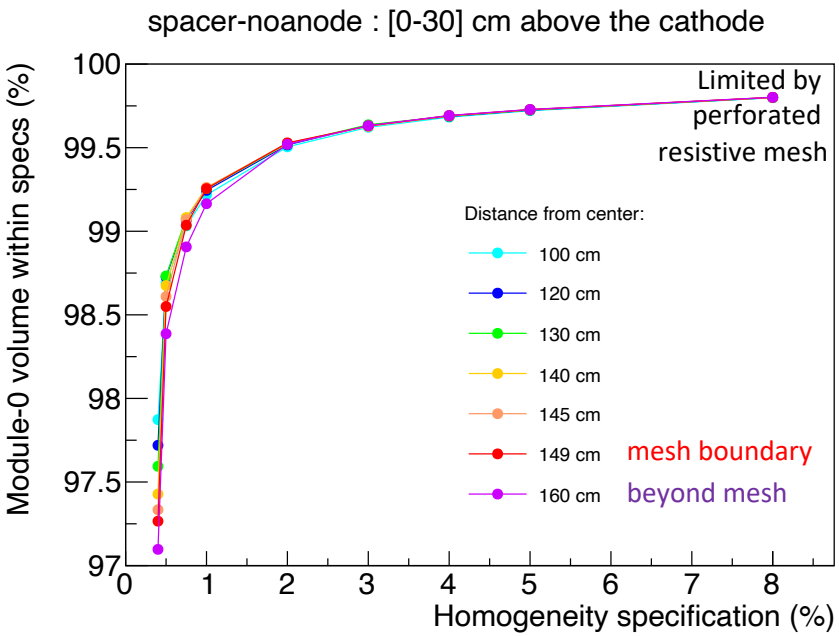
Zoom of the E-field

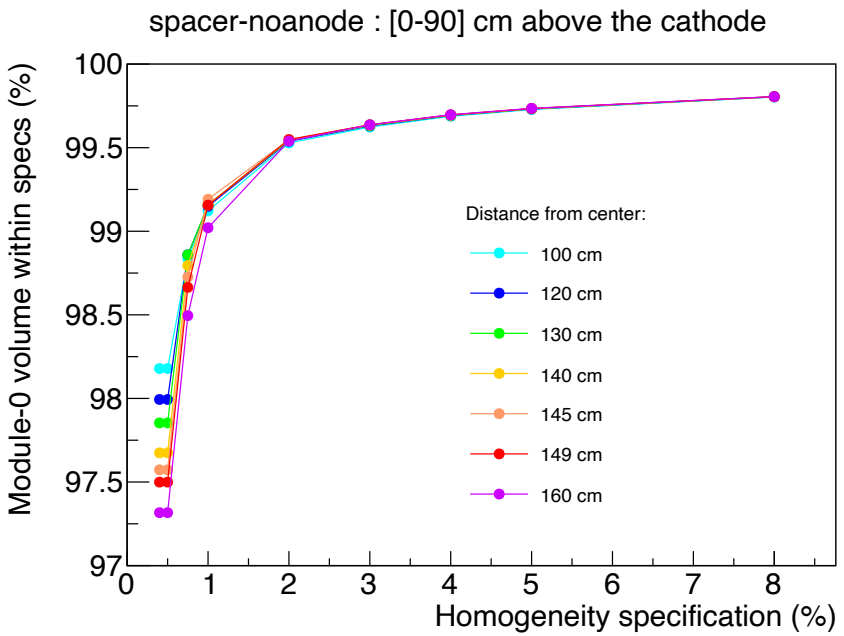
- Look at the field homogeneity at various height above the cathode
- Split volume according to the distance to the center to check when the field gets significantly distorted



Field homogenetity with spacer

- With spacer, no worsening of homogeneity as one gets closer to the mesh boundary

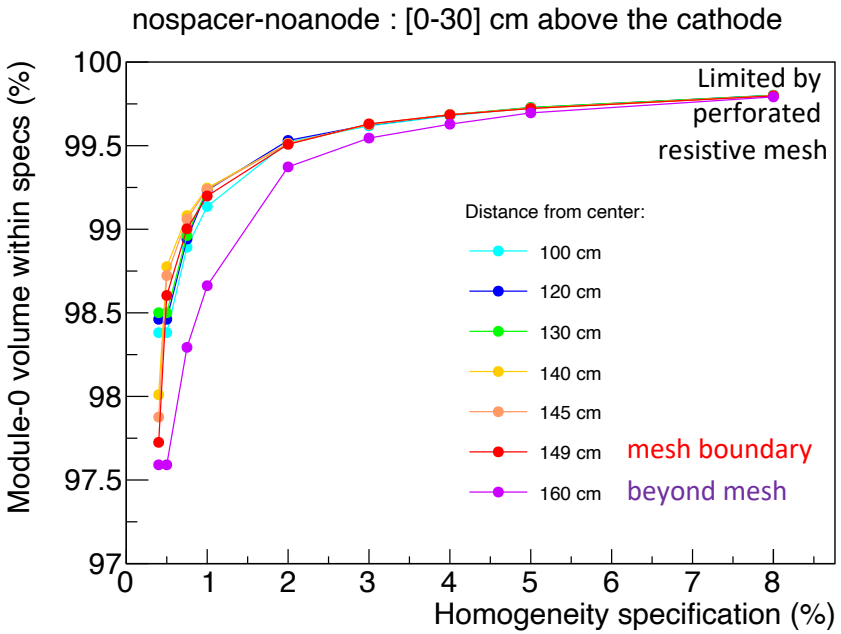


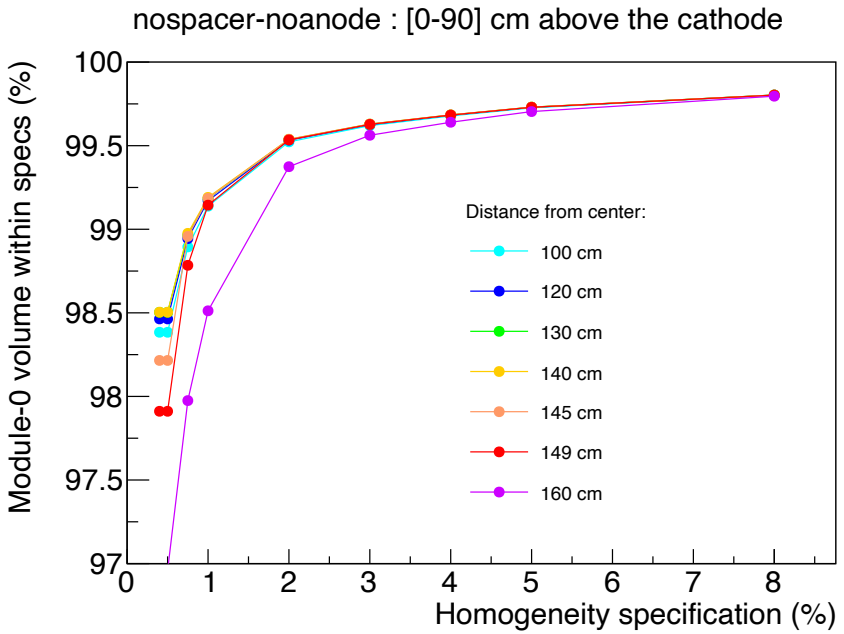


- No significant change beyond the mesh (160 cm) when a spacer is added

Field homogenetity without spacer

- Without spacer, not much difference w.r.t. « spacer case » in terms of homogeneity (within the calculation precision)





- Check that beyond the mesh (160 cm), homogeneity is degrading without spacer but this interspace volume will anyhow be lost (e^- not collected at the anode)

Closer lookup

- Spacer case
  - Blue area suggests that even with a spacer, we will get some little field distortion near the mesh boundary
- No spacer case
  - We get more but still localized distortion
  - But interplay of higher/lower field will make it difficult to create a visible effect in the data