JÜLICH
FORSCHUNGSZENTRUM

ExB Deflector Development

2017-03-14 | Jürgen Böker
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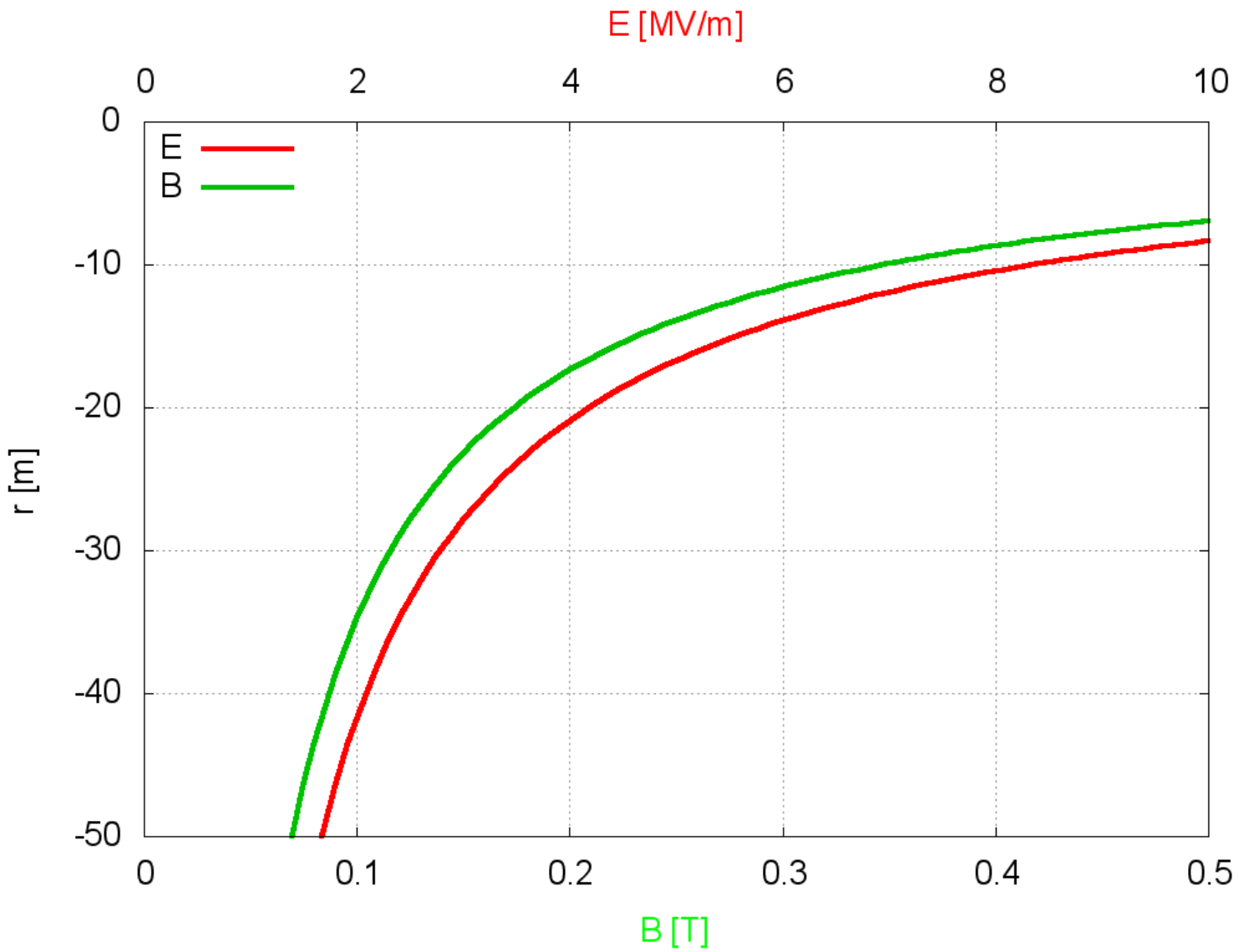
ExB Fields for 970 MeV/c Deuterons



r = 15 m

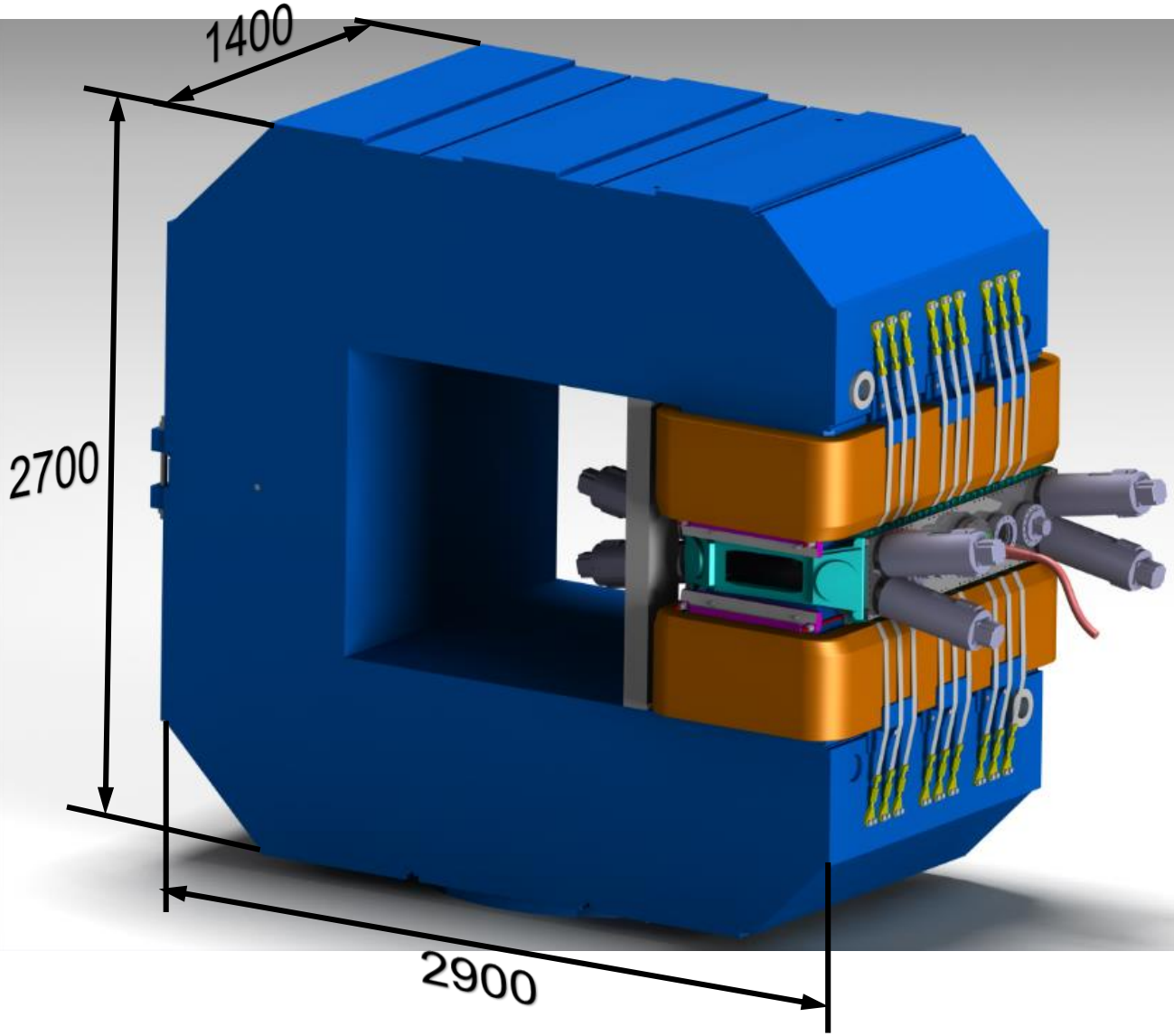
E = 6 MV/m

B = 0.25 T

Purpose of Development

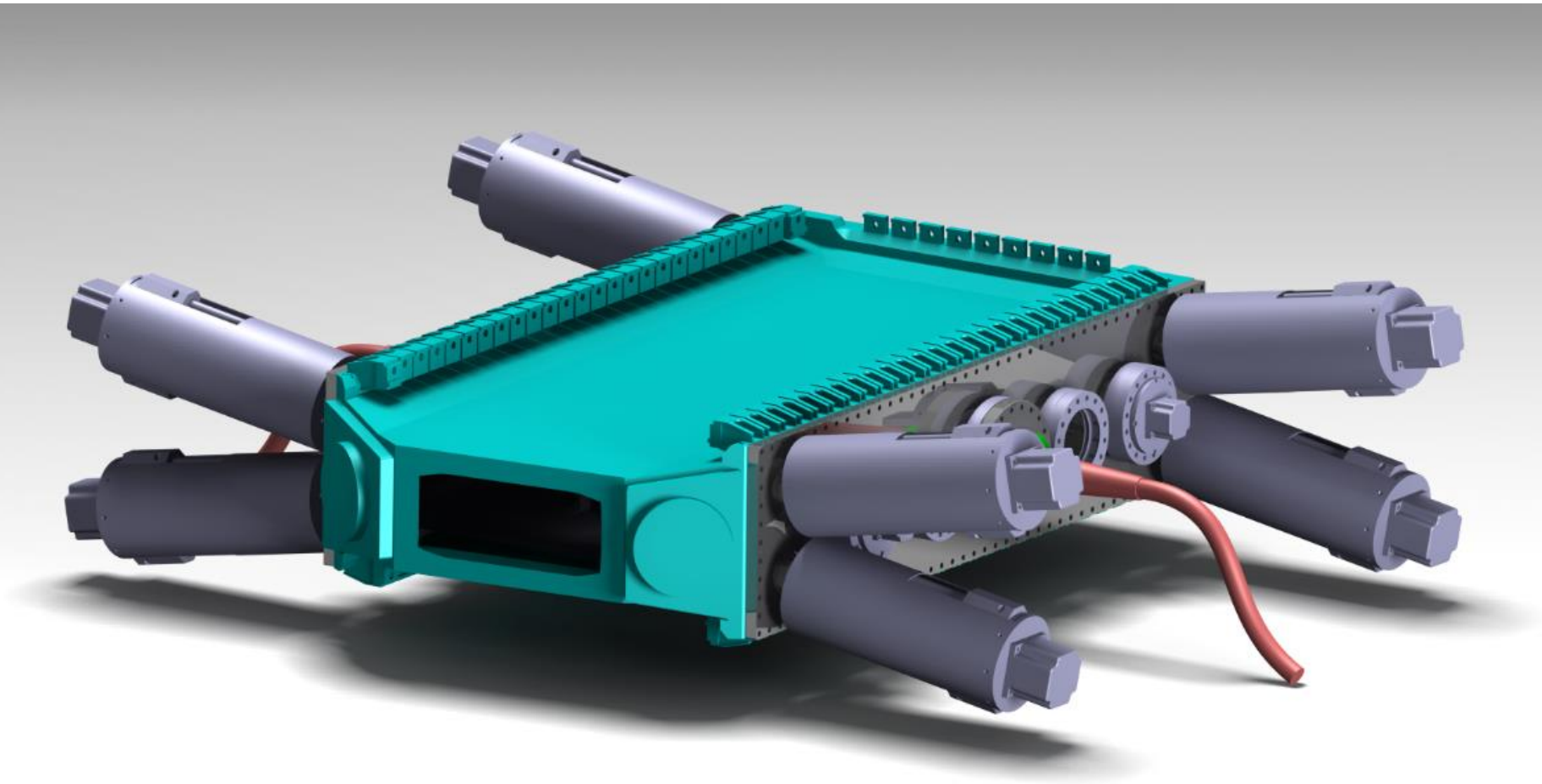
- B = 0.25 T
  - Iron-based magnets → easy
- E = 6 MV/m
  - Macroscopic HV components,
    i.e. more energy stored by the E-field
- Technical aspects
- Field emission in B-field
- Qualifying measurement methods

ANKE D2

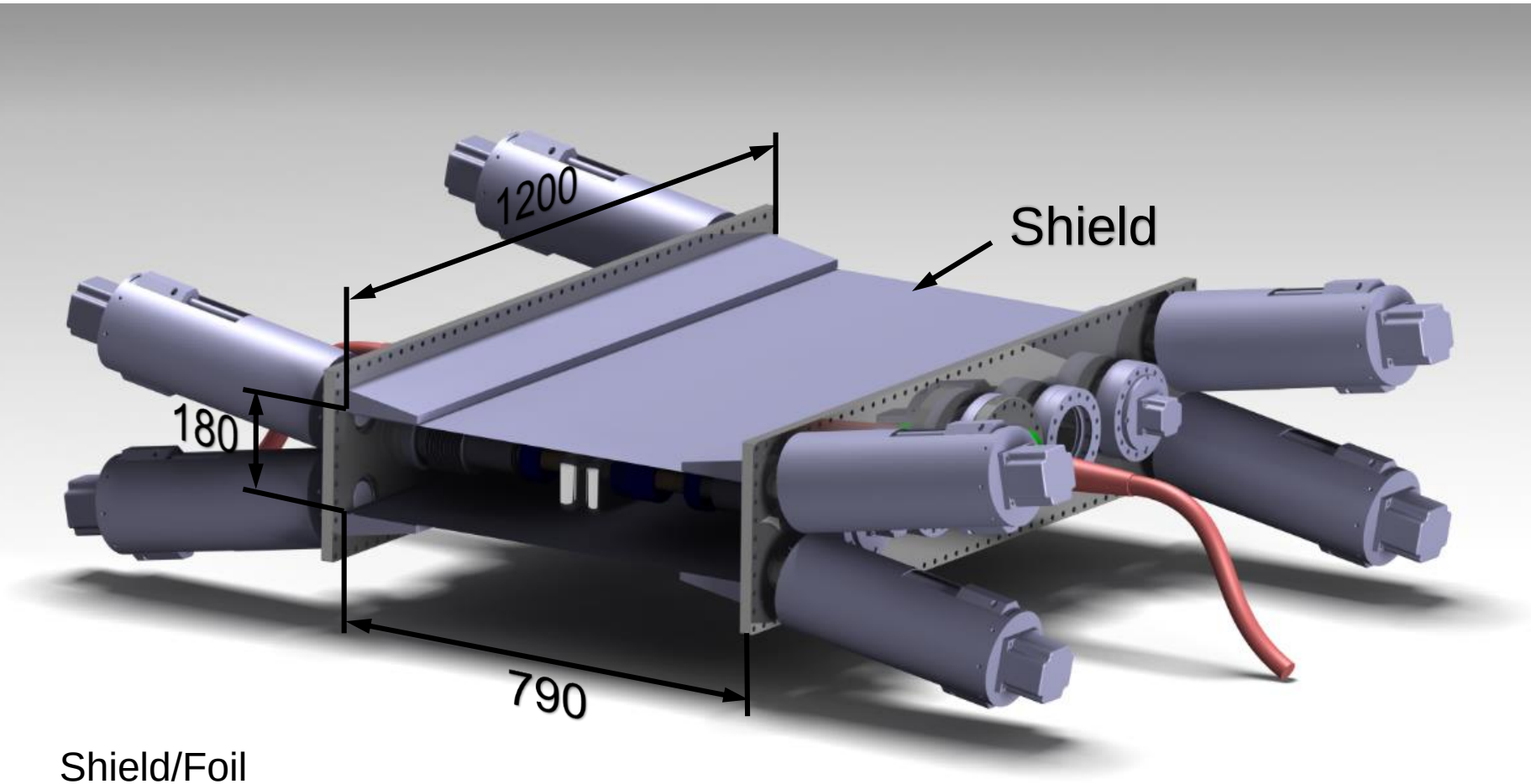


- B_{max} = 1.6 T
- m = 64 t
- Gap height 200 mm

Deflector w/ Vacuum Chamber



Deflector w/o Vacuum Chamber

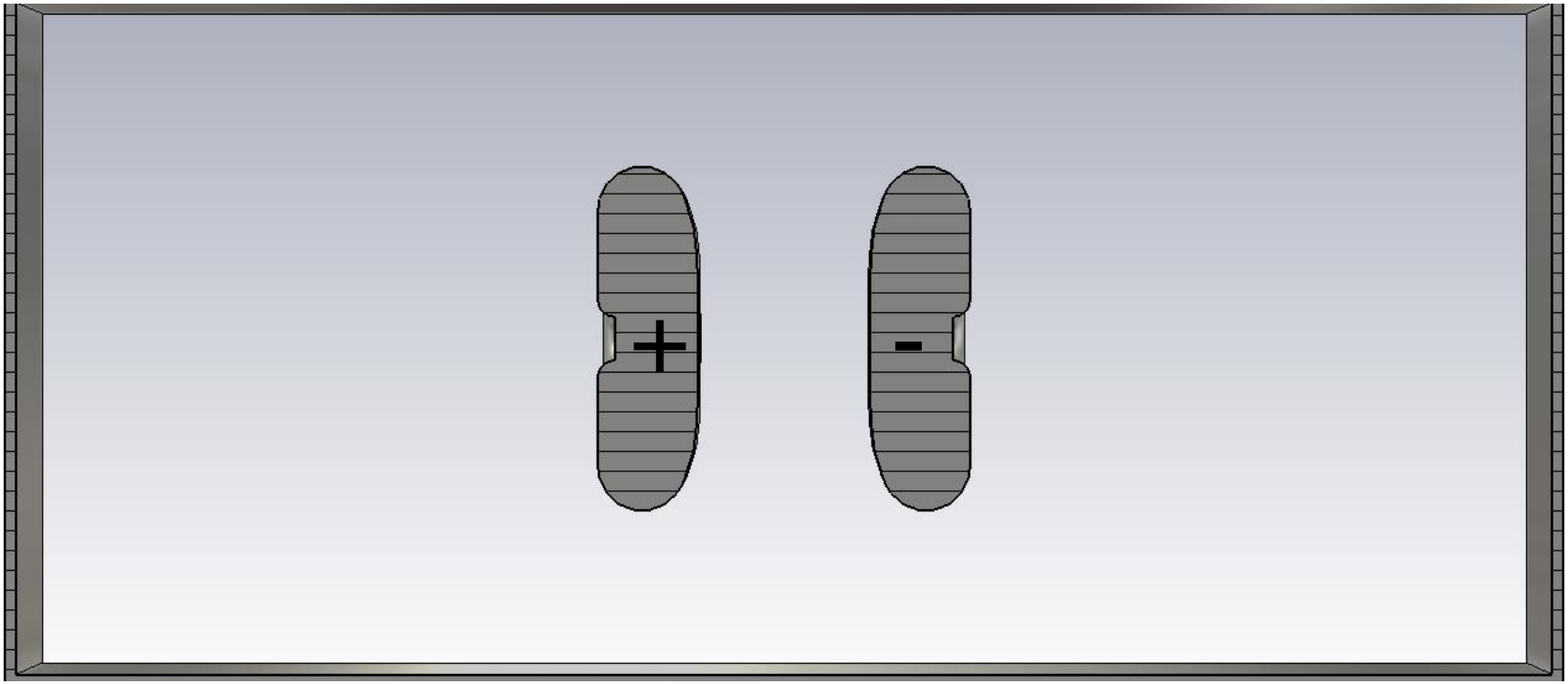


Shield/Foil

- Inserted between chamber wall and deflector
- Shield is on ground potential
- Deflector „sees“ only the shield

Electron Trajectories for E-field only

- Electrons‘ initial energy: 50 eV
- Voltage: ±100 kV → 4MV/m



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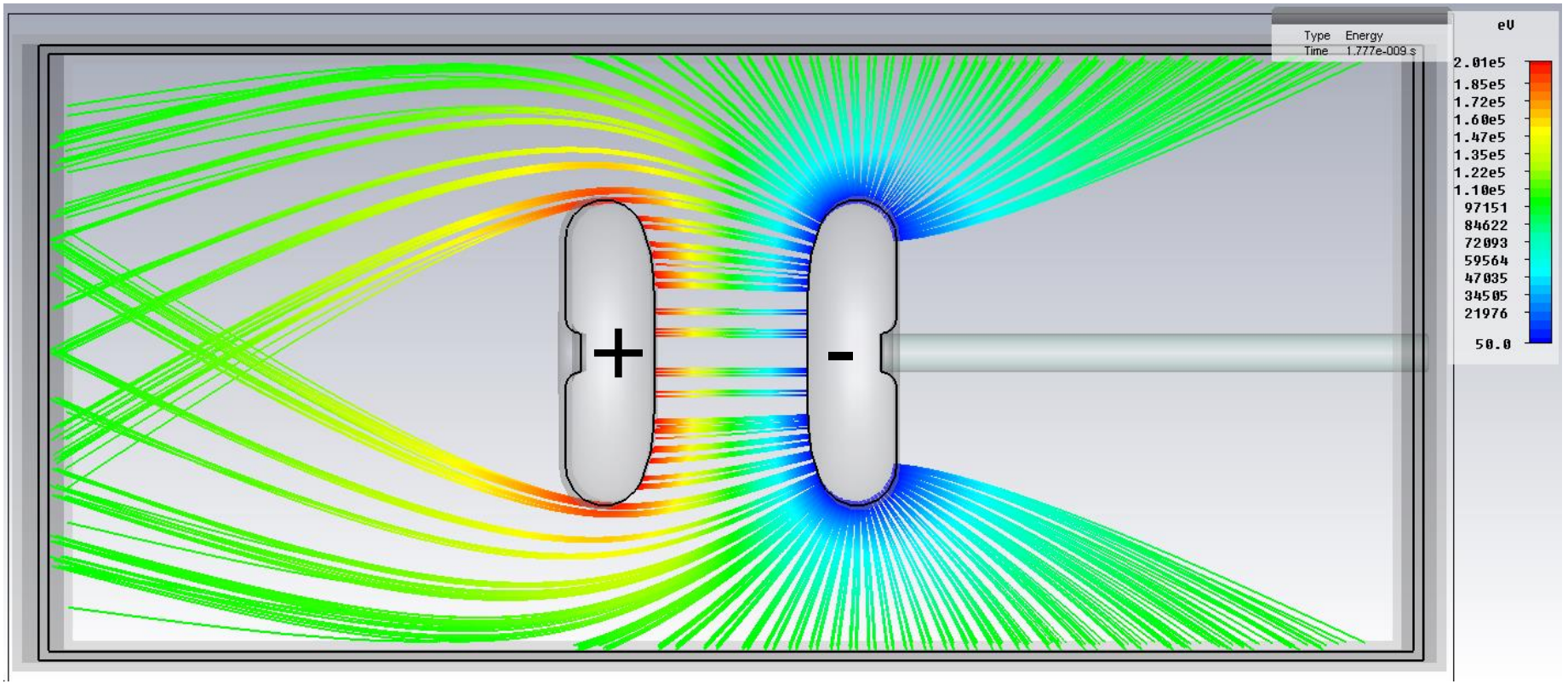
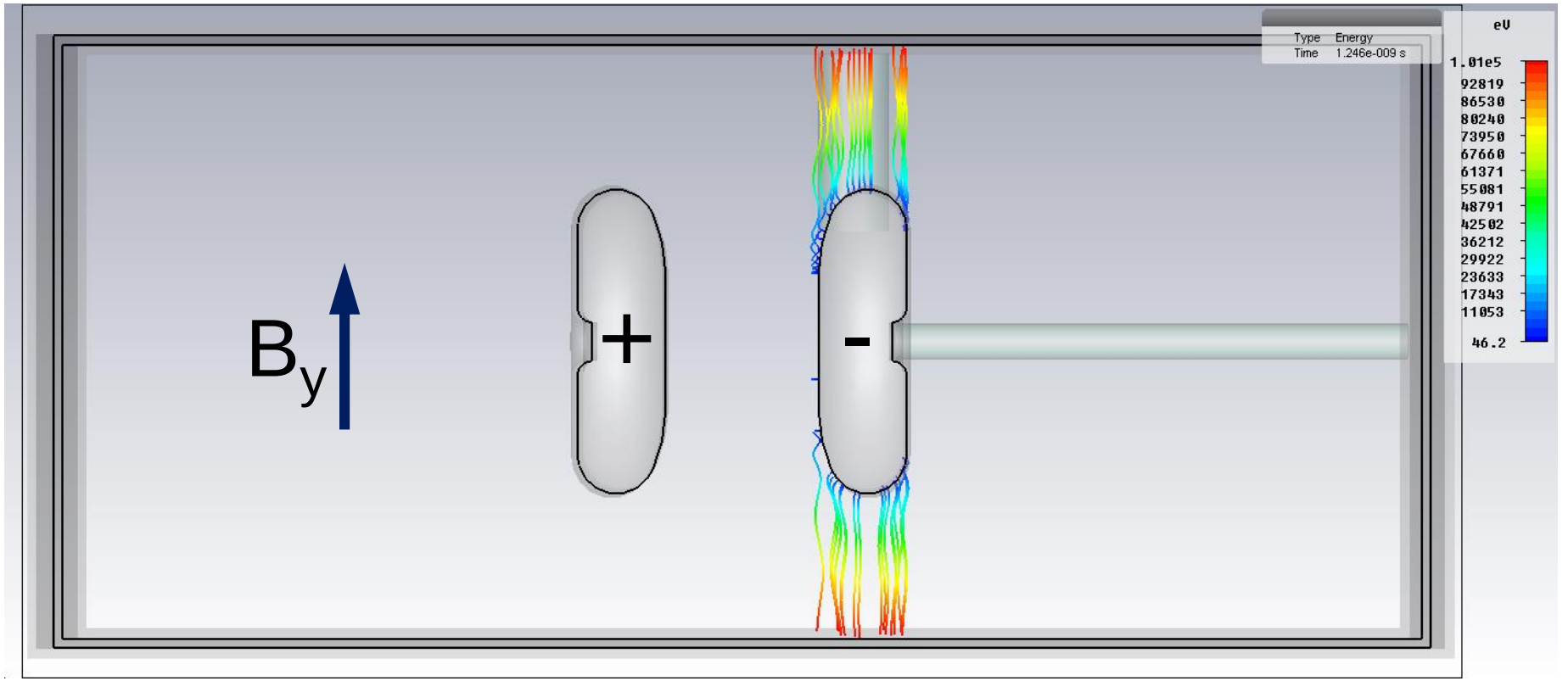
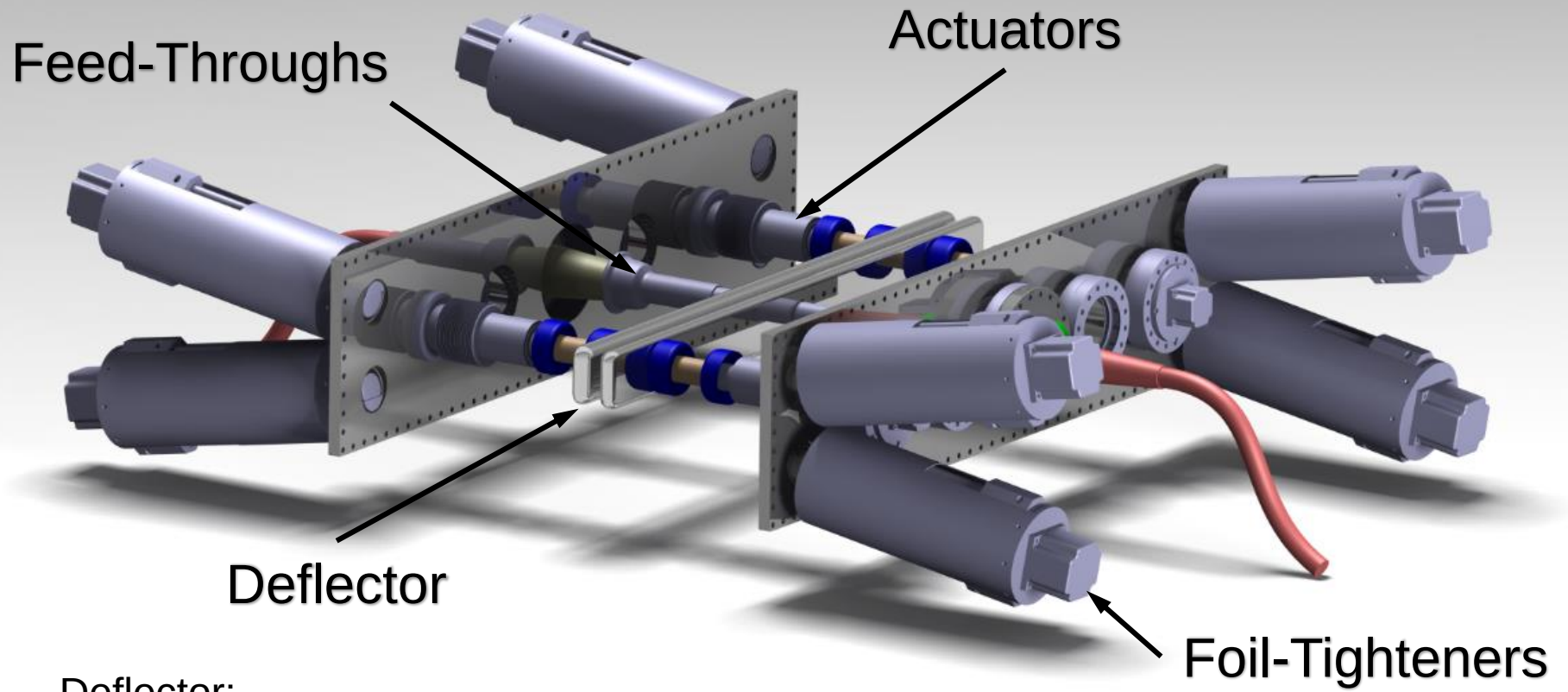


Electron Trajectories for E- and B-field

- Electrons‘ initial energy: 50 eV
- Voltage: ±100 kV → 4MV/m
- B-field: 0.15 T



Deflector w/o Vacuum Chamber

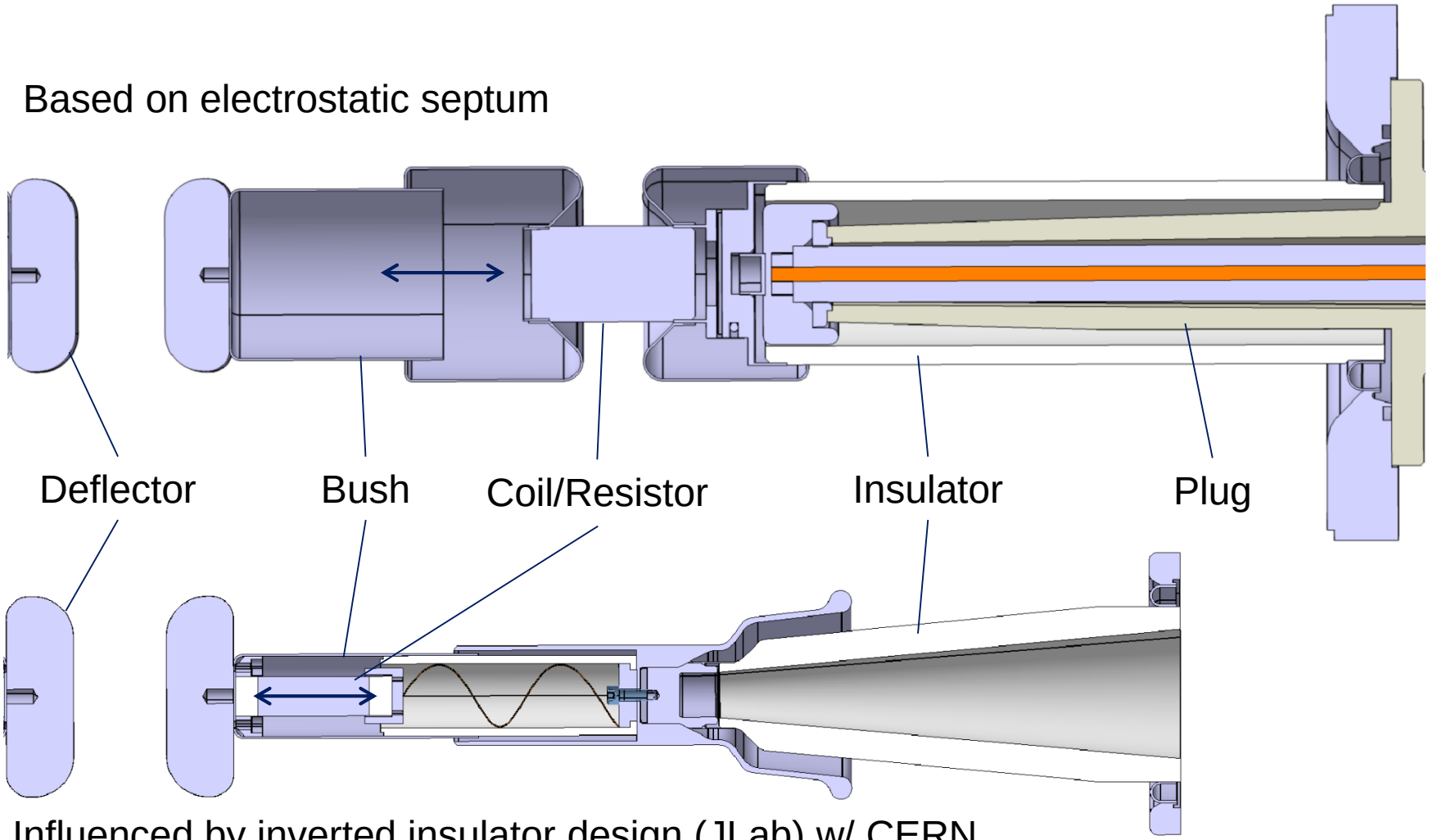


Deflector:

- Length 1020 mm
- Height 90 mm
- Gap 40 - 80 mm

HV-Feed-through Designs

Based on electrostatic septum

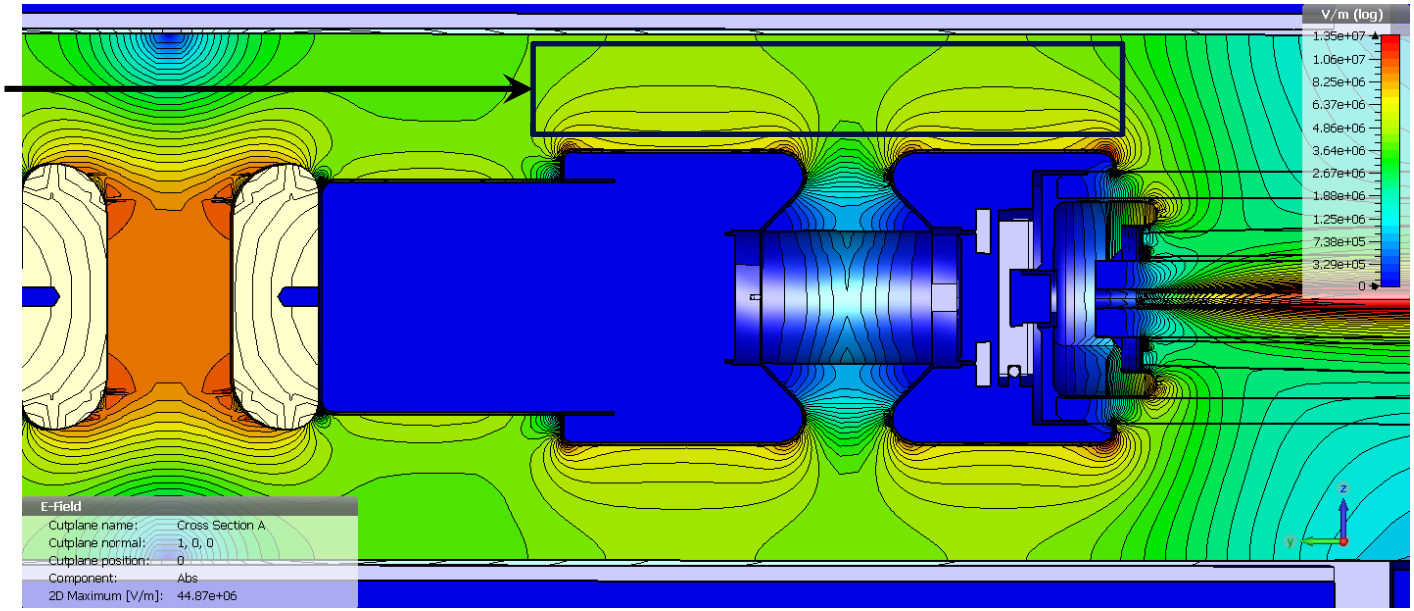


Influenced by inverted insulator design (JLab) w/ CERN (J.Borburgh) recommendations

E-Field Maps

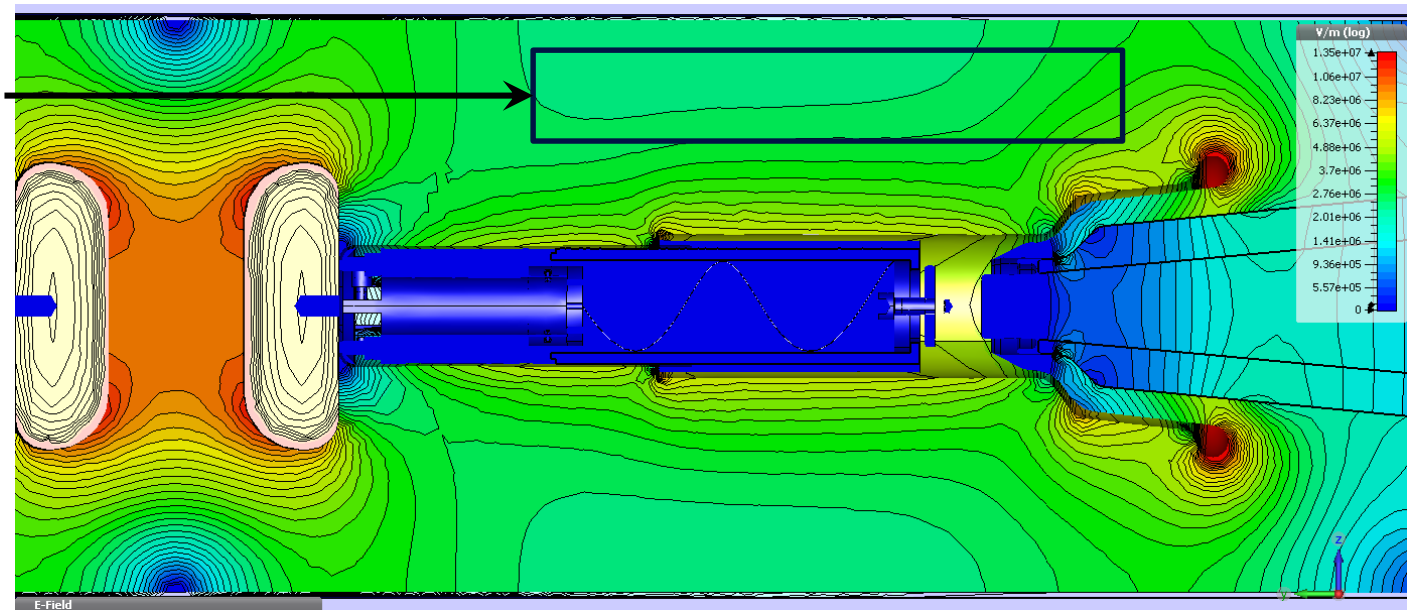
6 MV/m

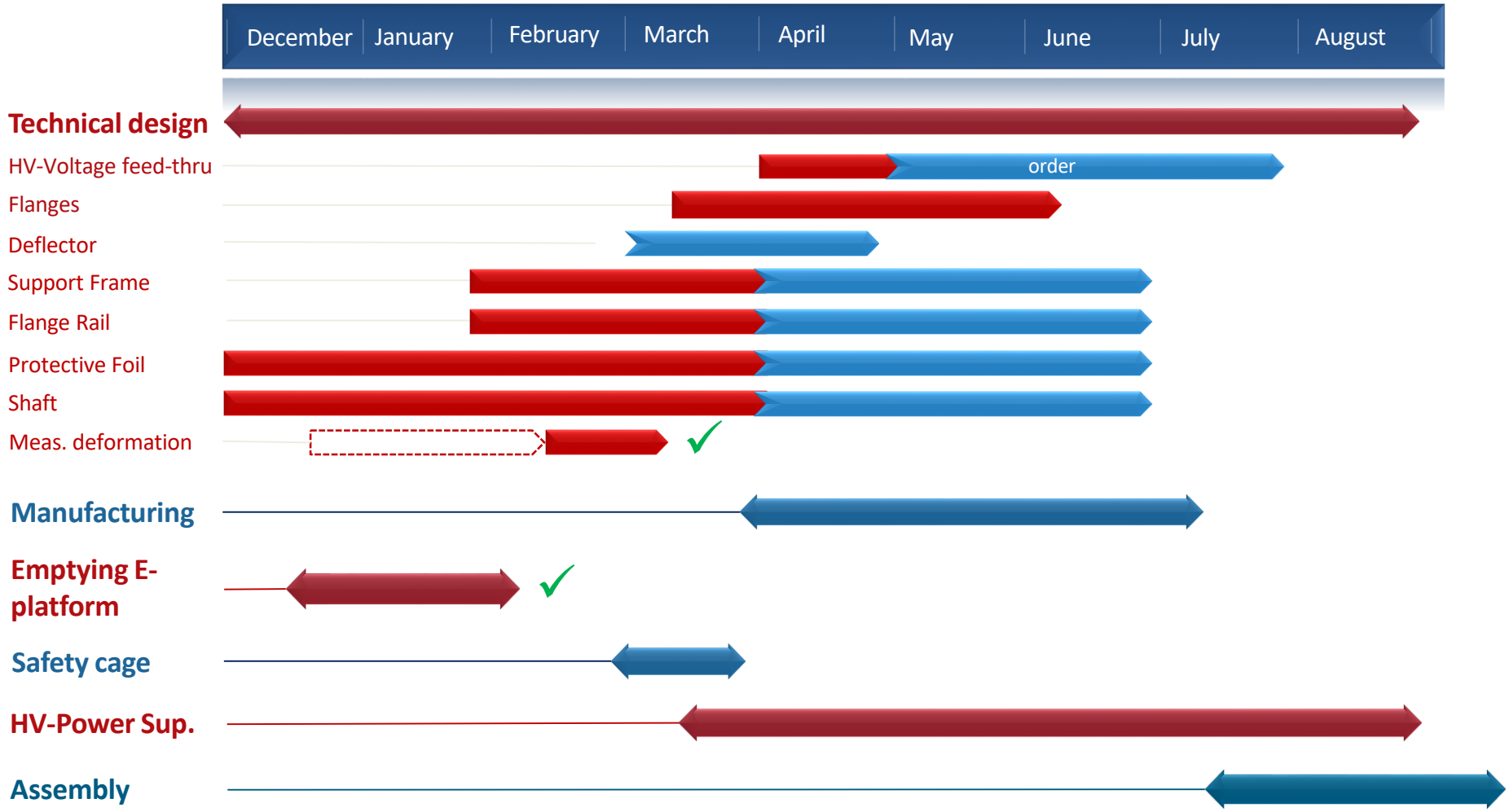
Septum Design



2.5 MV/m

Inverted Insulator (Jlab) w/ CERN ideas





Summary

- Basic ingredients for ExB deflector
  - Moderate/low B-fields
  - Strong E-fields
- B-fields

  → Iron-based magnets

  » A lot of iron close to E-field
- E-fields

  → Dark current

  » Smooth surfaces / geometries

  » Drainage of electrons

  » Limit amount of material

  » High work function

  → Field grading