Thermal-Electrical Study of a y   Disconnect Switch
with a Piezoelectric Actuator

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Introduction

- High speed disconnect switch
  - 15 kV$_{RMS}$, 200 A, 50-60 Hz
  - Opening in < 1 ms
  - Losses in on-state: < 5 W
- Applications:
  - Power electronics based distribution systems
  - Hybrid circuit breaker (in combination with semiconductors)
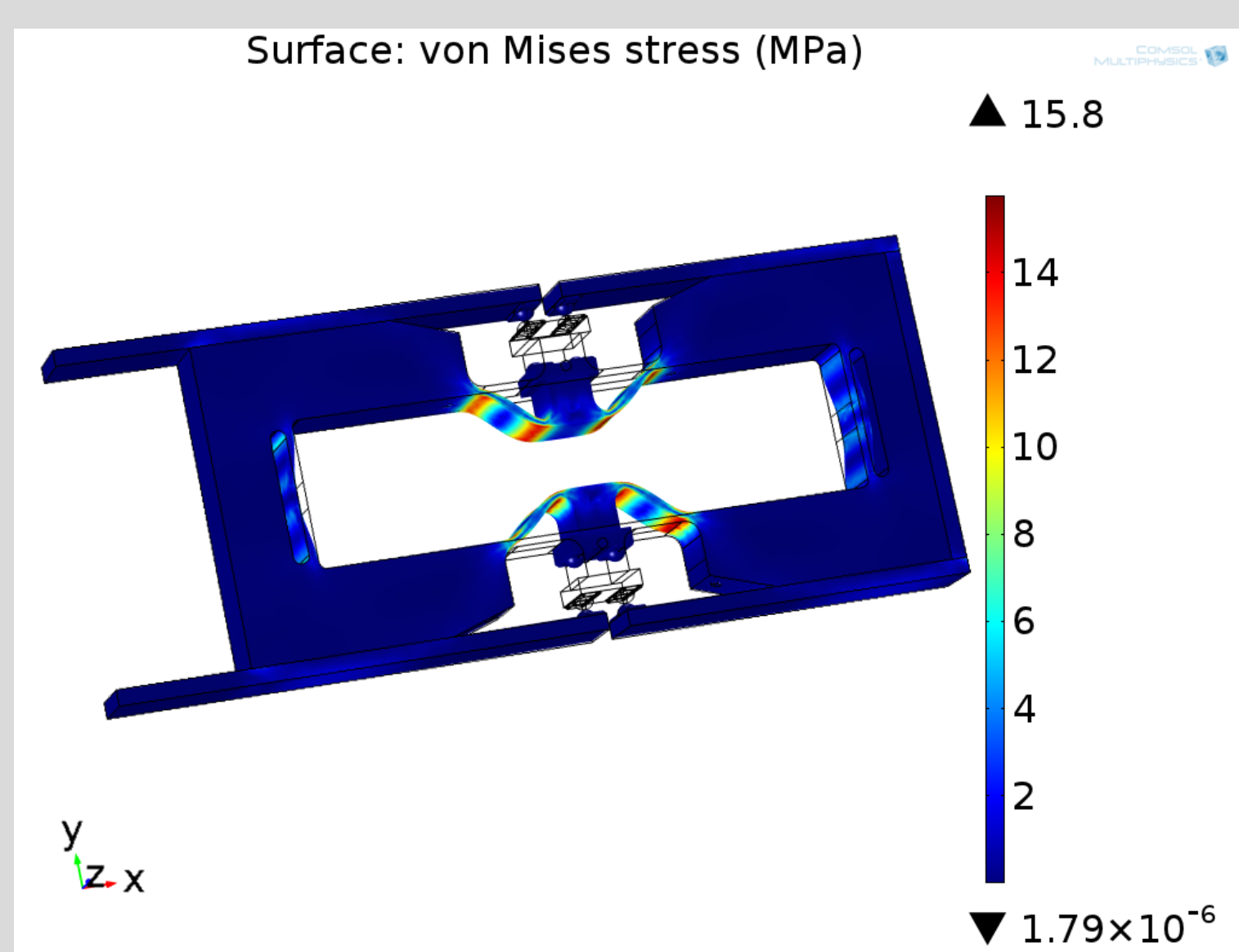
Static Mechanical Stress

Figure 1. Von Mises stresses in the insulator frame while the piezoelectric stack expands and the contacts retract.
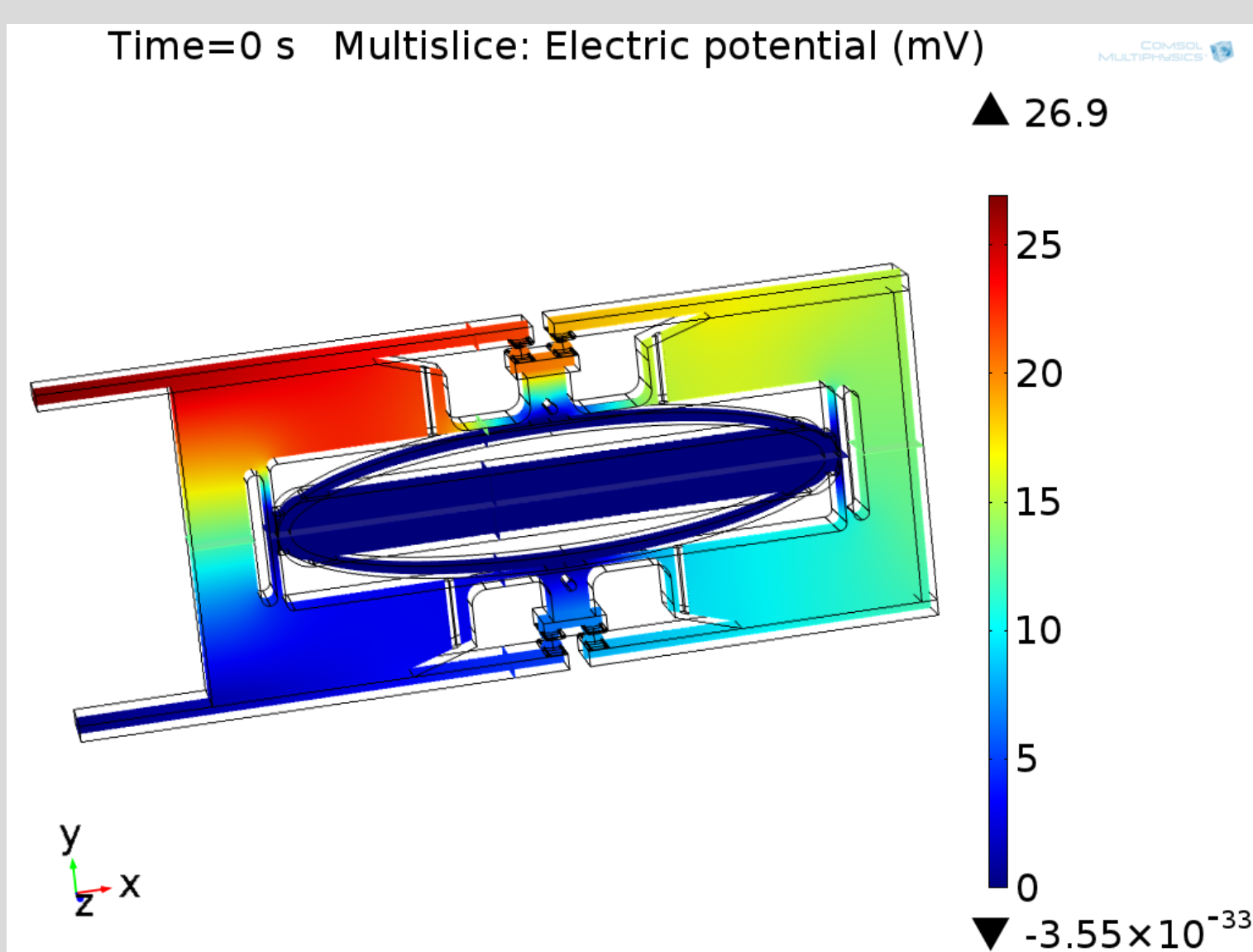
Losses and Peak Temperature

Figure 2. Voltage potential field at 200 A, resulting in a total voltage drop of 26.6 mV (approx. 5 W).
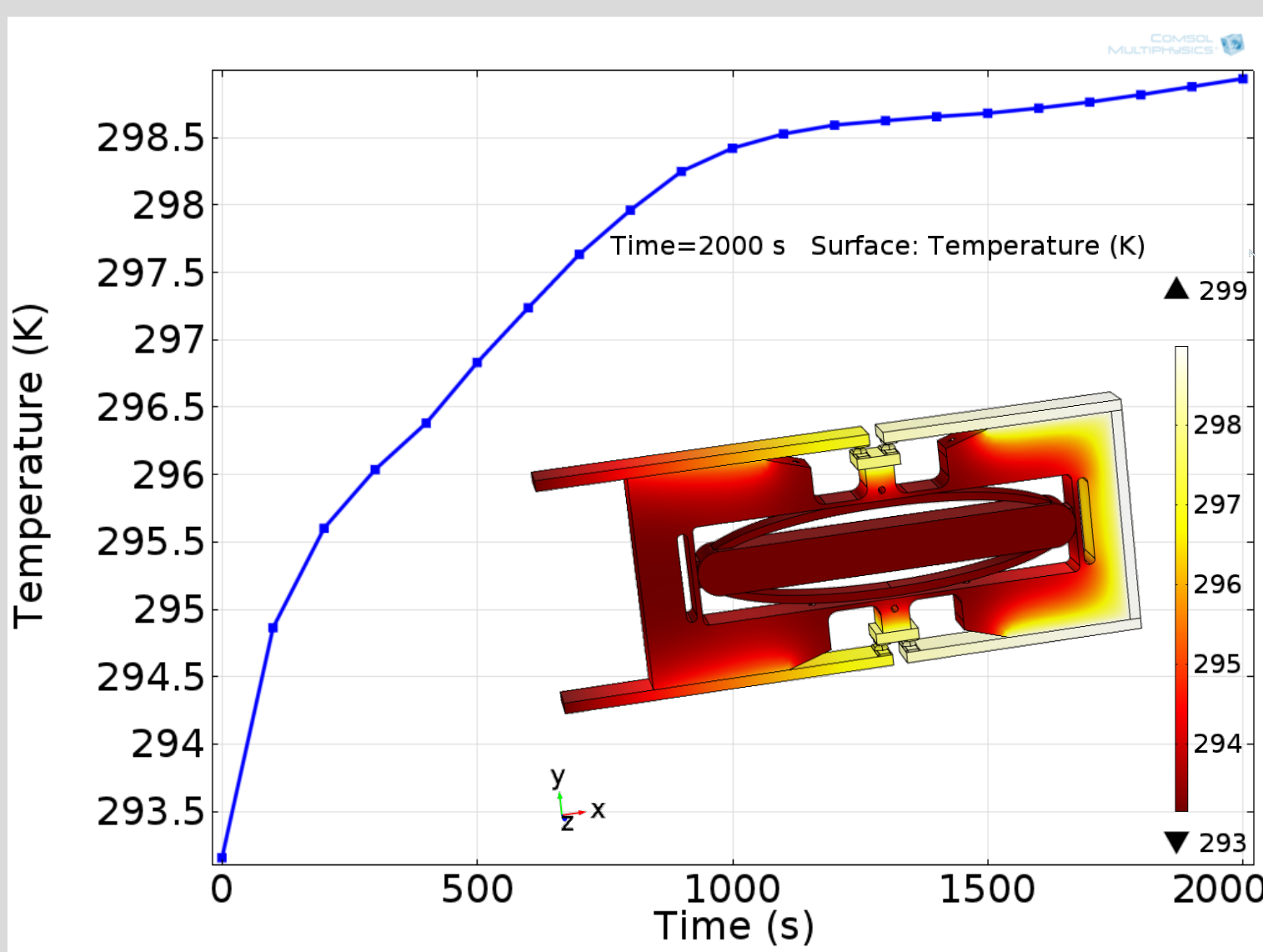

Figure 3. Peak temperature as a function of time and thermal field after 2000 s (insert).

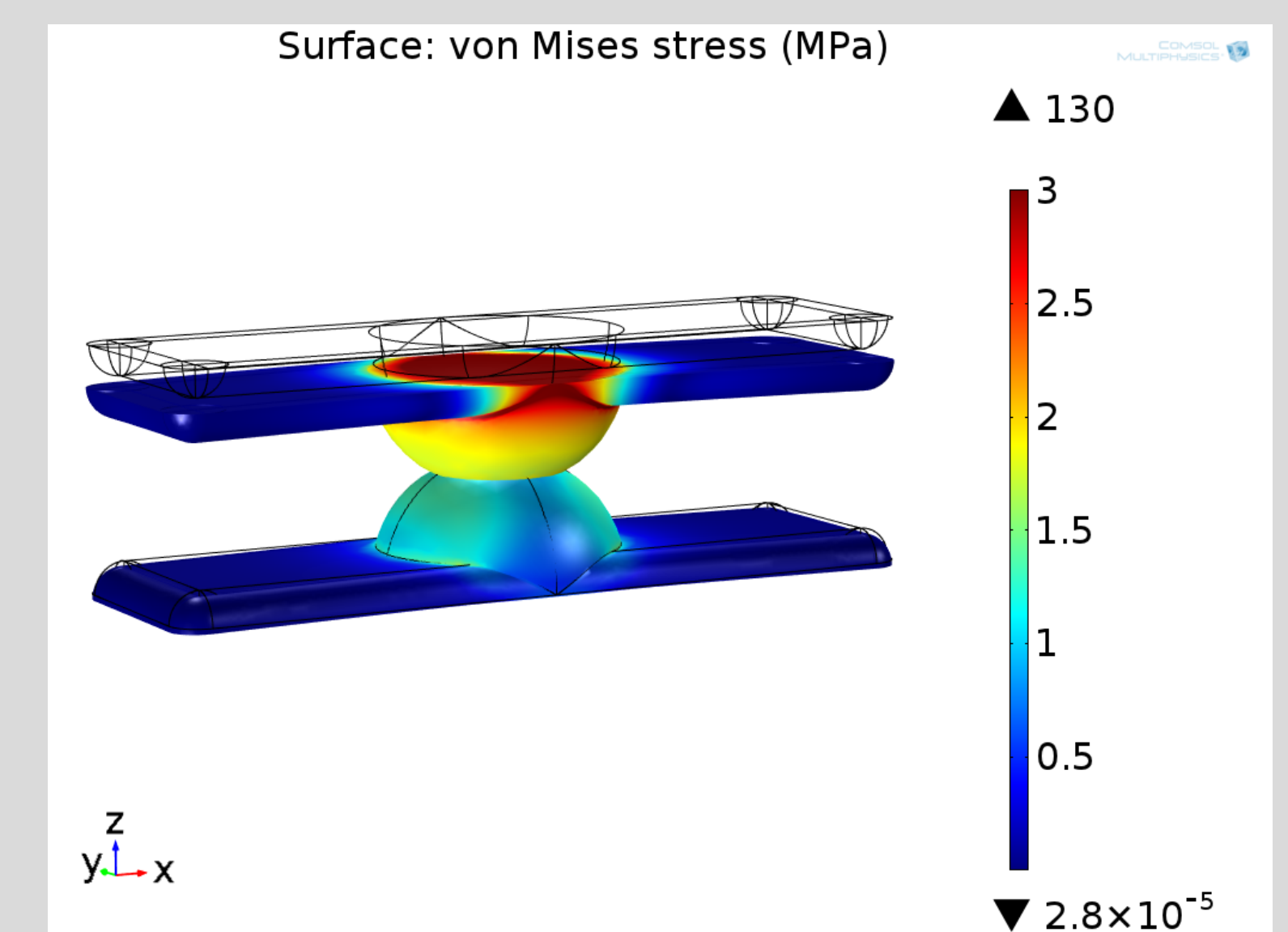## Static Contact Deformation

Figure 4. Von Mises stresses in the contact elements under perpendicular pressure.
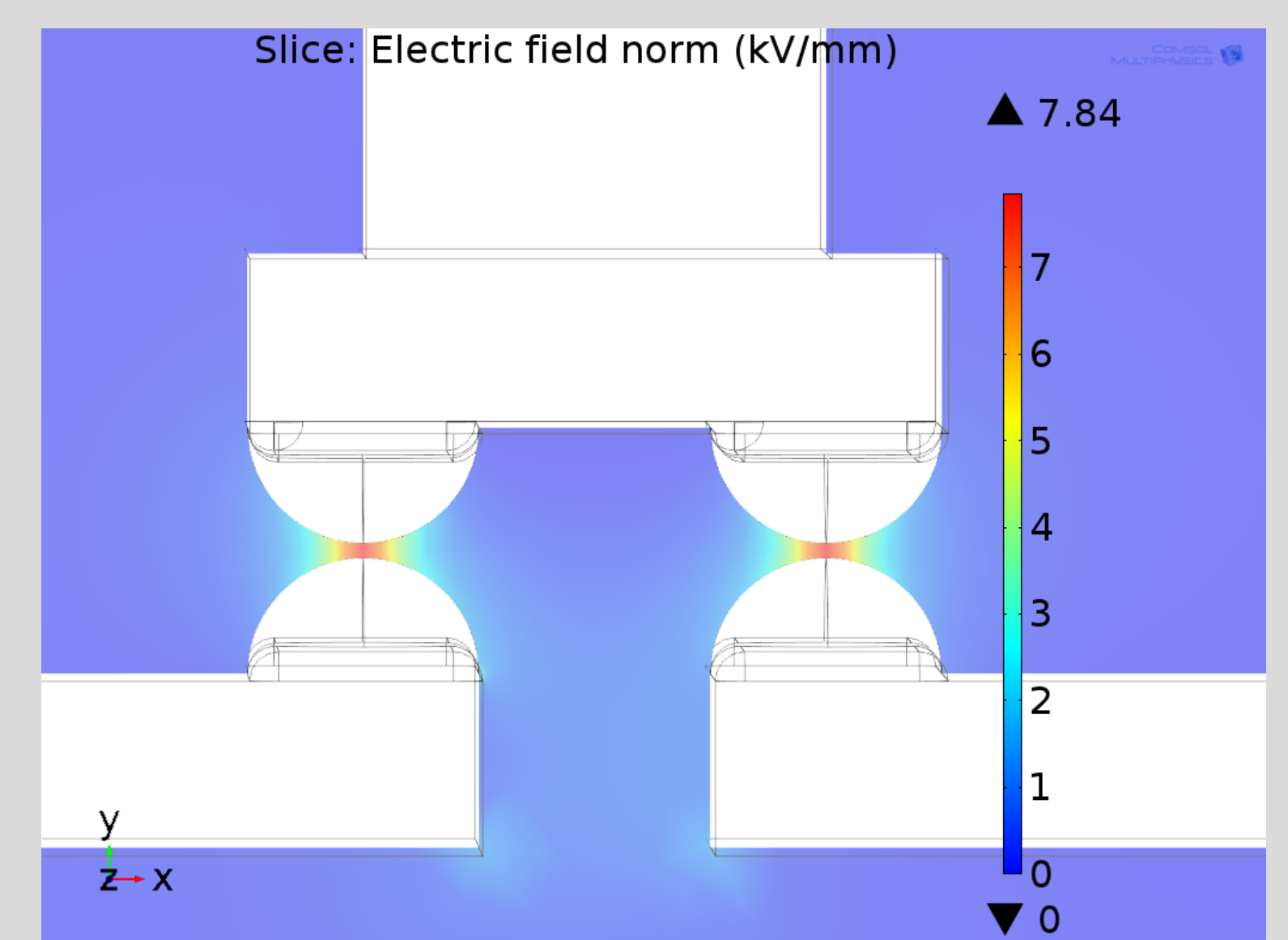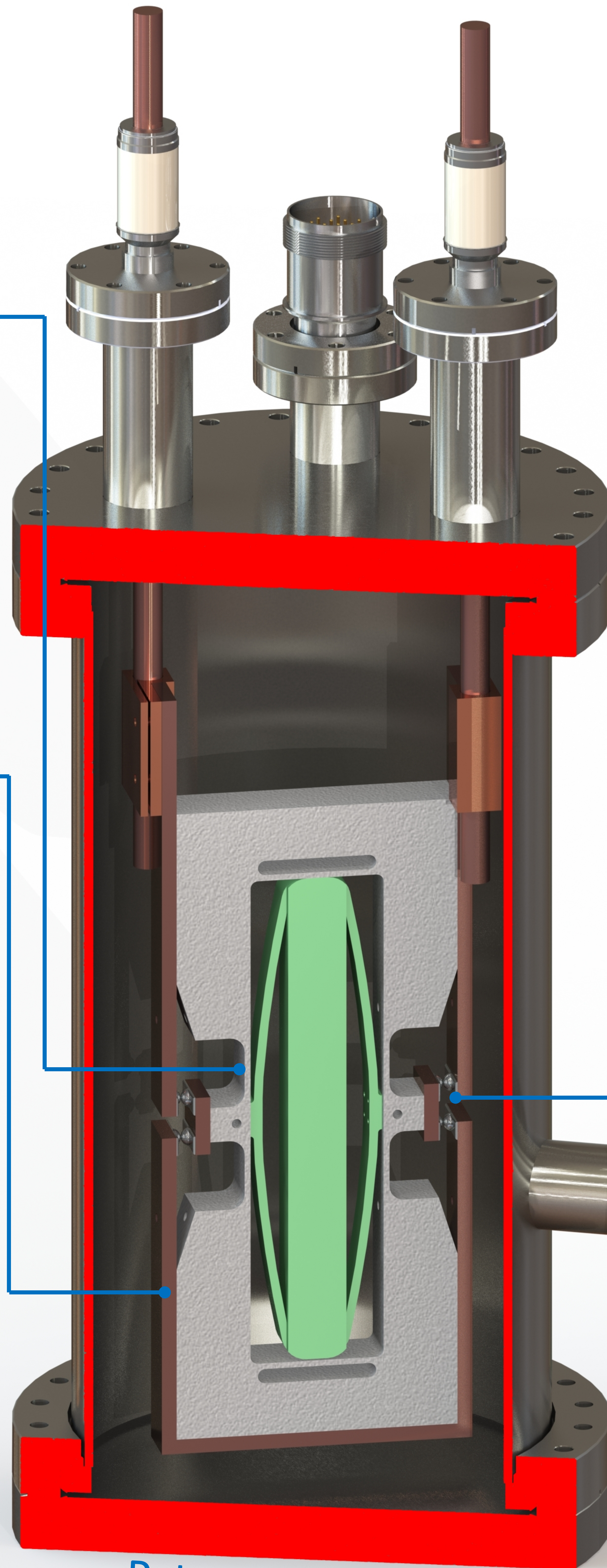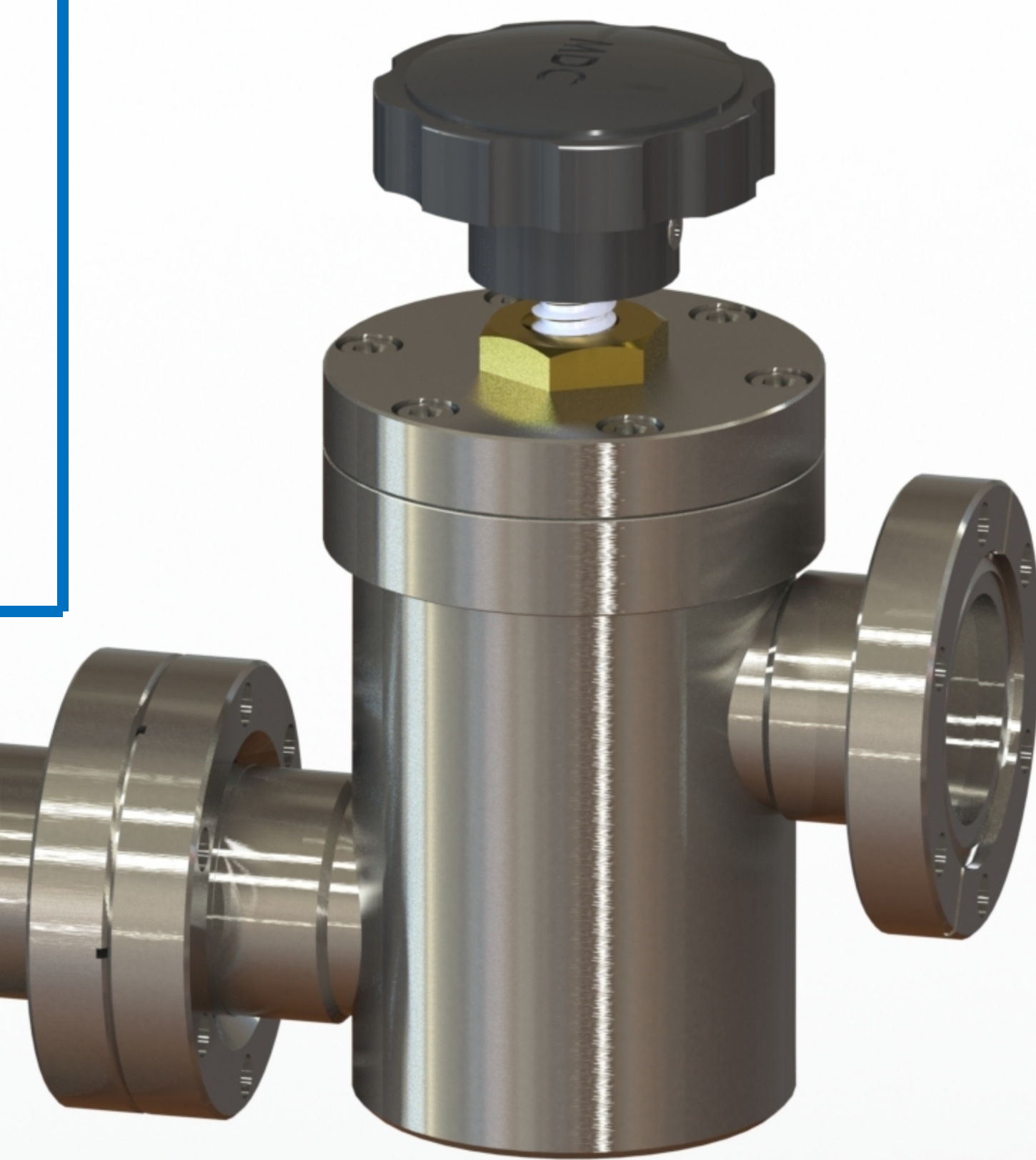
Electrostatic Field

Figure 5. Electrostatic field between the open contacts assuming uniform voltage grading across all four contacts in series.

Patents pending

Acknowledgement

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