

Statistical Sensitivity Analysis of Li-ion Pouch Battery Cell Dimension and Design

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Introduction:

- Large lithium-ion pouch cells in BEVs are subjected to several stress regimes,
- Increase of the heat generation in the cell,
- Heterogeneous heat distribution over the cell surface,
- Increase of the stress,
- Decrease of lifetime and performance,
- Need for optimized cell design,
- Assessment analysis of several battery cell design concept,

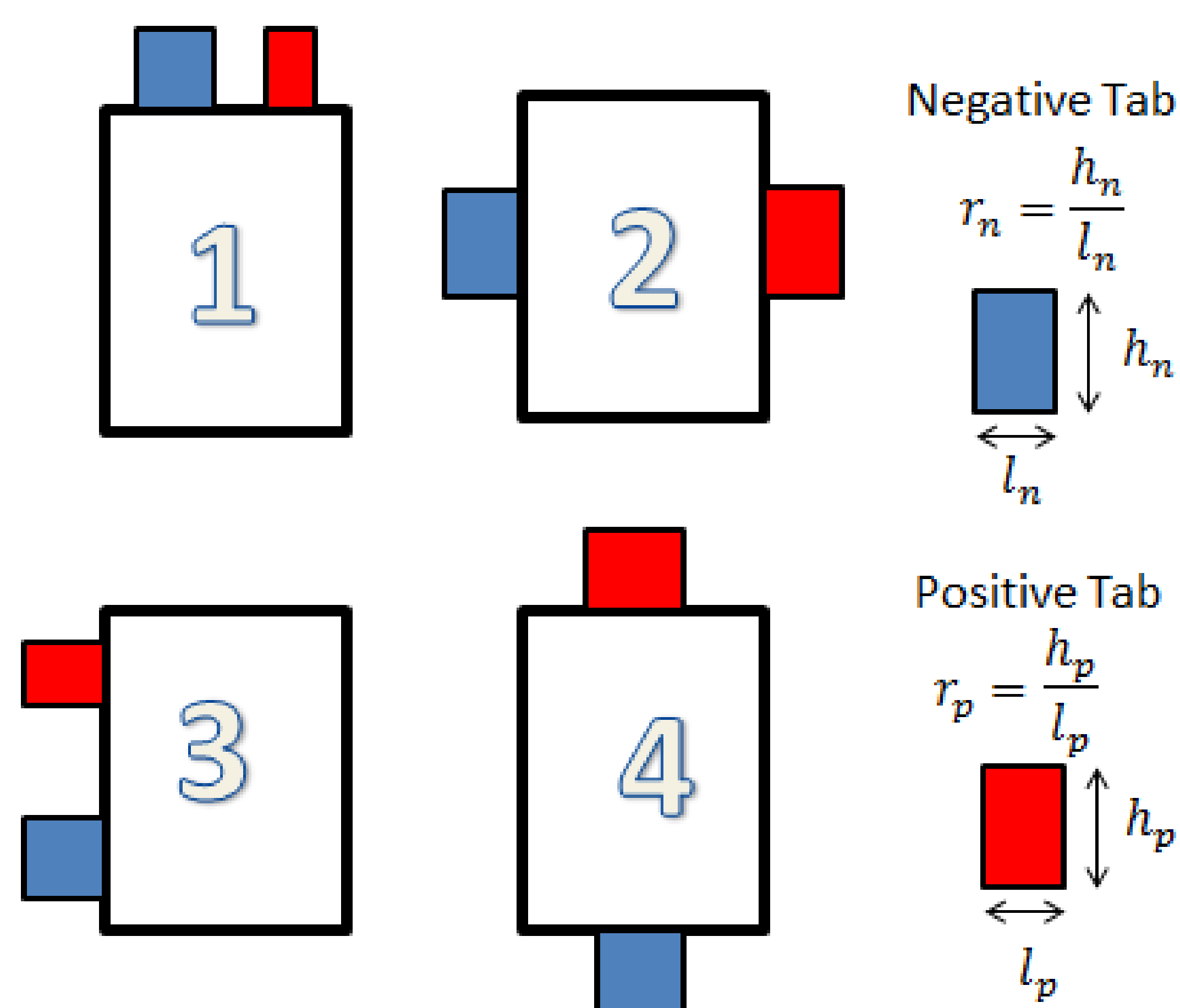
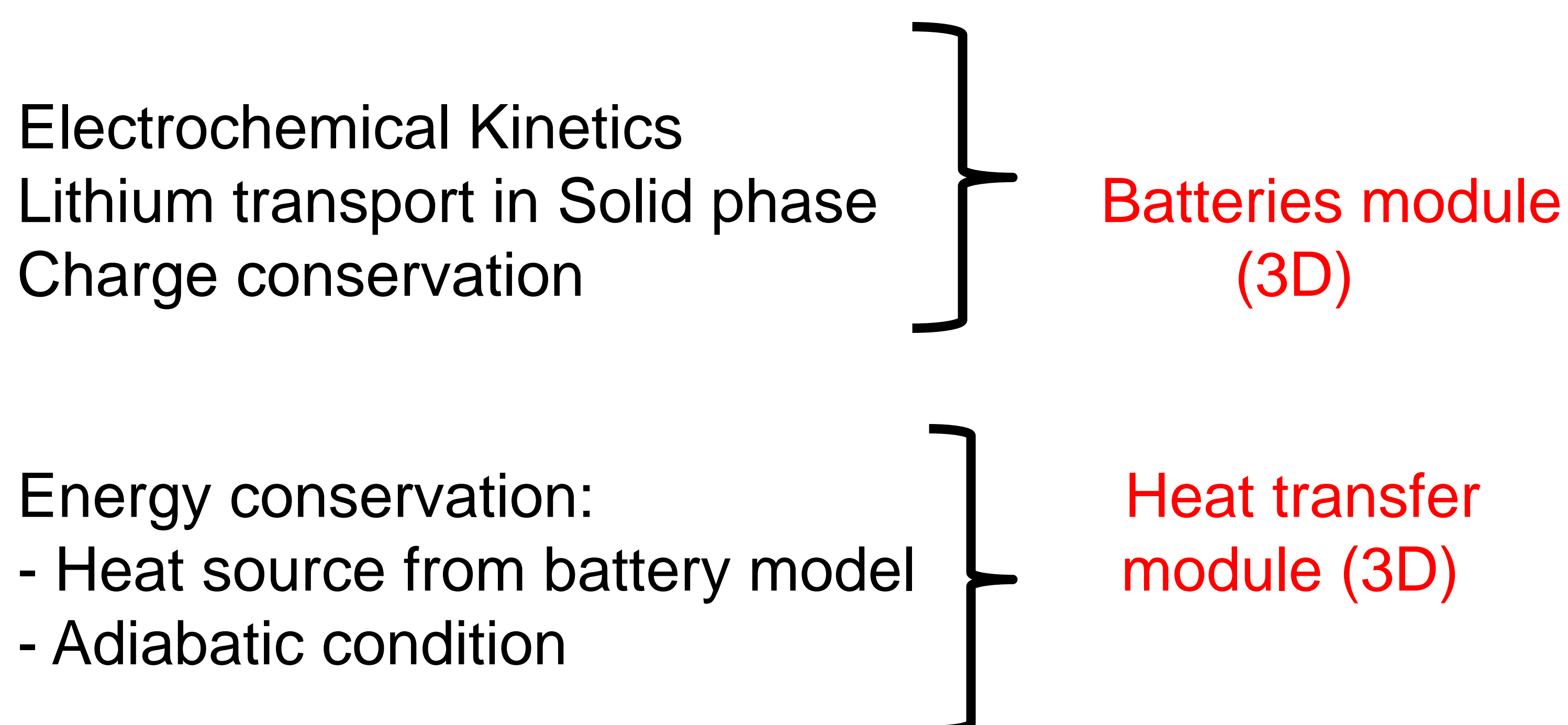


Figure 1. Configurations of several lithium-ion pouch cells

Computational Methods

Multi-Scale and Multi-Dimensional (MSMD) modeling approaches have been investigated to simulate the thermal, current and voltage distributions over the cell.



Results:

Configuration 1

- non-homogeneous distribution
- Wider tabs causes uniform thermal and voltage distribution

Configuration 2

- uniform thermal and voltage distribution

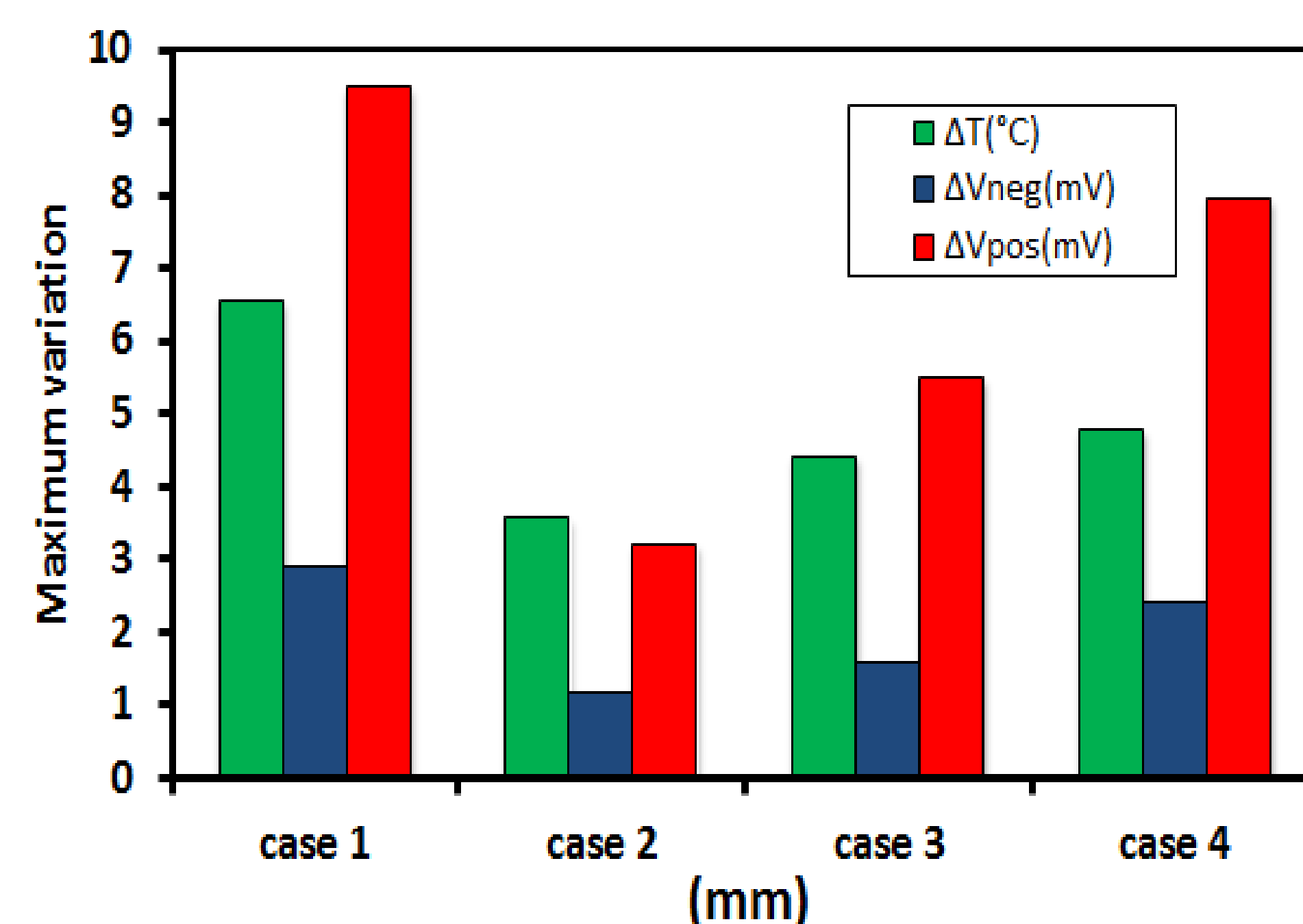


Figure 3. Comparisons of various configurations

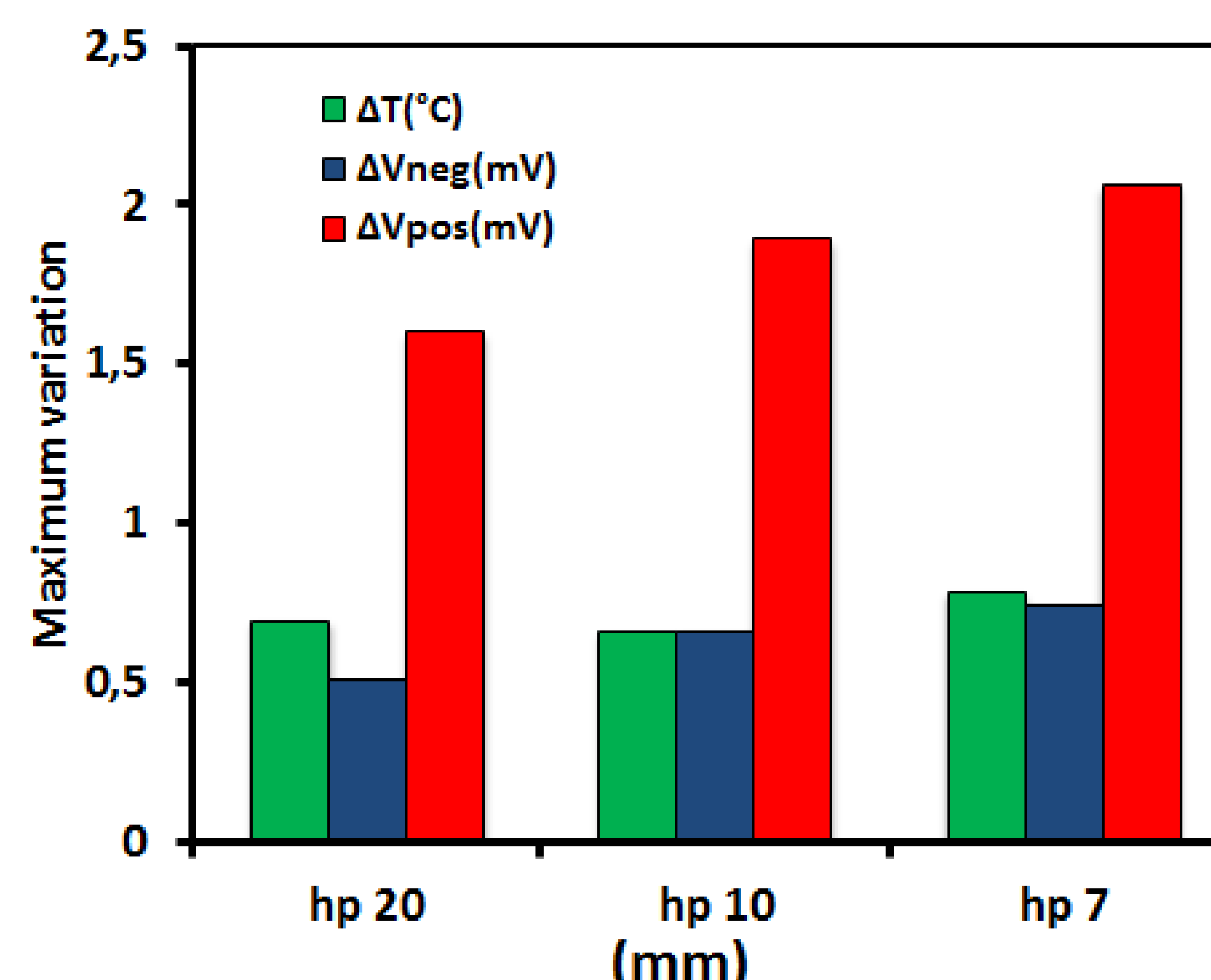


Figure 4. Influence of tab width in configuration 2

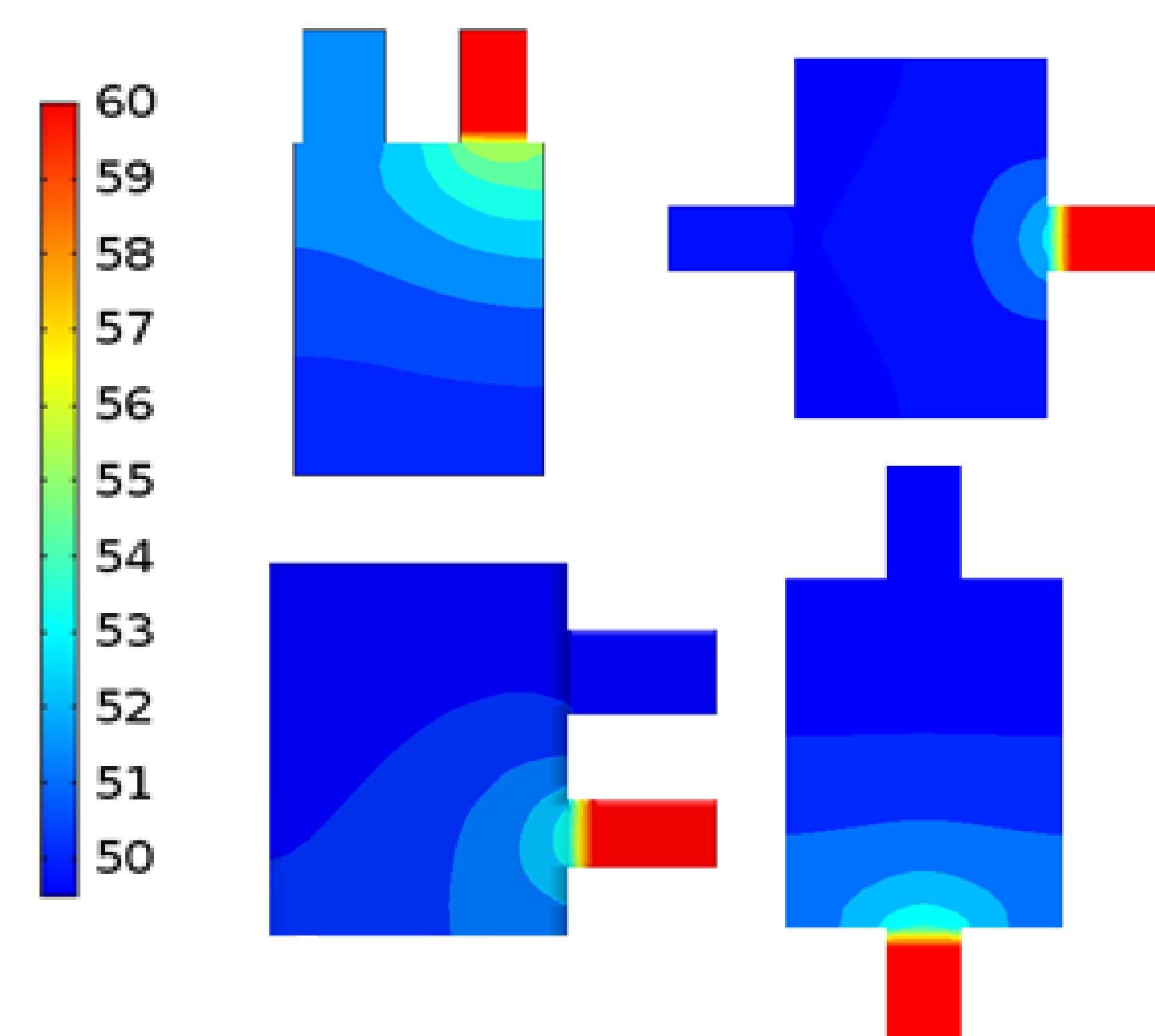


Figure 5. Thermal distribution at the end of charging

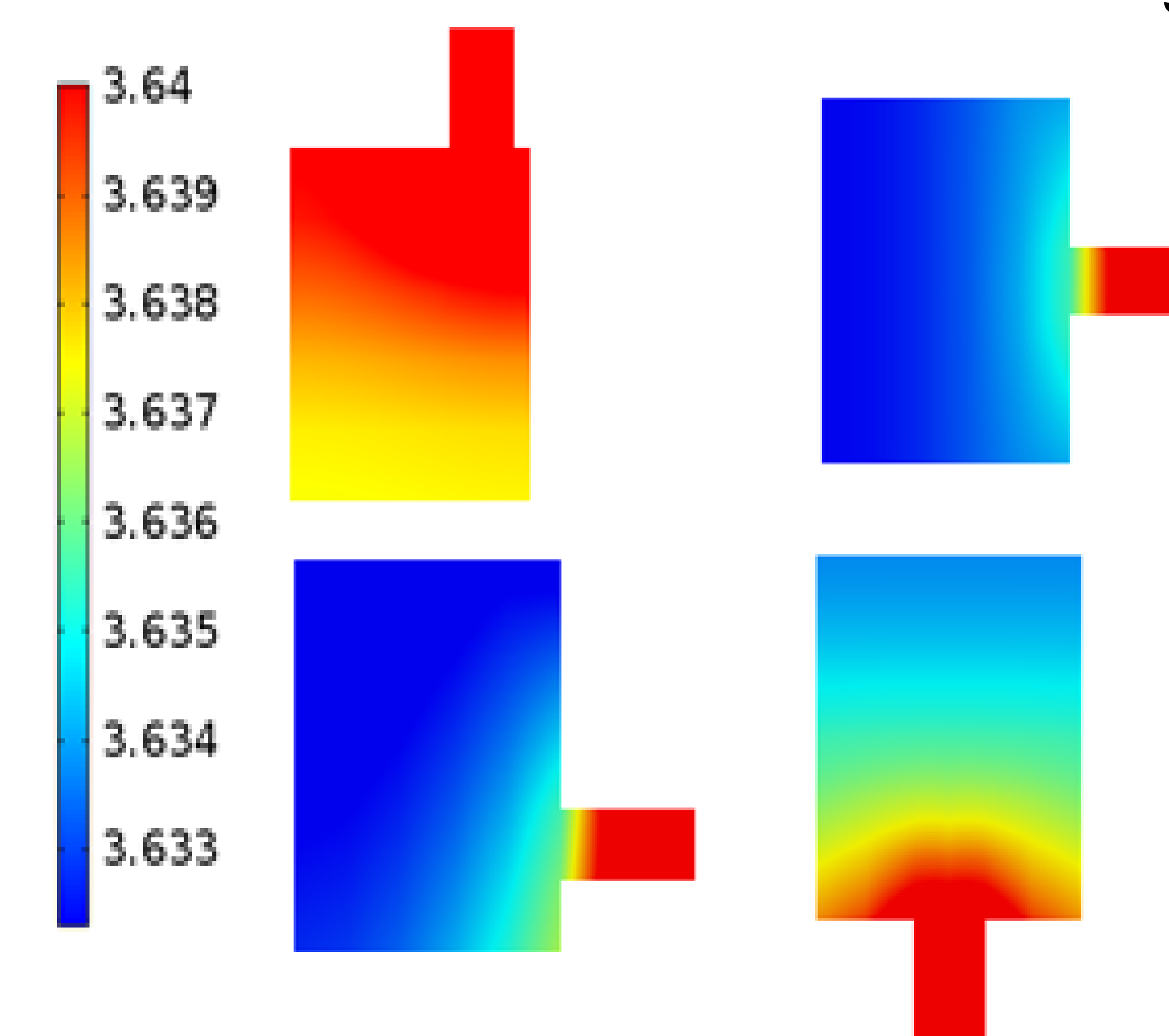


Figure 6. Voltage distribution at the end of charging

Conclusions:

- Extended analysis has been performed,
- Development of advanced simulation model,
- Optimization of cell design,
- Enhancement of battery performances,