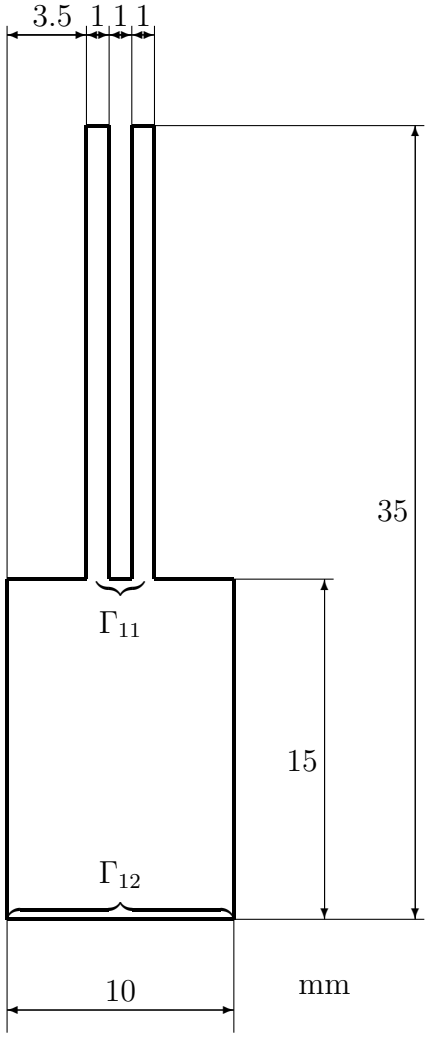
PA01 "TOOTH": Electric field computation

Compute the electric potential in the nerves of a tooth.
The dielectric constant equals 1



$$-\Delta u = 0 \text{ in } \Omega$$

$$u = \begin{cases} -0.1\text{V on } \Gamma_{11} \\ 0.1\text{V on } \Gamma_{12} \\ 0\text{V on } \partial\Omega \setminus (\Gamma_{11} \cup \Gamma_{12}) \end{cases}$$

Tasks:

- Derive the mathematical model. If possible use symmetries or reduction in the dimension
- Give the variational formulation
- Analysis: discuss existence and uniqueness of solutions
- Discretize the domain Ω
- Numerical analysis: provide an error estimate
- Choose a solver for the system of equations you obtain
- Implementation
- Visualize the results and (if possible) compare them to analytical solutions

1 Mathematical model

2 Variational formulation

3 Analysis

4 Discretization

5 Solver

6 Numerical analysis

7 Implementation

8 Numerical results