

# Cortical evoked potentials after stimulation of cutaneous nerve fibres by micropatterned electrodes with different interrail gaps

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## Introduction

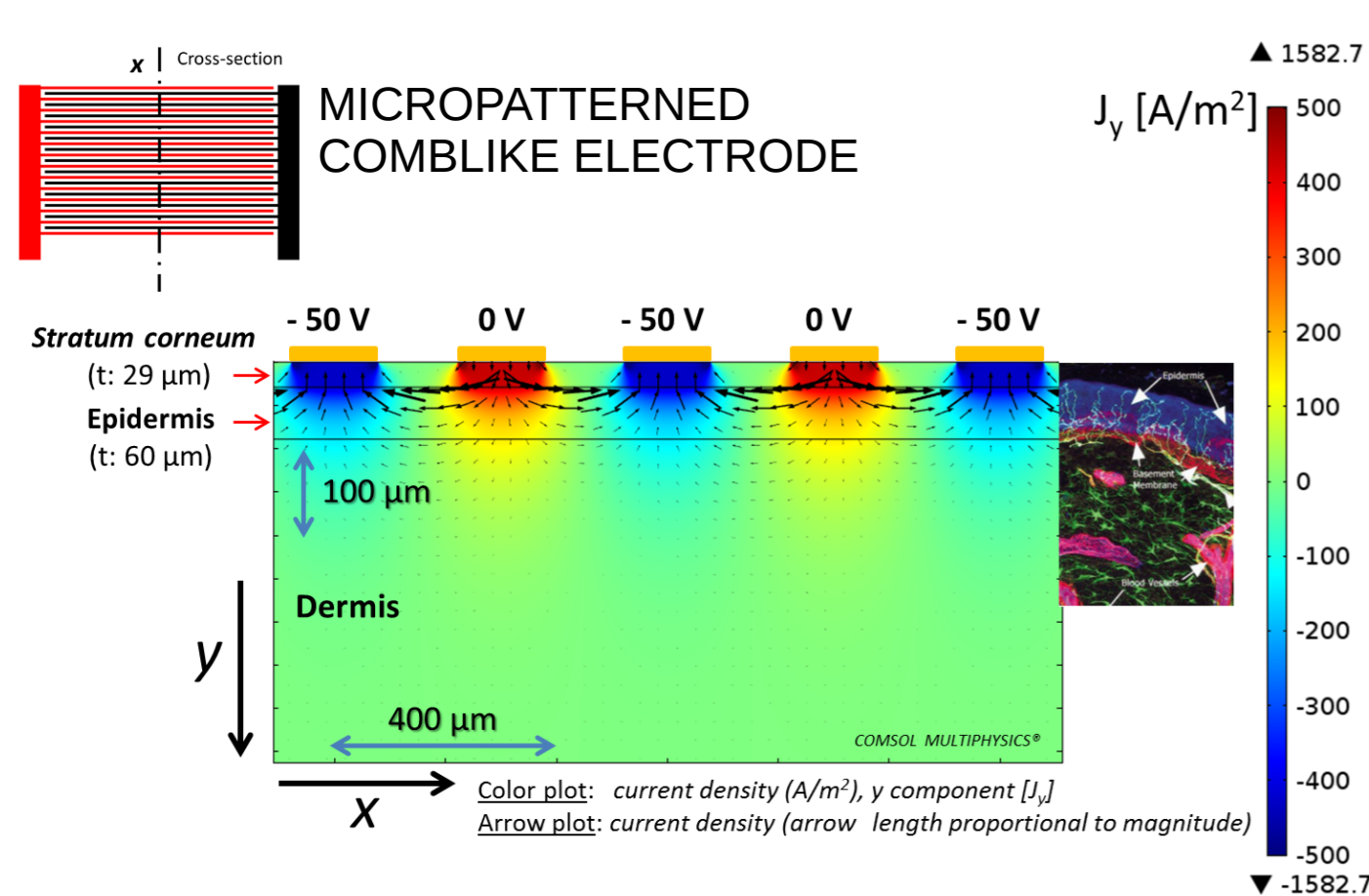
- Currently infrared laser is considered the gold standard for stimulation of intradermal nociceptive fibres but stimulus selectivity is still an issue
- Besides, laser stimulation shows many drawbacks: possible skin lesions, expensive equipment, asynchronous activation of too few fibres
- Electrical stimulation so far proved difficult because of lack of selectivity
- *We endeavoured to demonstrate that selective stimulation of large amounts of intraepidermal nociceptive free endings can be performed using a micropatterned comblike electrode with interrail gap of 150µm*

## Methods

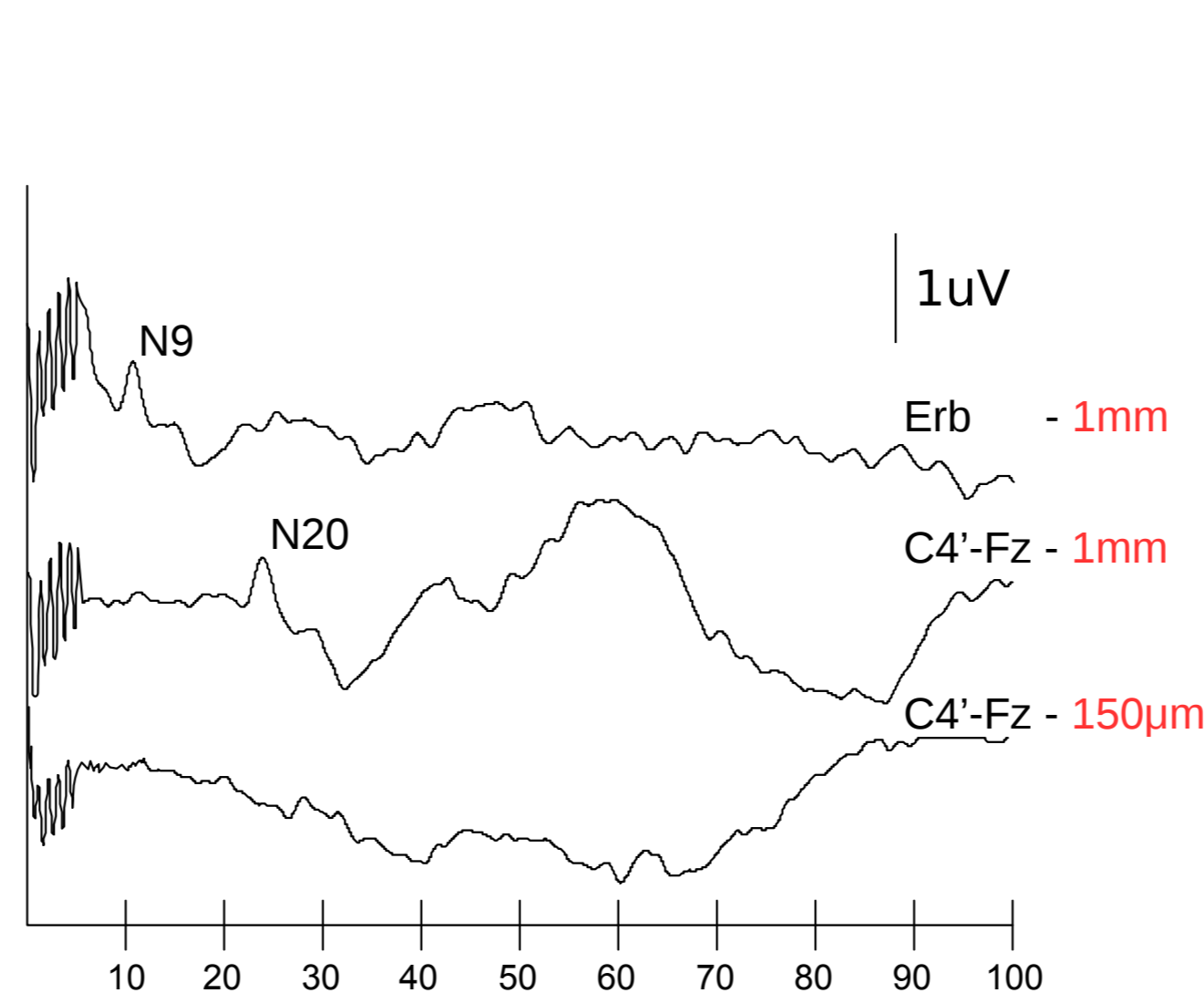
- 10 healthy volunteers
- Stimulation using comblike electrodes with 150µm and 1mm interrail distance (*Bionen, Firenze, under licence\**)
- In order to improve selectivity for Aδ fibres, stimulation consisted of a train of 5 to 10 pulses with 1ms inter-pulse interval, 0.2ms duration each
- Site of stimulation: hairy skin of the hand dorsum between the 1st and 2nd metacarpal bone of the non dominant side. No skin preparation.
- Recording: subdermal needles at Erb site and from the scalp derivations Cz-Auc and C3'/C4'-Fz

\* Italian Patent n. 1425199 (also published as WO2015186087), inventors M. Leandri, L. Pellegrino, A. Siri

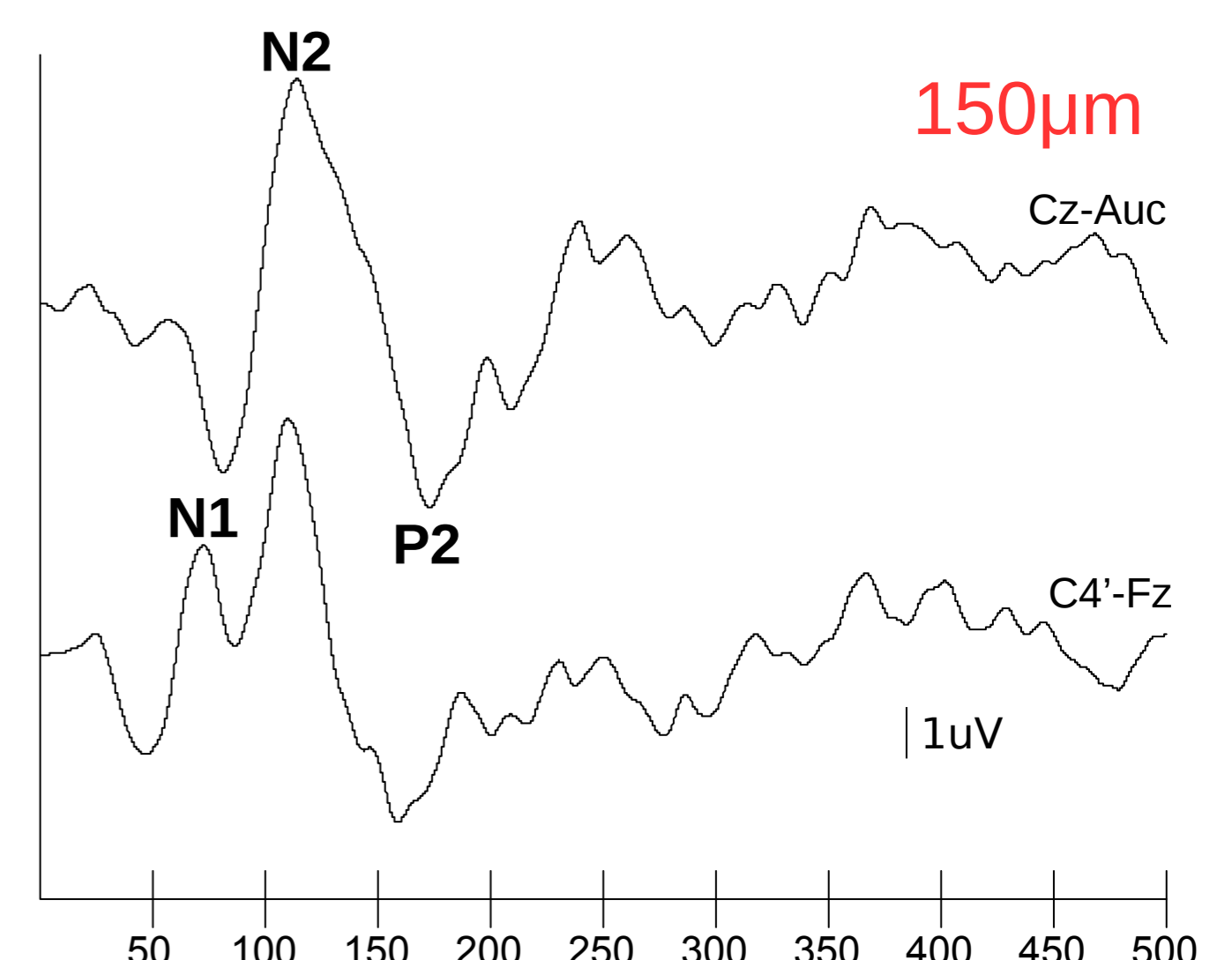
## Results



Computer simulation of the electric field generated by micropatterned comblike electrodes. The electric field affects the skin under the electrode according to a pattern evenly distributed, which results in activating the nerve endings situated in about 25% of the covered area



Erb and parietal small responses are only obtained stimulating with nonselective 1mm electrode. No early latency responses are visible following 150µm electrode stimulation, reflecting its selectivity



150µm electrode is able to evoke cortical responses at the vertex and temporal derivations

## Keypoints / Conclusions

- Only comblike electrodes with 1mm interrail gap, but not 150µm, evoke early/medium latency responses
- Micropatterned comblike electrode with interrail gap of 150µm selectively stimulates nociceptive free endings
- Micropatterned comblike electrode with interrail gap of 1mm is non-selective and stimulates Aβ fibers also
- Selective electrical stimulation of nociceptive afferents may be an effective alternative to laser-evoked potentials