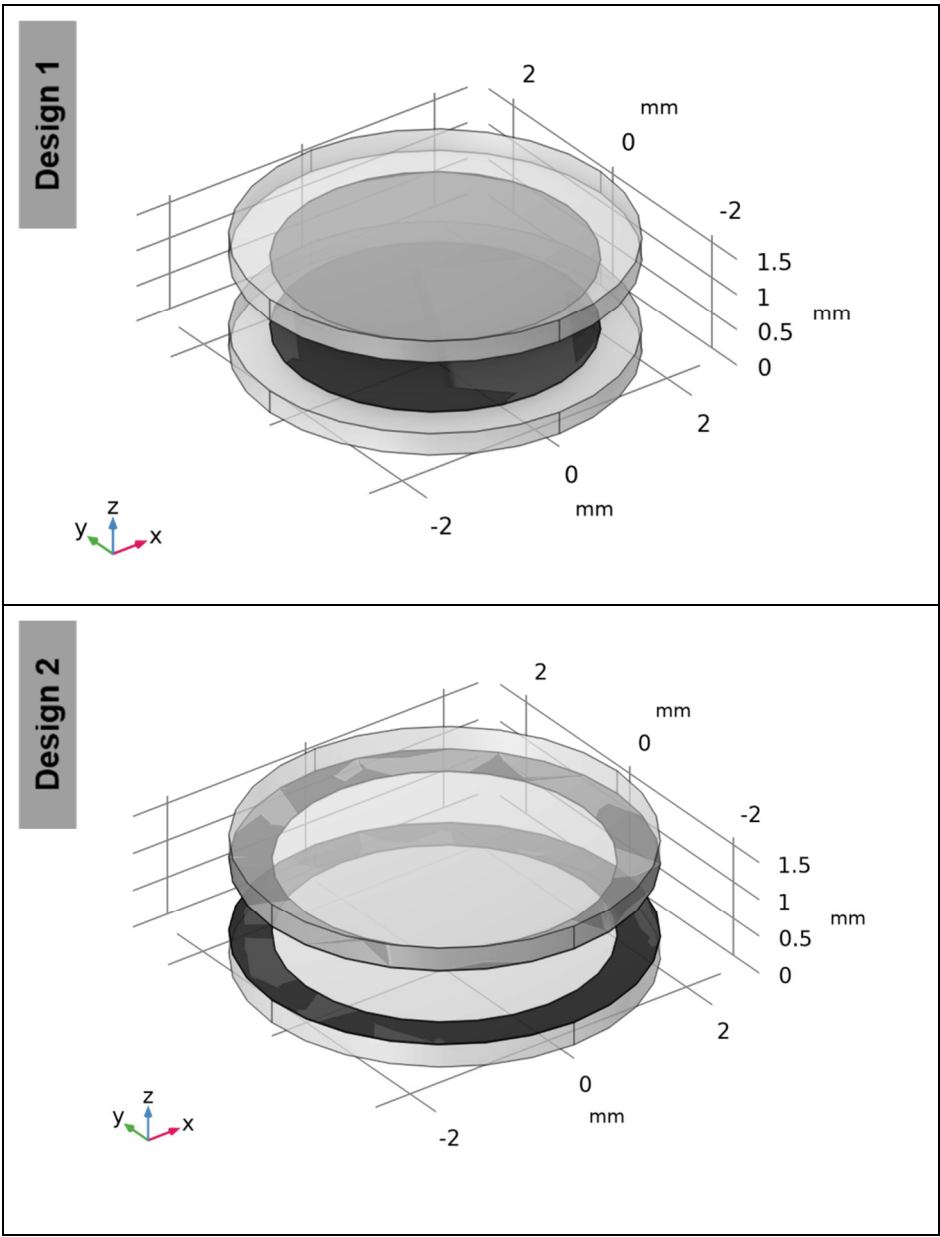


Supplementary information



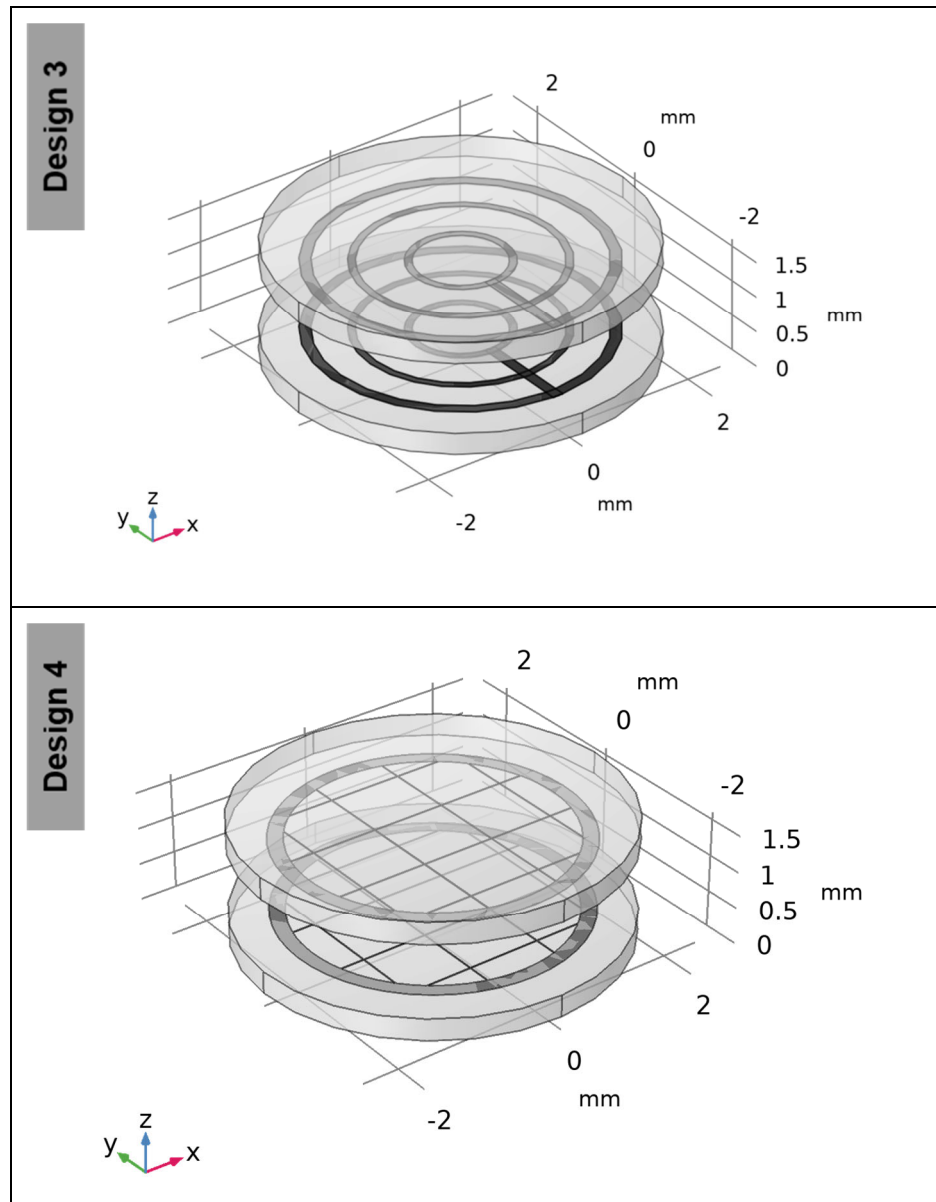


Figure S1. Dimensions and positioning in the cell-culture chamber (in grey) of the different electrodes (in black) used for the design of impedance sensors: (design 1) planar disk-electrodes, (design 2) ring-electrodes, (design 3) multi-ring-electrodes and (design 4) grid-electrodes.

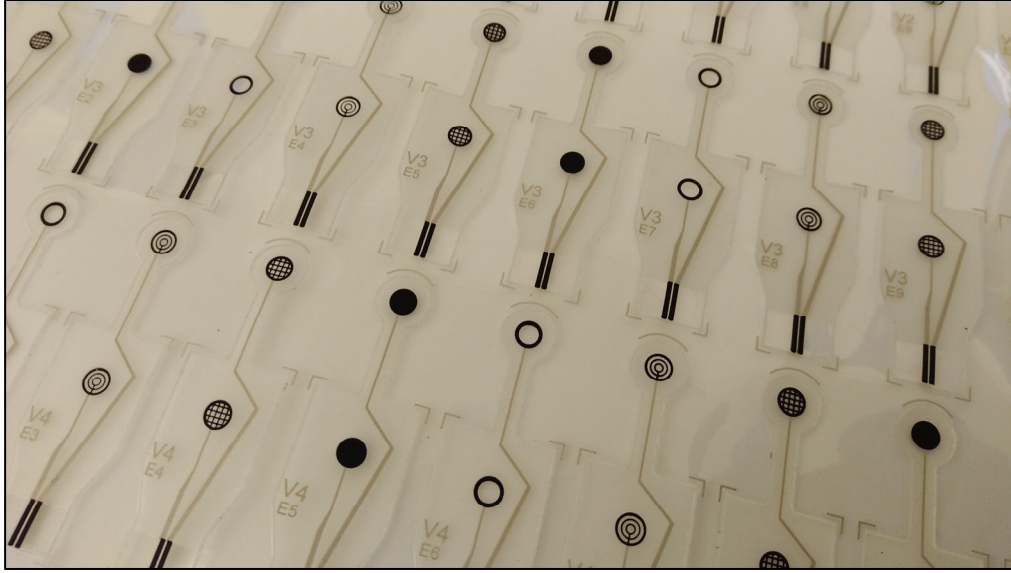


Figure S2. Fabrication process of the electrical impedance spectroscopy sensors using screen-printing technology (fabrication of 40 sensors per batch).

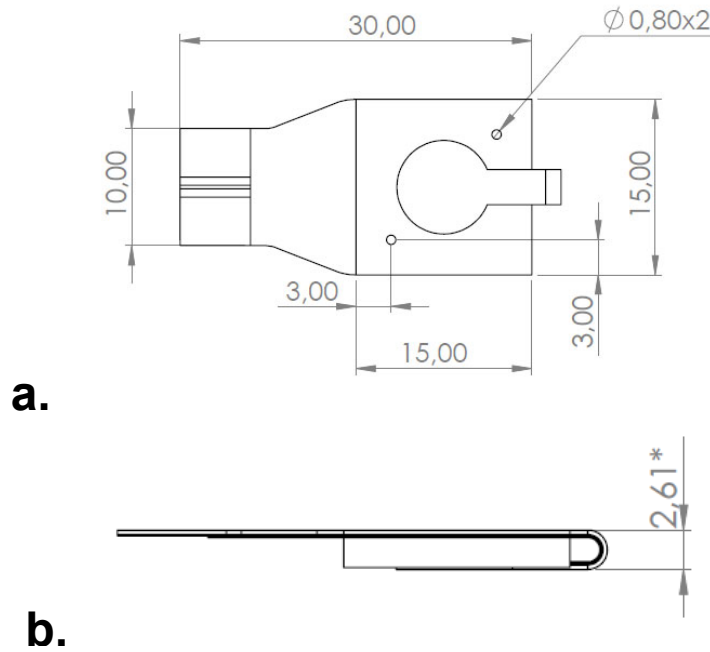
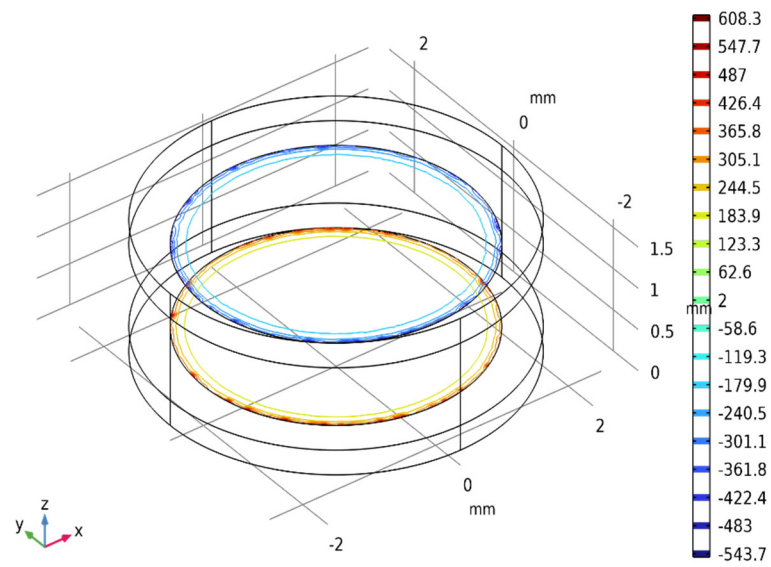
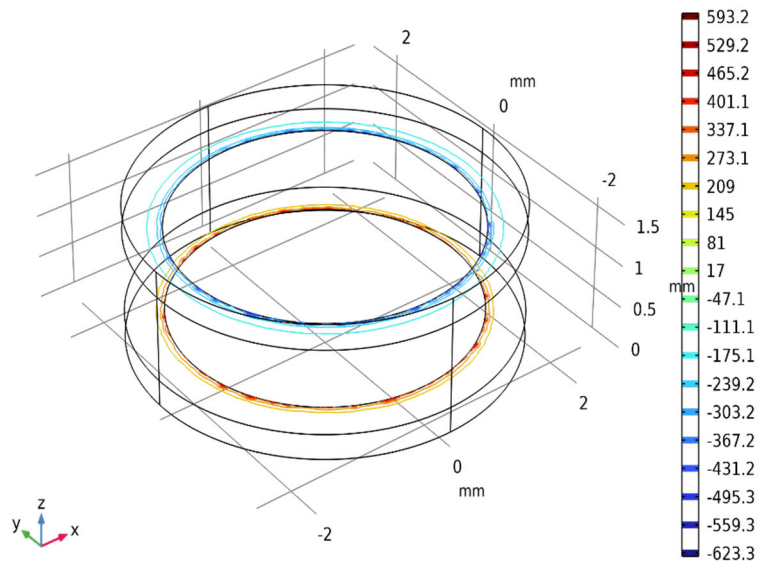


Figure S3. Dimensions of the embedded microfluidic cell-culture chamber (in mm) integrating the impedance sensors in: (a) top view and (b) side view.

Design 1



Design 2



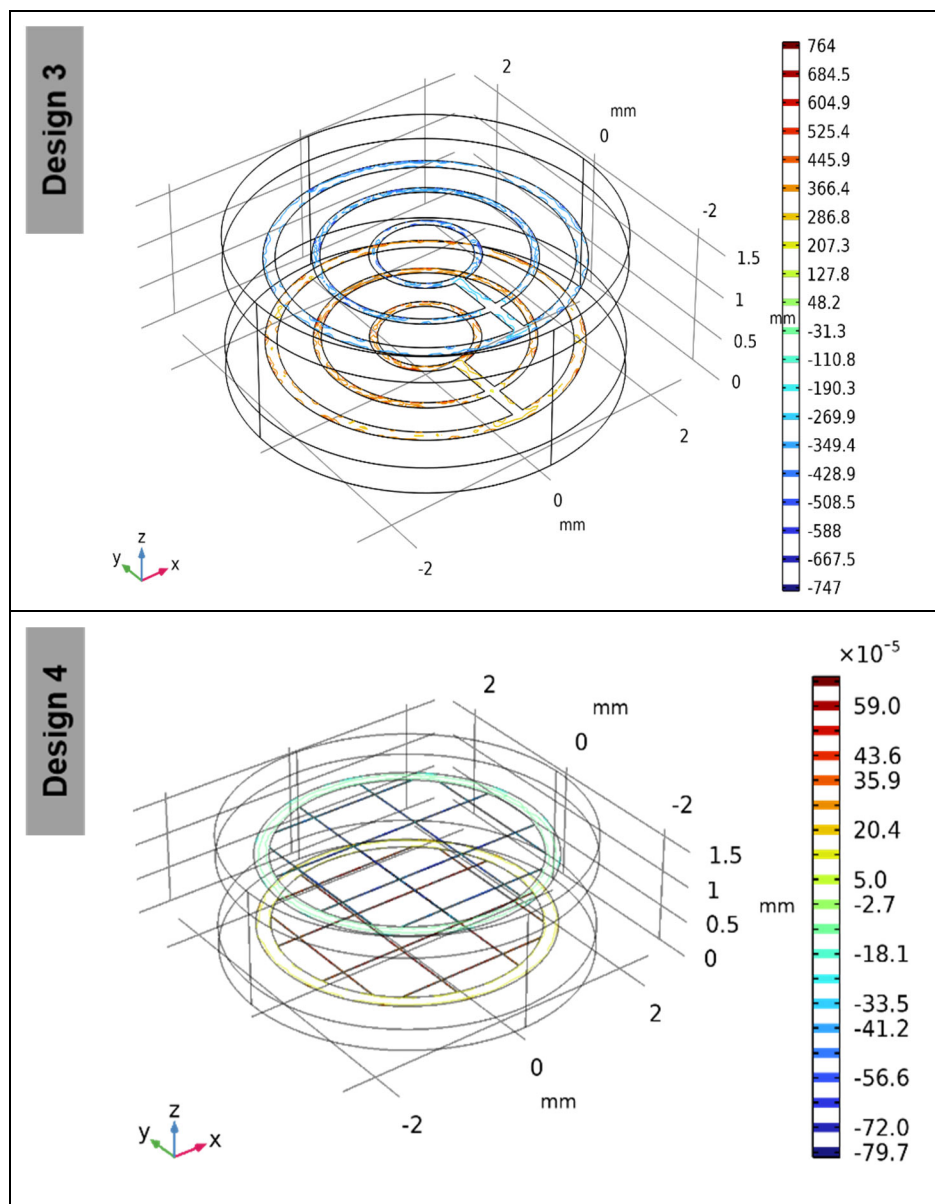


Figure S4. Distribution and variation of the current density (in A/m²) on the electrode surfaces of: (design 1) planar disk-electrodes, (design 2) ring-electrodes, (design 3) multi-ring-electrodes and (design 4) grid-electrodes.

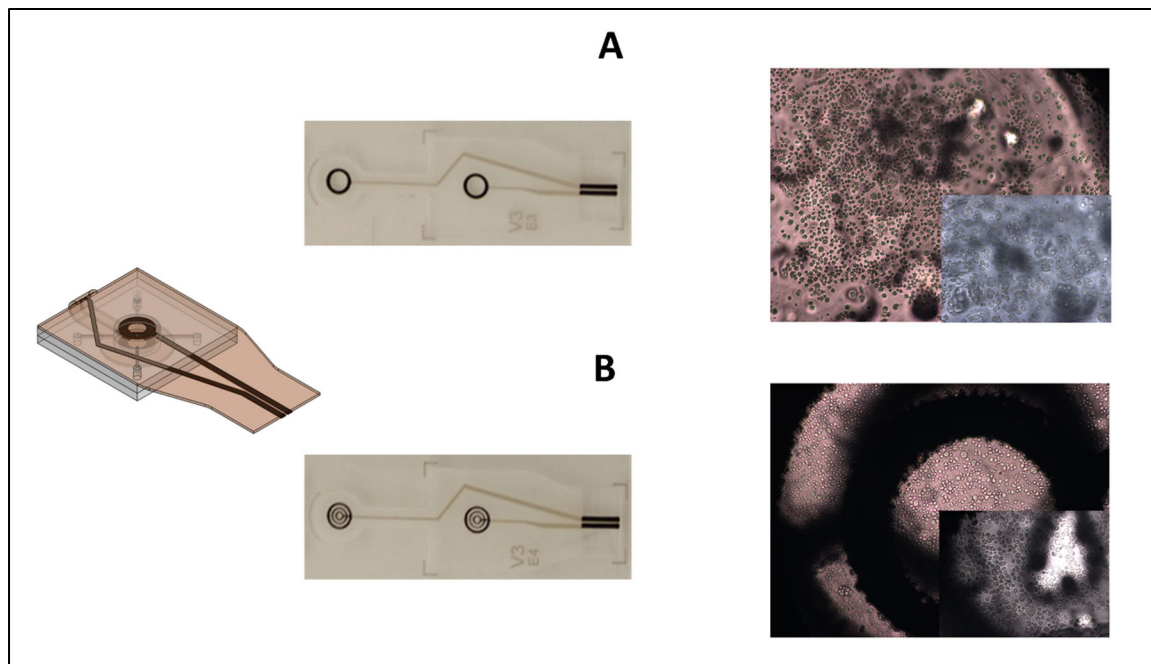


Figure S5. Impedance electrodes and bright field images of Calu-3 cells on (A) ring-electrodes design and (B) multi-rings electrodes after 4 days in perfused culture; magnification images highlights the cell morphology were Calu-3 cells grown as islands.