Electronic Supplementary Material (ESI) for Lab on a Chip.

SUPPLEMENTARY INFORMATION

ElectrochemCap: an integrated detection of loop-mediated isothermal amplification reactions

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Procedure 1. Detailed LAMP assay.

The reaction mix used contained: 1x master mix (WarmStart® Colorimetric LAMP 2X, including Bst 2.0 DNA Polymerase and phenol red, New England Biolabs), primer mix (1.6 µM each FIP and BIP primer, 0.2 µM each F3 and B3 primer and 0.4 µM each LoopF and LoopB primer and PCR-grade dH_2O (Invitrogen UltraPureTM Distilled Water (DNase/RNAse free), Life Technologies) up to 48 µL of final volume. A volume of 2 µL of template SARS-CoV-2 RNA (VR-1986D, ATCC®), if required, was added at the desired concentration. All concentrations are indicated as copies·μL^{-1} of standard or sample solution. In the case of negative (non-template) control reactions, 2 µL of PCR-grade dH_2O were added. All reactions were performed on low-retention, nuclease-free PCR grade tubes (PCR-02-L-C, AxygenTM) and were carried out under sterile conditions in a laminar flow hood. LAMPs were performed in a thermal block (MSC-100, Lan Technics) at 65ºC for 30 min.

Table S1. LAMP primers used in this study. Position in the SARS-CoV-2 genome is indicated.

Fragment	Primer	Sequence	Position
N1	F3	TGGACCCCAAAATCAGCG	28278 -28295
	B3	GCCTTGTCCTCGAGGGAAT	28479 - 28461
	FIP	CCACTGCGTTCTCCATTCTGGTAAATGCACCCCGCATTACG	28367 – 28340/ 28296 - 28314
	BIP	CGCGATCAAAACAACGTCGGCCCTTGCCATGTTGAGTGAGA	28370 – 28392/ 28450 - 28431
	Loop F	TGAATCTGAGGGTCCACCAAA	28335 - 28315
	Loop B	GGTTTACCCAATAATACTGCGTCTT	28396 – 28420

Table S2. Economic costs of the ElectrochemCap.

Component	Size per platform	Price of bulk material	Price/platform (EUR)
SPE	1 unit	76 EUR/50 units	1.52
PSA	1.6 cm^2	0.014 EUR/cm^2	0.02
TPU adapter	0.54 g	19.33 EUR/kg	0.01
Microcentrifuge tube	1 unit	70.2 EUR/1000 units	0.07
TOTAL			1.62
Reaction mix	50 µL	0.081 €/µL	4.05€
TOTAL (including reaction mix)			5.67 €

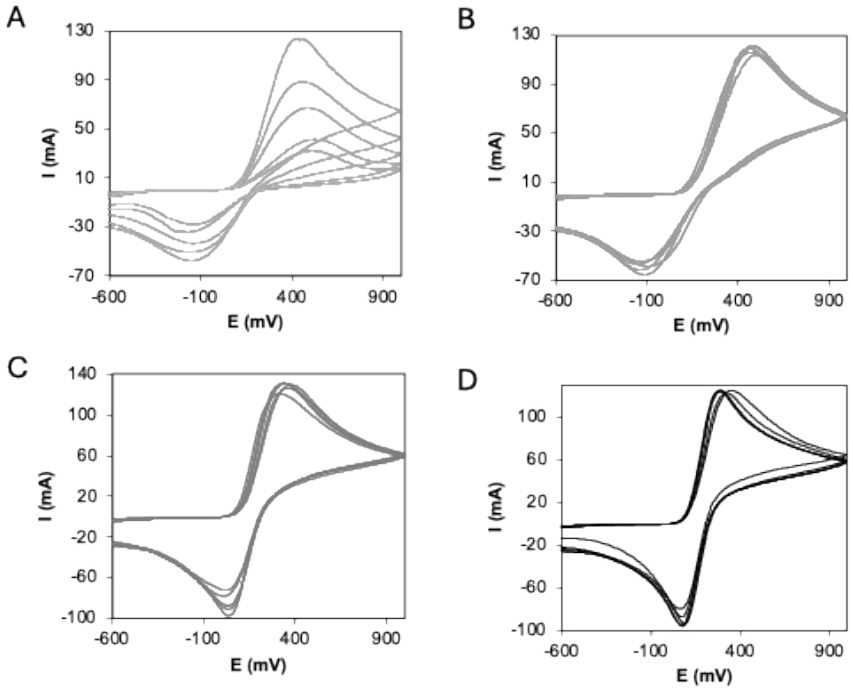

Figure S1. Electrochemical characterization of the ElectroCap using different reaction volumes. CVs (n = 5) recorded using A: 25 µL; B: 50 µL; C: 100 µL; D: 200 µL of 5 mM $K_3[Fe(CN)_6]$. Scan rate 0.1 $V \cdot s^{-1}$.

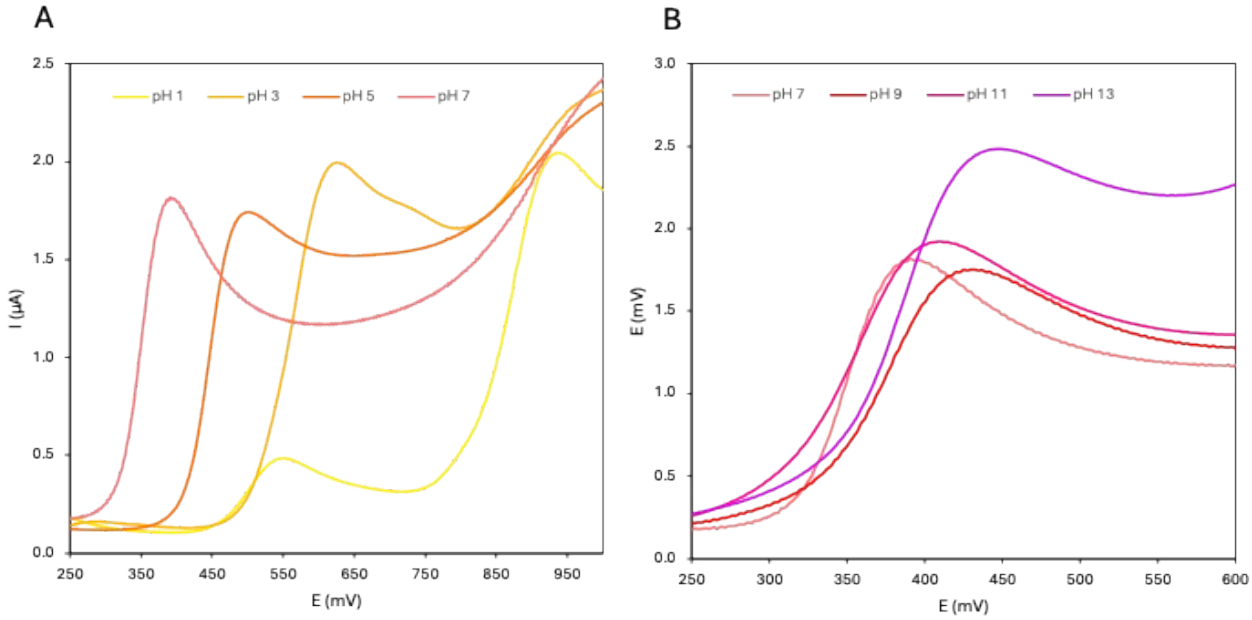

Figure S2. Phenol red linear sweep voltammograms recorded in 100 µM solutions, in more acidic (A) and alkaline (B) conditions. A: in 0.1 M HCl and in 0.1 M BR buffers of pH 3, 5 and 7. B: LSVs recorded in 100 µM PR solutions in 0.1 M BR buffers of pH 7, 9 and 11, and in 0.1 M NaOH. Scan rate 0.1 $V \cdot s^{-1}$.

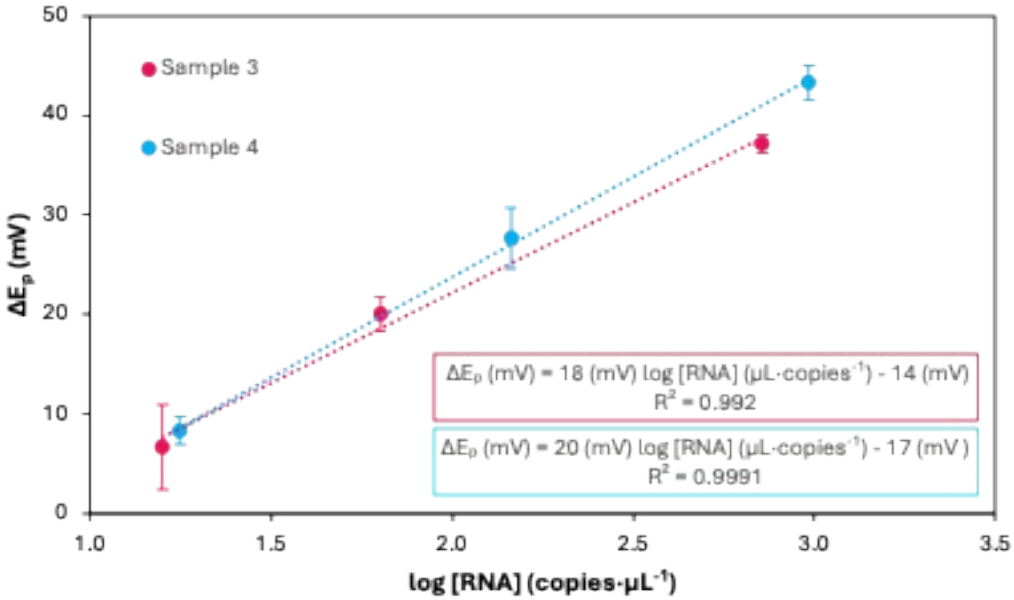

Figure S3. Sample dilution results. The shift in peak potential is represented *vs.* logarithm of the expected copy number. Regression equations and correlation coefficient are shown in a red or blue box for samples 3 and 4, respectively. All error bars represent the standard deviation of three replicates.

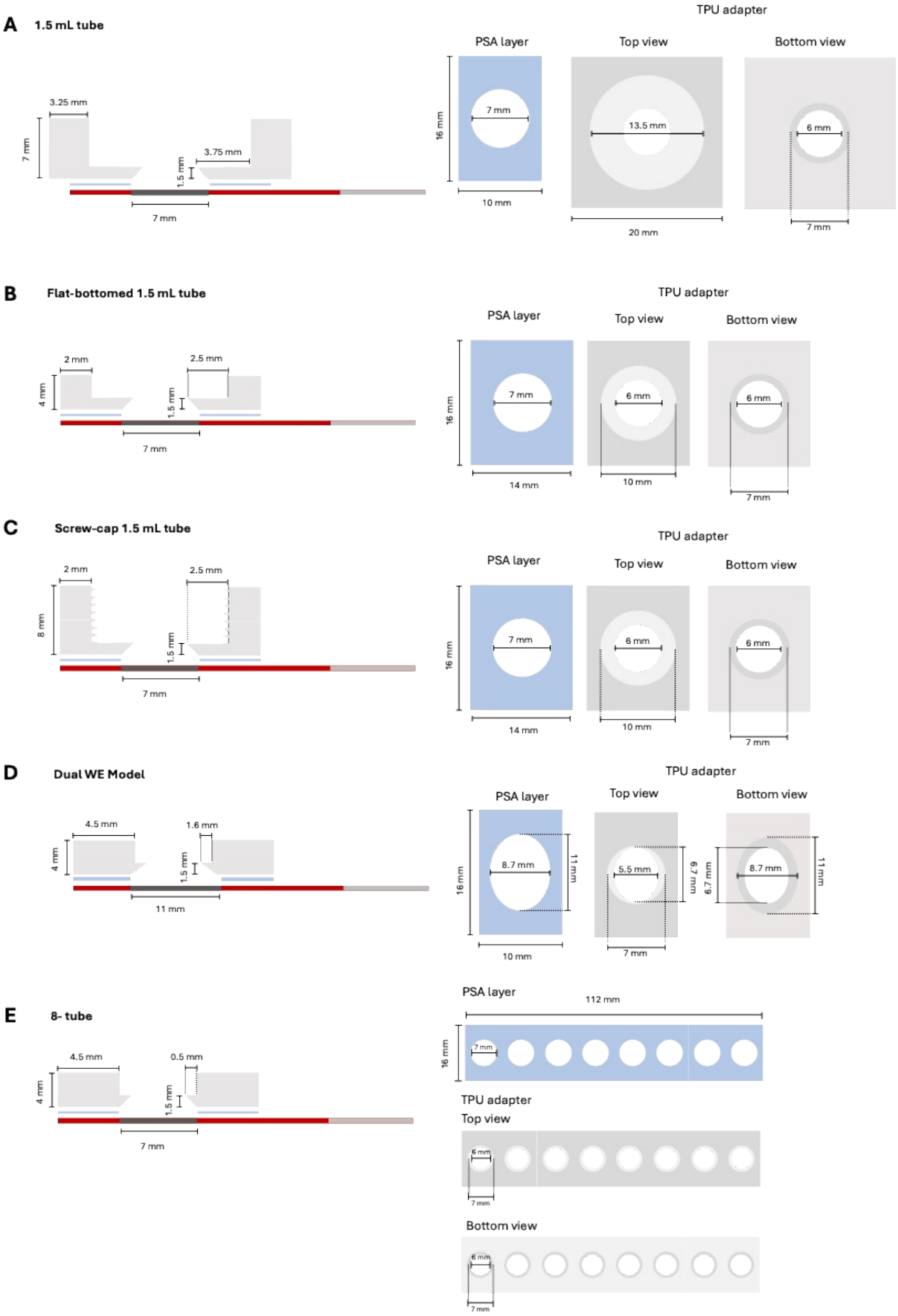

Figure S4. Detailed designs of the different ElectrochemCap proposed.