

## Supplementary Information

### Reagent free detection of SARS-CoV-2 using an antibody-based microwave sensor in a microfluidic platform

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#### S1. Point-of-Care devices on market for COVID-19 diagnosis.

Brand	Name of the system	Test	Test rate	Sensitivity	Specificity	POC device	FDA/EDA Approved	Ref.
Mesa Biotech	Accula SARS-CoV-2 Test	RT-PCR	30 mins	100%	100%	Yes	Yes	<sup>1</sup>
Abbott	ID NOW COVID-19 test	Isothermal DNA amplification.	13 mins	100%	100%	Yes	Yes	<sup>2</sup>
Cepheid	Xpert Xpress SARS-CoV-2 test	RT-PCR	40 mins	100%	100%	Yes	Yes	<sup>3</sup>
Cue Health	Cue COVID-19 Test	Isothermal DNA amplification.	20 mins	95%	100%	Yes	Yes	<sup>4</sup>
ACON Laboratories	FlowFlex SARS-CoV-2 Antigen Rapid Test	Antigen test	15 mins	97.1%	99.6%	Yes	Yes	<sup>5</sup>
Abbott	Binaxnow	Antigen test	15 mins	84.6%	98.5%	Yes	Yes	<sup>6</sup>
Roche	SARS-Cov-2 Rapid Antigen test	Antigen test	30 mins	82.5%	99.1%	Yes	Yes	<sup>7</sup>
BTNX	SARS-Cov-2 Rapid Antigen test	Antigen test	15 mins	94.55%	100%	Yes	Yes	<sup>8</sup>
LumiraDX	LumiraDX SARS-CoV-2 Antigen Test	Antigen test	12 mins	97.6%	96.6%	Yes	Yes	<sup>9</sup>

## S2. Microwave sensor structure



Figure S2. Microwave sensor structure and dimensions

## S3. S11 spectrum plot at different time

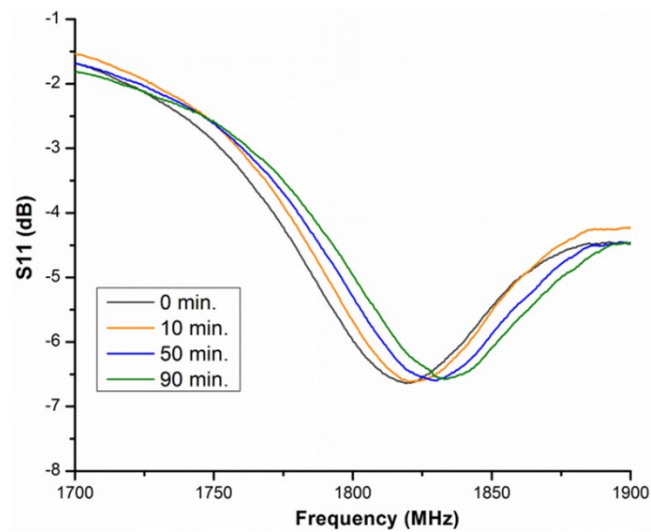


Figure S3. S11 spectrum plot when flowing SARS-CoV-2 antigen at different time steps: 0 min., 10 min., 50 min., 90 min.

S4. Frequency shift for tests involving the SARS-CoV-2 antigen and virus at 60 minutes.

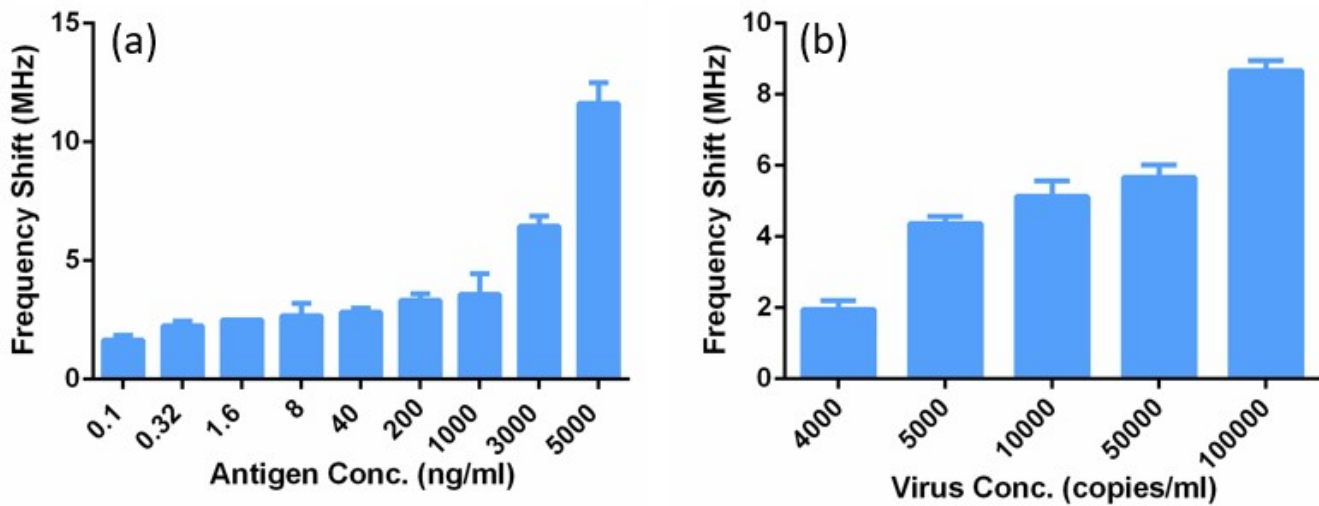


Figure S4. Frequency shift at 60 min. and the data are presented as the mean  $\pm$  SD; n=3, with T test  $p < 0.01$  for all cases compared with the blank control case. (a) Antigen test and (b) Virus test

S5. Preliminary testing using a miniaturized, inexpensive NanoVNA

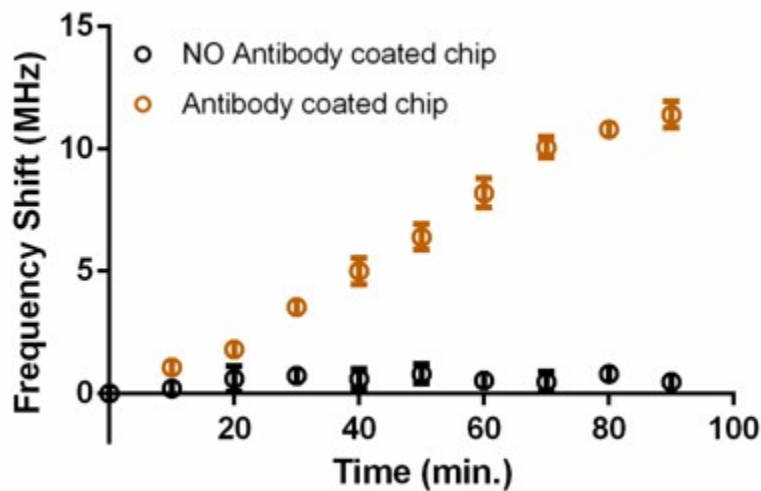


Figure S5. Preliminary testing using NanoVNA (NanoLab) to detect the SARS-CoV-2 virus based on the antibody-coated microwave sensor

## References

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