

Supplementary Information

Rapid and Accurate On-site Immunodiagnosics of Highly Contagious SARS-CoV-2 Using Portable SERS-LFA Reader

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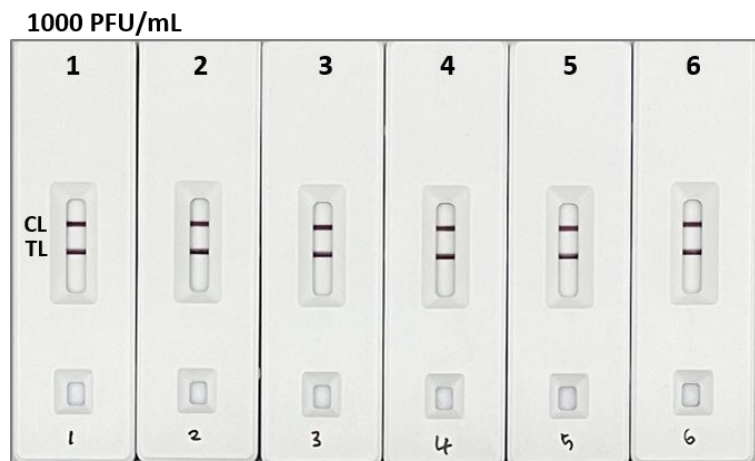
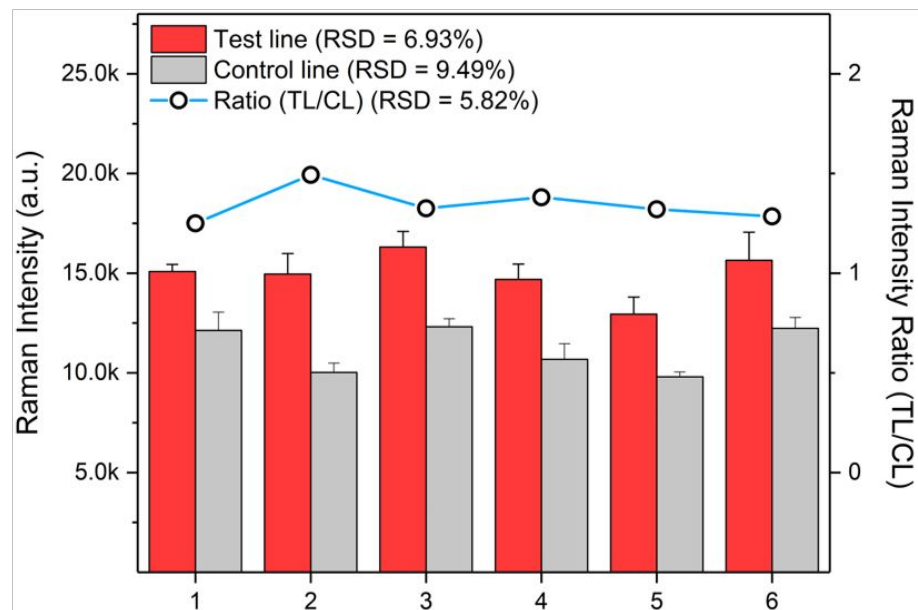
a**b**

Figure S1. Repeatability test of Raman peak intensities for six different SERS-LFA strips. (a) Color changes on the test and control lines of six different SERS-LFA strips for 1000 PFU/mL SARS-CoV-2, (b) Histograms comparing corresponding the average Raman peak intensities. The red and grey bars represent the changes in the Raman intensity of the test and control lines, respectively. The blue line represents the changes in the Raman intensity ratio between the test and control lines. The error bars indicate the standard deviations from the three measurements. The relative standard deviations is calculated as 6.93% for the test line, 9.49% for the control line, and 5.82% for the TL/CL ratio, all showing good reproducibility.

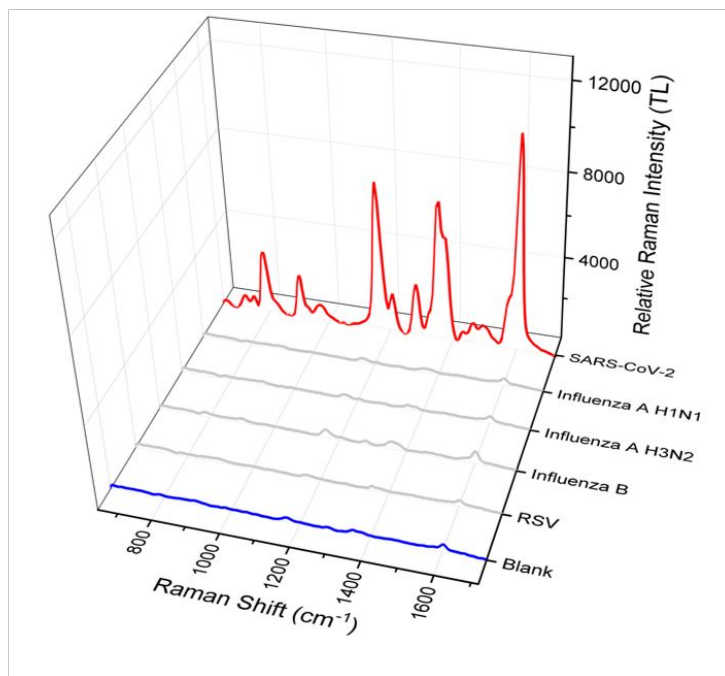
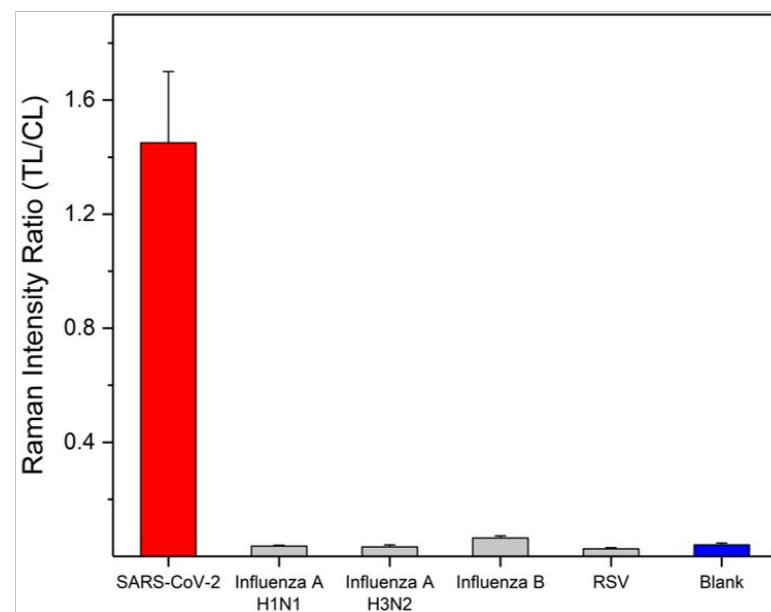
a**b**

Figure S2. Selectivity test of SARS-CoV-2 for SERS-LFA reader. (a) SERS spectra for five different types of respiratory viruses: SARS-CoV-2 (1000 PFU mL^{-1}), influenza A/H1N1 (4032 HAU mL^{-1}), influenza A/H3N2 (5461 HAU mL^{-1}), influenza B (2366 HAU mL^{-1}) and RSV ($10 \mu\text{g mL}^{-1}$) and (b) Corresponding TL/CL Raman intensity ratios measured using a portable SERS-LFA reader.

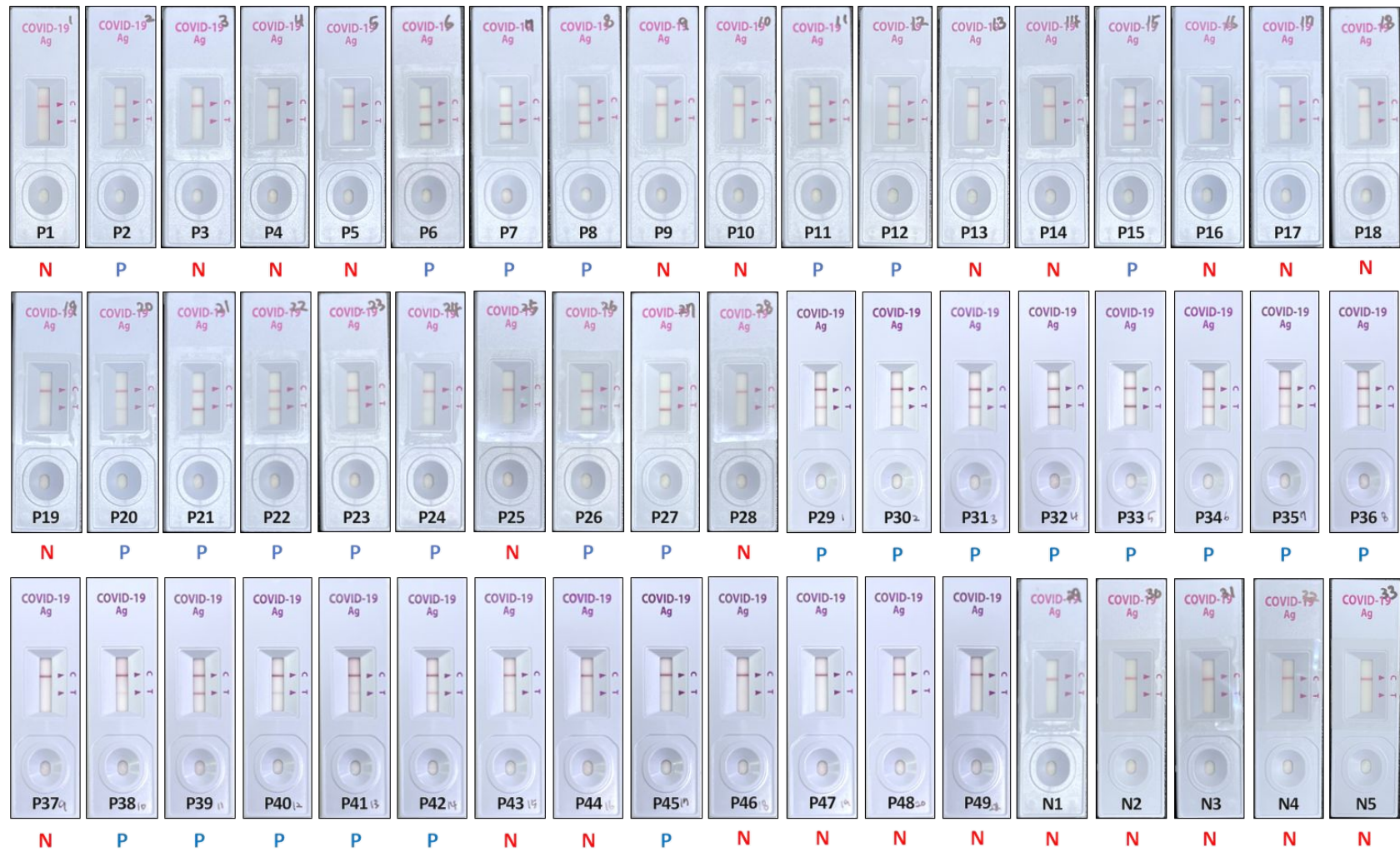


Figure S3. LFA assay results. Photos of the SARS-CoV-2 assay results using commercial LFA strips on 54 clinical samples.

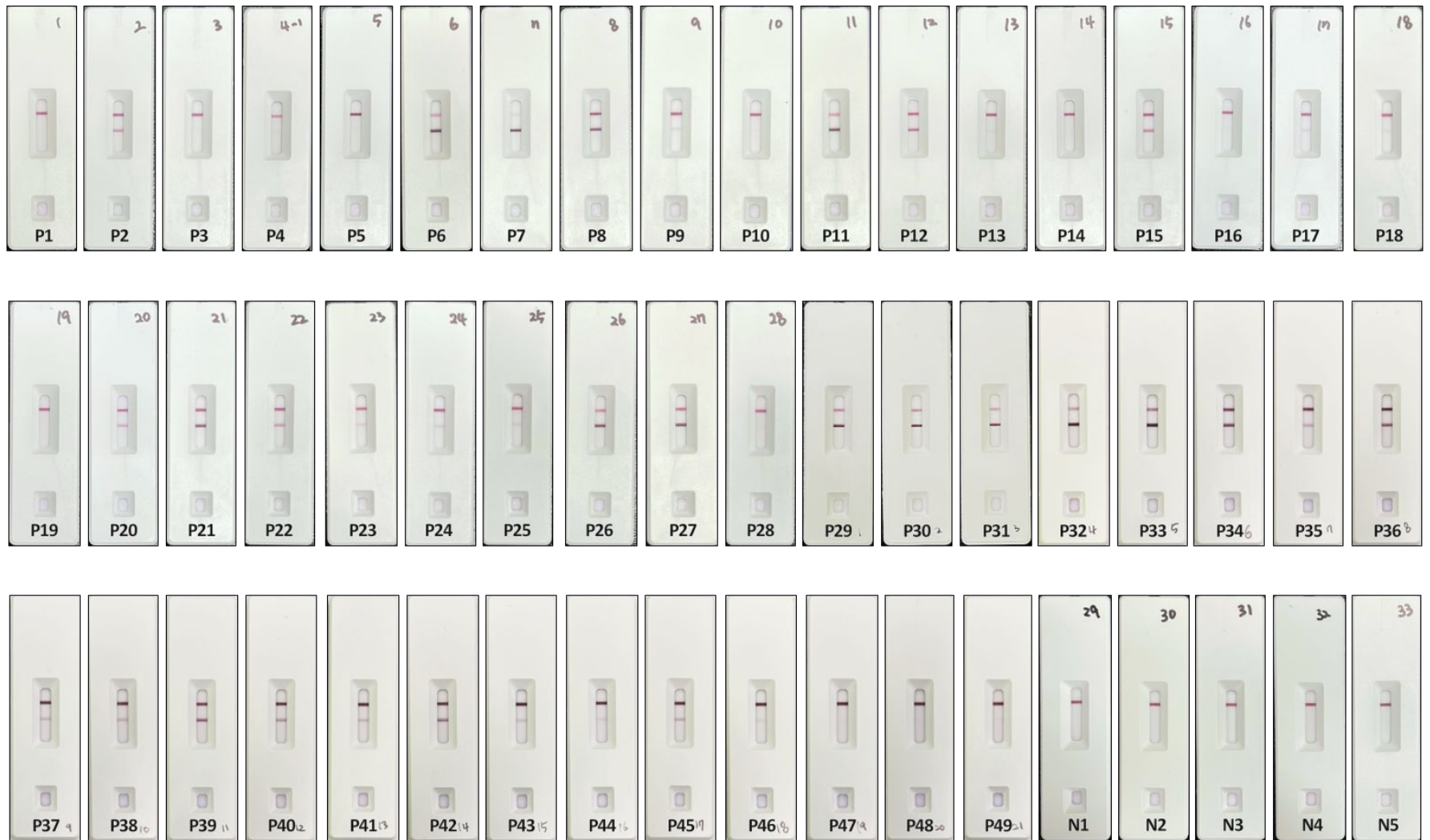


Figure S4. SERS-LFA assay results. Photos of the SARS-CoV-2 assay results using SERS-LFA strips on 54 clinical samples.

Table S1. SERS intensity ratios (TL/PL) for eight different SARS-CoV-2 concentrations.

Concentration (PFU/mL)	1000	500	100	50	10	5	1	0
TL	10995	8637.2	3365.7	2128.4	762.12	510.40	369.75	340.80
CL	4782.2	5550.2	5701.7	5718.3	6243.5	6589.0	6270.9	5928.2
Ratio (TL/CL)	2.2992	1.5562	0.5903	0.3722	0.1221	0.0775	0.0590	0.0575

Table S2. Comparison of clinical assay results by RT-PCR, commercial LFA strip and SERS-LFA strip performed on 54 clinical samples (49 positives and 5 negatives). Ct values of SARS-CoV-2 gene marker (RdRp gene) were determined by RT-PCR.

No.	RT-PCR		Portable SERS-LFA strip				Commercial LFA strip	
	Ct value (RdRp)	Group	TL Intensity	CL Intensity	TL/CL Ratio	P/N	P/N	
P7	14.19	<20	11726	601.00	19.511	P	P	
P6	15.52		11670	1930.4	6.0454	P	P	
P11	16.71		12300	1991.4	6.1766	P	P	
P27	17.48		13523	4561.0	2.9649	P	P	
P26	18.25		13375	3110.2	4.3004	P	P	
P27	18.68		10345	3719.3	2.8176	P	P	
P8	19.34		11947	8371.5	1.4271	P	P	
P30	20.51		20-25	10676	3813.0	2.8456	P	P
P31	20.66	10370		2850.3	3.7114	P	P	
P32	20.87	10423		2200.4	4.9168	P	P	
P33	20.97	10098		3061.2	3.3379	P	P	
P2	21.04	5530.3		8413.8	0.6573	P	P	
P21	21.35	12538		6433.4	1.9489	P	P	
P34	21.75	9082.2		6412.4	1.4190	P	P	
P12	22.44	11963		9561.9	1.2511	P	P	
P20	22.54	4804.7		8681.7	0.5534	P	P	
P15	24.14	8473.1		9651.4	0.8779	P	P	
P17	24.81	1071.6		8982.0	0.1193	P	N	
P24	25.27	25-30		1512.7	9489.7	0.1595	P	P
P35	25.47			4051.8	12572	0.3228	P	P
P18	25.69			630.07	8048.9	0.0784	P	N
P36	25.82			8252.2	11180	0.7392	P	P
P37	25.90		2526.3	11947	0.2114	P	N	
P38	26.59		2426.0	9960.1	0.2448	P	P	
P25	26.68		1009.9	7021.8	0.1440	P	N	
P39	26.68		8410.3	9369.2	0.8978	P	P	
P40	26.83		4382.7	10976	0.3996	P	P	
P13	27.25		593.20	9003.2	0.0656	P	N	
P41	27.25		2135.1	9882.6	0.2160	P	P	
P42	27.29		6316.5	10642	0.5925	P	P	
P22	27.50		6282.5	9283.2	0.6770	P	P	
P28	27.84		373.06	9251.3	0.0403	P	N	
P43	28.47		1739.8	11271	0.1547	P	N	
P23	28.57		1362.3	6992.3	0.1950	P	P	
P44	28.57		1290.0	12056	0.1070	P	N	
P45	28.65		2687.8	11157	0.2410	P	P	
P14	29.03		337.13	9859.7	0.0343	N	N	
P46	29.14		740.86	8727.4	0.0849	P	N	
P4	29.39		523.95	5109.4	0.1026	P	N	

P3	29.79		401.75	8826.2	0.0456	P	N
P9	30.48		974.15	9412.3	0.1042	P	N
P1	31.59		239.63	7641.8	0.0313	N	N
P47	31.70		489.67	9333.2	0.0525	P	N
P19	31.86		364.73	9046.8	0.0405	P	N
P16	31.92	30-35	546.73	10058	0.0543	P	N
P10	32.45		407.22	9352.0	0.0436	P	N
P48	32.45		512.02	12707	0.0403	P	N
P5	33.00		432.29	10631	0.0407	P	N
P49	33.87		793.36	10848	0.0730	P	N
N1	N/C		371.19	9920.0	0.0374	N	N
N2	N/C		306.69	9384.8	0.0327	N	N
N3	N/C	Neg.	291.66	9875.5	0.0295	N	N
N4	N/C		356.92	9500.3	0.0376	N	N
N5	N/C		306.25	9875.4	0.0310	N	N