SUPPLEMENTARY INFORMATION

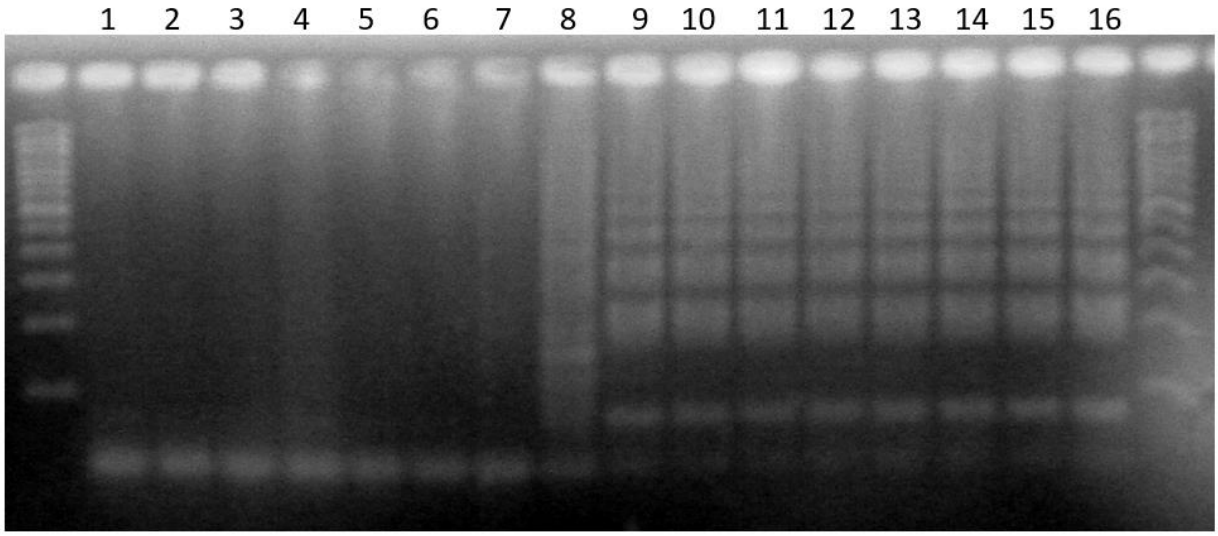
Emulsion-based Isothermal Nucleic Acid Amplification for Rapid SARS-CoV-2 Detection via Angle-dependent Light Scatter Analysis

Alexander S. Day, Tiffany-Heather Ulep, Babak Safavinia, Tyler Hertenstein, Elizabeth Budiman, Laurel Dieckhaus, and Jeong-Yeol Yoon*

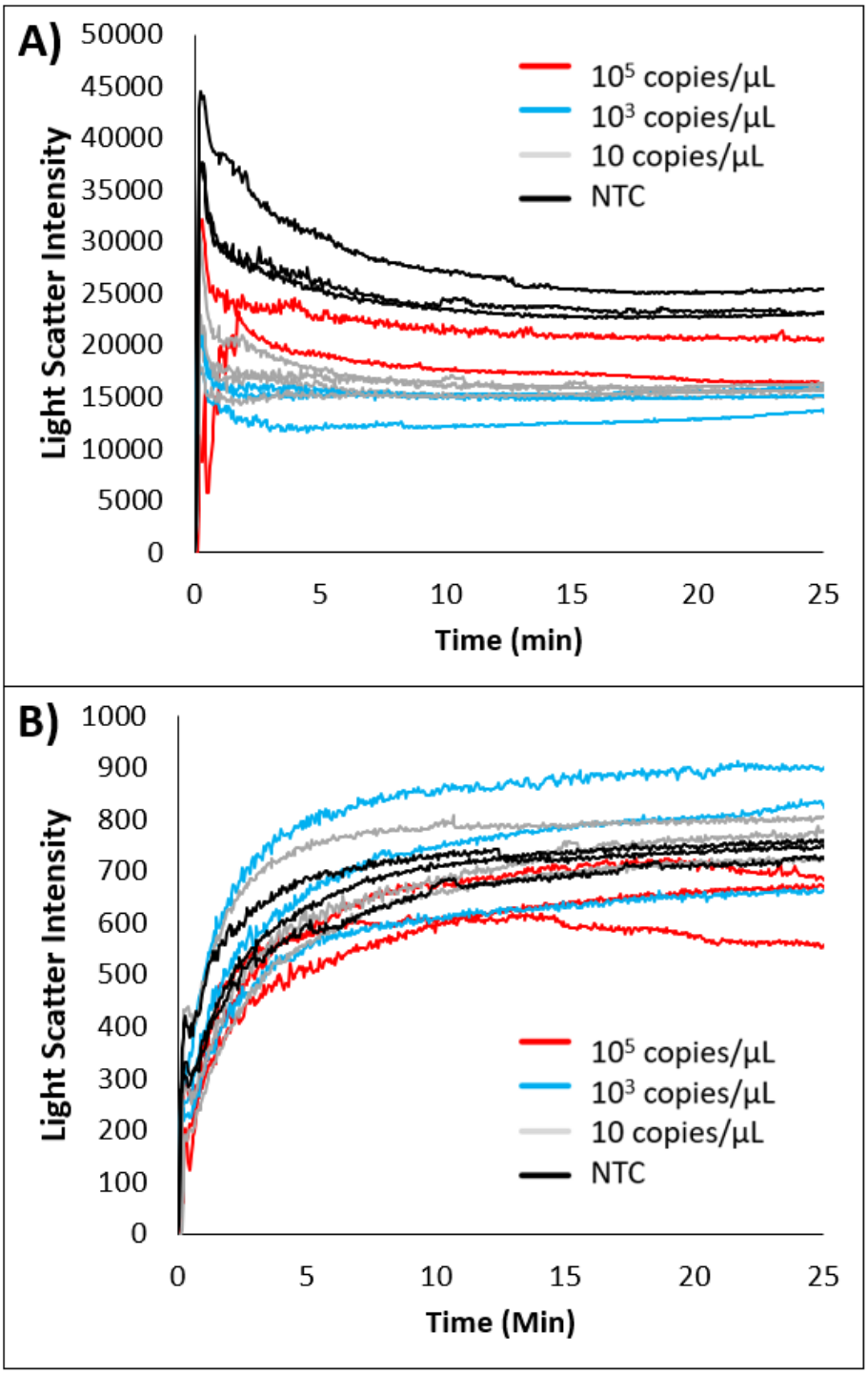
Target	Primer	Sequence (5' – 3')	Size (bp)
E. coli O157:H7 rfbe gene	F3	AACAGTCTTGTACAAGTCCA	20
	B3	GGTGCTTTTGATATTTTTCCG	21
	FIP	CTCTCTTTCCTCTGCGGTCCGATG TTTTTCACACTTATTGGAT	43
	BIP	TAAGGAATCACCTTGCAGATAAAC TAGTACATTGGCATCGTGT	43
	Loop F	CCAGAGTTAAGATTGAT	17
	Loop B	CGAAACAAGGCCAGTTTTTTACC	23
SARS-CoV-2 N gene	F3	TGGCTACTACCGAAGAGCT	19
	B3	TGCAGCATTGTTAGCAGGAT	20
	FIP	TCTGGCCCAGTTCCTAGGTAGTCC AGACGAATTCGTGGTGG	41
	Fluorescent FIP	TCTGGCCCAGTTCCTAGGTAGTCC AGACGAATTCGTGGTG/iFluorT/G	41
	BIP	AGACGGCATCATATGGGTTGCACG GGTGCCAATGTGATCT	40
	Loop F	GGACTGAGATCTTTCATTTTACCG T	25
	Loop B	ACTGAGGGAGCCTTGAATACA	21

Supplementary Table S1: Primer sequences for both E. coli and SARS-CoV-2 targets. Note that "/iFluorT/" indicates that a Fluorescein molecule was added to the primer sequence to allow for target-specific detection, as described in Gadkar et al. in 2018.

1. NTC – 15 min	9. 10^3 copies/µL – 15 min
2. NTC – 20 min	10. 10^3 copies/µL – 20 min
3. NTC – 25 min	11. 10^3 copies/µL – 25 min
4. NTC – 30 min	12. 10^3 copies/µL – 30 min
5. 10 copies/µL – 15 min	13. 10^5 copies/µL– 15 min
6. 10 copies/µL – 20 min	14. 10^5 copies/µL – 20 min
7. 10 copies/µL – 25 min	15. 10^5 copies/µL – 25 min
8. 10 copies/µL – 30 min	16. 10^5 copies/µL – 30 min



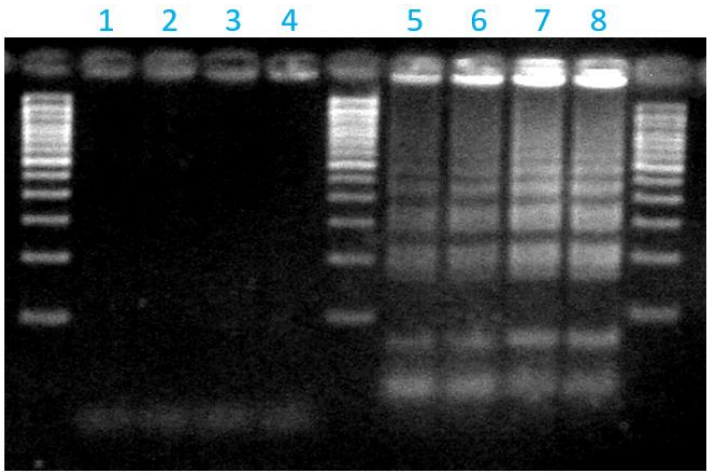
Supplementary Figure S1: Gel electrophoresis image showing time-series results for different SARS-CoV-2 concentrations across different amplification times. As the legend indicates, lanes 1-4 contain amplified NTC samples, lanes 5-8 10 copies/µL samples, 9-12 10^3 copies/µL samples, and 13-16 10^5 copies/µL samples.



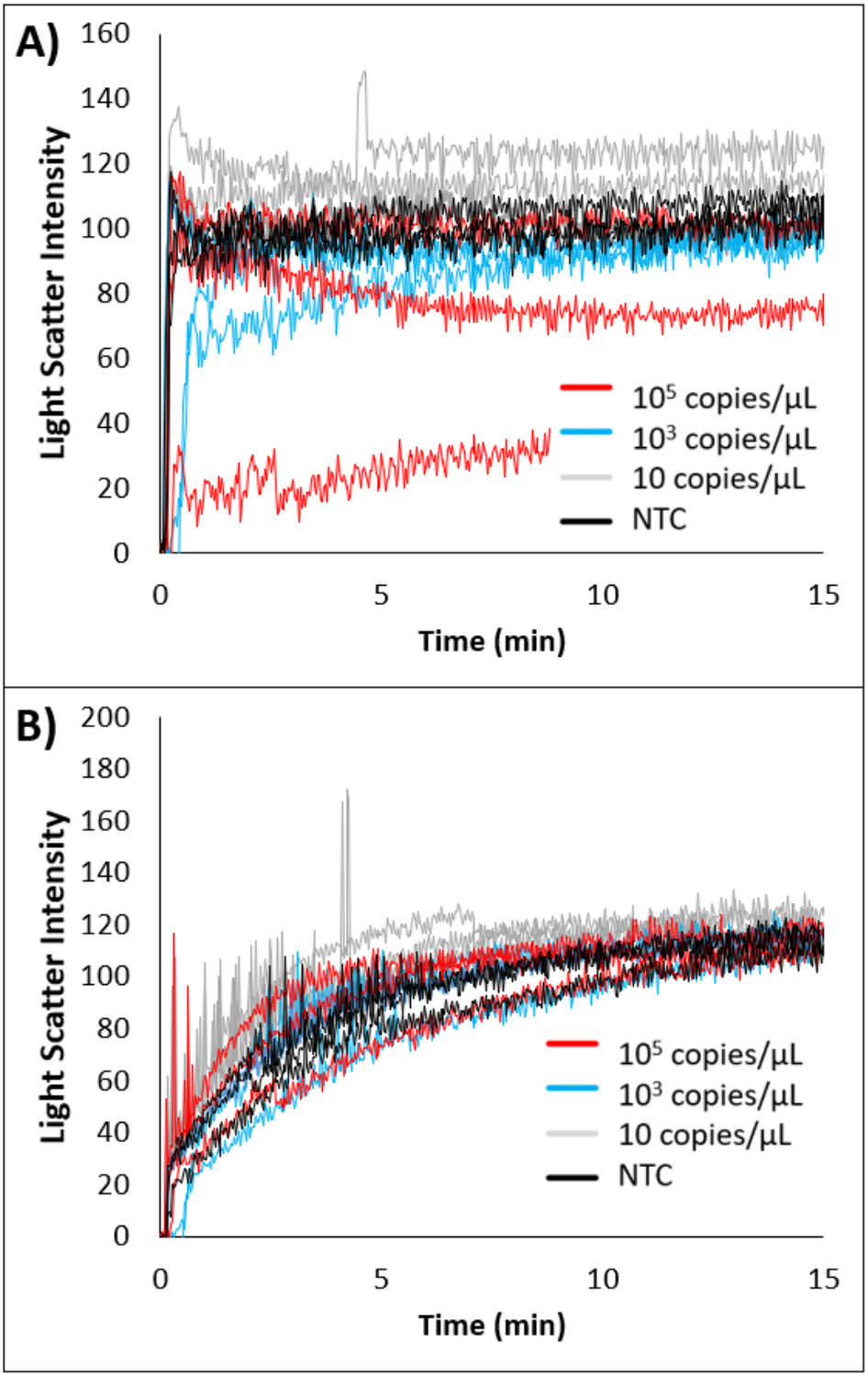
Supplementary Figure S2. *In situ* light scatter intensity changes for emulsion LAMP reaction of SARS-CoV-2 via spectrophotometer. Changes over time are shown at A) 30° and B) 60° angle with respect to 650 nm incident wavelength with varying initial SARS-CoV-2 positive control concentration of 10^5, 10^3, 10, and 0 copies per µL

1: NTC – No prior eLAMP
2: 10^1 copies/µL – No prior eLAMP
3: 10^3 copies/µL – No prior eLAMP
4: 10^5 copies/µL – No prior eLAMP

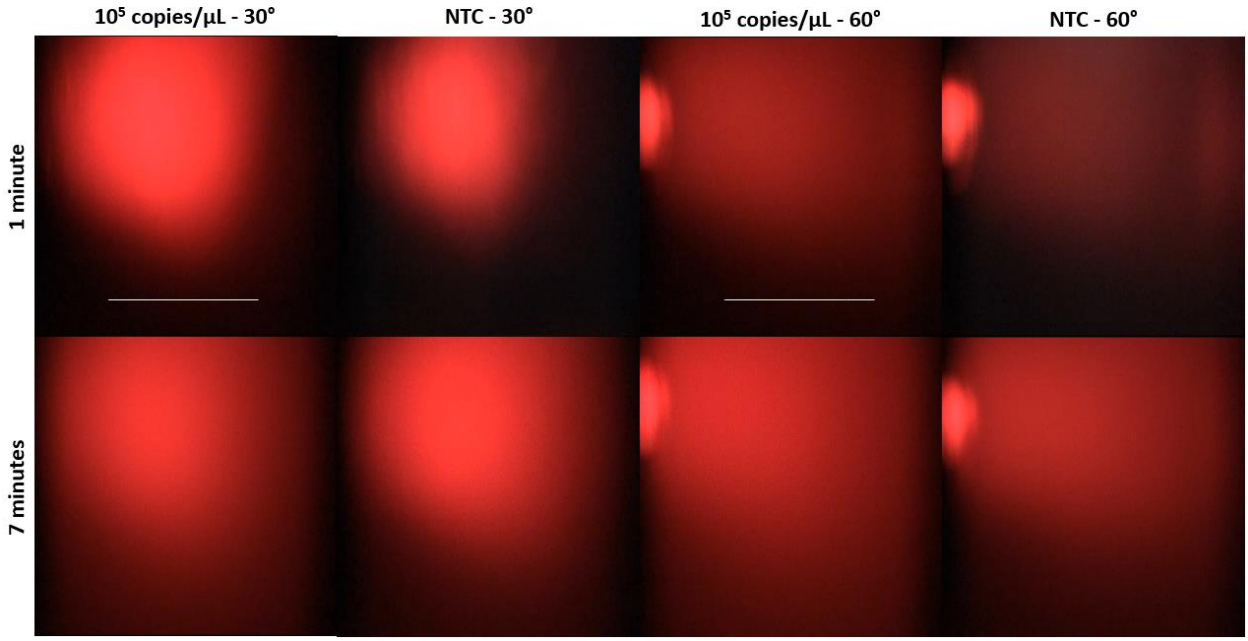
5: NTC – Prior eLAMP
6: 10^1 copies/µL – Prior eLAMP
7: 10^3 copies/µL – Prior eLAMP
8: 10^5 copies/µL – Prior eLAMP



Supplementary Figure S3: Gel electrophoresis images from the emulsion LAMP reactions (for 30 minutes) with varying initial concentrations of SARS-CoV-2, broken and extracted, and followed by additional 15-minute conventional LAMP reaction (lanes 5-8). Lanes 1-4 shows the same results without the emulsion LAMP reaction.



Supplementary Figure S4. *In situ* light scatter intensity changes for emulsion LAMP reaction of SARS-CoV-2 via smartphone. Changes over time are shown at A) 30° and B) 60° angle with respect to 650 nm incident wavelength with varying initial SARS-CoV-2 positive control concentration of 10^5, 10^3, 10, and 0 copies per µL



Supplementary Figure S5. Representative images of ongoing emulsion LAMP reactions containing either no SARS-CoV-2 (columns 1 and 3) or 10^5 copies/µL (columns 2 and 4) at one minute and seven minutes into the reaction process. Column headers indicate which images have the incident light source at an angle of either 30° or 60° relative to the smartphone camera. Scale bars indicate 5 mm.