



Real-time LAMP Kit for detecting 2019 *Novel Coronavirus (COVID-19)*

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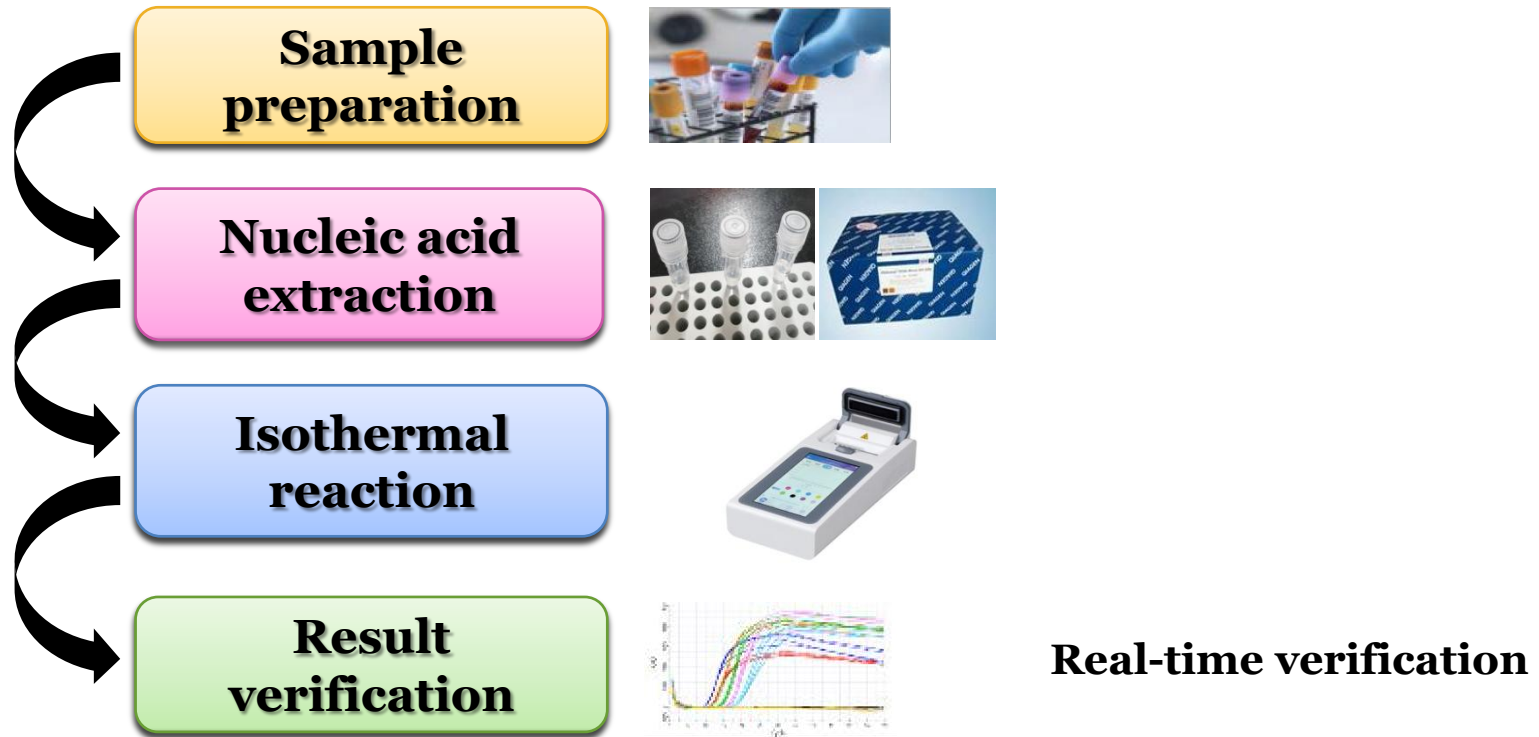
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► Simple Procedure



- Here, we adapted Allsheung Portable Real-time Isothermal Device as the exclusive device of *COVID-19* Real-time LAMP diagnostic kit.

* Other devices such as CFX 96 Real-time PCR Device can be used.



Allsheung Portable Real-time Isothermal Device

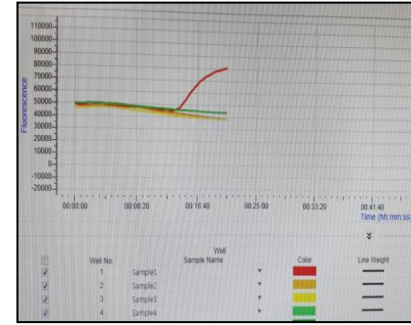
► Simple Protocol



1. Add extracted RNA(2 ul) to *COVID-19* Real-time LAMP Premix



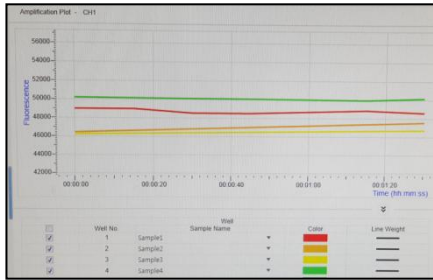
2. Insert RNA-included Premix to the Block of LAMP Device



3. Monitor LAMP Reaction

- Our *COVID-19* Real-time LAMP diagnostic kit's protocol is so simple, thus, non-experts can operate it easily (**User friendly**).
- Our kit rapidly diagnoses (In about 20 min) *COVID-19* infection in one step without cDNA conversion step of extracted RNA to cDNA as a **single-tube one step real-time reverse transcription loop-mediated isothermal amplification (RT-LAMP) method**.

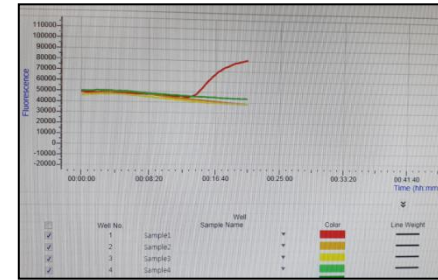
► Monitoring *COVID-19* Real-time LAMP



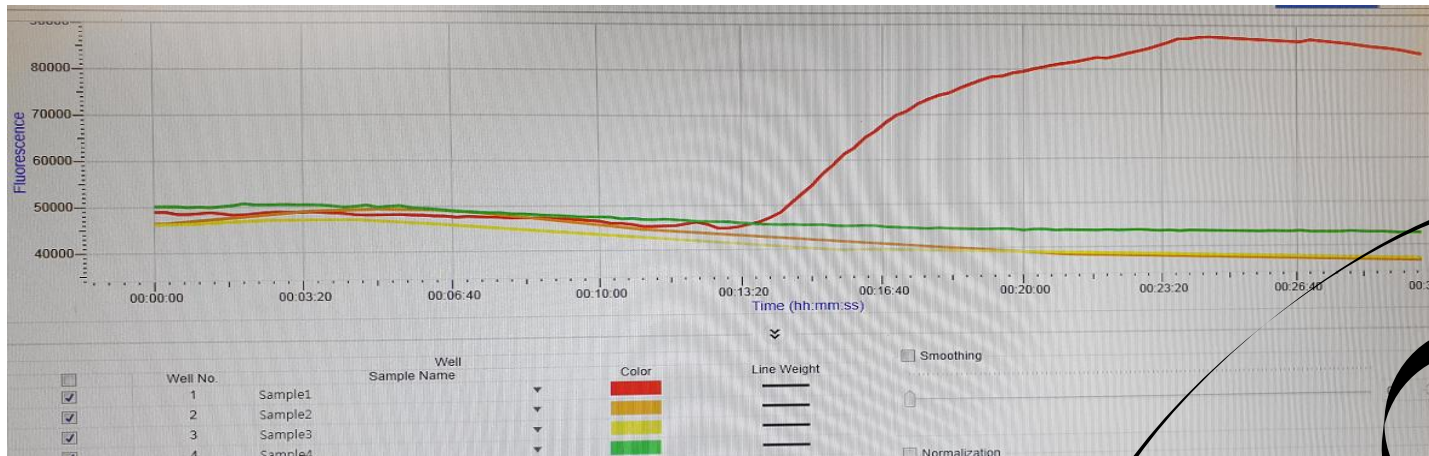
1. Check the fluorescence of each sample



2. Check Amplified Peak



3. Checked Saturated Peak



4. Check Final Peak

Results	Amplification
Positive	00:13:45

In about 14min, *COVID-19* diagnosis is possible.

No.	Color	Sample Name	Results	Amplification	Peak Value (°C)
1	Red	Sample1	Positive	00:13:45	---
2	Orange	Sample2	---	---	---
3	Yellow	Sample3	---	---	---
4	Green	Sample4	---	---	---

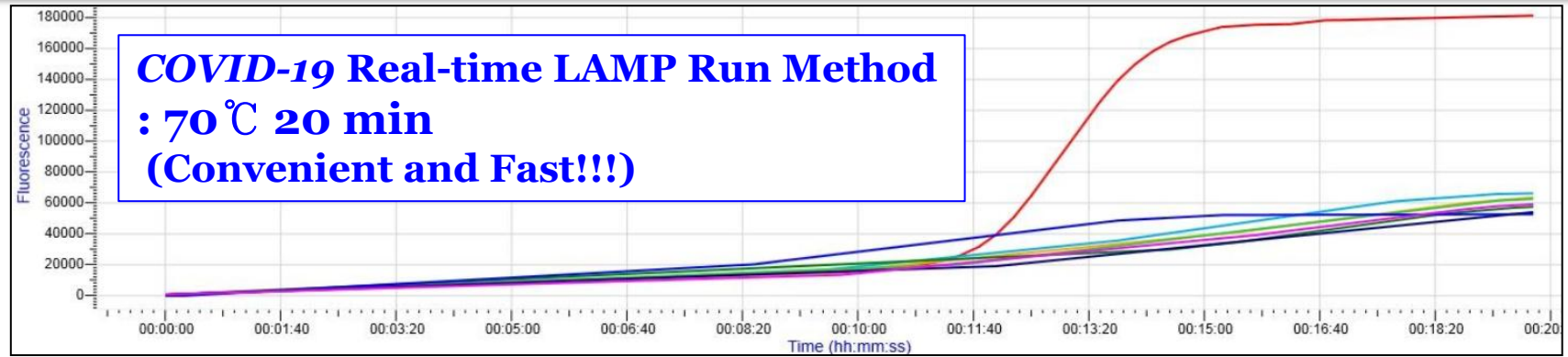
By Real-time PCR, *COVID-19* diagnosis takes about 2 hours.

5. Verify the positive or negative result through Cut-off value



► COVID-19 Real-time LAMP Result

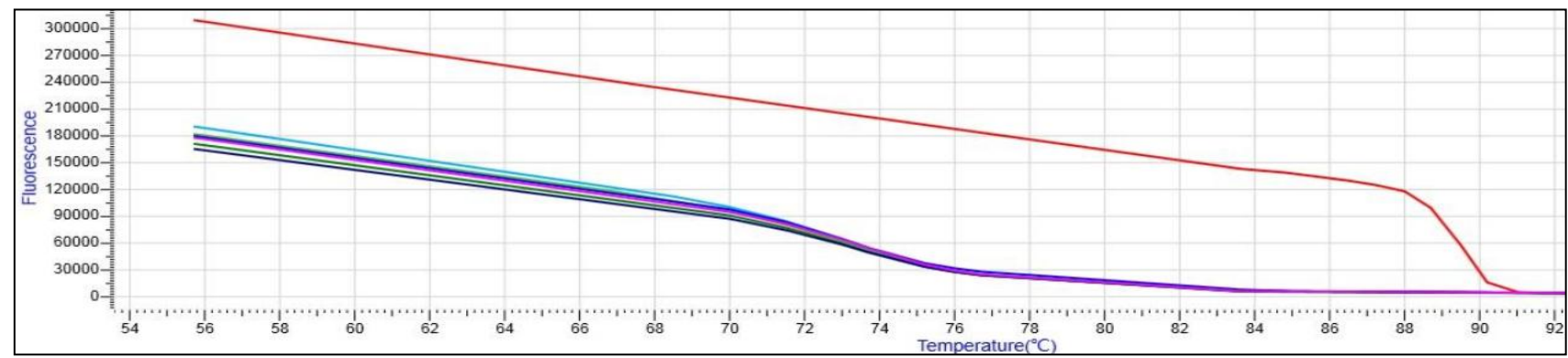
(Using Allsheung Portable Real-time Isothermal Device)



Well No.	Sample Name	Color	No.	Color	Sample Name	Results	Amplification	Peak Value (°C)
1	COVID-19	Red	1	Red	Sample1	Pos.	00:12:00	89
2	ADENOVIRUS	Orange	2	Orange	Sample2	Neg.	--	72.5
3	H influenzae	Yellow	3	Yellow	Sample3	Neg.	--	72.5
4	S pneumoniae	Green	4	Green	Sample4	Neg.	--	72.5
5	M pneumoniae	Dark Green	5	Dark Green	Sample5	Neg.	--	72.5
6	SFTS	Blue	6	Blue	Sample6	Neg.	--	72.5
7	S typhus	Dark Blue	7	Dark Blue	Sample7	Neg.	--	72.5
8	TB	Pink	8	Pink	Sample8	Neg.	--	72.5

* In several repeated experiments, we obtained similar results

COVID-19 Real-time LAMP Result using Portable Real-time Isothermal Device
[In about 12 min, COVID-19 Clinical sample was specifically detected)

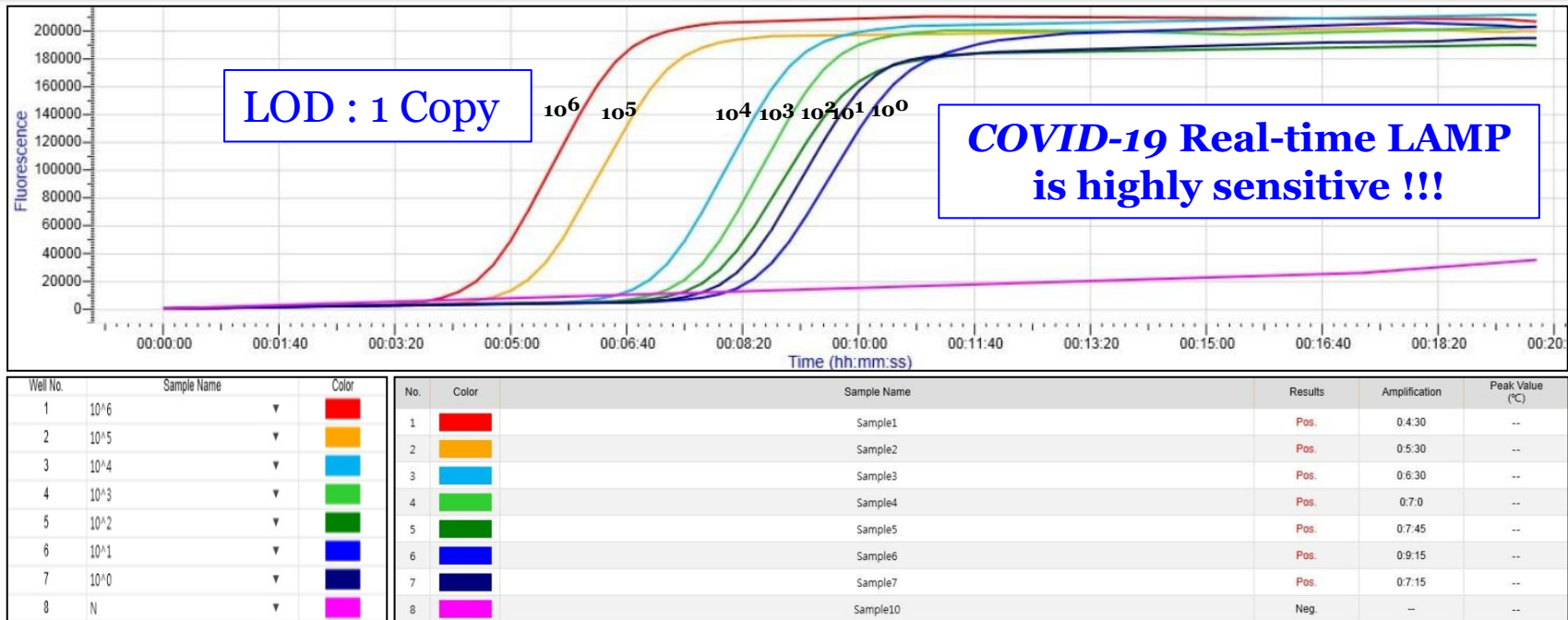


In COVID-19 Real-time LAMP Melting curve, we can detect the specific melting curve of COVID-19 RNA.

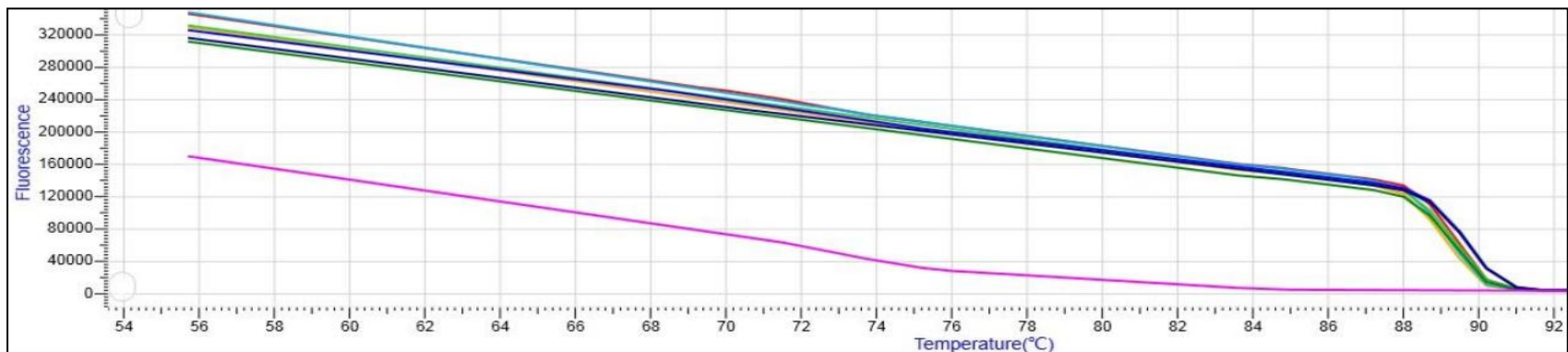


► LOD (Limit of detection) of *COVID-19* Real-time LAMP Result

(Using Allsheung Portable Real-time Isothermal Device)



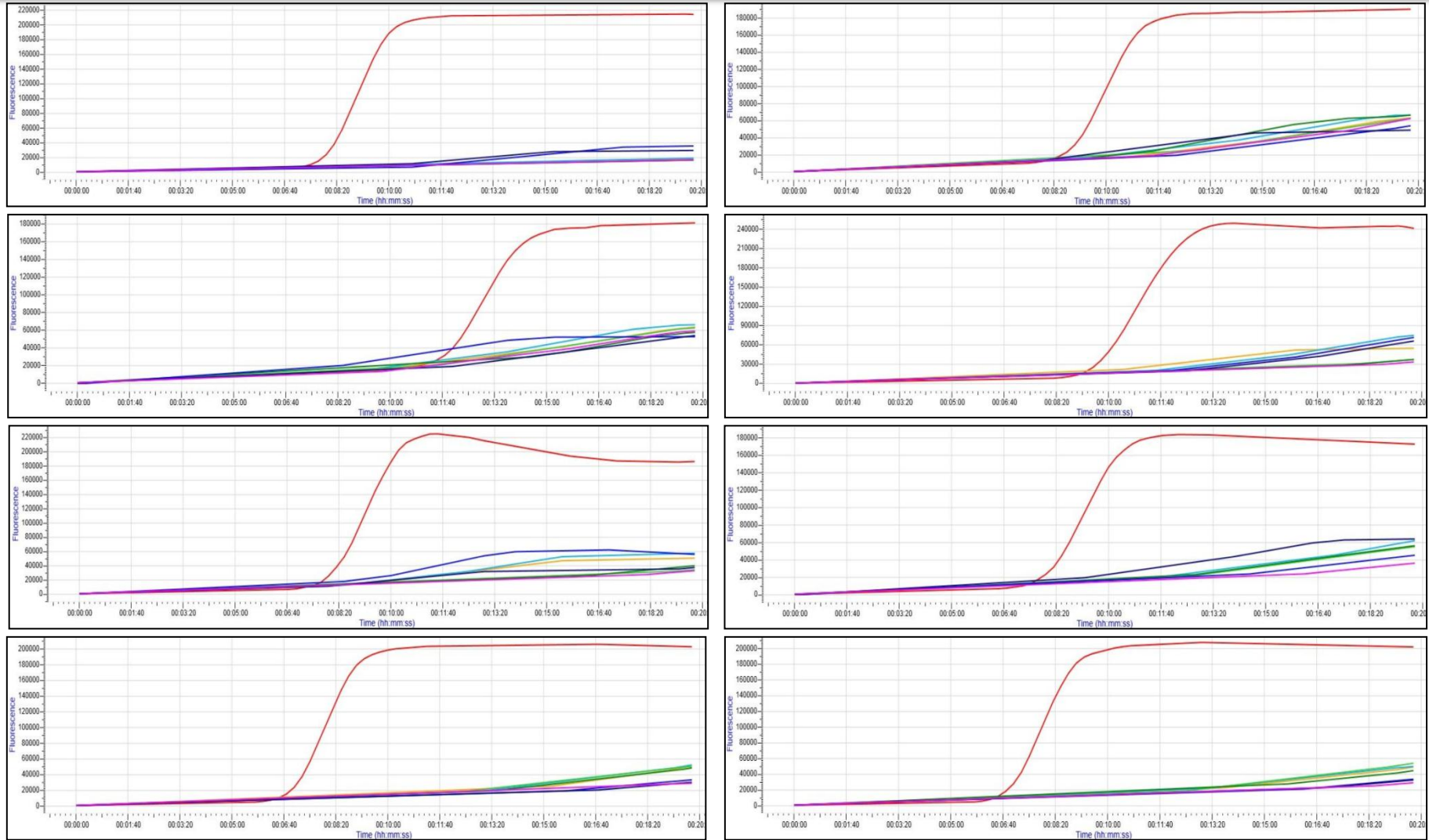
The LOD of *COVID-19* Real-time LAMP kit is determined as 1 copy.
[Until 15 min, we can observe the saturated curve even in 1 copy]



In *COVID-19* Real-time LAMP Melting curve, we can detect the specific melting curves of all copies.

► Performance of COVID-19 Real-time LAMP

(Using Allsheung Portable Real-time Isothermal Device)



Sensitivity : 8/8 (100%), Specificity : 56/56 (100%), Accuracy : 64/64 (100%)

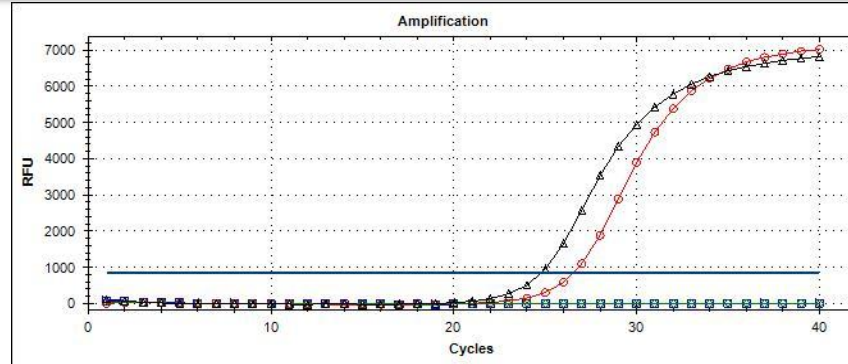
In addition to higher sensitivity, COVID-19 Real-time LAMP exhibited a higher discriminate power than Real-time PCR, as proved by AFMRI of ROK

► Comparative experiment (COVID-19 Real-time LAMP VS COGENE)



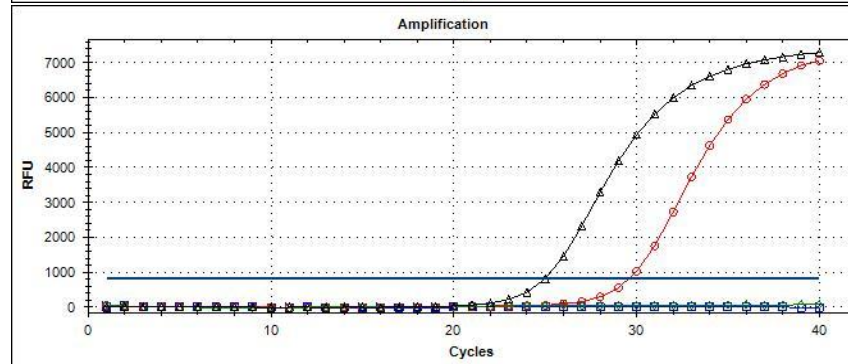
COGENE
E gene
Korea Emergency
Approval Kit

COGENE
RdRp gene
Korea Emergency
Approval Kit



○ RNA (Ct: 26.5)
△ Positive control (Ct: 24.7)

□ Negative 1
◇ Negative 2

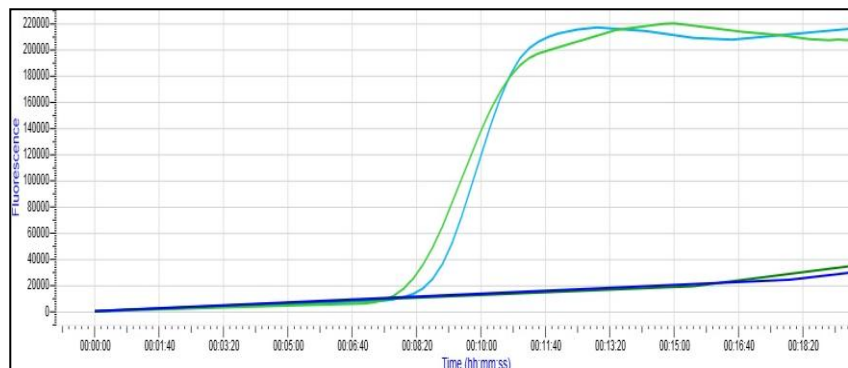


○ RNA (Ct: 29.6)
△ Positive control (Ct: 25)

□ Negative 1
◇ Negative 2

Cogene kit takes about 2 hours against Clinical sample.

COVID-19
Real-time LAMP

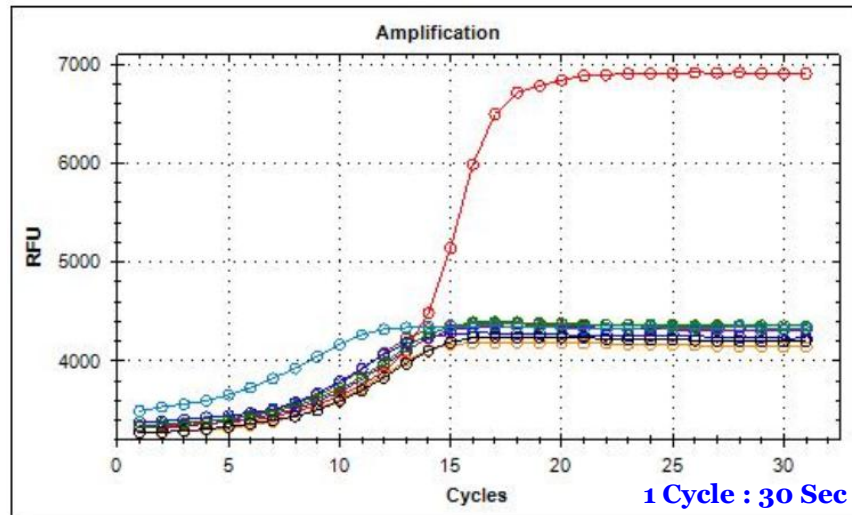


RNA (8 Min)
Positive control (8 Min)

Negative 1
Negative 2

COVID-19 Real-time LAMP takes about 8 min against same clinical sample.

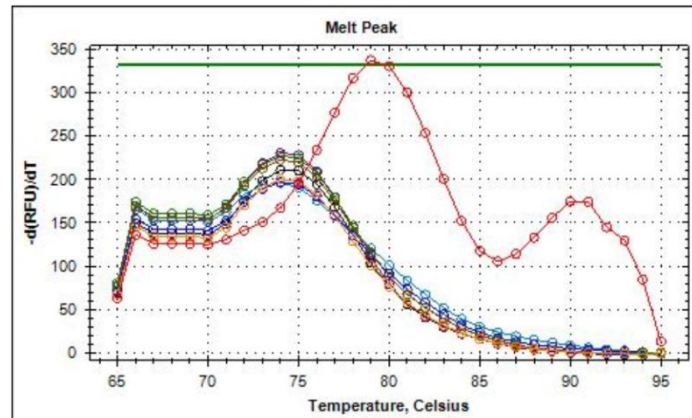
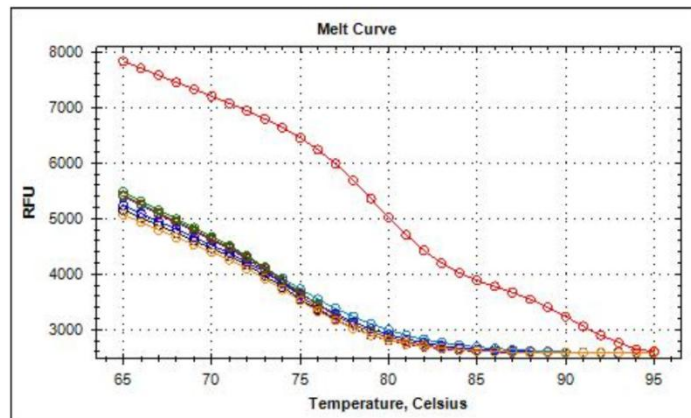
► *COVID-19* Real-time LAMP Result (BioRad CFX 96)



- *COVID-19* Clinical sample
- *Adenovirus type 55*
- *H. Influenzae*
- *S. Pneumoniae*
- *M. Pneumoniae*
- *SFTS Virus*
- *Malaria*
- *Scrub. Typhus*

***COVID-19* Real-time LAMP Result using BioRad CFX 96 Real-time PCR Device**
[In a about **20 cycles (10 min)**, *COVID-19* Clinical sample was specifically detected)

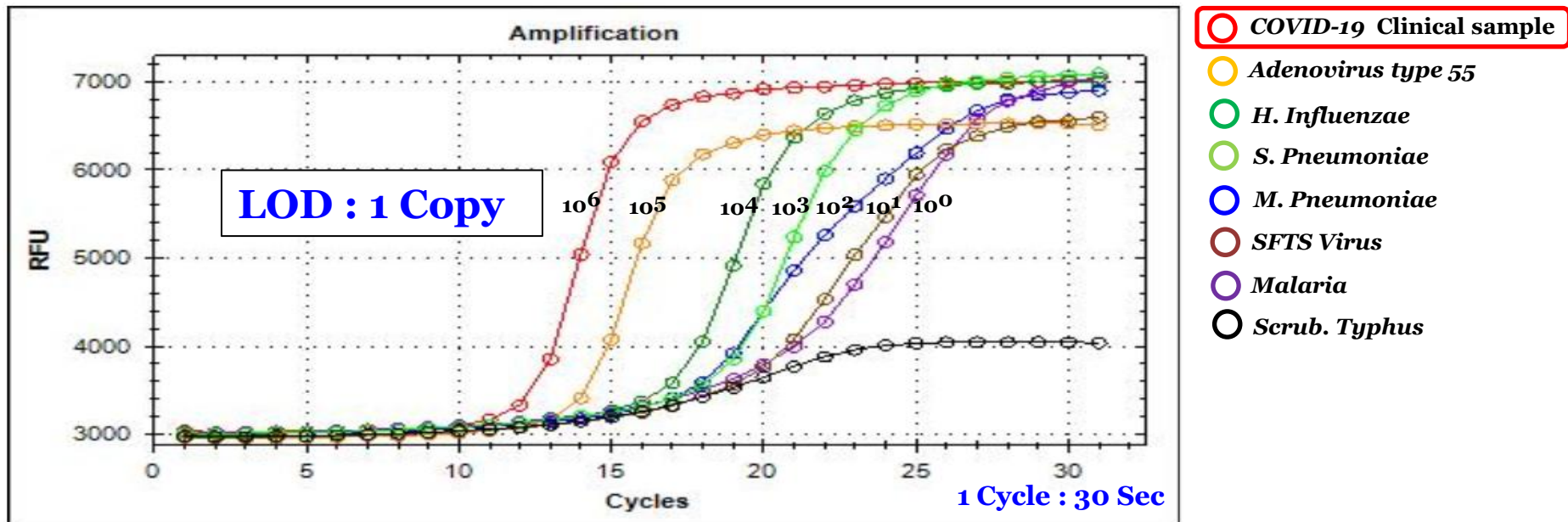
* Even in BioRad CFX 96 Real-time PCR Device, *COVID-19* Real-time LAMP Kit can work.



In *COVID-19* Real-time LAMP Melting curves and peaks, we can detect the specific melting curve and peak of *COVID-19* RNA.



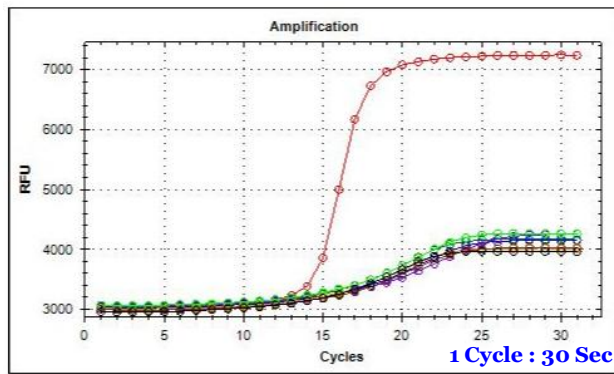
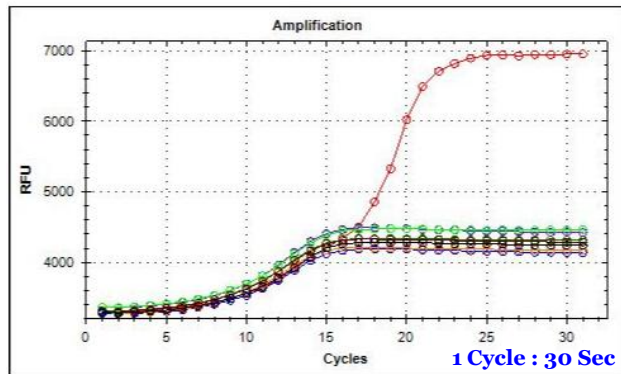
► LOD (Limit of detection) of *COVID-19* Real-time LAMP Result (Using BioRad CFX 96)



The LOD of *COVID-19* Real-time LAMP kit is determined as 1 copy.
[In 30 cycles (15 min), we can observe the saturated curve even in 1 copy]

► COVID-19 Real-time LAMP Result

(Using BioRad CFX 96)



○ COVID-19 Clinical sample

○ Adenovirus type 55

○ *H. Influenzae*

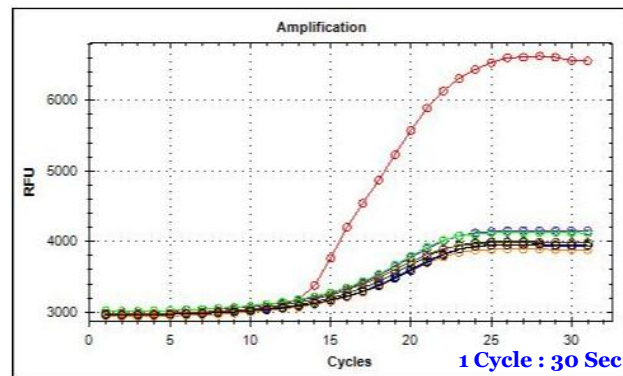
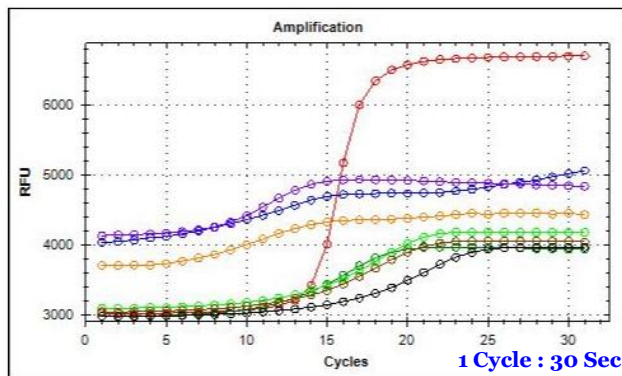
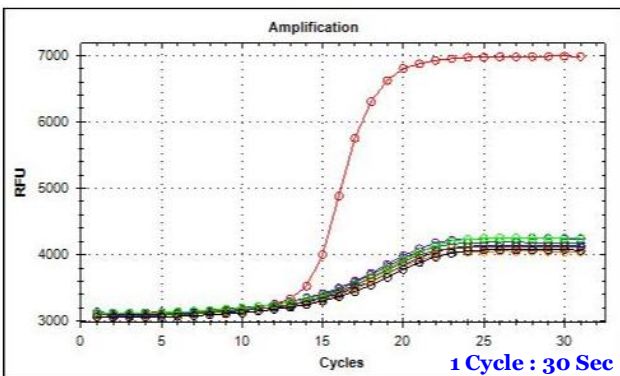
○ *S. Pneumoniae*

○ *M. Pneumoniae*

○ SFTS Virus

○ Malaria

○ Scrub. Typhus



Sensitivity : 5/5 (100%), Specificity : 35/35 (100%), Accuracy : 40/40 (100%)

* Using BioRad CFX 96 Real-time PCR Device, we confirmed higher performance of COVID-19 Real-time LAMP.