

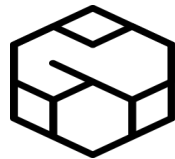
# Test methods

## GRAPHENE- HEAT DISSIPATION SHEET GADIANT

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Product Name: Gadiant

Purpose: electrical and electronic equipment fever reduction



**Graphene Core**

# Product Features

- The product "Gadiant" Graphene is a sheet for heat reduction for electrical and electronic.
- Attached to a heating element, such as a smart phone and a function to release the heat quickly to reduce the temperature rise of the device.
- Compared to conventional graphite sheet is non-peelable, non-damaged castle, and processing speed Castle (film lamination, followed paste) and the process is shortened.
- Safety, Vertical radiation, thin. There are characteristics of lightweight, flexible (high refraction non-damaged property).

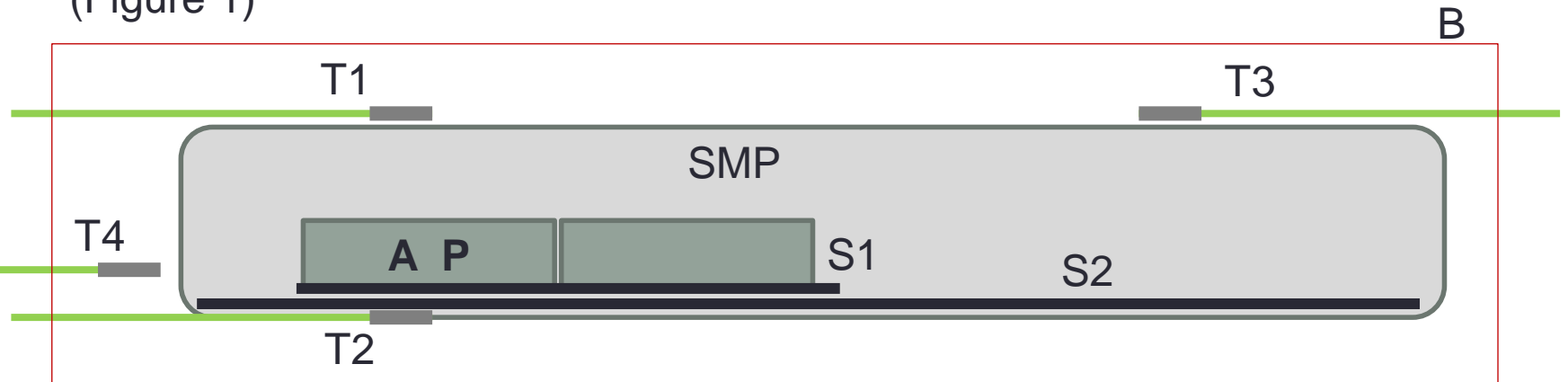
# Test characteristics

- This product does not form a film as the material for the heat conductive layer was formed on the heat conductive layer by using the graphene particles.
- It shall be tested traditional graphite sheet and the heat dissipation performance in other ways.
- After the product is applied to products such as smart phones it should be evaluated in a special way that emotional fever.  
Typical (W / m, k) can not measure value.
- “The heat reduction product graphene sheet can evaluate the performance by the test methods Test Method 1 and 2”

# Test methods 1.

## Graphene sheets smartphones heat reduction performance test methods

(Figure 1)



### Description of Figure 1

SMP = Smartphone

B = test tube

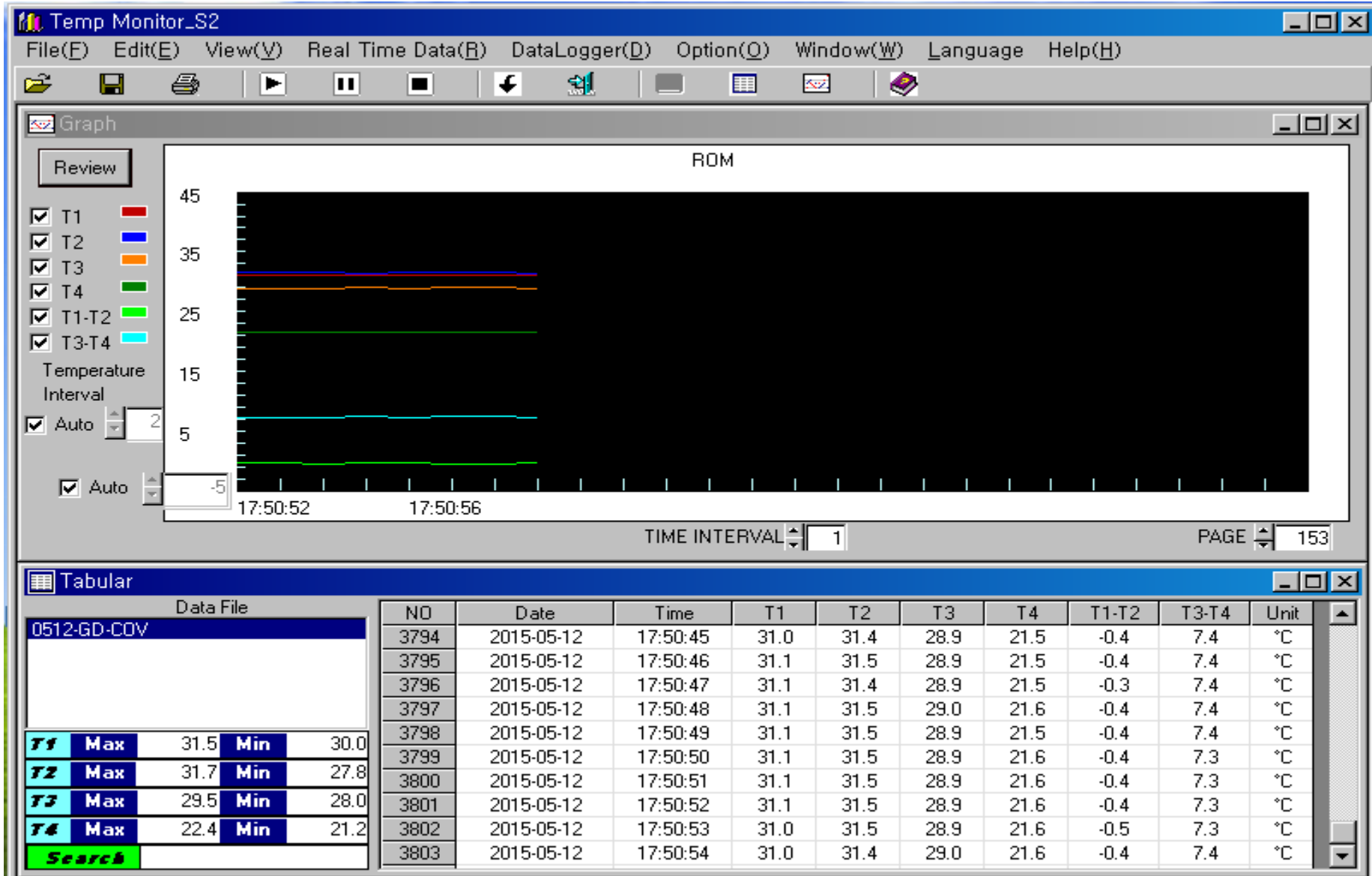
S = the graphene sheet (S1 graphene sheet (AP surface mount) S2: graphene sheet (attached to the inner surface casing))

T = sensor (T1: the upper surface of the liquid crystal side (AP upper portion) attached to the sensor T2: AP-up lower surface attached sensors T3: liquid surface sensor attached to the lower surface T4: test tube inside temperature (ambient temperature))

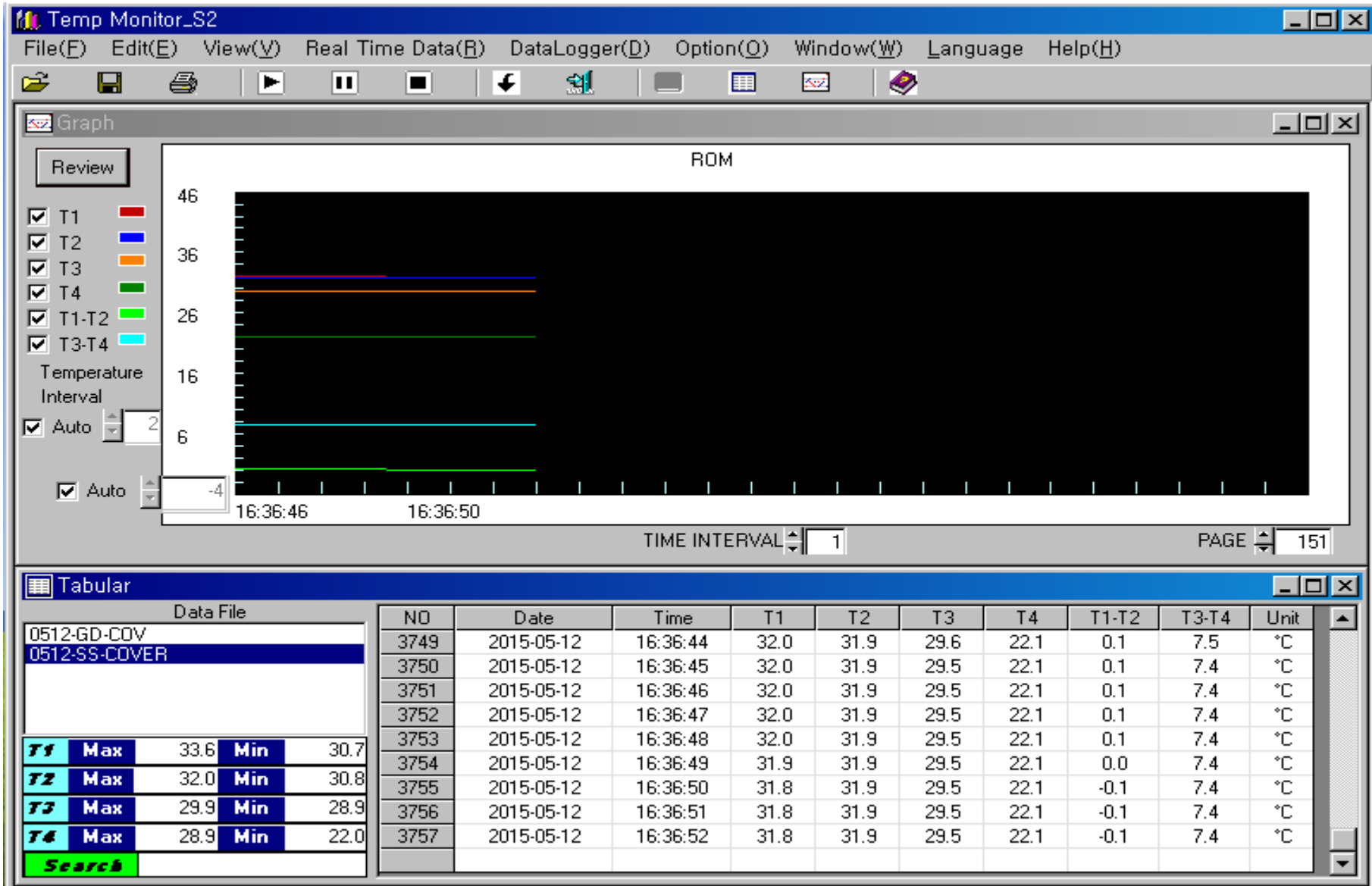
And a temperature-sensing location of the sensor mounting position of Graphene sheet may be changed according to the determined portion of the tester

1. Graphene sheet attached: the steps (Fig. 1) (SMP), the (AP) the surface of the smart phone (S1) a cover attached to the inner surface (S2) Graphene sheet.
2. A temperature sensor installed: Datalogger sensors (T1, T2, T3, T4) 4 dogs each  
Sensor T1: the upper surface of the liquid crystal side (AP upper portion) attached to the sensor  
T2: AP-up lower surface attached sensors T3: liquid surface sensor attached to the lower surface  
T4: test tube inside temperature (ambient temperature)
3. then sealed into a test tube (B). (To minimize the impact of external temperature)
4. A smart phone operates.
5. Activate the data logger.
6. If the one-second intervals to sense the temperature of the portion 4 is written to the PC.
7. For each unit on the basis of each manufacturer based on the evaluation by cooling the heat reduction performance.

# Test result by the testing method 1 (Graphene sheet-Gadiant) image data logger



# Test result by the testing method 1 (Graphite sheet) Image data logger



Test Method Comparative test results of the first comparative sample: the graphite sheet 20 $\mu\text{m}$ 2 layers. , Graphene sheets (GD36) Exam Date: 05/12/2015

Sheet	T1	T2	T3	T4	Remark
GD36 (36 $\mu\text{m}$ )	31	31.4	29	21.6	Room temperature (T4) + 0.5 was offset from the respective detected temperature
Graphite (20 $\mu\text{m}$ * 2 layer)	31.8	31.9	29.5	22.1	
Temperature difference	-0.3	0.0	0.0	+0.5	
Result	GD36 low of 0.3 degree				

T = sensor (T1: the upper surface of the liquid crystal side (AP upper portion) attached to the sensor T2: AP-up lower surface attached sensors T3: liquid surface sensor attached to the lower surface T4: test tube inside temperature (ambient temperature))

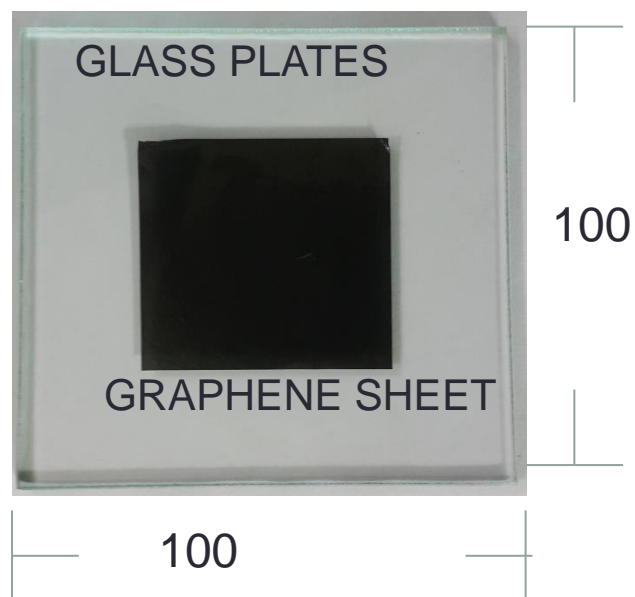


## Test Method 2: sheet breakage resistance test

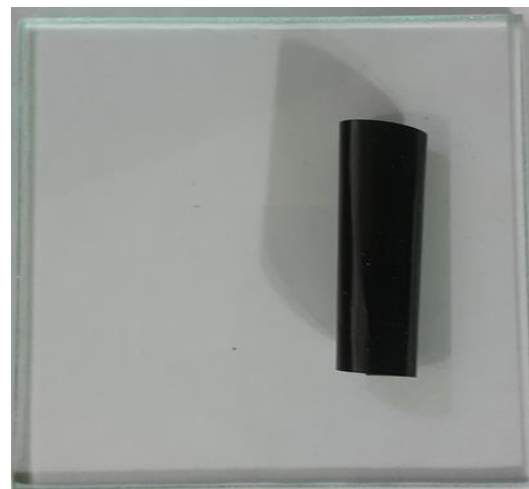
- Test methods: as shown in Figure 2 glass plates (100 \* 100) attached to the graphene sheet (50 \* 50) on the surface Detach again.
- Specification: Repeat 30 times.

Test results: The test and pass not to be broken, such as (A).  
(B) it is damaged, such as when failing.

(Figure 2)



(A)



(B)

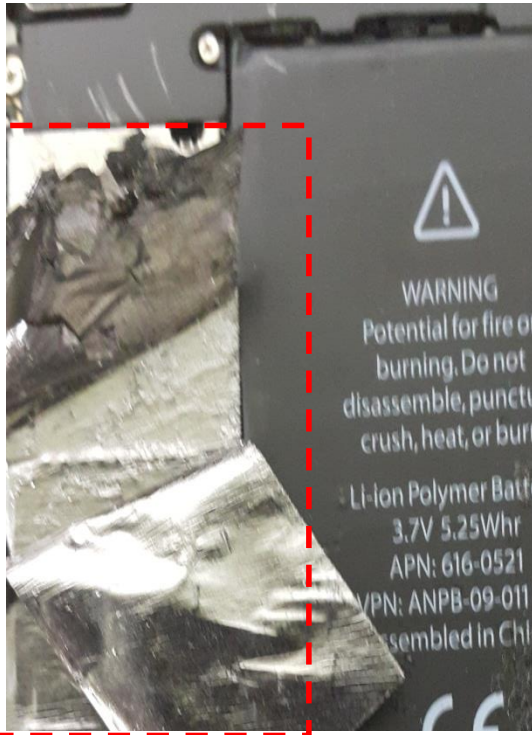


GRAPHITE SHEET

# References / breakage test

( Graphite sheet)

Interlayer  
breakage



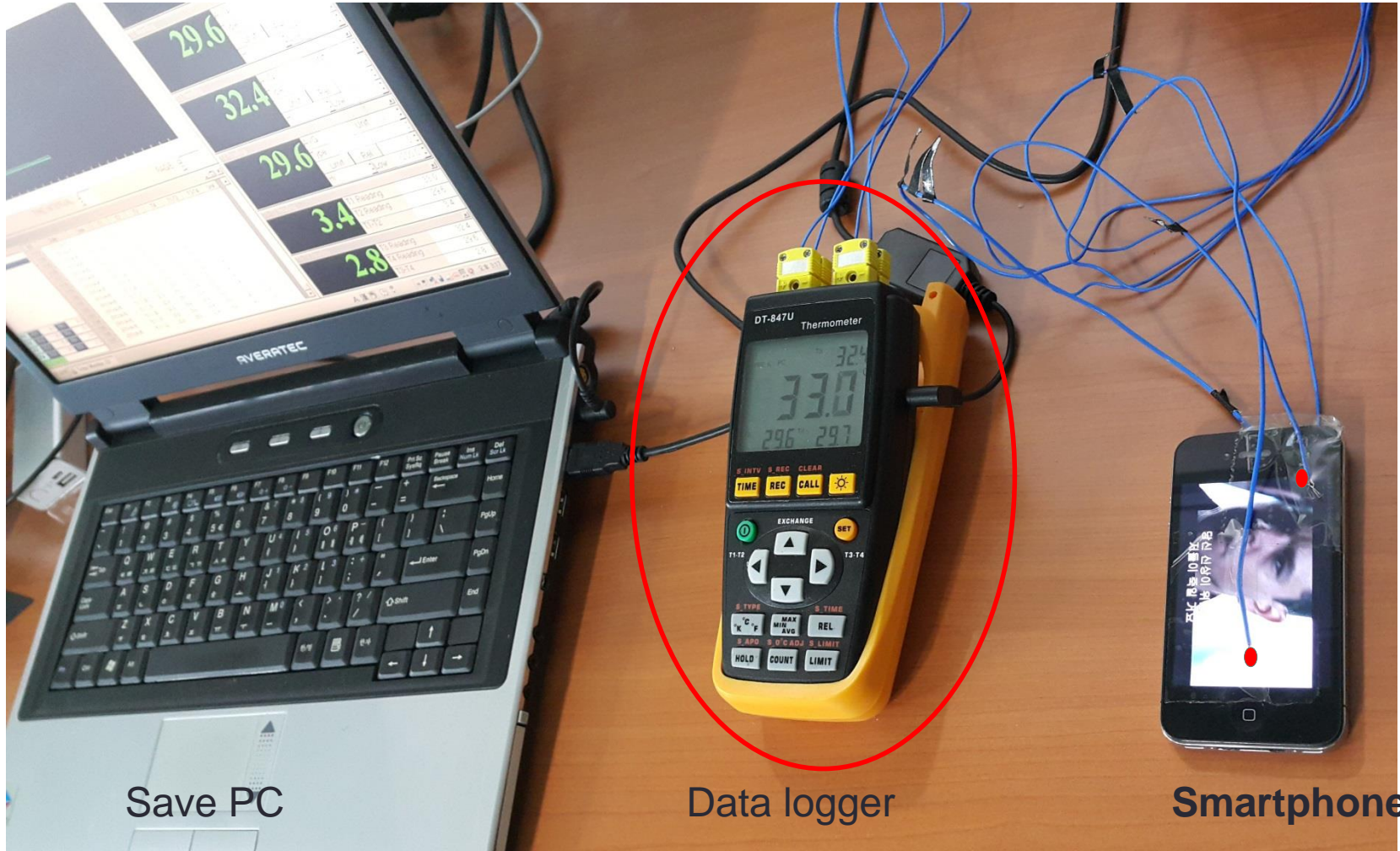
(Graphene/Gadiant)

No  
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ma  
ge



\*Smartphones attached to the AP Surface - was taken out again.

# Test Method 1 Test equipment / data device history record data logger



Save PC

Data logger

Smartphone

\* Record detected near the AP / liquid upper / lower LCD / room temperature such as a temperature change of the four parts of the smart phone at the same time by one second.



# Graphene Core

Anseong, Gyeonggi-do, Republic of Korea  
bogaemyeon Namsadang to 340-16

TEL.82-31-675-1905.

FAX. 82-31-675-1906

E-Mail. [graphene.kr@gmail.com](mailto:graphene.kr@gmail.com)

[graphene-core.com](http://graphene-core.com)

China Office:Add:14-3-201, fushui

park,youyinan road,hexi

DIST,TIANJIN,P.R.CHINA

Tel. 13920800731