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埃妥生物科技

Portable Real-Time Fluorescence Quantitative PCR System

Maverick qPCR （MQ4 Series）

Instruction Manual

Version（V1.0）

Manufacturer: Anitoa Biotechnology (Hangzhou) Co., Ltd.
Address: China-Australia Biomedical Industry Science and Technology Park, No.656 Binan Road, Binjiang District, Hangzhou, Zhejiang, China

Thank you for choosing our products. Please read this instruction manual carefully before use.

Anitoa Biotechnology (Hangzhou) Co., Ltd. (hereinafter referred to as Anitoa) warrants that the Maverick Fluorescent Quantitative PCR System (MQ4 Series) you are using has been fully tested and performs as described in the manual. The instructions and safety warnings given in this instruction manual must be followed in order to use the instrument, otherwise the warranty does not apply.

Software description

The software is a necessary tool for the operation of the instrument. For the purpose of improving its performance and reliability, Anitoa has the right to modify its functions or design, etc., in advance or subsequently without informing the clients, and Anitoa has all the intellectual property rights of the modified version.

Responsibility statement

Anitoa is not responsible for direct or indirect incidental damages arising from non-compliance with the operating instructions or incorrect use of the Maverick Real-Time Fluorescence Quantitative PCR System (MQ4 Series). Only Anitoa 's technicians or its authorized agents may inspect or provide parts for the instrument in question, and we are not responsible for direct or indirect collateral damage resulting from the user's disassembly and replacement of parts. The responsibility of Anitoa is limited to the repair of the machine and the replacement of the parts, but not for the results of the experiments.

Intellectual property statement

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Chapter 1 Important Notes

The following safety measures must be observed during all phases of operation, maintenance, and servicing of this instrument. Failure to observe these measures or the warnings and precautions indicated in this manual will likely undermine the safety standards for which the instrument was designed and manufactured and the intended scope of use of the instrument.

1.1 Instrument grounding

To ensure the personal safety of the operator, please use the power adapter provided by the manufacturer, which has a 10A three-prong grounding plug at the input end. When using the adapter, please use a grounding socket that matches the plug to ensure that the input power line of the instrument is reliably grounded.

1) Use of power supply

Before the instrument adapter is connected to the power cord, it must be ensured that the AC power supply voltage (100 to 240 VAC) and frequency (50/60Hz) are consistent with those required by the instrument adapter. When making the power cord connection, make sure that the instrument power switch is off. Do not touch the power switch and power cord with wet hands. It is prohibited to disconnect the power cord when the instrument is not powered off. It is forbidden to touch the power cord to the hot surface of the instrument. Do not clean the instrument when it is not disconnected. Please turn off the power when the instrument is no longer in use.

2) Power cord

The instrument should normally use the power cord supplied with it. If the power cord is broken, it must be replaced without repair. When replacing the power cord, it must be replaced with the same type of power cord of the same specifications. When this instrument is in use, do not place anything on the power cord, and do not place the power cord in a place where people move around.

3) Power cord plugging and unplugging

Power cord plugging and unplugging must be the correct handheld plug operating parts, plug insertion should ensure that the plug is completely, tightly inserted into the socket, do not pull hard when pulling out the plug, or yank the power cord.

1.2 Placement of the Instrument

1) The instrument should not be placed in a location where it is difficult to disconnect the power supply.
2) The instrument uses semiconductor cooling and fan-assisted heat dissipation, so when placing the instrument, ensure that there is no obstacle within 15cm around the instrument, and when multiple instruments are used at the same time, the distance

between each instrument should be not less than 30 cm.

3) The instrument should be placed in a place with low humidity, less dust, and far from water sources (such as pools, water pipes, etc.), with good ventilation, no corrosive gas or strong magnetic field interference, and avoiding direct sunlight and strong light sources. The table where the instrument is placed should be horizontal and stable.
4) High ambient temperature will affect the testing performance of the instrument or cause malfunction. Do not use this instrument in the place of direct sunlight and strong light source to avoid affecting the fluorescence detection of the instrument, and should be far away from heating, stove and all other heat sources.
5) Turn off the power when stop working. When the instrument is not used for a long time, cut off the power, unplug it, and cover it with soft cloth or plastic film to prevent dust and foreign objects from entering.

1.3 Precautions

1) During the test operation, avoid liquid dripping on the instrument.
2) The consumables and reagents used in the test should be disposed of according to the relevant standards, and should not be discarded or dumped at will.
3) If there are hazardous substances in the test, related training must be conducted before using them.
4) After use, the hazardous substances should be handled and stored properly in strict accordance with the relevant regulations.
5) The test personnel who operate the instrument need to be trained and have relevant qualifications.
6) When handling toxic, corrosive or infectious substances, safety goggles and gloves must be worn.
7) It is strictly forbidden to touch the metal module when the instrument is running and for a period of time just after the operation to avoid burns.
8) It is strictly forbidden to open the instrument during the operation of the instrument, otherwise it will cause abnormal experimental results.

1.4 After-sales service

1) After receiving the instrument, please confirm the relevant content on the after-sales warranty card and contact the shipping unit if you have any questions.
2) After unpacking the instrument, please keep the packing box and packing materials properly for use when returning to the factory for after-sales service.
3) Before sending the instrument to the maintenance department, the instrument must be disinfected.
4) After the instrument is delivered to the maintenance department and unpacked, the maintenance personnel must disinfect the instrument immediately.

1.5 Packaging, storage and transportation marking

Table 1-5-1 Package storage and transportation identification

Symbol	Title	Description	Position
	Place carefully and gently	This symbol is used to indicate that the product is a precision instrument and should be handled carefully and gently.	On the packing carton
	Upward	This symbol is used to indicate that the instrument must be kept upward during handling, storage and use, and must not be placed sideways or upside down to avoid damage to the instrument.	On the packing carton
	Afraid of getting wet	This symbol is used to indicate that the instrument must not be stored in a humid environment or in a place where it can be splashed with liquid.	On the packing carton
	Stacking 5 layers	This symbol is used to indicate the maximum number of layers of vertical stacking overlap allowed for a box.	On the packing carton
	Anti-bumping	This symbol is used to indicate that the instrument should be handled, stored, and used with care to avoid any impact on the performance of the instrument.	On the packing carton

1.6 Instrument Identification Information

Table 1-6-1 Instrument identification information

Symbol	Description	The location on the instrument where the symbol will appear
	Watch out for high temperatures	On the equipment
	Production date	On the equipment nameplate
	CE mark	On the equipment nameplate
	Pay attention to safety	On the equipment nameplate
	In vitro diagnostic medical instrument	On the equipment nameplate
	E-waste, pay attention to the classification	On the equipment nameplate
	Product number	On the equipment nameplate
	Serial number	On the equipment nameplate
	Instruction manual	On the equipment nameplate
	Biological hazards	On the equipment nameplate
	FCC mark	On the equipment nameplate

Chapter 2 Product Overview

This chapter mainly describes the usage, characteristics, specifications and performance parameters of MQ4 fluorescence quantitative PCR system.

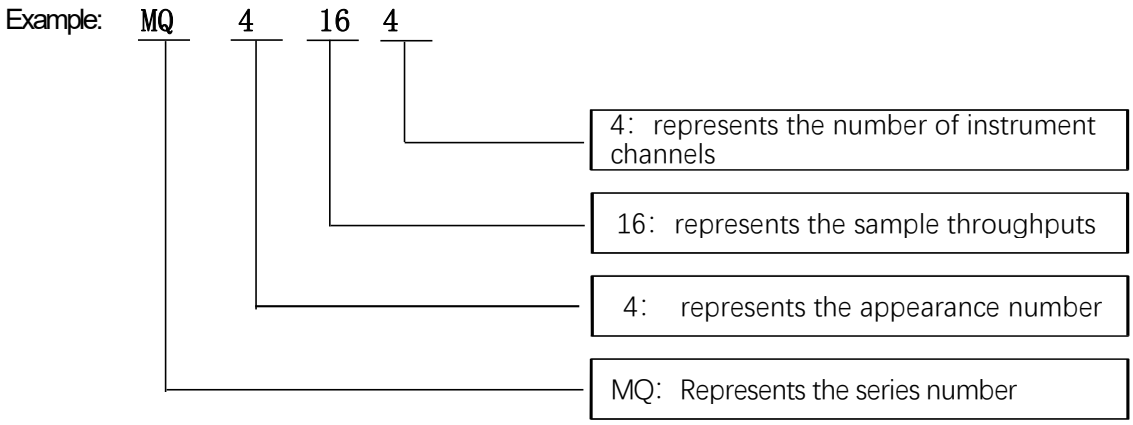
2.1 Product usage

The MQ4 model is an portable qPCR system with a large 10-inch touch screen for integrated operation. The product is developed based on our multi-channel fluorescence imaging optical system with CMOS bio-image sensor. The product can be widely used in universities and research institutes, CDC, Entry-Exit Inspection and Quarantine Bureau, Public Security Criminal Evidence Identification Center, veterinary stations, food companies and pharmaceutical companies.

2.2 Product Features

1) Efficient and fast: with fast temperature rise and fall system and unique fluorescence collection chip technology, fast detection can be achieved without specific consumables.
2) Touch operation: 10-inch LCD touch screen, integrated touch operation, no external computer, simple and convenient.
3) Lightweight and portable: compact and portable body (247*188*133mm), light weight (2.6kg), easy to move, strong environmental adaptability.
4) Stable and reliable: the whole machine has no moving parts, and the structure is sturdy and durable without regular calibration even after a long time of use.
5) Intelligent management: optional 4G module allows remote management or cloud management of experimental data as needed.
6) Multiple options: Support 2 or 4 fluorescence channels (more channels can be customized), suitable for most of current dyes, no cross interference between channels, no need for regular calibration maintenance.
7) Stable light source: independent LED light source for each fluorescence channel, stable and non-decaying LED light source, no need for regular replacement.
8) High sensitivity chip: the unique "Low-Light CMOS Image Sensor (CIS) Chips", millisecond-level extremely fast shooting, stable and reliable data.

2.3 Specification model description



2.4 Instrument models

Table 2-4-1 Instrument models

Model	Channel	Sample throughput
MQ4044	4 channels	4 wells
MQ4162	2 channels	16 wells
MQ4164	4 channels	16 wells

2.5 Main technical parameters

Table 2-5-1 Main technical parameters

Basic Performance	
Dimension	247*188*133mm
Bare weight	2.6 kg
Power	DC 15V 9.6A
Noise level	≤50dB
Communication interface	TypeA
PCR System Performance	
Sample volume	10 ~ 50ul
Applicable consumables	Transparent 0.2ml single tube, 8*0.2ml row tube. Recommended taper of 17.5°.
Temperature accuracy	≤ 0.5℃
Maximum heating rate	≥ 8.0℃/s

Maximum cooling rate	≥ 5.5℃/s
Temperature accuracy	≤ 0.5℃
Detection repeatability	Ct CV≤ 2%
Fluorescence Detection System Performance	
Light source	High brightness LED
Detector	low-light CMOS Bio-imaging chip
Excitation wavelength	F1：470nm F2：523nm F3：571nm F4：624nm
Detection wavelength	F1：527nm F2：564nm F3：612nm F4：694nm

Chapter 3 Instrument Installation

This chapter describes the use and storage conditions of the MQ4 portable quantitative fluorescence PCR instrument, its structural components, removal of the fixture, installation/uninstallation of the software, and preparation for power-up.

3.1 Environmental conditions

1) Transportation and storage conditions of the instrument
   a. Environmental temperature：－5℃～40℃ ；
   b. Relative humidity：≤75％
2) Working conditions requirements
   a. Environmental temperature：15℃~35℃
   b. Environmental humidity：35%~75％
   c. Input voltage： DC 15V 9.6A

3.2 Unpacking

1) The outer packaging of the product is a cardboard box, filled with shock-absorbing foam inside, after unpacking, first check whether the items you receive are missing or damaged.

2) If the outer packaging of the product is obviously damaged during transportation, please do not use it and contact the manufacturer and authorized distributor in time.

3) Check the completeness of the provided accessories against the packing list (Table 3-3-1).

4) If the instrument or accessories have been damaged or lost in transit, please inform the shipping company personnel and our customer service personnel.

3.3 Check the packing list

After opening the box, please check the contents of the box according to the packing list, if the items are found to be damaged or missing, please contact the manufacturer and the authorized distributor immediately.

Table 3-3-1 Packing list

Accessory	Quantity
Fluorescence Quantitative PCR System	1
Power Cord	1
Power Adapter	1
USB Cable	1
Instruction Manual	1

Factory Inspection Report	1
Warranty Card	1
Certificate of Conformity	1

3.4 Power cord connection

1) Adapter connection: the adapter supplied with the instrument should be used to connect the adapter to the instrument.
2) Power cord connection: use the power cord provided with the instrument. When connecting, the instrument power switch should be in the "off" state, and then turn on the instrument switch after connecting.

3.5 How to use the instrument

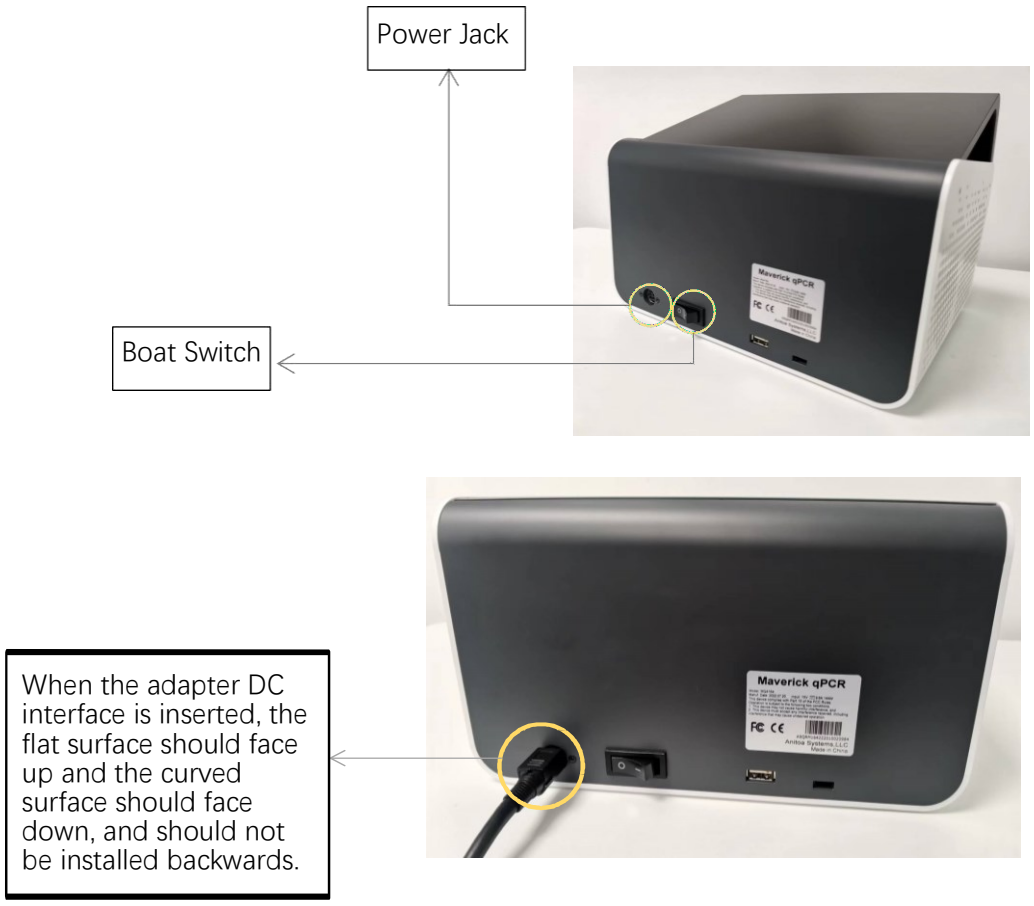


Figure 3-5-1 Back of the instrument

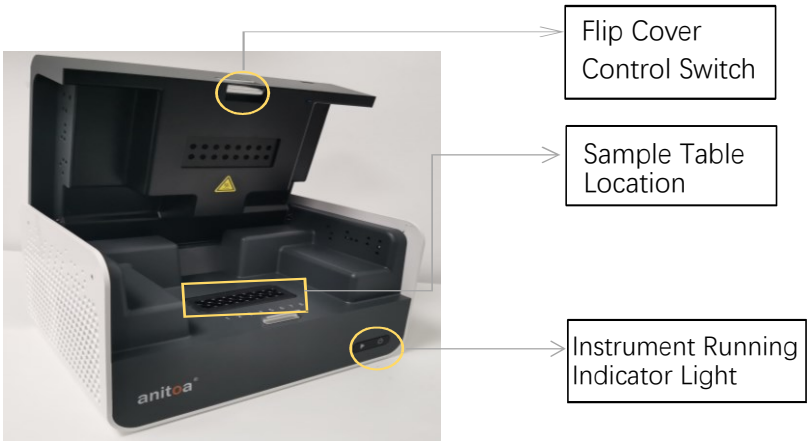


Figure 3-5-2 Front of the instrument

1) Insert the DC connector into the power jack of the instrument and hear the "click" sound to indicate that it is inserted in place, as shown in Figure 3-5-1.
2) Turn on the instrument power switch (boat switch) and the instrument power indicator lights up (green).
3) Open the flap of the instrument and put the collected sample tubes into the sample table position shown in the figure.
4) Close the flap, run the test, the instrument starts normally and then the operation indicator lights on (blue).

Chapter 4 Software Operation Guide

Anitoa qPCR software can be used to set up experiments, run experiments, and collect, analyze and manage experimental data. The software contains three main functional modules, namely "Test", "Data " and "Setup".

1) "Test" module: It mainly includes creating new experiments, setting experimental parameters, importing experimental templates and running experiments.
2) "Data" module: mainly contains experimental data analysis, upload, import data, export data, export PDF, standard curve.
3) "Setup" module: mainly contains upload configuration, user management, user switching, WLAN, Bluetooth, language, virtual keyboard, date and time, display, application information, version update, software version check, instrument number.

4.1 Launch software

1) After the instrument is turned on, it automatically enters the main interface of the software - Test.

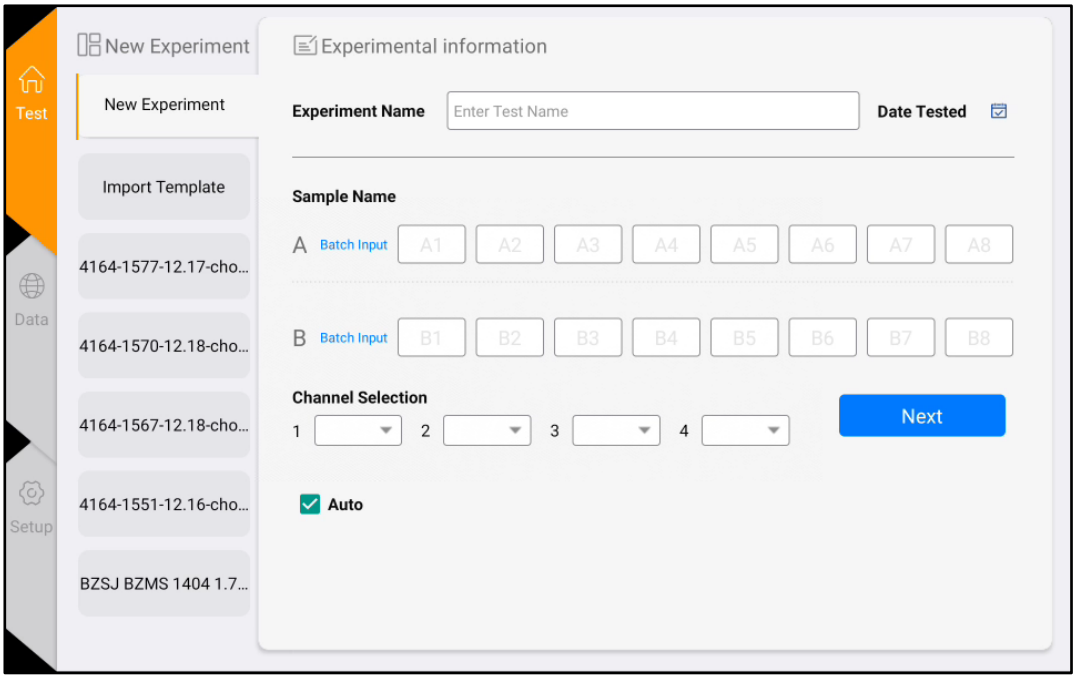


Figure 4-1-1 Main interface of the software

4.2 Experimental settings

1) In the Test interface, click <New Experiment>(Figure 4-2-1) the right panel is the Experiment Setting 1, in the Experiment Setting 1 (Figure 4-2-2), enter the experiment name, select the corresponding channel, select the well position, and enter the sample information, etc., and click "Next" to enter the Experiment Setting 2.

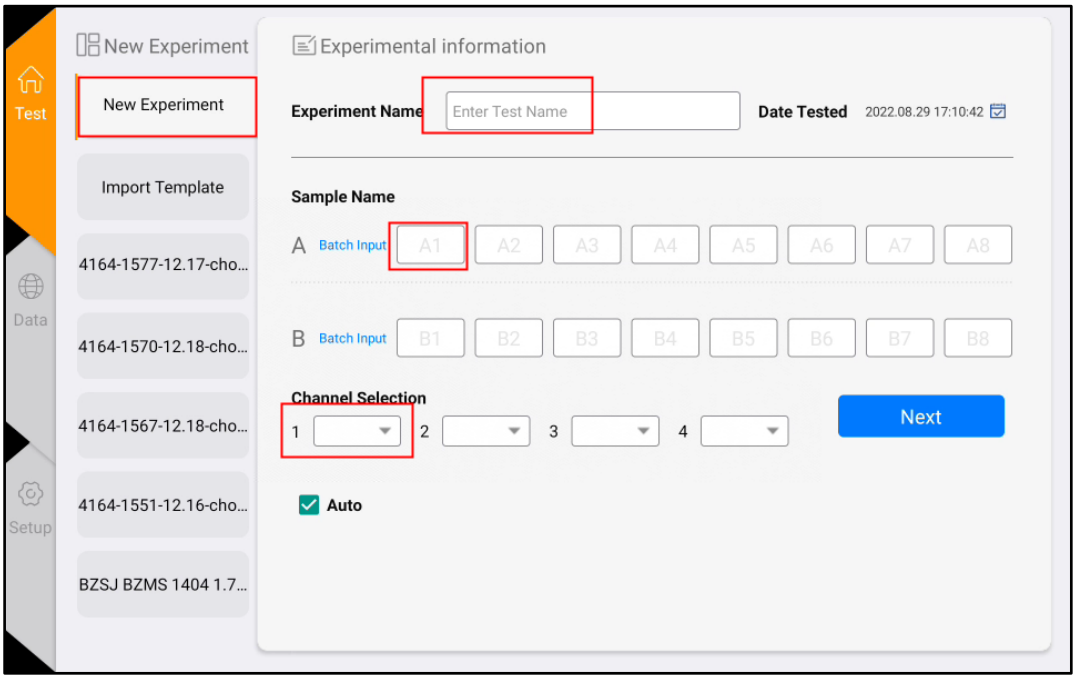


Figure 4-2-1 New experiment interface

2) In Experiment Setting 2 (Figure 4-2-3), set the reaction program (parameters such as reaction temperature, reaction time, number of cycles, photo stage, etc.).

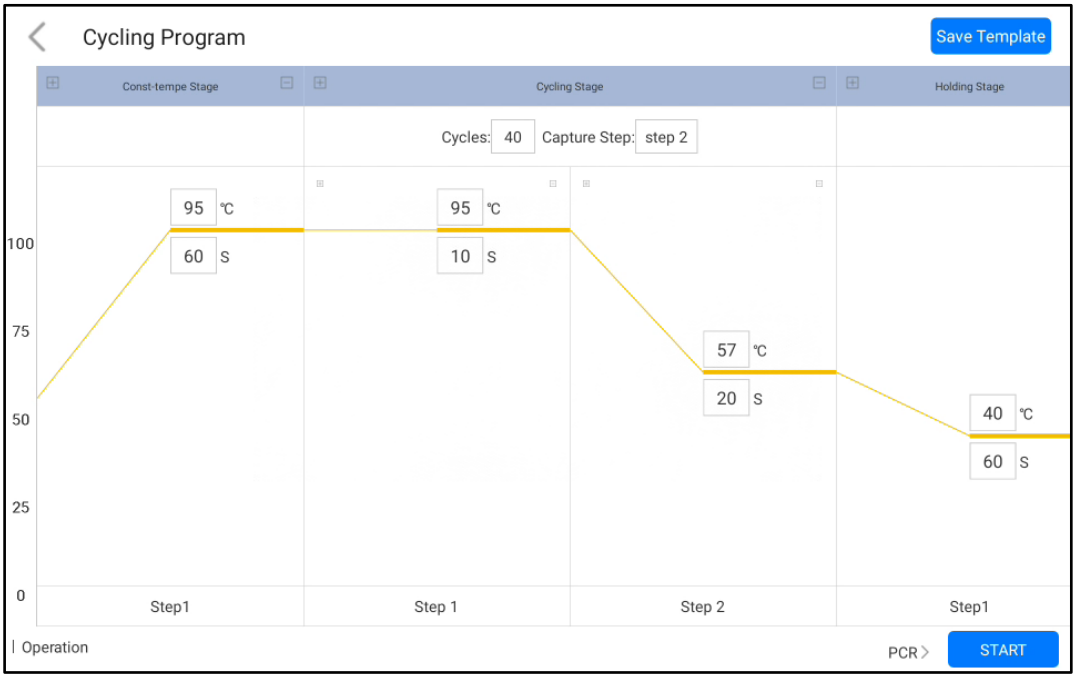


Figure 4-2-2 Experimental Setting 2

4.3 Save Template

1) Click the "Save Template" icon in the upper right corner to save the current template.

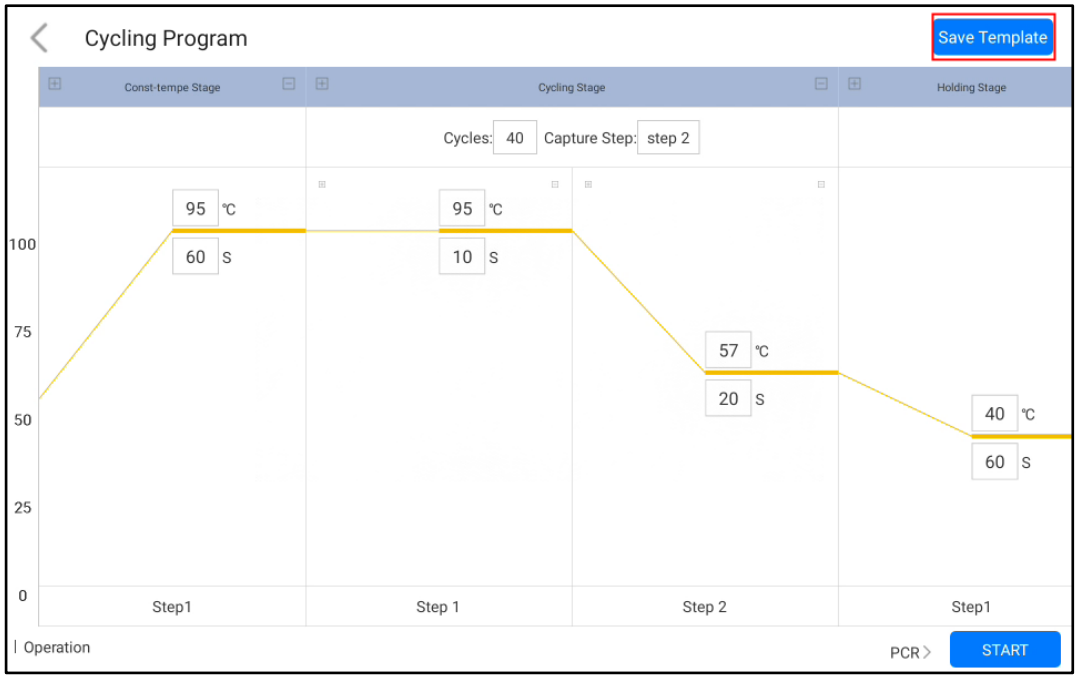


Figure 4-3-1 Program setting interface

2) The saved templates will appear in the "Test" interface for selection. Click the second option "Import Template" to import other experiment templates.

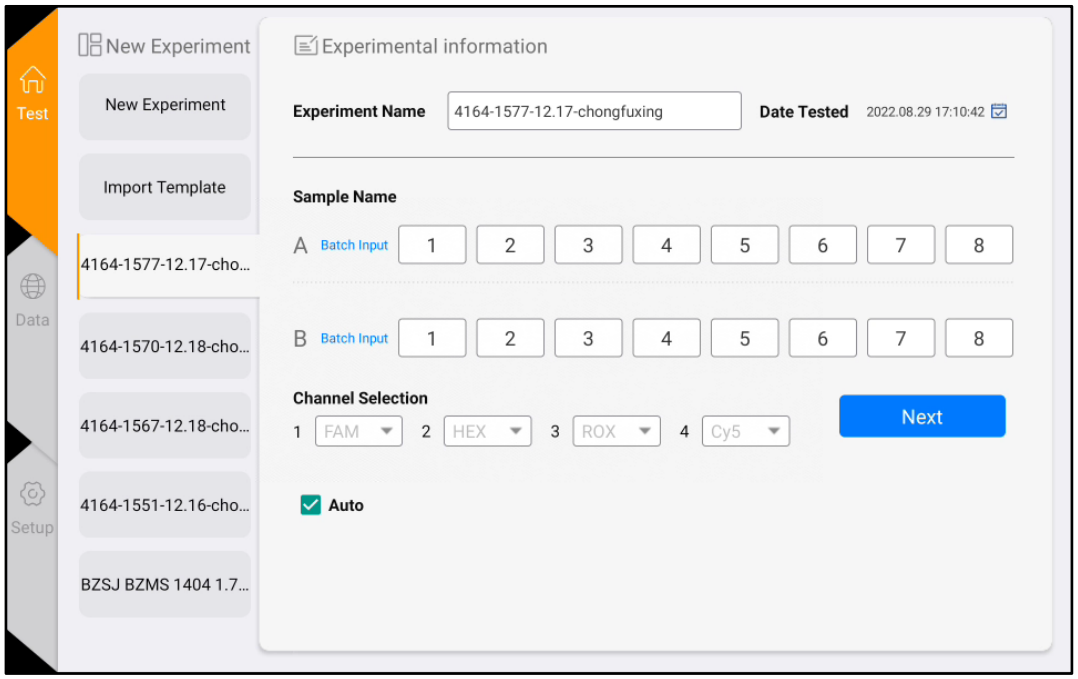


Figure 4-3-2 View the template page

4.4 Run the experiment

After the experiment settings are completed, click the "Start" button to start the experiment and enter the "Running" interface. Click "Force to stop" at the top right corner to stop the experiment.

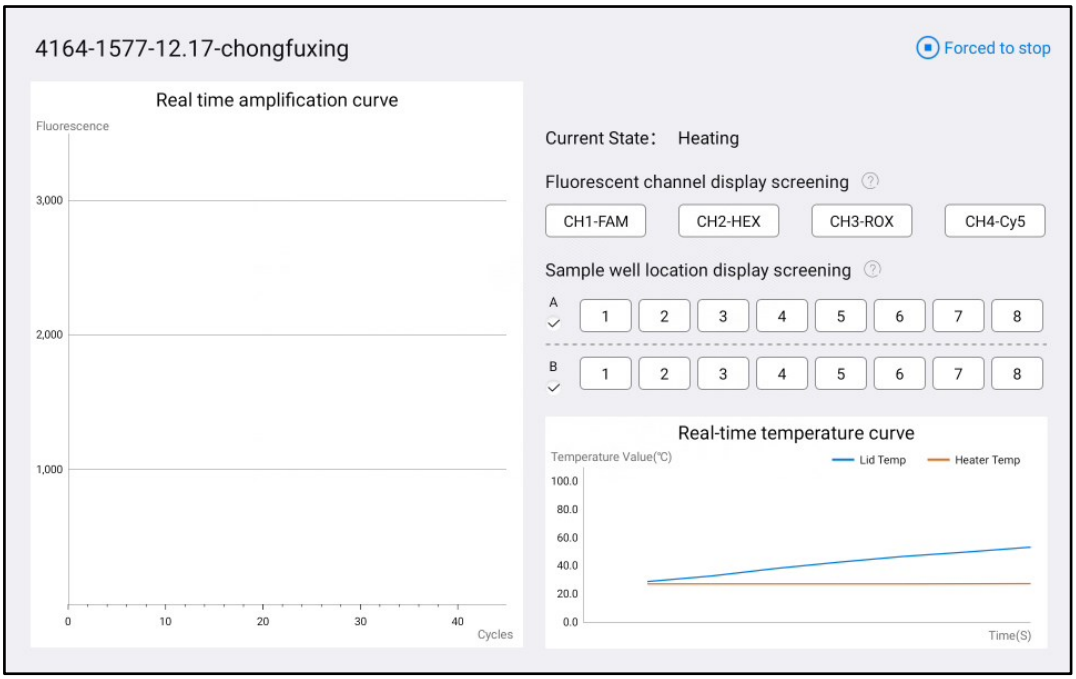


Figure 4-4-1 Running interface

In the experiment running interface click the channel buttons and sample well buttons on the right side to filter the image information, and the sample wells have an all-select button to filter the whole row.

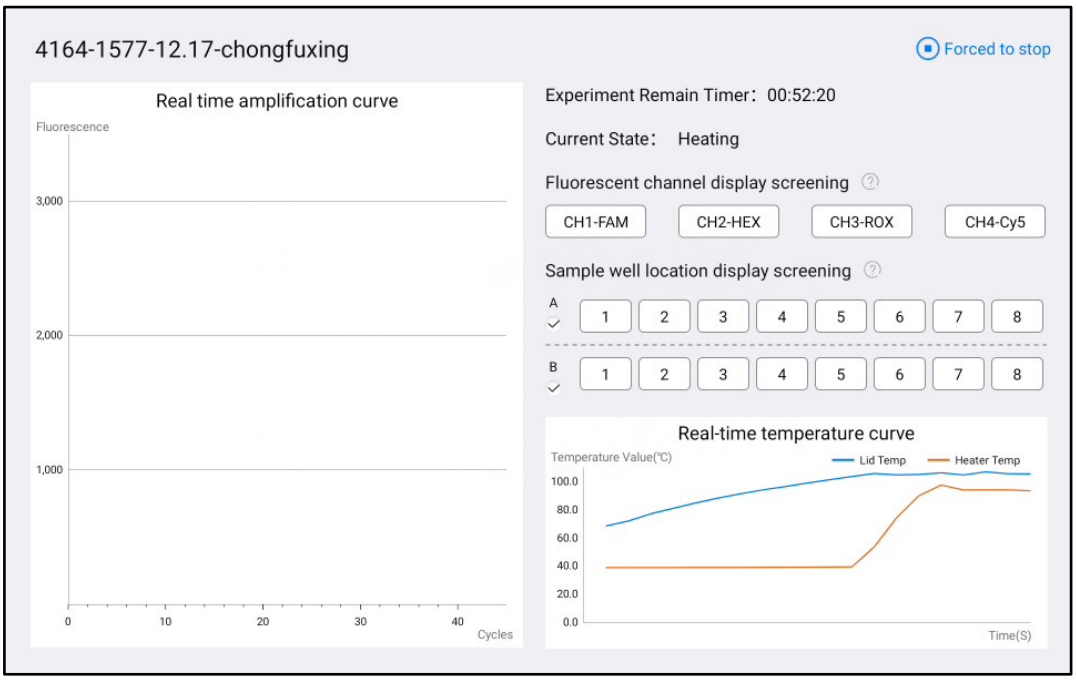
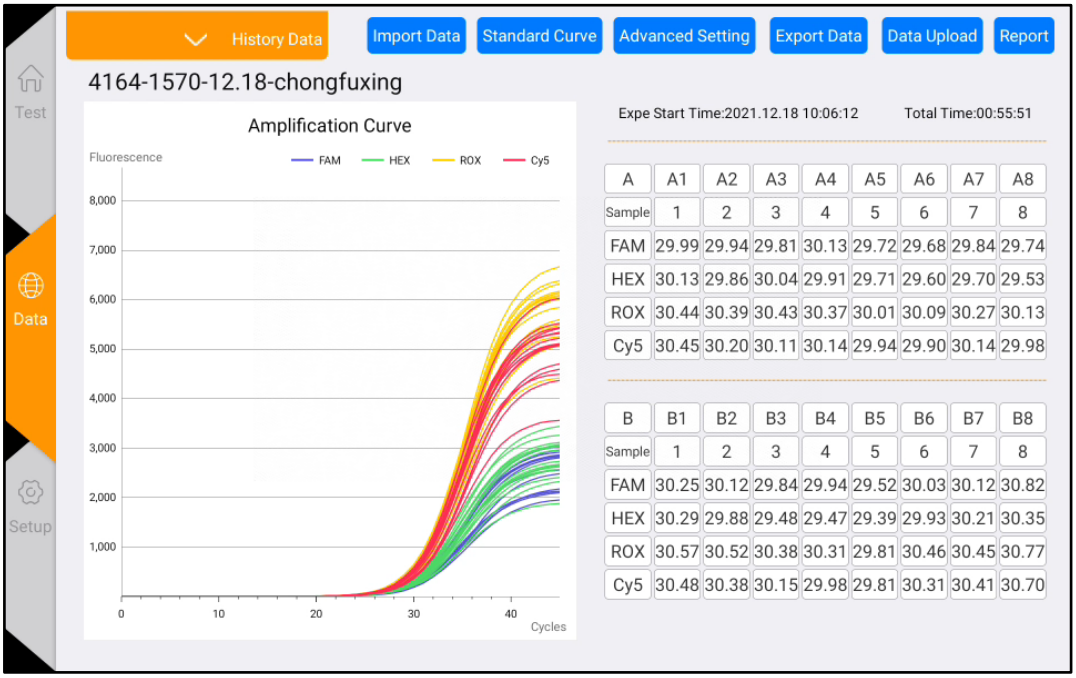


Figure 4-4-2 Running interface

4.5 Experimental analysis

1) Click the "Date" button on the main page to enter the "Result Analysis" page, as shown in Figure 4-5-1.

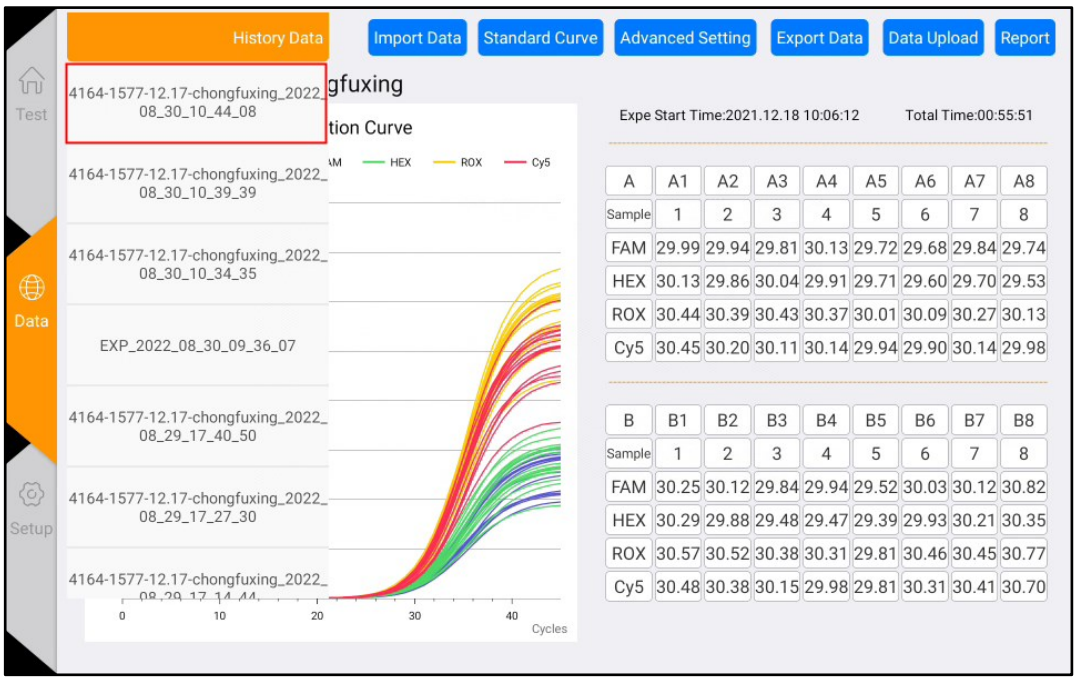


A	A1	A2	A3	A4	A5	A6	A7	A8
Sample	1	2	3	4	5	6	7	8
FAM	29.99	29.94	29.81	30.13	29.72	29.68	29.84	29.74
HEX	30.13	29.86	30.04	29.91	29.71	29.60	29.70	29.53
ROX	30.44	30.39	30.43	30.37	30.01	30.09	30.27	30.13
Cy5	30.45	30.20	30.11	30.14	29.94	29.90	30.14	29.98

B	B1	B2	B3	B4	B5	B6	B7	B8
Sample	1	2	3	4	5	6	7	8
FAM	30.25	30.12	29.84	29.94	29.52	30.03	30.12	30.82
HEX	30.29	29.88	29.48	29.47	29.39	29.93	30.21	30.35
ROX	30.57	30.52	30.38	30.31	29.81	30.46	30.45	30.77
Cy5	30.48	30.38	30.15	29.98	29.81	30.31	30.41	30.70

Figure 4-5-1 Result analysis interface

2) Click the History Data button above, you can pop up the historical experimental data results, select any one of the experimental results, you can view the data, such as Figure 4-5-2.



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Cy5	30.48	30.38	30.15	29.98	29.81	30.31	30.41	30.70

Figure 4-5-2 Date list

3) Experimental analysis (click the Advanced Setting button)

a. Adjust the baseline Ct lower limit.

b. Adjust Ct threshold percentage: default is 10%.

c. Normalize: normalize the amplification curve without affecting the results.

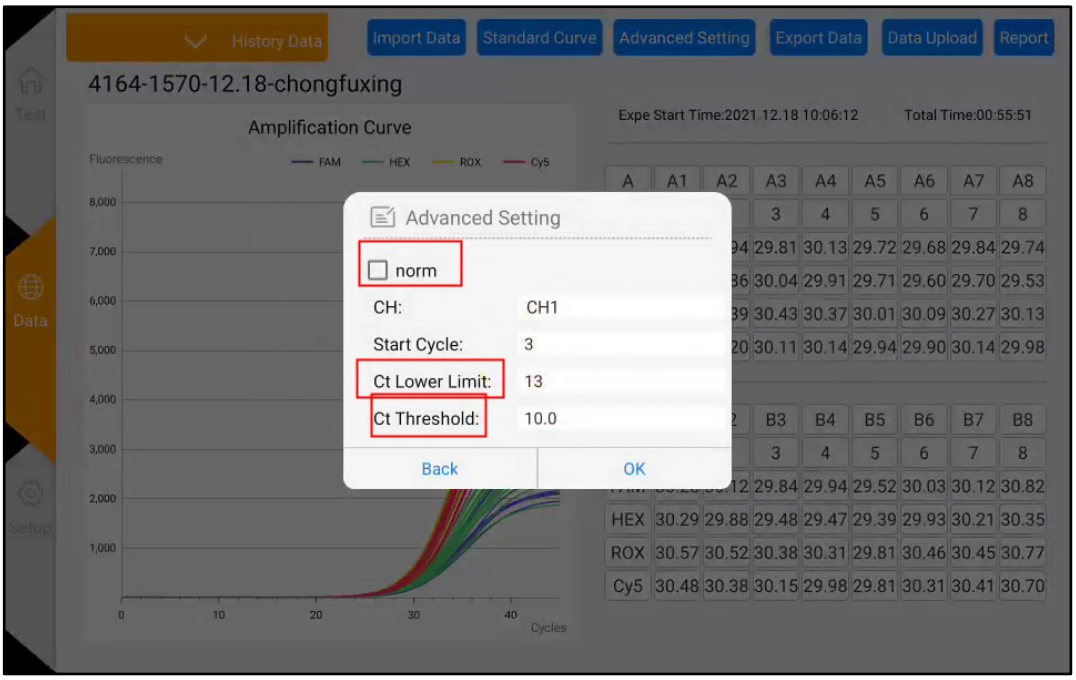


Figure 4-5-3 Experimental analysis- Advanced setting interface

d. Click on the channel and well buttons in the data table on the right to select the wells and channels for data analysis. (Gray button means not selected)

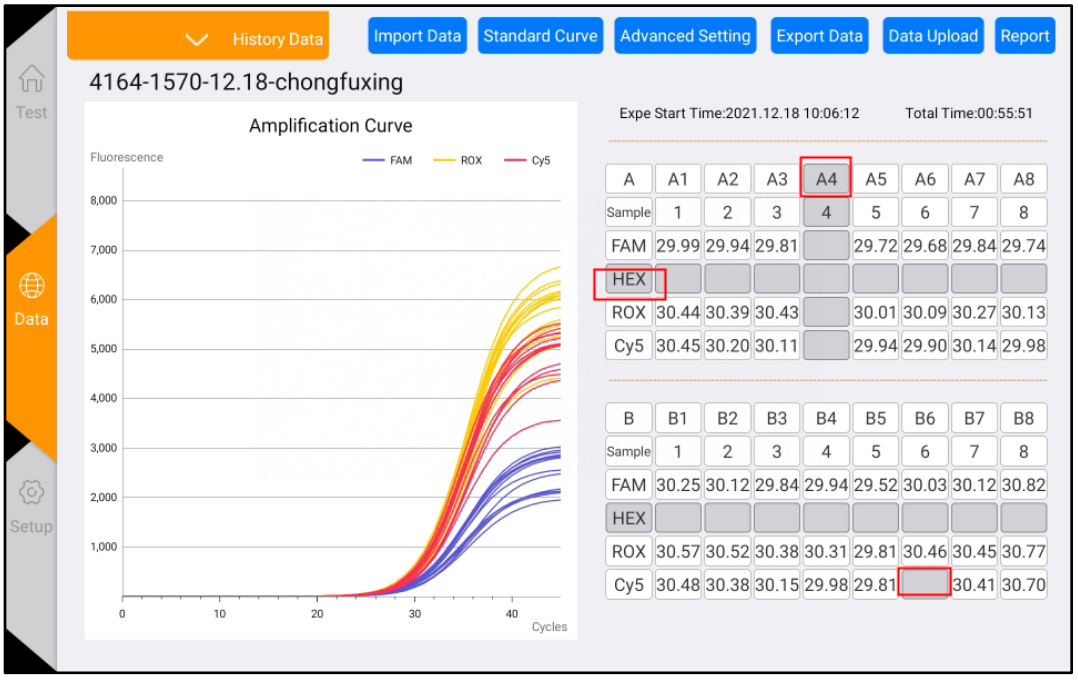


Figure 4-4-5 Data filtering interface

4) Calculate the standard curve

a. Click the Standard Curve button in the data interface to enter the standard curve interface (as shown in Figure 4-5-4).

b. Manually input the standard concentration, calculate the standard curve, and save it.

c. Then select Unknown Points, click Find Unknown, and select Use Saved Standard Curve to calculate the concentration of the unknown sample based on the Ct value.

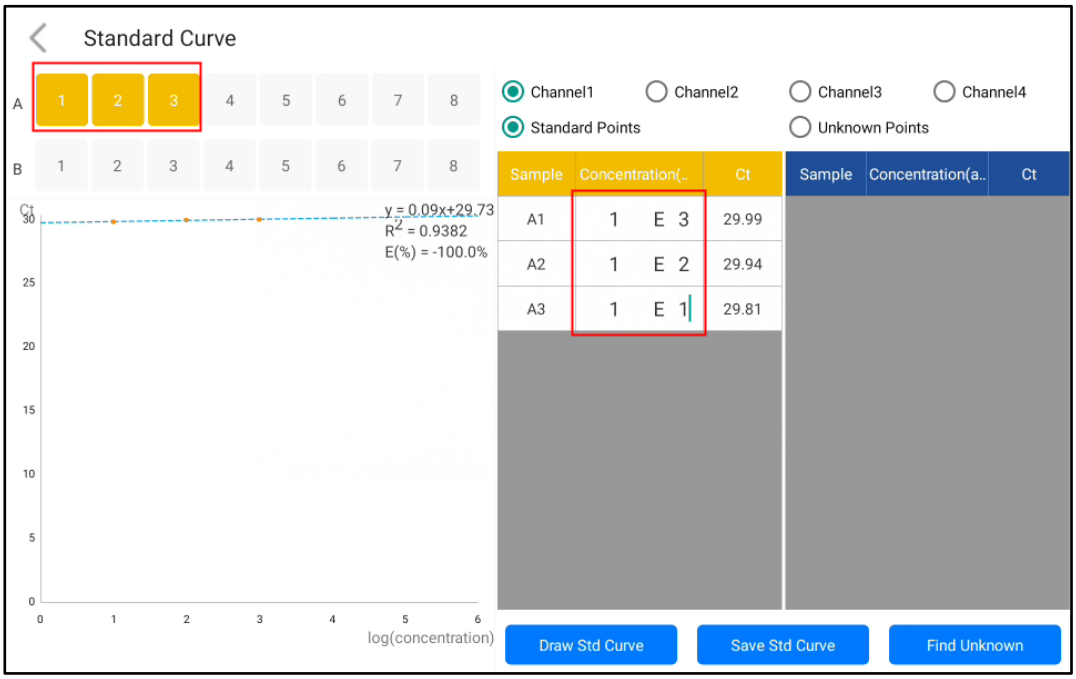


Figure 4-5-4 Standard curve interface

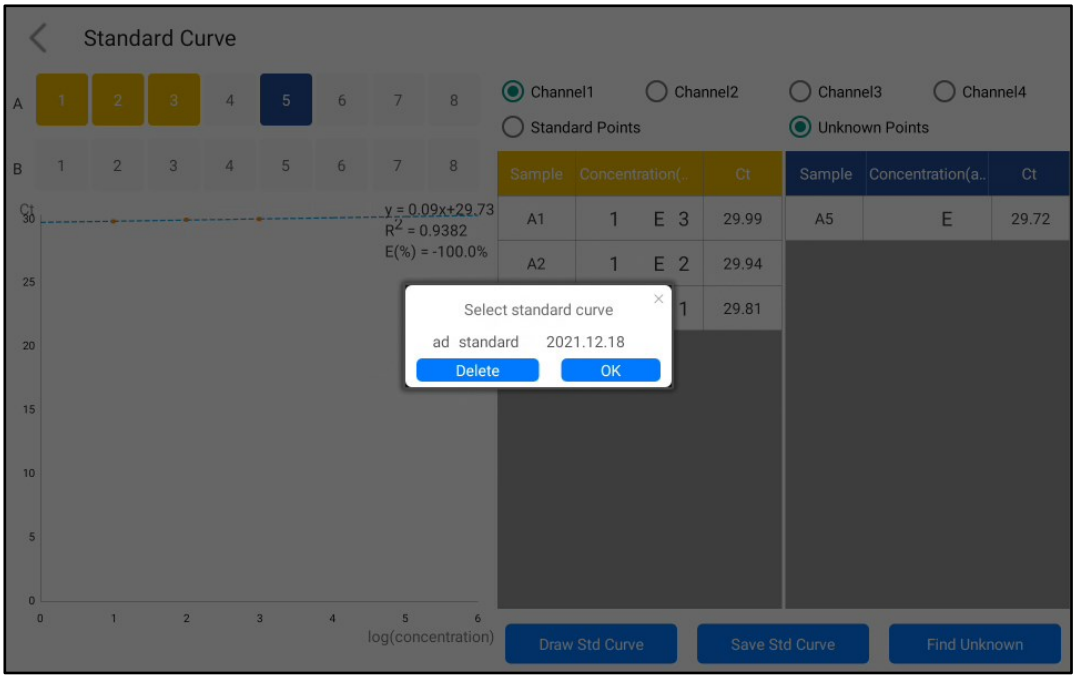


Figure 4-5-5 Selecting the standard curve used for the calculation

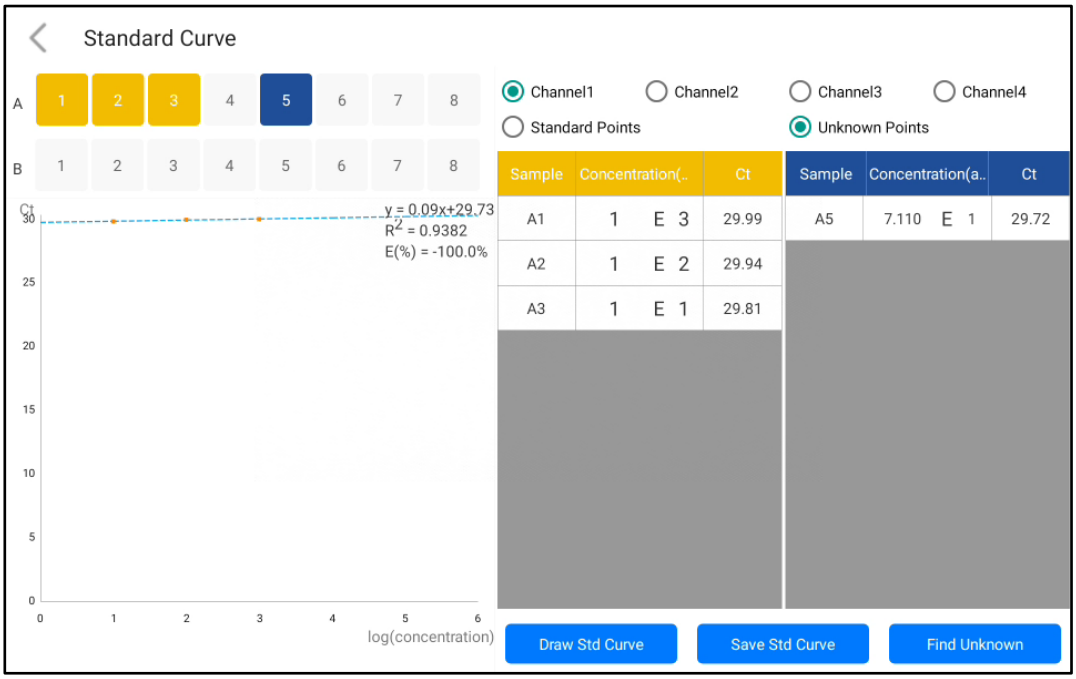
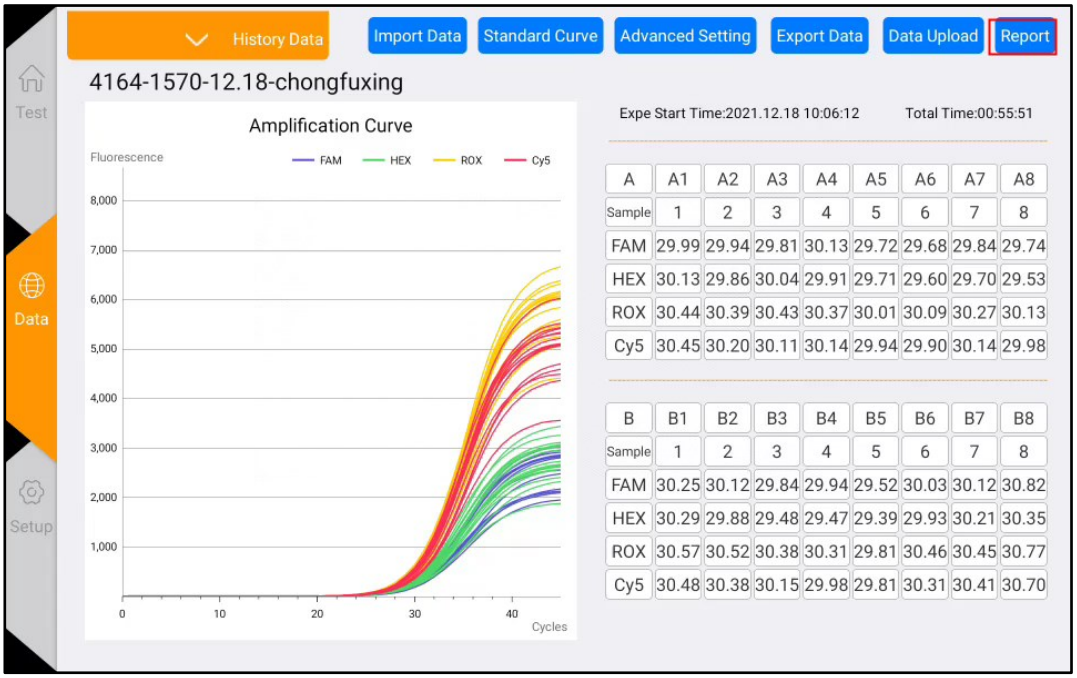


Figure 4-5-5 Calculating unknown points

4. 6 **Data export**

1) Click the "Report" button in the experiment analysis interface to enter the PDF preview



interface of the experiment report.

Figure 4-6-1 Data export

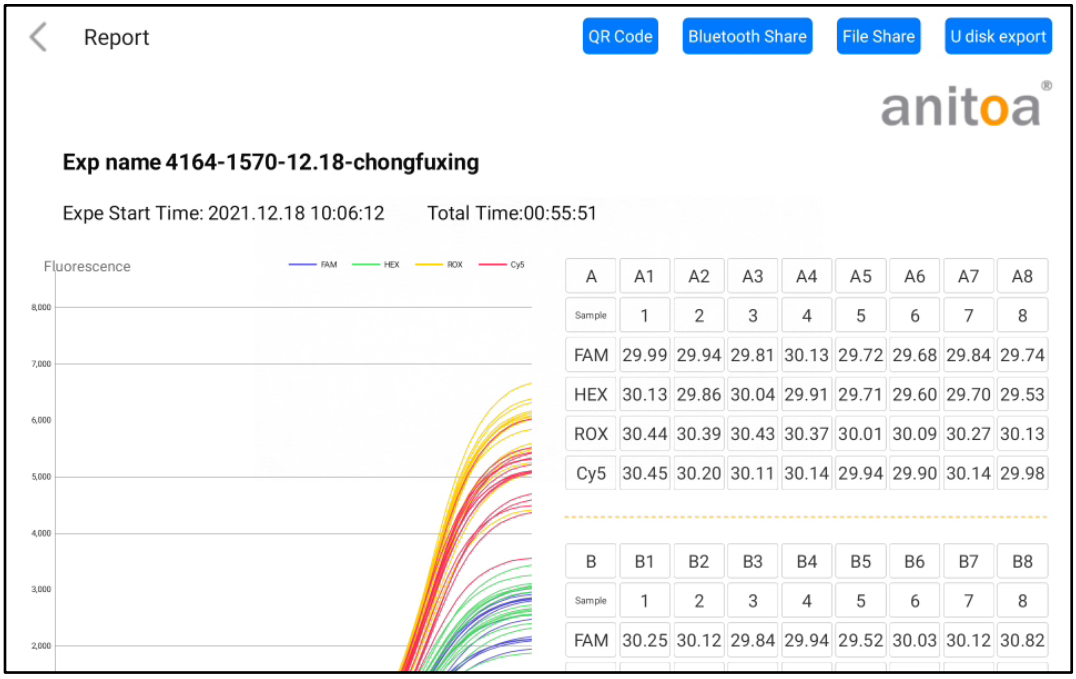


Figure 4-6-2 PDF preview page

2) At present, four sharing options are supported, which are "QR code", "Bluetooth share", "File share" and "U disk export". After inserting the USB flash drive, click the USB export, which means it is saved successfully, as shown in Figure 4-6-3.

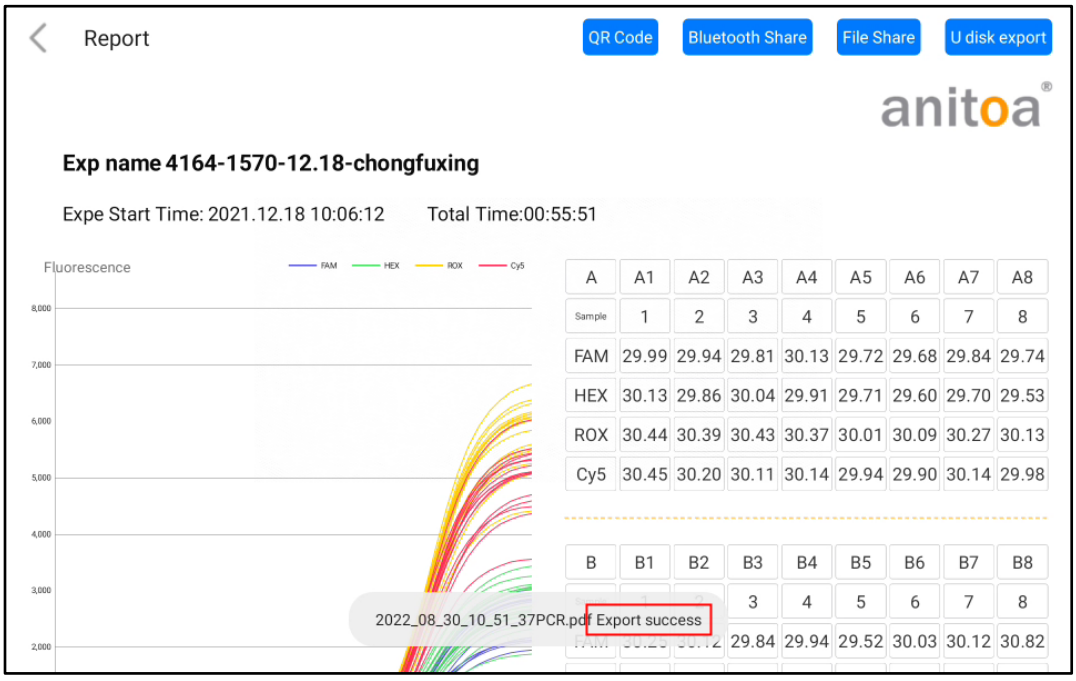
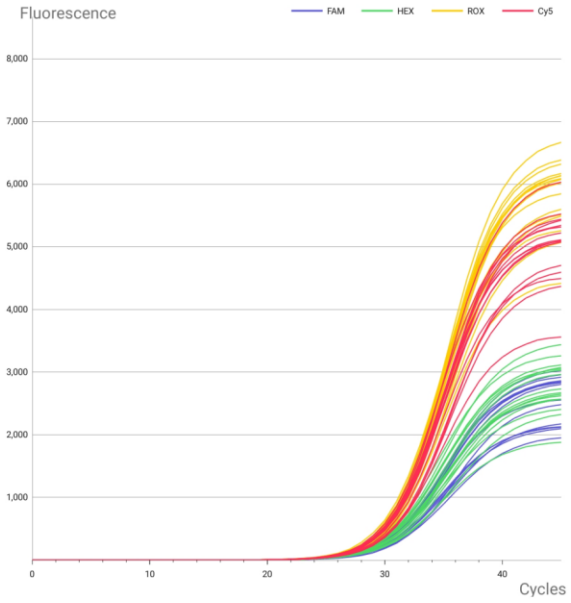


Figure 4-6-3 Export success page

anitoa®

Exp name 4164-1570-12.18-chongfuxing

Expe Start Time: 2021.12.18 10:06:12 Total Time:00:55:51



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HEX	30.29	29.88	29.48	29.47	29.39	29.93	30.21	30.35
ROX	30.57	30.52	30.38	30.31	29.81	30.46	30.45	30.77
Cy5	30.48	30.38	30.15	29.98	29.81	30.31	30.41	30.70

Conclusion

Unit: User: Sampling time:

Auditor: Date: 2022-08-30 10:50:32

Figure 4-6-4 Preview of the complete PDF export interface

Chapter 5 Instrument Maintenance

5.1 Instrument cleaning

(1) Instrument surface cleaning: the surface of the instrument should be scrubbed regularly with a soft cloth with 75% alcohol, and the instrument should be wiped dry after cleaning.

(2) Reaction wells cleaning：

a. Dust or impurities in the reaction wells can affect PCR amplification and fluorescence detection, and regular cleaning is recommended.

b. To prevent dust from entering the reaction wells, the flip-up cover must be closed when the instrument is not in use.

c. If any reagent enters the sample well, it should be wiped clean with a dust-free soft cloth with anhydrous ethanol.

d. ⚠The power must be turned off and the power cord unplugged before cleaning the instrument.

e. ⚠Do not pour liquids into the reaction module or inside the instrument.

f. ⚠Do not use corrosive solvents or organic solvents to scrub the instrument.

5.2 Instrument protection

(1) Do not switch the instrument on and off frequently.

(2) Please use the adapter provided by the original manufacturer.

(3) ⚠Boiling water bath or low temperature holding on the instrument is prohibited.

(4) ⚠It is forbidden to disassemble the instrument by non-original maintenance personnel.

5.3 Waste disposal

(1) After each experiment, there are a large number of amplification products in the test tube, which should be disposed of as soon as possible according to relevant regulations to avoid contaminating the laboratory and instruments.

(2) ☣Do not open the cover of the test tube after it is removed from the instrument, otherwise it will easily cause laboratory contamination.

5.4 Overheat protection

(1) When the temperature value of the instrument temperature control module exceeds the set threshold (120°C), the device will automatically stop heating up and force all ongoing actions to stop.

(2) After the above-mentioned failure of the heating system, the user should stop using the instrument and promptly contact the manufacturer or distributor for maintenance.

5.5 Operation requirements

(1) The use of the instrument, the operator may come into contact with harmful substances or infectious substances, the operator needs to have relevant training and relevant qualifications.

(2) The operator should operate the instrument in strict accordance with the relevant national regulations.

Chapter 6 FAQ

No.	Failure Phenomenon	Cause Analysis	Processing
1	The screen shows a black screen	Screen motherboard damage	Must replace the screen motherboard, please contact with the supplier or manufacturer
		If the screen lock function is incorrectly operated, the screen enters the black screen standby mode	Close the lock screen, and enter the test interface directly after the startup
		Screen damage	Need to replace the screen, please contact the supplier or manufacturer
	Software prompts "Abnormal auxiliary heating	Auxiliary temperature selftest abnormal	Please restart the instrument first to confirm, if still can not solve please contact the supplier or manufacturer
	Abnormal heat-up curve of hot cover	Power supply problems	Verify that the power is plugged in properly
		Hot cover assembly problems	Please restart the instrument first to confirm, if still can not solve please contact the supplier or manufacturer
2	Unable to turn on	Power supply problems	Verify that the power is plugged in properly
		Switch or power cable damage	Please restart the instrument first to confirm, if still can not solve please contact the supplier or manufacturer
3	USB flash drive export failed	The USB disk is not in good contact	Reinsert the USB flash drive for confirmation
			Can try to use WIFI, Bluetooth export function
			If the problem persists, contact the supplier or manufacturer
4	HID connection exception	Screen communication exception	Please restart the instrument first to confirm, if still can not solve please contact the supplier or manufacturer
5	No experimental data after instrument operation	Incorrect setting of experimental parameters	Verify that the thermal cycling parameters and sample parameters are set correctly, and set the fluorescent markers
6	Report upload and print function exception	WIFI setting error	Please check if the instrument WIFI setting is correct, please connect to the network correctly
7	Test time and report time are not synchronized	Time synchronization without network connection	The default time is used when the device is not connected to the network. Please connect to the network for immediate time update
8	Software prompts "Please close the	Instrument flip cover is not closed in place	Re-close the flap to ensure it is closed in place.

	hot cover"		