Operation Manual

V1.0

Feyond-A300
Microplate Reader
NB-12-0036

Foreword

Thank you for purchasing our Microplate Reader. This user manual describes how the instrument works and the operation guide, please read carefully before operation and keep for future reference.

Opening Check

Please check the Instrument and Accessories according to the packing list when you first open the packing case. If anything wrong or missing, please contact the distributor or the manufacturer.

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Safety Warnings and Guidelines

1. Important information for safe use

Users should have a clear main idea on how to use this instrument before operate, please read this manual carefully prior to operation.

Any improper operation may cause injured or electric shock. Please read the manual carefully and operate safely according to the guidelines.

This instrument intended to use in Scientific Research only!

2. Safety

The operation, maintenance and repair of the Instrument should comply with the basic guidelines and the remarked warning below. If you don't comply with them, it will have effect on the scheduled using life of the Instrument and the protection provided.

The instrument conform to class Ⅰ of GB 4793.1 standard. Indoor use only.

Warning: Biological contamination!! All samples for test, quality control, calibration are regarded as infectious, and any part contact with samples will also need to be treated as infectious. Please wear gloves when operate this device.

Before using the device, read the Manual carefully. These units are designed for use in laboratory environments. The device must be used by skilled personnel with the appropriate training.

Warning: Avoid injury. Keep your body or any part of body away 15cm (or more) from the instrument when running.

Except for the part which can be opened by the user according to the manual, the user is forbidden to disassemble the instrument.
Doing so will disqualify your warranty and may result in an electric shock.
In case of repair, the company is responsible for maintenance.

Before power on, guarantee the voltage used should be accordant to the voltage needed, and the rated load of electrical outlet should not lower than the demand.
If the electric line is damaged, you should replace it with the same type. You should assure there's nothing on the electric line and you should not put the electric line in the ambulatory place.
Hold the socket when you pull out the plug, and don't pull the electric line only.

The Instrument should be put in the place of dry, less dust, no water and no sun or strong lamp. What's more, the place shouldbe good ventilation, no corrosively gas or strong disturbing magnetic field, far away from central heating, camp stove andother hot resource.

Power off when you finish your work. Pull off the connector plug when there's long time no use of the Instrument and cover it with a cloth or plastic paper to prevent from dust.

Pull the connector plug from the socket at once in the following cases, and contact the vendor:

- There is some liquid flowing into the Instrument;
- Drenched or fire burned.
- Abnormal operation: such as abnormal sound or smell.
- Instrument dropping or outer shell damaged.
- Malfunction

Maintenance Instruction

a) Warranty content

One month from the date of delivery, in case of faults due to material and manufacturing defects, our company will be responsible for replacement.

Twelve months from the date of delivery, provide warranty for faults due to material and manufacturing defects. During the warranty period, our company will selectively repair or replace instrument that are proved to be defective.

The products under warranty must be delivered by customer to the repair department designated by our company. The freight of the instrument from the user to the maintenance department shall be paid by the user. Our company shall bear the freight of returning the instrument to the user.

For repairs beyond the warranty, our company will charge appropriate maintenance costs.

b) Warranty scope

The above warranty is not applicable to the damage caused by users' improper maintenance, use under non-conforming conditions, repair or modify without authorization.

Content

Chapter 1 Introduction

Feyond-A300 is a powerful and multifunctional microplate reader. It is a widely used biological, medical equipment, using Enzyme-linked Immunosorbent Assay which analyze the presence, absence and color depth of chromogenic substances qualitatively or quantitatively according to the principle of enzyme labeling. It can be used for monoclonal antibody screening, blood coagulation, antibiotic sensitivity test, and other analytical requiring colorimetry work. The instrument is suitable for clinical testing, microbiology, epidemiology, immunology, endocrinology, drug screening, environmental monitoring and agriculture and forestry science and other fields. It is widely used in hospitals, blood stations, epidemic prevention stations, biological products and other departments.

In addition to microplate reader, the product also has fluorescence and luminescence detection functions. The product consists of optical module, detection module, motion control module, reagent injector module, incubator module, display module, power adapter and operation software. Colorimetry, fluorescence and luminescence readings can be realized, including colorimetry (P), fluorescence intensity (FL), Glow, Flash, etc.

In addition to the above main functions, it also has the following functions:

1) Can be used for 96-, 384- well plate detection, absorption of light can also be used for micro plate detection;
2) The absorption light adopts grating splitting design, and the wavelength range can be selected by 1nm step from 200nm to 1000nm;
3) High-energy xenon lamp is used for absorption light and fluorescence detection, with a life of 10^9 times;
4) Fluorescence detection using high-precision filter. And filter replacement is convenient, can be adjusted according to user experiment;
5) With high performance PMT detector, can detect very weak light, has high sensitivity;
6) Z-axis movement function;
7) Optional automatic sampling device which can realize the automatic sampling function in the process of experiment;
8) The instrument mainly consists of three test modes: end-point method,

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kinetic and spectral scanning;

9) With temperature control system which can be used to incubate the microplate, suitable for temperature sensitive experiments;
10) The microplate can carry out linear, circular, double circular shaking, and the speed can be adjusted to ensure that the sample is fully mixed;
11) 10 inch capacitive LCD display, easy to view data and simple analysis;
12) Android system, man-machine interactive operation is more convenient, PC software ReaderIt-II compatible with Windows7 to 10 64-bit version;
13) The instrument has a scanning code module, which can be used to log in the instrument and import and export the protocol (under development);
14) The device comes with an expandable 4G module that connects to the Internet and cloud services.

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Chapter 2 Features

Working conditions:

Ambient temperature: 10°C~40°C

The relative humidity: 10%~80%(not be condensed)

Power: AC100-240V 50-60Hz 2A

The basic parameters and characteristics

Name	Microplate reader
Model	Feyond-A300
Function	Absorbance(ABS), fluorescence(FL), luminescence(Glow, Flash)
Absorbance	ABS
Plate Formats	96-, 384-wells, Microplate
Light source	Xenon flash lamp/ flash times >10^9
Wavelength range	200～1000nm, 1nm step
Wavelength accuracy	2nm
Wavelength repeatability(SD)	0.2nm
Half width (FWHM)	<2.5nm
Measuring range	0-4.0 OD
Resolution	0.0001 OD
Accuracy@450nm	96-precision mode: ±(1.0%+0.003) @ (0.0-2.0] ±2.0% @ (2.0-3.0]
Repeatability@450nm	CV < 1.0% or SD<0.003 Fast(0.0 - 3.0] CV < 0.5% or SD<0.003 Accurate(0.0 - 3.0]
Stability@450nm	< 0.005 Abs , (0.0 - 2.0 Abs] < 2% , (2.0 - 3.0 Abs]
linear@450nm	$R^2 \geq 0.999$, [0.0 - 3.0Abs]
Stray light	0.1%@220nm
Reading time	96 well: fast <15s, accurate<28s
Fluorescence	FL
Plate Formats	96-, 384-well
Reading mode	Top reading
Excitation light source	High energy xenon lamp
Detector	PMT
Wavelength range	EX: 200-1000nm; EM: 270-850nm;

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Filter EX / EM	3 groups, single module insert and remove

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Detection limit	≤1pM
Linear dynamic range	6 logs
Luminescence	LUM
Plate Formats	96-, 384-well
Detector	PMT
Detection limit	100amol/well
Linear dynamic range	6 logs
Crosstalk	≤ 0.005%
Shaking & Incubation	
Shaking mode	Linear, circular, double circular
Shaking frequency	Slow, mid, fast
Incubation temperature	RT+4℃ to 45℃
Temperature uniformity	±0.5℃ @ 37℃
Software	
Software interface	Chinese / English
Screen size	10-inch LCD display (Resolution: 1920×1200)
Operation method	Touch capacitive screen; use mouse
Data capacity	10GB
Compatibility	Support PC software, win7 to win10 64 bit
Data transmission	Test data report can be uploaded to PC server via FTP
Automatic Injector Module	(Optional)
Plate Formats	96-, 384-well
Quantity	2
Dispensing volume	5-1000μL, 1μL increment
Liquid injection speed	125-500 μL/s
Accuracy	±1μL @ 5-50μL ±2% @ 51-1000μL
Waste liquid collection	50mL
Others	
Instrument port	2 USB A type ports 1 USB B type port 1 Ethernet port Rs232 bus interface (injector connection)
Size(W×D×H)mm	420×550×386mm
Power supply	AC 100 to 240V, 50 to 60Hz
Power	100-240V 2A
Weight	33kg

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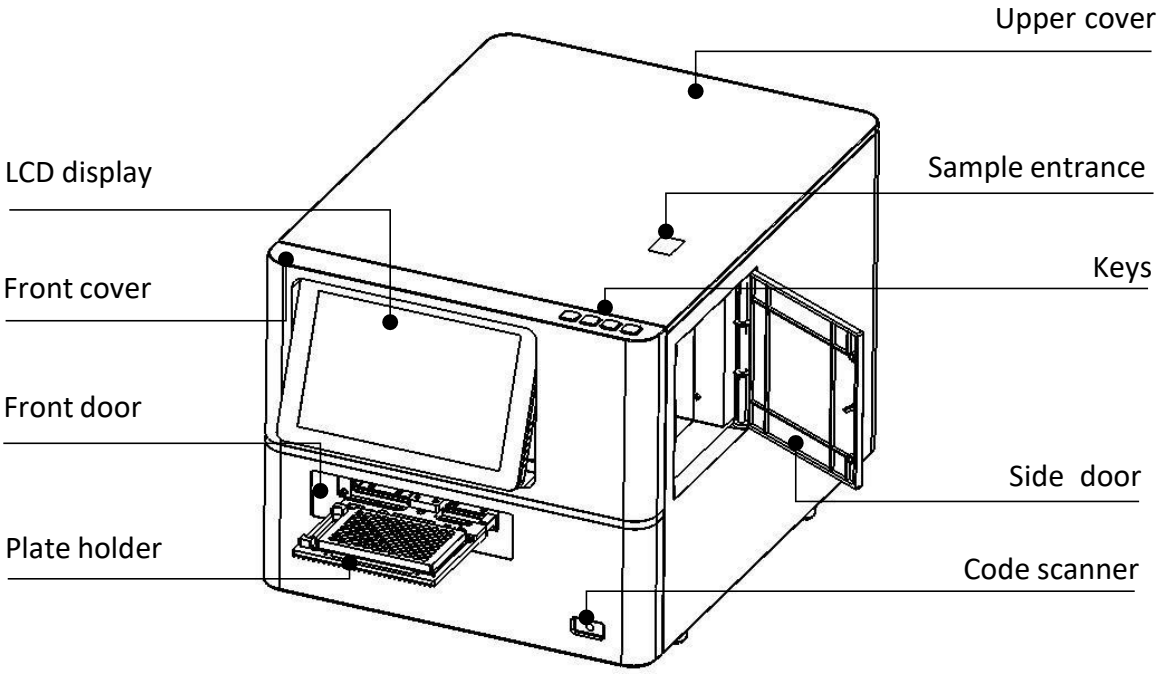
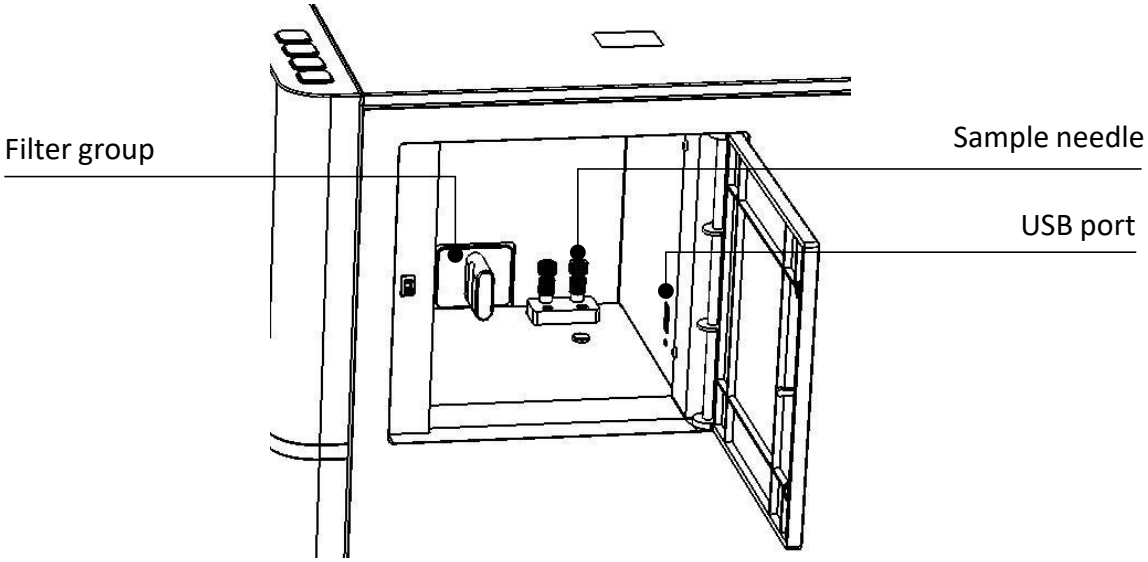
Chapter 3 Instrument structure

This chapter mainly introduces the structure of the instrument. Before first use of this instrument, please read this chapter carefully to make a better preparation.

Structure





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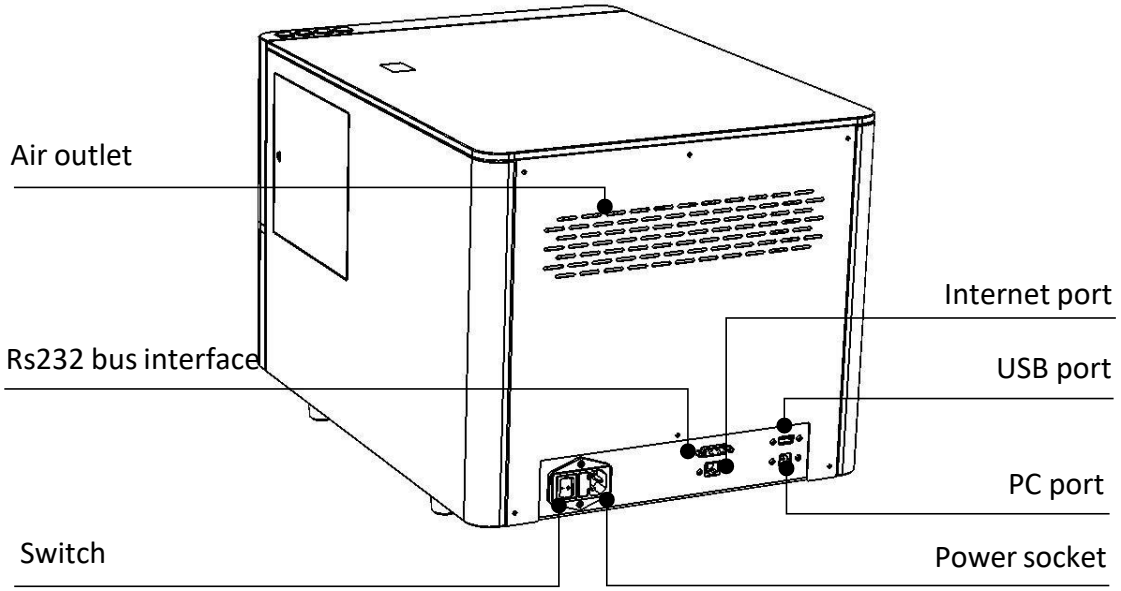

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Chapter 4 Installation

1. Opening check

Each Feyond-A300 is thoroughly tested before shipping, but please check again when you receive the instrument. Note if the following damage exist:

① The outer package is up side down or damaged

② The outer package has any obvious moisture stains

③ The outer package has marks of impact

④ The outer package has signs of being opened

Once the above damage is found, please immediately contact your local distributor or manufacturer.

If the outer packing is intact, please open the packing case and check it in the presence of the distributor and staff:

① According to packing list, confirm that all ordered accessories have been included;

② Check the instrument's appearance for any damage.

2. Installation requirement

① Working condition: locate instrument on a flat dry and clean work table. When placed on the table, keep 15cm space for back, left and right side to enable put or connect wires; keep the front side with enough space for plate holder in and out.

② Working environment:

a. Clean air free from corrosion steam or smoke.

b. Temperature should be within the range of +10°C ~ +40°C.

c. Relative humidity should be within the range of 10% ~ 80% to avoid condensation.

Note: KEEP INSTRUMENT AWAY FROM DESTRUCTIVE GAS OR LIQUID!

3. Installation steps

① Place the instrument and package lightly on the operation site, unpack the carton, take out the upper package, and then take out the instrument and place it on the work table.

Note: Please DO NOT loose any screw or parts without permission, or it will cause instrument damage and make it out of warranty.

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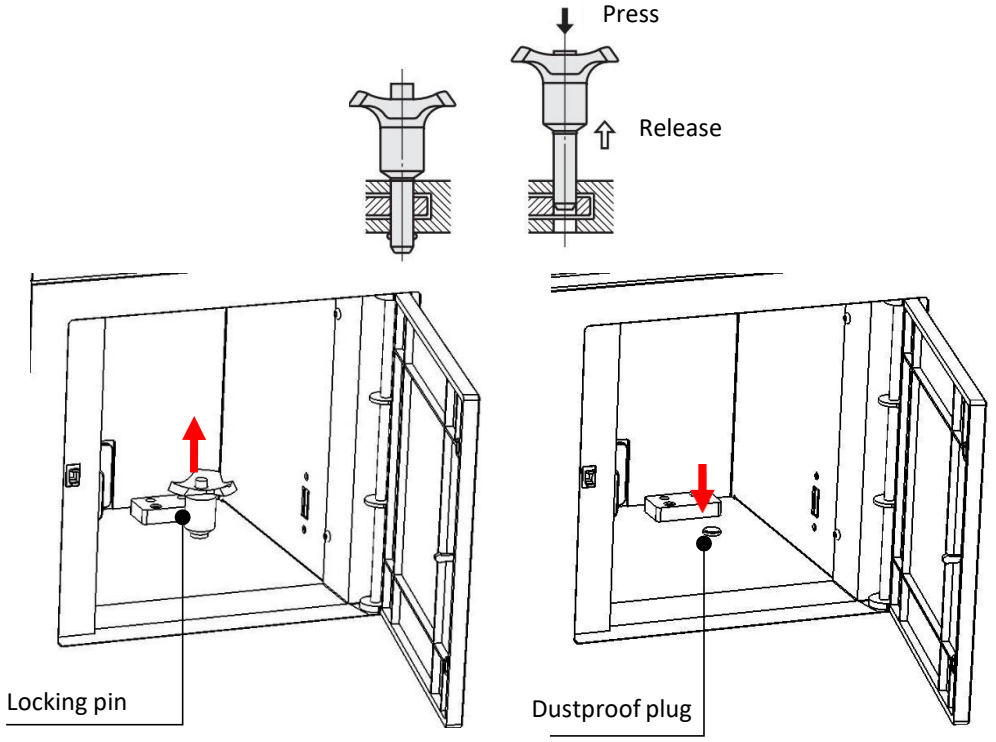
② Open the side door and press the button on the head of the locking pin with your finger to release the locking. Keep the pressing state, and upward to pull out the locking pin. Then plug the dustproof plug from the accessories to the installation hole of the locking pin, to play the role of dustproof and light avoidance.

Note: The locking pin plays a limiting role to ensure that the microplate bracket is in a fixed state during the instrument transportation. Please pull out the locking pin before the instrument is used.



③ Switch “I/O” button to “O” at the back of instrument. Take out the power cable, insert the plug into the power socket at the back of the instrument,and then connect the other end of the power cable to the power supply with thevoltage of AC100 ~ 240V.

Warning: Don’t connect instrument to power socket without ground wire.

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Chapter 5 Operation Guide

1. Start the instrument

After installing the instrument according to chapter 4, turn on the powerswitch to start the instrument and enter the self-test interface as Fig 5-1. Atthis time, the instrument will automatically complete the self-test and calibration. If there is a fault alarm, please refer to Chapter 7 Trouble shooting.

Fig 5-1

User login interface will appear after self-checking, see Fig 5-2.

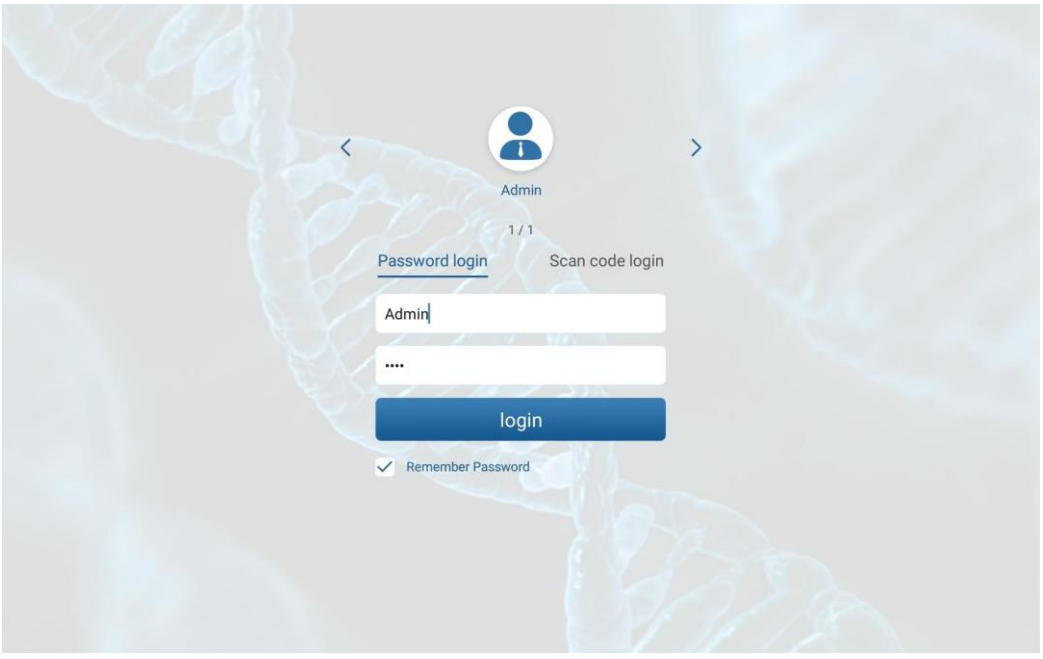

Fig 5-2

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Table 5-1 lists the permissions of the three types of users.

Table 5-1

Name	Permissions content	Remark
Admin	User administrator permissions, all permissions related to user operations. Users cannot log in after forgetting the password;	Unique account, fixed name, initial password 0000
Advanced user	For an administrator defined by Admin, the functions of the administrator are the same as that of Admin, or the permissions and functions of the administrator are less than or equal to that of Admin. The permissions and functions of the administrator are defined by Admin. The permissions are fixed before delivery, and the password is reset by Admin when forgotten;	Manage account group
User	Can only operate, can not do anything else, the lowest level of permission, the current permission factory is fixed;	User Account group

Note: Contact the manufacturer or your distributor when forgotten the password of Admin. Please keep the Manager password well to avoid unnecessary losses.

Click Account to enter the Account-Admin interface, see Fig 5- 3. By default, the change password interface is displayed, see Fig 5- 4.

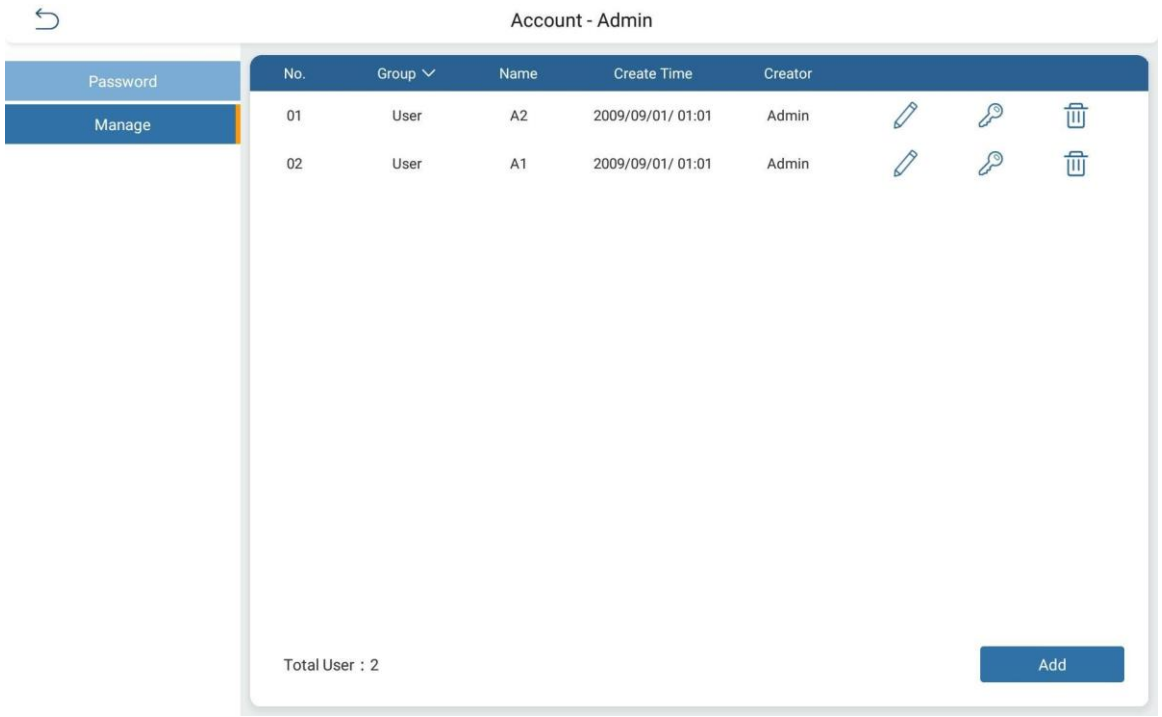

Fig 5- 3 Account -Admin interface

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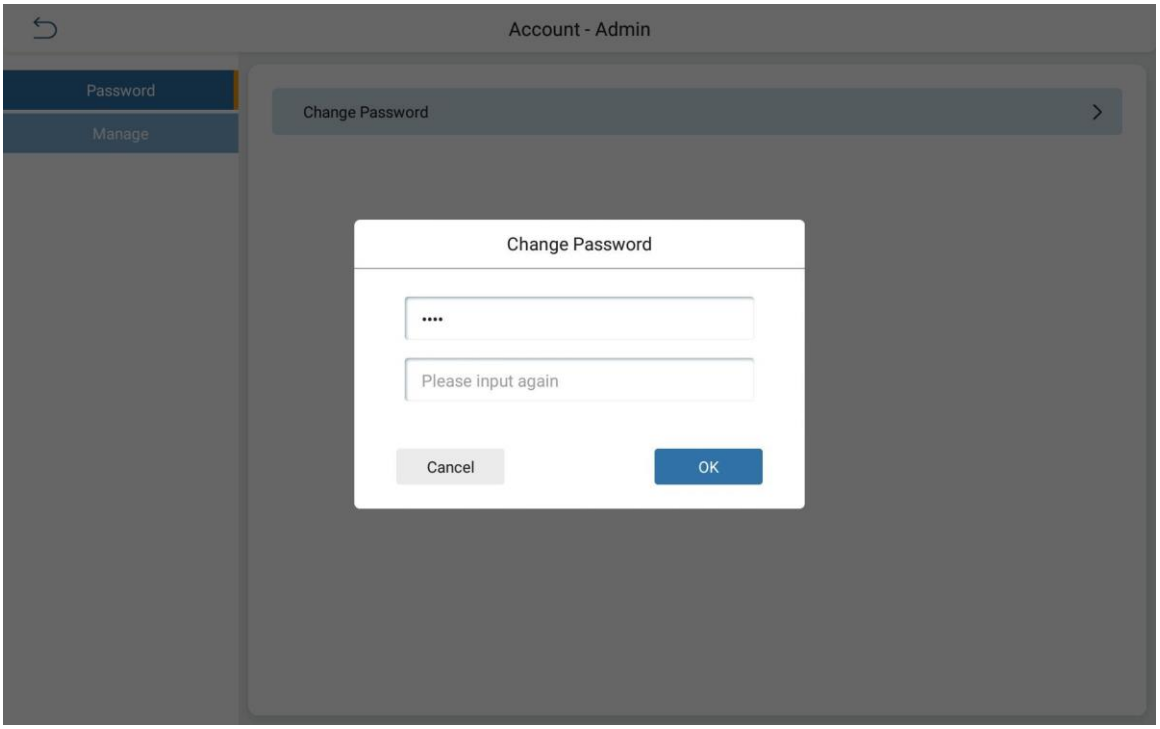

Fig 5- 4 Change password interface

After you select a user and enter the password, the system main interface is displayed, as Fig 5- 5.

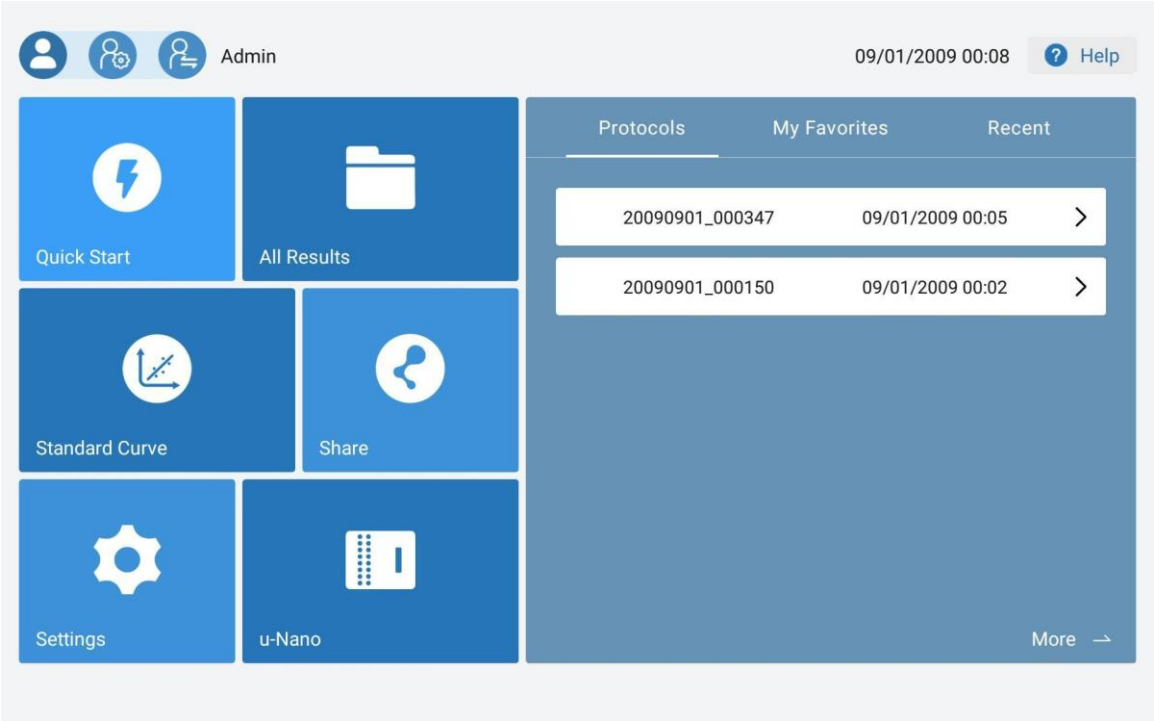

Fig 5- 5 Main interface

In this case, you can log out by pressing the button in the upper right corner, return to the user interface, and log in again.

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The files in this software are divided into three categories: protocol file (P), result file (R) and standard curve file (SC). Table 5- 2 lists the file functions onthe main interface;

Table 5- 2 File functions

Name	Type	Function
All results	Key	There is only the result file (R), which contains the running data
Standard curve	Key	There is only the standard curve file (SC), which is saved from the results
Share	Key	It includes protocol (P), result (R), standard curve (SC), Tab switch
Protocol	Key	There is only the protocol file (P), it includes layout, setting, algorithm parameters, without running data; Click "More" to view all protocol files;
My favorites	Key	There are only protocol files (P) in it. Click "More" to view all protocol files
Recent	Key	There may be either protocol (P) or results (R), which refers to the most recent operation of the 6 protocol/result files, in chronological order, the most recent time at the top, no "More" button.

2. System settings

Click "Quick Start" on the main interface to pop up a new protocol selection box. Users can select protocol parameters according to experimental requirements, as Fig 5- 6.

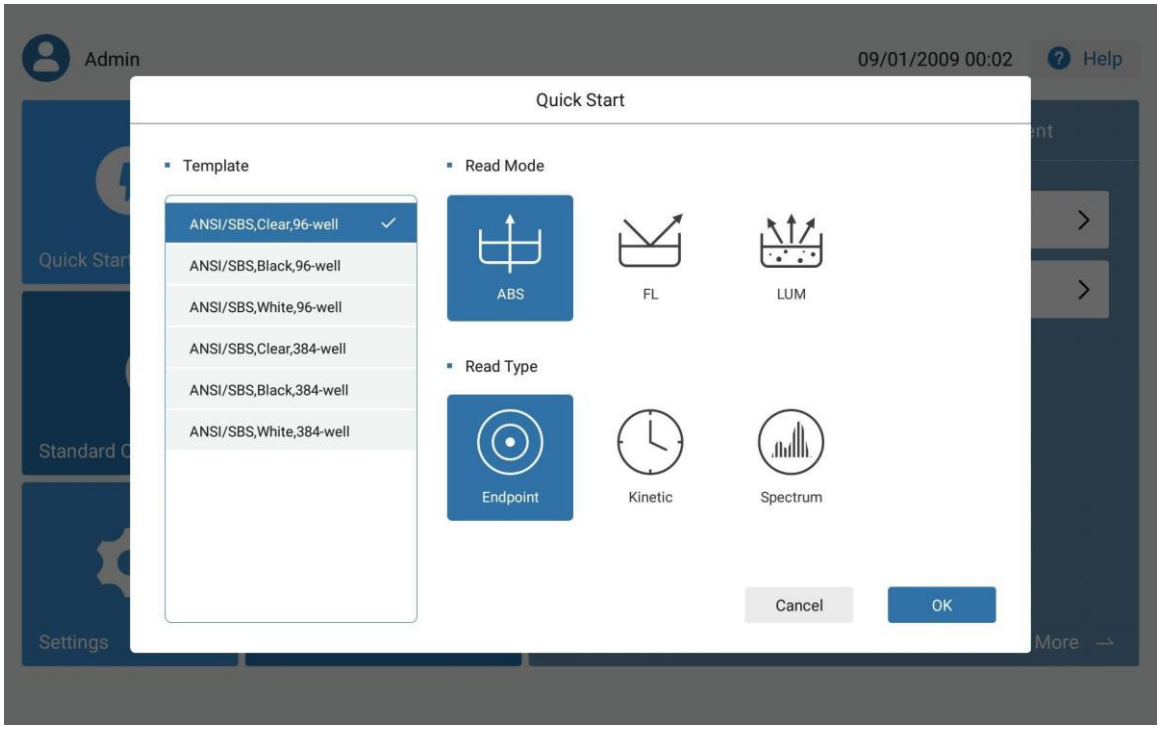

Fig 5- 6 Quick start interface

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After selecting protocol parameters, click the "OK" to enter the protocol interface, as Fig 5- 7. It mainly consists of title bar, main display area, menu bar and option bar.

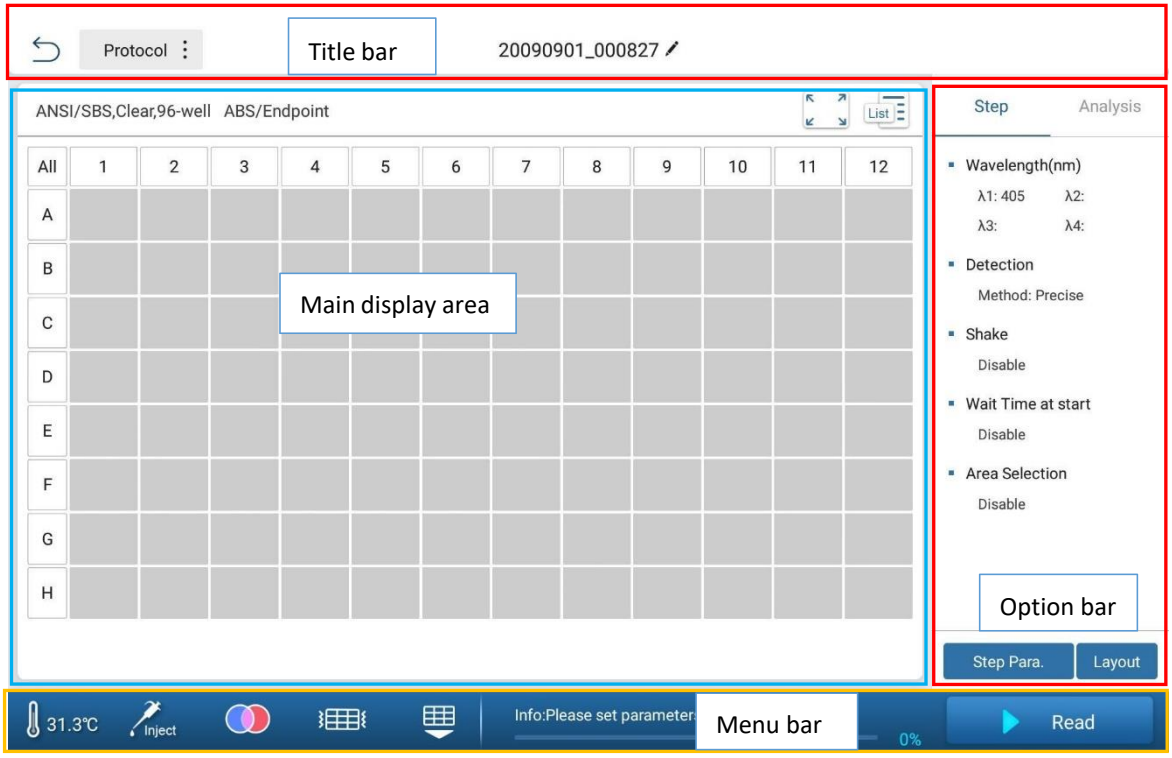

Fig 5- 7 Interface framework

There are four read modes: ABS, FL, LUM. The ABS mode have three read types: EndPoint, Kinetic, Spectrum, the other two read modes have only have EndPoint and Kinetic. The basic difference between the Endpoint and Kinetic is that the Endpoint only takes once read, whereas the Kinetic is a cycle read, with a minimum of two reads and a maximum of 99. Where the specific number of reads is determined by the setting of time reading in Kinetic, the spectrum is read in the wavelength range of 200-1000 according to specified rules. Table 5- 3 shows the relationship between read modes and read types.

Table 5- 3 Relationship between Read Modes and read types

	EndPoint	Kinetic	Spectrum
ABS	1.General 2.Shake 3.Advanced 4.Area Selection	1.General 2.Detection 3.Shake 4.Advanced 5.Area Selection	1.General 2.Shake 3.Advanced 4.Area Selection
FL			×
LUM	1.Injector 2.General 3.Shake	1.Injector 2.General 3.Detection	×

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	4.Advanced 5.Area Selection	4.Shake 5.Advanced 6.Area Selection	

2.1 Title bar

The title bar is used to return to the previous page, protocol operations, name and modify files, as Fig 5- 8.

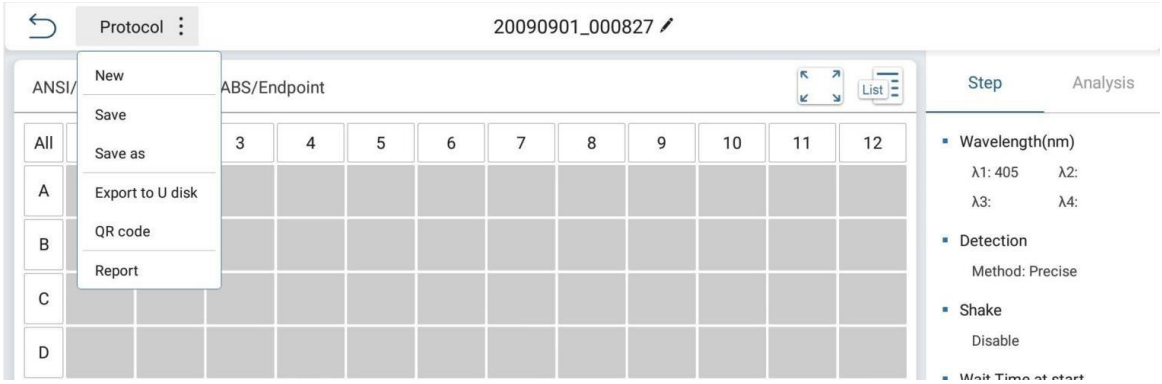

Fig 5- 8 Title bar

Table 5-4 describes the functions of the title bar.

Table 5- 4 Functions of title bar

Name	Functions
	Click and a prompt box will pop up asking the user whether to exit the current interface; click "OK" and another prompt box will pop up "Do you want to save the current protocol?"; click "OK" to save and exit; click "No" to exit without saving;
	Click to display the input box to modify the current name. The input box contains a maximum of 15 characters /15 Chinese characters, including upper/lower case letters, digits, Chinese characters, and symbols "-" and " ".
Protocol	Click to display operation optiions, including New, Save, Save as, Export to U disk, QR code;
New	Click and the selection box as Fig 5-6 will pop up;
Save	Click to save the current protocol/results;
Save as	Click to pop up the save protocol name input box, if the current protocol has been executed, then the pop-up box with another "without data" option;
Export to U disk	Click to determine whether to insert U disk first, if no, it will prompt, if yes, the selected protocol will be exported to U disk;
QR code	Click to generate a QR code for the data on the left of the standard curve;

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Click the "modify name", and the input box for modifying the protocol name will pop up, as Fig 5- 9. The red text indicates that the protocol has the repeated name; otherwise, it will not be displayed.

Fig 5- 9 Input box for protocol name

2.2 Main display area

The main display area consists of two parts: operation bar and display area. The default display area is 96-well plate, consisting of 8 rows (A-H) *12 columns (1-12). Click A-H to select all the wells in the row, click 1-12 to selectall the wells in this column, and click the blank block above A to select all the wells of the plate. Template include 96-well plates and 384-well plates. Table 5-5 lists the relationships between microplates and their names. The microplates cannot be scaled if the microplates are smaller than 96 well.

In the operation bar, you can view Kinetic or Spectrum data, run logs and data list.

Table 5- 5 Relationships between microplate and name

Well plate	Name
96 well plate	ANSI/SBS,clear,96-well
	ANSI/SBS,black,96-well
	ANSI/SBS,white,96-well
384 well plate	ANSI/SBS,clear,384-well
	ANSI/SBS,black,384-well
	ANSI/SBS,white,384-well

According to the type of the current interface, the content of the main display area is different. Fig 5- 10 shows the finished interface when the protocol is running Endpoint.

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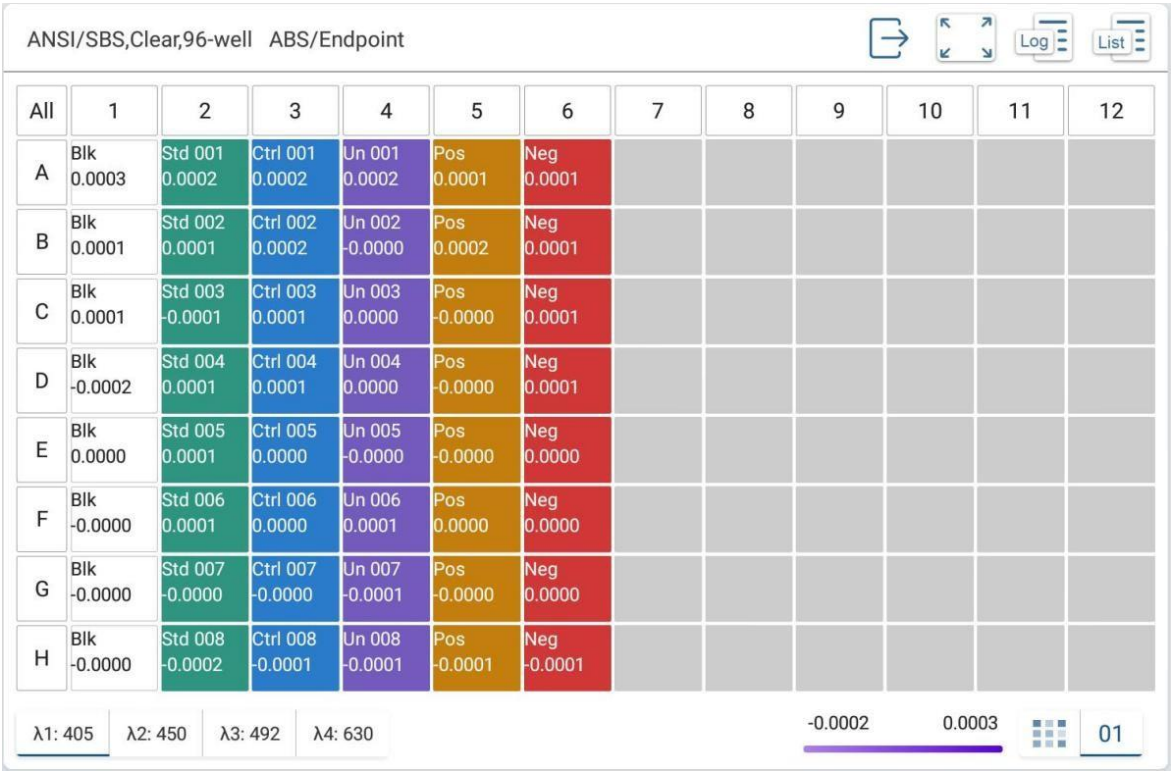

Fig 5- 10 Protocol finished interface(Endpoint)

After the protocol is finished, the heat diagram is shown in Fig 5- 11. Only the Endpoint has heat diagram.

Fig 5- 11 Heat diagram interface after protocol is finished

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Fig 5- 12 shows the interface when the protocol is finished, when Kinetic or Spectrum is running.

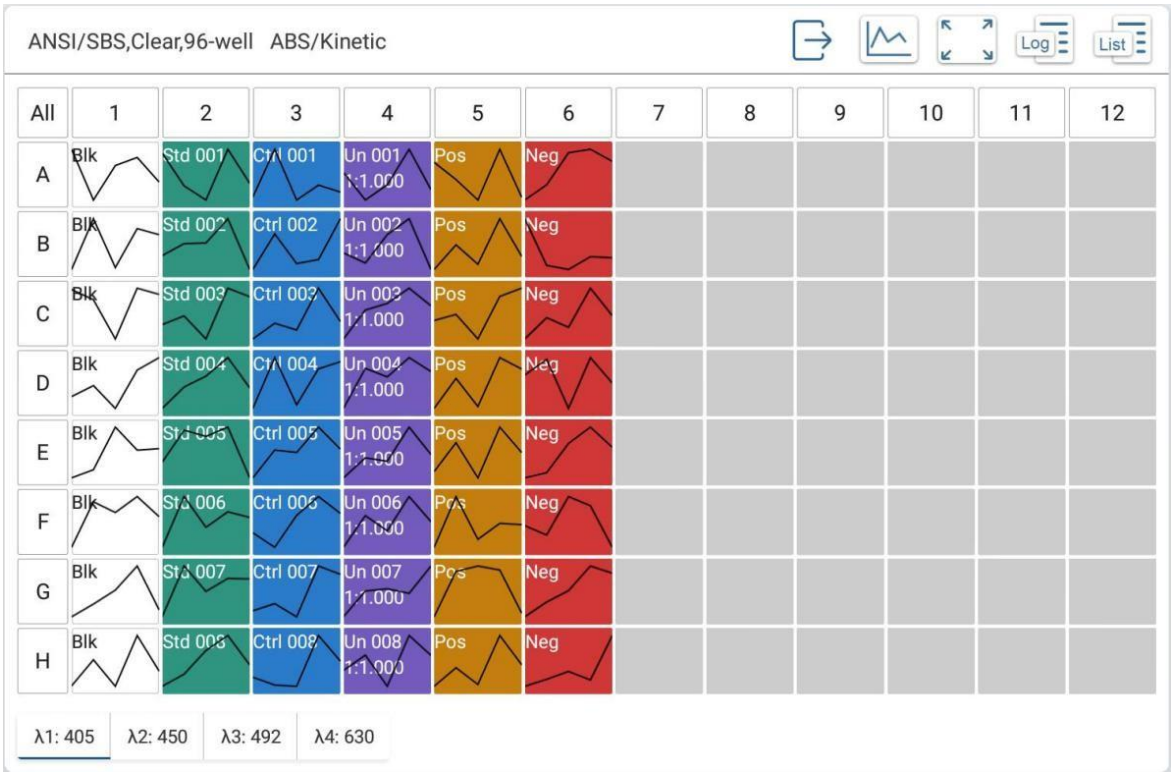

Fig 5- 12 Protocol finished interface(Kinetic)

2.3 Option bar

In the options bar, switch between step and analysis at the top, and display, set, and layout buttons at the bottom, as Fig 5- 13.

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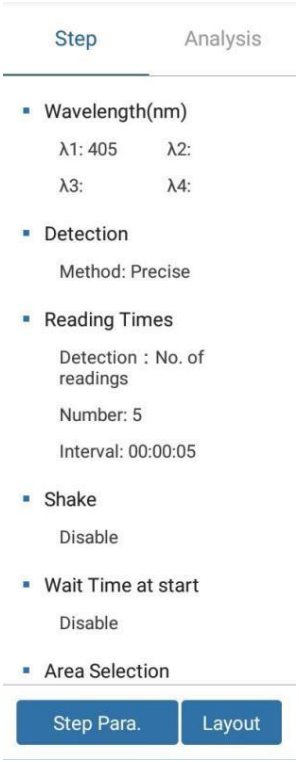

Fig 5- 13 Option bar

It is mainly used to set the parameter information of protocol running. There are four read modes: ABS, FL and LUM. There are three ABS read types: EndPoint, Kinetic and Spectrum, while the other two read modes only have EndPoint and kinetics.

2.4 Menu bar

The lower part is the menu bar, as Fig 5- 14. Including incubator, inject, filter, vibration, plate in/out, running information, Read button.

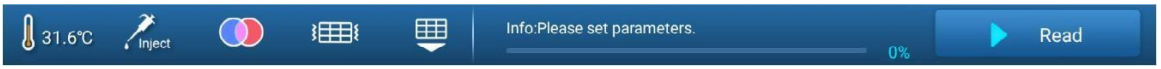

Fig 5- 14 Menu bar

Table 5- 6 lists the menu bar functions.

Table 5- 6 Menu bar function

Name	Function
	Click to pop up the incubator setting box;
	Click to pop up the inject setting box;

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	Click to pop up the filter setting box;
	Click to execute a vibration, lasting 1 second;
	When the plate of current instrument is out, click the plate into, otherwise the click plate out;
	Click to start reading, and the protocol becomes the stop button;

When you click the incubator button, the incubator temperature input box and keyboard will pop up. Enter the incubator temperature, as Fig 5-15.

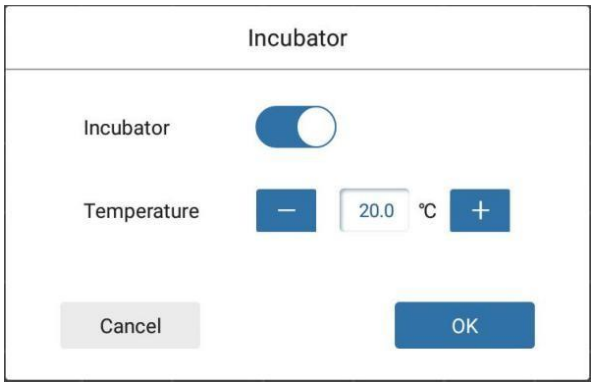

Fig 5- 15 Enter incubator temperature

The incubator function is a global variable. Table 5-7 lists the specific functions of the incubator setting interface.

Table 5- 7 Incubator interface function

Name	Function
Incubator	On or off incubation, off by default;
Temperature	Input the incubation target temperature, ranging from RT+4℃ to 45℃;
OK	Click to save the current Settings;
Cancel	Return button;

If the instrument does not have an automatic sample inject module, the button is gray and unavailable. When the injector button is available, click to pop up the injector interface, as Fig 5-16 and Figure 5-17.

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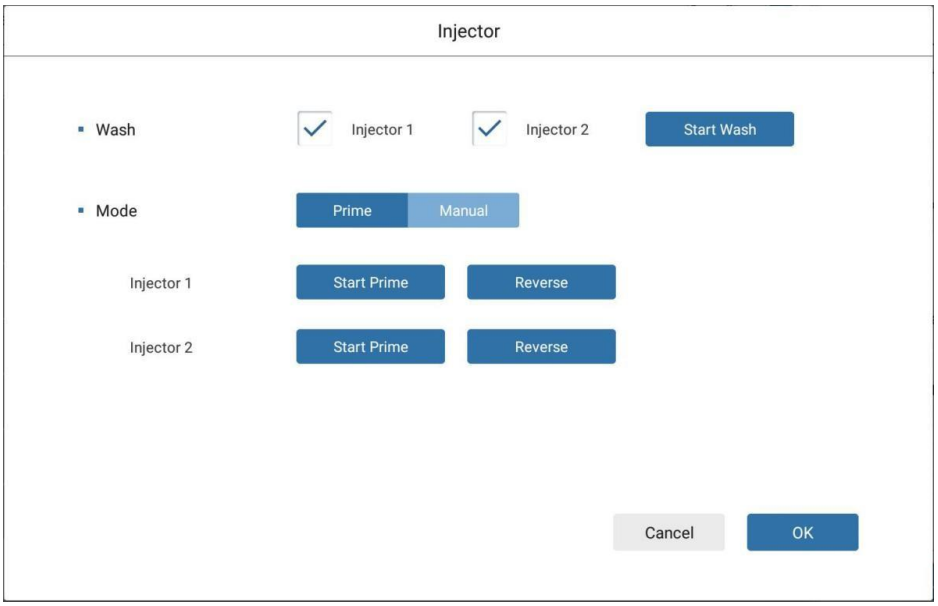

Fig 5- 16 Injector interface 1

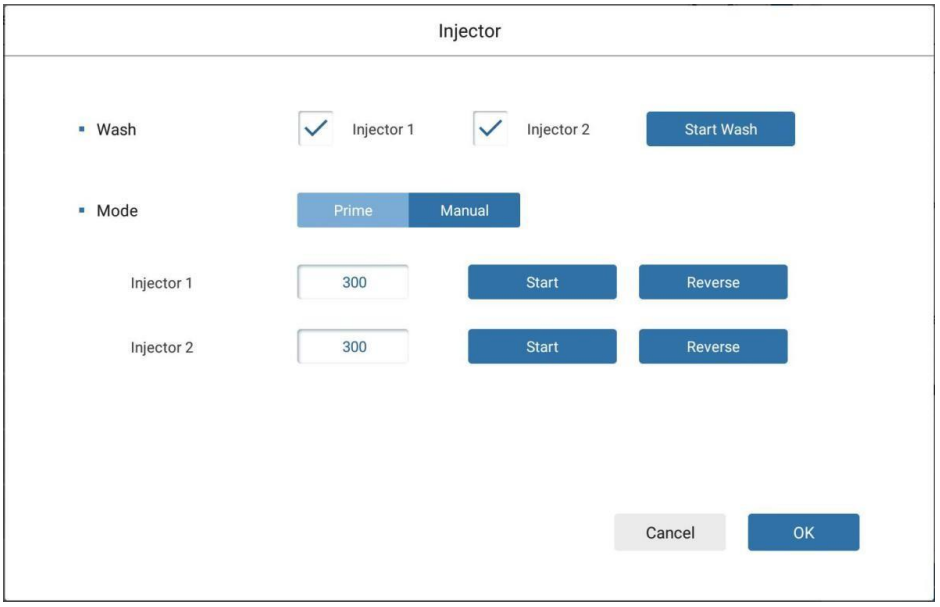

Fig 5- 17 Injector interface 2

Table 5-8 lists the functions of injection interface.

Table 5- 8 Functions of injection interface

Name	Function
Wash	Select at least one injector to be washed;
Mode	Select the injector mode, Prime or Manual is optional, default Prime. In Prime, the volume of wash and reverse is fixed;
Start Wash	Click to start wash;
Start	Click to start injection;
Reverse	Click to reverse part of the liquid;

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When you click the filter button, the filter setting interface pops up, as Fig 5-18, showing the information about the current filter and the filter that can be replaced.

Fig 5- 18 Filter interface

Table 5-9 describes the functions of the filter pop-up box.

Table 5- 9 Functions of filter interface

Name	Function
Excitation	Display the wavelength of excitation light;
Emission	Display the wavelength of emission light;
Replace	Click the instrument scanning module to scan the code. The user can scan the QR code of the new filter, and the interface will display the parameters of the new filter. Users can manually replace the filter;

The Microplate Reader has four physical buttons, namely "Start", "Stop", "Plate in/ Out", and "LCD" to flip the display. The physical buttons are only available on the plate interface.

3. Step parameter setting

3.1 ABS general setting

The general setting interface of Endpoint and Kinetic for ABS are the same, as Fig 5-19. On the left is the check box to confirm whether to enable the wavelength. If it is enabled, the corresponding graph box will be displayed. The graph box will change according to the input color. Enter range is 200-1000, λ1 defaults to 405, λ2 to 450, λ3 to 492, and λ4 to 630. Detection is divided into fast and precise, the default precise mode.

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Fig 5- 19 General setting interface of Endpoint and Kinetic for ABS

Table 5-3 lists the functions of general setting interface of Endpoint and Kinetic for ABS.

The general setting interface of spectrum for ABS is shown in Fig 5-20. Enter the start wavelength and end wavelength. The color of the graph box on the right changes according to the wavelength. The default value is 200nm for the start and 300nm for the end. The value ranges from 200nm to 1000nm. The default step is 10, it can change as required.

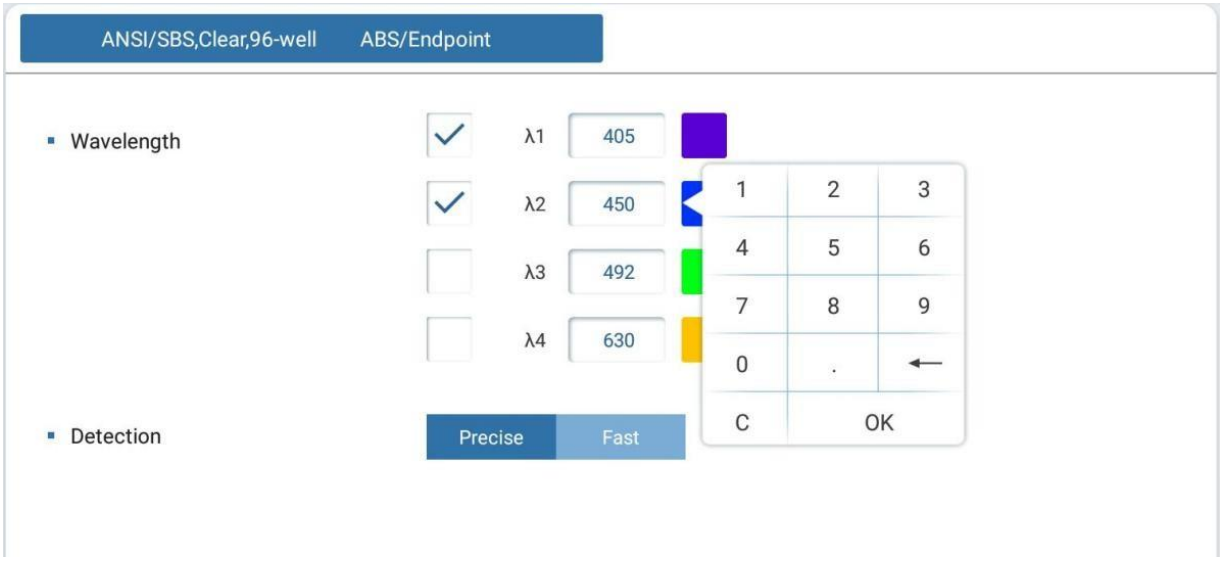

Fig 5- 20 The general setting interface of spectrum for ABS

3.2 FL general setting

The general setting interface of Endpoint and Kinetic for FL are the same, as Fig

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5-21. Table 5-10 lists the functions;

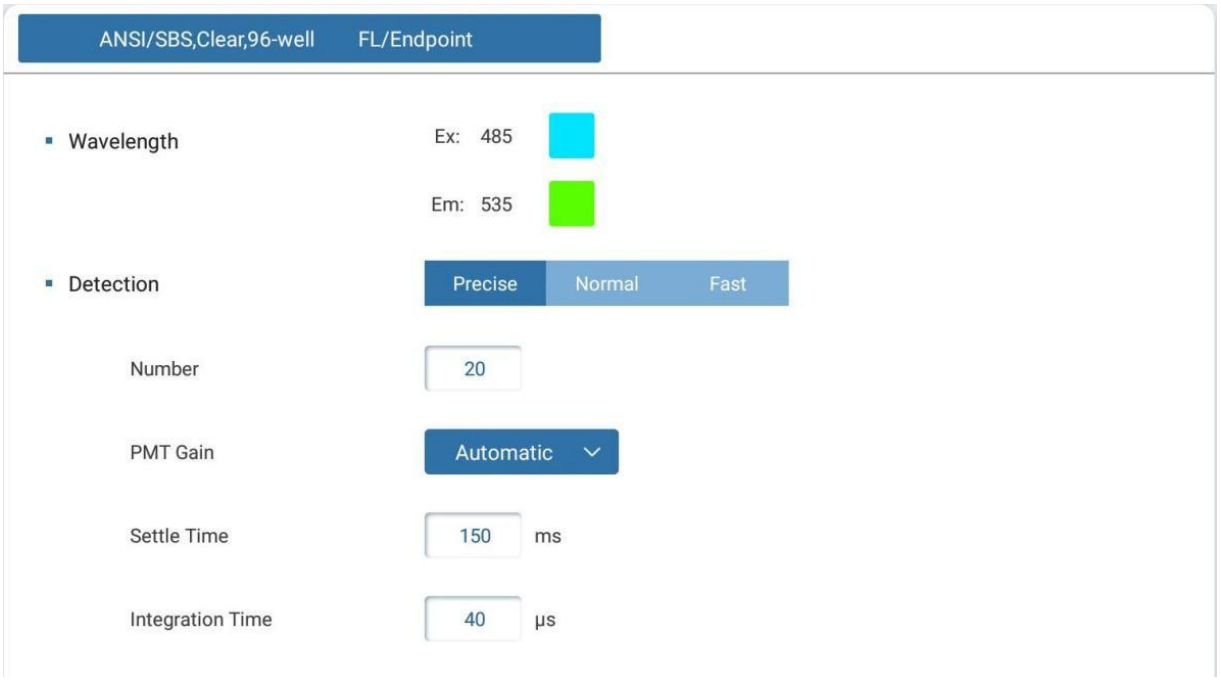

Fig 5- 21 The general setting interface of Endpoint and Kinetic for FL

Table 5- 10 Function of the general setting interface of Endpoint and Kinetic for FL

Name	Function
Wavelength	Display the excitation wavelength EX and emission wavelength EM of the instrument, which cannot be changed;
Detection	Can select Pricise, Normal or Fast, the default is Pricise. When selecting Pricise, you need to enter the number of times, the default is 20, and the range is 1-150;
PMT Gain	Optional Automatic/Low/Medium Low/Medium High/High, default automatic;
Settle Time	Settle time can be entered, default 150ms, range 5-999ms;
Integration Time	Integration time can be entered, default 40us, range 5-1000us;

3.3 LUM general setting

The general setting interface of Endpoint and Kinetic for LUM are the same, as Fig 5-22, Fig 5-23. Figure 5-22 shows the interface for selecting no reagent/reagent 1/ reagent 2 for injector, and Figure 5-23 shows the interface for selecting both reagents for injector.

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Fig 5- 22 The general setting interface 1 of Endpoint and Kinetic for LUM

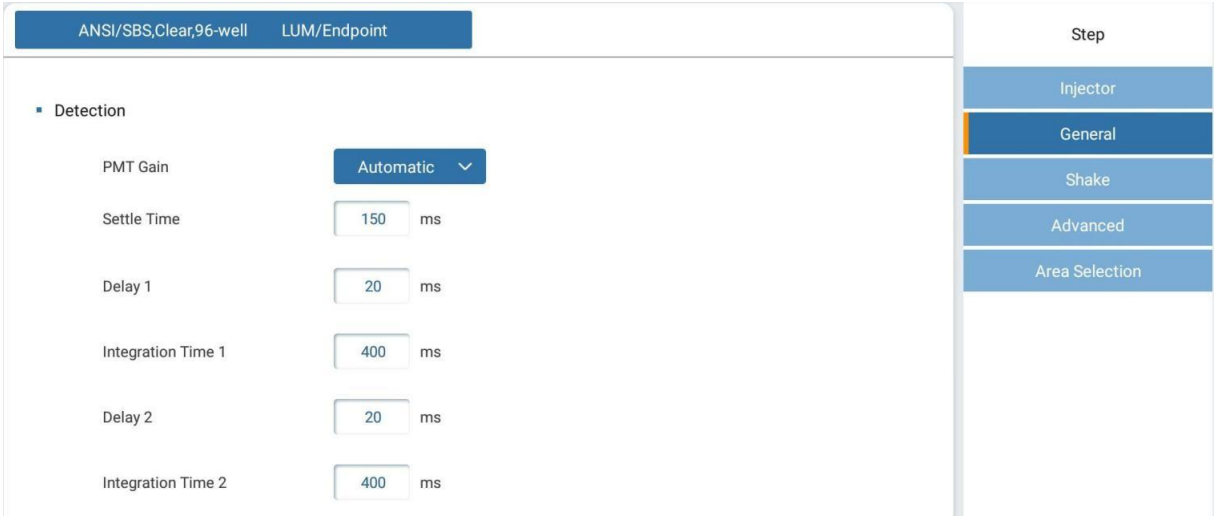

Fig 5- 23 The general setting interface 2 of Endpoint and Kinetic for LUM

The injector is specific to the LUM, as Fig 5-24 to 5-25. Input injector volume, default is 100µL. When both injectors are selected, the injector integrals are devided into injector volume 1 and injector volume 2, ranging from 5 to 500. Input injector speed, default 200uL/s. When both the injectors are selected, the injector speed is divided into injector speed 1 and injector speed 2, ranging from 5 to 500.

Fig 5- 24 Injector reagent 1

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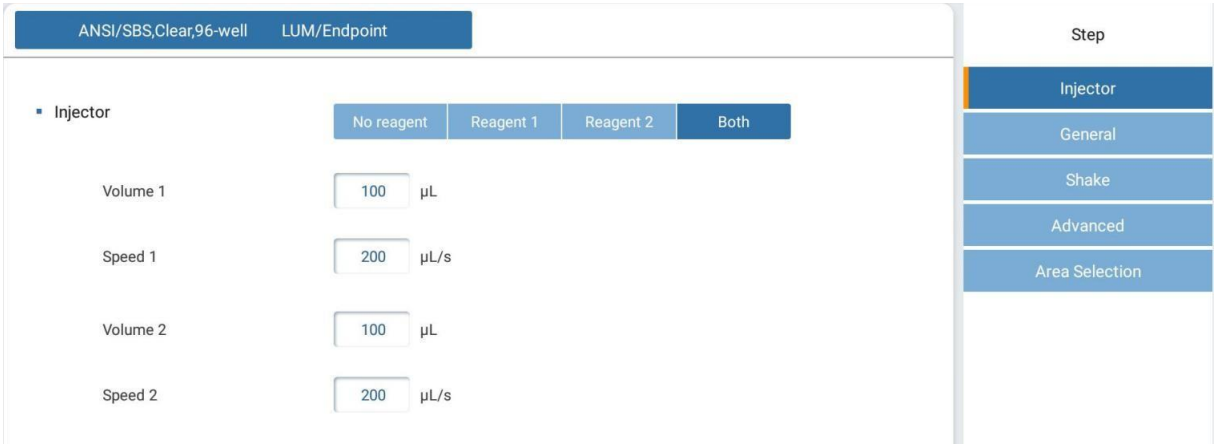

Fig 5- 25 Both injector reagents

3.4 Read setting

Click "Read" to enter the Kinetic parameter setting interface. The Kinetic Settings are divided into total time and number of readings, as shown in Figure 5-26 and Figure 5-27 respectively. When the total time is selected, the number of readings is calculated by rounding the value of time/ interval and adding 1. Table 5-11 lists the parameters to be set;

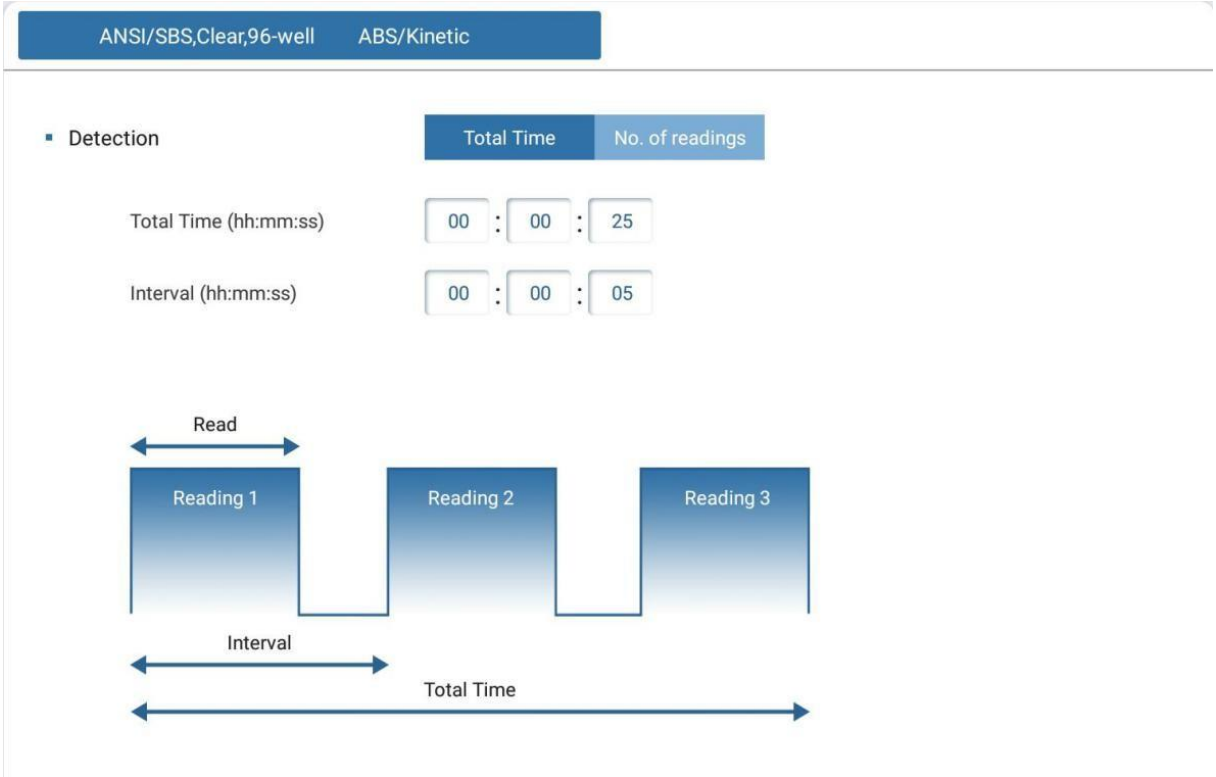

Fig 5- 26 Kinetic- Total Time setting

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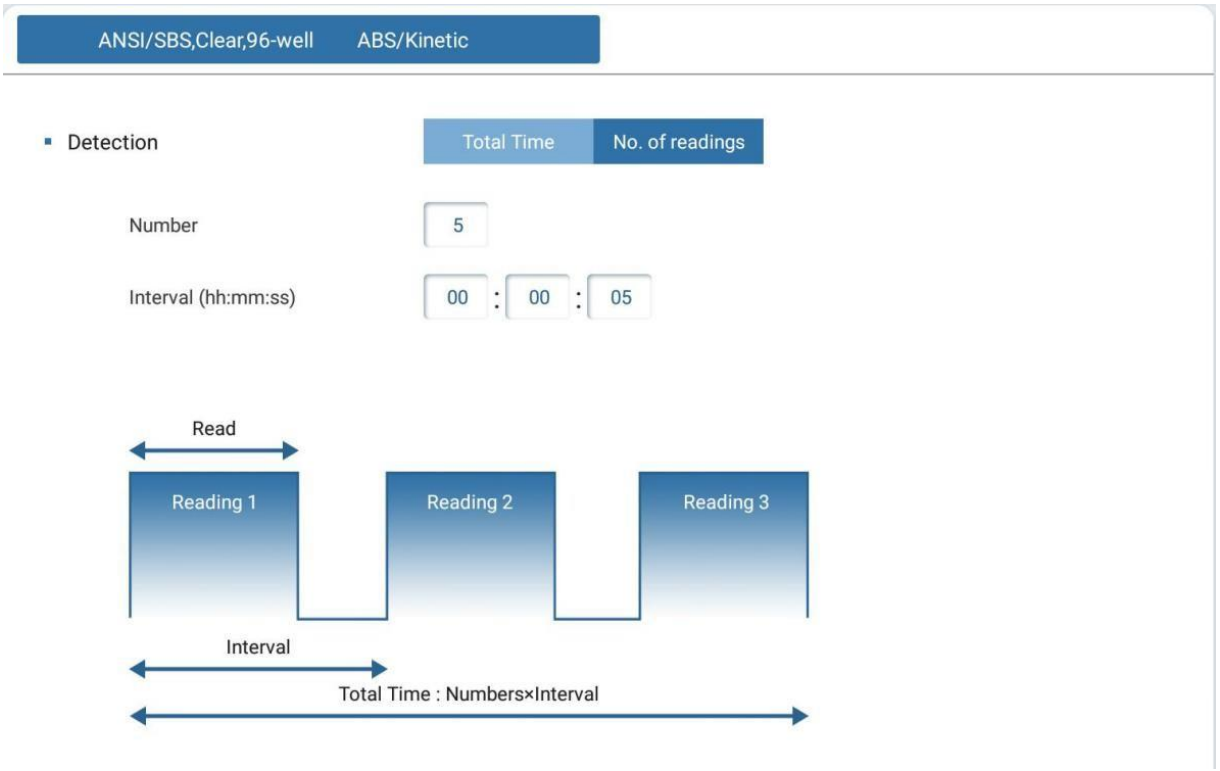

Fig 5- 27 Kinetic- No. Of readings setting

Table 5- 11 Function of Kinetic option columns

Name	Function
Total Time/No. of readings	Enable the total time to control the Kinetic cycle or according to the total number;
Total time	The maximum time is 99:59:59;
Number	The maximum number is 99;
Interval	The interval time between Kinetic, the maximum time is 99 hours 59 minutes 59 seconds;

3.5 Shake

Click Shake to enter the shake interface, as shown in Figure 5-28.

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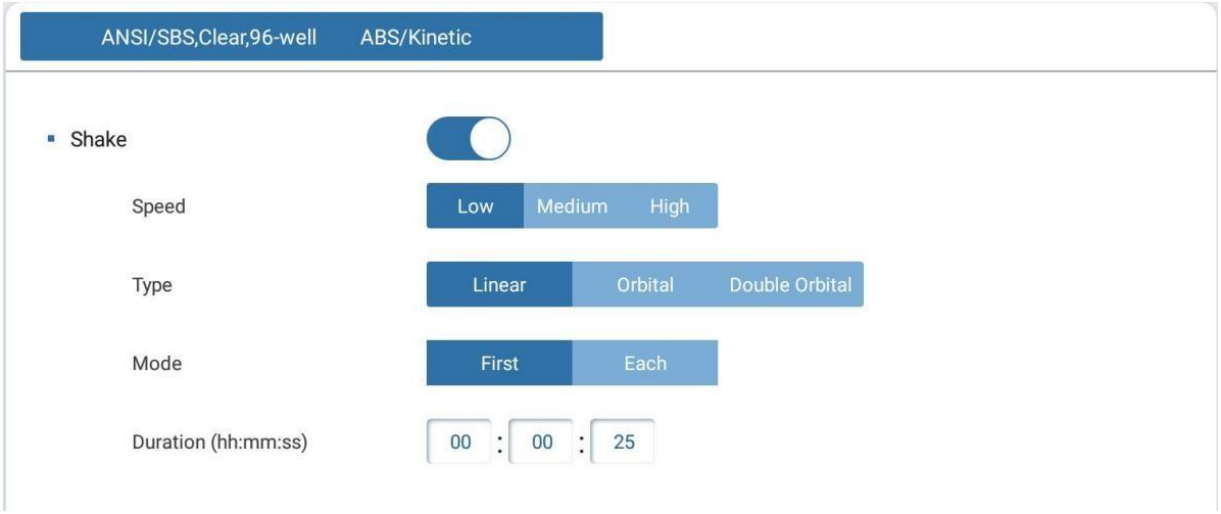

Fig 5- 28 Shake interface

Table 5-12 lists the default shake settings.

Table 5- 12 Default shake settings

Name	Default settings
Shake	The default value is off;
Speed	The default value is no display. When shake is on, the default value is low. It can select low/medium/high;
Type	The default value is linear. Linear/Orbital/Double Orbital is optional.
Mode	The default value is first time. It can select first time/each time. Only Kinetics has this function, Endpoint and spectrum do not have this function;
Duration	When shake is on, the default value is 00:00:25. The value ranges from 00:00:01 to 23:59:59;
Way	The default is plate, plate/well can be selected; Only LUM has this function, ABS, FL, TRF does not have this function.

3.6 Advanced

Click the advanced button to enter the advanced setting interface. At this time, the sub-option is closed. The advanced screen is displayed, as shown in Figure 5-29. Wait Time at start is on by default when LUM, and the rest are off by default. For LUM, the default time is 00:01:00, ranging from 1min to 30min. For others, the default time is 00:00:25, ranging from 0 to 01:59:59.

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Fig 5- 29 Advanced setting interface

4. Layout

Click the "Layout" button in the sidebar to switch to the layout interface, as shown in Figure 5-30.

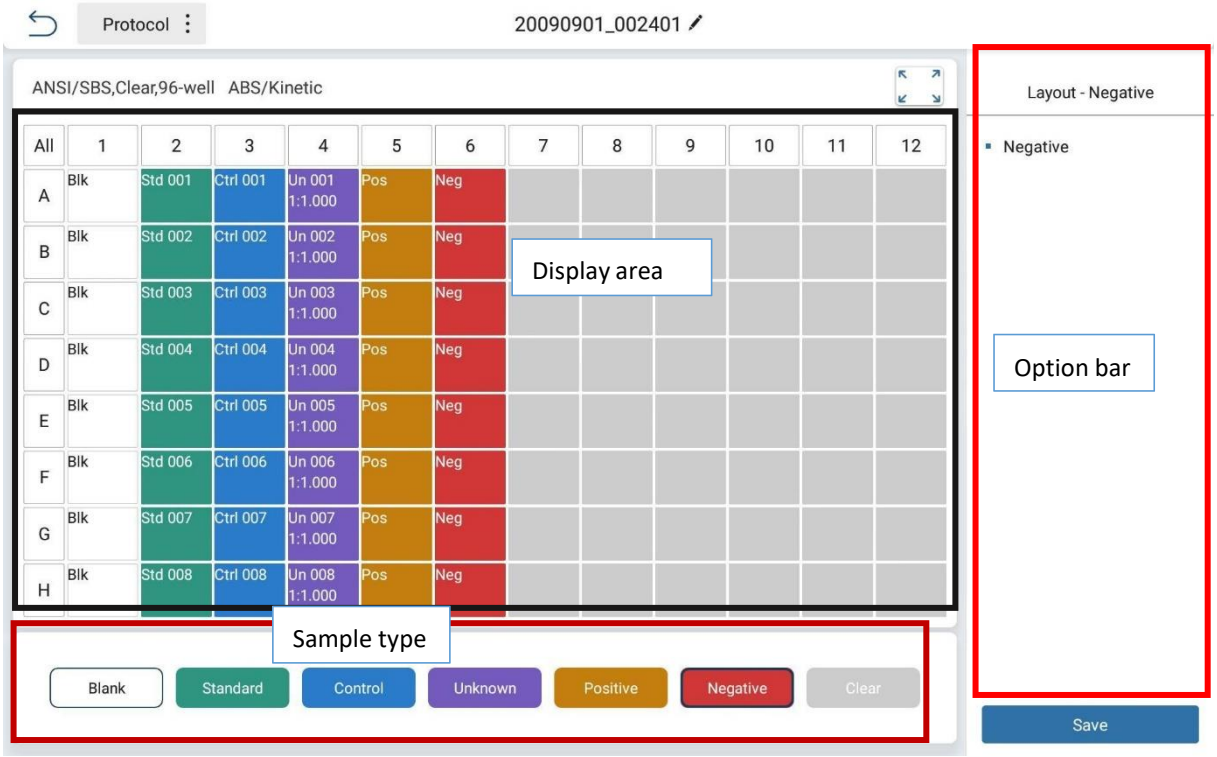

Fig 5- 30 Layout interface

Different colors correspond to different options, and different options include different operational functions. Sample types mainly include blank, standard, quality control, unknown, negative, positive and clear. These seven types are in single mode and displayed with stroke display after selection, as Table 5-13.

Table 5- 13 Sample types function

Name	Function	Icon

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Blank	Blank is replicas (replicates). By default, the name corresponds to the group name and number. The "Blank Subtraction" in the calculation is the average of all blank samples subtraction from the selected group.	

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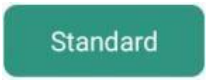
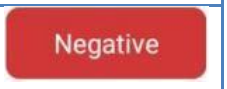
Standard	Standard is mainly used to place standard samples, standard curve can be made by standard products (standard curve). The concentration of the standard must be set in advance. It can be set as single well or replicates.	
Control	Control is used to place quality control samples. For user further operation analysis use, the default is replicates.	
Unknown	Used for placing solution samples of unknown concentration. Can be single well or replicates. Unknown product has dilution parameter option for setting dilution ratio.	
Negative	Negative samples are used for classification of special samples, default are replicates	
Positive	Positive samples are used for classification of special samples, default are replicates	
Clear	This parameter is used to clear the well status and set the well status to None. When a new protocol file is created, the default state of all wells is "None".	

5. Analysis interface

When the user clicks the "Analysis" button in the sidebar, the option bar will switch to the analysis interface, as Fig 5-31. The main display area includes the operation bar and the display area. The switch box is the data analysis area, and the option bar is the algorithm parameters and calculation type.

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Fig 5- 31 Main interface of result

Table 5-14 describes the functions of the data analysis area.

Table 5- 14 Function of Data analysis

Name	Type	Function
Raw Data	drop-down menu	Click to display the algorithm that can be selected;
Data Source	Key	Click to select the data source, the data source includes the raw data and blank subtraction data;

"Raw Data" is an item that cannot be deleted. The three operation modes of Endpoint, Kinetic and Spectrum have their own corresponding algorithm processes, and the algorithm cannot be deleted.

When click the existing calculation method in the data analysis area, the display area and the option bar on the right of the interface will jump to the corresponding content. For example, if select the standard curve calculation method in the data analysis area, the standard curve interface is displayed, and parameter settings of the standard curve are displayed in the option bar on the right.

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6. Algorithm

Users can choose the algorithm to calculate and analyze the raw data.

6.1 Endpoint

In the calculation analysis of the results, it should be made clear that all calculation methods operate on the data within the group, and a group is a whole. The Endpoint calculation method includes blank subtraction, basic calculation, standard curve, quality control, classification.

Table 5-15 shows the restriction relation of the endpoint method.

Table 5- 15 Restriction relation of the endpoint method

Name	Restriction condition
Blank Subtraction	Blank samples must be set
Standard Curve	The standard sample must be set, and the concentration of the standard sample is not always 0.
Quality Control	Quality control one must be set up
Classification	Negative and positive samples must be set

Table 5-16 shows the specific algorithm of the Endpoint method.

Table 5- 16 Specific algorithm of the Endpoint method

Name	Algorithm
Blank Subtraction	1) Blank subtraction(Android has normal blank only); 2) The read values of all blank wells in the sample group are averaged; 3)Subtract this average value from all samples within the group;
Basic Calculation	Data to data calculations 1)Select data as A; 2)Select one of the operators +, -, *, / between A and B; 3)Select data as B; 4)Get the calculation result.
Standard Curve	1.Linear 1)The read values of the standard samples were linearly fitted by the least square method. 2.Linear(through origin) 1)The read values of the standard samples were linearly fitted by the least square method. And must through origin. 3.Logistic(4PL)

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	1)Use 4PL fitting to calculate. 4.Quadratic, Cubic, Quartic Polynomial 1)Polynomial fitting calculation method, the core is the least square method. 5.Point to Point 1)The data points are wired from point to point directly. 6.Cubic Spline 1)Multiple linear system of equations. 7.Logitlog 1)The core is the least square method.
Classification	1)Select data source (concentration or absorbance); 2)Input values K1, K2, K3; 3)The critical value is calculated according to the formula K1*NC+K2*PC+K3 (where NC is the average value of negative sample reading, PC is the average value of positive sample reading); 4)Input values K4; 5)According to the weakly positive formula: ±K4%* critical value, the range of weakly positive was calculated; 6)According to the positive formula: > critical value, the positive range is calculated.
Quality Control	1)Select data source (concentration or absorbance); 2)Set target value and deviation value; 3)Calculate the values of the upper and lower limits according to the target value and deviation, and then check whether the read data is within the range of the upper and lower limits. If so, it will be displayed.

6.2 Kinetic

Kinetic algorithm include blank subtraction, basic calculation, and kinetic analysis.

Table 5-17 shows the restriction condition of the kinetic algorithm.

Table 5- 17 Kinetic algorithms restrict relation

Name	Restriction condition
Blank Subtraction	Blank samples must be set
Kinetic Analysis	Kinetic readings must be performed

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The specific algorithm of the kinetic is shown in Table 5-18.

Table 5- 18 The specific algorithm of the kinetic

Name	Algorithm
Blank Subtraction	1) Blank subtraction(Android version has just normal blank) 2) The read value of all blank well in the sample group are averaged; 3)Subtract this average value from all samples within the group.
Basic Calculation	Data to data calculations 1)Select data as A; 2)Select one of the operators +, -, *, / between A and B; 3)Select data as B; 4)Get the calculation result.
Kinetic Analysis	1. Average, SD and CV 1)Select reading range and take the kinetic read data of each wavelength; 2)Get average, SD and CV. 2.Integral to get the area of the curve 1)Set reading range and take the kinetic read data of each wavelength; 2)Calculate the area of line segments according to the calculation method of trapezoidal area (if it is multiple line segments, disassemble to calculate). 3.Baseline subtraction. Select a baseline and subtract the values corresponding to that baseline from all readings 1)Select reading range and take the kinetic read data of each wavelength; 2)Set baseline points (from the beginning to a baseline point or from a baseline point to the end) to get a baseline; 3) Take the average of the baseline; 4) All the absorbances minus the average. 4.Maximum Rate 1)Select readings range and take the kinetic read data of each wavelength; 2)Set the window value; 3) Set the units; 4) Calculate the reading difference between points (the reading at the last point minus the reading at the previous point) and divide by time. All results can be maximized according to the window partition. 5.Select Single Reading 1)Set the readings, select a single reading; 6.Select Reading Range 1)Set reading range and take the kinetic read data of each wavelength; 7.Maximum(Peak) 1)The maximum value of each curve

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6.3 Spectrum

Table 5-19 shows the constraints of the spectrum algorithm.

Table 5- 19 Spectrum algorithms restrict relation

Name	Restriction condition
Basic Calculation	Readings must have
Blank Subtraction	Blank samples must be set
Spectral Analysis	Must be in spectrum running mode

The specific algorithm of spectral is shown in Table 5-20.

Table 5- 20 The specific algorithm of spectrum

Name	Algorithm
Blank Subtraction	1) Blank subtraction(Android version has just normal blank) 2) The readings of all blank well in the sample group are averaged; 3)Subtract this average value from all samples within the group.
Basic Calculation	Data to data calculations 1)Select data as A; 2)Select one of the operators +, -, *, / between A and B; 3)Select data as B; 4)Get the calculation result.
Spectral Analysis	1.Spectral Maximum (select spectrum range) 1)Select spectrum range; 2) Select threshold; 3) Find out the absorption peak with the maximum wavelength, which is greater than threshold. 2.Spectral Normalization(select spectrum range) 1)Set the spectral range, take the maximum absorption peak as the number 1, and the remaining values are converted into percentages based on this baseline. 3.Ratio within Spectrum 1)Set two wavelength values, WL1 and WL2, which can be selected in the spectral range. Take the value of WL1/WL2. 4.Select Wavelength Range 1)Set the start and end wavelengths and read the measurements in the wavelength range. 5.Select Single Wavelength 1)Set the wavelength value and read the measured value at that wavelength.

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7. Algorithm parameter

The algorithm parameters are the specific setting parameters of the algorithm, which will change according to the change of the selected algorithm. The following are the algorithm parameters. Blank Subtracting does not need to set algorithm parameters, so it will not be introduced.

7.1 Standard curve

Figure 5-32 shows the algorithm parameter setting interface when standard curve is selected.

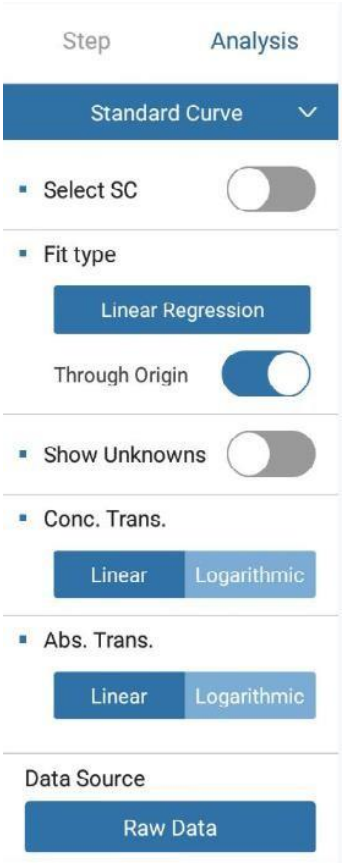

Fig 5- 32 Standard curve algorithm parameter interface

Table 5-21 describes the parameters of the standard curve algorithm.

Table 5- 21 Algorithm parameter function of standard curve

Name	Function
Fit type	Click to display the type selection interface of standard curve, as shown in Figure 5-32;
Show Unknowns	Click to display the reading point of the unknown sample in the figure, and click again to disappear;

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Through origin	The standard curve must be through origin when click it;
Conc. Trans.	Transfer the concentration of the readings to a linear or logarithmic display;
Abs. Trans.	Transfer the absorbance of readings to a linear or logarithmic display;

Figure 5-33 shows the interface for selecting a standard curve type. On this page, you can select a standard curve type, including linear regression, 4PL, quadratic polynomial, cubic polynomial, quartic polynomial, point to point, cubic spline, and Logit/log.

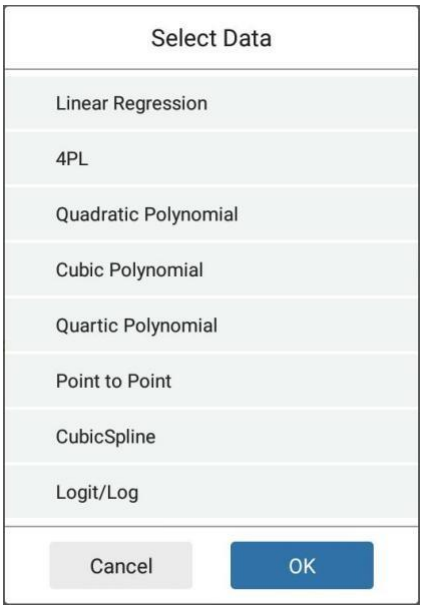

Fig 5- 33 Selecting interface of standard curve type

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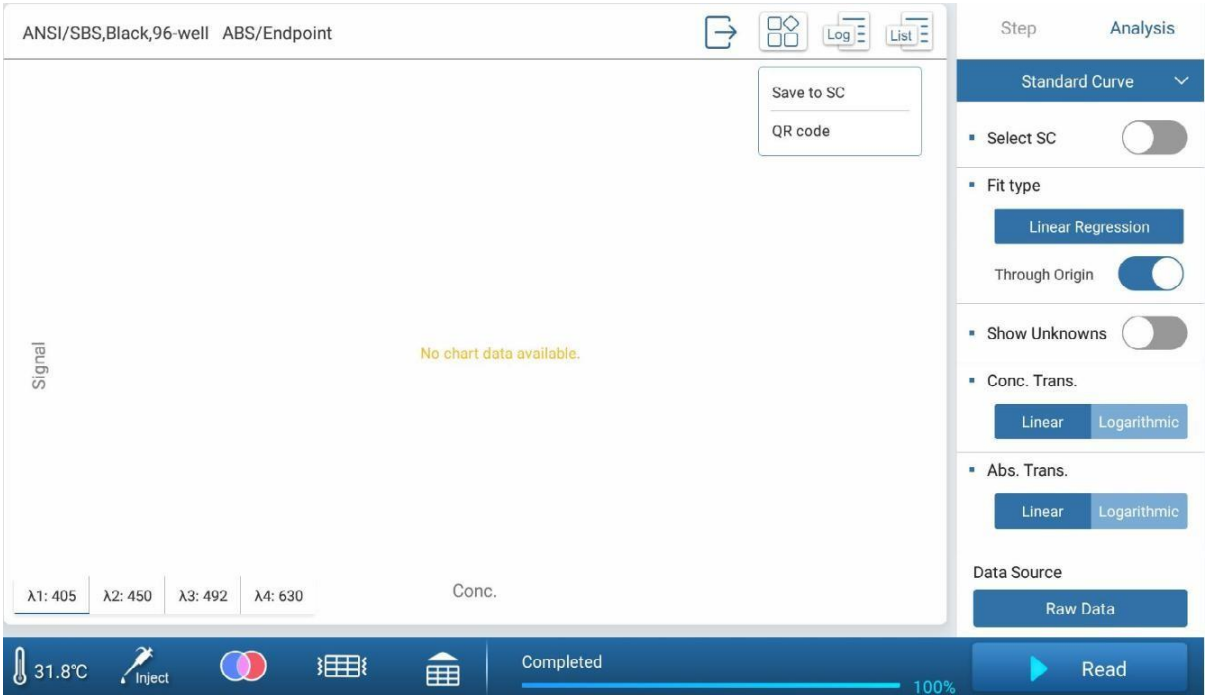
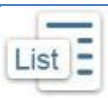


Table 5-22 describes the functions of display area on the standard curve interface.

Table 5- 22 functions of display area on the standard curve interface

Name	Function
	Click on the pop-up operation items, saved to SC and QR code
Saved to SC	Click saved the standard curve to SC
QR code	Click to generate the standard curve to QR code
	Click to zoom to restore the initial value
	Click to switch to the run log interface
	Click to switch to list interface
	Click to select wavelength to perform the standard curve analysis

7.2 Kinetic

When choose kinetic, calculation parameter settings vary according to different types of selection. the selection interface of kinetic calculation typeas shown in figure 5-34, including average, integral, baseline subtraction,

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select single reading, select reading range, maximum rate, maximum (peak) seven types of calculation, is single selection mode.

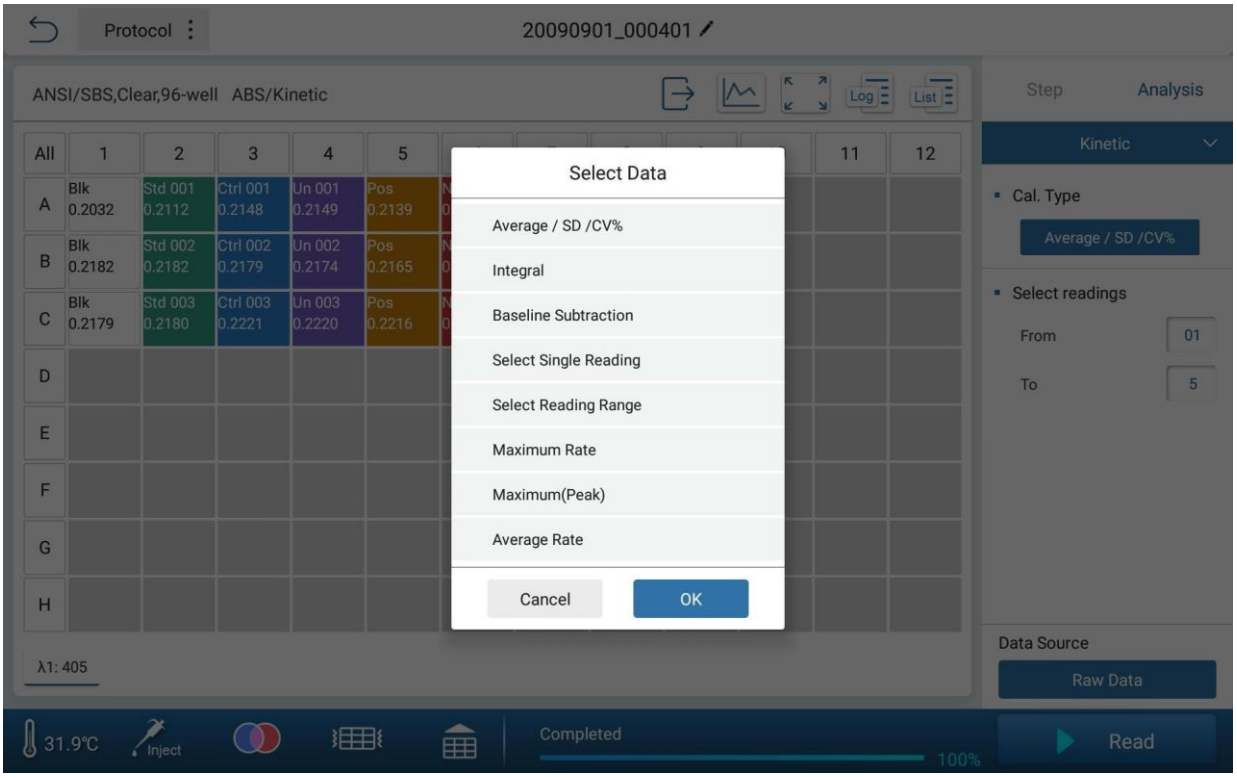

Fig 5- 34 Kinetic calculation type

7.3 Spectral analysis

When spectral analysis is selected, calculation parameter settings vary according to the selection type. Figure 5-35 shows the selection interface of spectral analysis calculation type, which includes five calculation types, namely spectral maximum, spectral normalization, ratio within spectrum, select wavelength range, and select single wavelength.

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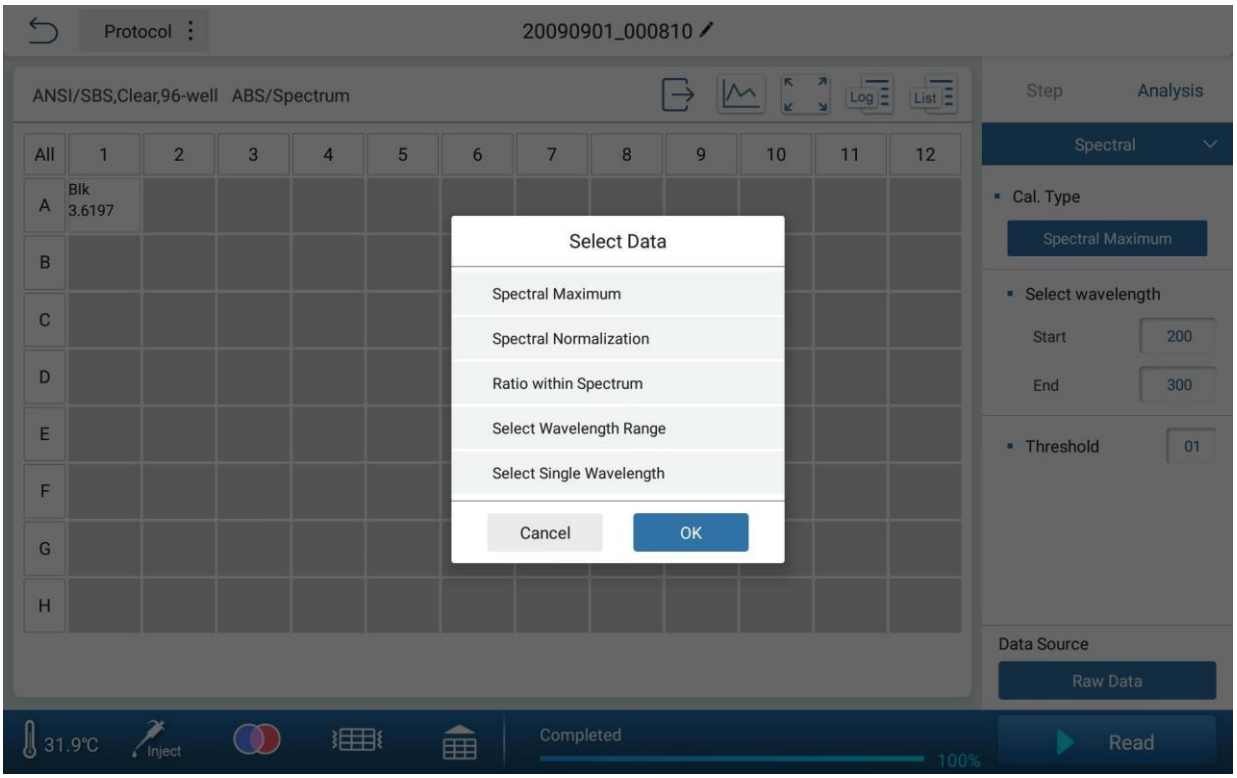

Fig 5- 35 Selection interface of spectral analysis calculation type

7.4 Basic calculation

When basic calculation is selected, Figure 5-36 shows the calculation parameter setting interface. Click to pop up the calculation type selection interface, including A+B, A-B, A*B, A/B.

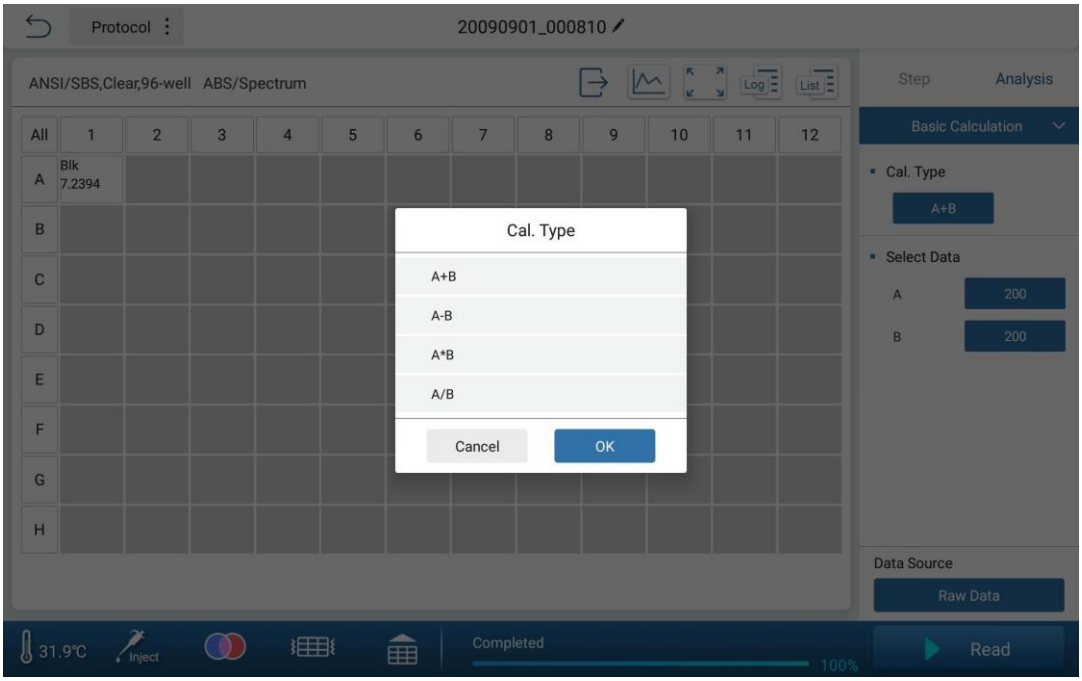

Fig 5- 36 Selection interface of basic calculation calculation type

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Figure 5-37 shows the interface for selecting basic calculation data. The raw data and all calculated steps are displayed on the left, and all optional values in the data are displayed on the right. The selection type is single.

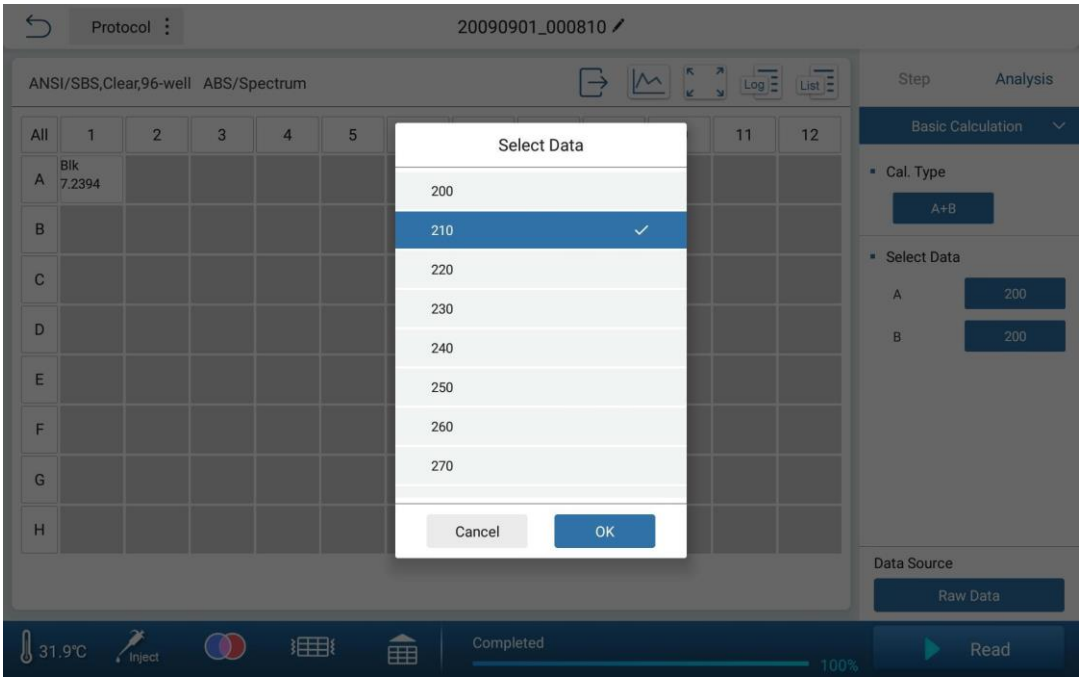

Fig 5- 37 Data selection interface of basic calculation

7.5 Quality control

When quality control is selected, the calculation parameter setting interface is shown in Figure 5-38.

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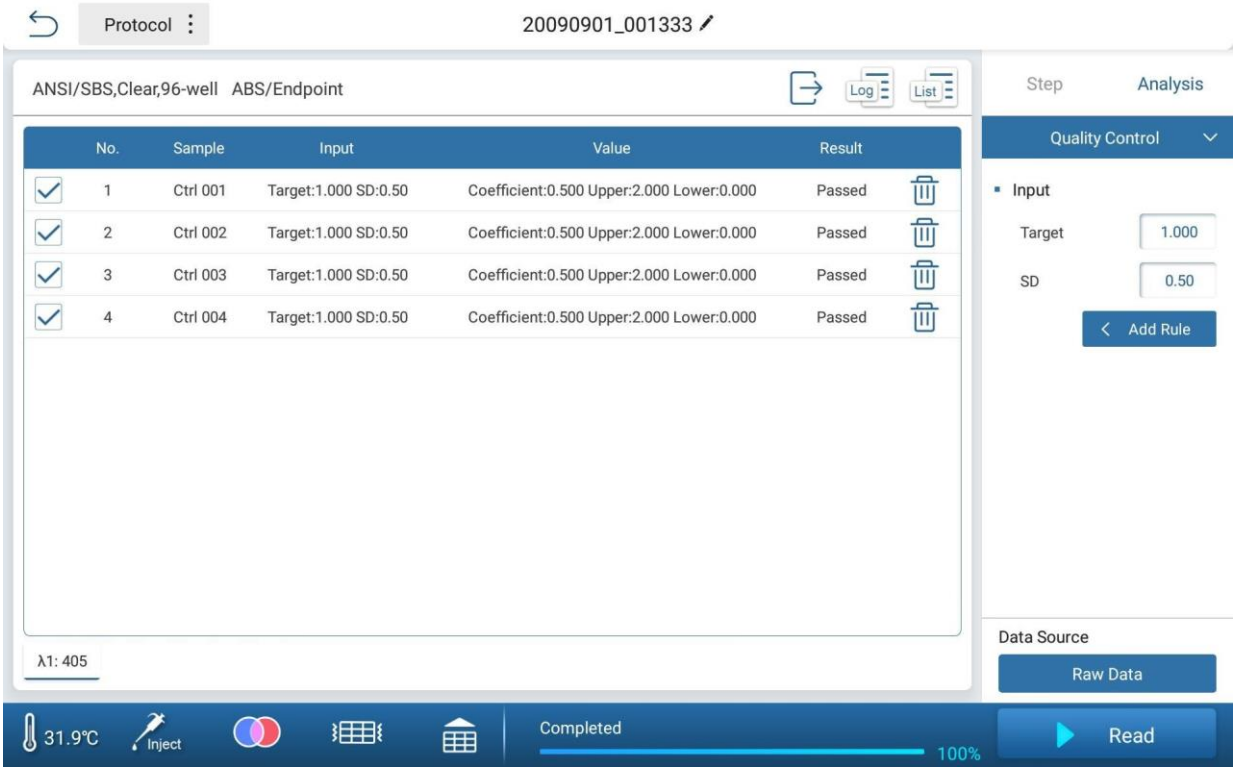

Fig 5- 38 Parameter setting interface of quality control

Table 5-23 describes the parameters of the quality control calculation.

Table 5- 23 Function of calculation parameters of quality control

Name	Function
Target	Click to enter the target value, default 1.000, range 0-999999, up to three decimal places;
SD	Click to enter the SD value, default 0.500, range 0-999999, up to three decimal places;
Add Rule	Click to add rules, and all values in the display area will judge whether each sample conforms to the set rules according to the set rules;

7.6 Classification

When classification is selected, the calculation parameter setting interface is shown in Figure 5-39.

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Fig 5- 39 Parameter setting interface of classification

Table 5-24 describes the calculation parameter setting interface for classification.

Table 5- 24 Function of calculation parameters of classification

Name	Function
Data Type	The value can be absorbance or concentration
K_1	Click to enter K1 values, default 1, range 0-999999, Up to three decimal places;
K_2	Click to enter K2 values, default 0, range 0-999999, Up to three decimal places;
K_3	Click to enter K3 values, default 0, range 0-999999, Up to three decimal places;
K_4	Click to enter K4 values, default 1, range 0-999999, Up to three decimal places;
Positive	Select the positive judgment sign;

In classification, the type will be displayed in the upper right corner of each data well in the display area. The positive icon is "++", the weakly positive iconis" + ", and the negative icon is "−", as shown in 5-39.

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8. FlexDrop Plate(optional)

This microplate is an optional part. If the user has purchased the U-Nano flexdrop plate of our company, this function can be used for flexdrop plate related tests. Click the "u-Nano" button on the main interface to pop up the reading type selection box, which can select Nucleic acid, Protein, or UV-VIS, as shown in Figure 5-40.

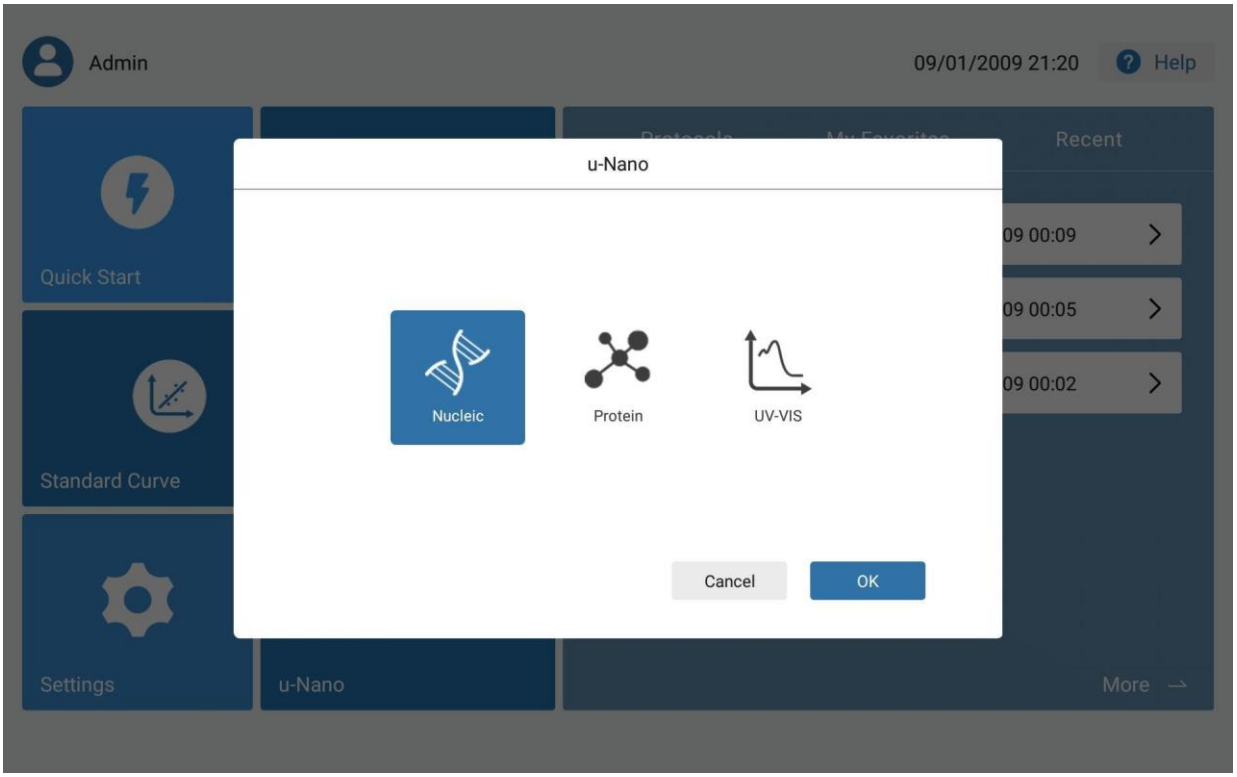

Fig 5- 40 Selection interface of u-Nano reading type

8.1 Nucleic acid

Select nucleic acid on the u-Nano interface and click OK to enter the nucleic acid reading interface and create a protocol. The main display area of nucleic acid interface is shown in Figure 5-41 and 5-42. On the left is the well location layout of flexdrop plate: row (A-H) * column (3-4).

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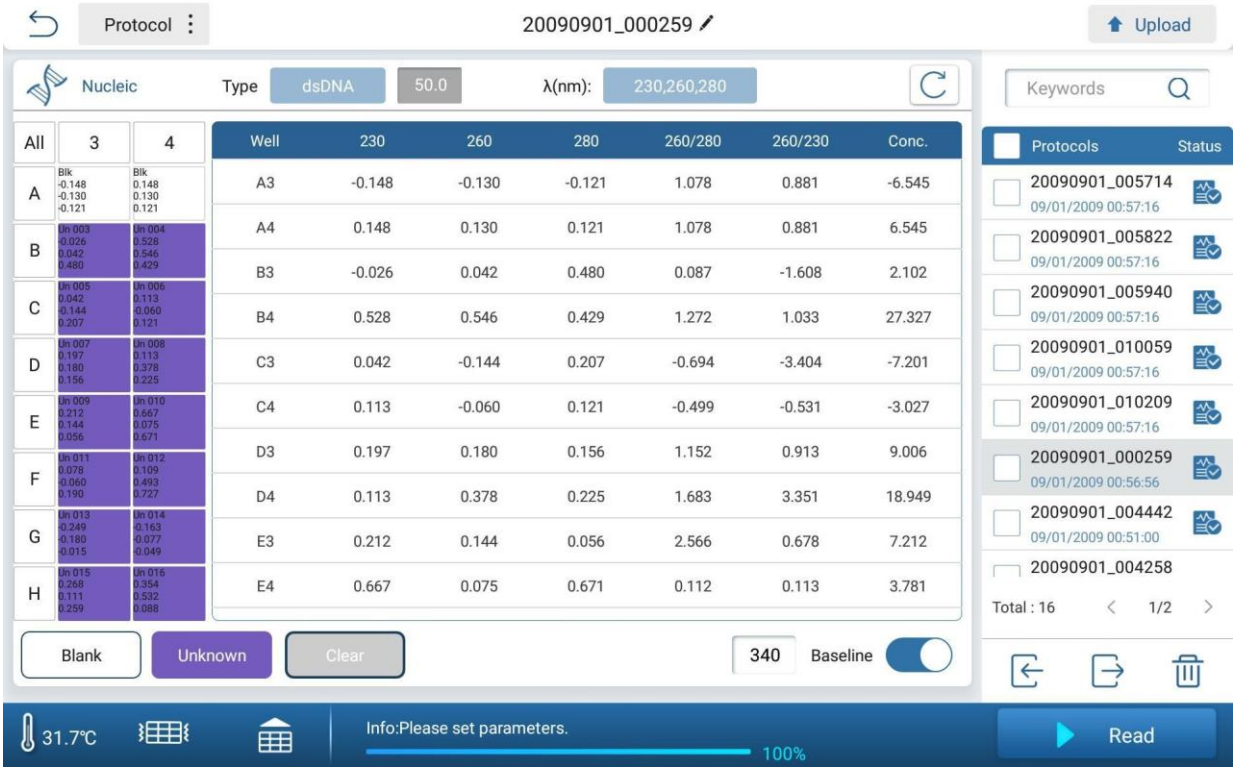

Fig 5- 41 Nucleic acid interface(multi-wavelength)

Fig 5- 42 Nucleic acid interface(spectrum)

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Table 5-25 describes the function of nucleic acid interface.

Table 5- 25 Function of nucleic acid interface

Name	Function
	Click to prompt whether to exit, if click "Yes" to prompt whether to save the current file, then click "Yes" to save and exit to the main interface, if click "No" to not save and exit to the main interface;
Protocol	Click the button to pop up the operation of the current selected protocol, including save, save as, export USB disk, QR code, report; When click save as, if the protocol has been run, a prompt box will pop up with whether to save the data option, otherwise, there is no option to save the data; The export format of the report is Xls, and the export format of protein and UV-VIS is the same;
	Click the pop-up modify input box, can modify the current protocol name;
Upload	Click to upload the current protocol to FTP. If the upload are not enabled in settings, the button will not be displayed. The function of protein and UV-VIS is the same;
Type	Click to select the type of nucleic acid reading, including dsDNA, ssDNA, RNA, Others; Among them, the coefficient of dsDNA is 50.0, ssDNA is 33.0, RNA is 40.0, the default value of Others is 25.0, users can manually input, the input range is 0.01-99.99;
λ(nm)	The reading mode can be selected from "multi-wavelength (230,260,280)" or "spectrum (220-350nm)";
	Click to view the graph of the selected well, only when the reading mode is spectrum, the button will be available;
	Click to refresh the current interface data;

Table 5-26 lists the functions of the main display area of nucleic acid.

Table 5- 26 Functions of the main display area of nucleic acid

Name	Function
Left wells	When not running, the well shows the sample name; When running multi-wavelength, the well displays the name and data; When running the spectrum, the well shows the name and curve Minimap; The operation of row, column, single selection and area selection of well is consistent with that of 96 well;

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Blank	Select this button, and then select the well of the flexdrop plate, then set the well to blank type;
Unknow	Select this button and then select the well of the flexdrop plate, then set the well to unknown type;
Clear	Select this button and then select the well of the flexdrop plate to clear the well setting, and there will be a prompt when clearing;
Baseline	Can set whether to open baseline, optional range of 220-350nm;
Well	Display well, display well list;

When reading the spectrum of nucleic acid, select the well and click the curve button to display the curve, as shown in Figure 5-43.

Fig 5- 43 Curve interface

The functions of the control area are shown in Table 5-27. The functions of the control area of protein and UV-VIS are consistent.

Table 5- 27 Functions of the control area

Name	Function
	Cannot be set. The incubation temperature is displayed in real time

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	Click and the instrument vibrates once
	When the plate is in the instrument, the plate out operation is performed; otherwise, the plate in operation is performed
	Click to run the protocol, and the key becomes stop key

On the right of the nucleic acid interface is a list of all nucleic acid files, including executed (with data) and unexecuted (without data). The executed icon is displayed next to the data, as shown in Figure 5-44. The file interface functions of protein and UV-VIS are consistent. Table 5-28 describes the functions of the file area.

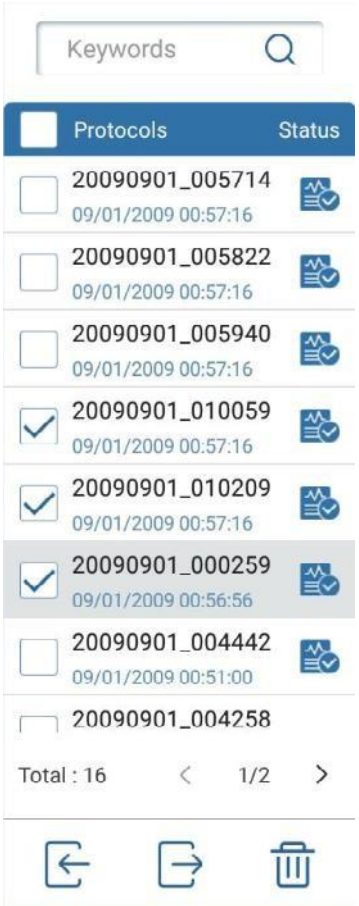
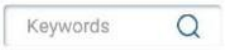


Fig 5- 44 File interface

Table 5- 28 Function of file interface

Name	Function
	Search based on input

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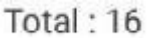
	Select the protocol to operate
	Displays the file name and the creation date
	Shows whether the protocol has been executed, the icon indicates that it has been executed, with running data
	Display the total protocol number
	Previous page, current/total page, next page
	Click, the box pops up, and display U disk specified directory, Udisk: \Feyond\ username \Nucleic. The user can select the protocol and import, as shown in Figure 5-45. The folder name of Protein is Protein, and the folder name of UV-VIS is Uv;
	Click to export the currently selected protocol to the USB disk, where the directory is Udisk: \ Feyond\ username\ Nucleic, as shown in Figure 5-46. If there is no USB disk, it will prompt. The folder name of Protein is Protein, the folder name of UV-VIS is Uv, and the folder name of Cuvette is Cuv;
	Click the pop-up prompt box to ask the user whether to delete the selected protocol, click yes to delete, the selected protocol refers to the check box selected.

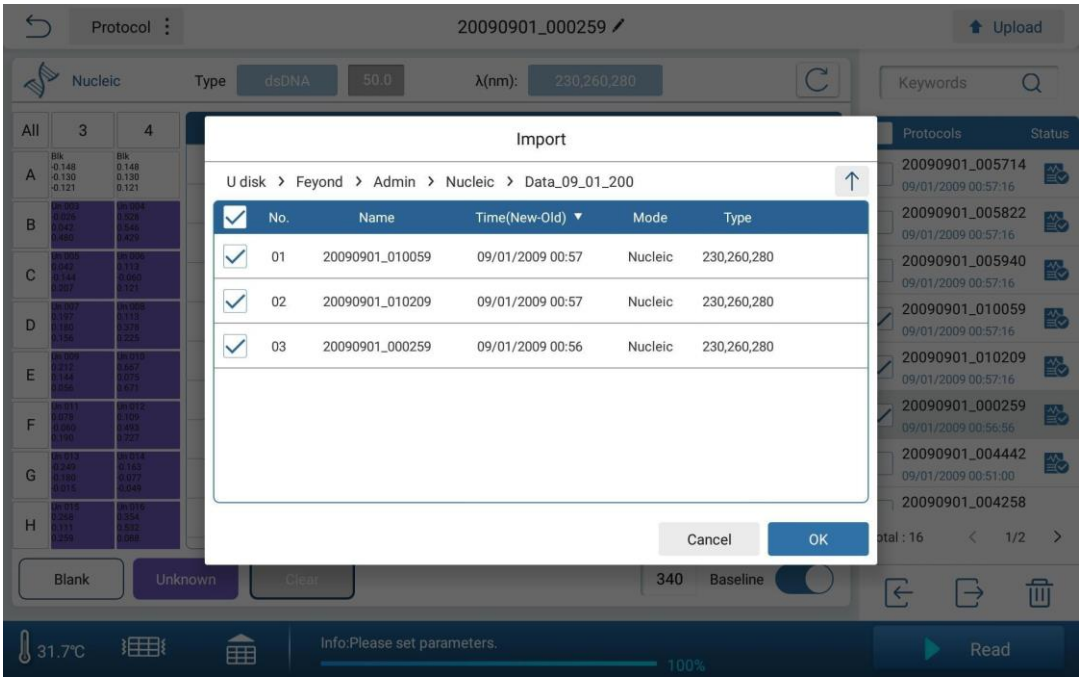


Fig 5- 45 Import protocol

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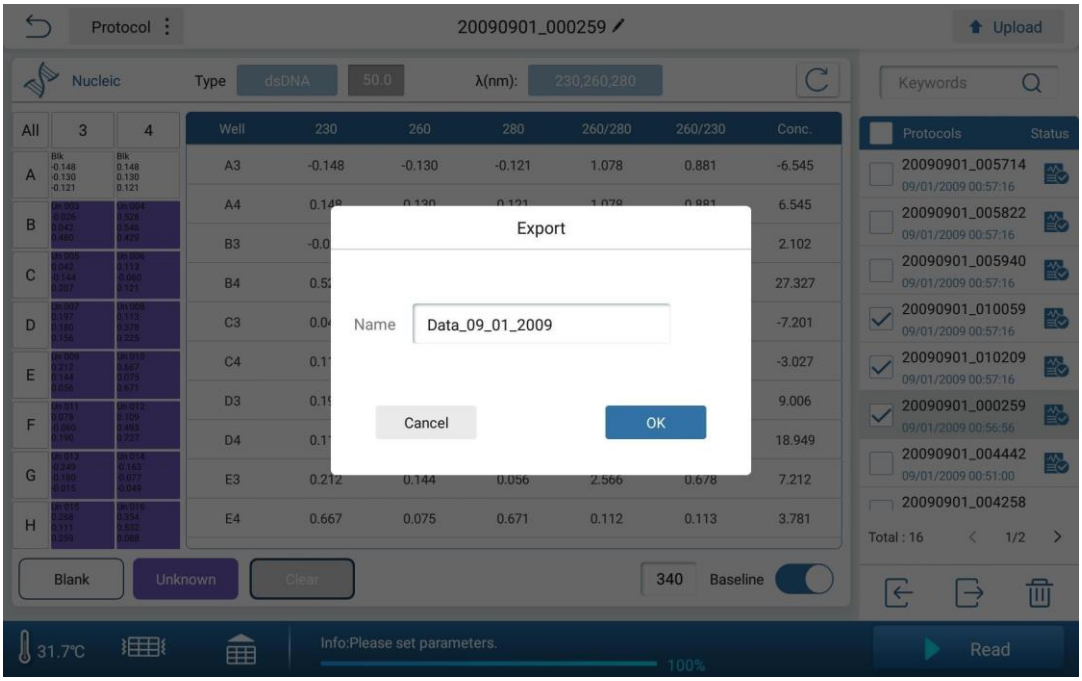

Fig 5- 46 Export protocol

8.2 Protein

Select the protein in the u-Nano interface and click OK to enter the protein reading interface, as shown in Fig 5-47 and Fig 5-48, where protein reading can be performed.

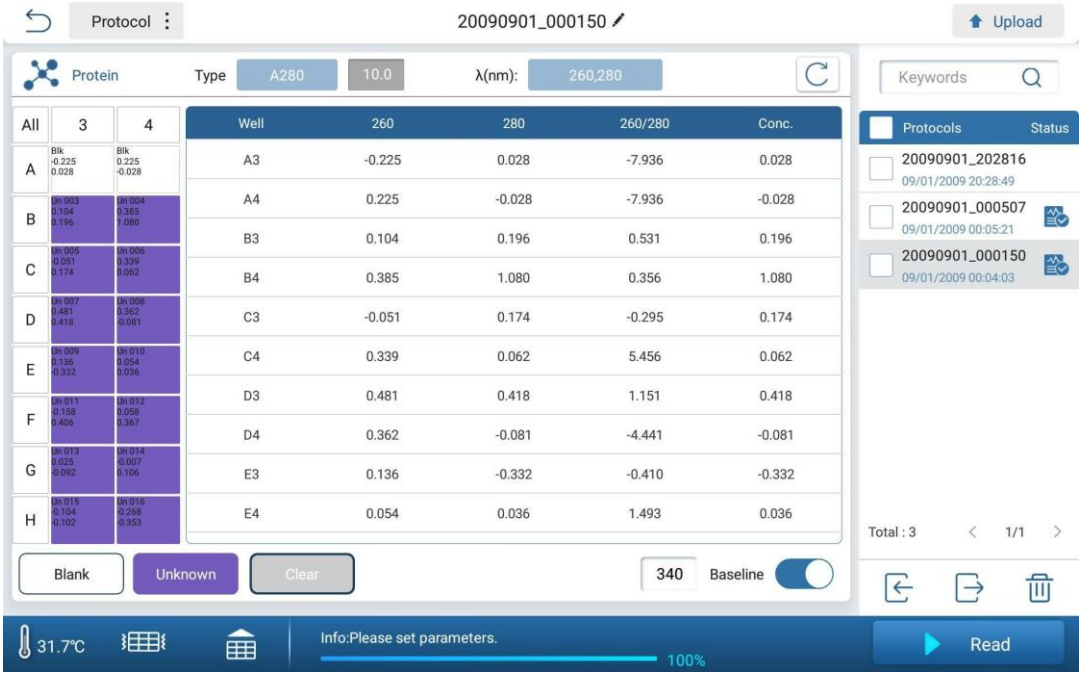

Fig 5- 47 Protein interface(multi-wavelength)

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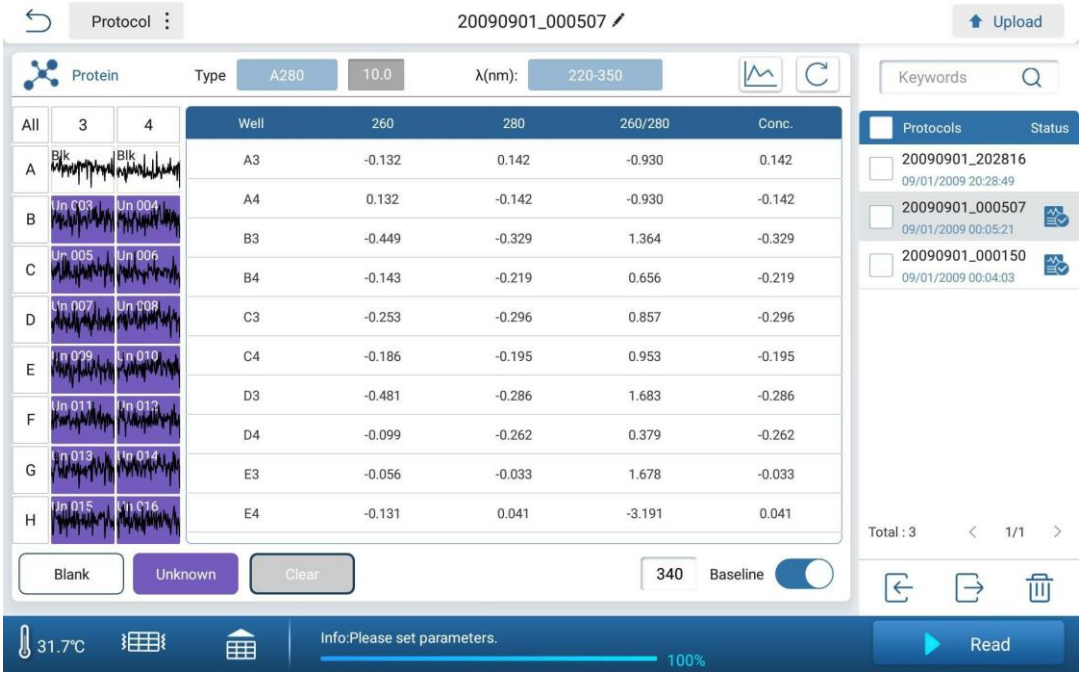

Fig 5- 48 Protein interface(spectrum)

Protein reading types, including A280, BSA, IgG, Lysozyme, others; The coefficient of A280 is 10.0, BCA is 6.7, IgG is 13.7, Lysozyme is 26.4, and the default value of Others is 25.0. It can manually enter the parameters from 0.01 to 99.99, as shown in Figure 5-49.

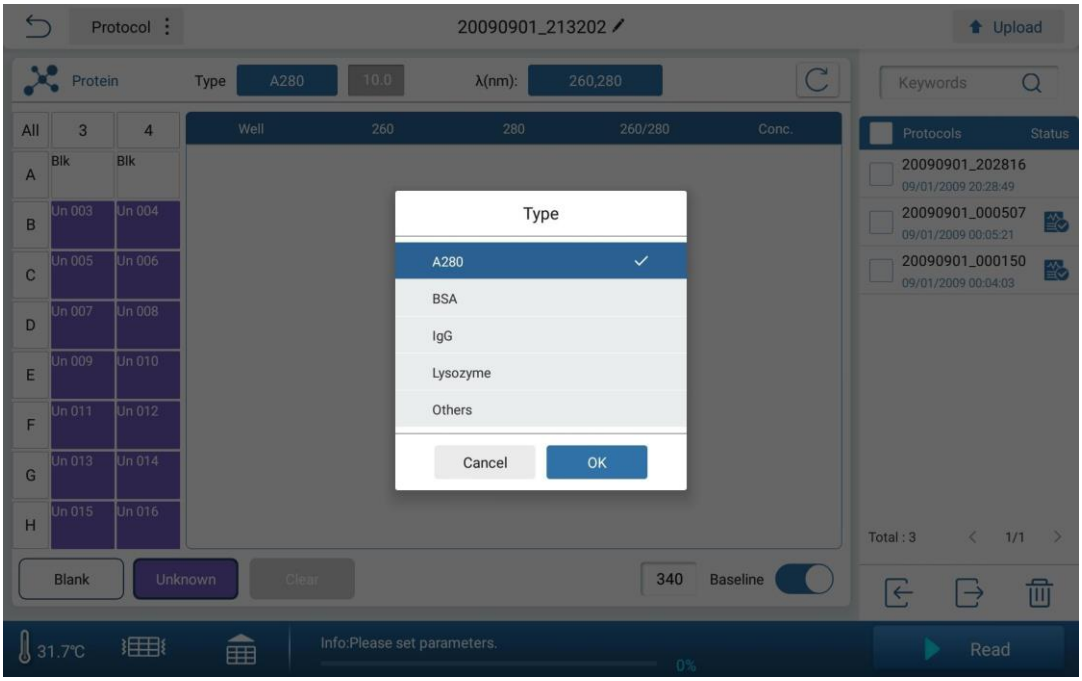

Fig 5- 49 Protein reading type

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8.3 Uv-Vis

Select UV-VIS on the u-Nano interface and click OK to enter the UV-VIS reading interface, as shown in Figure 5-50. λ(nm) Set the start wavelength, end wavelength, and step. The start wavelength must be smaller than the end. The default start value is 200, and the default end value is 350. The step value can be 1/5/10. The default value is 1. You can set whether to open baseline. The baseline wavelength can be set from the test wavelength range.

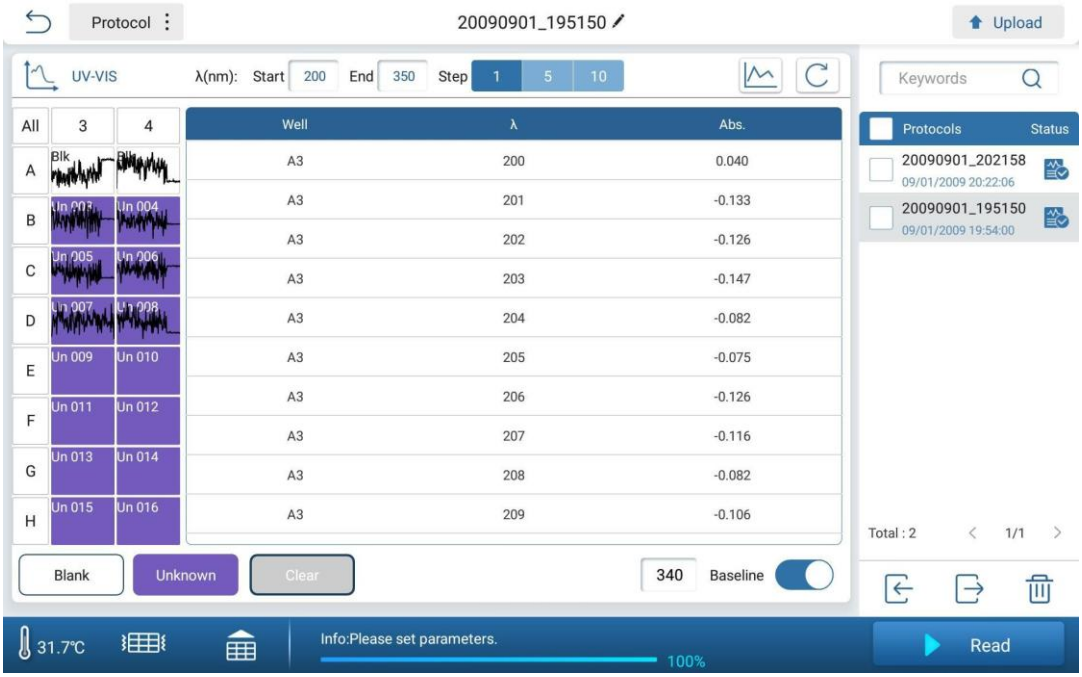

Fig 5- 50 Uv-Vis interface

9. Report export

After the results are processed, the processed data and raw data can be exported by the Report interface. Click "protocol" in the upper left corner, and then click "Report" to enter the main interface of the report as shown in Fig 5-51. is for quick export.

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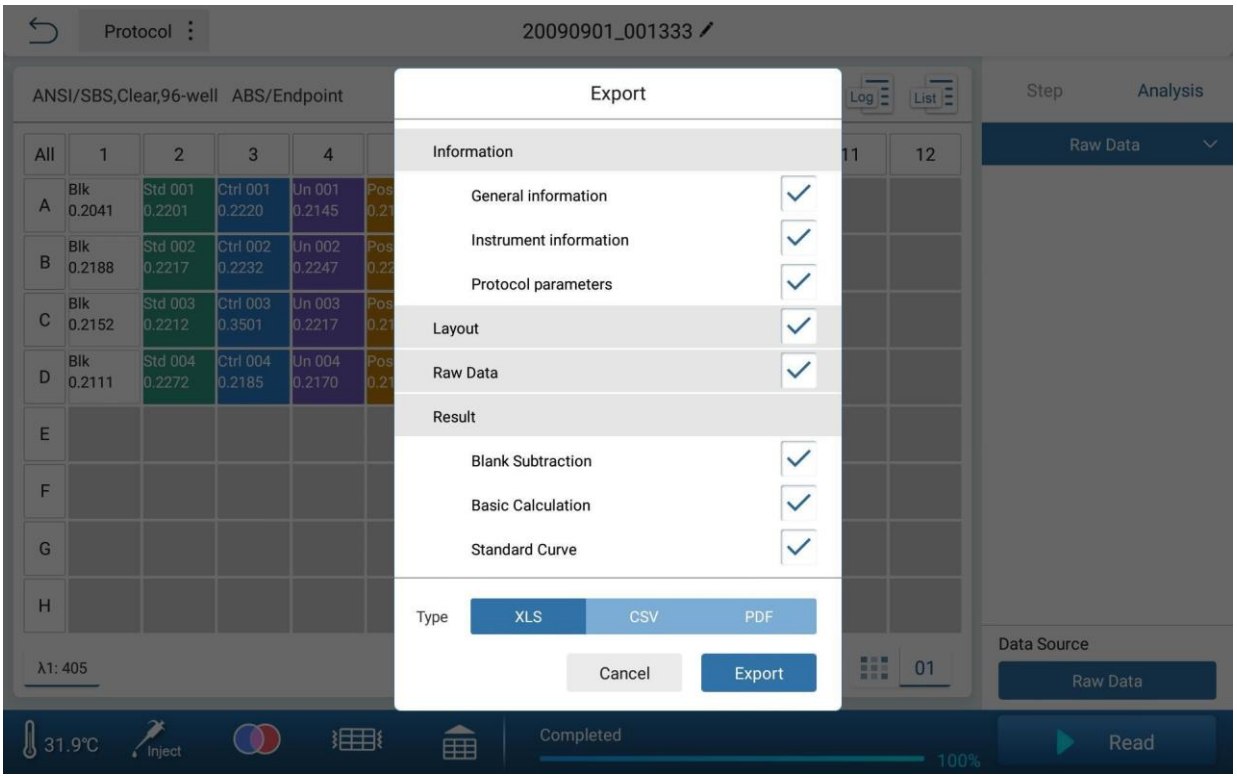

Fig 5- 51 Report export

In the File Type column, it can select the file format to export. Currently, three text formats are available:

- Xls
- Csv
- Pdf

On the right of Export content, select the content to be exported by click. If √ is displayed on the right, the option is selected. Click "Export" to export the data to the USB disk.

The export content is varies depending on the protocol setting and the result processing.

10. Power Off

When power off the device, note:

Remove the microplate kit from the instrument, and enter the microplate holder into the instrument;

Turn off the power switch at the back of the instrument to complete the power off.

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Chapter 6 Maintenance, storage, transportation

1. Maintenance

- Keep storage environment dry and clean to prevent moisture, corrosion, away from strong electromagnetic interference sources.
- Instrument already calibrated before leave factory. User is not allowed to disassembly and make adjustment. Any defectiveness, please contact manufacturer.
- Continuous emergency turning on/off is not allowed.
- Make sure apply the device with correct input voltage scope.
- Maintenance list

Content	/Day	/Week	/Year	When needed
Make sure the instrument power off correctly				√
Keep the instrument away from dust	√			
Remove overflowing solution right away in case any damage, then clean it by deionized-distilled water.	√			
If the surface been contaminated with a biohazard, sterilize it by mild disinfectant.	√			
Clean instrument enclosure regularly.		√		
Clean the plate holder when necessary.		√		
Verification by using light absorption verification plate.			√	
Sterilize the instrument when re-installing or maintaining.			√	
Maintenance				√

2. Storage and transportation

- Storage at room temperature -10℃～45℃, relative humidity less than 80%, without corrosive gas and with good ventilation.
- Keep away from heavy shock, vibration, and humidity during transportation.

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Chapter 7 Trouble shooting

Failure and solution:

No.	Trouble description	Possible reason	Solution
1	The Microplate Reader can not be started	Power supply failure	a. Check the if the instrument energized. b. If the power plug loose c. Check the voltage
2	"Communication timeout" during self-checking	Instrument not working	Restart the instrument and try again; if still same problem, please contact distributor or manufacturer.
3	"E913, E923, E933, E943" during self-checking	Insufficient of light intensity	Contact distributor or manufacturer.
4	"E912, E922, E932, E942" when self-checking	Light intensity is too strong	Contact distributor or manufacturer.
5	"E911, E921, E931, E941" when self-checking	Excessive dark current	Contact distributor or manufacturer.
6	"E612, E622, E632, E642" when self-checking	Detection module failure	Contact distributor or manufacturer.
7	"E402, E403, E415, E425, E435, E445" when self-checking	Motor failure	Contact distributor or manufacturer.
8	"E011~E056" when self-checking	Incubation failure	Contact distributor or manufacturer.
9	Test results are greatly deviated or all are zero	Xenon lamp damaged	Restart the instrument and try again; if still same problem, please contact distributor or manufacturer.
10	Microplate holder can not in or out	Blocked by something	Check whether obstacles around the plate holder or whether the plate cover is raised.
11	Crash noise occurred during running	The microplate is not in place or plate cover fell off	a. Check microplate b. If noise still there when running without plate, restart the instrument c. If noise still there, please contact distributor or manufacturer.
12	Test results unstable	Light path failure	Check if the plate is placed well, if liquid spilled out and whether the front door works well, then re-start the instrument. If problem still there, contact distributor or manufacturer.
13	Stop running during detection	Communication breakpoint	Press "stop", restart the detection

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Chapter 8 Accessories

No	Item	Type	Unit	Qty	Remarks
1	Power cord		PCS	1	
2	Mouse	Logitech	PCS	1	
3	Certification		PCS	1	
4	Operation Manual		PCS	1	
5	Performance test statement		PCS	1	
6	Packing List		PCS	1	
7	U-Disk		PCS	1	
8	Dustproof plug		PCS	1	
9	Filter assembly		PCS	1	
10	Quick Operation Guide		PCS	1	

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Memo

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