

Cooled High Sensitivity Spectrometer

ATP5020

Features

- Detector: Linear CMOS or back-illuminated CCD, cooled type
- Detector Pixels: 2048 pixels
- UV/IR-optimized models: ATP5020P/R
- Ultra-low-noise CCD signal processing circuit
- Maximum spectral range: 190–1100 nm (widest: 800 nm)
- Spectral resolution: 0.1–3 nm (depends on spectral range and slit width)
- Optical design: Crossed Czerny-Turner (C-T) configuration
- Integration time: 10 ms–65 s
- Power supply: DC 5V $\pm$ 10% @ <2.3A
- ADC: 18-bit, 570 kHz (actual output: 16-bit)
- Optical input: SMA905 or free-space
- Data output interface: USB Type-C (high-speed) or UART
- 20-pin dual-row programmable expansion interface

Applications

- Raman spectroscopy, online spectral analysis
- Micro-volume & rapid spectrophotometry
- Weak fluorescence detection
- Reflectance & transmittance measurement
- Fruit sorting & quality inspection

Description

The ATP5020 is a cooled high-sensitivity miniature spectrometer developed by Optosky, offering two detector configurations to meet diverse application needs. One variant, the ATP5020P/R, employs a high-sensitivity back-illuminated cooled area CCD with a minimum cooling temperature of -10°C. The other, the ATP5020, utilizes a TEC circuit-cooled linear CMOS detector with a minimum cooling temperature of -5°C. Both cooling methods effectively reduce sensor dark current and noise, thereby enhancing the spectrometer's dynamic range and signal-to-noise ratio (SNR).

Notably, the ATP5020P/R, equipped with a cooled back-illuminated CCD, achieves lower temperatures and superior cooling performance, resulting in higher SNR, better environmental adaptability, and more reliable test results.

Additionally, Optosky offers customized UV-optimized (ATP5020P) and IR-optimized (ATP5020R) models to meet specific spectral range requirements, enhancing the spectrometer's responsiveness in ultraviolet and infrared bands, respectively.

The ATP5020 series supports both SMA905 fiber-optic input and free-space light input, with spectral data output via USB2.0 or UART ports. It operates flexibly on a single 5V DC power supply, ensuring easy integration.

This spectrometer series is ideal for high-resolution applications such as Raman spectroscopy, microspectrophotometry, and reflectance/transmittance measurements.



1. Selection Guide

Model	Features
ATP5020	Standard model with 2048-pixel CCD detector
ATP5020-LVF	Built-in LVF (Linear Variable Filter) for multi-order diffraction suppression
ATP5020P	Enhanced UV response – High-resolution, high-sensitivity cooled design
ATP5020R	Enhanced IR response – Optimized for Raman spectroscopy and fruit sorting applications
ATP5020P/R-LVF	Integrated LVF eliminates higher-order diffraction effects

2. Parameter

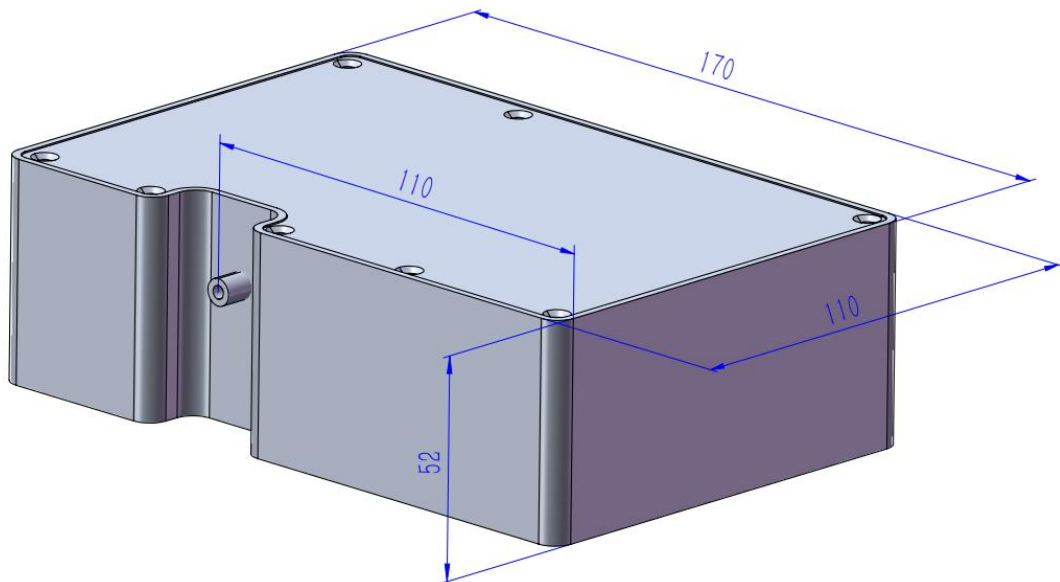
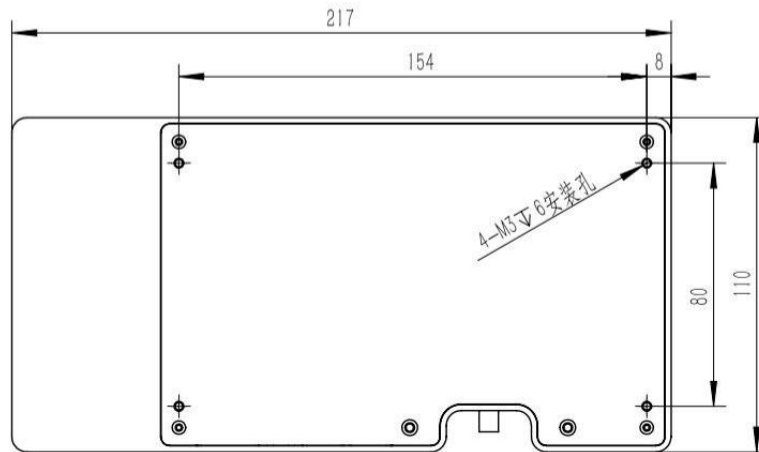
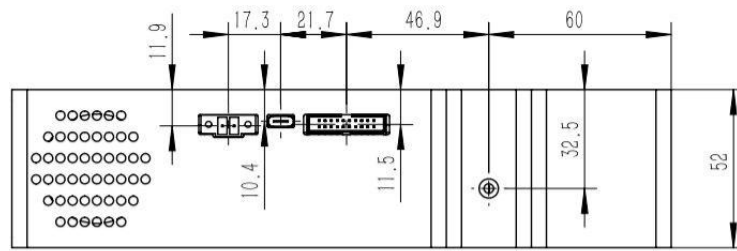
	Specifications	ATP5020/ATP5040	ATP5020P	ATP5020R
Detector	Type	Linear CMOS	Back-Illuminated Area CCD	
	Cooling Method	TEC cooling (-5°C)	Detector Cooling (-10°C)	
	Spectral Range	190-1100 nm		
	Effective Pixels	2048	2048×64	
	Sensitivity	1300V/(lx·s); 6.5 μV/e-		
	Dark Noise	0.4V/RMS; (6e-)		
Optical Specifications	Wavelength Range	190-1100 nm (maximum span: 800nm)		
	Optical Resolution	0.1-3 nm (slit width dependent)		
	Signal-to-Noise Ratio (SNR)	>600:1	> 800: 1	
	Dynamic Range	> 5000: 1	> 10000: 1	
	Optical Design	F/4 Crossed Asymmetric Czerny-Turner (C-T) Configuration		
	Entrance Slit Width	Standard Selectable Widths: 5/10/25/50/100/150/200 μm; Customization Available		
	Light Input Interface	SMA905 Fiber Optic Port; Free Space Input		
Electrical Parameters	Integration Time	10ms-65 s		
	Frame Rate	100 fps, Typical		
	Output Interface	USB Type-C or UART		
	ADC Bit Depth	18-bit (16-bit output)		
	Power Supply	DC 5V power supply		
	Operating Current	<2.3 A		
Physical Specifications	Dimensions	170×110×52 mm3	217×110×52 mm3	
	Weight	1.3 kg	1.6 kg	

3. Accessories

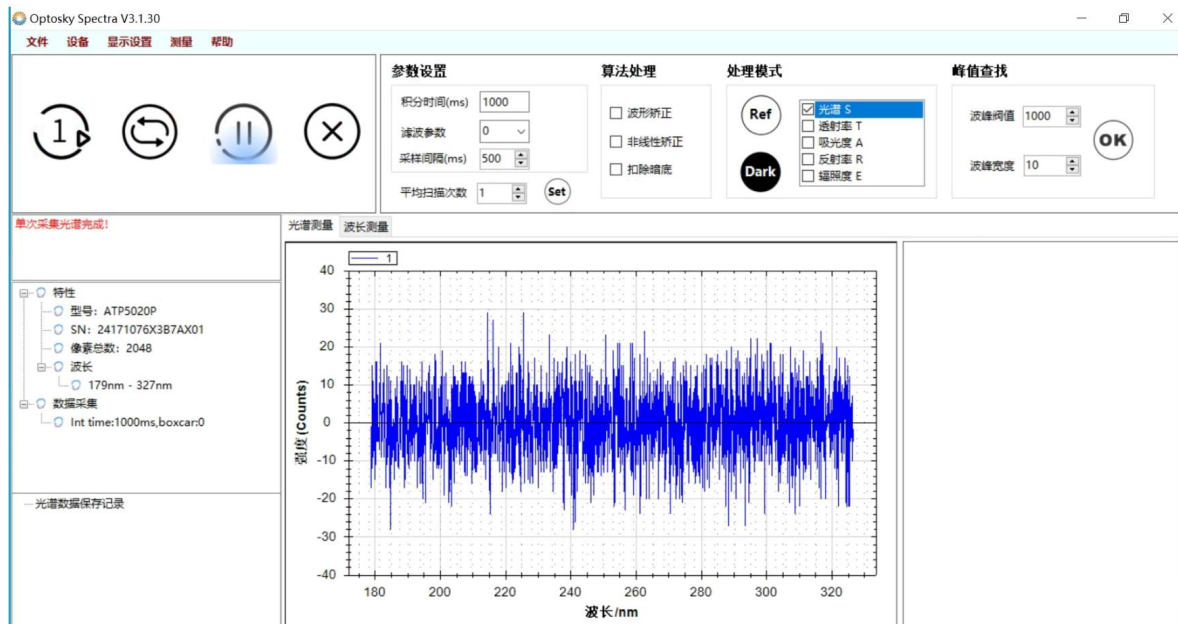
1	Type-C to USB data cable
2	5V standard adapter and power cord
Optional Accessories	
1	UV-Vis resistant optical fiber;
2	Adjustable optical attenuator
3	Standard diffuse reflectance standard white board
4	Transmittance/Reflectance measurement integrating sphere holder
5	Fiber Collimator
6	Cosine corrector

4. Effect Diagram

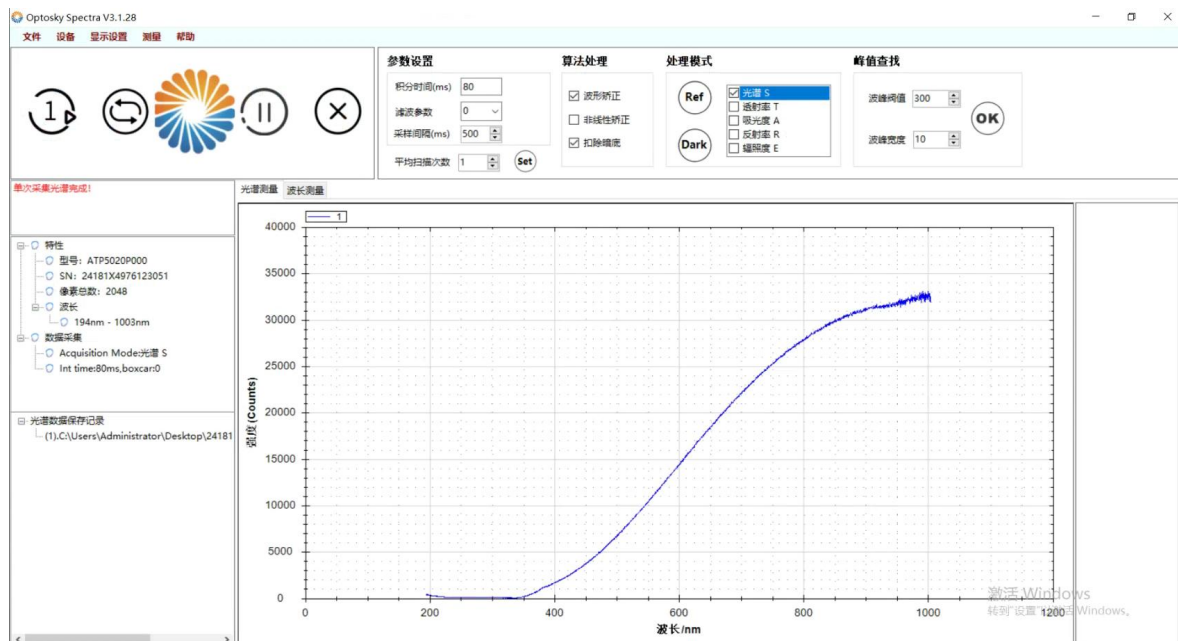




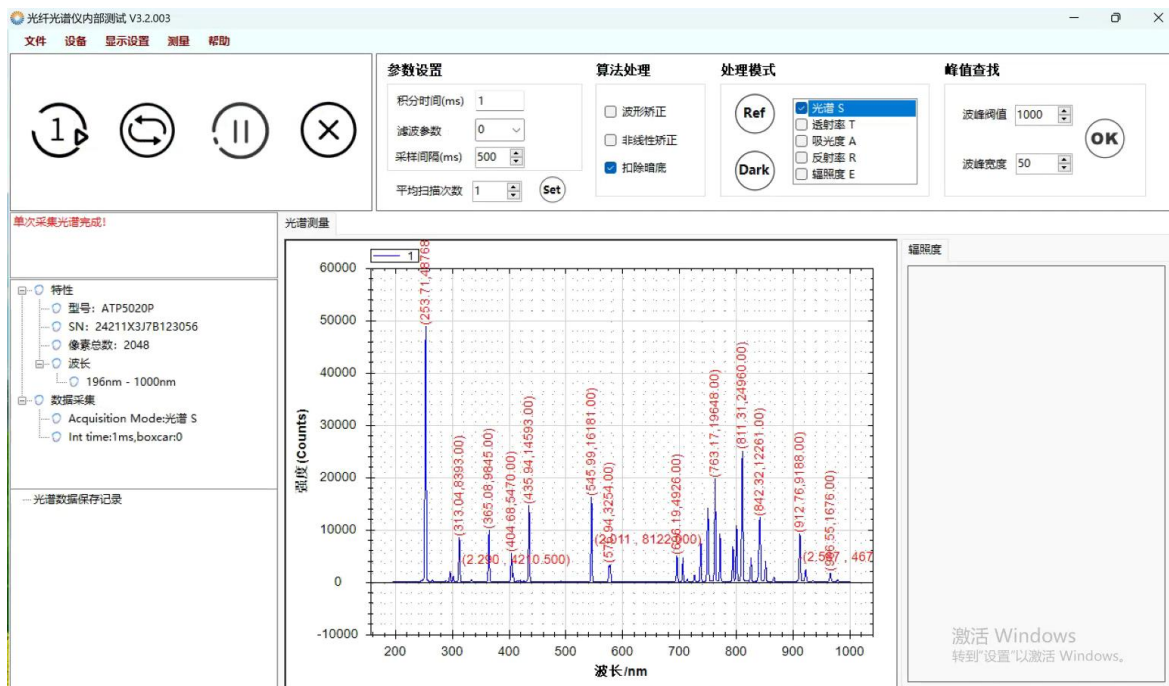
5. Performance Test



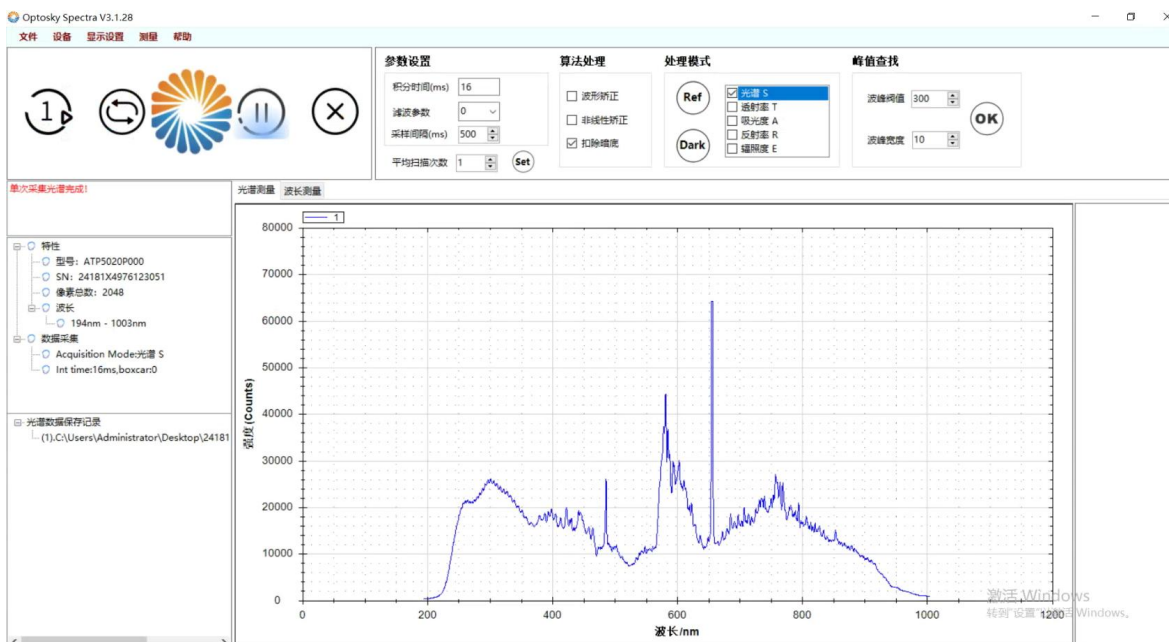
ATP5020P Dark Current Test (Integration Time 1000ms)



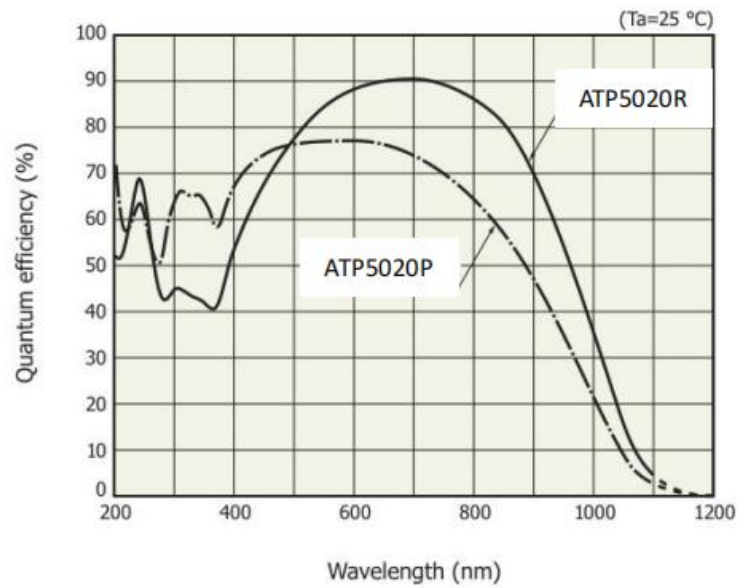
ATP5020P Waveform Correction



ATP5020P Resolution Test — 2.01nm @546nm



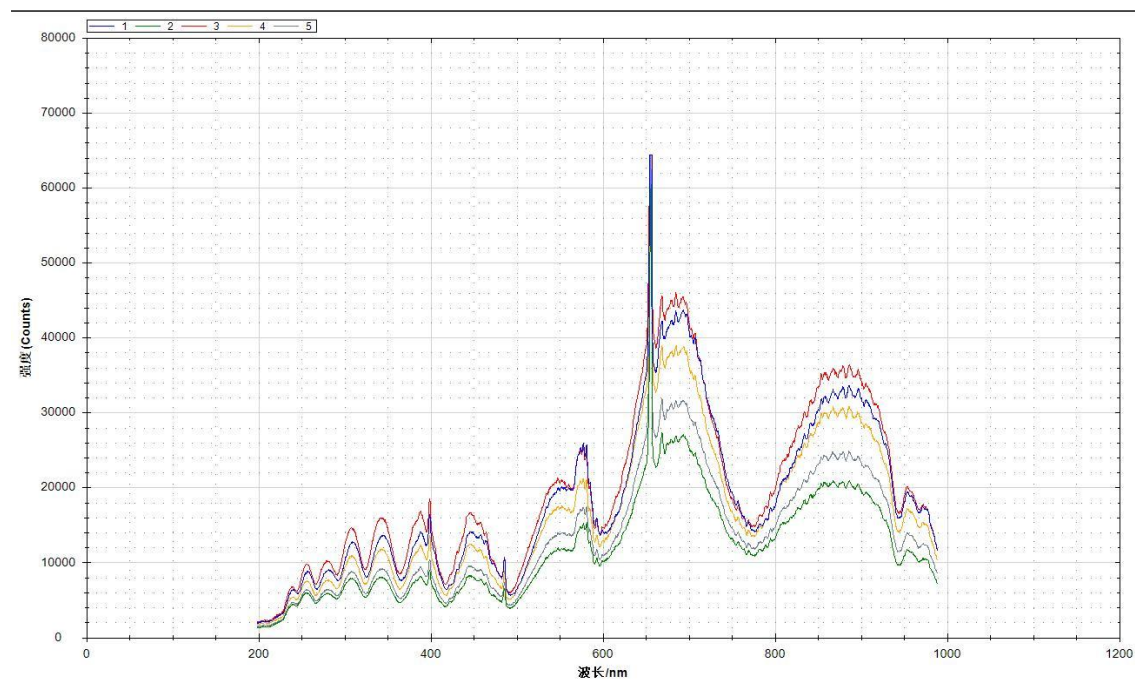
ATP5020P Deuterium-Halogen Lamp Test Spectrum



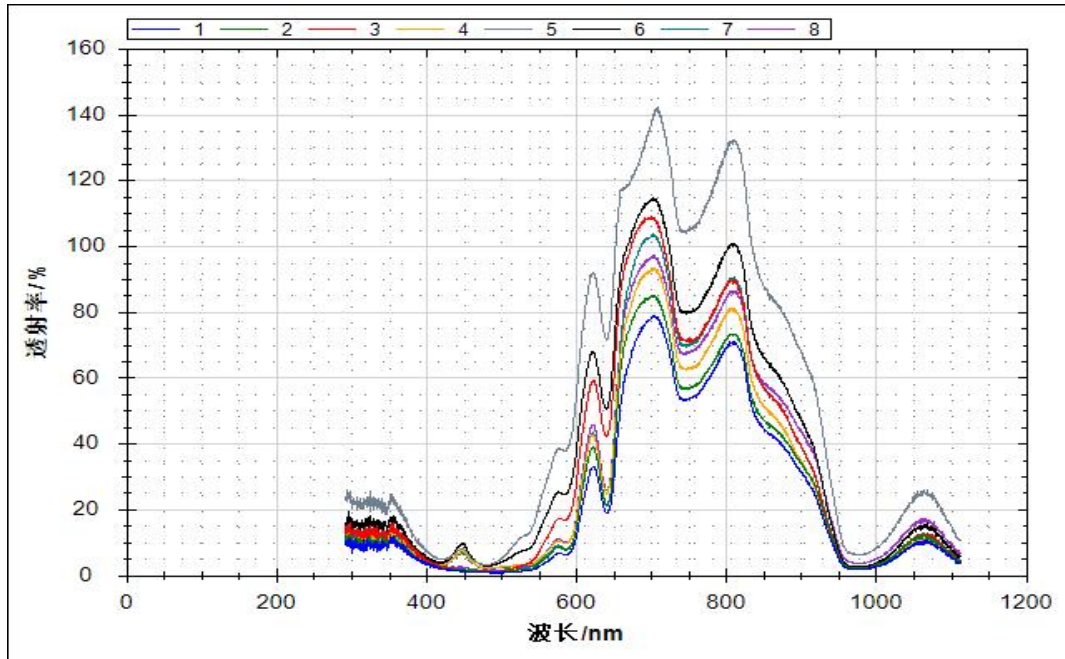
ATP5020P/R Band Optimization:

The ATP5020R exhibits higher responsivity in the >500nm range, while the ATP5020P demonstrates superior responsivity in the <500nm spectral region.

6. Application Scenarios And Measured Data



ATP5020P Silicon Lens Reflectance Spectrum Test



ATP5020P Transmittance Test for Various Egg Types