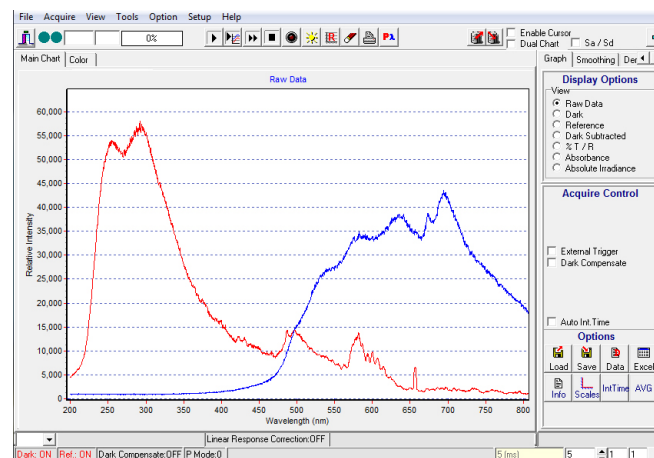


General Specifications:

DC Power Input	5V DC < 1.5 Amps
AC Adapter Input	100 - 240VAC 50/60 Hz, 0.5A @ 120VAC
Detector Type	Response Enhanced 2048 element linear silicon CCD array
Pixels	2048 x 1 elements @ 14µm x 200µm per element
Spectrograph F#	3.2
Spectrograph Optical Layout	Crossed Czerny-Turner
Dynamic Range	300 typical
Digitizer Resolution	16-bit or 65,535:1
Readout Speed	500 kHz
Data Transfer Speed	Up to 180 spectra per second via USB 2.0
Integration Time	5 ~ 65,535ms x multiplier
External Trigger	Aux Port
Operating Temperature	15°C - 35°C
Operational Relative Humidity	85% Noncondensing
TE Cooling	14°C
Weight	0.60 kg (1.32 lbs)
Dimensions	127.0mm x 39.0mm x 90.7mm (5in x 1.5in x 3.6in)
Computer Interface	USB 2.0 / 1.1
Operating Systems	Windows: XP, Vista (32-bit), 7 (32-bit)

Software

BWSpec™ features a wide range of tools designed to allow complex measurements and calculations to be completed at the click of a button. BWSpec™ allows the user to choose between multiple data formats and offers optimization of scanning parameters such as integration time and laser power output. In addition to powerful data acquisition and data processing, other features include automatic dark removal, spectrum smoothing, and manual/auto baseline correction. The software also contains an OCX interface for users to collect spectrum in Thermo Scientific GRAMS/AI.



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Your Photonics Partner



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BWTEK INC.
Your Photonics Partner

Spectrometer
Glacier™ X
TE Cooled 16-bit USB
Linear CCD Array Spectrometer



Features:

- UV - NIR Ranges
- 0.6nm - 4.0nm Resolution Range
- TE Cooled / Regulated
- 16-bit Digitizer
- 500 kHz Readout Speed
- Plug-and-play USB 2.0
- OEM Version Available

About the Glacier™ X

The Glacier™ X series is a high performance, Thermoelectric Cooled (TEC) linear CCD array spectrometer solution. Equipped with 2048 elements, built-in 16-bit digitizer, and high-speed USB 2.0 interface, this TE Cooled spectrometer will continuously deliver optimized high throughput results.

Compared to non-cooled CCD spectrometers, the Glacier™ X offers higher dynamic range, significantly reduced dark counts, and superior long-term operation stability, making it ideal for low light level detection and long-term monitoring applications.

Wavelength configurations are available from as low as 200nm to as high as 1050nm with standard configuration resolutions of 0.6nm to 4.0nm. Flexible custom configurations and application support are available for OEM applications.

Applications

- UV, Vis, and NIR: Spectroscopy / Spectroradiometry / Spectrophotometry
- WL Identification
- Absorbance
- Reflectance
- OEM Optical Instrumentation Building Blocks

Accessories

- Fiber Patch Cords
- Light Sources
- Cuvette Holder
- Inline Filter Holder
- Much more...

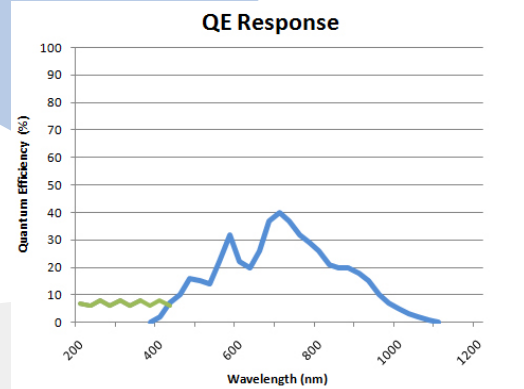
Workings of a Spectrometer: Glacier™ X

Standard Detector

6 2048 Pixel Linear CCD Array Detector

The Glacier™ X features a TE Cooled 2048 element linear silicon CCD array detector with a pixel format of 2048 x 1 elements @ 14µm per element with effective (active) pixels > 2000. Each pixel represents a portion of the spectrum and as the dispersed incident light strikes the individual pixels across the CCD the electronics can then translate and display the intensity using our BWSpec™ software.

The quantum efficiency (QE) and noise level of the array detector greatly influences the spectrometer's sensitivity, dynamic range and signal-to-noise ratio. The spectral acquisition speed of the spectrometer is mainly determined by the detector response over a wavelength region.



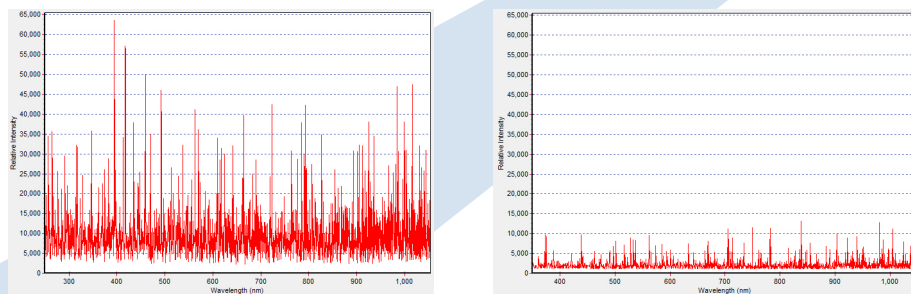
Specifications	
Wavelength Range	200nm - 1050nm
Pixels	2048
Pixel Size	14µm x 200µm
Well Depth	~90,000 e
Digitization Rate	500 kHz

Standard Thermoelectric Cooler

7 Reduces dark noise and increases the dynamic range

Cooling an array detector with a built-in Thermoelectric Cooler (TEC) is an effective way to reduce dark current and noise, as well as to enhance the dynamic range and detection limit. The graph below shows the dark current and noise for an uncooled vs. cooled CCD detector at an integration time of 30 seconds. When operating at room temperature, the dark current nearly saturates the uncooled CCD. When the CCD is cooled down to 14°C by the TEC, the dark current is reduced by four times and the dark shot noise is reduced by two times. This allows the spectrometer to operate at long integration times and detect weak optical signals.

Dark Current: Uncooled vs. Cooled CCD Detectors at 30 Seconds



Room Temperature

Cooled to 14°C

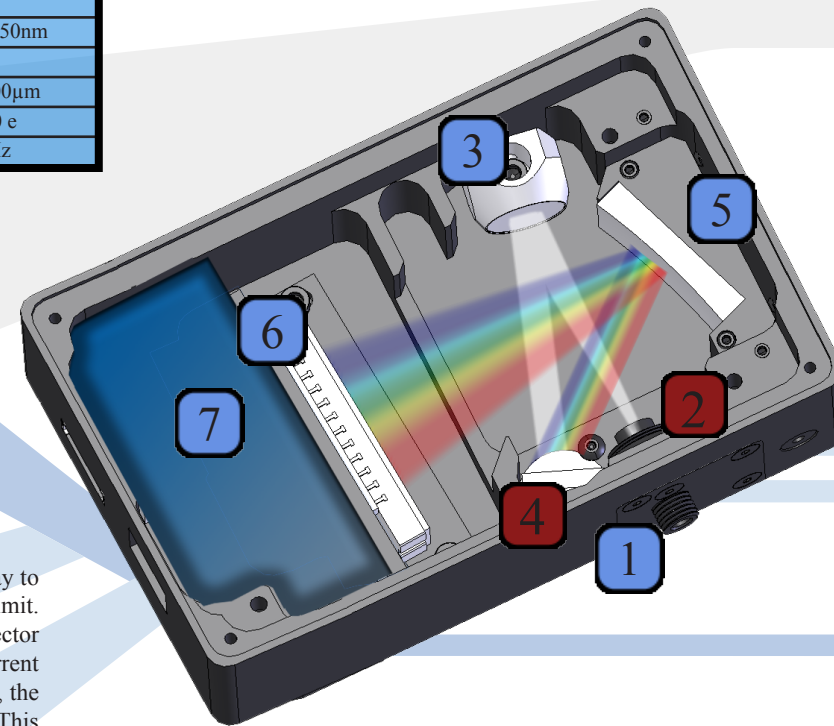
Standard Collimating Mirror

3 Collimates and redirects the light beam towards the grating

Standard Focusing Mirror

5 Refocuses the dispersed light onto the detector

Both mirrors are F# matched focusing mirrors coated with AlMg₂ which produces approximately 95% reflectance when working in the UV-Vis spectrum. Aluminum (Al) provides reflectance and Magnesium (Mg₂) protects the aluminum from oxidation.



Configurable Slit

2 Determines the photon flux and spectral resolution

Light entering into a spectrometer's optical bench via a fiber or lens is focused onto a pre-mounted and aligned slit. This ultimately determines the spectral resolution and throughput of the spectrometer after grating selection.

We offer a variety of slit widths and heights to match your specific application needs: from 5µm - 800µm wide and 1mm and 2mm high (1mm being our standard height).

Slit Option	Dimensions	Approx. Resolution 350-1050nm
10µm	10µm wide x 1mm high	1.1
25µm	25µm wide x 1mm high	1.4
50µm	50µm wide x 1mm high	2.2
100µm	100µm wide x 1mm high	Call
200µm	200µm wide x 1mm high	Call
Custom Slit Widths Available		

Configurable Grating

4 Wavelength Range and Spectral Resolution

The groove frequency of the grating determines two key aspects of the spectrometer's performance: the wavelength coverage and the spectral resolution. The higher the groove frequency the more resolution the instrument will achieve but the wavelength coverage will be less. Inversely, decreasing the groove frequency increases wavelength coverage at the cost of spectral resolution. With over twenty-five gratings offered, we can customize the spectrometer to suit your application needs.

The blaze angle or blaze wavelength of the grating is also a key parameter in optimizing the spectrometer's performance. The blaze angle determines the maximum efficiency the grating will have in a specific wavelength region. We have a variety of blaze angles available per groove frequency to match your application needs.

Best Efficiency	Spectral Coverage (nm)	Grating
UV / Vis	200-400	1800/250
UV - NIR	200-800	716/222
UV / Vis	250-600	1200/250
UV	280-370	3600/240
UV - NIR	300-900	600/400
UV - NIR	350-1050	700/530
Vis	380-750	900/500
Vis / NIR	400-800	1200/500
Vis / NIR	450-1050	830/800
Vis	550-700	1800/500
Vis / NIR	600-800	1714/650
Vis / NIR	750-1050	1200/750
Custom Configurations Available		

Standard SMA 905

1 Precision fiber coupler

By coupling the SMA 905 adaptor with a fiber or lens, light will be guided to the slit and optically matched. This ensures reproducibility for light coupling from the fiber or lens into the optical bench.