

WaveCapture™ FBG Interrogation Analyzers



HERMETICALLY SEALED



REPEATABILITY



LOW POWER CONSUMPTION



LOW COST



BAYSPEC

Pervasive Spectroscopy

www.bayspec.com

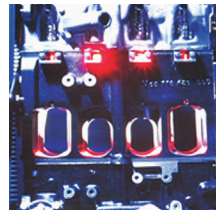
Applications for Fiber Optic Sensing

The invention of optical fiber and semiconductor lasers in the 1970s opened up a cornucopia of applications, notably as a medium of carrying light signals for communications and sensing applications. Optical fibers provide a fundamental improvement over traditional methods offering lower loss, higher bandwidth, immunity to electromagnetic interference (EMI), lighter weight, lower cost, and lower maintenance. By applying a UV laser to “burn” or write a diffraction grating (A Fiber Bragg Grating-FBG) in the fiber it became possible to reflect certain wavelengths of light, which used together with an interrogation analyzer (spectral analyzer) precise sensing measurements could be taken. The recent developments in the 1990s with optoelectronics components in the optical telecommunications field have dramatically enhanced the capabilities of many components, such as: light sources, fibers, detectors, optical amplifiers, mux/demuxes, switches, etc. As a result, numerous applications are now available for monitoring strain, stress and pressure in harsh environments.



Civil Structures

- Buildings
- Bridges
- Roadways
- Dams



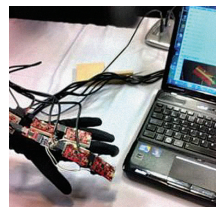
Transportation

- Automotive
- Naval vessels
- Railroads



Oil & Gas, Mining

- Down hole drilling
- Methane sensing
- Natural Gas Fracking
- Pipelines



Biomedical/Life Sciences

- Stroke recovery
- Electro-surgical aid
- Cardiovascular Monitoring



Energy Grid

- Nuclear plants
- Electrical generator
- Wind turbines
- Geothermal
- Electrical transmission station



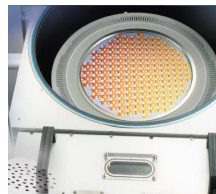
Sports

- Sailboats
- Yachts
- Facilities



Aerospace

- Commercial aircraft
- Military aircraft
- Space craft



Semiconductor Sensing

- Semiconductor manufacturing
- Temperature and strain monitoring
- Immune to EM noise & RF Interference
- Multipoints, large area, and long distance sensing

FBGA - Fiber Bragg Grating Analyzers

WaveCapture™ FBGA Series

BaySpec's WaveCapture™ Fiber Bragg Grating Analyzer (FBGA) is an integrated spectral engine simultaneously covering multiple wavelengths for precise and rapid fiber bragg grating (FBG) sensor system measurements.



The device covers wide wavelength ranges and provides simultaneous measurements at very fast response rates and excellent wavelength resolution. High reliability is achieved through a rugged mechanical design with no moving parts. Periodic calibration is not required. High speed spectrum acquisition and data transmission is achieved through the use of USB 2.0 communications or Ethernet interface (RS232 also supported at lower speeds).

The WaveCapture™ FBGA Series employs a highly efficient Volume Phase Grating (VPG®) as the spectral dispersion element and an ultra sensitive InGaAs array detector as the detection element, thereby providing high-speed parallel processing and continuous spectrum measurements. As an input, the device uses a single mode fiber, then collimating it with a micro lens. The signal is spectrally dispersed with the VPG®, and the diffracted field is focused onto an InGaAs array detector. The control electronics read out the processed digital signal to extract required information. Both the raw data and the processed data are available to the host.

Key benefits:

- No moving parts
- Ultra reliable Volume Phase Grating (VPG®)
- Athermal (no TEC)
- Solid-state electronics Hermetically sealed
- Hermetically sealed

Key features:

- Wide wavelength range
- Ultra fast response time (up to 5000Hz)
- Excellent wavelength repeatability and resolution
- Athermal design no TEC enabling battery-operated portable operation
- High reliability for use in harsh environment
- Compact, card-mountable design
- High Speed data interface
- Optical switch control output
- GPIO output for customer peripherals
- Hardware TTL trigger in and out

Applications:

- Real time fault detection and isolation in fiber optic sensing systems
- OEM module for portable handheld field test equipment Oil & Gas pipelines
- Mining
- Wind Energy
- Tidal Energy
- Marine vessels
- Aerospace
- Structural Health Monitoring
- Semiconductor sensing
- Medical
- Sports

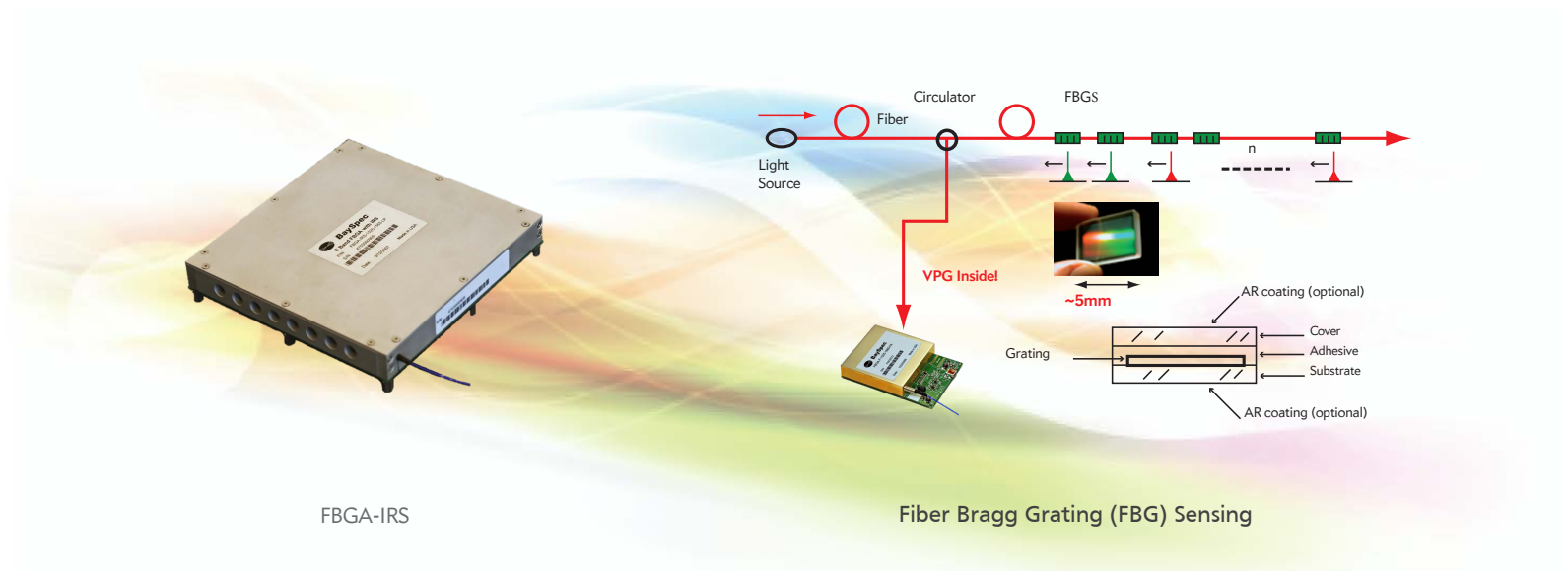
Compliance:

- Telcordia GR-63/1209/1221-CORE qualified
- FCC/EMI

High Accuracy FBG Analyzers

WaveCapture™ FBGA-IRS Series

BaySpec's WaveCapture™ FBGA-IRS is a spectral engine with an internal reference source that interrogates multiple wavelengths for precise fiber bragg grating (FBG) sensor system measurements requiring high end of life (EOL) wavelength accuracy at high frequency response time.



FBGA-IRS

Fiber Bragg Grating (FBG) Sensing

The device covers wide wavelength range and provides simultaneous measurements at very fast response rates and excellent wavelength resolution. High reliability is achieved through a rugged mechanical design with no moving parts. Periodic calibration is not required. High speed spectrum acquisition and data transmission is achieved through the use of USB 2.0 or Ethernet communications (RS232 also supported at lower speeds).

The WaveCapture™ FBGA-IRS Series employs a highly efficient Volume Phase Grating (VPG) as the spectral dispersion element and an ultra sensitive InGaAs array detector as the detection element, thereby providing high-speed parallel processing and continuous spectrum measurements. As an input, the device uses a single mode fiber, then collimating it with a micro lens. The signal is spectrally dispersed with the VPG, and the diffracted field is focused onto an InGaAs array detector. The control electronics read out the processed digital signal to extract required information. Both the raw data and the processed data are available to the host. An integrated reference source ensures long-term accuracy and stability.

Key benefits:

- Ultra reliable Volume Phase Grating (VPG®)
- Athermal (no TEC)
- Solid-state electronics
- Hermetically sealed
- Lifetime calibration

Key feature:

- Ultra fast response time (up to 5000Hz)
- Excellent wavelength repeatability and resolution
- Athermal design enabling battery-operated portable operation
- High reliability for use in harsh environment

Applications:

- Real time fault detection and isolation in fiber optic sensing systems
- OEM module for handheld field test equipment
- Harsh environments
- Long-term structural health monitoring

Compliance:

- Telcordia GR-63/1209/1221-CORE qualified

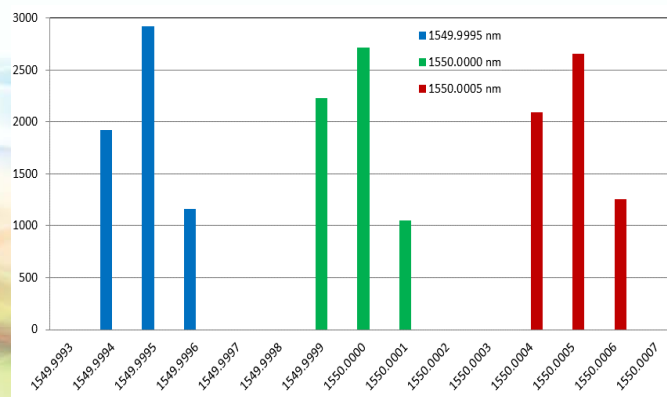
Ruggedized, Portable, Turn-key FBG Interrogator Systems

WaveCapture™ FBG Sensing System Series

BaySpec's WaveCapture™ FBGA System is an interrogation system with an integrated light source that monitors multiple wavelengths from multiple channels. Precise fiber bragg grating (FBG) sensor system measurements are achieved with high end of life (EOL) wavelength accuracy at high frequency response time.



Benchtop FBG Interrogator with 16 channels



FBGA wavelength repeatability measured at 1549.9995 nm, 1550.0000 nm and 1550.0005 nm

The device covers wide wavelength range and provides simultaneous measurements at very fast response rates and excellent wavelength resolution. High reliability is achieved through a rugged mechanical design with no moving parts. Periodic calibration is not required. High speed spectrum acquisition and data transmission is achieved through the use of USB2.0 communications (RS232 also supported at lower speeds).

The WaveCapture™ FBGA System's core spectral engine employs a highly efficient Volume Phase Grating (VPG) as the spectral dispersion element and an ultra sensitive InGaAs array detector as the detection element, thereby providing high-speed parallel processing and continuous spectrum measurements.

An integrated broadband light source interrogates the fiber optic sensing network. Multiple ports/channels can be added by use of an optical switch.

Key feature:

- Ultra fast response time (up to 5Hz)
- Excellent wavelength repeatability and resolution
- Hermetically sealed
- All solid-state electronics

Applications:

- Smart structures
- Strain measurements
- Perimeter sensing
- Aerospace vehicles
- Construction
- Oil & Gas down-hole drilling
- Electrical grid reliability
- Mining
- Medical devices
- Transportation
- Energy (Solar, Nuclear, Wind)
- Semiconductor sensing

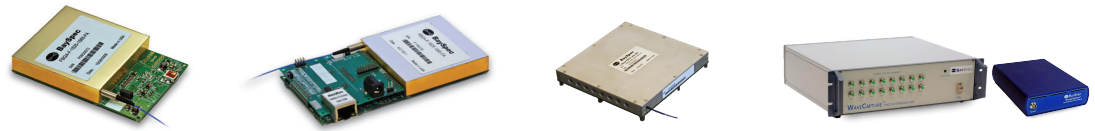
Key benefits:

- High reliability, no moving parts
- Ultra fast response time (up to 5 kHz)
- Excellent wavelength repeatability and resolution
- Low power consumption
- High reliability for use in harsh environment
- Integrated broadband light source
- 2, 4, 8, and 16 port options (or call)

Compliance:

- Telcordia GR-63/1209/1221-CORE qualified

Specifications



Model	FBG analyzer— USB 2.0 / RS232	FBG analyzer— Ethernet	FBG analyzer—IRS	Interrogator System
Number of Channel				1, 2, 4, 8, 16 or request
Wavelength Ranges	Standard: 1525-1565 nm Extended: 1510-1590 nm (Other wavelength ranges upon request)	Standard: 1525-1565 nm Extended: 1510-1590 nm (Other wavelength ranges upon request)	Standard: 1525-1565 nm Extended: 1510-1590 nm (Other wavelength ranges upon request)	Standard: 1525-1565 nm Extended: 1510-1590 nm (Other wavelength ranges upon request)
Wavelength Repeatability	± 0.1pm	± 0.1pm	± 0.04pm	± 0.1pm (without IRS); ± 0.04pm (with IRS)
Response Frequency	~5000Hz / 5Hz	~5000Hz	~5000Hz / 5Hz	Up to ~5000Hz maximum, depends on and limited by the speed of optical switches
Interface	USB 2.0 / RS232	Ethernet IEEE 802.3	USB 2.0 / RS232	USB 2.0
Internal Reference Source for Field Calibration	No	No	Yes	Optional
Light Source	No	No	No	Yes
Optical Circulator	No	No	No	Yes
Optical Interface	FC/APC connector (or Customer Specify)			
Size	96 x 68 x 15.8 mm ³	130 x 75 x 25 mm ³	148 x 142 x 25 mm ³	164 x 115 x 35 mm ³ (1-Channel) 330 x 280 x 120 mm ³ (4-Channels) 19" rackmount (16-Channels)
Operation Temperature	-5 to +75° C	-5 to +75° C	-5 to +75° C	-5 to +55°C; 0 to 85%, non-condensing
Storage Temperature	-20 to +85 ° C	-20 to +85 ° C	-20 to +85 ° C	-20 to +85°C; 0 to 95%, non-condensing
Software	BaySpec's Sense 2020 evaluation software included, SDK/dll for development upon request			

Specifications subject to change without notice.

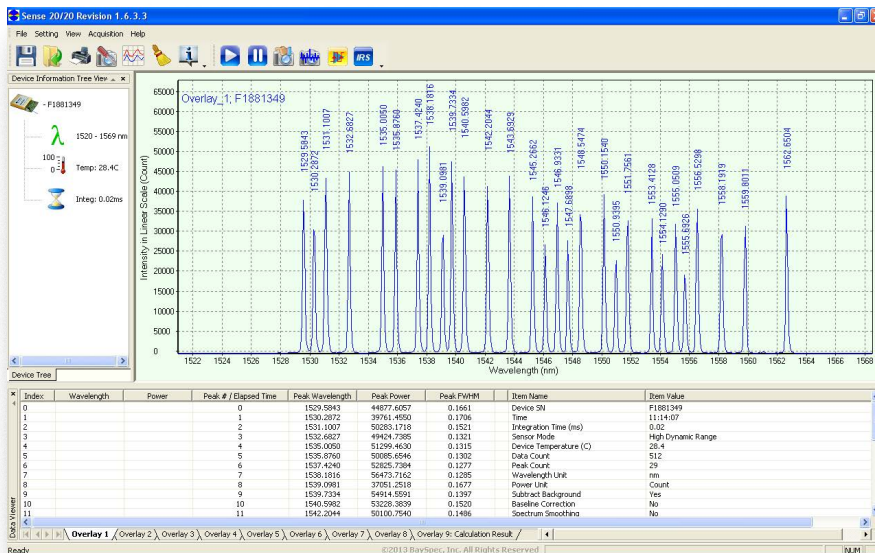
Call BaySpec for custom options: +1 (408) 512-5928, or email: info@bayspec.com

Sense 20/20 software

BaySpec Sense 20/20 application software is a MS-Windows based program for interfacing with the WaveCapture™ FBG analyzers and systems by USB / RS232 / Ethernet, and is designed for running under Windows 7 / 10 operating systems. It has the following features:

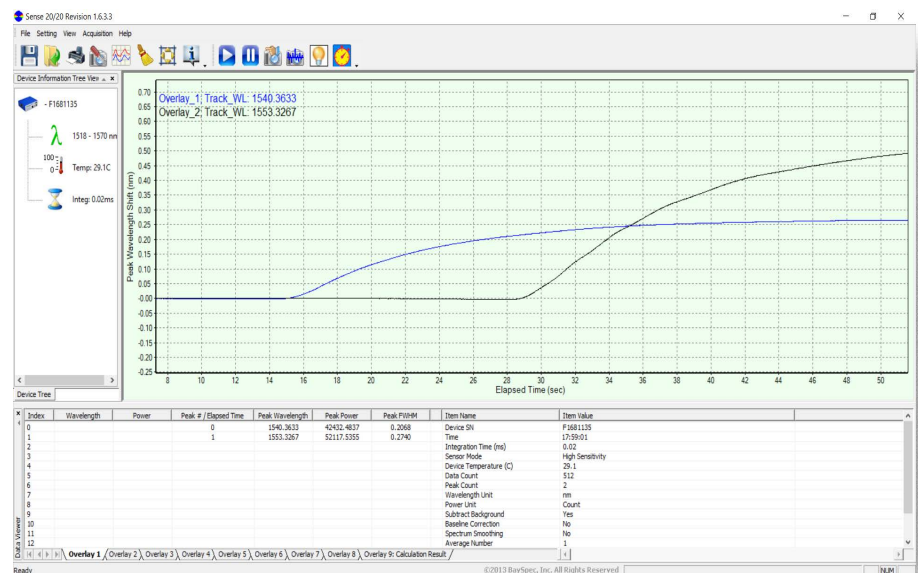
Sense2020 User Interface

- Setup acquisition mode and parameters
- Acquiring spectrum and display into multiple overlays
- Post-process spectrum data, such as peak search, background subtraction, spectrum smooth and baseline correction, save and load spectrum data
- Record and replay spectrum data in the fast acquisition mode
- Tracking the wavelength shift of the selected peaks
- Control SLED light source
- Control optical switch and GPIO output



Sense 20/20 SDK

BaySpec Sense 20/20 Software Development Kit (SDK) supplies the interface for the software developer to access the BaySpec WaveCapture™ FBGA series spectrometers. The Dynamic Link Library (DLL) in the SDK can be used under different programming environments: C, C++, Visual Basic and LabVIEW. The SDK provides a set of functions that allow user to configure and control the FBGA spectrometer, acquire and post-process the spectrum data. The sample program of Visual Studio 2005 C++ and LabVIEW 2013 are included in this SDK.



Founded in early 2000 with support from some of the leading corporations and venture capital firms in Silicon Valley, BaySpec is a vertically integrated spectral sensing company. The company designs, manufactures and markets advanced spectral instruments, from Optical Channel Performance Monitors (OCPM/OPM for telecommunication monitoring), UV-VIS-NIR-SWIR spectrometers, miniature Raman analyzers, hyper-spectral imagers, Fiber Bragg Grating Analyzers (FBGA for sensing/monitoring, et al), to portable, field-deployable mass spectrometers, for applications in the fields and industries of medical, biomedical, semiconductor, pharmaceuticals, chemical, food, security & defense, civil engineering, oil, gas, mining, energy grid, aerospace, transportation, and human/animal health sensing.

Engineering and Product Development

- Shortest product development cycle in the industry
- Extensive Intellectual Property covering key aspects of our products
- In-house capabilities encompassing all the important and critical components, from lasers to gratings and state-of-the-art detectors

Production

- 48,000 square foot production facility, including 9,000 square foot clean room
- History of producing and delivering more than 40,000 spectral engines of all types
- 100% made in the USA

Quality Control

Dedicated team, established procedures to ensure consistent and reliable product delivery



Safety and Environment

At BaySpec the safety of our employees and customers is our utmost concern. Rigorous training programs are implemented for laser, electrical, and hazardous materials safety. All products we release are extensively reviewed for any potential safety hazard. Every precaution is exercised, whether via hardware design or software control, to prevent safety issues from occurring. BaySpec is committed to green manufacturing techniques and processes. We strive to minimize or eliminate the use of hazardous materials in every manufacturing step, thus benefitting the health and well being of our employees and the environment. Our spectral sensing products are compact, and energy efficient and do not generate hazardous waste during normal usage.



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All BaySpec products are made in the USA