WaveCapture™ FBG Interrogation Analyzers

HERMETICALLY SEALED

REPEATABILITY

LOW POWER CONSUMPTION

LOW COST

BAYSPEC

Pervasive Spectroscopy

www.bayspec.com

BaySpec
Pervasive Spectroscopy

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

Oil & Gas, Mining

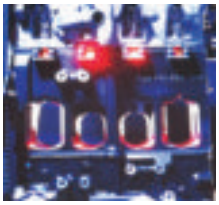
- Down hole drilling
- Methane sensing
- Natural Gas Fracking
- Pipelines

Energy Grid

- Nuclear plants
- Electrical generator
- Wind turbines
- Geothermal

Aerospace

- Commercial aircraft
- Military aircraft
- Space craft



Transportation

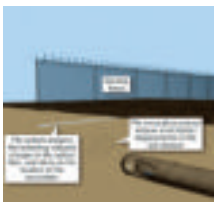
- Automotive
- Naval vessels
- Railroads

Biomedical/Life Sciences

- Stroke recovery
- Electro-surgical aid
- Sleep apnea
- Stream/Snow melt
- Groundwater

Sports

- Sailboats
- Yachts
- Facilities



Perimeter sensing

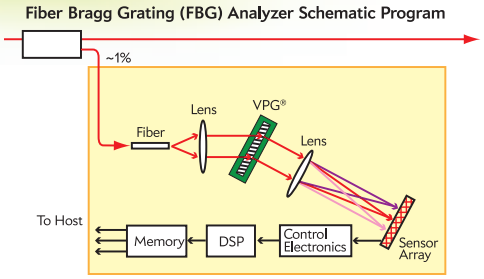
- Perimeter security
- Infrastructure protection
- Border patrol
- Public utilities

FBGA Analyzers–

WaveCapture™ FBGA Series & Ethernet ready E-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.

NEW! FBGA Ethernet | FBGA-S (RS232) | FBGA-F (USB 2.0)



The device covers wide wavelength ranges and provides simultaneous measurements at very fast response rates and excellent wavelength resolution. High reliability (MIL STD 810F shock and vibration) is achieved through a rugged mechanical design with no moving parts. Periodic calibration is not required. High speed Input/Output (I/O) is achieved through the use of USB 2.0 communications or Ethernet interface (serial communications 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 tapped signal from the main data transmission link through a single mode fiber, then collimate 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

Key Features

- Wide wavelength range
- Ultra fast response time (up to 5kHz)
- Excellent wavelength repeatibililty and resolution
- Athermal design enabling battery-operated portable operation
- High reliability for use in harsh environment
- Compact, card-mountable design
- Ethernet interface (Optional)

Compliance:

- Telcordia GR-63/1209/1221-CORE qualified
- MIL SPEC 810F

Applications:

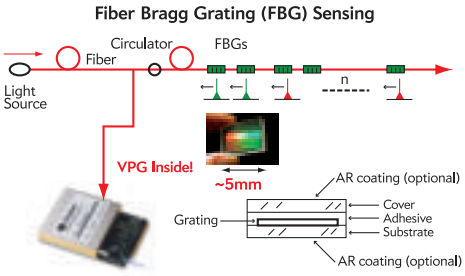
- Real-time fault detection and isolation in fiber optic sensing systems
- OEM module for portable handheld field test equipment Oil & Gas pipelines
- Mining
- Wind Energy
- Tidal Energy
- Marine vessels
- Aerospace
- Structural Health Monitoring
- Medical
- Sports

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 in stacked package

FBGA-IRS in thin package



The device covers wide wavelength range and provides simultaneous measurements at very fast response rates and excellent wavelength resolution. High reliability (MIL STD 810F shock and vibration) is achieved through a rugged mechanical design with no moving parts. Periodic calibration is not required. High speed Input/Output (I/O) is achieved through the use of USB 2.0 or Ethernet communications (serial communications 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 tapped signal from the main data transmission link through a single mode fiber, then collimate 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 intergrated reference source ensures long-term accuracy and stability.

Key benefits:

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

Key design benefits:

- Flexible wavelength range
- Ultra fast response time (up to 5 kHz)
- Excellent wavelength repeatiblity 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:

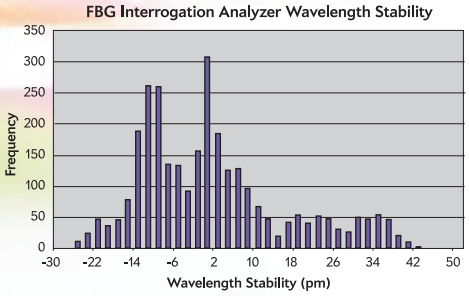
- Telcordia GR-63/1209/ 1221-CORE qualified
- MIL SPEC 810F

WaveCapture™ FBG Innterrogator System–
Ruggedized, Portable, Turn-key FBGA Sensing

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 4 channels
(Inquire on other channel counts)

Portable FBG System in self contained waterproof case



The device covers wide wavelength range and provides simultaneous measurements at very fast response rates and excellent wavelength resolution. High reliability (MIL STD 810F shock and vibration) is achieved through a rugged mechanical design with no moving parts. Periodic calibration is not required. High speed Input/Output (I/O) is achieved through the use of USB2.0 communications or Ethernet (serial communications 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. The signal is spectrally dispersed with the VPG, and the diffracted field is focused onto an InGaAs array detector.

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

Ideal for:

- High reliability, no moving parts
- Ultra fast response time (up to 5 kHz)
- Excellent wavelength repeatability and resolution
- Low power consumption design enabling battery-operated operation
- High reliability for use in harsh environment
- Integrated broadband light source
- 2, 4, 8, and 16 port options (or call)
- USB, Ethernet or RS232 interface

Key design benefits:

- Ultra reliable Volume Phase Grating (VPG)
- Low power consumption
- Battery operation
- All solid-state electronics
- Hermetic sealing
- Lifetime calibration

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)

Compliance:

- Telcordia GR-63/1209/ 1221-CORE qualified
- MIL SPEC 810F





Specifications*

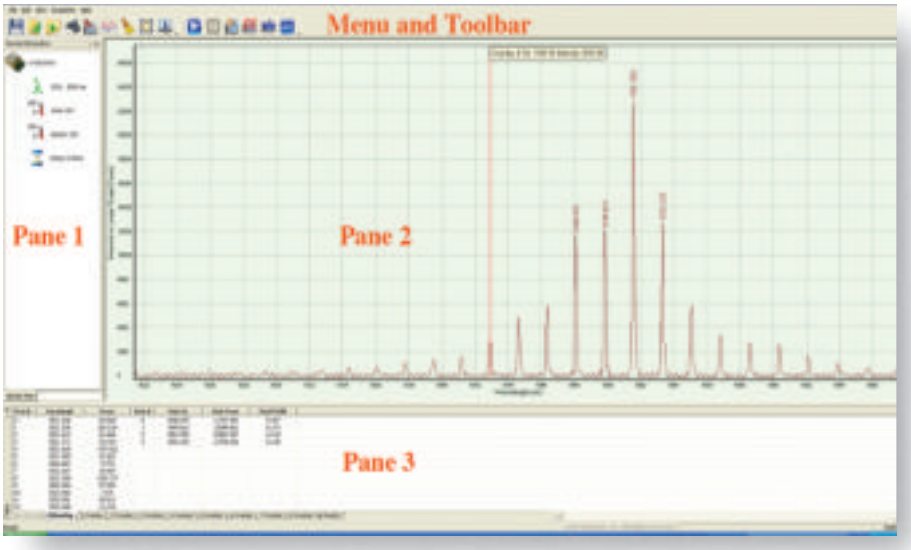
Model	FBG analyzer—Standard	FBG analyzer—USB 2.0	FBG analyzer—Ethernet	FBG analyzer—IRS	Interrogator System
Channel Number					1, 2, 4, 8, 16 or request
Standard Wavelength Ranges*	1525-1565 nm Extended: 1510-1590 nm	1525-1565 nm Extended: 1510-1590 nm	1525-1565 nm Extended: 1510-1590 nm	1525-1565 nm Extended: 1510-1590 nm	Standard: 1525-1565nm Extended: 1510-1590nm (*Other wavelength ranges upon request)
Wavelength Repeatability	± 5pm	± 5pm	± 5pm	± 2pm	± 2pm (with IRS); ± 5pm (without IRS)
Wavelength Readout Resolution	1pm	1pm	1 pm	1pm	1pm
Minimum Detectable Wavelength Change	1pm	1pm	1pm	1pm	1pm
Optical Interface	FC/APC connector (or Customer Specify)				
Frequency response time (typ.)	~5 Hz (Parallel, RS232, or USB 1.1)	~5 kHz	~5 kHz	~5 Hz (RS232/USB 1.1) Fast: ~5 kHz (USB 2.0/ or Ethernet)	1 to 5 Hz (RS232/USB 1.1) Fast: ~5 kHz (USB 2.0 or Ethernet)
Light Source	No	No	No	No	Yes
Internal Reference Source for Real-Time Calibration	No	No	No	Yes	Optional Integrated Reference Source
Channel Input Power Range	-60 to –20 dBm or specify	-60 to –20 dBm or specify	-60 to –20 dBm or specify	-60 to –20 dBm or specify	NA
Power Resolution	0.1dB	0.1dB	0.1 dB	0.1 dB	0.1 dB
Size	96 x 68 x 15.8 mm^3	96 x 68 x 15.8 mm^3	130 x 73 x 15.7 mm^3	113.5 x 84 x 47.5 mm^3 or 148 x 142 x 29.1 mm^3	330 x 280 x 127 mm^3 or 19" rackmount
Interface	Parallel, RS232, or USB 1.1	USB 2.0	Ethernet IEEE 802.3	RS232 or USB 1.1 Fast: USB 2.0 or Ethernet	RS232 or USB 1.1 Fast: USB 2.0 or Ethernet
Optical Circulator	No	No	No	No	Yes
Operating Temperature	-5 to +70° C	-5 to +70° C	-5 to +70° C	-5-70° C	-5 to 55°C; 0 to 80%, non-condensing
Storage Temperature	-20 to +85 ° C	-20 to +85 ° C	-20 to +85 ° C	-20 to +85 ° C	-20 to 70°C; 0 to 95%, non-condensing
Software	BaySpec's Sense 2020 or SEDP 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

Sense 20/20 graphical user interface (GUI) is a Windows-based application program for interfacing with BaySpec's FBGA spectral engines. It can perform the following tasks: acquire and analyze spectra, calibrate wavelength, verify and identify wavelengths. Sense 20/20 is provided with a full Software Development Kit and dll support (sample code for C/C++ and Labview) available with each system purchase. Sense 20/20 is available in both standard speed and fast speed for dynamic applications.



Sense2020 User Interface for Fast FBGA Devices:

Pane 1: Device Tree Viewer displays a list of devices that are connected to the host computer. Under the current selected device name, the wavelength range, real time case and sensor temperatures and the integration time currently used for the measurement are listed.

Pane 2: Spectrum Viewer displays all measured spectra that could be captured by snapshot or continuously acquisition. The spectra are coded with user-selectable colors.

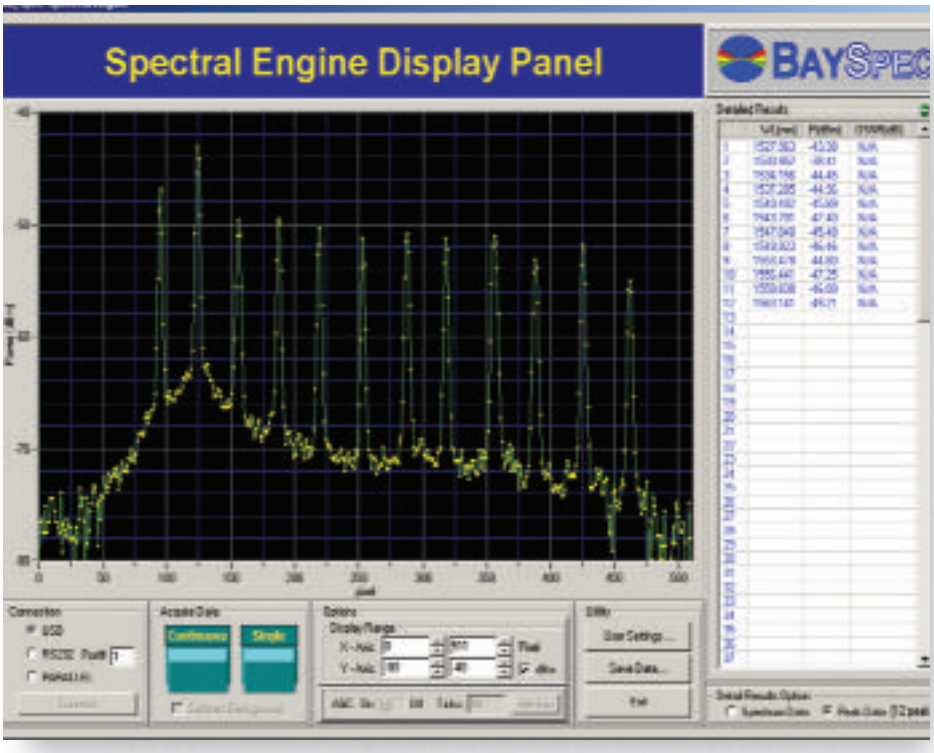
Pane 3: Data Viewer displays a list of spectral wavelength/pixel and intensity data, and a list of detected peaks if peak detection is activated for 0:Overlay ~ 8:Overlay. It can be closed by clicking the button on the top left corner in this viewer.

Menu and Toolbars: All functions and features of the Sense 2020 program, such as system setting, display setting, spectrum acquisition and processing, including set-up and configuration of multi-port/channels, can be selected in this area.

OEM Demo Software for Standard Speed FBGA Devices:

BaySpec's OEM software is designed to aid systems integrators with real-time acquisition and reporting of wavelength data, power and OSNR levels.

BaySpec supports OEM systems integrators with various interface(s) used for a host to communicate with the FBG Analyzer module. The client initiates the interface through either a direct connection (ADD/DAT Bus) or through serial connection (USB or RS232), and both give the module commands as well as receive sensor and processed data from the module. This interaction is true for either serial (USB or RS232) or direct (Dual Port memory) communications. Currently the USB driver for FBGA supports Windows 2000/XP/Win7-32 bit operation system.



Founded in 1999 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) to Fiber Bragg Grating Interrogation Analyzers (FBGA) for the biomedical, civil engineering, oil, gas, mining, energy grid, aerospace, transportation, sports and perimeter sensing markets.

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 Class 10,000 clean room
- History of producing and delivering more than 30,000 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.

BAYSPEC

Pervasive Spectroscopy

Contact info:

BaySpec, Inc.
1101 McKay Drive
San Jose, CA 95131
USA

Tel: +1 (408) 512-5928
Fax: +1 (408) 512-5929
Web: www.bayspec.com
email: sales@bayspec.com

All BaySpec products are made in the USA