1. Introduction to the si255 Hyperion

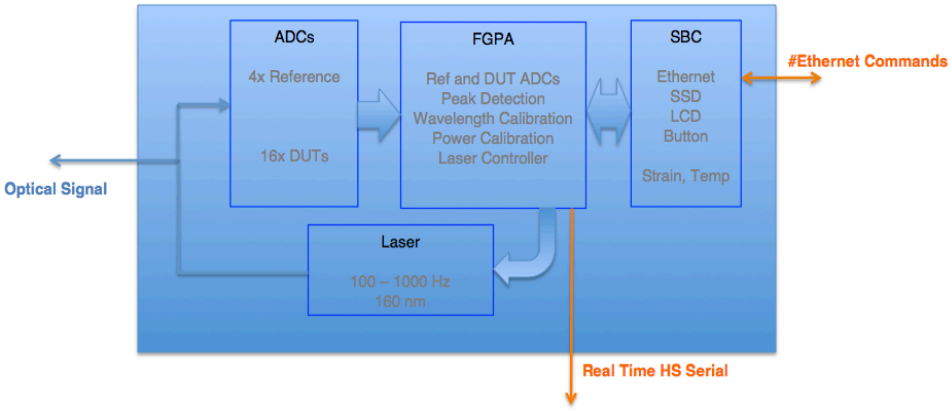
The si255 is an industrial grade fan-less optical sensing interrogator. Featuring both static and dynamic full spectrum analysis, the si255 provides long-term, reliable and accurate measurements of nearly 1000 sensors on 16 parallel, 160 nm wide channels.

The standard si255 features an all new, high power, low noise, ultra wide swept wavelength laser with guaranteed absolute accuracy on every scan which is realized with Micron Optics patented Fiber Fabry-Perot filter and wavelength reference technology.

The all new HYPERION platform, on which the si255 is based, features new and groundbreaking capabilities including high-performance on-board DSP and real-time FPGA processing. This enables rapid full-spectrum data acquisition and flexible peak detect algorithms of Fiber Bragg Gratings (FBG), Long Period FBGs and Fabry-Perot (FP) sensors with low-latency access to data for closed loop feedback applications.

The HYPERION platform includes a comprehensive fully supported Application Programing Interface (API) and LabVIEW, Python, Matlab, and C++ examples. Micron Optics ENLIGHT Sensing Analysis Software which provides a single suite of tools for data acquisition, computation, and analysis of optical sensor networks is coming soon.

1.1. Hyperion's Simple Architecture



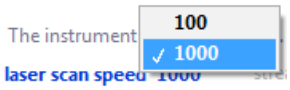
The si255 Hyperion is based upon a simple, but powerful data acquisition and processing architecture. As is seen in the figure above, the swept wavelength laser is couple to a number of parallel optical signal (left exit), which are comprised of both on-board reference and external sensor measurement channels. Each of these channels are directed back towards a bank of photodiodes, the outputs of which are digitized by a collection of up to 20 parallel high speed ADCs, each sampling at a simultaneous 40MS/s. The outputs of those ADCs are captured directly and simultaneously the onboard FPGA, which collects, processes, and transmits data for both laser control and data transmission purposes. This high speed, full spectrum data acquisition and processing chain allows for a range of measurement capabilities that will be outlined in this document.

© Micron Optics, Inc. 2015

1.2. Simple to Use

Despite a host of capabilities to be outlined in following sections, use of the si255 Hyperion is really very simple to use. The laser and data acquisition engine can be run in one of two speeds: 100 and 1000 Hz. Once powered on, the user will either simply accept the default running speed of 1khz or change to the lower speed (more on why the 100Hz speed is useful in a later section).

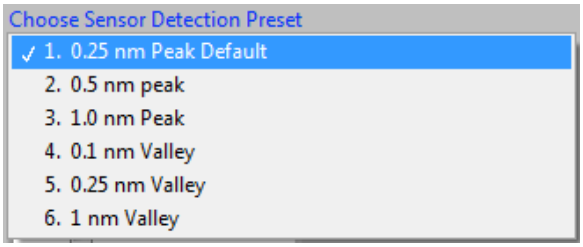
two modes - 1kHz and 100 Hz scans



- six peak detection presets - 3 widths for peaks and 3 widths for nulls

Even though the si255 is a dynamic optical interrogator, it is not fixed in the number and types of optical sensors that it can measure. As indicated in the introduction, the si255 is equally adept at measuring Fabry-Perot, long period grating, long gauge interferometric sensors, (etc, etc) as it is at measuring Fiber Bragg Grating sensors. Since the full optical spectrum of each channel is captures by the FPGA on every 1ms scan, that data can be analyzed in any of a number of ways to distill the data down to the meaningful information that the user needs from the sensor.

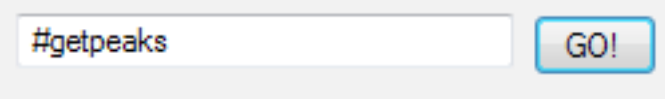
Choosing among different sensor types is really a simple process of choosing the type of spectral feature that the user wishes to detect on each channel. For example, for a standard UV written FBG, the user would select the 0.25 nm Peak Default peak detection parameter. In order to detect the nulls of an absorption gas sample, the user may select the 0.1 nm Valley peak detection preset. While there is an avenue to create and/or customize peak detection presets, the vast majority of measurement applications can be addressed by simply selecting one of the six pre-loaded Detection Presets for each measurement channel. The application examples of this document will illustrate how the presets work and when to choose each.



- two data acquisition commands - #GetPeaks, #GetSpectrum (with streaming options for both)

Once peak detection parameters are selected, the si255 is ready to present two key types of data to the user. As an intrinsically full spectrum instrument, the entire optical spectrum is captured and calibrated for each channel on each of the 1 ms kHz acquisitions. On each acquisition, the full spectrum is processed into the key peak and/or valley parameters of each sensor channel. These processed peaks and valleys are available to for user consumption at a full data acquisition rate of 1kHz via the #GetPeaks command. Access to the full spectrum data is easily facilitated via the #GetSpectrum command and is down-converted to an easy-to-consume data rate of 10 Hz.

© Micron Optics, Inc. 2015



Replies to both #GetPeaks and #GetSpectrum commands are formatted in both machine-readable binary and human-readable text formats.

```
Channel 1 - 16 Peaks
----------------------
1464.1344  1477.2234  1487.9795  1497.9889  1505.1205  1514.0187  1524.0393
1535.9325  1543.9549  1556.1153  1564.2313  1576.1325  1583.9754  1596.0212
1604.9751  1614.8711

Channel 2 - 16 Peaks
----------------------
1516.4543  1517.3310  1518.2292  1519.1496  1520.0987  1521.0740  1522.0774
1523.0964  1528.0277  1529.1935  1530.3868  1531.6040  1532.8447  1534.1132
1535.4119  1536.7177

Channel 3 - 2 Peaks
----------------------
1553.0721  1555.6187

Channel 4 - 9 Peaks
```


© Micron Optics, Inc. 2015

2. Application Examples - Hyperion do things where nothing else can

The measurement capability and flexibility of the si255 Hyperion are best demonstrated through application examples. The following example sections will offer insights into the ways that Hyperion can make enabling measurements possible in a number of measurement applications.

2.1. Medical/Surgical Device Measurements

Consider the follow scenario: you are responsible for designing and implementing a high performance optical sensing system to provide real-time feedback in a critical medical or surgical process.

"You need kilohertz measurements to drive a *dynamic feedback loop* in your medical application. Speed is essential, yet you absolutely *cannot generate and act upon erroneous data*. Through the Micron Optics patent-pending ***Gas Cell "Lock and Key"*** calibration technology, exclusively deployed in a ***dynamic FBG measurement system*** via the si255 Hyperion, you can deliver life-saving strain, force, and temperature, measurements with total assurance that only valid data is transferred to your control system.

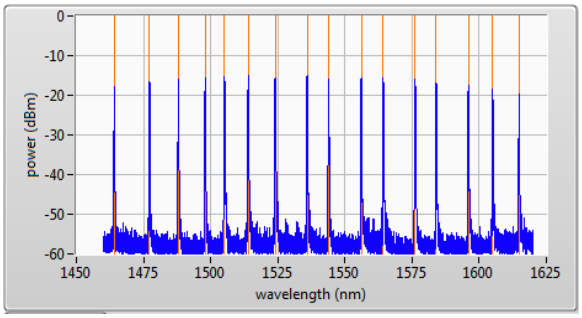
Use of an optical solution has already been decided… Immunity from RF interference and safety inside the human body is essential. Would the of any other optical technology that cannot offer the "Lock and Key" guarantee in this application would be sufficiently safe or responsible?"

Demonstration artifacts: 160 nm FBG array, gas cell

Measurement Mode: 1kHz scan speed, 0.25 peaks, 0.1 nm valleys detection presets

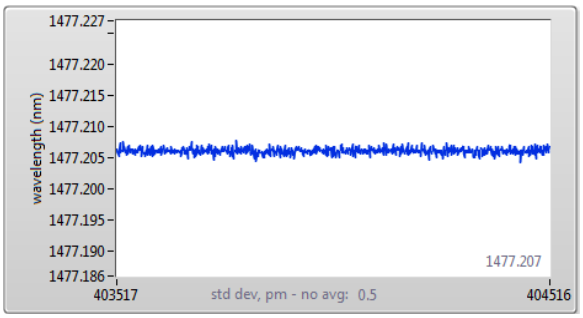
© Micron Optics, Inc. 2015

The measurements:

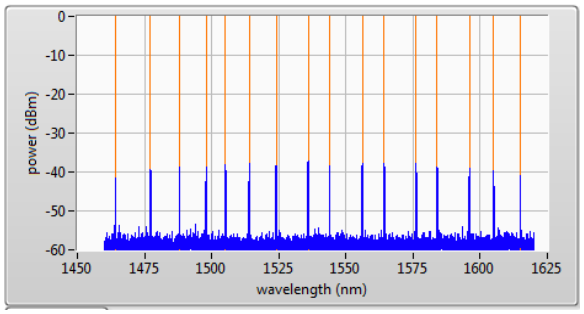


FBG Peak and Full Spectrum Detections

Fundamental to this application example is the ability to make repeatable, accurate, reliable measurements of strain and temperature from a series of FBG sensors. The si255 captures the full optical spectrum (blue) and instantaneously converts that spectrum precisely and repeatedly into FBG peak values (orange) at full kHz rates. Because that conversion from full spectrum to peak data happens in real-time FPGA calculates, that data can be transferred from the si255 Hyperion core instantaneously, with the fixed low latency transmission required for stable closed loop system controls.*



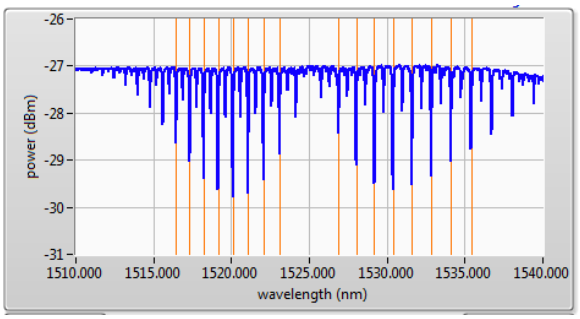
Excellent <1 pm repeatability



Superior > 20 dB Peak Dynamic Range at 1 kHz.

The si255 exhibits excellent peak detection repeatability and stability, allowing for measurement systems with sensitivity requirements on the order of 1 microstrain or 0.1 degrees C. Additionally, these performance parameters hold over a wide range of sensor losses, either channel-wide, or varying by individual sensor. Continuous > 20 dB dynamic range *per sensor* without any user gain or threshold management requirements allows system designer and user to focus on the results of the measurement system, rather than continual tweaking of instrument gains or detection parameters over varying operating conditions.

© Micron Optics, Inc. 2015



Gas cell "lock and key" data assurance.

Repeatable strain and temperature measurements over a wide range of input conditions ensure the operation of the medical monitoring system, but what assures the accuracy and thus the safety of the application. How can he designer, operator, be absolutely sure that these critical measurements are correct?

The answer lies again within Hyperion's unique capabilities of capturing and processing high resolution full optical spectrum during dynamic kHz acquisitions. On each scan, the si255's high-resolution laser simultaneously illuminates both the desired sensor channels as well as a NIST traceable on-board optical reference component. This atomic absorption gas cell is an internationally recognized primary optical wavelength reference and features a spectral "fingerprint" that is continually captured, analyzed, and compared against published values by Hyperion on every acquisition scan. Any deviation from true measurements by any potential failure mechanism (optical, electrical, mechanical, software) will result in a change to that spectral signature. The si255 Hyperion firmware analyzes this fingerprint on every scan, ensuring a complete match with the recognized standard fingerprint before transmitting any sensor data to mission critical applications. In a manner of speaking, the si255 regenerates a new reference cell signature spectrum (a metaphorical key) that must match the internationally recognized primary wavelength standard optical spectrum (a corresponding lock) before wavelength data will ever be transmitted from the system.

As a result of these features, **only Hyperion** can enable **real-time*** instrument strain measurements via inside the body via tiny, inert fibers, free from EMI, at **kHz rates** with absolute **"lock and key" wavelength certainty** for patient safety.

* NOTE: this type of instantaneous data transfer is a core capability of the Hyperion data acquisition core, although at present, transmission via a custom High Speed Serial protocol is currently a feature of OEM configurations only

© Micron Optics, Inc. 2015

2.2. Wind Turbine Monitoring and Controls

Consider this next measurement scenario: you are responsible for designing and implementing a high performance optical sensing system to provide real-time feedback in a critical monitored wind turbine deployment..

"Your next generation smart wind turbine designs require *real-time* deterministic strain* data from surface mount gauges in the hub.

The system requires a series of distributed arrays of strain and temperature sensors that run the length of the blades. You need the critical *motion data from accelerometers* monitoring the movements of the blade tips. The equipment must be installed in the rotating hub, so *fanless* operation over a wide *-20 to 60 C* temperature range is essential. The si255 Hyperion has the exclusive capability of ***simultaneously monitoring FBG sensors*** and next generation ***WDM multiplexed Fabry-Perot accelerometer arrays***. By choosing the Hyperion system, you employ the best of FBG and FP technology to fully instrument and monitor the critical movements of your win turbine rotor and blades. Through the innovative HW-based data acquisition, calibration, and control architecture of Hyperion, you can be assured that data is transferred with a ***fixed, low latency*** over a high speed serial connection*, guaranteeing the stability of your turbine control system. Use of a fiber-optic solution has already been decided…*Immunity from lightning* events on the sensors is essential. Use of any other fiber optic technology in this application would require system limiting choices between the FBG strain and temperature measurements and the FP acceleration measurements that you need."

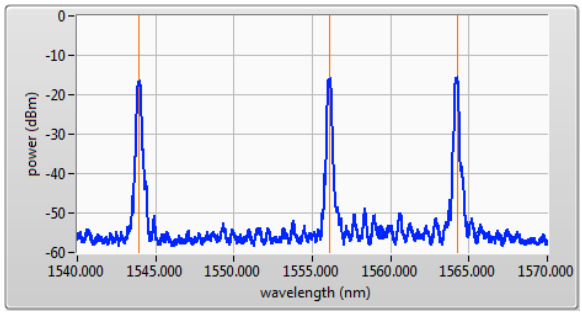
Demo Artifacts: 160/0.25 nm FBG array, 0.5 nm FBG, WDM'd accelerometers,

Measurement Mode: 1kHz scan speed, 0.25 peaks, 0.5 nm peaks, 0.25 nm valleys detection presets

© Micron Optics, Inc. 2015

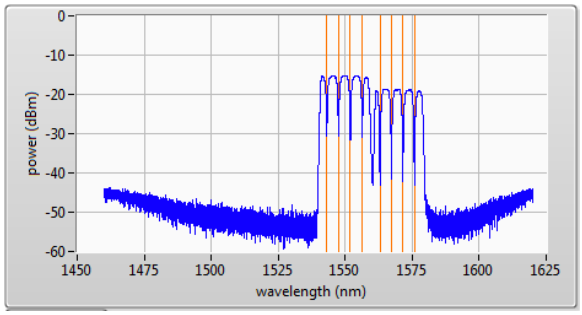
The measurements:

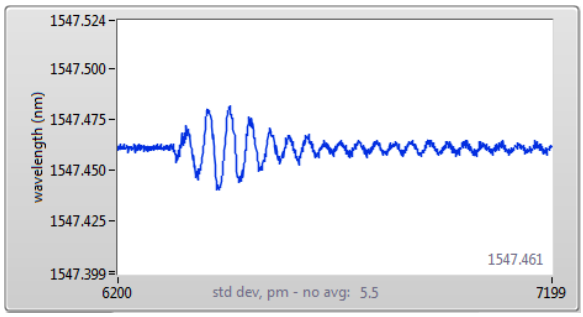
0.25 nm FBGs selected for blade length strain and temperature



FBGs provide for blade shape and pitch position information

Again, key to this measurement scenario's success is the ability to accurately and reliably measure the center wavelengths of FBG sensors for strain and temperature measurement. In this application example, it is conceivable that different types of FBGs (standard UV "strip-and-recoat", femtosecond (FS) FBGs, draw tower gratings (DTGs)) may be chosen for different areas of deployment on the turbine. For example, direct-bonded arrays of DTGs spanning the full 160 nm wavelength range of the si255 Hyperion may be deployed along the length of each blade to give indications of blade deformation or shape. Several higher level, ruggedized strain transducers built from "strip-and-recoat" FBGs may be deployed in the blade roots to facilitate active individual pitch control. Because of the si255 Hyperion flexibility with regard to sensor shape, bandwidth, and reflectivity, all of these types of FBG sensors can be simultaneously and robustly detected by the system.





The si255 Hyperion can also measure Fabry-Perot peaks or nulls, as is shown with these two multiplexed optical accelerometers.

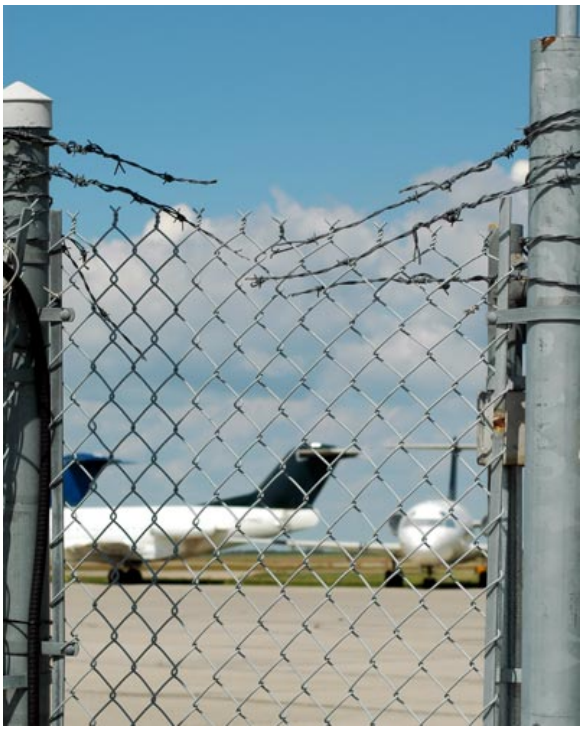
Unique to the si255 Hyperion is the ability to measure not just FBG profiles, but also interferometric sensors such as Mach-Zehnder or Fabry-Perot spectra. This capability is also key for the wind turbine application, allowing the system designer to simultaneously measure FBG sensors alongside the latest generation of high-performance all-optical Fabry-Perot accelerometers. These os7500 accelerometers from Micron Optics offer a combination of range and sensitivity to acceleration that is orders of magnitude higher performance than any other fiber coupled optical accelerometer on the market. Because of Hyperion's real-time programmable peak detection, both FBG and FP spectra can be simultaneously interrogated at dynamic speeds using the standard Peak Detection Presets.

Only Hyperion can fully monitor **real-time** lightning resistant root and blade **FBG strain and temperature sensors** and blade tip **Fabry-Perot accelerometers** in a robust, industrial grade **fanless** package.

© Micron Optics, Inc. 2015

3. Perimeter Security/Intrusion Detection

This next user application example demonstrates several additional key strengths of the si255 Hyperion interrogator. Consider for this scenario that you are chartered with combining fiber optic sensors to create a sensitive and reliable perimeters security and intrusion detection system. Let's see how Hyperion's features can help.



"The si255 Hyperion interrogator helps you to solve problems in the fields of perimeter intrusion detection and pipeline security that otherwise cannot be solved. ***16 channels of 160 nm*** of spectrum increase the simultaneous sensor count capability of Hyperion to ***4000 sensors, 32 times more capacity*** than its closest competitor. That means 64 times as many sensors, for *longer perimeters, for tighter spatial resolution* (thus enhancing event detection sensitivity). Hyperion technology also supports simultaneous detection of ***both FBG strain sensors*** and next generation WDM multiplexed ***Fabry Perot sensor accelerometer*** technology. Only with the si255 Hyperion can a security system simultaneously monitor FBG strain sensors to detect *climbing motion* on a wall, fence, or pipeline and *minute vibrations (digging, trenching)* in the ground using EMI resistant, *zero electrical emissions (undetectable)* fiber optic signals for a high-performance holistic intrusion detection system. Only Hyperion can combine 1kHz measurements with 1pm absolute and lifetime relative accuracy to detect temperature *changes as small as 0.005 degrees C*. Use of a fiber optic sensor network in this application brings many benefits, including longer distances, lower power consumption, in the non-detectable nature of the optical sensors. Use of any other fiber optic technology requires trade-offs between strain and sensitive acceleration, distance and resolution... when the si255 Hyperion can do it all."

Artifacts: FBG, AFPI(s), FP accelerometer(s)

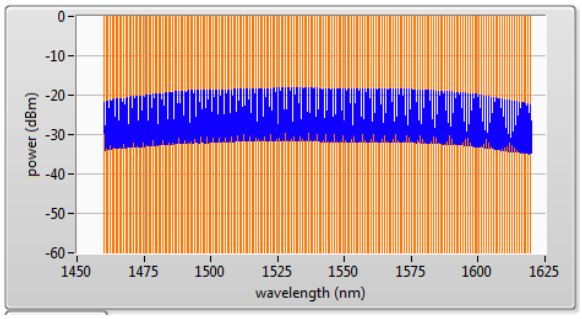
Measurement Mode: 1kHz scan speed, 0.25 peaks, 0.25 nm valleys detection presets

© Micron Optics, Inc. 2015

The measurements:

In perimeter security applications, the keys to success are a breadth of physical distance coverage with adequate measurement sensitivity to detect events, while maintaining sufficient system signal to noise to prevent unwanted erroneous event (false positive) detections. FBG sensor technology is proving to be a formidable competitor to more traditional distributed interferometric fiber PIDS systems due to the high SNR of the system and the associated protection from false positive event detection. Hyperion builds on those strengths and expands the reach and spatial resolution capabilities through its huge sensing capacity.

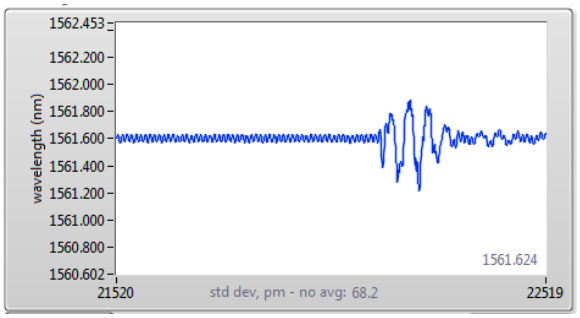
The wide 160nm scanning laser source of the si255 Hyperion has enough optical power to be shared among as many as 16 simultaneous detector channels. At a reasonable sensor spacing of 2nm for perimeter intrusion cable design, that means that as many as 80 x 16= 1280 FBG sensing points can be simultaneously interrogated by the system at a full 1kHz acquisition rate.



1461.622	1461.523	1461.663	1461.544	1609.971	1609.059		1609.086
1462.341	1462.238	1462.381	1462.260	1610.846	1609.932	1610.891	1609.958
1463.060	1462.955	1463.101	1462.976	1611.722	1610.800	1611.766	1610.827
1463.787	1463.677	1463.827	1463.699	1612.597	1611.672	1612.640	1611.699
1464.513	1464.397	1464.553	1464.420	1613.474	1612.542	1613.517	1612.569
1465.232	1465.115	1465.272	1465.137	1614.354	1613.414	1614.399	1613.441
1465.955	1465.836	1465.995	1465.857	1615.230	1614.290	1615.273	1614.317
1466.682	1466.559	1466.723	1466.581	1616.110	1615.162	1616.154	1615.189
1467.406	1467.279	1467.447	1467.301	1616.991	1616.037	1617.035	1616.064
1468.130	1468.000	1468.171	1468.022	1617.874	1616.915	1617.919	1616.941
1468.857	1468.724	1468.897	1468.746	1618.758	1617.794	1618.802	1617.821
1469.588	1469.449	1469.629	1469.470	1619.639	1618.671	1619.683	1618.698
1470.317	1470.175	1470.358	1470.197	0.000	1619.549	0.000	1619.576
1471.045	1470.900	1471.086	1470.922				

Literally hundreds of sensors per channel, thousands of sensors over 16 channels can be simultaneously detected at 1 kHz

Even at full sensor capacity, the si255 Hyperion makes no tradeoffs regarding accuracy, dynamic range, or sensor repeatability. Each one of the thousands of detected sensors are captured and reported with the same precision and insensitivity to loss as would a single sensor system.



1 kHz FBG with 1pm acc average to 0.005 deg C res at 1 Hz. **FP accelerometer detect footsteps, voices from meters away**

In fact, the speed, accuracy and repeatability of the system can be exploited to get the best performance over a number of sensor types at the same time using the si255 Hyperion. In this security application, strain sensors can be monitored at 1 kHz, with client software looking for key vibration signatures that may be indicative of a fence breach or scaling attempt. Temperature sensors may be interrogated at lower rates of speed, taking advantage of the accuracy, repeatability, and kHz acquisition rate to yield individual sensor repeatability of 10's of femtometers. This type of resolution allows the user to see changes in ambient temperature as low as 1/1000th of a degree C. Additionally, the highly sensitive optical os7500 optical accelerometers can be monitored at kHz rates to watch for footsteps or approaching vehicles. Together, the range, speed, sensitivity, and capacity of the si255 Hyperion afford many capabilities to implement high performance and economically viable perimeter intrusion monitoring systems.

© Micron Optics, Inc. 2015

Only Hyperion can simultaneously monitor **1000's of FBG sensors** over **km's of distance** at **1kHz rates** for motion detection, with **milli-degree temperature sensitivity**, and ultra-high resolution **Fabry-Perot optical accelerometers** for high performance, detection-proof perimeter intrusion detection systems.

© Micron Optics, Inc. 2015

4. Automotive (and Aerospace)

The si255 Hyperion system offers one-of-a-kind capabilities for robust and reliable measurements of embedded *strains in composite* panels using fiber sensors. Consider the following scenario where you are responsible for monitoring strain and fatigue on composite structures using embedded FBG sensors.

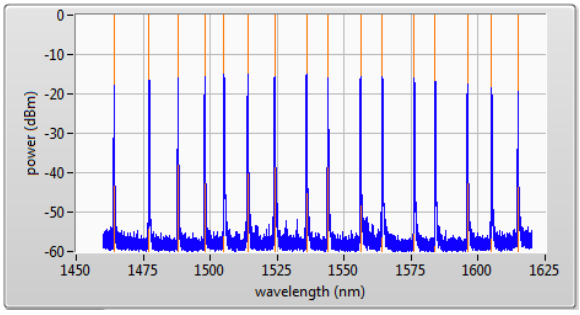
"For your application designing next-generation composite parts and panels, the si255 Hyperion can be uniquely deployed to accurately measure strain in FBG fiber sensors embedded inside those composite panels, *free from* the traditional limitations of *transverse-strain-induced spectral distortions (peak splitting) and/or birefringence* of the sensors that plague and limit other measurement systems. Employing a one-of-a-kind ***programmable dynamic hardware peak detection system*** in combination with and optional ***Low Degree of Polarization (DOP) Swept Laser Source***, si255 Hyperion can measure embedded fiber Bragg rating strain sensors without polarization induced noise and can easily adapt to changes in spectrum that result from the embedment process. The use of fiber sensors in your application is already been decided…Glass fibers are intrinsically compatible with your composite materials and are the best avenue to generate strain measurements from within. The si255 Hyperion with Low DOP option is uniquely capable of reliably monitoring sensors in this application where polarization and peak distortions are real a concern."

Artifacts: FBG array, compressed FBG (if available)

Measurement Mode: 1kHz scan speed, 0.25 peaks, 1.0 nm peaks detection presets

© Micron Optics, Inc. 2015

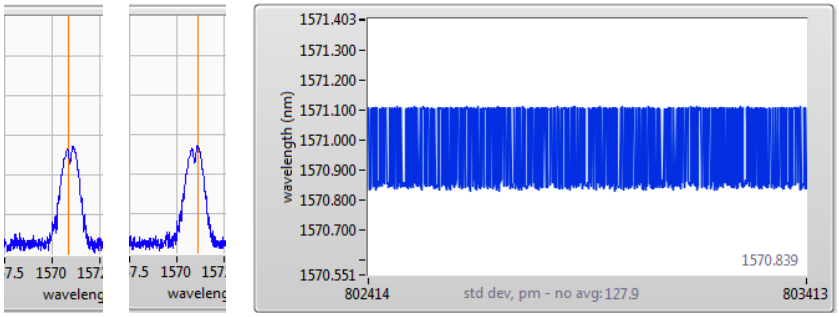
The measurements:



The wide wavelength range of the si255 Hyperion allow for a large number of FBGs to be embedded on each channel, providing for good spatial resolution of detection within the structure. The 16 channels of parallel detections enable star-networks of optical sensors where such and architecture offers an advantage in system design or deployment.

Direct embedment of optical fiber sensors into composite structures offers several key operational advantages that continue to entice engineers and system designers in a number of industries. However, there are several key operational complexities that can limit the effectiveness of sensor embedment. The si255 Hyperion has features to address these issues.

When optical sensors are either embedded into or directly bonded to the surface of a composite material, there can be forces on the optical sensor with orientations other than the desired measurement direction. These forces may present as either transverse or non-uniform strains along the length of the FBG, which can in turn manifest as spectral distortions or “peak splitting”

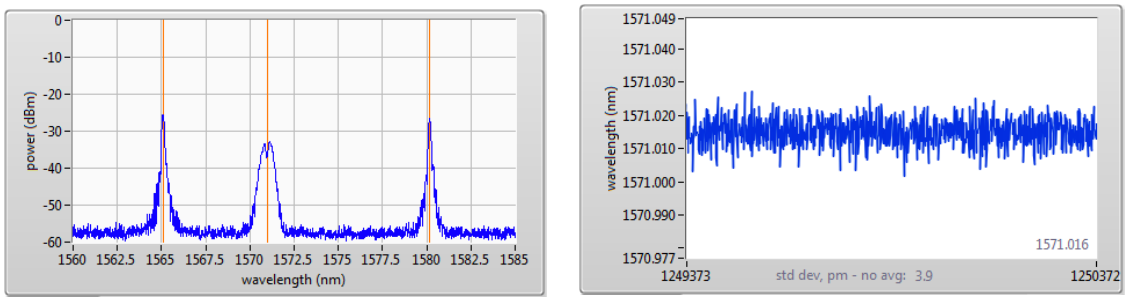


Embedded sensors can suffer from spectral distortion or “peak splitting” from transverse or non-uniform strains.

As is seen in the images above, split peaks can potentially result in unreliable peak detection of an affected sensor, resulting in bi-stable measurements or worse. If an optical sensor interrogator has a fixed peak detection algorithm, distortions on the sensors can easily render those affected sensors as effectively useless.

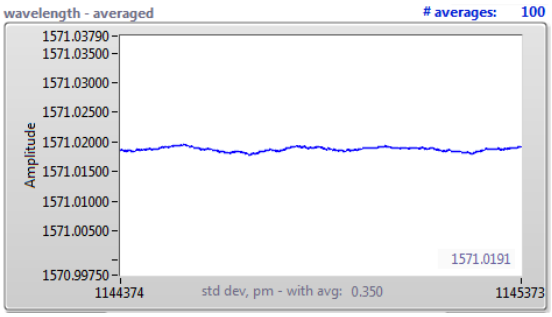
In the case of the si255 Hyperion, the full optical spectrum of all sensors is captured by the instrument on every 1 kHz acquisition. As such, the user can simply select a different Peak Detection Preset for the affected channel, assuring ongoing reliable detection of an otherwise jeopardized measurement point.

© Micron Optics, Inc. 2015



Selecting a wider peak profile enables stable peak finding on distorted peaks.

Additionally, the high 1kHz acquisition the si255 allows for real-time averaging to yield highly repeatable measurements of distorted signals at still-useful acquisition rates.



High speed acquisition, flexible hardware peak detection, and peak averaging yields high repeatability.

An addition to gracefully contending with spectrally distorted peaks, the si255 Low DOP option provides for stable and reliable measurements of sensors which may become birefringent, or polarization sensitive, as a result of the bonding or embedment process. Please see Micron Optics Application note ANXXXX for details.

NOTE: The si255 Low DOP option is equally effective in mitigating the intrinsic birefringence of femtosecond (FS) laser inscribed FBGs.

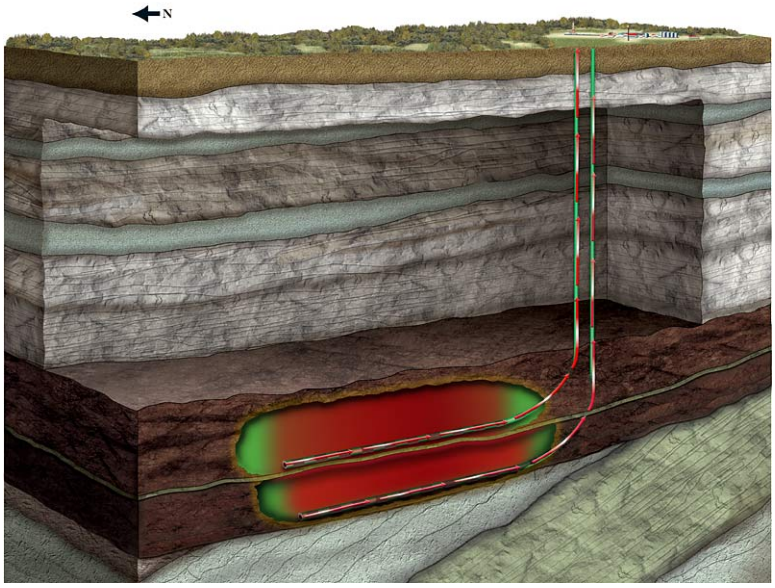
Only Hyperion yields accurate, **repeatable measurements on birefringent** and spectrally distorted FBG peaks** that commonly occur in composite embedded FBGs.

© Micron Optics, Inc. 2015

5. Oil and Gas (Proprietary Gauge)

The last application example will highlight the strength of the 16 channel full spectrum capabilities of the si255 Hyperion. Consider for this example that you are charged with the development and deployment of a down-hole fiber optic sensor that will be used to optimize and guide critical processes in a hydrocarbon recovery application.

In this application scenario, the si255 is shown to serve well as both laboratory sensor design instrumentation as well as field deployed monitoring system. Consider the following:



Proprietary Gage, Fiber Darkening

A. Field Deployment

"You have done it. You've created an optical sensor technology unlike any other. It bears certain strengths of the FBG sensor… It does things that traditional FP sensors do, but this thing is all your own. You've made this sensor respond in a way that no other sensor before it has. And you know who needs it and you use it to deliver powerful measurements but will save them millions. You've done your development work on the best bench-top optical test and measurement gear available…Agilent lasers, EXFO/Burleigh wave meters, Anritsu spectrum analyzers. The prototype system is working great. All you need now is a *highly accurate, fast, multi-channel, wide-band, field-deployable spectrum analyzer* to measure it for as long as hydrogen darkening will allow. You know the secret sauce of your sensor… All you need is accurate, high resolution, high reliability spectral information served into your algorithms"

Artifacts: Hybrid FP/FBG Sensor (or wavelength multiplexed FP accelerometer channel)

Measurement Mode: laser scan speed 100Hz with 10 Hz 16 channel full spectrum (for client side detection)

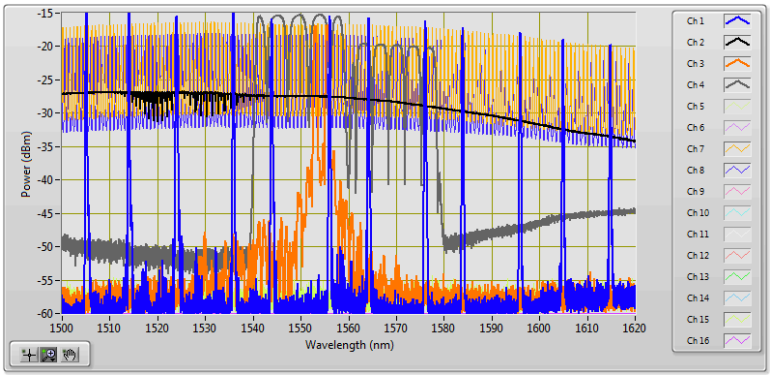
© Micron Optics, Inc. 2015

The measurements:

In all previous measurement application examples, the laser has been set to its default scan rate of 1kHz. In this measurement example, where priority is place on the highest quality full spectrum data, the acquisition rate is reduced to 100Hz. This reduction in scan rate provides for a number of operation benefits.

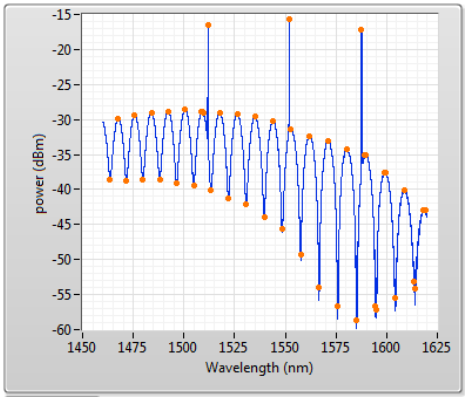
1. With a 10x reduction in scan rate, more of the processing power of the FPGA is applied to optimizing the optical full spectrum data. At 100 Hz laser scan rate with 10 Hz data rate delivery, the spectral traces exhibit and extremely high degree of wavelength and power stability, spectral resolution, spectral detail, and signal dynamic range.

2. At a 100Hz laser scan rate, full spectrum traces are internally captured on all 16 channels at 100Hz, the internally averaged to yield a solid and robust data delivery rate of 10 Hz for all 16 channels of data to the user via the #GetSpectrum command. The image below depicts the client side delivery of those 16 channels of 20,000 data points each.

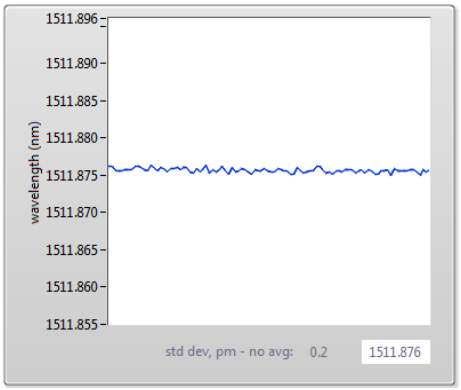


16 channels of 160nm spectrum at simultaneous 10 Hz

By delivering the full spectrum reliably at exactly 10 Hz, users can consume the full spectrum data stream from their sensors and run any external spectral analysis algorithm that they choose in their own software. The two images below show the process and results of running client-side detection on the Hyperion supplied 10 Hz full spectrum data



Client side algorithm running on 10 Hz full spectrum.



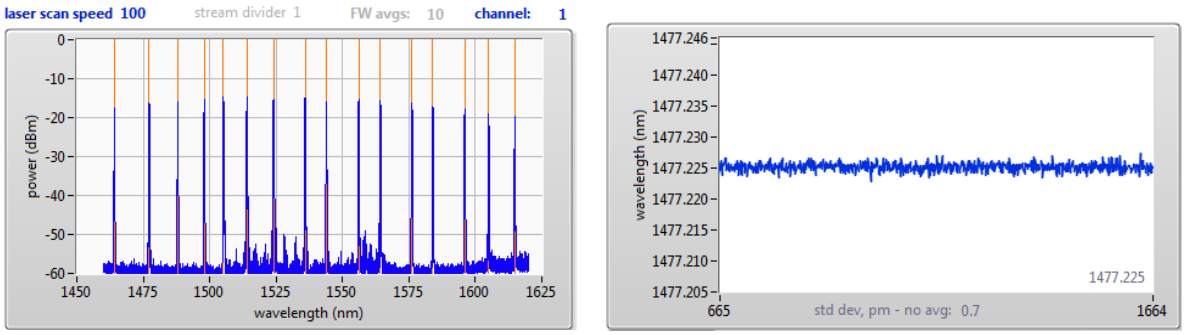
0.2 pm external peak detection repeatability at 10 Hz.

© Micron Optics, Inc. 2015

In this manner, users can take advantage of the many filed deployment and sensor capacity advantages of the si255 Hyperion interrogator while still relying on their own custom or proprietary sensor analysis algorithms.

"The si255 Hyperion is the only field deployable, lab performance-grade optical spectrum measurement device in the world. Unlike diode arrays, there are no mechanical drift effects or arbitrary power scales. Unlike OFDR systems, there is no vibration sensitivity to the measurement. Unlike scanned aperture spectrum analyzers, there are no bulk moving parts for misalignment. Unlike TDM systems you don't just have to look at total integrated power as an indication of your sensors behavior. The255 Hyperion serves ***fully wavelength and power calibrated optical spectrum data*** to one picometer accuracies and measures powers over the wide range of -10 to -60 dBm, streaming calibrated wideband spectrum over Ethernet for up to ***16 parallel channels*** simultaneously. Only the si255 can provide that data in a field ready package over the wide 160 nm wavelength range and 10 Hz speed that you need."

It is also worth noting that the optimized full spectrum capabilities of the si255 Hyperion interrogator in 100Hz mode does not preclude internal peak detection operation. In fact, the si255 is capable of supporting both 16 channel 10 Hz full spectrum data streaming alongside 100 Hz peak data for 1000's of sensors.



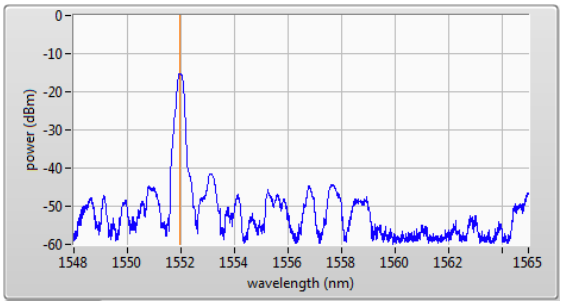
Simultaneous 100 Hz peak data delivery on 1000's of sensors

B. Sensor Development

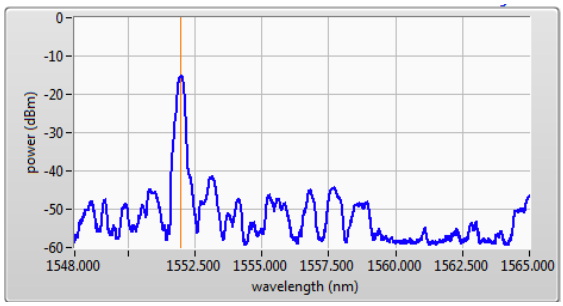
Though the si255 was developed for field deployments, it is reasonable to recognize that its measurements capabilities and specifications are on-par or superior to that of many traditional "laboratory grade" instruments, including OSA's, ASE sources, tunable lasers, etc. In that respect, the interrogator that you choose for your sensor deployments is equally capable for use in sensor development.

The spectral plot of an apodized FBG below shows the noise performance, dynamic range, and spectral resolution of the si255, confirming that it is more equally useful for laboratory measurements during the sensor development phase of an optical sensing program.

© Micron Optics, Inc. 2015



100 Hz laser scan mode - 16 channels FS delivered at 10 Hz



Data rate averaged to 2 Hz - for historical comparison

Fun fact: spectral noise performance of the dynamic si255 exceeds all static-only interrogators on the market.

Only Hyperion can serve **16 channels of simultaneous/parallel power calibrated, 1 pm wavelength accurate full spectrum over 160 nm at 10 Hz** rates for use as a field interrogator or production measurement device, putting the full power of your sensor and full spectrum into your hands.

3. Summary

Only the si255 HYPERION offers

16 parallel channels

160 nm of scanning range

1kHz measurements with gas cell accuracy

Programmable sweep rates

Programmable real-time hardware peak detection

Simultaneous FBG, FP, long gauge interferometric, LPG detection

Dynamic peak data and high resolution full spectrum

Peak distortion and polarization insensitivity

Wide -20 to 60 degree fanless operation

© Micron Optics, Inc. 2015