

Application Note

Keywords

- High resolution
- Low stray light
- High throughput

Techniques

- Absorbance
- Fluorescence
- Emission

Applications

- Biomolecule quantification
- Plasma monitoring
- Thin film characterization

High Definition Optics for Exceptional Performance in a Compact Spectrometer



The innovative design of the Ocean HDX spectrometer sets new benchmarks for throughput, resolution, stray light and thermal stability. With a high-sensitivity, back-thinned detector and pioneering High Definition Optics, the Ocean HDX delivers exceptional performance in a compact, UV-Visible spectrometer.

High Definition Optics

At the heart of the Ocean HDX is its High Definition Optics design, using a combination of optimized optical bench components, specialized materials and precision engineering to maximize optical resolution, increase throughput, reduce stray light and maintain thermal stability. This elevates system performance in several ways:

- Low stray light performance contributes to high dynamic range and high absorbance linearity for determining the concentration of analytes in solutions. These features also make it possible to measure optically dense samples, quickly and with high accuracy.
- High throughput and the use of a back-thinned CCD detector deliver higher sensitivity performance for low light applications including fluorescence.

- Optical resolution of <math><1.0\text{ nm}</math> (FWHM) and extraordinary peak symmetry set a new benchmark for this size of bench, delivering superior performance in applications such as absolute color accuracy.

Improvements in the resolution, peak shape and throughput result from an optical bench design optimized for use with aspheric toroidal mirrors. These high performance, solid aluminum mirrors are polished to reduce scattered light, resulting in lower stray light. Material matching for the mirrors and optical bench give the Ocean HDX outstanding thermal stability ensuring resolution and both wavelength and intensity calibrations remain stable over a wide operating temperature range.

Also, stray light is minimized through the design of integral light-absorbing baffles and structures in the optical bench. These baffles trap stray light coming from the grating so it does not reflect toward the detector. Finally, excellent system-to-system reproducibility is achieved through tight tolerancing of the optical components and their alignment.

Ocean HDX for Research and Science

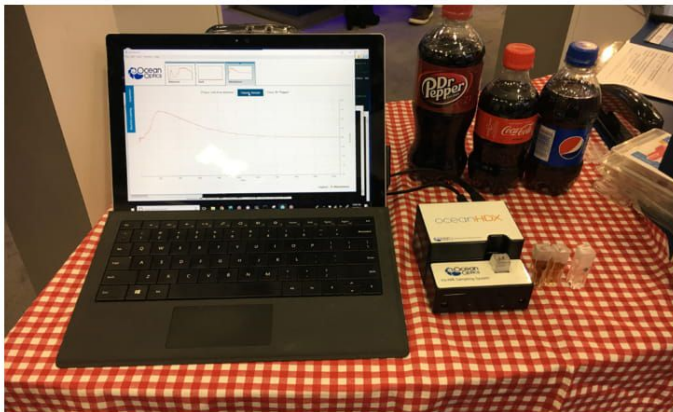


Figure 1. Its low stray light performance makes Ocean HDX ideal for absorbance measurements of optically dense solutions.

Ocean HDX is the tool for researchers at the forefront of their fields. With outstanding UV sensitivity, high resolution, high throughput and low stray light, Ocean HDX delivers performance to keep your results decisive and unambiguous. From UV absorbance of biomolecules like protein and DNA to reflection measurements of live specimens, Ocean HDX is the choice for high quality measurements.

Absorbance measurements are a staple of the research laboratory. Used to evaluate chemical composition in the identification of unknown samples or to determine concentration using a standard curve, absorbance is a key measurement in most laboratories. Researchers will appreciate the upgraded optical performance of the Ocean HDX including the low stray light coming from the HD optics. High stray light in the UV region is a common challenge for modular spectrometers measuring absorbance. Stray light limits the maximum absorbance attainable with the spectrometer, necessitating sample dilution, which increases the potential for errors and sample changes. Ocean HDX's high performance optical design and high definition optics reduce stray light enabling accurate concentration determination even for optically dense samples (**Figure 1**).

Ocean HDX for Industrial

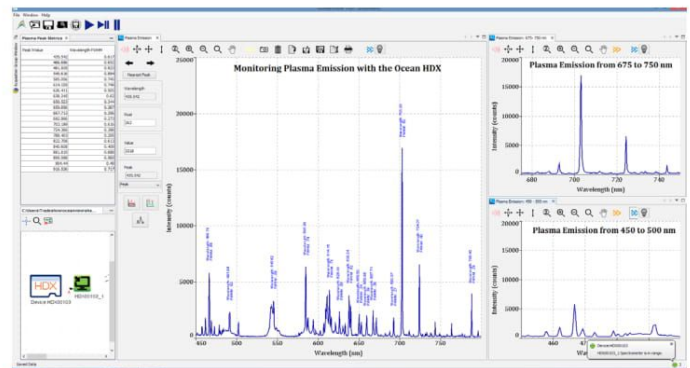


Figure 2. Great optical resolution and remarkable peak symmetry over the entire wavelength range make Ocean HDX a good choice for monitoring plasma emission.

With uncompromising performance and unparalleled ease of integration, the Ocean HDX is well-suited for use in an industrial setting. Ideal for integration on a manufacturing line, the reliable, robust Ocean HDX combines high definition optics with X-platform electronics to deliver high performance with a range of communications options and onboard analysis capabilities. Outstanding unit-to-unit repeatability ensures consistency in performance across multiple monitoring points on a process line or across multiple plant locations.

Key industrial applications for the Ocean HDX include thin film analysis on a production line, high speed, high throughput color and irradiance measurements for

QA/QC, and real-time elemental analysis using plasma monitoring (**Figure 2**). Online measurements benefit from Ocean HDX's high definition optics yielding high resolution, symmetrical peaks. The high quality of the peaks measured with the Ocean HDX provides exceptional spectral data for elemental analysis, endpoint detection and plasma monitoring. With high throughput and high sensitivity in the UV region, the Ocean HDX is a fantastic choice for integration on manufacturing and process lines.

Ocean HDX for Biomedical OEMs

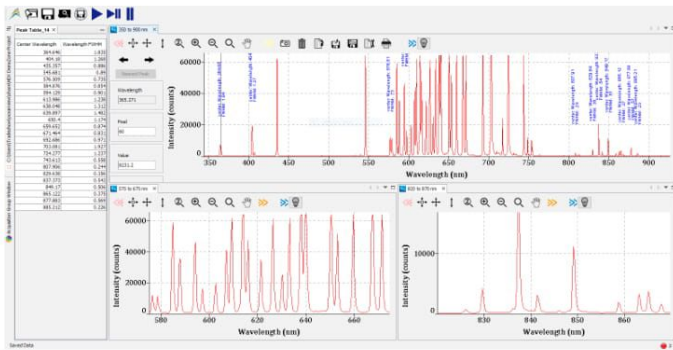


Figure 3. By using Ocean HDX to measure the output of gas-discharge mercury-argon and neon light sources, we can demonstrate the system's great optical resolution and peak symmetry.

Combined with our in-house expertise and technical support, Ocean HDX is an excellent option for OEMs developing biomedical instrumentation. As with all our spectrometers, we offer high-performance systems in compact, easy to integrate packages, supported by a global network of highly skilled sales and service teams, to meet OEM needs from components and subassemblies to complete solutions. What's more, exceptional quality systems and manufacturing capabilities can be scaled to your needs.

As a high performance, highly reliable UV absorbance instrument producing very repeatable results, Ocean HDX offers users a high degree of confidence. In the case of biomedical and clinical applications, great absorbance linearity will enable the determination of sample concentrations at high absorbance levels for online, in situ measurements and measurements in a clinical laboratory setting.

Whether integrating the Ocean HDX on your process line for real-time measurements or using the Ocean HDX as the heart of your biomedical analysis system,

HD optics and the X-platform provide high performance in a compact footprint.

Conclusions

Ocean HDX pushes the boundaries of modular spectrometer performance with great resolution, amazing peak symmetry across the UV, VIS and NIR wavelengths (**Figure 3**) and low stray light for higher maximum absorbance levels. Ocean HDX truly has next-level optical performance, while maintaining the benefits of a small bench. High definition optics give the Ocean HDX high throughput, low stray light and great resolution plus narrow, symmetrical peaks across the UV-NIR wavelength range. This exceptional optical performance is elevated by the high sensitivity back-thinned CCD detector – all in a compact spectrometer with excellent thermal stability. The application possibilities are virtually limitless. 🐼

