

Verity
INSTRUMENTS, INC.

SPECTROGRAPHY
ADVANCED PROCESS CONTROL

PLASMA DIAGNOSTICS



SD1024FH

Super High Performance Imaging Spectrometer

With SD1024FL Appendix

PEUG Meeting
August 13, 2008

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Motivation

- Challenging applications need better S/N ratio
 - Low exposure Dielectric Etch and Ion Beam Etch
 - Advanced Process Control and Fault Detection
 - Any process that is S/N challenged
- Verity wants to continue to lead the industry
- The SD1024FH represents a significant step in that direction



SD1024FH Design Goals

- Maximize Signal to Noise ratio for:
 - ✓ Improved Endpoint capability
 - ✓ Increased dynamic range for APC (advanced process control) and fault detection applications
- Accomplished with:
 - ✓ ~ 75% greater optical throughput
 - ✓ Proprietary data acquisition scheme
 - ✓ Novel signal processing methods
 - ✓ Superior system noise control



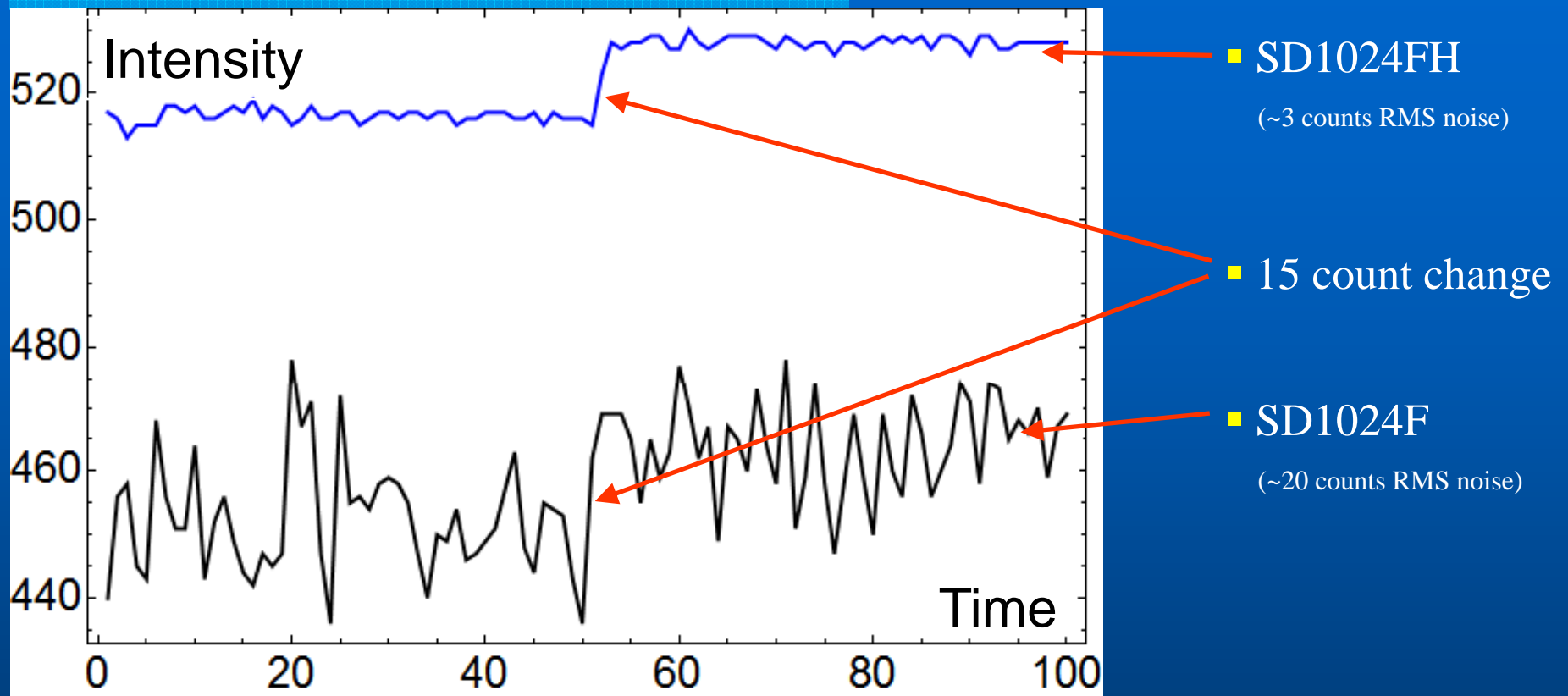
SD1024FH Features



- Spectral range: 200 - 800 nm
- Scientific grade CCD – back-thinned, TE cooled, and deep well
- Optimized UV response
- Resolution < 2nm
- Background Noise ~ 1- 2 counts
- Signal to Noise Ratio > 1000 at Full Scale
- Readout Time 7msec
- Single or multi-fiber input
- Interface to SpectraView™ software
 - ✓ Including PHD™ for APC\FDC



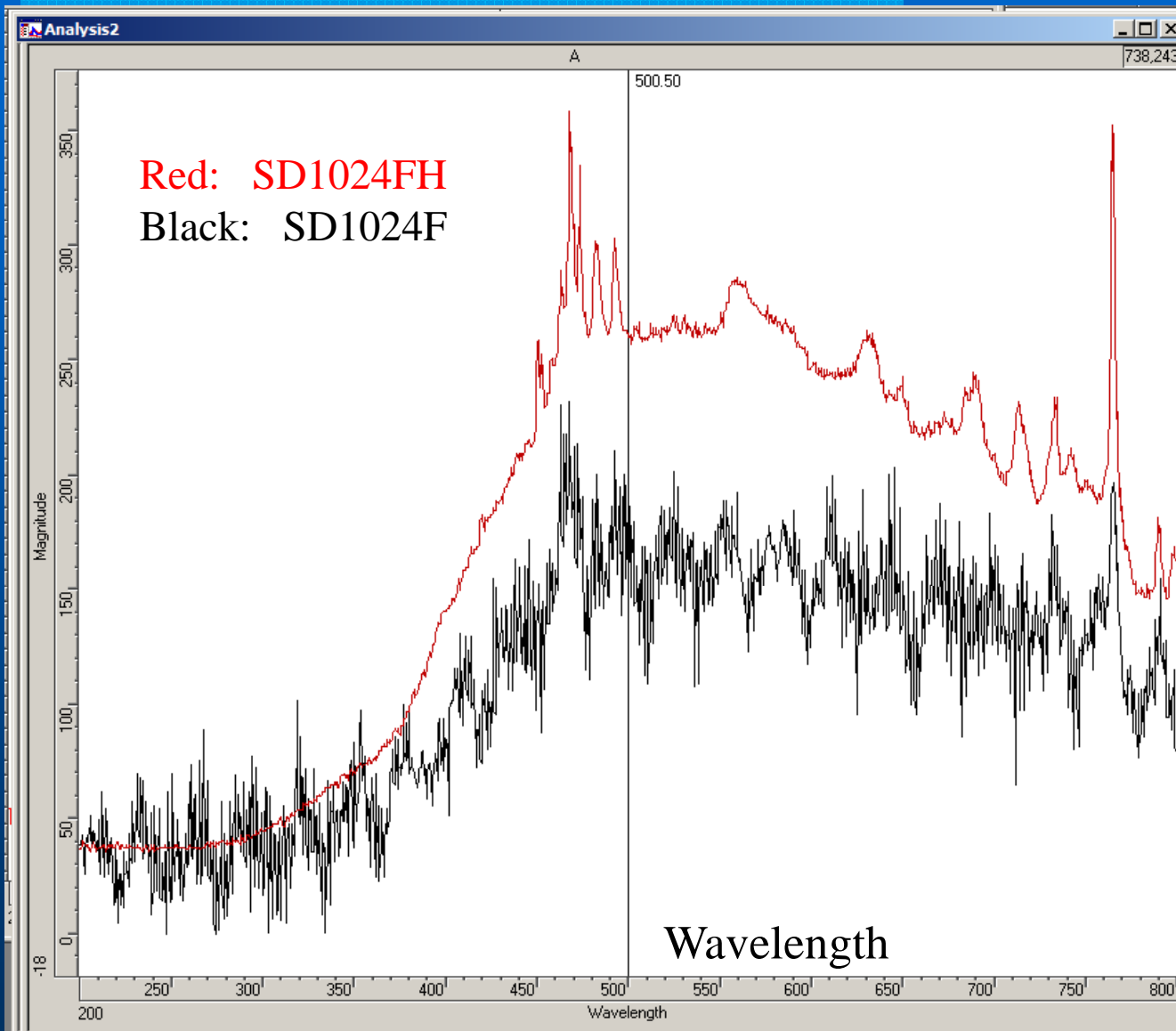
Comparison: Low-Light Trend Resolution



- The SD1024F and SD1024FH see the same light source at the same time
- A small change of 15 counts on a signal of 500 counts is clearly seen with the SD1024FH, and very hard to resolve with the SD1024F
- Conditions: a stable LED at 387nm is monitored at a $\frac{1}{2}$ nm region at 100 ms



Sample Low-Light Spectrum

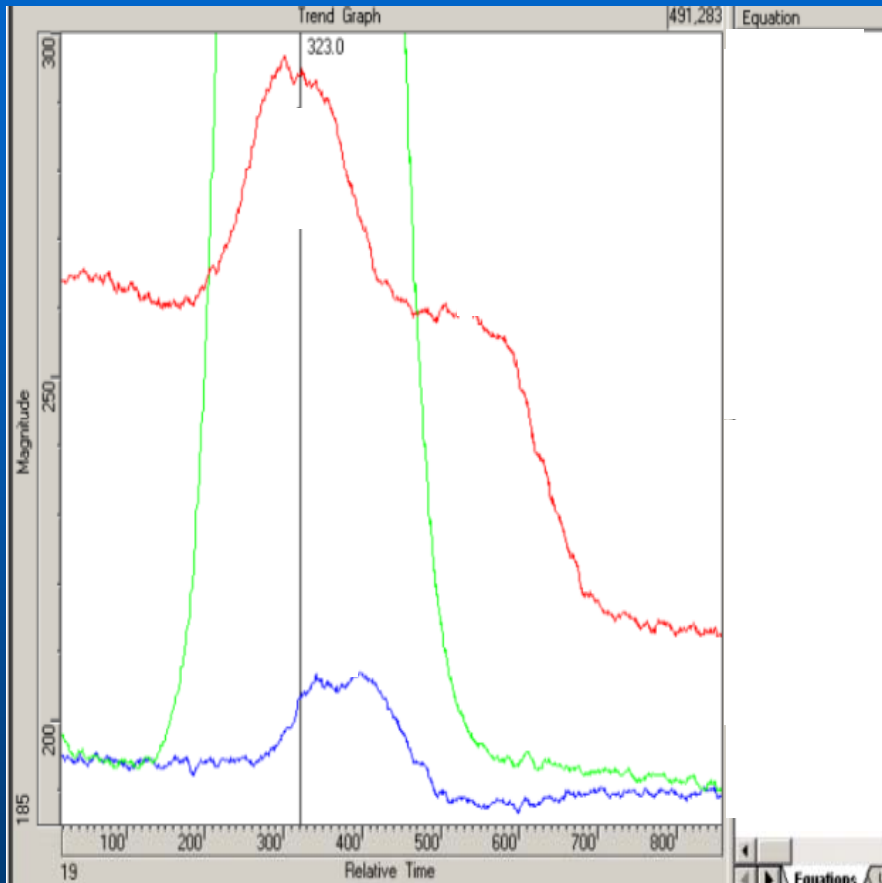


The low noise capability of the SD1024FH provides much improved dynamic range as shown by the data at left.

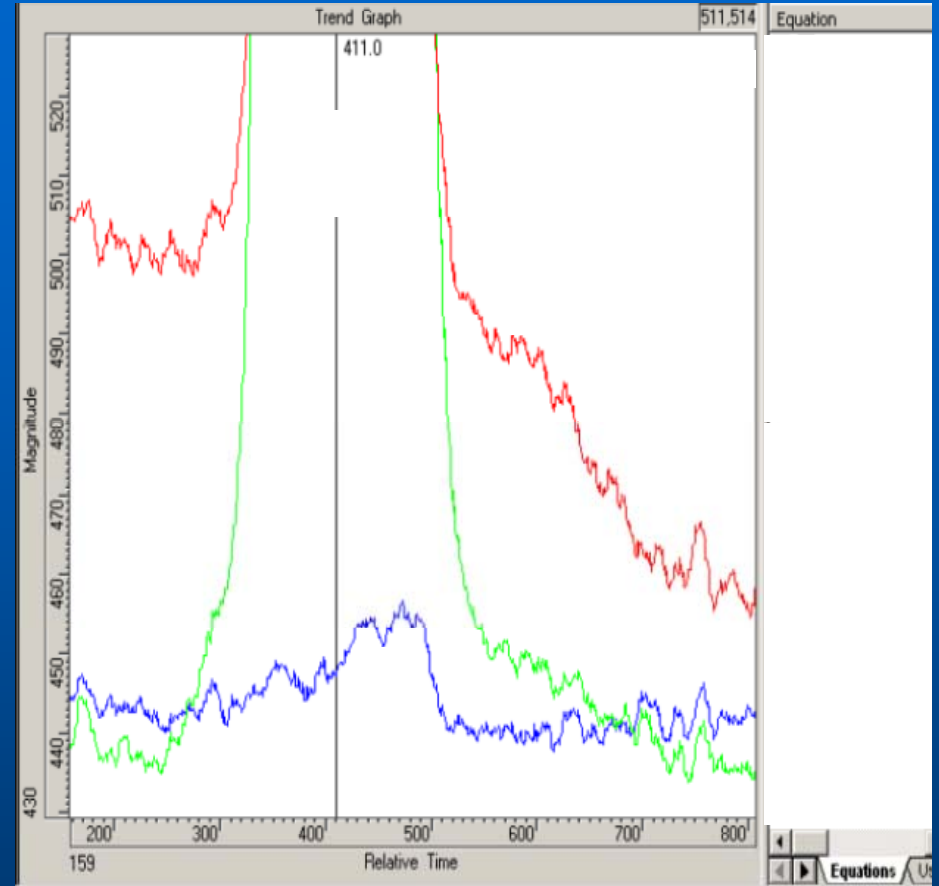
This data is from a side by side test using a Xe flashlamp at very low intensity. It represents a single spectrum with each instrument collected at 13ms integration time.



Trend Line Comparison



SD1024FH



SD1024D

Notes:

- 5 sample data smoothing is used with both sets of data
- The S1024D run had higher power setting and different wafers



Summary

- The SD1024FH offers significant improvement in S/N ratio compared to the SD1024F and SD1024D
- The improvement is most dramatic at “low” signal levels
- All signal levels show some improvement due to increased signal intensity





Appendix

SD1024FL

Line Array Spectrometer

Overview

- The SD1024FL is a replacement for the SD1024DL
 - ✓ RoHS-Compliant
 - ✓ Incorporates back-thinned CCD for superior UV performance
 - ✓ 200- 800 nm spectral range (optionally to 1100 nm)
 - ✓ Lower noise than the SD1024DL
 - ✓ Better sensitivity than SD1024DL at most wavelengths



Summary

- The SD1024FL includes some of the same improvements as the SD1024FH
- The Signal to Noise ratio of the SD1024FL is 3.5 – 8x times better than the SD1024DL due to:
 - ✓ Lower noise of the SD1024FL
 - ✓ Better sensitivity of the SD1024FL vs. the SD1024DL

