

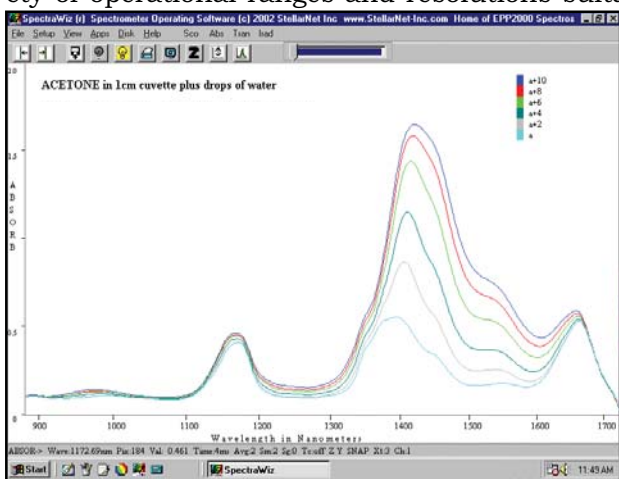
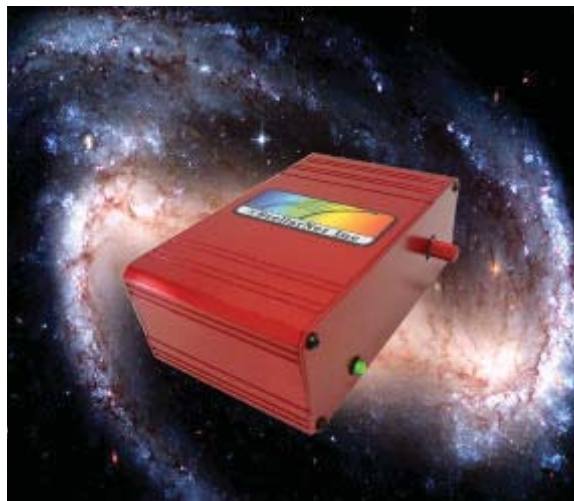
# Analytical Instrumentation

*Surf the New Wave in Portable Fiber Optic Spectrometry*



## NIR Spectrometers for Portable & OEM Applications

StellarNet's newest NIR spectrometer, the **DWARF-Star**, is small, robust, and equipped with high performance InGaAs detector array for the 900-1700nm wavelength range and achieves resolving resolutions to 1.25nm. The DWARF-Star features no moving parts and is packaged in a small rugged metal enclosure (5"x3"x2") for portable, process, and OEM applications. Advancements in electronic and optical design have allowed for size reduction never before achieved in a NIR spectrometer. The InGaAs detector is a Sensors Unlimited linear photo diode array with 512 pixels (1024 optional) 25 $\mu$ m by 500 $\mu$ m tall to provide maximum sensitivity. The detector has an integrated thermo electric cooler (TEC) maintained at -10 °C, stabilized within +/-0.1 °C. The NIR spectrometers accept a single strand SMA-905 terminated, low OH, fiber optic cable as input. Several models provide a variety of operational ranges and resolutions suitable for both spectroscopy and optical spectrum analysis.



Each DWARF-Star includes free SpectraWiz® Software and a developer's toolbox of source codes, customizable demo programs, and full spectroscopy applications in LabVIEW, Visual Basic, Delphi Pascal, and MS Visual C. High speed spectral data acquisition with advanced features, such as time series analysis and episodic data capture with rapid sample logging are standard features. Post processing techniques such as baseline correction, data smoothing, and spectral derivatives are included. Additionally, add-on chemometrics packages are available for complete multivariate calibration, analysis, and run-time with the DWARF-Star.

Specifications		DWARF-Star NIR Spectrometer	
Dynamic range:	4000:1 with 5 decades	Dimensions:	5"x3"x2"
Resolving resolution:	2.5nm with 25 $\mu$ m slit	TEC Power	1.5 Amps @ 5 VDC
InGaAs PDA Detector:	512 or 1024 pixels	Interface:	USB-2
Detector range:	900-1700nm	Data transfer speed:	40x faster than USB-1
Pixel size:	25um x 500um	Detector Integration:	1 millisecond to 30 secs
Pixel well depth:	130 x10 <sup>8</sup> electrons	Slit size options:	25um
Selectable well control:	130 x10 <sup>8</sup> or 5 x10 <sup>6</sup> el.	Operating systems:	XP/Vista/ Win 7
Signal to noise:	4000:1 with TEC cooling	Digitizer:	16 bit @ 2.5 MHz rate



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## DWARF-Star InGaAs NIR Spectrometers for Portable and OEM Applications

The StellarNet DWARF-Star fiber optic spectrometers are available in several models to provide optimal ranges and resolutions for various NIR applications in the 900-1700nm range. The standard detector is a 512 element photo diode array with 25 x 500 $\mu$ m tall pixels and has zero defects.

The units interface to a PC via USB-2 and can be operated simultaneously with StellarNet UV-VIS spectrometers to provide a Dual-Detector Super-Range (Dual-DSR) spectroscopy system. StellarNet also offers light sources, probes, and sampling accessories to facilitate virtually any NIR application. The miniature DWARF-Star NIR spectrometer is ideal for process analytical technology for industries such as food and drug, chemical, oil and gas, and plastics. The DWARF-Star's miniature size, low cost, and rugged design also make it ideal for the field, enabling on-site product analysis and quality control never before attainable.



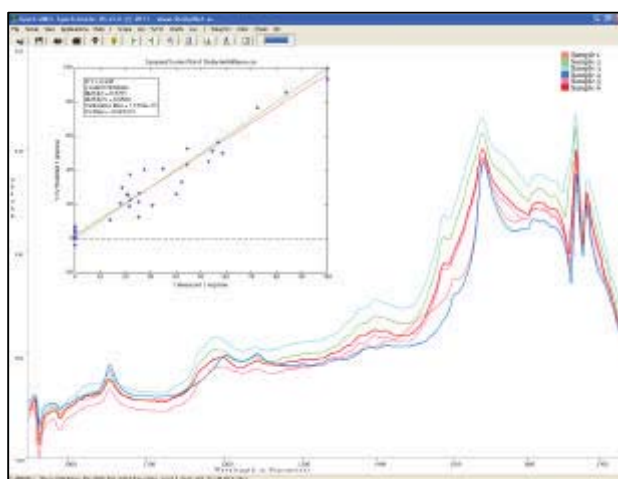
### DWARF-STAR Standard Models

InGaAs Model	Number of Elements	Spectrometer Range (nm)	Grating (g/mm)	Grating Range (nm)	Dispersion (nm/pixel)	Estimated Resolving Resolution
NIR	512	900-1700	250	800nm	1.25	2.50nm
NIRb	512	1000-1700	300	650nm	1.00	2.00nm
NIR2	512	1250-1575	600	325nm	0.50	1.00nm
NIR2b	512	1150-1475	600	325nm	0.50	1.00nm
NIR	1024	1000-1700	600	700nm	0.62	1.25nm

The optical resolution is based on the grating range obtained by the StellarNet spectrograph and a 512 pixel detector to yield the dispersion. A 25 $\mu$ m slit will image onto one 25 $\mu$ m pitch pixel, and possibly 2, therefore our estimate of resolving resolution uses a factor of 2 times the dispersion. Actual resolutions may vary from the estimates shown. Multiply x2 for FWHM.



Spectrum from DWARF-Star-512 showing 2<sup>nd</sup> Derivative spectral reflectance of type-2 plastics



SpectraWiz software interface displaying raw NIR reflectance spectra of dietary supplement powders with inset multivariate calibration model



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