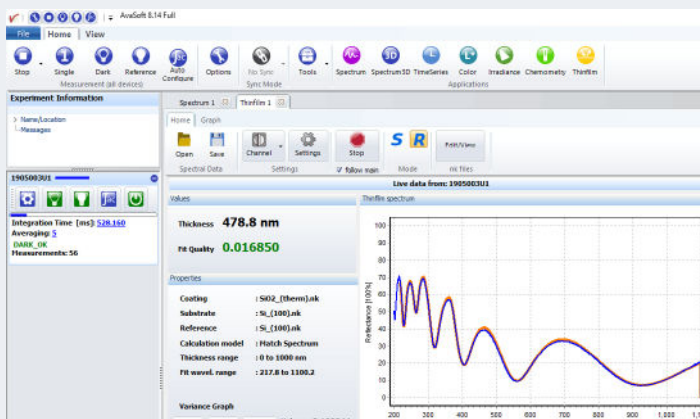


## DATASHEET

Thin films refer to a layer of material that ranges from a few nanometers to roughly 100 micrometers thick, equivalent to a few atoms. Such films are deposited on a surface, known as a substrate, or on top of previously applied layers, and are central to high-tech optical devices. Thin film manufacturing involves three primary methods: chemical vapor deposition (CVD), physical vapor deposition (PVD) and atomic layer deposition (ALD). In CVD, volatile materials create a chemical transformation on the substrate surface, whereas PVD and ALD entail releasing a coating material from a source through vaporization achieved by the user of heating, electron beam sputtering, laser ablation and other methods. In all these techniques material is deposited on a substrate and this process can be monitored and controlled using spectroscopic techniques such as transmission and reflection. Spectroscopy's advantage is its ability to remotely measure samples in the vacuum chamber during the manufacturing process in real-time. For post process quality control of thin film coatings, spectroscopy can perform non-contact measurements in high speeds.

The determination of the optical thickness of a coating is accomplished through white light interference, with the resulting pattern being translated into an optical thickness value using mathematical calculations. Critical to these calculations are the so-called optical constants,  $n$  and  $k$ , where  $n$  is refractive index per wavelength and  $k$  is the extinction coefficients per wavelength. Thin film metrology involves utilizing these calculations to determine the presence and thickness of coatings that have been deposited onto substrate materials using a variety of techniques. Various methods are available for measuring the thickness, such as profilometry, ellipsometry, spectroscopic reflectometry, and x-ray analysis. Avantes offers instruments and fiberoptic sampling tools that enable the use of spectroscopic reflectometry and transmission to measure thin film thicknesses, which can be utilized in a range of industries, from semiconductors to solar and optical coatings. Avantes' thin film configurations are designed to provide measurement systems that can detect/measure single layer thin films for post process quality control. The following page details our reflectance and transmission configurations. Below in figure 1 is a snapshot of Avantes proprietary thin film software. Avantes instruments and accessories can also be configured for inline measurements during thin film deposition processes and for more information about these configurations please contact a sales engineer at [infousa@avantes.com](mailto:infousa@avantes.com).

**FIGURE 1**



## KEY FEATURES

**Film Thickness Range:** 10 nm - 50 microns

**Range:** 200-1100 nm

**Resolution:** 1.0 nm to 9.2 nm (Slit Dependent)

**Integration Time:** 9 Microseconds to 59 Seconds

**Signal to Noise:** 300:1

## APPLICATIONS IN THIN FILM

Coatings/Thin Film  
Deposition

Biomedical Implants

PV solar cell measurements

Optical coatings

## REFLECTANCE SETUP FOR THIN FILM MEASUREMENT



PART NUMBER	DESCRIPTION
<b>AVA-TF-Reflectance-Kit</b>	<p><b>Spectrometer:</b> Avaspec-ULS2048CL-EVO-RS Ultra-low stray light fiber optic UV/VIS/NIR spectrometer grating UA: 200-1100 nm; Slit 25, DCL-UV/VIS-200, OSC-UA</p> <p><b>Light Source:</b> Avalight-DHc Compact Deuterium-Halogen light source 200-2500 nm with TTL-shutter, needs PS-12V/1.0A (not included)</p> <p><b>Fiber:</b> FCR-7UVIR400-2-ME reflectance Probe</p> <p><b>Thin Film Stage:</b> Reflectance Stage</p> <p><b>Reference Tile:</b> (RS-2)</p> <p><b>Software:</b> Avasoft Thin Film</p>

## TRANSMISSION SETUP FOR THIN FILM MEASUREMENT



PART NUMBER	DESCRIPTION
<b>Ava-TF-Transmission-Kit</b>	<p><b>Spectrometer:</b> Avaspec-ULS-2048CL-EVO-RS Ultra-low stray light fiber optic UV/VIS/NIR spectrometer grating UA: 200-1100 nm; Slit 25, DCL-UV/VIS-200, OSC-UA</p> <p><b>Light Source:</b> Avalight-DHc Compact Deuterium-Halogen light source 200-2500 nm with TTL-shutter, needs PS-12V/1.0A (not included)</p> <p><b>Fiber:</b> FCR-7UVIR400-2-ME reflectance Probe</p> <p><b>Fiber:</b> FC-UVIR600-1-MS</p> <p><b>Transmission Stage:</b> TR-Stage-US</p> <p><b>Software:</b> Avasoft for Thin Film</p>