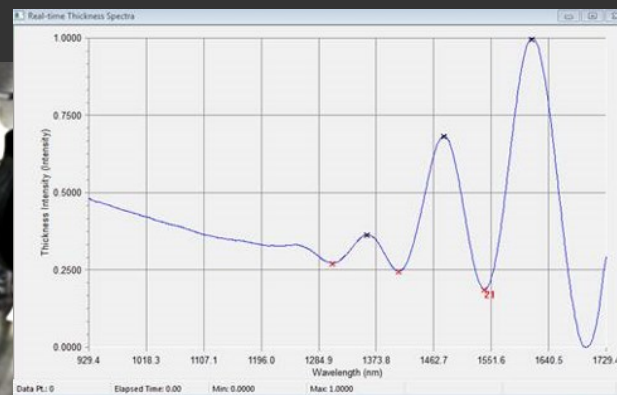
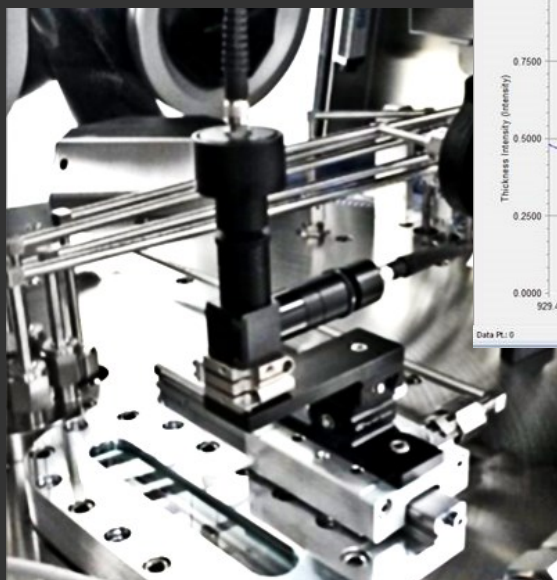




kSA SpectR

- Spectral Reflectance
- Growth Rate
- Film Thickness
- Process Control



The k-Space SpectR metrology tool provides absolute spectral reflectance measurements for in-line and *in situ* deposition applications such as Sputtering, MBE and MOCVD applications. This non-contact, non-invasive, real-time, wafer and film reflectance monitor is used for process monitoring and process control for semi-transparent thin-films. The software is complete with film thickness monitoring for single-layer and multi-layer (film-stack) films from the acquired reflectance spectra. Custom spectral features such as reflectance minima, maxima, inflection points, or baseline scatter level, over a user defined wavelength range of interest, are easily measured. When monitored as a function of time during deposition, the film growth rate can also be determined.

Measures:

Absolute Spectral Reflectance
Film Thickness
Growth Rate
Color Scale Parameters ($L^*a^*b^*$)
End Point Detection for Process Control

Applications:

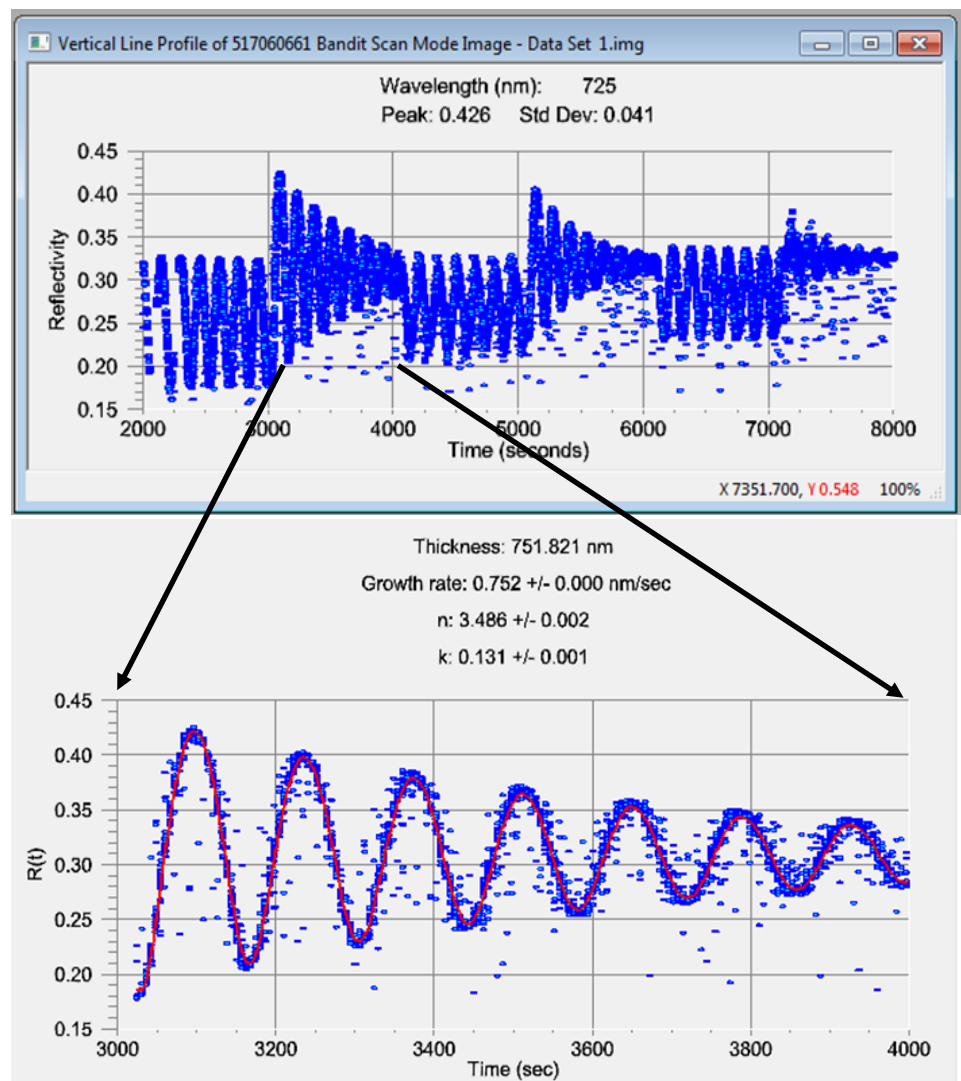
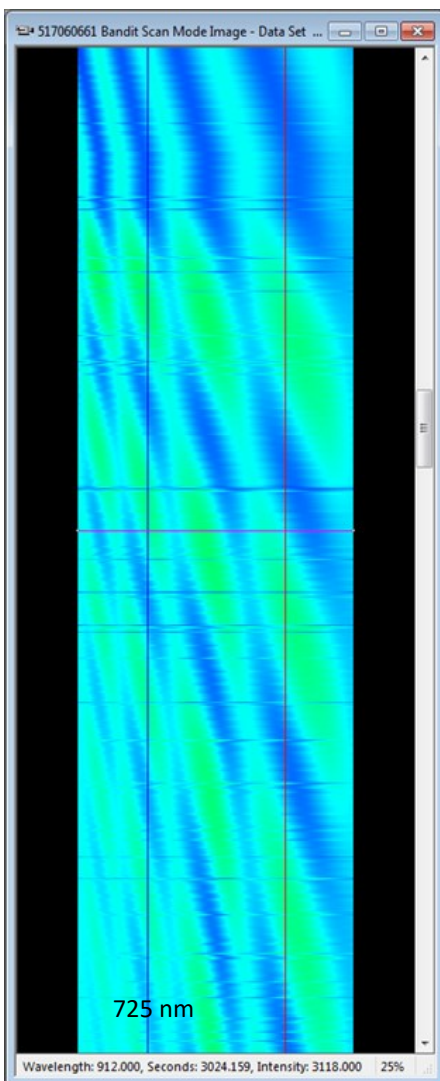
VCSELs
TCOs
<i>In Situ</i> or In-Line monitoring
Sputtering
MBE
MOCVD



kSA SpectR Measurement Technologies

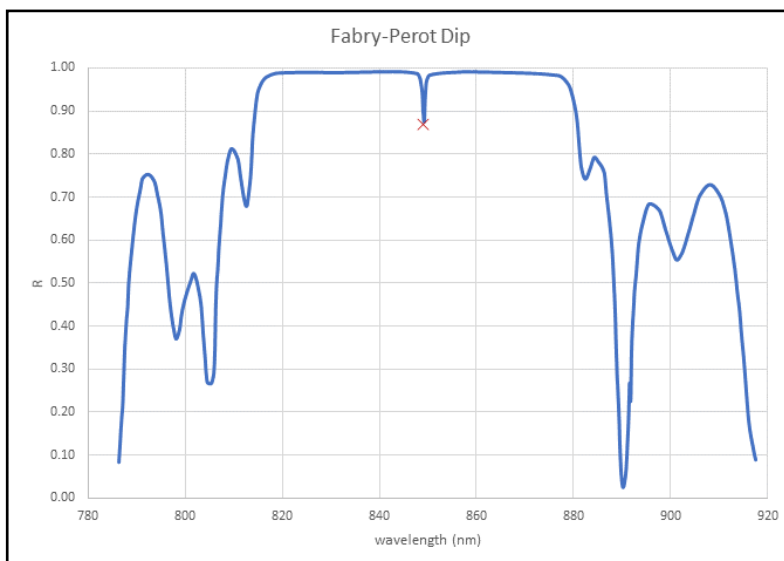
Spectral Film Thickness and Growth Rate: The thickness and growth rate of a film may be determined in real-time through analysis of extrema positions in the interference spectra.

Single Wavelength Film Thickness and Growth Rate: The thickness, growth rate, and n and k of the growing film may be determined in real-time through analysis of the reflectance at a particular wavelength as a function of time.





Identification of Custom Spectral Features: Custom real-time spectral analysis allows the user to configure the software to look for peaks or valleys within a specified wavelength range for optimizing process control and feedback.



kSA SpectR Models:

Models	Description
SR-NIR-1670 Spectrometer: 870-1670 nm, 128 element InGaAs array	<ul style="list-style-type: none">Measures absolute reflectance spectra;Measures real-time film growth rate and thickness;Measures film thickness from reflectance spectra.
SR-NIR-HR1670 Spectrometer: 950-1670 nm, 512 element InGaAs array	<ul style="list-style-type: none">Measures absolute reflectance spectra;Measures real-time film growth rate and thickness;Measures film thickness from reflectance spectra;Enhanced resolution which allows measurement of thicker films.
SR-VIS-1100 Spectrometer: 600-1100 nm, 512 element Si array	<ul style="list-style-type: none">Measures absolute reflectance spectra;Measures real-time film growth rate and thickness;Measures film thickness from reflectance spectra;Enhanced resolution, shorter wavelengths which are ideal for thinner films and/or applications with spectral interest from 600-1100 nm.

*Custom spectrometer ranges and slit widths available upon request.

*Custom mounting or referencing quoted separately.



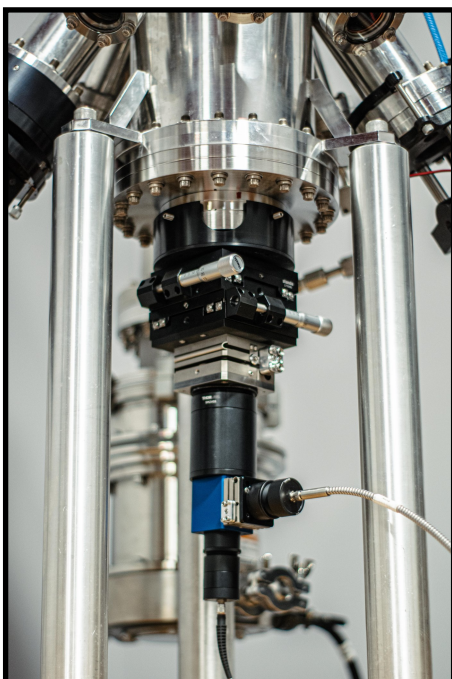
Hardware Configuration:

Each kSA Spectral Reflectance system is delivered as a turn-key system, equipped with the following:

- Integrated spectrometer and control electronics, packaged in a 3U 19" rack unit,
- Custom optics head for your growth reactor, including light source and collection optics,
- All necessary control cables and optical fibers,
- PC-based Windows 10 controller,
- kSA Spectral Reflectance software and license, as well as an additional desktop license for post-acquisition analysis.

Optical Head Configuration:

The kSA Spectral Reflectance mounting configuration varies based on the particular chamber or application. Since this is a reflection based measurement, the measurement is completed at normal incidence or at small specular angles. If the measurement is to be taken through a viewport at normal incidence, an angled viewport is required. Standard MBE mounting accommodates both 2.75" CF and 4.5" CF flanges. MOCVD mounting typically requires fiber coupling of both the light source and detector due to the small optical apertures. For typical MOCVD path lengths, a clear aperture of at least 3mm in diameter is required. For in-line based measurements, the measurement is completed at normal incidence or at small specular angles. To confirm the best optical head configuration for your chamber or application, please contact k-Space for more information.



kSA SpectR optics head designed for an MBE chamber



kSA SpectR optics head for commercial MOCVD reactor



Upgrades or Add-ons:

	Description
SR-MWP	kSA Multi-Wafer Production Software upgrade.
kSA-TRG	Optically-based rotational home pulse generator.
kSA-AIX-COM	Reactor Communication Module - Module provides input connections for one opto-isolated on/off dry contact switch for the reactor home pulse and four on/off 24V connections from an ES2008, and output connections for conditioned digital signals suitable for interfacing with up to three kSA metrology tools.
VP-075-F1-7	Angled 1.33" CF Viewport @ 7 degrees.
VP-150-F2-7	Angled 2.75" CF Viewport @ 7 degrees.
VP-250-F4-4	Angled 4.5" CF Viewport @ 4 degrees.

kSA Spectral Reflectance Software

The kSA Spectral Reflectance software is a full featured package that controls and monitors the light source, spectrometer (s), and all data I/O. Hardware interfacing is through a single USB connection to the Spectral Reflectance rack.

- System utilizes signal intensity changes in the wafer and carrier to define measurement locations during rotation (if required). Wide markers are available when averaging is desirable.
- Multi-wafer acquisition is available for full real-time integration and display of all pertinent acquisition parameters, at all marker positions.
- Complementary analysis software for post-deposition/acquisition analysis. Data storage in ASCII, Excel, or binary file formats facilitates alternative data analysis by user.
- Export graphics directly to Windows clipboard or export directly to .wmf, .bmp, .png, or .tif formats. Export data to .xls and .txt formats.
- Complete TCP/IP interface for custom, real-time data transfer and program control.
- Ability to write data in real-time to an SQL database.
- Complete analog and digital data I/O capability.
- User configurable window layout.

Facilities Specifications

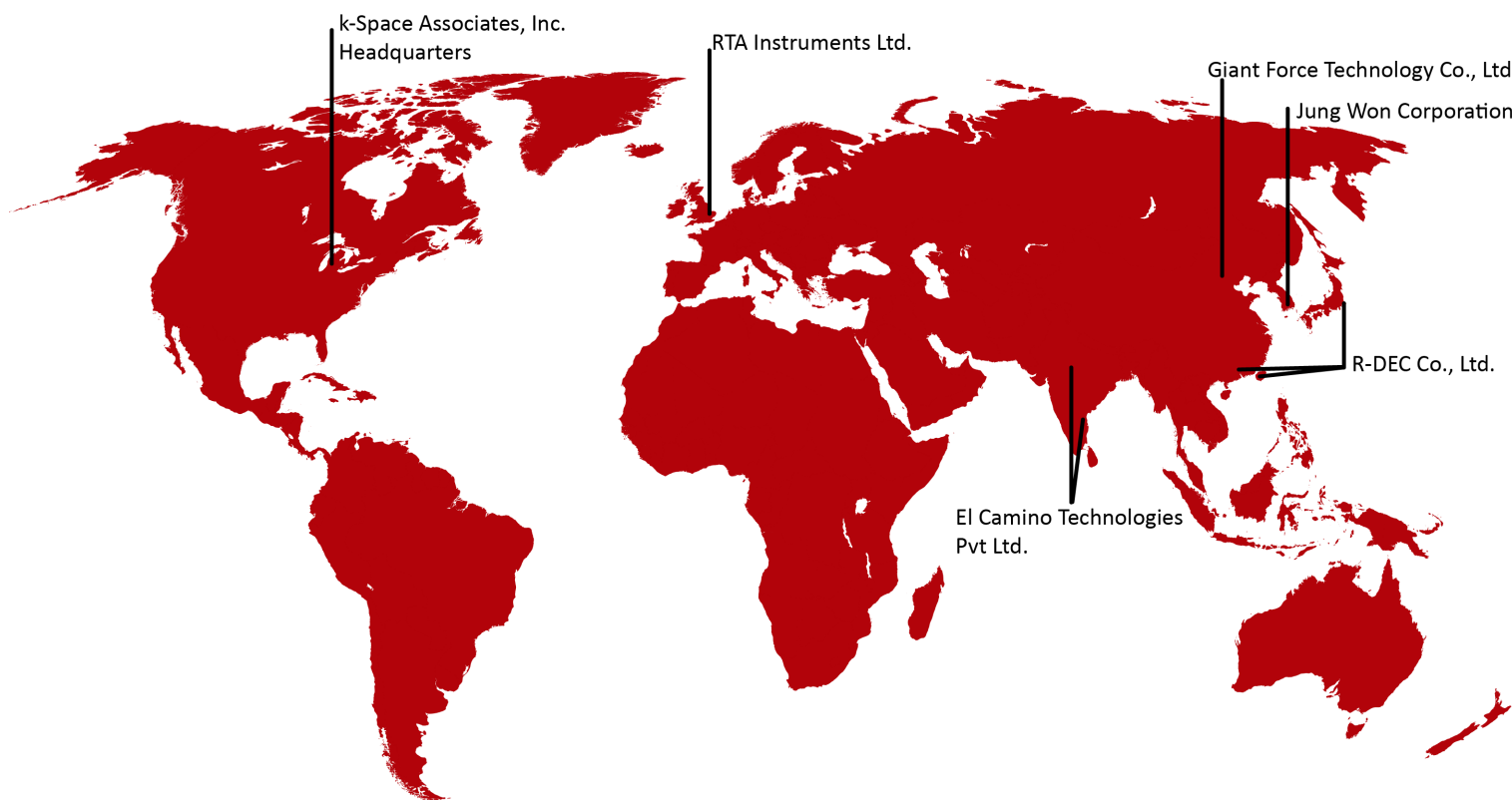
System Power: 120VAC with 10A max or 230VAC with 5A max, 50/60Hz compatible.

Installation and Training

A minimum of 2-3 days of on-site customer installation and training are required with system purchase.

Warranty

All kSA systems and integrated components are warranted against defective materials and workmanship for a period of ONE YEAR from the date of delivery to the original purchaser.



k-Space has an expansive network of distributors to best serve our worldwide customer base.

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About k-Space Associates, Inc.

k-Space Associates, Inc., is a leading metrology supplier to the semiconductor, surface science, and thin-film technology industries. Since 1992, we've delivered the most advanced thin-film characterization tools and software, thanks to close collaboration with our worldwide customer base. We realize the best products are developed with our customers' input, so we're good listeners. For your real-time surface analysis, curvature/stress, temperature, deposition rate, or custom project, we look forward to helping you with your thin-film characterization needs.

Specifications are subject to change without notice. While due caution has been exercised in the production of this document, possible errors and omissions may occur. Version: March 15, 2022