



Automated Light Measurement System with Center Mounting Hatch

# AUTOMATED LIGHT MEASUREMENT SYSTEM – ALMS 80

## Automates Photometric Tests

- Measures up to 80 devices in 10 minutes
- Automates LM-80, LM-79 Measurements: Chromaticity, Luminous Flux, Vf
- 0.05% Luminous Flux Measurement Repeatability
- High Power Current Source - Up To 200V/5A
- Precision Pulse Width And Integration Time : 10uS to 10S, 10nS steps
- High Throughput 1m Hemisphere: Supports 2π, 4π Sources
- Back Cooled Load Board Thermal Control: 20 to 120C range, 0.01 C Stability

## CONFIGURATION

8 CHANNELS (independently controlled)

## DRIVE CAPABILITY

DC, SINGLE PULSE, CONTINUOUS PULSE  
 THERMAL RESISTANCE MEASUREMENT  
 1kW  
 40V, 100V, 200V  
 20mA to 5A



## BATCH TESTING OF HIGH POWER LEDs

The Vektrex Automated Light Measurement System - (ALMS 80) is optimized for batch testing of high power LEDs mounted on load boards with up to 80 LEDs. The ALMS 80 integrates the thermal control, electrical and optical instrumentation, and software tools needed to perform precision measurements compliant with LM-80, LM-79, and other high power LED testing standards at controlled temperatures from 20 to 120C.

## ALMS 80 CONFIGURATION INFORMATION

| BASE SYSTEM           | DESCRIPTION  |
|-----------------------|--|
| Hemisphere            | 1 Meter hemisphere   |
| Current Source        | 8 Channel 75mA - 5A, higher and lower currents available   |
| Max Comp Voltage      | Specify 40V, 100V, or 200V   |
| Max # of LEDs         | 80 per load board, 10 per Channel  |
| Load Boards Supported | Vektrex n+1 6" x 6" (150mm x 150mm) 6" x 12" (150mm x 300mm) available, Other load board types available |
| Spectrometer          | Instrument Systems CAS-140 VIS standard, Others available  |
| Software              | Vektrex LEDBench, Instrument Systems SpecWinPro (if CAS-140)   |
| Auxiliary Lamp        | 75W incandescent source with power supply  |

## HIGH PERFORMANCE INTEGRATING HEMISPHERE

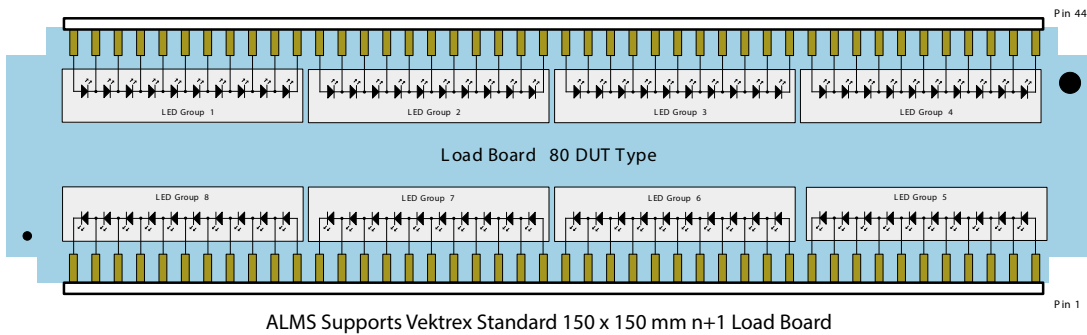
The ALMS 80 system features a 1m integrating hemisphere with a back-cooled drop-down loading hatch. This unique hemisphere design provides a planar mounting surface for 2n sources in the center of the mirror - creating a virtual 4n optical geometry - without the need for interior sample supports or side ports that absorb light and distort measurements. 4n LEDs and luminaires can also be measured using special mounts that place the sample in front of the mirror plane.



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## ALMS SUPPORTS VEKTREX HIGH CAPACITY N+1 LOAD BOARDS

High capacity load boards require up to four electrical connections per LED – 320 connections for a typical 80 LED load board. These connections complicate the system’s optical and electrical design. To combat this, the ALMS utilizes a unique circuit arrangement that wires groups of 10 LEDs in series. Using this arrangement, it is possible to individually power and monitor any group of n LEDs with n+1 connections. Thus an 80 LED load board requires only 88 connections. The ALMS also supports other load board circuit arrangements with special adapter cables.

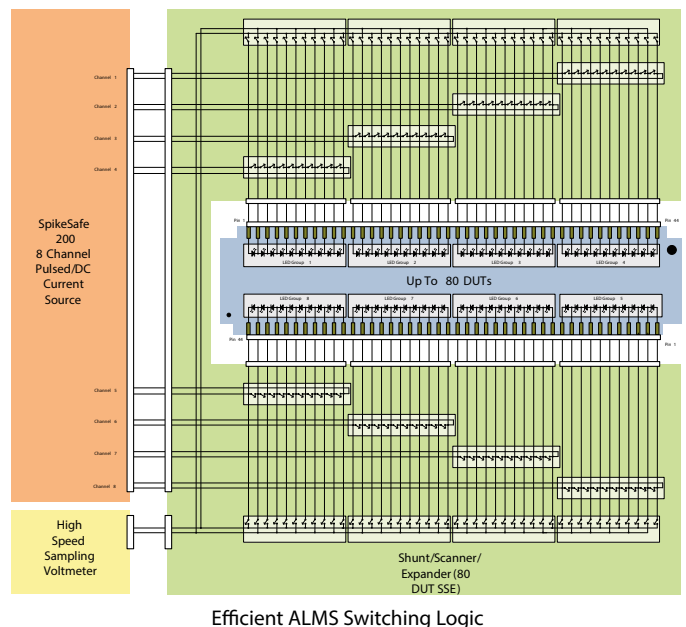


## ALMS DRIVE AND SIGNAL SWITCHING HANDLES HIGH POWER LEVELS

The SpikeSafe 200 eight channel current source drives the eight LED groups on the load board. The SpikeSafe 200 provides pulsed or DC current at levels up to 5A and 200V, along with SpikeSafe protection for the LEDs. A high power solid-state switch matrix steers the drive signals by shunting the current around LEDs that are not being tested. A separate solid-state switch matrix routes the measurement signals to a 6½ digit sampling voltmeter that provides forward voltage measurements with microvolt resolution.

## PRECISION TIMING = REPEATABLE MEASUREMENTS

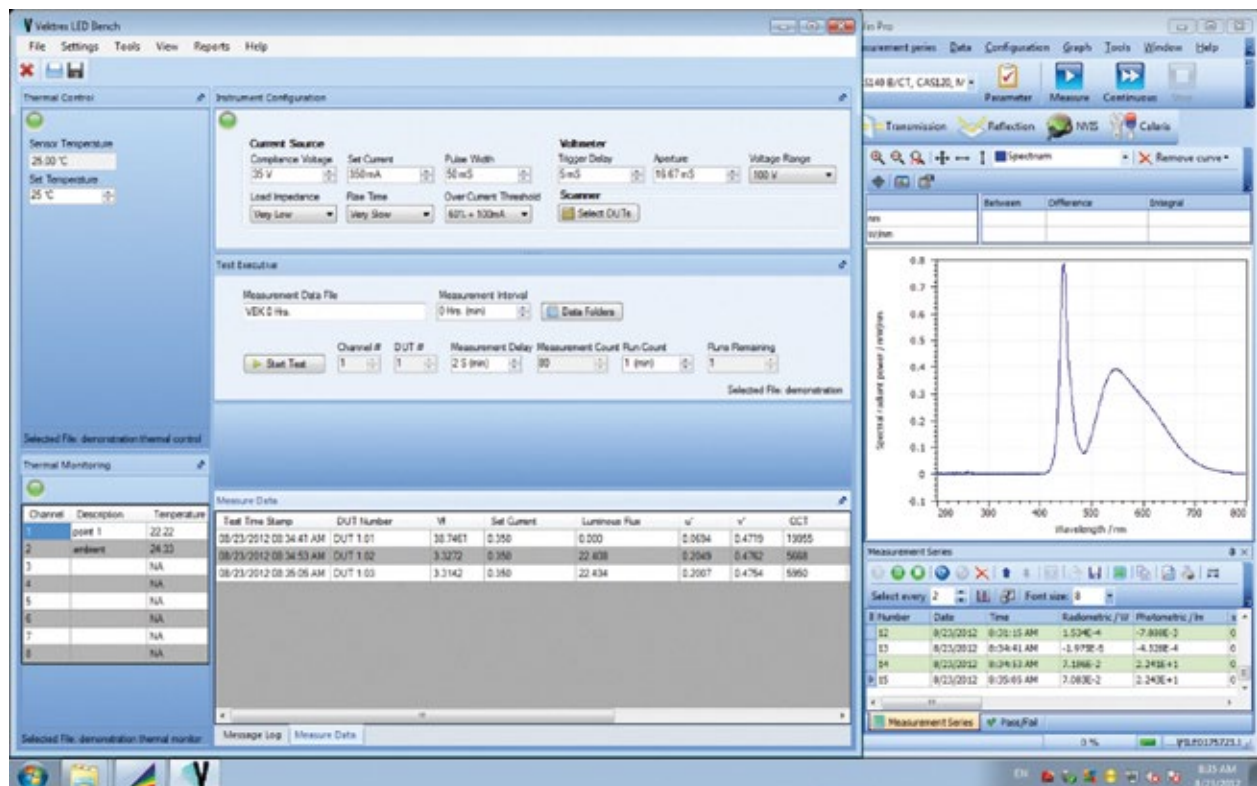
Traditional photometric measurement procedures specify lengthy warm-up periods to allow LEDs to stabilize. This process produces good measurements but it is difficult and time consuming for high power LED batch testing. Pulse techniques produce rapid results, but the LED light changes throughout the pulse, making manually triggered measurements impossible. The ALMS uses a 100 MHz timing system that precisely synchronizes the current source, sampling voltmeter and spectrometer. This timing system allows an 80 LED load board to be measured using pulse techniques in about 10 minutes with 0.05% flux repeatability.



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## LEDBENCH SOFTWARE APPLICATION SIMPLIFIES MEASUREMENTS AND DATA RECORDING

LEDBench works in parallel with the Instrument Systems' SpecWinPro providing the ultimate in flexibility and ease of use. LEDBench is focused on instrument control and configuration, enabling the user to define electrical and thermal configuration parameters including temperature, pulse duration, current, and sampling voltmeter triggering. SpecWinPro allows the user to configure the spectrometer parameters and perform self-absorption corrections. LEDBench supports single, repeated, or sequences of multiple automated measurements. Configuration windows allow key instrument parameters to be quickly optimized for the best measurements. Once optimized, these measurement sequences and settings may be saved and later recalled to support production testing. Collected data is stored in standard Excel-compatible csv measurement files that are tagged with the elapsed time and a reference to the original SpecWinPro ISD file. The original ISD data files generated by SpecWinPro are also collected to support laboratory audits.



LEDBench Software Showing Scan of Load Board with White LEDs

## POSITIONAL AND ELECTRICAL CORRECTIONS IMPROVE MEASUREMENT ACCURACY

The ALMS employs a near ideal measurement geometry, with the LED placed in the center of a large virtual sphere. However its response to LEDs not at the precise center, such as those at the corners of a load board, differs slightly from the nominal center characteristic. To mitigate this, the ALMS includes a set of tools that allow small correction factors – based on the LED radiation pattern and its position on the load board – to be determined. These factors are saved in measurement adjustment files that are normally associated with a specific load board type. These adjustments ensure that LEDs from the same production lot measure correctly, regardless of their position on the load board.

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## SPECIFICATIONS (TYPICAL 40V, 5A CONFIGURATION)

### OVERALL

|                                     |   |
|-------------------------------------|---|
| Integrating Sphere                  | 1m hemisphere with center hatch   |
| LED Capacity                        | 80 LEDs maximum, 8 source channels; 10 devices per source channel   |
| Test Board Size                     | 150 x 150 mm (6" x 6") n+1 Vektrex standard load board  |
| Instrument Cabinet                  | 910 mm high half rack with computer monitor on top  |
| Representative Measurements         | Total Luminous Flux, Chromaticity, CCT, CRI, Forward Voltage, Temperature, Full spectrum based upon spectrometer capabilities |
| Test Time                           | 10S/LED typical   |
| Software                            | LEDBench, SpecWinPro  |
| Flux Measurement Repeatability      | 0.05% typical   |
| Chromaticity Repeatability          | Less than 0.001 u' or v' variation typical  |
| Flux Measurement Uncertainty (k=2)* | 2.0% for single LED at center<br>2.9% for all 80 LEDs in array  |
| Chromatic Uncertainty (k=2)*        | 0.0013 - u'<br>0.0021 - v'  |

### LED DRIVE CURRENT SOURCE

|                            |   |
|----------------------------|---|
| Type                       | Vektrex SpikeSafe™ 200 Current Source                   |
| Output Current Range       | 20mA - 5A per source channel                            |
| Maximum Compliance Voltage | 40V (up to 200V)  |
| Setpoint Resolution        | 100uA   |
| Pulse Range                | 10uS to 10S, 10-100uS pulsing supported only above 75mA |
| Accuracy                   | 0.1% + 80uA typical at 20mA, 0.1% + 2mA over full range |
| Stability                  | 25uA  |
| Switching System           | Vektrex Solid State 80 DUT Shunt Scanner                |

### SPECTROMETER SUB-SYSTEM

|                         |  |
|-------------------------|--|
| Type                    | CAS-140CT-151 VIS                                  |
| Construction            | Temperature-stabilized, cooled spectroradiometer   |
| Detector Spectral Range | Back-thinned, TE-cooled 1024 x 128 array 360-830nm |
| Spectral Resolution     | 2.2nm  |
| Integration Time        | 9mS to 65S   |

### HIGH SPEED VOLTMETER SUB-SYSTEM

|                   |                                |
|-------------------|--------------------------------|
| Measurement       | 16 bit, 4 wire                 |
| Resolution        | 6 ½ Digits;                    |
| Range             | 10v, 100v, 1000v               |
| Sampling Aperture | 20uS to 3S                     |
| Vf Accuracy       | 0.03% Typical                  |
| Vf Repeatability  | Better than 100uV for 3.5V LED |

### CALIBRATION SUB-SYSTEM

|                            |                                   |
|----------------------------|-----------------------------------|
| Current Source             | Vektrex SS100 4.167A fixed source |
| Calibration                | Forward Spectral Flux Standard    |
| Self Absorption Correction | Quartz halogen correction lamp    |

### THERMAL CONTROL SUB-SYSTEM

|                   |   |
|-------------------|---|
| Type              | Thermoelectric cooler with forced air cooling |
| Temperature Range | 20 to 120C                                    |

### POWER CAPABILITY

|                       |                |
|-----------------------|----------------|
| Temperature Stability | 0.01C typical  |
| Absolute Accuracy     | Better than 1C |

### OVERALL PHYSICAL

|           |           |
|-----------|-----------|
| Mass      | 250 kg    |
| Footprint | 2m x 2.5m |

### INPUT POWER

|             |                          |
|-------------|--------------------------|
| Input Power | 90-240V AC, 800W maximum |
|-------------|--------------------------|