

New Products

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New Products

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In order to supplement manufacturers' information, this Department will welcome the submission by our readers of brief communications reporting measurements on the physical properties of materials which supersede earlier data or suggest new research applications.

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NEW INSTRUMENTS AND COMPONENTS

Current–voltage (I–V) source

Lake Shore Cryotronics offers its MeasureReady 155 I–V source for use in materials and scientific research and development (R&D) laboratories involved in characterizing novel materials and early-stage devices. In materials characterization, the cleaner the excitation signal, the better the end measurements. According to Lake Shore, the 155 source provides the precise, very-low-noise output needed for such measurements, in part because it uses the same noise-rejection technology employed in the company's cryogenic thermometry products. The source generates just 200 nVRMS (1 μ V_{p-p}) of low-frequency noise and 7 μ VRMS of higher-frequency noise in the 10-mVDC range. There is no need to add external filters. The 155 provides DC low-noise performance without compromising AC bandwidth. Because it generates less noise, the source provides a solid foundation for users performing I–V curve, Hall effect, resistance, resistivity, and other fundamental measurements. It is also suitable for high-accuracy device testing and for semiconductor material and device research that requires a high-quality source to excite samples. Lake Shore claims that the 155 source is very straightforward to operate. Its uncluttered touch display with a "TiltView" screen has no confusing buttons to navigate. Wi-Fi, universal serial bus, and local area network connectivity allow for easy integration with systems using LabVIEW, .NET, and other software. A mobile app is included and allows users to operate the instrument remotely, either in the same room or farther away.—*Lake Shore Cryotronics, Inc., 575 McCorkle Boulevard, Westerville, Ohio 43082. (614-891-2243) <http://www.lakeshore.com>*



Magnetron and power supply packages

The Kurt J. Lesker Company (KJLC) has released its Research Advantage magnetron and power supply packages, or RAPs. The packages enable users to create a complete magnetron and power supply package and include all the cables and connectors needed to integrate the RAP into an existing sputtering system. The RAPs offer a choice of a 2-, 3-, or 4-in. Torus Mag Keeper sputtering source. The sources feature KJLC's latest design technology, which offers quick target capability and ultrahigh-vacuum (UHV)-compatible operation. The magnetrons come with a flexible assembly and standard magnets, and the Mag Keeper source can be packaged with a DC or radio frequency power supply. Users who choose a DC supply have the option of adding one of KJLC's Impulse high-power magnetron sputtering power supplies.—*Kurt J. Lesker Company, 1925 Route 51, Jefferson Hills, Pennsylvania 15025. (800-245-1656 or 412-387-9200) <http://www.lesker.com>*



Nonmagnetic UHV picomotor actuators

Newport, an MKS Instruments company, has brought to market its New Focus 83xx-UHV-NM series of picomotor actuators with Kapton wires. The actuators provide 0.5 in. (12.7 mm) or 1.0 in. (25.4 mm) of travel. They are suitable for applications that require low magnetic susceptibility and permeability, such as e-beam lithography, particle

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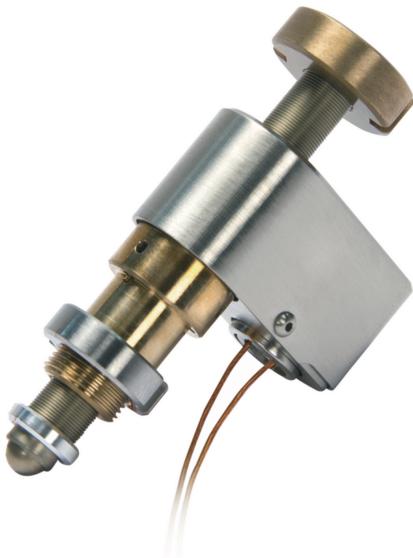
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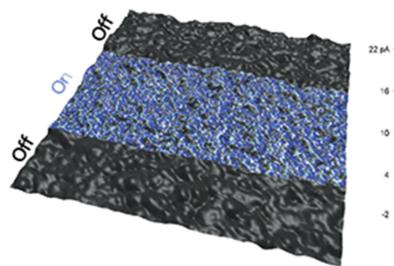
acceleration, scientific magnetic resonance imaging scanning, and other life and health sciences and non-magnetic original equipment manufacturer (OEM) applications. The actuators can be used in UHV environments, including for beam steering and other motion-control applications in vacuum down to 10^{-9} Torr, and in radiation applications that require Kapton wiring. They provide high stiffness, better than 30-nm resolution with minimal backlash, and a load capacity of 22 N. Picomotor actuators will only move when voltage is applied to the piezoelectric element, which ensures long-term stability for setups even when the system is powered down.—*Newport Corporation, 1791 Deere Avenue, Irvine, California 92606. (949-863-3144) <https://www.newport.com>*



Photovoltaic option for atomic force microscopes (AFMs)

Asylum Research, an Oxford Instruments company, has expanded the versatility of its MFP-3D Infinity AFM by introducing a photovoltaic (PV) option for characterizing photoconductive materials. Characterizing the photoresponse of those materials with the AFM has traditionally required the researcher to develop a great deal of custom instrumentation. According to Asylum Research, its PV option offers a turnkey solution that streamlines operation and can be used with a wide range of sample heights and illumination sources. Combined, the MFP-3D Infinity and PV option enable high-resolution imaging and advanced electrical characterization with techniques such as conductive AFM, electrostatic force microscopy, and Kelvin probe force microscopy. Those modes are critical for investigating photocurrent and related photoresponse, including effects caused by heterogeneous interfaces, grain boundaries, and/or phase-separated domains. The PV option is compatible with the company's entire suite of nanoelectrical and nanomechanical characterization techniques. It may potentially open up new possibilities for the design of experiments aimed at improving the performance of photoconductive materials. The option is also compatible with an array of MFP-3D

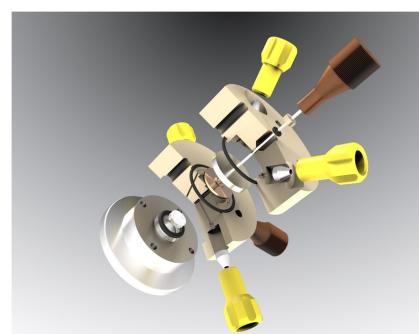
infinity options, including the BioHeater and the closed fluid and humidity sensing cells that enable complete environmental isolation and control.—*Asylum Research, 6310 Hollister Avenue, Santa Barbara, California 93117. (888-472-2795 or 805-696-6466) <http://www.AsylumResearch.com>*



NEW DETECTORS, MEASUREMENTS, AND MATERIALS

Flow cell for real-time electrochemistry

By agreement with the Lawrence Berkeley National Laboratory and the University of California, Berkeley, Hiden Analytical is commercializing a novel dual-layer differential electrochemical flow cell for use with its HPR-40 DSA membrane inlet mass spectrometer. The combined differential electrochemical mass spectrometry (DEMS) technique characterizes electrocatalytic performance, which has special relevance to fuel-cell chemistry. It allows for fast, *in situ* identification of gaseous and volatile products and intermediates generated during the electrochemical faradaic reactions taking place directly at the electrode-electrolyte interface. The benchtop system provides real-time multispecies analysis, high sensitivity, and detailed characterization as its monitors evolved and adsorbed species across the atomic mass range from 1 amu to 300 amu.—*Hiden Analytical, Inc., 37699 Schoolcraft Road, Livonia, Michigan 48150. (888-964-4336 or 734-542-6666) <http://hideninc.com>*



Helium leak detector

Leybold's Phoenix 4 family of helium leak detectors is suitable for both R&D and industry:

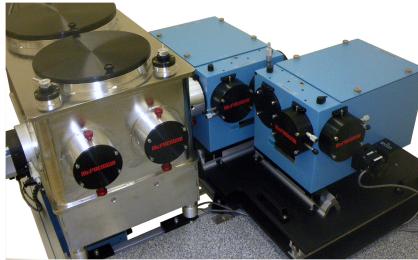
Applications for the versatile instrument range from securing the UHV demands in CERN's particle accelerator to industrial uses such as leak detection in the Hyperloop vacuum transport system and for semiconductor production. The fourth-generation Phoenix features ergonomic design, improved measuring characteristics, and higher standards with regard to response times, helium sensitivity, reliability, and ease of use compared to its predecessor L300i instrument. For example, it is now possible to change the filter without removing the housing. Monitoring and control functionality have been upgraded. The Phoenix 4 has an integrated web server and can be operated comfortably via an intuitive, sensitive color touch display or wirelessly with an Internet-capable mobile device. To facilitate data export and the creation of test reports, the number of interfaces for data acquisition, communication, and system integration has been increased. Additional communication and bus interfaces are now integrated directly at the leak detector alongside new optional interface modules. The Phoenix 4 series is based on a uniform technology platform and measuring system. It is available in three classes: Vario, Quadro, and Magno, which are differentiated by size, backing pump, and pumping speed configuration. The smallest, the Vario, can save space in special research applications. For flexibility and low weight (30 kg), it does not have an integrated backing pump. The Quadro has an oil-sealed Trivac rotary vane vacuum pump as backing pump; the dry version uses a diaphragm pump. The Quadro is suitable for use in analytical technology, the food and packaging industry, and automotive production. The powerful Magno can be employed with large test volumes. The Sogevac rotary vane vacuum pump is installed in the oil-sealed version and the dry version has the oil-free Scrollvac vacuum pump.—*Leybold USA, Inc., 5700 Mellon Road, Export, Pennsylvania 15632. (800-764-5369 or 724-327-5700) <http://www.leybold.com>*



Triple-monochromator Raman spectrometer

McPherson has announced a new optical system, a triple monochromator suitable for making Raman, photoluminescence, and Thomson scattering measurements in various ways. The triple configuration allows users to create a bandpass "notch" of select wavelengths and disperse them onto a sensitive charge-coupled device or other array detector. The width and slope of the notch's edges can be tailored for the user's application. For high throughput, McPherson also offers the triple monochromator with astigmatic optics for point-to-point imaging. The

triple monochromator uses exclusively reflective optics. It can work deep into the ultraviolet (UV), below 190 nm if necessary. The efficient instrument can be equipped with many different diffraction gratings and works fast as f/5. According to McPherson, that represents a higher light-gathering power than many single spectrometers can offer. For Raman applications, the rejection edge can be set close as 4 cm⁻¹ from Rayleigh scatter. The triple monochromator's tunable wavelength, deep UV capability, and adjustable notch are potentially useful for spectroscopy research and experimental science in applications involving quantum materials properties. Those include superconductivity, electronic ordering, thermoelectricity, and metal-insulator transitions.—*McPherson, Inc., 7A Stuart Road, Chelmsford, Massachusetts 01824. (800-255-1055 or 978-256-4512) <http://www.McPhersonInc.com>*



BIOINSTRUMENTATION AND BIOTECHNOLOGIES

Upright confocal microscopes

Olympus now offers its FV3000 confocal laser scanning microscope in two upright models designed for *in vitro* and *in vivo* experiments. In applications such as electrophysiology, many biological processes can only be captured by video-rate or higher imaging. Without compromising the field of view, the FV3000 microscope's resonant scanner acquires video-rate confocal images at up to 438 fps, which Olympus claims is the fastest available. The company's TruSpectral detection technology can further improve imaging by combining high sensitivity and high accuracy for multichannel spectral imaging. The FV3000 microscopes make it simple to view samples up close as well as in their larger context. Nosepieces that accommodate up to seven objectives and an optimized macro-to-micro light path allow users to capture images from 1.25 \times to 150 \times . They can quickly locate regions of interest in a low-magnification overview and then switch to a higher magnification to observe fine details. Combined with the system's stitching algorithm, high-resolution macro images can be created to show samples in context. Those imaging features are now available in two upright frames, one optimized for fixed tissue experiments and the other for electrophysiology. For standard imaging of fixed tissue, the upright microscope's motorized seven-position nosepiece and condenser enable automated transitions from low to high magnification for macro-to-micro applications. For electrophysiology experiments, the

modified microscope frame features more working space around the objective lens so users can easily install and operate patch clamp equipment or other electrophysiology devices. Additional working space can be created for experiments that involve small animals by lowering the height of the stage.—*Olympus Corporation of the Americas, 3500 Corporate Parkway, Center Valley, Pennsylvania 18034-0610. (484-896-5000) <http://www.olympus-lifescience.com>*



Superresolution mode for laser scanning microscope (LSM)

The Zeiss LSM 8 family with Airyscan now features a two-dimensional (2D) imaging mode. According to Zeiss, its 32-channel gallium arsenide phosphide array detector captures more spatial information than traditional confocal microscopes. The 2D superresolution mode uses that additional information to create an optical section of 0.2 Airy units (AU) and resolves structures down to 120 nm laterally in a single image. Users formerly had to acquire a stack of z-slices and subsequently deconvolve to obtain optical sections thinner than one AU and enhance lateral resolution. Temporal resolution was thus limited and made a prolonged light exposure of the sample inevitable. Researchers can now use the 2D superresolution mode to overcome that problem and perform gentle live-cell imaging experiments without the need to acquire a z-stack. They profit from very low light exposure, highly resolved structural information, and excellent signal-to-noise ratios. Unlike traditional confocal microscopes that reject photons from outside of the focal plane at a pinhole, the Airyscan area detector detects all precious fluorescence emission photons of 1.25 AU. Their information is then used to deliver higher sensitivity, superresolution, and high acquisition speeds. The new xmode takes advantage of the fact that the Airyscan captures x, y, and z information of the confocal point spread function. A new processing algorithm



uses that inherent spatial information captured in a single image. It specifically distinguishes between photons originating from the focal plane of 0.2 AU and photons from outside of that focal plane. In a traditional confocal microscope, users could only close the pinhole to 0.2 AU to attempt to achieve the same optical sectioning. That would mean sacrificing many photons, even from the focal plane, thus reducing the signal-to-noise ratio drastically. Researchers can process both existing and new Zeiss Airyscan data with the 2D superresolution mode.—*Carl Zeiss Jena GmbH, Carl-Zeiss-Promenade 10, 07745 Jena, Germany. (+49 3641 64-2646) <https://www.zeiss.com>*

Analysis of intraocular lenses (IOLs)

The WaveMaster IOL 2 developed by Trioptics allows for in-depth quality control of all conventional refractive IOLs—monofocal, toric, spherical, and aspheric—used for cataract treatment. For the analysis of IOLs, the relevant ISO standard 11979 defines the determination of optical characteristics, such as the measurement of effective focal length and the qualitative evaluation by means of the modulation transfer function (MTF). The additional evaluation of the wavefront across the entire aperture of the lens is particularly helpful when designing a new lens shape. The functional principle of the WaveMaster IOL 2 is based on wavefront measurements that use a Shack-Hartmann sensor. Measurements can be performed on hydrophobic and hydrophilic lenses in air or *in situ* with a model eye and with optional heating as per ISO 11979. Easy-to-use software permits automated determination of the refractive power, cylinder power, MTF, and deviation of the toric axis from the marked axis. The refractive power of IOLs can be measured with accuracies of up to one-third of the tolerances stated in the ISO standard, according to Trioptics. For customized analyses of lens aberrations, particularly in R&D, the software can be expanded to include a Zernike analysis module. The development of the WaveMaster IOL 2 especially focused on the simplified,



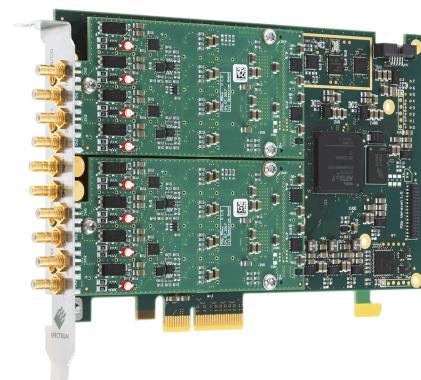
user-independent measurement of toric IOLs. That includes the automated determination of the MTF in both main sections. With the integration of an additional camera, the WaveMaster IOL 2 automatically determines deviations of the markers on the lenses from the measured toric axis. The camera image can also be used for a visual inspection of the lenses.—*Trioptics GmbH, Hafenstrasse 35-39, 22880 Wedel, Germany.* (+49 4103 18006-0) <https://www.trioptics.com>

NEW FACILITIES AND HARDWARE

Modular digitizer card series

Spectrum Instruments has announced the first products of a new generation of its midrange digitizer series for making high-resolution measurements in applications in areas such as large-scale physics experiments, ultrasound, lasers, radar, and light detection and ranging. The M2p.59xx PCI Express (PCIe) series' M2p platform board and 59xx module form 13 16-bit digitizer cards with many options regarding speed and channels. The series is available with speed grades of 20 MS/s, 40 MS/s, and 80 MS/s and from one to eight channels per card. The card length has been reduced to 167 mm, but the product offers more features than its predecessors. For example, each channel has a separate analog-to-digital converter and an individually programmable input amplifier with ranges between ± 200 mV and ± 10 V, programmable input offset for unipolar measurements, programmable input termination of $50\ \Omega$ and $1\ M\Omega$, and an integrated calibration circuit. Models are available with up to eight single-ended and up to four differential channels. The smaller size allows the powerful 16-bit digitizers to fit into smaller personal computer systems than previously, which is potentially useful for compact OEM solutions. A PCIe $\times 4$ lane interface increases the available streaming speed to more than 600 MByte/s or more than 75 MS/s continuous streaming for four channels. That complements the onboard memory of 1 GByte and enables applications that need continuous data storage or fast online calculations. Intelligent acquisition modes such as multiple recording, gated sampling, or ABA (dual time base or the combination of fast and slow continuous acquisition) match many application demands. Up to 16 cards in one system can be synchronized using Spectrum's star-hub technology. It allows systems to be created with up to 128 channels, all sharing a common clock and trigger, in one single chassis. Clock and trigger inputs and outputs for synchronization with external equipment are standard. Four individually programmable connectors on the front plate offer additional trigger inputs, status outputs, synchronous digital input lines, asynchronous input/output, or a reference clock input for an integrated time-stamping unit. The new card is based on Spectrum's general driver application

programming interface. More than 400 products share that common driver library, allowing easy switching from slow to fast products and combining PCIe, PXIe, or Ethernet/LXI products with one common software interface. A complete software development kit based on Windows and Linux is included, as are drivers and examples for nearly every programming language on the market.—*Spectrum Instrumentation Corp., 15 Warren Street, Suite 25, Hackensack, New Jersey 07601. (201-562-1999)* <https://spectrum-instrumentation.com>

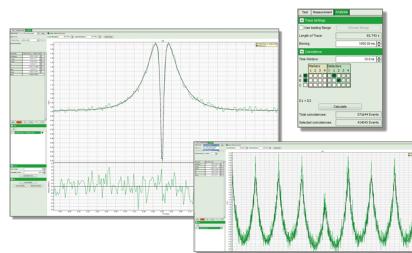


NEW LITERATURE AND SOFTWARE

Software for analyzing quantum correlations

PicoQuant has launched its QuCoA software package for data acquisition and analysis using the T2 time-tagging mode of the company's time-correlated single-photon counting electronics. QuCoA is aimed at research areas that rely on coincidence detection, such as general quantum optics, quantum key distributions, Hanbury Brown–Twiss setups to study single photon sources, and Hong–Ou–Mandel setups to study photon entanglement. It offers special analysis routines for coincidence correlations and for coincidence counting applications. According to PicoQuant, QuCoA features one of the fastest software correlators available for coincidence correlation, which allows users to correlate the absolute arrival times of photons in real time. That permits, for example, assessment of the quality of an antibunching curve during the measurement. The $g^{(2)}(0)$ value and count rates on all detectors are continuously calculated and displayed. Several established models can be fitted to the measured data. Those include a single emitter with or without shelved state or an exponentially decaying pulsed excitation, including the influence of the limited detector resolution and correlated or uncorrelated background. The fitting models support both pulsed and continuous-wave excitation.

The QuCoA software provides an easy-to-use event filter feature for coincidence counting applications. Filters can be constructed via a simple, intuitive graphical user interface that permits detection channels and marker signals to be combined in a user-defined time window using logical operations. The filters can be applied during both data acquisition and offline analysis modes. By defining time gates, users can restrict coincidence detection to specific time ranges.—*PicoQuant, Rudower Chaussee 29, 12489 Berlin, Germany.* (+49-30-6392-6929) <https://www.picoquant.com>



Piezo positioning systems catalog

Physik Instrumente's 240-p. catalog for piezo positioning shows all the company's standard products that use piezo actuators as their drive principle. The portfolio ranges from simple, housed piezo actuators that come with or without preload to lever-amplified piezo actuators, six-axes scanners with subnanometer precision position sensors, and OEM drives with PiezoWalk technology and capacitive position sensors. Many piezo controllers and drivers are available for various application scenarios, which include high-precision positioning and high-dynamic, high-power applications. The catalog also includes examples of custom developments and solutions for specific markets. Special packaged solutions for microscopy can be integrated into the hardware or software of appropriate microscopes from leading manufacturers.—*Physik Instrumente LP, 16 Albert Street, Auburn, Massachusetts 01501. (508-832-3456)* <https://www.physikinstrumente.com>

