# SPECTRUM

News from Quantum Design Europe

Edition 38 | June 2022


## New energy discriminating detectors for soft and hard X-ray radiation

Detectors based on CCD or CMOS sensors are measuring instruments for the incident radiation power. These image sensors made of silicon are excellently suited for highly sensitive detection of visible light, but also for parts of the invisible spectrum. They offer the scientist a variety of features such as high spatial resolution and high dynamic range. However, radiation sensors of this type have the disadvantage that they cannot detect photons as single events. However, this is particularly interesting and technically possible in the X-ray spectrum because the energy of one photon is large enough to generate several hundred excitons.

Our newcomer ADVACAM from Prague (Czech Republic) and Espoo (Finland), respectively, fills this gap in the X-ray spectrum for the soft to hard energy range. ADVACAM started in 2013 as a spin-off from the Institute of Experimental and Applied Physics at the University of Prague. ADVACAM OY is a spin-off company of VTT Technical Research Centre of Finland. The companies are certified according to ISO 9001 standards. We are pleased to bring their products on board. The detectors are based on the Timepix or Medipix technology developed at CERN. The sensors are made of silicon or CdTe. They cover different energy ranges: silicon is


used from 3 keV, CdTe from 5 keV. There are operation modes like photon counting, time over threshold and time of arrival.

In addition to spatial and temporal resolution, they also enable energy discrimination of individual high-energy photons. The achievable energy resolution is given by material properties.

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## New headquarters for Quantum Design Europe

### Quantum Design Europe will move to a new town

After more than 50 years in Darmstadt, we thought it was time for a change. In less than two years, we will be operating from Pfungstadt, a small town only 10 km south of here.


On an area of approx. 8500 m², our new headquarters will boast 2800 m² of state-of-the-art office facilities and approx. 1000 m² of warehouse space. We look particularly forward to spacious demo and training areas as a core element of our work and the support of our customers.

The official permit to start construction was already granted in February of this year. Since then,

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## Content



Quantum Design EUROPE

# New energy-resolving detectors for soft and hard X-rays

» The detectors operate in list mode, in which a continuous list of entries containing this information is generated from the detector events. The principle is known from particle physics. The current Timepix3 sensors allow a time resolution of 1.6 ns without dead time at a count rate of up to 40 million events per second.

The comprehensive Pixel Pro software supports the user in data acquisition and analysis. Their applications for Advacam's detectors include non-destructive fluoroscopy, X-ray imaging of tissue and animals, rock samples from geology, and crystal structure analysis using X-ray diffraction. Methods that require energy-resolving detectors for ions or even neutrons can use Advapix models for this purpose.

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# Quantum efficiency in photovoltaics

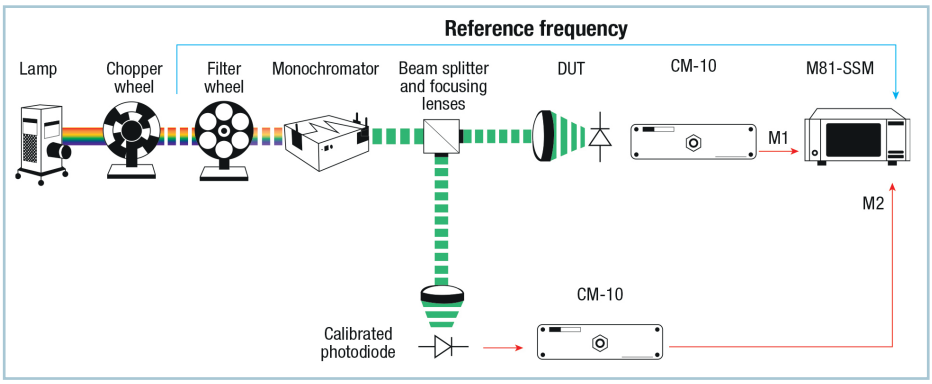
Quantum efficiency in photovoltaics is the ratio of electrons in a photocurrent to the number of photons that hit, for example, a solar cell. Since no one wants to count individual electrons or photons, it is common to compare the component that is to be tested with a calibrated element. The unknown quantum efficiency QE is results from the following:

$$QE = QE_{kal} \cdot \frac{I_{mess}}{I_{kal}}$$

$QE_{kal}$ is the quantum efficiency of the calibrated component, and the quotient is the ratio of the two generated currents. This is subject to both cells being irradiated with the same luminous intensity. The image shows a typical QE measurement setup (here: on a photodiode). On the left side radiation of a specified wavelength (energy) is created. The chopper creates lighting packages of a determined frequency. On the right you can see an M81 with two current measurement pods. The main system M81-SSM entangles and measures the two currents ($I_{mess}$ and $I_{kal}$) which occur at the photodiodes, with reference to the chopper frequency and phase.

Compared to the classic measurement setup with two preamplifiers and two lock-in channels, this system not only saves hardware but also gains metrological flexibility. For example, the M81 allows DC measurements like current/voltage characteristic (IV) curves or creating a bias (by using additional pods, if necessary). In the table, you will find the specifications of the combination M81-SSM with the current measure module CM.

In principle, quantum efficiency can also be measured on other optoelectronic components, like phototransistors, photomultipliers, photocathodes, solar cells and image intensifiers.




Instrumentation of an sEQE measurement using an M81-SSM with CM-10 module. Here, the M81 can be configured to perform both DC-I-V sweeps and lock-in detection of the AC photocurrent occurring in the device.

### M81 CM-10 Current measure module

- Frequency: DC to 100 kHz
- Best sensitivity: 10 fA
- Max. range: 100 mA
- Bias voltage: +/-10 V

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# The new headquarters of Quantum Design Europe

» large amounts of scrubs have been taken away. After that, almost 2000 m³ must be carried away, before we can start constructing the actual buildings.


We symbolically broke the ground in February at perfect weather conditions: Under blue skies and sunshine, we talked about the new site, construction plans, and last but not least - future neighbors.

With sparkling white wine, we toasted with city council Horst Knell, Christine Rühl from City Development Pfungstadt and the architect in charge Jörk Zimmermann to the beginning of a bright future.

We look forward to the coming construction phases.

If you are curious — you can check out our website for information on the development.

www.qd-europe.com/new-building/

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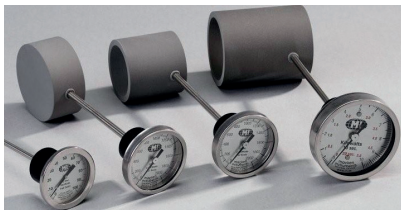
# Good old state-of-the-art: Laser Power Meters from Macken

For more than 30 years, Macken has been our team partner when it comes to laser power meters. Classic power meters (aka "bones") are still in demand by many users. They provide fast and easy measurements at little cost and effort.



In the meantime, new, digital power meters have entered the market and with help of license-free software, measurements can also be taken and stored online.

NIST-traceable calibrations and continuous calibration services are offered and recommended to ensure reproducible measurements.

In addition, we still offer Macken's well-established image plates (regular and water-cooled for high powers) to align for example beamline systems in laser plants. The image plates are also quick and easy to use.

Laser spectrum analyzers are critical in the inspection of laser resonators. This unique grating spectrograph visualizes all laser transactions of a $CO_2$ laser at the same time. All analyzers are calibrated in both wavelength and rotational line designation to allow easy identification of 140 possible laser transitions between 9.1 and 11.3 µm. These transitions are visually displayed using a UV-excited, thermally sensitive screen which darkens in the area struck by the IR laser beam.

Laser spectrum analyzers for CO, HF and DF lasers are standard. Analyzers for $N_2O$ and $CS_2$, $CO_2$ carbon isotope and broadband wavelengths are available upon request. The spectrum analysis screen has a response time of 1/4 seconds and allows the instrument to resolve all the $CO_2$ rotational lines. Model 16-A is light, portable and can easily be integrated into laboratory setups.

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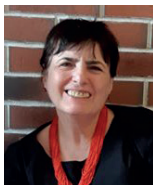
# IR-VASE at the Institute of Physical Chemistry of the Romanian Academy of Sciences in Bucarest

## Short overview of the task at hand with IR spectral ellipsometry

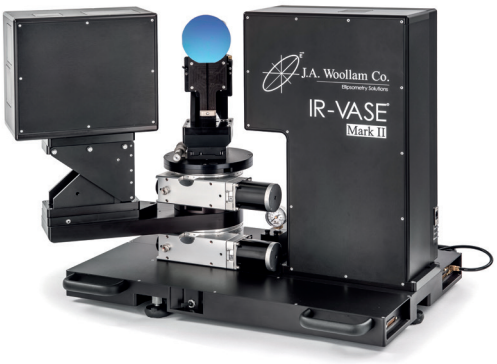
By Dr. Mariuca Gartner, Head of Laboratory



Since August 2008, the Institute of Physical Chemistry has had an Infrared Spectroscopic Ellipsometer (IR - VASE) — built by J. A. Woollam (now available in updated configuration). This is still a unique system in Romania. It has mainly been used to investigate optical, chemical, and vibrational properties of thin films obtained by chemical (sol-gel) and physical (sputtering, PLD) methods. These properties are analyzed as function of technological parameters of deposition (substrate, annealing, dopant concentrations and others).

The IR-VASE based studies (carried out over 1.7-30 μm wavelength range) offer increased sensitivity over FTIR spectroscopy and yield quantitative values for the optical constants n, and k. This technique has excellent sensitivity in regards to thin layer thickness and doping concentration, which is not seen using UV-VIS wavelengths.

Compared with FTIR or Raman, IRSE can offer more information from a single measurement, like optical constants and chemical composition.

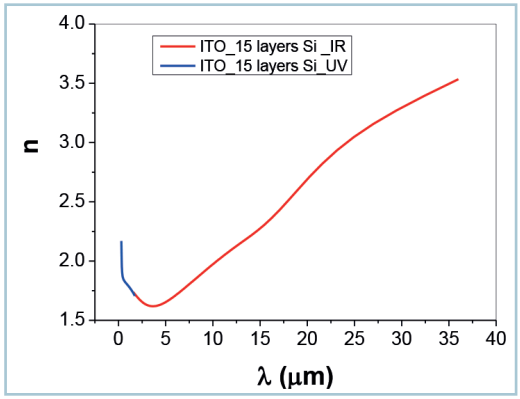


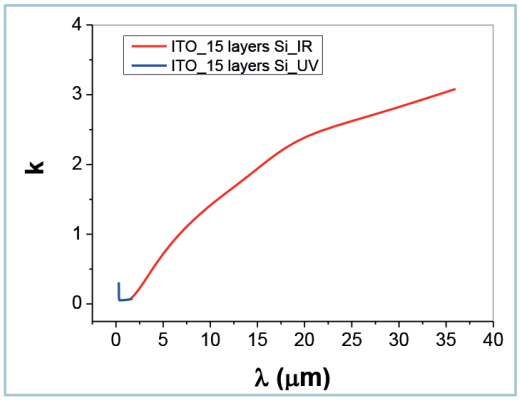

IR-VASE, Mark II

## Our institute performs the following studies:

1. The vibrational bands' assignation can be made very quickly, directly from experimental IR spectra (from the inflexion points of the Ψ and Δ spectra) without any calculations [1]. Raman assignations confirm those obtained by IR-VASE.

2. The analysis of the dielectric functions evaluated from the IR-VASE spectra showed the formation of thin layers in nitrogen plasma implanted Si, which is identified as oxynitride with low N concentration. The inclusion of N atoms in the Si-O network in different configurations was analyzed by IRSE, and the results were confirmed by XPS and VISSE spectroscopy [2].




Optical constants of ITO deposited on silicon by sol-gel process

3. The vibrational spectra of the phonon modes E1(TO) and A1(LO) of different films (deposited on other substrates and by various preparation techniques) were analyzed [3-5]

4. If we unify the data obtained from UV-VIS-NIR (0.193 - 1,7 μ) range with these from IR range (1.7-33 μ), we can have a large image of the optical constants and of the transmission on a very large scale from UV to IR (0.193 to 33μ) [6, 7].

## References:

1. M. Nicolescu, M. Anastasescu, J.M. Calderon-Moreno, A.V. Maraloiu, V.S. Teodorescu, S. Preda, L. Predoana, M. Zaharescu, M. Gartner, "Optical, microstructural and vibrational properties of sol—gel ITO films", Optical Materials 114 (2021) 110999

2. M. Gartner, A. Szekeres, S. Alexandrova, P. Osiceanu, M. Anastasescu, M. Stoica, A. Marin, E. Vlaikova, E. Halova, "Infrared ellipsometry as an investigation tool of thin layers grown into plasma immersion N+ implanted silicon", Appl.Surf.Sci., 258, 7195— 7201(2012)]

3. Nitrogen Amount on the Microstructural and Optical Properties of Thin r.f.-Sputtered ZnO Films Treated by Rapid Thermal Annealing", Appl.Surf.Sci., 261, 815— 823 (2012)

4. S. Bakalova, A. Szekeres, M. Anastasescu, M. Gartner, L. Duta, G. Socol, C. Ristoscu, I.N Mihailescu, „VIS/IR spectroscopy of thin AlN films grown by pulsed laser deposition at 400°C and 800°C and various N2 pressures", Journal of Physics: Conference Series 514, 012001(2014)

5. N. Dulgheru, M. Stoica, J.M. Calderon-Moreno, M. Anastasescu, M.

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» Nicolescu, H. Stroescu, A. Szekeres, M. Gartner, „Influence of compositional variation on the optical and morphological properties of Ge-Sb-Se films for optoelectronics application“, Infrared Physics and Technology 93 (2018) 260—270

6. M. Nicolescu, M. Anastasescu, S. Preda, J. M. Calderon-Moreno, H. Stroescu, M. Gartner, V .S. Teodorescu, A.V. Maraloiu, V. Kampylafka, E. Aperathitis, M. Modreanu, “Surface topography and optical properties of nitrogen-doped ZnO thin films formed by radio frequency magnetron sputtering on fused silica substrates”, J. Optoelectron. Adv. Mater, 12 (6), 1343-1349 (2010)

7. H.Stroescu, M.Anastasescu, S.Preda, M.Nicolescu, M.Stoica, N.Stefan, E. Aperathitis, M. Modreanu, M. Zaharescu, M. Gartner, „Influence of thermal treatment in N2 atmosphere on chemical, microstructural and optical properties of ITO and ITO: N sputtered thin films”, Thin Solid Films, 541,121-126 (2013)

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# AFSEM nano – Correlative AFM- & SEM analysis now in Stanford

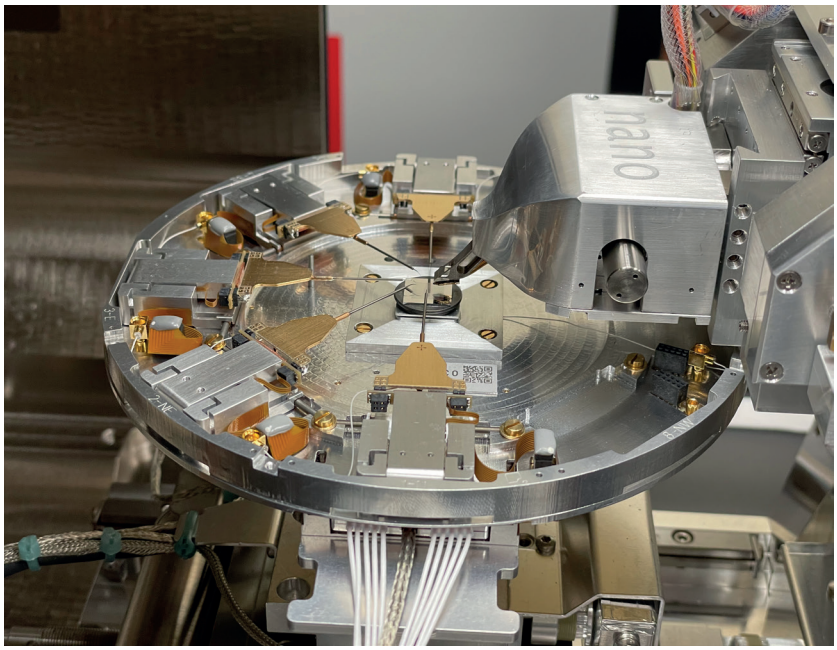
As kind of an early Christmas present, our AFSEM nano system was installed at the University of Stanford in the beginning of December.

Prof. Dr. Fritz Prinz and his group for nanoscale prototyping work on fundamental issues around energy conversion and storage in the nanoscale range. By integrating the AFSEM nano into their Thermo Fisher Scientific Teneo-SEM, the possibilities for material characterization have greatly increased. The focus of their planned research is the analysis of new semiconductor components by correlative AFM and SEM measurements. AFSEM nano provides information on the 3D-topography and mechanic, electric and magnetic properties of nanostructures - all inside the SEM.

In addition, AFSEM nano can be combined with their own Kleindiek nanoprobing platform, which applies a current to the components so they can be analyzed during operation. The scientists of Stanford University hope that these new measuring possibilities open up new developments in energy storage.

## AFSEM nano

Quantum Design's AFSEM nano is the logical development of the innovative AFSEM concept. The compact meausuring head allows easy integration in consisting SEM and FIB systems and combines the complimentary advantages of both microscopy methods.




This gives brand-new insights into the micro and nano worlds and allows users in situ characterization of mechanic, electric or magnetic properties with nanometer precision.

We look forward to discussing with you the options and advantages of correlative SEM/AFM analysis for your application.

https://www.qd-microscopy.com

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# The Prisma XRM – a new class in x-ray 3D-tomography

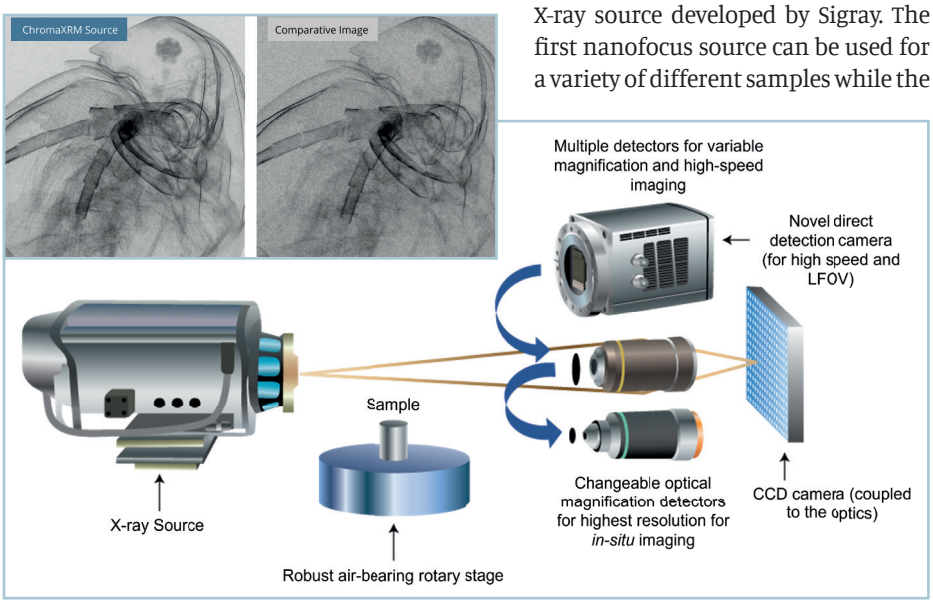
The Prisma XRM from Sigray defines a new class in the field of X-ray tomography and X-ray microscopy. The founder of Sigray, Mr. Wenbing Yun as already proven with his first company Xradia that there are new possibilities in the field of X-ray tomography. Xradia established the field of so-called X-ray microscopes (XRM) in the laboratories around the world which breaks with the traditional plat panel detector design that was used and which is still used in commercial available laboratory X-ray ct-systems. This traditional design is using a nanofocus X-ray source and a flat panel detector behind the sample and the reachable resolution is driven by the geometrical magnification of the system. Primarily by the size of the focus of the X-ray source, the distance between source to sample and the distance sample to detector. This means that you need to bring your sample as close to the source as possible to get the best possible resolution.

Mr. Wenbing Yun thought about a different approach to overcome these limitations and to achieve an even better resolution. He implemented a new detector approach by inserting microscope objectives with a very thin scintillator film on top. These objectives had different magnifications and this whole new X-ray system was in principle comparable to a traditional optical microscope. That is the reason why this new class of systems is called X-ray microscope instead of the traditional name Computer Tomography systems (or µCT system). The general internal setup of such an XRM can be seen in picture 1 and it has the following major advantages:

- The overall resolution of the system is no longer not only depending on the size of the focus spot of the X-ray source and the source to sample distance but has now a second magnification step with the used optical objective.
- This means that we are much more independent from the geometrical magnification, and we can now use much larger source to sample distances which will open the road to in-situ experiments while keeping the achievable resolution still as high as possible.

Wenbing Yun was now able to get to resolutions beyond 500 nm while increasing the possibilities in the field of in-situ X-ray experiments.

The new Sigray Prisma XRM system is now pushing the limits even further. It is using not only one of the best nanofocus X-ray sources that is available in the market but can in addition equipped with a second innovative X-ray source developed by Sigray. The first nanofocus source can be used for a variety of different samples while the second source is primarily focusing on softer samples made out of low z materials (e.g. life science or polymer science samples). These softer samples are very hard to measure with traditional-ray sources as those sources are using most often target materials like Tungsten which simply generate too much X-ray energy (which is very good for hard materials) but which is not the best solution for such delicate and light sample materials. Therefor Sigray developed the new Chroma source (please see Spectrum E37) and implemented it into the new Prisma XRM system to cover both types of samples, hard as well as soft materials.




Picture 2 is showing the impact that the Target material can have to the image quality. You see a Life Science sample measured with the Chroma source on the left (target material was Chromium) and the same sample measured with a traditional Tungsten target. You clearly can see that the Chroma source produces a much sharper image with more internal details compared to the traditional Tungsten source. Another highlight of the Chroma x-ray source is the possibility to equip this source with up to 5x different target materials. This will increase the capabilities of the source even further.

This makes the Prisma XRM to the most powerful XRM and CT-system up to date. In combines the requirements that a multi-user facility has into one cutting edge system. You have the best possible resolution (<500 nm) and the flexibility of different sources and different target materials to measure all type of samples. No matter if these samples are from Material Science departments or from the Life Science departments.

We are open to measure your samples to prove that this system is really the most powerful system that one can find.

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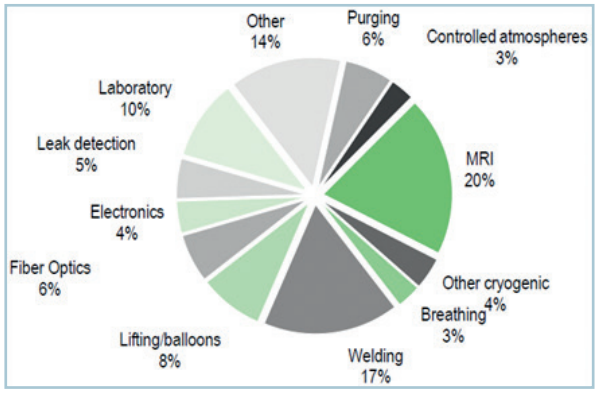
# Reasons for worldwide helium shortage

If you want to buy liquid helium, you currently have to dig deep in your pocket. Prices have increased considerably during the past 12 months. Since the second half of 2021, the amount of available helium has significantly decreased. The reason was maintenance work at the American gas processing plant Cliffside in Texas. Hopes that the Russian Amur plant would be able to compensate the production downtime were not fulfilled, even before the war against Ukraine. Amur, one of the world's largest helium gas plants, opened doors in September 2021. It was supposed to reach a capacity of 20 mio cubic meters gas per year and was meant to expand until 2025. Due to two fires in October and January, however, helium production has ceased. Even if Russian helium has not been sanctioned yet, we believe that existing export sanctions will delay the necessary plant repair work. This means, an end of the helium shortage is nowhere to be seen.

Helium is needed in many industrial applications. Only about 10% of the helium is used in the scientific sector.

### Typical helium applications are:

- Shielding gas for welding
- Part of breathing gas for divers and other people working under pressure conditions
- Cryogenics in research
- Magnetic resonance tomography in the medical field
- Leak detection
- Shielding gas for growing silicon and germanium crystals and for the manufacturing of titanium and zirconium
- Cooling agent for nuclear reactors
- Defense technology (gas for supersonic wind tunnels, high-speed propellant gas in rockets for directional correction, propellant for liquid fuel rockets, simulations of nuclear detonations with conventional explosives)
- Airships for border control




Source: Macro View - Edison Investment Research (Feb 2019). Depending on the source, data varies

### Helium production in 2021 [1]:

| Source | Mio. cubic meters (rounded) |
|---|---|
| USA | 77 |
| Algeria | 14 |
| Australia | 4 |
| Canada | 1 |
| China | 1 |
| Poland | 1 |
| Qatar | 51 |
| Russia | 9 |

Large helium suppliers only give limited supply guarantees at the moment. Institutes without a contract must pay up to 75 EUR/liter for liquid helium. This poses quite a challenge, especially for universities, because the high prices for helium are not in the current budgets.

There are two ways to handle the costs: The use of cryostats with closed helium cycles and the installation of helium recovery systems. Both come with larger prior investments.

Closed-cycle cryostats have advantages when it comes to automated experiments. They increase their maximum duration and prevent helium logistics. Disadvantages are smaller cooling powers and higher


base temperatures. Depending on the experiment, there might also be higher vibrations. Certain models like CryoAdvance from Montana Instruments and OptiCool from Quantum Design have a vibration level of a few nanometers and are available for vibration-sensitive measurements. A closed-cycle cryostat can be used for most common experiments.

To keep using existing "wet" cryostats, a helium recovery system can be used either as labwide/institute-wide plant or as individual solution for a single cryostat. A recirculating gas cooler from Lake Shore (former Janis), can upgrade a flow cryostat so that a liquid helium refill is no longer necessary. The helium liquefier NexGen from Quantum Design is a compact system which can already be profitable with two cryostats. The liquefier is installed directly in the lab. It is only a little larger than the transport dewar and can easily be handled by people in the lab.

If you want to become independent from external helium supply, contact us! We plan, install and maintain helium recovery and liquefaction systems. In addition, we provide Europe's largest selection of closed-cycle cryostats. Please refer to our articles on pages 9 and 10 for more information.

[1] HELIUM U.S. Geological Survey, Mineral Commodity Summaries, January 2022

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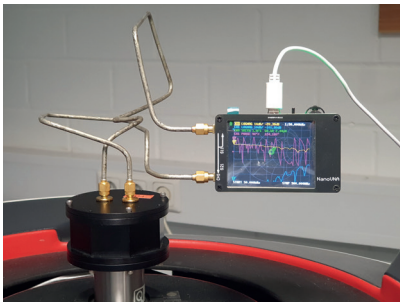
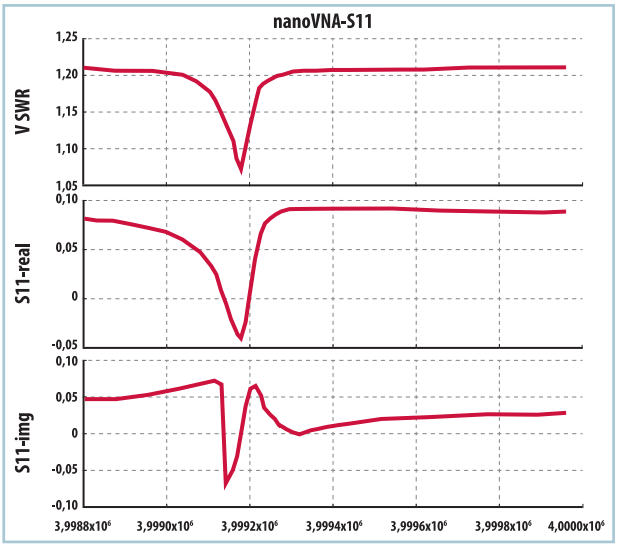
# High frequencies in the DynaCool measurement system

Apart from measurement options, our PPMS, DynaCool and VersaLab systems allow the integration of proprietary electronics or measurement setups. The Multifunction Probe (MFP) is a sample holder for measurements with proprietary cables, light guide and more which can easily be integrated in the cryostat and be connected with the sample. Just lately, we used the MFP in our application lab for a high-frequency measurement. The MFP was fitted with common RF cables. In a first test, we measured the frequency of a 4 MHz quartz crystal as function of temperature. We used a nanoVNA.



Starting at 300 K (approx. 3.9992 MHz), the quartz frequency decreases to about 3.9946 MHz, at a temperature of 10 K. The figure shows the measurement data points S11 and the Vertical Standing Wave Ratio (VSWR) at 300 K. The dip caused by the quartz oscillation is clearly visible.




The MFP allows easy integration of hardware. Scripting enables measurement data of third-party devices to be integrated in the MultiVu software. Scripts, for example, may be integrated in the sequence.

The PPMS, DynaCool and VersaLab are platforms for high magnetic fields and low temperatures which allow many automated measurement options for magnetic, thermal and electric sample characterization.

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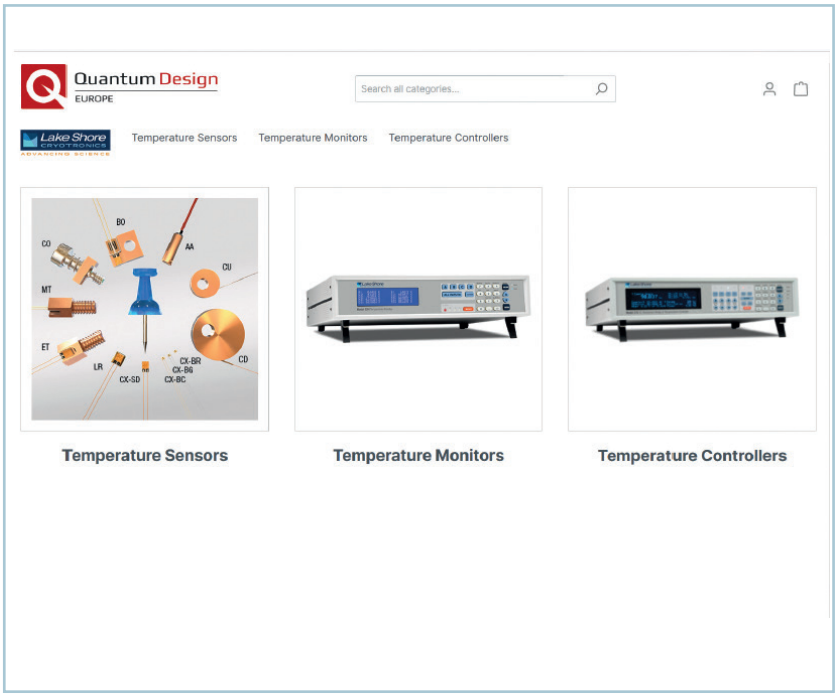
# Lakeshore components inquiry portal

Lakeshore offer a large number of temperature sensors, monitors and controllers. We have created a web portal to facilitate the selection of the right type of component. The web portal will automatically limit the possible options according to the specified requirements.

Please follow this link:

https://lakeshore.qd-europe.com

to get an overview of all sensors, monitors and controllers.

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# Cryogenic probe stations as turnkey measurement systems

Lake Shore is the largest provider of cryogenic probe stations in the world. Probe stations allow efficient measurements on electronic components under controlled conditions. Temperature and magnetic field can be precisely adjusted. With only little effort, several samples can be measured in various ways through flexible probe tips. Sensors are available for DC-, HF and optical measurements.

Additional technology like current source and voltmeter are normally supplied by the user. If the experimental setup requires central control, a corresponding script must be written to control the individual devices. This is particularly true for automized, temperature-dependent measurements.

CRX-4K

M81 – Synchronous Source Measure System

Lake Shore now offers the first ready-to-use measurement modules as options for their probe stations, with proprietary MeasureLINK software used for control. Two modules are available so far:

## M81 – Synchronous Source Measure System

M81 is a system made for electrical measurements. It enables AC and DC measurements for electric characterization. It features a modular setup and can be fitted with various sources and measuring units, depending on the measurement requirements. All modules are inherently synchronized.

- Electrical measurements with DC, AC, to 100 kHz and lock-in
- For special sensitivity requirements (nV, fA)
- Up to 3 source and 3 measure modules inherently synchronized

## M91 – FastHall™

M91 is configured for fast and precise Hall measurements. It provides a full Hall analysis incl. charge carrier mobility and concentration, Hall coefficient/voltage and magnetoresistance. Since the field polarity does not need to be switched during the measurement, even materials with low mobility can be measured in a short time.

- Automatic Hall analysis incl. van der Pauw and Hall bar geometry
- Large mobility range to 0.001 cm2/Vs
- Automatic optimization of excitation and measurement range
- High-resistance option to 200 GΩ

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# Helium recovery with proprietary liquefaction

We have a comprehensive guide on available helium recovery systems on our website [1] and would be happy to discuss your helium recovery requirements and options.

We provide all necessary components. For example: Lab liquefiers with various capacities, NexGen helium liquefiers [2] and the coldhead-based helium gas purifier ATP-30 [3]. At the current helium prices, a liquefaction system pays off after only a few years.

To get a first impression of the economic efficiency and the most profitable configuration, all we need is your yearly helium consumption.

[1] https://qd-europe.comhelium-introduction/

[2] https://qd-europe.com/helium-liquefier/

[3] https://qd-europe.com/helium-gas-purifier/

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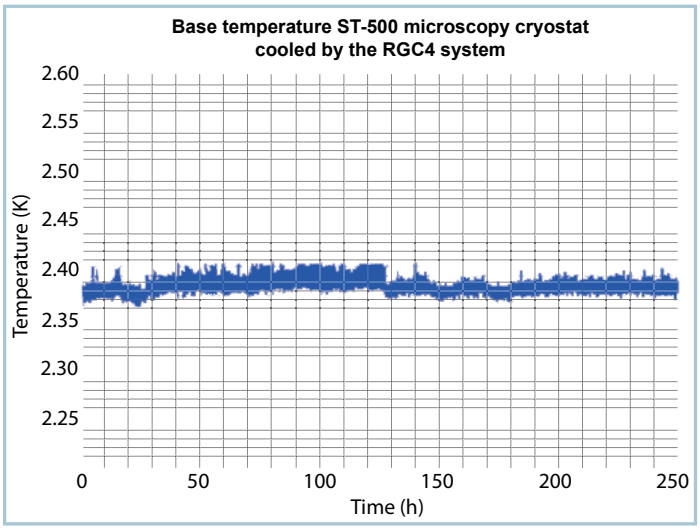
# Recirculating cryocooler for "wet" cryostats

The recirculating cryocooler from Janis release "wet" cryostats from their dependency on liquid helium. Janis RGC4 series combines the advantages of cryo systems with open and closed cooling cycles.

Instead of cooling the samples directly through the cold head of the cryocooler, a secondary cooling cycle is set up and the cold head of a classic "wet" cryostat is cooled. This has several advantages:

- Same flexibility and convenience as a continuous-flow cryostat without liquid helium
- Quick sample change without warming up the RGC4 cooler
- Outstanding thermal performance
- Low vibration




Pulse tube and GM coolers are available with 1 to 2W at 4.2 K. The system also includes a gas handling system and dry scroll pump for gas circulation.

Compatible cryostats are:

- optical ST-100
- non-optical ST-200
- compact ST-300 for use in a magnet
- UHV configuration ST-400 and
- microscopy configuration ST-500 and the ST-500 based probe station

Please contact us to discuss whether your cryostat from Janis or a third party provider is compatible with the recirculating cryocooler.

Please contact us
cryo@qd-europe.com

# New Xenics camera family – Ceres T

Longwave microbolometer cameras measure temperatures in the ranges -20 to 120 °C and 50 to 400 °C. Thanks to the integrated FPGA, the Ceres T camera series is capable of quickly compensating any temperature variations. This means no more drifts in the results of longer-term measurements. The built-in electronics ensure precise measurements even of fast changing temperatures.

The Ceres T camera family is available with either GigE with PoE or CameraLink interface. All cameras are GenICam compatible.

The small-scale cameras are perfectly suited for both processing plant applications and lab experiments. The dimensions are 45 x 45 x 67 mm³ and their weight starts from 220 g.

To ensure perfect temperature management,

all lenses are firmly attached to the camera. Choose between the following horizontal FoVs: 12°, 16°, 25° and 48°.

All cameras are available with either a 640 x 480 sensor or the new 1280 x 1024 microbolometer.

Please contact us
imaging@qd-europe.com

# 1.5 kW Laser-Based Floating Zone Furnace

Quantum Design Japan have just launched a new version of their laser furnace for single crystal fabrication.

In addition to the version with 2 kW laser power, there now is a version with 1.5 kW. It has 5 lasers with each 300 W for homogeneous temperature distribution in the melting zone. The raw material blank is turned over a rotator and the melting zone is adjusted by moving the blank to create a single crystal. This process can lead to temperatures as high as 2750 °C. The laser beam profile is optimized for crack-free single-crystal growth. The laser comes pre-aligned and does not need to be adjusted by the customer. Compared with IR furnaces with halogen or xenon lamps, a laser furnace impresses with its concentrated energy level in the melting zone, which makes it particularly suited for high-volatility materials. Please check out our website for images of single crystals grown with our laser furnaces. I look forward to discussing your application!

https://qd-europe.com/laser-furnace/

Please contact us
materials@qd-europe.com

# MOXTEK Performance comparison tool

Our partner MOXTEK boasts a wide range of polarizers and beamsplitters for a variety of applications. Their filters feature large acceptance angles of ±20° and high thermal stability to 200 °C (>5000 h). They are available as contrast or transmission optimized versions, reflecting or absorbing. To find the best solution among all these possibilities, Moxtek has developed a performance comparison tool. Compare typical parameters like Tp, Ts and Rp, Rs, contrast and efficiency at different AoIs. Further parameters are depicted in addition to the values in the specified areas for the selected filter types.

https://compare.moxtek.com/

By the way: Moxtek uses 200 mm wafers to produce polarizers and beamsplitters. Therefore all filters are available in sizes up to 180 mm in diameter and 130 mm x 130 mm in size.

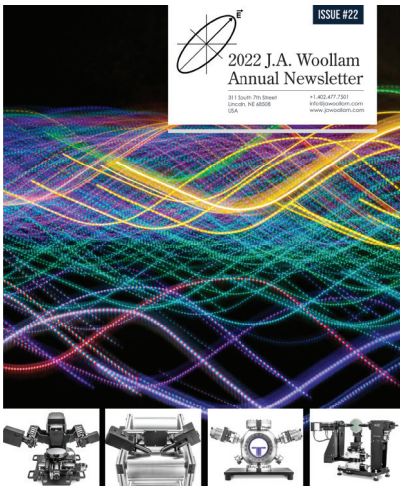
Please contact us
optics@qd-europe.com

# Woollam-Newsletter – Edition 21 now released

Woollam's latest newsletter has been published! Edition 21 offers interesting features on spectroscopic ellipsometry and other topics around the Woollam company. One article deals with the options and performance of transmission Mueller matrix ellipsometry.

Other topics are:

- An interview with Hans Arwin - his life dedicated to ellipsometry and his joy of reading
- Portrait of: Prof. Maurizio Canepa, University of Genoa




In the article "Ellipsometry on flexible polarizing substrates", we present interesting case studies demonstrating the power of spectroscopic ellipsometry for flexible substrates and their devices.

The entire article can be found in Woollam newsletter no. 21.

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# Electrical measurements at low temperatures – Multi-Contact Wedges

The most common method to characterize electronic components at low temperatures are measurements through cryogenic probe stations. The systems combine up to six individually movable measuring tips with a cryostat. When more than 6 contacts are required, you can use a Multi-Contact Wedge (MCW). An MCW is a wedge-shaped setup of a dozen or more measuring tips which are used instead of a single contact. A probe station can fit up to 6 MCWs. This facilitates more than enough contact points for any standard application. The setup is limited by the heat load because many feedthroughs lead to an increase in heat input. This can be avoided by choosing a probe station with a low base temperature.

Lake Shore is the market leader for cryogenic probe stations. Multi-Contact Wedges can be used in all Lake Shore systems. GGB Industries, specialized in the manufacturing of measurements tips, provide customized MCWs.

- Temperature range: 2 K - 675 K
- Number of flexible probe pins: up to 6
- Magnetic field: up to 2.5 T

Please contact us
cryo@qd-europe.com

# May I introduce myself?

My name is Merle Gerhardt. I finished my 2-year apprenticeship in wholesale and foreign trade with Quantum Design and am happy to be your commercial contact person in our cryotechnology and magnetism department.

Before serving the apprenticeship, I had already worked as a volunteer in social work at the local Department of Children's and Young People's Affairs.

When I am not working, you can find me outdoors. I love to work with plants and enjoy hiking and riding my bicycle. For six years, I have also been working as a voluntary organizer of youth camps.

What I like most about working in the office are the versatile and interesting tasks that offer new challenges every day. I truly enjoy being part of the QD team and look forward to what the future has to offer.

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**Editor: Joachim Weiss, PhD**

**Please note that not all products are available in every country.**