

## Optical Cryostat For Small Money

**Manufacturer:** Montana Instruments MI.

**Distribution:** Quantum Design.

**Product:** Affordable entry-level “CryoCore” cryostat system. Base temperature and vibrations are slightly higher than in the “Cryostation”, but still beat most other cryostats by a significant margin. Like all cryostats of this manufacturer, it comes as a turnkey system.

**Features:** The system covers the temperature range from 4.9 K to 300 K, with vibrations (peak-to-peak) < 100 nm. It works with a closed helium cycle. Compared to the “Cryostation”, the number of options has been reduced, but the “CryoCore” basic system comes with extensive basic equipment: 5 viewing windows, 12 DC and 2 RF feedthroughs with corresponding sample holder are already included. Vacuum system, temperature controller, cold head, helium compressor and a PC with touchscreen form part of each cryostat system. In the same way as an optical component, the system can be installed directly on the optical table, without the need for an external suspension. The temperature of the sample is regulated with efficient conduction cooling. The cryostat is fully automated: The desired temperature is set on the



touchscreen and the system will evacuate the sample chamber, cool it down and stabilize the temperature.

**Applications:** The new system is the right choice for all users who are looking for an affordable yet powerful entry-level cryostat for sensitive optical measurements.

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## Lasers for Confocal Microscopy

**Manufacturer:** Coherent.

**Product:** Two series of CW lasers for the confocal microscopy. The “OBIS” series offers output power up to 150 mW, the “Sapphire” series supports applications needing power up to 500 mW, including super-resolution techniques such as Structured Illumination Microscopy (SIM) that transcend the diffraction limit.

**Features:** The ultra-compact smart lasers of the “OBIS” series with plug & play functionality are now available at over 30 wavelengths extending from the UV to near-IR, and include optional fiber delivery. A stripped-down miniaturized format called “OBIS Core” is also specifically optimized for OEM applications.

The “Sapphire” lasers provide power up to 500 mW with a choice of nine wavelengths between 458 nm and 594 nm and the option of fiber-coupled output. These well-proven lasers (the series recently passed the 55,555 unit milestone) were the first solid state blue alternatives to the ar-



gon ion laser. One of the numerous advantages is their efficiency: Each of them saves about 1 ton of CO<sub>2</sub> per year, compared to power hungry ion lasers.

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## Quantum photonics for environmental sensors

*TOPTICA eagleyard* is one of seven project partners in the “SIM-QPla” quantum photonics research project. Goal of this project is the development of low cost, quick and reliable mobile detection methods for microplastics in treated waste water so that quantum photonics can be used for environmental sensor technology in the future.

Currently, purification plants are not yet able to filter microplastics completely. MIR-spectroscopy is used for the detection and analytics of microplastic in water – a very complex method. The new technology needs to be compact and robust to enable the analytic of water samples without complex preparation of the samples in order to detect even small amounts of microplastics. The samples will be measured with photons in mid infrared which leads to improved cleaning stages to ensure less microplastics in water.

*TOPTICA eagleyard* focuses on the development of hermetically sealed butterfly packages for mobile usage so that the detection of microplastic can be done on site. Moreover, the industrial production will be prepared for the end of the project. Thus, for the hermetical fiber feedthrough, low voltage assembly will be used for the first time. Special submounts as high-performance ceramics will be designed and implemented for effective heat spread. As mobile usage is key, a low power consumption of the thermoelectric cooler is essential while the temperature control needs to be precise.

The project team evaluates different concepts for the collimation of fiber adjustment. In order to integrate the optical isolator in the laser module, a miniature format needs to be developed that fulfills the requirements the analytics. In addition, the electrical control for the pump laser and the sensor module need to be downsized in order to be integrated. As a later roll-out is essential, new manufacturing processes for the highly integrated micro-assembly will be defined. At the end of this project, laser modules for quantum sensor technology will be available for industry usage.

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## New Energy Discriminating Detectors for Soft and Hard X-Ray Radiation

**Manufacturer:** ADVACAM.

**Distribution:** Quantum Design.

**Product:** Image Sensors for X-ray radiation with high spatial resolution and high dynamic range that can detect photons as single events.

**Features:** The detectors are based on the “Timepix” or “Medipix” technology developed at CERN. The sensors are made of silicon or CdTe and cover different energy ranges: silicon is used from 3 keV, CdTe from 5 keV. There are multiple modes of operation like photon counting, time over threshold and time of arrival, depending on the application.

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. The detectors operate in list mode, in which a continuous list of 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 any 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.

**Applications** 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-re-

solving detectors for ions or even neutrons can use “Advapix” models.

The manufacturer 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.

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## Low-Noise GHz Photoreceivers

**Manufacturer:** FEMTO Messtechnik.

**Product:** Compact and ultra-fast Si and InGaAs photodetectors of the “HSPR” and “HSA-X-S” series with integrated GHz amplifier providing a bandwidth range from 10 kHz to up to 2 GHz in the wavelength range from 320 to 1700 nm. The optical inputs are optionally free space or FC fiber-coupled. The free space inputs are available with 1.035”-40 threaded flange or alternatively with 25mm round flange to ensure maximum compatibility with common optical accessories.

**Features:** The GHz photoreceivers show very low noise with an NEP down to 11 pW/√Hz. The high gain provides a sensitivity of up to 4750 V/W and thus enables the measurement of fast signals down to the microwatt range. The frequency response is flat and without peaks, resulting in optimal pulse transmission, with pulse rise times of down to 180 ps. The high-quality housing offers very good protection against electromagnetic

interference (EMI) and is also designed for use in heavily disturbed environments. All models are equipped with M4 as well as 8-32 UNC threaded holes and can therefore be easily and stably integrated into optical systems with standard post holders.

The “HSPR” series features an inverted output and has an optimized matching with a VSWR of 1.4:1 and thus ensures that subsequent devices such as oscilloscopes can also be connected via relatively long cables without impairing the signal quality.

**Applications:** Spectroscopy, ultra-fast pulse and transient measurements, optical triggering, optical front-end for oscilloscopes and ultra-fast A/D converters.

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