Edition No. 1

Quantum Design
UK AND IRELAND

imaging cameras

Thermal Imaging, High Speed, SWIR, CCD and EMCCD and X-Ray Cameras

IR-based Detection of Elevated Body Temperature

High-Speed Scanning of Drill Cores

SWIR Cameras for Telecommunications Applications

Case Study: Hyperspectral Imaging in the Food Industry

Remote sensing of Vegetation using SWIR cameras on a UAV

High-speed framing and streak imaging cameras

WWW.QD-UKI.CO.UK/IMAGING-CAMERAS

WITH CONTENT CONTRIBUTIONS FROM OUR PARTNERS:

Raptor Photonics

Raptor Photonics aims to provide world class low light level camera solutions to industrial, research and governmental organisations around the globe. Raptor Photonics Limited is a high-tech company based in Northern Ireland, which was established in September 2006. Its main focus is to design, manufacture and sell the next generation of high performance, cutting edge, low light level digital cameras.

Specim

Specim is a globally leading supplier in hyperspectral imaging. As a true pioneer and forerunner in this field, we celebrated our 25th anniversary in 2020. Our international team of 70+ professionals, with expertise in optics, electronics, software, and machine vision, serves the market with the broadest range of hyperspectral cameras, imaging spectrographs, systems, and accessories. We are known as a trusted partner with products and support of superb quality and cost-efficiency.

Cordin Scientific

For Over Sixty Years, Cordin has been at the Pinnacle of High Speed Imaging. Cordin offers the fastest and highest quality scientific camera systems in the world: multichannel/multi-CCD framing cameras, image converter and rotating-mirror streak cameras, and compact single-chip framing cameras.

InfraTec

The Dresden-based company InfraTec GmbH is a specialist for products and services in the field of infrared technology. InfraTec offers solutions for every kind of thermographic measurement task. Discover the new generation of stationary and handheld infrared cameras with megapixel formats and automated thermography solutions.

Contact us here at Quantum Design UK and Ireland to discuss your requirements

Quantum Design UK AND IRELAND

Contents

CAMERAS

A NEWSLETTER FROM QUANTUM DESIGN UK AND IRELAND

Highlights

SWIR CAMERAS FOR TELECOMMUNICATIONS APPLICATIONS

Infrared Cameras for Temperature Scanning in the Fight Against COVID19

ADVANCING GEOLOGY WITH HYPERSPECTRAL IMAGING

Case Study: Avoiding Contamination in the Food Industry. "Nuts, and nothing but nuts" with Strelen

DEMO PRODUCTS AVAILABLE FOR YOU

PHOTO COMPETITION - win a thermal imaging camera

FOREWORD

Quantum Design UK and Ireland (QDUKI) is proud to bring you this newsletter with information about new products, publications and white papers that have been produced using products that we offer.

QDUKI has been involved with Imaging Cameras for **20** years as a distributor.

We're particularly excited to announce that we will have demo products available to send out so you can 'try before you buy'. This includes the InfraTec Image IR (p. 31)and the Specim IQ (p. 37).

Plus, don't forget to enter our photo competition (p. 11), to be in with a chance of winning a thermal imaging camera add-on for your phone. Ideal for an introduction to thermal imaging.

Luke Nicholls
CAMERA SALES ENGINEER
QUANTUM DESIGN UK AND IRELAND

NEW ADDITION TO THE QDUKI TEAM: LUKE NICHOLLS

Camera Sales Engineer

We are delighted to introduce our newest member of the Quantum Design UK and Ireland team. Luke Nicholls has joined us as our Camera Sales Engineer. He will be taking care of our Imaging Cameras.

His research experience in Photonics and Nanotechnology to help customers across the Scientific and R&D market find camera solutions throughout the EM spectrum, from X-ray, through to visible and infrared, for their applications.

Luke joins Quantum Design following a Postdoc in the properties of complex beams at King's College London in the Photonics & Nanotechnology group, headed by Prof. Anatoly Zayats.

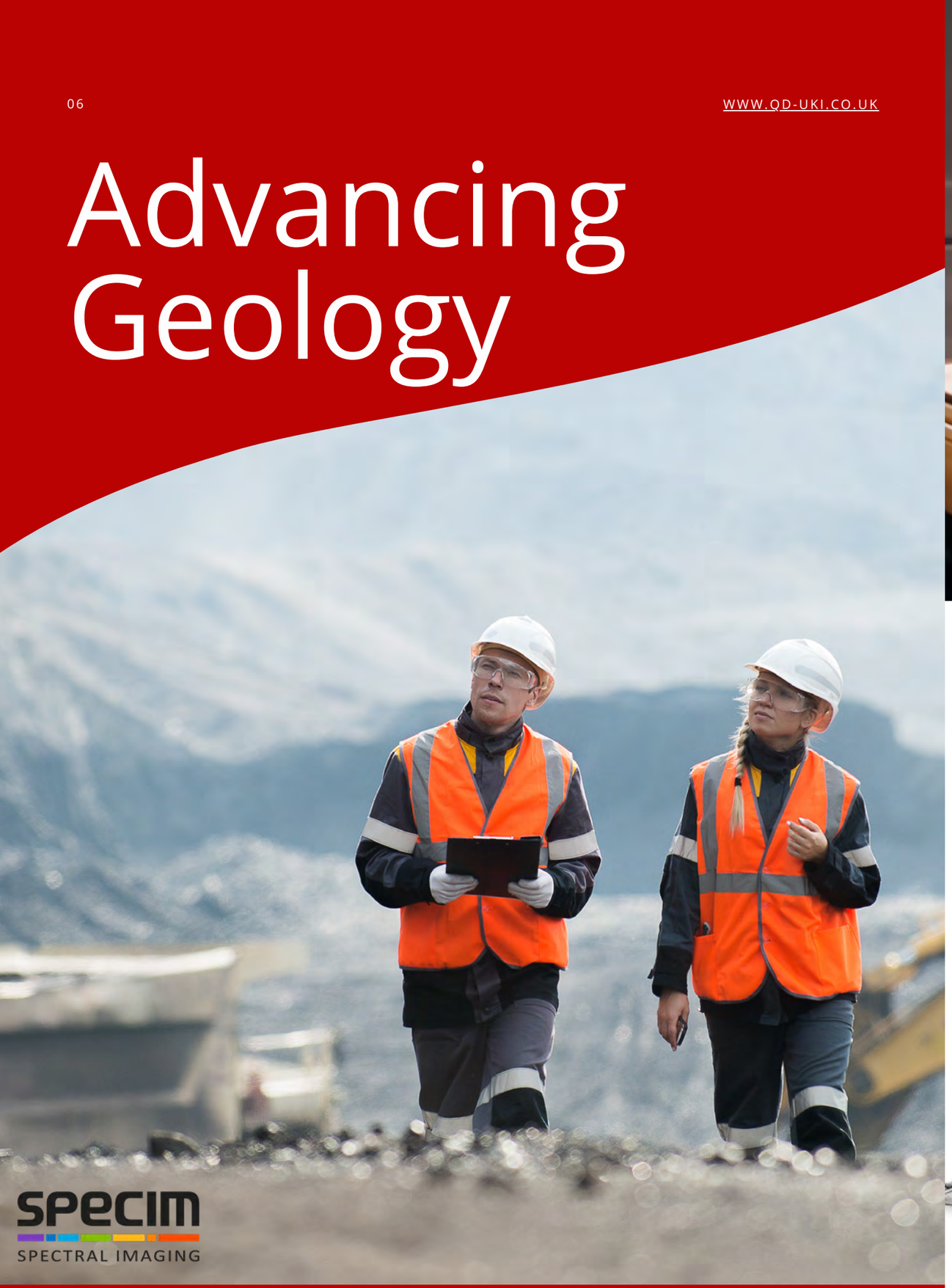
He completed his PhD in Physics, also at King's College London, with a thesis entitled *"Controlling light with light: exploiting fast free-electron nonlinearities in plasmonic metamaterials for the control of light polarisation"*. During his time in academic research Luke has gathered an array of experimental expertise in spectroscopy, ultrafast lasers, nonlinear optics and imaging.

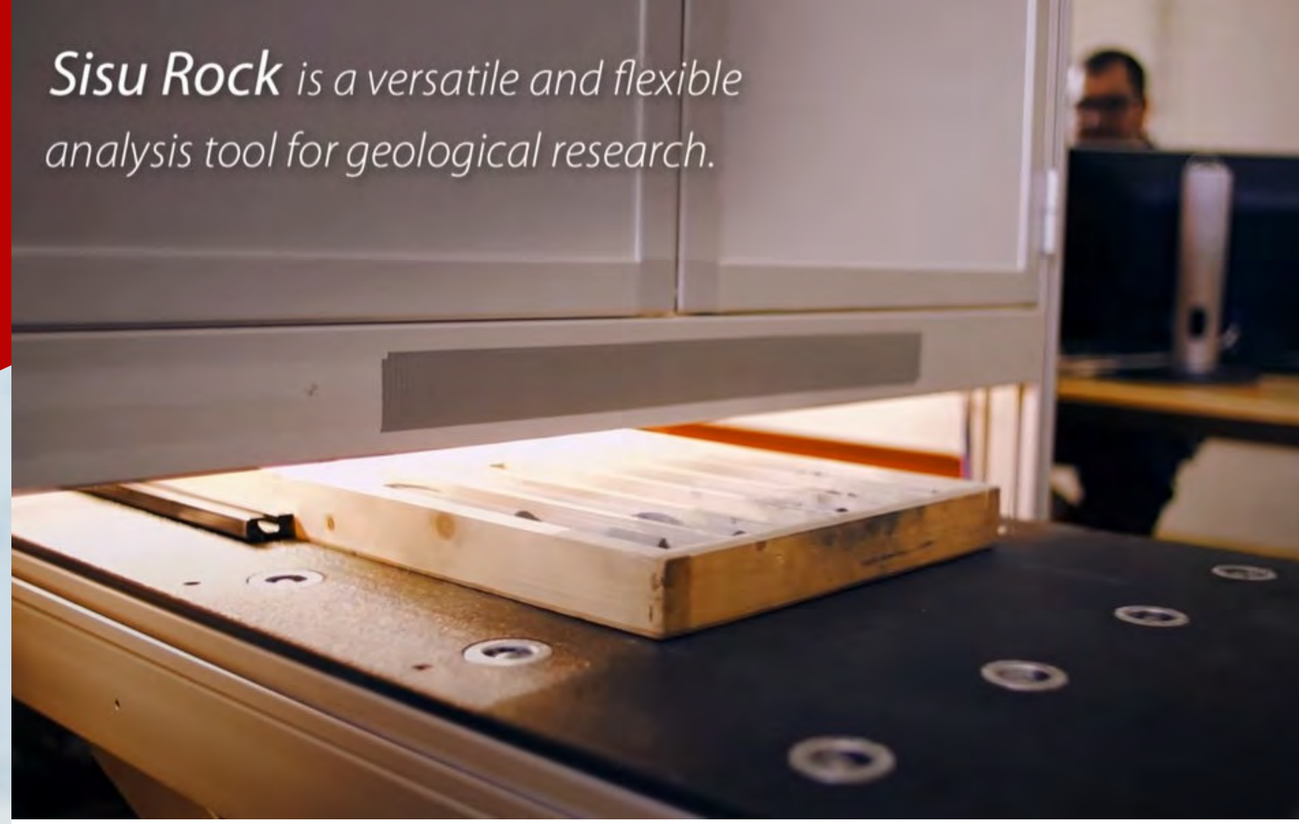
Luke hopes to bring his wide ranging knowledge of optics to assist customers in providing solutions to their applications.

Luke is available for office/laboratory visits to talk through your application requirements, have a live seminar and/or to demonstrate the cameras. Get in touch with Luke today to have a chat and book in your appointment:

luke@qd-uki.co.uk

Advancing Geology





Hyperspectral imagery is a powerful technology to locate minerals that are exposed or weathered in areas of residual soil.

The foremost airborne application of hyperspectral imagery provides mineral mapping for exploration clients in the mining, oil, gas, and geothermal sectors over large and often remote and inaccessible areas.

Geological samples, such as drill cores, can rapidly be mapped for nearly all minerals of a commercial interest with hyperspectral imaging. Specim's SisuROCK generates an image where each pixel contains a full spectrum, unique to each mineral of interest.

High speed, automated computer algorithms identify the minerals and convert the data into mineral maps of the samples depicted.

Specim customers have reported achieving savings worth hundreds of millions of dollars by using HSI technology.

Learn more about Specim SisuROCK Hyperspectral Core Imaging Station

SisuROCK is a fully automated hyperspectral core imaging instrument for easy and high-speed scanning of drill cores and other geological samples. It is capable of imaging a single drill core in a high-resolution mode or a whole core box in a high-speed scanning mode. Hyperspectral imaging data of a whole core box is acquired in less than 15 seconds, highly improving productivity in drill core analysis.

SisuROCK provides an efficient and high throughput production tool for the mining industry and a versatile and flexible analysis tool for geological research applications. SisuROCK applies Specim's state-of-the-art hyperspectral cameras for the rapid collection of hyperspectral data from various geological samples.

The SisuROCK workstation makes a full-scale scan, with all cameras, of the full core area in just a few seconds. Scanning a core tray, from loading it to the scanning table to loading the next box takes only less than 2 minutes. The SisuROCK workstation can scan hundreds of boxes in one day and is the fastest system available.

FAST

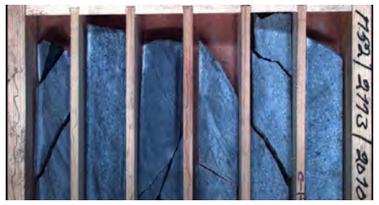
By using several cameras for different wavelength ranges from visual to thermal the SisuROCK is the most versatile hyperspectral workstation available for a full range of geological problems, unmatched in its capabilities to catch and record even the most difficult types of deposits, samples, and textures in its images.

VERSATILE

Hyperspectral imaging of geological samples is a 100% repeatable method, giving the same complete results every day, every time. When you use the SisuROCK workstation you will get all data of the full core area in digital format the first time you scan, and there is no need to revisit a remote core archive to view the core again.

REPEATABLE & COMPLETE

An average data collection rate with SisuROCK 1,200 meters of core per day



1 THE SISUROCK SYSTEM CAN BE EQUIPPED WITH UP TO X3 DIFFERENT CAMERAS

2 SINGLE CORE SCANNER FOR LOWER THROUGHPUT WORK

3 NO SAMPLE PREPARATION REQUIRED

4 AUTOMATED WORKFLOW

5 OPTION FOR HIGH-RESOLUTION RGB CAMERA

6 OBJECTIVE AND CONSISTENT DATA

Learn more about Specim SisuROCK Hyperspectral Core Imaging Station

win a thermal imaging camera

CompactPRO

Post your happiest 'back in the lab' photos on Twitter (with or without colleagues). There are some great prizes up for grabs, including a powerful thermal imaging camera designed for your smartphone.

Our panel of expert judges will adjudicate based on happy faces, funny captions and use of lab mascots. To enter, join our mailing list and post your happy lab photo on Twitter with the hashtag #HappyToBeBackInTheLabQD

Prizes:

- **Thermal Imaging Camera**
- **Meal for your lab team (up to 6 people)**
- **£50 Amazon voucher**
- **Case of wine**

How to Enter:

1. Take a photo of you/your team in the lab
2. Post your pic with the hashtag #HappyToBeBackInTheLabQD on Twitter
3. Join our mailing list here.

Entry Deadline:

June 30, 2021

Full terms and conditions are available here.

QDUKI Twitter

QDUKI Mailing List

#HappyToBeBackInTheLabQD

CASE STUDY

SWIR CAMERAS FOR TELECOMMUNICATION APPLICATIONS

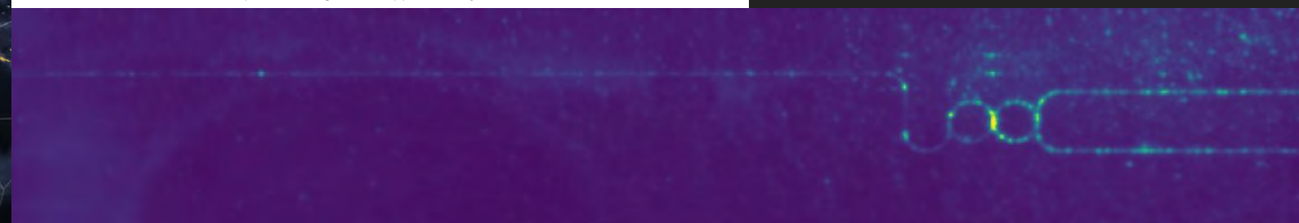
Chromosol have a vision to transform the future of photonic integrated circuits by developing their Silicon Photonics 2.0 platform to provide silicon based lasers and amplifiers.

Photonics engineers at Chromosol were able to use Raptor Photonics' Owl 640 N low noise SWIR camera to successfully assess their photonic waveguide structures. In the image below you can see light input from the left being coupled through two ring resonators and into another planar waveguide, all approximately 650 nm in width.

The waveguide has low propagation losses and so even weak scattering at the bends is observed due to the high sensitivity of the OWL 640 N camera. The intensity across the rings and the waveguides gives a good indication of the coupling efficiency and ring life times. The range of SWIR cameras from Raptor Photonics provides a great solution for customers in the telecommunications and photonic circuitry R&D to help develop products of the future.

CHROMOSOL

Fig 1. light input from the left, coupled through two ring resonators and into another planar waveguide, all approximately 650 nm in width



Raptor photonics **OWL 640 N**

The best performing VIS-SWIR camera in the World

Using next-generation technology, Raptor has launched one of the lowest noise VIS-SWIR cameras on the market, perfect for imaging in low light conditions.

- **Ultra low noise sensor** – Enables ultimate night vision VIS-SWIR image
- **VIS-SWIR technology** – Compatible with VIS-SWIR illuminators, markers & pointers
- **15µm x 15µm pixel pitch** – Enables highest resolution VIS-SWIR image
- **On-board Automated Gain Control (AGC)** – Enables clear video in all light conditions
- **Ultra compact, Low power** – Ideal for hand-held, mobile or airborne systems

Learn more about Raptor OWL 640 N

IR-BASED DETECTION OF ELEVATED BODY TEMPERATURE FOR CORONAVIRUS, SARS, EBOLA

Use Infrared Cameras for Temperature Scanning

Major travel hubs like airports, seaports, railway stations and long-distance bus stations are one of the points on which the security measures of public authorities are aimed when infectious diseases such as:

- Coronavirus (2019-nCoV, COVID-19, SARS-CoV-2)
- Severe Acute Respiratory Syndrome (SARS)
- Ebola Virus Disease (EVD)
- Middle East Respiratory Syndrome Coronavirus (MERS-CoV)

cause global problems. From there, diseases can be effectively prevented from spreading further.

InfraTec infrared cameras can be used for a corresponding elevated body temperature scanning of passengers, employee scanning and workplace entrance screening. Certainly, thermographic cameras can neither detect the virus itself nor a person carrying the virus!

However, these cameras enable the precise non-reactive, contactless and planar recording of surface temperatures while using the technical temperature measurement technology known as thermography.

Hence, they are highly suitable for the quick and easy detection of elevated body temperatures, which can be an indication of a possible virus infection of people subjected to screening.

The body temperature preferably is detected at the inner angle of the eye with the infrared camera. Slightest differences and thus abnormal body temperatures can be displayed and will result in alarms.

Performing such health screenings, e.g. via implementing temperature checkpoints for example for employee screening, enable the acquisition of important information as a basis for decision-making for subsequent medical examinations of the selected people and thus serve to secure public areas.

Such indications must, of course, always be followed by other examination methods that allow a reliable positive or negative statement about the disease and to initiate appropriate actions!

InfraTec
MADE IN GERMANY

Contact us here at Quantum Design UK and Ireland to discuss your IR camera requirements.

Advantages of THERMAL-CHECK at a Glance

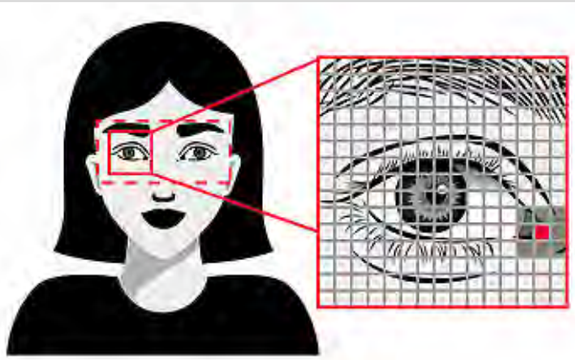
- **Reliable detection of persons with elevated body temperature**
- **Compliance with data protection guidelines: no collection of biometric data or ID cards, no comparison with personal registers**
- **Screening of several people at the same time, even when moving, with consistently high measurement accuracy**
- **High-resolution, repeatable measurement technology thanks to high geometrical and thermal resolution with at least (640 x 480) IR pixels for absolute precision**
- **Camera can be used flexibly for other measuring tasks, e.g. in research and development, quality assurance, etc.**

Learn more about VarioCam Industrial Thermal Cameras

Achieve Reliable Measurement Results for Detection of Elevated Body Temperature

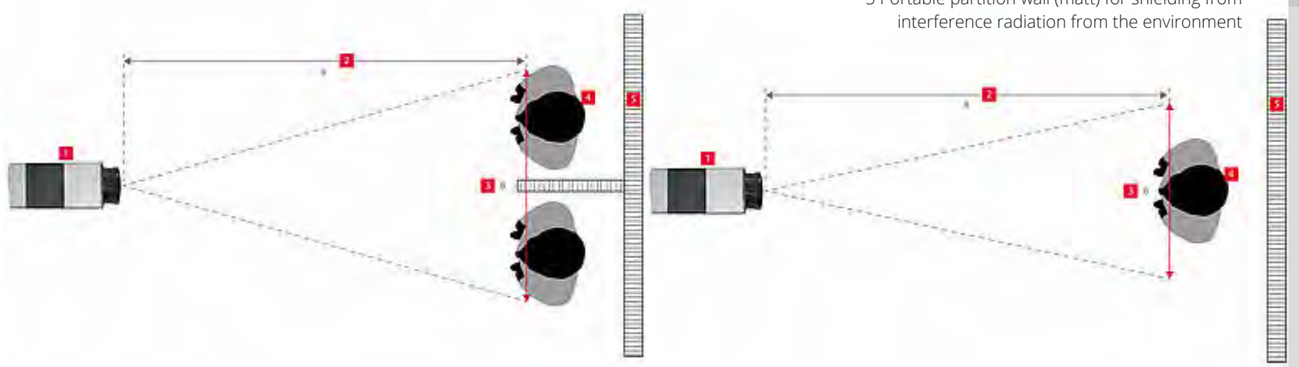
The thermographic temperature measurement for detection of elevated body temperature puts high demands on suitable thermal cameras: In addition to a high thermal resolution, which can make even the smallest temperature differences visible, there must be very good stability and measuring accuracy in order to be able to reliably distinguish a person with an elevated body temperature from a person without these symptoms using critical temperature thresholds and alarm values.

Another very important criterion is the required high geometric resolution, which is expressed in the number of so-called infrared (IR) pixels. This is necessary because the area that has been proven in several studies to be suitable for reliably detecting elevated body temperature at the inner eyelid angle has only a small surface area, but must be sharply mapped for error-free temperature measurement.



The measurement itself takes less than a second and is usually carried out in access areas, for example at the entry control at airports, where the people who are to be screened are already lined up. Largely determined by the wide-ranging requirements of the users, the evaluation of the measured data can range from simple manual use to select people with elevated body temperature for further examinations to automatic detection and storage.

Legend
1 Thermal camera on tripod
2 Distance from the camera to the person
3 Horizontal field of view of the camera
4 Position of the person/two persons (only possible with partition wall using VarioCAM® High Definition with XGA resolution)
5 Portable partition wall (matt) for shielding from interference radiation from the environment



Here at Quantum Design UK and Ireland, we only want to send you the information that you would like to see. When filling out the form, please tick the particular fields and product suppliers that interest you, and we will make sure you are kept up to date with ONLY the most relevant information.

CORDIN SCIENTIFIC HIGH SPEED IMAGING CAMERAS

High speed framing and streak imaging cameras

For over sixty years, Cordin has been at the pinnacle of high speed imaging and offers the fastest and highest quality scientific imaging systems in the world with the broadest product line of any high speed imaging provider. Cordin frequently works with end users to develop custom solutions to imaging challenges.

Cordin Scientific Imaging cameras provide high speed imaging solutions for situation that meet the following criteria:

- The event is visually observable and can be detected or triggered
- The event dynamics are in the sub-millisecond or sub-microsecond time domain
- The highest possible speed and resolution are required
- A record length of some hundred or fewer frames is adequate

CORDIN
SCIENTIFIC IMAGING

Learn more about Cordin High Speed Cameras

APPLICATIONS

Cordin Cameras are used in a broad variety of short time domain studies

Aerodynamics
- Supersonic and hypersonic flows
- Gas dynamics
- Turbulence
- Shock waves

Computer Imaging
- Particle Image Velocimetry (PIV)
- Digital Image Correlation

High Energy Physics
- Plasma physics
- Propellant and propulsion studies
- Laser physics

Hydrodynamics
- Hydroshock dynamics
- Fluid cavitation
- Aerosol and fuel injector studies
- Droplet formation
- Multi-phase flow dynamics

Life Sciences
- Micro bubble studies
- Bio-fluorescence

Materials Science Research
- Shock compression and fracture
- Crack propagation
- Dynamic loading

Mechanics
- Vibration analysis
- Shock waves
- Hopkinson-Bar studies

Military and Defense Research
- Explosive and detonation studies
- Ballistic and projectile studies
- Impact dynamics
- Shape charge studies
- Explosion front characterisation
- Synchro-ballistic imaging

Nanotechnology
- Micromechanical machine dynamic analysis
- Nanoscale material behaviour studies
- Micro bubble studies

Time resolved spectroscopy

imaging cameras roadshow

COMING THIS AUTUMN

Our Camera Sales Engineer, Luke Nicholls, will be embarking on an adventurous road trip around the UK this Autumn.

He will be visiting Universities and laboratories up and down the country to provide live seminars, demos and talks.

Get in touch if you'd like Luke to visit you.

luke@qd-uki.co.uk

20 WWW.QD-UKI.CO.UK

Nuts, and certainly nothing else but nuts

CASE STUDY

Strelen Control Systems

Strelen Control Systems GmbH uses a hyperspectral camera from the Finnish manufacturer Specim to check nuts before processed in the food industry. High-precision nozzles shoot faulty parts and foreign bodies out of the process in flight. There is only a little time left for reliable image processing.

One of the most critical food manufacturers' tasks is to avoid contamination in their products to minimise the risk of damage to health, expensive product recalls, and the associated loss of reputation. Of course, this also applies to foods that contain nuts as components, such as muesli, muesli bars, trail mixes, or biscuits.

"Because of the visual similarity, reliably differentiating nuts from their shells or other contamination at high speed is an extremely demanding task,"

says Dr. Stephan Strelen, Managing Director of Strelen Control Systems GmbH based in Büttelborn near Darmstadt, Germany.

Dr. Strelen's company has been developing solutions for inspection and analysis and the automation and control of production processes in various industries for many years. They have already collected a lot of experience with applications from the food industry.

"We have been dealing with machine vision since the company was founded and have our specialist department with six specially trained opto-engineers and employees who have specialised in this technology. Machine vision is our focus, and many of the projects we have implemented contain solutions that are based on the evaluation of images."

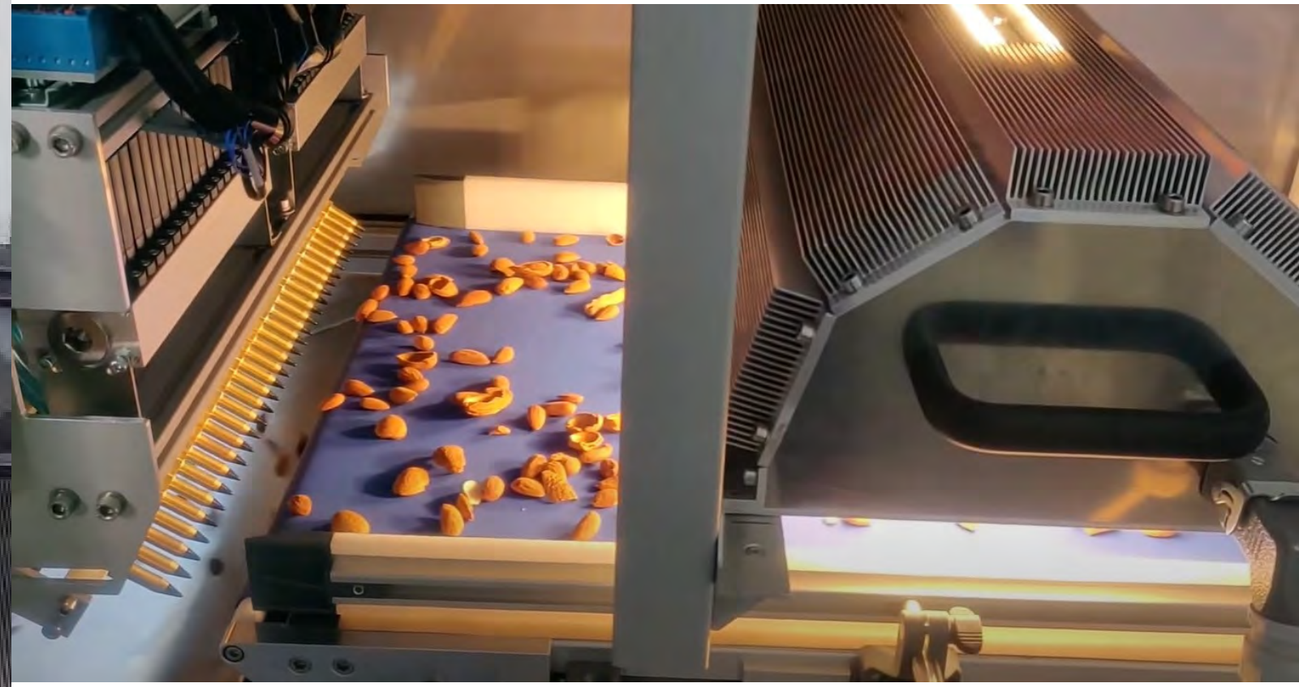
Strelen felt that his company was well equipped for a food producer request for a system for sorting nuts, especially since Strelen Control Systems had already implemented various other sorting systems.

"The machine vision systems used were based on conventional RGB colour cameras that, like the human eye, work with the three primary colours red, green, and blue and display all colours of human vision in a corresponding mixture. However, there's only little variation in the brown tones of nuts and their shells, which is why it was practically impossible to differentiate them reliably with such a camera."

The solution is hyperspectral

Hyperspectral cameras work on a different principle and analyse a recording spectrum of up to 250 spectral bands in the wavelength range from the visible to the near-infrared range. This allows individual spectra of the light to be recognized. On this basis, a hyperspectral system can distinguish whether the same shade of brown is created from one or more superimposed wavelengths.

The nuts to be processed, such as almonds, hazelnuts, walnuts, cashews, macadamia nuts, peanuts, and other types of nuts, each has identifiable spectra. With the use of suitable software, the hyperspectral images can be analysed quickly and reliably. The system recognizes all spectra that do not correspond to the expected types of nuts, such as shells, remains of shells, plastic parts, nuts infected with mould, or any contamination, and assigns each recognised particle as good or not good. “To guarantee the purity of the end product, the sorting only recognises perfect parts as good parts and rejects all objects that do not meet the requirements,” Strelen emphasises.



SORTED OUT IN FLIGHT

Safe-Ident Sort is the name of the machine Strelen Control Systems has developed for nut sorting, which has been in use since autumn 2020. It works with a conveyor belt where the unsorted bulk material is transported at a speed of 150 mm per second under an FX10 hyperspectral camera from the Finnish manufacturer Specim. This camera continuously records images and forwards them to the Halcon-based image processing software, specially developed for that application.

The conveyor belt ends at a pulley where the bulk material falls over an edge to remove defective parts and all kinds of contamination. Based on the image evaluation results, the system controls 32 high-precision nozzles, which catapult detected objects not meeting the expectations out of the trajectory and into a reject container with targeted air blasts while falling. On the other hand, faultless parts land undisturbed in a collecting container and can be processed further.

Learn more about Specim FX Series

Contact us here at Quantum Design UK and Ireland to discuss your requirements

SOPHISTICATED SYSTEM DESIGN

To enable this process and achieve the required speed and accuracy, a sophisticated design of the entire system, the machine vision part, and the communication between all components are required.

"***The Specim FX10 hyperspectral camera is the central element of the machine vision system and has convinced us for various reasons,***" explains Strelen. "The main argument was that it covers a large number of wavelengths in the spectrum relevant for this task. Also, it is the only hyperspectral camera that is also suitable for the visible range of the light spectrum. Besides, there is compatibility with the LuxFlux software libraries used for the classification and pre-processing of the image data and the Halcon software for the OK / NOK decision based on the LuxFlux results, the compact size, and, **last but not least, the fair price of the camera**."

On top of that, Strelen was also impressed by the competent support provided by the Finnish manufacturer.

Optimal illumination is an essential requirement for the performance of a hyperspectral system. Hyperspectral cameras require a broad spectrum of light to identify the spectral responses of different materials reliably. The illumination has to get brighter as the inspection speed increases. Strelen Control Systems solved this requirement with in-house development, indirect homogeneous halogen illumination with a broad wavelength spectrum from 400 to 1000 nm. A special heat sink for this illumination dissipates the generated heat.

"Safe-Ident Sort based on the Specim FX-10 hyperspectral camera enables economical and safe testing of various types of nuts according to the strict requirements of the food industry."

Dr. Stephan Strelen, Strelen Control Systems

EASY CHANGEOVER

The first Safe-Ident Sort system has been running for Ortlieb Organic in Bensheim, Germany, since autumn 2020 and can do more than conventional sorting machines from established manufacturers. Strelen emphasises: "**Sorting systems are usually designed for a certain type of nuts. A change to a different nut requires the exchange of components, which can only be done with relatively great effort. However, Ortlieb Organic needed a system that can be quickly and easily converted to different nuts and shell products.**"

This is where the Specim hyperspectral camera, in combination with the software used, shows its particularity, explains the Managing Director: "**Safe-Ident Sort can be converted to different products simply by reprogramming and does not require any retrofitting or replacement of components. For a program change, only a parameter change in the software programming is necessary. Even this step can be handled without the slightest effort due to the clear and user-friendly interface of the software**."

Ortlieb Organic is extremely satisfied with the performance of the finished system, reports Founder and CEO Eberhard Ortlieb

"Since we have been working with Safe-Ident Sort, we have saved two workers per shift who previously checked the incoming goods manually on a sorting belt. Safe-Ident Sort enables the processing of approximately 900 kg nuts per hour and detects all good nut portions with a very high level of reliability in real-time. This gives us a high guarantee that our goods are free of defects concerning the nuts used. That hawse has therefore installed good protection against recalls or claims for damages. The reliable image recognition by the Specim FX10 hyperspectral camera and the simple conversion of the system to different types of nuts are the main reasons for this development's success. Without this system, 100% quality control would not even be economically feasible given the high production speeds in the production of food according to the strict requirements of the food industry."

Specim FX10

Applications

The FX10 is a compact, lightweight, cost-effective hyperspectral camera for the VNIR spectral range (400-1000 nm). F/1.7 optics enables excellent light throughput, high sensitivity, short integration times and high signal-to-noise ratio. The FX10 operates with an impressive frame rate of 330 fps (full frame) using 1024 spatial pixels and 220 spectral bands. By reducing the number of spectral bands, the frame rate can be increased up to 9,900 fps.

Learn more about Specim FX Series

Food Sorting

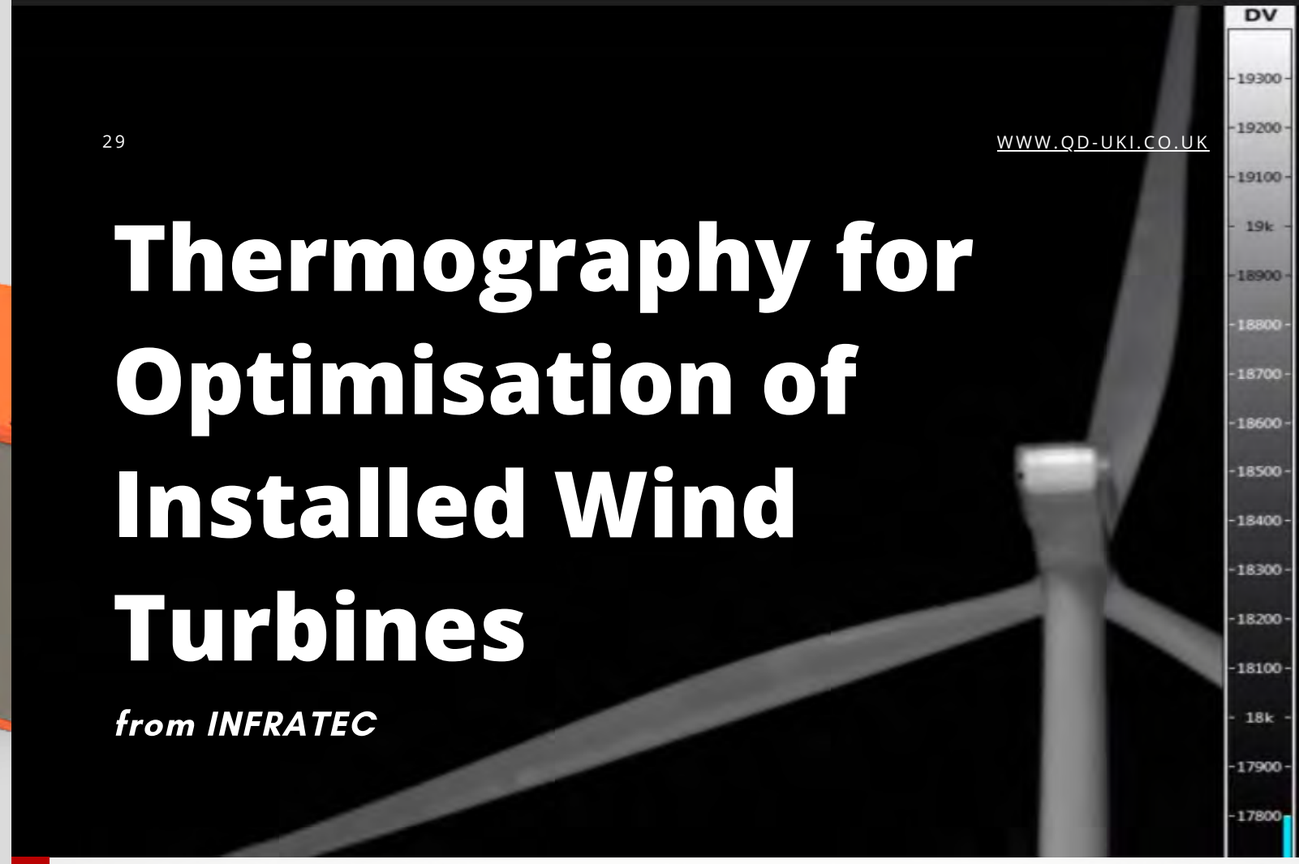
Phenotyping

Agriculture

Colour in Printing

Thermography for Optimisation of Installed Wind Turbines

from INFRATEC



Due to the decreasing number of suitable locations for wind turbines and the increasing push towards renewable energy sources, new activities have been introduced to improve the efficiency of rotor blades for wind turbines.

The goal towards high efficiency is of great interest, because it has a direct impact on the achievable energy output of wind turbines and thus, on the profit of the operator. Of course, the rotor blades of modern wind turbines have an already optimised efficiency resulting from decades of aerodynamic research: their profiles are designed with supercomputers and optimised in wind tunnels.

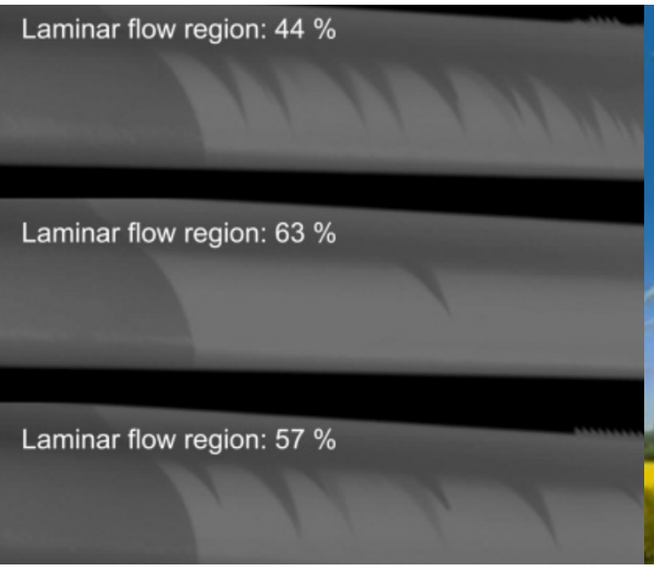
In their production new technologies are applied, which were first designed for the construction of high performance aircrafts. The goal of these measures is to have maximum percentage as well as maximum controlling of laminar flow between the rotor surface and the surrounding air. However, turbulent flows reduce the efficiency and therefore must be reduced to what is absolutely necessary.

In addition, there are many more factors that negatively affect the efficiency of wind power stations. It starts with alignment of the blades, leading edge contamination, erosion and damages to defective flow control add-ons, such as leading edge protection, vortex generators and zig-zag tape sections.

For several years now, thermography has been a valuable tool for investigating the boundary layer behaviour on air foils in order to aerodynamically optimise it. It makes use of the fact that the heat transfer resistance of the boundary layer is significantly lower in turbulent flow than in laminar flow. For example, if the surrounding air is colder than the rotor blade surface, a thermal pattern appears on the surface which indicates the state of the flow. Because the temperature on the turbulent flow region is colder than on the laminar low region, measuring this thermal pattern with a thermal imaging camera permits detecting the boundary layer condition in real-time.

with friendly support from:

BIMAQ Deutsche WindGuard



Highly thermally sensitive high-speed infrared cameras with high performance telephoto lenses are used to visualise the boundary layer condition of rotor blades in operation, in which the rotor blades and the measurement position are several hundred meters apart. These measurements deliver qualitative information regarding the transition location along the rotor blades, and allow comparisons between different operational states and conditions.

A high-speed actively cooled high-end infrared camera ImageIR® 8300 with an InSb-focal-plane array photon detector in the format (640 x 512) IR pixels and with a thermal resolution better than 20 mK is used together with a telephoto lens of 200 mm to acquire high resolution thermal images of rotor blades in operation. Due to extremely short integration times, only minor motion blurs occur during tip speeds of 75 m/s.

ImageIR 8300

Avoid Measurement Errors Using Highest Geometrical Resolution of (640 × 512) Infrared Pixels

The most solid all-rounder of the cooled infrared camera systems

- Detection of small details with detector of (640 × 512) IR pixels
- High thermal resolution better than 20 mK for precision measurements
- Snapshot detector for precise image acquisition at frame rates up to 125 kHz in full frame
- Motorised focus unit enabling precise, remotely controlled and fast focusing

Learn more about InfraTec ImageIR 8300 Series

Available from July

FOR DEMO OR EXTENDED LOAN

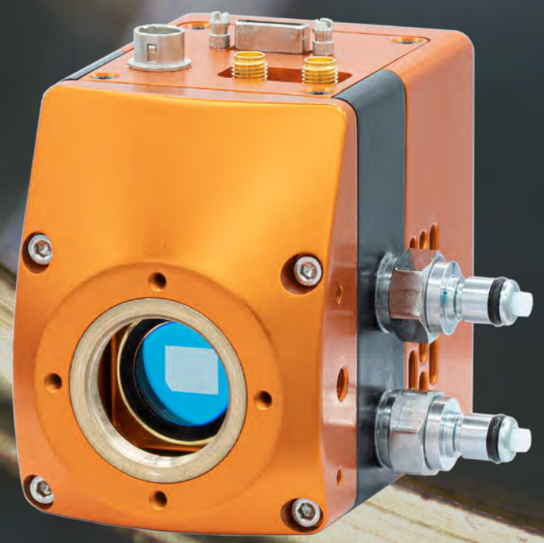
High-speed thermography systems
Precise radiometric calibration

try before you buy

luke@qd-uki.co.uk

SCIENTIFIC CAMERAS FOR MICROSCOPY APPLICATIONS

THESE CAMERAS ARE BEING USED FOR MOLECULAR IMAGING AND IN-VIVO FLUORESCENCE (NIR-II) IMAGING USING DYES, MARKERS AND NANO-PARTICLES OPTIMISED TO EMIT IN LONGER WAVELENGTHS. THEY ARE ALSO BEING USED IN IMAGING SPECTROSCOPY AND HYPERSPECTRAL IMAGING.



Learn more about the Kestrel EMCCD Camera

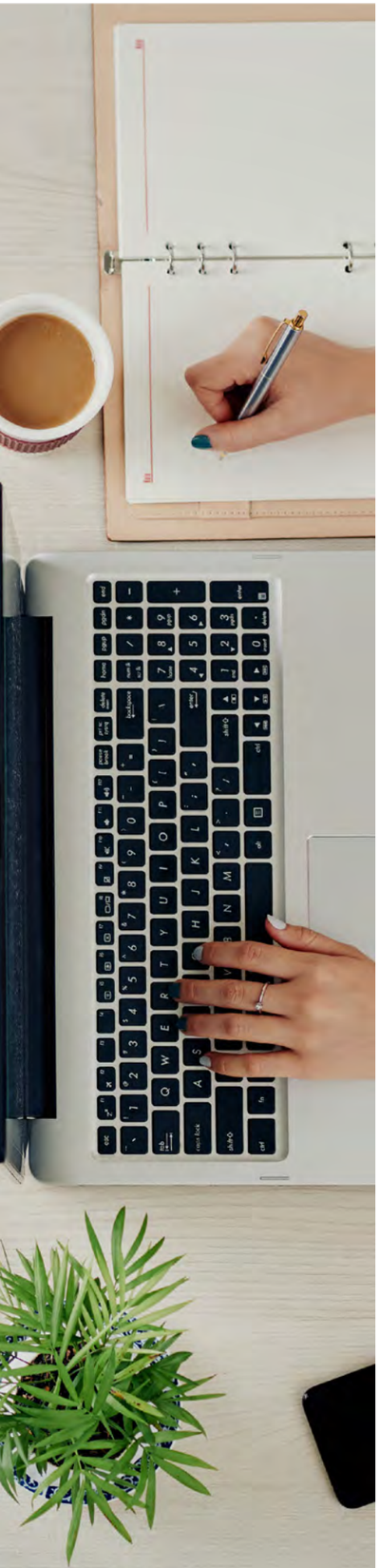
In terms of microscopy cameras Raptor offers a range of solutions to meet a wide variety of applications. The Ninox family of cameras use high-performance InGaAs sensors cooled to enable longer integration times. The cameras offer SWIR and Vis-SWIR wavelength coverage and are available in different resolutions and pixel pitches. The Ninox 1280 offers HD format (1280x1024) resolution with 10µm pixel pitch. The camera is cooled to -15°C and offers impressive low noise and low dark current. The Ninox 640SU offers 640 x 512 with 15µm pixel pitch and is cooled to -80°C. The low noise performance of these cameras mean that the sensitivity and quality of image are “best in class”.

Raptor also offers a suite of next generation EMCCD cameras offering the ultimate combination of resolution, sensitivity, and speed. The Falcon III model uses a 1MP back-illuminated sensor with 10µm pixels, this camera offers less than 1e- readout noise while running at 31 frames per second. It will run faster if ROI’ed or binned. The camera is cooled to -70°C. Applications include fluorescence imaging / spectroscopy, flow cytometry, FRET / FRAP / TIRF, genome sequencing, high content screening, high-resolution fluorescence imaging, live cell imaging, photon counting and single molecule detection.

The Kestrel 1000 runs at 1,000 frames per second in full frame (up to 2,000 fps with ROI). It uses a 128 x 128 back-thinned EMCCD sensor with 24µm x 24µm pixels. It is cooled to -20°C and offers up to 95% QE for optimum photon collection. It is used for fast events such as adaptive optics, calcium signalling, particle image velocimetry and high-speed object tracking.
These cameras come with standard C-Mount, use a digital CameraLink interface and run through MicroManager and ImageJ.

WATCH IMAGING CAMERAS WEBINARS

Don't miss out on the best webinars - watch them now



1

INTRODUCING THE SPECIM AFX

BY SPECIM HYPERSPECTRAL

In this webinar, Specim will show you the ins and outs of the **Specim AFX series**, its installation and use, possible applications, and sample data.

watch now

2

OVERVIEW OF THERMOGRAPHY SOLUTIONS

BY QUANTUM DESIGN AND INFRATEC

Key points to have in mind when using thermography. Selection criteria for thermographic cameras InfraTec's product range at a glance. Applications

watch now

3

SPECIM FX50 AND MWIR, THE FORGOTTEN WAVELENGTH

BY SPECIM HYPERSPECTRAL

In this webinar, Specim's Mathieu and Jeff run through the typical applications in the MWIR region and talk about the challenge it creates for hyperspectral imaging.

watch now

4

INTRODUCING SPECIMONE SPECTRAL IMAGING PLATFORM

BY SPECIM HYPERSPECTRAL

In this webinar, Specim will show you their new SpecimONE spectral imaging platform in more detail.

watch now

5

SEEING LIFE IN SHORT WAVE INFRARED

BY QUANTUM DESIGN RAPTOR PHOTONICS

In this webinar, Mark Donaghy, VP Sales & Marketing at Raptor gives a brief overview of Raptor Photonics and its SWIR heritage. Then looks at InGaAs / SWIR sensor and camera technology. Then focuses on a broad and growing range of applications that Raptor customers have benefited from using Raptor SWIR cameras.

watch now

6

HOW TO FIND THE PERFECT IR CAMERA FOR YOUR APPLICATION

BY QUANTUM DESIGN AND INFRATEC

This webinar will help you work out the ideal camera for your particular applications. Including Physical aspects, Different sensor technologies, Parameters of cooled IR cameras, Parameters of uncooled IR cameras.

watch now

7

PERFORMANCE OF COOLED AND UNCOOLED STANDALONE SYSTEMS

BY INFRATEC

Interested in knowing more about microthermography? This webinar covers performance and limits of uncooled IR-cameras for microthermograpy; performance of cooled IR-cameras for microthermography; MicroScan technology for resolution enhancement for cooled ImageIR® series

watch now

HYPERSPECTRAL GOES MOBILE

Discover for Yourself

Demos Available Now

QDUKI has access to a Specim IQ Hyperspectral camera that you can use for a time to get used to the functions and see if it's suitable for your needs.

Get in touch today to discuss your requirements:

luke@qd-uki.co.uk

Specim IQ is a portable hyperspectral camera, where data capturing, data processing and result visualisation are integrated into a one ready-to-use package. The camera is able to screen the imaging target and show the results on the camera display in just seconds. The weight of the camera, 1.3 kg containing a chargeable battery and a memory card for data storing, allows true portability for imaging in locations, where it has not been possible before.

InfraTec.

CASE STUDY

ANALYSIS OF THE THERMAL CONDUCTIVITY IN NANO- AND MESOSTRUCTURED POLYMER SYSTEMS

A Lock-in Thermography with Infrared Camera VarioCAM® HD research 800

New materials with precisely controlled optical and thermal transport characteristics can make a large contribution to resource-saving thermal management. Scientists of the University of Bayreuth are pursuing this vision. They use infrared thermography to quantitatively determine thermal conductivity in nano- and mesostructured polymer materials.

Thermal conduction and thermal radiation are essential transport mechanisms that play a key role in various applications, from the smallest microchips to complete buildings. Their control requires a sophisticated material design that reaches into the nanometre range.

Prof. Markus Retsch and his team from the Chair for Physical Chemistry 1 of the University of Bayreuth are working on the development and characterisation of such innovative materials.

Modern cooling and air conditioning systems still require an external energy supply. But the cooling technology of the future should work without additional energy. To achieve this, materials are needed that selectively radiate heat.

This can take place, for example, in clear weather when radiation occurs into very cold outer space through the so-called "Sky Window" in the long-wave spectral range of 8 … 13 µm, in which the atmosphere is transparent.

"This process is called passive cooling and requires materials that emit heat via thermal radiation within a selective spectral range. At the same time as little solar energy as possible should be absorbed from the sun, for instance by improving the reflection or scattering properties of the material."

PROF MARKUS RETSCH,
UNIVERSITY OF BAYREUTH

Learn more about VarioCam Industrial Thermal Cameras

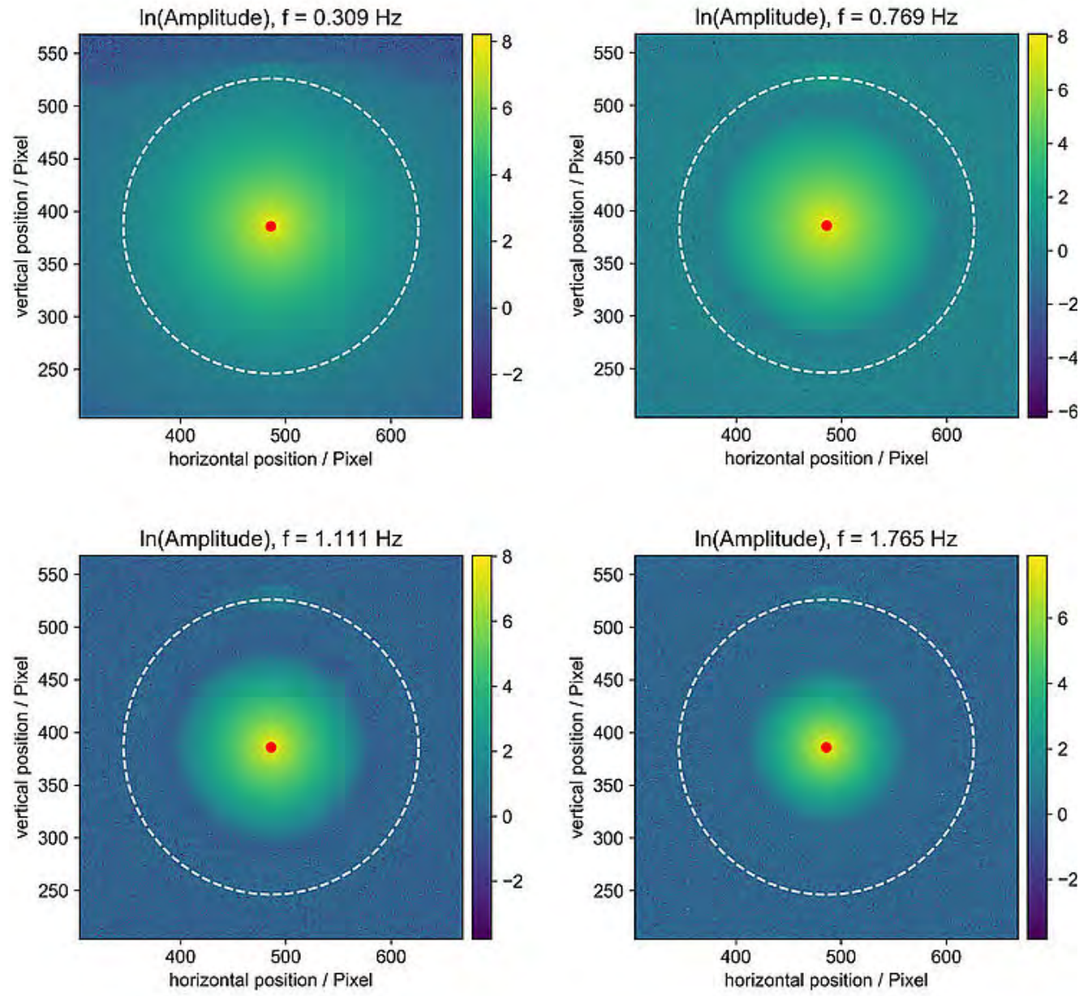


Fig. 1 Isotropic, free-standing films were measured with different excitation frequencies. The temperature distribution around the excitation source depends on the excitation frequency. It extends differently far into the material. A modulated laser was used as thermal excitation source, which was focused as a point source on the sample in the centre of the image

Thin Samples Actively Excited by a Laser

On the path to such passive cooling materials, understanding of the thermal conductivity process is important. To do this, Prof. Retsch's group is working with free-standing samples of, for example, thin polymer foils, 3D-prints, and fibre mats with a film thickness of only a few hundred micrometres.

These samples are investigated with the goal of determining their direction-dependent thermal diffusivity. With this value and including the specific heat capacity and density of the sample, the corresponding thermal conductivity is calculated.

As part of the analysis, the measurement objects are excited by an intensity-modulated laser. Depending on the characteristics of the sample, the heat flux extends differently into the material (see fig. 1).

The scientists actively control the entire measurement through the thermography software IRBIS® 3. The infrared camera that they use,

VarioCAM® HD research 800 from InfraTec, detects the emitted infrared radiation, whose intensity varies with the lock-in modulation frequency.

Analysis Requires an Infrared Camera with High Spatial and Thermal Resolution

Of primary interest for the examinations are the position-dependent change of phase and amplitude of the emitted thermal wave. . Therefore, he combines the detector format of the VarioCAM® HD research 800 of (1,024 × 768) IR pixels with an add-on close-up lens 0.5x for a 30 mm lens.

"In our case, the measurement method of lock-in thermography requires a detector format that is large enough to measure position-dependently on such small objects. Only then we are able to record the thermal wave precisely"

PROF MARKUS RETSCH,
UNIVERSITY OF BAYREUTH

Besides the spatial resolution, the thermal resolution also plays a large role. Depending on the material, temperature-dependent phase transitions can occur, which negatively influence the measurement. Such errors can be avoided through measurement with small thermal excitations. But for that, a temperature resolution less than 100 mK is required.

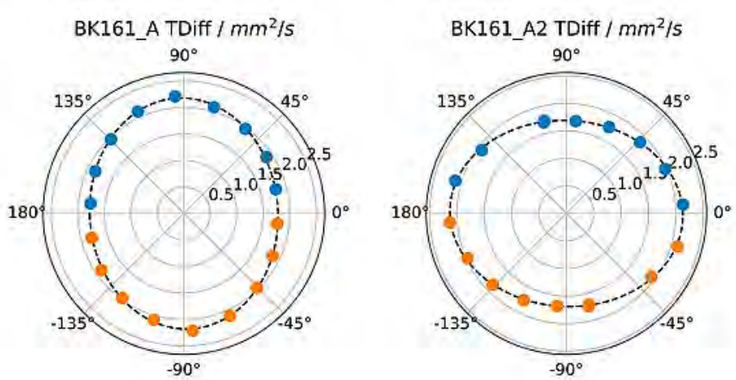


Fig. 2 Materials, such as Kapton foils, have an anisotropic thermal diffusivity. The dashed line represents the fit ellipse. Sample A2 is rotated by 90° relative to sample A. The anisotropy remains and is not a measurement artifact.

Fig. 3 Amplitude pattern (left) and phase pattern (right) show the temperature distribution on the surface of the Kapton foil. The foil is periodically heated on the back with a line-shaped laser. Amplitude and phase were calculated with the thermography software IRBIS® 3 active from InfraTec. A self-developed analysis software automatically finds the line laser (white line) and reduces the 2D-image data to a 1D-profile perpendicular to the laser line.

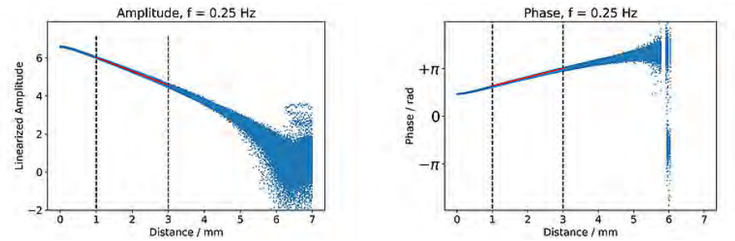
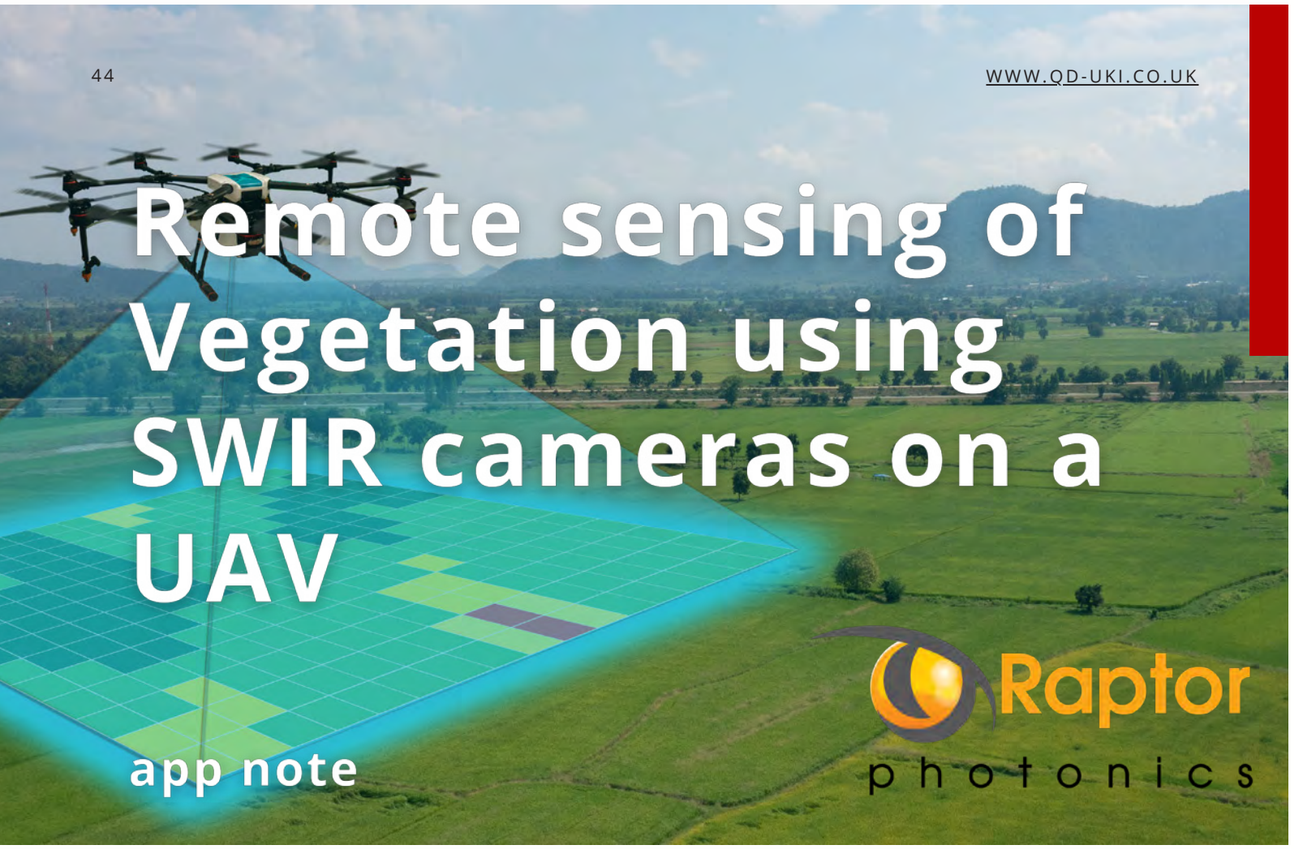


Fig. 4 The linearised amplitude pixels (left) and phase pixels (right) are depicted as a function of the distance from the laser line. From the slopes in the linear range, the scientists working with Prof. Markus Retsch determine the thermal diffusivity of the samples.



Remote sensing of Vegetation using SWIR cameras on a UAV

app note

Raptor photonics

Raptor Photonics has recently published an Application Note showing how reflectance spectroscopy methods using drone based remote sensing systems are now being used to derive well-established vegetation indices (VIs) more efficiently than biomass sampling.

Forage Mass Monitoring (FFM) analysis has been traditionally done using biomass sampling to calculate biomass yield per hectare (t ha-1). Current research projects are now looking at reflectance spectroscopy methods using remote sensing systems based on unmanned aerial vehicles (UAVs).

Promising results in recent years prove the principal suitability of such systems for airborne monitoring of small to medium sized farmland in agricultural applications for precision agriculture, such as biomass for crops and grasslands.

An imaging system in the form of a multispectral multicamera system is often used to derive well-established vegetation indices (VIs) efficiently. However, due to the use of silicon-based sensors, the spectral application range of such multi-camera systems is limited to the visible (VIS) and near-infrared (NIR) wavelength range (400-1000nm).

Therefore, more robust indicators linked to biomass in the short-wave infrared (like cellulose or moisture content) cannot be considered as estimators.

In a joint research project, a team from the University of Applied Science Koblenz and the Remote Sensing and GIS group at the University of Cologne developed a UAV-based multi-camera system to collect NIR/SWIR data, to prove more robust and better-performing estimators of biomass monitoring. The system displayed in figure 1 shows a spectral camera unit (SCU) and a sensor management unit (SMU), both mounted onto a drone solution. The SCU deploys two Raptor Owl 640 M Vis-SWIR cameras enabling the coverage from 600 to 1700 nm of the electromagnetic spectrum.

Figure 1: Schematic system overview (See Ref [1])

These camera modules were chosen because of their optimised “Size, Weight and Power” parameters. Thanks to the small form factor, the energy-efficient uncooled (TEC-less) design and the high sensitivity, these modules are ideal for integrating multiple camera modules into a lightweight, UAV-based remote sensing system for daylight operations.

Another advantage is the interchangeable lens mount used for a custom filter flange solution to adapt application-specific narrow bandpass filters in the optical path.

The study aimed to validate the spectral performance and investigate spectral image data of a newly developed VNIR/SWIR multi-camera prototype for forage mass monitoring. For this purpose, aerial image data were acquired by the system on a permanent experimental grassland site near Cologne (chessboard trial), Germany, under clear sky conditions in July 2019. Spectral ground truth data were acquired with an ASD Fieldspec3 (FS3) spectroradiometer in twelve selected plots. Forage mass expressed in dry matter yield (DMY) was obtained by destructive biomass sampling 14 days after the flight date from all 156 trial plots

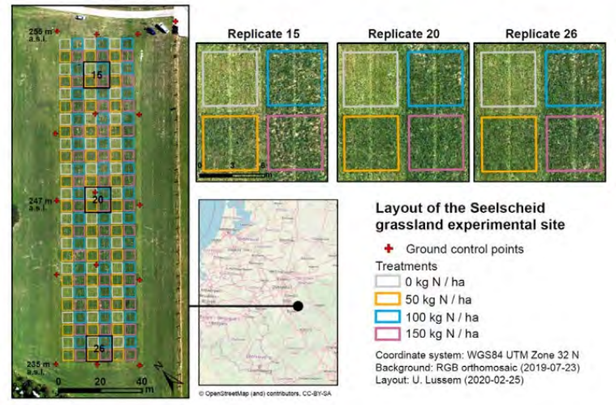


Figure 2: Location and layout of the experimental site (see Ref [2])

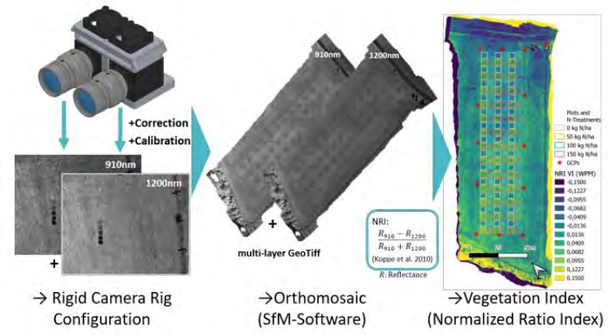
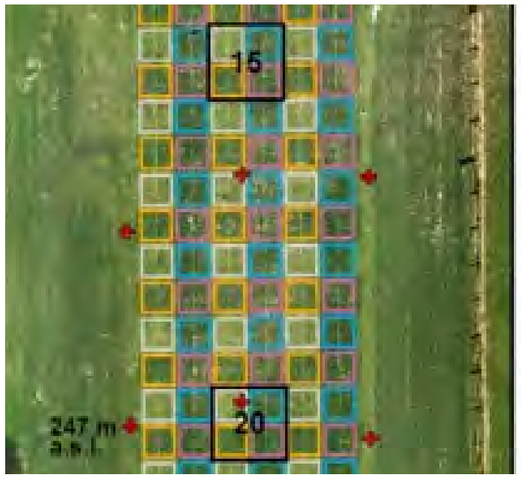


Figure 3: Image data processing workflow.



> these first promising evaluation results demonstrate these novel InGaAs sensors' suitability for use in multi-camera systems for UAV-based vegetation monitoring

To evaluate the VNIR/SWIR camera system's spectral properties, the reflectance values of the individual spectral bands, and the two derived VIs, NRI (Koppe et al. 2010)3 and GnyLi (Gnyp et al. 2014)4 , were directly compared with the corresponding FS3 values. Moreover, the camera- and FS3-based VIs were further analysed in simple linear regression models as estimators for DMY. The camera-based SLR resulted in an R2 of 0.71 to 0.75. These are promising results for a single flight date data set. However, further multi-temporal studies with advanced evaluation methods have to be carried out to confirm these results.

Moreover, further estimation models for nitrogen concentration and crude protein content have to be evaluated. Evaluations for cereal crops are currently under investigation. Ultimately, these first promising evaluation results demonstrate these novel InGaAs sensors' suitability for use in multi-camera systems for UAV-based vegetation monitoring. They provide easy-to-use data with excellent spatial resolution in the selected wavelength bands over the entire spectral range from 600 – 1700nm.

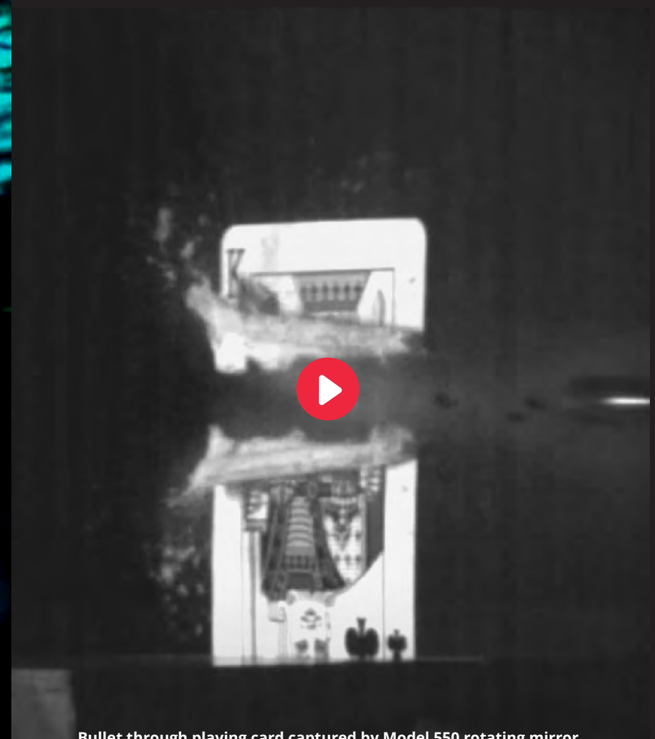
VIDEO GALLERY

A streak image is like a graph of one dimension of space over time. A streak camera captures a thin line of image information continuously at very fast rates. Cordin offers streak cameras using rotating mirror and image converter technologies. Cordin Image Converter Streak Cameras capture light information in the picosecond time domain. Cordin rotating mirror streak cameras capture images with a combination of speed and resolution unavailable anywhere else.

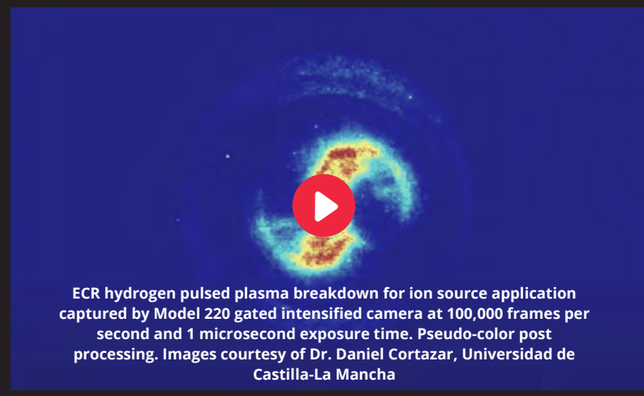
CORDIN
SCIENTIFIC IMAGING

Learn more about Cordin Scientific High Speed Imaging Cameras

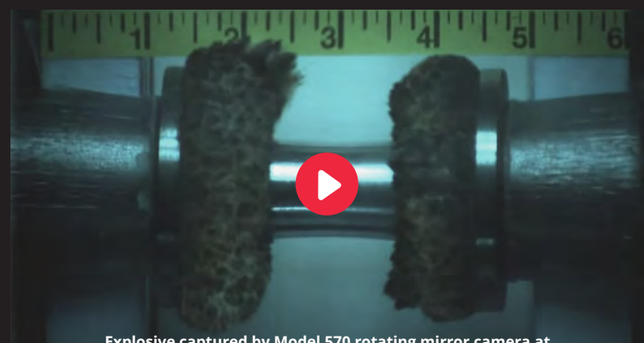
	Rotating Mirror	Image Converter
Temporal Resolution	Sub-nanosecond	Picosecond
Spatial Resolution	Very high	Moderate
Dynamic Range	12-14 bit	4-8 bit
Image Noise	Very low	Moderate
Sensitivity	High	Very High
Physical Size	Large	Moderate
Complexity	High	Moderate
Applications	Explosives testing, complex velocity measurements, impact ballistics, synchro-ballistic imaging	Time resolved spectroscopy, laser studies, optical communications, semiconductor physics



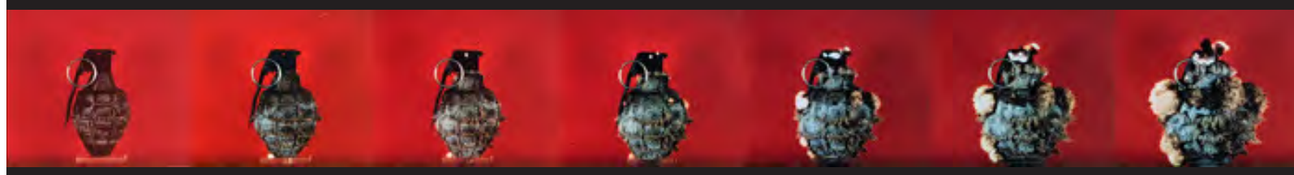
Bullet through playing card captured by Model 550 rotating mirror camera at 70,000 frames per second



ECR hydrogen pulsed plasma breakdown for ion source application captured by Model 220 gated intensified camera at 100,000 frames per second and 1 microsecond exposure time. Pseudo-color post processing. Images courtesy of Dr. Daniel Cortazar, Universidad de Castilla-La Mancha



Explosive captured by Model 570 rotating mirror camera at 2.5 million frames per second



Alternate frames of a 26 frame sequence taken at 2/3 million frames per second of an electrically detonated hand grenade. Sequence taken by a Model 126 Rotating Mirror Convertible Streak/Framing camera with the 26 frame module. Displayed rate is 6.5% of camera's capacity.

Crack propagation in glass captured by Model 550 rotating mirror camera at 100,000 frames per second

Expanding tube experiment captured by Model 550 rotating mirror camera at 150,000 frames per second. Images courtesy of Dr. K. Ravi-Chandar, University of Texas at Austin

TAKE YOUR OPTICAL RESEARCH TO CRYO TEMPERATURES

Closed Cycle Optical Cryostats

MONTANA INSTRUMENTS®
COLD SCIENCE MADE SIMPLE

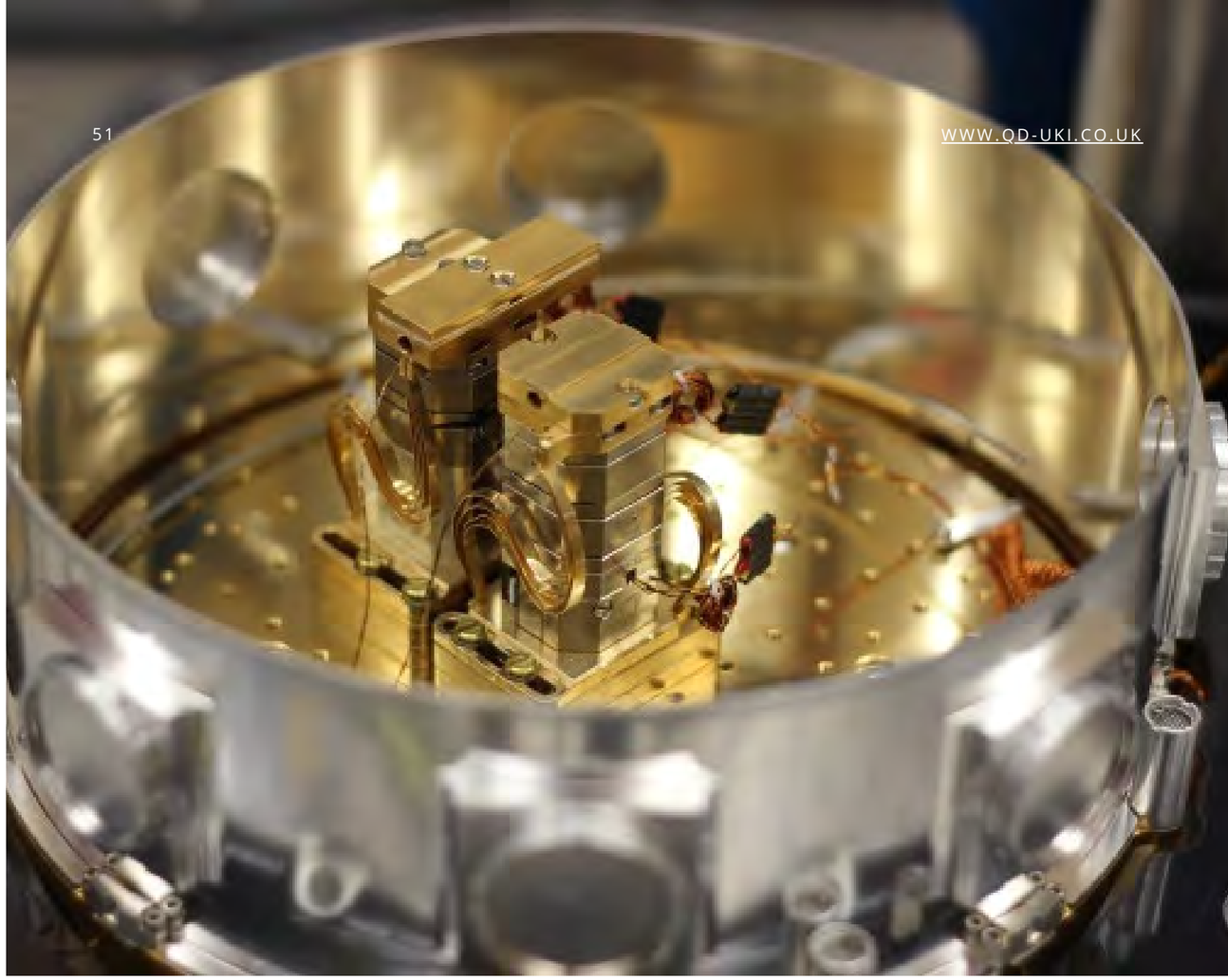
Montana Instruments are on a mission – to make cold science simple. Their philosophy is centred on three main principles:

1) Ease of use
2) Ease of access
3) Turn-key operation

All their optical cryostats are cryogen-free and combine low vibration, high temperature stability, low sample drift and superb optical access – making them suited for the most demanding cryogenic experiments.

"We serve pioneers of science with technologies that will help change the world – we are truly grateful for the opportunity we've been given to create instruments which help propel the advancement of society. "

LUKE MAURITSEN, CEO & FOUNDER
MONTANA INSTRUMENTS



Standard Series

The standard "s-series" platform architecture utilises a versatile tabletop mounting architecture which makes it easy to move the system without being tied to the table or an external support structure. Optimised performance parameters accommodate a wide range of configuration options and operating abilities.

Active & passive thermal stabilisation is used to achieve greater than a 20x reduction in cryocooler induced thermal fluctuations at the sample. Sample stage positional drift is virtually eliminated with the use of a thermal contraction cancleing cryogenic support. This stability ensures great sample alignment throughout the full temperature range and dramatically reduces focal drift for each new temperature setpoint.

SIMPLICITY WITH UNMATCHED STABILITY

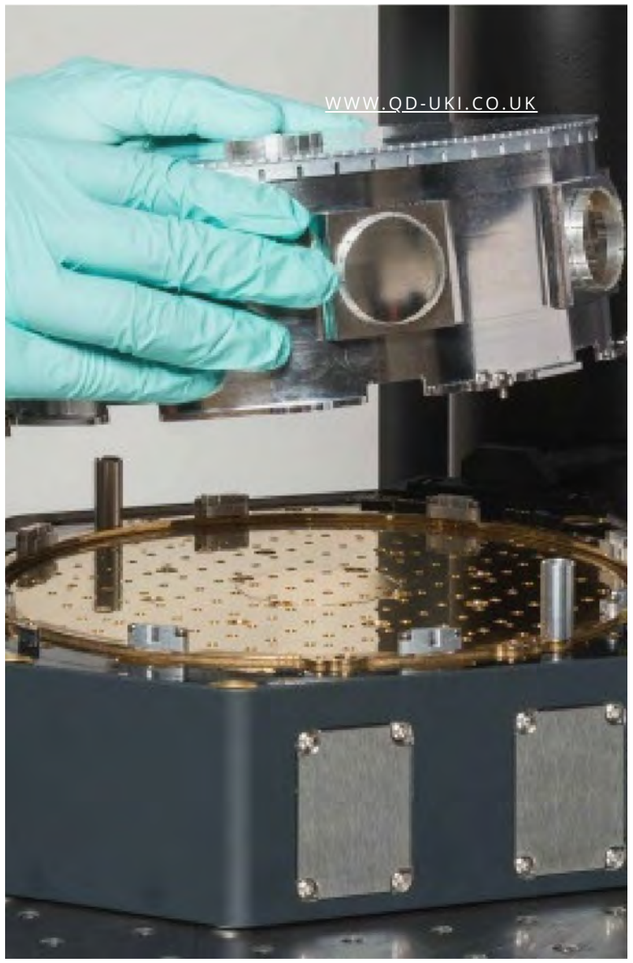
Cryostat Class:
High-End Closed-Cycle
Performance Class: Low Vibration, Fully-Automated
Application Areas: Microscopy & Spectroscopy, Condensed Matter, Photonics, Quantum Information, Materials Science

Learn more about Montana Instruments Cryostation

CASE STUDY

Dr Alex S. Clark
Centre for Cold Matter, Imperial College London

“The Montana Cryostation lies at the heart of a number of experiments in my group. The Cryo-Optic add-on allows us to perform optical spectroscopy on single organic molecules at low temperature with excellent collected photon count rates from the in-vacuum high-NA objective. The system reaches a base temperature low enough to observe atomically-narrow resonances in these molecules, making them suitable for use in quantum technology. The automated temperature control allows us to investigate the effects of phonon-induced dephasing with ease, while the integrated nano-positioning system and sample holder – designed in collaboration with Montana Instruments and QD-UK – is fully compatible with the nanophotonic devices we are investigating at low temperature.



"The Montana Cryostation lies at the heart of a number of experiments in my group."

All of our experiments benefit from the low vibrations seen in the Montana Cryostation, from stable coupling to nanophotonic waveguides to diffraction-limited confocal microscopy. The support we have received from QD-UK has been excellent – they are easily contactable should issues arise and are very open to collaborative problem solving to expedite finding a solution. Having all of this is in a closed-cycle system that does not require the purchase of expensive and increasingly rare liquid helium is the icing on the cake.”

Aerial Fire Mapping in New Zealand

with VarioCAM® HD

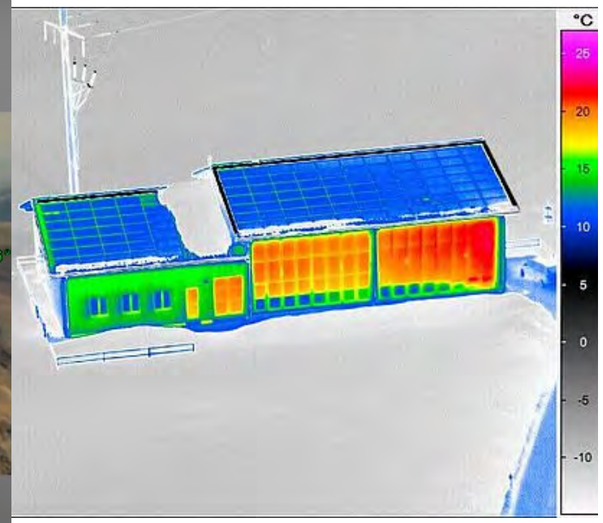
Wildfires are a permanent threat for several regions around the world – and the global climate change is adding to the number and strength of these events. Fighting them is a huge challenge, strong winds, heat and inaccessibility make it even more difficult and dangerous for those who risk their life to protect others.

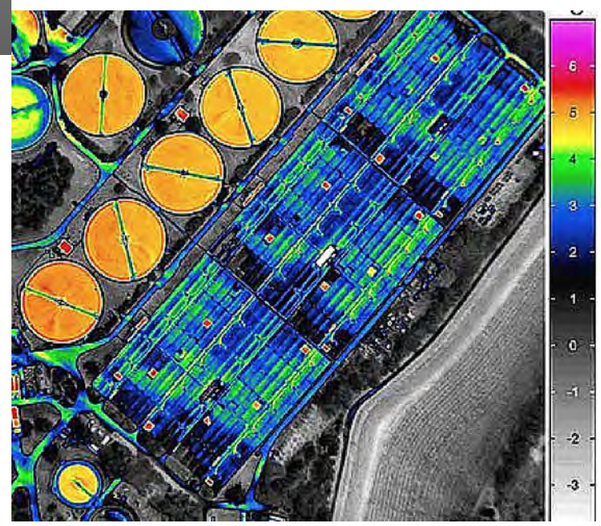
One approach to tackle wildfires is the usage of airborne fire mapping. Highland Helicopters is a service company which added this task to their portfolio, as wildfires on New Zealand´s South Island happened right at their front door.

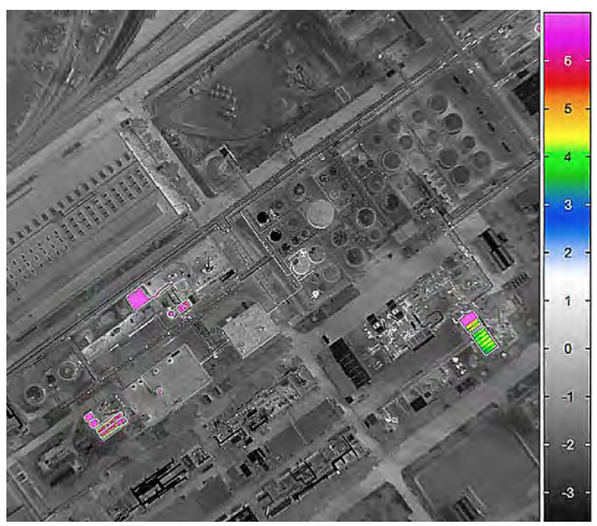
Fire mapping from a helicopter offers a unique elevated perspective on remote fires to those who have to organise firefighting ground activities. For this, Highland Helicopters uses the LWIR thermal imaging camera VarioCAM® HD head from InfraTec, integrated into a GIMBAL system outside the helicopter.

Whereas the view of visual cameras is blocked by dust and smoke, the thermal imaging camera VarioCAM® HD head delivers exact images of fire sources, fire areas and water channels even under the most adverse conditions. It thus reliably provides information about the situation on the ground. When this camera is radiometrically calibrated, it also creates the opportunity to indicate actual fire and ground temperatures and to find persons, mammals or vehicles nearby.

Complex Data Acquisition and Storage Provides for Easy Analysis







Infrared Camera Systems of InfraTec with High Pixel Count and Special Lenses Will Display Smallest Details On the Ground

The high geometrical resolution of the available infrared camera systems allows for the detection of small details from a big height. Like this for instance animals can be surveyed without disturbing them in their normal behaviour. Also in predictive maintenance advantages come up. For instance power transmission lines can be monitored from a helicopter despite of their small thickness. The wide range of available special lenses additionally adds to positive measurement.

Aerial thermography provides you with a fast and wide area overview

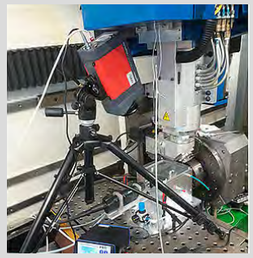
- Detection of energy losses of buildings and thermal storage ability of biotops
- High geometrical resolution allows recognition of small structurs from big heights
- Fast infrared camera systems offer low smearing
- Integration of GPS data and visual images
- Wide range of accessories like gimbal systems

download the brochure now

CLICK HERE

PUBLICATIONS

White papers, articles and App Notes



HIGH-END-THERMOGRAPHY

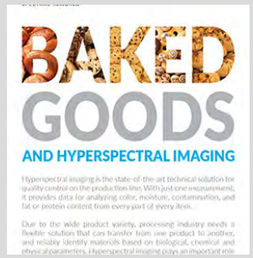
USE OF HIGH-SPEED THERMOGRAPHY IN LASER HIGH-TEMPERATURE CAPILLARY GAP BRAZING

BETTER, SAFER PHARMA

HYPERSPECTRAL CAMERAS LET YOU SEE BEYOND THE VISUAL INSPECTION – THEY REVEAL THE INVISIBLE

PEAK PRESSURES FOR EXPLOSIONS

OPTICAL MEASUREMENT OF PEAK AIR SHOCK PRESSURES FOLLOWING EXPLOSIONS



BAKED GOODS AND HSI

ANALYSE COLOUR, MOISTURE, CONTAMINATION, AND FAT/PROTEIN CONTENT

SILICON WAFER INSPECTION

SILICON WAFER INSPECTION WITH SWIR CAMERAS

ELECTRON MULTIPLYING GAIN

UNDERSTANDING ELECTRON MULTIPLYING GAIN

HAVE YOUR SAY

BE INCLUDED IN THE NEXT EDITION

SEND IN YOUR RESEARCH OR WHITE PAPERS

We'd love to share your findings

SHARE YOUR APPLICATIONS

What have you been using imaging cameras for recently?

imaging cameras

Further reading:

Hyperspectral Imaging Cameras

Imaging Cameras

Imaging Cameras Articles

Produced by:
Quantum Design UK and Ireland
Unit 1, Mole Business Park, Leatherhead, Surrey, KT22 7BA
+44 (0)1372 378822
info@qd-uki.co.uk
www.qd-uki.co.uk

Follow us: