



# Press Coverage

---

Publications: EuroPhotonics  
Date: October – November 2006

---

Laurin Publications

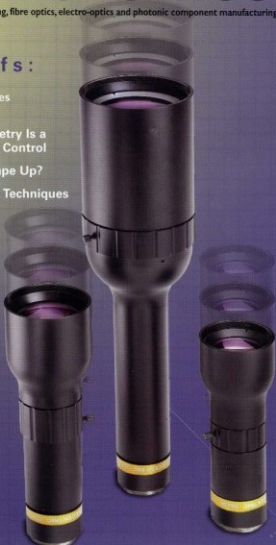
October/November 2006

# EUROPHOTONICS

European coverage of optics, lasers, imaging, fibre optics, electro-optics and photonic component manufacturing

## photonics tech briefs:

- LED Multiplexing Improves Video Projection
- Spectroscopic Reflectometry Is a Versatile Tool for Quality Control
- How Does Your Fruit Shape Up?
- Selecting Image-Transfer Techniques for High-Speed Imaging



# EUROPHOTONICS

a laurie publication

European coverage of product developments in optics, lasers, imaging, fibre optics, electro-optics and photonic component manufacturing

volume 11  
issue 6



page 14

## product highlights

### Spotlight on Imaging

Discover some of the best new imaging products and accessories from European manufacturers and distributors. .... 20

### Photonic Product Preview

Leading European manufacturers and distributors showcase their latest product releases. .... 44

### EUROPHOTONICS Showcase

A presentation of products and media from manufacturers. .... 70

## regular columns

Company/Organization Index	10
EUROPHOTONICS News	12
EuroResearch	39
Meetings & Calendar	72
Advertiser Index	75
Picture This	76

## photonics tech briefs

### How Does Your Fruit Shape Up?

Digital image analysis automates fruit shape determination, which is useful in horticultural research.

by Dr. Manfred Kaessens, Olympus Soft Imaging Solutions, Münster, Germany ..... 26

### Selecting Image-Transfer Techniques for High-Speed Imaging

The variety of interface standards and the onboard facilities of CMOS cameras widen the capabilities of industrial high-speed imaging.

by Mark Williamson, Firstsight Vision Ltd, Tongham, UK ..... 30

### Spectroscopic Reflectometry Is a Versatile Tool for Quality Control

Originally developed for semiconductor wafer-processing applications, spectroscopic reflectometry has become a quality-control tool for characterizing thin films in industrial and consumer-related fields.

by Gerald Nitsch, Mikropack GmbH, Ostfildern, Germany, and Gregory Finn, Putting Photonics into Context, Munich ..... 32

### LED Multiplexing Improves Video Projection

LEDs have long held promise for their extended lifetime and high efficiency, traits that are well-suited to projection display applications.

by Ben Standish and Peter Egerton, Bookham, Towcester, UK ..... 36



page 42

## the cover:

This month's cover shows telecentric lenses from Edmund Optics Ltd, on page 42. Designed by Juliana T. Salvatore

## photonics:

The technology of generating and harnessing light and other forms of radiant energy whose quantum unit is the photon. The range of applications of photonics extends from energy generation to detection to communications and information processing.

**photonik technologie-  
kurzbeiträge:**

**Wie entwickelt sich die Form  
Ihrer Frucht?**  
von Dr. Manfred Kaessens, Olympus Soft  
Imaging Solutions, Münster, Germany ..... 26

**Wahl von Bildtransfer-Techniken  
für die Hochgeschwindigkeits-  
Bildverarbeitung**  
von Mark Williamson, Firstsight  
Vision Ltd., Tongham, UK ..... 30

**Spektroskopische Reflektometrie  
ist ein vielseitiges Werkzeug für die  
Qualitätskontrolle**  
von Gerald Nitsch, Mikropack GmbH,  
Ostfildern, Germany, and Gregory Flinn,  
Putting Photonics into Context, Munich ..... 32

**LED-Multiplex-Lösung liefert  
hocheffiziente Kopplung für  
Projektionsdisplays durch kompakte  
Optiken**  
von Ben Standish and Peter Egerton,  
Bookham, Towcester, UK ..... 36

**produkte:**

**Spotlight auf Bildverarbeitung**  
Erflechten Sie einige der besten neuen  
Bildverarbeitungs-Produkte und Zubehör  
von europäischen Herstellern und  
Distributoren ..... 20

**Photonik-Produktvorschau**  
Führende Hersteller stellen ihre neuesten  
Erfindungen vor ..... 44

**Hersteller-Schaufenster**  
Brochüren und Produkt-Höhepunkte  
von führenden Photonik-Firmen ..... 70

**rubriken:**

Firmen- und Verbandsverzeichnis ..... 10  
EuroPhotonics Überblick ..... 12  
Aus den Journalen ..... 39  
Tagungen und Seminare ..... 72  
Inseratenverzeichnis ..... 75  
Stellen Sie sich vor ..... 76



**résumés techniques de  
photonique:**

**Votre fruit est-il en pleine forme ?**  
par Dr. Manfred Kaessens, Olympus Soft  
Imaging Solutions, Münster, Germany ..... 26

**Sélection de techniques de  
transfert d'images pour l'imagerie à  
haute vitesse**  
par Mark Williamson, Firstsight  
Vision Ltd., Tongham, UK ..... 30

**La réflectométrie spectroscopique  
est un outil souple de contrôle  
de qualité**  
par Gerald Nitsch, Mikropack GmbH,  
Ostfildern, Germany, and Gregory Flinn,  
Putting Photonics into Context, Munich ..... 32

**La solution de multiplexage  
des LED fournit un couplage à haute  
efficacité par l'intermédiaire d'un  
système d'optiques compactes pour  
écrans de projection**  
par Ben Standish and Peter Egerton,  
Bookham, Towcester, UK ..... 36

**produits:**

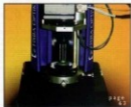
**Pleine feux sur l'imagerie**  
Découvrez quelques-uns des meilleurs  
nouveaux produits et accessoires  
d'imagerie des fabricants et distributeurs  
européens ..... 20

**Avant première sur les produits  
en photonique**  
Les fabricants présentent leur  
derniers développements ..... 44

**Les fabricants**  
Les brochures et les nouveautés  
des principaux fabricants en photonique ..... 70

**rubriques:**

Index des Sociétés et organisations ..... 10  
Perspective EuroPhotonics ..... 12  
Résumé des Revues ..... 39  
Calendrier des salons et Conférences ..... 72  
Index de Publicité ..... 75  
Imaginez ça ..... 76



**notizie flash sulle  
tecnologie fotoniche:**

**La vostra frutta è in forma?**  
di Dr. Manfred Kaessens, Olympus Soft  
Imaging Solutions, Münster, Germany ..... 26

**Come selezionare le tecniche di  
trasferimento d'immagine per  
sistemi di visione ad alta velocità**  
di Mark Williamson, Firstsight  
Vision Ltd., Tongham, UK ..... 30

**La riflettometria spettroscopica  
è un metodo versatile per il  
controllo di qualità**  
di Gerald Nitsch, Mikropack GmbH,  
Ostfildern, Germany, and Gregory Flinn,  
Putting Photonics into Context, Munich ..... 32

**Una soluzione a led multiplexati  
garantisce un accoppiamento ad  
alta efficienza mediante elementi ottici  
compatti, nei display per proiezione**  
di Ben Standish and Peter Egerton,  
Bookham, Towcester, UK ..... 36

**prodotti:**

**Riflettori puntati su Sistemi per  
il trattamento dell'immagine**  
Scopriamo alcuni dei migliori nuovi  
prodotti ed accessori per il trattamento  
dell'immagine, proposti da fabbricanti  
e distributori europei ..... 20

**Anteprima di prodotti fotonici**  
I migliori fabbricanti presentano i loro  
più recenti sviluppi nel settore ..... 44

**Vetrina dei Produttori**  
Le più avanzate aziende nell'area della  
fotonica presentano brevi descrizioni  
dei loro prodotti ..... 70

**rubriche:**

Index delle Aziende/Organizzazioni ..... 10  
Prospettive di Mercato ..... 12  
Dalle riviste specializzate ..... 39  
Calendario Mostre/Conferenze ..... 72  
Index degli inserzionisti ..... 75  
Te lo puoi immaginare ..... 76



## LED Multiplexing Improves Video Projection

by Ben Standish and Peter Egerton, Bookham, Towcester, UK

LEDs have long held promise for their extended lifetime and high efficiency, traits that are well-suited to projection display applications.

**LED-Multiplex-Lösung liefert hocheffiziente Kopplung für Projektionsdisplays durch kompakte Optiken**  
LEDs sind seit langem vielversprechend wegen ihrer langen Lebensdauer und hohen Effizienz – Merkmale, die gut für Projektionsdisplay-Anwendungen geeignet sind.

**La solution de multiplexage des LED fournit un couplage à haute efficacité par l'intermédiaire d'un système d'optiques compactes pour écrans de projection**  
Les LED ont pendant longtemps tenu la promesse de longue durée de vie et de haute efficacité, caractéristiques qui sont bien adaptées aux écrans de projection.

**Una soluzione a led multiplexati garantisce un accoppiamento ad alta efficienza mediante elementi ottici compatti, nei displays per proiezione**  
I LED hanno ampiamente mantenuto la loro promessa di vita utile più estesa ed alta efficienza, caratteristiche molto adatte alle applicazioni nei display per proiezione.

LEDs offer many benefits that make them desirable for use in projection displays. In addition to having long-lived efficiency, LEDs achieve full brightness in nanoseconds, eliminating the color wheel required in lamp-based illumination to quickly cycle colors while providing a wider color gamut.

Recently, LEDs with the design, fabrication, packaging, high power and thermal management required

for video projection have become commercially available. The first products to market yielded roughly half the brightness of existing incandescent bulb-sourced products, so large, costly collection/combining optics were required to optimize efficiency and achieve acceptable output. A new compact LED optical coupling component design that employs dielectric thin-film filters optimized for video projection appli-

cations demonstrates that lumens can be efficiently directed to the display screen without large, expensive free-space optical assemblies. Such merging of LED and thin-film technologies will enable the next generation of projection products.

Through the integration of collection/transmission optics and wide-angle dichroic filters, it has been possible to couple red, green and blue LED sources directly to a 16:9-aspect-ratio light pipe using a design that demonstrates exceptionally high efficiency for its size. With a combination of filter and mechanical design optimization, a wide range of LED sizes and étendue — or throughput — figures can be achieved for multiple LEDs while still accommodating high-output cooling requirements. The resulting commercial products will facilitate a new generation of portable, high-output pocket projectors and will make rear-projection TVs more competitive with their plasma and LCD flat panel counterparts. New applications for high-efficiency LED multiplexing outside consumer electronics also will become possible with this mating of technologies.

The first generation of consumer-electronics projection displays employs LED illumination sources with conventional free-space combining optics that are either large and expensive or small and inefficient. Engineers at Bookham's thin-film product group have pioneered an LED multiplexing solution that occupies less than 10 per cent of the volume required for conventional free-space optics with the equivalent optical output.

The LED structure emits light in a lambertian 180° hemisphere distribution. Collecting this light

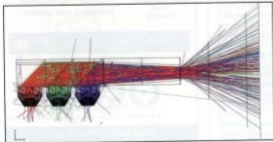


Figure 1. Module length and LED placement can be modified to accommodate étendue requirements and cooling methods.

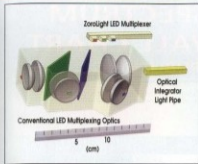


Figure 2. Typical architecture of currently deployed rear-projection LED multiplexing requires approximately 600 cm<sup>3</sup> without the light pipe, while the Bookham ZoroLight includes this function in less than 20 cm<sup>3</sup>.

efficiently and shaping it to meet system étendue requirements has generally necessitated large collection/collimation optics in free space.

The multiplexing approach couples each LED to combining optics with a sealed collection design. Instead of using collimating lenses, LED transmission is collected within an optimized dielectric-coated housing, which directs the light to wide-angle dichroic filters that combine the red, green and blue colours within an optical integrating light pipe. Novel filter designs create a one-way window between the collection and combining optics that recycle light through multiple reflections until it is within the useful angular range of the target étendue.

Optimized thin-film dielectric filters that are efficient and durable are key to achieving these scale economies. The Bookham coating process allows the combining dichroic filters to achieve high efficiency for a broad range of angles. Because most of the light is at a high angle of incidence at  $\theta/1$ , a wide range of angles is seen by the thin-film filter stacks. The spectral efficiency of the red-green-blue dichroics — the spectral component of light before and after interaction with the filter — is between 90 per cent and 96 per cent for angles from 15° to 75°.

Meanwhile, collection optics near the LED are subject to 150 °C surface

temperatures, which can quickly lead to failure for soft coatings and which creates challenges for injection-moulded lenses.

Metal-oxide thin-film coatings are required to create a durable filter/reflector that meets target optical specifications. Soft transmissive and reflective coatings have shown edge degradation and even delamination after short periods in damp environments. These failures produce visible flaws and performance problems within a few years of environmental exposure. Even hard optical coatings don't adhere well to plastic at these temperatures, so glass collection housings often are required.

The layout of the compact multiplexing architecture can be optimized easily for LED cooling requirements and methods as well as for different numbers of LEDs. The typical red-green-blue configuration can be in-line on one edge of the optical integrating light pipe to share a single liquid cooling pathway. Alternately, combining dichroics can be arranged to accommodate individual LED cooling fins, with green and blue LEDs across from each other and with red on the end facing down the combining channel.

This channel can be extended to accommodate additional LEDs for increased brightness or to broaden the gamut with more colours. This flexibility in design enables wide

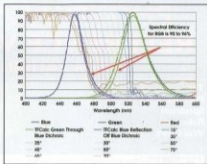


Figure 3. This chart illustrates the angular dependence of the special dichroic filters in the compact LED combiner. The filter has been optimized for performance over the wide range of input angles present in this optical system.

use in display applications.

The application of compact multiplexing in palm-size pocket projectors will enable a new generation of products without the brightness limitations (<20 lm) of those currently available. These new devices will outperform even the 50-lm pocket projectors anticipated for 2007, in projectors that are a fraction of the size.

Major rear-projection television manufacturers plan to convert whole product lines to LEDs, replacing lamp-based sources for digital light processing. This strategy relies on the brightness of LEDs doubling in the future and the availability of compact, efficient coupling methods so that designs are less dependent on high-gain screens that achieve brightness but restrict optimal viewing angles.

New applications are being explored that will enable the use of LEDs in areas other than projection display. Designs can be adjusted to accommodate many requirements. How these additional applications evolve will depend on cost, brightness and available LED wavelengths, and on the creativity of solution-seekers. □

Contact: Ben Standish, Bookham; e-mail: ben.standish@bookham.com; Peter Egerton, Bookham; e-mail: peter.egerton@bookham.com; fax: +44 1327 356 775; or circle 92.