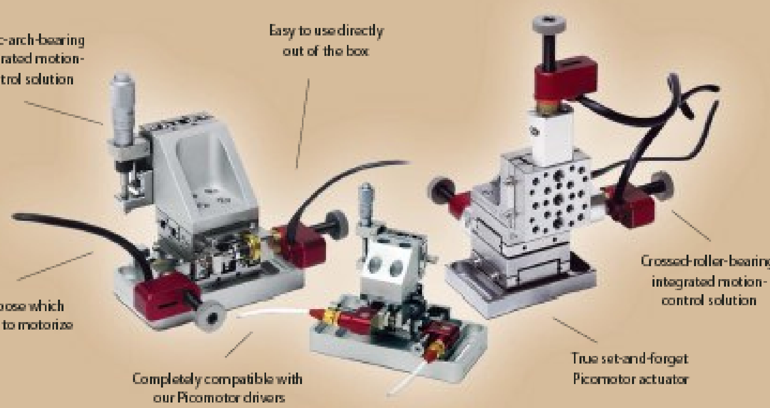
Laser Focus World - February 2006 - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Laser Focus World | Contents | Pages | Search | Links | Settings | Archives | Share | Download

Reach the Next Stage

Simply Better™ Integrated Motion-Control Solutions



We've incorporated our Picomotor™ actuators with our popular gothic-arch-bearing, crossed-roller-bearing, and aluminum Triple Divide™ translation stages to achieve the ultimate in stability and rigidity along with remote-control operation. The addition of the Picomotor actuators enables the stages to achieve remote high-resolution (<30-nm) adjustment of X, Y or Z motion. All necessary clamps, brackets and base plates are included so that the stage can be used right out of the box. So call us at 866-NUFOCUS regarding your motion control needs.

Our iPico™ control modules make system integration simple.

WWW.NEWFOCUS.COM • 1-866-NUFOCUS

New Focus—Simply Better Photonics Tools™

SHOP ONLINE — Now Accepting PO's! Visit www.newfocus.com anytime for convenient online ordering, where most products ship within 24 hours.

New Focus™ A Division of Bookham

Lasers Detectors Power Meters Breadboards Modulators Optics Optomechanics Motion Control OEM

newsbreaks

Tabletop system performs angle-resolved photoemission spectroscopy

Researchers in the laboratory of Daniel Dessau in the department of physics and JILA at the University of Colorado (Boulder) have developed a tabletop system to perform angle-resolved photoemission spectroscopy (ARPES). This technique is one of the key tools used in the quest to understand the complex electronic interactions responsible for high temperature superconductivity. Typically, ARPES experiments are performed at large multiuser synchrotron light sources costing on the order of a $100 million. Instead, the Dessau lab system uses 6-eV photons from the fourth harmonic of a Ti:sapphire laser produced through two stages of nonlinear second-harmonic generation in BBO (beta barium borate) crystals.

The resulting flux of 2×10^{14} photons/s in a bandwidth of less than 5 meV represents about two orders of magnitude improvement over even the best synchrotron beam lines. The relatively low photon energy also greatly increases the momentum resolution and decreases the background signal of ARPES relative to higher-energy synchrotrons. In addition, the pulsed nature of the Ti:sapphire laser opens up the possibility to directly observe electron dynamics using ARPES. *Contact Jacob Koralek at* Koralek@colorado.edu.

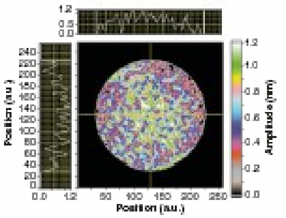
Polymer solar cells achieve 5.2% efficiency

Researchers from Wake Forest University (Winston-Salem, NC), Universidad Autonoma de San Luis Potosi (San Luis Potosi, Mexico), and New Mexico State University (Las Cruces, NM) have achieved what they claim to be the highest power-conversion efficiency so far reported for polymer-based solar cells: 5.2%.

Although polymer photovoltaic cell efficiencies have been greatly improved by the bulk-heterojunction concept—an interpenetrating network of nanoscale materials (such as fullerenes) that improve photon absorption and electron mobility—the "hopping" nature of electrons within disordered fullerene networks severely limits the obtainable efficiency. The researchers overcame this disorder by controlling the structure of the nanophase of the 120- to 170-nm-thick films through careful selection of the polymer/nanoparticle mixture ratio and controlled annealing procedures. As various fabrication parameters were changed, a near-field scanning optical microscope was used to understand how fullerene crystallization in the nanophase could be controlled to optimize performance. Polymer-based solar cells offer lower cost of fabrication, ease of processing, mechanical flexibility, and versatility of chemical structure compared to silicon-based solar cells. *Contact David Carroll at* carroldl@wfu.edu.

Angle-scanning an etalon precisely measures its thickness variation

Used in imaging solar spectroscopy, tunable Fabry-Perot interferometers made from lithium niobate wafers must have thickness variations of no more than 1 nm rms (root mean square) across their rather large working apertures (tens of millimeters in diameter). Measuring these small variations is difficult, but a group of researchers at CSIRO Industrial Physics (Lindfield, Australia) has come up with a simple approach that involves rotating the etalon in a collimated, frequency-stabilized He-Ne laser beam and measuring the transmission versus angle.



In a standard laboratory environment, a test etalon with a 37.5-mm clear aperture was rotated on a precise stage with a 0.00008° angular resolution and the transmitted light captured by a digital video camera. The angle of maximum etalon transmission was found for each camera pixel and the data used to determine optical etalon thickness (relative to other pixels) at that point; physical thickness was then easily derived. To check, measurements were taken at different angular wafer orientations and on different days. Measurement repeatability was 0.07 nm rms or better and reproducibility 0.16 nm rms or better; absolute thickness variations were on the order of 1.3 nm. *Contact John Arkwright at* john.arkwright@csiro.au.

CORRECTION

In "Gallium nitride has low loss at 1550 nm" (Newsbreaks, December 2005, p. 11) we neglected to note that the work was a joint effort by Lucent Technologies' Bell Labs and Samsung Advanced Institute of Technology.