DISPLAY SYSTEMS

P.61: Turn-Type Color 3-D Display System Using Scanned Arrays of LEDs

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Arrays of RGB light-emitting diodes, mounted at different radii on a rotating drum, were swept to form a volumetric 3-D image. Vertical offsets between arrays have been used to increase the number of scan lines, and improved drive electronics have increased the color depth.

P.62: Grating-Based Optical Film for High-Efficiency Backlights

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LCD backlights have to fulfill somewhat competing requirements: high luminance and uniform emission. By utilizing the characteristics of diffraction gratings, micro-patterned optical films that provide both highly collimated emission and good uniformity have been developed. The design strategies, optical characteristics, and high-precision patterning of the films will be presented.

P.63: *Distinguished Student Poster Paper:* Effects of Glass Capacitance on the Performance of External Electrode Fluorescent Lamps

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The effects of glass capacitance on the performance of external electrode fluorescent lamps (EEFL) will be described. The efficiency of EEFLs with a new glass tube reaches 45 lm/W, which is approximately 20% higher than the 38 lm/W in conventional glass tubes. The new design exhibits high resistance against pinholes.

P.64: Development of High-Efficiency Hg-Free Flat-Fluorescent Lamp through the Computational Experiments

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A study was conducted on the dependence of discharge efficiency upon discharge voltage, its spatial distribution, and distribution of electron-beam injected in a Ne-Xe mixture discharge lamp through 2-D fluid simulation and 1-D particle-in-cell simulation combined with a fluid model, respectively.

P.65: Plasma Parameters of Gas Discharge in CCFLs and External Electrode Fluorescent Lamps

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A new diagnostic technology to measure plasma parameters in a gas-discharge tube with a fine diameter has been developed. From light propagation observation along the tube of CCFLs and EEFLs, electron temperature and plasma density were estimated as $kT_e \sim 2$ eV and $n_e \sim 10^{16}$ m^{-3}, respectively.

P.66: Analysis and Reduction of Moiré in Two-Layered 3-D Displays

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A simulator for moiré in two-layered 3-D displays has been developed and moiré reduction has been investigated. Attachment of a lens array to the front surface of a rear LC panel is a good solution for moiré reduction, while suppressing the deterioration of contrast and brightness of a rear-panel picture.

P.67: Region-Partitioned LED Backlight Design for Field-Sequential-Color LCDs

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A 7-in. backlight module, consisting of 10 isolated microstructured linear light guides and two light-collimating bars along with serial full-color LEDs, has been developed for a field-sequential-color LCD system. The collimating lighting system not only yields a narrow angular light distribution, but also solves color mixture issues in the scanning backlight for FSC applications.

P.68: Color-Sequential TFT-LCD with Shared Array Mask Structure and Color-Breakup Reduction Scheme

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A 7-in. color-sequential TFT-LCD module has been successfully developed. The main features of the color-sequential display module include 800 × 480 resolution, TTL digital interface, fast response time (< 4 msec) with OCB mode, wider color gamut, and high-color-expression characteristic (NTSC 110%) was achieved by using red, green, and blue LED backlight illumination. A novel driving method with color-breakup reduction scheme has also been invented to drive the color-sequential display.

P.69: A Localized Partition Approach for High-Dynamic-Range Displays

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A mosaic-form backlight system for high-dynamic-range displays will be described. The backlight system forms an isolated square super-Gaussian distribution over the local area of the LCD. The high-dynamic-range display system employing this design can reduce the time required for processing the compensated image signal.

P.70: Additional Glass Element for Thinner LED Scanning Backlight

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In order to reduce the thickness of conventional LED backlights and to allow a scanning mode while maintaining the luminance level and uniformity, a novel architecture including an additional element made of textured and coated glass diffuser plate is proposed. The total thickness with this new element ranges from 25 to 35 mm.

P.71: Investigation of Optical-Film Ripple Phenomenon in TFT-LCD Modules by Numerical Computing

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Mura is an appearance that indicates low contrast and non-uniform brightness in TFT-LCD devices. It is caused by optical defects, such as ripple, smear, Newton's rings, and moiré. The ripple of optical films by using both experimental and numerical models to help understand how ripple occurred and why ripple is seen by inspectors will be discussed. The root cause that induces ripple will be disclosed and the parameters that control the physical phenomenon will be detailed.

P.72: Light Recycling and Collimation Caused by Fresnel Reflection

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The impact of Fresnel reflection from a clear optical film, a polarizer, and a reflective polarizer on light recycling in a variety of LCD backlight configurations has been investigated. It was found that Fresnel reflection plays an important role in on-axis and off-axis gain, and this reflection results in higher gain at an angle near Brewster's angle in a horizontal plane in the presence of a polarizer with its pass axis in the horizontal plane.

P.73: A Novel Backlight Unit Using a Light-Guide Plate with an High-Fill-factor Microlens Array and a Conical microlens Array Sheet

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A novel LCD backlight unit composed of a light-guide plate having high a fill-factor microlens array and an optical sheet with conical microlens array with a slanted angle of 54.5° has been developed. The proposed BLU shows 13.6% improvement in total luminance compared with a conventional BLU and a viewing angle of 108°.

P.74: A Reflection-Based Printing Dot Pattern for LED Backlights

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A reflection-based printing dot pattern has been developed, which redistributes light energy and removes vertical and horizontal dark bands between LED arrays. Thinner LED backlight and larger LED pitch were attained, optical losses were reduced, and luminance at the normal direction of this backlight is comparable to conventional approaches.

P.75: Light-Weight Backlight Module with a Reflective Light Guide

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A light-weight solution for a side-edge-type backlight module will be described. The light guide is composed of a reflective plate and optical films used in conventional backlight modules. The total weight of the prototype reflective light guide is 55 g.

P.76: Highly Efficient Backlight Unit with a Polarization-Separating Anisotropic Layer

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A highly efficient backlight unit has been developed with a polarization-separating anisotropic layer on which asymmetric microstructures were embossed. This BLU provides polarized light output along the direction normal to the anisotropic layer and has over 30% higher luminance than a BLU that adopts a reflective polarizer.

P.77: A High-Luminance Optical Film with Improved Cosmetic Appearances

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A new optical film, which enhances cosmetic appearance, will be described. This film employs the use of two-dimensional light-directing structures that have a variable pitch. The microstructures of the film are optimally arranged to reduce moiré effects. Optical measurements of the prototypes of the new film illustrate performance improvements.

P.78: A Thermally Adaptive Response-Time Compensation System for LCD Panels

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A thermally adaptive driver design has been developed for use in response-time compensation of a LCD with an integrated sensor. The design consists of analog sensor signal conditioning and a digital feedback algorithm embedded on a FPGA. This design reduces response time by 50% over a temperature range from 0 to 60°C.

P.79: Light-Leakage Improvement in LCD Modules by Numerical Analysis

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The light leakage issue of an LCD panel due to a sharp temperature gradient and non-uniform stress distribution will be discussed. By using numerical analysis and experiments, the relationship between light leakage and temperature gradient has been determined. Thermal and stress simulations were applied in the analysis of the light-leakage phenomenon. Additionally, simulation tools were used to predict the effectiveness of solutions for reducing the temperature gradient and stress distribution of LCD glass substrates.

P.80: External Electrode Fluorescent Lamps and Backlight Units for Large-Area 32- and 42-in. LCD TVs

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The commercialized EEFL BLUs of 32-, 37-, and 42-in. LCD-TVs will be reported with respect to the basic characteristics of luminance and efficiency. The capacitive and resistive reactance will also be presented to design the inverter for lamps and BLUs.

P.81: Reduced-Aberration Tunable-Focus Liquid-Crystal Lenses for 3-D Displays

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The curvature of a tunable-focus liquid-crystal lens has been optimized to reduce aberration across different driving voltages. An array of such lenses could be used to adjust the focus of pixels in an autostereoscopic display to enable variable eye accommodation.

P.192: Side-Emitting LED for Direct LED Backlight

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A side-emitting LED for a direct LED backlight system is proposed. The lens used for this side-emitting LED is simple in shape and easily fabricated. The design rule of the lens and an excellent simulation result for a 32-in. direct backlight system with side-emitting RGB LEDs will be demonstrated.

P.201L: *Late-News Poster:* Comparative Analysis on Thermal Properties of $Y_3Al_5O_{12}:Ce^{3+}$ and $(Ba, Sr)_2SiO_4:Eu^{2+}$ Yellow Phosphors for White LEDs

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Temperature-dependent yellow-emission spectra demonstrate that $Y_3Al_5O_{12}:Ce^{3+}$ (YAG) phosphor is excellent in the quenching temperature and the color variation, whereas (Bad, Sir) $2SiO_4:Eu^{2+}$ (BOS) phosphor is excellent in the intensity difference caused by thermal stress.

P.209: Optimization of Discharge Gases for a Mercury-Free Flat Fluorescent Lamp (FFL)

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A high-luminance flat fluorescent lamp (FFL) using Xe-Ne, Xe-He, and Xe-Ne-He gas mixtures without mercury has been developed. The FFL panel showed a maximum luminance of 8610 cd/m^2 under a bias of a 20-kHz pulse of 2.9 kV.