2018 TECHNICAL ACHIEVEMENTS

Optimizing Plant Growth

Overcoming Bandwidth Shortages

The Connected Environment

Low Cost Sensors
Optimizing Plant Growth

The horticulture testbeds at LESA allow for full exploration of new approaches for increasing the energy efficiency of horticultural lighting fixtures; developing new optical sensors that permit plant growth optimization; and examining tradeoffs between dynamic spectral power distributions and plant health, growth rate and nutritional content.

LESA has developed low-cost biofluorescence sensors to monitor plant stress that will set the stage for new lighting control systems. The lighting control systems will autonomously alter growth conditions
Visible Light Communications (VLC) can provide high data rates with low power requirements. VLC uses an unregulated bandwidth and does not interfere with radio frequency (RF) systems. Further, there are no known health concerns.

The patent received by the LESA Center helps to overcome the bandwidth limitations of LEDs, providing a 3x to 5x improvement in data rates over current methods.

The analog output signals modulate the current to LEDs to provide a high capacity visible light communication link. This technique avoids high peak power transmission that can saturate...
LESA’s Smart Conference Room

LESA’s Smart Conference Room Testbed is an autonomously operated meeting space. From the moment people enter the room, the sensors detect how many people are in the room, where they are located, and whether they are sitting, standing or on the ground. Fitted with optimized lighting, window blinds and HVAC controls, the testbed represents a local Internet of Things (IoT) platform that makes independent decisions about its operating conditions through a fusion of networked sensors.

The testbed is ready to host complex projects on human cognition and comfort, and is
Low Cost Sensors

Sensors are an integral part of every engineered system and will help to enable the cognitive immersive environments that LESA envisions. The high-speed visible light communications receiver pictured at right will be used to improve the range capabilities of low-cost, time-of-flight sensing platforms. LESA has also developed plenoptic light field sensors for simultaneously resolving spectrum, angle of arrival, light intensity and data streams. The plenoptic detector was invented and patented by LESA and forms the basis for the new, wide field-of-

High-performance 4x4 low crosstalk receiver with a composite bandwidth capability exceeding 40 GHz. The inset shows the eye diagram for two adjacent receivers.
Growing the Future of Urban Farming with High-Tech Lighting
Helux Lighting Inc. Formed to Commercialize Research Funded by the NSF
Statewide Event for K-12 Students Receives STEM Award
Researchers Deploy Testbed of 15 Light-Based Cells for Wireless Access
Center Develops Optoelectronic Devices for Next-Generation High-Efficiency Lighting Systems
Lighting Enabled Systems Researchers Awarded Patent with Broad Applications for Everyday Life
Using a MEMS Mirror to Provide Laser Lighting with Integrated MEMS Light Field Control
Undergraduate at Center Awarded Trip to International Poster Competition in Saudi Arabia
Researchers use MEMS-based Spatial Light Modulator to Capture Light from Multiple Sources
Partnership Integrates Wi-Fi with Asymmetric VLC, Addressing Uplink Challenges
Center Spin-off Aims to Make LED TVs, Monitors Faster and Cheaper to Produce and Use
Centers, Industrial Partner Develop Durable Tips for Nanolithography Applications
Educator at Center Selected for Award for Contributions to STEM Education, Workforce
ERC Team Awarded Patent for Occupancy Detection Using Lights Instead of Cameras
Center Develops System to Use Light Transmission for High Bandwidth Data Transfer
Smart Lighting Review Featured on Cover of Advanced Optical Materials
New Hybrid Nanoparticles Make for More Efficient LEDs
New Dimming Scheme Will Speed Adoption of Visible Light Communications into LEDs
Flexible Carbon Nanotube Hybrid Paper Has Efficient UV Sensing, Photocatalyst Applications
Smart-Lighting in Hospital Room Adjusts Automatically, Will Help Study Impacts on Health
NexGen Secures SBIR, NSF Funding To Accelerate Development of Rapid Virus Diagnostics
Undergrads Develop Wearable Tech and App to Study Impact of Light on Circadian Rhythms
Directed Self-Assembly May Revolutionize Manufacturing Process for Electronic Components
ERC Students Showcase Visible Light Communications Research at White House
Smart Lighting Undergraduates Adapt Google Glass for Bio Research
Students’ Inaugural Bulb Replacement Effort Saves Rensselaer More Than $21,000 Annually
“Science You Can See” Summer Camp for Precollege Students
Testbed Produces a Wearable Board and Algorithm to Advance Circadian Rhythm Estimation
Tunable Polymer Nanocomposites for Advanced LED Lighting Systems
Integration of Optoelectronic Devices on a Chip Will Lead to Smarter Lighting
Smart Lighting Spinoff Company Uses LEDs to Pinpoint Locations
Young Scholars Program Cultivates Pipeline of Future Engineers
Discovery of New Structure for Phosphors Points to More Efficient White LEDs
Overhead Lights Can Boost Capacity of Wireless Networks
New Technique Boosts Output of Green LEDs