My work and LED activities at DTU Fotonik

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DTU Fotonik

- Educational and research institute at the DTU
  - Telecommunication and optical technologies
- Campus at Lyngby and Risø, Roskilde
- 200 employees incl. 60 Ph.D.-students (in 2012)
- 25 different nationalities (in 2012)
- > 50 graduate courses offered (in 2012)
- 80 M.Sc. candidates and 15 Ph.D students per year (not updated)
- Access to world class clean room process facilities, DANCHIP (>1000 m²)
LED team

Risø campus:
Paul Michael Petersen
Carsten Dam-Hansen
Dennis Corell
Anders Thorseth
Peter Behrensdorff Poulsen
Søren Hansen
Peter Jensen
Jesper Wolff
Sune Thorsteinsson
Maria Louisa Rosenberg Welling
Jakob Munkgaard Andersen
Thøger Kari Jensen
Maumita Chakrabarti
LED activities

LED – the future light source, energy efficient, long life, high light quality, compact, robust than incandescent lamps

Need for:
Research and development, Master and Ph.d – education, Education of designers, Lighting industry, Product characterisation and Information for consumers

• Research projects on LEDs, materials and characterisation
• Master course on LED and PV technology
• Annual Industrial LED course and course for high school students
• Application specific R&D projects in collaboration with Danish companies with a focus on energy savings and light quality
• Commercial development and characterisation of LED systems
LED competences

LED systems

Test and characterisation

Control electronics, design and prototyping

Al. circuit board design and reflow soldering

Thermal modeling and test

Optical design, modeling, and test fabrication

Spectral design

LEDs

Swedish Energy Agency Summer Advanced Lighting Study

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New LED system for display cases

- developed and installed, April 2011 in the royal treasury at Rosenborg Castle

Patent application on the LED optical system

Industry collaboration: film about the project:

High quality replacement of 5 W incandescent lamps
CCT = 2200 K, CRI > 93
> 80 % energy reduction
heat problem eliminated
> 20 x longer lifetime
Multi color high power LED engine

- New optical system that collimates and combines the light
- Be controlled in a large color gamut
- White light in a wide range of color temperature (2700 K – 6500 K) with high color rendering
- Color rendering index higher than 95
- High output ~ 10000-20000 lm
- Uniform and homogeneous output throughout the spot size
- Application: stage lighting and it could replace the conventional lamps of ~ 1000W
LED education

Annual conference on LED technology and lighting from 2007 till date

- Several participants from companies, municipalities and institutions
- Companies in exhibition

Swedish Energy Agency Summer Advanced Lighting Study

Maumita Chakrabarti, DTU Fotonik
Industrial LED workshop

9th of February 2011

- 20 participants (max 20)
- Lectures combined with theoretical and experimental exercises
- Build and characterise participant’s own LED system

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Cooperation with designers

LED Waterlilly lamp, 2006
Design : Jesper Olsen

• White LEDs for functional lighting
• RGB LEDs for decorative illumination of the rim

• Replacement lamp (E27 socket)
• Concealed is a LED light source
• LED 12 W, 806 lumen,
• warm white 2700 K

Swedish Energy Agency Summer Advanced Lighting Study
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Cooperation with designers

Demonstration projects in Albertslund kommune

Intelligent stone with solar powered LED illumination

Produced by Philips Lighting and installed in Albertslund

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Facilities for light measurements

Near field goniometer with
- luminance camera
- spectrometer
- photometer
for intensity and color distribution
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Thank you for your kind attention