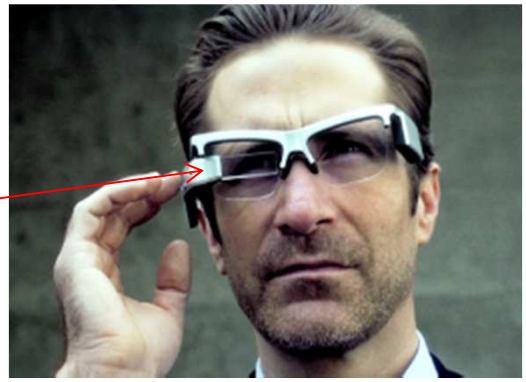
Presentation for Dissemination

OLED Microdisplays with Enhanced Brightness and Colour Performances for Imaging and Augmented Reality Applications

CEA-LETI, Merck KGaA, MICROOLED SAS, University Cologne, Yukon Optics, Optinvent SA

The Project



Basics:

- **Project acronym: SCOOP**
- **Project title: OLED Microdisplay with enhanced brightness and Color Performance for Imaging and Augmented Reality Applications**
- **30 months STREP from 1-9-2011 to 28-2-2014**
- **Budget : 4782k€ with 3462k€ requested EU contribution**

Motivation:

- **Growing Market for OLED Microdisplays: DSC, sport-optics, video-glasses, medical**
  - Superior image quality
  - Very low power consumption
  - Extremely compact solution



- **Potentially Huge opportunity for « Data-Glass » and Augmented Reality devices**

  Examples: Google Glass, Optinvent Ora, Recon Jet,….

  Both for Professional and Consumer Market

- **A major aim of SCOOP is to bring these two together**
  - OLED microdisplay is THE ideal solution in terms of compactness, power consumption, black level
  - The challenge is the **HIGH BRIGHTNESS** required, namely for outdoor use high transparency of the device

Objectives

- **Provide device technology, new materials, and process for improved performance of OLED Microdisplays**
  - High brightness
  - Large color gamut
  - Improved reliability.
- **Demonstrate the performance of the developed technology**
  - prototypes of OLED microdisplay modules
  - innovative visualisation systems
- **Support the industrial partners**
  - maintain and improve technological advance
  - extend market share by enabling new products and materials
- **Strengthen Europe's scientific and technology base via the institutional partners**
  - in the field of OLED and thin film encapsulation
  - for a variety of applications, including displays, lighting and organic photovoltaic

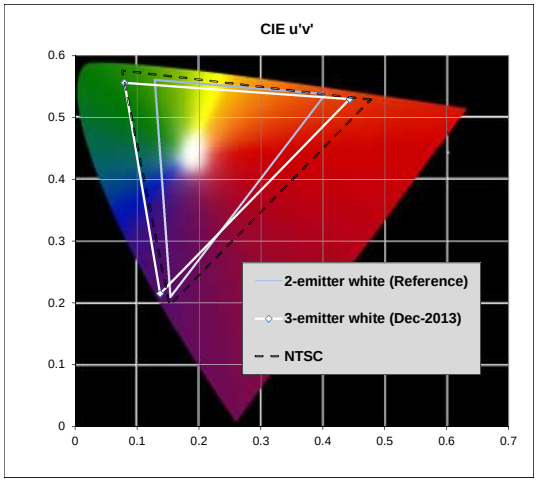
The Team

- **CEA-LETI (Grenoble, France): Applied Research**
  - project coordinator
  - development of thin film encapsulation
  - OLED stack optimisation on CMOS test substrates & process optimisation.
- **MERCK KGaA (Darmstadt, Germany): OLED Materials**
  - OLED materials development
  - OLED device architectures.
- **MICROOLED (Grenoble, France) : Microdisplay Components**
  - Technical manager of the project
  - coordination of the activities on exploitation and dissemination
  - Integration of the technology bricks into microdisplay prototypes
- **University of Cologne (Germany): Fundamental Reseach**
  - Development of new cross-linkable OLED Materials, compatible to conventional photolithography
- **Yukon Advanced Optics (Vilnius, Lithuania): Advanced Vision Systems**
  - Integration of OLED microdisplays into electronic viewfinders
  - Design and realisation of a see-trough head mounted display
- **Optinvent (Rennes, France):**
  - Design and realisation of thin & compact optical see-trough system integrating OLED Microdisplays
  - Integration into Augmented Reality glasses

Chemistry Department
Cologne University

Achievements (1)

- **Large Color Gamut:**
  - A new deep blue emitter material: 5.4cd/A at CIExy = 0.14/0.09
  - Improved white top emission structure: 100% s-RGB coverage in microdisplay prototype.
- **High Brightness:**
  - A new RGB top emission OLED stack: 29cd/A
  - 2-color Red-Green microdisplay: luminance >2000cd/m².
  - Proof-of-principle: RGB full color microdisplay at 3000cd/m².
- **High Reliability:**
  - Thin film encapsulation for top emission OLED, resting 1500 hrs under 85°C and 85% relative humidity
  - Good OLED thermal stability at 70°C operation (70°C)



Photograph of the 2 color BY microdisplay demonstrator at 2000cd/m²

Achievements (2)

- **Electronic Viewfinders (Yukon)**

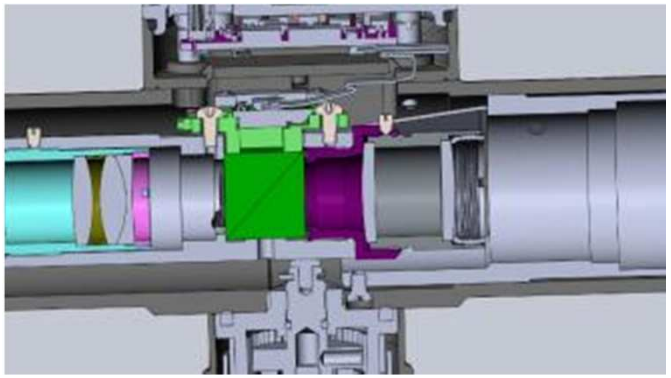
  - Power consumption: 0.35W, Eye Relief: 12mm, Weight: 65g, Eyepiece Focus: 12mm

- **Optical See-Through Module (Yukon)**

  - Light transmission: 70%, Weight: 45g, Advanced Electronic Interface

- **Head Mounted Display for professional applications (Yukon)**

  - Thermal camera resolution: 640x480, Fully adjustable main module positioning, Weight: 240g



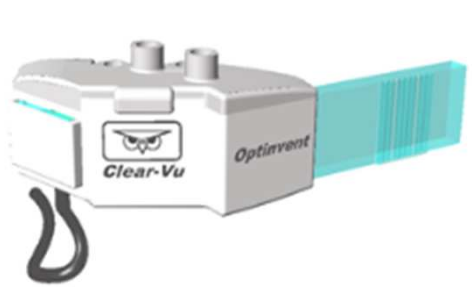
Achievements (3)

- **A very compact and lightweight Optical See-Through Module**

-4mm thickness of optical waveguide

-Transparency: 45%.

-Module weight: 24g.



- **Head Mounted Displays with see-through function for consumer applications (Optinvent)**

-weight: 50g

-Transparency: 45%,