Deliverable D 7.8
M30 Dissemination Kit

Delivery date: M30 (E-Feb 2014)
Submission date: 24/03/14

EU founded FP7-Strep project SCOOP, 287595
Date: 19/03/14
Lead author: G Haas
Dissemination level: PU

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DOCUMENT KEYDATA

Deliverable nr	7.8
Title of Deliverable	*Dissemination Kit*
Contributing WP(s)	WP7
Dissemination level	PU (Public)
Contractual delivery date	28/02/2014

DOCUMENT HISTORY

Date	Version	Editor	Change
19/03/14	V0.1	GH	Initial version
21/03/14	V2.0	SLC	Version sent to partners for validation
24/03/14	V3.0	SLC	Approved version

Used status / version(X) numbering: 0.X (outline), 1.X (draft), 2.X (proposed), 3.X (approved)

DISTRIBUTION LIST

Due *Date*	*Issue*	*Distribution*
24/03/2014	V3.0	Martyn.CHAMBERLAIN@ec.europa.eu, Maud.HENRARD@ec.europa.eu
24/03/2014	V3.0	Consortium

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1. Introduction

This document gives a general overview of the SCOOP project including major outcomes. It is foreseen for dissemination at public level.

2. Report

SCOOP is a European funded project (FP7 project number 287595) focussed on OLED technology, microdisplays based on the combination of OLED with CMOS technology, and innovative visualisation systems like electronic viewfinders, informative eyewear ("data glass") or augmented reality glasses. The main objectives of SCOOP were:

- To provide device technology, new materials, and process for improved performance of OLED Microdisplays in terms of brightness, color gamut, and reliability.
- To demonstrate the performance of the developed technology by prototypes of OLED microdisplay modules in innovative visualisation systems.
- To support the industrial partners to maintain and improve their technological advance and to extend their market share by enabling new products and materials.
- To strengthen Europe's scientific and technology base in the field of OLED and thin film encapsulation for a variety of applications, including displays, lighting and organic photovoltaic via the institutional partners.

The project partners and their main tasks were:

CEA-LETI (Grenoble, France) is a worldwide leading institute for applied research in the field of micro- and nanotechnologies for microelectronics, microsystems, biology, and communication. LETI has initiated the MINATEC European Innovation Centre for Micro and Nanotechnology and will muster over 4000 people from Education to Research and Industry. Within SCOOP, LETI took over the role of the project coordinator as well as the development of thin film encapsulation adapted to OLED micro displays specifications, OLED stack optimisation on CMOS test substrates, and process optimisation.

MERCK KGaA (Darmstadt, Germany) is a global pharmaceutical and chemical company. Liquid Crystals are a key product group. Close cooperation in development and production of liquid crystals with the world's leading display manufacturers has made Merck the number one company worldwide in this field. Thanks to continuous investments in research and production, Merck is also the technology leader in new lighting and display technologies such as OLEDs. In SCOOP, Merck was responsible for the work on OLED materials and device architectures, in close collaboration with LETI and Microoled.

MICROOLED (Grenoble, France) develops and produces high-performance microdisplays for near-to-eye applications like video glasses, electronic viewfinders for cameras, or professional applications. MICROOLED is uniquely positioned for these markets by providing microdisplays with the worldwide highest pixel density, lowest power consumption, and a widely recognised outstanding image quality. Microoled took over the technical management of the SCOOP project and the coordination of the activities on exploitation and dissemination, as well as the integration of the technology bricks developed in the project into microdisplay components, related process development, and the realisation of microdisplay prototypes.

University of Cologne (Germany): The research group of Pr. Meerholz develops and characterises novel materials and fabrication processes for high-performance electro-optic devices based on organic materials. The group works on the forefront of research on OLEDs, organic solar cells, organic field-effect transistors, holographic imaging and bio-sensors. Within SCOOP, the group has been working on the development of new cross-linkable OLED Materials that could be fine-patterned by conventional photolithography as used in CMOS technology.

Yukon Advanced Optics (Vilnius, Lithuania) comprises a group of companies engaged in design and manufacturing of variety of observation devices, mostly night vision products for consumer market and accountable for more than 70% of market shares worldwide. Within the project, Yukon's task was to integrate the microdisplay prototypes into innovative systems like an electronic viewfinder assembly for outdoor applications, a prism-based optical Optinvent.

Optinvent (Rennes, France) concentrates on developing innovative optical technologies that it packages into modules or finished products. The company is targeting applications such as see-through glasses for mobile video and gaming applications and Head Mounted Displays (HMD) for professional and military applications with a display module called Clear-Vu. More recently, Optinvent developed and will deliver to the customers the ORA product, a Monocular Wireless Augmented Reality glasses for B to B market. Within SCOOP, Optinvent has designed and realised prototypes of see-trough optical system optimised for integrating the OLED microdisplay demonstrators.

Major outcomes of SCOOP are:

- **Large color gamut**: A new fluorescent deep blue emitter material with very good efficiency of 5.4cd/A at CIE xy = 0.14/0.09 has been developed. Together with an improved white top emission structure, we could demonstrate 100% s-RGB coverage in a microdisplay prototype.
- **High Brightness:** A new white top emission OLED stack with an efficiency of 29cd/A has been demonstrated. Based on this type of architecture, we could realise a 2-color Red-Green microdisplay with a luminance >2000cd/m². We could also demonstrate a proof-of-principle of a full color microdisplay at 3000cd/m².
- **High reliability:** A highly resistant thin film encapsulation for top emission OLED has been developed and successfully tested during 1500hrs at 85°C and 85% relative humidity with very little impact on the underlying OLED. Improved OLED lifetime as well as good thermal stability at high temperature operation (70°C) could be demonstrated as well.
- Prototypes of **Electronic Viewfinders** with and without optical see-through functions have been realised using the high brightness OLED microdisplays.
- A very compact and lightweight **Optical See-Through Module** for head mounted displays has been developed integrating the high brightness OLED microdisplays. It is based on an optical waveguide of 4mm thickness and has a transparency of 45%. The whole module weight is only 24g.
- 2 types of **Head Mounted Display** with see-through function based on this optical module have been realised and successfully tested. One is dedicated for consumer, the other for professional applications.