Advanced Displays Research Integration Action

Displays as key driver for large area electronics in intelligent environments

The adria strategy paper for FP7

SPIE / EPIC OLED Workshop
Cambridge, June 7, 2005
Eric Maiser, VDMA-DFF

Outline

- Introduction to adria
  - Creating a "one-stop-shop" for FPD in Europe: Structure, actors and objectives
- Roadmapping /strategy
  - Some visions for future displays
  - OLED position
- Funding and funding strategy
  - White paper: strategic opportunities
  - “The valley of death” and how to find bridges
- The OLED case
- Conclusion / recommendations
Advanced Displays Research Integration Action

Adria:
Beaches, sunshine, leisure ...

Adria:
About all of Europe!
Advanced Displays Research Integration Action

“Advanced Displays Research Integration Action”

Networking Project
to prepare an
Association
for European Community

adria in a nutshell

- Project: Advanced Displays Network funded by the European Commission
- Partners: six
- Duration: 01.10.2004 - 30.09.2006
- Manpower: 67 person months
- Mission:
  - To strengthen the advanced displays industries in Europe by creating a European platform on advanced displays research and technology.
- Vision:
  - To appeal to the entire display community in Europe to create a common knowledge base, to create a common vision for a display future in Europe and to create appreciated services.
Advanced Displays Research Integration Action

The consortium:
Strong industry and academia networks

- **VDMA-dff (DE)**
  - Coordinator, expertise from VDMA and DFF platforms
- **SEMI Europe (Europe/Int'l.)**
  - Int'l FPD Standards, roadmapping, FPD market
- **Scottish Optoelectronics Association (UK)**
  - Roadmapping, standards, education & training
- **Club VISU / SID France (F)**
  - Connection with SID in Europe, conferences, training
- **Swedish LCD Center (SE)**
  - LCD masters degree, industry & university network
- **University of Dundee (UK)**
  - UK DisplayMasters degree, university network

In the drivers seat:
Committed individuals

**Steering Committee**

- Hermann Schenk, covion (chairman)
- Ian Underwood, MED
- Alain Doré, Club VISU / SID France
- Pierre Lucas, semi
- Kent Skarp, Swedish LCD Center
- David Rodley, U Dundee

**Advisory Board**

- Norman Bardsley
- Werner Becker, Merck KGaA
- Jeremy Burroughes, CDT
- Norbert Frühauf, U Stuttgart
- Paul-Henri Guering, Saint-Gobain Research
- Gunther Haas, Thomson
- Eliav Haskal, Philips Research
- Jyrki Kimmel, Nokia Research
- Bruno Mourey, CEA-LETI
- Jean-Paul Parneix, U Bordeaux
- Chris Williams, Flexynet / UKDN
Advanced Displays Research Integration Action

Creating a “one-stop-shop” for FPD in Europe: Objectives

- Fostering interaction among all European players along the FPD value chain
- Common vision, i.e. common rules for future investment in the FPD sector
- Effective training / development of an EU FPD education curriculum
- Consolidation and enhancement of FPD standardisation knowledge
- Integration of dissemination activities
- Representation of the European FPD community globally

Integration ➔ Networking ➔ Platform

Objectives translate into Workpackages

- Competence mapping
- Technology Roadmapping
- Education and training
- Standardization
- Promotion and dissemination
- Establishment of an association

The actors are:
- Consortium
- Working Groups
- European FPD community
- Partnering organisations worldwide

Everyone’s invited to contribute!

OLED Workshop, Cambridge
Advanced Displays Research Integration Action

**Competence Mapping**

**Europe has great competence in...**

- Displays **R&D** in Europe has been and still is a big source of innovation...
- The **supply industries** in Europe are an enabler for display production...
- Strong **EU industries**, e.g. automotive, telecommunication, mechanical engineering... They have visions for future applications!

**Goal**

- Collect all information into a
  - multi-dimensional
  - systematic & structured
  - Europe-wide
  - comprehensive & web-based

**Database**

---

**Roadmapping = Vision for Visualisation**

**Examples I.**

- **Transparent displays**
- **Intuitive navigation** through complex databases
- **Animated electronic paper**

Scenes from "Minority Report" 20th Century Fox, 2002
Advanced Displays Research Integration Action

Roadmapping = Vision for Visualisation

Examples II.

- Autostereoscopic 3D
- Volumetric 3D
- 3D holography

Scenes from "Minority Report"
20th Century Fox, 2002

Advanced Displays Research Integration Action

Roadmapping = Vision for Visualisation

Examples III.

- E-paper
- Update via wireless broadband access

- Roll-out displays

Picture: IBM Germany
Picture: Siemens
Advanced Displays Research Integration Action

Roadmapping = Vision for Visualisation

Examples IV.

- Ubiquitous personalised advertising
- “Electronics everywhere”
- Pervasive computing

- Large area electronics
- Wallpaper displays
- Intelligent environments

Examples V.

- New markets
- Integration of logic, sensors, display and power supply
- No costly semiconductor processes, clean room environment
- High volume, large area, continuous production process (e.g. printing)

- Organic electronics
  - OLED displays
  - OLED lighting
  - O-TFT backplanes
  - RFID tags
  - smart labels
  - photovoltaics
  - sensor arrays ...

Picture: TMC

Picture: FhG-IZM

Picture: PolyIC
Advanced Displays Research Integration Action

**Promising Market Development**

![Graph showing market development over time]

**OLED position**

![Venn diagram illustrating the integration of different electronics and displays]

OLED Workshop, Cambridge  June 7, 2005
adria Roadmapping: The Methodology

There are huge differences between Technology roadmapping for semiconductors and for display devices:

- Technology roadmapping for displays is more complex than roadmapping in the semiconductor area, where only feature size and lower cost dominate the critical system requirements.
- The performance requirements for displays largely depend on the application field (e.g., the needs for automotive displays are essentially different from those for TV-set displays).

Definition of five areas with comparable needs and performance requirements

---

Advanced Displays Research Integration Action

Large area processing does not take the silicon route

Courtesy B. Mourey

CMOS
Design rules < 0.5µm
Substrate < 0.1m²
Capacity: m²/h

Dry process
0.5µm < design rules < 5µm
Substrate = 1m²
Capacity: m²/h

Wet process
5 µm < design rules < 50 µm
Roll to Roll Substrate
Capacity: >100 m²/h

Number of Transistors per function

OLED Workshop, Cambridge
June 7, 2005, Page 19
adria Roadmapping

There are huge differences between technology roadmapping for semiconductors and for display devices:

- Technology roadmapping for displays is more complex than roadmapping in the semiconductor area, where only feature size and lower cost dominate the critical system requirements.

- The performance requirements for displays largely depend on the application field (e.g., the needs for automotive displays are essentially different from those for TV-set displays).

Definition of five areas with comparable needs and performance requirements

Creating a “one-stop-shop”
Objectives translate into Workpackages

- Competence mapping
- Technology Roadmapping
- Education and training
- Standardization
- Promotion and dissemination
- Establishment of an association

The actors are:
- Consortium
- Working Groups
- European FPD community
- Partnering organisations worldwide

Everyone’s invited to contribute!
adria Roadmapping

What about public funding?

- Regional Programmes
  - e.g. Federal State of Saxony

- National Programmes
  - e.g. recent German OLED 2015 programme (100 M€ for 5 years)

- Cross-border activities
  - e.g. “OLEDFAB” project with Thomson as coordinator

- European funding
  - EUREKA-type
  - 4th, 5th, 6th Framework Programmes for Research and Technological development

Marc Boukerche, DG INFSO-G2!

- Public funding does not lead to success without strong commitment from private side!

---

What about future EC funding?

- Community recommendations for the 7th framework programme of the EC by questionnaire

- Strategy paper
  “Displays as key driver for large area electronics in intelligent environments”

- First draft submitted to the Commission on 23.12.2004

- Handed over to Commissioner Ms Reding

- Prioritisation of RTD agenda underway
Advanced Displays Research Integration Action

White paper

95 contributors from 17 countries

30 individuals in high-level group

OLED Workshop, Cambridge

Advanced Displays Research Integration Action

White paper

Strategic Opportunities

- “Displays will always get cheaper”
  - Heavier displays => high shipping cost => local production
- EU enlargement could foster manufacturing
  - Why go to China?
    - Shift labour intensive back-end towards Eastern Europe
- Rapid prototyping vs. price wars in mass manufacture
  - Custom design manufacture instead of commodities
- Integration of best inorganic and organic technologies
  - Functionality into LTPS, FSA, 3-D PCB seamless tiled displays...
- 3D
- Smart displays and organic electronics
  - Combining printing techniques and flexible substrates

OLED Workshop, Cambridge
**Advanced Displays Research Integration Action**

**The Valley of Death: Funding Gap between Invention and Production**

**Capital to develop ideas into manufacturable products**

- **Research up to demonstrator level**
  - **Public funds**

- **No funding in the “Valley of Death”**
  - **Real products, viable business**
  - **Private funds**

**Drawn by US congressman Vernon Ehlers**

see also: Charles Wessner, The National Academies

OLED Workshop, Cambridge
Advanced Displays Research Integration Action

The Semiconductor Equipment Assessment Programme of the EC

- Very successful European programme to evaluate/certify/assess equipment
- Important: under "close-to-production conditions"!
- Collaboration of entire value chain: research, materials, equipment and producers
- Producers also from US/Japan!
- Follow-up in FP6 underway
- *Translate the concept to displays and LAE!*
- www.sea.rl.ac.uk

Advanced Displays Research Integration Action

The OLED case:
Some thoughts for discussion

- OLED mass manufacture not viable with point source deposition!
- Need for alternative production technologies!
  - Equipment is key
  - Develop concepts beyond demonstrator level into pilot
  - on technology platforms
- Integrated view on entire manufacturing process!
  - backplane
    - AM supply? LTPS supply?
    - Strategic domestic backplane manufacture?
  - OLED stack
  - encapsulation
  - drivers
- Combine existing strengths in electronics and printing industries!
Advanced Displays Research Integration Action

Conclusion:
Mavericks are great movie heroes...

...we need strong collaborations to strengthen the OLED landscape in Europe!

OLED Workshop, Cambridge
June 7, 2005
Page 31

Advanced Displays Research Integration Action

Contact

adria Secretariat

Dr. Michael Becker
Stefanie Jost-Koestering
c/o VDMA –
The German Engineering Federation
Lyoner Str. 18
D – 60528 Frankfurt am Main
Germany
Tel.: +49 69 6603-1479
Fax: +49 69 6603-2479
eMail: secretariat@adria-network.org

www.adria-network.org

OLED Workshop, Cambridge
June 7, 2005
Page 32