DisplaySearch Sees Expanded Growth for OLED Displays Reaching over US$3.1B by 2012; AMOLEDs Projected to Achieve a Five Year CAGR of 96%

Austin, Texas, April 11, 2008—DisplaySearch, the worldwide leader in display market research and consulting, reports in its *OLED Technology Report* that sales of Organic Light Emitting Diode (OLED) displays are expected to surge 69% to more than $826.5 million in 2008, and then grow by 83% in 2009 and 53% in 2010 as Active Matrix OLED (AMOLED) displays become mainstream. According to DisplaySearch's Senior Advisor and Consultant Barry Young, "2008 will be a break-out year for AMOLED displays as Samsung SDI, LG Display, Sony and CMEL deliver almost 17M displays, which is up over 380% compared to 2007. The displays will be used in products such as mobile phones, digital cameras, digital photo frames, handheld TVs and free standing TVs." Young added, "By 2009, OLED display manufacturers are expected to commence shipments of displays for notebooks and then move rapidly into TVs, building on the success of the Sony XEL-1, arguably the TV with the most vivid and realistic image."

This 550-page report is a comprehensive examination of the OLED industry covering virtually every segment from material, devices, manufacturing, applications, equipment, lighting, costs, participants, and forecasts of display shipments, revenues, ASP and area by application and technology.

Key findings in the report include

- Materials
  - Material lifetime improvements acclerated over the last two years due to the cooperation between makers of transport and injection layers with host and dopant suppliers.
  - Both lifetime (initial luminace of 1,000 cd/m^2) and effiency of devices in the lab are setting new records:
    - Red – 28 cd/A and >100,000 hrs to ½ luminance
    - Green – 67 cd/A and > 200,000 hrs to ½ luminance
    - Blue – 10cd/A and >50,000 hrs to ½ luminance
  - New white materials the have achieved 65 lm/W with a CRI greater than 80 for lighting and display applications.
- Backplanes
  - Existing AMOLED manufacturers are using excimer laser (ELA) based LTPS manufacturing processes. These have achieved greater than 75% yields, eliminating mura defects.
  - New approaches for LTPS, such as Super Grain Silicon (SGS) from Samsung SDI, promise to move the substrate limits beyond Gen 4 to Gen 5 and greater.
  - a-Si backplanes are being tested with some very creative schemes that compensate for both deterioration of the TFT and the OLED.
  - Alternatives to a-Si and p-Si are being evaluated:
    - c-Si on glass via a printing process
    - Nanowires on glass or flex
    - Low temperature oxides on glass and flex
    - Organic TFTs on flex
- OLED Deposition and Patterning
  - Thermal evaporation is the leading technique used in making PMOLEDs and AMOLEDs (Point Source).
  - Alternatives include ink-jet printing, laser induced thermal imaging and blanket printing. All are used to increase material utilization and reduce Total Average Cycle Time (TACT).
- Device Architectures
  - The standard approach, using RGB with single transport/injection layers is being challenged.
  - White with RGBW color filters designed in a tandem architecture as practiced by Kodak is gaining momentum.
  - New approaches using micro cavities and luminaires are being designed to increase the external quantum efficiency.
  - The difference between top emission and bottom emission devices is explained.
- Material Usage
  - The report differentiates and forecasts organic material usage divided by
    - Small Molecule
    - P-OLEDs

    - Alternative architectures are modeled to determine use of RGB and white for P-OLEDs, Florescent OLEDs and Phosphorescent OLEDs.
- Solid State Lighting
    - OLED lighting will be challenged to improve efficiences to ~100 lm/W while increasing the lifetime.
    - New approaches to manufacturing include the recently announced roll-to-roll process by GE.
    - The biggest challenge remains the cost of the process, which is today orders of magnitude higher than existing lighting approaches, leaving the manufacturers to seek niche markets initially.

As shown in Table 1 below, PMOLEDs displays dominated the market in 2007, but by 2012, AMOLED production will pass PMOLEDs.

Table 1: OLED Display Shipments (000)

	2007	2008	2009	2010	2011	2012
AMOLED	3,513.0	16,919.4	36,987.8	65,457.0	85,930.9	118,554.8
PMOLED	72,589.3	84,313.7	88,252.1	94,864.8	101,087.9	108,563.4
Y/Y AMOLED	1071%	382%	119%	77%	31%	38%
Y/Y PMOLED	1%	16%	5%	7%	7%	7%

The next table shows the actual and projected revenues for AMOLEDs and PMOLEDs. It is forecasted that PMOLED revenue will remain flat during the five-year period and that AMOLED will have a five-year CAGR of 96%.

Table 2: OLED Display Revenue (US$ millions)

	2007	2008	2009	2010	2011	2012
AMOLED	$93	$422	$1,115	$1,909	$2,219	$2,719
PMOLED	$395	$405	$394	$393	$392	$396
Y/Y AMOLED	517%	354%	164%	71%	16%	23%
Y/Y PMOLED	-12%	2%	-3%	0%	0%	1%

The *OLED Technology Report* is available immediately and comes with an optional small/medium cost of ownership model and a model for calculating the organic material volume and revenue. For more information on the DisplaySearch 2008 *OLED Technology Report*, please contact arie@displaysearch.com, or contact your regional DisplaySearch offices in Japan, Korea, Taiwan and China.

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