High Accuracy printed electronics down to µm size, for Organic Large Area Electronics (OLAE) Thin Film Transistor (TFT) and Display Applications

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PUBLIC SUMMARY OF Deliverable Report: D3.2 – Design and Realisation of Driving System for OTFT

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Dissemination level		
PU	Public	**X**
CO	Confidential, only for members of the consortium (including the Commission Services)	

1 PUBLIC SUMMARY

Project Hi-Accuracy has targeted 1.24” diagonal 300 ppi RGB colour displays using printed top-emission QD-LEDs driven by OTFT on PEN plastic susbtrates. The project uses Smartkem TRUFLEX™ OTFT materials processed using conventional backplane fabrication tools such as lithography, wet-etching, sputtering, dry-etching in a 2T-1C circuit for driving QD-LEDs. OTFTs were designed with the capability of driving the printed LEDs to a brightness of 1000 nits provided the current efficiency is greater than 0.5 cd/A.

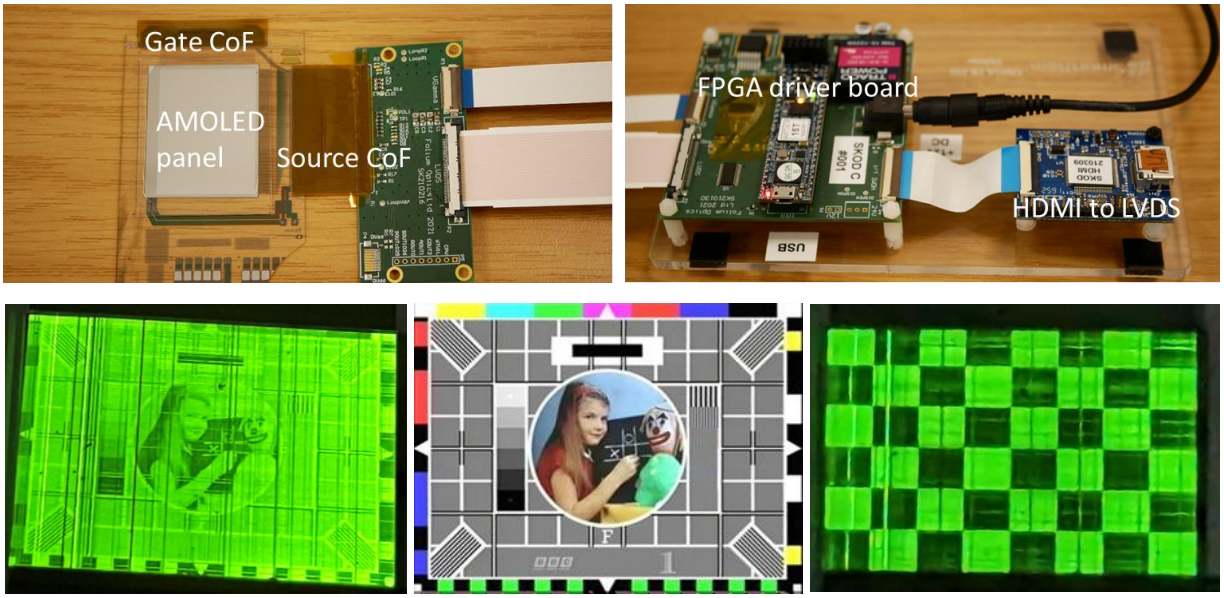
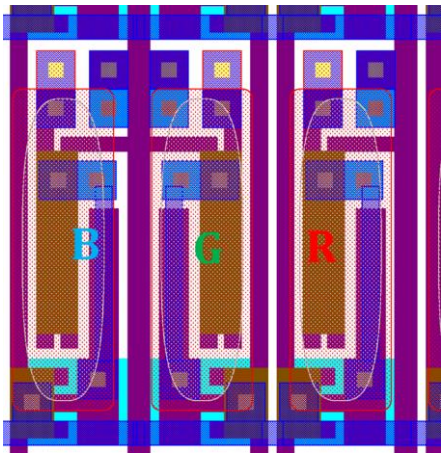
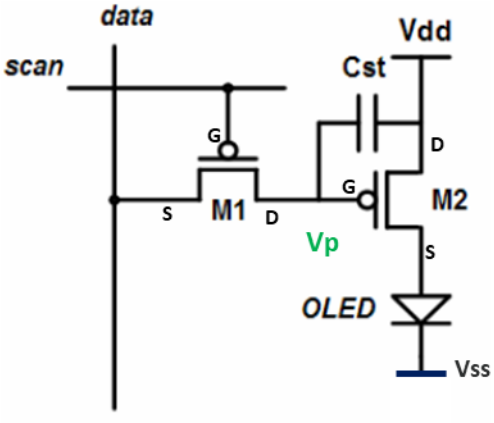


Figure 1 – Photographs (top left and right) of the QVGA driver system developed by Folium Optics. In these images it is shown connected to a QVGA monochrome OLED panel using a 200ppi OTFT backplane. Hi-accuracy will develop a 300ppi RGB colour display. Bottom – images of 240x360 AMOLED OTFT (left) using Test card F (middle) and a checkerboard (right) to demonstrate the system working correctly.

The display will be driven using chip-on-flex CoF drivers for the gate and source lines. These are controlled by a custom-made electronics driver system provided by Folium Optics UK (Figure 1).

The sub-pixel circuit was simulated using Silvaco SmartSpice and SmartKem’s OTFT model (Figure 2). It was determined that the kickback voltage (V_k) was approximately 1.3V. During simulation the scan voltage kept -15V to +15V, data voltage 0V to -8V. Reduction of the kickback voltage will be considered in further design iterations once the printed QD-LED devices have been optimized for high efficiency. This will allow enlargement of the storage capacitor due to the reduction in size of the drive transistor.





Parameters	Blue	Green	Red	Description
M1(W/L)	IU- 13.5u/2.0u	IU- 13.5u/2.0u	IU- 13.5u/2.0u	SW Tr.
M2(W/L)	IU- 38u/1.5u	IU- 38u/1.5u	IU- 38u/1.5u	Dr Tr.
Cst	18 fF	18 fF	18 fF	Storage Cap.

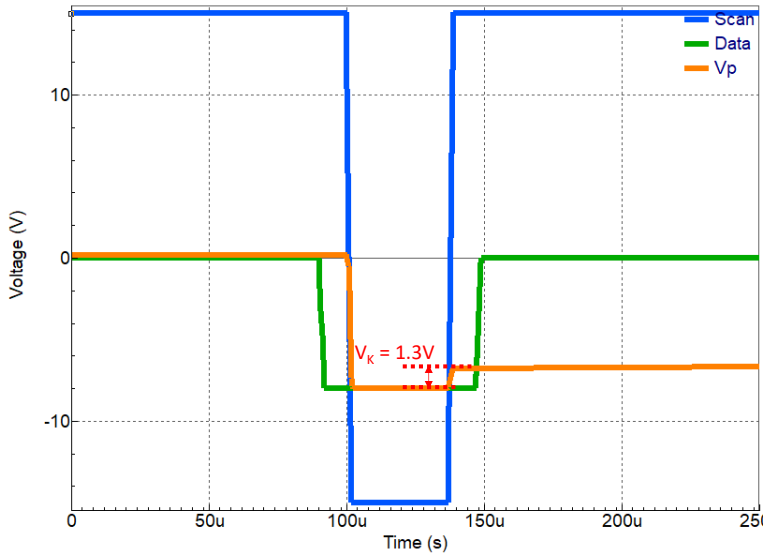


Figure 2 – Top left – CAD drawing of a pixel of the Hi-Accµracy 300 ppi display. Top right – schematic of 2T-1C sub-pixel design. Middle – dimensions of the drive TFTs, select TFTs and storage capacitors in the circuit. Bottom – Output of simulation of the programming of Vp in the sub-pixel circuit