

# Flexi display technology is now

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Rigid television screens, bulky laptops and still image posters are to be a thing of the past as new research, published today, Thursday, 2 October, in the *New Journal of Physics*, heralds the beginning of a technological revolution for screen displays.

Screen display technology is taking a significant step forward as researchers from Sony and the Max Planck Institute demonstrate the possibility of bendable optically assessed organic light emitting displays for the first time, based on red or IR-A light upconversion.

The paper, 'Annihilation Assisted Upconversion: All-Organic, Flexible and Transparent Multicolour Display', makes feasible the design of computers that can be folded up and put in your pocket, the mass-production of moving image posters for display advertising, televisions which can be bended to view or, even, newspaper display technology which allows readers to upload daily news to an easy-to-carry display contraption.

All organic, upconversion multicolour displays have significant advantages when compared to the traditional technology used for projection displays and televisions. Namely UC displays are:

- All-organic – transparent and flexible
- Ultra low excitation intensity (red or IR)– less than  $15 \text{ mWcm}^{-2}$
- Emissive display – no speckles
- Coherent or non-coherent excitation allowed
- High efficiency – at the moment ca. 6 %

- Fast response times – ca. 1  $\mu\text{s}$  up to 500  $\mu\text{s}$  on request (LCDs have ms)
- Almost unlimited viewing angle – up to the total internal reflection angle
- Tailoring of emitted colours realised even when using the same excitation source
- Multilayer Displays
- Size limited only by the size of the substrates

With LCD-based projection displays, the liquid crystal acts as a filter for the light being shone through so when coherent excitation is used (e.g. laser diodes) the problems with speckles are serious. For this organic emissive UC displays, the organic molecules themselves emit non-coherent light in 4 $\pi$  (all directions) to produce an image.

Sony announced the development of flexible OLED display screens in 2006 but glitches such as size and resolution limitations, and the difficulty of structuring the organic compounds so as not to be distorted when bent, have stopped designs coming to market. This new technology for optically excited organic emissive displays hasn't got this problem and gives further opportunities for new applications.

The research published today concludes through the use of a new structure and unique combinations for the organic compounds within viscous polymeric matrix, that there need be no size or resolution limitations for the new screens.

The researchers conclude, "To the best of our knowledge we demonstrate for the first time a versatile colour all-organic and transparent UC-display. The reported displays are also flexible and have excellent brightness."

Citation: The published version of the paper "Annihilation Assisted Upconversion: All-Organic, Flexible and Transparent Multicolour

Display" (Miteva T, Yakutkin V, Nelles G and Balushev S 2008 New J. Phys. 10 103002) will be available online from Thursday, 2 October. It will be available at [stacks.iop.org/NJP/10/103002](https://stacks.iop.org/NJP/10/103002) .

Source: Institute of Physics

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