# EURIPIDES Forum 2010 in Paris

**September 30th – October 1st, 2010 in Paris**

# EoI's on • Strechable electronics for smart textile, and • Ultra-high density millimetre wave flexible circuits for conformal integration.

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| Name of the organisation submitting the EoI: | Uppsala University |
| Contact persons details  shili.zhang, klas.hjort, henrik.kratz, anders.rydberg, @ angstrom.uu.se | Presenter:  Title (Dr. / Prof.): Prof. Family Name: Rydberg First Name: Anders Phone: +46-18-4713228, mobile: +46-70-1679102 Fax: +46-184717244 E-Mail: anders.rydberg@angstrom.uu.se |

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|---|---|
| **Acronym** | TEST<br>ULTRAMILLIFLEX |
| **Title of the EoI** | **Stretchable electronics for smart textile (TEST)**<br>(shili.zhang@angstrom.uu.se, anders.rydberg@angstrom.uu.se)<br>**Ultra-high density millimetre wave flexible circuits for conformal integration (ULTRAMILLIFLEX)**<br>(klas.hjort@angstrom.uu.se, henrik.kratz@angstrom.uu.se) |

**Project vision & innovation for Stretchable electronics for smart textile:**

*The project vision is to integrate Single Wall Carbon Nano Tube (SWCNT)-based flexible thin-film transistor TFT circuits in a stretchable substrate that also the host for all the passive components and antenna circuitry. The innovation will be to increase the operation frequency for the TFT to 1GHz.*

**Project vision & innovation for Ultra-high density millimetre wave flexible circuits for conformal integration:** The vision is to establish a new high performance platform for substrate integrated circuits and systems. The innovation will be to transfer current technology to a high performance flexible PCB material such as liquid crystal polymer (LCP)."

**Abstract for Stretchable electronics for smart textile**

*Large-area electronics for RF applications that provides stretchability and flexibility are of importance in many applications where conformity with the applications surface is essential. A mean to achieve this objective Is to use advanced electronic component technology based on single-walled carbon nanotubes (SWCNTs) for extremely high carrier mobility and mechanical flexibility. Applications are by example stretchable active wireless tags integrated into smart textile.*

**Abstract for Ultra-high density millimetre wave flexible circuits for conformal integration**

*Flexible printed circuit board (flex PCB) technology is an interesting candidate for next generation millimetre-wave (MMW) passive circuitry in the form of substrate integrated circuits (SIC). However to achieve this objective the through-the-foil metal structures like vias need to be small and formed at high aspect ratio, high resolution and high density. The board material need to have low losses and very low water-absorption.*

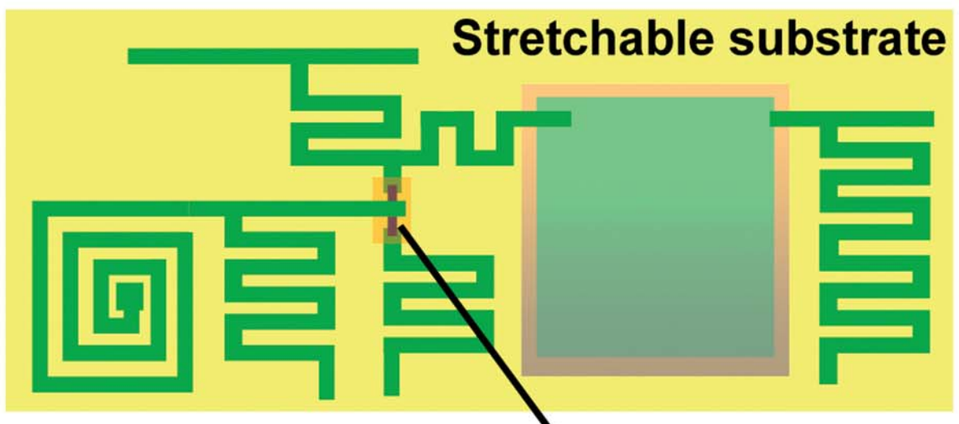
**Fields of Application for Stretchable electronics for smart textile:** *Application areas for stretchable large-area electronics are e.g. RF-ID, health, rehabilitation and fitness in combination with smart textile.*

**Fields of Application for Ultra-high density millimetre wave flexible circuits for conformal integration:** *The applications are in systems demanding low-cost, conformal, mass-producible, high-performance and high yield microwave and millimeter-wave technologies.*

**Existing or expected Partnership / Complementaries / R&D chain**

*End-users in different applications and co-ordinator for the project.*

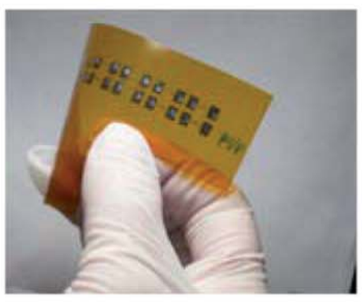
## Stretchable electronics for smart textile

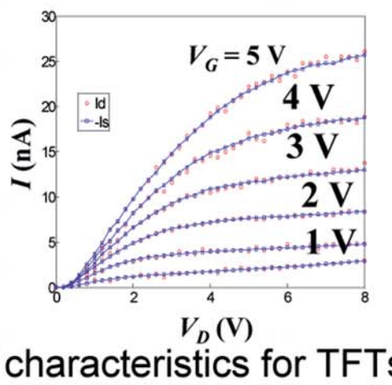



Schematic of an SWCNT-based TFT on a flexible substrate

Printable SWCNT-based ink

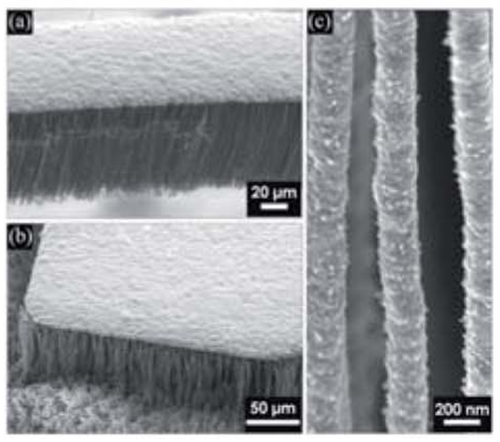
Hand-held inkjet printed TFT arrays on Kapton





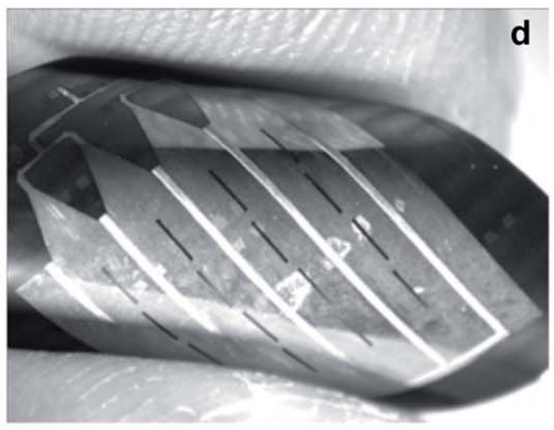

I-V characteristics for TFTs

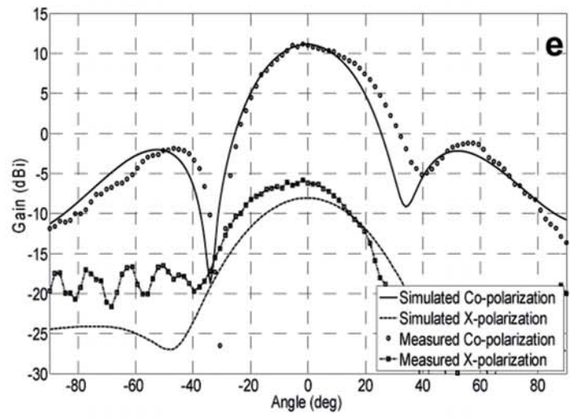
## Ultra-high density millimetre wave flexible circuits for conformal integration




Scanning electron microscope images of fabricated structures where the polyimide was removed prior to imaging by plasma etching to reveal the embedded structures.

a: Segment of a SIC wall that is detached from the underlying copper layer. The individual wires have merged at the top of the SIC. b: A grounding through-hole via. c: Individual nickel wires in a SIC wall.




d: Image of a 77GHz folded four-by-four slot array antenna based on SIC and e: measured results.

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