

ROLL-TO-ROLL UV IMPRINTING TECHNOLOGY FOR THIN FOIL POLYMER MICRO-OPTICS

EPIC Meeting on Wafer Level Optics

8th November 2019, Neuchâtel, Switzerland

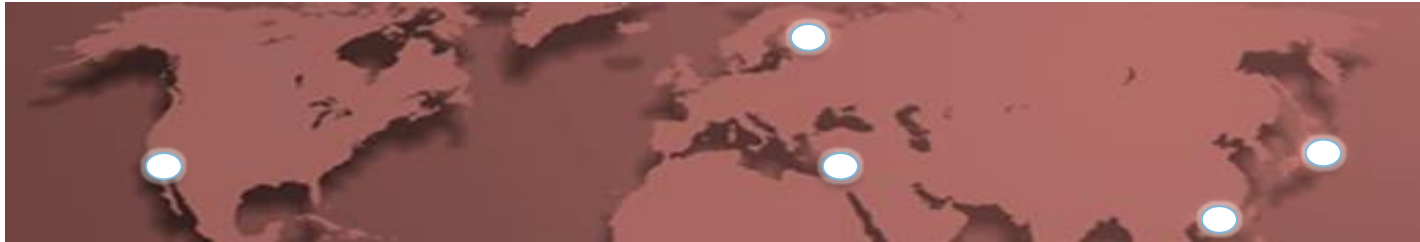
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Nanocomp (FINLAND)

FLEXIBLE LIGHT GUIDING



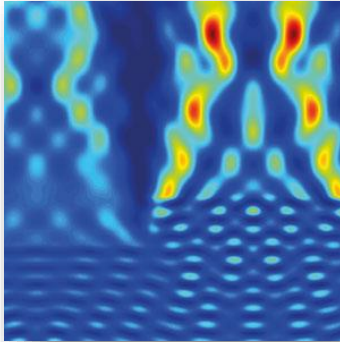
NANOCOMP IN BRIEF

- Privately-held high-technology company
- Focused on manufacturing of micro- and nanophotonics products for consumer electronics
- Production is based on roll-to-roll process
- Operating globally, headquarters and factory in Finland and factory also in China. Other locations in California, Japan, and Hong Kong.



ADDED VALUE BY EXCELLENCE

Design



Design, analysis and simulation of optics

Tooling



Production of nickel stampers through electroforming

Production



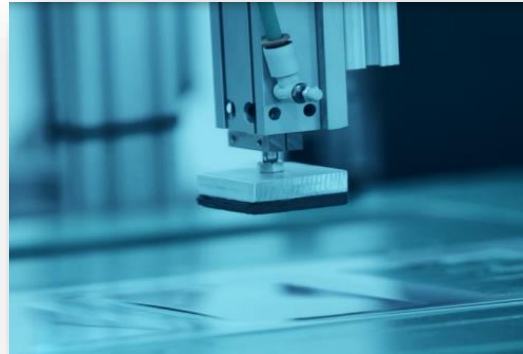
High accuracy mass production (R2R replication and die-cutting with 100% AOI)

Prototyping – Material and process development – Project management

ISO9001, ISO14001 and OHSAS18001 certified

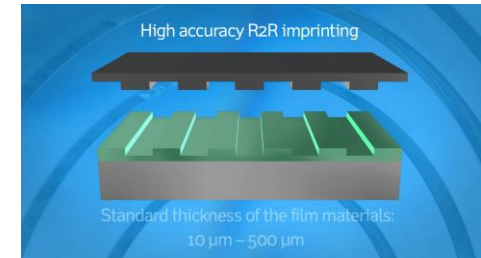
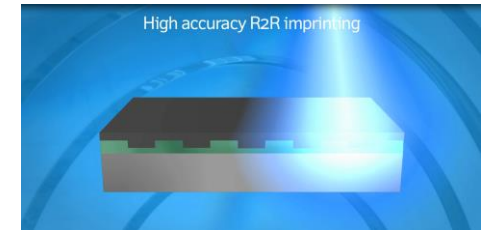
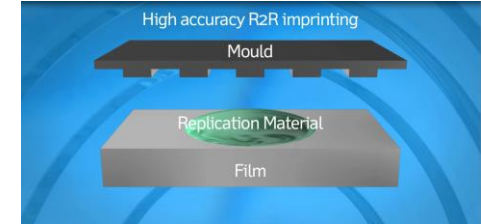
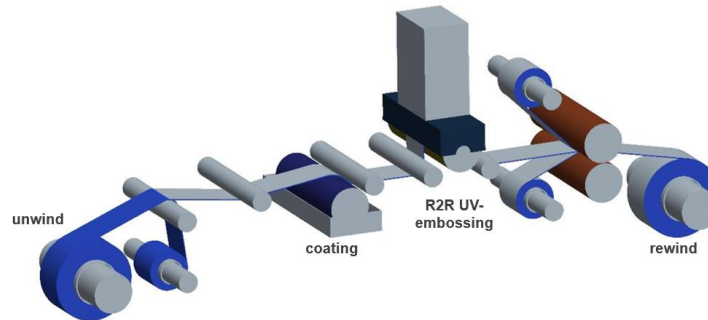
NANOCOMP CAPACITY

- Electron beam and gray scale laser lithography
- Electroforming line for metal tooling
- UV –curing based replication capacity
 - Sheet level replication setup (450 mm x 450 mm)
 - Roll-to-roll replication lines (Line nr. 1. and 2.)
- Cutting process
 - Laser cutting (1. and 2. unit)
 - Die cutting (1. ,2 and 3. line)
-



UV-ROLL-TO-ROLL PROCESS

- Substrate film materials
 - PC, PMMA, PET and TPU
- In-house developed replication materials for polymer substrate film
- Standard thickness of the substrate materials:
 - 10 μm – 500 μm

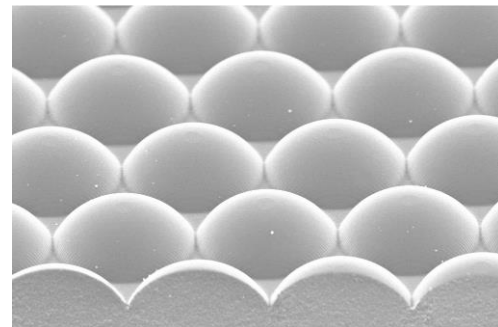
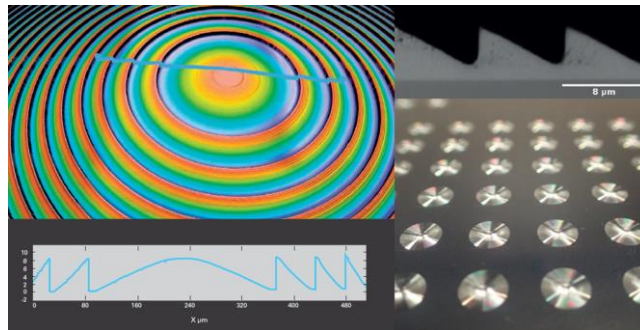


ULTRA THIN MLA FILMS

MicroLens Array films manufactured by UV roll-to-roll imprinting

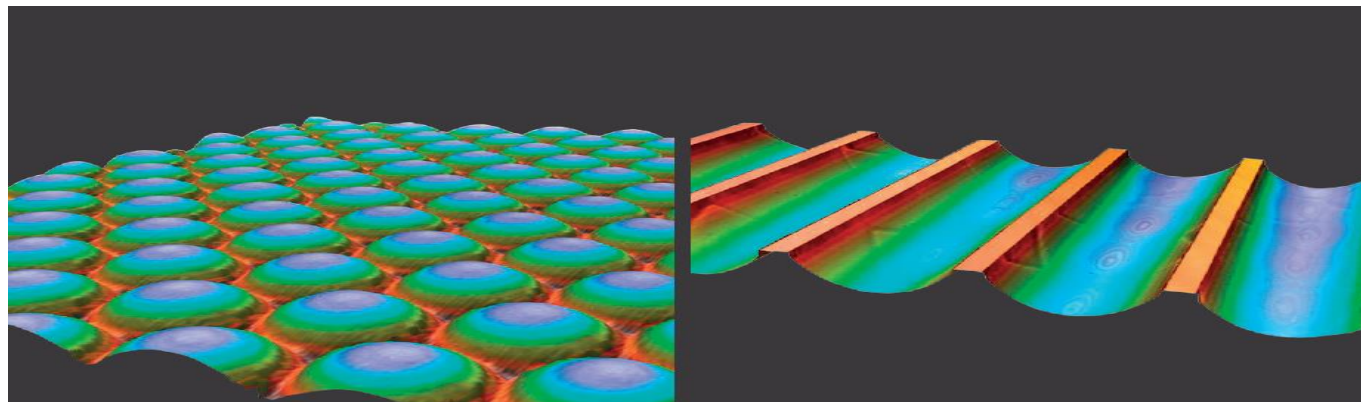
APPLICATIONS

- > Displays
- > Diffusers in BLU
- > CCD and CMOS sensors
- > Fiber couplers
- > 3D imaging and VR
- > Security and surveillance

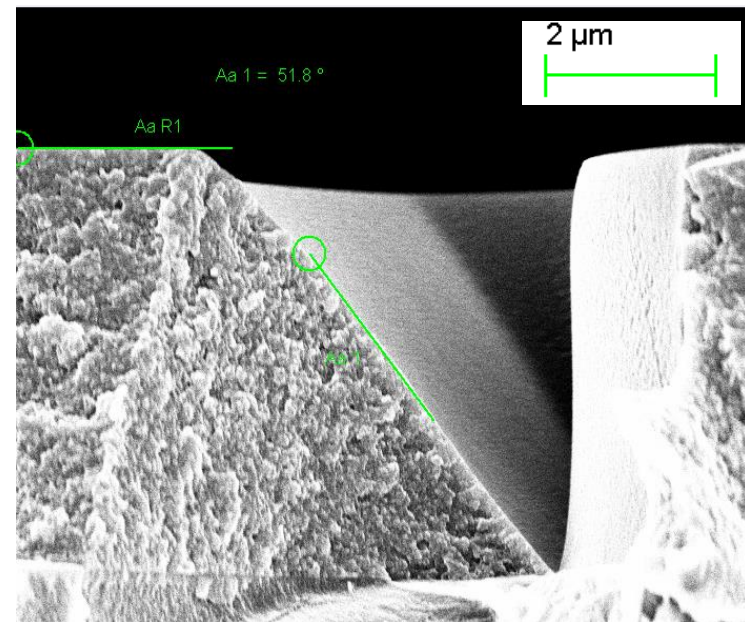
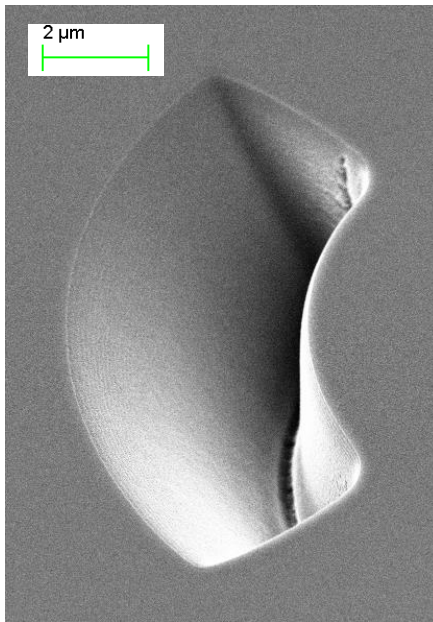
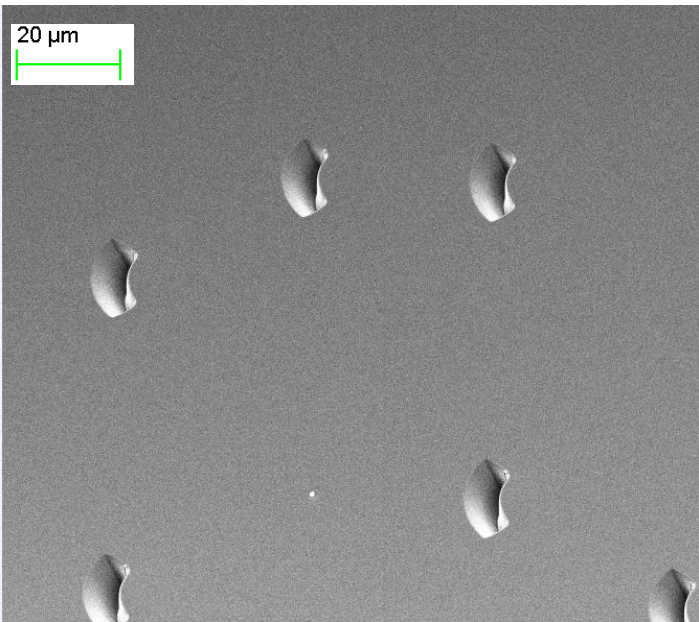


KEY BENEFITS

- > Ultra thin and flexible
(down to 10 μm total thickness)
- > Excellent optical performance
by precise structures
- > Customized arrangements and
parameters

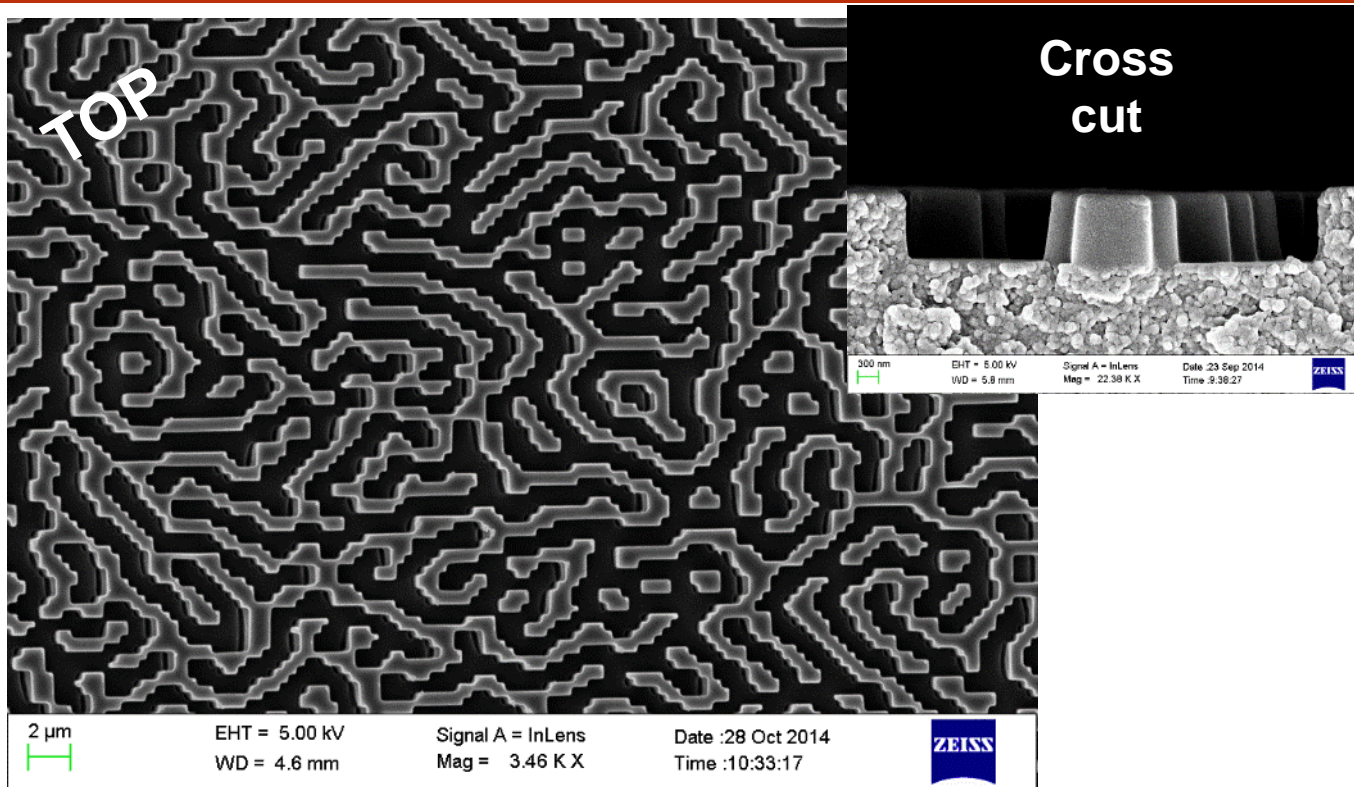


EXAMPLES OF THE UTILIZED STRUCTURES: MOLULATED MICRO PRISM FOR LIGHT OUTCOUPLING

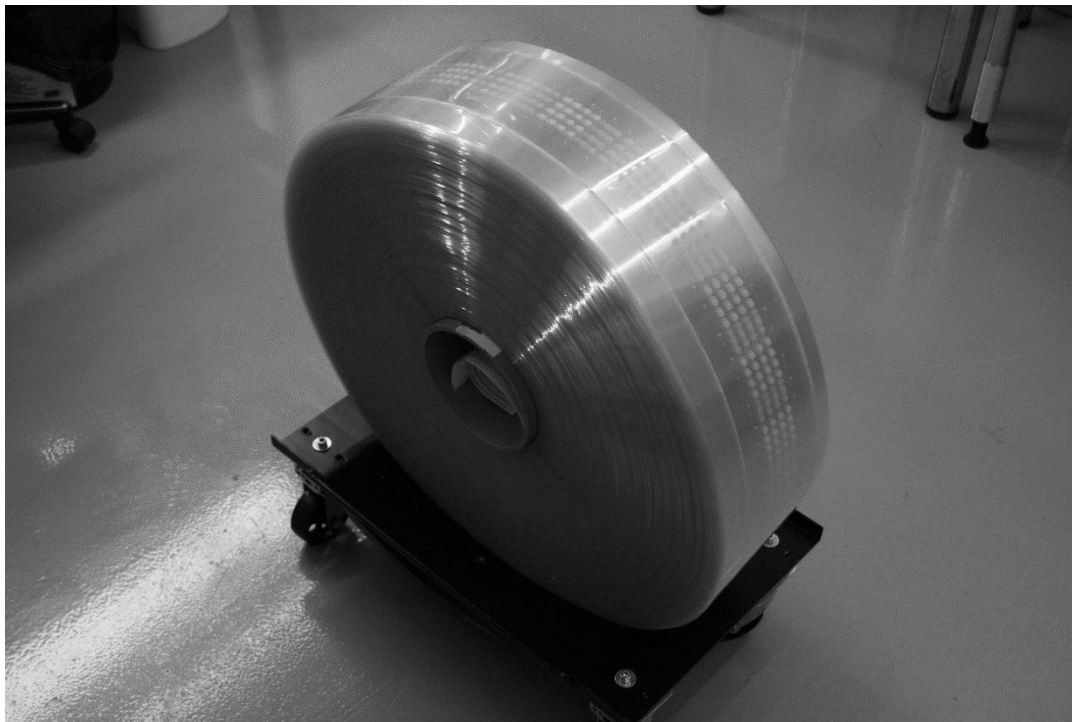


DOE DESIGN & STRUCTURE

EXAMPLE: IR-DOE AT 905 NM WAVELENGTH

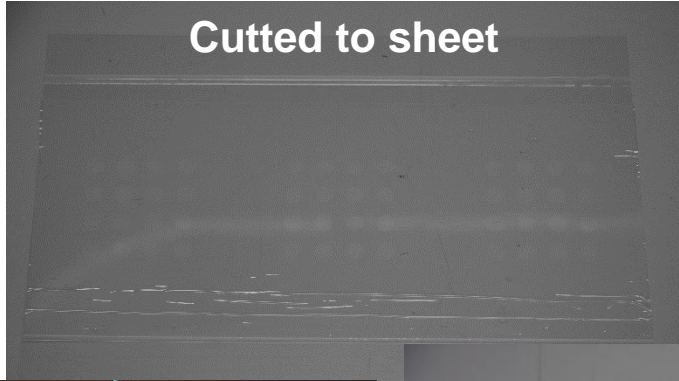


COMPONENTS ON ROLL FORMAT

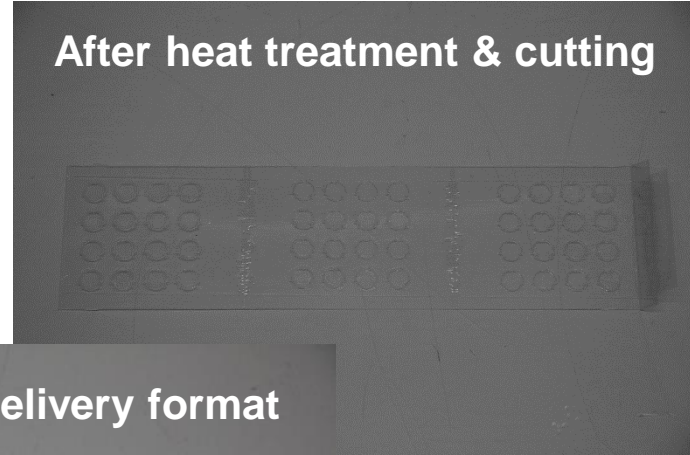


COMPONENTS ON PROCESS

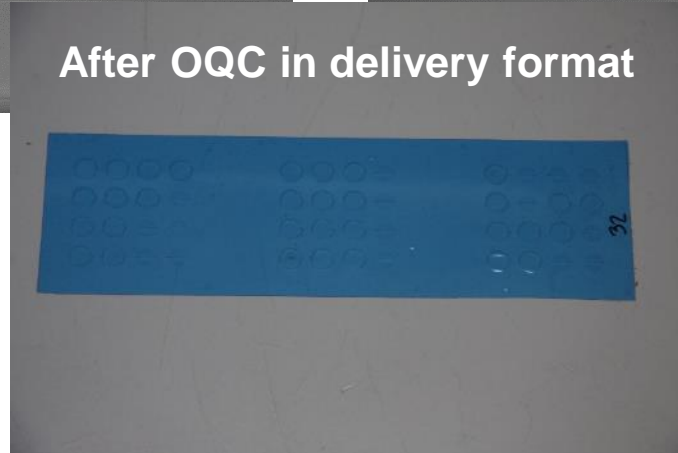
Cutted to sheet



After heat treatment & cutting



After OQC in delivery format



TURNKEY SOLUTIONS FOR DISPLAYS

We can help to solve complex customer challenges in today's fast-paced, global environment

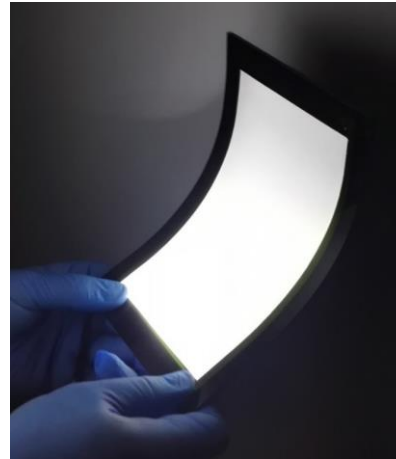
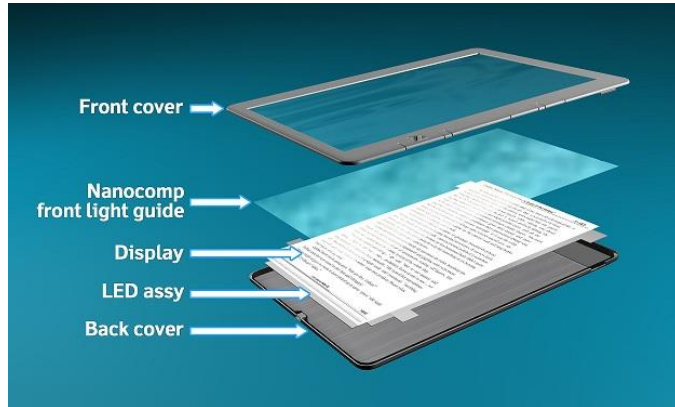
NANOCOMP

FLEXIBLE LIGHT GUIDING



DISPLAY ILLUMINATION

- Display back- and frontlight guides for portable devices (e.g. tablets, notebook PCs, E-readers), wearables, automotive etc.



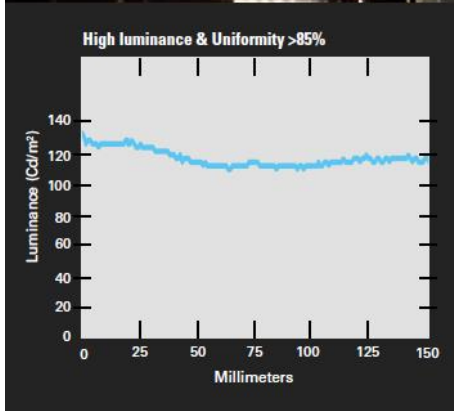
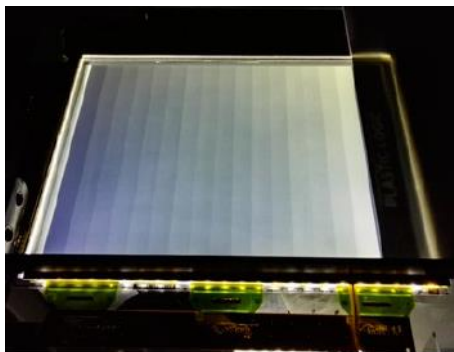
→ BENEFITS

- Ultra-thin & flexible: 0.2-0.5 mm
- Large sizes: up to 15.6" (diag.)
- Excellent optical performance through proprietary micro-imprint technology
- Cost effective and accurate UV-R2R mass-manufacturing process

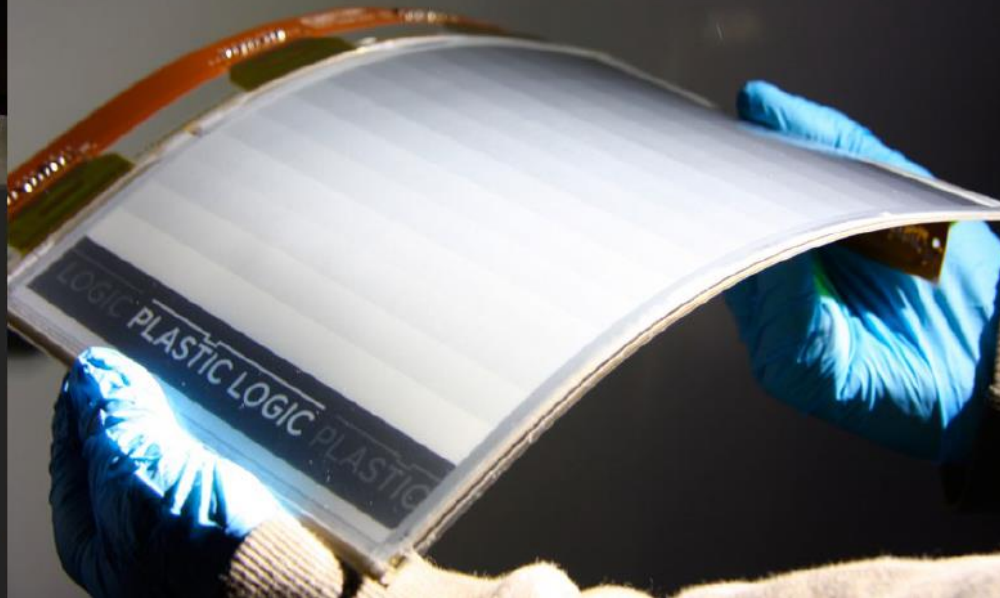
ULTRA THIN FRONT LIGHT GUIDE for e-paper display module

BENEFITS

- ✓ *Flexible & ultra thin: 0.2-0.375 mm*
- ✓ *Excellent color & clarity with invisible micro-structures*
- ✓ *Cost effective mass production through UV-R2R process*
- ✓ *Large sizes: up to 15.6" (diag.)*

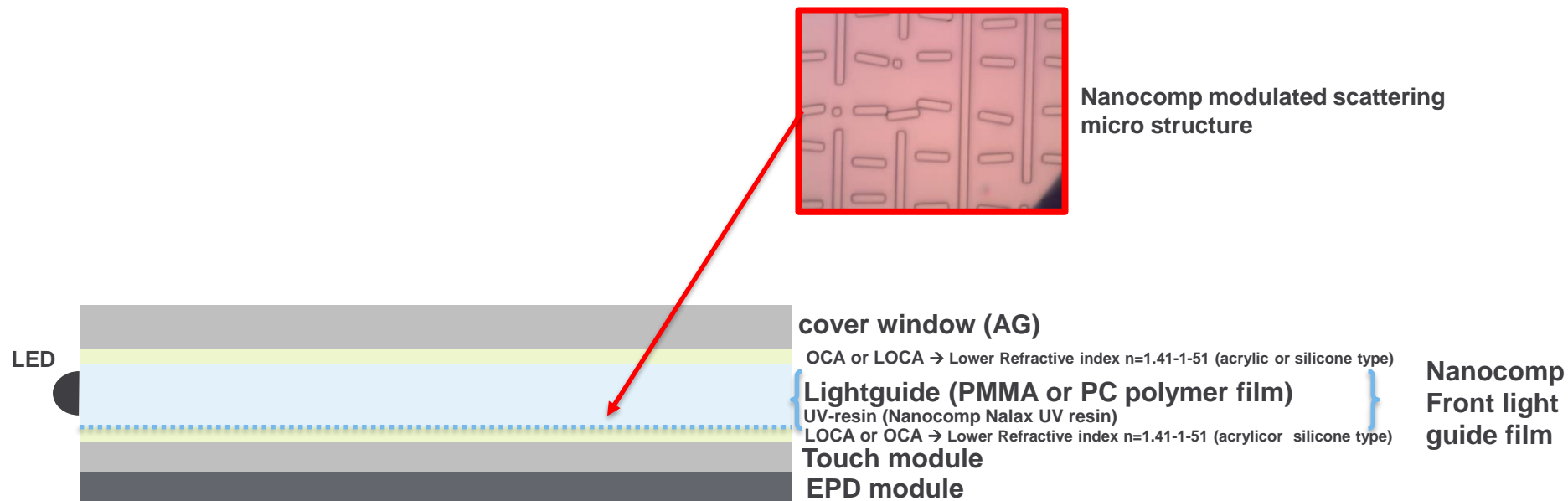


Truly flexible designs with high performance



10.7" FLG laminated on a flexible e-paper display.

REFLECTIVE DISPLAY STACK



Note: Figure not draw to scale

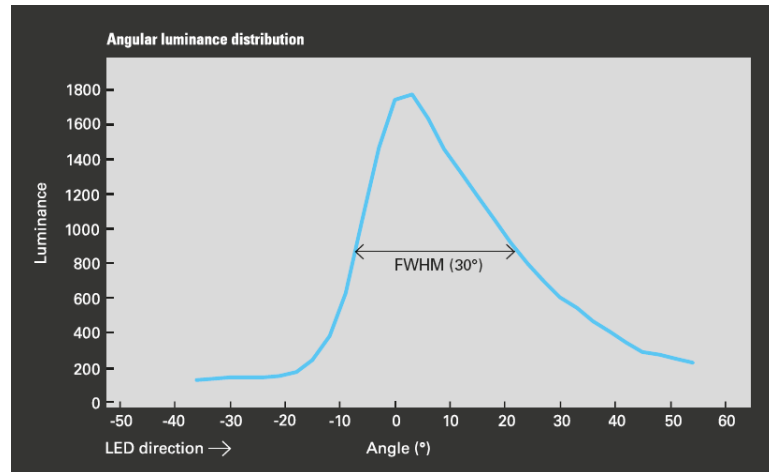
DIRECTIONAL LIGHT GUIDE FILM for lighting application

*High efficiency
and directivity*

*For displays and
all other lighting
applications*

BENEFITS

- > Can be used independently without other optical films
- > See-through component even with lights on
- > High accuracy UV-R2R mass-manufacturing process - Cost effective





THANK YOU!

www.nanocomp.fi

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FLEXIBLE LIGHT GUIDING



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