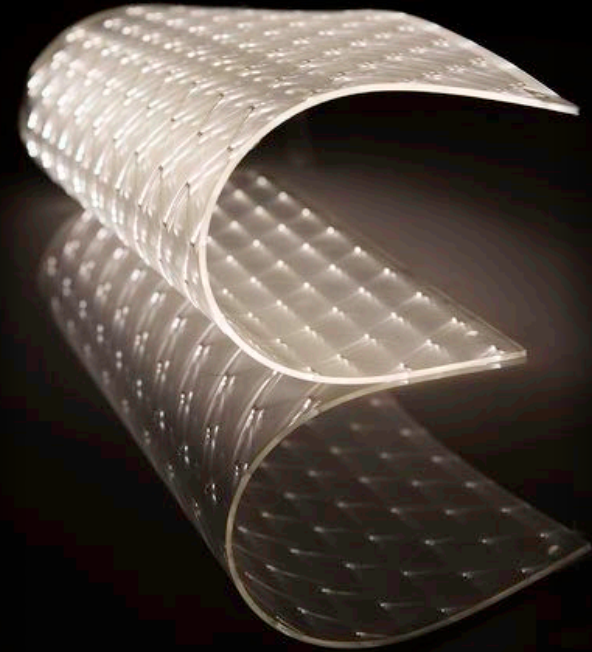




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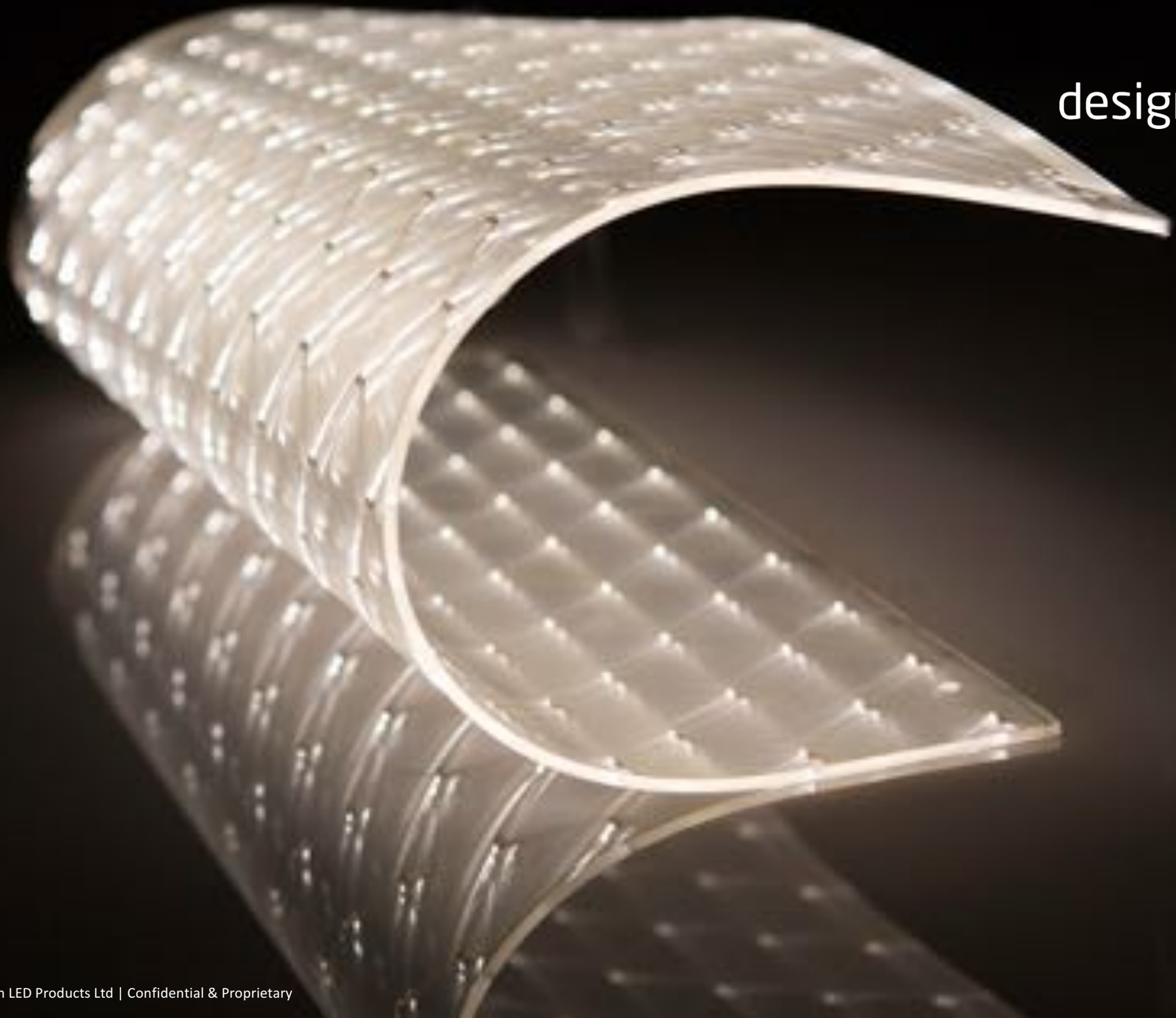


Flexible Large Area LED Modules: Total Customisation & Smart Lighting Potential

Dr Derek Peden
Innovation Manager



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Who Are We?

- SME, based in Scotland
- Head Offices near Edinburgh
 - Engineering
 - R&D & Innovation
 - Prototyping
- London Sales Office, focused on Retail Lighting & Architectural Lighting
- Manufacturing Licences
 - Parlex - world leader in flexible electronics
 - High Volume Lighting Manufacturer in Asia



Intellectual Property

- 51 granted patents
 - UK
 - European Patent Office
 - United States of America
 - China
 - Taiwan
 - India
 - Korea
 - Japan
 - Australia



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Investors

- Siemens
- OSRAM GmbH
- IKEA GreenTech (of IKEA B.V.)

SIEMENS





Our Strategy

Step 1.

Focus where we have a clear **Right to Win** in a **Valuable Market** segment

Step 2.

Collaboration in a high profile use case

Step 3.

Strategic alliance or partnership with **dominant market player**

Step 4.

Joint commercial exploitation on a global scale

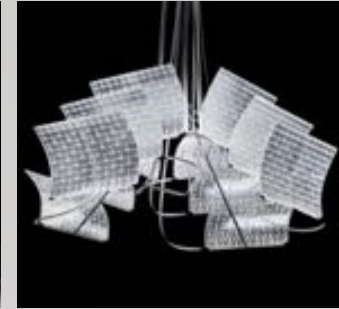
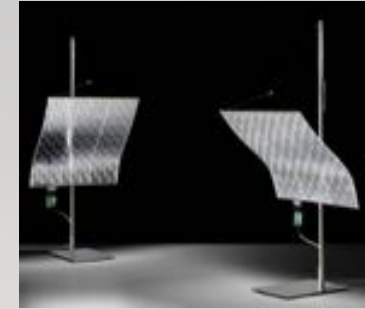


Our Strategy in Action

1. Design Concept in Consumer Lighting

2. Design Collaboration

- Ingo Maurer, Munich



3. Strategic partnership with dominant market player

- IKEA



4. Joint commercial exploitation on a global scale

- 2 rounds of investment
- Technology Transfer to IKEA manufacturer
- Collaboration on short/medium/long term products for international roll-out starting in Q1-18



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Disruptive Lighting Technology



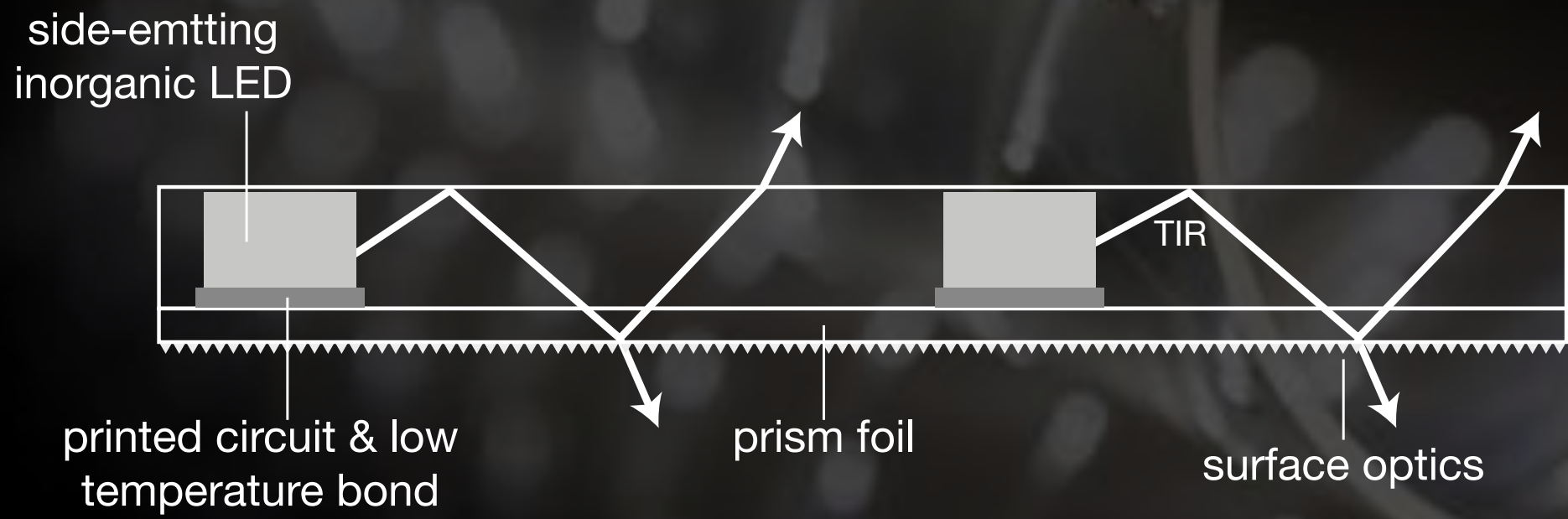
Disruptive Lighting Technology

- Thin, mechanically flexible LED lighting system
- Current technology base:
 - Screen printed electrical tracking
 - PET substrates
 - LED package SMT by thermally curable conductive epoxy
 - LED encapsulation by transparent polymer
 - Typical thickness of 1 - 2 mm, determined by LED



Surface Optics

- Textured inks
- White inks
- PET-based prism foils

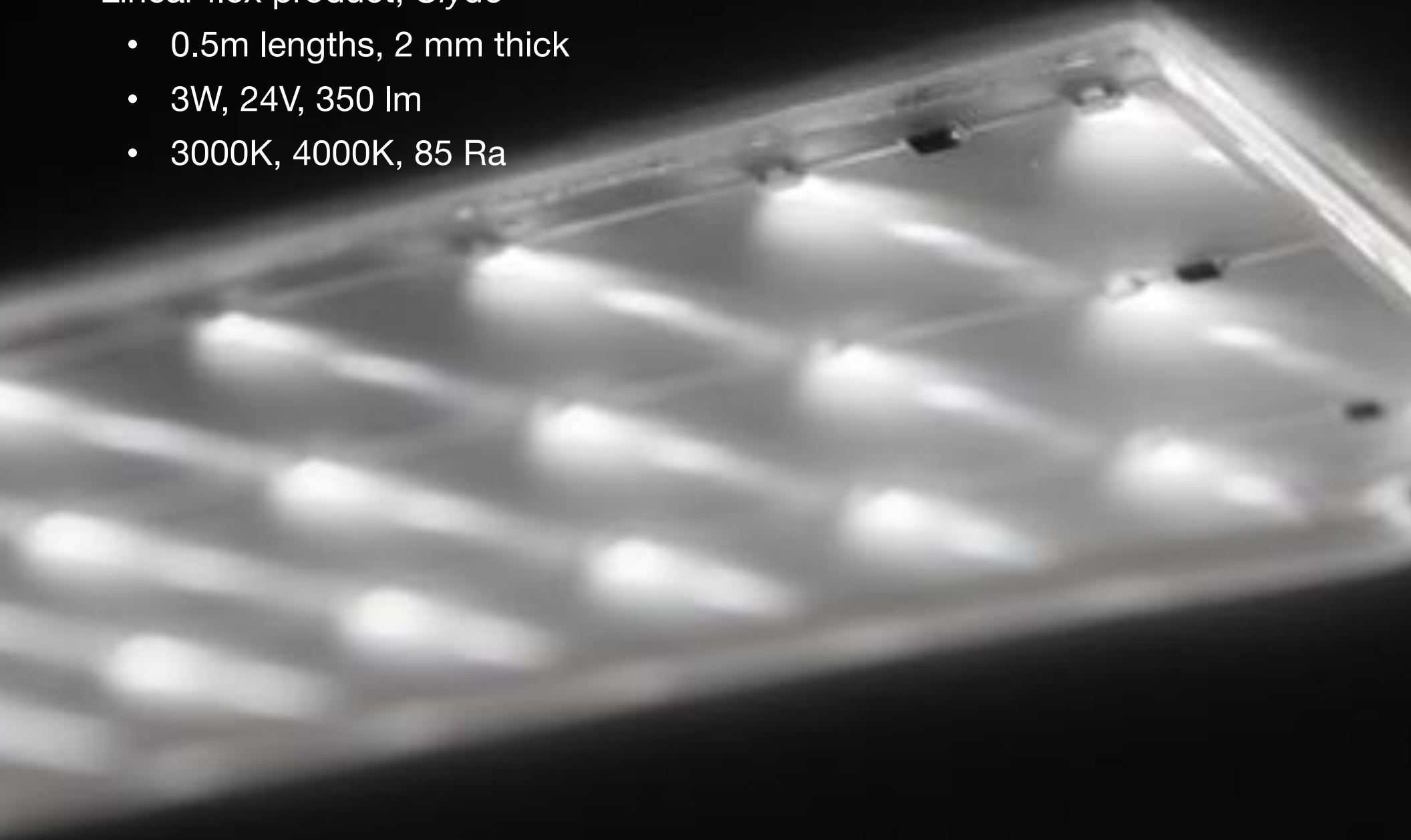


Direct Lighting Example



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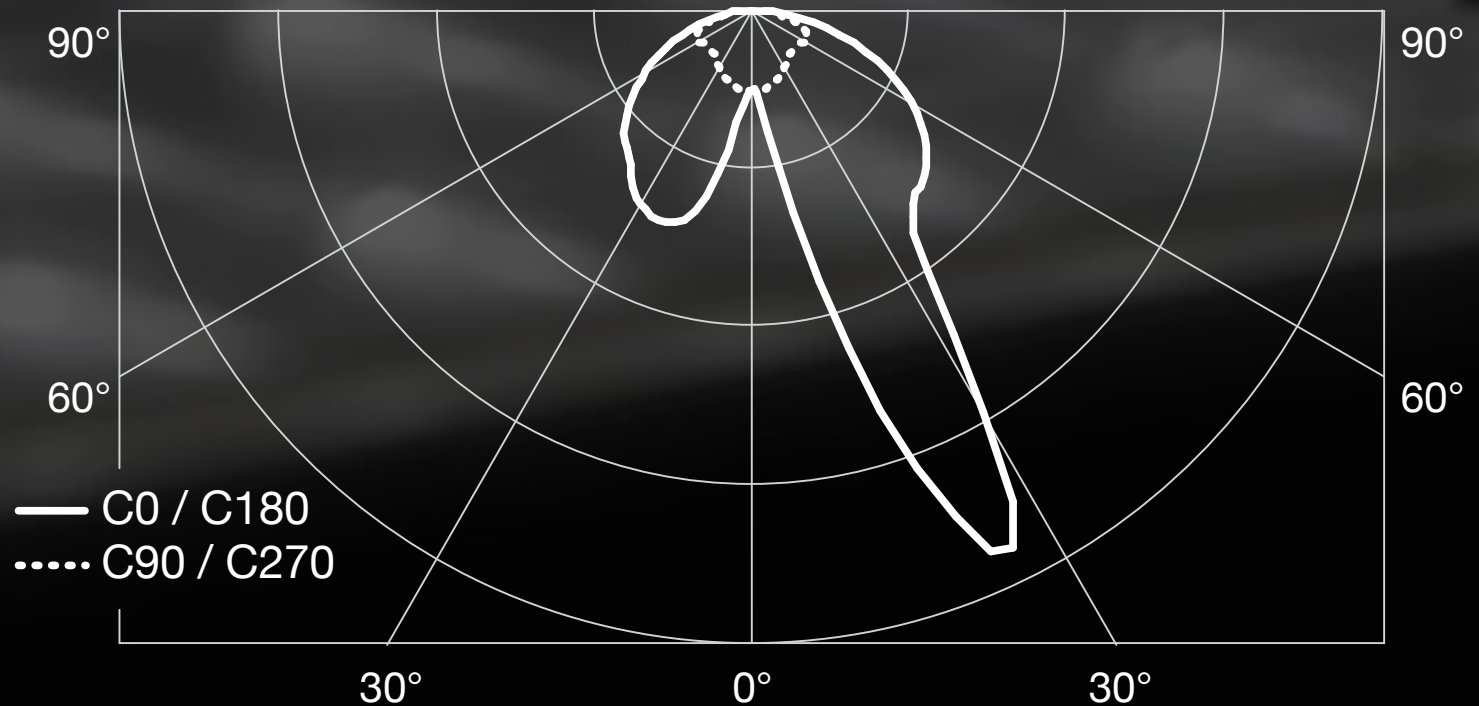
- Linear flex product, *Clyde*
 - 0.5m lengths, 2 mm thick
 - 3W, 24V, 350 lm
 - 3000K, 4000K, 85 Ra





Tile light intensity distribution

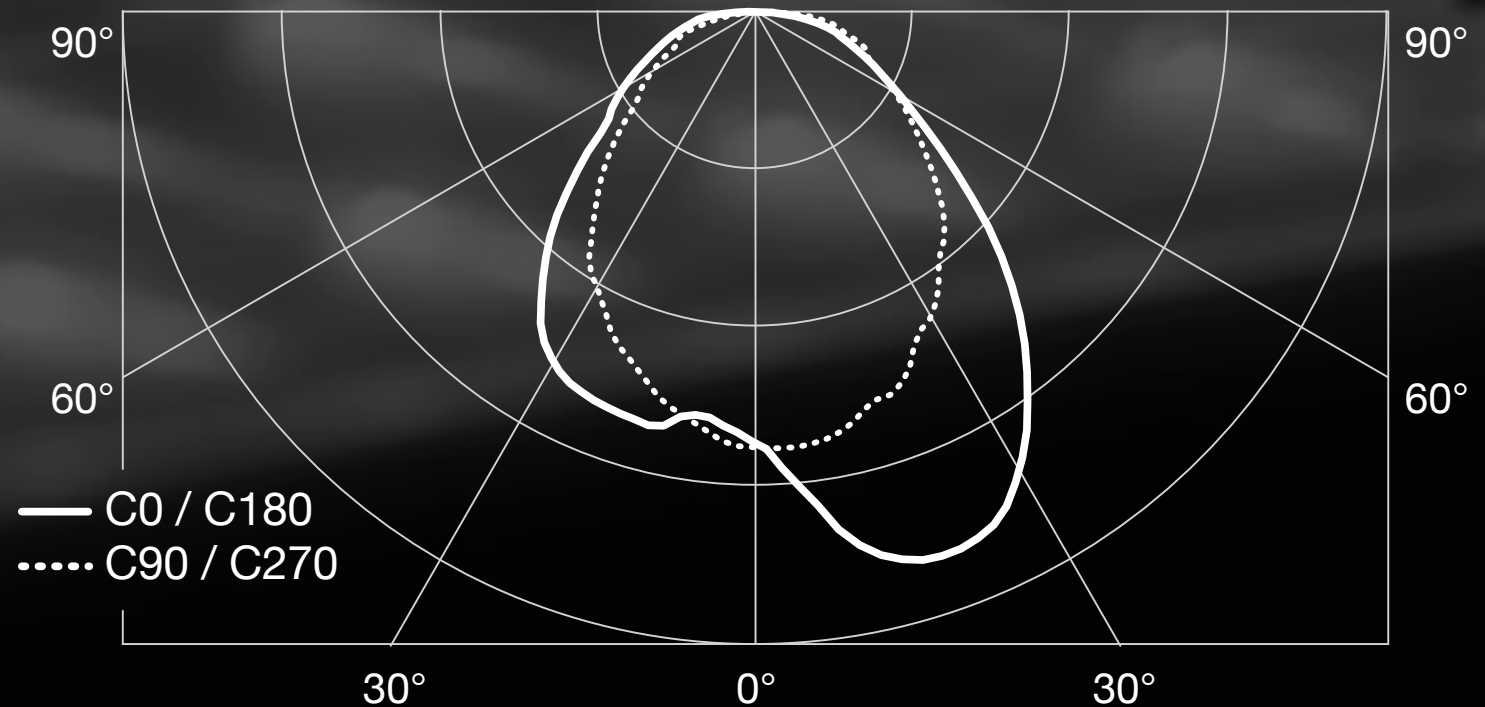
- 90° PMMA prism film substrate
- Prisms against diffuse reflector





Diffused light intensity distribution

- Prismatic film substrate
- Prisms against diffuse reflector
- Diffuser on resin surface





- Focused illumination from lambertian LED
- High light quality - no shadow artefacts





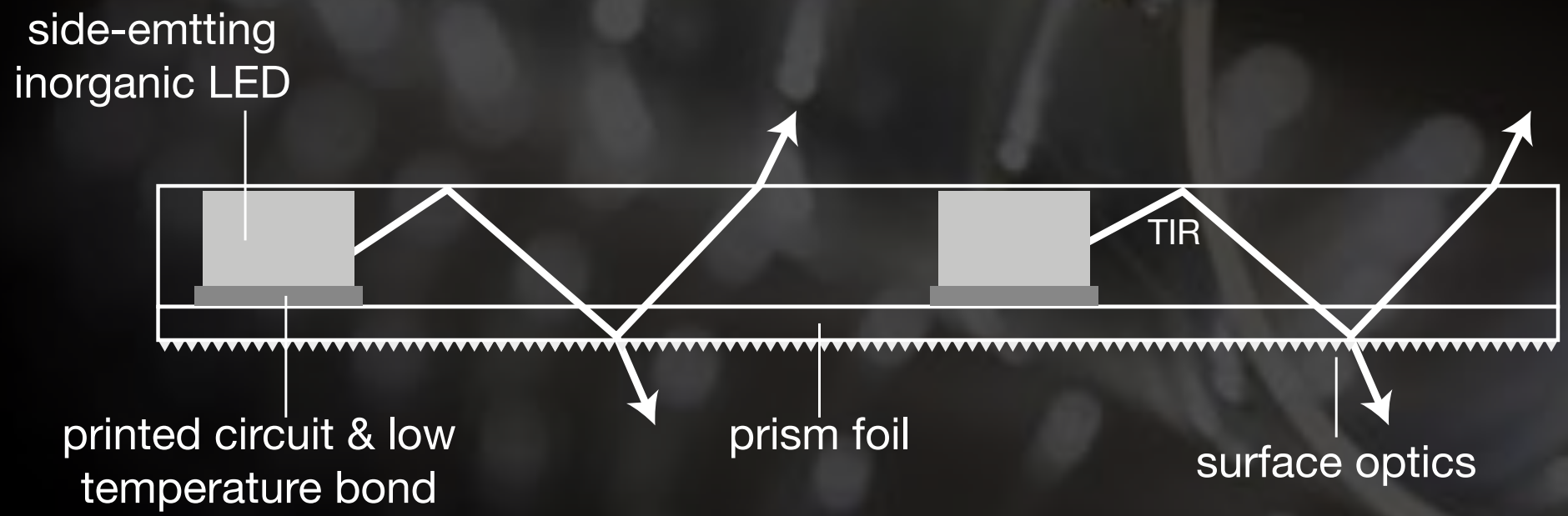
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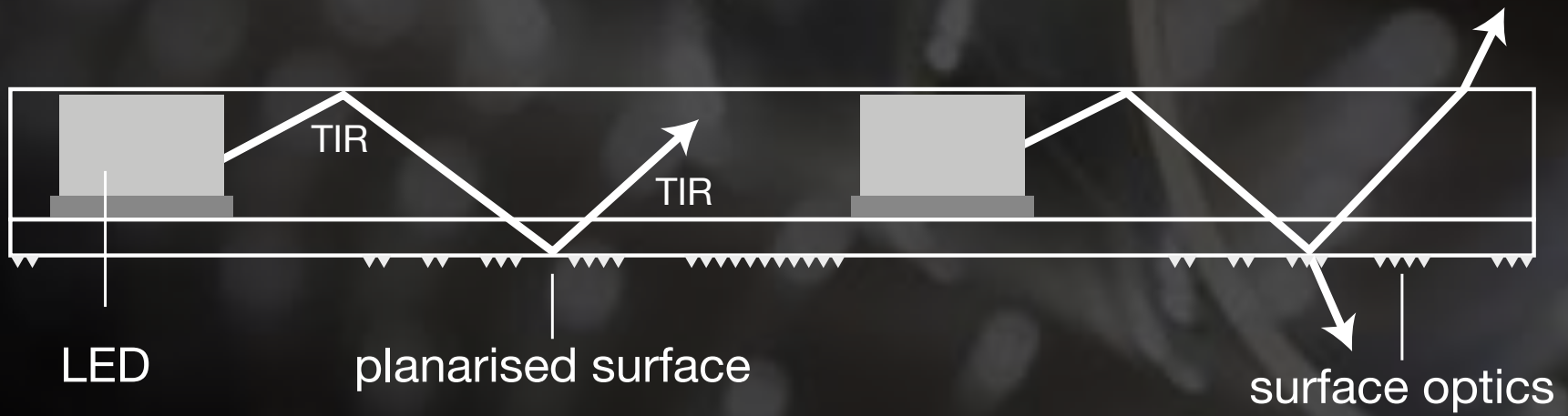
Surface Optics

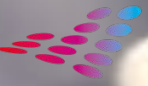
- Textured inks
- White inks
- PET-based prism foils
- **Clear ink - *index matched to prism structure***



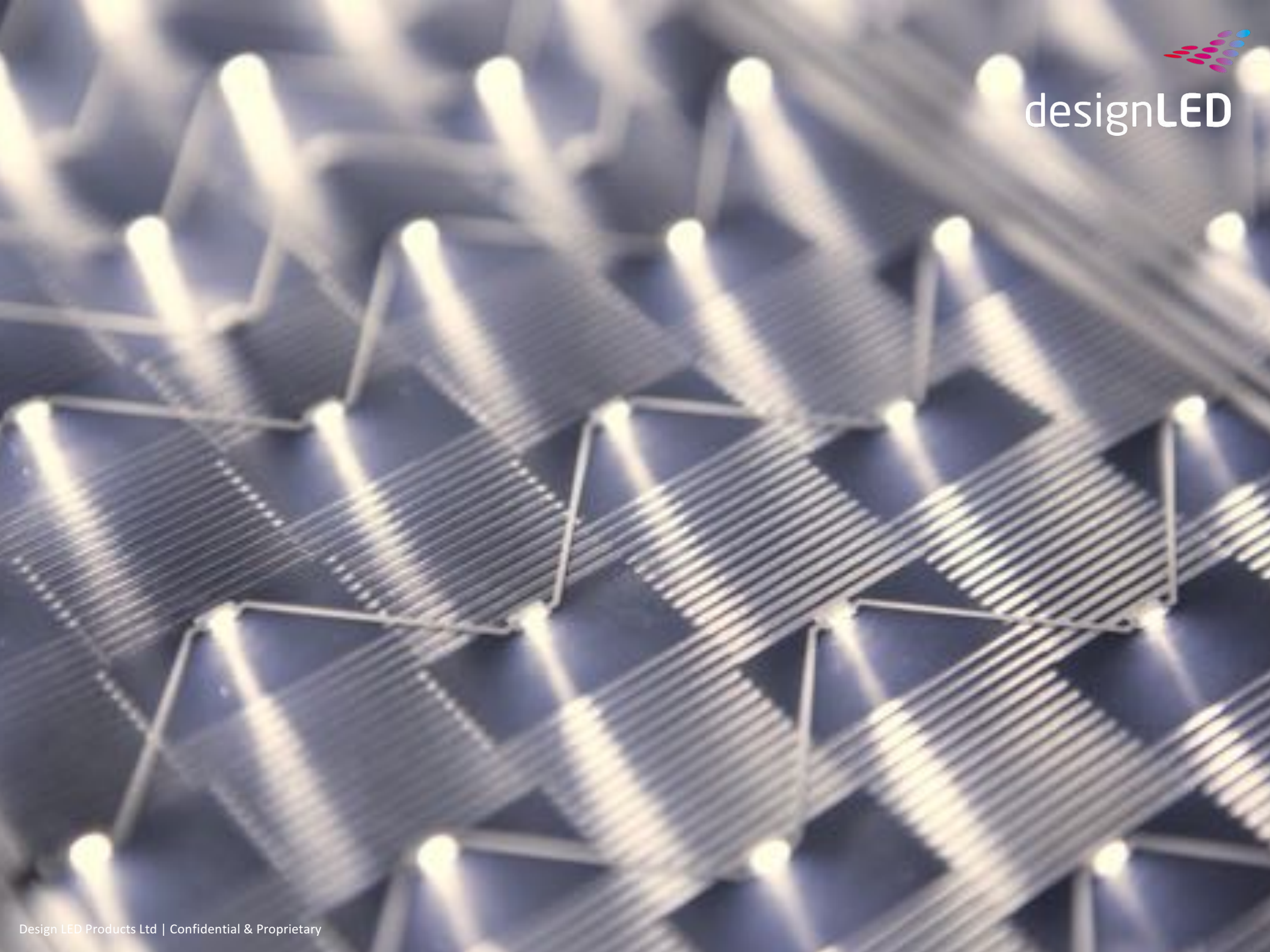


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PRIFYSOOL
ABERTAWNE



CROESO
WELCOME

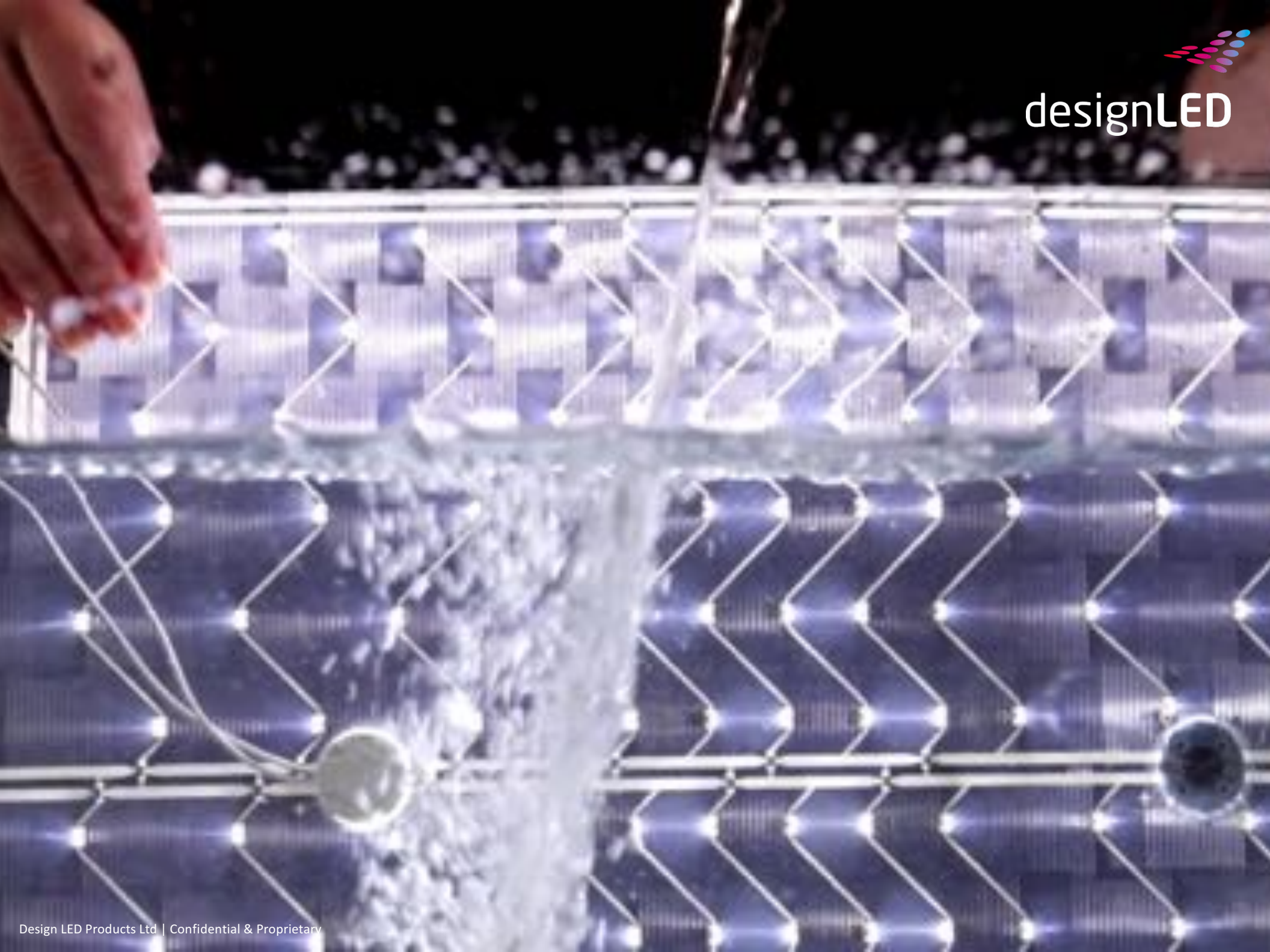


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Customisation

- Form Factor
 - Size, ≤ 0.5 m per module
 - Shape
- LED
 - Quantity
 - CCT (2700 K - 6500 K)
- Electrical Layout
 - CV
 - CC
- Interconnect
 - Pin-Header
 - Custom IDC (IP67)
 - FFC tail
 - Other

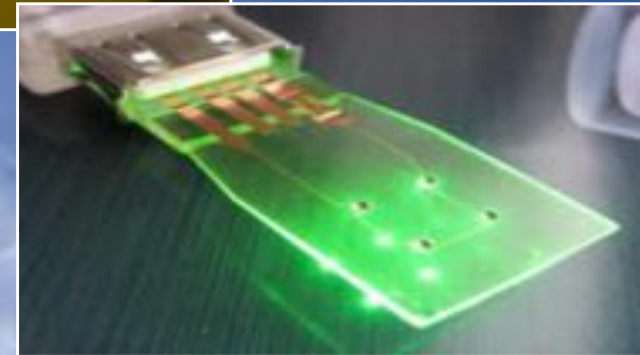
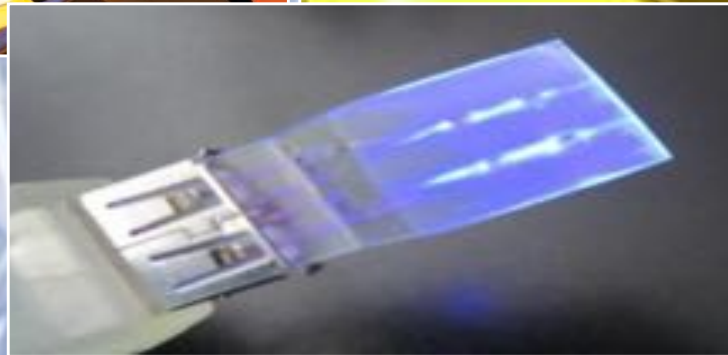
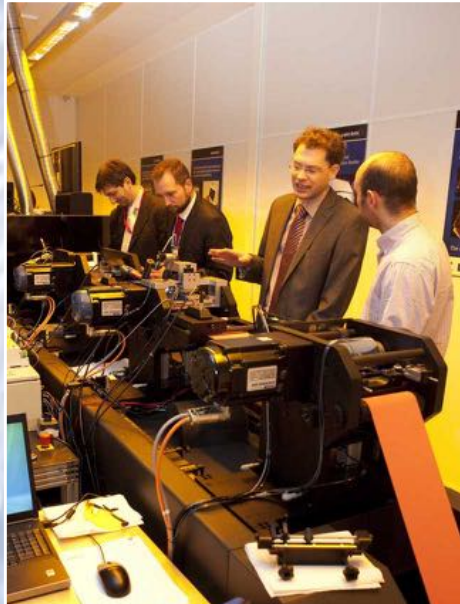
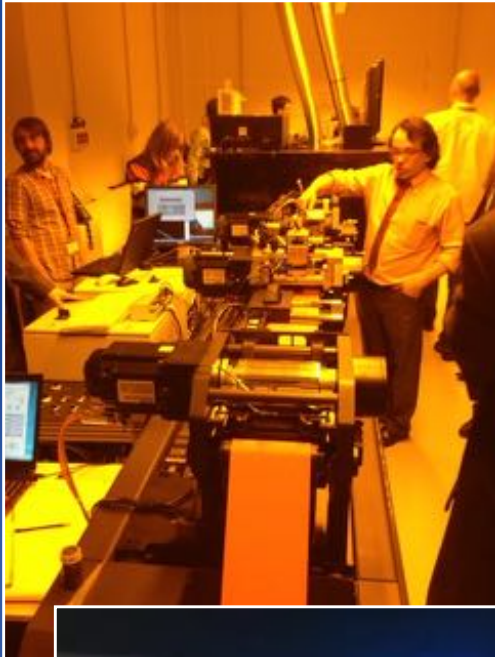


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European Projects



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Light-Rolls

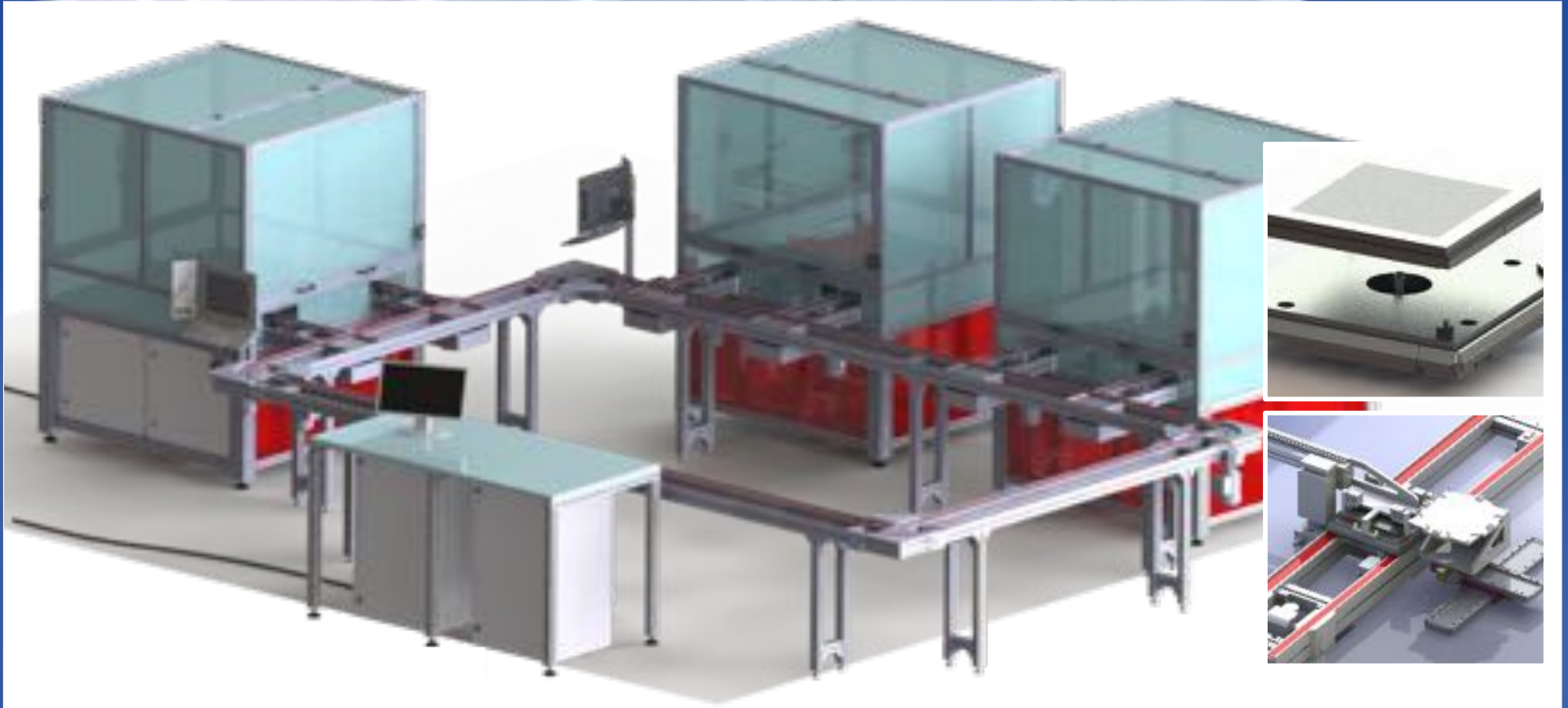


FACTORY OF FUTURE



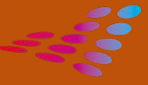


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SL SMARTLAM





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Smart Lighting



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Smart Lighting

- Large Area Electronics
- Film based system for smart light integration



Smart Lighting

- Electronics Integration
 - Packaged Devices
 - Chip Integration
- Sensing
- Control
- Connectivity



Smart Lighting

- Human Centric Lighting
 - Wellbeing
 - Sustainability
 - Circular Economy
- Smart Horticultural
 - Vertical Farming
 - Hydroponics
 - Aquaponics



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e.g. Growth Monitoring

- Proximity Sensing
- Colour
- Environmental





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What's Next?



What's Next?

- EU Funded Collaborations
- Joint Development



Materials & Processing

- Roll-to-Roll Manufacture
- Fine-pitch printing & SMT
- Electronics Integration
- Optical Films
- LED Packaging

A curved, perforated metal structure, possibly a light fixture or architectural element, is shown against a dark background. The structure is illuminated from within, creating a glowing effect. A cluster of colorful, oval-shaped lights in shades of red, pink, purple, and blue is visible on the right side of the structure.

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www.designled.com