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BATM SYSTEMS

Welcome to ICT Seminar
Hayling Island

Spirit Circuits

Lunaris Experience

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Who remembers this chap

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THE BETTER WAY

The Innovators Dilemma – a real word example in PCB imaging

ICT Annual Symposium | 5th June 2013

Stuart Hayton

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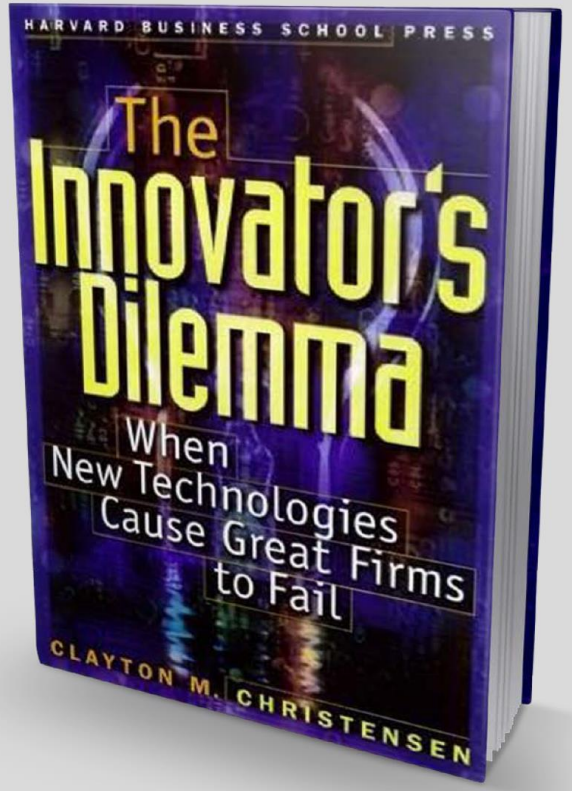
Background

Harvard Professor
Clayton M. Christensen



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www.mutracx.com

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Disruptive Technology

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Disruptive Technology

Vs.

Sustainable Technology

Disruptive technology

A disruptive technology is one that displaces an established technology and shakes up the industry or a ground-breaking product that creates a completely new industry

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Customers don't always know what they need selling a disruptive concept is not easy

- Budgets are easy with existing technology, disruptive technology re-writes the rule book and assumptions have to be made
- Unstated and future needs are not considered with sustainable technologies Safe bet syndrome
- Hanging on to existing revenue streams not risking new avenues of opportunity are common drivers in decision making

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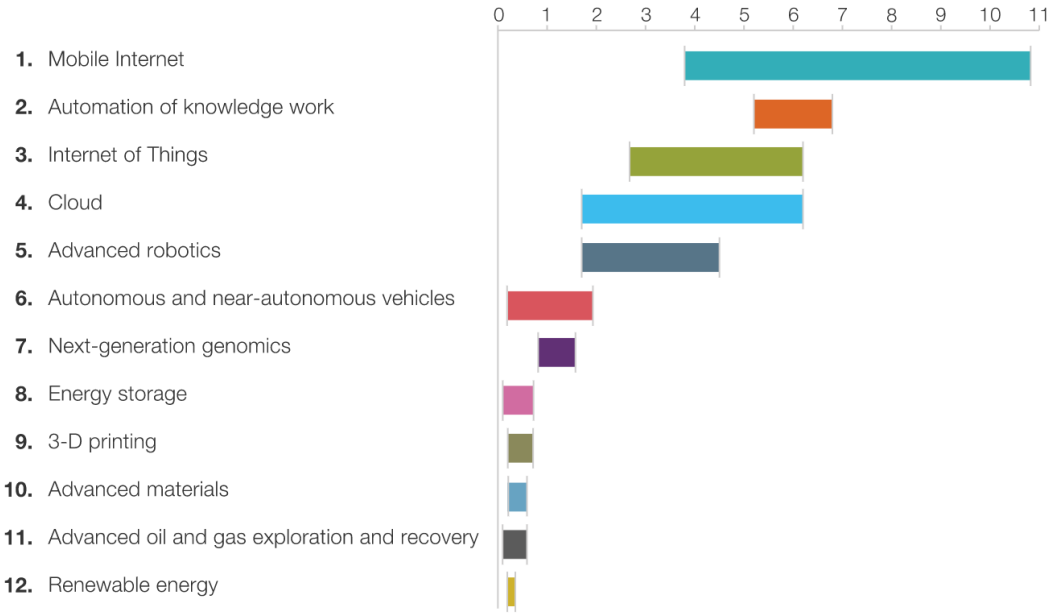
Simple examples of disruptive technology

- Computer displaced the Typewriter
- Email displaced letter writing
- Digital printing vs. Silver Halides
- 3D printing displaces milling and moulding

McKinsey Report

A gallery of **disruptive technologies**

Estimated potential economic impact of technologies across sized applications in 2025, $ trillion, annual



SOURCE: McKinsey Global Institute

Notes on sizing: These economic impact estimates are not comprehensive and include potential direct impact of sized applications only. They do not represent GDP or market size (revenue), but rather economic potential, including consumer surplus. The relative sizes of technology categories shown do not constitute a "ranking," since our sizing is not comprehensive. We do not quantify the split or transfer of surplus among or across companies or consumers, since this would depend on emerging competitive dynamics and business models. Moreover, the estimates are not directly additive, since some applications and/or value drivers are overlapping across technologies. Finally, they are not fully risk- or probability-adjusted.

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3 years later we ordered one and it is now installed in Romania

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Why did we choose Lunaris

- We had a blank canvas and no barriers to overcome
- New factory, new staff, new technology
- No pre-conceived ideas on how to make a PCB
- Green credentials
- Suited to agile manufacturing
- Reduced lead times
- Low energy consumption
- Small foot print
- Modern, clean, innovative and forward thinking
- Capability matched our needs
- Plug and play
- Local supply and support

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We are in production

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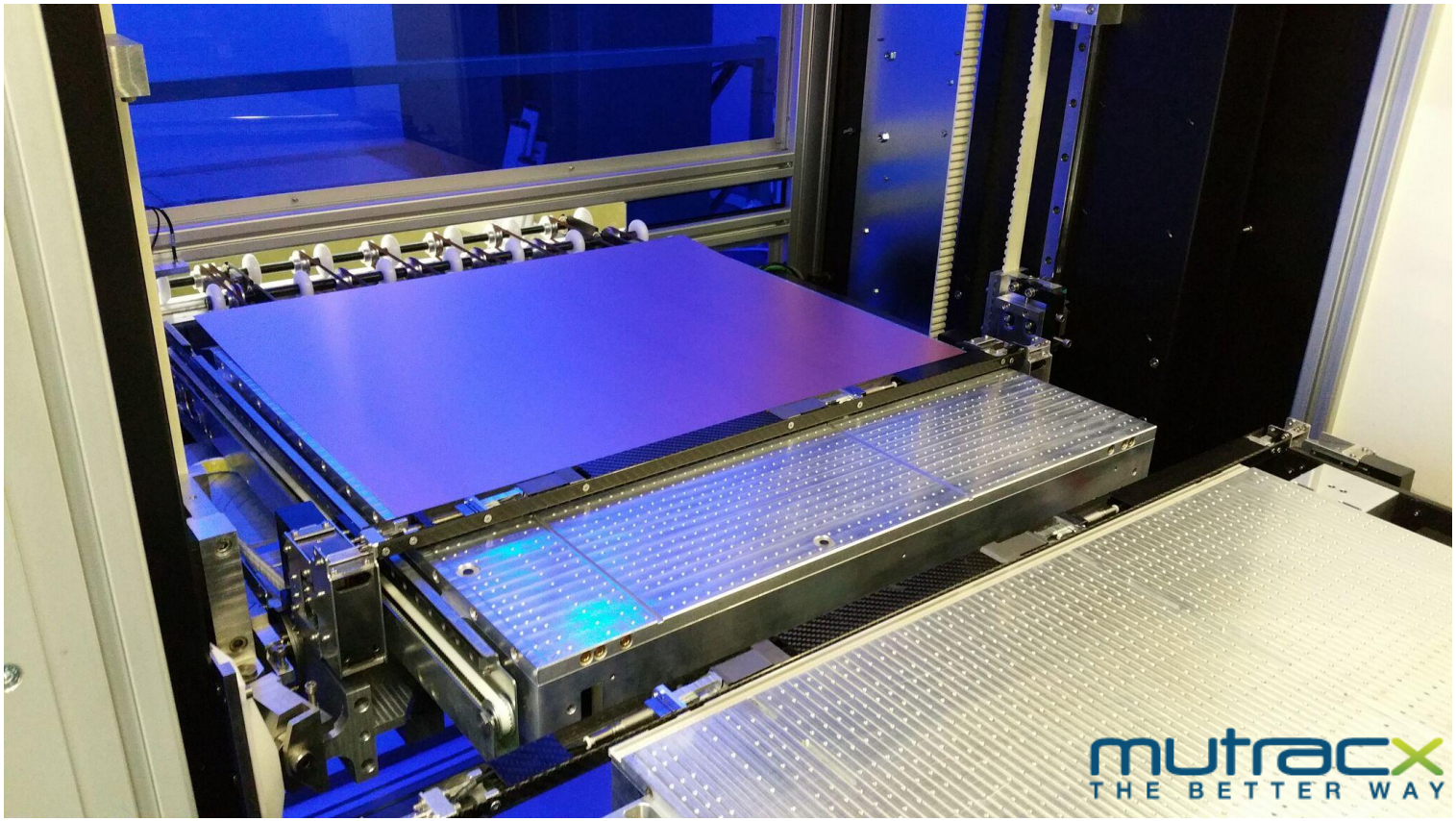
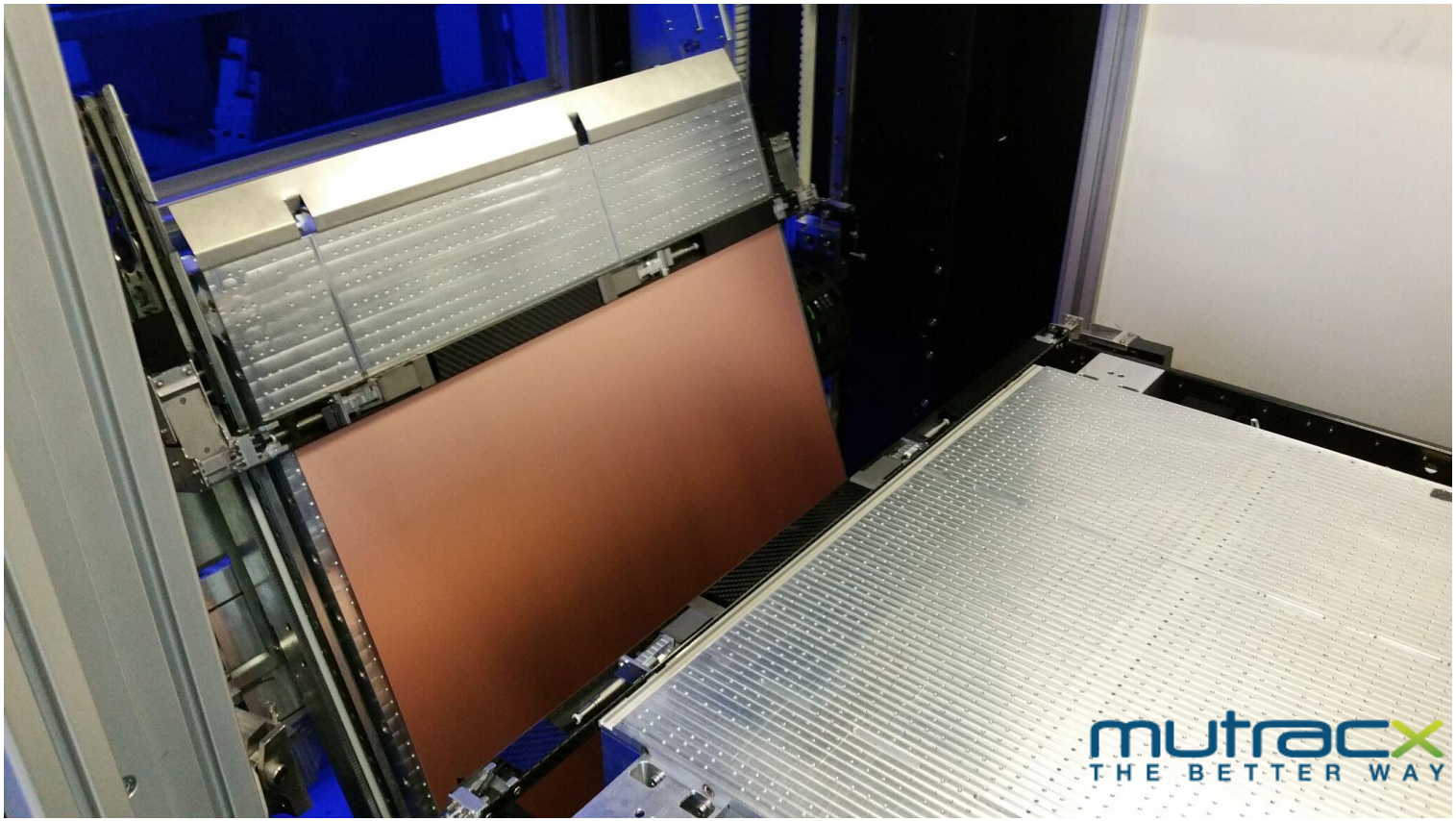
- Training and support has been excellent
- CAM training was 5 minutes.
- Operator training, simple and easy to use
- Maintenance and up keep is ongoing and we are learning all the time.
- Print heads are the main area of maintenance
- Start-up is long with calibration panels and head cleaning
- Reliability has been very good nothing catastrophic
- Evolvement and tweaking of the machine to suit our production has been received well and modifications are in process.
- Printing is a proven process.
- Engineering team are excellent

Panel delivered to the “Chuck”



Panel is gripped and then held by vacuum



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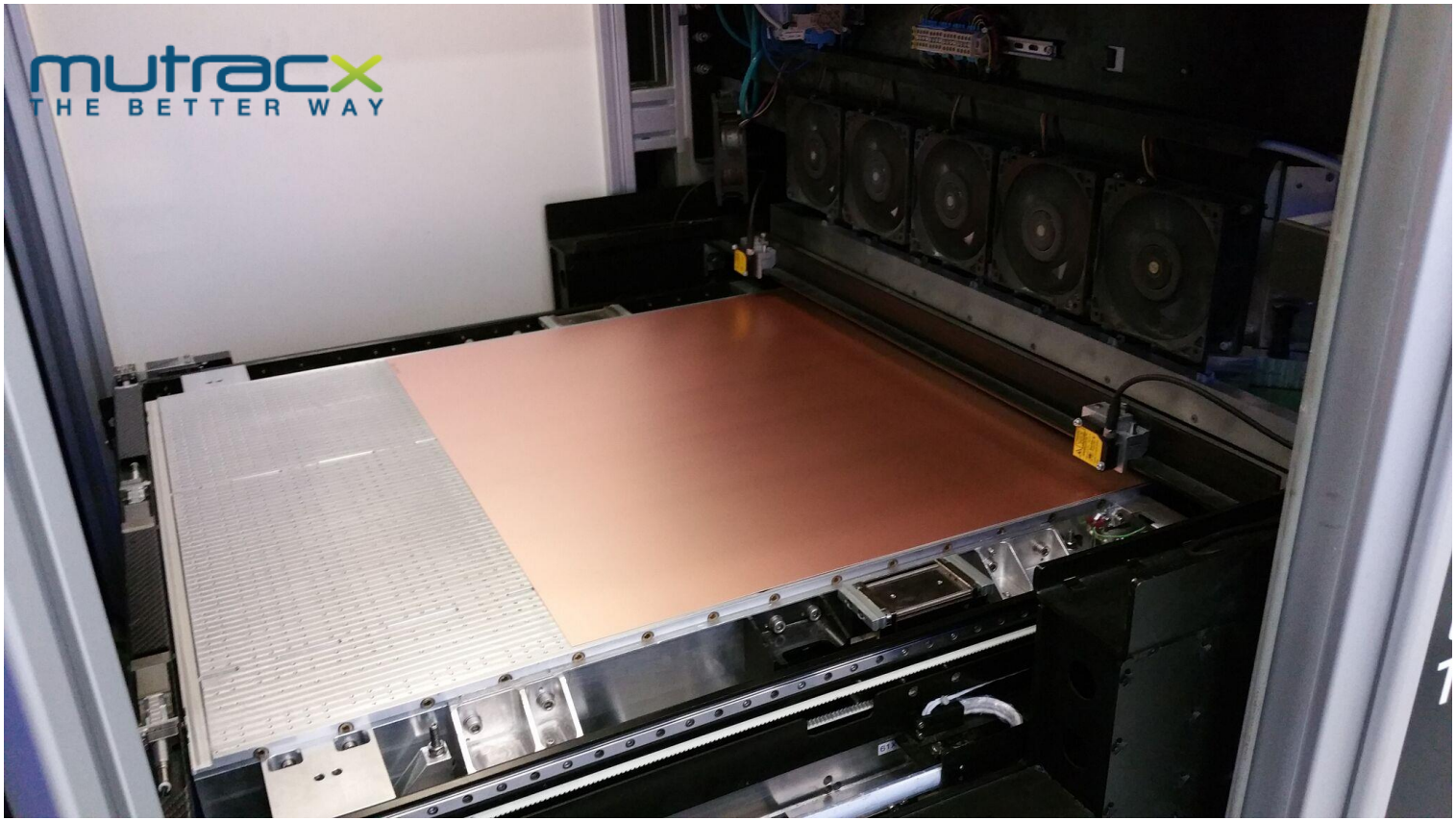
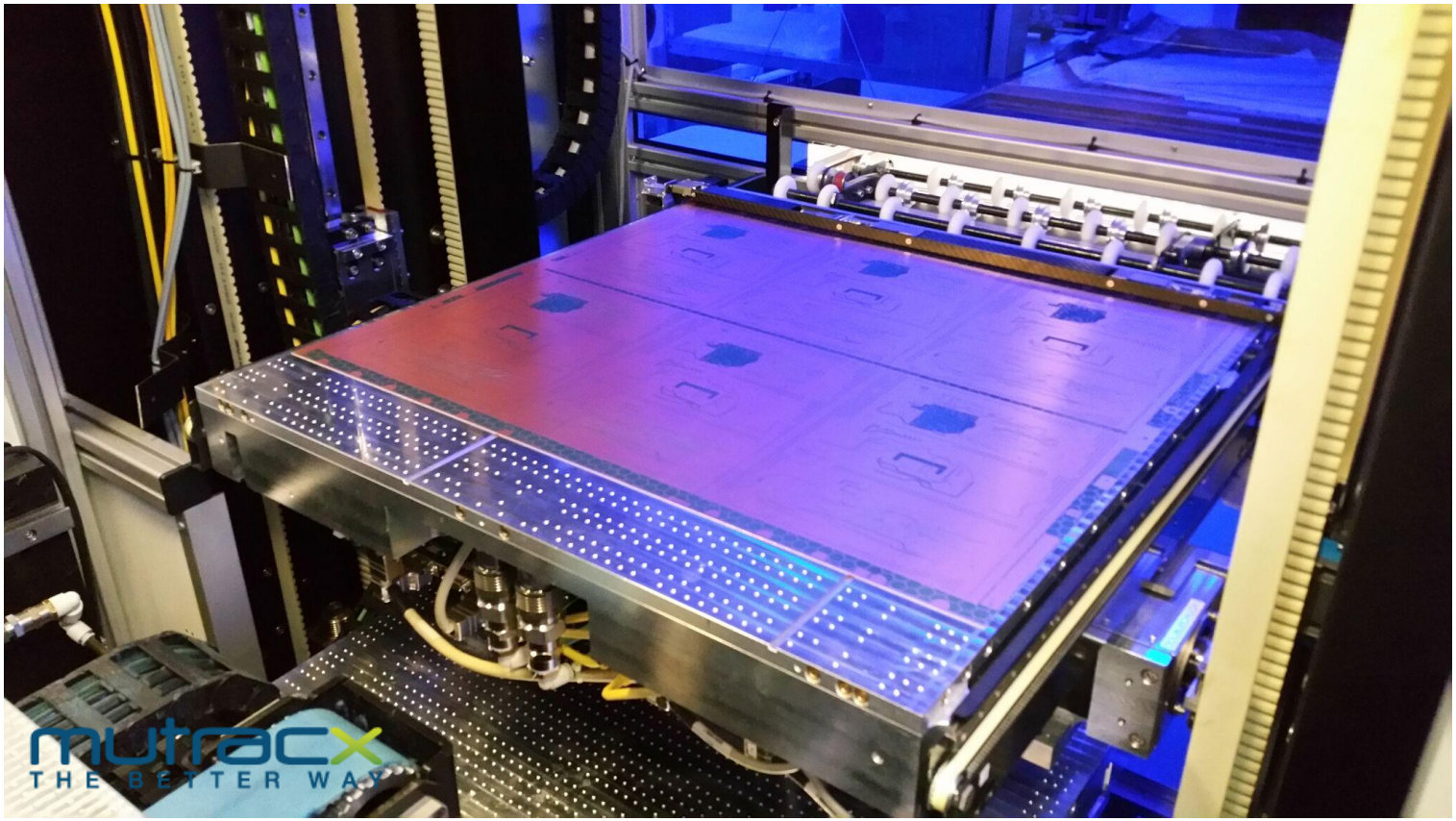
Panel enters the print zone and is protected by “bull bars”



Printing is performed by 20 of the 60 heads



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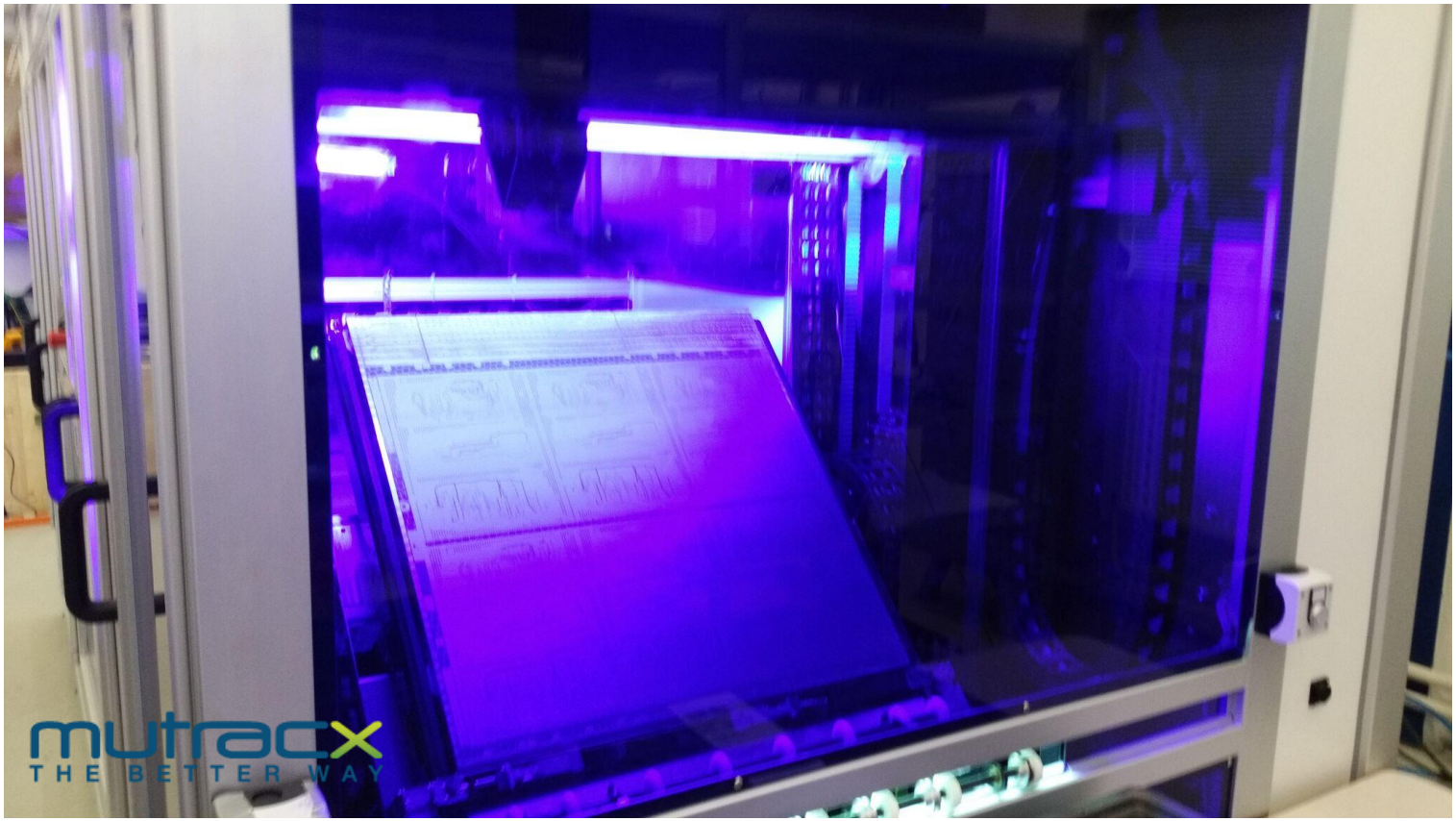
The image is printed, AOI is performed on the fly and then the image is cured



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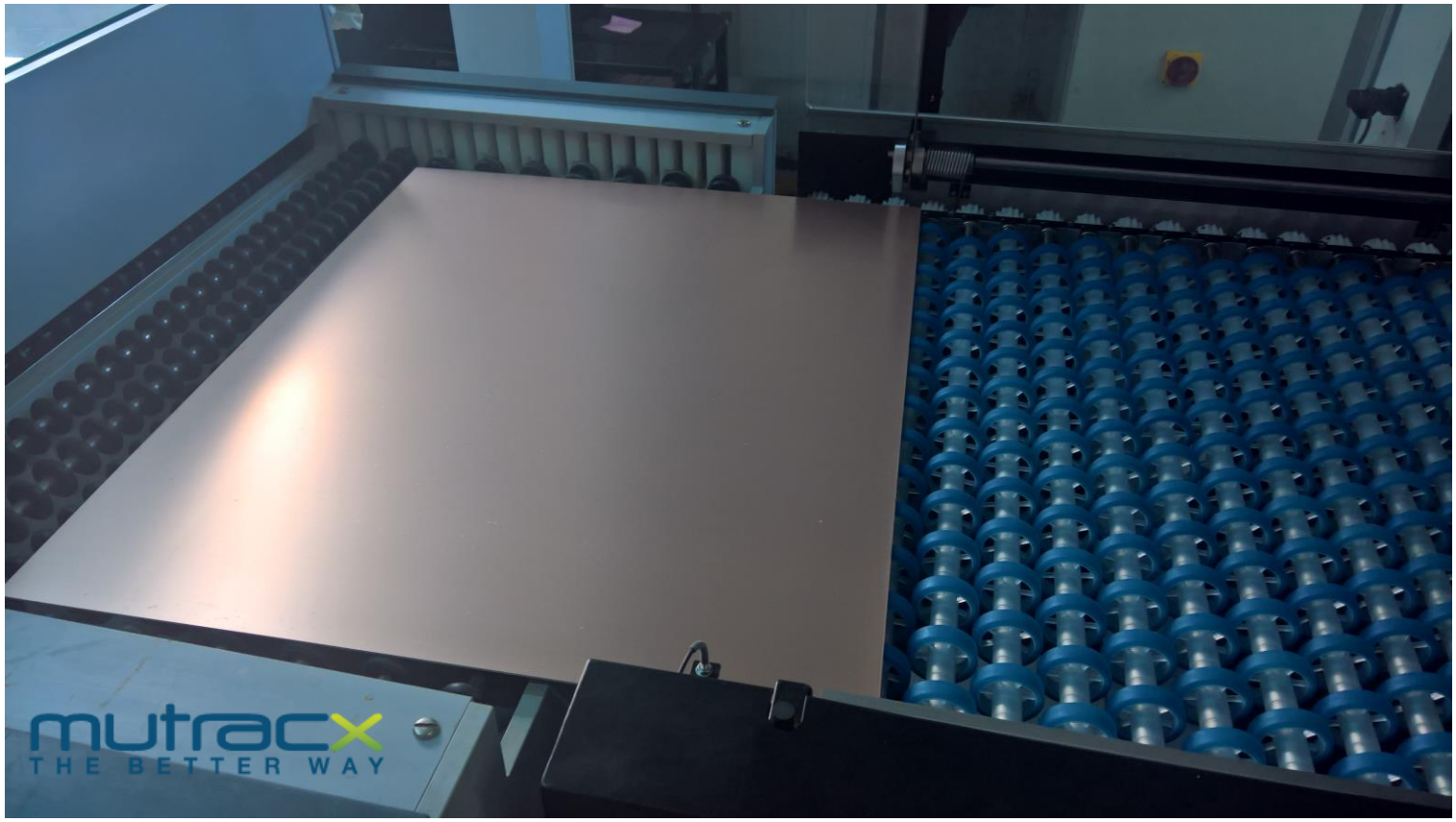
Some of the challenges

Pre clean vs. no clean



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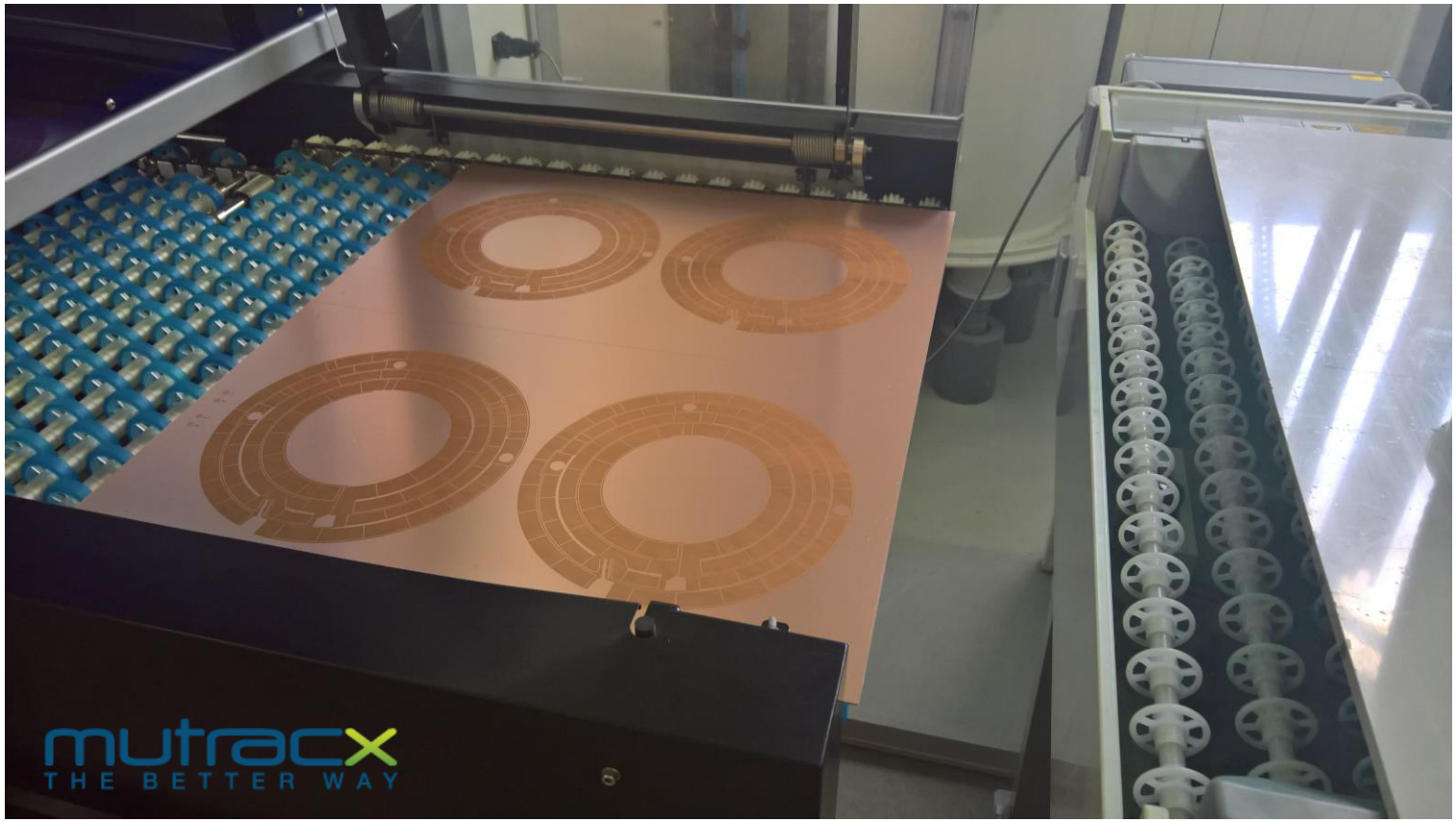
Typical production panel



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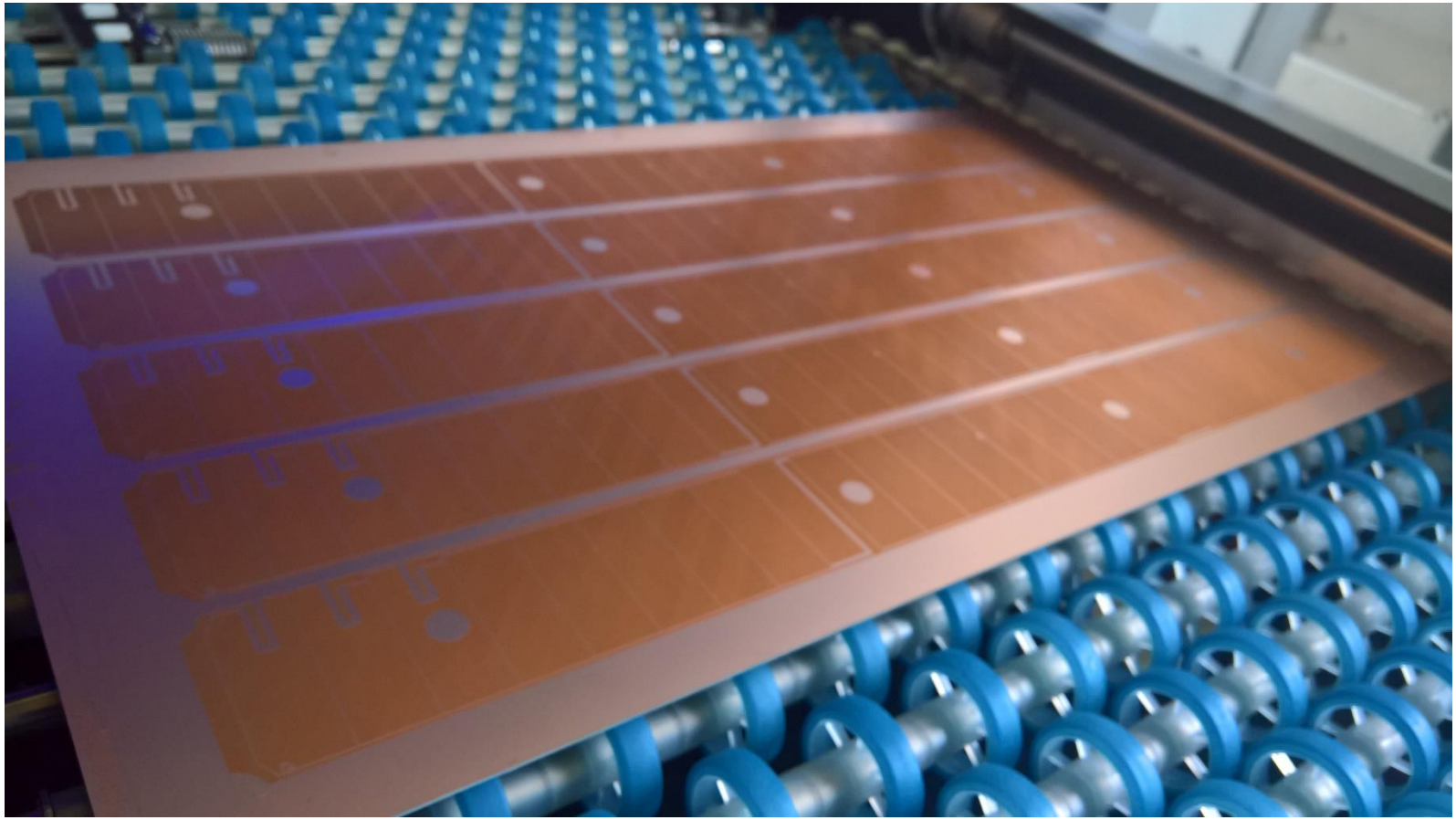

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Dow Chemicals Etch Resist

- Dow Lithojet 223 hybrid ink
- Hotmelt UV-curable
- Acidic & alkaline etch resistant
- Sn/Cu plating compatible

Non-toxic, environmentally safe etch resist

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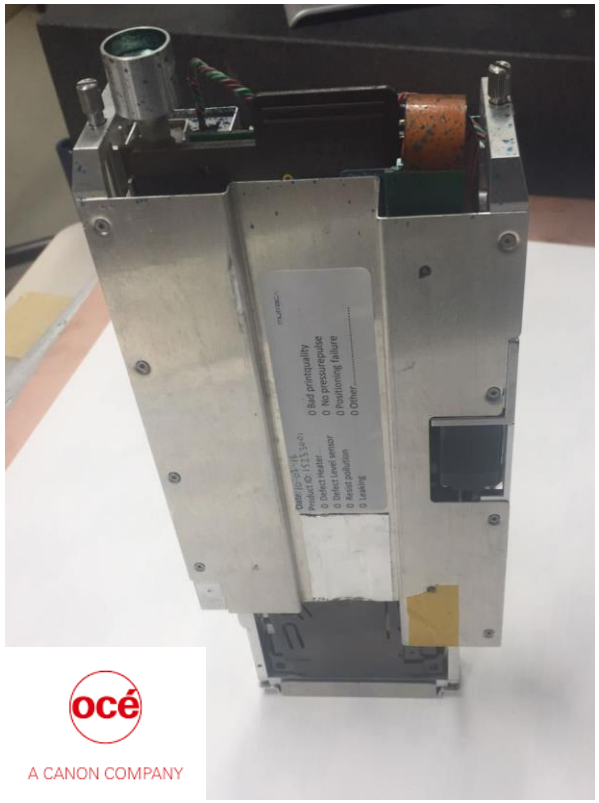
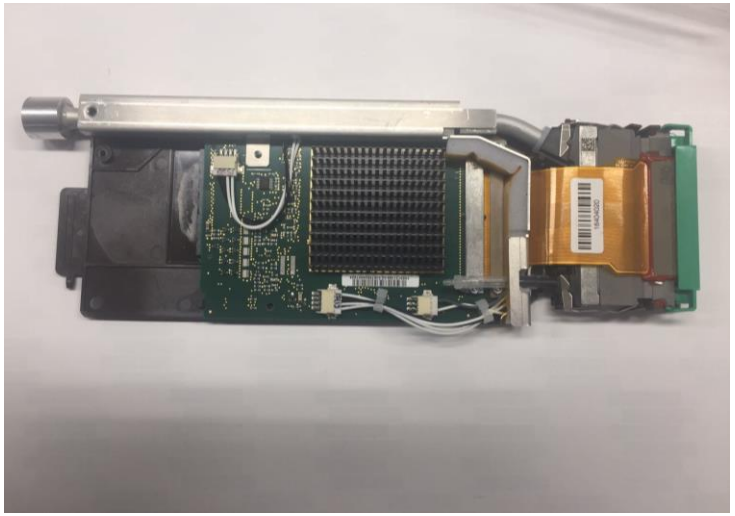
Océ (Canon) piezo print head



Océ (Canon) piezo print head
256 nozzles - 26 pL - up to 135 °C



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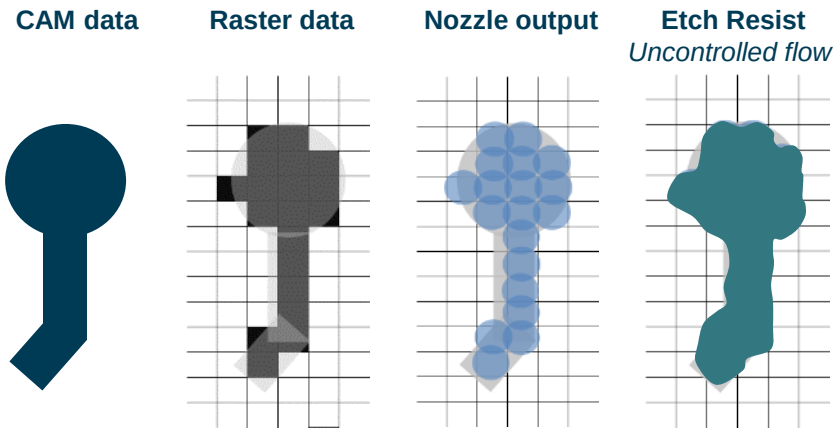
Patented Inkjet Technology

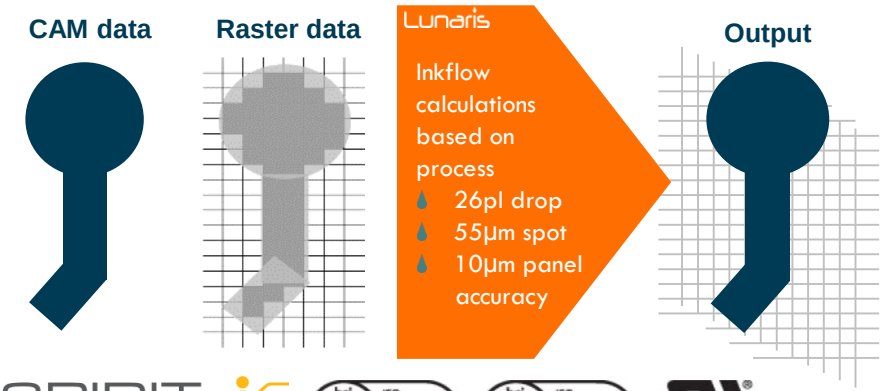
Strip model pre-processing

- Advanced mathematical model
- Can incorporate ink flow
- Edge shift through frequency variation giving different strip width
- Based on 2,5 µm raster, not on drop size
- Focus on good contour
- Overlap within area fills to guarantee no opens

Without a Print Strategy…….



With Advanced Print Strategy …….



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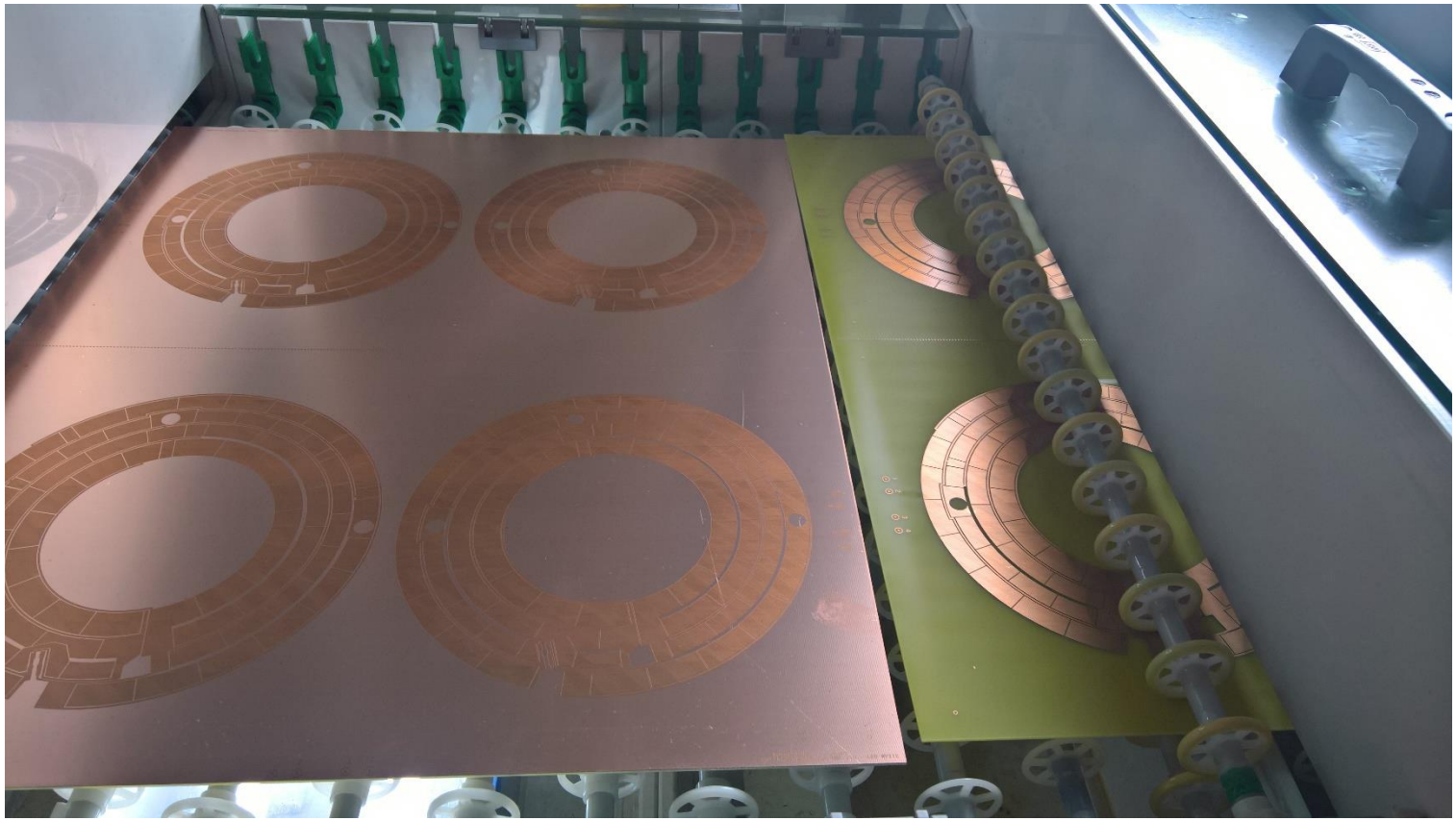
Images look the same before and after etch, no change in ink colour and very similar in appearance to copper



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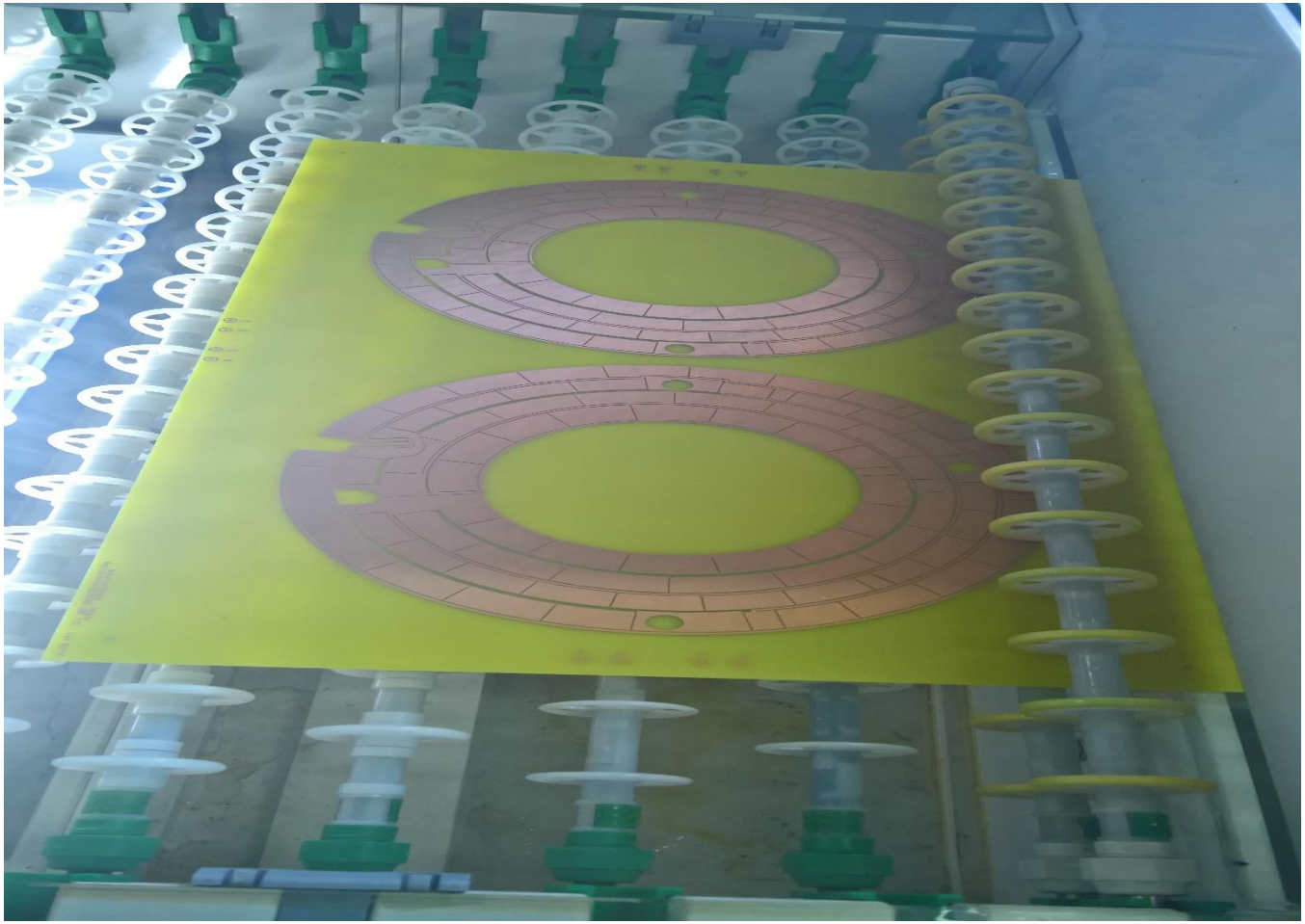
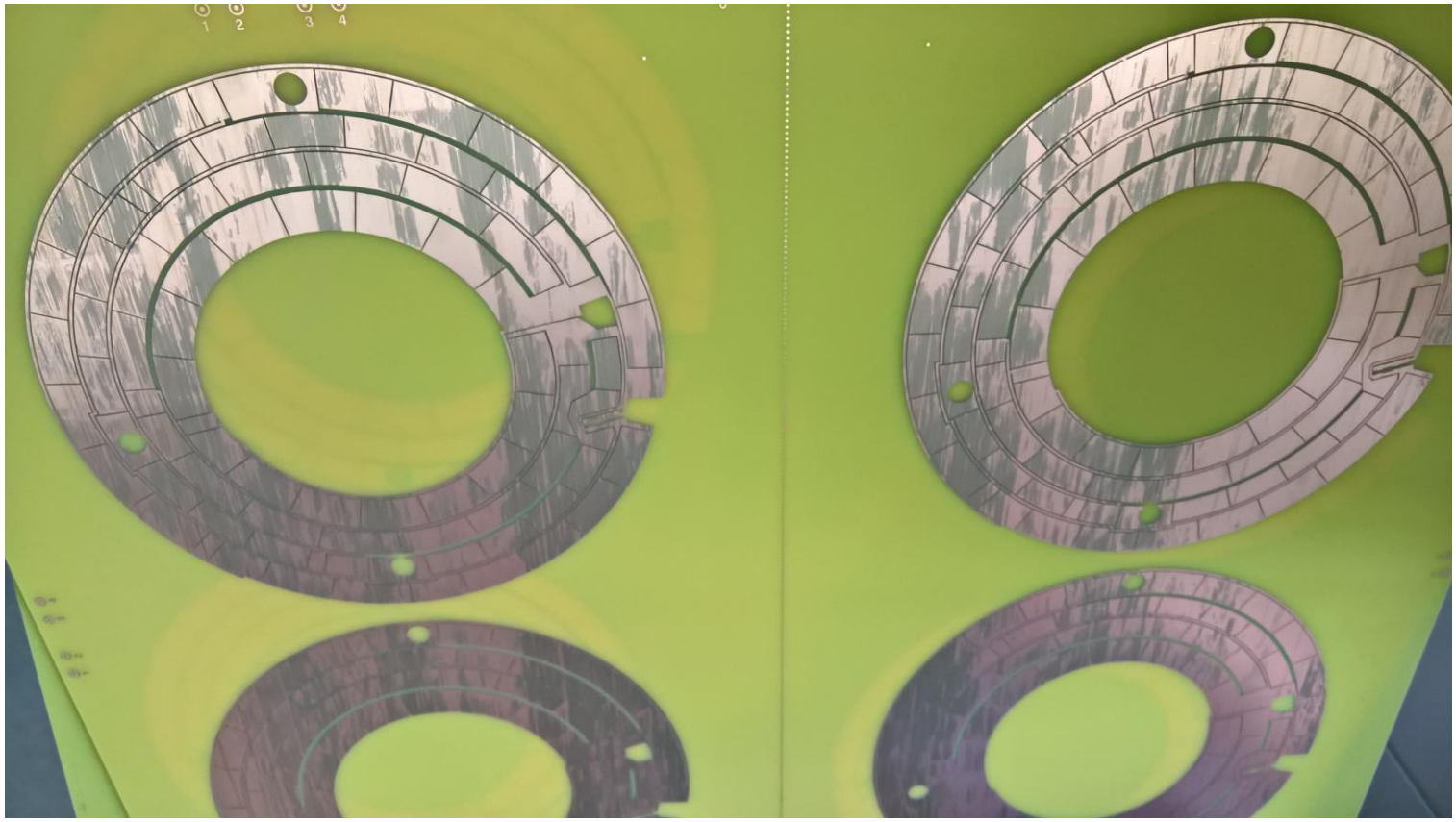
After etch and before strip



Stripping issues



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A new set of rules and claims from Mutracx

- Lunaris throws away the rule book in so many ways:
- Guaranteed 100% yield
- CAM to etch in 5 minutes
- Dramatically reduces cost and complexity
- Eliminates 11 of 15 process steps in inner layer fabrication
- Historical yield and registration problems tackled head on
- Completely removes the environmental impact
- No clean room or specialist infrastructure needed

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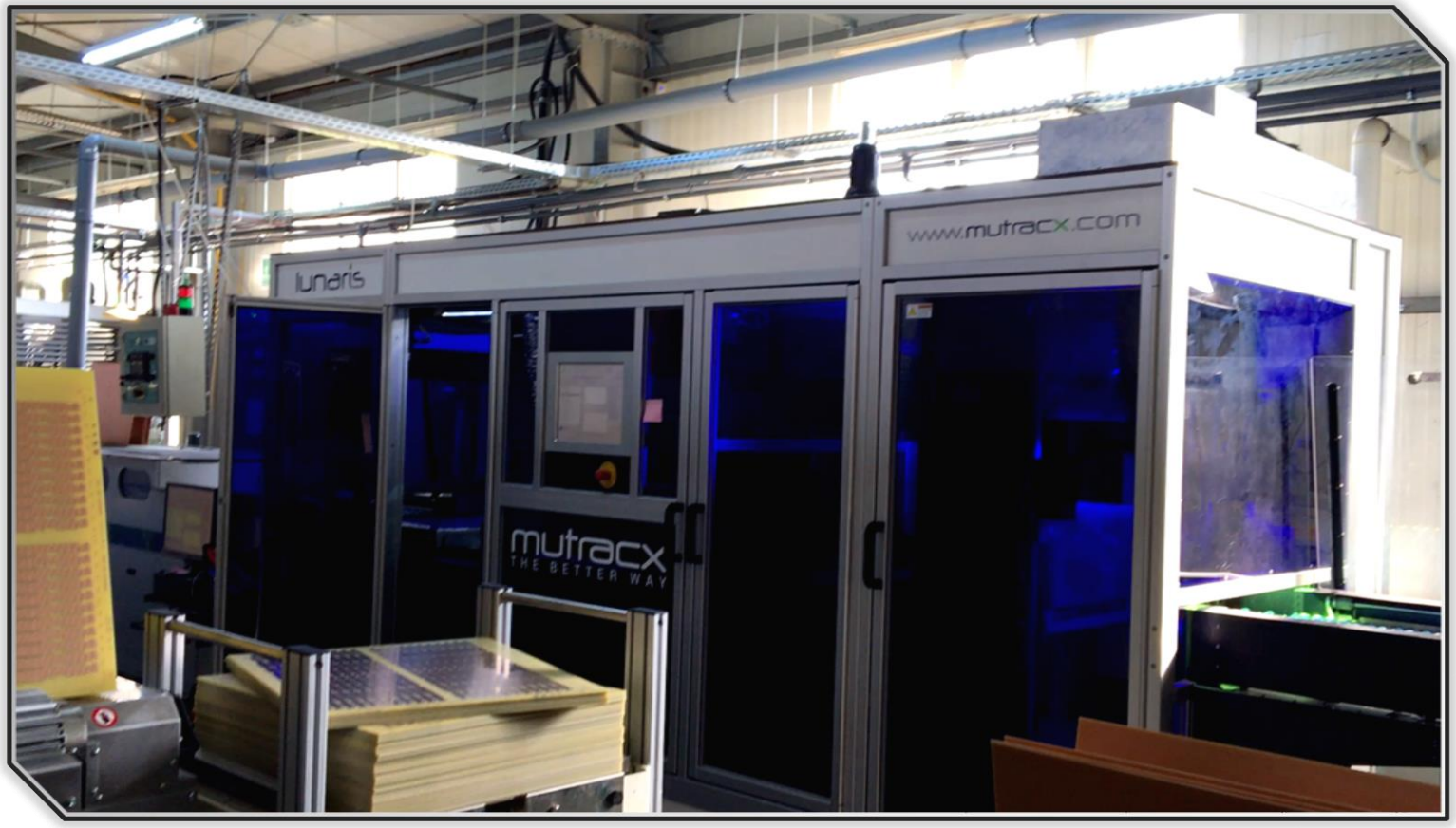
Lunaris



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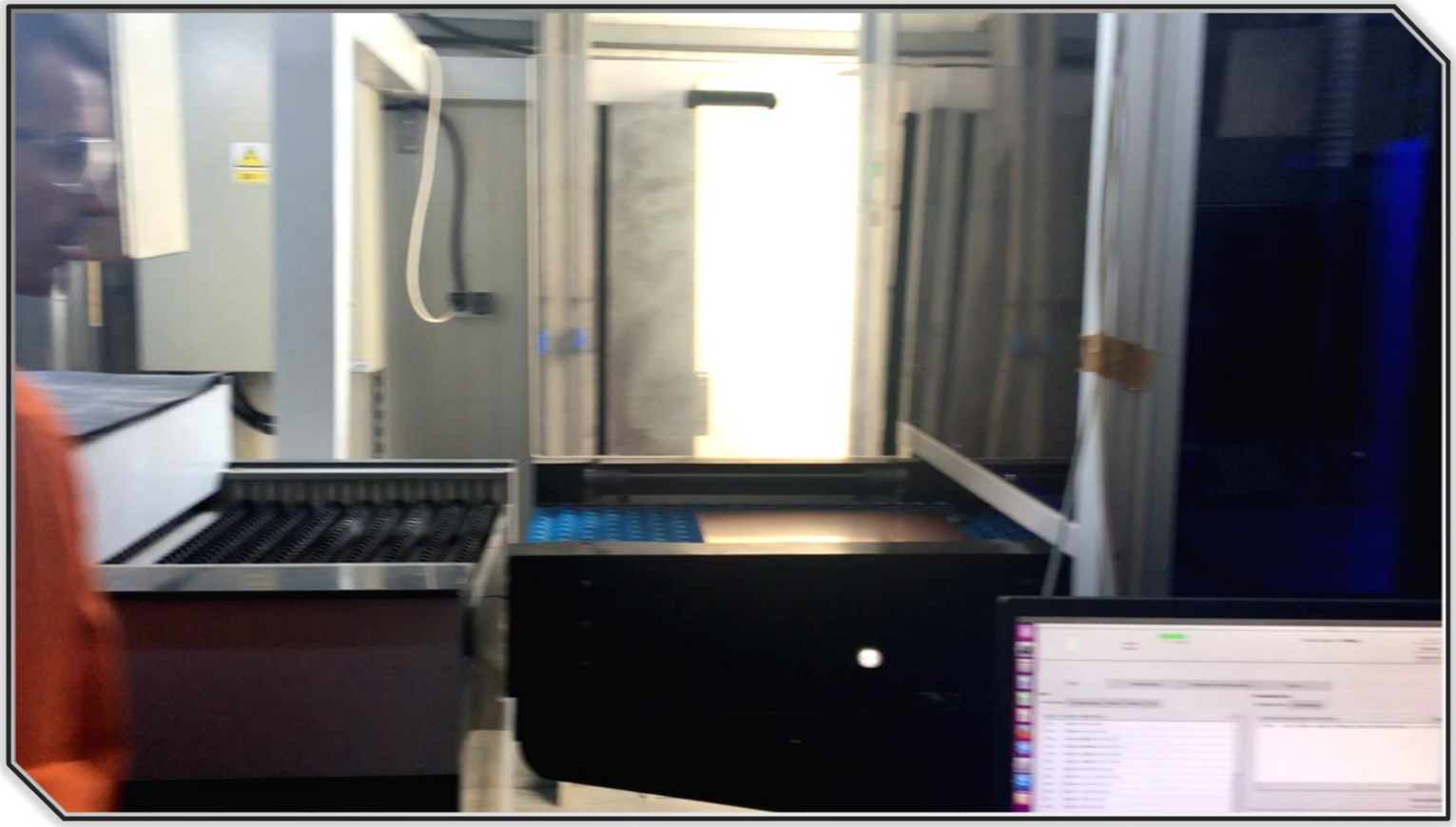
Lunaris



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Current status

- We have proved the Lunaris can deliver in excess of 70 good prints per hour
- We are processing circa 350 panels/day
- The constraints are the before and after processes.
- The machine is sensitive to surface preparation, bow, twist and burrs
- The ink/wax continues to be a challenge, we have proven production on one laminate type.
- We are now introducing other laminates and new issues are arising.

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It is a team effort

I would like to take this opportunity to thank everyone who is supporting Spirit with the new BATM factory in Romania and with this disruptive change to processing PCBs.

The support and interest is humbling encouraging and appreciated. For Mutracx to continue to be successful the whole supply chain needs to understand the needs of the industry change.

Viking

DOW

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To Conclude

- Disruptive technologies will disrupt the status quo and bring new challenges to the supply chain and the organisation
- Default standards such as IPC are out dated and new supply specifications are needed
- Open minds and collaboration with suppliers and customer will make change possible

Thank you

If we have a few moments I would like to share a few pictures of our new facility in Romania

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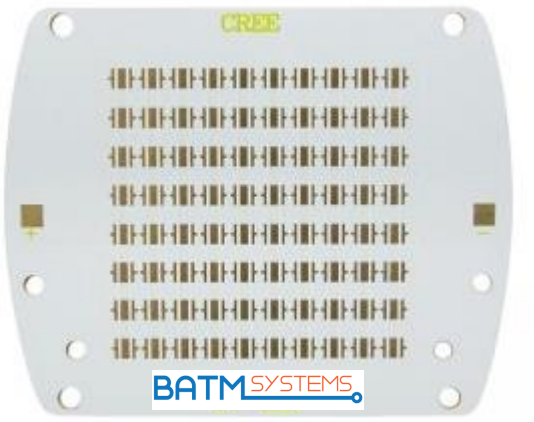
BATM Systems SRL

Romania's First Volume PCB factory



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BATM Systems Location

Sc BATM Systems

Str Ciocarliei Nr. 4, Carcea, Dolj

Tel:+(4)0251 453 779

Sc Batm Systems is located in the Airport Industrial area on the eastern side of Craiova City

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Travel Options

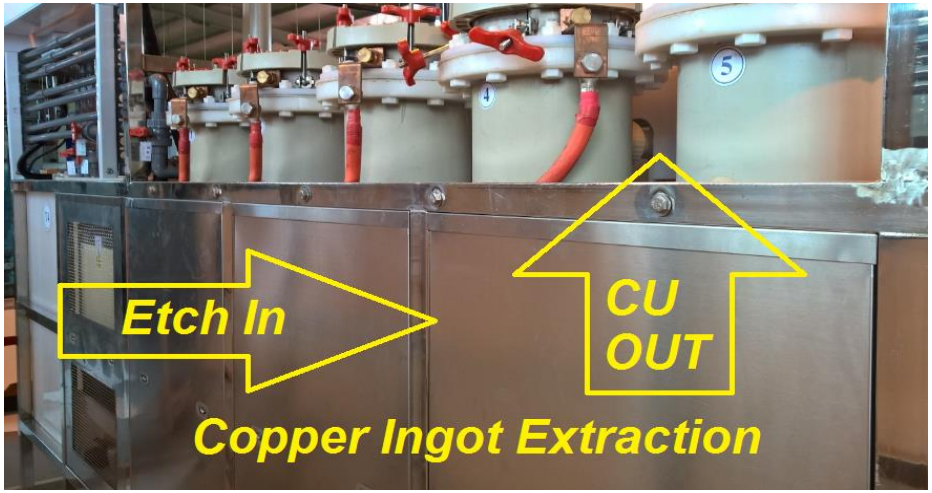
Craiova airport has limited flights served by either Wizz Air or Ryan Air

Alternatives would be to fly to Bucharest and travel by rental car (4 hours)

Train is also an option from Bucharest

Green Production

- Printed Circuit Board manufacture has never been an environmentally friendly operation, the chemicals used can be aggressive and require safe disposal and handling, we are installing the latest equipment designed to regenerate etchant and remove any environmental concerns.
- Using ground breaking “Lunaris” disruptive technology removing materials and waste.
- Over €250, 000 invested in water and chemical treatment and recycling processes.
- Copper reclaim from all etch and micro-etch processes



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In May we achieved ISO 9001:2015

SGS

Certificate RO17/81994238

The management system of

BATM SYSTEMS S.R.L.

4, Ciocarlei Street
Carcea, 207206, Dolj County, Romania

has been assessed and certified as meeting the requirements of

ISO 9001:2015

For the following activities

Manufacture and sales of printed circuit boards, cables and interconnectors.

Further clarifications regarding the scope of this certificate and the applicability of ISO 9001:2015 requirements may be obtained by consulting the organisation

This certificate is valid from 20 July 2017 until 19 July 2020 and remains valid subject to satisfactory surveillance audits.
Re certification audit due before 30 May 2020
Issue 1. Certified since 20 July 2017
The audit leading to this certificate commenced on 25 May 2017

Authorised by

SGS United Kingdom Ltd Certification and Business Enhancement
Rossmore Business Park Ellesmere Port Cheshire CH65 3EN UK
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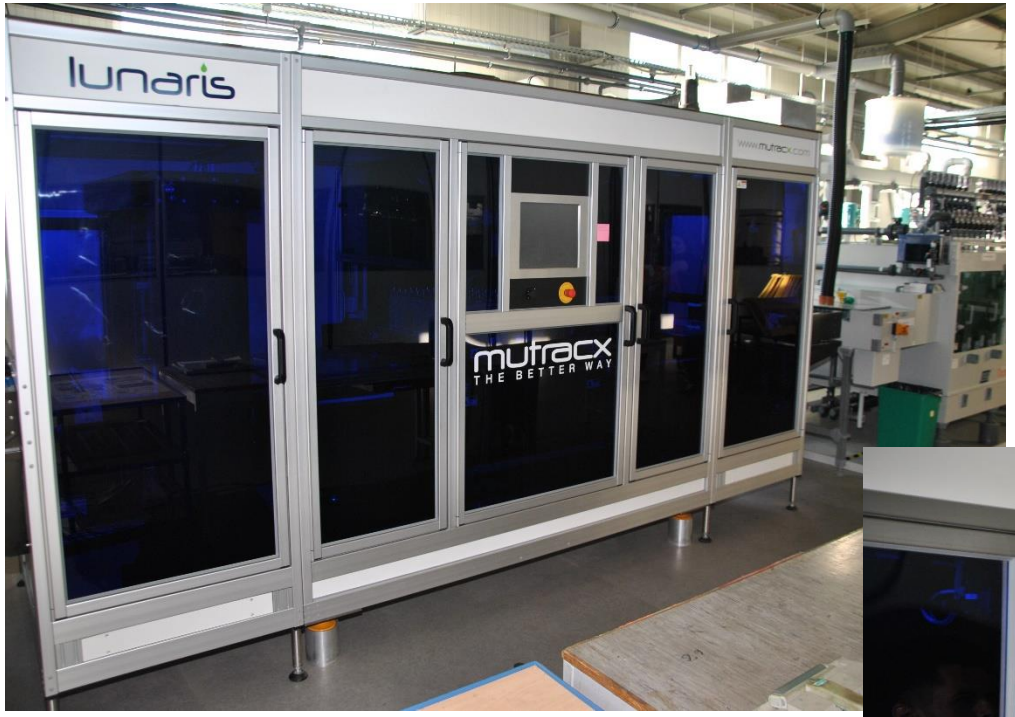
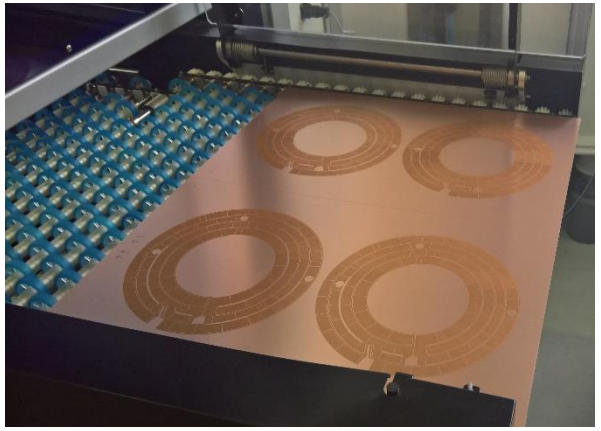
Lunaris in production





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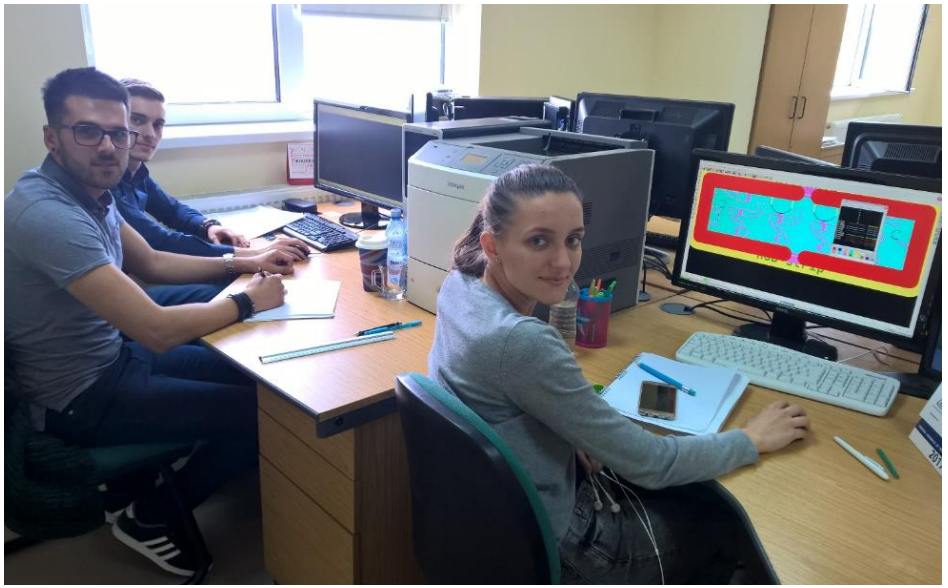
Reception & CAD Department

A Warm welcome from our reception area



CAD / CAM Engineering department producing the working files for the shop floor production

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Etching & Copper preparation lines

All chemistry from the copper etch and cleaning lines are treated, regenerated and recirculated In a closed loop system

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Drilling, Routing & Printing

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Surface Finish OSP & LF HASL

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Dimensional Checks and Flying Probe

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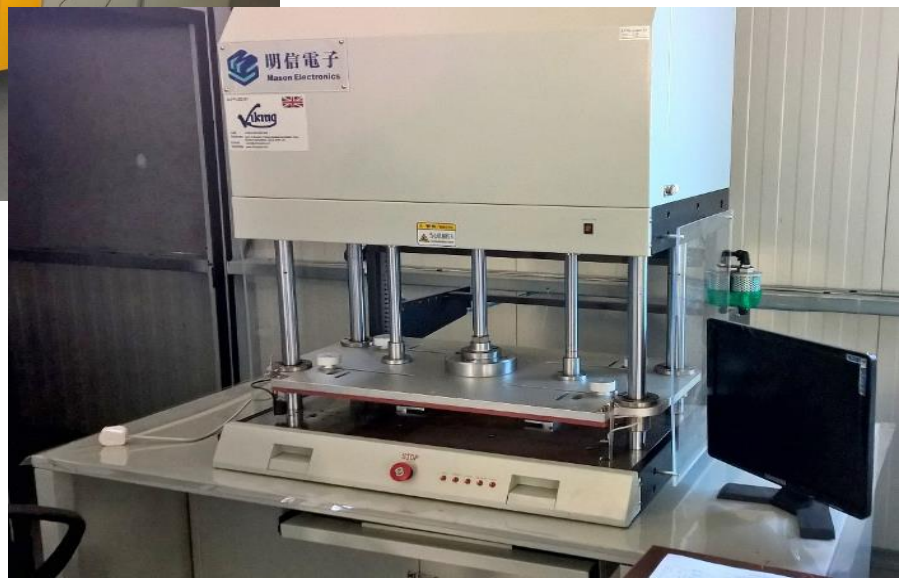
Mason BBT machines



Laboratory Facilities

- Physical and stress testing of products
- Chemical control of processes
- Environmental control

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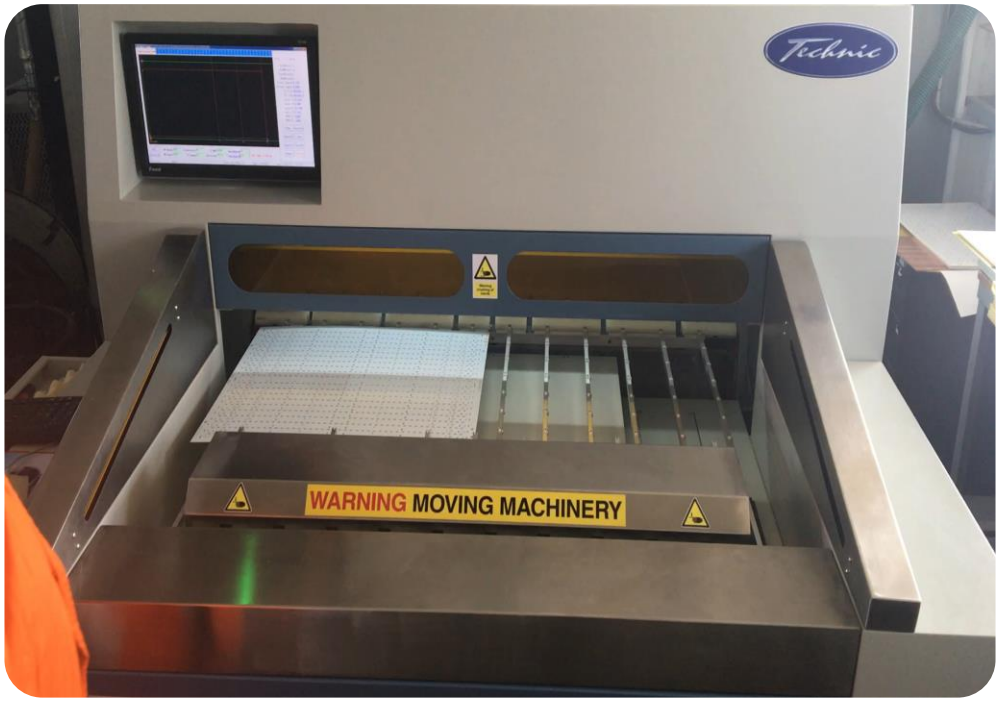
CNC V-Scoring



Working PCB dimension	**mm**	**Max: 630 x 1250** **Min: 100 x 100**

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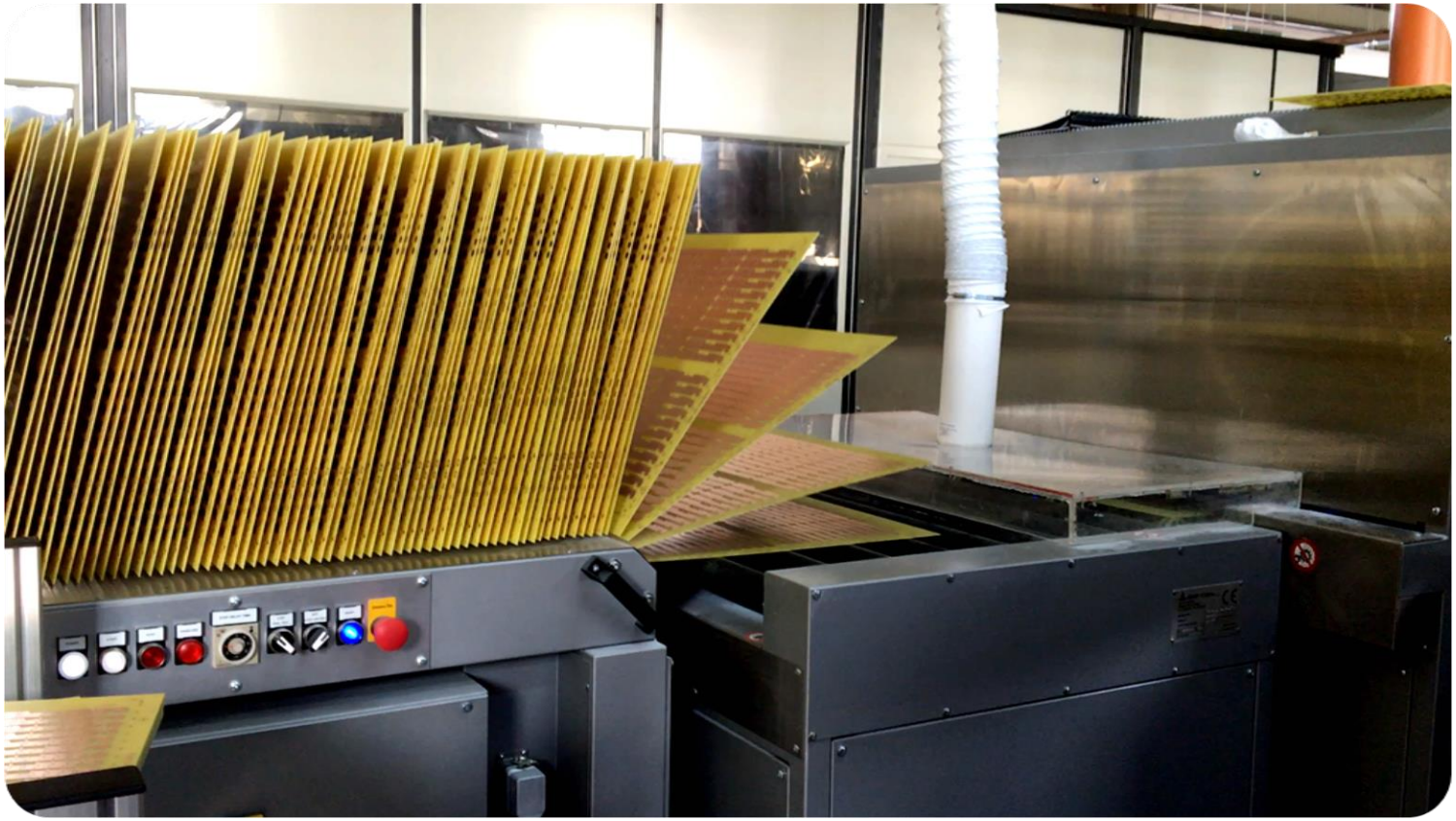
Solder Mask Spray Coating



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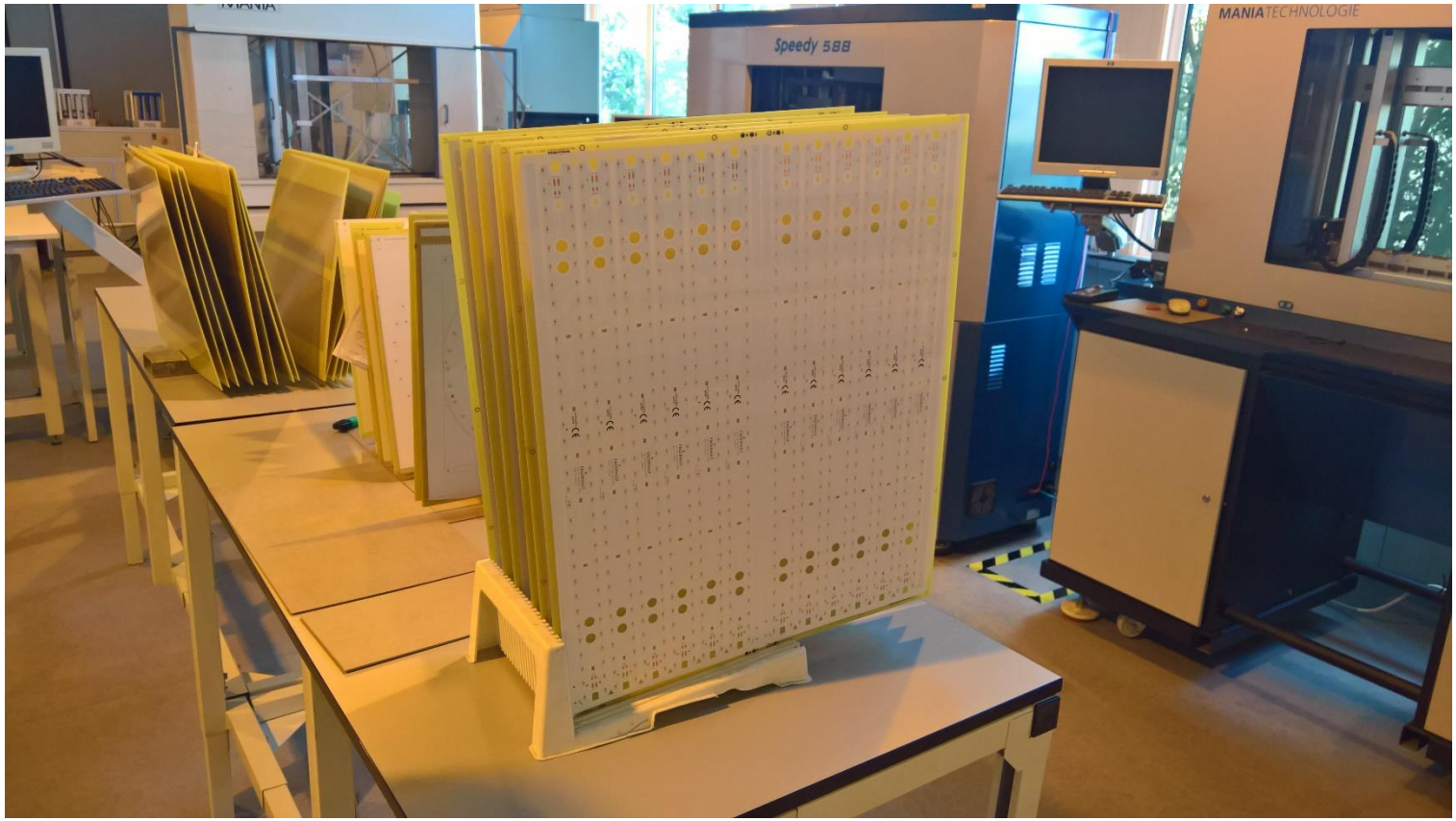
All Production is white solder mask



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