SWTEST
PROBE TODAY, FOR TOMORROW
2025 CONFERENCE

Engineering tomorrow's Advanced Vertical Probe Card Guide Plates: Balancing Precision & Economy whilst meeting Next Generation Demands

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Overview

- Introduction
- Importance of the Guide Plate Assembly
- What are the current design constraints for the Guide Plate and Why?
- What are we doing about it and how does it help the Industry?
- What does the future look like for Guide Plates?
- Summary

Introduction

Oxford Lasers started from Oxford University Physics Laboratory almost 50 years ago

- Global Laser Experts in many fields – Laser machining is one major division
- World Class subcontract micromachining facility in Oxford UK
- Over 20 years experience in Ultra High Precision guide plate production
- Manufacturer of home made production laser tools

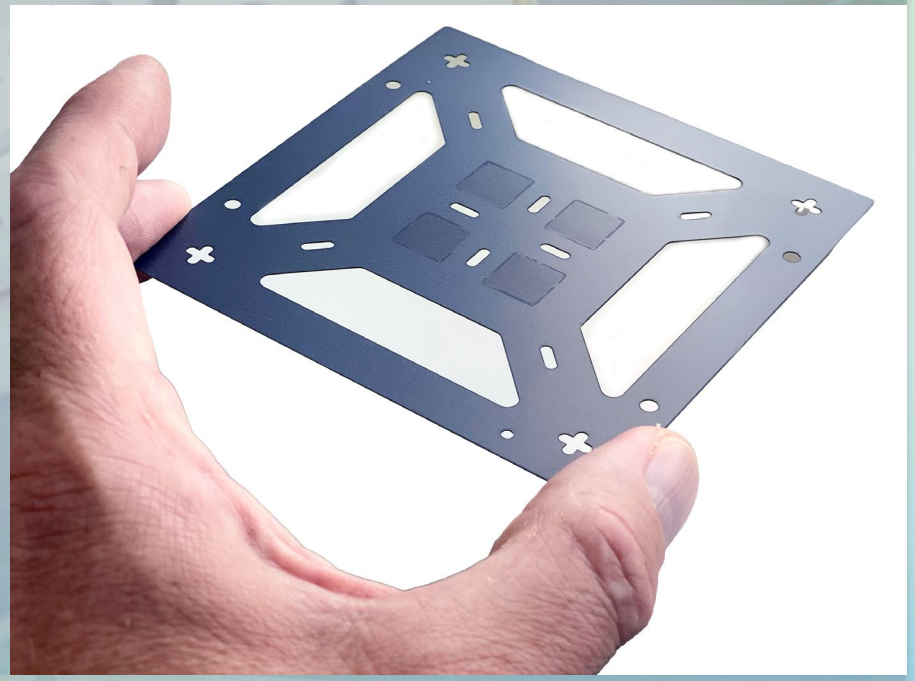
Importance of the Guide Plate Assembly

- A Guide Plate is the test probe guidance system for a vast array of probe card systems globally

- Providing holes that guide probe pins that are 100% consistent in:

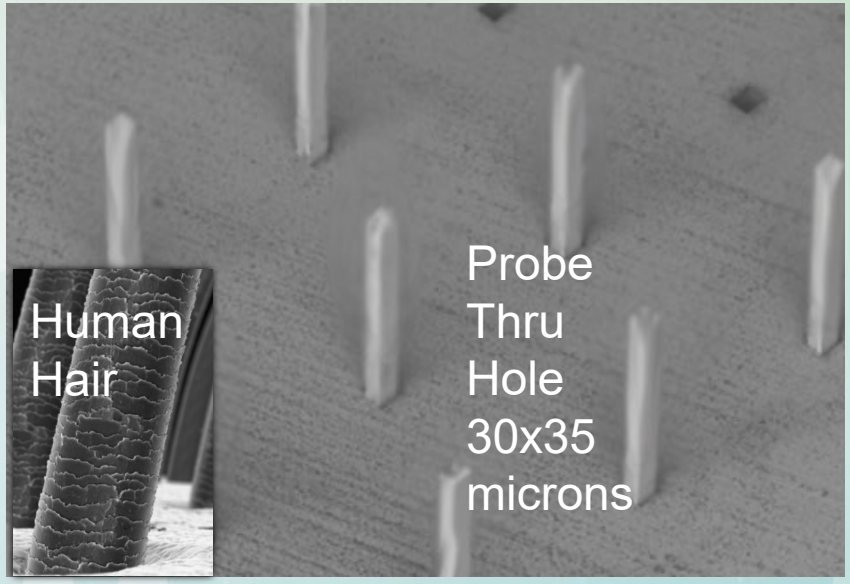
  - Position accuracy relative to assembly datums
  - Hole size and quality

Is Key to providing 100% successful touchdowns
In an unprecedented era of high demand tests



Importance of the Guide Plate Assembly

- As a major supplier to the industry we see:
  - An accelerated demand on tighter pitch
  - Designs to suit six figure hole counts
  - Material thickness drastic increases
  - Newly developed materials

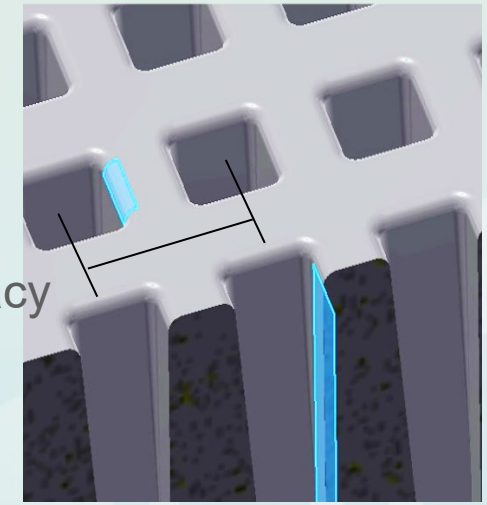


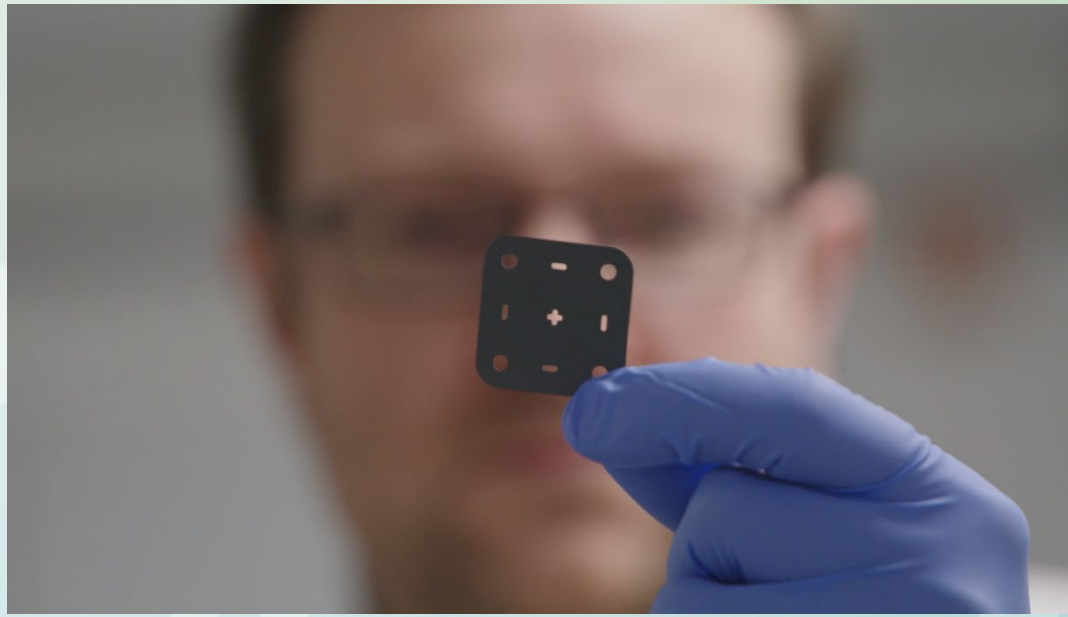
- All have to be developed simultaneously

to provide the most technically advanced plates yet

Importance of the Guide Plate Assembly

- We ask a lot of these little sets of ceramic plates
- The micro hole is required to be positionally accurate by up to 1 micron relative to every feature





- And keeping this accurate for 200,000 times produces complexities in laser machining that is pushing the boundaries

What are the current design constraints for a Guide Plate and Why?

- Every Probe Card Engineer would like to know the ultimate thickness, accuracy, minimum pitch and smallest hole of a ceramic Guide Plate

- Every Guide Plate manufacturer would like to tell the engineer this

  "Tell me what you want – Can you tell me what you can achieve"

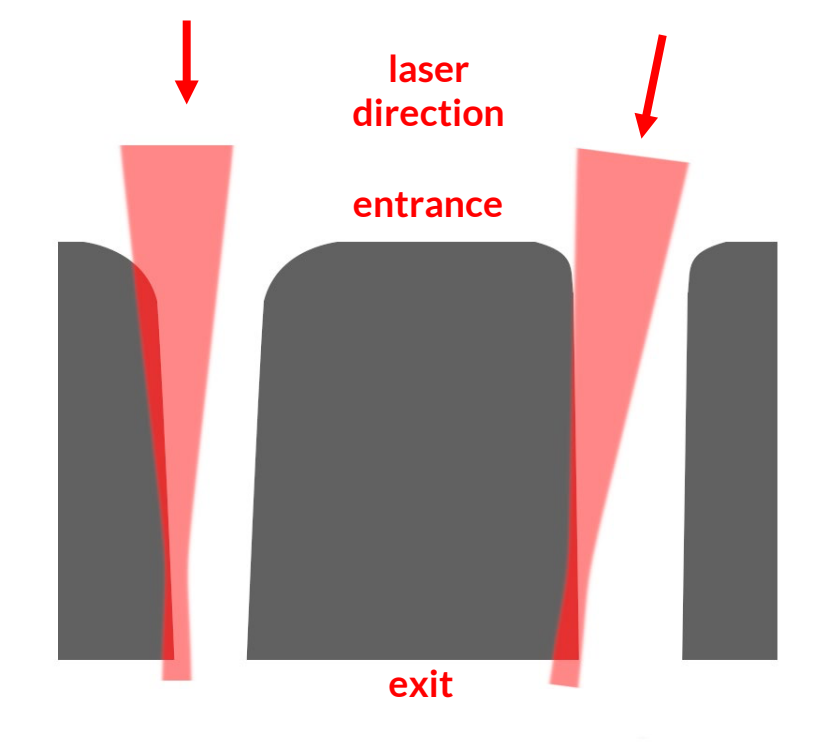
- To produce the new required complexities in a Guide Plate we need to collaborate more

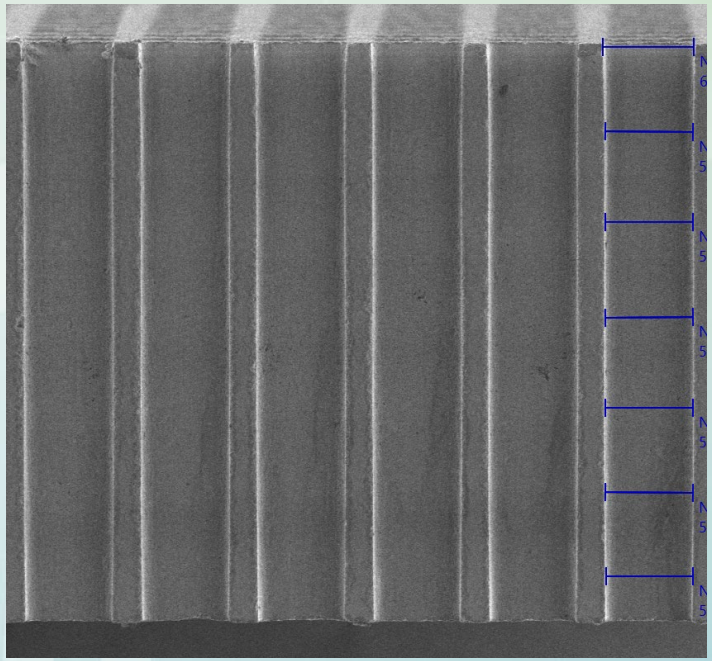
What are the current design constraints for a Guide Plate and Why?

- To understand why there are challenges comes down to the physics of light and material

Tilting the beam provides control of taper and quality of Hole bore

Thicknesses reaching 1mm provide problems with energy absorption

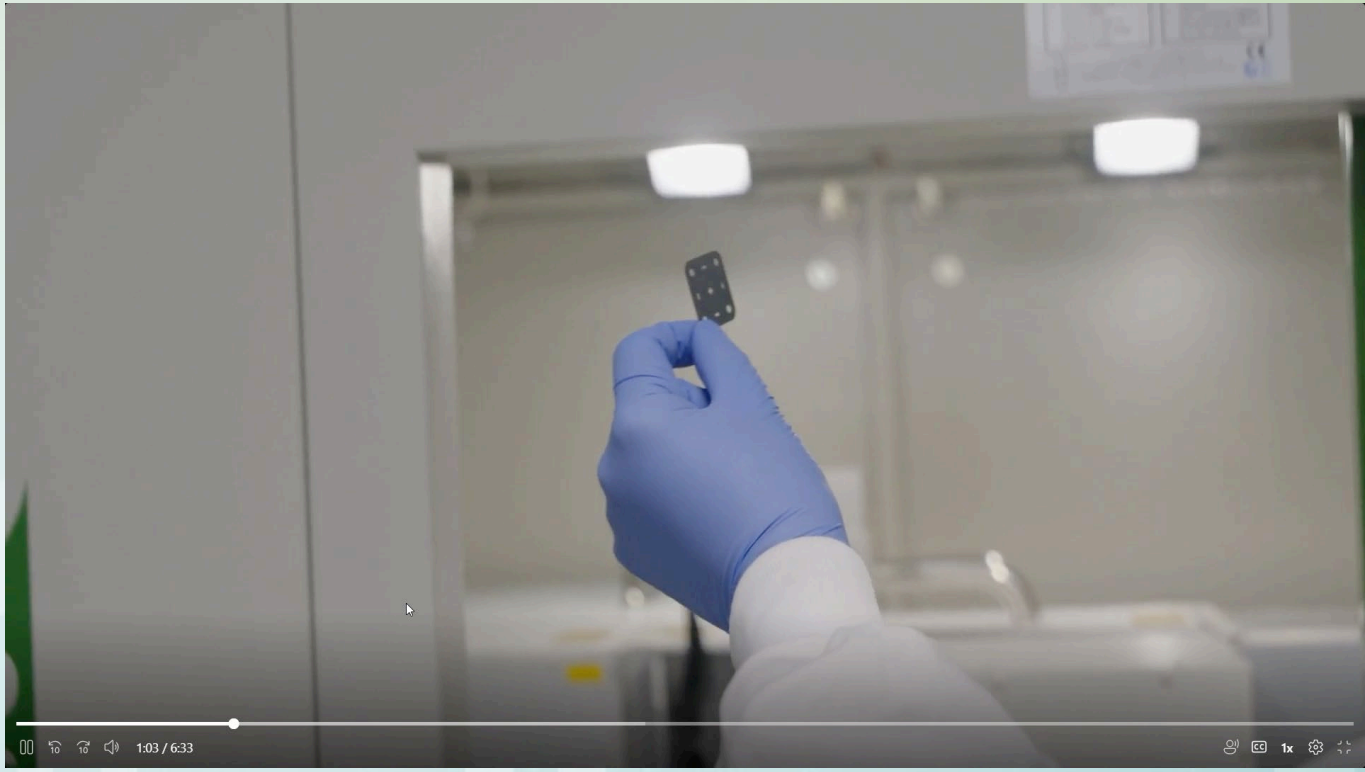




600 Microns thickness with almost no taper

What are the current design constraints for a Guide Plate and Why?

- So lets go back to Basics – Material
- To produce a Guide Plate we need to utilize the latest materials of the ceramics manufacture
- Demands on the material for structural stability, higher coefficients in thermal properties provides a more complex recipe to laser ablate ceramics



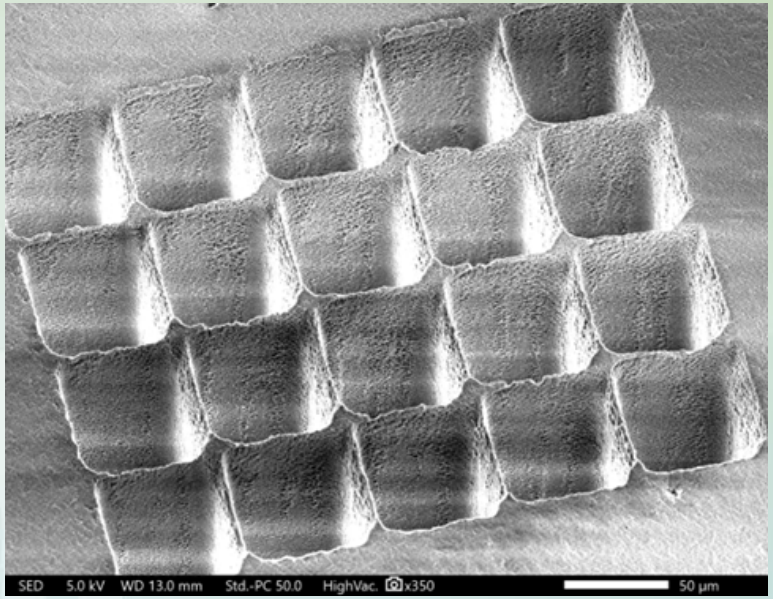
What are the current design constraints for a Guide Plate and Why?

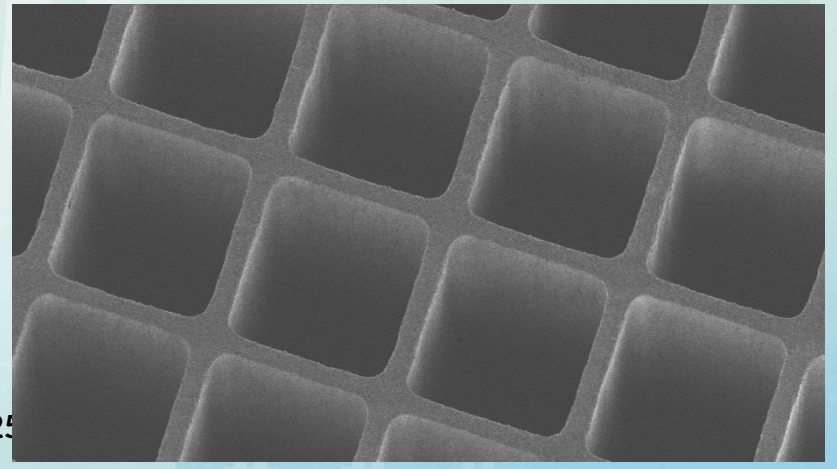
- Hole Pitch

- We can now machine rectangular holes with very close pitches allowing probes to be very densely packed in a DUT with a hole count beyond 200,000

- This has its own drawbacks – time per hole stays same but volume means 3-day drilling

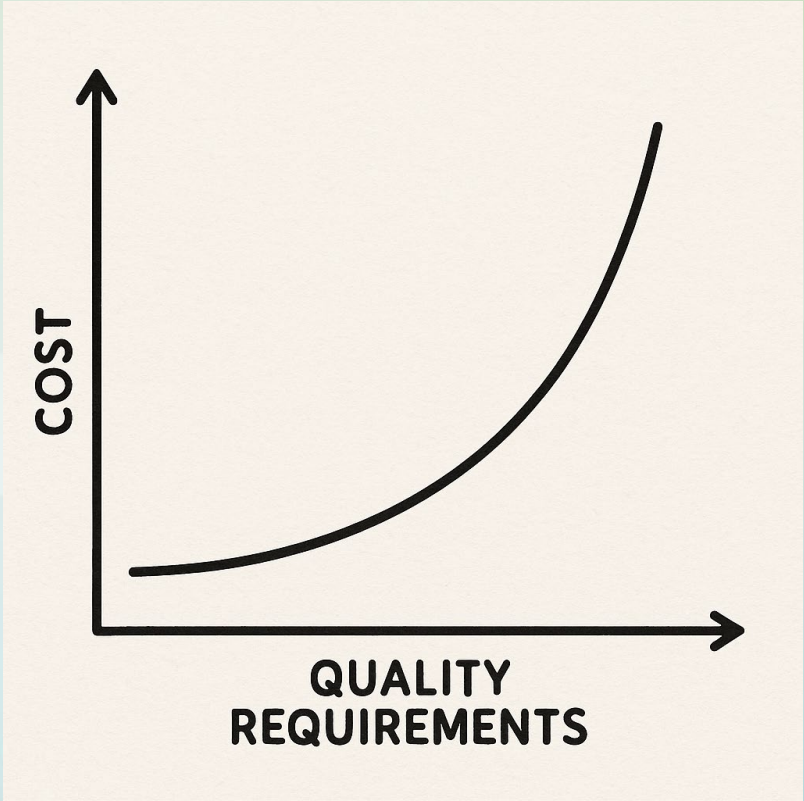
- Physicality of the material itself – thin wall





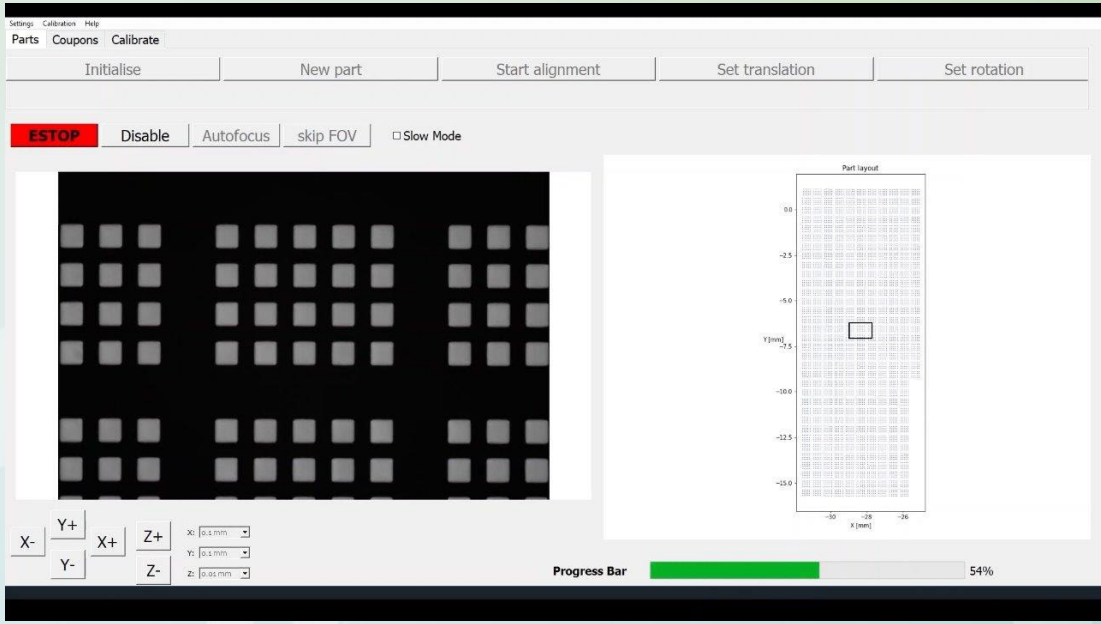
What are the current design constraints for a Guide Plate and Why?

- Next is Hole Size and quality
- This is very much down to the required quality of exit, bore and entrance
- Further complicated by the type of guidance system required
- Increasingly tighter tolerances for position, taper, corner radii require significant recipe development before production
- This amounts to increasing setup and drilling time



What are the current design constraints for a Guide Plate and Why?

- Hole count and design is critical
- Densely packing holes in the same DUT areas but more of them causes slow down in drilling to ensure positional accuracy remains
- Once hole drilling is optimized in the new materials this then a question of drill times
- Drill times is directly affecting costs where 200k holes can take 3 days to drill non stop

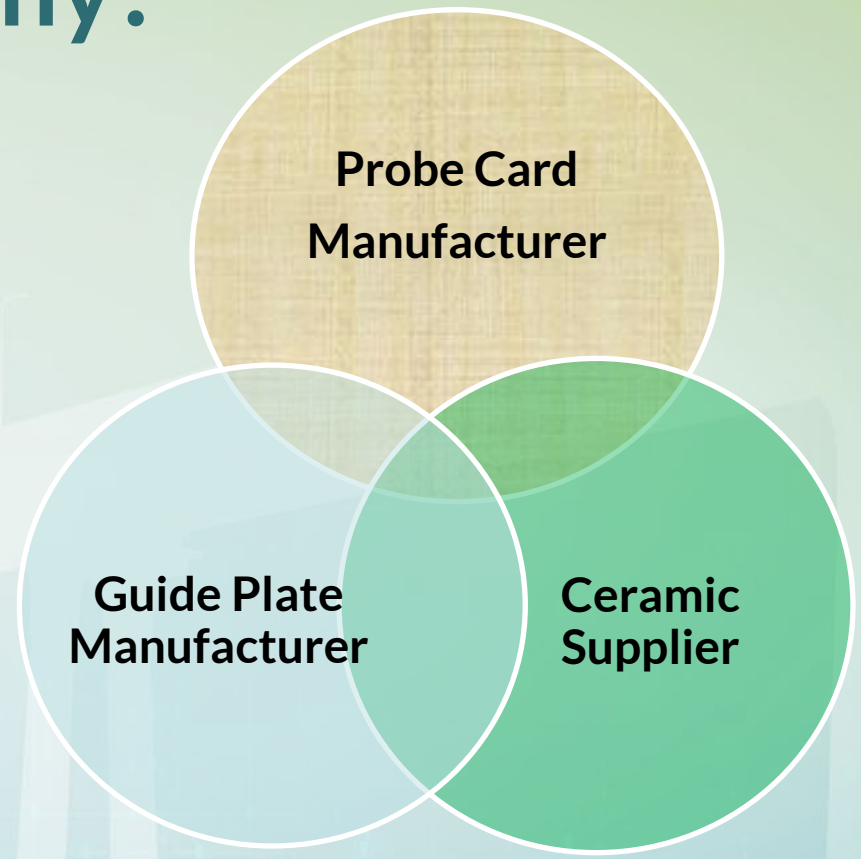


What are the current design constraints for a Guide Plate and Why?

- Finally it is material type and thickness
- There is a variance of quality of raw material in ceramics globally same recipe very different results

- This draws us back to the collaboration of three important areas – the material supplier , the probe card company and the Guide plate supplier

- Thickness now up to 900 microns and beyond are being demanded in certain cases so we have to adapt the tool belt with specific wavelength selection

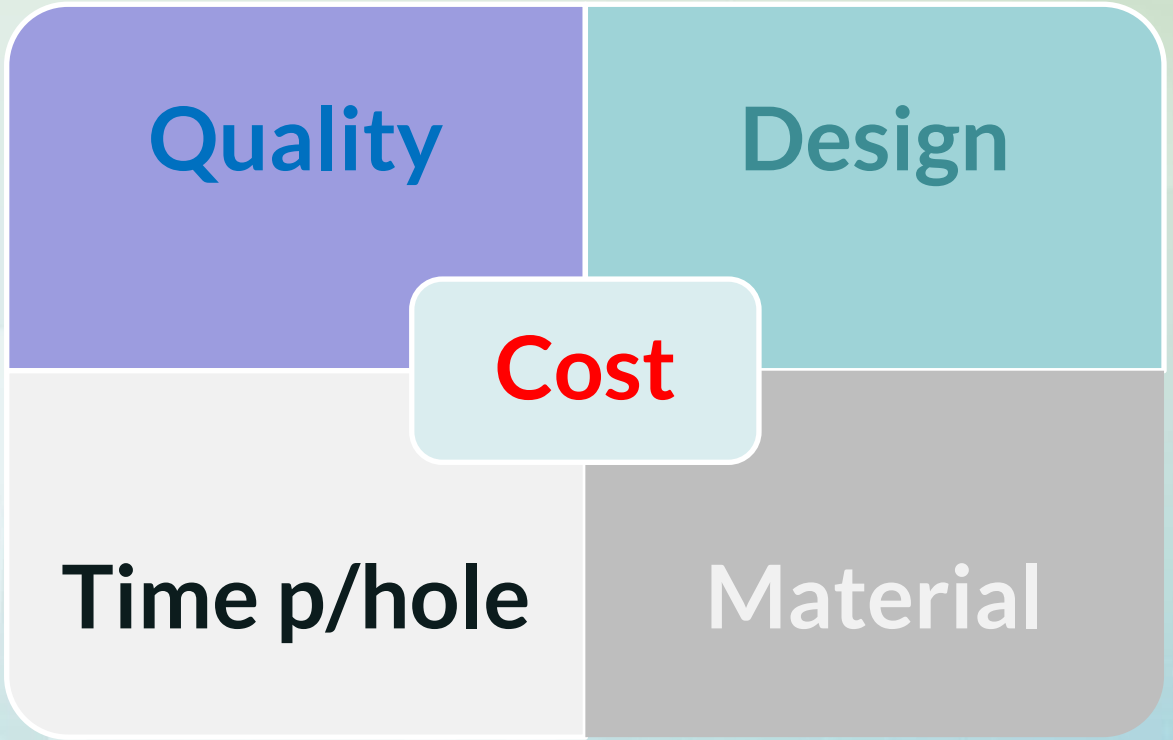


What are we doing about it and how does it help Probe Cards?

- So we have seen what causes constraints in Guide Plate manufacture

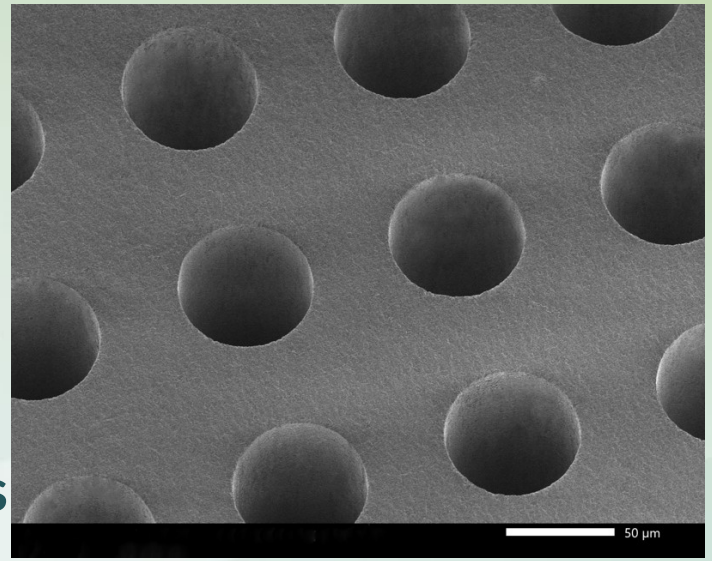
1. Type of Material
2. Quality requirements
3. Design and Tolerances
4. Time per hole
5. Cost

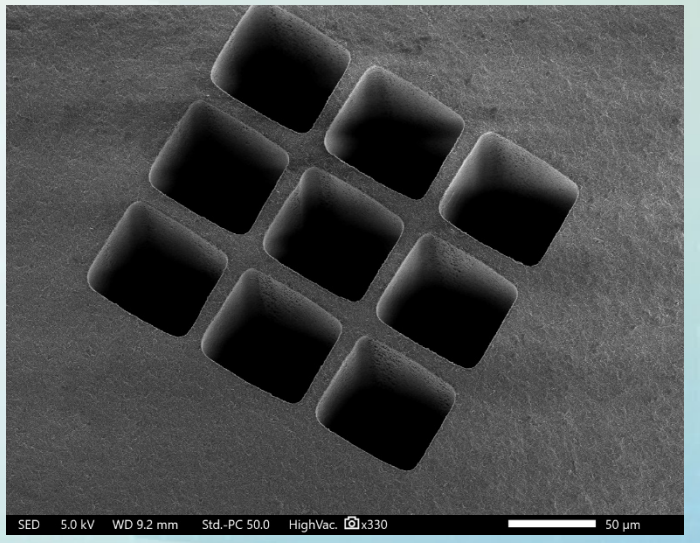
What are we doing to resolve this?



What are we doing about it and how does it help Probe Cards?

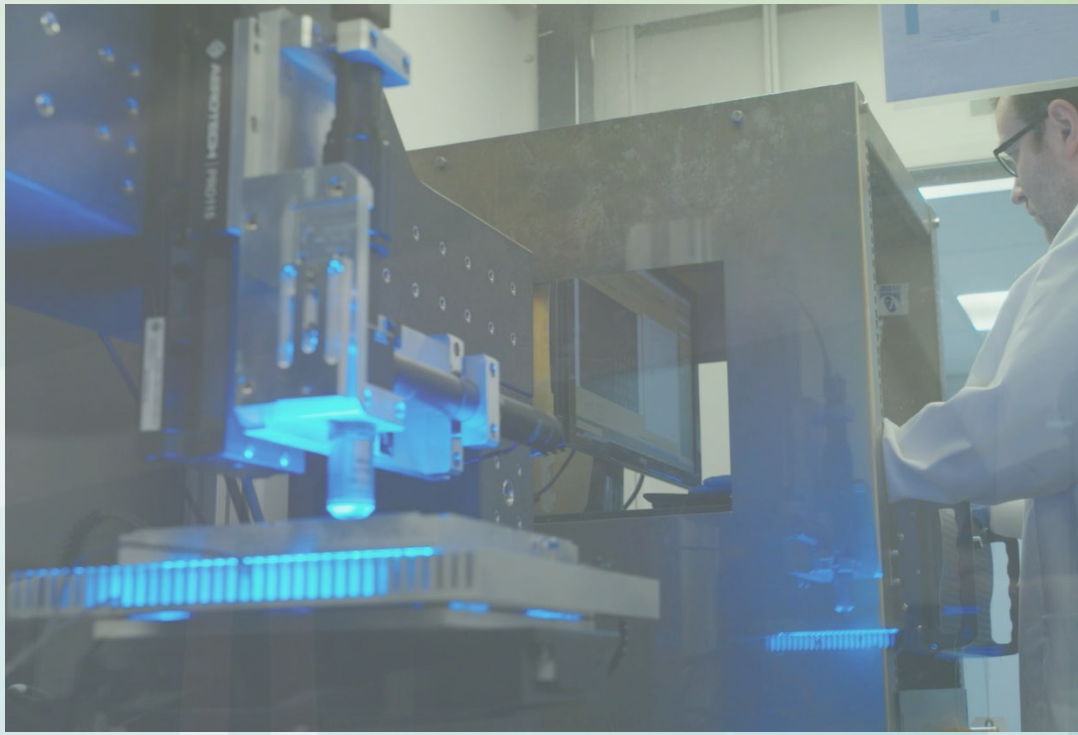
- Collaborate with the material manufacturer to provide more insight expertise from us
- Intelligent drilling techniques on localizing holes that need higher tolerancing and quality rather than one fits all – this speeds up manufacture
- Currently achieving 830 microns thick ceramic drilling in both rectangular and round holes
- New Ultrafast laser tool with specific wavelength providing excellent results developing time per hole





What are we doing about it and how does it help Probe Cards?

- Guide Plate suppliers MUST use a varied suite of production tools
- For example Nanosecond UV wavelength with its packed energy to provide super quick holes in reasonably thick ceramic up to 500 microns
- Or using ultrafast pulse duration with IR wavelength providing precise and fine detail in corners of rectangular holes whilst also providing very high quality bores
- Cost of test is becoming very demanding now that Probe Card project times are being halved and therefore there are new tricks we can use



What is the Next step to Summarize?

- When holes are now reaching 200k per plate drill time and quality is critical – Can we localize the requirements of drilling tolerances?
- Collaboration with Probe Card, Guide Plate supplier and material manufacturer
- There will be a physicality limit to laser drilling and material at some point in the future which leads onto new methods of testing such as non contact using lasers and photonic
- If you cannot test it then it cannot be built. Collaboration is key

Thankyou

My thanks for this work go to :

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Simon Tuohy

Thank you for your Attention