SWTEST
PROBE TODAY, FOR TOMORROW
2025 CONFERENCE

cost reduction in probing operations
by surveillance of mechanical probe card integrity

SOLARIUS

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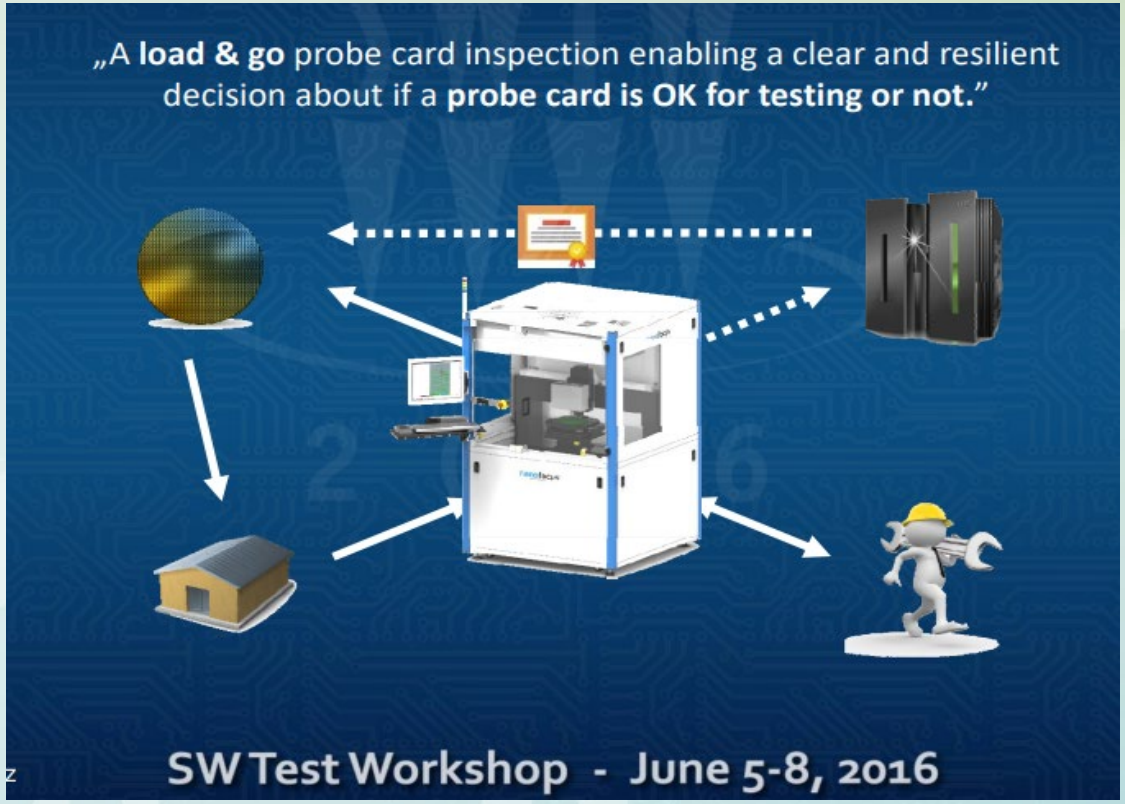
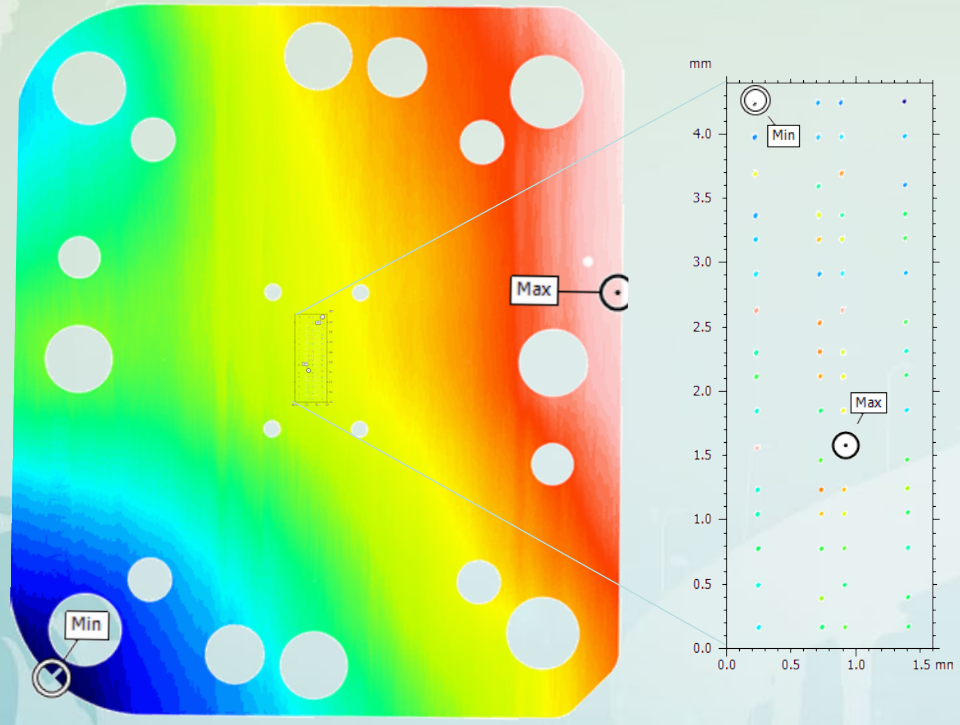
how it started years ago

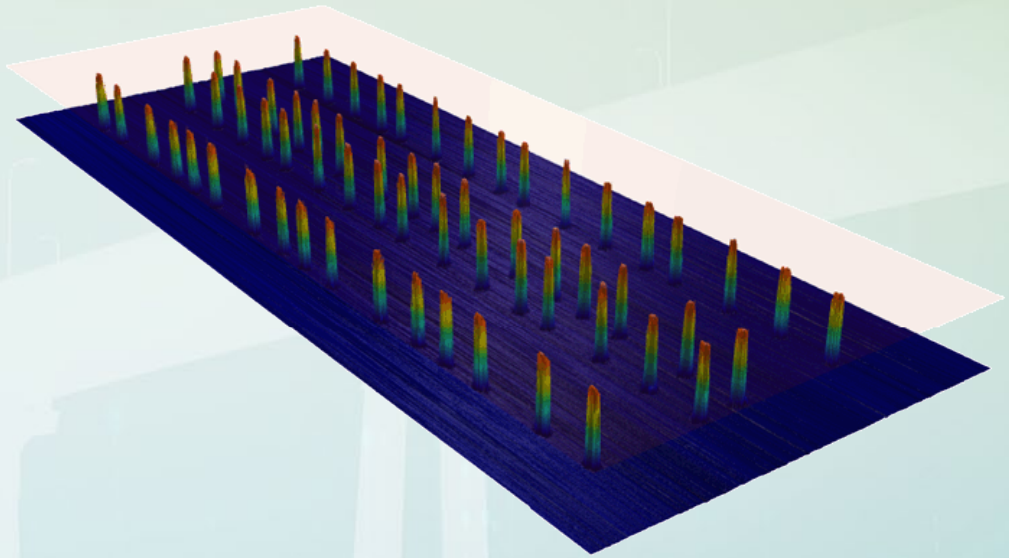
2016 the seed was spread
2020 someone took initiative
2022 we gained attention
2023 we built a prototype
2024 we qualified a process
2025 we closed sucessfully



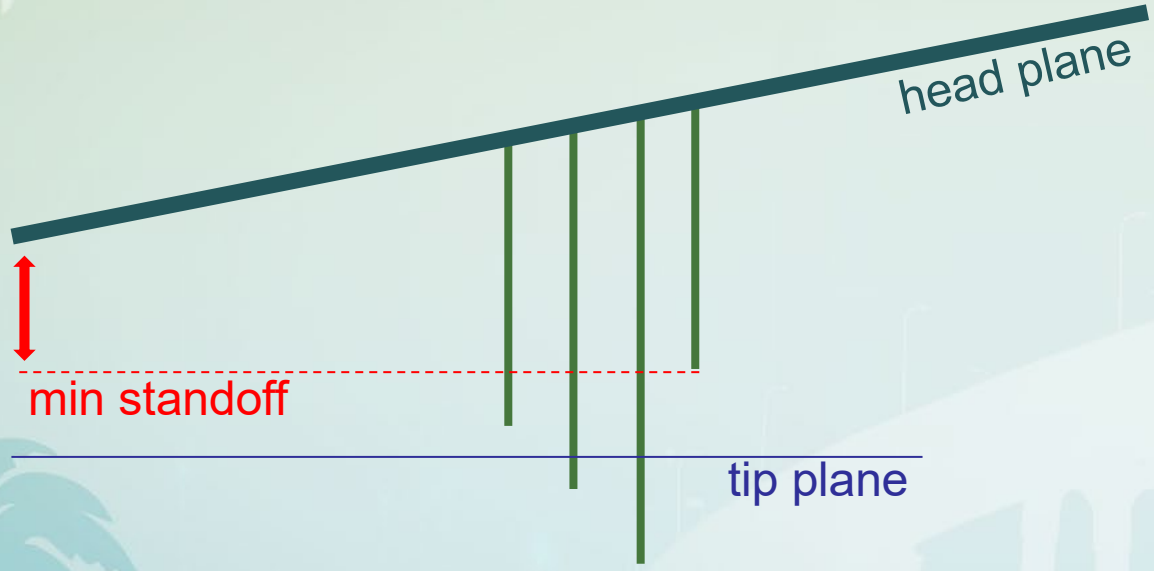
Source: https://www.swtest.org/swtw_library/2016proc/PDF/S09_01_Kunz_SWTW2016.pdf at 17 August 2024

gaining attention by…





…timely identifying an expensive threat



- card was punching wafer surface
- card was sent for repair
- card was received back
- card was measured
- standoff was less than overdrive

➢ physical damage was prevented
➢ significant cost was saved

prototyping a process

2016 the seed was spread
2020 someone took initiative
2022 we gained attention
2023 we defined a process
2024 we qualified a prototype
2025 we closed successfully

process requirements

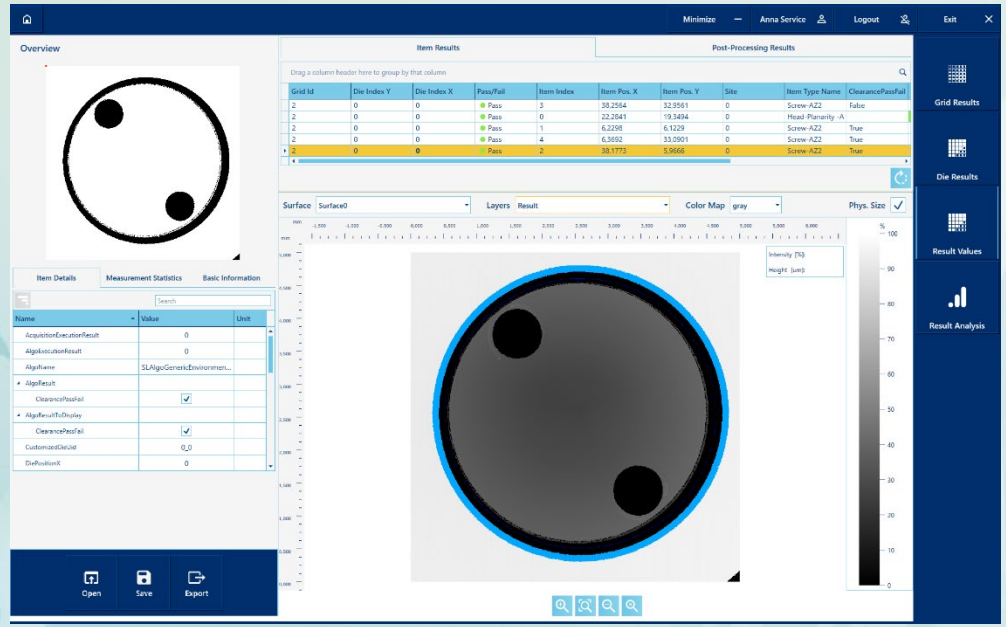
reducing cost in wafer probing by

- preventing damage & loss
- reducing human related errors
- using resources more extensively
- saving time

- allowing comparability
- creating a safe process
- creating a simple to use process

preventing damage & loss

- checking tip length, position, diameter, planarity
- checking head flatness, tilt to stiffener plane
- checking for foreign objects, debris, particles
- checking proper fixation of screws

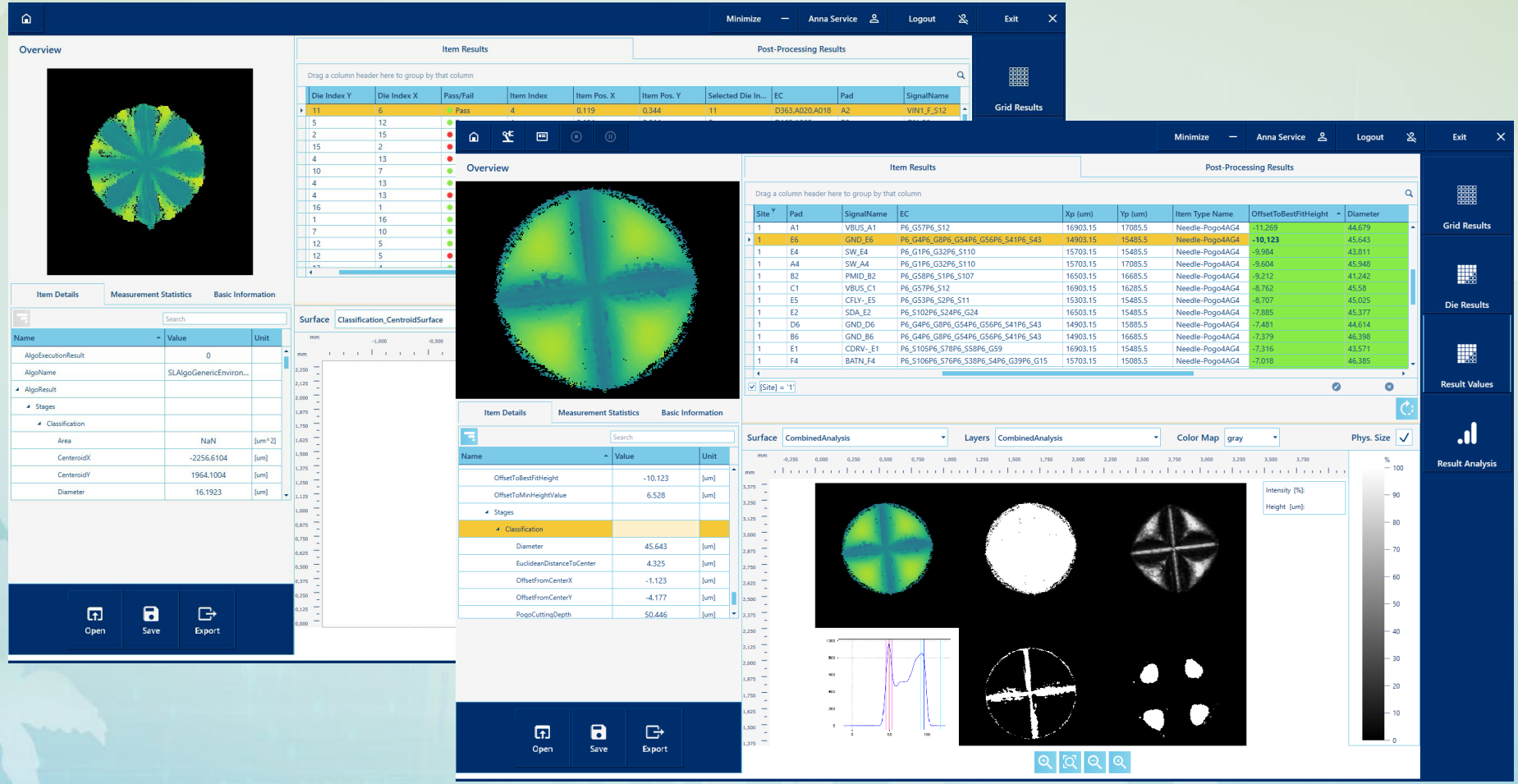


➢ OK screw

➢ not OK screw

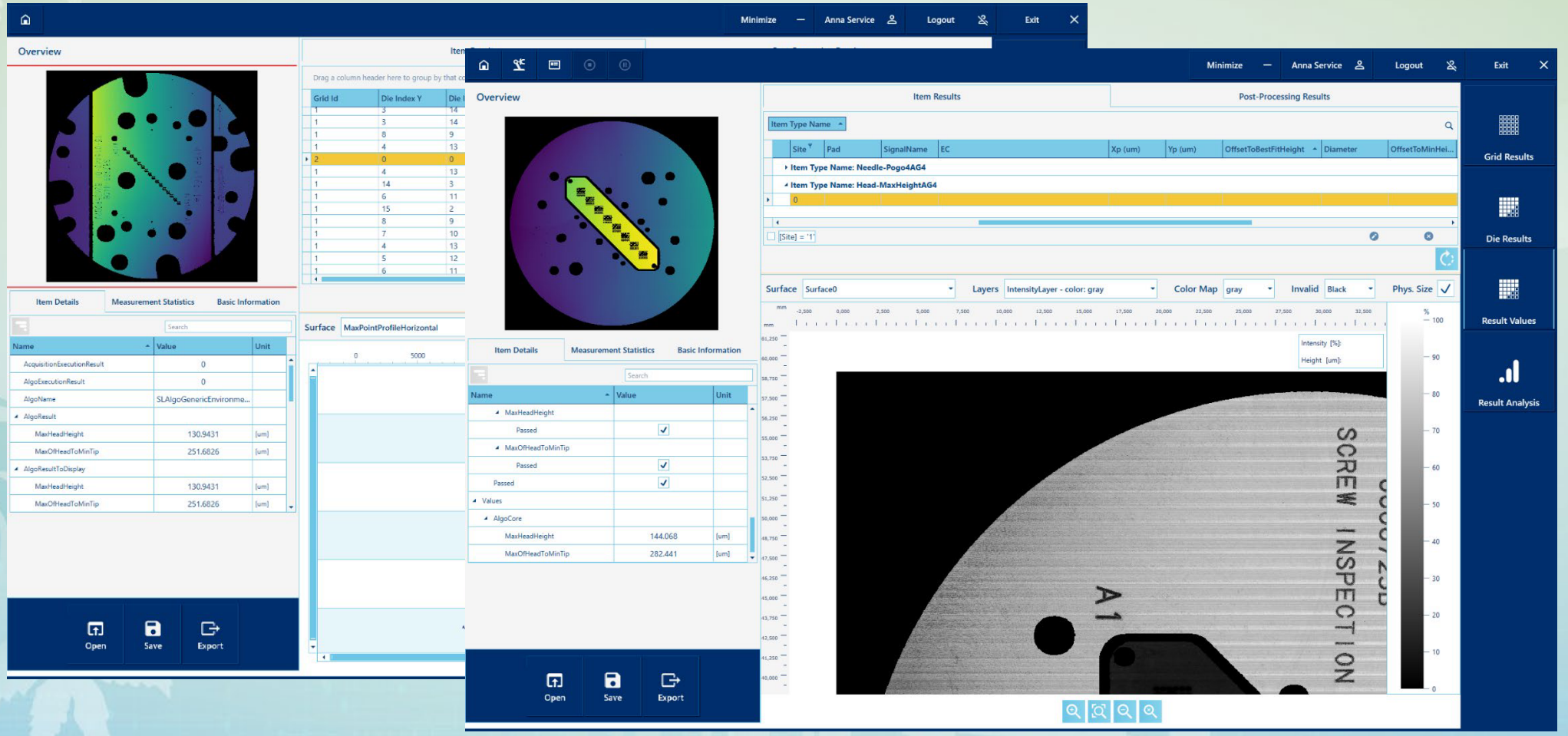
preventing damage & loss

- checking tip length, position, diameter, planarity



preventing damage & loss

- checking head flatness, tilt to tip plane, PCB & stiffener plane



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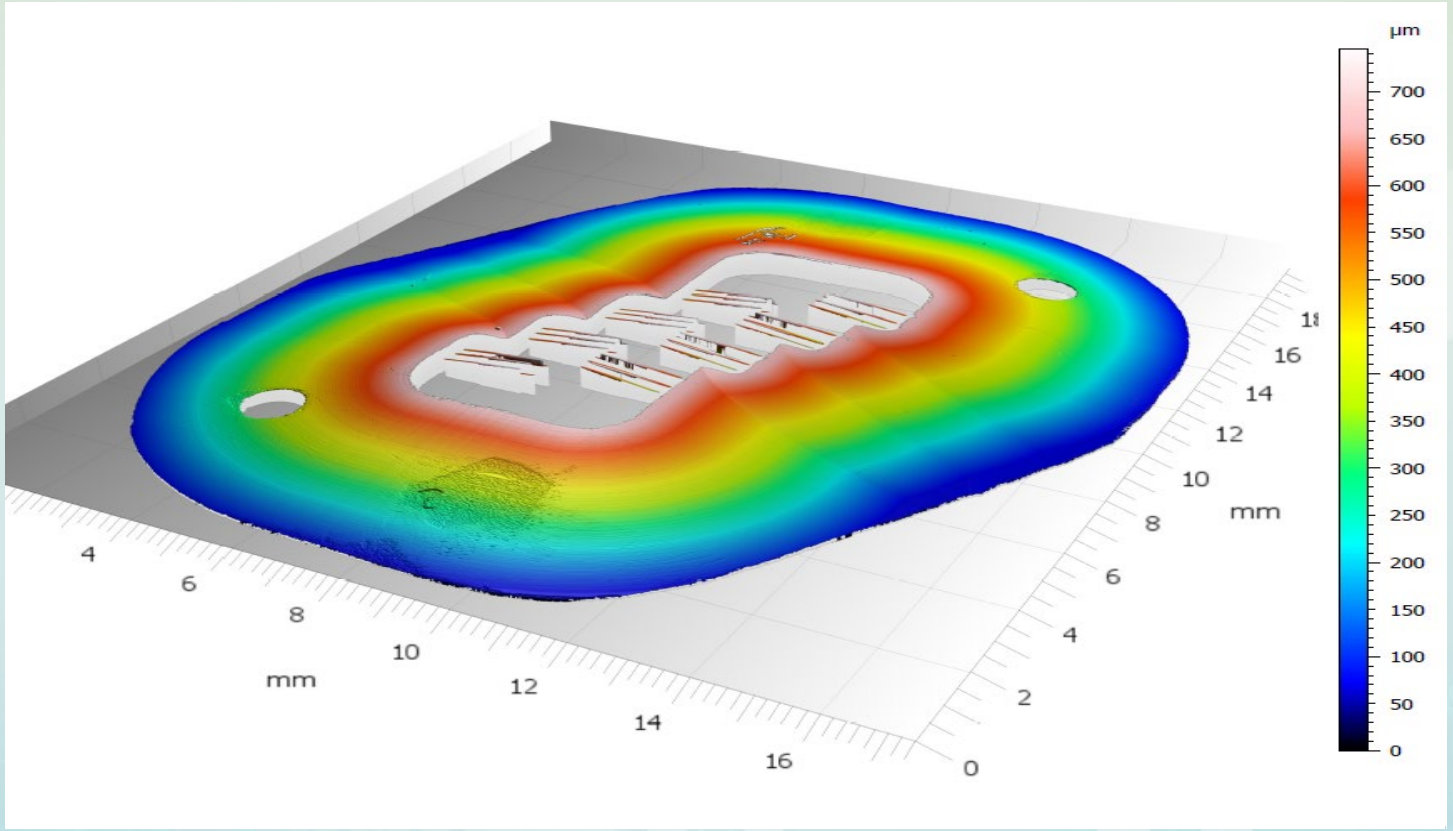

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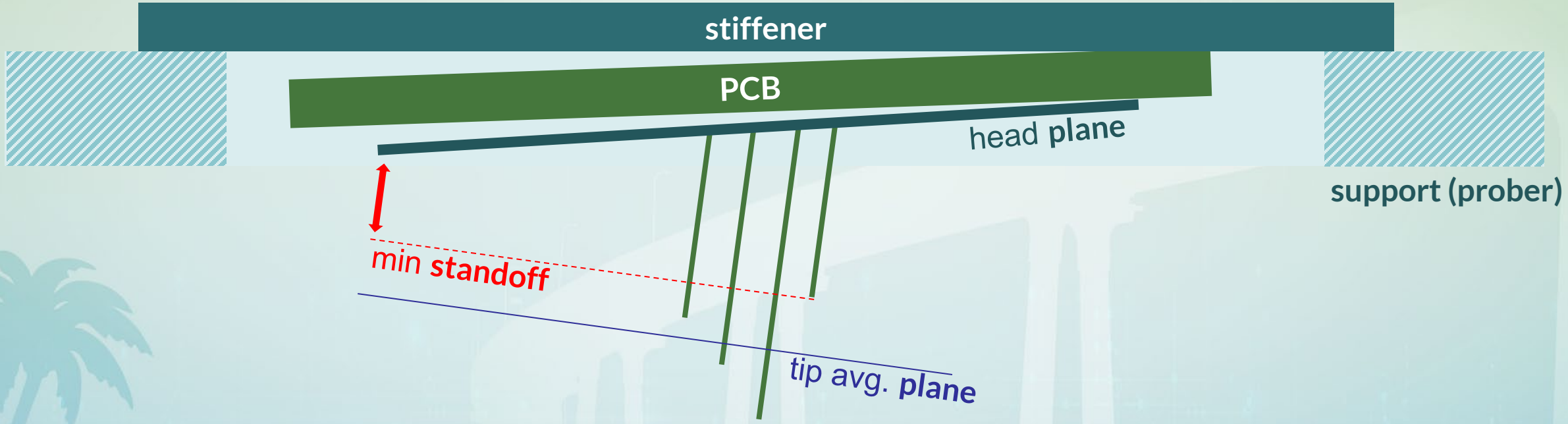
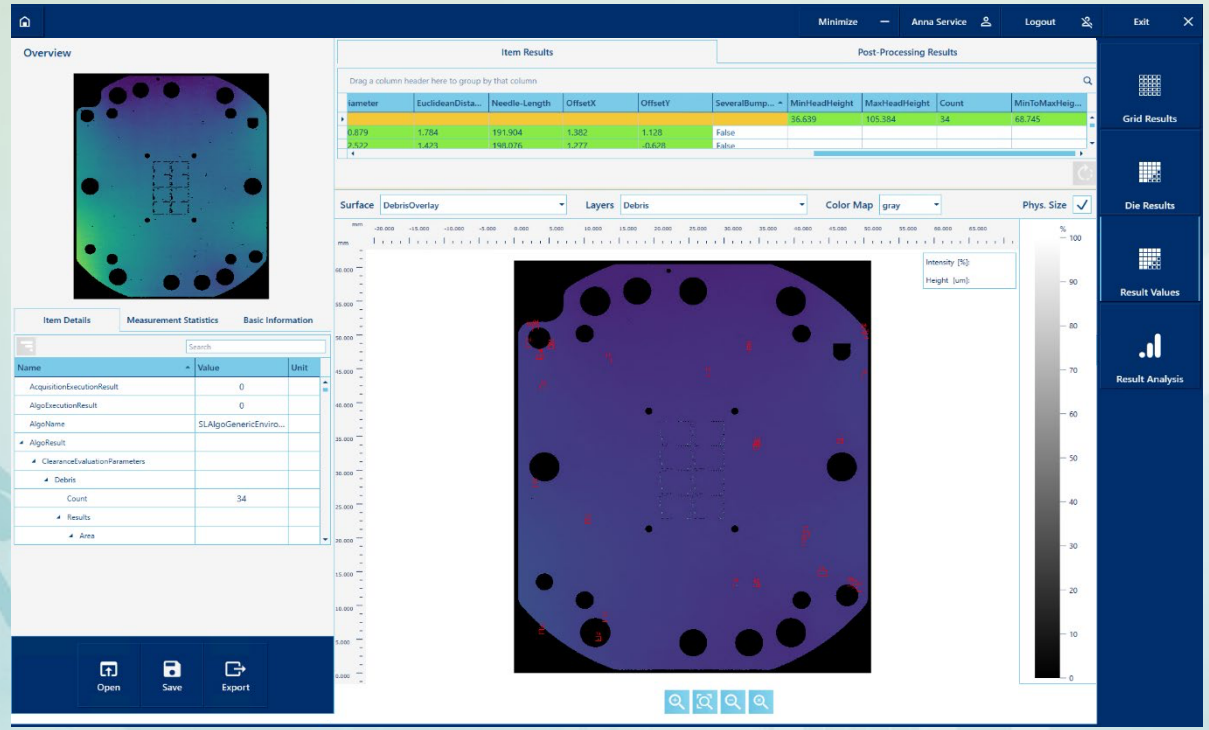
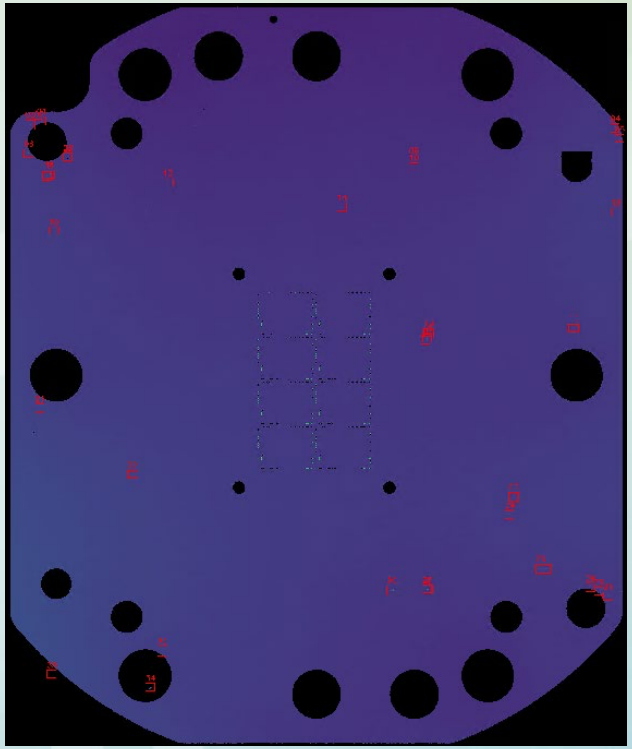


preventing damage & loss

- checking for foreign objects, debris, particles





preventing damage & loss

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process requirements

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- preventing damage & loss
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- saving time
- reducing human related errors

- allowing comaparability
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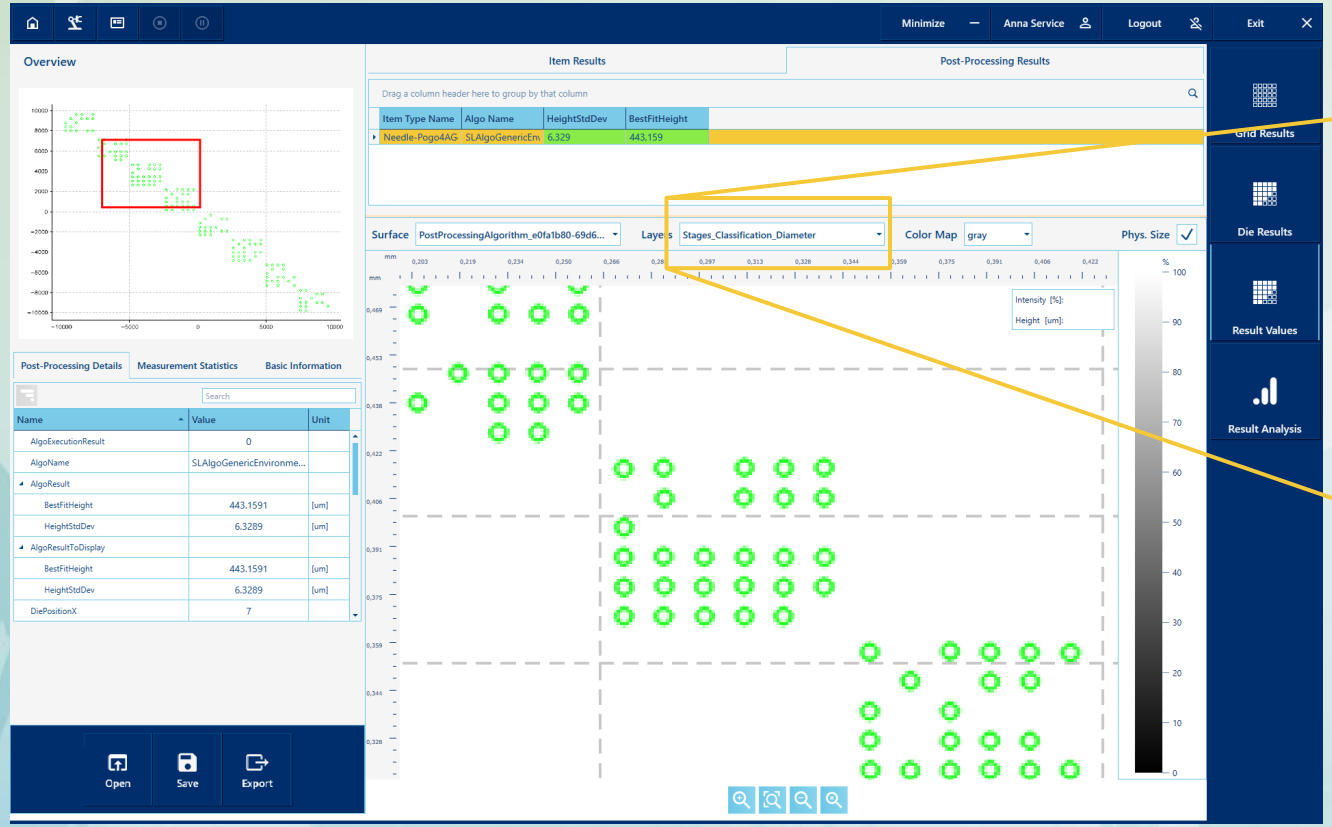
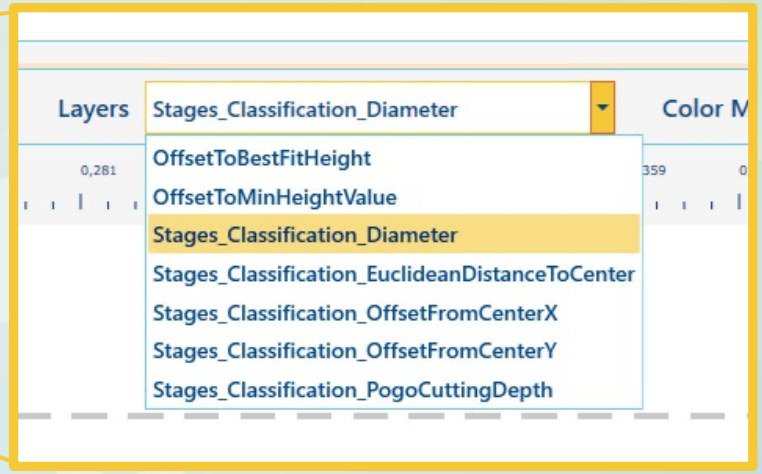
allowing comparability

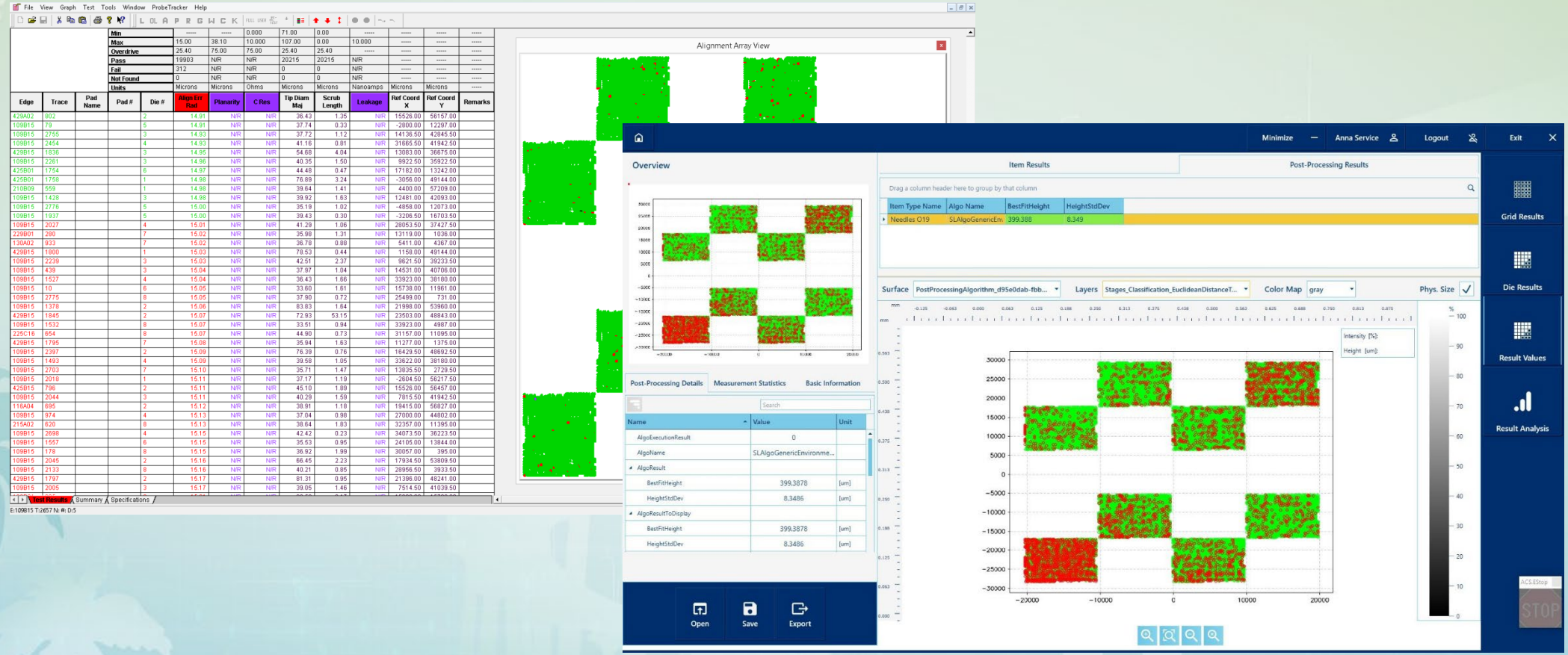
- masked mapping of probe tip results





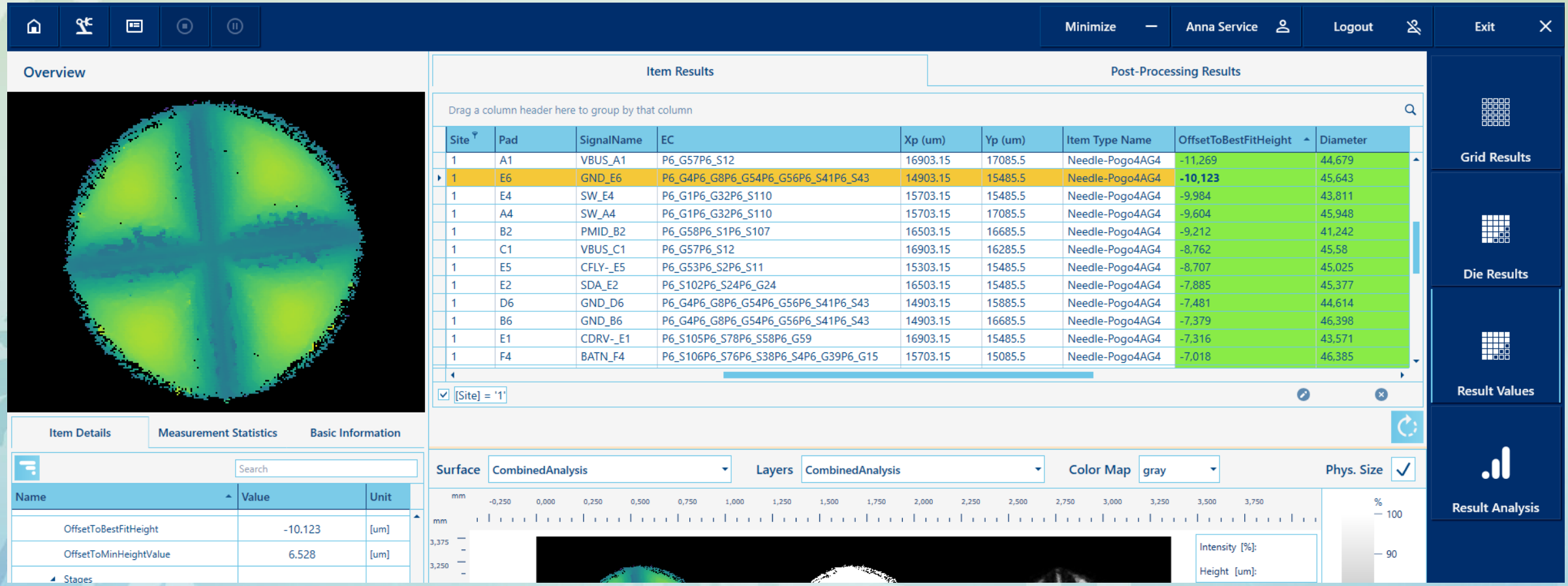
allowing comparability

- masked mapping of probe tip results



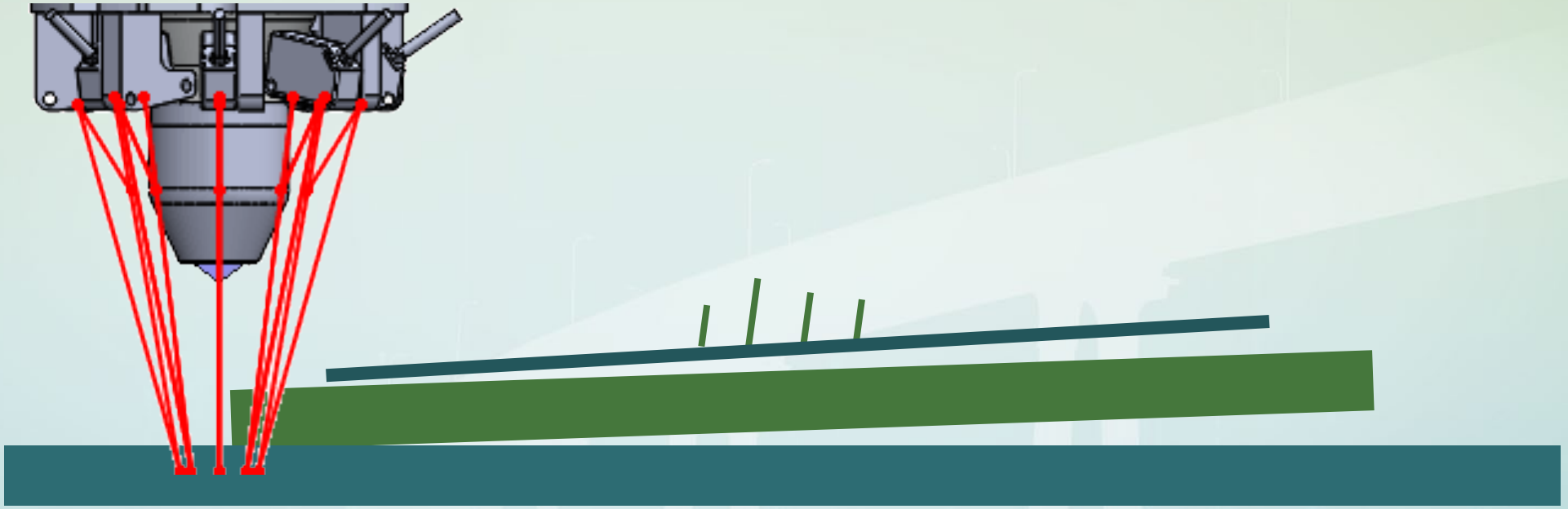
allowing comparability

- importing and progressing resource data



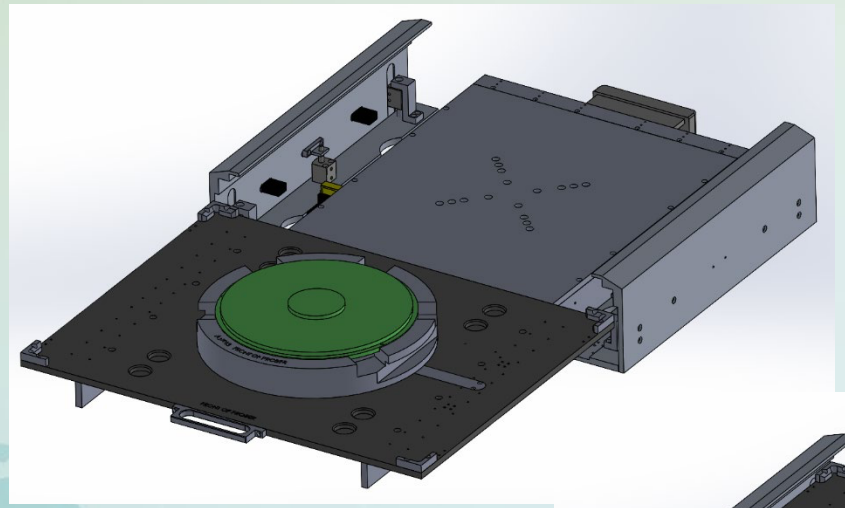
creating a safe process

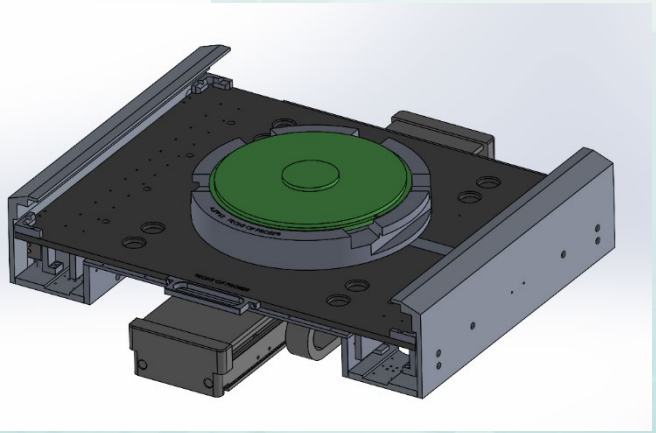
- probe card topography is complicated

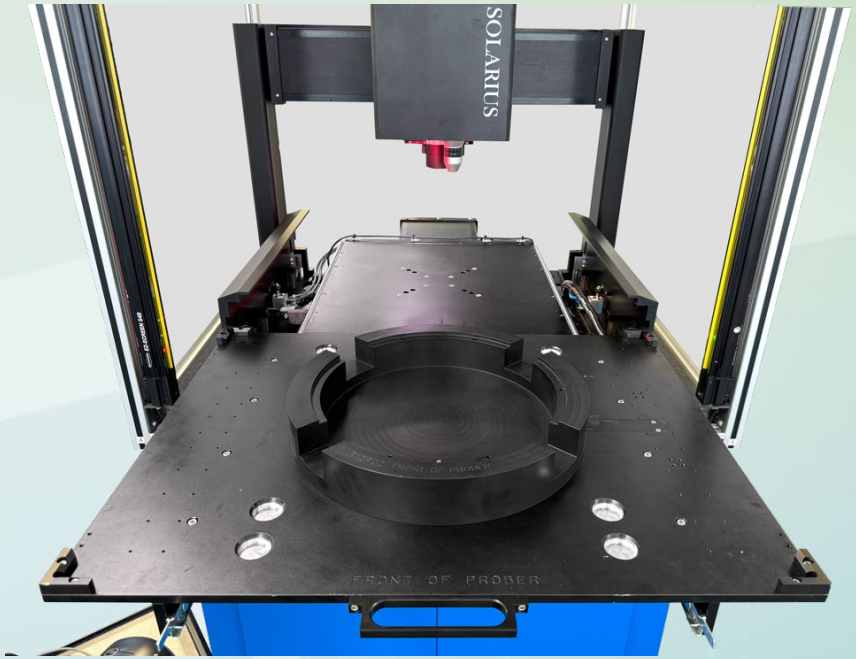


make the process simple to use

- concatenated tasks on heavy weight objects

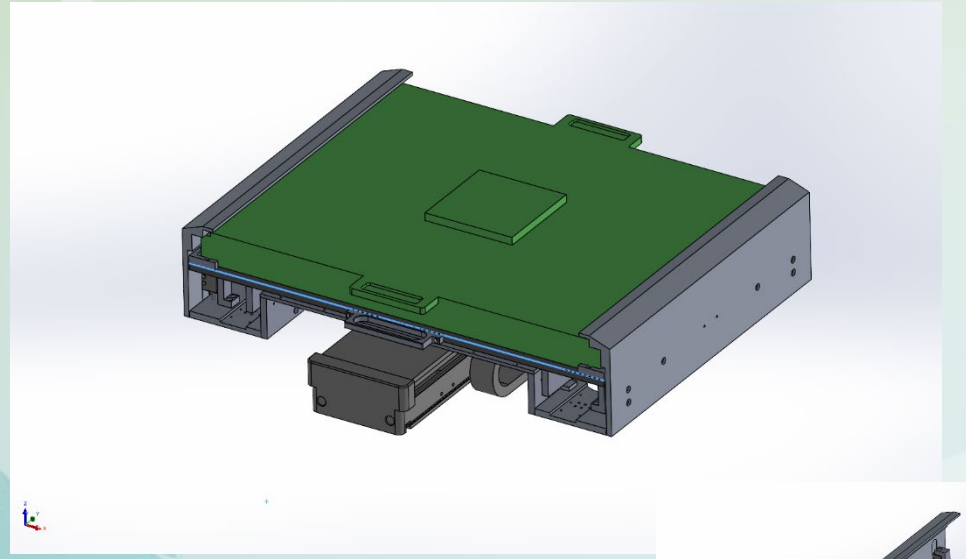


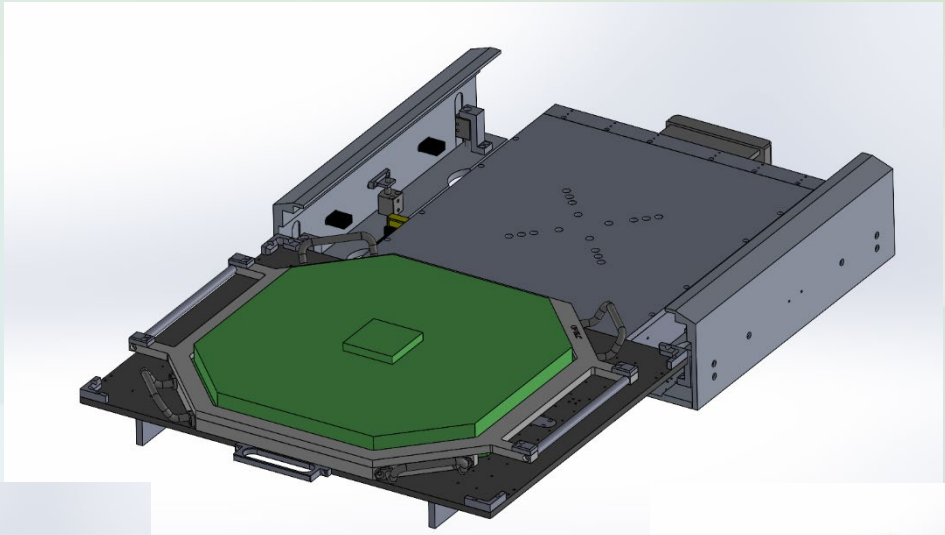


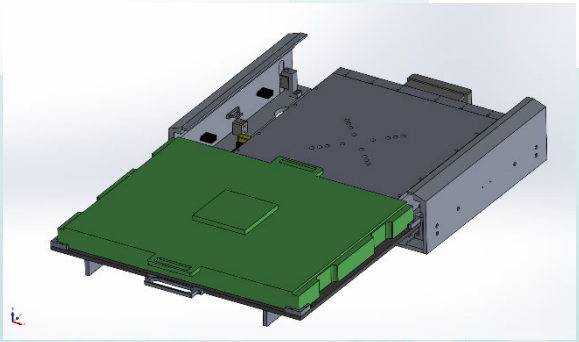


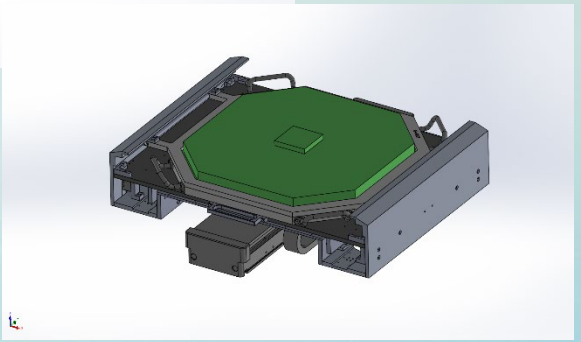
make the process simple to use

- loading & unloading heavy weight objects



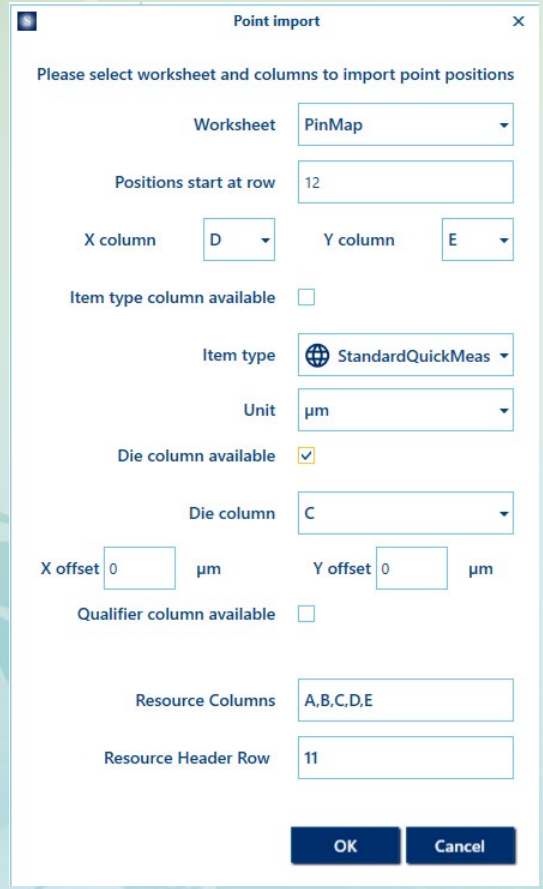


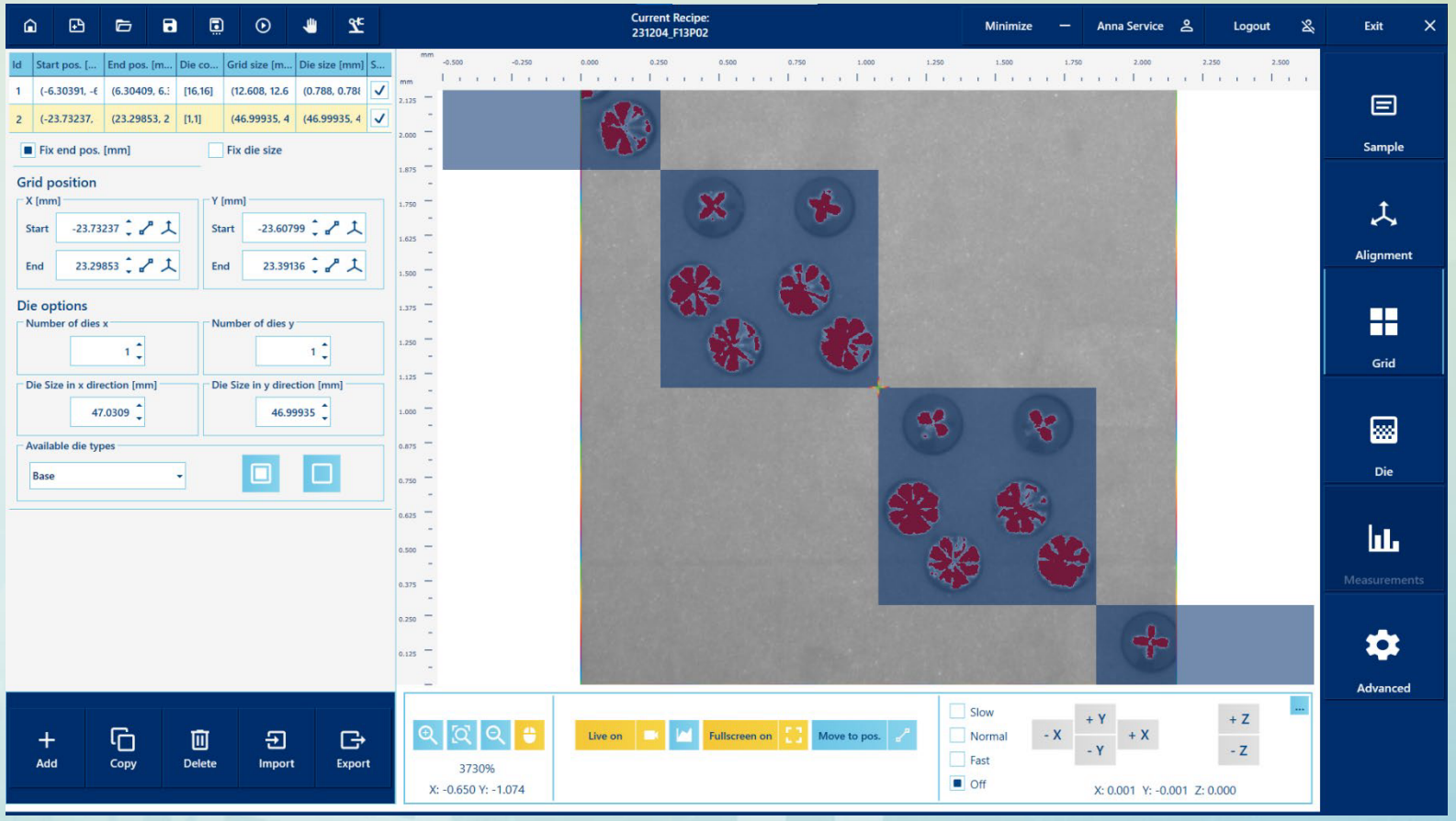




make the process simple to use

- importing, teaching and mapping inspection cycles





tool qualification

- initial tool specification

Solarius Probe Card Inspection Tool Spec	
Item	**Spec**
Vendor	Solarius
Tool Platform	AOP 900
Imaging Technology	Area Scan
Max Card Support Weight	50 kg (110 lbs)
Relative Accuracy	2 µm @ 3σ for 18µm tip or larger
Precision	2 µm @ 3σ for 18µm tip or larger
Operator Mode criteria	Pass/Fail Results
Receiving Site	CDPR
Process	Probe Card Inspection
Inspections Task	tip Coplanarity , tip height, tip position, tip diameter, head flatness, head tip tilt
Tip Types	Vertical / MEMS / POGO / Cantilever / FFI
False Positive Rate	< 2%
Fresh card setup process and time	<15 minutes*TBC
Recipe setup	Capacity to support: -Checksum verification against 'Global server' -Local and global card name (card family + CDDS name) -Load and store from two different (local and global) server location, and from machine - Import Xp Yp Coordination from pinmap, Column D and Column E - prefer no conversation from CDDS files to .txt or .csv
Throughput	TBA after receive all the probe card
Tool Dimensions (LxWxH)	1040x970x1500mm
Probe cards size	640x600mm
Scan area	250x200mm
Operation Temp	room temperature±2°
Maintenance method	warning for calibration. (customized: i.e.: 6 months, 12 months). Duration of the warning sign.
Calibration cost	Provide calibration quote, service contract quote

Solarius Probe Card Inspection Tool Spec	
Item	**Spec**
Maintenance requirements/tool	Calibration pass spec and any extra calibration tool?
Maintenance frequency	Expect 1x/Year
Fixture	Slider / drawer concept to present different probe cards (ETS 800, ETS 200, ETS364, Uflex, Uflex+, V93K, VLCT, J750). The fixture must be universal for all mentioned probe card. Inley to be discussed upon receiving all probe card from TI
Scan Result	Summary report with pass/fail + Detailed report output
Tip Length	Always from 'base to tip (or visa versa)'
	Base:
	Vertical, Pogo = tip leaving probe head
	Cantilever = start of the ~90 deg. Bend
	Membrane, FFI T3 / T11 = base of the pyramid
	The planarity = Highest measured tip point - Lowest tip point
	Limits must be available for the 'Lowest tip point' and for the highest difference in planarity allowed.
Tip diameter:	Detection if probe diameter gets too large. Smallest limit for a too large diameter: 18um (@ 3sigma -> CPK > 1.6)
Position	X/Y position of the probe tips needs to be verified (relative to each other) to ensure they will still be inside the bond pads. (minus some guardband).
	The bond pads also might not be quadratic, but can be hexagonal, round or rectangular.
Clearance and prevent collision	clearance 5.3mm, No collision should be occur toward probe card
	Should never be lower than the maximum allowed over travel.
	Anyway - we'd better go with the 'base plane' (see Measurement of tip length). Nothing should be 'higher' than this plane.
	In pre-defined areas we also need to determine, if some planes are lower by a certain distance than the correlation plane. (e.g. if screws have been tightened enough).
Debris:	Any kind of irregularities (particles, debris, ...) in the clearance volume.
Operting system requirment	Windows 10

tool qualification

- assessement phases

Phase 1	Head	Screw	Tip
Phase 2	Head	Screw	Tip
Phase 3	Head	Screw	Tip
Phase 4	long term testing		

- phase 1, general capability & comparative test
- phase 2, MSA for all tip and head types
- phase 3, different cards of identical types

- ETS364 large
- ETS364 small
- ETS800
- J750
- Ultra
- UF+
- 93k
- ETS200T

prospective topics

- Improvement of UX, teaching time
- Enhance UI capabilities towards „known good features“

- fixture automation for OHT, AGV
  - SECS communictation is supported
- top down tool version for „direct OHT“ loading

- PC rework enhancement kit

thank you for listening!