

# Micro-optics Functional Testing

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18-19 September 2024. Salzburg, Austria

EPIC Technology Meeting on  
Photonics for Miniaturized Optics:  
From Components to Use-cases at Sony DADC



# Alfamation: 33 years of expertise



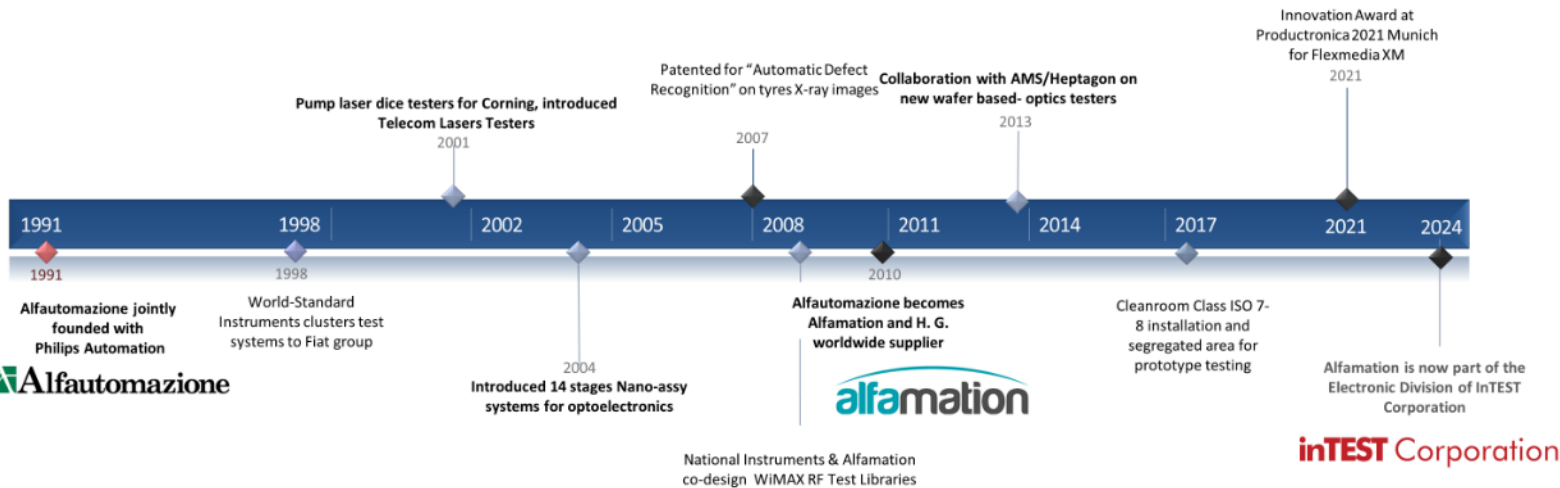
Headquarters in Lissone (MB) Italy  
Part of inTEST Corp. (NJ USA)  
NYSE: INTT



Diversified Global Manufacturer of Innovative **Functional Test** Systems



**130+ Employees**  
2000+ Worldwide Installations  
Global Presence through inTEST



Since 1991, a history of innovation

- Strong R&D and Engineering
- Expertise in Optics
- Deep knowledge in Image Processing
- Experience in Optoelectronics and Photonics



- RF & Wireless
- Infotainment & Telematics
- 5G and V2X

- Consumer Electronics
- Displays
- PCBA Functional Test

- Audio Amplifier Test
- 32 Simultaneous Audio Channel Testing

## Hyperion™ Common Test Platform

## flexmedia XM

MULTIPLE INSTRUMENTS, ONE FAMILY

- Specialty Test Modules
- Audio-Video Generators/Analyzers
- Camera Simulators
- Ethernet-powered, OS-Agnostic



BATTERY MANAGEMENT PCBA TEST



## PIXELSHOOTER™

Fully Automated Display & Instrument Cluster Tester



## WALOT

### WAfer-Level-Optics Tester

High-volume micro-optics manufacturing test



# Micro-optics Functional Testing

*“What does it mean on the production floor?”*

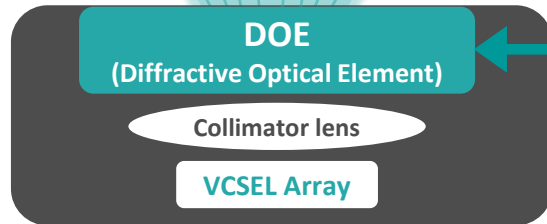
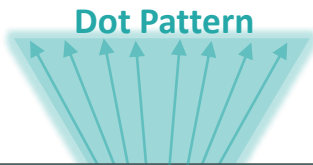
## Consumer Electronics 3D Sensing



Face ID



Gesture Recognition



Tested at  
wafer-level

### Performance

**Test Metrics:** Angular position, Efficiency, Uniformity.

Up to **3000 UPH** (Units per hour)

**Gage R&R < 10%**

50 Mpx, 105° or 150° field of views

< 0.5° optical resolution

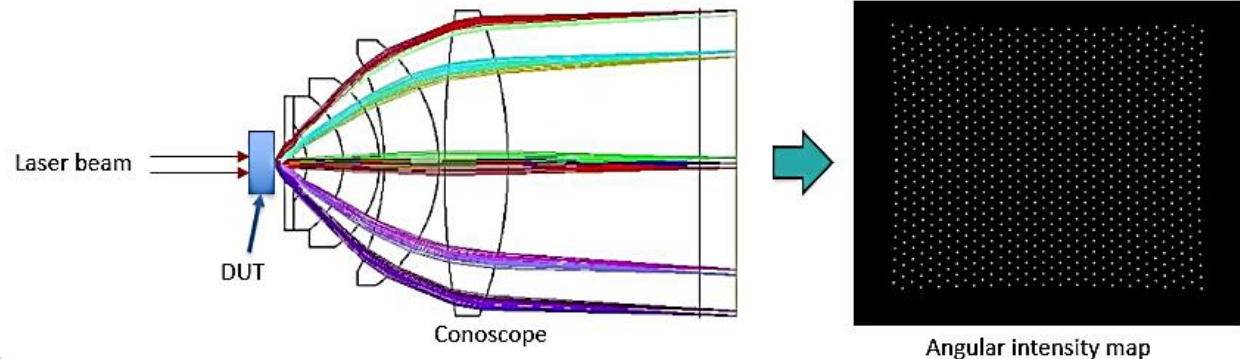
# Conoscopy



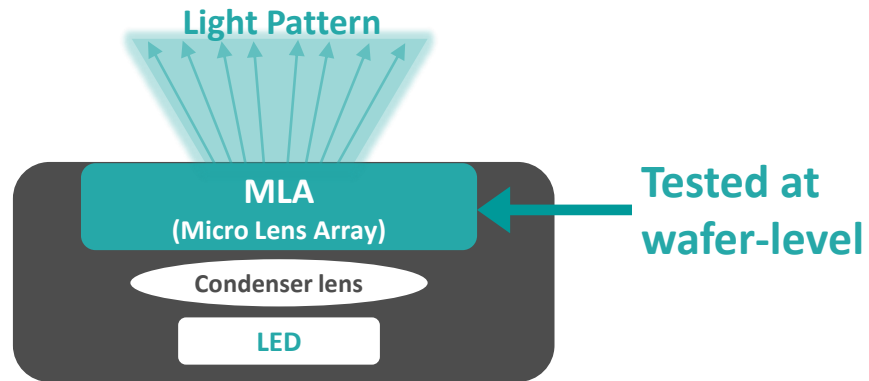
105°conoscope



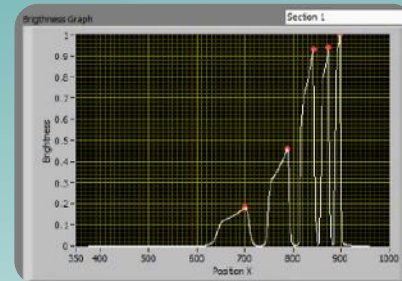
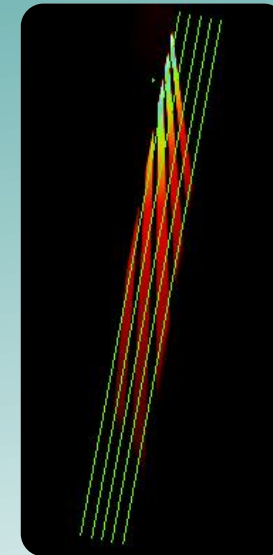
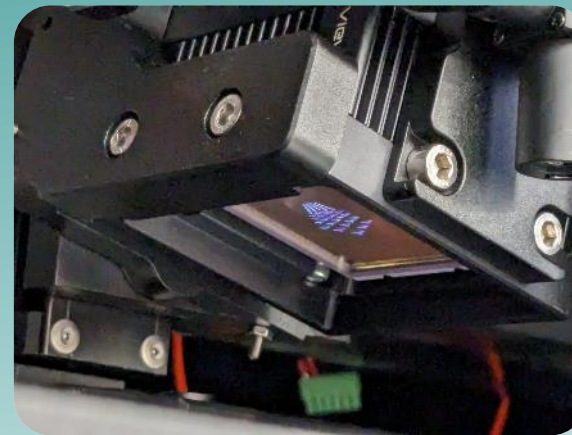
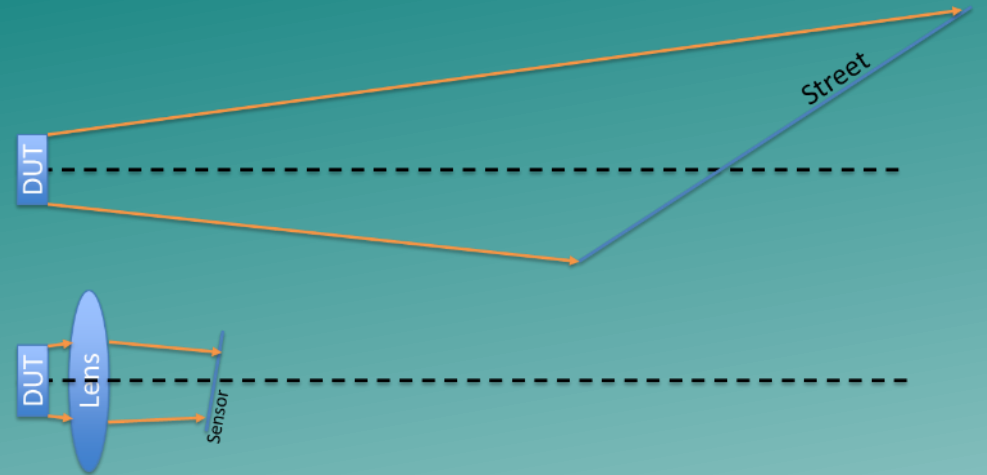
150°conoscope



## Automotive Light Pattern Projection



# Light Pattern Projector Testing



Projected Image on  
Rotated Sensor

## Performance

**Test Metrics:** Dimensions, Sharpness, Brightness, Ghosts.

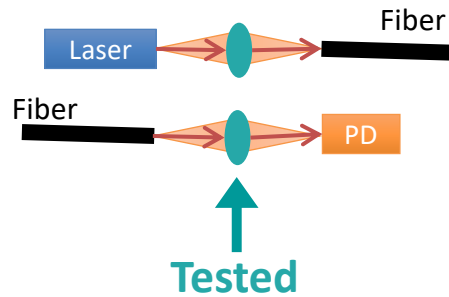
**Automated setup flexibility**

Up to **2500 UPH**

**Gage R&R < 10%**

**Sub-mm resolution** on target image surface

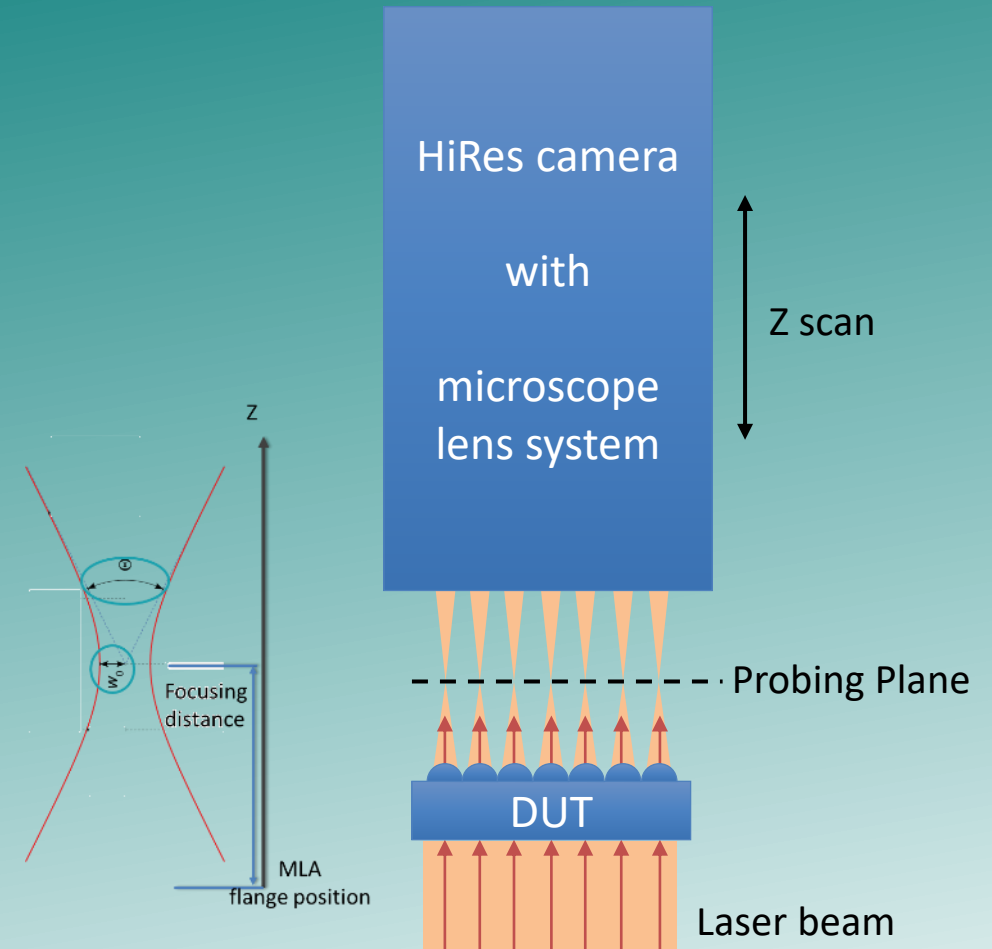
## Telecom Coupling Optics



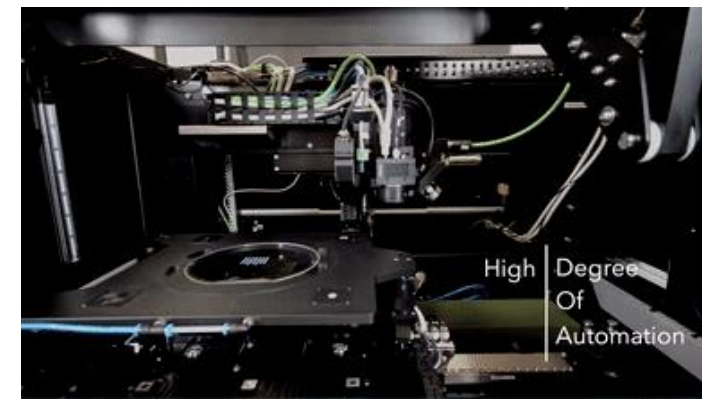
### Performance

**Metrics:** Uniformity, Flange Focal Length, Efficiency, ...  
Up to **1500 UPH**  
Gage R&R < **10%**  
Z Scan resolution < **5  $\mu\text{m}$**

# Coupling Optics Testing



# What makes a good ATE ? (Automated Test Equipment)



## High Throughput

- Optimized test sequence
  - Parallel processes
  - **Batch sequencing**
- Built-in step-by-step test time analyzer

## Test Reliability

- **Automated calibration sequences**
- Golden units monitoring
- Built-in statistical tools

## Cost optimization

- **Sweet spot** among:
  - Instruments perf
  - Testing scope
  - Testing time
  - Test flexibility
- Standard base platform
  - **Common base components and spare parts**

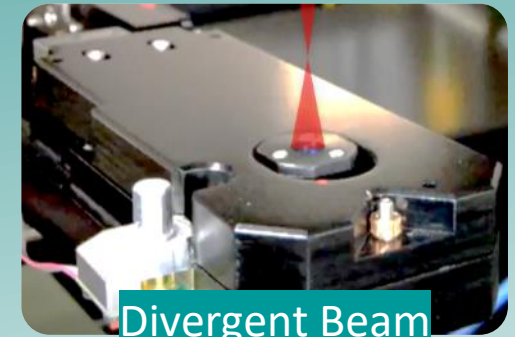
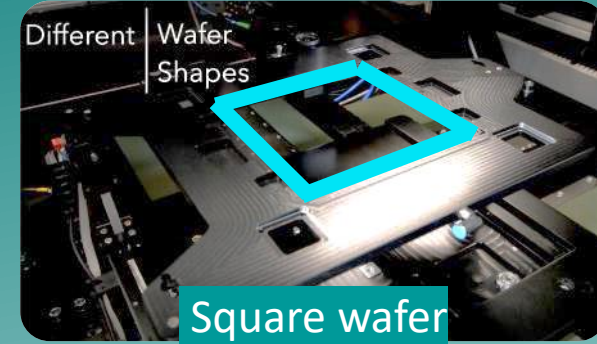
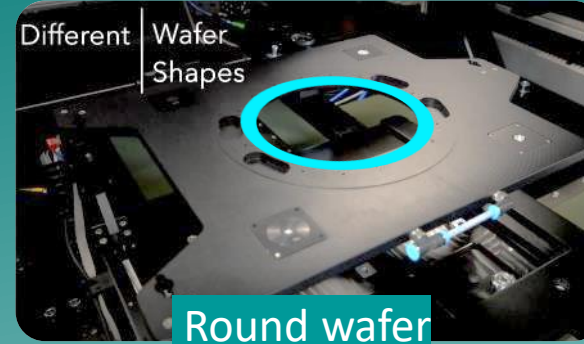
## Cleanroom Friendly

- **Low operator workload**
  - **Automated serial number reading and alignment**
  - **Robotized wafer loading**
- **Reduced footprint**
- Cleanroom compatible
- Network integration



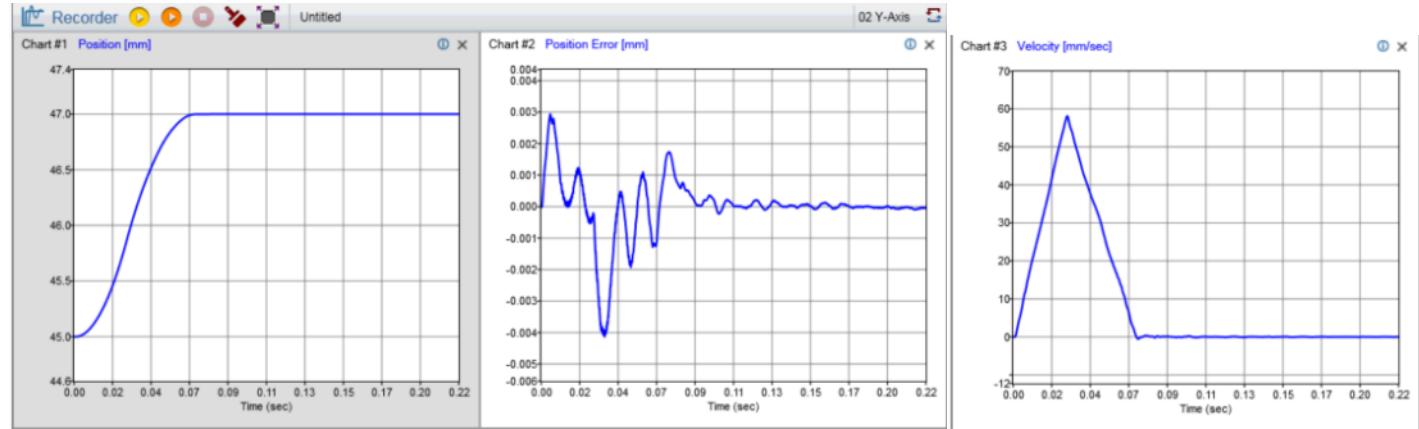
# No Standard → Flexibility

- Various Wafers **sizes, shapes and thickness**
- Wafer fixing :
  - Vacuum
  - Clamping
- Beam shaping of LED or Laser, with controlled:
  - Polarisation
  - Divergence
  - Intensity profile
  - Active area size and shape.

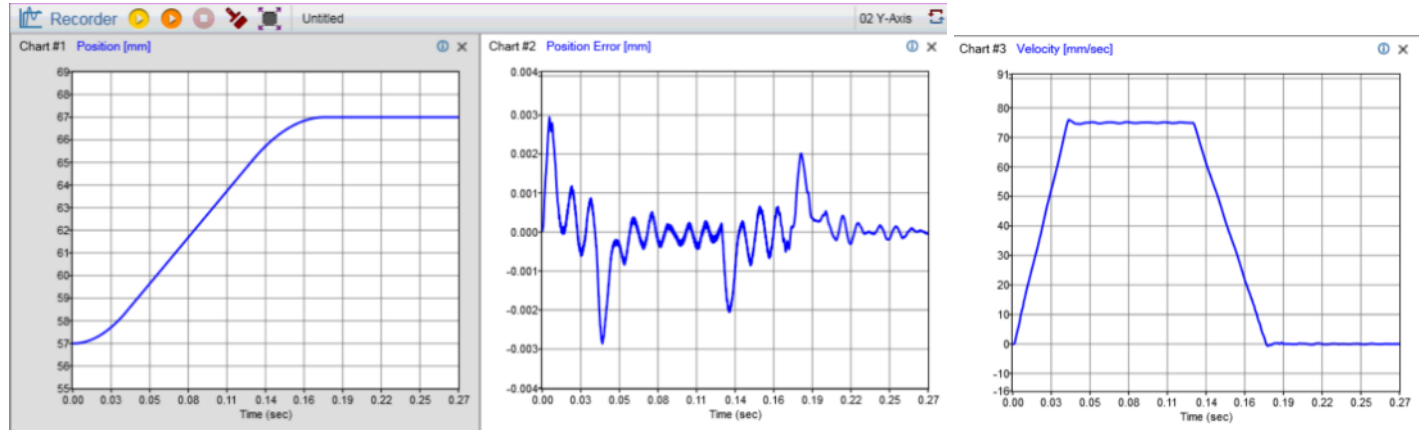


# Stepping from DUT to DUT in less than 200ms

| Step size | Stepping time<br>(Settling within 300nm) |
|-----------|--|
| 2 mm      | 90 ms                                    |

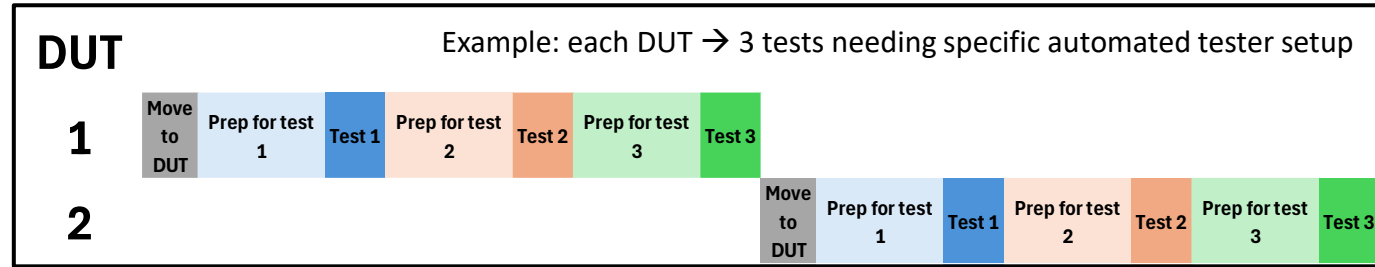


| Step size | Stepping time<br>(Settling within 300nm) |
|-----------|--|
| 10 mm     | 200 ms                                   |

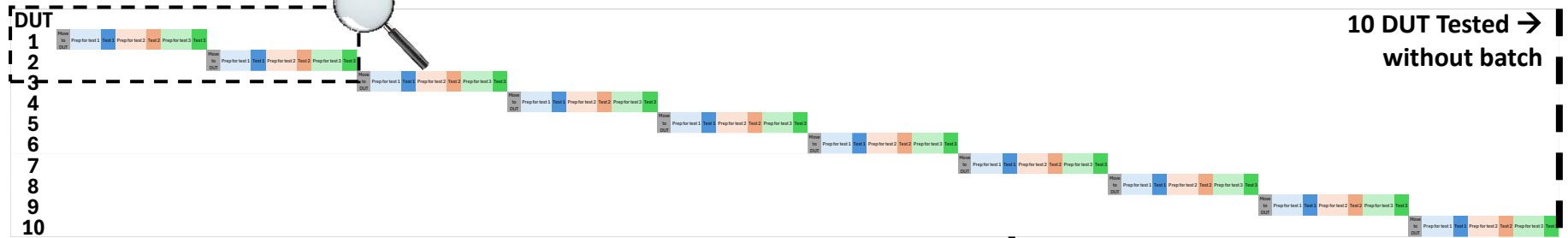


# Time optimization strategy for complex test scopes

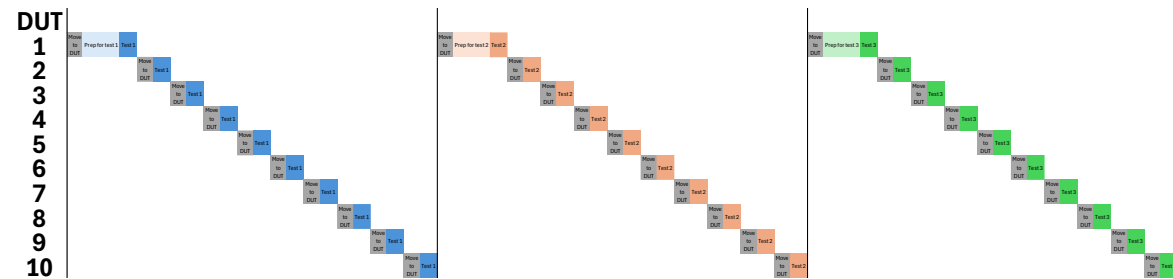
- When several tests are performed, with tester setup for each test taking more time than stepping.
- Batch Testing helps reduce test time, keeping same test scope.



Without Batch Testing



With Batch Testing



Reduced test time  
Same test scope

# Being EPIC together

- What can **You** do for **Alfamation**?
  - test method
  - instrument
  - micro-optics and photonics test challenge
- What can **Alfamation** do for **You**?
  - Supply Automated Test Equipment
  - Develop new test methods
  - **Not only at wafer-level !**

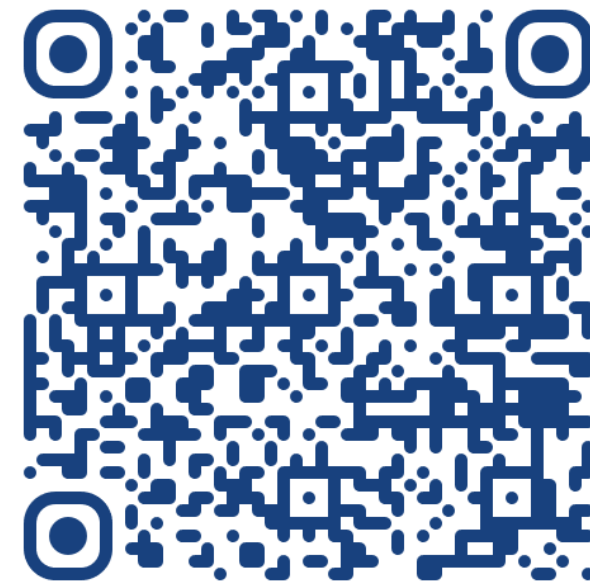


# Q&A



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