



# LOMSS

## Development of Advanced Adhesion Testing Method for Polymer Interfaces

### Objectives:

- Evaluate the effects of moisture ingress in electronic devices;
- Establish a reproducible testing procedure to assess the effect of moisture degradation on the adhesion strength; and
- Reduce testing scatters that were common in former testing methods.



## Background and Motivation

Moisture ingress into an electronic device may cause failure via degradation of several polymer interfaces (die attach/substrate, die-top/molding compound, chip-underfill etc.)



A method to accurately evaluate the effect of moisture degradation on components is needed to select appropriate materials for anticipated operating conditions to avoid failure



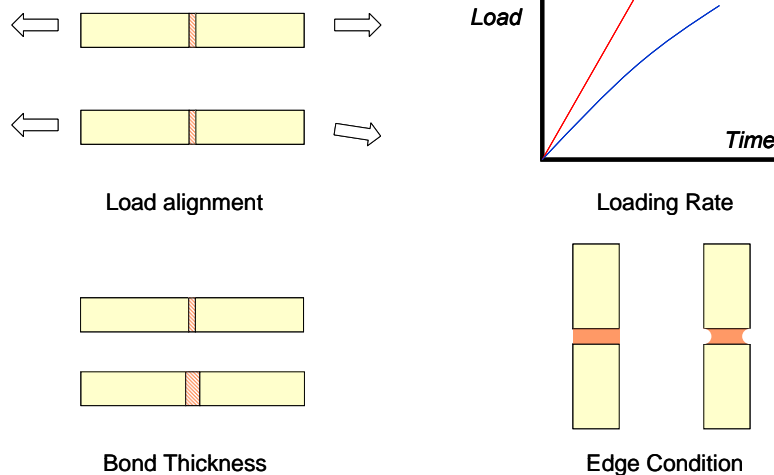
ASTM cites acceptable differences in adhesion test results of up to 41% for intralaboratory testing and up to 58.7% for interlaboratory testing



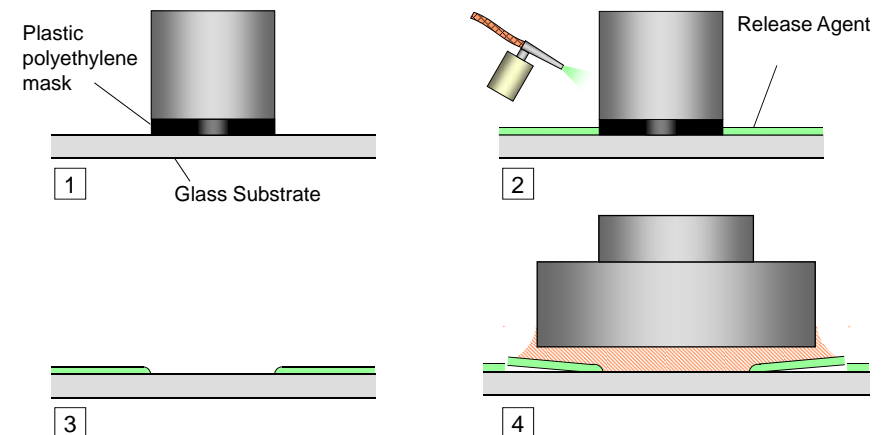
*A consistent, quantifiable adhesion test method is needed to clearly observe the effect of moisture absorption on adhesion strength.*



## Variables Addressed That Affect Uncertainty

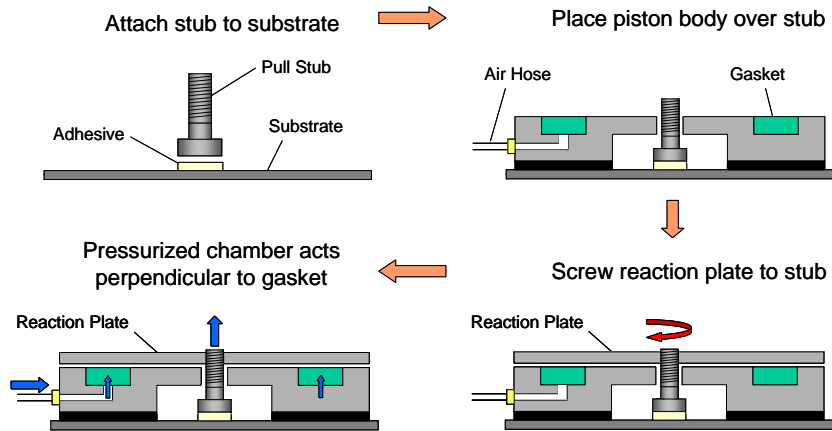


## Enhancing Edge Geometry Repeatability by Artificial Crack Creation

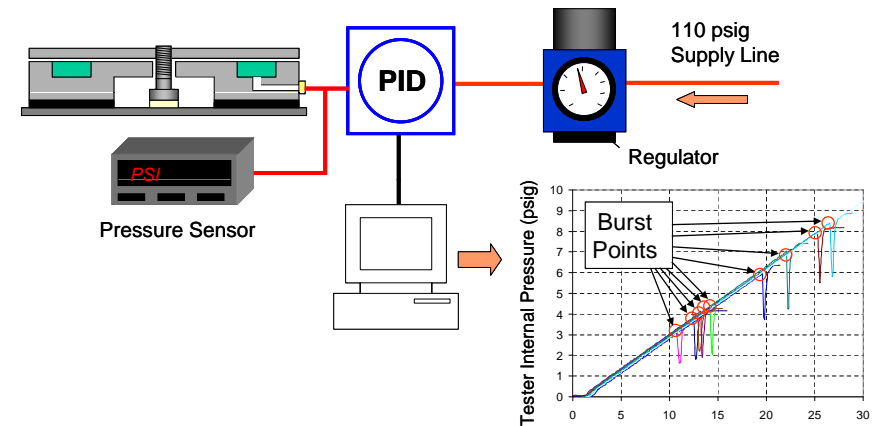




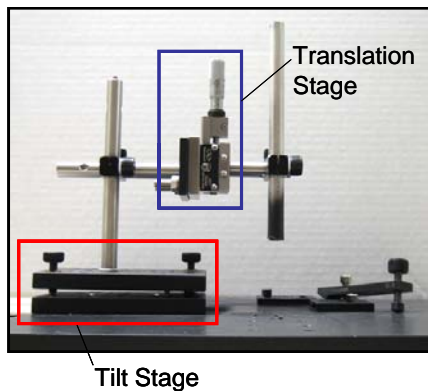
## Enhancing Load Alignment - Unique Pneumatic Self Aligning Capability



## Enhancing Loading Rate Control Using PID



## Enhancing Bond Thickness/Evenness Control



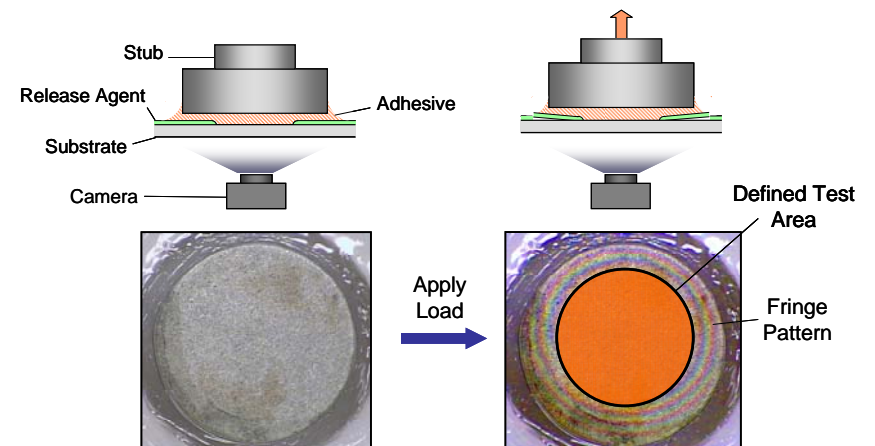
New preparation apparatus provides means to control...

bond evenness using XY precision tilt stage.

bond thickness using micrometer driven translation stage.

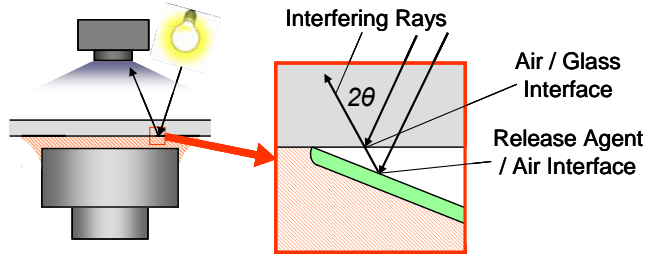


## Application of White Light Interference to Verification of Crack Propagation





# Application of White Light Interference to Verification of Crack Propagation



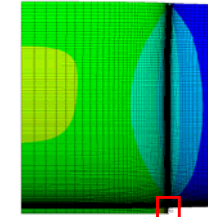
$$N(S, \lambda) = \frac{S}{\lambda}$$

$$H = N \frac{\lambda}{2 \cos \theta}$$

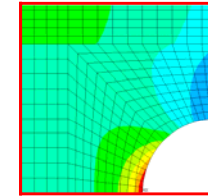
Optical interference indicates existence of release agent separation.



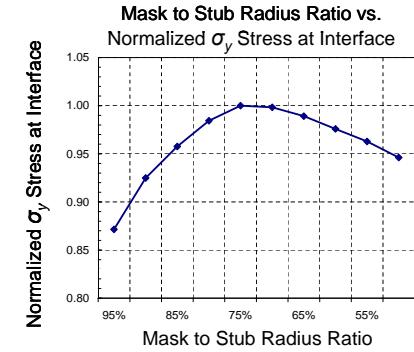
# Enhancing Edge Geometry Repeatability – Optimizing Ratio of Mask to Stub Radius using FEA



$\sigma_y$  Element Solution



$\sigma_y$  Element Solution at Interface



Mask size uncertainty can be minimized near 75%.