# SPTS Claritas – Enhanced OES

## February 2012

*The information in the presentation is the property of SPTS and may not be duplicated, disclosed to any third party, or used for any purpose other than that for which it is supplied without the written consent of SPTS.*

# Introduction to Claritas

SPTS

- Historically it has only been possible to end-point a subset of the deep Si etches that MEMS & TSV customers require for their production
- Until now no Etch vendor has been able to successfully end-point ..
  - Wafers that have very low exposed areas (0.1-3.0% open area)
  - High pressure processes that operate in the 100 mtorr range
- Claritas is the first end-point system to address these process regimes
- Claritas extends the use of existing OES options available on SPTS DRIE modules and enhances the detection of reactants and/or by-products
- Claritas is operated under fully automatic recipe control

© SPTS Technologies

*The information in the presentation is the property of SPTS and may not be duplicated, disclosed to any third party, or used for any purpose other than that for which it is supplied without the written consent of SPTS.*

# Standard OES End-Point

Pressure

40mT

100mT

Undetectable

0.6%

5%

30%

Open Area

Standard OES
(CCD Array OES)

★ Indicates recent customer demos

Detectable

Limited on open area & process pressure

© SPTS Technologies

*The information in the presentation is the property of SPTS and may not be duplicated, disclosed to any third party, or used for any purpose other than that for which it is supplied without the written consent of SPTS.*

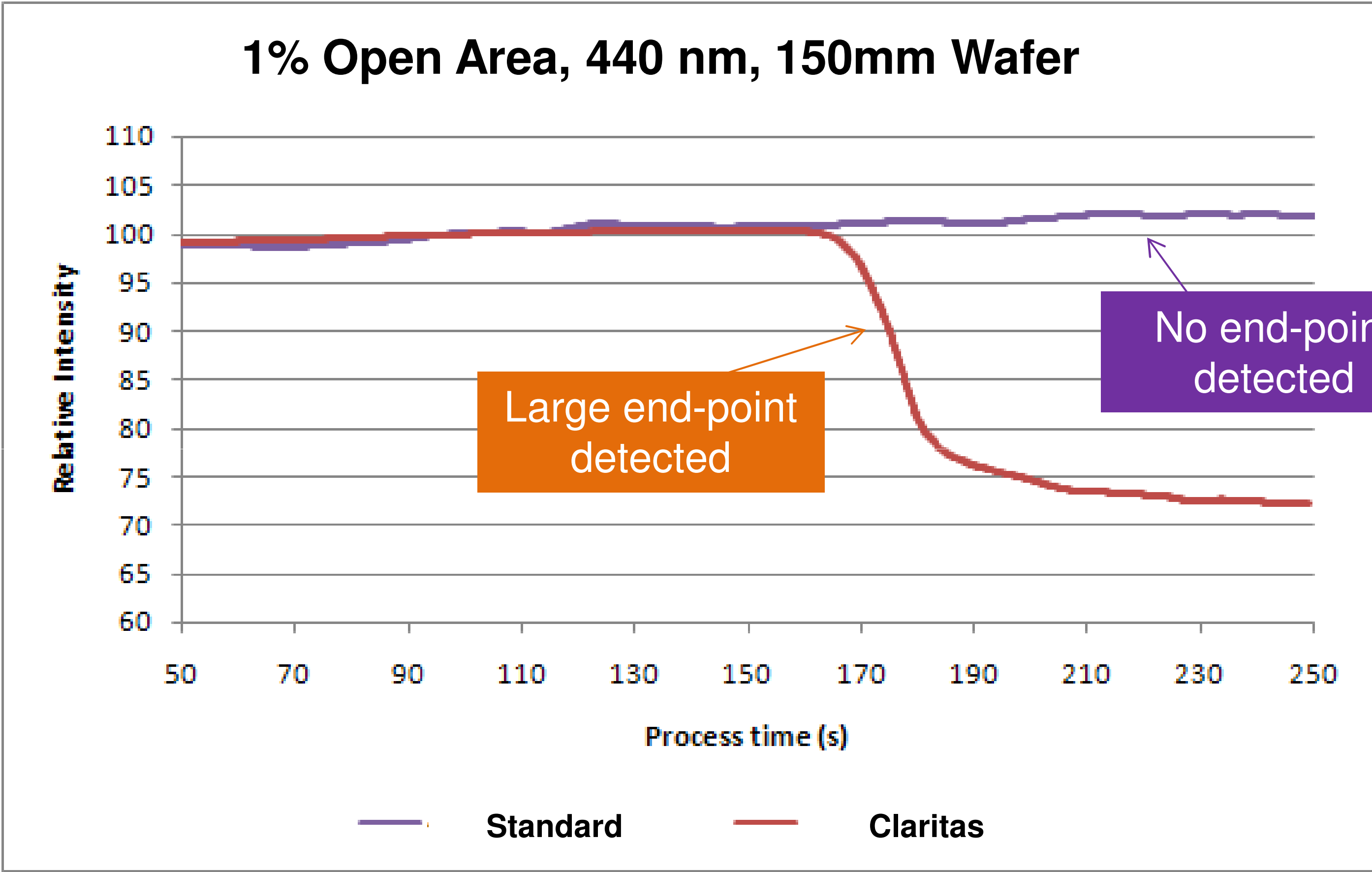
# Claritas – Advanced End-Point

Large operating envelope
Successful end-pointing within previously inaccessible process regimes

© SPTS Technologies

*The information in the presentation is the property of SPTS and may not be duplicated, disclosed to any third party, or used for any purpose other than that for which it is supplied without the written consent of SPTS.*

# Claritas Tests at SPTS



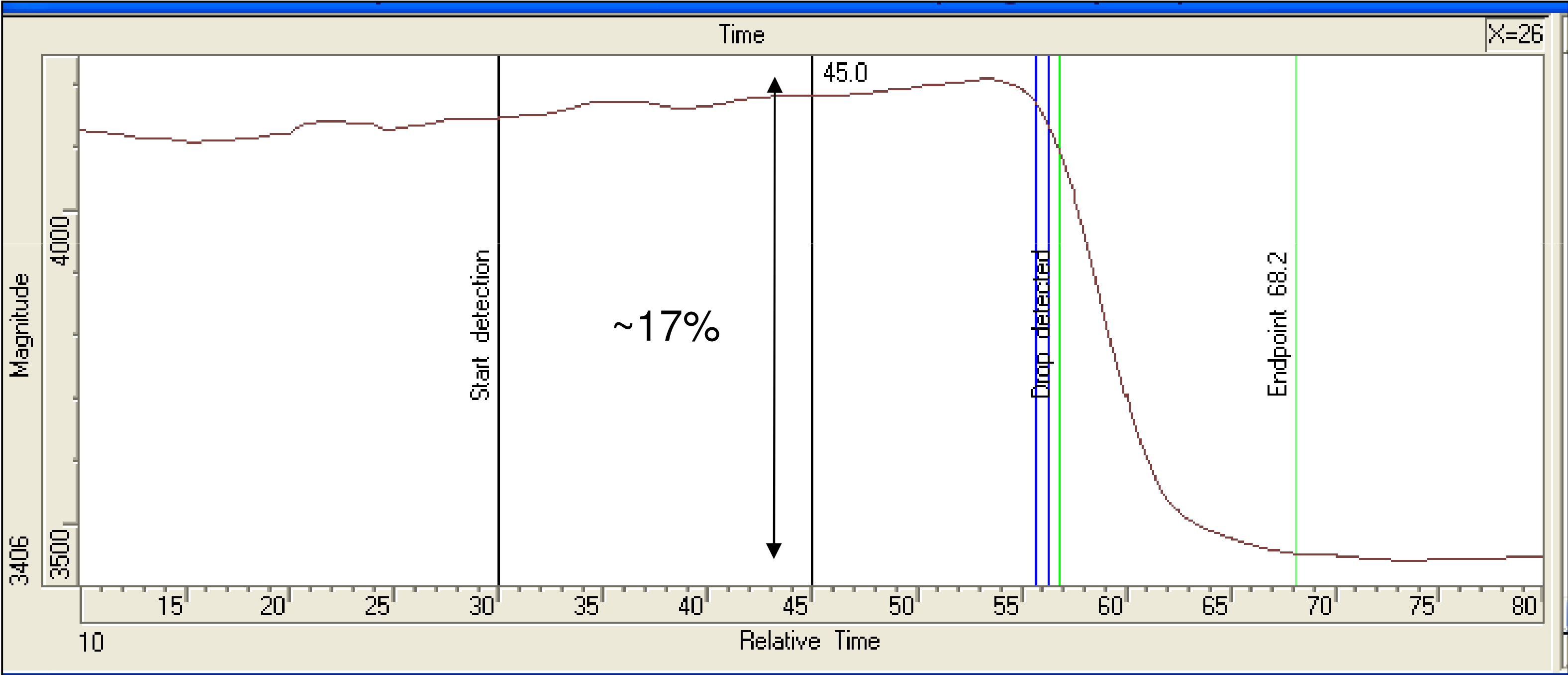

Claritas easily copes with 1% open area

© SPTS Technologies

*The information in the presentation is the property of SPTS and may not be duplicated, disclosed to any third party, or used for any purpose other than that for which it is supplied without the written consent of SPTS.*

# Claritas Tests at SPTS

- Customer recipe – customer #1
- 150 mm wafer, <1% open area



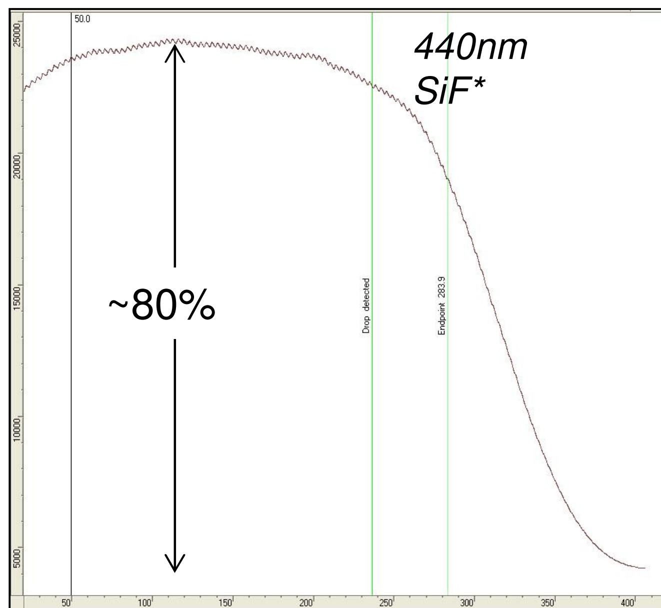

Claritas easily copes with <1% open area

© SPTS Technologies

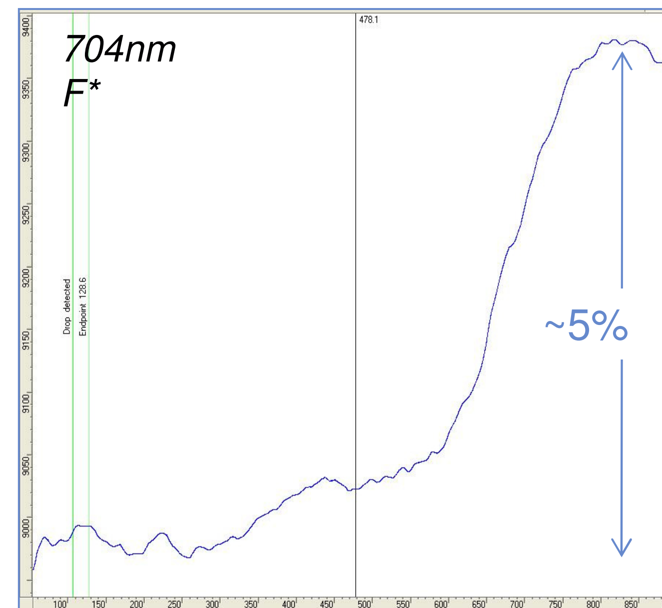
*The information in the presentation is the property of SPTS and may not be duplicated, disclosed to any third party, or used for any purpose other than that for which it is supplied without the written consent of SPTS.*

# Claritas Tests at SPTS

- Customer recipe – customer #2
- 150 mm wafer, Application #1, ~50% open area
- Best endpoints available for a given recipe condition




Claritas



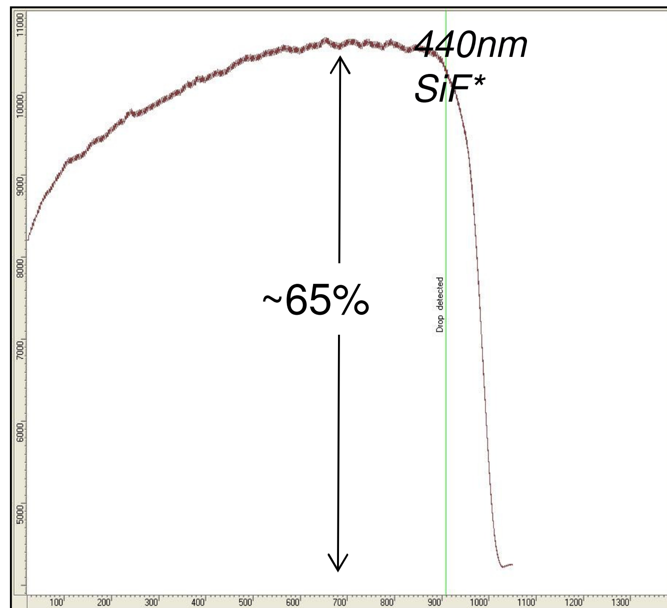

Standard OES



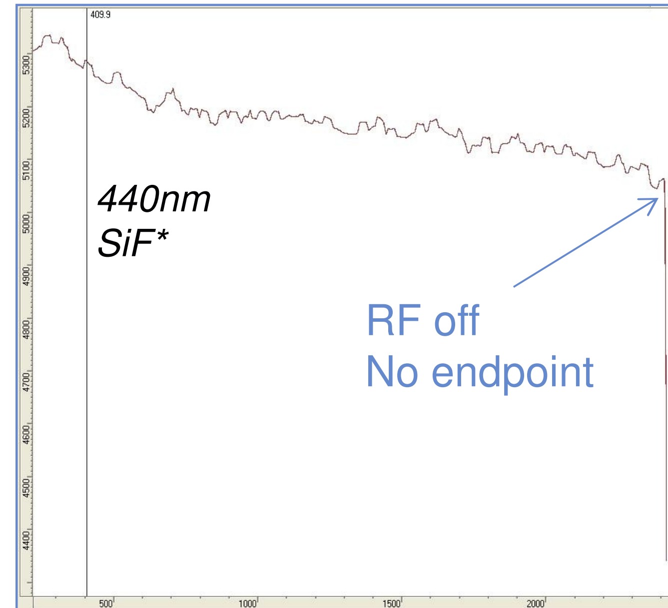
*The information in the presentation is the property of SPTS and may not be duplicated, disclosed to any third party, or used for any purpose other than that for which it is supplied without the written consent of SPTS.*

# Claritas Tests at SPTS

- Customer recipe – customer #2
- 150 mm wafer, Application #2, ~30% open area
- Best endpoints available for a given recipe condition




Claritas



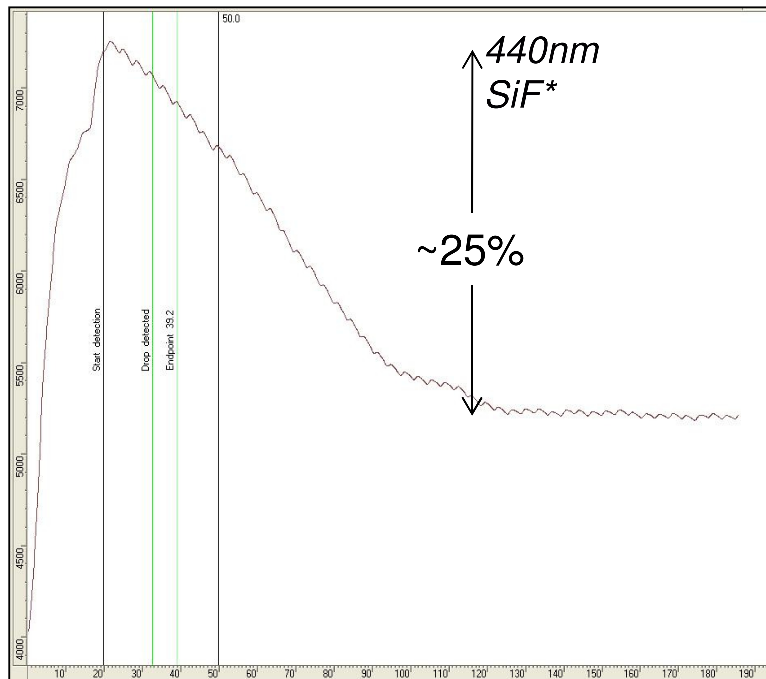

Standard OES

© SPTS Technologies

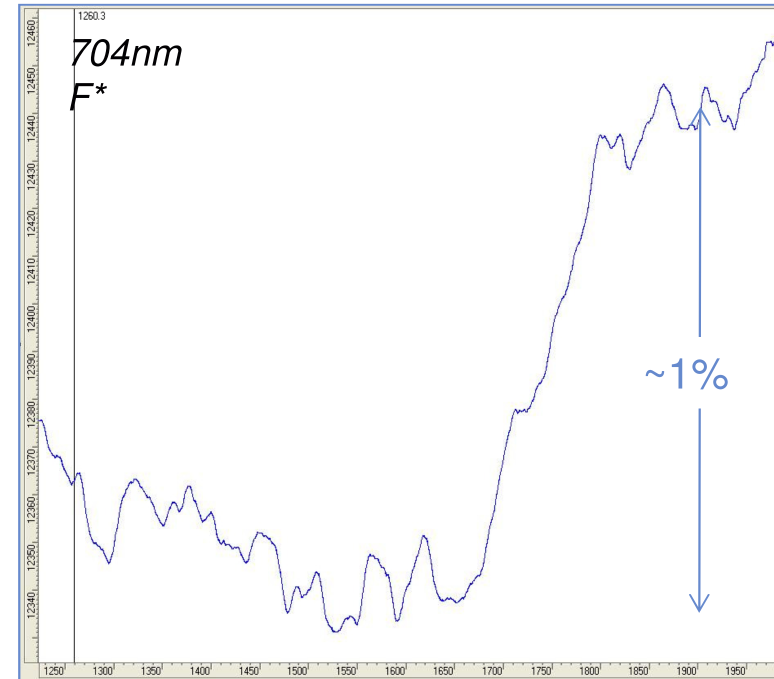
*The information in the presentation is the property of SPTS and may not be duplicated, disclosed to any third party, or used for any purpose other than that for which it is supplied without the written consent of SPTS.*

# Claritas Tests at SPTS

- Customer recipe – customer #3
- 150 mm wafer, Application #1, 16% open area
- Best endpoints available for a given recipe condition




Claritas



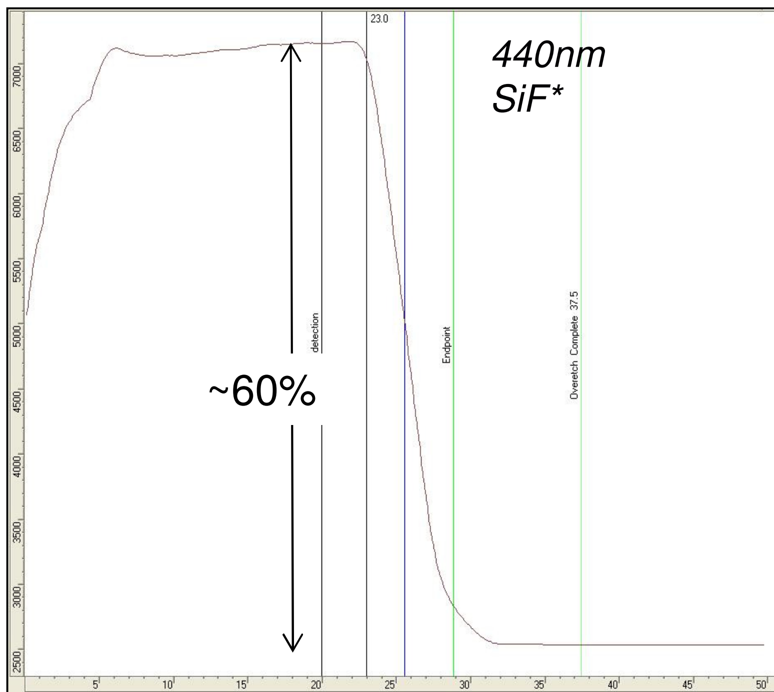

Standard OES

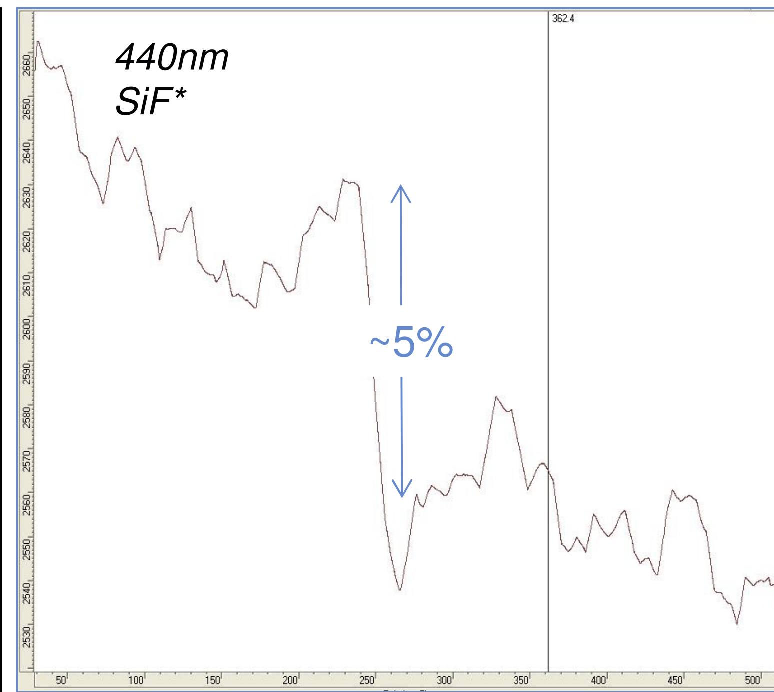
© SPTS Technologies

The information in the presentation is the property of SPTS and may not be duplicated, disclosed to any third party, or used for any purpose other than that for which it is supplied without the written consent of SPTS.

# Claritas Tests at SPTS

- Customer recipe – customer #3
- 150 mm wafer, Application #2, ~20% open area
- Best endpoints available for a given recipe condition




Claritas

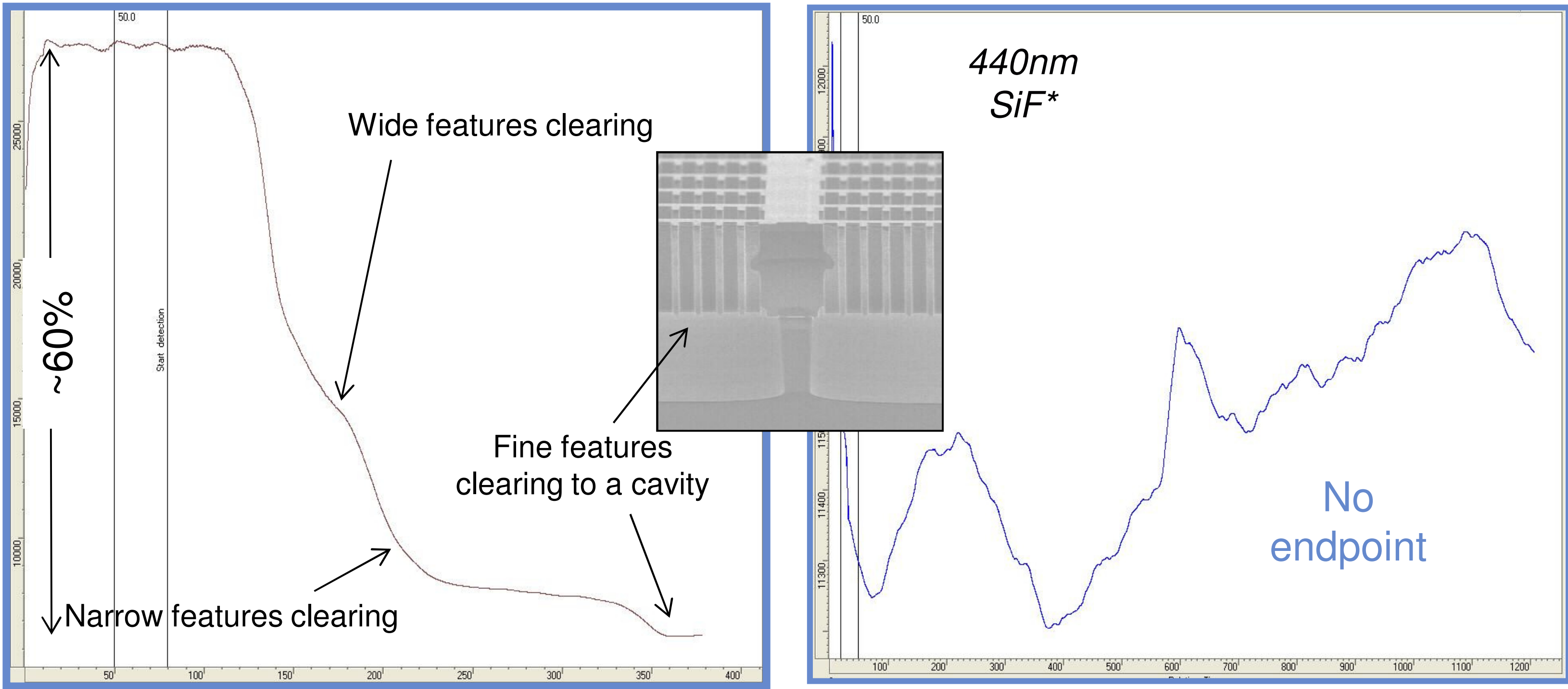
Standard OES

© SPTS Technologies

The information in the presentation is the property of SPTS and may not be duplicated, disclosed to any third party, or used for any purpose other than that for which it is supplied without the written consent of SPTS.

# Claritas Tests at SPTS

- Customer recipe – customer #3
- 150 mm wafer, Application #3, ~20% open area
- 3 Discrete endpoints seen for multiple features on same mask




Claritas

Standard OES

© SPTS Technologies

The information in the presentation is the property of SPTS and may not be duplicated, disclosed to any third party, or used for any purpose other than that for which it is supplied without the written consent of SPTS.

# Claritas Performance Summary

| Wafers | Open area | Process | Standard OES Signal Change | Claritas Signal Change |
|---|---|---|---|---|
| Internal | ~1% | SPTS' | None | 28% |
| Customer #1 | <1% | Customer's | None | 17% |
| Customer #2 | ~50% | Customer's Application #1 | 5% | 80% |
| | ~30% | Customer's Application #2 | None | 65% |
| Customer #3 | ~16% | Customer's Application #1 | 1% | 25% |
| | ~20% | Customer's Application #2 | 5% | 60% |
| | ~20% | Customer's Application #3 | None | 60% |

**Claritas delivers**:

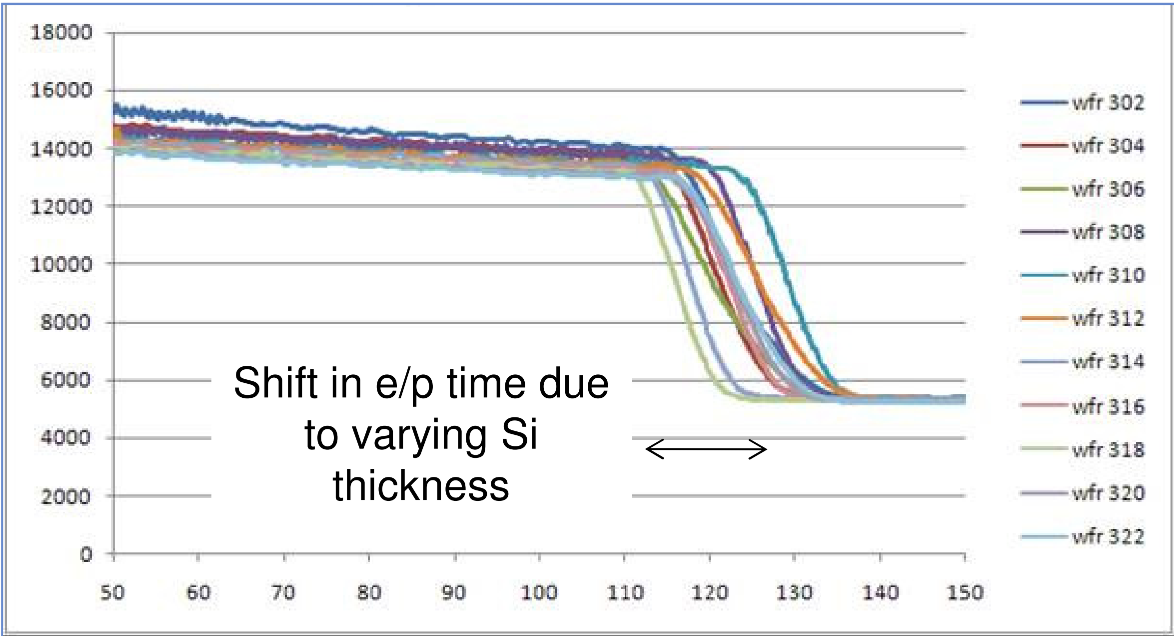
- Large operating envelope
- Successful end-pointing across all applications

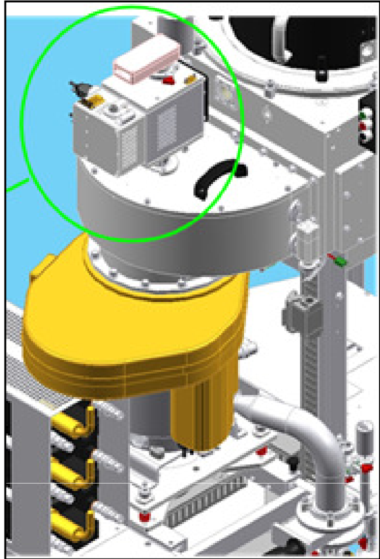
© SPTS Technologies

*The information in the presentation is the property of SPTS and may not be duplicated, disclosed to any third party, or used for any purpose other than that for which it is supplied without the written consent of SPTS.*

# Claritas – Additional Example

- 70 x 70 µm TSV etch stopping on oxide
- Objective
  - Consistent, reliable end-pointing



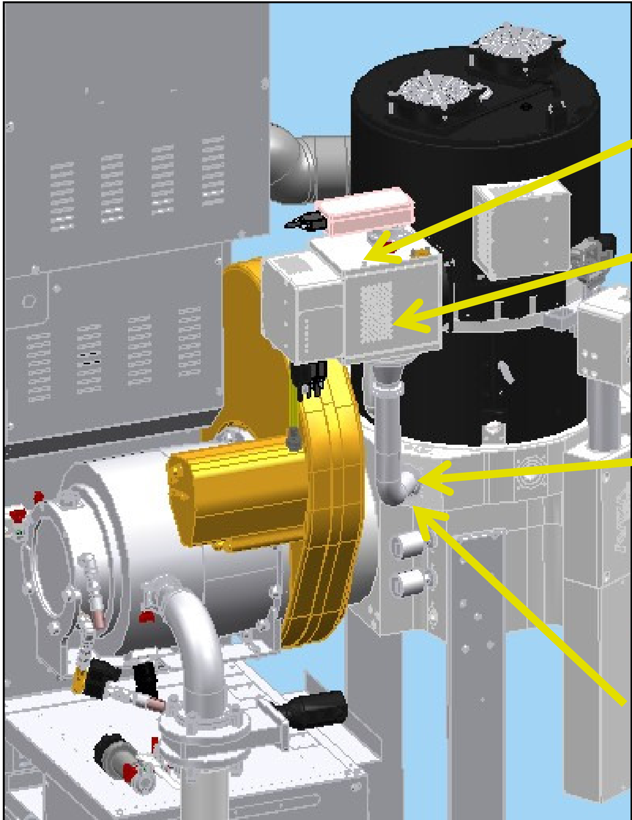
Objective met:
Good e/p reliability
~60% signal change
**Allows early capture of e/p to improve wafer repeatability**

© SPTS Technologies

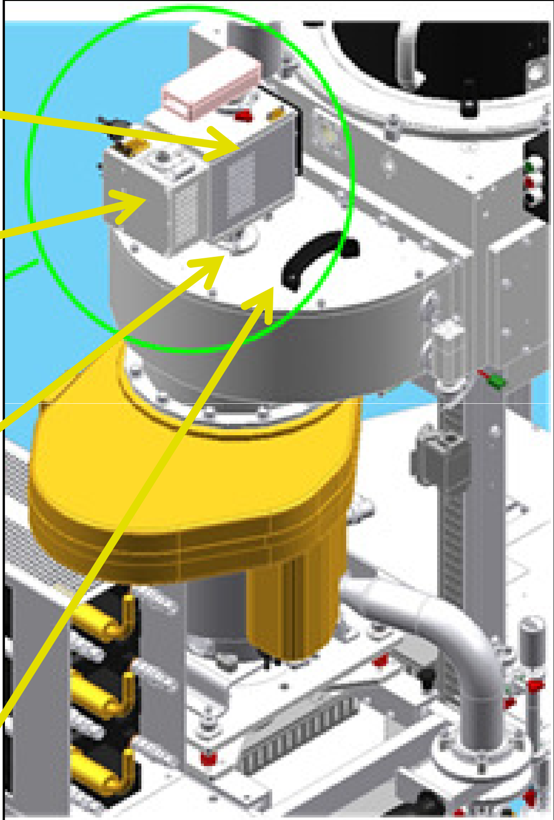
*The information in the presentation is the property of SPTS and may not be duplicated, disclosed to any third party, or used for any purpose other than that for which it is supplied without the written consent of SPTS.*

# Installation
## (Pegasus DSi, Pegasus Rapier)

200 mm Module



300 mm Module



Claritas endpoint unit

Detector uses this secondary chamber

Connected to PM via existing port

Easily detached for ready access to module for wet cleaning

Claritas easily retrofitted
Claritas is compatible with existing OES detectors

© SPTS Technologies

*The information in the presentation is the property of SPTS and may not be duplicated, disclosed to any third party, or used for any purpose other than that for which it is supplied without the written consent of SPTS.*

# Installation
## (Pegasus)

Claritas endpoint unit

Detector uses this secondary chamber

Connected to Pegasus via existing port

Easily detached for ready access to module for wet cleaning

Claritas easily retrofitted

Claritas is compatible with existing OES detectors

© SPTS Technologies

*The information in the presentation is the property of SPTS and may not be duplicated, disclosed to any third party, or used for any purpose other than that for which it is supplied without the written consent of SPTS.*

# Return on Investment

- ROI calculations have been completed
- Based on 3 deep Si etch applications
  - Combination of TSV & MEMS etches
- Assume periodic wafer cleaving (for SEM inspection) is required when no endpoint system is used
  - Varied between 1 per lot, 1 per day, 1 per shift and 1 per week
  - Assume periodic cleaving reduces to 1 per week when Claritas is used
  - Assume 0.1% wafer scrap when Claritas is not used
- ROI period is calculated based on the combined costs of testing wafers and the risk of a low level (0.1%) of wafer scrap
  - These calculations are available on request

ROI calculated to be **1-3 months** depending on whether the customer already has a CCD OES

© SPTS Technologies

*The information in the presentation is the property of SPTS and may not be duplicated, disclosed to any third party, or used for any purpose other than that for which it is supplied without the written consent of SPTS.*

# Summary

SPTS

- Claritas is the first end-point system to work successfully in the low exposed area (<1.0-3.0%) & high pressure (~100 mtorr) process regimes that are required for MEMS & TSV etching
- Claritas is compatible with & greatly extends the reach of SPTS's existing OES options
- Available for….
  - Pegasus DSi
  - Pegasus Rapier
  - Pegasus (PRO2 models only)

© SPTS Technologies

*The information in the presentation is the property of SPTS and may not be duplicated, disclosed to any third party, or used for any purpose other than that for which it is supplied without the written consent of SPTS.*