Achieving Accurate On-wafer Device Characterization in Half the Time

Cascade Microtech, Inc.
The Challenge of Setting Up a Modeling Solution

- Multiple Instrument Providers
- Multiple Probe Station Providers
- Multiple Probe Providers
- Multiple Cable Providers
- No Test Automation Software
The Challenge of Setting Up a Modeling Solution

- Which Instruments Are Compatible with Which Prober?
- Which Probes Are Compatible with Which Analyzer?
- What connectors and cables are compatible?
- Who provides the cables?
- What adapters are needed?
The Challenge of Setting Up a Modeling Solution

- Who do I call if something goes wrong?
- What happens if I forget to order a cable or adapter?
- Who takes responsibility for the calibration accuracy?
- Who trains me on the using the test cell?
- How long will it take to write the automation software?
Solution: Cascade Microtech & Keysight Alliance

A New, more intimate strategic partnership agreement between Keysight and Cascade Microtech

Our Collaboration brings together the technology and market leaders in test and measurement and on-wafer probing (true best-of-breed collaboration)

Offering our wafer-level measurement solutions that you can trust and have confidence

Guaranteed configuration, installation and support from Keysight and Cascade Microtech are support pillars to your success

Taking the risk out of your decision making process and enabling a faster time to first measurement
Cascade Microtech & Keysight Technologies

MeasureOne

Cascade Microtech

Keysight Technologies

Prober

Instrument

Wafer-level Measurement Solution (WMS)
Wafer-level Measurement Solutions Overview

Cascade Microtech & Keysight Joint solution

“Solution Experts” from Cascade Microtech and Keysight install and verify the system

Guaranteed Configuration
Guaranteed Installation
Guaranteed Support
Factory Measured Performance
FMP Enables Measurement Trust & Confidence

**Guaranteed Configuration**
All configuration combinations tried and tested

**Repeatability**
Repeatability is a prerequisite for accuracy

**Accuracy**
Compared against a known reference

**Drift**
Measurement stability over time and temperature
Comprehensive Test Suite
Guaranteed Set of Performance Attributes

Appendix 3 – Measurement Verification Datasheet (MVD)

<table>
<thead>
<tr>
<th>Verification test</th>
<th>Measure</th>
<th>Ideal</th>
<th>Limit</th>
<th>Typical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure 40 ps Line. Delta from Ref Benchmark std</td>
<td>S21</td>
<td>0%</td>
<td>2.00%</td>
<td>1.16%</td>
</tr>
<tr>
<td>Measure 40 ps stub. Delta from Ref Benchmark std</td>
<td>S11/S22</td>
<td>0%</td>
<td>3.00%</td>
<td>1.70%</td>
</tr>
<tr>
<td>20 Cals, measure open response</td>
<td>S11</td>
<td>0dB</td>
<td>+/-0.015dB</td>
<td>0.007dB</td>
</tr>
<tr>
<td>20 Cals, delta between first and all other</td>
<td>S11/S22</td>
<td>0%</td>
<td>0.50%</td>
<td>0.26%</td>
</tr>
<tr>
<td>Open Capacitance Comparison</td>
<td>S11/S22</td>
<td>-6.75pF</td>
<td>+/-0.3pF</td>
<td>-6.69pF</td>
</tr>
<tr>
<td>Cal worse cal deviation over 20 cals</td>
<td>S1ij</td>
<td>0.00%</td>
<td>1.50%</td>
<td>0.77%</td>
</tr>
<tr>
<td>Drift 1 hour after calibration, 10 min intervals, measure open</td>
<td>S11/S22</td>
<td>0dB</td>
<td>+/-0.03dB</td>
<td>0.015dB</td>
</tr>
<tr>
<td>Drift delta after 1 hour, 10 min intervals, measure open</td>
<td>S11/S22</td>
<td>0.00%</td>
<td>0.40%</td>
<td>0.24%</td>
</tr>
</tbody>
</table>

Customer WMS Solution Validated against these Attributes
Proven Data – Clear Expectations

Re-measurement of known Standards – Proves System Accuracy
Transparent Differences

Worse case deviation for reference measurement highlight system errors
Unique Verification Substrate

Verification Substrate with Independent Verification Standards
The Three Guarantees

Only the Keysight and Cascade Microtech Alliance can provide a complete solution which includes three guarantees:

- **Guaranteed Configuration** – No missing parts
- **Guaranteed Installation** – Installed, verified and working
- **Guaranteed Support** – One contact, one call
Guaranteed Configuration

Configuration complete as per your expectation.

We ensure that all cables, adapters, fixtures, options and probes are included such that we meet the agreed statement of work.

Should any part be missing and we do not satisfy our promise, then Cascade Microtech or Keysight will supply the missing component free of charge.

Values of WMS

- Zero risk of delays and incompatibilities
- Reduced time in checking configurations between suppliers
- Piece of mind in a working and complete solution
Guaranteed Installation

A standardized statement of work is agreed before the order is placed

Factory Measured Performance defines performance expectations

Solution is verified against the Installation Guarantee Document

Includes installation, system verification and training

Values of WMS

- Clear and documented expectation of performance
- Zero risk to to achieving measurements
- Fastest time to first measurement
- No payment until acceptance of system
Guaranteed Support

Cascade Microtech is the first line of support for the complete Wafer-level Measurement Solution

Support includes the probe station, instruments and on-wafer calibration

Regional Solution Experts available for system level trouble shooting, measurement best practice and applications training

A guaranteed response time ensures your uptime

Values of WMS

- Single point of focus for the complete solution
- Access to wafer-level Solution Expert
- More time measuring, less time fixing!
Solution Expert

Cascade Microtech & Keysight have trained regional WMS solution experts

During pre-sales these Solutions Experts will help you –
• Identify your requirements
• Select the correct solution
• Answer technical questions

During installation the Solution Expert will –
• Manage your installation, training and acceptance of the complete Systems

Post acceptance Solution Experts are able to offer you –
• First line technical support
• Continuous training plans (part of enhanced service)
• Application consultancy (part of enhanced service)
WaferPro Express (WaferPro-XP)

A modern, cost effective, easy to use, yet powerful and efficient software platform to control **automated on-wafer measurements** of devices and circuit components.
WMS Solution Roadmap

Solutions Today
- Device Characterization - Silicon
- Device Characterization - III-V
- Circuit Characterization

Near Solutions
- DC Only Characterization
- 1/f & RTS Characterization
- High Power Device Characterization

Future Solutions
- Load-pull & Noise Parameter
- THz
- More to follow…
Wafer-level Measurement Configurations

5 Simple Options
1. Wafer size
2. Thermal needs
3. Application
4. DC requirements
5. Frequency

72 Pre-configured Solutions
- All configurations checked
- All fully characterized
- More to be added
Example – 300 mm Device Characterization

2-port Keysight PNA 110 GHz
B1500 Parameter Analyzer - 4 High-Resolution SMU’s

Elite 300/AP
Semi-automated Thermal
eVue digital microscopy system
MicroChamber
AttoGuard
WinCal XE
110 GHz Infinity probes

CONNEC
the Cascade Microtech community
Example – 200 mm Circuit Characterization

2-port Keysight PNA-X 50 GHz
N6705B Power Supply

Summit 12000/M
Semi-automated
Thermal
eVue digital
microscopy system
MicroChamber
WinCal XE
50 GHz Infinity
probes
4 RF positioners
InfinityQuad probes

WaferPro XP
Key Values

3 Guarantees
- Guaranteed Configuration
- Guaranteed Installation by Solution Experts
- Guaranteed Support

Coordinated Team Work between Keysight and Cascade Microtech
- From first need
- Solution definition to quotation – Joint quote
- Order to delivery – Coordinated shipment
- From delivery to first reference measurement – Solution Experts

Unique Comprehensive Solutions provided by leaders in the industry
- System Software for Automation – WaferPro-XP by Keysight Technologies
- Performance T&M instruments (PNA, DC Parameter Analyzer, Power Supplies) by Keysight Technologies
- Probe stations, probes, calibration standards and WinCal XE by Cascade Microtech

Lower Risk, Higher Confidence and Faster Time to First Measurements
- Roles & responsibilities documented in Installation Guarantee Document
- Global Support & Partnership
- Seamless on-site system integration
Thank You For Your Attention Any Questions?