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NuTool®

LuminaCu Reverse Linear CMP (RL-CMP™) Technology for < 100nm Interconnect Applications

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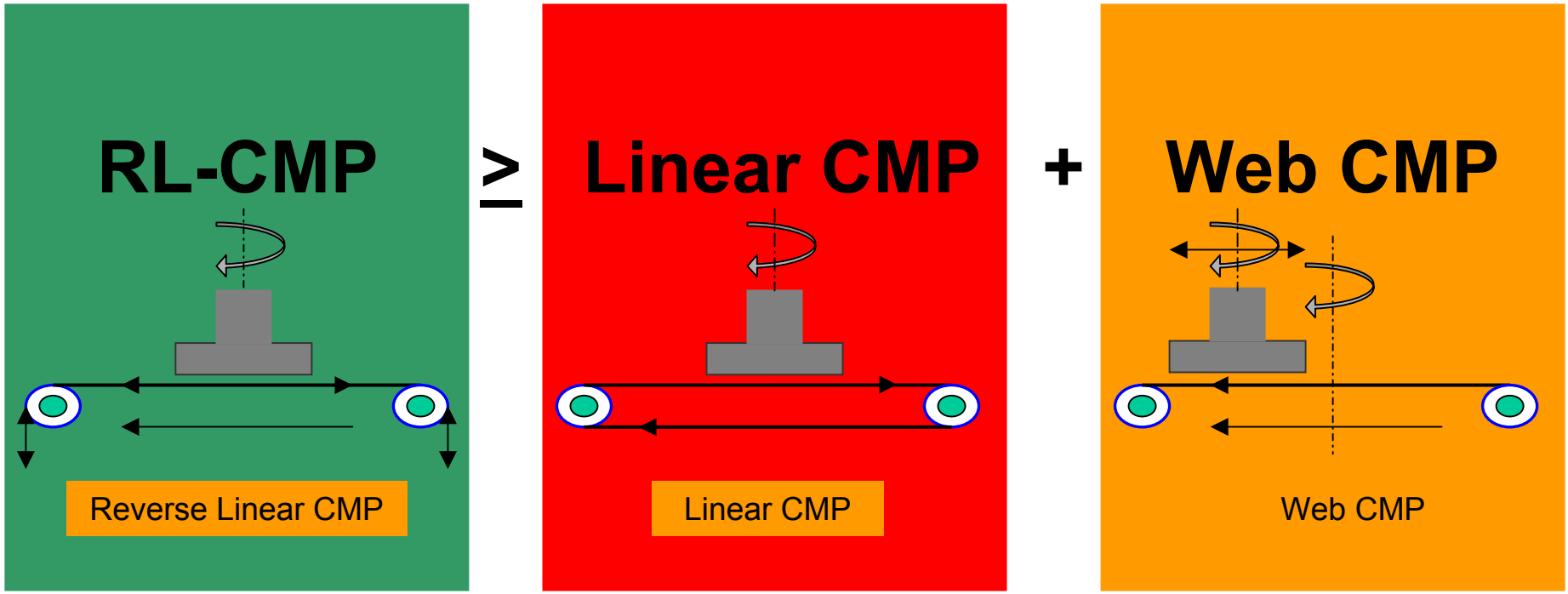
CMPUG

What is RL-CMP ?



LuminaCu RL-CMP Module

Key Design Features

- **Pad/Polishing Head Design**
  - Same head/pad design for Cu and STI CMP
  - No retaining ring
  - No sub-pad
  - Integrated SmartEndpoint™
- **Reverse Linear CMP Technology**
  - “Shoe Shine” belt motion
  - Belt indexing
- **Post CMP Cleaner**
  - Double sided brush clean
  - Megasonics capability

LuminaCu RL-CMP

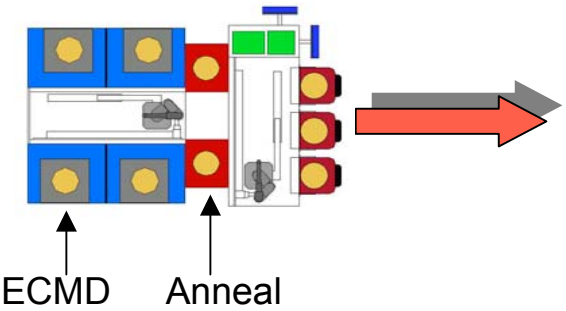
Features and Benefits

- ☑ **Roll/Roll Design**
  - Conventional or Fixed Abrasive Polishing Tape
- ☑ **Reverse Linear Technology**
  - Up to 400ft/min
  - Roll to Roll Indexing
- ☑ **Cu/Barrier Polishing Station**
  - Single Wafer/Single Station
  - Independent Control of Cu and Barrier Chemistries
- ☑ **Smart Endpoint**
  - Multi-zone Pressure Control
  - Optical Cu endpoint measurement
- ☑ **Integrated Cleaner**
  - Double Brush/Megasonics
  - Spin-Rinse-Dry
- ☑ **No Tape Conditioning**
  - Lower Defects and Longer Tape Life
- ☑ **High Linear Velocity**
  - High Polishing Rate
  - Better Process Control
- ☑ **Compact Design**
  - No Retaining Ring/No Hard Pad
  - Small Footprint
  - Lower Chemical Usage and Minimize Effluent Waste
- ☑ **Process Stability**
  - Uniformity Control
  - Dishing/Erosion Control across Wafer
- ☑ **Dry-In/Dry-Out**
  - Surface Passivation and Defect Removal

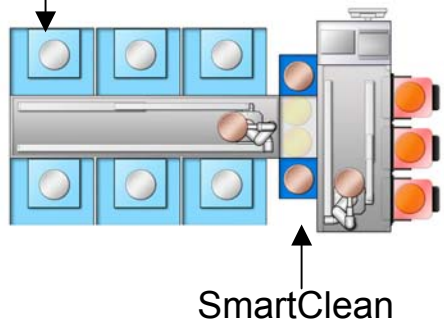
NuTool® Product Platform Evolution

NuTool2000™ Platform

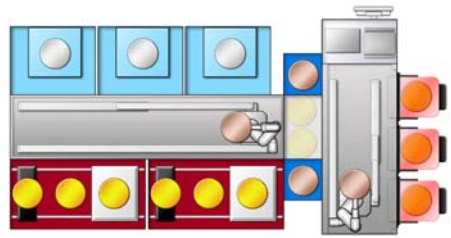
NuTool2000 ECMD™



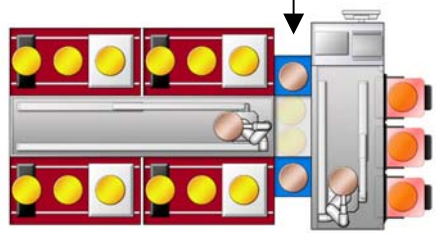
LuminaCu™ Platform



LuminaCu ECMD™ — 70-90 WPH



Integrated LuminaCu — 30-40 WPH

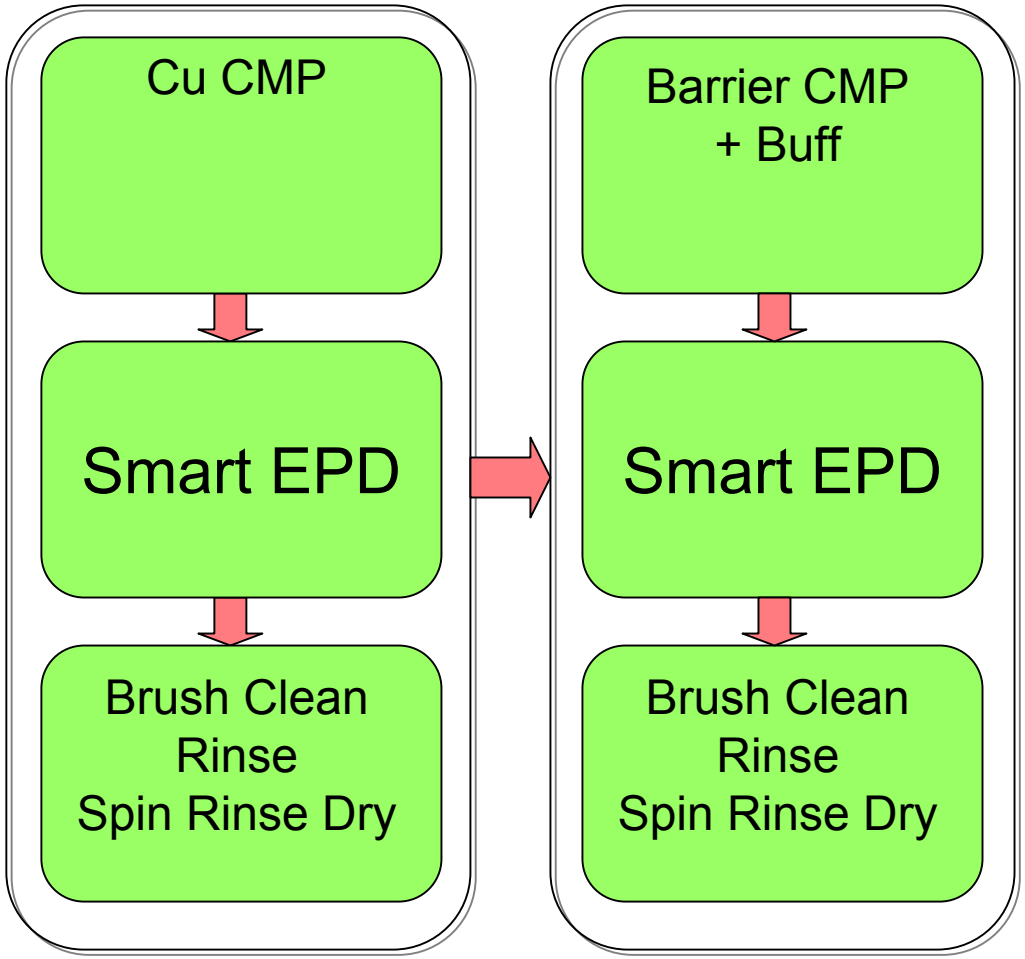


LuminaCu RL-CMP™ — >60 WPH

Q4'01			Q1'02			Q2'02			Q3'02			Q4'02			Q1'03			Q2'03		
Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun

LuminaCu RL-CMP

Typical Process Flow



Cu CMP Module

Barrier/Buff CMP Module

Typical Results

- Cu Chemistry
  - Removal Rate (A/min)

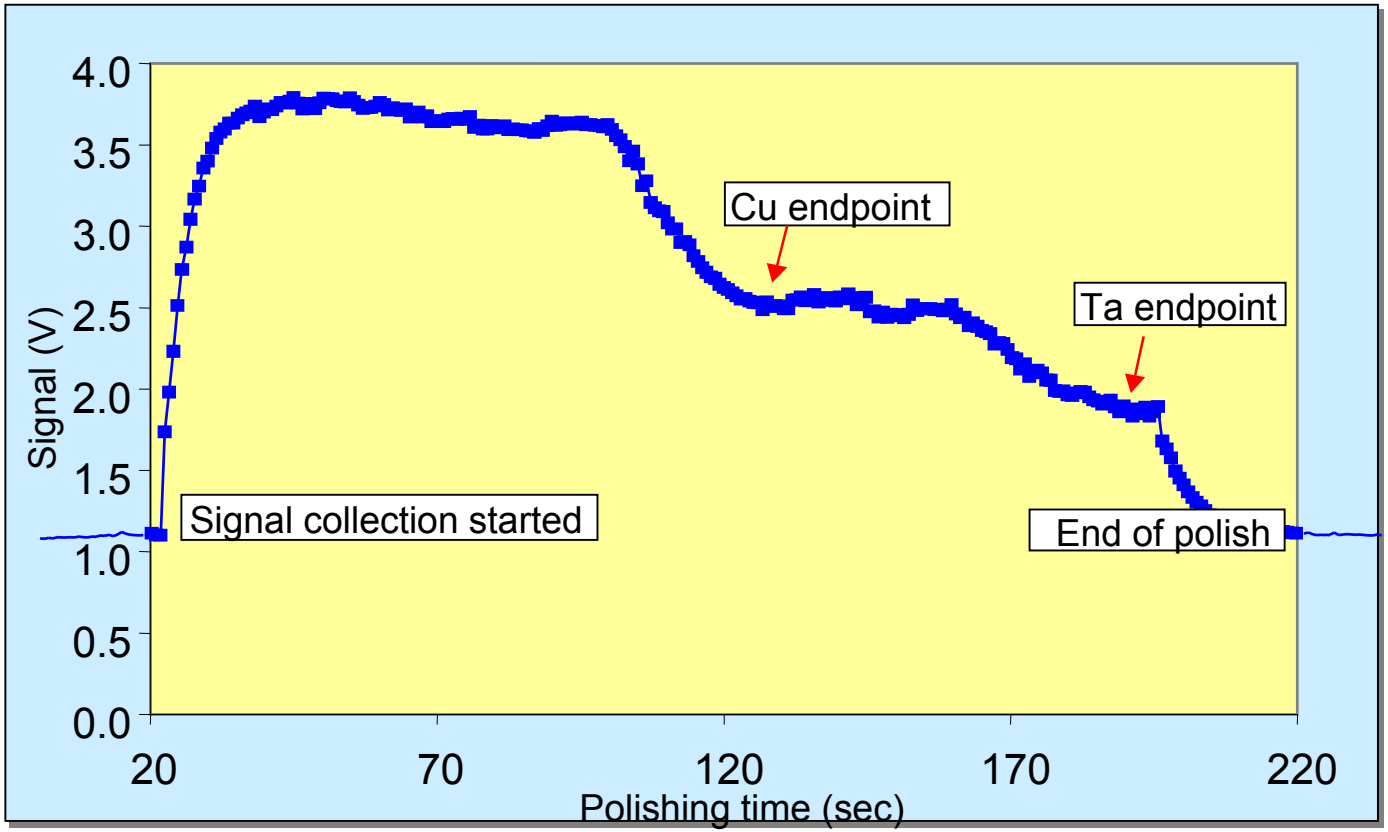
Cu	4000-6000
Ta/TaN	<100
Oxide	<100

- Barrier Chemistry
  - Removal Rate (A/min)

Cu	<100
Ta/TaN	400-1200
Oxide	<100

LuminaCu RL-CMP

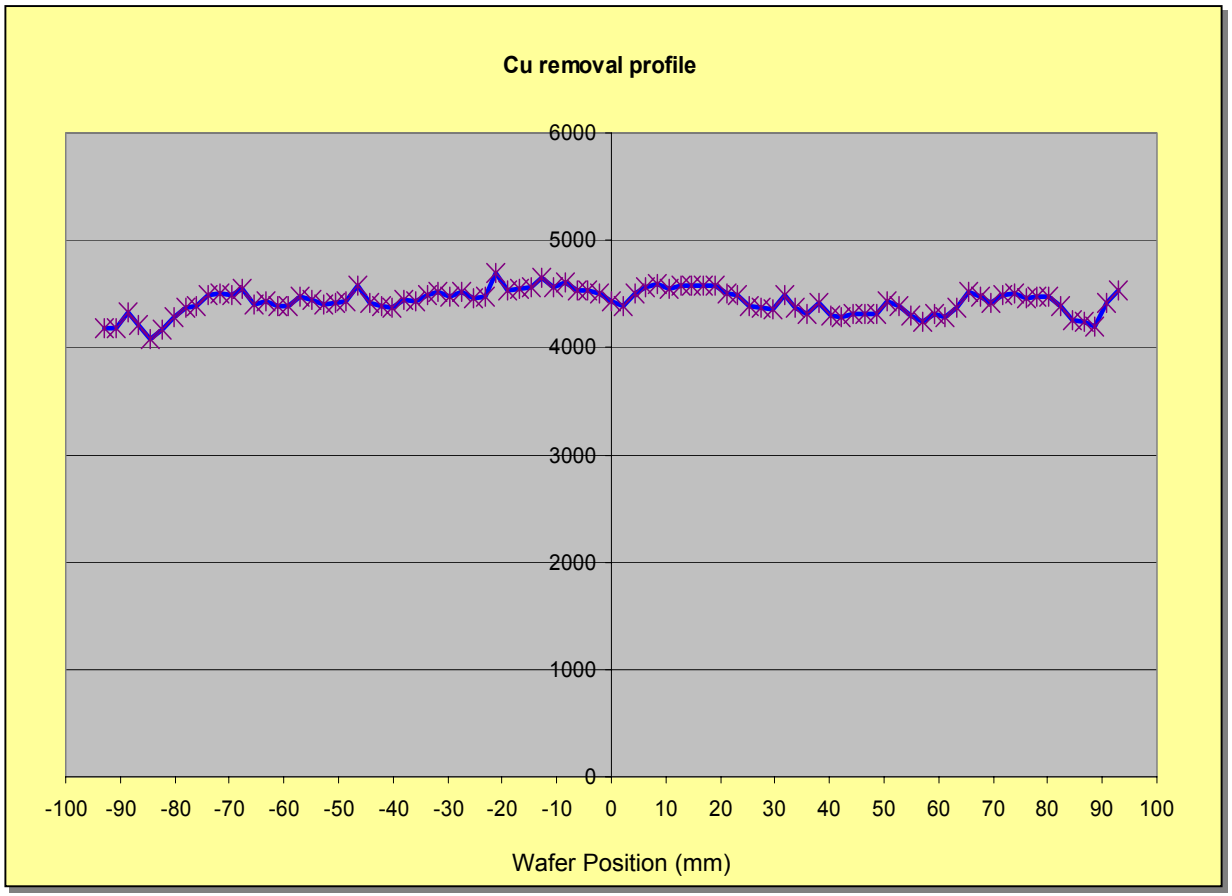
Endpoint Control



Excellent Process Control with Easy to Use Endpoint

LuminaCu RL-CMP

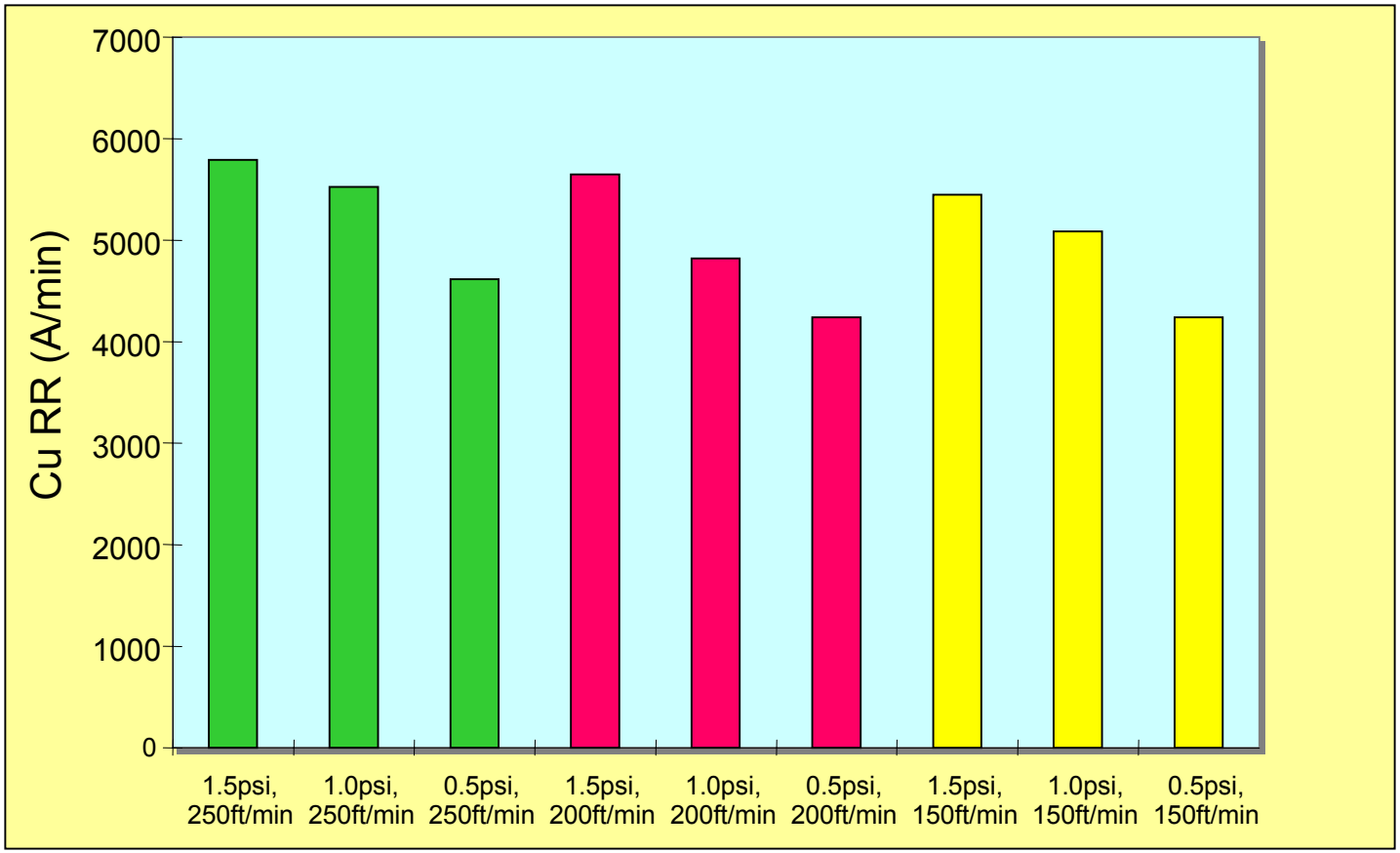
Profile Control – Within Wafer Uniformity



Excellent Polish Profile Control

LuminaCu RL-CMP

Down Force and Belt Speed



Wider Process Window
Ultra Low Polish Pressure and High Belt Speed

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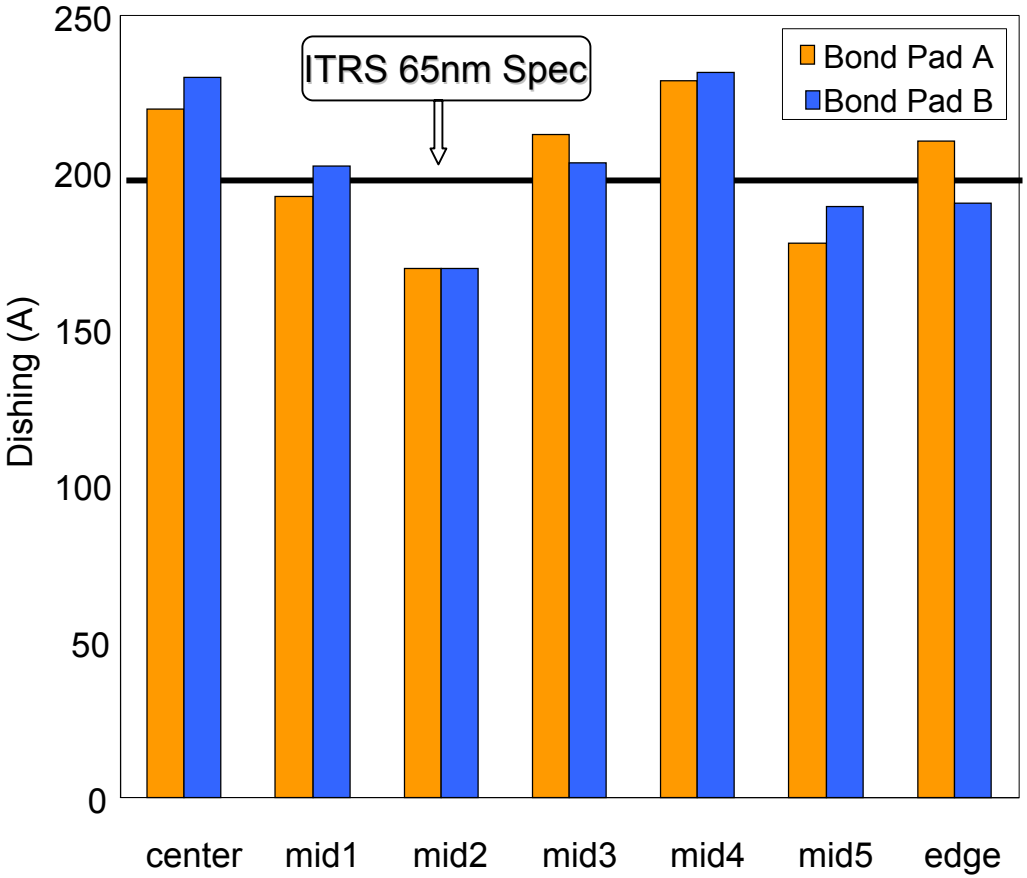
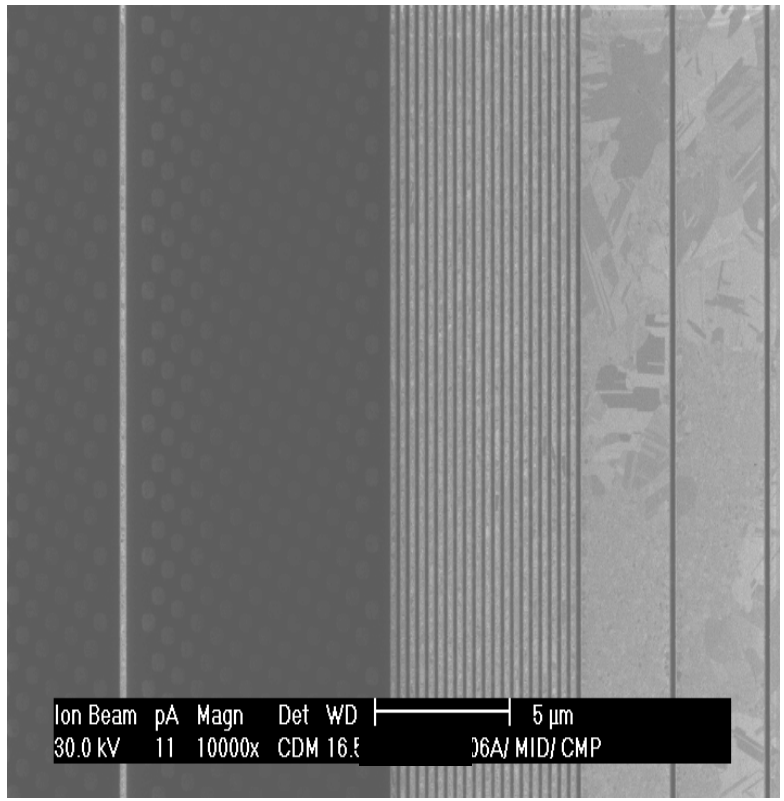
LuminaCu RL-CMP

- **300mm Dishing (150μmx50μm Bond Pad)**
  - Low Oxide Loss



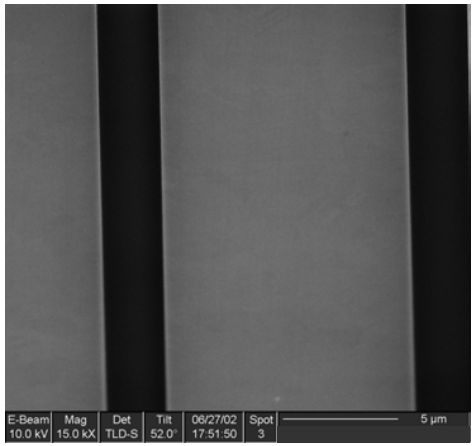
- **SOD Low-κ Integration (with ECMD)**
  - No Delamination

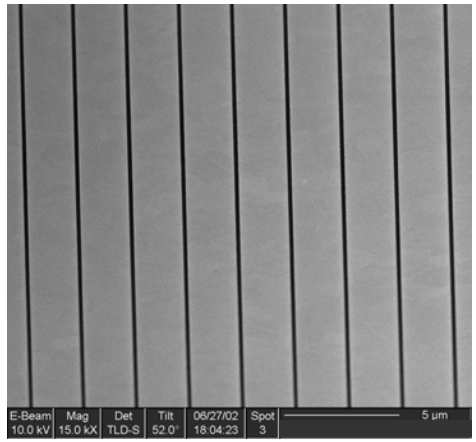


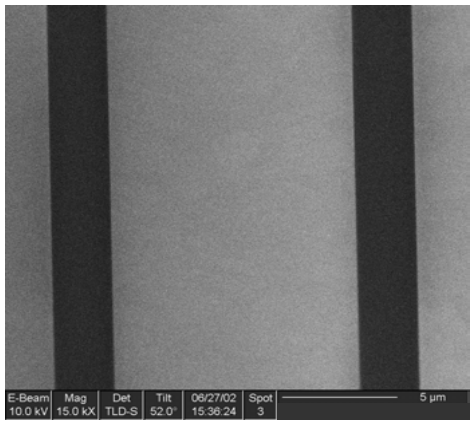
LuminaCu RL-CMP

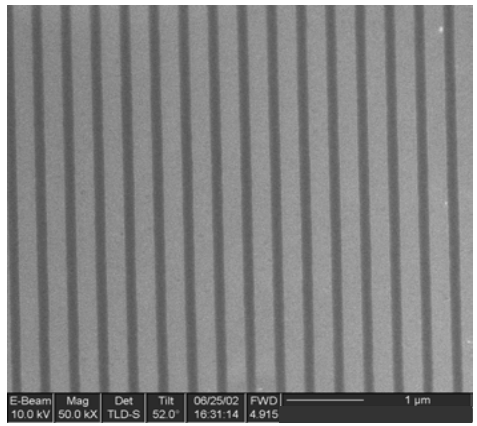
Post CMP Surface Finish

Ta removal/buffing with Politex embossed pad





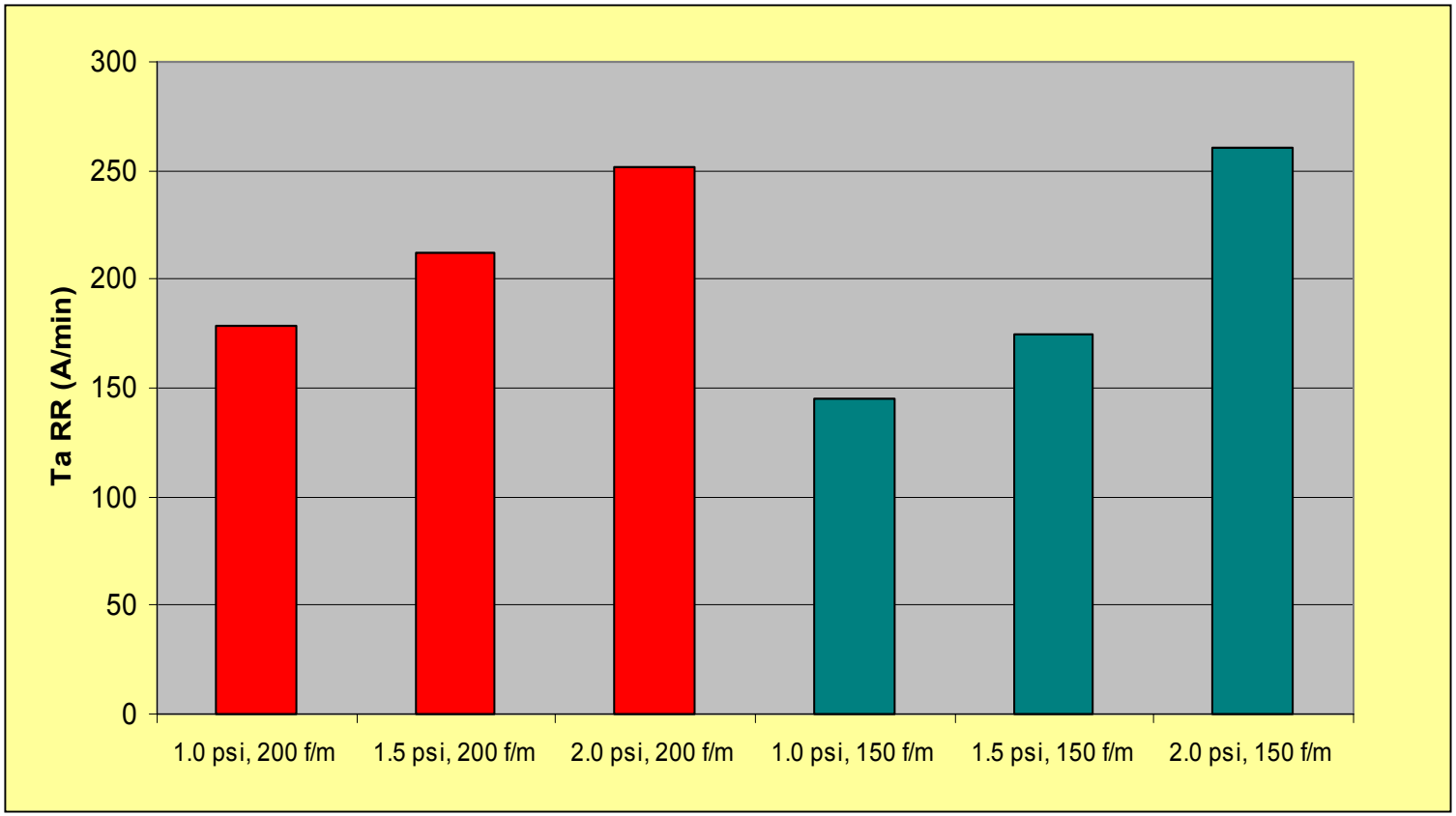




Damage Free Post CMP Surface Results

LuminaTa RL-CMP

Down Force and Belt Speed



Wider Process Window
Ultra Low Polish Pressure and High Belt Speed

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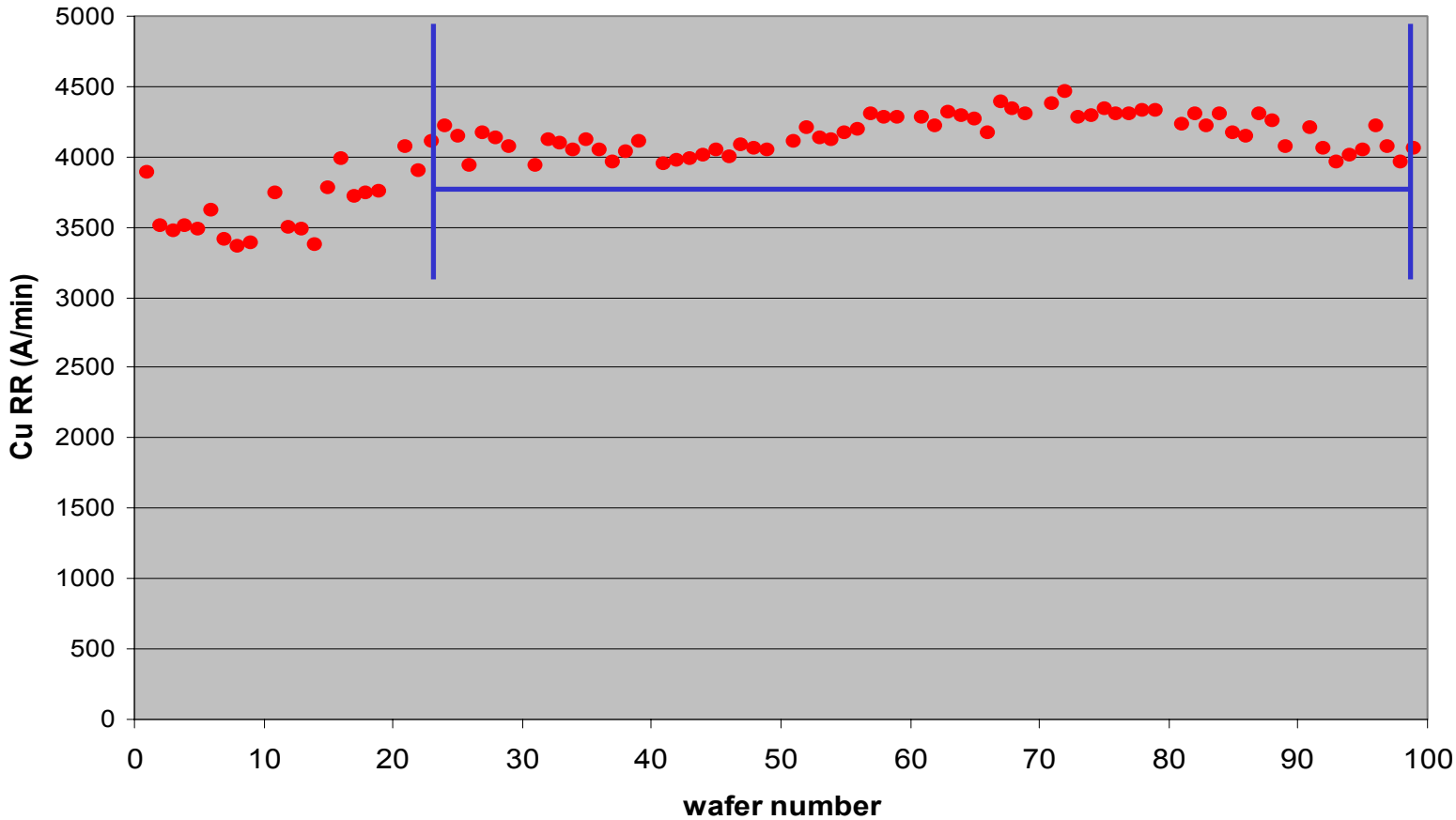
LuminaCu RL-CMP
100 wafers Extended Run
1st Observation

Extended Run Cu Polish

Removal Rate Efficiency

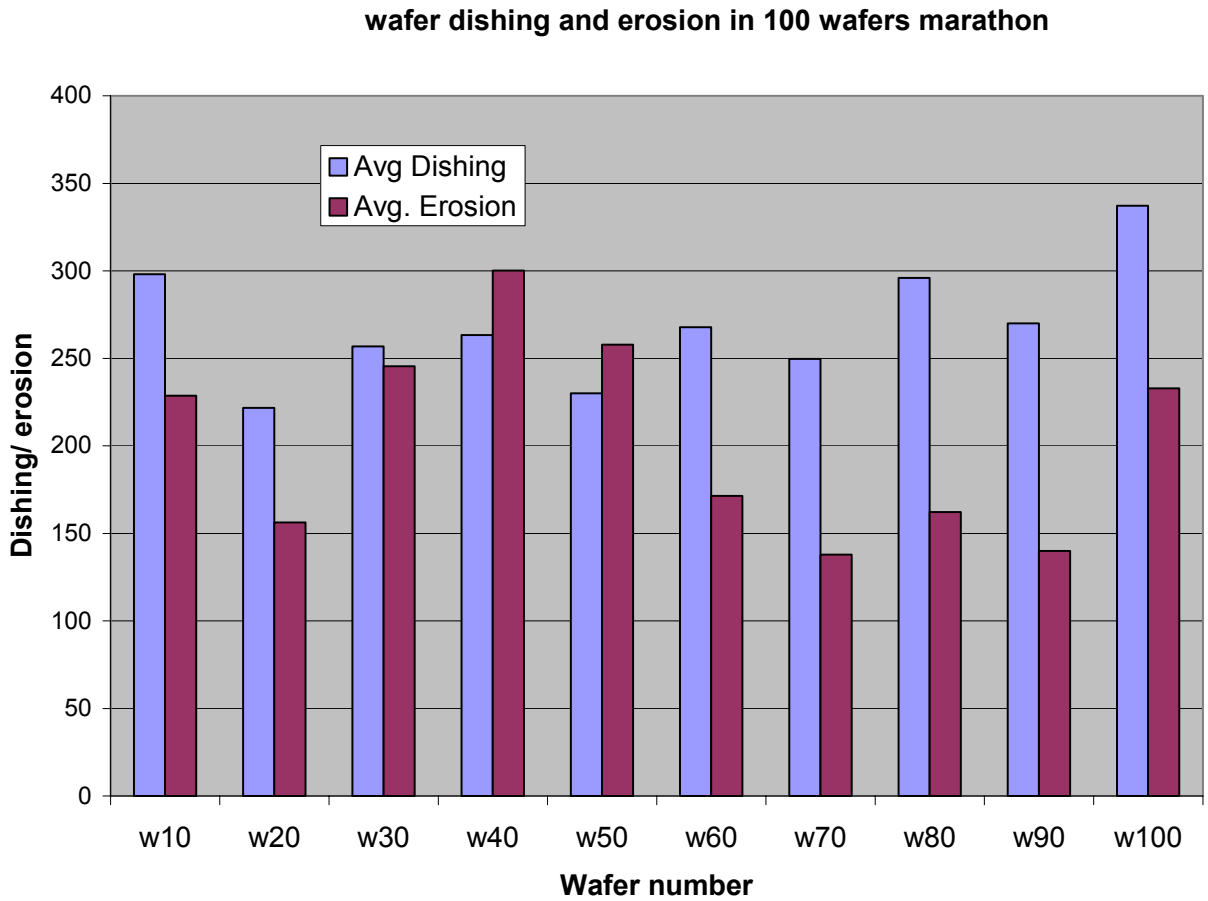
100 wafers stability run on MWR66
1.5 min @1.5 psi/250 f/m and 60 rpm pad with index 5 mm per wafer



Stable Removal Rate Performance

Extended Run Cu Polish

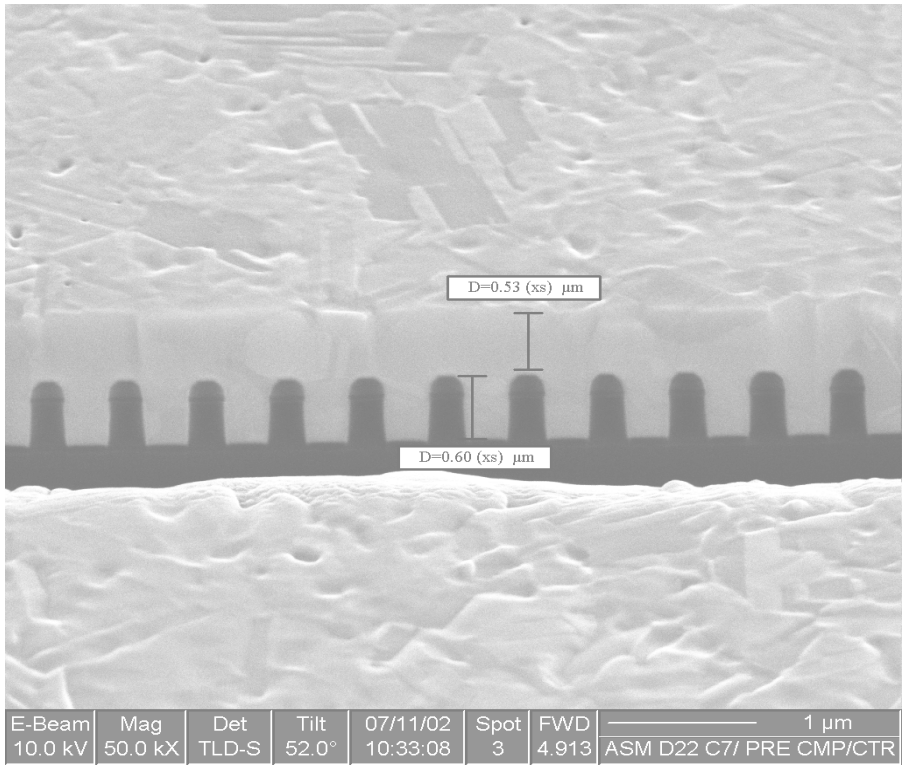
Dishing and Erosion on Pattern Wafers



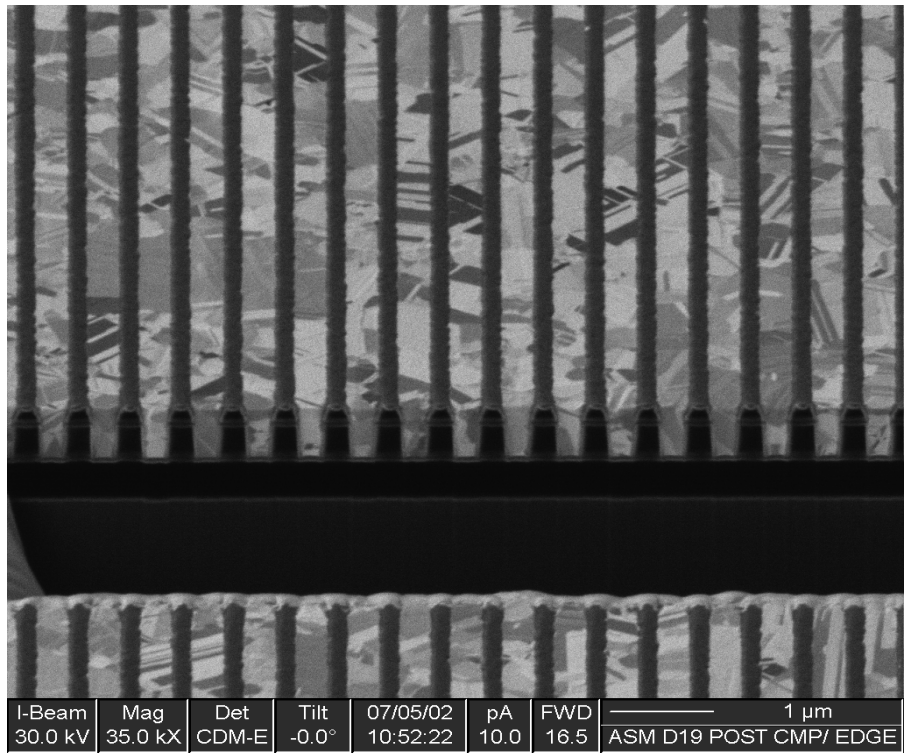
Stable Low Dishing and Erosion Performance

Global Technology Alliances

NuTool Cu ECMD + ASMI Aurora™ Low-k Dielectric + NuTool Cu RL-CMP



Pre RL-CMP

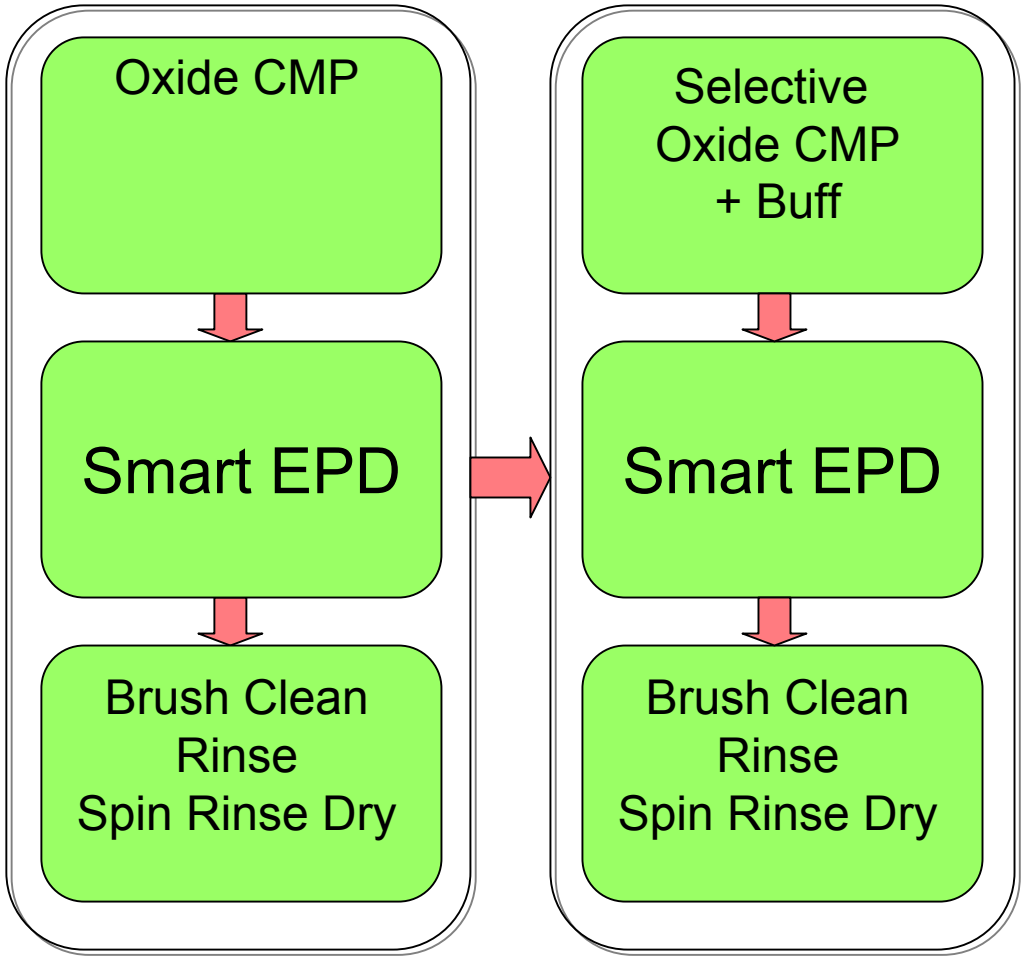


Post RL-CMP

LuminaSTI RL-CMP

LuminaSTI RL-CMP

Typical Process Flow



Oxide CMP Module

Buff CMP Module

Typical Results

- Oxide Chemistry
  - Removal Rate (A/min)

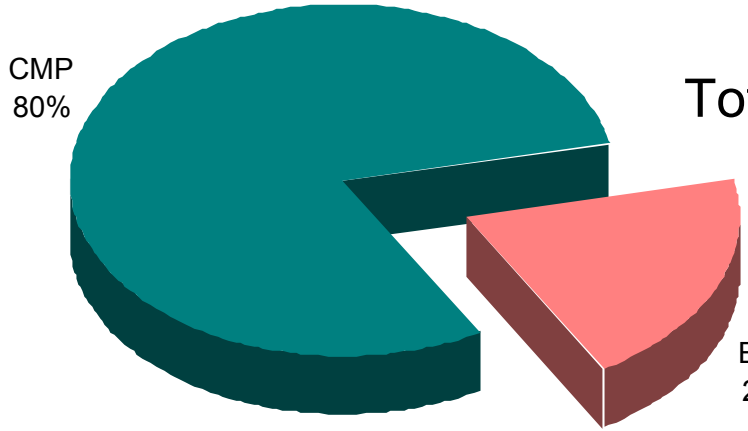
    Oxide 2000-3000

- Selective Chemistry
  - Removal Rate (A/min)

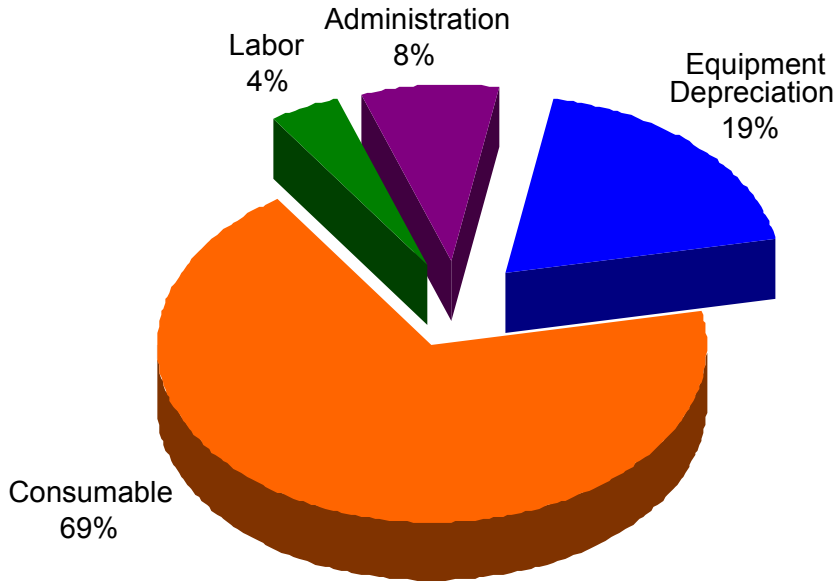
    Oxide 1000-2000
    Nitride 50-100

LuminaCu RL-CMP
CoO Advantages

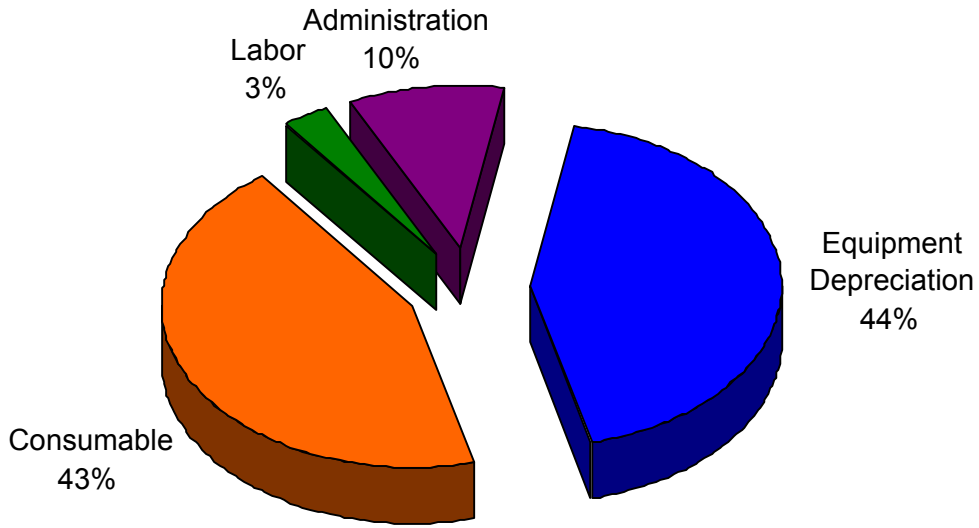
Cu ECD and CMP CoO Analysis



Total CoO = $20-40/Layer

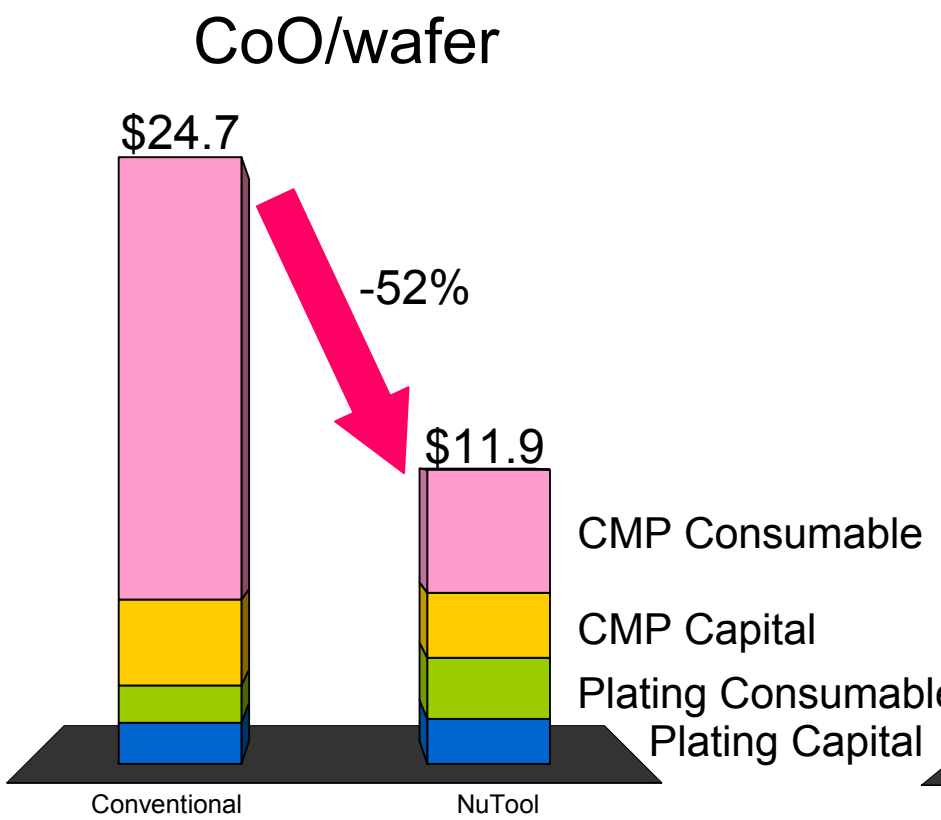


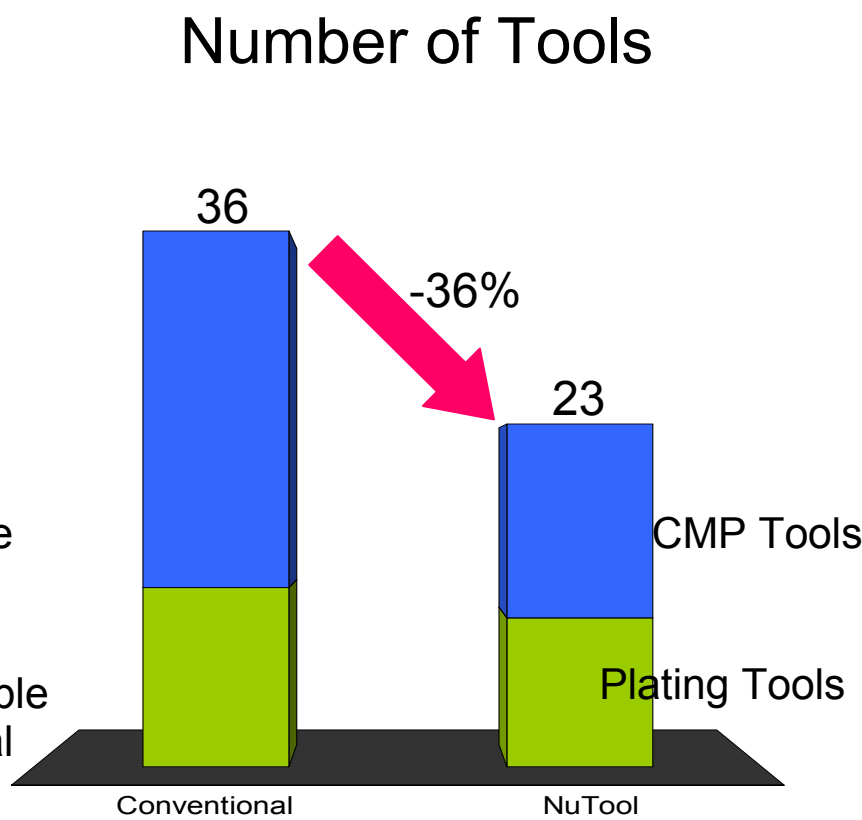
CMP



ECD

Advantages of LuminaCu ECMD and LuminaCu RL-CMP Technologies





Lower Cost

Higher Productivity

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LuminaCu Summary

- **Lower CoC**
  - Lower Cost
  - Reduce Scrap
  - Higher Productivity
- **Breakthrough Cu Technologies**
  - Integration of Web and Linear CMP technology
- **Global Alliances and Partnerships**
  - Customer Support and Services
  - Technology Integration

LuminaCu RL-CMP is designed to meet sub-micron Cu/low-k integration needs


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