

# Polishing Pad Impact on the Yield on W CMP

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# Acknowledge

- Work was done at ProMos Technologies, Inc.
  - Ron Lin, Joseph Tung, and Robert Chan
- Product
  - 300 mm memory devices
  - 0.14 um technology with local interconnect
- CMP consumables
  - Ferric nitrate slurry
  - TWI W711 pad and polyurethane pad

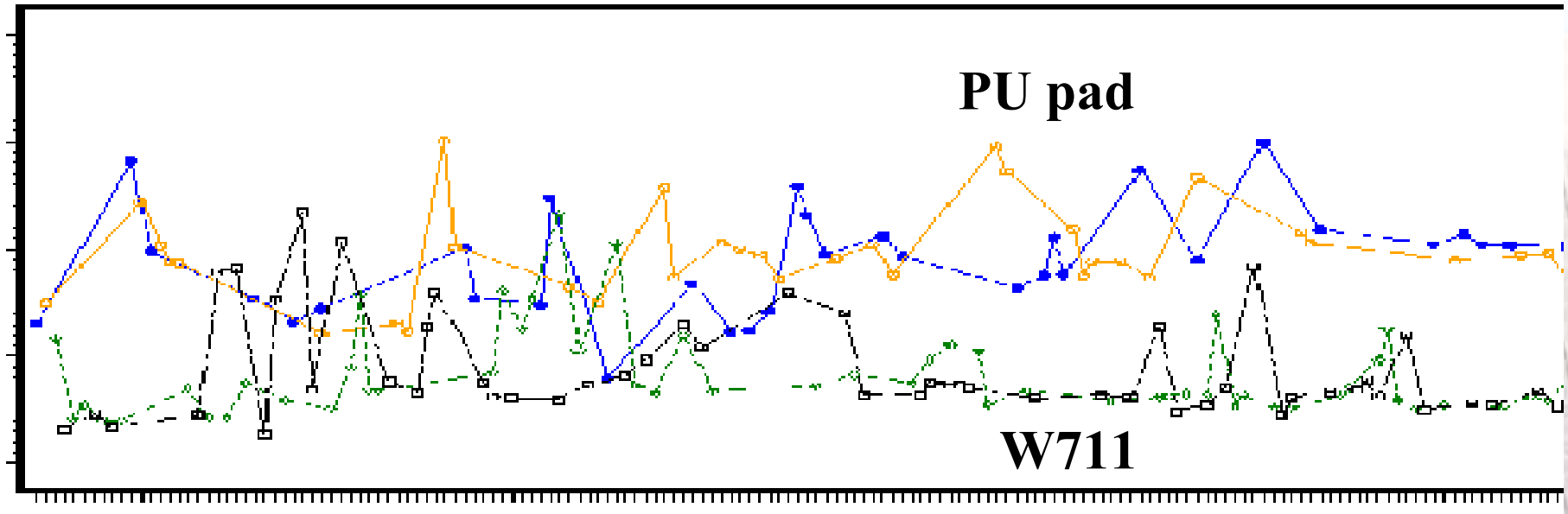
# Avenues to Impact Yield in CMP

- WIWNU
  - Local over-polishing / under-polishing
- Defect
- Metal loss / oxide loss
  - Dishing / erosion -- resistance

# Factors Affecting WIWNU

- Incoming wafer profile
- Polishing tool / wafer carrier
- Slurry
- Pad
  - Slurry transport mechanism
  - Slurry retention capability
  - Response to conditioning
  - Pad uniformity
    - Thickness, property

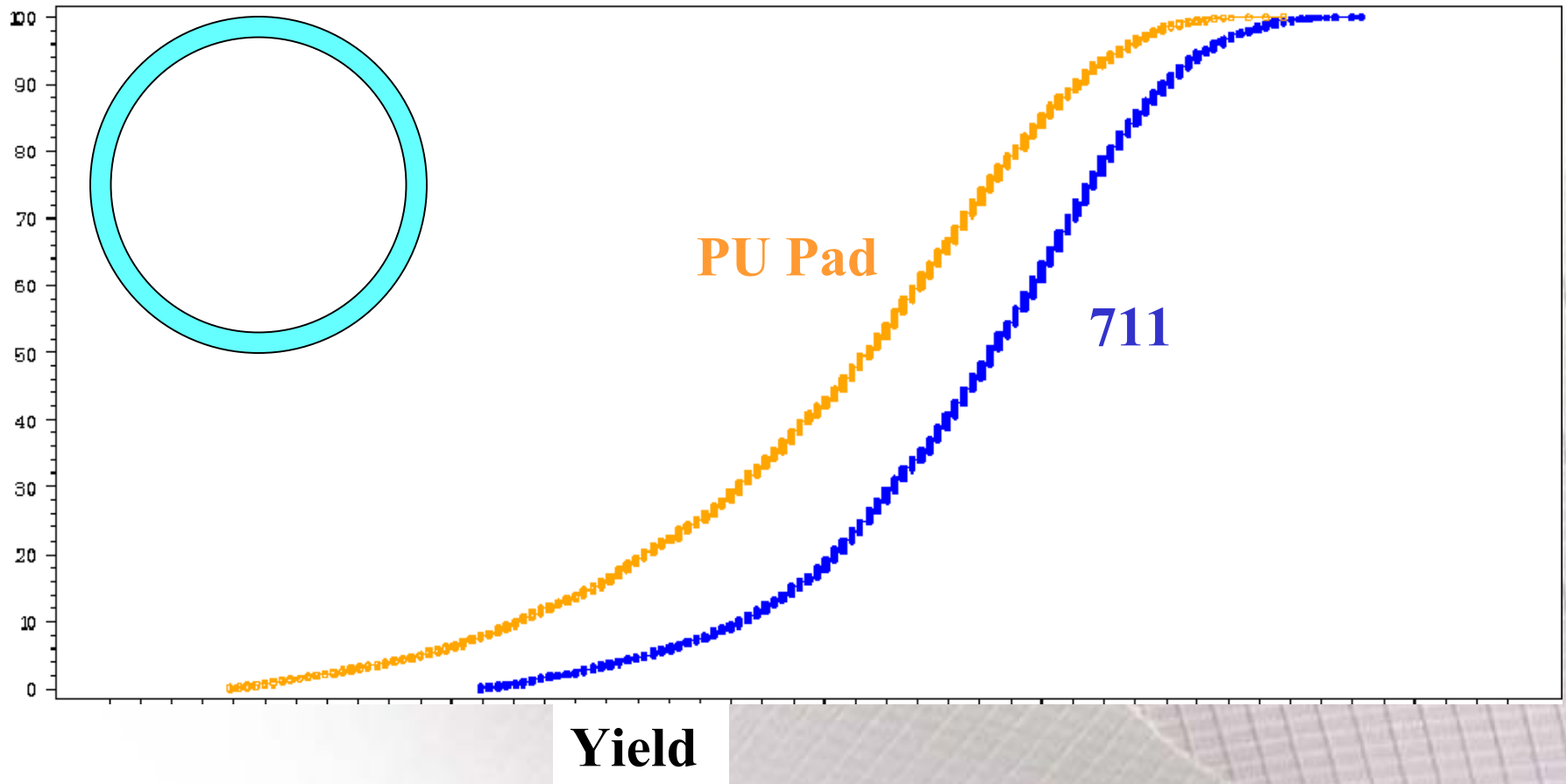
# WIWNU of Blanket Wafer



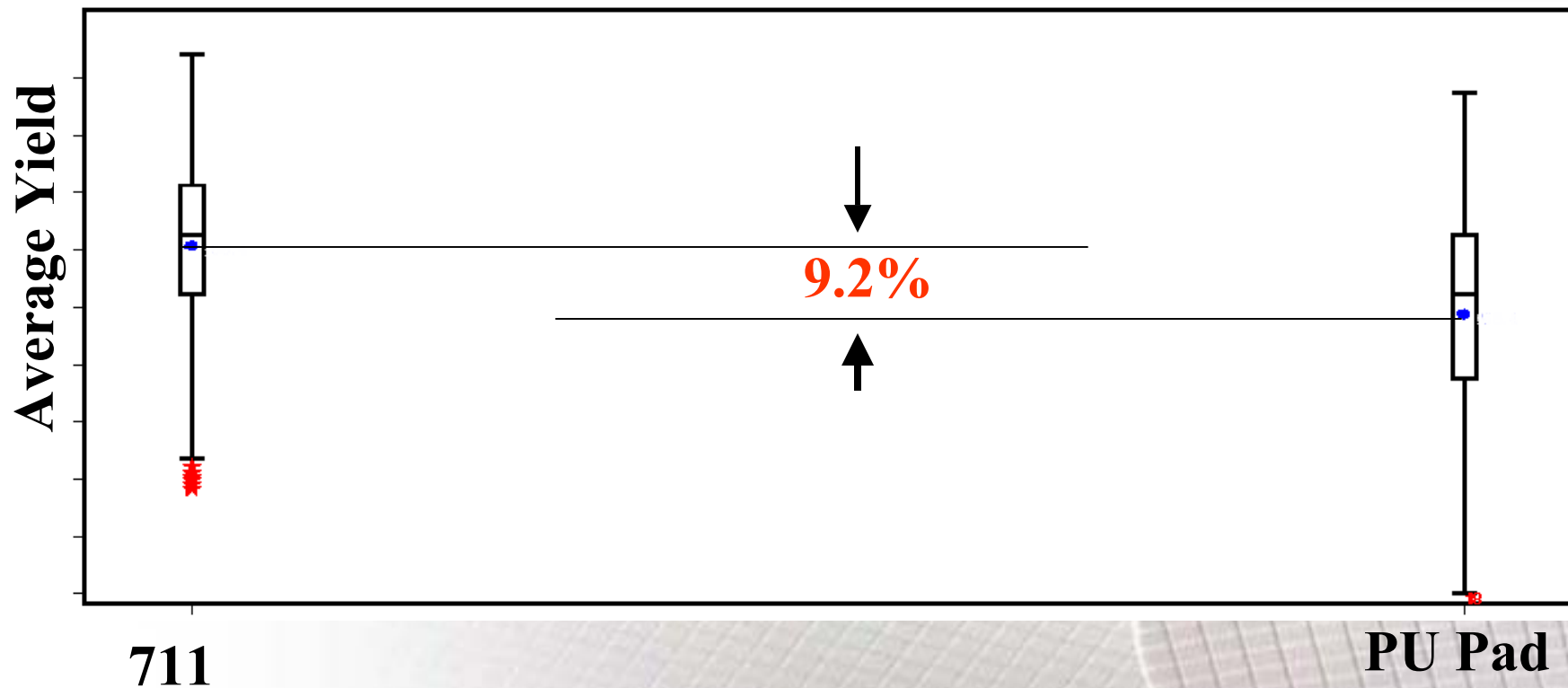
**In-line monitor results**

**The WIWNU on W711 is about half of NU on polyurethane pad.**

# Yield of the Edge Region



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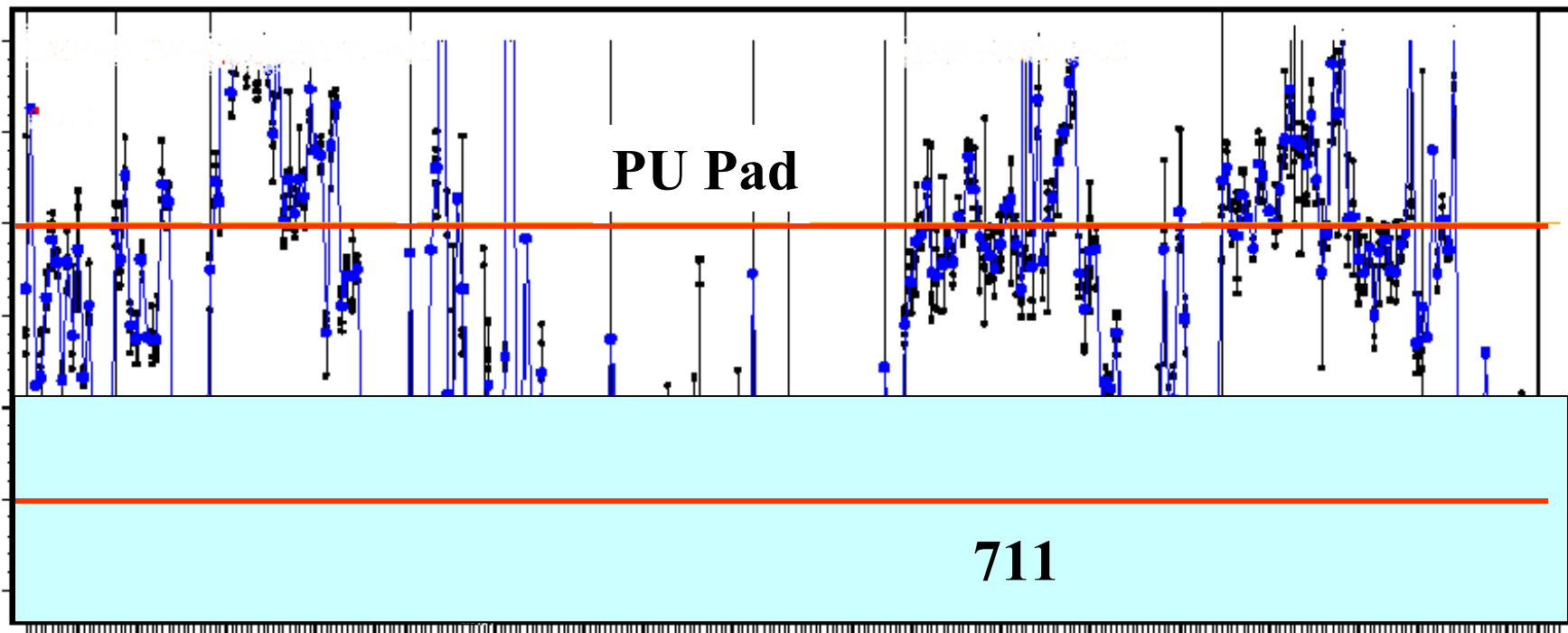


# Factors Affecting Defect

- Hardware system
  - Slurry delivery system / filtering system
  - Polishing tool / wafer handling
  - cleaner
- Slurry
  - Abrasive type
  - Abrasive size and distribution
  - Chemicals / agglomeration
- Conditioner
- Pad properties
  - Hardness
  - Mechanism to remove polishing debris

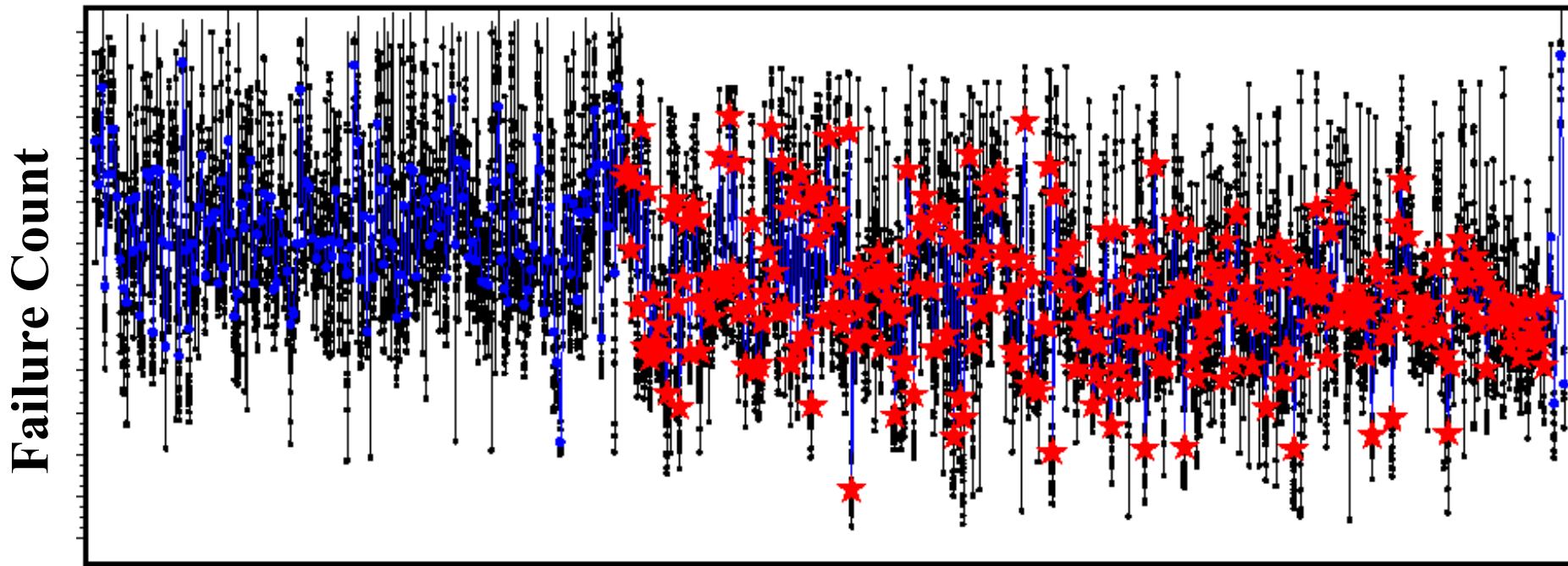
# Defect Count in M0 Device (local interconnect)

Defect Count



**The defect count on 711 is only about one quarter of defect count on PU pad**

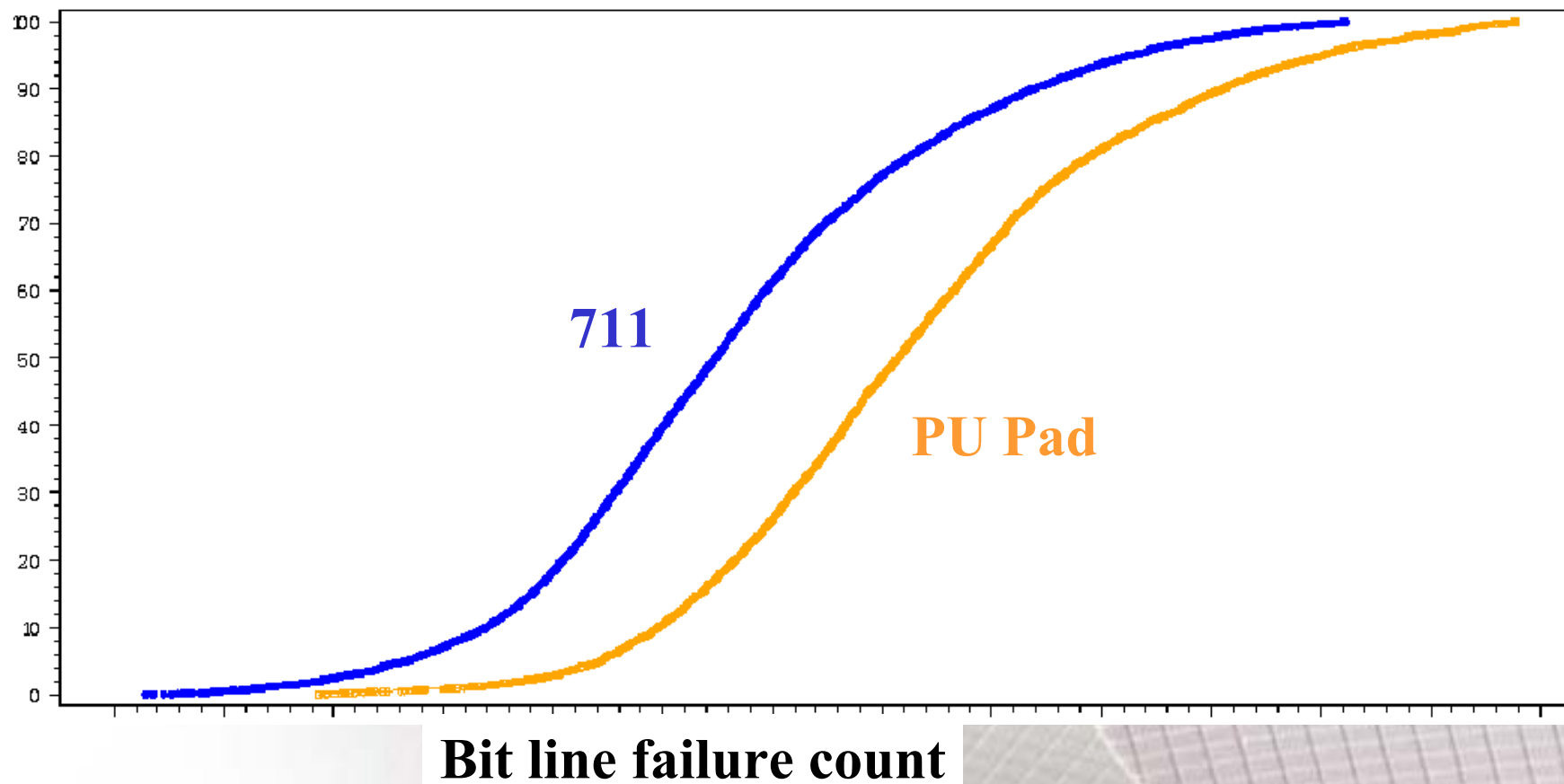
# Bit-line Failure Count



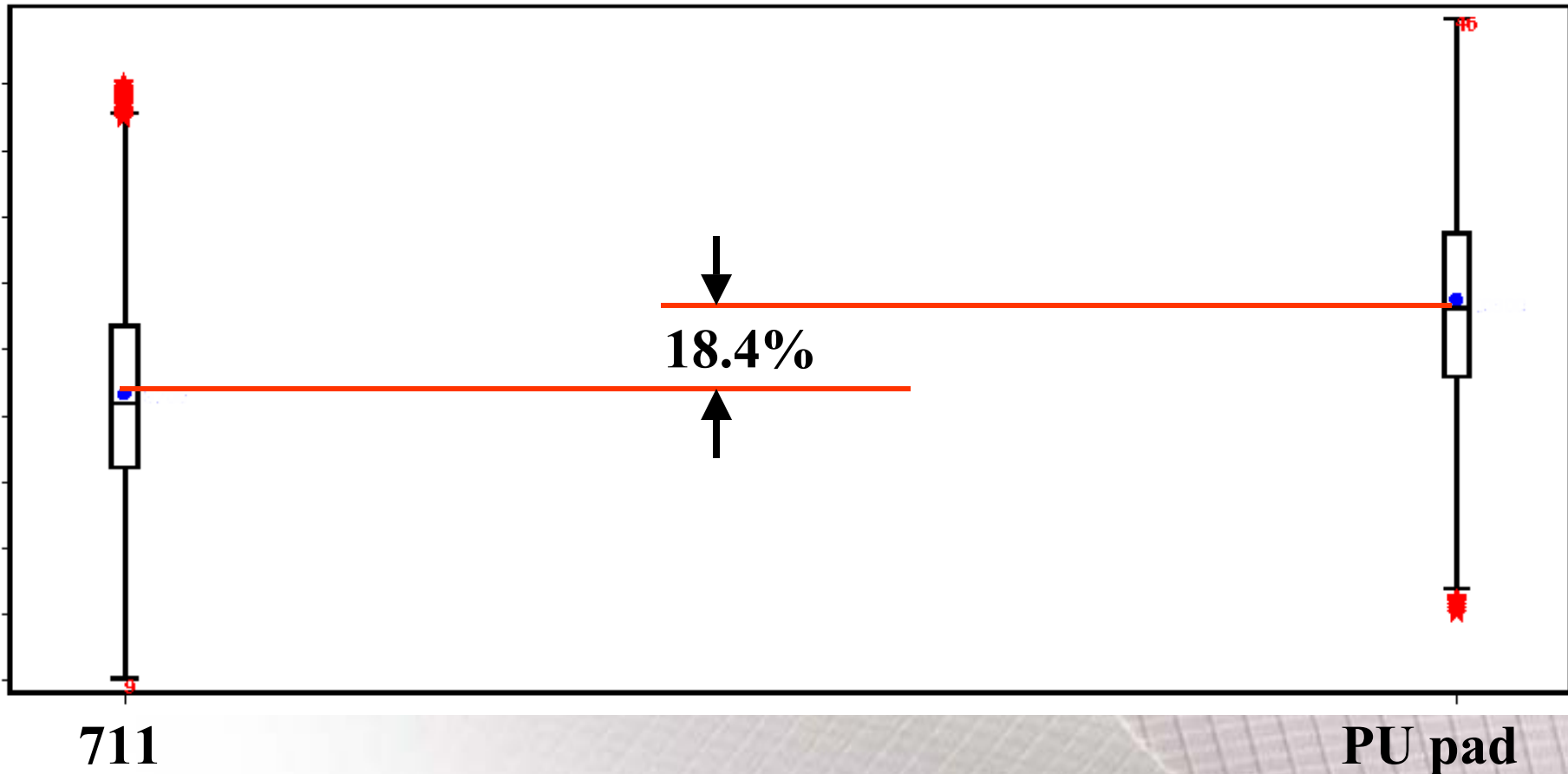
**Red symbol: 711**

**Blue symbol: PU pad**

# Bit-line Failure Count



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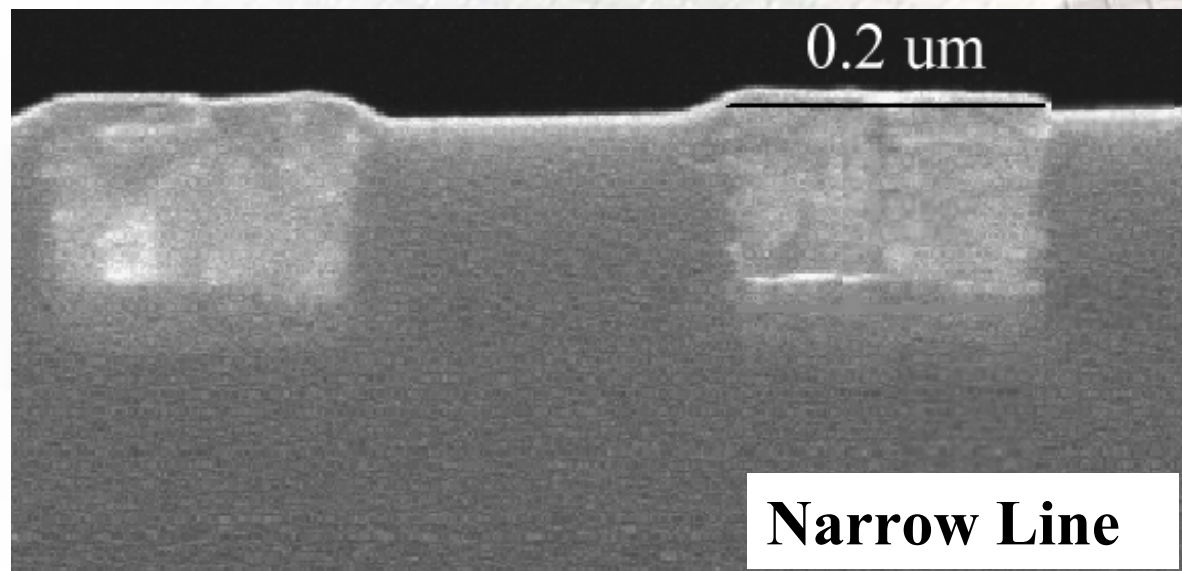
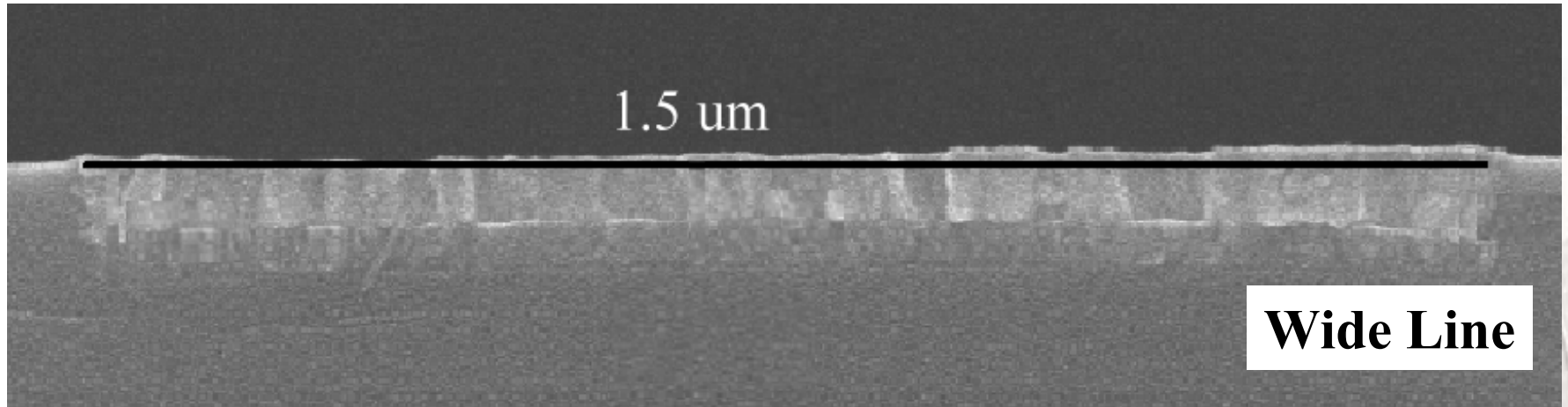


Failure rate on 711 is ~18.4% lower than that on PU pad

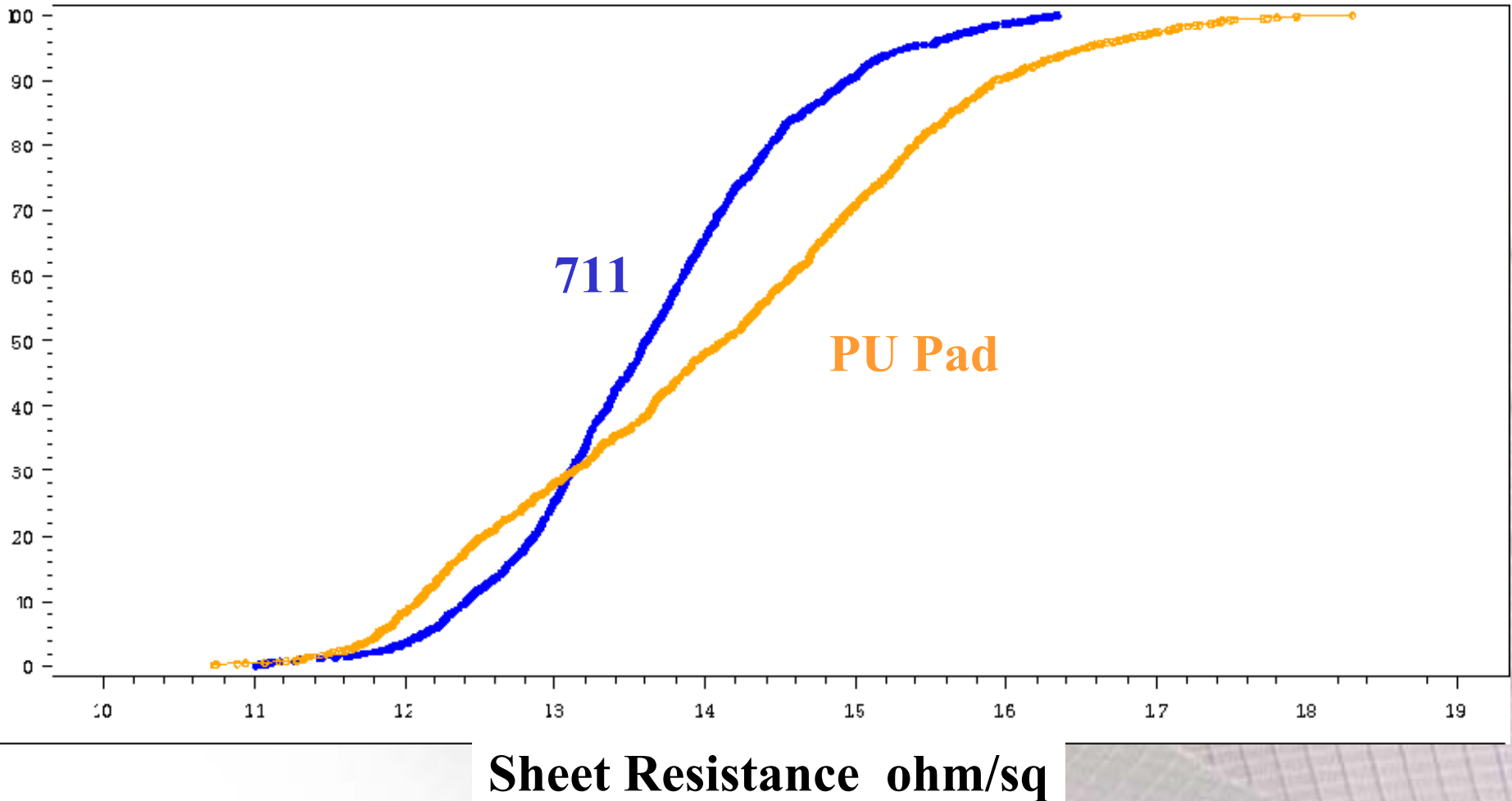
# Factors Affecting Metal Loss

- Slurry properties
  - Selectivity on various films
  - Chemical etching rate
- Pad properties
  - Selectivity on various films
  - Pad stiffness / planarization
  - Surface finishing

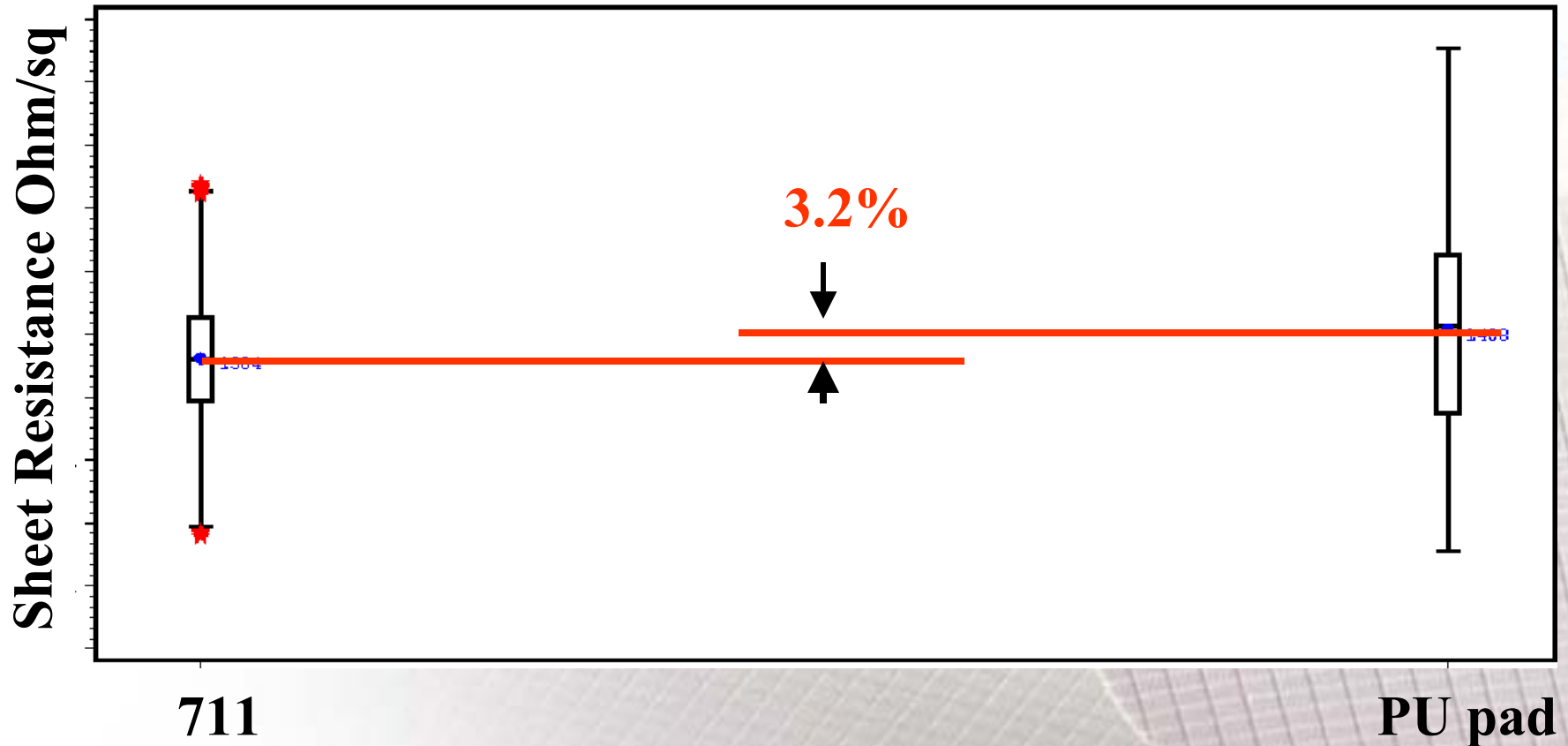
# Resistance Measurement Structure



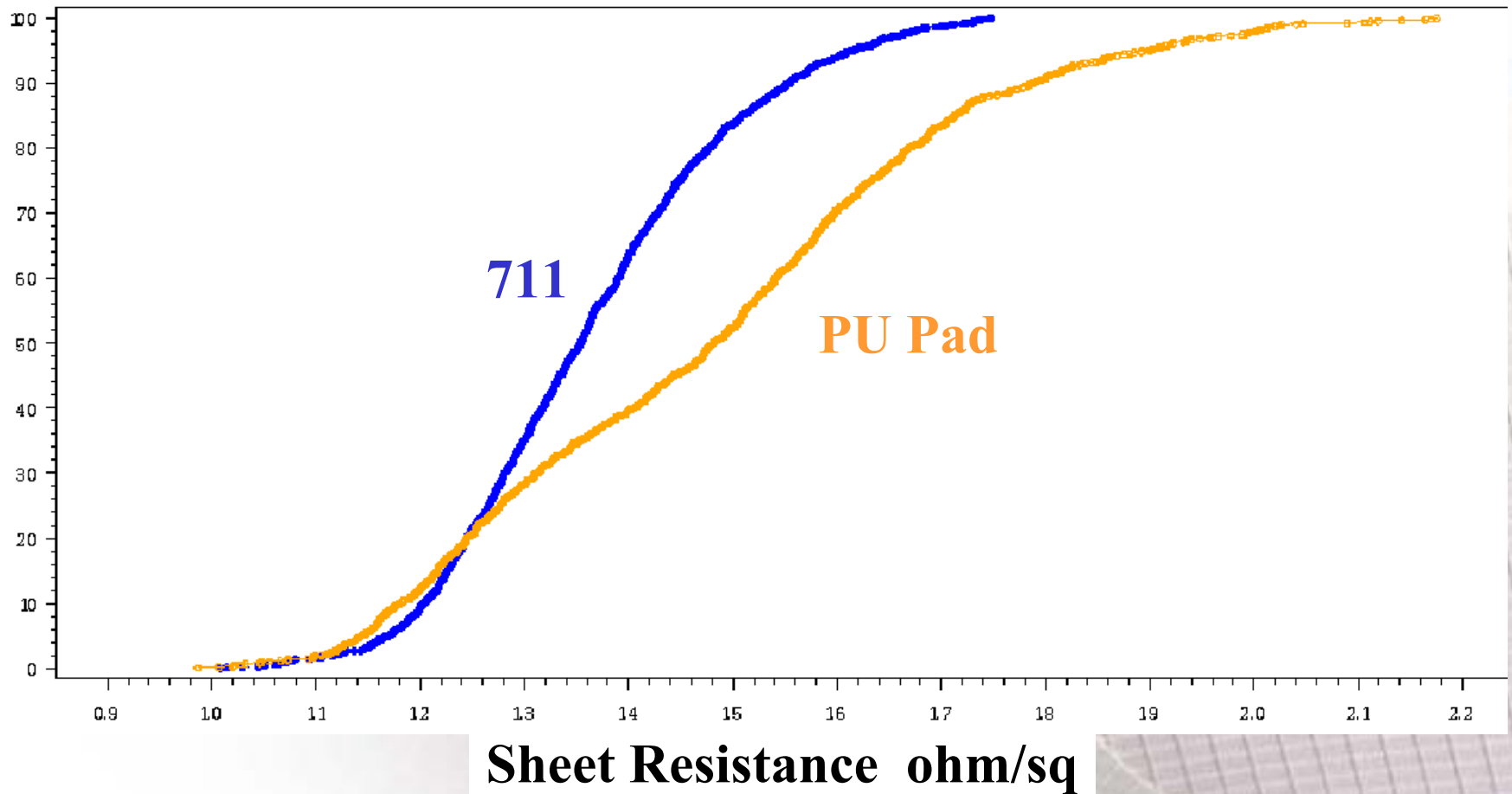
# Sheet Resistance of Narrow Line



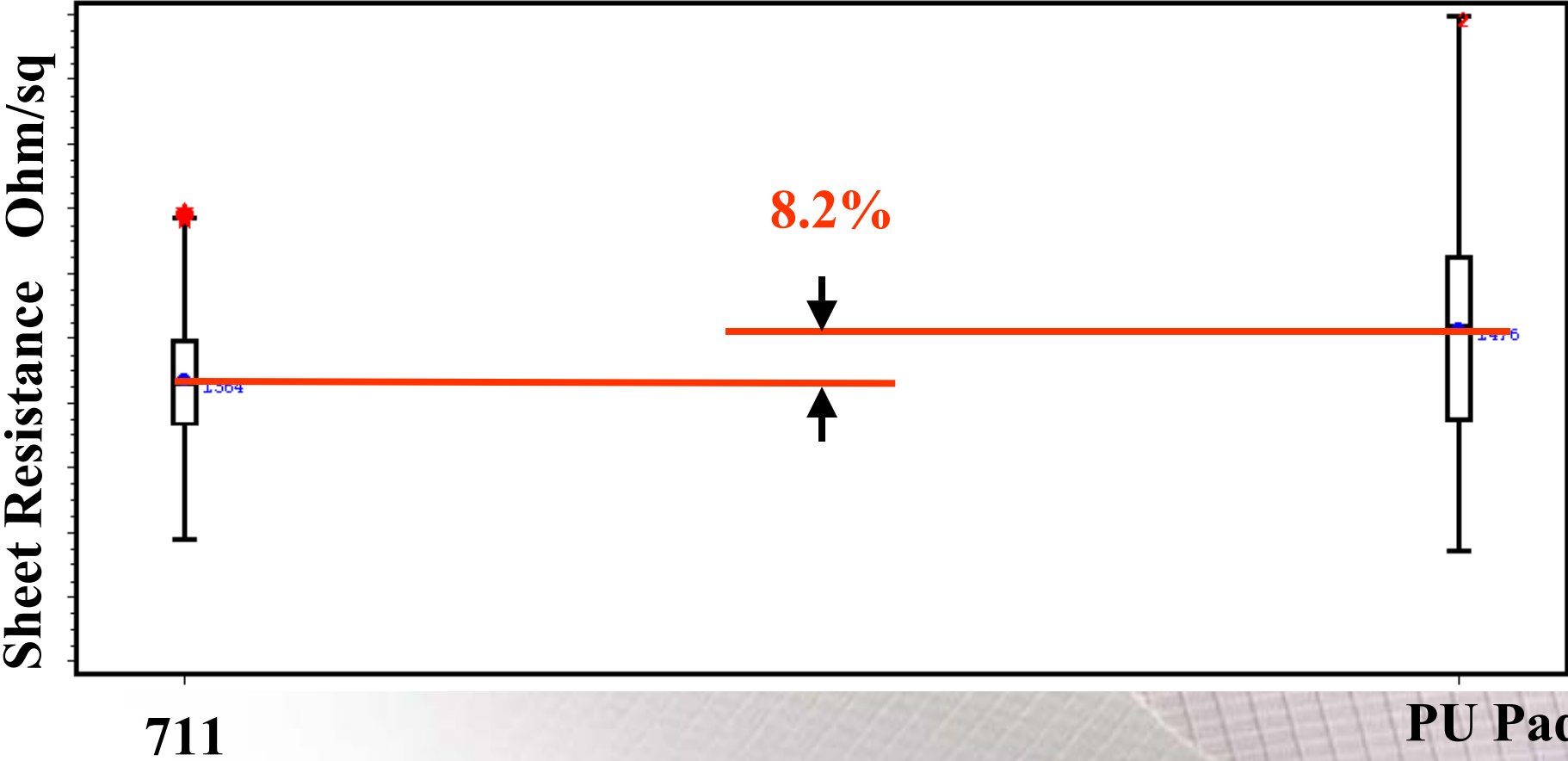
# Sheet Resistance of Narrow Line



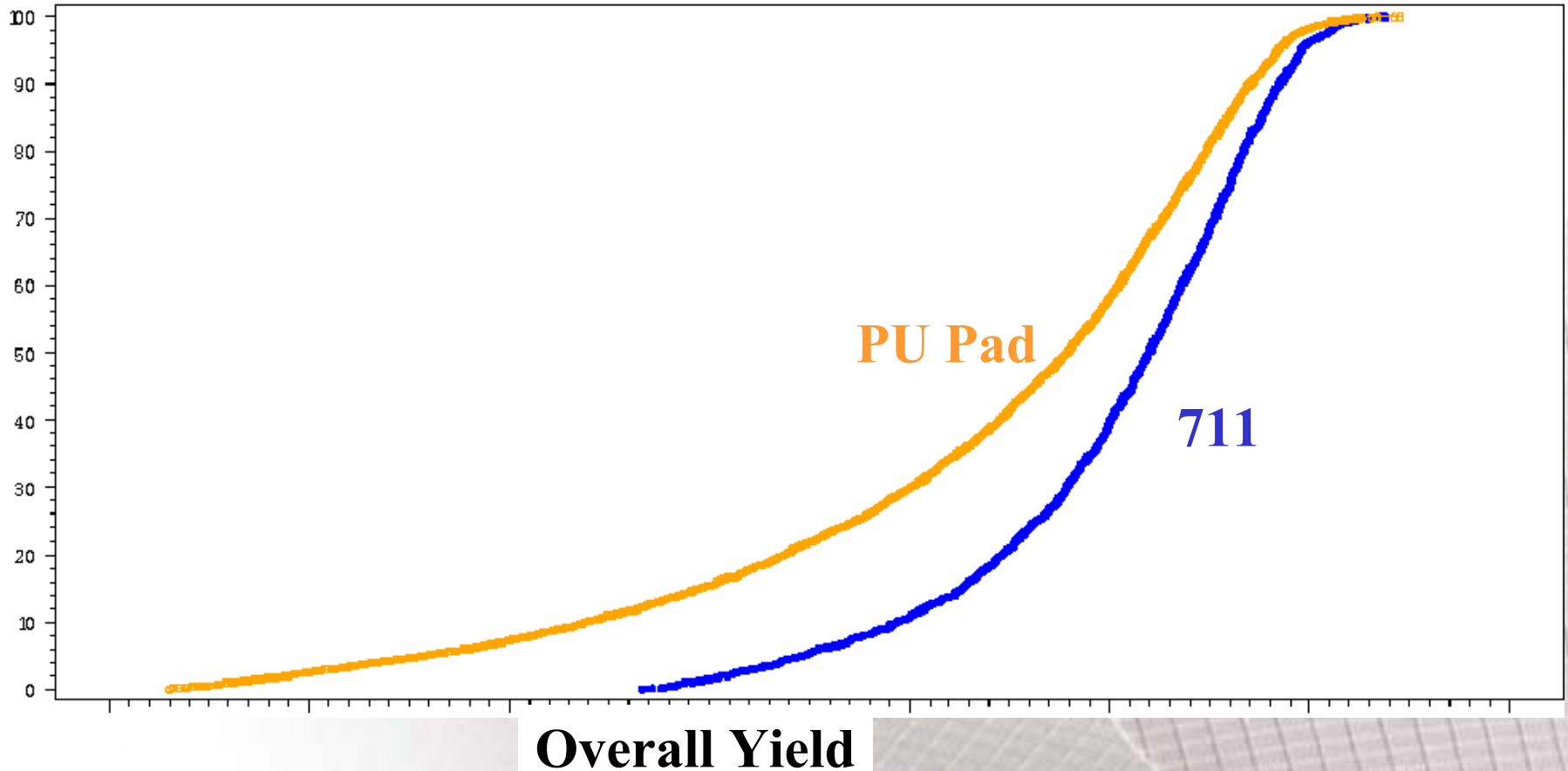
# Sheet Resistance of Wide Line



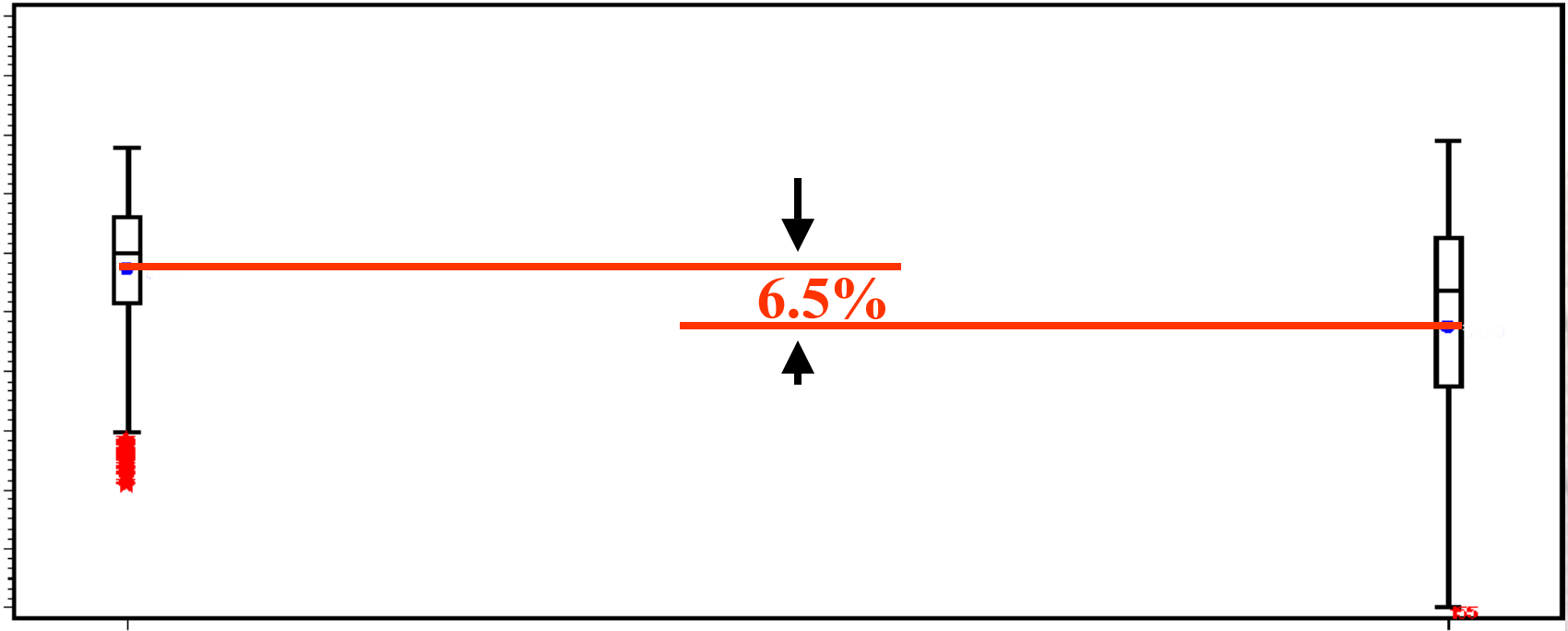
# Sheet Resistance of Wide Line



# Summary – Overall Yield



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# Summary

- Polishing pad can have significant impact on yield. The influence can be attributed to
  - WIWNU
  - Defect
  - Metal loss