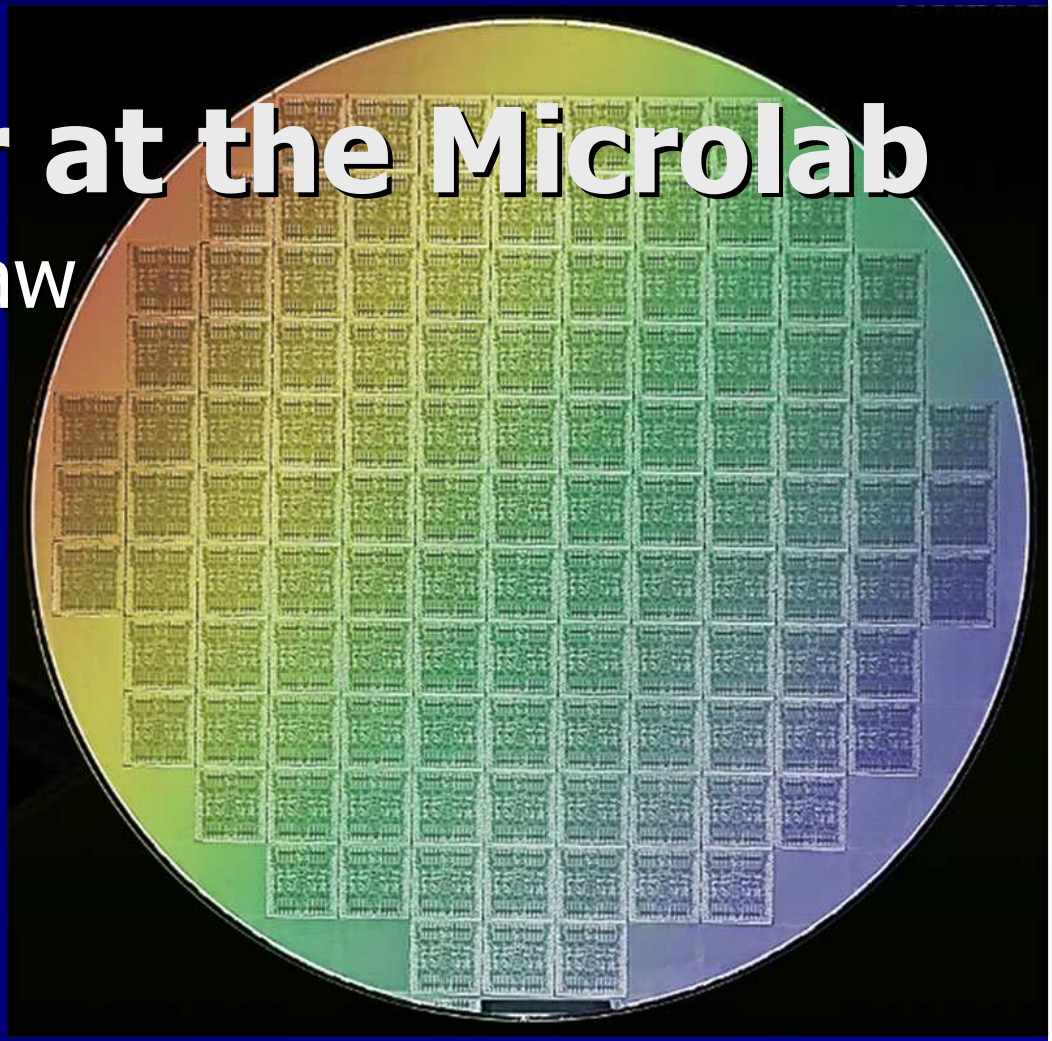
Berkeley
University of California

Summer at the Microlab

Kelsey Brokaw



Getting to Berkeley

Chemical **M**echanical **P**olisher

1. Chemical

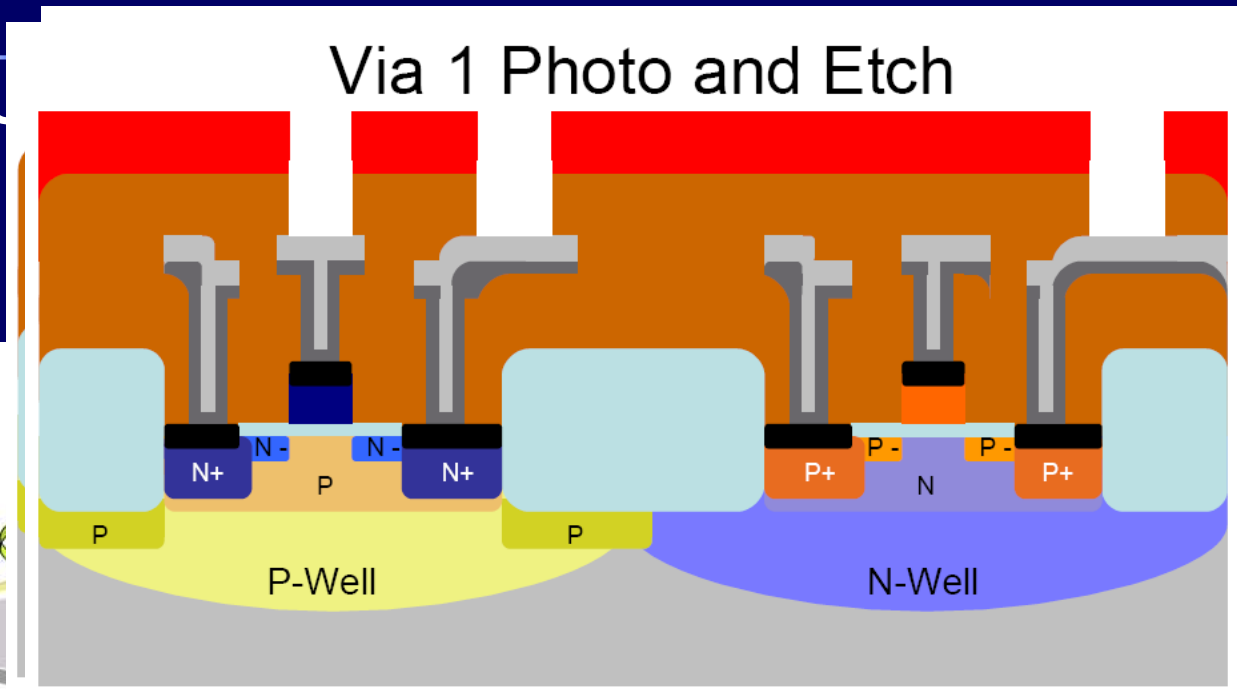
Weaken the surface material to allow polishing

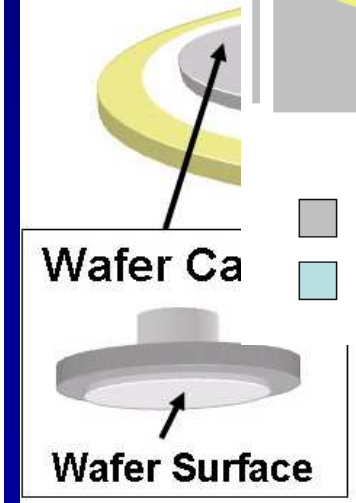
2. Mechanical

2 rotating wheels work like sand-paper

- Table Speed (rpm)
- Chuck Speed (rpm)
- Slurry Flow (ml/min)
- Back Pressure (psi)
- Down Force (psi)
- Temperature (°C)
- Time (sec)
- Pad Down Force (lbs)
- Ring Force (psi)

You and the CMP



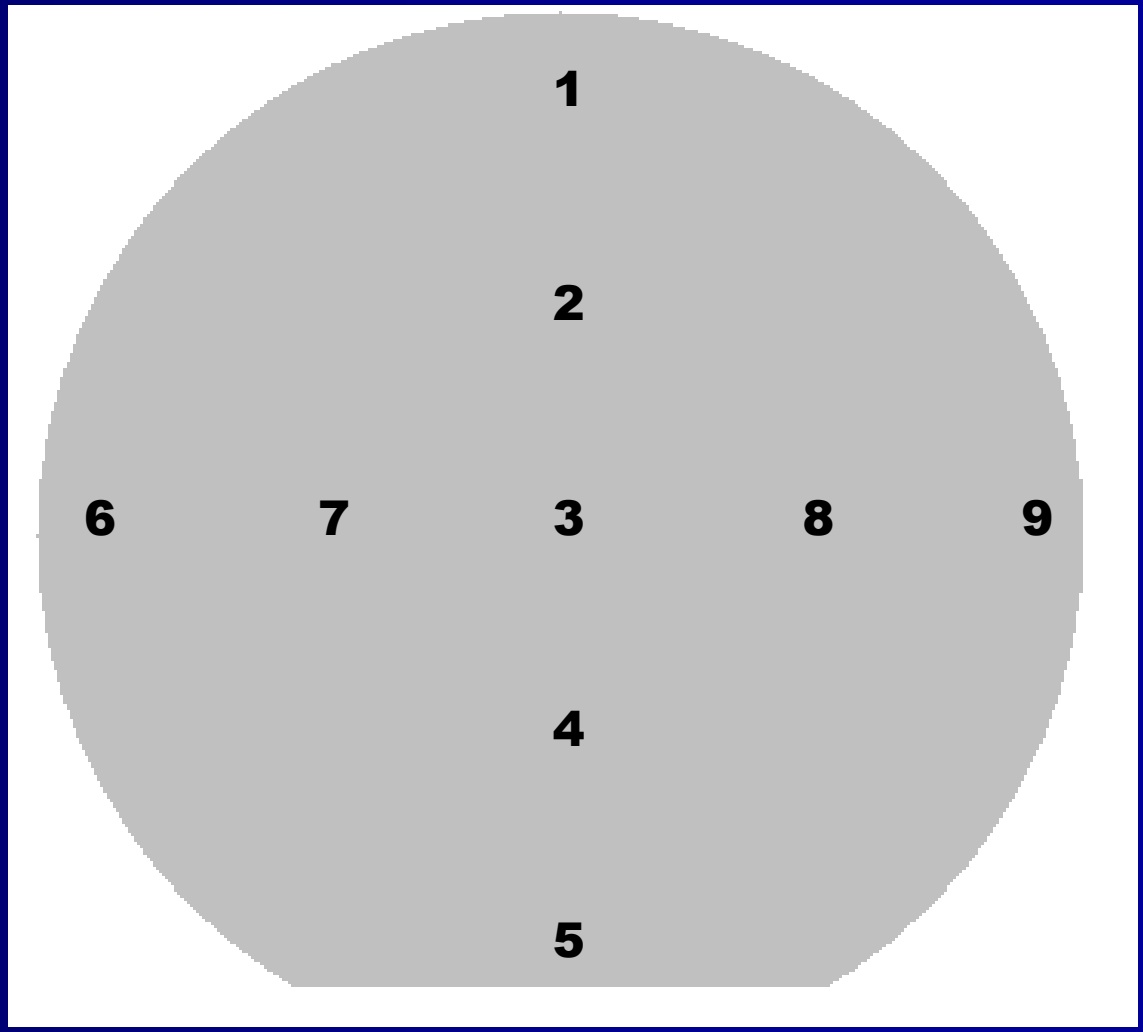


Goals

1. Used Pad – Better or Worse?
2. New Design – Faster, Better Polishing?
3. Settings – How do we optimize what we have?

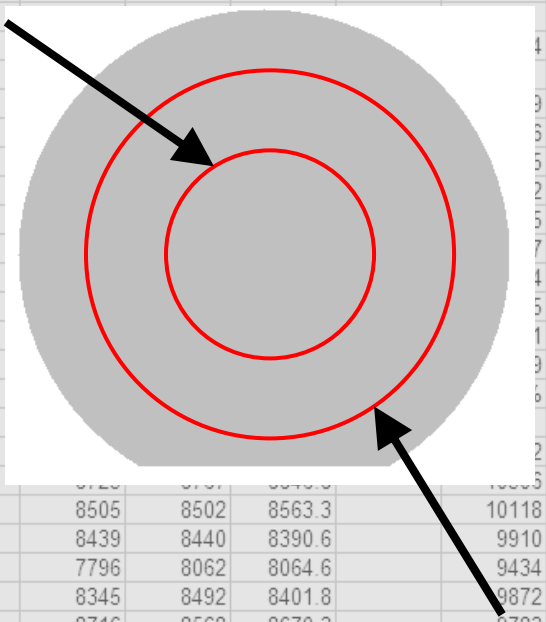
Measuring

1. Top
2. Top Center
3. Center
4. Flat Center
5. Flat
6. Left
7. Left Center
8. Right Center
9. Right



Recording

- Every number
- Every average
- % Non-uniformity of:
  - Oxide layer
  - Polish rate
- Average of Outer Ring
- Average of Inner Ring



Analyzing

- Polish Rate

$$= \frac{\text{initial thickness} - \text{final thickness}}{\text{Number of minutes}}$$

- % Non-Uniformity

$$= 100 \times \frac{\text{Max} - \text{Min}}{\text{Average}}$$

- In case of flyers:
  - Re-measure in case of mistake
  - Do not use data

The Process

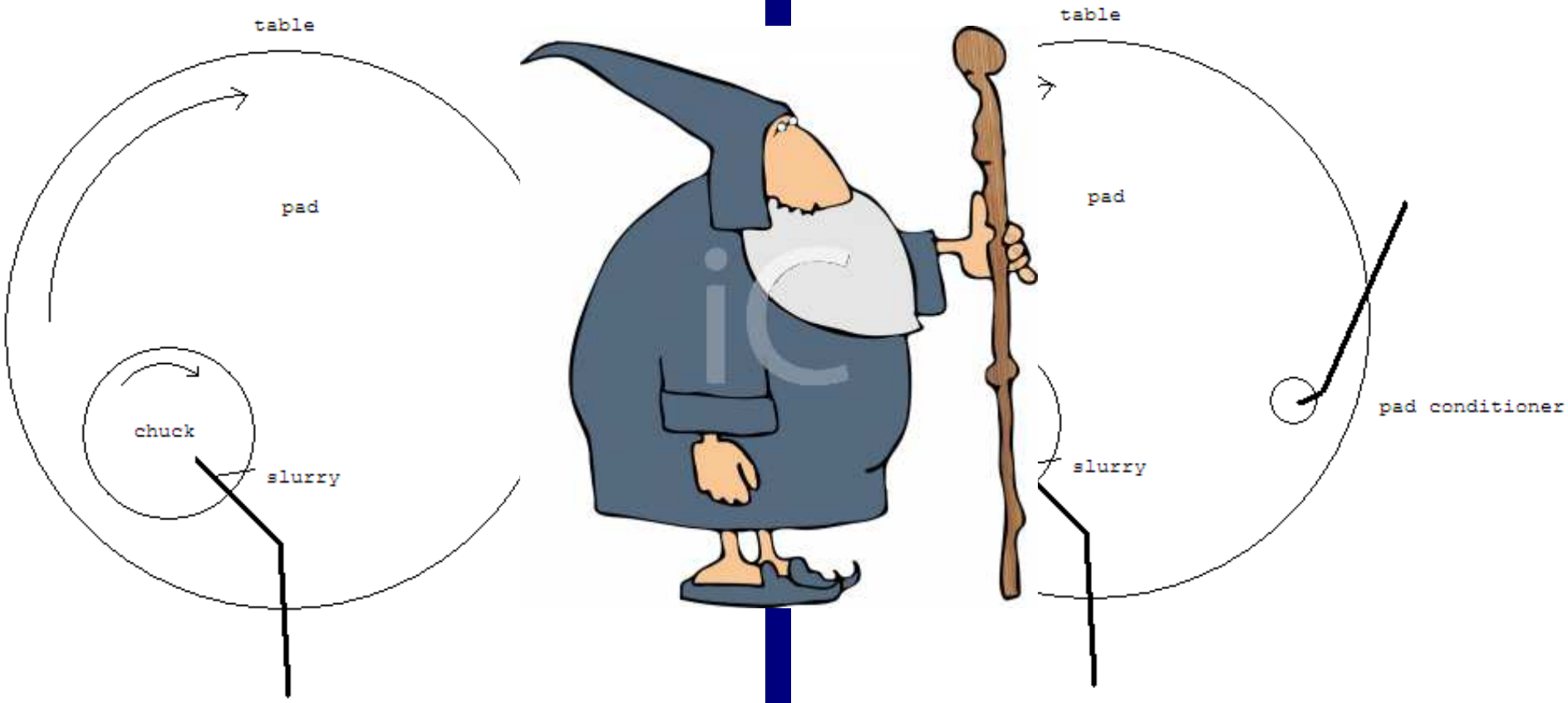
Recipe:

A-PE-USG-1.0

The Used Pad

Ex-situ

In-situ



The New Pad

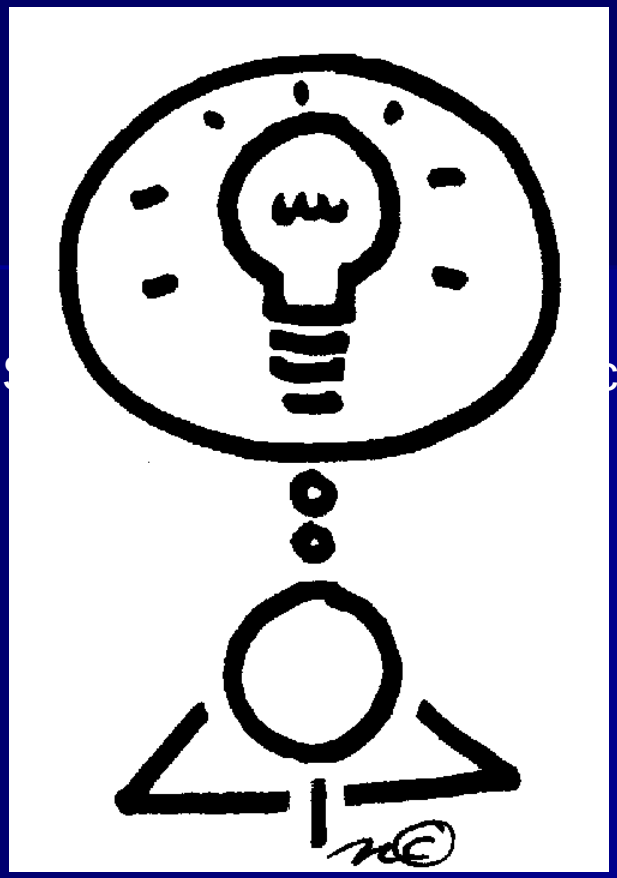
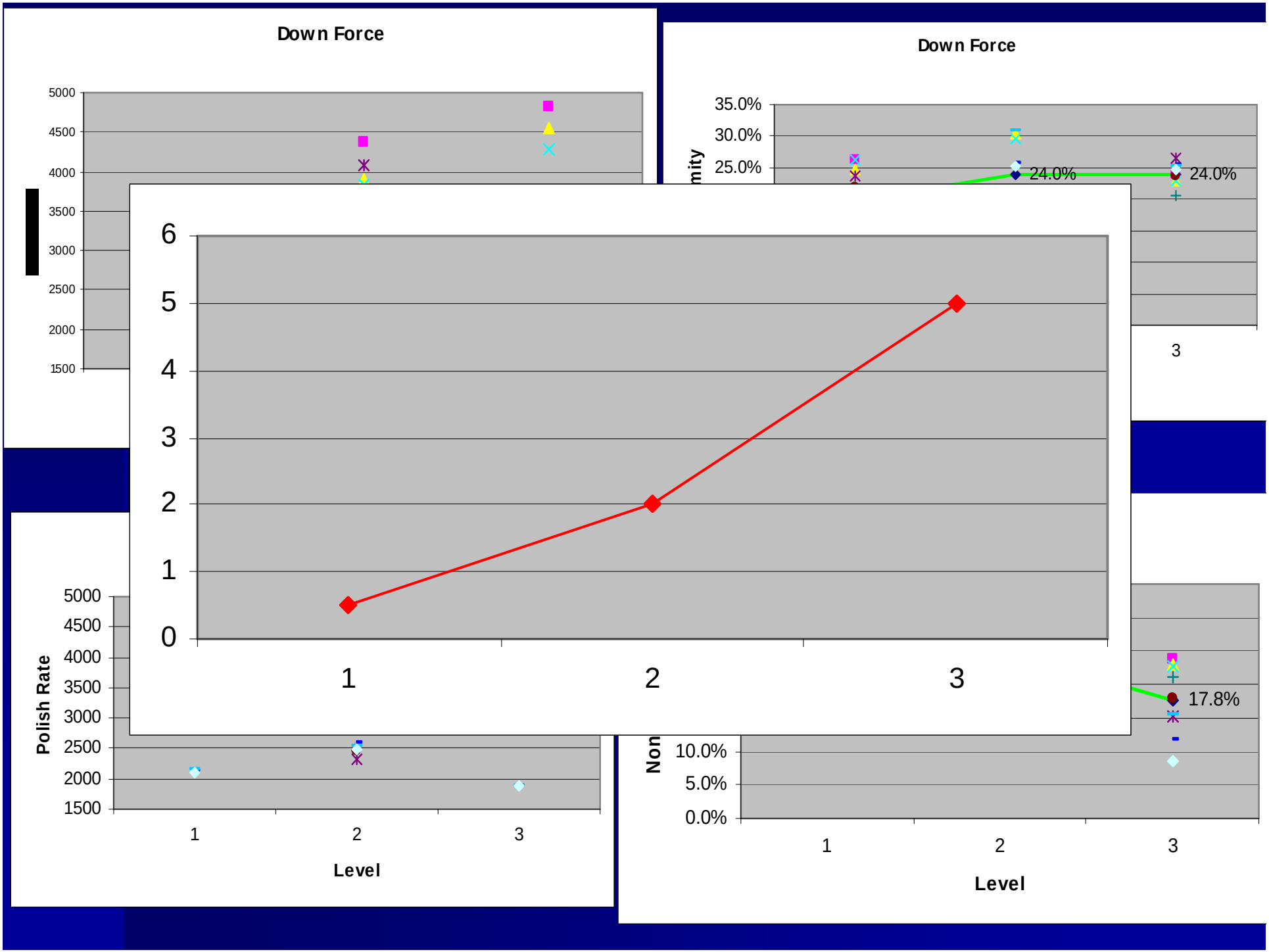
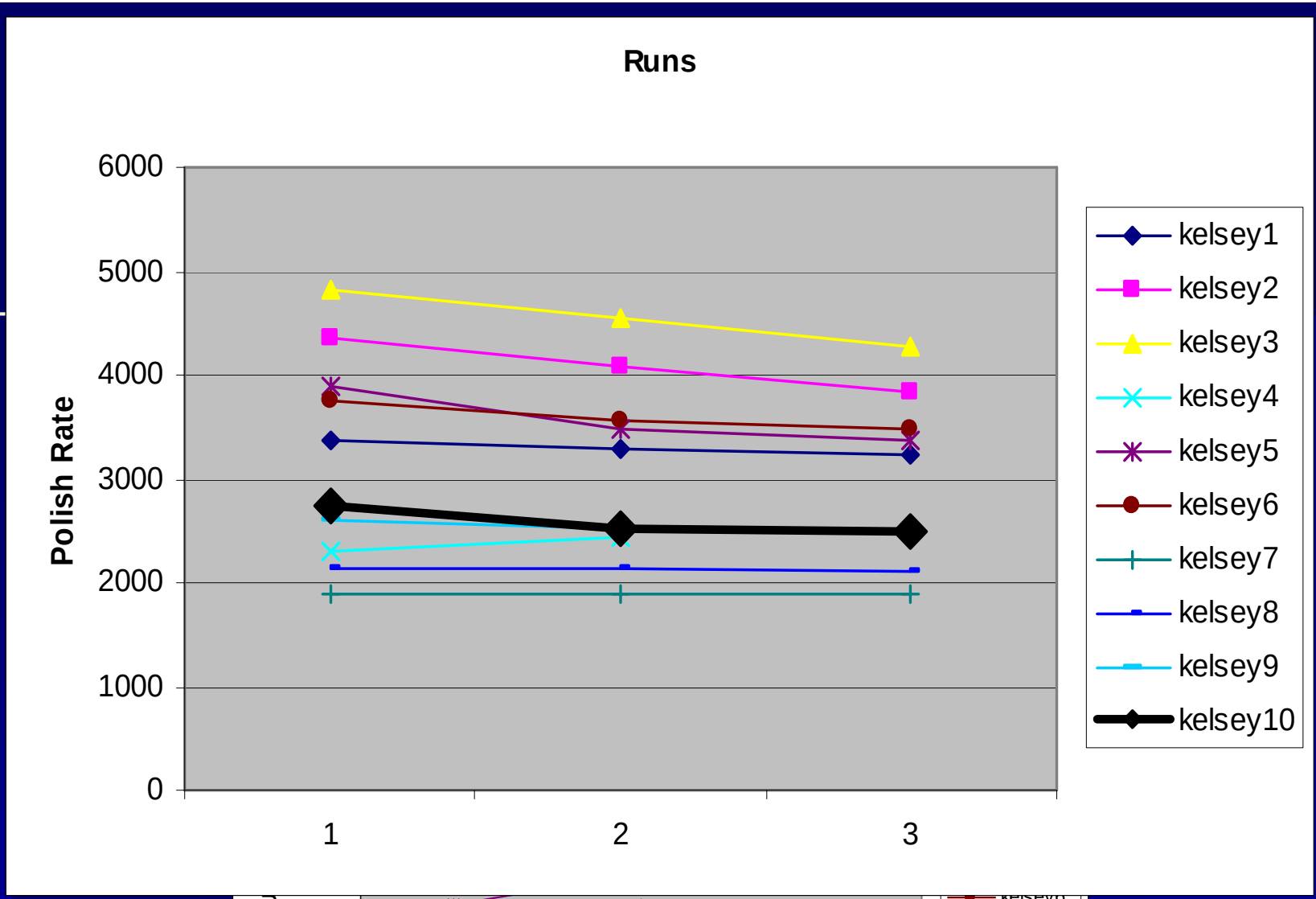
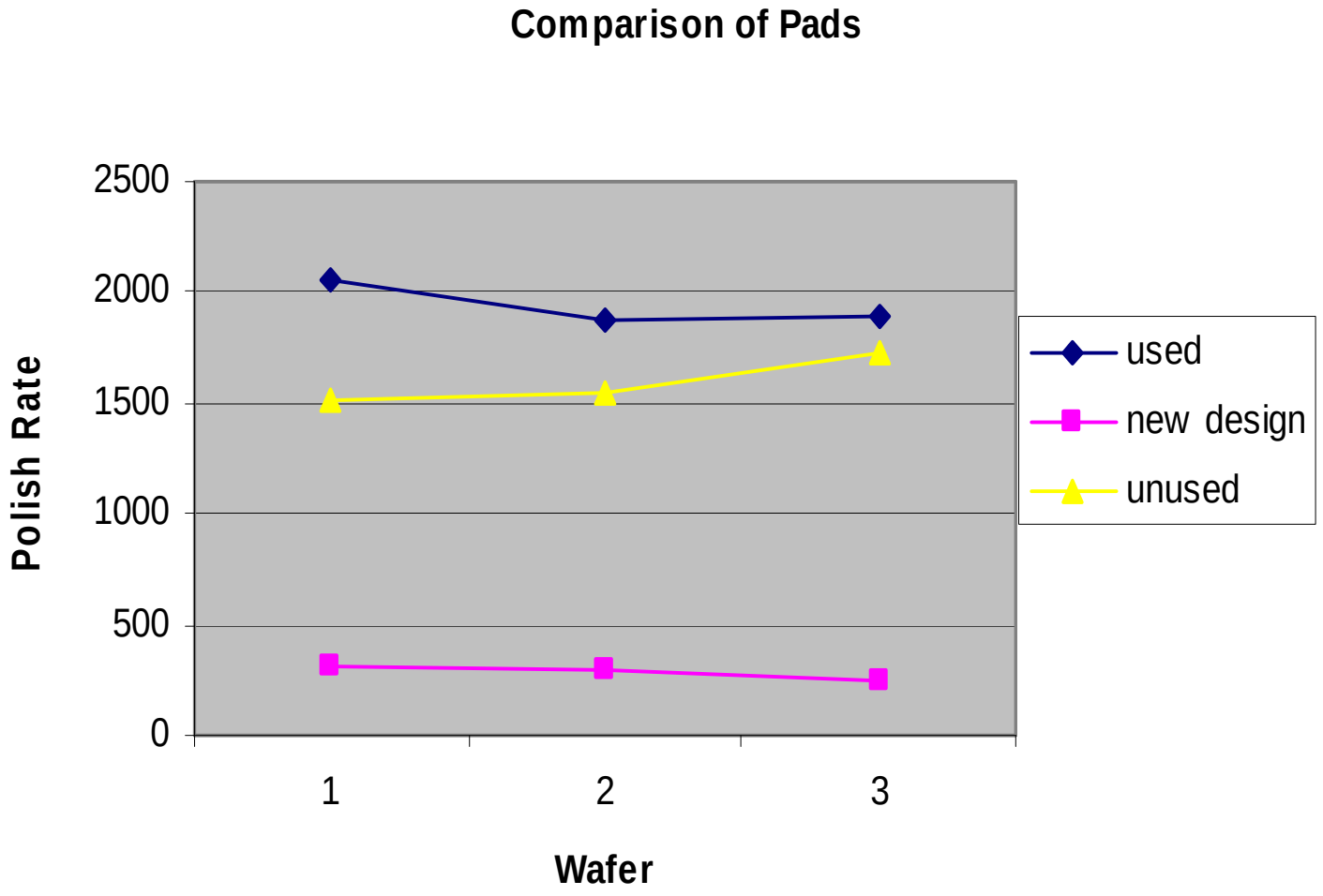


Table S ck Pressure Slurry Flow

run no.				
1			1	1
2			2	2
3			3	3
4			2	3
5			3	1
6			1	2
7			3	2
8	3	2	1	3
9	3	3	2	1
1=	100	8	2	75
2=	66	10	4	100
3=	33	12	6	150


Down Force
5000
4500
4000
3500
3000
2500
2000
1500
Down Force
35.0%
30.0%
25.0%
24.0%
24.0%
3
6
5
4
3
2
1
0
1
2
3
Polish Rate
5000
4500
4000
3500
3000
2500
2000
1500
1
2
3
Level
10.0%
5.0%
0.0%
17.8%
1
2
3
Level


Runs
Polish Rate
6000
5000
4000
3000
2000
1000
0
1
2
3
kelsey1
kelsey2
kelsey3
kelsey4
kelsey5
kelsey6
kelsey7
kelsey8
kelsey9
kelsey10
15.0%
10.0%
5.0%
0.0%
kelsey7
kelsey8
kelsey9
kelsey10


Comparison of Pads
Polish Rate
2500
2000
1500
1000
500
0
1
2
3
Wafer
used
new design
unused

A Final Conclusion

- Don’t throw away an old pad
- Keep your settings
- Try new things, it’s not the end of the world if they don’t work

Acknowledgements

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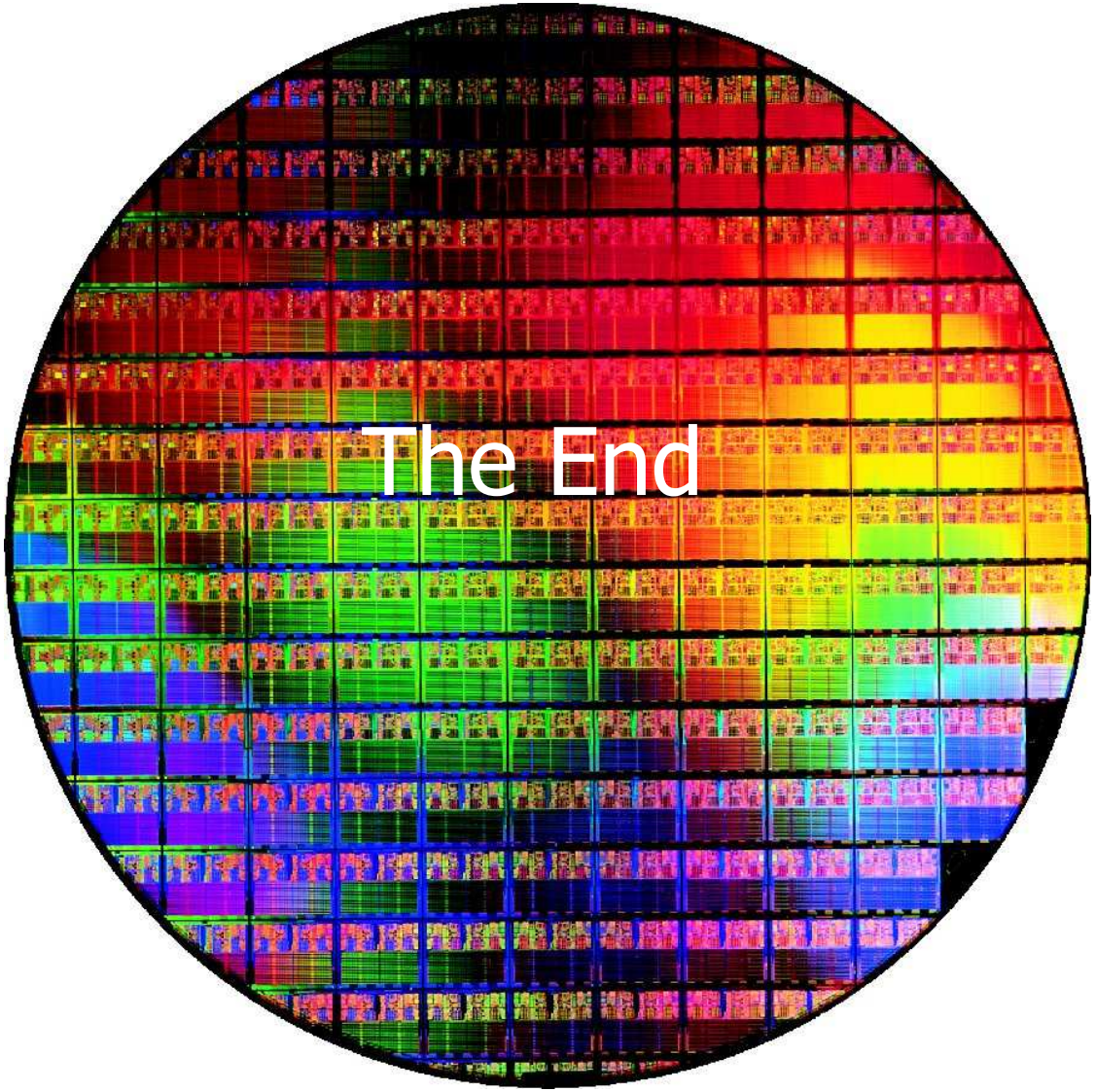
The End