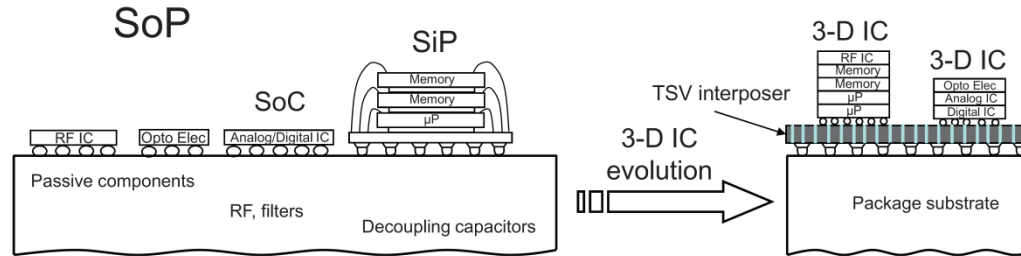


High density, Low Power, Low cost 3D IC

Jan-2018

The problem: The cost of transferring information



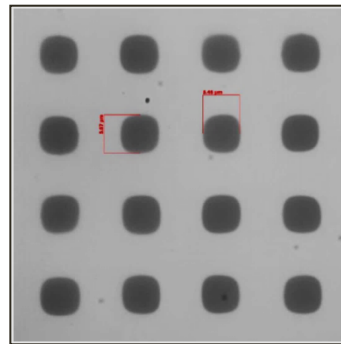
**Pavlidis et al., Three-Dimensional Integrated Circuit Design 2nd ed., 2017*

- Density of current 3D solutions is low, even with microbumps* (pitch >20um).
- Throughput and costs involved are the main limitation for 3D ICs.
- As a byproduct, Chip-to-Chip data moving is a major energy consumer.

Our solution

- Co-invented by Prof. Ron Naaman of the Weizmann Institute of Science and Erez Halahmi.
- Use of free electrons inside special tubes.
- Very high density. Scalable down to 1nm of tube diameter.
- Already proven with 5um pitch, 500um length.
- No need for direct contact between the dies.
- No practical energy loss along the path, regardless of distance.
- Compatible with current production technics.
- Very high throughput, low cost.

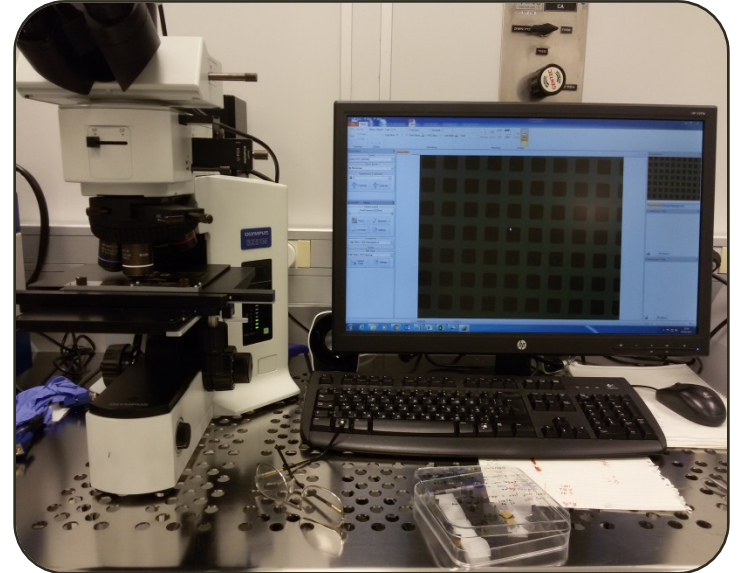
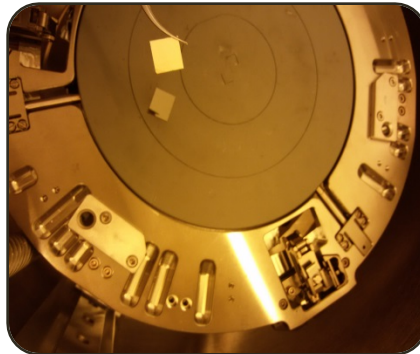
Top view



Prototype

FAB made chip-to-chip prototype

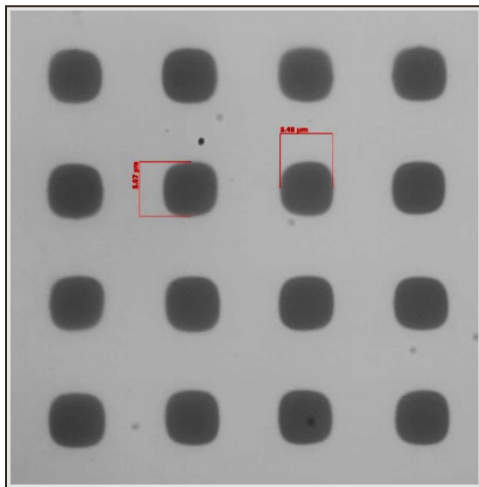
- A prototype was manufactured in a FAB.



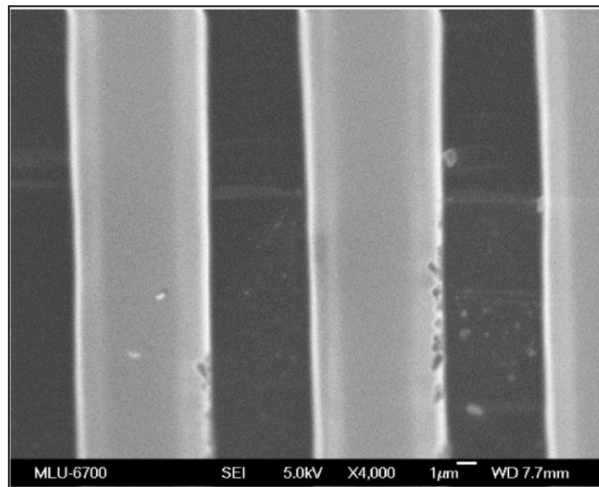
FAB made chip-to-chip prototype

Aspect ratio of the vias – 1:100

Top view

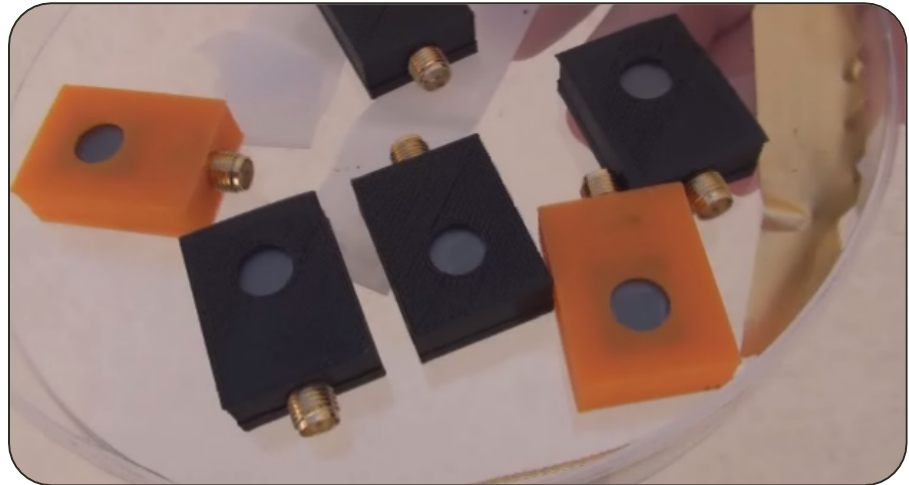
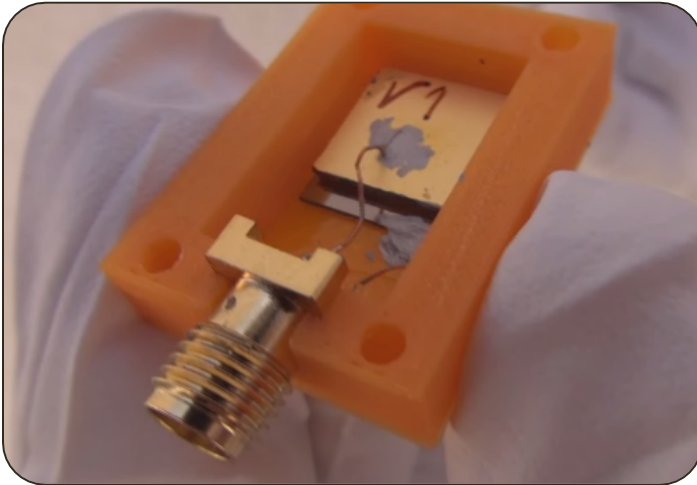


Cross section



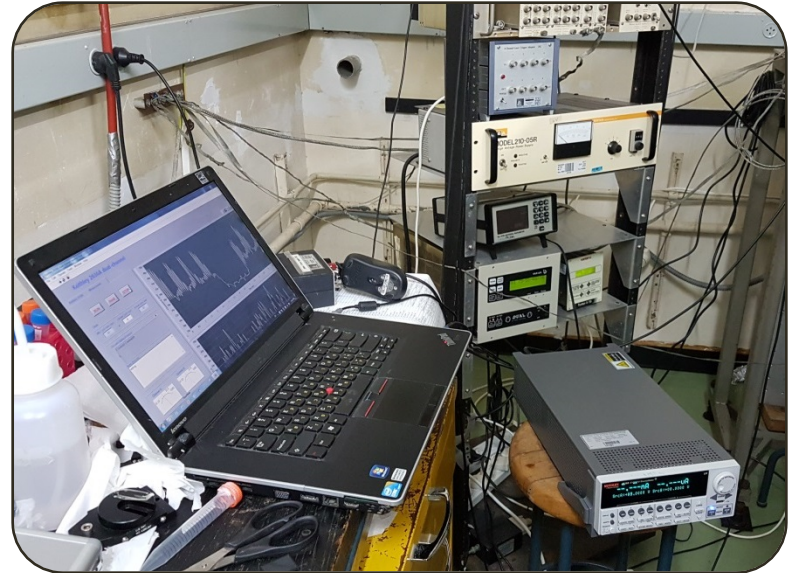
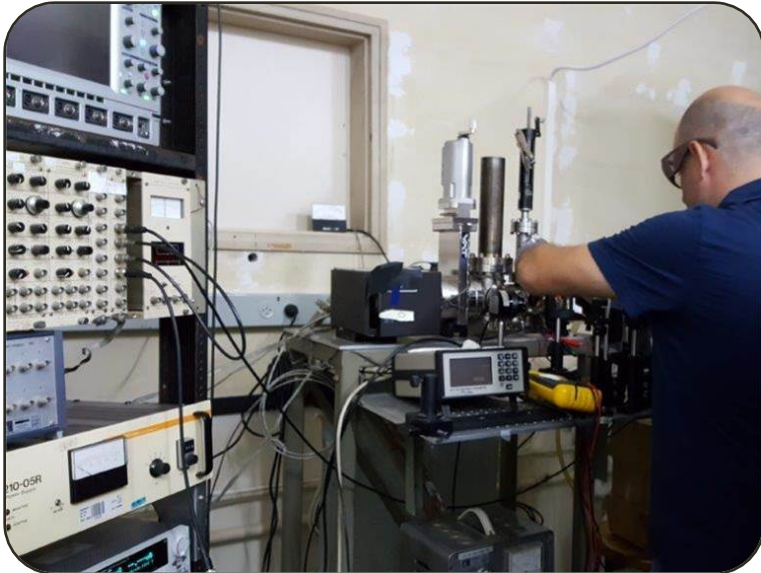
Chip packaging

- Prototype chips were packaged and prepared for testing.



Chip measurements

- Experiments performed in a laboratory at the Weizmann Institute of Science demonstrated data transfer between two chips without any practical energy loss.



Thank you for your time