Microsystem Interfaces – Needs and example solutions

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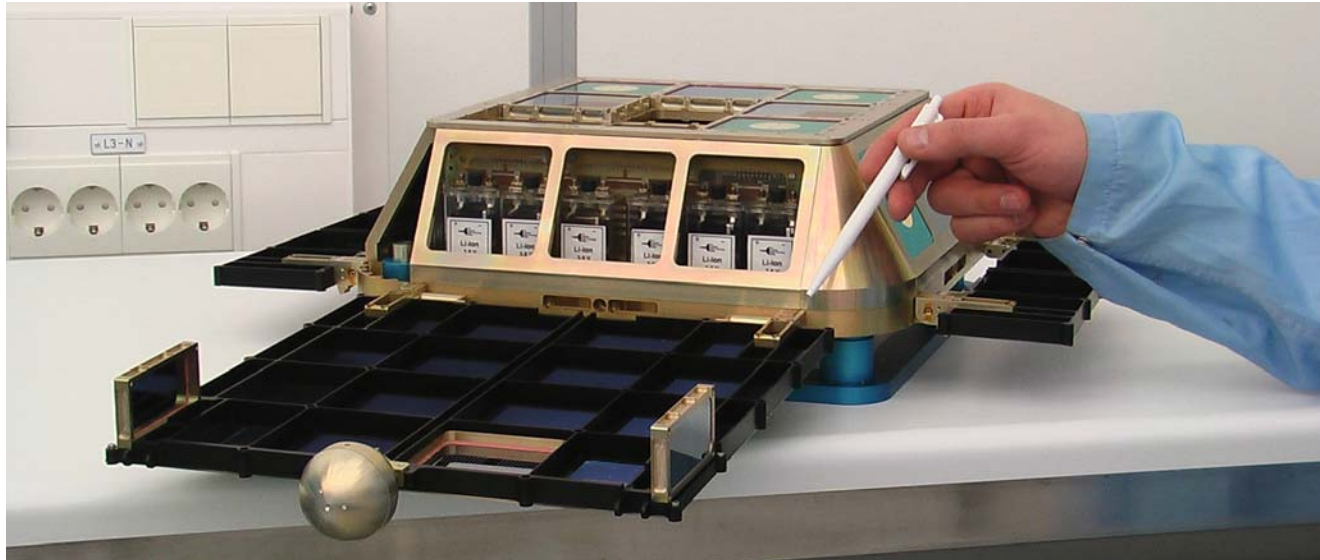

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Microsystem Interfaces Overview

	In-plane i/f Wafer-level (between feat. & dev)	Out-of-plane i/f Between wafers	Inter-module i/f Between µ-system modules
Mechanical			
Thermal			
Fluidic			
Electric			

Microsystem Interfaces Overview

	In-plane i/f	Out-of-plane i/f	Inter-module i/f
Mechanical	Clamps, molds	bonds	Mounting frames
Thermal	Suspen-sions, heat pipes	Barriers, therm. vias	Therm. Mounts/ molds
Fluidic	Channels, valves, seals	Vias, valves, seals	Tubes, seals
Electric	Thin-films	Bumps, electric vias	Flex, conn. pins

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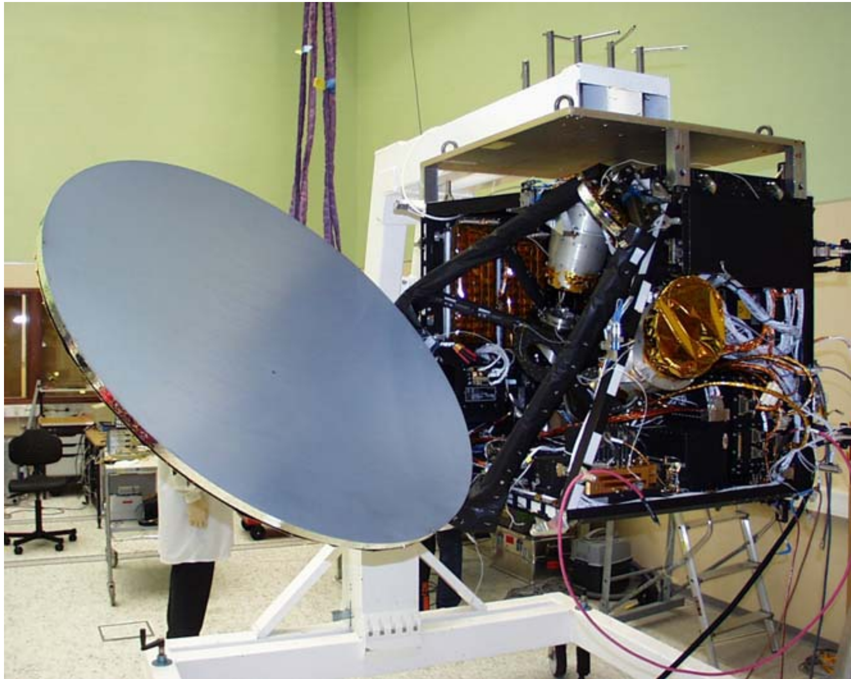
Microsystem Packaging

Bosch Accelerometer

Standard system packaging



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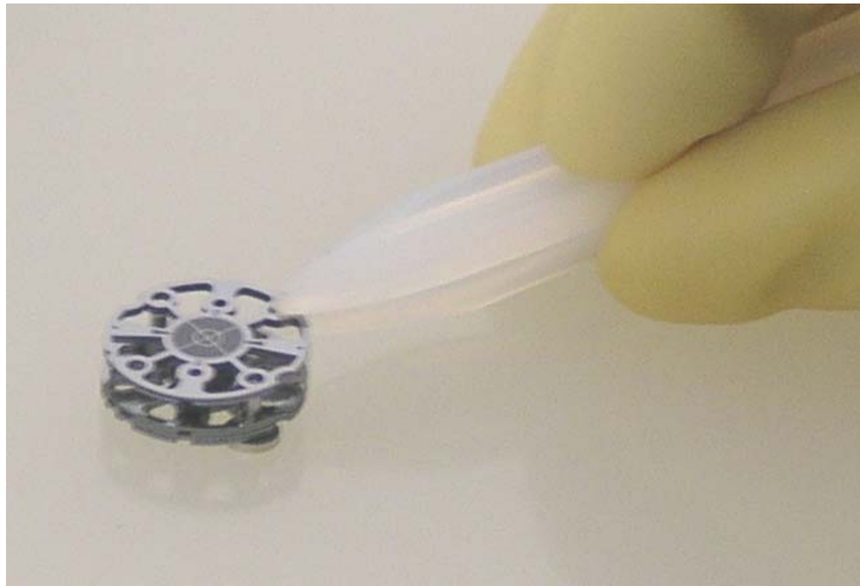
Microsystem integration

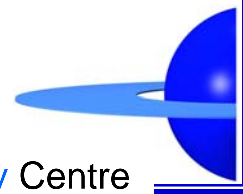
- Wafer level
  - Chip integration
  - Microfluidics
  - Electric circuitry
- Wafer bonding
  - Multiwafer bonding
  - Temperature limits
  - Spaceflight environment

Microsystem modules

	In-plane i/f Wafer-level (between feat. & dev)	Out-of-plane i/f Between wafers	Inter-module i/f Between µ-system modules
Mechanical		X	
Thermal		X	
Fluidic		X	
Electric			

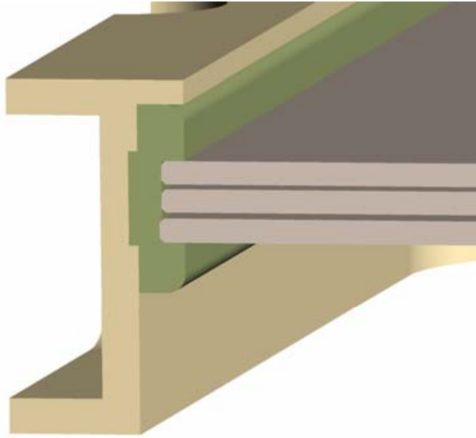
Wafer bonding

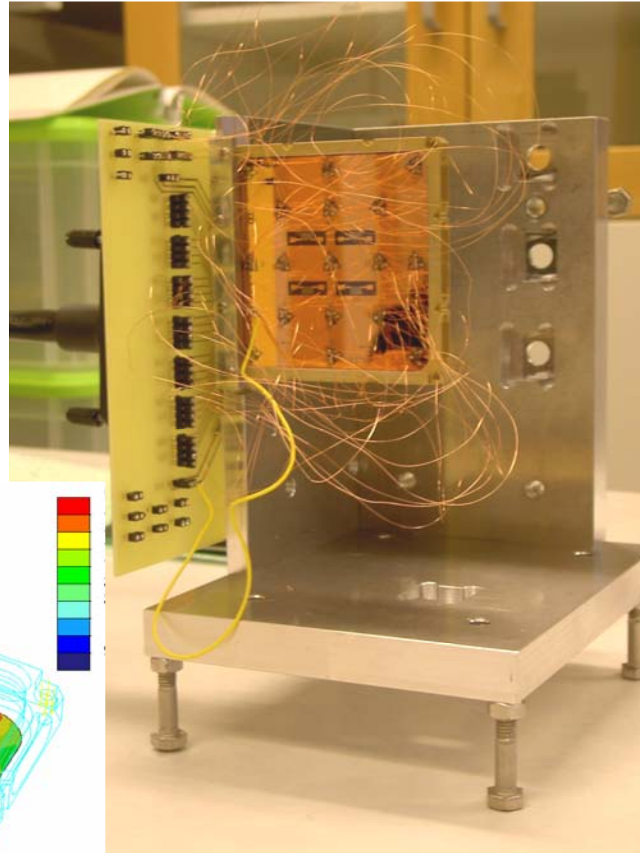


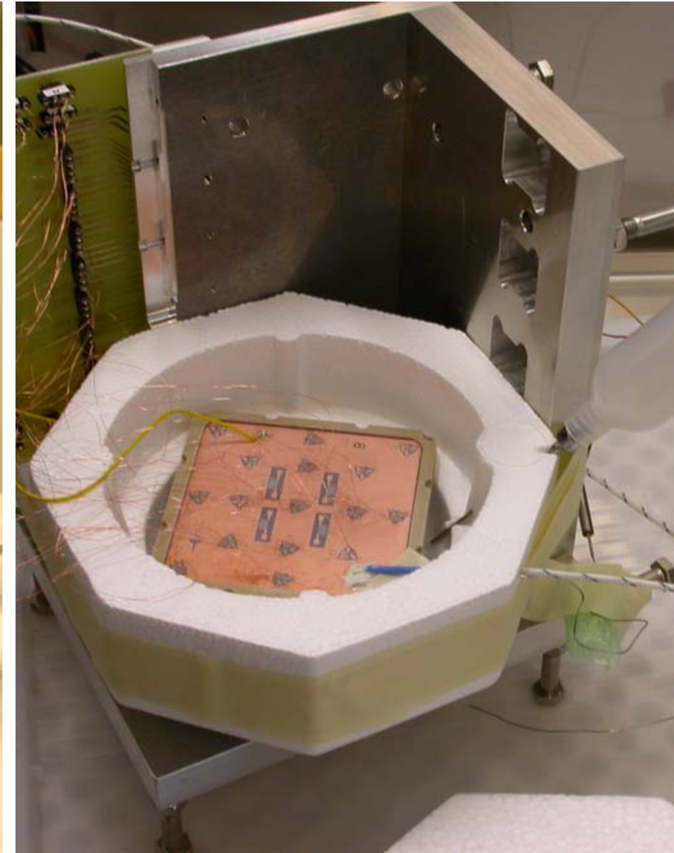


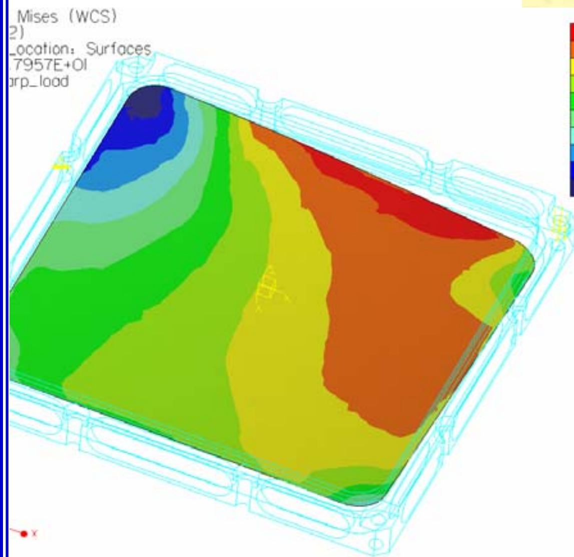
	In-plane i/f Wafer-level (between feat. & dev)	Out-of-plane i/f Between wafers	Inter-module i/f Between µ-system modules
Mechanical			X
Thermal			X
Fluidic			
Electric			

Microsystem module structural interface



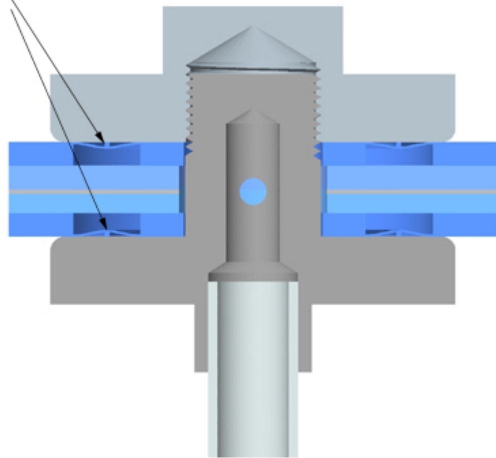


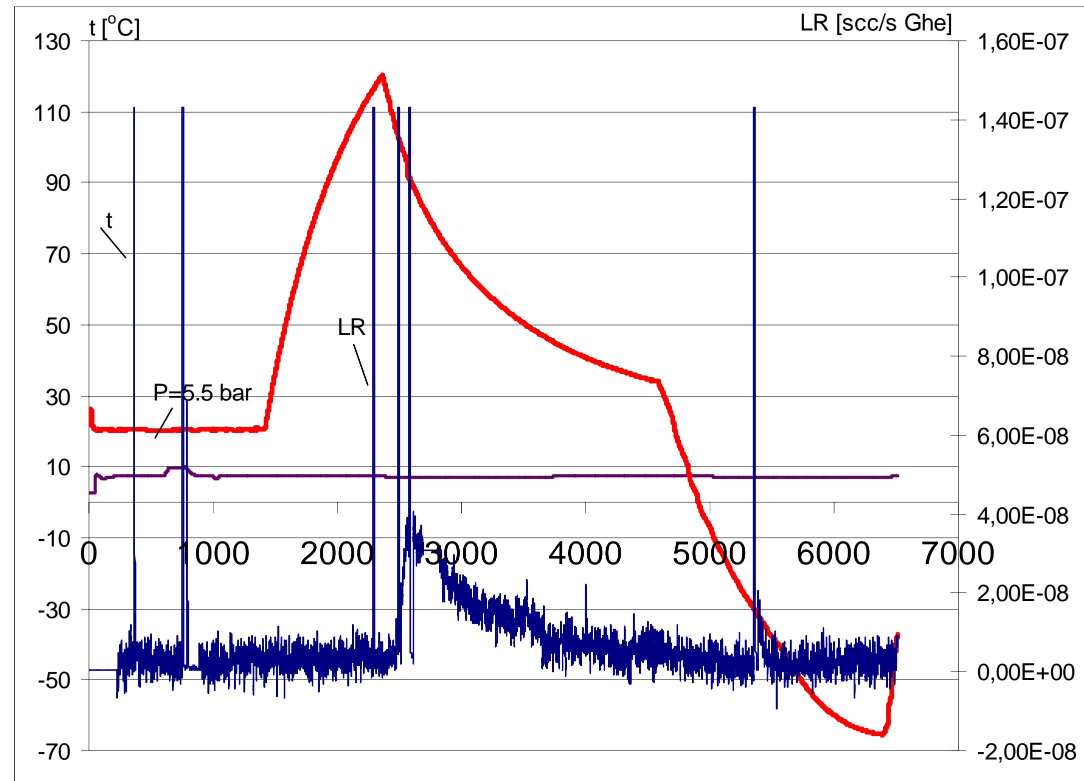




	In-plane i/f Wafer-level (between feat. & dev)	Out-of-plane i/f Between wafers	Inter-module i/f Between µ-system modules
Mechanical			
Thermal			X
Fluidic			X
Electric			

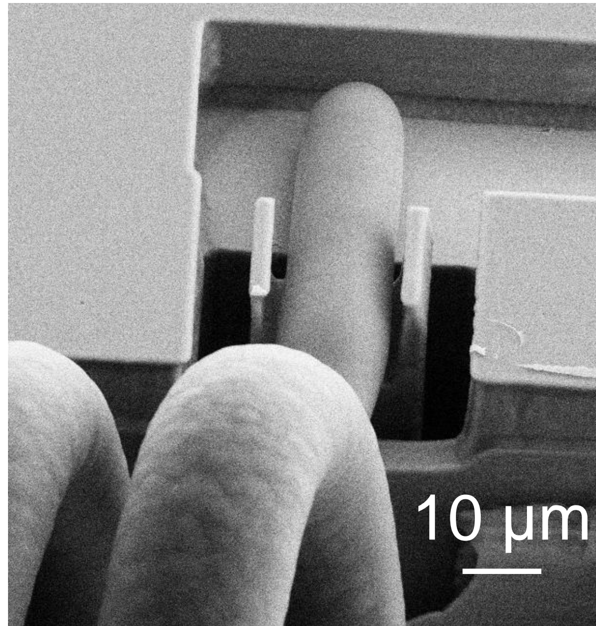
Microsystem module dismountable fluidic interface

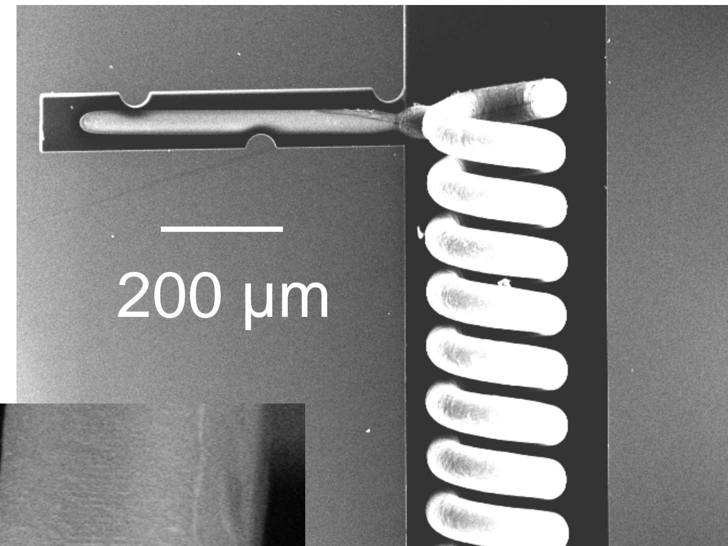


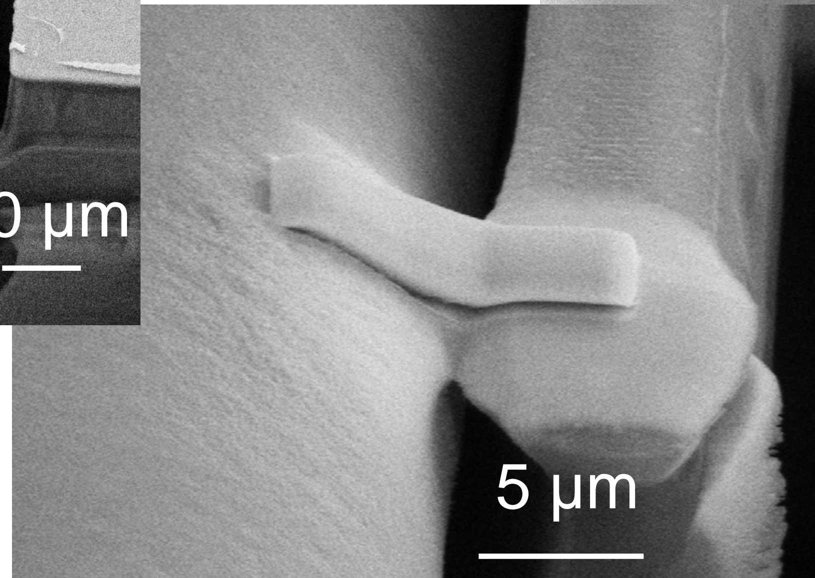


	In-plane i/f Wafer-level (between feat. & dev)	Out-of-plane i/f Between wafers	Inter-module i/f Between μ-system modules
Mechanical	X		
Thermal	X		
Fluidic			
Electric	X		

Mechanical microclamps







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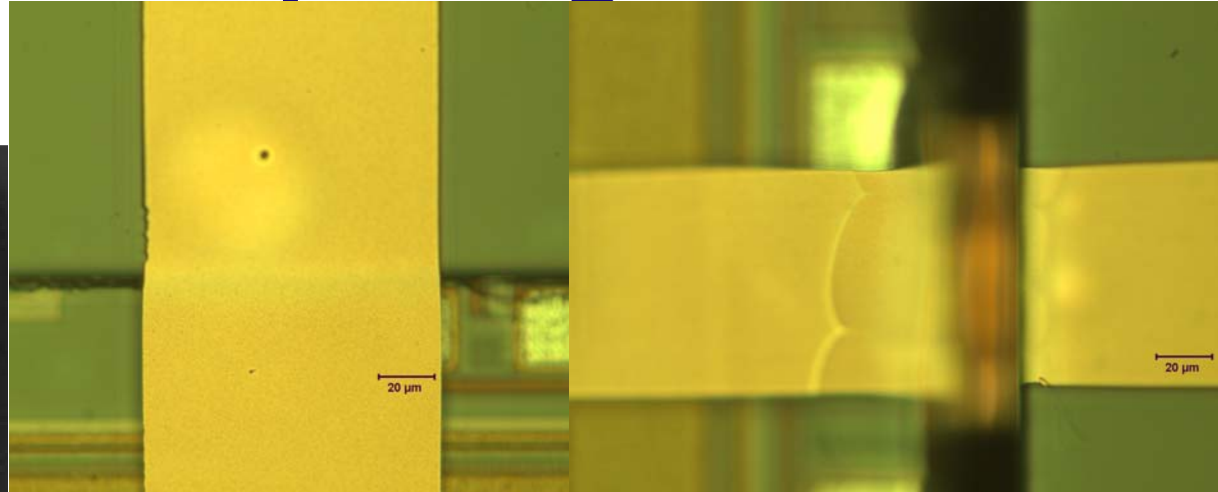
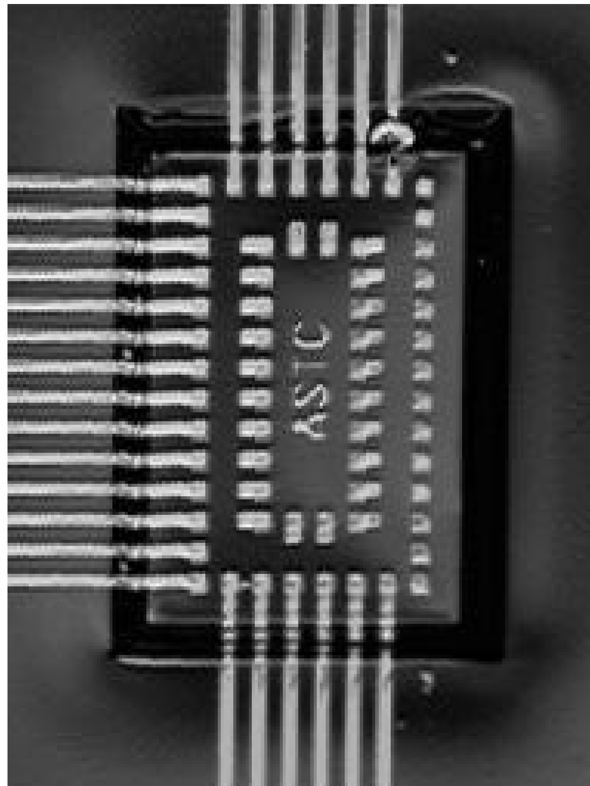
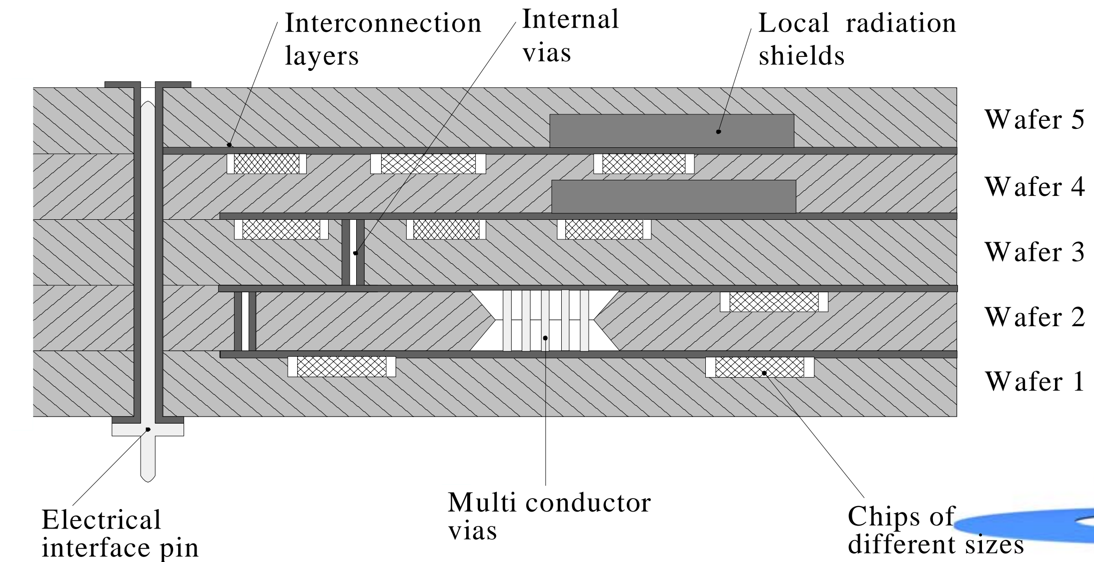
Chip integration







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Conclusions

- Volume or mass reduction potential: better than tenfold (system envelope)
- Wafer level integration extensively studied
- Inter-modular and out-of-plane integration technology not extensively studied