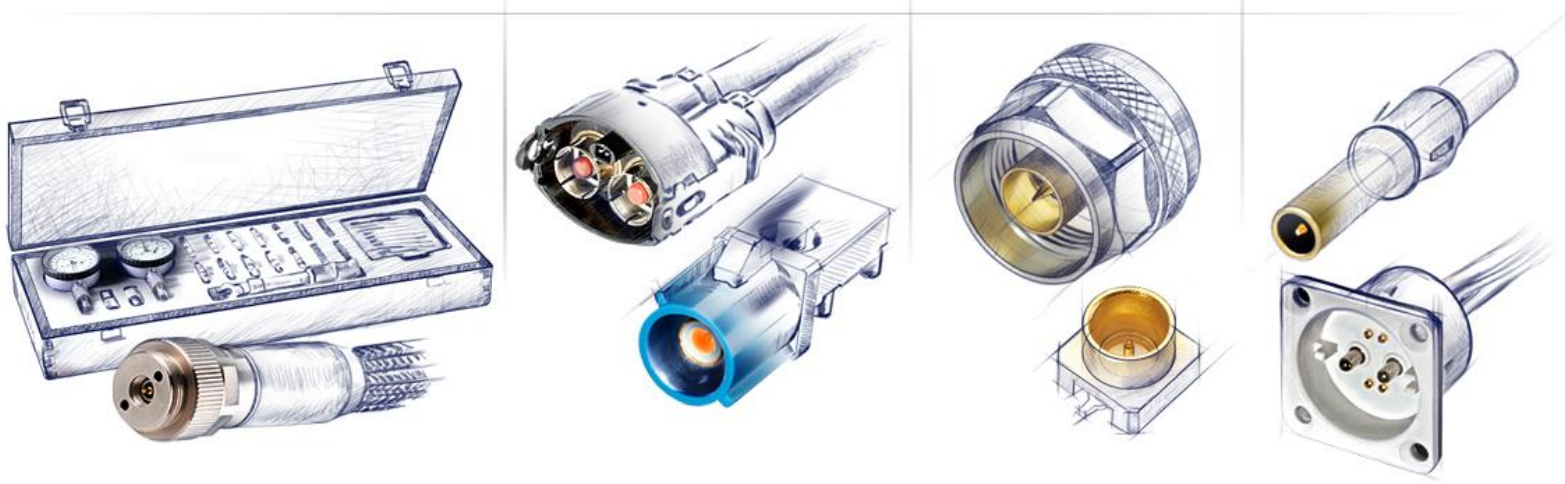
Rosenberger

ANSYS Santa Clara Convergence Conference 2013

Frank Schonig, Sandeep Sankararaman, Steve Fahrner, Jim Jaquette



Monolithic Compliant Interconnect

Rosenberger

Outline

- Brief introduction to Rosenberger
- Brief introduction to the “LIGA” process
- Examples of parts produced with the “LIGA process”
- Mechanical Simulation Approach
- Electrical-Mechanical Bridge
- A little on HFSS
- Iterative Design
- Team Introduction
- Appendix (time allowing)

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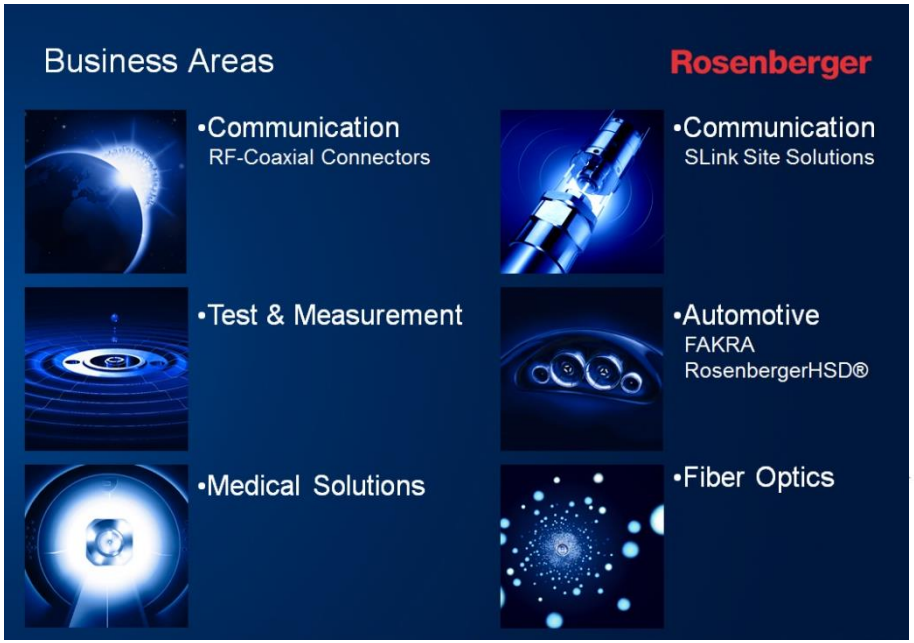
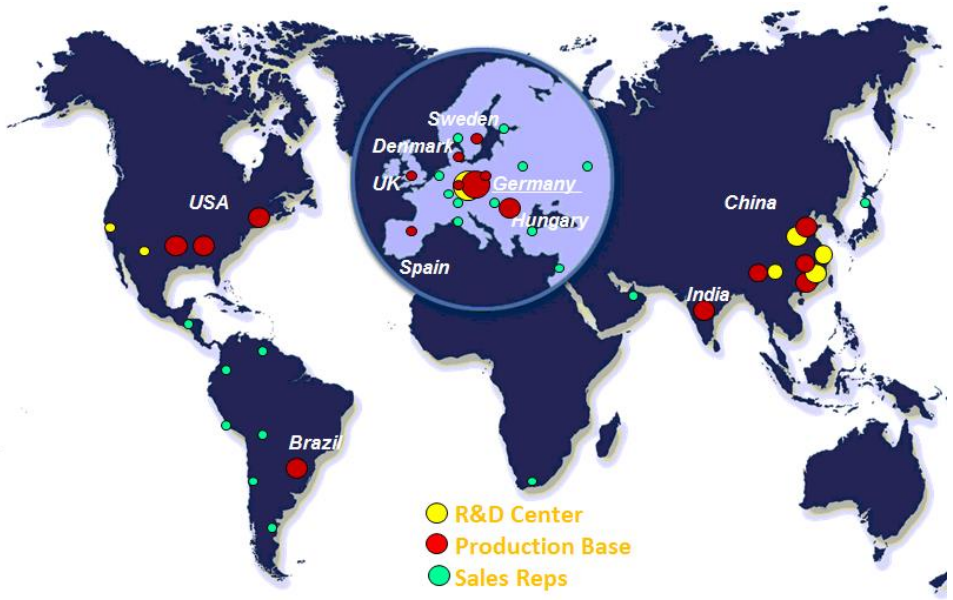
Rosenberger Hochfrequenztechnik
Rosenberger High Frequency Technology





12 Countries – A global engineering and manufacturing company

18 Production facilities WW

~4900 Employees WW

We are industry leaders in HF signal delivery

Most process lines vertically integrated

Well known, respected leader in innovation in all served market segments

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LIGA according to Wikipedia

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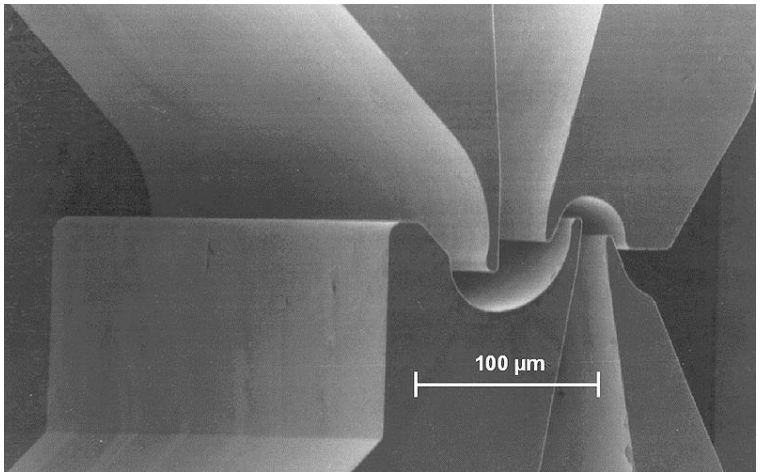
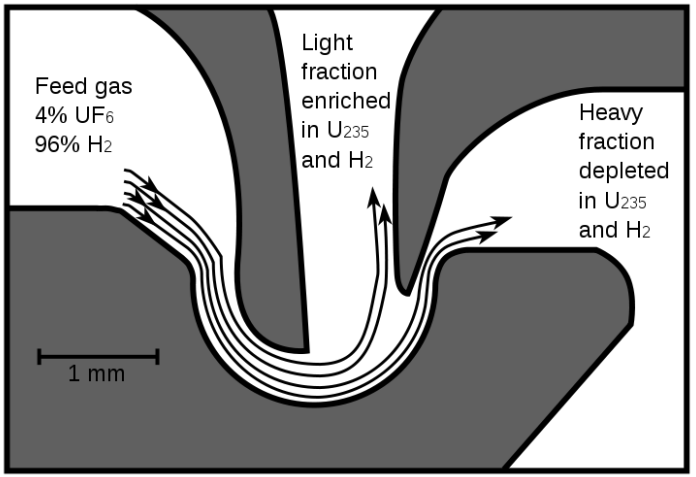
LIGA is a German acronym for: Li*thographie, G*alvanoformung, A*bformung*

(Lithography, Electroplating, and Molding) a fabrication technology used to create high-aspect-ratio microstructures.

- X-Ray LIGA is a fabrication process in micro-technology that was developed in the early 1980s.
- X-Ray LIGA requires exposure to parallel beams of high-energy synchrotron radiation (X-rays)
- UV LIGA utilizes an inexpensive ultraviolet light source
- UV LIGA is much cheaper and more accessible than its X-ray counterpart.
- UV LIGA is not as effective at producing precision molds as its X-ray counterpart.
- UV LIGA is used when cost must be kept low and very high aspect ratios are not required.

The X-ray LIGA process was originally developed at the Forschungszentrum Karlsruhe, Germany, to produce nozzles for uranium enrichment. http://en.wikipedia.org/wiki/LIGA





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Example of released wafer (6”)

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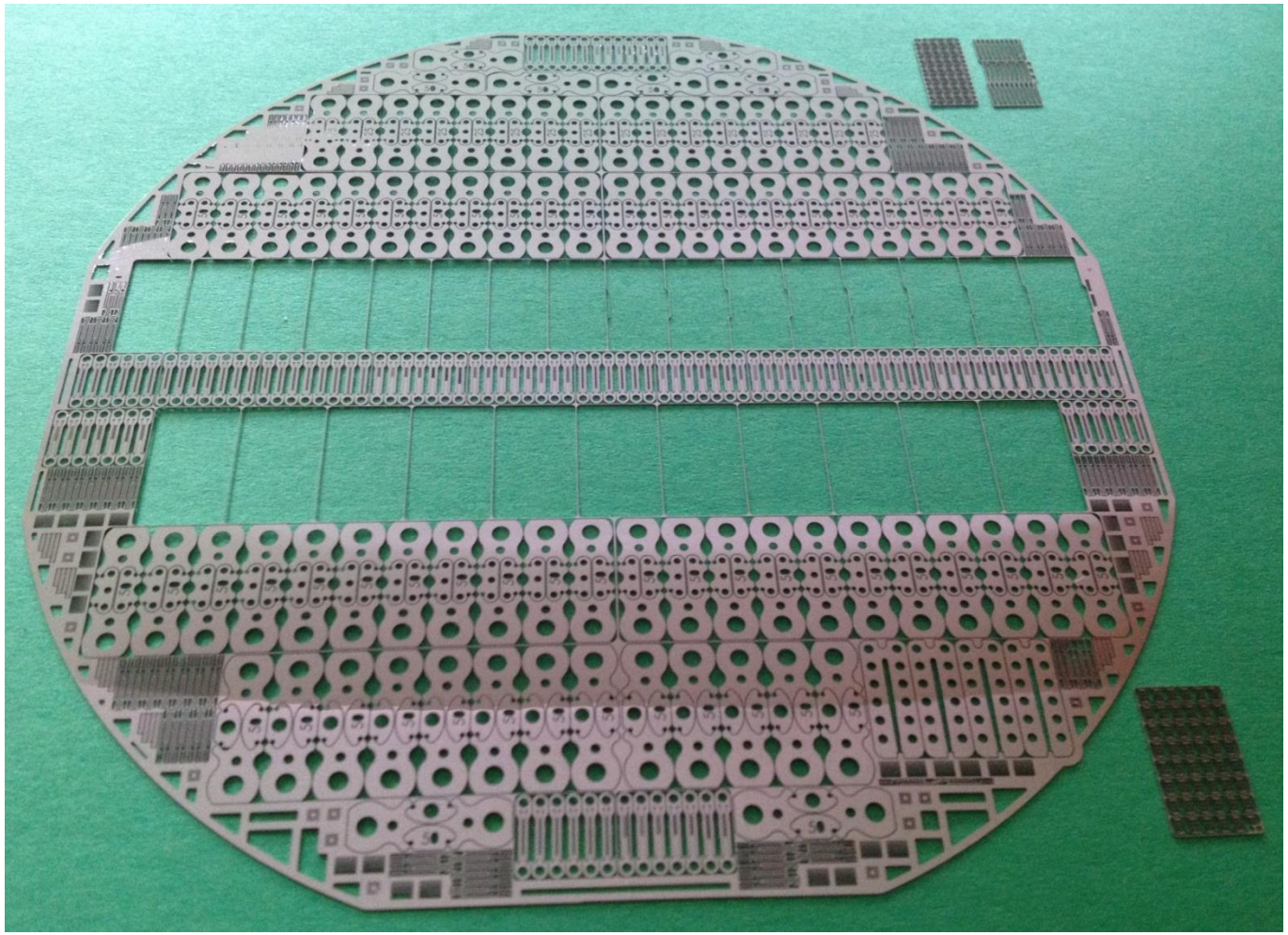

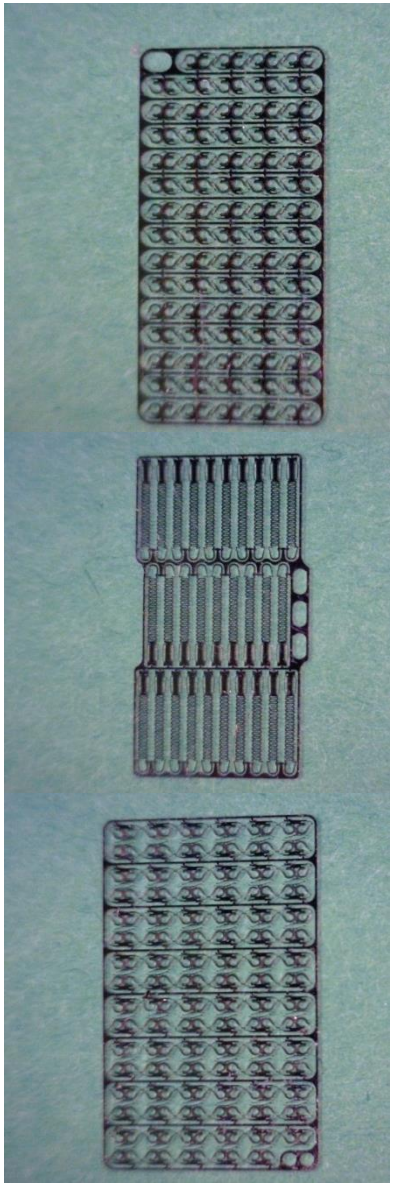

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MCI Products in Development

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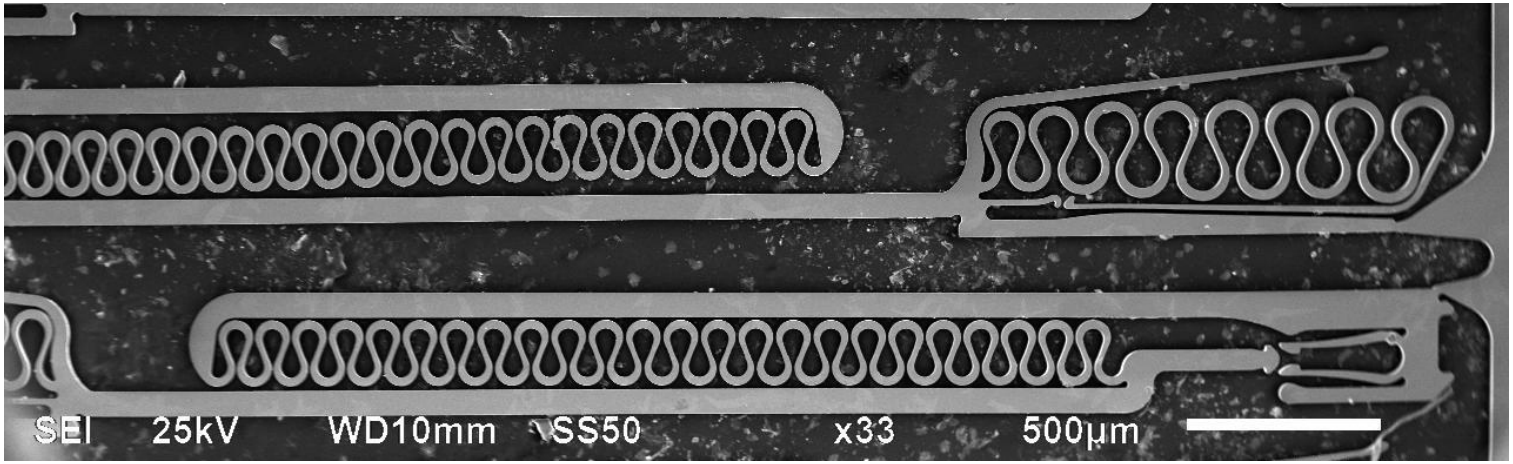

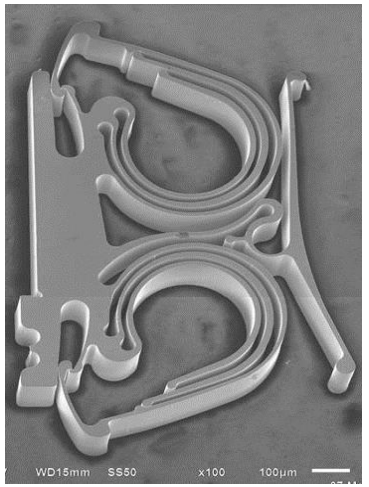

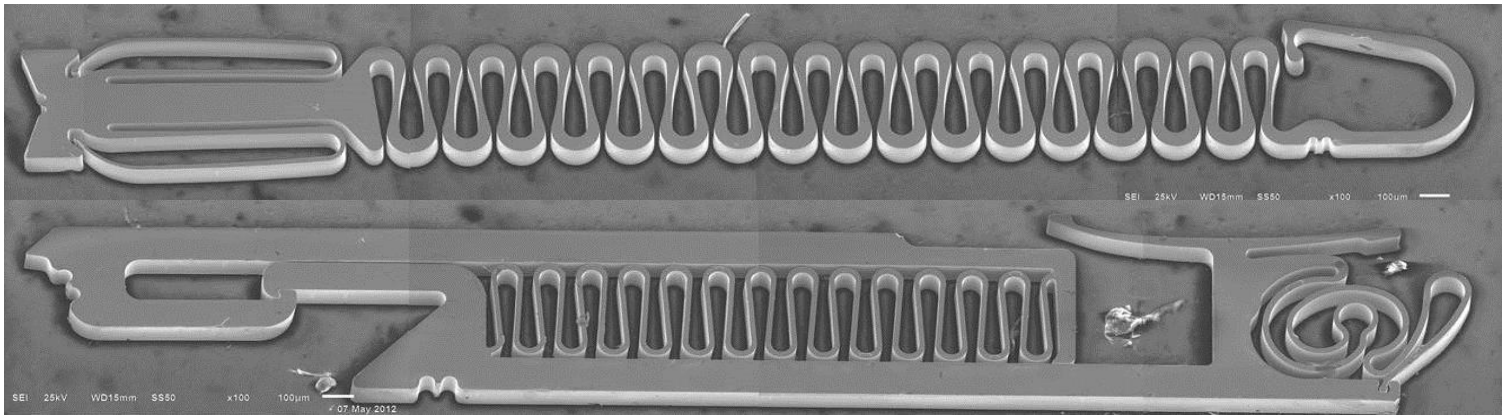

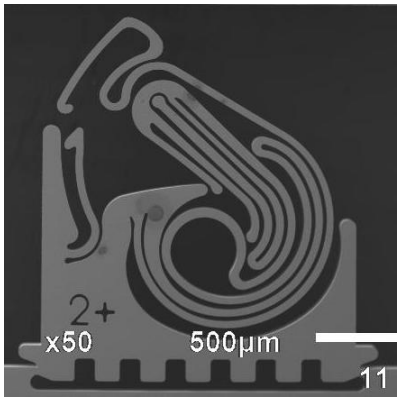

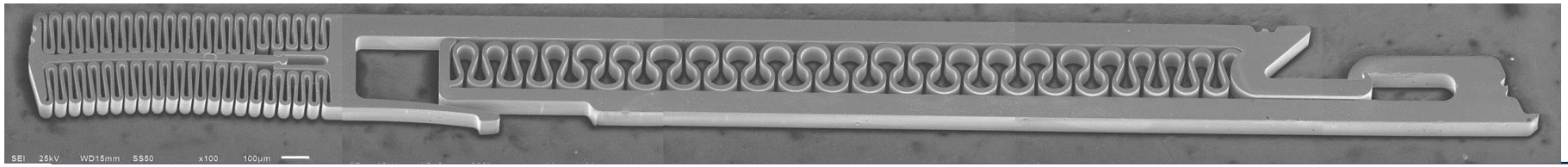

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General idea of scale

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.02 € Ø 18.75
.01 $ Ø 19.06
Globe Ø 7.6

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General idea of Aspect Ratio

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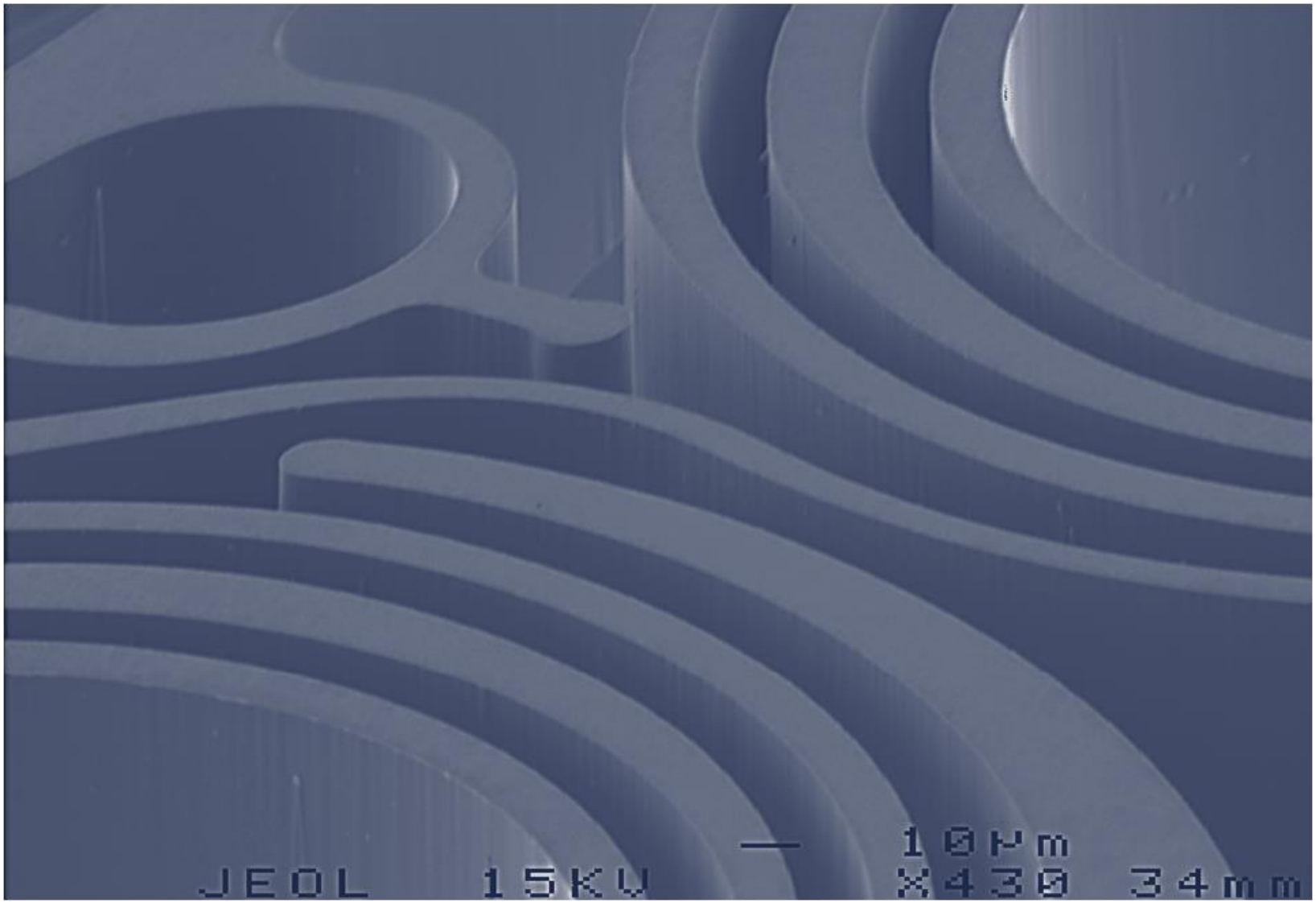

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LP6 – WLCSP Spring Pin Alternative

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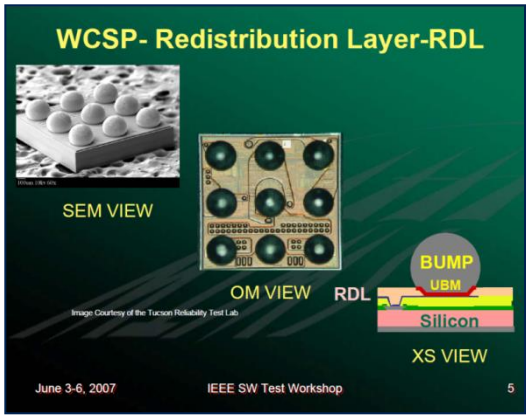
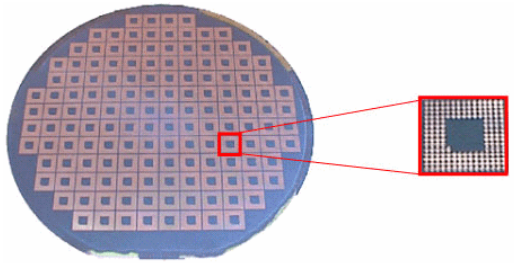
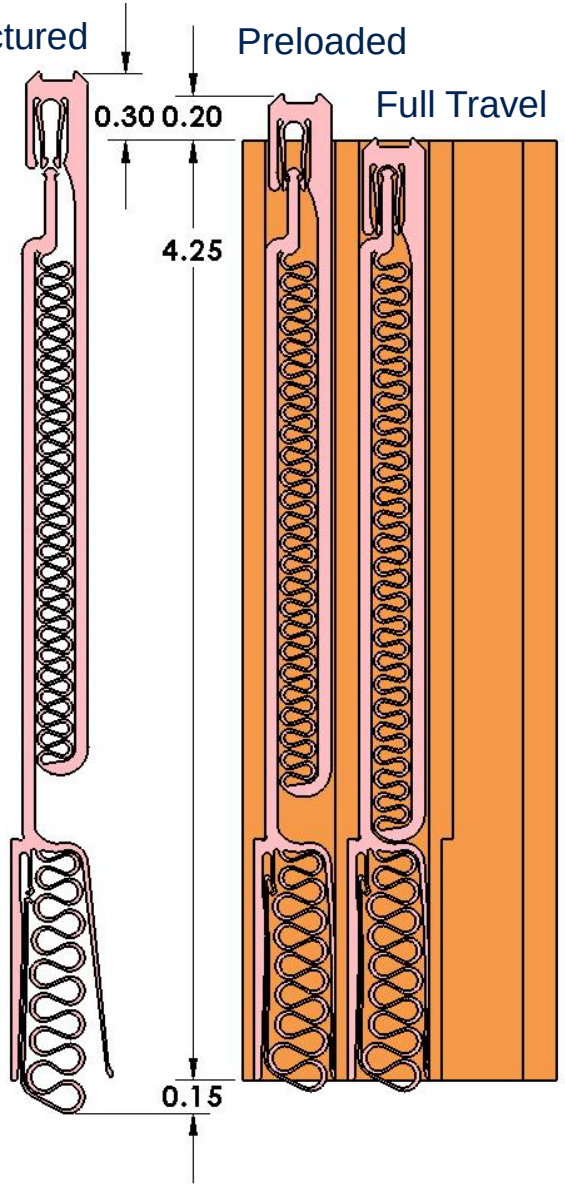
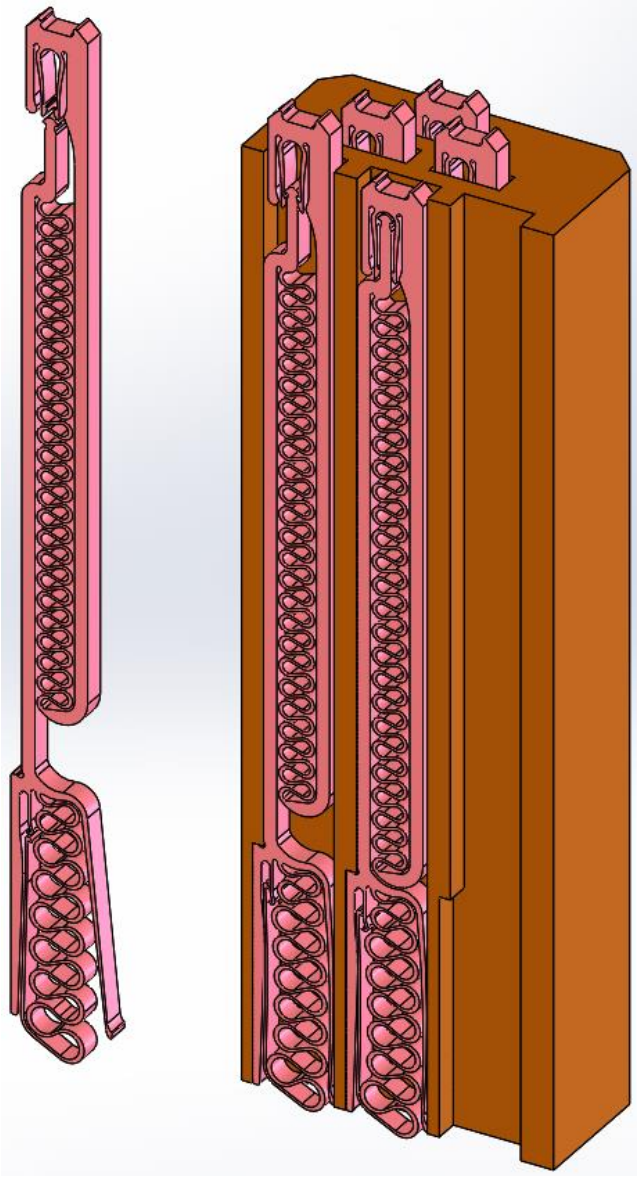
- 0.3 mm pitch array
- 4.2 mm compressed height
- 0.2 mm travel DUT side
- ~9 gf DUT side
- 0.15 mm travel PCB side









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The Analyses Process

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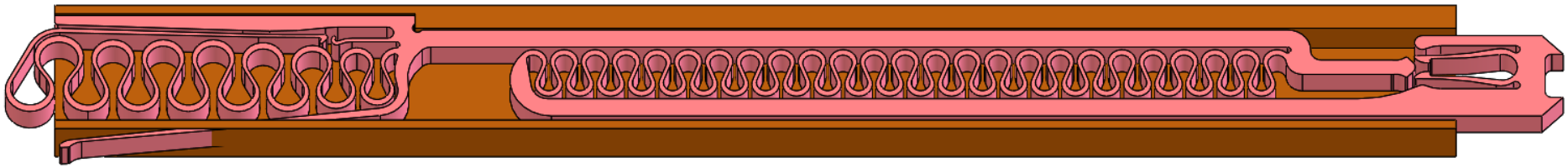

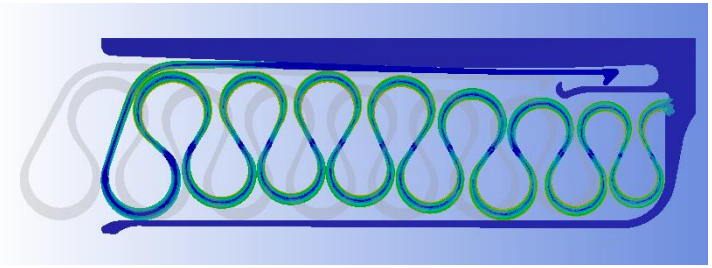

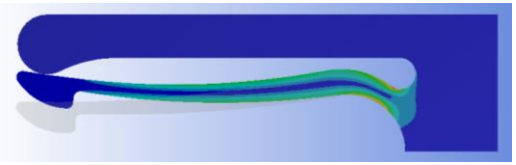

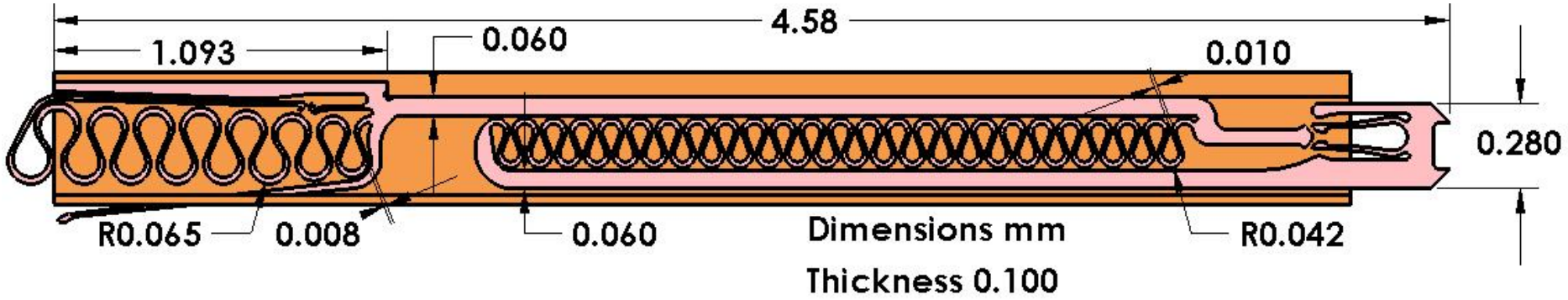

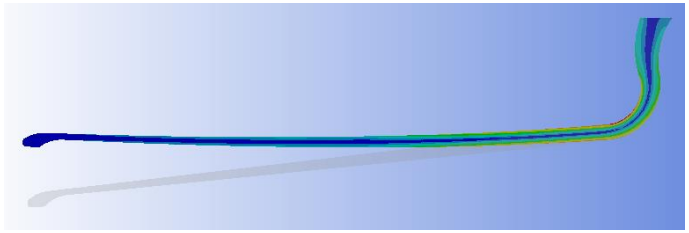

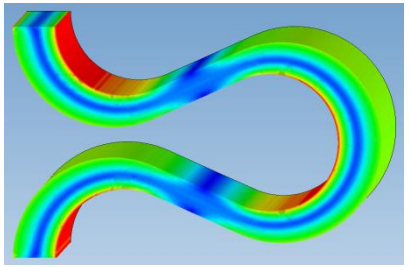

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WLCSP-CSP Interconnects (0.4 mm Shown)

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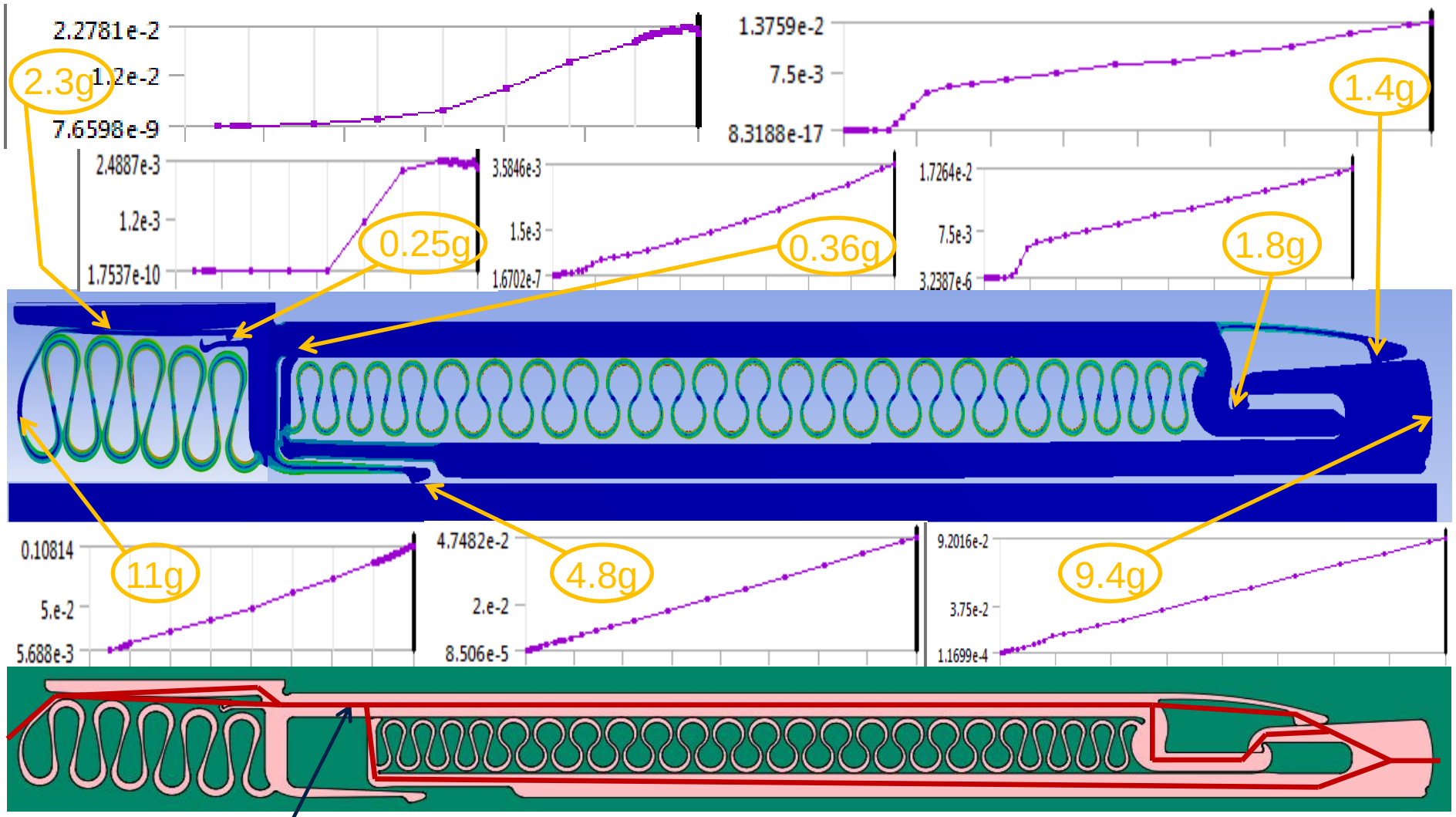

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Electrical-Mechanical Bridge (deformed shape conversion)

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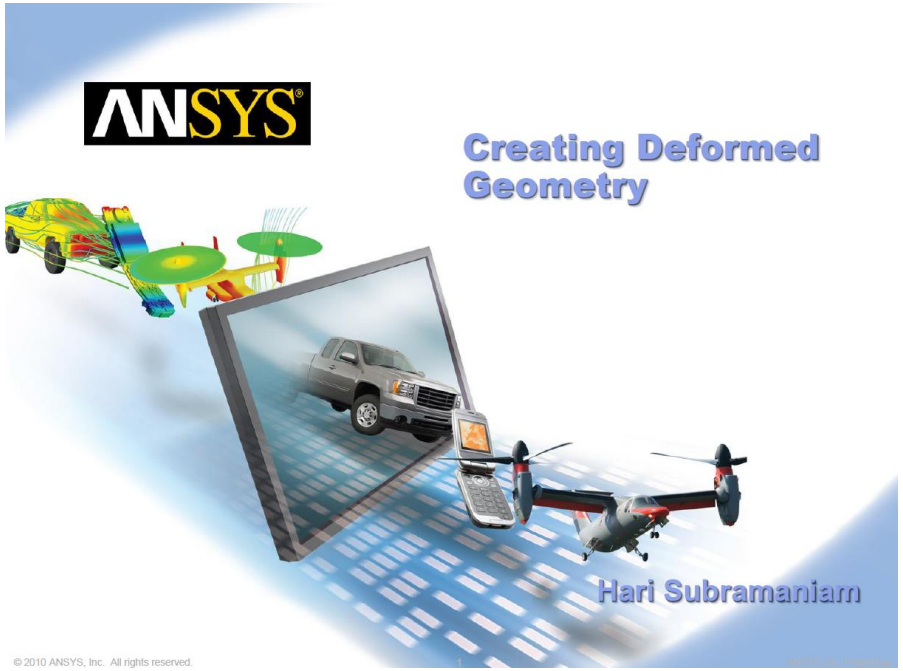

Two Deformed Geometry Options

(not to imply there are not more)

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Electrical-Mechanical Bridge (deformed shape conversion)

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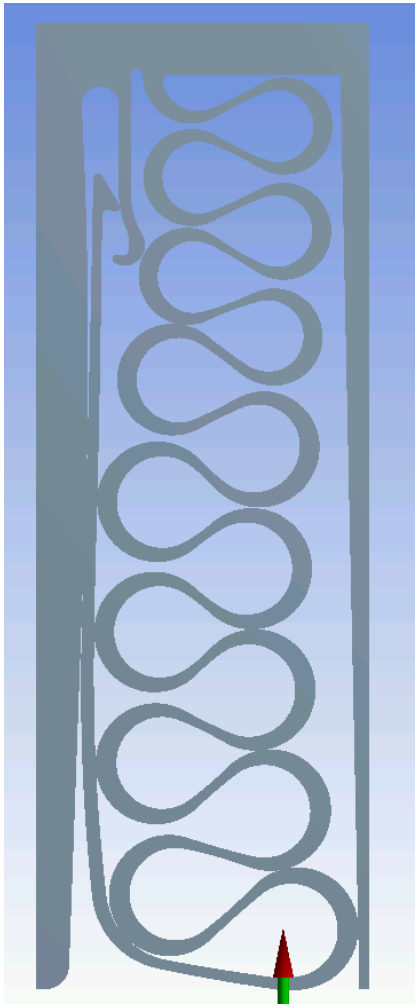
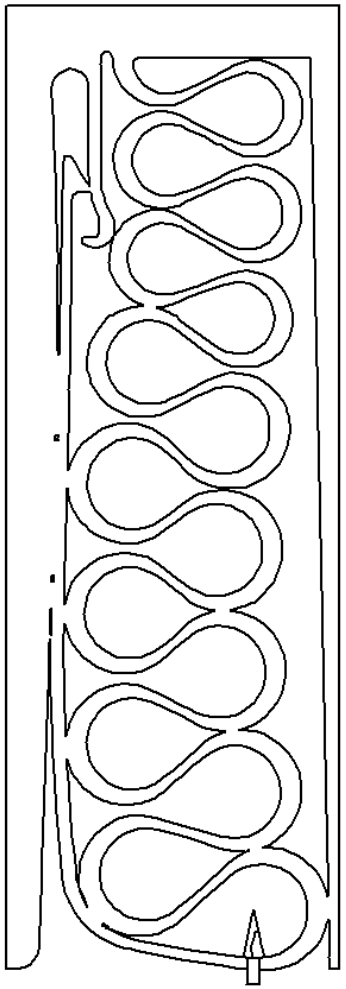
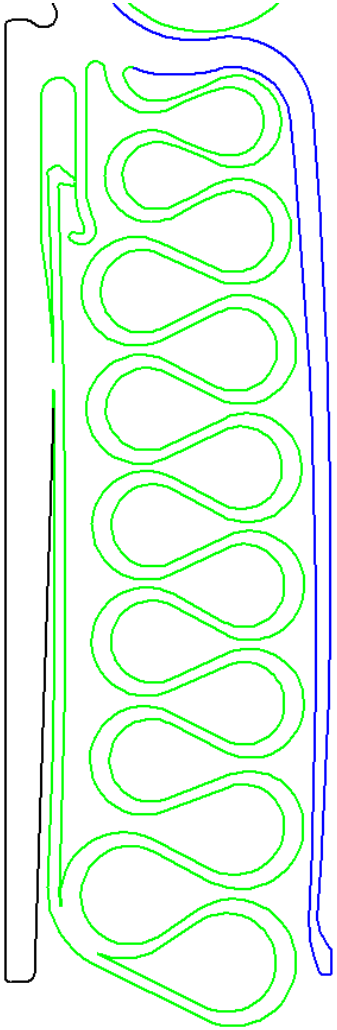
Ansys Screen shot compressed



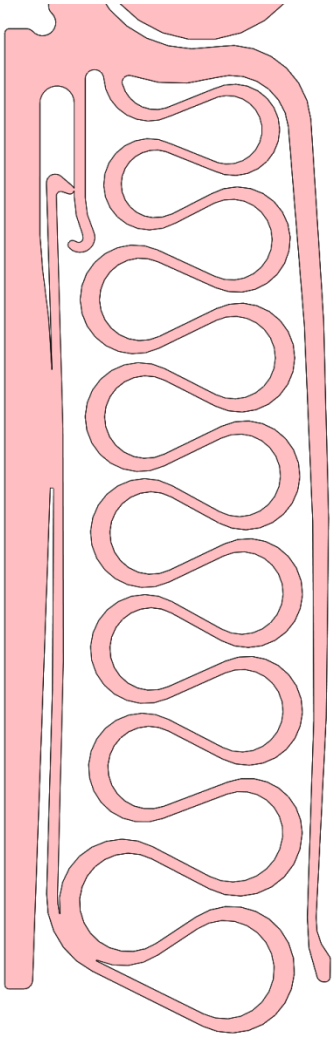
.dxf Output from Vector Magic



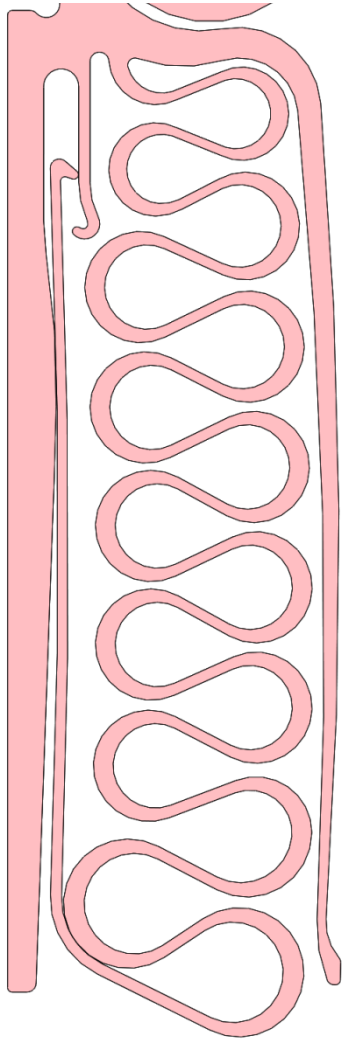
Rebuild model in 2D (.dwg)



HFSS model file compressed



Cartoon model compressed



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Electrical-Mechanical Bridge (deformed shape conversion)

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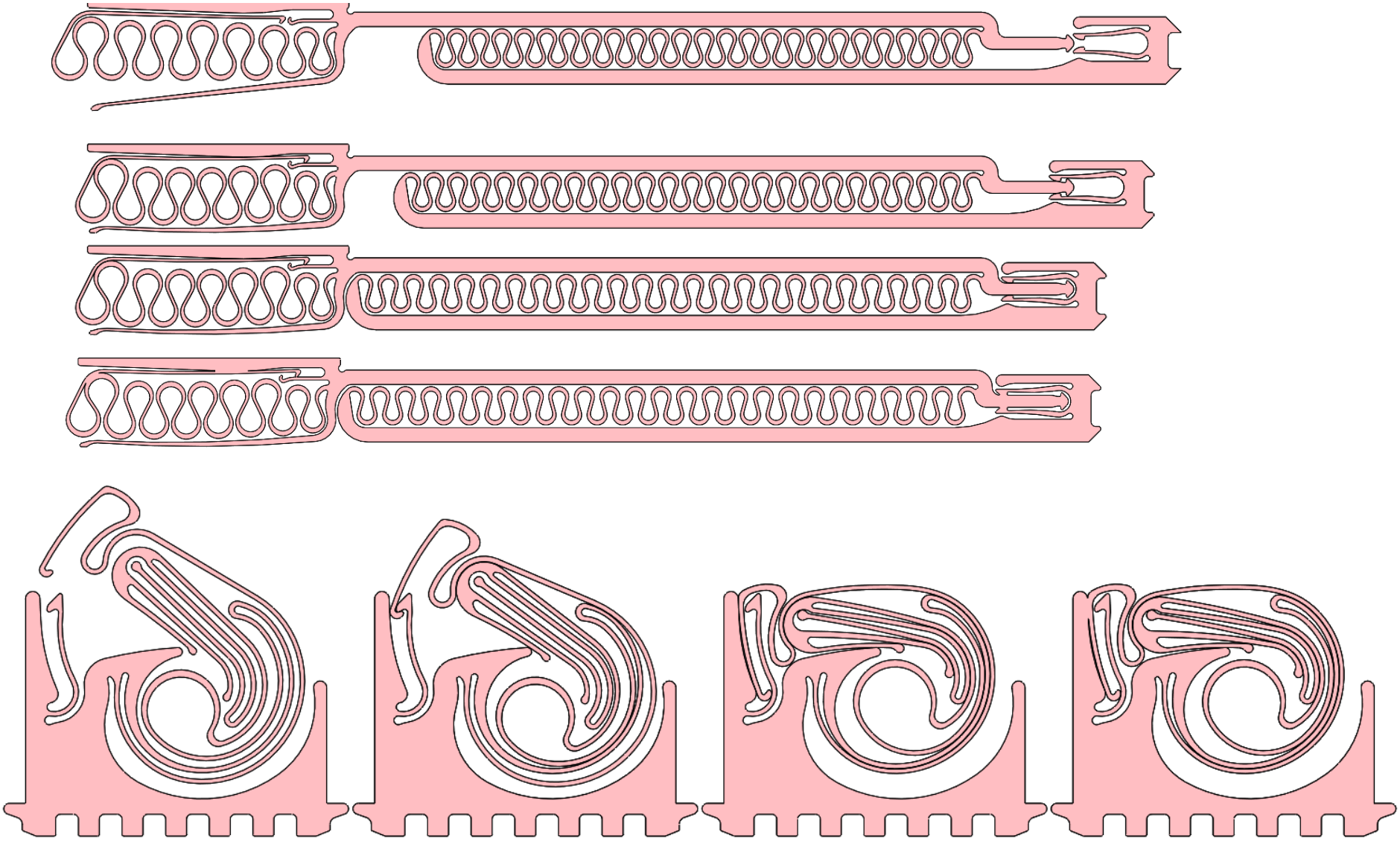

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LP3 0.8 Pitch Array Interposer

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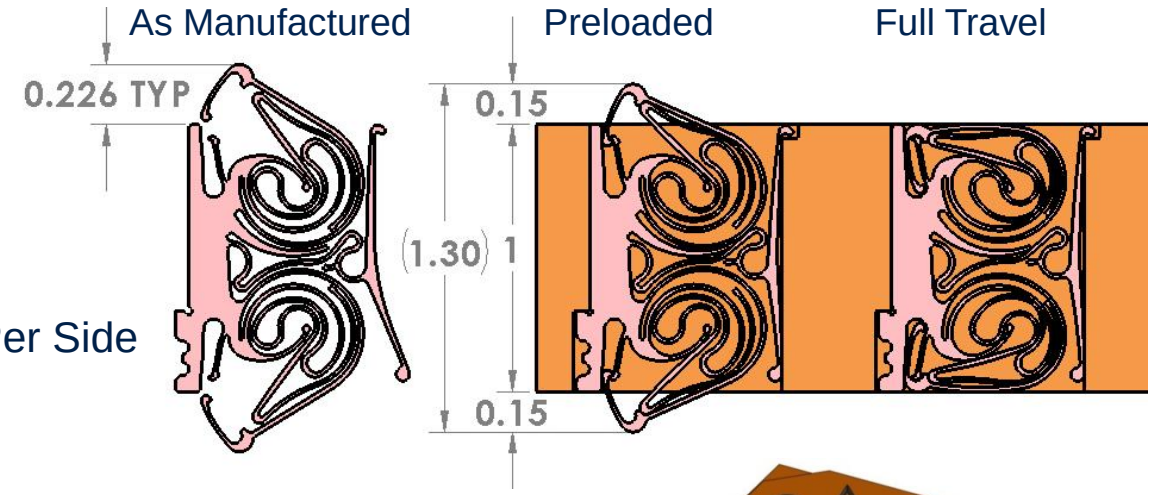
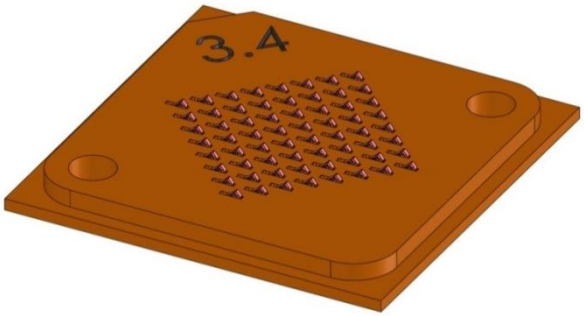
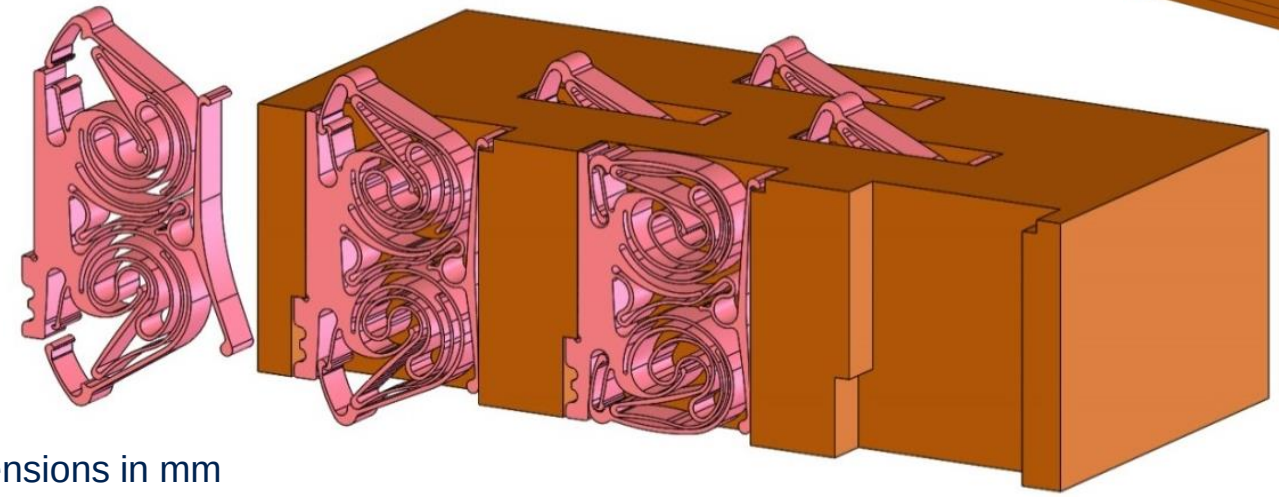
- 0.076mm Preload Per Side
- 0.15mm Usable Travel Per Side
- 0.30mm Total Usable Travel
- 0.150mm Thickness
- 0.065mm Contact to DUT Scrub Per Side
- 1.0mm Fully compressed Height
- Total Travel is ~31% of Height
- Force target per side ~8gf







Dimensions in mm

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LP7 – SMT Interposer (Socketed ASIC)

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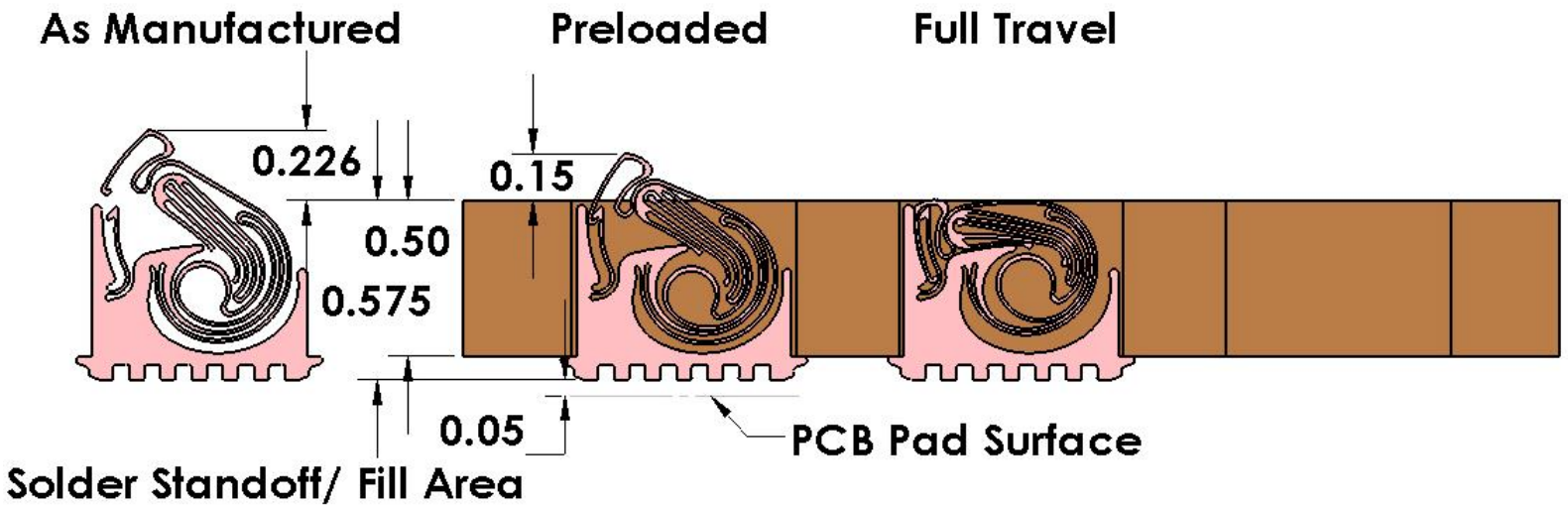

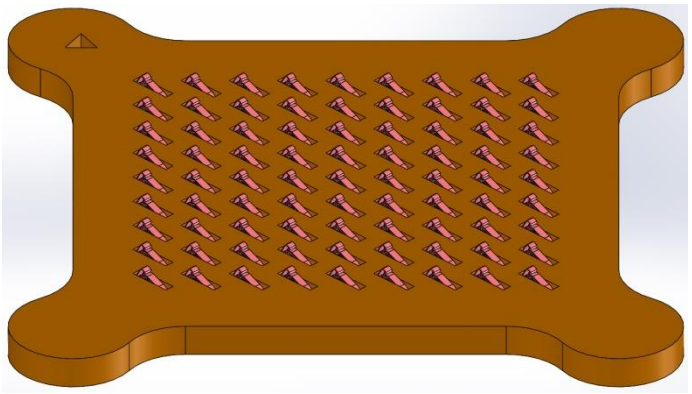

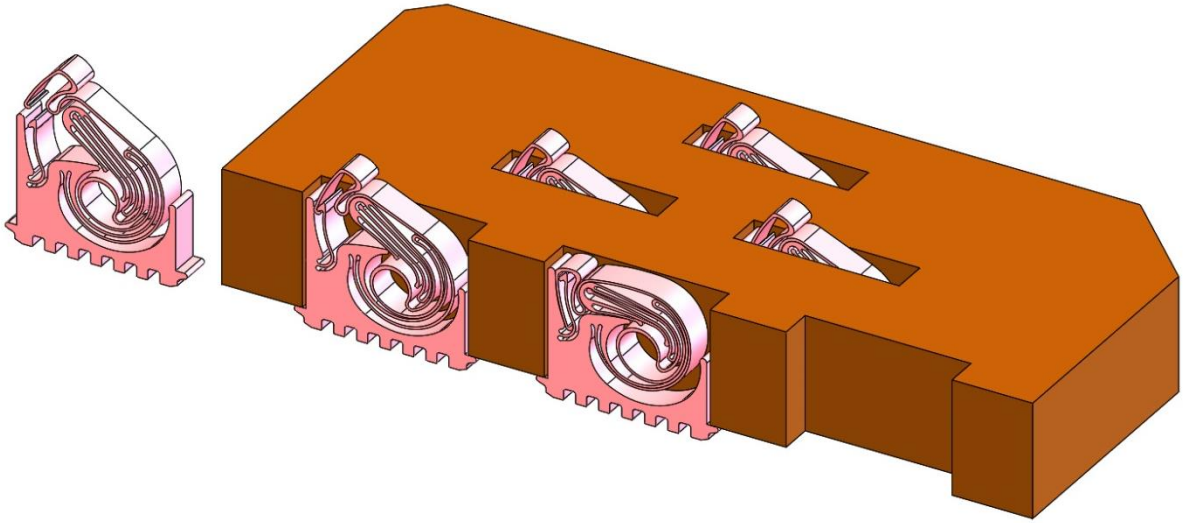

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LP7 SMT Experiments

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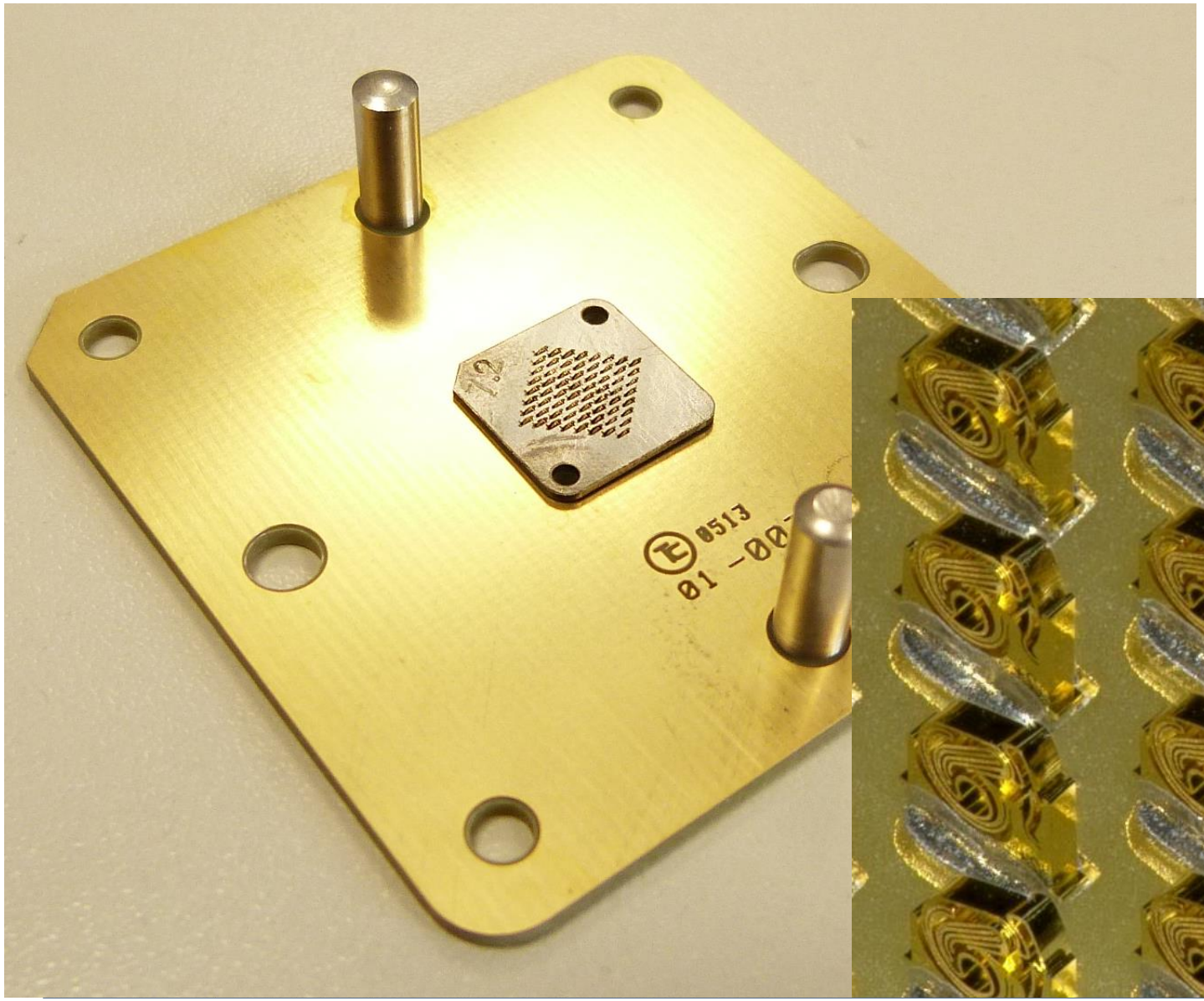
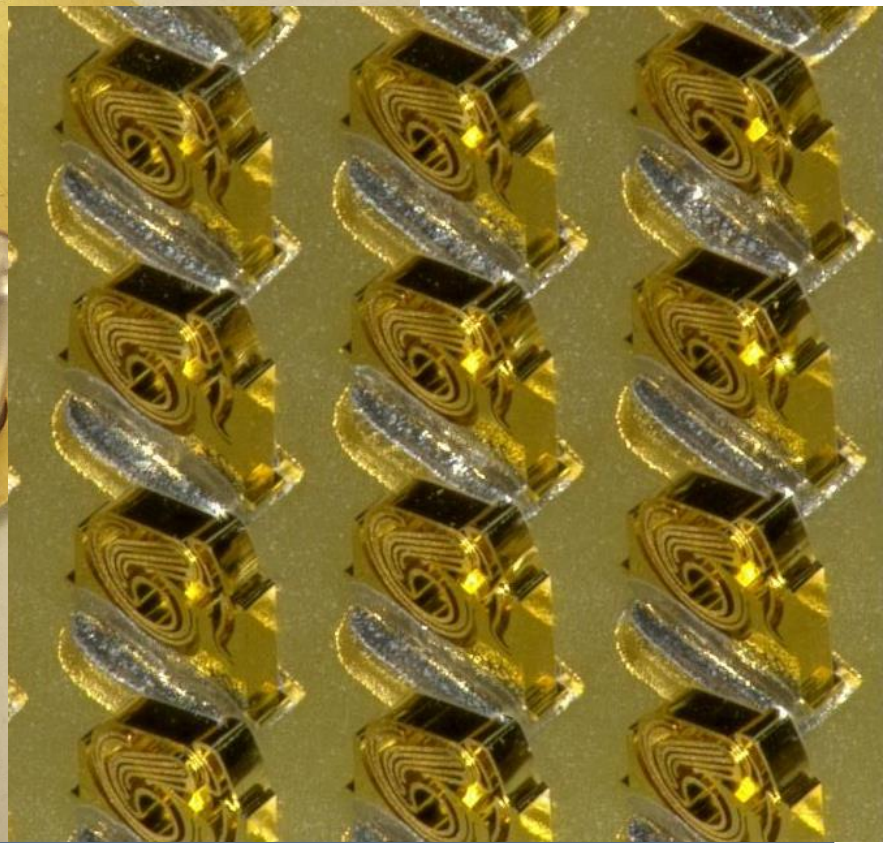


50mm x 50mm PCB

8x8 pin array @
0.7424mm pitch



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Simulation vs. Measurement

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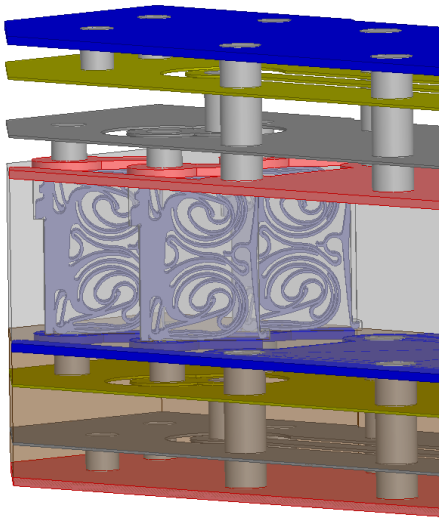

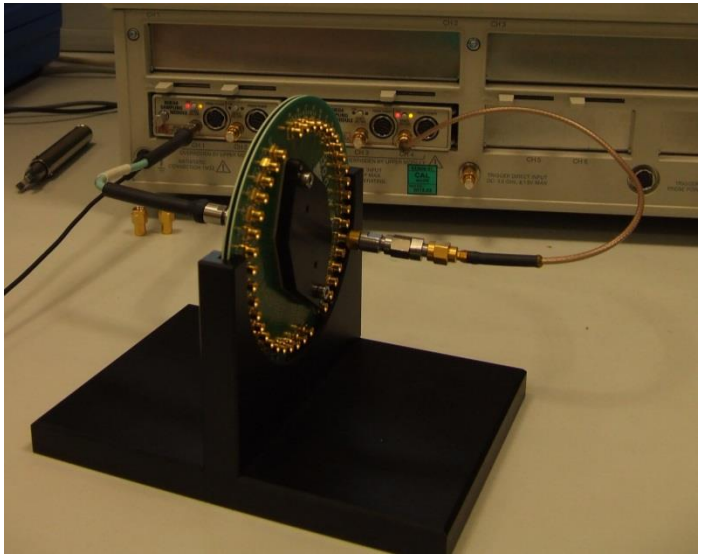

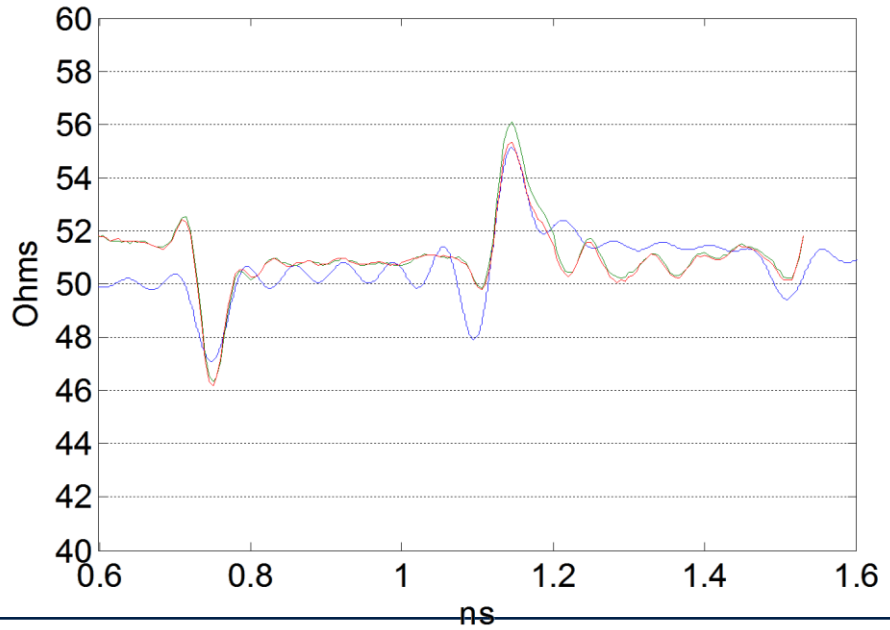

HFSS

Insufficient Compression (Measured)

Designed Compression (Measured)

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0.8mm Array HFFS Model

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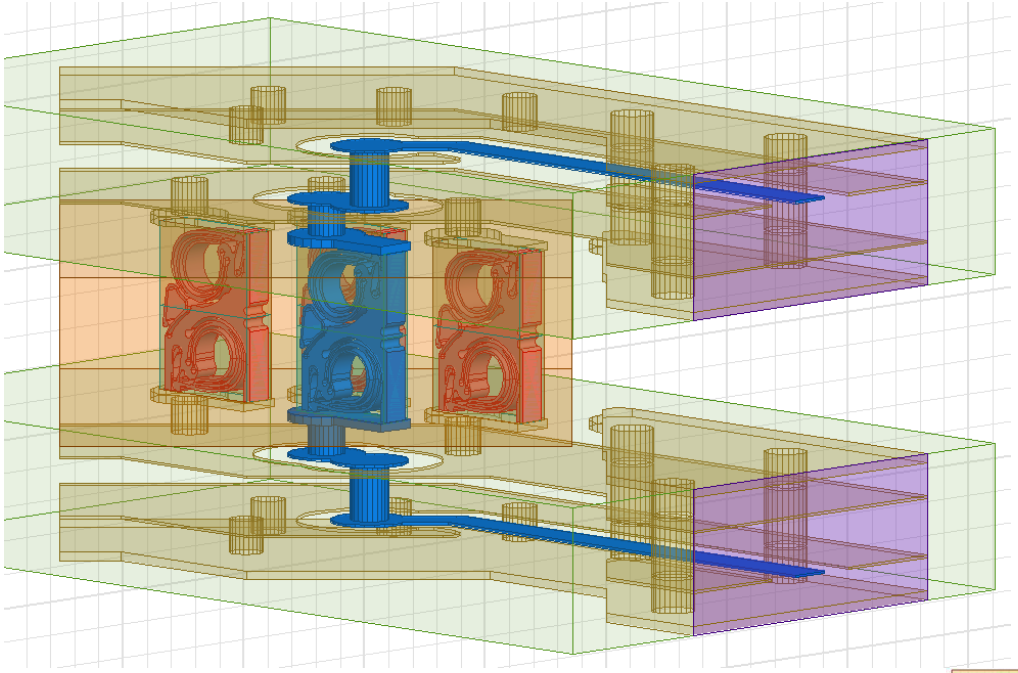

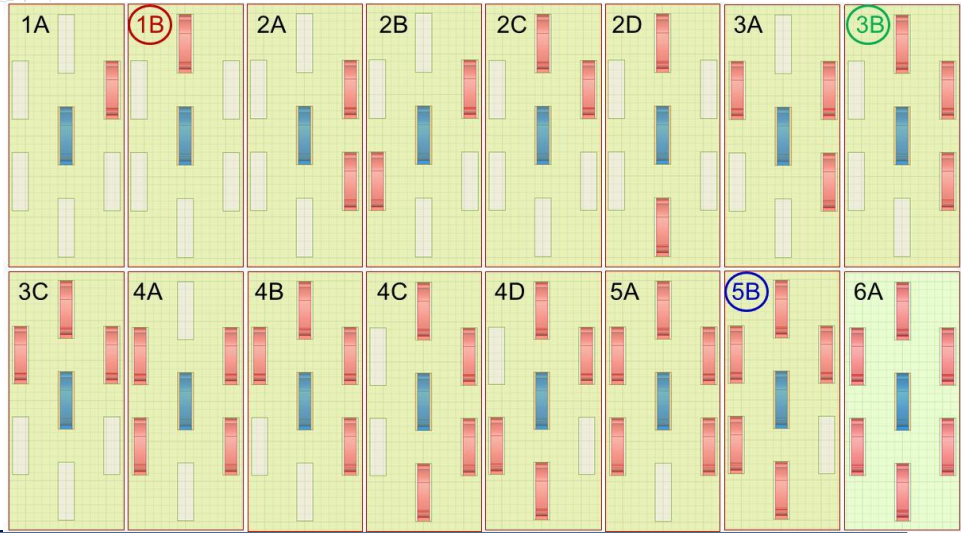

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LP3 Measurements & Analysis

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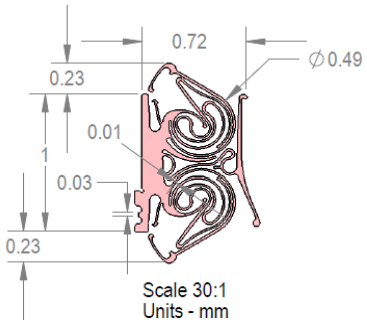
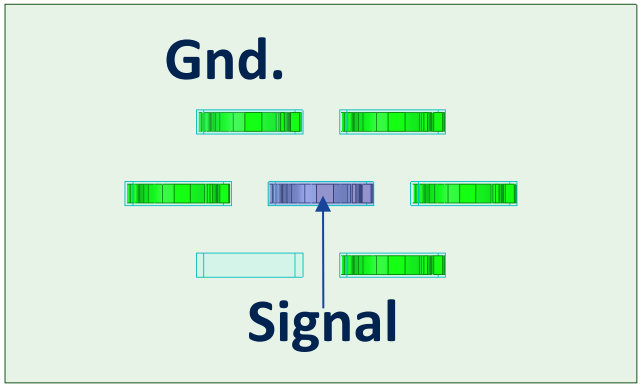
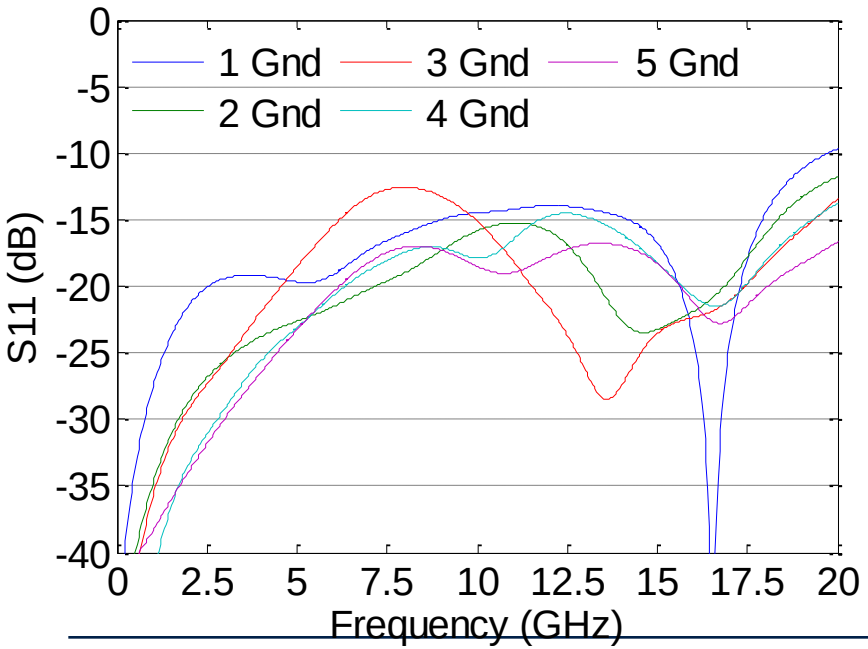
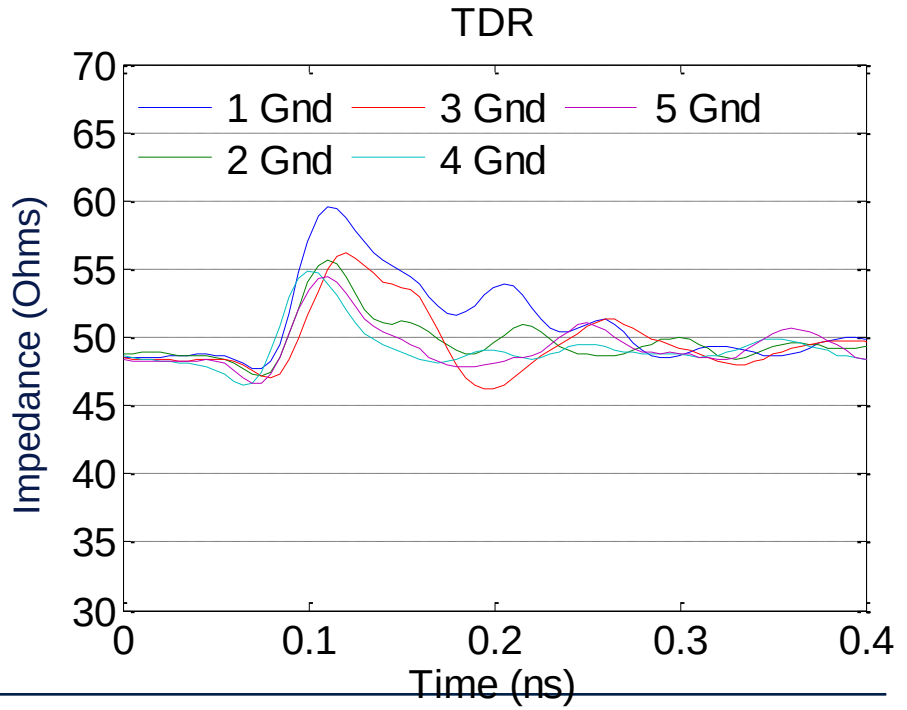
Pin configuration (Top view)





Config. (no. of returns)	Test fixture only 20-80 Risetime (ps)	Test fixture + MCI 20-80 Risetime (ps)	Equivalent BW (GHz)
1 GND	35.5	57.7	7.7
2 GND	35.1	56.3	8.0
3 GND	36.3	61.2	7.1
4 GND	36.8	52.6	9.3
5 GND	35.8	52.6	9.1





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The path from design optimization to design verification

Traditionally
Designers design
Analysis analyze

Some thoughts on a different approach using Ansys
(both in general and specifically)

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“Iterative Design”

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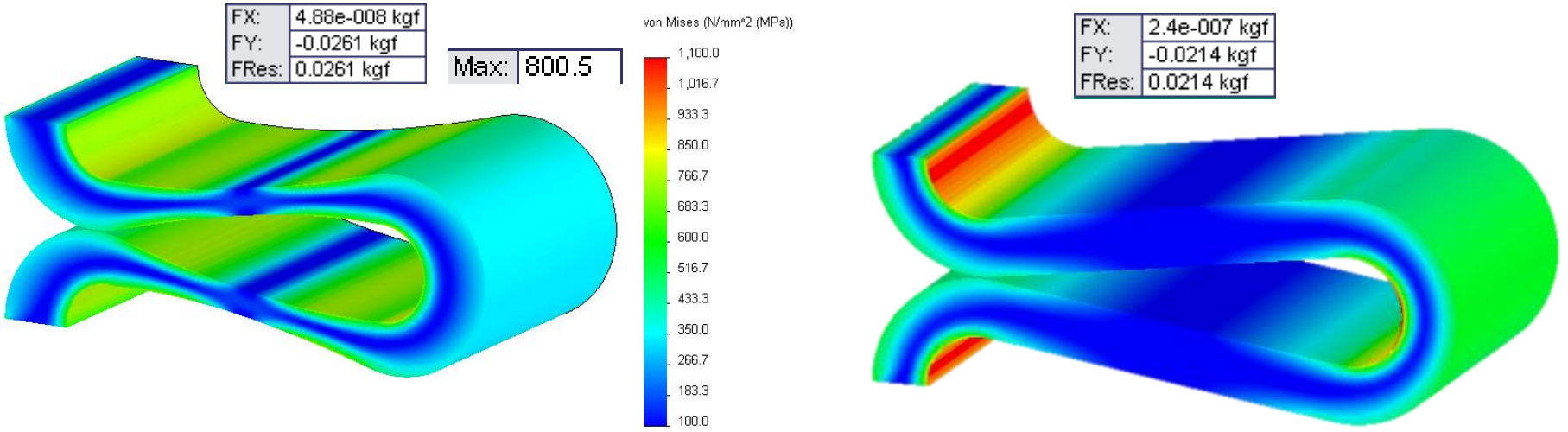
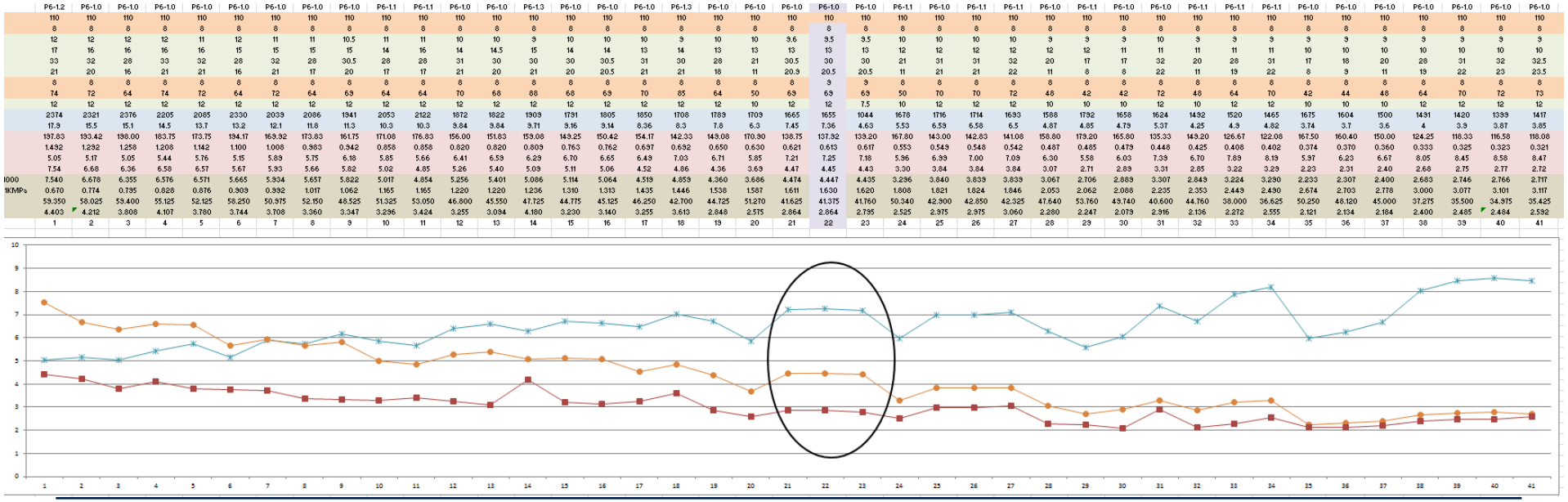


~23% less peak stress with ~22% more force The only change is the tapering



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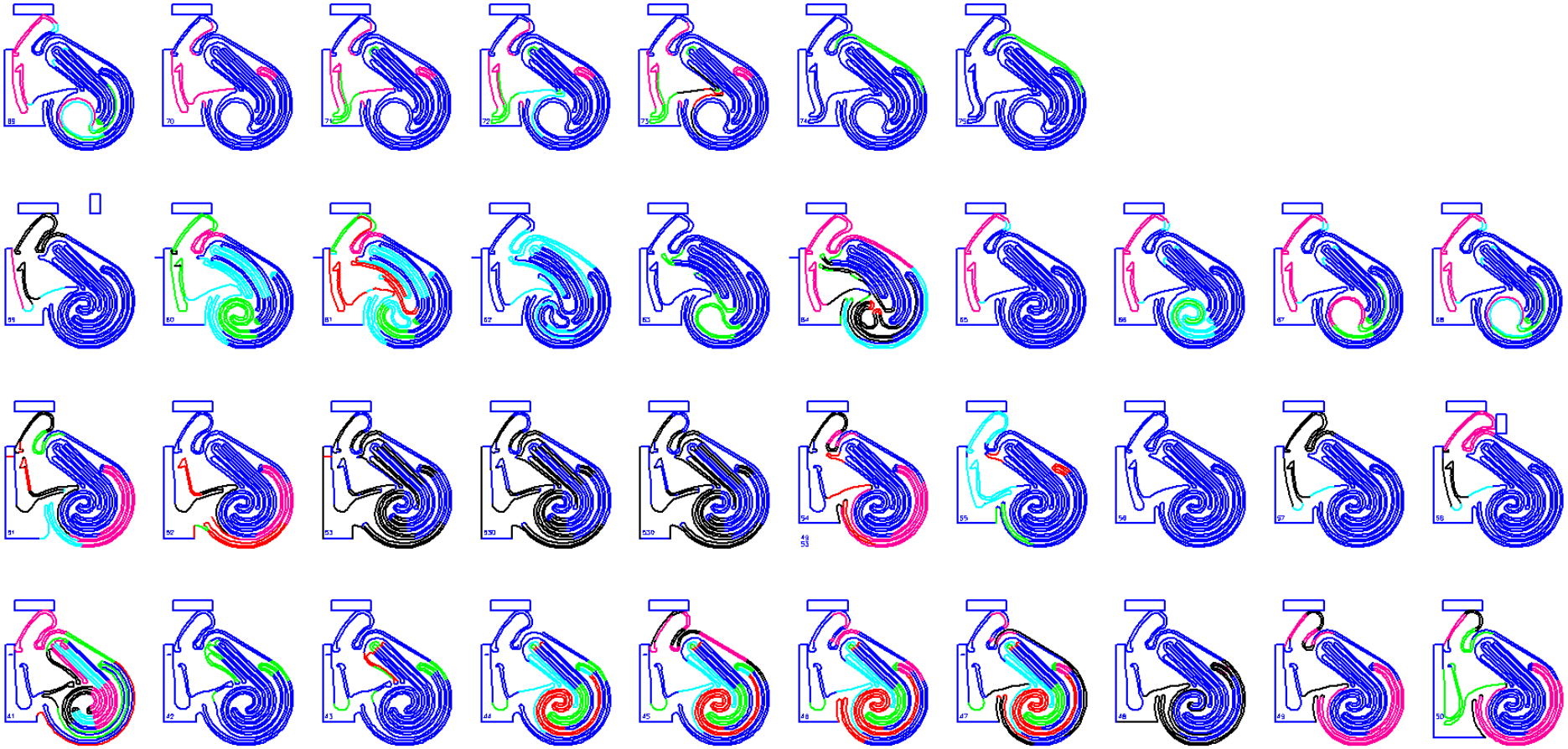

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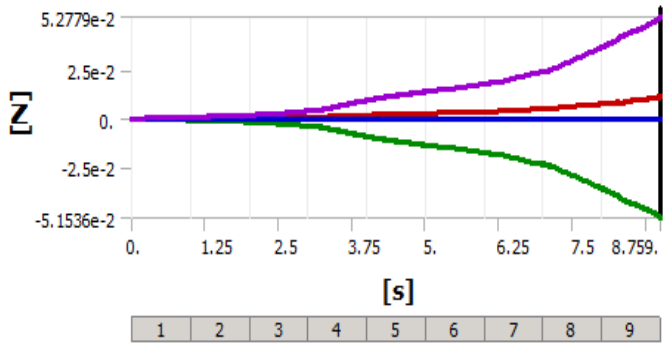

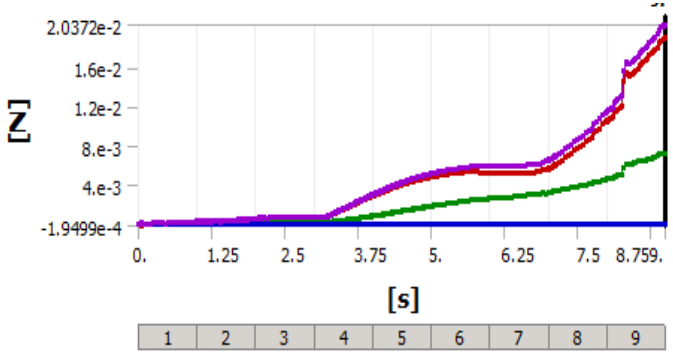

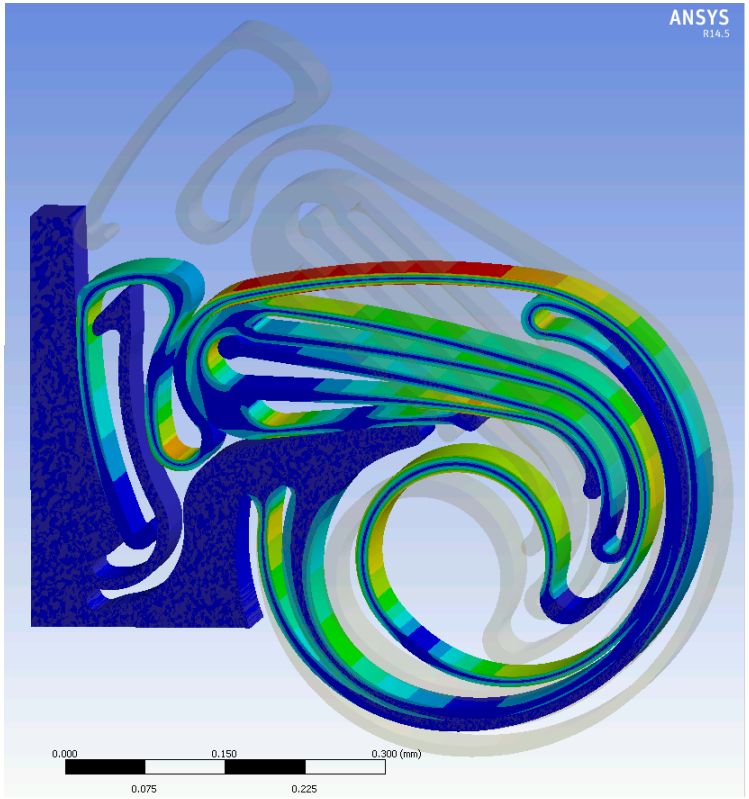

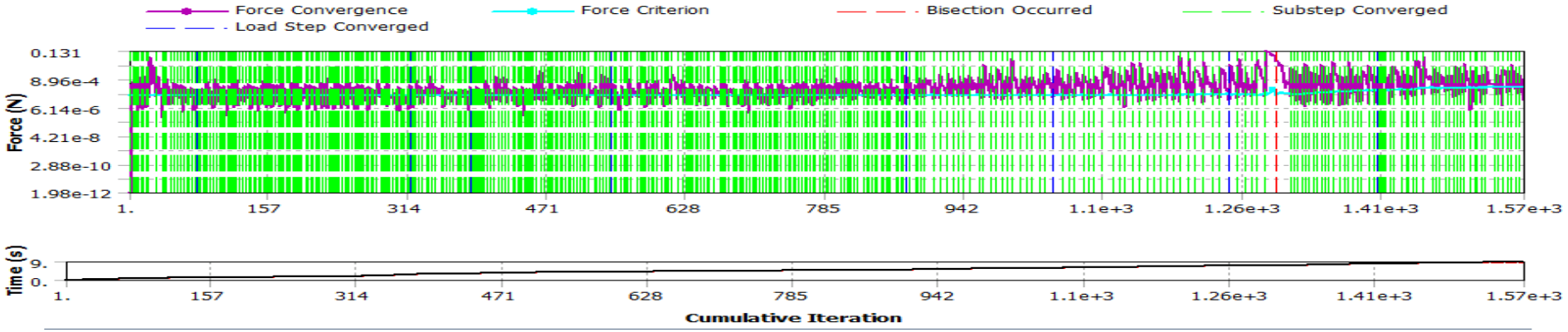

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Full Model Setup

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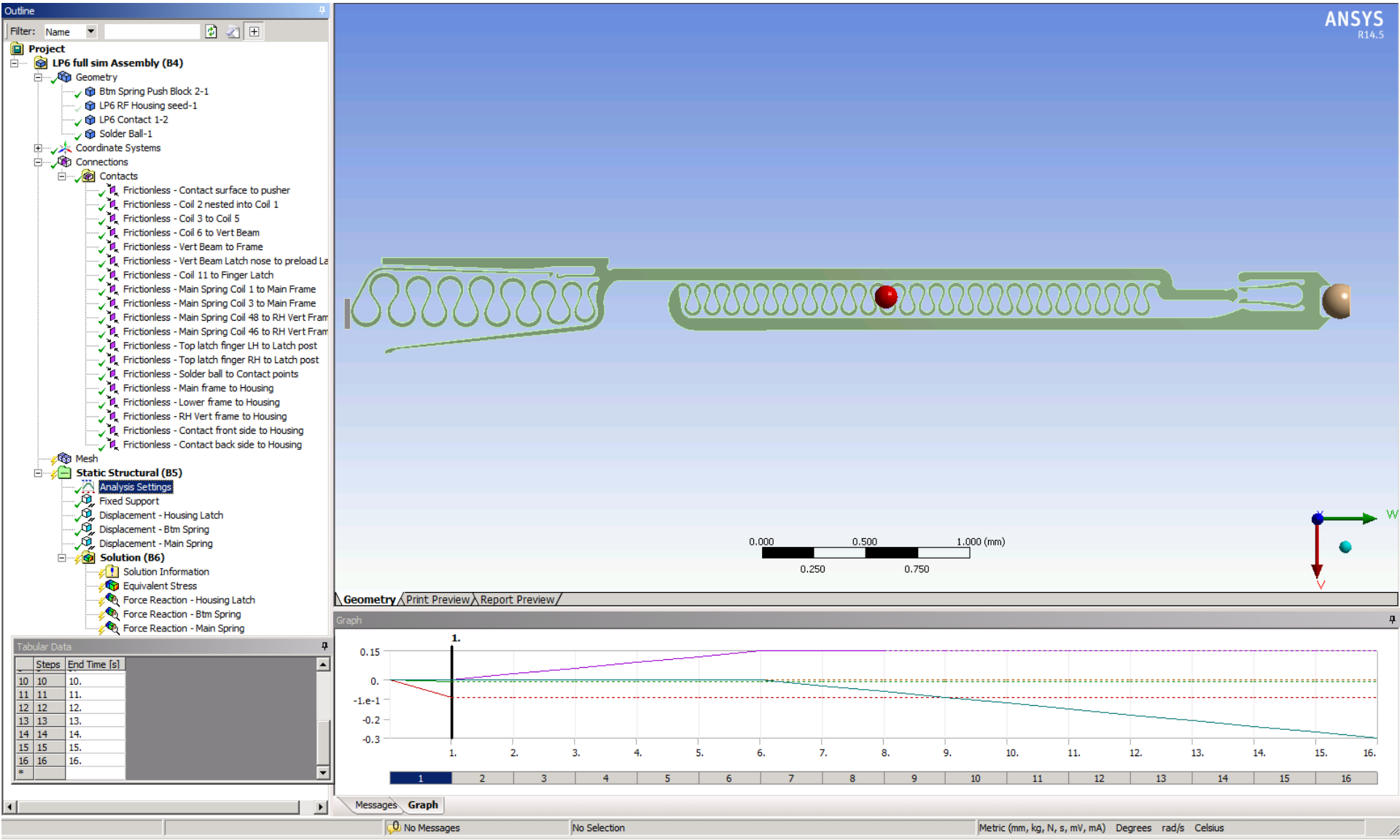

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Introductions

Rosenberger

Frank Schonig, R&D Advanced Technology Development (Mechanical)

Sandeep Sankararaman, R&D Advanced Technology Development, (EE)

Steve Fahrner, Perdix Engineering, Structural/Thermal Analyst (Analysis)

Jim Jaquette, R&D Advanced Technology Development (Program Management)

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Appendix

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Thank you for your time
Hopefully you found some value in this

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Material Properties - Expectations Vs. Reality

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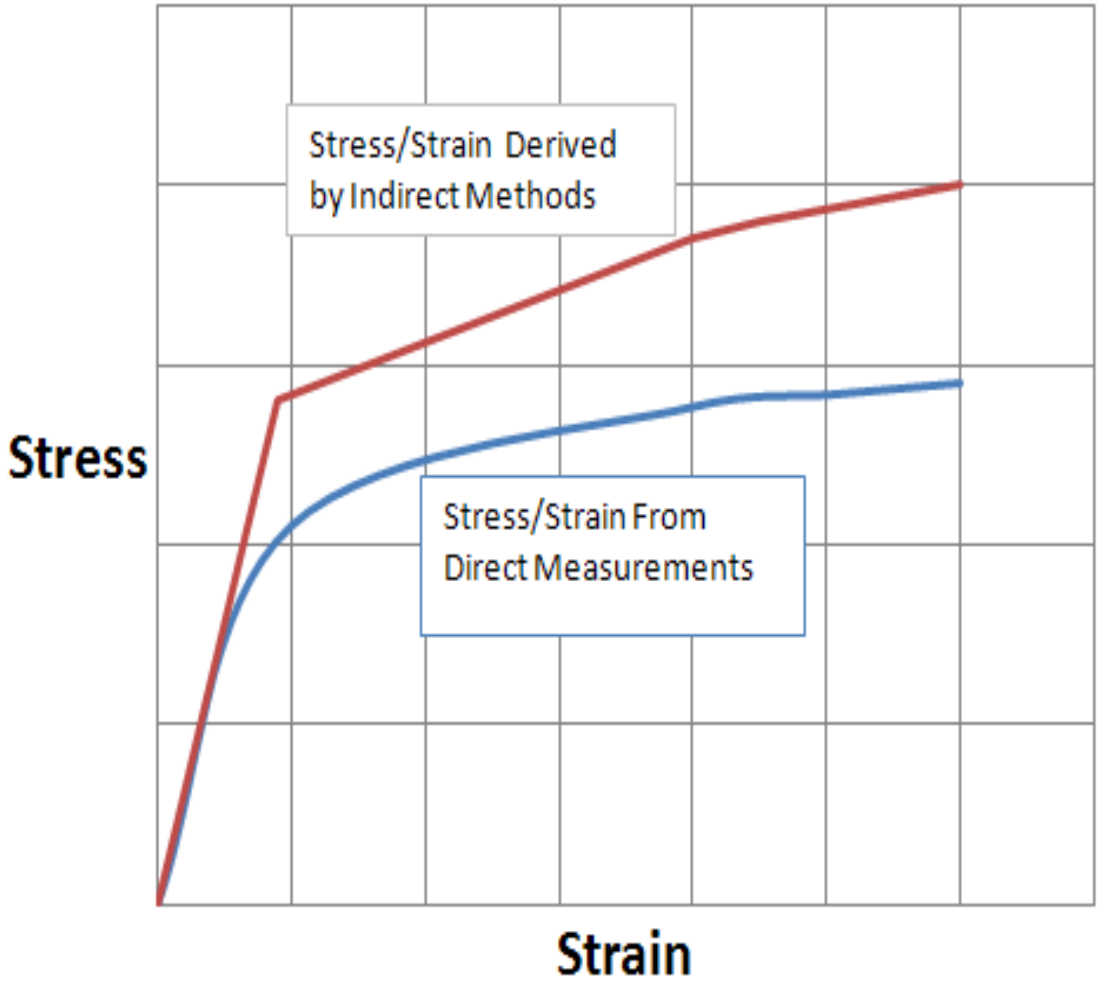
Common industry (LIGA) practice is for mechanical properties to be indirectly derived from failure data.

Current mechanical properties based on actual tests of micro samples.

Precise Yield stress is difficult to define.

There is no substitute for direct measurements…



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Material Properties - The Solution

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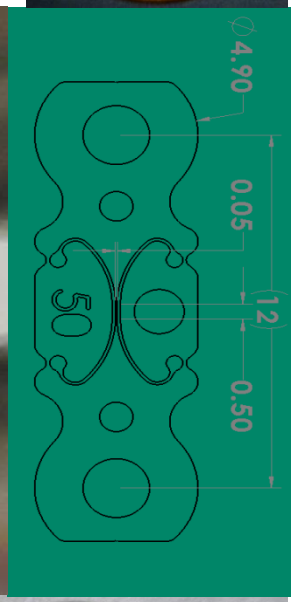

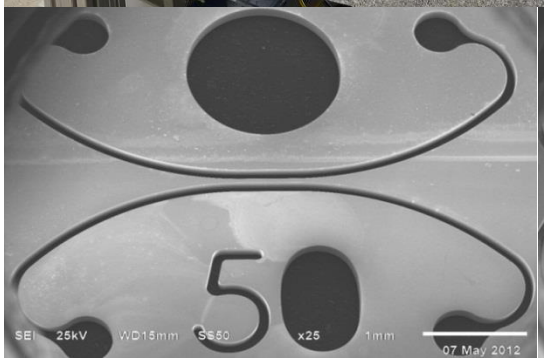

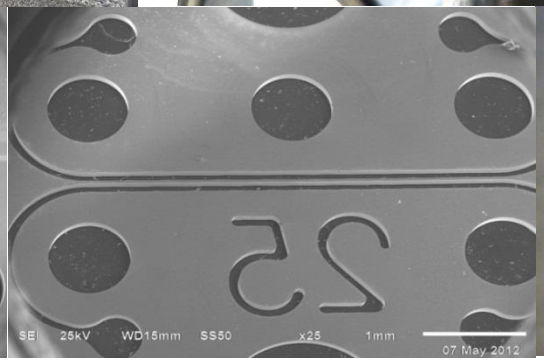

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