Column Replaceable Elastomer Socket

BH Kim, YC Nam, DH Roh, Josh Choi
TSE Co., Ltd

TestConX™
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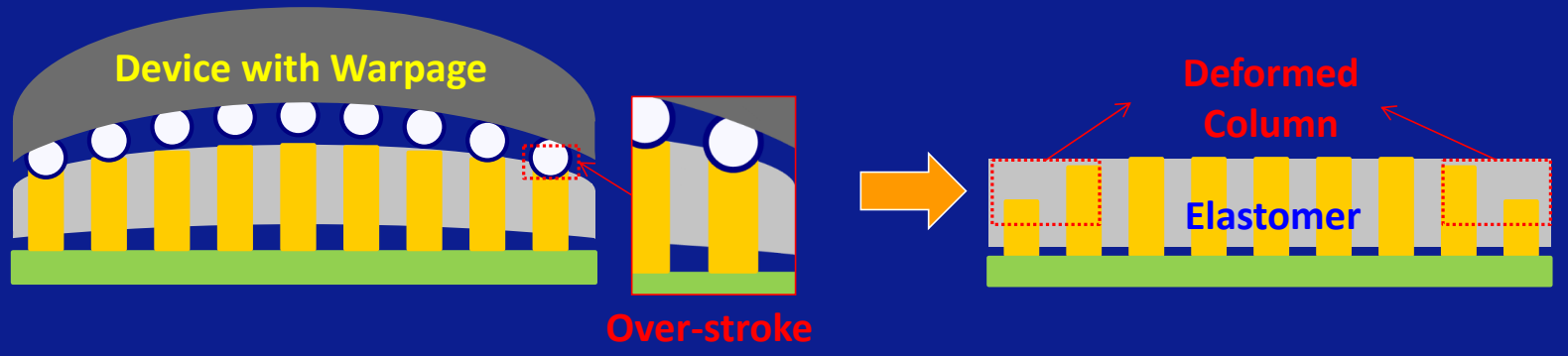
Structure and Limitation of Conventional Elastomer

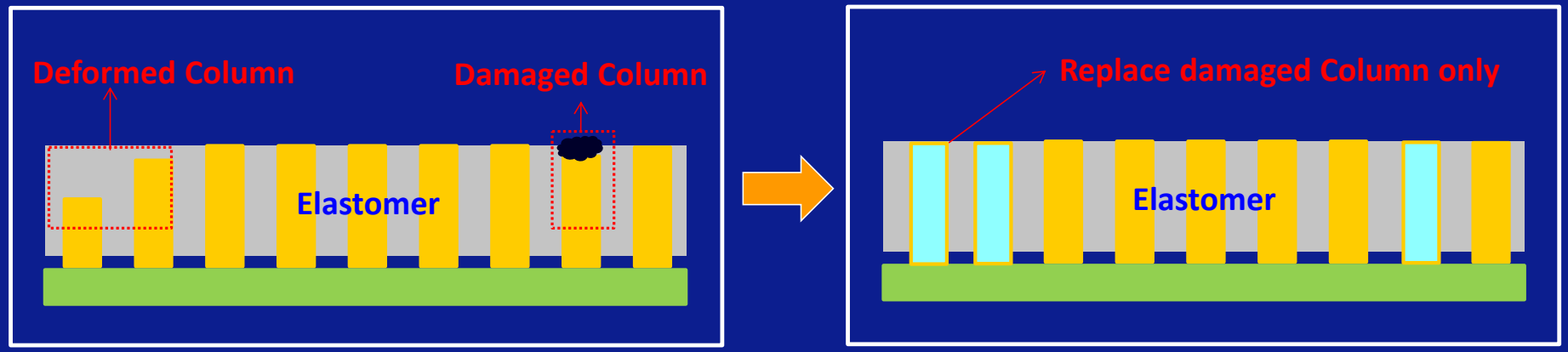
➢ Structure and Limitations of Conventional Elastomer Socket (1)

- When testing, Warpage of the Device repeatedly exerts greater pressure on the certain column, weakening elasticity and ultimately accelerating the depression of specific column
- Unlike Pogo sockets, conventional elastomers cannot replace damaged specific columns, requiring the replacement of the entire socket



ELTUNE-air : Overcome Limitations of Conventional Elastomer

- **Column Replaceable Elastomer Socket**
  - ELTUNE-air – Each Columns of ELTUNE-air are surrounded by air, giving them an independent structure, which enables individual replacement even in the event of depression or damage



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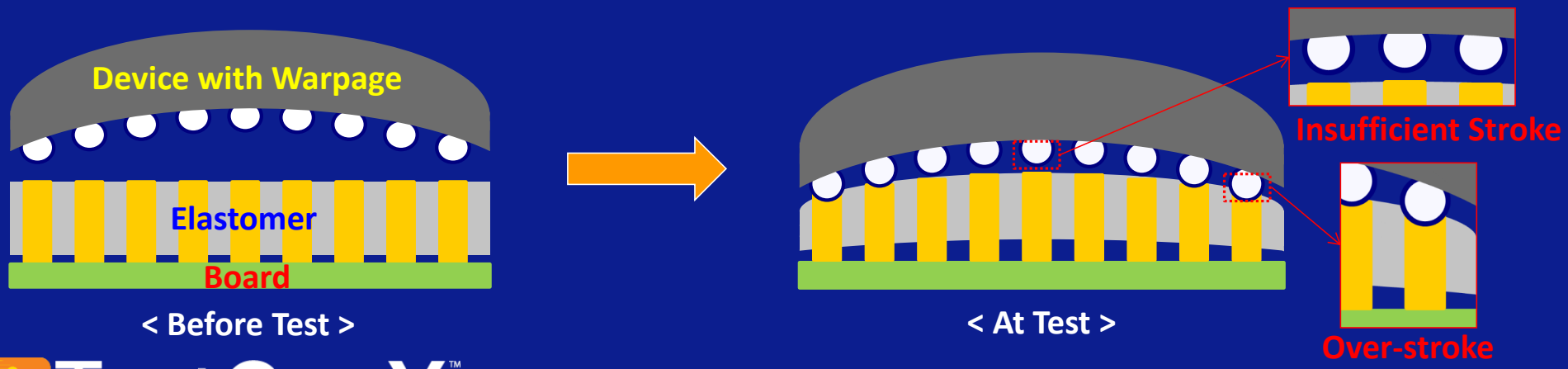
Structure and Limitation of Conventional Elastomer

➢ Structure Limitations of Conventional Elastomer Socket (2)

- Since all Columns are surrounded by a silicon mold, challenging to achieve the organic movement of individual columns like Pogo Socket
- When testing a device with large Warpage, the outer edges of the device over-stroke the column, while the central area suffers from insufficient stroke, leading to unstable test results.



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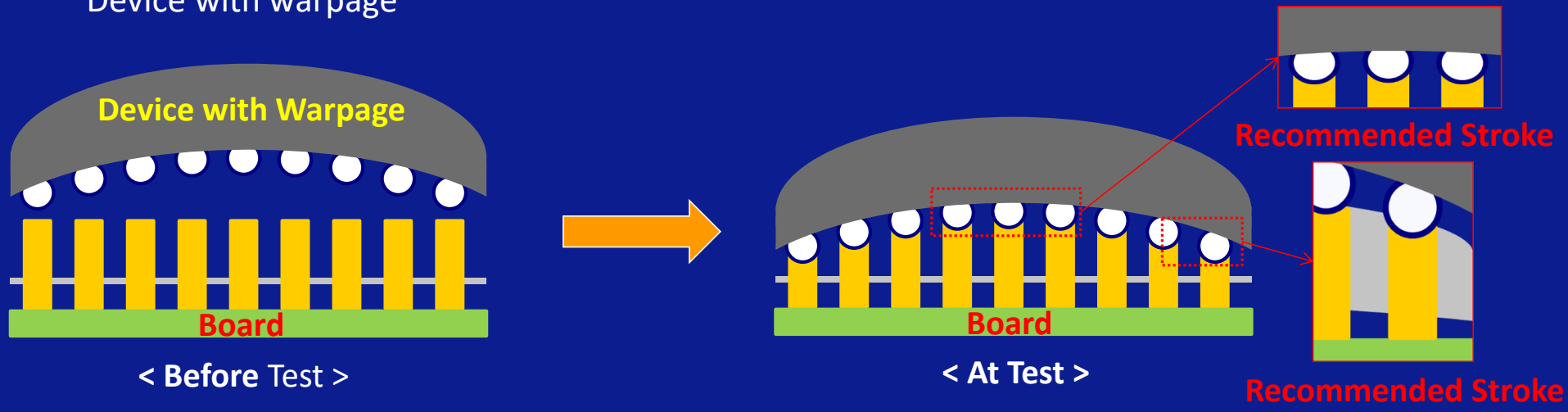
ELTUNE-air : Overcome Limitations of Conventional Elastomer

- **Structurally independent Column Formation**
  - ELTUNE-air, capable of overcoming the disadvantages of conventional elastomers, enables the organic movement of individual columns.
  - By utilizing an Air gap, ensure to avoid interference between columns when contacting with Device with warpage



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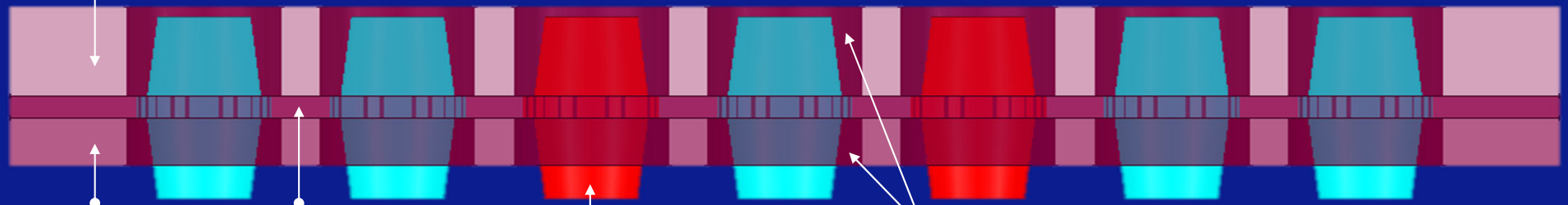
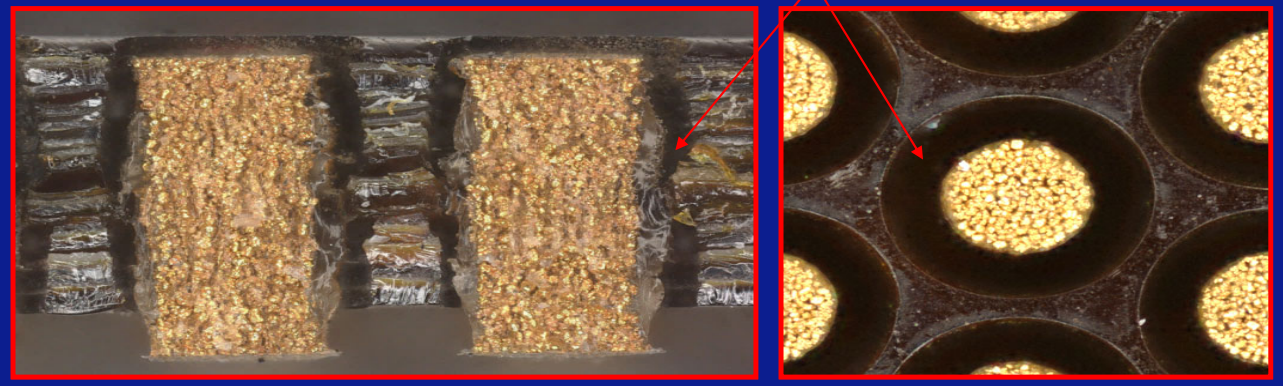
Structure of ELTUNE-air





[Section View] [Top View]

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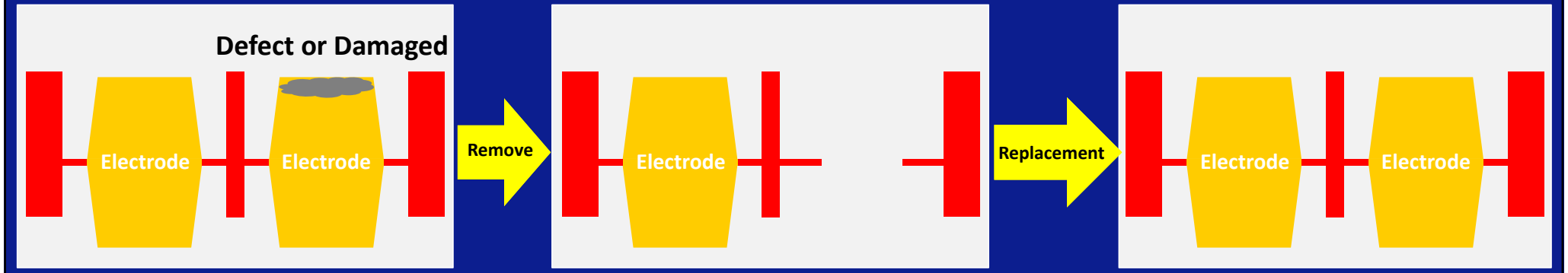
Advantage of ELTUNE-air

- **Advantage 1. Individual Column Replacement**
  - Conventional Elastomer need to replace whole Socket if even a single column becomes defective
  - Individual column replacement provides advantages in terms of maintenance and cost saving



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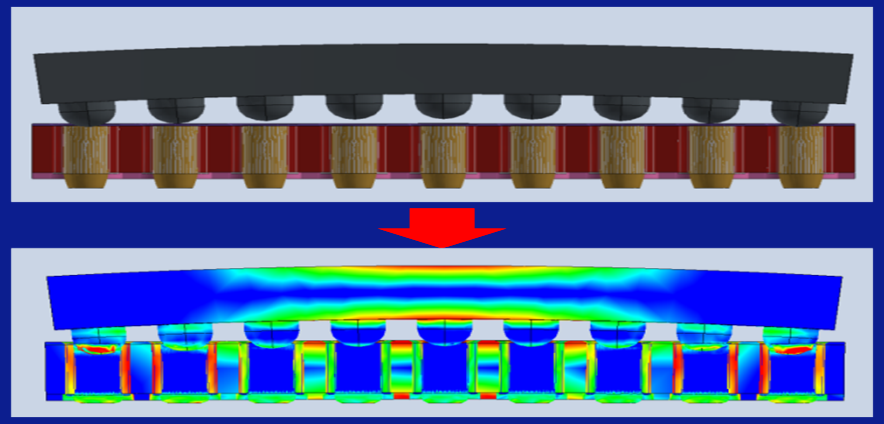
Advantage of ELTUNE-air

- **Advantage 2. Increased Life-Span**
  - When testing devices with Warpage, structural characteristics cause larger deformation in the outer column
  - The air-gap structure in ELTUNE-air convert over-strokes into linear compression, minimizing damage



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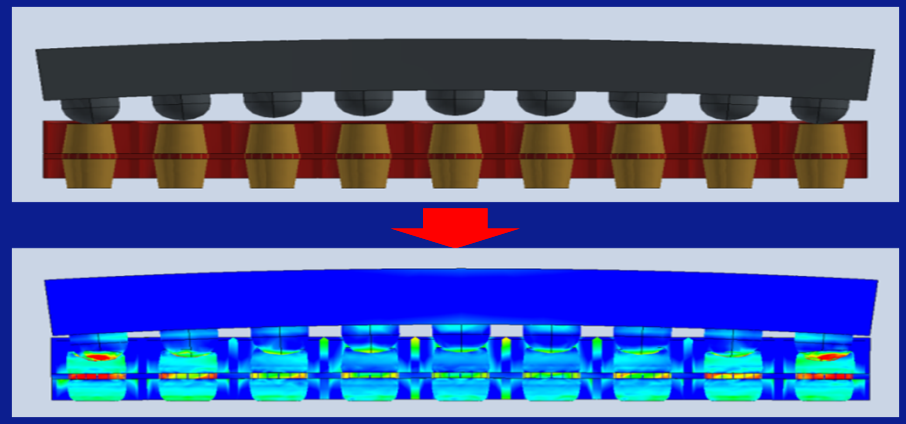
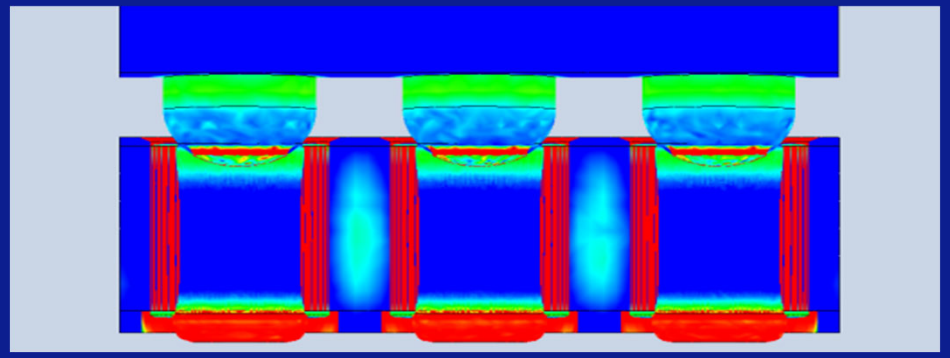


< ELTUNE-Air Socket >

Advantage of ELTUNE-air

- **Advantage 3. Low Force**
  - Able to overcome Max force limitation of Handler through Low force of Socket
  - When contacting, Air gap distributes the force, enabling low force
  - Stable testing is possible with approximately 20% of the force compared to conventional sockets



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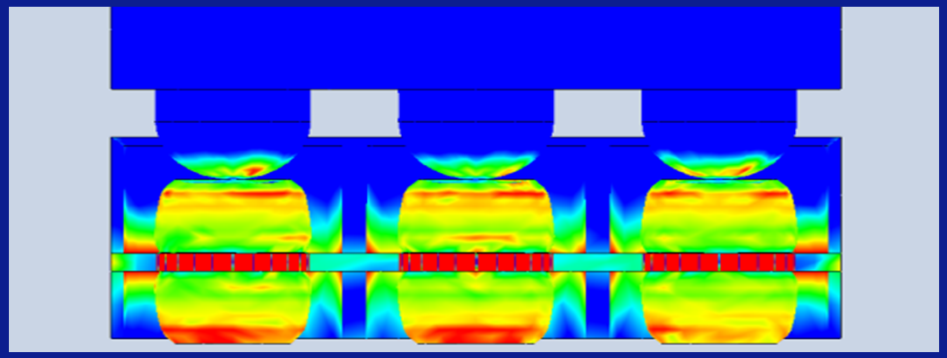


< ELTUNE-air Socket >

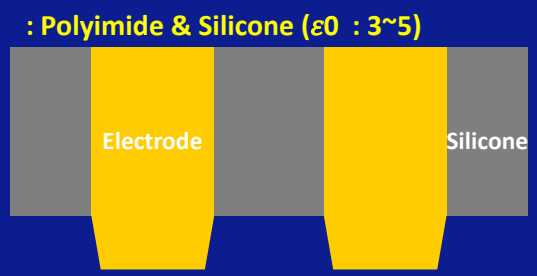
Advantage of ELTUNE-air

➢ Advantage 4. High Speed Performance

- The dielectric constant of the dielectric material surrounding the existing column ranges from 3 to 5, which limits the improvement in SI
- ELTUNE-air, the dielectric surrounding the column is air (dielectric constant of **1**), providing an advantage of high SI
- Due to the matching of characteristic impedance (Z_o), the lower the dielectric constant (ε_o) value, the better the Signal Integrity (SI) characteristics

  ※ Target : IL : 20% ↑, RL : 10% ↑, Z_o : 10% ↑

$$Z_0 \approx \sqrt{\frac{L}{C}} = \sqrt{\frac{\mu}{\varepsilon}} \ln\left(\frac{d}{a}\right)/\pi$$



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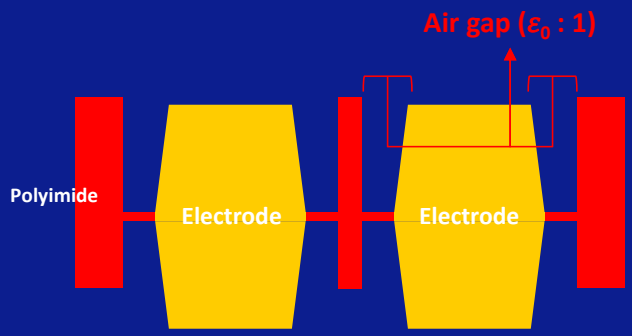

< ELTUNE-air Socket >

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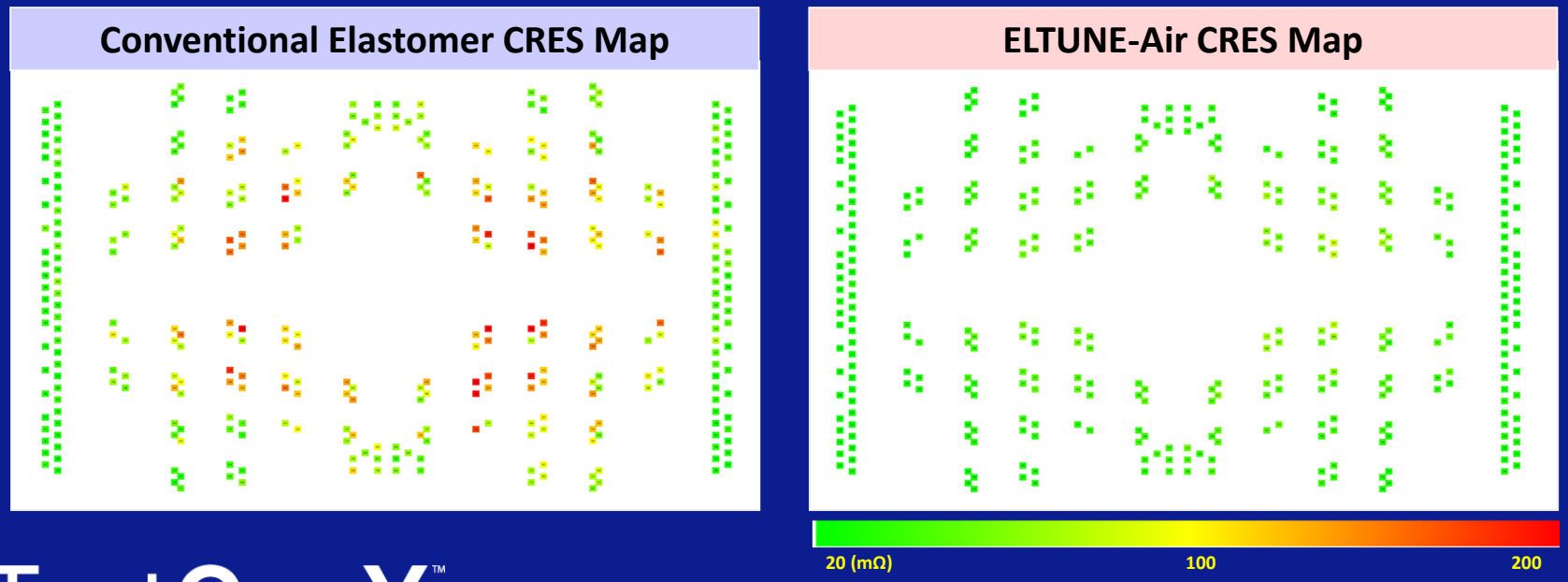
Comparison : Conventional Elastomer vs ELTUNE-air

- **Contact Resistance**
  - When measuring CRES Pkg with Warpage, ELTUNE-Air shows consistently lower CRES values compared to the conventional elastomer socket



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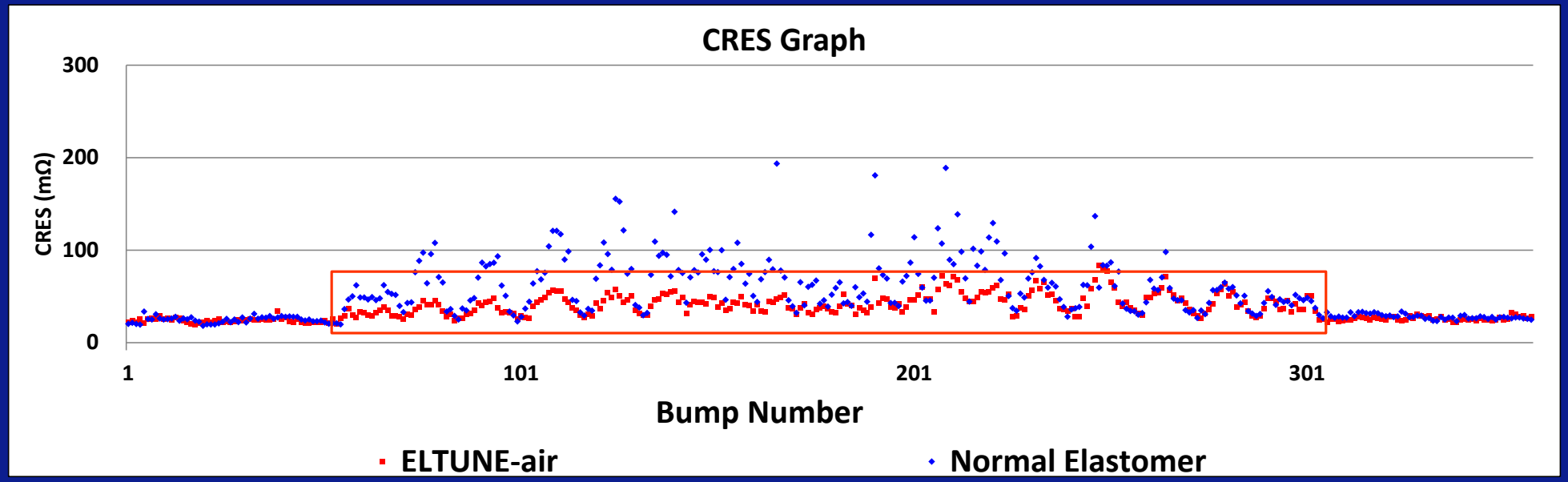
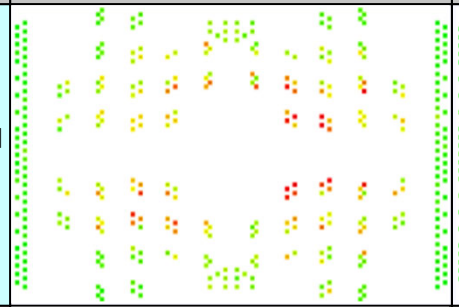
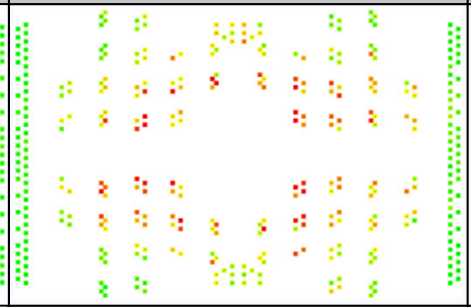
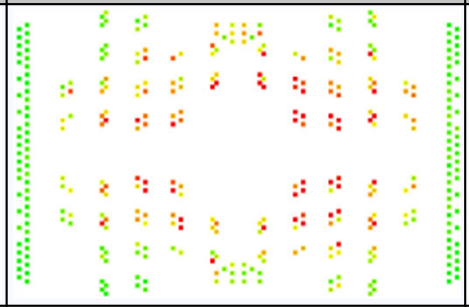
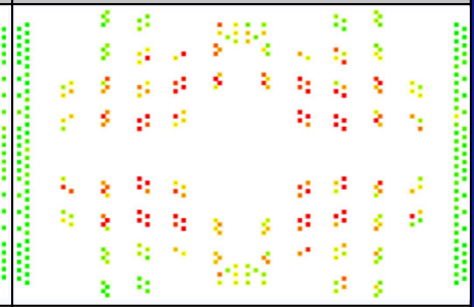
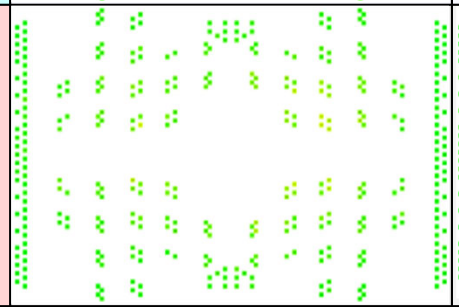
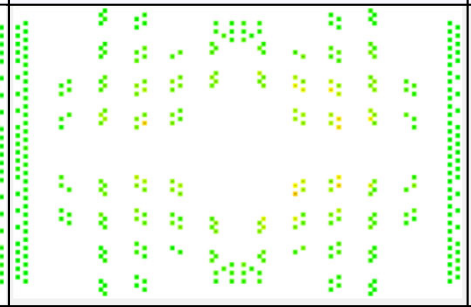
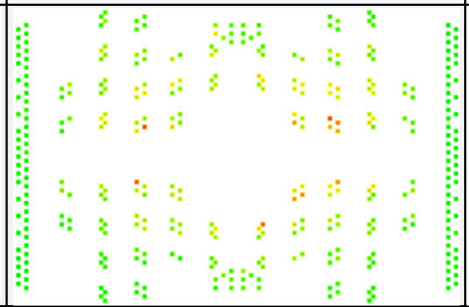
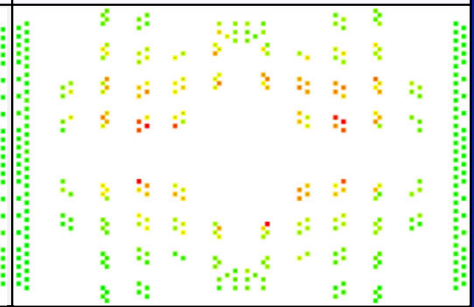
Comparison : Conventional Elastomer vs ELTUNE-air

- **Contact Resistance (Variance)**
  - From the graph data, ELTUNE-air shows superior CRES characteristics, particularly with reduced Min and Max variation, indicating much more uniform bump characteristics



Comparison : Conventional Elastomer vs ELTUNE-air

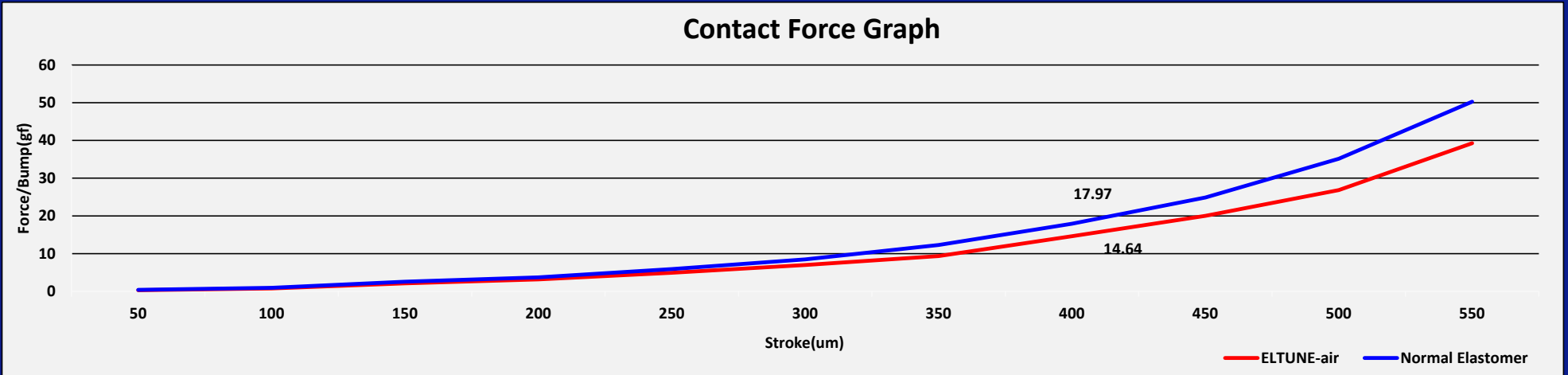
- **Contact Resistance (Life Span)**
  - ELTUNE-Air shows superior CRES characteristics during 100K touchdowns

	Initial	After 10K Touchdown	After 50K Touchdown	After 100K Touchdown
Conventional Elastomer				
ELTUNE-Air				

Comparison : Conventional Elastomer vs ELTUNE-air

➢ Contact Force

- ELTUNE-Air shows 20% Lower Force at recommended stroke

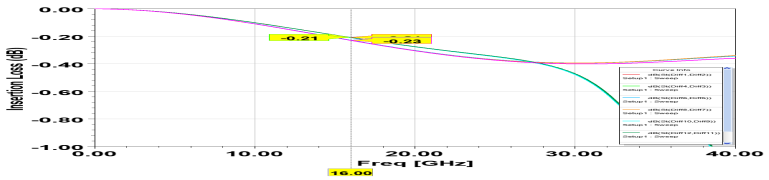
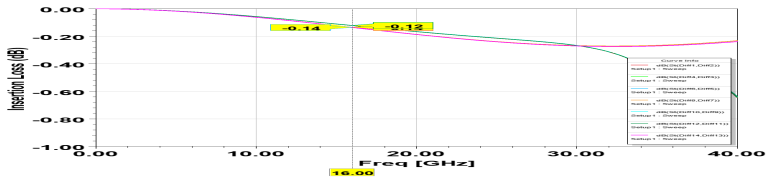
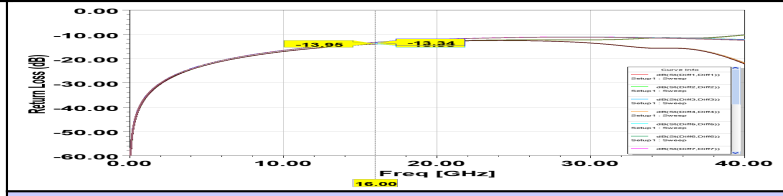
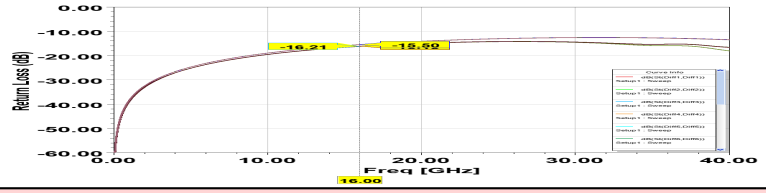


Stroke(um)		50	100	150	200	250	300	350	400	450
Force/Bump (gf)	Conventional Elastomer	0.40	0.96	2.59	3.74	5.91	8.49	12.30	17.97	24.87
	ELTUNE-Air	0.32	0.78	2.15	3.18	4.94	7.00	9.38	14.64	20.06

Comparison : Conventional Elastomer vs ELTUNE-air

➢ Signal Integrity

- ELTUNE-Air has 39% superior Insertion Loss than Conventional Elastomer socket
- ELTUNE-Air has 16% superior Return Loss than Conventional Elastomer socket

Signal Integrity Performance	Conventional Elastomer	ELTUNE-air
Insertion Loss (dB)		
	-0.23	-0.14
Return Loss (dB)		
	-13.32	-15.49
Z_0	71Ω (85Ω±16%)	79Ω (85Ω±7%)

Summary

- Introduction to ELTUNE-air Socket
  → Enhancing Existing Elastomer Limitations
- Bump with Individual Compliance
  → Advantages in CRES, low force, and SI performance
- Ideal for Testing Warped Package Devices
  → ELTUNE-air Socket is the optimal solution for Final Testing of Large Packages

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