A method for overlapping two DIC views by using a two-tone speckle pattern
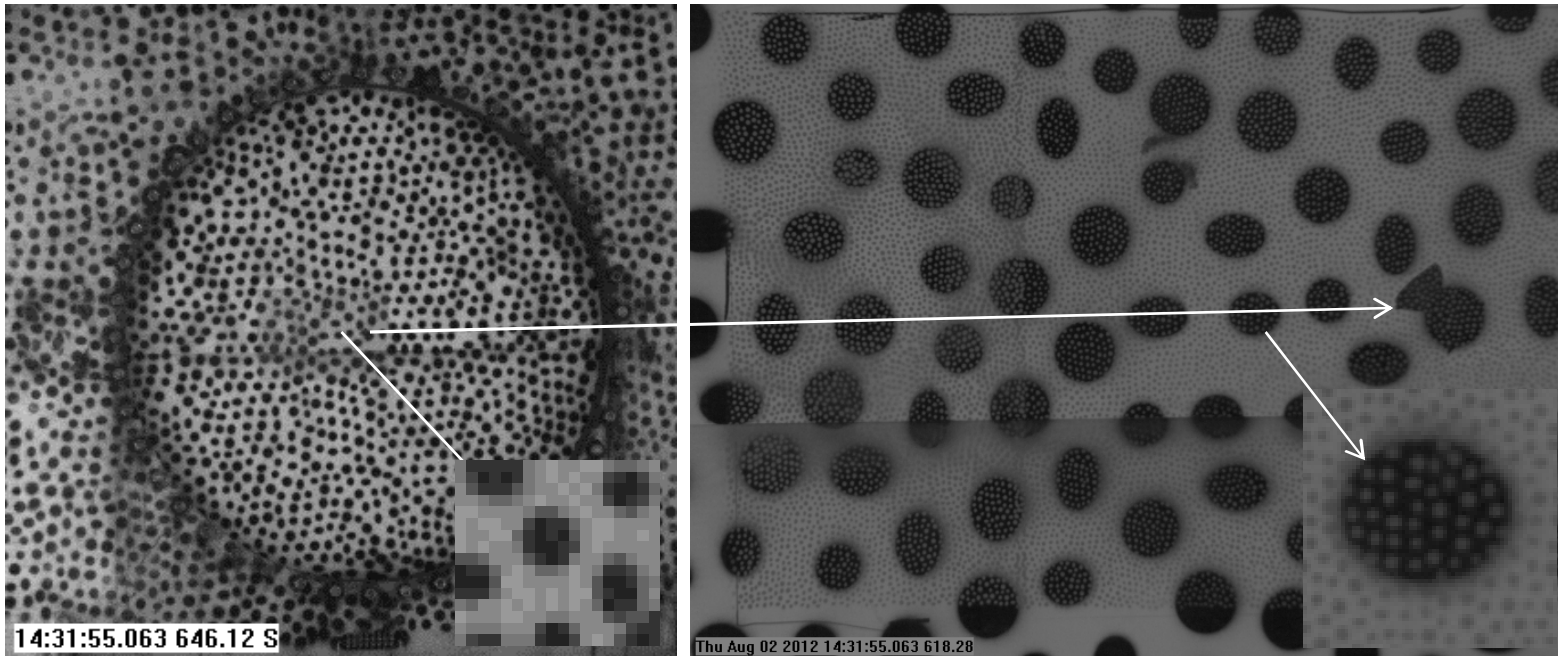
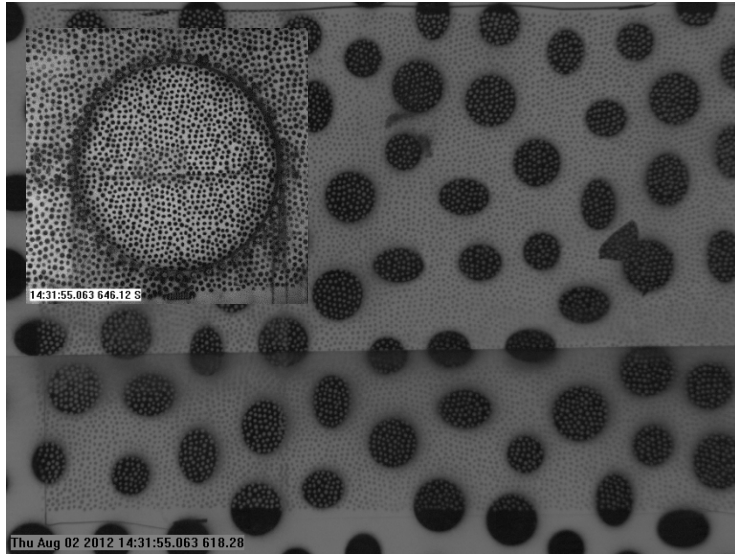**SEM Annual Conference June 3-5, 2013**

Phillip L. Reu

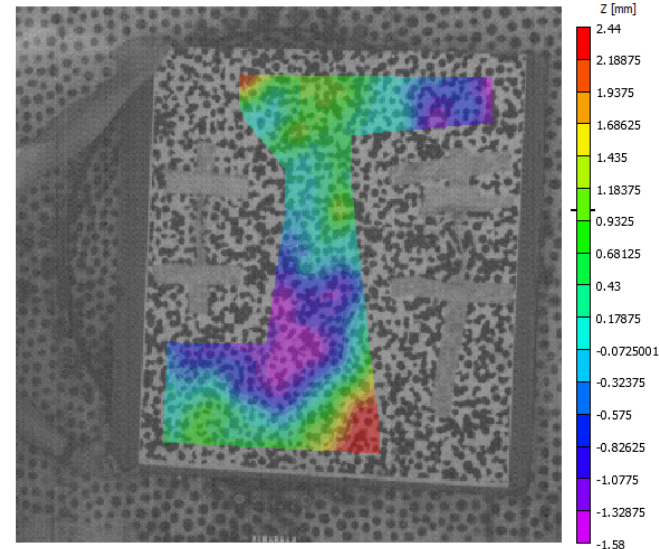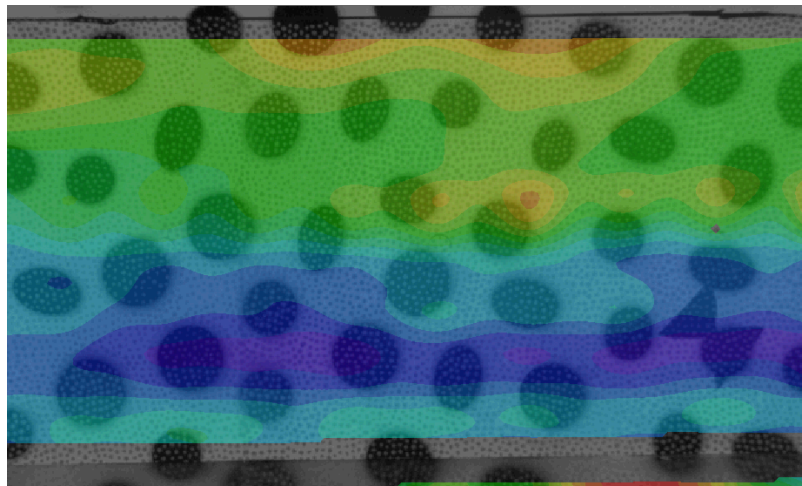**Principal Member Technical Staff**

To acquire both fine details and overall motion can require two fields-of-view

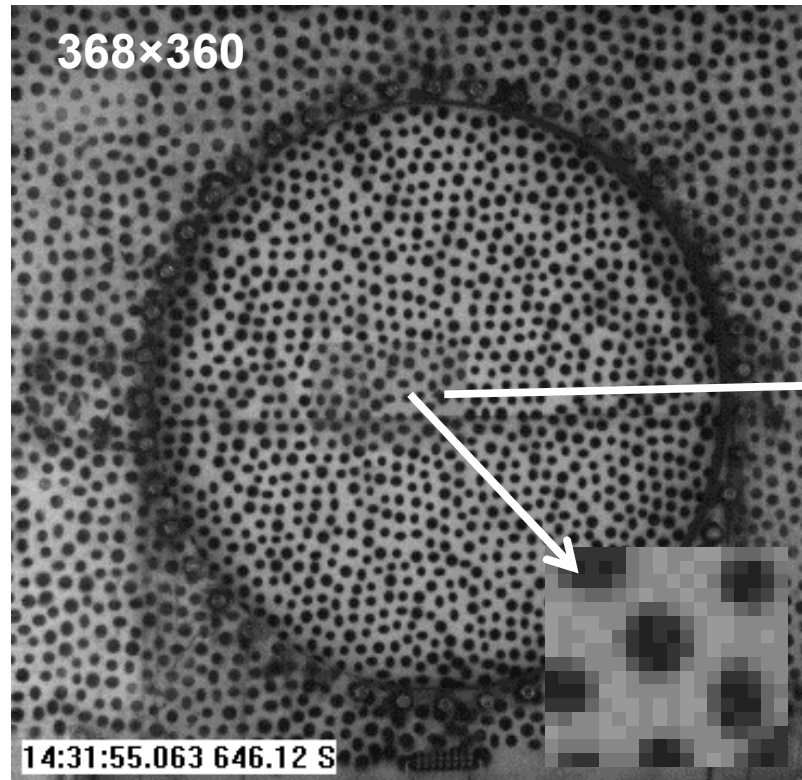**Experimental Details**

Beware of Lexan

Results

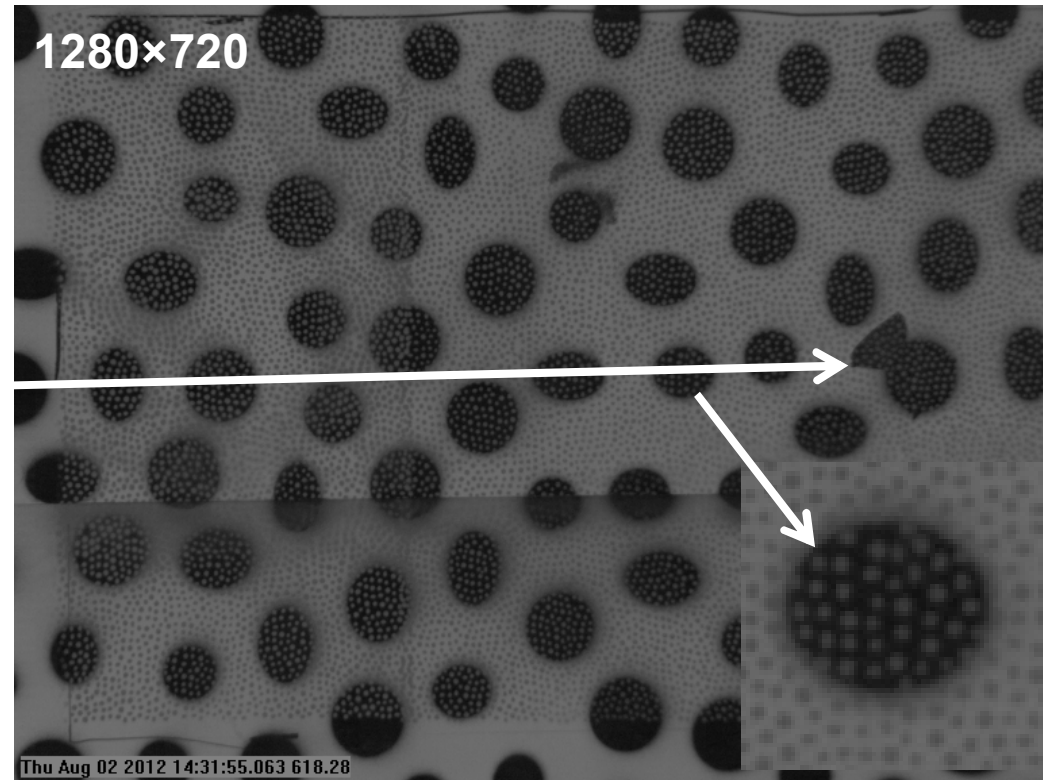# Conflicting requirements require two different fields-of-view

- **Camera synchronization (FSYNC) was used to ensure that the images are taken simultaneously.**
- **Cameras were protected behind a barrier.**

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Two tone speckle patterns allow overlapping FOVs
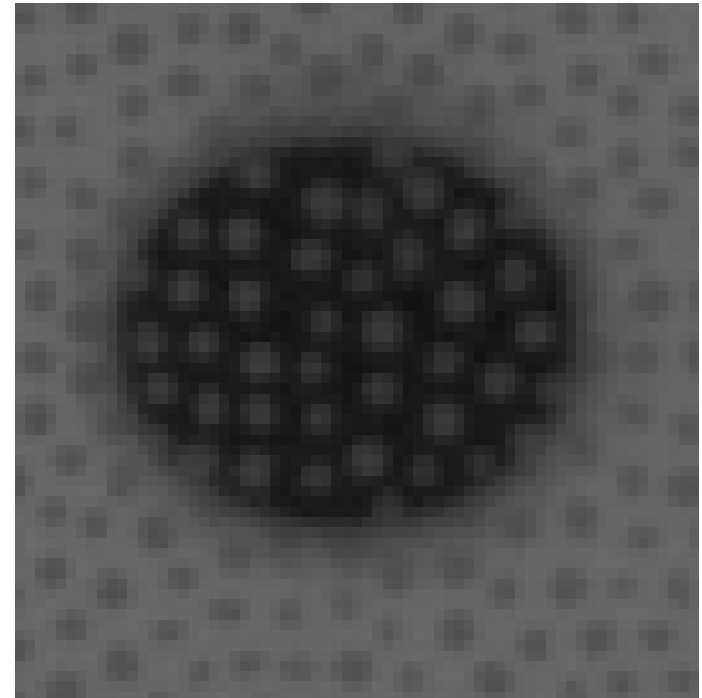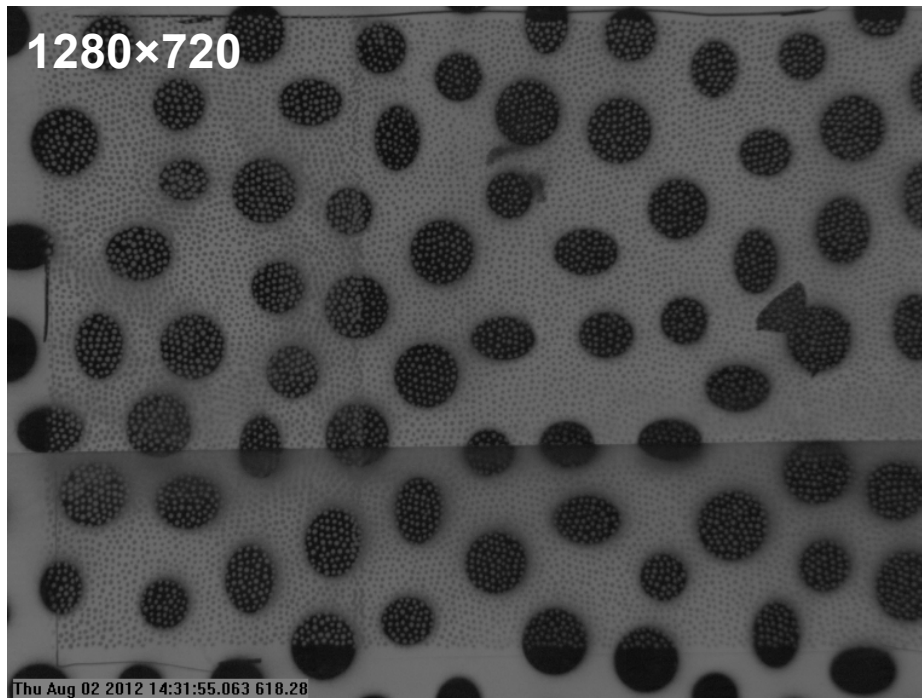

4 mm/pixel   0.4 mm/pixel

This works because the small speckles are severely aliased in the wide FOV.

DIC results quality is proportional to the image noise divided by the contrast.

1280×720

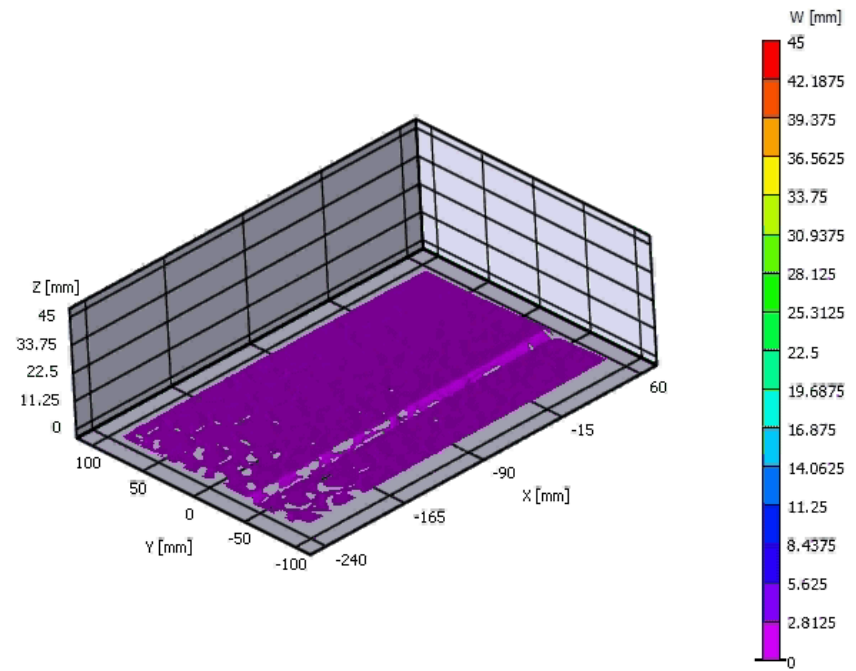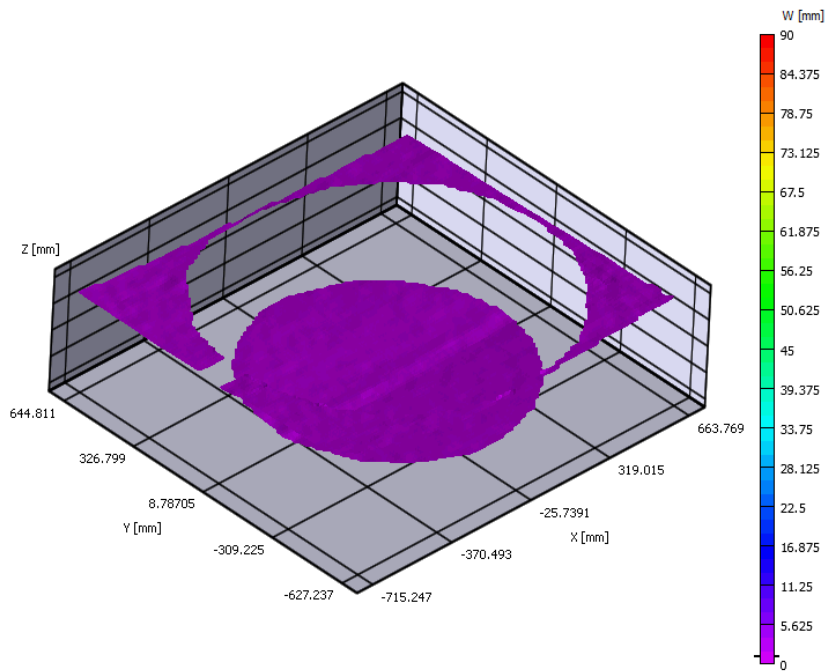Thu Aug 02 2012 14:31:55.063 618.28

- 9000 grey levels between the white and grey
- 9000 grey levels between the grey and black
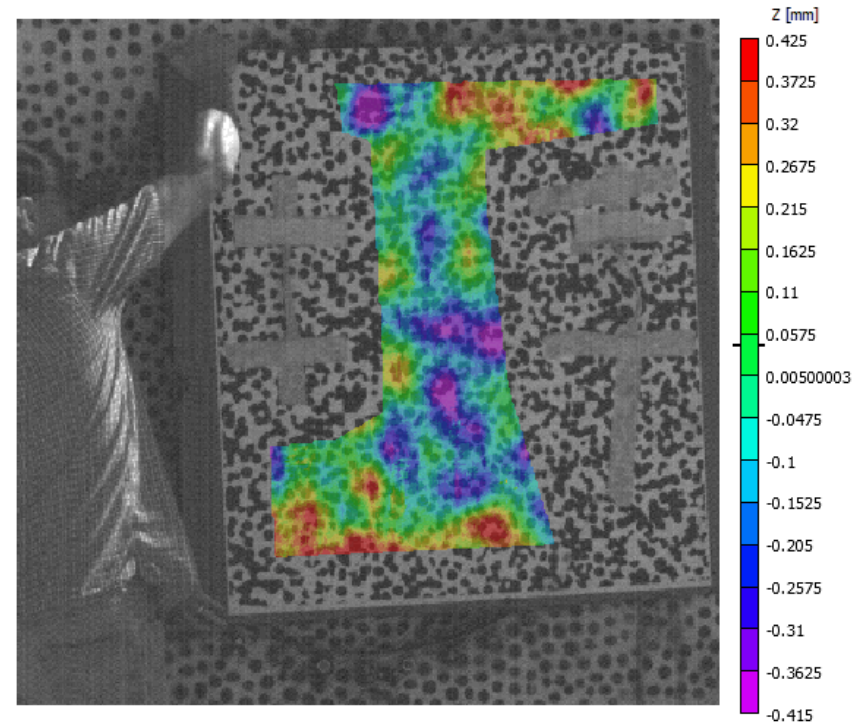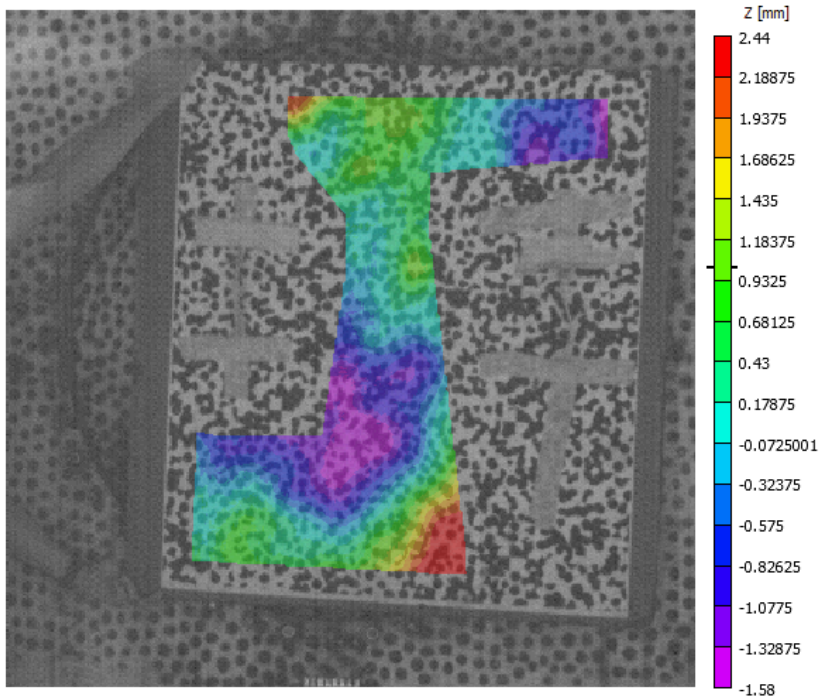- 12-bit camera saves the day!
- Noise = 0.6% (278 GL)

$$Error = \frac{Noise}{SubsetSize\sqrt{\sum(Gradients^2)}}$$

Conflicting requirements require two different fields-of-view

Beware of extra components in the imaging path – Lexan may add distortion

Lexan over opening

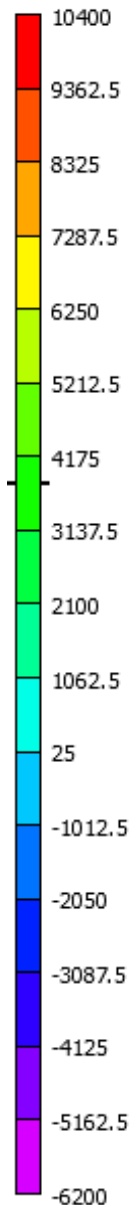|	Lexan	Lens Only
Average Projection	0.045	0.014
Max Projection	0.054	0.027
Average U Error 2σ	0.487	0.108
Average V Error 2σ	0.589	0.091
Average W Error 2σ	1.195	0.478
Max U Error	1.282	0.247
Max V Error	1.148	0.297
Max W Error	3.077	1.128

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The overall and tight results compare very well…

Virtual gage size is important to the final results: Mesh density study!

Step = 4 pixels
Subset = 29 pixels
Strain Window = 5 points
Virtual Gage = 8 mm
Rivet Size = 6 mm

Three Rows of Rivets

eyy [um/m] - Lagrange

10400	
9362.5	
8325	
7287.5	
6250	
5212.5	
4175	
3137.5	
2100	
1062.5	
25	
-1012.5	
-2050	
-3087.5	
-4125	
-5162.5	
-6200	

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Strain profiles across rivets.

Strain (µm/mm)

Virtual Gage = 8-mm

Virtual Gage = 14.4-mm

X-Location (mm)

Rivets = 6-mm

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Questions?