Deformation of Corrugated Carbon in Electron-Hadron End-Caps

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Initial Conditions

Geometry

The Geometry is comprised of two carbon fiber flat face sheets glued to either side of a corrugated sheet. The face sheets are laid up as 0/90/0 and the corrugated sheets are 90/0/90

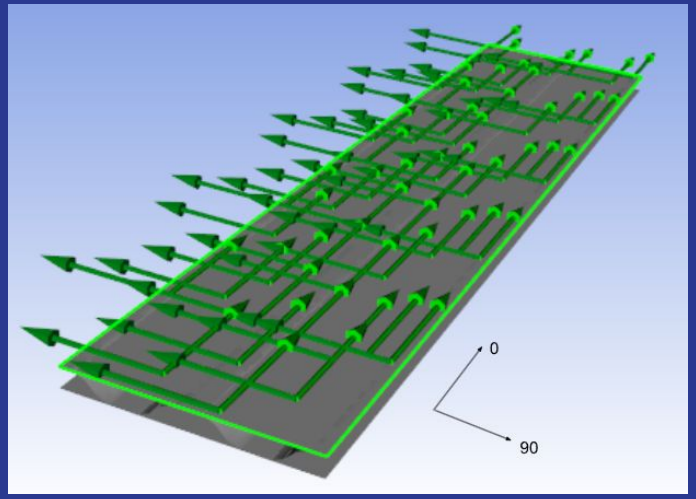
Context

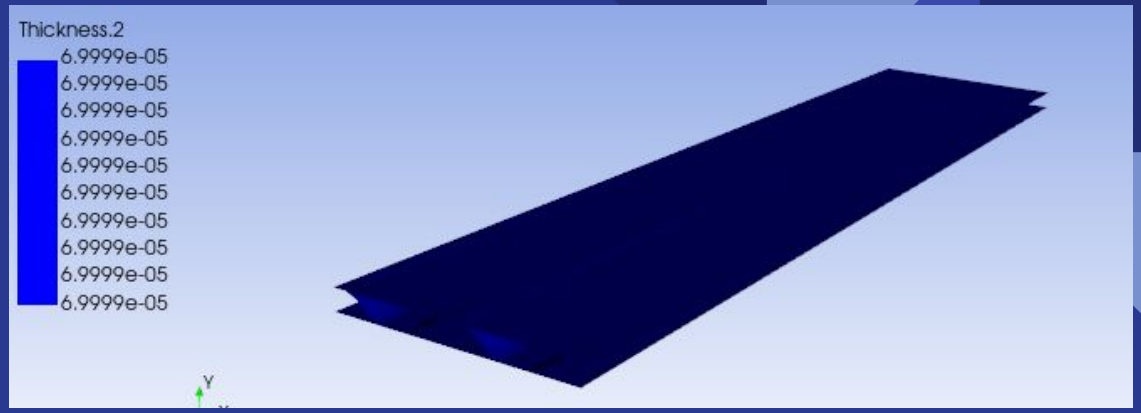
The ANSYS simulation mirrors real life three point bend tests. Face sheets are bonded to the corrugation, and the contact between the part and the dowels is frictional with coefficient 0.1 This mimics a real three point bend test.

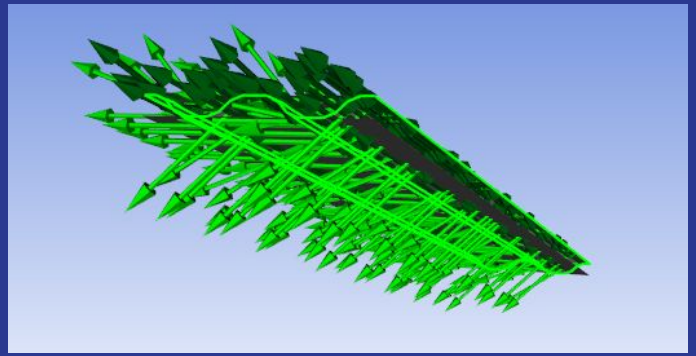
Problem statement

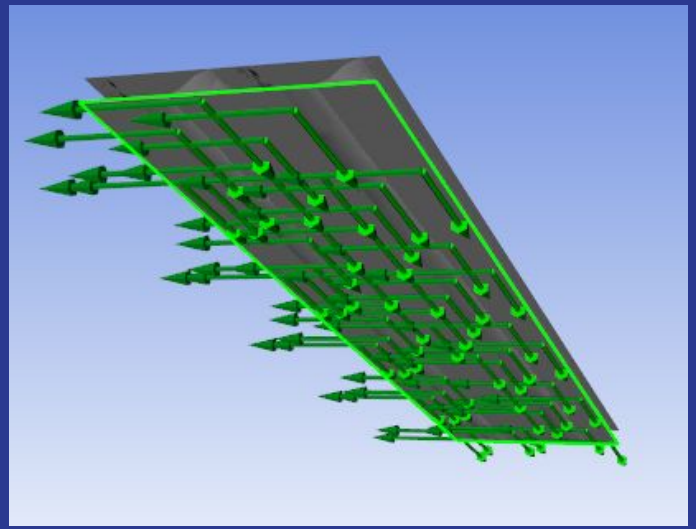
Simulate the three point bend test in ANSYS and compare to rel three point bend test results to determine deformation properties of the corrugated sandwich material used in Electron-Hadron end caps.

ACP Model



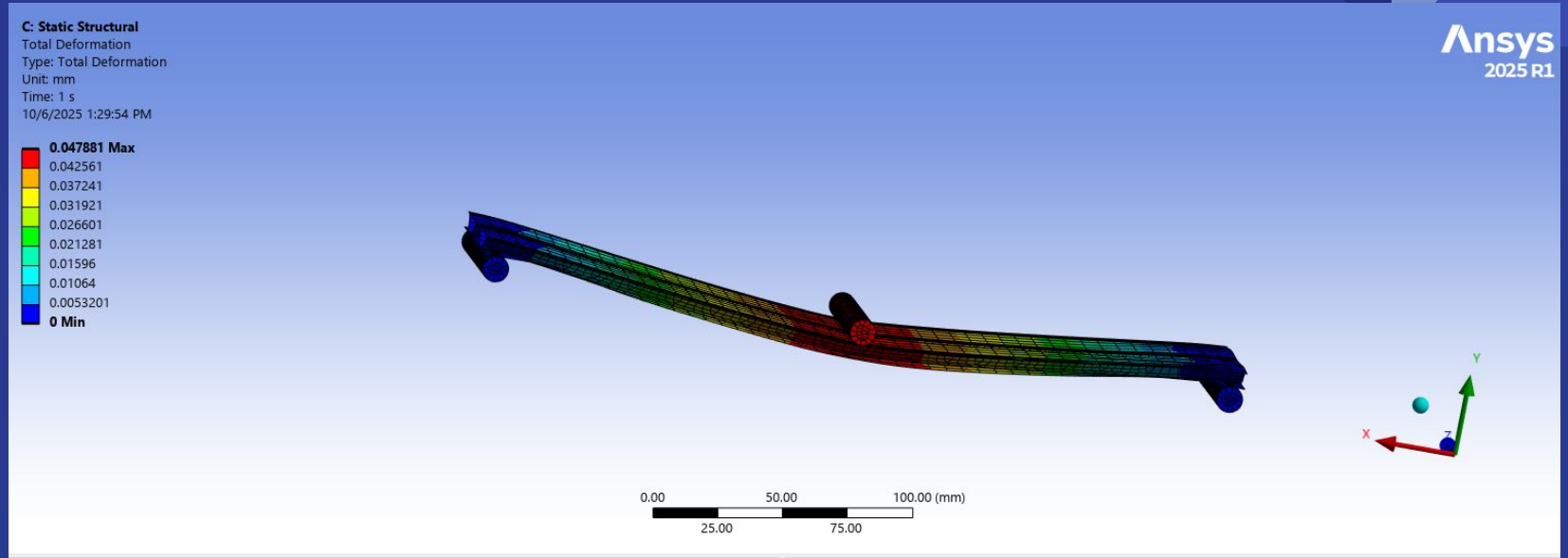


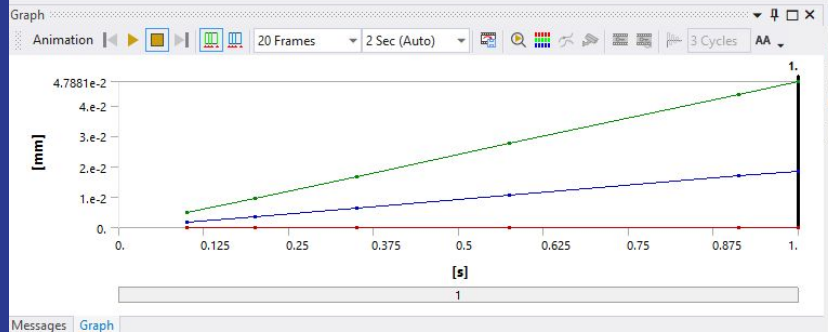




These models show the direction in which plies are laid up for each component, and the thickness they come out to (same as measured)

Deformation Results

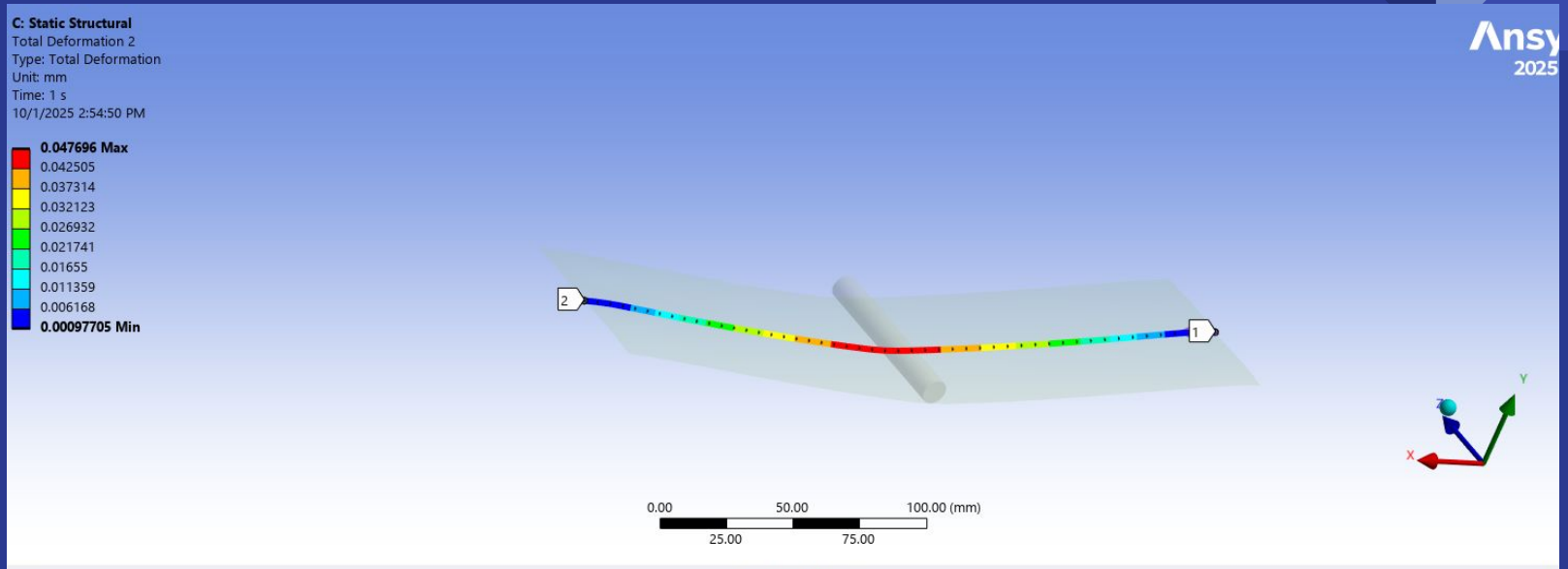


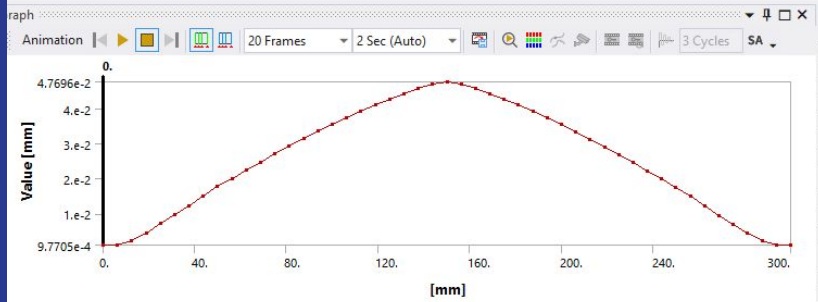


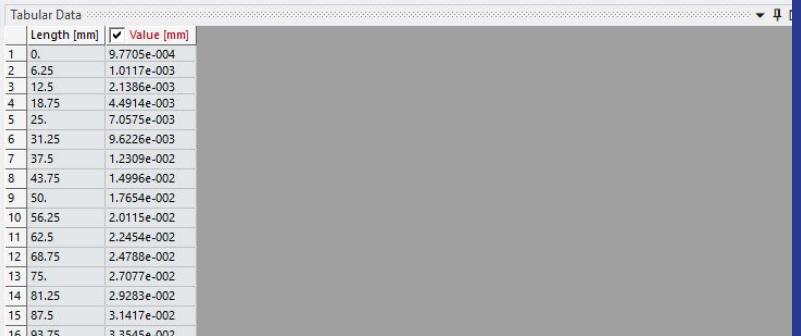
Tabular Data

	Time [s]	Minimum [mm]	Maximum [mm]	Average [mm]
1	0.1	0.	4.7882e-003	1.8583e-003
2	0.2	0.	9.5763e-003	3.7166e-003
3	0.35	0.	1.6758e-002	6.5041e-003
4	0.575	0.	2.7532e-002	1.0685e-002
5	0.9125	0.	4.3692e-002	1.6957e-002
6	1.	0.	4.7881e-002	1.8583e-002

Deformation (Path Based)

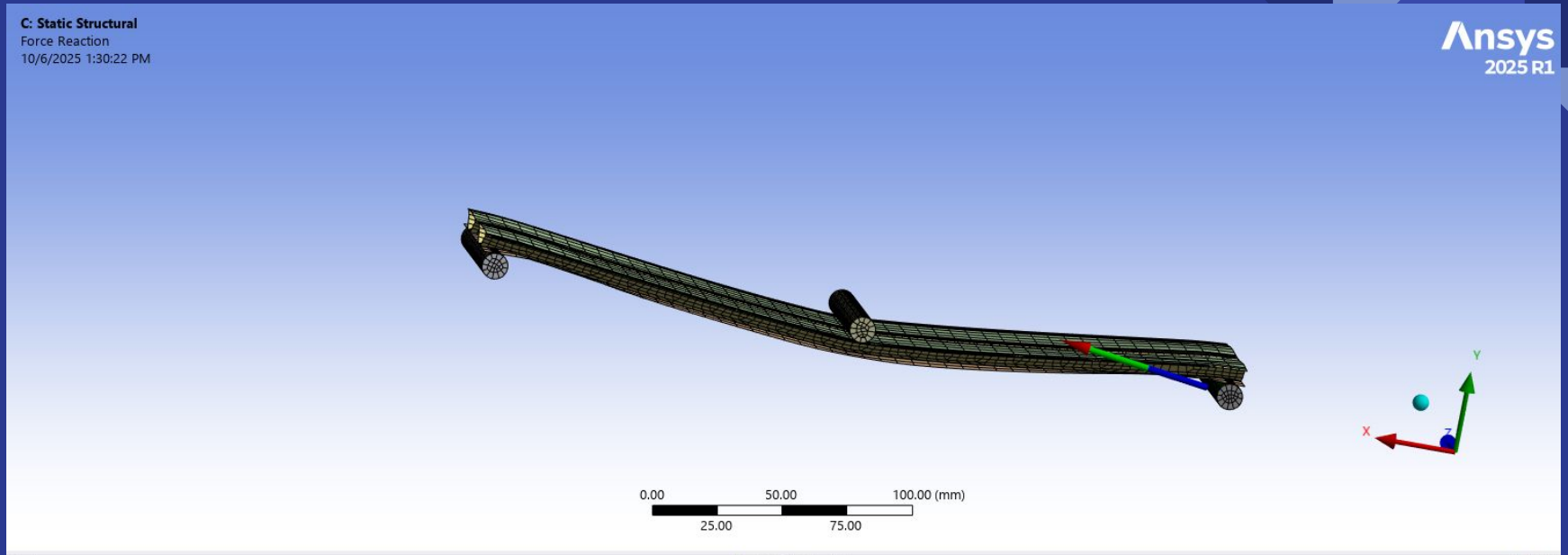






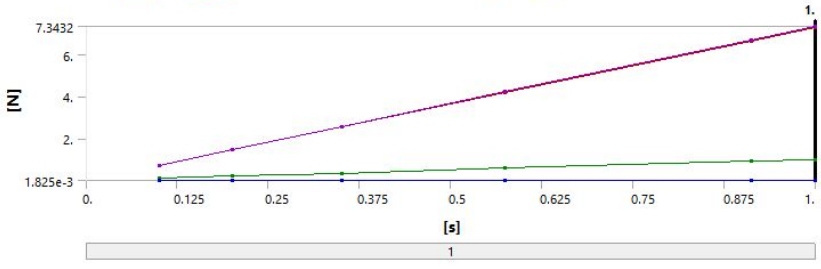
	Length [mm]	Value [mm]
1	0.	9.7705e-004
2	6.25	1.0117e-003
3	12.5	2.1386e-003
4	18.75	4.4914e-003
5	25.	7.0575e-003
6	31.25	9.6226e-003
7	37.5	1.2309e-002
8	43.75	1.4996e-002
9	50.	1.7654e-002
10	56.25	2.0115e-002
11	62.5	2.2454e-002
12	68.75	2.4788e-002
13	75.	2.7077e-002
14	81.25	2.9283e-002
15	87.5	3.1417e-002
16	93.75	3.3545e-002

Force Reaction



Graph

Animation | 20 Frames | 2 Sec (Auto) | 3 Cycles | SA



Tabular Data

	Time [s]	Force Reaction (X) [N]	Force Reaction (Y) [N]	Force Reaction (Z) [N]	Force Reaction (Total) [N]
1	0.1	0.72749	0.10003	1.825e-003	0.73434
2	0.2	1.455	0.20006	3.6503e-003	1.4687
3	0.35	2.5462	0.3501	6.3882e-003	2.5701
4	0.575	4.183	0.57517	1.0495e-002	4.2224
5	0.9125	6.6382	0.91277	1.6655e-002	6.7007
6	1.	7.2748	1.0003	1.8253e-002	7.3432

Resources/Data (excel format)

https://drive.google.com/file/d/1wwJBQX-jBx5ooDJktc1jPiFV3vWY6syx/view?usp=sharing

https://drive.google.com/file/d/1FYurHOo_UnEKRDN0jJ4vBDGpVHNsHiRS/view?usp=sharing

https://drive.google.com/file/d/1tb1lJLsMrkVQ8x7b1yclAnKLFytVbdV6/view?usp=sharing