Supplementary Materials: Simplified Design Method for the Mechanical Stability of Slit-Shaped Additive Manufacturing Reactor Modules

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Table S1. Composition of metal powders in wt-%. Both powders conformed both ASTM A276 and DIN EN 10088.

Component	CT POWDERRANGE 316LF Batch PR100334	SLM Solutions 316L Batch 2022000726
C	0.02	0.011
Cr	17.8	16.901
Fe	Bal.	Bal.
Mn	0.91	1.127
Mo	2.34	2.322
Ni	12.6	11.413
N	0.06	0.0987
O	0.02	0.0385
P	0.012	0.012
Si	0.67	0.718
S	0.007	0.02

Table S2. Modules without internal structures t_w=1 mm, φ=0.

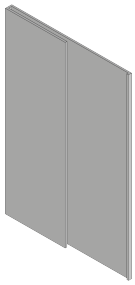
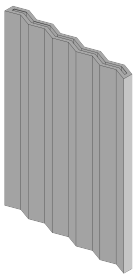
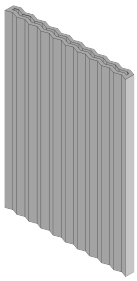
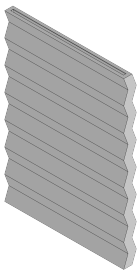
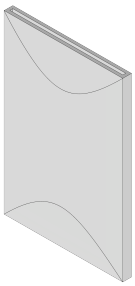
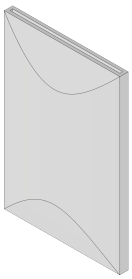
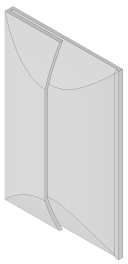
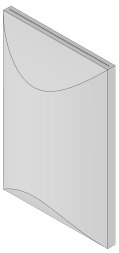
Planar	Corrugated $n = 5$	Corrugated $n = 10$	Corrugated perpendicular
			
Arched δ=5°	Arched δ=15°	Arched δ=30°	Arched δ=45°
			

Table S3. Pin-equipped modules with t_w=0.6 mm.

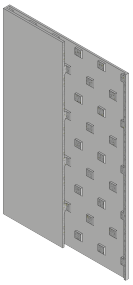
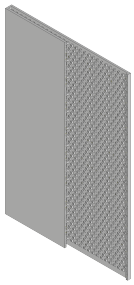
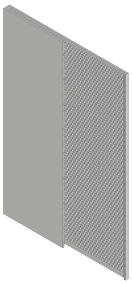
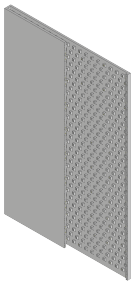
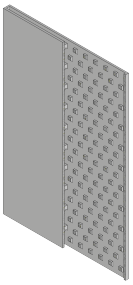
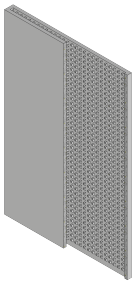
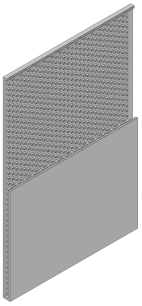
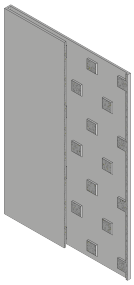
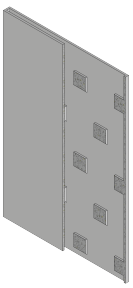
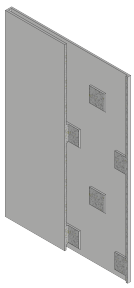
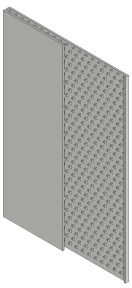
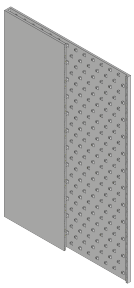
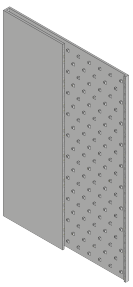
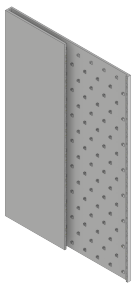
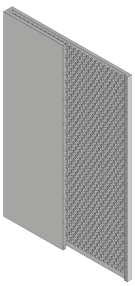
t_p / mm	2	0.42	0.26	0.6
				
φ / -	0.09	0.15	0.19	0.14
t_p / mm	1.0	0.42 regular.	0.42 trans.	3
				
φ / -	0.12	0.13	0.15	0.12
t_p / mm	4	5	0.42	0.42
				
φ / -	0.11	0.11	0.07	0.04
t_p / mm	0.42	0.42	0.42	0.42, t_w=1 mm
				
φ / -	0.02	0.017	0.01	0.15

Table S4. Fin-equipped modules.

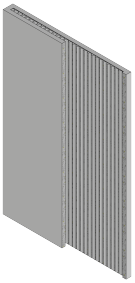
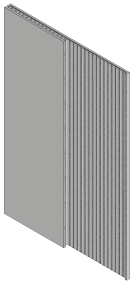
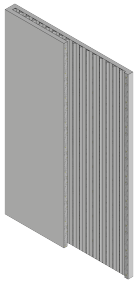
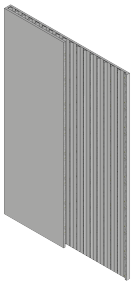
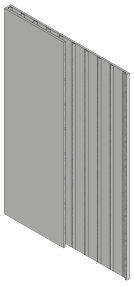
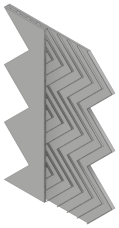
t_w / mm	1.0	0.6	1.0
t_e / mm	1	1	2
			
φ / -	0.33	0.33	0.14
t_e / mm	2	4	4
t_w / mm		0.6	
			
φ / -	0.14	0.10	

Table S5. FGE-equipped modules t_w=0.8 mm.

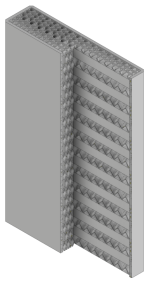
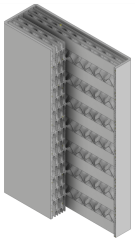
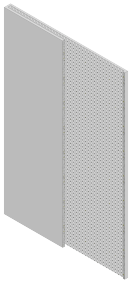
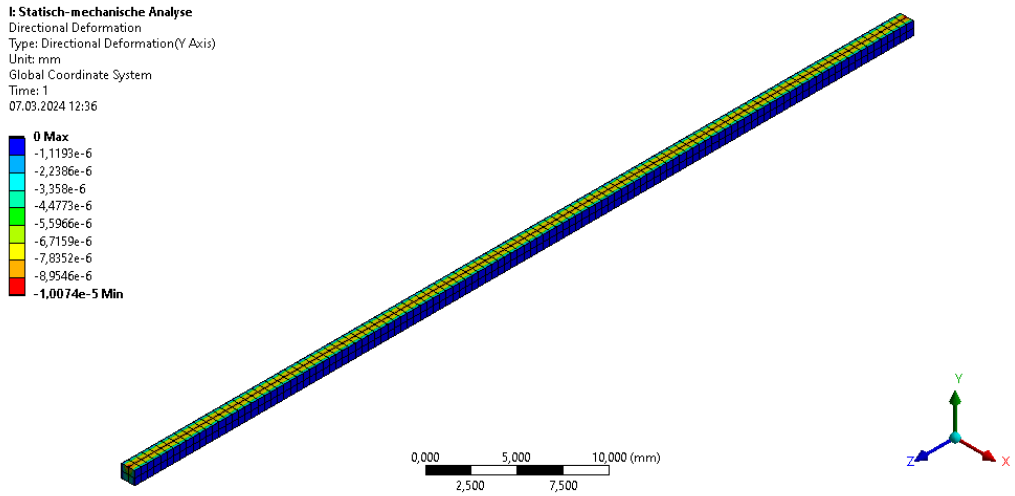
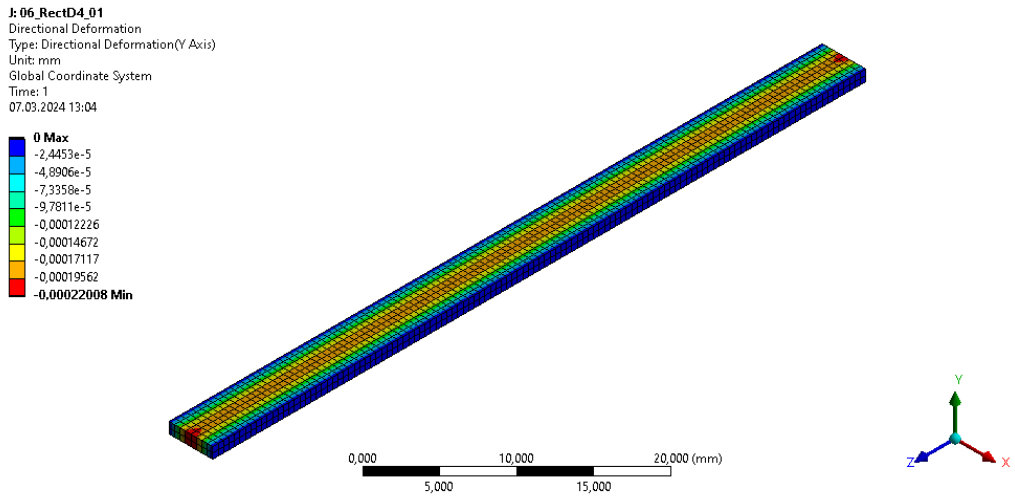
d_{FGE} / mm	1.333	2	3	4
				
φ / -				

Table S6. Lattice-equipped module.

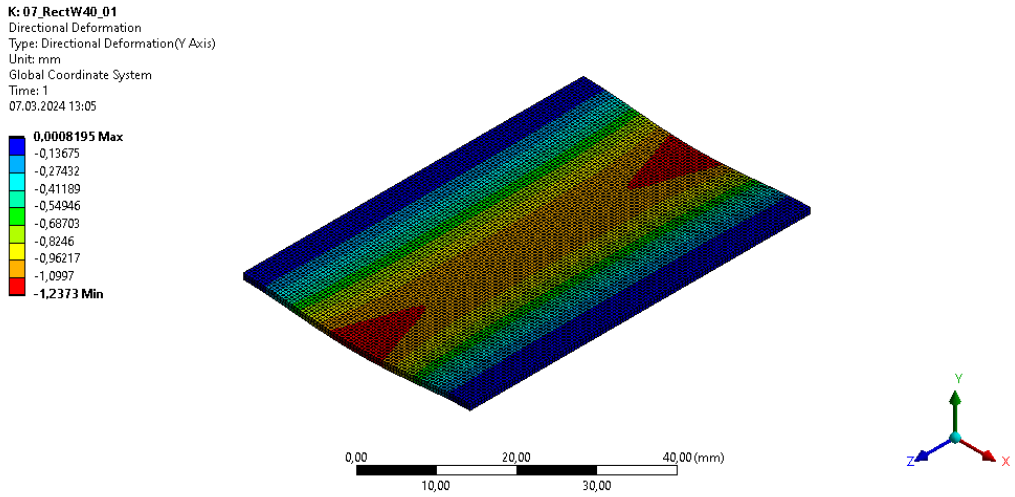
	6201
t_w / mm	0.6
t_e / mm	1
	
φ / -	0.20



(a) w=1 mm.

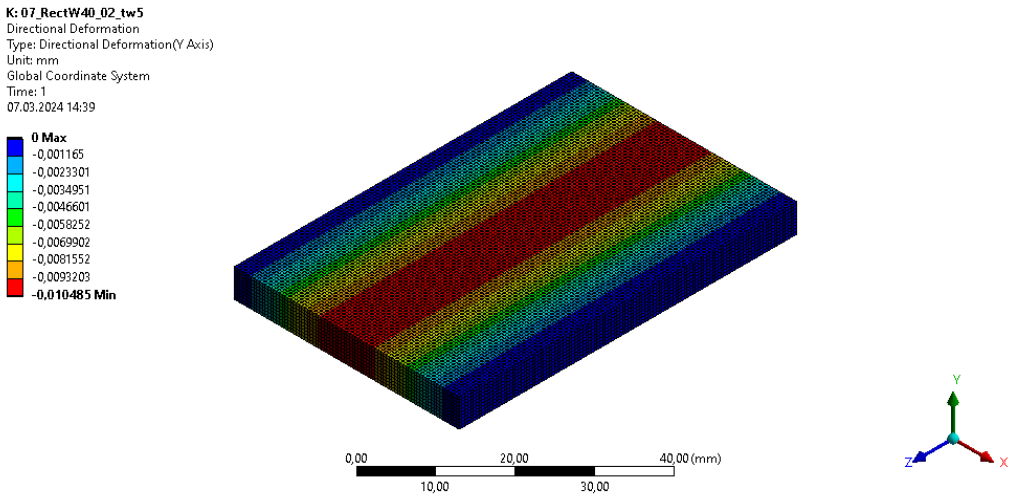


(b) w=4 mm.



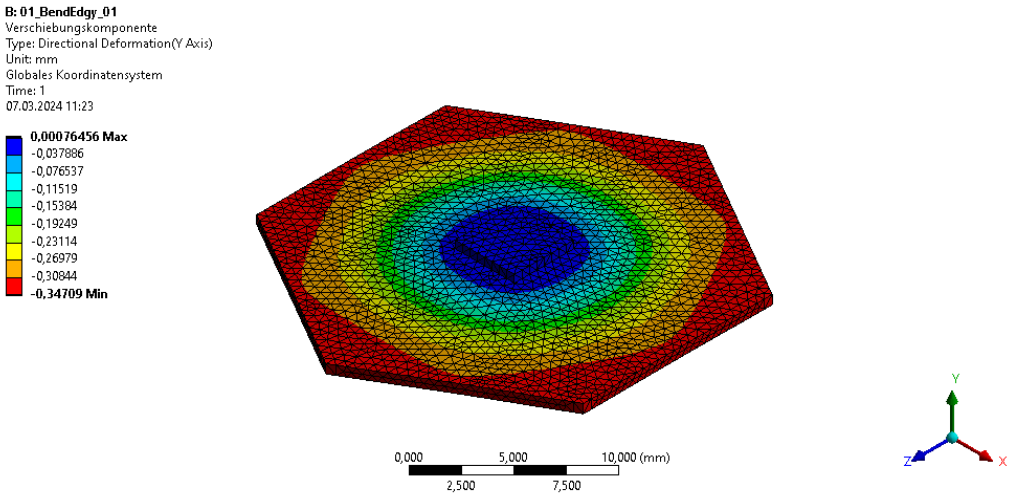
(c) w=40 mm.

Figure S1. FEA results of empty and fin-equipped modules t_w=1 mm, l=60 mm.

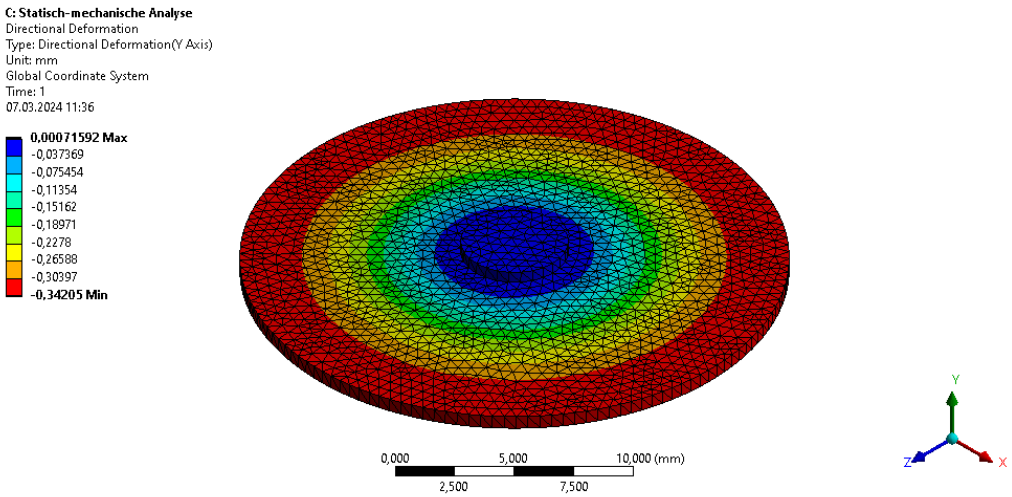


(d) w=40 mm, t_w=5 mm.

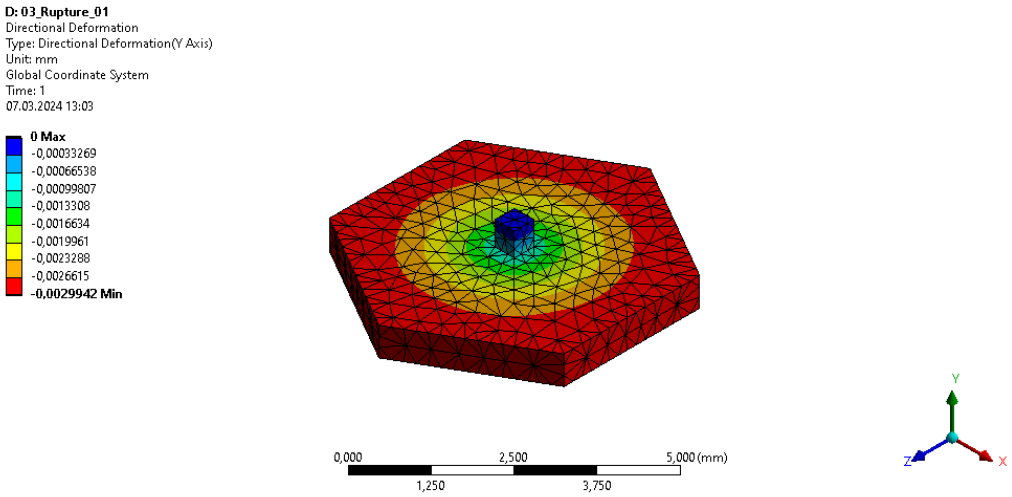
Figure S1. FEA results of empty and fin-equipped modules t_w=1 mm, l=60 mm. (cont.)



(a) t_p=4 mm, a=20 mm.

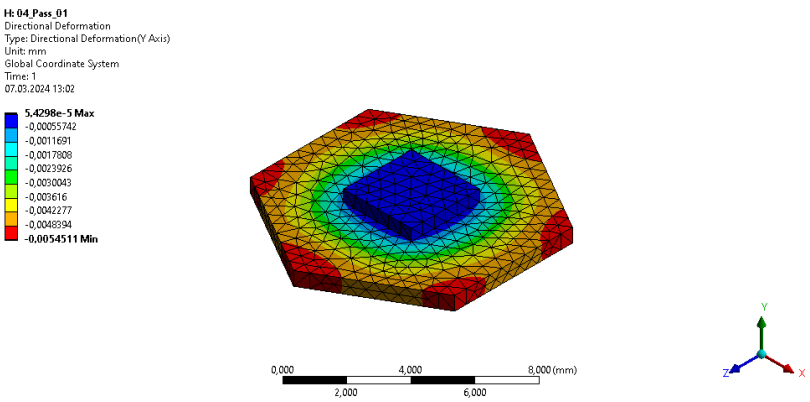


(b) d_i=4.514 mm, d_o=21 mm.



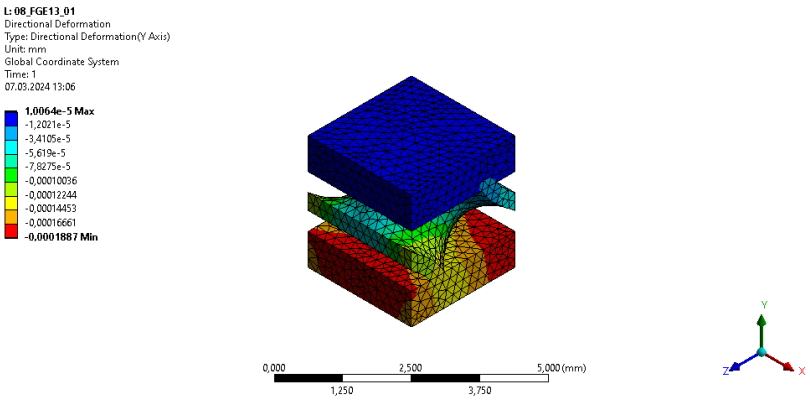
(c) $_\mathrm{p}$=0.42 mm, a=5 mm, φ=0.0081.

Figure S2. FEA results of pin-equipped modules t_w=0.6 mm.

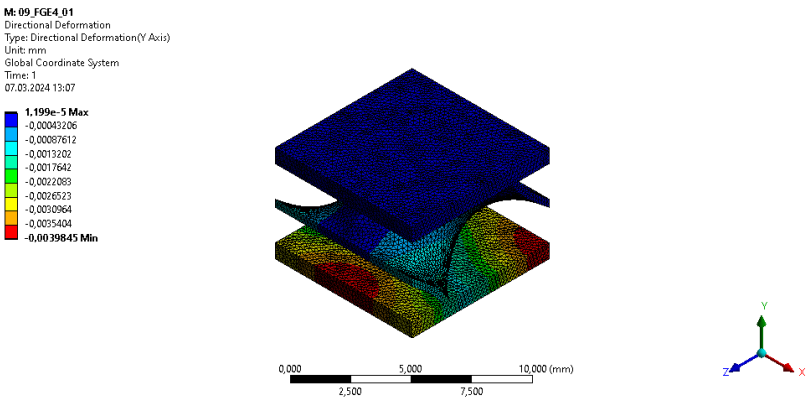


(d) $_{\mathrm{p}}$=3 mm, a=9 mm.

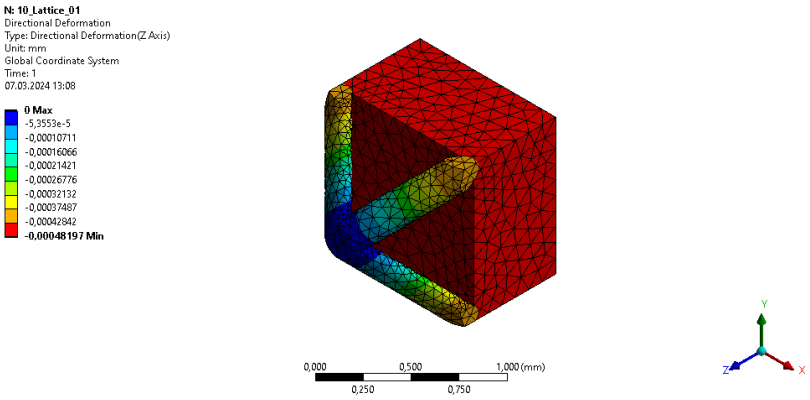
Figure S2. FEA results of pin-equipped modules. (cont.)



(a) d_{FGE}=1.333 mm.



(b) d_{FGE}=4 mm.



(c) d_{strut}=0.2 mm.

Figure S3. FEA results of FGE-equipped (t_{w}=0.8 mm, t_{FGE}=0.4 mm) and lattice-equipped (t_{w}=0.6 mm) modules.

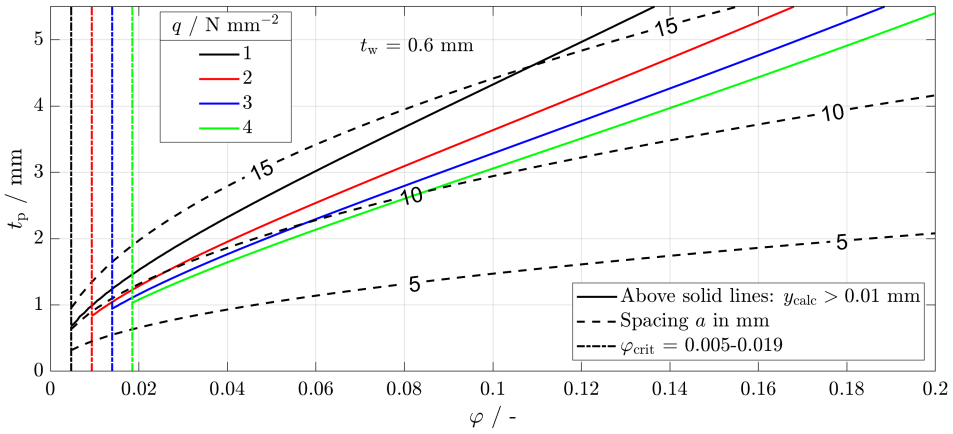


Figure S4. Calculated stability criterion for various loads at constant thickness.

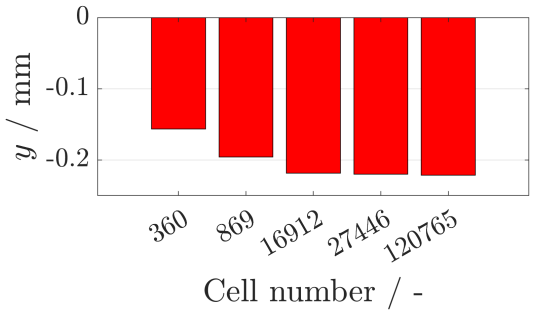


Figure S5. Results of mesh independence study with element size from t = 2, 1, 0.5, 0.2, to 0.1 mm.

Author Contributions: Conceptualization, D.F.M., C.K. and R.D.; methodology, D.F.M.; software, D.F.M.; validation, D.F.M.; formal analysis, D.F.M.; investigation, D.F.M.; resources, C.K. and R.D.; data curation, D.F.M.; writing—original draft preparation, D.F.M.; writing—review and editing, D.F.M., C.K. and R.D.; visualization, D.F.M. and C.K.; supervision, C.K. and R.D.; project administration, C.K. and R.D.; funding acquisition, R.D. All authors have read and agreed to the published version of the manuscript

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Data Availability Statement: Data can be made available upon request.

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Conflicts of Interest: The authors declare no conflicts of interest.

Abbreviations

The following abbreviations are used in this manuscript:

Symbol	Meaning	Unit
	Latin Symbols	
d_{FGE}	Depth of fluid guiding element	mm
d_{strut}	Diameter of strut	mm
t	Dimension	mm
t_{w}	Wall thickness	mm
	Greek Symbols	
δ	Angle of inclination of parabola	°
ϕ	Volume fraction	
	Indices	
e	Empty	
l	Lattice	
p	Pins	