

Background

Orbital ATK in Goleta is an industry leader in deployable space systems, including spring-loaded solar panel arrays. These solar arrays are designed for zero gravity in space, yet they must be tested here on earth. AutoTrack's Offloader is designed to support the weight of a solar panel while testing.

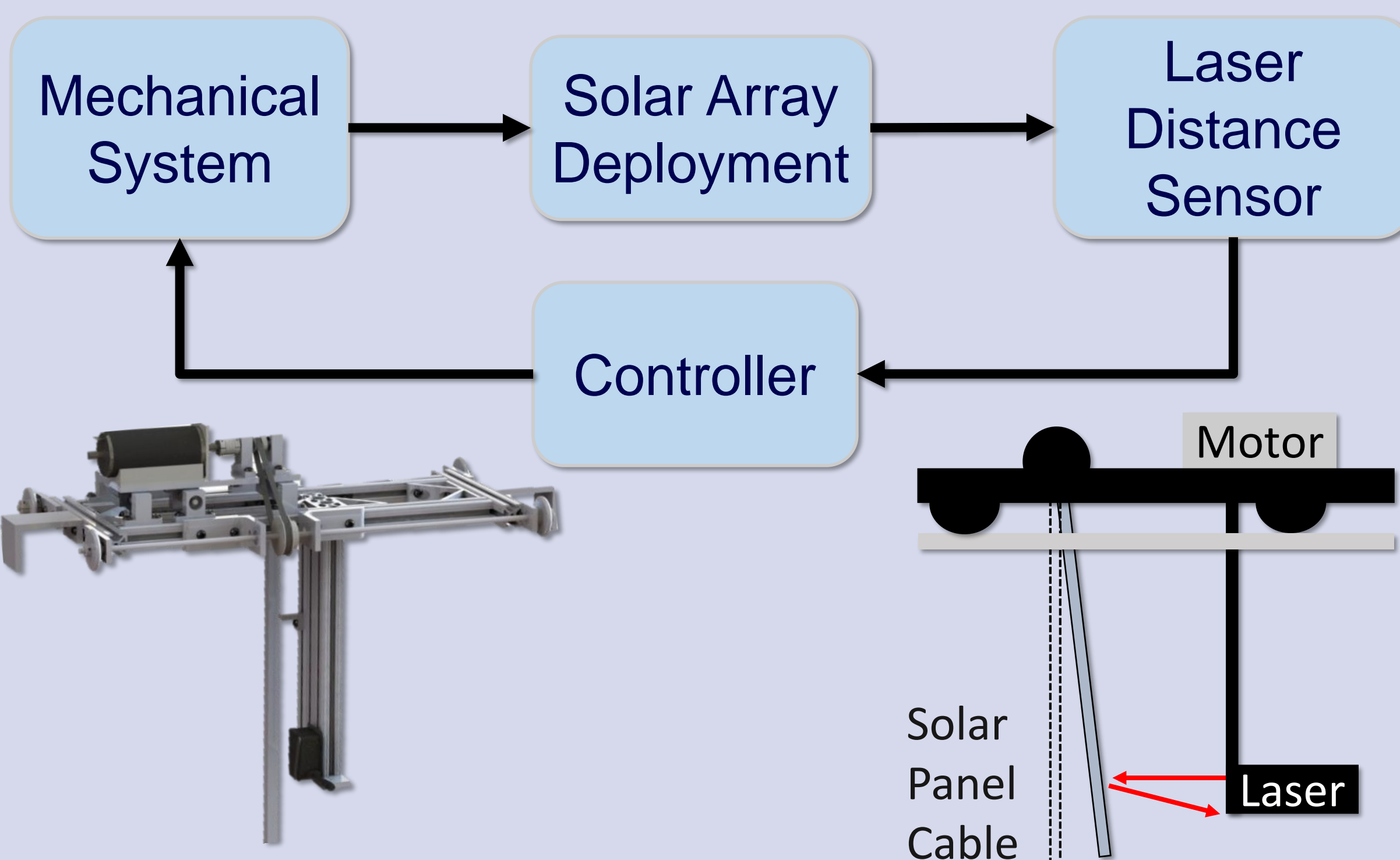


Design Specifications

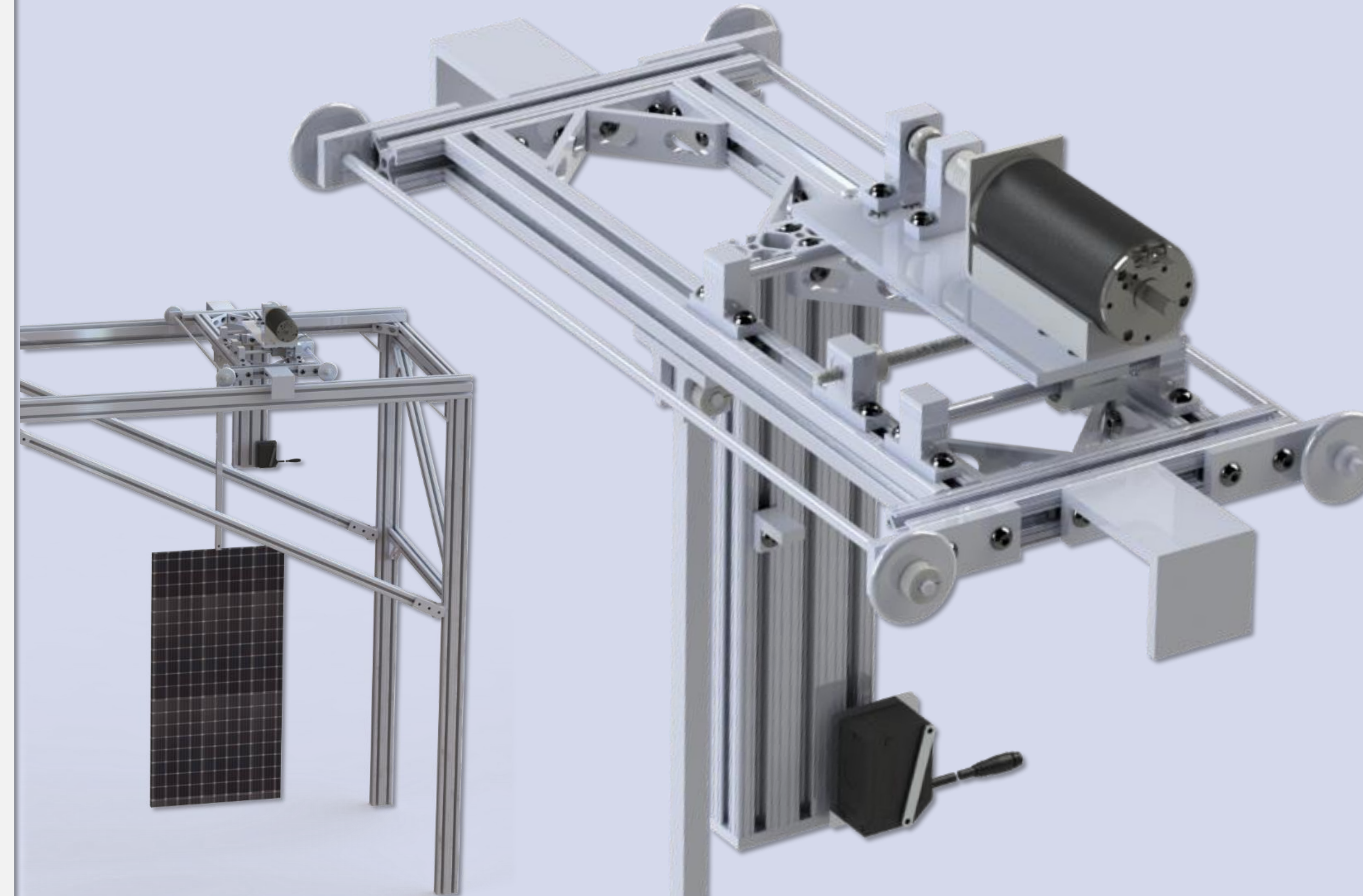
	Load Capacity	$F^* = F_{Applied} / W_{Panel}$	Thermal Feasibility
Required	10lb	0.0014	-60°C Feasibility
Reach	25lb	0.0005	-60°C Actual
AutoTrack	55lb	0.00021	-60°C Feasibility

F^* is the nondimensional force metric where $F_{Applied}$ is the lateral force of the cart on the solar panel and W_{Panel} is the solar array weight.

Functional Flow Diagram



AutoTrack Offloader



Key Components



Keyence IL - 065 w/ Amplifier

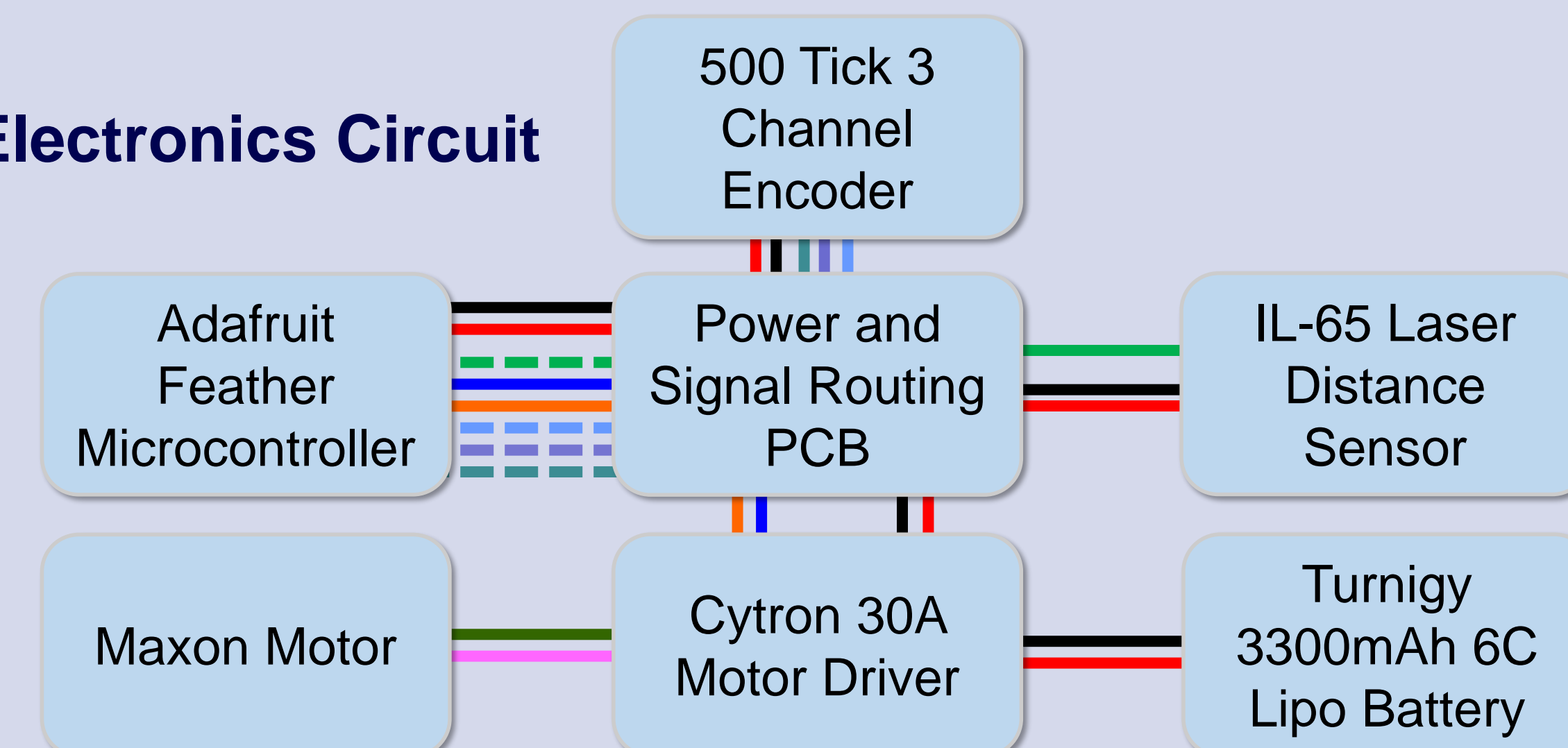
- Distance sensor
- Samples every 0.33 ms
- 2 μ m repeatability



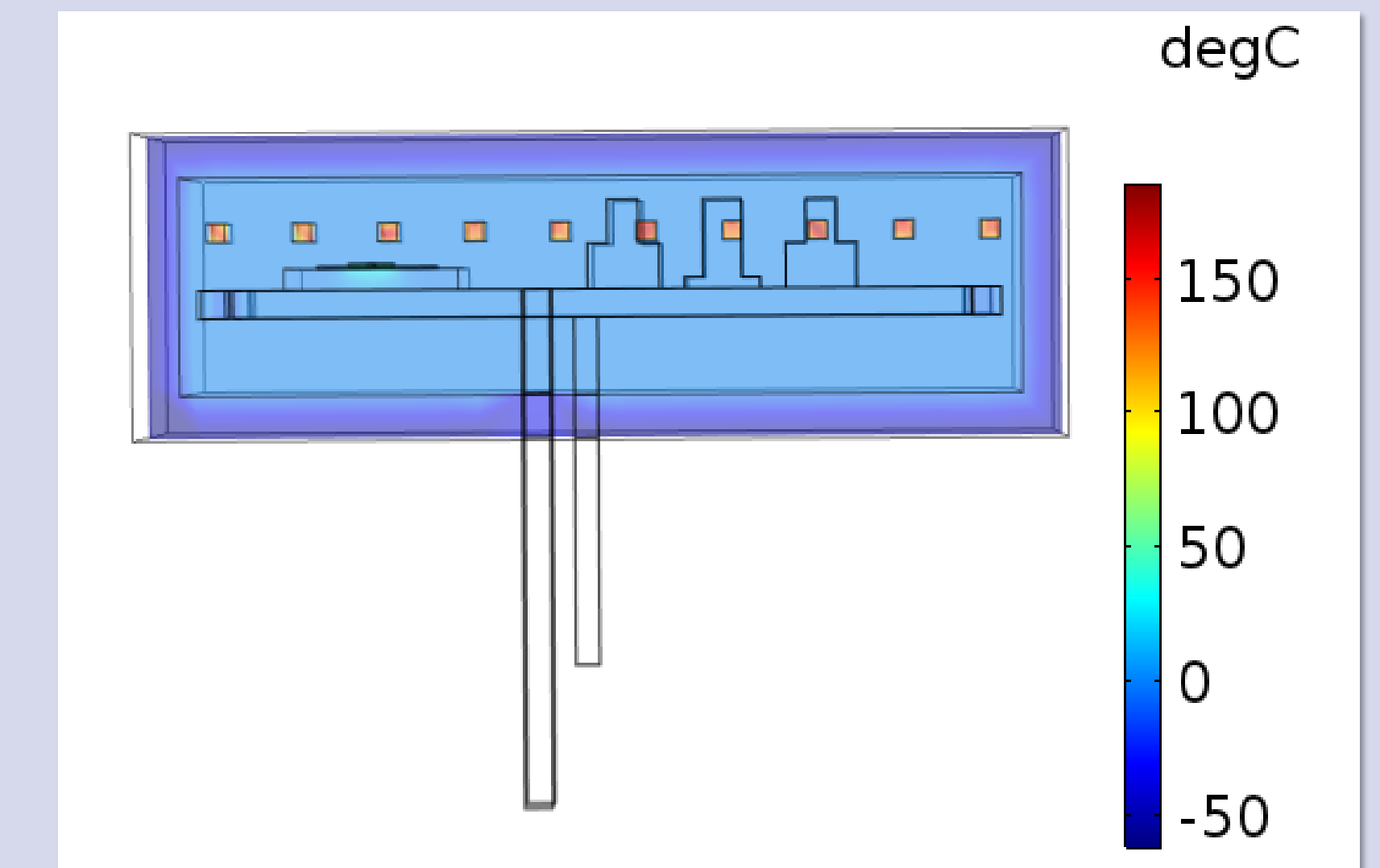
Maxon RE 50 Motor

- Brushed DC motor for easy controls
- Encoder attached for fail safe

Electronics Circuit

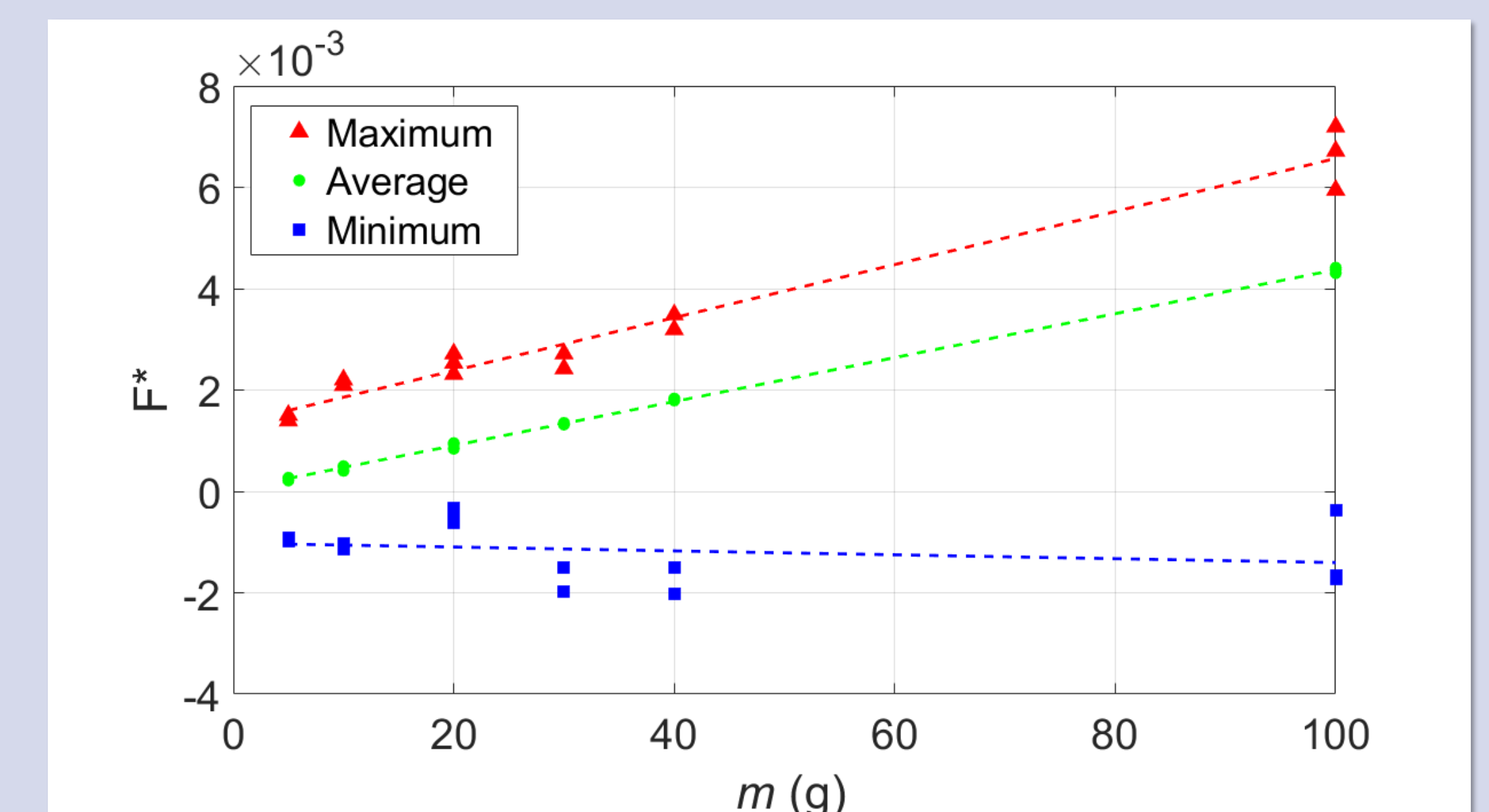


Thermal Simulation



- Thermal analysis in COMSOL supports the feasibility of the AutoTrack Offloader to perform in -60°C
- Requires 80W of power to heat the cart to operate at 0°C

Deployment Test



- F^* increases linearly as deploying force increases
- Max $F^* = 0.0072$, Min $F^* = 0.00021$

Conclusions

- System performance limited by quantization error from electronics
- AutoTrack's Offloader performed at best, 6.7x better than the current solution at Orbital ATK in terms of force applied on the panel from the cart

Acknowledgements:

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