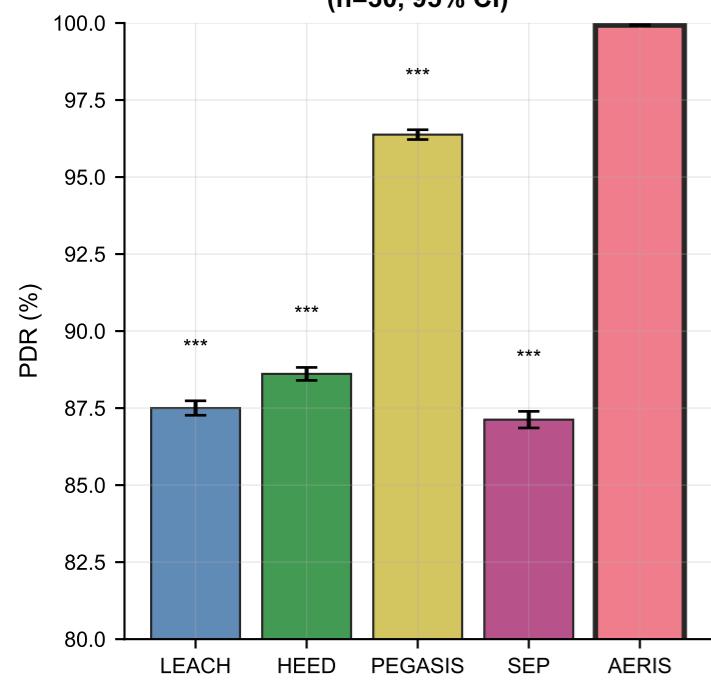
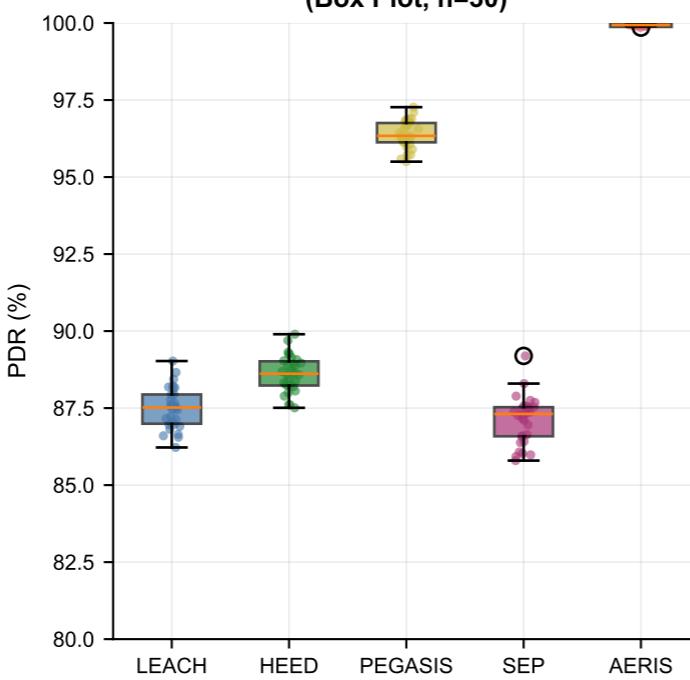


**AERIS: SOTA Protocol Comparison with Rigorous Statistical Testing**  
 (Same geometry/energy model; AERIS includes full reliability stack, n=30 runs each)

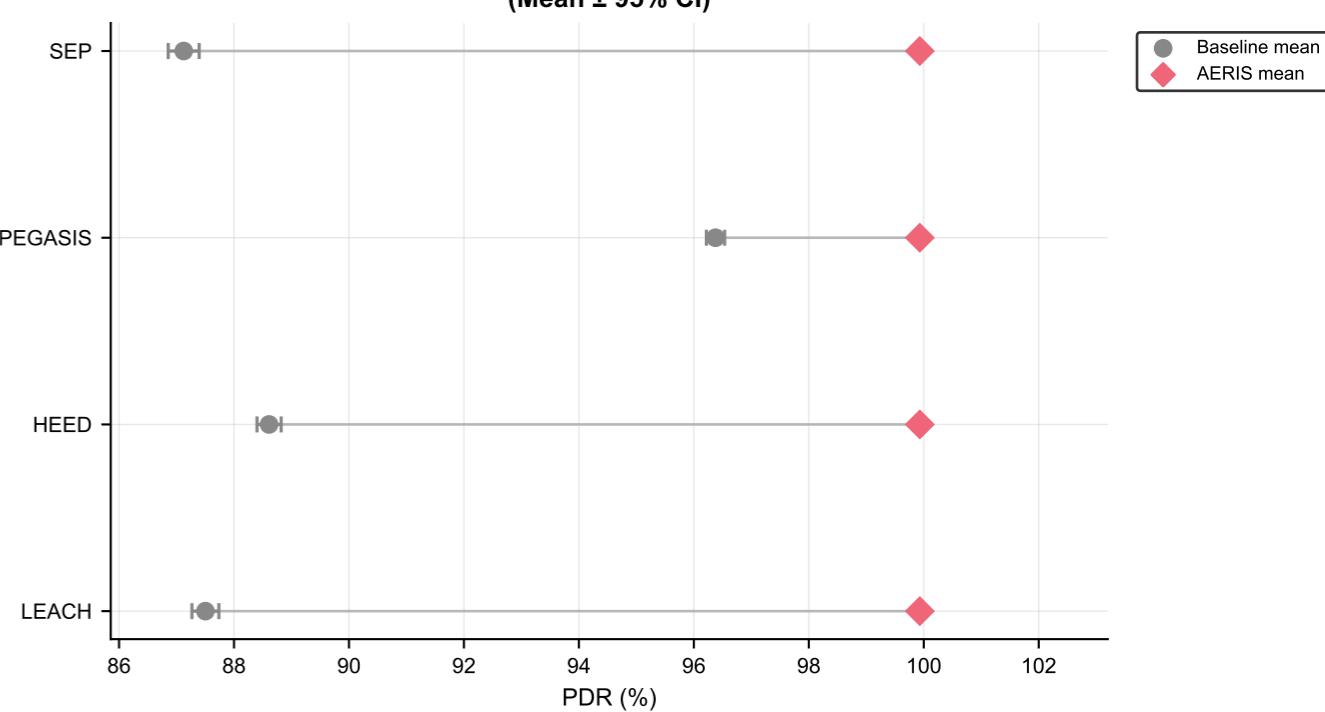
**(a) Protocol PDR Comparison**  
 (n=30, 95% CI)



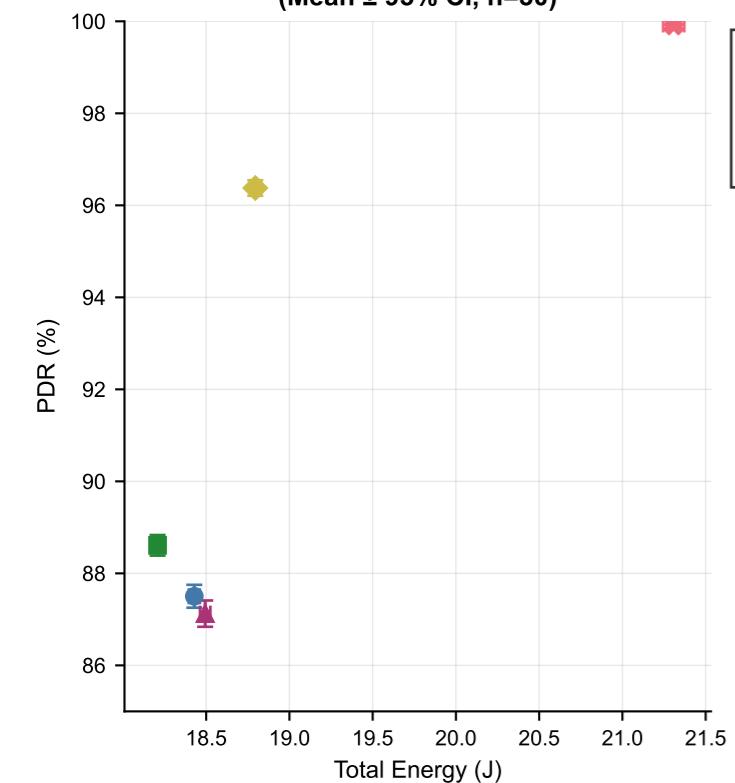
**(b) PDR Distribution**  
 (Box Plot, n=30)



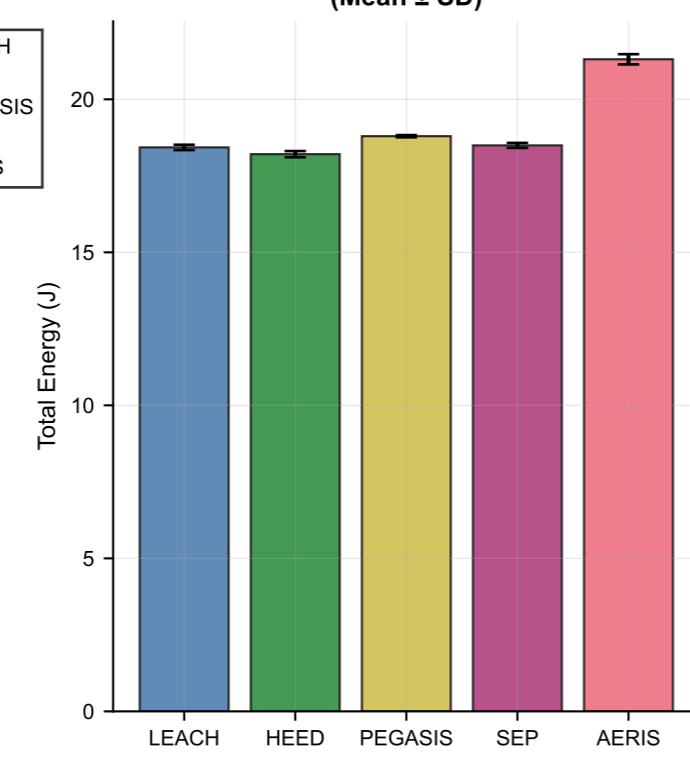
**(c) AERIS vs Baselines**  
 (Mean  $\pm$  95% CI)



**(d) PDR–Energy Trade-off**  
 (Mean  $\pm$  95% CI, n=30)



**(e) Energy Consumption**  
 (Mean  $\pm$  SD)



**(f) Statistical Validation Summary**  
 (Shapiro-Wilk  $\rightarrow$  Levene  $\rightarrow$  t-test)

Baseline	Test	p	$\Delta$ PDR (pp)	Direction
LEACH	Welch's t-test	1.0e-38	12.43	AERIS higher
HEED	Welch's t-test	6.2e-39	11.32	AERIS higher
PEGASIS	Welch's t-test	5.6e-28	3.55	AERIS higher
SEP	Welch's t-test	2.5e-37	12.81	AERIS higher