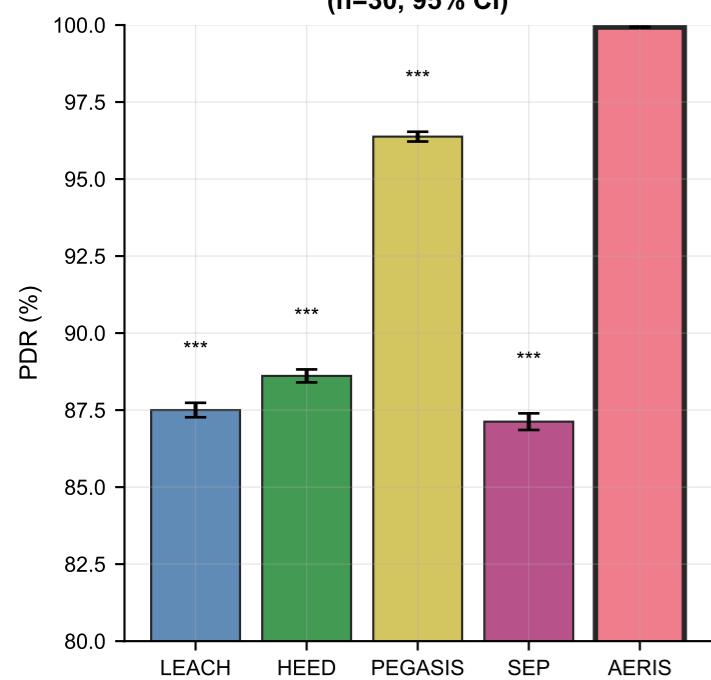
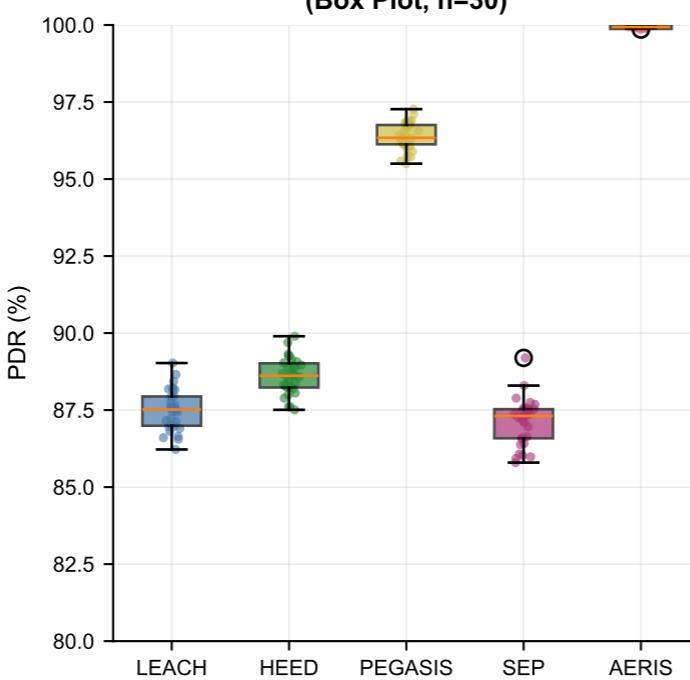


AERIS: SOTA Protocol Comparison with Rigorous Statistical Testing
 (Same geometry/energy model; AERIS includes full reliability stack, n=30 runs each)

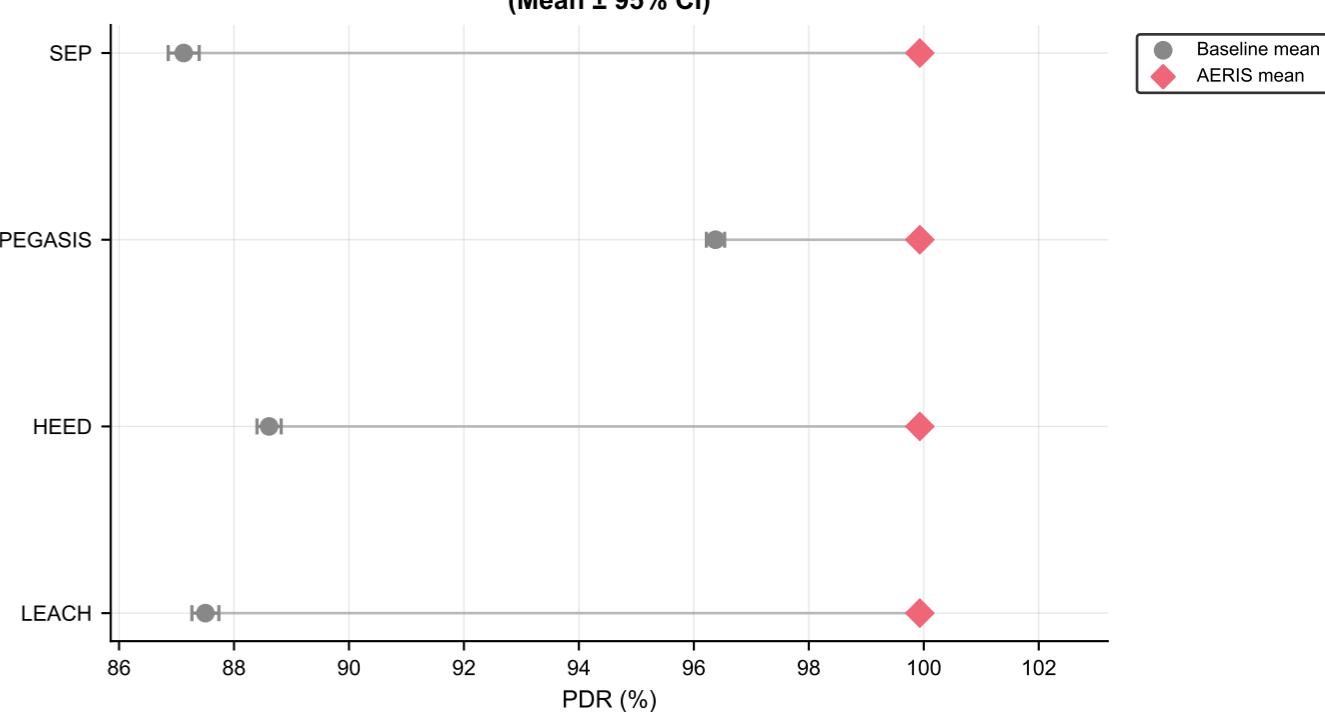
**(a) Protocol PDR Comparison
(n=30, 95% CI)**



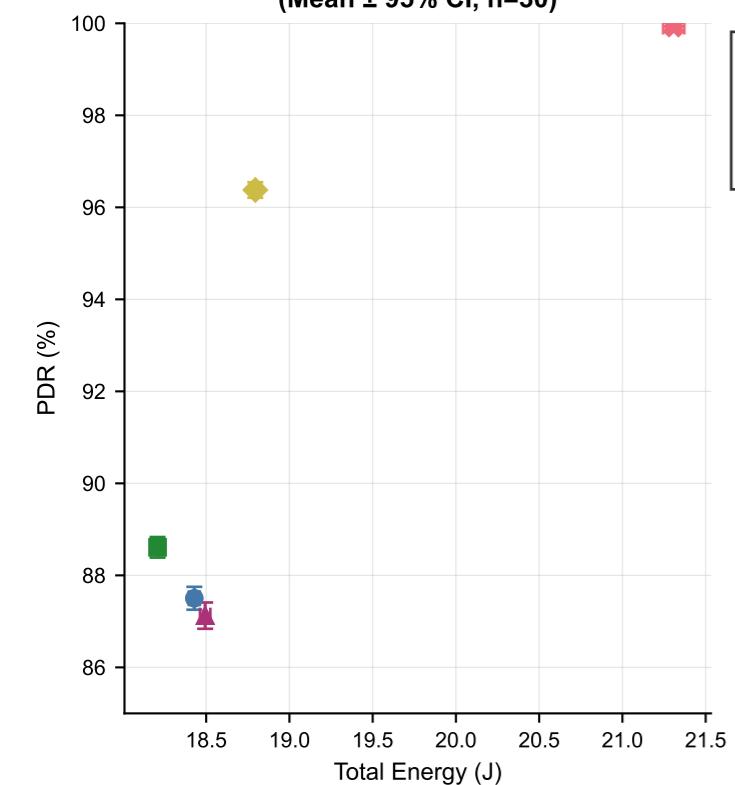
**(b) PDR Distribution
(Box Plot, n=30)**



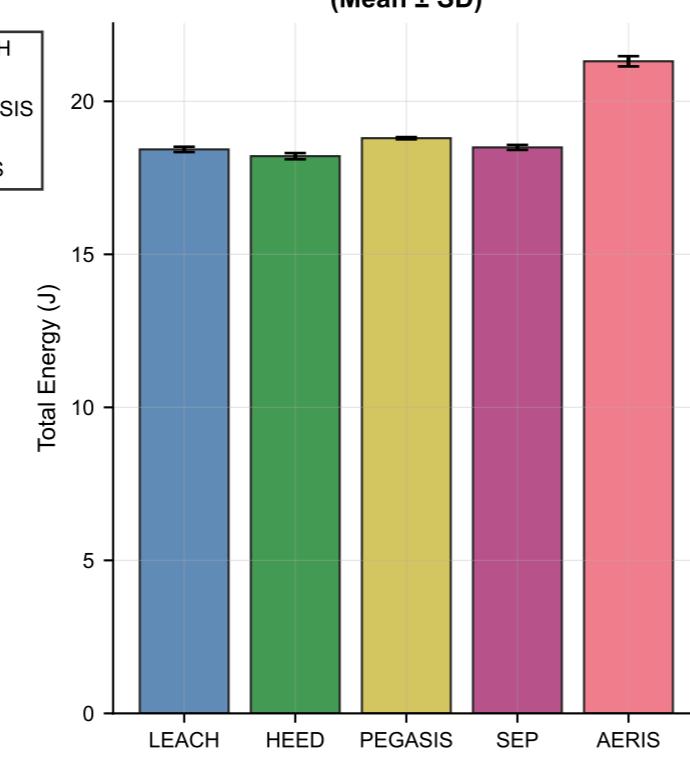
**(c) AERIS vs Baselines
(Mean ± 95% CI)**



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



**(e) Energy Consumption
(Mean ± SD)**



**(f) Statistical Validation Summary
(Shapiro-Wilk → Levene → t-test)**

| Baseline | Test | p | ΔPDR (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 |