

NIST STS Entropy Scorecard

STS SP 800-22 • $\alpha = 0.01$ • 200 sequences × 1,000,000 bits • Binary mode
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PASS
Winner: **QSE**

Headline Verdict: Both sources pass NIST STS; QSE shows slightly stronger margins across tests.

QSE OVERALL

PASS
Passed Tests: 188/188

SYSTEM OVERALL

PASS
Passed Tests: 188/188

WINS BY TEST

9 QSE • 6 System
0 ties

Key Risk / Weakest Tests

| Source | Weakest Test | Pass Rate | Uniformity p-value | Threshold Margin |
|--------|-------------------------|------------------|--------------------|------------------|
| QSE | RandomExcursions | 114/118 (96.61%) | 0.021594 | 2 |
| System | RandomExcursionsVariant | 126/130 (96.92%) | 0.416251 | 3 |

Note: STS evaluates statistical randomness. It does not alone certify cryptographic strength or "quantum resilience."

Per-Test Comparison (All Tests)

| Test | QSE Pass Rate | QSE p-value | System Pass Rate | System p-value | Winner |
|--------------------|-------------------|-------------|-------------------|----------------|--------|
| ApproximateEntropy | 199/200 (99.50%) | 0.149495 | 198/200 (99.00%) | 0.062821 | QSE |
| BlockFrequency | 197/200 (98.50%) | 0.616305 | 197/200 (98.50%) | 0.262249 | QSE |
| CumulativeSums | 200/200 (100.00%) | 0.689019 | 199/200 (99.50%) | 0.605916 | QSE |
| FFT | 197/200 (98.50%) | 0.971699 | 198/200 (99.00%) | 0.64753 | System |
| Frequency | 198/200 (99.00%) | 0.133404 | 200/200 (100.00%) | 0.955835 | System |
| LinearComplexity | 196/200 (98.00%) | 0.437274 | 198/200 (99.00%) | 0.657933 | System |

| | | | | | |
|-------------------------|----------------------|----------|----------------------|----------|--------|
| LongestRun | 199/200 (99.50%) | 0.289667 | 200/200 (100.00%) | 0.689019 | System |
| NonOverlappingTemplate | 199/200 (99.50%) | 0.983453 | 199/200 (99.50%) | 0.064822 | QSE |
| OverlappingTemplate | 195/200 (97.50%) | 0.057146 | 197/200 (98.50%) | 0.319084 | System |
| RandomExcursions | 117/118 (99.15%) | 0.257477 | 128/130 (98.46%) | 0.028669 | QSE |
| RandomExcursionsVariant | 117/118 (99.15%) | 0.534146 | 127/130 (97.69%) | 0.430204 | QSE |
| Rank | 199/200 (99.50%) | 0.699313 | 197/200 (98.50%) | 0.410055 | QSE |
| Runs | 200/200 (100.00%) | 0.102526 | 199/200 (99.50%) | 0.050305 | QSE |
| Serial | 198/200 (99.00%) | 0.366918 | 199/200 (99.50%) | 0.504219 | System |
| Universal | 200/200 (100.00%) | 0.626709 | 197/200 (98.50%) | 0.859637 | QSE |

Recommended Next Steps

- Run multiple independent batches (e.g., 5 runs) with newly generated data for both sources.
- Increase sequences to 200–300 per run for stronger statistical confidence.
- Track stability: count how often any test hits minimum thresholds across runs.
- Archive all STS reports and parameters for auditability.

— End of Report —