✓ LIKELY TRULY RANDOM — All Statistical Guardrails Passed

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TOTAL BYTES **1.000.000** Evaluated stream size	SHANNON ENTROPY (H) PASS **7.999821 b/B** Ideal = 8.000000 bits/byte	MIN-ENTROPY (H∞) PASS **7.942174 b/B** Worst-case unpredictability (≥ 7.0)
OPTIMUM COMPRESSION PASS **0.00%** Ideal = 0.00% size reduction	CHI-SQUARE (X^2) PASS **247.70** Degrees of freedom df = 255	EXCEED PROBABILITY PASS **0.62%** pochisq tail probability % (Ideal = 50%)
ARITHMETIC MEAN PASS **127.5783** Ideal random center = 127.5000	MONOBIT BALANCE PASS **p = 0.771882** Bit balance ratio (p-value ≥ 0.01)	RUNS OSCILLATIONS PASS **p = 0.943042** Bit transitions test (p-value ≥ 0.01)
POKER TEST (4-BIT) PASS **χ² = 11.85** 16-pattern uniformity (df = 15)	MONTE CARLO PI PASS **3.1386846** Ideal = 3.14159265 (err: 0.0926%)	SERIAL CORRELATION PASS **0.000936** Totally uncorrelated = 0.000000

BSI AIS 20 / AIS 31 Physical TRNG Suite

Active: 6 / 9 | Passed: 6 | Failed: 0

ID	Test Name	Theoretical Ideal	Statistic	p-value	Status
T0	Test T0: Disjointness	0 duplicate words	N/A	N/A	NOT IMPLEMENTED
T1	Test T1: Monobit	9,654 < count < 10,346	0.2899	0.7719	PASS
T2	Test T2: Poker Test	χ² < 46.17 (df = 15)	11.8535	0.6901	PASS
T3	Test T3: Runs	Runs within bounds (len 1-6)	4000101.0000	0.9430	PASS
T4	Test T4: Long Runs	Max run length < 34 bits	2.0975	0.8355	PASS
T5	Test T5: Autocorrelation	|Z_τ| < 3.00 (τ = 1..16)	0.0009	0.9813	PASS
T6	Test T6: Uniform Distribution	Uniform bit transitions	N/A	N/A	NOT IMPLEMENTED
T7	Test T7: Comparative Test	Homogeneity p ≥ 0.01	N/A	N/A	NOT IMPLEMENTED
T8	Test T8: Shannon Entropy	H ≥ 7.976 bits/byte	7.9998	1.0000	PASS