

Final Metrics Summary - BB84 Quantum Encryption System

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1. Quantum Key Distribution (BB84) Summary

Metric	AES-GCM	ChaCha20
Key A Length	104	120
Key B Length	103	117
Key B (1s count)	46	48
Key B (0s count)	57	69
A/B Match %	100.0	100.0
Error Rate	0.0	0.0
Shannon Entropy	0.9904	0.971
Key Confirmation	Passed	Passed

2. Encryption Performance Summary

Metric	AES-GCM	ChaCha20
Timestamp	2025-12-09 21:30:21.360499	2025-12-09 21:31:43.758058
Encryption Time (s)	0.7901	0.7047
Original File Size (bytes)	37730	37730
Encrypted File Size (bytes)	76896	76897
SHA-256 Hash	045b2a2ae9268f01a74c...	ed1252d9338ed2221e83...
Post-Quantum Signature	Enabled	Enabled

Interpretation:

- + ChaCha20 was 10.8% faster than AES-GCM in encryption
- + Both produced similar encrypted file sizes
- + Post-quantum Dilithium5 signatures protect against quantum attacks

3. Decryption Performance Summary

Metric	AES-GCM	ChaCha20
Timestamp	2025-12-09 21:31:00.789941	2025-12-09 21:32:18.339835
Decryption Time (s)	0.0724	0.0909
AEAD Authentication	Passed	Passed
Decrypted File Size (bytes)	37730	37730
SHA-256 Hash	32780b3fca0ec880d2a2...	32780b3fca0ec880d2a2...

Interpretation:

- + VERIFICATION PASSED: Both ciphers decrypted to identical files
- + AES-GCM was 20.4% faster than ChaCha20 in decryption

- + AEAD authentication prevents tampering and ensures data integrity
- + Both ciphers provide equivalent 256-bit security strength