

Final Metrics Summary - BB84 Quantum Encryption System

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1. Quantum Key Distribution (BB84) Summary

Metric	AES-GCM	ChaCha20
Key A Length	96	112
Key B Length	95	112
Key B (1s count)	47	52
Key B (0s count)	48	60
A/B Match %	100.0	100.0
Error Rate	0.0	0.0
Shannon Entropy	0.9997	0.9963
Key Confirmation	Passed	Passed

2. Encryption Performance Summary

Metric	AES-GCM	ChaCha20
Timestamp	2025-12-09 22:26:08.293253	2025-12-09 22:26:34.469405
Encryption Time (s)	0.6892	0.6213
Original File Size (bytes)	1245	1245
Encrypted File Size (bytes)	12034	12035
SHA-256 Hash	368d1dc1bb9e1b3650df...	ce1513b005954b167477...
Post-Quantum Signature	Enabled	Enabled

Interpretation:

- + ChaCha20 was 9.9% 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 22:27:02.517246	2025-12-09 22:27:31.770854
Decryption Time (s)	0.0686	0.0868
AEAD Authentication	Passed	Passed
Decrypted File Size (bytes)	1245	1245
SHA-256 Hash	bac0040822321c109d43...	bac0040822321c109d43...

Interpretation:

- + VERIFICATION PASSED: Both ciphers decrypted to identical files
- + AES-GCM was 21.0% faster than ChaCha20 in decryption

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