Final Metrics Summary - BB84 Quantum Encryption System

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1. Quantum Key Distribution (BB84) Summary

Metric	AES-GCM	ChaCha20
Key A Length	120	104
Key B Length	117	103
Key B (1s count)	65	52
Key B (0s count)	52	51
A/B Match %	100.0	100.0
Error Rate	0.0	0.0
Shannon Entropy	0.995	1.0
Key Confirmation	Passed	Passed

2. Encryption Performance Summary

Metric	AES-GCM	ChaCha20
Timestamp	2025-12-10 20:44:33.176597	2025-12-10 20:45:06.012315
Encryption Time (s)	7.2426	6.4759
Original File Size (bytes)	3736835	3736835
Encrypted File Size (bytes)	6653070	6653071
SHA-256 Hash	786cbcb6e74cf360fece...	e118c68c95b5061c4f03...
Post-Quantum Signature	Enabled	Enabled

Interpretation:

+ ChaCha20 was 10.6% 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	2025-12-10 20:46:07.020327	2025-12-10 20:45:41.549077
Decryption Time (s)	0.3089	0.2664
AEAD Authentication	Passed	Passed
Decrypted File Size (bytes)	3736835	3736835
SHA-256 Hash	874f3165663e8f3ee964...	874f3165663e8f3ee964...

Interpretation:

+ VERIFICATION PASSED: Both ciphers decrypted to identical files

+ ChaCha20 was 13.8% faster than AES-GCM in decryption

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