

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	112
Key B Length	113	111
Key B (1s count)	41	60
Key B (0s count)	72	51
A/B Match %	100.0	100.0
Error Rate	0.0	0.0
Shannon Entropy	0.9264	0.9963
Key Confirmation	Passed	Passed

2. Encryption Performance Summary

Metric	AES-GCM	ChaCha20
Timestamp	2025-12-09 21:48:44.175737	2025-12-09 21:50:00.363186
Encryption Time (s)	9.6531	8.8268
Original File Size (bytes)	5292044	5292044
Encrypted File Size (bytes)	9417899	9417900
SHA-256 Hash	4d4860da054ee1107553...	39d8f7144cdc25c4a08c...
Post-Quantum Signature	Enabled	Enabled

Interpretation:

- + ChaCha20 was 8.6% 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	2025-12-09 21:49:20.649545	2025-12-09 21:50:45.228385
Decryption Time (s)	0.3507	0.2943
AEAD Authentication	Passed	Passed
Decrypted File Size (bytes)	5292044	5292044
SHA-256 Hash	4ddea4df13ee6c45f1a6...	4ddea4df13ee6c45f1a6...

Interpretation:

- + VERIFICATION PASSED: Both ciphers decrypted to identical files
- + ChaCha20 was 16.1% faster than AES-GCM in decryption

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