ABE-Based Quantum Threats and Cybersecurity Implications

This report provides a high-level technical analysis of how Aharonov–Bohm Effect (ABE)-based systems could present cybersecurity threats to quantum infrastructure, communications, and even biological systems. It is intended for cybersecurity researchers, quantum engineers, and national security analysts.

1. ABE vs. Quantum Entanglement

ABE leverages gauge potentials to create measurable phase shifts even in field-free regions. This makes it different from quantum entanglement, which relies on nonlocal correlations of multi-particle wavefunctions. Both are non-classical phenomena and can be used to encode phase information, but ABE is deterministic and potentially more robust to decoherence, making it a candidate for covert communication or interference with quantum systems.

2. Threats to Quantum Systems

- **Decoherence Injection:** Carefully structured vector potentials could accelerate decoherence in superconducting qubits, trapped-ion systems, or spin qubits, effectively functioning as a denial-of-service attack against quantum computers. - **Phase Manipulation:** Adversaries could bias measurement statistics in QKD systems by applying covert phase offsets. - **Covert Side-Channels:** Because vector potentials penetrate shielding, attackers could exfiltrate information from quantum laboratories or bypass Faraday cages.

3. Biological & Cognitive Targets

Low-frequency phase-modulated fields could entrain or disrupt brain rhythms, producing measurable cognitive or neurological effects. This raises risks for neurowarfare applications and remote psychological operations. These risks mirror concerns from the "Havana Syndrome" case studies, where external fields were suspected to cause neurological symptoms.

4. Defensive Strategies

- Deploy pseudo-random vector potential noise fields around quantum hardware to decorrelate malicious signals. - Monitor quantum bit error rates (QBER) for anomalous phase drift, which may indicate covert phase injection. - Use magnetometers or SQUID detectors to monitor shielded environments for abnormal potential fluctuations. - For biological systems, use controlled EM noise fields (like Persinger's random phase noise) to block synchronization.

5. Significance of Timing and Acceleration

Accelerating rhythms sweep through multiple natural resonances, maximizing probability of phase capture. 3 ms pulse windows correspond to neuronal phase-reset windows and may represent an optimal temporal "handle" on biological and quantum oscillators.

Conclusion

ABE-based systems represent a dual-use technology: they could underpin covert communications and shielding systems, but they also create new cybersecurity risks for quantum infrastructure and biological targets. The field of "neural and quantum defense" must integrate these insights to develop active countermeasures and monitoring systems for both digital and human systems.