Is Entanglement Signaling Really Impossible?

APS CA SLAC 11-11-11
Jack Sarfatti
adastra1@me.com
ISEP
San Francisco, CA 94133

An overlooked loophole?

- Quantum entanglement cannot be used as a communication channel without an auxiliary light speed limited classical key to unlock the message at the receiver? Hermitian observables guarantee orthogonal sender base states that erase any nonlocal influence of the sender settings on the detection probabilities at the receiver. However, this is no longer true when the entangled whole has different macro-quantum coherent Glauber sender states. Glauber states are non-orthogonal eigenstates of the non-Hermitian photon destruction operator. The Born probability interpretation breaks down because of "phase rigidity" (P.W. Anderson's "More is different"). This is a new regime that is to orthodox quantum theory what general relativity is to special relativity. Antony Valentini has argued that the breakdown of the Born probability rule entails "signal non locality" (aka entanglement signals). The space-time interval between the sending and the receiving irreversible measurements is irrelevant depending only on the free will of the local observers. That is, this is a pre-metrical topological information effect. There is asymmetry between the sending and the receiving. Therefore, there is no ambiguity between active (retro) cause and passive effect.

My 1978 Concept Reborn?

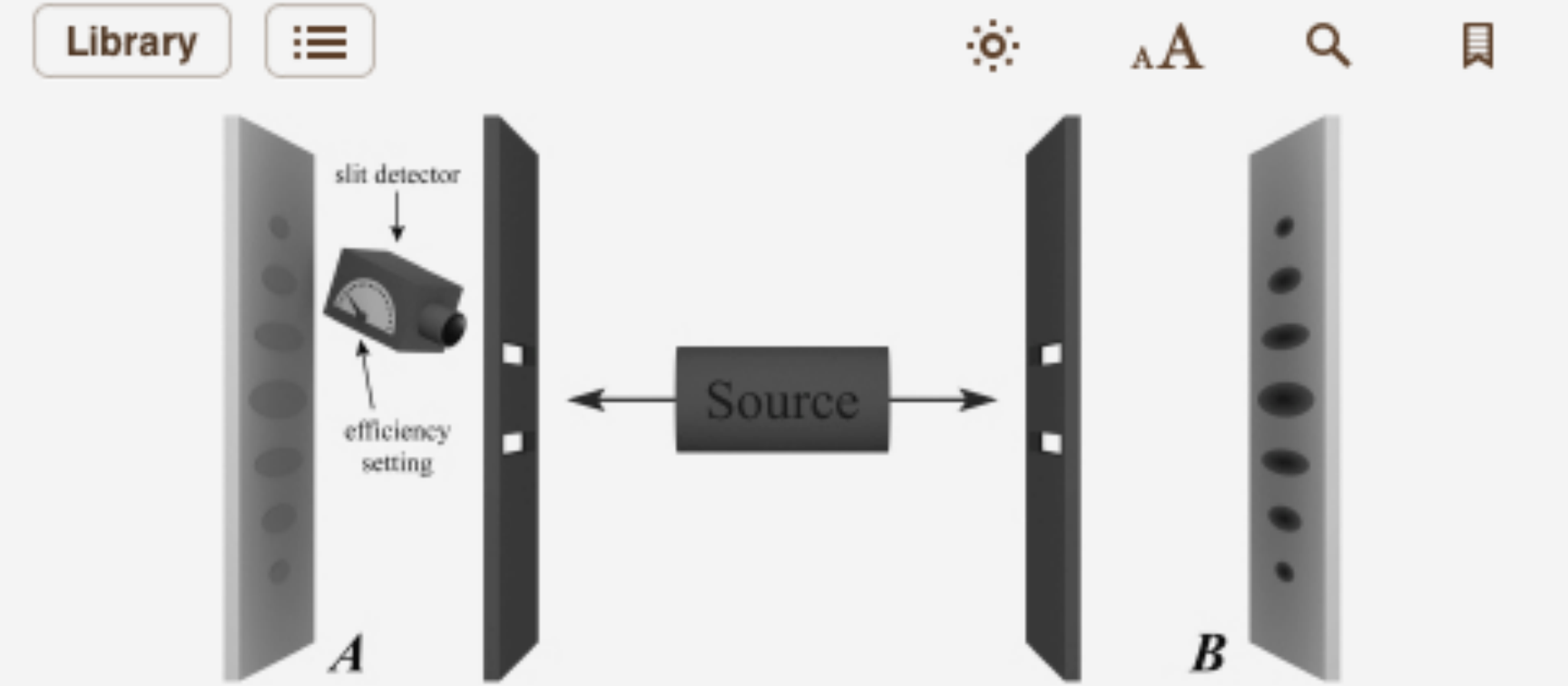

FIGURE 9.1. **Jack Sarfatti's design of a faster-than-light commu-**

Antony Valentini wrote

- *"It is argued that immense physical resources - for nonlocal communication, espionage, and exponentially-fast computation - are hidden from us by quantum noise, and that this noise is not fundamental but merely a property of an equilibrium state in which the universe happens to be at the present time. It is suggested that 'non-quantum' or nonequilibrium matter might exist today in the form of relic particles from the early universe. We describe how such matter could be detected and put to practical use. Nonequilibrium matter could be used to send instantaneous signals, to violate the uncertainty principle, to distinguish non-orthogonal quantum states without disturbing them, to eavesdrop on quantum key distribution, and to outpace quantum computation (solving NP-complete problems in polynomial time)."*
- http://arxiv.org/abs/quant-ph/0203049

Coherent State Sender Entangled With A Single Qubit Receiver

$$|A,B\rangle = \frac{1}{\sqrt{2}}\left(|\alpha\rangle_A|0\rangle_B + |\beta\rangle_A|1\rangle_B\right)$$

$$\langle A,B|B,A\rangle = \frac{1}{2}\begin{pmatrix}\langle\alpha|\alpha\rangle_A\langle 0|0\rangle_B + \langle\beta|\beta\rangle_A\langle 1|1\rangle_B \\ +\langle\alpha|\beta\rangle_A\langle 0|1\rangle_B + \langle\beta|\alpha\rangle_A\langle 1|0\rangle_B\end{pmatrix}$$

$$= \frac{1}{2}\left(\langle\alpha|\alpha\rangle_A + \langle\beta|\beta\rangle_A\right) = 1$$

Nonorthogonal Sender Coherent States Give Signal Nonlocality

$$\langle \alpha | \beta \rangle = e^{-\frac{1}{2}\left(|\alpha|^2 + |\beta|^2 - 2\alpha * \beta\right)} \neq \delta(\alpha - \beta)$$

Entangled Density Matrix

$$\rho_{AB} = |A,B\rangle\langle B,A| = \frac{1}{2}\begin{pmatrix} |\alpha\rangle_A|0\rangle_B\,{}_B\langle 0|\,{}_A\langle\alpha| + |\beta\rangle_A|1\rangle_B\,{}_B\langle 1|\,{}_A\langle\beta| \\ +|\alpha\rangle_A|0\rangle_B\,{}_B\langle 1|\,{}_A\langle\beta| + |\beta\rangle_A|1\rangle_B\,{}_B\langle 0|\,{}_A\langle\alpha| \end{pmatrix}$$

The Nonlocal Entanglement Signal

$$P(1)_B = Tr\left\{ |1\rangle_B \, {}_B\langle 1| \, \rho_{AB} \right\} = \frac{1}{2}\left(1 + \left|\langle \alpha | \beta \rangle\right|_A^2\right)$$

Violation of Born Probability Rule

$$P(0)_B = Tr\left\{|0\rangle_B\ {}_B\langle 0|\,\rho_{AB}\right\} = \frac{1}{2}\left(1+\left|\langle\alpha|\beta\rangle\right|_A^2\right) = P(1)_B$$

$$P(0)_B + P(1)_B = 1+\left|\langle\alpha|\beta\rangle\right|_A^2 > 1$$