

Abstract Submitted  
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**Quantum steering ellipsoids: The way to represent two qubits<sup>1</sup>**

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Imperial College London — A single qubit state is faithfully represented as a vector in the Bloch sphere. A two qubit state may be faithfully represented as two vectors and a quantum steering ellipsoid (QSE) in the Bloch sphere. When Alice and Bob share a pair of qubits, the QSE is the geometric set of states that Bob can steer Alice's qubit to when he implements all possible measurements on his qubit. We argue that the QSE is the way one should visualise a two qubit state and show how the correlative properties of the state manifest themselves in this paradigm, in particular we give simple conditions for when the state is entangled, or has discord. We will also present novel features of the two qubit state that are revealed by the QSE formalism, and show that a state corresponding to an ellipsoid with non-zero volume contains a new type of correlation. Such a state is a useful resource in a game where Bob succeeds if he can steer Alice's qubit to three states with linearly independent Bloch vectors.

<sup>1</sup>EPSRC, Royal Commission for the Exhibition of 1851

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