



Contribution ID: 0

Type: **not specified**

Electric fields and quantum wormholes

Monday, 13 April 2015 09:00 (40 minutes)

A classical Einstein-Rosen bridge changes the topology of spacetime, allowing (for example) electric field lines to penetrate it. It has recently been suggested that in the bulk of a theory of quantum gravity, the quantum entanglement of ordinary perturbative quanta should be viewed as creating a quantum version of an Einstein-Rosen bridge between the quanta, or a “quantum wormhole”. For this “ER=EPR” correspondence to make sense it then seems necessary for a quantum wormhole to allow (for example) electric field lines to penetrate it. I will discuss (within low-energy effective field theory) whether or not this happens.

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Session Classification: Morning session