

SFA

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Lecture I, II: Quantum tests with twisted light.

The orbital angular momentum of light can take on infinitely many different states, representing a far larger "alphabet" to encode information in than e.g. polarisation. Orbital angular momentum states, emitted from a non-linear down-conversion crystal, are entangled due to phase matching in the crystal, and orbital angular momentum is conserved in the down-conversion process. Since 10 years orbital angular momentum entanglement has been studied by a number of groups, with investigations including quantum communication, hyper entanglement and ghost imaging. The high-dimensional entanglement of orbital angular momentum states allows tests of the foundations of quantum mechanics, as expressed by Bell inequalities, the EPR paradox or even more obscure tests.

I will discuss the origin of orbital angular momentum entanglement in down-conversion, introduce various tests and potential applications of entanglement and show how these can be realised in experimental set-ups.