

## **PHORBITECH - A Toolbox for Photon Orbital Angular Momentum Technology**

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Orbital angular momentum (OAM) is a degree of freedom of light associated with rotationally structured transverse spatial modes of light beams, as in helical wave-front beams. In many respects OAM is analogous to polarization, but in contrast to polarization it is defined in an unbounded infinite-dimensional space. This may allow for the encoding of a much larger amount of information in a single photon than in the case of polarization, a feature that offers very interesting prospects for applications in photonics and, in particular, in the fields of quantum communication and computation, optical data storage and materials probing.

The objective of this proposal is the development of a "toolbox" of highly innovative optical components and devices for the full control of OAM, including its generation, manipulation, transmission and detection. These proposed components are based on entirely new designs and ideas and/or on the novel combination of recently proposed new concepts. The toolbox as a whole will provide a dramatic breakthrough in our capability of controlling the OAM of light and exploiting it in photonic applications and in new scientific investigations.

The proposal vision is to make the OAM generation, manipulation, transmission and detection as easy and commonplace as currently is the management of the polarization degree of freedom of light, for future applications in quantum information technology, high density optical data storage, and materials probing.

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