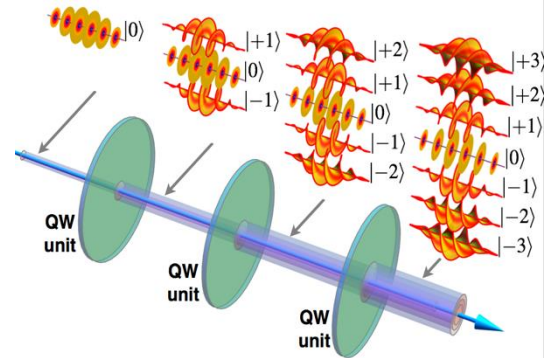


Implementing quantum computations with structured photons Ebrahim Karimi

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Structured light, possessing a complex amplitude, phase and polarisation distribution, invokes interesting fundamental properties that enable novel applications in classical and quantum optical experiments. They are highly advantageous to encode more information per single carrier as physical realizations of high-dimensional states. In the quantum regime, structured photons are robust against imperfections during generation, detection and transmission. Therefore, they may provide the technical infrastructure for the generation of ultra-secure and super-dense quantum communications.

In my speech, I will present the recent progress, challenges and development in performing high-dimensional quantum key distribution as well as our recent achievements in simulating quantum computations with structured photons.



Schematic of quantum walk (QW) with photonic spin and orbital angular momentum.

Bibliography of Prof. Ebrahim Karimi

Professor Ebrahim Karimi received his diploma in Mathematics and Physics from Eghbal Lahori (Saghez, Iran) in 1997. He fell in love with physics and mathematics as a high school student while attending several national physics conferences. He received a B. Sc. in Physics with emphasis in mathematics from Kerman University in 2001. He joined the mathematical physics group in IASBS for graduate studies and was ranked 18th among all incoming students. He later changed his research focus and graduated under the supervision of Prof. Arashmid Nahal “Laser Cooling and Trapping of Natural Atoms” in 2002; Prof. Yousuf Sobouti was his graduate advisor. In 2009, he received a Ph.D. degree from the University of Naples “Federico II”, under supervision of Prof. Lorenzo Marrucci and Prof. Enrico Santamato. He received the best Ph.D. thesis award for his thesis titled “Light orbital angular momentum and its application on the classical and quantum information”. After his Ph.D., he worked as a postdoctoral fellow under Phorbitech FET project (led by Prof. Lorenzo Marrucci), and in Prof. Robert Boyd’s Quantum Optics group. Prof. Ebrahim Karimi is currently holding the Canada Research Chair in the field of Structured Light, and is the group leader of Structured Quantum Optics (SQO) at the University of Ottawa. Applications of structured quantum waves (light and particles) in modern science are the main subject of his research team.