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## Polarization Encoded QKD in Fibre

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Quantum Key Distribution employs the laws of quantum mechanics for the purpose of cryptography. Two parties, called Alice and Bob, are able to create a random key which is used to encrypt a message. QKD is a provably secure method for cryptography because any eavesdropper attempting to anonymously retrieve the key must make measurements, thereby disturbing the system. Using this principle, a high error rate between the two authenticated parties indicates a compromise in the system and the process by which the key is shared is aborted. The quantum channel can be implemented using a free-space link between Alice and Bob, but in many instances, this is not practical for implementations. Fibre optic cables provide an alternative with current technology. In order to implement protocols such as the BB84 protocol, the state of polarization of photons must be maintained between Alice and Bob. This is because the BB84 protocol utilizes the states of polarization of photons as qubits (quantum bits). However, the polarization of light is altered when passed through a fibre. This is due to impurities in the fibre, manufacturing errors or environmental stresses such as heating or movement. This causes refractive differences between polarized states which change the state of polarization. This property is called birefringence. Polarization mode dispersion allows for the state of polarization to be corrected when a photon is transmitted through fibre. If the fibre is fixed, the environmental stresses result in a unique and constant change of polarization [4]. This can be compensated for by rotating each photon appropriately before being measured and each length of fibre will require its own unique adjustment. If the fibre is subjected to variable conditions, changes in the state of polarization of photons must be monitored and adjustments must be made at suitable time intervals. Using this method, polarization encoded QKD can be implemented in fibre.

**Level (Hons, MSc, &nbsp; PhD, other)?**

MSc

**Consider for a student &nbsp; award (Yes / No)?**

Yes

**Would you like to <br> submit a short paper <br> for the Conference <br> Proceedings (Yes / No)?**

Yes

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