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Design of Voltage Pulse Control Module for Free Space Measurement-Device-Independent Quantum Key Distribution

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Measurement-device-independent quantum-key-distribution protocol (MDIQKD), which is immune to all hacking attacks on detection, guarantees the security of information theoretically even with single-photon detectors, whose performance is not perfect. Fiber channel is used by the previous MDIQKD experimental device. However, the signal attenuation increases exponentially along with the transmission distance increases. But using free space as the channel for signal transmission, with the signal attenuation increases squarely (without considering the scattering of the atmosphere), the signal attenuation trend can be effectively reduced. In order to implement free space MDIQKD experiments, a modulation module is needed to modulate the wide pulse chopping, decoy-state, normalization, phase encoding and time encoding. In this paper, we present a design of Voltage Pulse Control Module (VPCM) for free space MDIQKD. The main function of voltage pulse control is as a modulation circuit, with a total of 5 Digital to Analog Converter (DAC) outputs. The output voltage of 5 DACs can be adjusted from 0V to 6V in 0.05V steps. And all 5 DACs have adjustable delay times of ± 15 ns in 100ps steps. The rising edge of the DAC outputs is about 1ns, and the maximum amplitude can reach 7V with a 50Ω impedance. And with the increase of power, we can get a flatter pulse, which can better serve the subsequent optical modulator. After that, we are going to implement a system with clock frequency up to GHz. By increasing the clock frequency, we expect that the security key rate can be further increased.

Minioral

Yes

Description

Key

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