

Research on the Influence of SNSPDs Using Multimode Fiber in Space Target Laser Ranging Receiving system

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The Tianqin laser ranging station has applied fiber coupled superconducting single photon detector (SNSPD) to the space target laser ranging system and achieved lunar laser ranging in the near-infrared band. SNSPD is used to receive echo photons from the corner reflector of the space target. When there is a deviation angle between the optical axis of the telescope and the echo beam, it affects the coupling efficiency between the spatial light and the multimode fiber at the front end of SNSPD, further affecting the effective photon number of the echo. The author theoretically calculated the effect of fiber coupling on the number of echo photons and conducted the experimental verification. In addition, the angle and length of the light beam transmitted to the front end of the fiber affect the time jitter of the system, thereby affecting the ranging accuracy. The author theoretically calculated the jitter introduced by different incident angles and fiber lengths, and the random error introduced by the multimode fiber was obtained through experiments.