

---

# Laser feedback frequency-modulated continuous-wave LiDAR for non-cooperative targets ranging and 3D imaging

*Tsinghua University, China*

**Yidong Tan**

**Email: [tanyd@tsinghua.edu.cn](mailto:tanyd@tsinghua.edu.cn)**

Frequency-modulated continuous-wave (FMCW) based light detection and ranging (LiDAR) is a powerful three-dimensional imaging modality with high precision and immunity to crosstalk. However, the detection distance of current FMCW based ranging, the core technology of LiDAR, is relatively short, which limits further applications. This presentation presents a system achieving noncooperative targets ranging hundreds of meters away in space. Also, a compensation device is proposed to correct the Doppler effect induced by the optical path drift in transmission. Owing to the high sensitivity of laser feedback technique and the validity of the compensation, the system achieves 1.1 mm resolution and is able to clearly distinguish the step motion of 500  $\mu\text{m}$ , targeting at an aluminum sheet at 150m, with sub milliwatts probe beam power under non-laboratory conditions. Further, the system is combined with a galvanometer to achieve 3D imaging of multiple real-world scenes. Long range, high relative precision, and low photon consumption demonstrate new capabilities that promise to enable a wide range of scientific, and industrial applications.

**Short Bio:**



**Yidong Tan** received his PhD degree in Optical Engineering in the Department of Precision Instruments from Tsinghua University, China. He is a professor and doctoral supervisor in the Department of Precision Instruments at Tsinghua University. He is also a selected candidate of the National Talent Plan, recipient of the Excellent Youth Science Fund of the National Science Foundation of China, Newton advanced fellowship of the Royal Society of UK, and the head of the innovation team awarded by Ministry of Education.