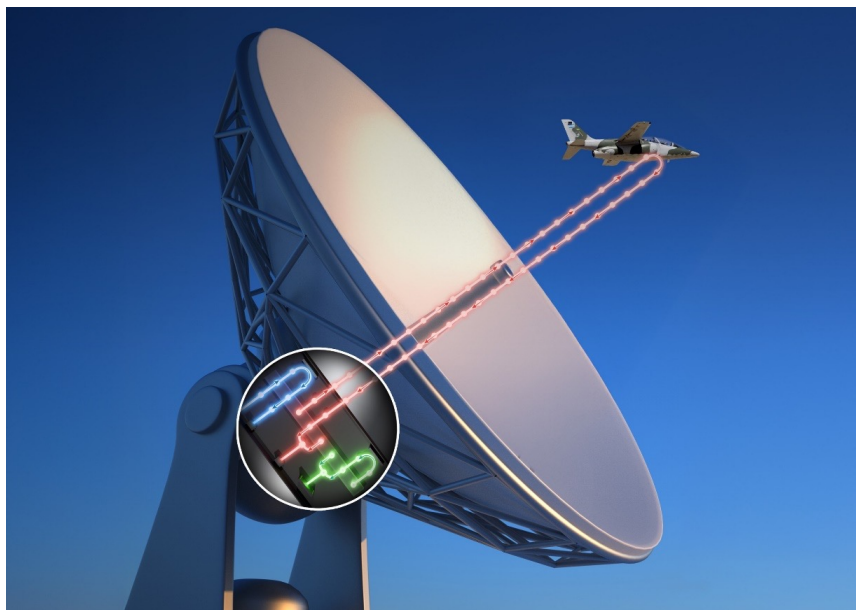


qCOMBPASS: Quantum Radar with Undetected Photons

Scientific Achievement

- A novel quantum sensing framework using quantum frequency combs with path identity for remote sensing of signatures (“qCOMBPASS”).



qCOMBPASS in a surveillance operation. Quantum remote sensing allows to detect without being detected.

Significance and Impact

- Existing sensing schemes require a quantum memory to store a single photon of an initially entangled pair until its twin reflects off a target and returns.
- qCOMBPASS uses quantum frequency combs – optical trains of identical laser pulses.

Research Details

- Proposed scheme is akin to quantum radar based on entangled frequency comb pairs that uses path identity to detect/range/sense a remote target of interest by measuring pulses of one comb in the pair that never flew to target, but that contains target information “teleported” by quantum-induced coherence from the other comb in the pair that did fly to target but is not detected.
- Challenges: long-time quantum storage and photon loss and noise.

Work was performed, in part, at the Center for Integrated Nanotechnologies.



Dalvit, D.; Volkoff, T.; Choi, Y.-S.; Azad, A.; Chen, H.-T.; Milonni, P. Quantum Frequency Combs with Path Identity for Quantum Remote Sensing.

<https://science.osti.gov/>