CLAIMS

1. An optical range finding device comprising:

a light source configured to generate light with a super-Poissonian timing statistic;

an optical module for splitting the light into a reference beam and a probe beam and for directing the probe beam towards a target in free-space;

a first single-photon detector configured for illumination by the reference beam;

a second single-photon detector configured for illumination by the probe beam after reflection by the target in free-space;

a timing module coupled to the first and second single-photon detectors for detecting a time difference between detection of quantum-correlated photons in the reference beam and the reflected probe beam for determining a distance between the device and the target.

2. The device of claim 1, comprising a polarizer for polarizing the light generated by the light source prior to the splitting of the light, for increasing a temporal photon bunching signature of the light emitted from the light source.

3. The device of claims 1 or 2, comprising one or more optical elements for bandpass filtering of the reference beam and the reflected probe beam prior to detection by the first and second detectors.

4. The device of claim 3, wherein the one or more optical elements for filtering comprise sets of one or more identical components for the reference beam and the reflected probe beam, respectively.

5. The device of claim 3, wherein the one or more optical elements for filtering comprise one set of one or more components for the reference beam and the reflected probe beam.

6. The device of any one of claims 1 to 5, comprising one or more coherence elements for enforcing spatial coherence of the probe beam for increasing a range of the probe beam in free space and/or for optimizing optical coherence between the reference beam and the probe beam.

7. The device of any one of claims 1 to 6, wherein the light source comprises one of a group consisting of a laser source configured to generate the light below lasing threshold, super-luminescent diode, sub-threshold gas or solid state laser (including semiconductor laser), light emitting diode, arc lamp, incandescent light bulb, Sunlight and starlight, blackbody radiator, and a mode-hopping laser.

8. The device of any one of claims 1 to 7, wherein each of the first and second detectors is able to detect the arrival time of a single photon with a timing accuracy commensurate or higher than the coherence time of the photons.

9. The device of claim 8, wherein each of the first and second detectors comprise one of a group consisting of a photomultiplier, superconducting nanowire detector, superconducting transition edge detector, and actively or passively quenched avalanche diode photon detector.

10. The device of any one of claims 1 to 9, wherein the optical module for splitting the light into the reference beam and the probe beam is polarizing.

11. The device of claim 10, comprising a rotatable polarizer for balancing beam intensities exposed to the first and second single-photon detectors.

12. The device of claims 10 or 11, comprising two waveplates disposed for minimizing losses in the optical module for splitting the light into the reference beam and the probe beam.

13. An optical range finding method comprising the steps of:

generating light with a super-Poissonian timing statistic;

splitting the light into a reference beam and a probe beam and directing the probe beam towards a target in free-space;

illuminating a first single-photon detector by the reference beam;

illuminating a second single-photon detector by the probe beam after reflection by the target in free-space;

detecting a time difference between detection of quantum-correlated photons in the reference beam and the reflected probe beam for determining a distance between the device and the target.

14. The method of claim 13, comprising polarizing the generated light prior to the splitting of the light, for increasing a temporal photon bunching signature of the light.

15. The method of claims 13 or 14, comprising bandpass filtering of the reference beam and the reflected probe beam prior to detection by the first and second detectors.

16. The method of any one of claims 13 to 15, comprising enforcing spatial coherence of the probe beam for increasing a range of the probe beam in free space.

17. The method of any one of claims 13 to 16, comprising optimizing optical coherence between the reference beam and the probe beam.

18. The method of any one of claims 13 to 17, comprising balancing beam intensities exposed to the first and second single-photon detectors.

19. The method of any one of claims 13 to 18, comprising minimizing losses in the optical module for splitting the light into the reference beam and the probe beam.