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Development of kHz applied optical remote sensing for atmospheric insect monitoring applications

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Effective ways of monitoring insect activities in situ is crucial for entomologists. Such studies have in the past relied more on manual analysis using traps and sweep nets [1-3]. However, it is difficult to monitor fast interaction kinetics and huge numbers simultaneously, which leads us to look for other ways of studying the activity of atmospheric fauna. We have developed a kHz applied optical remote sensing system for monitoring atmospheric insect, which is capable of determining wing-beat frequency, flight directions, optical cross-section and range. This is a comprehensive system, which works both in active and passive modes. The passive mode is based on a remote dark field spectroscopy technique. We use sun light as an illumination source, a dual band detector (silicon (Si) and indium gallium arsenide (InGaAs)) to study the iridescence features, silicon quadrant detector to determine flight direction and a spectrometer for colour information. We have used a 25cm diameter F/4 receiving telescope and dark termination box to reduce the back ground signal. In the active mode, which is continuous wave light detection and ranging (CW-LIDAR) technique, we use a 3W, 808nm laser transmitted by F/5 refractor telescope and the same receiving telescope as in the dark field experiments. In our previous work, we were able to determine wing-beat frequency, irradiances features and flight direction of insects remotely [4, 5]. This technique enables us to track fast events and huge numbers.

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