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in Quantum Enhanced Imaging

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Multiplexed single-photon timing fluorescence system

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Fluorescence provides a multidimensional signature of a molecule and is widely used for analysis and research across the globe. Sequencing the human genome and disease diagnostics are but two of the many important applications where fluorescence has made its mark.

Horiba Jobin Yvon IBH, the Glasgow-based subsidiary of the Japan-headquartered Horiba Group, has entered into a development partnership with researchers at QuantIC. Funded under the QuantIC Partnership Resource, the project will develop a novel multiplexed, time-correlated single-photon timing fluorescence system.

The fluorescence signature of a molecule carries information that includes the wavelengths of excitation and emission (colour), the intensity of the emitted light (brightness), the characteristic time for emission (decay time), polarization (alignment), position (image) and yield (efficiency). However, at present all commercially available fluorescence instrumentation accesses only a small fraction of this information and requires many sequential measurements over a long period of time to build up a complete molecular fluorescence signature.

In the last four decades Horiba Jobin Yvon IBH has pioneered advances in time-correlated single-photon correlation (TCSPC) technology, for example developing picosecond-scale diode light sources suitable for the ultrafast timescale on which fluorescence takes place, and deep-ultraviolet LEDs for protein analysis. The next step is targeted at implementing new Single Photon Avalanche Diode technology developed by QuantIC in collaboration with STMicroelectronics, to obtain a multiplexed version of the existing Horiba Jobin Yvon IBH technology.

The advanced detector will enable the full "signature" of a molecular fluorescence signal to be captured. The increased speed of measurements will open up new applications, for example in the study of transient species.

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