Synchronously Pumped Optical Parametric Oscillators

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Synchronously-pumped optical parametric oscillators (SPOPOs) operate in an interesting power/gain regime that is not generally available to short-pulse lasers. Since the parametric gain is dependent on the instantaneous pump intensity, the gain can be very high compared to that of a laser pumped by the same average power. Particularly large gains are achievable when using quasi-phase-matched (QPM) nonlinear materials. Conversely, very low thresholds can be achieved, with much lower average pump powers than needed by short-pulse lasers. This talk will describe some of the possibilities offered by these high gain SPOPOs. These include:

- Operation at very long idler wavelengths, where the idler suffers strong lattice absorption, but the parametric gain is still sufficient to overcome the effect of this loss. In PPLN we have reached idler oscillation even beyond 7μm.

- Operation as a fibre-feedback OPO (FFOPO), i.e. with an optical fibre in the feedback path of the OPO. This arrangement has provided insensitivity to the path length of the OPO resonator and has shown operation at a very high average power (18W of average signal output at ~1.5μm)

- Fibre-laser-pumped OPOs and diode-laser pumped OPOs.

Results from the above schemes will be reported. A survey of some future prospects will also be given.