

IOP presentation abstract

Fibre circuits offer great potential for the development of convenient, compact, diode-pumpable ultrashort pulse suitable for a broad range of applications spanning from telecommunications, all-optical processing down to their use as basic laboratory tools. The principle advantages of the fibre environment for short pulse generation lie: (a) in the mode-confinement which results in low (≈ 10 mW) laser thresholds, high efficiencies and ready access to fibre non-linearities (which are suitable for passive mode-locking and pulse processing), and (b) in the simple integratability of fibre devices which facilitate the construction of complex but compact functional circuits for the generation of specific optical pulse output.

We review the basic features and techniques for short pulse generation in fibres and discuss recent developments in the field highlighting the principle achievements in: (a) ultrashort pulse generation e.g. < 100 fs pulse generation from diode pumpable integrated fibre based laser + compressor circuits, and (b) in the generation of ultrahigh repetition-rate pulse trains e.g. 200 GHz soliton generation using beat-signal transformation techniques in dispersion decreasing fibre. As a final example of the potential of fibre for the generation of elaborate waveforms, we present recent research results we have obtained demonstrating the synchronous generation of 110 GHz bright and dark pulse trains from an all-fibre circuit.