WHAT IS CLAIMED IS:

1. A system, comprising:

an optical transmitter that includes a pulsed laser for outputting a pulsed laser signal, wherein the optical transmitter is configured to modulate the pulsed laser signal based on a plurality of data signals to form a plurality of modulated optical data signals, to optically time division multiplex the plurality of modulated optical data signals to obtain a multiplexed optical data signal, and to transmit the multiplexed optical data signal together with an optical clock signal derived from the pulsed laser signal; and

an optical receiver that includes a clock recovery branch and a data branch,

wherein the clock recovery branch is configured to recover and phase-shift the optical clock signal into a plurality of phase-shifted recovered optical clock signals,

wherein the data branch includes a plurality of saturable absorbers (SA), and

wherein each SA is in optical communication with one of the plurality of phase-shifted recovered optical clock signals and is configured to receive the multiplexed optical data signal and to transmit one of the modulated optical data signals received in the multiplexed optical data signal according to the one of the plurality of phase-shifted recovered optical clock signals.

2. The system of claim 1, wherein the optical clock signal and the multiplexed optical data signal are transmitted by the optical transmitter in orthogonal transverse modes over a single mode fiber optic cable.

3. The system of claim 1, wherein the optical clock signal and the multiplexed optical data signal are each transmitted by the optical transmitter over a separate cable in a full-duplex fiber optic cable.

4. The system of claim 1, wherein a clock pulse from one of the plurality of phase-shifted recovered optical clock signals saturates a respective SA to thereby cause the respective SA to release a pulse from one of the plurality of modulated optical data signals.

5. The system of claim 1, wherein the clock recovery branch includes a splitter and a phase-shifter for extracting the optical clock signal into the plurality of phase-shifted extracted optical clock signals phase-shifted recovered optical clock signals.

1. A system, comprising:

an optical transceiver that includes an optical transmitter and an optical receiver,

wherein the optical transmitter includes a pulsed laser for outputting a pulsed laser signal wherein the optical receiver includes a data branch and a clock branch and wherein the optical transmitter is configured to modulate the pulsed laser signal based on a plurality of data signals to form a plurality of modulated optical data signals, to optically time division multiplex (OTDM) the plurality of modulated optical data signals to obtain a multiplexed optical data signal, and to transmit the multiplexed optical data signal and an optical clock signal derived from the pulsed laser signal separately from the plurality of modulated optical data signals; and

a polarization splitter that splits the pulsed laser signal into the data branch for preparing the multiplexed optical data signal for transmission, and into the clock branch for transmission of the optical clock signal,

wherein the clock branch is configured to recover and phase-shift the optical clock signal into a plurality of phase-shifted recovered optical clock signals,

wherein the data branch includes a plurality of saturable absorbers (SA), and

wherein each SA is in optical communication with one of the plurality of phase-shifted recovered optical clock signals and is configured to receive the multiplexed optical data signal and to transmit one of the modulated optical data signals according to one of the plurality of phase-shifted recovered optical clock signals.

2. The system of claim 1, wherein the optical clock signal and the multiplexed optical data signal are transmitted by the optical transmitter in orthogonal transverse modes over a single mode fiber optic cable.

3. The system of claim 1, wherein the optical clock signal and the multiplexed optical data signal are each transmitted by the optical transmitter over a separate cable in a full-duplex fiber optic cable.

6. The system of claim 1, wherein the optical receiver further includes one or more dispersion managers configured for dispersion correction of the plurality of modulated optical data signals and the plurality of phase-shifted recovered optical clock signals.

7. The system of claim 1, wherein the optical receiver further comprises output components configured for extracting the plurality of data signals from each of the plurality of modulated optical data signals.

8. The system of claim 1, wherein the pulsed laser is a selected from the group consisting of a bulk laser, a quantum well laser, a quantum dot laser, a semiconductor mode-locked laser and a mode-locked integrated external-cavity surface emitting laser.

9. The system of claim 1, wherein the pulsed laser has a pulse repetition rate between 5 GHz to 100 GHz.

10. The system of claim 1, wherein the optical receiver includes an optical amplifier (OA).

11. The system of claim 10, wherein the OA is a quantum dot semiconductor optical amplifier.

12. The system of claim 1, wherein the modulation is one of a pulsed amplitude modulation (PAM) or a quadrature amplitude modulation (QAM).

13. The system of claim 1, wherein the plurality of data signals includes between 2-16 data signals per wavelength.

14. The system of claim 1, wherein the plurality of data signals includes digital signals and/or analog signals.

15. A transmission system, comprising:

a first transceiver; and

a second transceiver,

wherein each of the first and second transceivers includes an optical transmitter, an optical receiver and a controller,

4. The system of claim 1, wherein a clock pulse from one of the plurality of phase-shifted recovered optical clock signals saturates a respective SA to thereby cause the respective SA to release a pulse from one of the plurality of modulated optical data signals.

5. The system of claim 1, wherein the clock branch includes a second splitter and a phase-shifter for extracting the optical clock signal into the plurality of phase-shifted recovered optical clock signals.

6. The system of claim 1, wherein the optical receiver further includes one or more dispersion managers configured for dispersion correction of the plurality of modulated optical data signals and the plurality of phase-shifted recovered optical clock signals.

7. The system of claim 1, wherein the optical receiver further comprises output components configured for extracting the plurality of data signals from each of the plurality of modulated optical data signals.

8. The system of claim 1, wherein the pulsed laser is a selected from the group consisting of a bulk laser, a quantum well laser, a quantum dot laser, a semiconductor mode-locked laser and a mode-locked integrated external-cavity surface emitting laser.

9. The system of claim 1, wherein the pulsed laser has a pulse repetition rate between 5 GHz to 100 GHz.

10. The system of claim 1, wherein the optical receiver includes an optical amplifier (OA).

11. The system of claim 10, wherein the OA is a quantum dot semiconductor optical amplifier.

12. The system of claim 1, wherein the modulation is one of a pulsed amplitude modulation (PAM) or a quadrature amplitude modulation (QAM).

13. The system of claim 1, wherein the plurality of data signals includes between 2-16 data channels.

~~wherein each optical transmitter is configured to modulate the pulsed laser signal based on a plurality of data signals to form a plurality of modulated optical data signals, to optically time division multiplex the plurality of modulated optical data signals to obtain a multiplexed optical data signal, and to transmit the multiplexed optical data signal together with an optical clock signal derived from the pulsed laser signal,~~

~~and wherein each optical receiver includes a clock recovery branch and a data branch, wherein the clock recovery branch is configured to recover and phase-shift the optical clock signal into a plurality of phase-shifted recovered optical clock signals,~~

~~wherein the data branch includes a plurality of saturable absorbers (SA), and~~

~~wherein each SA is in optical communication with one of the plurality of phase-shifted recovered optical clock signals and is configured to receive the multiplexed optical data signal and to transmit one of the modulated optical data signals received in the multiplexed optical data signal according to the one of the plurality of phase-shifted recovered optical clock signals.~~

~~16. The transmission system of claim 15, wherein each controller is configured for monitoring transceiver performance and for performing adjustment of the transmitter and receiver in order to optimize the transceiver performance.~~

~~17. The transmission system of claim 16, wherein the monitoring includes monitoring of one or more of bit error rate, data throughput, frame loss, or jitter.~~

~~18. The transmission system of claim 15, wherein each transceiver is formed on a common semiconductor substrate as an IC.~~

14. The system of claim 1, wherein the plurality of data signals includes digital signals and/or analog signals.

15. A transmission system, comprising:

a first optical transceiver and a second optical transceiver,

wherein each of the first and second optical transceivers includes an optical transmitter, an optical receiver and a controller,

wherein each optical transmitter includes a respective pulsed laser for outputting a respective pulsed laser signal,

wherein each optical receiver includes a respective clock branch and a respective data branch, and

wherein each optical transmitter is configured to modulate the respective pulsed laser signal based on a plurality of data signals to form a respective plurality of modulated optical data signals, to optically time division multiplex (OTDM) the respective plurality of modulated optical data signals to obtain a respective multiplexed optical data signal, and to transmit the respective multiplexed optical data signal and a respective optical clock signal derived from the respective pulsed laser signal separately from the respective plurality of modulated optical data signals; and

a respective polarization splitter that splits the respective pulsed laser signal into the data branch for preparing the respective multiplexed optical data signal for transmission, and into the respective clock branch for transmission of the respective optical clock signal,

wherein each respective clock branch is configured to recover and phase-shift the respective optical clock signal into a respective plurality of phase-shifted recovered optical clock signals,

wherein each data branch includes a plurality of respective saturable absorbers (SA), and

wherein each respective SA is in optical communication with one of the respective plurality of phase-shifted recovered optical clock signals and is configured to receive the respective multiplexed optical data signal and to transmit one of the respective modulated optical data signals according to one of the respective plurality of phase-shifted recovered optical clock signals.

16. The transmission system of claim 15, wherein each controller is configured for monitoring transceiver performance and for performing adjustment of the transmitter and receiver in order to optimize the transceiver performance.

17. The transmission system of claim 16, wherein the monitoring includes monitoring of one or more of bit error rate, data throughput, frame loss, or jitter.

18. The transmission system of claim 15, wherein each transceiver is formed on a common semiconductor substrate as an integrated circuit.

19. The system of claim 15, wherein the respective optical clock signals and the respective multiplexed optical data signals are each transmitted by the respective optical transmitter over a separate cable in a full-duplex fiber optic cable.