CLAIMS

1. An optical device for dispersion compensation comprising:

a channel waveguide and two sidewalls coupled to at least a portion of the channel waveguide, the two sidewalls respectively arranged at opposing sides of the channel waveguide along a longitudinal axis of the channel waveguide,
wherein each of the two sidewalls comprises a plurality of optical elements arranged along the channel waveguide of the waveguide, and the plurality of optical elements are configured to interact with light propagating in the waveguide so as to compensate dispersion of the light by transmitting the light in a regime close to a stopband of the plurality of optical elements defined by a period of the plurality of optical elements, wherein the sidewalls are apodized such that an amplitude is equal to zero at two ends of the sidewalls and gradually increases from the two ends to a center portion of the sidewalls.

2. The optical device of claim 1, wherein the plurality of optical elements are configured to interact with the light propagating in the channel waveguide so as to compensate positive dispersion of the light by transmitting the light in a regime close to a red-side of the stopband of the plurality of optical elements where the transmission causes negative dispersion.

3. The optical device of claim 1, wherein the plurality of optical elements have a sinusoidal profile.

4. The optical device of claim 1, wherein the amplitude at the center portion of the sidewalls is about one tenth of a width of the channel waveguide of the waveguide.

5. The optical device of claim 1, wherein the channel waveguide is made of silicon nitride materials.

6. The optical device of claim 1, wherein the channel waveguide of the waveguide has a width in a range of 500 nm to 1.5 μm and a height in a range of 150 nm to 2 μm.

7. The optical device of claim 1, wherein the period of the plurality of optical elements of one of the two sidewalls of the channel waveguide is at least substantially similar to the period of the plurality of optical elements of the other of the two sidewalls of the channel waveguide.

8. The optical device of claim 1, further comprising a cladding arranged over the channel waveguide and the plurality of optical elements.

9. The optical device of claim 8, wherein the cladding is silicon dioxide in a range of 1 to 5 μm.

10. The optical device of claim 1, further comprising:
a grating coupler or an inverse tapering region at an end region of the channel waveguide.

11. The optical device of claim 1, further comprising a carrier, wherein the channel waveguide is formed on the carrier.

12. The optical device of claim 1, wherein the plurality of optical elements form a Bragg grating.

13. The optical device of claim 12, wherein the stopband of the plurality of optical elements is configured to be longer than a wavelength of the light having the dispersion by a range of 0.1 nm to 1 nm.

14. An optical system comprising:

an optical transmitter for providing at least one optical signal;

an optical fiber coupled to the optical transmitter for receiving and transmitting the at least one optical signal;

the optical device of any one of claims 1 to 13 for compensating dispersion of the at least one optical signal induced by the transmission in the optical fiber; and

an optical receiver.

15. The optical system of claim 14, wherein the optical device is integrated with the optical transmitter or the optical receiver in a manner that the optical transmitter or the optical receiver is a system-on-a-chip.

16. The optical system of claim 14, wherein the optical transmitter comprises a multiwavelength optical transmitter for providing a plurality of wavelength-distinct optical signal and the optical receiver comprises a multiwavelength optical receiver.

17. The optical system of claim 14, wherein the multiwavelength optical transmitter is configured to provide C-band and L-band wavelength optical signals.

18. The optical system of claim 14, wherein the optical transmitter is configured to provide modulated signals including Pulse Amplitude Modulation (PAM) and non-return-to-zero (NRZ) modulated signals.

19. The optical system of claim 14, wherein the optical fiber is a single mode fiber.

20. The optical system of claim 19, wherein a length of the optical fiber is at least 2 km.

21. The optical system of claim 14, further comprising:

an erbium doped fiber amplifier and a bandpass filter coupled between the optical fiber and the optical device, wherein the optical device is configured to receive an output from the bandpass fiber and to compensate dispersion of the output.

22. The optical system of claim 14, wherein the optical receiver is configured to convert optical signals to electrical signals.

23. The optical system of claim 22 further comprising:

a digital sampling oscilloscope for analyzing the converted electrical signals.

24. A method for forming an optical device, the method comprising:

forming a channel waveguide; and

forming two sidewalls coupled to at least a portion of the channel waveguide by at least one of ion-implantation or photo lithography, the two sidewalls respectively arranged at opposing sides of the channel waveguide along a longitudinal axis of the waveguide and are apodized such that an amplitude is equal to zero at two ends of the sidewalls and gradually increases from the two ends to a center portion of the sidewalls, wherein each of the two sidewalls comprises a plurality of optical elements extending to a respective side opposite to the portion of the channel waveguide of the waveguide, and the plurality of optical elements interact with light propagating in the waveguide so as to compensate dispersion of the light by transmitting the light in a regime close to a stopband of the plurality of optical elements defined by a period of the plurality of optical elements.

25. Use of the optical device of any one of claims 1 to 13 in dispersion compensation of a light, comprising:

transmitting the light in the regime close to the stopband of the plurality of optical elements defined by the period of the plurality of optical elements,

wherein the light has a positive dispersion and the light has a wavelength longer than the stopband of the plurality of optical elements by a range of 0.1 nm to 1 nm, or wherein the light has a negative dispersion and the light has a wavelength shorter than the stopband of the plurality of optical elements by a range of 0.1 nm to 1 nm.