to delineate the scope of the invention. Its sole purpose is to present some concepts of the invention in a simplified form as a prelude to the more detailed description that is presented later.

[0006] ~~The~~Embodiments of the present invention provides a transceiver having relatively few optical alignment steps, a relatively small size, and relatively lower power consumption. Specifically, the transceiver of the present invention uses direct modulated long-wavelength VCSELS, which offers a number of benefits. For example, the use of such VCSELs reduces the power and thus the need to dissipate heat. This is especially helpful in multi-channel transceivers having high density transmitters and drive circuitry. The electronics can work more efficiently and therefore less airco units are needed to cool the systems. Furthermore, because the VCSEL may be fabricated in arrays, they reduce fabrication cost per transceiver considerably. For example, by aligning bars of 12 components the number of alignment steps is reduced. The compact arrays also reduce the footprint of the transceiver substantially. Still more benefits will become obvious to those of skill in the art in light of this disclosure.

[0007] The use of such VCSELs is unobvious and is generally not favored for long-wavelength applications because VCSELs at such wavelengths do not lend themselves to flip chip mounting. As used herein, long-wavelength VCSELs refer to VCSEL having an operating wavelength of 1200 – 1600 nm (e.g., 1270nm, 1290nm, 1310nm, 1490nm). Consequently, at this time, to use such wavelength VCSELs, wire bonding techniques must be used. Although wire bonding is a well known and reliable technology, it is generally discouraged for high speed applications such as those generally encountered in optical communications. Applicants have realized, however, that in fiber- to-the-home applications, high speed operation is not as important as the reliability and manufacturability of the transceivers. Therefore, even though the VCSELs may need to be wire bonded to the substrate and thus may be limited in operating frequencies, such limitations are outweighed by the aforementioned benefits of the VCSEL array configurations that VCSELs afford.

[0008] Accordingly, ~~one aspect~~embodiments of the present invention ~~of the invention is~~disclose a transceiver ~~comprises~~comprising an array of long-wavelength VCSELs. ~~In one embodiment, the transceiver comprises (a) at least one chip comprising an array of long-wavelength VCSELs and an array of receiving optical devices; (b) an optical interface optically coupled to the VCSELs and the receiving~~

~~optical components and configured to optically couple with an optical connector; (c) transmitting and receiving circuitry electrically connected the VCSELs and the receiving optical devices, and adapted for connecting to an electrical connector; and (d) a frame for holding the chip, the optical interface, and the transmitting and receiving circuitry.~~

According to an aspect of the present invention, there is provided a transceiver comprising: at least one chip comprising at least a first array of long-wavelength VCSELs and at least a second array of receiving optical devices; an optical interface optically coupled to said VCSELs and said receiving optical devices and configured to optically couple with an optical connector; transmitting and receiving circuitry electrically connected said VCSELs and said receiving optical devices, and adapted for connecting to an electrical connector; and a frame for holding said chip, said optical interface, and said transmitting and receiving circuitry.