

## RESUMEN

Telecommunications over optical fibers is immensely successful. The volume of transmitted data grows exponentially, and due to novel data-hungry applications this growth is expected to continue. In binary coding of data, either a light pulse is transmitted within one clock period, or none to represent logical "ones" and "zeroes". For this format, the data-carrying capacity of existing optical fibers hits a ceiling now, and data formats "beyond binary" are currently investigated, to transmit more than a single bit per clock period. A combination of phase, amplitude, and polarization modulation is used. Moreover, space and/or mode multiplexing are being discussed, but these require special fibers and are incompatible with the existing worldwide fiber network. Economically it seems prudent to pursue technology that works with legacy fibers. The current state will be explained.

So far the fiber's inherent optical nonlinearity is being avoided. Once one accepts to exploit it, one can use soliton pulses which possess a unique robustness to perturbations. Solitons are used in a few commercial systems, but they have always been understood to provide a binary format only. We have recently demonstrated that they can be used for a quaternary format, and it is reasonably expected that they can go beyond. The concept makes use of so-called 'soliton molecules', bound states of several solitons. Experimental results will be reported, and it will be argued that this scheme may be advantageous in some cases.