

## **Spectral amplitude coding OCDMA: Performance analysis on detection schemes using vectors combinatorial code families**

In Spectral Amplitude Coding Optical Code Division Multiple Access (SAC-OCDMA) system, Multip-user Interference (MUI) problem which increases with the number of users severely limits the performance of the system. However, phase induce intensity noise (PIIN) arising from spontaneous emission of broad band source is another problem leads to system deterioration should be addressed. Moreover, a proper design of detection scheme which is being able to extract the wanted signal from the unwanted signal successfully needs to be considered as well. In order to overcome the stated problems, Vectors Combinatorial Codes (VCC) with ideal in-phase cross correlation, based on combinations of specific vectors is proposed. In our approach, any integer number of users and weights can be used in code construction. This makes our proposed code a strong candidate for future optical communication systems. The complementay detection schem can be used to give accurate results if the cross correlation (CC) is fixed, therefore, a new detection scheme based on XOR logic is proposed. This new detection scheme can be used even if the CC is not fixed. In addition, a new encoder/decoder structure based on this new scheme using fiber Brag gratings (FBGs) for VCC is proposed. It has been shown that, performance can be improved significantly when VCC used with XOR detection scheme instead of complementary and AND detection schemes.