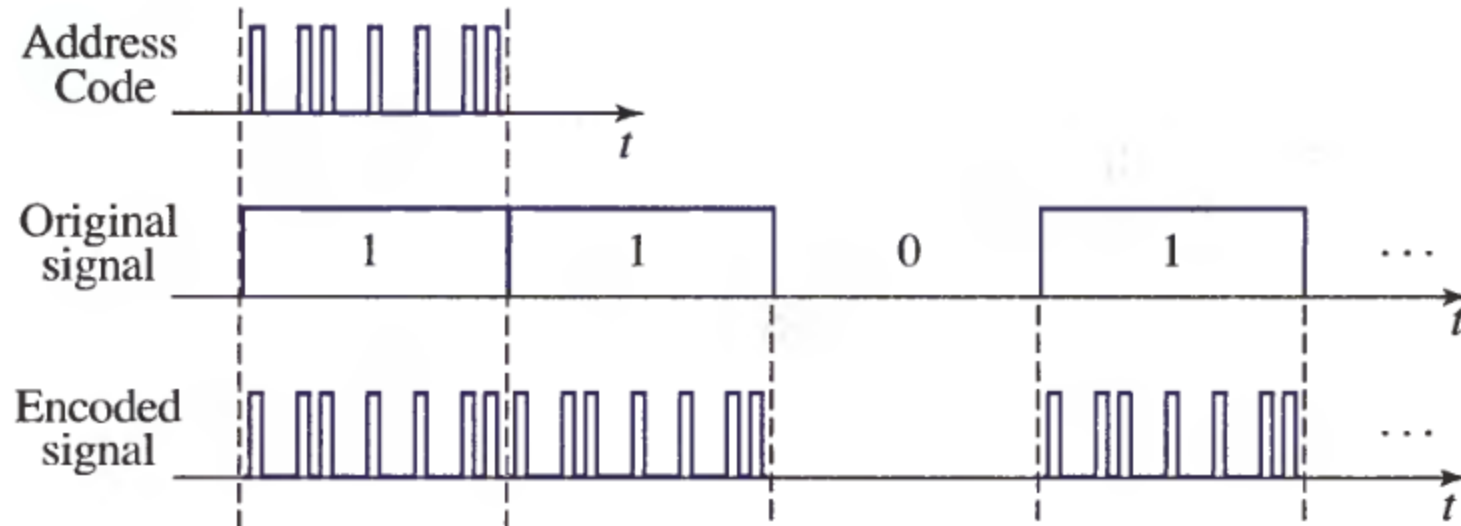


Fiber Optic Communications

Lecture 10: Modulation Formats

- CDM, TDM
- ASK, PSK, and FSK

Code Division Multiplexing

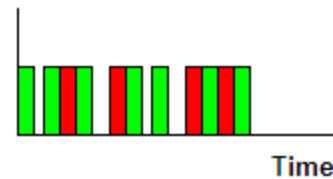
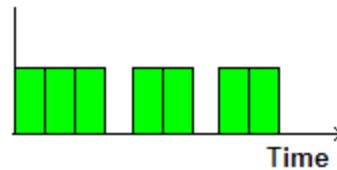
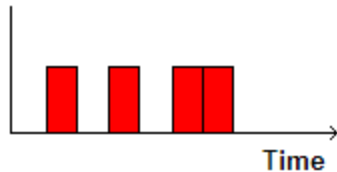


- Each channel is encoded differently using different keys.
- Decoding requires a key which selects only a particular channel.

Code Division Multiplexing

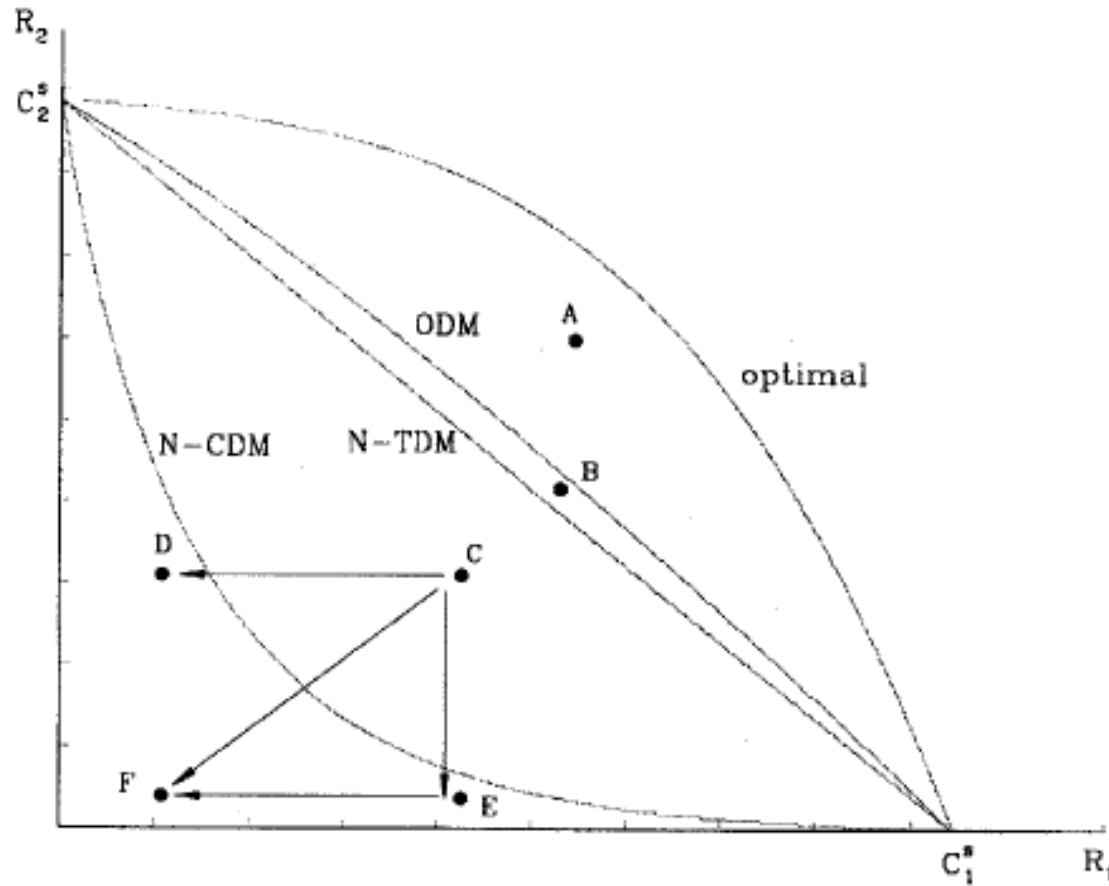
- Mathematically, create a multidimensional vector space with orthogonal vectors

Time Division Multiplexing

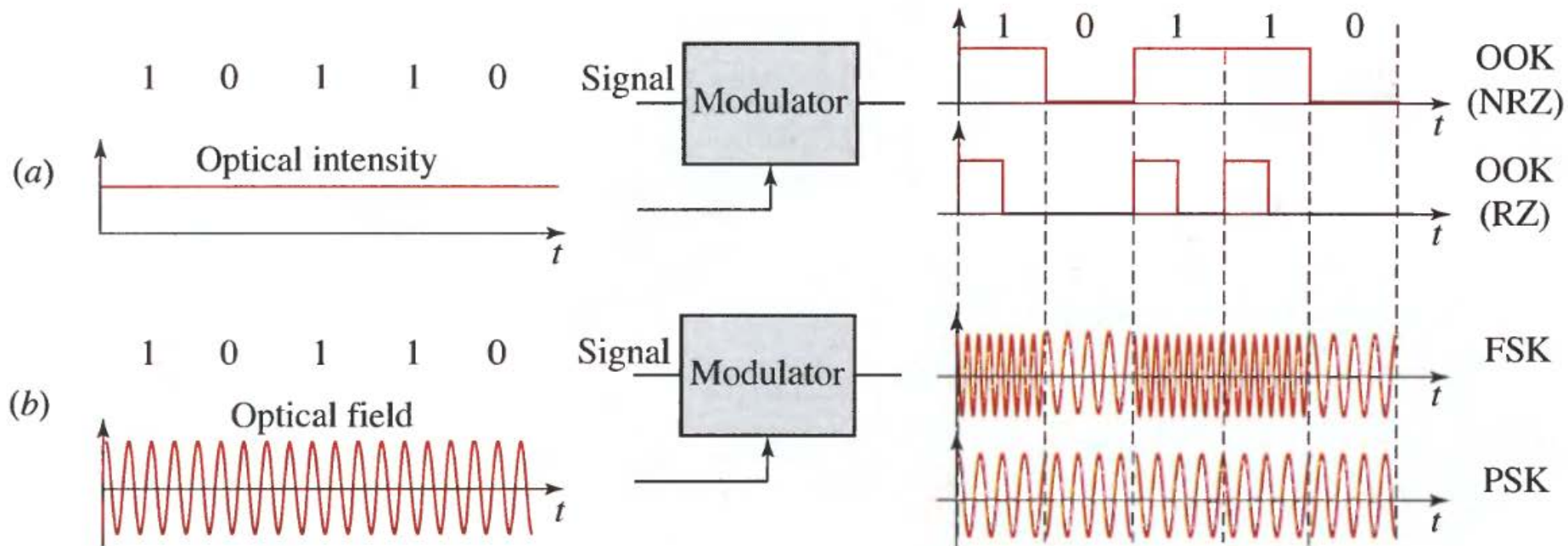


- Each signal has particular time windows within a periodic array
- Arguably a special case of CDM with 'Cartesian' codes

Bitrate for Various Techniques: 2-user Gaussian channel

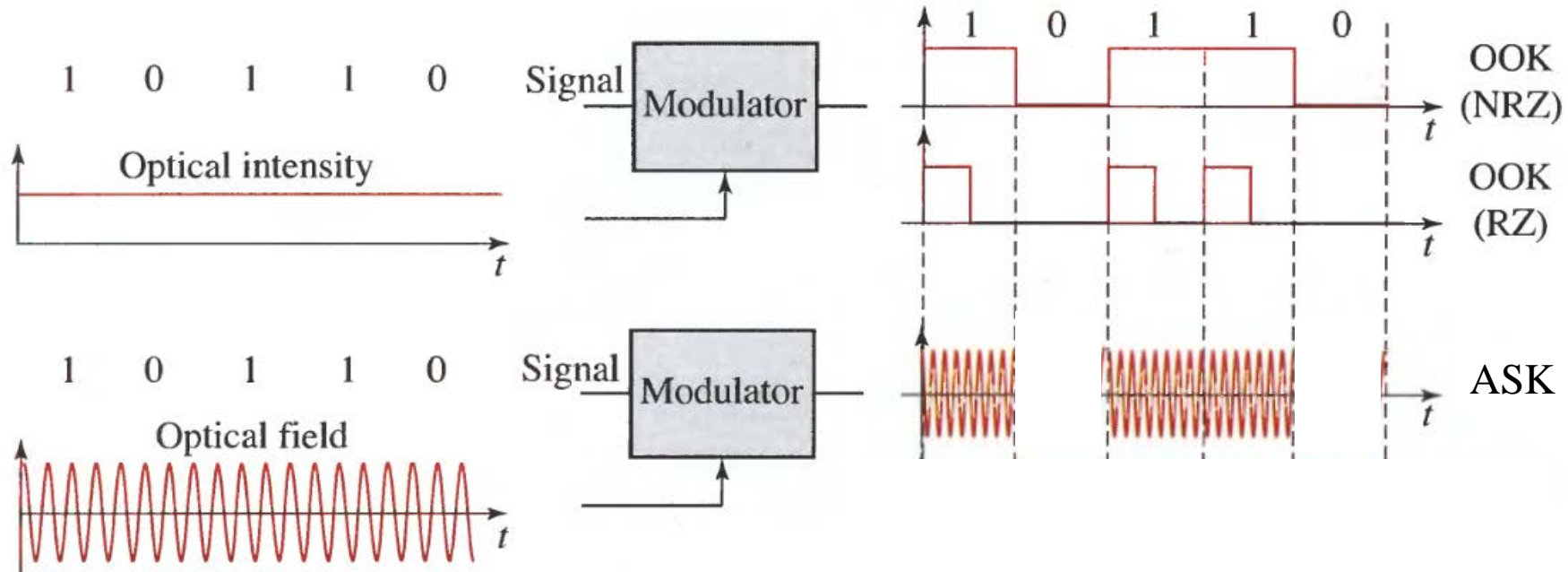


Recap: ON-OFF Keying (OOK)



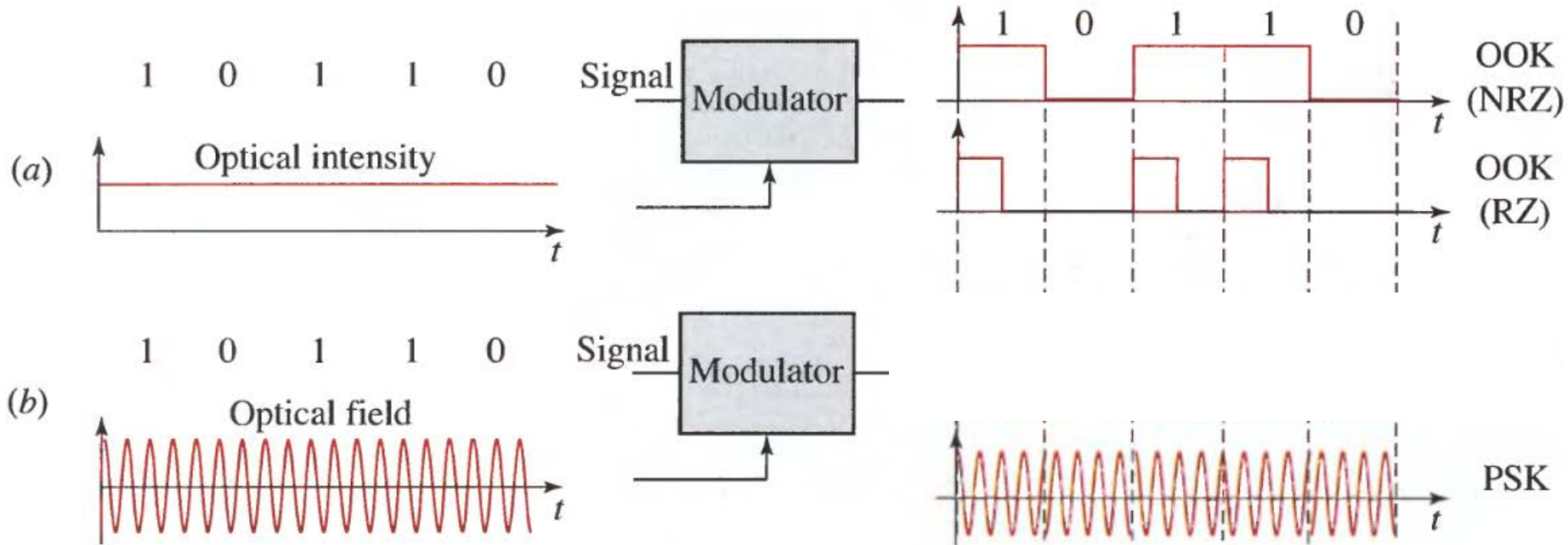
Frequency shift keying (FSK) and Phase Shift keying (PSK) are variants of OOK. Amplitude shift keying (ASK) is considered more difficult to implement optically.

Amplitude Shift Keying



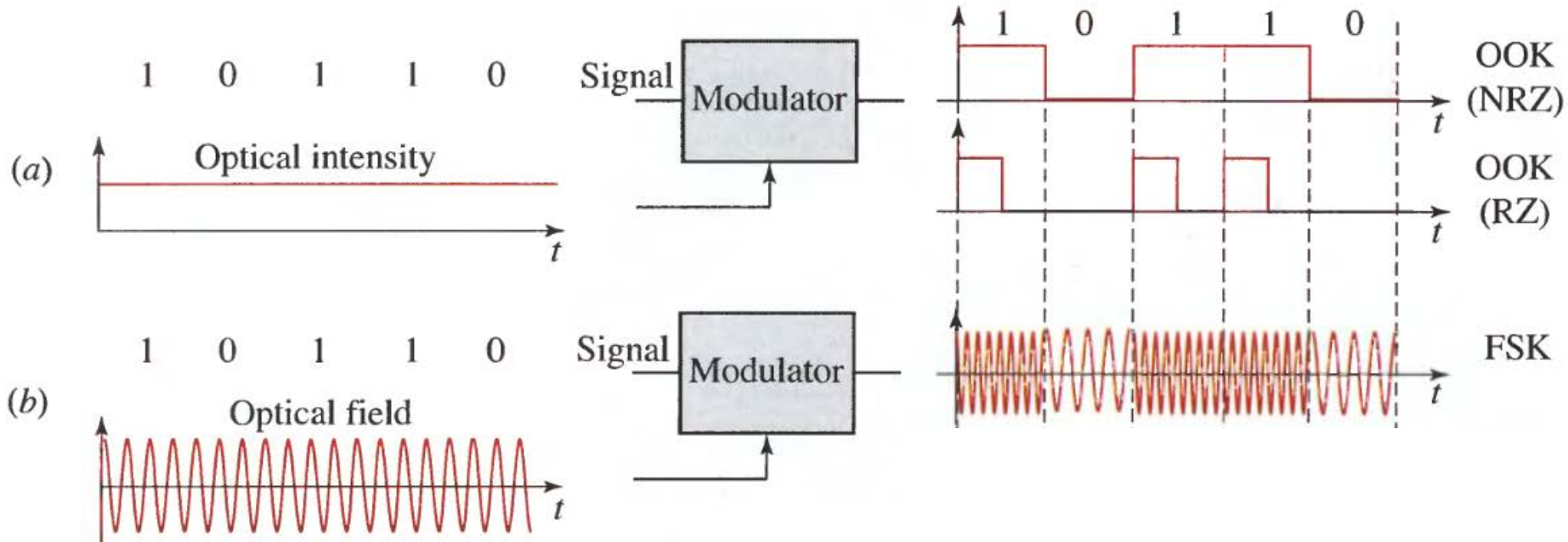
Can only be implemented coherently with an external modulator
Most common configurations: lithium niobate in a MZ interferometer

Phase Shift Keying



Phase shift will obey $\delta\phi = (2\pi/\lambda)(\delta n)l_m$
 Can thus be tuned through voltage variation

Frequency Shift Keying



Two types: narrow and wide-band frequency variation, characterized by the ratio of frequency shift to bit rate. Can use lithium niobate or acousto-optic modulators

Laser Response

