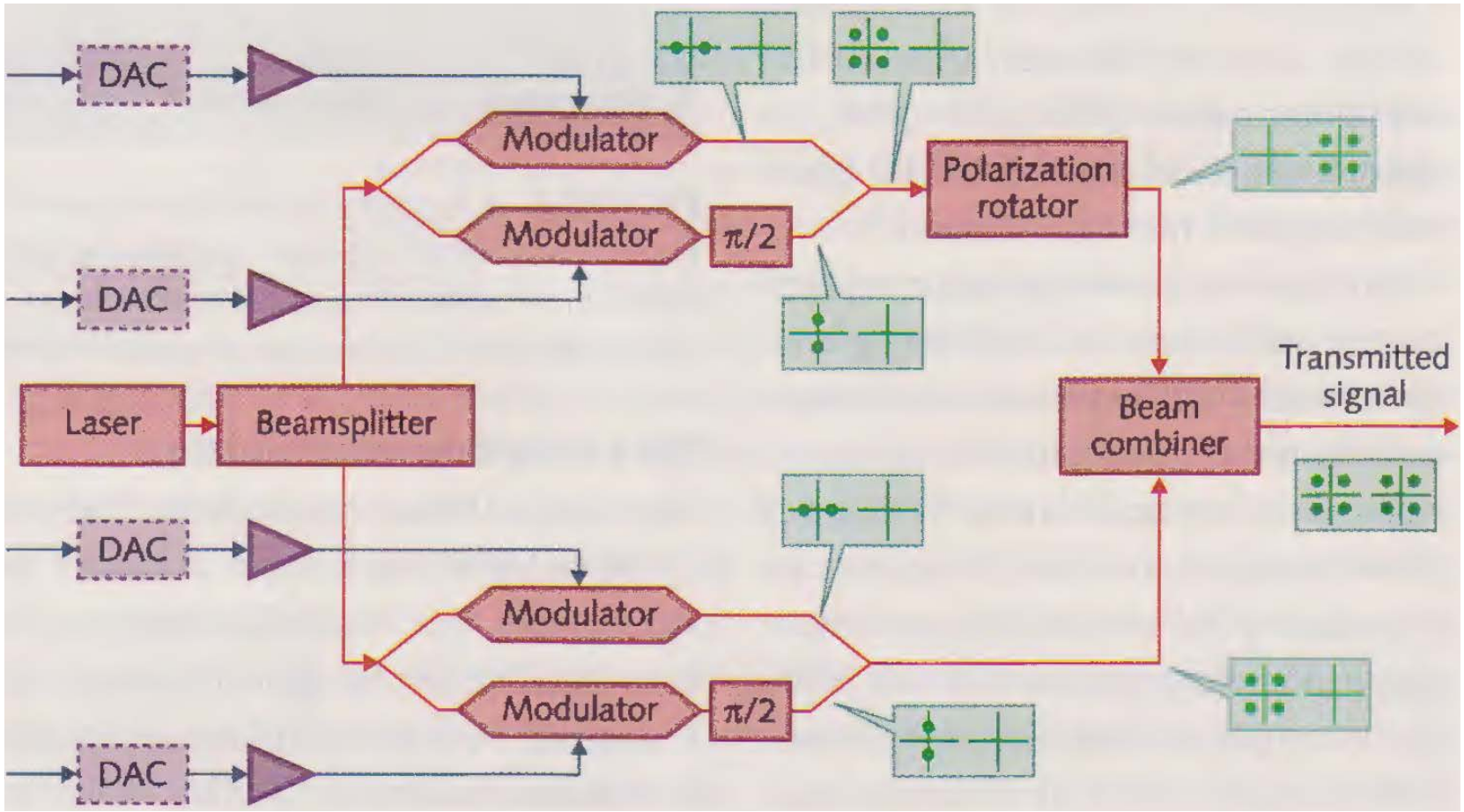
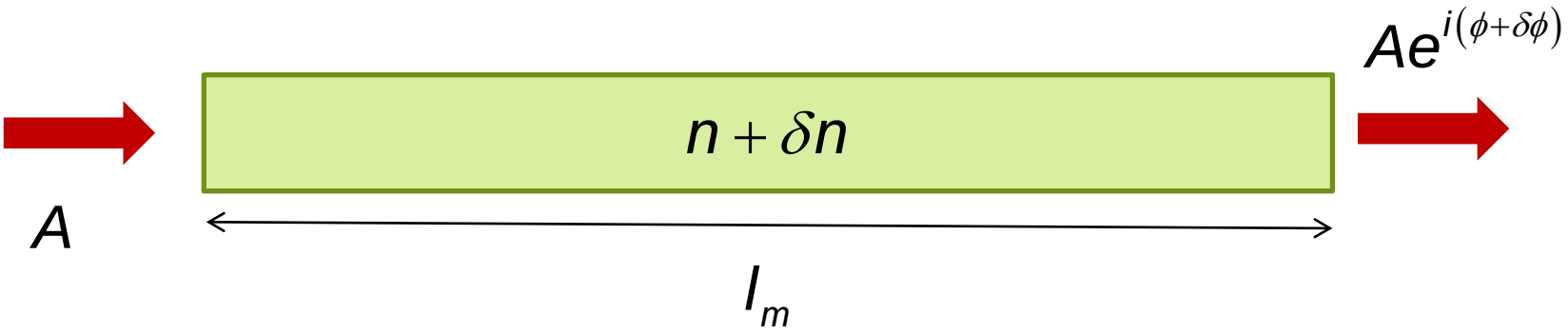
A DP-QPSK Transmitter



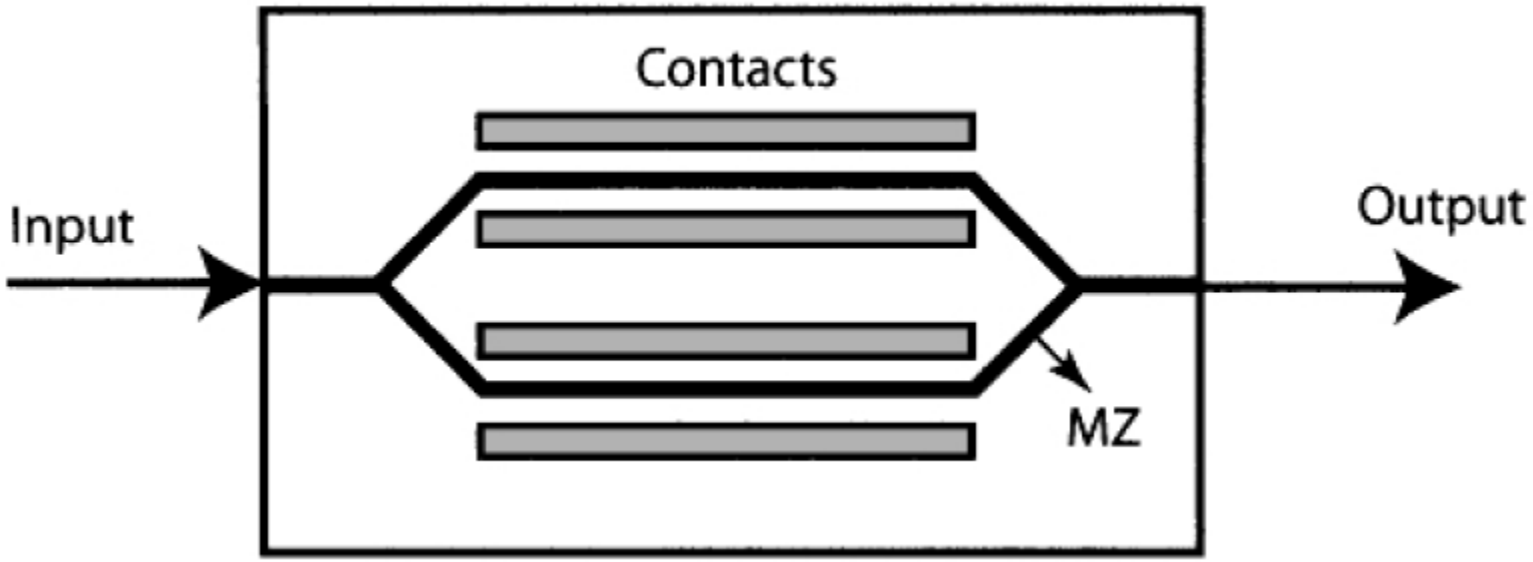
From "Multilevel Modulation Formats Push Capacities Beyond 100 Gbits/sec," Shubhashish, Data, and Crawford, In Laser Focus World, February, 2012, pp. 58-63.

A Phase Shifter



$$\delta\phi = \frac{2\pi}{\lambda}(\delta n) l_m$$

A Mach-Zehnder Optical Modulator

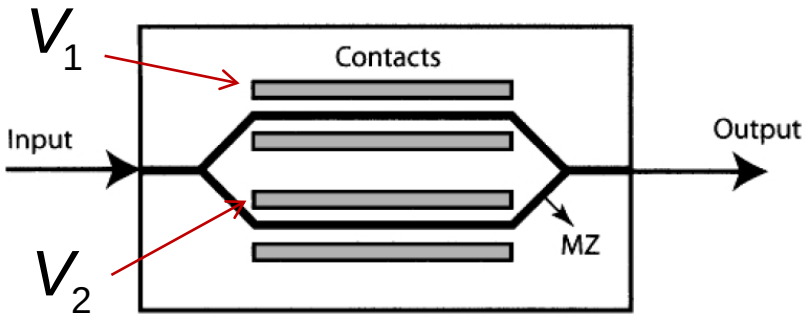


$$A_t = \tfrac{1}{2} A_i \left(e^{i\phi_1} + e^{i\phi_2} \right)$$

$$t_m = A_t / A_i = \cos\left[\tfrac{1}{2}\left(\phi_1 - \phi_2 \right) \right] \exp\left[i\left(\phi_1 + \phi_2 \right) / 2 \right]$$

From *Fiber-Optic Communication Systems*, Govind P. Agrawal, Chapter 10, (Wiley, 2010)

A Mach-Zehnder Optical Modulator

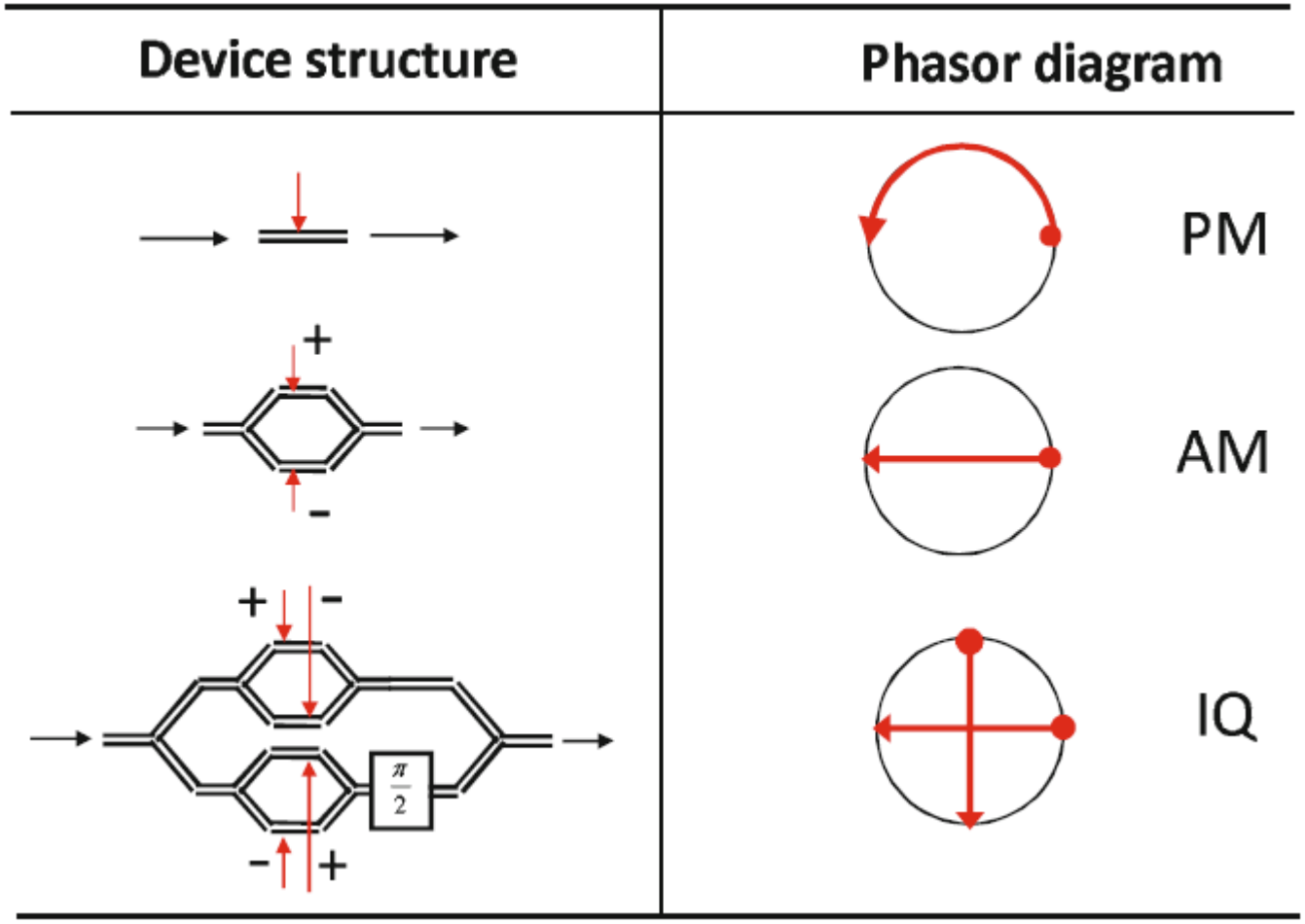


$$t_m = \frac{A_t}{A_i} = \cos\left[\tfrac{1}{2}\left(\phi_1 - \phi_2\right)\right]\exp\left[\frac{i\left(\phi_1 + \phi_2\right)}{2}\right]$$

$V_2 = -V_1 \Rightarrow \phi_1 + \phi_2 = const. \Rightarrow$ Pure Amplitude Modulation

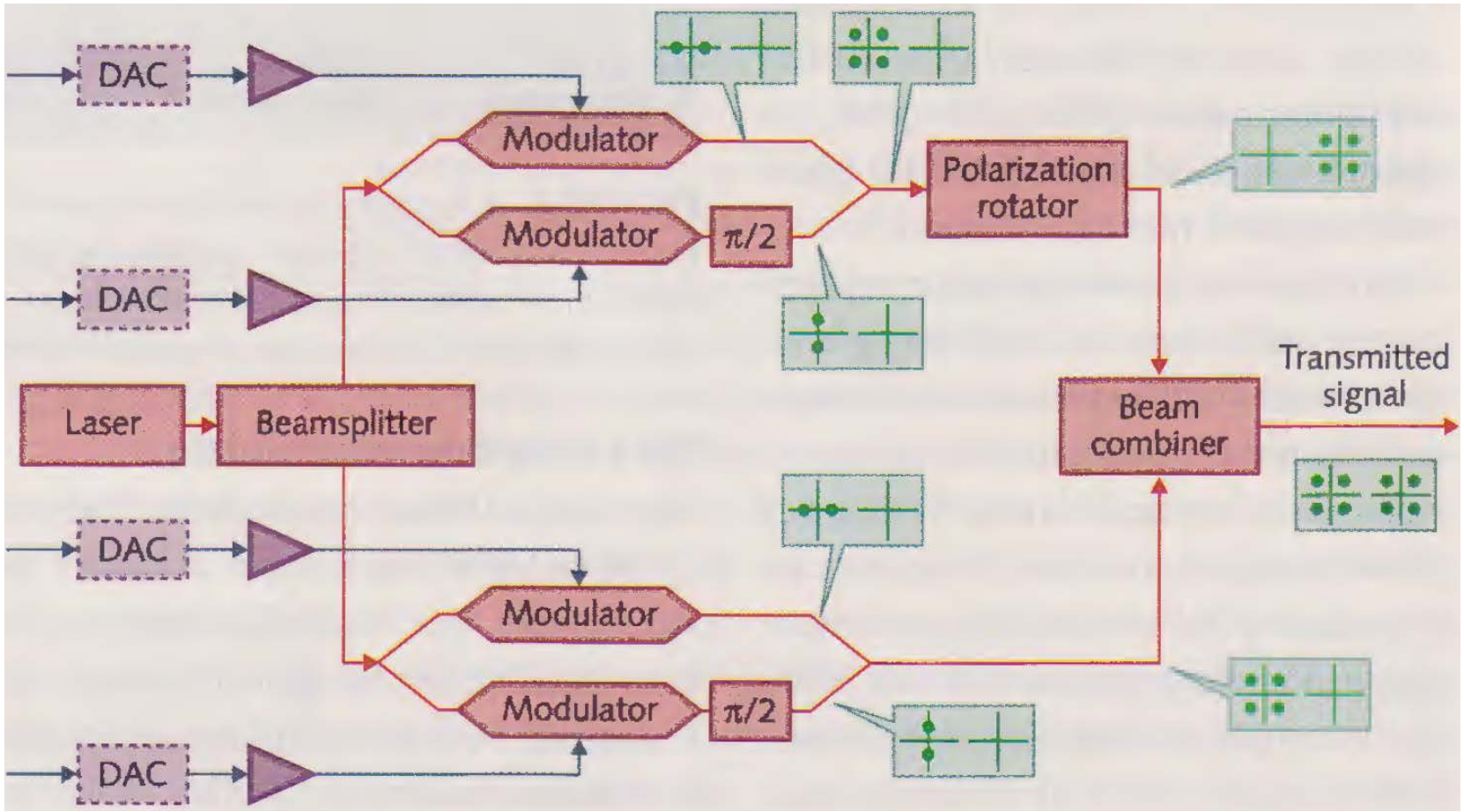
$V_2 = V_1 \Rightarrow \phi_1 = \phi_2 \Rightarrow$ Pure Phase Modulation

Phase, Amplitude, and In-Phase and Quadrature Modulation



"Coherent Optical Communications: Historical Perspectives and Future Directions", Kazuro Kikuchi, in *High Spectral Density Optical Communication Technologies* (Springer Verlag, 2010)

A DP-QPSK Transmitter



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