Semiconductor Optical Amplifiers

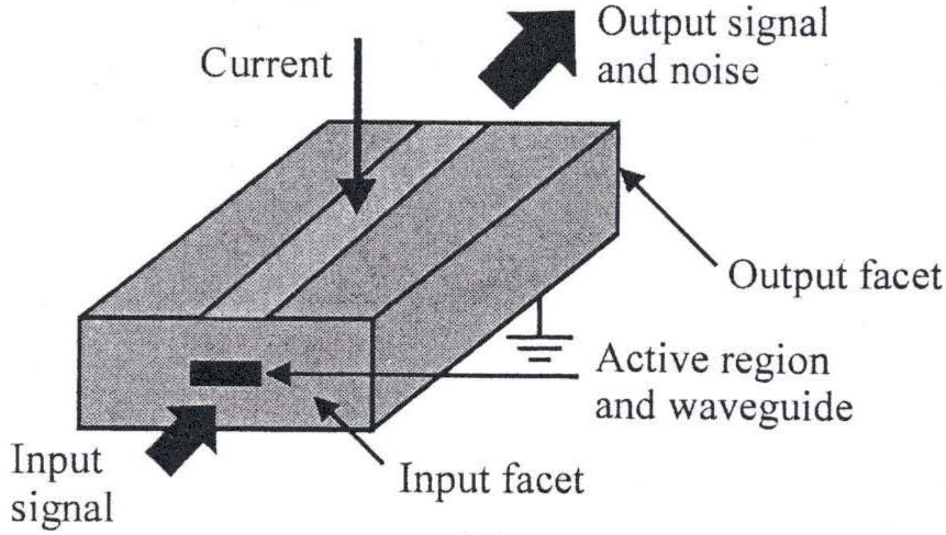
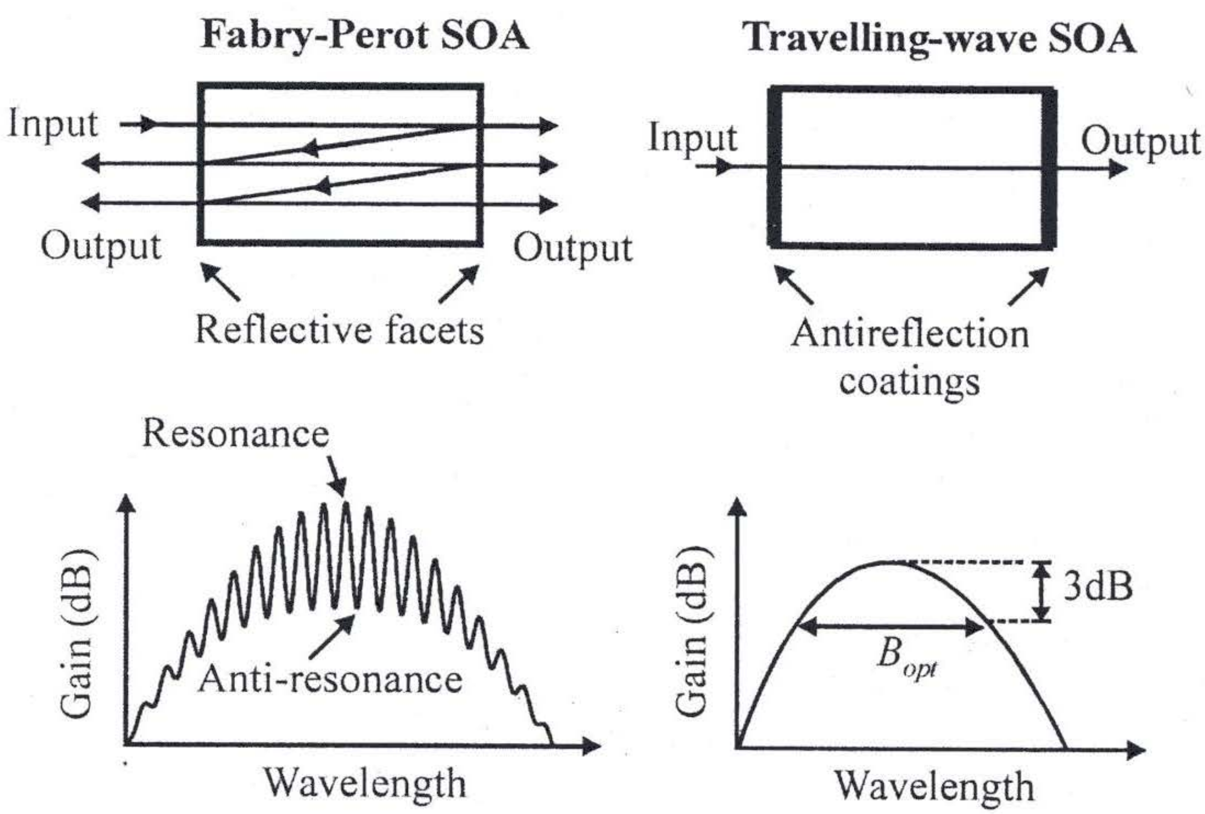
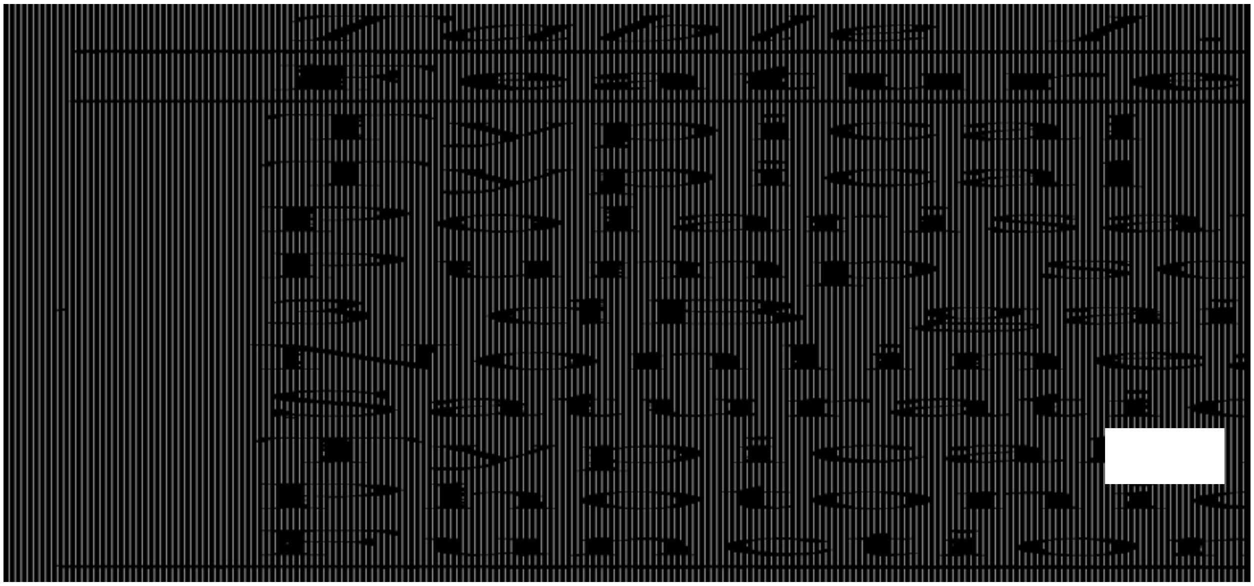
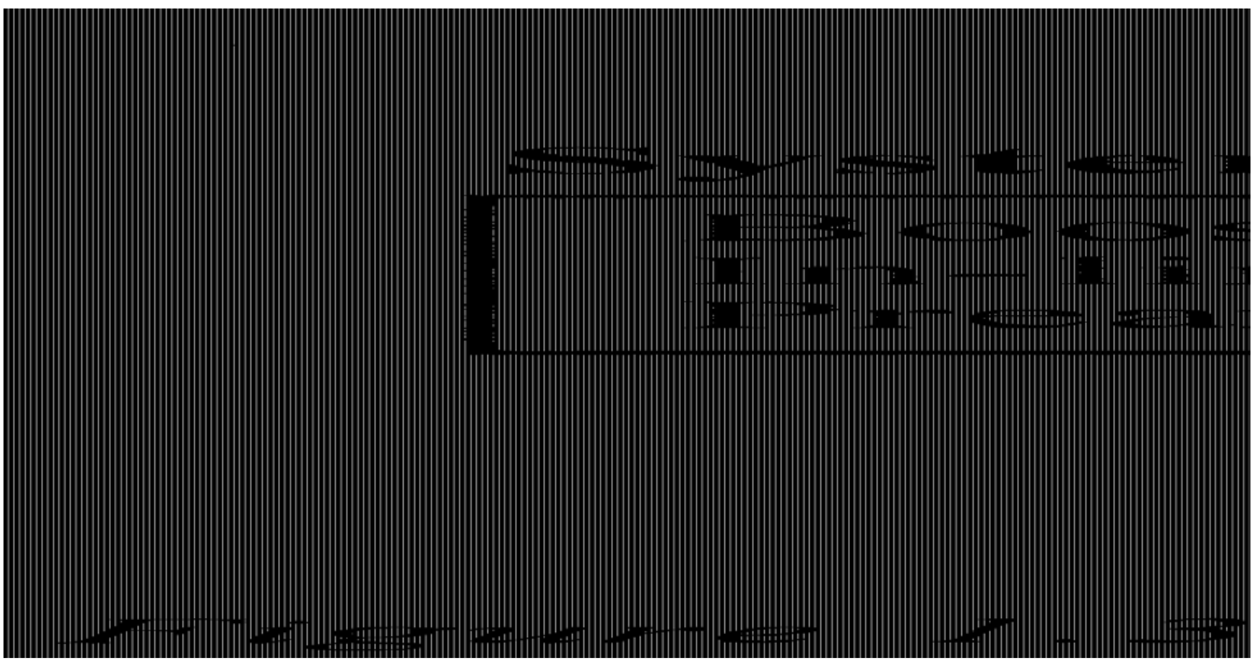


Figure 2.1. Schematic diagram of an SOA.







Figures and Table from Semiconductor Optical Amplifiers, Michael Connelly

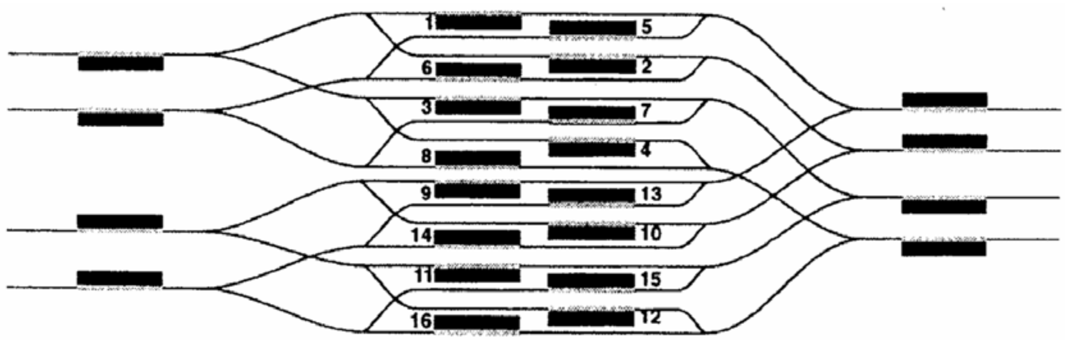
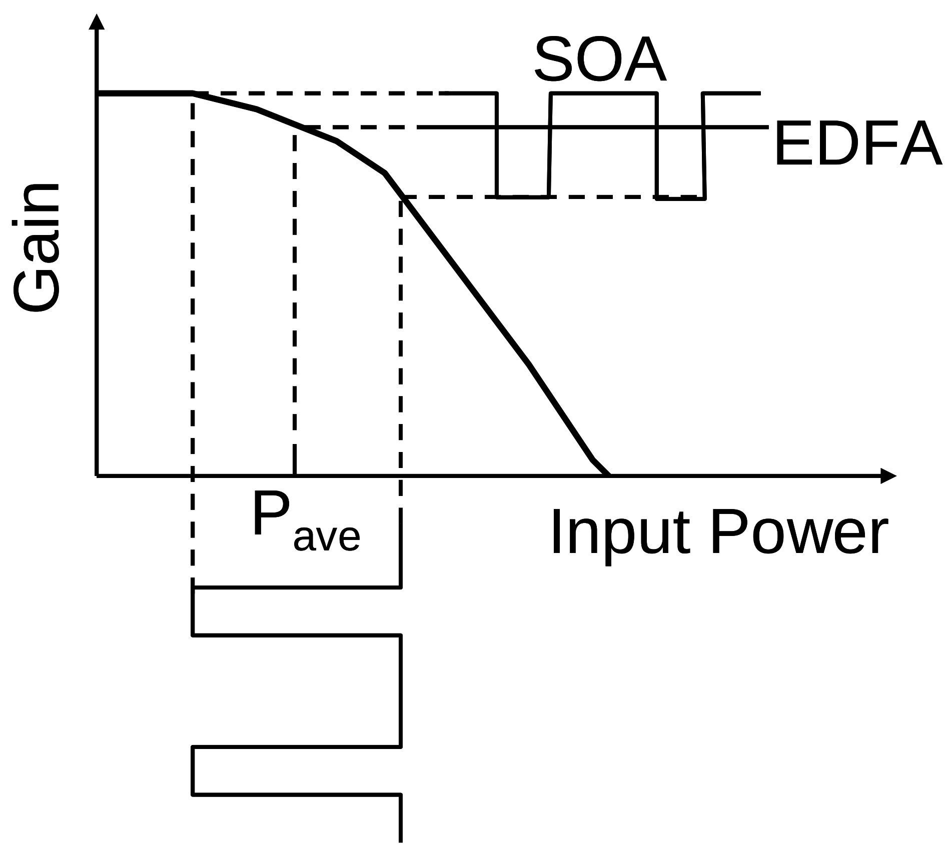


Fig. 6.12 Structure of a 4 × 4 InP-based optical space switching matrix. The key element is the semiconductor optical amplifier, which is used either as a logic gate or as a booster amplifier. (After [19] with permission of IEE).

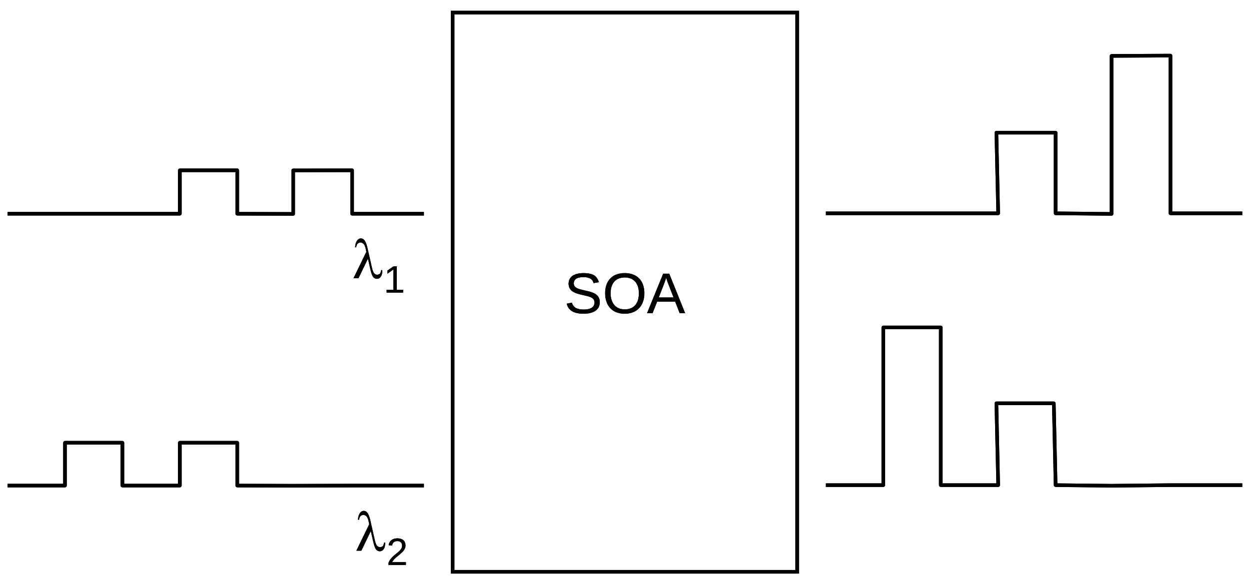
From High Speed Optical Communications, Sabella and Lugli

The Dynamics of Gain Saturation in Optical Amplifiers



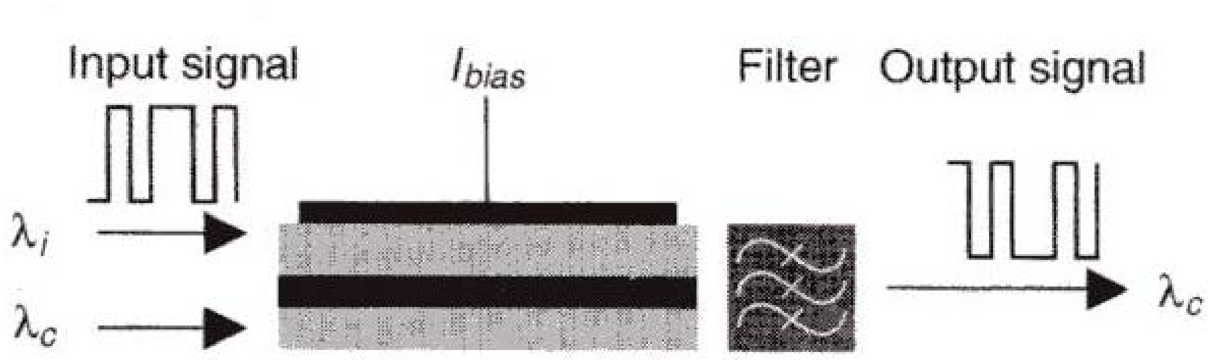
Question: When is gain saturation in SOAs bad?

Answer: When it causes cross-talk.



Question: When is gain saturation in SOAs good?

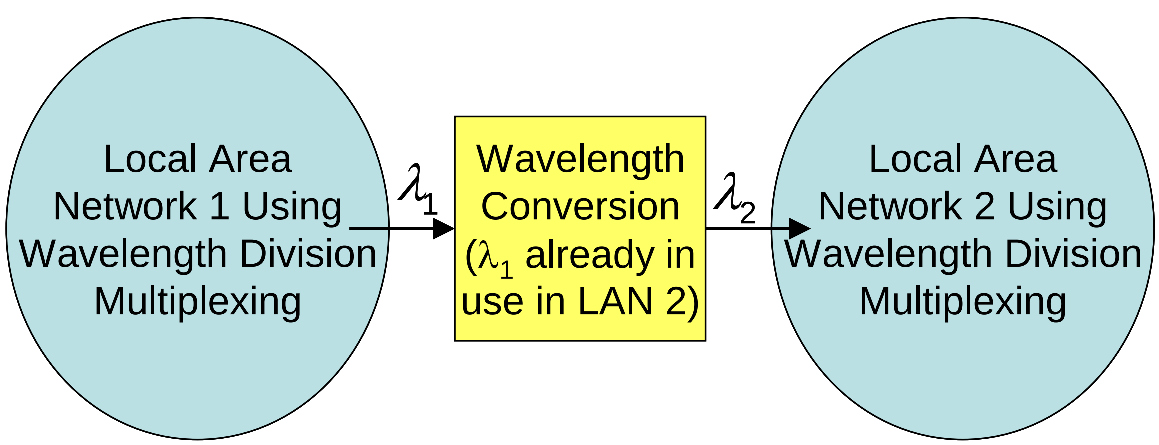
Answer: When it is used for wavelength conversion.



From High Speed Optical Communications, Sabella and Lugli

Question: When would we want to do wavelength conversion?

Answer: When sub-networks, trying to communicate with each other, share the same set of optical wavelengths.

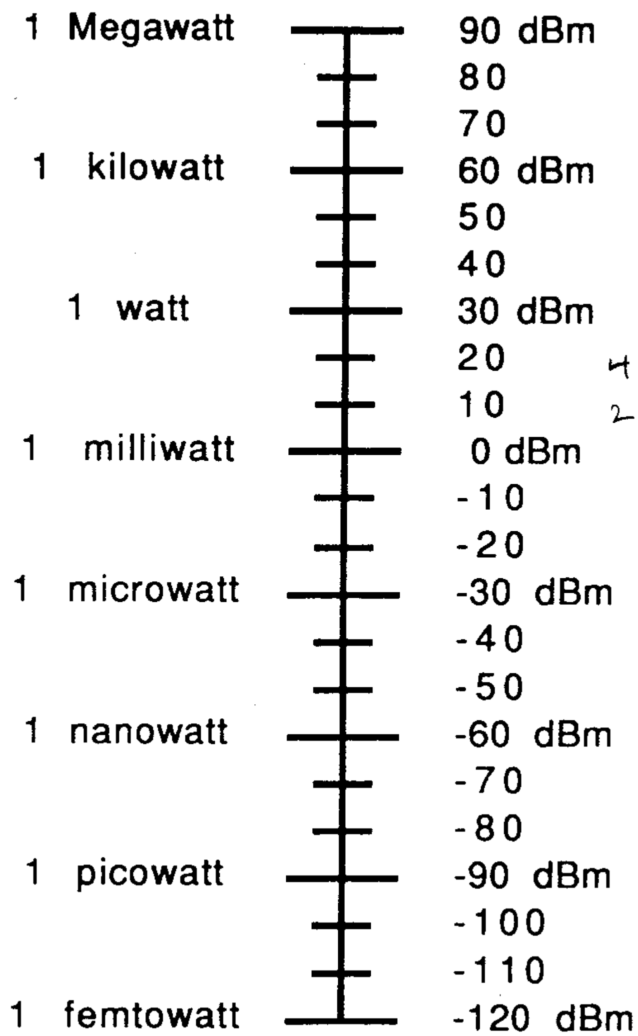


Optical Power Chart

From "Understanding Microwaves"
Allan W. Scott

MICROWAVE POWER—dB AND dBm

$10 \log\left(\frac{P}{1\,mW}\right)$

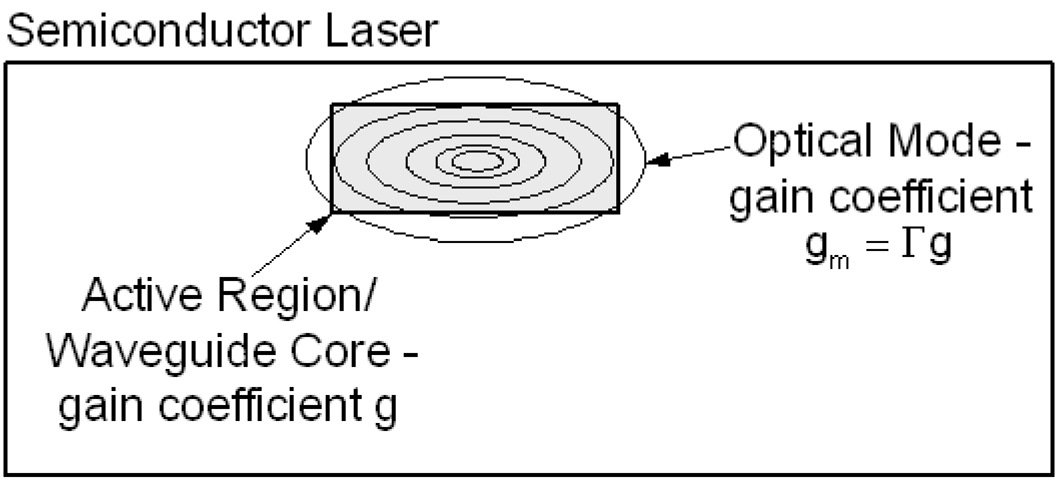


4mW = 6dBm
2mW = 3dBm

Figure 3.1 Microwave power. ← & optical

$10^{(P/10\,dBm)}$

Gain and the Confinement Factor



The gain seen by the optical mode is reduced by the optical confinement factor

$$\Gamma = \frac{\int_{\text{Gain Region}} |E|^2 \, dA}{\int_{\text{All Space}} |E|^2 \, dA}$$