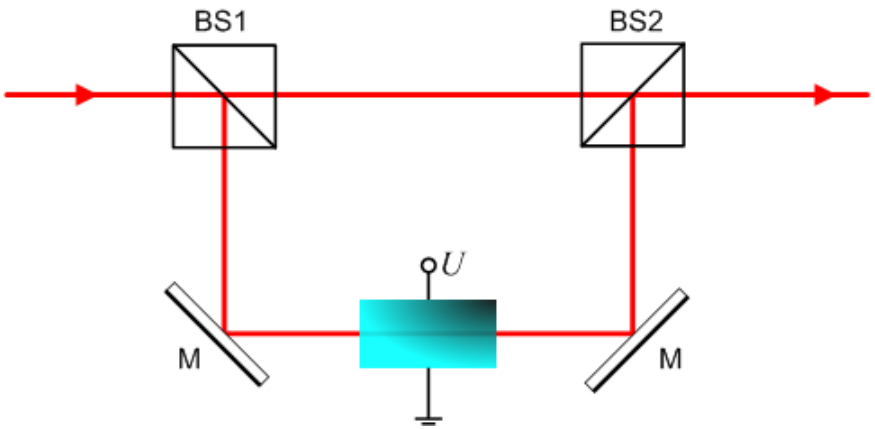
Mach-Zehnder-Modulators

Principles and pre-irradiation measurements

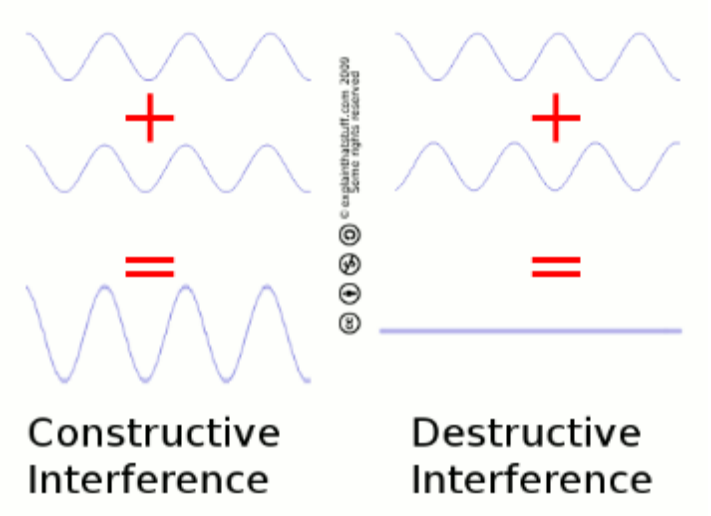
Interference of Light

basic setup



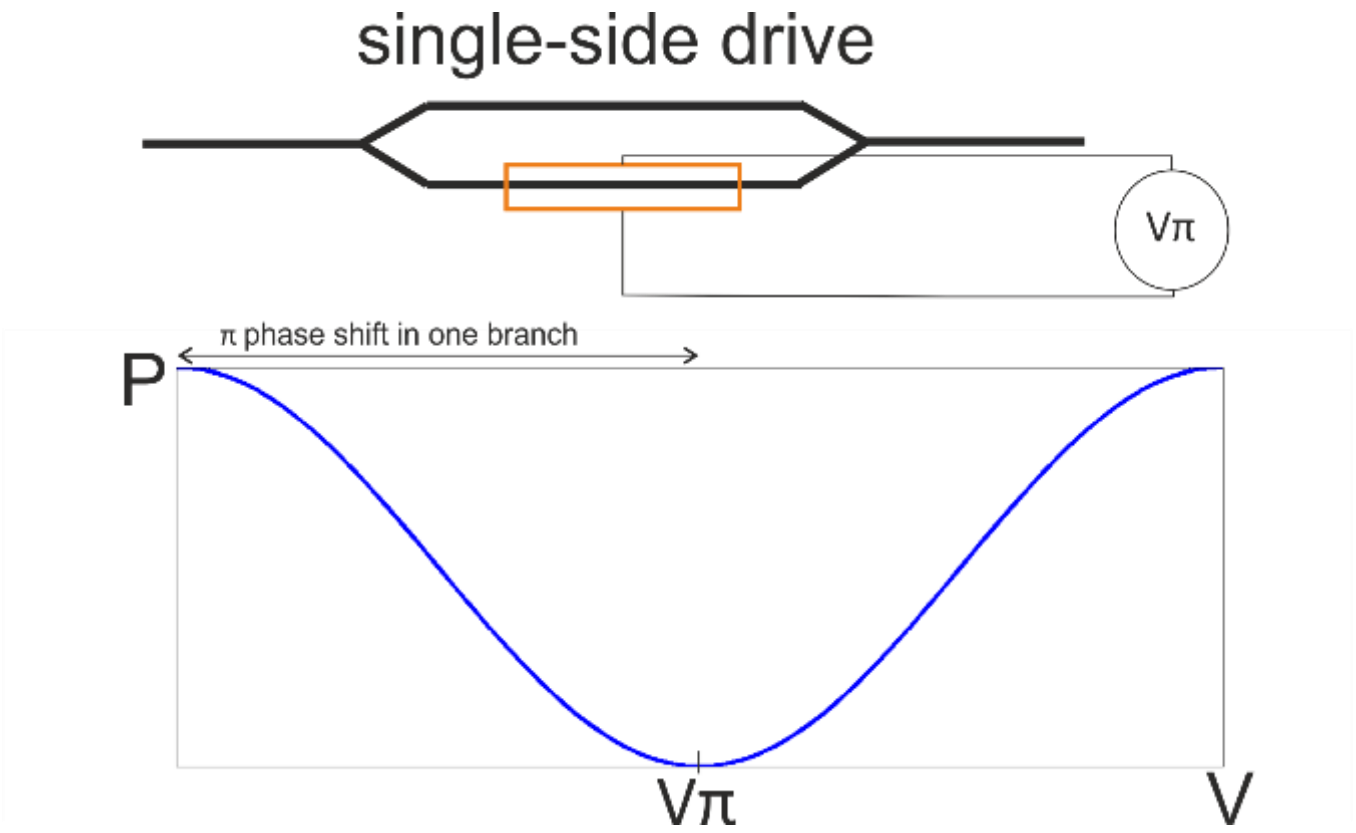
http://upload.wikimedia.org/wikipedia/de/a/a4/Mach-Zehnder-Modulator.png

results



http://ffden-2.phys.uaf.edu/212_spring2011.web.dir/michael_hirte/waveinterference.jpeg

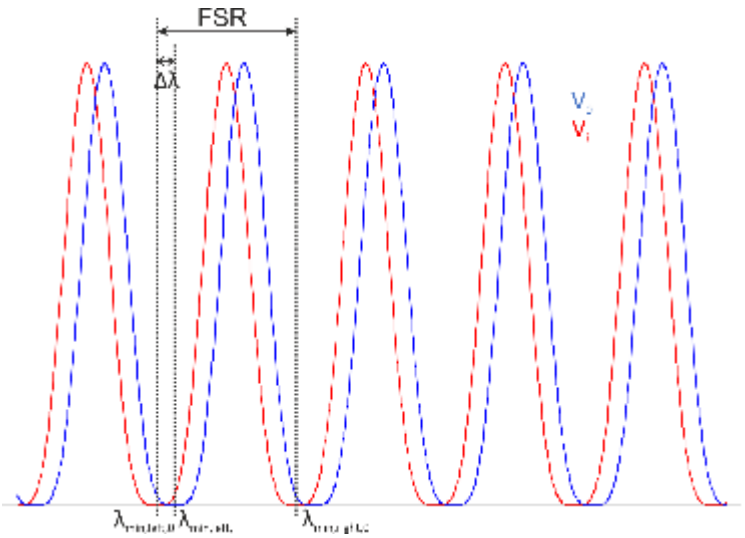
Simple MZM

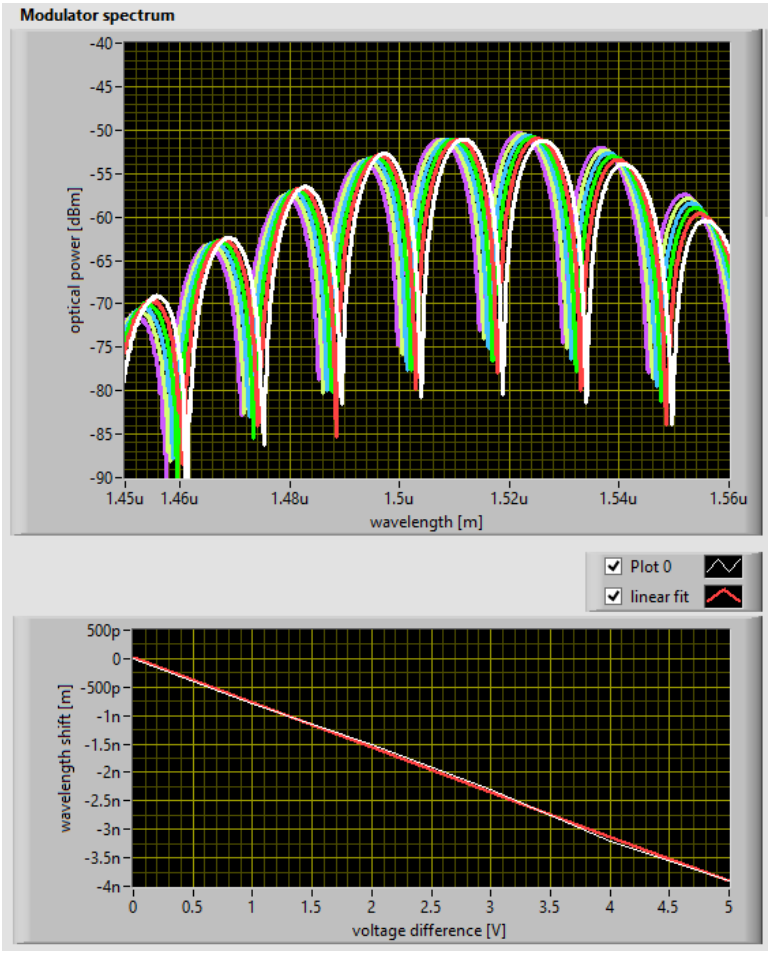


Main device characteristics

- Optical losses due to scattering, absorption, coupling (difference in optical power in fiber w/ and w/o modulator)
- Voltage to introduce phase shift of π (measured with Optical Spectrum Analyzer)
- Small signal cutoff frequency (RF test bed needed for measurements)

Determination of V_π





- Plotting wavelength shift Δλ in dependence of applied voltage V
- Linear fit with slope m
- $V_\pi = \frac{FSR}{2m}$

Phase efficiency for MZM diodes

- Measure of efficiency of phase modulation in high-speed diode
- Phase efficiency for diode with length L:

$$\mathrm{PE} = \frac{\mathrm{L} \times \mathrm{FSR}}{2(\Delta\lambda)}$$

Phase shift Δλ between 0V and 1V