
DTU

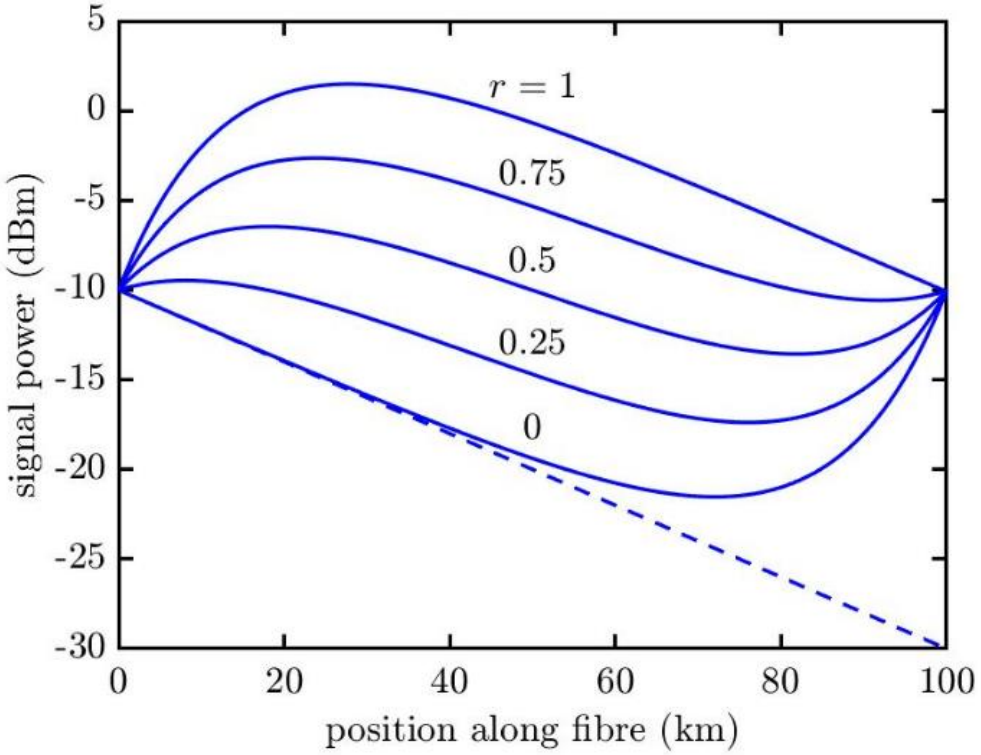
Raman Aplification Simulator
04-09-2025

Forward and Backward Pumping

$$\frac{dP_s}{dz} = -\alpha_s P_s + C_R(\lambda_s, \lambda_p)\left[P_p^+ + P_p^-\right] P_s$$
$$\pm\frac{dP_p^\pm}{dz} = -\alpha_p P_p^\pm - \left(\frac{\lambda_s}{\lambda_p}\right) C_R(\lambda_s, \lambda_p) P_s P_p^\pm$$

- Solved using sovle_bvp
- Known:
  - Forward pump power at L=0
  - Signal power at L=0
  - Backward pump power at L=L_max
- Guesses:
  - Forward pump power at L=L_max
    - Ppf0 * exp(-alpha_p * L_max)
  - Signal power at L=L_max
    - Signal power at L=0
  - Backwart pump power at L=0
    - PpbL * exp(-alpha_p * L_max)

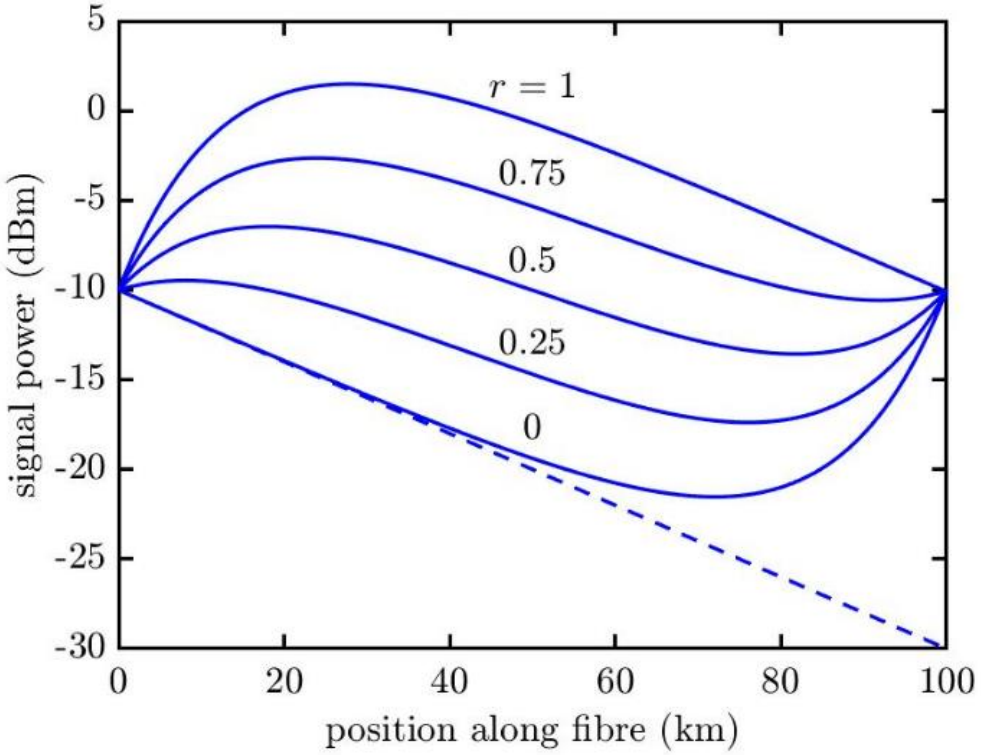
Validation experiment setup

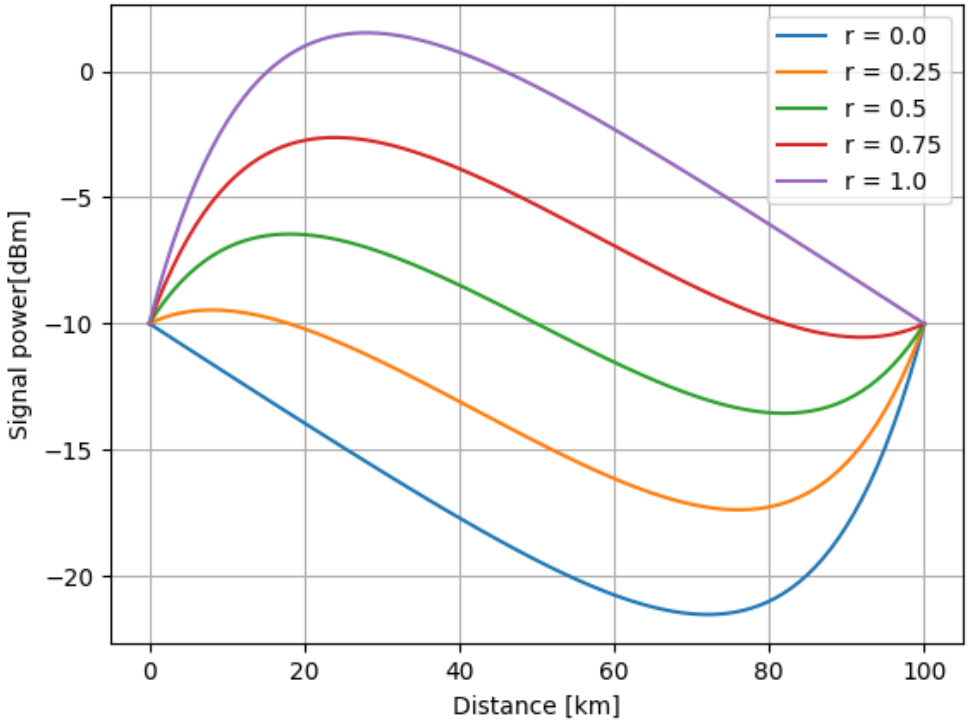


Parameters:

- Signal power (initial) - 0.1 mW
- Signal wavelength – 1550 nm
- Pump power (initial) - 758.2 mW
- Pump wavelength – 1455 nm
- Fiber – Standard Single Mode Fiber
- Fiber length – 100 km
- Fiber loss at pump wavelenght – 0.3 dB/km
- Fiber loss at signal wavelenght – 0.2 dB/km
- Raman efficiency - 0.42 * 10^-3 1/W/m

Validation experiment results





Other fiber types