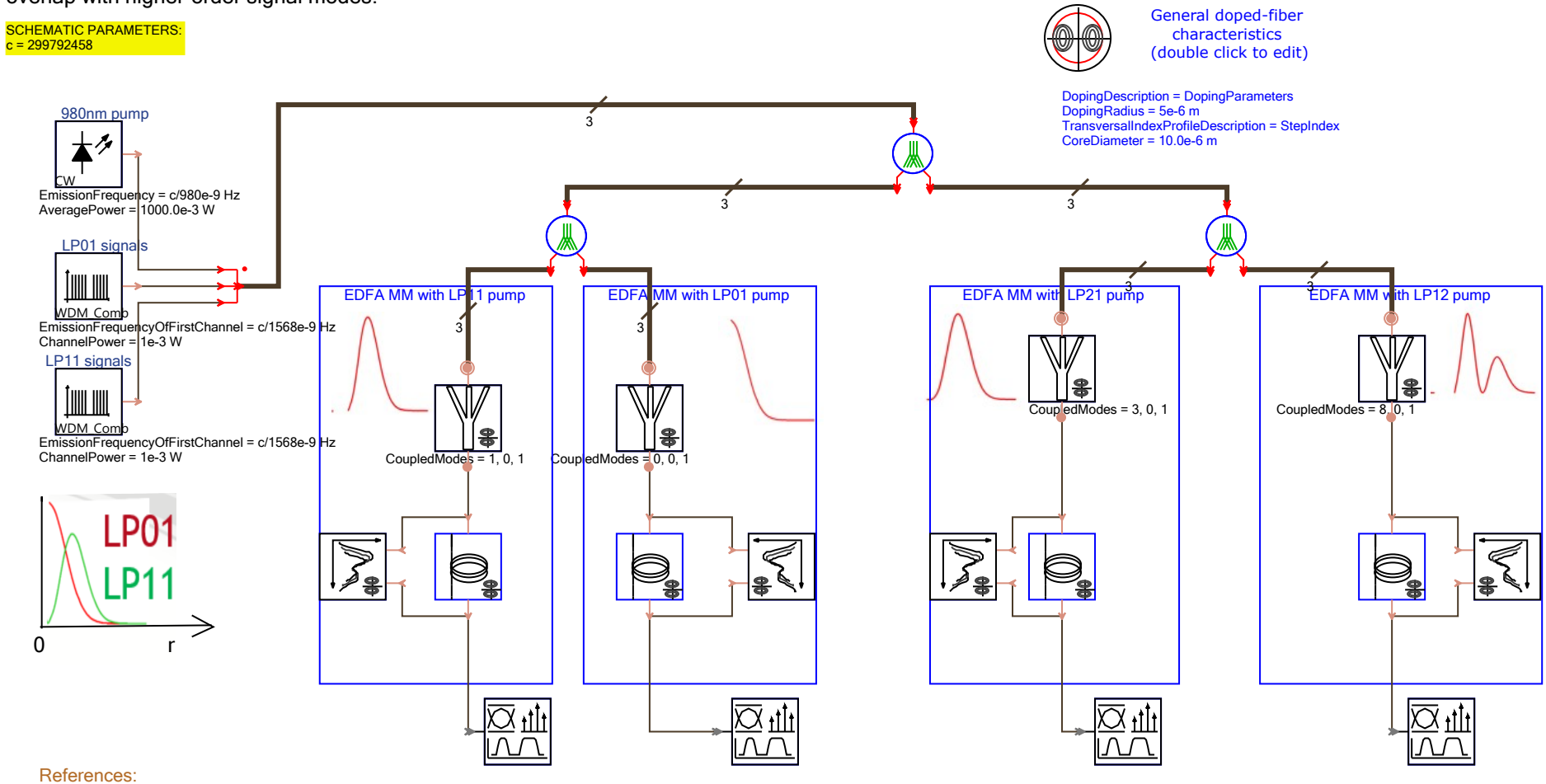
Control of the Differential Modal Gain Through Pump Mode Optimization

This illustrates the effect of the pump mode choice on the differential modal gain (DMG) in the erbium-doped multimode fiber amplifier (EDFA MM). A multimode signal (LP01 and LP11 modes in the C-band) and a direct pumping at 980 nm in one of the LP01, LP11, LP21 or LP12 modes are used. The type of the modes for the pump- and signal waves is defined by the mode number in the CouplerFiberMM module (parameter CoupledModes).

The fundamental LP01 signal mode that has better overlap with the doping distribution (that is confined to the fiber center). This leads to the higher gain values for this mode in comparison with the LP11 signal mode. The DMG can be partially compensated by choosing higher-order modes for pumping. Such pumping scheme produces a distribution of the excited ions that is different in shape from the step-like doping profile and has better overlap with higher-order signal modes.



References:
N.Bai, et al, "Multimode Fiber Amplifier with Tunable Modal Gain Using a Reconfigurable Multimode Pump", OPTICS EXPRESS, vol. 20, pp. 16601-16611, 2011