MIMO-OFDM with Variable Pilot-to-data Power Ratio (PDPR) Simulator Tutorial

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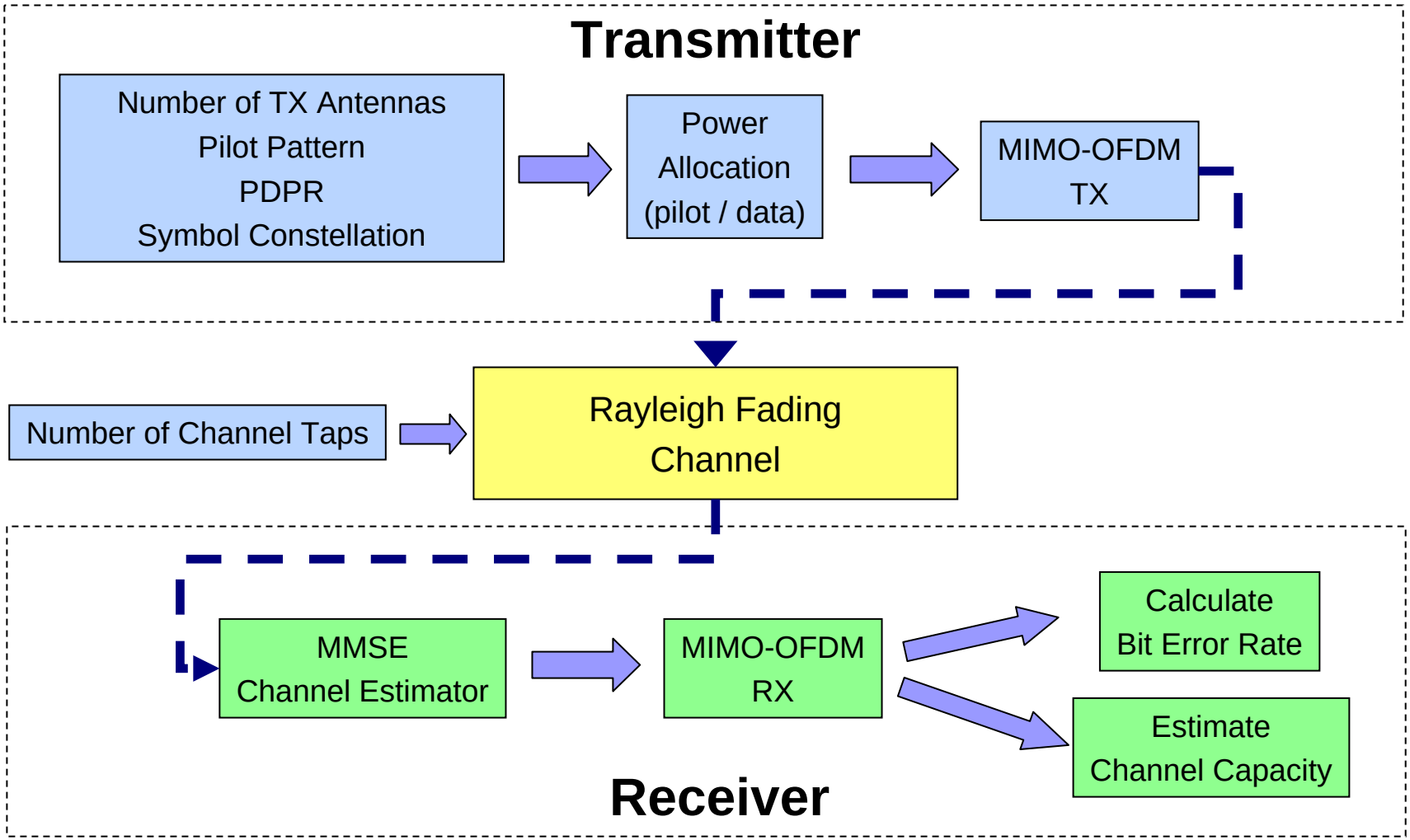
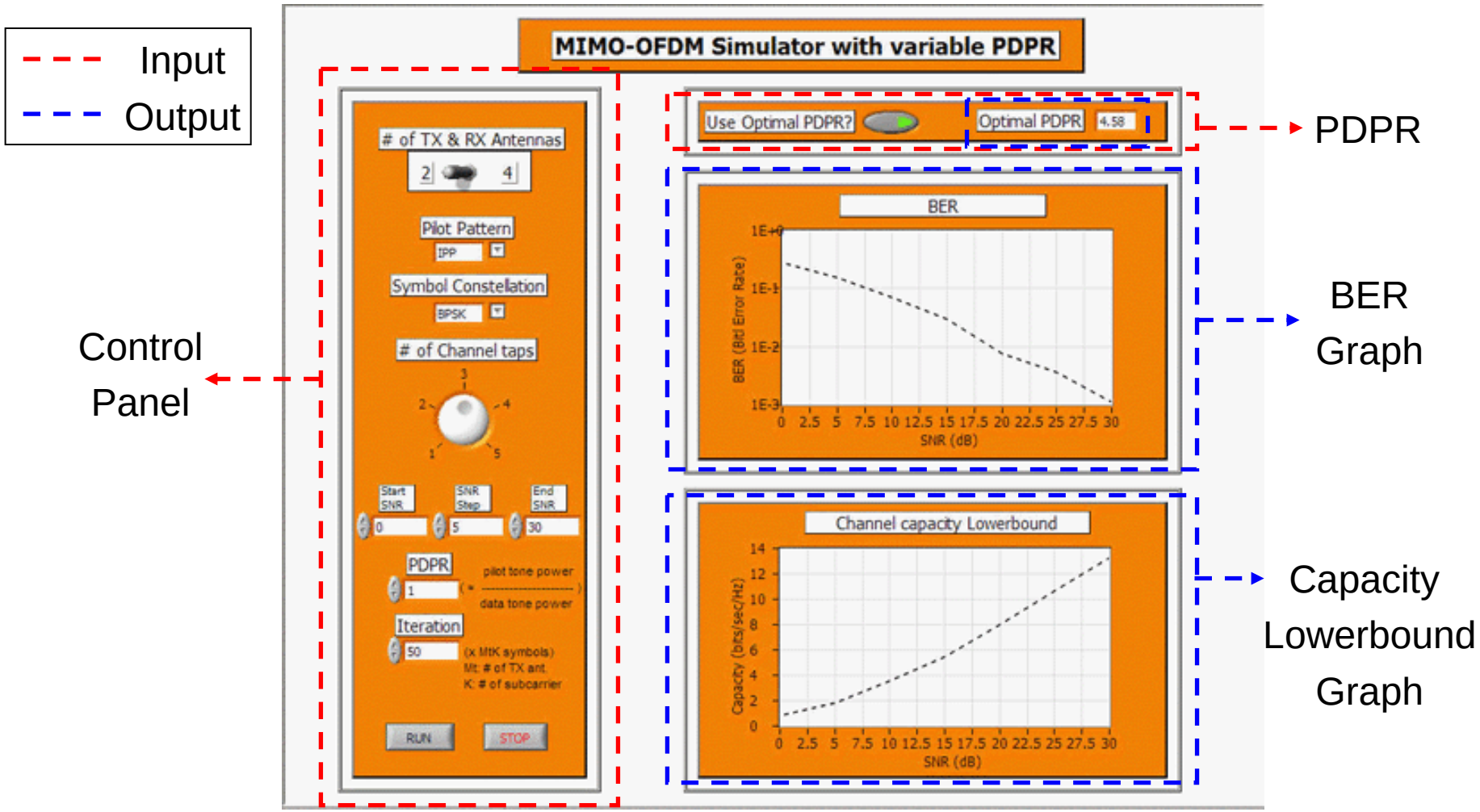
Block Diagram of Simulator



Front Panel (User Interface)

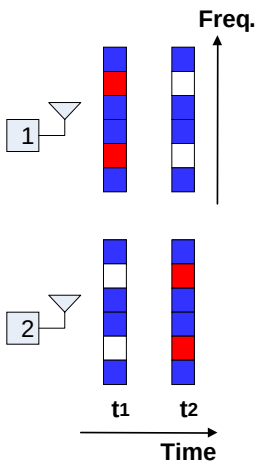


Control Panel (1)

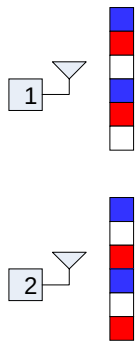
1. **# of TX & RX Antennas:** Decide the number of TX & RX antennas. In this simulator, TX and RX have the same number of antennas.

2. **Pilot Pattern:** Specify pilot patterns
   - **Independent:** Independent pilot pattern (orthogonal in time)
   - **Scattered:** Scattered pilot pattern (orthogonal in frequency)
   - **Orthogonal:** Orthogonal pilot pattern (orthogonal in code)

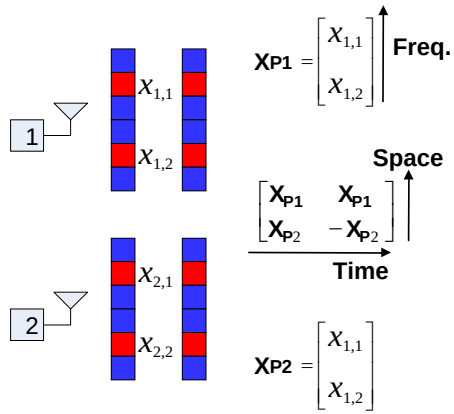
• Independent (IPP)

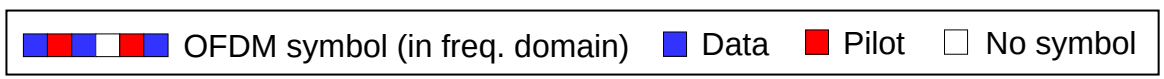


• Scattered (SPP)



• Orthogonal (OPP)





Control Panel (2)

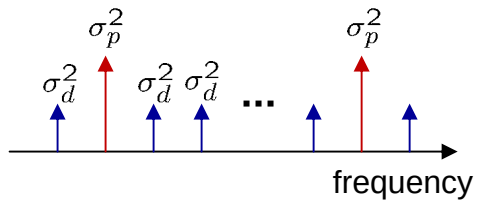
1. **Symbol Constellation:** Choose **BPSK, QPSK, 16QAM, or 64QAM** for the transmit symbol constellation

2. **# of Channel taps:** Specify the number of channel taps of Rayleigh fading in time domain

3. **SNR:** Determine SNRs for the simulation. Simulation will be performed from "**Start SNR**" to "**End SNR**" at every "**SNR Step**".

4. **PDPR:** Pilot-to-data ratio (PDPR) is used for power allocation between pilot and data tones of OFDM system.

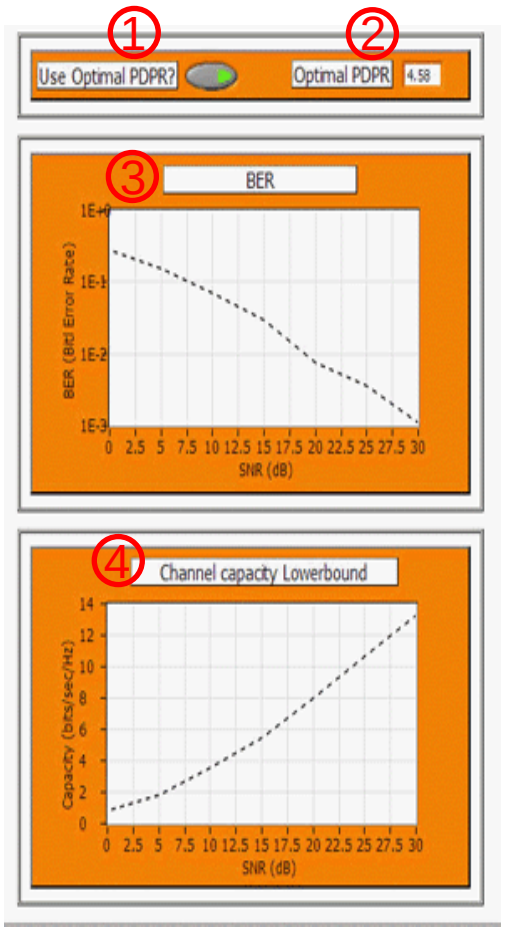
$$\eta(\text{PDPR}) = \frac{\sigma_p^2}{\sigma_d^2} = \frac{\text{pilot symbol power}}{\text{data symbol power}}$$



5. **Iteration:** Determine the iteration number for simulation.

   (1 iteration means that simulation is performed for Mt OFDM symbols = KMt BPSK/QPSK symbols. Mt: # of TX antennas, K: # of subcarriers)

PDPR & Simulation Result



1. **Use Optimal PDPR:** If this button is on, then the optimal PDPR for current settings will be calculated and used for simulation.

2. **Optimal PDPR:** It shows the optimal PDPR for current simulation settings.

3. **BER:** It shows the bit error rate (BER) result of the simulation.

4. **Channel capacity lower bound:** It shows the channel capacity lower bound using MMSE estimated channels for the current simulation settings.

Instructions to install the Toolkit

1. Download and unzip the **“mimoofdm.zip”** file into a convenient directory.
2. Open the **“mimoofdm.llb”**. Once you open this file you will see a list of all the LabVIEW VIs which are needed for the simulator.
3. Open the file named **“simulator.vi”.** This is the top level application file.
4. Run the VI by going to Operate->Run, or press Ctrl-R.
5. You can run simulation by click “Run” in the control panel after setting parameters. Then, you will see the BER and channel capacity lower bound results in the right side of the simulator.