

Motivation

- **Spectrum scarcity is leading to more frequency-agile standards**
 - Non-contiguous transmission
 - Carrier Aggregation (CA) in LTE-Advanced
 - Cognitive radio
 - 5G New Radio (NR) cellular
- **Non-contiguous carriers intermodulate**
 - Caused by nonlinearities in power amplifiers (PAs)
 - Undesired spurious emissions (spurs) and spectral regrowth
 - Could interfere with nearby channels
 - Self-interference to own receiver when using FDD
- **DPD requires extra hardware**
 - Extra RX chains with fast sampling rates
 - Larger area
 - More power
- **Need computationally and hardware efficient way to linearize for this scenario**

Main Idea

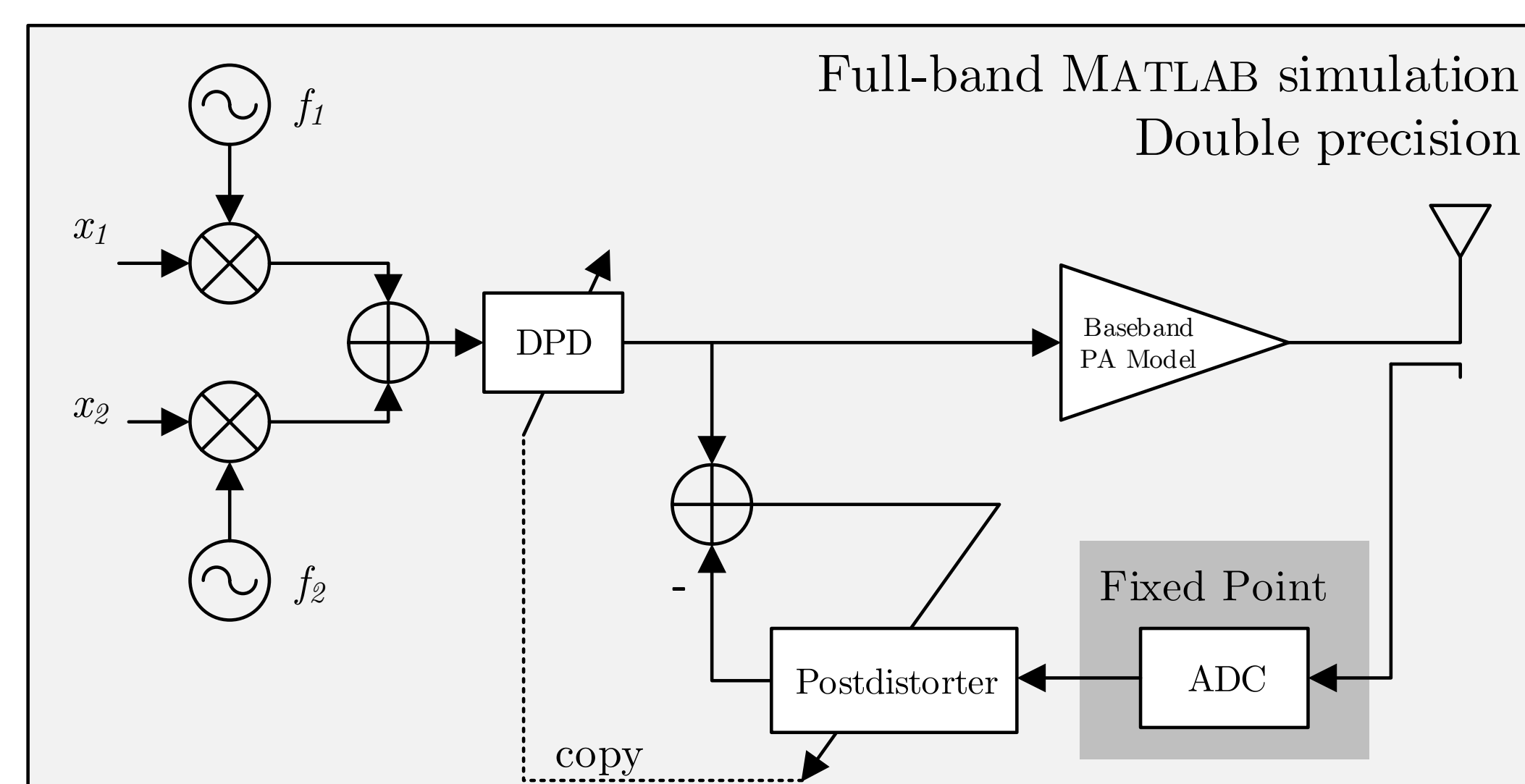
- **Use a lower precision ADC for DPD on a UE device**
 - Reduce the necessary area
 - Reduce the power
 - Reduce the cost
 - Reduce the computational complexity by using shorter word lengths
 - Increase sampling rates

MATLAB Simulator

- **LTE-Advanced CA Scenario**
 - Two, 5 MHz component carriers
 - 5th order, parallel Hammerstein PA model
 - Fixed point toolbox to emulate ADC

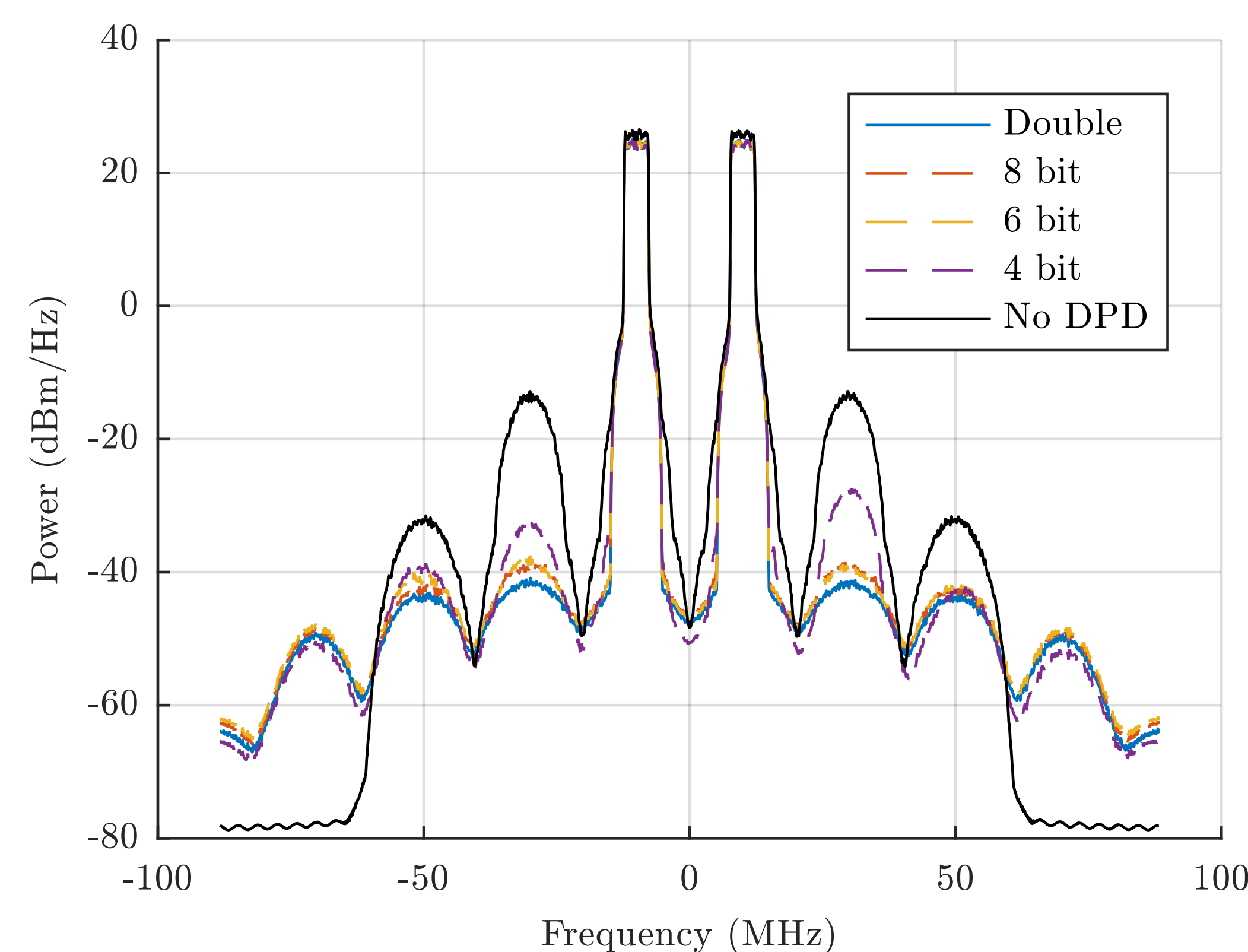
Full-band DPD Simulations

Simulation Architecture



- Traditional, indirect-learning DPD

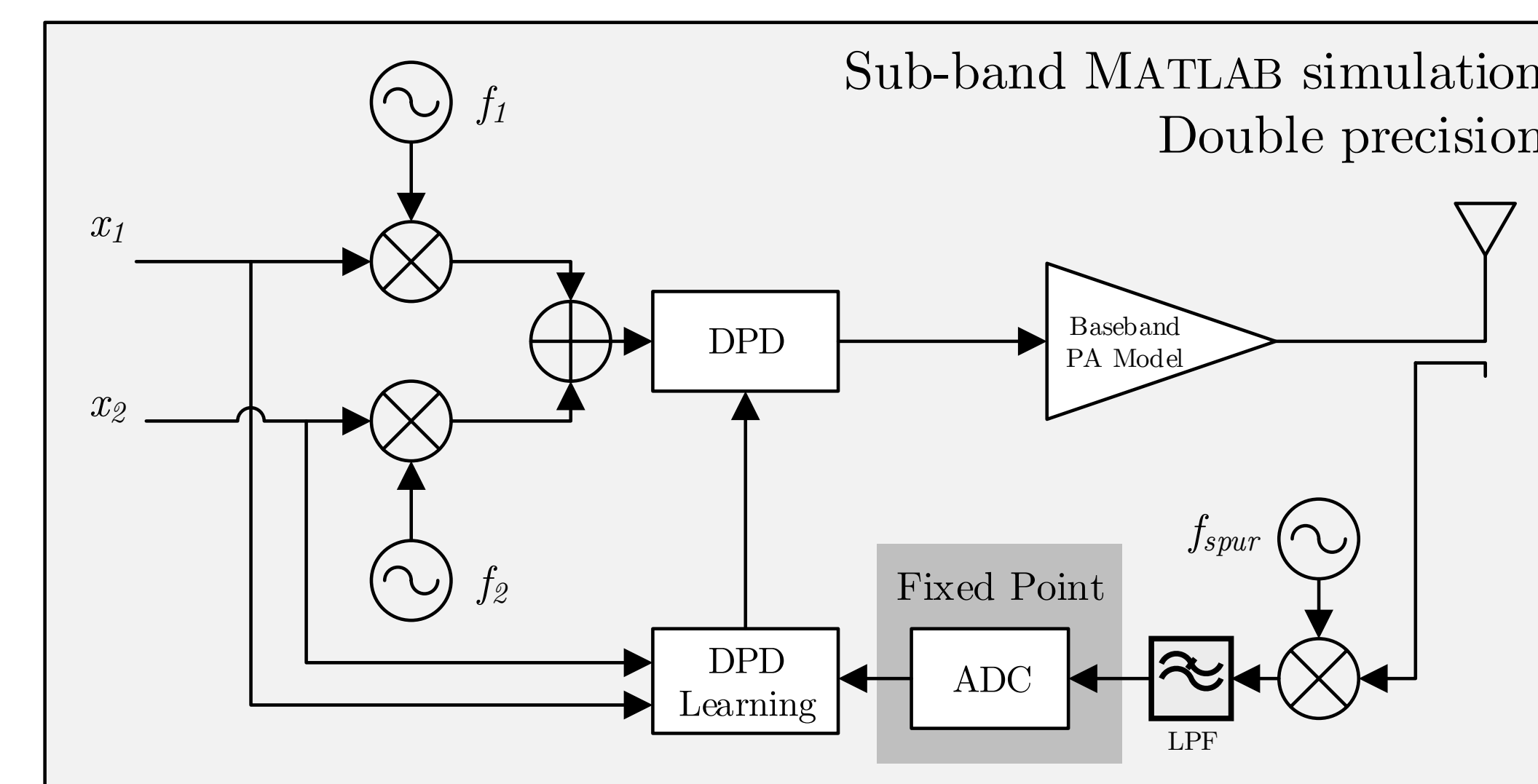
Suppression Results:



- Near ideal performance for as low as 6 bits

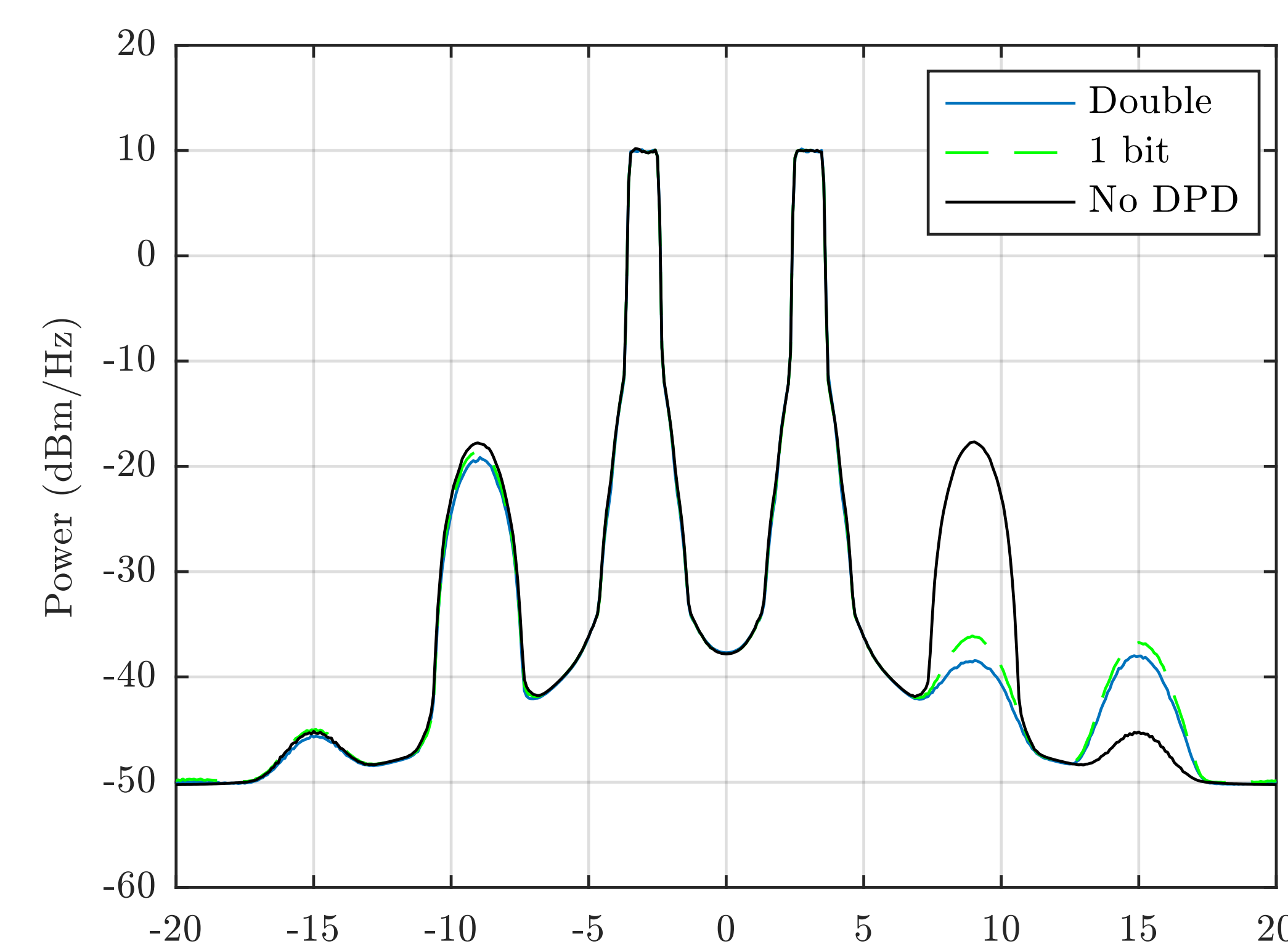
Sub-band DPD Simulations

Simulation Architecture



- Uses LMS adaptive training to learn inverse of PA nonlinearities

Suppression Results:



- Near ideal performance for as low as 1 bit
- RX feedback gain can be set to get better resolution of the spurious signal
- Main carriers no longer likely to saturate the ADC

Future Work

- **Computational complexity analysis**
- **Multi sub-band, single-bit DPD solution**
- **Hardware testing with a real PA using the WARP SDR platform**