

## 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

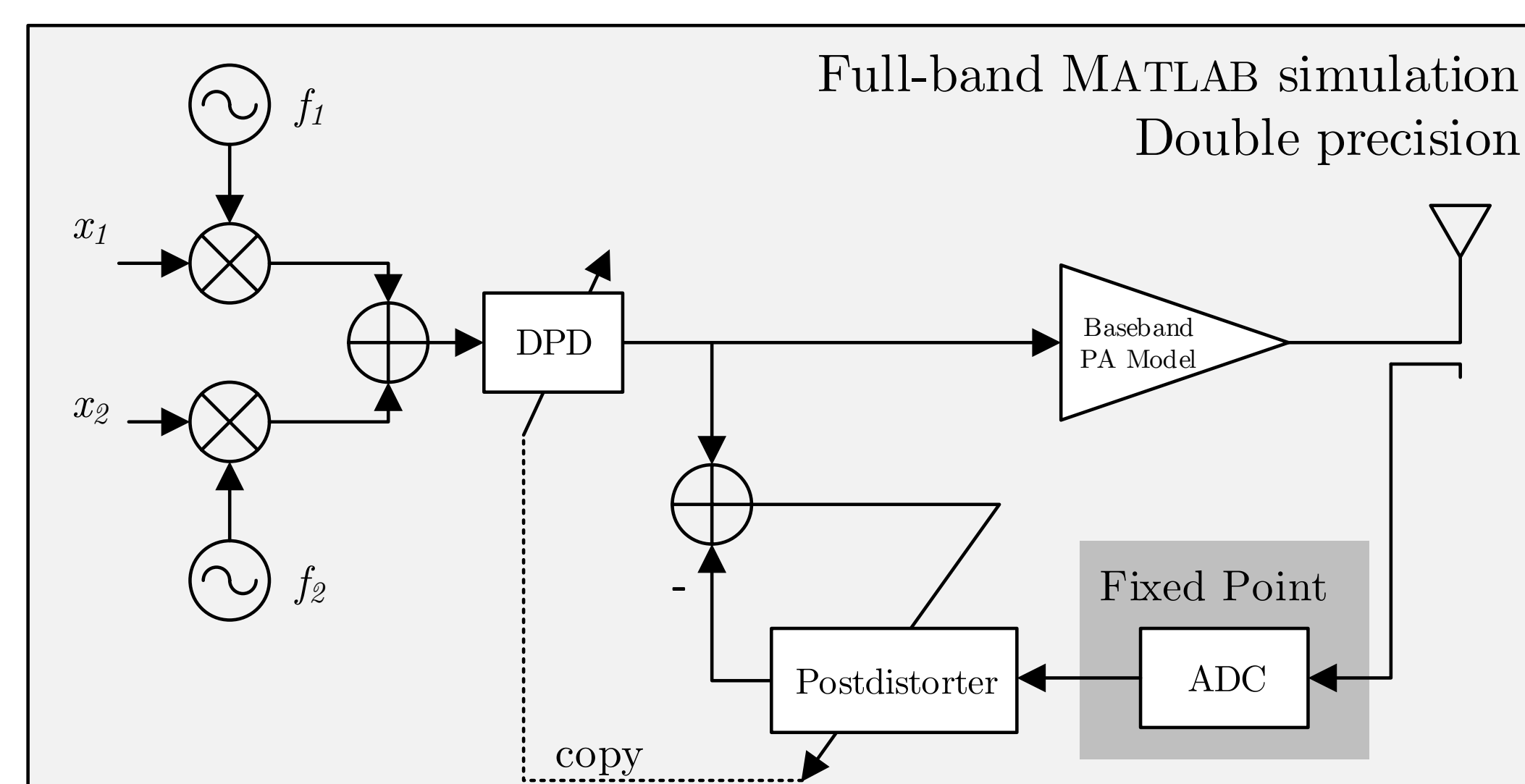
- **Use a lower precision ADC for DPD on a UE device**
  - Reduce the necessary area
  - Reduce the power
  - Reduce the cost
  - Reduce the computational complexity by using shorter word lengths
  - Increase sampling rates

## MATLAB Simulator

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

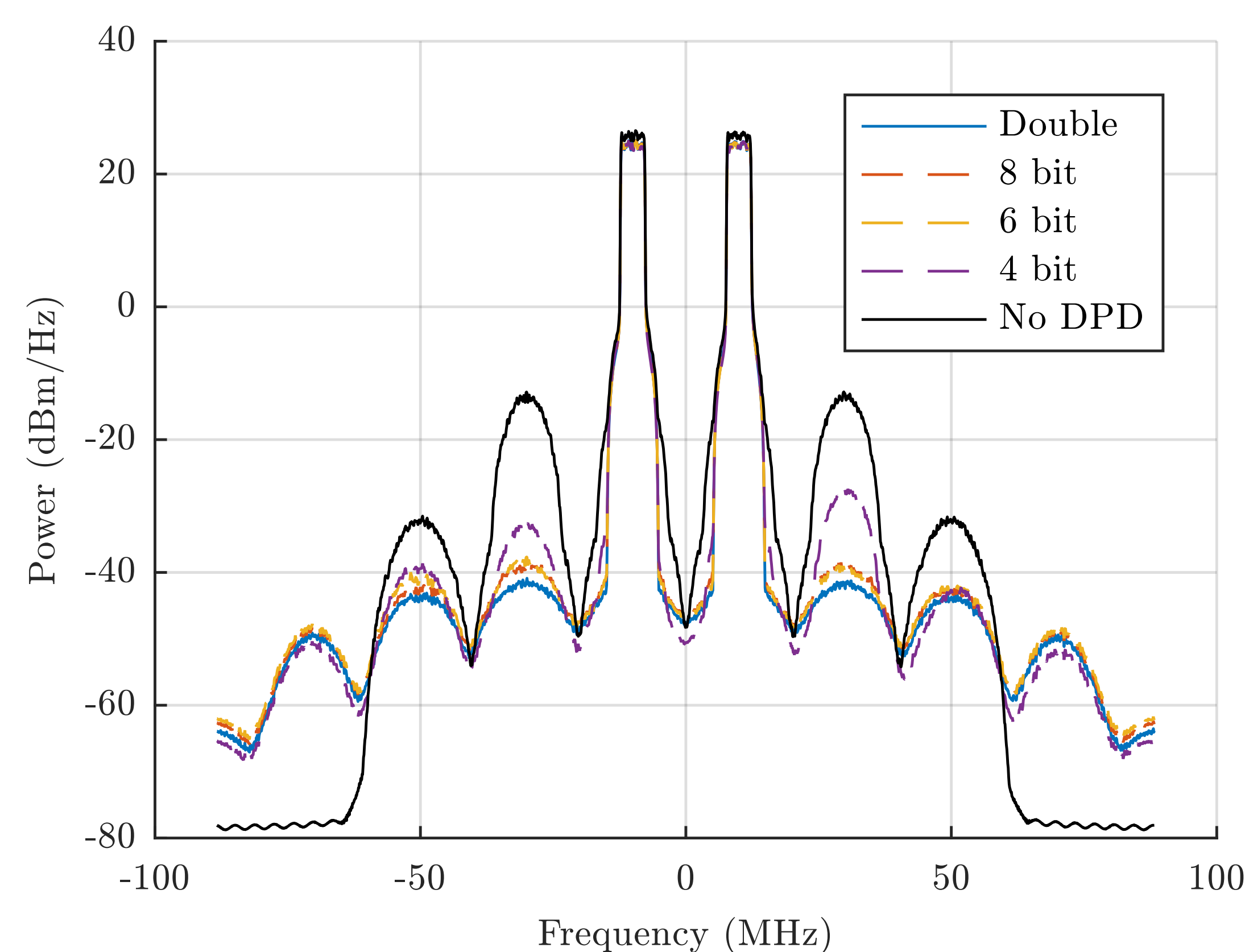
## Full-band DPD Simulations

### Simulation Architecture



- Traditional, indirect-learning DPD

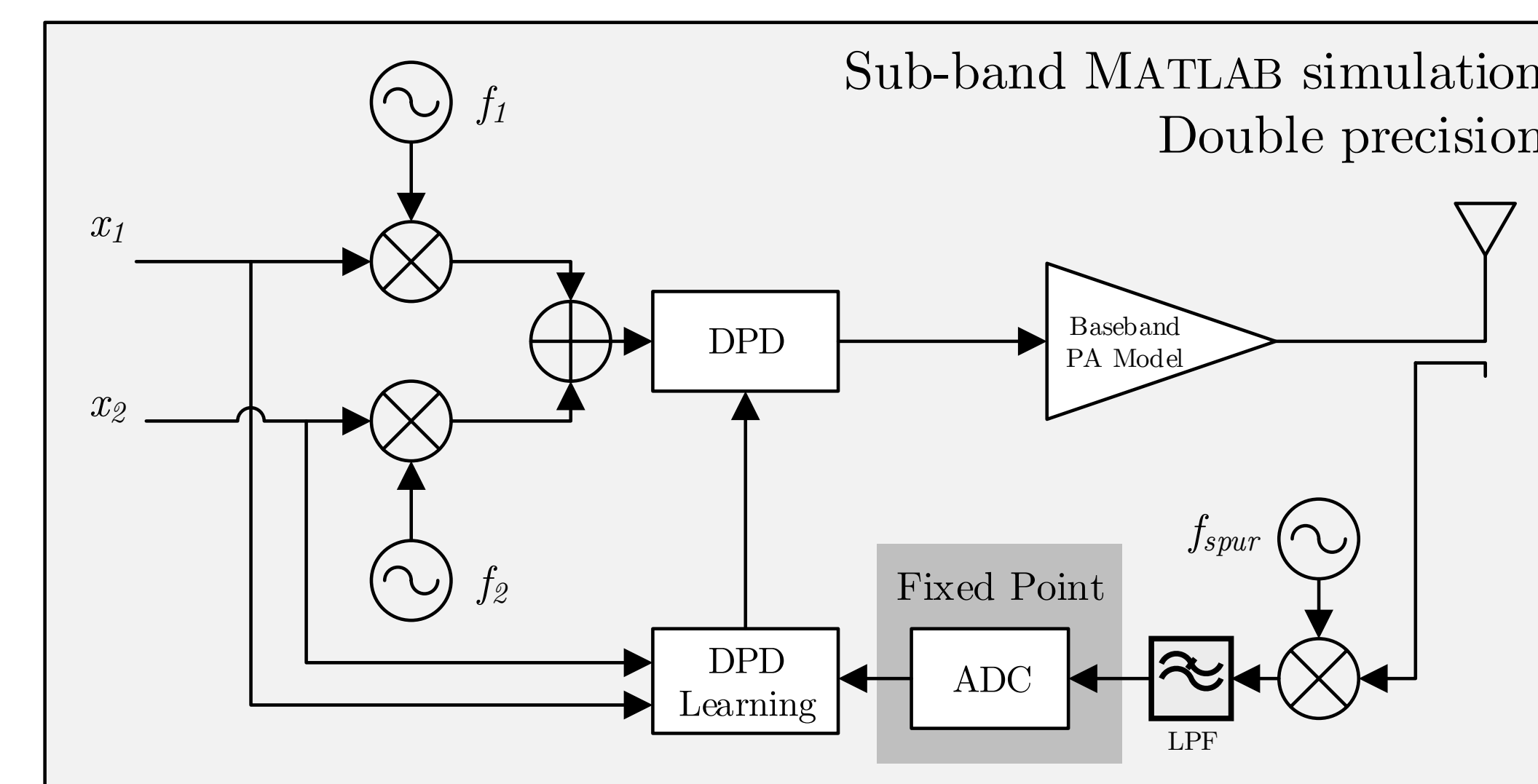
### Suppression Results:



- Near ideal performance for as low as 6 bits

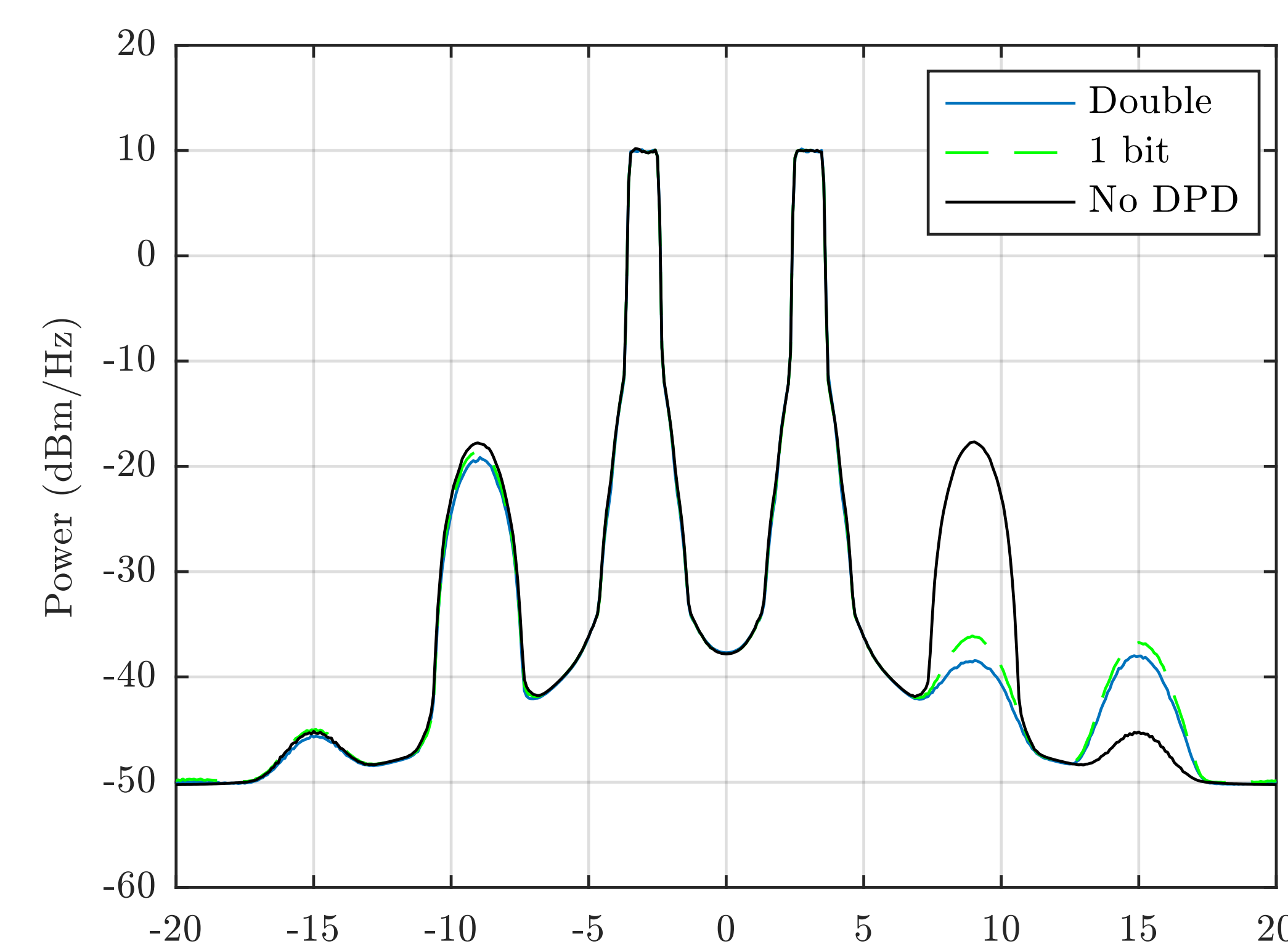
## Sub-band DPD Simulations

### Simulation Architecture



- Uses LMS adaptive training to learn inverse of PA nonlinearities

### Suppression Results:



- Near ideal performance for as low as 1 bit
- By targeting a single spur, gain can be set to get better resolution of the 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**