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3GPP TSG RAN Meeting #93-e
Electronic Meeting, September 13 - 17, 2021

RP-212009

AI: 9.0.2

Rel-18 UL Enhancement

Background

- Following example areas were identified in Rel-18 RWS:
  - >4 Tx operation
  - Enhanced multi-panel/multi-TRP uplink operation
  - Frequency-selective precoding
  - Further coverage enhancement
- Pre RAN#93-e email discussion concluded with tentative set of items for UL enhancement in Rel-18

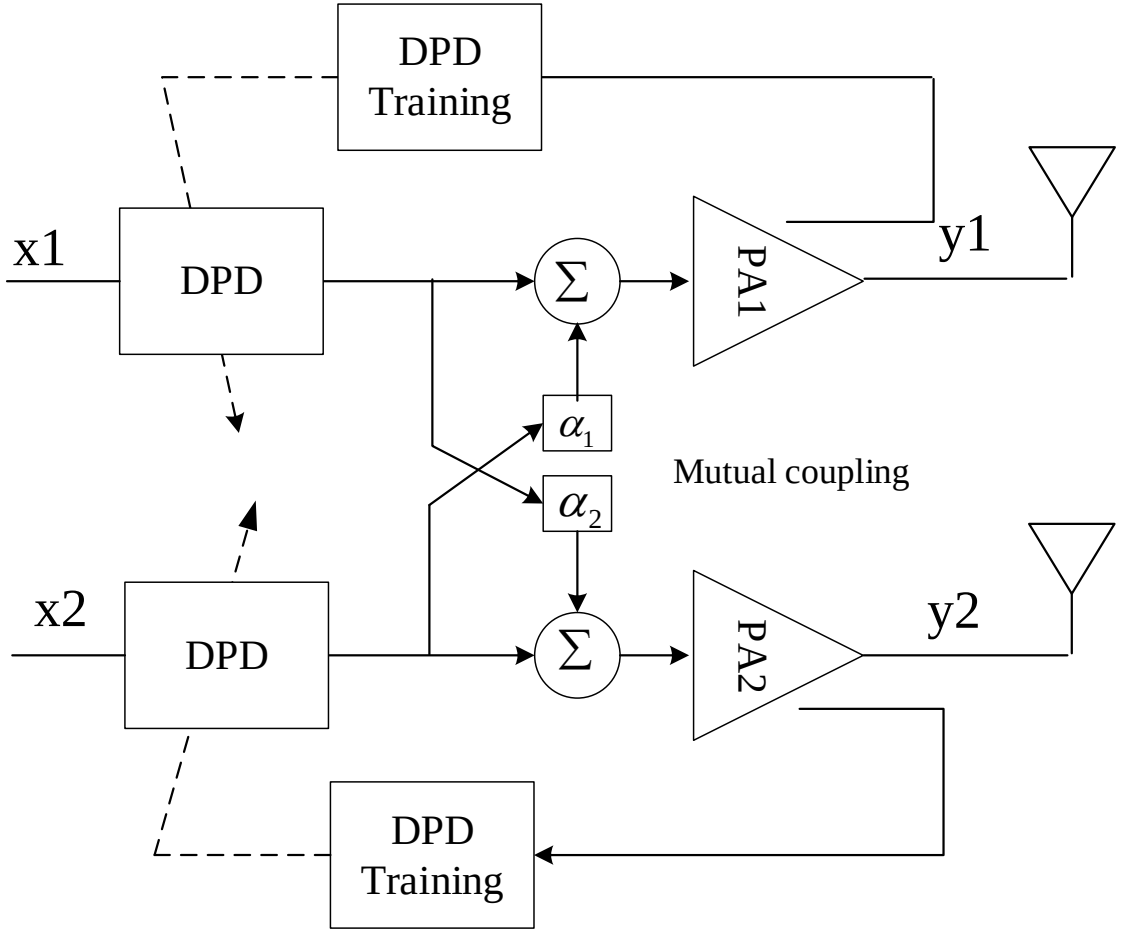
Real deployment issues at UE

- Other important aspects to consider
  - Impact of implementation issues, e.g. crosstalk between RF chains, on UL throughput
    - Cross-talk coefficient between RF chains may not be static; e.g. temperature has different level of impact
    - Study hardware impact on UL performance, and potential standard based solution for compensation
    - *See Annex for preliminary evaluation results*
  - Potential enhancement for DFT-s-OFDM, improving power efficiency at UE
    - Support rank>1 (up to rank 4) for DFT-s-OFDM without PAPR increase
      - Potential DMRS, PTRS enhancement
    - More flexible switching between DFT-s-OFDM and CP-OFDM waveforms

Annex:
Evaluation on impact of cross-talk in UL performance

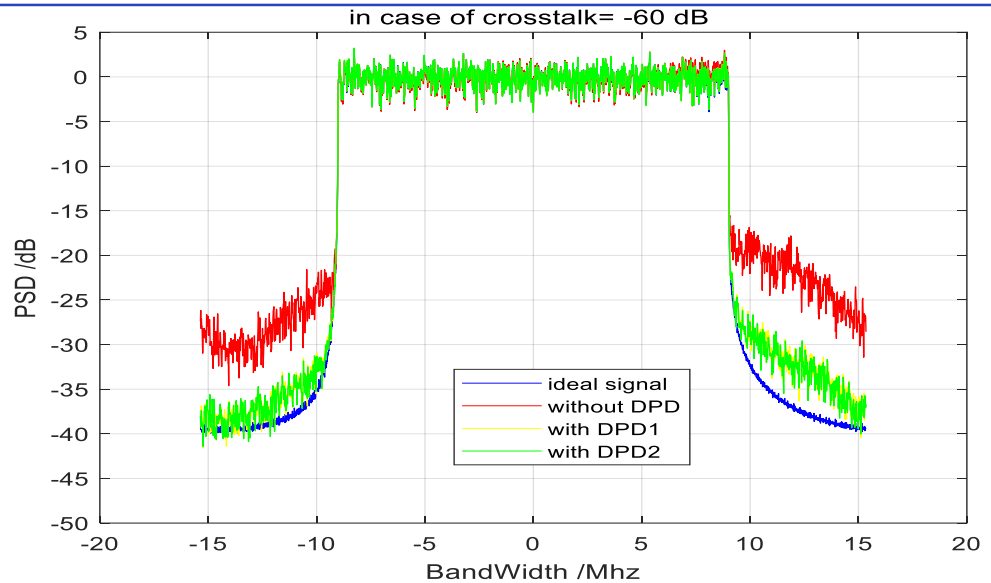
Two types of DPD with different training schemes are evaluated.

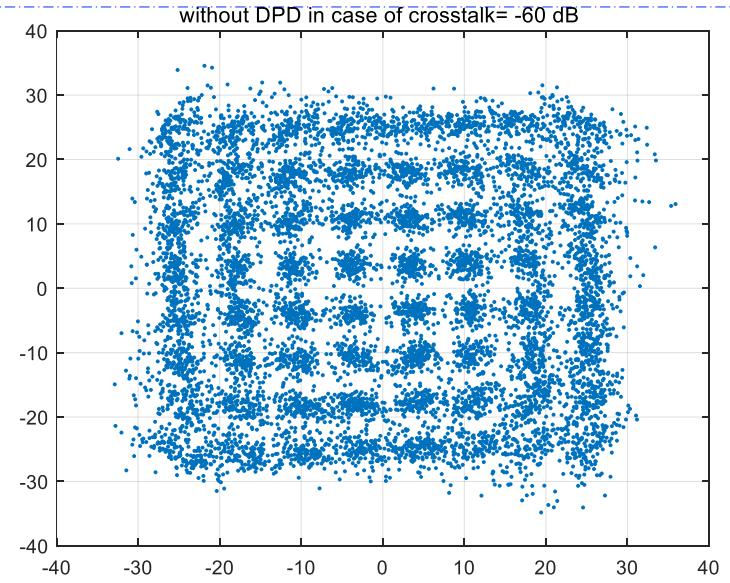
1. DPD1: the coefficients of DPD is obtained by training PA assuming single-Tx, which does not take cross-talk into account.
2. DPD2: the coefficients of DPD is obtained by training PA assuming Multi-Tx, and the non-linear mutual coupling model and Memory Polynomial model for PA are integrated. Impacts of both cross-talk and non-ideal PA are compensated.

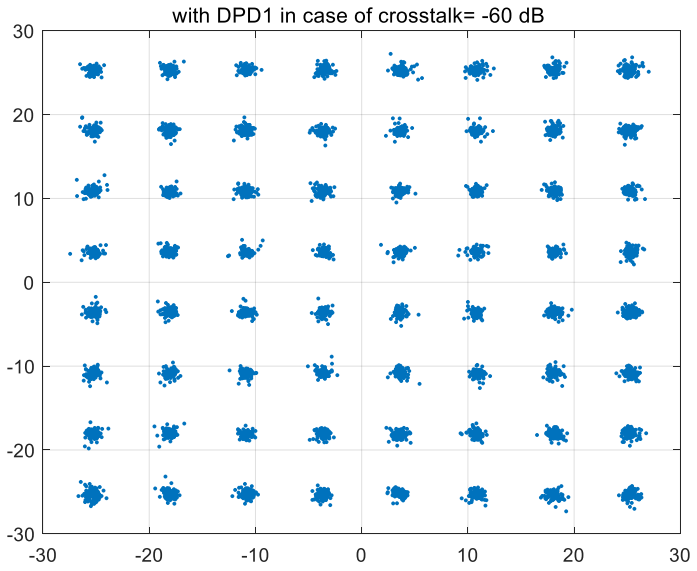


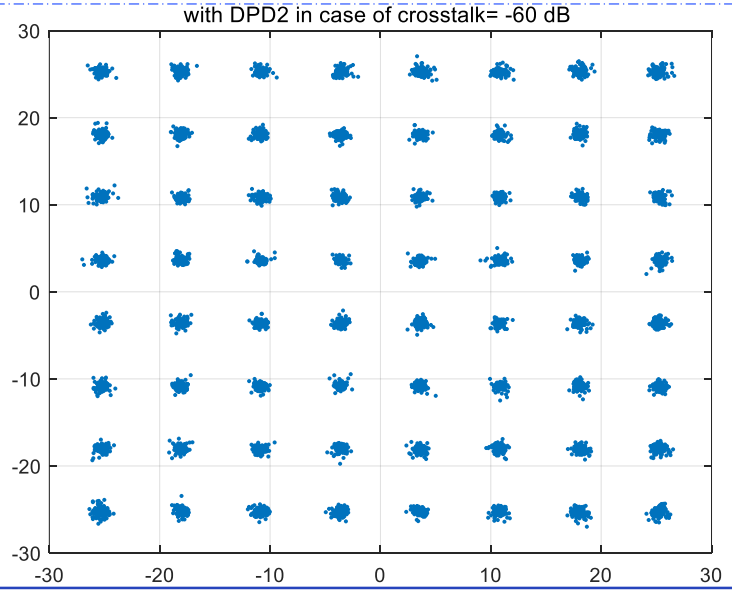
Perfectly matched coefficient of DPD

Coefficient=0.001 (cross-talk = -60dB): same ALCR of PSD and same performance of QAM pattern are observed by different DPD processing, since the coefficient is so small that the impact of cross-talk is negligible.



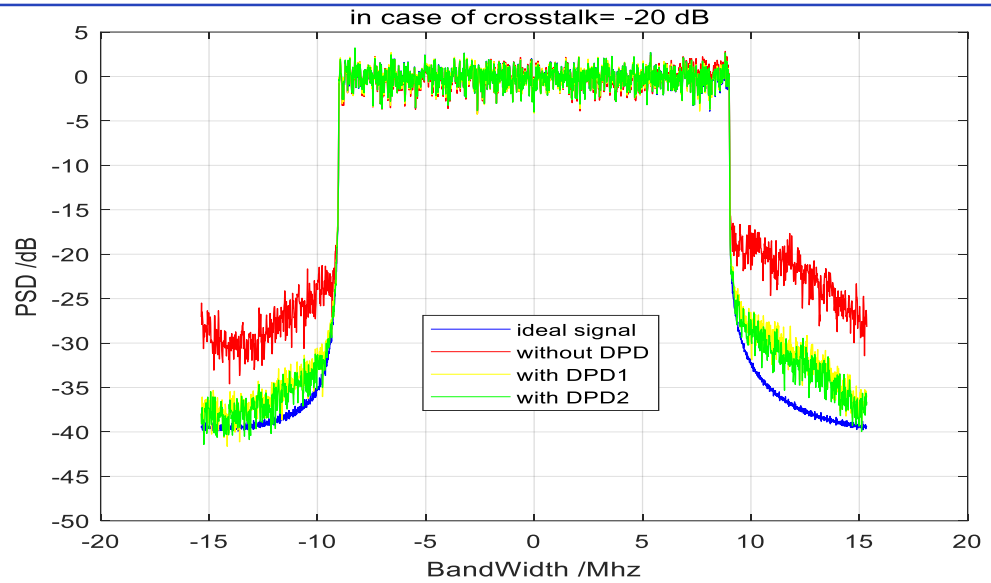


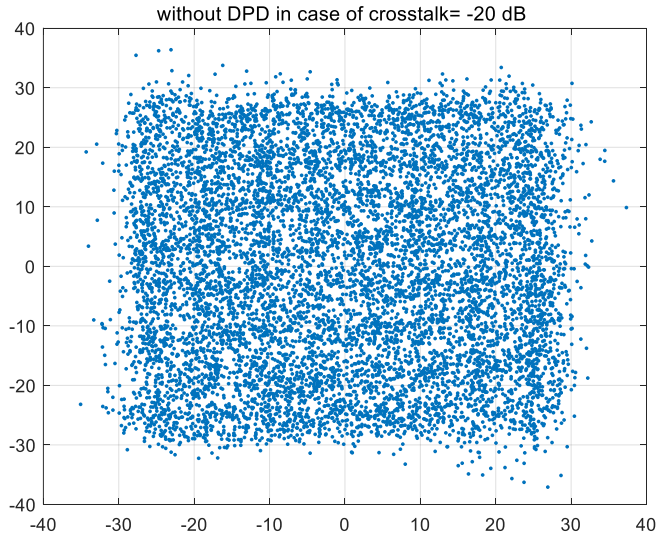


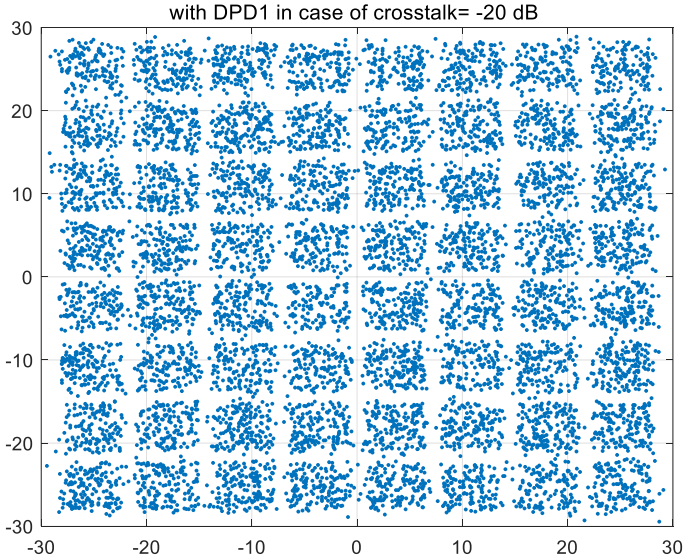


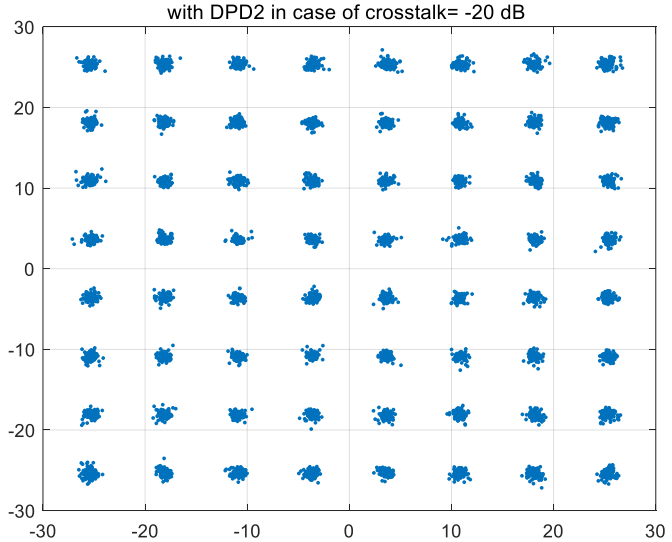
Perfectly matched coefficient of DPD

Coefficient=0.1 (cross-talk = -20dB): similar ACLR of PSD are observed by different DPD processing, but the performance of QAM is different, DPD2 is better than DPD1 since cross-talk is effectively compensated by DPD2.





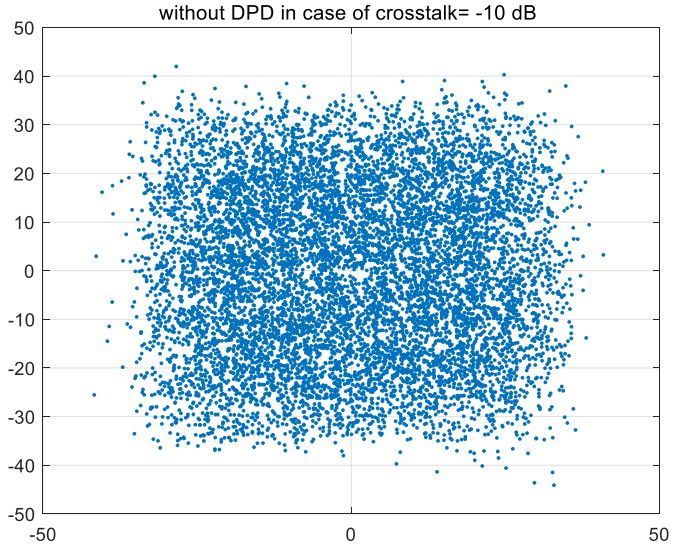


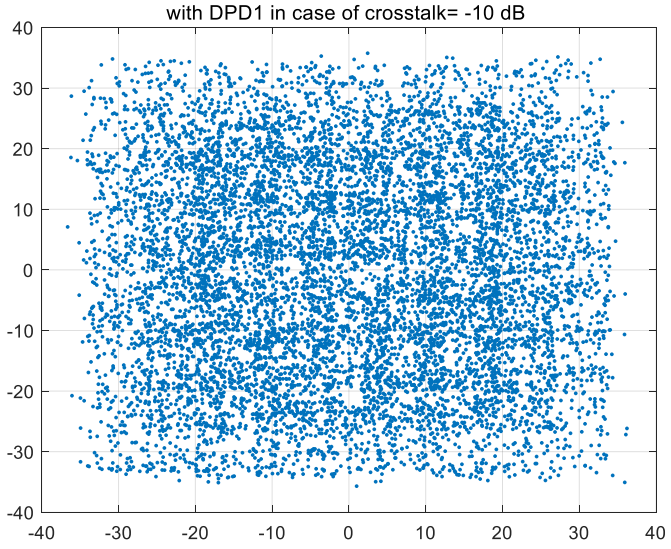


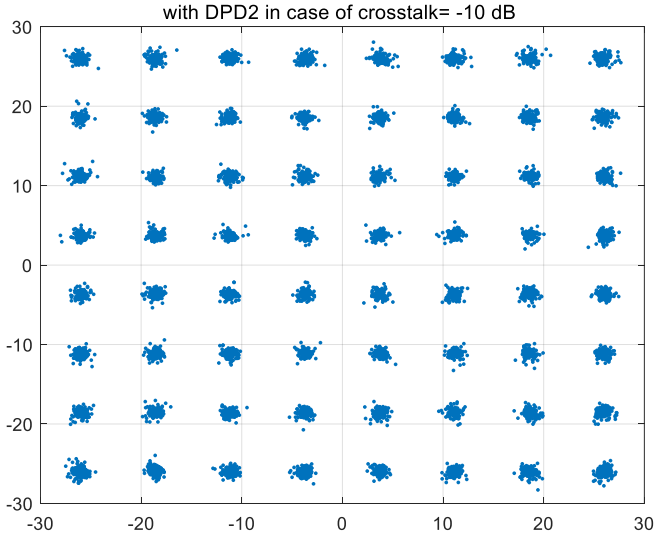
Perfectly matched coefficient of DPD

Coefficient=0.3162 (cross-talk = -10dB): both ACLR of PSD and the performance of QAM are different, DPD2 is better than DPD1 since cross-talk is effectively compensated by DPD2.

-10dB cross-talk between RF chains is typical scenario in UE implementation!

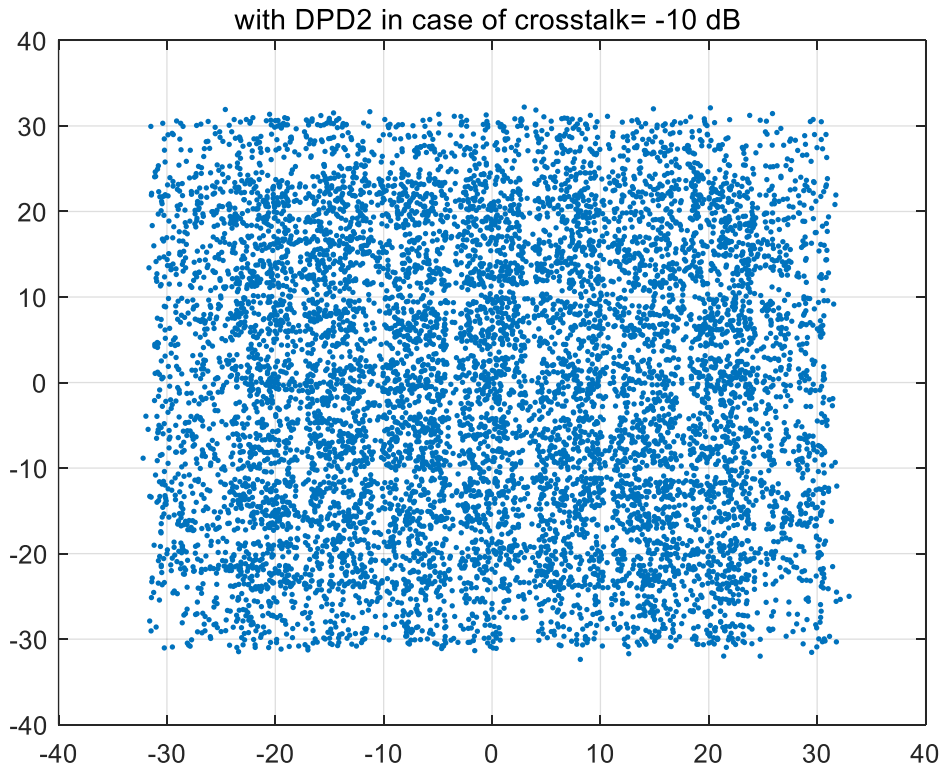


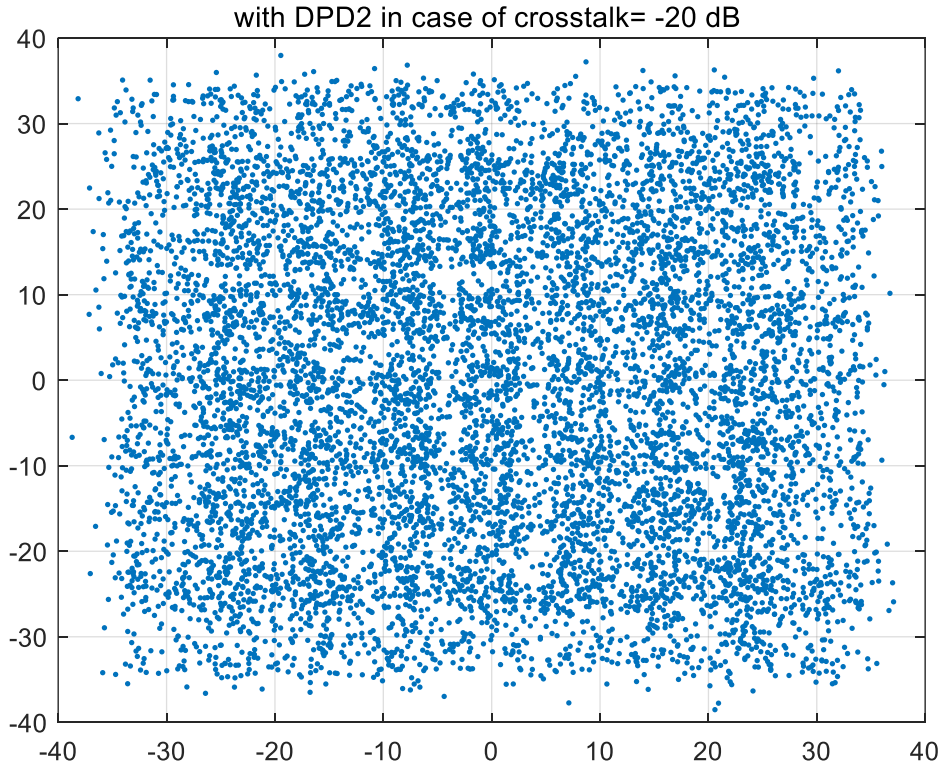




Mismatched coefficient of DPD

Considering the cross-talk is not static in real implementation, mismatched DPD coefficients with real cross-talk between RF chains are evaluated. In left figure, the DPD2 coefficients trained for crosstalk(-20dB) is applied to crosstalk of (-10dB); while in right figure, the DPD2 coefficients trained for crosstalk(-10dB) is applied to crosstalk of (-20dB). It can be observed that mismatched DPD coefficients cannot work.





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THANK YOU.
谢谢。