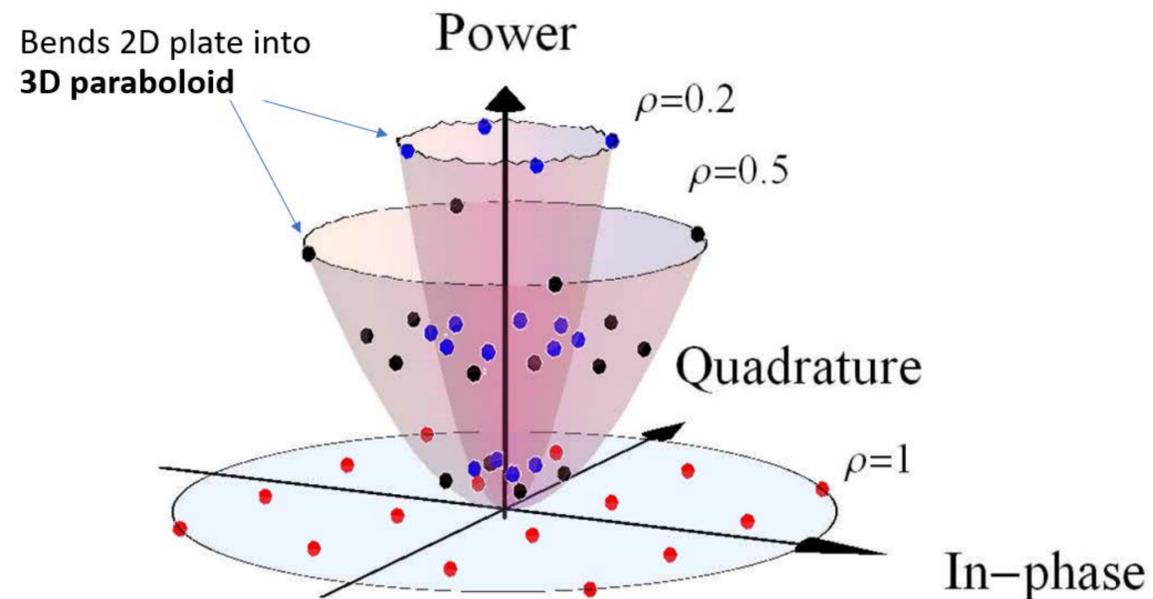
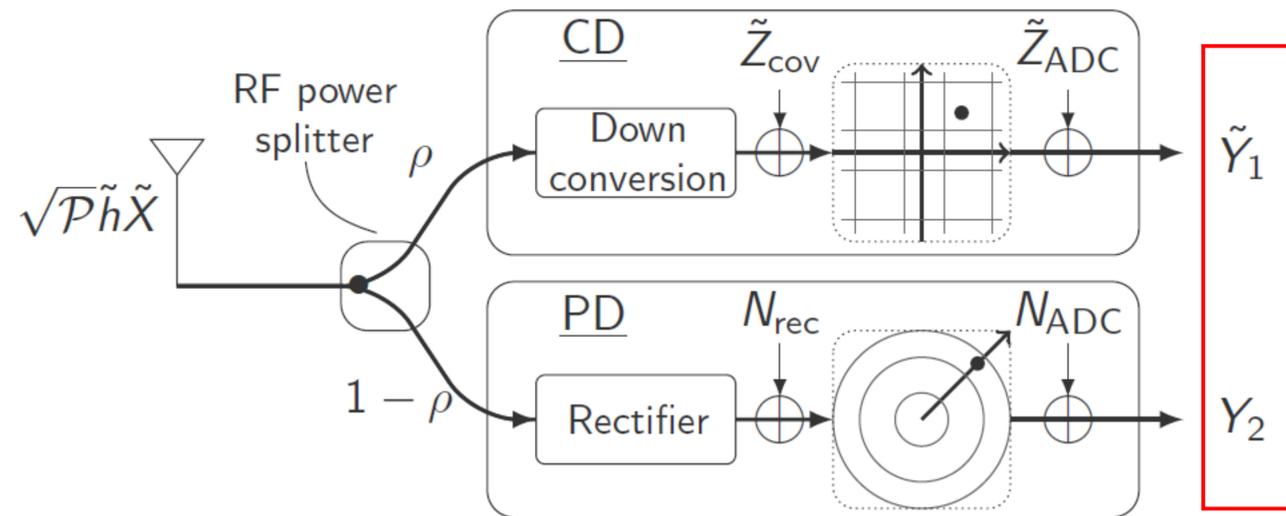


## Novel Splitting Receiver Architecture [1-2]

**Open Problem:** What is the optimal radio-frequency (RF) receiver architecture for signal detection?

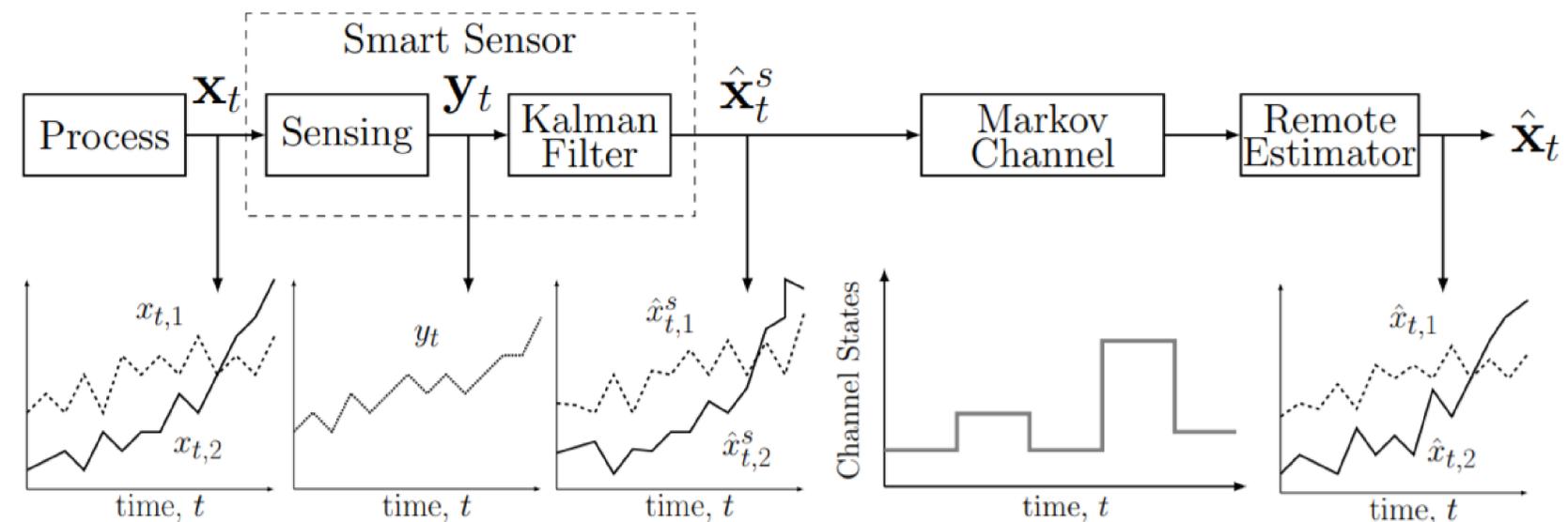


The splitting receiver has a potential **50% rate improvement**, i.e., can reduce 1/3 of the transmission latency.

## Remote State Estimation over Markov Fading Channels [3]

**Open Problem:**

Stability condition of a remote state estimation problem of discrete-time linear time-invariant (LTI) systems over Markov fading channels.



$$\mathbf{x}_{t+1} = \mathbf{A}\mathbf{x}_t + \mathbf{w}_t, \quad \mathbf{y}_t = \mathbf{C}\mathbf{x}_t + \mathbf{v}_t,$$

Mean-Square Stability Condition:  $\rho^2(\mathbf{A})\rho(\mathbf{DM}) < 1$

where  $\rho(\cdot)$  denotes the spectral radius,  $\mathbf{A}$  is the state transition matrix of the LTI system,  $\mathbf{D}$  is a diagonal matrix containing the packet drop probabilities in different channel states, and  $\mathbf{M}$  is the transition probability matrix of the Markov channel states.

[1] **W. Liu**, X. Zhou, S. Durrani, P. Popovski, "A Novel Receiver Design with Joint Coherent and Non-Coherent Processing," in IEEE Transactions on Communications, Aug. 2017.

[2] **Y. Wang**, **W. Liu**, X. Zhou, G. Liu, "On the Performance of Splitting Receiver with Joint Coherent and Non-Coherent Processing," in IEEE Transactions on Signal Processing, 2020

[3] **W. Liu**, D. E. Quevedo, Y. Li, K. H. Johansson and B. Vucetic "Remote State Estimation with Smart Sensors over Markov Fading Channels", submitted to IEEE Transactions on Automatic Control, 2020 [under revision]