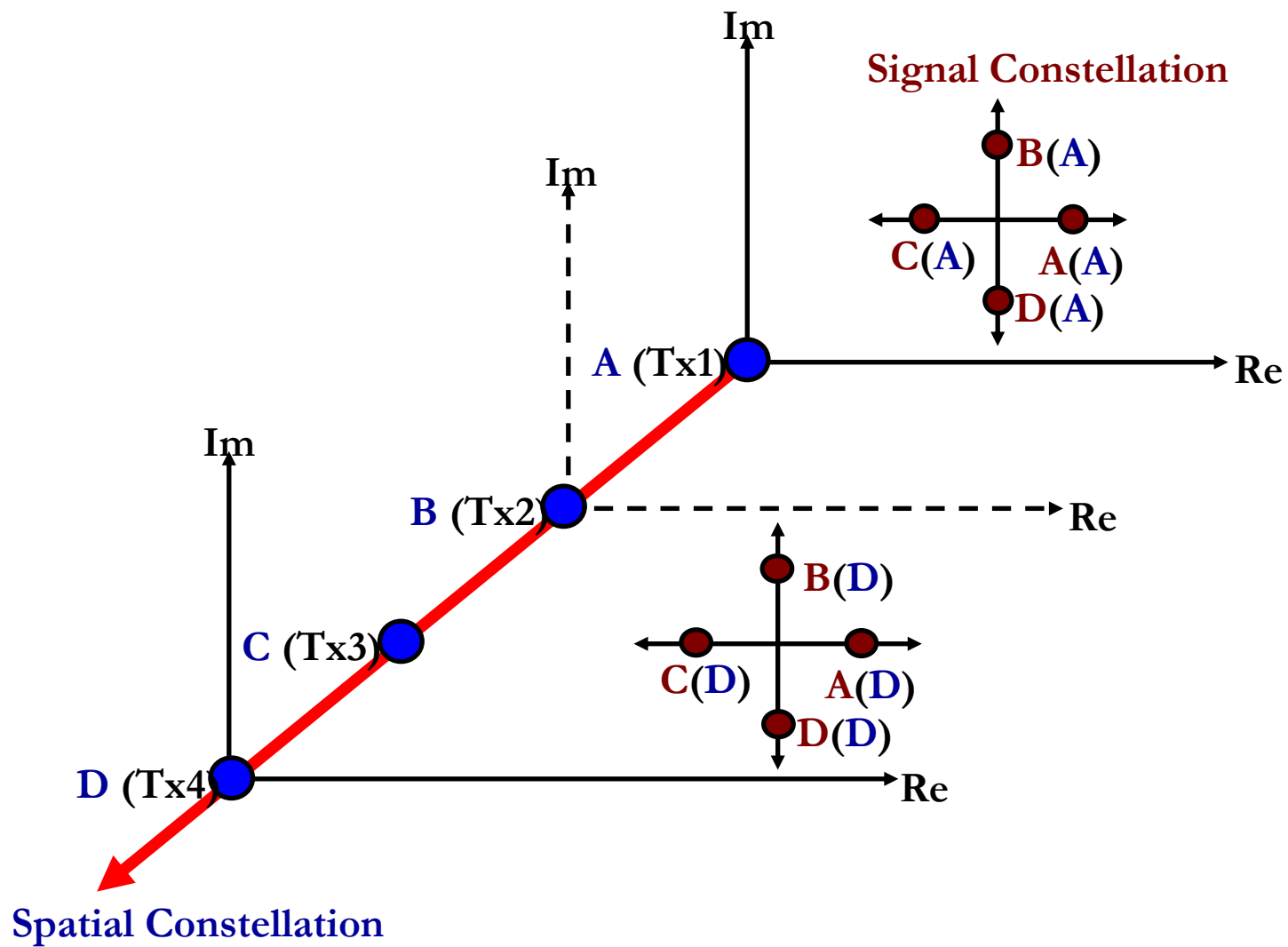


Known issues of spatial multiplexing MIMO

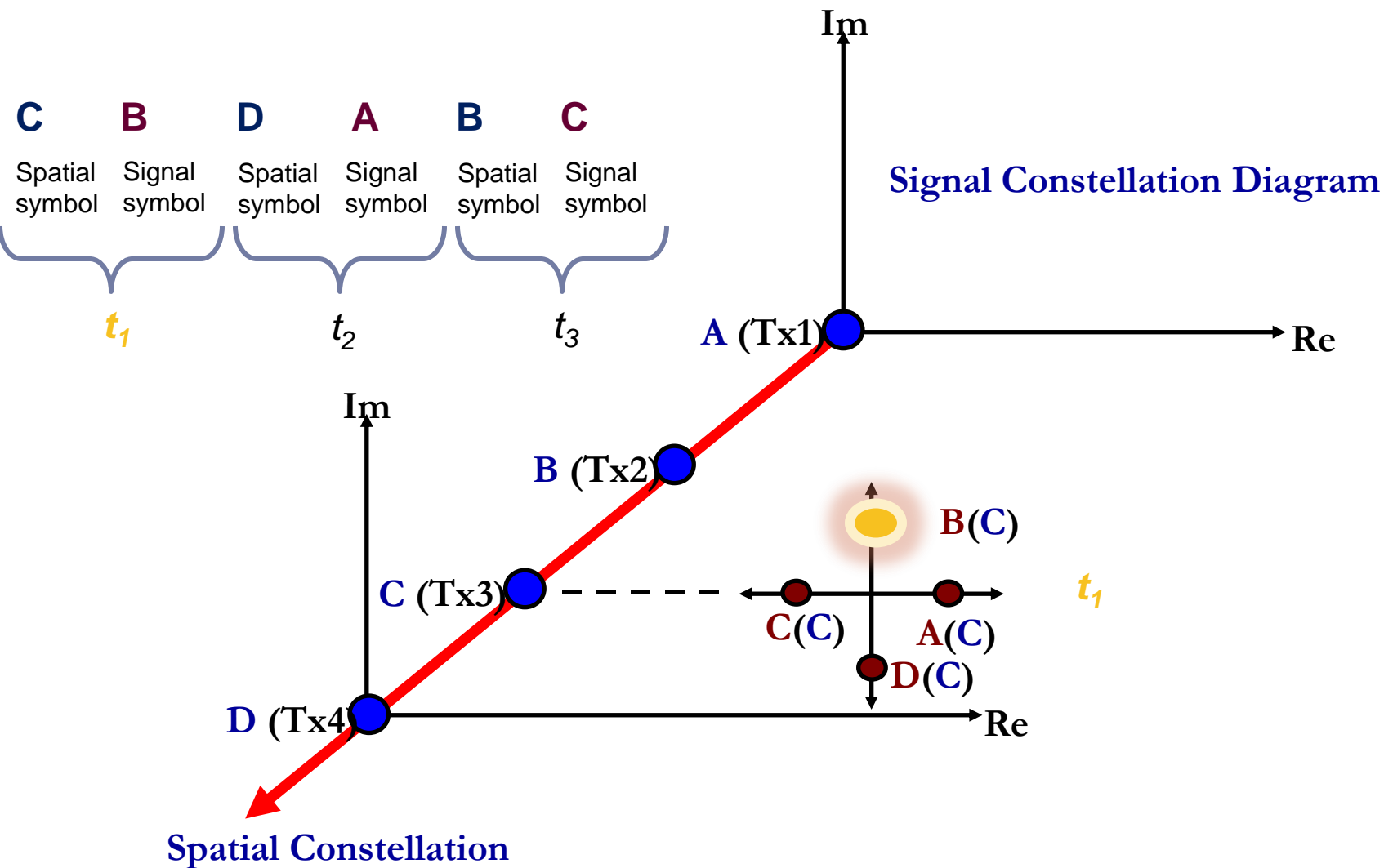


- ▶ Spatial multiplexing MIMO significantly improves spectral efficiency, but:
 - ▶ Suffers from **inter-channel interference** resulting in **high computational complex** algorithms (*e.g.*, Vertical – Bell Labs Layered Space Time (V-BLAST) algorithm)
 - ▶ Requires **inter-antenna synchronisation** (IAS)
 - ▶ Requires **multiple RF-chains** (→ **expensive** and requires **high energy**)
 - ▶ Suffers from **error propagation**

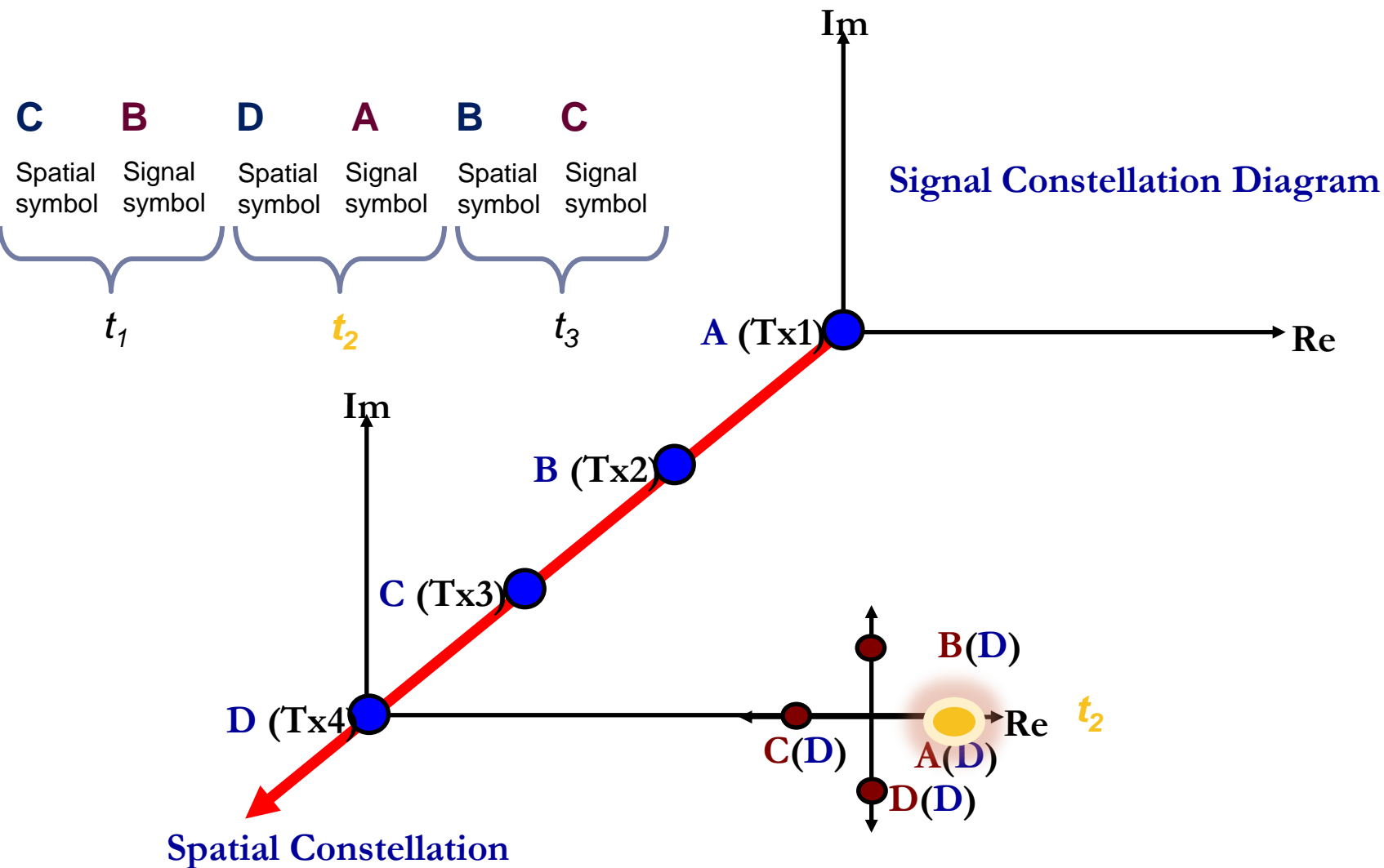
Spatial Modulation: How does it work?



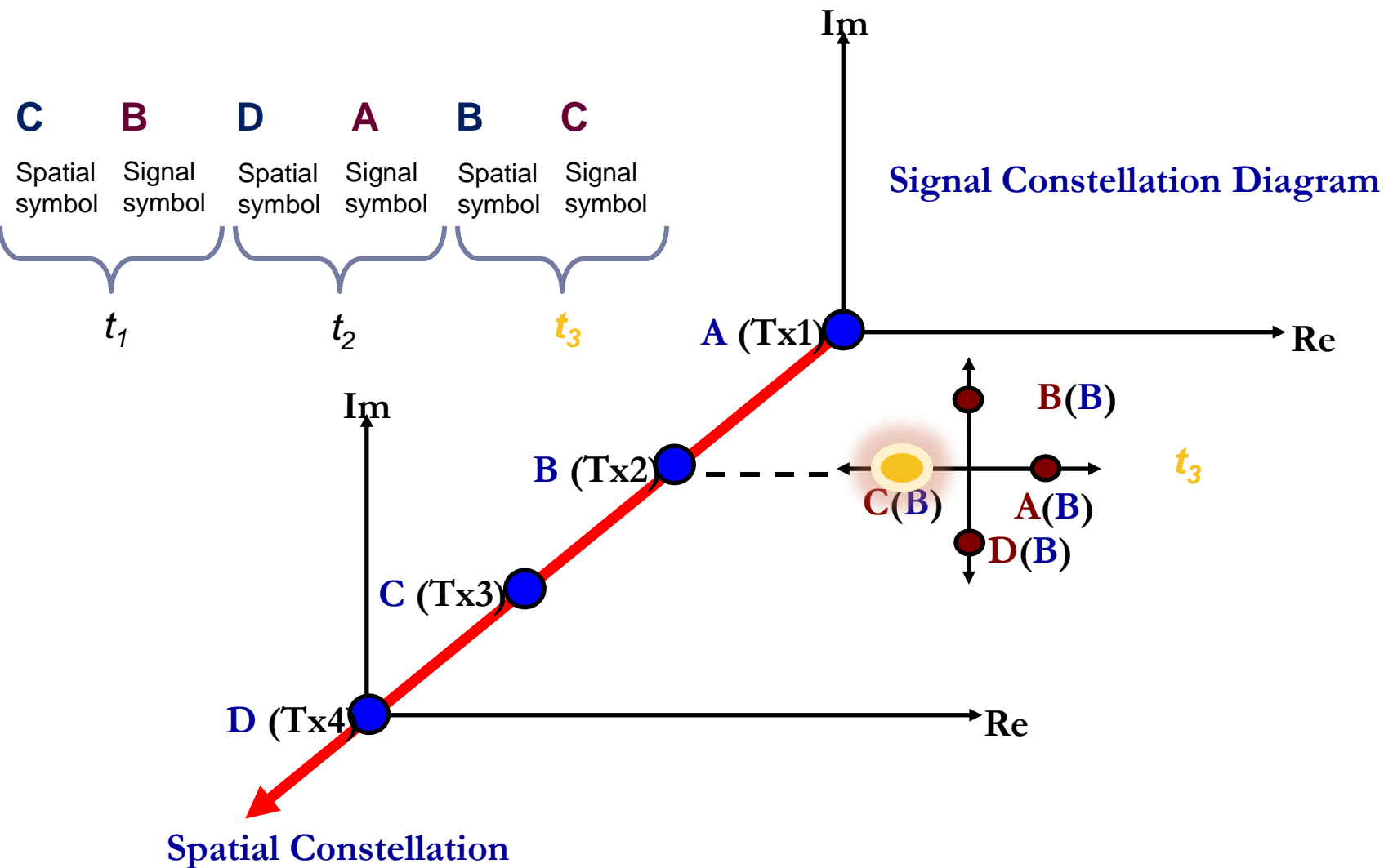
SM Principle



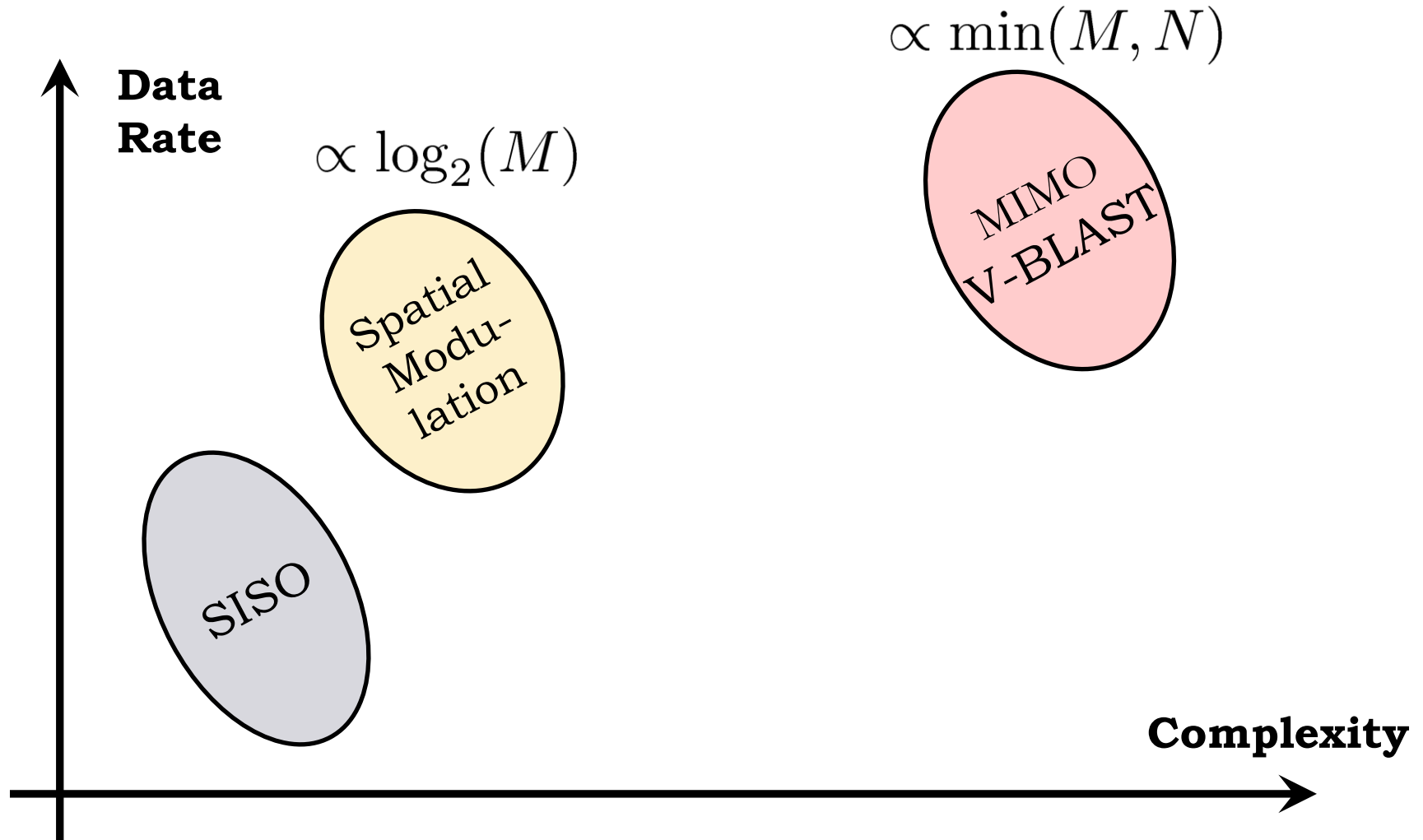
SM Principle



SM Principle



SM Complexity vs. Performance



Key Advantages of SM

- ▶ SM **entirely avoids inter-channel interference (ICI)** and requires **no synchronisation** between the transmit antennas.
- ▶ **No constraints** on the **number of receive antennas** or transmit antennas.
- ▶ Achieves **spatial multiplexing gains** even for a **single receive** antenna.
- ▶ **Only a single RF chain** is required at the transmitter.
- ▶ Better **robustness** to **channel estimation errors** compared to V-BLAST.
- ▶ Better **robustness** to **channel correlation** compared to V-BLAST.
- ▶ Has been shown to **outperform V-BLAST** in terms of ABER.
- ▶ The **computational complexity** is **independent** of the **number of transmit** antennas.