

Source: Ericsson
Agenda Item: 7.1.6
Document for: Discussion, Decision



MULTI-POINT MIMO CONNECTIVITY

BACKGROUND: SELF CONTAINED TRANSMISSIONS

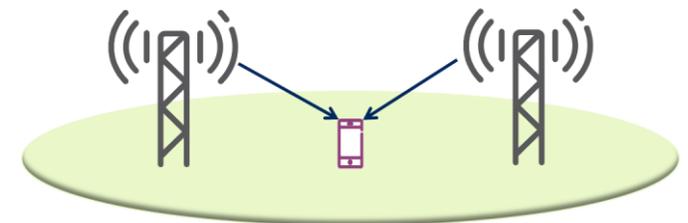


› Lean-based

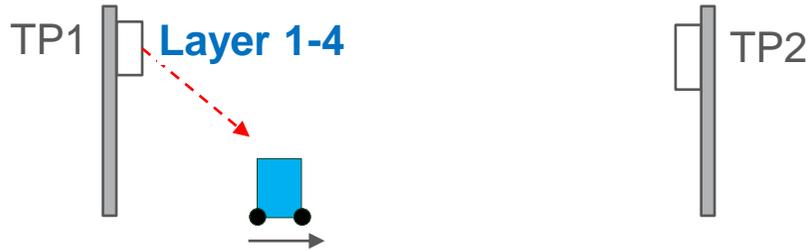
- Minimize always-on transmissions (reference signals, sync signals, broadcasted sysinfo, ...)
- Baseline: all subframes are treated as undefined until explicitly configured
 - › The UE treats a subframe as DL unless instructed to transmit in UL
 - › No assumptions on subframe content made by a UE RX unless it is scheduled in that subframe
 - › Some subframes may contain signals to support beamforming etc
- **Benefits:** Forward compatible, energy efficient, low-load performance

› Beam-based

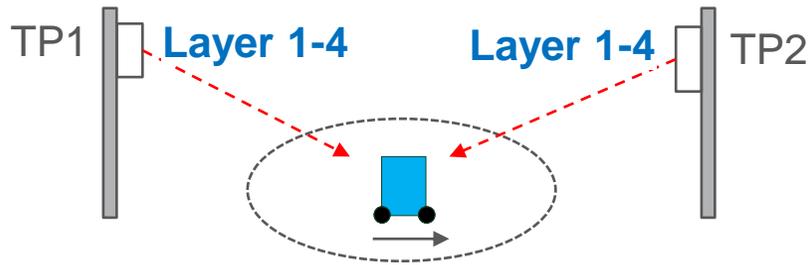
- Minimize dependencies across subframes and (sets of) antenna port(s)
- Self-contained transmissions, processing “per beam and subframe” possible
- A UE may receive transmissions on multiple sets of antenna ports – may originate from different sites
- No (very limited) QCL across different sets of antenna ports
- **Benefits:** Forward compatible, **Multi-point connectivity**



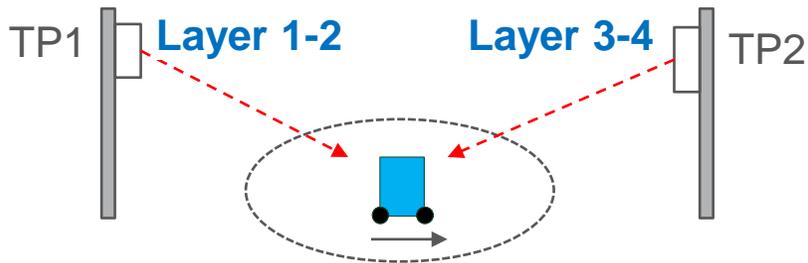
MIMO WITH MULTIPLE POINT CONNECTIVITY



- › Single transmission point (TP)
 - In line-of-sight
 - › Two layers can be separated with polarization
 - › 3-4 layers is more difficult with small spatial separation



- › Dual TP
 - Layer separation properties similar to single transmission
 - Transmission of 4 layers from both transmission points
 - Each code word is transmitted from both TPs



- › Distributed MIMO
 - 2 layers from each transmission point to one UE
 - › Each code word is transmitted from only one TP
 - › Possibility for self contained transmission from each TP if backhaul is slower
 - Large spatial separation improves layer separation

OUTDOOR COVERAGE AND MACRO DIVERSITY GAIN



TP 1 only

Total DL Throughput [Mbps]

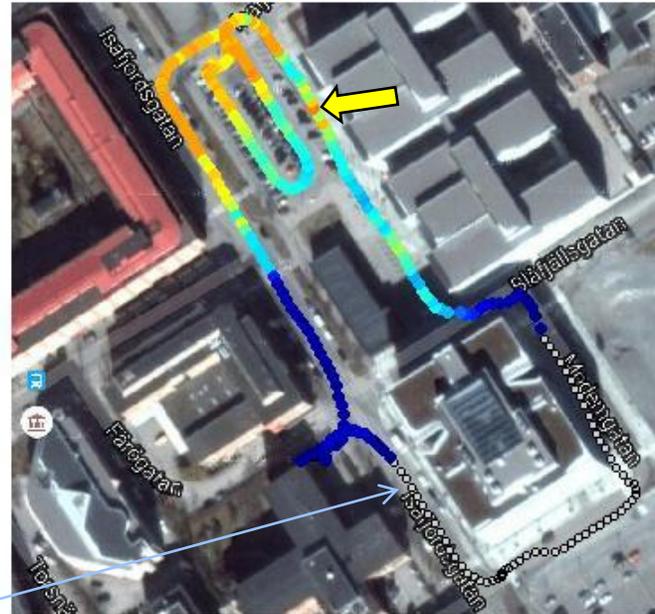


2015

Coverage by TP1

TP 2 only

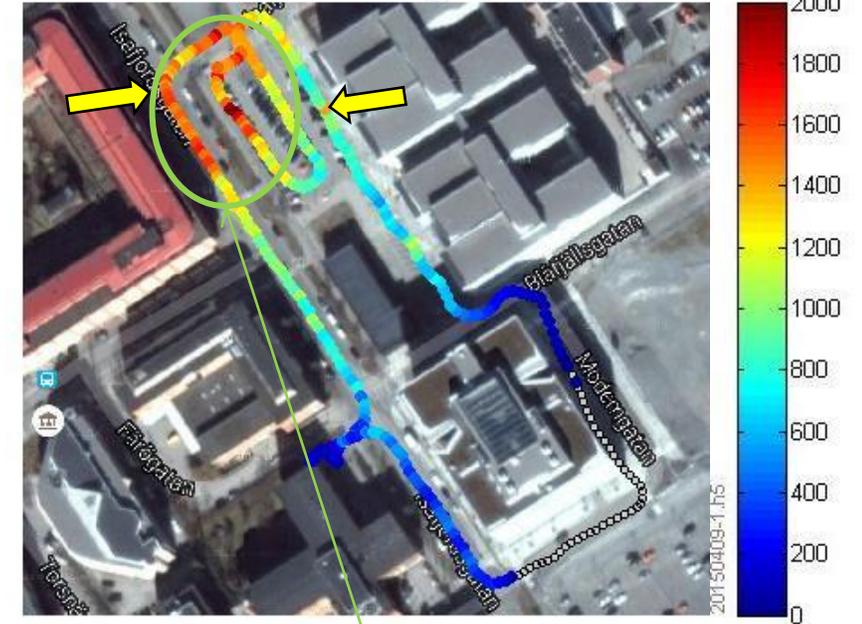
Total DL Throughput [Mbps]



REAL 2015

Distributed MIMO

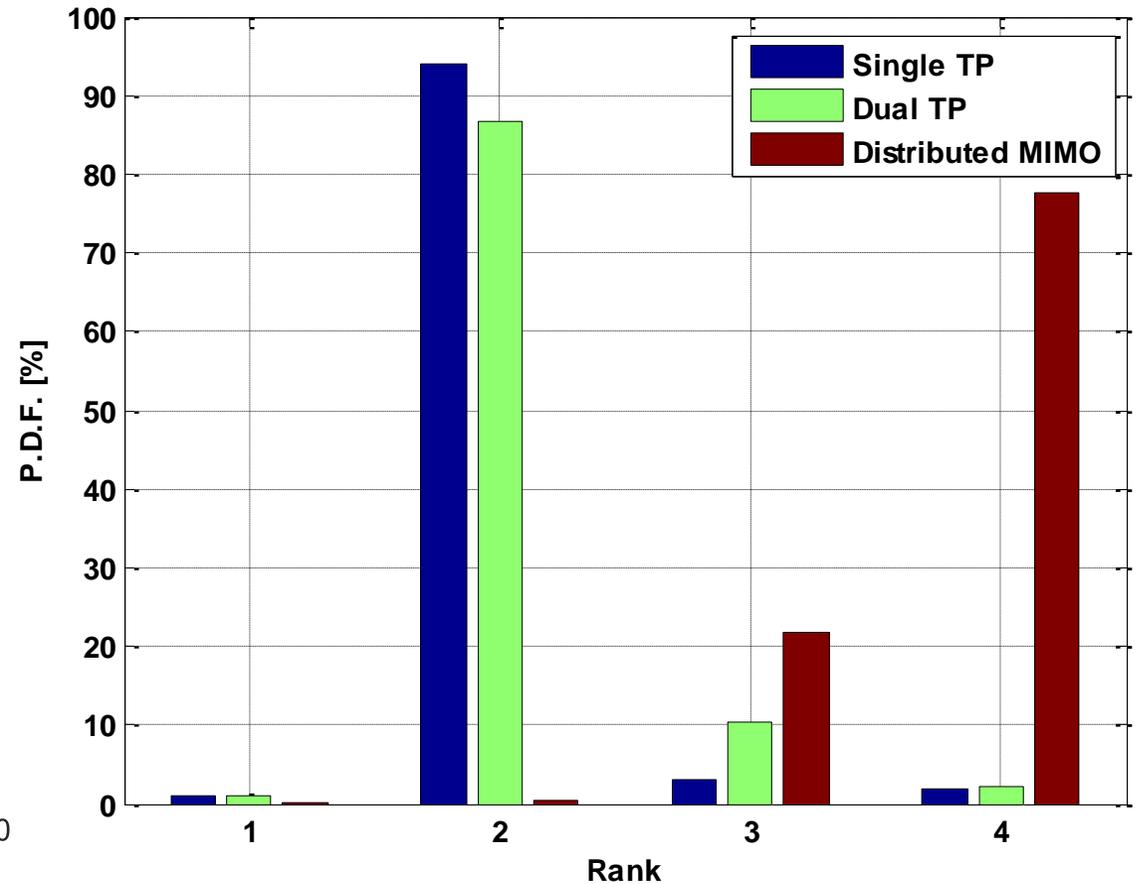
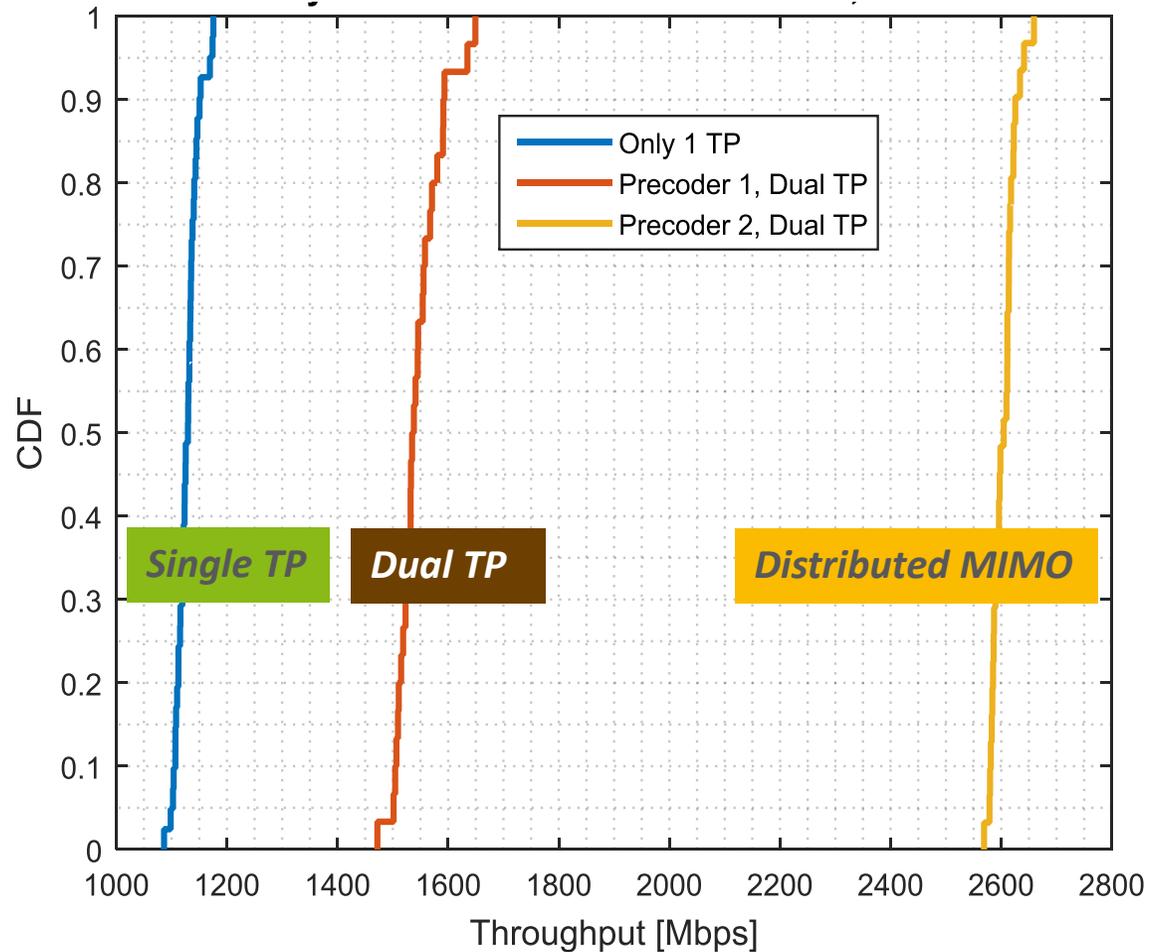
Total DL Throughput [Mbps]



REAL 2015

Area with dual TP/distr. MIMO
throughput gain

OUTDOOR THROUGHPUT, STATIONARY UE



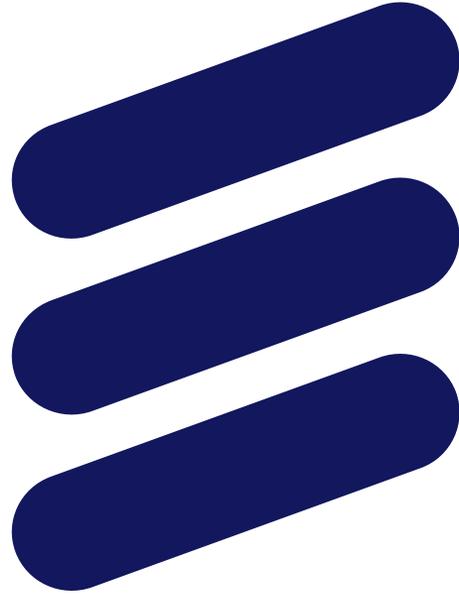
Multi-site (distributed) MIMO is necessary to reach 2.6 Gbps in this LOS scenario

CONCLUSIONS



- › 2.6 Gbps on 200 MHz demonstrated in outdoor environment corresponding to lightly loaded system
- › Multi-site MIMO using dual TP transmission improves performance in outdoor environment in lightly loaded system
 - Increase transmission rank in LOS with spatial diversity
 - Macro diversity improvement of signal strength
- › Multi-site MIMO using Distributed multipoint transmission enhances single user MIMO performance in LOS and in lightly loaded system
 - Improves layer separation in receiver
 - Needed for a substantial fraction of rank higher than 2
 - Enables 4-layer spatial multiplexing
 - Required for 4x4 MIMO peak throughput outdoor
 - **Enabled by two self contained transmissions, one from each TP**

Study multi-TP MIMO transmissions where each TP may transmit its own self-contained PDCH



ERICSSON

DISTRIBUTED MIMO MEASUREMENT SETUP



- › 15 GHz carrier frequency,
- › 2x100 MHz carrier aggregation,
- › Numerology: LTE scaled 5x, e.g.
 - 75 kHz subcarrier spacing
 - 0.2 ms subframe length
 - 20% CP length compared to LTE
- › 2 transmission points
- › Single user with 4 RX