

LTE REL-12

LTE GOES SMALL CELLS

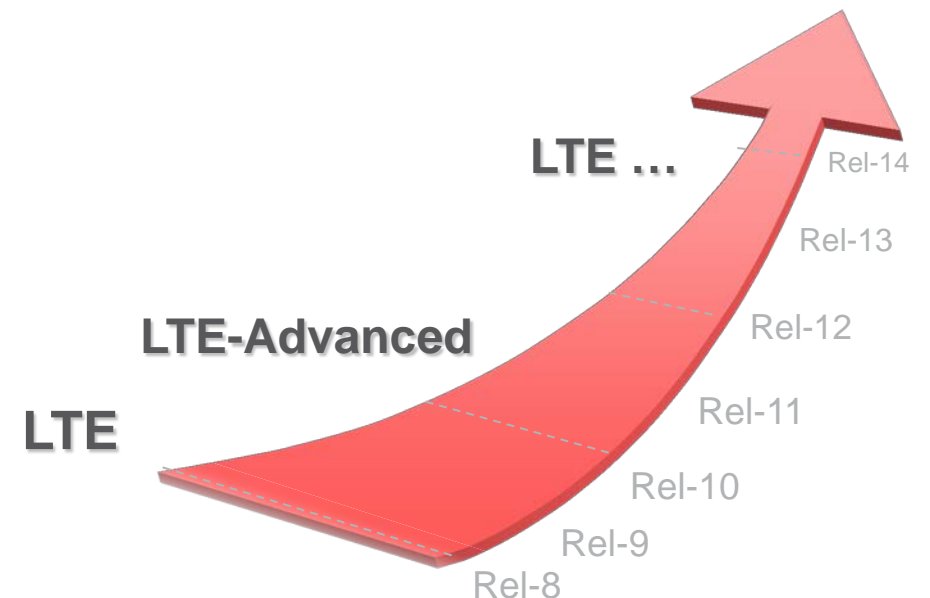
Dr. Christian Hoymann
Ericsson Research



BACKGROUND

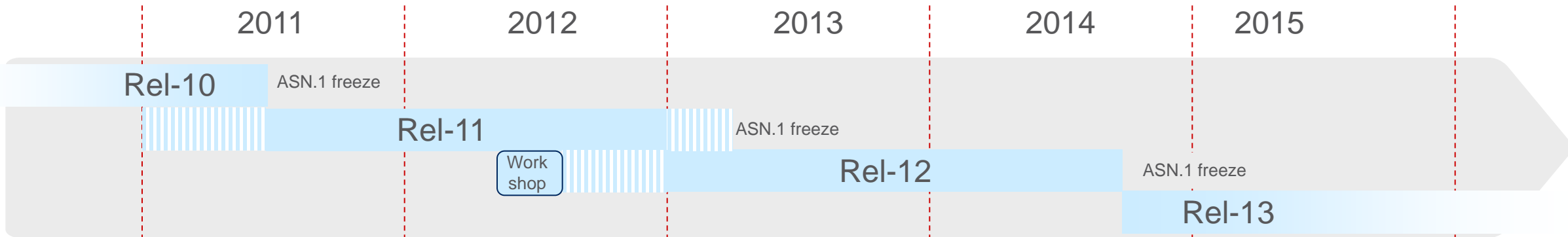


- › Rel-8 – First LTE release
 - OFDM, FDD & TDD, MIMO, multiple bandwidths, etc.
- › Rel-9 – Minor enhancements
 - MBMS, ...
- › Rel-10 – IMT-Advanced requirements in focus
 - Carrier aggregation, MIMO enhancements, relaying, ...
- › Rel-11 – Further enhancements
 - CoMP, improvements for heterogeneous deployments, ...
- › Rel-12 – Next major step



BACKGROUND

TIMELINE



- › 3GPP Rel-12 workshop in June 2012
- › Small cell enhancements on top of the agenda
- › New Rel-12 SIs/WIs gradually started

REL-12 WORK/STUDY ITEMS

MOST OF THEM



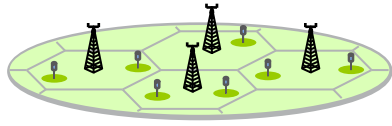
- RAN1**
- › **New carrier type**
 - › **Further enhancements to LTE TDD**
 - › **Further DL MIMO enhancements**
 - › **Small cell enhancements– physical-layer aspects**
 - › **3D-channel model**
 - › **Low cost MTC terminals**
 - › **Study on LTE device to device proximity services**
 - › **Network assisted interference cancellation/suppression**
 - › **Enhanced CoMP**
 - › **Elevation beamforming,**
 - › **FD MIMO**
 - › **CA enhancements, LTE coverage enhancements, eMBMS enhancements**

- RAN2**
- › **Hetnet mobility enhancements for LTE**
 - › **Machine type and other mobile data applications**
 - › **WLAN/3GPP radio interworking**
 - › **Small cell enhancements– higher-layer aspects**
 - › **Enhancement for MDT, Further enhancements for DDA**
 - › **Smart Congestion Mitigation in E-UTRAN**
 - › **Push to talk over LTE**

- RAN3**
- › **CB-ICIC for HetNet**
 - › **Mobile Relays**
 - › **Next-generation SON (incl. AAS)**
 - › **Further enhancements for H(e)NB mobility-Part3**
 - › **Further enhancements for HeNB mobility-X2-GW**
 - › **Enhancements for UMTS/HSPA and LTE interworking**
 - › **Study on energy saving enhancement**

- RAN4**
- › **Performance requirements of 8 Rx**
 - › **RF requirements for AAS**
 - › **Base station specification structure**
 - › **PIM handling for UTRA & LTE basestations**
 - › **CRS-IC**

REL-12 – MAJOR THEMES



Small-cell Enhancements
("Local-Area Access")



Multi-antenna
Enhancements



Device-to-Device
Communication



Machine-type Communication



General Enhancements

LOCAL-AREA ACCESS

SMALL CELL ENHANCEMENTS



› Dual Connectivity

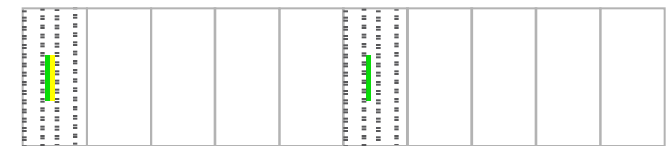
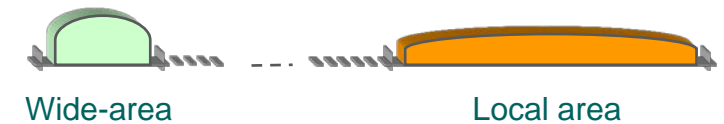
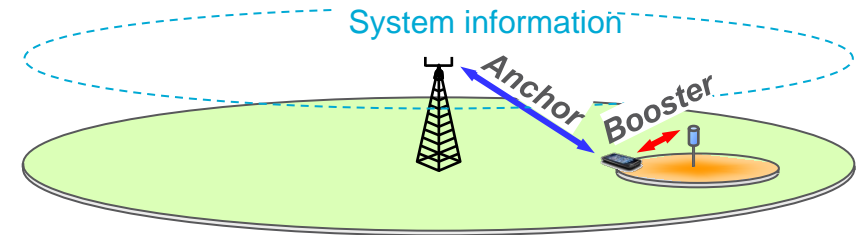
- Connection to macro *and* pico
- Macro assists pico communication
- Robustness, reduced CN mobility signaling, decoupling of UL and DL, ...

› Increased focus on frequency-separated pico layer

- Co-frequency and frequency-separated deployment
- Co-frequency discussed already in Rel-10/11

› New carrier type

- Minimize transmission of always-on signals
- Reduced interference and overhead, energy efficiency

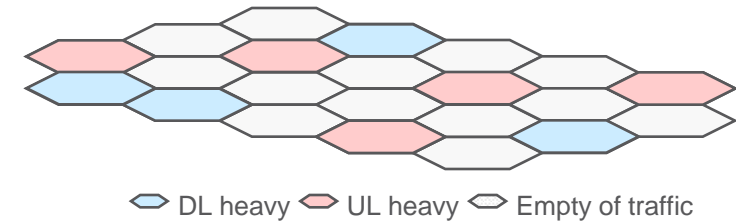
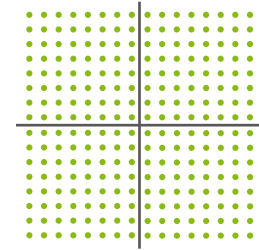


LOCAL-AREA ACCESS

SMALL CELL ENHANCEMENTS



- › Physical layer aspects
 - Interference coordination for dense unplanned deployments
 - 256QAM, reference signal overhead reduction, ...
- › Dynamic TDD
 - Adapt UL-DL allocation to instantaneous traffic situation
- › LTE-WiFi integration
 - Network-controlled access selection



MULTI-ANTENNA ENHANCEMENTS



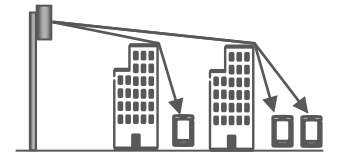
- › Further DL MIMO enhancements
 - Improve (2/4/8Tx) MU/SU-MIMO with enhanced CSI feedback

- › Requirements for active antenna systems (AAS)
 - RF components integrated with antenna for improved performance, smaller footprint, simpler installation

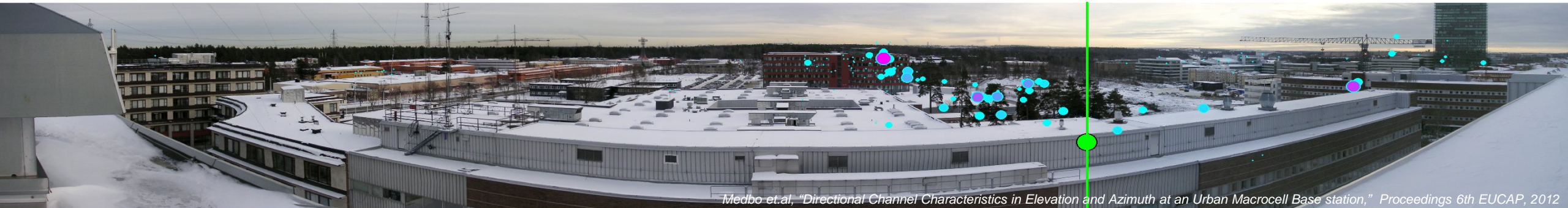
MULTI-ANTENNA ENHANCEMENTS



- › 3D channel modeling
 - Include elevation domain, for studies of 3D MIMO
- › 3D MIMO
 - Elevation beam forming
 - Massive MIMO (up to 64 basestation antennas)
- › Coordinated multipoint (CoMP) enhancements
 - Enhancements for RRU-type of deployments
 - CoMP also for non-ideal backhaul

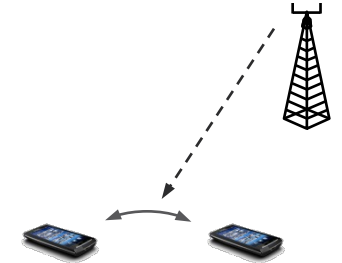


No decision (yet) to start these activities

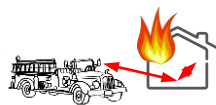


DEVICE-TO-DEVICE COMMUNICATION

- › Device-to-device Proximity Services
 - Licensed cellular spectrum
 - Benefit from network coverage when available



- › NSPS
 - Proximity detection and communication
 - Also in absence of network coverage



NSPS

- › Commercial
 - Initially proximity detection only
 - In presence of network coverage only



Proximity based
social networking



Proximity-enabled
communication

MACHINE-TYPE COMMUNICATION

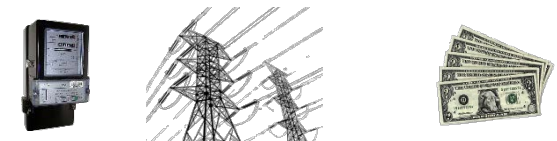


- › Wide range of applications ➔ *very* different requirements
 - Coverage, cost, reliability, data rates, ...



Consumer Electronics

- › LTE already capable of handling many of these applications



Smart grids

ePayment

- › Reduced device cost
 - › Reduced-bandwidth operation, reduced peak-rate, single antenna, half-duplex FDD, ...
- › Reduced power consumption
 - › Longer DRX cycles, ...
- › Signaling load reductions
- › Coverage improvements

Potential improvement areas



Surveillance

Security



Smart Transportation

GENERAL ENHANCEMENTS



› Receiver requirements

- Single-user MIMO receivers, including SIC
- Intercell interference rejection (IRC)
- (Partial) intercell interference mitigation (primarily cell-specific reference signals)
- More advanced receivers, network-assisted cancellation



› Carrier aggregation

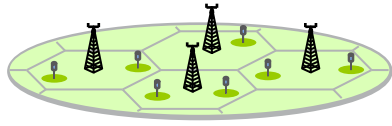
- Aggregation of FDD+TDD

} No decision (yet) to start these activities

› ...

SUMMARY

REL-12 – MAJOR THEMES



Small-cell Enhancements
("Local-Area Access")



Multi-antenna
Enhancements



Device-to-Device
Communication



Machine-type Communication



General Enhancements



ERICSSON