RP-131172
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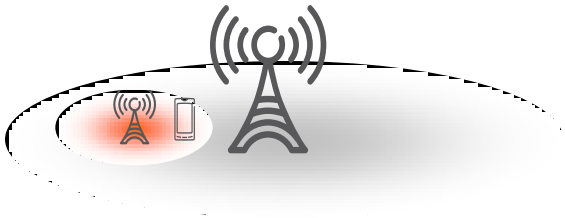
WAY FORWARD FOR NEW CARRIER TYPE

Ericsson

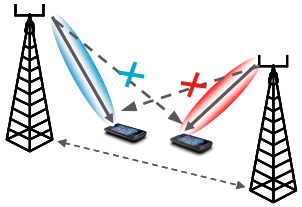
TARGET AREAS FOR IMPROVEMENT FOR NCT

› Improved energy efficiency in entire network and at all traffic loads

› Further optimizations & enhancements



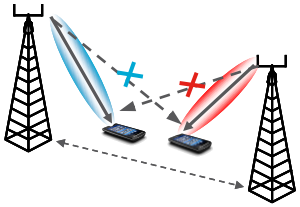
› Enhanced network capacity and user experience



TARGET AREAS FOR IMPROVEMENT FOR SMALL CELL ON/OFF

› Improved energy efficiency in entire network and at all traffic loads

› Enhanced network capacity and user experience



BACKWARDS COMPATIBILITY CONSIDERATION

- Both NCT and small cell on/off with discovery signal will be none-backwards compatible when fully utilized

- Schemes has been discussed for both NCT & small cell on/off that allows legacy UEs to operate on a cell when either of these schemes are used
  - → Possible reduces the issues with non-backwards compatibility

SUMMARY

- Dynamic Downlink eNB DTX has been shown to improve system performance
- Attempts to harvest this gain include
  - New carrier type
  - Small cell on/off with discovery signal
- Instead, this WF proposes to add dynamic downlink eNB DTX functionality to current LTE carrier
  - This by combining the New carrier type and the small cell on/off with discovery signal to unified proposal

PROPOSED WORK PLAN

- The NCT is combined with the small cell on/off with discovery signal
  - The combination forms a new WI "Dynamic Downlink DTX eNB"
  - The NCT work item is closed down
  - The small cell on/off operation is not proceed in any other WI.

DYNAMIC DOWNLINK DTX ENB

DYNAMIC DOWNLINK DTX ENB

- Dynamic Downlink eNB DTX: Any DL subframe can be off with the following restrictions
  - When there are one or more UEs configured with currently existing TMs in a cell, PSS/SSS/CRS is always transmitted in a cell
  - When there are one or more UEs configured with proposed enhanced TMs in a cell, CRS in subframes 0 and 5 are always transmitted
    - FFS: PSS/SSS DTX considering discovery signal design and deployment type
  - Discovery signal is always transmitted.
  - Restrictions ("always transmitted") are not applicable when in dormant mode as already defined in RAN3
    - FFS: other condition
- Enhance TM10 to allow operation without any CRS transmissions in a subframe
  - Possibility for all CRS REs to be used for PDSCH if CRS is not present in a subframe
- Support cell detection/measurements based on "discovery signal"
  - FFS whether PSS/SSS/CRS is sufficient as discovery signal or new discovery signal is necessary
- Supported for secondary cell CA operation and SeNB operation for dual connectivity in Rel-12
  - Specify support for single Tx/Rx UEs based on the dual connectivity and/or carrier aggregation protocol structure if it is found to be beneficial

DYNAMIC DOWNLINK ENB DTX ENHANCE TM10

- TM10 (Rel-11)
  - "PDSCH RE Mapping and Quasi-co-location Indicator Field (PQI)" field dynamically (per subframe) signals
    - Number of CRS ports (minimum is 1)
    - Start symbol of the PDSCH (earliest is symbol 1)
  - Meaning of the parameter set indicated by 2 PQI bits is defined by higher layer signaling

- Enhanced TM10 (proposed for Rel-12)
  - Meaning of the parameter set is modified to also allow inclusion of
    - Zero CRS ports
    - PDSCH start symbol 0

- Enhanced TM10 can flexibly accommodate 0 or more CRS ports and presence or absence of legacy control region in any subframe

- Enhanced TM 10 impacts:
  - Presence of CRS guaranteed only in SF 0 and 5 (baseline). Impact is the same as already agreed for the NCT

SPECIFICATION IMPACT

SPECIFICATION IMPACT COMPARISON FOR REL-12

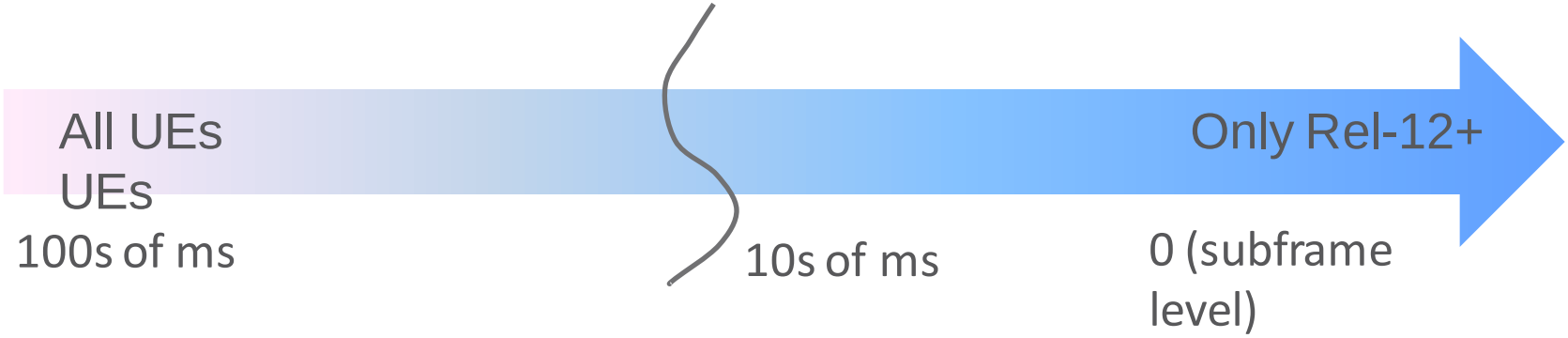
	Dynamic eNB Downlink DTX	Non-standalone NCT	Standalone NCT	Small cell on/off with discovery signal
Position of PSS/SSS or DM-RS conflict resolution	No	Yes	Yes	No
ePBCH	No	No	Yes	No
Bandwidth of CRS	No	Yes	Yes	No
Discovery signal PHY	Yes	Maybe	Maybe	Yes
Discovery signal RRM procedure	Yes	Maybe	Maybe	Yes
New/additional time/Freq tracking procedure/requirement	No	No	No	Yes
New Idle mode behavior	No	No	Yes	No
CSS on EPDCCH	No	Maybe if required by dual connectivity	Yes	No
Enhanced TM10 (CRS free in some subframes)	Yes	Yes	Yes	No
New RLM	No	No	Yes	No
ePHICH	No	Maybe	Maybe	No
TBS table modification	Maybe	Maybe	Maybe	Maybe for other aspects in small cell PHY
Carrier type switching (potentially)	No	Yes	Yes	No

ADDITIONAL INFORMATION

SIGNALS WITH DTX RESTRICTIONS

	Discovery signal (FFS as PSS/SSS/CRS or new signal)	CRS	PSS/SSS
UE configured with currently existing TMs in a cell	ON	ON	ON
Only UEs configured with proposed enhanced TM in a cell	ON	ON at least in SF 0 and 5	ON (FFS: PSS/SSS DTX considering discovery signal design and deployment type)
No UE in a cell	ON	OFF	OFF
Dormant mode defined in RAN3 or other FFS case	OFF	OFF	OFF

USE CASES



DTX (On/Off) Transition Times

- Enhancements used only when Rel-12 UEs are in the cell
  - DTX (On/Off) with faster transition times
    - Enabled by discovery signals
  - Enhanced TM10 without any CRS in a subframe
    - Enhanced TM10 can also operate with CRS in a subframe

FURTHER CLARIFICATIONS

› Available in R1-13995

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