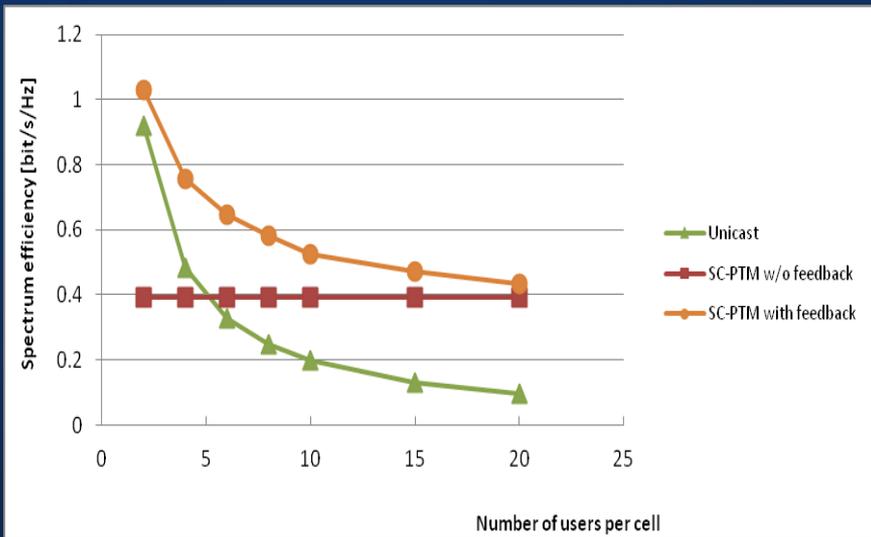


Motivation

- Single-cell point-to-multipoint (SC-PTM) , which was introduced in Rel-13, provides a high radio efficiency, flexible resource allocation and easy deployment multicast mechanism.
- Due to the tight schedule in Rel-13, some of the component features, e.g. CSI/HARQ feedback, HARQ operation and multi-carrier SC-PTM operation, were not introduced.
- In addition to critical communications, the usage of SC-PTM can be further extended to support MTC (i.e. narrowband operation and coverage enhancement), TV service and SC-PTM use in unlicensed spectrum.
- In order to meet the industry and operators' demand, it is important to enhance SC-PTM even further.

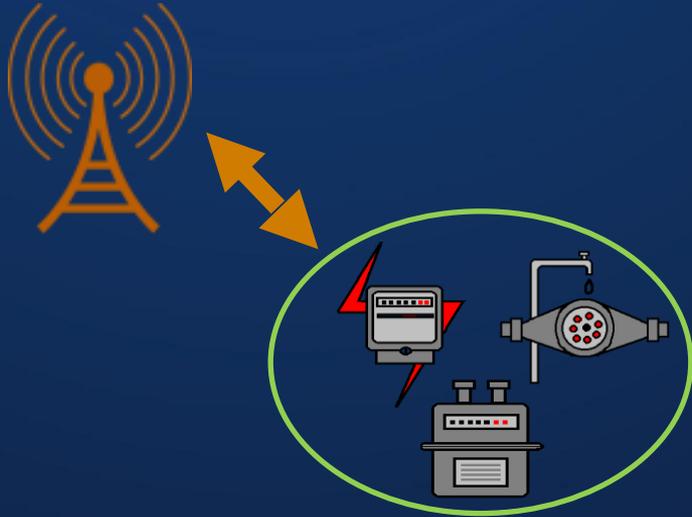
UL feedback and HARQ operation for SC-PTM



(ITU - rural macro cell, Carrier frequency=800Mhz, Inter-site distance=1732m, Traffic model = full buffer)

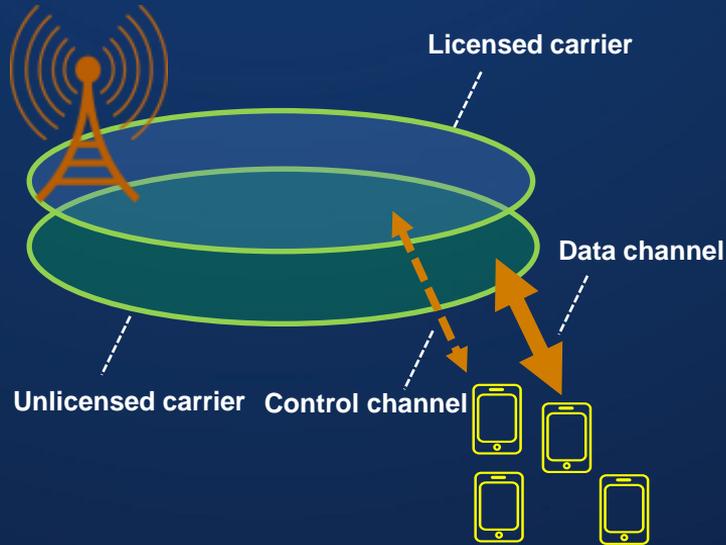
- As shown in the study item, Link adaptation allowed by the availability of UL HARQ/CSI feedback provides significant gains when the number of receiving users is small (e.g. < 15).
- HARQ with retransmissions can further improve the spectral efficiency.

SC-PTM for MTC



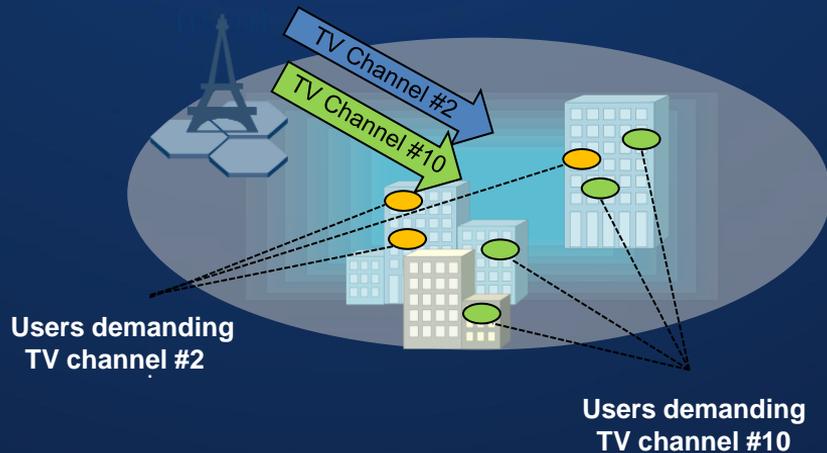
- Multicast functionality is important for e.g. software update and group message delivery for MTC, as identified in the Rel-13 SA2 WI “Group based Enhancements”
- Compared to MBSFN, it is more straightforward for SC-PTM to support narrowband operation and coverage enhancement for MTC:
 - SC-PTM is PDSCH based transmission, which can directly reuse the coverage enhancement technologies developed in Rel-13 eMTC.
 - SC-PTM can naturally support narrowband operation with the support of M-PDCCH.

SC-PTM over unlicensed spectrum



- It is considered beneficial to extend the LAA concept to multicast transmissions so that the network could offload some group services to unlicensed spectrum.
- Compared to MBSFN, it is more straightforward to provide SC-PTM over unlicensed spectrum, as the network only needs to perform LBT on a per cell basis and coordination between multiple eNBs is not required.

Provision of TV services over SC-PTM



- Broadcast transmission is not optimal for a large amount of linear TV programming.
- SC-PTM can provide on-demand TV programming multicast and the multicast area can be dynamically adjusted cell by cell according to user's physical location:
 - One TV channel is transmitted only if the channel is demanded by user(s).
 - One TV channel is transmitted only in the cell(s) where the demand user(s) locates.
 - TV channels that are not demanded by any user will not be transmitted.
 - Prompt response for user demand: <300ms.

Provision of TV services over SC-PTM

Application	Resolution	Compressed Bit rate
HD-DVD/SHV	1920*1080 /7680*4320	8~20Mbps
HDTV	1280*720	2~8Mbps
DVD/SDTV	720*576	1~2Mbps
LDTV/Video conferencing	352*288	128~1000kbps

According to the simulation result on UL feedback in Page 2, if TV services are provided over SC-PTM, one of the following scenarios can be supported by a cell with 20Mhz system bandwidth:

- 10~20 SDTV channels, 2 users for each channel
- 3~10 HDTV channels, 2 users for each channel
- 5~10 SDTV channels, 10 users for each channel
- 4-8 SDTV channels, 20 users for each channel

Provision of TV services over SC-PTM



- UL feedback for SC-PTM is beneficial for the provision of TV services, because it can bring significant gain on radio efficiency considering that generally the number of users in one cell that watching TV is not expected to be so big.



- SC-PTM over unlicensed spectrum allows the operators/TV broadcasters to provide more TV channels in hotspot areas, thus making the TV broadcast more attractive.

Scope of Work Item

This work item will specify the following enhancements for single-cell point-to-multipoint (SC-PTM) transmission for LTE:

1. Specify means to enable efficient SC-PTM transmission assisted by the UL feedback from group users in RRC_CONNECTED.
2. Specify means to enable SC-PTM reception by bandwidth reduced low complexity UEs and/or UEs in enhanced coverage.
3. Specify means to enable SC-PTM reception on a SCell on unlicensed spectrum that is assisted by the PCell on licensed spectrum using the Carrier Aggregation framework.
4. Specify support for multi-carrier SC-PTM/unicast operation involving reception from one or more SC-PTM cells that may be SCell (regardless of whether the SCell is activated or deactivated), potentially configured SCell, or asynchronous SCG cell.
5. Specify means to support anonymous TV service over both SC-PTM and unicast, and coordinate with relevant SA WGs if necessary.

THANK YOU

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