

# IEEE 802.16m UL Common Feedback

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Venue:

TGm – Call for contributions on Project 802.16m System Description Document – IEEE 802.16m-08/016r1  
(Uplink Control Structures)

Base Contribution:

IEEE C802.16m-08/275

Abstract:

Proposal for 16m uplink control structure with common feedback.

Purpose:

Adoption of proposed text/content for 802.16m System Description Document

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# UL Common Feedback

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## □ Purpose of UL Common Feedback

- Interference Overload Mitigation
  - Indication of interference overload on one or multiple PRU
- MBMS with feedback
  - Service dependent common uplink feedback channel from MBMS MSs

## □ Principle of UL Common Feedback

- Multiple common time-frequency region is reserved for UL control
  - Interference overload mitigation
  - MBMS feedback region corresponding to each MBMS service
- Each common region used by all MS's to send Ack/Nack
  - Same time/frequency resource and sequence is allocated to all the MSs
  - Feedbacks from multiple MSs combine naturally at the receiver

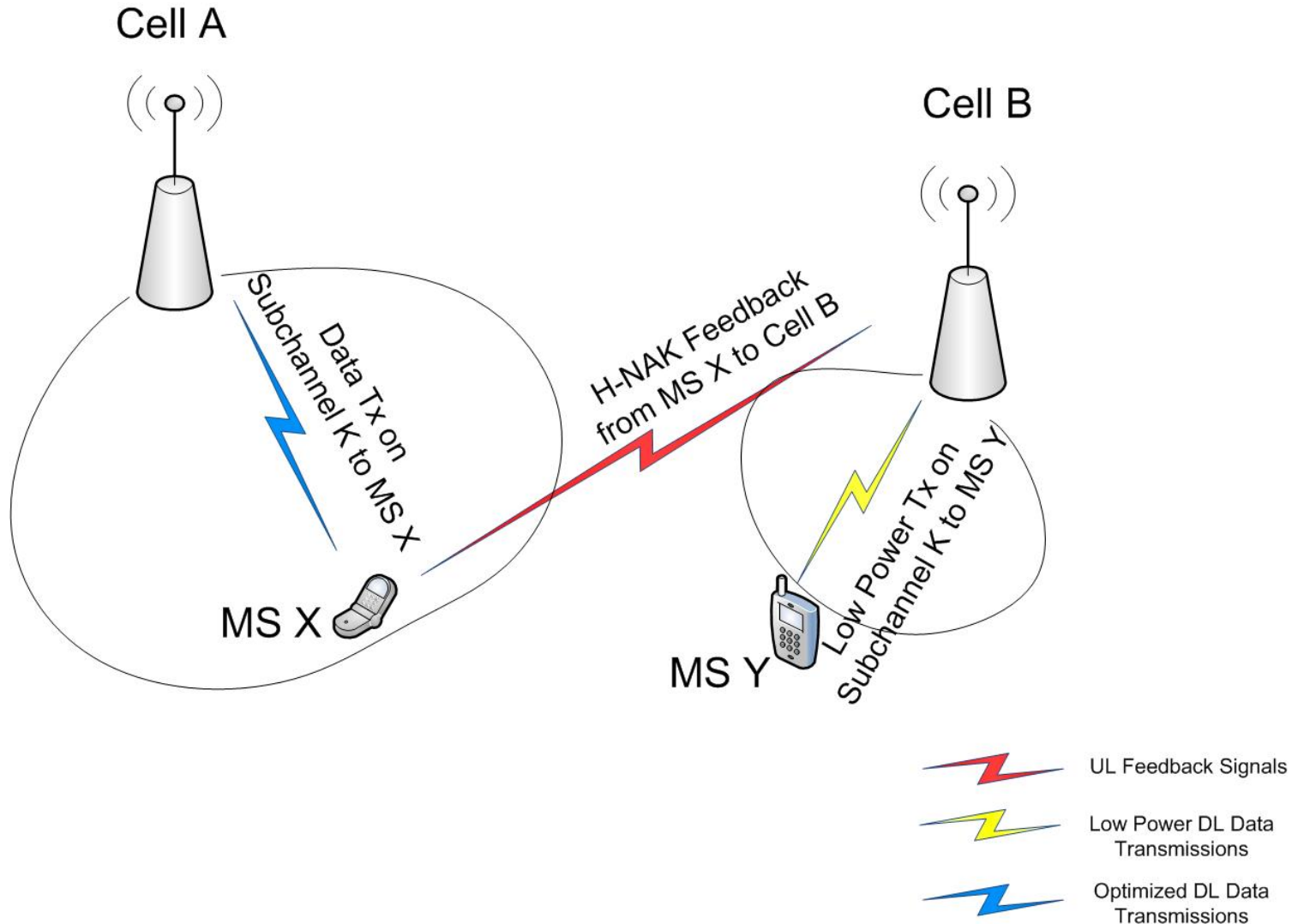
# DL Interference Overload Mitigation (1)

- ❑ Need for UL Control to indicate Interference Overload
  - Latency-sensitive traffic (VoIP, video etc) performance is critically determined by the air-interface delay outage.
  - Coverage improvements even for other classes of traffic are highly desirable, especially to allow dynamic fractional frequency reuse
    - Loading conditions in real deployments not known apriori
- ❑ Propose UL signaling approaches to improve coverage and outage:
  - **NACK** Signaling Feedback: done by the receiver to reach interfering cells to indicate interference overload on particular PRU's
    - Enables dynamic co-operative interference reduction when a user's packet is close to being in outage.
    - Also allows for slow adaptation of FFR patterns using feedback from all users – thus adapts to actual cell and traffic distributions

# DL Interference Overload Mitigation (2)

- ❑ Users that are about to experience an outage to get interference relief from their nearest interfering cells
  - Users transmit a **NACK** to reach other cells when the packet is about to fail
    - Other cells know the channelization (channel tree node allocation) by the position/modulation of the NACK
    - Requires a pool of common resources allocated for UL Interference Overload signaling
    - Multiple Users can send the NACK feedback corresponding to their allocated PRU's using the same NACK sequence
    - Cells will mute or reduce transmit PSD on those requested PRU's for the a fixed duration of following the request
      - If the energy of NACK signaling exceeds a preset threshold in the PRU's under question
  
- ❑ This signaling can also allow for slow adaptation of fractional frequency reuse patterns
  - Depending on an aggregate metric of NACK signaling, a BS can decide how much power to reduce on a given PRU's to allow for "soft FFR"
  - Advantage is that the signaling is fed back at a slow basis, and allows FFR to adapt to network-specific loading conditions

# DL Interference Overload Mitigation (3)

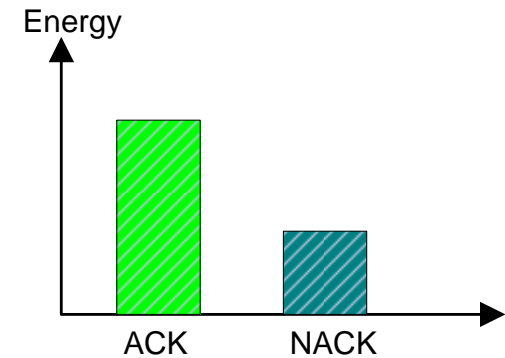
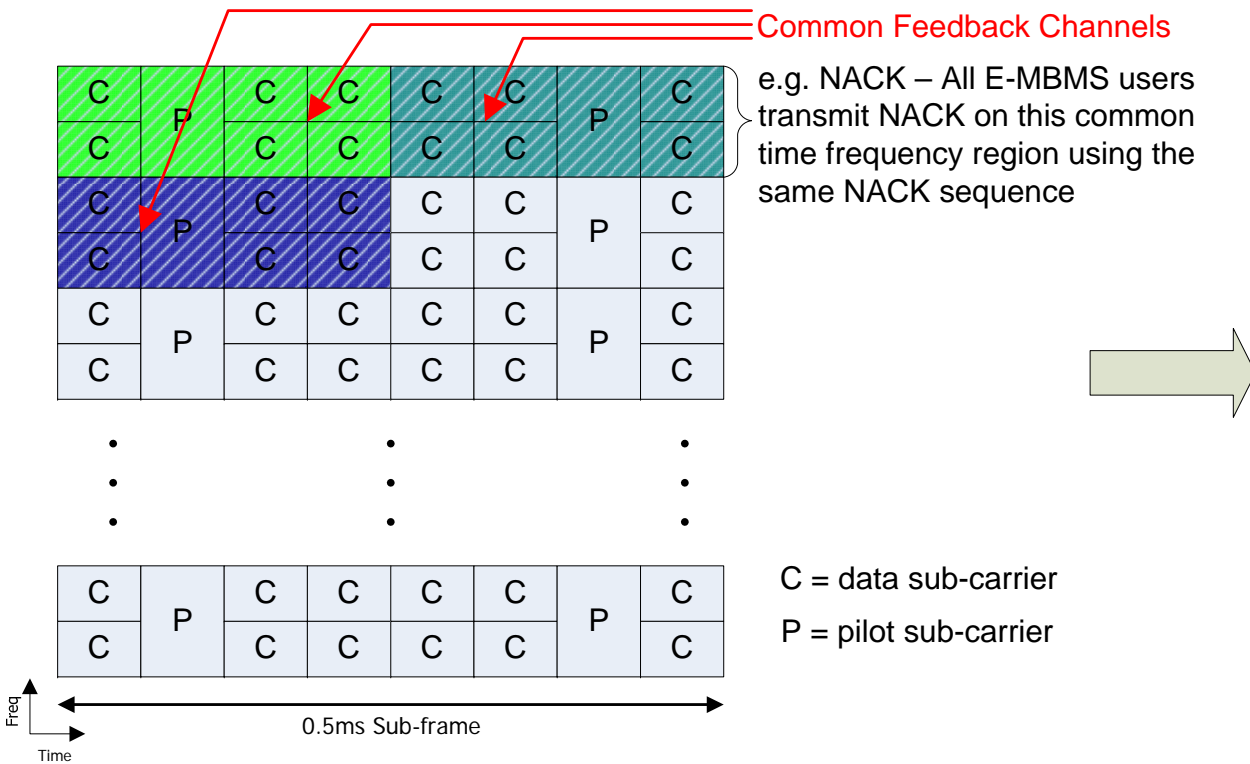


# MBMS with feedback (1)

## □ Principle of MBMS with feedback

- Common uplink feedback channel for MBMS:
  - Service dependent common uplink feedback channel from MBMS MSs.
  - Combined naturally at the receiver.
- AP adapts the MBMS data rate upon the feedbacks:
  - Adapts the MBMS data rate to maximize the throughput.
  - Different system loads/configurations and MS distributions result in different optimal data rate.
- Re-transmission with early termination to improve the MBMS throughput :
  - AP processes the combined feedbacks from multiple MSs.
  - Determines re-transmission or early termination to reach 1% FER with 95% coverage.

# MBMS with feedback (2)



Example: Energy detection used to determine ACK to NACK ratio for E-MBMS so re-transmission or power/data-rate adjustment could be done

**Common Feedback Channels**  
- provide information such as ACK/NACK or whether a particular SFER target is being met

**E-MBMS data rate adaptation and/or re-transmissions based on feedbacks**

# Proposed Text for 16m SDD

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- ❑ Adopt contribution C802.16m-08/272
  - Include “*Uplink Common Control*” in 16m UL control structure