# 16jm Ad Hoc Group Recommendations on High Level Constructs for 16m Relay Frame Structure

**IEEE 802.16 Presentation Submission Template (Rev. 9)**

Document Number:

IEEE C802.16m-08/499

Date Submitted:

2008-05-11

Source: Ad Hoc Group Chairs

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Source:

Base document

Venue:

Macau, China

Base Contribution:

None

Purpose:

For informing TGm about the discussions that took place in the 16jm AHG regarding frame structure constructs.

# 16jm Ad Hoc Group Recommendations on High Level Constructs for 16m Relay Frame Structure

*Prepared by*

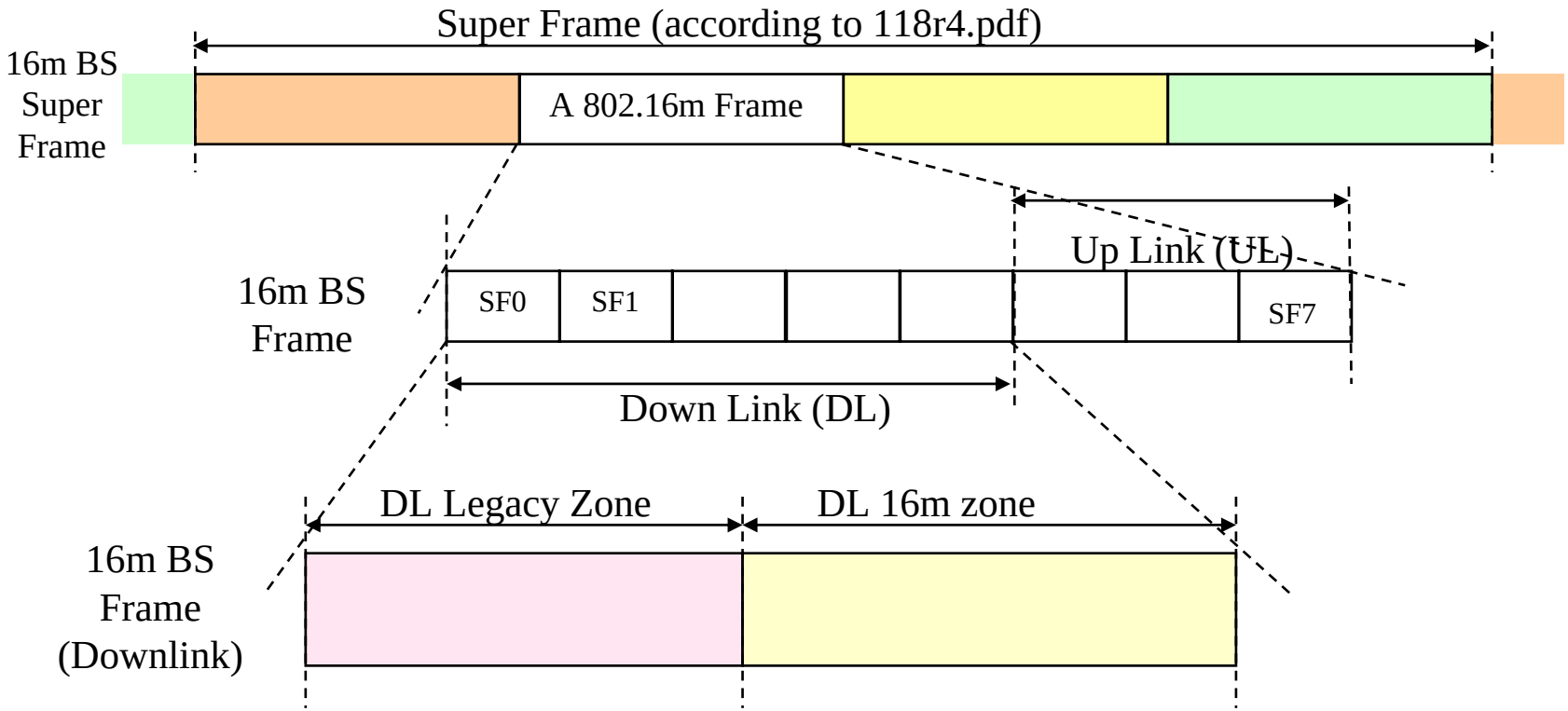
*16jm Ad Hoc Group Chairs*

*Rakesh Taori and Peiying Zhu*

# Slides 6 and 7 from the Original Discussion Material (16mRelayFS-AHG.pdf)

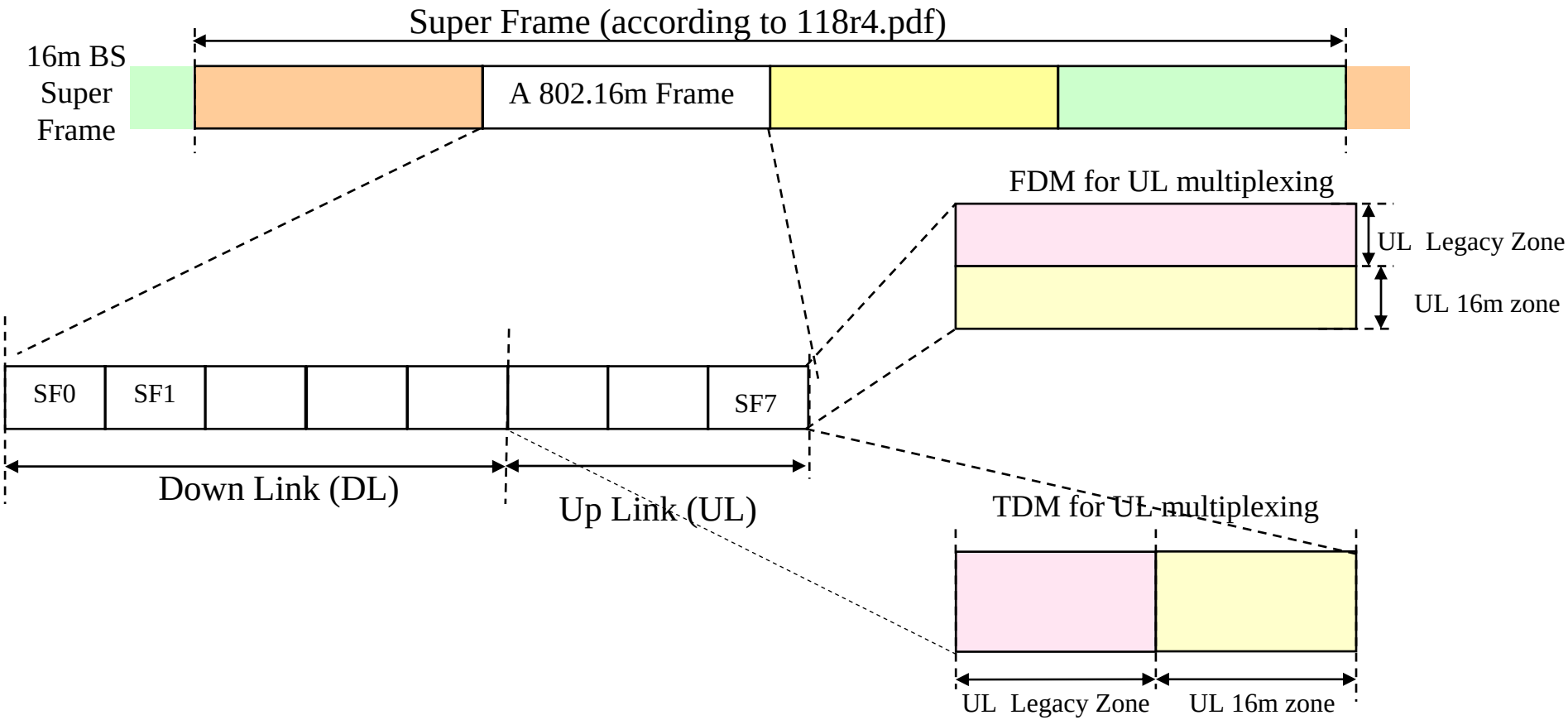
- Original slides 6 and 7
- Comments Received on slides 6 and 7
- AHG Chairs' recommendations based on Received Comments

# Slide 6 from 16mRelayFS-AHG.pdf: Multiplexing Legacy RS and 16m RS in DL




Possible Text for SDD: A 16m BS that supports relay stations shall multiplex communications with the legacy RSs (16j RSs) and the 16m RSs using TDM in the DL.

# Slide 7 from 16mRelayFS-AHG.pdf: Multiplexing Legacy RS and 16m RS in UL

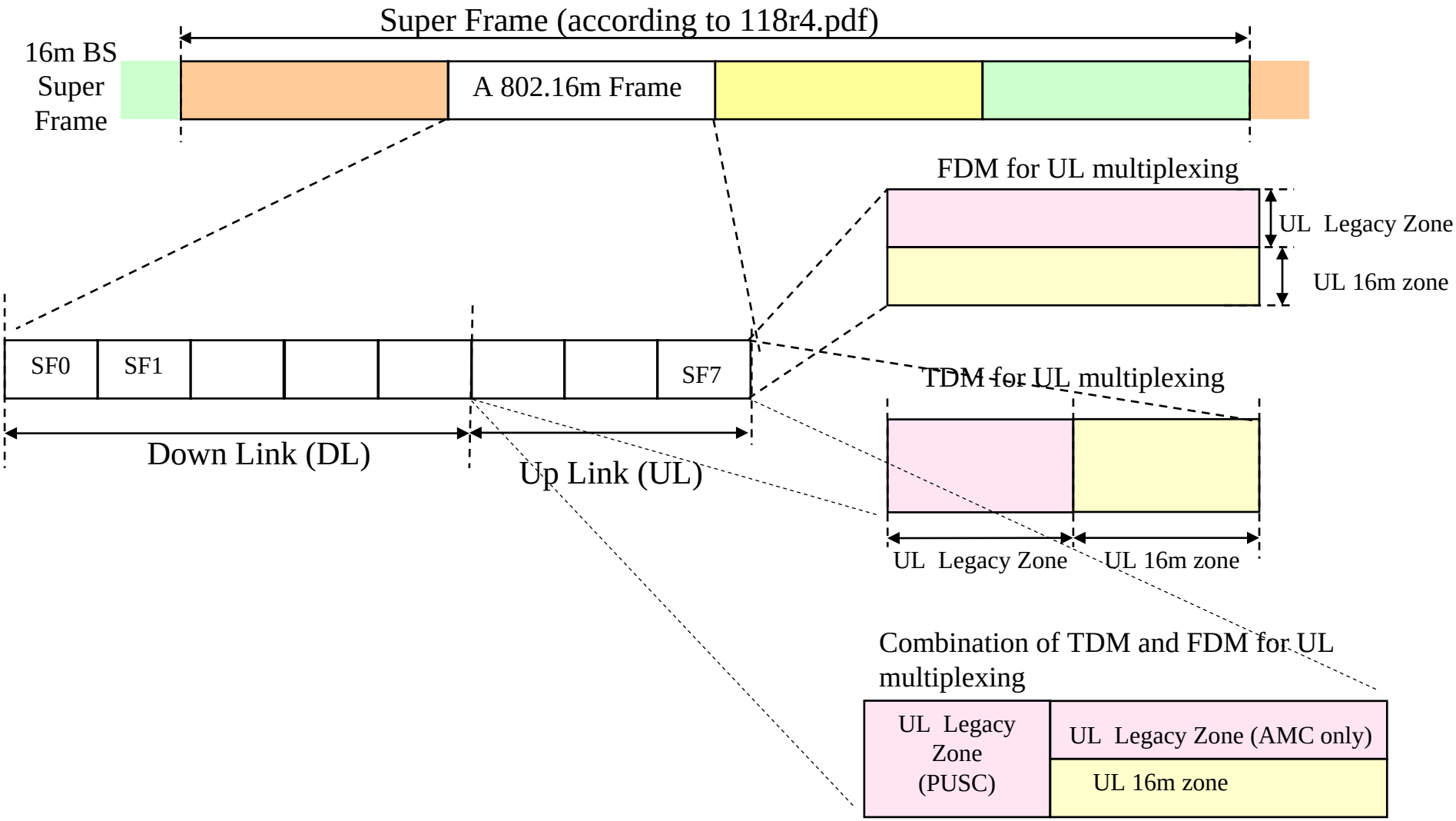



Possible Text for SDD: In the UL, the 16m BS should support TDM as well as FDM for multiplexing communications with the legacy RSs (16j RSs) and 16m RS

# Comments Received on slide 6 and 7

- 2 comments:
  - Nortel:
    - Replace the text on slides 6 and 7 with the following text:
      - A 16m BS that supports legacy relay station shall communicate with the 16j RS in the legacy zone. A 16m BS that supports 16m relay station shall communicate with the 16m RS in the 16m zone.
  - Intel:
    - Modify slide 7 as follows: See next slide

# (slide 7 – Intel's modifications to the figure)




Possible Text for SDD: In the UL, the 16m BS should support TDM as well as FDM for multiplexing communications with the legacy RSs (16j RSs) and 16m RS

# Material for discussion in TGm concerning Slides 6 and 7 (AHG recommendations)

- There is consensus on the SDD text in slides 6 and 7. No objection was raised. There were comments. New text is proposed based on the above.
  - [Quick Reference] Text already in the SDD (Page 8, lines 3-6):
    - A 16m BS that is capable of supporting a 16j RS, shall communicate with the 16j RS in the "legacy zone". The 16m BS is not required to provide 16j protocol support in the "16m zone". The design of 16m relay protocols should be based on the design of 16j wherever possible, although 16m relay protocols used in the "16m zone" may be different from 16j protocols used in the "legacy zone".
  - New SDD text for slides 6 and 7 (Proposed):
    - Insert in SDD Section 11.4.5, page 22:
      - A 16m BS that supports 16m relay stations shall communicate with the 16m RS in the 16m zone. The 16m BS shall multiplex the legacy zone and the 16m zone using TDM in the DL. In the UL, the 16m BS should support TDM as well as FDM for multiplexing legacy zone and the 16m zone.
- Based on the inputs received, there seem to be several ways in which FDM multiplexing can be realized in the UL. The question of exactly how legacy and 16m zones should be partitioned in the UL is not a relay-specific topic. It should be discussed/debated in the TG.

# Slide 8 from the Original Discussion Material (16mRelayFS-AHG.pdf)

- Original slides 8
- Comments Received on 8
- AHG Chairs’ recommendations based on Received Comments

# Slide 8 from 16mRelayFS-AHG.pdf: Multiplexing Access Link and Relay Link in Legacy Zone

- Possible text for SDD: The 16m specification shall not alter the legacy zone operation. The access link and the relay link communications in the legacy zone shall be multiplexed using TDM in the UL as well as DL in accordance with the 802.16j specifications.

# Comments Received on slide 8

- Two comments (Delete = Strikethrough Red. Add = Underlined Blue)
  - III: The 16m specification shall not alter the legacy zone operation. The access link and the relay link communications in the legacy zone shall be multiplexed ~~using TDM in the UL as well as DL~~ in accordance with the 802.16j specifications.
  - Mitsubishi Electric: The 16m specification shall not alter the legacy zone operation. The access link and the relay link communications in the legacy zone shall be multiplexed using TDM in the UL as well as DL in accordance with the 802.16j specifications. 16m MSs or 16m RSs may also transmit or receive in the legacy zone.
    - Chairs' remarks: The additional information is better handled along with 16m RS frames which is discussed later.
  - Intel: Modify slide 8 according to the decision on multiplexing of Legacy and 16m zones in the UL.

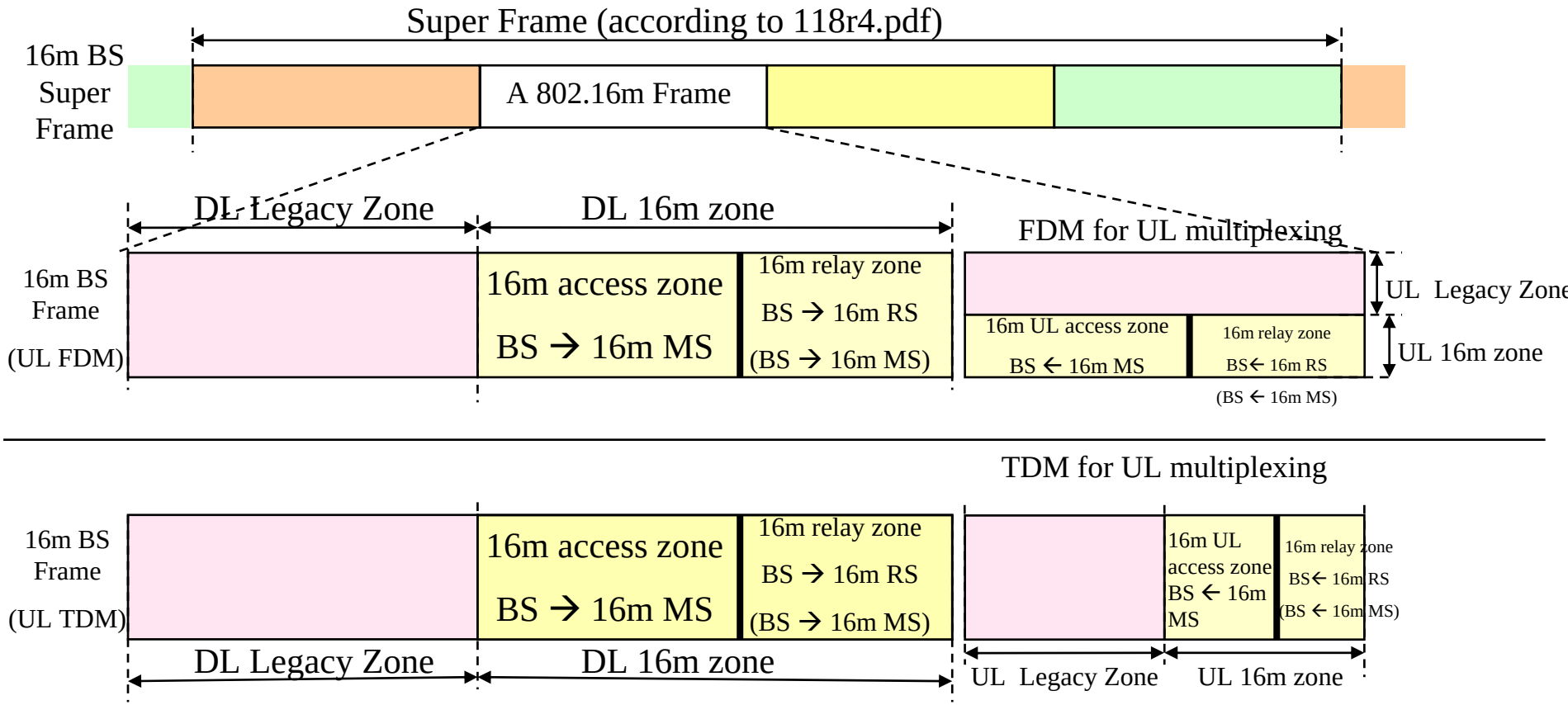
# Material for discussion in TGm concerning Slide 8 (AHG recommendations)

- There is consensus on the SDD text in slides 8. No objection was raised. There were comments. New text is proposed based on the above.
- New SDD text for slides 8 (Proposed):
  - Insert in SDD Section 11.4.5, page 22:
    - The 16m specification shall not alter the legacy zone operation. The access link and the relay link communications in the legacy zone shall be multiplexed in accordance with the 802.16j specifications.

# Slide 9 from the Original Discussion Material (16mRelayFS-AHG.pdf)

- Original slides 9
- Comments Received on 9
- AHG Chairs’ recommendations based on Received Comments

# Slide 9 from 16mRelayFS-AHG.pdf
# Multiplexing Access and Relay Link in 16m zone




Possible Text for SDD: In the 16m zone, the 16m BS and the 16m RS shall multiplex the access link communications (16m BS – 16m MS, 16m RS – 16m MS) and the relay link communications (16m BS – 16m RS) using TDM in the UL as well as the DL.

# Comments Received on slide 9 (…1)

- [Original text]: In the 16m zone, the 16m BS and the 16m RS shall multiplex the access link communications (16m BS – 16m MS, 16m RS – 16m MS) and the relay link communications (16m BS – 16m RS) using TDM in the UL as well as the DL.
- [Option 1: Samsung]: In the 16m zone, the 16m BS ~~and the 16m RS~~ shall multiplex the access link communications (16m BS – 16m MS, 16m RS – 16m MS) and the relay link communications (16m BS – 16m RS) using TDM in the UL as well as the DL, in case of a half duplex RS.
- [Option 2: III]: In the 16m zone, the ~~16m BS and the~~ 16m RS shall multiplex the access link communications ~~(16m BS – 16m MS, 16m RS – 16m MS)~~ and the relay link communications (16m BS – 16m RS) using TDM in the UL as well as the DL.
- [Option 3: Interdigital]: In the 16m zone, the 16m BS and the 16m RS shall multiplex the access link communications ~~(16m BS – 16m MS, 16m RS – 16m MS)~~ and the relay link communications ~~(16m BS – 16m RS)~~ using TDM in the UL as well as the DL.
- [Option 4: LGE]: In the 16m zone, the 16m BS and the 16m RS shall multiplex the access link communications (16m BS –16m MS, 16m RS –16m MS, 16m BS←16mRS→16mMS) and the relay link communications (16m BS –16m RS, 16m BS←16mRS→16mMS) using TDM in the UL as well as the DL. The relative position between 16m access and relay zones is FFS. (Editor's interpretation: Modify the Figure to reflect bi-directional).
- [Option 5: Mitsubishi]: In the 16m zone, the 16m BS and the 16m RS shall multiplex the access link communications (16m BS –16m MS, 16m RS –16m MS) and the relay link communications (16m BS –16m RS) using TDM in the UL as well as the DL. 16j RS may also transmit or receive in the 16m zone.
- [Option 6: Nortel] Delete the figure. Modify the SDD text as follows: In the DL and UL 16m zone, the access zone and the relay zone shall be TDM

# Comments Received on slide 9 (…2)

- [Option 7: Alvarion] In the DL 16m zone, inserted in BS DL sub-frame, the traffic is FDM multiplexed in different Zones based on Relay Rx or Tx operation. In the UL 16m zone, inserted in BS UL sub-frame, the traffic is FDM multiplexed based on Relay Tx operation.

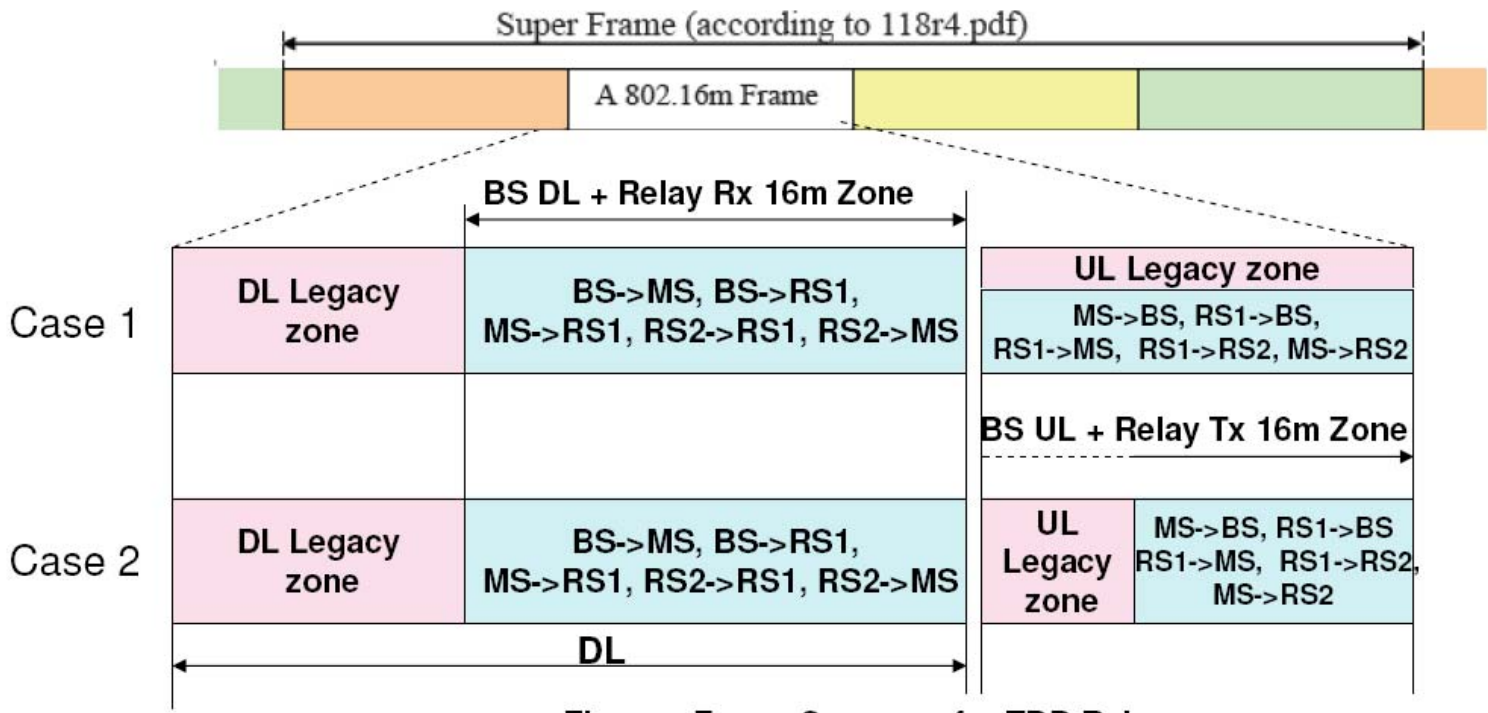



Fig. xa Frame Structure for TDD Relay

# Material for discussion in TGm concerning Slide 9 (AHG recommendations)

- There is no consensus for the SDD text on slide 9. Several comments were received.
- The received inputs can be categorized. Proposed modifications to the text aimed at:
  - capturing >2 hop relay support.
  - Facilitating bi-directional transmission to (or receiving from) super ordinate and subordinate stations at the same time.
  - Enabling simultaneous Tx/Rx to subordinate station and Rx from superodinate station (full duplex relaying).
  - 16j RS behavior in 16m zone (from 16m BS perspective).
- Most comments indicate that the “sub-zoning” within the 16m zone is rigid (makes it difficult to capture the intended features).
- More discussions are needed to finalize the high level frame structure constructs for the 16m zone.

# Slide 10 from the Original Discussion Material (16mRelayFS-AHG.pdf)

- Original slides 10
- Comments Received on 10
- AHG Chairs’ recommendations based on Received Comments

# Slide 10 from 16mRelayFS-AHG.pdf
# Text for 16m zone (Perspective of 16m/16j RSs).

1. Assuming that connection 6 in the connection chart is agreed, we need to define the operation of a 16m RS in terms in legacy zone and 16m zone
   - Possible text for SDD: A 16m RS shall communicate with the 16e MS in the "legacy zone".
2. Should the 16m zone and the legacy zone for 16m BS frame and the 16m RS frame be aligned (as shown in several contributions e.g. Nortel's)
   - If yes, possible text for SDD: The Legacy zone and 16m zone for the 16m entities shall be time aligned.
3. Can a 16j RS communicate with a 16e MS in the duration of the 16m zone? (as shown in several contribution e.g. Intel's 83r3?)
   - If yes, possible text for SDD: A 16j RS may communicate with 16e MSs during the 16m zone.
4. Can a 16m BS/RS communicate with 16m MSs in the UL/DL relay zone? (as shown in several contributions, e.g. Samsung's
   - If yes, possible text for SDD: In the relay zone of the16m zone, the 16m BS, or a 16m RS, may communicate with the 16m MS.
5. If the above is accepted, can a BS send/receive transmissions to/from MS spanning beyond the access or relay zone.
   - If yes, possible text for SDD: In the 16m zone, the 16m BS may send (or receive) frames to (or from) the 16m MS that start in the access zone (or relay zone) and finish in the adjacent relay zone (or access zone).

# Comments Received on slide 10 (…1)

- 1st bullet
  - Received support from Nortel, Samsung, III, Mitsubishi
  - No objections received.
- 2nd bullet
  - Received support from Nortel, Intel, Samsung, III, Mitsubishi.
  - 1 objection received (LGE): Delete bullet 2
- 3rd bullet
  - Received support from Intel, Samsung
  - Modification (Mitsubishi): A 16j RS may communicate with 16e MSs or 16j RSs during the 16m zone.
  - 2 objection received (III, Nortel)
    - III's proposed modification: A 16j RS shall not communicate with 16e MSs during the 16m zone.
- 4th bullet
  - Received support from Intel, Samsung, III, Interdigital, Mitsubishi
  - Modification (LGE): In the relay zone of the16m zone, the 16m BS, or a 16m RS, may communicate with the 16m MS. More specifically, a 16m RS may communicate with 16m MS in the 16m UL relay zone.
  - Comment (Nortel): This should be up to scheduler and also the 16m channelization structure for the access zone and relay zone have to be the same. The relay zone should be defined from an RS perspective. See comments on slide 11.

# Comments Received on slide 10 (…2)

- 5th bullet
  - Received support from Intel, III, Samsung
  - 1 request for clarification (Mitsubishi)
  - Comment from Nortel: Same as Nortel's comment on the 4th bullet.
- Other comments
  - [Samsung]: Merge 4th and 5th bullet. Merged bullets should read:
    - In the 16m zone, the 16m BS can always transmit or receive to/from 16m MS.
  - [Alvarion]: Delete all the text.
  - [Mitsubishi]: Add a bullet: The legacy zone and 16m zone are divided on the boundary of subframe. Meanwhile the access zone and relay zone within each legacy zone and 16m zone are partitioned on the boundary of an OFDMA symbol.
  - [LGE]: Add a bullet: Can a 16m RS communicate with 16m BS in the DL access zone? (as shown in LGE contribution)
    - If yes, possible text for SDD: In the DL access zone of the16m zone, a 16m RS, may communicate with the 16m BS.

# Material for discussion in TGm concerning Slide 10 (AHG recommendations)

- There is no objection to the 1st item.
  - New SDD text for the 1st bullet on slide 10 (Proposed):
    - Insert in SDD Section 11.4.5, page 22:
      - A 16m RS shall communicate with the 16e MS in the "legacy zone".
- There is one objection to the 2nd item.
  - New SDD text for the 2nd bullet on slide 10 (Proposed):
    - Insert in SDD Section 11.4.5, page 22:
      - The Legacy zone and 16m zone for the 16m entities shall be time aligned.
- For the other items, further discussion is needed.

# Slide 11 from the Original Discussion Material (16mRelayFS-AHG.pdf)

-Original slides 11
- Comments Received on 11
- AHG Chairs' recommendations based on Received Comments

# Slide 11 from 16mRelayFS-AHG.pdf Terminology

- Legacy Zone
  - where 16m BS communicates with 16j RS or 16e MS, and where 16m RS communicates with a 16e MS. The Legacy zone, if present, shall consist of 1 or more 16e Access Zone and 0 or more 16j Relay Zones.
- 16e Access Zone
  - where 16m BS or a 16m RS communicates with a 16e MS.
- 16j Relay Zone
  - where 16m BS communicates with a 16j RS.
- 16m Zone
  - where 16m BS communicates with 16m RS or 16m MS, and where 16m RS communicates with a 16m MS. The 16m zone shall consist of 1 or more 16m Access Zone and 0 or more 16m Relay Zones.
- 16m Access Zone
  - where 16m BS or 16m RS communicates with a 16m MS.
- 16m Relay Zone
  - where 16m BS communicates with a 16m RS.

# Comments Received on slide 11 (…1)

- [Samsung]
  - Modify the terminology of 16m zone
    - where 16m BS communicates with 16m RS or 16m MS, and where 16m RS communicates with a 16m MS.
      Delete: ~~"The 16m zone shall consist of 1 or more 16m Access Zone and 0 or more 16m Relay Zones."~~
  - Delete the terminology of "16m access zone"
  - Modify the terminology of "16m relay zone"
    - where 16m BS can communicate with a 16m RS
- Huawei
  - To support a 16m RS, the 16m zone is further divided into Access zone and Bi-direction Relay zone.
  - Considering the DL and UL, there are four types of zones in the 16m zone:
    - DL Access Zone (DLAZ): this zone is used by BS (RS) to transmit to a directly connected MS.
    - UL Access Zone (ULAZ): this zone is used by BS (RS) to receive from a directly connected MS.
    - Bi-direction Receiving Zone (BDRZ) : this zone is used by RS to receive from superordinate station and subordinate station at the same time.
    - Bi-direction Transmission Zone (BDTZ) : this zone is used by RS to transmit to superordinate station and subordinate station at the same time.
- III
  - Legacy Zone
    - where 16m BS communicates with 16j RS or 16e MS, and where 16m RS communicates with a 16e MS. The Legacy zone, if present, shall consist of 1 or more 16e Access Zones and 0 or more 16j Relay Zones.
  - 16m Relay Zone
    - where 16m BS communicates with a 16m RS or 16m MS.

# Comments Received on slide 11 (…2)

- LGE
  - Legacy zone
    - where 16m BS communicates with 16j RS, 16m RS or 16e MS and where 16j RS or 16m RS communicates with a 16e MS. The legacy zone, if present, shall consist of 1 or more 16e Access Zone and 0 or more 16ej Relay Zones. In the legacy zone, 16m RS should be operated by a legacy mode.
  - 16e Access Zone
    - where 16m BS, a 16j RS or a 16m RS communicates with a 16e MS.
  - 16j Relay Zone
    - where 16m BS communicates with a 16j RS, 16m RS, or 16e MS.
  - 16m Access Zone
    - where 16m BS or 16m RS communicates with a 16m MS, or a 16m RS transmits to 16m MS's and a 16m BS.
  - 16m Relay Zone
    - where 16m BS communicates with a 16m RS, or 16m BS communicates with 16m MS's, or A 16m RS transmits to 16m MS's and a 16m BS.

# Comments Received on slide 11 (…3)

- Mitsubishi
  - Legacy Zone
    - where 16m BS communicates with 16j RS or 16e MS, and where 16m RS communicates with a 16e MS. The Legacy zone, if present, shall consist of 1 or more 16e Access Zone and 0 or more 16j Relay Zones. 16m MSs and 16m RSs can also transmit or receive in the legacy zone.
  - 16m zone
    - where 16m BS communicates with 16m RS or 16m MS, and where 16m RS communicates with a 16m MS. The 16m zone shall consist of 1 or more 16m Access Zone and 0 or more 16m Relay Zones. 16j RSs can also transmit or receive in the 16m zone.
- Nortel
  - Legacy Zone
    - Where 16m BS communicates with 16j RS or 16e MS, and where 16j RS communicates with 16e MS or 16j subordinate RS. The legacy zone, if present, shall consist of 1 or more 16e Access Zone and 0 or more 16j Relay Zones
  - 16m zone
    - where 16m BS communicates with 16m RS or 16m MS, and where 16m RS communicates with super-ordinate station or sub-ordinate station. The 16m zone shall consist of 1 or more 16m Access Zone and 0 or more 16m Relay Zones.
  - 16m Relay Zone :
    - where 16m RS communicates to the superordinate station or the sub-ordinate station. Within a 16m Relay Zone, the 16m RS may transmit to (or receive from) both super-ordinate station and sub-ordinate station.

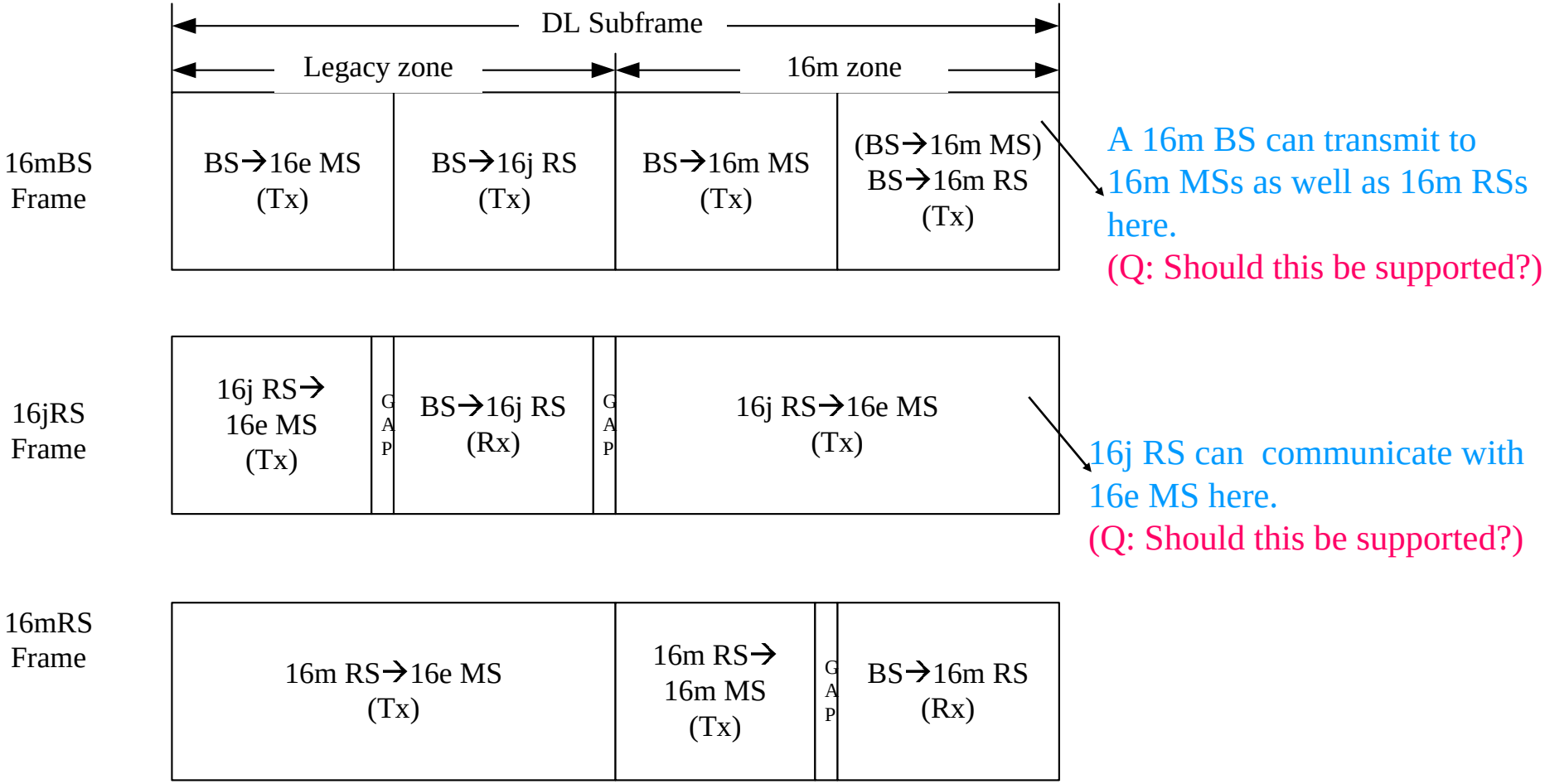
# Material for discussion in TGm concerning Slide 11 (AHG recommendations)

- Try to get agreement on the first 4 terms on slide 11.
- The terms that deal with sub-zoning within the 16m zone need further discussion.

# Slide 13 from the Original Discussion Material (16mRelayFS-AHG.pdf)

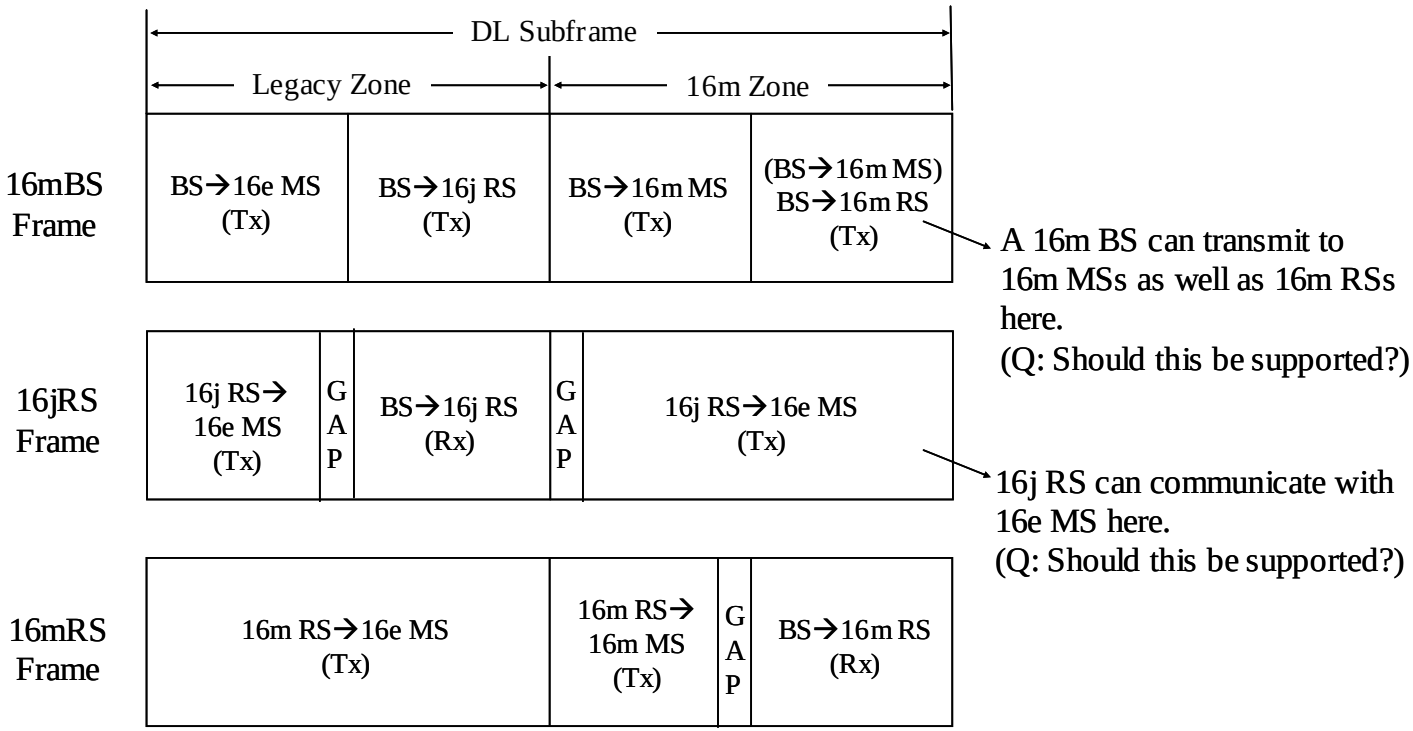
-Original slides 13
- Comments Received on 13
- AHG Chairs' recommendations based on Received Comments

# Slide 13 from 16mRelayFS-AHG.pdf
# Example DL Frame Structure for Case 8



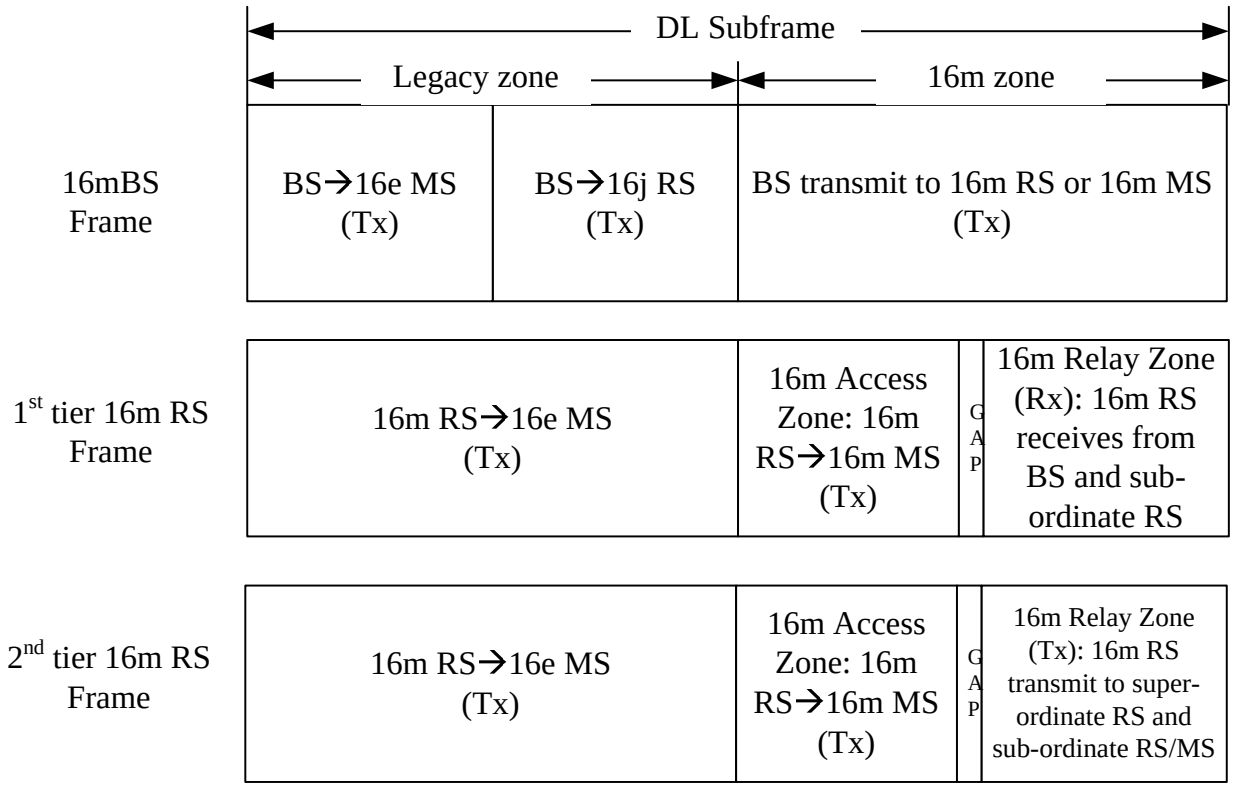
# Comments Received on slide 13 (…1)

- Interdigital: Yes to 1st question
- Samsung: Yes to both the questions.
- LGE: The relative position between 16m access and relay zones is FFS.
- III: The boundaries of relay zones at 16m BS and 16j RS shall be time-aligned.



# Comments Received on slide 13 (…2)

- Nortel: Replace the figure as follows:



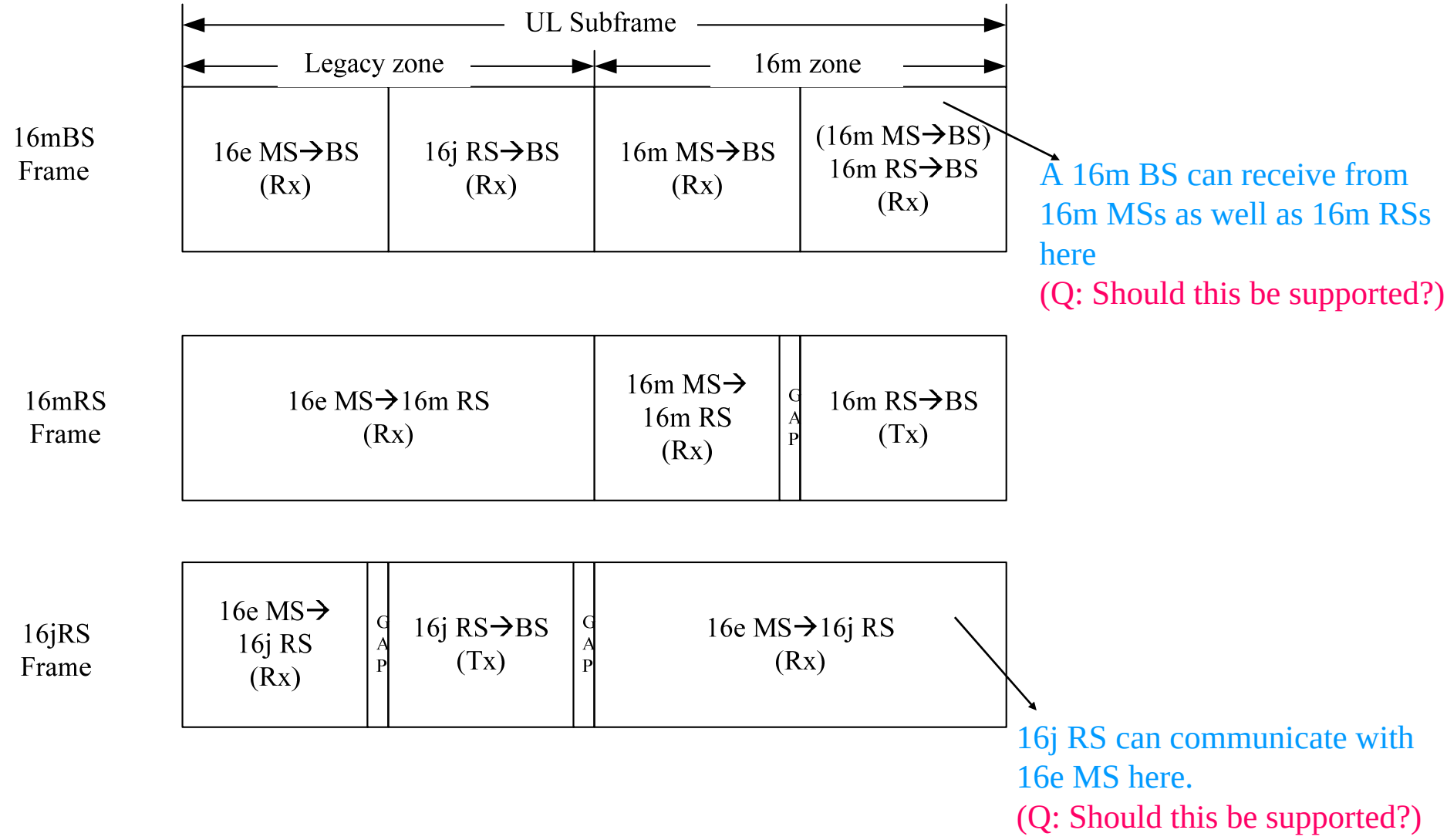
# Material for discussion in TGm concerning Slide 13 (AHG recommendations)

- Defer discussion until decision on the basic constructs (Slides 6 through 11 of 16mRelayFS-AHG.pdf) can be made.

# Slide 14 from the Original Discussion Material (16mRelayFS-AHG.pdf)

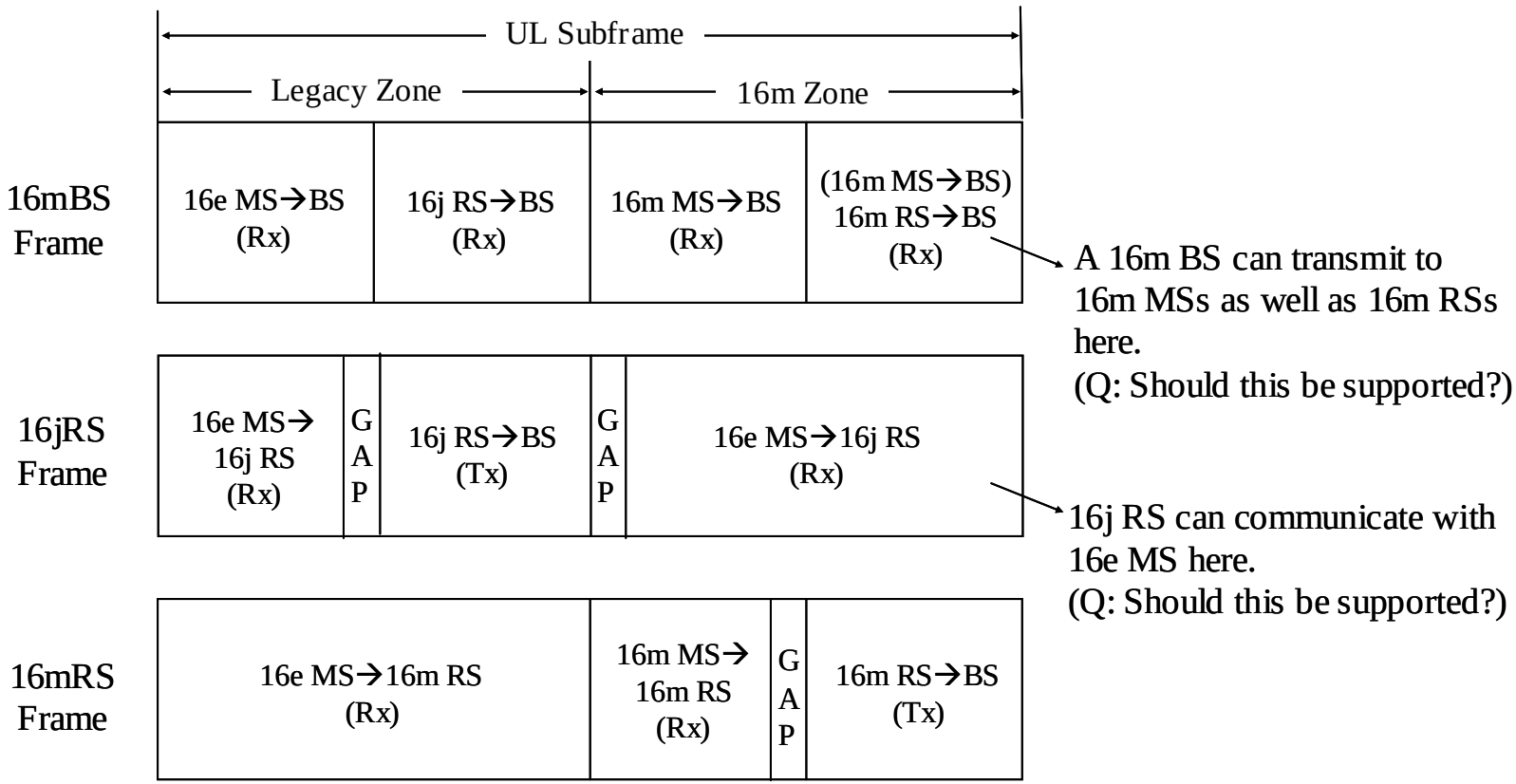
-Original slides 14
- Comments Received on 14
- AHG Chairs' recommendations based on Received Comments

# Slide 14 from 16mRelayFS-AHG.pdf
# Example UL Frame Structure for Case 8 (TDM)



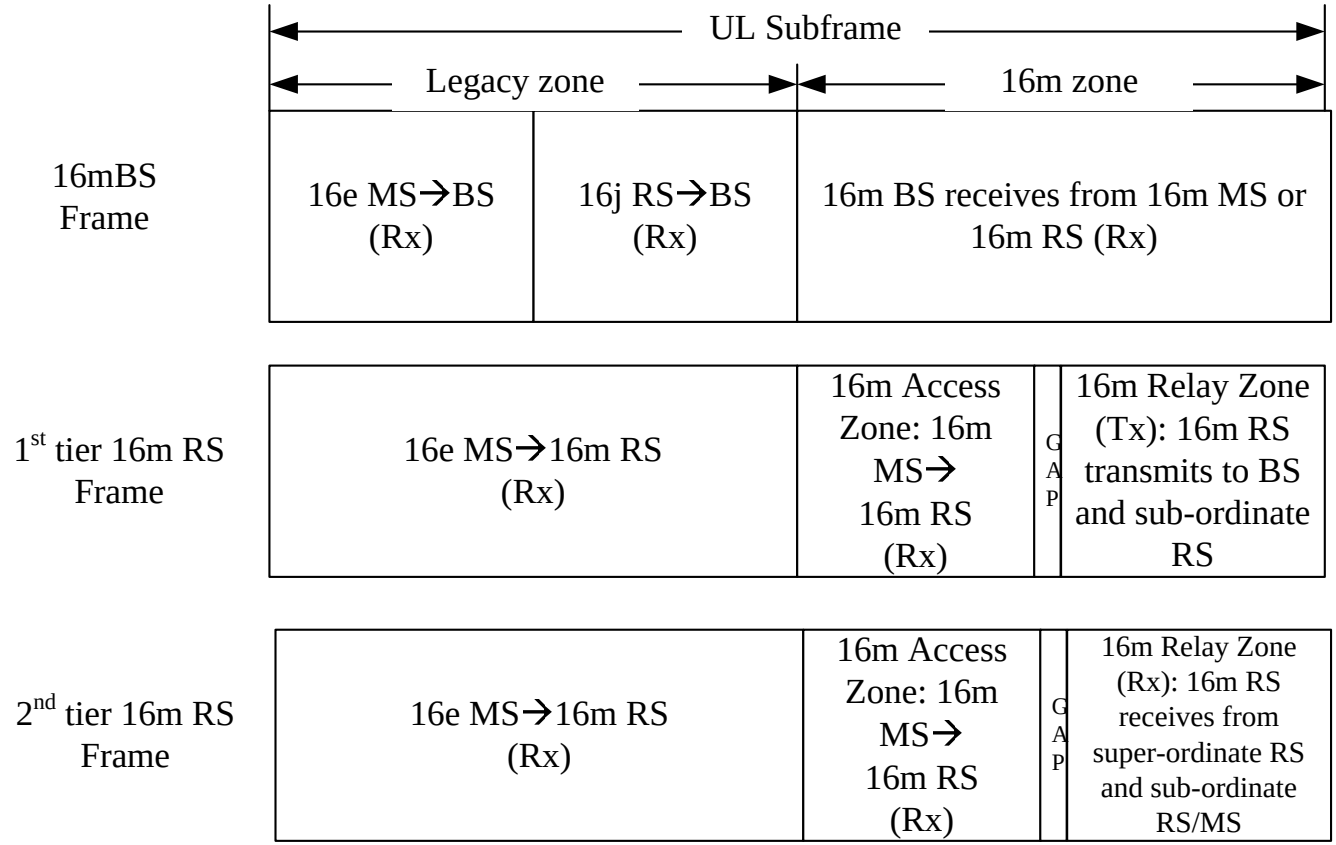
# Comments Received on slide 14 (…1)

- Interdigital: Yes to 1st question
- Samsung: Yes to both the questions.
- III: The sequence of the figures of 16m RS and 16j RS frame structure should be reversed.



# Comments Received on slide 14 (…2)

- Nortel: Replace the figure as follows:



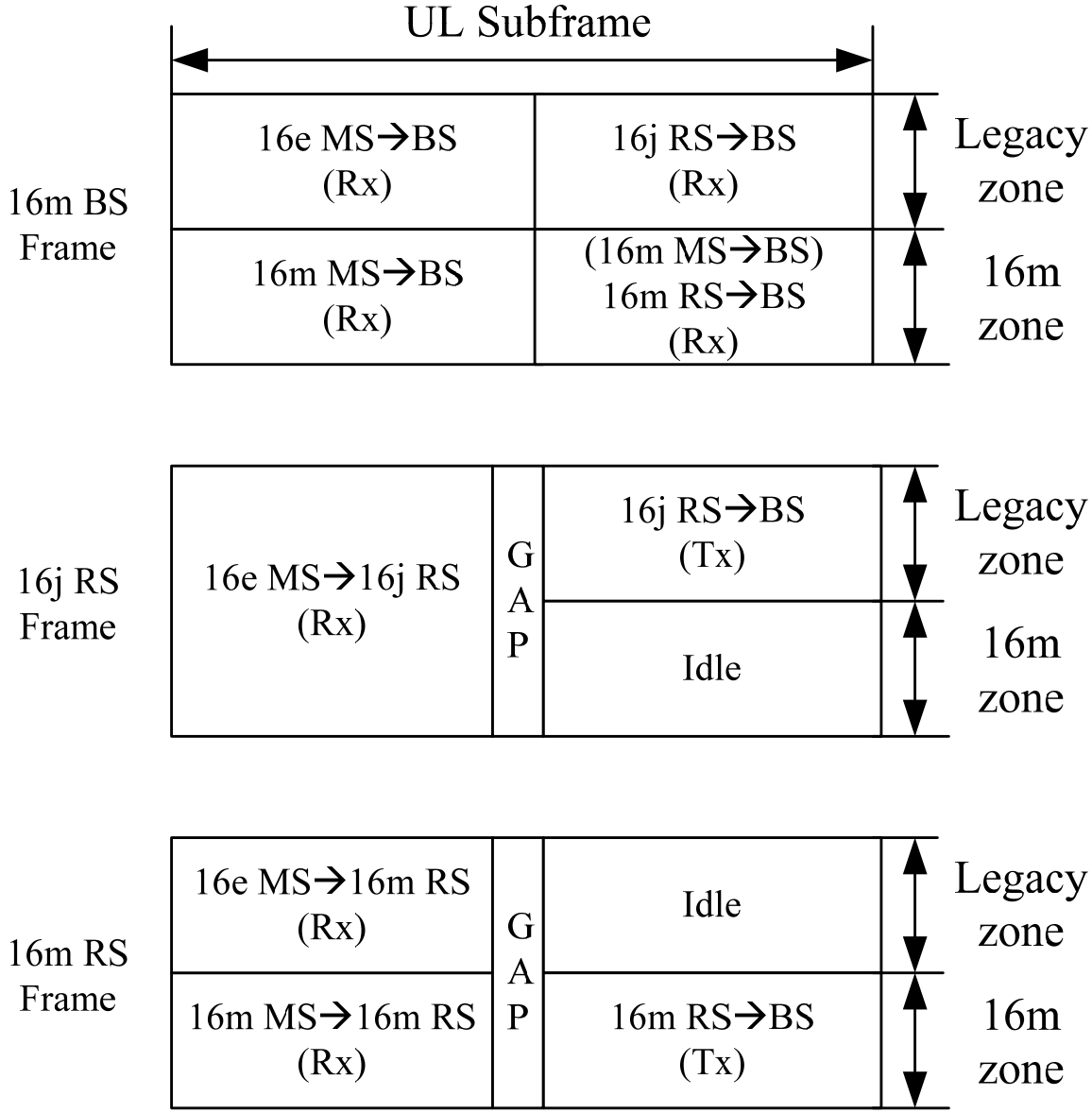
# Material for discussion in TGm concerning Slide 14 (AHG recommendations)

- Defer discussion until decision on the basic constructs (Slides 6 through 11 of 16mRelayFS-AHG.pdf) can be made.

# Slide 15 from the Original Discussion Material (16mRelayFS-AHG.pdf)

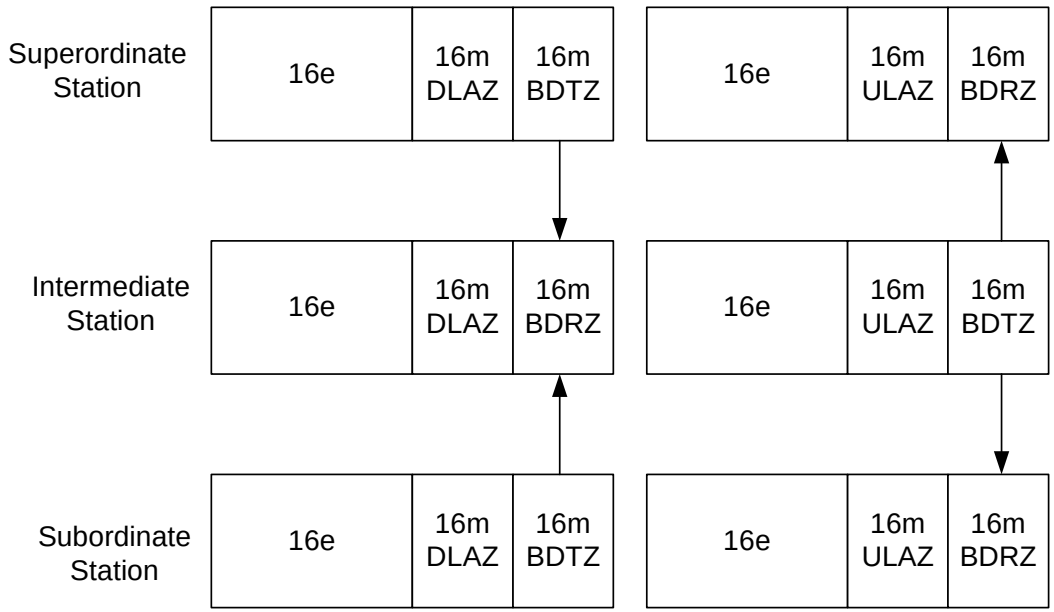
-Original slides 15
- Comments Received on 15
- AHG Chairs' recommendations based on Received Comments

# Slide 15 from 16mRelayFS-AHG.pdf
# Example UL Frame Structure for Case 8 (FDM)



# Comments Received on slide 15

- Intel: Modify slide 15 according to decision on multiplexing of Legacy and 16m zones in the UL.
- Huawei: Alternative Illustration




**DLAZ:DL Access Zone**
**ULAZ:UL Access Zone**
**BDRZ:Bi-direction Receive Zone**
**BDTZ:Bi-direction Transmit Zone**

# Material for discussion in TGm concerning Slide 15 (AHG recommendations)

- Defer discussion until decision on the basic constructs (Slides 6 through 11 of 16mRelayFS-AHG.pdf) can be made.