Correction of RS Preamble Configuration Request (RS_Config-REQ) Message

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Provides summary of the contribution C802.16j-07/318 for presentation to the Relay TG at session #49.

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Overview

- In meeting #48 a feature was introduced as part of the RS configuration message that enabled configuring one RS to transmit multiple (one, two or three) preamble sequences
- We have studied the performance and complexity issues from FRS and MRS point-of-view and believe that this feature is not useable for a number of reasons.
- Contribution C802.16j-07/318 provides the details and these slides summarise the main points, considering FRS and MRS separately

Recommendation

- Accept-modify comment 1081 to accept C802.16j-07/318r2
  - Remove support for multiple preamble transmission at the RS
- Accept-modify comment 013 to accept C802.16j-07/041r14
  - 088 is merged into it
  - Clarifies an further alternative way of using preexisting messaging to do the preamble reassignment
  - Defines PN sequence subset reservation and the preamble reassignment algorithm:
  - Clarification on using virtual RS and network initiated HO procedures already in the standard to deal with case of preamble collision causing a problem
- Supersede comment 1129 (C802.16j-07/088) by 013
- Withdraw 1247

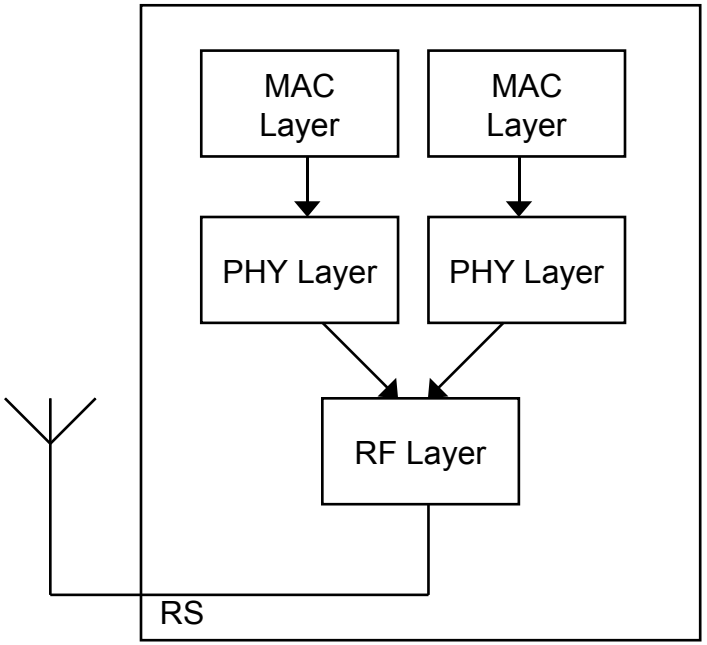
Backup slides

Contents

- What does multiple preamble transmission mean
  - High-level PHY/MAC layer implications
- Application in FRS
- Application in MRS
- Conclusion & recommendation

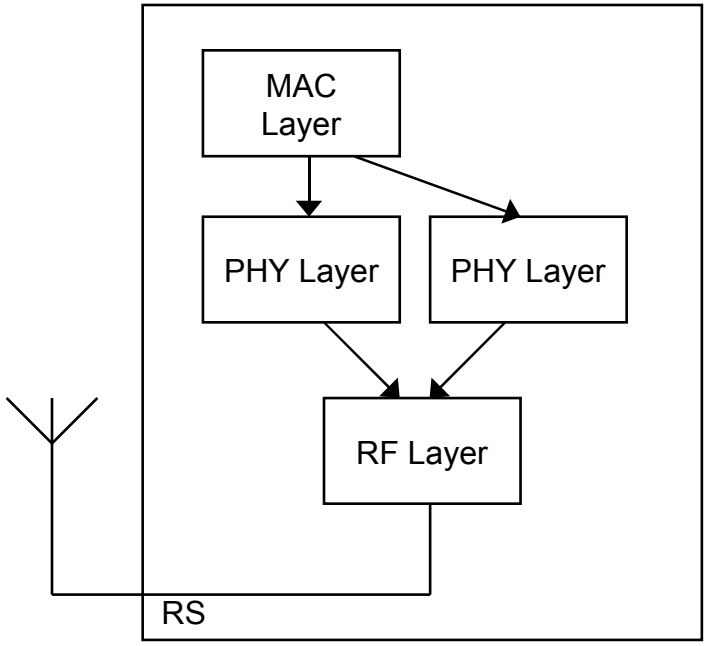
What does multiple preamble transmission mean?

- According to section 8.4.3.2:
  - *"A Segment is a subdivision of the set of available OFDMA subchannels (that may include all available subchannels).* ***One segment is used for deploying a single instance of the MAC."***
- The RS must have separate parallel MAC instances when configured
  - → requiring two MAC engines
- In reality the PHY layer has to be duplicated
  - → PRBS generators are different on each segment
  - → FCH / MAP IEs are different,
  - → Subchannel numbers are different
  - → Etc.
- Many RF layer issues resulting from the change to the structure of the preamble symbol (see later)



What does multiple preamble transmission mean?

- Could we support two segments from one MAC instance?
  - The same MAC PDUs are sent on both segments
  - RPT-REQ has to indicate segment/PRBS number → which one to use?
- There will be problems



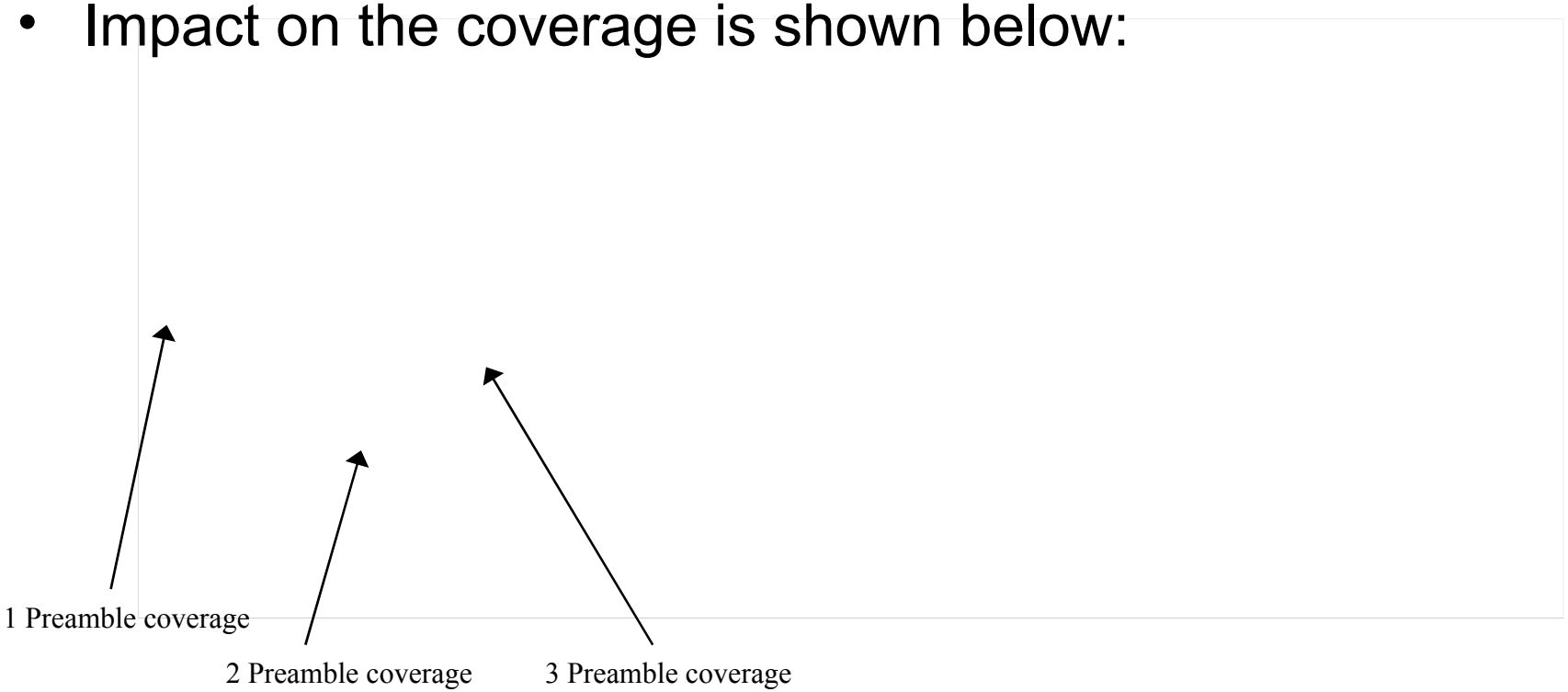
The FRS case

- For an FRS start by considering the RF layer issues
- The impact of modulation of multiple sequences:
  - Destroys the low PAPR of preamble symbol
  - Requires increase in TX power (more subcarriers)
  - Therefore, must increase back-off relative to 1 preamble transmission

		FFT Size		
$N_{preamble}$	**Parameter**	**2048**	**1024**	**512**
1	Max PAPR dB]	4.9113 dB	4.4924 dB	4.4450 dB
2	Max PAPR [dB]	7.7079 dB	7.1161 dB	6.9343 dB
	Power increase [dB]	3.01	3.01	3.01
	Max RF power back-off factor [dB]	10.72	10.13	9.93
	Overall input back-off factor degradation [dB]	**5.81**	**5.63**	**5.50**
3	Max PAPR [dB]	9.1988	8.6532	8.3600
	Power increase [dB]	4.77	4.77	4.77
	Max RF power back-off factor [dB]	13.97	13.42	13.13
	Overall input back-off factor degradation [dB]	**9.06**	**8.93**	**8.69**

The FRS case

- Impact on the coverage is shown below:



- Using multiple preambles through the same PA will result in significantly reduced coverage areas
- What is the benefit of a this type of RS with a PA backed-off by 10dB?
- More RF issues such as spectral mask considered in C802.16j-07/318

The MRS case

- Why multiple preamble transmission MAY be useful:
  - Could have the case that MRS moves into FRS or MR-BS cell with same preambles → preamble collision
  - In the case the transmit power on the relay uplink is greater than that on the access downlink, then it can be argued that the PA will already be backed off on the access DL so adding extra preamble may not cause RF issues
- However, there is a much simpler approach:
  - Reserve a subset of PN sequences only for assignment to MRS, in this case no collision will ever occur between FRS/MR-BS and MRS
  - Will only get collision if two MRSs stop next each other → This may not always cause a problem
  - However if collision occurs and it is a problem, solutions exist. Either:
    - Virtual RS group the colliding RSs
    - Network initiated HO the MSs to other RS (or MR-BS) while MRS reassigns its preamble sequence
  - C802.16j-07/088 & 041r11 deals with this → see contributions

Conclusion

FRS:

- No benefit for FRS case: more complex RS covers a smaller area

MRS:

- Two possible solutions: as discussed
- The multiple preamble transmission is not a good solution for the MRS case,
- Better to enable reservation of a subset of PN sequences to minimise chance of collision
- And, if collision occurs and it is a problem use C802.16j-07/088 or C802.16j-07/041r11 as the solution
- Consequently, adopting the alternative solution to multiple preamble transmission results in much simpler RS (one MAC instance, one PHY layer and no RF issues)