Source: TSG RAN WG1

Title: Liaison statement on SFN and BCH coding

To: TSG RAN WG2

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WG1 would like to thank WG2 for the liaison statement regarding the length of SFN in Tdoc TSGR2#6(99)974 (TSGR1#6(99)C40). WG2 raised two questions to WG1 requiring a response in this liaison statement, they are dealt with separately below:

<u>**SFN as an RRC parameter:**</u>
WG1's understanding of this request is that the SFN value would not be visible to Layer 1. WG1 would like to inform WG2 that we see the SFN as a very important Layer 1 parameter, which of course may also be used by higher layers.
Layer 1 uses the SFN for a number of reasons, for example:
* Scheduling of wake up times during idle mode
* The SFN of neighbour cells is decoded prior to a intra-frequency handover, in order to measure superframe time offset.
* The SFN is used in the parameterization of compressed mode
If the BCH transport block itself contains the SFN, then the SFN needs to be extracted by higher layers and then inform it to Layer 1. This would place a time constraint on the higher layer processing of this message in order for the layer 1 to use the SFN for the functions described above.

<u>**Clarification of CRC attachment:**</u>
WG2 asked WG1 to clarify the meaning of the statement "WG1 wishes to have CRC applied to this L1 information together with the BCH transport channel blocks". The correct interpretation of this is that WG1 plan to use a single CRC for both the SFN and a BCH transport block.

WG2 suggested that applying separate CRCs to the BCH transport block and the SFN would have two potential advantages, namely:
1. The SFN can be defined to have more robust coding than the BCH.
2. When the UE reads the SFN of an adjacent cell for making timing measurements before entering soft handover it would only need to decode the SFN number and would not need to decode the BCH blocks.

With regard to the first advantage, WG1 had not considered making the SFN field more robust than the BCH transport block. WG1 would like to point out that as the SFN is broadcast on a regular basis (although incremented each time) it may be acceptable to have occasional errors.

As regards the second claim, due to interleaving the SFN field is distributed throughout the whole of its 'transmission time interval' (TTI). Therefore, if the SFN and the BCH are part of the same transport channel then it is necessary to receive the whole TTI before the SFN can be extracted. In light of this WG1 considers that there is very little complexity difference between being able to decode the SFN field directly, or, having to decode the BCH and SFN together and then extracting the SFN field.

WG1 would like to point out however that we have not yet completed the definition of how to map the SFN and BCH to the physical channel. In order to assist WG1 in doing this, we request WG2 to consider the following questions.

Broadcast rate of SFN:
Whilst Layer 1 requires to have visibility of the SFN value, we don't have a strong opinion as to whether the broadcast rate is either every 10ms or 20ms, however WG1 would not like to see a slower broadcast rate than 20ms. WG1 would like to ask WG2 for their opinion on this.
Also it should be noted that if the SFN is broadcast at a rate of 20ms, then the least significant bit conveys no information, so WG1 would propose not to transmit this bit. This would in no way limit the use of the SFN to identify 10ms frames, it just removes redundancy on the air interface. WG1 would like WG2's opinion on this.

Availability of SFN prior to inter-frequency FDD-FDD hard-handover:
WG1 would like to inform WG2 that in the case of a FDD to FDD inter-frequency hard-handover, the maximum compressed mode time gap length is not sufficient to allow decoding of any 10ms frames on the candidate frequency. This means that if the SFN is interleaved over at least 10ms as WG1 currently proposes, then it will not be possible to obtain the SFN from the candidate frequency prior to inter-frequency hard-handover. Is this acceptable to WG2?

Protection requirements of SFN:
WG1 would like to ask WG2 their opinion on whether the SFN needs a different protection than the BCH data.

Transmission Time Interval of the BCH data:
WG1 would like to ask WG2 if they have any preference as to what the transmission time interval should be. Currently WG1 is considering values of 10 and 20ms, are these acceptable to WG2?

Coding of SFN and BCH data
With consideration of the above issues would it be acceptable to WG2 if the SFN and BCH transport blocks are encoded together with a single CRC in order to reduce overhead as proposed by WG1.