

TSG-RAN Working Group 2 meeting #3

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TSG-RAN Working Group1 meeting#3

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Source: 3GPP TSG RAN WG#1

Title: Liaison from TSG RAN WG#1 to TSG RAN WG#2 regarding the proposed USCH

To: 3GPP TSG RAN WG#2

The liaison from ETSI SMG2 UMTS L2/3 Experts to the ETSI SMG2 UMTS L1 Experts regarding Uplink Shared Channels (USCH) had gone unanswered by ETSI L1 Experts group [1]. This liaison was looking for guidance on physical layer issues associated with the USCH proposal presented to ETSI L2/3 and subsequently to ETSI L1 and 3G-PP RAN WG#1. In the meantime, several contributions have been presented to ETSI L1 and then TSG RAN WG#1 addressing the physical layer issues [2][3][4][5]. As a result, a response to those questions posed by ETSI L2/3 is presented.

In the liaison, the ETSI L2/3 group had identified three physical layer impacts associated with the proposal and sought answers to the following questions:

- 1) It was noted that if the assignment of uplink resource is made for only a short period (ie. for just one or maybe a few frames) then potentially a relatively large percentage of the time (for which the USCH is allocated) could be spent whilst the power control loop is converging. Layer 2/3 group seeks the recommendation of the Layer 1 group on whether this is a problem and if so what the minimum assignment period should be in order for the system to be operated efficiently from a power control viewpoint.*
- 2) It was also noted that in order to implement a time division access on the uplink there may be a requirement for a timing advance, guard periods or some other mechanism for ensuring that transmissions from separate UE's in subsequent frames do not overlap in time (due to differences in propagation delay). Layer 2/3 group seeks the advice of the Layer 1 group, firstly on whether such mechanisms are needed and secondly on the complexity and performance impact.*
- 3) Layer 2/3 group also would like to understand whether there would be any problems with the proposal with respect to acquisition and channel estimation if the uplink transmissions of a single user are bursty and the period between the uplink transmissions of each user may span many frames.*

With regard to the first question, a method of power control and channel estimation for Uplink Shared Channel (USCH) using preamble transmission was introduced [3]. When assignments are made in consecutive frames, only one pre-amble is required prior to the first frame in the group. In [4], simulation results are presented using the reverse link-layer simulator for a) continuous packet data transmission, b) discontinuous packet data transmission without preamble, and c) discontinuous packet data transmission with preamble transmission. It was observed from the simulations that in case of discontinuous transmission the receiver performance degrades by about 2dB at slow speeds while at high speeds the performance degradation was minimal. It was further shown that, with the use of preamble transmission, there is no significant degradation in performance. The simulation results presented were based on the source model proposed in ETSI for web browsing. At present it is our understanding that the preamble based packet transmission is sufficient for power control loop convergence.

With regard to the third question, any problems with acquisition and channel estimation are expected to be remedied by the method of pre-amble transmission described in [3]. The simulation conducted in [4] modeled non-ideal channel estimation. Therefore, our present understanding is that there are no problems with channel estimation on discontinuous transmissions. However, WG#1 Ad Hoc 14 had some concerns that the simulation modeled ideal searcher and finger management. The multi-path profile during the discontinuities modeled by the

ETSI data traffic pattern are not expected to vary significantly. Therefore, simulations with non-ideal finger management are expected to confirm the expectation.

With regard to the second question on timing advance concerns, three methods for timing advance have been proposed in [5]. However, discussion regarding timing advance in WG#1 Ad Hoc 14 on Packet Mode Operation has come to the conclusion that the added complexity required for timing advance is not warranted. In Ad Hoc 14, it has been argued that overlap of consecutive frames from two different UEs will never exceed 1% of the frame. Even if all the chips within the overlap are rendered useless, the impact over the frame including channel coding is most likely not even visible with normal simulation accuracy. Of course, CDMA properties of the uplink transmissions will not render the chips within overlap useless. Therefore, it is the current working assumption in WG1 that timing advance is not required for the FDD USCH concept.

In general, the current working assumption in WG1 is that discontinuous transmission can be supported without significant Layer 1 performance degradation over the continuous transmission alternative.

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- [1] SMG2 UMTS L2/3 Experts Group, "Liaison from SMG2 L2/3 Expert Group to L1 Expert Group with regards to proposed USCH," SMG 2 UMTS L23 581/98.
 - [2] Motorola, "Methods for Operating the Uplink Shared Channel," SMG 2 UMTS L1 046/99
 - [3] Motorola, "Operation of the Uplink Shared Channel," TSGR1#2(99)064
 - [4] Motorola, "Discontinuous Packet Data Transmission – Simulation Results," TSGR1#3(99)176
 - [5] Motorola, "Timing of the Uplink Shared Channel," TSGR1#2(99)65