

**Source:** Ad Hoc #10

**Title:** Report from Ad Hoc #10: Spreading and scrambling

**Agenda item:** 6

**Document for:** Decision

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**Summary:** The ad-doc was conducted via-email. A new item has been proposed. Conclusions are reached for 2 study items, and recommendations on the way forward are given for the other two.

**Item 1:** 40960 chip (10ms) Gold code with HPSK versus 512\*72\*40960 chip Gold code with HPSK

It is recommended that 10ms Gold codes with HPSK is used for UL scrambling for the following reasons:

- There is no evidence that the longer scrambling code increases system capacity by offering a better interference averaging effect
- Uplink frame combining/selection does not benefit from a longer scrambling code. The combining is done in the RNC which receives unscrambled information in appropriately stamped frames from the BSs over the Iub. The BS does not require a code that is longer than the frame length in order to keep track of the frame number.
- Testing is simplified by using the shorter code i.e. test equipment synchronization to the UE can be achieved with exhaustive search without the need for explicit timing information from the UE via wired connection.

**Item 2:** Will long code (10ms) and short code (256chips) uplink scrambling coexist?

*1st Conclusion:* Long code (LC) uplink scrambling will be described in Release 99.

There are a number of unresolved issues with regard to short code (SC) uplink scrambling. A non-exhaustive listing follows:

- Will BTS that can utilize SCs for multi-user detection (MUD) and BTS that do not, coexist in the same network?
- In case of co-existence will code handover be necessary? What is the associated procedure?
- Is there a performance impairment on the uplink of cells that do not employ MUD when some UEs use SC scrambling?
- Are there anticipated scenarios on capacity issues associated with products based on Release 99 that cannot be dealt with if LC only is described in Release 99?

*Recommendation:* If there is a substantial progress that results in no FFS items associated with SC usage remaining by the relevant milestone 2, short code scrambling will be described in Release 99. If not, long code scrambling *only* will be described in Release 99. A first assessment of progress on the FFS items will be made at WG1#4.

**Item 3:** Scrambling code for different sectors of the same BS

It is recommended that a different scrambling code is used for each sector as opposed to a shifted version of the same code. The reasons are as follows:

- Operators have not provided any negative feedback with regards to a code planning problem that could be generated with this solution. Effectively no problem has been identified.
- Decoding of the BCH is not essential for identification of the target sector during inter-frequency hard handover. This has speed and power consumption advantages.

**New item:** It has been proposed that the generator polynomials for LC scrambling should be changed to facilitate implementation with 32 bit processors. There has been no opposition to this

proposal but further discussion is needed to come to a conclusion. Two more requirements have been proposed for the selection of the codes 1) the codes should be long enough to allow use with higher chiprates without the need for repetition within a frame 2) there should be a large enough number of codes to ease allocation strategies but not a significantly higher number than is necessary.

It has been agreed that the new pulse shaping scheme will be discussed in WG4

The phase rotation scheme has been withdrawn