**Agenda Item:**     15.1

**Source:**          CSELT

**Title:**           Mode control strategies for tx diversity

**Document for:**    Discussion

_____

This document contains some text on mode control strategies for tx diversity. The text is based on TSGR2#5(99)531. It is proposed to include this text into a dedicated section of 25.922.

## 1. Tx diversity modes

Tx diversity modes can be classified into two categories:
- Open loop modes
- Closed loop modes

In open loop mode no feedback information from the UE to the node B is transmitted in order to control how the signal is transmitted from the diversity antennas. This is in contrast to closed loop operation where UE sends feedback information to the Node B in order to optimize the transmission from the diversity antennas.

For a detailed description of Tx diversity techniques in both FDD and TDD mode, refer to [L1 Spec].

## 2. Mode control strategies

### 2.1 DPCH

What mode will be used on DPDCH and when is controlled by Node B. Important criteria for the mode control are the radio channel conditions. This is because depending on the radio channel different modes will provide the best performance.

Regarding the downlink performance there are two important factors which should be considered when doing mode control:
- Maximum doppler frequency (i.e., speed of the UE)
- Number of multipath components.

Basically the UE could measure both of these and report back to Node B. As it happens both of these can be measured by Node B as well. Therefore, there is no need to signal this information from UE to Node B.

It would also be very important to have the possibility to indicate if there is a default Tx diversity mode used on the dedicated channels. We could further define a default Tx diversity mode separately for the case of non-SHO and SHO. This kind of information could be broadcasted on BCCH or could be defined in call set up. The benefit of it could be reduced signalling e.g. in SHO but the drawback is the increased overhead of BCCH or additional signalling in call set up. Note that even if no default mode exist the use of Tx diversity on dedicated channels can be told to UE in call set-up phase.

## 2.2 Common channels

Only open loop can be used for PCCPCH, SCCPCH, and AICH. For common channels the most straightforward way of informing the UE about the use of Tx diversity on them is to broadcast the information on BCCH. How many bits per BCCH frame is needed depends on how nuch flexibility will be given to operators in use of Tx diversity. Two extreme cases are:

- Most limited flexibility: one bit every BCCH frame is used to indicate if Tx diversity is being used on PCCPCH, SCCPCH and AICH
- Maximum flexibility: use of Tx diversity on different broadcast channels can be controlled independently. Obvious way of informing UE about this is to transmit 3 bits of information in each BCCH frame. Note that the impact of the use of 3 bits on the overall BCCH capacity has to be further considered.