

**Agenda item:** AH99  
**Source:** Ericsson  
**Title:** CR 25.214-124: Clarification of closed loop mode TX diversity initialisation  
**Document for:** Decision

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## Introduction

From the current specification text in TS 25.214 it is not fully clear how the UTRAN shall initialise its transmission in closed loop mode TX diversity before the first feedback command has been received.

### Closed loop mode 1:

In the UE it is crucial to have knowledge about the phase adjustments done in the UTRAN, since there is currently no formal requirement for the UE to use antenna verification as described in Annex A of TS 25.214.

It is currently specified how the UTRAN initialises its transmission *after* reception of the first FB command, where the

weight is calculated as  $w_2 = \frac{\cos(\mathbf{p} / 2) + \cos(\mathbf{f}_0)}{\sqrt{2}} + j \frac{\sin(\mathbf{p} / 2) + \sin(\mathbf{f}_0)}{\sqrt{2}}$ . This is equivalent to assuming a preceding FB command corresponding to a phase adjustment of  $\text{Pi}/2$ , i.e. FSM=0.

A logical extension would be the use of phase adjustments according to FSM=0 all the time before the first FB command is received in the UTRAN, which means that the phase adjustments toggle between 0 and  $\text{Pi}/2$  and that a

constant weight  $w_2 = \frac{1}{\sqrt{2}}(1 + j)$  is used in the UTRAN.

During WG1#14, CR 25.214 -120 was approved in Tdoc R1-00-0947, which changes the definition of  $w_1$  and also the scaling of  $w_2$  [division by “2” instead of “sqrt(2)”] in the closed loop mode 1 section. The proposed updates to this section in the attached CR are aligned with the previous changes from WG1#14.

### Closed loop mode 2:

For closed loop mode 2, the initial behaviour of the UTRAN is already specified, giving the phase and amplitude adjustments during reception of the first 3 FSM bits. However, the current text could be slightly improved to clarify that this is also valid before the first FSM message is received, i.e. not only during reception of the first 3 bits.

## Proposal

It is proposed to update the specification text according to the attached CR.

# CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

**25.214 CR 124**

Current Version: **3.3.0**

GSM (AA.BB) or 3G (AA.BBB) specification number ↑

↑ CR number as allocated by MCC support team

For submission to: **TSG-RAN #9**

list expected approval meeting # here ↑

for approval   
for information

strategic   
non-strategic  (for SMG use only)

Form: CR cover sheet, version 2 for 3GPP and SMG The latest version of this form is available from: <ftp://ftp.3gpp.org/Information/CR-Form-v2.doc>

**Proposed change affects:** (U)SIM  ME  UTRAN / Radio  Core Network   
(at least one should be marked with an X)

**Source:** Ericsson **Date:** 2000-08-16

**Subject:** Clarification of closed loop mode TX diversity initialisation

**Work item:**

**Category:** F Correction  **Release:** Phase 2   
(only one category shall be marked with an X) A Corresponds to a correction in an earlier release  Release 96   
B Addition of feature  Release 97   
C Functional modification of feature  Release 98   
D Editorial modification  Release 99   
Release 00

**Reason for change:** It is not fully clear how the UTRAN shall calculate its weights for closed loop mode TX diversity before the first feedback message is received. To enable a reasonable reception in the UE, this should be specified.

**Clauses affected:** 7.2.2, 7.3.2

**Other specs affected:** Other 3G core specifications  → List of CRs:  
Other GSM core specifications  → List of CRs:  
MS test specifications  → List of CRs:  
BSS test specifications  → List of CRs:  
O&M specifications  → List of CRs:

**Other comments:**

## 7.2.2 Mode 1 normal initialisation

For the first frame of transmission UE determines the feedback commands in a normal way and sends them to UTRAN.

Before the first FB command is received, the UTRAN shall use the initial weight  $w_2 = \frac{1}{2}(1 + j)$ .

Having received the first FB command the UTRAN calculates the  $w_2$  as follows:

$$w_2 = \frac{\cos(\mathbf{p} / 2) + \cos(\mathbf{f}_0)}{2} + j \frac{\sin(\mathbf{p} / 2) + \sin(\mathbf{f}_0)}{2} \quad (8)$$

where:

$\mathbf{f}_0$  = phase adjustment from slot 0 of the first frame.

### 7.3.2 Mode 2 normal initialisation

For the first frame of transmission using closed loop mode 2, the operation is as follows.

The UE starts sending the FSM message from slot 0 in the normal way. The UE may refine its choice of FSM in slots 1 to 3 from the set of weights allowed given the previously transmitted bits of the FSM.

~~Before the first FSM message is received and during the reception of the first three FSM bits (that is before the full four bits are received),~~ the UTRAN Access Point shall initialise its transmissions as follows. The power in both antennas is set to 0.5. The phase offset applied between the antennas is updated according to the number and value of FSM<sub>ph</sub> bits received as given in table 12.

**Table 12: FSM<sub>ph</sub> normal initialisation for closed loop mode 2**

FSM <sub>ph</sub>	Phase difference between antennas (radians)
- - -	$\pi$ (normal initialisation) or held from previous setting (compressed mode recovery)
0 - -	$\pi$
1 - -	0
0 0 -	$\pi$
0 1 -	$-\pi/2$
1 1 -	0
1 0 -	$\pi/2$
0 0 0	$\pi$
0 0 1	$-3\pi/4$
0 1 1	$-\pi/2$
0 1 0	$-\pi/4$
1 1 0	0
1 1 1	$\pi/4$
1 0 1	$\pi/2$
1 0 0	$3\pi/4$

This operation applies in both the soft handover and non soft handover cases.