TSG-RAN WG4#8 ***TSGW4#8(99737***
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Document for:	Discussion and working assumption

1. INTRODUCTION

This document discusses minimum power requirements for FDD UE. Concerns have been raised about the noise rise due to terminal located near the base station will increase the noise rise and consequently impact the link budget

In this scenario all mobiles belong to one cellular radio network and are subject to power control by that network. For this scenario, the minimum power transmissions from the mobile results will results in an increase in the noise rise for a given loading factor. We present a mechanism based on an uplink slotted mode process that can be used to reduce the average minimum transmit power of the mobile so as to improve the cell capacity/coverage.

This reduction in the minimum average transmit power by 3 - 6+ dB can be realised without the need for major changes to the specification in particular the UE implementation requirements. Furthermore the choice of which schemes are adopted could be flexible and would be selected by the network/operator to suit the required operating scenario.

2. LOADING VS UE MINIMUM POWER: NO UNCOORDINATED MOBILES

Figure 1 below, shows the relationship between the loading in users per cell and the UE minimum power, the Figure is for an MCL of 70dB and a noise rise of 10dB. The figure is derived from "FDD UE minimum transmission power simulation results," TSGW4#6(99)395 presented in Edinburgh, 26-29th July 1999, source Nokia.

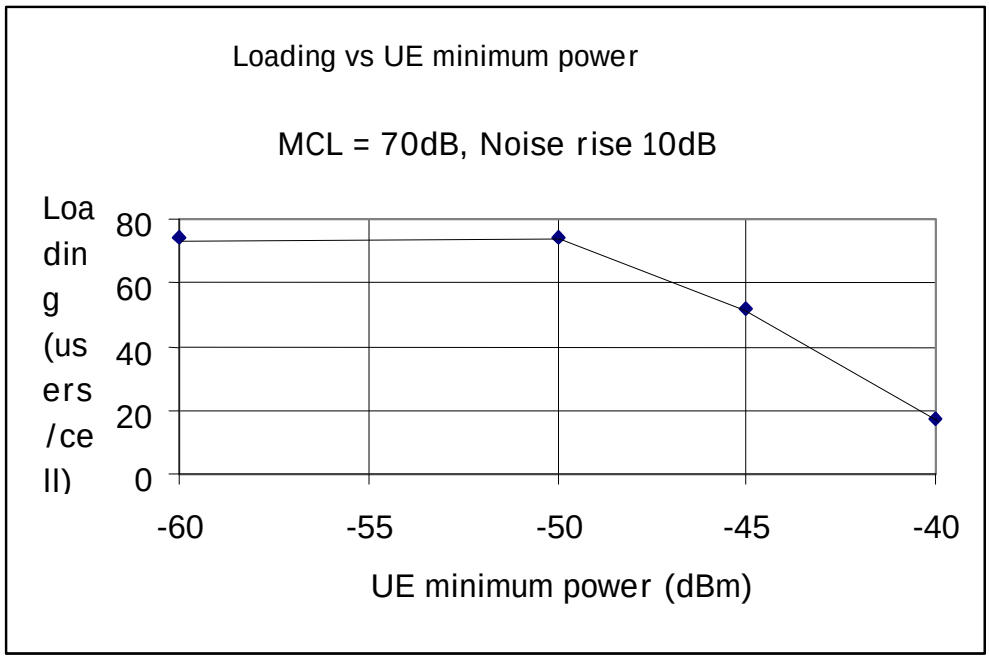

Figure 1 Loading vs UE minimum power

The Figure shows that for UE minimum transmit power of -50dBm or below, further reductions in power have no effect on the achievable loading. However, the source data does not show data points between –45 and –50dBm so it is not clear whether asymptotic behaviour is reached for minimum transmit powers a few dB above –50dBm.

The present working assumption is that the UE minimum transmit power should be –44dBm. However, from the figure above it is clear that there will be a benefit to the system if the minimum transmit power can be reduced. As stated above, it is not clear whether this reduction should be as much as 5dB or whether 3 or 4dB would be sufficient.

3. A TRANSMIT TIME BASED MECHANISM TO REDUCE UE AVERAGE MINIMUM TX POWER

Specification of the UE minimum transmit power applies a constraint on UE implementation in the following two areas:

- This will increase the power control dynamic range in the terminal and will be difficult to achieve sufficient isolation and power control accuracy at the lower minimum values in the case of small terminals.

- It will also requirement the TX OFF power to be increased from the –50 dBm so to achieve sufficient SNR at minimum transmit power

Thus, specification of an unduly low minimum power should be avoided else unnecessary costs may be incurred. On the other hand, an unduly lax specification will impact system performance.

Here we propose a mechanism for reducing the mobile station minimum average transmit power without impacting mobile implementation. It is based on the simple concept of reducing the time for which the mobile is transmitting. It is also a basic assumption that requirement to reduce the minimum power by the network would imply that the UL QOS target is exceeded, since reducing minimum power would imply reducing the QOS.

It is not the purpose of this paper to detail a specific mechanism of achieving this as that will be a task for the WG1 and perhaps WG2 committees should the concept be approved, in principle, here in WG4. However, there are many ways, in which this can be achieved, for example,

1. the mobile can delete slots until it achieves its required QoS

2. the mobile could be placed into a modified slotted mode, transmitting for less than a full slot but without increasing the transmit power as with conventional slotted mode

3. The mobile can decrease the SF and delete frames until the required QOS is achieved.

4. the mobile can do any combination of the above while also reducing the spreading factor

Entering UL slotted mode with a reduction in spreading by a factor of 2, without increasing transmit power, will reduce transmit power by 3dB. In addition, a slot deletion process that deletes 25% of slots will reduce the average power by about 1.25dB. Another mechanism, which would allow greater reduction in average power, would be to allow for frame deletion with an associated decrease in SF.

Thus, a reduction in the minimum average transmit power by 3- 6+dB should be realised without the need for major changes to the specification. There is also the potential for some reduction in the power consumption in the terminal when operating in this mode, however the potential gains have not been quantified.

The choice of which schemes are adopted could be flexible and would be selected by the network/operator to suit the required operating scenario.

3. CONCLUSION

The proposed approach for reducing of mobile minimum transmit power uses the available mechanisms in the standard in a new way to reduce the time that the mobile station needs to transmit for and does not involve any changes to the mobile implementation. Therefore, an operator would be free to implement the process while another operator who has no requirement to implement the process would not end up with an increased cost in the mobile stations.