

## **Comments on MIMO complexity text in technical report**

### **Introduction**

We provide the following comments regarding the text proposed in section 7.4.2, MIMO UE Complexity Evaluation:

#### **1) UE form factor**

We feel that assumptions should not be made regarding the size and/or form factor of terminals that would support high-speed data services in the future. Specifically, it may not be assumed that all high-speed data terminals will be large enough to support multiple antennas. Examples of this would include i) a very small handset having a form factor of a voice-style phone that would provide high-speed data to a laptop computer via bluetooth or other wireless local link, or ii) a WCDMA “data-modem” on a PCMCIA card plugged into a laptop computer.

Antennas, by their nature, must be free from near-field disturbances that greatly influence their radiation efficiency, tuning, directivity and so on, such as may be encountered in a portable equipment operating environment. Our proposal would be to not include the two sentences regarding UE form factor and size.

#### **2) RF complexity:**

The text does not mention the most obvious impact on UE complexity, that is the duplication of the RF receive paths. We propose the addition of some text e.g. “For each receive antenna, a separate receive path is required. The duplication of receive paths will have a significant impact on the RF complexity of the UE.”

#### **3) Baseband complexity:**

It is difficult to comment without knowing the assumptions that have used in the evaluations. It would be useful if Lucent could provide these details on how they arrived at the estimates for “operations per second” required for the various scenarios.

#### **4) Antenna spacing required to achieve required decorrelation:**

There are many factors that can greatly affect the correlation between the antennas, e.g. their physical geometry and disturbances in the near-field, such as the proximity of antennas to the human body and other objects. It may be better so say that “in some cases 1/2 wavelength spacing can achieve uncorrelated fading but this is affected by factors such as the proximity to the human body and other objects.”

## **5) Multiple antenna reference:**

A multiple antenna reference should be included in the technical report, as we currently have no basis on which to compare any improvements. A closed loop transmit diversity with four transmitting elements is under study in WG1. This mode could be incorporated as a reference point for MIMO performance comparisons.

### **References**

[1], "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Physical Layer Aspects of UTRA High Speed Downlink Packet Access; (Release 2000)", (3G Technical Report (TR) 25.848, version 0.2.1), Tdoc R1-00-1480, TSG-RAN WG1, Boston, USA; January 15<sup>th</sup> – 18<sup>th</sup>, 2001.