TSG-RAN Working Group 1 Meeting #16 ***TSGR1#16(00)1184***

Pusan, Korea
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Agenda Item:	**AH24: High Speed Downlink Packet transmission**
Source:	**Panasonic**
Title:	**Signalling of CPICH and DSCH power ratio for M-ary demodulation**
Document for:	**Discussion**

Introduction

In TSG-R1 meeting High Speed Down Link Packet Access (HSDPA) studies have been presented. This contribution presents the necessary of signalling information from UTRAN to UE. The purpose of the signalling is to make it possible for UE to demodulate M-ary QAM DSCH signals.

Discussion

In the proposed HSDPA system usage of M-array Modulation on DSCH is proposed. Soft decision method of M-ary QAM demodulation for Turbo decoding was proposed in [1]. The information about traffic channel gain A_d and pilot channel gain A_p are necessary to demodulate M-ary QAM signals. (Please see the last page's quote.)

But in the current 3GPP specification UTRAN signals power ratio between CPICH and PICH or AICH, but doesn't signal power ratio between CPICH and DSCH. So UE can recognize A_p but can not recognize $A_{d.}$ Therefore UE can NOT demodulate M-ary QAM signals on DSCH using proposed scheme [1].

We propose to add signalling information about DSCH's relative power ratio to CPICH.(A_d/A_p). UE can calculate the A_d from A_p using the information of $A_d/A_{p.}$

We inform the necessity of the signalling of CPICH and DSCH power ratio also from the view point of FCSS. [2]

Conclusion

We proposed the signalling of CPICH and DSCH power ratio from UTRAN to UE.
Using the power ratio, UE can demodulate M-ary signal.
We propose WG1 would send the liaison statement to WG2.

References

[1] R1-00-1093, "Link Evaluation Methods for High Speed Downlink Packet Access (HSDPA)" Berlin, Germany, August 21-24, 2000.
[2] R1-00-1185 "Signalling of CPICH and DSCH power ratio for FCSS" Pusan , Korea, October 10-13 , 2000

The following section is quoted from R1-00-1093 page 4.

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3 Turbo decoding

The *M*-ary QAM demodulator generates soft decisions as inputs to the Turbo decoder. As a baseline method, the soft inputs to the decoder may be generated by an approximation to the log-likelihood ratio function. First define,

$$? ^{(i)}(z) \; ? \; K_f \, ? \underset{j ? S_i}{Min} ?d_j^2 ? ? \underset{j ? \overline{Si}}{Min} ?d_j^2 ?? , \; i \; ? \; 0,1,2, \ldots , \log_2 M \; ? 1 \qquad (1)$$

where *M* is the modulation alphabet size, i.e. 8, 16, 32 or 64 and

$$z \; ? \; A_d A_p ? \; ?\hat{} \; e^{? j ? ? ?\hat{} ?} x \; ? \; n \, , \qquad (2)$$

x is the transmitted QAM symbol, A_d is the traffic channel gain, A_p is the pilot channel gain, $? \; e^{j?}$ is the complex fading channel gain, and $A_p ?\hat{} \; e^{j?\hat{}}$ is the fading channel estimate obtained from the pilot channel,

$$S_i \; ? \; ?? \, j : i^{th} \text{ component of } y_j \text{ is "0"} ? , \qquad (3)$$

$$\overline{S_i} \; ? \; ?? \, j : i^{th} \text{ component of } y_j \text{ is "1"} ? \qquad (4)$$

and K_f is a scale factor proportional to the received signal-to-noise ratio. The parameter d_j is the Euclidean distance of the received symbol z from the points on the QAM constellation in S or its complement. The Pilot/Data gain is assumed known at the receiver. In this case the distance metric is computed as follows

$$d_j^2 \; ? \; \left| A_p z \; ? \; Q_j ?? ^2 \right|^2 \quad Q_j \; ? \; S_i \; \textbf{ or } \overline{S}_i \qquad (5)$$

where $? \; ? \; A_d$ and $? \; ? \; A_p ?\hat{}$ is an estimate formed from the pilot channel after processing through the channel estimation filter.
