

Agenda Item:

Source: Ericsson
Title: Common pilot pattern
Document for: Approval

1. Introduction

In email discussions in AdHoc 6 and 15 two different patterns for the common pilot for Tx diversity was proposed,

proposal 2

Primary CPICH	Ant 1	A, A, A, A, A, A, A, A, A, A, A, A,
	Ant 2	A,-A,-A, A, A, -A, -A, A, A,-A,

proposal 3

Primary CPICH	Ant 1	A, A, A, A, A, A, A, A, A, A, A, A,
	Ant 2	A,-A, A,-A, A, -A, A,-A, A,-A,

It was claimed by Ericsson that proposal 2 had an advantage in performance. In this document there is an explanation why this proposal should be selected.

2. Background

We have studied two different algorithms for frequency acquisition, FFT and differential phase estimation. In the case of the Tx diversity scheme the FFT algorithm requires constant relation between signals transmitted from the two antennas. One requirement to be able to do good estimates is that the channel is constant during the measurement, except the frequency shift.

With proposal 2 the FFT algorithm can therefore easily be used only relying on that the channel is constant over two symbols. The differential phase estimation can also be used on this channel.

One advantage that is claimed for the proposal 3 is the simplicity and that there are no discontinuity in this scheme. However proposal 2 is almost as simple in the structure, the UE is symbol synchronized when doing this and then it is known where the discontinuity is located.

3. Simulations

Some different schemes have been simulated, the performance is shown in the figures below. In these figures algorithms 1-3 and 5 are FFT based while 4 and 6 are differential phase estimation algorithms.

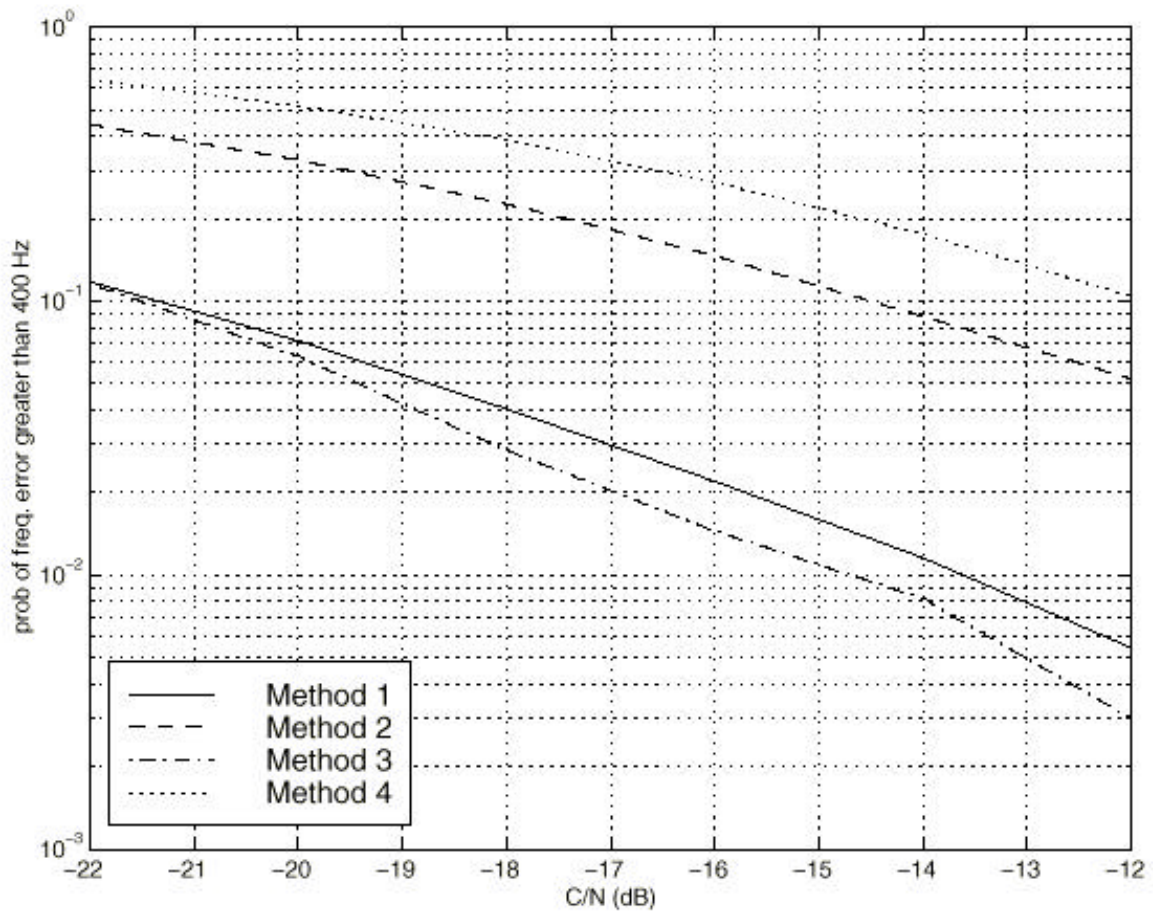


Figure 1: Coarse frequency acquisition performance in a fading channel with ± 20 KHz initial frequency error and 20 msec synchronization time).

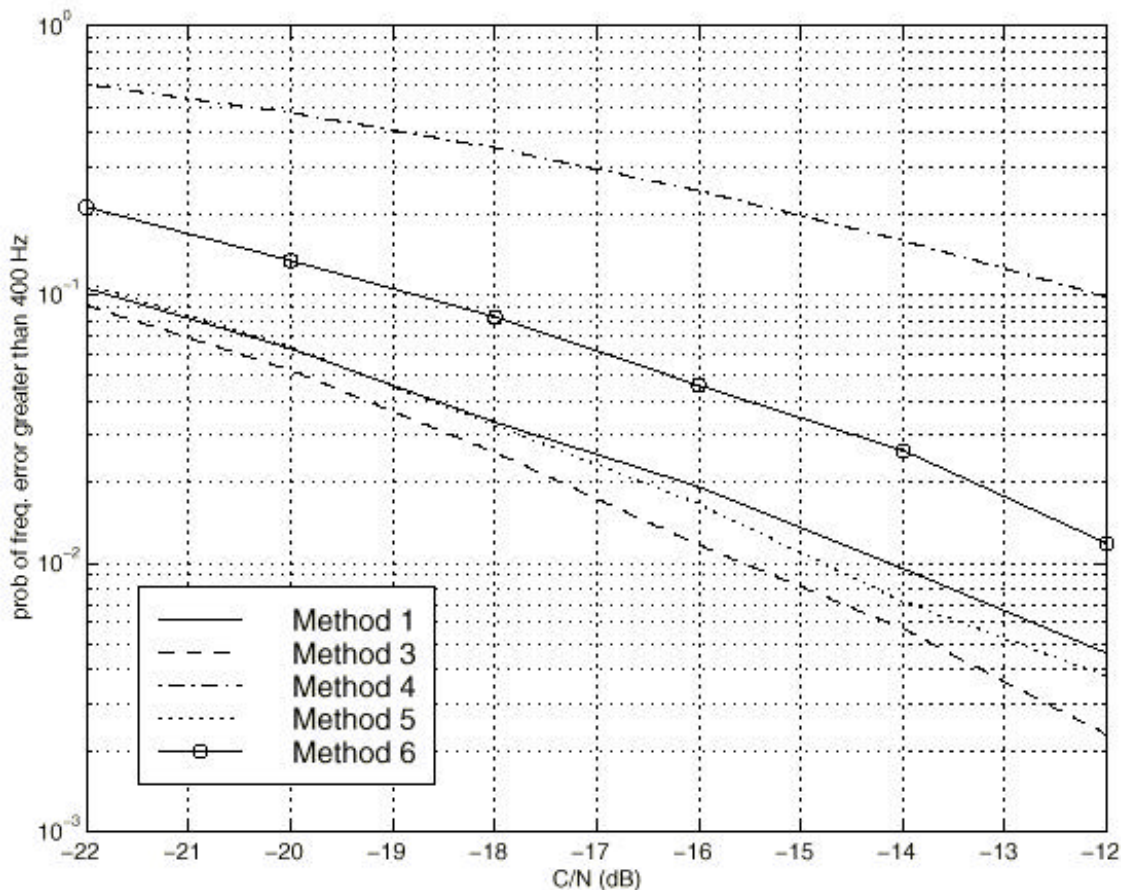


Figure 2 Coarse frequency acquisition performance in a fading channel with +/-5 KHz initial frequency error and 20 msec synchronization time).

From these two figures it is clearly seen that the FFT based algorithms are much better in a noisy environment than the differential phase algorithms. These are more complex but not a very big complexity. Furthermore it is only used during initial synchronization

The pilot pattern in this system should support the option to the terminal manufacturers to select a FFT based algorithm without a penalty like requiring that the channel is constant during period.

4. Proposal

Select the proposal 2 in paragraph 1 as the patterns used in Tx diversity.