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Detection Performance of LTE PUCCH

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***Abstract*:** *In much practical system, it is necessary to detection the existence of a UE transmitting PUCCH. In this paper a PUCCH detection algorithm is presented based on the reference signal. The performance of the presented algorithm is evaluated by simulation.*

Keywords: *PUCCH, RS, detection.*

1. Introduction

LTE is a widely used wireless standard based on OFDM techniques [1]. In an LTE system, PUCCH is used for the transmission of feedback information from a UE to eNodeB.

In many practical environments, for several purpose, it is necessary for an eNodeB to check the existence of the UE transmitting PUCCH. In this paper, a PUCCH detection algorithm is presented based on the RS of PUCCH. With the presented algorithm, a UE compete the received power of the RS of PUCCH and decides the existence of the PUCCH transmission based on it.

The performance of the presented algorithm is evaluated based on numerical simulation. The results show that reliable PUCCH detection performance can be obtained using the presented algorithm,

2. System Model

In this section, a system model is presented. In the model, there is an eNodeB and a UE communicating each other. The eNodeB tries to detect the existence of an uplink signal based on the control signal transmitted from the UE.

The control information is transmitted on uplink resources assigned for PUCCH. The control information includes channel-state information, hybrid-ARQ acknowledgements and scheduling request by the PUCCH transmission. There are several PUCCH transmission formats depending on the type of the control information. PUCCH consists of two resource blocks (RBs) located at the edge of a system bandwidth. Each slot of the subframe is composed of time multiplexed control data symbols and demodulation reference signals (DM-RS). Fig. 1 shows the structure of PUCCH format 1a/1b for a normal CP [2].

Reference signals (RSs) are included in PUCCH for coherent demodulation. The sequence $c_{i,m}(t)$ of an RS is determined by the subframe number m and the cell ID i [3]. The sequence are not orthogonal each other, if their cell IDs are different. Each UE transmits PUCCH using a sequence $c_{i,m}(t)$ for the time duration T_s of a subframe. The power of RS $c_{i,m}(t)$ is normalized to satisfy $\frac{1}{T_s}\int_0^{T_s}|c_{i,m}(t)|^2 dt = 1$ for all i, m.