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ABSTRACT

Long Term Evolution (LTE) has been investigated, because of high data rate, low latency and packet optimized radio access technology. While orthogonal frequency division multiple accesses (OFDMA) is used in multiplexing, the main drawback of OFDMA is high peak to average power ratio (PAPR) properties of an OFDMA signal, resulting in worse uplink coverage. Thus SC-FDMA (Single Carrier Frequency Division Multiple Access) is suggested using LTE uplink, which presents better PAPR properties compared to OFDMA signal. But In uplink transmission, the user equipment (UE) causes the interference to other neighbor cell, this degrades the cell performance, therefore close loop power control (CLPC) and open loop power control (OLPC) are suggested and modeled to solve this problem. In the OLPC, the signal strength UE which reach to neighbor cell is considered to set transmit power. In CLPC the adjustment of power control (PC) command continuously and then set transmit power. The main contribution of this research focuses on the affect of OLPC and CLPC in the bit error rate (BER). The simulation is achieved using MATLAB and the results showed that, at signal to noise ratio (SNR) 25dB, the OLPC and CLPC given typical BER of (10^{-5}). In term of the power, the OLPC consumes much power as compared to CLPC. Compared when the SNR less than 10dB, the OLPC achieves better results as compared to CLPC; otherwise the CLPC gives better results.

التجريد

تم تطوير التطور الطويل الامد نسبة لامتيازه بمعدل البيانات العالية والتاخير الاقل. في هذه التقنية استخدم الوصول المتعدد بتقسيم التردد المتعامدة، ولكن المشكلة الاساسية في هذه التقنية ان نسبة القدرة القصوى للمتوسطة فيها عالية جدا، وهذه تؤدي الى ضعف التغطيه في الوصلة الصاعدة لذا تم اقتراح الوصول المتعدد بتقسيم التردد ذات الحامل المفرد للوصلة الصاعدة، والتي تمثل نسبة القدرة القصوى للمتوسطة فيها جيدة مقارنة مع اشارة تقنية الوصول المتعدد بتقسيم التردد المتعامدة. ولكن الارسال عن طريق الوصلة الصاعدة من مستخدم الموبايل الى المحطة الاساسية يسبب تداخل الى الخلية الجارة، و هذة تؤثر على اداء الخلية، لذا اقترح التحكم في قدرة الارسال بواسطة الحلقة المفتوحة والتحكم في قدرة الارسال بواسطة الحلقة المغلقة لحل هذه المشكلة. في حالة الحلقه المفتوحة اعتبر قوة الاشارة من المستخدم الى الخلية الجارة لضبط قدرة الارسال و في حالة الحلقة المغلقة تم الضبط المستمر لامر تحكم القدرة لضبط قدرة الارسال. الاضافة الفعلية لهذا البحث ركز على تاثير الحلقة المفتوحة والحلقة المغلقة على معدل الخطأ في البيانات. المحاكاة تمت بواسطة الماتلاب والنتائج وضحت ان: في حالة نسبة الاشارة للضجيج تساوي 25 ديسبل واعلى، فان الحلقة المغلقة والحلقة المفتوحة تعطيان نفس قيمة معدل الخطأ في البيانات (10^{-5}). بالنسبة للقدرة فان الحلقة المفتوحة تستهلك قدرة اكثر مقارنة مع الحلقة المغلقة. عند نسبة الاشارة للضجيج اقل من او تساوي 10 ديسبل الحلقة المفتوح اعطت نتائج افضل من الحلقة المغلقة، وعند اي قيمة اخرى لنسبة الاشارة للضجيج الحلقة المغلقة افضل.

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ABBRIVIATIONS

Abbreviation	Description
3GPP	3rd Generation Partnership Project
BER	Bit Error Rate
BS	Base Station
BPSK	Binary Phase Shift Keying
CQI	Channel Quality Indicator
CLPC	Close Loop Power Control
CP	Cyclic Prefix
CSI	Channel State Information
CIR	Carrier to Interference Ratio
DL	Downlink
DFTS	Discrete Fourier Transform System
DAC	Digital to Analog Conversion
E-Node-B	Enhanced Base Station
FBS	Femto Base Station
FD-SS	Frequency Domain Stochastic Scheduler
FPC	Fractional Power Control
FDMA	Frequency Division Multiple Access
FDD	Frequency Division Duplex
FDM	Frequency Division Multiplexing
FFT	Fast Fourier Transform
GSM	Global System for Mobile

ICI	Inter Carrier Interference
ISI	Inter Symbol Interference
IFFT	Inverse Fast Fourier Transform
LOS	Line of Sight
LTE	Long Term Evolution
MCS	Modulation and Coding Scheme
MIMO	Multiple Input Multiple Output
MCM	Multicarrier Modulation
MS	Mobile Station
MISO	Multiple Input Single Output
NRB	Number of Resource Block
OFDMA	Orthogonal Frequency Division Multiple Access
OLPC	Open Loop Power Control
OFDM	Orthogonal Frequency Division Multiplexing
PC	Power Control
PDSCH	Physical Downlink Shard Channel
PMCH	Physical Multicast Channel
PBCH	Physical Broadcast Channel
PUSCH	Physical Uplink Shared Channel
PL	Path Loss
PSD	Power Spectral Density
QPSK	Quadrature Phase Shift Keying
QAM	Quadrature Amplitude Modulation
QoS	Quality of Service
RSRP	Reference Symbol Received Power
RRM	Radio Resource Management

RB	Resource Block
RF	Radio Frequency
SC-FDMA	Single Carrier Frequency Division Multiple Access
SISO	Single Input Single Output
SNR	Signal to Noise Ratio
SIMO	Single Input Multiple Output
SINR	Signal to Interference Noise Ratio
UE	User Equipment
UL	Uplink
UMTS	Universal mobile Telecommunication System
TDD	Time Division Duplex
TTI	Transmit Time Interval
TPC	Transmit Power Control
WCDMA	Wideband Code Division Multiple Access
WLAN	Wireless Local Area Network

NOTATIONS

P_{TX}	Transmitted Signal Power
P_{RX}	Received Signal Power
L	Loss
g	Gain
PL	Path Loss
β	Constant depend on antenna specific parameter
γ	Constant Parameter
R	Distance between transmitter and receiver
σ^2	Variance
λ_k^2	Channel gain
q_{kk}	Transmit power for each channel
E_S/N_o	Signal power to noise power
σ_{MSE}^2	Channel estimation error
P_e	Average signal to noise ratio
P_{max}	Maximum transmit power
M	Number of PRBs
α	Cell specific parameters
P_o	Power allocated to one PRB
δ_{msc}	Offset specific to user equipment
$f(\Delta_i)$	The Correction function specific to user
$\beta_\circ$	Positive small value to make system fast

α	The compensation factor
δ	Correction factor
BW_{eff}	Bandwidth efficiency
S_{eff}	SNR efficiency at system level
$PL_{UL,i}$	Uplink Path loss