International Journal of Research
Available at https://edupediapublications.org/journals
e-ISSN: 2348-6848
p-ISSN: 2348-795X
Volume 04 Issue-17
December 2017

Improved resource allocation in LTE-A relay networks using ACLR

Krishna Babu Pedda & P.Ashok Kumar
[1]M-Tech (DECS),Department of ECE, Eluru Collegeof Engineering and Technology, JNTU Kakinada.
[2]AssistantProposer, Department of ECE, Eluru College of Engineering and Technology, JNTU Kakinada.

ABSTRACT

Future wireless networks will face the dual challenge of supporting large traffic volumes while providing reliable service for delay-sensitive traffic. To meet the challenge, relay network has been introduced as a new network architecture for the fourth generation (4G) LTE-Advanced (LTE-A) networks. In this paper, we investigate resource allocation including subcarrier and power allocation for LTE-A relay networks under statistical quality of service (QoS) constraints. By dual decomposition, we derive the optimal subcarrier and power allocation strategies to maximize the effective capacity (EC) of the underlying LTE-A relay systems. Characteristics of optimal resource allocation strategies are identified, and a low-complexity suboptimal scheme is developed through optimizing the subcarrier and power allocation individually. In this paper proposed in Filter Bank Multicarrier with Offset Quadrature Amplitude Modulation (FBMC/OQAM) is recognized as an appropriate modulation scheme for 5G wireless technologies.as per the extremely low ***Adjacent Channel Leakage Ratio (ACLR)****, FBMC/OQAM scheme is a suitable candidate for cognitive radio (CR) applications. Like all multicarrier systems, FBMC/OQAM suffers from the high Peak to Average Power Ratio (PAPR).*

INTRODUCTION

OVER the past two decades, mobile wireless services have grown from niche market applications to globally available components of daily life. In February 2015, Cisco predicted a 57% compound annual growth rate (CAGR) for global mobile data traffic from 2014 to 2019, indicating an order of magnitude growth in data traffic by year 2019. Furthermore,future mobile data networks will carry delay-sensitive traffic types including video, web/data, online gaming, voiceover-IP (VoIP), etc. In 2019, nearly three-fourths of the global mobile data traffic will be video. Since a significant portionof the video traffic is delay-sensitive with stringent quality ofservice (QoS) constraints, the predictions clearly suggest thatfuture mobile data networks will face the dual challenge ofsupporting large traffic volumes and providing reliable servicefor applications of heterogeneous service constraints.

Meanwhile, relay networks with a deployment of bothhigh power base stations (BSs) and low power relay nodes(RNs) sharing the same spectrum resources have been recentlyadopted in the 4G mobile broadband system—3GPP LTE-A networks. The introduction of low power relay nodeschanges the traditional homogeneous cellular network to aheterogeneous one where nodes with different transmissionpower levels are overlaid with each other, and creates bothopportunities and challenges. In LTE-A relay networks,base stations and relay nodes share the same spectrum resourceto serve mobile stations (MSs). In this way, the overallinformation-theoretic capacity of a heterogeneous network canbe significantly increased due to the “cell-splitting” gain.

However, the introduction of low power relay nodes also bringsadditional problems to the network. Since both the access linkand the backhaul link share the same spectrum resource, resourceallocation between these two links should be optimizedto ensure maximal utilization of the overall system resource.For example, in LTE-A systems where orthogonal frequencydivision multiplexing access (OFDMA) is used subcarriersneed to be optimally allocated for the access (RN-MS) link andthe backhaul (BS-RN) link respectively.

A new LTE protocol named LTE Direct works as an innovative device-to-device technology enabling the discovery of thousands of devices in the proximity of approximately 500 meters.[56] Pioneered by Qualcomm, the company has been leading the standardization of this new technology along with other 3GPP participants. LTE Direct offers several advantages over existing proximity solutions including but not limited to Wi-Fi or Bluetooth. One of the most popular use cases for this technology was developed by a New York City based company called Compass.to. The core feature of proximal discovery among devices included a targeted discount voucher to a nearby device which matched specific interests.[57] The Compass.to use case was featured at global conferences and events such as CES 2015, MWC 2015, and said to be extended to many other scenarios including film festivals, theme parks and sporting events. “You can think of LTE Direct as a sixth sense that is always aware of the environment around you,” said Mahesh Makhijani, technical marketing director at Qualcomm, at a session on the technology. Additionally, the protocol offers less battery drainage and extended range when compared to other proximity solutions.

Existing Method:

Future wireless communication networks will face the dual challenge of supporting large traffic volumes while providing reliable service for heterogeneous traffic types. In order to meet the ever increasing traffic demand, heterogeneous relay network is introduced as an enabling technology for the fourth generation (4G) mobile broadband networks. In this paper, we will investigate optimal power and subcarrier allocation strategies for heterogeneous relay networks under statistical quality of service (QoS) constraints. To be specific, we will characterize the effective capacity of a wireless relay system under QoS constraints. The properties of the optimal resource and subcarrier allocation strategies for delay-sensitive traffic over heterogeneous relay networks will also be identified. Two low complexity resource and subcarrier allocation algorithms will be introduced to optimize the effective capacity. Our results suggest that the optimal power and subcarrier allocation strategies depend heavily on the underlying QoS constraint. In the low signal-to-interference-plus-noise (SINR) regime, when there is no QoS constraint, both base stations and relay nodes will allocate all the transmit power to the best subcarrier. However, as the QoS requirement becomes more stringent, both base stations and relay nodes will spread their transmit power over multiple subcarriers.

Disadvantages:

1. Not applicable for multi stream transmission
2. Not performing widely linear processing

LTE-Method:

Future wireless networks will face the dual challengeof supporting large traffic volumes while providing reliable servicefor delay-sensitive traffic. To meet the challenge, relay networkhas been introduced as a new network architecture for the fourthgeneration (4G) LTE-Advanced (LTE-A) networks. In this paper,we investigate resource allocation including subcarrier and powerallocation for LTE-A relay networks under statistical quality ofservice (QoS) constraints. By dual decomposition, we derive theoptimal subcarrier and power allocation strategies to maximizethe effective capacity (EC) of the underlying LTE-A relay systems.Characteristics of optimal resource allocation strategies areidentified, and a low-complexity suboptimal scheme is developedthrough optimizing the subcarrier and power allocation individually.Our result suggests that the optimal subcarrier and powerallocation strategies depend heavily on the underlying QoS constraint.For example, in the low signal-to-interference-plus-noise(SINR) regime, when there are less stringent QoS constraints, basestations and relay stations tend to allocate all the power to thebest available subcarrier. However, as QoS requirements becomemore stringent, both base stations and relay stations will spreadtheir power over available subcarriers. On the other hand, in thehigh SINR regime, regardless of the QoS constraints, base stationsand relay stations tend to equally allocate power among availablesubcarriers.

Advantages:

1. Applicable for multi stream transmission
2. perform widely linear processing

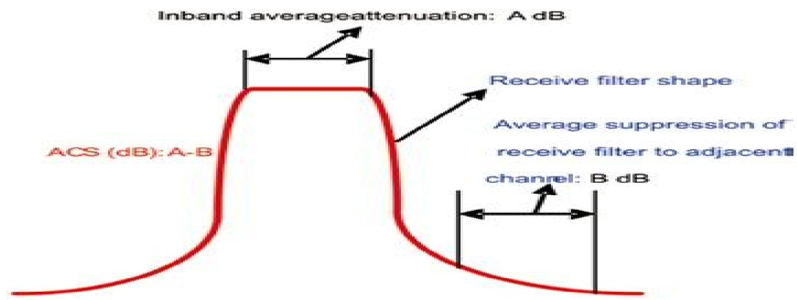
Disadvantages:

1. High complexity is the usage of 5G networks

Proposed Method:

Filter Bank Multicarrier with Offset Quadrature Amplitude Modulation (FBMC/OQAM) is recognized as an appropriate modulation scheme for 5G wireless technologies. With an extremely low Adjacent Channel Leakage Ratio (ACLR), FBMC/OQAM scheme is a suitable candidate for cognitive radio (CR) applications. Like all multicarrier systems, FBMC/OQAM suffers from the high Peak to Average Power Ratio (PAPR). Because of its overlapping signal structure, the direct application of the PAPR reduction schemes proposed for the Orthogonal Frequency Division Multiplexing (OFDM) signal to FBMC/OQAMone is not effective. In this investigation, the main contribution is a novel PAPR reduction scheme based on the extension of the current Tone Reservation (TR) scheme as used in OFDM toFBMC/OQAM. Based on simulation results, the proposed scheme shows almost the same PAPR reduction performance when compared with that of the conventional TR method originally proposed for OFDM.

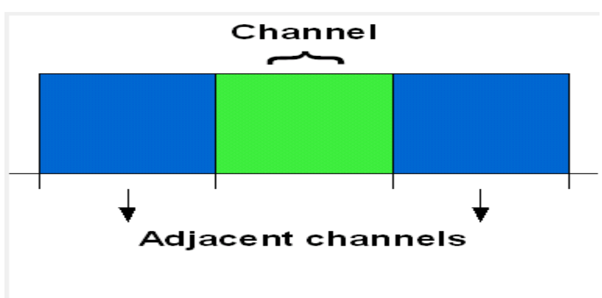
Adjacent Channel Leakage Ratio Measurement Description. As defined in 3GPP TS 34.122, ACLR is the ratio of the RRC filtered mean power centered on the adjacent channel frequency to the RRC filtered mean power centered on the assigned channelfrequency. The adjacent channels are located at ±1.6 MHz and ±3.2 MHz offsets



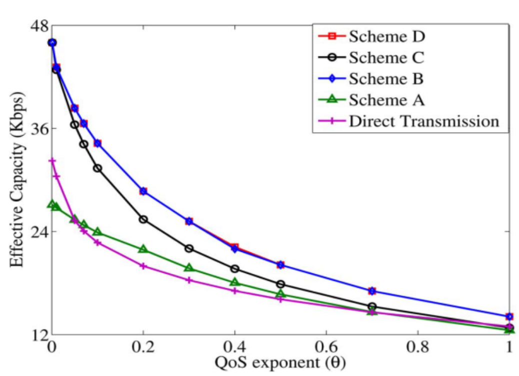
Basic Adjacent Channel Leakage Ratio Measurement

ADJACENT CHANNEL:

Adjacent channel is the channel (or frequency) that is directly above or below a specific channel (or frequency).



RESULT



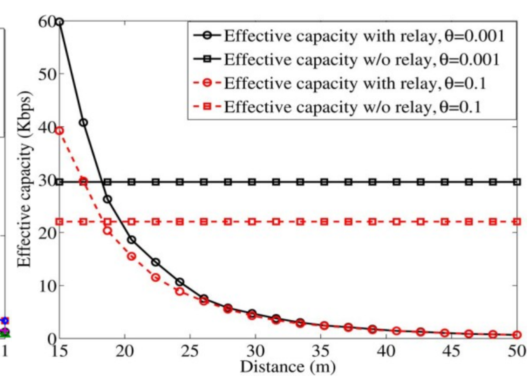
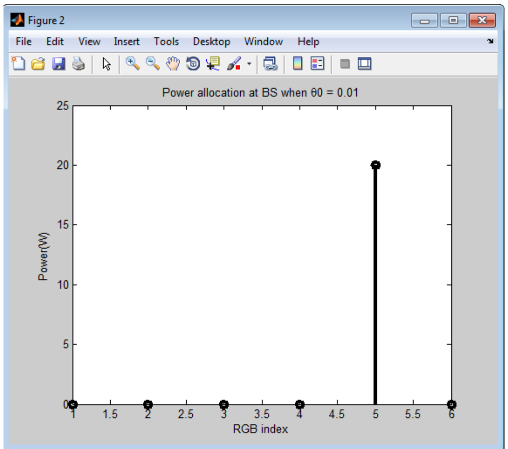


fig : 1Effective capacity comparisonfig: 2 Effective capacity comparisons with different RN

With different θlocation

e-ISSN: 2348-6848
p-ISSN: 2348-795X
Volume 04 Issue-17
December 2017



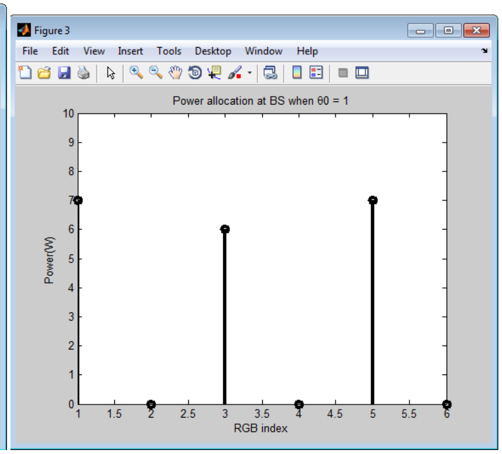


fig.3 power allocation at BS when θ0 =0.01 fig.4 power allocation at BS when θ0 =1

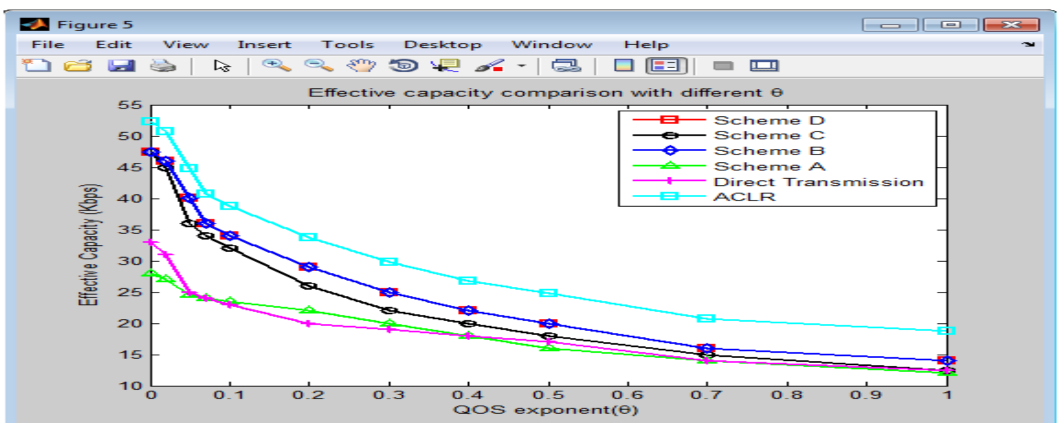


Fig: 5Effective capacity component with different θ

CONCLUSIONS

In this paper proposed in Filter Bank Multicarrier with Offset Quadrature Amplitude Modulation (FBMC/OQAM) is recognized as an appropriate modulation scheme for 5G wireless technologies. as per the extremely low **Adjacent Channel Leakage Ratio (ACLR)**, FBMC/OQAM scheme is a suitable candidate for cognitive radio (CR) applications. Like all multicarrier systems, FBMC/OQAM suffers from the high Peak to Average Power Ratio (PAPR).

It is also observed that in the high SINR regime, both the base station and relay node will distribute their power equally to all the available subcarriers regardless of the QoS constraint $\theta 0$. In the low SINR regime, as the QoS constraint $\theta 0$ becomes more stringent, the transmit tends to spread its transmit power over available frequency resources.

By relaxing the Adjacent channel leakage ratio sensitive traffic for lte-A relay networks allocation constraints and adopting the linear or non linear decomposition, we obtained the optimal resource allocation strategy to maximize the effective capacity of the average power ratio system. Based

e-ISSN: 2348-6848
p-ISSN: 2348-795X
Volume 04 Issue-17
December 2017

on optimal power allocation strategy, suboptimal low-complexity resource allocation strategiesare introduced. The effective capacity performance of strategies are compared to that of the lte-A relay networks allocation allocation scheme based on exhaustive search. Simulation result suggests that our introduced optimal resource allocation ACLR achieve exactly the same performance as the one based on exhaustive search. Furthermore, the loss of the effective capacity of the suboptimal strategy in minimal at stringent QoS constraints (large $\theta 0$).

REFERENCES

[1] Y. Li, L. Liu, H. Li, Y. Li, and Y. Yi, "Adaptive resource allocation for heterogeneous traffic over heterogeneous relay networks," in *Proc. IEEE ICC*, Jun. 2013, pp. 5431–5436.

[2] Cisco Syst., Cisco visual networking index: Global mobile data traffic forecast update, 2014–2019. Cisco, San Jose, CA, USA, Feb. 2015.

[3] P. Bhat *et al.*, "LTE-Advanced: An operator perspective," *IEEE Commun.Mag.*, vol. 50, no. 2, pp. 104–114, Feb. 2012.

[4] M. Baker, "From LTE-advanced to the future," *IEEE Commun. Mag.*,vol. 50, no. 2, pp. 116–120, Feb. 2012.

[5] L. Liu, Y. Li, B. Ng, and Z. Pi, "Radio resource and interference management for heterogeneous networks," in *Heterogeneous Cellular Networks*, New York, NY, USA: Wiley, 2012.

[6] L. Liu, J. C. Zhang, Y. Yi, H. Li, and J. Zhang, "Combating interference:MU-MIMO, CoMP, and HetNet," *J. Commun.*, vol. 7, no. 9, pp. 646–655,Sep. 2012.

[7] H. Dhillon, R. Ganti, F. Baccelli, and J. G. Andrews, "Modeling andanalysis of k-tier downlink heterogeneous cellular networks," *IEEE J. Sel.Areas Commun.*, vol. 30, no. 3, pp. 550–560, Apr. 2012.

[8] D.Wu and R. Negi, "Effective capacity: A wireless link model for supportof quality of service," *IEEE Trans. Wireless Commun.*, vol. 2, no. 4, pp. 630–643, Jul. 2003.

[9] L. Liu, P. Parag, J. Tang, W.-Y. Chen, and J.-F. Chamberland, "Resource allocation and quality of service evaluation for wireless communication systems using fluid models," *IEEE Trans. Inf. Theory*, vol. 53, no. 5,pp. 1767–1777, May 2007.

[10] L. Liu, P. Parag, and J.-F. Chamberland, "Quality of service analysis for wireless user-cooperation networks," *IEEE Trans. Inf. Theory*, vol. 53, no. 10, pp. 3833–3842, Oct. 2007.