Coordinated Multipoint Transmission and Reception in Downlink and Uplink LTE Systems

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Abstract. Coordinated Multi-Point (CoMP) activity is considered as an amazing innovation focused for LTE-A standard to diminish obstruction, improve range effectiveness, increment information throughput and upgrade viable inclusion region, specifically for cell-edge clients. Interference is a major drawback in Long Term Evolution (LTE/LTE-Advanced) framework. The paper focuses the standardization and inspiration of explicit plan decisions for composed multipoint (CoMP) support in reasonable system executions, including Fundamental activity standards. There are a few strategies accessible for CoMP innovation where most methodologies require some planning data in regards to the UEs information at the distinctive BSs that must be mutual among them. This sharing outcomes expanded unpredictability and flagging overhead on arrange.

Keywords: CoMP, LTE, UE, LTE-A, Cell-edge;

INTRODUCTION

In late decade the distant business has been experiencing enormous extending demand for data traffic over cell sort out, and the improvement of forefront quick customer handsets, for instance propelled cell phones and tablets, further accelerate this intrigue. The example of growing enthusiasm for superior of organization at the customer terminal or customer gear (UE), joined with the absence of far-off range, requires additionally created distant correspondence methodology to reduce intercell among derivation and augmentation the cell edge throughput. Encouraged multipoint (CoMP) transmission and social event strategies utilize diverse send and get radio wires from different accepting wire site regions, which could possibly have a spot with the equal physical cell, to redesign the signal quality and spatial impedance. This paper discusses the potential CoMP propels and their key sending circumstances, which is recognized during the CoMP study performed by the3GPPfor the Long-Term Evolution (LTE)- Advanced standard improvement. The downlink CoMP is considered in this article with the frameworks of frequency division duplex (FDD) and time-division duplex (TDD) techniques.

Multipoint transmission and assembly truly infers a wide scope of techniques that take part in complex coordination or transmission and party with various geographically isolated eNBs. It will probably redesign the general framework execution, make significantly more proficient utilization of the advantages and improve the nature of the association of end clients. The information rates are typically simple to hold near the base station yet they are getting progressively hard to keep up as separations grow. Given the incredible ways from the base station (eNB), not exclusively is the sign lower in cost, yet more levels from neighbouring eNBs will be higher in light of the fact that the UE is nearer to them.
1. DOWNLINK LTE COMPONENTS

A set of antennas with specific geographical arrangements are considered in the particular sector is configured as a cell. The user equipment (UE) terminal is connected to the cell based on the maximum received power at a given time is a serving cell. The term transmission point (TP) is used to refer to a set of collocated antennas, and a cell can correspond to one or more of TPs. The single geographical site area contains multiple TPs in the case of sectorization, and one TP corresponding to one sector is shown in Figure 1. CoMP techniques is used to define the coordination between TPs.

![Figure 1. Block Diagram of LTE arrangement](image)

1.1 Joint Processing Scheme for Transmitting in Downlink

LTE Organized multipoint information, data is sent at the same time to the UE from various specific eNBs. The objective is to improve the subsequent signal quality. It might likewise have the capacity of purposefully dropping transmission obstruction planned for other EU. This planned multipoint circumstance involves a unbelievable interest on the backhaul, organize due to the information to be communicated to the UE. Each eNB must be sent with the goal that it very well may be sent to the EU. This can build the measure of data inside the bound together system generously, on which number of eNBs the information can be sent. Moreover, data of the joint preparing between all eNBs required inside the CoMP region must be sent.

1.2 Coordinated Scheduling or Beamforming

It characterizes the information being communicated to a UE by one eNB. Booking decisions are organized so as to control the contention which could be produced. The advantage of this methodology was that the models for correspondence over the backhaul system could be definitely decreased for two reasons: EU data would not like to be communicated from more than one eNBs, and hence best needed to be guided to in any event one eNB. Just planning determinations and bar data are expected to facilitate between a couple eNBs.
2. UPLINK LTE COORDINATED MULTIPOINT

2.1 Joint reception and processing:

The main aim of this organization is to utilize reception antenna at different areas. A virtual radio wire exhibit difficult to frame by planning between the particular eNBs. The signs got by the eNBs are then consolidated and prepared to give the absolute last yield signal. Coordinated scheduling for uplink technique is used in order to minimize conflict by organizing scheduling decisions among the ENBs. Only timing selections and beam information are needed to coordinate between a few eNBs. A lot of geologically gathered receiving wires is routinely arranged as a versatile which relates to a given sectorization. At a given time a UE terminal is trapped for the most part based on the relating combined communicated signal capacity to an unmarried gadget. Because of the new significances of the CoMP situations as recently applied, the receiving wires designed as a phone may not be geologically arranged. It is then possible to utilize the term transmission point (TP) to allude to an assortment of arranged reception apparatuses and in any event at least one of those TPs that relate to a phone as shown in the Figure 2, more than one TPs in a solitary geographic area, with one TP alluding to one part, on account of sectorization.

Figure 2, Homogenous and Heterogeneous COMP

2.2 Coordinated Beamforming and Scheduling

The CB arrangement is focused on a signal to impedance in addition to levelling issue (SINR) where the force ranges and beamforming coefficients are resolved to acquire certain particular SINRs inside the framework or to upgrade the base SINR. Specifically, the main revelation isolates the whole network into bunches and performs brought together booking inside each group so that the TPs inside the group are to
be communicated in each space time and to which UE. Simultaneously, later examinations use CS/CB as a technique to limit multi-client multicell association. Various strategies is concentrated in LTE-Advanced which consolidate CS and CB simultaneously, which can be represented by that multi-layered nature request.

2.3 Joint Transmission

Joint transmission is usually characterized as concurrent transmission of records from numerous collaborating TPs to a UE terminal. The trans-assignment can be sound or non-cognizant and means to improve the general framework throughput or a general exhibition metric indistinguishable over the gadget. Improving versatile zone yield by moving a meddling sign to a favoured sign is particularly useful. With huge little portable arrangements and heterogeneous low-power hub systems, there will be numerous UE terminals that get huge sign vitality from several TPs simultaneously. In addition, a single BBU controlling more than one TPs in RRH deployments can allow very low-latency communication between them and allow for joint scheduler implementation. A joint scheduler enables the pooling of resources, with the support of dynamically adjusting to short-term channel situations and various traffic masses faced throughout the BBU’s control area.

However, higher synchronization and much smaller timing error differences between transmission points are needed to realize the full capacity gains of coherent JT schemes, which can further limit their applicability only to TPs linked by a quick backhaul. The theoretical information boundaries with ideal CSI predict the great benefit with multiple Transmission Path coordination scheme. The emphasis was on allowing linear pre-coding techniques on the transmitter, and extensions of codebook-based remarks that could currently be accepted for single-transmission point multiple input Multiple Output are most likely multi-TP feedback applicants. The UE can also book a PMI and respective channel great indicator (CQI) with JT’s belief from a fixed TP-like antenna. By using the network the TPs for JT can be set up partially.

2.4 Transmission Points (TPS)

In LTE-Advanced, the determination of transmission focuses (TPS) is done by utilizing a symmetrical recurrence division multiplexing technique, the idea of controlling site choice for fast power transmission. The sign to a given UE is sent from a solitary trans-venture point inside the helpful CoMP set on a positive time-recurrence asset by decision of Transmission Point. The record of their picked TP and comparing CSI, which is in the end utilized for transmission, is expressed by UE basically. Through time-recurrence area dynamic booking, the chose TP could likewise powerfully move from one sub outline, which is the base sign send time unit equivalent to 1ms, to some other sub outline. Moreover, if the neighbouring TPs stay quiet by not communicating any information, the UE’s gotten SINR might be expanded further.

3. RESULTS AND DISCUSSION

The perspective that needs to be considered at the UE is the best approach to degree the channel palatable to the TPs inside the system in which CoMP works. The size here can incorporate long haul sign power to screen client versatility, and present moment CSI estimations to fit associations. In a customary system
work, the reason for long haul estimations is to plan the handover. About the CSI scale, all the neighbouring signs are seen as impedance in the estimation of the privilege PMI and CQI. In examination, there are a few TPs (cells) in a CoMP working system that can be feasible for a phone (from the regular system perspective) to send the favoured sign. The signal strength of LTE at different eNodeB is shown in Figure 3. MU-MIMO is a spatial transmission system where the use of the same time frequency aid from a transmitting point is intended for more than one user, where the co-channel interference between customers is accomplished by appropriate precoding and processing. The Signal Noise Ratio is plotted against the BLER to calculate the channel quality of different channel is plotted in the Figure 4.

![Image of Signal strength of LTE](image)

**Figure 3**, Signal strength of LTE

![Image of Channel quality](image)

**Figure 4**, Channel quality

The pathloss of an urban model is given by plotting the distance Vs pathloss in the Figure 5 which indicates the linear increase in pathloss over distance which is good for broadband communication.
The performance of particular base station is given in the Figure 6 by plotting and calculating the average UE throughput, average UE spectral efficiency and SNR with respect to that throughput.

4. CONCLUSION

The conclusion of CoMP strategies demonstrated that CoMP can doubly improve the cell-angle shopper experience. Comparative ends were made inside the LTE Advanced CoMP study, wherein CoMP execution focal points are found in each homogeneous and heterogeneous system. The pastime for the
CoMP period is foreseen to develop as new system geographies (e.g., heterogeneous systems) and topographically circulated radio wires for intelligent cell comparably request answers for obstruction relief. Lower rate radio hubs, improved backhaul association joins, faster processors at the base stations as appropriately as individual terminals, presently permit CoMP to be considered as a staggering innovation for functional usage and organization.

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