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A Survey on Mimo Cellular Network

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Abstract: *This paper focuses on the HSDPA for MIMO cellular networks. To understand the role of HSDPA and the limitations of the existing work a survey is conducted in this paper. The impact of HSDPA can play a key role in upcoming cellular services where continuous streaming of data is required. HSDPA employs fast retransmission scheme, new frame structure and new adaptive higher order modulation scheme.FUS (far user streaming) will be used to provide the enhanced services of HSDPA to near user as well as far user fairly at the cost of little delay.*

Keywords: *FUS MIMO; HSDPA; Fast retransmission scheme.*

I. Introduction

HSDPA, also called 3.5G, is the evolution of the third generation (3G) and is considered the previous step before the fourth generation (4G), the future High-Speed Mobile Network. HSDPA and High Speed Uplink Packet Access (HSUPA) are the components of the High-speed Packet Access (HSPA) family. HSPA is an upgrade of the network infrastructure and it is part of the WCDMA 3G network. As an enhancement of UMTS, HSDPA was designed to improve the quality of services, increase the peak data rates (currently speeds supported by HSDPA are 1.8, 3.6, 7.2 and 14.4 Mbps). Also compared to UMTS, the spectral efficiency is significantly increased, and this allows more users being able to use high data rates on a single carrier. The fundamental technique used in HSDPA to achieve this improvement is Adaptive Modulation extensive multi-code operation and a fast and spectrally efficient retransmission strategy. The assignment of the HS-DSCH (High-Speed Downlink Shared channel) among the users on a TTI basis (1 TTI = 2ms) is coordinated by a fast scheduler. Higher cell capacity and higher spectral efficiency are required to provide these higher data rates and new services with the current base station sites. Figure1.Illustrates the estimated cell capacity per sector Per 5MHz with WCDMA, with basic HSPA and with enhanced HSPA in the macro-cell.

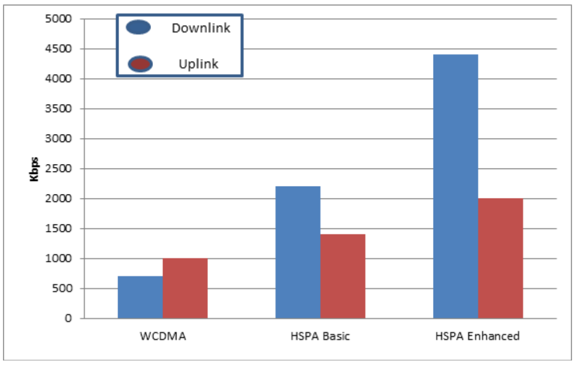

Fig1. Estimated cell throughput per sector [2]

HSDPA is able to satisfy the most demanding multimedia applications such as email attachments, Power Point presentations or web pages. An HSDPA 3.6 Mbps network can provide a 3MB music file in 8.3 seconds and a 5 MB video clip in 13.9 seconds. Speeds achieved by HSDPA reach 14.4 Mbps but currently most network operators provide speeds up to 3.6 Mbps, with the rollout of 7.2 Mbps quickly growing. It is important to note that the total available downlink speed within one sector is split among all the active users. Also, HSDPA can coexist with Release 4 in the same frequency band of 5 MHz. There are 185 commercial HSDPA networks in 92 different countries, the current deployment of HSPA networks in the world and the HSDPA data rates supported are shown in Table1.

Data Rates	Networks
0-3.6 Mbps	56
3.6-7.2 Mbps	91
7.2-14.4 Mbps	38

Table1. Current HSDPA commercial networks and data rates [1]

A. HSDPA Standardization

High-Speed Downlink Packet Access (HSDPA) was standardized as part of 3GPP Release 5 with the first specification version in March 2002. High-speed uplink packet access (HSUPA) was part of 3GPP Release 6 with the first specification version in December 2004. HSDPA and HSUPA together are called 'high-speed packet access (HSPA). The first commercial HSDPA networks were available at the end of 2005, and many improvements have been introduced in the Release 6, 7, and 8.HSPA is deployed on top of the WCDMA network. Both of them can share all the network elements in the core network and in the radio network including base stations, Radio Network Controller (RNC), Serving GPRS Support Node (SGSN) and Gateway GPRS Support Node (GGSN). WCDMA and HSPA are also sharing the base station sites, antennas and antenna lines. 3GPP creates the technical content of the specifications, based around work items, though small changes can be introduced directly as "change requests" against specification, but it is the organizational partners that actually publish the work. In addition to the organizational partners, there are also market representation partners, such as the UMTS Forum, part of 3GPP. With bigger items a feasibility study is done usually before rushing in to making actual changes to the-specification [2].

A feasibility study for HSDPA was started in March 2000 in line with 3GPP principles, having at least four supporting companies. Motorola and Nokia supporting the start of the work from the vendor side and BT/Cell net, T-Mobile and NTT Do-Como from the operator side. There were issues studied to improve the downlink packet data transmission over Release 4 specifications. BTS-based scheduling was studied as well as adaptive modulation. The study also incorporated some investigations for multi-antenna transmission and reception technology, titled MIMO (Multiple Input Multiple Output), and also Fast Cell Selection (FCS), [2]

B. HSDPA vs. Release 4 DCH

In Release 4 specifications basically exist three different methods for downlink packet data operation: dedicated channel (DCH), forward access channel (FACH) and downlink shared channel (DSCH). The most interesting comparison is between Release 4 and HSDPA dedicated channel; the FACH is used either for small data volumes or when setting up the connection and during state transfers. In connection with HSDPA, the FACH is used to carry the signalling when the terminal has moved. However the DSCH has been replaced with the high-speed DSCH of HSDPA. The Release 4 based DCH is the key part of the system, and Release 5 HSDPA is always operated with the DCH running in parallel. If the service is only for packet data, then at least the signalling radio bearer (SRB) is accepted on the DCH. In the circuit-switched, the service always runs on the DCH. In Release 5, uplink user data always go on the DCH (when HSDPA is active), whereas in Release 6 an alternative is provided by the Enhanced DCH (E-DCH) with the introduction of high-speed uplink packet access (HSUPA). In the case of multiple services, the reserved capacity is the sum of the peak data rate of the services. The main functionality for the DCH is the fast power control in addition to encoding the data packet provided by the RNC. Furthermore, soft handover is supported for the DCH. As a difference with Release 4, HSDPA introduces some methods for improving downlink packet.

The key differences between the HS-DSCH (HSDPA dedicated channel) and the Release DCH-based packet data operation are as follows:

- Support of higher order modulation than the DCH. With 16-Quadrature Amplitude Modulation (16QAM) the number of bits carried per symbol is doubled in favourable conditions compared to the quadrature phase shift keying (4QAM) in Release 4.
- User allocation with base station based scheduling every 2ms, including fast physical layer signalling. With DCH the higher layer signalling from the RNC allocates semi permanent code (and a spreading factor) to be used. The transmission time interval (TTI) is also longer with the DCH, allowing values such as 10, 20, 40 or 80 ms. (The longest is limited in the specific case of small data rates that have a spreading factor of 512).
- Lack of soft handover. Data are sent from one serving HS-DSCH cell only.
- Multi-code operation with a fixed spreading factor. Only spreading factor 16 is used, while with the DCH the spreading factor could be a static parameter between 4 and 512.
- No discontinuous transmission (DTX) on the time level. The HS-PDSCH is also completely transmit or not transmitted at all during the 2-ms TTI.

The main differences are summarised in Figure2

DCH	HS-DSCH

• Fast-power control • Multi-code operation	• AMC • Multi code extended operation • Physical layer retransmissions • BTS-based scheduling and link adaptation

Figure2. Fundamental properties of the DCH and HS-DSCH[2].

C. Radio resource management architecture

The radio resource management (RRM) functionality with HSDPA and HSUPA is significantly changed compared to Release 4. In Release 4 the scheduling control was purely based in the radio network controller (RNC) while in the base station (BTS or Node B in 3GPP terminology) mainly a power control related functionality (fast closed loop power control) was located. In Release 4 if there were two RNCs involved in the connection, the scheduling was distributed. The serving RNC (SRNC) - the one being connected to the core network for that connection - would handle the scheduling for dedicated channels (DCHs) and the one actually being connected to the base transceiver station (BTS) would handle the common channels.

Due to the BTS based scheduling, the overall RRM architecture changed. The SRNC will still retain control of handovers and is the one which will decide the suitable mapping for quality of service (QoS) parameters. With HSDPA the situation is simplified because, as there are no soft handovers for HSDPA data, the utilization of the Iur interface can be avoided by performing SRNC relocation, when the serving high-speed downlink shared channel (HS-DSCH) cell is under a different controlling RNC (CRNC). Thus, just a single RNC could be enough for the typical HSDPA scenario, [2]. Figure3 shows the new RRM architecture.

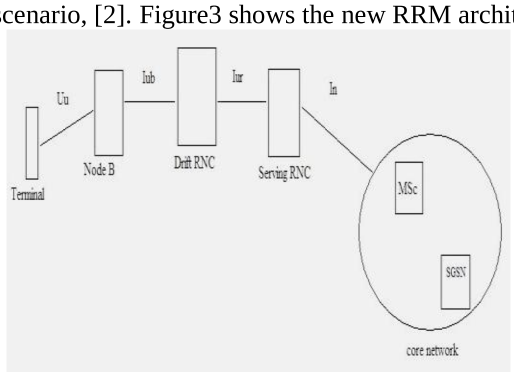

Figure3. RRM architecture [2]

Node B

- Fast power control (HSUPA only)
- Scheduling
- Dynamic resource allocation
- Qos provision
- Load and overhead control

Drift RNC

- Admission control
- Initial power setting (HSUPA only)
- Radio resource condition for HSDPA/HSUPA
- DL code allotment and code three management
- Load and overhead control(overall)

Serving RNC

- Qos parameters mapping
- Handover control
- Outer loop power control(HSUPA)

D. HSDPA operation principle

HSDPA is based on a fast Node B scheduling where the Node B estimates the channel quality of each active HSDPA user on the basis of the physical layer feedback arriving in the uplink. Scheduling with link adaptation are then conducted on a fast pace depending on the scheduling algorithm and the user prioritization scheme. The other new key technology is physical layer retransmission. In Release 4 when the data has not been received correctly, is necessary to retransmit it again from the RNC. In Release 4 there is no difference in physical layer operation, regardless if the packet is a retransmission or a new packet. With HSDPA the packet is first received in the buffer in the BTS. The BTS keeps the packet in the buffer even if has sent it to the user and, in case of packet decoding failure, retransmission automatically takes places from the base station without RNC involvement. So, the terminal can combine the transmissions, capturing the energy of both. Using a radio link control (RLC)-acknowledged mode of operation, RLC layer acknowledgement is provided in the RLC layer as would be done for Release 4 based operation.

E. HSDPA channels

HSDPA new channels: Several new channels have been introduced for HSDPA operation. For user data there is the high-speed downlink shared channel (HS-DSCH) and the corresponding physical channel. For the associated signalling needs there are two channels: high-speed dedicated physical control channel (HS-DPCCH) in the uplink direction and high-speed shared control channel (HS-SCCH) in the downlink. In addition to the basic HSDPA channel covered in Release 5 specifications, there is now a new channel in Release 6 specifications the fractional dedicated physical channel (F-DPCH) - to cover for operation when all downlink traffic is carried on the HS-DSCH.

i. High-speed downlink shared channel

The HS-DSCH is the transport channel that carries the actual user data. In the physical layer the HS-DSCH is mapped onto the high-speed physical downlink shared channel (HS-PDSCH).
An important property of the HS-DSCH is that it can dynamically allocate the resource. When the Node-B decides which user is going to be served, the data is sent continuously during the 2 ms TTI, so there is no discontinuous transmission (DTX) on the slot level like with the DCH. With DTX the downlink interference generated is reduced, but it keeps the code resource occupied according to the highest data rate possible on the DCH, because the code resource reservation is not changed when moving to a lower data rate; (the only way to reduce resource consumption is to reconfigure the radio link, but this takes time in reconfiguring the data rate to a new smaller value, and then a new reconfiguration to upgrade the data rate again). As a difference to DTX, with HS-DSCH, once there are no more data to be transmitted for that user, there is no transmission on the HS-DSCH again for the same user, but the resources in the according 2-ms are allocated to another user.

ii. High-speed shared control channel (HS-SCCH)

The HSDPA concept includes a Shared Control Channel (HS-SCCH) to signal the users when they are going to be served as well as the necessary information for the decoding process. Compared with the HS-DSCH, the HS-SCCH has two slots offset. This enables the HSSCCH to carry time-critical signalling information which allows the terminal to demodulate the correct codes. A spreading factor of 128 allows 40 bits per slot to be carried (with 4QAM modulation). The phase reference does not change when using HS-DSCH due to the lack of pilots or power control bits on the HS-SCCH.

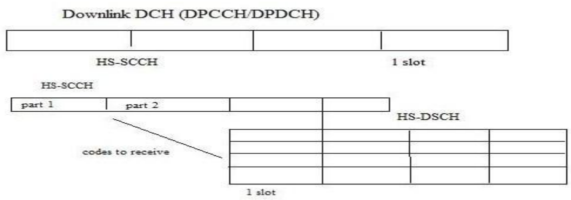

Fig4. Relative timing between HS-SCCH and HS-DSCH [2].

The HS-SCCH carries the following information.

- UE Id Mask
- Transport Format Related Information
- Hybrid ARQ Related Information

iii. High-speed dedicated physical control channel

An uplink High Speed Dedicated Physical Control Channel (HS-DPCCH) carries the necessary control information in the uplink, namely, the ARQ acknowledgements, and the Channel Quality Indicator (CQI) reports. To aid the power control operation of the HS-DPCCH an associated Dedicated Physical Channel (DPCH) is run for every user. This information from the terminal to the base station allows for the link adaptation and physical layer retransmissions.

iv. Fractional DPCCH

For Release 6, further optimization took place for the situation where only packet services are active in the downlink other than the signalling radio bearer (SRB). In such a case, especially with lower data rates, the downlink DCH introduces too much overhead and can also consume too much code space if looking for a large number of users using a low data rate service (like VoIP). The solution was to use an F-DPCH, which is basically a stripped-down version of DPCH that handles the power control.

II. Fus Algorithm

FUS (far user streaming) to provide the enhanced services of HSDPA to near user as well as far user fairly at the cost of little delay. Users falling in 64QAM modulation range get the facility of HSDPA i.e. high data rates but users falling outside this range are unable to exploit HSDPA technology. To solve this problem of far users a new algorithm is to be introduced is called FUS. Consider near user/seeders: User who falls in the 64QAM or HSDPA range of the base station and Far user/lechers: User outside the 64QAM or HSDPA range. In FUS scheme near user/seeders provide HSDPA link to far users/lechers via multi hop network, near users play the role of relay nodes. Three main concepts which are important for understanding multi-hop network are sectorization, ad-hoc networking, and cluster head formation in the absence of fixed relay nodes.

In sectorization base station's cellular area is divided on behalf of spatial division technique to identify the mobile nodes. Ad-hoc networking is responsible for establishment of an autonomous network by a group of mobile units to form a cooperative network. The function of cluster head is to control mobile unit of an ad-hoc network. For solving the above defined problem users are targeted to form an Ad-hoc network based on their sectors and then near users act as relay nodes for lechers. Based on the MIMO antennas at base station, or pre-sectorzed regions, or number of far users, the basestation divides spatial area into various sectors. Users form adhoc network and selects a cluster head as explained in the flowchart. On the basis of stream request from far user and whether near user is able to fulfil the need, cluster head decides about the relay nodes. A cluster head maintains all the information regarding downlink shared control channel as well as data channel. The head can be chosen on the basis of:

- The optimized (mid) distance between base station and far user.
- Seeders with highest MIMO antennas.
- Seeders who has got more energy.
- Seeders who has got a good processing and storage configuration i.e. at least better than rest of the seeders.

III. MMSE(Minimum Mean Square Error) Equalizer

Diversity plays an important role in improving the reliability of a message signal. It uses two or more communication channels with different characteristics as it combats fading and co-channel and avoids error bursts Diversity coding techniques are used when there is no channel knowledge at the transmitter. Multiple-input and multiple-output (MIMO) is the use of multiple antennas at both the transmitter and receiver to improve communication performance.

In MIMO wireless communication, an equalizer is in used in a network that makes an attempt to recover a signal that suffers with an Inter symbol Interference (ISI). A MMSE equalization algorithm separates multiple transmitted sequences and minimizes the ISI simultaneously. An approach which minimizes the mean square error (MSE), which is a common measure of estimator quality. Its main feature is that it does not usually eliminate ISI completely but minimizes the total power of the noise and ISI components in the output.

IV. Related work

An easy framework for Monte-Carlo simulations [3] of a multiple-input-multiple-output radio channel is planned. They derived model include the partial correlation between the paths in the channel, as well as fast fading and time dispersal. The barely input parameters required for the model are the shape of the power delay spectrum and the spatial correlation functions at the transmit and receive side. They furthermore demonstrated that the Shannon capacity of the channel is highly dependent relative on the considered environment.

A prolonged effort is started to support the evolution of the UMTS [4] standard to meet the fast developing needs assoc aid with wireless Internet applications. To maintain high High-speed Downlink Packet Access (HSDPA) is provided by income of a new, shared channel called High-Speed Downlink Shared Channel (HSDSCH) which is enabled by a number of performance attractive technologies such as Adaptive Modulation and Coding (AMC), Hybrid ARQ (HARQ), Fast Cell Site Selection (FCSS) and Multiple Input Multiple Output (MJMO) antenna techniques. To completely assistance from this technology, one must assurance fast and reliable control message exchange among the base station and the user terminals. The downlink signalling is done through the use of Shared Control Channels (SCCH) accompanied with each HS-DSCH. Since the SCCHs, HSDSCH, and voice channels share the same resources (power, bandwidth), control signalling is often improved at the cost of system resources and capacity. They evaluate the performance of SCCH. The challenges and tradeoffs in the SCCH design will also be discussed.

The special effects of multi-hop relay [5] on the throughput of the downstream channel in cellular systems can be demonstrated. In exacting, they compare the throughput of the multi-hop system with that of the conventional cellular system, representative the attainable throughput upgrading by the multi-hop relaying. They also propose a hybrid control strategy for the multi-hop relaying, in which they advocate the use of in cooperation, the shortest transmission and the multi-hop relaying. Their study shows that most of the throughput gain can be obtained with the use of two- and three hop relaying scheme. The multi-hop cellular system architecture can also be utilized as a self-configuring network mechanism that efficiently accommodates spatial and temporal variability of traffic patterns. They have studied the throughput enhancement for the homogeneous, as well as for the non-homogeneous traffic distribution, and they conclude that the use of multi-hop relaying in cellular networks would be comparatively robust to changes in the traffic allocation. The significance of this conclusion lies in the detail that it allows less stringent design and planning of such multi-hop cellular systems, as well as to improve the presentation of the existing systems that are subject to temporal traffic changes.

Downlink throughput results are obtainable for cases where the available cell transmission [6] resources are shared between HSDPA and DCH users. the totality cell throughput can be improved by 69% by allocating only 5 HS-PDSCH codes and 7Wfor HSDPA transmission, compared to a situation without HSDPA enable. These results are obtained in favour of a macro cellular scenario with best effort packet traffic. It is verified that part of this throughput increase originates from a better utilization of available cell transmit power when HSDPA is introduced, since condition of less power control headroom is required.

Non-uniform coverage [7] is a main concern in cellular data networks based on HSDPA/HDR access technologies. Poor coverage lowers the overall operation of the cell and results in location-dependent downlink throughput for mobile users. Their focus point on the planning of Ad hoc Relay Network (ARN) in providing an improved cellular coverage. Specifically, they present and discuss issues and approaches for relay node placement in cellular space. Through extensive simulation modelling, they provide the valuation of the improvement in the location dependent cellular data rate by employing the ARN.

The primary techniques [8] exploit space diversity available through cooperating terminals' relaying signals for one another. Their outline several strategy employed by the cooperating radios, together with fixed relaying schemes such as amplify-and-forward and decode-and-forward, assortment relaying schemes that adapt based upon channel capacity between the cooperate terminals, and incremental relaying schemes that adapt based upon limited feedback from the goal terminal. They develop performance characterizations in terms of outage events and associated outage probabilities, which measure toughness of the transmissions to waning, focusing on the high signal-to-noise ratio (SNR) regime. Excluding for permanent decode and forward, each and every one of the cooperative diversity protocols are efficient in the sense that they achieve full diversity (i.e., second-order diversity in the case of two terminals), and, moreover, are close to optimum (within 1.5 dB) in certain regimes. Thus, using distributed antennas; they can provide the powerful benefits of space diversity without need for corporal arrays, though at a loss of spectral efficiency due to half-duplex operation and possibly at the cost of additional receive hardware. Appropriate to any wireless scenery, together with cellular or ad hoc networks where ever space constraints exclude the use of physical arrays the performance characterizations reveal that large power or energy savings result from the use of these protocols.

Recently, a lot of channel-dependent scheduling [9] schemes for High Speed Downlink Packet Access (HSDPA) systems have been introduced to provide high system throughput and quality-of-service (QoS) guarantee. However, no work has measured hybrid automatic repeat request (HARQ), one of special features of Universal Mobile Telecommunications System (UMTS) Release 5 network. The new packet scheduling algorithm which suspends HARQ process is proposed. The concert of the proposed scheme is compared with normal HARQ mode with Max CIR and PF algorithms in fast fading channel. Results from system-level simulation show that with the proposed algorithm average cell throughput can be increased with no degradation of QoS.

The main significant characteristic of an optimal scheduler [10] is to maximize throughput while servicing users in a fair mode. Here in, they formulate MIMO scheduling as a Generalized Assignment Problem (GAP) and propose a wide-ranging solution for the GAP, namely, a Cross-Layer MIMO scheduler (CMS), which uses a novel Adaptive Proportional Fairness (APF) mapping approach in conjunction with a new Fast Transmit Antenna Selection (FTAS) technique, to establish the set of users to transmit to and the antenna over which the data associated to each user should be transmitted. The planned scheduler is applied for packet transmission in High-Speed Downlink Packet Access (HSDPA), taking benefit of the use of adaptive modulation and coding while coping with the constraints on the maximum number of instantaneous codes a user tools can support, the limited uplink signalling, and the absence of swift power control. Numerical result demonstrates that the proposed CMS provides up to 70% increase in total throughput compare to other scheduling schemes.

High-speed packet access (HSPA) [11] was integrated in Third Generation Partnership Project(3GPP) releases 5 and 6 for downlink and for uplink. The 3GPP release 7 offer a number of HSPA improvement, provided that major improvements to the end-user performance and to system efficiency. The release 7 features are introduced in this paper. Release 7 also is known as HSPA progression or HSPA+. The HSPA+ downlink peak bit rate can be increased to 28.8 Mbps with a multiple input multiple outputs (MIMO) antenna solution and the uplink rate can be improved to 11.5 Mbps with higher order modulation in release 7.

Relay-assisted cellular network [12] is one of the mainly capable architectures for the next-generation mobile cellular system, which is envisage to support high-rate multimedia services in a wide variety of environment indoors, outdoors, low and high-mobility, etc. This work aims to investigate the hypothetical performance of downlink transmissions of relay assisted cellular networks in the multi-cell environment with optimized system parameters. A genetic-algorithm based move towards to propose for joint multi-cell optimization of system parameters together with locations of relay stations, path selection, and reuse pattern and resource allocation to exploit the system spectral efficiency. Two types of value of end-user experience (QoE)(fixed-bandwidth allocation and fixed-throughput allocation) are investigated along with two path selection schemes (spectral efficiency-based and SINR-based). Numerical results show that with the use of relay stations, the system performance is considerably improved over the conventional cellular networks.

Emerging cellular networks [13] are liable to handle users with diverse quality of service desires attending to the nature of their underlying service application, the superiority of their wireless equipment, or even their agreement terms. While sharing the same physical resources (power, bandwidth, transmission time), the effectiveness they get from using them may be very different and arbitrage is needed to optimize the global process of the network. In this admiration, resource allocation strategies maximizing network utility under practical constraints are investigated. In particular, they focus on a cellular network with half duplex, MIMO terminal and relay infrastructure in the form of fixed and dedicated relay station. Whereas orthogonal frequency division multiple accesses is assumed, it is seen as a frequency diversity enabler since path loss is the only channel state information (CSI) known at the transmitters, which is revitalized periodically. The performance of a state-of-the art relay-assisted transmission protocol is characterized in terms of the argotic reachable rates, for which novel concave inferior bounds are developed. The use of these limits allows them to derive two efficient algorithms computing resource allocations in polynomial period, which address the optimization of the uplink and downlink directions mutually.

Mostly, ad hoc networks [14] can potentially connect dissimilar wireless devices to enable more powerful wireless applications and mobile computing capability. To meet the forever increasing communication need, it is imperative to improve the network throughput while guarantee communication reliability. Multiple-input-multiple-output (MIMO) technology can provide significantly superior data rate in ad hoc networks where nodes are equipped with multi-antenna arrays. Although MIMO technique itself can sustain diversity transmission when channel situation degrades, the use of diversity transmission often compromises the multiplexing gain and is also not sufficient to deal with extremely weak channel. Their scheduling scheme can capably invoke relay transmission without introducing significant signalling overhead as conventional relay schemes, and flawlessly integrate relay transmission with multiplexed MIMO transmission. They also design a MAC protocol to implement the distributed algorithm. Their performance results demonstrate that the employ of cooperative relay in a MIMO framework could bring in a significant throughput improvement in all the scenarios studied, with the disparity of node density, link failure ratio, and packet arrival rate and retransmission threshold.

They physical layer [15] multiple-input–multiple-output High-Speed Downlink Packet Access (HSDPA) throughput measurements. These measurements were accepted out in two different environments: 1) an alpine valley and 2) a city. In addition to the standard obedient single and two-transmit antenna HSDPA schemes, they defined and measured a four-transmit-antenna HSDPA scheme to explore future enhancement of the standard. To analyze the performance loss, they introduce the so called achievable mutual information and compare it with the actually measured data throughput. They find that the measured data throughput is far from the most favourable, leaving room for future receiver optimizations. Moreover, they find that the achievable mutual information is far from the channel capacity. Thus, optimizations in the pattern could further improve HSDPA performance.

A 3-cell network [16] multiple input multiple-output (MIMO) architecture with fractional frequency reuse (FFR) and a novel tri-sector frequency partition format. One basic question to apply the network MIMO technique in such a high interference environment is how many base stations should be coordinated together to provide sufficient performance? They will demonstrate that the FFR-based3-cell network MIMO architecture with the proposed tri-sector frequency partition can not only effectively overcome the inter group interfering, but can avoid execute the complex multi base station joint processing for a huge number of cluster of cells at all locations. It will be exposed that the proposed 3-cell network MIMO with the rearranged tri-sector frequency partition strategy can outperform the 7-cell network MIMO with Omni-directional antennas. A variety of sector antenna architectures and the process for formative the inner region of the FFR cell planning are also discussed and analyzed on top of the network MIMO system. They hope that this study can provide important insights into the design of the network MIMO systems from the perspective of architecture and employment.

V. Conclusion

This paper has focused on the recent enhancement in the high speed downlink packet access (HSDPA). HSDPA is an improved structure in 3GPP systems for the broadcast of downlink packet data to increase the volume of downlink within the available spectrum. Two leading techniques which are responsible for enhancing the data rate of HSDPA are 64-QAM and MIMO. By presenting these two in cellular network the downlink data rate can be improved significantly. The influence of HSDPA can play a key role in upcoming cellular services where continuous streaming of data is required. It is found that the existing work has focus on Far User Streaming (FUS) algorithm.

In near future we will enhance the results further by using the Minimum Mean Square Error (MMSE) equalization technique. To enhance the results further we will integrate the FUS algorithm with MMSE to improve the outcomes of HSDPA.

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