distributed broadband wireless systems based on optical infrastructure

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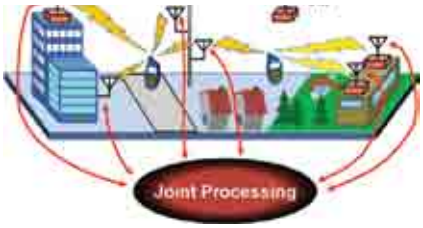
There are currently in the wireless arena considerable researches aiming at what is commonly called 4G systems that are spurred by interdependent technical and economical / deployment trends. Such 4G systems should fulfil several goals, among which: provision of true broadband , increase of the system level capacity; fairness access and power efficiency.
It is more or less consensual that to achieve targets outlined for systems beyond IMT-2000, will require the use of MIMO (Multiple-Input Multiple-Output) technology based on multiple antennas at the transceivers to exploit the scattering properties of the wireless medium. Unfortunately due to the physical limitations in the size of the transceivers, the number of antenna elements cannot be large and furthermore the spacing between them is limited. At IT-Aveiro and within the ICT FUTON project a novel architecture has been proposed which is based on a Distributed Antenna System (DAS) supported by an optical infrastructure. The mobiles communicate simultaneously with several antenna units, with the broadband and low loss characteristics of the optical fibre ensuring perfect cooperation between them. This allows the antennas to be treated as physically distributed antennas of one composite base station and achieve distributed MIMO.
The architecture proposed brings several advantages both in terms of system performance as well as CAPEX/OPEX. In addition to the cooperative MIMO, it allows namely, the Transparent support of legacy (2G, 3G) and future high capacity RATs (4G) over a single infrastructure, facilitate the implementation of Cooperative MIMO and integration of macro and small cells.
The project has developed several solutions towards the concept and has shown the technical feasibility of fibre supported cooperative MIMO, by developing an experimental testbed demonstrating of cooperation mechanisms for LTE-Advanced bit rates employing two remote antenna units connected to the central unit though optical fiber with several pedestrian users. This research is expected to have impact on the industry, with these concepts and integration of the optical and wireless technologies being strongly pushed by the major Chinese manufacturers.



allergic asthma on the breath: metabolomics brings diagnosis a step closer

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Allergic asthma represents an important public health issue with significant growth over the years, especially in the paediatric population. Currently, diagnosis is based upon symptoms and in the measurement of non-specific and broad biomarkers. The present study is based on the analysis of exhaled breath (EB), a non-invasive, easily performed and rapid sampling approach. EB is a rich source of data with potential to provide valuable information about respiratory and systemic diseases that can lead to a deeper knowledge of human health status. Studies have been performed in our group concerning the optimization of several parameters of EB sampling. EB metabolites were analyzed by comprehensive two-dimensional gas chromatography-time of flight mass spectrometry, which leads to the identification of several hundred compounds pertaining to different chemical families. Multivariate analysis plays an important role in understanding which metabolites are characteristic of asthmatic children exhaled breath and a “breath-print” of 134 volatile compounds was identified that allowed the distinction between allergic asthmatic and control children. This data set comprises compounds possibly linked to oxidative stress, inflammation processes or other cellular processes that may characterize asthma.
A pattern of six compounds pertaining to the alkanes characterized the asthmatic population and on to otherwise, a set of aldehydes characterized the control population. Nevertheless, for clinical purposes, and having in mind that molecular diagnosis is thought to be the next step in clinical practice, this pattern formed by the six alkanes and the aldehydes was tested and the results accentuate the possibility of EB analysis, not only in a metabolomic point-of-view for allergic asthma knowledge, but also in clinical applicability as a possible add-in to the standard tests performed actually. The uprising issue of personalized medicine led to the monitorization of a child that had never taken an asthma drug (naive). The results of this study provided a novel methodological approach to characterize allergic asthma as a function of its metabolomic patterns, which will open new strategies to early diagnosis, therapy monitoring, and understanding the asthma pathogenesis that affects millions around the world.