How to increase the capacity of mobile wireless networks without changing anything (well, almost anything)!

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The proliferation of smart phones, tablets and other advanced wireless devices has caused an explosion in wireless data traffic. Between Q1'2013 and Q1'2014 the mobile traffic grew a remarkable 65%, with the Q1'2014 mobile traffic alone surpassing the total traffic in 2011. This explosive growth is projected to continue for many years, driven by mobile video applications, web browsing, gaming, machine-to-machine communications, *etc*. The carriers are faced with a daunting task of trying to upgrade their networks rapidly to keep up with this ever-increasing traffic. However, the traditional capacity options, such as adding spectrum and cell towers, are seriously limited by cost and other factors. The massive deployment of small cells, sometimes cited as the panacea of wireless capacity, is also rather expensive and in addition it introduces high complexity in interference management and handoff. For now, the carriers have little choice but to discourage mobile data consumption over certain limits through pricing. Wi-Fi offload is available to consumers in many public places, but with limited mobility, security risks, and still subject to slow data rates when many users are present.

Blue Danube Systems is a US startup developing a new cost-effective method for increasing the wireless mobile network capacity by a large factor. This solution does not require any changes to the mobiles or to 4G and beyond cellular standards such as LTE. It does not even require changes to the base station architecture and base station radios all the way up to the RF front end. There, a new analog/RF section shapes the transmitted and received radiation patterns such as to create much more efficient communication channels between the base station and the mobiles than in existing systems. For the first time since the deployment of the cellular system, the over-the-air communication will be done without major inefficiencies, such as transmitting energy in areas other than where the intended users are. The net effect on the overall wireless system performance will be a major improvement of the cellular average data rates by a factor of 5–10 or more compared to existing conditions.

The key enabling innovations for our technology include new low-complexity mixed-signal functionality implemented in a custom RFIC. Unlike other proposed approaches to increase the wireless network capacity, which typically are based on heavy digital signal processing and produce only modest results, our technology uses no digital signal processing and delivers impressive results. This presentation will describe the new design principles applied in our technology, our current implementation approach, and the system performance results in comparison to standard wireless industry metrics.