Optimizing the coexistence of the new mobile generation (5G) features called bandwidth part and beamforming

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The new mobile communications generation (5G) brings many new advanced features to meet the new arising requirements. Bandwidth Parts and massive beamforming are some examples. This project optimized the interoperability of those two features.

The Fifth mobile communications generation is the latest being developed after 30 years of evolution of mobile technologies. The world is experiencing a great digital transformation that is changing society in many aspects, such as economy, culture, education, or even social relationships. Inside this revolution, mobile communication technologies are playing a significant role

Around every 7 to 10 years, a new mobile generation, e.g., 3G, 4G or 5G, has appeared bringing more advanced features, such as a fastest access to the Internet. For the user, this is usually translated in new functionalities in their devices or higher-quality access to media like videos or conferences.

One of the reasons why mobile communications can evolve so quickly and in sync around the world is standardization. Standardization allows the industry to jointly develop new generations of mobile telephony in a global effort so that all devices are compatible. In other words, users of terminals from different manufacturers can communicate with each other. The international body in charge of the standardization of mobile communication generations is the 3GPP.

Since 2012, the 3GPP is focused on the standardization of the Fifth Generation (5G). The main feature of this new generation is that it aims to fulfill new use cases divided into three groups. In a few words, the new requirements are to enable even more extensive data volumes and enhanced user experience, connect a massive number of machine devices to the Internet and offer services with high reliability or timing requirements such as telemedicine.

Because of this broad range of use cases, the main design principle of the new generation standard is to allow enough flexibility to meet all the requirements given by the use cases. As a consequence, the new standard introduces a new concept called Bandwidth Parts (BWP). Bandwith Part is a new concept that allows flexibility in the use of the electromagnetic spectrum.

However, the introduction of this new feature might impact other techniques that were already introduced in mobile communications, such as beamforming. Beamforming is a technique that allows more efficient use of the resources to obtain higher data-rates in the system.

For that reason, this project researched the interoperability of those techniques looking to optimize the use of both features. To that end, a simulator was developed, emulating a real-world environment. The results show that it is feasible to improve the system capacity if both parameters are considered together. As a consequence, a system capacity improvement can be translated into a better user experience.