

Non-Contiguous Multicarrier Transmission for Spectrally Opportunistic Wireless Access: Design Decisions and Trade-Offs

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Tutorial

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Multicarrier modulation has been employed in numerous modern wireless communications standards due to its ability in providing high data rates while simultaneously counteracting the effects of intersymbol interference due to multipath fading channels. In the recent years, multicarrier modulation is being investigated as a possible candidate data transmission scheme for achieving spectrally agile wireless access in scenarios where unlicensed users temporarily “borrow” unoccupied licensed frequency bands while minimizing interference with spectrally adjacent signals, i.e., opportunistic wireless access. Specifically, the divide-and-conquer data transmission approach employed by multicarrier modulation makes it an attractive option for realizing wireless communication systems that do not require a single continuous transmission frequency band.

In this tutorial, we present several multicarrier transmission solutions designed for efficiently achieving opportunistic wireless access. In particular, we shall investigate two types of spectrally-

agile multicarrier modulation schemes, namely, non-contiguous orthogonal frequency division multiplexing (NC-OFDM) and non-contiguous non-orthogonal frequency division multiplexing (NC-NOFDM). The viability of these two techniques employed within an opportunistic wireless access scenario is assessed using actual spectrum measurement data, and a comparative study in terms of out-of-band (OOB) interference mitigation as well as implementation complexity is provided.

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