PHYDYAS - Physical layer for dynamic spectrum access and cognitive radio
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PHYDYAS proposes an advanced physical layer, using filter bank-based multi-carrier (FBMC) transmission, for the new concepts in radiocommunications: dynamic access spectrum management (DASM) and cognitive radio. It shows that the performance and operational flexibility of systems are enhanced by exploiting the spectral efficiency of filter banks and the independence of sub-channels. Combining with offset quadrature amplitude modulation (OQAM), no cyclic prefix is needed, all the radiated power is used and gains in maximum throughput compared to OFDM are achieved. Robustness to Doppler and jammers is obtained and new functionalities are possible. The high resolution spectrum analysis capability is exploited for DASM and cognitive radio and a single device can do spectrum sensing and reception simultaneously.

Research in signal processing is carried out to complete the knowledge in filter banks for transmission and satisfy requirements of new radio systems: fast initialization, optimum transmit-receive processing for single and multiple antenna (MIMO) systems, scalability. Research in communications concerns dynamic access and cross-layer aspects, and compatibility with OFDM. In cognitive radio, research deals with radio scene analysis and channel identification and the impact of the independence of sub-channels on transmit power control and dynamic spectrum management. A simulation software is developed for a typical WiMAX configuration and scenario and performance comparison with OFDM is carried out. A real time soft/hardware demonstrator is built to complete simulation results and show efficient architectures.

The expected impact of PHYDYAS is the migration of wireless systems to a physical layer that is more efficient and better responds to the needs of dynamic access and cognitive radio. The consortium consists of leading academic research groups across Europe, teamed with world leading companies in infrastructures, circuit design and instrumentation.

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