

Fachbereich Elektrotechnik und Technische Informatik  
*Department of Electrical Engineering and Computer Science*

**Master Thesis**  
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# **Implementation and Evaluation of a Cooperative Cognitive Radio Approach Providing a Deterministic Medium Access**

## **Abstract**

The radio spectrum is statically allocated and divided between licensed and license-free bands. Caused by increasing demands for wireless devices in the last decade, license-free bands such as the 2.4 GHz ISM band become more and more crowded. As a consequence, interferences are inevitable. To avoid impairments caused by interferences, there have to be mechanisms to stop coexisting systems to interfere each other in unlicensed bands and to optimize spectrum efficiency. An inter-system communication based on cooperative deterministic medium access operation using cognitive radio systems could be a solution to mitigate interference in an efficient way and to optimize spectrum efficiency.

In general, an inter-system communication based on a cooperative cognitive medium access method, adapts to the environment by sensing channels, predicting channel occupancies, negotiating information, and finally tuning adequately.

This master thesis considers the introduction of a novel approach: implementation and evaluation of a cooperative cognitive radio approach providing a deterministic medium access. The dissertation includes three general steps: (i) definitions, (ii) implementation, and (iii) verification of a novel approach. Definitions aim to clarify the basic cognitive wireless communication fundamentals. The implementation step aims to realize a selected scenario based on a new cooperative deterministic medium access method in a real-time narrow-band test bed using a CC2500 transceiver and a MSP430 microcontroller based platform. The verification step includes quality measurements in radio environments

Finally, benefits of the novel approach are shown in comparison to cognitive radio systems without deterministic medium access, and also to non-cooperative cognitive radio systems with deterministic medium access.

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