DAB to FM Converter

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Subject Area	Mobile Communications
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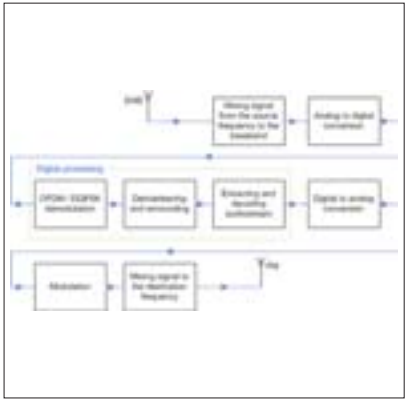
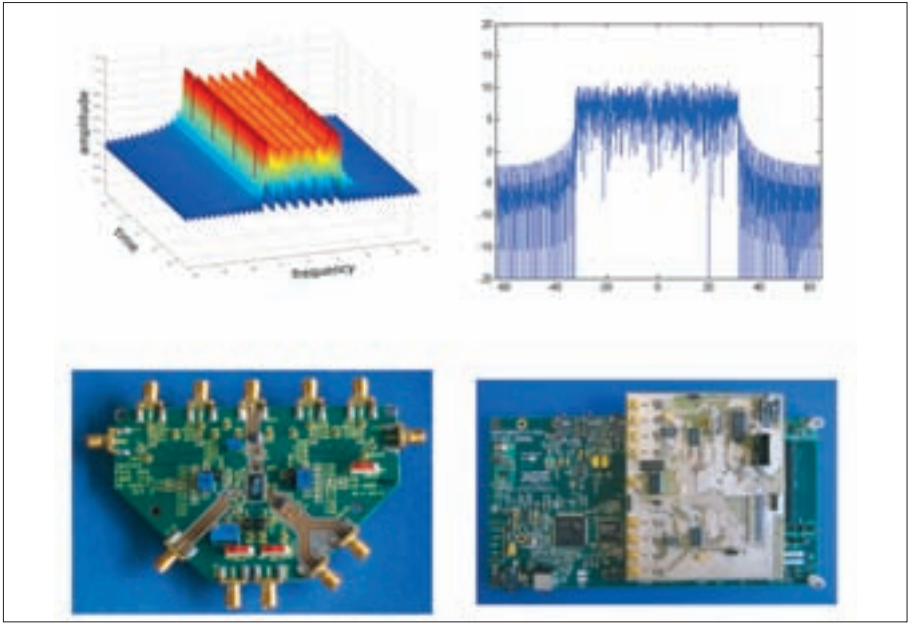


System overview

Task: The traditional FM broadcast radio is increasingly being replaced by DAB (Digital Audio Broadcast). But the transition from the traditional FM broadcast radio to DAB is progressing very slowly. This is because the analog broadcast radio still has some advantages over DAB. The receivers are very cheap and have good sound quality and low energy consumption, which is particularly important for mobile solutions. The additional advantages which DAB provides, like slide shows, program guide and sometimes better reception quality, do not seem sufficient to persuade most users to change to DAB. It would be very reasonable if those who would nevertheless like to switch to DAB could use their old radio instead of buying a new one. This is especially important for cars, where it can be troublesome to install a different radio. In such cases, the best solution would be a set top box that converts the DAB signal to a normal FM signal. There already are some solutions available on the market to solve this problem, but most of them need a special audio connector on the radio.

Project Goal: The goal of this bachelor thesis is to create a DAB to FM converter with minimal functional requirements.



Top left: OFDM signal with zero symbols as in DAB, top right: A DAB signal spectrum
Bottom left: HF front end, bottom right: DSP with the extension board

This means that the device should at least be able to receive a given DAB channel, demodulate and decode the embedded audio stream and transmit an FM modulated version over a given frequency, such that a normal radio is able to receive it.

Solution: There is a DAB channel on 227.36 MHz which can be received via a lambda/4-antenna and mixed down to the baseband with an I/Q-mixer. The resulting two signals (I and Q) can be sampled with two analog-to-digital converters and read into a DSP.

From there the following six steps need to be implemented in order to fulfill the project goal:

1. Synchronizing the DAB frame
2. Demodulating the DQPSK signal
3. Deinterleaving
4. Viterbi decoding (correcting the transmission errors)
5. Analyzing the binary datastream
6. Decoding the MPEG Layer II audiostream