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Design and implementation of a digital front-end for multi-standard software defined radio

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Recent effort in the current mobile communications market focus on multistandard operation. Software defined radio concept has emerged in order to design multistandard wireless communications devices by simply running a different program on a reconfigurable and reprogrammable hardware platform. This work presents the design of a Digital Front-End (DFE), which performs Sampling Rate Conversion and Channelization filtering tasks for a GSM-DECT receiver. Oversampled digitization of a wideband signal containing a bundle of channels at a fixed sampling rate using sigma delta modulator is considered to design the digital front end. A FPGA based reprogrammable and reconfigurable DFE to deal with different channel bandwidths, sampling rates, symbol rate, peak to peak ripple and carrier to noise ratio (CNR) requirements of each standard is presented. Much of the effort required to design the digital front end is determined by selecting desired baseband channel in the presence of strong adjacent channel interferers and blockers using multiplierless digital quadrature downconversion and multirate filtering. Three differing multirate FIR filtering based DFE implementations are described and the best implementation is chosen by taking into account the limited available resources of mobile terminals in terms of chip area and also the power consumption.