Conclusion

Vast attention has been paid to active continuous-time filters over the years. Thus as the cheap, readily available integrated circuit OpAmps replaced their discrete circuit versions, it became feasible to consider active-RC filter circuits using large numbers of OpAmps. Similarly the development of integrated operational transconductance amplifier (OTA) led to new filter configurations. This gave rise to OTA-C filters, using only active devices and capacitors, making it more suitable for integration. The demands on filter circuits have become ever more stringent as the world of electronics and communications has advanced. In addition, the continuing increase in the operating frequencies of modern circuits and systems increases the need for active filters that can perform at these higher frequencies; an area where the LC active filter emerges. This research concentrates on the design of high frequency continuous-time Gm-C integrated filters.

In general, the bandwidth of the OTA used in the filter must be much larger than the filter cut-off frequency. The OTA must also have with linearity in order to achieve acceptable low distortion levels. For high frequency filters, single stage OTAs are preferred, because the internal nodes of multi-stage designs result in additional excess phase shift, as well as increased power consumption.

The designed Wilson Current Mirror base folded cascode OTA works for frequencies that lead to a base band circuit design for RF application, is based on transistor sizing methodology. Simulation results are performed using SPICE software and BSIM3V3 model for CMOS 0.18um process, show that the designed folded cascode OTA has a 52dB DC gain, a unity gain bandwidth around 390MHz, phase margin of 50degrees with power consumption 288μw. The circuit denotes an offset voltage of 0.05V, a Slew Rate of 160V/μs, and Input Common Mode Range (ICMR) close to Supply Rails (± 1.8V)

Mobile telephony together with mobile phones has revolutionized the world and the way people communicate. While the first mobile phones were simple devices whose main and only features were the voice communication and the messaging capability, today’s mobile phones are innovative devices that provide a wide variety of services to users.

Among such wide variety of services, one of the most attractive mobile phone services are the entertainment services, and specially the functionality that allows users to listen to FM radios through their mobile phones.

This thesis concentrates on the design and implementation of analog continuous- time Gm-C IF filter for Dual Band (FM and GSM) receivers. The main reason for using an intermediate frequency is to improve frequency selectivity. In communication circuits, a very common task is to separate out or extract signals or components of a signal that are close together in frequency. This is called filtering. With all known filtering techniques the filter's bandwidth increases proportionately with the frequency. So a narrower bandwidth and more selectivity can be achieved by converting the signal to a lower IF and performing the filtering at that frequency.

CMOS Gm-C IF filter is used in wireless systems for channel selection and filtering in Intermediate Frequency (IF) ranges. The Filter is designed either as external filters or on-chip filters. External filters provide very high Quality factor (Q) but require buffers to drive the off-chip components. These buffers consume more power and in order to reduce the power consumption, on-chip filters are preferred in wireless systems. On-chip filters are designed with active circuits and offer very low power consumption and good efficiency. Most of the on-chip filters are designed with Operational Transconductance Amplifier (OTA) and capacitors and are generally called as Gm-C filters. The Gm-C filter offers many advantages in terms of low-power and works well at high frequencies. The Gm-C circuits represent a popular technique of integrated realization of high frequency continuous time filters. Gm-C filters can operate in a wide range of frequencies from several hundred of KHz to more than 100MHz. The Q of Gm-C filters can be adjusted by controlling the output impedance even at lower frequencies.

The objective of this work is to design an integrated second order active Gm-C CMOS IF band pass filter for Dual Band Receiver; operating at center Frequency (10.6MHz IF for FM Band and 70MHz IF for GSM Band IF) range with tunability, Linearity, silicon area and Low power consumption

Designed of a 2^{nd} order Gm-C dual-band IF filter to be used in a dual-band down conversion receiver for FM band and GSM band, as design is carried out in the TSMC 0.18μm CMOS technology with the BSIM3V3 Level 49 MOSFET model and the filter operates form 1.8V single supply. The performances of the filters designed are analyzed using various parameters like center frequency, gain, bandwidth, Q, and S-parameters.

The ac responses of the 2nd order Gm-C dual-band IF Band Pass filter provides high Q (13.72 for GSM Band and 6.12 for FM Band) with bandwidth (5.10MHz for GSM Band and 1.73MHz for FM Band) and good gain (4.31 for GSM Band and 4.45 for FM Band)

The S-parameter simulation is performed for the 2nd order Gm-C dual-band IF Band Pass filter for impedance matching of 50 ohms on input and output of the filter. The S-parameters are found by considering the filter structures as two port network. S-parameters found are input return loss in dB (S_{11}) and forward voltage gain in dB (S_{21}). The S-parameter simulation of the 2nd order Gm-C dual-band IF Band Pass filter shows that the forward voltage gain (S_{21}) are at maximum (-1.56dB for GSM Band and -0.71dB for FM Band) at the center frequency of the filters and the losses (S_{11}) are at minimum (-37.23dB for GSM Band and -50.07dB for FM Band) at the center frequency of the filters.

The designed filter has tuning ratio 6.6 and suitable for IF channel selection of Wireless System with power consumption 575μw. Designed of a 2^{nd} order Gm-C dual-band IF filter is based on capacitor array (CA) and a digital automatic tuning system is implemented for tuning the Intermediate Frequency (IF) for GSM band and FM band.