

國立交通大學
電機與控制工程研究所
碩士論文

應用於無線個人通訊

低功率分時帶通和差調變類比數位換器



**A Low Power Time Interleaved Band-pass
Sigma Delta A/D Converter
for Wireless Personal Communication**

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中華民國九十四年七月

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摘 要

帶通類比數位轉換器對電容的誤差以及高速度的處理上，面臨著對誤差極為靈敏，以及功率消耗極高的問題。因此我們採用了分時系統 (Time Interleaved System) 並且搭配上合成雜訊轉移函式 (NTF Synthesis)，利用四個低通的三角積分 ($\Delta \Sigma$) 類比數位轉換器合成一帶通類比數位轉換器。利用四個 ADC 的 channel 分時操作，每個一個 ADC 通道僅須操作在四分之一的帶通類比數位轉換器的工作頻率，如此一來除了可大幅降低 ADC 的功率消耗，延長電池的使用時間。此外，由於每一個 ADC channel 為一個 single loop low-pass sigma delta ADC，此架構之 ADC 對於電容的不匹配，及 OP DC gain 的要求較為寬鬆不靈敏，因此我們亦可在設計電路上得到附加的好處，以及避免掉非理想效應及製程飄移所帶來的問題，以達到所求之解析度。

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The logo of National Chiao Tung University is a circular emblem with a gear-like outer border. Inside the circle, there is a stylized representation of a building or a ship, with the university's name in Chinese characters and English. The word "ABSTRACT" is superimposed over the center of the logo.

ABSTRACT

The thesis proposes a low power four path time-interleaved sigma-delta modulator with switched-opamp technique for personal wireless communication applications, such as the GSM system. In this thesis, we design a time interleaved bandpass sigma delta modulator by using four channels with lowpass sigma delta modulator, and implement by TSMC.18 μm 1P6M CMOS models. And, to avoid gain and offset mismatch produce by each channel, additional reference channel calibrated the errors by off-chip digital calibration technique described in section 3.3. We implement the bandpass A/D converter by low power technique and we overcome the non-ideal effect by off-chip calibration.

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