

## 2 · 項目簡介

(項目所屬科學技術領域、主要技術內容、授權專利情況、技術經濟指標及應用推廣情況)

The main objective of the project is to develop and experimentally demonstrate new types of analog-to-digital converters (ADCs) for low power, high-speed, high-resolution and wide-bandwidth requirements in the future communication and infotainment systems. The strategic goal of this project is to extend the existing boundary in various performance bottlenecks in the various ADCs in different application aspects, including the resolution, bandwidth, power efficiency, and area consumption. The project includes 4 technology field that is summarized below:

A. Low-Moderate Resolution Energy Efficient GHz range ADCs for Wireline and Wireless Communication System

B. Design and Analysis of High Performance SAR-Type ADCs

C. Calibration and Comprehensive Study on pure SAR ADCs toward Higher Resolution

D. Wideband CMOS Multi-Stage Noise Shaping (MASH) Sigma-Delta Modulator

The project with 4 research directions and 14 key innovation technologies have substantially contributed to the impact of the society and worldwide in the research field of data converter ICs. The research results leads to a significant breakthrough of the state-of-the-art data converter performance in terms of energy efficiency, resolution and bandwidth, placing the University of Macau (UM) as one of leadership positions worldwide in data converters research area with well recognized and appraised by world most renowned experts in field, e.g. Prof. Man-Chung Frank Chang (President, National Chiao Tung University), Mr. 熊俊 (华为海思半导体项目经理), Prof. Kofi Makinwa (Antoni van Leeuwenhoek Professor, Delft University of Technology), Prof. Borivoje Nikolic (UC Berkeley), Prof. Franco Maloberti (University of Pavia) and Prof. Boris Murmann (Stanford University). Such recognition is further proven from the no. of published world's top-class IEEE Solid-State Society papers including ISSCC, JSSC, VLSI, CICC, ESSCIRC, A-SSCC, within 2014-2015 is ranked as 5th internationally, and UM is the no. 1 ranked university from in Greater China Region including Mainland, Taiwan, Hongkong and Macau,

The research have nurturing/under training over 1 Assistant Professor, 3 Post-Doctorial Fellows, 1 invited Visiting Fellow, 6 Research Fellows, 10 Ph.Ds, 19 M.Sc and 11 B.Sc students, led to a total of 6 international journals (all SCIE-indexed) and 3 top level international Solid State conference publications (all indexed by EI & IEEEExplore and all world-class solid-state conferences), two works receive top level IEEE SSCS award (ESSCIRC best paper award 2014 (Award 3) and SSCS pre-doctoral achievement award 2015), 2 Student Research Previews in ISSCC 2015 (Award 5) and 2016 (Award 5) respectively. These achievements also lead to 1 IEEE Fellow (Award 1) and 1 IEEE SSCS Distinguished Lecturer (Award 2) in our group. We are invited to be served in the world-top "Chip Olympic" ISSCC Technical Program Committee – Data Converter sub-committee (1 of us) and "Asian Chip Olympic" A-SSCC Technical Program Committee - Data Converter sub-committee, Analog Circuits and Systems sub-committee and Student Design Contest sub-committee (Supporting documents 2,3,4), where we are the only member from China including HK and Macau in the corresponding field. Also 2 of us are invited speaker in International Symposium of Integrated Circuits held in Singapore in 2014 (Supporting documents 5). Also our students are invited to the A-SSCC Student Design Contest in 2015 (Supporting documents 6) and the invited paper submission to A-SSCC Special Issue in

Journal of Semiconductor Technology and Science. All these shows the influence and recognition from our committee Position that demonstrated our strength and position as an achievement of this project.

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