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### Seminar On

## Handheld Total Chemical and Biological Analysis Systems - Bridging NMR, Digital Microfluidics and Semiconductors

Professor Pui-In (Elvis) Mak

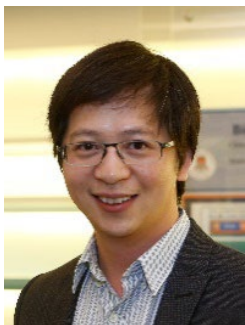
University of Macau, Macao, China

- Date** : 09 September 2022 (Friday)  
**Time** : 10:00 am – 11:00 am  
**Venue** : Online  
**Registration** : <https://events.vtools.ieee.org/event/register/321857>

### Abstract

Point-of-use biological/chemical assays are aimed to transform the bulky laboratory instruments into facile lab-on-a-chip platforms, bringing down the cost, size and sample-use by orders of magnitude. A micro-Nuclear Magnetic Resonance (NMR) CMOS transceiver enables repeatable, versatile and low cost screening of samples as it is label-/washing-free, and immobilization-free for the electrodes. Herein, two lab-on-CMOS NMR systems are presented: one facilitates multi-step multi-sample management by electronic-automated digital microfluidics, and another one benefits from magnetic-field stabilization and thermal management to unify multi-type assays (target detection, protein state analysis and solvent-polymer dynamics) in a handheld scale suitable for healthcare, food industry and colloidal applications. The detection limit is down to 50pM for *E. faecalis* derived DNA. The platform consumes 120x less sample, and is 96x lighter, 175x smaller and 16x cheaper than a 135kg commercial product.

### Biography



**Pui-In (Elvis) Mak** received the Ph.D. degree from University of Macau (UM), Macao, China, in 2006. He is currently Full Professor at UM Faculty of Science and Technology – ECE, and Interim Director at the UM State Key Laboratory of Analog and Mixed-Signal VLSI. His research interests are on analog and radio-frequency (RF) circuits and systems for wireless and multidisciplinary innovations.

He is currently the Associate Editor of IEEE Journal of Solid-State Circuits ('18-) and IEEE Solid-State Circuits Letters ('17-). He is/was the TPC Member of A-SSCC ('13-'16), ESSCIRC ('16-'17) and ISSCC ('17-'19). He is/was Distinguished Lecturer of IEEE Circuits and Systems Society ('14-'15) and IEEE Solid-State Circuits Society ('17-'18). He was inducted as an Overseas Expert of the Chinese Academy of Sciences since 2018.

He is a Fellow of the IET, IEEE and UK Royal Society of Chemistry.

\*\*\* ALL ARE WELCOME \*\*\*

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