Monolithic Integrated Circuits

The MMIC Design and Characterization Research Group has many years of expertise and experiences in: (1) characterization and modelling, and (2) MMIC design and measurement.

(1) Characterization and modeling
The group characterises and models both the passive and active elements for MMIC design. The passive elements include: MIM capacitors, spiral inductors, thin-film resistors, couplers, baluns, etc. For active elements, the Group focus only on sub-micron HEMT devices. They use a Semiconductor Parameter Analyzer for DC IV characterisation, and a Pulsed IV Analyzer for S-parameter characterisation up to 40 GHz, and a prober with ATN source and load pull systems for on-wafer noise and power characterisation.

The group uses equivalent circuit modelling approach for modelling. Conventional model topologies are used, and at times, many are custom developed to improve the extraction consistency and accuracy. The linear and nonlinear models developed are verified extensively by comprehensive sets of characterisation data. All the models are implementable in common CAE tools or platform.

(2) MMIC design and measurement
The group focuses on innovative circuit design at microwave and millimetre wave frequencies. The goal is to develop novel design topologies that improves MMIC circuit performances in terms of bandwidth, efficiency, noise figure and frequency of operation. The group uses a suite of CAE tools for simulation and design of these circuits. After fabrication, the performances of the circuits are verified using on-wafer measurement system to fully characterise their performances.