

Notice of dissertation defense

30.11.2017

Implementation of CMOS Technology at W-band

Title	Design and Characterisation of Monolithic Millimetre-Wave Integrated Circuits for Phased-Array Transmitter Front-End
Content	<p>This dissertation presents the research contributions of monolithic integrated circuit design and implementation, and seven scientific publications. The study presents the feasibility of using CMOS technology for design and characterisation of radio front-ends at W-band (75-110 GHz). The designed circuit components in this work, for instance phase shifters and amplifiers, are used to realise a phased-array transmitter front-end.</p> <p>Design of the phase shifter and amplifier is carried out with a 1-V supply in 28nm CMOS. The phase shifter is a differential vector-sum phase shifter with two control voltages realised in the 0.552 mm² die area. When the control voltages are changed, a 90° phase resolution is generated which is suitable for an array having four antenna elements. After a suitable phase shift is generated by the phase shifter, the amplifier is used for signal amplification which has a reasonable noise figure as a differential buffer amplifier. The die size of the amplifier is 0.36 mm².</p> <p>In order to manufacture the phased-array transmitter front-end, all passives are fabricated by low temperature co-fired ceramic (LTCC) technology. The size of the fabricated LTCC is 2 cm × 4.5 cm. Finally, the active components are flip-chipped on the LTCC. The size of the fabricated transmitter front-end, including the designed PCB for measurements, is 9 cm × 6 cm. The measurements are carried out for a communication distance of 1 m using a horn antenna at the receiver side. The design is scalable for a higher number of array elements and two-dimensional beam-steering for future investigations.</p>
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