A COMPARISON STUDY OF EM AND PHYSICAL EQUIVALENT CIRCUIT MODELING FOR MIM CMOS CAPACITORS

X. Z. Xiong and V. F. Fusco
High Frequency Group
School of Electrical and Engineering
Queen's University of Belfast
Ashby Building, Strammils Road
Belfast BT9 5AH, North Ireland

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ABSTRACT: *In this Letter a new physical model for metal–insulator–metal CMOS capacitors is presented. In the model the parameters of the circuit are derived from the physical structural details. Physical behaviors due to metal skin effect and inductance have been considered. The model has been confirmed by 3D EM simulator and design rules proposed. The model presented is scalable with capacitor geometry, allowing designers to predict and optimize quality factor. The approach has been verified for MIM CMOS capacitors.* © 2002 Wiley Periodicals, Inc. Microwave Opt Technol Lett 34: 177–181, 2002; Published online in Wiley InterScience (www.interscience.wiley.com). DOI 10.1002/mop.10409

Key words: *model; metal–insulator–metal; CMOS capacitors*

INTRODUCTION

In recent years, monolithic microwave integrated circuits have been more and more used in many RF and microwave applications such as low-noise amplifiers, mixers, RF switches, power amplifiers, and voltage-controlled oscillations, et cetera [3]. Here high Q capacitor performance is very important [2]. There are three types of passive capacitors generally used in microwave circuits: microstrip, interdigital, and metal–insulator–metal (MIM). In general, microstrip capacitors can only be used for low capacitance (<0.2 pF), while the interdigital capacitor can be used up to 1 pF. MIM capacitor can be used over the range 0.1–25 pF or so [8]. Because the MIM capacitors have high-quality factor, good lin-