Optimized Architectures for Cantilevered Beam RF MEMS Switch

Ahmed Khairy Aboul Seoud, Ahmed Khairy Mahmoud, and Alaa El-Din Sayed Hafez

Faculty of Engineering, Alexandria University, Alexandria, Egypt

Aboulseou_35@yahoo.com, Khairy_M@yahoo.com, Alaahafez@ieee.org

***Abstract*— The electronic and mechanical characteristic of RF MEMS switches depends significantly on the structure of the switch. This article proposes new optimized architectures for cantilevered beam RF MEMS switches. The modeling approach is based on nodal analysis to solve coupled non-linear differential equations that describe the electromechanical system using Matlab toolbox for MEMS called SUGAR. The model used SUGAR to calculate; netlist of a cantilever beam subjected to an external force, Static analysis of deflection, display of structure and displacement values. The switching voltage of mentioned construction for MEMS switches is determined and analyzed at different geometrical parameters. The results investigate the geometrical parameters of the five MEMS architectures that control the switching voltage to achieve a maximum frequency response for the switch at lower driving voltage. The structure of the proposed cantilever type MEMS switches indicates that the switch can operate with driving voltage of 4.2 V with maximum switching frequency of 6.65 GHz.**

***Keywords*— MEMS Switches, Microwave Phase shifters**

Ahmed Khairy Aboul-Seoud is professor in Faulty of Engineering, Alexandria University, Alexandria, Egypt. He holds B.Sc. in Electronics and Communications from Faculty of Engineering, Alexandria University, He also holds M.Sc. and Ph.D. in Electrical Engineering from Faculty of Engineering, Alexandria University. He tought many technical courses in Electrical and Electronic (Analog and Digital) system design and Implementation, works as System Engineer for more than 20 years, teach up to 30 undergraduate, postgraduate subjects, supervising more than 75 thesis, publish more than 120 papers in different international conferences, Forums and Journals.

Alaa El-Din Sayed Hafez is an affiliate instructor in Faculty of Engineering, Alexandria University, Alexandria, Egypt. He was born in Cairo, Egypt in 1967and became a member of IEEE in 2000, a Senior member of IEEE in 2011. He holds B.Sc. in Electronics and communications from Faculty of Engineering, Alexandria University, M.Sc. in Electronics and Communication from Arab Academy for Science and Technology and Maritime Transport,Alexandria. He also holds M.Sc. and Ph.D. in Electrical Engineering from Faculty of Engineering, Alexandria University. He received many technical courses in Surveillance Radar design and Implementation, work as Radar System Engineer for more than 5 years, teach up to 20 undergraduate subjects, supervising more than 12 thesis, publish more than 50 papers in different international conferences and journals.

Ahmed Khairy Mahmoud is a Post Graduate Student (Ph.D.), Alexandria University, Alexandria, Egypt and became a Member of IEEE in 2012. He was born in Sohag, Egypt in 1974. He holds B.Sc. in Electronics and Communications from Faculty of Engineering, Alexandria University, M.Sc. in Electrical Engineering from Faculty of Engineering, Alexandria University. He received many technical courses in electronic engineering design and Implementation.