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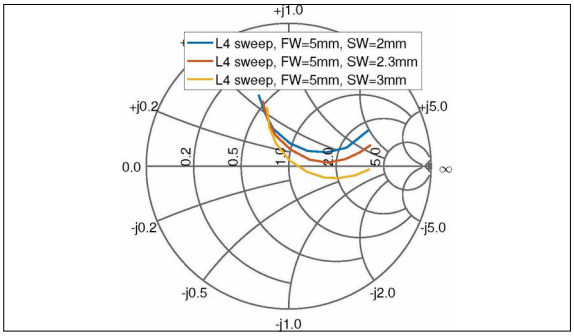
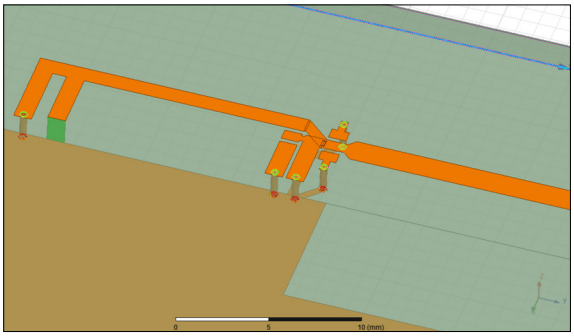
Subject Area	Innovation in Products, Processes and Materials - Industrial Technologies

Reconfigurable Antenna Design

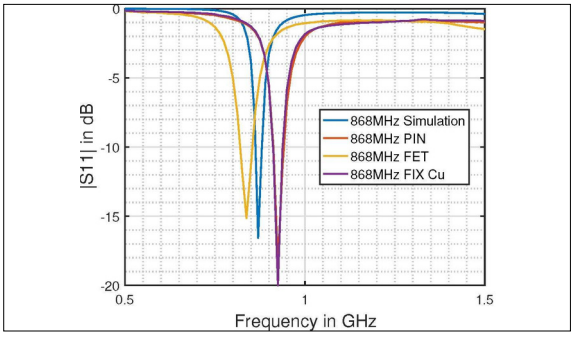
Development of a reconfigurable antenna for IoT



Simulation of the S11 parameter for different dimensions



Designed reconfigurable inverted-F antenna



Simulated and measured S11 parameter for 868MHz for the different configurations

Introduction: The advantages of microelectromechanical systems (MEMS) are currently praised in many articles. The most interesting MEMS in the field of wireless communication is the MEMS switch. The characteristics of such MEMS switches are: high linearity, high power switching, low power consumption and low parasitic effects. The goal in this work is to compare different types of switches in the application of a reconfigurable antenna. The switches that have to be compared are: MEMS switch, FET switch and PIN diodes. To this purpose a reconfigurable antenna has to be designed to compare these different types of switches.

Procedure / Result: The approach for the reconfigurable antenna is a reconfigurable inverted-F antenna. Many applications use the frequencies 2.4GHz and 868MHz, therefore the reconfigurable antenna should be switchable between these two frequencies. The inverted-F antenna is designed using the CEM software HFSS. A set of dimensions that fit both frequencies could be found using parameter sweeping. Of course, one dimension differs for the two frequencies. This dimension can be switched in length. The additional length is either connected to the antenna or to the ground. The inverted-F antenna is fabricated on a standard FR4 PCB and assembled in four configurations: with a FET switch, PIN diodes, and soldered fixed, either for 2.4GHz or 868GHz. MEMS switches could not be ordered because they were either: discontinued, not available anymore, or the order quantity had to be too high.

Result: The measurements showed that the simulation result is close to the measured characteristics if parasitic effects are also respected. While the PIN diode and the fixed soldered configurations have a slight offset in frequency, which can be corrected in a second simulation pass, the FET switch configuration has a huge offset in frequency. Inserting the s-parameters of the FET switch, this offset could be also simulated. Good parameters for the antenna with the FET is difficult to find due to the high capacitance loading at the reflective open pin of the switch. Therefore this FET switch is not useful without simulating the antenna from the beginning including the switch model.