Abstract: An insulator, by definition, carries no conduction current. Practical insulators (e.g. oxide) however seem to not know the definition and as voltages are ramped across them, charges injected from the electrodes accumulate within the oxide, and change their capacitive response in unpredictable ways. The problem of dielectric charging has long been discussed in wide variety of contexts and to this day continue to dictate the material choice in many electronics applications. Indeed, given the history of technological relevance in electronics industry, scientists have worked hard to understand dielectric charging in gate oxides and perovskites for electronic applications. And there is a general perception that the basic mechanisms of the charge injection/accumulation processes are reasonably well understood and that the performance of the oxide – including the charging effect – may be predicted with reasonable certainty over a prolonged period of time. Unfortunately, the dielectric charging in RF-MEMS can still not be described by a comparably predictive model, as it has been difficult to characterize the additional complexity of oscillating electrode making only a fleeting, non-uniform, yet harsh contact with the oxide per cycle. In this talk, we will explore the basic elements of dielectric charging problem specific to RF-MEMS switches and explain our initial attempts to encapsulate these elementary concepts into a simple phenomenological model. The principle of dielectric charging in RF-MEMS is shared by many other devices of scientific (e.g., AFM) and technological (NEMs based non-volatile memory) interest, and therefore we anticipate that even a simple and phenomenological model may be of broad interest to the electronics community.

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