



ROMES SEMINAR SERIES

TITLE OF TALK

Air-interfaces Treatment of Superconducting Coplanar Wave Guide Resonators with Self-assembled Monolayer to Improve their Quality Factor

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Dr. Saleem Rao is an Associate Professor of Physics at KFUPM, Saudi Arabia. In 2005, he received his Ph.D. in Physics from Florida State University, fabricating and characterizing CNT-based integrated circuits. After completing his Ph.D., he served as faculty member in USA and in Pakistan, and in 2009 he joined KFUPM as an Assistant Professor. His area of research is nanoscale integrated circuit fabrication and their characterization including superconducting circuits.

ABSTRACT

Superconducting coplanar waveguide (CPW) microwave resonators in quantum circuits are among the best to read and change the state of artificial atoms because of their excellent coupling to quantum systems. The presence of deleterious thin film amorphous defects can result in an irrevocable loss of coherent information. The amorphous dielectric layers on surface and interfaces in planer superconducting resonators and their associated losses are topics of active research. These resonators are very sensitive to defects in their surfaces, such as two-level systems (TLS) in oxidized metal and nonequilibrium quasiparticles, making these devices suitable probe tools for different loss mechanisms. We will present improvement in quality-factor of Niobium CPW resonators with a particular surface treatment using self-assembled monolayers (SAMs) that results in mitigating the growth/regrowth of oxides in superconducting circuits, where SAM-passivated resonators show more than 106 internal quality factors at single-photon. Quality factor improvement due to SAM is supported by structural characterization tools (SEM, XPS and TEM). We finally compare the improvements in quality factors to our numerical simulations.

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