Title:
From RF-MST to RF Nanotechnology, the way toward nano enabled RF intelligence

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Abstract: Recent developments in micro and nano manipulation of materials conventionally used in microsystem technology (including MEMS) and the recent introduction of fascinating nanostructured matter such as carbon nanotubes and graphene, are expected to trigger a completely new class of devices and systems. These developments are based on the impressive achievements in nanoscale manufacturing processing and on the convergence of multidisciplinary theoretical and experimental observations. Owing to the fact that nanostructured devices exhibit a variety of intriguing properties at radio frequencies (defined broadly here up into the optical frequency range), a new class of devices and systems can be conceived.
The scope of this course is first to introduce the background and the motivation behind the role of nanotechnology with respect to future RF applications. Then the role of materials and manufaturing processes aiming to bridge microsystem technology to the nanoscale will be outlined. In this respect the potential impact of recently discovered carbon based material will be introduced by recalling the expected benefit in terms of miniaturization (smaller and faster FET, interconnects switches and higher frequency/quality factor resonators) and novel functionalities (e.g. ambipolar transport in grapheme based frequency multipliers and detectors, and field emission self oscillation in CNT based resonators and antennas). Finally a series of conclusive remarks on major present limitations and perspectives on future developments will be given.

Outline

1. Introduction: background and motivation

2. Nanotechnology enabler processes and materials:
- Limits of conventional planar lithographic processes
- Nanofabrication and nanostructured materials
- Carbon Based Electronics (Graphene, Carbon Nanotubes)

3. Miniaturization of conventional functionalities
- Graphene and CNT FET
- Interconnects (flexible electronics)
- Nano-electromechanical Switches

4. Novel applications and advanced functionalities
- Graphene frequency multiplier based on ambipolar transport
- CNT electromechanical RF transducer (Nanoradio)

5. Conclusions: Present limitations Perspectives