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Perspectives for Wireless THz Sensing and Communications

D. Bajon[1], H. Baudrand[2] , S. Wane[3]
[2] Université de Toulouse- ISAE-Supaero,[2] RCEM,- Toulouse France, [3] NXP-Semiconductors France

Increasing interest in the application of terahertz wave for communication providing extremely large bandwidths for ultra-broadband applications motivates introduction of photonic technologies for signal generation, modulation and detection. Enhanced bandwidth or data rate together supporting hybrid integration solutions are expected to bridge the gap of fiber-optics and wireless networks.

The monolithic integration offered by SiGe technology solutions opens new perspectives for wireless Inter-Chip/Intra-Chip communications and imaging/detection applications. In addition to standard tradeoffs between application driving parameters such as noise, power, linearity, thermal dissipation, environment conditions, designing functions in THz domain faces specific challenges. Among them are design of active or non-linear components and effective modeling of broad-band material responses [1-2].

Accurate knowledge of materials properties represents a strong enabler for the development of innovative electronic devices, systems and instruments. Extracting effective permittivity function of dielectric materials is essential for simultaneously co-designing their electromagnetic, mechanical and thermal properties where anisotropic effects are properly accounted for. Extracting broadband models of complex permittivity functions fulfilling passivity and causality conditions remain challenging and will be discussed

At THz frequencies, traditional scaling technics are no more applicable and require new concepts for their extension. This contribution will discuss both theoretical and practical considerations [3-4] in the perspective of wireless THz sensing and communication including specific attention on potentialities of plasmonic interactions.