Photobolometer based on high mobility graphene hetero-stacks as enabling technology for sub-THz wireless links

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Transmitting and detecting multi Gbit/s wireless signals at short-distances (~ few m), with low latency (< 0.1 ms) and over sub-THz carrier frequencies is one of the main challenge for 6G communication systems[1], but it can also enable radar applications in food inspection, medical imaging and non-destructive quality control [2,3]. Current electronic and optoelectronic technologies working in sub-THz window suffer of different drawbacks, such as large phase noise, carrier frequency instabilities, limited frequency tunability and large components footprint [4].
In this research project, we are implementing a new approach based on graphene integrated photonics to overcome aforementioned technical bottlenecks.
We assembled high-mobility graphene hetero-stacks relying on chemical vapour deposited graphene [5] and used them to fabricate photobolometers integrated on passive Si_3N_4 waveguides [6]. By exploiting their bias-dependent photoresponsivity, these photobolometers can mix an electrical baseband signal with an optical one and upconvert it.
We report graphene-based photobolometers performing >4Gb/s datarate transmission and working at frequencies >96 GHz, with potential applications up to the D-band (130-170 GHz).

References

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