Flexible Graphene based NFC devices

Presenting Author

Alessandra Scidà (ISOF - CNR, IT)

Co-Authors

Emanuele Treossi (ISOF – CNR, IT),
Samiul Haque (Nokia R&D, UK),
Adam Robinson (Nokia R&D, UK),
Santo Smerzi (ST Microelectronics, IT),
Sebastiano Ravesi (ST Microelectronics, IT),
Stefano Borini (Nokia R&D, UK),
Vincenzo Palermo (ISOF - CNR, IT)

ISOF - Consiglio Nazionale delle Ricerche (CNR),
V. Piero Gobetti 101, Bologna, Italy

alessandra.scida@isof.cnr.it

Abstract

Near-field communication (NFC) [1] is a set of communication protocols that enable two electronic devices to transfer data. NFC devices are nowadays more and more used to identify objects, they are employed in several fields as the tracking and management of inventories, assets, people, animals, in contactless payment systems, in security cards, social networking, etc.

Graphene, a bi-dimensional crystal of pure carbon, is currently one of the most extensively studied materials in the world, both at scientific and industrial level. It has shown exceptional properties from various points of view: extremely high mobility of electric charge, high mechanical strength, excellent thermal conductivity, high surface area and it is impervious to all common gases.

We have realized flexible NFC antennas based on different graphene derivatives. Several designs, materials and configurations were studied and tested. The graphene antennas were laminated on different substrates like paper, silk, PET, PVC, Kapton. The completely flexible graphene NFC device demonstrators were tested with a mobile phone showing good functionality whether flat or fixed on curved objects. Finally, some fully working graphene smart cards, flexible graphene NFC tags and wearable graphene NFC bracelets were prepared in order to be used as electronic keys, business cards and other typical NFC applications. Some of these devices will be showcased at the "Graphene Factory" booth during this conference.[2]

Graphene NFC devices open a new scenario in the field of flexible electronics and communication technology, especially for wearable electronics. By combining material characterization, computer modelling and engineering of the device, the antenna could exchange information with NFC devices such as example mobile phones, matching the performance of standard, commercial metallic antennas. The high conductivity and high flexibility of graphene paper allows the processing and transfer of the paper on a wide variety of substrates materials with scalable, environmentally friendly processes and no need of high temperatures. Being composed of carbon, the paper will be chemically and thermally stable and easily disposable.

References

[1] http://nearfieldcommunication.org/
[2] http://grafene.cnr.it/

Figures

Figure 1: NFC smart card

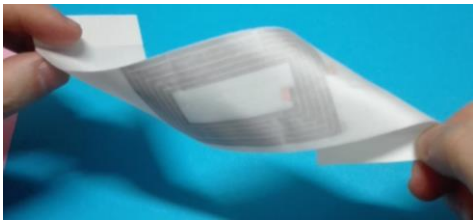

Figure 2: Wearable NFC bracelet