UNIUNEA EUROPEANĂ

GUVERNUL ROMÂNIEI

Instrumente Structurale
2007-2013

Programul Operaţional Sectorial „Creşterea Competitivităţii Economice“
„Investiţii pentru viitorul dumneavoastră“
CENTRUL DE CERCETARE PENTRU NANOTEHNOLOGII DEDICATE SISTEMELOR INTEGRATE
ŞI NANOMATERIALE AVANSATE PE BAZĂ DE CARBON – CENASIC
Proiect co-finanţat prin Fondul European de Dezvoltare Regională

Research Centre for Integrated Systems Nanotechnologies and Carbon Based Nanomaterials

CENASIC

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Project Coordinates

- **Sectoral Operational Program - Increase of Economic Competitiveness**
- **Thematic priority: 4. Materials, processes and innovative products**
- **Implementation deadline: April 2015**
- **Total value: 6,230 k euro**

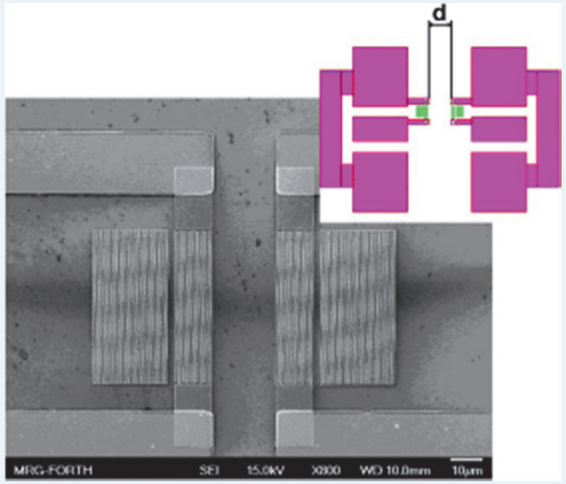
Main Project Aims

- **Development of a research center within IMT-Bucharest, dedicated to technologies based on carbon nanomaterials: SiC, graphene, nanocrystalline diamond**
- **Focused research approach for this RD area, through:**
  - **construction of new spaces for: R&D/education/collaborations**
    - **new building on an existing constructed footprint - over 1000 sqm**
    - **4 levels: clean room, technical level, plus 2 levels for labs and offices**
  - **dedicated technological facilities:**
    - **clean room - 200sqm, class 1000/100 (adjacent and complementary to the CVD+dry-etching clean room)**
    - **advanced equipment for synthesis, processing, characterization, simulation**

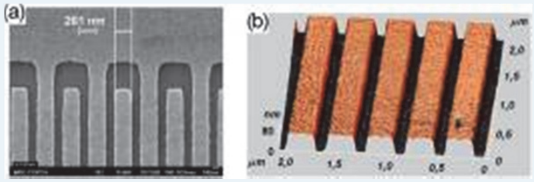
Research Directions

- SiC technologies and functional micro-nanostructures
  - Processes for SiC-based micro- and nanostructures
  - Processes and development of wide band gap materials for high-frequency devices and for MEMS/NEMS with application in energy management
  - Processing for metamaterials and 3D nanostructures for integrated optical systems
- Technologies for graphene and hybrid MEMS/NEMS
  - Technologies for graphene synthesis and processing
  - Development and processing of graphene based hybrid materials for structural health monitoring microsystems
  - Technologies for graphene nanoribbons functionalization and integration in MEMS/NEMS
- Technologies for nanocrystalline diamond and applications in MEMS/NEMS and precision mechanics
  - Technologies for growth and processing of nanocrystalline diamond structures
  - Advanced technologies for nanocrystalline diamond-based sensors applied in scanning probe microscopy
  - Processing of micro- and nanostructures for nanocrystalline diamond resonators

SAW devices for microwave applications



SEM micrograph of the test structure. The distance between the IDTs was d = 20 μm; for the other test structures, it was d = 100, 200, and 600 μm.

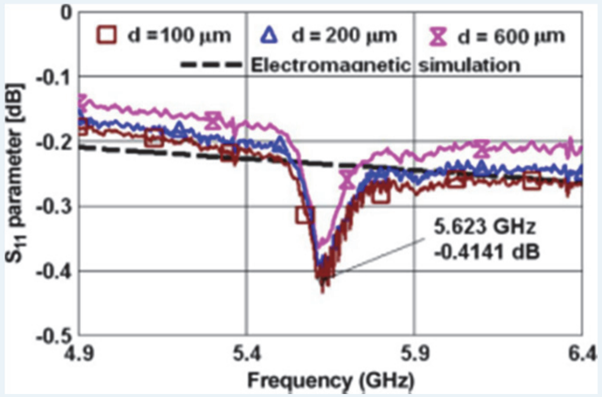


Detail of the nanolithographic process with fingers and interdigits which are nominally 200-nm wide, developed on the GaN surface. (a) SEM photograph. (b) AFM image.

A.Muller; D.Neculoiu; G.Konstantinidis; G. Deligeorgis; A. Dinescu; A. Stavrinidis; A. Cismaru; M.Dragoman; A.Stefanescu; **"SAW Devices Manufactured on GaN/Si for Frequencies Beyond 5 GHz "**

IEEE ELECTRON DEVICE LETTERS Volume: 31 Issue: 12 Pages: 1398-1400 (2010)

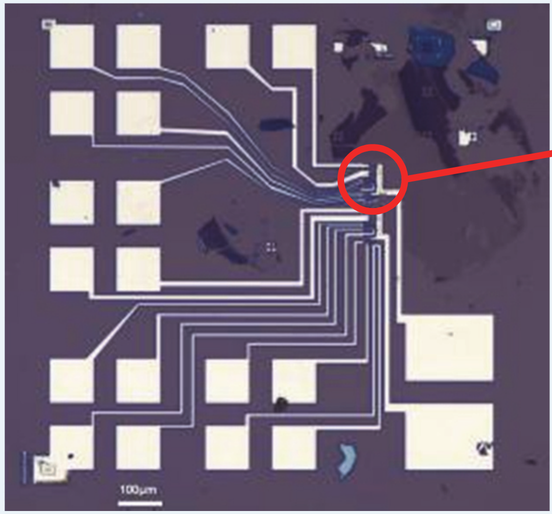
Results 2010
Resonance > 5GHz on GaN



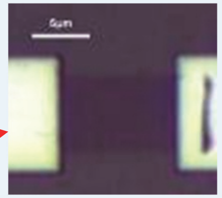
Measured reflection losses ($S11$) versus the frequency for three structures with different distances between the IDTs compared with the electromagnetic simulated results (without the inclusion of the piezoelectric effect).

The highest resonance frequency reported for a SAW structure on GaN (on sapphire) is 2.225 GHz, with the interdigitated transducer (IDT) having 600-nm-wide fingers and spacings: T. Palacios, F. Calle, E. Monroy, and F. Munoz, "Submicron technologyfor III-nitride semiconductors," *J. Vac. Sci. Technol. B, Microelectron. Process. Phenom.*, vol. 20, no. 5, pp. 2071–2074, Sep. 2002.

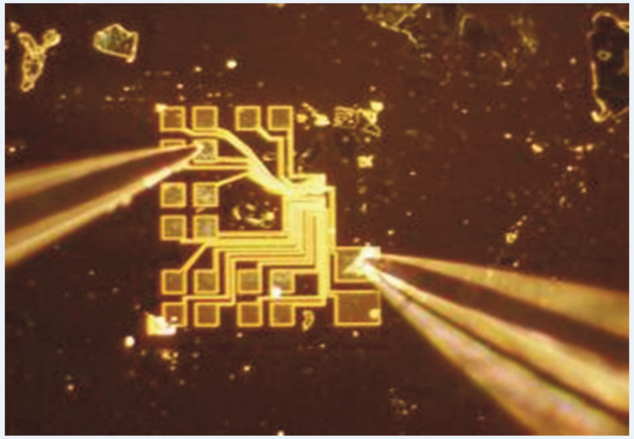
Grahene based devices



Array of 18 BG-FETs on graphene

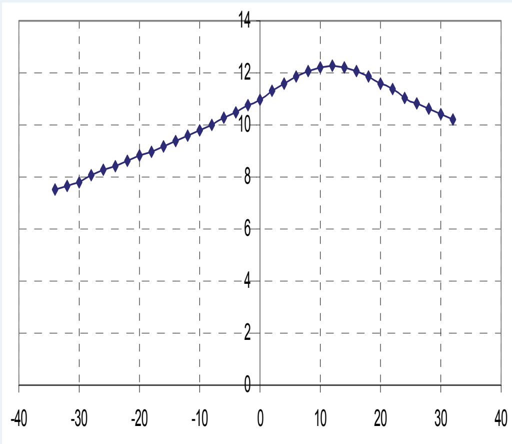


A back gated FET on graphene ribbon

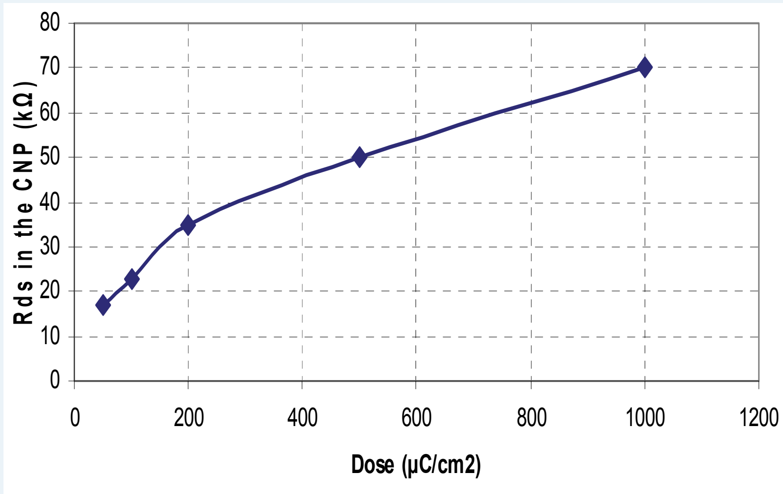


The device under test, on the probing station

Rds (kΩ)



Back gate voltage (V)



Rds in the CNP vs irradiation dose (HV = 200V)

Similar behavior at 500V and 1kV

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Towards a terahertz direct receiver based on graphene up to 10 THz

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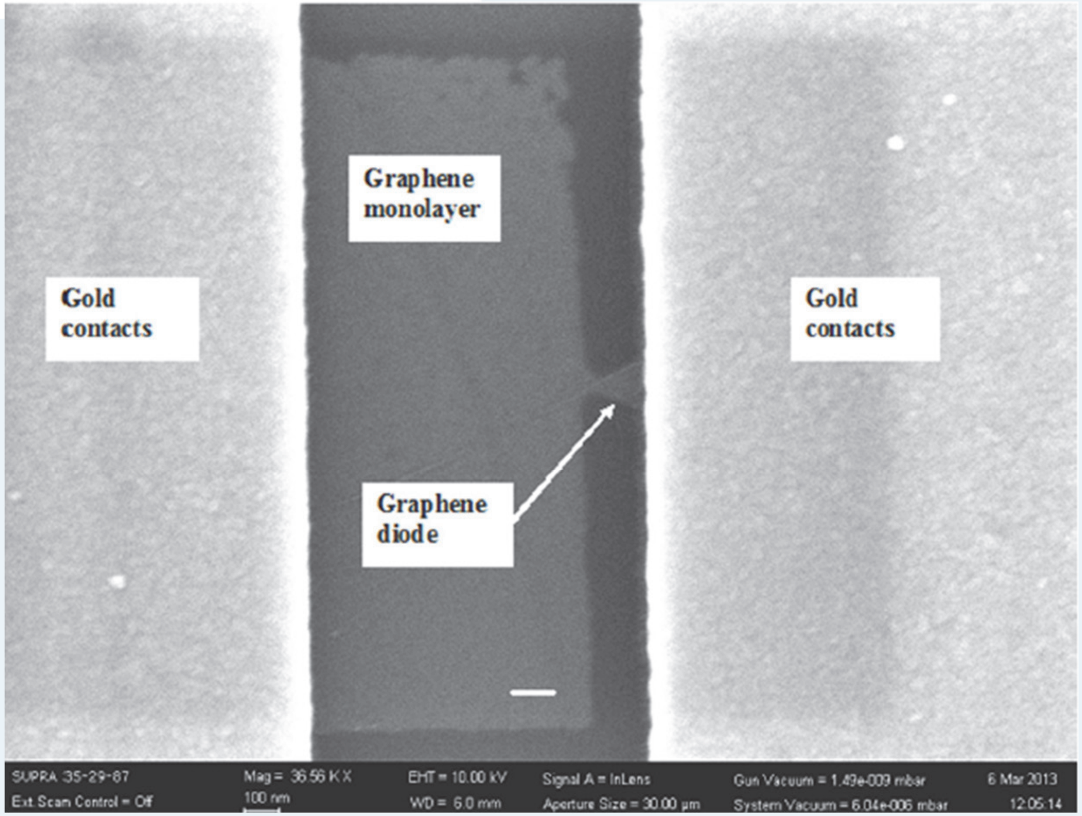
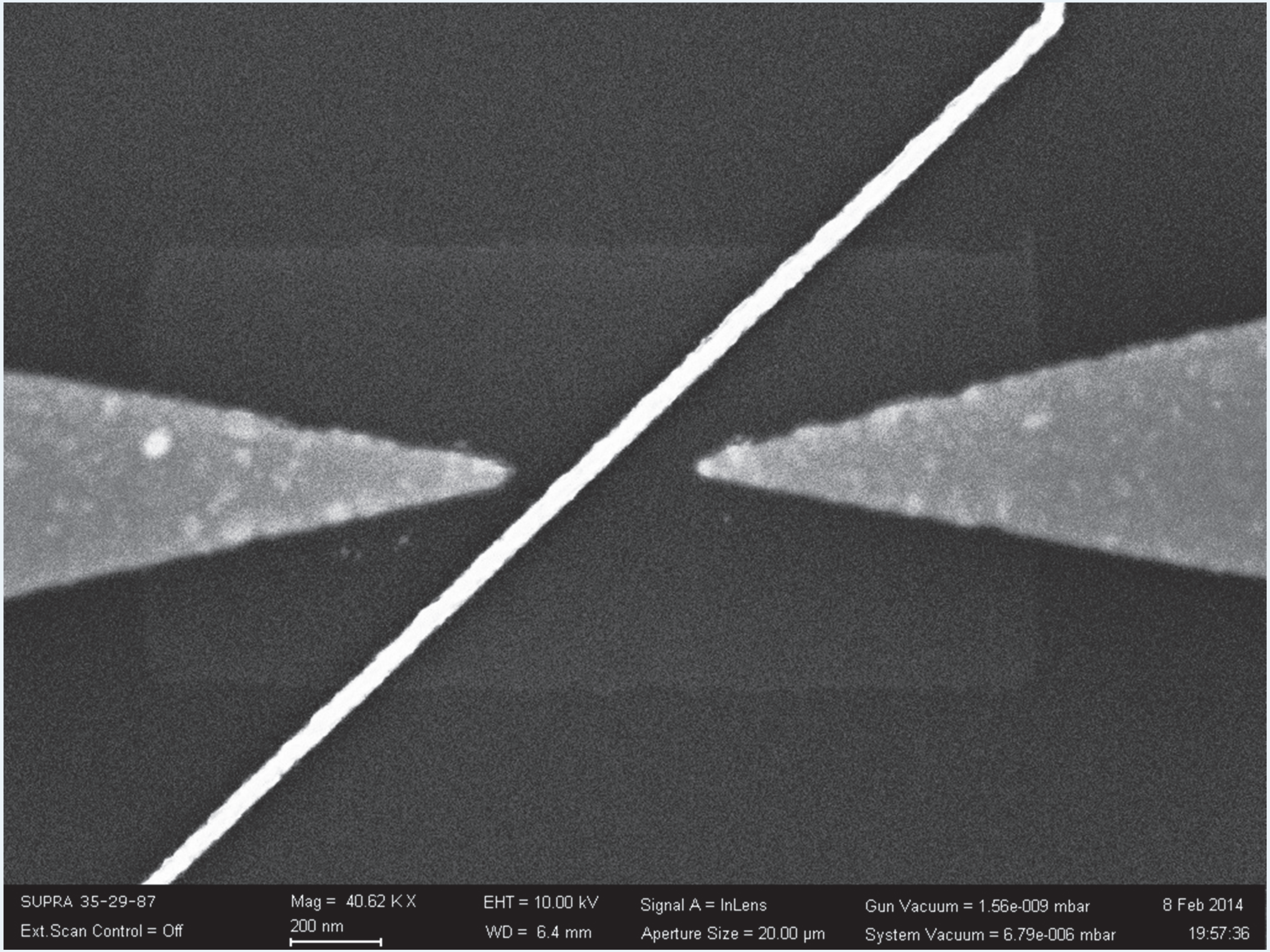
(Received 18 November 2013; accepted 13 January 2014; published online 27 January 2014)

We present a study for a THz receiver based on graphene. First, the dipole and the bowtie THz antennas on graphene are designed, and followed by the on-wafer fabrication of a graphene diode matched to the antenna. Finally the responsivity of the receiver up to 10 THz is computed. Our results show that the antenna and the diode behaviors exhibit new properties (e.g., the antennas are acting as high reactive impedance surfaces, the diode is rectifying only due to its geometrical shape). These new properties are due to the physical properties of graphene having the carrier transport described by Dirac equation.
[http://dx.doi.org/10.1063/1.4863305]




SUPRA 35-29-87
Ext.Scan Control = Off
Mag = 40.62 K X
200 nm
EHT = 10.00 kV
WD = 6.4 mm
Signal A = InLens
Aperture Size = 20.00 µm
Gun Vacuum = 1.56e-009 mbar
System Vacuum = 6.79e-006 mbar
8 Feb 2014
19:57:36