

NANOSCALE-LAB, IMT-Bucharest

IMT- Bucharest is coordinating 2 Romanian innovative networks acting in the nanoelectronics and nanotechnology area, developing advanced research, providing services for structuring and characterization at nanoscale and "hands on training" activities:

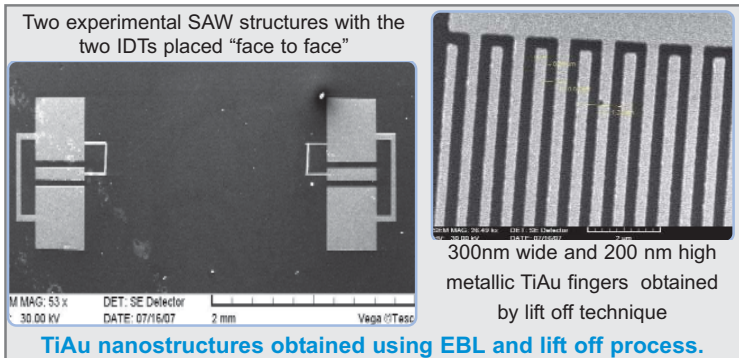
- **RTN-NANOEL:** Romanian Technological Network for integration in the European Platform for NANOElectronics (ENIAC) (2006-2008), **coordinator Prof. Dan Dascalu.**
- **NANOSCALE-CONV:** Network of scientific services for nano-scale structuring and characterization, with applications in the development of convergent technologies (2005-2008), **coordinator Dr Raluca Muller.**

NANOSCALE-LAB is a laboratory open for various research teams, education and innovation.

Equipments in NANOSCALE-LAB:

• **Nanolithography Equipment** composed of a SEM and EBL. EBL Pattern Generator from RAITH. SEM Scanning Electron Microscopy TESCAN VEGA 5136 LM. *Technical characteristics:* Resolution: 3 nm @ 30 kV, accelerating voltage 200V-30 kV, electron gun source: tungsten filament, magnification : 13X – 1.000.000X, detectors: SE, BSE, LVSTD. **Nanostructuring using EB Nanolithography** for manufacturing SAW structures with operating frequencies in the GHz range. The experiments were developed on AlN and GaN thin films with nanometric lines for the IDT.

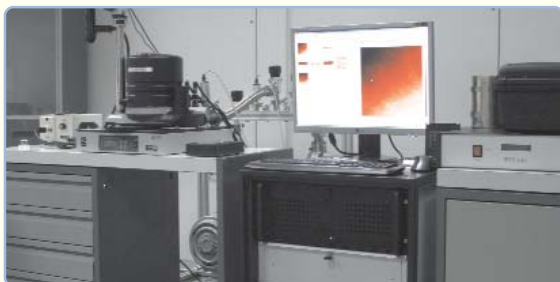
The design transfer on the wafer was performed using a Scanning Electron Microscope equipped with a PG (pattern generator) for direct writing purposes.



New Equipment in the NANOSCALE- LAB!

• **SPM - Multifunctional Scanning Probe Microscope NTEGRA Aura (NT-MDT)** has been recently installed. It allows operation in air, liquids, low vacuum (10-2 torr) and controlled gaseous atmosphere. Vacuum operation optimises the resonance frequency or "Q factor" of the cantilever, producing better images for semi-contact AFM modes and increased sensitivity for non-contact modes such as MFM and EFM (magnetic and electrostatic force microscopy).

Temperature control of the sample is possible up to 200°C. The special Thermohead™ provides extremely low thermal

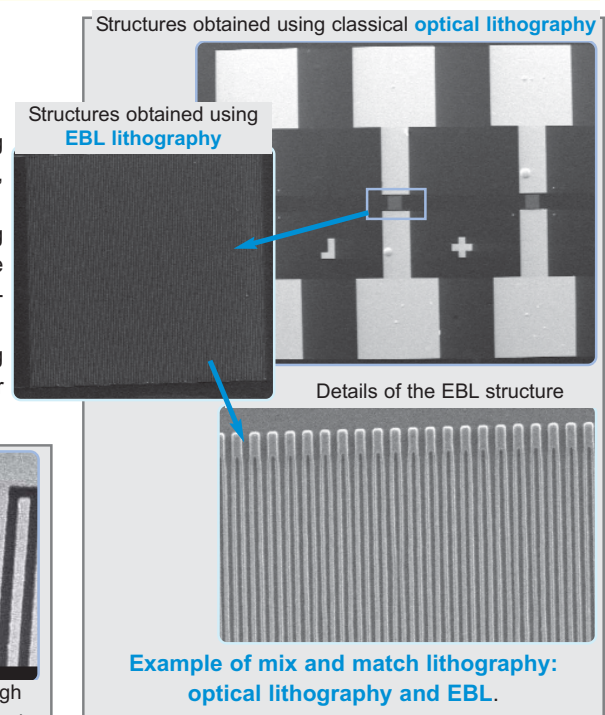


The equipments acquisitioned by these networks contributed to the development of a new lab in IMT- Bucharest:

NANOSCALE-LAB

The mission of the NANOSCALE-LAB is characterization and structuring at the "nano" scale, more specifically:

- Surface morphology imaging and characterization (AFM, STM, SEM);
- Determination of the chemical composition of solid samples, thin layers or particles under investigation in electron microscopes;
- Electron beam lithography for: quantum device studies, diffractive optical elements, MEMS and NOEMS, photonic crystal devices, GMR studies etc;
- Scanning probe lithography;



Results published in the CAS 2007 Proceedings, Vol 1, pp 255-258.

drift, which allows long-term measurements to be done in pre-defined points on the specimen surface.

- Characteristics:**
- Maximum scan range: 100x100x10 μm (up to 150x150x15 μm in DualScan™ mode);
 - Min Control Resolution XY: 0.0004 nm;
 - x, y: Nonlinearity, with closed-loop sensors 0.15%;
 - z: Noise level, with sensors: 0.04 nm (typically);
 - Thermal stability to ± 0.005°C (typically);
 - Operation modes in air: STM Scanning Tunneling Microscopy/ STS Scanning Tunneling Spectroscopy/contact AFM/ LFM/ ResonantMode (semicontact + noncontact AFM)/ Phase Imaging/ Force Modulation (viscoelasticity)/ MFM/ EFM/ Adhesion Force Imaging/AFM Lithography-Force/Spreading Resistance Imaging (SRI)/AFM Lithography-Voltage/Scanning Capacitance Imaging (SCI)/Scanning Kelvin probe microscopy(SKM).

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