SE2A - „Nanoelectronics for Safe, Fuel Efficient and Environment Friendly Automotive Solution"
ENIAC2008-1, Contract No: 12009, 2018 – 2011, Coordinator: NXP Semiconductor Netherlands BV, The Netherlands, 21 European partners

The ENIAC SE2A project has developed Nanoelectronics solutions for automobile manufacturers enabling higher fuel efficiency, lower CO_2 emission and enhanced safety.

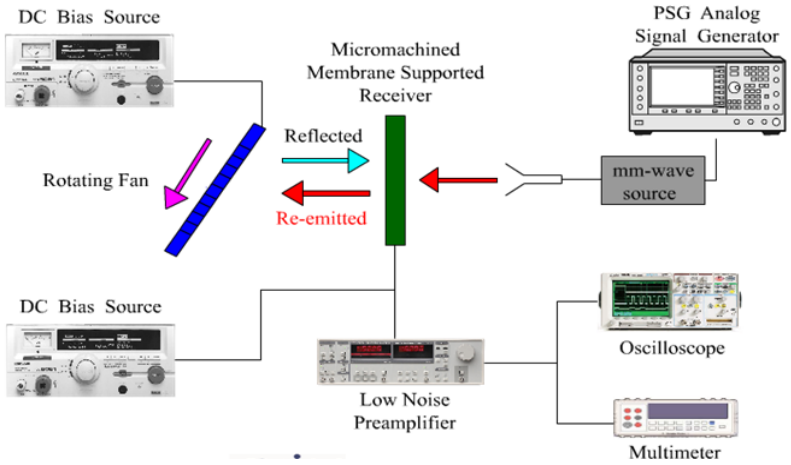
The SE2A consortium consists of European industrial, institutional and academic players in the field of R&D and innovation for automotive applications. It has 21 partners, located in 7 European countries.

Classical methods to measure the speed for cars became imprecise if the road has major irregularities or if it is covered with mud. For SUV cars, it is necessary to have a real ground speed measurement system, because they develop relative high speed (tens of km/h) on low quality roads. Radar type ground speed measurement solutions are most precise and reliable.

IMT team has developed a **Monolithic millimetre wave (77 GHz) Doppler Radar** for real ground speed measurements for SUV cars. The IMT team design and tested the demonstrator and was involved in the manufacturing processes together with FORTH-Heraklion. The laboratory tests were performed at IMT using the novel equipments dedicated to millimetre wave measurements (signal generator, spectrum analyzer up to 110GHz).

The **demonstrator** of radar based real speed measurements was developed and was based on a micromachined receiver structure (the folded slot antenna, monolithic integrated with the millimetre wave GaAs Schottky diode are supported on the same 2 μm thin GaAs membrane).

The demonstration measurements are described bellow:



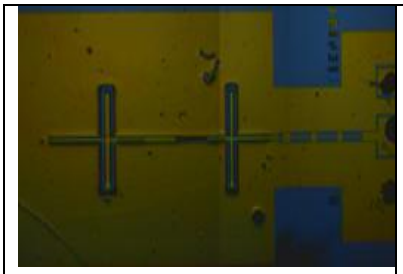
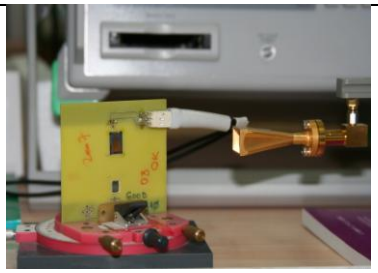
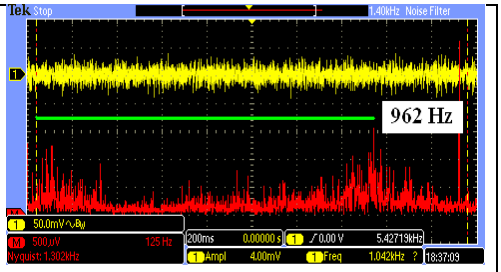
The measurement set-up

The signal is generated by the Analog Signal Generator into the emitting horn antenna, which illuminates the membrane supported antenna. The signal arrives, via the two lobes of the membrane supported folded slot antenna, to the moving surface. The reflected signal

from the moving surface, with a shift in frequency due to the Doppler effect, arrives to the receiver and mixes with the incident signal. The output signal is amplified and displayed on an oscilloscope. The frequency of the signal is depending on the speed of the moving object (a rotating fan covered with an abrasive reflecting material).

There are several applications, e.g. vehicle dynamics and active safety functions that are dependent of a speed measurement. Today, the speed measurement is estimated from the wheels, which is not always the exact combined lateral and longitudinal speed. With a true ground speed sensor, these applications would improve their performance and enhance the safety of the vehicle.

The proof of concept was performed with a membrane supported monolithic integrated direct (video-type) receiver module for 77 GHz based on GaAs micromachining.

		
Membrane supported structure fabricated using GaAs micromachining: monolithical integration of a Schottky diode with a double folded slot antenna	*Detail of the experimental setup: membrane supported Doppler sensor*	*Proof of concept for the true speed sensor:* *Tape speed: 2.7 m/s;* *Doppler frequency: 962 Hz;* *Measured speed: 2.65 m/s*

New design of the membrane supported structure (Electromagnetic modelling and optimization): the mask manufacturing, the characterization of the structures was performed using the IMT infrastructure. Manufacturing of the membrane supported antenna was performed in collaboration with FORTH Heraklion.

One of the partners involved in this research was Volvo company.
The new results obtained within the project were presented at the inauguration of the Renault Technology Romanian- RTR – test center Titu.
Also the successful results permit the IMT team to be invited in other ENIAC projects (on going in this moment).