MNEMOSYNE - Magnetic non-volatile Random Access Memory for SPACE with Serial interface

Program memories are critical components in space applications. They permanently store a program that is executed on a microcontroller or the configuration data for field-programmable gate array (FPGA). They have the strictest requirements in terms of reliability, fault tolerance and radiation hardness. The EU-funded MNEMOSYNE project aims to demonstrate a new generation of radiation-hardened high-density non-volatile program memories with a serial interface. The technology will be based on the most advanced commercially available embedded magnetic RAM using a 22 nm FD-SOI process. If this proves successful, the project will unveil the first radiation-hardened non-volatile program memory with a density higher than 64 Mb for space applications.

Memories are critical components for space applications. They can be separated into three types: mass, cache and program memories. The latter permanently stores a program which can be executed as a MCU boot memory or FPGA configuration non-volatile memory (NVM). In space applications, the program memory is the one which requires the highest reliability, zero error tolerance, and the highest radiation hardness as it is directly related to the system power up. On the other side, as the requirements of system performance increased, integrated circuits (IC) are more and more dense. The recent space program memory requires higher speed and density. For example, the European rad-hard FPGA BRAVE NG-Medium requires at least a 13Mb configuration. The next generations NG-large, and NG-Ultra will require 128Mb and up to 512Mb high speed, low pin-count configuration memories. Currently, for this critical memory, there is no European radiation hardened memory component available.

MNEMOSYNE project aims to develop (design and prototype) the new generation of radiation hardened high density NVM with serial interface based on most-advance and matured European commercially available 22 nm FDSOI Magnetic RAM (MRAM) technology.

Thanks to FDSOI semiconductor structure, this process naturally provides good radiation tolerance. In addition, MRAM technology is naturally SEU immune. Key innovations are:
- The first European RHBD (radiation hardened by design) space NVM with density higher than 1Mb;
- The first World Wide RHBD space NVM with density higher than 16Mb;
- The first European embedded RHBD high performance space NVM IP core on process lower than 65nm;
- The first new generation Spin-Transfer Torque (STT) MRAM for space application;
- The first RHBD applied on 22nm FDSOI on both digital and analog IPs' for TID & SEE mitigations;

The development of a high density MRAM will reshape the whole memory chips market for space industry and beyond.

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Find out more: **https://cordis.europa.eu/project/id/870415**