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Assessment of Mixed Signal Technology

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In 2013, within the ECI (European Component Initiative) program of the European Space Agency, the activity "Assessment and characterization of Mixed Signal Technology" has been initiated. In this paper the activities performed for the assessment and selection of an European mixed signal technology suitable for the development of ASICs for space applications will be described. In order to drive the assessment and selection process three different surveys have been carried out. The main results will be presented in this paper.

In the first survey a comparative assessment, the availability of several existing European mixed signal technologies has been performed. The assessment focused on the availability (access, licensing, condition for use, process lifetime, process options, supported tool chain, etc.), environment supported (voltage and temperature range, radiation tolerance, ESD and EMC levels, etc.), quality features (wafer thickness, yield, FIT, PID, failure analysis support, process stability, etc.), analogue (Spice model accuracy, devices primitives availability, simulators model supported, etc.) and digital (gate density, power consumption, clock frequency, supply voltage range, leakage current, cell libraries, model accuracy, supported tool chain, sign-off, etc.) performances.

In the second survey, inputs covering the needs for mixed-signal ASICs from the space community and the Agency's planned missions has been collected.

In last survey, information about the existing rad hard libraries and design kits in terms of primitive devices, SEEs, TID and reliability performances have been collected. Six European foundries have been contacted: Atmel, Austria Micro Systems (AMS), IHP Microelectronics, ON Semiconductor, Telefunken Semiconductor and XFAB; the data obtained from a total of 18 technology processes have been collected and analysed.

Based on the review of the data obtained by the collected questionnaires and by consideration that multiple mixed signal ESA and national Space Agencies activities are currently on-going on several technologies, the CMOS High Voltage 180nm process with NVM option by XFAB has been chosen for further characterization in phase 2. The work will consist in the design of a test vehicle containing primitive devices and simple circuits. The characterization will consist of I-V and C-V curve extraction, end of life (EOL) test, Total Ionization Dose (TID) test, Single Event Transient (SET) evaluation in term of pulse width and charge injected and it will be aimed to analyze the reliability and radiation test results. The final objective is to extract electrical basic analogue device models and to incorporate those into the design-kit.

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