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P11 - Fifteen years of the microbeam facility at the INFN-LABEC laboratory in Florence

Friday, 11 July 2014 13:00 (1 hour)

2014 is a very significant year for the applied nuclear physics group in Florence, as twenty-five years have passed since the start of the activities in Ion Beam Analysis (IBA), fifteen from the birth of our external microbeam and ten since the new accelerator installation.
The first electrostatic Van de Graaf accelerator arrived in the early 70s and allowed for the beginning of nuclear physics experiments in Florence. From the mid of the 80s, some of the younger members started to work in applied physics and the first IBA studies were accepted for publications in 1989. Since the late 80s and throughout the 90s, IBA activity developed in both environmental and cultural heritage fields; in the latter, main results were obtained in the characterisation of medieval and Renaissance pigments and for the reconstruction of the chronology of Galileo's writings by PIXE.
At the end of the 90s, the EMBE (External MicroBEam) experiment was financed by the Italian National Institute of Nuclear Physics. In 1999 a strong focusing doublet, allowing for the extraction of the first microbeam, was installed, followed in 2000 by a beam scanning system. In 2004, the new Tandem machine in the new laboratory in Sesto Fiorentino allowed for a better beam quality, as regards energy definition, stability, transport and minimum dimensions. Beam transport became easier, faster and highly reproducible, thanks to the installation of a computer-controlled diagnostic system, based on 5 beam profile monitors and 3 monitoring stations along the beam path.
The 2-detector PIXE setup of the early 2000s has been gradually upgraded by making the PIGE, BS and IL techniques also available. By the end of 2000s, the IBIC and STIM techniques have been operative; to obtain this result, it has been necessary to reduce in a controlled way the beam intensity from the nA range down to few thousand of particles per second. This has been achieved through a setup for the detection of the forward-scattered particles in the [-90, 90°] angular range. Detector positioning has been remotely actuated, which has allowed us to quickly adjust the beam intensity to any desired value.
The installation of a second independently-positioned detector in the forward configuration opened up to the possibility of detecting hydrogen in external, even in coincidence mode, to enhance the sensitivity. The most recent developments regard the feasibility study of extracted carbon microbeam.

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