

ESR 13

Development of neutron dosimetry & spectrometry using track detectors

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Mauritius island!!







Mauritius



- Developing country with a diversified economy
- Independent since 1968
- Multicultural population of 1.2 M inhabitants
- Volcanic island of lagoons and white sand beaches
- Unfortunately, lack of infrastructures at the UoM to study advanced experimental physics



Education

➤ BSc degree in Applied Physics

- University of Paris Sud 11



➤ MSc degree in Fusion Science and Technologies

- Commissariat à l'Energie Atomique (CEA), Ecole Polytechnique de Palaiseau & Université Paris Sud 11
- Diagnostics for Inertial and Magnetic confinement fusion devices
- Simulation of the wall surface damage from high energy particles in the International Thermonuclear Experimental Reactor (ITER Organization)



ARDENT

- PhD on Neutron dosimetry and spectrometry with track detectors
- Early Stage Researcher (ESR) n° 13
- Starting PhD on January 2013 due to delay on visa and residence permit process...
- Further partnerships with AIT, CERN
- Possible research collaboration with CNAO



Host organisations

- MI.AM

- Development of instruments for measuring ambient radiation
- Radon detection
- POLITRACK system for automatic analysis of track detectors

- POLIMI

- Hosting university for the PhD project
- Development of adapted Monte Carlo codes
- Statistical physics
- Further investigation into personal and environmental neutron dosimetry

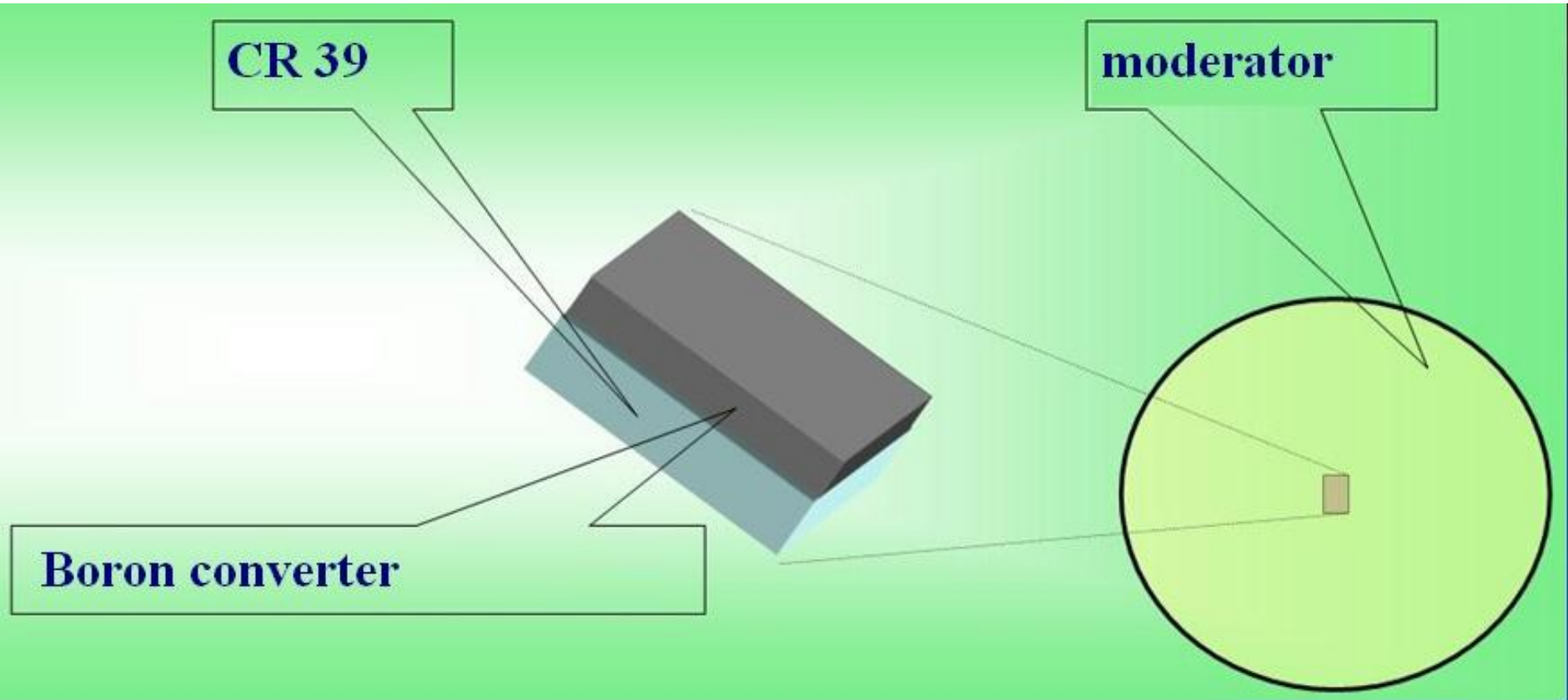


Development of neutron dosimetry and spectrometry using track detectors

1. Use of CR-39 track detector coupled to a boron converter, as thermal neutron detector (exploiting the n, α reaction on ^{10}B), inside Bonner spheres and REM counters.
 - The neutron is detected by the 1.47 MeV α particle.



Use of CR39 as thermal neutron detector

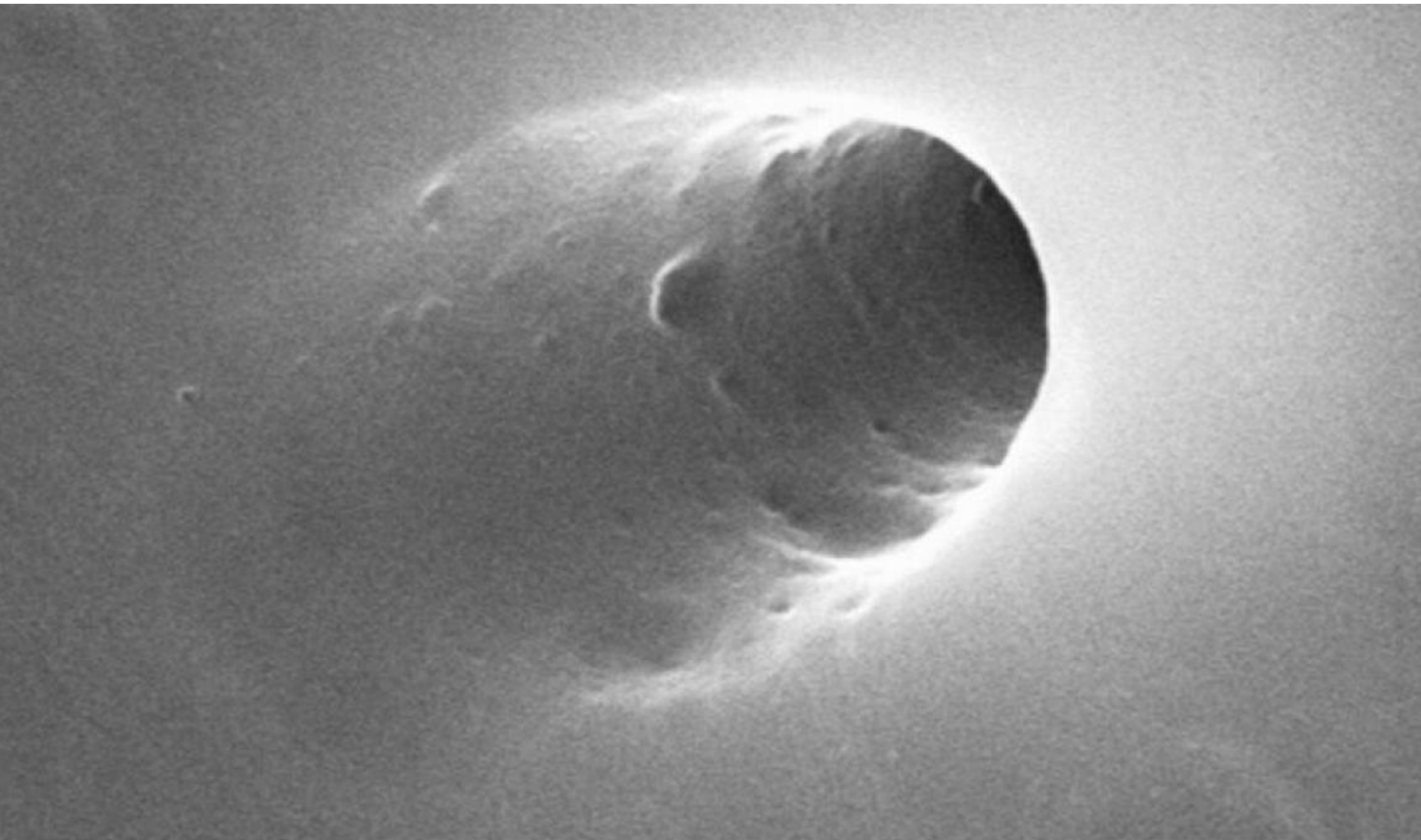


Development of neutron dosimetry and spectrometry using track detectors

- Use the recoil protons (radiator–degrader technique).
 - The number of tracks is proportional to the fast neutron fluence.
 - The detection efficiency depends on the neutron energy.
- Calculation of particle LET and impinging angle.
 - Direct estimate of the equivalent dose by calculating, for any particle the dose and the quality factor $Q(\text{LET})$.



Cone shape track left after chemical treatment (Etching)



10-Jun-2003
Detector= SE1

EHT=20.00 kV
Mag= 11.79 K X

I Probe= 100 pA
1μm



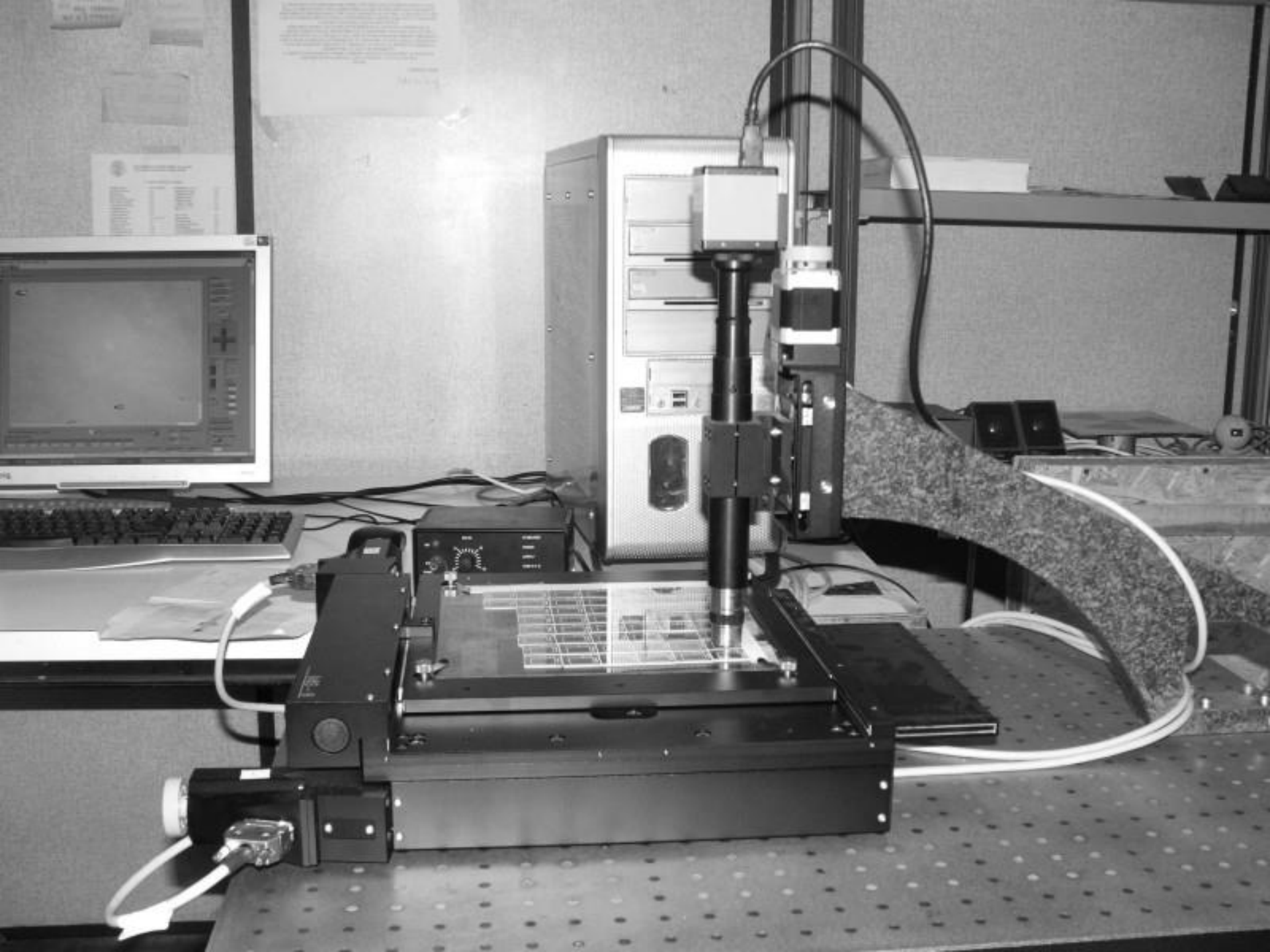
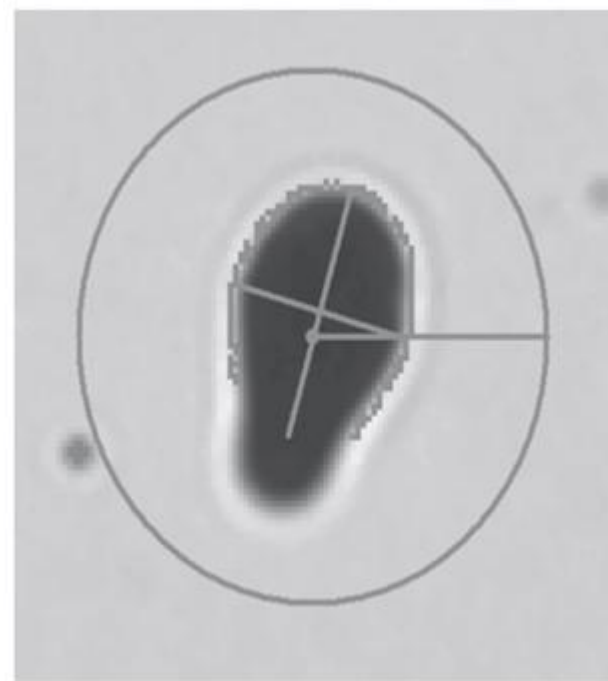
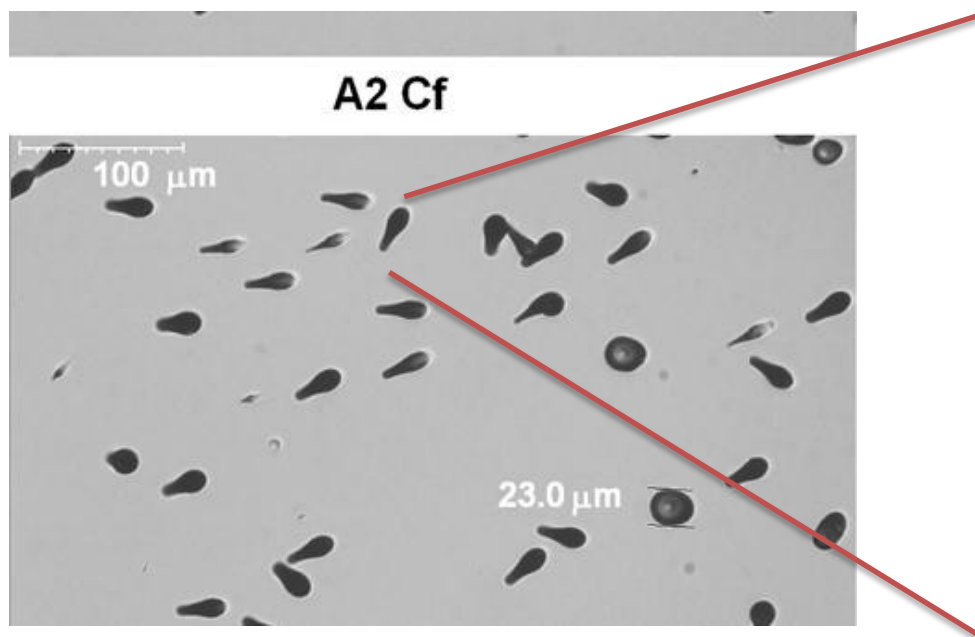
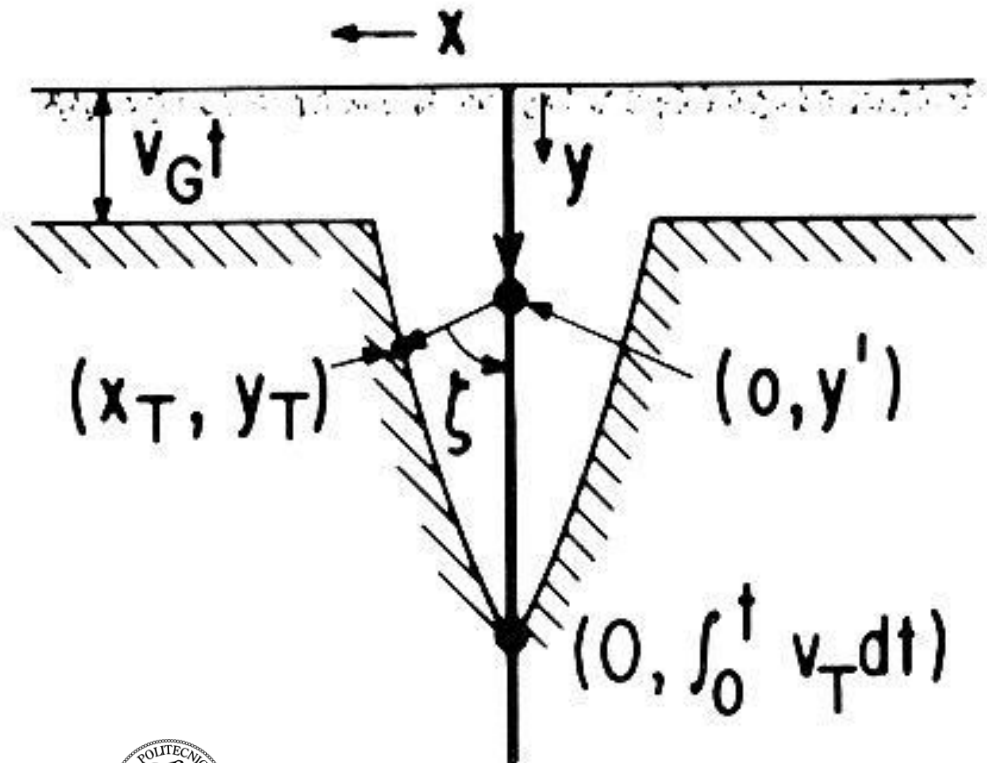


Image processing with POLITRACK



- V_t measured from geometrical parameters of tracks formed
- LET deduced from V

ORIGINAL SURFACE
SURFACE AT TIME t



Work in perspective:

- A full Monte Carlo characterization of the dosimeters
- Angular response still to be understood
- Metrological characterization for personal and environmental dosimetry
- Medical physics application (?) : secondary dose evaluation due to fragments, with LET spectrometry



Thank you for your attention!