Introduction ARDENT ESR5

Host Institute: Seibersdorf Laboratories
Supervisor: DI Dr. Peter Beck

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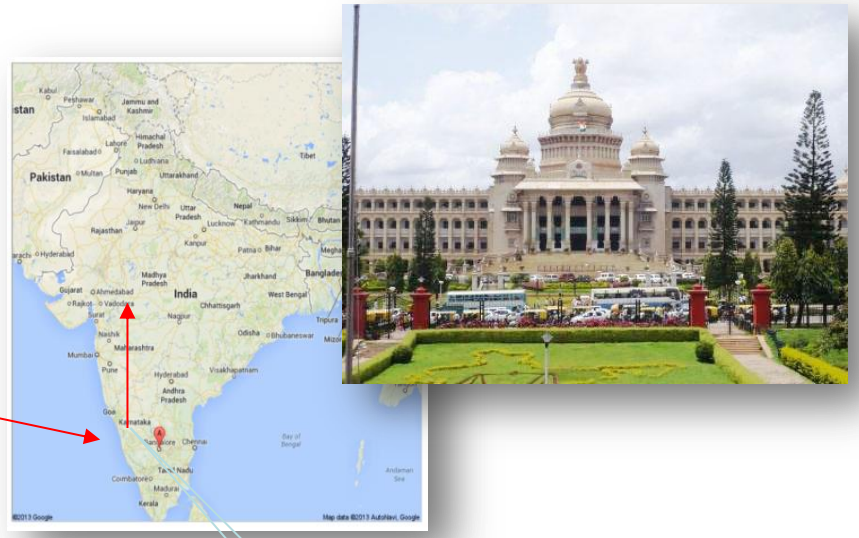
Seibersdorf Laboratories, Austria

ARDENT Workshop
Milano, 14 – 18, October 2013

Education - Undergraduate

1981 – 1999

- Grew up in Bangalore (India)



1999– 2003

- Electronics and Communications Engineering
- University: Maulana Azad National Institute of Technology - Bhopal (India)
- Final Degree: Bachelor

Education – Postgraduate

2005 – 2006

- Information Technology
- University: Scuola Superiore Sant´Anna, Pisa (Italy)
- Final Degree: Master

2006

- Research internship – Cognitive Neurosciences
- Institute: International School for Advanced Studies Trieste (SISSA) - Trieste (Italy)

2006 – 2007

- Courses in Cryptography, Rings and modules at University of Padova (Italy)

2008 – 2009

- Courses in Sustainable Energy at University of Porto (Portugal)

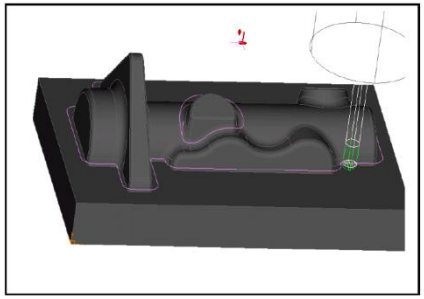
Employment

2004 – 2005

- Engineer (Design and Development) at **Tata Elxsi Ltd, Bangalore**
  - Software Testing and Development: Embedded Electronic devices

2009 – 2011

- Research Engineer at **Missler Software, Evry (France)**
  - Computer Aided Manufacturing Software
  - Algorithms for Pencil machining operation



2011– 2012

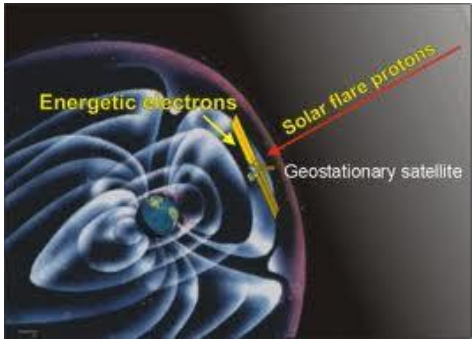
- IT Engineer at **World Organisation for Animal Health, Paris**
  - Database Testing
  - Automatizing Database-queries

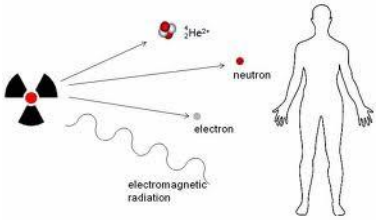
My Interests in ARDENT

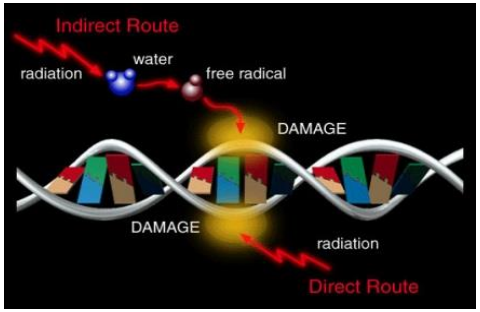
- Gain expertise in radiation effects due to space radiation
  e.g. DNA-damage, microdosimetry, single event effects in electronics

- Dosimetry in mixed radiation fields

- PhD degree to increase my chances of obtaining a researcher position with teaching responsibilities







Proposed PhD

Working Title

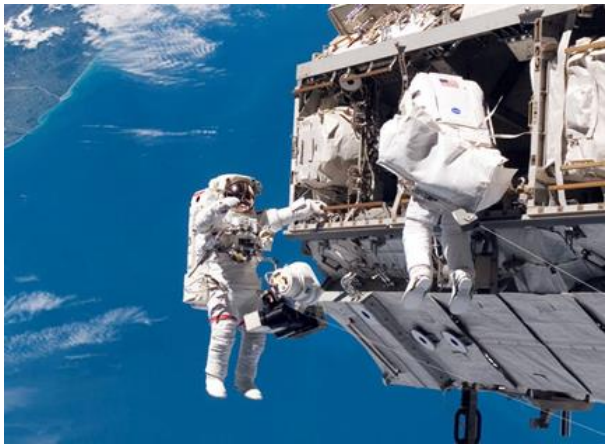
Investigations on Space Radiation and its Effects to Humans and Electronic Components using Methods of Microdosimetry

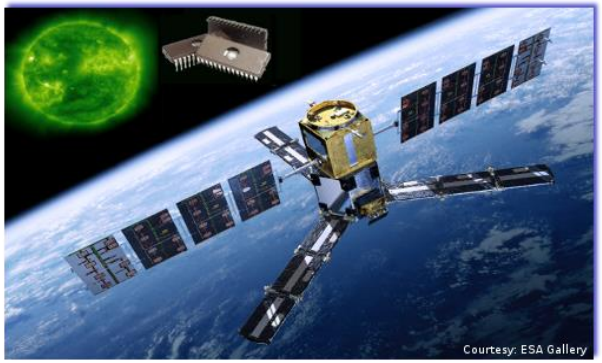
Objectives

- Compare measurements and numerical calculation of microdosimetry quantities in mixed radiation fields using TEPC
- Undertake exposure experiments on electronic components in space radiation-like accelerator facilities using different shielding materials

Methods

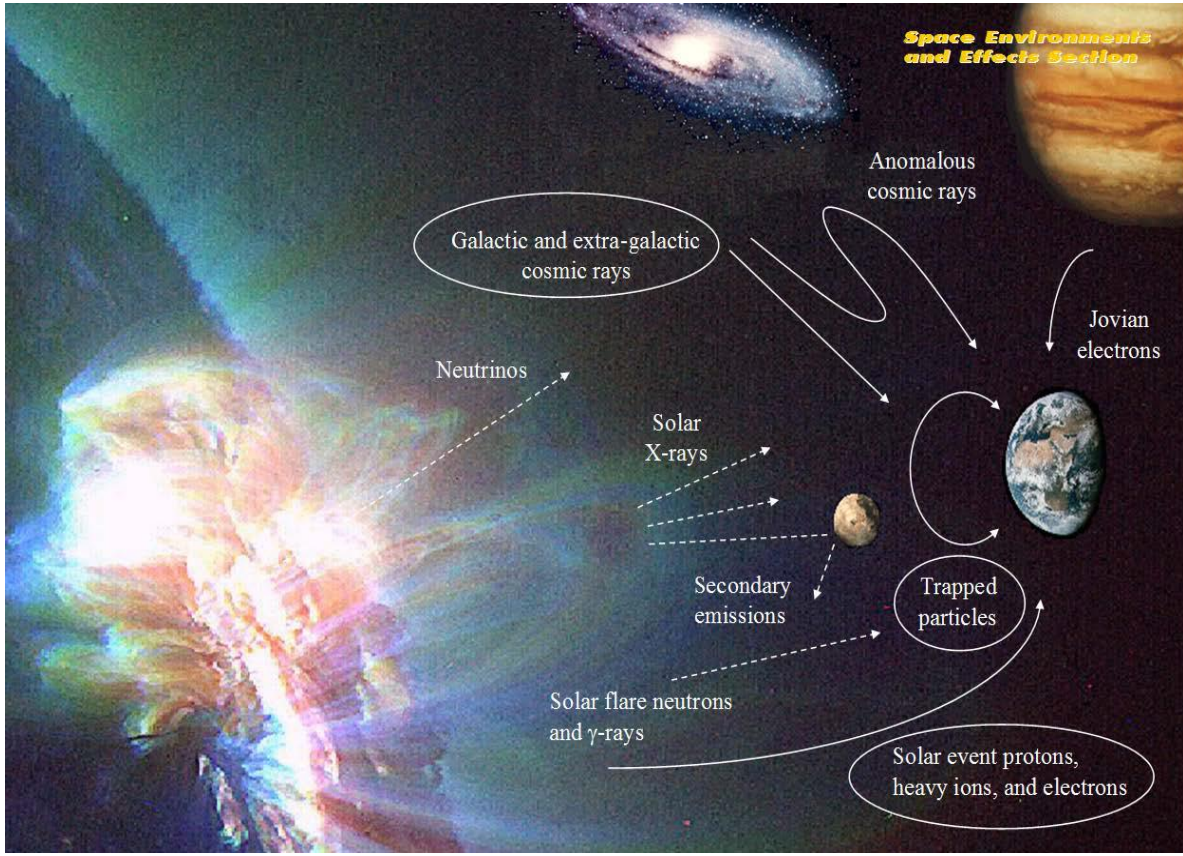
- Exposure experiments at accelerator facilities
- Numerical simulations using Monte Carlo methods (FLUKA, GEANT4)





Space Radiation Environment

- Investigate space radiation environment
- Discuss effects of energy and particles:
  - Electrons
  - Protons
  - Neutrons
  - Heavy ions



Microdosimetry – TEPC

EuCPAD: European Crew Personal Active Dosimeters

Team: DLR, SL, PTB, Tyndall, MIRION

Associated Partners: LNL-INFN, Univ. of Padova.

- Radiation quality and dose in complex radiation field in Space at the International Space Station (ISS)

- Document Astronaut's exposures and support risk assessment

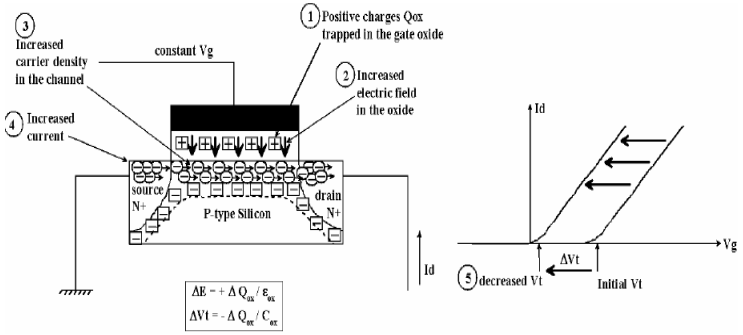
Activities:

- Measurements of TEPC in irradiation facilities
- Numerical simulation by Monte Carlo methods

Space radiation effects in electronics

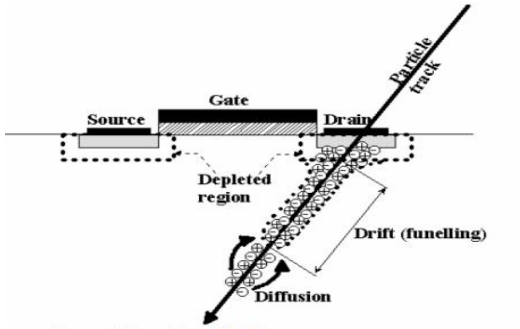
Total Ionizing Dose Effects (TID)

- Charge Accumulation Effects
- Displacement effects



Single Event Effects (SEE)

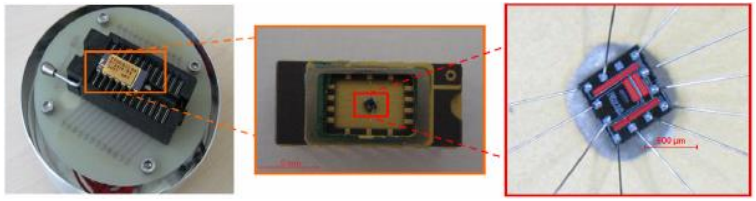
- Single densely ionizing particle effect
- Critical charge density along the track
- e.g. single event burnout, single event gate rupture, single event latch-up, single event upset



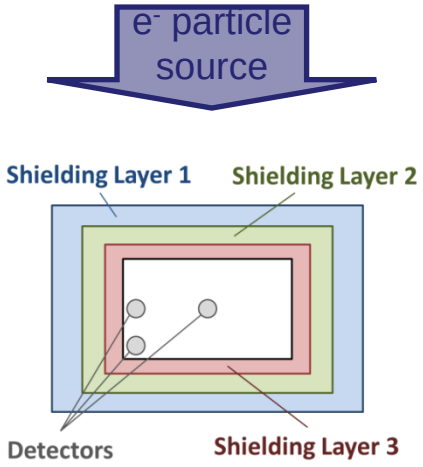
Funelling in MOS :
Transient pulse in a node
=> upset in SRAM (latches)
and error in logic circuits.

Shielding Study

e2-RAD: Energetic Electrons Radiation Assessment Study for JUICE (JUpiter ICy moons Explorer) Mission



- Investigate shielding (materials, geometry, layers, thicknesses)
- Experiments for measurements in electron radiation field: 5 - 35 MeV
- Study degradation due to exposure in RadFET
- Numerical modelling using GEANT4 and FLUKA.



Current activities

- Literature review
- Enrollment into PhD programme at Technical University of Graz
- Enrollment into German language course
- Visit of ESA/ESTEC to discuss about training/secondment.
- Training course on FLUKA (7-11 October, 2013)

Future Steps

- Training course on GEANT4 2013/2014.
- Discuss and finalize upon options for secondment.
- Visit of CERN radiation effects to components
- TEPC experiments at HIMAC, Japan
- Exposure of EEE components at PSI

Thank you for your attention!