Karlsruhe Institute of Technology

The intensive DT neutron generator of TU Dresden

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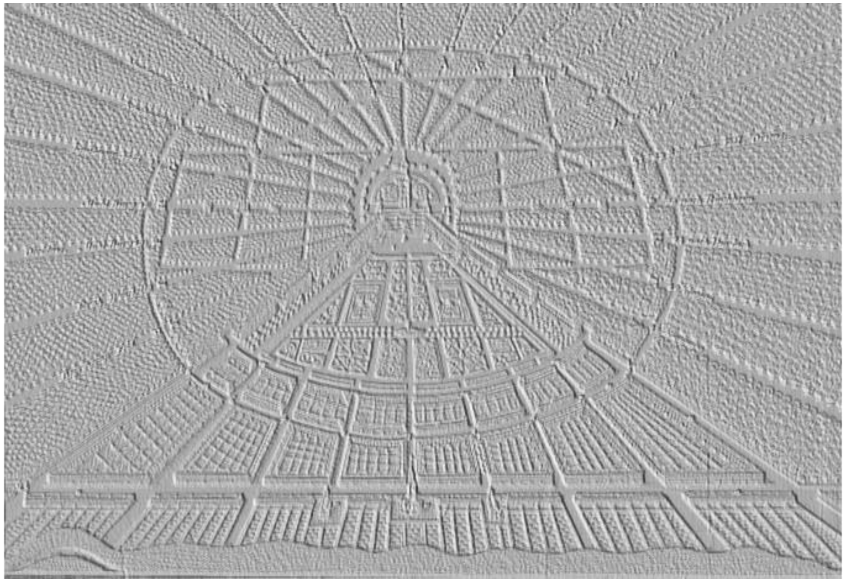
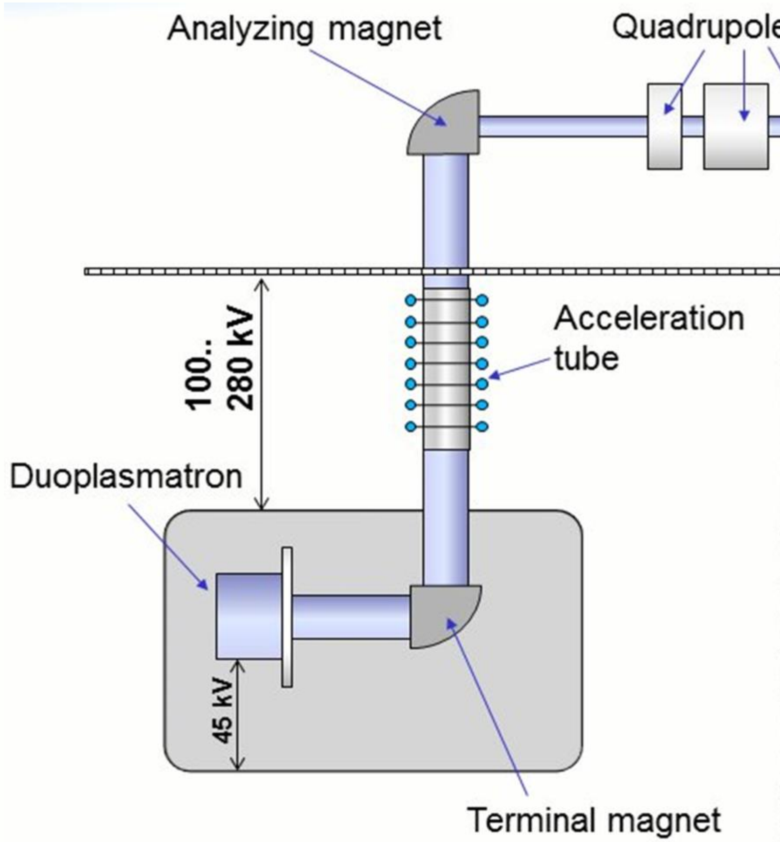
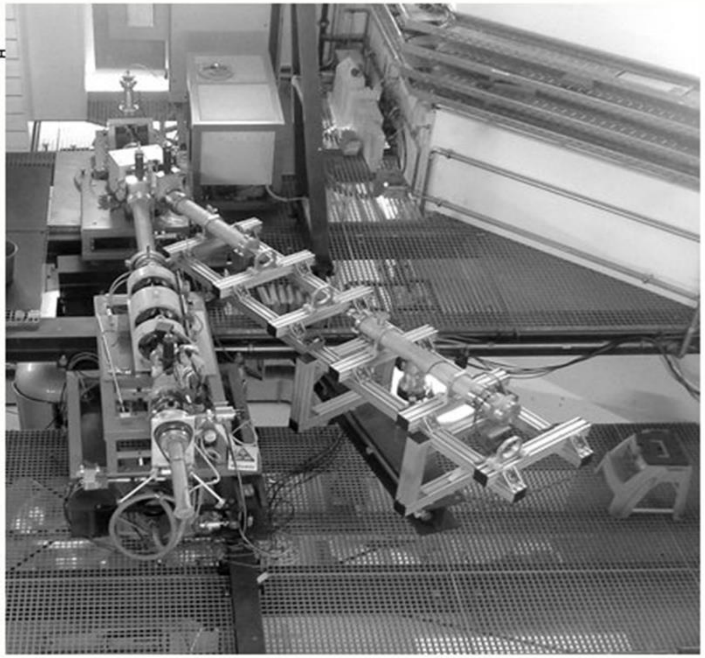


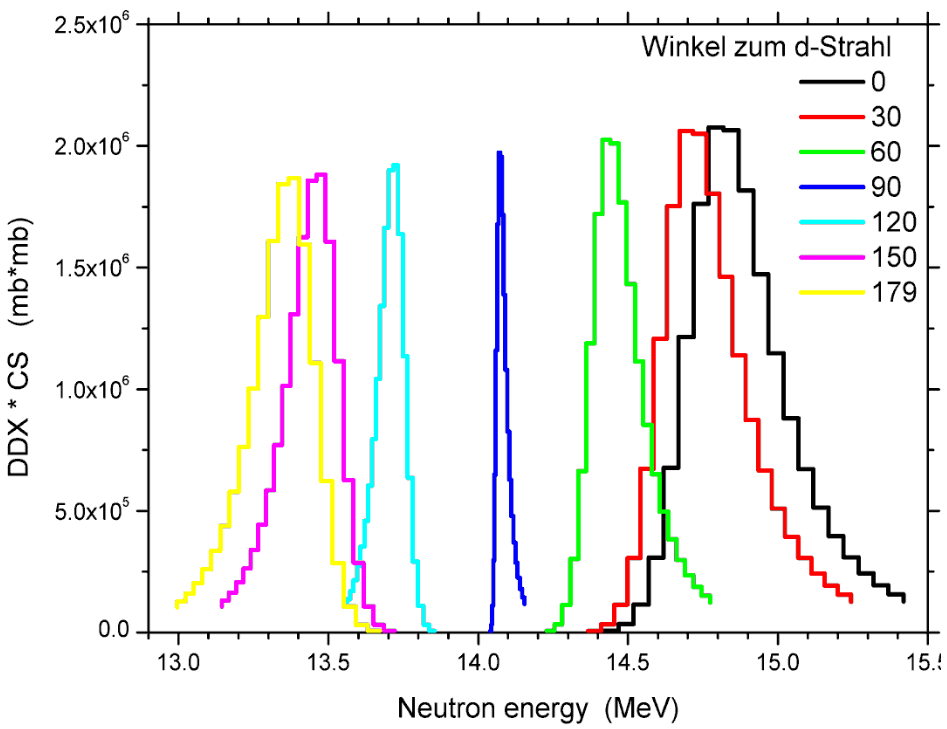
Technical University of Dresden Neutron Generator

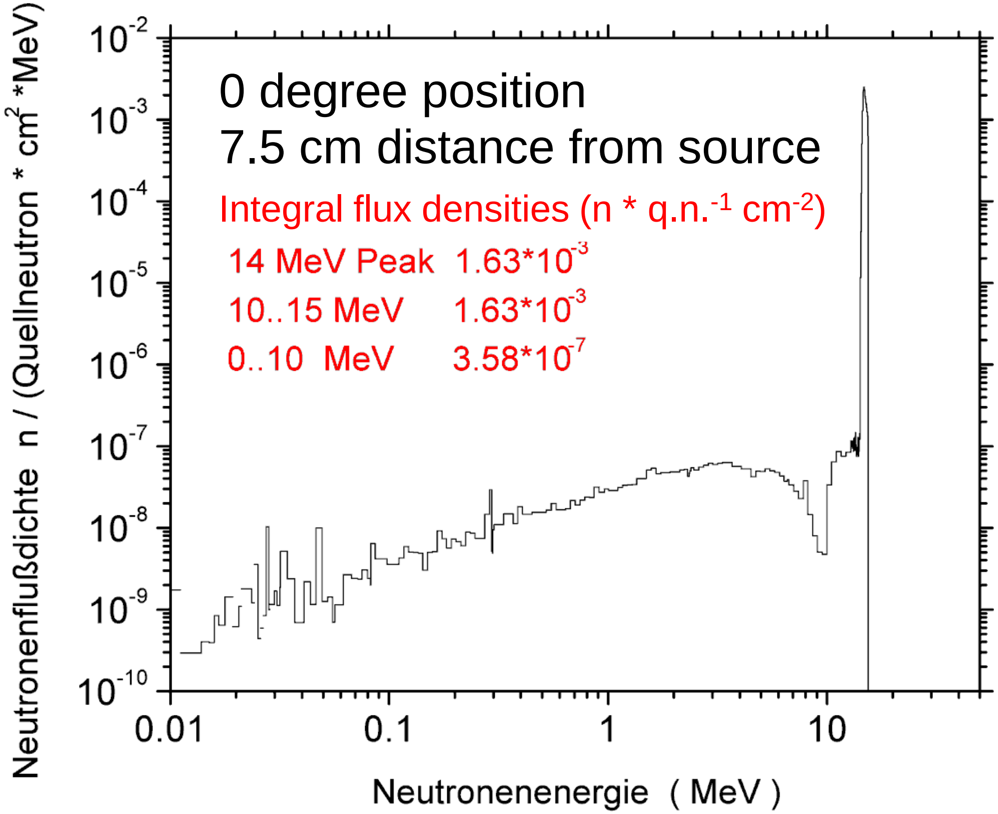




- Accelerator with Greinacher multiplier (Cockroft-Walton)
- Cw and pulsed mode (μs available, ns upgradeable)
- Solid-type water-cooled tritium target based on titanium matrix
- Maximum beam current 8...10 mA
- Neutron yield at 1 mA of the order of 10^{11} n/s in 4π
- Neutron source monitored via α/p associated with the DT/DD reaction, and a ^{238}U fission chamber

Technical University of Dresden Neutron Generator





Calculated spectrum of the DT neutron peak depending on angle to d-beam

Assuming thick target and 320 keV deuteron energy

Calculated neutron spectrum

Neutron energy distribution from DROSG[1]

Transport through target assembly with MCNP[2] .

1) M.Drosg, DROSG-2000: Neutron Source Reactions, IAEA-NDS-87, IAEA Nuclear Data Section, May 2005
2) MCNP—A General Monte Carlo N-Particle Transport code, Version 5, Report LA-UR-03-1987, Los Alamos, 2003

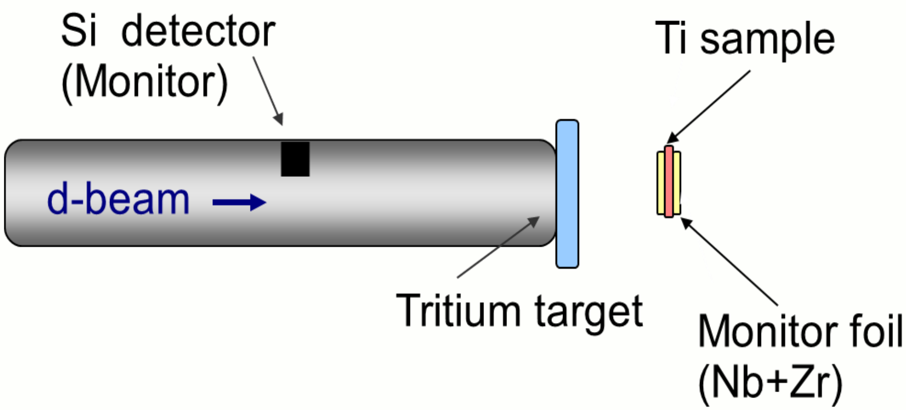
Material activation for ultra-low background experiments and nuclear fusion

Ti sample in fusion peak field of DT generator

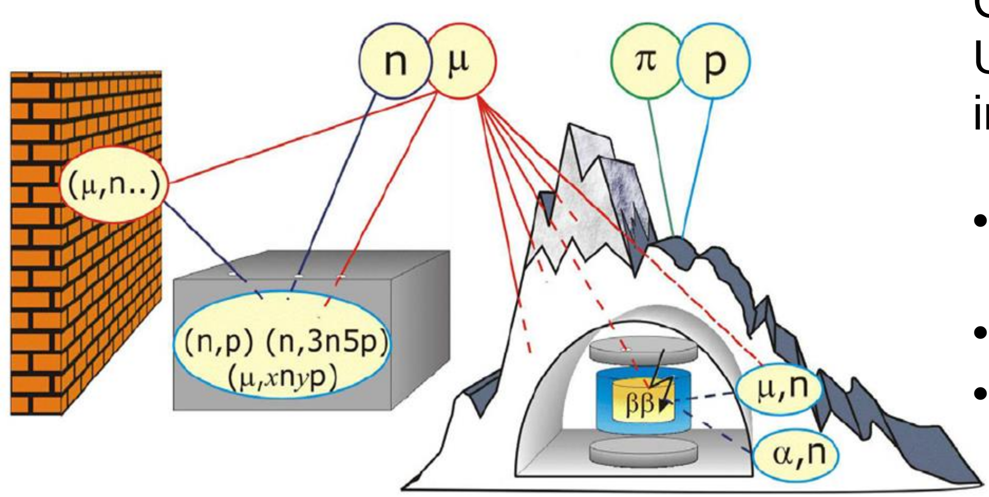
Sample size: 1 cm^2 x 0.5 mm thick

Irradiation time: 2.46 hrs, fluence $5.41 * 10^{11}$ n/cm^2

Measurement: γ-ray spectra at several times after irradiation with HPGe spectrometer



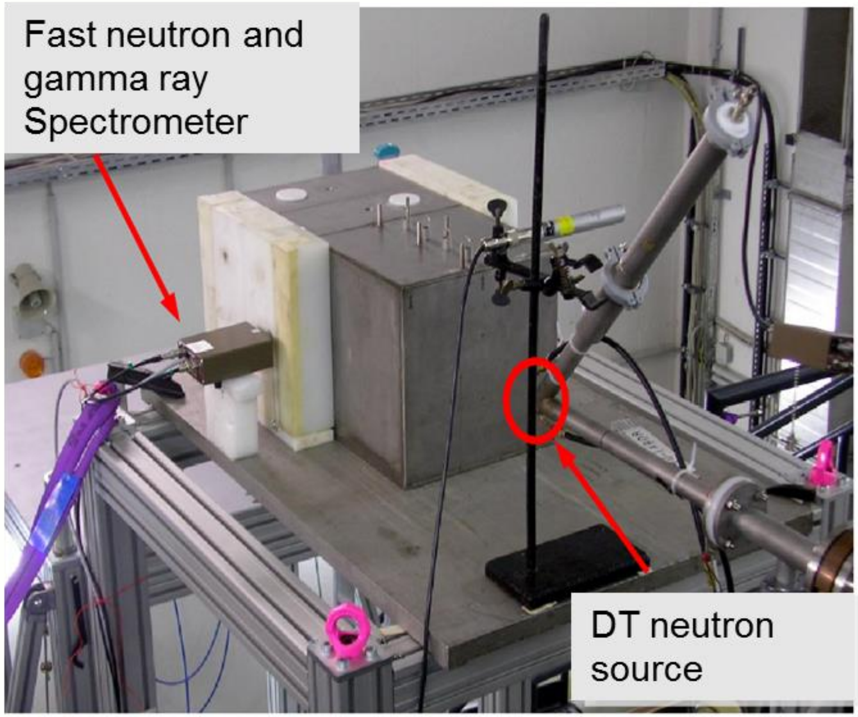
Research in ultra low background experiments



Cosmogenic neutrons as main background for ULB-experiments cause material activation or in-situ interaction.

- activation cross section measurements / benchmark-experiments
- investigation of nuclear level-schemes
- study of decay-chains

Radiation transport in ITER TBM mock-ups (HCLL and HCPB)



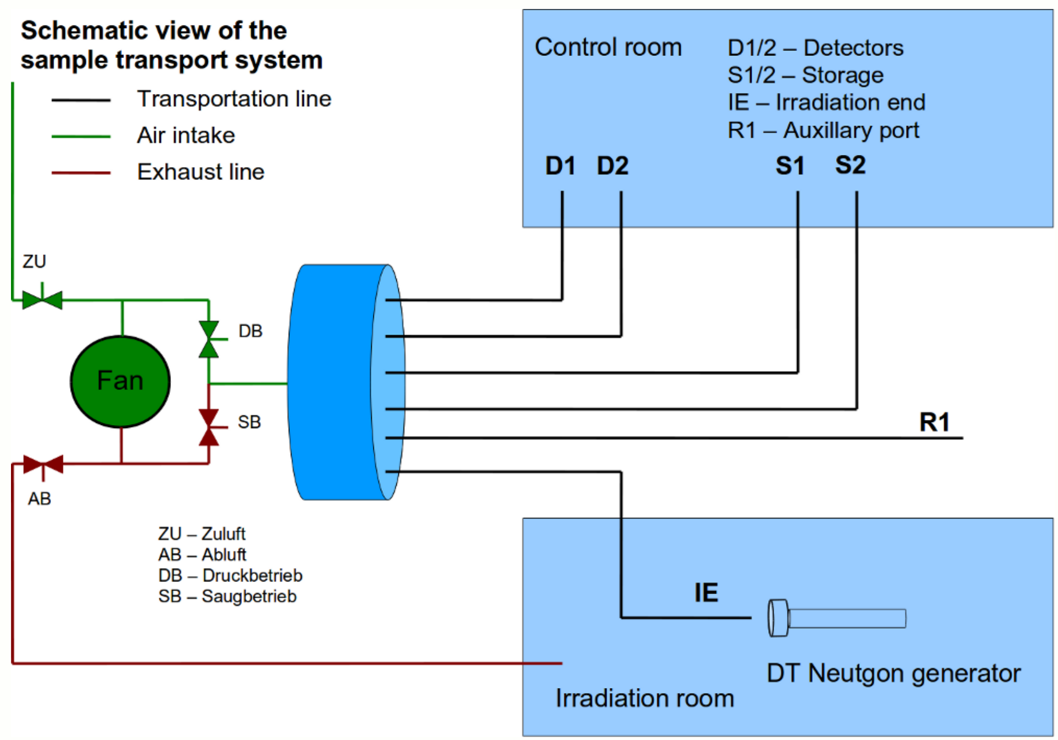
Neutron and photon flux spectra in mock-ups of the European Helium-Cooled Pebble Bed and Helium-Cooled Lithium-Lead Test Blanket Modules under DT neutron irradiation.

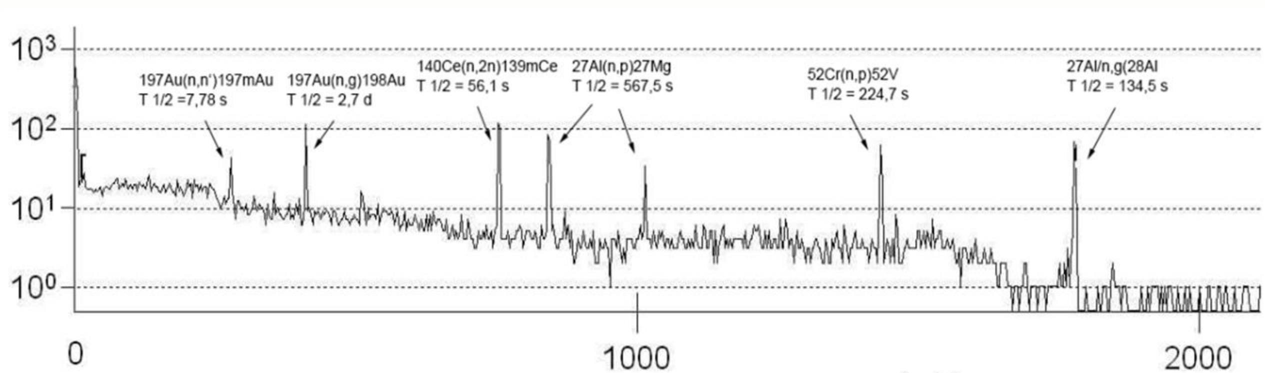
(ENEA, TUD, FZK/KIT, AGH, JSI, JAEA (IEA-NTFR Implementing Agreement)

Neutronics tests for an ITER Test Blanket Module Neutron Activation System

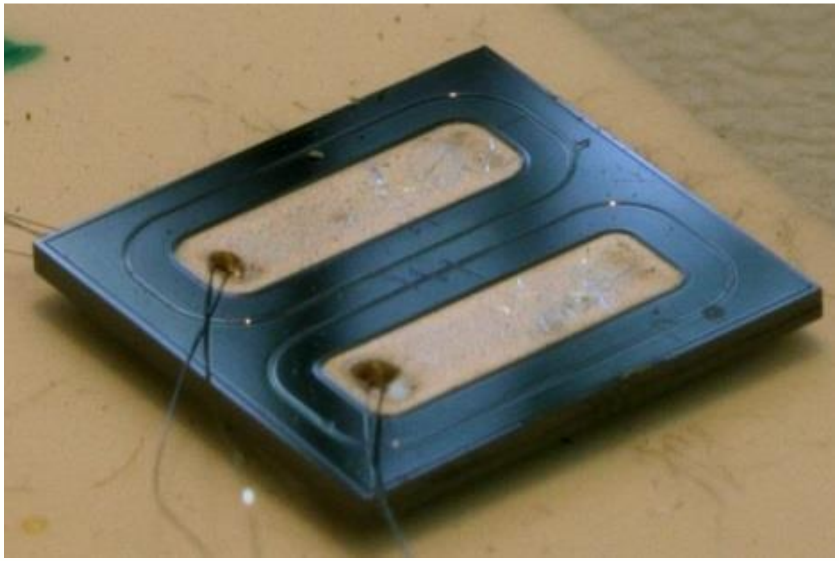
Pneumatic transport system (Rabbit system) for testing at TUD-NG
designed in collaboration with Technical University of Dresden

Experimental testing of a ***multi-material activation probe*** for a Neutron Activation System for the European ITER Test Blanket Moduls (TBM NAS)

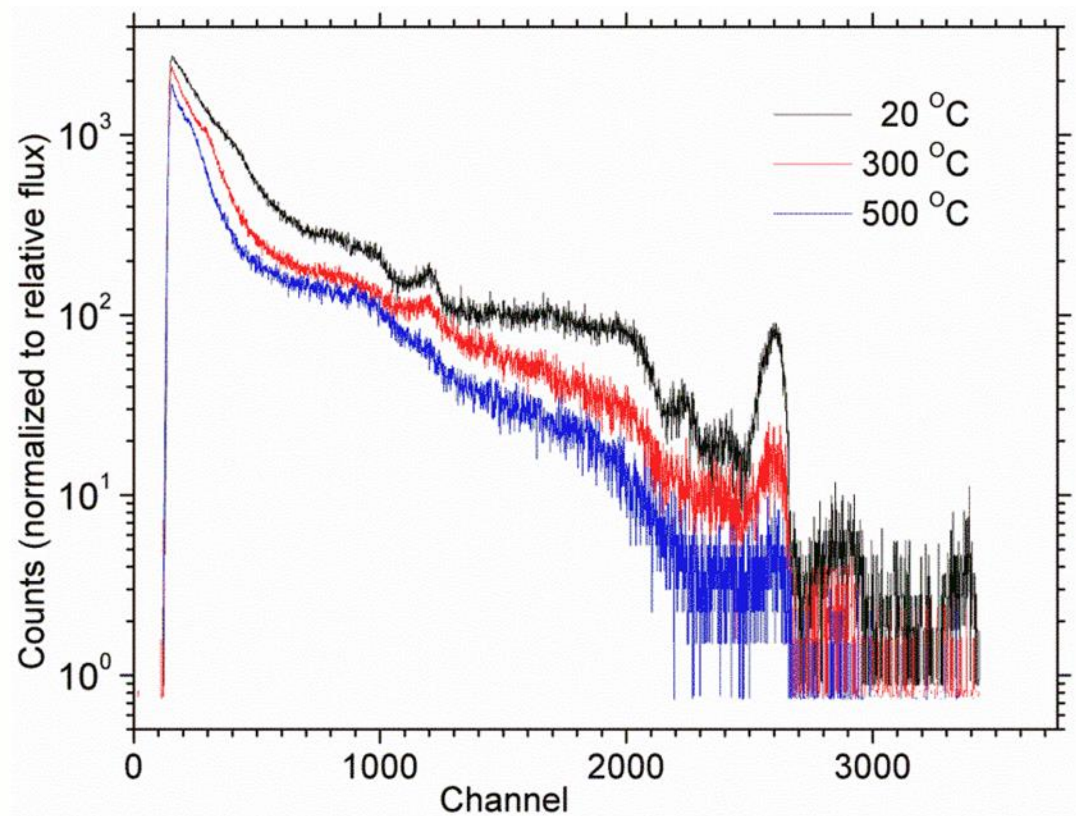




SiC detectors for harsh environments



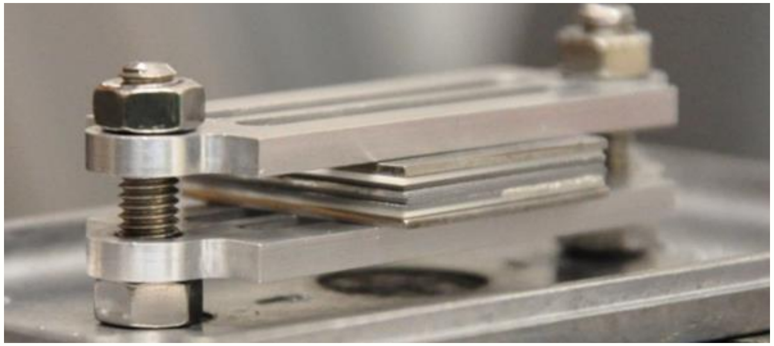
An typical SiC detector



I_SMART Collaboration

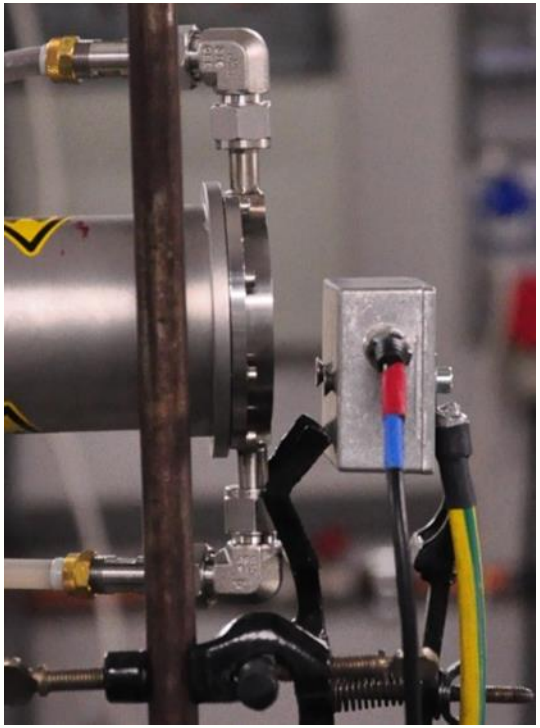
- SiC based diodes with and without boron implantation for high temperature application
- Tests under DT neutron irradiation at temperatures up to 500 ^{O}C successfully performed

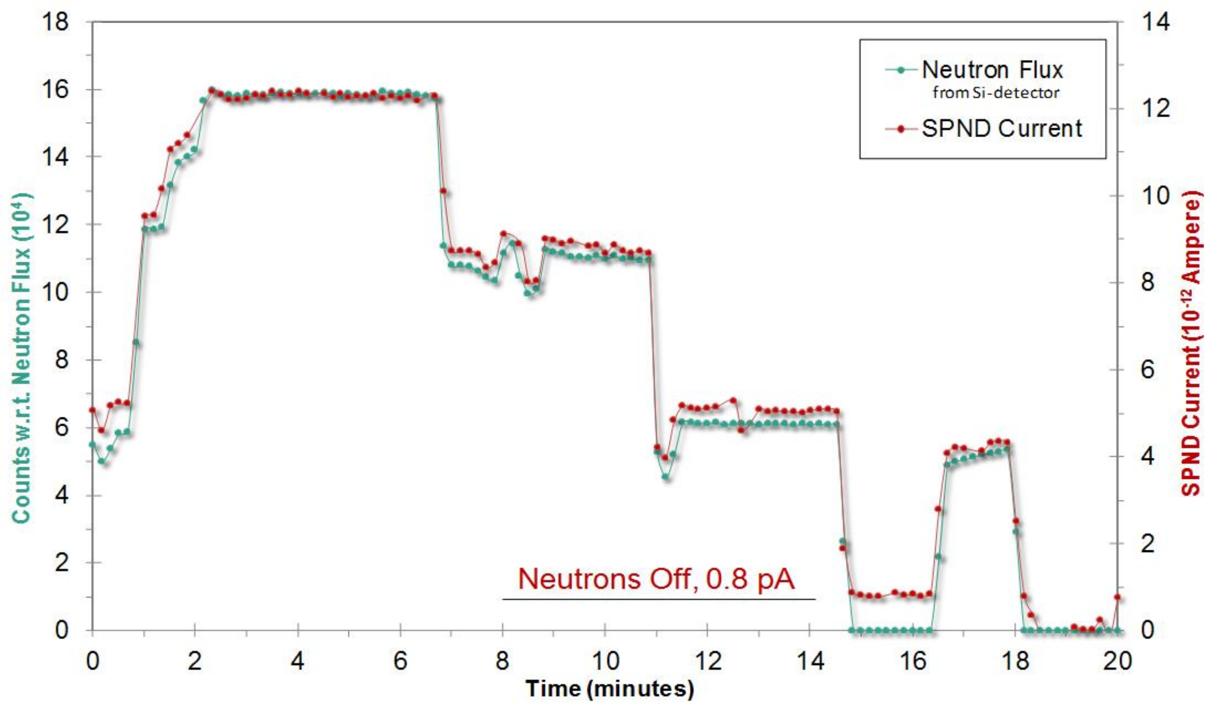
Self-Powered Detectors for the EU ITER TBM



Self-Powered detectors for neutron/ photon flux measurement in the European ITER TBM

- Sandwich style for better utilization of the neutron source
- Several emitter materials tested
- Signal dominated by a prompt component
- Will require sophisticated calibration in TBM





For more see P. Raj, #226, Wed. 11:00-11:20

The End

of the presentation

Disclaimer for parts of the work presented herein:
This work, supported by the European Communities under the Contract of Association between EURATOM and Forschungszentrum Karlsruhe, was carried out within the framework of the European Fusion Development Agreement. The views and opinions expressed herein do not necessarily reflect those of the European Commission.