

# PLEPS: Pulsed low energy positron system

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**Abstract:** PLEPS, operated by the Universität der Bundeswehr München, located at NEPOMUC, is a unique tool for depth profiling of defects with positron annihilation lifetime spectroscopy using a pulsed positron beam of variable energy.

## 1 Introduction

Positron lifetime measurements allow to determine type and size of open volume defects (such as vacancies, vacancy-clusters, dislocations, grain boundaries etc., and free volumes in polymers) in a wide variety of materials and provide information on defect-concentration. In combination with a monoenergetic positron beam of variable energy depth-resolved defect analysis becomes possible.

## 2 Typical applications

- Defect identification in thin layers and layered structures of semiconductors and insulators
- Radiation induced defects in materials for fusion and fission reactors
- Characterisation of free volumes in polymers and glasses

## 3 Technical Data

### 3.1 Beam properties

- Positron implantation energy:  $E = 0.5 - 20$  keV
- Beam spot  $\varnothing \sim 1$  mm
- Count rate:  $\sim 5000 - 10000$  cps

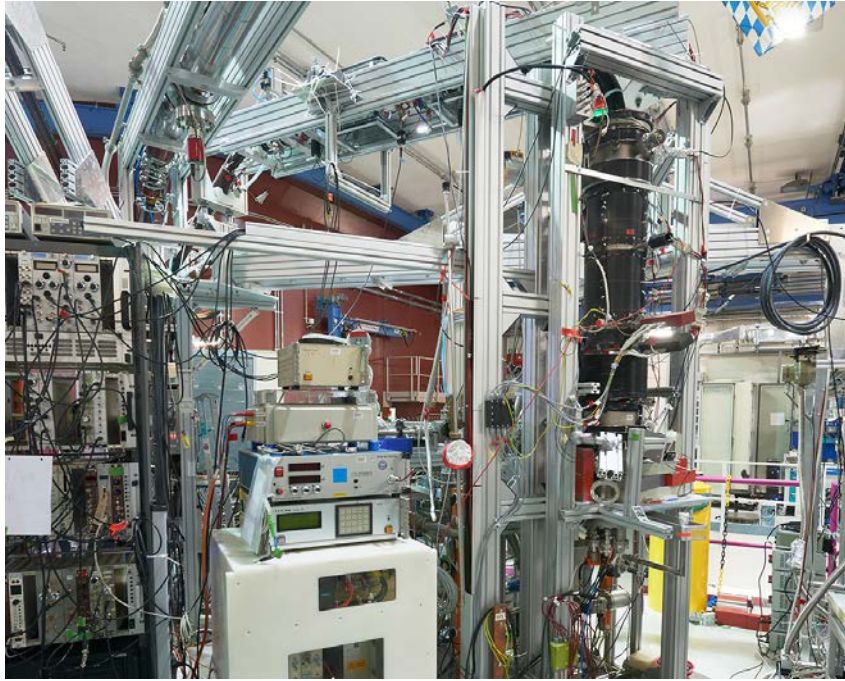


Figure 1: Instrument PLEPS at NEPOMUC (Copyright by W. Schürmann, TUM).

### 3.2 Sample

- Limited to  $5 \times 5 \text{ mm}^2 - 9 \times 9 \text{ mm}^2$

### 3.3 Typical measurement times

- $< 10$  min per spectrum  
( $> 3 \cdot 10^6$  counts in the spectrum)
- Depth-profile: 4 – 5 h  
(15 – 20 implantation energies,  $> 3 \cdot 10^6$  counts in the spectrum)
- Time-window: 20 ns or 40 ns
- Time-resolution: 260 – 280 ps
- Peak/ background  $> 50000 : 1$