

# Determination of positron lifetime in matter

Slovak University of Technology in Bratislava, Exercise STU-08

**Main topic:** Non-destructive material testing

**Keywords:** Positron lifetime, material testing, non-destructive analysis

**Purpose:** The basic objective of the experiment is to develop a better understanding of the principles of the positron annihilation spectroscopy (PAS) method, to investigate the processes of annihilation, positron formation and decay and to experimentally determine the positron lifetime in specific material samples.

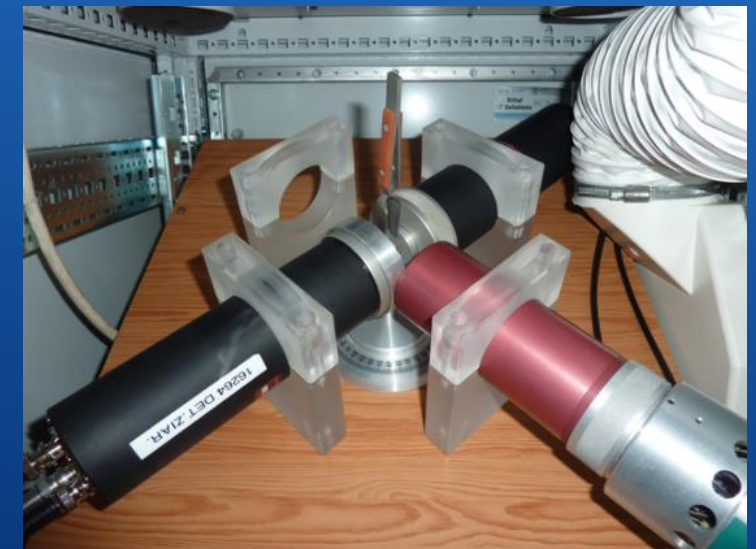
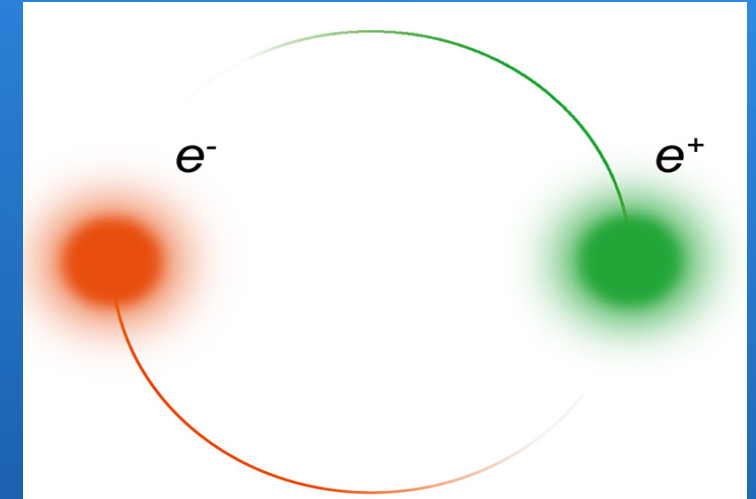
**Level of exercise:**  Basic  Advanced  Complex  
**Level of education:**  BSc  MSc  PhD

## What you will learn:

The students will get familiar with the main principles of the positron annihilation spectroscopy method, will understand the basic principles and will realize the PAS abilities for the industrial use.

## Important information:

- Minimal size of student group: 2
- Maximal size of student group: 4
- Overall duration of the experiment (in wall clock hours): 2



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**Possibility to perform experiment on demand:**  Yes  No

**Frequency of occurrence:** 2-3 times per year

**Examination modalities:** report

**Teaching languages:** English, Slovak

**Pre-knowledge required:** Knowledge of radioactive decay law, sources, types and interaction of radiation with matter, material structures, detector types and evaluation of uncertainties

## Instruments required for exercise:

- BAF2 scintillators and DSR4 evaluation board
- QtPALS and high voltage power supply-PALS
- Na-22 positron source

## Execution:

- The experimental setup is created to measure the time since the birth of positron to its annihilation using Na-22 source
- This gamma quantum is issued as a starter signal for measuring the lifetime of positrons by the conventional method
- Pulses from detectors are digitized by DRS4 evaluation board and processed by QtPALS software
- To fit a measured spectrum, the standard two components method is used where the parameters such as the positron mean lifetime, positron lifetime time in a bulk, etc. are evaluated

## Limitations:

Pregnant and breastfeeding women are not allowed to enter the controlled radiation area. Legal age (18) is required.

For more information on procedures please visit <http://www.ujfi.fei.stuba.sk/kontakt.php>

