

# LEDs radiation tests

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## Introduction

Light emitting diodes (LEDs) suffer irreversible damage after irradiation with fast neutrons. The LEDs exposed to neutrons produce less luminescence light than unexposed, when connected to the constant current power supply. The experiment aims to investigate the radiation damage phenomena of the LEDs irradiated with neutrons produced in the Linac II accelerator tunnel.

## Plan of the experiment

1. Estimation of the light output characteristics of a group of yellow LEDs operated at various input current level.
2. Irradiation of the LEDs with fast neutrons in the Linac II accelerator tunnel at various dose levels.
3. Evaluation of the LEDs.
4. Data analysis and estimation of the neutron flux, depending on the data from CERN calibration of LEDs.

## Test system

Test system for evaluating LEDs consists of:

- photometer - RS 180-7133
- constant current power supply
- digital multimeter - Metex M-3650CR
- alluminium cup (used for mounting LEDs on the photometer)

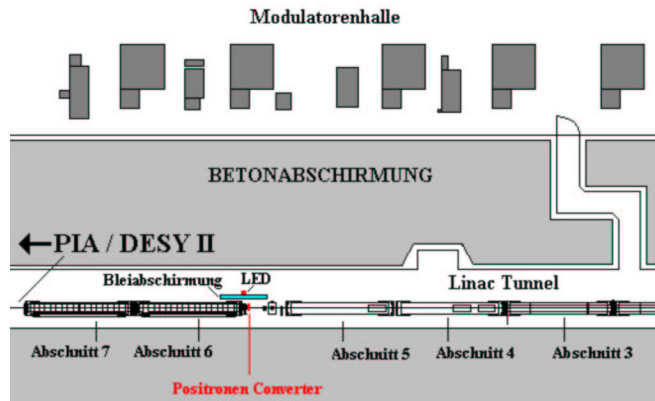


Figure 1: Position of LED diodes in Linac II accelerator tunnel

The diodes are placed on the shield near electron-positron converter (picture ??).

There are yellow LEDs chosen for experiment, because of their highest output light, comparing to green and red LEDs. The diodes, used for tests, are the simplest and the cheapest kind of diodes available on the market - Panasonic LN 48 YPX.

## Results

Results of first evaluation (before irradiation) shows picture ??.

There were done four runs of irradiation with the Linac II beam energy about 450 MeV.

No.	Start time	Stop time	Linac II working time [min]	PIA average beam current [mA]
1	24.07.2003 @ 10:47	29.07.2003 @ 14:00	1560	6.6
2	04.08.2003 @ 16:40	11.08.2003 @ 11:50	5191	15.8
3	11.08.2003 @ 12:02	18.08.2003 @ 10:37	2043	13.8
4	18.08.2003 @ 10:43	22.08.2003 @ 13:15	2955	27.7

Figure 2: Irradiation tests of LED diodes

The approximately Linac II beam current can be counted from the formula: (PIA average beam current) / 13. The average light output characteristics of LEDs before and after irradiation tests are shown on picture ??.

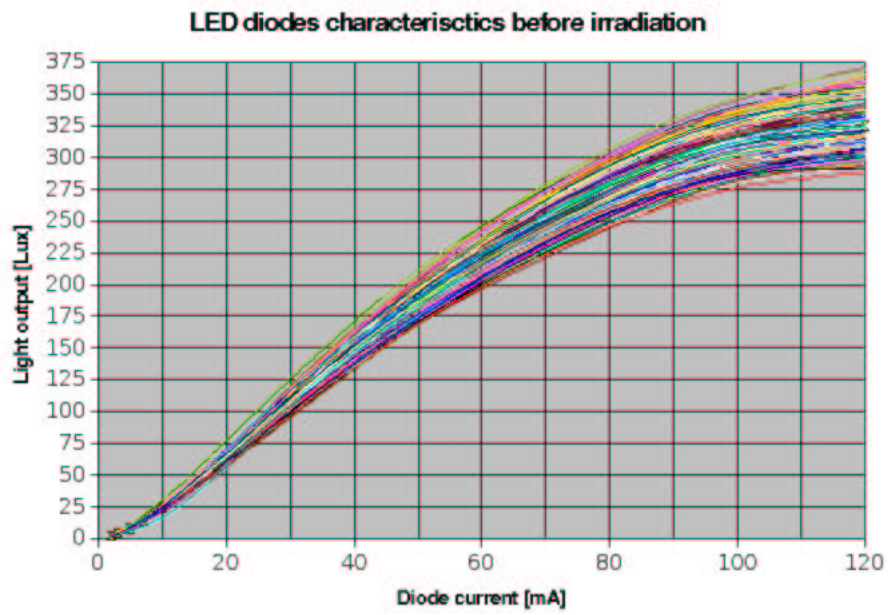


Figure 3: LEDs light output characteristics before irradiation

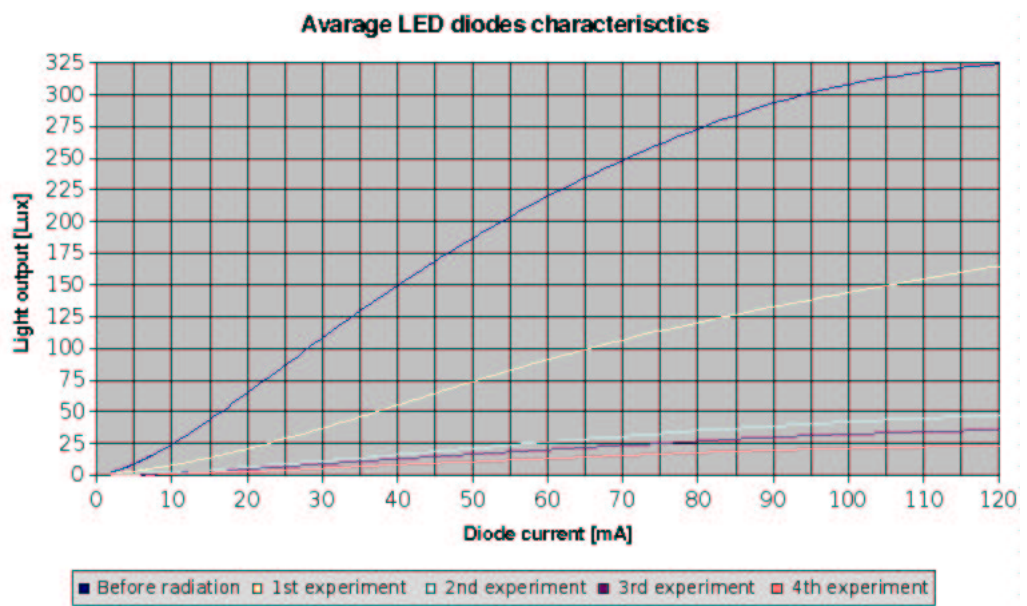


Figure 4: Average light output characteristics of LEDs