Study of the radiation aging of materials at BINP SB RAS (V.Bobrovnikov)

BNCT facility at BINP as source of fast neutrons

- Deuteron beam is used to generate neutrons
- Nuclear reactions due the interaction of the beam with lithium target

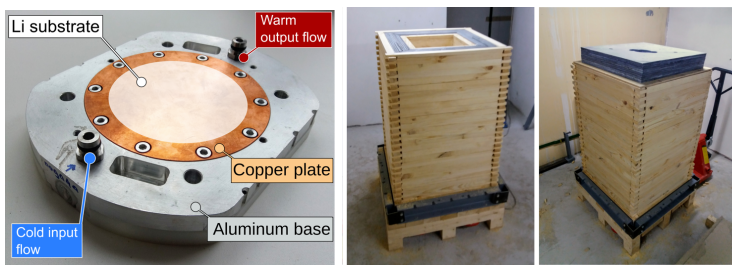
$$d + {}^{7}Li \rightarrow {}^{8}Be + n + 15.028\ MeV$$

$$d + {}^{7}Li \rightarrow 2^{4}He + n + 15.122\ MeV$$

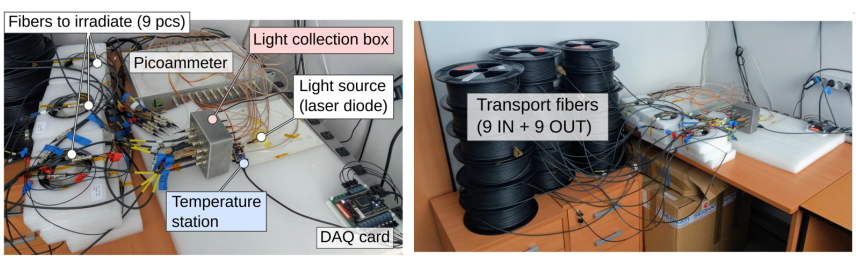
- For irradiation aging it was used beam with energy 1.5 MeV and current 1 mA

Experimental setup

- Vacuum chamber, neutron producing target and lead concentrator were done at BINP for the test
- Set of special studies was carried out on the residual activation of various materials to test possibility of their using in the concentrator construction and target



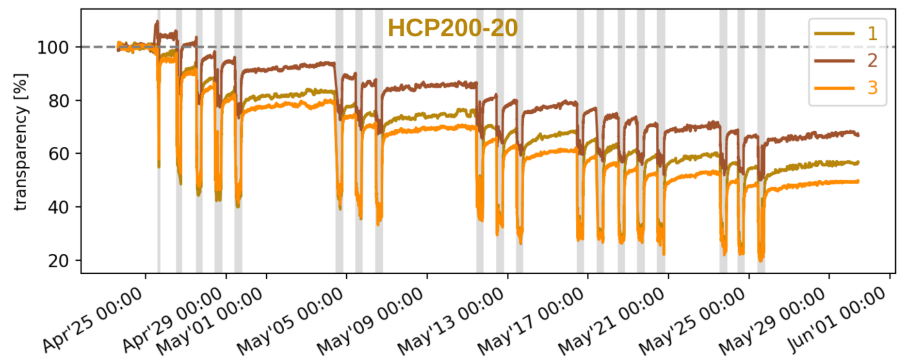
- Measuring equipment and materials were provided by the Saclay team



- Simulation on base FLUKA package was used for calculation of neutron fluence for high doses
- The difference between experimental data and simulation results is around 10%

Results

- Duration of the irradiation test was one month, 18 daily shifts per 7–8 hours
- Deuteron current fluence is 122 mAh
- Obtained doses are $(0.54 \div 2.37) \times 10^{14}$ neq/cm^2
- Example degradation of transparency for HCP200–20 fibers



- The degradation of transparency at level from 20% to 35% (over the full length of the fibres)
- BNCT facility at BINP SB RAS provides irradiation the dose at level **10^{14}** neq/cm2, this is quite enough to check the radiation resistance of materials, which proposed for use in the field of HEP
- The uniqueness of this radiation tests in contrast to irradiation in reactor is the precise control of the level of the accumulated dose with continuous measuring of degradation fiber transparency