B N C **Experimental Report**	*Experiment title* **Neutron flux measurements in reactor channels used for radiation damage studies**	*Proposal No.* *Local contact:* A. Simonits
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Objectives

Foil activation technique and gamma-ray spectrometry has been applied to characterize so-called "fast neutron channels" in BNC.

Results

Overall neutron flux characterizations have been performed in several vertical channels ("Bagira", 353, 555, 147, etc.) of the Budapest Research Reactor constructed for neutron damage studies. Due to the extreme experimental conditions ($> 5 \cdot 10^{13}$ thermal and fast fluxes, 100÷ 3000 h irradiation periods, etc.) special dosimetry foils developed at IRMM-Belgium (Al-0.01% Co, etc.), as well as high-rate gamma-ray spectrometry (Loss-free counting with Dual Spectrum Option) were used. Thermal and epithermal neutron fluxes were determined by 1/v- and resonance detectors (Fe, Al-Au, Al-Co, Nb, etc.) where the actual epithermal flux was approximated by the $1/E_n^{1+\alpha}$ function (Table 1). Fast fluxes were determined with a number of threshold reactions covering the 2-10 MeV energy range (Fe, Cu, Ti, Nb, Zr, etc.). As shown, the actual fast neutron flux distribution did not deviate from the fission flux with more than 5 % in channels investigated. The overall accuracy for thermal and fast integral fluxes approached 1-3 %. The method will be refined to monitor the required 0 – 18 MeV energy range more evenly.

Reaction used	E_{thres} **MeV**	**Term. flux (n/cm^{2}s)**	? (1/E$^{1+?}$)	**Fast flux (n/cm^{2}s)**
$_{63}$Cu(n,α)^{60}Co	10		-0.03	4.52 10^{13}
$_{58}$Fe(n,γ)^{59}Fe	-	3.99 10^{13}		
$_{54}$Fe(n,p)^{54}Mn	2.8			4.60 10^{13}
$_{59}$Co(n, ?)^{60}Co	-	4.00 10^{13}		
$_{94}$Zr(n, ?) ^{95}Zr	-	4.05 10^{13}		
$_{90}$Zr(n,2n)^{89}Zr	13			4.73 10^{13}
$_{47}$Ti(n,p)^{47}Sc	2.2			4.38 10^{13}
$_{46}$Ti(n,p)^{46}Sc	4.4			4.46 10^{13}
$_{48}$Ti(n,p)48Sc	6.9			4.50 10^{13}
Weighted averages:		**4.00 10^{13}**		**4.50 10^{13}**

Table 1. Neutron flux parameters determined in reactor channel position 147/3

Reference

A. Simonits, F. De Corte, S. Van Lierde, S. Pommé, P. Robouch, M. Eguskiza: “The k_0 and Q_0 values for the Zr isotopes: a re-investigation” Paper presented on the 10th Conf. on MTAA, Washington, April 19-23, 1999 (in print, J. Radioanal. Nucl. Chem. Articles)

Future prospects

Neutron spectrum adjustments are being performed with the aid of the SANDBP code. (in co-operation with BME, Budapest)