

Annual neutron doses in the UNILAC experimental hall

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Annual doses in 2011 and 2012

Figure 1 shows the downstream part of the UNILAC, a part of the TK and the experimental areas with the positions of the neutron detectors. The detectors are placed on the roof of the caves. The actual dose rates are listed in Tab.1. The measured values are in the range of 0.05 mSv/a up to 4.73 mSv/a. The highest dose values in 2012 were observed at X8.

The dose values are comparable to recent years [1] and are within the limits imposed by the radiation protection ordinance i.e. the annual doses are below 6 mSv/a.

An experiment carried out at X8 has been the reason for the increase of the accumulated dose in comparison to 2011. Additional shielding has been placed on several places, as mentioned later.

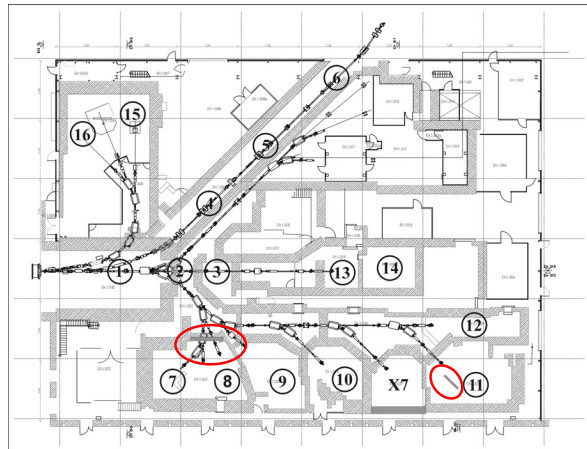


Figure 1: Measurement positions of the neutron doses in the UNILAC experimental hall outside the shielding.

Table 1: Measured Neutron doses in the UNILAC experimental hall outside the shielding, the positions are shown in Fig. 1

Position	Area	Neutron - Dose H*(10) [mSv]	
		2011	2012
1	end of UNILAC	0,08	0,22
2	end of UNILAC	0,12	0,25
3	end of UNILAC	0,11	0,28
4	TK	0,09	0,17
5	TK	0,09	0,15
6	TK	0,05	0,05
7	X 1	0,05	0,12
8	X 2,3	0,06	0,18
9	X 4	0,14	0,31
10	X 6	0,17	0,48

11	X 8	0,83	4,73
12	X 0	0,11	0,21
13	Y7 target	8,07	0,37
14	Y 7 Ship	0,12	0,21
15	M 1	0,07	0,09
16	M 3	0,07	0,10

Beamtime at X8

The beam time in X8 for the search of element 120 took almost 6 months in 2012. During the experiment it was necessary to declare certain areas around the cave and the beamline as temporarily controlled areas. This has been done due to dose rates higher than 3 μSv/h which represent the low limit value for controlled areas. Therefore based on the experience of the past year, the shielding was reinforced at two points before the experiment. This applies to the experimental cave X1 (fig. 1, position 7/8). Increased beam losses within the deflection of the beam coming from the UNILAC entering the X branch is producing additional neutrons, raising the local dose rates. The separating wall was reinforced by 0.5 m of concrete to reduce dose rates in X1. The reduction achieved by a factor of 10 was sufficient to leave X1 accessible during the beam time. Also a local shielding with Polyethylene was placed in the target area of X8 (fig. 1, position 11). As a result, the dose rates in X7 were reduced. However, due to higher beam losses along the X branch near X8, area X7 was declared a controlled area.

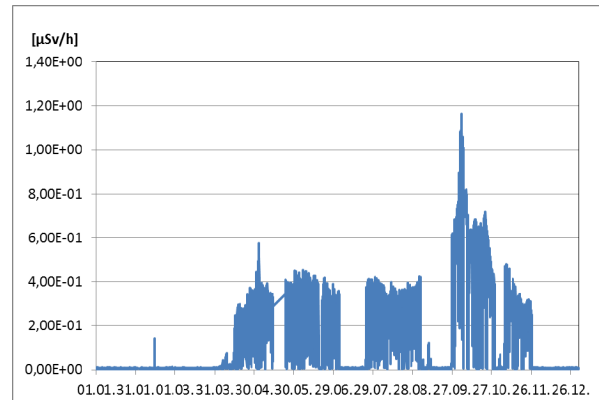


Figure 2: Measured neutron dose rate near X8 by ambient surveillance monitor in 2012. An accumulated dose of 1.33 mSv was observed for the operational year.

References

[1] C. Pöppe, P. Kewes, GSI annual report 2011