

## 6 - 32 Radiation Safety Report of HIRFL in 2012

Su Youwu, Li Zongqiang, Li Wuyuan, Xu Junkui, Mao Wang, Xu Chong, Yan Weiwei, and Pang Chengguo

The year-round operation time of HIRFL is 7009 h in 2012, the total beam time is about 4983.6 h (from 21 Dec. 2011 to 2012), which include 2302.7 h for physics experiment, 563.7 h for life science research, 1422 h for material science research, 695.2 h for machine research, and 249 h for time-sharing for the beam. There are 19 heavy ions beams were provided by HIRFL in 2012. The highest ions energy provided is 400 MeV/u, the maximum accumulated ion intensity is 800  $\mu\text{A}$ .

The residual radiation level of accelerator components had been measured before the workers started overhaul when the accelerator was shut down, for the external dose received by workers mainly due to the residual radiation after the accelerator was shut down. A maximum surface dose rate of 7 mSv/h on the SFC deflector surface had been measured, but since the operating time is quite short, the total accumulated dose of the works is not very high, this is consistent with the individual dose monitoring results.

286 persons accepted individual dose monitoring in 2012, and the results are shown in Table 1. The annual collective effective dose was 34.3 mSv. 208 was less than 0.1 mSv. The highest individual dose was about 2.6 mSv, which was under the national dose limit (20 mSv).

**Table 1 Individual dose monitoring results in 2012**

Time	Number of monitored individuals	Annual collective effective dose (mSv)	Average annual effective dose(mSv)	Number of individuals with different annual effective dose(mSv)					
				<0.1	0.1~1	1~5	5~10	10~20	$\geq 20$
2012	286	34.3	0.12	208	74	4(2.6)	0	0	0

Environment radiation level was measured with TLDs which were placed in the yard institute around HIRFL, 17 sites of radiation level show no difference with environment background level of Gansu province<sup>[1]</sup>. Total  $\alpha$ ,  $\beta$  radioactivity in soil, water and plant samples from environment around HIRFL are measured with BH1216 low background  $\alpha$ ,  $\beta$  Measuring Instrument, radionuclides in soil samples around HIRFL and 108 Radioactive Waste Storeroom are measured with Compton Suppressed Spectrometer, the results are shown in Tables 2 and 3 respectively, and compared with the background level of China<sup>[2]</sup>.

**Table 2 Total  $\alpha$ ,  $\beta$  radioactivity of the environmental samples in 2012**

Site	Water (Bq/L)		Site	Soil(Bq/kg)		Plant(Bq/kg)	
	$\alpha$	$\beta$		$\alpha$	$\beta$	$\alpha$	$\beta$
Huanghe new bridge	0.0303	0.0709	North of CSRe	478.2279	730.3756	5.56	180.08
Sangyuanzi bridge	0.0345	0.0360	South of the institute	597.9197	872.7316	5.47	151.35
Tap water	0.0575	0.0352	North of 6 <sup>#</sup> building	523.7445	737.9942	5.15	134.27
Waste water	0.0782	0.0273	South lake park	417.2542	711.4432	5.42	165.38

**Table 3 Natural radionuclides radioactivity of the environmental samples in 2012 (Bq/kg)**

Soil	Nuclide			
	K-40	Ra-226	U-238	Th-232
South lake park	2455.195	133.593	5.994	2.856
North of CSRe	2440.830	115.659	7.072	2.333
South of the institute	2754.974	123.673	6.157	2.694
North of 6 <sup>#</sup> building	2491.728	117.390	7.017	2.348
West of 108 radioactive waste storeroom	2454.388	205.527	6.816	2.911
North of 108 radioactive waste storeroom	2437.606	187.156	13.581	2.315
East of 108 radioactive waste storeroom	2468.015	128.729	8.405	2.850
South of 108 radioactive waste storeroom	2504.251	120.121	10.789	2.875

### References

- [1] Liu Chunting, Bai Shuming, Ren Xiuying, et al., Radiation Protection (in Chinese), 16, 2(1996)121.  
 [2] The Investigation Group of National Environmental Natural Radioactivity Level, Radiation Protection (in Chinese), 12, 2 (1996)122.