

§4. Environmental Radiation Monitoring at Toki Area

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Environmental radiation monitoring activity has been continued to define radiological distribution and behavior with time elapse under natural conditions. To clarify the regional radiological characteristics means to study environmental dynamics at the view points of geological effect to the local area according to operation of LHD and another devices. This study started as collaboration with Plasma Research Committee of Toki-city (Chairman: I. Yoshida, Principal of Tokikita high school). It is significant at the point of discussing and working together with researchers of the institute and teachers of public schools at Toki area. Radiation monitoring methods and the results of this study are as follows.

TLD (thermo-luminescence dosimeter) pellets (CaSO₄.Tm, UD-200S made by Matsushita Elec. Co.) were set at 12 posts in Toki city and 3 posts in Tajimi city for 3 months (exchanged in June, September, December and March). Table 1 shows environmental radiation dose rate at the representative monitoring posts measured by the TLD. Those data are average in recent years, and the deviation is about 10 %. The environmental radiation exposure rates are distributing in 50-130 mrem/year. These data show not large fluctuation at each monitoring post and the trends are not changed. Environmental radiation was measured also by using several detectors such as an ionization chamber, a NaI scintillation detector and a Ge semiconductor detector. Exposure rates obtained from the ionization chamber and the TLD are higher than the rates from the NaI and the Ge detectors. This is because the NaI and the Ge

detectors count selected energy radiation by energy spectrum analyses. As the result of spectrum analysis, the accounting ratio of uranium series and thorium series was different even though the radiation level was nearly equal.

Radon and its daughter nuclides are considered as representative radiation source for public exposure from natural radiation especially at indoor. The ratio accounted for about 30 % of the public radiation exposure is radon in Europe. To detect the radon concentration in the environment, a nuclear track detector of CR-39 plastic was applied. About 1 cm square CR-39 plate was set in a hemispherical cup made of aluminum. Air in the cup may be ventilated naturally one time per 5 hours. Radon emits an alpha particle at nucleic decay, and the particle injects into the CR-39 plastic plate. After 3 months the plastic plate is removed, and is etched in 7.5 N NaOH solution at 80 °C. After etching, the track number is counted by micro-scope. This radon monitoring result is expected to give significant information about natural radiation in the environment. We are planning to continue this radon measurement in the next collaboration activity.

Table 1 Environmental radiation dose rate measured by TLD at Toki area.

Monitoring post	Dose rate (mrem/year)
In lead box (Reference)	22-30
Tokikita high school room	82-103
field	72-88
Kawai	121-145
Oroshi hospital	81-105
Toki commercial high school	55-67
Toki station	79-93
Oroshi clay digging field	51-65
NIFS site boundary	47-60
"	55-66
Tokitsu primary school	76-99
Oroshi primary school	71-84
Dachi primary school	73-85
Seiryō junior high school	73-97
Akeyo primary school	61-74
Tajimi technical high school	72-83
Tajimikita high school	58-72
Tajiminishi high school	54-56