

2008 6 3 / 2008 7 9 1 , 2008 7 21 2 / 2008 7 22

가

가 . 2008 1 ~ 3
⁴⁰K 72
(MDA) ²²²Rn ²²⁰Rn
가
: , HEPA , ,

1.

HEPA (0.3 μm 99.97%) 37.5
[5] 가
(HEPA) 2008 1/4
가
가
[1,2] 가 [3,4].
(Advanced Fuel 2.
Science Building; AFSB, 가 , 2.1
, 3 HEPA

(Alpha Sentry Continuous Air Monitoring System, Canberra, U.S.A., Alpha CAM .)
가
U₃Si UO₂ 가 12.4 g/cm³ 5 g/cm³
가 / [3,5].
Alpha CAM PIPS (Passivated Implanted Planar Silicon) (23.3 mm, 0.001 Bq/m³) 256 MCA가 ,
U.S.A. 4mm, Millipore (Millipore Inc., 3μm)

: , sychang@kaeri.re.kr, 305-353 1045
4.77 MeV(²³⁴U)
(6.0 MeV(²¹⁰Po) ~ 8.78 MeV)

가 [6].

2.2

2008 1 3 1/4 Alpha CAM
1 2

Table 1. Alpha concentration of stack effluents measured by Alpha CAM for 3 months.

Mon	Period		α conc.(Bq/m ³)
	From	To	Average
Jan.	1/7	1/13	0.017
	1/14	1/20	0.019
	1/21	1/27	0.015
	1/28	2/3	0.006
	Average		0.013
Feb.	2/4	2/10	0.028
	2/11	2/17	0.007
	2/18	2/24	0.006
	2/25	3/2	0.007
	Average		0.012
Mar.	3/3	3/9	0.014
	3/10	3/16	0.009
	3/17	3/23	0.005
	3/24	3/31	0.005
	Average		0.008
1st Qtr.	Average		0.011

1 2 2008 1/4
0.003 ~ 0.044 Bq/m 0.011
Bq/m³, 0.004
~ 0.031 Bq/m 0.012 Bq/m

2.3

Alpha CAM

Alpha CAM

1 (Tennelec Series 5, Canberra, U.S.A.)
72
3 ~ 6 1 Alpha CAM

(MDA)

2.4

Alpha CAM

2008 1 21 ~ 1 27 1
(4) (: Gamma Spectrometer : HPGe + 8183 ch. MCA, Canberra, U.S.A.)

7
(²³⁴U, ²³⁵U ²³⁸U)
⁴⁰K ($T_{1/2} = 1.27 \times 10^9$ y)
(²³²Th) ²²⁸Ac ($T_{1/2} = 6.13$ h) ²²⁰Rn
($T_{1/2} = 55.6$ s) ²¹²Pb ($T_{1/2} = 10.64$ h) ²¹⁴Bi ($T_{1/2} = 60.55$ m), ²⁰⁸Tl ($T_{1/2} = 3.07$ m)

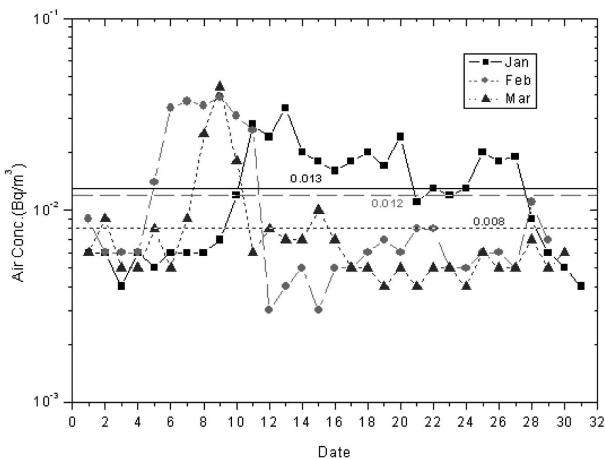


Fig. 1. Daily variation of stack effluent concentration for Jan. ~ Mar. 2008.

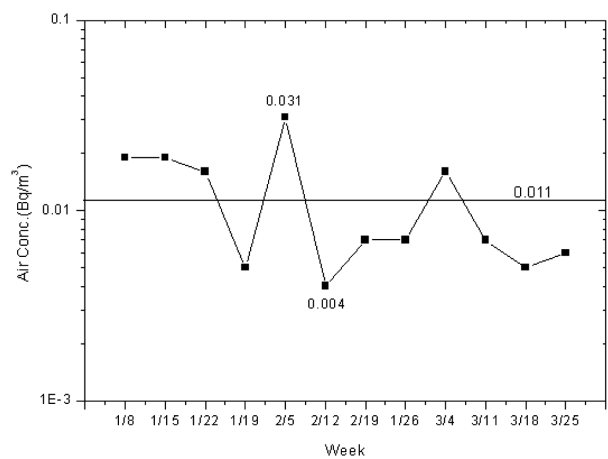


Fig. 2. Weekly variation of stack effluent concentration for Jan. ~ Mar. 2008.

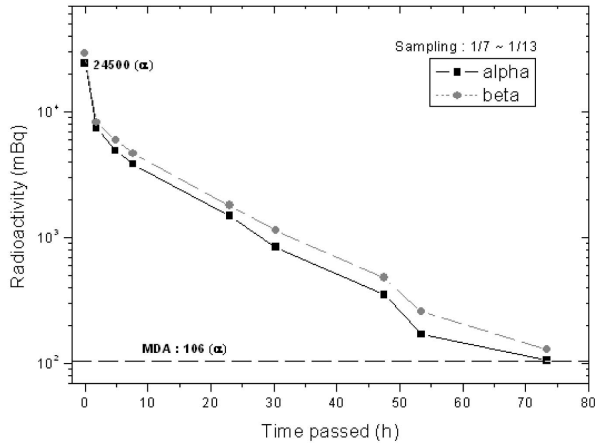


Fig. 3. Variation of radioactivity in a stack air filter sampled for 1/7 ~ 1/13.

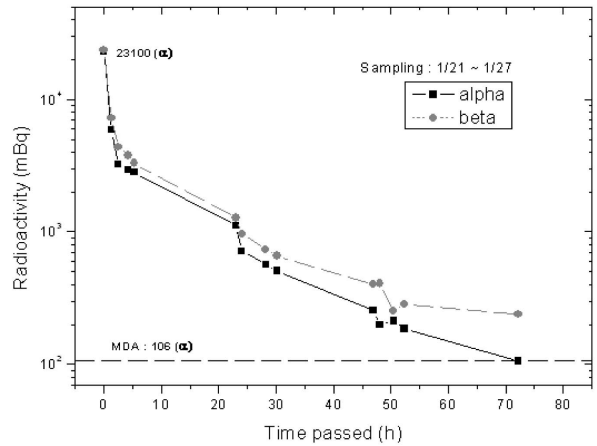


Fig. 4. Variation of radioactivity in a stack air filter sampled for 1/21 ~ 1/27.

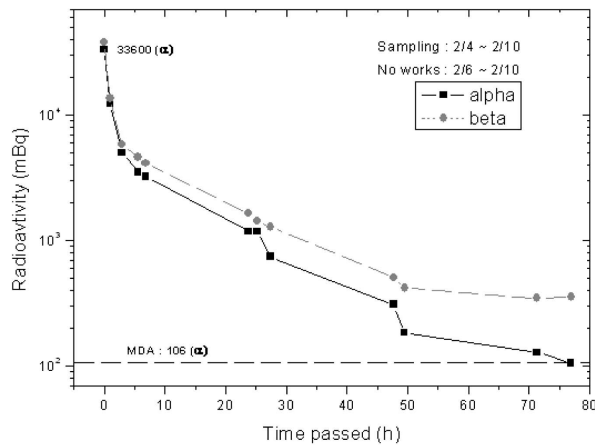


Fig. 5. Variation of radioactivity in a stack air filter sampled for 2/4 ~ 2/10. No works and ventilation performed during holiday period of 2/6 ~ 2/10.

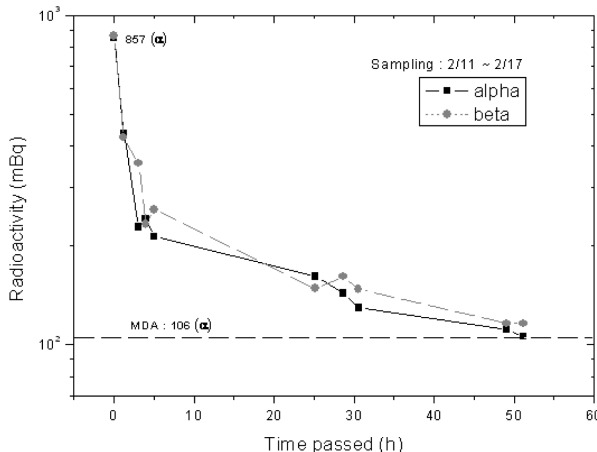


Fig. 6. Variation of radioactivity in a stack air filter sampled for 2/11 ~ 2/17.

(^{238}U) ^{222}Rn ($T_{1/2} = 3.82 \text{ d}$) ^{214}Pb ($T_{1/2} = 26.8 \text{ m}$), ^{214}Bi ($T_{1/2} = 19.9 \text{ m}$) ^{210}Pb ($T_{1/2} = 13.8 \text{ m}$) [7]

1 14 ~ 1 20
2

(: Alpha King Spectrometer, Model 676 E.G. & G. ORTEC, U.S.A.)

g/cm³ U₃Si UO 가 12.4 g/cm³ 5

background

HEPA 8 [3,5] 2008 3 3 ~ 3 9 1

(MDA) 9

Alpha CAM 8 7

Alpha CAM

3.

2.5 Alpha CAM

2008 1 7 ~ 1 13

(MDA)

Alpha CAM 3 (72)

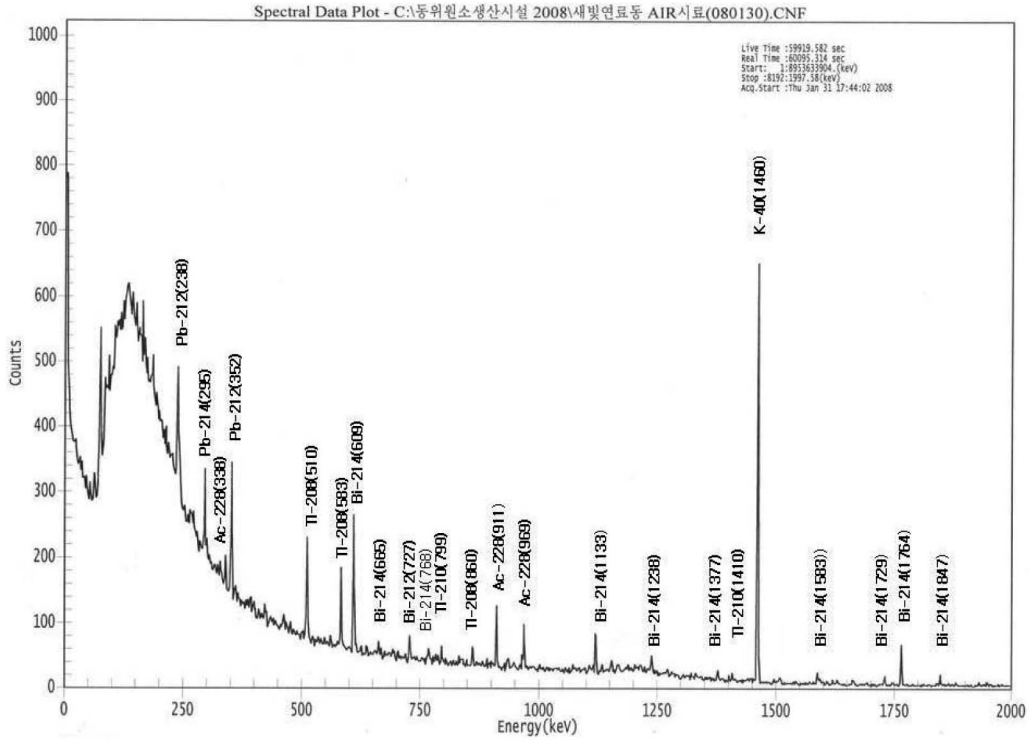


Fig. 7. Gamma Ray Spectra from stack air filter sampled for 1/21 ~ 1/27.

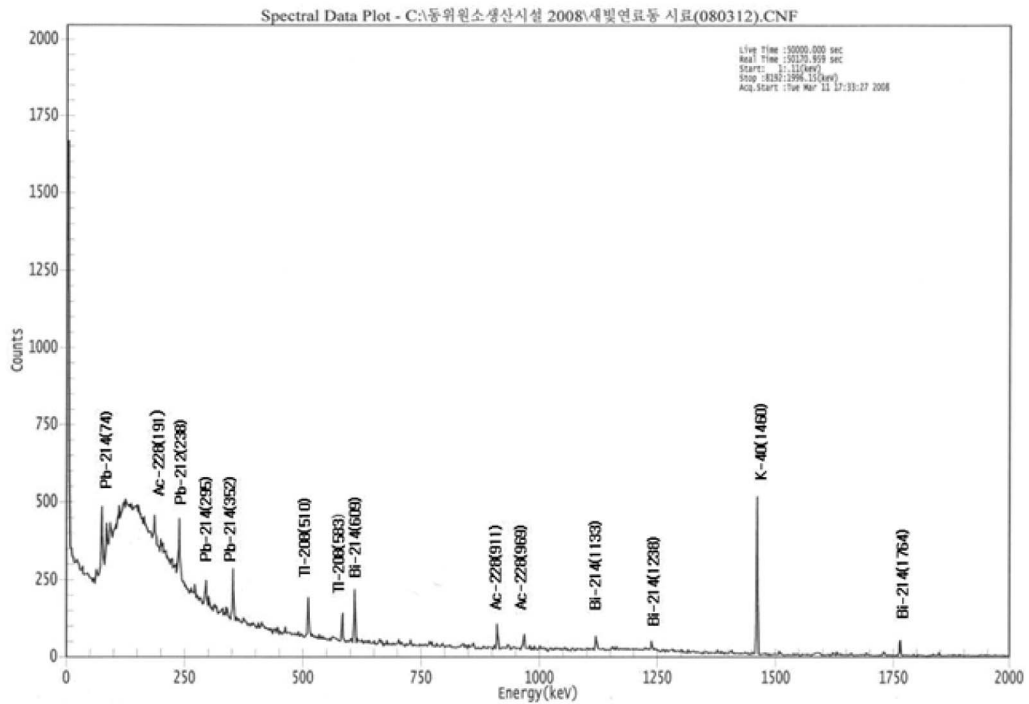


Fig. 8. Gamma Ray Spectra from stack air filter sampled for 3/3 ~ 3/9.

[8] 가 ^{238}U 7.0×10^{-8} ^{235}U 4.5×10^{-9} , 2008 (2/6 ~ 2/10)
 가 (2/4 ~ 2/10)

Evaluation of Radioactive Stack Air Effluents from the Advanced Fuel Science Building at KAERI

S. Y. Chang, B. H. Kim
Korea Atomic Energy Research Institute

Abstract - Radioactivities of the stack air effluents from the Advance Fuel Science Building (AFSB) at KAERI have been investigated and evaluated. In this AFSB, nuclear fuels for the HANARO research reactor have been fabricated and the advanced nuclear fuels have been studied. A stack air monitoring system has been continuously operating to monitor the stack air effluents from the facility to protect the environment. As the results of the periodical radioactivity measurement and both the gamma and alpha spectrometry for the millipore filters taken from the stack air monitor from January until March 2008, a trace amount of primordial ^{40}K and the short-lived decay products of natural borne ^{222}Rn and ^{220}Rn have been detected. However, the radioactivities have rapidly decayed to the level below the Minimum Detectable Activity (MDA) of the counting system. Therefore, it was evaluated that no uranium isotopes have been released to the atmosphere from the stack of the AFSB at KAERI.

Keywords : Stack air monitor, HEPA filter, Millipore filter, ^{222}Rn and ^{220}Rn , MDA