

ACTIVITY MONITORS IN KEK AND THE CONVERSION OF  
RATEMETER READINGS TO ACTIVITY CONCENTRATION

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During accelerator operation various radio-active nuclides are produced in air and in water by the interaction of primary or secondary particles. The activity monitors installed in KEK are gas monitors (BLU), dust monitors (BRN) and water monitors (VLT). The types of the detectors used for the individual monitors are shown in the Table along with the monitoring areas which they cover. The dust monitors are all equipped with GM counters, while gas monitors with either NaI(Tl) detectors or an ionization chamber and water monitors with either NaI(Tl) detectors or a GM counter.

I) Gas Monitors

a) Monitor using NaI(Tl) crystal: A 2" diam.x2" NaI(Tl) detector is located at the center of an aluminum-made cubic gas sampling chamber that has a dimension of 32 cm in each side. A preamplifier is attached just outside the sampling chamber and they are both installed in a 3 mm thick iron chamber which is surrounded with 25 mm thick lead blocks. The gas is introduced into the chamber with a rotary pump. The conversion factor for radioactive gas concentration in air was determined by using standard  $^{133}\text{Xe}$  gas of 0.96 uCi.

b) Monitor using ionization chamber: A 141 ionization chamber is used as a detector. Ion-precipitator is provided in front of the chamber. The detection sensitivity is  $1 \times 10^{-7}$  uCi/cm<sup>3</sup> for  $^{85}\text{Kr}$  and  $^{131}\text{I}$ .

II) Dust Monitors

Each of the four dust monitors is equipped with a 1" diam. GM tube. It has also an additional space for a NaI(Tl) detector to be set. A long filter paper tape, upon which sampled air is blown, is moved either in every previously-set time interval or manually. Every dust monitor can cover several areas by means of long sampling pipes and electromagnetic valves

are attached to them at their suction ports.

The calibration graphs for determining the radioactive dust concentration in air from ratemeter readings were made by using a disc source of known activity. The lower detection limit was found to be  $2 \times 10^{-11}$  uCi/cm<sup>3</sup>.

### III) Water Monitors

Among four water monitors three are equipped with 2" diam. x2" NaI(Tl) detectors and one with a long GM tube. Each NaI(Tl) detector along with preamplifier is set in a stainless steel pipe and installed in the corresponding water tank.

The calibration curves are made from the relation between ratemeter readings and water levels in the tank using radioactive water of a known <sup>131</sup>I concentration (2.6 uCi/cm<sup>3</sup>). The lower detection limit has turned out to be  $2 \times 10^{-7}$  uCi/cm<sup>3</sup> for <sup>131</sup>I.

ACTIVITY MONITOR	NAME	DETECTOR	AREAS THAT EACH MONITOR COVERS
Gas Monitor (Blue)	BLU-1	NaI(Tl)	Exhausting air from Main Ring Tunnel
	BLU-2	NaI(Tl)	Exhausting air from Booster Hall
	BLU-3	Ionization Chamber	Radioisotope Handling Facility
Dust Monitor (Brown)	BRN-1	GM	Linac RF Room, Booster Hall, & Injection Area to Main Ring
	BRN-2	GM	Exhausting air from Booster Hall
	BRN-3	GM	Counter Experimental Hall, Slow Extraction Area, & Main Ring Tunnel
	BRN-4	GM	Fast Extraction Area, Bubble Chamber Beam Line Hall
Water Monitor (Violet)	VLT-1	NaI(Tl)	Tank-1 All water that come out of accelerator facilities and counter experimental hall
	VLT-2	NaI(Tl)	Tank-2 Same as above
	VLT-3	GM	Radioisotope Handling Facility
	VLT-4	NaI(Tl)	Radioactive Liquid Waste Handling Facility