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Natural Radioactivity in Brazilian Underground Mines

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❖ Objective

The authors aim to characterize the natural radioactivity in 8 Brazilian underground mines. This work is a part of the Radon Project which is being conducted by the National Nuclear Energy Commission - CNEN.

❖ Methodology

Radon and Radon Progeny in the Air



Equilibrium Factor and Effective Dose



$$F = \frac{EEC}{C_o}$$

$$E = C_o \times F \times T \times k$$

Groundwater Radon Measurement



➤ Measurement of ^{226}Ra , ^{232}Th , ^{40}K Activity Concentrations

❖ Summary of Results

Mine	Mine Situation	Air Velocity (m.s ⁻¹)	C _o (Bqm ⁻³) [mean (min-max)] ^a	EEC (Bq.m ⁻³) [mean(min-max)] ^a	F	E (mSv.a ⁻¹)	D (mSv.a ⁻¹)	Total Effective Dose (mSv.a ⁻¹)
Mine A	Out of operating	- ^b	3889 (528-4128)	1174 (43-1317)	0.3	21	1	22
	Operating	0.7	714 (299-2088)	377 (42-1581)	0.5	7	1	8
Mine B	Operating	1.8	949 (584-1264)	259 (123-444)	0.3	5	2	7
Mine C	Operating	<0.1	113 (38-192)	76 (26-144)	0.7	1	0,3	1
Mine D	Operating	- ^b	4964 (1392-10880)	1148 (209-2765)	0.2	21	0,2	21
Mine E	Out of operating	<0.1	1442 (792-2288)	228 (96-357)	0.2	4	0,4	5
Mine F ^c	Operating	-	327 (65-617)	141 (19-279)	0.4	3	0,8	4
Mine G	Operating	<0,1	326 (272-380)	213 (179-249)	0,7	4	0,1	4
Mine H	Operating	<0,1	60 (39-99)	12 (3-36)	0,2	0,2	0,3	1