

# Researching of natural radiation dose level in the around of Beyşehir Lake of Turkey



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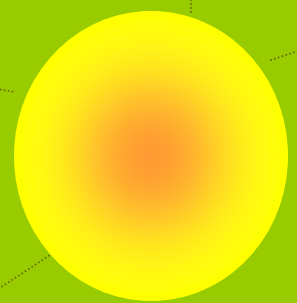
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# Radiation is everywhere



**Cosmic**

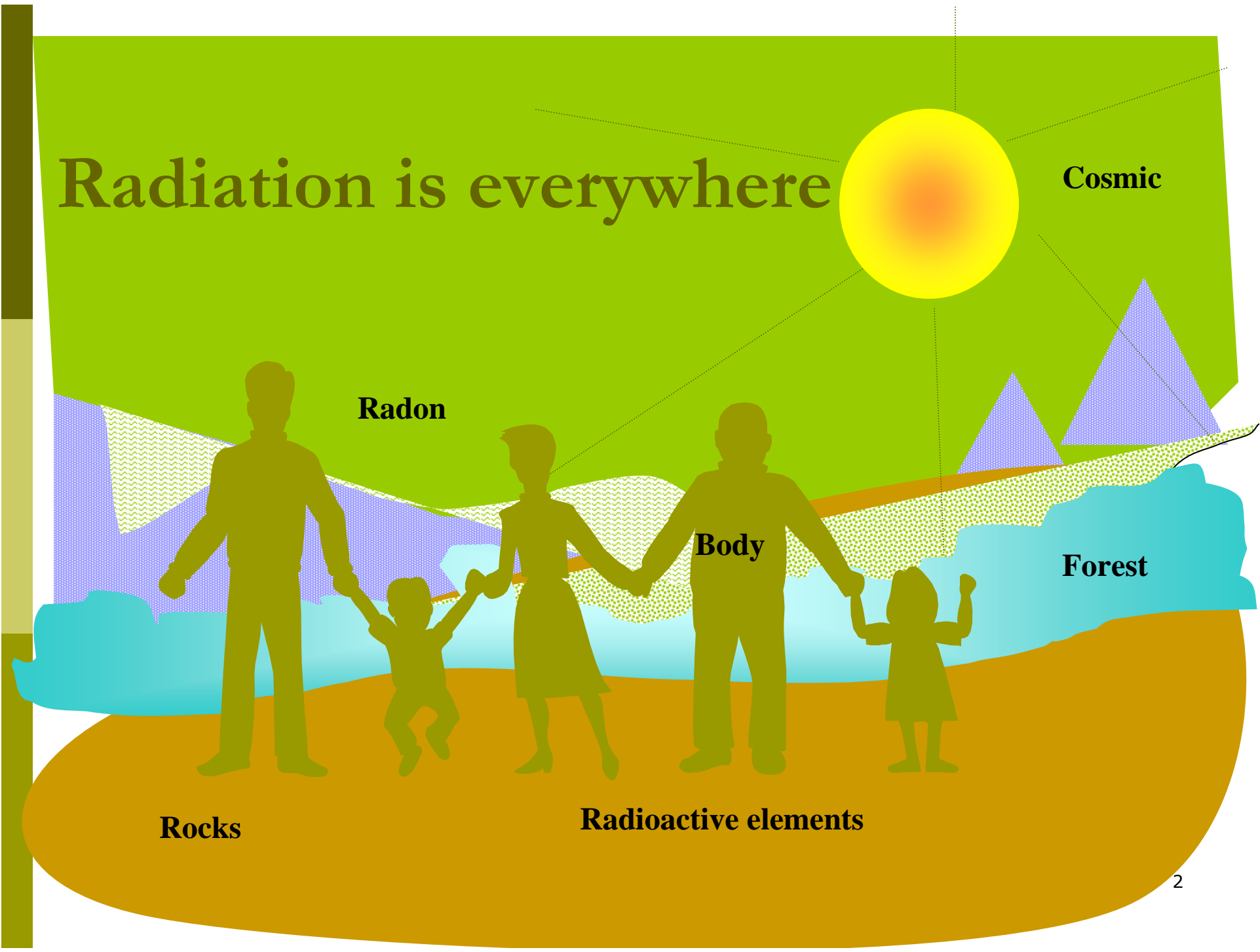
**Radon**

**Body**

**Forest**

**Rocks**

**Radioactive elements**



# Sources of Radiation

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## Sources of natural radiation (%85)

- Cosmic rays coming from Space
- Fossil fuels
- Radioactive elements in the body (K-40)
- Radiation taken by means of food, drink and respiration
- Radon gas (Ra-226)

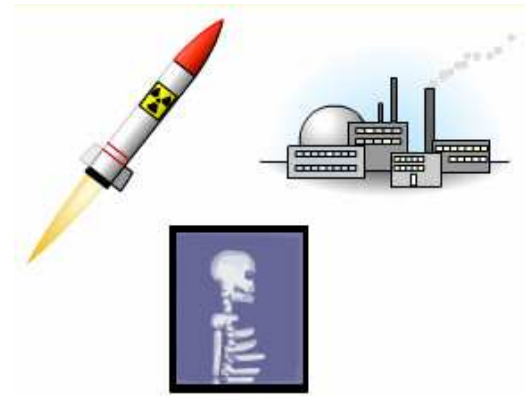


# Sources of Radiation

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## Sources of artificial radiation (%15)

- x and  $\gamma$  rays used in the medical, agricultural and industrial applications
- Radioactive sprinkle
- Consumer products i.e. TV, computer, phosphorous watches etc.
- Nuclear facilities

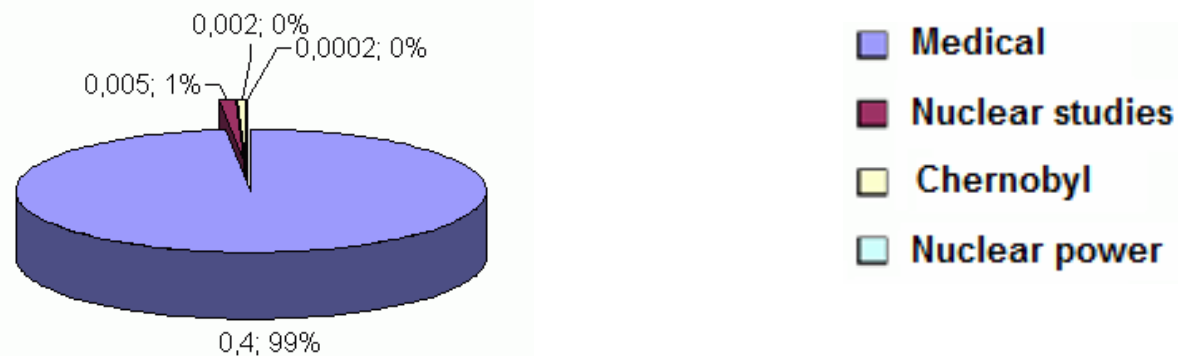


# Sources of Radiation

## □ Sources of natural radiation



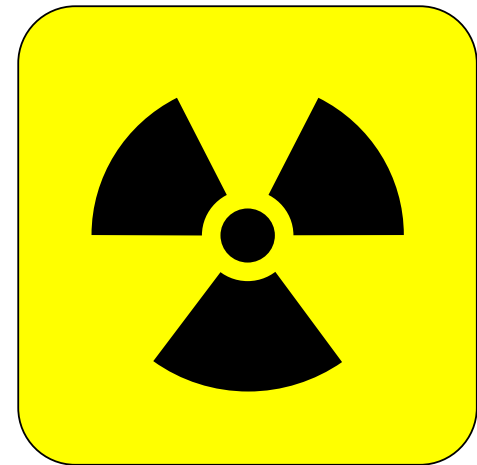
## □ Sources of artificial radiation



# Measurement of Natural Background Radiation

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- Knowing the ratios of natural radiation at any region is quite important to determine the radiation changes of this area. The determination of this changes is also possible with knowing the previous radiation.
- Knowing the ratios of radiation is necessary to determine the life areas with or without any risk about health.
- In this work, the measurements of natural background radiation near Beyşehir Lake in Konya have been carried out.



# Material and Method

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- ❑ **Location:** Shore of Beyşehir Lake, Yenişarbademli, Vali Çeşmesi (Mountain)
- ❑ **Time:** December 2008-November 2009
- ❑ **Frequency:** Morning, noon, evening per month
- ❑ **Height:** 1 meter from the ground
- ❑ **Instrument:** Geiger-Mueller LND712
- ❑ **Measurement:** CPM and  $\mu\text{Sv/h}$



# Geiger-Mueller Detector Properties

## 712 End Window-Alpha-Beta-Gamma Detector

### GENERAL SPECIFICATIONS

Gas filling	Ne +Halogen
Cathode material	446 Stainless Steel
Maximum length (inch/mm)	1.94/49.2
Effective length (inch/mm)	1.5/38.1
Maximum diameter (inch/mm)	0.59/15.1
Effective diameter (inch/mm)	0.36/9.1
Connector	Pin
Operating temperature range °C	-40 to +75

### WINDOW SPECIFICATIONS

Areal density (mg/cm <sup>2</sup> )	1.5 - 2.0
Effective diameter (inch/mm)	0.36/9.1
Material	Mica

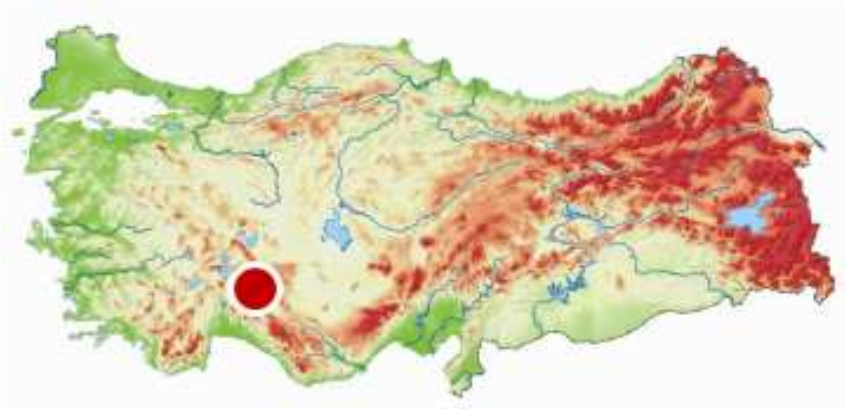
### ELECTRICAL SPECIFICATIONS

Recommended anode resistor (meg ohm)	10
Maximum starting voltage (volts)	325
Recommended operating voltage (volts)	500
Operating voltage range (volts)	450 - 650
Maximum plateau slope (%/100 volts)	6
Minimum dead time (micro sec)	90
Gamma sensitivity Co60 (cps/mr/hr)	18
Tube capacitance (pf)	3
Weight (grams)	8
Maximum background shielded 50mm Pb + 3mm Al (cpm)	10





# Beyşehir Lake



# Locations of Measurement

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Beyşehir Lake (1115 m)



Yenişarbademli (1160 m)



Vali Çeşmesi (Mountain) (1830 m)

# Findings of Research

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- Measurements were obtained at **cpm** (counts per minute ) and  **$\mu\text{Sv/h}$**  units.
- Our measurement results are given in Table 1.
- Average values per year of measurement locations as **cpm**,  **$\mu\text{Sv/h}$**  and **mSv/year** are given in Table 2.

# Findings of Research

**Table 1. Measurements in the mornings, noons and evenings per months.**

	Beyşehir Lake shore (1115 m) (CPM)			Indoor (Yenişarbademli) (1160 m) (CPM)			Vali Çeşmesi (Mountain) (1810 m) (CPM)		
	Morning	Noon	Evening	Morning	Noon	Evening	Morning	Noon	Evening
<b>Dec 2008</b>	14	15	13	17	19	17	17	19	15
<b>Jan 2009</b>	15	16	14	19	21	18	--	20	--
<b>Feb 2009</b>	15	17	15	21	22	20	--	--	--
<b>Mar 2009</b>	16	18	16	20	21	20	19	23	17
<b>Apr 2009</b>	16	19	16	21	23	21	21	24	19
<b>May 2009</b>	18	20	17	22	24	21	22	24	20
<b>Jun 2009</b>	19	21	19	22	24	23	21	25	22
<b>Jly 2009</b>	21	23	22	23	25	24	25	28	24
<b>Aug 2009</b>	19	24	21	22	24	22	24	26	25
<b>Sep 2009</b>	18	21	19	20	23	21	22	25	23
<b>Oct 2009</b>	16	18	15	18	21	19	20	22	19
<b>Nov 2009</b>	15	16	14	17	20	17	18	20	17
<b>Aritmetic mean</b>	<b>16,83</b>	<b>19,00</b>	<b>16,75</b>	<b>20,17</b>	<b>22,25</b>	<b>20,25</b>	<b>20,90</b>	<b>23,27</b>	<b>20,10</b>

# Findings of Research

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**Table 2. Average values per year.**

	CPM	$\mu\text{Sv/h}$	mSv/year
Beyşehir Lake shore	17,5	0,166	1,454
Indoor (Yenişarbademli)	20,9	0,199	1,743
Vali Çeşmesi (1810 m)	21,4	0,203	1,778

# Conclusions

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- ❑ The average values of natural radiation dose of the location change between **0,166  $\mu\text{Sv/h}$**  and **0,203  $\mu\text{Sv/h}$**  .
- ❑ There has been approximately 10% increase generally on June, July and August months.
- ❑ It has been seen approximately 10% increase on the measurements carried out in the noon hours.
- ❑ The maximum value of radiation dose for people at any year is **5 mSv/year** . (UNSCEAR, 2000)
- ❑ The average values of measurement locations are obtained between **1,454 mSv/year** and **1,778 mSv/year**.

# Conclusions

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- Natural radiation shows difference according to both months of year and also different hours of the same day.
- A lot of factors i.e. locations, type of ground, items of buildings, seasons, weather conditions, wind, rain, pressure determine the level of natural radiation.
- According to all these results; it is found that the level of natural radiation dose near Beyşehir Lake has been determined under the dose limits per year and has not generated any danger.

# References

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- ❑ ICRP, 1991. 1990 Recommendations of the International Commission on Radiological Protection. ICRP Publication 60, Annals of the ICRP, Pergamon Press, Elmsford, New York, 21, 1-3.
- ❑ Akkurt I., Sevin Z., Mavi B., Kaplan A. 2004. Isparta Bölgesinde Doğal Gamma Radyasyonu Ölçümü. Süleyman Demirel Üniversitesi Fen Bilimleri Enstitüsü Dergisi 8-2,Özel Sayı, s.108-110.
- ❑ Büyükuslu, H. , 2007. "Isparta'nın Yalvaç İlçesi ve Çevresinin Doğal Fon (background) Radyasyon Düzeylerinin Araştırılması" Yüksek Lisans Tezi SDÜ Fen Bil. Enst.





Thank you for your  
attention !