Review Form 1.7

Journal Name:	**Physical Science International Journal**
Manuscript Number:	**Ms_PSIJ_116598**
Title of the Manuscript:	**Comparative assessment of the concentration of radioactive materials in natural sources associated with mining activities in the Republic of Niger using two measurement techniques.**
Type of the Article	

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PART 1: **Review Comments**

	Reviewer's comment	**Author's comment***(if agreed with reviewer, correct the manuscript and highlight that part in the manuscript. It is mandatory that authors should write his/her feedback here)*
Compulsory REVISION comments **1. Is the manuscript important for scientific community?** (Please write few sentences on this manuscript) **2. Is the title of the article suitable?** (If not please suggest an alternative title) **3. Is the abstract of the article comprehensive?** **4. Are subsections and structure of the manuscript appropriate?** **5. Do you think the manuscript is scientifically correct?** **6. Are the references sufficient and recent? If you have suggestion of additional references, please mention in the review form.** **(Apart from above mentioned 6 points, reviewers are free to provide additional suggestions/comments)**	**YES** Can be made shorter: For example:**A comparative analysis of radioactive material concentrations in natural sources linked to mining in Niger using two measurement methods.** **YES** **YES** **YES** **Add links as proposed in the comments below.**	
Minor REVISION comments **1. Is language/English quality of the article suitable for scholarly communications?**	Yes Use **the same symbol** to represent a single nuclear isotope! For example: 235U or U-235, or ^{235}U.	
Optional/Generalcomments	**Reviewer's comment** **Page 2: Lines 7-8** Two methods can be used to calculate the net area of spectral peaks [4]: Specify the methods! **2.1 .1 Preparation of samples for gamma spectroscopy measurement** Were the soil samples pre-treated in any way, such as drying or homogenising them, prior to analysis? Please, specify! Please provide a succinct description of the experimental setup, including details of the HPGe gamma-spectrometer calibration procedure employed, as well as its key characteristics such as energy resolution and efficiency in relation to gamma-ray energy. Alternatively, you may provide links to relevant information. Provide a link to the source where the following data was taken: The activity concentrations of 238-U and 232-Th were determined from the average nuclide concentration [Pb-214 (295.2keV; 19.20%), Pb-214 (351. 9keV; 37.10%), Bi-214 (609.3keV; 46.90%), Bi-214 (1120.2keV; 15.04%) and Bi-214 (1764.49Kev; 15.90%)] and [Pb-212 (238.6keV;43.6%), Pb-212 (300.09 kev; 15.90%)] and [Pb-212 (238.6keV;43.6%), Pb-212 (300.09 kev; 15.90%)]. 3.18%), and Ac-228 (911.2keV;25.8%), Ac-228 (968.9keV; 15.8%),Ac-228 (338.32Kev; 11.27%)] respectively. For the energy of gamma-rays it is better to use the notation '**keV**', neither 'Kev' nor 'kev'. It is good to provide an experimental gamma-ray energy spectrumfrom the sample **§2.1.1, Line 4**	

…for both counting modes…
Which are the both counting modes? Please, specify!

2.1.2 Sample preparation for neutron activation analysis (NAA) measurement
The measurement of this quantity, commonly practiced in the past on activation detectors placed between two fuel pellets, was then developed on fuel rods from 1995 onwards. The γ spectrometry bench equipped with a planar-type detector was specially designed to measure γ lines at 277.6 keV, emitted by neptunium 239 (produced by neutron capture on uranium 238), and at 293.3 keV, emitted by cerium 143 for normalization to the total fission rate. If the uranium and thorium content of the sample is low, determining the concentration of 238-U and 232-Th is difficult.
Provide a link to these measurements!

Two samples from the Republic of Niger, an IAEA standard sample (IAEA-313) in which the activities are known, and a blank (IAEA Soil-7)
Give the characteristics of the samples and/or the links to them!

Two measurements were made for each sample, one for a short irradiation time of 60 seconds and the second for a long irradiation time of 3600 seconds. The irradiation process was managed in accordance with the procedure that follows radiological safety rules, in which the samples to be irradiated were stored in an irradiation bar that was located inside an irradiation isolation room or cobalt room using robotic arms. At the end of each irradiation, the capsule was removed from the reactor and allowed to cool (decay) until the activity level was within acceptable limits for handling. The samples were then removed from the capsule for counting. Each sample was placed at the appropriate position on the detector and counts were accumulated over a predetermined time to obtain spectral intensities. For short irradiation, a count time of 600 seconds proved adequate, and for long irradiation, the count time was 3600 seconds.
Where and how was done the irradiation? Reactor, neutron channel, distance from the core, etc…
Where was measure the induced activity and the geometry of the measurement: distance, solid angle, efficiency, etc…
It is good to provide experimental gamma-ray energy spectra of the irradiated samples

2.1.3 Measuring activity in the context of low-noise counting
…the detection limit is calculated by Curie's formula of equation (1)

$$Dl = 2{,}71 + 4{,}65\sqrt{NB} \quad (1)$$

$$DL = 2.71 + 4.65\sqrt{N.B}$$

Give a link to the formula. What are N and B?

$$MDA = \frac{DL}{\varepsilon \times T_L \times I_\gamma}$$

$$MDA = \frac{DL}{\varepsilon . T_L . I_\gamma}$$

$$MDA = \frac{DL}{\varepsilon \times T_L \times I_\gamma \times m}$$

$$MDA = \frac{DL}{\varepsilon . T_L . I_\gamma . m}$$

$$A_i = \frac{N_{in} - N_B}{\varepsilon_E \times T_L \times I_\gamma \times m}$$

$$A_i = \frac{N_{in} - N_B}{\varepsilon_E . T_L . I_\gamma . m}$$

$$F_E = \frac{M_E \times C}{\lambda_E \times N_A \times I_\gamma \times f \times n} \times \sum_{i=1}^{n} A_i$$

$$F_E = \frac{M_E \times C}{\lambda_E . N_A . I_\gamma . f . n} \times \sum_{i=1}^{n} A_i$$

between 19.74 ±12.3 and 125.53±20.41 counts and between 42.17±27.29 and 253.66±43.61 for Bi-214 (1764.49keV) and
between 20 ± 12 and 126 ± 20 counts and between 42 ± 27 and 254 ± 44 for Bi-214 (1764.49keV) and

Table 3. Minimum detectable activity for nuclides present in the background.
Radionclid
Radionuclide

Table 4. Precision and accuracy for NMGS technique.

Radionuclide	U-238	Th-232	K-40
COMINAK soil x(mg/kg)	2.320 ± 0.002	11.670 ± 0.001	19822 ± 0.001
SOMAIR soil x(mg/kg)	1.350 ± 0.003	7.2 ± 0.002	17350 ± 0.002
IAEA Sample 7, x (mg/kg)	2.6 ± 0.7	8.2± 0.5	12100± 600
%P COMINAK	10.8	18	63
In COMINAK	0.199	0.73	4.21
%P SOMAIR	43	12	85
In SOMAIR	0.45	0.999	8.63

3.2.2. **Activity concentrations of radionuclides U-238, Th-232 and K-40**
3.2.2.Activity concentrations of radionuclides U-238, Th-232 and K-40

$$C_{samp} = C_{st} \frac{W_{st} \times A_{sampl}}{W_{sampl} \times A_{st}}$$

$$C_{samp} = C_{st} \frac{W_{st} . A_{sampl}}{W_{sampl} . A_{st}}$$

Table 1. Detection limits for gamma-ray spectrometry in normal mode.

Correct rounding the results are shown
in the table below:

Radio-nuclide	Critical level (counts)	Detection limit (counts)

Pb-212	126 ± 20	254 ± 44
Pb-214	46 ± 19	95 ± 40
Ac-228	95 ± 19	192 ± 40
Pb-214	81 ± 18	165 ± 40
Pb-212	105 ± 26	212 ± 55
Bi-214	85 ± 13	172 ± 28
Ac-228	63 ±17	128 ± 36
Ac-228	53 ± 16	108 ± 35
Bi-214	48 ± 21	99 ± 45
Bi-214	20 ± 12	42 ± 27
K-40	59 ± 17	120 ± 36

Table 2. Activity concentration in the soil sample

Sample	Activity concentration in Bq/kg			Concentration in mg/k		
	238U	232Th	40K	238U	232Th	4(
COMINAK	27.36 ± 0.02	47.21 ± 0.01	619.87 ± 0.01	2.32 ± 0.002	11.670 ± 0.001	19
SOMAIR1	15.70 ± 0.03	29.14 ± 0.02	542.48 ± 0.01	1.35 ± 0.003	7.200 ± 0.002	17

Cite correctly, adding DOI, if available! For example:

[1] Winde F, Brugge D, Nidecker A, Ruegg U: Uranium from Africa - An overview on past and current mining activities: Re-appraising associated risks and chances in a global context. J. African Earth Sciences 128: 759-778 (2017).
[1] Frank Winde, Doug Brugge, Andreas Nidecker, Urs Ruegg,Uranium from Africa – An overview on past and current mining activities: Re-appraising associated risks and chances in a global context,Journal of African Earth Sciences,Volume 129,2017,Pages 759-778,ISSN 1464-343X,https://doi.org/10.1016/j.jafrearsci.2016.12.004.

[2] Cooper, Malcolm B. 2005. "Naturally occurring radioactive materials (NORM) in Australian industries-review of current inventories and future generation." Report ERS-006(EnviroRad Services Pty. Ltd.) to the Radiation health and Safety Advisory Council.
[2] Malcolm B. Cooper, Naturally Occurring Radioactive Materials(NORM) in Australian Industries - Review ofCurrent Inventories and Future Generation,A Report prepared for the Radiation Health and Safety Advisory Council, ERS-006, 2005, EnviroRad Services Pty. Ltd.
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etc.

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PART 2:

	Reviewer's comment	**Author's comment***(if agreed with reviewer, correct the manuscript and highlight that part in the manuscript. It is mandatory that authors should write his/her feedback here)*
Are there ethical issues in this manuscript?	*(If yes, Kindly please write down the ethical issues here in details)*	

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