



**National University of Science and Technology
POLITEHNICA BUCHAREST**

Doctoral School of Power Engineering

SUMMARY of PhD THESIS

**Contributions to the evaluation of tritium
distribution around CANDU nuclear power plants**

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SYNTHESIS OF THE PHD THESIS

A. SCOPE AND OBJECTIVES

The main purpose of the PhD thesis was the evaluation of the tritium concentration distribution in the environmental compartments, around CANDU nuclear power plants, especially for the nuclear objective: Cernavoda NPP – branch of Nuclearelectrica company from Romania.

Considering that tritium is present in all environmental compartments, in different forms (gaseous: HT, CH₄T, liquid: HTO vapours, in the tissue-free water: TFWT or in the organically-bound form: OBT) and it is produced by natural reactions of cosmogenic radiations with nitrogen atoms from the upper atmosphere and also by anthropogenic sources – remaining from the nuclear tests or from nuclear installation emissions, in normal operations or accidental releases, this study has proposed the following specific objectives:

1. annually monitoring of environmental tritium levels (HTO, TFWT and OBT) in order to evaluate spatial and temporal variations, and to provide data for a database which can be used as inputs for the implementation of the new version of Canadian standard CAN-CSA N288.1-20 “Guidelines for modelling radionuclide environmental transport, fate, and exposure associated with the normal operation of nuclear facilities”;
2. performing tritium measurements and quantification of HTO and OBT concentrations from the main types of environmental samples, specific for the human food behaviour of the population from Cernavoda town, which contribute to the supplementary annual dose calculated for the normal operation of the Cernavoda Nuclear Power Plant;
3. validation of the organically-bound tritium (OBT) determination method during studies that includes inter-laboratory comparison exercises on environmental matrices from the Cernavoda area;
4. calculation of OBT/HTO concentration ratios in different types of environmental samples;
5. calculation of OBT contribution to the annual dose for a representative person from the population of the Cernavoda town.

B. MOTIVATION FOR THE PHD THESIS

Complex behaviour of tritium (H-3) in the biosphere and the evaluation of OBT levels in the environmental matrices, as well as the probability of increasing tritium concentrations around the nuclear facilities were the promoters for the research and development studies focused on laboratory methods suitable to accurately determine different forms of tritium in the environment, in order to ensure the radiological protection of the population and the environment, according to the requirements of the regulatory bodies from the applicable norms/legislation.

Tritiated water (HTO) is very similar to the light water (H₂O), having a small atomic mass difference. HTO is incorporated into the organisms and the environment much faster than the molecular tritium (T₂), it enters the whole body and emits beta (β^-) radiations, generating a dose to the soft tissues, with a biological half-life of approximately 10 days.

Although beta radiations have a very short length (they cannot penetrate a paper) and the maximum energy of β^- radiations emitted by H-3 is low (18.6 keV), the physical half-life is 12.3 years, tritium enters rapidly into the organisms through inhalation, ingestion, skin diffusion, where it is rapidly bound in the cells, inducing radiative effects, that can produce chromosome aberrations. According to the bio-kinetic models developed by experts in the field, it is estimated that the biological half-life for the organically-bound tritium (OBT) is different for each person (between 23 and 104 days, with an average value of 59 days); the ICRP model (Publication ICRP 134/ 2016) recommended the mean value of 40 days (UNSCEAR, 2016).

Comparing to the determination method of the tritiated water (HTO) that is describes in ISO 9698, as standard method for the measurement of tritium by liquid scintillation counting, starting from 1989, with a revision in 2010 and actual revision available also in Romanian language – SR EN ISO 9698:2019, for a better evaluation of tritium in the environment it was necessary to improve the determination method for the organically-bound tritium (OBT) in the environmental samples, to test and validate it through intercomparison exercises.

This challenging topic was in progress for analysis at the Cernavoda NPP and the first results achieved from the OBT monitoring program at the Cernavoda NPP (2018 – 2020), were presented at the annual Conference of the Romanian Radioprotection Society – SRRp (October 2021) and published in Romanian language in the conference volume: Simona Zaharov, Alexandru E. Nedelcu, Veronica Tudorache, „*Evaluation of organically-bound tritium levels in*

the environmental samples from Cernavoda area, between 2018-2020 period”, Volume of SRRp Conference 2021, ETNA, 2021, ISBN 978-973-1985-75-6, pp.95-100.

The research studies described in the PhD thesis were performed in the Environmental Control Laboratory (ECL) from the Radioprotection Department of Nuclearelectrica – Cernavoda NPP, and are based on the evaluation of tritiated water, tissues-free water tritium and organically bound tritium concentrations, their distribution in different kind of environmental samples and on the quantification of OBT contribution to the annual dose for a representative person of population from the Cernavoda town.

A synthesis of the results from the OBT monitoring program at the Cernavoda NPP (2018 – 2023) was presented at the annual Conference of the Romanian Radioprotection Society – SRRp (October 2024) and published Romanian language in the conference volume: Simona Zaharov, Ștefan Babu, Alexandru E. Nedelcu, *“Development of the Environmental Radioactivity Monitoring Program for OBT Analysis”*, Volume of SRRp Conference 2024, online edition no. 1, ISSN 3061 – 6166, ISSN - L 3061 – 6166, pp. 34-49, <https://srrp.ro/wp-content/uploads/2024/12/Conferinta-Nationala-SRRp-2024-cu-ISSN.pdf>

In this thesis, results of two studies for inter-laboratory comparison exercises for OBT determinations in fruit samples (quinces and grapes) were included. These were performed in the Environmental Control Laboratory of the Cernavoda NPP as a commitment to the OBT International Group, that was founded in 2012, thanks to the contribution and dedicated work of prestigious specialists from research and industry field from different countries: France, Canada, United Kingdom, Romania, etc.

The main challenge of the PhD thesis was the organization of the international intercomparison exercise for OBT determinations in grape samples, since the length of such a study can be extended to almost 2 years and in particular cases it cannot be accomplished if the criteria are not met: reference material with a certain tritium concentration (relatively low), homogeneous and stable composition, quantity enough for at least 20 labs, laboratories to be able to report in time and according to the specific requirements of the organizer, etc.

In this case, the exercise was successfully accomplished. Grapes were picked-up in September 2023, a fine, homogeneous and stable matrix was prepared, having tritium concentration of environmental levels, detectable by different methods; the exercise was carried out in 2024 with 22 participating labs from 11 countries: 8 countries from Europe, Canada,

Republic of Korea, Japan; the statistical evaluation of their results was accomplished in the second trimester of 2025.

The results obtained in the research studies for the PhD thesis have contributed to the improvement of the OBT determination method and were included in a database to be used as input values for the implementation of the Canadian standard CAN-CSA N288.1-20 “Guidelines for modelling radionuclide environmental transport, fate, and exposure associated with the normal operation of nuclear facilities”.

Dissemination of the results was performed through conferences: Annual Conferences of the Romanian Radioprotection Society (SRRp) in 2022, 2023, 2024 – Bucharest; Tritium 2022 – Bucharest; ICRM2023 – Bucharest; ALMERA-IAEA in 2022 – Monaco and in 2023 – Vienna; 9th OBT Workshop 2023 – Belgium; 10th OBT Workshop 2025 – Bucharest, as well as scientific papers in journals and conference volumes: Conference Volume of SRRp (2021, 2024); Fusion Science and Technology (FST, 2023); Applied Radiation and Isotopes (ARI, 2024); Journal of Environmental Radioactivity (JENVR, 2025), UPB Scientific Bulletin, Series B: Chemistry and Materials (U.P.B. Sci. Bull., Series B, 2025).

C. CONTENT OF THE PHD THESIS

The PhD Thesis is structured on 7 chapters as follows:

Chapter I. Actual status of thematics related to the evaluation of tritium levels around CANDU nuclear power plants

- includes a short presentation on CANDU technology;
- describes the purpose of the environmental radioactivity monitoring programs around nuclear power plants,
- included data from specific literature related to tritium level estimations produced from natural and anthropogenic sources;
- describes the actual study about the organically-bound tritium level estimation, applying mathematical models, that were developed in the international working groups of prestigious researchers selected by IAEA, Vienna: BIOMASS and EMRAS projects.

Chapter II. Requirements for the environmental radioactivity monitoring around CANDU nuclear power plants

- presents the monitoring requirements for the reactors from Canada, with similar technology as the Cernavoda Nuclear Power Plant; including the name and locations of the nuclear facilities from Canada;
- includes the structure of the Environmental Management System for the adequate protection of the environment and the applicable standards, described in the report of the regulatory body from Canada in the nuclear field – Canadian Nuclear Safety Commission;
- specifies the difference between the environmental radioactivity monitoring programs from Canada and Romania related to the discharge requirements of the regulatory bodies for both countries, which are the basis for establishing the Derived Released Limits;
- describes the Environmental Radioactivity Monitoring Program at the Cernavoda Nuclear Power Plant.

Chapter III. Analytical methods for preparation and determination of HTO and OBT

- describes the analytical methods for preparation of food samples through extraction of the free water from the fresh tissue (TFWT) using an installation of azeotrope distillation;
- includes a diagram of sample preparation protocol for tritium determination, using liquid scintillation method (LSC);
- describes the calibration procedure, using the attenuation curve (quench) and the calculation method of H-3 concentration in the measured samples;
- describes the sample preparation method of food sample through extraction of the combustion water; includes the equipments used for the drying step (dry oven, freeze drying) and different types of combustion equipments along with the operation diagrams, as well as the measurements methods of OBT concentration (LSC and „He ingrowth” method with mass spectrometry).

Chapter IV. Determination of tritium concentration at the Cernavoda NPP

includes the concentrations of H-3 in air in different monitoring points located at distances between 1.5 km and 25 km from the Cernavoda NPP site, in 2007 – 2023 period, and the background values determined before the commissioning of Unit 1 of the Cernavoda NPP, using as reference the Pre-operational Report;

- includes the maps with the monitoring points for diverse types of environmental samples applicable to the Cernavoda NPP;
- contains annual variations of H-3 average concentrations in drinking water, in 2007 – 2023 period, compared with the legal limit;
- presents the results of H-3 determinations in food samples: milk, meat, fish, eggs, vegetables, fruits, grains, on a 30 km area around the NPP, in 2007 – 2023 period; their variation on sample types;
- describes the OBT monitoring program and the results from 2021 – 2024 period, for fish, grass, apricots, wheat, and potatoes, from 2 locations: Cernavoda and Seimeni; the OBT concentrations are presented in graphs both for [Bq/kg dry mass] and for [Bq/L water of combustion] units;
- includes the evaluation of OBT/ HTO concentration ratios in food samples (fish, apricots, potatoes, and wheat), in Bq/kg fresh sample – study performed in the 2021 – 2024 period.

Chapter V. Determination of OBT concentration in environmental samples

- includes a short history about the OBT International Project, formation of the OBT International Working Group with specialists from different countries (Canada, France, United Kingdom, Romania, etc.) in 2012, the list of the OBT intercomparison exercises organized in 2013 – 2025 period, and the results obtained in these exercises by the Environmental Control Laboratory of the Cernavoda NPP;
- details all the stages performed by the ECL for the 6th OBT intercomparison exercise in quince samples, between 2019 and 2020; the statistical evaluation of the results reported by the participating laboratories – provided in the final report of this exercise; all the results were published during the scientific activities of this PhD thesis;

- includes the study performed for the 7th OBT intercomparison exercise for grape matrix: sampling (September 2023), reference material preparation, sample dispatch and result reporting (in 2024), statistical evaluation of the results, according to ISO 13528:2022 standard (in 2025) and the conclusions of the study; activities were performed in the Environmental Control Laboratory of the Cernavoda NPP.

Chapter VI. Evaluation of H-3 level contribution to the dose for population from the Cernavoda area

- includes a case-study for the Point Lepreau NGS from Canada and the Canadian standard (CAN-CSA N288.1) applicable for the modelling of radionuclide environmental transport, fate, and exposure associated with the normal operation of nuclear facilities;
- describes the calculation method to estimate the contribution of tritium to the annual dose for population; the case-study for the Cernavoda NPP.

Chapter VII. Contributions to the evaluation of tritium distribution around the Cernavoda NPP. General conclusions. Original contributions. Future perspectives.

- includes the general conclusions from the studies of this PhD thesis;
- presents the original contributions and benefits obtained along with the studies and the proposed objective achieved;
- proposes future perspectives to be considered to continue the research studies and to benefit from the present results of this PhD thesis.

GENERAL CONCLUSIONS

Nuclearelectrica – Cernavoda Nuclear Power Plant gives special importance to the environmental monitoring, to the accuracy of the radioactivity measurements and to the calculation of annual dose for the population, according to the requirements of the Directive 2013/59/EURATOM.

Starting from 2012, Cernavoda NPP has actively participated in the OBT International Project, to determine the organically-bound tritium (OBT) in environmental samples, for the purpose of validating analytical and measurement methods for OBT through intercomparison exercises.

Results obtained by the Cernavoda NPP met the acceptance criteria, thus validating its method, that was the basis to elaborate and implement a supplementary program for OBT determinations.

The environmental radioactivity monitoring program for the Cernavoda NPP, extended with the OBT supplementary program in 2018, performed by the Environmental Control Laboratory from the Radioprotection Department of the Cernavoda NPP, is the basis of the implementation of the Canadian standard CAN-CSA N288.1-20, so that the dose calculations for a representative person from the population to be refined comparing to the actual models that conservatively overestimate the results.

The research studies performed for this PhD thesis contributed to the development of the OBT determination program, by testing new matrices of environmental samples, improvements to the combustion method, tritium measurements and calculation of OBT concentrations, calculation of OBT/HTO concentration ratios in fresh samples and calculation of OBT contribution to the annual dose for a representative person from the population of the Cernavoda town, opening new opportunities for the development of the environmental radioactivity monitoring program for the Cernavoda NPP.

ORIGINAL CONTRIBUTIONS

The research studies from the PhD thesis “Contributions to the evaluation of tritium distribution around CANDU nuclear power plants” performed in the Doctoral period (2021 – 2025) have an important contribution to the development of the environmental radioactivity monitoring program for the Cernavoda NPP, as well as in-depth knowledge of the organically-bound tritium (OBT) form and its distribution in the environmental samples from the Cernavoda town and surrounding areas; the OBT field being poorly explored previously.

The original results, personal contributions and the benefits gained in the studies presented in this PhD thesis are as follows:

1. choosing the environmental matrices, preparation and characterization of these for the HTO and OBT concentrations, in an OBT supplementary program;
2. determination of the organically-bound tritium (OBT) levels in the environmental samples for 4 years of monitoring, evaluating the variations in time and the distributions in different types of samples;
3. determination of OBT concentrations in [Bq/L water of combustion] and [Bq/kg dry sample], as well as transformation in OBT concentration in the fresh samples in [Bq/kg fresh weight] – the food parts ingested by human;
4. determination of OBT contribution (%) and OBT/ HTO concentration ratios in different types of environmental samples;
5. validation of OBT determination method for environmental samples, that allowed to include the OBT determination in the Certification of the Environmental Control Laboratory, as Testing Laboratory, according to ISO/IEC 17025 “General requirements for the competence of testing and calibration laboratories”;
6. comparative study of the results obtained through the monitoring of the HTO, TFWT and OBT levels at the Cernavoda NPP with those obtained by CANDU reactors from Canada, that have similarities regarding the annual tritium releases in air and in water, as well as comparing with independent results obtained by the competent authority with responsibilities for environmental monitoring – that demonstrate the validity of the results of the Cernavoda NPP, which has a low level impact on the environment through its releases, and the supplementary doses for the public are very low comparing to the legal limit – 1 mSv/ year;

7. starting a research study to determine the contribution of OBT concentration to the dose for a representative person from population, which will build the trust of the public in the permanent focus of the Cernavoda NPP to the public health and to the environmental protection;
8. building a database with statistical data that will be the inputs for the implementation of the Canadian standard CAN-CSA N288.1-20 „Guidelines for modelling radionuclide environmental transport, fate, and exposure associated with the normal operation of nuclear facilities”, so that the dose calculation will consider measured OBT concentration instead of estimated ones;
9. evaluation of the reported results of the participating laboratories in the international OBT intercomparison exercise for quince samples – organized in 2019 and postponed due to the pandemic period; the evaluation was performed according to ISO 13528:2015 standard;
10. development of a grape matrix, characterization as reference material and organization of an international intercomparison exercise for OBT determinations, in 2024; statistical evaluation of the results of the 22 participating laboratories from Romania, Canada, France, United Kingdom, Belgium, Republic of Korea, Japan, IAEA, etc., was performed according to the latest version of ISO 13528:2022 standard “Statistical methods for use in proficiency testing by interlaboratory comparisons”;
11. comparing results from different methods and sample preparation and measurement equipment for OBT determination and studying the correlation of these results with different parameters, specific for each sample preparation and measurement stages;
12. coordinating the international event „10th Organically-Bound Tritium Workshop” organized by Nuclearelectrica in Bucharest, 1-3 April 2025, for the dissemination of the results for the OBT inter-laboratory comparison exercise for grape samples – organized in 2024, in the spirit of continuing the international collaboration for OBT determination; the event brought together the members of the Scientific Committee of the OBT International Group, representatives from the participating labs of the 7th OBT exercise, prominent specialists in the field of H-3 and OBT measurements and mathematic modelling, as well as the representatives of regulatory bodies in the nuclear field (CNCAN from Romania, CNSC from Canada, ASNR from France, KINS from Republic of Korea, etc.) and from the research institutes (IFIN-HH Bucharest, ICSI

Râmnicu-Vâlcea and ICN Pitești from Romania, CEA from France, SCK-CEN from Belgium, Canadian Nuclear Laboratories and University of Ottawa from Canada, GAU Radioanalytical Laboratories and University of Southampton from UK, etc.);

13. studying stability and homogeneity of the reference material used in the 6th OBT intercomparison exercise, organized by the Environmental Control Laboratory of the Cernavoda NPP, for quince samples;
14. evaluating the distribution of OBT concentrations in the environment necessary for the impact evaluation of the Cernavoda NPP operation of 2 Units, and for preparing the environmental reports requested by the regulatory bodies;
15. dissemination of the results extracted from the studies at different national and international conferences such as:
 - Annual Conference of the Romanian Radioprotection Society in 2021, 2022, 2023 and 2024;
 - The 13th International Conference on Tritium Science and Technology (TRITIUM2022)
 - The 23rd International Conference on Radionuclide Metrology and its Applications (ICRM 2023)
 - The 19th ALMERA-IAEA Coordination Meeting (2022)
 - The 20th ALMERA-IAEA Coordination Meeting (2023)
 - The 9th Organically Bound Tritium Workshop (2023)
 - The 10th Organically Bound Tritium Workshop (2025)
 - EURACHEM Workshop (2025),as well as through published articles used as references in this PhD thesis.

FUTURE PERSPECTIVES

The monitoring of tritium level distributions in general, and of OBT levels in particular, into the environment is necessary for the evaluation of the impact of the Cernavoda NPP operation with 2 Units, and to establish the “basis levels”, required for the evaluation of the impact of the future nuclear project at the Cernavoda NPP (Refurbishment of Unit 1, Tritium Removal Facility – CTRF, construction and operation of Units 3&4, etc.).

To refine the dose calculation results and to implement the Canadian standard CAN- CSA N288.1-20 it is necessary to continue the evaluation studies of the OBT concentration levels in the Cernavoda area, which involves the monitoring for an interval of about 10 years.

Results from the monitoring program are necessary to be integrated into the modelling software that allows to perform the calculation of transfer parameters, leading to the annual dose calculation for a representative person of population from Cernavoda town.

Testing new matrices of environmental samples (milk, meat, corn, vegetables and fruits, etc.) and characterization of those materials are important to develop reference materials for OBT determination to be used in the following intercomparison exercises and to validate the results through these exercises.

It is recommended to enhance national and international collaborations with research institutes/ laboratories (IAEA, CEA and CETAMA from France, CONEXUS Nuclear Inc., etc.) that are accredited as calibration laboratories, in order to certify the reference materials for the environmental samples from the Cernavoda town and surrounding areas; the collaboration with modelling specialists is absolutely necessary for the validation of transfer models and dose calculations using measured OBT values instead of estimated ones.

List of the articles published by the author of the PhD thesis

1. Simona Zaharov, Alexandru E. Nedelcu, Veronica Tudorache, „*Evaluation of organically-bound tritium levels in the environmental samples from Cernavoda area, between 2018-2020 period*”, Volume of SRRp Conference 2021, ETNA, 2021, ISBN 978-973-1985-75-6, pp.95-100, <https://srrp.ro/wp-content/uploads/2021/12/Conferinta-Nationala-SRRp-2021-A4-ver.7-finala.pdf>
2. Simona Zaharov, Alexandru E. Nedelcu, Liliana A. Samson, „*Evaluation of Environmental Tritium Activity Levels and the Impact on the Public Health around Cernavoda Nuclear Power Plant after 25 Years of Operation*”, Fusion Science and Technology, Volume 80 (Issue 3-4), 2023, pp. 576-581, <https://doi.org/10.1080/15361055.2023.2214701>
3. Simona Zaharov, Nicolas Baglan, Alexandru E. Nedelcu, Carmen Varlam, Irina Vagner, “*Interlaboratory comparison exercises for organically-bound tritium in the development of reference materials of environmental samples*”, Applied Radiation and Isotopes, Volume 210, 2024, 111336, ISSN 0969-8043, <https://doi.org/10.1016/j.apradiso.2024.111336>
4. Simona Zaharov, Ștefan Babu, Alexandru E. Nedelcu, “*Development of the Environmental Radioactivity Monitoring Program for Organically Bound Tritium (OBT) Analysis*”, Volume of SRRp Conference 2024, Online edition no. 1, ISSN 3061 – 6166, ISSN – L 3061 – 6166, pp. 34-49, <https://srrp.ro/wp-content/uploads/2024/12/Conferinta-Nationala-SRRp-2024-cu-ISSN.pdf>
5. Simona Zaharov, Alexandru E. Nedelcu, Daniel Dupleac, „*Evaluation of the Sample Preparation Method for Environmental Reference Matrices suitable for Organically-Bound Tritium Interlaboratory Comparison Exercises*”, Journal of Environmental Radioactivity, Volume 287, 2025, 107730, ISSN 0265-931X, <https://doi.org/10.1016/j.jenvrad.2025.107730>
6. Simona Zaharov, Alexandru E. Nedelcu, Daniel Dupleac, „*Quantifying the organically-bound tritium levels in the environmental samples around the Cernavoda Nuclear Power Plant*”, UPB, Scientific Bulletin, Series B, Chemistry and Materials Science, 2025, ISSN 1454-2331, Volume 87, Issue 2, pp. 107-116, https://www.scientificbulletin.upb.ro/rev_docs_arhiva/rezd71_151007.pdf

SELECTIVE BIBLIOGRAPHY

1. IAEA-TECDOC-1738, "Transfer of Tritium in the Environment after Accidental Releases from Nuclear Facilities. Report of Working Group 7. Tritium Accidents of EMRAS II Topical Heading Approaches for Assessing Emergency Situations", International Atomic Energy Agency, IAEA, Vienna, 2014
2. S. Popoaca, C. Bucur și V. Simionov, „Determination of ^3H and ^{14}C in Organic Samples After Separation Through Combustion Method”, Journal of Energy and Power engineering, vol. 4, nr. 1, pp. 1687-1694, 2014
3. S.B. Kim, J. Olfert, N. Baglan, N. St-Amant, B. Carter, I. Clarck, C. Bucur, „Canadian inter-laboratory organically bound tritium (OBT) analysis exercise”, Journal of Environmental Radioactivity, vol. 150, nr. <https://doi.org/10.1016/j.jenvrad.2015.08.021>, pp. 236-241, 2015
4. A. Melintescu, D. Galeriu, „Uncertainty of current understanding regarding OBT formation in plants”, Journal of Environmental Radioactivity, Volume 167, 2017, Pages 134-149, ISSN 0265-931X, <https://doi.org/10.1016/j.jenvrad.2016.11.026>
5. N. Baglan, C. Cossonnet, E. Roche, S.B. Kim, I.W. Croudace, P.E. Warwick, "Feedback of the Third Interlaboratory Exercise Organised on Wheat in the Framework of the OBT Working Group", Journal of Environmental Radioactivity, vol. 181, no. <https://doi.org/10.1016/j.jenvrad.2017.09.009>, pp. 52-61, 2018
6. Canadian Standardization Association, „CAN/CSA-N288.1-20 Guidelines for modelling radionuclide environmental transport, fate, and exposure associated with the normal operation of nuclear facilities”, CSA, 2020
7. S. Zaharov and N. Baglan, "OBT International Group. 6th Inter-laboratory Exercise Report", SNN-Cernavoda NPP, Romania; CEA France, 2020
8. S. Zaharov, A.E. Nedelcu, V. Tudorache, Evaluation of organically-bound tritium levels in the environmental samples from Cernavoda area, between 2018-2020 period”, Volume of SRRp Conference 2021, ETNA, 2021, ISBN 978-973-1985-75-6, pp.95-100, 2021, <https://srrp.ro/wp-content/uploads/2021/12/Conferinta-Nationala-SRRp-2021-A4-ver.7-finala.pdf>
9. Canadian Nuclear Safety Commission, „Canadian National Report for Convention on Nuclear Safety, Ninth Report”, CNSC, August 2022
10. S. Zaharov, A.E. Nedelcu și L.A. Samson, „Evaluation of Environmental Tritium Activity Levels and the Impact on the Public Health around Cernavoda Nuclear Power Plant after 25 Years of Operation”, Fusion Science and Technology, American Nuclear Society vol. 80, pp. 576-581, 2023, (Issue 3-4: Selected papers from the 13th International Conference on Tritium Science and Technology), <https://doi.org/10.1080/15361055.2023.2214701>
11. S.N. Nuclearelectrica S.A.-CNE Cernavodă, „Environmental Radioactivity Monitoring Report of the Cernavoda NPP, in 1996 – 2023 period”, 2024
12. S. Zaharov, N. Baglan, A.E. Nedelcu, C. Varlam, I. Vagner, „Interlaboratory comparison exercises for organically-bound tritium in the development of reference materials of environmental samples”, Applied Radiation and Isotopes, Elsevier, vol. 210 (2024) 111336, pp. 1-6, 8 May 2024, ISSN 0969-8043, <https://doi.org/10.1016/j.apradiso.2024.111336>
13. S. Zaharov, Ș. Babu, A.E. Nedelcu, “Development of the Environmental Radioactivity Monitoring Program for OBT Analysis”, Volume of SRRp Conference 2024, online edition no. 1, ISSN 3061 – 6166, ISSN - L 3061 – 6166, pp. 34-49, <https://srrp.ro/wp-content/uploads/2024/12/Conferinta-Nationala-SRRp-2024-cu-ISSN.pdf>
14. S. Zaharov and N. Baglan, "OBT International Group. 7th Inter-laboratory Comparison Exercise Report", SNN-Cernavoda NPP, Romania; CEA France, 2025
15. S. Zaharov, A.E. Nedelcu, D. Dupleac, „Evaluation of the Sample Preparation Method for Environmental Reference Matrices suitable for Organically-Bound Tritium Interlaboratory Comparison Exercises”, Journal of Environmental Radioactivity, Elsevier, Volume 287, 2025, 107730, ISSN 0265-931X, <https://doi.org/10.1016/j.jenvrad.2025.107730>
16. S. Zaharov, A.E. Nedelcu, D. Dupleac, „Quantifying the organically-bound tritium levels in the environmental samples around the Cernavoda Nuclear Power Plant”, UPB, Scientific Bulletin, Series B, Chemistry and Materials Science, 2025, ISSN 1454-2331, Volume 87, Issue 2, pp. 107-116, https://www.scientificbulletin.upb.ro/rev_docs_arhiva/rezdz71_151007.pdf