

EURADOS IC2022n exercise: Participants' meeting

Coordinator : Marie-Anne Chevallier (IRSN, France)

Members of the Organization Group:

Elena Fantuzzi (ENEA, Italy),
Michael Hajek (IAEA, Austria),
Sabine Mayer (PSI, Switzerland)

IC2022n Participants' meeting : programme

9h - 9h05	Welcome and Organisational Matter	5 min	Marie-Anne CHEVALLIER, IRSN
9h05 - 9h10	Description of the IC2022n Action	5 min	Marie-Anne CHEVALLIER, IRSN
9h10 - 9h20	Irradiations at PTB	10 min	Andreas ZIMBAL, PTB
9h20 - 9h30	Irradiations at IRSN	10 min	Amokrane ALLAOUA, IRSN
9h30 - 10h	Overview on Results	30 min	Michael HAJEK, IAEA
10h - 10h20	Open discussion	20 min	IC2022n OG
10h20 - 10h30	Final overview / closure	10 min	Elena FANTUZZI, ENEA

Description of the IC2022n exercise

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Michael Hajek (IAEA, Austria),
Sabine Mayer (PSI, Switzerland)



Italian National Agency for New Technologies,
Energy and Sustainable Economic Development



Elena
FANTUZZI

ENEA
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PAUL SCHERRER INSTITUT



Sabine
MAYER

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MEMBERS OF THE ORGANISATION GROUP



Michael
HAJEK

IAEA
Austria

Marie-Anne
CHEVALLIER

IRSN
France



IAEA

International Atomic Energy Agency

Atoms for Peace and Development



RÉPUBLIQUE
FRANÇAISE

Liberté
Égalité
Fraternité

IRSN

INSTITUT
DE RADIOPROTECTION
ET DE SÛRETÉ NUCLÉAIRE

MEMBRE DE
ETSON

IRSN

EURADOS WG2 Inter-comparison Exercises

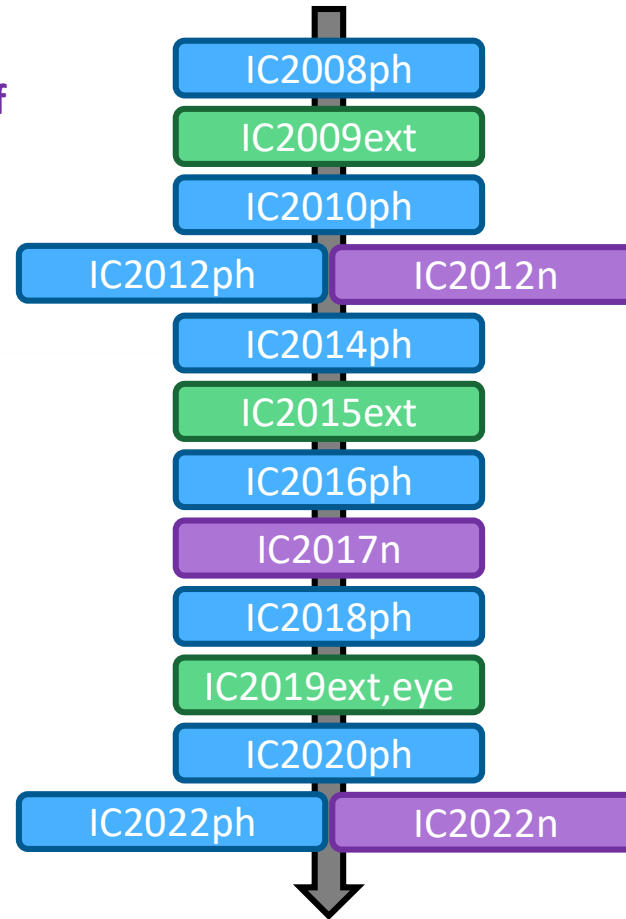
Working Group 2 (WG2) was assigned the task of setting up a self-sustained program of personal dosimeter inter-comparisons in Europe.

Goal of intercomparison exercises

To stimulate Individual Monitoring Services (IMS) to improve the quality of their results and assist with harmonization of the IMS quality control standards.

Organization on a regular basis

- Photons => every 2 years
- Ext, eye lens => every 4 years
- Neutrons => every 5 years – started in 2012



IC2022n inter-lab comparison exercise: overview

Similar scope than for the 2 former exercises:

↩ This inter-comparison concerns the performance of neutron dosimeters intended to **measure neutron personal dose equivalent $H_p(10)$** provided by individual monitoring services.

↩ The neutron dosimeters may be **passive or active** but must be **used routinely in individual monitoring** of exposed workers.

No systems under development are allowed in the inter-comparison.



IC2022n inter-lab comparison exercise: overview

Number of participating systems

	IC2012n	IC2012n	IC2022n
Number of IMSs	31	32	29
Numbers of dosimetry systems fully tested	32	33	31
participant fees	3000 € per dosimetry system	3200 € per dosimetry system	3300 € per dosimetry system
Specificity	2-step procedure	1-step procedure	1-step procedure

Country	Number of participating system per country
Italy	6
France	4
Austria, Switzerland, Germany, Japan	2
Belgium, China, Czech Republic, Algeria, Finland, United-Kingdom, Israel, India, Republic of Korea, Poland, Romania, Turkey, United States	1

10 IMSs : 1st time
15 IMSs : 3rd time

For IC2022n:
a total of 29 IMSs participated
with 31 dosimetry systems

Participating systems



Dosemeter category	Need of A priori information	
	YES	NO
Albedo	8	3
Track	8	12

IC2022n inter-lab comparison exercise: overview

Outlines of IC2022n exercise

As for IC2017n exercise, registration + communication to the OG via an Online Platform



[Start page](#) ♦ [Documents](#) ♦ [Login](#) ♦ [Registration](#)

♦ Welcome! ♦

Welcome to the EURADOS Neutron dosimeter intercomparison IC2022n!

On this homepage, participants of the **Neutron dosimeter intercomparison IC2022n** can log in and check the current status of the intercomparison, receive information about the irradiation process, enter their dose values and much more.

For the documentation please have a look at the file 'IC2022n Online Platform Documentation.pdf' which is available via the 'Documents' link!

As the deadline for registration is over (Tuesday, 2022-02-15, 23:59 (CET)), registration is no longer possible.

By the way: you can change the language of this homepage in the bottom left corner.

With the help of Christian GÄRTNER,
from Seibersdorf Labor GmbH,
administrator of the platform



IC2022n inter-lab comparison exercise: overview

Outlines of IC2022n exercise

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to the OG via an Online Platform

1-step procedure



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1-step procedure

Confidentiality Clause signed by all OG

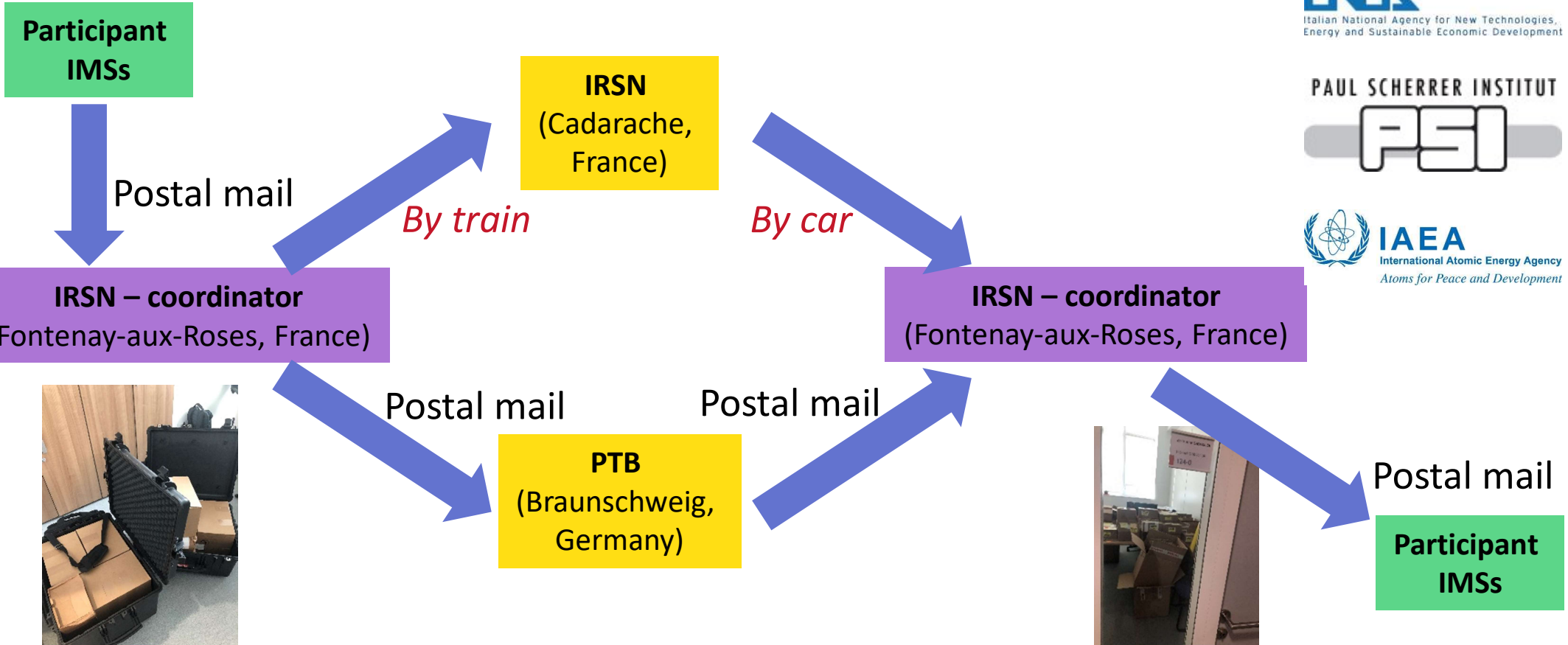
Coordination

Preparation of
the dosimeters



Coordination

Shippings



EURADOS

Coordination

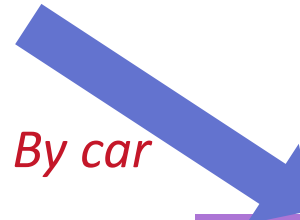
Shippings



Participant
IMs



IRSN
(Cadarache,
France)



IRSN – coordinator
(Fontenay-aux-Roses, France)

Participant
IMs

IRSN – coordinator
(Fontenay-aux-Roses, France)

PTB
(Braunschweig,
Germany)



CAUTION
DO NOT
X-RAY
Postal mail

By train

By car

CAUTION
DO NOT
X-RAY
Postal mail

CAUTION
DO NOT
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Irradiations at accredited irradiation facilities

Quality at irradiation laboratory	Angle of incidence	$H_p(10)$ (mSv)	Number of dosimeters	Irradiation laboratory
Bare ^{252}Cf	0°	0.3	4	IRSN
Bare ^{252}Cf	0°	5	4	IRSN
Bare ^{252}Cf	30°	0.5	2	IRSN
Bare ^{252}Cf	45°	0.5	2	IRSN
Bare $^{241}\text{AmBe}$	0°	1	4	IRSN
Bare $^{241}\text{AmBe}$	30°	0.5	2	IRSN
^{252}Cf (D_2O moderated) at 0°	0°	0.8	4	PTB
Bare ^{252}Cf source at 0° (0.45 mSv) + additional thermal field (0.15 mSv)	0°	0.45 (fast) 0.15 (thermal)	2	PTB
Un-irradiated dosimeters: spare + background	-	-	4 + 4 4 + 4	PTB IRSN
Fake irradiated dosimeters	-	-	4	Stayed at IRSN coordinator site

IC2022n inter-lab comparison exercise: overview

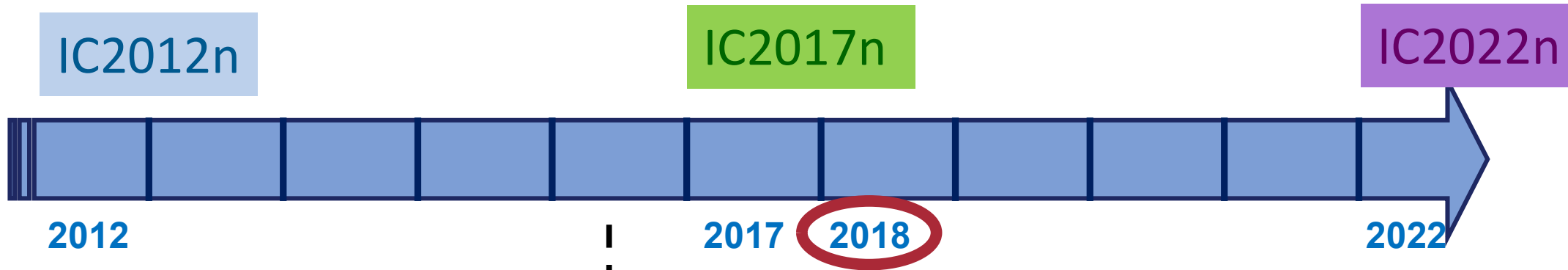
Radiation field information provided to the participants

- Participants were requested **to only apply routine procedures** as declared in the application form **AND confirmed** before the coordinator sent back the dosimeters for analysis, where they could also declare whether **they needed additional simplified a priori information** on the energy distribution of the radiation fields **to allow correction of the bare results** of neutron personal dosimeters

Irradiation conditions	Information provided to participants	
	NO a priori information requested	with a priori information requested
Bare ^{252}Cf , $0^\circ - 30^\circ - 45^\circ$	Irradiated	Bare radionuclide source
Bare $^{241}\text{AmBe}$, $0^\circ - 30^\circ$		
^{252}Cf (D_2O moderated) at 0°	Irradiated	radionuclide source, significantly moderated
Bare ^{252}Cf source at 0° (0.45 mSv) + additional thermal field (0.15 mSv)		
Un-irradiated dosimeters: spare + background	NOT irradiated	NOT irradiated
Fake irradiated dosimeters	Irradiated	Bare radionuclide source

IC2022n inter-lab comparison exercise: overview

Performance criteria



Chosen *guideline* for the IC2012n:

$$0.5 \leq \frac{H_{mes} \pm l_{mes}}{H_{ref}} \leq 2$$

ISO 14146 Performance limits

- Trumpet curves according to this equation (for neutrons):

$$0,5 \cdot \left(1 - \frac{2 \cdot H_0 / 1,5}{H_0 / 1,5 + H_{ref}} \right) \leq R \leq 2$$

- Independent of the energy and the angle of incidence

IC2022n inter-lab comparison exercise: overview

Time schedule

	Actions	Date	
		Provisional	Realized
2021	Announcement - call for participants and open the registration	15-nov	<i>December 2021</i>
	Registration closed: Deadline for IMS sending Application Forms	15th Feb	15th Feb
	Confirmation of participation by OG coordinator	April	April
	Deadline for IMS sending dosimeters to OG coordinator	May	May
	Irradiations	Summer	Summer
	Dosemeters received by coordinator from the irradiation laboratories	end- August	end- August
	Dosemeters sent back to IMSs for readout Instructions to the IMSs on the platform	15-sept	15-sept
	Deadline for IMS to upload results	15th Oct	15th Oct
2023	Draft report (certificate) including final and reference results available for download on the online platform	15 Nov	<i>15th Jan</i>
	Deadline to confirm results by IMSs	15 Dec	<i>15th Feb</i>
	Participants' meeting Certificates of Participation given to IMSs	EURADOS AM 2023	EURADOS AM 2023
	Download of Certificate of Participation via online platform available + Certificates of Participation to IMSs via posta mail		1 week more after AM
2024-25	EURADOS Report + publications	2024-25	2024-25



IC2022n inter-lab comparison exercise: overview

Certificate of Participation

- The IMS can use the Certificate of Participation to show compliance with the stated performance to its customers and/or with technical standards requirements.

European Radiation Dosimetry Group **EURADOS**

European Radiation Dosimetry Group • P.O. Box 1129 • D-37191 Neustadt, Germany | Certificate of Participation EURADOS-2022n-SXXX

Certificate of Participation

in the EURADOS Interlaboratory Comparison 2022 for whole-body neutron dosimeters

Certificate number: EURADOS-2022n-SXXX
Number of pages: 3
Date of issue: 2nd June, 2023
Participating institute: Name and address of the IMS
Dosimetry system: SXXX (system code) - description dosimetry system
Requested a priori information: YES

Intercomparison procedure: The EURADOS Interlaboratory Comparison 2022 for whole-body neutron dosimeters (IC2022n) was managed and coordinated on behalf of EURADOS by the WGD Intercomparison Organization Group for neutron dosimetry (OGn). The OGN established the irradiation plan and announced the intercomparison, including the range limits of the doses and radiation qualities, in December 2021. On the application form candidate participants were asked to indicate details of the dosimeter, including its reference point and whether or not their system will need a priori information on the neutron field. After completing subscription procedures, the participant sent its dosimeters to the OGN Coordinator (May 2022). Each participant provided 44 dosimeters: 28 dosimeters were irradiated, 8 were kept as spares and 8 were transit controls. The Coordinator sent all dosimeters, along with the instructions to two irradiation laboratories. Each laboratory irradiated a certain number of dosimeters according to the irradiation plan and thereafter returned all dosimeters to the Coordinator (August-September 2022). The Coordinator requested confirmation on the next of a priori information and thereafter returned the dosimeters to the participant for assessment (September 2022). Non-irradiated dosimeters were clearly indicated. The participant was instructed to follow normal routine procedures as much as possible. Those participants, who indicated a need to receive a priori information on the radiation fields for their evaluation procedure (YES), were provided the following description: (i) bare radionuclide source, and (ii) radionuclide source, significantly moderated. All other participants ("NO") received no information on the radiation fields. The participant was required to submit the results of the dosimeter readings in terms of $H_p(10)$ to the Coordinator within one month after receiving the dosimeters, using an online response form provided by the Organization Group (October 2022). After receipt of results from all participants, the Coordinator informed of the reference values for $H_p(10)$ along with detailed information of the radiation fields (January 2023).

Note 1: The irradiation plan of the IC2022n exercise might not fully be within the scope of the dosimetry system tested.
Note 2: Four dosimeters were used to test for false positive response. This specific test was performed as a matter of scientific point of view. The corresponding dosimeters were not considered for the evaluation of dosimetry system performance.

Number of participants: 29 organizations participated in EURADOS IC2022n with a total of 31 dosimetry systems.
Irradiation data: See attached certificates of the irradiation laboratories.
 Reference Nos: EURADOS_IC2022n_E-4-2021-1-21_SXXX and CN-22-XXXX.

Intercomparison results: See table on page 2 of this Certificate.

On behalf of the IC2022n Organization Group: On behalf of EURADOS:
 Marie-Anne CHEVALLIER Filip VANHAVERE
 Coordinator Chairperson

European Radiation Dosimetry Group **EURADOS**

European Radiation Dosimetry Group • P.O. Box 1129 • D-37191 Neustadt, Germany | Certificate of Participation EURADOS-2022n-SXXX

Result of the intercomparison:

SXXX/OGn-1 Code	Irradiation Laboratory	H _p (10) Reference value (mSv)	A priori/Field information	Radiation field	H _p (10) Participant's value (mSv)	Remark of participant	Ratio (Participant's value / Reference value)
1000-2022-01	RSN	0.00	Bare radionuclide source	None (7-252 source at 0)	0.00		1.00
1000-2022-02	RSN	0.00	Bare radionuclide source	None (7-252 source at 0)	0.00		1.00
1000-2022-03	RSN	0.00	Not irradiated	Not irradiated	0.00		0.00
1000-2022-04	RSN	0.30	Bare radionuclide source	None (7-252 source at 0)	0.30		1.00
1000-2022-05	RSN	0.30	Bare radionuclide source	None (7-252 source at 0)	0.30		1.00
1000-2022-06	RSN	0.30	Bare radionuclide source	Not irradiated (SNAP)	0.00		0.00
1000-2022-07	RSN	1.00	Bare radionuclide source	None (see the remark at 0)	1.00		1.00
1000-2022-08	PTB	0.00	Not irradiated	Not irradiated	0.00		0.00
1000-2022-09	RSN	1.00	Bare radionuclide source	None (see the remark at 0)	1.00		1.00
1000-2022-10	RSN	0.00	Bare radionuclide source	None (7-252 source at 0)	0.00		0.00
1000-2022-11	PTB	0.00	Not irradiated	Not irradiated	0.00		0.00



IC2022n inter-lab comparison exercise: overview

Conclusions

- 3rd neutron dosimetry intercomparison within EURADOS organized 5 years after the first one as planned
- 2nd time online platform was used for the neutron intercomparison
- 1 irradiation with mixed field
- 1-step procedure for delivering results was chosen instead of a 2-step procedure
- additional simplified *a priori* information on the energy distribution was given only to those participants who stated that they need it
- number of participating systems was almost the same as in IC2012n and IC2017n (IC2012n: 34 systems \leftrightarrow IC2017n: 33 systems $\leftarrow \rightarrow$ IC2022: 31 systems)
- 10 IMSs participated for the 1st time, 15 IMSs for the 3rd time

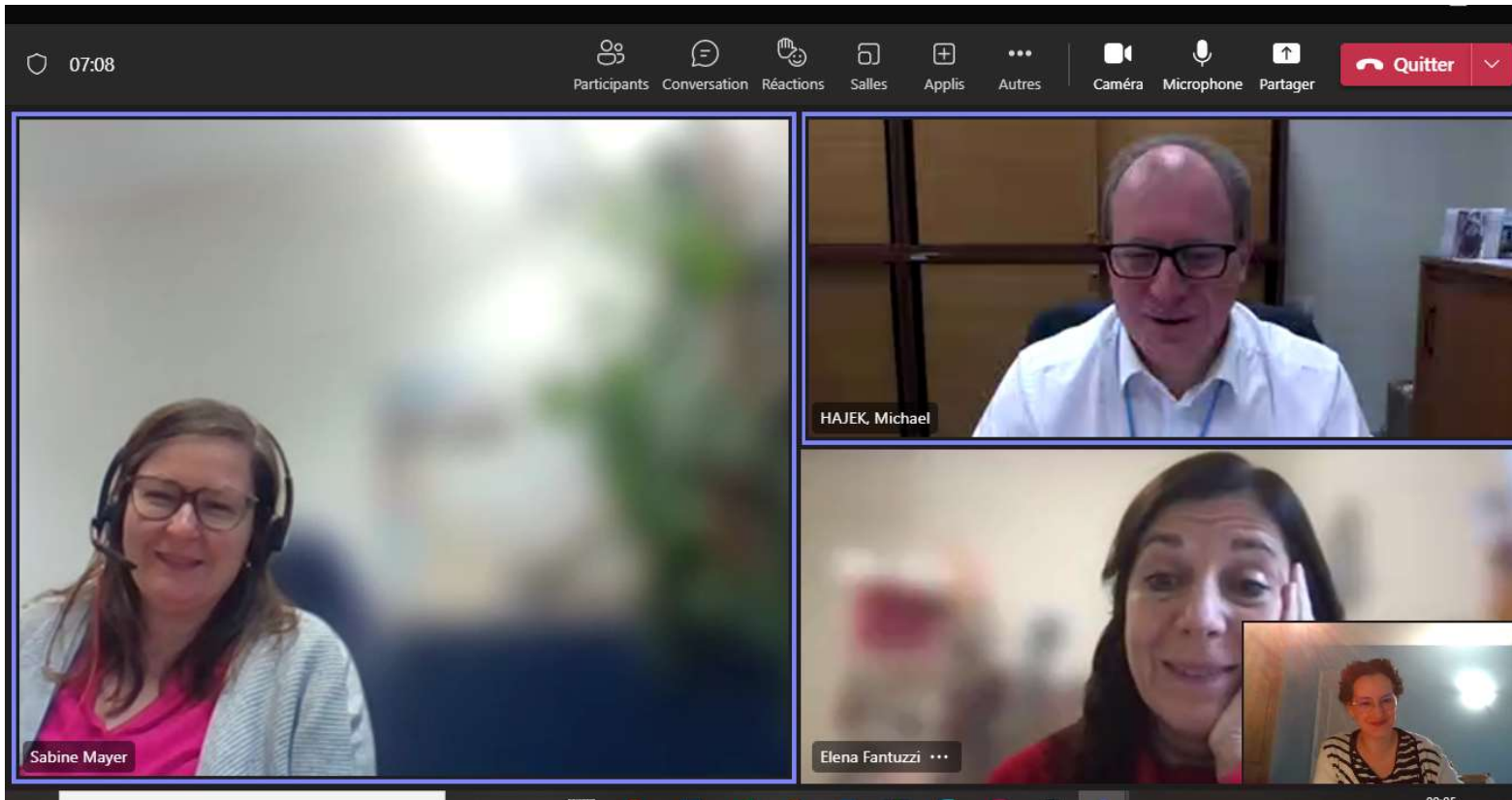
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Conclusions (bis)

- Exercises such as IC2017n are **important for informing the radiation protection community** about the **present state of the art** in neutron dosimetry.
- They **unearth potential difficulties** and provide the dosimetry services with opportunities **to demonstrate the capabilities of their doseimeters** and any recent improvements they have made.

IC2022n inter-lab comparison exercise: overview

During all IC process: many online meetings



EURADOS

IC2022n inter-lab comparison exercise

Thank you!

Please let us know your suggestions or claims
by e-mail to:

ic2022n@eurados-intercomparison.org

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