EURADOS European Radiation Dosimetry Group

Whole body dosemeter intercomparison IC2022ph

Certificate of Participation

for the EURADOS Intercomparison 2022 for whole body dosemeters (IC2022ph)

Certificate Number:	EURADOS-IC2022ph-S050 for system S050/2022
Number of pages:	4
Date of Issue:	July 07th, 2023
Participating Institute:	TECNORAD s.u.r.l., Italy
Dosimetry System:	Green Film
Reporting number:	111 (this anonymous number will be used in further publications)
Intercomparison procedure:	The EURADOS Intercomparison 2022 for whole body dosemeters was managed and coordinated on behalf of EURADOS by the WG2 Intercomparison Organization Group (OG). The OG established the irradiation plan and announced the intercomparison, including the range limits of the doses and radiation qualities, in May 2022. Participants were asked to indicate details of the dosemeter reference point on the online application form. After completing application procedures the participants sent their dosemeters, according to the instructions, to the OG coordinator (July 2022). The coordinator checked the correct labelling of the dosemeters and transferred all dosemeters, along with the instructions, to the irradiation laboratory. The laboratory irradiated the dosemeters according to the irradiation plan and sent all the dosemeters back to the coordinator (November 2022). The coordinator then returned the dosemeters to the participants for assessment and indicated which dosemeters were not irradiated. The participants were instructed to follow normal routine procedures as far as possible. The participants then sent the results of the dosemeter readings to the coordinator (January 2023). After receipt of the participants' results, the coordinator sent the irradiation data to the participants.
Number of participants:	96 institutes participated in IC2022ph with a total of 116 systems.
Coordinator:	Christian Gärtner (Seibersdorf Labor GmbH, A-2444 Seibersdorf)
Intercomparison results:	See the tables on pages 2 to 4 of this certificate.
Irradiation data:	See the attached certificate of the irradiation laboratory: Number Dos/2896-050/2022
Participant results:	See the attached signed dose report provided by the participant.

On behalf of the intercomparison Organization Group:

Christian Gärtner
Coordinator

On behalf of EURADOS:

Filip Vanhavere
Chairperson

Whole body dosemeter intercomparison IC2022ph

Result of the Intercomparison (Dosimetry System S050/2022)

EURADOS Dosemeter ID	Participant's Dosemeter ID	Radiation Quality	Quantity	Participant's Value	Reference Value	Ratio
S050/2022–01	S050/2022-01	S-Cs, 0°	$H_p(10)$	2.77 mSv	2.70 mSv	1.02
			$H_p(0.07)$	2.77 mSv	2.70 mSv	1.02
S050/2022–07	S050/2022-07	S-Cs, 0°	$H_p(10)$	2.72 mSv	2.70 mSv	1.01
			$H_p(0.07)$	2.72 mSv	2.70 mSv	1.01
S050/2022–12	S050/2022-12	S-Cs, 0°	$H_p(10)$	2.76 mSv	2.70 mSv	1.02
			$H_p(0.07)$	2.76 mSv	2.70 mSv	1.02
S050/2022–27	S050/2022-27	S-Cs, 0°	$H_p(10)$	2.85 mSv	2.70 mSv	1.06
			$H_p(0.07)$	2.85 mSv	2.70 mSv	1.06
S050/2022–06	S050/2022-06	S-Cs, 0°	$H_p(10)$	9.16 mSv	8.80 mSv	1.04
			$H_p(0.07)$	9.16 mSv	8.80 mSv	1.04
S050/2022–17	S050/2022-17	S-Cs, 0°	$H_p(10)$	9.34 mSv	8.80 mSv	1.06
			$H_p(0.07)$	9.34 mSv	8.80 mSv	1.06
S050/2022–04	S050/2022-04	S-Co, 0°	$H_p(10)$	9.58 mSv	8.50 mSv	1.13
			$H_p(0.07)$	9.75 mSv	8.65 mSv	1.13
S050/2022–15	S050/2022-15	S-Co, 0°	$H_p(10)$	9.48 mSv	8.50 mSv	1.12
			$H_p(0.07)$	9.65 mSv	8.65 mSv	1.12
S050/2022–11	S050/2022-11	S-Co, 0°	$H_p(10)$	127.10 mSv	122.00 mSv	1.04
			$H_p(0.07)$	129.40 mSv	124.10 mSv	1.04
S050/2022–13	S050/2022-13	S-Co, 0°	$H_p(10)$	126.70 mSv	122.00 mSv	1.04
			$H_p(0.07)$	128.90 mSv	124.10 mSv	1.04

Result of the Intercomparison (Dosimetry System S050/2022), continued

EURADOS Dosemeter ID	Participant's Dosemeter ID	Radiation Quality	Quantity	Participant's Value	Reference Value	Ratio
S050/2022–16	S050/2022-16	S-Co, 0°	$H_p(10)$	258.10 mSv	281.00 mSv	0.92
			$H_p(0.07)$	262.60 mSv	285.90 mSv	0.92
S050/2022–23	S050/2022-23	S-Co, 0°	$H_p(10)$	261.70 mSv	281.00 mSv	0.93
			$H_p(0.07)$	266.20 mSv	285.90 mSv	0.93
S050/2022–02	S050/2022-02	N-40, 0°	$H_p(10)$	5.74 mSv	5.57 mSv	1.03
			$H_p(0.07)$	6.08 mSv	5.89 mSv	1.03
S050/2022–18	S050/2022-18	N-40, 0°	$H_p(10)$	5.60 mSv	5.57 mSv	1.01
			$H_p(0.07)$	5.92 mSv	5.89 mSv	1.01
S050/2022–05	S050/2022-05	N-40 + S-Cs mixed, 0°	$H_p(10)$	3.87 mSv	3.40 mSv	1.14
			$H_p(0.07)$	3.98 mSv	3.50 mSv	1.14
S050/2022–08	S050/2022-08	N-40 + S-Cs mixed, 0°	$H_p(10)$	3.84 mSv	3.40 mSv	1.13
			$H_p(0.07)$	3.95 mSv	3.50 mSv	1.13
S050/2022–03	S050/2022-03	W-80, 0°	$H_p(10)$	6.56 mSv	6.30 mSv	1.04
			$H_p(0.07)$	6.08 mSv	5.84 mSv	1.04
S050/2022–28	S050/2022-28	W-80, 0°	$H_p(10)$	6.65 mSv	6.30 mSv	1.06
			$H_p(0.07)$	6.16 mSv	5.84 mSv	1.05
S050/2022–09	S050/2022-09	W-80, 60°	$H_p(10)$	5.20 mSv	5.90 mSv	0.88
			$H_p(0.07)$	4.89 mSv	6.37 mSv	0.77
S050/2022–10	S050/2022-10	W-80, 60°	$H_p(10)$	5.22 mSv	5.90 mSv	0.88
			$H_p(0.07)$	4.90 mSv	6.37 mSv	0.77

Result of the Intercomparison (Dosimetry System S050/2022), continued

EURADOS Dosemeter ID	Participant's Dosemeter ID	Radiation Quality
S050/2022–14	S050/2022-14	not irradiated
S050/2022–19	S050/2022-19	not irradiated
S050/2022–20	S050/2022-20	not irradiated
S050/2022–21	S050/2022-21	not irradiated
S050/2022–22	S050/2022-22	not irradiated
S050/2022–24	S050/2022-24	not irradiated
S050/2022–25	S050/2022-25	not irradiated
S050/2022–26	S050/2022-26	not irradiated
S050/2022–29	S050/2022-29	not irradiated
S050/2022–30	S050/2022-30	not irradiated

Radiation Qualities and average photon energy (according to ISO 4037-1 and IEC 61267):

- Nuclide Radiation:
  - S-Cs: 662 keV
  - S-Co: 1250 keV
- X-Rays:
  - N-40: 33 keV
  - W-80: 56.5 keV

Calibrations
Cert. No 116(6)

HELLENIC REPUBLIC
MINISTRY OF DEVELOPMENT AND INVESTMENTS
GENERAL SECRETARIAT FOR RESEARCH & INNOVATION

EEAE ΕΛΛΗΝΙΚΗ ΕΠΙΤΡΟΠΗ ΑΤΟΜΙΚΗΣ ΕΝΕΡΓΕΙΑΣ GREEK ATOMIC ENERGY COMMISSION

Ag. Paraskevi, 19/05/2023
Our Ref: B/428/11274

IONIZING RADIATION CALIBRATION LABORATORY
Affiliated to the Hellenic Metrology Institute

IRRADIATION CERTIFICATE No: Dos/2896- 050/2022

Number of Pages: 2
Date of Issue: 24/05/2023

The following personnel dosimeters from:	**EURADOS INTERCOMPARISON PROGRAM SYSTEM No:S050/2022**

have been irradiated at the ***Ionizing Radiation Calibration Laboratory of Greek Atomic Energy Commission:***

Personal Dosemeters (PD):	**Whole body**
Dosemeter Identification:	-
Detection Principle:	-
Irradiation Period:	**See below**

The Kair reference values have been obtained using the secondary standards ionization chambers PTW W-32002-LS01 (S/N: 69) or FC65-G (S/N: 634) and the electrometer PTW UNIDOS 10002 (S/N 20314). The LS01 chamber was calibrated in PTB during 06 & 07-03-2019 (PTB, Cal. Cert. No PTB-6.3-4094018). The FC65-G chamber was calibrated at BIPM on 24-04-2019 (BIPM, Cal. Cert. No 25).
The irradiation conditions are in accordance to ISO 4037/1-2-3-4 and IEC 62387.

Irradiation conditions

Phantom:	ISO water phantom, (30x30x15) cm^3
Source to PD Distance:	100-300 cm, depending on required Kair rate
Kair Rate:	S-Cs: 454.3 μGy/min (at 100 cm) W-80: 2.63 mGy/min (at 200 cm) N-40: 203.7 μGy/ min (at 200 cm) S-Co: 145.5 mGy/min (at 100 cm) S-Co: 18.6 mGy/min (at 300 cm) S-Co: 0.90 mGy/min (at 300 cm with lead block)
Field Size:	S-Cs: Circular with diameter of 55.6 cm (at 200 cm) x-rays: Circular with diameter 26.8 cm (at 200 cm) S-Co: Rectangular (30x30) cm^2 (at 300 cm)
Build up PMMA:	(0.3 x 30x30) cm^3
Reference point of PD:	Frontal surface of slab phantom

Environmental conditions during irradiations:

Temperature	Pressure	Relative Humidity
19.0-21.0 °C	981.0-985.0 hPa	10 %

Irradiation Data

# Dosemeter	Date	Quality	$H_p(10)$ mSv	U %[1]	$H_p(0.07)$ mSv	U %[1]
S050-12	09/09/2022	S-Cs	2.70	4.9	2.70	4.9
S050-27	09/09/2022	S-Cs	2.70	4.9	2.70	4.9
S050-07	09/09/2022	S-Cs	2.70	4.9	2.70	4.9
S050-01	09/09/2022	S-Cs	2.70	4.9	2.70	4.9
S050-06	30/08/2022	S-Cs	8.80	4.9	8.80	4.9
S050-17	30/08/2022	S-Cs	8.80	4.9	8.80	4.9
S050-04	16/11/2022	S-Co	8.50	4.9	8.65	4.9
S050-15	16/11/2022	S-Co	8.50	4.9	8.65	4.9
S050-11	22/09/2022	S-Co	122	4.9	124	4.9
S050-13	22/09/2022	S-Co	122	4.9	124	4.9
S050-16	30/08/2022	S-Co	281	4.9	286	4.9
S050-23	30/08/2022	S-Co	281	4.9	286	4.9
S050-18	29/09/2022	N-40-(0°)	5.57	5.1	5.89	5.1
S050-02	29/09/2022	N-40-(0°)	5.57	5.1	5.89	5.1
S050-28	04/11/2022	W-80-(0°)	6.30	5.1	5.84	5.1
S050-03	04/11/2022	W-80-(0°)	6.30	5.1	5.84	5.1
S050-09	10/11/2022	W-80-(60°)	5.90	5.3	6.37	5.3
S050-10	10/11/2022	W-80-(60°)	5.90	5.3	6.37	5.3

# Dosemeter	Date	Quality	$H_p(10)$ mSv	U %[1]	$H_p(0.07)$ mSv	U %[1]
S050-05	12/09/2022	Cs-137	1.60	4.9 %	1.60	4.9 %
	14/10/2022	N-40	1.80	5.1 %	1.90	5.1 %
	Total		3.40	7.1 %	3.50	7.1 %
S050-08	12/09/2022	Cs-137	1.60	4.9 %	1.60	4.9 %
	14/10/2022	N-40	1.80	5.1 %	1.90	5.1 %
	Total		3.40	7.1 %	3.50	7.1 %

[1]U= uncertainty 95% confidence level (k=2)

Not Irradiated Dosemeters :

S050-14; S050-19;S050-20;S050-21;S050-22; S050-24;S050-25;S050-26; S050-29;S050-30;

Irradiations performed by:

Boziari A., Medical Physicist
Stamatopoulou E., Technician
Askounis P., Physicist

Argiro Boziari
Head of Dosimetry and Calibration Unit

Calibrations Cert. No 116(6)

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General Data

P051/2022, TECNORAD s.u.r.l., 37135 VERONA (Italy)

S050/2022, Green Film

Dose Values

Dosemeter 'S050/2022 - 01':	**Hp(10) dose = 2.765 mSv**
S050/2022-01	**Hp(0.07) dose = 2.765 mSv**
irradiated	**Remark =**
Dosemeter 'S050/2022 - 02':	**Hp(10) dose = 5.744 mSv**
S050/2022-02	**Hp(0.07) dose = 6.076 mSv**
irradiated	**Remark =**
Dosemeter 'S050/2022 - 03':	**Hp(10) dose = 6.557 mSv**
S050/2022-03	**Hp(0.07) dose = 6.075 mSv**
irradiated	**Remark =**
Dosemeter 'S050/2022 - 04':	**Hp(10) dose = 9.584 mSv**
S050/2022-04	**Hp(0.07) dose = 9.751 mSv**
irradiated	**Remark =**
Dosemeter 'S050/2022 - 05':	**Hp(10) dose = 3.868 mSv**
S050/2022-05	**Hp(0.07) dose = 3.976 mSv**
irradiated	**Remark =**
Dosemeter 'S050/2022 - 06':	**Hp(10) dose = 9.162 mSv**
S050/2022-06	**Hp(0.07) dose = 9.162 mSv**
irradiated	**Remark =**
Dosemeter 'S050/2022 - 07':	**Hp(10) dose = 2.719 mSv**
S050/2022-07	**Hp(0.07) dose = 2.719 mSv**
irradiated	**Remark =**
Dosemeter 'S050/2022 - 08':	**Hp(10) dose = 3.843 mSv**
S050/2022-08	**Hp(0.07) dose = 3.950 mSv**
irradiated	**Remark =**
Dosemeter 'S050/2022 - 09':	**Hp(10) dose = 5.201 mSv**
S050/2022-09	**Hp(0.07) dose = 4.887 mSv**
irradiated	**Remark =**
Dosemeter 'S050/2022 - 10':	**Hp(10) dose = 5.216 mSv**
S050/2022-10	**Hp(0.07) dose = 4.902 mSv**
irradiated	**Remark =**

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General Data

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S050/2022, Green Film

Dose Values, continued

Dosemeter 'S050/2022 - 11':	**Hp(10) dose = 127.100 mSv**
S050/2022-11	**Hp(0.07) dose = 129.400 mSv**
irradiated	**Remark =**
Dosemeter 'S050/2022 - 12':	**Hp(10) dose = 2.756 mSv**
S050/2022-12	**Hp(0.07) dose = 2.756 mSv**
irradiated	**Remark =**
Dosemeter 'S050/2022 - 13':	**Hp(10) dose = 126.700 mSv**
S050/2022-13	**Hp(0.07) dose = 128.900 mSv**
irradiated	**Remark =**
Dosemeter 'S050/2022 - 14':	**Hp(10) dose = 0.000 mSv**
S050/2022-14	**Hp(0.07) dose = 0.000 mSv**
not irradiated	**Remark = Background; 0.218 mSv**
Dosemeter 'S050/2022 - 15':	**Hp(10) dose = 9.480 mSv**
S050/2022-15	**Hp(0.07) dose = 9.645 mSv**
irradiated	**Remark =**
Dosemeter 'S050/2022 - 16':	**Hp(10) dose = 258.100 mSv**
S050/2022-16	**Hp(0.07) dose = 262.600 mSv**
irradiated	**Remark =**
Dosemeter 'S050/2022 - 17':	**Hp(10) dose = 9.341 mSv**
S050/2022-17	**Hp(0.07) dose = 9.341 mSv**
irradiated	**Remark =**
Dosemeter 'S050/2022 - 18':	**Hp(10) dose = 5.598 mSv**
S050/2022-18	**Hp(0.07) dose = 5.922 mSv**
irradiated	**Remark =**
Dosemeter 'S050/2022 - 19':	**Hp(10) dose = 0.000 mSv**
S050/2022-19	**Hp(0.07) dose = 0.000 mSv**
not irradiated	**Remark = Background; 0.221 mSv**
Dosemeter 'S050/2022 - 20':	**Hp(10) dose = 0.000 mSv**
S050/2022-20	**Hp(0.07) dose = 0.000 mSv**
not irradiated	**Remark = Background; 0.217 mSv**

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S050/2022, Green Film

Dose Values, continued

Dosemeter 'S050/2022 - 21':	**Hp(10) dose = 0.000 mSv**
S050/2022-21	**Hp(0.07) dose = 0.000 mSv**
not irradiated	**Remark = Background; 0.228 mSv**
Dosemeter 'S050/2022 - 22':	**Hp(10) dose = 0.000 mSv**
S050/2022-22	**Hp(0.07) dose = 0.000 mSv**
not irradiated	**Remark = Background; 0.187 mSv**
Dosemeter 'S050/2022 - 23':	**Hp(10) dose = 261.700 mSv**
S050/2022-23	**Hp(0.07) dose = 266.200 mSv**
irradiated	**Remark =**
Dosemeter 'S050/2022 - 24':	**Hp(10) dose = 0.000 mSv**
S050/2022-24	**Hp(0.07) dose = 0.000 mSv**
not irradiated	**Remark = Background; 0.190 mSv**
Dosemeter 'S050/2022 - 25':	**Hp(10) dose = 0.000 mSv**
S050/2022-25	**Hp(0.07) dose = 0.000 mSv**
not irradiated	**Remark = Background; 0.189 mSv**
Dosemeter 'S050/2022 - 26':	**Hp(10) dose = 0.000 mSv**
S050/2022-26	**Hp(0.07) dose = 0.000 mSv**
not irradiated	**Remark = Background; 0.203 mSv**
Dosemeter 'S050/2022 - 27':	**Hp(10) dose = 2.849 mSv**
S050/2022-27	**Hp(0.07) dose = 2.849 mSv**
irradiated	**Remark =**
Dosemeter 'S050/2022 - 28':	**Hp(10) dose = 6.648 mSv**
S050/2022-28	**Hp(0.07) dose = 6.160 mSv**
irradiated	**Remark =**
Dosemeter 'S050/2022 - 29':	**Hp(10) dose = 0.000 mSv**
S050/2022-29	**Hp(0.07) dose = 0.000 mSv**
not irradiated	**Remark = Background; 0.224 mSv**
Dosemeter 'S050/2022 - 30':	**Hp(10) dose = 0.000 mSv**
S050/2022-30	**Hp(0.07) dose = 0.000 mSv**
not irradiated	**Remark = Background; 0.201 mSv**

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S050/2022, Green Film

Dose Values, continued

Transit dose: **Hp(10) dose = 0.208 mSv**

Remark =

TECNORAD
PERSONAL DOSIMETRY SERVICE
TECNORAD S.r.l. e Socio Unico
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Signature | DANIELE BONAMINI Name | 21/01/2023 Date